APPOMATTOX LONG-TERM WATER SUPPLY PROJECT

Jointly funded by the

Town of Appomattox
County of Appomattox
http://www.appomattox.com/

Final Report

September 30, 2005

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PREFACE

This study for the Joint Appomattox Long-term Water Supply Project was prepared by the staff of the Virginia's Region 2000 Local Government Council, formally the Region 2000 Regional Commission, in cooperation with the officials from the Town of Appomattox and County of Appomattox. The contents of this study reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. This study does not constitute a standard, specification, or regulation.

Acceptance of this study by the officials of the Town of Appomattox and County of Appomattox as evidence by the fulfillment of the objectives within the Scope of Work for the Joint Appomattox Long-term Water Supply Project, does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design, nor commitment to fund any such improvements. Additional project level environmental assessments and/or studies of the alternatives may be necessary.

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Public Comment and Study Acceptance:

- Approved by the Town of Appomattox, July 28, 2005
- Approved by the County of Appomattox, July 28, 2005

ACKNOWLEDGEMENTS

The staff of the Virginia's Region 2000 Local Government Council (R2LGC), formally the Region 2000 Regional Commission, presents this study as the fulfillment of the project requirements outlined in the Scope of Work for the Joint Appomattox Long-term Water Supply Project, dated August 2004.

I wish to thank the members of the Board of Supervisors for the County of Appomattox, Town Council for the Town of Appomattox and Mayor for the Town of Appomattox for their guidance and assistance throughout the study. I wish to acknowledge and thank Administrator for the County of Appomattox and Manager for the Town of Appomattox for their guidance in bringing the study to the attention of the elected members of their respective Board of Supervisors and Town Council. I would like to thank the staff of the R2LGC for their contributions to this study.

While acknowledging the assistance and support of these individuals and organizations, any errors or omissions in this report remain the responsibility of the primary author.

EXPANSION OF ACRONYMS

ADD	Average Daily Demand
C/I/I	Commercial/Institutional/Industrial
CDBG	Community Development Block Grant Program
COA	County of Appomattox
CWS	Community Water System
ERC	Equivalent Residential Connection
FTE	Full Time Equivalent Employee
GASB	General Accounting Standards Board
gpm	gallons per minute
MDD	Maximum Daily Demand
MG	Million Gallons
MGD	Million Gallons per Day
MHI	Medium Household Income
psi	pounds per square inch
R2LGC	Region 2000 Local Government Council
SDWA	Safe Drinking Water Act
TEA-21	Transportation Equity Act for the 21st Century
TOA	Town of Appomattox
USEPA	U.S. Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VDH	Virginia Department of Health
VDOT	Virginia Department of Transportation
WSPR	Water Supply Planning Regulation

EXECUTIVE SUMMARY

The Joint Appomattox Long-term Water Supply Project *steering committee*, whose members are identified in **Figure D-1** in the **Appendix D**, was formed to provide guidance through a series of meetings beginning in August 2004. The result of these meetings was the development of a *scope of work*, as detailed in **Figure E-1** in **Appendix E**, for *services and activities that the staff of the R2LGC would provide for the development of an action plan that will culminate with the formulation of strategies for the construction of a long range and dependable water source.*

The decision to move forward with the study for the Joint Appomattox Long-term Water Supply Project was made because future unfunded mandates to the federal and state drinking water quality standards and guidelines under the Safe Drinking Water Act (SDWA) will require substantial changes to the strategic planning, operations, and maintenance characteristics of the existing drinking water supply system for the Town of Appomattox.[i]

The Commonwealth of Virginia is also developing legislation for a new water supply planning regulation (WSPR) under section 62.1-44.38:1.8.2.[ii] The proposed WSPR requires the Virginia Department of Environmental Quality (VDEQ) to promulgate a regulation necessary for the establishment of a comprehensive water supply planning process including criteria for the development of local and regional water supply plans. The proposed WSPR will influence the long-term planning requirements for sustainable sources of drinking water supplies throughout the state. However, the WSPR requirements is not expected to begin until the end of 2006.

The study for the Joint Appomattox Long-term Water Supply Project provides a precautionary review of the existing drinking water supply system for the County and Town of Appomattox relative to the planning and management impacts of the proposed WSPR. The study was completed in June 2005.

The conclusions of the study include:

1. *A new sustainable drinking water supply source is needed;*
2. *The existing drinking water supply system needs substantial improvements; and*

[i] Mays, *Urban Water Supply Handbook*, McGraw-Hill, Inc., New York, NY, pages 3-10, 2002

[ii] Benninger and McEvoy, *Proposed Water Supply Planning Regulations*, VA-AWWA Newsletter, page 10, January 2005

3. *The existing water rate structure and size of the customer base requires that the costs of the preferred alternative be a primary consideration for its selection.*

The recommendations of the study include:

1. *Plan and establish a joint Public Service Authority;*
2. *Plan, design, and construct the Water Line to Concord ; and*
3. *Complete a 25/75 Loan/Grant USDA Application.*

A joint public comment meeting was held at the Appomattox Community Center on July 28, 2005 from 6:30 pm through 8:30 pm. A presentation of the results of the study were given by the staff of the R2LGC. The public was given an opportunity to comment on the results of the study. Upon the hearing the public comments, the Appomattox Board of Supervisors and Town Council voted to move forward with **Alternative 2B**. Also, the Town Manger and County Administrator were instructed to begin negotiations with Campbell County and the Campbell County Utilities Service Authority over the coming months to determine the feasibility of purchasing wholesale water through a long-term contract.

The establishment of a joint Public Service Authority (PSA) should promote an atmosphere of economic development through connection and business incentives. The Concord water line extension will increase the reliability and capacity of the existing drinking water system through the development of an additional and sustainable drinking water source. The long-term cost of drinking water can be controlled through tradeoffs between the level of production of the existing drinking water system and level of wholesale drinking water purchases.

These conclusions and recommendations of the study are from the perspective of the current resident of the Town of Appomattox. It is assumed that the current resident wants to mitigate the negative impact of the future technological and regulatory requirements on continuing own, operate, and maintain the existing water supply system through 2050. The mitigation of these negative impacts directly affect the rate of increase that the current resident is expected to pay for drinking water over the next 50 years.

INTRODUCTION

The County of Appomattox (**COA**) and Town of Appomattox (**TOA**) are part of Central Virginia Planning District 11 as set by the Virginia Department of Housing and Community Development. The extent of the Central Virginia Planning District 11 is illustrated in **Figure A-1** in **Appendix A**. The Central Virginia Planning District 11 contains the counties of Amherst, Bedford, and Campbell, the towns therein, and the cities of Bedford and Lynchburg.

During FY04, officials form the **COA** and **TOA** formed a joint steering committee to investigate the feasible alternatives for a new long-term drinking water supply source. The joint steering committee members are identified in **Figure D-1** in **Appendix D**. The need for a long-term drinking water supply source is driven by the: (1) Potential for economic development; (2) Stricter drinking water quality standards; (3) Increasing costs for infrastructure operations and maintenance; and (4) New WSPR requirements. The purpose of the joint steering committee was to guide and focus the study on a cooperative effort to identify and implement a preferred alternative for developing a long-term drinking water supply source.

The R2LGC staff was asked by the joint steering committee to provide the technical expertise for the completion of the study that would identify the feasible alternatives for such a long-term drinking water supply source. The joint steering committee and R2LGC staff developed a scope of work and associated cost for completing the study, as detailed in **Figure E-1** in **Appendix E**. The Appomattox Board of Supervisors and Town Council approved the funding for the completion of the study in July 2004.

The scope of work for the Joint Appomattox Long-Term Water Supply Study requires the: (1) identification of sustainable sources for drinking water supply; and (2) creation of a more detailed plan for use in the possible implementation of the study's conclusions and recommendations. The purpose of this study is to provide guidance and recommendations to the local governing bodies concerning sustainable sources for drinking water supply issues and strategies. This study is intended to be a template for assistance in the decision-making process.

Appomattox Long-Term Water Supply Project Work

1. Systems Analysis of the Existing Drinking Water Supply System:

The **TOA** operates the existing drinking water supply system as an active Community Water System[iii] (CWS) under the conditions of Water System Permit ID VA5011050[iv] issued by the Virginia Department of Health (VDH). The primary source of water for the existing water supply system is ground water.

The total population of the TOA is 1,961 persons living within 767 households, which equates to approximately 2.5 persons per household, as counted in the 2000 U.S. Census.[v] The existing drinking water supply system serves approximately 1,765 customers or 90% of the total population on a year round basis.

a. Drinking Water Resources[vi]

The **COA** is divided between two large river basins – the *James River* and *Roanoke River* basins. Tributaries to the *James River* drain northerly and those to the *Roanoke River* drain southerly, from a divide which roughly corresponds to US Route 460. Both the *James and Roanoke Rivers* receive waters from the **COA**, but only the *James River* is physically located within the county – forming the northwest border.

The headwaters of the *Appomattox River* are contained in the **COA**. The *Appomattox River* and its tributaries are Class III streams, which means they are generally satisfactory for secondary contact recreation, propagation of fish and aquatic life, and other beneficial uses. This stream classification means the applicable standard for minimum dissolved oxygen is 4.0 mg/L, pH is 6.0 to 9.0, and maximum temperature is 32 degrees Celsius. *Falling River and Cub Creek*, as well as their tributaries, have the same stream classification with the special standard that the pH of the waters falls between the 6.5 to 9.0 ranges. There are very few direct discharges to surface water in the county.

[iii] The USEPA defines a Community Water System as a public water supply service that serves at least 25 people or 15 connections on a year round basis.

[iv] The USEPA – *Safe Drinking Water Information System*, Envirofacts Database, for Appomattox, VA, queried on August 19, 2004

[v] The U.S. Census Bureau website URL: http://quickfacts.census.gov/qfd/states/51/51031.html

[vi] A Comprehensive Water and Sewer Report for Appomattox County, VA, Hankins and Anderson Consulting Engineers, January 1972

Accessible groundwater can be found throughout the **COA**. However, most groundwater supplies are found in the fracture zones, joints in the bedrock, or just above the bedrock in the weathered rock zones at depths usually within 150 feet of the surface. The accessible groundwater is withdrawn through shallow large diameter wells of which 80% of these well yield less than 20 gpm. In general, the more dependable groundwater supplies come from deeper wells as the shallow wells are more susceptible to fluctuations in level and yield due to short droughts.

The quality of the accessible groundwater is generally good for most uses. However, the accessible groundwater is susceptible to contamination, especially from nearby septic fields. The quality of the deeper groundwater is variable, depending on the lithology of the rock in which the water is in contact, but is generally soft to moderate hard and low in total dissolved solids. Groundwater derived from sercite phyllite in the central area may be hard in the vicinity of the altered limestone area.

There are numerous surface impoundments in the county, only four of which are greater than 10 acres. The major impoundment is *Holliday Lake*, which straddles the Appomattox–Buckingham county line. The majority of the impoundments in the county are farm ponds that range in size from less than one to several acres. These impoundments offer recreational opportunities as well as flood control and sedimentation and erosion control benefits.

b. Drinking Water Production

The **TOA**'s existing drinking water supply system utilizes eight interspersed underground wells that range in depth from 100 feet to 300 feet. The maximum pumping rate of these eight wells is 730 gpm or 1.14 MGD. The pumping capacity of these eight underground wells on a 8-hr basis is 0.35 MGD. The pumping capacity of these eight underground wells on a 12-hr basis is 0.53 MGD. The pumping capacity of these eight underground wells on a 24-hr basis is 1.05 MGD.

Currently, the average daily demand (ADD) for the existing drinking water supply system is approximately 0.23 MGD. Therefore, given the same consumptive use pattern, the excess capacity of the eight underground wells is 0.12 MGD, 0.30 MGD, and 0.82 MGD on a 8-hr, 12-hr and 24-hr basis, respectively.

The eight underground wells are operated on an 8-hour basis with 2.5 FTE for supervisory, operations, and maintenance activities. The eight underground wells

require spot treatment for chlorination, pH control, and corrosion control as the raw water is generally considered of good quality. The infrastructure or piping transfer losses have been estimated at around 9% of the raw water input volume, which is considered well above the industry average of 12% to 15%. The infrastructure transfer losses include piping leakage, meter reading/sizing inaccuracies, unauthorized connections, etc.

c. Drinking Water Infrastructure

The service area of the existing drinking water supply system encompasses approximately 3.0 square miles as shown in **Figure A-2** in **Appendix A**. The age of the drinking water supply system's infrastructure ranges from 20 to 75 years old. The infrastructure includes eight underground wells, two aboveground water storage tanks with an storage capacity of 1.1 million gallons, and approximately 26 miles of water distribution piping, valves, fire hydrants, etc. The infrastructure of the existing drinking water supply system was assessed at approximately $2.5 million.[vii]

d. Drinking Water Storage

The **TOA** drinking water supply system contains two pressure zones that are generally separated by the railroad tracks that run through the middle of town. The drinking water supply system uses two above-ground water storage tanks to ensure adequate emergency and fire protection reserves. The volume of drinking water stored is approximately fives times the ADD volume and two times the maximum daily demand (MDD) volume for the **TOA**.

The existing water storage tanks allow the drinking water supply system to maintain system pressures between 45 psi to 75 psi, well above the required minimum 20 psi. The low pressure zone contains a 1.0 million gallon above-ground water storage tank with an overflow elevation of 997 feet. This above-ground water storage tank maintains pressures in the range of 50 psi to 75 psi throughout the low pressure zone. The high pressure zone contains a 100,000 gallon above-ground water storage tank with a overflow elevation of 914 feet. This above-ground water storage tank maintains pressures in the range of 40 psi to 60 psi throughout the high pressure zone.

[vii] The 2003 Appomattox Community Development Plan, Community Facilities and Services, Town of Appomattox, VA, page VIII-I

The resident time for stored drinking water within the drinking water supply system is approximately five days at the current level of the ADD volume. The overall quality of the drinking water to the consumer is based on the ability of the drinking water system to properly circulate water as it ages through its infrastructure.

e. Drinking Water Demand

As stated previously, the drinking water supply system serves **1765 persons** through **785 service connections**. The customer-base for these 785 service connections is broken down as **650 (83%) residential**, **114 (14%) commercial**, **15 (2%) institutional**, and **6 (1%) industrial manufacturing**. The drinking water supply system's ADD is approximately 0.23 MGD. Therefore, the average daily consumption rate for a typical service connection for the **TOA** is approximately 293 gallons per day.

Assuming that the historical average daily consumption rate for a typical **TOA** resident is **57 gallons per day** then the total residential ADD is approximately 0.10 (44%) MGD. The total commercial, institutional, and industrial (C/I/I) ADD is approximately 0.13 (56%) MGD. Therefore, a typical residential service connection consumes approximately 154 gallons per day and a typical C/I/I connection consumes approximately 963 gallons per day.

However, CWS are generally compared on an equivalent residential connection (ERC) basis. An ERC standardizes the residential consumption rate over a certain number of residents or households at the standard consumption rate for comparative systems analysis. An ERC for a standard residential household consumes 145 gallons per day or 4400 gallons per month or 52,800 gallons per year. A typical ERC resident consumes 58 gallons per day. Therefore, using a ERC interpretation means that the 785 service connections are broken down as **720 ERCs** with an ADD of approximately 0.104 (45%) MGD and **65 C/I/I connections** with an ADD of approximately 0.126 (55%) MGD. Therefore, a typical ERC for the **TOA** consumes approximately 145 gallons per day and a typical C/I/I connection consumes approximately 1940 gallons per day.

f. Water Supply Planning Regulation

The proposed **WSPR** is promulgated through VDEQ's Statutory Authority, under Title 62.1 of the Code of Virginia, CHAPTER 780 LOCAL AND REGIONAL WATER SUPPLY PLANNING, 9 – VAC – 25 – 780 – 10 through 200. The proposed **WSPR**

states that all counties, cities and towns in the Commonwealth of Virginia **shall submit** a local water supply plan **or shall participate** in a regional planning unit in the submittal of a regional water supply plan to the board in accordance with chapter 780.

The provisions of the **WSPR** shall not affect any water supply project for which a permit application was submitted prior to January 1, 2003, to any state or federal agency. The provisions of this regulation shall not affect any water supply project for which an application for grant, loan or other funding has been made to a state or federal agency prior to January 1, 2003. All projects shall remain subject to applicable federal and state regulatory requirements.

The purpose of chapter 780 is to establish a comprehensive water supply planning process for the development of local, regional, and state water supply plans. This process shall be designed to (1) ensure that adequate and safe drinking water is available to all citizens of the Commonwealth, (2) encourage, promote, and protect all other beneficial uses of the Commonwealth's water resources, and (3) encourage, promote, and develop incentives for alternative water sources, including but not limited to desalinization.

Local governments, such as the **COA** and **TOA**, shall develop programs for **local or regional water plans** that are necessary to comply with the **WSPR**. Local governments shall consult and coordinate with all CWS in the planning area during the preparation of local or regional programs. CWS within the planning area shall cooperate and participate with the locality during preparation of the local program.

Counties, cities, and towns are encouraged to develop regional programs. Local programs shall be designed to (1) ensure that adequate and safe drinking water is available, (2) encourage and protect all beneficial uses, (3) encourage and promote alternative water sources, and (4) promote conservation.

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

1) A description of the **existing water sources** in accordance with the requirements of 9-VAC-25-780-80 of this chapter.

2) A description of the **existing water use** in accordance with the requirements of 9-VAC-25-780-90 of this chapter.

3) A description of the **existing water resource conditions** in accordance with the requirements of 9-VAC-25-780-100 of this chapter.

4) An assessment of the **projected water demand** in accordance with the requirements of 9-VAC-25-780-110 of this chapter.

5) A description of the **water management actions** in accordance with the requirements of 9-VAC-25-780-120 and 130 of this chapter.

6) A **statement of need** in accordance with the requirements of 9-VAC-25-780-140 of this chapter.

7) An **alternatives analysis** that identifies potential alternatives to address projected deficits in water supplies in accordance with the requirements of 9-VAC-25-780-140 of this chapter.

8) A map or **maps identifying important elements** of the program which may include existing environmental resources, existing water sources, significant existing water uses, and proposed new sources;

9) A copy of the **adopted program documents** including any local plans or ordinances or amendments that incorporate the local program elements required by this chapter;

10) A **resolution approving the plan** from each local government that is party to the plan; and

11) A **record of the local public hearing**, a copy of all written comments and the submitter's response to all written comments received.

The above requirements of the proposed **WSPR** is expected to begin impacting the localities by the end of 2006. The actual schedule for compliance with the **WSPR** is based on the size of the population served.

2. Financial Analysis of the Existing Water Rates:

Historically, the cost of water and associated water rates for the **TOA** have steadily increased since 1950, as illustrated in **Figure 1**:

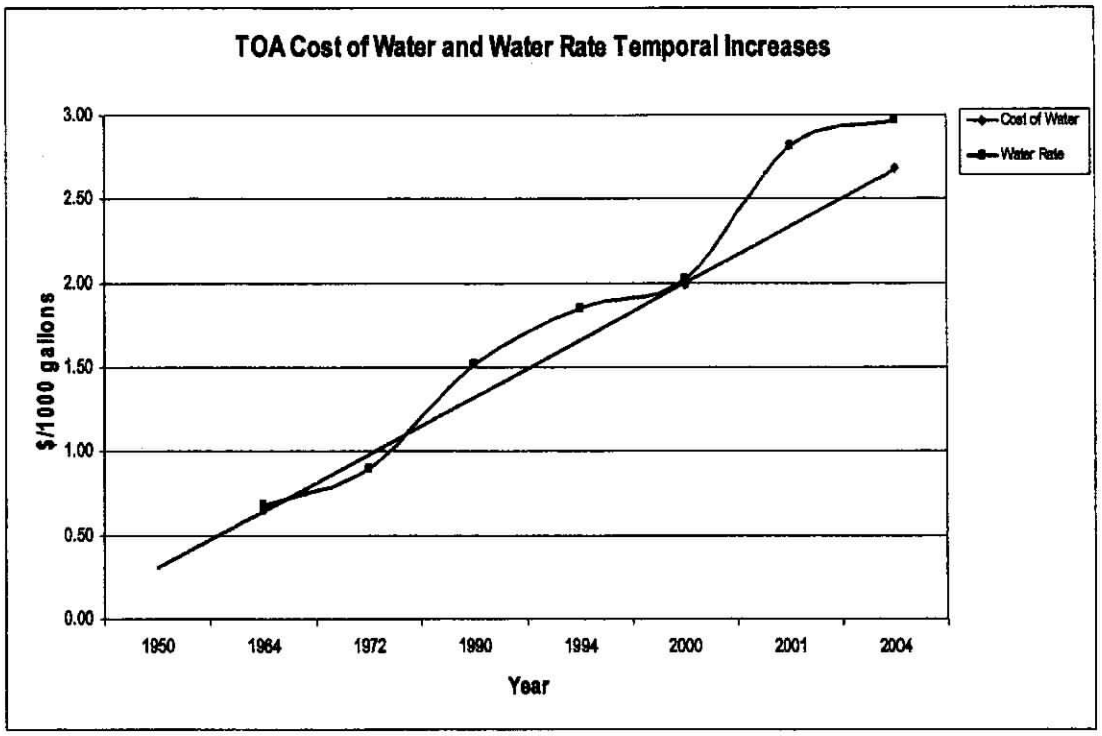


Figure 1: **The Historic Changes for the Cost to Produce Drinking Water and Associated Water Rate for the Town of Appomattox from 1950 though 2005.**

Figure 1 shows that for the 50 year period from 1950 through 2000, the cost to produce drinking water for the **TOA** increased by 308% from $0.65 per 1000 gallons to $2.00 per 1000 gallons. Assuming a similar increase in the cost to produce drinking water over the next 50 years, through 2050, a typical **TOA** resident can expect to pay $6.00 per 1000 gallons of drinking water produced or approximately $21.78 per month in 2005 dollars.

Figure 1 also shows that since 2000, the **TOA** water rate has increased by 48% from $2.00 per 1000 gallons to $2.97 per 1000 gallons of drinking water consumed. On average, in 2005, a **TOA** resident expects to pay $10.70 per month. Therefore, at a minimum, the **TOA** water rate is expected to increase by approximately 1.6% per year to cover the cost to produce drinking water through 2050. It is important to note that the temporal change in the historical **TOA** water rate follows a cyclic pattern, since the water rate is generally increased at specific points in time as it approaches the cost to produce.

In FY 2005, the existing water rate structure for the **TOA** was broken down by in-town and out-of-town water rates. The in-town water rate structure is $6.05/month with

2000 gallon allowable metered sales and $2.85 for every 1000 gallons that is consumed above 2000 gallons. The out-of-town water rate structure is $13.40/month with 2000 gallon allowable metered sales and $3.15 for every 1000 gallons that is consumed above 2000 gallons. Of course, the amount that a typical TOA household pays is dependent on the number of persons within the household, as illustrated in **Figure 2**:

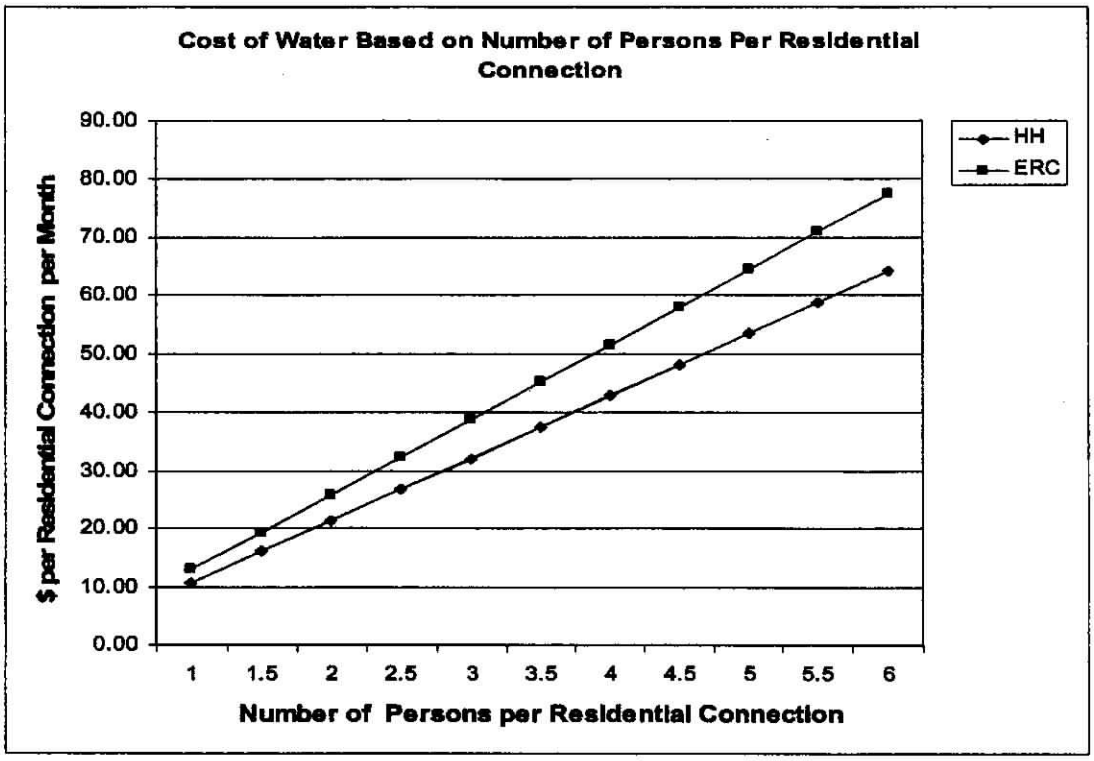


Figure 2: **The Monthly Cost of Drinking Water for a Typical In-Town Residential Service Connection and ERC as the Number of Persons within the Household Increases.**

Figure 2 shows the cost per **TOA** residential connection ($10.70 per resident per month) relative to the number of persons within the household. The monthly cost for drinking water consumption within the household increases significantly as the number of persons increases.

Figure 2 also shows the cost per ERC ($12.89 per person per month) relative to the number of persons within the household. Again, the monthly cost for drinking water consumption within the household increases significantly as the number of persons increases. Therefore, the historical changes in the cost to produce drinking water as well as number of persons within a typical household, i.e., customer-base are important

indicators of the magnitude of future increases to the existing water rates for a typical **TOA** resident.

a. Cost to Produce Drinking Water

The existing water system's budgetary analysis process seeks to balance the annual budget. Therefore, the annual revenues should equal the annual service expenditures. The FY2005 budget anticipates the level of the annual service expenditures to be approximately $277,300. These expenses are based on the existing 8-hr well production schedule with 2.5 FTE. The annual service expenditures are broken down as $226,300 (82%) for administrative, operation, and maintenance activities and $51,000 (18%) as emergency reserves for emergency repair and capital improvement activities.

The annual service expenditures are further broken down as labor (50%) and material (50%) costs for water treatment operations (88%), asset maintenance (5%), and capital improvements (7%). However, the level of annual service expenditures varies with the level of unplanned emergency repair and planned capital improvement activities. These activities are highly dependent of the age and condition of the existing water supply infrastructure. Finally, the level of the administrative, operation and maintenance expenses is highly dependent on the variation in the annual inflationary level.

The annual finished or drinking production volume from the eight underground wells for FY2005 is approximately 0.230 MGD (83.95 MGY). Assuming that the infrastructure transfer losses are equal to 9% of the raw water input volume, the net or metered drinking water production volume was approximately 0.209 MGD (76.4 MGY). The difference between the two drinking water production volumes is the amount of the infrastructure transfer losses throughout the existing water system.

The cost of water is generally broken down on a per capita and/or 1000 gallon basis. For the existing water system, the cost of producing drinking water at the well sites is approximately $128 per capita or $2.70 per 1000 gallons. The cost of producing drinking water at the well sites and delivering drinking water to its customers is approximately $139 per capita or $2.97 per 1000 gallons. The increased cost represents the systems' inefficiency in delivering drinking water through the level of the drinking water infrastructure transfer losses.

Today, all CWS are required to maintain emergency reserves for asset management expenses under the *General Accounting Standards Board* (GASB) – 34 requirements for public services. An effective asset management program increases reliability by rehabilitating critical drinking water infrastructure in a timely manner through an appropriate level of emergency reserves. Therefore, the total cost for producing, maintaining, and delivering drinking water to the **TOA** consumer is approximately $173 per capita or $3.63 per 1000 gallons.

It is important to note that the average water rate for a in-town customer is $2.97 per 1000 gallons and out-of-town customer is $5.52 per 1000 gallons. The current average in-town water rate covers the cost to produce and deliver drinking water. The average in-town water rate does not cover the additional cost to maintain the drinking water system. At a minimum, the **TOA** water rate must cover the cost to produce, maintain, and deliver drinking water to all of its customer.

b. Revenues from Drinking Water

The anticipated revenue stream for FY2005 for the existing drinking water system consists of water sales, connection fees, availability charges, and re-connection fees. The sale-of-water revenue stream brings in approximately 90% of the total revenues for the **TOA**. The level of annual revenues throughout the fiscal year should closely approximate the level of the annual service expenditures.

To maintain financial viability, the anticipated level of net income, i.e., revenues minus expenditures, for FY2005 for the existing drinking water system should be positive. A positive net income level ensures enough cash reserves for planned asset management/capital improvement projects to maintain and/or improve the level of service of the existing drinking water supply system for the **TOA**. Finally, a sufficient level of net income will preserve the quality and reliability of the drinking water system for its customers on a sustainable basis.

c. Water Rate Structure for Drinking Water

The price of drinking water signals value to the customer and helps determine whether consumers use water efficiently. Full cost pricing means factoring all life cycle costs, i.e., administrative, operation, maintenance, repair, disposal, and capital, into

the price of water. Full cost pricing seeks to encourage conservation and takes the form of a rate structure, i.e., increasing block rates, time-of-day pricing, water surcharges, seasonal rates, uniform rate structures, flat fee rates, etc.

The life-line water rate structure also facilitates equity as well as efficiency. [ix] The life-line water rate structure promotes water conservation through an increasing-scale water rate structure. Therefore, the more water that is consumed the higher the cost of the water. The water rate structure should include the full cost of producing, maintaining, and delivering drinking water to the tap.

The existing water rate structure for the **TOA** is a declining-scale structure, which means that as the demand or consumption increases the cost of water to the consumer decreases, as illustrated in **Figure 3**:

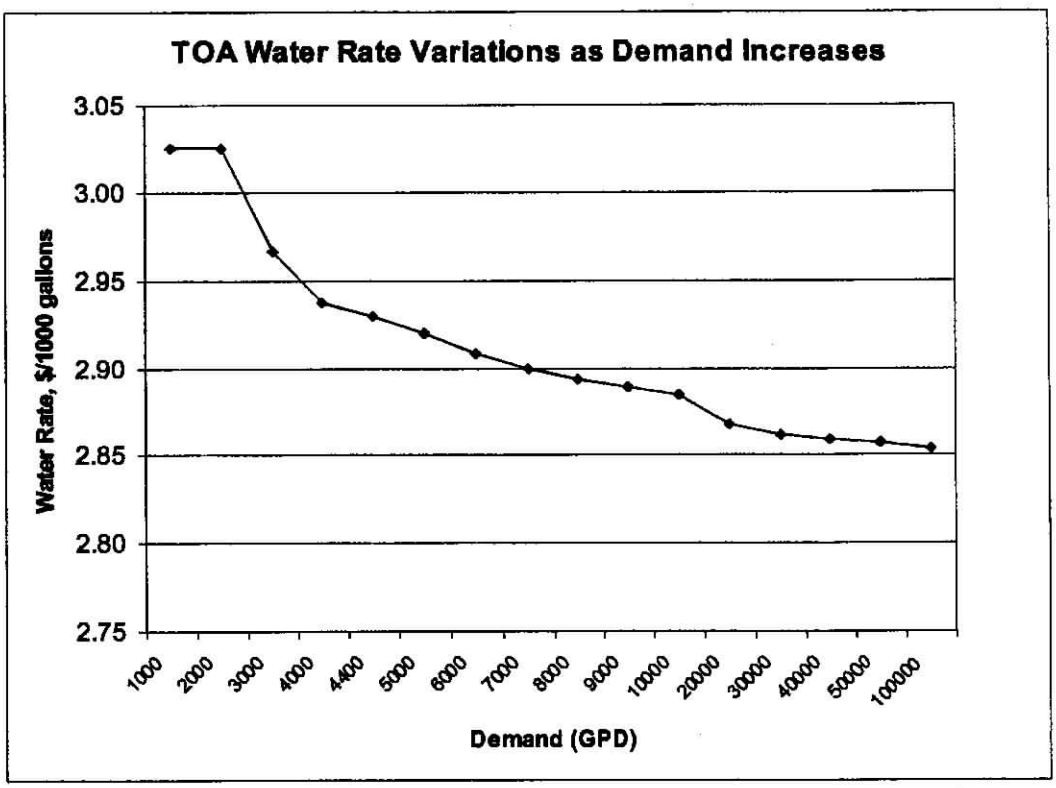


Figure 3: **The Change in the Average Drinking Water Rate for the Town of Appomattox as the Level of Demand Increases.**

[ix] USEPA, *Water and Wastewater Pricing :Affordability Information (Lifeline Rates)*, OWM, Washington, D. C., accessed on 12//21/04: http://www.epa.goc/water/infrastructure/pricing/affordability.htm

Figure 3 shows that the existing water rate structure is level or constant through the first 2000 gallons of usage. The cost of water decreases with each additional 1000 gallons of consumption. This water rate structure is beneficial for attracting new demand. However, it does not foster water conservation among the consumers since the cost of drinking water decreases as demand increases.

In addition to the **TOA**'s declining-scale water rate structure, drinking water is charged on an in-town and out-of-town basis. Assuming that the average **TOA** resident consumes approximately 3630 gallons per month the average monthly bill would be equal to $6.05 + $2.85 (1.63) = $10.70. The average out-of-town customer would pay approximately $13.40 + $3.15*(1.63) = $18.53 per month or approximately 1.75 times for the same drinking water volume.

However, both of the average in-town and out-of-town **TOA** monthly water bill levels are significantly lower than the allowable level under the USEPA's affordability threshold for an average monthly water bill.[x] The USEPA's affordability threshold is based on the level of the locality's median household income (**MHI**). The affordability threshold is calculated as 2.5% of this MHI level. For the **COA** and **TOA** the MHI is approximately $24,000 per year, as determined through the U.S. demographic data from the 2000 census. Therefore, under the guidelines of the USEPA's affordability threshold, the maximum water rate for a median household within the **COA** and **TOA** shall not exceed $605 per year or $50 per month.

Since the FY2005 levels for the average monthly water bill for an in-town and out-of-town customer are well below the allowable affordability threshold level for monthly water bills, the rate-setters for the **TOA** have an option to increase the current water rate levels to offset future expenditures for asset management and capital improvements to the existing drinking water supply system.

3. Long-Range Drinking Water Source Alternatives:

This study evaluates the pros, cons, and costs in selecting one of the six possible long-term drinking water supply alternatives, as detailed in **Table 1**:

[x] USEPA, *Water and Wastewater Pricing :Affordability Information (Lifeline Rates)*, OWM, Washington, D. C., accessed on 12//21/04: http://www.epa.goc/water/infrastructure/pricing/affordability.htm

Table 1: **The Six Drinking Water Supply Alternatives that were evaluated under the Joint Appomattox Long-Term Water Supply Project.**

No.	Alternative	Transmission Line Size (Dia, inches)	Transmission Line (Length, mi)	Projected 2050 (Demand, MGD)	Capital Cost ($x10^6$)	Annual O&M Cost
1	**Do Nothing**	**N/A**	**N/A**	**0.60**	**$1.6**	**$226,300**
2A	**Concord Water Line**	**12**	**7**	**1.50**	**$ 3.0**	**$294,000**
2B	**Concord Water Line**	**16**	**8**	**2.00**	**$ 5.5**	**$303,000**
3	**Lynchburg Water Line**	**20** **16**	**6** **7**	**2.40**	**$ 13.0**	**$303,000**
4	**Multi-Purpose Reservoir**	**16**	**3**	**2.50**	**$ 16.0**	**$ 730,000**
5	**James River Intake**	**16**	**12**	**2.50**	**$ 17.0**	**$ 730,000**

Notes: 1. Includes cost of producing water in current **TOA** drinking water system.
2A. Includes constructing a 12" transmission line and booster pump station.
2B. Includes constructing a 16" transmission line w borings and booster pump station.
3. Includes constructing of 20" & 16" transmission line and booster pump station.
4. Includes constructing of dam, intake p/s, 2.0-MGD WTP, & 16" transmission line.
5. Includes constructing of intake p/s, 2.0-MGD WTP, 16" transmission line, & booster p/s.

Table 1 includes long-term drinking water supply alternatives that range from doing nothing to constructing a new water line to establishing a new surface water intake to permitting a new multi-purpose reservoir The alternatives for the Lynchburg water line, multi-purpose reservoir, and James River intake were detailed in a Wiley and Wilson study entitled, *Water Resource Study for the Appomattox Area for the Town of Appomattox and County of Appomattox*, dated August 2003. The cost estimates for these alternatives were adjusted for inflation through 2005. The alternatives for the Do Nothing and Concord water line were added as part of this study. The cost estimates for all six alternatives are found in **Appendix B**.

The study's assumptions for the existing drinking water system in FY2005 are that the **TOA**: (1) Serves a customer-base of 1765 customers; (2) Consumes a ADD of 0.23 MGD; (3) Uses a water rate structure of $6.05 for first 2000 gallons + $2.85 for each additional 1000 gallons; (4) Receives $800,000 under the provisions of the VA STAG

grant program for small water supply system improvements and is expected to receive an additional $800,000 during the next fiscal cycle; (5) Applies for and receives a USDA 25/75 loan/grant for funding for project design and construction costs;[xi] (6) Negotiates future wholesale water rates of $3.00 per 1000 gallons; and (7) Completes a hydraulic analysis to determine the actual physical requirements and equipment of the preferred project alternative.

The following sections discuss each long-term drinking water supply alternative in detail and terms of its' pros and cons from the perspective of a current **TOA** resident:

a. Alternative 1 – TOA does nothing and continues to produce drinking water:

The **Alternative 1** evaluates the decision for the **TOA** to stay in the drinking water production business, while making the necessary asset improvements to its' existing infrastructure. These asset improvements are expected to cost approximately $1.6 million, which is equivalent to the anticipated VA STAG appropriations. Therefore, the level of the emergency reserves is assumed to be minimal over the analysis period.

The existing water system operates eight interspersed underground wells on an 8-hr basis with 2.5 FTE. Each well uses spot chlorination with pH and corrosion control to meet the current water quality standards under the SDWA. The existing drinking water system is capable of storing 1.1 MG of drinking water in two aboveground storage tanks. The existing distribution system contains 26 miles of piping covering approximately three square miles, as illustrated in **Figure A-2** in **Appendix A.**

The existing underground wells have a maximum daily capacity of 0.35 MGD on an 8-hour basis and 0.52 MGD on a 12-hour basis. The existing drinking water system has an ADD of 0.23 MGD and MDD of 0.45 MGD, while serving 1765 customers. The average water rate is $2.97 per 1000 gallons when based on a consumption rate of 3630 gallons per month. This means that the average **TOA** resident pays approximately $10.70 per month for drinking water. The projected 2050 ADD is estimated to approach 0.60 MGD, given a modest growth rate of 0.8% per annum for the **TOA**.

[xi] The annual principle/interest payments for the USDA 25/75 loan/grant package are calculated over 40 years at 5% per annum or $(1.05)^{40}$. The requirements for the USDA Rural Development grant can be accessed at: http://www.usda.gov/rus/water/2005funding.htm.

The pros of **Alternative 1**include the: (1) Existence of five additional well sites as a future drinking water source for future growth; (2) Growth is primarily outside of the town limits where the existing water rate structure generates water sale revenues at a rate that is approximately 1.5 times the in-town water sale revenue rate; (3) Existing drinking water system operates at approximately 66% and 44% of it's pumping capacity on an 8-hr and 12-hr basis, respectively; (4) Existing drinking water system's infrastructure losses through pipe leaks, meter reading/sizing inaccuracies, and unauthorized connections is less than 10%, which is significantly less than the national average of 15%; (5) Existing drinking water system's operating pressures and storage requirements are excellent for its future population and demand characteristics; (6) **TOA** maintains full control over the ability to set water rates over the long-term; (7) Population growth rate of 0.8% per year through 2050 is manageable under the existing drinking water system characteristics; and (8) Anticipated VA STAG grant subsidies will pay for the asset management and capital improvement projects that the existing drinking water system requires over the next five to ten years.

The cons of **Alternative 1**include the: (1) Continued reliance on ground water as the only drinking water supply source, which represents a greater risk due to future quality, withdrawal, and drawdown issues; (2) Potential for economic development within the immediate vicinity of the **TOA** is limited by the capacity of the existing well system; (3) Increasing growth in population served through 2050 will increase the level ADD and associated MDD volumes necessitating that the existing drinking water system institute 24-hour operations, which will significantly increase the cost to produce, maintain, and deliver drinking water to the customer; (4) Cost to produce drinking water is expected to more than double by 2050 due to stricter SDWA water quality standard revisions; (5) Stricter future water quality standards of the SDWA will require advanced treatment processes necessitating a central water treatment plant concept, which will be extremely expensive for the existing water system to institute under it's current individual well site concept; and (6) Existing **TOA** water rate structure does not promote water conservation over the long-term and the existing water rates do not include sufficient funding levels for maintaining adequate reserves for effective asset management and capital improvement projects.

Today, the existing **TOA** water system is technically sound requiring approximately $1M to $2M in capital improvements over the next few years. However, as the level of

demand and stricter water quality regulations increase the cost to produce, maintain, and deliver drinking water will increase significantly over the same period. When taken in conjunction with the new requirements under the proposed **WSPR**, **Alternative 1** does not help the **COA** or **TOA** to meet the future long-term drinking water planning and management issues.

b. Alternative 2A – TOA constructs Concord water line, purchases wholesale water from local purveyor, and continues to produce ½ of Its' ADD:

The **Alternative 2A** evaluates the decision that the **TOA** will stay in water production business, while making the necessary asset improvements to the existing drinking water system using the anticipated VA STAG Grant funding. In addition, in order to increase the reliability of the existing drinking water system, the **TOA** would finance the cost of constructing a 7-mile 12 inch diameter water line with booster pump station down U.S. 460 West to Concord as illustrated in **Figure A-3** in **Appendix A**. The capital costs for constructing the new 7-mile 12-inch transmission line with booster pump station is approximately $3.0 million, as illustrated in **Table B-1** in **Appendix B**. However, the **COA** residents and businesses within this U.S. 460 corridor would not fully benefit from the construction of the new water transmission line as the purpose of the water line extension is to provide a secondary water supply source to increase the reliability of the existing drinking water system for the **TOA**.

Under **Alternative 2A**, the **TOA** would continue to produce 50% of the current ADD (0.11 MGD) and purchase 50% of the ADD (0.12 MGD) from a local purveyor through a long-term wholesale water agreement. The wholesale water rate is assumed to be approximately $3.00 per 1000 gallons. The **TOA** would continue to operate the eight underground wells on an 8-hr basis with 2.5 FTE. Each well would continue to use spot chlorination with pH and corrosion control to meet the current water quality standards under the SDWA. The existing drinking water system would still be capable of storing 1.1 MG of drinking water in two aboveground storage tanks. However, the existing distribution system and population served could increase through the construction of the seven-mile 12-inch transmission line with booster pump station along the U.S. 460 West corridor. The allowable increase in the consumption rate and turnover rate of drinking water within the water line extension is determined by its' hydraulic and water quality characteristics.

The existing eight underground wells would still have a maximum daily capacity of 0.35 MGD and 0.52 MGD on a 8-hr and 12-hr basis, respectively. However, the drinking water production levels for the current ADD and associated MDD volumes would be cut in half to 0.11 MGD and 0.22 MGD, respectively, while continuing to serve its 1765 customers. This level of in-town drinking water production would continue at the average water rate of $2.97 per 1000 gallons. However, the other half of the existing drinking water system's ADD of 0.12 MGD would be purchased from a local purveyor at the assumed $3.00 per 1000 gallons.

The financial impact of the addition of the new debt service for the construction of Concord water line extension, continued drinking water production of one-half the current ADD at the current water rate, and negotiated contractual purchase of the other half of the current ADD at the assumed wholesale rate for the average **TOA** resident is an 137% increase in the average monthly water bill to approximately $14.65 per month. However, by opening up the U.S. 460W corridor to Concord, the projected 2050 ADD is expected to increase to 1.50 MGD. This increase in ADD assumes a modest population growth rate of approximately 1.0% per annum for the **COA** and **TOA** as well as a minimal potential for economic growth along the U.S. 460W corridor. The potential for a larger customer-base from the new population served along the U.S. 460 corridor means that the increased costs for operating the existing drinking water system can now be distributed more effectively, thereby, mitigating the negative financial impact on the current **TOA** resident.

The pros of **Alternative 2A** include the: (1) Development of the five additional well sites, along with a new drinking water supply source, will significantly increase the reliability of the existing drinking water system for future growth; (2) Growth is primarily outside of the town limits where the existing water rate structure generates water sale revenues at a rate that is approximately 1.5 times the in-town water sale revenue rate; (3) Existing drinking water system now operates at approximately 33% and 22% of it's pumping capacity on an 8-hr and 12-hr basis, respectively, which deceases the risk of short-term and long-term water shortages; (4) Existing drinking water system's infrastructure losses through pipe leaks, meter reading/sizing inaccuracies, and unauthorized connections is less than 10%, which is significantly less than the average water system losses of 15%; (5) Existing drinking water system's operating pressures and storage requirements are excellent for the future population and demand

characteristics; (6) **TOA** maintains full control over the ability to set long-term water rates through its' existing water rate setting procedures and new negotiated wholesale water agreement; (7) Population growth rate of approximately 1.0% per year through 2050 is manageable under the new drinking water system characteristics; and (8) Anticipated VA STAG grant funding, along with the USDA loan/grant subsidies, will pay for a significant portion of the total asset management and capital improvement costs that the new drinking water system requires for the implementation of **Alternative 2A**.

The cons of **Alternative 2A** include the: (1) Required upgrading of the existing drinking water system's water treatment technology as the stricter water quality standards are instituted under the SDWA, which will increase the long-term cost to produce, maintain, and deliver drinking water to the customer; (2) Expected long-term cost to produce water will more than double by 2050; (3) Stricter water quality regulations will require advanced treatment processes necessitating a central water treatment plant concept, which will be extremely expensive for the existing drinking water system to institute under it's current individual well site concept; (4) Increasing growth in population served through 2050 will increase the level ADD and associated MDD volumes necessitating that the existing drinking water system institute 24-hour operations, which will significantly increase the cost to produce, maintain, and deliver drinking water to the customer; (5) Additional financial uncertainty that will be assumed for the prediction of the minimum quantity of drinking water to be purchased from the purveyor, since half of the current and future ADD will be purchased through a negotiated long-term wholesale contract; (6) Potential for economic development, along the U.S. 460 Corridor, will be limited by the size of the water line and quantity of wholesale drinking water that is negotiated within the long-term wholesale contract; (7) Additional increases in the current **TOA** water rates to include a portion for maintaining adequate reserves for essential asset management and capital improvement projects; and (8) Additional costs that require the average **TOA** resident to pay an additional $3.95 per month for the construction of the proposed 7-mile 12-inch transmission line, completion of the existing drinking water system asset improvements, purchase of the minimum quantity of wholesale water from the purveyor, and continued operations of the existing drinking water system.

Alternative 2A has the lowest capital cost requirements of any of the long-term water supply alternatives. **Alternative 2A** also has minimal regulatory permitting requirements since the construction of a public water line is generally permitted in less than one year. The additional capacity of the existing water system's underground wells from the purchase of wholesale drinking water becomes the backup emergency water supply source for future drought events. As stated previously, the existing **TOA** drinking water system still requires approximately $1M to $2 M in capital improvements over the next few years. However, when taken in conjunction with the implementation of the proposed **WSPR**, **Alternative 2A** addresses many of these new requirements for the **COA** or **TOA** to meet the future long-term drinking water planning and management issues.

c. Alternative 2B – Joint PSA constructs Concord water line and purchases wholesale water from local purveyor:

Alternative 2B evaluates the decision that the **TOA** gets completely out of the water production business by establishing a joint Public Service Authority (**PSA**) with the **COA**. The 2.5 FTE for the operations of the existing drinking water system would be absorbed into the PSA. In order to increase the long-term reliability of the new drinking water system, the joint PSA would then construct a new eight mile 16-inch transmission line with highway borings and booster pump station to Concord, along the U.S. 460 West corridor, as illustrated in **Figure A-3** in **Appendix A.** The capital costs for the construction of a new eight mile 16-inch transmission line with highway borings and booster pump station to Concord is approximately $3.5M, as illustrated in **Table B-2** in **Appendix B.** In addition, the **TOA** would sell its assets for the existing drinking water system to the joint PSA for approximately $2.0M. The joint PSA would then be responsible for setting its water rates and negotiating a long-term wholesale water supply contract with a local purveyor. The anticipated wholesale water rate of the joint PSA is assumed to be equal to $3.00 per 1000 gallons.

Alternative 2B provides the means for the **TOA** to eliminate the liability and costs of running a public drinking water system, while increasing reliability through the development of a new primary long-term drinking water supply source. Under **Alternative 2B** it is assumed that the joint PSA would purchase 100% of its current and future ADD volume through a negotiated wholesale water supply contract with a local purveyor. The existing drinking water system would be primarily utilized as a

backup emergency drinking water supply source for severe drought events. However, it is understood that the joint PSA could establish and operate at the most efficient operating point for producing, purchasing, maintaining, and delivering drinking water according to the corresponding customer-base and associated level of the ADD.

The current level of the ADD is 0.23 MGD, which would be supplied through wholesale drinking water purchases. The associated level of the MDD is 0.45 MGD. The current customer-base is 1765 customers that are served through 785 service connections, which equates to 2.25 persons per service connection. The current consumption rate for drinking water is 293 gallons per day per service connection or 130 gallons per day per person.

The result of the addition of the new debt service for the construction of the new water line extension, purchase of the assets of the existing drinking water system, and purchase of 100% of the ADD at the projected wholesale rate for the average **TOA** resident is a 189% increase in the average monthly water bill to approximately $20.20 per month. However, by establishing the joint PSA and opening up the U.S. 460 corridor to Concord, the projected 2050 ADD is expected to increase to 2.00 MGD. This increase assumes a modest population growth rate of approximately 1.0% per annum for the **COA** and **TOA** as well as a significant increase for potential economic growth along the U.S. 460 corridor. Economic development would be promoted through incentives to increase the customer-base and associated level of demand as quickly as possible. The potential for a significantly larger customer-base from the new population served and economic development along the U.S. 460 corridor means that the increased costs for operating the new drinking water system can now be distributed more effectively, thereby, mitigating the negative financial impact on the current **TOA** resident.

The pros of **Alternative 2B** include the: (1) Development of a new primary drinking water supply source for the **COA** and **TOA** through long-term wholesale drinking water purchases, which will increase the reliability of drinking water for future growth; (2) Utilization of the existing underground well system as an emergency backup drinking water supply source for severe drought events; (3) **TOA** is now out of the water production business through establishment of the joint PSA; (4) Future cost to produce drinking water is mitigated through its dilution within a much larger customer-base; (5) Potential for economic development is enhanced through increased water reliability

and connection/rate incentives; (6) Wholesale water rate growth is controlled through a negotiated contract over a 30 to 50 year period; (7) Projected growth rate for the population served is still manageable at approximately 1.0% per year through 2050; and (8) Anticipated VA STAG grant funding, along with the USDA loan/grant subsidies, pays for a significant portion of the total capital improvement, asset purchase, and asset management costs that the new drinking water system requires for the implementation of **Alternative 2B**.

The cons of **Alternative 2B** include the: (1) Additional regulatory and legal requirements for the establishment of a joint PSA to operate the existing drinking water production business; (2) Additional debt service that the joint PSA will incur for the purchase of the $2.0M in assets from the **TOA**; (3) Additional complexity of predicting the increases in the joint PSA's population served and associated ADD through 2050 to effectively negotiate the levels for the minimum quantity of drinking water purchased and associate water rate adjustments within long-term wholesale contract with a local purveyor; (4) Increased variability in predicting the impact of future economic development activities, along the U.S. 460 corridor, on the magnitude of the ADD through 2050, which will adversely affect the size and associated capital costs of the Concord water line extension and negotiated levels for the minimum quantity of water purchased under the long-term wholesale contract with the local purveyor; (5) Requirement for the joint PSA to establish a new uniform water rate for all customers; (6) Requirement for the joint PSA's water rate structure to promote water conservation over the long-term trough its water rates, which will include a portion for maintaining adequate reserves for asset management and capital improvement projects; and (7) Additional costs that require the average **TOA** resident to pay an additional $9.50 per month for the construction of the eight mile 16-inch transmission line with highway borings to Concord, purchase of the existing **TOA** assets, purchase of a sustainable quantity of wholesale water from the purveyor, and operations of the new drinking water system.

Alternative 2B has the fourth highest capital cost requirements of the six long-term drinking water supply alternatives. **Alternative 2B** also requires an additional amount for equipment expenditures, i.e., a new 250,000 MG aboveground water storage tank, pump station, as the service demand grows through 2050. **Alternative 2B** also has minimal regulatory permitting requirements since the construction of a public water line

is generally permitted in less than one year. However, the establishment of a joint PSA for the **COA** and **TOA** will require at least one year, which may run concurrently with the permitting process for the construction of the new Concord water line extension.

As stated previously, until the existing **TOA** water system is deactivated, it will still require approximately $1M to $2 M in capital and asset improvements over the next five to ten years. The water line construction is estimated to cost approximately $3.5M and asset purchase is estimated to cost approximately $2.0M, which significantly increases the cost of **Alternative 2B**. However, when taken in conjunction with the implementation of the proposed **WSPR**, **Alternative 2B** also addresses many of these new requirements for the **COA** or **TOA** to meet the future long-term drinking water planning and management issues.

d. Alternative 3 – Joint PSA constructs Lynchburg water line and purchases wholesale water from local purveyor:

Alternative 3 evaluates the decision that the **TOA** gets completely out of the water production business by establishing a joint PSA with the **COA**. The 2.5 FTE for the operations of the existing drinking water system would be absorbed into the joint PSA. In order to increase the long-term reliability of the new drinking water system, the joint PSA would then construct a new five miles of 20-inch transmission water line with future 1-MG aboveground storage tank located at Concord and eight miles of 16-inch transmission line with highway borings and booster pump station along the U.S. 460 corridor, as illustrated in **Figure A-4** in **Appendix A**. The capital costs for the construction for **Alternative 3** are approximately $11M, as illustrated in **Table B-3** in **Appendix B**. In addition, the **TOA** would sell its assets for the existing drinking water system to the joint PSA for approximately $2M. The joint PSA would then be responsible for setting its water rates and negotiating a long-term wholesale water supply contract with a local purveyor. The anticipated wholesale water rate of the joint PSA is assumed to be equal to $3.00 per 1000 gallons.

Alternative 3 provides the means for the **TOA** to eliminate the liability and costs of running a public drinking water system, while increasing the reliability of its' long-term drinking water supply source. Under **Alternative 3** it is assumed that the joint PSA would purchase 100% of its current and future ADD through a negotiated wholesale water supply contract with a local purveyor. The existing drinking water system would be primarily utilized as a backup emergency drinking water supply source for severe

drought events. However, it is understood that the joint PSA could establish and operate at the most efficient operating point for producing, purchasing, maintaining, and delivering drinking water according to the corresponding customer-base and associated level of the ADD.

The current level of the ADD is 0.23 MGD, which would be supplied through wholesale drinking water purchases. The associated level of the MDD is 0.45 MGD. The current customer-base is 1765 customers that are served through 785 service connections, which equates to 2.25 persons per service connection. The current consumption rate for drinking water is 293 gallons per day per service connection or 130 gallons per day per person.

The result of the addition of the new debt service for the construction of a new water line extension, purchase of the assets of the existing water system, and purchase of 100% of the ADD at the projected wholesale rate for the average **TOA** resident is a 335% increase in the average monthly water bill to approximately $35.90 per month. However, by establishing the joint PSA and opening up the U.S. 460 corridor to Lynchburg, the projected 2050 ADD is expected to increase to 2.40 MGD. This increase assumes a modest population growth rate of approximately 1.0% per annum for the **COA** and **TOA** as well as a significant increase for potential economic growth along the U.S. 460 corridor. Economic development would be promoted through incentives to increase the customer-base and associated level of demand as quickly as possible. The potential for a significantly larger customer-base from the new population served and economic development along the U.S. 460 corridor means that the increased costs for operating the new drinking water system can now be distributed more effectively, thereby, mitigating the negative financial impact on the current **TOA** resident.

The pros of **Alternative 3** include the: (1) Development of a new primary drinking water supply source for the **COA** and **TOA** through long-term wholesale drinking water purchases that will increase the reliability of drinking water for future growth; (2) Utilization of the existing underground well system as an emergency backup drinking water supply source for severe drought events; (3) **TOA** is now out of the water production business through establishment of the joint PSA; (4) Future cost to produce drinking water is mitigated through its dilution within a much larger customer-base; (5) Potential for economic development is enhanced through increased reliability and

connection/rate incentives; (6) Wholesale water rate growth is controlled through a negotiated contract over a 30 to 50 year period; (7) Projected growth rate for the population served is still manageable at approximately 1.0% per year through 2050; and (8) Anticipated VA STAG grant funding, along with the USDA loan/grant subsidies, pays for a significant portion of the total capital improvement, asset purchase, and asset management costs with the implementation of **Alternative 3**.

The cons of **Alternative 3** include the: (1) Additional regulatory and legal requirements for the establishment of a joint PSA to operate the existing drinking water production business; (2) Additional debt service that the joint PSA will incur for the purchase of the $2.0M in assets from **TOA**; (3) Additional complexity of predicting the increases in the joint PSA's population served and associated ADD through 2050 to effectively negotiate the levels for the minimum quantity of drinking water purchased and associate water rate adjustments within long-term wholesale contract with a local purveyor; (4) Increased variability in predicting the impact of future economic development activities, along the U.S. 460 corridor, on the magnitude of the ADD through 2050, which will adversely affect the size and associated capital costs of the Concord water line extension and negotiated levels for the minimum quantity of water purchased under the long-term wholesale contract with the local purveyor; (5) Requirement for the joint PSA to establish a new uniform water rate for all customers; (6) Requirement for the joint PSA's water rate structure to promote water conservation over the long-term trough its water rates, which will include a portion for maintaining adequate reserves for asset management and capital improvement projects; and (7) Additional costs that require the average **TOA** resident to pay an additional $25.20 per month for the construction of the new thirteen mile 20/16-inch transmission water line to Lynchburg, purchase of the existing **TOA** assets, purchase of a sustainable quantity of wholesale water from the purveyor, and operations of the new drinking water system.

Alternative 3 has the third highest capital cost requirements of the six long-term drinking water supply alternatives. **Alternative 3** also requires a significant amount of additional equipment expenditures, i.e., 1.00 MG aboveground water storage tank, pump station, etc. as the service demand grows through 2050. **Alternative 3** still has minimal regulatory permitting requirements since the construction of a public water line is generally permitted in less than one year. However, the establishment of a joint PSA

for the **COA** and **TOA** will also require at least one year, which may run concurrently with the permitting process for the construction of the new Lynchburg water line.

As stated previously, until the existing **TOA** water system is deactivated, it will still require approximately $1M to $2 M in capital and asset improvements over the next five to ten years. The water line construction is estimated to cost approximately $11M and asset purchase is estimated to cost approximately $2M, which significantly increases the cost of **Alternative 3**. However, when taken in conjunction with the implementation of the proposed **WSPR**, **Alternative 3** addresses many of these new requirements for the **COA** or **TOA** to meet the future long-term drinking water planning and management issues.

e. Alternative 4 – Joint PSA constructs James River Intake and produces water:

Alternative 4 evaluates the decision that the TOA gets completely out of the water production business by establishing a joint PSA with the **COA**. The 2.5 FTE for the operations of the existing drinking water system would be absorbed into the joint PSA. In order to increase the long-term reliability of the new drinking water system, the joint PSA would then construct a new surface water intake pump station located in the James River with a 2.00-MGD water treatment plant, twelve mile 16-inch transmission line, and booster pump station, as illustrated in **Figure A-5** in **Appendix A**. The capital costs for the construction of **Alternative 4** are approximately $15M, as illustrated in **Table B-3** in **Appendix B**. In addition, the **TOA** would sell its assets for the existing drinking water system to the joint PSA for approximately $2M. The joint PSA would then be responsible for setting its own water rates.

Alternative 4 provides the means for the **TOA** to eliminate the liability and costs of running a public drinking water system, while increasing the reliability of its' long-term drinking water supply source. Under **Alternative 4** it is assumed that the joint PSA would supply 100% of its ADD through a new surface water intake and treatment system. The existing groundwater system would be primarily utilized as a backup emergency drinking water supply source for severe drought events. However, it is understood that the joint PSA could establish and operate at the most efficient operating point for producing, maintaining, and delivering drinking water according to the corresponding customer-base and associated level of the ADD.

The current level of the ADD is 0.23 MGD, which would be supplied through wholesale drinking water purchases. The associated level of the MDD is 0.45 MGD. The current customer-base is 1765 customers that are served through 785 service connections, which equates to 2.25 persons per service connection. The current consumption rate for drinking water is 293 gallons per day per service connection or 130 gallons per day per person.

The result of the addition of the new debt service for the construction of the James River intake, water treatment plant, water line extension, and purchase of the assets of the existing drinking water system to the average **TOA** resident is a 625% increase in the average monthly water bill to approximately $66.70 per month. However, by establishing the joint PSA and providing a new long-term drinking water source, the projected 2050 ADD is expected to increase to 2.50 MGD. This increase assumes a modest population growth rate of approximately 1.0% per annum for the **COA** and **TOA** as well as an increased potential for economic growth along the U.S. 26 corridor and within a two mile radius around the **TOA**. Economic development would be promoted through incentives to increase the customer-base and associated level of demand as quickly as possible. The potential for a larger customer-base from the new population served and economic development along the U.S. 26 corridor is significantly less than along the U.S. 460 corridor. This means that the increased costs for operating the new drinking water system can not be significantly diluted, thereby, enhancing the negative financial impact on the current **TOA** resident.

The pros of **Alternative 4** include the: (1) Development of a new primary drinking water supply source on the James River for the **COA** and **TOA**; (2) utilization of the existing **TOA** underground well system as an emergency backup drinking water supply source for severe drought events; (3) **TOA** is out of the drinking water production business through establishment of the joint PSA; (4) Potential for economic development along the U.S. 26 corridor is enhanced through the increased reliability and quantity of drinking water through the joint PSA; (5) Projected growth rate for the population served is still manageable at approximately 1.0% per year through 2050; and (6) Anticipated VA STAG grant funding, along with the USDA grant/loan subsidies, pays for a significant portion of the total capital improvement, asset purchase, and asset management costs with the implementation of **Alternative 4**.

The cons of **Alternative 4** include the: (1) Additional regulatory and legal requirements for the establishment of a joint PSA to operate the drinking water production business; (2) Additional debt service that the joint PSA will incur for the purchase of the $2.0M in assets from **TOA**; (3) Additional complexity of predicting the increases in the joint PSA's population served and associated ADD through 2050 to effectively stage the capacity development of the new 2.00-MGD water treatment plant; (4) Increased adverse impact on the magnitude of the future water bills of the customer-base of the joint PSA because the potential for economic development along the U.S. 26 corridor is limited; (5) Requirement for the joint PSA to establish a new uniform water rate for all customers; (6) Requirement for the joint PSA's water rate structure to promote water conservation over the long-term trough its water rates, which will include a portion for maintaining adequate reserves for asset management and capital improvement projects; and (7) Additional costs that require the average **TOA** resident to pay an additional $56.00 per month for the construction of the new surface water intake pump station/water treatment plant/12-mile 16-inch transmission line/booster pump station, purchase of the existing **TOA** assets, and operations of the new drinking water system.

Alternative 4 has the highest capital cost requirements of the six long-term drinking water supply alternatives. The likelihood of significant economic development along the US 26 corridor is much lower than along the US 460 corridor. **Alternative 4** requires the greatest amount of additional equipment expenditures, i.e., intake pump station, water treatment plant, booster pump station, 12-mile 16-inch transmission line, etc., within the immediate future. **Alternative 4** has significant regulatory permitting requirements for the construction of a new James River intake, which can typically take two to five years to complete. The establishment of a joint PSA for the **COA** and **TOA** will also require at least one year, which may run concurrently with the permitting process for the construction of the new James River Intake.

As stated previously, until the existing **TOA** drinking water system is deactivated, it will still require approximately $1M to $2 M in capital and asset improvements over the next five to ten years. The James River Intake construction is estimated to cost approximately $15M and asset purchase is estimated to cost approximately $2M, which significantly increases the cost of **Alternative 4**. However, when taken in conjunction with the implementation of the proposed **WSPR**, **Alternative 4** addresses

many of these new requirements for the **COA** or **TOA** to meet the future long-term drinking water planning and management issues.

f. **Alternative 5 – Joint PSA constructs a multi-purpose reservoir and produces water:**

Alternative 5 evaluates the decision that the TOA gets completely out of the water production business by establishing a joint PSA with the **COA**. The 2.5 FTE for the operations of the existing drinking water system would be absorbed into the joint PSA. In order to increase the long-term reliability of the new drinking water system, the joint PSA would then construct a new multi-purpose reservoir with dam structure, intake pump station, 2.00-MGD water treatment plant, and three mile 16-inch transmission line, as illustrated in **Figure A-6** in **Appendix A**. The capital costs for **Alternative 5** are approximately $14M, as illustrated in **Table B-5** in **Appendix B**. In addition, the **TOA** would sell its assets for the existing drinking water system to the joint PSA for approximately $2M. The PSA would then be responsible for setting its water rates.

Alternative 5 provides the means for the **TOA** to eliminate the liability and costs of running a public drinking water system, while increasing the reliability of its' long-term drinking water supply source. Under **Alternative 5** it is assumed that the joint PSA would produce 100% of its ADD through a new surface water impoundment and treatment system. The existing underground water system would be primarily utilized as a backup emergency drinking water supply source for severe drought events. However, it is understood that the joint PSA could establish and operate at the most efficient operating point for producing, maintaining, and delivering drinking water according to the corresponding customer-base and associated level of the ADD.

The current level of the ADD is 0.23 MGD, which would be supplied through wholesale drinking water purchases. The associated level of the MDD is 0.45 MGD. The current customer-base is 1765 customers that are served through 785 service connections, which equates to 2.25 persons per service connection. The current consumption rate for drinking water is 293 gallons per day per service connection or 130 gallons per day per person.

The result of the addition of the new debt service for the construction of the multi-purpose dam, water treatment plant, water line extension, and purchase of the assets of the existing water system for the average **TOA** resident is a 600% increase in the

structure to promote water conservation over the long-term trough its water rates, which will include a portion for maintaining adequate reserves for asset management and capital improvement projects; and (7) Additional costs that require the average **TOA** resident to pay an additional $53.50 per month for the construction of the new surface impoundment/intake pump station/water treatment plant/3-mile 16-inch transmission line/booster pump station, purchase of the existing **TOA** assets, and operations of the new drinking water system.

Alternative 5 has the second highest capital cost requirements of the six drinking water supply alternatives. The likelihood of significant economic development within a 2 mile radius of the TOA is much lower than along the U.S. 460 corridor. **Alternative 5** also requires a significant amount of additional equipment expenditures, i.e., dam, intake pump station, water treatment plant, booster pump station, 3-mile 16-inch transmission line, etc., within the immediate future. **Alternative 5** has very significant regulatory permitting requirements for the construction of a new multi-purpose reservoir, which can typically take seven to ten years to complete. The establishment of a joint PSA for the **COA** and **TOA** will require at least one year, which may run concurrently with the permitting process for the construction of the new multi-purpose reservoir.

As stated previously, until the existing **TOA** drinking water supply system is deactivated, it will still require approximately $1M to $2 M in capital and asset improvements over the next five to ten years. The construction of the multi-purpose reservoir is estimated to cost approximately $14M and asset purchase is estimated to cost approximately $2M, which significantly increases the cost of **Alternative 5**. However, when taken in conjunction with the implementation of the proposed **WSPR**, **Alternative 5** addresses many of these new requirements for the **COA** or **TOA** to meet the future long-term drinking water planning and management issues.

1) Wreck Island - Stonewall Mill Impoundment:

Through additional discussions of feasible long-term drinking water supply alternatives it became known that Nelson County constructed a new surface impoundment, as illustrated in **Figure A-7** in **Appendix A**. The question was presented as to whether a similar surface impoundment could be constructed for the Appomattox situation.

The new drinking water supply impoundment for Nelson County is filled by a 3 square mile watershed and expected to meet a future ADD of 0.11 MGD. A conservative estimate for the future ADD for the joint PSA's drinking water supply system is approximately 1.5 MGD. Therefore, a drinking water supply impoundment for Appomattox would need to be served by a 40 square mile watershed that is expected to meet a future ADD of 1.50 MGD.

Further research revealed that hydrologic data was collected and analyzed for Wreck Island Creek near Stonewall Mill in the report completed by Wiley and Wilson entitled, *Water Resource Study for the Appomattox Area for the Town of Appomattox and County of Appomattox*, dated August 2003. The hydrologic analysis of the Wreck Island creek showed that its' 39 square mile watershed would require a 17 ft high impoundment to store 20 MG. This hydrologic analysis assumes that the safe yield of the Wreck Island creek is approximately 1.0 MGD.

A comparative analysis of the construction costs of the Nelson County impoundment revealed that a similar impoundment that is sized for the Appomattox ADD would require the construction of an impoundment structure, intake pump station, 2.00-MGD water treatment plant, eight mile 16-inch transmission line, and booster pump station, as illustrated in **Table B-6** in **Appendix B**. The capital costs for the **Wreck Island-Stonewall Mill Impoundment** are approximately $13M, which are similar in magnitude to the **Alternative 5** capital costs for a multipurpose reservoir. Therefore, the **Wreck Island-Stonewall Mill Impoundment** is not included as a viable long-term drinking water supply alternative.

g. Results of the analysis of the long-term drinking water supply alternatives:

Table C-1 in **Appendix C** presents a comparative cost summary of the above discussions regarding the six long-term drinking water supply alternatives. It is important to note that these results are dependent on the following study assumptions for the existing **TOA** drinking water supply system in FY2005: (1) Serves a customer-base of 1765 customers; (2) Consumes a ADD of 0.23 MGD; (3) Uses a water rate structure of $6.05 for first 2000 gallons + $2.85 for each additional 1000 gallons; (4) Receives $800,000 under the provisions of the VA STAG grant program for small water supply system improvements and is expected to receive an additional $800,000 during the next fiscal cycle; (5) Applies for and receives a USDA 25/75 loan/grant for

funding for project design and construction costs;[xii] (6) Negotiates future wholesale water rates of $3.00 per 1000 gallons; and (7) Completes a hydraulic analysis to determine the actual physical requirements and equipment of the preferred project alternative.

Given these assumptions, **Alternatives 3, 4,** and **5** are not economically viable when considering the size if the existing customer-base. **Alternative 1** is economically viable, but it does not address the long-term reliability problem of depending on a single highly variable groundwater drinking water source. **Alternative 2A** is economically viable in the short-term and addresses the long-term reliability problem through an additional drinking water source. However, **Alternative 2A** assumes that the **TOA** will continue to produce 50% of its' drinking water. The cost of producing drinking water is highly variable and expected to increase significantly over the next 20 years due to stricter water quality standards. The uncertainty in the cost to produce drinking water will adversely affect the existing water rates for the current **TOA** resident.

Alternative 2B offers the **TOA** the ability to get out of the drinking water production business through the establishment of a joint PSA with the **COA**. Once the joint PSA is established it would then construct a water line to Concord, which requires the lowest capital costs in-terms of developing a long-term and sustainable drinking water supply source. The joint PSA would negotiate a long-term wholesale drinking water contract with a local purveyor, which will increase the reliability of its' drinking water system over the next 30 to 50 year period. The assets of the existing TOA drinking water system would be sold to the joint PSA and utilized as an emergency backup drinking water supply during severe drought periods.

It is assumed that the development of a joint PSA that will serve to promote a business-like atmosphere for the production, maintenance, and delivery of drinking water over a significantly larger customer-base. The joint PSA would develop incentives for new customers and promote economic development throughout its' service area especially along the U.S. 460 corridor to Concord. The joint PSA would also establish equable water rates that reflect the full cost to produce, maintain, and

[xii] The annual principle/interest payments for the USDA 25/75 loan/grant package are calculated over 40 years at 5% per annum or $(1.05)^{40}$. The requirements for the USDA Rural Development grant can be accessed at: http://www.usda.gov/rus/water/2005funding.htm.

deliver drinking water to its' customers, while promoting water conservation over the long-term.

The extension of the water line, along the U.S. 460 corridor, to Concord provides the best option for expanding the existing **TOA** customer-base as well as providing an economically viable alternative for increasing the reliability of the existing **TOA** drinking water supply system. Increasing the existing **TOA** customer-base through residential connection fee and/or economic development incentives is critical for mitigating the predicted increases in the cost of producing drinking water on the existing **TOA** residents.

The immediate financial impact of **Alternative 2B** on the existing **TOA** resident is approximately $9.50 per month or a 90% increase in their current monthly water bills. This immediate financial impact is reflective of purchasing 100% of their ADD from the joint PSA through a long-term, i.e., 30 to 50 years, wholesale drinking water contract and the new debt service of: (1) $3.5M for the construction of the new 8-mile 16-inch water line extension to Concord; and (2) $2.0M for the purchase of the assets of the existing **TOA** drinking water system. However, this $5.5M debt service is expected to be reduced to approximately $1M through grant funding of $1.6M and $2.9M from the VA STAG grant and USDA 25/75 loan/grant programs, respectively.

Although a 90% increase in a typical **TOA** resident monthly water bill seems large, when taken in conjunction with the fact that the cost to produce drinking water is expected to increase by more than 200% within the next 20 years, it is actually quite reasonable. Finally, the establishment of the joint PSA with **COA** will provide the existing **TOA** resident the best opportunity for mitigating the impact of the future cost of drinking water through the effective utilization of technology, whose costs will be diluted over a much larger customer-base.

4. Impact of Residential Growth on ADD:

The projected population growth data for the **COA** and **TOA** was gathered and analyzed from the U.S. Census Bureau and Virginia Employment Commission (VEC) databases, as illustrated in **Table 2**:

***Table 2:* The Projected Population Growth Rates for Appomattox from 1990 through 2050.**

	1990	2000	2010	2020	**2050**
Population	12,147	13,710	14,126	14,833	**20,000**

Source: U.S. Census Bureau website URL: http://quickfacts.census.gov/qfd/states/51/51031.html

Table 2 is inclusive of the **TOA** population growth. The combined population growth rate for the **COA** and **TOA** from 1990 though 2000 was approximately 1.15% per annum. The combined population growth from 2000 through 2020 is projected to be approximately 0.50% per annum. Therefore, for this study the **TOA**'s population growth rate is projected to be approximately 0.8% per annum through 2050. While, the combined population growth rate for the **COA** and **TOA** is projected to be approximately 1.0% per annum through 2050.

As the total population increases through 2050, the population served by the drinking water supply system will also increase. In 2005, the population served by the drinking water supply system is approximately 1765 or 12% of the total Appomattox population. Therefore, assuming that this percentage remains constant through 2050, the population served could reach approximately 2400 customers. However, does this conservative population served projection actually reflect the historical demand and population served characteristics of the existing **TOA** drinking water supply system?

a. Present Demand Analysis

The present demands for the **TOA**'s drinking water supply system are estimated from the historical demand data that was gathered through previous studies, as delineated in the reference section for this study. The total drinking water consumption rate for the actual gallons per day per capita (gpdpc) is estimated to be approximately 130 gpdpc for the **TOA**'s drinking water system. A referenced drinking water consumption rate for the Commonwealth of Virginia is estimated to be approximately 137 gpdpc. [xiii] Therefore, the level of the ADD for the **TOA**'s drinking water supply system is very similar with other CWS within the Commonwealth of VA. However, many design characteristics of drinking water supply systems are dependent of the level of the MDD or peak daily demand.

[xiii] Dewberry and Davis, *Land Development Handbook*, Table 13.3, page 464, McGraw-Hill, New York, NY, 1996

The levels of the present ADD and MDD for the **TOA**'s drinking water supply system were estimated from the 2004 Annual Report of Water Withdrawals, as submitted to the South Central Regional Office of the VDEQ and dated December 6, 2004. The **TOA**'s drinking water supply system produced 83.7 MGY, which equates to an ADD of 0.23 MGD. The relationship between the **TOA**'s drinking water supply system ADD and MDD levels is illustrated in **Figure 4**:

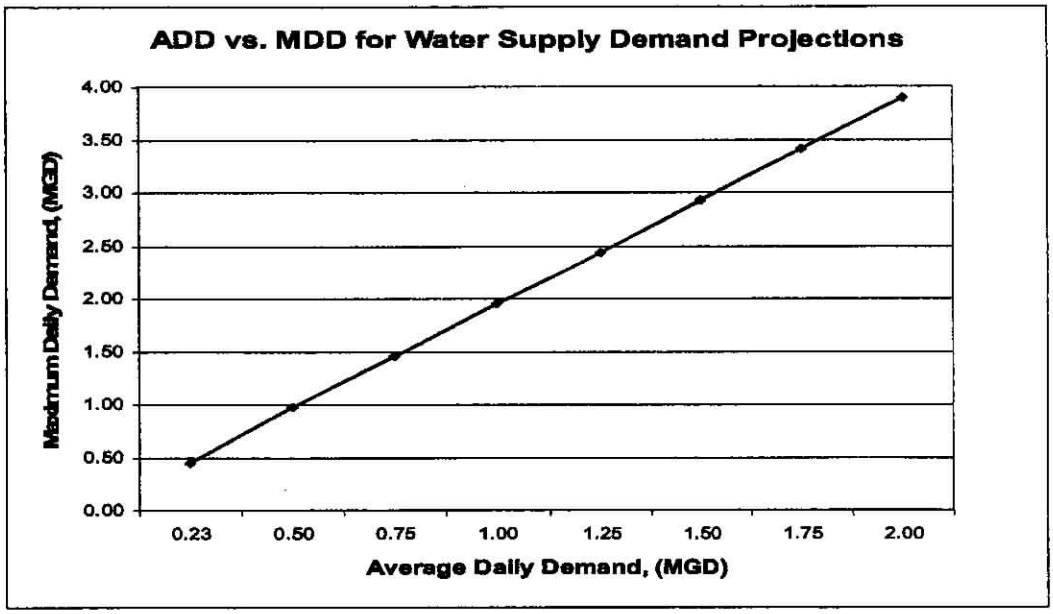


Figure 4: **The Relationship Between the Levels of the Average Daily Demand and Maximum Daily Demand for the Town of Appomattox.**

Figure 4 illustrates that the level of the MDD is approximately two times the level of the ADD. Assuming that this relationship holds through 2050, as the level of the ADD approaches 2.00 MGD the level of the MDD will approach 4.00 MGD. Therefore, it is important to design the future drinking water supply infrastructure for this daily peak or maximum flow rate.

b. Future Demand Analysis

Is the future level of the ADD of the **TOA**'s drinking water supply system likely to approach 2.00 MGD by 2050? This level of ADD is highly dependent on the projected growth rates for the total population and population served for the **TOA**'s drinking water supply system, as illustrated in **Figure 5**:

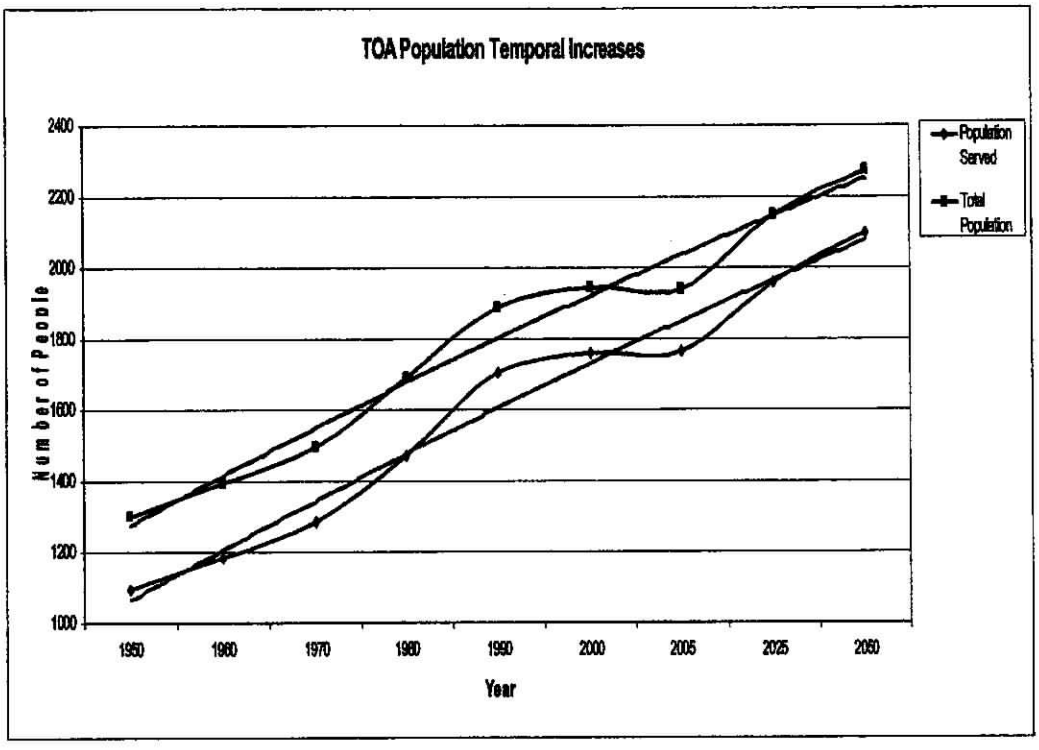


Figure 5: **The Historical Temporal Increases in the Total Population and Population Served Characteristics for Appomattox.**

Figure 5 shows that if the historical growth rate for the total population and population served are extended from 1960 through 2050 the number of customers served by the **TOA** drinking water supply system should approach 2100. This is approximately 300 less customers then predicted when using the above conservative method that uses 12% of the total Appomattox area population as the predictor for the population served. Given that the average **TOA** customer continues to consume approximately 60 gpdpc then the associated increase in the level of ADD through 2050 is illustrated in **Table 3**:

Table 3: **The Projected Population Growth and ADD for Town of Appomattox from 2000 through 2050.**

Year	Projected Total Population	Projected Population Served	MGD @ 60 gpdpc	MGD @ 86 gpdpc
2050	2,272	2,100	0.126	0.181
2025	2,150	1,960	0.118	0.168
2005	1,940	1,765	0.105	
2000	1,945	1,706	0.102	

VEC VELMA URL: http://velma.virtuallmi.com/analyzer/mappages/cnty.asp?mapcode=04

Table 3 reveals that the levels of the population served and ADD for the **TOA**'s drinking water supply system should increase by approximately 20% through 2050. The last column uses a consumption rate of 86 gpdpc, which represents a design or standard residential consumption rate from the (USGS, 1995).

Theoretically, if the service area of the **TOA**'s drinking water supply system is extended along the U.S. 460 and 26 corridors, the existing customer-base of 767 households would be expanded to include the **COA** residents within the extended service area, as illustrated in **Table 4**:

***Table 4:* The Projected Population Growth and ADD for the Extended Appomattox Service Area from 2000 through 2050.**

Year	Projected Total Population	Projected Population Served	MGD @ 60 gpdpc	MGD @ 86 gpdpc
2050	20,000	2,400	0.144	0.206
2025	14,833	2,100	0.126	0.181
2005	13,770	1,765	0.105	
2000	13,710	1,706	0.102	

VEC VELMA URL: http://velma.virtuallmi.com/analyzer/mappages/cnty.asp?mapcode=04

Table 4 reveals that by extending the service area of the existing **TOA**'s drinking water supply system, along the U.S. 460 and 26 corridors, the projected population served and ADD would require that drinking water be provided for an additional 300 customers through 2050. The combined **TOA and COA** population served and ADD should conservatively approach 2,400 customers with an ADD between 0.144 MGD and 0.206 MGD and MDD between 0.288 MGD and 0.412 MGD, respectively. This projected level of residential demand is well within the capabilities of the existing underground well system. However, when the projected ADD levels for the existing and future C/I/I consumption are included within the Appomattox demand projections the existing underground well system is unable to meet the total consumption rate.

5. Impact of Economic Development on ADD and MDD:

The projected growth rate for the drinking water supply system's population served is also highly dependent on the expansion of the existing **TOA** service area into the **COA**, especially along the U.S. 460 corridor. The U.S. 460 corridor provides the best opportunities for economic development within the extended service area of the **TOA**'s drinking water supply system.

a. Appomattox Economic Development Sites[xiv]

Currently there are five economic development sites within two miles of the **TOA**. Approximately 831 acres may be developed within these sites. These sites are accessible from the U.S. 460 and/or 26 corridors. The expected level of ADD from the development of these sites is approximately 0.10 MGD.

b. Appomattox Center for Business and Commerce Site

The Appomattox Center for Business and Commerce is an existing Industrial Park that is within 2 miles of the **TOA**. The industrial park contains 485 acres for development. This site is also accessible from the U.S. 460 and/or 26 corridors. The expected level of ADD from the development of this industrial park site is approximately 0.20 MGD.

c. Regional Industrial Park Site

The proposed regional industrial park is an industrial park site consisting of 1900 acres that is situated in **COA** and contiguous to the Campbell County line near Concord. This site is accessible from the U.S. 460 corridor. The expected level of ADD from the development of this site is approximately 0.95 MGD.

The projected ADD from the full development of the existing **TOA** economic development, existing Appomattox Center for Business and Commerce, and proposed regional industrial park sites is highly speculative because of the stochastic nature of locating businesses within competing jurisdictions. Localities must compete for the privilege of hosting new businesses within their respective jurisdictions. This involves providing economic incentives for the business to relocate its operations within its jurisdiction. Many localities have constraints as to the type and size of the business that they are willing to attract to their jurisdiction. Of course these constraints change over the years depending on the local economic conditions. Therefore, the study predictions regarding the rate of economic development within the Appomattox area are conservative.

The present C/I/I demand for the **TOA**'s drinking water system is estimated to be approximately 0.13 MGD, as illustrated in **Table 5**:

[xiv] VEDP website: http://virginiascan.yesvirginia.org/phase2

***Table 5:* The Projected Commercial, Institutional, and Industrial ADD for the Extended Appomattox Service Area from 2005 through 2050.**

Projected C/I/I breakdown	Current TOA	1300 AC E/D	1900 AC I/P	Total Projected ADD
MGD	0.13	0.30	0.95	1.40

VEC VELMA URL: http://velma.virtuallmi.com/analyzer/mappages/cnty.asp?mapcode=04

Table 5 also reveals that existing six sites for economic development in and around the **TOA** amount to approximately 1300 acres with a projected ADD of 0.30 MGD. The proposed regional industrial park site contains 1900 acres with a projected ADD of 0.95 MGD. Therefore, the total projected C/I/I demand through 2050 is 1.40 MGD. Given the existing **COA** zoning requirements along the U.S. 460 and 26 corridors, the potential for additional economic development sites is unlikely at this point in time. Therefore, only the existing economic development and potential regional industrial park sites are included in the calculation of the projected C/I/I ADD through 2050.

Combined Appomattox area residential and C/I/I demands for the extended service area of the existing **TOA** drinking water supply system from 2005 through 2050 are illustrated **Table 6**:

***Table 6:* The Projected Total Residential, Commercial, Institutional, and Industrial ADD Level for the Extended Appomattox Service Area from 2005 through 2050.**

Year	Projected Residential @ 86 gpdpc MGD	Projected COA and TOA C/I/I Demand MGD	Projected Regional Industrial Park Demand MGD	Total Projected Demand MGD
2050	0.20	0.43	0.95	1.58
2025	0.15	0.28	0.50	0.93
2005	0.10	0.13	0.00	0.23

Table 6 reveals that when using the design residential consumption rate of 86 gpdpc the projected combined Appomattox area residential and C/I/I level of ADD will significantly exceed the capacity of the existing **TOA**'s drinking water supply system. As discussed earlier in the study, the drinking water supply system's capacity for the eight underground wells is 0.35 MGD on an 8-hour basis and 0.52 MGD on a 12-hour basis. Therefore, if the total population served and associated level of ADD for the **TOA**'s drinking water supply system continues to grow at the average consumption rate it will exceed the existing pumping capacity within the next five to ten years depending on the rate of economic development.

The previous discussions are based on the projected level of the ADD for the **TOA**'s drinking water supply system through 2050. How will the level of MDD change through 2050? Remember that the level of the MDD is the peak daily flow rate that the drinking water supply system will experience at the associated level of ADD, as illustrated in **Table 7**:

***Table 7:* The Projected Total Residential, Commercial, Institutional, and Industrial MDD Level for the Extended Appomattox Service Area from 2005 through 2050.**

Year	Projected Total Level of ADD MGD	Peaking Factor @ 2 x ADD MGD
2050	1.58	3.16
2025	0.93	1.86
2005	0.23	0.46

Table 7 reveals that the current level of the MDD exceeds the current 8-hour pumping capacity of the existing **TOA**'s drinking water supply system. However, the existing drinking water supply storage capacity of 1.1 MG offsets the need for increasing the pumping capacity. The level of the MDD is expected to exceed the 12-hour pumping capacity of the existing drinking water supply system within the next five to ten years. The required drinking water supply storage capacity requirements will need to be reassessed at that time to ensure sufficient drinking water to meet this level of MDD. However, by 2050 the level of MDD for the extended service area of the existing drinking water supply system is expected to approach 4.00 MGD. Therefore, the future drinking water supply infrastructure should be able to handle this level of the MDD.

Of course the future levels of ADD and MDD for the existing **TOA**'s drinking water supply system will be determined by the actual residential and economic development activities that occur within the extended service area. These activities can be encouraged through business relocation incentives, continued extension of the existing service area, and tourism promotional activities. The development of a joint PSA is an external indicator to perspective business partners that the Appomattox area is serious about attracting new business to its jurisdiction.

The ability of the existing drinking water supply system to meet the future demand of the residential and economic development activities will greatly enhance the success of these locality objectives. The six long-term drinking water supply alternatives presented in this study provide the mechanism for ensuring that the need for drinking water will not be the limiting factor for future economic development decisions.

6. Possible Funding Sources:

There are a number of possible funding opportunities available to the **COA** and **TOA** to support the construction of an alternative long-term drinking water supply source. The goal of the community would be to maximize grant opportunities at both the State and Federal levels. In most cases there will be a local funding match required to any Federal and State grant. Matching local funding may be cash, loans from traditional financial institutions or revenue bonds. In-kind services cannot be used as a match for the funding opportunities that will presented in this report. In some cases matching funds may be used to support more than one grant. This will be discussed later in this document. The localities will need to determine which of these resources meet the needs of the community and what can be supported by the adopted water rate schedule.

a. Federal Programs

1) STATE AND TRIBAL ASSISTANCE GRANTS (STAG):

Each year the United States Congress authorizes funding for special projects and programs through the appropriations act. These funds are distributed by the United States Environmental Protection Agency (EPA) and the projects are administered by both the EPA and the VDH. Requests for these funds are usually submitted and sponsored by a representative of the locality's congressional district. These funds represent 55% of the total projected construction cost and require a match of 45%. Approximately 3.7% of the grant amount is withheld to pay for the administration of the project by the VDH.

The **TOA** has already received STAG funding in the amount of $1,000,000. The actual grant award is $962,200. The matching local funds required for this grant will be $787,255. Even though these funds have been allocated to the **TOA** an application process needs to be completed which will then ensure access to the funding.

2) U. S. DEPARTMENT OF AGRICULTURE, RURAL DEVELOPMENT GRANTS (USDA):

Rural Development has as its mission the improvement of the quality of life through public service projects such as public facilities and services such as water and sewer systems, housing, health clinics, emergency service facilities, and

electric and telephone service. Rural Development has the ability to fund up to 75% of a project within a community using various rating criteria such as average household income, etc. The 25% matching funds can be borrowed from USDA at a below market rate of interest and the loan can be paid back over a 40 year period if needed. The loan can be paid off at any time without a penalty.

USDA funding may be used as the match for a STAG which enhances the funding opportunity for the locality. Assuming the locality applied for a grant with USDA of $2 million at 75% from USDA and 25% from the locality then the $500,000 25% match from the locality could be leveraged against the STAG funding thereby enhancing the funding availability for the project.

b. State Programs

1) VIRGINIA REVOLVING LOAN FUND (VRLF):

This program is administered by the VDEQ. The projects that this program will fund are airports, water, wastewater, stormwater drainage, solid waste, public safety, and brownfields remediation. The interest rates are usually very competitive. Interest rates can be adjusted based on the community's ability to pay if justification can be made for a reduction.

The loans may be structured from 5 to 30 years and can be suited to the localities needs. Fundable projects usually begin at around $500,000 and continue into the multiple millions. The submittal application process is annual and ends in the fall of each year. The Commonwealth sells bond each year and the bond proceeds are available by December of each year. The dollar amount of the bonds sold is usually reflective of the applications received. There are a number of requirements to be met if the locality is awarded the loan which are very similar to any federal grant or loan program.

2) VIRGINIA DEPARTMENT OF HEALTH (VDH):

The VDH has a loan/grant program, that is federally funded, which has as its main criteria the locality's mean household income. These federal program dollars require a 20% match which is provided by the Commonwealth and is recovered through the interest payments on loans made from the program. This program has a wider eligibility than most since it is available to both public and private operators of a public water system. This program provides separate funds

for planning and design which are usually given as grants up to $25,000. This provides the water purveyor with the professional expertise needed to submit the construction estimates needed for the application process. The planning grants are limited and are competitive in nature.

The application requirements of this program are not as stringent as other federal programs. There is some preference given to localities serving less than 10,000 customers. The interest rate for these loans is below market with terms for normally 20 years, but could be negotiated out to 30 years for a disadvantaged community. This program is primarily directed toward water systems in the Commonwealth. Applications for planning grants are due in the late summer and construction grants are due in the early spring.

3) VIRGINIA MUNICIPAL LEAGUE LOAN FUND (VMLLF):

This program is sponsored by the Virginia Municipal League (VML). The VML pools various projects from local governments and serves as the borrowing agency for these projects. By pooling a number of projects the VML can get preferred rates that some smaller localities may not be able to negotiate for various reasons. This program has been in existence for a number of years and is relatively easy to access as it does not have the more stringent requirements of a grant or federal loan. This program is very user friendly since it is maintained by the VML and most of the localities belong to that organization. This loan program caters to small to midsize local governments.

VML uses this buying power to purchase General Obligation Bonds that are in turn funded by the revenue from the repayment of the loans. The interest rates are very competitive and a number of localities utilize this funding mechanism that do not qualify for grants or federally funded programs.

4) VIRGINIA RESOURCES AUTHORITY (VRA):

This program is sponsored by the Commonwealth of Virginia. The program provides low interest loans to local governments for community infrastructure projects. The interest rates are usually very competitive and the requirements to qualify are fairly simplistic. There are very few compliance issues for the locality which makes the program user friendly.

This program is very similar to the VML Loan Fund and usually localities consult both programs to see which will provide the best rate for their project.

There are a number of financing opportunities and as can be seen it depends on what the local government or PSA is looking for given its ability to pay and its ability to meet the requirements of the funding source. The majority of the programs shown above will require a Preliminary Engineering Report and an Environmental Report as part of the initial application process and could take 6 to 8 months. The timing of the application process is also critical since the majority of these programs follow a strict funding cycle and the application process must allow the appropriate time for reviews and approvals to meet the funding cycle.

Allowing 6 to 8 months for the design and approval process the County and the Town should anticipate 12 to 18 months, depending on the application cycle, before any construction would begin. Should the County and the Town decide to pursue the project then the formation of a Public Service Authority (PSA) would be the appropriate mechanism to execute the project. The application process will be much less cumbersome if one entity is handling all of the submittals.

7. Easement Acquisition Restrictions:

The restrictions for the acquisition of easements for the construction of the new potable waterline from Appomattox to Concord along the U.S. 460 corridor appear to be minor in nature. The investigation of the VDOT right-of-way along the U.S. 460 corridor indicates that there is substantial width with minimal obstructions to the construction of the potable waterline in the right-of-way of the westbound lane. The railroad right-of-way on the south side of U.S. 460 presents problems at certain points along the eastbound lane by substantially narrowing the width of the VDOT right-of-way.

8. VDOT Right-of Way Restrictions along US460:

The Appomattox District Office for VDOT was contacted in September 2004 for information on the right-of-way restrictions along the U.S. 460 corridor between Appomattox and Concord. Mr. James Martin investigated the right-of-way restrictions and found that the west bound lanes were 48 feet all the way to Concord. However, the east bound lanes varied from 28 feet (at the railroad tunnel) to 52 feet. Mr. Martin advised me

to contact the land and Development Division of the Lynchburg District Office to obtain full-size copies of the construction and upgrades to the US 460 highway.

The Lynchburg District Office, Land and Development Division was contacted in September 2004. Ms. Carolyn Frances researched the as-built drawings for the U.S. 460 highway lane renovations and associated right-of-way restrictions. Ms. Frances provided one copy of the drawings from VDOT Project No. 0460-006-105-C501, C502, and C503. These copies were given to R2LGC staff for future utilization.

A on-site investigation was conducted of the U.S. 460 corridor for the construction of the Concord water line between Appomattox and Concord in October 2004. This investigation found that the eastbound lane of U.S. 460 has little development potential because of the existing railway right-of-way restrictions. However, the westbound lane has substantial right-of-way for the construction of an potable water line. There are potentially twelve roadway boring locations that will be required to access the existing development on the south side of U.S. 460. Clearly, there are only few minor construction obstacles within the westbound lane VDOT right-of-way that would pose a threat for the new water line from Appomattox to Concord.

9. Public Service Authority Legal Requirements:

The General Assembly has granted authority to the local governments a mechanism by which they can form a PSA that in effect have a number of the same powers of a local government. The PSA can be formed by a single local government or several entities that provide a specific service to those localities. Authorities have been used for airports, jails, solid waste, and utilities.

Chapter 15 of the Code of Virginia provides the legal authority for the formation of a PSA under the Virginia Water and Waste Authorities Act. The following is a discussion of the mechanics of forming an authority:

a. General Requirements

One or more localities may form a PSA and it is usually created by ordinance or resolution. The State Corporation Commission issues a charter to the PSA and it also oversees the activities of the PSA. The charter for the PSA exists for 50 years or until the localities decide that there is no longer a need for the PSA. The charter can

be renewed assuming there is still a need for its activity and it is performing a needed service to the community.

The Charter contains all of the vital information about the PSA such as name, address, participating localities, etc. The PSA is governed internally by a Board that is made up of representatives from the participating localities and any other representatives they may wish to include. The Charter also includes the service area and clearly establishes the boundaries of the PSA's focus as they look at extending water lines or servicing the needs of the service area. The localities dictate where the boundaries are located and the PSA cannot go outside of the designated service area without the expressed permission of the participating localities. The localities also specify which projects they wish the PSA to pursue given adequate funding is secured by the PSA.

b. Powers of the PSA

The PSA has similar powers to that of the local government. The PSA may acquire, purchase, or lease as a lessee land or structures that may be need in the provision of service in the designated service area. The PSA may also construct, reconstruct, improve, or extend the water system in any manner it deems necessary to fulfill its mission to provide water to the designated service area. The PSA may operate and maintain a water system as long as it complies with the regulations of the Commonwealth in its operation.

The PSA may incur debt as long as it has the revenue source available to service that debt. The PSA may also issue revenue bonds and fix water rates based on its operating cost. The PSA has the power of eminent domain that may be required in constructing the facilities it needs to provide service as well as enter into contracts that facilitate the PSA's overall mission.

c. Debts of the PSA

Any debt incurred by the Authority is the sole responsibility of the PSA. The participating local governments have no responsibility for the debts of the PSA and those debts have no bearing on the credit worthiness of the local governments. The debts of the PSA are paid through fees for services provided by the PSA. General tax revenue may not be used to subsidize the debts of the PSA unless explicitly authorized by the local government. The local governments can give funding to the

PSA for a particular project, but only after an affirmative vote of the local governing body.

d. Powers of the Governing Body over the PSA

It is the responsibility of the local governing body to establish the service area as well as potential projects and priorities for those projects. It is also their responsibility to establish the rationale for the creation of the PSA and goals regarding the service area. The participating localities should also have input as to the beginning rates and potential capital cost for priority projects. The participating localities may dissolve the PSA at any time assuming all debts are satisfied and the local governments agree there is no longer a need for the PSA.

PSA's have been in existence for many years and have served the Commonwealth well. They provide a mechanism for specific services that are needed by the localities and remove them from the political process which enhances the ability to focus only on providing the needed services of the customer. There are however, built into the makeup of the PSA Board, controls that allow the local governments voice to be heard regarding the priorities of the PSA and the methodology used to serve the service area.

10. Wholesale Water Purveyor Requirements:

The local wholesale purveyors include Campbell County Utilities Service Authority (CCUSA) and the City of Lynchburg. CCUSA would serve as the local purveyor if the chosen drinking water supply alternative is the construction of a new water line extension to Concord. However, the City of Lynchburg would serve as the local purveyor if the chosen water supply alternative is the construction of a new water line extension to Lynchburg.

Currently, the CCUSA services approximately 20,000 customers from five different water sources, while producing approximately 1.63 MGD. However, 95% of its customer-base is serviced from its Otter River Water Treatment Plant. The Otter River Water Treatment Plant has a water treatment capacity of 3.0 MGD with a ADD of 1.53 MGD. The CCUSA has a water withdrawal permit capacity of 6.0 MGD from the Big Otter River.

Currently, the City of Lynchburg services approximately 58,600 customers from two different water sources. The primary source is a 1200 MG surface water impoundment. The secondary source is a permitted water withdrawal intake from the

James River. The City of Lynchburg's customer-base is serviced from two Water Treatment Plants that have a combined water treatment capacity of 26 MGD, while producing approximately 12 MGD. Finally, the City of Lynchburg has long-term wholesale water supply contracts with the Amherst County Service Authority (0.30 MGD), Bedford County Public Service Authority (2.10 MGD), and CCUSA (1.50 MGD) to supply up to 3.90 MGD of wholesale drinking water. These wholesale drinking water sales equate to approximately 1/3rd of the current ADD level for the City of Lynchburg.

The City of Lynchburg and its wholesale water purchasers are undertaking a comprehensive water rate study throughout Region 2000. The expected results of this water rate study is a uniform methodology for assessing wholesale water rates that can be equality applied across Region 2000. Also, the development of standard wholesale water provisions for a template long-term contract will be available to all Region 2000 CWS.

a. Level of the Minimum Wholesale Water Purchases

The level of the minimum wholesale water purchases has a impact on the quality of the drinking water within the water transmission line. The level of the minimum wholesale water purchases is highly dependent on the turnover rate of the drinking water within the transmission line. The turnover rate shall not exceed five days to ensure that a minimum water quality level is maintained within the new water transmission line and existing infrastructure. Therefore, once the distance and size of the water transmission line is established a calculation can be made based on the level of the minimum wholesale water purchases to ensure that the drinking water within the transmission line is turned over in the required period of time to ensure a minimum water quality level in maintained at all times

The level of the minimum wholesale water purchases is also dependent on the maximum pressure or head loss within the transmission water line. The water system must maintain a minimum pressure of 20 psi and a maximum pressure of 80 psi under all levels of demands for static and dynamic conditions. The pressure loss is highly dependent on the size or diameter of the transmission water line for a given level of demand or flow. An example hydraulic analysis was completed for the proposed eight mile transmission water line from the **TOA** to Concord, as illustrated in **Figure 6**:

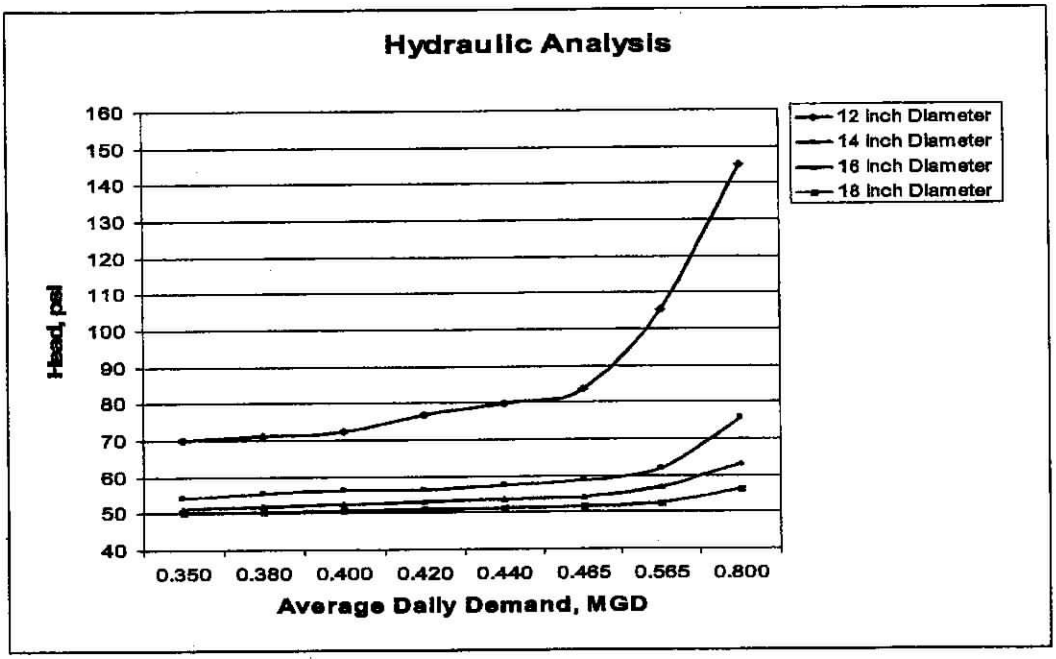


Figure 6: **The Example Hydraulic Analysis Characteristics for the Proposed Concord Water Line Extension to the Appomattox Drinking Water System.**

Figure 6 evaluates the static head loss for several transmission water line sizes over increasing flow rates and reveals that a 12-inch diameter transmission water line will encounter significant head losses at flow rates above 0.50 MGD. The 14-inch through 18-inch diameter transmission water lines appear to handle these flow rates without excessive head or pressure losses. However, these results are dependent on the type, distance, and overflow elevations that the transmission water line will actually experience. The point of this discussion is to highlight the need for a formal hydraulic analysis before determining the size of the new transmission water line as well as the level of the minimum wholesale water purchases.

b. Wholesale Water Rate Structure

The study assumes a negotiated wholesale water rate of $3.00 per 1000 gallons or $2.24 per HCF. This level of the negotiated wholesale water rate was chosen to match the current level of the wholesale water rate for the CCUSA, as illustrated in **Table 8**:

***Table 8:* The Wholesale Drinking Water Rate for the CCUSA relative to the Average Water Rate for the TOA for 2005.**

CWS	Wholesale ($/1000 gals)	E/D ($/1000 gals)	Retail ($/1000 gals)
CCUSA	$1.82	$2.62	$4.61
Town of Appomattox			**$2.97**

Table 8 reveals that the CCUSA currently pays a wholesale water rate of $1.82 per 1000 gallons or $1.36 per HCF. The CCUSA purchases wholesale water from the City of Lynchburg through a 25 year wholesale water contract. The CCUSA sells wholesale water at a reduced rate as an economic development incentive for $2.62 per 1000 gallons or $1.96 per HCF. The CCUSA's standard water rate to it's regular customers is $4.61 per 1000 gallons or $3.45 per HCF. Therefore, it is reasonable to assume that the **TOA** and/or joint PSA could negotiate a long-term wholesale water rate that is equivalent to the average in-town water rate for the current in-town **TOA** resident, which is approximately $2.97 per 1000 gallons or $2.22 per HCF.

11. Future Regulatory Requirements for Drinking Water:

The future regulatory requirements will significantly effect the cost of producing acceptable drinking water. As the future regulatory requirements become stricter to facilitate safe, reliable, and clean drinking water at reasonable rates, the associated to cost to produce acceptable drinking water will increase accordingly. These drinking water supply regulations will require more integrated planning and management activities for strategic watershed planning as well as stricter pollution command and control requirements through new water quality standards.

a. Drinking Water Supply Planning Regulation

As previously stated, the VDEQ's Statutory Authority under Title 62.1 of the Code of Virginia, CHAPTER 780 LOCAL AND REGIONAL WATER SUPPLY PLANNING, 9-VAC-25-780-10 through 200 states that all counties, cities and towns in the Commonwealth of Virginia shall submit a local water supply plan or shall participate in a regional planning unit in the submittal of a regional water supply plan to the board in accordance with chapter 780. This proposed WSPR is expected to impact localities by the end of FY2006.

b. SDWA Water Quality Standards

The USEPA is in the process of promulgating increased technological requirements to monitor future stricter drinking water quality standards. These new technological requirements include transitioning to watershed based management for source protection, risk based assessments for enhanced physical security, pre-cautionary based standards for integrative quality control, and computer based technology for better operational and customer responsiveness. However, the reliance on new technology will require substantial expenditures to upgrade the existing drinking water infrastructure.

The impact of these new technology based drinking water quality standards will generate a need for installing expensive integrative treatment and management technologies, training for operators to understand and control the integrative processes, and training for managers to understand the results of the integrated decision support systems to make efficient allocation decisions for the effective utilization of limited financial resources. Small CWS, such as the TOA's drinking water supply system, will experience extreme pressures to find ways to institute these future technology based regulatory requirements without significantly increasing its current drinking water rates. Innovative solutions, such as consolidation through the formation of a joint PSA, will be necessary for these small CWS to meet these future unfunded mandates.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions:

The conclusions of the study include the:

a. Reliability of the existing underground drinking water source will continue to degrade as demand continues to increase. Regulations on drinking water supply planning and management are imminent. The present drinking water supply system will require continued investment due to age.

b. Cost of drinking water will increase significantly by 2050. Historically, the **TOA** water rates increase by approximately 1.5% per year. The **TOA** needs to continue subsidizing the current drinking water rate as the drinking water production costs continue to increase.

c. Cost to treat, operate, and maintain a drinking water supply system is expected to more than double by 2050 due to stricter water quality standards. Stabilization of the drinking water rate is dependent on customer-base expansion.

d. Residential consumption rate will not increase significantly through 2050 due to manageable 1% annual growth rate and future water conservation programs. However, a significant portion of the future growth in the population served will occur outside the **TOA** limits, which are charged at 1.6 times the in-town water rate.

e. Level of economic development is critical for controlling the future water rate increases. The benefits of economy of scale through a greater customer-base will mitigate the level of the expected water rate increases. However, land use in the **COA** will not reach its full economic potential without utilities, particularly water. Essentially, expanded economic growth translates into less burden on the real estate tax base.

2. Recommendations:

The purpose of the study is to provide guidance and recommendations to the local governing bodies concerning issues and strategies for developing a sustainable source of drinking water supply.

This study provides the technical information for making the selection of a preferred long-term drinking water supply alternative. **Table 9** provides a summary of the financial impact of the six long-term drinking water supply alternatives on the cost of drinking water for a typical **TOA** resident.

***Table 9:* The Impact of the Long-Term Drinking Water Supply Alternative on the Cost of Drinking Water for the Current TOA Resident.**

No.	Alternative	$/Cap/Month	$/1000 gallons
1	Do Nothing or Maintain Status Quo	$11	$3
2A	Concord Water Line + TOA Production	$14	$4
2B	PSA + Concord Water Line + Wholesale	$18	$6
3	PSA + Lynchburg Water Line + Wholesale	$28	$9
4	PSA + James River Intake	$56	$13
5	PSA + Multi-Purpose Reservoir	$55	$16

Table 9 reveals that **Alternatives 3, 4**, and **5** are not economically feasible in the short-term with the small customer-base. **Alternative 1** does not address the need to increase the reliability of the existing drinking water supply system through an additional sustainable drinking water source. **Alternative 2A** requires that the TOA remain in the drinking water supply business, which has increased financial uncertainty due to stricter water quality standards. **Alternative 2B** evaluates the opportunity for the **TOA** to establish a joint PSA with the **COA** to manage the drinking water supply system as a business enterprise.

The recommendations of the study include:

a. The **TOA** should continue as is and make short-term system improvements to its existing drinking water supply system to ensure safe and reliable water.

b. The **COA** and **TOA** should proceed with the development of a joint PSA to ensure an optimal atmosphere for economic development along U.S. 460.

c. The joint PSA should secure funding of $2M for the acquisition of the TOA existing drinking water system assets and $3.5M for design and construction of the eight mile 16-inch water line extension to Concord.

d. The joint PSA should determine the optimal operating point for producing drinking water and purchasing wholesale drinking water as the drinking water system demand increases through 2050.

REFERENCES:

1. Previous Studies

a. Scope of Work for the Appomattox County/Town Water Supply Project dated August 2004

b. Water Resource Study for the Appomattox Area for the Town of Appomattox and County of Appomattox, Wiley and Wilson, August 2003

c. Appomattox Community Development Plan, Town of Appomattox, VA, 2003

d. Guidance for Conducting a Comprehensive Public Drinking Water Supply Needs Assessment, Virginia Department of Health, Division of Water Supply Engineering, Office of Drinking Water, May 2000

e. Feasibility Study for Water Services along the Route 460 Corridor from the City of Lynchburg to the Town of Appomattox, Wiley and Wilson, January 1998

f. Comprehensive Water and Sewer Study for the Town of Appomattox and County of Appomattox, Wiley and Wilson, January 1991

g. A Comprehensive Water and Sewer Report for Appomattox County, VA, Hankins and Anderson Consulting Engineers, January 1972

h. Engineering Report on the Water Supply and Sewage Treatment Systems, Town of Appomattox, VA, Hankins and Anderson Consulting Engineers, February 1964

2. Website URLs

a. **Project**

R2RC: http://www.regcomm.org/

Region 2000: http://www.region2000.org/

Appomattox: http://www.appomattox.com/

b. **Government**

USEPA-DWS: http://www.epa.gov/ebtpages/water.html

USEPA-OGWDW: http://www.epa.gov/OGWDW/

USEPA- SDWA: http://www.epa.gov/safewater/sdwa/index.html

USEPA-Watershed: http://cfpub.epa.gov/surf/county.cfm?fips_code=51011

USGS- Surface Water:
http://waterdata.usgs.gov/va/nwis/uv/?site_no=02039500&PARAmeter_cd=00065,00060,00067,00062

c. **State**

VDH-ODW: http://www.vdh.state.va.us/dw/INDEX.ASP

VDH Public Water Supply Needs Assessment:
http://www.vdh.state.va.us/dw/files/covwsgfinal.pdf

VDH Financial sources: http://www.vdh.state.va.us/dw/financial.asp

Virginia Hydrologic Unit Atlas:
http://192.206.31.57/arcims/website/hubas/viewer.htm

VDCR: http://www.dcr.state.va.us/sw/hu.htm#vh

d. Public Service Authority

Virginia Water and Sewer Authority Act (Chapter 28, Title 15.1, Code of Virginia, 1950, as amended)

Montgomery County: http://www.montva.com/departments/psa/

Western Virginia Water Authority:
http://www.westernvawater.org/WebMgmt/ywbase61b.nsf/DocName/$WVWAHome

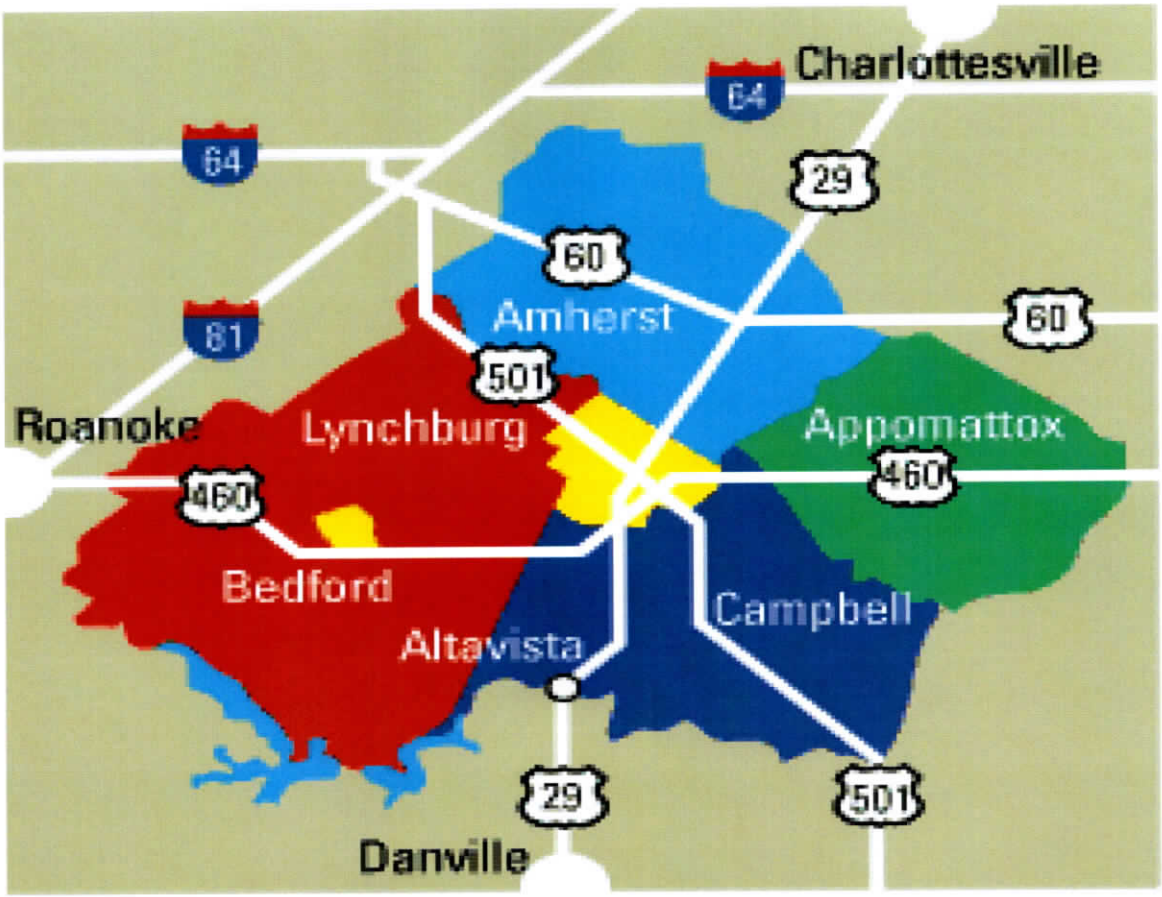
e. Financial Resource

VARA: http://www.vra.state.va.us/customers/customers.html

VDH:
http://www.vdh.virginia.gov/dw/drinkingWaterFund.asp#Construction

APPENDIX – A

FIGURE A-1 THE MAP OF THE EXTENT OF CENTRAL VIRGINIA PLANNING DISTRICT 11.



For more information:
828 Main Street - P.O. Box 937 - Lynchburg, Virginia 24505
Toll Free: (800) 628-3413 - Phone: (434) 847-1447 - Fax: (434) 847-1455
Accessed on 9/17/04

***FIGURE A-2* THE MAP OF SERVICE AREA OF THE EXISTING TOA WATER SUPPLY SYSTEM.**

***FIGURE A-3* THE MAP OF SERVICE AREA OF THE PROPOSED CONCORD WATER LINE.**

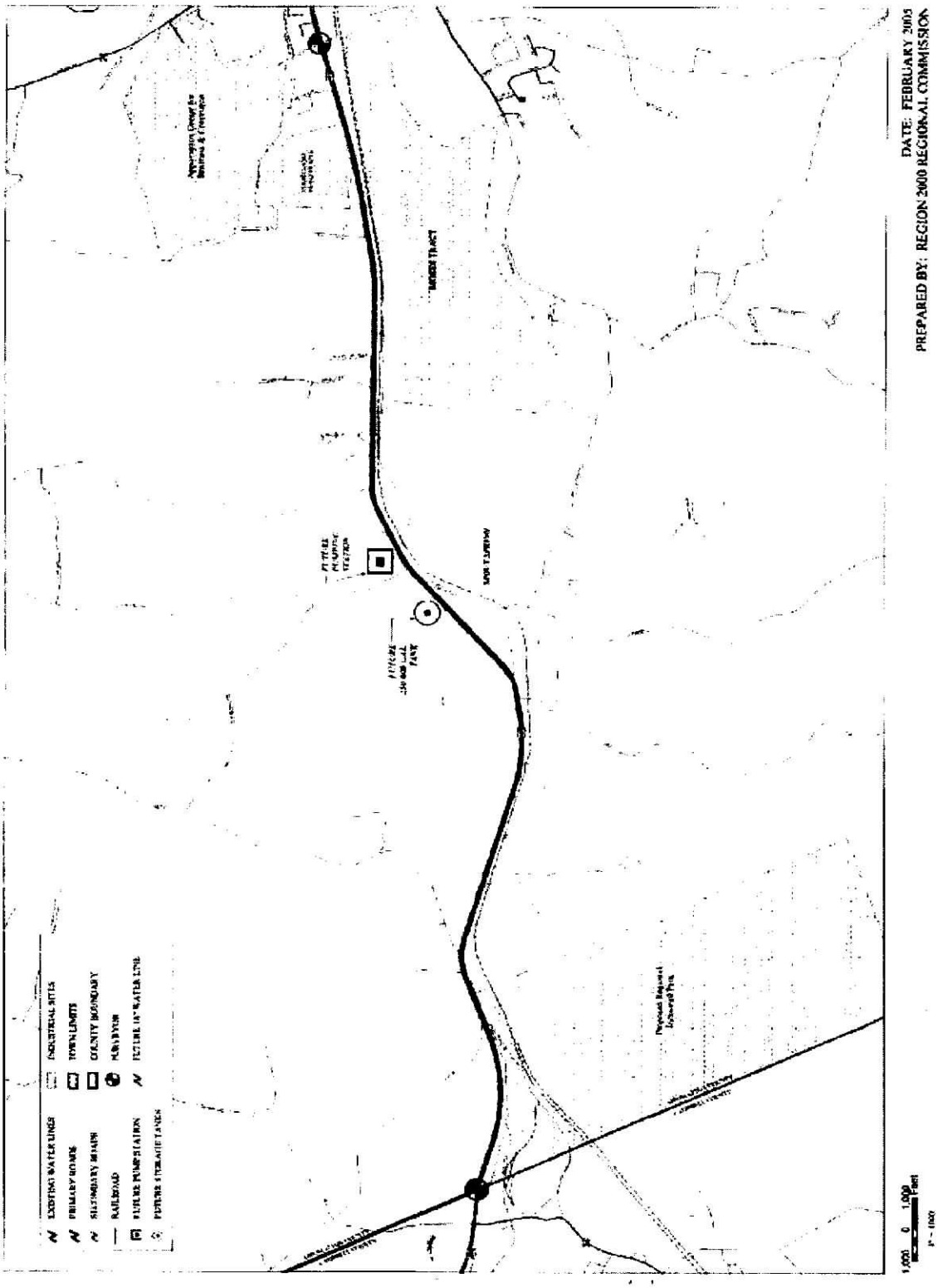


FIGURE A-4 **THE MAP OF SERVICE AREA OF THE PROPOSED LYNCHBURG WATER LINE.**

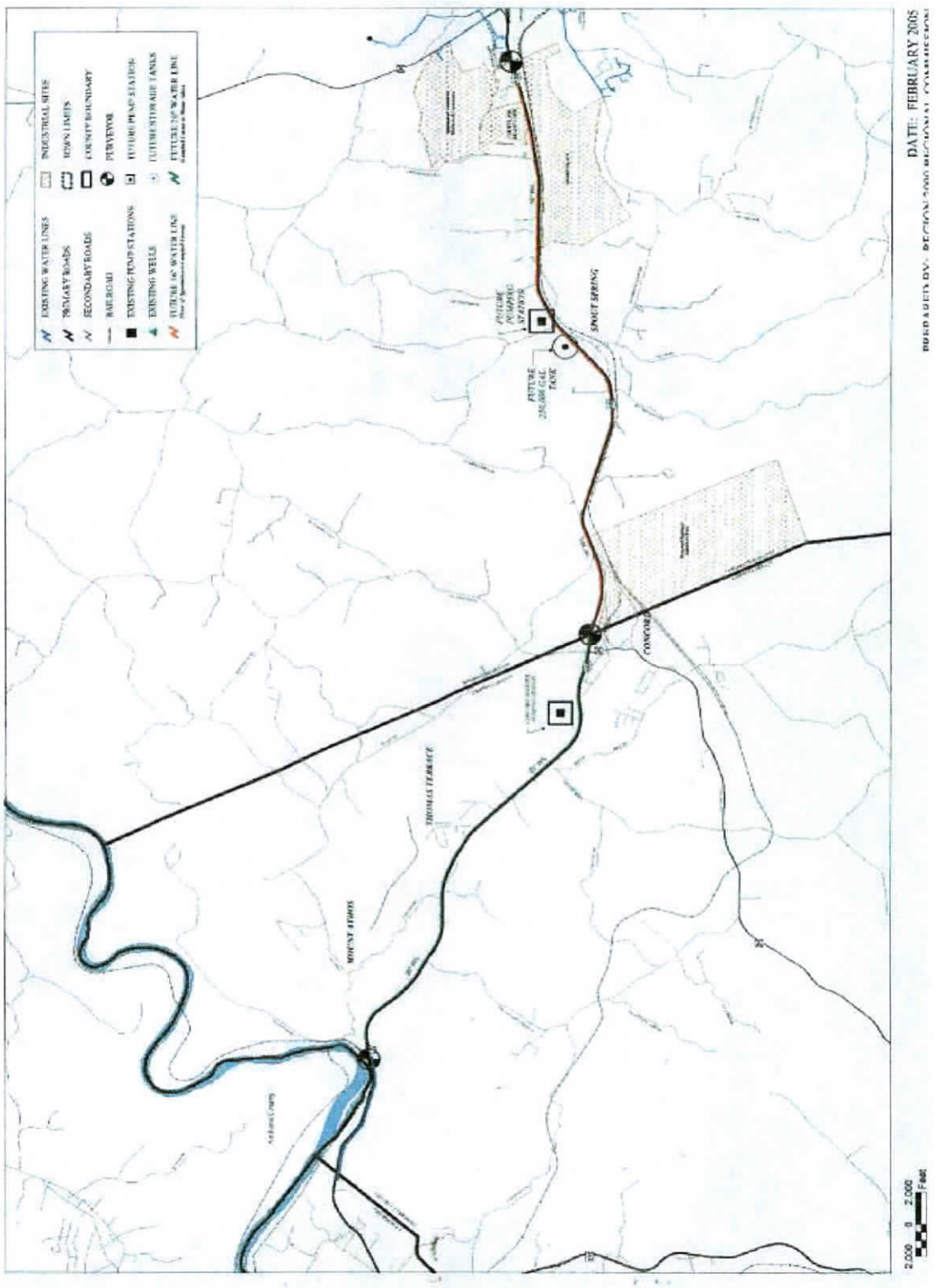


***FIGURE A-5* THE MAP OF SERVICE AREA OF THE PROPOSED JAMES RIVER INTAKE.**

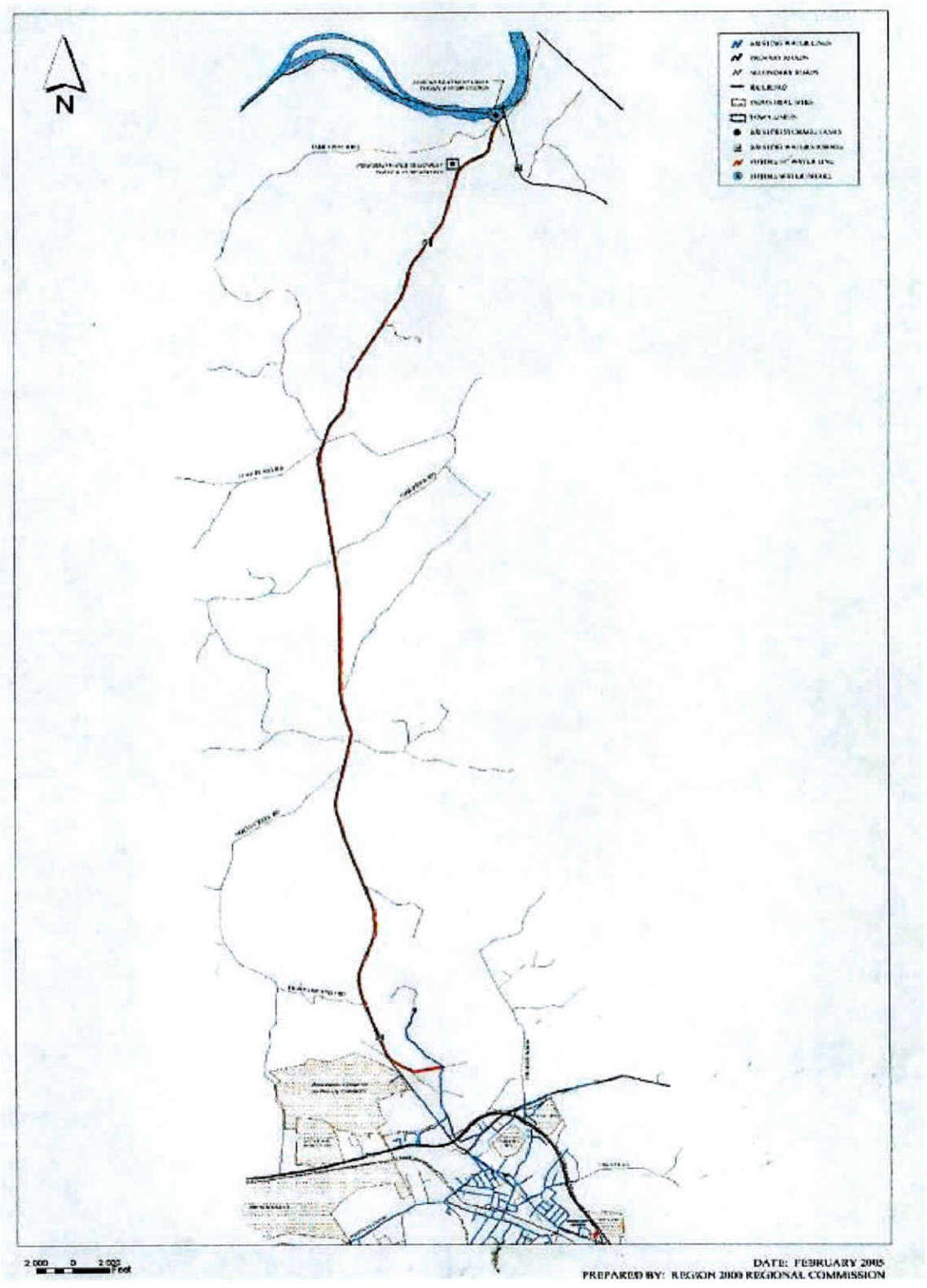


FIGURE A-6 **THE MAP OF SERVICE AREA OF THE PROPOSED MULTI-PURPOSE RESERVOIR.**

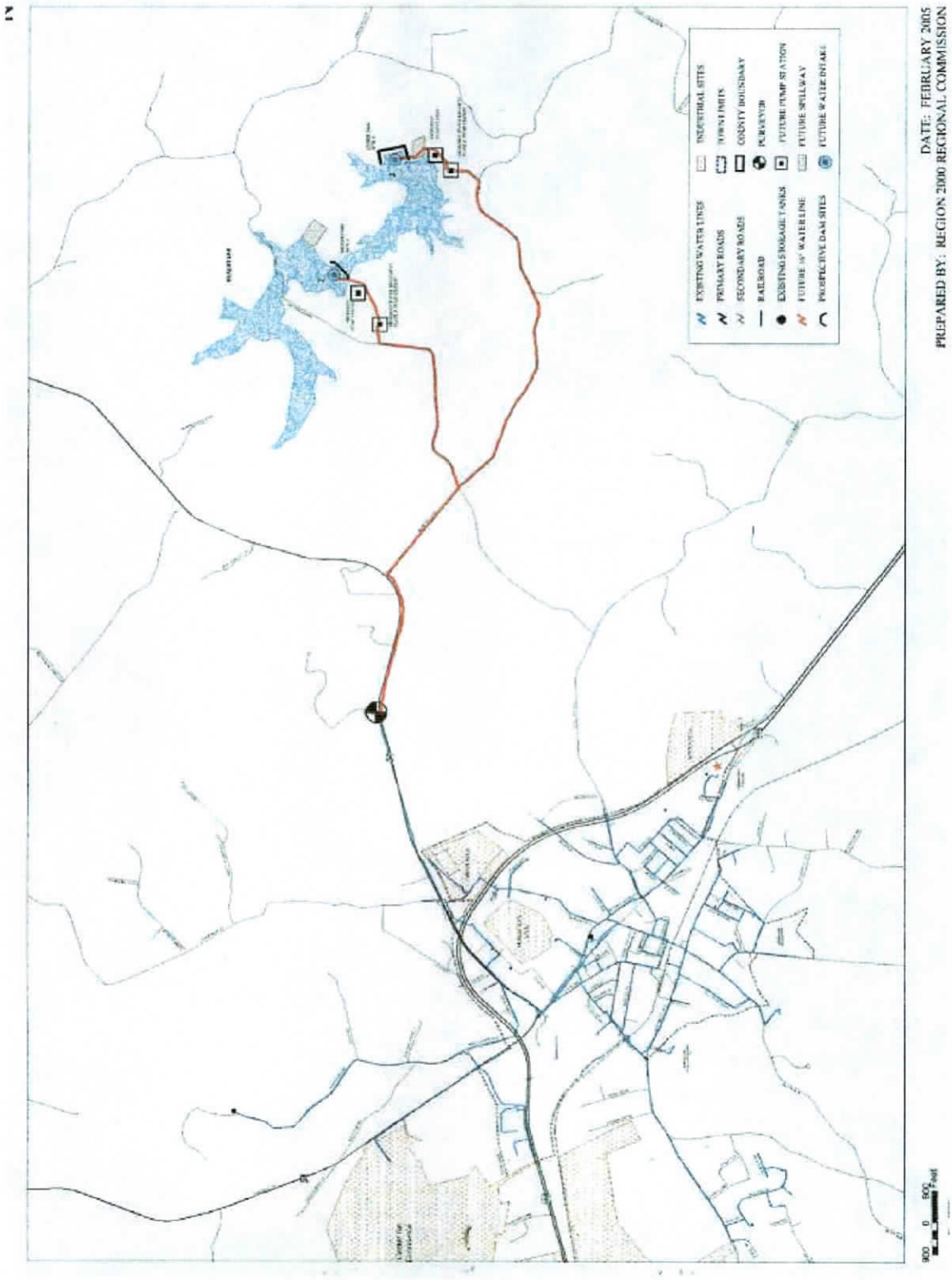


***FIGURE A-7* THE MAP OF NELSON COUNTY IMPOUNDMENT.**

APPENDIX – B

TABLE B-1 THE COST ESTIMATE FOR ALTERNATIVE 2A.

Concord to Appomattox Water Line	
Transmission Line – 12 "	$ 2,500,000
Booster Pump Station	$ 500,000
Total	**$ 3,000,000**

TABLE B-2 THE COST ESTIMATE FOR ALTERNATIVE 2B.

Concord to Appomattox Water Line	
Transmission Line – 16 "	$ 3,000,000
Booster Pump Station	$ 500,000
Subtotal	**$ 3,500,000**
Purchase TOA Assets	$ 2,000,000
Total	**$ 5,500,000**

TABLE B-3 THE COST ESTIMATE FOR ALTERNATIVE 3.

Lynchburg - Appomattox Water Line Option	
Transmission Line - **20" + 16"**	$ 8,600,000
Booster Pump Station	$ 500,000
1.0 MG Elevated Tank	$ 1,500,000
Subtotal	$10,600,000
(3% Inflation Factor)	$ 400,000
Subtotal	**$11,000,000**
Purchase TOA Assets	$ 2,000,000
Total	**$13,000,000**

TABLE B-4 THE COST ESTIMATE FOR ALTERNATIVE 4.

James River Water Intake Option

Intake and Pump Station	$ 1,000,000
Transmission Line -16"	$ 7,000,000
2.0 MGD Water Treatment Plant	$ 6,000,000
Booster P.S. near Town	$ 500,000
Subtotal	$14,500,000
(3% Inflation Factor)	$ 500,000
Subtotal	**$15,000,000**
Purchase TOA Assets	$ 2,000,000
Total	**$17,000,000**

TABLE B-5 THE COST ESTIMATE FOR ALTERNATIVE 5.

Reservoir Site 2 - Middle Appomattox River Option	
Dam Site	$ 5,000,000
Intake & Pump Station	$ 700,000
Transmission Line -16"	$ 1,300,000
2.0 MGD Water Treatment Plant	$ 6,000,000
Booster P.S. near Town	$ 500,000
Subtotal	$13,500,000
(3% Inflation Factor)	$ 500,000
Subtotal	**$14,000,000**
Purchase TOA Assets	$ 2,000,000
Total	**$16,000,000**

TABLE B-6 THE COST ESTIMATE FOR WRECK ISLAND-STONEWALL MILL IMPOUNDMENT.

W&W Site 5 - Wreck Island Stonewall Mill

Dam Site (17 ft w storage 20 MG)	$ 1,000,000
Intake & Pump Station	$ 700,000
Transmission Line - 8 mi at 16"	$ 3,000,000
Two MGD WTP	$ 6,000,000
Booster P.S. near Town	$ 500,000
Subtotal	**$11,200,000**
Purchase TOA Assets	$ 2,000,000
Total	**$13,200,000**

APPENDIX – C

FIGURE C-1 THE COMPARISON CHART FOR THE SIX LONG-TERM DRINKING WATER SUPPLY ALTERNATIVES FOR APPOMATTOX .

Number	Alternative	Total Capital Cost	Projected STAG Grants	Projected USDA 25/75 Loan/Grant	Annualized Debt Svc	Annual Expenses	$/Capita /Year	$/Capita /Month	$/1000 gals
1	Do Nothing	$1.6M	$1.6M	0	0	$226K	$128	$10.70	$2.70
2A	Concord Water Line + TOA Production	$3.0M	$1.6M	$0.4M/$1.0 M	$70K	$240K	$175	$14.65	$3.69
2B	PSA + Concord Water Line + Wholesale	$5.5M	$1.6M	$1.0M/$2.9 M	$175K	$252K	$242	$20.20	$5.10
3	PSA + Lynchburg Water Line + Wholesale	$13M	$1.6M	$2.9M/$8.5M	$507K	$252K	$430	$35.90	$9.05
4	PSA + James River Intake	$17M	$1.6M	$3.9M/$11.5M	$682K	$730K	$800	$66.70	$16.80
5	PSA + Multi-Purpose Reservoir	$16M	$1.6M	$3.6M/$10.8M	$630K	$730K	$770	$64.20	$16.20

APPENDIX – D

FIGURE D-1 JOINT STEERING COMMITTEE MEMBERS

GARY CHRISTIE REGION 2000 REGIONAL COMMISSION	JEFF ROGERS REGION 2000 REGIONAL COMMISSION	BILL GILLESPIE REGION 2000 REGIONAL COMMISSION
RONNIE SPIGGLE TOWN OF APPOMATTOX	DAVID GARRETT TOWN OF APPOMATTOX	AILEEN FERGUSON APPOMATTOX COUNTY

APPENDIX – E

FIGURE E-1 THE SCOPE OF WORK FOR THE JOINT LONG-TERM WATER SUPPLY PROJECT

The following services and /or activities would need to be accomplished as a part of the development of an action plan that will culminate with the formulation of strategies for the construction of a long range and dependable water source for Appomattox County and the Town of Appomattox:

1. Brief review of the various alternatives presented to validate pros and cons.

   - Deliverable – Physical report and presentation on the various alternatives to clarify original preferred water supply method.

2. Develop/validate preliminary cost of potential alternatives.

   - Deliverable - Physical report identifying probable cost and possible funding streams.

3. Present a final report as to a preferred long range water source.

   - Summary report that identifies both present and future water demands, economic development opportunities, possible funding sources, and potential construction timelines.

4. Investigate the development of a Public Service Authority (PSA) and the mechanics of how it should be set up.

   - Deliverable - Report identifying communities with similar size authorities, their bylaws, and their organizational structure.
   - Meet with the attorneys representing both localities to ensure the PSA is in compliance with the Code of Virginia.
   - Present findings of PSA formation to both elected bodies and develop consensus as to how to proceed with the formation of the PSA.
   - Assist in data gathering for attorneys in drawing up legal documents for PSA formation.
   - Assess the value of the existing water and sewer system and the process needed for the Town of Appomattox to transfer ownership of the system to a PSA.

5. Conduct public awareness meetings to keep the community informed of the project status.

- Appear before each local governing body on a quarterly basis to update on the progress of the project.

6. Interview potential funding agencies and develop capital outlay scenarios for consideration by the appropriate public body. (Local government/PSA??)

- Provide a listing of funding opportunities and their related requirements for eligibility.
- Provide specific construction options/phases with possible available funding options.
- Conduct meetings with federal and state elected officials and funding agencies to assess their interest in the project.

7. Conduct meetings and negotiate vendor contracts with possible purveyors that may be available to provide water via an external transmission line.

- Meet with the City of Lynchburg and Campbell County to discuss the plans of the Appomattox area and develop potential water cost and rate structure over time.
- Make rate comparisons with existing Town water rates and the potential rates assuming an alternative water source is constructed.
- Provide an analysis of the financial effects on the local water rates over a long term contract. 5, 10, 15, 20 years

8. Seek economic development grants that would support the construction project.

- Research available economic development grants that would be applicable to this project in conjunction with the existing or planned land use along the Rte. 460 corridor.

9. Develop private sector support for the project in applying for external funding sources.

- Meet with the leading private sector interests within the community and solicit support for the project. Use as leverage in seeking funding for construction of the project.

10. Develop final action plan with appropriate strategies as to how to approach funding and construction of a waterline along Route 460.

11. Prepare grant application for STAG grant from Department of Agriculture.

12. Establish finance protocols for STAG grant accounting to Department of Agriculture.