REGIONAL WATER SUPPLY PLAN

for

Town of Culpeper, Virginia
and
County of Culpeper, Virginia

DRAFT
May 2011

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Background

On November 2, 2005 the State Water Control Board adopted changes to the Code of Virginia, Title 9 VAC 25-780, Local and Regional Water Supply Planning to incorporate a regulation establishing a planning process and criteria that all local governments will use in the development of local or regional water plans. These plans will be reviewed by the Department of Environmental Quality and a determination will be made by the State Water Control Board on whether the plans comply with this regulation. Within 5 years of the compliance determination by the board, the plan will be reviewed to assess adequacy and significant changes will require the submission of an amended plan and review by the board. All local programs will be reviewed, revised and resubmitted to the Department of Environmental Quality every 10 years after the last approval.

At its August 11, 2009 Council Meeting, and subsequent September 1, 2009 Board of Supervisors Meeting, Town Council and the Board of Supervisors approved resolutions in accordance with 9 VAC 25-780 Local and Regional Water Supply Planning stating that both jurisdictions intends to participate within a water supply planning region consisting of the Town of Culpeper and Culpeper County. This regional water supply plan must be submitted no later than November 2, 2011.

Local governments must adopt a local program as defined in 9 VAC 25-780 including any revisions to comprehensive plans, water supply plans, and other local authorities necessary to implement the requirements of 9 VAC 25-780-50. A local public hearing consistent with §15.2-1427 of the Code of Virginia is required during the development the local program. The public hearing may be combined with other public hearing that may be required.

The local program shall contain the elements listed below. This information may be derived from existing, readily available information and additional detailed studies shall not be required.

1. A description of existing water sources in accordance with the requirements of 9 VAC 25-780-70;
2. A description of existing water use in accordance with the requirements of 9 VAC 25-780-80;
3. A description of existing water resource conditions in accordance with the requirements of 9 VAC 25-780-90;
4. An assessment of projected water demand in accordance with the requirements of 9 VAC 25-780-100;
5. A description of water management actions in accordance with the requirements of 9 VAC 25-110 and 9 VAC 25-780-120;
6. A statement of need in accordance with the requirements of 9 VAC 25-780-130;
7. An alternatives analysis that identifies potential alternatives to address project deficits in water supplies in accordance with the requirements of 9 VAC 25-780-130;
8. 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;
9. A copy of the adopted program documents including any local plans or ordinances or amendments that incorporate the local program elements required by 9 VAC 25-780-50;
10. A resolution approving the plan from each local government that is party to the plan; and
11. A record of the local public hearing, a copy of all written comments and the submitter's response to all written comments received.

To facilitate review, this plan has been indexed into chapters in accordance with the above numbering scheme.

1. Existing Water Source and Use Information for Town of Culpeper

Currently, the Town of Culpeper uses Lake Pelham reservoir as its sole source of water supply. Two other existing reservoirs, Mountain Run Lake and Lake Caynor, are upstream of Lake Pelham in the Mountain Run drainage basin and contribute substantially to the reduction in sediment load entering Lake Pelham (Draper Aden & Associates, 1987). This reduction of sediment results in an increase in the sediment storage life of Lake Pelham.

A 1992 study concluded 100 percent of Lake Caynor's storage volume was dedicated to sediment storage, 50% of Lake Pelham's volume was dedicated to sediment storage, and 13% of Mountain Run Lake's volume was allotted to sediment storage (see Table 1.1, Lake Storage Capacities).

TABLE 1.1

LAKE STORAGE CAPACITIES (ACRE-FEET)

FROM 1992 REPORT

	Water Storage	Sediment Storage	Total Storage
	Acre-ft	Acre-ft	Acre-ft
Lake Pelham	1,000	942	1,942
Mountain Run Lake	531	80	611
Caynor Lake	0	73	73
Catalpa Lake	114	168	282

All four of these lakes are located in the Mountain Run drainage area which is a sub-basin of the Rappahannock River Basin.

1.1 Lake Pelham

Lake Pelham is a man-made impoundment created by an earth dam with a drainage area of 26.2 square miles (including Mt. Run Lake drainage area), located on Mountain Run west of the Town of Culpeper (See Map 1.1, Existing Surface Water Supply). The dam and reservoir were constructed in 1972. Using the total water storage volume for Lake Pelham of 2,004 acre-feet (653 million gallons) and a 100 year sediment storage volume of 100 million gallons, the 2004 Water Supply Master Plan concluded that the safe yield of Lake Pelham was 4.4 MGD based on drought conditions experienced through 2001. Currently there are no withdrawal limitations on Lake Pelham.

The earth dam at Lake Pelham is 37 ft tall (elevation 403.1), with a top width of 14 feet. The current maximum pool elevation is 384.9. An emergency spillway is located at the north abutment of the earth dam. The emergency spillway crest is at elevation 391.2 and the spillway is 300 feet wide. The

emergency spillway discharges to a grass lined channel on a shallow grade that terminates into Mountain Run below the dam. The reservoir volume between the maximum pool elevation of 384.9 and the emergency spillway crest elevation of 391.2 is dedicated for flood containment.

The water intake at the Lake Pelham dam is a concrete tower structure located in the reservoir, behind the centerline of the dam. The structure rises about 3 feet above the normal pool elevation of Lake Pelham. Atop the concrete intake structure, an enclosure houses the intake control valves and gate operators, and the water treatment plant raw water potassium permanganate feed equipment. A footbridge provides pedestrian access to the intake structure from the up-river face of the earth dam.

Reservoir water enters the water intake through two trash racks on opposite walls of the structure. Two slide gates, located at 4 feet and 10 feet below the normal pool elevation control flow entering the water treatment plant raw water pipe. Water is screened before entering the raw water intake pipes. When the gates to the raw water intake pipes are closed, water passes through the intake structure and is released downstream of the dam into Mountain Run.

A four-lane highway, U.S. Route 29, passes over the southern arm of Lake Pelham on an earthen embankment with a culvert crossing which allows the tributary arm of the reservoir to pass under U.S. 29.

1.2 Mountain Run Lake

Mountain Run Lake is a man-made impoundment created by an earth dam with a drainage area of 6.4 square miles, located on a tributary to Mountain Run, west of the Town of Culpeper and upstream of Lake Pelham (See Map 1.1, Existing Surface Water Supply). The dam and reservoir were constructed in 1958. The dam has a reservoir withdrawal valve 10 feet below normal pool elevation that was repaired in 2009 and can be operated to drain the reservoir downstream to Lake Pelham. Mountain Run Lake has a municipal water storage capacity of 173 MG based on record drawings. By opening the withdrawal valve to utilize the municipal water storage capacity of Mountain Run Lake an additional safe yield of 0.7 MGD can be added to the 4.4 MGD of safe yield available in Lake Pelham resulting in a total safe yield of 5.1 MGD.

1.3 Lake Caynor

Lake Caynor is a man-made impoundment created by an earthen dam, located northwest of Mountain Run Lake (See Map 1.1, Existing Surface Water Supply). The dam and reservoir were constructed in 1972. Currently the lake has no water supply structure and the water storage in the lake is not used for water supply. Based on the 1992 Lake Pelham Watershed Study, the reservoir has 73 acre-ft of total storage, of which the entire 73 acre-feet are dedicated for sediment storage (see Table 1.1, Lake Storage Capacities).

1.4 Lake Catalpa

Lake Catalpa is a man-made impoundment created by an earthen dam with a drainage area of 3.99 square miles, located northwest of the Town of Culpeper (See Map 1.1, Existing Surface Water Supply). The dam and reservoir were constructed in 1972. Based on record drawings, the reservoir has a total storage capacity of 1,249 acre-feet, of which 967 acre-ft is dedicated to water storage. The remaining

282 acre-ft is dedicated for water supply and sediment storage (see Table 1). Lake Catalpa currently has no means to transfer water to the Town of Culpeper water treatment plant.

The critical drought period for Mountain Run occurred over a 239 day period from June 28, 1965 to February 15, 1966. If the 282 acre-ft dedicated for water supply of Catalpa Lake were used to provide additional safe yield throughout the 239 day drought period, the results would be a minimal 0.23 MGD increase in safe yield. The water could be transferred from Catalpa Lake to Lake Pelham by 2 miles of 6-inch permanent water line and transfer pumps.

1.5 Town of Culpeper Surface Water Treatment Facility

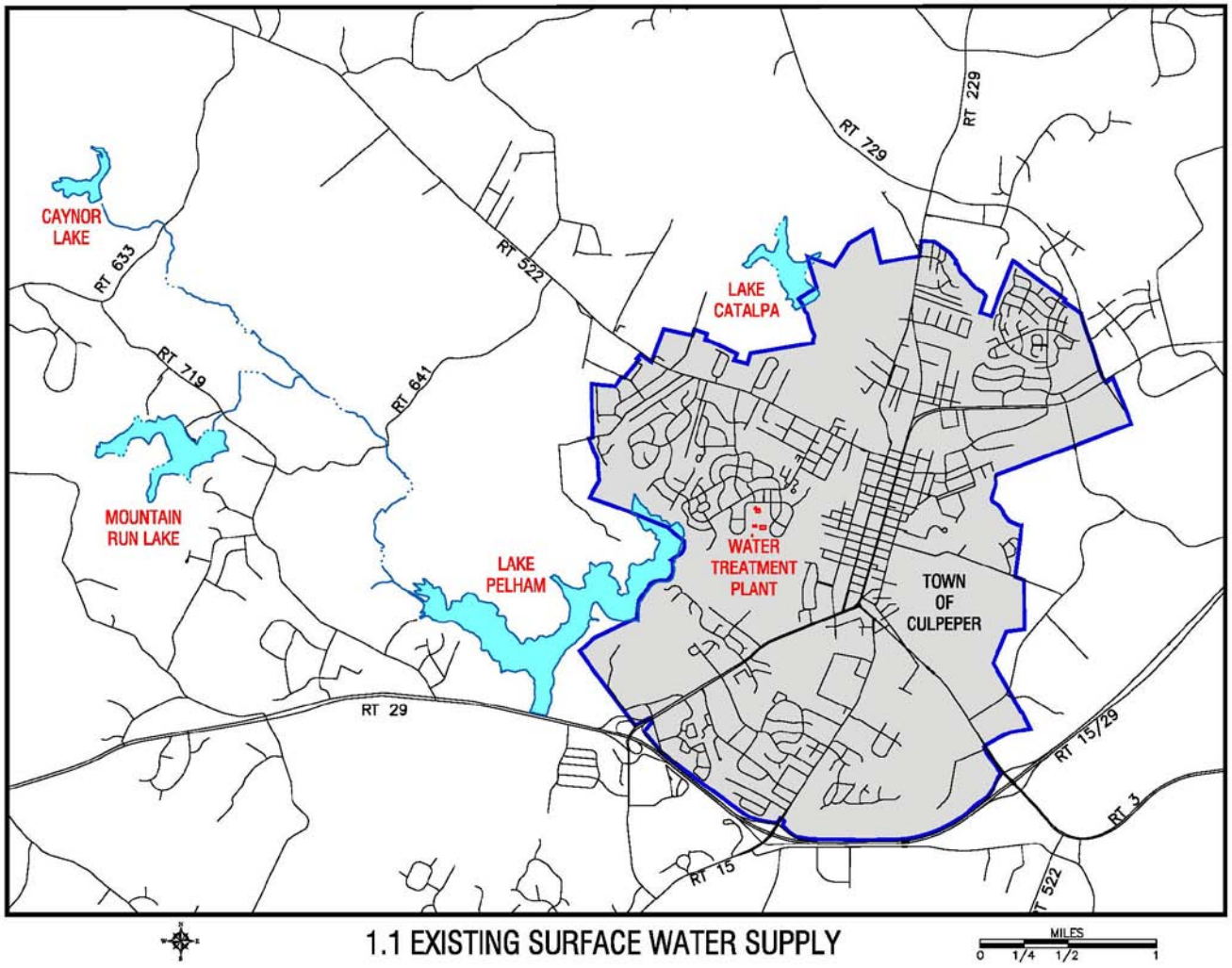
The Town of Culpeper currently has one surface water treatment facility with a rated capacity of 4.0 MGD. The treatment facility includes a raw water pump station, flash mix chamber, two super-pulsator up flow clarifiers, a Greenleaf filter module comprised of four sand dual media filters, finished water clear wells and finished water pump station. The facility currently meets all Virginia Department of Health requirements. Current design capacity for average day and peak day withdrawals from Lake Pelham is 4.0 MGD.

1.6 Self-Supplied Users

The Town of Culpeper is not aware of any self-supplied users of more than 300,000 gallons per month of surface water or ground water from within the Town planning area or from the above mentioned water impoundments. Within the Town planning area approximately 20 residences or businesses are self-supplied. This equates to an estimated population of 50 served by individual wells. Based on a typical residential usage rate of 200 gallons per day per equivalent residential connection the estimated annual average usage for self-supplied users within the planning area is 1.46 million gallons per year. These wells are grandfathered wells within the planning area. Additional Self-supplied users are not anticipated within the planning area due to an ordinance requirement for future water users to connect to the Town of Culpeper system.

A list of self-supplied users for Culpeper County is included in section 2 below.

Map 1.1, Existing Surface Water Supply



2. Existing Water Use Information

2.1 Existing Water Use Information for the Town of Culpeper

The Town of Culpeper currently serves 6,462 customers with an estimated population of 16,379 based on the 2010 Census. The 2010 annual average raw water withdrawal for the Town planning area was 1.96 million gallons per day (MGD) and the maximum daily raw water withdrawal for the Town planning area was 3.01 MGD . The 2010 annual average finished water usage for the Town planning area was 1.73 MGD and the maximum daily finished water usage for the Town planning area was 2.83 MGD. Table 2.1, Monthly Water Usage, includes monthly average and peak data for raw water withdrawals and finished water usage.

Table 2.1
Monthly Water Usage (Town)

2010	Raw Avg (MGD)	Raw Peak (MGD)	Finished Average (MGD)	Finished Peak Day (MGD)
Jan	1.83	2.26	1.59	1.95
Feb	1.75	1.94	1.53	1.74
Mar	1.77	2.37	1.54	2.11
Apr	1.91	2.68	1.67	2.20
May	1.99	2.58	1.77	2.24
Jun	2.08	2.52	1.89	2.32
Jul	2.15	2.99	1.9	2.83
Aug	2.06	2.46	1.82	2.37
Sept	2.12	3.01	1.92	2.51
Oct	1.96	2.62	1.69	2.35
Nov	1.97	2.48	1.76	2.23
Dec	1.9	2.59	1.68	2.31

Current finished water usage is broken down into residential, commercial, industrial, plant backwash and unaccounted for water subcategories. Average water usage for these subcategories is broken down as follows:

Table 2.2
Average Water Usage by Subcategory

Residential	0.85 MGD
Commercial	0.41 MGD
Industrial	0.18 MGD
Plant Backwash	0.23 MGD
Bulk Sales	0.007 MGD
Unaccounted for Water	0.28 MGD

2.2 Existing Water Source and Use Information for Culpeper County

The County of Culpeper manages the following municipal community water systems:

- Clevengers Village (6 wells, to be operational on December 1, 2010),
- Emerald Hill Elementary School (2 wells),
- Industrial Air Park (2 wells),
- Culpeper Sports Complex (1 well currently for nonpotable use) and
- Piedmont Technical Center (1 well).

All of these public systems are groundwater-based and consist of multiple wells. For County systems that were active and supplying finished water, water use data for FY2009 is provided below:

Table 2.3
Monthly Water Usage (County)

	Monthly Totals			Daily Averages		
	Airpark	**Emerald Hill**	**Piedmont**	**Airpark**	**Emerald Hill**	**Piedmont**
7-08	141430	36900	65100	4562.26	1190.32	2100.00
8-08	159440	101100	53100	5143.23	3261.29	1712.90
9-08	110160	135200	81500	3672.00	4506.67	2716.67
10-08	214876	125190	94500	6931.48	4038.39	3048.39
11-08	172594	80120	92700	5753.13	2670.67	3090.00
12-08	165390	86420	119700	5335.16	2787.74	3861.29
1-09	180250	28940	125100	6008.33	964.67	4170.00
2-09	194460	12880	112700	6945.00	460.00	4025.00
3-09	184809	15220	114400	5961.58	490.97	3690.32
4-09	205461	308820	328700	6848.70	10294.00	10956.67
5-09	125238	123190	75800	4174.60	4106.33	2526.67
6-09	122183	94750	81900	3941.39	3056.45	2641.94
7-09	171000	24500	80600	5516.13	790.32	2600.00
Total	**2,147,291**	**1,173,230**	**1,425,800**	**5445.61**	**2970.60**	**3626.14**

Additionally, there are numerous community and non-community water systems that are operational throughout the county. These water systems serve a variety of needs to include industrial process water and water for consumption by residents (see Appendix A for a systems listing as of July 2009). Appendix A also identifies (highlights) water systems in Culpeper County that extract and process more than 300,000 gallons per month. More detailed construction information concerning community and non-community water system wells is provided in Appendix B. The County does not possess specific operational data for community water systems other than what was provided in Appendices A and B.

The County does not have specific information on agricultural, non-agricultural, individual, or domestic/residential wells and has not included this content in this Water Supply Plan.

3. Existing Resource Information

3.1 INTRODUCTION

This chapter covers the minerals, soils and hydrologic resources in Culpeper County. Topography and other development constraints, as well as endangered species are also discussed.
In Culpeper County, the resources we use for our growing needs are plentiful, but limited. The degree to which we can meet these demands depends on the ability of our environment to support them. As the County evolves we intend to preserve and conserve our natural resources through responsible planning.

3.2 SOILS

Soil is the living medium of the earth's surface that helps store water and nutrients and provide habitat. Soil characteristics are determined by (1) the physical and mineralogical composition of the parent material (underlying bedrock), (2) the climate under which the soil has formed or accumulated, (3) the relief or slope of the land, (4) the biologic forces (plant and animal interaction) and (5) the length of time the climatic and biologic forces act upon the soil.

Culpeper County lies entirely within the Piedmont Plateau physiographic province. Physiographic provinces are geologic regions with similar relief, biologic and climatic characteristics. The north, northwest and western portions of the County is known as the Piedmont Uplands and is composed of acid crystalline rock material such as granites, gneisses, basalts and arkosic sandstones. The southeastern part of the County, east of Lignum near the Rapidan-Rappahannock confluence, is also a remnant part of the Piedmont Uplands and is composed of basic metamorphic rock such as sericite shists. The southern and central portion of the County, east of Route 15 to Lignum, is known as the Triassic plain or basin (an old ocean bed) and is composed of sedimentary rock such as shale and sandstone with intrusions of igneous rock. The different rock types determine the physical and chemical composition of the overlying soil types.

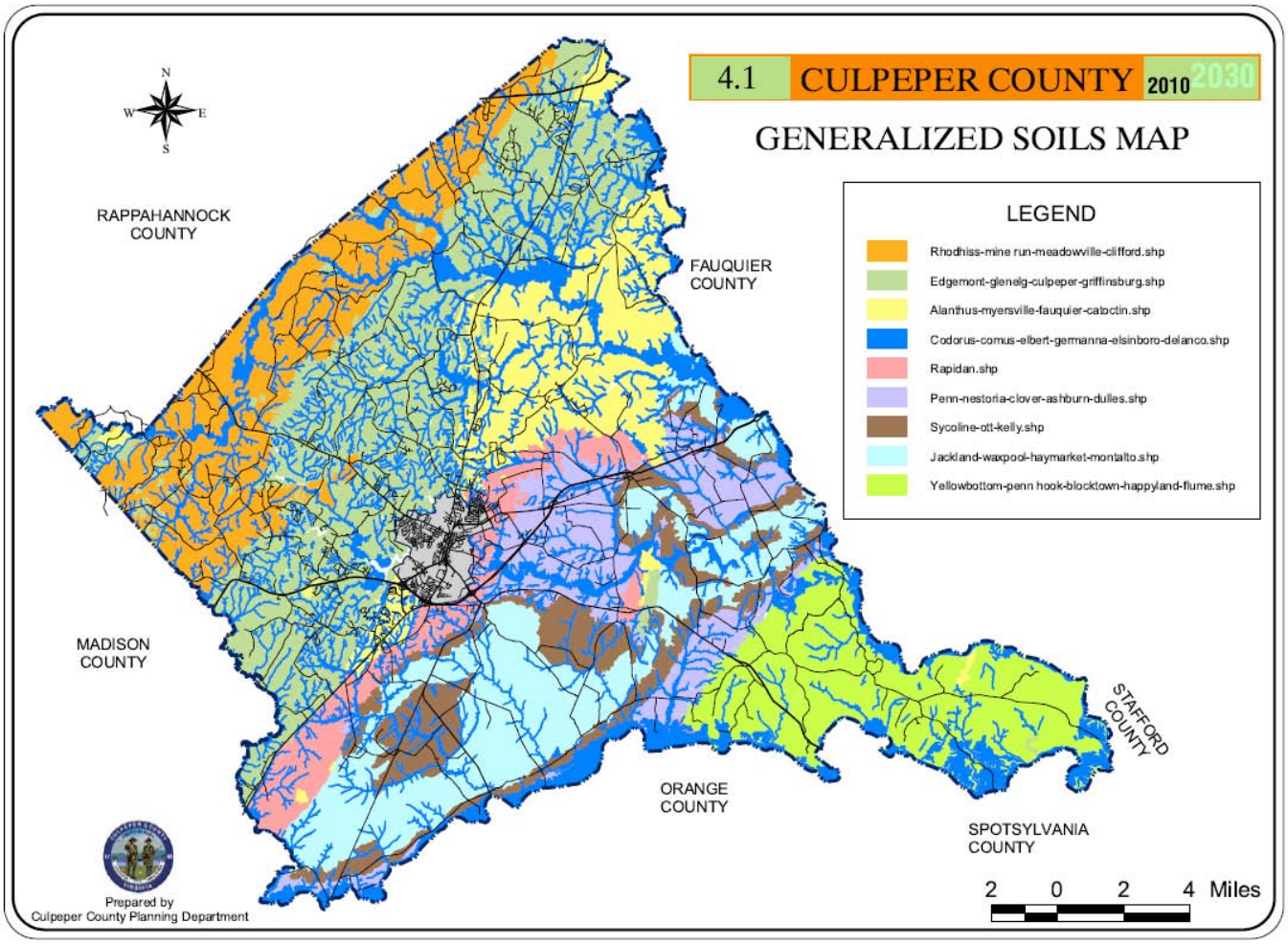
Source: Culpeper County Soil Survey Series. Soil Conservation Service. 1941. No 3.
Many soils found within the County are suitable for agricultural and residential purposes. Soil limitations do exist in some locations; these limitations include steep slopes, susceptibility to wind and water erosion, shallow soil depths, unfavorable soil structure and workability, and permanent wetness problems that hinders farming and septic disposal. All soils require careful management and conservation practices to prevent deterioration in water quality and to maintain and improve soil quality. See table 3.1 and Map 3.1, Generalized Soils Map for a list of soils associated with wetlands and the websoilsurvey.nrcs.usda.gov online for additional soils information.

TABLE 3.1	CULPEPER COUNTY SOILS		
SOIL NAME	**SLOPE CHARACTERISTICS**	**ACRES**	**PERCENT**
Alanthus - Myersville complex	7 to 15 percent slopes	5,326	2.2
Alanthus - Myersville complex	15 to 25 percent slopes	3,726	1.5
Ashburn-Dulles complex	0 to 2 percent slopes	532	0.2
Blocktown-Yellowbottom complex	15 to 25 percent slopes	2,923	1.2
Blocktown-Yellowbottom complex	25 to 45 percent slopes	998	0.4
Cardova-Edgemont complex	7 to 15 percent slopes	365	0.1
Cardova-Edgemont complex	15 to 25 percent slopes	258	0.1
Catoctin -Fletcherville complex	2 to 7 percent slopes	769	0.3
Catoctin-Alanthus complex	7 to 15 percent slopes	2,035	0.8
Catoctin-Alanthus complex	15 to 25 percent slopes	2,063	0.8
Catoctin-Alanthus - Rock Outcrop complex	25 to 45 percent slopes	566	0.2
Clifford loam	2 to 7 percent slopes	2,814	1.1
Clifford loam	7 to 15 percent slopes	3,178	1.3
Clover-Penn complex	0 to 2 percent slopes	2,661	1.1
Clover-Penn complex	2 to 7 percent slopes	1673	0.7
Codorus and Hatboro soils	0 to 2 percent slopes, frequently flooded	1,360	0.6
Codorus and Meadowville soils	2 to 7 percent slopes, occasionally flooded	9,778	4.0
Codorus silt loam	0 to 2 percent slopes, occasionally flooded	6,423	2.6
Comus silt loam	0 to 2 percent slopes, frequently flooded	6,257	2.6
Culpeper sandy loam	2 to 7 percent slopes	5,310	2.2
Delanco-Kinkora complex	0 to 2 percent slopes, rarely flooded	213	*
Dulles-Nestoria complex	0 to 2 percent slopes	3,574	1.5
Dulles-Nestoria complex	2 to 7 percent slopes	1,616	0.7
Edgemont sandy loam	2 to 7 percent slopes	920	0.4
Edgemont-Culpeper complex	7 to 15 percent slopes	14,850	6.1
Edgemont-Culpeper complex	15 to 25 percent slopes	710	0.3
Edgemont-Rixeyville complex	15 to 25 percent slopes, very rocky	7,488	3.1
Edgemont-Rixeyville complex	25 to 45 percent slopes, very rocky	3,426	1.4
Elbert silt loam	0 to 2 percent slopes, occasionally ponded	3,835	1.6
Elsinboro-Delanco complex	2 to 7 percent slopes, rarely flooded	1,861	0.8
Fauquier silt loam	2 to 7 percent slopes	3,478	1.4
Fauquier silt loam	7 to 15 percent slopes	6,289	2.6
Fletcherville-Myersville complex	2 to 7 percent slopes	69	*
Fletcherville-Myersville complex	7 to 15 percent slopes	68	*

Flume loam	2 to 7 percent slopes	825	0.3
Flume-Goldvein complex	7 to 15 percent slopes	375	0.2
Germanna silt loam	2 to 7 percent slopes	2,828	1.2
Germanna silt loam	7 to 15 percent slopes	2,300	0.9
Germanna silt loam	15 to 25 percent slopes	464	0.2
Glenelg silt loam	2 to 7 percent slopes	2,166	0.9
Glenelg silt loam	7 to 15 percent slopes	9,122	3.7
Glenelg-Rixeyville complex	15 to 25 percent slopes	3,923	1.6
Glenelg-Griffinsburg complex	25 to 45 percent slopes	494	0.2
Griffinsburg-Edgemont complex	7 to 15 percent slopes	520	0.2
Griffinsburg-Edgemont complex	15 to 25 percent slopes, very rocky	288	0.1
Griffinsburg-Edgemont complex	25 to 45 percent slopes, very rocky	788	0.3
Halifax gravelly fine sandy loam	2 to 7 percent slopes	106	*
Happyland-Flume complex	15 to 25 percent slopes	643	0.3
Happyland-Mine Run complex	25 to 45 percent slopes	527	0.2
Haymarket-Jackland complex	7 to 15 percent slopes, bouldery	527	0.2
Haymarket silt loam	15 to 25 percent slopes, very bouldery	364	0.1
Haymarket silt loam	25 to 45 percent slopes, extremely bouldery	238	*
Jackland and Haymarket soils	0 to 2 percent slopes	2,150	0.9
Jackland and Haymarket soils	2 to 7 percent slopes	8,539	3.5
Jackland and Haymarket soils	0 to 2 percent slopes, very bouldery	284	0.1
Jackland and Haymarket soils	2 to 7 percent slopes, very bouldery	4,317	1.8
Meadowville loam	7 to 15 percent slopes	1,086	0.4
Minnieville loam	2 to 7 percent slopes	512	0.2
Montalto silty clay loam	2 to 7 percent slopes	387	0.2
Montalto silty clay loam	7 to 15 percent slopes	692	0.3
Montalto silty clay loam	15 to 25 percent slopes	189	*
Ott-Kelly complex	2 to 7 percent slopes	5,406	2.2
Ott-Kelly complex	7 to 15 percent slopes	533	0.2
Penhook silt loam	2 to 7 percent slopes	2,536	1.0
Penhook silt loam	7 to 15 percent slopes	2,120	0.9
Penn-Nestoria complex	0 to 2 percent slopes	1,798	0.7
Penn-Nestoria complex	2 to 7 percent slopes	5,350	2.2
Penn-Nestoria complex	7 to 15 percent slopes	565	0.2
Penn-Nestoria complex	15 to 25 percent slopes	132	*
Pits	quarry	91	*
Rapidan silty clay loam	2 to 7 percent slopes	2,050	0.8
Rapidan-Penn complex	7 to 15 percent slopes,	8,974	3.7

	rocky		
Rapidan-Penn complex	15 to 25 percent slopes, rocky	1,015	0.4
Rapidan-Rock Outcrop complex	25 to 45 percent slopes	293	0.1
Rhodhiss-Mine Run complex	7 to 15 percent slopes	10,788	4.4
Rhodhiss-Mine Run complex	15 to 25 percent slopes	9,535	3.9
Rhodhiss-Mine Run complex	25 to 45 percent slopes	2,750	1.1
Sycoline-Kelly complex	0 to 2 percent slopes	9,695	4.0
Udorthents smoothed-Urbanland	0 to 7 percent slopes	951	0.4
Waxpool silt loam	0 to 2 percent slopes, occasionally ponded	10,827	4.4
Waxpool silt loam	0 to 2 percent slopes, very bouldery, occasionally ponded	1,090	0.4
Yellowbottom loam	2 to 7 percent slopes	2,647	1.1
Yellowbottom loam	7 to 15 percent slopes	10,265	4.2
Yellowbottom-Goldvein complex	2 to 7 percent slopes	848	0.3
Yellowbottom-Milldraper complex	15 to 25 percent slopes	414	0.2
Water		1,961	0.8
TOTAL		**244,700**	**100**

Map 3.1, Generalized Soils Map



3.3 HYDROLOGY

Surface Hydrology

The County of Culpeper lies wholly within the Rappahannock River basin. The County is drained by three major tributaries and their stream networks into the Rappahannock River. The three major tributaries are the Hazel River, which drains the northern portion of the County; Mountain Run, which drains the central portion of the County and consists of several impoundments that were designed as multi-purpose lakes; and the Rapidan River, which drains the southern portion of the County and forms the County's southern boundary. The Rappahannock River itself forms the northern and eastern boundaries of Culpeper County and the confluence of the Rappahannock and Rapidan Rivers border the southeastern tip of the County. The County is also located in the nontidal portion of the Chesapeake Bay Watershed. Approximately 2,075 acres of Culpeper County is covered by lakes, rivers and streams.

The 26 square mile portion of the Mountain Run watershed west of the Town of Culpeper contains Lake Pelham and Mountain Run Lake which serve as the primary water supply sources for the Town of Culpeper. These lakes are also used for recreation, including fishing and boating, although gas engines are prohibited. Mountain Run Lake was completed in 1959 and consists of an earth fill structure approximately 700 feet long and 40 feet high that impounds 611 acre-feet of which 531 acre-feet are reserved for water supply storage and 80-acre feet are reserved for sediment storage. The lake has a surface area of 75 acres. Lake Pelham was completed in 1972 and consists of an earth-fill structure about 1,000 feet long and 38 feet high. The dam impounds 1,942 acre-feet of which 1,000 acre-feet are reserved for water supply and 942 acre-feet are reserved for sediment storage. Lake Pelham has a surface area of 254 acres (Lake Pelham Watershed Management Plan, 1989 Espey, Houston & Associates). There are two additional lakes, Caynor and Merrimac, in the watershed that could possibly be considered for future water supply. These impoundment structures are owned and maintained by the Culpeper Soil and Water Conservation District.

There are 16,542 acres in the drainage area for Lake Pelham, approximately 30% is suburban and 70% is agricultural and forestal. The lakes west of the Town of Culpeper have proved to be an amenity, increasing growth pressures in this area thereby increasing the potential of point and non-point source pollution. To mitigate the adverse environmental impacts of this growth and associated development, the Town and County have developed a watershed management plan that will protect and enhance the water quality conditions within the watershed. This plan led to the adoption of a Watershed Management District (WMD) which is detailed later in this document. See Maps 3.2, Watershed Management District and 3.3, Lake Pelham & Mountain Run Lake Drainage Sub-Area Designations for the watershed and sub-basin boundaries.

Several stream flow-gauging stations are maintained throughout the County. The U.S. Geological Survey publishes the data from these annually (http://va.water.usgs.gov/). Flow information coupled with water quality information can help determine the feasibility of water withdrawals or surface water impoundments along these streams and rivers.

The Virginia Department of Environmental Quality (DEQ) released the Draft 2010 305(b)/303(d) Water Quality Assessment Integrated Report (Integrated Report) on August 23, 2010. The 2010 Integrated Report is a summary of the water quality conditions in Virginia from January 1, 2003, to December 31, 2008. The Virginia Department of Environmental Quality develops and submits this report to the U.S.

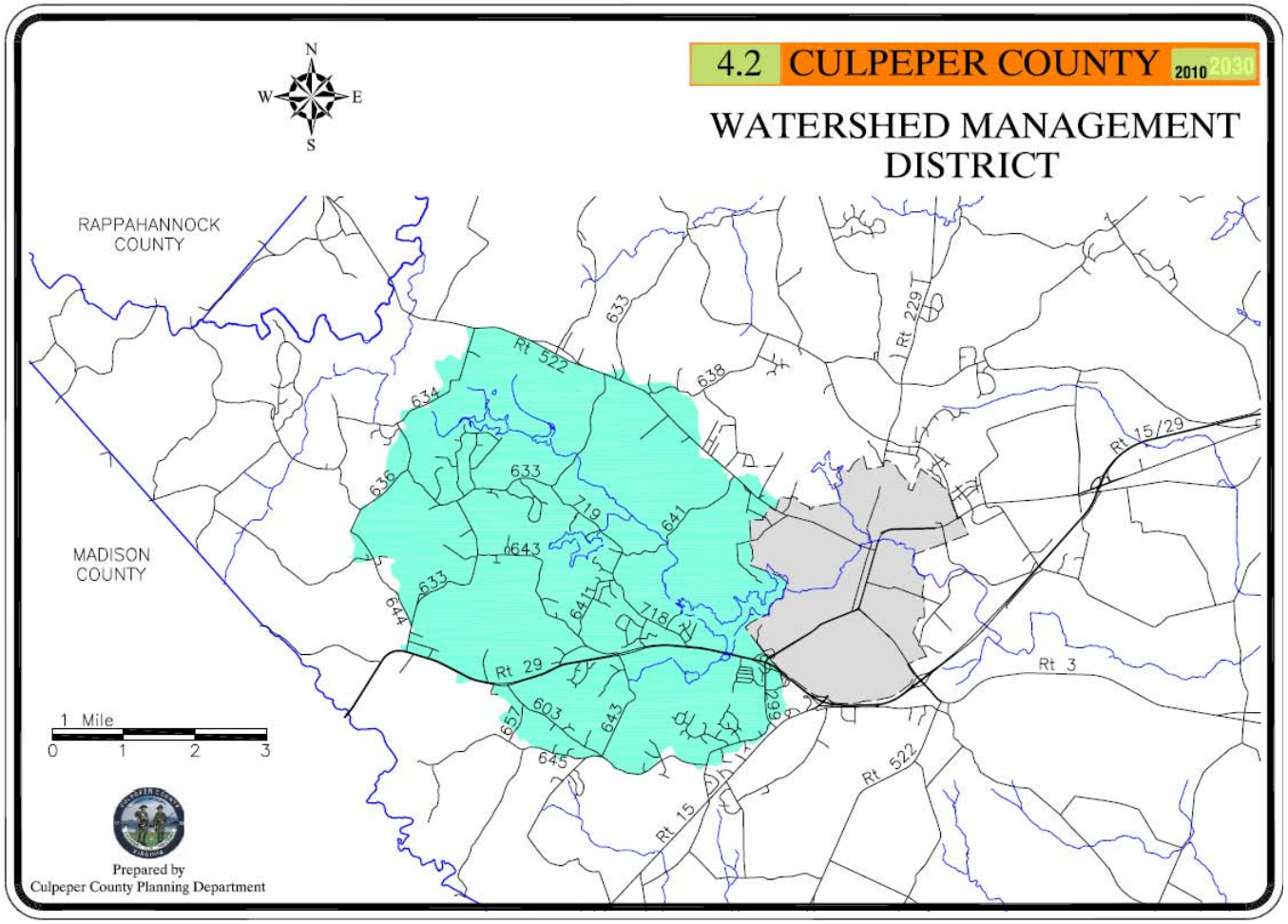
Environmental Protection Agency every even-numbered year. Impaired waters are listed to identify a potential risk to public health and safety. These listed waters require implementing an action plan called a TMDL to improve water quality. There was a number of Culpeper County streams included on this impaired waters list. Table 3.2 lists the stream segments and the impairment of streams within Culpeper County.

Table 3.2 DEQ Integrated Report of Impaired Streams 2010 IMPAIRED WATERS

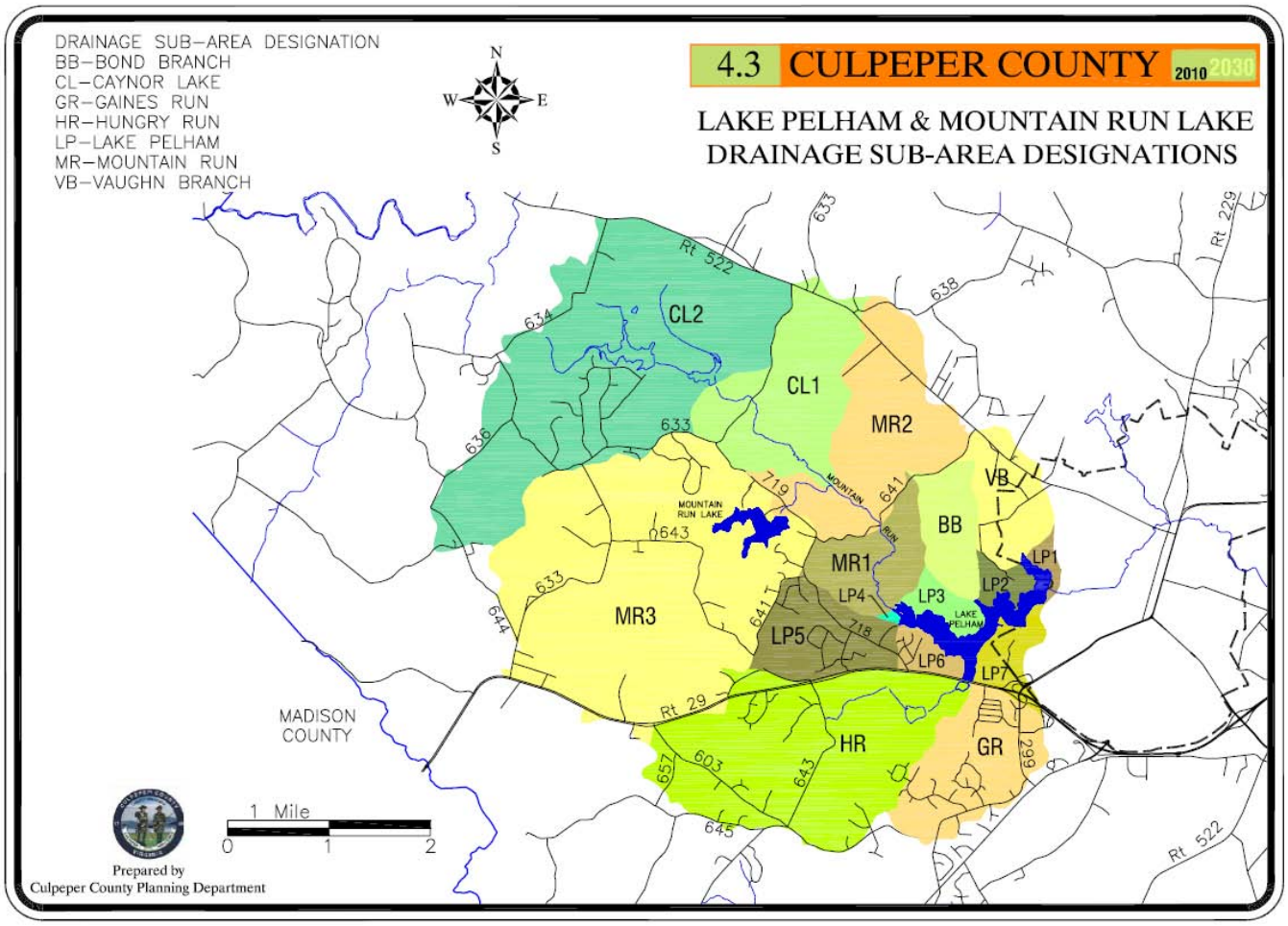
NAME	LOCATION	CAUSE	ORIGINAL LIST YEAR	IMPAIRED MILES
Mountain Run	Segment begins at the Route 15/29 bridge crossing and continuing downstream until the confluence with the Rappahannock River.	Benthic-Macroinvertebrate Bioassessments	2003 2004 2006	19.33
Mountain Run	Segment begins at the Route 15/29 bridge crossing and continuing downstream until the confluence with the Rappahannock River.	PCB in Fish Tissue	2003 2004 2006	19.33
Rapidan River	Segment begins at the confluence with Flat Run and continuing downstream to the confluence with the Rappahannock River	Mercury in Fish Tissue	2006	10.26

Land development which may further impact impaired streams should be required to take additional measures in order to prevent any further degradation.

Map 3.2, Watershed Management District



Map 3.3, Lake Pelham & Mountain Run Lake Drainage Sub-Areas Designations



Geology

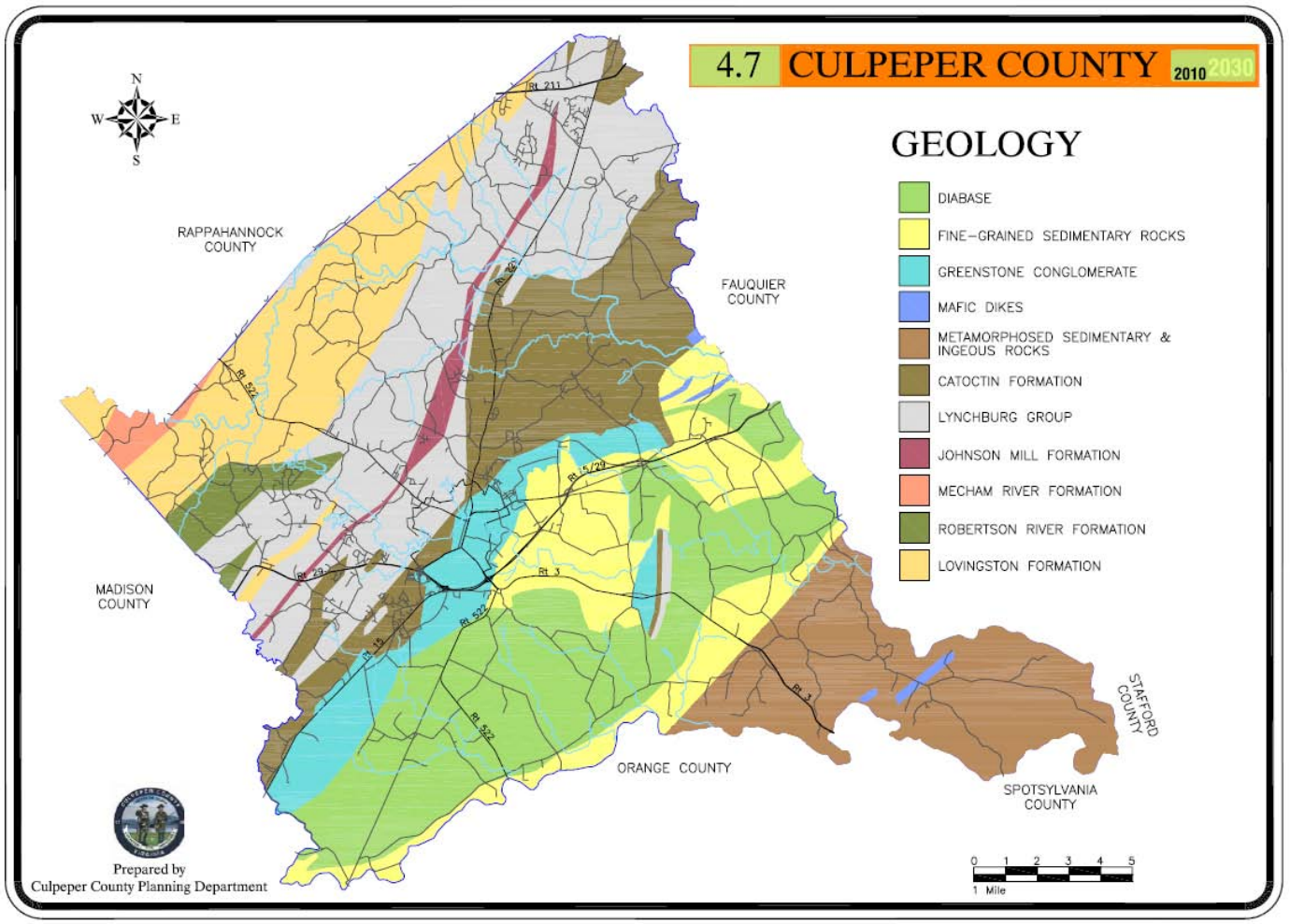
Culpeper County is located within the Northern Piedmont and Blue Ridge Major Land Resource Areas (Land Resource Regions and Major Land Resource Areas of the United States, USDA, NRCS, 1981) and is underlain by igneous, sedimentary, and metamorphic rocks (see Map 3.4, Geology). These areas are bordered by the North Appalachian Ridge Valley to the west and the North Coastal Plain to the east.

The Triassic-Jurassic Basin, also known as the Culpeper Basin, is the dominant feature of Culpeper County's geology and stretches from the mid-eastern portion of the County diagonally to the southern tip (see Map 3.5, Culpeper Basin). The rocks in this basin are Triassic-Jurassic red and brown shales, siltstones, and sandstones intruded by diabase. The types of rocks within this region include sandstone, siltstone, shale, hornfels, diabase, basalt, limited coal seams in some areas, and conglomerate. Groundwater quality in this basin is generally lower because of hardness, acidity, salinity, and iron.

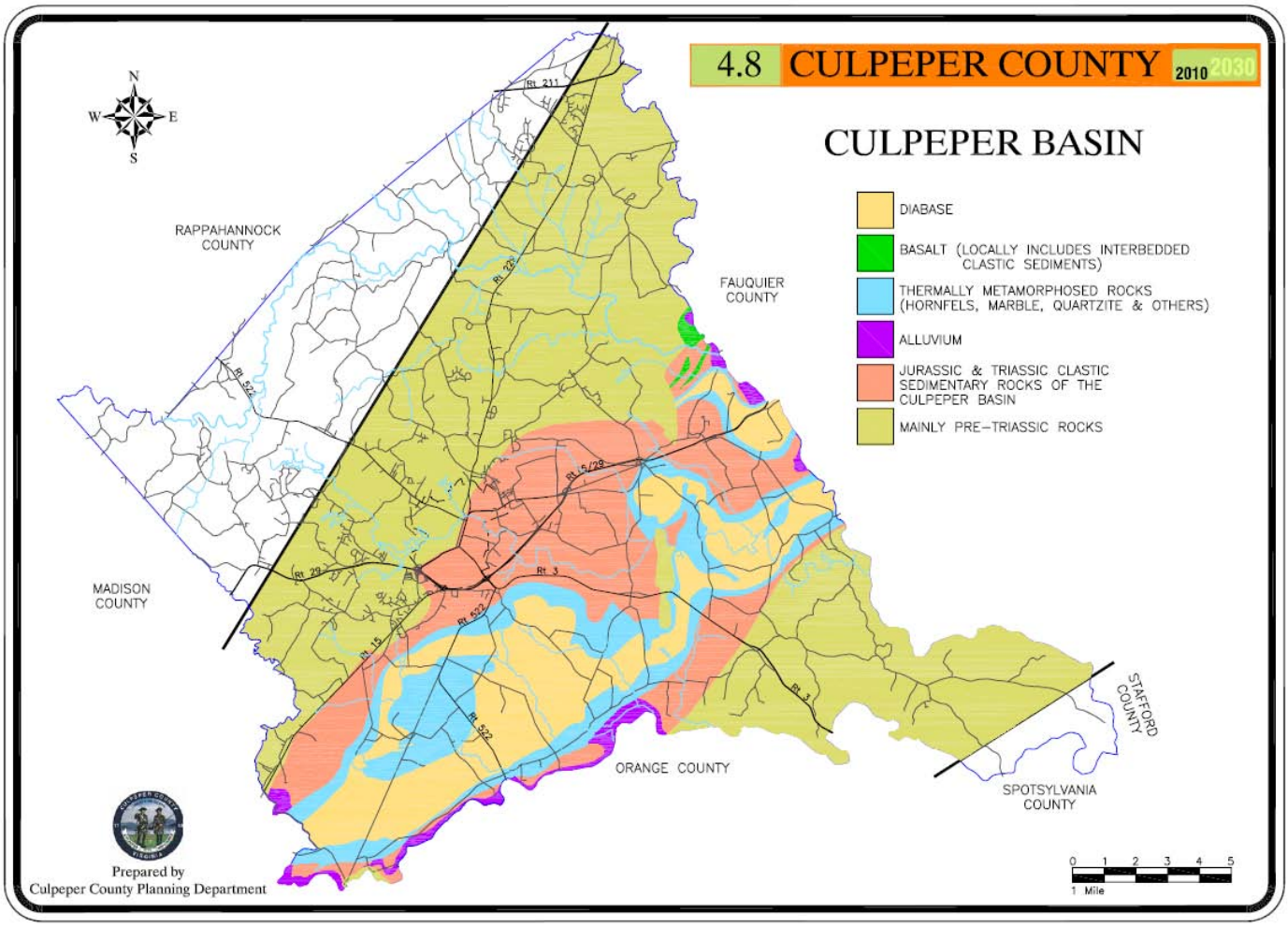
TABLE 3.3 CULPEPER GEOLOGY

GEOLOGIC AGE	ROCK UNITS	DRILLED WELL DATA
JURASSIC	**DIABASE:** Dikes, sills, and thermally-metamorphosed sedimentary rocks which exhibit characteristics similar to diabase and basalt lava flows	43 Wells; Mean Depth = 480' Mode Depth = 450' Mean Static Level = 40' Mean Yield = 3.7 GPM
TRIASSIC	**FINE-GRAINED SEDIMENTARY ROCKS:** Sandstone, Siltstone, Shale and Argillite	77 Wells; Mean Depth = 205' Mode Depth = 180' Mean Static Level = 18' Mean Yield = 16 GPM
TRIASSIC	**GREENSTONE CONGLOMERATE**	66 Wells; Mean Depth = 160' Mode Depth = 150' Mean Static Level = 15' Mean Yield = 40 GPM
LATE PRECAMBRIAN -PALEOZOIC	**MAFIC DIKES:** Metabasalt, Metagabbro, and Meta-Pyroxenite	4 Wells; Mean Depth = 318' Mode Depth = None Mean Static Level = 20' Mean Yield = 28 GPM (1@60)
LATE PRECAMBRIAN -PALEOZOIC	**METAMORPHOSED SEDIMENTARY AND IGNEOUS ROCKS:** Phyllite, Schist, and Gneiss, and Columbia Granite and Quartz DiorIte	78 Wells; Mean Depth = 415' Mean Depth = 390' Mean Static Level = 30' Mean Yield = 4.2 GPM
LATE PROTEROZOIC	**CANDLER FORMATION:** Phyllites, Minor Micaceaus Sandstones and stones, marble, limestone at top of unit	
LATE PROTEROZOIC	**CATOCTIN FORMATION:** Massive Metabasalts and Flow Breccia, Interbedded Arkosic and Graywacke Quartzites	314 Wells; Mean Depth = 465' Mode Depth = 480' Mean Static Level = 20' Mean Yield = 3.6 GPM
LATE PROTEROZOIC	**LYNCHBURG GROUP:** Charlottesville Formation, Fine-Grained Meta-Siltstones and Meta-Arkose; Rockfish Formation, Meta-Graywacke and Meta-Graywacke Conglomerates; Monumental Mills Formation, Meta-Siltstone and Meta-Graywacke; Fauquier Formation, Meta-Arkose and Meta-Arkose Conglomerates	691 Wells; Mean Depth = 265' Mode Depth = 300' (37 Wells) Mean Static Level = 26' Mean Yield = 7.3 GPM
	JOHNSON MILL FORMATION: Carbon-Rich Phyllites and Graphitic Schists. (Well Quality = Poor, Often very high in Iron and Sulpher; Low PH)	104 Wells; Mean Depth = 280' Mode Depth = 230' Mean Static Level = 20' Mean Yield = 5.6 GPM
	MECHUMS RIVER FORMATION: Metamorphosed Sandstones, Arkoses, Schists and Phyllites	6 Wells; Mean Depth = 320' Mode Depth = NONE Mean Static Level = 25' Mean Yield = 6 GPM
MIDDLE PROTEROZOIC	**ROBERTSON RIVER FORMATION:** Granites, Syenites and Sub-Volcanic Felsites	61 Wells; Mean Depth = 327' Mode Depth = 410' (7 WELLS) Mean Static Level = 20' Mean Yield = 6.3 GPM
MIDDLE PROTEROZOIC	**LOVINGSTON COMPLEX:** Flint Hill Gneiss, Amissville Granite and Augen Gneiss	218 Wells; Mean Depth = 362' Mode Depth = 390' Mean Static Level = 37' Mean Yield = 11.3 GPM

Map 3.4, Geology



Map 3.5, Culpeper Basin



Subsurface Hydrology

Culpeper County depends on groundwater for domestic, commercial and industrial use. The Town of Culpeper and several areas adjacent to the Town of Culpeper utilize the Town's water system which is supplied by surface water from Lake Pelham and Mt. Run Lake; otherwise, development is serviced by individual or community wells.

Culpeper County's groundwater lies in two aquifer systems, the Piedmont/Mesozoic basin aquifer (Culpeper Triassic basin) and the Piedmont/Blue Ridge Crystalline aquifer. Culpeper Triassic basin is composed of sedimentary rocks such as shale and sandstone which have good porosity; however, due to compaction and cementation the pores have decreased in size and become poorly interconnected creating confining layers called aquitards. The Culpeper Triassic basin covers 33 square miles or 21,280 acres from Locust Dale to Brandy Station and ranges in depth from 10 feet to 2,000 feet. Groundwater moves primarily along joints, fractures and bedding planes as continuous tabular aquifers, but with poor hydraulic connection between individual aquifers. The water can become perched when encountering a restrictive layer such as a Diabase (or other igneous rock) intrusion in the form of a dike or sill. The water of the Triassic Basin is very hard with large concentrations of dissolved solids such as calcium and magnesium rendering the water basic with a pH of 7.6. The Piedmont/Blue Ridge Crystalline aquifers are composed of intrusive igneous and metamorphic rocks. Groundwater within the crystalline rocks is stored in the pores spaces of the regolith (weathered soil and rocks) and in the fractures of the underlying bedrock. The aquifers tend to be more connected since the groundwater moves in the direction of the fractures, but sustained quantities are highly variable. The water of the Piedmont/Blue Ridge Crystalline aquifers is slightly acidic with a pH of 6.7 producing a much lower hardness level than the Culpeper Triassic basin aquifer.

Groundwater is the primary source of base flow for many streams in the County. Base flow is the part of the stream discharge not attributed to direct runoff from rainfall and snowmelt. The Piedmont/ Blue Ridge Crystalline aquifers account for an average base-flow of 33 to 67 percent of stream flow, whereas the Piedmont/Mesozoic basin aquifer (Culpeper basin) provides an average base-flow of 68 percent of stream flow. The difference in base flow contributions is due to groundwater recharge factors and depth to water table. Groundwater recharge factors include the topography, vegetation and land use practices of the contributing watershed. The depth to water table is dependent on soil type and underlining geology. The groundwater of the Triassic Basin maintains a closer relationship with surface water due to large, flat watersheds and shallow depth to the water table (U.S. Geological Survey, Hydrologic Atlas 730-L. Henry Trapp, Jr. and Marilee A. Horn, 1997).

Groundwater is a vulnerable resource in which its quality is largely determined by how people use the land. Due to Culpeper County's dependence on groundwater, it is imperative that measures are taken to protect this resource. According to the Virginia Water Control Board, the most severe threats to groundwater quality come from leaking surface impoundments used to store, treat and recycle waste products; leaking underground storage tanks; malfunctioning septic tanks and drain fields; improper uses and inadequate design of landfills; and agricultural use of fertilizers and pesticides.

There are several areas in the County that have been associated with potential groundwater contamination. Petroleum products have been identified in several wells along Business Route 15/29 at Inlet. The State Water Control Board studied this area and recommended extending the Town water service to those residences and businesses with contaminated water supplies, which was done in 1994.

A site off Route 706 was identified, and illegally buried barrels of chemicals were discovered and removed. No well contamination resulting from this situation has been identified. The Brandy Station area has water quality problems that result from the combination of malfunctioning drain fields in poor soils and shallow wells.

A groundwater protection program is being developed for the County to insure that this vital and limited resource is protected. This cannot be done effectively without the nature, location, and hydrogeology of the groundwater in the County being fully evaluated. It is essential that a thorough, County-wide groundwater study be completed and that groundwater protection ordinances be developed and implemented. A generalized program for groundwater protection through mandatory and voluntary Best Management Practice (BMP) implementation, recycling programs for used oil and waste reduction in the landfill, household and farm hazardous waste cleanup days, and public education currently seems attainable. In addition, the protection of surface and groundwater quality and quantity must be considered each time a land use change is proposed.

In order to evaluate potential groundwater development sites a study of the bedrock geology, fracture fabric analysis is required to determine the productivity and quality of potential wells. Two distinct geologic provinces underlie the planning area: the Blue Ridge Province and the Culpeper Basin. The two geologic provinces are separated by the east-dipping Triassic Border Fault.

The Blue Ridge Province occupies approximately 20 percent of the Development Area. The Catoctin Formation and the Lynchburg Group are the key rock formations of the Blue Ridge Province in the Development Area. Rocks in both units are considered too be moderately favorable for groundwater resource development. However, the contact between the two units is considered to be a very favorable groundwater source.

The Culpeper Basin occupies 80 percent of the planning area. The Culpeper Basin within the Development Area contains the following rock formations: the Balls Bluff Siltstone, the Mountain Run Member of the Tibbstown Formation, the diabase, and the Thermally Metamorphosed Jurassic Triassic hornfels. Only the Balls Bluff Siltstone is considered to be a good source of groundwater. Groundwater quality from wells in the Balls Bluff Siltstone has been generally good when wells are not excessively deep and do not intersect the hornfels. The hornfels is variable in its ability to produce groundwater, but water quality if often poor.

Although not included in this report, Culpeper County and the Town of Culpeper have been and continue to work with Emery & Garrett Groundwater, Inc. (EGGI) to evaluate the Culpeper County geology to identify future sources of groundwater. EGGI utilizes a six step approach to identify sources of groundwater. In Phase I, existing records are evaluated and site visits are conducted to perform a detailed evaluation of the bedrock geology, delineate fractures, locate contaminant threats and ultimately select favorable Groundwater Development Zones (GDZ's). During Phase II, geophysical investigations are conducted within the GDZ's to identify specific test well drilling targets and rank them from most promising to least promising. During Phase III, the drilling targets are drilled with appropriate yield and water quality testing being performed. Phase IV consists of converting an acceptable test well to a production well. Phase V consists of testing the production well for sustainable yield and water quality with Phase VI consisting of preparing and submitting a final hydrogeologic report. The Town of Culpeper and Culpeper County are currently active in these various stages of groundwater investigation with EGGI. Refer to the Culpeper County Phase II, February 2008 and Town of Culpeper Phase I, June 2010 reports for additional information on their findings. At the time this report was written, EGGI was

conducting the Phase II evaluation recommended in the Phase I, June 2010 report. Map 7.1 shows a composite listing of the Culpeper Groundwater Development Zones identified in the Phase II Assessment performed by EGGI for the Town and County.

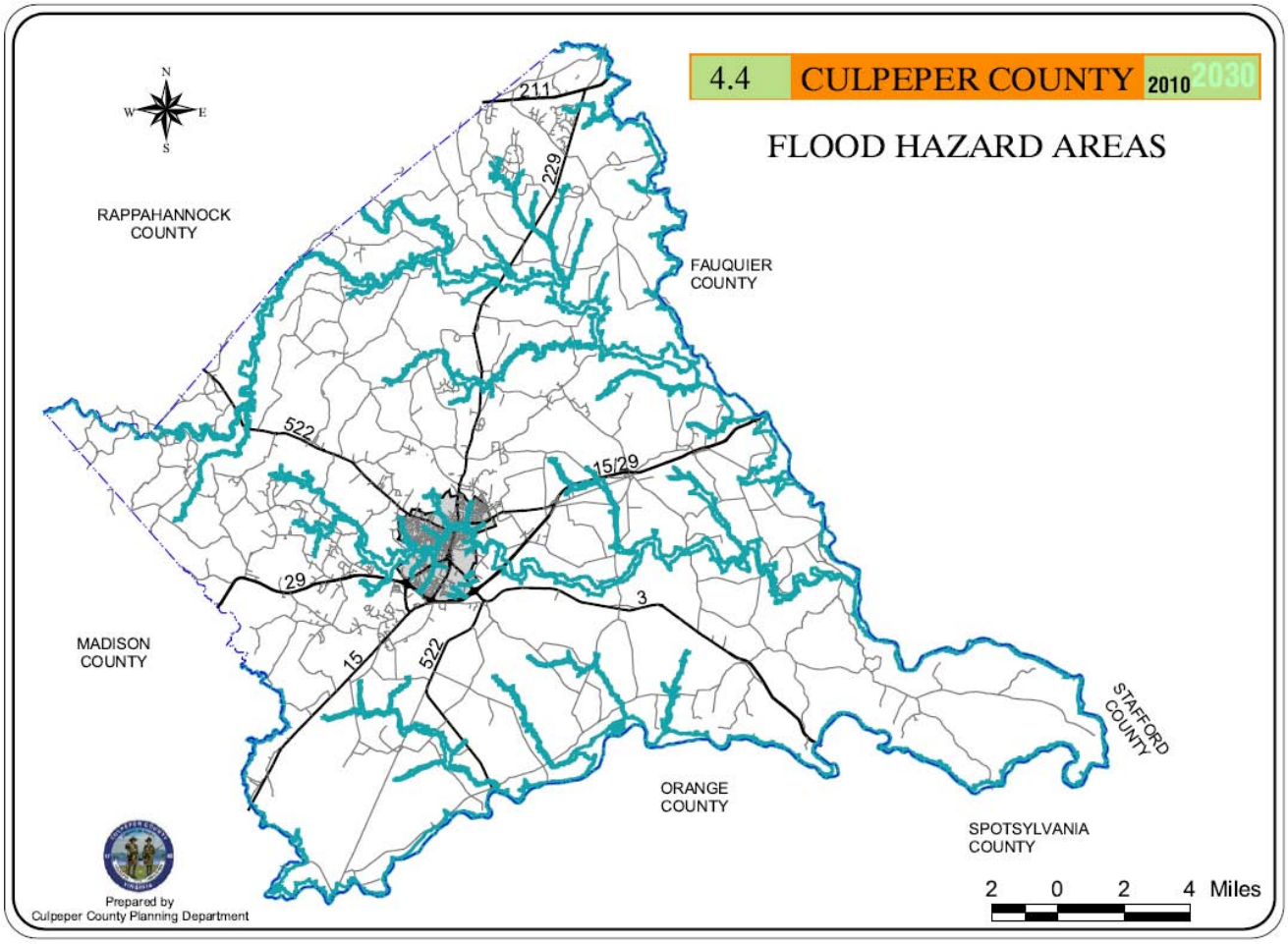
3.4 FLOODPLAIN

Flood prone areas in Culpeper County occur along all major streams as designated by the Flood Hazard Map (Map 3.6, Flood Hazard Areas) developed from the 2007 HUD Flood Hazard Boundary Maps. Approximately 17,000 acres in Culpeper County are located in the 100-year floodplain. The Development Constraints Map (Map 3.7, Development Constraints) also shows the approximate limits of the 100-year floodplain along with topographical and soils constraints.

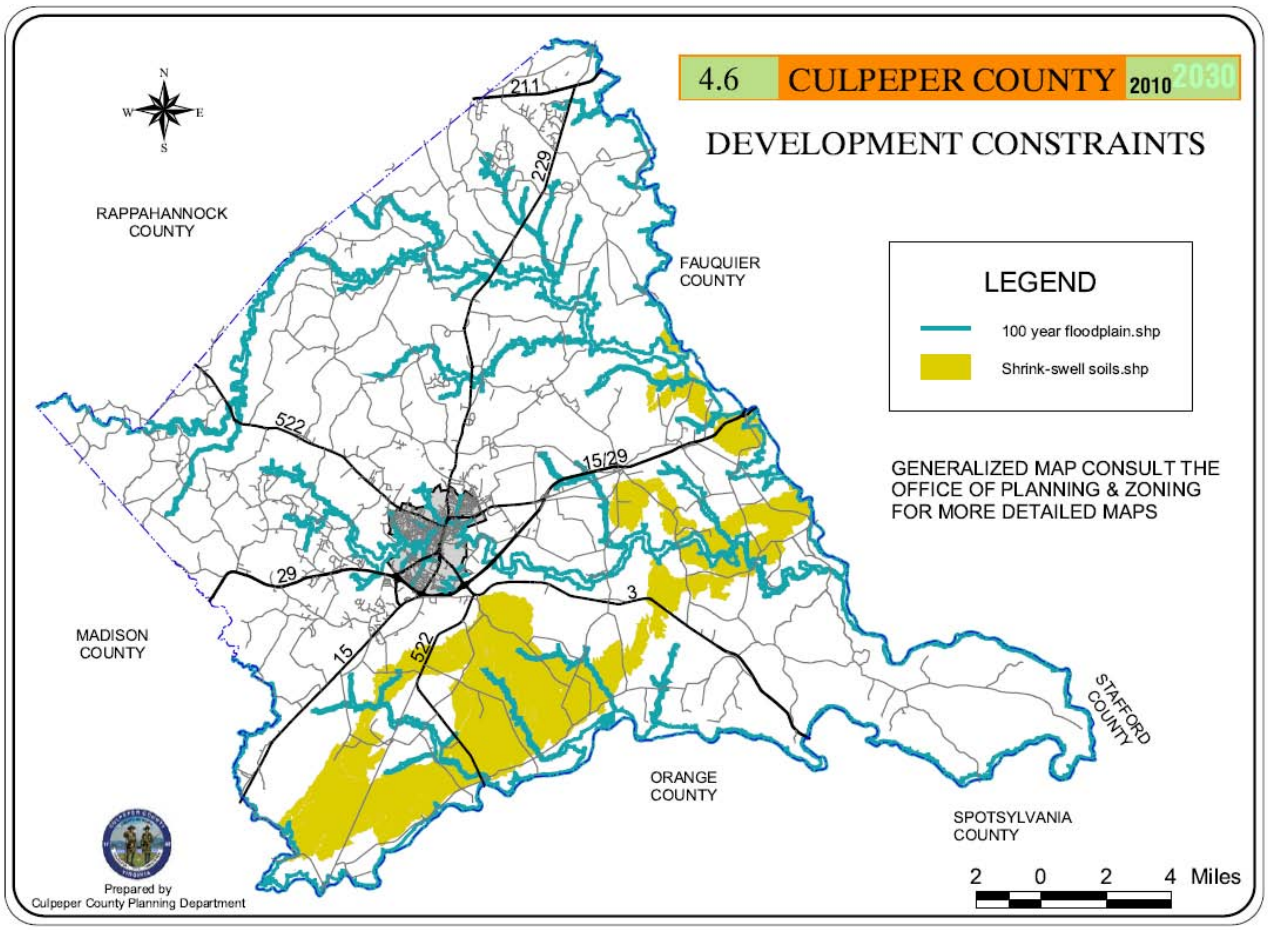
Land uses in the flood prone areas are subject to the provisions contained in the County's Floodplain Overlay District section of the County Zoning Ordinance. The Floodplain Overlay District outlines permitted uses, special uses, and other regulations concerning development and structures within the 100-year floodplain areas. Culpeper County is also a participant in the National Flood Insurance Program that allows for the issuance of flood insurance and disaster assistance in the case of flooding.

Forests and other natural vegetation along streams and ponds are important to protecting water quality. These vegetated streambanks and shorelines provide a riparian buffer that filters nutrients and sediments, provide shade that moderates water temperature, and provide habitat and food for wildlife. In addition to the County's Floodplain and Watershed Management Overlay Districts, Culpeper County encourages development to protect streams and surface water from disturbance through the use of riparian buffer setbacks under the County's storm water Management ordinance. For proposed development there shall be a 100-foot setback from the Hazel, Rapidan, and Rappahannock River, 50-foot setback for all other perennial streams and 25-foot setback for all intermittent streams and storm water ponds. Culpeper County plays a vital role in protecting the water quality in the headwaters of the Rappahannock River.

Map 3.6, Flood Hazard Areas



Map 3.7, Development Constraints



3.5 WETLANDS

Wetlands are transitional zones between open water and dry land. Non-tidal wetlands, as are found within Culpeper County, often occur where water is found at or near the surface of the ground or in places where the ground is covered by shallow water ranging from a few inches to several feet. Some wetland areas are dry during certain seasons and flooding is common during the winter and spring when rivers overflow their banks. Nontidal wetlands include freshwater marshes and ponds, shrub swamps, bottomland hardwood forests, and wooded swamps and bogs.

Wetlands are adjacent to both Lake Pelham and Mt. Run Lake as well as within other potential future reservoir sites. A surveyed wetlands delineation following the USACE guidance would be required for the Environmental Impact Report as part of any future plan to raise either of the existing lakes or construct a new lake.

Wetland Definition

The Federal Manual for Identifying and Delineating Jurisdictional Wetlands identifies three technical criteria that must be met for an area to be considered a wetland. These criteria are the presence of: 1.) **hydrophytic vegetation**, 2.) **hydric soils** and 3.) **wetland hydrology**.

Hydrophytic vegetation (Table 3.4) is defined as macrophytic plant life, which means water-loving plants that the naked eye can see growing in water or in soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. Plants that grow in wetlands are classified in two ways. One way is by their stratum, that is, whether they are trees, saplings, shrubs, vines, herbs or bryophytes (mosses and liverworts). The other way is according to their relative ability to live in either wetlands or uplands. If a plant is found only in wet areas, it is classified as “obligate” (OBL). If it is found in either wetlands or uplands, it is classified as ”facultative” (FAC) and if it is facultative but is found more often in wetlands, it is considered to be “facultative wet” (FACW). Other plants are found only in uplands (UPL) or more often in uplands than in wet areas (FACU).

Hydric soils are saturated, flooded or ponded long enough during the growing season (usually between March and October in Culpeper County) to develop anaerobic conditions, that is oxygen deficient, in the upper layers. Wetland hydrology is characterized by flooding or saturation which is either permanent or which recurs for significant periods of time.

The U.S. Army Corps of Engineers, in cooperation with the EPA, administers wetlands through Section 404 of the Clean Water Act and has had the primary regulatory authority for preserving non-tidal wetlands in Virginia. The Corps must review any development plan that involves wetland areas, and a permit to work in a wetland or a letter indicating that a permit is not necessary must be obtained.

TABLE 3.4 TYPICAL DOMINANT PLANTS IN VIRGINIA'S WETLANDS			
COMMON NAME	**INDICATOR**	**COMMON NAME**	**INDICATOR**
TREES		***HERBACEOUS PLANTS***	
Red Maple	FAC	Sweet Flag	PBL
River Birch	FACW	Giant Cane	OBL
Green Ash	FACW	False Nettle	FACW
Sweet Gum	FAC	Sedges	OBL or FACW
Water Tupelo	OBL	Joe Pye Weed	FACW (most)
Black Gum	FAC	Marsh Hibiscus	OBL
Swamp Chestnut Oak	FACW	Irises (various)	OBL
Bald Cypress	OBL	Soft Rush	FACW
SHRUBS		***SEEDBOX***	
Highbush Blueberry	FACW	Waterlilies	OBL
Hazel Alder	OBL	Sensitive Fern	FACW
Buttonbush	OBL	Cinnamon Fern	FACW
Sweet Pepperbush	FAC	Arrow Arum	OBL
Northern Spicebush	FACW	Common Reed	FACW
Sweetbay Magnolia	FACW	Smartweeds Spp.	OBL
Southern Waxmyrtle	FAC	Pickerel Weed	OBL
Willows (Various Sp.)	FACW (most)	Arrowhead	OBL
		Lizards Tail	OBL
		Cattail Spp.	OBL
VINES			
Common Greenbriar	FAC		

CHESAPEAKE BAY LOCAL ASSISTANCE DEPARTMENT

HYDRIC SOILS FOR CULPEPER COUNTY	
ASHBURN-DULLES	0-2 percent slopes
CLOVER-PENN	0-2 percent slopes
CLOVER-PENN	2-7 percent slopes
CODORUS AND HATBORO	0-2 percent slopes, frequently flooded
CODORUS AND MEADOWVILLE	2-7 percent slopes, occasionally flooded
CODORUS SILT LOAM	0-2 percent slopes, occasionally flooded
COMUS SILT LOAM	0-2 percent slopes, frequently flooded
DELANCO-KINKORA	0-2 percent slopes, rarely flooded
DULLES-NESTORIA	0-2 percent slopes
DULLES-NESTORIA	2-7 percent slopes
ELBERT SILT LOAM	0-2 percent slopes, occasionally ponded
ELSINBORO-DELANCO	2-7 percent slopes, rarely flooded
HAYMARKET-JACKLAND	7-15 percent slopes, very bouldery
HAYMARKET SILT LOAM	15-25 percent slopes, very bouldery
HAYMARKTER SILT LOAM	25-45 percent slopes, extremely bouldery
JACKLAND AND HAYMARKET	0-2 percent slopes
JACKLAND AND HAYMARKET	2-7 percent slopes
JACKLAND AND HAYMARKET	0-2 percent slopes, very bouldery
JACKLAND AND HAYMARKET	2-7 percent slopes, very bouldery
MEADOWVILLE LOAM	7-15 percent slopes
OTT-KELLY	2-7 percent slopes

OTT-KELLY	7-15 percent slopes
PENN-NESTORIA	0-2 percent slopes
PENN-NESTORIA	2-7 percent slopes
PENN-NESTORIA	7-15 percent slopes
PENN-NESTORIA	15-25 percent slopes
RAPIDAN SILTY CLAY LOAM	2-7 percent slopes
RAPIDAN-PENN	7-15 percent slopes, rocky
RAPIDAN-PENN	15-25 percent slopes, rocky
SYCOLINE-KELLY	0-2 percent slopes
WAXPOOL SILT LOAM	0-2 percent slopes, occasionally ponded
WAXPOOL SILT LOAM	0-2 percent slopes, very bouldery, occasionally ponded

USDA SOILS SURVEY - CULPEPER COUNTY, VIRGINIA soildatamart.nrcs.usda.gov

Wetland Preservation

In 1780, it is estimated that there were 220 million acres of wetlands in what is now the continental United States. In 1980, it was estimated that only 104 million acres of wetlands remained, and that we are continuing to lose wetlands at a rate of 100,000 to 300,000 acres per year.

Wetlands perform the following functions:

- By trapping waterborne sediment and its pollutants, wetlands protect the quality of surface waters. Therefore, the preservation of wetlands will help mitigate the water quality impacts that future development will have on the streams and lakes in Culpeper County.

- Wetlands serve as a natural means of flood control; they absorb and store water during high runoff periods, thereby reducing flood crests, and protecting life and property.

- Wetlands are critical at times of drought because they maintain critical base flow to surface waters through the gradual release of stored flood-waters. Wetlands, therefore, can reduce the need to create the reservoirs and other water storage facilities often constructed as a means to augment municipal water supplies.

- Some wetlands contain important, even unique, communities of wild plant and animal species. They also serve as temporary refuge for migratory birds such as ducks.

- Wetlands provide recreational venues for hunters, fishermen, and campers, as well as open spaces to buffer incompatible uses.

Wetlands are a valuable resource that must be preserved. Therefore, it will be the policy of Culpeper County to discourage the drainage or destruction of wetlands that meet the criteria as outlined in the Federal Manual for Identifying and Delineating Wetlands (or the most current federal identification and delineation policy). If such disturbance is unavoidable, the proper permits must be obtained from the Army Corps of Engineers. Innovative storm water management and Best Management Practices (BMPs) that preserve, establish and enhance wetland features are encouraged.

When evaluating potential future sites for a future surface water impoundment, the area should be

evaluated for the presence of wetlands. The amount and significance of the wetlands found should be considered when ranking the various sites to minimize the impact on wetlands as much as practicable.

3.6 TOPOGRAPHY

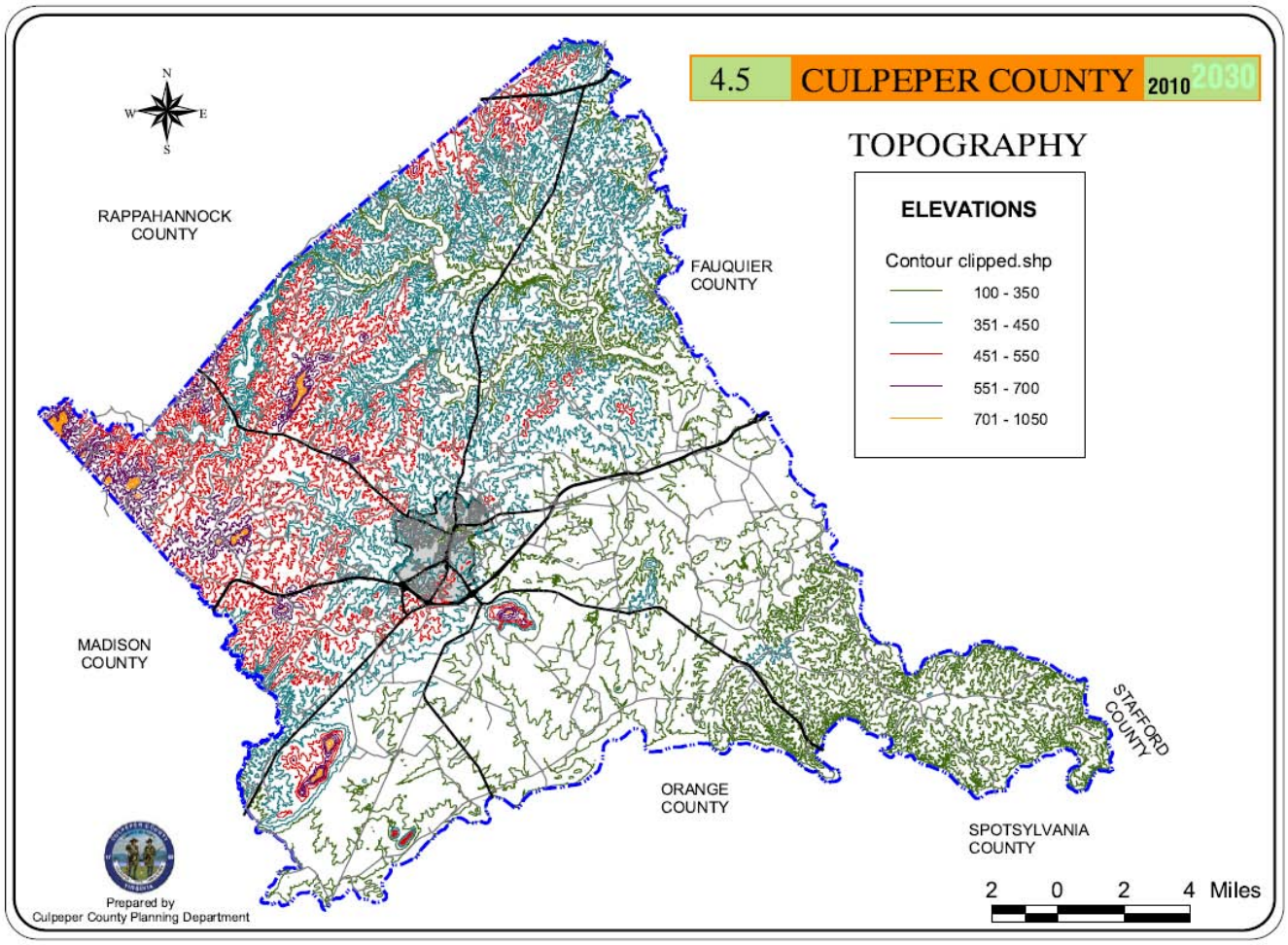
Culpeper County topography ranges from an elevation of 1160 feet above sea level on Mitchell's Mountain to 130 feet above sea level at the junction of the Rapidan and the Rappahannock Rivers (see Map 3.8, Topography). In general, the land surface slopes southeastward from an average altitude of 600 feet above sea level in the western portion of the county to 350 feet in the southeast. The northwestern portion of the County is generally hilly to steep, the central portion of Culpeper County ranges from mostly level to rolling; and the southeastern section of the County is rolling. There are numerous mountains designated in the County, the elevations of which are shown in Table 3.5.

Development and land disturbing activities, excluding agriculture, on 15-25% slopes should always require grading permits with erosion and sediment controls prescribed. Additionally, drain fields located on 15-25% slopes should require a hydrologic report assuring that ground and surface water will be protected both on and off-site. Those areas located on 25% or greater slopes should be restricted from development and drain fields should be prohibited.

TABLE 3.5 MOUNTAIN ELEVATIONS IN CULPEPER COUNTY

MOUNTAIN	ELEVATION
Mitchells Mountain	1,160
Scott Mountain	890
Hitt Mountain	882
Bruce Mountain	850
Cedar Mountain	833
Parrish Mountain	817
Mount Pony	790
Fox Mountain	762
Buzzard Mountain	621
Fleetwood Hill	540
Sheads Mountain	540
Coles Hill	510
Hansbrough's Ridge	470
Stony Point	410

Map 3.8, Topography

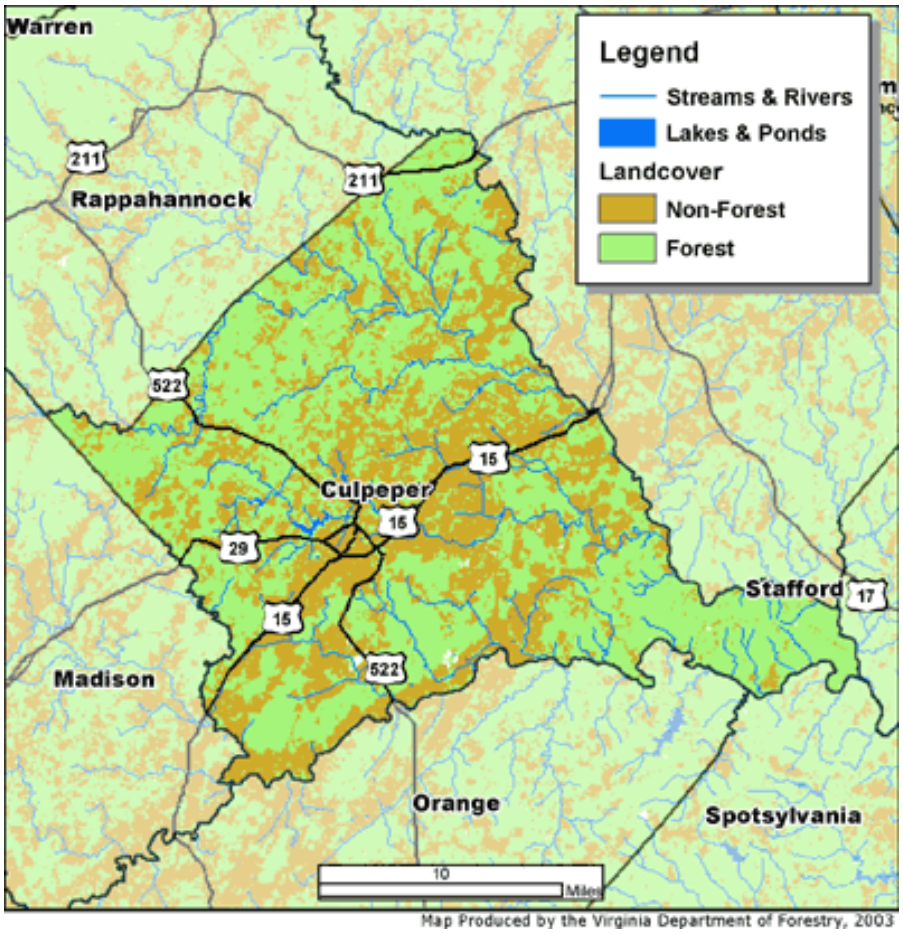


3.7 WOODLAND FEATURES

Culpeper County has forested land in tracts that range from small privately owned wood lots to major parcels managed for commercial harvest. In addition to commercial timber opportunities, wooded areas also provide the following benefits: Watershed protection through storm water management and erosion control, aesthetic and scenic viewsheds, air pollution and noise reduction, groundwater recharge areas and recreation.

As shown in diagram 3.1, a large portion of the County is wooded. Retention of this acreage will help ensure that the environmental quality of the community is protected. Areas that are managed for commercial timber operations should use Best Management Practices (BMP) and should enact a reforestation plan. Areas under development should provide plans that indicate preservation of the existing woodland features and re-vegetation of areas that are denuded in order to reduce the erosion, sedimentation, and storm water runoff impacts on downstream areas. Retention of existing woodlands on slopes greater than 15% is encouraged.

DIAGRAM 3.1 CULPEPER FOREST COVER



3.8 ENDANGERED SPECIES

The Virginia Natural Heritage Program was established in 1986 and in 1988 became an organizational component of the Virginia Department of Conservation and Recreation in the Division of Natural Heritage. Natural Heritage Resources (NHRs) are defined by the Virginia Natural Area Preserves Act as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest".

Based upon the current listing of the Virginia Natural Heritage Program, there is no species in Culpeper County on the Federal and State "threatened" list. The State "threatened" list includes the upland sandpiper, bald eagle, and green floater. The 'threatened' category has a legal status and federal protective policies apply. A species carrying the 'special concern' designation does not have legal status but habitats are to be protected to the extent practicable. Currently, the only species of special concern status listed for Culpeper County is the Yellow Lance.

In addition to the above listed species, the Virginia Department of Game and Inland Fisheries lists the loggerhead spike and loggerhead migrant shrike as species "State Threatened, and the following as "special concern":

Regal Fritillary
Winter Wren
Northern Harrier
Barn Owl
Brown Creeper
Great Egret
Common Moorhen
Caspian Tern
Red-breasted Nuthatch
Hermit Thrush
Golden-crowned Kinglet
Magnolia Warbler
Dickcissel
Purple Finch
Northern River Otter

Barn Owl *Photo by Jerry Liguori*

From a water resource standpoint, the yellow lance (Elliptio lanceolata), and the green floater (Lasmigona subviridis) are of particular concern. The yellow lance is a freshwater mussel that inhabits sandy substrates, rock and mud, and slack water areas but is apparently absent from lakes. The green floater is a freshwater mussel that inhabits low gradient, slow moving streams. Construction of a new reservoir could threaten the yellow lance and green floater by removing their habitat. The federal, state, and local governments regulate endangered species. Habitat surveys for each of these species would be required as part of any future new reservoir development.

Reference http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml & http://vafwis.org/fwis/ (9-13-10).

No rivers in Culpeper County were identified as anadromous, trout or other significant fisheries, Ref. http://www.dgif.virginia.gov/gis/gis-data.asp (9-13-10).

3.9 RIVER SEGMENTS OF RECREATIONAL SIGNIFICANCE

The National Park Service Nationwide River Inventory lists three river segments that potentially qualify as national wild, scenic or recreational river areas. They are listed as follows:

- Rapidan River segment to north of Indian Town
  - Historic – Rapidan Dam Canal of the Rappahannock Navigation system is a linear National Historic Register site within the corridor. Segment also includes numerous site remains of locks and dams from canal days.
  - Geologic – Rare, significant topographical variation including cliffs over 200' high.
  - Recreation – Possesses the largest and most diverse amount of flow gradient in the area. Unspoiled undeveloped stream readily accessible to large urban populations. Offers excellent small mouth bass fishing.
- Rappahannock River segment from I-95 near Fredericksburg to one mile past Route 620
  - Same as Rapidan River Segment above.
- Robins River segment from confluence with the Rapidan River to Route #670 Bridge
  - Recreation – Segment includes a variety of flow gradients including Class 3 rapids with numerous 2 to 3 foot ledges
  - Historic – Segment was in proximity of, and of strategic importance to, the Civil War battles of Cedar Mountain and the ensuing second battle at Manassas Junction

Reference http://www.nps.gov/ncrc/programs/rtca/nri/states/va.html (9-13-10).

3.10 LAND CAPACITY / DEVELOPMENT CONSTRAINTS

The Development Constraints Map (Map 3.7) identifies both areas that are restricted from building and those with building limitations. This is a generalized map that approximates those areas with development constraints. The map is not intended to be site specific or all-inclusive. Site-specific information should be provided for any development project that encounters areas with building restrictions.

The allowable activities in a floodplain area include agricultural uses, public and private recreational uses, accessory residential uses such as yards and gardens, and storm water management facilities as long as the floodplain elevation is not altered as described in the floodplain ordinance.

Soil properties are measured in terms of depth to water table, ease with which water filters through, moisture retention capacity, stability with changes in temperature and moisture content, acidity (ph), corrosiveness and a variety of other criteria. The relative importance of each criterion varies with the

contemplated use. Specifically, home sites are relied upon to provide both drinking water and to clean wastes. The areas designated as unsuitable for drain fields are those in areas where the soils have high shrink swell potential or shallow depth to bedrock. In general, the soils with the greatest building limitations are found in the Triassic Basin.

Slope can be a limiting and restrictive development factor for buildings and grading. Disturbing moderately steep (15-20 %) and steep slopes (>20%) can increase erosion rates and change the hydrology of the landscape. Critical slope is typically defined as a slope gradient exceeding 15 percent where erosion rates increase and groundwater flows can seep to the surface. Practical engineering judgment should be used when developing on critical slope areas and conservative use of erosion control measures is encouraged.

3.11 WATERSHED PROTECTION: GENERAL

Chesapeake Bay Act

With the advent of the Chesapeake Bay Preservation Act (the Bay Act), enacted in 1988 by the State legislature, a program of watershed management was initiated designed to restore the once pristine water quality afforded by the Chesapeake Bay. Stringent guidelines and enforcement measures were set in place to manage tributaries leading to the Bay. These measures impact private citizenry, private industry and public policy with the goal of improving the ecology of the Bay.

The implementation of measures taken from the Bay Act may be advisable to improve water quality over time.

Storm water Management Ordinance and Low Impact Development

In July 2006 the Culpeper County Planning Department was awarded grant funding from the Department of Conservation and Recreation Water Quality Improvement Fund. This allowed the planning staff to hire consultants to write a countywide Storm water Management Ordinance. Along with the consultant, a steering committee was created whose members included a local planner, an engineer, Soil and Water Conservation District staff, county staff, and Department of Conservation and Recreation staff. The steering committee met on several occasions and reviewed the draft ordinance. The ordinance was adopted by the Board of Supervisors June 3, 2008

The purpose of the ordinance is to mitigate the effects of the ever increasing impermeable surfaces which have resulted from the recent increase in development. Impermeable surfaces increase water runoff rates and can accelerate erosion of the soil. The ordinance requires that post-development runoff rates do not exceed pre-development runoff rates for any site disturbing more than one acre.

The Culpeper County Storm water Management Ordinance requires that Storm water Management Concept Plans use low-impact development site planning to the maximum extent practicable. Low Impact Development (LID) is an approach to site design and storm water that seeks to maintain the site's predevelopment rates and volumes of runoff. LID accomplishes this through the minimization of

impervious cover, strategic placement of buildings, pavement and landscaping, and the use of small-scale distributed management features collectively called “Integrated Management Practices”.

A full LID design must be considered in every case. The feasibility of LID design will vary based on factors such as soils, topography, downstream drainage, proposed land use, cost, and others.

Riparian Buffers and Conservation Easements

http://www.dcr.virginia.gov/natural_heritage/clinfo.shtml

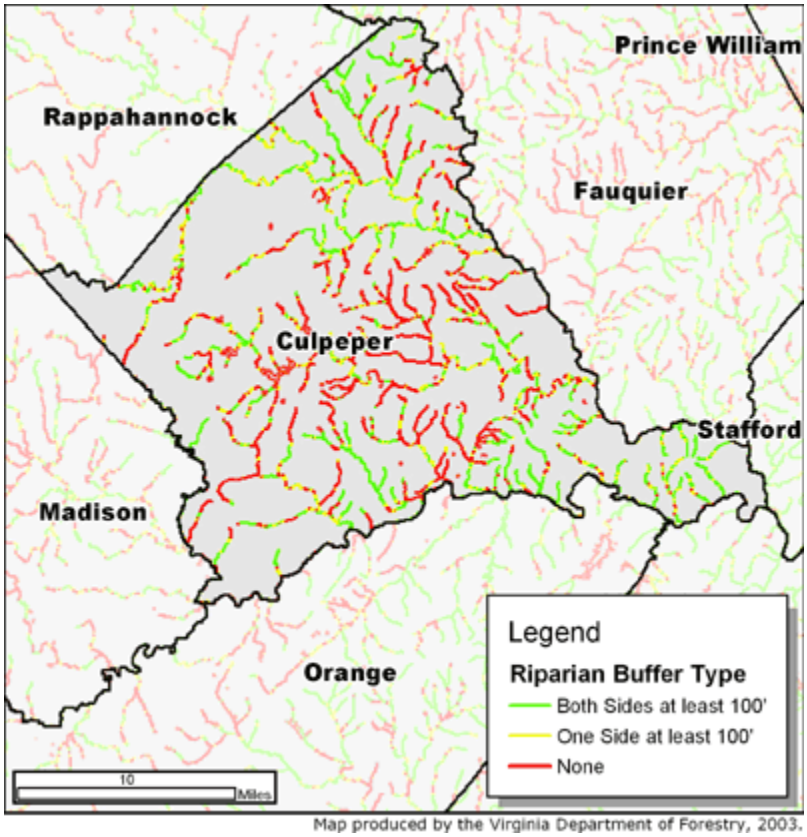
Virginia's stream corridors are an important part of overall environmental health. Riparian buffers, the forested area along stream banks, are the best land use type near streams.

Riparian buffers filter nutrients, sediments, and other pollutants before they can enter a waterway. Over 80% of nutrients and sediments are captured in a forest buffer.

Riparian buffers also offer a great habitat for plants and animals.

Several programs exist with the Virginia Department of Forestry for landowners to plant or enhance their forest buffers. More information can be obtained from the Virginia Department of Game and Inland Fisheries Stream Restoration Biologist at http://www.dgif.virginia.gov/about/offices.asp . Diagram 3.2 shows the extent of riparian stream buffers that exist within Culpeper County.

DIAGRAM 3.2 CULPEPER RIPARIAN BUFFERS

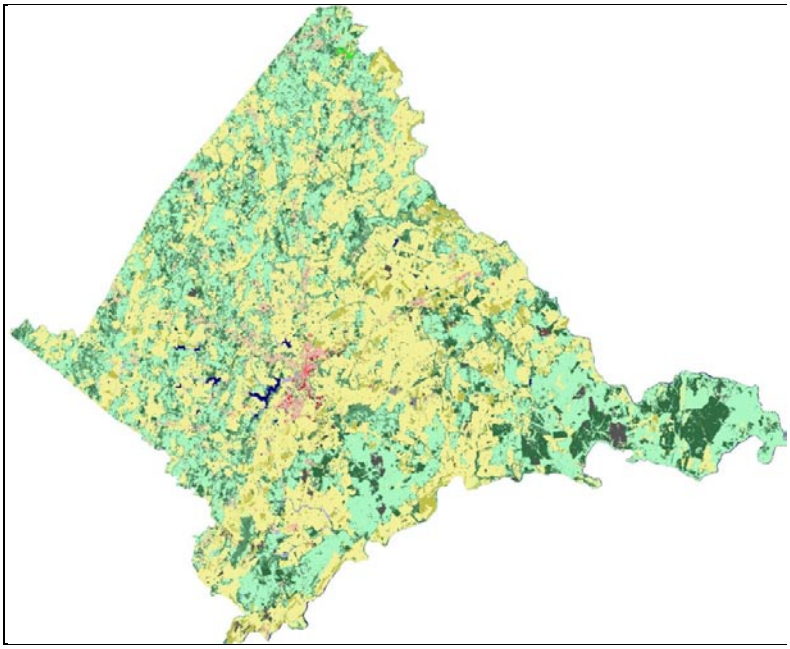


Map produced by the Virginia Department of Forestry, 2003.

Impervious Cover

Land coverage type can be found in diagram 3.3 below, which was developed by the University of Virginia and can be found in the Virginia Gazetteer Searchable Database. As show in this map a significant portion of Culpeper County is forested or farmland, predominantly pasture/hay. 1.8% of Culpeper County is covered by low intensity residential, primarily in the Town of Culpeper and environs surrounding the Town. Other, smaller areas of development are occurring at Stevensburg, Brandy Station and South Wales .

DIAGRAM 3.3 CULPEPER LAND COVERAGE



Land Cover Type	Percent	Color Shade
Pasture/Hay	40.3	
Row Crops	3.3	
Low Intensity Residential	1.8	
Transitional	1.1	
Deciduous Forest	30.5	
Evergreen Forest	6.7	
Mixed Forest	15.4	

Reference http://www.lib.virginia.edu/scholarslab/resources/gis/vagaz/search_by_quad.php (9-13-10)

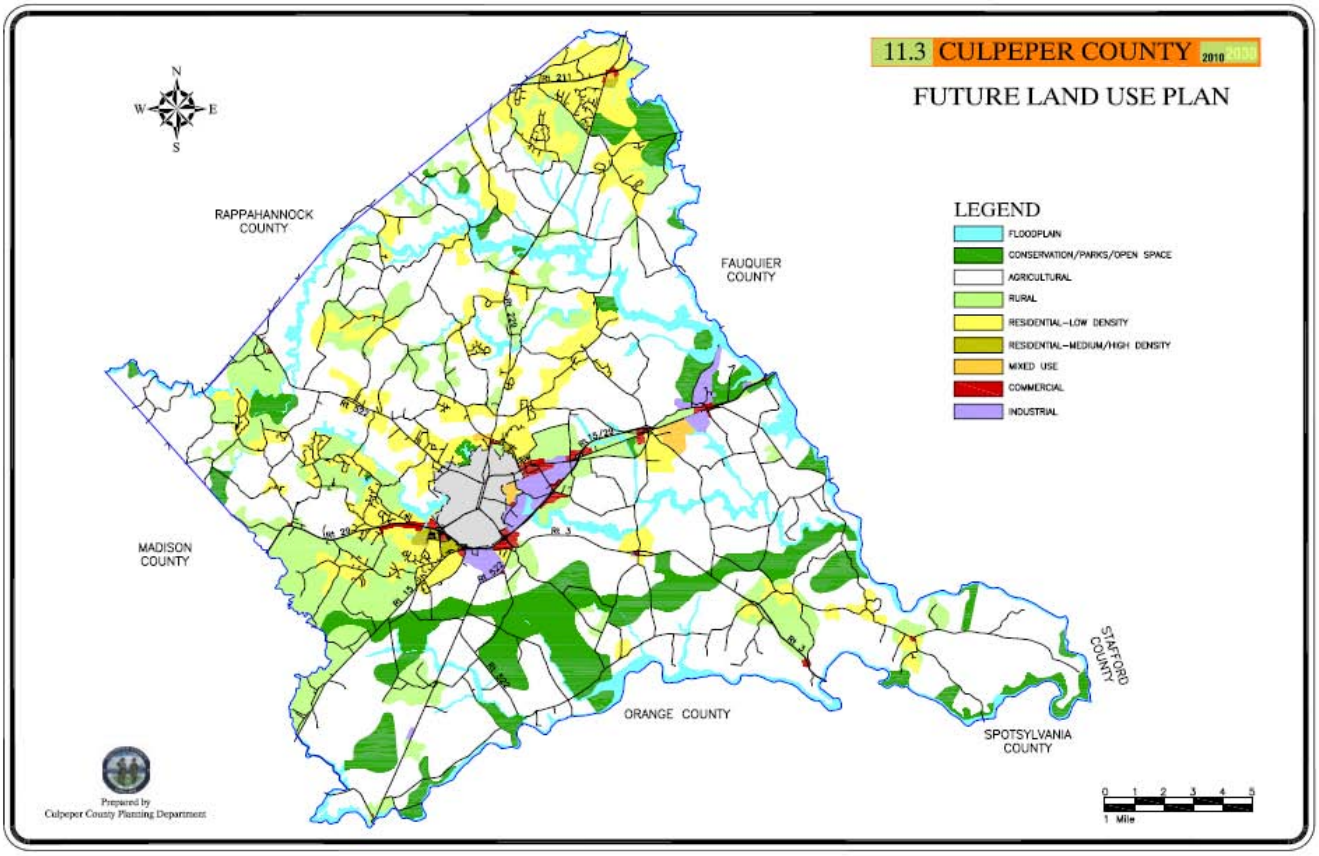
Land development within the Lake Pelham and Mountain Run Lake watersheds could impact water quality of these water supply sources. As growth occurs in the watershed, impacts to water quality and storage volume could result due to an increased rate of siltation and contaminant runoff associated with development around Lake Pelham. Lake Pelham was given a high susceptible rating when the SWAP evaluation was performed in 2002. To address this high risk rating, a Watershed Management District was put in place to reduce the impact of land development in the watershed, refer to 3.12 below.

Land development could also impact future ground water sources. As land development occurs, potential water supply drilling locations could be lost or made more difficult to develop. To minimize the impact of land development on these future ground water sources, the Town and County are actively working to identify potential drilling targets which could be developed and protected prior being impacted by future development.

Land development could also impact future surface water impoundments. The Town commissioned a study in 2004 which identified various potential alternatives for additional surface water supplies. The results of this report will be discussed later in this report. The alternatives identified in this report should be further investigated to determine feasibility . Town Council has set a goal of further exploring these surface water alternatives within the next 2-3 years after a better understanding of groundwater availability can be determined as part of the ongoing groundwater study.

Map 3.9 depicts currently planned land use to include conservation easements and open space/parks.

Map 3.9, Land Use and Conservation Easements



3.12 LAKE PELHAM AND MOUNTAIN RUN LAKE WATERSHEDS

For the protection of existing drinking water resources, the Culpeper Town Code (Section 27 – 427 to 429) establishes "watershed protection overlay districts" for the Lake Pelham and Mountain Run watersheds. Within the watershed protection overlay district, certain land uses are prohibited, except as accessory to a residential use. Additionally, on March 3, 1992, the Culpeper County Board of Supervisors adopted Article 8C *Watershed Management District (WMD)*, into the Culpeper County Zoning Ordinance (see Map 3.2, Watershed Management District). The WMD is an overlay zone specific to the Mountain Run Lake - Lake Pelham Watershed. The Ordinance seeks to implement the policies that follow. The maximum densities allowable, as well as other aspects of the ordinance, differ slightly from the policies listed below which are as outlined in the Culpeper County Comprehensive Plan. As with all of the guidelines set forth in this Comprehensive Plan, these policies are general in nature, and implementation must be undertaken with many considerations in mind, and at the discretion of the Board of Supervisors.

General Policy

1. The County seeks to outline a set of general policies (goals) and specific implementing policies (or objectives) which will achieve the protection of the public health and safety and the prevention of

water quality deterioration in the Lake Pelham watershed.

2. Any strategy to improve water quality will seek to keep costs of land use conservation and water quality enhancement below the cost of the benefits achieved for public health and safety. In considering benefits, the County will fully consider the costs to the public health from damage to the water supply and where necessary attempt to quantify the same.

3. In determining whether the water quality of the water supply is being maintained, the County will examine the following water quality parameters: (1) the amount of nitrogen, phosphorous, solids, and the effect on dissolved oxygen; (2) the amount and concentration of the following metals and toxics: arsenic, cadmium, chromium, lead, mercury and zinc; (3) fecal coli form concentrations; (4) temperature; (5) tree cover distribution.

Specific or Implementation Policies

1. Because non-residential uses, particularly commercial and industrial uses, involve considerable threats of toxin and metal pollution, both from their own wastes and from heavy auto travel associated with the uses, non-residential development, other than what already exists or is planned should be limited. Non-residential uses, other than parks, schools, churches and other community facilities, and those public facilities that must locate in the Lake Pelham Watershed in order to serve development that has or is likely to locate there, shall be required to provide storm water management facilities and utilize Best Management Practices (BMPs), which insure water quality will not be degraded.

2. The average overall density for residential development in any sub-area as set out in the LPW Management District shall not exceed the density for the full area unless adjustments are made to another sub-area which would result in the same or lesser overall impact being achieved.

3. Cluster styles of development, such as cluster subdivisions, planned residential developments, architecturally integrated developments, and planned unit developments, offer the opportunity, although not the certainty, that the development will pose the least adverse impact on the water supply. Clustering provides an opportunity to improve the use of open space for filtering and to avoid highly erodible soils or steep slopes or other areas where impacts could be difficult to control. The County acknowledges that cluster styles of development that are designed to protect the water supply are the preferred method of development in the LPW.

4. The County will require that developments using clustering demonstrate that densities are actually increasing as they move further from the lakes and primary creeks and streams, or that the developments have been specifically designed to maximize the effectiveness of local wet ponds.

5. Natural vegetated buffer areas are encouraged along intermittent streams and around storm water ponds in order to allow soils an opportunity to filter out particles before they reach the water supply. Natural filtration is a proven way to reduce pollution in the water supply.

6. In order to protect the water supply the County will require that a natural vegetated buffer areas of at least 200 feet be provided along Lake Pelham and Mountain Run Lake, at least 100 feet shall be provided along primary creeks and streams leading into those Lakes, and at least 50 feet shall be provided along tributaries to the lakes and to those creeks and streams. Adequate mechanisms are

needed in development proposals to insure that these areas remain and be maintained in a natural state.

7. At the heart of the watershed protection plan is a reliance on Low Impact Development and other Best Management Practices intended to engineer at the site and regional levels a system that will protect the water supply. The amount of runoff in the Lake Pelham Watershed is directly related to the amount of impervious surface. The quality of that runoff is directly related to the land use and intensity. The County will modify development standards to require that developments utilize Low Impact Development and other Best Management Practices. Grading is limited during development to only that which is necessary to put roads, utilities, driveways, parking areas, principal structures, necessary accessory structures and a reasonable amount of activity space in place.

8. The Lake Pelham Watershed is susceptible to pollution from failed drain fields or highly concentrated pollutant loadings, especially in areas directly abutting Lake Pelham, or within direct storm water access. Because the principal problem anticipated in the Lake Pelham watershed is nitrification, development of public sewer is encouraged. In order to avoid future lake degradation, policies shall be implemented which properly restrict septic systems in the Lake Pelham area. The County shall discourage those developments in the Lake Pelham area which cannot be served by Town water and sewer, or wait for the availability of those services. Alternative methods of sewage are strongly discouraged within the Lake Pelham Watershed.

9. The County requires Erosion and Sediment Control Plans for land disturbing activities of greater than 5,000 sq. ft. in the WMD.

3.13 Historical Resources

The Virginia Landmark Registry, prepared by the Department of Historic Resources (DHR) lists 29 sites as historical landmarks (as of 9-13-10). This list can be found at http://www.dhr.virginia.gov/registers/registers.htm and should be reviewed when considering a site for a future water impoundments. In addition to registered landmarks, any potential future water impoundment sites should be reviewed to insure that the site is not significant from an early Indian or civil war perspective.

Correspondence from the DHR indicates that dam construction may have a negative impact on archeological resources. A Phase IA Survey to identify high, medium, and low probability areas for archeological resources within the area that would be disturbed or inundated would be required to address the DHR issues. DHR suggests that a qualified archeologist survey the area to identify areas of potential effect as part of any future new reservoir development.

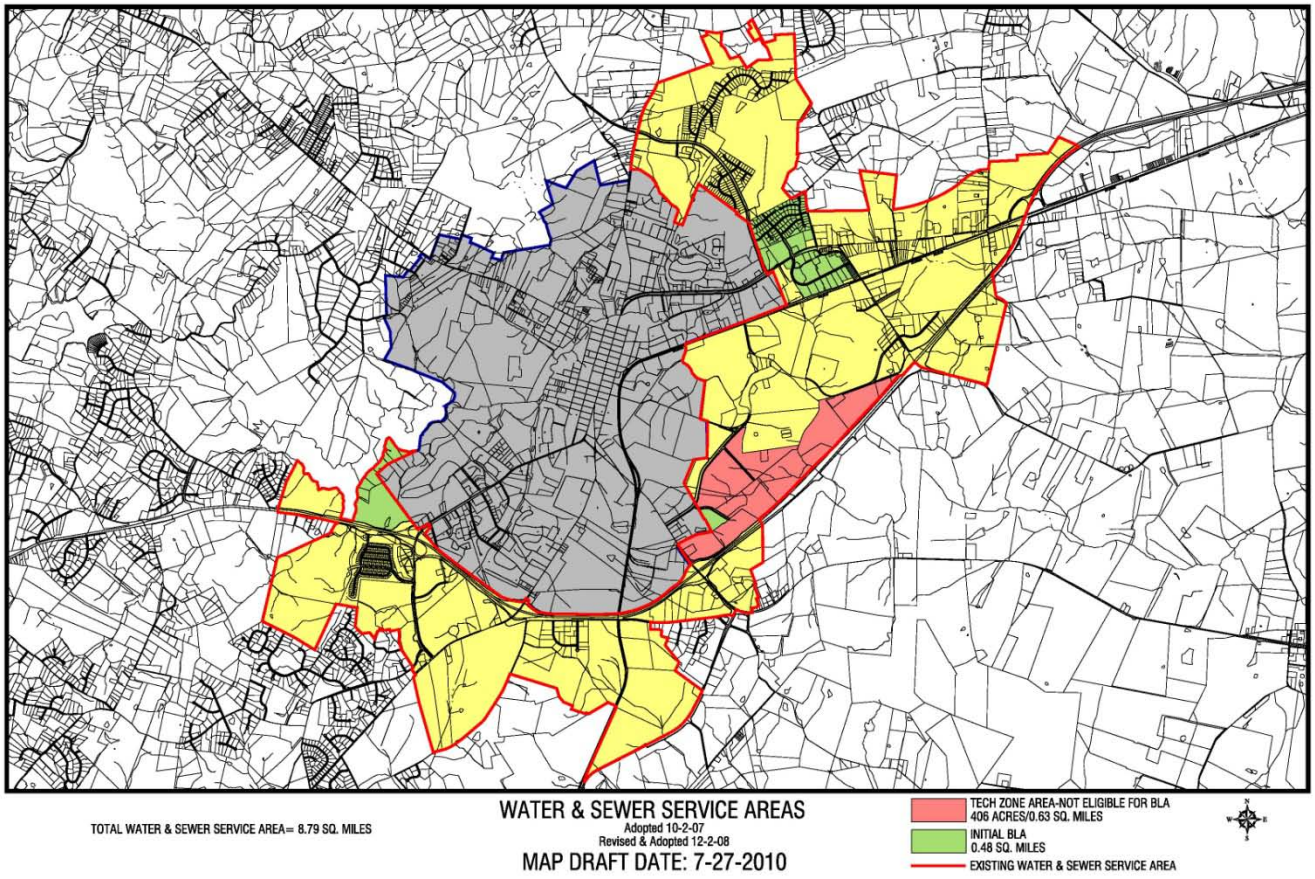
4. Projected Water Demand Information

4.1 Projected Water Demand Information for Town of Culpeper

Water projections within the Town of Culpeper planning area were developed in coordination with the Town of Culpeper Planning Office and with the assistance of McBride-Dale. Water and sewer is virtually 100% available to all areas within the planning area, although low density land still remains within that area. To extrapolate growth, a review of the current zoning and potential demands associated with that zoning was undertaken. In calculating future demands associated with vacant parcels within the current Town, it was assumed that the vacant land would ultimately be developed to build-out at a density equal to 80% of the permitted zoning density. This density was determined by reviewing existing density patterns within the Town of Culpeper. As a result of this analysis a potential build-out population of 28,500 was determined for the Town of Culpeper and areas currently served by 2 and 3-party agreements. Additionally, commercial and industrial development was projected to grow linearly based on the population projection within the existing Town boundary up to the existing Town boundary build-out population of 24,700. Growth rate was then applied based on the historical growth rate of 2% per year within the planning area. Based on this growth rate, it is anticipated that the Town of Culpeper planning area will be built out within 30-40 years.

Also included in the Town of Culpeper service area is the Town Environs which are located outside but adjacent to the Town boundary. This area has historically been served on a limited basis from the Town system but the Town and County are currently finalizing an agreement to serve up to 1.5 million gallons per day (MGD) of potable water demand and sewer service for this area. Based on the current agreement, Culpeper County will provide the water and sewer service in this area once the potable demand exceeds 1.5 MGD. Although the demand for this area in excess of 1.5 MGD is anticipated to be provided by the County, the additional demand is included in the demand projections for this service area since the Town and County have agreed to work together to develop raw water sources to meet these needs. The County has projected a demand of 2.1 MGD for this area by 2050. Map 4.1 shows the current Town Environs Water & Sewer Service Area as designated by the County.

Map 4.1, Town Environs Water & Sewer Service Area



Based on this calculation, a projected annual average raw water demand of 5.50 MGD was calculated for the Town of Culpeper service area at year 2050. Following is a breakdown of the water demand projections for the planning area:

Demand Projections

Table 4.1

	2010	2020	2030	2040	2050
Population	16,379	19,966	24,338	29,668	36,165
Residential (MGD)	0.85	1.24	1.63	2.01	2.18
Commercial (MGD)	0.41	0.70	0.98	1.23	1.40
Industrial (MGD)	0.18	0.42	0.64	0.84	1.01
Plant Backwash (MGD)	0.23	0.23	0.23	0.23	0.23
Bulk Sales (MGD)	0.007	0.009	0.010	0.012	0.012
Unaccounted for Water (MGD)	0.28	0.34	0.47	0.59	0.66
Total Average Usage (MGD)	1.96	2.93	3.96	4.91	5.50
Peak Month (MGD)	2.25	3.38	4.58	5.69	6.37
Self-Supplied Users (MGD)	0.004	0.004	0.004	0.004	0.004

The above demand projections address the projected needs of domestic consumption as well as the anticipated economic potential for the planning area. Through proper water shed management of Mountain Run Lake and Lake Pelham, numerous in-stream uses are also protected. Both of these lakes are currently used for recreational non-motorized boating and fishing activities and are anticipated to continue to be available for these uses in the future as water demands increase. Reservoir safe yield calculations take into account these other uses in the volumes set aside for silt accumulation between dredging activities.

The above demand projections do not take into account any reduction in demand associated with the adoption of water conservation measures or improved leak detection since there programs are relatively new or anticipated and no history is available that would support a reduction in demand .

4.2 Projected Water Demand Information for Culpeper County

Based on the County's Comprehensive Plan, the following table 4.2 provides a forecast on population growth throughout the County to include the Town of Culpeper.

County Population Projections
Table 4.2

2008 CULPEPER COUNTY POPULATION			
	County only	Town	Total
Weldon Cooper Center	33,540	13,977	47,517

CULPEPER COUNTY POPULATION PROJECTIONS				
SOURCE	2010	2015	2020	2030
Geometric Mean*	50,532	57,592	65,639	85,261
VEC**	49,543	54,995	61,047	75,223
Staff***	48,164	53,438	60,460	77,394

*Average growth rate since 1970, 2.65% per year

** Projects an annual growth rate of 2.1% per year

*** Starting from the U.S. Census Bureau 2008 population estimate of 46,203, projects an annual growth rate of 2.1% through the year 2015 and 2.5% from 2015-2030

The population growth projections provided above were based on a 2008 study by the Weldon Cooper Center.

Actual County population data based on the **2010 U.S. Census** is provided below:

Town of Culpeper: **16,379**

County of Culpeper: **46,689**

Culpeper County operates a variety of "captive" water systems that do not correlate well with overall County population growth projections. Instead, the County's principal water systems at Clevengers Village (0.86 MGD) and the Industrial Air Park (0.025 MGD) are limited by design capacity.

The County of Culpeper manages the following municipal water systems:

- Clevengers Village (6 wells, to be operational on December 1, 2010),
- Emerald Hill Elementary School (2 wells),
- Industrial Air Park (2 wells),
- Culpeper Sports Complex (1 well currently for nonpotable use) and
- Piedmont Technical Center (1 well).

All of these systems are groundwater-based and consist of multiple wells. For County systems that were active and supplying finished water, water use data for FY2009 is provided below in table 4.3:

County Systems Water Usage
Table 4.3

	Monthly Totals			Daily Averages		
	Airpark	**Emerald Hill**	**Piedmont**	**Airpark**	**Emerald Hill**	**Piedmont**
7-08	141430	36900	65100	4562.26	1190.32	2100.00
8-08	159440	101100	53100	5143.23	3261.29	1712.90
9-08	110160	135200	81500	3672.00	4506.67	2716.67
10-08	214876	125190	94500	6931.48	4038.39	3048.39
11-08	172594	80120	92700	5753.13	2670.67	3090.00
12-08	165390	86420	119700	5335.16	2787.74	3861.29
1-09	180250	28940	125100	6008.33	964.67	4170.00
2-09	194460	12880	112700	6945.00	460.00	4025.00
3-09	184809	15220	114400	5961.58	490.97	3690.32
4-09	205461	308820	328700	6848.70	10294.00	10956.67
5-09	125238	123190	75800	4174.60	4106.33	2526.67
6-09	122183	94750	81900	3941.39	3056.45	2641.94
7-09	171000	24500	80600	5516.13	790.32	2600.00
Total	**2,147,291**	**1,173,230**	**1,425,800**	**5445.61**	**2970.60**	**3626.14**

Additionally, there are numerous community and non-community water systems that are operational throughout the county. These private water systems serve a variety of needs to include industrial process water and water for consumption by residents (see Appendix A for a systems listing as of July 2009). Also, these independent waterworks are considered to be “captive” systems and do not trend well with population growth projections. Appendix A also identifies (highlights) water systems in Culpeper County that extract and process more than 300,000 gallons per month. More detailed construction information concerning community and non-community water system wells is provided in Appendix B.

The County does not possess specific operational data for community water systems other than what was provided in Appendices A and B.

The County does not have specific information on agricultural, non-agricultural, individual, or domestic/residential wells and has not included this content in this Water Supply Plan.

Projections using the USGS standard of 120 gpcd have been cited by Virginia DEQ as an adequate reference for daily per capita consumption of water. Assuming an “unserved municipal water supply” population (County residents not served by the Town of Culpeper’s municipal water system) of approximately 32,000, the estimated daily consumptive use would be about 3.84 MGD.

Based on previously cited County population growth projections over the next 40 years, the following water demand table is provided:

YEAR	2010	2020	2030	2040	2050
Projected Population	**46,689**	**60,460**	**77,394**	**94,343**	**115,004**
Water Demand in MGD (County Only)	**3.84**	**4.86**	**6.37**	**6.98**	**9.46**

4.3 Cumulative Demand, Use Conflict, or In-Stream Flow Information

At this time, the State Water Resource Plan is not complete and therefore information regarding cumulative demand, use conflict, or in-stream flow information developed pursuant to 9VAC25-780-140G cannot be incorporated into this regional plan.

5. Water Demand Management Information

5.1 Building Code

Culpeper County, which includes the Town of Culpeper, has adopted the mandatory sections of the Virginia Uniform Statewide Building Code. These mandatory sections incorporate the 2009 International Plumbing Code by reference which includes water efficiency requirements for plumbing fixtures. By adoption of this code, new construction and change of use are required to use more efficient plumbing fixtures.

5.2 Environmentally Sustainable Building - LEED Design

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high performance low impact commercial and institutional buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health; sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Culpeper County seeks to encourage LEED certification. Consideration should be given to providing incentives for development which attains such certification. Additionally, County projects should endeavor to obtain LEED certifications where economically feasible.

The Allied Concrete showroom was one of the first sites in Culpeper County to qualify for LEED certification

5.3 Green Building Code

The National Green Building Standard, known as ICC-700, was approved Jan. 29, 2009 as an American National Standard. The new Standard provides guidance for safe and sustainable building practices for residential construction, including both new and renovated single-family to high-rise residential buildings. This is the only "green" standard that is coordinated with the Code Council's family of I-Codes and standards.

The International Code Council and the National Association of Home Builders developed the Standard with input from diverse stakeholders ranging from code officials and other building professionals to the entire spectrum of the "green" building community. This new standard and other programs like it provide a practical route and clear guidance towards greener residential construction. The standard also promotes homeowner education for the maintenance and operation of residential buildings in order to ensure long-term health, financial, and environmental benefits.

The Culpeper County Building Department will continue internal training with this new code section and support the use of "green" technology within the community.

5.4 Conservation

One large user of water within the planning area is the Water Treatment Plant (WTP). Currently the WTP backwash water is released into the sewage collection system resulting in a loss of source water as well as increasing the influent flow to the Water Pollution Control Facility. The backwash water accounts for an average of approximately 200,000 gallons per day. As water demands increase, approaching the safe yield capacity of the water system, the system should explore options of treating this filter effluent and returning the treated water back to Mountain Run Lake to retain the use of this water.

The Town's largest water customer implemented a water recycling program in 2009. This program has been very successful and has resulted in a reduction in water consumption by approximately 80,000 gallons per day. The reuse program resulted in a significant reduction in the customer's water and sewer costs which paid for the capital investment required to implement the reuse program and will ultimately result in a profit for the customer. Although the program was customer initiated, this is a good example of effective conservation which should be used as a model when promoting reuse in the planning area.

5.5 Water Loss Prevention & Demand Management

Water loss can account for a significant loss in water within the planning area without a proper monitoring, maintenance and replacement program. The distribution system is monitored continuously by the use of a System Control and Data Acquisition (SCADA) system. This system monitors flow entering the distribution system as well as the tank levels within the system. By monitoring the system late at night when system demands are minimal, the operator can detect water losses within the system which are not routine in nature. Additionally, system losses can be calculated by comparing of monthly water treated to water sold. This comparison does not distinguish between water loss and meter losses and does not monitor potential water losses on the customer's side of the meter. To detect water losses on the customer's side of the meter and provide more data to evaluate water losses on the

system side of the meters an Advanced Meter Infrastructure System (AMI) is anticipated to be purchased and installed within the Town system. This system will provide leak detection for the customer's system's as well as provide additional meter reading data to assist with leak detection within the distribution system. This system also provides the capability of installing leak detection devices to monitor and evaluate the distribution system for leaks. Additionally, this system will allow the Town to monitor customer water use during drought conditions that warrant water restrictions providing a valuable tool in the enforcement of restrictions. Additionally, this system is anticipated to be compatible with leak detection sensors which once deployed should provide a direct indication of leaks as well as their location within the system.

The Town currently has a robust maintenance program to insure proper maintenance of the distribution system as well as a capital replacement program for lines which are deemed to be structurally inadequate.

6. Drought Response and Contingency Plans

6.1 Town of Culpeper Water Conservation Policy

The Town of Culpeper adopted a drought response and contingency plan "Water Conservation Policy" in December 2007. A copy of this plan follows:

WATER CONSERVATION POLICY

I. Purpose.

Water is one of the most precious resources available to the Town of Culpeper, without which the Town would cease to exist. It is therefore incumbent upon all customers of the Town of Culpeper system to exercise prudence when utilizing this precious resource. The purpose of this water conservation policy is to provide guidance through which the customers of the Town of Culpeper water system can be informed and educated of water conservation methods and practices, and to establish the framework through which water conservation can occur, not only during periods of sufficient or excess water supply flows, but also during periods of drought or low water supply flows.

II. Education.

The primary means by which water conservation can be achieved is through education of the customers of the Town of Culpeper water system. Therefore, one of the primary functions of this policy is to empower the Town Manager to use every necessary form of media available to educate the public of water conservation methods. This water conservation education campaign shall be an ongoing effort to keep the customers of the water system informed of methods to achieve water conservation.

III. Water conservation measures.

During certain months of the calendar year, reservoir levels normally decrease due to periods of reduced rainfall and/or increased temperatures. It is during these periods when the reservoir level is low that water conservation measures become increasingly important. In those months where the reservoir should be full and overflowing, if the reservoir is low, then greater water conservation measures are needed. So as to ensure the customers of the Town of Culpeper water system remain informed of the importance of water conservation during these periods, and upon determination by the Town Manager of the existences of the following conditions, the Town Manager may take the following actions:

(1) Stage 1: When the water level of Lake Pelham reaches the designated point as indicated in the Water Conservation grid in Appendix 1, the Town Manager may, through appropriate means, notify the public of existing reservoir levels, and indicate that voluntary reductions may be necessary in the future.

(2) Stage 2: When the water level of Lake Pelham reaches the designated point as indicated in the Water Conservation Grid in Appendix 1, the Town Manager may, through appropriate means, call upon the public to employ prudent restraint in water usage, and to conserve water voluntarily by whatever methods are available.

IV. Extraordinary water conservation measures.

During periods of unusual and extraordinary conditions, based upon the month and reservoir level, it may become necessary to reduce water consumption to levels not normally achieved through ordinary water conservation efforts. Although these extraordinary conditions rarely occur, a comprehensive water conservation policy should always include provisions for such conditions. During a continued period of drought or any other extraordinary condition, the protection of the health, safety and welfare of the residents of the Town of Culpeper may require that certain uses of water, not essential to public health, safety and welfare, be reduced or restricted. As water reservoir levels become increasingly more critical, extraordinary conservation measures to reduce demand on the water supply may be necessary. The point at which extraordinary conservation measures are to be considered for implementation shall be as designated in the Water Conservation Grid in Appendix 1.

V. Authority to declare water emergencies.

The Town Council may declare a water emergency in the Town affecting the use of the water in any area of the Town, and thereby control and restrict the use of water during an emergency resulting from a water shortage. Upon the declaration of a water emergency, the Town Council shall enact an emergency ordinance that may incorporate the guidelines set forth hereto in Sections VI, VII, VIII, and IX.

State law references – Water supply emergency ordinances, Code of Virginia, 15.2-924;
Powers and duties of political subdivisions, Code of Virginia, 44-146.19.

VI. Publication of declaration.

Upon the declaration of a water emergency, the Town Manager shall immediately post a written notice of the emergency at all entrances of the Town Hall, shall place a notice in a newspaper of general circulation in the Town, shall request a public service announcement be aired on local radio stations, and shall post a notice on the official web site of the Town of Culpeper.

VII. Use of water restricted.

The Town Manager is authorized and directed to implement extraordinary conservation measures by ordering the restricted use or absolute curtailment of the use of water for certain nonessential purposes for the duration of the water shortage in the manner hereinafter identified. In exercising this discretionary authority, and making the

determinations set forth herein, the Town Manager shall give due conservation to water levels, available/usage storage on hand, draw down rates and the projected supply capability in the water reservoirs of the Town, daily water consumption and consumption projections of the system's customers; prevailing and forecast weather conditions; fire service requirements; estimates of minimum essential supplies to preserve public health and safety and such other data pertinent to the past, current and projected water demands. All data collected and considered by the Town Manager shall be reduced to writing and maintained by the Town Manager.

Upon the declaration of a water emergency by the Town Council, the Town Manager shall take the following actions, which shall apply to any person whose water supply is provided by the Town's water system:

(1) *Stage 3:* When the water level of Lake Pelham reaches the designated point on the water conservation grid, the Town Manager shall notify the public of the water emergency declaration, and shall impose mandatory water usage restrictions on all customers as follows:

(a) The water of shrubbery, trees, lawns, grass, plants, or any other vegetation, except indoor plantings, greenhouse or nursery stocks.

(b) The washing of automobiles, trucks, trailers, boats, or any other type of mobile equipment, except in facilities operating with a water recycling system approved by the Town, provided; however, that any facility operating with a water recycling system shall prominently display in public view a notice approved by the Town stating that such recycling system is in operation. In lieu of this provision, the Town Manager may reduce the hours of operation of commercial enterprises offering such services or which wash their equipment.

(c) The washing of streets, driveways, parking lots, service stations aprons, office buildings, exteriors of homes or apartments, or other outdoor surfaces.

(d) The operation of any ornamental fountain or other structure making a similar use of water.

(e) The filling of swimming and/or wading pools, or the refilling of swimming and/or wading pools that were drained after mandatory water restrictions were imposed.

(f) The use of water from fire hydrants for any purpose other than fire suppression or other public emergency, provided; however, that any necessary flushing of the water distribution system by authorized personnel to ensure public health, safety and welfare, shall be permitted.

(g) The serving of drinking water in restaurants, cafeterias or any other food establishment unless requested by the individual.

(h) The sale of bulk water from the water treatment facility shall be restricted to end uses within the Town and County of Culpeper, and any outside entities having specific agreements with the Town as approved by the Town Council.

(2). *Stage 4:* When the water level of Lake Pelham reaches the designated point on the water conservation grid, the Town Manager shall impose additional mandatory water restrictions as follows:

(a) All sales of bulk water from the water treatment facility, excepting emergency uses as specifically designated by Town Council, shall cease.

(b) Industrial, institutional, commercial, governmental, and all other nonresident customers shall be allotted a percentage reduction based on that customer's average monthly and/or quarterly previous calendar year's consumption. Such reduction shall be at the discretion of the Town Manager.

(c) Individual residential customers shall be limited to a specific volume or percentage reduction of water per quarter. Such reduction shall be at the discretion of the Town Manager.

If the allotted monthly water usage is exceeded, the customer shall be charged fifteen dollars ($15.00) for every one thousand (1,000) gallons of water consumed above the allotted volume. Where prior consumption data is not available the Town Manager shall estimate allocations based upon the data available from similar activities of equal intensity.

The determination of *Stage 3 and 4* by the Town Manager shall be accompanied by a written report, which shall set out the criteria utilized and data relied upon in making such determination including a narrative summary supporting the determination. Each report shall be available for public inspection in the Town Manager's office. The Town Manager shall provide a copy of each report to the Town Council.

VIII. Limitation of restrictions.

The provisions of this policy, or regulations promulgated hereunder by the Town Manager, which are hereby authorized, shall not apply to any governmental activity, institution, business or industry which shall be declared by the Town Manager, upon a proper showing, to be necessary for the public health, safety and welfare or the prevention of severe economic hardship or the substantial loss of employment. Any activity, institution, business or industry aggrieved by the finding of the Town Manager may appeal that decision to the Town Council.

IX. Penalty.

(1). Upon the declaration of a water emergency by the Town Council, any person who shall violate any of the provisions set forth in *Stages 3 or 4* of this policy, or of any of the conservation regulations promulgated by the Town Manager pursuant thereto, shall be guilty of a Class 3 misdemeanor and fined not more than five-hundred dollars ($500.00), in addition to charges set forth in Section VII. (2) hereof.

(2). Each act or each day's continuation of a violation shall be considered a separate offense.

(3). In addition to the foregoing, the Town Manager may suspend water service to any person continuing to violate the provisions in *Stages 3 or 4* of this policy or the regulations promulgated therein. If such water service is terminated, the person shall pay a reconnection fee in accordance with the adopted fee structure in place at that time.

X. Notification of end of water emergency.

The Town Manager shall notify the Town Council when the water emergency no longer exists. Upon concurrence of the Council, the water emergency shall be declared to have ended. The determination by the Town Council to end the water emergency shall be based primarily on the level of water in Lake Pelham recovering to a level where restrictions, as specified in the Water Conservation Grid in Appendix 1, are no longer required. Voluntary water conservation measures may be encouraged until such time as the water level in Lake Pelham recovers to normal pool elevation.

APPENDIX 1

Water Restriction Grid

Level Lake is Down below Overflow

Month	6"	12"	18"	24"	30"	36"	42"
January	Stage 2	Stage 3	Stage 4	Stage 4	Stage 4	Stage 4	Stage 4
February	Stage 2	Stage 3	Stage 4	Stage 4	Stage 4	Stage 4	Stage 4
March	Stage 2	Stage 3	Stage 4	Stage 4	Stage 4	Stage 4	Stage 4
April	Stage 2	Stage 2	Stage 3	Stage 3	Stage 4	Stage 4	Stage 4
May	Stage 1	Stage 2	Stage 3	Stage 3	Stage 4	Stage 4	Stage 4
June	Stage 1	Stage 2	Stage 2	Stage 3	Stage 4	Stage 4	Stage 4
July	None	Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 4
August	None	Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 4
September	None	Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 4
October	None	Stage 1	Stage 2	Stage 3	Stage 3	Stage 4	Stage 4
November	Stage 1	Stage 2	Stage 3	Stage 3	Stage 4	Stage 4	Stage 4
December	Stage 1	Stage 2	Stage 3	Stage 3	Stage 4	Stage 4	Stage 4

If water level drops more than 3" per week, we go to the next level or stage 3 immediately.
If water level drops more than 2" per week, we go to the next level or stage 2 immediately.

Level 1	Mention to public that lake is low and voluntary restrictions may be necessary.
Level 2	Voluntary Restrictions
Level 3	Mandatory Restrictions as outlined in Town policy.
Level 4	Target Percentage Reduction for all customers as outlined in Town policy.

6.2 Culpeper County Drought Contingency Plan

The County of Culpeper has developed the following drought contingency plan:

The County of Culpeper manages the following municipal community water systems: Clevengers Village, Emerald Hill Elementary School, Industrial Air Park, Culpeper Sports Complex and Piedmont Technical Center. All of these systems are groundwater-based and consist of multiple wells. Individual well performance can often necessitate localized contingencies to ensure adequate water supply for County customers.

The Culpeper County Drought Contingency Plan is based on the condition and severity of the drought and the guidelines for the restriction of water usage each community determines is necessary. The Culpeper County Environmental Services Department will issue water system warnings following the receipt of a regional drought declaration issued by the Governor's Office.

The Director of Environmental Services will be responsible for determining when to initiate drought contingencies contained in this plan and will notify the County Administrator for issuing community notices. The County Administrator will be responsible for enacting the following drought restrictions:

- Stage 1: Voluntary Conservation
- Stage 2: Mandatory Restrictions
- Stage 3: Emergency Restrictions

Stage 1: Voluntary Conservation

Stage 1 in Culpeper County's Drought Contingency Plan is voluntary conservation. The County Director of Environmental Services and the County Administrator will determine if the drought is severe enough to issue a Stage 1 water restriction notice. The customers will be asked to voluntarily reduce their indoor and outdoor water consumption. If drought conditions worsen, Stage 2 mandatory restrictions will be enacted. Action steps of Stage 1 include:

- Customers will be asked to reduce outdoor water use by:
    - Only using water before 10 am and after 7 pm daily;
    - Reducing turf and lawn watering;
    - Using a broom, not a hose, to clean driveways and sidewalks;
    - Reduce vehicle washing;
    - Using bucket watering instead of hose watering when possible;
    - Turning off ornamental fountains;
- Customers will be asked to reduce indoor water use by:
    - Identifying and repairing leaks;
    - Reducing shower time to five minutes or taking baths with less water;
    - Only using the clothes washer and dishwasher machines when there are full loads;
    - Storing water in the refrigerator instead of running it to get cold;
    - Installing water-saver devices in the home, such as low-flow toilets and shower heads;

Stage 2: Mandatory Restrictions

As drought conditions worsen, the County Director of Environmental Services and the County Administrator may initiate Stage 2 mandatory restrictions on water use. In addition to measures enacted in Stage 1 voluntary conservation, the following mandatory restrictions will be enacted:

- Customers will only be permitted to water shrubbery, trees, lawns, grass, plants or other outdoor vegetation one time per week and only before 10 am or after 7 pm daily;
- Washing vehicles except from a bucket or other container not exceeding 3 gallons in capacity or with recycled water will be prohibited;
- Washing driveways, sidewalks, home or business exteriors or other outside surfaces will be prohibited; however, any person regularly engaged in the business of washing such areas shall be permitted to use water for such purposes as long as the amount of water being used is minimized;
- The operation of any ornamental fountain or similar structure using water will be prohibited;
- The water level in swimming pools may be supplemented only to the extent necessary to preserve structural integrity or to the extent necessary to provide for the safe operation of the pool's chemical feed equipment;
- Restaurants and similar establishments will be prohibited from serving water unless specifically requested by the customer;
- Flow testing of fire hydrants will not be permitted;
- Customers who do not abide by these mandatory restrictions will be subject to a warning letter for the first offense. Subsequent violations will be subject to water service termination and reconnection fees or other penalties included in the County Code;

Stage 3: Emergency Restrictions

During continued drought conditions, the County Director of Environmental Services and the County Administrator may initiate Stage 3 emergency restrictions that curtail water uses that are not essential to public health, safety and welfare. In addition to measures enacted under Stages 1 and 2, the following emergency restrictions will be in effect:

- All public water uses not required for health or safety will be prohibited;
- Watering outdoor vegetation will be prohibited, except from a watering can or other container not exceeding three (3) gallons in capacity or with recycled water. Any person regularly engaged in the sale of plants will be permitted to irrigate only in the amounts necessary to prevent the loss of nursery stock;
- The filling or refilling of swimming or wading pools will be prohibited;
- Fire hydrant use will only be permitted for fire protection;

- Residential customers who exceed the greater of 5,000 gallons per month of consumption or use more than their base average for the same period in the previous twelve (12) months will be subject to water service termination and reconnection fees.

A rescission of any or all of the above restrictions would be initiated by the County Director of Environmental Services. Culpeper County reserves the right to modify this plan as conditions change.

7. Statement of Need and Alternatives

Town of Culpeper Water System

The raw water need projection as stated in section 4 above indicate a 40 year need of 6.4 MGD (based on projected peak month usage) for the Town of Culpeper service area. Currently the Town of Culpeper system has a safe yield of 5.1 MGD, although it may not be practical or possible to treat 100% of the available safe yield of the available supply. Comparing the current safe yield available with the anticipated safe yield requirement over the next 40 years indicates a deficit of 1.3 MGD. Additionally, all water currently used in the Town of Culpeper System originates from Lake Pelham. In addition to providing additional safe yield for future growth, providing a backup water supply is considered prudent from a reliability standpoint. As a prudent planning target, an additional safe yield of 3.5 MGD is recommended due to the difficulties anticipated with treating 100% of the safe yield capacity of the existing source.

To increase the safe yield available and increase reliability by developing a secondary water source, the Town of Culpeper water system has several options. Development of an additional surface water source takes time to develop due to the regulatory concerns, land acquisition and construction. Although the development of an additional surface water source is recommended, it should be viewed as a long term project which will not improve system reliability for many years.

Although many previously completed studies exist within the Town of Culpeper and Culpeper County, four studies were considered most helpful in evaluating the current options and determining a plan of action for the Town of Culpeper service area. A summary of these studies follows:

2004 Water Supply Master Plan

HSMM completed the 2004 Water Supply Master Plan for the Town of Culpeper in 2004. This plan summarized the following water supply alternatives:

(From 2004 Water Supply Master Plan, Table 19)

SUMMARY OF WATER SUPPLY ALTERNATIVES

Alternative	Yield (MGD)	Capital Cost	Cost Per Million Gallons*	Issues	2010 Update
Existing Conditions	4.4	$1,000,000	NA	Current Dam Safety Regulations and Future Demand Requirements	Dam Safety Evaluation currently underway in preparation of 2013 permit reissuance
Raise Lake Pelham 2 Feet (Cost Includes $1,000,000 from above)	0.9	$4,600,000	$300	This option contingent on the dam upgrade to meet current safety requirements. In-stream flows, historical resources, archaeological resources, and wetlands would be issues.	Dam cannot effectively be raised as described due to development which prevents spillway widening. Additional study required to determine viability.
Raise Lake Pelham 8.6’	NA	NA	NA	This option would increase 100-year flooding significantly. Not possible due to current dam design.	No Change in Issues
Dredge Lake Pelham	0.4	$6,100,000	$800	High cost for low yield	No Change in Issues
VDOT Quarry	0.7	$1,500,000	$100	Routing water line through undeveloped area could have potential wetland impacts not evaluated as part of this study. Yield is for short duration only.	Potential for water contamination exists due to proximity of contamination site. Additional study required to determine viability.
Pump from Catalpa	0.2	$1,300,000	$400	Routing water line through undeveloped area could have potential wetland impacts not evaluated as part of this study. Yield is for short duration only.	No Change in Issues
Lake Caynor	0	NA	NA	There is no water storage according to prior reports	No Change in Issues
Modify Mountain Run	0.7	$200,000	$20	No issues	Completed
Groundwater	0.9	$1,500,000	$100	Iron and manganese in groundwater. Drawdown of the aquifer and the presence of other wells.	Studies continue by Emery & Garrett Groundwater for both the Town and County
New Reservoir	4.3	$21,000,000	$300	Wetlands, in-stream flow requirements, land, historical resources, and dam safety.	Since modifications to Mt. Run above have been completed, safe yield is 3.6 MGD.

***Cost per Million Gallons = Capital Cost / {(Yield) *(365 days/year)*(50 years)}**

Lake Pelham Watershed – Raw Water Study

Wiley & Wilson completed a raw water study for the Town of Culpeper in February 1992. This study summarized the following water supply alternatives:

TABLE 5-1
SUMMARY OF OPTIONS

Alternative	Safe Yield (mgd)	Add. Yield (mgd)	Add. Storage Req'd (mgd)	Cost To Develop	Cost/Additional (mgd)
Lake Pelham Watershed					
- Existirig yield	4.3				
- Raise Mountain Run	5.0	0.7	162	$ 270,000	$ 386,000
- Raise Mountain Run	6.0	1.7	408	$ 637,000	$ 375,000
- Raise Caynor Lake	5.0	0.7	162	$ 456,000	$ 651,000
- Raise Caynor Lake	6.0	1.7	408	$ 826,000	$ 486,000
Lake Pelham Watershed					
- New Reservoir	10.2	5.9	1,480	$3,885,000	$ 658,000
Lake Pelham Watershed					
- Excavate Lakes	5.0	0.7	162	$9,166,000	$5,392,000
- Excavate Lakes	6.0	1.7	408	$3,468,000	$5,211,000
Lake Pelham Watershed					
- Groundwater Wells*	5.3	1.0	0	$ 615,000	$ 615,000
Pump Over from Hazel to Lake Pelham Watershed					
- 2 mgd pump over	6.0	1.7	0	$ 743,000	$ 427,000
- 4 mgd pump over	7.5	3.2	0	$1,045,000	$ 329,000
- 6 mgd pump over	8.9	4.6	0	$1,137,000	$ 246,000
Lake Catalpa Watershed					
- Existing 1/2 mgd pump over	0.5	0.5	0	$ 486,000	$ 972,000
- 1 mgd pump over	1.0	1.0	170	$1,213,000	$1,213,000

*** Does not necessarily require further treatment.**

Culpeper County Reservoir Study

Wiley & Wilson completed a reservoir study for Culpeper County in March 2001. This plan summarized the following water supply alternatives:

(From 2001 Reservoir Study, Table 1)
Summary of Reservoir Statistics

Site #	Source River	Normal Surface Area (acres)	Normal Volume (MGD)	Watershed Area (acres)	Diversion Pump Capacity (MGD)	Max Yield (MGD)	Total Cost (mill $)	Cost per MGD (mill $/MGD)
3	Hazel & Indian Run	461	3,149	4,897	77.6	7.5	15.1	2.01
3A	Indian Run	461	3,149	4,897	0	4.8	5.89	1.23
7	Rappahannock	227	1,331	1,360	90.5	2.8	7.25	2.59
10	Hazel	243	763	5,957	90.5	3.5	6.91	1.98
10A	Muddy Run	243	763	5,957	0	3.5	2.85	0.81
13	Rappahannock	115	705	1,706	97.0	2.3	5.32	2.31
Roanoke County, Spring Hollow Project*		158	3,200	540	80.0	17	33.0	1.94

* *Yield and Cost Statistics for Roanoke County's Spring Hollow Reservoir are included for comparative purposes.*

Each of these alternative sites is discussed in detail in the 2001 report with associated pros and cons of each being described. In addition, the proximity to the Town of Culpeper water system should be included in a more detailed evaluation of the sites before a site is selected.

Groundwater Exploration and Development

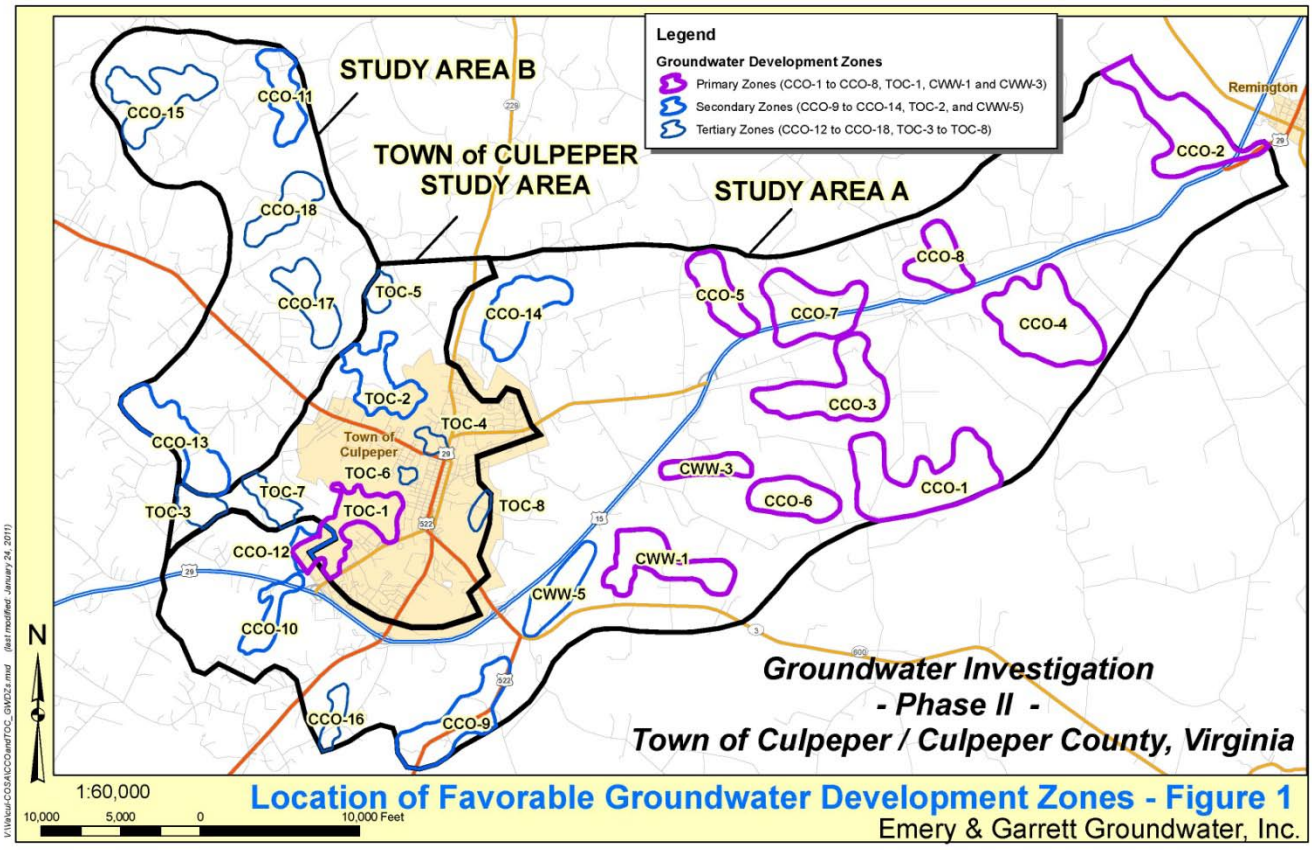
Emery & Garrett Groundwater, Inc. has completed or is completing several groundwater exploration and development studies for Culpeper County and the Town of Culpeper. These studies are typically completed in six phases. Phase I includes an evaluation of the study area to determine potential development zones which warrant additional study. Phase II includes a geophysical survey of the potential development zones to identify specific well targets. Phase III includes the drilling of selected targets and the completion of water quantity and quality testing. Phase IV is the conversion of test wells to projection wells. Phase V includes additional testing to determine sustainable yield and water quality. Phase VI includes the preparation and submission of a final hydrogeologic report specifying recommended operational and monitoring guidelines for the production well.

Results of this study has identified one 0.5 MGD potable water production well and one non-potable production well for Culpeper County. Currently Emery & Garrett Groundwater is working on Phase II of an area lying between two completed studies for Culpeper County which includes the Town of Culpeper and an area west of Town. Once complete, the various studies will be evaluated together to determine appropriate priorities for drilling of additional drilling targets. Based on Emery & Garrett Groundwater's findings to date, the potential exists for the development of 1.5 to 3.0+ MGD of groundwater from fractured bedrock aquifers in the identified study areas.

The development of groundwater primarily as a backup secondary supply is considered ideal for this service area since it is a completely separate system from the current surface water source and since drought conditions that affect surface water generally do not correspond with events affecting ground water. Additionally, the safe yield calculation for surface water supplies is based on available storage and minimum stream flows during periods of extreme drought. During other periods, the available yield is much greater than the calculated safe yield. Therefore, reliance on groundwater to increase the safe yield of the supply is only required during these extreme drought events, leaving extended periods of time in which the groundwater source can rest and recover.

More detailed results of these studies can be found in "Culpeper Study Area A and B Groundwater Investigation, Selection of Proposed Exploratory Test Well Sites, (Results of Phase II – Geophysical Surveys), Culpeper County, Virginia, February 2008" and "Groundwater Exploration and Development Results of Phase I Investigation, Town of Culpeper Study Area, Culpeper, Virginia, June 2010". A composite map showing the location of these groundwater development zones is included as Map 7.1.

Map 7.1, Groundwater Development Zones



Recommended Course of Action

To maximize the efficient use of raw water resources the Town of Culpeper and Culpeper County should continue to work together to develop a long term plan for serving the Town of Culpeper service area which includes the Town environs. Currently the Town and County are finalizing a 30 plus year agreement that, once finalized, will foster and require a regional approach to water service and water supply planning within this service area.

Currently, the Town of Culpeper service area uses Lake Pelham and Mountain Run Lake reservoirs as its sole source of water supply. Lake Pelham and Mountain Run Lake have a combined safe yield of 5.1 MGD, while the 40 year projected water resource requirement is 6.4 MGD. Although the difference equals a deficit of 1.3 MGD, a prudent planning target of 3.5 MGD is recommended due to the difficulties anticipated with treating 100% of the safe yield capacity of the existing source.

In the near term, continuing efforts to develop groundwater as an additional and secondary supply is recommended. Groundwater withdrawal sources could be developed to provide another 1.5 to 3.0+ MGD safe yield with minimal regulatory issues and at a substantially reduced cost compared to the development of additional surface water sources.

In the long term, the development of an additional surface water supply is recommended. Since the development of a new surface water supply could take in excess of 20 years to develop, this effort should be started within the next few years after a better understanding of groundwater availability can be determined. The first step in developing an additional surface water supply should be the revisiting of the two surface water studies to verify current safe yield and to more fully evaluate the surface water options to determine which potential supply should be developed. Once determined, a joint effort of the Town and County should continue with permitting and land acquisition.

In addition to the above mentioned alternatives to increase the water supply for the Town of Culpeper service area, water demand management alternatives should be considered. Once the automatic meter reading system is completed, the utility will have the capability of providing additional information to customers to assist them with demand side management and leak detection. This new capability, coupled with continued public education on the benefits of conservation and water reuse will not alleviate the need for an additional raw water source but will maximize the benefit of the existing system. Additionally, the Town of Culpeper should evaluate the potential to reuse the water filter plant backwash water by returning it to the head of the plant or Lake Pelham. This alternative has the potential of increasing the effective safe yield of the system by 0.23 MGD. Before implementing filter backwash recycling, careful consideration should be given to potable water safety concerns as well as other regulatory concerns by DEQ and VDH.

Appendix A

Listing of Community and Non-Community Water Systems in Culpeper County

Table X. Public Water Systems in Culpeper County, Virginia

PWSID	System Name	AVG DAILY PROD MSR	Calculated Approx. MONTHLY (30 * daily)	GALS PER MIN MSR	CASING DEPTH MSR	DEPTH AT COMP MSR	WELL DIAMETER MSR	CASING DIAM MSR
VA6047010	**ASHMORE ACRES**	2043	**61,290**	0	66	265	6	6
VA6047015	**BAILEYS TRAILER PARK**	2963	**88,890**	0	0	265	6	0
VA6047015	**BAILEYS TRAILER PARK**	2963	**88,890**					
VA6047012	**BELLA POINTE SUBDIVISION**	4800	**144,000**					
VA6047013	**BLUE RIDGE GROWERS-BREAK ROOM**	0	**0**					
VA6047014	**BLUE RIDGE GROWERS-OFFICE**	0	**0**					
VA6047325	**BOSTON WATER AND SEWER**	0	**0**					
VA6047019	**BOXWOOD TREATMENT CENTER**	4500	**135,000**					
VA6047490	**BRENRIDGE SUBDIVISION**	0	**0**					
VA6047490	**BRENRIDGE SUBDIVISION**	0	**0**	47	52	400	8	8
VA6047023	**CAMP HAPPYLAND**	1500	**45,000**	0	0	150	6	6
VA6047023	**CAMP HAPPYLAND**	1500	**45,000**	12	54	350	6	6
VA6047023	**CAMP HAPPYLAND**	1500	**45,000**	0	0	0	6	6
VA6047025	**CATALPA SUBDIVISION**	2836	**85,080**	0	100	225	0	0
VA6047436	**CEDAR MOUNTAIN CAMPGROUND**	0	**0**					
VA6047038	**CEDARBROOKE SUBDIVISION**	47000	**1,410,000**					
VA6047038	**CEDARBROOKE SUBDIVISION**	47000	**1,410,000**	75	75	215	6	6
VA6047030	**CHILDHELP**	3300	**99,000**	23	61	800	0	10
VA6047041	**CHURCHILL SUBDIVISION**	2357	**70,710**	7	63	605	8	8
VA6047041	**CHURCHILL SUBDIVISION**	2357	**70,710**	7	53	605	8	8
VA6047041	**CHURCHILL SUBDIVISION**	2357	**70,710**	16	50	490	8	8
VA6047040	**CLAIRMONT MANOR**	9700	**291,000**	22	61	500	6	6
VA6047040	**CLAIRMONT MANOR**	9700	**291,000**	134	61	320	6	6
VA6047016	**COFFEEWOOD CORRECTIONAL CENTER**	215539	**6,466,170**	195	58	382	0	0
VA6047016	**COFFEEWOOD CORRECTIONAL CENTER**	215539	**6,466,170**	325	58	520	8	8
VA6047016	**COFFEEWOOD CORRECTIONAL CENTER**	215539	**6,466,170**	85	58	560	8	8
VA6047043	**COMMUNICATIONS CORP OF AMERICA**	500	**15,000**	8	0	750	6	6
VA6047049	**CULPEPER COMMUNITY COMPLEX WATERWORKS**	0	**0**	300	61	0	8	8
VA6047550	**CULPEPER INDUSTRIAL AIRPARK**	6000	**180,000**	122	51	295	10	10
VA6047550	**CULPEPER INDUSTRIAL AIRPARK**	6000	**180,000**	120	52	220	10	10
VA6047050	**CULPEPER MOBILE HOME PARK**	4428	**132,840**	0	50	175	6	6

Systems highlighted are calculated to pump more than 300,000 gallons per month

Table X. Public Water Systems in Culpeper County, Virginia

PWSID	System Name	AVG DAILY PROD MSR	Calculated Approx. MONTHLY (30 * daily)	GALS PER MIN MSR	CASING DEPTH MSR	DEPTH AT COMP MSR	WELL DIAMETER MSR	CASING DIAM MSR
VA6047050	**CULPEPER MOBILE HOME PARK**	4428	**132,840**	0	50	0	6	6
VA6047060	**CULPEPER TOWN YARD**	8108	**243,240**	20	53	415	6	6
VA6047500	**CULPEPER, TOWN OF**	1500000	**45,000,000**					
VA6047500	**CULPEPER, TOWN OF**	1500000	**45,000,000**					
VA6047065	**DUTCH HOLLOW SUBDIVISION**	6889	**206,670**	69	69	340	6	6
VA6047065	**DUTCH HOLLOW SUBDIVISION**	6889	**206,670**	21	67	420	6	6
VA6047070	**EMERALD HILL ELEM SCHOOL**	2000	**60,000**					
VA6047070	**EMERALD HILL ELEM SCHOOL**	2000	**60,000**	20	135	420	6	6
VA6047075	**ERINBROOK**	10000	**300,000**	23	58	395	6	6
VA6047100	**FAIRVIEW ACRES**	23000	**690,000**	22	58	79	10	10
VA6047100	**FAIRVIEW ACRES**	23000	**690,000**	60	100	440	6	6
VA6047230	**FOREST VIEW SUBDIVISION**	0	**0**	28	83	400	6	6
VA6047250	**GIBSON MILLS SUBDIVISION**	1946	**58,380**	0	103	425	0	0
VA6047255	**GLENDALE SUBDIVISION**	0	**0**	0	60	0	0	6
VA6047260	**HAZEL RIVER**	0	**0**	56	0	265	6	6
VA6047300	**HERITAGE ESTATES**	5419	**162,570**	70	76	391	6	6
VA6047021	**INN AT KELLY`S FORD**	0	**0**					
VA6047021	**INN AT KELLY`S FORD**	0	**0**					
VA6047318	**KAVANAUGH MEADS**	7915	**237,450**	21	58	235	10	6
VA6047318	**KAVANAUGH MEADS**	7915	**237,450**	9	76	670	6	6
VA6047225	**LAKESIDE MOBILE HOME PARK**	2588	**77,640**	0	0	130	6	6
VA6047330	**MERRIMAC SOUTH**	7182	**215,460**	29	105	525	6	6
VA6047340	**MOUNTAIN VIEW TRAILER PARK**	4377	**131,310**	0	0	0	0	0
VA6047340	**MOUNTAIN VIEW TRAILER PARK**	4377	**131,310**	0	0	0	0	0
VA6047200	**NATIONAL AUDIOVISUAL CONSERVATION CENTER**	0	**0**					
VA6047200	**NATIONAL AUDIOVISUAL CONSERVATION CENTER**	0	**0**	65	51	440	12	6
VA6047200	**NATIONAL AUDIOVISUAL CONSERVATION CENTER**	0	**0**	33	58	460	12	6
VA6047355	**NORMAN ACRES SUBDIVISION**	3920	**117,600**	0	55	165	6	6
VA6047360	**NORTHTOWN VILLAGE**	5548	**166,440**	8	63	520	10	6
VA6047360	**NORTHTOWN VILLAGE**	5548	**166,440**	0	50	200	6	6
VA6047391	**OVERLOOK HEIGHTS I**	3228	**96,840**	100	68	385	10	6

Table X. Public Water Systems in Culpeper County, Virginia

PWSID	System Name	AVG DAILY PROD MSR	Calculated Approx. MONTHLY (30 * daily)	GALS PER MIN MSR	CASING DEPTH MSR	DEPTH AT COMP MSR	WELL DIAMETER MSR	CASING DIAM MSR
VA6047391	**OVERLOOK HEIGHTS I**	3228	**96,840**	15	100	297	10	6
VA6047392	**OVERLOOK HEIGHTS II**	4074	**122,220**	110	50	235	6	6
VA6047392	**OVERLOOK HEIGHTS II**	4074	**122,220**	15	100	175	6	6
VA6047400	**PELHAM MANOR**	11855	**355,650**	35	100	700	10	10
VA6047400	**PELHAM MANOR**	11855	**355,650**					
VA6047400	**PELHAM MANOR**	11855	**355,650**	20	80	330	6	6
VA6047408	**PIEDMONT TECHNICAL EDUCATION CENTER**	1000	**30,000**	0	0	0	0	0
VA6047415	**PONDEROSA MOBILE HOME PARK**	0	**0**	0	0	300	6	6
VA6047431	**RANDLE RIDGE**	0	**0**	0	0	0	6	6
VA6047433	**RAPPAHANNOCK ELECTRIC COOP**	0	**0**	0	0	250	0	0
VA6047437	**ROTHERWOOD I SUBDIVISION**	1680	**50,400**	130	114	425	12	8
VA6047453	**RRCSB**	700	**21,000**	6	65	455	6	6
VA6047478	**SOUTH WALES GOLF COURSE**	0	**0**					
VA6047475	**SPRINGWOOD SUBDIVISION**	2442	**73,260**					
VA6047475	**SPRINGWOOD SUBDIVISION**	2442	**73,260**	0	0	0	0	0
VA6047560	**VA STATE POLICE - 2ND DIVISION HQ**	250	**7,500**	0	0	0	0	0
VA6047700	**WARRENTON TRAINING CENTER**	960	**28,800**	5	60	660	10	10
VA6047851	**WESTLAKES SUBDIVISION**	7400	**222,000**	56	100	170	10	6
VA6047851	**WESTLAKES SUBDIVISION**	7400	**222,000**	60	100	0	6	6
VA6047865	**WESTOVER ESTATES**	2558	**76,740**	0	74	405	6	6
VA6047950	**WESTVIEW TRAILER PARK**	4602	**138,060**	0	90	125	6	6
VA6047955	**WILDWOOD FOREST**	12686	**380,580**	51	63	400	8	8
VA6047955	**WILDWOOD FOREST**	12686	**380,580**	15	73	520	6	6
VA6047965	**WILLOW RUN COMPANY**	0	**0**	0	0	116	6	0

FacName - Culpeper County Records	System Name - VDH Records
Ashmore Acres	ASHMORE ACRES
Baileys Trailer Park	BAILEYS TRAILER PARK
	BELLA POINTE SUBDIVISION
	BLUE RIDGE GROWERS-BREAK ROOM
	BLUE RIDGE GROWERS-OFFICE
	BOSTON WATER AND SEWER
	BOXWOOD TREATMENT CENTER
Brenridge Subdivision	BRENRIDGE SUBDIVISION
	CAMP HAPPYLAND
Catalpa Subdivision	CATALPA SUBDIVISION
	CEDAR MOUNTAIN CAMPGROUND
Cedarbrooke Subdivision	CEDARBROOKE SUBDIVISION
Childhelp	CHILDHELP
Churchill Subdivision	CHURCHILL SUBDIVISION
Clairmont Manor	CLAIRMONT MANOR
Coffeewood Correctional Center	COFFEEWOOD CORRECTIONAL CENTER
Communications Corp. of America	COMMUNICATIONS CORP OF AMERICA
	CULPEPER COMMUNITY COMPLEX WATERWORKS
	CULPEPER INDUSTRIAL AIRPARK
Culpeper Mobile Home Park	CULPEPER MOBILE HOME PARK
	CULPEPER TOWN YARD
	CULPEPER, TOWN OF
Dutch Hollow Subdivision	DUTCH HOLLOW SUBDIVISION
Emerald Hill Elementary School	EMERALD HILL ELEM SCHOOL
Erinbrook	ERINBROOK
Fairview Acres	FAIRVIEW ACRES
	FOREST VIEW SUBDIVISION
Gibson Mills Subdivision	GIBSON MILLS SUBDIVISION
	GLENDALE SUBDIVISION
Hazel River	HAZEL RIVER
Heritage Estates	HERITAGE ESTATES
	INN AT KELLY`S FORD
Kavanaugh Meads Subdivision	KAVANAUGH MEADS
Lakeside Mobile Home Park	LAKESIDE MOBILE HOME PARK
Merrimac South Subdivision	MERRIMAC SOUTH
Mountain View Mobile Home Park	MOUNTAIN VIEW TRAILER PARK
	NATIONAL AUDIOVISUAL CONSERVATION CENTER
Norman Acres	NORMAN ACRES SUBDIVISION
Northtown Village	NORTHTOWN VILLAGE
Overlook Heights I & II	OVERLOOK HEIGHTS I

Systems highlighted are calculated to pump more than 300,000 gallons per month based on VDH data

	OVERLOOK HEIGHTS II
Pelham Manor	PELHAM MANOR
Piedmont Technical Education Center	PIEDMONT TECHNICAL EDUCATION CENTER
Ponderosa Mobile Home Park	PONDEROSA MOBILE HOME PARK
Randle Ridge	RANDLE RIDGE
	RAPPAHANNOCK ELECTRIC COOP
Rotherwood I Subdivision	ROTHERWOOD I SUBDIVISION
	RRCSB
South Wales	SOUTH WALES GOLF COURSE
Springwood Subdivision	SPRINGWOOD SUBDIVISION
Va. State Police - Division Hdqtrs.	VA STATE POLICE - 2ND DIVISION HQ
Warrenton Training Center	WARRENTON TRAINING CENTER
Westlakes Subdivision	WESTLAKES SUBDIVISION
Westover Estates	WESTOVER ESTATES
Westview Trailer Park	WESTVIEW TRAILER PARK
Wildwood Forest	WILDWOOD FOREST
	WILLOW RUN COMPANY

Appendix B

VDH Summary of Water Well Construction in Culpeper County

PWSID	System Name	Activity Status	PWS Type	Primary Source	Water Class	County	Primary Population	Total Population	Service Connections	Water Source Name	Pump Type	Pump Capacity
VA6047010	ASHMORE ACRES	A	C	GW	VI	CULP	31	31	10	WELL 1	SUBMERSIBLE	9
VA6047015	BAILEYS TRAILER PARK	A	C	GW	VI	CULP	84	84	28	DRILLED WELL	SUBMERSIBLE	25
VA6047015	BAILEYS TRAILER PARK	A	C	GW	VI	CULP	84	84	28	WELL 2		
VA6047012	BELLA POINTE SUBDIVISION	A	C	GW		CULP				BELLA POINTE WELL 1		
VA6047013	BLUE RIDGE GROWERS-BREAK	A	NTNC	GW	VI	CULP	60	60	1	WELL 1		
VA6047014	BLUE RIDGE GROWERS-OFFICE	A	NTNC	GW	VI	CULP	60	60	1	WELL 3		
VA6047325	BOSTON WATER AND SEWER	A	NC	GW	N/A	CULP	70	70	3	UPPER WELL		
VA6047019	BOXWOOD TREATMENT CENTER	A	NC	GW	N/A	CULP	46	46	2	DRILLED WELL		
VA6047490	BRENRIDGE SUBDIVISION	A	C	GW	VI	CULP	150	150	56	WELL 2		
VA6047490	BRENRIDGE SUBDIVISION	A	C	GW	VI	CULP	150	150	56	WELL 1	SUBMERSIBLE	47
VA6047023	CAMP HAPPYLAND	A	NC	GW	N/A	CULP	250	250	33	WL001		25
VA6047023	CAMP HAPPYLAND	A	NC	GW	N/A	CULP	250	250	33	WL003		0
VA6047023	CAMP HAPPYLAND	A	NC	GW	N/A	CULP	250	250	33	WL002		0
VA6047025	CATALPA SUBDIVISION	A	C	GW	IV	CULP	48	48	19	DRILLED WELL	SUBMERSIBLE	60
VA6047436	CEDAR MOUNTAIN CAMPGROUND	A	NC	GW	N/A	CULP	30	30	41	DRILLED WELL		
VA6047038	CEDARBROOKE SUBDIVISION	A	C	GW	VI	CULP	147	147	52	WELL 2		
VA6047038	CEDARBROOKE SUBDIVISION	A	C	GW	VI	CULP	147	147	52	WELL 1	SUBMERSIBLE	0
VA6047030	CHILDHELP	A	C	GW	VI	CULP	64	64	5	WELL 2		20
VA6047041	CHURCHILL SUBDIVISION	A	C	GW	VI	CULP	115	115	46	WL006	5 HP	7
VA6047041	CHURCHILL SUBDIVISION	A	C	GW	VI	CULP	115	115	46	WL004	5 HP	7
VA6047041	CHURCHILL SUBDIVISION	A	C	GW	VI	CULP	115	115	46	WL002	5 HP	16
VA6047040	CLAIRMONT MANOR	A	C	GW	VI	CULP	153	153	61	WELL A	SUBMERSIBLE	22
VA6047040	CLAIRMONT MANOR	A	C	GW	VI	CULP	153	153	61	WELL B	SUBMERSIBLE	74
VA6047016	COFFEEWOOD CORRECTIONAL	A	C	GW	IV	CULP	2000	2000	20	WELL 5	SUBMERSIBLE	200
VA6047016	COFFEEWOOD CORRECTIONAL	A	C	GW	IV	CULP	2000	2000	20	WELL 1	SUBMERSIBLE	246
VA6047016	COFFEEWOOD CORRECTIONAL	A	C	GW	IV	CULP	2000	2000	20	WELL 2	SUBMERSIBLE	43
VA6047043	COMMUNICATIONS CORP OF	A	NTNC	GW	VI	CULP	170	170	1	WL001	SUBMERSIBLE	15
VA6047049	CULPEPER COMMUNITY COMPLEX	A	NC	GW		CULP				CCC WELL 3A	SUBM	300
VA6047550	CULPEPER INDUSTRIAL AIRPARK	A	NTNC	GW	V	CULP	500	500	14	WL002	SUBMERSIBLE	114
VA6047550	CULPEPER INDUSTRIAL AIRPARK	A	NTNC	GW	V	CULP	500	500	14	WL001	SUBMERSIBLE	147
VA6047050	CULPEPER MOBILE HOME PARK	A	C	GW	VI	CULP	160	160	70	WELL 2	SUBMERSIBLE	15
VA6047050	CULPEPER MOBILE HOME PARK	A	C	GW	VI	CULP	160	160	70	WELL 1	SUBMERSIBLE	50
VA6047060	CULPEPER TOWN YARD	A	NTNC	GW	VI	CULP	45	45	3	WL001	2-HP	18
VA6047500	CULPEPER, TOWN OF	A	C	SW	II	CULP	14200	14200	6200	FAUQUIER STREET WELL		
VA6047500	CULPEPER, TOWN OF	A	C	SW	II	CULP	14200	14200	6200	SPRING STREET WELL		
VA6047065	DUTCH HOLLOW SUBDIVISION	A	C	GW	VI	CULP	231	231	77	WL002	3-HP	55
VA6047065	DUTCH HOLLOW SUBDIVISION	A	C	GW	VI	CULP	231	231	77	WL001	3-HP	21
VA6047070	EMERALD HILL ELEM SCHOOL	A	NTNC	GW	V	CULP	977	977	2	WELL 2		
VA6047070	EMERALD HILL ELEM SCHOOL	A	NTNC	GW	V	CULP	977	977	2	WL001	SUBMERSIBLE	25
VA6047075	ERINBROOK	A	C	GW	VI	CULP	100	100	37	WELL #1	SUBMERSIBLE	21
VA6047100	FAIRVIEW ACRES	A	C	GW	VI	CULP	405	405	134	WL001	SUBMERSIBLE	22
VA6047100	FAIRVIEW ACRES	A	C	GW	VI	CULP	405	405	134	WL003	SUBMERSIBLE	60
VA6047230	FOREST VIEW SUBDIVISION	A	C	GW	VI	CULP	25	25	24	WELL 1		23
VA6047250	GIBSON MILLS SUBDIVISION	A	C	GW	VI	CULP	44	44	11	WELL 1	SUBMERSIBLE	9
VA6047255	GLENDALE SUBDIVISION	A	C	GW	VI	CULP	51	51	4	GLENDALE SUBDIVISION		0
VA6047260	HAZEL RIVER	A	C	GW	VI	CULP	39	39	11	WELL 1	SUBMERSIBLE	0
VA6047300	HERITAGE ESTATES	A	C	GW	VI	CULP	72	72	33	WELL 2	SUBMERSIBLE	60
VA6047021	INN AT KELLY`S FORD	A	NC	GW	N/A	CULP	125	125	8	WELL 2		
VA6047021	INN AT KELLY`S FORD	A	NC	GW	N/A	CULP	125	125	8	WELL 3		
VA6047318	KAVANAUGH MEADS	A	C	GW	VI	CULP	108	108	48	WELL 1	1.5 HP	18
VA6047318	KAVANAUGH MEADS	A	C	GW	VI	CULP	108	108	48	WELL 2	SUBMERSIBLE	9

VA6047225	LAKESIDE MOBILE HOME PARK	A	C	GW	VI	CULP	50	50	22	WELL 1	TURBINE	27
VA6047330	MERRIMAC SOUTH	A	C	GW	VI	CULP	175	175	44	WELL 1	SUBMERSIBLE	28
VA6047340	MOUNTAIN VIEW TRAILER PARK	A	C	GW	VI	CULP	75	75	32	WELL 1 (UPPER WELL)	SUBMERSIBLE	0
VA6047340	MOUNTAIN VIEW TRAILER PARK	A	C	GW	VI	CULP	75	75	32	WELL 2 (LOWER WELL)	SUBMERSIBLE	0
VA6047200	NATIONAL AUDIOVISUAL	A	NTNC	GW		CULP				WELL 3		
VA6047200	NATIONAL AUDIOVISUAL	A	NTNC	GW		CULP				WELL 2	7.5 HP	65
VA6047200	NATIONAL AUDIOVISUAL	A	NTNC	GW		CULP				WELL 1	5 HP	35
VA6047355	NORMAN ACRES SUBDIVISION	A	C	GW	VI	CULP	70	70	20	WL001	1-HP	40
VA6047360	NORTHTOWN VILLAGE	A	C	GW	VI	CULP	50	50	21	WELL 2A		0
VA6047360	NORTHTOWN VILLAGE	A	C	GW	VI	CULP	50	50	21	WELL 1	SUBMERSIBLE	18
VA6047391	OVERLOOK HEIGHTS I	A	C	GW	VI	CULP	60	60	22	WELL 1	5-HP	37
VA6047391	OVERLOOK HEIGHTS I	A	C	GW	VI	CULP	60	60	22	WELL 4	3-HP	29
VA6047392	OVERLOOK HEIGHTS II	A	C	GW	VI	CULP	60	60	26	WELL 3 (GAYHEART)	SUBMERSIBLE	0
VA6047392	OVERLOOK HEIGHTS II	A	C	GW	VI	CULP	60	60	26	WELL 2 (HAYES)	2-HP	15
VA6047400	PELHAM MANOR	A	C	GW	VI	CULP	250	450	72	WELL 1	3-HP	32
VA6047400	PELHAM MANOR	A	C	GW	VI	CULP	250	450	72	WL003		
VA6047400	PELHAM MANOR	A	C	GW	VI	CULP	250	450	72	WELL 2	SUBMERSIBLE	0
VA6047408	PIEDMONT TECHNICAL EDUCATION	A	NTNC	GW	IV	CULP	75	75	6	WELL 1	SUBMERSIBLE	0
VA6047415	PONDEROSA MOBILE HOME PARK	A	C	GW	VI	CULP	60	60	13	WL001	SUBMERSIBLE	0
VA6047431	RANDLE RIDGE	A	C	GW	VI	CULP	57	57	19	WELL #1	SUBMERSIBLE	0
VA6047433	RAPPAHANNOCK ELECTRIC COOP	A	NTNC	GW	VI	CULP	65	65	4	WELL 1	2-HP	0
VA6047437	ROTHERWOOD I SUBDIVISION	A	C	GW		CULP			68	WL001	25 HP	125
VA6047453	RRCSB	A	NTNC	GW	VI	CULP	85	85	1	WELL 1		0
VA6047478	SOUTH WALES GOLF COURSE	A	NC	GW	NA	CULP	200	200	1	WELL 1		
VA6047480	SOUTH WALES	A	C	GW	IV	CULP	855	1681	342			
VA6047475	SPRINGWOOD SUBDIVISION	A	C	GW	VI	CULP	50	50	13	WELL 2		
VA6047475	SPRINGWOOD SUBDIVISION	A	C	GW	VI	CULP	50	50	13	WELL 1	SUBMERSIBLE	0
VA6047560	VA STATE POLICE - 2ND DIVISION HQ	A	NTNC	GW	VI	CULP	40	40	2	WL001	SUBMERSIBLE	25
VA6047700	WARRENTON TRAINING CENTER	A	NTNC	GW	VI	CULP	150	150	7	WELL #2	SUBMERSIBLE	5
VA6047851	WESTLAKES SUBDIVISION	A	C	GW	VI	CULP	70	70	28	WL002	SUBMERSIBLE	47
VA6047851	WESTLAKES SUBDIVISION	A	C	GW	VI	CULP	70	70	28	WL001	SUBMERSIBLE	0
VA6047865	WESTOVER ESTATES	A	C	GW	VI	CULP	35	35	14	WL001	SUBMERSIBLE	10
VA6047950	WESTVIEW TRAILER PARK	A	C	GW	VI	CULP	100	100	28	WELL 1	1-HP	18
VA6047955	WILDWOOD FOREST	A	C	GW	VI	CULP	225	225	75	WL001	SUBMERSIBLE	48
VA6047955	WILDWOOD FOREST	A	C	GW	VI	CULP	225	225	75	WL002	SUBMERSIBLE	12
VA6047965	WILLOW RUN COMPANY	A	NTNC	GW	VI	CULP	80	80	1	WL002	SUBMERSIBLE	27

Casing Depth	Well Depth	Well Diameter	Casing Diameter	Casing Type	Grout Depth	Gallons per min	Avg Daily Production	Est Avg Monthly Production 1/08-5/09	Est Avg Yrly Production 1/08-5/09	Design/System Capacity gpd
66	265	6	6	STEEL	53	0	2043	58260	699120	11 conn.
0	265	6	0		0	0	2963	51720	620640	28 conn.
							2963	51720	620640	29 conn.
							4800			
							0			
							0			
							0			
							4500			
							0			
52	400	8	8	STEEL	52	47	0	251460	3017520	21600
0	150	6	6		0	0	1500			
54	350	6	6	STEEL	50	12	1500			
0	0	6	6		0	0	1500			
100	225	0	0	STEEL	100	0	2836	33300	399600	19 conn.
							0			
							47000	640260	7683120	42000
75	215	6	6	STEEL	75	75	47000	640260	7683120	42000
61	800	0	10	STEEL	50	23	3300	93330	1119960	3333
63	605	8	8	STEEL	60	7	2357	271920	3263040	70 conn.
53	605	8	8	STEEL	50	7	2357	271920	3263040	70 conn.
50	490	8	8	STEEL	50	16	2357	271920	3263040	70 conn.
61	500	6	6	STEEL	55	22	9700	316500	3798000	33450
61	320	6	6	STEEL	55	134	9700	316500	3798000	33450
58	382	0	0	STEEL	58	195	215539	6480840	77770080	257760
58	520	8	8	STEEL	58	325	215539	6480840	77770080	257760
58	560	8	8	STEEL	58	85	215539	6480840	77770080	257760
0	750	6	6	STEEL	0	8	500			
61	0	8	8	STEEL	55	300	0			
51	295	10	10	STEEL	50	122	6000			
52	220	10	10	STEEL	52	120	6000			
50	175	6	6	STEEL	50	0	4428	127290	1527480	71 conn.
50	0	6	6	STEEL	50	0	4428	127290	1527480	71 conn.
53	415	6	6	STEEL	53	20	8108			
							1500000	61308000	735696000	4000000
							1500000	61308000	735696000	4000000
69	340	6	6	STEEL	50	69	6889	462810	5553720	32883
67	420	6	6	STEEL	50	21	6889	462810	5553720	32883
							2000			
135	420	6	6	STEEL	50	20	2000			
58	395	6	6	STEEL	58	23	10000	203910	2446920	16800
58	79	10	10	STEEL	58	22	23000	636540	7638480	44000
100	440	6	6	STEEL	100	60	23000	636540	7638480	44000
83	400	6	6	STEEL	83	28	0	74430	893160	15200
103	425	0	0	STEEL	50	0	1946	47880	574560	11 conn.
60	0	0	6	STEEL	0	0	0	7530	90360	
0	265	6	6	STEEL	0	56	0	41430	497160	14 conn.
76	391	6	6	STEEL	50	70	5419	283170	3398040	33 conn.
							0			
							0			
58	235	10	6	STEEL	58	21	7915	286230	3434760	21600
76	670	6	6	STEEL	76	9	7915	286230	3434760	21600

0	130	6	6	STEEL	0	0	2588	61950	743400	22 conn.
105	525	6	6	STEEL	50	29	7182	274380	3292560	19600
0	0	0	0	STEEL	0	0	4377	54240	650880	35 conn.
0	0	0	0	STEEL	0	0	4377	54240	650880	35 conn.
							0			
51	440	12	6	STEEL	51	65	0			
58	460	12	6	STEEL	52	33	0			
55	165	6	6	STEEL	52	0	3920	81270	975240	20 conn.
63	520	10	6	STEEL	52	8	5548	145650	1747800	20 conn.
50	200	6	6	STEEL	50	0	5548	145650	1747800	20 conn.
68	385	10	6	STEEL	68	100	3228	122970	1475640	23 conn.
100	297	10	6	STEEL	100	15	3228	122970	1475640	23 conn.
50	235	6	6	STEEL	50	110	4074	54690	656280	28 conn.
100	175	6	6	STEEL	100	15	4074	54690	656280	28 conn.
100	700	10	10	STEEL	0	35	11855	320790	3849480	72 conn.
							11855	320790	3849480	72 conn.
80	330	6	6	STEEL	50	20	11855	320790	3849480	72 conn.
0	0	0	0	STEEL	0	0	1000			
0	300	6	6	STEEL	0	0	0			
0	0	6	6	STEEL	0	0	0			20 conn.
0	250	0	0	STEEL	0	0	0			
114	425	12	8	STEEL	70	130	1680			68 conn.
65	455	6	6	STEEL 13-	50	6	700			
							0	1901070	22812840	145600
							2442	35490	425880	15 conn.
0	0	0	0	STEEL	0	0	2442	35490	425880	15 conn.
0	0	0	0	STEEL	0	0	250			
60	660	10	10	STEEL	56	5	960			
100	170	10	6	STEEL	100	56	7400	209460	2513520	28 conn.
100	0	6	6	STEEL	50	60	7400	209460	2513520	28 conn.
74	405	6	6	STEEL	50	0	2558	52770	633240	14 conn.
90	125	6	6	STEEL	0	0	4602	127800	1533600	30 conn.
63	400	8	8	STEEL	56	51	12686	436530	5238360	42000
73	520	6	6	STEEL	72	15	12686	436530	5238360	42000
0	116	6	0		0	0	0			

Appendix C

Resolutions Approving Plan by Town of Culpeper and Culpeper County

The recommendation of the Light & Power, Water and Wastewater Committee is that Council authorizes the Town Manager to execute the Settlement Agreement on behalf of the Town of Culpeper and pay the Settlement amount of $40,000.

Councilmember duFrane moved, Councilmember Jenkins seconded, approval of the recommendation.

Councilmember duFrane stated he believed this was a good example of "big" government coming down on the heads of people who cannot defend themselves in an awkward situation. He believed the Town was being held hostage, because it did not have the records to prove it did not do something. He stated it was not only a testimonial against government of any kind, but it's a testimony of why we should protect our second amendment rights in order to take appropriate action.

Mayor Rimeikis noted he personally would like to vote no, but since it is in the best interest of the community, he would not.

The motion carried by the following voice vote: Ayes: Coleman, duFrane, Jenkins, Olinger, Richards, Rimeikis, Risner, Snider (8); Nay: Yowell (1); Absent: (0)

NEW BUSINESS

PUBLIC HEARINGS – There were none.

REPORTS & RECOMMENDATIONS FROM AUTHORITIES, BOARDS & COMMISSIONS - There were none

REPORTS & RECOMMENDATIONS FROM COUNCIL COMMITTEES

LIGHT & POWER AND WATER & WASTEWATER COMMITTEE

R/R Re: Revised Water Conservation Policy

Town Manager Godfrey presented the following report and recommendation: At its October meeting, the Light & Power, Water, and Wastewater Committee requested staff to draft a proposed revision to the Water Conservation Policy to adjust for seasonal precipitation, lake levels, and treated water demands. Staff developed a water conservation restriction grid to attach to the Water Conservation Policy.

The level of Lake Pelham fluctuates on an annual basis. Late fall and winter seasons are the times when deficits are usually replenished. If the lake is not full at the beginning of and during the winter, tighter water use restrictions will be required in January to reduce demand for the coming spring and summer dry seasons.

The impact of water restrictions on residential customers during Stage 3 is certainly felt, but is comparably less than the Town-wide economic impact that would result from Stage 4 water restrictions to businesses. The grid is designed to restrict business water use as a measure of last resort. If the preventive measures of voluntary restrictions (stage 2) and moderate restrictions (stage 3) are imposed early enough, the likelihood of needing to go to stage 4 and thereby affecting all businesses is lessened.

The restriction level grid may cause the Town to impose restrictions more often. The conservative approach in the grid will reduce going deeper into the lake water reserves during periods of drought, resulting in higher chemical treatment costs and lower quality taste.

The water restriction grid also considers the water level drop rate. In a high water use season where the relative humidity is low, the lake loses significant water due to evaporation. If the level drops as much as 3" in a week, which corresponds to 21 million gallons and 4% of the total lake volume, the grid calls for the activation of restrictions.

Finally, water usage restrictions should be maintained for a minimal period of time to avoid confusing the public. When we reevaluate our current mandatory water usage restrictions later this month, we should consider extending them through January, then reducing the restriction stage only if well on our way to removing the deficit.

A well considered, conservative water conservation policy will enable the Town to manage the water resources we have to ensure growth and prosperity for our foreseeable future.

There will be no direct cost to the Town should we implement the revised water conservation policy. The short-term loss of water sales revenue during times of restriction will be offset by the corresponding decrease in water treatment expenses.

It was recommended that Town Council adopt this revised water conservation policy effective immediately.

Town Manager Godfrey explained the different stages illustrated in a grid format, which was attached as an appendix to the policy.

Councilmember duFrane moved, Councilmember Risner seconded, to approve the recommendation.

Mayor Rimeikis questioned if according to the chart, the Town would be entering Stage 4 condition at the beginning of January. Town Manager Godfrey noted according to the plan if the lake was not at 18 inches below normal pool, the Town would be at Stage 4 restrictions, and he believed this was possible. He further discussed the steps needed to activate Stage 4 restrictions.

The motion carried by the following voice vote: Ayes: Coleman, duFrane, Jenkins, Olinger, Richards, Rimeikis, Risner, Snider, Yowell (9); Nay: (0); Absent: (0).

PUBLIC SAFETY, PUBLIC WORKS, PLANNING & COMMUNITY DEVELOPMENT COMMITTEE

R/R Re: Request to Rename Wine Street Memorial Park

Town Manager Godfrey presented the following report and recommendation: On September 28, former Mayor and long-time community servant Waller P. Jones died. Shortly following the memorial service, the Culpeper Mid-Day Lions Club, of which Mr. Jones was highly active, approached staff with a request to rename Wine Street Memorial Park to Waller P. Jones Memorial Park.

In the letter from the Culpeper Mid-Day Lions, the Club is prepared to donate $5,000 for a central monument dedicated to Waller P. Jones and all veterans serving in World War II and the Korean War. This donation is contingent upon renaming Wine Street Memorial Park "Waller P. Jones Memorial Park" in memory of the former Mayor.

The Culpeper Mid-Day Lions Club is very determined to memorialize the former Mayor, as is witnessed in their donation request, and feels that renaming the park for such a long-standing public servant and World War II veteran is more than appropriate.

Appendix D

Record of Local Hearings, Written Comments Received & Response