LOUISA COUNTY

LONG RANGE REGIONAL WATER SUPPLY PLAN

Prepared For:

Louisa County

Town of Louisa

Town of Mineral

Louisa County Water Authority

Prepared By:

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&
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Date: June 2011

Louisa County
Long Range Regional Water Supply Plan

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The County of Louisa, Virginia Comprehensive Plan, September 5, 2006
Virginia Employment Commission Louisa Community Profile, April 5, 2008
Weldon Cooper Center Total Population Estimates for Virginia Counties and Cities, 2006 Final and 2007 Provision Estimates, January 28, 2008
Louisa County Countywide Build-Out Analysis Draft Results, July 6, 2007
Fluvanna County Raw Water Intake, Anderson and Associates, Inc. letter, January 25, 2005
County of Louisa Water Quality Management Plan and Groundwater Study, January 1998
Bowlers Mill Lake Safe Yield Analysis, January 2006
Zion Crossroads Service Area Master Plan, August 2004
Virginia Department of Health (VDH)
    Listing of Waterworks and Owners:
    http://www.vdh.state.va.us/DrinkingWater/waterworks_owners.htm
    Monthly Operation Reports
    Groundwater System Sanitary Survey Reports
    Engineering Description Sheets
Virginia Department of Environmental Quality (VDEQ)
    Virginia Water Use Data System
    http://www.deq.virginia.gov
    http://gisweb.deq.state.va.us
United States Department of Agriculture, National Agricultural Statistics Survey
    2007 Census of Agriculture
    Farm and Ranch Irrigation Survey
Virginia Department of Game and Inland Fisheries Websites:
    http://www.vafwis.org/fwis
    http://www.dgif.virginia.gov
National Park Service Nationwide Rivers Inventory
    http://www.nps.gov/ncrc/programs/rtca/nri/states/va.html
Virginia Department of Historic Resources
    http://www.dhr.virginia.gov
Virginia Department of Conservation and Recreation
    http://www.dcr.virginia.gov
    http://www.dcr.virginia.gov/natural_heritage/clinfo.shtml
National Wetlands Inventory
    http://www.fws.gov/wetlands/
Virginia Department of Forestry
    http://www.dof.virginia.gov/info/my-county.htm

ACRONYMS AND UNIT ABBREVIATIONS

VAC	: Virginia Administrative Code
VDEQ	: Virginia Department of Environmental Quality
VWUDS	: Virginia Water Use Data System
VDH	: Virginia Department of Health
VEC	: Virginia Employment Commission
VUSBC	: Virginia Uniform Statewide Building Code
DCR	: Department of Conservation and Recreation
USDA SCS	: United States Department of Agriculture Soil Conservation Service
NOAA	: National Oceanic & Atmospheric Administration
NCDC	: National Climatic Data Center
USGS	: United States Geological Survey
LCWA	: Louisa County Water Authority
LCBOS	: Louisa County Board of Supervisors
SSU	: Self-Supplied User
GPOD	: Groundwater Protection Overlay District
CO	: Certificate of Occupancy
GA	: Growth Area
SA	: Service Area
CWS	: Community Water System
PWSID	: Public Water System Identification Number
GW	: Groundwater
SW	: Surface Water
SWP	: Surface Water Purchase
GPD	: Gallons per Day
GPD/person	: Gallons per Day per Person
GPD/p	: Gallons per Day per Person
Gal/Mo	: Gallons per Month
Gal/year	: Gallons per Year
MGD	: Million Gallons per Day
BGD	: Billion Gallons per Day
COs/yr	: Certificates of Occupancy Issued per Year

EXECUTIVE SUMMARY

In response to Virginia Code 9 VAC 25-780, "Local and Regional Water Supply Planning", Louisa County, the Town of Louisa, the Town of Mineral, and the Louisa County Water Authority have completed a plan which outlines the Regional Water Supply for Louisa County. The plan addresses each of the required subsections under Chapter 780 of the Virginia Code and provides guidance for each of the government entities to allow for proper planning through the year 2050.

This plan has analyzed multiple sources of data to outline current population and water demands, proposed growth within the County, Towns, private communities, and County designated growth areas, and projected water demands for the associated planning time steps. Based on this analysis, the combined water demand for municipal community water systems is anticipated to exceed the current permitted public source capacity in 2021, and surpass the known available public source capacity in 2041 to create an estimated public water supply deficit of approximately 841,000 gallons per day in 2050. It is important to note that existing and available public water sources are not in the vicinity of each of the County's designated growth areas (proposed municipal service areas), which could necessitate the development of new water sources near or within the proposed municipal service areas based on technical and economical feasibility. Private community water systems are not expected to have a water supply deficit through the 2050 planning period.

In response to the public water system deficit, this plan identifies alternatives to support the projected water demands of the County. These alternatives will require future in-depth analysis to ensure that the new sources are strategically located to minimize the potential for environmental disturbances, impacts to the rural communities within the County, and costs associated with the construction and operation of the systems.

The plan has been reviewed by the general public through a series of "open houses", and accepted by each of the participating governments by their respective Boards and Councils. The plan is a "living document" which will be updated, modified, and expanded as additional information becomes available and new water sources are developed.

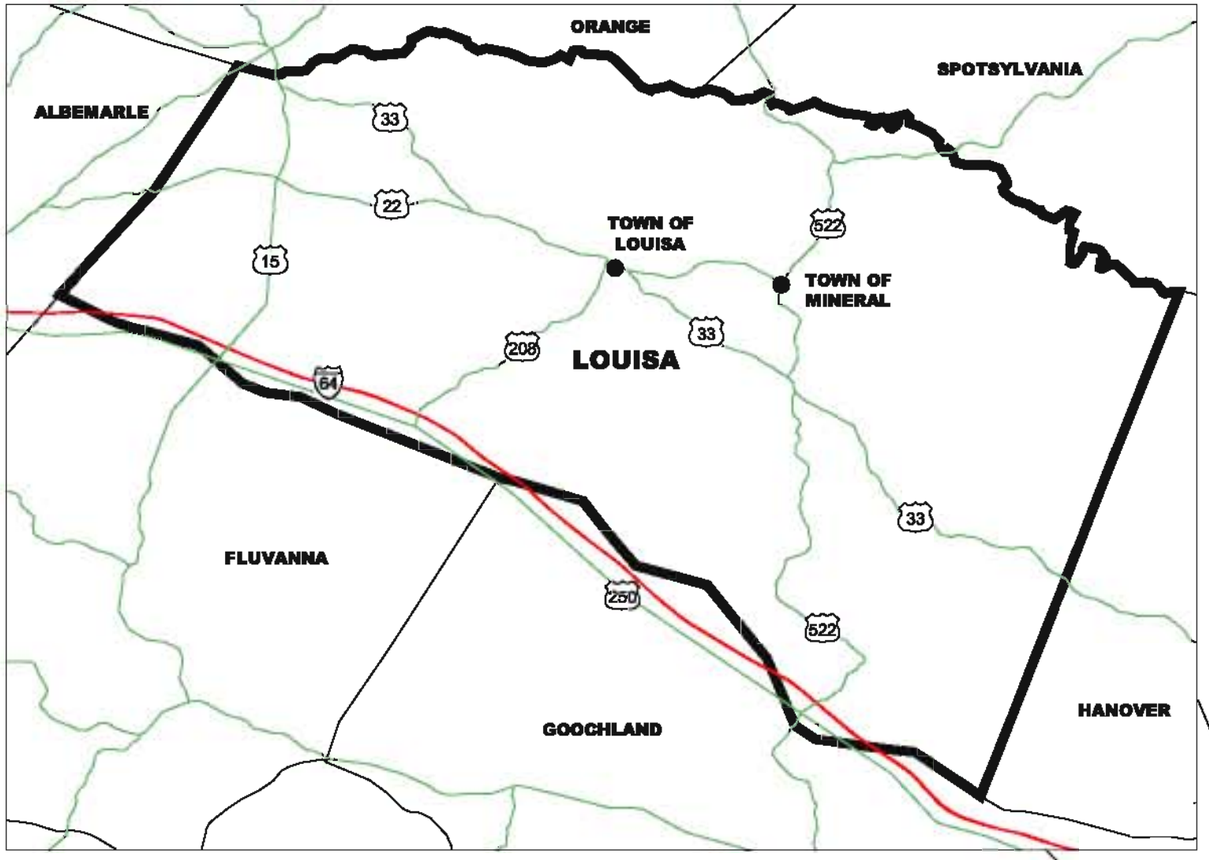
I. INTRODUCTION

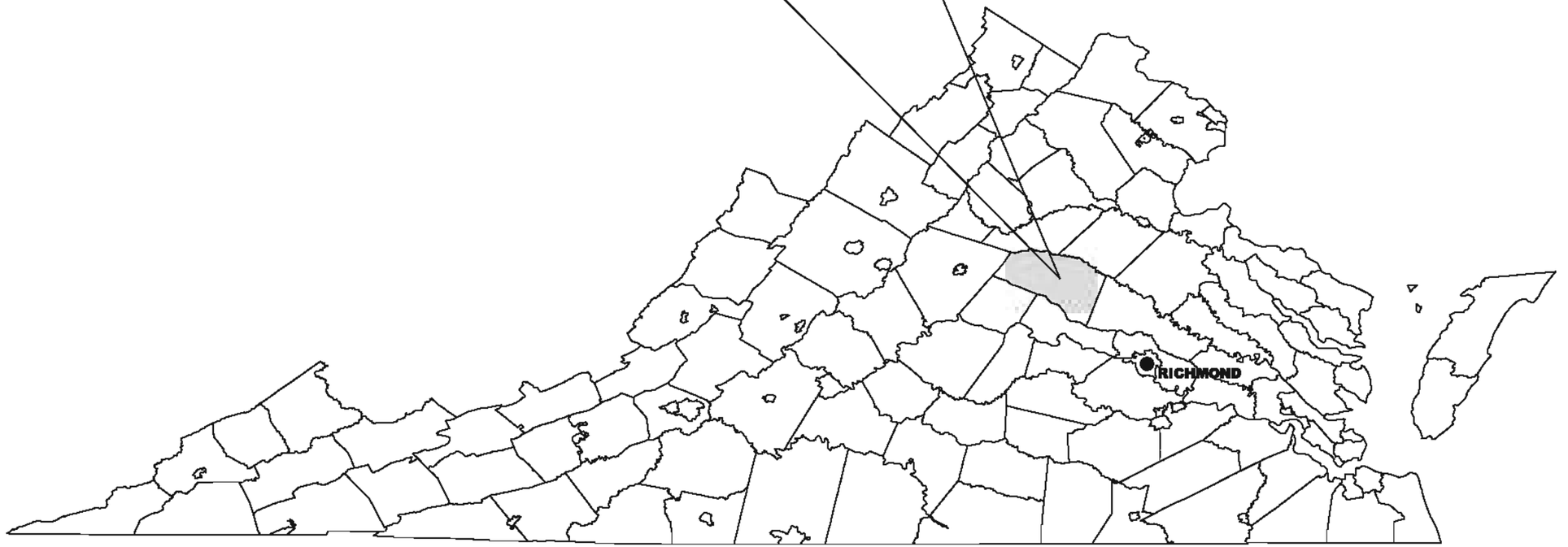
A. Purpose

In response to Virginia Code 9 VAC 25-780, "Local and Regional Water Supply Planning", Louisa County, the Town of Louisa, the Town of Mineral, and the Louisa County Water Authority combined efforts to complete this plan, which outlines the Regional Water Supply Plan for all of Louisa County through the year 2050. **Figure 1** shows the location of Louisa County within the Commonwealth of Virginia.

With Louisa's rural character, much of the county utilizes individual wells. However, public water is provided within the limits of two (2) municipal service areas, as well as a few private communities with multiple users. The Louisa County Water Authority (LCWA) was created by the Louisa County Board of Supervisors in 1968 with its primary purpose to establish and operate a water or sewer system, or both, for the benefit of residents and places of business in the County and to exercise all powers granted under the Virginia Water and Sewer Authorities Act (Code of Virginia, § 15.1-1239 et seq.). With respect to water systems, the LCWA operates and maintains the water treatment facilities, as well as portions of the water distribution system for the County's two (2) existing municipal service areas. One (1) service area, located centrally in the County, includes both the Town of Louisa and the Town of Mineral. Both Towns own and maintain the water distribution system within their respective Town limits and bill clients for water usage. The Town of Louisa purchases water from the LCWA and provides it to its residents and businesses. The Town of Mineral supplies water to its customers from its own groundwater source; however, also purchases water from the LCWA to supplement the Town's water demands. Customers within this central service area, but separate from the Towns, are billed directly by the LCWA. The second service area in the County encompasses Zion Crossroads, located at Exit 136 on Interstate 64, which is a designated growth area per the Louisa County Comprehensive Plan. Customers connected to the public water distribution system at Zion Crossroads are billed by the LCWA.

The purpose of the Louisa County Long Range Regional Water Supply Plan is to establish a comprehensive tool to be used by each of the governing bodies in addressing the increasing water demands through the planning period. This document will be updated, modified, and expanded as additional information becomes available and new water sources are developed. The goal of the plan is to be a "living document" that is approved by all governing bodies who participated in its preparation.





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LOUISA COUNTY WATER SUPPLY MASTER PLAN

AREA MAP

LOCATION MAP

LEGEND

- PRIMARY ROADS
- INTERSTATE
- COUNTY BOUNDARY

SOURCE NOTE:

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FIGURE 1

B. Scope of the Regional Water Supply Plan

In accordance with Virginia Code 9 VAC 25-780, the Louisa County Long Range Regional Water Supply Plan addresses all applicable sections of Chapter 780, "Local and Regional Water Supply Planning".

These sections include:

- Existing Water Source Information (9 VAC 25-780-70)
- Existing Water Use Information (9 VAC 25-780-80)
- Existing Resource Information (9 VAC 25-780-90)
- Projected Water Demand Information (9 VAC 25-780-100)
- Water Demand Management Information (9 VAC 25-780-110)
- Drought Response and Contingency Plans (9 VAC 25-780-120)
- Statement of Need and Alternatives (9 VAC 25-780-130)

Each section is discussed in detail throughout this plan. Supplemental information regarding the specific sections and data compiled, analyzed, and/or developed through the preparation of the plan is included in the Appendix.

C. Existing Data Collection and Investigation

Within the Local and Regional Water Supply Planning regulations, the Virginia Department of Environmental Quality, Division of Water Resources, Office of Water Supply Planning (VDEQ) was assigned certain program development, guidance and assistance roles. All information related to the required "Existing Water Source Information" (9 VAC 25-780-70) and "Existing Water Use Information" (9 VAC 25-780-80) was collected and utilized in the "Local and Regional Water Supply Plan" templates supplied by VDEQ. These templates were developed for compiling and reporting available data for existing water sources and existing water uses, and made available on VDEQ's website. Extensive coordination with VDEQ and the Virginia Department of Health, Office of Drinking Water (VDH) was completed to secure all available data and compile it in the desired format. At the time of this plan's initial investigation, VDEQ could not provide example documents for other completed plans in response to the "Local and Regional Water Supply Planning" regulation; therefore, the best attempt at presenting the available data and utilizing the templates in an effective manner was made. Information included in this plan was initially collected and input into the VDEQ pilot templates during spring of 2007.

Since the time of completion for the initial data investigation and collection for this plan, VDEQ further developed and revised the templates to be utilized for "Local and Regional Water Supply Planning". The initial data collected was reviewed, verified and/or clarified,

and transferred to the latest approved version of the VDEQ templates. These templates are included in **Appendix A**.

As mentioned above, there was close coordination with VDEQ and VDH during the data collection and investigation for this plan. Coordination with VDH included a visit to the VDH office in Lexington, Virginia in March of 2007 to review available records and gather relevant data. To capture relatively rapid growth that had been occurring in the County since about 2005, data was used for the twelve preceding months (March 2006 through February 2007) rather than one calendar year in an effort to keep the data as current as possible through the lengthy plan development process. Monthly production records, Groundwater System Sanitary Survey Reports, and Engineering Description Sheets for Louisa County water systems proved to be most useful and hard copies of available data were obtained. VDH staff members assisted in this process. Monthly production reports identified the water source type, monthly water production, as well as the population served for each water system in the county. Sanitary Surveys offered general information and compliance history, and the Engineering Description Sheets provided more detailed information related to system features such as permitted system capacity, number of wells, well yield, depth, and diameter. Information for active water systems was also available through VDH's website. The VDH listing of Waterworks and Owners provided a spreadsheet containing owner and system name, contact information, source type, service connections, and population served.

Supplemental information was also secured in discussion with County staff, and water system operators to clarify information gathered and supplement data for unknown water system conditions; however, limited additional information was available.

Beginning in April 2008, data for water production and sales in the municipal service areas was requested and obtained from Louisa County Water Authority and both Towns to once again try to capture recent data and expansion, most notably in the Zion Crossroads Service Area, to be utilized in the detailed evaluation of water demand projections. This data spanned the twelve months from April 2007 to March 2008. Population was also clarified with the County, Towns, and the Louisa County Water Authority during this time. Population projection and water demands were discussed with the County, both Towns, the Louisa County Water Authority, and VDEQ. Upon discussion and mutual agreement, a memo summarizing the population projections and water demands through 2050 was submitted to all parties, including VDEQ, in October 2008. This memo is included in **Appendix B**.

During revisions for the Final Draft of this plan, raw water data was reviewed to verify water use utilized in the water demand projections provided in the memo and Preliminary Draft of this plan. Data that was no longer documented or could not be verified was replaced with more current information through coordination with VDH. Also, data for

private community systems was clarified to be water production or withdrawal, rather than water usage. Based on these findings, the tables included in the plan from the memo have been updated accordingly.

The preliminary water demand projections did not include surface water withdrawal for self-supplied, non-agricultural users using more than 300,000 gallons per month, and did not include self-supplied, agricultural users using more than 300,000 gallons per month of ground or surface water. As suggested by VDEQ, data for non-agricultural surface water withdrawal was obtained by requesting a report from VDEQ's Virginia Water Use Data System, and data for agricultural water use was estimated from the *2007 Census of Agriculture*, and *Farm and Ranch Irrigation Survey*, both issued by the United States Department of Agriculture, National Agricultural Statistics Service. The United States Geological Survey livestock water use factors provided in the VDEQ templates were utilized with the Census livestock inventory to estimate livestock water use. This data is now provided in tables within this document.

The following sections summarize the findings from the data collection and investigation.

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

Louisa County utilizes both surface water and ground water for its water demands.

The Northeast Creek Reservoir, with a surface area of 185 acres and watershed of 9.73 square miles, is the only reservoir currently used in the County for potable water supply to a community water system. A municipal water distribution system extends north from the Northeast Creek Reservoir on U.S. Route 33 to the center of the Town of Louisa. There is also a water main connected to the system that extends from the Town of Louisa to the east along Route 22/208 to the Town of Mineral. Northeast Creek Reservoir is the main water source for the centrally located municipal service area, also known as the Northeast Creek Reservoir Service Area. While the Northeast Creek Reservoir has a current permitted capacity of 1.0 MGD, the safe yield of the reservoir is approximately 2.77 MGD. The Northeast Creek Reservoir Service Area is also supplemented by water from three (3) groundwater sources: the Louisa County Water Authority Industrial Park Well, and two (2) wells owned by the Town of Mineral.

The municipal Zion Crossroads Service Area and the seven (7) private community water systems located throughout the county are supported solely through the use of groundwater wells. Specific information for each system can be found in the VDEQ templates in **Appendix A**.

County residents who are not supplied by municipal or private community water systems are supplied water by private individual groundwater wells.

In addition to the potable water sources, there are four (4) significant self-supplied systems withdrawing surface water for non-potable uses. Self-supplied systems are waterworks defined by VDH as Non-Community or Non-Transient, Non-Community. A significant self-supplied system is one that uses more than 300,000 gallons per month (Gal/Mo) per the VDEQ templates. The Tanyard Branch Country Club Golf Course in the Town of Louisa is irrigated by surface water withdrawals from Tanyard Branch Creek and Richardson Pond. Spring Creek Development located at Zion Crossroads irrigates its golf course from an onsite irrigation lake which is supplied water from the Camp Creek impoundment. The Louisa County Water Authority supplies raw water from the Bowlers Mill Reservoir (also known as Lake Gordonsville) to Old Dominion Electric Cooperative's Louisa power station near the Town of Gordonsville for use in their cooling system. The County's largest surface water withdrawal from Lake Anna is used for the North Anna Nuclear Power Station's hydro-power and cooling system, which is a "once-through" system that returns the full amount of withdrawal to the Lake and/or to the river below the dam.

With the exception of the North Anna Power Station, limits for the non-potable surface water withdrawals were not included in the data sources used for completing the VDEQ

templates. Maximum cooling water withdrawal from Lake Anna is 2.708 billion gallons per day (Unit 1 – 1.354 BGD, Unit 2 – 1.354 BGD). There is also the withdrawal for the two (2) hydro units at the Lake Anna Dam, one with a maximum 25.85 million gallons per day (MGD) operated when the lake level is above 248 feet Mean Sea Level (MSL), and the other with a maximum 84.02 MGD operated when the lake level is above 250 feet MSL.

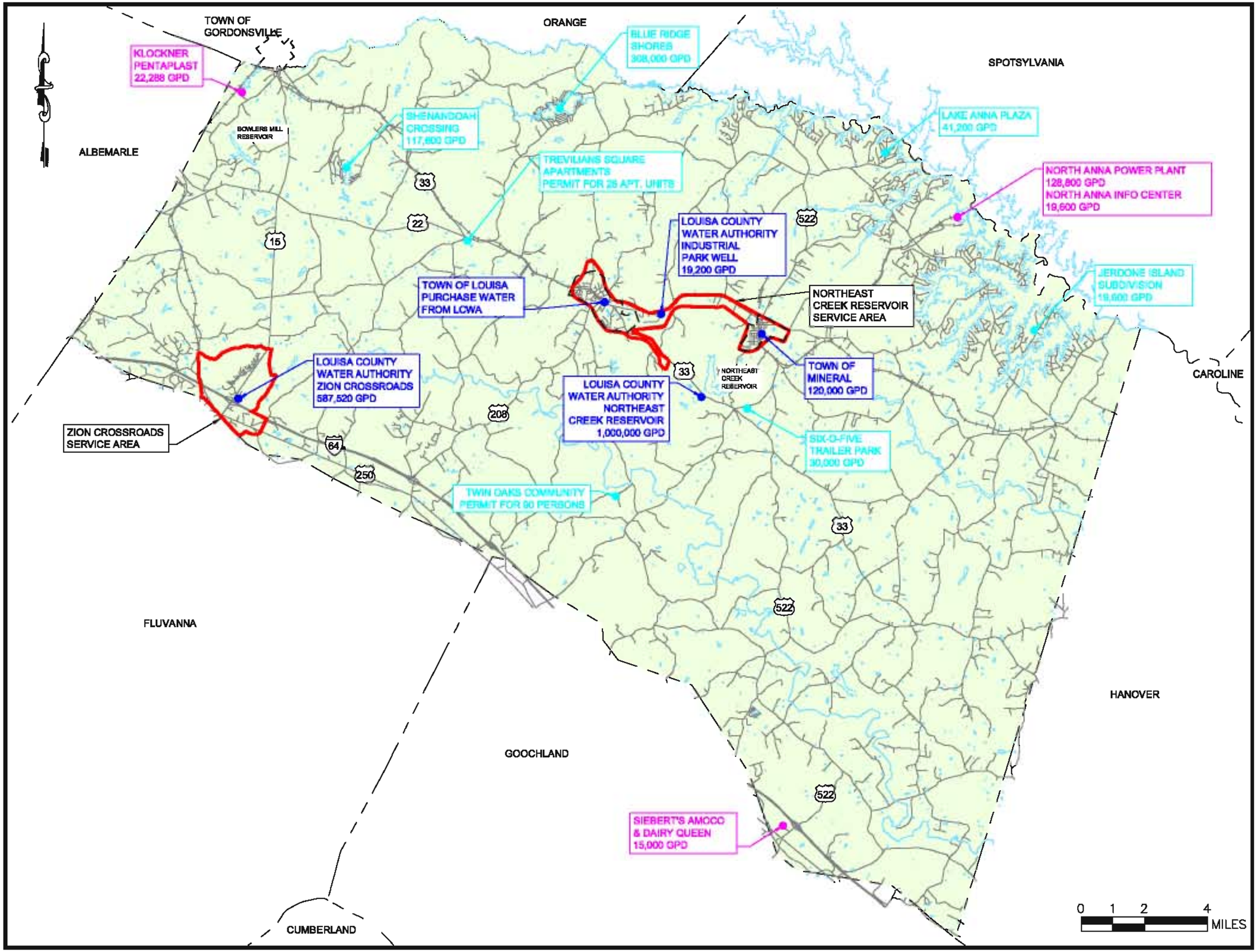
An analysis completed in 2006 determined a safe yield of 0.75 MGD for Bowlers Mill Reservoir, as detailed in the *Bowlers Mill Lake Safe Yield Analysis*, dated January 2006.

Table 1 provides a summary of the existing potable water source information collected in the VDEQ templates in **Appendix A**. Permitted capacity is based on gallons per day (GPD).

Table 1: Existing Potable Water Source Summary

Community Water Systems (Groundwater)	
Municipal Water Systems	***VDH Permitted Capacity (GPD)***
Louisa County Water Authority Industrial Park Well	19,200
Town of Mineral	120,000
Zion Crossroads	587,520
Private Water Systems	***VDH Permitted Capacity (GPD)***
Blue Ridge Shores	308,000
Shenandoah Crossing	117,600
Six-o-Five Village Trailer Park	30,000
Trevilians Square Apartments	Permitted for 28 Apt. Units
Twin Oaks	Permitted for 90 persons
Lake Anna Plaza	41,200
Jerdone Island	19,600
Community Water Systems (Surface Water)	
Municipal Water Systems	***VDH Permitted Capacity (GPD)***
Louisa County Water Authority Northeast Creek Reservoir	1,000,000
Self-Supplied Users > 300,000 Gal/Mo (Groundwater)	
Private Water Systems	***VDH Permitted Capacity (GPD)***
Klockner Pentaplast	22,288
North Anna Power Plant	128,800
North Anna Information Center	19,600
Siebert Amoco and Dairy Queen	15,000
Crossing Pointe *(connected to public water in August 2010)*	was 25,200 (wells no longer active)

Figure 2 identifies the location and daily permitted capacity for potable water sources in gallons per day for the existing community water systems, and self-supplied users using greater than 300,000 Gal/Mo based on the data included in the VDEQ templates, and summarized above.



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LOUISA COUNTY WATER SUPPLY MASTER PLAN

EXISTING POTABLE WATER SOURCES & DAILY PERMITTED CAPACITY

LOCATION MAP

LEGEND

- ROADS
- RAILROADS
- WATER
- COUNTY BOUNDARY
- MUNICIPAL SERVICE AREA
- MUNICIPAL COMMUNITY WATER SYSTEM
- PRIVATE COMMUNITY WATER SYSTEM
- SELF-SUPPLIED USER > 300,000 GAL/MONTH

SOURCE NOTE:

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FIGURE 2

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

Louisa County's existing water demand is comprised mainly of residential, commercial, and agricultural users. These uses are met through surface water and groundwater supplied through municipal and private community water systems, and individual self-supplied systems. Detailed information about each system's use is outlined in the section "Projected Water Demand" and included in **Appendix A** and **Appendix B**.

Of the estimated average 4.0* million gallons per day (MGD) of water demand in Louisa County for the base year of 2007, approximately 0.546 MGD or 14% is surface water.

The Louisa County Water Authority currently treats approximately 306,000 gallons per day (GPD) of surface (reservoir) water and distributes this water to the Town of Louisa and customers in the Town of Mineral and surrounding areas. The remaining county demand is met by groundwater wells, either through municipal community water systems, private community water systems or private individual wells.

While Northeast Creek Reservoir is the County's only surface water withdrawal for potable water, there are additional surface water withdrawals in the County for the purpose of irrigation and power station cooling systems. North Anna Power Station uses a considerable amount of water from Lake Anna for cooling.

Current self-supplied users using greater than 300,000 gallons per month (Gal/Mo) for potable water supply are not in the vicinity of an existing municipal service area. The one self-supplied user, Crossing Pointe, that was within the limits of a municipal service area connected to the Zion Crossroads public water system in August 2010 due to quality issues with their private wells. Crossing Pointe private wells were taken off-line in conjunction with the user connecting to public water supply. Water demands for Crossing Pointe are still summarized under self-supplied users, given the collected historical water demand data provided separate water demands for Zion Crossroads Service Area and Crossing Pointe.

Table 2 provides a summary of the existing water withdrawal information collected in the VDEQ templates in **Appendix A**.

**Estimated average water demand of 4.0 MGD does not include the Lake Anna surface water withdrawal for the North Anna Power Station. The North Anna Power Station uses over 500 times the amount of the overall County's average water demand for its cooling system and hydro units.*

Table 2: Existing Water Withdrawal Summary

Community Water Systems (Groundwater)		
Municipal Water Systems	***Annual Average Water Withdrawal (GPD)***	***Peak Day Water Withdrawal (GPD)***
Louisa County Water Authority Industrial Park Well	3,364	5,046
Town of Mineral	45,661	68,491
Zion Crossroads	99,397	149,095
Private Water Systems	***Annual Average Water Withdrawal (GPD)***	***Peak Day Water Withdrawal (GPD)***
Blue Ridge Shores	54,749	96,707
Shenandoah Crossing	81,081	121,622
Six-o-Five Village Trailer Park	12,587	18,881
Trevilians Square Apartments	6,100	9,150
Twin Oaks	7,628	11,442
Lake Anna Plaza	4,442	6,664
Jerdone Island	6,598	9,896
Community Water Systems (Surface Water)		
Municipal Water Systems	***Annual Average Water Withdrawal (GPD)***	***Peak Day Water Withdrawal (GPD)***
Louisa County Water Authority Northeast Creek Reservoir	306,200	459,300
Self-Supplied Users > 300,000 Gal/Mo (Groundwater)		
Private Water Systems	***Annual Average Water Withdrawal (GPD)***	***Peak Day Water Withdrawal (GPD)***
Klockner Pentaplast	10,147	15,221
North Anna Power Station	10,998	16,497
North Anna Info Center	766	1,149
Siebert Amoco and Dairy Queen	15,000	22,500
Crossing Pointe	12,625	18,938
Self-Supplied Users > 300,000 Gal/Mo (Surface Water)		
Private Water Systems	***Annual Average Water Withdrawal (GPD)***	***Peak Day Water Withdrawal (GPD)***
Tanyard Country Club Golf Course	64,060	96,090
Spring Creek Golf Course	162,342	243,513
North Anna Power Station	2,150,000,000	3,225,000,000
LCWA (ODEC power station)	13,671	20,507
Self-Supplied Users > 300,000 Gal/Mo (Agriculture)		
Private Water Systems	***Annual Average Water Withdrawal (GPD)***	***Peak Day Water Withdrawal (GPD)***
Livestock	174,644	261,966
Irrigated Land	138,644	207,966

IV. EXISTING RESOURCES (9 VAC 25-780-90)

Existing resource data related to geologic, hydrologic, meteorological, and environmental conditions was obtained from a variety of agencies and existing County reports. Primary existing report sources included the Louisa County Comprehensive Plan, dated September 5, 2006, and the *County of Louisa Water Quality Management Plan and Groundwater Study*, dated January 1998. These two reports contained detailed and specific information for the existing resources of Louisa County and are transcribed below.

Existing resources are relevant to water supply planning given they can impact the expansion or creation of a water source or water system, for example conservation easements or historic districts can require additional agency review of design, additional permitting, and/or altering the location of the proposed water system improvements.

A. Geologic Conditions

Louisa County is approximately 514 square miles and located entirely on the Piedmont Plateau in central Virginia. The County's rolling terrain gradually slopes downward to the east and is well dissected by streams. The inter-stream divides are fairly wide and sloping or rolling. In areas along the lower tributaries of large streams, the divides are steep. Entrenchment along the lower tributaries of the major streams has been rapid. As a result, there are many bluffs and V-shaped valleys that have steep sides that rise abruptly from the flood plain. The mean seal level elevation varies from a high of 540 feet to a low of 180 feet (United States Department of Agriculture Soil Conservation Service (USDA SCS), 1976).

The County is underlain by igneous and metamorphic bedrock that ranges in age from 300 million years to more than one billion years. Bedrock in the western portion of the County is predominantly mica schist and phyllite that represent metamorphosed sandstone, siltstone, and mudstone originally deposited in an Early Paleozoic (500 million years ago) ocean basin. The Green Springs area is underlain by a mafic-composition igneous rock, the Green Springs Pluton, and associated granitic rocks. The Ellisville Granodiorite is a granitic igneous rock body that underlies the north-central portion of the County, extending southwestward through the Town of Louisa to beyond Ferncliff. The east-central portion of the County is underlain by metamorphosed mafic and felsic composition volcanic rocks of the Cambrian-age (560 million years ago) Chopawamsic Formation, and the Ordovician-age (450 million years ago) Quantico Slate. The Chopawamsic contains a series of gold and sulfide mineral deposits that extend from north of the Town of Mineral, southwestward to the Shannon Hill area and beyond. The southeastern portion of the County is underlain by billion-year-old garnet-biotite gneisses of the Maidens Formation, which appear to represent ancient sedimentary deposits that have been deeply buried and metamorphosed at high temperatures and pressures. The Maidens is intruded by a series of granitic plutonic

rocks. Throughout Louisa County, many of the boundaries between the individual rock formations are faults, some of which are regionally extensive and have histories of multiple movements. **Figure 3** presents the Geology map from the Louisa County Comprehensive Plan.

The characteristics of a soil type may be traced from its parent material, the underlying rock or material moved by water or gravity that has settled as unconsolidated deposits over existing bedrock. Soil type characteristics include texture, mineral content, base saturation, kind and quantity of clay, color, drainage, and agricultural suitability. Louisa County is primarily a rural agricultural area. Many of the soils are suited to a wide variety of crops, and the climate is favorable for both general farming and livestock production.

The quality of soils within a region has a direct relationship to the type and extent of land development that has occurred or is occurring in that region. Content, permeability, and stability of soil types in a region are the primary determining factors for potential land development. There are eight (8) soil types, or classifications within Louisa County. These include: (1) Nason-Tatum-Manteo; (2) Nason-Tatum; (3) Zion-Poindexter-Iredell; (4) Grover-Ashlar-Madison; (5) Appling-Ashlar-Cecil; (6) Appling-Cecil; (7) Sekil-Iredell-Cullen; and (8) Masada-Chewacla. In-depth information about these soil classification types may be obtained from the U.S. Natural Resource Conservation Service (NRCS; formerly Soil Conservation Service), Soil Survey of Louisa County, Virginia. Of the soil types listed above, types (1) and (2) are the least suitable for agriculture or development based on information from the survey. Soil types (3, (7), and (8) are fully suitable for agriculture, but usually not acceptable for most other types of development (VDMME, 1999). **Figure 4** presents the general Soils map from the Louisa County Comprehensive Plan.

B. Hydrologic Conditions

i. Watersheds and Hydrologic Units

Louisa County is drained primarily by the North Anna and South Anna Rivers, and their tributaries, which are part of the York River watershed. There are some small areas along the southern boundary of the County that are part of the James River basin.

The boundaries of the hydrologic units coincide with the specific watersheds of the County. Within Louisa County, the North Anna watershed is made up of the upper North Anna River basin, the Contrary Creek watershed, the Lake Anna / Pamunkey Creek watershed, and the Lower North Anna watershed. The Upper and Lower Little River watersheds, along with the Newfound River watershed also are part of the North Anna River basin, but these rivers do not join the North Anna until many miles east of the Louisa County border. The South Anna River watershed consists of the Upper

Map 4: Louisa County Geology

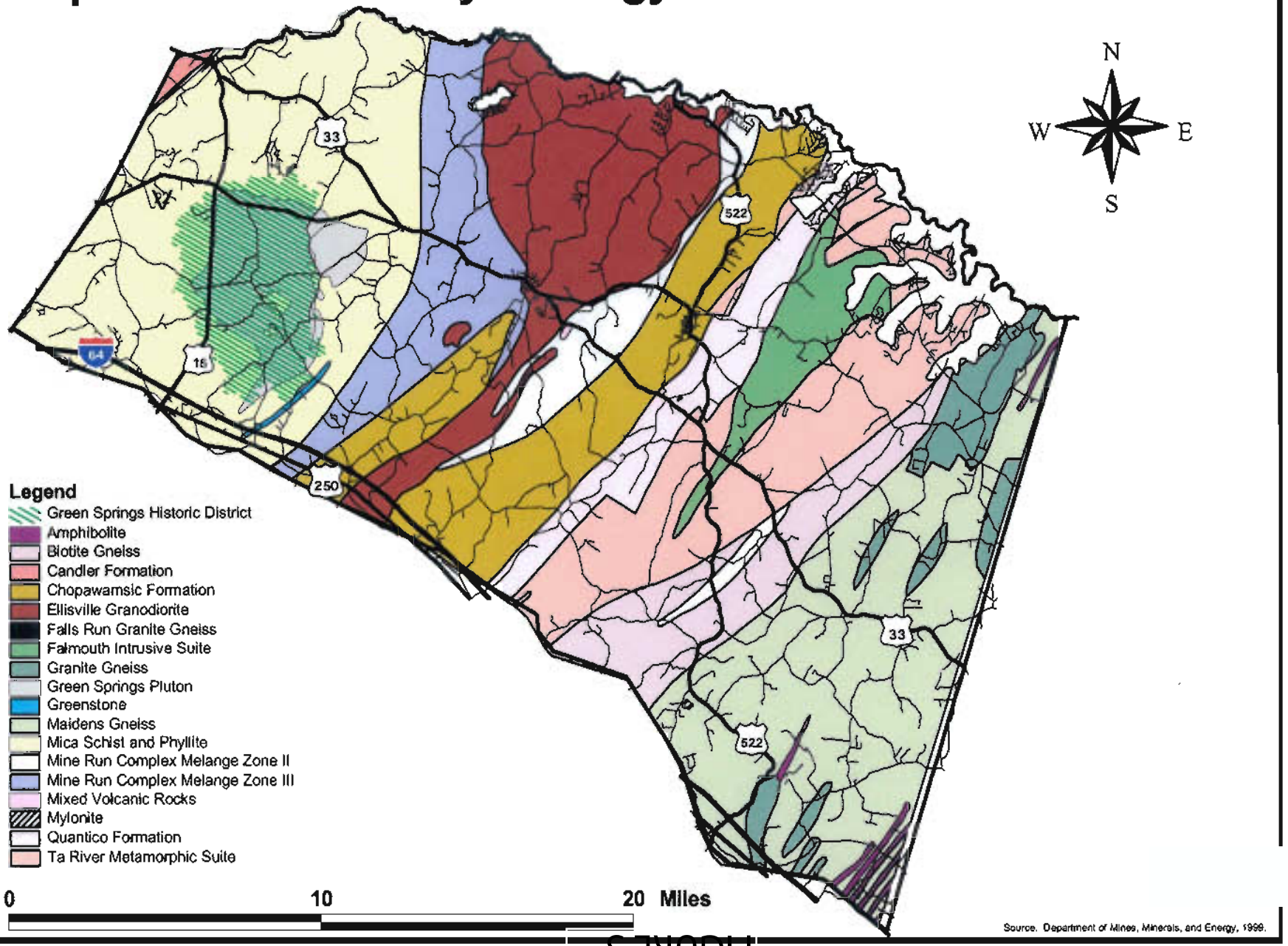
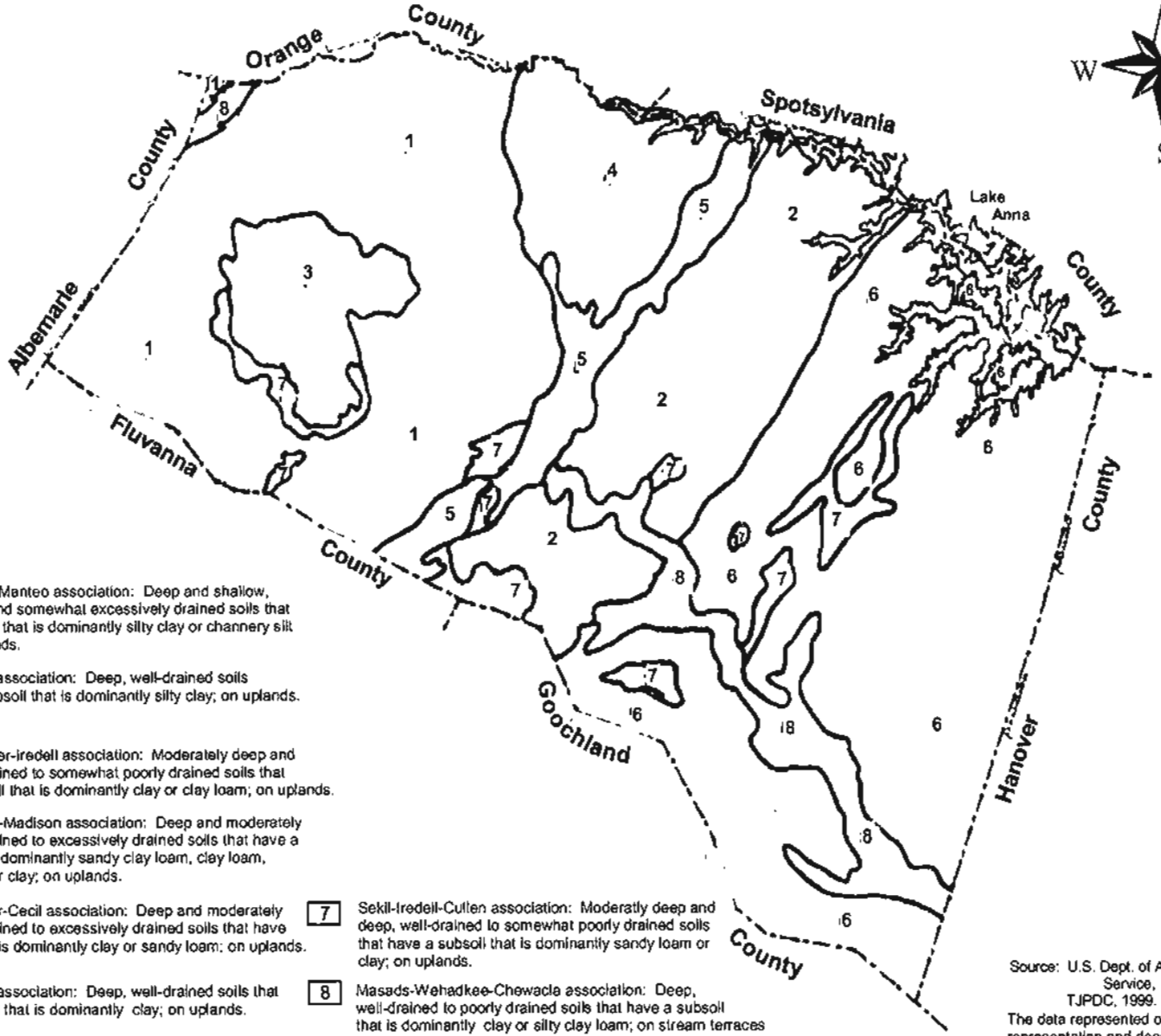


FIGURE 3

Map 5: Louisa County Soils



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1. Nason-Tatum-Manteo association: Deep and shallow, well-drained and somewhat excessively drained soils that have a subsoil that is dominantly silty clay or channery silt loam; on uplands.
2. Nason-Tatum association: Deep, well-drained soils that have a subsoil that is dominantly silty clay; on uplands.
3. Zion-Poindexter-Iredell association: Moderately deep and deep, well-drained to somewhat poorly drained soils that have a subsoil that is dominantly clay or clay loam; on uplands.
4. Grover-Ashlar-Madison association: Deep and moderately deep, well-drained to excessively drained soils that have a subsoil that is dominantly sandy clay loam, clay loam, sandy loam, or clay; on uplands.
5. Appling-Ashlar-Cecil association: Deep and moderately deep, well-drained to excessively drained soils that have a subsoil that is dominantly clay or sandy loam; on uplands.
6. Appling-Cecil association: Deep, well-drained soils that have a subsoil that is dominantly clay; on uplands.
7. Sekil-Iredell-Cullen association: Moderatly deep and deep, well-drained to somewhat poorly drained soils that have a subsoil that is dominantly sandy loam or clay; on uplands.
8. Masads-Wehadkee-Chewacla association: Deep, well-drained to poorly drained soils that have a subsoil that is dominantly clay or silty clay loam; on stream terraces and flood plains.

Source: U.S. Dept. of Agricult
Service, 1974.
TJPDC, 1999.
The data represented on map
representation and does not reflect geo-coded
data.

FIGURE 4

South Anna watershed, the South Anna / Roundabout Creek watershed, and the South Anna / Taylors Creek watershed. The hydrologic basins that are part of the James River watershed include the Mechunk Creek watershed, the Byrd Creek watershed, the Big Lickinghole Creek watershed, and the James River / Beaverdam Creek watershed. **Figure 5** presents the Hydrologic Units map from the Louisa County Comprehensive Plan.

Twelve (12) of the 145 third-order watersheds in Louisa County are classified as high priority. A high priority watershed is at a high level of environmental sensitivity. Another 57 watersheds discharge to the high priority areas and, therefore, may also be considered critical. Expressed in terms of area, about 53,416 acres of Louisa County (about 16% of the County) are within high priority watersheds, and an additional 122,250 acres of the County (about 37%) drain into the high priority watersheds.

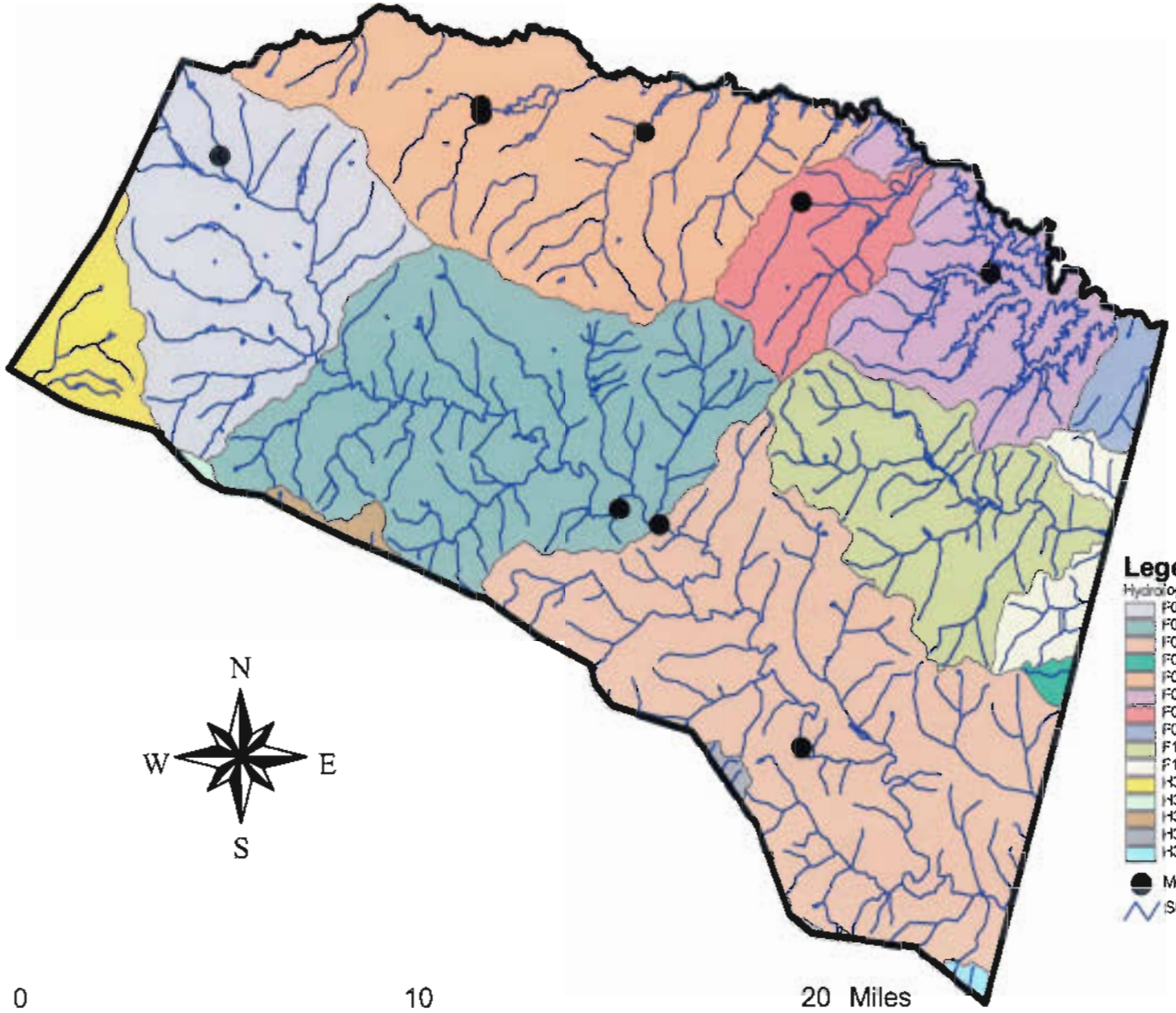
The South Anna River was ranked a high priority because of an abundance of associated wetlands. Similarly, wetlands are present in areas adjacent to the County sanitary landfill. The area near Northeast Creek Reservoir is ranked high priority because it is a source of potable water. It is important to note that at least some portions of the Northeast Creek Reservoir watershed appear to drain mining areas (Draper Aden, 1998).

The Department of Housing and Urban Development mapped some stream and river floodplains in Louisa County prior to and during 1974. Louisa County qualified for the Flood Insurance Program in March 1974. Both the South Anna and the Little River watersheds are in the flood control program of the U.S. Natural Resource Conservation Service. A number of impoundments, including the Northeast Creek Reservoir and Bowlers Mill impoundment, have been built under this program. **Figure 6** presents the Flooplains and Hydric Soils map from the Louisa County Comprehensive Plan.

ii. Surface Water

There is a fairly large supply of surface water available from the North Anna and the South Anna Rivers during times of normal precipitation. However, storage reservoirs are needed to provide dependable supplies during periods of prolonged drought. Water volume in the County has never been measured to any great extent. There is a gauging station on Bunch Creek near Boswell's Tavern. The drainage area above the station is only 4.1 square miles, but there is an average stream flow of 3 million gallons per day (MGD). The gauging stations on the North Anna and the South Anna Rivers are in neighboring Hanover County. The North Anna River has a station near Doswell that shows an average stream flow of 2.39 MGD; the station on the South Anna River near Ashland shows an average flow of 2.21 MGD.

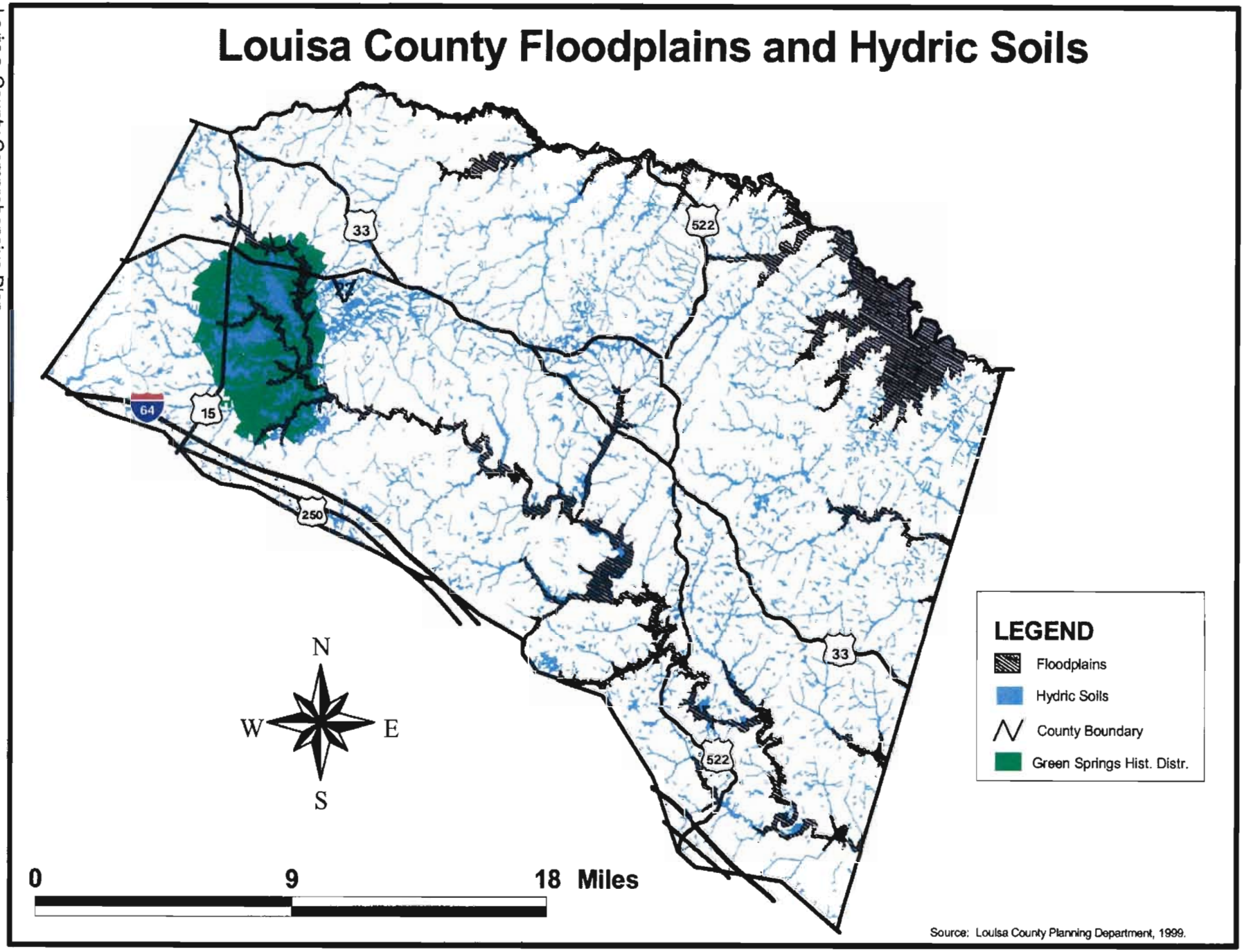
Map 9: Louisa County Hydrologic Units



sources:
Virginia Department of Environmental Quality
Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation

FIGURE 5

FIGURE 6


Louisa County Floodplains and Hydric Soils
33
522
64
15
250
33
522
N
W
E
S
0
9
18 Miles
LEGEND
Floodplains
Hydric Soils
County Boundary
Green Springs Hist. Distr.
Source: Louisa County Planning Department, 1999.

The quality of surface water appears to be good throughout most of Louisa County according to previous studies. All of the surface water is soft, and thus usuable for municipal and industrial areas.

The County's two largest man-made lakes, Lake Anna and Lake Louisa, are in the North Anna watershed. Lake Anna on the County's northern boundary is one of Virginia's largest lakes. Created by Dominion Virginia Power to provide cooling water for its North Anna Nuclear Power Station, the lake is 17 miles long and has 200 miles of shoreline along 13,000 acres of surface water. The lake straddles the border between Louisa County, Orange County, and Spotsylvania County.

Lake Louisa on Hickory Creek is a privately owned 300-acre lake created for the Blue Ridge Shores residential/recreational subdivision. In addition, Bowlers Mill Reservoir is an 80-acre lake on Bowlers Creek in the South Anna watershed. Its planned use is for flood control, recreation, and possible future water supply.

The Northeast Creek Reservoir just north of Route 33 between the Towns of Louisa and Mineral was completed in 1981. This impoundment serves the water needs of both Towns, and will provide water for future development in that area.

iii. Groundwater

A large majority of Louisa County's residents rely on groundwater for their drinking water. Given growth in the County is scattered, it is not economically feasible to serve the entire population with public water, nor is it preferred given the County wants to maintain its rural character. Thus, it is imperative that the County identify potential problem areas or areas in need of protection and institute protective measures to ensure groundwater remains a viable resource for the County and its residents.

The water-bearing properties of the bedrock are fairly uniform throughout the County. The rock types have low permeability and are considered relatively poor producers of groundwater, although a few exceptional yields have occurred. The success of a well is nearly always dependent upon water-filled fractures encountered within the first 200 feet of drilling, and it is generally less effective to drill deeper than 300 feet.

The quality of groundwater appears to be good throughout most of the County. Water from wells drilled in bedrock is soft to moderately hard, and low in dissolved mineral matter. Wells in the Zion Crossroads area have been found to contain zinc. The exception is the central portion of the County where iron and acid conditions have been reported. Water from wells bored in the zone of soil and partially weathered rock (above bedrock) is reported to contain small amounts of iron and lime, and may be moderately hard and turbid.

There are few natural springs in the County. Those that do exist generally are low in yield and intermittent.

DRASTIC is used to evaluate groundwater pollution potential. It is an acronym for seven measured parameters: Depth (to groundwater); Recharge (net); Aquifer media; Soil media; Topographic position; Impact of vadose zone; and hydraulic Conductivity. Based on an analysis of these parameters, a numerical value (index) was assigned to each of the three hydrogeological settings that exist in Louisa County. A higher index value represents a higher pollution potential. The Louisa County DRASTIC mapping project resulted in the production of a map showing the areas of Louisa County that are most vulnerable to groundwater pollution. The report proposed strategies to protect the groundwater in the most vulnerable areas.

The Strategy proposed as a result of the DRASTIC analysis was the development of Groundwater Protection Overlay Districts (GPODs). GPODs overlay the areas within the County with the highest potential for groundwater pollution. In order to address these potentials for groundwater pollution, the DRASTIC report recommends specific strategies for the areas with the GPODs. Full-color maps of these GPODs and strategies are available for review from the Thomas Jefferson Planning District Commission or the Louisa County Planning Department.

A full description of the DRASTIC report process and findings, including recommendations for groundwater protection in the GPODs, is available from the County upon request.

C. Meteorological Conditions

Due to its location in the Central Piedmont region of Virginia, Louisa County typically experiences warm summers, relatively mild winters, and normally adequate rainfall. Elevation differences within the County are not large enough to cause significant difference in the climate. The Atlantic Ocean has only a small moderating effect on the climate since the County is located well inland. The County lies in the path of warm moist air currents moving northward and cold dry air currents moving southward. These alternating currents frequently bring sharp, abrupt changes in daily weather. The Appalachian Mountain range to the west tends to lessen the intensity of winter storms that pass through the area.

Average annual temperature varies slightly from year to year but averages about 56 degrees Fahrenheit. Temperatures of more than 95 degrees and less than 15 degrees Fahrenheit are infrequent. Prolonged periods of very hot or very cold weather are unusual.

The growing season, defined as the period between the average dates of the last freezing temperature in the spring and the first freezing temperature in the fall, is 167 days. This

growing season is long enough to allow proper maturation of many crops. The pasture season is slightly longer, but feed and shelter for livestock are necessary during the winter.

Precipitation ranges from an average low of 3.0 inches in October to an average high of 4.6 inches in July. Rainfall is greatest in July and August because of shower and thunderstorm activity; however, it is variable in time and location and usually is insufficient due to the high rates of evaporation also prevalent at this time. Dry spells of various lengths do occur in which moisture demands exceed the available supply. Flooding also may occur during times of excessive rainfall (USDA SCS, 1976).

D. Environmental Conditions

i. State or federal listed threatened or endangered species or habitats of concern

The Virginia Department of Game and Inland Fisheries lists several species that are considered state threatened, federal species of concern, federal candidate, or collection concern. Species such as the upland Sandpiper, loggerhead Shrike, and migrant loggerhead Shrike are state threatened. The bald eagle is a federal species of concern and state threatened. The fluted Kidneyshell is a federal candidate species. The yellow Lance is a federal species of concern. And, the spotted Turtle, and timber Rattlesnake are collection concern species.

ii. Anadromous, trout, and other significant fisheries

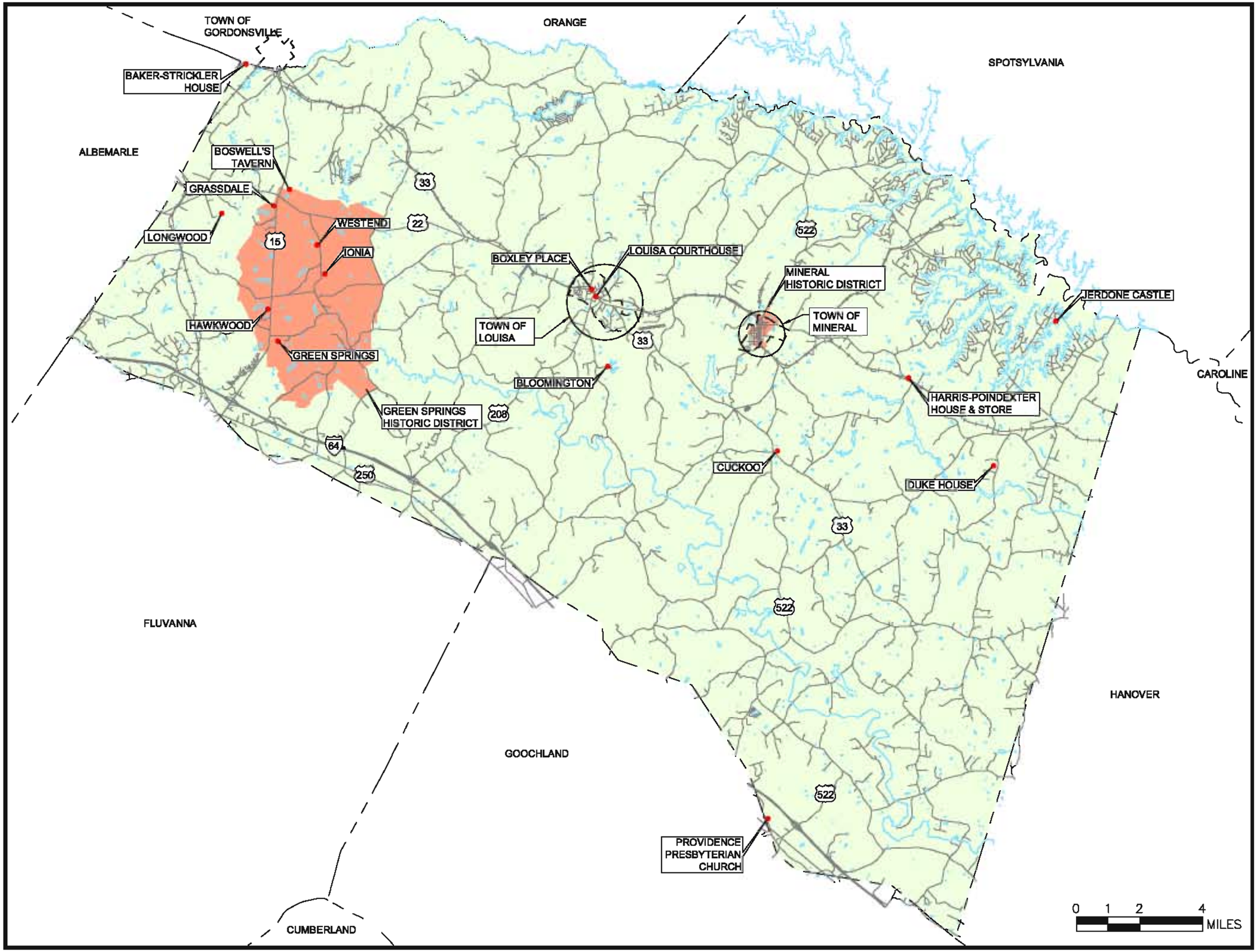
Anadromous refers to those species that migrate to spawn in freshwater after spending most of their life in an estuary or ocean. Virginia's anadromous species include the: shortnose sturgeon, Atlantic sturgeon, blueback herring, alewife, hickory shad, American shad, white perch, and striped bass. Per the Virginia Department of Game and Inland Fisheries, there do not appear to be natural anadromous fisheries in Louisa County. Striped bass is stocked in Lake Anna. Trout and other significant fisheries do not appear to be present in the County.

iii. River segments that have recreational significance, including state scenic river status

According to National Park Service Nationwide Rivers Inventory, the South Anna River within Louisa County is considered recreational and historic.

iv. Sites of historic or archaeological significance

There are several sites in Louisa County that are considered historic or of archaeological significance by the Virginia Department of Historic Resources. These sites are the Boxley Place, Mineral Historic District, Green Springs Historic District, Bloomington, Boswell's Tavern, Cuckoo, Duke House, Grassdale, Harris-Poindexter House & Store, Hawkwood, Ionia, Jerdone Castle, Longwood, and Providence Presbyterian Church. **Figure 7** identifies these locations.



Dewberry

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LOUISA COUNTY WATER SUPPLY MASTER PLAN

HISTORIC SITES

LOCATION MAP

LEGEND

- ROADS
- RAILROADS
- WATER
- COUNTY BOUNDARY
- HISTORIC DISTRICT
- HISTORIC SITE

SOURCE NOTE:

Base mapping provided by Louisa County GIS information is for general reference and display only. Reproduction of this information is prohibited without permission from Louisa County engineering staff.

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FIGURE 7

v. Unusual geologic formations or special soil types

Due to the variety of bedrock types within Louisa County, a host of economic rock and mineral resources occur within the County, and the mining of these resources has been and continues to be a component of the Louisa County economy. Clay for brick manufacture has been produced near Mineral and Trevilians. Kyanite-bearing layers are present in the schists and gneisses of the area.

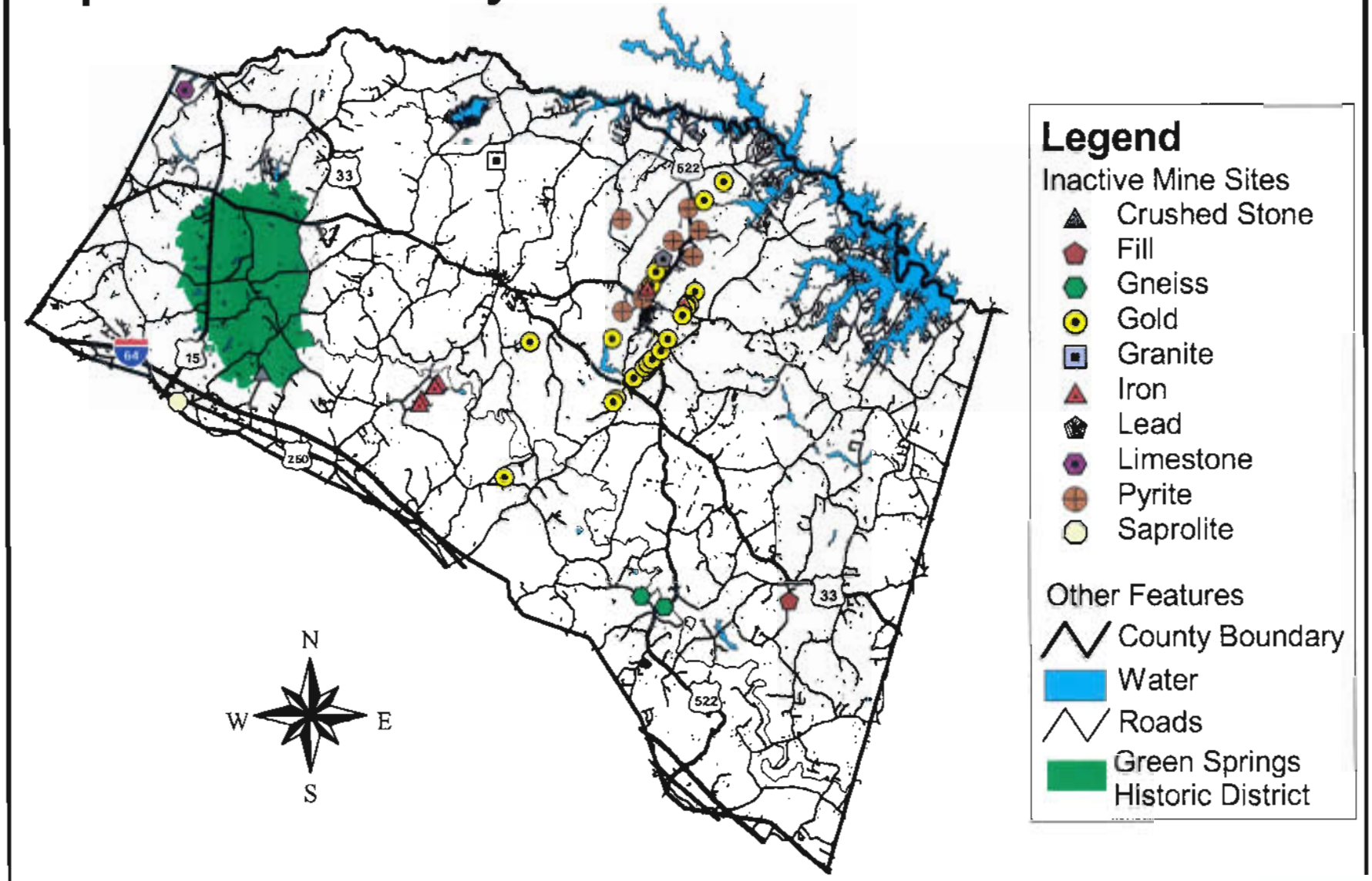
Vermiculite is a naturally occurring mineral that is associated with a mafic igneous rock body known as the Green Springs Pluton. This rock body underlies about 12 square miles in the northwestern part of the County. Vermiculite is presently being extracted from a shallow surface mine adjacent to the South Anna River north of Route 22. The County recognizes that vermiculite extraction is a contributing part of the local economy; however, considers it the responsibility of permitted mining operations to be good corporate citizens in terms of safeguarding the environment and quality of life in Louisa.

There is presently one active crushed-stone quarry within the County. Quarrying and crushing of stone for use as aggregate continues to be vital to the construction of roads, buildings, and other infrastructure in the County. It is in the best economic interests of the County to ensure that aggregate continues to be produced locally. The County recognizes the importance of local quarry operations not only in terms of the jobs they provide, but also in terms of how the costs of transporting aggregate into Louisa County from elsewhere would negatively impact construction costs within the County.

Mining operations can create conflicts with existing land uses and with other goals, such as water quality protection and the preservation of the rural character of the County. Precautions should continue to be exercised, as water contact with surface deposits or waste materials caused by the mining process can result in the formation of acids and metallic salts which may enter local drainage and surface water systems.

Figures 8, 9, and 10 present the Inactive, Prospect, and Active Mine Sites from the Louisa County Comprehensive Plan.

Map 6: Louisa County Mines -- Inactive Sites



Source: Va Dept of Mines, Minerals, and Energy, 1999.

FIGURE 8

Map 7: Louisa County Mines -- Prospect Sites

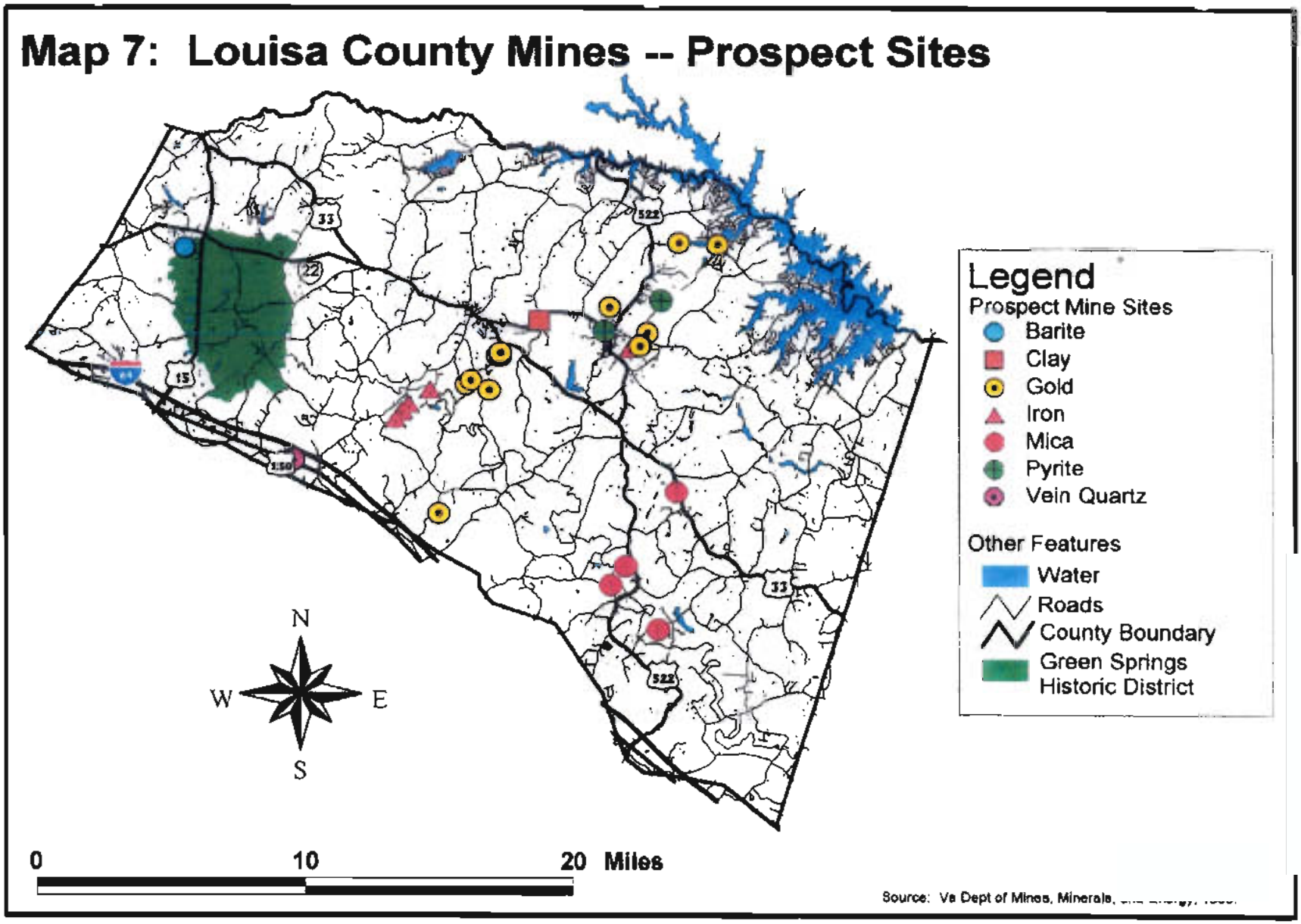
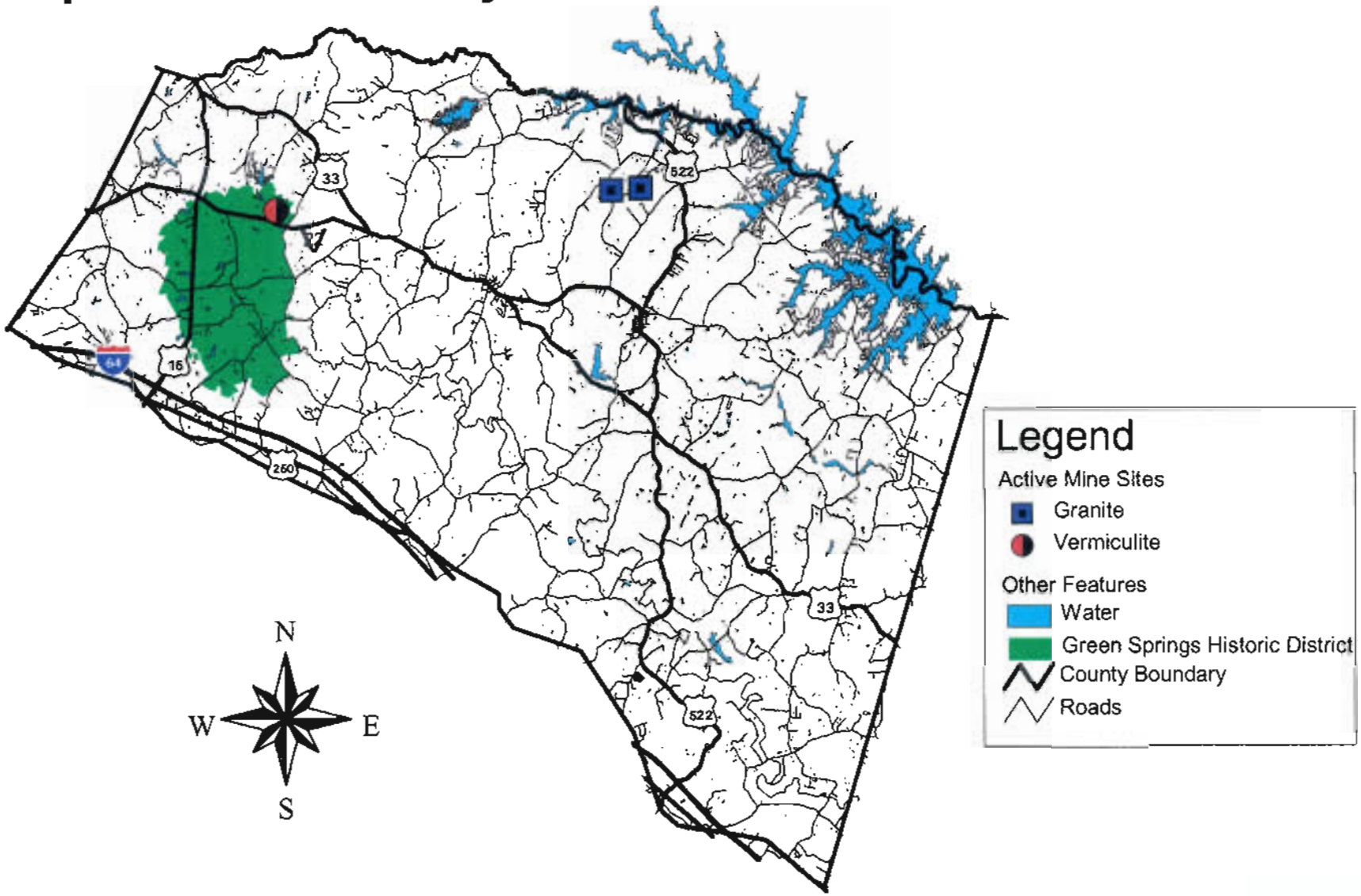


FIGURE 9

Map 8: Louisa County Mines -- Active Sites



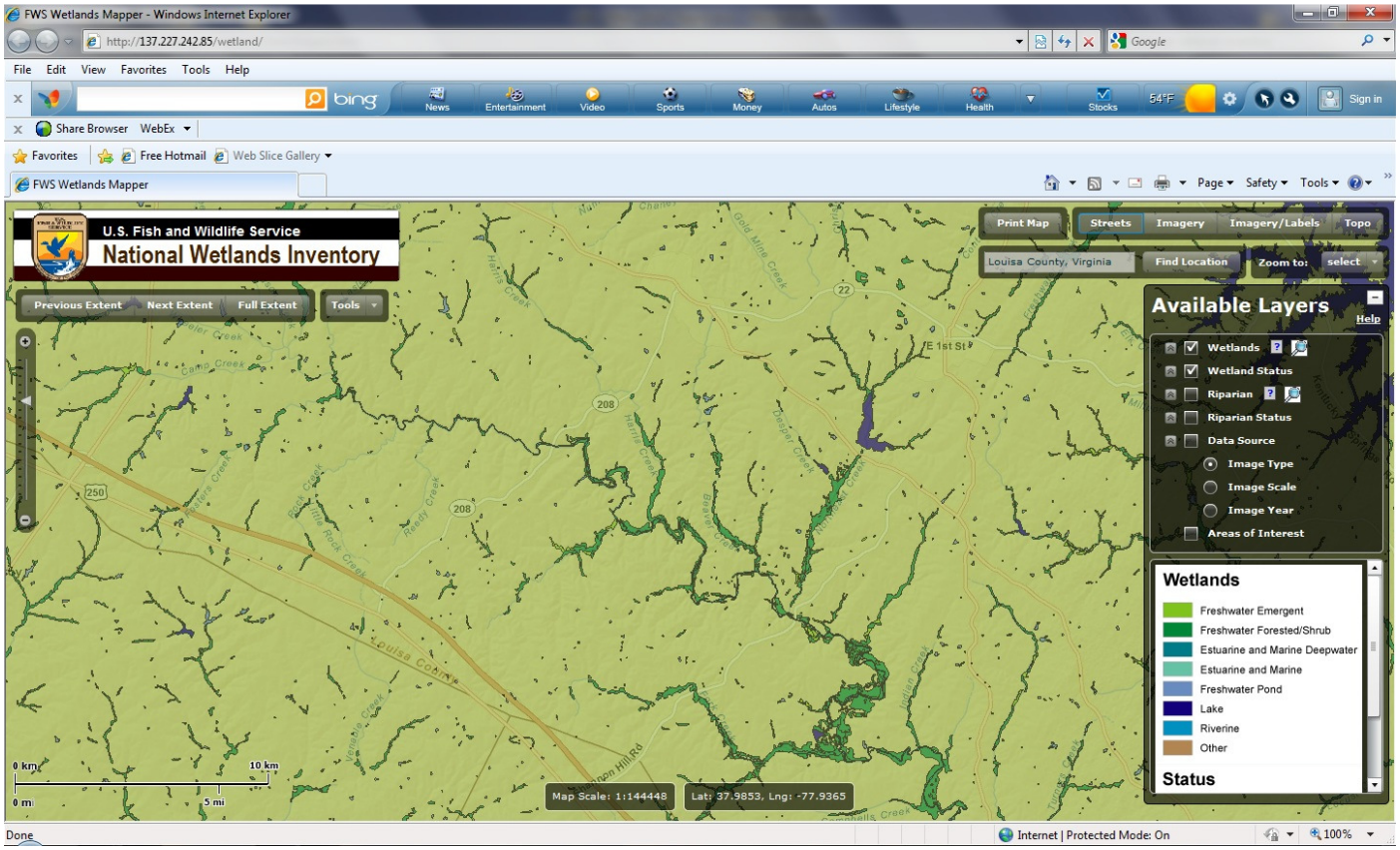
Source: Va Dept of Mines, Minerals, and Energy, 1999.

FIGURE 10

vi. Wetlands

Wetlands information and mapping is available from the National Wetlands Inventory website. The mapping is a general reference only and does not constitute all the wetlands in the County. A website "screenshot" is provided as **Figure 11**. The wetlands layers cannot be seen when the extents of the window show the full view of the County, so a "zoomed in" view is shown. Northeast Creek Reservoir can be seen towards the upper right of the screenshot.

Figure 11: National Wetlands Inventory Website Screenshot



vii. Riparian buffers and conservation easements;

Riparian buffers information is available from the Virginia Department of Forestry. Conservation easements information is available from the Virginia Department of Conservation. Buffers and easements are generally used to reduce and/or control flooding, and improve water quality and water storage. **Figure 12** provides a website "screenshot" of the Virginia Department of Forestry website mapping. **Figure 13** provides a website "screenshot" of the Virginia Department of Conservation website mapping. More specific information on the conservation easements is available on the results tap, whereas the maps tab (shown on "screenshot") illustrates the location in the County.

Figure 12: Virginia Department of Forestry Website Screenshot

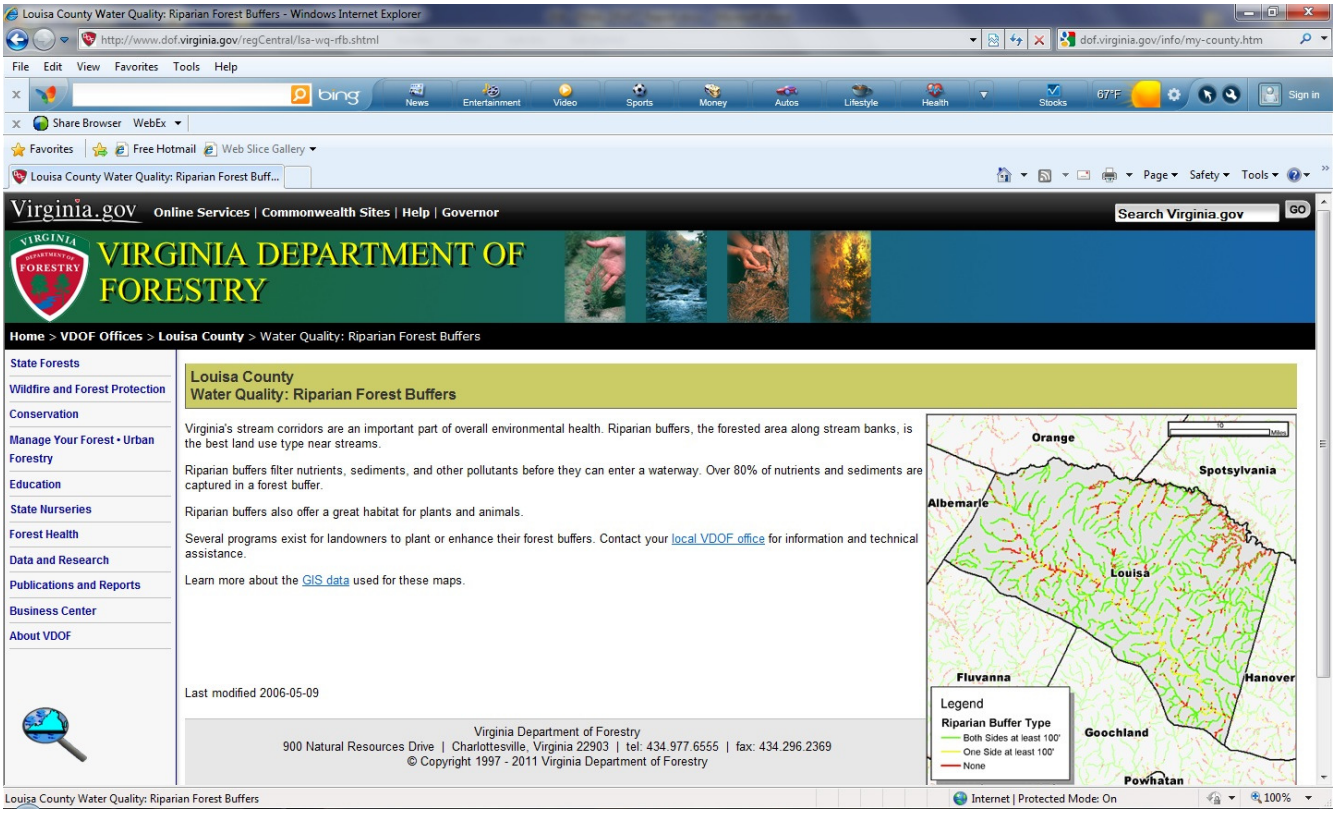
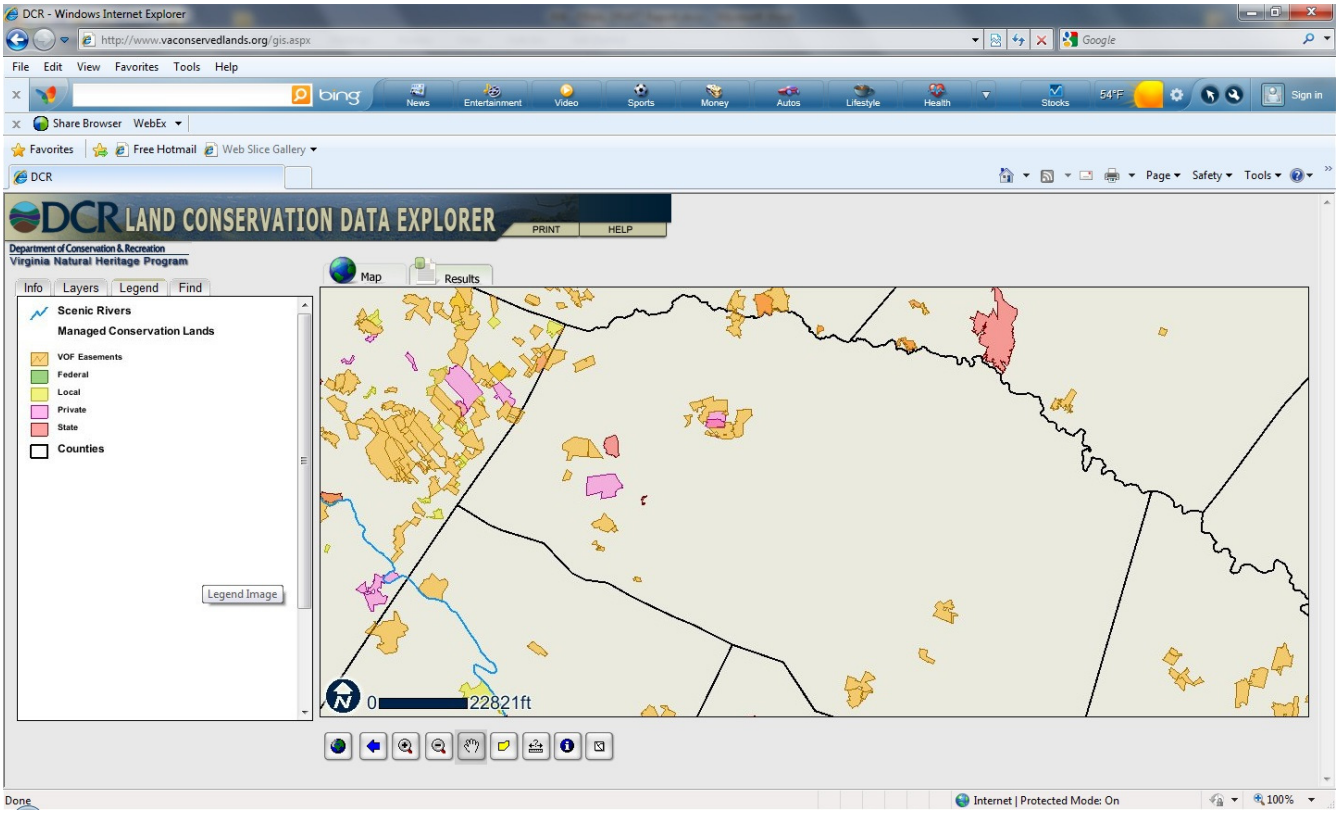


Figure 13: Virginia Department of Conservation Website Screenshot



viii. Land use and land coverage including items such as percentage of impervious cover within a watershed and areas where new development may impact water quality of the source

Runoff is the portion of rainfall that does not infiltrate the soil (to become groundwater) or become captured in local depressions. It is a key component in the local and regional water budget. Stormwater runoff in urbanized or urbanizing areas is a significant source of non-point source pollution. Contaminants introduced into state waters from diffuse activities and locations are collectively call "non-point" source pollution.

Runoff also has implications for groundwater. The greater the percentage of rainfall that flows as runoff, the less groundwater recharge occurs in a given area. In naturally vegetated areas, stormwater gets trapped by vegetation and slowly soaks into the ground. In contrast, in areas intensively affected by human activities, stormwater travels preferentially by overland flow, becomes channelized by drains and ditches, and is rapidly discharged into streams and impoundments. Such channelized flows have high velocities, which entrain (take along with the flow) sediment and pollutants, increase erosion and siltation, and have a negative effect on aquatic ecology, particularly native fish populations. For example, coliform bacteria levels show a strong positive correlation with times of high runoff.

As development occurs, stormwater management programs have handled the increased rate and volume, velocity and flow rate of runoff by requiring developers to construct onsite ponds and drainage systems that control one or more of the runoff characteristics. In urban and suburban areas, studies have shown that runoff increases in direct proportion to the percentage of impervious surface within the drainage sub-basin. Furthermore, studies in more rural areas have shown that agricultural land uses can have similar impact on runoff as do urban land uses. Regional studies encompassing multiple basins have shown that where impervious surfaces reach ten percent or more of the land area, significant degradation of the ecology of local streams becomes apparent.

It is likely that all drainage basins within Louisa County contain less than ten percent impervious surface or equivalent for agricultural land. However, as development proceeds, the combined effect of urban and agricultural land uses will need to be evaluated for significant increases in local runoff and associated environmental problems.

ix. Presence of impaired streams and the type of impairment

Several creeks and portions of rivers in the County are on the current State list of "impaired waters" per VDEQ's website. The majority of the impairments are E-coli

bacterial impairments, which resulted in an impairment classification for recreation use and in some cases fish consumption. Waters with e-coli bacterial impairments are Gold Mine Creek, Christopher Creek, Fork Creek, Cub Creek, Owens Creek, a central portion of the South Anna River, and a portion of Little River. It is important to note that Gold Mine Creek, Christopher Creek, and Contrary Creek are tributaries of Lake Anna. Biologic monitoring found the aquatic life use to be impaired for Wheeler Creek and Locust Creek. An upper portion of South Anna River is listed due to an exceedance for total phosphorus. Dissolved oxygen impairment was monitored in Cub Creek, resulting in an impaired classification for recreation use, and the same portion of Little River mentioned above also has a dissolved oxygen impairment, as well as a pH impairment, resulting in an additional impairment classification for aquatic life use. Contrary Creek has a historic acute exceedance for copper and zinc water quality, and pH impairment, resulting in impaired classification for aquatic life use, and fish consumption. Contrary Creek is impacted by acid mine drainage from a number of abandoned pyrite mines in its watershed. **Figure 14** illustrates the impaired waters in Louisa County.

x. Locations of point source discharges

The Environmental Protection Agency Envirofacts Water Data Warehouse lists the following facilities with permits to discharge into rivers in Louisa County: Lake Anna Family Campground, Louisa Regional Sewage Treatment Facility, Northeast Creek Water Treatment Plant, Reedy Creek (Ryan Homes), Six-O-Five Village Trailer Park, Spring Creek (Ryan Homes), Twin Oaks Community, North Anna Power Station, and Zion Crossroads Wastewater Treatment Plant. North Anna Power Station is the only significant Virginia Pollutant Discharge Elimination System (VPDES) discharger located in Louisa per the VDEQ website.

xi. Potential threats to the existing water quantity and quality, other than those from above

Septic systems have been identified by the Environmental Protection Agency as the most frequently reported sources of groundwater contamination in the United States. However, a properly designed, installed, maintained, and utilized septic system should function well for many years.

One reason many septic tank / drainfield systems fail or reach their design life early is because of improper maintenance, primarily not pumping out the septic tank regularly. VDH recommends that homeowners pump out their septic tanks every 3 to 5 years. Because most of these systems are operated and maintained at individual residences, it is difficult to determine the percentage of drainfields that are operating properly and how many are not functioning at the proper treatment standards unless a system has an obvious failure. **Figure 15** presents the Reported Failed Drainfields map from the Louisa County Comprehensive Plan.

TOWN OF GORDONSVILLE

ORANGE

SPOTSYLVANIA

ALBEMARLE

BOWLERS MILL RESERVOIR

LAKE LOUISA

IZAC LAKE

SOUTH ANNA RIVER

HAGELIN CREEK

GOLD MINE CREEK

CHRISTOPHER CREEK

CONTRARY CREEK

TOWN OF LOUISA

TOWN OF MINERAL

NORTHEAST CREEK RESERVOIR

CAROLINE

FORK CREEK

LITTLE RIVER

LOCKET CREEK

CUB CREEK

TAYLORS CREEK

CHERRY CREEK

FLUVANNA

GOOCHLAND

HANOVER

CUMBERLAND

33 22 15 208 64 250 522

0 1 2 4 MILES

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LOUISA COUNTY WATER SUPPLY MASTER PLAN

IMPAIRED WATERS

LOCATION MAP

LEGEND

- ROADS
- RAILROADS
- WATER
- COUNTY BOUNDARY
- HISTORIC DISTRICT
- IMPAIRED WATER

SOURCE NOTE:

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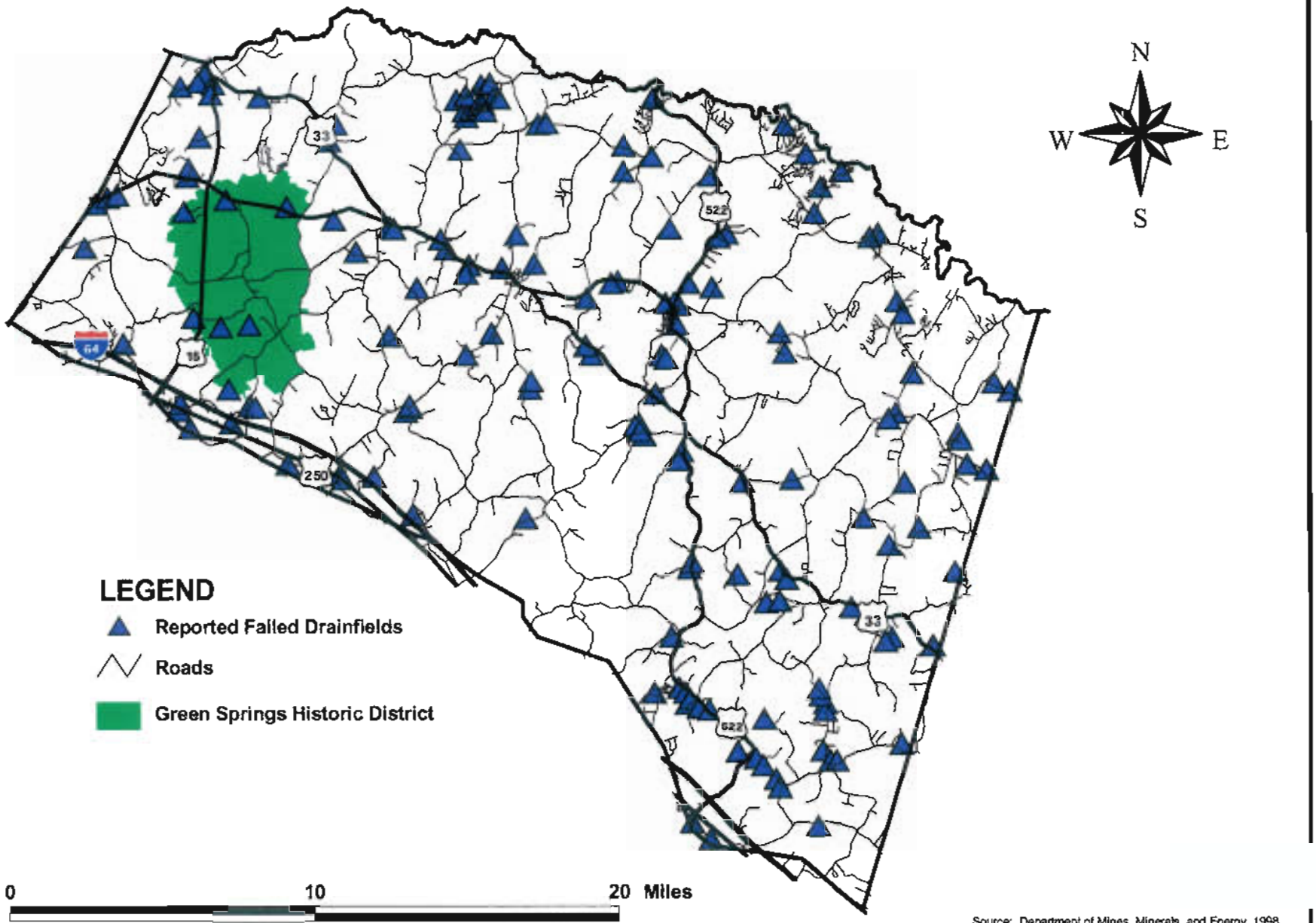
FIGURE 14

Map 27: Louisa County Reported Failed Drainfields



Source: Department of Mines, Minerals, and Energy, 1998

FIGURE 15

V. POPULATION PROJECTIONS

A. Overall County Population

Population trends are an important component in projecting water demands. In development of 9 VAC 25-780-100, "Projected Water Demand Information" a detailed analysis was completed to identify the baseline County Population for 2007, and projected populations for the years 2010, 2020, 2030, 2040, and 2050.

To complete this analysis, several sources were consulted. These sources included the Virginia Employment Commission (VEC) Louisa County Community Profile, Weldon Cooper Center, the Louisa County Comprehensive Plan (dated September 5, 2006), and a Countywide Build Out Analysis performed by Louisa County in July of 2007. Weldon Cooper Center and the Countywide Build Out Analysis provided 2007 populations (Weldon Cooper Center – 31,177 and Countywide Build Out – 31,268), but did not provide specific year predictions for population past 2007. Therefore, only the VEC data and the data obtained from the Louisa County Comprehensive Plan could be analyzed in detail. **Table 3** below is a side-by-side comparison of these two (2) sources.

Table 3: Population Projection by Source

Louisa County Comprehensive Plan	
Year	***Population***
1990	20,325
2000	25,407
2010	30,003
2020	34,599
2030	39,195
2040	43,791
2050	48,387
Interpolate	
2007	**28,624**

VEC Community Profile	
Year	***Population***
1990	20,325
2000	25,627
2010	33,153 *
2020	41,889
2030	50,739
2040	57,474 **
2050	65,183 **
Interpolate	
2007	**30,895**

** Updated with 2010 Census data*
*** Linear Extrapolation*

Based on discussions with Louisa County representatives, the Comprehensive Plan utilized VEC data from either 1999 or 2000. Therefore, the data would not have accounted for the large population increase around 2005. The County accepted the current VEC profile as the most representative population numbers and projections.

Given the lengthy process for this plan's preparation, preliminary U.S. Census data is available for 2010 with a population of 33,153 for Louisa County. VEC has not updated their population number of 33,923 for 2010 or projections for their Louisa County Community Profile, as they are waiting for the remaining census data to be released.

However, in an effort to keep the population projections up-to-date, the U.S. Census Louisa County population for 2010 has been utilized in the revisions to this plan's preliminary draft population projections from 2010 to 2050.

The Weldon Cooper Center has evaluated the U.S. Census data from 2000 through 2010 to estimate County population for each year of the decade. An updated Weldon Cooper Center population of 31,220 has been utilized for the baseline year of 2007. While this number is larger than the interpolated 2007 population from the VEC profile, the larger baseline population number was utilized in conjunction with the larger VEC population numbers based on the following criteria:

- A more conservative estimate, so water resources will be allocated for a greater population in the plan, and
- Since the Louisa County Build Out Analysis provides for an ultimate population estimate of 283,504 with rezoning, the current VEC population projection (higher projection) will provide for a better planning tool, even though in 2050 it is still only 23% of the potential maximum County population.

As another cross-reference, and at the suggestion of VDEQ, the above population data was compared to the population projections included in the permit application for the James River water withdrawal by Fluvanna County and Louisa County. The consulting firm that completed the water study for the permit utilized population projections from VEC, May 2003. These numbers are slightly different from the current VEC data, but similar to the VEC numbers in the Louisa County Comprehensive Plan. Again, since these numbers do not appear to account for the large population increase in 2005, the most recent VEC population data was used in an effort to provide the most accurate analysis possible.

Once overall County population was determined for the baseline year of 2007 and each time step through 2050, subdivision of the total population into different areas of the County was completed. The subdivision began with an analysis of rural area population versus non-rural area population.

B. County Designated Growth Areas and Existing Private Communities

Louisa is a diverse county with different types of communities and land uses. In accordance with Louisa County's Comprehensive Plan, the County has made a commitment to preserving the rural character of Louisa and focusing development in certain concentrated areas. Nine (9) growth areas have been identified by the County. These designated growth areas will have higher densities, more public services, and more fully developed infrastructure than the remainder of the County. As previously mentioned, Louisa County has seven (7) existing private communities which provide water connections to each community's central water system. **Figure 16** identifies the locations of the growth areas and private communities.

TOWN OF GORDONSVILLE

ORANGE

SPOTSYLVANIA

ALBEMARLE

FLUVANNA

GOOCHLAND

CUMBERLAND

HANOVER

CAROLINE

GORDONSVILLE GROWTH AREA

BLUE RIDGE SHORES

SHENANDOAH CROSSING

LAKE ANNA PLAZA

BOSWELLS TAVERN GROWTH AREA

TOWN OF LOUISA GROWTH AREA

TREVILIANS SQUARE APARTMENTS

JERDONE ISLAND SUBDIVISION

TOWN OF MINERAL GROWTH AREA

ZION CROSSROADS GROWTH AREA

TWIN OAKS COMMUNITY

SIX-O-FIVE TRAILER PARK

FERNCLIFF GROWTH AREA

SHANNON HILL GROWTH AREA

GUM SPRING GROWTH AREA

33 22 15 522 208 64 250

0 1 2 4 MILES

SOURCE NOTE:

Base mapping provided by Louisa County GIS Information is for general reference and display only. Reproduction of this information is prohibited without permission from Louisa County engineering staff.

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Gannett Fleming

LOUISA COUNTY WATER SUPPLY MASTER PLAN

GROWTH AREAS AND PRIVATE COMMUNITIES

LOCATION MAP

LEGEND

- ROADS
- RAILROADS
- WATER
- COUNTY BOUNDARY
- AGRICULTURAL / VERY LOW DENSITY RESIDENTIAL
- LOW DENSITY RESIDENTIAL
- VILLAGE RESIDENTIAL
- COMMUNITY SERVICE
- REGIONAL SERVICE
- INDUSTRIAL
- MIXED USE
- OPEN SPACE
- HISTORIC DISTRICT
- GROWTH AREA / PRIVATE COMMUNITIES BOUNDARY
- MUNICIPAL SERVICE AREA

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FIGURE 16

Due to the commitment by the County to support future development in these areas, an analysis was completed to identify the expected population growth in the rural areas versus the non-rural areas (existing private communities and designated growth areas).

In 2007, the growth patterns were examined as part of the Countywide Build Out Analysis based on the issuance of Certificates of Occupancy (CO) from 2001 to 2007. While this analysis did show a higher density of COs issued in growth areas, overall numbers showed that the growth in rural areas and the growth in designated growth areas was equal. Basically, 50% of COs issued were for rural areas and 50% of COs issued were for growth areas.

However, based on additional information from the County Administrator, the two Town Managers, and the General Manager of the Louisa County Water Authority (LCWA), it is believed that this trend will not continue due to recent changes in zoning regulations. It is expected that in coming years more people will settle in the growth areas rather than the rural areas. For example, Louisa County completed modifications to the zoning ordinances which reduced by-right rural densities by more than 50%. This reduction was driven by the desire to maintain the rural character of the County.

Therefore, for the purposes of this plan a uniform percentage increase to population in growth areas and rural areas for 2010, and a higher percentage increase in growth areas for subsequent time steps will be utilized, as shown in **Table 4**.

Table 4: Incremental Population Increase and Distribution

VEC data			Population Distribution		
Year	***Total Population***	***Incremental Population Increase***	***Ratio (rural/growth)***	***Rural Area***	***Private Communities/ Growth Areas***
2007	31,220	--		--	--
2010	33,153*	1,933	50/50	966	967
2020	41,889	8,736	35/65	3,058	5,678
2030	50,739	8,850	25/75	2,212	6,638
2040	57,474	6,735	25/75	1,684	5,051
2050	65,183	7,709	25/75	1,927	5,782

** 2010 U.S. Census data*

After the division of population between the rural areas and the non-rural areas, the population was further divided within the non-rural areas. The purpose of this analysis was to create a methodology to apply the proposed population increases across each of the designated growth areas and the existing communities. Since some of the private

communities have limited opportunities for expansion beyond current development, there may be instances where a population increase in a private community reaches a maximum.

This methodology was developed by investigating the existing number of addresses, the available number of addresses, and the number of certificates of occupancy per year (COs/yr) that have been issued between 2001 and 2007, for each respective community and growth area. In addition, to convert between COs and population, the 2000 census data of 2.56 people per household (or CO) in Louisa County was used unless actual population data was available. This information is shown in **Table 5**.

Table 5: Baseline Year Population Data

Private Communities & Municipal Service Areas	County Info		Countywide Build-Out Analysis Info (Ph 3)		Historical Development	
	Existing Addresses	***Population***	***Available Addresses (COs)***	***Population Increase***	***COs issued (1/01-6/07)***	***COs/yr***
Blue Ridge Shores	575	1,472	633 ***	1621	77	12
Shenandoah Crossing	193	495	276 ***	707	25	4
Six-o-Five Village Trailer Park	97	249	11 ***	29	98	16
Trevilians Sq. Apt.s	7 bldgs	61 **	0 ***	0	0	0
Twin Oaks	15	100 **	0 ***	0	0	0
Lake Anna Plaza (Lake Anna)	43	111	12 ***	31	12	2
Jerdone Island (Lake Anna)	57	146	67 ***	172	22	4
Town of Louisa (GA)	935 *	2,490 *	267	684	151	24
Town of Mineral (GA)	828 *	1,808 *	318	815	84	13
Zion Crossroads (GA)	622	1,593	578 ***	1480	268	42
County Growth Areas (Proposed Service Areas)	**County Info**		**Countywide Build-Out Analysis Info (Ph 3)**		**Proposed Development**	
	Existing Addresses	***Population***	***Available Addresses (COs)***	***Population Increase***		
Lake Anna (remaining area)	2292	5,868	2333	5973	Distribution of projected population will be based on the percentage of addresses in that growth area to the total number of growth area addresses	
Gum Spring	180	461	122	313		
Ferncliff	235	602	165	423		
Shannon Hill	117	300	70	180		
Boswell's Tavern	27	70	32	82		
Gordonsville	169	433	104	267		

Notes:

1. *Phase 3 from Countywide Build-Out Analysis assumes build-out of all existing lots - one unit/lot*
2. *Population column assumes 2.56 people per address unless otherwise noted*
3. *Certificate of Occupancy (CO) is equivalent to one address*
4. ** Combination of Build-Out Analysis data and Town data; household connections and population within Town limits provided by Towns*
5. *** Population from internet; not calculated*
6. **** County provided data for communities not included in the Countywide Build-Out Analysis and updated data for Zion Crossroads*

For the private communities in Table 5, the population is distributed per the historical COs/yr until the available addresses have been exhausted. When all available addresses are occupied, then population growth stops in the existing community. The reason for stopping the population growth in the existing communities is based on information from Louisa County that there are no current plans in review or on file that suggest future growth or expansion for any of the private communities. The only exception to this methodology is Shenandoah Crossing which includes a private residential community and a resort development (Time Share). However, since the methodology cannot predict when the resort development will choose to expand the facilities, the current owners and operators of the community will be required to address future water demands at the time in which an expansion is implemented.

For the designated growth areas, it is assumed that once the available addresses have been exhausted, rezoning will occur during the planning period to allow for more development and growth in each growth area. At that point, the population continues to be distributed to the growth areas; however, it is distributed based on the percentage of addresses in each growth area compared to the total number of addresses in all growth areas.

Table 6 shows the population distribution to each private community, each growth area, and rural area for the entire planning period. It also shows the amount of the population currently connected, and the number of residents projected to be connected to public water under the "connected" column, versus the portion of the population assumed to be on private individual wells under the "not connected" column.

Table 6: Population Projection

Service Area		2007 population		2010 population			2020 population			2030 population			2040 population			2050 population		
Existing Private and Muncipal Community Water Systems		not connected	connected	not connected	COs issued (2007-2010)	connected	not connected	COs issued (2010-2020)	connected	not connected	COs issued (2020-2030)	connected	not connected	COs issued (2030-2040)	connected	not connected	COs issued (2040-2050)	connected
Blue Ridge Shores		--	1,472	--	36	1,564	--	120	1,871	--	120	2,178	--	120	2,485	--	120	2,792
Shenandoah Crossing		--	495	--	12	526	--	40	628	--	40	730	--	40	832	--	40	935
Six-o-Five Trailer Park		--	249	--	11	278	--	0	278	--	0	278	--	0	278	--	0	278
Trevilians Square Apartments		--	61	--	0	61	--	0	61	--	0	61	--	0	61	--	0	61
Twin Oaks		--	100	--	0	100	--	0	100	--	0	100	--	0	100	--	0	100
Lake Anna Growth Area	Lake Anna Plaza	--	111	--	6	126	--	6	142	--	0	142	--	0	142	--	0	142
	Jerdone Island	--	146	--	12	177	--	40	280	--	15	318	--	0	318	--	0	318
Northeast Creek Reservoir Service Area	LCWA	--	221	--	*6*	236	--	--	236	--	--	236	--	--	236	--	--	236
	Town of Louisa (GA)	878	1,501	878	*21*	1,555	790	240	2,258	711	404	3,371	639	290	4,185	575	336	5,109
	Town of Mineral (GA)	1,058	640	1,058	*0*	640	952	130	1,079	856	130	1,508	770	168	2,024	693	194	2,598
Zion Crossroads Service Area		1,139	454	1,139	*141*	814	1,025	420	2,003	922	401	3,133	829	288	3,963	746	334	4,901
Sub-total Population (not connected) =		3,075	--	3,075	--	--	2,767	--	--	2,489	--	--	2,238	--	--	2,014	--	--
Sub-total Population (connected) =		--	5,450	--	--	6,077	--	--	8,936	--	--	12,055	--	--	14,624	--	--	17,470
County Growth Areas (Proposed Municipal Water Systems)		not connected	connected	not connected	COs issued (2007-2010)	connected	not connected	COs issued (2010-2020)	connected	not connected	COs issued (2020-2030)	connected	not connected	COs issued (2030-2040)	connected	not connected	COs issued (2040-2050)	connected
Gum Spring		461	--	461	8	20	414	73	254	372	88	521	334	63	720	300	73	941
Ferncliff		602	--	602	11	28	541	95	332	486	115	681	437	83	943	393	96	1,232
Shannon Hill		300	--	300	6	15	270	47	165	243	58	341	218	42	474	196	48	619
Lake Anna	Remaining Area	5,868	--	5,868	108	277	5,281	929	3,242	4,752	1129	6,661	4,276	812	9,216	3,848	940	12,050
Boswell's Tavern		70	--	70	0	--	63	11	35	56	13	76	50	9	105	45	11	138
Gordonsville		433	--	433	0	--	389	67	215	350	80	459	315	58	643	283	67	846
Sub-total Population (not connected) =		7,734	--	7,734	--	--	6,958	--	--	6,259	--	--	5,630	--	--	5,065	--	--
Sub-total Population (connected) =		--	0	--	--	340	--	--	4,243	--	--	8,739	--	--	12,101	--	--	15,826
Rural Area (Individual wells)		not connected	connected	not connected	COs issued (2007-2010)	connected	not connected	COs issued (2010-2020)	connected	not connected	COs issued (2020-2030)	connected	not connected	COs issued (2030-2040)	connected	not connected	COs issued (2040-2050)	connected
Sub-total Population (not connected) =		14,961	--	15,927	--	--	18,985	--	--	21,197	--	--	22,881	--	--	24,808	--	--
Total Population =		**31,220**		**33,153**			**41,889**			**50,739**			**57,474**			**65,183**		

	967 pop =	378 COs		5678 pop =	2218 COs		6638 pop =	2593 COs		5051 pop =	1973 COs		5782 pop =	2259 COs	
	COs left =	133 COs		COs left =	1222 COs		COs left =	2288 COs		COs left =	1813 COs		COs left =	2099 COs	
Growth Area (GA)	GA	%	COs	GA	%	COs	GA	%	COs	GA	%	COs	GA	%	COs
ToL - Town of Louisa	ToL	--	*21*	ToL	--	*240*	ToL	17.6%	403.6	ToL	16.0%	290.2	ToL	16.0%	335.9
ToM - Town of Mineral	ToM	--	*0*	ToM	--	*130*	ToM	--	*130*	ToM	9.3%	168.1	ToM	9.3%	194.6
Z - Zion Crossroads	Z	--	*141*	Z	--	*420*	Z	17.5%	401.0	Z	15.9%	288.3	Z	15.9%	333.7
LA - Remaining Lake Anna	LA	81.2%	107.9	LA	76.1%	930.0	LA	49.3%	1128.7	LA	44.8%	811.5	LA	44.8%	939.6
GS - Gum Spring	GS	6.4%	8.5	GS	6.0%	72.8	GS	3.9%	88.5	GS	3.5%	63.5	GS	3.5%	73.4
F - Ferncliff	F	8.3%	11.1	F	7.8%	95.4	F	5.1%	115.6	F	4.6%	83.0	F	4.6%	96.1
SH - Shannon Hill	SH	4.1%	5.5	SH	3.9%	47.7	SH	2.5%	57.6	SH	2.3%	41.5	SH	2.3%	48.2
BT - Boswell's Tavern	BT	--	*0*	BT	0.9%	10.6	BT	0.6%	13.0	BT	0.5%	9.4	BT	0.5%	10.8
G - Gordonsville	G	--	*0*	G	5.4%	65.5	G	3.5%	80.0	G	3.2%	57.5	G	3.2%	66.7

- Once all available addresses have been occupied in the existing systems, population is distributed to growth areas based on percentage of total growth area addresses

VI. PROJECTED WATER DEMAND (9 VAC 25-780-100)

The following section outlines the methodology for developing the projected water demands for Louisa County through year 2050.

A. Rural Areas

Since dwellings with individual wells are typically not metered, a conservative estimate for water usage in rural areas was based on the daily consumption rate of 100 gallons per day (GPD) per person. This rate is as specified by the Virginia Department of Health (VDH) Waterworks Regulations.

B. Municipal Service Areas

Historical municipal community water system data included in the VDEQ templates was utilized to calculate a typical daily water use rate per person for the existing municipal service areas, as well as provide a basis for the water use rate per person for the County designated growth areas or proposed municipal service areas.

Data obtained from the Towns and the Louisa County Water Authority (LCWA) for the VDEQ templates included water production, water sold (if applicable), and water usage. The water usage was categorized as residential or commercial. A difference was identified in comparing the water production records with the water usage/sales records. On average, this difference was approximately 15%, and represented the lost or unaccountable water within the distribution system. The lost or unaccountable water was incorporated into the total water demands within the planning period, and an assumed reduction in lost or unaccountable water was identified as a potential water conservation approach.

Table 7 provides a breakdown of the data analyzed. Again, to convert between households or certificate of occupancy's (COs) and population, the 2000 census data of 2.56 people per household (or CO) in Louisa County was used unless actual population data was available.

Table 7: Municipal Community Water System Usage

Municipal Community Water Systems	Northeast Creek Reservoir Service Area			Zion Crossroads Service Area
	LCWA	***Town of Louisa***	***Town of Mineral***	***LCWA***
Residential Water Usage (gal/year)	4,303,090	35,278,599	14,707,760	12,907,615
Residential Water Usage (GPD)	11,789	96,654	40,295	35,363
Active Residential Households	86	*population data used instead of connections*	*population data used instead of connections*	177
Persons per Household (or CO), 2000 U.S. Census	2.56			2.56
Population	221	1501 *	640 **	454
Residential Water Consumption (GPD/person)	53	64	63	78
Commercial Water Usage (gal/year)	17,025,610	20,393,300	4,887,430	17,703,940
Bulk Sales (gal/year)	1,050	N/A	N/A	1,414,275
Total Water Usage (gal/year)	21,329,750	55,671,899	19,595,190	32,025,830
Residential Water Usage (%)	20.2%	63.4%	75.1%	40.3%
Commercial Water Usage (%)	79.8%	36.6%	24.9%	55.3%

Notes:

1. Water usage/consumption based on water meter reports from the Towns and LCWA for period of April 2007 to March 2008.

*2. * Town of Louisa populations provided, not calculated.*

*3. ** Town of Mineral population provided w/in Town limits; plus calculated to include customers outside Town limits.*

4. Based on water production reports versus water meter reports, total water usage equals ~85% of water produced, so 15% of water produced is considered lost/unaccounted which will be included in overall water demands.

While the Towns and Zion Crossroads are each considered growth areas by the Louisa County Comprehensive Plan, there is an obvious distinction in the residential water usage for these areas. The Towns are older, more established areas in comparison to the newer, "booming" growth in the Zion Crossroads area. A large percentage, if not all, of the newer homes in Zion Crossroads have irrigation systems. Based on the data analysis, the following residential water usage rates to the nearest 5 GPD/person will be used:

- Northeast Creek Reservoir Service Area
  - LCWA customers (55 GPD/person)
  - Town of Louisa customers (65 GPD/person)
  - Town of Mineral customers (65 GPD/person)
- Zion Crossroads Service Area (80 GPD/person)
- Proposed Service Areas (80 GPD/person). Remaining proposed service areas include Gum Spring, Ferncliff, Shannon Hill, Boswell's Tavern, Lake Anna, and Gordonsville.

Commercial water usage requires a slightly different projection than residential water usage because it is not possible to calculate commercial water usage per person. **Table 7** above shows the percentage of commercial water usage compared to residential water usage. Since commercial growth is anticipated to continue with residential growth during the planning period, the percentage of commercial water usage for the water demand projections was maintained as it relates to residential usage. This means the population projections were used to obtain the number of residents, the baseline residential water usage per person was used to calculate total residential water usage, and then the commercial water usage was calculated based on the residential and commercial percentages shown in **Table 7** above**.**

Again, due to the differences between the two (2) existing Towns and the Zion Crossroads growth area discussed above, the Zion Crossroads growth area will be considered representative of the remaining designated growth areas (Gum Spring, Ferncliff, Shannon Hill, Boswell's Tavern, Lake Anna, and Gordonsville). Each Town's historical data is used for the Towns growth areas.

However, it is not believed that the percentage breakdown of residential versus commercial water usage in Zion Crossroads can be equally applied to all growth areas. A Wal-Mart Distribution Center is currently located in Zion Crossroads. It is believed that the amount of water being used by this facility is skewing the commercial percentage since residential development has only begun over the last five plus (5+) years (Wal-Mart Usage = Approximately 835,000 Gallons per Month vs. Remaining Commercial = Approximately 640,000 Gallons per Month). **Table 8** shows the percentage breakdown when the Wal-Mart Distribution Center water usage is removed:

Table 8: Residential and Commercial Water Usage in Zion Crossroads Service Area (Without Wal-Mart Distribution Center)

Residential Water Usage (%)	**58.6%**
Commercial Water Usage (%)	**34.9%**
Bulk Sales (%)	**6.4%**

The residential usage in **Table 8** increases to 60% rather than the 40% shown in **Table 7** above. Based on discussions with Louisa County, Town of Louisa, Town of Mineral, and the LCWA, it is believed that the current 60% commercial usage in Zion Crossroads would be representative for the designated growth areas located along Interstate 64 (Zion Crossroads, Gum Spring, Ferncliff, and Shannon Hill), but that the remaining growth areas (Lake Anna, Boswell's Tavern, and Gordonsville) will be closer to 40% commercial usage as shown in **Table 8** above. Therefore, the planning period utilizes the breakdowns outlined above for the representative growth areas.

C. Existing Private Communities

Since the existing private communities also contribute to the overall plan, average consumption rates are required to provide anticipated water resource demands for individual time steps. The water production data from the VDEQ templates was used to calculate each system's average water withdrawal rates per person. **Table 9** shows this information.

Table 9: Private Community Water System Daily Rates (GPD/person)

Private Community Water System	Annual Average Water Withdrawal (GPD/person)	Annual Average Water Usage (GPD/person)	Peak Day Water Withdrawal (GPD/person)	Peak Day Water Usage (GPD/person)
Blue Ridge Shores	37	32	66	56
Shenandoah Crossing	164	139	246	209
Six-o-Five Village Trailer Park	51	43	76	65
Trevilians Square Apartments	100	85	150	128
Twin Oaks	76	65	114	97
Lake Anna Plaza	40	34	60	51
Jerdone Island	45	38	68	58

Notes:

1. *Water withdrawal based on VDEQ templates, which utilized VDH monthly operation reports.*
2. *Community water systems do not have commercial water usage.*
3. *Assume water consumption is 85% of water produced.*

Water withdrawal and usage rates for the existing communities will be based on a rate to the nearest 5 GPD/person.

D. Self-Supplied Users Using > 300,000 Gallons Per Month

In addition to the rural areas, municipal service areas, and the private communities, there are "Self-Supplied Users" in the County that use greater than 300,000 Gallons per Month (Gal/Mo) for non-agricultural and agricultural uses.

Self-supplied users of non-agricultural potable groundwater are Klockner Pentaplast near the Town of Gordonsville, the North Anna Power Station and North Anna Information Center at Lake Anna, and Siebert's Amoco and Dairy Queen. Crossing Pointe at Zion Crossroads was self-supplied until August 2010 when it connected to the public water system.

Self-supplied users of non-agricultural non-potable surface water include Tanyard Country Club Golf Course in the Town of Louisa, Spring Creek Golf Course at Zion Crossroads, North Anna Power Station, and LCWA providing water to Louisa Power Station.

While each self-supplied user is not known for agricultural water use, livestock water use and land irrigation was estimated using the 2007 Census of Agriculture and Farm and Ranch Irrigation Survey, issued by the United States Department of Agriculture, National Agricultural Statistics Service. The United States Geological Survey livestock water use factors provided in the VDEQ templates were utilized with the Census livestock inventory to estimate livestock water use.

These large water consumers are identified in **Table 10** below, and their respective flows were incorporated into each individual time step to provide a complete demand for the County. Since the County does not have any plans on record at this time for future expansion of facilities or demands for any of these large consumers during any of the time steps identified in this plan, their demands remained constant for each step.

Table 10: Self-supplied Users > 300,000 Gallons/Month Daily Rates

Self-Supplied User	Annual Average Water Withdrawal (GPD)	Annual Average Water Usage (GPD)	Peak Day Water Withdrawal (GPD)	Peak Day Water Usage (GPD)	Use Category
Klockner Pentaplast	10,147	8,625	15,221	12,938	Potable Water
North Anna Power Station	10,998	9,348	16,497	14,022	Potable Water
North Anna Info Center	766	651	1,149	977	Potable Water
Siebert's Amoco & Dairy Queen	15,000	12,750	22,500	19,125	Potable Water
Crossing Pointe	12,625	10,731	18,938	16,097	Potable Water
Tanyard Country Club Golf Course	64,060	54,451	96,090	81,677	Irrigation
Spring Creek Golf Course	162,342	137,991	243,513	206,986	Irrigation
North Anna Power Station	2,150,000,000	1,827,500,000	3,225,000,000	2,741,250,000	Cooling and Hydropower
LCWA (ODEC power station)	13,671	11,620	20,507	17,431	Cooling
Agriculture: County Livestock	174,644	148,447	261,966	222,671	Agriculture
Agriculture: Irrigated Land	138,644	117,847	207,966	176,771	Agriculture

Notes:

1. *Water withdrawal based on VDEQ templates, which utilized VDH monthly operation reports, VDEQ VWUDS, and Ag Census.*
2. *Assume water consumption is 85% of water withdrawal.*
3. *Assume Peak Factor of 1.5.*

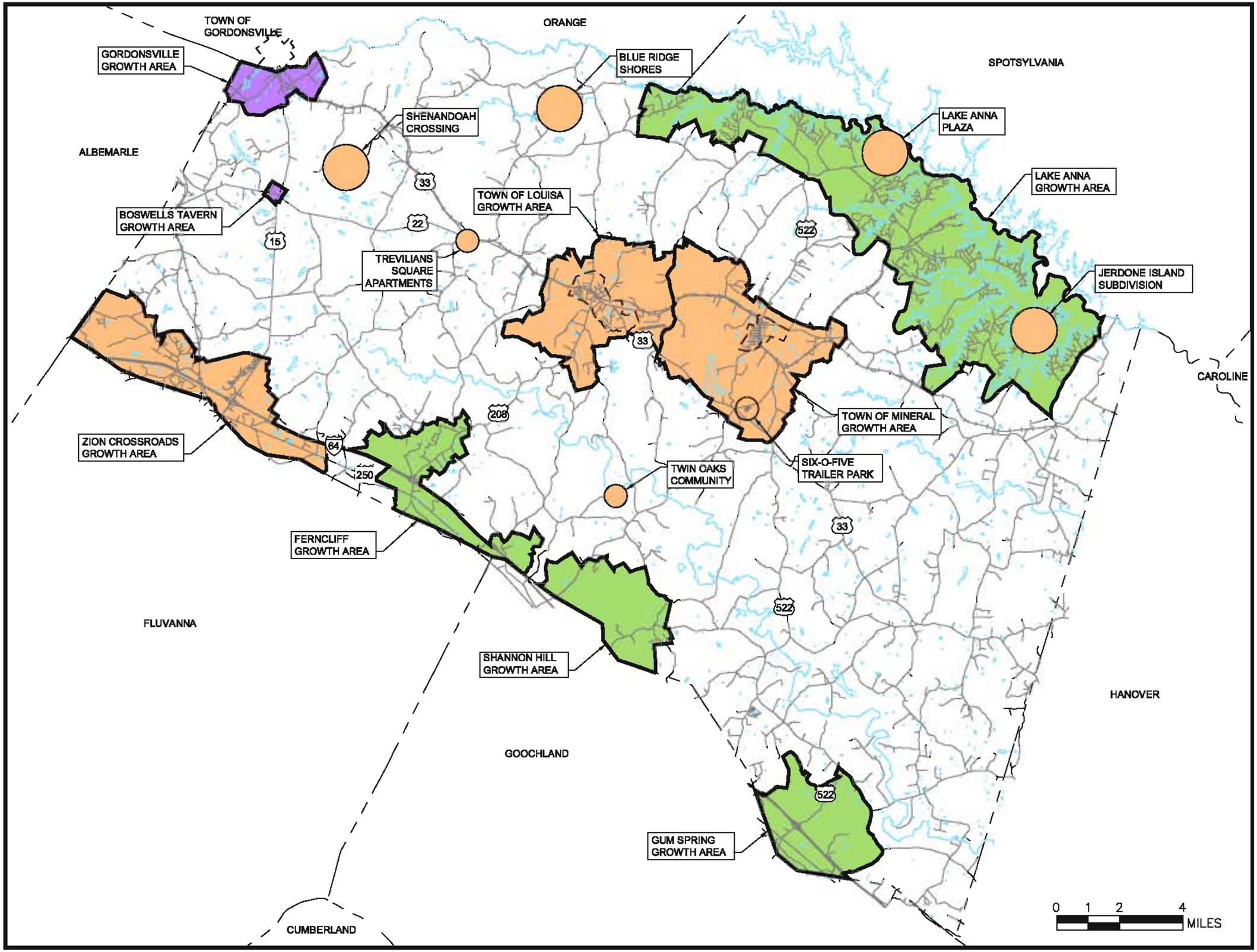
E. Phasing Plan

Once the population projections and the water demand projections were complete, they were loaded across each of the time steps to provide a final Countywide demand through the year 2050. To complete the loading of the time steps, consideration was given to the public infrastructure development or "phasing in" of a municipal service areas in each of the County's designated growth areas.

Per the County's Comprehensive Plan, public infrastructure is a defining quality for each of the nine (9) designated growth areas since public utilities and facilities are expected to encourage and attract development related to the County's land use plan. Of the nine (9) delineated growth areas, only three (3) (Town of Louisa, Town of Mineral, and Zion Crossroads) currently have public utilities provided by the County. The phasing plan illustrates when the County anticipates potentially providing public utilities to each growth area.

While Lake Anna could be considered "in phase" given current development, the existence of County provided public utilities has not been significantly developed to provide a reliable source to a variety of customers. Therefore, for purposes of this plan, Lake Anna is considered a proposed future growth area in the baseline year of 2007.

In an effort to correctly "phase in" the remaining growth areas, an investigation was completed to identify speculative projects or projects under review by County officials. This investigation suggested that four (4) (Lake Anna, Gum Spring, Ferncliff, and Shannon Hill) of the growth areas are likely to become "in phase" during or after the 2010 time step, and the final two (2) growth areas (Boswell's Tavern and Gordonsville) are likely to become "in-phase" during or after the 2020 time step. Therefore, the time steps for the water demand projections were loaded accordingly. **Figure 17** identifies the proposed phasing plan.



Dewberry

Gannett Fleming

LOUISA COUNTY WATER SUPPLY MASTER PLAN

PHASING PLAN

LOCATION MAP

LEGEND

- ROADS
- RAILROADS
- WATER
- COUNTY BOUNDARY
- CURRENTLY IN PHASE
- TO BE PHASED IN: 2010 - 2020
- TO BE PHASED IN: 2020 - 2050

SOURCE NOTE:

Base mapping provided by Louisa County GIS Information is for general reference and display only. Reproduction of this information is prohibited without permission from Louisa County engineering staff.

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JUNE 2011

FIGURE 17

F. Final Projections

Based on the development of the population projections, water demand projections, and methodology for "phasing in" future service areas, each time step was loaded to achieve the final projections for the planning period. **Table 11** provides a summary of the final population and water demand projections separated by private communities, municipal service areas (existing and proposed), self-supplied users more than 300,000 Gallons/Month, and areas served by individual wells for the 2007, 2010, 2020, 2030, 2040, and 2050 time steps.

As previously stated, the withdrawal water demands for the North Anna Power Station cooling system and hydro units are not included in the total Self-Supplied Users water demands, given the considerable amount of surface water withdrawal is over 500 times the total County water demand, and the water is returned to Lake Anna or the river below the dam after its use. Water demand projections are in Million Gallons per Day (MGD).

Table 11: Projected Population and Water Demand

Year	County Pop.	Private Communities		Municipal Service Areas		SSU > 300,000 Gal/Mo		Individual Wells		Total County Water Demand	
		Ave. (MGD)	Peak (MGD)	Ave. (MGD)	Peak (MGD)	Ave. (MGD)	Peak (MGD)	Ave. (MGD)	Peak (MGD)	Ave. (MGD)	Peak (MGD)
2007	31,220	0.172	0.275	0.424	0.648	0.603	0.904	2.78	4.17	**3.98**	**5.99**
2010	33,153	0.182	0.290	0.571	0.870	0.596	0.894	2.86	4.29	**4.21**	**6.34**
2020	41,889	0.212	0.339	1.62	2.44	0.589	0.884	3.08	4.61	**5.49**	**8.28**
2030	50,739	0.238	0.381	2.77	4.17	0.582	0.874	3.20	4.81	**6.79**	**10.2**
2040	57,474	0.262	0.420	3.61	5.45	0.576	0.864	3.28	4.92	**7.73**	**11.7**
2050	65,183	0.285	0.458	4.54	6.85	0.569	0.854	3.39	5.08	**8.78**	**13.2**

- Pop.: Population
- SSU: Self-Supplied Users
- Ave: Annual Average
-Peak: Peak Day

A more detailed breakdown of each time step can be found in the following **Tables 12 - 17**.

Table 12: 2007 Population and Water Demand Projections

2007																
Existing Private and Municipal Community Water Systems		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (85% of Demand) (GPD)	Peak Day Total Usage (85% of Demand) (GPD)	Average Water Lost (15% of Demand) (GPD)	Peak Day Water Lost (15% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Blue Ridge Shores		1,472	30	55	44,160	80,960	0	0	--	--	44,160	80,960	7,793	14,287	51,953	95,247
Shenandoah Crossing		495	140	210	69,300	103,950	0	0	--	--	69,300	103,950	12,229	18,344	81,529	122,294
Six-o-Five Trailer Park		249	45	65	11,205	16,185	0	0	--	--	11,205	16,185	1,977	2,856	13,182	19,041
Trevilians Square Apartments		61	85	130	5,185	7,930	0	0	--	--	5,185	7,930	915	1,399	6,100	9,329
Twin Oaks		100	65	100	6,500	10,000	0	0	--	--	6,500	10,000	1,147	1,765	7,647	11,765
Lake Anna	Lake Anna Plaza	111	35	50	3,885	5,550	0	0	--	--	3,885	5,550	686	979	4,571	6,529
	Jerdone Island	146	40	60	5,840	8,760	0	0	--	--	5,840	8,760	1,031	1,546	6,871	10,306
Northeast Creek Reservoir Service Area	LCWA	221	55	85	12,155	18,785	48,018	74,210	--	--	60,173	92,995	10,619	16,411	70,792	109,406
	Town of Louisa	1,501	65	100	97,565	150,100	56,323	86,651	--	--	153,888	236,751	27,157	41,780	181,045	278,530
	Town of Mineral	640	65	100	41,600	64,000	13,793	21,220	--	--	55,393	85,220	9,775	15,039	65,168	100,258
* Zion Crossroads Service Area		454	80	120	36,320	54,480	54,480	81,720	--	--	90,800	136,200	16,024	24,035	106,824	160,235
Sub-total =		5,450	--	--	333,715	520,700	172,614	263,801	--	--	506,329	784,501	89,352	138,441	595,681	922,942
Self-Supplied Users > 300,000 gal/month		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (85% of Demand) (GPD)	Peak Day Total Usage (85% of Demand) (GPD)	Average Water Lost (15% of Demand) (GPD)	Peak Day Water Lost (15% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Klockner Pentaplast		--	--	--	--	--	8,625	12,940	0	0	8,625	12,940	1,522	2,284	10,147	15,224
North Anna Power Station and Info Center		--	--	--	--	--	10,000	15,000	0	0	10,000	15,000	1,765	2,647	11,765	17,647
Siebert Amoco and Dairy Queen		--	--	--	--	--	12,750	19,125	0	0	12,750	19,125	2,250	3,375	15,000	22,500
Crossing Pointe		--	--	--	--	--	10,730	16,095	0	0	10,730	16,095	1,894	2,840	12,624	18,935
Tanyard Country Club Golf Course		--	--	--	--	--	54,450	81,675	0	0	54,450	81,675	9,609	14,413	64,059	96,088
Spring Creek Golf Course		--	--	--	--	--	137,990	206,985	0	0	137,990	206,985	24,351	36,527	162,341	243,512
LCWA (Louisa Power Station)		--	--	--	--	--	11,620	17,430	0	0	11,620	17,430	2,051	3,076	13,671	20,506
Agriculture (Livestock & Irrigated Land)		--	--	--	--	--	0	0	266,295	399,440	266,295	399,440	46,993	70,489	313,288	469,929
Sub-total =		--	--	--	--	--	246,165	369,250	266,295	399,440	512,460	768,690	90,434	135,651	602,894	904,341
Private Individual Wells		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (85% of Demand) (GPD)	Peak Day Total Usage (85% of Demand) (GPD)	Average Water Lost (15% of Demand) (GPD)	Peak Day Water Lost (15% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Growth Areas		10,809	80	120	864,720	1,297,080	0	0	--	--	864,720	1,297,080	152,598	228,896	1,017,318	1,525,976
Rural Area		14,961	100	150	1,496,100	2,244,150	0	0	--	--	1,496,100	2,244,150	264,018	396,026	1,760,118	2,640,176
Sub-total =		25,770	--	--	2,360,820	3,541,230	0	0	--	--	2,360,820	3,541,230	416,615	624,923	2,777,435	4,166,153
Total =		31,220	--	--	2,694,535	4,061,930	418,779	633,051	266,295	399,440	3,379,609	5,094,421	596,402	899,015	**3,976,011**	**5,993,436**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 7.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

Table 13: 2010 Population and Water Demand Projections

2010															
Existing Private and Municipal Community Water Systems		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (86% of Demand) (GPD)	Peak Day Total Usage (86% of Demand) (GPD)	Average Water Lost (14% of Demand) (GPD)	Peak Day Water Lost (14% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Blue Ridge Shores		1,564	30	55	46,920	86,020	0	0	--	--	46,920	86,020	7,638	14,003	54,558	100,023
Shenandoah Crossing		526	140	210	73,640	110,460	0	0	--	--	73,640	110,460	11,988	17,982	85,628	128,442
Six-o-Five Trailer Park		278	45	65	12,510	18,070	0	0	--	--	12,510	18,070	2,037	2,942	14,547	21,012
Trevilians Square Apartments		61	85	130	5,185	7,930	0	0	--	--	5,185	7,930	844	1,291	6,029	9,221
Twin Oaks		100	65	100	6,500	10,000	0	0	--	--	6,500	10,000	1,058	1,628	7,558	11,628
Lake Anna	Lake Anna Plaza	126	35	50	4,410	6,300	0	0	--	--	4,410	6,300	718	1,026	5,128	7,326
	Jerdone Island	177	40	60	7,080	10,620	0	0	--	--	7,080	10,620	1,153	1,729	8,233	12,349
Northeast Creek Reservoir Service Area	LCWA	236	55	85	12,980	20,060	51,277	79,247	--	--	64,257	99,307	10,461	16,166	74,718	115,473
	Town of Louisa	1,555	65	100	101,075	155,500	58,349	89,768	--	--	159,424	245,268	25,953	39,927	185,377	285,196
	Town of Mineral	640	65	100	41,600	64,000	13,793	21,220	--	--	55,393	85,220	9,017	13,873	64,410	99,093
* Zion Crossroads Service Area		814	80	120	65,120	97,680	97,680	146,520	--	--	162,800	244,200	26,502	39,753	189,302	283,953
Sub-total =		6,077	--	--	377,020	586,640	221,100	336,755	--	--	598,120	923,395	97,368	150,320	695,488	1,073,715
Self-Supplied Users > 300,000 gal/month		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (86% of Demand) (GPD)	Peak Day Total Usage (86% of Demand) (GPD)	Average Water Lost (14% of Demand) (GPD)	Peak Day Water Lost (14% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Klockner Pentaplast		--	--	--	--	--	8,625	12,940	0	0	8,625	12,940	1,404	2,107	10,029	15,047
North Anna Power Station and Info Center		--	--	--	--	--	10,000	15,000	0	0	10,000	15,000	1,628	2,442	11,628	17,442
Siebert Amoco and Dairy Queen		--	--	--	--	--	12,750	19,125	0	0	12,750	19,125	2,076	3,113	14,826	22,238
Crossing Pointe		--	--	--	--	--	10,730	16,095	0	0	10,730	16,095	1,747	2,620	12,477	18,715
Tanyard Country Club Golf Course		--	--	--	--	--	54,450	81,675	0	0	54,450	81,675	8,864	13,296	63,314	94,971
Spring Creek Golf Course		--	--	--	--	--	137,990	206,985	0	0	137,990	206,985	22,463	33,695	160,453	240,680
LCWA (Louisa Power Station)		--	--	--	--	--	11,620	17,430	0	0	11,620	17,430	1,892	2,837	13,512	20,267
Agriculture (Livestock & Irrigated Land)		--	--	--	--	--	0	0	266,295	399,440	266,295	399,440	43,350	65,025	309,645	464,465
Sub-total =		--	--	--	--	--	246,165	369,250	266,295	399,440	512,460	768,690	83,424	125,136	595,884	893,826
County Designated Growth Areas (Proposed Municipal Service Areas)		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (86% of Demand) (GPD)	Peak Day Total Usage (86% of Demand) (GPD)	Average Water Lost (14% of Demand) (GPD)	Peak Day Water Lost (14% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
* Gum Spring		20	80	120	1,600	2,400	2,400	3,600	--	--	4,000	6,000	651	977	4,651	6,977
* Ferncliff		28	80	120	2,240	3,360	3,360	5,040	--	--	5,600	8,400	912	1,367	6,512	9,767
* Shannon Hill		15	80	120	1,200	1,800	1,800	2,700	--	--	3,000	4,500	488	733	3,488	5,233
Lake Anna	Remaining Area	277	80	120	22,160	33,240	14,773	22,160	--	--	36,933	55,400	6,012	9,019	42,946	64,419
Boswell's Tavern (not in phase)		--	--	--	--	--	0	0	--	--	0	0	0	0	0	0
Gordonsville (not in phase)		--	--	--	--	--	0	0	--	--	0	0	0	0	0	0
Sub-total =		340	--	--	27,200	40,800	22,333	33,500	--	--	49,533	74,300	8,064	12,095	57,597	86,395
Private Individual Wells		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (86% of Demand) (GPD)	Peak Day Total Usage (86% of Demand) (GPD)	Average Water Lost (14% of Demand) (GPD)	Peak Day Water Lost (14% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Growth Areas		10,809	80	120	864,720	1,297,080	0	0	--	--	864,720	1,297,080	140,768	211,153	1,005,488	1,508,233
Rural Area		15,927	100	150	1,592,700	2,389,050	0	0	--	--	1,592,700	2,389,050	259,277	388,915	1,851,977	2,777,965
Sub-total =		26,736	--	--	2,457,420	3,686,130	0	0	--	--	2,457,420	3,686,130	400,045	600,068	2,857,465	4,286,198
Total =		33,153	--	--	2,861,640	4,313,570	489,598	739,505	266,295	399,440	3,617,533	5,452,515	588,901	887,619	**4,206,434**	**6,340,133**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 7.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 14: 2020 Population and Water Demand Projections

2020																
Existing Private and Municipal Community Water Systems		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (87% of Demand) (GPD)	Peak Day Total Usage (87% of Demand) (GPD)	Average Water Lost (13% of Demand) (GPD)	Peak Day Water Lost (13% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Blue Ridge Shores		1,871	30	55	56,130	102,905	0	0	--	--	56,130	102,905	8,387	15,377	64,517	118,282
Shenandoah Crossing		628	140	210	87,920	131,880	0	0	--	--	87,920	131,880	13,137	19,706	101,057	151,586
Six-o-Five Trailer Park		278	45	65	12,510	18,070	0	0	--	--	12,510	18,070	1,869	2,700	14,379	20,770
Trevilians Square Apartments		61	85	130	5,185	7,930	0	0	--	--	5,185	7,930	775	1,185	5,960	9,115
Twin Oaks		100	65	100	6,500	10,000	0	0	--	--	6,500	10,000	971	1,494	7,471	11,494
Lake Anna	Lake Anna Plaza	142	35	50	4,970	7,100	0	0	--	--	4,970	7,100	743	1,061	5,713	8,161
	Jerdone Island	280	40	60	11,200	16,800	0	0	--	--	11,200	16,800	1,674	2,510	12,874	19,310
Northeast Creek Reservoir Service Area	LCWA	236	55	85	12,980	20,060	51,277	79,247	--	--	64,257	99,307	9,602	14,839	73,859	114,146
	Town of Louisa	2,258	65	100	146,770	225,800	84,728	130,351	--	--	231,498	356,151	34,592	53,218	266,090	409,369
	Town of Mineral	1,079	65	100	70,135	107,900	23,254	35,775	--	--	93,389	143,675	13,955	21,469	107,343	165,144
* Zion Crossroads Service Area		2,003	80	120	160,240	240,360	240,360	360,540	--	--	400,600	600,900	59,860	89,790	460,460	690,690
Sub-total =		8,936	--	--	574,540	888,805	399,620	605,913	--	--	974,160	1,494,718	145,564	223,349	1,119,724	1,718,067
Self-Supplied Users > 300,000 gal/month		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (87% of Demand) (GPD)	Peak Day Total Usage (87% of Demand) (GPD)	Average Water Lost (13% of Demand) (GPD)	Peak Day Water Lost (13% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Klockner Pentaplast		--	--	--	--	--	8,625	12,940	0	0	8,625	12,940	1,289	1,934	9,914	14,874
North Anna Power Station and Info Center		--	--	--	--	--	10,000	15,000	0	0	10,000	15,000	1,494	2,241	11,494	17,241
Siebert Amoco and Dairy Queen		--	--	--	--	--	12,750	19,125	0	0	12,750	19,125	1,905	2,858	14,655	21,983
Crossing Pointe		--	--	--	--	--	10,730	16,095	0	0	10,730	16,095	1,603	2,405	12,333	18,500
Tanyard Country Club Golf Course		--	--	--	--	--	54,450	81,675	0	0	54,450	81,675	8,136	12,204	62,586	93,879
Spring Creek Golf Course		--	--	--	--	--	137,990	206,985	0	0	137,990	206,985	20,619	30,929	158,609	237,914
LCWA (Louisa Power Station)		--	--	--	--	--	11,620	17,430	0	0	11,620	17,430	1,736	2,604	13,356	20,034
Agriculture (Livestock & Irrigated Land)		--	--	--	--	--	0	0	266,295	399,440	266,295	399,440	39,791	59,686	306,086	459,126
Sub-total =		--	--	--	--	--	246,165	369,250	266,295	399,440	512,460	768,690	76,574	114,862	589,034	883,552
County Designated Growth Areas (Proposed Municipal Service Areas)		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (87% of Demand) (GPD)	Peak Day Total Usage (87% of Demand) (GPD)	Average Water Lost (13% of Demand) (GPD)	Peak Day Water Lost (13% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
* Gum Spring		254	80	120	20,320	30,480	30,480	45,720	--	--	50,800	76,200	7,591	11,386	58,391	87,586
* Ferncliff		332	80	120	26,560	39,840	39,840	59,760	--	--	66,400	99,600	9,922	14,883	76,322	114,483
* Shannon Hill		165	80	120	13,200	19,800	19,800	29,700	--	--	33,000	49,500	4,931	7,397	37,931	56,897
Lake Anna	Remaining Area	3,242	80	120	259,360	389,040	172,907	259,360	--	--	432,267	648,400	64,592	96,887	496,858	745,287
Boswell's Tavern		35	80	120	2,800	4,200	1,867	2,800	--	--	4,667	7,000	697	1,046	5,364	8,046
Gordonsville		215	80	120	17,200	25,800	11,467	17,200	--	--	28,667	43,000	4,284	6,425	32,950	49,425
Sub-total =		4,243	--	--	339,440	509,160	276,360	414,540	--	--	615,800	923,700	92,016	138,024	707,816	1,061,724
Private Individual Wells		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (87% of Demand) (GPD)	Peak Day Total Usage (87% of Demand) (GPD)	Average Water Lost (13% of Demand) (GPD)	Peak Day Water Lost (13% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Growth Areas		9,725	80	120	778,000	1,167,000	0	0	--	--	778,000	1,167,000	116,253	174,379	894,253	1,341,379
Rural Area		18,985	100	150	1,898,500	2,847,750	0	0	--	--	1,898,500	2,847,750	283,684	425,526	2,182,184	3,273,276
Sub-total =		28,710	--	--	2,676,500	4,014,750	0	0	--	--	2,676,500	4,014,750	399,937	599,905	3,076,437	4,614,655
Total =		41,889	--	--	3,590,480	5,412,715	922,145	1,389,703	266,295	399,440	4,778,920	7,201,858	714,091	1,076,140	**5,493,011**	**8,277,998**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 7.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 15: 2030 Population and Water Demand Projections

2030															
Existing Private and Municipal Community Water Systems		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (88% of Demand) (GPD)	Peak Day Total Usage (88% of Demand) (GPD)	Average Water Lost (12% of Demand) (GPD)	Peak Day Water Lost (12% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Blue Ridge Shores		2,178	30	55	65,340	119,790	0	0	--	--	65,340	119,790	8,910	16,335	74,250	136,125
Shenandoah Crossing		730	140	210	102,200	153,300	0	0	--	--	102,200	153,300	13,936	20,905	116,136	174,205
Six-o-Five Trailer Park		278	45	65	12,510	18,070	0	0	--	--	12,510	18,070	1,706	2,464	14,216	20,534
Trevilians Square Apartments		61	85	130	5,185	7,930	0	0	--	--	5,185	7,930	707	1,081	5,892	9,011
Twin Oaks		100	65	100	6,500	10,000	0	0	--	--	6,500	10,000	886	1,364	7,386	11,364
Lake Anna	Lake Anna Plaza	142	35	50	4,970	7,100	0	0	--	--	4,970	7,100	678	968	5,648	8,068
	Jerdone Island	318	40	60	12,720	19,080	0	0	--	--	12,720	19,080	1,735	2,602	14,455	21,682
Northeast Creek Reservoir Service Area	LCWA	236	55	85	12,980	20,060	51,277	79,247	--	--	64,257	99,307	8,762	13,542	73,020	112,849
	Town of Louisa	3,371	65	100	219,115	337,100	126,492	194,603	--	--	345,607	531,703	47,128	72,505	392,736	604,208
	Town of Mineral	1,508	65	100	98,020	150,800	32,499	49,999	--	--	130,519	200,799	17,798	27,382	148,317	228,181
* Zion Crossroads Service Area		3,133	80	120	250,640	375,960	375,960	563,940	--	--	626,600	939,900	85,445	128,168	712,045	1,068,068
Sub-total =		12,055	--	--	790,180	1,219,190	586,229	887,789	--	--	1,376,409	2,106,979	187,692	287,315	1,564,101	2,394,295
Self-Supplied Users > 300,000 gal/month		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (88% of Demand) (GPD)	Peak Day Total Usage (88% of Demand) (GPD)	Average Water Lost (12% of Demand) (GPD)	Peak Day Water Lost (12% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Klockner Pentaplast		--	--	--	--	--	8,625	12,940	0	0	8,625	12,940	1,176	1,765	9,801	14,705
North Anna Power Station and Info Center		--	--	--	--	--	10,000	15,000	0	0	10,000	15,000	1,364	2,045	11,364	17,045
Siebert Amoco and Dairy Queen		--	--	--	--	--	12,750	19,125	0	0	12,750	19,125	1,739	2,608	14,489	21,733
Crossing Pointe		--	--	--	--	--	10,730	16,095	0	0	10,730	16,095	1,463	2,195	12,193	18,290
Tanyard Country Club Golf Course		--	--	--	--	--	54,450	81,675	0	0	54,450	81,675	7,425	11,138	61,875	92,813
Spring Creek Golf Course		--	--	--	--	--	137,990	206,985	0	0	137,990	206,985	18,817	28,225	156,807	235,210
LCWA (Louisa Power Station)		--	--	--	--	--	11,620	17,430	0	0	11,620	17,430	1,585	2,377	13,205	19,807
Agriculture (Livestock & Irrigated Land)		--	--	--	--	--	0	0	266,295	399,440	266,295	399,440	36,313	54,469	302,608	453,909
Sub-total =		--	--	--	--	--	246,165	369,250	266,295	399,440	512,460	768,690	69,881	104,821	582,341	873,511
County Designated Growth Areas (Proposed Municipal Service Areas)		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (88% of Demand) (GPD)	Peak Day Total Usage (88% of Demand) (GPD)	Average Water Lost (12% of Demand) (GPD)	Peak Day Water Lost (12% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
* Gum Spring		521	80	120	41,680	62,520	62,520	93,780	--	--	104,200	156,300	14,209	21,314	118,409	177,614
* Ferncliff		681	80	120	54,480	81,720	81,720	122,580	--	--	136,200	204,300	18,573	27,859	154,773	232,159
* Shannon Hill		341	80	120	27,280	40,920	40,920	61,380	--	--	68,200	102,300	9,300	13,950	77,500	116,250
Lake Anna	Remaining Area	6,661	80	120	532,880	799,320	355,253	532,880	--	--	888,133	1,332,200	121,109	181,664	1,009,242	1,513,864
Boswell's Tavern		76	80	120	6,080	9,120	4,053	6,080	--	--	10,133	15,200	1,382	2,073	11,515	17,273
Gordonsville		459	80	120	36,720	55,080	24,480	36,720	--	--	61,200	91,800	8,345	12,518	69,545	104,318
Sub-total =		8,739	--	--	699,120	1,048,680	568,947	853,420	--	--	1,268,067	1,902,100	172,918	259,377	1,440,985	2,161,477
Private Individual Wells		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (88% of Demand) (GPD)	Peak Day Total Usage (88% of Demand) (GPD)	Average Water Lost (12% of Demand) (GPD)	Peak Day Water Lost (12% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Growth Areas		8,748	80	120	699,840	1,049,760	0	0	--	--	699,840	1,049,760	95,433	143,149	795,273	1,192,909
Rural Area		21,197	100	150	2,119,700	3,179,550	0	0	--	--	2,119,700	3,179,550	289,050	433,575	2,408,750	3,613,125
Sub-total =		29,945	--	--	2,819,540	4,229,310	0	0	--	--	2,819,540	4,229,310	384,483	576,724	3,204,023	4,806,034
Total =		50,739	--	--	4,308,840	6,497,180	1,155,176	1,741,209	266,295	399,440	5,464,016	8,238,389	745,093	1,123,417	**6,791,450**	**10,235,317**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 7.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 16: 2040 Population and Water Demand Projections

2040															
Existing Private and Municipal Community Water Systems		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (89% of Demand) (GPD)	Peak Day Total Usage (89% of Demand) (GPD)	Average Water Lost (11% of Demand) (GPD)	Peak Day Water Lost (11% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Blue Ridge Shores		2,485	30	55	74,550	136,675	0	0	--	--	74,550	136,675	9,214	16,892	83,764	153,567
Shenandoah Crossing		832	140	210	116,480	174,720	0	0	--	--	116,480	174,720	14,396	21,595	130,876	196,315
Six-o-Five Trailer Park		278	45	65	12,510	18,070	0	0	--	--	12,510	18,070	1,546	2,233	14,056	20,303
Trevilians Square Apartments		61	85	130	5,185	7,930	0	0	--	--	5,185	7,930	641	980	5,826	8,910
Twin Oaks		100	65	100	6,500	10,000	0	0	--	--	6,500	10,000	803	1,236	7,303	11,236
Lake Anna	Lake Anna Plaza	142	35	50	4,970	7,100	0	0	--	--	4,970	7,100	614	878	5,584	7,978
	Jerdone Island	318	40	60	12,720	19,080	0	0	--	--	12,720	19,080	1,572	2,358	14,292	21,438
Northeast Creek Reservoir Service Area	LCWA	236	55	85	12,980	20,060	51,277	79,247	--	--	64,257	99,307	7,942	12,274	72,199	111,581
	Town of Louisa	4,185	65	100	272,025	418,500	157,037	241,595	--	--	429,062	660,095	53,030	81,585	482,092	741,679
	Town of Mineral	2,024	65	100	131,560	202,400	43,620	67,107	--	--	175,180	269,507	21,651	33,310	196,831	302,817
* Zion Crossroads Service Area		3,963	80	120	317,040	475,560	475,560	713,340	--	--	792,600	1,188,900	97,962	146,943	890,562	1,335,843
Sub-total =		14,624	--	--	966,520	1,490,095	727,494	1,101,289	--	--	1,694,014	2,591,384	209,372	320,283	1,903,386	2,911,667
Self-Supplied Users > 300,000 gal/month		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (89% of Demand) (GPD)	Peak Day Total Usage (89% of Demand) (GPD)	Average Water Lost (11% of Demand) (GPD)	Peak Day Water Lost (11% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Klockner Pentaplast		--	--	--	--	--	8,625	12,940	0	0	8,625	12,940	1,066	1,599	9,691	14,539
North Anna Power Station and Info Center		--	--	--	--	--	10,000	15,000	0	0	10,000	15,000	1,236	1,854	11,236	16,854
Siebert Amoco and Dairy Queen		--	--	--	--	--	12,750	19,125	0	0	12,750	19,125	1,576	2,364	14,326	21,489
Crossing Pointe		--	--	--	--	--	10,730	16,095	0	0	10,730	16,095	1,326	1,989	12,056	18,084
Tanyard Country Club Golf Course		--	--	--	--	--	54,450	81,675	0	0	54,450	81,675	6,730	10,095	61,180	91,770
Spring Creek Golf Course		--	--	--	--	--	137,990	206,985	0	0	137,990	206,985	17,055	25,582	155,045	232,567
LCWA (Louisa Power Station)		--	--	--	--	--	11,620	17,430	0	0	11,620	17,430	1,436	2,154	13,056	19,584
Agriculture (Livestock & Irrigated Land)		--	--	--	--	--	0	0	266,295	399,440	266,295	399,440	32,913	49,369	299,208	448,809
Sub-total =		--	--	--	--	--	246,165	369,250	266,295	399,440	512,460	768,690	63,338	95,007	575,798	863,697
County Designated Growth Areas (Proposed Municipal Service Areas)		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (89% of Demand) (GPD)	Peak Day Total Usage (89% of Demand) (GPD)	Average Water Lost (11% of Demand) (GPD)	Peak Day Water Lost (11% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
* Gum Spring		720	80	120	57,600	86,400	86,400	129,600	--	--	144,000	216,000	17,798	26,697	161,798	242,697
* Ferncliff		943	80	120	75,440	113,160	113,160	169,740	--	--	188,600	282,900	23,310	34,965	211,910	317,865
* Shannon Hill		474	80	120	37,920	56,880	56,880	85,320	--	--	94,800	142,200	11,717	17,575	106,517	159,775
Lake Anna	Remaining Area	9,216	80	120	737,280	1,105,920	491,520	737,280	--	--	1,228,800	1,843,200	151,874	227,811	1,380,674	2,071,011
Boswell's Tavern		105	80	120	8,400	12,600	5,600	8,400	--	--	14,000	21,000	1,730	2,596	15,730	23,596
Gordonsville		643	80	120	51,440	77,160	34,293	51,440	--	--	85,733	128,600	10,596	15,894	96,330	144,494
Sub-total =		12,101	--	--	968,080	1,452,120	787,853	1,181,780	--	--	1,755,933	2,633,900	217,025	325,538	1,972,959	2,959,438
Private Individual Wells		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (89% of Demand) (GPD)	Peak Day Total Usage (89% of Demand) (GPD)	Average Water Lost (11% of Demand) (GPD)	Peak Day Water Lost (11% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Growth Areas		7,868	80	120	629,440	944,160	0	0	--	--	629,440	944,160	77,796	116,694	707,236	1,060,854
Rural Area		22,881	100	150	2,288,100	3,432,150	0	0	--	--	2,288,100	3,432,150	282,799	424,198	2,570,899	3,856,348
Sub-total =		30,749	--	--	2,917,540	4,376,310	0	0	--	--	2,917,540	4,376,310	360,595	540,892	3,278,135	4,917,202
Total =		57,474	--	--	4,852,140	7,318,525	1,515,347	2,283,069	266,295	399,440	6,367,487	9,601,594	786,993	1,186,714	**7,730,278**	**11,652,004**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 7.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 17: 2050 Population and Water Demand Projections

2050															
Existing Private and Municipal Community Water Systems		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (90% of Demand) (GPD)	Peak Day Total Usage (90% of Demand) (GPD)	Average Water Lost (10% of Demand) (GPD)	Peak Day Water Lost (10% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Blue Ridge Shores		2,792	30	55	83,760	153,560	0	0	--	--	83,760	153,560	9,307	17,062	93,067	170,622
Shenandoah Crossing		935	140	210	130,900	196,350	0	0	--	--	130,900	196,350	14,544	21,817	145,444	218,167
Six-o-Five Trailer Park		278	45	65	12,510	18,070	0	0	--	--	12,510	18,070	1,390	2,008	13,900	20,078
Trevilians Square Apartments		61	85	130	5,185	7,930	0	0	--	--	5,185	7,930	576	881	5,761	8,811
Twin Oaks		100	65	100	6,500	10,000	0	0	--	--	6,500	10,000	722	1,111	7,222	11,111
Lake Anna	Lake Anna Plaza	142	35	50	4,970	7,100	0	0	--	--	4,970	7,100	552	789	5,522	7,889
	Jerdone Island	318	40	60	12,720	19,080	0	0	--	--	12,720	19,080	1,413	2,120	14,133	21,200
Northeast Creek Reservoir Service Area	LCWA	236	55	85	12,980	20,060	51,277	79,247	--	--	64,257	99,307	7,140	11,034	71,397	110,341
	Town of Louisa	5,109	65	100	332,085	510,900	191,708	294,936	--	--	523,793	805,836	58,199	89,537	581,993	895,373
	Town of Mineral	2,598	65	100	168,870	259,800	55,990	86,139	--	--	224,860	345,939	24,984	38,438	249,845	384,376
* Zion Crossroads Service Area		4,901	80	120	392,080	588,120	588,120	882,180	--	--	980,200	1,470,300	108,911	163,367	1,089,111	1,633,667
Sub-total =		17,470	--	--	1,162,560	1,790,970	887,096	1,342,502	--	--	2,049,656	3,133,472	227,740	348,164	2,277,396	3,481,635
Self-Supplied Users > 300,000 gal/month		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (90% of Demand) (GPD)	Peak Day Total Usage (90% of Demand) (GPD)	Average Water Lost (10% of Demand) (GPD)	Peak Day Water Lost (10% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Klockner Pentaplast		--	--	--	--	--	8,625	12,940	0	0	8,625	12,940	958	1,438	9,583	14,378
North Anna Power Station and Info Center		--	--	--	--	--	10,000	15,000	0	0	10,000	15,000	1,111	1,667	11,111	16,667
Siebert Amoco and Dairy Queen		--	--	--	--	--	12,750	19,125	0	0	12,750	19,125	1,417	2,125	14,167	21,250
Crossing Pointe		--	--	--	--	--	10,730	16,095	0	0	10,730	16,095	1,192	1,788	11,922	17,883
Tanyard Country Club Golf Course		--	--	--	--	--	54,450	81,675	0	0	54,450	81,675	6,050	9,075	60,500	90,750
Spring Creek Golf Course		--	--	--	--	--	137,990	206,985	0	0	137,990	206,985	15,332	22,998	153,322	229,983
LCWA (Louisa Power Station)		--	--	--	--	--	11,620	17,430	0	0	11,620	17,430	1,291	1,937	12,911	19,367
Agriculture (Livestock & Irrigated Land)		--	--	--	--	--	0	0	266,295	399,440	266,295	399,440	29,588	44,382	295,883	443,822
Sub-total =		--	--	--	--	--	246,165	369,250	266,295	399,440	512,460	768,690	56,940	85,410	569,400	854,100
County Designated Growth Areas (Proposed Municipal Service Areas)		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (90% of Demand) (GPD)	Peak Day Total Usage (90% of Demand) (GPD)	Average Water Lost (10% of Demand) (GPD)	Peak Day Water Lost (10% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
* Gum Spring		941	80	120	75,280	112,920	112,920	169,380	--	--	188,200	282,300	20,911	31,367	209,111	313,667
* Ferncliff		1,232	80	120	98,560	147,840	147,840	221,760	--	--	246,400	369,600	27,378	41,067	273,778	410,667
* Shannon Hill		619	80	120	49,520	74,280	74,280	111,420	--	--	123,800	185,700	13,756	20,633	137,556	206,333
Lake Anna	Remaining Area	12,050	80	120	964,000	1,446,000	642,667	964,000	--	--	1,606,667	2,410,000	178,519	267,778	1,785,185	2,677,778
Boswell's Tavern		138	80	120	11,040	16,560	7,360	11,040	--	--	18,400	27,600	2,044	3,067	20,444	30,667
Gordonsville		846	80	120	67,680	101,520	45,120	67,680	--	--	112,800	169,200	12,533	18,800	125,333	188,000
Sub-total =		15,826	--	--	1,266,080	1,899,120	1,030,187	1,545,280	--	--	2,296,267	3,444,400	255,141	382,711	2,551,407	3,827,111
Private Individual Wells		Population	Average Residential Water Usage Rate (GPD/p)	Peak Day Residential Water Usage Rate (GPD/p)	Average Residential Water Usage (GPD)	Peak Day Residential Water Usage (GPD)	Average Commercial Water Usage (GPD)	Peak Day Commercial Water Usage (GPD)	Average Agricultural Water Usage (GPD)	Peak Day Agricultural Water Usage (GPD)	Average Total Usage (90% of Demand) (GPD)	Peak Day Total Usage (90% of Demand) (GPD)	Average Water Lost (10% of Demand) (GPD)	Peak Day Water Lost (10% of Demand) (GPD)	Average Water Demand (GPD)	Peak Day Water Demand (GPD)
Growth Areas		7,079	80	120	566,320	849,480	0	0	--	--	566,320	849,480	62,924	94,387	629,244	943,867
Rural Area		24,808	100	150	2,480,800	3,721,200	0	0	--	--	2,480,800	3,721,200	275,644	413,467	2,756,444	4,134,667
Sub-total =		31,887	--	--	3,047,120	4,570,680	0	0	--	--	3,047,120	4,570,680	338,569	507,853	3,385,689	5,078,533
Total =		65,183	--	--	5,475,760	8,260,770	1,917,283	2,887,782	266,295	399,440	7,393,043	11,148,552	821,449	1,238,728	**8,783,892**	**13,241,380**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 7.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

VII. WATER DEMAND MANAGEMENT (9 VAC 25-780-110 & 120)

Section VII outlines Louisa County's response to 9 VAC 25-780-110 "Water Demand Management Information" and 9 VAC 25-780-120 "Drought Response and Contingency Plans". This section will review existing and potential future water use efficiency, conservation, and water loss reduction approaches by the County, along with the County's anticipated response to drought.

A. Water Use Efficiency

Louisa County's Board of Supervisors adopted the Virginia Uniform Statewide Building Code (VUSBC) in 1971 (Chapter 18, Section 18-1). Both Town Councils adopted the VUSBC in 1973 (Town of Louisa Chapter 47, Section 47-1); Town of Mineral Chapter 150, Section 150-2). The Building Inspection Department as established by the Louisa County Board of Supervisors has the full authority and responsibility to enforce the provisions of the VUSBC for the County and both Towns. Changes to the VUSBC which limit maximum flow of water closets, urinals, and appliances were adopted in 2000.

There are currently no ordinances in place for the County, Towns, or Louisa County Water Authority (LCWA) to develop or implement a master plan for water efficient landscaping, and no homeowner's associations have policies regarding the use of low-water use landscaping. Ordinances declaring wasteful water use and/or excess running of water do not exist, and water suppliers currently do not implement water use efficiency measures. At present, there are no water suppliers or landscape irrigation professionals in the County which participate in the Environmental Protection Agency's WaterSense partners program.

The LCWA and both Towns each implement a practice to increase irrigation efficiency by billing sewer charges based on water use, including irrigation. To avoid sewer charges for irrigation, customers have the option to install a separate meter for irrigation.

B. Water Conservation

Both Towns have ordinances in place for reduction of water use in cases of emergency. The Mayor may, if at any time is of the opinion that there is a shortage in the Town water supply and that an emergency exists with respect thereto, at such time, give due and adequate notice of the existence of such emergency and prescribe the extent to which the use of water shall be curtailed. Any person found guilty of using water other than as permitted by the terms of the order of the Mayor after due publication of the notice shall be guilty of a misdemeanor (Town of Louisa Chapter 160, Section 160-8; Town of Mineral Chapter 418, Section 418-15: both included in **Appendix C**). The Town Council reserves the right to reserve a sufficient supply of water at all times in its reservoirs to provide for fires and other emergencies and to restrict or regulate the quantity or quality of water used by consumers in the case of scarcity or whenever the public welfare may require it (Town

of Louisa Chapter 160, Section 160-9; Town of Mineral Chapter 418, Section 418-16: both included in **Appendix C**).

Water suppliers in the County presently do not have water conservation plans, or standard operating procedures in place to improve water conservation. There are no low-flow and/or no-flow fixtures in the water supplier facilities. No State Revolving Funds have been used to upgrade/retrofit facility fixtures, build new facilities, purchase efficient landscape irrigation equipment for publicly owned facilities, or provide public education on water conservation measures. However, both Town Halls have had water conserving plumbing fixtures installed with their respective renovations.

There are no dual-pipe distribution systems or parallel distribution networks in the County to use reclaimed water for residential, industrial, business, institutional, or irrigational users for non-potable water use purposes.

There are no incentives programs offered to customers for implementing measures to conserve water, other than the tiered rate structure which charges a minimum use rate with additional charges over a certain amount set by each Town and the LCWA. The LCWA distributes an annual flyer to customers with conservation tips.

C. Water Loss Reduction

Based on water production and sales records from the LCWA and the Town of Louisa, it is estimated that the County is currently experiencing an approximate average of 15% loss or unaccountable water in production or transmission of their systems. The Town of Louisa is actually seeing a rise in their water loss when comparing their surface water purchase to water sales. The Town believes meter inaccuracy is part of the issue and has been replacing approximately 100 meters a year for the past two years. There are approximately 760 meters in the Town of Louisa. State Revolving Funds have not been utilized to install meters or implement water audit and leak detection practices. Both Towns track water loss, and the Town of Mineral has performed some audio leak detection in the past.

Leaks in any public water system are repaired as quickly as possible after discovery. When possible, water supply is shutoff in areas requiring repair to minimize water loss. Replacement of water lines that have a history of several emergency repairs, most likely due to age and material, are typically budgeted by the respective governing body.

Other than citizens reporting, there are no policies in place to track unauthorized connections.

For the purposes of this plan, a reduction of lost or unaccountable water of approximately 1% was assumed for every ten year period for all of Louisa County. This reduction can be

accomplished through detailed reporting of water system flushing, and water system repairs. The reduction will also be achieved by upgrades to existing pipes, tanks, and equipment that will begin to lose efficiency in their operation during their useful life.

D. Drought Response and Contingency Planning (9 VAC 25-780-120)

In addition to water use efficiency, conservation, and loss reduction this plan addresses a coordinated response to drought in Louisa County. In response to the 9 VAC 25-780 Regulations, the preparation and adoption of a "Drought Response and Contingency Plan" is required.

VDH currently permits 11 Community Water Systems in Louisa County. The drought contingency program impacts only those systems using over 300,000 gallons per month; those systems are marked with an asterisk '*' below in **Table 18**.

Table 18: Community Water Systems (Ranked by Approximate Population Served)

PWSID	System Name	# of Connections	Approx. Population Served	Source
VA2109450	Town of Louisa*	706	1,501	SWP
VA2109265	Blue Ridge Shores*	575	1,472	GW
VA2109525	Town of Mineral*	338	640	GW
VA2109650	Shenandoah Crossing*	193	495	GW
VA2109990	Louisa County Water Authority Zion Crossroads *	187	454	GW
VA2109675	Six-O-Five Village Trailer Park*	97	249	GW
VA2109510	Louisa County Water Authority*	152	221	SW
VA2109625	Jerdone Island Subdivision	57	146	GW
VA2109340	Lake Anna Plaza	43	111	GW
VA2109825	Twin Oaks Community	15	100	GW
VA2109800	Trevilians Square Apartments	28	61	GW
		2,391	**5,450**	**Totals**

- GW = Groundwater (Wells)
- SW = Surface Water
- SWP = Surface Water Purchased
- * = Users over 300,000 gallons per month

i. State & Local Regulations, Policies, and Ordinances Regarding Drought Response

VDEQ has established drought evaluation regions within the Commonwealth, and has assigned Louisa County to the Northern Piedmont Region. The Virginia Drought Coordinator makes recommendations to the Governor on declaring a drought emergency in all or any portions of the Commonwealth. Such declarations require a certain percentage reduction in total water use, but it remains the responsibility of the Counties, Cities, and Water Authorities to adopt ordinances and policies with specific water use prohibitions.

The Louisa County Board of Supervisors (LCBOS) has an ordinance in place for drought management, including water use restrictions, which takes effect upon the declaration by the Governor of Virginia of a Drought Emergency that includes Louisa County. The LCBOS should also have a drought management ordinance in place to take effect upon the declaration by the LCBOS of a Drought Emergency. A copy of the adopted County ordinance and a model ordinance are included in **Appendix C** of this plan.

ii. Drought Stages and Indicators/Triggers for Drought Declaration in Louisa County

The Virginia Drought Monitoring Task Force (Task Force) makes recommendations to the Virginia Drought Coordinator based on four phases for drought declaration and potential water shortage: Normal Conditions, Stage I (Drought Watch), Stage II (Drought Warning), and Stage III (Drought Emergency). There are four drought indicators used by the Task Force as initial parameters for consideration when declaring a specific drought stage:

Precipitation Deficits: Using data collected by the Office of the State Climatologist, deficits are measured by comparing present precipitation amounts with historical normal long-term average precipitation values.

The National Oceanic & Atmospheric Administration (NOAA) and the National Climatic Data Center (NCDC) have rain gages for Louisa County, as well as a summary of the monthly average precipitation values for the past 30 years. Information can be found on the NCDC and NOAA website (www.ncdc.noaa.gov). Precipitation information for Louisa County, as well as data from the last two years from two rain gages, can be found at the Weather Underground website (www.wunderground.com).

Streamflows: Using streamflow gauges that represent drought evaluation regions, streamflow responses to drought conditions are monitored by comparing representative daily flow values to historic flow statistics for the period of record.

The gauge selected to monitor drought severity in the Northern Piedmont Drought Evaluation Region is the Rapidan River near Culpeper, U.S. Geological Survey (USGS) #01667500. The USGS does not have daily discharge data current up to the present date.

USGS also has one gauge in Louisa County on the North Anna River near Partlow (USGS #01670400).

Ground Water Levels: Using water table ground water monitoring wells that represent drought evaluation regions, the ground water responses to drought conditions are monitored by comparing measured ground water levels with historic level statistics for the period of record.

The monitoring well chosen to be the drought monitor for the Northern Piedmont Drought Evaluation Region is the Gordonsville Observation Well, USGS #45P 1 SOW 030.

Reservoir Storage: Water supply reservoirs will be used as a drought indicator based on the estimated number of days of remaining useable storage they have available. Louisa County uses the Northeast Creek Reservoir, which is operated by the LCWA. Lake Anna is not used for water supply purposes. Although the Virginia drought response plan indicates Lake Anna could be used as an indicator for reservoir levels, the Northeast Creek Reservoir storage levels will be used for Louisa County and obtained through the LCWA.

Formal public declaration of a change in drought stage for all or part of Louisa County will be guided by the Task Force's indicator conditions below:

Stage I Indicator - Drought Watch (entire county)

a. Precipitation levels are at or below the percent of normal precipitation for the time period in the Precipitation Deficit Table. See **Table 19** below.
b. Streamflows fall between the 10^{th} and 25^{th} percentile (e.g. streamflow at the 10^{th} percentile indicates that 90% of streamflows exceed the current flow for the period of record).
c. Measured ground water levels fall between the 10^{th} and 25^{th} percentile for all historic levels.
d. Water supply reservoirs contain between 90 and 120 days of useable storage.

Table 19: Precipitation Deficit Table

Months Analyzed	Normal (% of Normal Precipitation)	Watch (% of Normal Precipitation	Warning (% of Normal Precipitation)	Emergency (% of Normal Precipitation)
October – December	>75.0	< 75.0	< 65.0	< 55.0
October – January	>80.0	< 80.0	< 70.0	< 60.0
October – February	>80.0	< 80.0	< 70.0	< 60.0
October – March	>80.0	< 80.0	< 70.0	< 60.0
October – April	>81.5	< 81.5	< 71.5	< 61.5
October – May	>82.5	< 82.5	< 72.5	< 62.5
October – June	>83.5	< 83.5	< 73.5	< 63.5
October – July	>85.0	< 85.0	< 75.0	< 65.0
October – August	>85.0	< 85.0	< 75.0	< 65.0
October – September (and previous 12 months)	>85.0	< 85.0	< 75.0	< 65.0

Stage II Indicator - Drought Warning (entire county)

a. Precipitation levels are at or below the percent of normal precipitation for the time period in the precipitation table.
b. Streamflows fall between the 5th and 10th percentile.
c. Measured ground water levels fall between the 5th and 10th percentile for all historic levels.
d. Water supply reservoirs contain between 60 and 90 days of useable storage.

Stage III Indicator - Drought Emergency (portions of county as indicated)

a. Precipitation levels are at or below the percent of normal precipitation for the time period in the precipitation table. (Surface Water Users)
b. Streamflows are at or below the 5th percentile. (Surface Water Users)
c. Measured ground water levels are at or below the 5th percentile for all historic levels. (Groundwater Users)
d. Water supply reservoirs contain 60 days or less of useable storage. (Surface Water Users)

iii. Critical Action Plan for Drought Stages

The following is a list of critical actions for each drought stage (note that drought watch and drought warning conditions are recommended, and compliance is voluntary):

Stage I Action - Drought Watch

a. Set a voluntary water-use reduction goal of 15% for all community and non-community water systems that use more than 300,000 gallons per month, and/or serve a population of 100 persons or more.

b. Initiate contact with state and federal agencies including Federal Emergency Management Agency (FEMA), USGS, Environmental Protection Agency (EPA), and the United States Department of Agriculture (USDA) in order to identify federal assistance capabilities and drought workshops.
c. Initiate weekly reservoir level reporting to see changes and behavior trends over time
d. Request local health directors to track and report on both shallow and deep wells.
e. Consider preparations to reactivate "emergency" and "inactive" sources and systems of water supply for potential use.

Stage II Action - Drought Warning

a. Set a water use reduction goal of 20% for all community and non-community water systems that use more than 300,000 gallons per month, and/or serve a population of 100 persons or more.
b. Identify leaks and focus on accelerated repairs and implementation of water conservation measures.
c. Increase public education and information.
d. Undertake physical measures necessary to bring emergency and inactive sources of water supply on-line.
e. Identify non-essential water uses for implementation at the Drought Emergency stage.

Stage III Action - Drought Emergency

a. Mandate 25% water conservation for all community and non-community water systems that use more than 300,000 gallons per month and/or serve a population of 100 persons or more. Also mandate 25% water conservation for all individual wells, systems, and communities that use 300,000 gallons per month or less.
b. Apply for federal assistance and funding as appropriate.
c. Initiate use of emergency and inactive sources of water supply.
d. Assist owners of residential wells with drought-related problems and the obtaining of permits to construct wells, or evaluate the possibility of connecting to a public water supply.

iv. Notification of Drought Conditions

When one or more of the conditions specified under the "Critical Action for Drought Stages" outlined above are met indicating that the local community has reached a Drought Watch stage, the County Administrator will recommend to the LCBOS that a Drought Watch be officially declared for the County. At the time a Drought Watch is declared, the LCBOS will authorize the County Administrator, in consultation with the General Manager of the LCWA, the Town Manager of the Town of Mineral, and the Town Manager of the Town of Louisa, to declare a Drought Warning or a Drought Emergency should drought conditions later reach the levels defined by the guidance outlined above.

The County Administrator will provide appropriate immediate notification to the LCBOS, the General Manager of the LCWA, the Town Manager of the Town of Mineral, the Town Manager of the Town of Louisa, and the news media at any time a new drought stage has been declared. At that time, retail providers will activate water use restrictions and other conservation measures as defined in this Plan. The Town of Mineral and the Town of Louisa will require action by their respective Town Councils to activate a drought stage.

Drought stages may be discontinued or reduced in severity after the water supply has sufficiently recovered such that water use restrictions are no longer necessary. It is recommended that drought declarations remain in force until such time that recovery has reached an acceptable level.

v. Procedures for Implementation and Enforcement of Water Restrictions

There are three ways that water use restrictions can be initiated: (1) a declaration by the Governor of a drought emergency that includes Louisa County; (2) a declaration by the LCBOS, or the County Administrator acting on behalf of the Board, that a drought emergency exists county-wide; or (3) a declaration by the LCWA, Town of Mineral, or Town of Louisa that a drought emergency exists in their own customer service area.

It is important to note that LCWA's Northeast Creek Reservoir has ample capacity, such that water use restrictions on the rest of the County may not apply to customers supplied by the Northeast Creek Reservoir, except in the case of a Governor-declared drought emergency.

During periods of time in which drought stages are declared, water use restrictions will be in effect and enforced within the following jurisdictional areas as defined below:

Town of Mineral: At the direction of the Town Council, the Town Manager will implement and enforce water use restrictions on water customers within the Town.

Town of Louisa: At the direction of the Town Council, the Town Manager will implement and enforce water use restrictions on water customers within the Town.

Louisa County Water Authority: At the direction of the LCBOS, the LCWA General Manager will implement and enforce water use restrictions on LCWA water customers who may not be within the Town of Mineral or the Town of Louisa.

Remainder of Louisa County: At the direction of the LCBOS, the County Administrator will implement and enforce water use restrictions on all remaining water users who are not LCWA customers nor within the Town of Mineral or the Town of Louisa.

Local governments of the Commonwealth are authorized to adopt local ordinances to enforce mandatory non-essential water use restrictions and to establish, collect, and retain fines for violations of these restrictions. **Appendix C** provides an example ordinance to help guide Louisa County, the Town of Mineral, and the Town of Louisa in the

development of a formal government action. Nothing contained in this drought response plan should be construed to limit the powers of local government to adopt and enforce local emergency ordinances as necessary to protect the public welfare, safety and health.

Local governments and public waterworks may impose water use restrictions more stringent than the mandatory non-essential water use restrictions consistent with local water supply conditions at any time.

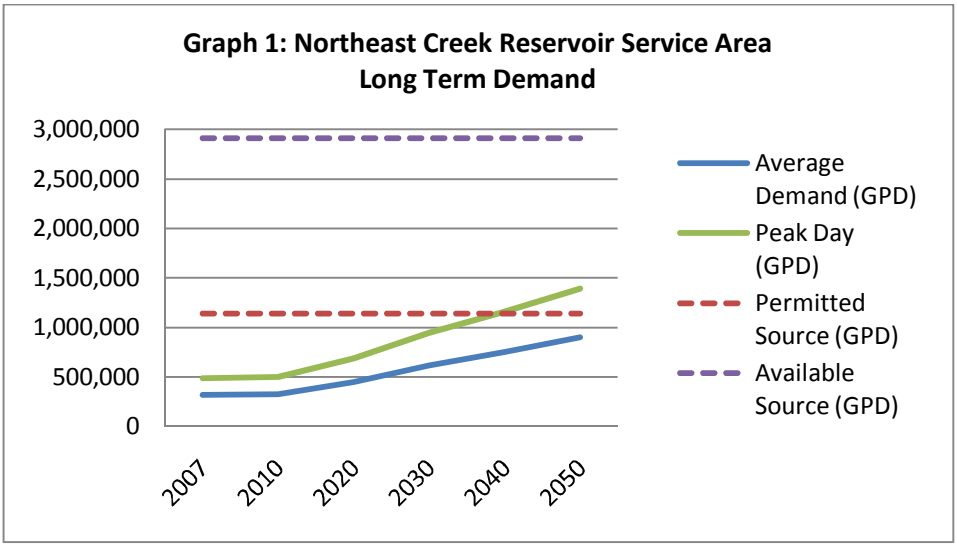
VIII. STATEMENT OF NEED (9 VAC 25-780-130)

In response to 9 VAC 25-780-130, the following two sections of this plan will address the "Statement of Need and Alternatives" for Louisa County. As stated previously, information on individual wells serving residents in rural areas is unknown. Individual groundwater wells for residents who will not connect to a public water system during the planning period are assumed to have adequate capacity for projected water demands. To identify a statement of need, a comparison of the currently permitted water source capacity and available source capacity versus the projected long-term water demands for the existing municipal and private community water systems is presented in this section. Existing permitted capacity and available source for the current municipal water systems is also examined against the projected water demands for the County's designated growth areas, given the County anticipates providing public water for these areas.

A. Existing Municipal Community Water Systems

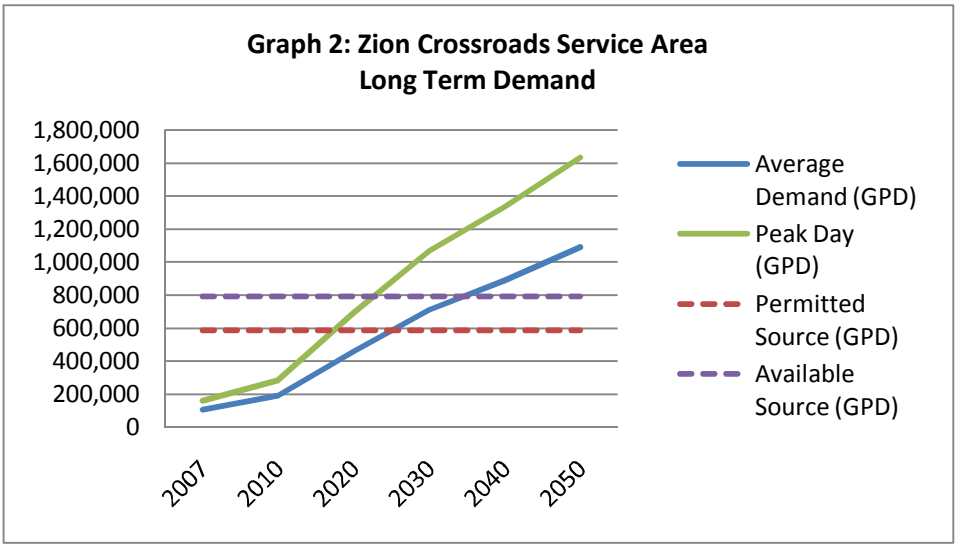
Northeast Creek Reservoir Service Area

The Northeast Creek Reservoir Service Area water system is operated and maintained by the Louisa County Water Authority (LCWA) and serves customers in the Town of Louisa, Town of Mineral, and nearby areas. The current permitted capacity of the three (3) water sources supplying this service area is 1,139,200 GPD (Northeast Creek Reservoir: 1.0 MGD, LCWA Industrial Park Well: 19,200 GPD, and Town of Mineral wells: 120,000 GPD), which is more than sufficient to meet the average water demands of the service area through 2050; however the peak day water demand surpasses the permitted capacity in 2039. Additional source capacity is available at the Town of Mineral wells in the amount of 1,600 GPD, and the safe yield of 2.77 MGD for the Northeast Creek Reservoir. Improvements at the Town of Mineral wells site and Northeast Creek Water Treatment Plant would be required to utilize the available source.

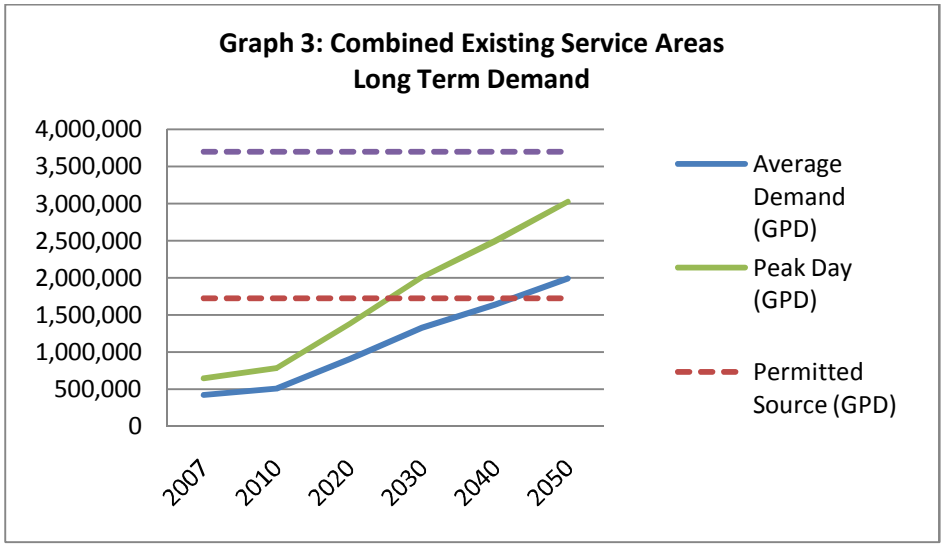


Zion Crossroads Service Area

The LCWA currently operates six (6) of the eight (8) wells in the Zion Crossroads Service Area with a combined permitted capacity of 587,520 GPD. The additional two (2) wells, when developed, will provide an additional capacity of 204,800 GPD. Although the permitted capacity of the existing wells is ample for the current population served, the water demand is expected to outpace the permitted supply by the year 2025 for average day demand and the year 2017 for peak day demand. The additional two wells will provide additional source that will be outpaced by the year 2034 for average day demand and 2022 for peak day demand.



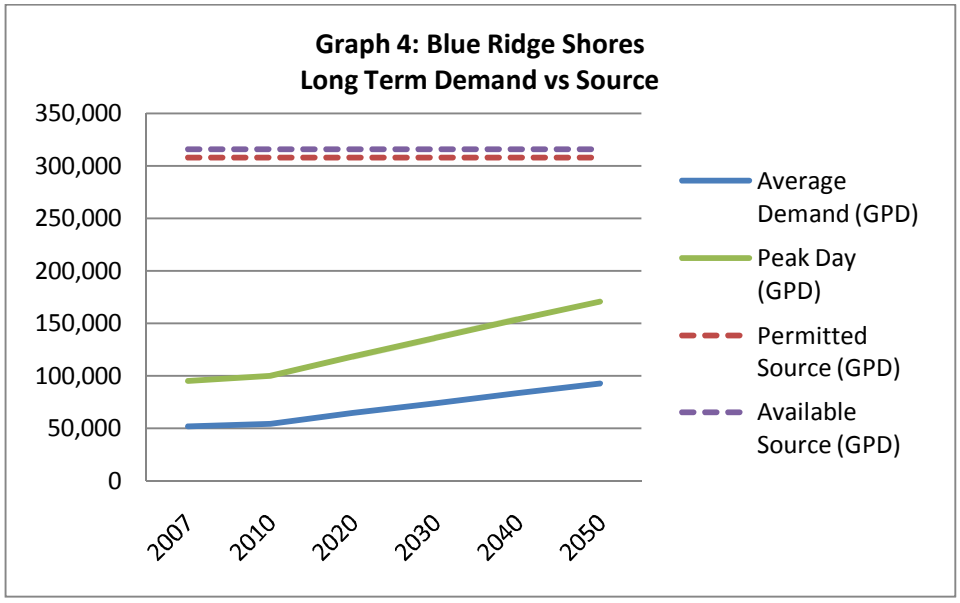
Given the additional source available in the Northeast Creek Reservoir Service Area, a graph combining the two existing service areas illustrates that if the service areas were to be connected and all available source capacity developed, Zion Crossroad's supply deficit would be eliminated for the planning period.



B. Existing Private Community Water Systems

Blue Ridge Shores

Blue Ridge Shores owns and operates eight (8) wells with a permitted system capacity of 308,000 GPD. As shown in the graph, there is ample capacity in the current system to meet projected water demands through 2050.

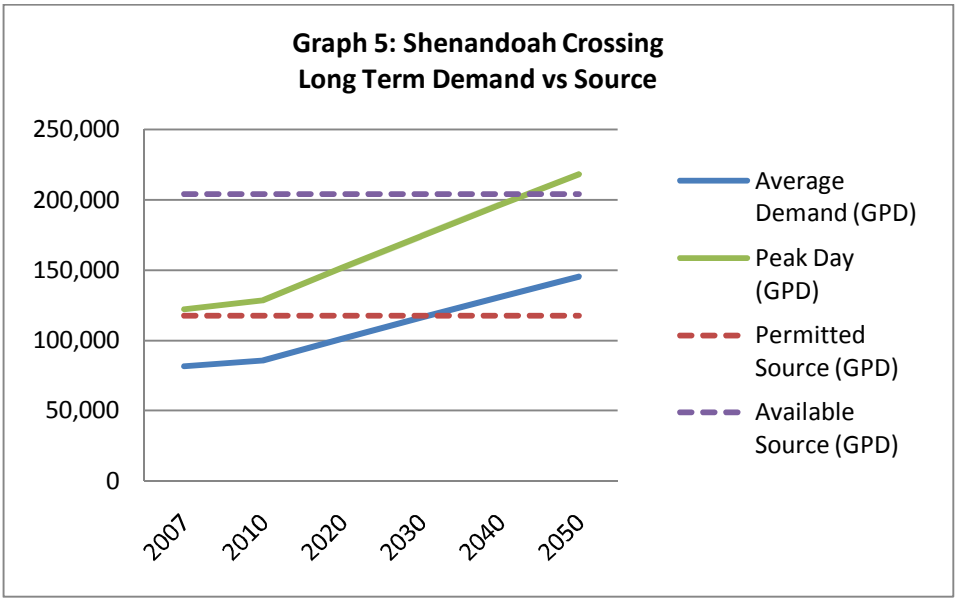


Shenandoah Crossing

Shenandoah Crossing owns and operates six (6) wells with a permitted system capacity of 117,600 GPD. Monthly data for this system is unfortunately skewed since large leaks were discovered during the summer of 2010. Water system production for January 2010 was reported at 2.94 MGD; whereas water production for January 2011 was 1.59 MGD, a reduction of 46% for withdrawal. Given a full year's worth of data without water system leaks is unavailable, the projected demands through 2050 are unfortunately elevated. Therefore, even though the below graph illustrates that the annual average day demand and peak day demand surpass the current permitted capacity of the system and eventually the available source during the planning period, it is inaccurate to assume this water system will need additional water source. Actually, if the peak day projection of 218,167 GPD for 2050 is reduced by 46% to 117,810 GPD, then the available source for this system can be developed to meet demands.

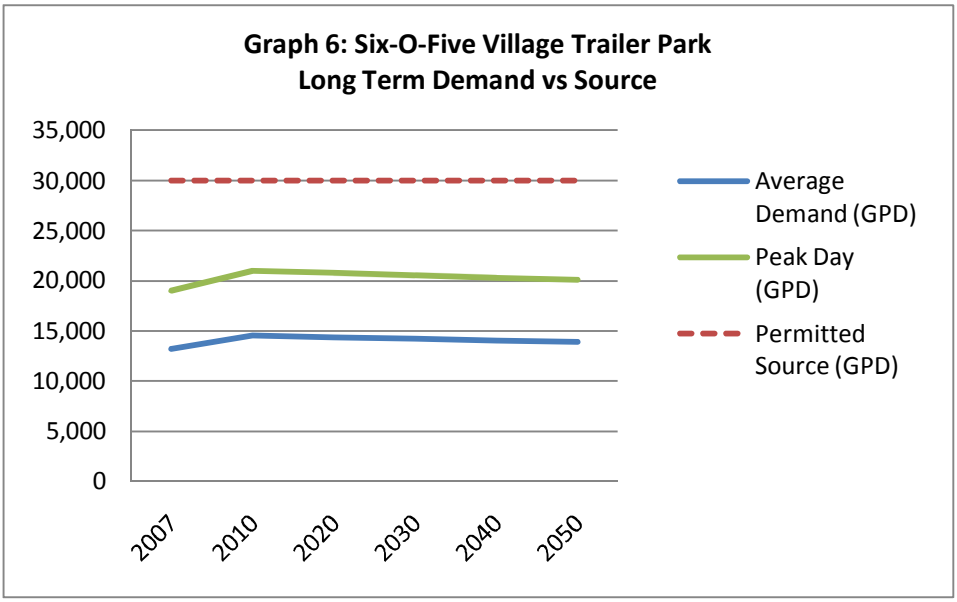
As stated in Section V, Shenandoah Crossing includes both residential and resort development (time shares). The historical water demand includes water supplied to the existing resort development. Projected water demands are based on the existing resort development, and anticipated growth of the residential portion. Shenandoah Crossing has

plans to expand their resort development, but ultimate resort water demands are unknown. Based on the resort development, additional water sources may be required.



Six-O-Five Village Trailer Park

The Six-O-Five Village Trailer Park owns and operates two wells with a permitted system capacity of 30,000 GPD. Original 2006 water production data provided by VDEQ for this system reported an average daily withdrawal over 50,000 GPD. This data obviously appeared unreasonable based on the permitted capacity. 2009 data illustrated an annual average usage of approximately 13,000 GPD. Based on the updated data, this system has ample capacity to meet this community's water demand through 2050.



Trevilians Square Apartments

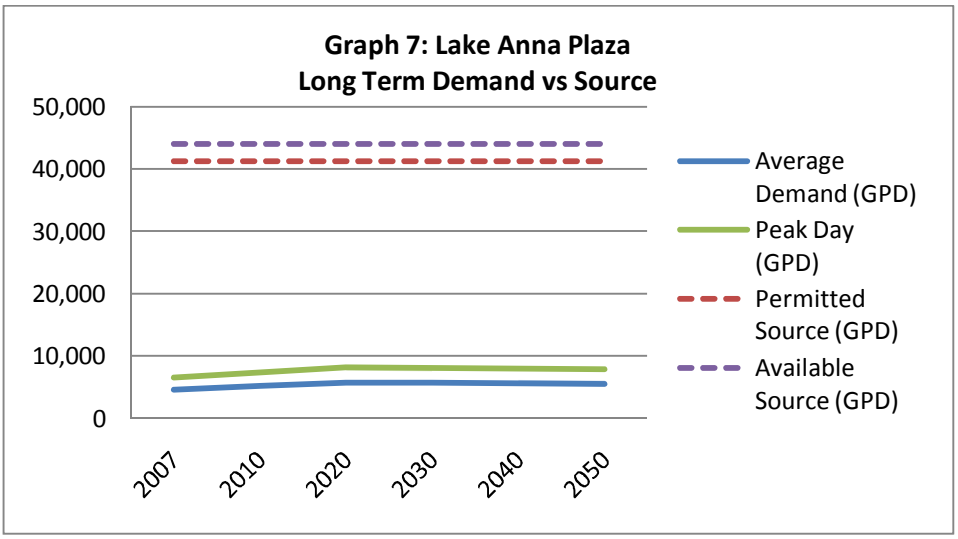
Trevilians Square Apartments is supplied water through two (2) groundwater sources, one (1) primary well and one (1) emergency well. Well yield data is not available for either well. Given this lack of information, VDH has permitted this system on the design basis of the existing 28 apartment units. The population is not expected to change over the planning period, and so it is assumed that the current permitted system capacity is adequate to meet the projected water demands. If the apartment complex ever expanded, well drawdown tests would need to be completed to determine the true available source of the two (2) existing wells. At that time, additional capacity may be required and the apartment complex would need to investigate options for additional water source if needed.

Twin Oaks

Twin Oaks is supplied water through one (1) groundwater source. Well yield data is not available for the well. Given this lack of information, VDH has permitted this system on the design basis of a population of 90 persons. Twin Oaks website states there are 100 residents in their community, which was the basis for the projected water demands. The population is not expected to change over the planning period, and so it is assumed that the current permitted system capacity is adequate to meet the projected water demands. If the community ever expanded, a well drawdown test would need to be completed to determine the true available source of the existing well. At that time, additional capacity may be required and the community would need to investigate options for additional water source if needed.

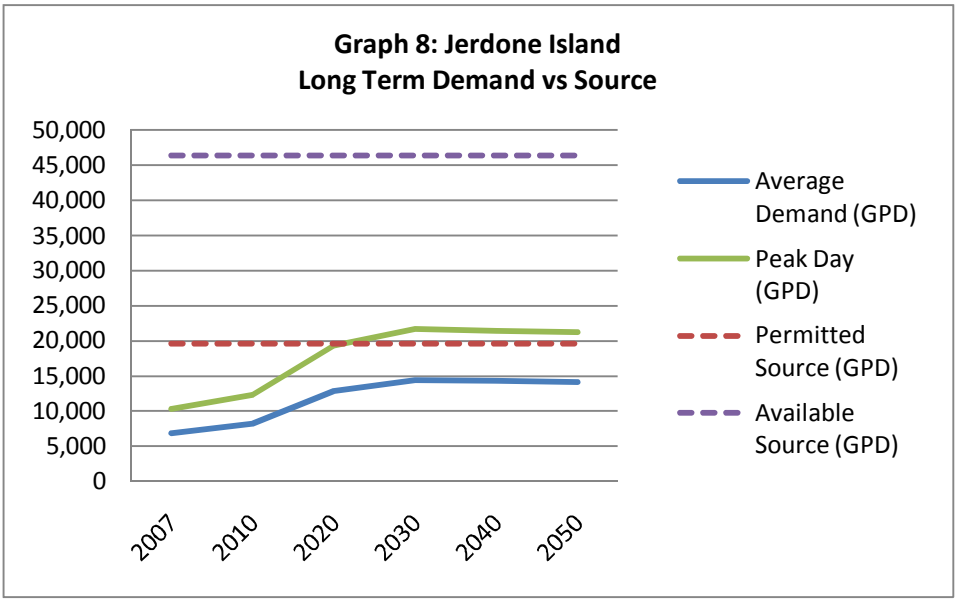
Lake Anna Plaza

Lake Anna Plaza owns and operates two (2) wells with a permitted system capacity of 41,200 GPD. As shown in the graph, there is ample capacity in the current system to meet projected water demands through 2050.



Jerdone Island Subdivision

The Jerdone Island Subdivision owns and operates one (1) well with a permitted system capacity of 19,600 GPD. Current permitted capacity is sufficient to meet the annual average water demand through 2050; however, peak day demands exceed the current permitted capacity in the year 2021. Based on the well yield, additional capacity is available in the existing well. As demands increase and approach the permitted limit, the subdivision will need to investigate what measures need to be taken to obtain approval from VDH for an increased system capacity. An additional well source may be required for redundancy.



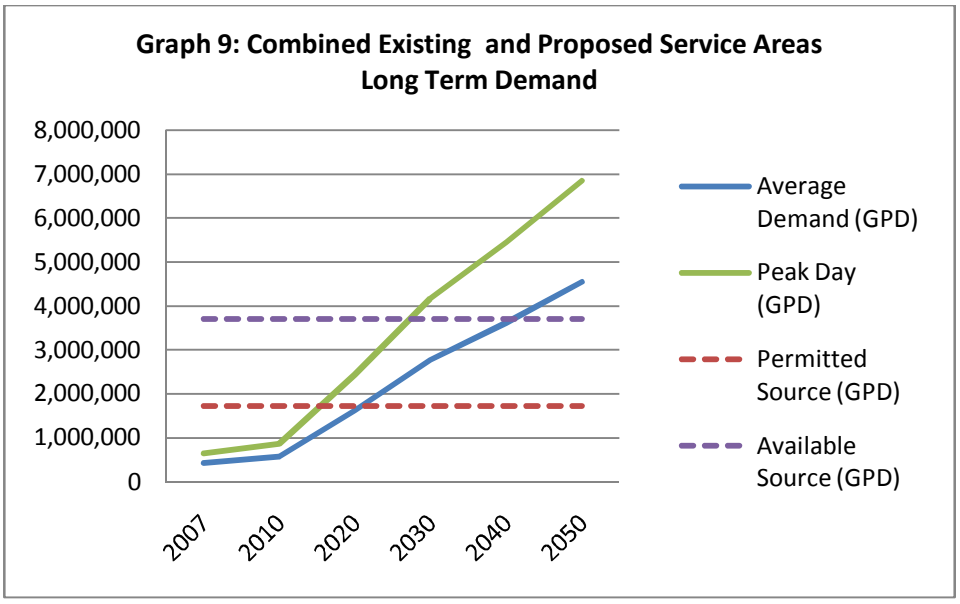
C. Proposed Municipal Community Water Systems

County Designated Growth Areas (Proposed Service Areas)

Currently, the only County designated growth areas with public water are the Town of Louisa, the Town of Mineral, and Zion Crossroads. The remaining County designated growth areas, Gum Spring, Ferncliff, Shannon Hill, Lake Anna, Boswell's Tavern, and Gordonsville are anticipated to receive access to public water based on the timeline presented with the phasing plan included in Section VI. While a small number of Louisa users (estimate of 20 residences) in the Gordonsville area are connected to the Town of Gordonsville public water supply, it is unknown if the Town of Gordonsville could supply all the necessary water for the Gordonsville growth area.

The combined existing and proposed public service area demands are graphed against the current permitted public source capacity, as well as the available public source capacity. Even if all existing available municipal water source capacity were developed, the proposed municipal community water system demands could not be met. Projected average day demands for the combined existing and proposed municipal service areas

exceed the existing permitted public sources in the year 2021, and surpass the available public sources in the year 2041. Peak day projections for the combined existing and proposed municipal service areas outpace the existing permitted sources in the year 2015, and exceed the available public sources capacity in the year 2027.



D. Estimated County Water Surplus and Deficit for the Planning Period

Based on the review of each existing and proposed community water system above, it is clear that Louisa County will require additional water source(s) to meet the anticipated demands for proposed municipal service areas in the County.

All private community water systems are anticipated to have adequate water source to meet projected water demands through 2050 with the exception of Shenandoah Crossing. As previously mentioned, it is likely Shenandoah Crossing has the necessary water source capacity to meet projected water demands given the system's elevated water production data due to water system leaks. Therefore, additional water sources are not anticipated for private community water systems.

While peak day demands are graphed above for each system, annual average day demands are more relevant when planning for development of additional water source. Annual average day demands account for peak days throughout the year, and water system design typically includes water storage within the system to meet peak day demands. **Table 20** provides the average demands through 2050 for the existing and proposed municipal community water systems, as well as compares the demands to the current permitted capacity and available public source. Water surplus (+) and water deficit (-) are also presented at each time step.

Table 20: Municipal Community Water Surplus / Deficit

Existing Municipal Water Systems	2010 *Average Demand (GPD)*	2020 *Average Demand (GPD)*	2030 *Average Demand (GPD)*	2040 *Average Demand (GPD)*	2050 *Average Demand (GPD)*
NE Creek Reservoir SA	324,505	447,292	614,073	751,122	903,235
Public Source	1,139,200	1,139,200	1,139,200	1,139,200	1,139,200
Surplus/Deficit (+/-)	+814,695	+691,908	+525,127	+388,078	+235,965
Year of Deficit	N/A	N/A	N/A	N/A	N/A
Zion Crossroads SA	189,302	460,460	712,045	890,562	1,089,111
Public Source	587,520	587,520	792,320	792,320	792,320
Surplus/Deficit (+/-)	+398,218	+127060	+80,275	-98,242	-296,791
Year of Deficit	N/A	N/A	***Available Source Required 2025***	**2034**	--
Combined SA Demands	*513,807*	*907,752*	*1,326,118*	*1,641,684*	*1,992,346*
Public Source	*1,726,720*	*1,726,720*	*1,726,720*	*1,726,720*	*3,703,120*
Surplus/Deficit (+/-)	*+1,212,913*	*+818,968*	*+400,602*	*+85,036*	*+1,710,774*
Year of Deficit	*N/A*	*N/A*	*N/A*	*N/A*	***Available Source Required 2042***
Proposed Municipal Water Systems	**2010** *Average Demand (GPD)*	**2020** *Average Demand (GPD)*	**2030** *Average Demand (GPD)*	**2040** *Average Demand (GPD)*	**2050** *Average Demand (GPD)*
Gum Spring	4,651	58,391	118,409	161,798	209,111
Ferncliff	6,512	76,322	154,773	211,910	273,778
Shannon Hill	3,488	37,931	77,500	106,517	137,556
Lake Anna	42,946	496,858	1,009,242	1,380,674	1,785,185
Boswells Tavern	0	5,364	11,515	15,730	20,444
Gordonsville	0	32,950	69,545	96,330	125,333
Subtotal =	***57,597***	***707,816***	***1,440,985***	***1,972,959***	***2,551,407***
TOTAL SA Demands	*571,404*	*1,615,568*	*2,767,103*	*3,614,643*	*4,543,753*
Public Source	*1,726,720*	*1,726,720*	*3,703,120*	*3,703,120*	*3,703,120*
Surplus/Deficit (+/-)	*+1,155,316*	*+111,152*	*+936,017*	*+88,477*	*-840,633*
Year of Deficit	*N/A*	*N/A*	***Available Source Required 2021***	*N/A*	**2041**

Notes:

1. *"Average Demand" represents an annual average daily demand*
2. *SA: Service Area*
3. *Source for Northeast Creek Reservoir Service Area includes Northeast Creek Reservoir (1,000,000 GPD), LCWA Industrial Park Well (19,200 GPD), and Town of Mineral Wells (120,000 GPD).*
4. *"Year of Deficit" is interpolated from individual graphs.*

Based on the above table, current permitted source can meet all water demands for existing and proposed municipal community water systems through the year 2021. At that time available source would need to be developed, which could meet the County's public water

system needs through the year 2041. However, existing and available public water sources are not in the vicinity of each of the County's designated growth areas (proposed municipal service areas), which could make the development of new water sources near or within the proposed municipal service areas more technically and economically feasible.

The following section outlines available alternatives to address the deficit in overall water sources and their locations.

IX. ALTERNATIVES (9 VAC 25-780-130)

As stated in Section VIII, Louisa County is predicted to generate municipal community water system demand deficits during the planning period based on the population projections included in this plan.

Zion Crossroads Service Area will require its available source capacity to be developed by 2025. Additional source capacity will then need to be identified and developed by 2034, given the projected demand deficit of approximately 98,000 GPD for 2040 and 297,000 GPD for 2050. However, there is available public water source in the Northeast Creek Reservoir Service Area, which would eliminate the deficit in Zion Crossroads if the two systems were connected.

Available public water source in the County was also compared to the projected water demands for all the proposed municipal community water systems in the last section. Available public water sources would need to be developed by 2021. Additional source capacity would need to be identified and developed by 2041, given the projected overall County municipal water demand deficit of approximately 841,000 GPD in 2050.

Several alternatives to either expand existing community water systems with excess water source capacity or develop additional water sources to meet the anticipated growth and water demand in several areas of the overall County are available. However, each alternative will require careful planning and analysis of the available safe yield, environmental impacts, existing resource impacts, and financial viability. Alternatives for private community water systems and municipal community water systems are offered below with a brief description of the process to expand an existing water source or develop a new water source.

Existing Private Community Water Sources

It is anticipated that all existing private community water systems will continue to meet current demands through the use of groundwater. The County does not have plans at this time to take ownership of any of the private community water systems, nor provide future connections to municipal community water systems. As outlined in Section V and Section VIII, future growth of these private community water systems is expected to generate water demands that are within the limits of their existing water sources. In the event that future plans require expansion of the water sources, additional groundwater wells are anticipated. The process for developing additional groundwater wells for private community water systems is identical to the explanation provided in the below section for “New Municipal Community Water Sources”.

Existing Municipal Community Water Sources

Northeast Creek Reservoir Service Area (Town of Louisa & Town of Mineral Growth Areas)

As stated previously, Northeast Creek Reservoir in conjunction with the Louisa County Water Authority (LCWA) Industrial Park well serve the municipal water system for the Town of Louisa and the LCWA customers outside the Town limits. In addition, it supplements the municipal water system for the Town of Mineral, which utilizes two (2) groundwater wells. Currently, there is approximately 1.14 million gallons per day (MGD) of permitted available water source to meet demands for the Town of Louisa and Town of Mineral Growth Areas. This available water is in large part limited by the current permitted capacity of the Northeast Creek Water Treatment Plant of 1.0 MGD. However, if the plant were to be expanded, total available water could be at least 2.77 MGD. Average water demand in the Northeast Creek Reservoir Service Area is not expected to exceed 0.903 MGD through the year 2050; therefore, there is the possibility that some of the excess source capacity could be redirected to other areas within the County that may show insufficient existing water sources to meet current or future demands.

In evaluating the distribution of water outside of the Northeast Creek Reservoir Service Area, there are several factors that must be taken into consideration. These include an analysis between the development of new sources in closer proximity to existing or proposed water demands versus the extension of transmission mains to these areas. In addition, it has been previously discussed that the intent of Louisa County is to maintain the rural character of the County. It may be considered difficult to maintain the rural character if finished water transmission mains are extended throughout the majority of the County.

Zion Crossroads Service Area (and Growth Area)

As stated in Section VIII, Zion Crossroads currently utilizes six (6) wells to meet the existing water demand and these six (6) wells will be outpaced by average water demand by 2025. The two (2) additional wells that are not currently being used can provide a water surplus until 2034. Therefore, additional water sources must be identified to further support Zion Crossroads, and the surrounding area.

Louisa County had begun development of a new water source for designated growth areas in the County through a partnership with Fluvanna County. This partnership included a water withdrawal from the James River and a maximum source of 6.0 MGD. The initial phase of the project would have included a firm source capacity of 1.5 MGD for Louisa County, and ultimately 3.0 MGD. While a withdrawal permit has been obtained, Fluvanna County is currently not proceeding with necessary design and construction to utilize this water source. At such time that Fluvanna County proceeds with water withdrawal from the James River, the James River water available to Louisa County in conjunction with the

existing Zion Crossroads wells would be sufficient to serve the Zion Crossroads Growth Area through the 2050 planning period.

As with the Northeast Creek Reservoir analysis above, the County will need to evaluate the benefit of extending the potential water surplus to other areas of the County that may have a deficit or no water at all.

Public Water Use Efficiency, Conservation, and Loss Reduction

While water use efficiency, conservation, and loss reduction do not provide additional water source, there are respective measures for each category that can help reduce water withdrawal, thereby allowing existing water sources to support public water demands for a longer period of time. As stated in Section VII, the County currently has very few measures in place to address these items. The following suggestions have been identified by the LCWA as actions for County review and potential implementation.

1. Reduction of the 15% Lost or Unaccountable Water

   An assumption has been made that through detailed reporting of water system flushing and repairs, and upgrades to existing pipes, tanks, and equipment, the County can reduce its lost or unaccountable water by at least 1% for every ten year period. If the County chooses to implement a plan which focuses on identifying leaks within the public distribution system(s), it is possible that a greater reduction in lost water in a shorter amount of time could occur with the repair of identified leaks.

2. Incentives to Reward Conservation and Punish Waste

   There are currently no regulations in place to encourage or enforce water use efficiency or water conservation. A more stringent rate structure with several tiers of usage could be passed to promote more efficient water use. Limits could also be set for irrigation usage, or separate meters could be required for irrigation.

3. Public Infrastructure for Non-Potable Purposes

   Any public infrastructure provided or made available by the County for recycled and/or grey water for non-potable water usage would promote water efficiency and/or water conservation. New County ordinances could be established to encourage an initiative for County residents to use reclaimed water.

Proposed Municipal Community Water Sources

County Designated Growth Areas

The remaining six (6) growth areas currently do not have a developed public water source. To meet the anticipated growth outlined in this plan, a new water source will need to be developed in each of the proposed areas or a transmission main will need to be extended from another source. This source may be within or outside the limits of Louisa County. In addition, consideration shall be given to aquifer recharge when groundwater is identified as a potential source. This would include an analysis of aquifers that support Louisa County, and their ability to sustain long term groundwater withdrawals.

Alternatives for new public community water sources follow with a brief description of the analysis required to determine the water source yield, as well as the necessary steps for the County to utilize the water source. Without detailed analysis, it is difficult to identify or estimate the potential water yields from many of the alternatives.

1. Groundwater Wells

   Development of groundwater wells typically begins with the completion of a Hydrogeologic Report, which can include identification of well location(s), drilling of well(s), determination of well yield through a 48-hour drawdown test, aquifer response analysis to determine ability to sustain long term groundwater withdrawals, and water quality testing. Some of these items could be performed independently of the Hydrogelogic Report. Virginia Department of Health (VDH) must be contacted prior to drilling wells to obtain approval for any proposed well site. If the Hydrogeologic Report results are favorable and support the estimated water system needs, the remaining process to develop the well(s) can proceed. A construction permit must be obtained from VDH. Information required to obtain this permit will be the investigation results previously mentioned, as well as a well lot plat and dedication document. Treatment of the groundwater will vary depending on the water quality test results. At a minimum, chlorination for disinfection is assumed and potentially corrosion inhibitors. However, various media filters, softeners, or other processes may be required to address water quality deficiencies.

2. Water Withdrawal from a Stream or River or other Surface Water

   The first step towards water withdrawal from a stream or river or other surface water would be an investigation to analyze and determine the surface water's safe yield. This investigation would most likely be in the form of a feasibility study and could include installation of a stream/river gage to monitor and collect stream/river flow data, an analysis of the watershed feeding the surface water, and a determination of the available water withdrawals and associated required bypass needed to sustain

downstream aquatic resources. A water withdrawal permit would be required through Virginia Department of Environmental Quality (VDEQ). A pre-application process is required for major withdrawals, including coordination with VDEQ, public notice, and public information meetings. Once a water withdrawal permit is obtained, the County could proceed with design and construction of the necessary surface water intake structure. During design, a joint permit application would need to be submitted to Virginia Marine Resources Commission, VDEQ, and Army Corps of Engineers. VDH would also need to review and approve the intake structure design and its incorporation with an existing or proposed water system.

3. Water Withdrawal from Surface Water with a New Off-line Reservoir

   In addition to the steps listed above for determining the safe yield for withdrawal from surface water, a preliminary engineering report to analyze the creation of an off-line reservoir, as well as a detailed water budget analysis with modeling of reservoir storage scenarios would also be needed. An "off-line" reservoir is simply a large manmade holding pond that is not naturally fed from a stream or river. Off-line reservoirs are typically much less environmentally damaging than creating an impoundment on an existing stream or river. The intake structure would gravity feed or pump water to the off-line reservoir. To create an off-line reservoir, a suitable site would need to be identified, along with a potential land purchase or leasing agreement. A geotechnical report to evaluate the soil type(s) of the proposed site, and provide recommendations for the reservoir design, such as a potential requirement of a liner would be required. As with the intake structure, VDH would need to review and approve the off-line reservoir design and its incorporation with an existing or proposed water system.

4. Extension of Water Transmission Mains from Other Growth Area(s)

   While typical water main extensions within an existing water system don't require a study or preliminary engineering report, a significant water transmission main extension between growth areas would warrant a preliminary engineering report to analyze alternate routes, topography, water quality, environmental impacts, resource impacts, and water system modeling for average and peak day demands, as well as fire protection. Not only is the preliminary engineering report recommended, but it would most likely be required by Virginia Department of Health. Upon completion of a preliminary engineering report, and selection of a preliminary design and route, the design and construction of the water transmission main could proceed. Given the extent of such a transmission water main, design submission would be anticipated to several review agencies for review and permitting, such as Virginia Marine Resources Commission, VDEQ, Army Corps of Engineers, VDH, Virginia Department of Transportation, Virginia Department of Conservation and Recreation.

5. Upgrade Existing Northeast Creek Water Treatment Plant

   An initial step towards upgrading the existing Northeast Creek Water Treatment Plant would be the VDH required preliminary engineering report to evaluate different expansion alternatives. The preliminary engineering report would provide advantages and disadvantages of each alternative, preliminary design calculations, preliminary layouts, and cost estimates for each alternative. Once an alternative is chosen, design and construction of the chosen expansion alternative could proceed. Review and permitting of the new construction would be required by VDH, and most likely Virginia Department of Conservation and Recreation. In addition, if modifications to the existing intake structure are required, a Joint Permit Application would need to be submitted to Virginia Marine Resources Commission, VDEQ, and Army Corps of Engineers.

6. Partnership with Neighboring County for Regional Water Withdrawal

   The potential partnership with Fluvanna County was mentioned earlier in this section, which would provide Louisa County as much as 3.0 MGD. Currently, this option is not viable given Fluvanna is unable to fund the design and construction of the intake structure and transmission main. However, this potential water source is important to note, as it may be developed in the future.

   Another potential partnership could be with the Town of Gordonsville in Orange County. The Town of Gordonsville currently purchases their municipal water supply from Rapidan Service Authority. Based on a 1971 contract, the limit of their contract is 800,000 GPD. The Town of Gordonsville uses anywhere from 300,000 GPD to 600,000 GPD of their contract limit. The projected average day demand for Louisa County's Gordonsville growth area is approximately 125,000 GPD. Depending on the anticipated growth of the Town of Gordonsville, it's possible that Louisa County could develop an agreement with the Town of Gordonsville or Rapidan Service Authority to purchase public water supply for the Gordonsville growth area.

   Additional partnerships may be found with Albemarle County or Goochland County in the future.

7. Upgrade Bowlers Mill Reservoir

   An intake structure, pump station, and raw water transmission main currently exist at Bowlers Mill Reservoir to provide untreated water for cooling purposes to the Old Dominion Electric Cooperative (ODEC) power station near the Town of Gordonsville. At present, the surface water withdrawal is solely for non-potable use. However, the addition of a water treatment plant near or at this site would allow the Bowlers Mill Reservoir to be used for public water supply. The safe yield for Bowlers Mill was

determined to be 0.75 MGD in January 2006. A water transmission main could be constructed to provide public water source to one or more of the County's designated growth areas. A water treatment plant and finished water transmission main would require the same procedures outlined in Items 7 and 8 above.

8. New Reservoir (Impoundment)

   While a new reservoir is a potential alternative for a new water source, it would most likely be the last alternative considered given there are several more practicable and less environmentally damaging alternatives mentioned above. Creating an impoundment on an existing stream or creek would involve a much more difficult permitting process than the other alternatives as well given the environmental impacts; specifically the Joint Permit Application would require an alternative analysis, most likely in the form of a preliminary engineering report to prove a new reservoir is the preferred option. Steps involved in developing a new reservoir would entail identification of a stream or creek, as well as a feasibility study which could include installation of a stream/creek gage to monitor and collect stream/creek flow data, an analysis of the watershed, a determination of the available water and associated required bypass needed to sustain downstream aquatic resources, and a detailed water budget analysis with modeling of reservoir storage scenarios. An environmental impact report would need to be completed and submitted to all necessary environmental assessment agencies for their review and input. As with the off-line reservoir, a suitable site would need to be identified, along with a potential land purchase or leasing agreement. A geotechnical report would also be required, although excavation should be less than with an off-line reservoir. Once permitting has been approved, design and construction can proceed as with the other alternatives.

Each alternative presents opportunities and potential impacts for the citizens of Louisa County. The County will be committed to investigate each alternative to analyze the best solution for meeting the anticipated water demands. In addition to safe yield analyses, the investigations will include environmental impacts and resource impacts resulting from source development and/or new construction.

Table 21 provides a list of the growth areas currently without a municipal community water system and summarizes the different alternatives that may be considered for each area. A new reservoir is not a likely alternative at this time, and is therefore not included in the table. For alternatives where a specific water source or growth area extension is anticipated, the specific consideration is included in parentheses and clarified by notes.

Table 21 – New Municipal Water Source Alternatives

Growth Area	Groundwater Wells	Water Withdrawal (Stream or River)	Water Withdrawal (Stream or River) w/ Off-line Reservoir	Water Withdrawal (Surface Water)	Extend Water Main from Other Growth Area(s)	Upgrade Existing Northeast Creek WTP	Partner w/ Neighboring County for Water Withdrawal
Gum Spring	✓	✓ *(SA)*	✓		✓ *(SH)*		✓ *(JR)*
Ferncliff	✓		✓		✓ *(SH, ZC, and/or NCR)*	✓	✓ *(JR)*
Shannon Hill	✓	✓ *(SA)*	✓		✓ *(GS, F, and/or NCR)*	✓	✓ *(JR)*
Lake Anna	✓	✓ *(NA)*	✓	✓ *(LA)*	✓ *(NCR)*	✓	✓
Boswells Tavern	✓			✓ *(BMR)*	✓ *(ZC,G)*		
Gordonsville	✓			✓ *(BMR)*			✓ *(ToG - RR)*

Notes:
SA - South Anna River *NA - North Anna River* *JR - James River* *RR - Rapidan River*
LA - Lake Anna *BMR - Bowler's Mill Reservoir*
SH - Shannon Hill Growth Area *ZC - Zion Crossroads Growth Area*
GS - Gum Springs Growth Area *F - Ferncliff Growth Area*
G - Gordonsville Growth Area *ToG - Town of Gordonsville*
NCR – Northeast Creek Reservoir Service Area

APPENDIX A

VDEQ WATER SYSTEM TEMPLATES

Local and Regional Water Supply Planning

Existing Water Source and Water Use Data Entry Template

Local or Regional Plan:	Local ☐ Regional ☑
Political Locality(s):	Louisa County, Louisa County Water Authority, Town of Louisa, Town of Mineral
Locality FIPS Code(s):	109
Planning Area Population:	31,473 (Louisa County VEC interpolation for 2007)
River Basin(s):	York
	James
River Sub-basin(s):	Pamunkey (02080106)
	Mattaponi (02080105)
Contact Name:	Heather A. Campbell, P.E.
Title:	Project Manager
Mailing Address:	4180 Innslake Drive
City and Zip Code:	Glen Allen, Virginia
Phone:	804-205-3351
Fax:	804-290-7928
E-mail:	hcampbell@dewberry.com

The following data entry spreadsheets will allow you to enter information regarding the existing water source (9 VAC 25-780-70) and existing water use (9 VAC 25-780-80) water supply planning criteria.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Community Water Systems: Groundwater Sources
Louisa County

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List all well information for community water systems using groundwater. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark well locations on associated map.

COMMUNITY WATER SYSTEMS (MUNCIPAL & PRIVATE) USING GROUND WATER (9 VAC 25-780-70 B)

PWSID	Water System Name	VDH Permitted System Capacity (gpd)	Calculated VDH Permitted System Capacity (MGD)	INDIVIDUAL WELL DATA: Well Name and ID #	Well Depth (feet)	Casing Depth (feet)	Screen Depth (Top & Bottom) or Water Zones	Well Diameter (inches)	Withdrawal Design Capacity: AVERAGE DAILY (gpd)	Withdrawal Design Capacity: AVERAGE DAILY (MGD)	Withdrawal Design Capacity: MAXIMUM DAILY (gpd)	Withdrawal Design Capacity: MAXIMUM DAILY (MGD)	GROUNDWATER MANAGEMENT AREA WELLS: DEQ Permitted Monthly Withdrawal (MGD)	DEQ Permitted Annual Withdrawal (MGD)	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
2109075	Blue Ridge Shores	308,000.00	0.31	1 (154-013)	163	51	140 - 163	6.5		0.00	79,200.00	0.08			Contact: Delton Hanson
			0.00	1A	405	61	135 - 137 277 - 278	8		0.00		0.00			540-967-1408
			0.00	2	300	50		7		0.00	14,400.00	0.01			
			0.00	3 (154-011)	239	50	115 - 115.5 148 - 149	5		0.00	14,400.00	0.01			Well 1A does not have it's own source capacity --- it's combined
			0.00	5	260	113	100 - 155 470 - 477	8		0.00	360,000.00	0.36			with Well 1.
			0.00	6	850	129	493 - 494 497 - 498	8		0.00	96,480.00	0.10			VDH Engineering Description Sheet used for majority of data.
			0.00	7	575	104		8		0.00	37,440.00	0.04			
			0.00	8	545	61	130 - 140	8		0.00	266,400.00	0.27			
2109650	Shenandoah Crossing	117,600.00	0.12	1	280	115		6		0.00	123,840.00	0.12			Contact: Tim Bernhardt
			0.00	2	300	80		6		0.00	97,920.00	0.10			540-832-9400
			0.00	3	280	55		6		0.00	36,000.00	0.04			tim.bernhardt@bluegreencorp.com
			0.00	4	305	55		6		0.00	34,560.00	0.03			VDH Engineering Description Sheet
			0.00	5	455	69		6		0.00	44,640.00	0.04			used for data.
			0.00	6	605	50		6		0.00	30,240.00	0.03			
2109675	Six-O-Five Village (Trailer Park)	30,000.00	0.03	1	310	105		6		0.00	43,200.00	0.04			VDH Engineering Description Sheet
			0.00	2	365	113		6		0.00	10,800.00	0.01			used for data.
2109800	Trevilians Square Apartments		0.00	1	N.I.	N.I.		6		0.00		0.00			Contact: Don Gray, 540-967-0965
			0.00	2 (emergency)	N.I.	N.I.		6		0.00		0.00			Permitted for 28 Apartment Units per VDH Engineering Description Sheet.
2109825	Twin Oaks Community		0.00	1	N.I.	N.I.		N.I.		0.00		0.00			Contact: Woody Kawatski, 540-894-5126 Permitted for 90 persons per VDH Engineering Description Sheet.
2109340	Lake Anna Plaza	41,200.00	0.04	1	335	77		6		0.00	11,520.00	0.01			Contact: BJ, 540-894-4400
			0.00	2	230	110		6		0.00	86,400.00	0.09			VDH Engineering Description Sheet used for data.
2109265	Jerdone Island Subdivision	19,600.00	0.02		200	51		6		0.00	83,520.00	0.08			Contact: James Lewis 540-872-0289 VDH Engineering Description Sheet used for data.
2109510	Louisa County Water Authority Industrial Park Well	19,200.00	0.02	154-121	550	98		6		0.00	34,560.00	0.03			Contact: Steve Kvech, VDH ODW 540-463-7136 x524 VDH Engineering Description Sheet used for data.
2109525	Town of Mineral	120,000.00	0.12	4 (154-001)	200	98		8		0.00	201,600.00	0.20			Contact: Shelly Ortiz, Sydnor Hydro 804-643-2725 x249
			0.00	5 (154-157)	365	63		6		0.00	17,280.00	0.02			VDH Engineering Description Sheet used for data.
2109990	Louisa County Water Authority	587,520.00	0.59	ZC-1	325	60		8		0.00	53,280.00	0.05			Contact: Steve Kvech, VDH ODW
	Zion Crossroads		0.00	ZC-2	225	55		8		0.00	50,400.00	0.05			540-463-7136 x524
			0.00	GS-3	400	120		8		0.00	63,360.00	0.06			VDH Engineering Description Sheet
			0.00	GS-4	500	55		8		0.00	364,320.00	0.36			used for data.
			0.00	GS-5	600	60		8		0.00	93,600.00	0.09			
			0.00	SC-3	590	83		8		0.00	499,680.00	0.50			
	well drilled, but not developed		0.00	SC-1	605	103		8		0.00		0.00			SC-1 Well Yield = 82 gpm
	well drilled, but not developed		0.00	SC-2	605	82		8		0.00		0.00			SC-2 Well Yield = 174 gpm
Existing Source Totals - for all CWS's using wells (MGD)			**1.24**							**0.00**		**2.85**	**0.00**	**0.00**	

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List reservoir information for all community water systems using surface water reservoirs. This list should also include any quarries that are being used as municipal surface water reservoirs. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark reservoirs and intakes on associated map.

COMMUNITY WATER SYSTEMS (MUNICIPAL & PRIVATE) USING SURFACE WATER RESERVOIRS (9 VAC 25-780-70 C)

Is your water system comprised of interconnected reservoirs? ☐ **Yes** ☑ **No**

If YES, designate which reservoirs and which intakes constitute a system. Report the drainage area and amount of storage available for water supply from each reservoir independently. Designed maximum daily withdrawal and the safe yield may be reported for the entire system or subsets of the system.

PWSID #	Water System Name	Reservoir Name	Reservoir watershed **Basin/ Sub-basin**	Reservoir watershed **Drainage Area** (square miles)	On-Stream Storage Available for Water Supply (gallons)	On-Stream Storage Available for Water Supply (MG)	DESIGN CAPACITY: **Average Daily** Withdrawal (gpd)	**Average Daily** Withdrawal (MGD)	**Maximum Daily** Withdrawal (gpd)	**Maximum Daily** Withdrawal (MGD)	Associated **Water Treatment Plant** (gpd)	Associated **Water Treatment Plant** (MGD)	Reservoir **Safe Yield** (MGD)	VDH Permitted System Capacity (gpd)	VDH Permitted System Capacity (MGD)	Limitations on Withdrawal Permit	**Notes or Comments** **(This may include references to maps, data sources, data gaps, etc.)**
						0.00		0.00		0.00		0.00			0.00		
2109510	Louisa County Water Authority	Northeast Creek	Northeast Creek Watershed	9.73	479,653,303.50	479.65	1,000,000.00	1.00	1,000,000.00	1.00	1,000,000.00	1.00	2,770,000.00	1,000,000.00	1.00	N/A	Contact: Steve Kvech
			Pamunkey Watershed			0.00		0.00		0.00		0.00			0.00		w/ VDH ODW
			York River Basin			0.00		0.00		0.00		0.00			0.00		540-463-7136 x525
						0.00		0.00		0.00		0.00			0.00		VDH Engineering Description
						0.00		0.00		0.00		0.00			0.00		Sheet used for data.
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
Existing Source Totals - for all CWS's using surface water reservoirs (MG or MGD)						479.65		1.00		1.00		1.00			1.00		

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List intake information for all community water systems using stream intakes. Additionally, include a qualitative description of existing in-stream beneficial uses within the planning area or outside the planning area that may be affected by point of stream withdrawal. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark intakes on associated map.

COMMUNITY WATER SYSTEMS (MUNICIPAL & PRIVATE) USING STREAM INTAKES* (9 VAC 25-780-70 D, - 80 B10)

*** For municipal or private community water system(s) using springs, list applicable information for your spring sources below.**

PWSID #	Water System Name	Stream, River, or Spring Name	Basin / Sub-basin	Intake Drainage Area (square miles)	DESIGN CAPACITY: Average Daily Withdrawal (gpd)	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (gpd)	Maximum Daily Withdrawal (MGD)	Pump Station (gpd)	Pump Station (MGD)	Water Treatment Plant (gpd)	Water Treatment Plant (MGD)	Safe Yield of Stream (MGD)	Lowest Daily Flow of Record (cfs)	VDH Permitted Capacity (gpd)	VDH Permitted Capacity (MGD)	Limitations on Withdrawal Permit	EXISTING INSTREAM BENEFICIAL USES: Within Planning Area	Outside Planning Area	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
						0.00		0.00		0.00		0.00				0.00				
N/A						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
Existing Source Totals - for all CWS's using stream intakes &/or springs (MGD)						0.00		0.00		0.00		0.00				0.00				

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List information regarding the amount of ground or surface water to be purchased from water supply systems outside the geographic boundaries of the planning area (9 VAC 25-780-70G). Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark and label on associated map.

AMOUNT OF GROUND OR SURFACE WATER TO BE PURCHASED FROM WATER SUPPLY SYSTEMS OUTSIDE THE GEOGRAPHIC BOUNDARIES OF THE PLANNING AREA (9 VAC 25-780-70G)

PWSID#, Community Water System Name	Source: Ground Water Well Name & ID No.	Source: Surface Water Reservoir & Sub-basin or Stream/River Name & Sub-basin	Amount to be Purchased: Maximum Daily (gpd)	Maximum Daily (MGD)	Average Annual (gpd)	Average Annual (MGD)	Contract Limitations: Supplier(s) Name(s) (PWSID #)	Contract or Agreement Terms	Recipient(s) or Area(s) Served	Contract Limits	Other
				0.00		0.00					
6137400, Town of Gordonsville		Town purchases Surface Water from Rapidan Service Authority		0.00	5,120.00	0.01	6137400, Town of Gordonsville	N/A (individually billed)	20 Louisa residential connections	N/A	Town of Gordonsville Treasurer, Tabitha Carpenter
		Source: Rapidan River		0.00		0.00					confirmed 10 definite
				0.00		0.00					connections, and stated an
				0.00		0.00					estimated 20 connections
				0.00		0.00					total would be an overly
				0.00		0.00					conservative estimate of the
				0.00		0.00					Louisa connections to their
				0.00		0.00					water system.
				0.00		0.00					
				0.00		0.00					20 x 2.56 x 100 gpd =
				0.00		0.00					5,120 gpd
				0.00		0.00					
				0.00		0.00	Additional Information for	Town of Gordonsville:			
				0.00		0.00	6127300, RSA 15 6137500, Town of Orange	Town purchases water from Rapidan Service Authority	6137400, Town of Gordonsville	Per 1971 contract, limit is 800,000 GPD	Town of Gordonsville uses 300,000 to 600,000 GPD
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
Total Amount of Water To Be Purchased Outside the Planning Area (MGD):				**0.00**		**0.01**					

List information for the amount of ground or surface water available to be purchased from outside the geographic boundaries of the planning area from water supply systems with the capacity to draw more than 300,000 gallons per month (9 VAC 25-780-70H). Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark and label on associated map.

AMOUNT OF WATER AVAILABLE TO BE PURCHASED, OUTSIDE THE PLANNING AREA, FROM ANY SOURCE WITH CAPACITY TO WITHDRAW MORE THAN 300,000 GALLONS PER MONTH OF SURFACE OR GROUND WATER
(9 VAC 25-780-70H)

PWSID#, Community Water System Name	Source: Ground Water Well Name & ID No.	Source: Surface Water Reservoir & Sub-basin or Stream/River Name & Sub-basin	Amount Available to be Purchased: Maximum Daily (gpd)	Maximum Daily (MGD)	Average Annual (gpd)	Average Annual (MGD)	Contract Limitations: Supplier(s) Name(s) (PWSID #)	Contract or Agreement Terms	Recipient(s) or Area(s) Served	Contract Limits	Other
				0.00		0.00					
N/A				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
Total Amount of Water Available for Purchase Outside the Planning Area				**0.00**		**0.00**					

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Note findings and recommendations from source water assessment plans and/or wellhead protection programs. Reference sources and note any assumptions. If unable to find data or data not applicable, note accordingly. If applicable, mark program/plan areas on associated map.

FINDINGS AND RECOMMENDATIONS FROM APPLICABLE SOURCE WATER ASSESSMENT PLANS OR WELLHEAD PROTECTION PROGRAMS

Locality Name	Source Water Assessment Plan(s):		Wellhead Protection Program(s):	
	Date of Plan	Summary of Findings and Recommendations	Date of Program	Summary of Findings and Recommendations
	2/15/2006	VDH Source Water Assessment Plan: SWAP's goal is to establish procedures and provide a foundation of support for protecting the Commonwealth's drinking water resources from degradation. Degradation can be a result of residential, industrial, commercial, agricultural, waste management, or transportation's: accidental introduction of contaminants; improper land use practices; illegal material handling practices; and other conditions. The Office of Drinking Water encourages public waterworks to purchase land and/or establish conservation easements to increase the protection of vital drinking water resources. The SWAP has identified future land use development in source water protection areas as a predominant risk to the viability of public waterworks.	N/A	N/A
2109075 - Blueridge Shores		High Susceptibility		
2109650 - Shenandoah Crossing		High Susceptibility		
2109675 - Six-O-Five Village		High Susceptibility		
2109800 - Trevilians Square Apts		High Susceptibility		
2109825 - Twin Oaks Community		High Susceptibility		
2109340 - Lake Anna Plaza		High Susceptibility		
2109265 - Jerdone Island Subdivision		High Susceptibility		
2109510 - LCWA Northeast Creek Reservoir & Industrial Park Well		High Susceptibility		
2109525 - Town of Mineral		High Susceptibility		
2109990 - LCWA Zion Crossroads		High Susceptibility		
2109300 - Klockner Pentaplast, Inc.		High Susceptibility		
2109600 - North Anna Power Plant		High Susceptibility		
2109145 - Crossing Pointe		High Susceptibility		
2109130 - Christopher Run Campground		High Susceptibility		
2109150 - Expressions I Learning Center		High Susceptibility		
2109260 - Jouett Elementary School		High Susceptibility		
2109090 - Lake Anna Rescue		High Susceptibility		
2109640 - Prospect Hill		High Susceptibility		
9109925 - Small Country Campground		High Susceptibility		
2109725 - Tavern on the Rail		High Susceptibility		
2109025 - Trevilians Elementary School		High Susceptibility		
2109100 - Zion Crossroads Burger King		High Susceptibility		

Community Water Systems: Withdrawal Information
Louisa County

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Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 3 and fill out a separate spreadsheet for each data year.**

COMMUNITY WATER SYSTEMS USING GROUND AND SURFACE WATER: *water withdrawal information* (9 VAC 25-780-80 B1-B3)

YEAR: Mar 2006 - Feb 2007

PWSID	Water System Name	Source Name	Population Served	Number of Connections	WITHDRAWAL: Average Daily (MGD)	WITHDRAWAL: Maximum Daily (MGD)	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
			Municipal Systems				
	Municipal Community Water System Totals:		**0**	**0**	**0.00**		
			Private Systems				
							Sources/Assumptions:
2108075	Blueridge Shores		1,472	575	0.054749	0.096707	# of addresses within each community provided by Louisa County Planner in July 2008.
2109800	Trevilians Square Apartments		61	28	0.006100	0.00915	Trevilians Sq. Apts. population from VDH Listing of Waterworks and Owners
2109825	Twin Oaks Community		100	15	0.007628	0.011442	Twin Oaks population is from their website.
2109340	Lake Anna Plaza		111	43	0.004442	0.006664	Assume # of addresses = # of connections.
2109265	Jerdone Island Subdivision		146	57	0.006580	0.009896	Population = # of connections x 2.56
							Average Daily withdrawal available from VDH monthly
							operation reports.
							Daily data available only for Blueridge Shores.
							Max daily withdrawal assumed to be 1.5 x Average Daily
							as instructed on worksheet 80 B5 "peak day use" for
							remainder of systems.
	Private Community Water System Totals:		**1,890**	**718**	**0.08**		
	Municipal and Private Community Water System Totals:		**1,890**	**718**	**0.08**		

Community Water Systems: Withdrawal Information
Louisa County

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Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 3 and fill out a separate spreadsheet for each data year.**

COMMUNITY WATER SYSTEMS USING GROUND AND SURFACE WATER: *water withdrawal information* (9 VAC 25-780-80 B1-B3)

YEAR: Apr 2007 - Mar 2008

PWSID	Water System Name	Source Name	Population Served	Number of Connections	WITHDRAWAL: Average Daily (MGD)	WITHDRAWAL: Maximum Daily (MGD)	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
Municipal Systems							
							Sources/Assumptions:
	Northeast Creek Service Area						# of active residential and commercial connections provided by LCWA and Towns in 2008
2109510	Louisa County Water Authority Northeast Creek Reservoir and Industrial Park Well		221	152	0.307896	0.461844	When population was unknown, it was calculated by multiplying 2.56 x residential connections.
2109450	Town of Louisa		1,501	706	0		Town of Louisa provided census population of 1501.
2109525	Town of Mineral		640	338	0.045661	0.06849	Town of Mineral 2007 census estimate = 471; Town also stated there are 66 residential connections outside town limits, so 66 x 2.56 = ~169. 471 + 169 = 640
							Average Daily withdrawal provided by LCWA and Towns.
	Zion Crossroads Service Area						Max Daily withdrawal assumed to be 1.5 x Average Daily as instructed on worksheet 80 B5 "peak day use" since daily
2109990	Louisa County Water Authority Zion Crossroads		454	187	0.099397	0.149095	data isn't available.
Municipal Community Water System Totals:			**2,816**	**1,383**	**0.45**		
Private Systems							
Private Community Water System Totals:			**0**	**0**	**0.00**		
Municipal and Private Community Water System Totals:			**2,816**	**1,383**	**0.45**		

Community Water Systems: Withdrawal Information
Louisa County

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Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 3 and fill out a separate spreadsheet for each data year.**

COMMUNITY WATER SYSTEMS USING GROUND AND SURFACE WATER: *water withdrawal information* (9 VAC 25-780-80 B1-B3)

YEAR: 2009

PWSID	Water System Name	Source Name	Population Served	Number of Connections	WITHDRAWAL: Average Daily (MGD)	WITHDRAWAL: Maximum Daily (MGD)	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
			Municipal Systems				
Municipal Community Water System Totals:			**0**	**0**	**0.00**		
			Private Systems				
							Sources/Assumptions:
2109650	Shenandoah Crossing		495	193	0.081081	0.121622	# of addresses within each community provided by Louisa
2109675	Six-O-Five Village (Trailer Park)		249	97	0.012587	0.018881	County Planner in July 2008.
							Assume # of addresses = # of connections.
							Population = # of connections x 2.56
							Average Daily withdrawal available from VDH monthly
							operation reports.
							Max daily withdrawal assumed to be 1.5 x Average Daily
							as instructed on worksheet 80 B5 "peak day use" for
							remainder of systems.
Private Community Water System Totals:			**744**	**290**	**0.09**		
Municipal and Private Community Water System Totals:			**744**	**290**	**0.09**		

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

CWS Annual Average and Average Monthly Water Use
Louisa County

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Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map.

Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.

Community Water Systems Using Ground and Surface Water: *annual average and average monthly water use* (9 VAC 25-780-80 B4)

YEAR 2006-2007	PWSID #2108075 Blue Ridge Shores – Source (GW) - Private			PWSID #2109800 Trevilians Square Apartments – Source (GW) - Private			PWSID #2109825 Twin Oaks Community – Source (GW) - Private			PWSID #2109340 Lake Anna Plaza – Source (GW) - Private			PWSID #2109265 Jerdone Island – Source (GW) - Private			Locality or Region Total Water Use (MG/Mo)	Locality or Region Total Average Monthly by Month (MGD)
	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)		
January	1,428,145.00	1.43	0.046	189,100.00	0.19	0.006	216,030.00	0.22	0.007	248,600.00	0.25	0.008	253,900.00	0.25	0.008	2.34	0.08
February	1,248,500.00	1.25	0.045	170,800.00	0.17	0.006	175,250.00	0.18	0.006	181,500.00	0.18	0.006	278,100.00	0.28	0.010	2.05	0.07
March	1,497,891.00	1.50	0.048	189,100.00	0.19	0.006	189,990.00	0.19	0.006	110,200.00	0.11	0.004	221,900.00	0.22	0.007	2.21	0.07
April	1,429,187.00	1.43	0.048	183,000.00	0.18	0.006	215,000.00	0.22	0.007	85,000.00	0.09	0.003	123,700.00	0.12	0.004	2.04	0.07
May	2,042,264.00	2.04	0.066	189,100.00	0.19	0.006	260,280.00	0.26	0.008	101,600.00	0.10	0.003	129,900.00	0.13	0.004	2.72	0.09
June	1,950,986.00	1.95	0.065	183,000.00	0.18	0.006	253,660.00	0.25	0.008	199,700.00	0.20	0.007	227,700.00	0.23	0.008	2.82	0.09
July	2,006,310.00	2.01	0.065	189,100.00	0.19	0.006	301,810.00	0.30	0.010	191,200.00	0.19	0.006	245,000.00	0.25	0.008	2.93	0.09
August	2,280,507.00	2.28	0.074	189,100.00	0.19	0.006	282,010.00	0.28	0.009	126,500.00	0.13	0.004	288,100.00	0.29	0.009	3.17	0.10
September	1,602,423.00	1.60	0.053	183,000.00	0.18	0.006	228,270.00	0.23	0.008	157,400.00	0.16	0.005	128,900.00	0.13	0.004	2.30	0.08
October	1,704,401.00	1.70	0.055	189,100.00	0.19	0.006	269,090.00	0.27	0.009	83,500.00	0.08	0.003	123,500.00	0.12	0.004	2.37	0.08
November	1,573,987.00	1.57	0.052	183,000.00	0.18	0.006	195,630.00	0.20	0.007	69,000.00	0.07	0.002	166,700.00	0.17	0.006	2.19	0.07
December	1,218,690.00	1.22	0.039	189,100.00	0.19	0.006	197,130.00	0.20	0.006	67,300.00	0.07	0.002	220,700.00	0.22	0.007	1.89	0.06
Total Annual (MG)		19.98			2.23			2.78			1.62			2.41		29.02	
Average Monthly (MG/Mo)		1.67			0.19			0.23			0.14			0.20		2.42	
Average Daily (MGD)		0.055			0.006			0.008			0.004			0.007		0.080	
NOTES or COMMENTS:	Source: VDH Monthly Operation Reports, **Mar 2006 - Feb 2007**			Source: No information available. Population = 61. Assume 100 GPD per person.			Source: VDH Monthly Operation Reports, **Mar 2006 - Feb 2007**			Source: VDH Monthly Operation Reports, **Mar 2006 - Feb 2007**			Source: VDH Monthly Operation Reports, **Mar 2006 - Feb 2007**				

CWS Annual Average and Average Monthly Water Use
Louisa County

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Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map.

Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.

Community Water Systems Using Ground and Surface Water: *annual average and average monthly water use* (9 VAC 25-780-80 B4)

YEAR 2007-2008	PWSID #2109510 LCWA Northeast Creek Reservoir			PWSID #2109510 LCWA Industrial Park Well			PWSID #2109450 Town of Louisa			PWSID #2109525 Town of Mineral			PWSID #2109525 Town of Mineral			PWSID #2109990 LCWA Zion Crossroads			Locality or Region Total Water Use (MG/Mo)	Locality or Region Total Average Monthly by Month (MGD)
	Source (SW) - Municipal			Source (GW) - Municipal			Source (SWP) - Municipal			Source (GW) - Municipal			Source (SWP) - Municipal			Source (GW) - Municipal				
	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)		
January	2,501,300.00	2.50	0.081	0.00	0.00	0.000	6,497,900.00	6.50	0.210	1,111,285.00	1.11	0.036	527,100.00	0.53	0.017	2,165,700.00	2.17	0.070	12.80	0.41
February	2,649,800.00	2.65	0.095	0.00	0.00	0.000	5,840,200.00	5.84	0.209	2,156,845.00	2.16	0.077	350,000.00	0.35	0.013	2,021,300.00	2.02	0.072	13.02	0.46
March	2,808,200.00	2.81	0.091	0.00	0.00	0.000	6,194,300.00	6.19	0.200	971,240.00	0.97	0.031	244,100.00	0.24	0.008	2,186,700.00	2.19	0.071	12.40	0.40
April	3,953,900.00	3.95	0.132	0.00	0.00	0.000	4,573,500.00	4.57	0.152	1,408,410.00	1.41	0.047	172,800.00	0.17	0.006	2,946,000.00	2.95	0.098	13.05	0.44
May	3,987,300.00	3.99	0.129	135,420.00	0.14	0.004	5,487,100.00	5.49	0.177	1,317,820.00	1.32	0.043	192,800.00	0.19	0.006	3,233,600.00	3.23	0.104	14.35	0.46
June	4,364,000.00	4.36	0.145	138,790.00	0.14	0.005	6,037,500.00	6.04	0.201	1,360,260.00	1.36	0.045	370,300.00	0.37	0.012	4,091,700.00	4.09	0.136	16.36	0.55
July	4,044,100.00	4.04	0.130	20,410.00	0.02	0.001	6,027,900.00	6.03	0.194	1,473,890.00	1.47	0.048	80,500.00	0.08	0.003	4,349,000.00	4.35	0.140	16.00	0.52
August	3,486,400.00	3.49	0.112	128,330.00	0.13	0.004	6,121,100.00	6.12	0.197	1,489,720.00	1.49	0.048	268,100.00	0.27	0.009	3,793,700.00	3.79	0.122	15.29	0.49
September	3,417,700.00	3.42	0.114	156,330.00	0.16	0.005	5,617,100.00	5.62	0.187	928,710.00	0.93	0.031	253,700.00	0.25	0.008	3,716,800.00	3.72	0.124	14.09	0.47
October	2,912,000.00	2.91	0.094	39,680.00	0.04	0.001	6,226,800.00	6.23	0.201	1,654,850.00	1.65	0.053	123,900.00	0.12	0.004	3,648,100.00	3.65	0.118	14.61	0.47
November	2,666,400.00	2.67	0.089	0.00	0.00	0.000	5,118,300.00	5.12	0.171	1,014,642.00	1.01	0.034	161,700.00	0.16	0.005	2,257,200.00	2.26	0.075	11.22	0.37
December	2,831,800.00	2.83	0.091	0.00	0.00	0.000	5,469,200.00	5.47	0.176	1,778,418.00	1.78	0.057	183,100.00	0.18	0.006	1,869,980.00	1.87	0.060	12.13	0.39
Total Annual (MG)		39.62			0.62			69.21			16.67			2.93			36.28		165.33	
Average Monthly (MG/Mo)		3.30			0.05			5.77			1.39			0.24			3.02		13.78	
Average Daily (MGD)		0.109			0.002			0.190			0.046			0.008			0.099		0.453	
NOTES or COMMENTS:	Source: Water production and sales spreadsheet provided by LCWA in April 2008 for **Apr 2007 - Mar 2008**. Above numbers do not include water sold to Town of Louisa and Town of Mineral. Raw water amounts unavailable for July-Oct; Finished water amounts used for those months.			Source: Water production and sales spreadsheet provided by LCWA in April 2008 for **Apr 2007 - Mar 2008.**			Source: Water production and sales spreadsheet provided by LCWA in April 2008 for **Apr 2007 - Mar 2008.**			Source: Water source and usage spreadsheet provided by Town of Mineral in May 2008 for **Apr 2007 - Mar 2008.**			Source: Water source and usage spreadsheet provided by Town of Mineral in May 2008 for **Apr 2007 - Mar 2008.**			Source: Water production and sales spreadsheet provided by LCWA in April 2008 for **Apr 2007 - Mar 2008.** Raw water pumped amount unavailable for Dec; Water usage (billing) amount used for that month.				

Office of Water Supply Planning
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CWS Annual Average and Average Monthly Water Use
Louisa County

Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map.

Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.

Community Water Systems Using Ground and Surface Water: *annual average and average monthly water use* (9 VAC 25-780-80 B4)

YEAR 2009	PWSID #2109650 Shenandoah Crossing			PWSID #2109675 Six-O-Five Village (Trailer Park)			PWSID # System Name			PWSID # System Name			PWSID # System Name			Locality or Region Total Water Use (MG/Mo)	Locality or Region Total Average Monthly by Month (MGD)
	Source (GW) - Private			Source (GW) - Private			Source (SW or GW)			Source (SW or GW)			Source (SW or GW)				
	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)		
January	1,587,665.00	1.59	0.051	437,100.00	0.44	0.014		0.00	0.000		0.00	0.000		0.00	0.000	2.02	0.07
February	1,026,396.00	1.03	0.037	361,200.00	0.36	0.013		0.00	0.000		0.00	0.000		0.00	0.000	1.39	0.05
March	1,835,789.00	1.84	0.059	328,383.00	0.33	0.011		0.00	0.000		0.00	0.000		0.00	0.000	2.16	0.07
April	2,559,060.00	2.56	0.085	332,820.00	0.33	0.011		0.00	0.000		0.00	0.000		0.00	0.000	2.89	0.10
May	2,849,272.00	2.85	0.092	405,294.00	0.41	0.013		0.00	0.000		0.00	0.000		0.00	0.000	3.25	0.10
June	2,852,070.00	2.85	0.095	485,040.00	0.49	0.016		0.00	0.000		0.00	0.000		0.00	0.000	3.34	0.11
July	2,938,769.00	2.94	0.095	340,194.00	0.34	0.011		0.00	0.000		0.00	0.000		0.00	0.000	3.28	0.11
August	2,918,247.00	2.92	0.094	421,600.00	0.42	0.014		0.00	0.000		0.00	0.000		0.00	0.000	3.34	0.11
September	2,522,100.00	2.52	0.084	396,000.00	0.40	0.013		0.00	0.000		0.00	0.000		0.00	0.000	2.92	0.10
October	2,747,437.00	2.75	0.089	328,600.00	0.33	0.011		0.00	0.000		0.00	0.000		0.00	0.000	3.08	0.10
November	2,791,320.00	2.79	0.093	372,000.00	0.37	0.012		0.00	0.000		0.00	0.000		0.00	0.000	3.16	0.11
December	2,966,607.00	2.97	0.096	386,167.00	0.39	0.012		0.00	0.000		0.00	0.000		0.00	0.000	3.35	0.11
Total Annual (MG)		29.59			4.59			0.00			0.00			0.00		34.19	
Average Monthly (MG/Mo)		2.47			0.38			0.00			0.00			0.00		2.85	
Average Daily (MGD)		0.081			0.013			0.000			0.000			0.000		0.094	
NOTES or COMMENTS:	Source: 2006 Data appears undocumented. Requested Water Production Report from Steve Kvech (VDH); Above data represents **Apr 09 - Dec 09, Jan 11 - Mar 11**; large leaks were discovered in 2010 and usage has significantly dropped since repair; actual summer usage remains to be seen.			Source: 2006 data was obtained from Ed Morrow (VDEQ) with daily average of 50,416 GPD, which appears unreasonable based on system's permitted capacity. Steve Kvech (VDH) contacted. The only full year of monthly data available is for **2009** (shown above).													

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Community Water Systems: Peak Day Use
Louisa County

Office of Water Supply Planning
629 East Main Street,
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URL: http://www.deq.virginia.gov/watersupplyplanning/

Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.**

Community Water Systems Using Ground and Surface Water: *peak day use* (9 VAC 25-780-80 B5)

YEAR 2006-2007	PWSID #2108075 Blue Ridge Shores		PWSID #2109800 Trevilians Square Apartments		PWSID #2109825 Twin Oaks Community		PWSID #2109340 Lake Anna Plaza		PWSID #2109265 Jerdone Island	
	Source (GW) - Private		Source (GW) - Private		Source (GW) - Private		Source (GW) - Private		Source (GW) - Private	
	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)
January	48,581.00	0.049	9,150.00	0.009		0.000	6,664.00	0.007		0.000
February	58,670.00	0.059		0.000		0.000		0.000		0.000
March	53,914.00	0.054	9,150.00	0.009		0.000		0.000		0.000
April		0.000		0.000		0.000		0.000		0.000
May	95,628.00	0.096	9,150.00	0.009		0.000		0.000		0.000
June	91,104.00	0.091		0.000		0.000		0.000		0.000
July	95,631.00	0.096	9,150.00	0.009	11,442.00	0.011		0.000		0.000
August	96,707.00	0.097	9,150.00	0.009		0.000		0.000	9,896.00	0.010
September	63,938.00	0.064		0.000		0.000		0.000		0.000
October	57,815.00	0.058	9,150.00	0.009		0.000		0.000		0.000
November	63,613.00	0.064		0.000		0.000		0.000		0.000
December	50,761.00	0.051	9,150.00	0.009		0.000		0.000		0.000
NOTES or COMMENTS:	Source: VDH Monthly Operation Reports. 3-day readings were averaged for GPD.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.	

Worksheet Instructions:

1) Enter the data year and your system name.
2) Enter source code (GW = Ground Water; SW = Surface Water).
3) Enter peak day water use for each month in gallons per day (gpd). If you only have peak day data for your peak month (one month), enter that value in the appropriate cell.
4) If you do not have daily data for your system, but know your peak month then estimate your peak day use by using the following equation and enter this information into the applicable month cell above.

Peak Day "Raw" Water Use (gpd) =
Average Daily Withdrawal* (MGD) X 10^6 (g/MG) X 1.5 Peaking Factor
**from worksheet "80 B1-B3 CWS Use"*

5) Enter notes or comments (this may include references to maps, data sources, data gaps, etc.) in the approriate cells.
6) If you need additional data entry columns, "unhide" columns K through AN.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Community Water Systems: Peak Day Use
Louisa County

Office of Water Supply Planning
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Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.**

Community Water Systems Using Ground and Surface Water: *peak day use* (9 VAC 25-780-80 B5)

YEAR 2007-2008	PWSID #2109510 LCWA Northeast Creek Reservoir		PWSID #2109510 LCWA Industrial Park Well		PWSID #2109450 Town of Louisa		PWSID #2109525 Town of Mineral		PWSID #2109525 Town of Mineral		PWSID #2109990 LCWA Zion Crossroads	
	Source (SW) - Municipal		Source (GW) - Municipal		Source (SWP) - Municipal		Source (GW) - Municipal		Source (SWP) - Municipal		Source (GW) - Municipal	
	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)
January		0.000		0.000	284,428.00	0.284		0.000	12,033.00	0.012		0.000
February		0.000		0.000		0.000	68,491.00	0.068		0.000		0.000
March		0.000		0.000		0.000		0.000		0.000		0.000
April		0.000		0.000		0.000		0.000		0.000		0.000
May		0.000		0.000		0.000		0.000		0.000		0.000
June		0.000		0.000		0.000		0.000		0.000		0.000
July	162,834.00	0.163		0.000		0.000		0.000		0.000	149,095.00	0.149
August		0.000		0.000		0.000		0.000		0.000		0.000
September		0.000	5,046.00	0.005		0.000		0.000		0.000		0.000
October		0.000		0.000		0.000		0.000		0.000		0.000
November		0.000		0.000		0.000		0.000		0.000		0.000
December		0.000		0.000		0.000		0.000		0.000		0.000
NOTES or COMMENTS:	Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.	

Worksheet Instructions:

1) Enter the data year and your system name.

2) Enter source code (GW = Ground Water; SW = Surface Water).

3) Enter peak day water use for each month in gallons per day (gpd). If you only have peak day data for your peak month (one month), enter that value in the appropriate cell.

4) If you do not have daily data for your system, but know your peak month then estimate your peak day use by using the following equation and enter this information into the applicable month cell above.

Peak Day "Raw" Water Use (gpd) =
Average Daily Withdrawal* (MGD) X 10^6 (g/MG) X 1.5 Peaking Factor
**from worksheet "80 B1-B3 CWS Use"*

5) Enter notes or comments (this may include references to maps, data sources, data gaps, etc.) in the approriate cells.

6) If you need additional data entry columns, "unhide" columns K through AN.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Community Water Systems: Peak Day Use
Louisa County

Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.**

Community Water Systems Using Ground and Surface Water: *peak day use* (9 VAC 25-780-80 B5)

YEAR 2009	PWSID #2109650 Shenandoah Crossing		PWSID #2109675 Six-O-Five Village (Trailer Park)		PWSID # System Name		PWSID # System Name		PWSID # System Name		PWSID # System Name	
	Source (SW) - Municipal		Source (GW) - Municipal		Source (GW or SW)		Source (GW or SW)		Source (GW or SW)		Source (GW or SW)	
	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)
January		0.000		0.000		0.000		0.000		0.000		0.000
February		0.000		0.000		0.000		0.000		0.000		0.000
March		0.000		0.000		0.000		0.000		0.000		0.000
April		0.000		0.000		0.000		0.000		0.000		0.000
May		0.000		0.000		0.000		0.000		0.000		0.000
June		0.000	18,881.00	0.019		0.000		0.000		0.000		0.000
July		0.000		0.000		0.000		0.000		0.000		0.000
August		0.000		0.000		0.000		0.000		0.000		0.000
September		0.000		0.000		0.000		0.000		0.000		0.000
October		0.000		0.000		0.000		0.000		0.000		0.000
November		0.000		0.000		0.000		0.000		0.000		0.000
December	121,622.00	0.122		0.000		0.000		0.000		0.000		0.000
NOTES or COMMENTS:	Daily readings unavailable. Peak day reading calculated per instructions below.		Daily readings unavailable. Peak day reading calculated per instructions below.									

Worksheet Instructions:

1) Enter the data year and your system name.

2) Enter source code (GW = Ground Water; SW = Surface Water).

3) Enter peak day water use for each month in gallons per day (gpd). If you only have peak day data for your peak month (one month), enter that value in the appropriate cell.

4) If you do not have daily data for your system, but know your peak month then estimate your peak day use by using the following equation and enter this information into the applicable month cell above.

Peak Day "Raw" Water Use (gpd) =
Average Daily Withdrawal* (MGD) X 10^6 (g/MG) X 1.5 Peaking Factor
**from worksheet "80 B1-B3 CWS Use"*

5) Enter notes or comments (this may include references to maps, data sources, data gaps, etc.) in the approriate cells.

6) If you need additional data entry columns, "unhide" columns K through AN.

Community Water Systems: Disaggregated Use
Louisa County

Office of Water Supply Planning
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For each community water system included in the water plan, include an estimate of the disaggregated annual average amount of water used in categories of use appropriate for the system. Reference sources and note any assumptions regarding calculations. **If unable to find data or data not applicable, note accordingly in the Notes/Comments Column and highlight applicable cells. Note the data reference year in Row 4 and fill out for the most recent data year.**

COMMUNITY WATER SYSTEMS (MUNICIPAL & PRIVATE): DISAGGREGATED ANNUAL AVERAGE WATER USE AMOUNTS (9 VAC 25-780-80 B9)

YEAR: 2006-2008

PWSID	Water System Name	System Total (MGD)	Residential (gpd)	Residential (MGD)	Commercial Institutional Light Industrial *CIL* (gpd)	Commercial Institutional Light Industrial *CIL* (MGD)	Heavy Industrial (gpd)	Heavy Industrial (MGD)	Military (gpd)	Military (MGD)	Other (gpd)	Other (MGD)	Production Processes (gpd)	Production Processes (MGD)	Unaccounted for Losses (gpd)	Unaccounted for Losses (MGD)	Sales to Other CWS's: Amount Sold (gpd)	Sales to Other CWS's: Amount Sold (MGD)	Sales to Other CWS's: System Name	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
	Municipal	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2109510	LCWA Northeast Creek Reservoir and LCWA Industrial Park Well	0.308	11,789.00	0.012	46,646.00	0.047		0.000		0.000		0.000	7,134.00	0.007	44,683.00	0.045	197,644.00	0.198	Town of Louisa, Town of Mineral	Amount sold to Town of Louisa and Town of Mineral needs to be subtracted from the Systems Total, otherwise it is counted twice.
2109450	Town of Louisa	0.190	96,654.00	0.097	55,872.00	0.056		0.000		0.000		0.000		0.000	37,163.00	0.037		0.000		"Unaccounted for losses" is the difference between water produced/sold versus billing.
2109525	Town of Mineral	0.054	40,295.00	0.040	13,390.00	0.013		0.000		0.000		0.000		0.000		0.000		0.000		"Other" represents bulk water purchases.
2109990	LCWA Zion Crossroads	0.100	35,363.00	0.035	48,504.00	0.049		0.000		0.000	3,875.00	0.004		0.000	12,736.00	0.013		0.000		Municipal water amounts represent usage based on billing.
	Private	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2108075	Blueridge Shores	0.055	54,749.00	0.055		0.000		0.000		0.000		0.000		0.000		0.000		0.000		Private water amounts represent production based on system's monthly operation reports.
2109650	Shenandoah Crossing	0.081	81,081.00	0.081		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2109675	Six-O-Five Village (Trailer Park)	0.013	12,587.00	0.013		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2109800	Trevilian Square Apartments	0.006	6,100.00	0.006		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2109825	Twin Oaks Community	0.008	7,628.00	0.008		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2109340	Lake Anna Plaza	0.004	4,442.00	0.004		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
2109265	Jerdone Island	0.007	6,598.00	0.007		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
Total Use By Category in MGD (for All Community Water Systems)		0.825		0.357		0.164		0.000		0.000		0.004		0.007		0.095		0.198		

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List non-agricultural surface water source and use information for all self-supplied users of more than 300,000 gallons per month. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark users on associated map. **Note the data reference year in Column I, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, NON-AGRICULTURAL USERS USING MORE THAN 300,000 GAL/MONTH OF SURFACE WATER (9 VAC 25-780-70 E, - 80 B6, and - 80 C)

Water User Name	Waterbody Source Name	Use Category	DESIGN CAPACITY: Average Daily Withdrawal (gpd)	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawals (gpd)	Maximum Daily Withdrawals (MGD)	Limitations on Withdrawal Permit(s)	WATER USE: Estimated Annual Average (MGD) Year 2006-2007	Notes or Comments (Include service area user falls within and references to any maps, data sources, data gaps, etc.)
Within Community Water System (Municipal & Private) Service Areas									
				0.000		0.000			
Tanyard Country Club Golf Course	Tanyard Branch	IRR		0.000		0.000		0.027	Annual average amounts from VDEQ VWUDS database,
	Richardson Pond	IRR		0.000		0.000		0.037	**Mar06-Feb07**
				0.000		0.000			
				0.000		0.000			No information available for
				0.000		0.000			Average and Maximum Daily
				0.000		0.000			Withdrawals
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
Spring Creek Golf Course	Main Irrigation Lake	IRR		0.000		0.000		0.162	Pump Flow Meter Data
	(pumped from Camp Creek Transfer Lake)			0.000		0.000			**Mar 06 - Feb 07**
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
Within Community Water System Service Area Totals (MGD):				**0.000**		**0.000**		**0.226**	
Outside Community Water System (Municipal & Private) Service Areas									
				0.000		0.000			
North Anna Power Station	Lake Anna Unit 1	PN		0.000	1,354,000,000.00	1,354.000		1,044.000	SW withdrawal returned to outfall 001
	Lake Anna Unit 2	PN		0.000	1,354,000,000.00	1,354.000		1,055.000	SW withdrawal returned to outfall 001
	Lake Anna Hydro Dam	PH		0.000	84,020,000.00	84.020		51.000	SW withdrawal released to river below dam
				0.000		0.000			Contact: Jud White provided max daily amounts.
				0.000		0.000			Annual average amounts from VDEQ VWUDS database,
				0.000		0.000			**Mar06 - Feb07**
				0.000		0.000			
Louisa County Water Authority	Bowlers Mill Reservoir	OTH		0.000		0.000		0.014	Annual average amounts from VDEQ VWUDS database,
				0.000		0.000			**all 2006** data, so as to capture
				0.000		0.000			largest withdrawals (Jan 06 -
				0.000		0.000			Feb 06)
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
Outside Community Water System Service Area Totals (MGD):				**0.000**		**2,792.020**		**2150.014**	
Self-Supplied Nonagricultural Users of Surface Water Totals (MGD):				**0.000**		**2,792.020**		**2150.240**	

Non-Agricultural, Self-Supplied Users of Ground Water
Louisa County

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List non-agricultural groundwater source and use information for all self-supplied users of more than 300,000 gallons per month. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark users on associated map. **Note the data reference year in Column M, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, NON-AGRICULTURAL USERS USING MORE THAN 300,000 GAL/MONTH OF GROUND WATER (9 VAC 25-780-70 F, - 80 B6, and - 80 C)

Water User Name	Use Category	DESIGN CAPACITY: Average Daily Withdrawals (gpd)	DESIGN CAPACITY: Average Daily Withdrawals (MGD)	DESIGN CAPACITY: Maximum Daily Withdrawals (gpd)	DESIGN CAPACITY: Maximum Daily Withdrawals (MGD)	INDIVIDUAL WELL DATA: Well Name and ID #	Well Depth (feet)	Casing Depth (feet)	Screen Depth (Top & Bottom) or Water Zones	Well Diameter (inches)	Limitations on Withdrawal Permit(s)	WATER USE: Estimated Annual Average (MGD) YEAR 2006-2007	Notes or Comments (Include service area user falls within and references to any maps, data sources, data gaps, etc.)
Within Community Water System (Municipal & Private) Service Areas													
			0.000		0.000								
Crossing Pointe	COM		0.000		0.000	1	305	52		6	14800	0.013	Within LCWA Zion Crossroads
Permitted Capacity was 25,200 GPD			0.000		0.000	2	305	52		6	10400		Service Area.
(Wells taken offline in August 2010)			0.000		0.000								
			0.000		0.000								Average Daily from VDH
			0.000		0.000								Monthly Operation Reports
			0.000		0.000								for total system (Wells 1&2)
			0.000		0.000								**Mar 06 - Feb 07**
			0.000		0.000								VDH Engineering Description
			0.000		0.000								Sheet used for Max. Daily.
			0.000		0.000								
			0.000		0.000								***UPDATE*** - This user
			0.000		0.000								connected to the LCWA
			0.000		0.000								Zion Crossroads public water
			0.000		0.000								system in **August 2010**.
Within CWS Service Area Totals (MGD):			0.000		0.000							0.013	
Outside Community Water System (Municipal & Private) Service Areas													
			0.000		0.000								
Klockner Pentaplast	COM		0.000	57,600.00	0.058	2(1972)	280	50		8	32000	0.010	Contact: Keith Roberts
Permitted Capacity = 22,288 GPD			0.000	388,800.00	0.389	1-process (1992)	245	95		8	216000		l.mitchell@kpfilms.com Jim Gibson, 540-832-1400 x549
			0.000	288,000.00	0.288	2-process (1992)	120	114		8	160000		Annual Average from VDH
			0.000	33,120.00	0.033	3	125	90		8	18400		Monthly Operation Reports
			0.000		0.000	Barrier well abandoned	305	76		8	29600		for total system, **Mar 06 - Feb 07**
			0.000		0.000								VDH Engineering Description
			0.000		0.000								Sheet used for Max. Daily.
			0.000		0.000								
North Anna Power Station	PN		0.000	63,360.00	0.063	4(new)	305	111		6	35200	0.011	Contact: Tony Banks
Permitted Capacity = 128,800 GPD			0.000	79,200.00	0.079	6	375	142		6	44000		804-273-2170;
			0.000	89,280.00	0.089	7	730	103		8	49600		tony.banks@dom.com
			0.000		0.000	2(emerg.) abandoned	385	103		5	7200		or Jud White, Environmental Manager
			0.000		0.000	4(old) abandoned	200	100		6	43200		Annual Averages from VDH Monthly Operation Reports
			0.000		0.000								**Mar 06 - Feb 07**
North Anna Information Center	PN		0.000	89,280.00	0.089	1	260	72		8	59200	0.001	
Permitted Capacity = 19,600 GPD			0.000		0.000								VDH Engineering Description
			0.000		0.000								Sheet used for Max. Daily.
			0.000		0.000								
Siebert Amoco and Dairy Queen	COM		0.000	63,360.00	0.063	1	300	115		6	15000	0.015	Contact: Randy Siebert
Permitted Capacity = 15,000 GPD			0.000		0.000								804-276-3728 x30
			0.000		0.000								Annual Average based on 1500 customers per day and assume 10gpd/customer
			0.000		0.000								VDH Engineering Description
			0.000		0.000								Sheet used for Max. Daily
Outside CWS Service Area Totals (MGD):			0.000		1.152							0.037	
Self-Supplied Nonagricultural Users of Ground Water Totals (MGD):			0.000		1.152							0.050	
Self-Supplied Nonagricultural Users Totals (surface and groundwater in MGD):			0.000		2,793.172							2,150.290	

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Agricultural, Self-Supplied Users
Louisa County

List data for all agricultural users who utilize more than 300,000 gallons per month of ground or surface water. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark and label on associated map. **Note the data reference year in Column F, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, AGRICULTURAL USERS > 300,000 GAL/MONTH OF GROUND OR SURFACE WATER (9 VAC 25-780-70 I, -80B7, and -80D)

User Name	SOURCE TYPE: Ground Water Well Name & ID No.	SOURCE TYPE: Surface Water Reservoir & Sub-basin or Stream/River Name & Sub-basin	USE TYPE: Irrigation (Place an "X" in appropriate column cell)	USE TYPE: Nonirrigation (Place an "X" in appropriate column cell)	WATER USE: Estimated Annual Average (MGD) Year 2007 — Surface Water (MGD)	WATER USE: Estimated Annual Average (MGD) Year 2007 — Ground Water (MGD)	Notes or Comments (Include service area user falls within and any references to maps, data sources, data gaps, etc.)
Within Community Water System (Municipal & Private) Service Areas							
Within Community Water System Service Area Water Use Totals (MGD):					**0.000**	**0.000**	
Outside Community Water System (Municipal & Private) Service Areas							
Total County Livestock (Inventory):							Sources:
Milk Cows (442)				X		0.015	2007 Census of Agriculture USDA,
Beef Cows (6,847)				X		0.082	National Agricultural Statistics Service,
Other Cattle (5,083)				X		0.061	and Farm and Ranch Irrigation Survey
Hogs and Pigs (364)				X		0.001	
Sheep (264)				X		0.001	USGS Livestock Water Use
Goats (782)				X		0.002	
Horses and Ponies (957)				X		0.011	Water Source Type is **UNKNOWN.**
Mules, Burros, and Donkeys (97)				X		0.001	All water use is shown as ground water.
Total County Irrigated Land (Acres):							
Forage - all hay, grass silage, & greenchop (25)			X			0.004	
Land in Orchards (37)			X			0.023	
Hay - including alfalfa, and small grain (12)			X			0.003	
Vegetables (8)			X			0.003	
Remaining Irrigated Land (196)			X			0.105	
Outside Community Water System Service Area Water Use Totals (MGD):					**0.000**	**0.313**	
Estimated Total Agricultural Useage By Source (MGD):					**0.000**	**0.313**	

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Estimate well use information for small, self-supplied users on individual wells. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. **Note the data reference year in Row 7.**

ESTIMATED NUMBER OF RESIDENCES AND BUSINESSES THAT ARE SELF-SUPPLIED BY INDIVIDUAL WELLS WITHDRAWING LESS THAN 300,000 GALLONS PER MONTH (9 VAC 25-780-70J); ESTIMATED WATER USE BY SELF-SUPPLIED USERS ON INDIVIDUAL WELLS (9 VAC 25-780-80 B8 and -80 E)

ESTIMATING SMALL SELF-SUPPLIED USERS							ESTIMATING SMALL SELF-SUPPLIED WATER USE								
	Step 1: Estimate Total Population of Individual Self-Supplied Well Users			Step 2: Estimate Number of Residences and Businesses on Individual Wells			Step 3: Estimate Total Self-Supplied Water Use OUTSIDE COMMUNITY WATER SYSTEM SERVICE AREA				Step 4: Estimate Total Self-Supplied Water Use INSIDE COMMUNITY WATER SYSTEM SERVICE AREA				
Locality	Locality Population	Total Population Served by Community Water System(s)	Estimated Population Served by Individual Wells	Locality Specific Population Per Household Factor	Estimated Number of **RESIDENCES** on Wells (Column D ÷ Column E)	Estimated Number of **BUSINESSES** on Wells	Estimated Population Served by Individual Wells	Per Capita Water Use Factor (gal/person/day)	Average Annual Residential Use (gpd) (Column H x Column I)	Estimated Average Annual Use (MGD)	# of Self-Supplied Residences Within Service Area	Locality Specific Population Per Household Factor	Per Capita Water Use Factor (gal/person/day)	Average Annual Residential Use (gpd) (Columns M x N x O)	Estimated Annual Average Use (MGD)
	YEAR 2007	YEAR 2007													
Northeast Creek Reservoir Service Area:			0		-		0		0	0.000				0	0.000
Town of Louisa	2,379	1,501	878	2.56	343		878		0	0.000	343	2.56	65	57,075	0.057
Town of Mineral	1,698	640	1,058	2.56	413		1,058		0	0.000	413	2.56	65	68,723	0.069
LCWA Customers	221	221	0	2.56	-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
Zion Crossroads Service Area	1,593	454	1,139	2.56	445	1	1,139		0	0.000	445	2.56	80	91,136	0.091
			0		-		0		0	0.000				0	0.000
Future Service Areas:			0		-		0		0	0.000				0	0.000
Gum Spring	461	0	461	2.56	180	1	461	80	36,880	0.037				0	0.000
Ferncliff	602	0	602	2.56	235	1	602	80	48,160	0.048				0	0.000
Shannon Hill	300	0	300	2.56	117		300	80	24,000	0.024				0	0.000
Lake Anna	5,868	0	5,868	2.56	2,292	3	5,868	80	469,440	0.469				0	0.000
Boswell's Tavern	70	0	70	2.56	27		70	80	5,600	0.006				0	0.000
Gordonsville	433	0	433	2.56	169	1	433	80	34,640	0.035				0	0.000
			0		-		0		0	0.000				0	0.000
Rural Area	15,214	0	15,214	2.56	5,943	8	15,214	100	1,521,400	1.521				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
			0		-		0		0	0.000				0	0.000
Planning Area Totals:	28,839	2,816	26,023		10,165	15	26,023		2,140,120	2.140	1,201			216,934	0.217

Notes or Comments: (This may include references to maps, data sources, data gaps, etc.)	Estimated Number of Businesses = NC and NTNC water systems from VDH Waterworks/Owners List.

APPENDIX B

DETAILED WATER DEMAND MEMORANDUM

Dewberry
4180 Innslake Drive
Glen Allen, VA 23060
804.290.7957
804.290.7928 (fax)

Memorandum

Date: October 14, 2008

To: Lee Lintecum {Louisa County}
Bar Delk {Louisa County Water Authority}
Brian Marks {Town of Louisa}
Willie Harper {Town of Mineral}
Andrea Putscher {VDEQ}

From: Skip Notte, P.E. and Heather Campbell, P.E. {Dewberry}

RE: Louisa County Long Range Water Resource Plan
Determination of Population Projection and Water Demand

==========

This memo outlines the methodology utilized to establish the population projection and water demands for the Louisa County Long Range Water Resource Plan from 2007 to 2050.

Population Projection

Overall County Population

Several sources were consulted to determine the current population in Louisa County and develop projections for the increase in population through 2050. These sources included the Virginia Employment Commission (VEC), Weldon Cooper Center, the Louisa County Comprehensive Plan (dated September 5, 2006), and a Countywide Build Out Analysis performed by Louisa County in July of 2007. Weldon Cooper Center and the Countywide Build Out Analysis provided 2007 populations (Weldon Cooper Center – 31,177 and Countywide Build Out – 31,268), but did not provide specific year predictions for population past 2007. Therefore, only the VEC data and the data obtained from the Louisa County Comprehensive Plan could be analyzed in detail. **Table 1** is a side-by-side comparison of these two (2) sources.

Table 1: Population Projection by Source

Louisa County Comprehensive Plan	
year	population
1990	20,325
2000	25,407
2010	30,003
2020	34,599
2030	39,195
2040	43,791
2050	48,387
interpolate 2007	28,624

VEC community profile	
year	population
1990	20,506
2000	25,757
2010	33,923
2020	41,889
2030	50,739
2040 *	57,542
2050 *	65,202
* extrapolate w/ linear trendline. interpolate 2007	31,473

It is not completely understood why there is a discrepancy between the Louisa County Comprehensive Plan and the current VEC community profile since the Comprehensive Plan cites VEC as its source. Louisa County has stated that the VEC data which was included in the Comprehensive Plan was from either 1999 or 2000. Therefore, the data would not have accounted for the population boom around 2005. The County believes the current VEC profile has updated their numbers and adjusted the projection accordingly. In addition, the data from the current VEC profile, Weldon Cooper Center, and the Build Out Analysis appear to compare quite well for the year 2007.

Based on the above comparison, Dewberry's recommendation is to use the larger population numbers from the current VEC community profile; first, it is a more conservative estimate, so water resources will be allocated for a greater population in the Long Range Water Resources Plan, and second, since the Louisa County Build Out Analysis provides for a population estimate of 283,504 at complete county build-out with rezoning, the current VEC population projection (higher projection) will provide for a better planning tool, even though it is still only 23% of the potential maximum population in 2050.

As another cross-reference, the Virginia Department of Environmental Quality (VDEQ) suggested comparing the above population data to the population projections included in the permit application for the James River withdrawal by Fluvanna County and Louisa County. The consulting firm that completed the water study for the permit utilized population projections from VEC, May 2003. These numbers are slightly different from the current VEC data, but similar to the VEC numbers in the Louisa County Comprehensive Plan. Again, since these numbers do not appear to account for the population boom in 2005, Dewberry still recommends using the most recent VEC population data in an effort to provide the most accurate analysis possible.

Growth Rates By Area

After development of the overall County population projections, the second element for consideration is whether or not population growth would increase by a greater percentage in some areas vs. others for the analysis period. As part of the 2006 comprehensive plan, Louisa County identified nine specific areas (Town of Louisa, Town of Mineral, Zion Crossroads, Gum Spring, Ferncliff, Shannon Hill, Boswell's Tavern, Lake Anna, and Gordonsville) in the County for guiding growth and development. The county's intention for these growth areas was to have higher densities, more public services, and more fully developed infrastructure than the rest of the county.

In addition, the County also has individual communities (Blue Ridge Shores, Shenandoah Crossing, Six-o-Five Trailer Park, Trevilians Square Apartments, Twin Oaks, Lake Anna Plaza, and Jerdone Island) that provide private connections to central services. For the purposes of this analysis, these communities have been included with the growth areas for the entire County, however, they have been restricted to the amount of growth potential based on current subdivision of the community and/or current plans submitted for review by the County for future development within the respective community.

In 2007, the growth patterns were examined as part of the Countywide Build Out Analysis based on the issuance of Certificates of Occupancy (CO) from 2001 to 2007. While this analysis did show a higher density of COs issued in growth areas, overall numbers showed that the growth in rural areas and the growth in designated growth areas was equal. Basically, 50% of COs issued were for rural areas and 50% of COs issued were for growth areas. Dewberry consulted with the County Administrator, the two Town Managers, and the General Manager of the Louisa County Water

Authority (LCWA) to determine if this trend should be continued for the purposes of the Long Range Water Resources Plan. Per this consultation it is believed that this trend will not continue due to recent changes in zoning regulations, and in coming years more people will settle in the growth areas rather than the rural areas. Louisa County has just completed modifications to the zoning ordinances which have reduced by-right rural densities by more than 50%. This reduction was driven by the desire to maintain the rural character of the county. ***Based on suggestions made by the County and Town officials, Dewberry recommends a uniform percentage increase to population in growth areas and rural areas for 2010, and a higher percentage increase in growth areas for subsequent time steps***, as shown in **Table 2**.

Table 2: Incremental Population Increase and Distribution

VEC data			Population Distribution		
year	total population	incremental population increase	Ratio (rural/growth)	Rural Area	Existing Communities and Growth Areas
2007	31,473	--		--	--
2010	33,923	2,450	50/50	1,225	1,225
2020	41,889	7,966	35/65	2,788	5,178
2030	50,739	8,850	25/75	2,212	6,638
2040	57,542	6,803	25/75	1,701	5,102
2050	65,202	7,660	25/75	1,915	5,745

Additional data was also collected from the County on the existing private communities and proposed nine growth areas, such as the current number of addresses, the available number of addresses, and the number of COs issued from 2001 to 2007. This information is shown in **Table 3**.

Table 3: Population Data

	County Info		Countywide Build-Out Analysis Info (Ph 3)		Historical Development	
Existing Communities and Existing Growth Areas (GA)	**Current Addresses**	**Current Population**	**Available Addresses (COs)**	**Population Increase**	**COs issued (1/01-6/07)**	**COs/yr**
Blue Ridge Shores	575	1,472	633 ***	1621	77	12
Shenandoah Crossing	193	495	276 ***	707	25	4
Six-o-Five Trailer Park	97	249	11 ***	29	98	16
Trevilians Sq. Apt.s	7 bldgs	61 **	0 ***	0	0	0
Twin Oaks	15	100 **	0 ***	0	0	0
Lake Anna Plaza (Lake Anna)	43	111	12 ***	31	12	2
Jerdone Island (Lake Anna)	57	146	67 ***	172	22	4
Town of Louisa (GA)	935 *	2,490 *	267	684	151	24
Town of Mineral (GA)	828 *	1,808 *	318	815	84	13
Zion Crossroads (GA)	622	1,593	578 ***	1480	268	42
Proposed Growth Areas	**Current Addresses**	**Current Population**	**Available Addresses (COs)**	**Population Increase**	**Proposed Development**	
Lake Anna (remaining area)	2292	5,868	2333	5973	Distribution of projected population will be based on the percentage of addresses in that growth area to the total number of growth area addresses	
Gum Spring	180	461	122	313		
Ferncliff	235	602	165	423		
Shannon Hill	117	300	70	180		
Boswell's Tavern	27	70	32	82		
Gordonsville	169	433	104	267		

Notes:

1. *Phase 3 from Countywide Build-Out Analysis assumes build-out of all existing lots - one unit/lot*
2. *Current Population column assumes 2.56 people per address unless otherwise noted*
3. *Certificate of Occupancy (CO) is equivalent to one address*
4. ** combination of Build-Out Analysis data and Town data; household connections and population within Town limits provided by Towns*
5. *** current population from internet; not calculated*
6. **** County provided data for communities not included in the Countywide Build-Out Analysis and updated data for Zion Crossroads*

Based on this information, the percentage of the incremental population increase designated to existing communities and growth areas at each time step (Table 2) can then be further distributed among each existing community and each proposed growth area. For the existing communities, the population is distributed per the historical COs/yr until the available addresses have been exhausted. When all available addresses are occupied, then population growth stops in the existing community. For the growth areas, it is assumed that even once the available addresses have been exhausted, rezoning will occur to allow for more development and growth in each growth area. At that point, the population is distributed based on the percentage of addresses in each growth area compared to the total number of addresses in all growth areas. **Table 4** shows the population distribution to each existing community, each growth area, and rural area.

Table 4: Population Projection

Service Area		2007 population		2010 population			2020 population			2030 population			2040 population			2050 population		
Existing Community and Existing Growth Area (GA) Water Systems		not connected	connected	not connected	COs issued (2007-2010)	connected	not connected	COs issued (2010-2020)	connected	not connected	COs issued (2020-2030)	connected	not connected	COs issued (2030-2040)	connected	not connected	COs issued (2040-2050)	connected
Blue Ridge Shores		--	1,472	--	36	1,564	--	120	1,871	--	120	2,178	--	120	2,485	--	120	2,792
Shenandoah Crossing		--	495	--	12	526	--	40	628	--	40	730	--	40	832	--	40	935
Six-o-Five Trailer Park		--	249	--	11	278	--	0	278	--	0	278	--	0	278	--	0	278
Trevilians Square Apartments		--	61	--	0	61	--	0	61	--	0	61	--	0	61	--	0	61
Twin Oaks		--	100	--	0	100	--	0	100	--	0	100	--	0	100	--	0	100
Lake Anna	Lake Anna Plaza	--	111	--	6	126	--	6	142	--	0	142	--	0	142	--	0	142
	Jerdone Island	--	146	--	12	177	--	40	280	--	15	318	--	0	318	--	0	318
Northeast Creek Reservoir	LCWA (GA)	--	221	--	--	221	--	--	221	--	--	221	--	--	221	--	--	221
	Town of Louisa (GA)	878	1,501	878	72	1,685	790	303	2,549	711	451	3,783	639	326	4,690	575	371	5,704
	Town of Mineral (GA)	1,058	640	1,058	39	740	952	130	1,179	856	130	1,608	770	179	2,152	693	203	2,749
Zion Crossroads (GA)		1,139	454	1,139	126	777	1,025	420	1,966	922	404	3,103	829	292	3,944	746	332	4,876
Sub-total Population (not connected) =		3,075	--	3,075	--	--	2,767	--	--	2,489	--	--	2,238	--	--	2,014	--	--
Sub-total Population (connected) =		--	5,450	--	--	6,255	--	--	9,275	--	--	12,522	--	--	15,223	--	--	18,176
Proposed Growth Area Water Systems		not connected	connected	not connected	COs issued (2007-2010)	connected	not connected	COs issued (2010-2020)	connected	not connected	COs issued (2020-2030)	connected	not connected	COs issued (2030-2040)	connected	not connected	COs issued (2040-2050)	connected
Gum Spring		461	--	461	10	26	414	58	221	372	86	483	334	62	680	300	71	896
Ferncliff		602	--	602	14	36	541	75	289	486	112	631	437	81	887	393	92	1,166
Shannon Hill		300	--	300	7	18	270	38	145	243	56	315	218	40	442	196	46	582
Lake Anna	Remaining Area	5,868	--	5,868	133	340	5,281	734	2,806	4,752	1091	6,128	4,276	789	8,624	3,848	897	11,348
Boswell's Tavern		70	--	70	0	--	63	8	27	56	12	65	50	9	94	45	10	125
Gordonsville		433	--	433	0	--	389	51	174	350	76	408	315	55	584	283	62	775
Sub-total Population (not connected) =		7,734	--	7,734	--	--	6,958	--	--	6,259	--	--	5,630	--	--	5,065	--	--
Sub-total Population (connected) =		--	0	--	--	420	--	--	3,662	--	--	8,030	--	--	11,311	--	--	14,892
Rural Area (Individual wells)		not connected	connected	not connected	COs issued (2007-2010)	connected	not connected	COs issued (2010-2020)	connected	not connected	COs issued (2020-2030)	connected	not connected	COs issued (2030-2040)	connected	not connected	COs issued (2040-2050)	connected
Sub-total Population (not connected) =		15,214	--	16,439	--	--	19,227	--	--	21,439	--	--	23,140	--	--	25,055	--	--
Total Population =		**31,473**		**33,923**			**41,889**			**50,739**			**57,542**			**65,202**		

	1225 pop =	478 COs		5178 pop =	2023 COs		6638 pop =	2593 COs		5102 pop =	1993 COs		5745 pop =	2244 COs	
	COs left =	164 COs		COs left =	1267 COs		COs left =	2288 COs		COs left =	1833 COs		COs left =	2084 COs	
Growth Area (GA)	GA	%	COs	GA	%	COs	GA	%	COs	GA	%	COs	GA	%	COs
ToL - Town of Louisa	ToL	--	*72*	ToL	23.9%	303.0	ToL	19.7%	450.7	ToL	17.8%	326.0	ToL	17.8%	370.6
ToM - Town of Mineral	ToM	--	*39*	ToM	--	*130*	ToM	--	*130*	ToM	9.7%	178.7	ToM	9.8%	203.2
Z - Zion Crossroads	Z	--	*126*	Z	--	*420*	Z	17.6%	403.7	Z	15.9%	291.9	Z	15.9%	332.0
LA - Remaining Lake Anna	LA	430.5%	706.1	LA	57.9%	733.9	LA	47.7%	1091.6	LA	43.1%	789.1	LA	43.1%	897.2
GS - Gum Spring	GS	33.8%	55.5	GS	4.5%	57.6	GS	3.7%	85.7	GS	3.4%	62.0	GS	3.4%	70.5
F - Ferncliff	F	44.2%	72.4	F	6.0%	75.4	F	4.9%	112.0	F	4.4%	81.0	F	4.4%	92.1
SH - Shannon Hill	SH	22.0%	36.1	SH	3.0%	37.6	SH	2.4%	56.0	SH	2.2%	40.5	SH	2.2%	45.9
BT - Boswell's Tavern	BT	--	*0*	BT	0.7%	8.3	BT	0.5%	12.1	BT	0.5%	8.8	BT	0.5%	10.0
G - Gordonsville	G	--	*0*	G	4.0%	51.2	G	3.3%	76.0	G	3.0%	55.0	G	3.0%	62.5

- Once all available addresses have been occupied in the existing systems, population is distributed to growth areas based on percentage of total growth area addresses

Water Demand

As stated previously, Louisa County is comprised of existing communities, nine growth areas, and rural areas. Dwellings in existing communities and growth areas are generally connected to public water systems, whereas dwellings in rural areas generally have individual wells.

Since individual wells are typically not metered, the conservative estimate for water usage in rural areas is recommended to be the daily consumption rate of 100 gallons per day (gpd) per person which is specified by the Virginia Department of Health (VDH) Waterworks Regulations.

In an effort to calculate a more accurate water consumption rate per person for the existing communities and the nine growth areas, Dewberry utilized water usage history from the Towns, LCWA, and the VDEQ templates for the Long Range Water Resource Plan. The templates were created from data and reports from VDH and VDEQ.

The data received from the Towns and LCWA represents water usage from April 2007 to March 2008 for the Northeast Creek Reservoir service area (Town of Louisa, Town of Mineral, and LCWA customers), and for the Zion Crossroads service area (LCWA customers), and was categorized as residential or commercial. See **Table 5**.

Table 5: Water Usage for the Towns and LCWA

	Northeast Creek Reservoir Service Area			Zion Crossroads Service Area
	LCWA	Town of Louisa	Town of Mineral	LCWA
Residential Water Usage (gal/year)	4,303,090	35,278,599	14,707,760	12,907,615
Residential Water Usage (GPD)	11,789	96,654	40,295	35,363
Active Residential Households	86	--	--	177
Persons per Household, 2000 U.S. Census	2.56	--	--	2.56
Population	221	1501 *	640 **	454
Residential Water Consumption (GPD/person)	53	64	63	78
Commercial Water Usage (gal/year)	17,025,610	20,393,300	4,887,430	17,703,940
Bulk Sales (gal/year)	1,050	N/A	N/A	1,414,275
Total Water Usage (gal/year)	21,329,750	55,671,899	19,595,190	32,025,830
Residential Water Usage (%)	20.2%	63.4%	75.1%	40.3%
Commercial Water Usage (%)	79.8%	36.6%	24.9%	55.3%

Notes:

1. Water usage/consumption based on water meter reports from the Towns and LCWA for period of April 2007 to March 2008.
*2. * Town of Louisa populations provided, not calculated.*
*3. ** Town of Mineral population provided w/in Town limits; calculated for customers outside Town limits.*
4. Based on water production reports versus water meter reports, total water usage equals ~85% of water produced, so 15% of water produced is considered lost/unaccounted.

The data received from the Towns and LCWA also identified a difference between the water produced and the water sold. This difference was approximately 15%, and is considered lost or unaccountable water. Therefore, the plan will look to provide future resources that take this into consideration, while also identifying reduction in lost or unaccountable water as a potential water conservation approach. ***Dewberry recommends that the methodology includes a reduction of 1% in lost or unaccountable water for each time step as a goal for conservation.***

While the Towns and Zion Crossroads are each considered growth areas by the Louisa County Comprehensive Plan, there is an obvious distinction in the water usage for these areas. The Towns are older, more established areas in comparison to the newer, booming growth in the Zion Crossroads area. A large percentage, if not all, of the newer homes in Zion Crossroads also have irrigation systems. ***Based on this information, Dewberry recommends using a water consumption rate to the nearest 5 GPD/person for the LCWA customers within the Northeast Creek Reservoir service area (55 GPD/person), the Town of Louisa (65 GPD/person), and the Town of Mineral (65 GPD/person), and 80 GPD/person for the growth areas (Zion Crossroads, Gum Spring, Ferncliff, Shannon Hill, Boswell's Tavern, Lake Anna, and Gordonsville).***

Commercial water usage requires a slightly different projection than residential water usage because it's not possible to calculate commercial water consumption per person. Table 5 shows the percentage of commercial water usage compared to residential water usage. ***Dewberry recommends maintaining the percentage of commercial water usage for the water demand projections. This means the population projections will be used to obtain the number of residents, the baseline residential water consumption per person will be used to calculate residential water usage, and then the commercial water usage can be calculated based on the residential and commercial percentages shown in Table 5.***

Zion Crossroads will again be representative of the growth areas (not the Towns). However, Dewberry does not believe the percentage breakdown of residential versus commercial water usage in Zion Crossroads applies to all growth areas. A Wal-mart Distribution Center is currently located in Zion Crossroads. It is believed that the amount of water being used by this facility is skewing the commercial percentage since residential development has only begun over the last five plus years. **Table 6** shows the percentage breakdown when the Wal-mart Distribution Center water usage is removed:

Table 6: Residential and Commercial Water Usage in Growth Areas

	Zion Crossroads Service Area
Residential Water Usage (%)	58.6%
Commercial Water Usage (%)	34.9%
Bulk Sales (%)	6.4%

The residential usage changes to 60% rather than the 40% shown in Table 5. The County Administrator, the two Town Managers, and the General Manager of LCWA believe that the current 60% commercial usage in Zion Crossroads would be representative for growth areas located along Interstate 64 (Zion Crossroads, Gum Spring, Ferncliff, Shannon Hill), but that the remaining growth areas (Lake Anna, Boswell's Tavern, Gordonsville) will be closer to 40% commercial usage.

As stated above, water usage reports on record with VDH and VDEQ were used to complete the VDEQ templates for the Louisa County Long Range Water Resources Plan. Since the private communities will contribute to the overall plan, average consumption rates are required to provide anticipated water resource demands for individual time steps. The templates and water usage records were used to calculate the average water consumption rates. **Table 7** shows this information.

Table 7: Water Usage for Existing Communities

	Blue Ridge Shores	Shenandoah Crossing	Six-o-Five Trailer Park	Trevilians Square Apts	Twin Oaks	Lake Anna Service Area	
						Lake Anna Plaza	Jerdone Island
Residential Water Consumption (GPD/person)	35	113	251	100	85	41	133

Notes:
1. *Water consumption based on VDEQ templates, which utilized VDH and VDEQ water reports.*
2. *Community water systems do not have commercial water usage.*
3. *Assume water consumption is 85% of water produced.*

As recommended previously with the Towns and LCWA customers, Dewberry also recommends using a water consumption rate to the nearest 5 GPD/person for the existing communities.

In addition to the rural areas, nine growth areas, and the private existing communities, there are four "Self-Supplied Users" that use greater than 300,000 gallons/month of groundwater for non-agricultural uses that are not located in existing growth areas. These large water consumers will need to be identified in the plan and incorporated into each individual time step to help provide a complete demand for the County. ***Since it is uncertain at this time if any of these large consumers will expand in any of the time steps identified in this plan, Dewberry recommends their consumptions to remain constant for each step.*** **Table 8** shows this information.

Table 8: Water Usage for Self-supplied Users > 300,000 GPD/month

	Klockner Pentaplast	North Anna Power Plant	Siebert Amoco and Dairy Queen	Crossing Pointe
Commercial Water Usage (GPD)	10,150	11,710	15,000	12,760

Notes:
1. *Water consumption based on VDEQ templates, which utilized VDH and VDEQ water reports.*
2. *Assume water consumption is 85% of water produced.*

Phasing of New Service Areas

After development of the population projections and the water demand projections, the final portion of the methodology includes loading each of the time steps to generate overall Countywide demands. To complete this final portion, consideration must be given to the "phasing in" of new service areas. As stated above, the County has nine growth areas. Only three (Town of Louisa, Town of Mineral, and Zion Crossroads) of the nine growth areas, currently have public utilities provided by the County. While Lake Anna can be considered "in phase", the existence of County provided public utilities has not been significantly developed to provide a reliable source to a variety of customers. Therefore, for purposes of this methodology, Lake Anna will be considered a proposed growth area. Based on this approach and an initial investigation of speculation projects or projects under review by County officials, ***Dewberry recommends that four (Lake Anna, Gum Spring, Ferncliff, and Shannon Hill)***

of the remaining six growth areas become "in phase" in the 2010 time step. This will leave the final two growth areas (Boswell's Tavern and Gordonsville), which are recommended to come "in-phase" in the 2020 time step.

Conclusion

The attached tables illustrate the recommended final population and water demand projections separated by existing communities, growth areas (existing and proposed), self-supplied users more than 300,000 gal/mo, and rural areas for the 2007, 2010, 2020, 2030, 2040, and 2050 time steps.

Table 9 summarizes the total population and total water demand for Louisa County at each time step.

Table 9: Projected Population and Water Demand

Year		2007	2010	2020	2030	2040	2050
Total Population		31,473	33,923	41,889	50,739	57,542	65,202
Total Water Demand (MGD)	***Existing Communities***	0.246	0.265	0.305	0.333	0.354	0.376
	Growth Areas	0.424	0.597	1.55	2.70	3.55	4.47
	SSU > 300,000 gal/mo	0.0584	0.0577	0.0570	0.0564	0.0558	0.0551
	Individual Wells	2.81	2.92	3.10	3.23	3.31	3.41
Total County Water Demand (MGD)		3.54	3.84	5.02	6.32	7.27	8.31

- SSU: Self-Supplied Users

Table 10: 2007 Population and Water Demand Projections

2007								
Existing Community and Existing Growth Area (GA) Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (85% of Demand) (GPD)	Water Lost (15% of Demand) (GPD)	Water Demand (GPD)
Blue Ridge Shores		1,472	35	51,520	0	51,520	9,092	60,612
Shenandoah Crossing		495	115	56,925	0	56,925	10,046	66,971
Six-o-Five Trailer Park		249	250	62,250	0	62,250	10,985	73,235
Trevilians Square Apartments		61	100	6,100	0	6,100	1,076	7,176
Twin Oaks		100	85	8,500	0	8,500	1,500	10,000
Lake Anna	Lake Anna Plaza	111	40	4,440	0	4,440	784	5,224
	Jerdone Island	146	135	19,710	0	19,710	3,478	23,188
Northeast Creek Reservoir	LCWA (GA)	221	55	12,155	48,018	60,173	10,619	70,792
	Town of Louisa (GA)	1,501	65	97,565	56,323	153,888	27,157	181,045
	Town of Mineral (GA)	640	65	41,600	13,793	55,393	9,775	65,168
* Zion Crossroads (GA)		454	80	36,320	54,480	90,800	16,024	106,824
	Sub-total =	5,450	--	397,085	172,614	569,699	100,535	670,234
Self-Supplied Users > 300,000 gal/month		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (85% of Demand) (GPD)	Water Lost (15% of Demand) (GPD)	Water Demand (GPD)
Klockner Pentaplast		--	--	--	10,150	10,150	1,791	11,941
North Anna Power Plant		--	--	--	11,710	11,710	2,066	13,776
Siebert Amoco and Dairy Queen		--	--	--	15,000	15,000	2,647	17,647
Crossing Pointe		--	--	--	12,760	12,760	2,252	15,012
	Sub-total =	--	--	--	49,620	49,620	8,756	58,376
Water Source: Individual Wells		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (85% of Demand) (GPD)	Water Lost (15% of Demand) (GPD)	Water Demand (GPD)
Growth Areas		10,809	80	864,720	0	864,720	152,598	1,017,318
Rural Area		15,214	100	1,521,400	0	1,521,400	268,482	1,789,882
	Sub-total =	26,023	--	2,386,120	0	2,386,120	421,080	2,807,200
	Total =	31,473	--	2,783,205	222,234	3,005,439	530,372	**3,535,811**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 5.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

Table 11: 2010 Population and Water Demand Projections

2010								
Existing Community and Existing Growth Area (GA) Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (86% of Demand) (GPD)	Water Lost (14% of Demand) (GPD)	Water Demand (GPD)
Blue Ridge Shores		1,564	35	54,740	0	54,740	8,911	63,651
Shenandoah Crossing		526	115	60,490	0	60,490	9,847	70,337
Six-o-Five Trailer Park		278	250	69,500	0	69,500	11,314	80,814
Trevilians Square Apartments		61	100	6,100	0	6,100	993	7,093
Twin Oaks		100	85	8,500	0	8,500	1,384	9,884
Lake Anna	Lake Anna Plaza	126	40	5,040	0	5,040	820	5,860
	Jerdone Island	177	135	23,895	0	23,895	3,890	27,785
Northeast Creek Reservoir	LCWA (GA)	221	55	12,155	48,018	60,173	9,796	69,969
	Town of Louisa (GA)	1,685	65	109,525	63,227	172,752	28,122	200,875
	Town of Mineral (GA)	740	65	48,100	15,948	64,048	10,426	74,474
* Zion Crossroads (GA)		777	80	62,160	93,240	155,400	25,298	180,698
	Sub-total =	6,255	--	460,205	220,434	680,639	110,802	791,440
Self-Supplied Users > 300,000 gal/month		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (86% of Demand) (GPD)	Water Lost (14% of Demand) (GPD)	Water Demand (GPD)
Klockner Pentaplast		--	--	--	10,150	10,150	1,652	11,802
North Anna Power Plant		--	--	--	11,710	11,710	1,906	13,616
Siebert Amoco and Dairy Queen		--	--	--	15,000	15,000	2,442	17,442
Crossing Pointe		--	--	--	12,760	12,760	2,077	14,837
	Sub-total =	--	--	--	49,620	49,620	8,078	57,698
Proposed Growth Area Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (86% of Demand) (GPD)	Water Lost (14% of Demand) (GPD)	Water Demand (GPD)
* Gum Spring		26	80	2,080	3,120	5,200	847	6,047
* Ferncliff		36	80	2,880	4,320	7,200	1,172	8,372
* Shannon Hill		18	80	1,440	2,160	3,600	586	4,186
Lake Anna	Remaining Area	340	80	27,200	18,133	45,333	7,380	52,713
Boswell's Tavern (not in phase)		--	--	--	--	--	--	--
Gordonsville (not in phase)		--	--	--	--	--	--	--
	Sub-total =	420	--	33,600	27,733	61,333	9,984	71,318
Water Source: Individual Wells		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (86% of Demand) (GPD)	Water Lost (14% of Demand) (GPD)	Water Demand (GPD)
Growth Areas		10,809	80	864,720	0	864,720	140,768	1,005,488
Rural Area		16,439	100	1,643,900	0	1,643,900	267,612	1,911,512
	Sub-total =	27,248	--	2,508,620	0	2,508,620	408,380	2,917,000
	Total =	33,923	--	3,002,425	297,787	3,300,212	537,244	**3,837,456**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 5.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 12: 2020 Population and Water Demand Projections

2020								
Existing Community and Existing Growth Area (GA) Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (87% of Demand) (GPD)	Water Lost (13% of Demand) (GPD)	Water Demand (GPD)
Blue Ridge Shores		1,871	35	65,485	0	65,485	9,785	75,270
Shenandoah Crossing		628	115	72,220	0	72,220	10,791	83,011
Six-o-Five Trailer Park		278	250	69,500	0	69,500	10,385	79,885
Trevilians Square Apartments		61	100	6,100	0	6,100	911	7,011
Twin Oaks		100	85	8,500	0	8,500	1,270	9,770
Lake Anna	Lake Anna Plaza	142	40	5,680	0	5,680	849	6,529
	Jerdone Island	280	135	37,800	0	37,800	5,648	43,448
Northeast Creek Reservoir	LCWA (GA)	221	55	12,155	48,018	60,173	8,991	69,165
	Town of Louisa (GA)	2,549	65	165,685	95,648	261,333	39,050	300,383
	Town of Mineral (GA)	1,179	65	76,635	25,409	102,044	15,248	117,292
* Zion Crossroads (GA)		1,966	80	157,280	235,920	393,200	58,754	451,954
	Sub-total =	9,275	--	677,040	404,995	1,082,035	161,683	1,243,718
Self-Supplied Users > 300,000 gal/month		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (87% of Demand) (GPD)	Water Lost (13% of Demand) (GPD)	Water Demand (GPD)
Klockner Pentaplast		--	--	--	10,150	10,150	1,517	11,667
North Anna Power Plant		--	--	--	11,710	11,710	1,750	13,460
Siebert Amoco and Dairy Queen		--	--	--	15,000	15,000	2,241	17,241
Crossing Pointe		--	--	--	12,760	12,760	1,907	14,667
	Sub-total =	--	--	--	49,620	49,620	7,414	57,034
Proposed Growth Area Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (87% of Demand) (GPD)	Water Lost (13% of Demand) (GPD)	Water Demand (GPD)
* Gum Spring		221	80	17,680	26,520	44,200	6,605	50,805
* Ferncliff		289	80	23,120	34,680	57,800	8,637	66,437
* Shannon Hill		145	80	11,600	17,400	29,000	4,333	33,333
Lake Anna	Remaining Area	2,806	80	224,480	149,653	374,133	55,905	430,038
Boswell's Tavern		27	80	2,160	1,440	3,600	538	4,138
Gordonsville		174	80	13,920	9,280	23,200	3,467	26,667
	Sub-total =	3,662	--	292,960	238,973	531,933	79,484	611,418
Water Source: Individual Wells		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (87% of Demand) (GPD)	Water Lost (13% of Demand) (GPD)	Water Demand (GPD)
Growth Areas		9,725	80	778,000	0	778,000	116,253	894,253
Rural Area		19,227	100	1,922,700	0	1,922,700	287,300	2,210,000
	Sub-total =	28,952	--	2,700,700	0	2,700,700	403,553	3,104,253
	Total =	41,889	--	3,670,700	693,588	4,364,288	652,135	**5,016,423**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 5.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 13: 2030 Population and Water Demand Projections

2030								
Existing Community and Existing Growth Area (GA) Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (88% of Demand) (GPD)	Water Lost (12% of Demand) (GPD)	Water Demand (GPD)
Blue Ridge Shores		2,178	35	76,230	0	76,230	10,395	86,625
Shenandoah Crossing		730	115	83,950	0	83,950	11,448	95,398
Six-o-Five Trailer Park		278	250	69,500	0	69,500	9,477	78,977
Trevilians Square Apartments		61	100	6,100	0	6,100	832	6,932
Twin Oaks		100	85	8,500	0	8,500	1,159	9,659
Lake Anna	Lake Anna Plaza	142	40	5,680	0	5,680	775	6,455
	Jerdone Island	318	135	42,930	0	42,930	5,854	48,784
Northeast Creek Reservoir	LCWA (GA)	221	55	12,155	48,018	60,173	8,205	68,379
	Town of Louisa (GA)	3,783	65	245,895	141,952	387,847	52,888	440,735
	Town of Mineral (GA)	1,608	65	104,520	34,654	139,174	18,978	158,153
* Zion Crossroads (GA)		3,103	80	248,240	372,360	620,600	84,627	705,227
	Sub-total =	12,522	--	903,700	596,985	1,500,685	204,639	1,705,324
Self-Supplied Users > 300,000 gal/month		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (88% of Demand) (GPD)	Water Lost (12% of Demand) (GPD)	Water Demand (GPD)
Klockner Pentaplast		--	--	--	10,150	10,150	1,384	11,534
North Anna Power Plant		--	--	--	11,710	11,710	1,597	13,307
Siebert Amoco and Dairy Queen		--	--	--	15,000	15,000	2,045	17,045
Crossing Pointe		--	--	--	12,760	12,760	1,740	14,500
	Sub-total =	--	--	--	49,620	49,620	6,766	56,386
Proposed Growth Area Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (88% of Demand) (GPD)	Water Lost (12% of Demand) (GPD)	Water Demand (GPD)
* Gum Spring		483	80	38,640	57,960	96,600	13,173	109,773
* Ferncliff		631	80	50,480	75,720	126,200	17,209	143,409
* Shannon Hill		315	80	25,200	37,800	63,000	8,591	71,591
Lake Anna	Remaining Area	6,128	80	490,240	326,827	817,067	111,418	928,485
Boswell's Tavern		65	80	5,200	3,467	8,667	1,182	9,848
Gordonsville		408	80	32,640	21,760	54,400	7,418	61,818
	Sub-total =	8,030	--	642,400	523,533	1,165,933	158,991	1,324,924
Water Source: Individual Wells		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (88% of Demand) (GPD)	Water Lost (12% of Demand) (GPD)	Water Demand (GPD)
Growth Areas		8,748	80	699,840	0	699,840	95,433	795,273
Rural Area		21,439	100	2,143,900	0	2,143,900	292,350	2,436,250
	Sub-total =	30,187	--	2,843,740	0	2,843,740	387,783	3,231,523
	Total =	50,739	--	4,389,840	1,170,138	5,559,978	758,179	**6,318,157**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 5.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 14: 2040 Population and Water Demand Projections

2040								
Existing Community and Existing Growth Area (GA) Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (89% of Demand) (GPD)	Water Lost (11% of Demand) (GPD)	Water Demand (GPD)
Blue Ridge Shores		2,485	35	86,975	0	86,975	10,750	97,725
Shenandoah Crossing		832	115	95,680	0	95,680	11,826	107,506
Six-o-Five Trailer Park		278	250	69,500	0	69,500	8,590	78,090
Trevilians Square Apartments		61	100	6,100	0	6,100	754	6,854
Twin Oaks		100	85	8,500	0	8,500	1,051	9,551
Lake Anna	Lake Anna Plaza	142	40	5,680	0	5,680	702	6,382
	Jerdone Island	318	135	42,930	0	42,930	5,306	48,236
Northeast Creek Reservoir	LCWA (GA)	221	55	12,155	48,018	60,173	7,437	67,610
	Town of Louisa (GA)	4,690	65	304,850	175,986	480,836	59,429	540,265
	Town of Mineral (GA)	2,152	65	139,880	46,378	186,258	23,021	209,279
* Zion Crossroads (GA)		3,944	80	315,520	473,280	788,800	97,492	886,292
	Sub-total =	15,223	--	1,087,770	743,663	1,831,433	226,357	2,057,789
Self-Supplied Users > 300,000 gal/month		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (89% of Demand) (GPD)	Water Lost (11% of Demand) (GPD)	Water Demand (GPD)
Klockner Pentaplast		--	--	--	10,150	10,150	1,254	11,404
North Anna Power Plant		--	--	--	11,710	11,710	1,447	13,157
Siebert Amoco and Dairy Queen		--	--	--	15,000	15,000	1,854	16,854
Crossing Pointe		--	--	--	12,760	12,760	1,577	14,337
	Sub-total =	--	--	--	49,620	49,620	6,133	55,753
Proposed Growth Area Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (89% of Demand) (GPD)	Water Lost (11% of Demand) (GPD)	Water Demand (GPD)
* Gum Spring		680	80	54,400	81,600	136,000	16,809	152,809
* Ferncliff		887	80	70,960	106,440	177,400	21,926	199,326
* Shannon Hill		442	80	35,360	53,040	88,400	10,926	99,326
Lake Anna	Remaining Area	8,624	80	689,920	459,947	1,149,867	142,118	1,291,985
Boswell's Tavern		94	80	7,520	5,013	12,533	1,549	14,082
Gordonsville		584	80	46,720	31,147	77,867	9,624	87,491
	Sub-total =	11,311	--	904,880	737,187	1,642,067	202,952	1,845,019
Water Source: Individual Wells		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (89% of Demand) (GPD)	Water Lost (11% of Demand) (GPD)	Water Demand (GPD)
Growth Areas		7,868	80	629,440	0	629,440	77,796	707,236
Rural Area		23,140	100	2,314,000	0	2,314,000	286,000	2,600,000
	Sub-total =	31,008	--	2,943,440	0	2,943,440	363,796	3,307,236
	Total =	57,542	--	4,936,090	1,530,469	6,466,559	799,238	**7,265,797**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 5.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

Table 15: 2050 Population and Water Demand Projections

2050								
Existing Community and Existing Growth Area (GA) Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (90% of Demand) (GPD)	Water Lost (10% of Demand) (GPD)	Water Demand (GPD)
Blue Ridge Shores		2,792	35	97,720	0	97,720	10,858	108,578
Shenandoah Crossing		935	115	107,525	0	107,525	11,947	119,472
Six-o-Five Trailer Park		278	250	69,500	0	69,500	7,722	77,222
Trevilians Square Apartments		61	100	6,100	0	6,100	678	6,778
Twin Oaks		100	85	8,500	0	8,500	944	9,444
Lake Anna	Lake Anna Plaza	142	40	5,680	0	5,680	631	6,311
	Jerdone Island	318	135	42,930	0	42,930	4,770	47,700
Northeast Creek Reservoir	LCWA (GA)	221	55	12,155	48,018	60,173	6,686	66,859
	Town of Louisa (GA)	5,704	65	370,760	214,035	584,795	64,977	649,772
	Town of Mineral (GA)	2,749	65	178,685	59,244	237,929	26,437	264,366
* Zion Crossroads (GA)		4,876	80	390,080	585,120	975,200	108,356	1,083,556
	Sub-total =	18,176	--	1,289,635	906,418	2,196,053	244,006	2,440,058
Self-Supplied Users > 300,000 gal/month		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (90% of Demand) (GPD)	Water Lost (10% of Demand) (GPD)	Water Demand (GPD)
Klockner Pentaplast		--	--	--	10,150	10,150	1,128	11,278
North Anna Power Plant		--	--	--	11,710	11,710	1,301	13,011
Siebert Amoco and Dairy Queen		--	--	--	15,000	15,000	1,667	16,667
Crossing Pointe		--	--	--	12,760	12,760	1,418	14,178
	Sub-total =	--	--	--	49,620	49,620	5,513	55,133
Proposed Growth Area Water Systems		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (90% of Demand) (GPD)	Water Lost (10% of Demand) (GPD)	Water Demand (GPD)
* Gum Spring		896	80	71,680	107,520	179,200	19,911	199,111
* Ferncliff		1,166	80	93,280	139,920	233,200	25,911	259,111
* Shannon Hill		582	80	46,560	69,840	116,400	12,933	129,333
Lake Anna	Remaining Area	11,348	80	907,840	605,227	1,513,067	168,119	1,681,185
Boswell's Tavern		125	80	10,000	6,667	16,667	1,852	18,519
Gordonsville		775	80	62,000	41,333	103,333	11,481	114,815
	Sub-total =	14,892	--	1,191,360	970,507	2,161,867	240,207	2,402,074
Water Source: Individual Wells		Population	Residential Water Usage (GPD/p)	Residential Water Usage (GPD)	Commercial Water Usage (GPD)	Total Usage (90% of Demand) (GPD)	Water Lost (10% of Demand) (GPD)	Water Demand (GPD)
Growth Areas		7,079	80	566,320	0	566,320	62,924	629,244
Rural Area		25,055	100	2,505,500	0	2,505,500	278,389	2,783,889
	Sub-total =	32,134	--	3,071,820	0	3,071,820	341,313	3,413,133
	Total =	65,202	--	5,552,815	1,926,544	7,479,359	831,040	**8,310,399**

Notes:

1. The Towns and LCWA utilize the Commercial Water Usage % shown in Table 5.

*2. * Growth Areas along I-64 utilize a projection of 60% Commercial Water Usage and 40% Residential Water Usage.*

3. Remaining Proposed Growth Areas utilize a projection of 40% Commerical Water Usage and 60% Residential Water Usage.

APPENDIX C

DROUGHT RESPONSE AND CONTINGENCY PLAN ORDINANCES

BOARD OF SUPERVISORS
COUNTY OF LOUISA
RESOLUTION

At a regular meeting of the Board of Supervisors of the County of Louisa held in the Louisa County Office Building at 5:00 p.m. on the 21st day of October 2002, at which the following members were present, the following resolution was adopted by a majority of all members of the Board of Supervisors, the vote being recorded in the minutes of the meeting as shown below:

PRESENT	VOTE
C. Edward Kube, Jr., Chairman	Yes
Willie L. Harper, Vice-Chairman	Yes
Fitzgerald A. Barnes	Yes
Edward T. Deale	Yes
David B. Morgan, M.D.	Yes
William A. Seay, Jr.	Yes
Jack T. Wright	Yes

On motion of Mr. Wright, seconded by Mr. Barnes, which carried by a vote of 7-0, the following resolution was adopted:

A RESOLUTION TO ESTABLISH PROVISIONS RELATING TO MANDATORY RESTRICTIONS ON THE USE OF SURFACE AND GROUND WATER IN THE COUNTY, INCLUDING PROVISIONS TO RESTRICT THE USE OF WATER FOR IRRIGATION PURPOSES, TO ESTABLISH CERTAIN OTHER RESTRICTIONS ON THE USE OF WATER, AND TO ESTABLISH PENALITIES OF FIFTY DOLLARS FOR THE SECOND VIOLATION AND ONE HUNDRED DOLLARES FOR THE EACH SUBSEQUENT VIOLATION OF THE RESTRICTIONS, PURSUANT TO TITLE 15.2, CHAPTER 21 OF THE CODE OF VIRGINIA, AND INCLUDING SPECIFICALLY VIRGINIA CODE §15.2-924(A) AND TITLE 44, CHAPTER 3.2, INCLUDING SPECIFICALLY VIRGINIA CODE §44-146.17(1).

WHEREAS, stream flows and ground water have reached historic low levels that necessitate limiting use of the public and private water sources for the protection of the health, safety and general welfare of the citizens of the County; and

WHEREAS, on August 30, 2002, the Governor of the Commonwealth of Virginia issued Executive Order Number 33, entitled Declaration of a State of Emergency Due to Extreme Drought Conditions throughout the Commonwealth (the "Executive Order"), in which he proclaimed a state of emergency throughout the Commonwealth due to drought conditions, instituted mandatory restrictions on certain uses of surface and ground water in the County and in other localities in the Commonwealth, mandated agencies of both state and local governments to render appropriate assistance to address drought conditions, and authorized local governments to establish, collect, and retain fines for violations of the water restrictions.

NOW, THEREFORE, BE IT ORDAINED by the Board of Supervisors of Louisa County:

1. That the following Ordinance is hereby adopted to read in its entirety as follows:

Sec. 1. Finding of an Emergency.

It is hereby determined and found that a state of emergency exists, as proclaimed in the Executive Order of the Governor of the Commonwealth, due to extreme drought conditions in the County and throughout the Commonwealth, and that a water supply emergency continues to exist in the Commonwealth, due to the impact of the drought on the Commonwealth's water supply sources for its public water system and anticipated demand in the immediate future, which together necessitate the adoption of this Ordinance mandating restrictions on the use of water in the County under the terms and conditions set forth in this Ordinance.

Sec. 2. Definitions.

The following words and phrases, when used in this Ordinance, shall have the meaning ascribed to them below, except in those instances where the context clearly indicates a different meaning:

Assessment date: The date of the water bill on which a fine for violation of this Ordinance is imposed.

Fountain: A water display where water is sprayed strictly for ornamental purposes.

Lawn: Grass areas of any property, including residential, commercial or industrial areas, but excluding agricultural fields and athletic fields.

Person: Any individual, corporation, partnership, association, company, business, trust, joint venture or other legal entity.

Vegetable garden: Any "non-commercial" vegetable garden planted primarily for household use; "non-commercial" includes incidental direct selling of produce from such a vegetable garden to the public.

Sec. 3. Mandatory Surface and Ground Water Use Restriction Measures.

All persons and households in the County shall limit their use of surface water, which includes water from the public water system, and ground water including but not limited to private wells consistent with the Executive Order, and in accordance with this section:

a) Lawns. Watering of lawns is prohibited at all times. New and replanted or resodded lawns may be watered for a period not to exceed 30 days.

b) Vegetable Gardens, Flowers, Trees and Shrubs. Watering is limited to three (3) days per week by address. Addresses ending with an odd number may water only on Tuesday, Thursday and Saturday. Addresses ending with an even number, or with no number, may water only on Wednesday, Friday and Sunday. Watering is prohibited on Mondays. Watering with buckets that have a capacity of 5 or fewer gallons is permitted at any time.

c) Vehicle Washing. Vehicle washing by persons other than commercial car washes is prohibited at all times. Commercial car washes, auto dealers, body shops and car rental agencies are permitted to operate under normal conditions, except that such businesses may not wash corporate fleet vehicles. This restriction shall not apply to the washing of emergency vehicles for health and safety purposes.

d) Swimming Pools. Filling is prohibited at all times, with the exception of pools used by health care facilities for patient care and rehabilitation, which are permitted to operate under normal conditions. New or repaired pools may be filled as needed to maintain the structural integrity of the pool. Indoor pools may be filled as necessary to ensure swimmer health and safety.

e) Golf Courses. Watering of tees and greens is permitted daily between the hours of 8:00 p.m. and 8:00 a.m. All other watering is prohibited at all times, except that new and refurbished fairways may be watered for a period not to exceed 30 days.

f) Fountains. Water use is prohibited.

g) Paved Areas. Washing is prohibited except for health and safety requirements.

h) Restaurants. Water shall be served to customers only upon request.

i) All Other Businesses. Water use is limited to uses essential for business use and human hygiene.

Sec. 4. When Restrictions Go Into Effect.

a) The water use restrictions set forth in this Ordinance shall take effect immediately.

b) The water use restrictions shall remain in effect so long as the Executive Order remains in full force and effect.

Sec. 5. Notice.

Notice of these public water use restrictions shall be published in the Central Virginian Newspaper for a period of every week for one (1) month during which the restrictions are in force.

Sec. 6. Violation.

It shall be a violation of this Ordinance for any person to use water, or allow or cause the use of water, in violation of the provisions of this Ordinance after the first publication required by Section 5 of this Ordinance.

Sec. 7. Penalty.

a) Any person who violates any provision of this Ordinance shall be subject to the following penalties:

1) For the first offense, violators shall receive a written warning delivered in person or posted by the Code Enforcement Officer and Building Inspectors.
2) For the second offense, violators shall be fined $50.00.

3) For the third and each subsequent offense, violators shall be fined $100.00 for each offense.

4) Each violation by a person shall be counted as a separate violation by that person, irrespective of the location at which the violation occurs.

b) Persons who have been assessed a penalty shall have the right to challenge the assessment by providing a written notice to the County Attorney within ten (10) days of the date of the assessment of the penalty. The County Attorney shall determine whether the penalty was properly assessed and notify the complaining person in writing of his determination. Should the County Attorney determine that the penalty was properly assessed; the person may appeal that determination by providing written notice to the County Administrator within ten (10) days of receiving the notice of determination. The County Administrator shall determine whether the penalty was properly assessed and notify the complaining person in writing of his determination.

c) The County Attorney may waive the penalty if he determines that the violation occurred due to no fault of the person.

2. That the provisions of this Ordinance are severable, and the unenforceability of any provision in the Ordinance, as determined by a court of competent jurisdiction, shall not affect the enforceability of any other provision in the Ordinance.

3. That this Ordinance shall take effect immediately.

A Copy, teste:

C. Lee Lintecum

C. Lee Lintecum, Clerk
Board of Supervisors
Louisa County, Virginia

CHAPTER 160 WATER

[HISTORY: Adopted by the Town Council of the Town of Louisa 5-28-1981 as Ch. 19 of the 1981 Code. Amendments noted where applicable.]

GENERAL REFERENCES

Building construction — See Ch. 47.

Fire protection — See Ch. 87.

Sewers — See Ch. 132.

Streets, sidewalks and public places — See Ch. 139.

Subdivision of land — See Ch. 143.

Zoning — See Ch. 165.

The Mayor may, if at any time he is of the opinion that there is a shortage in the Town water supply and that an emergency exists with respect thereto, at such time, give due and adequate notice of the existence of such emergency and prescribe the extent to which the use of water shall be curtailed. Any person found guilty of using water other than as permitted by the terms of the order of the Mayor after due publication of the notice shall be guilty of a misdemeanor.

The Town Council reserves the right to reserve a sufficient supply of water at all times in its reservoirs to provide for fires and other emergencies and to restrict or regulate the quantity or quality of water used by consumers in the case of scarcity or whenever the public welfare may require it.

CHAPTER 418 WATER

[HISTORY: Adopted by the Town Council of the Town of Mineral effective 1-1-1982 as Ch. 20, Arts. I, II and IV of the 1982 Code. Amendments noted where applicable.]

GENERAL REFERENCES

Streets and sidewalks — See Ch. 375

Sewers — See Ch. 355.

Subdivision of land — See Ch. 380.

ARTICLE I Water Supply System Generally (§ 418-1 — § 418-20)

Editor's Note: For state law as to water supply systems generally, see Title 15.2, Ch. 21, Code of Virginia. As to power of Town Council with respect to utilities, see § 15.2-2109, Code of Virginia. For the State Water Control Law, see § 62.1-44.2 et seq., Code of Virginia. As to conservation of water resources, see § 62.1-44.36 et seq., Code of Virginia.

The Mayor may, if at any time he is of the opinion that there is a shortage in the Town water supply and that an emergency exists with respect thereto, at such time, give due and adequate notice of the existence of such emergency and prescribe the extent to which the use of water shall be curtailed. Any person found guilty of using water other than as permitted by the terms of the order of the Mayor after due publication of the notice shall be guilty of a misdemeanor.

The Town Council reserves the right to reserve a sufficient supply of water at all times in its reservoirs to provide for fires and other emergencies and to restrict or regulate the quantity or quality of water used by consumers in the case of scarcity or whenever the public welfare may require it.

DRAFT

Model Drought Ordinance

Louisa County, Virginia

WHEREAS, the Virginia Department of Environmental Quality's Drought Management Task Force monitors the occurrence and severity of droughts throughout the Commonwealth of Virginia; and

WHEREAS, drought conditions may develop and occur within Louisa County from time to time which could create shortages of drinking water for the citizens of the County; and

WHEREAS, the Louisa County Board of Supervisors has the authority to declare drought watches, drought warnings and drought emergencies within the County; and

WHEREAS, the Louisa County Board of Supervisors has the authority to establish, collect, and retain fines for a violation of the restrictions promulgated herein; and

WHEREAS, the Board of Supervisors of Louisa County finds that a violation of the mandatory restrictions of this ordinance during a drought emergency shall be enforced as a Class 3 Misdemeanor;

NOW, THEREFORE, BE IT HEREBY ORDAINED THAT:

A. Should the Board of Supervisors, at any time, declare there to be an emergency in the County arising wholly or substantially out of a shortage of water supply, the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board are hereby authorized during continuation of the water emergency to order the restriction or prohibition of any or all uses of the water supply, including but not limited to:

    1. Watering of outside shrubbery, trees, lawn, grass, plants, home vegetable gardens, or any other vegetation, except from a watering can or other container not exceeding three (3) gallons in capacity. This

limitation shall not apply to commercial greenhouses or nursery stocks, which may be watered in the minimum amount required to preserve plant life before 7:00 a.m. or after 8:00 p.m.

2. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.
3. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state, or local law.

4. The operation of any ornamental fountain or other structure making a similar use of water.

5. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools which were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage, for pools constructed or contracted for on or before the effective date the declaration of emergency restrictions.

6. The use of water from fire hydrants for any purpose other than fire suppression, unless otherwise approved by the County Administrator.

7. The serving of drinking water in restaurants, except upon request.

8. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

9. Any additional water use restriction deemed necessary.

The above restrictions, or any of them, shall become effective upon their being printed in any newspaper of general circulation in the county, or broadcast upon any radio or television station serving the county.

B. Upon implementation of subsection A, above, the County Administrator shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections A on a case by case basis and, if warranted, to make equitable adjustments to such provisions. The County Administrator shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsection A. The County Administrator shall, in deciding applications, balance economic and other hardships to the applicant resulting from the imposition of water use

restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of exemptions.

C. Should measures taken pursuant to subsection A of this section prove insufficient to preserve sufficient supplies of water for the citizens of the County, the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board are hereby further authorized to impose temporary rate increases or surcharges on the consumption of water, to restrict or discontinue the supply of water to any industrial or commercial activity which uses water beyond the sanitary and drinking needs of its employees and invitees, to declare a moratorium on new water connections to buildings issued a building permit after the date of declaration of emergency, and to restrict water use to basic human needs only.

D. Any person violating any provision of this section, or any order of the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, issued pursuant to the authority granted hereunder shall be guilty of a class 3 misdemeanor.

E. In addition, the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board are hereby authorized to terminate the water service, for the duration of the emergency, to any person convicted of such violation.

F. In addition to the penalties set forth in subsection D, above, the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, may impose penalty charges on any person violating any provision of this section. Such penalty charges shall be in an amount determined by the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, and shall be imposed on the violator's next water bill. If a violation continues after a notice of violation has been issued, or if such penalty charges are not paid when due, the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, are authorized to terminate the water service and take any additional measures authorized by law. Persons who have been assessed a penalty charge shall have the right to challenge the assessed charge by providing a written notice within ten (10) days of the date of the assessment of the penalty charge. The Louisa County

Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, or his designee shall determine whether the penalty charge was properly assessed and notify the complaining person in writing of his determination. Any person aggrieved by the decision may appeal that decision to a committee of the Louisa County Water Authority, the Town Council of the Town of Louisa, the Town Council of the Town of Mineral, or the County Board of Supervisors, by filing an appeal in writing within five (5) days of notice of the decision by the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board. The penalty charge may be waived if it is determined that the violation occurred due to no fault of the person. Water service shall not be terminated during the pendancy of any appeal.

G. Nothing in this section shall be construed to prohibit the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, from rescinding any orders issued thereunder when the conditions creating the need for such orders have abated.

H. Nothing in this section shall be construed to prohibit the Louisa County Water Authority (LCWA) and its General Manager, the Town of Louisa and its Town Manager, the Town of Mineral and its Town Manager, and the County Administrator acting on behalf of the Board, from exercising any and all powers and taking any and all actions authorized by the Virginia Water and Waste Authorities Act, Virginia Code §§ 15.2-5100, et al.

State law reference--Va. Code §15.2-924.

12/30/2008

APPENDIX D

LOCAL GOVERNMENT RESOLUTIONS

APPENDIX E

RECORD OF LOCAL PUBLIC HEARINGS

LOUISA COUNTY, TOWN OF LOUISA, AND TOWN OF MINERAL
LONG RANGE WATER RESOURCE PLAN

PUBLIC INFORMATION SESSION

JANUARY 29, 2008 AND JANUARY 30, 2008
TOWN OF LOUISA, TOWN HALL
4PM TO 6PM

SIGN-IN SHEET

NAME	NAME	NAME
Skip Nolte		
Doug Frago		
James Dillard		
Pam Stone		
Jason Parley		
Willie Hammer		
[illegible]		
Bernice Rube		
[illegible]		
Ed Rube		
[illegible]		
Mark Howerton		
Willie Gentry		

LOUISA COUNTY, TOWN OF LOUISA, AND TOWN OF MINERAL
LONG RANGE WATER RESOURCE PLAN

PUBLIC INFORMATION SESSION

JANUARY 29, 2008 AND JANUARY 30, 2008
TOWN OF LOUISA, TOWN HALL
4PM TO 6PM

SIGN-IN SHEET

NAME	NAME	NAME
BRAD HUMPHREY		
Brian Mayes		

LOUISA COUNTY, TOWN OF LOUISA, AND TOWN OF MINERAL
LONG RANGE WATER RESOURCE PLAN

PUBLIC INFORMATION SESSION

JANUARY 29, 2008 AND JANUARY 30, 2008
TOWN OF LOUISA, TOWN HALL
4PM TO 6PM

SIGN-IN SHEET

NAME	NAME	NAME
Mary Kay Bullard		
Rick MARTIN		
Darren Coffey		
BAR DEAK		
Tommy J. Barlow		

JES – 3/31/09

LOUISA COUNTY, TOWN OF LOUISA, AND TOWN OF MINERAL LONG RANGE WATER RESOURCE PLAN

PUBLIC INFORMATION SESSION

MARCH 30, 2009 at LOUISA COUNTY BETTY J. QUEEN INTERGENERATIONAL CENTER
MARCH 31, 2009 at JOUETT ELEMENTARY SCHOOL

7PM TO 9PM

SIGN-IN SHEET

NAME	NAME	NAME
Ed Kube - LAO		
Dan Byer		
JACK WRIGHT		
Doug Smith		
Jeremy Camp		
Skip Notte		
DALE G. Mullen		
BARBARA CRAWFORD		
Robin Rutter		
Amanda Weiler		

LOUISA COUNTY, TOWN OF LOUISA, AND TOWN OF MINERAL
LONG RANGE WATER RESOURCE PLAN

PUBLIC INFORMATION SESSION

MARCH 30, 2009 at LOUISA COUNTY BETTY J. QUEEN INTERGENERATIONAL CENTER
MARCH 31, 2009 at JOUETT ELEMENTARY SCHOOL

7PM TO 9PM

SIGN-IN SHEET

NAME	NAME	NAME
Barbara Crawford		

LOUISA COUNTY, TOWN OF LOUISA, AND TOWN OF MINERAL LONG RANGE WATER RESOURCE PLAN

PUBLIC INFORMATION SESSION

MARCH 30, 2009 at LOUISA COUNTY BETTY J. QUEEN INTERGENERATIONAL CENTER
MARCH 31, 2009 at JOUETT ELEMENTARY SCHOOL

7PM TO 9PM

SIGN-IN SHEET

NAME	NAME	NAME
Richard Harvasy		
Willie Harper		
Edwin Keller		
DALE G. Mullen		
Willie Gentry		
Jeremy Camp		
Skip Notte		