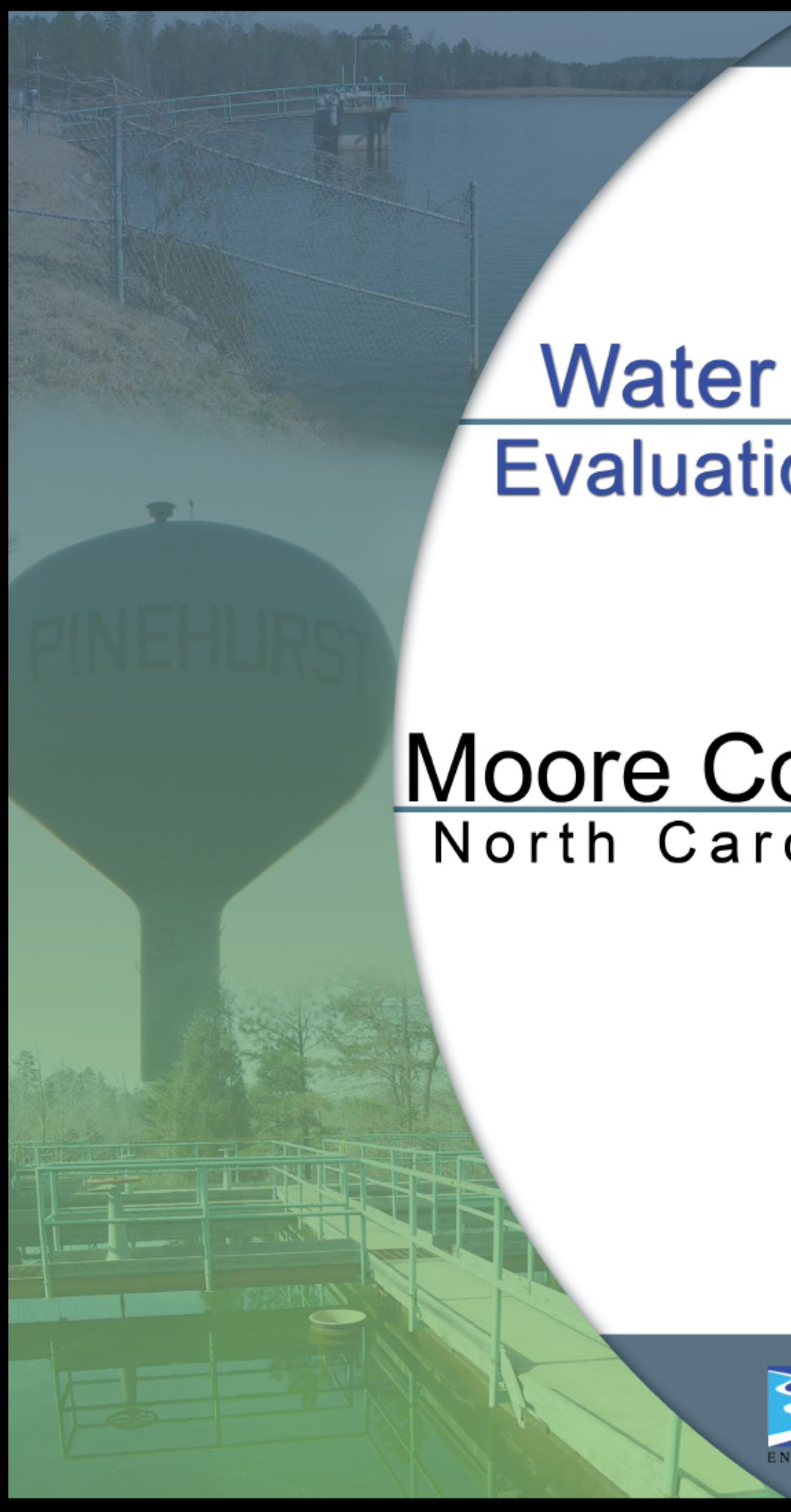
July 2008

Water Source Evaluation and Plan

Moore County North Carolina



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WATER SOURCE EVALUATION AND PLAN

COUNTY OF MOORE, NORTH CAROLINA

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LIST OF ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure
CDBG	Community Development Block Grant
CIP	Capital Improvements Plan
CFS	cubic feet per second
CWS	Carolina Water Service
DENR	North Carolina Department of Environment and Natural Resources
DOT	North Carolina Department of Transportation
DWR	North Carolina Division of Water Resources
EIS	environmental impact statement
EMC	Environmental Management Commission
ERC	Environmental Review Commission
ETJ	extraterritorial jurisdiction
GPD	gallons per day
GPM	gallons per minute
IBT	inter-basin transfer
LWSP	Local Water Supply Plan
MCPU	Moore County Public Utilities
MGD	million gallons per day
NCSDC	North Carolina State Data Center
pCi/l	pico-curies per liter
POG	project oversight group
USCB	United States Census Bureau
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WPA	water purchase agreement
WWTP	wastewater treatment plant
WPCF	Water Pollution Control Facility

SECTION ES EXECUTIVE SUMMARY

Introduction

Moore County is located in the Sandhills Region of central North Carolina, and had a population of 82,292 residents in 2006 according to the North Carolina State Data Center (NCSDC). Public water service is currently provided to approximately 50,000 of the County's residents by the Moore County Public Utilities (MCPU) Department, East Moore Water District, and nine (9) additional municipalities that operate water distribution systems.

Moore County is currently experiencing considerable growths in population. One of the major planning issues facing the County today is the procurement of safe and dependable sources of drinking water to accommodate this growth. Recent drought conditions and well closures have decreased the amount of water available to some system owners, and therefore, many of the sources that are presently relied upon have limitations or are not predictable beyond the short term.

The purpose of this study is to prepare the water distribution system owners within the County for the future procurement of safe and dependable drinking water sources. The objectives of the study are to:

- Anticipate future user needs and demands for drinking water
- Identify practical and technically sound solutions that address regional priorities
- Carefully consider the economic implications of all alternatives
- Establish a clear path for implementing the proposed plan

Existing and Future Water Demands

In completing this study, McGill Associates contacted and/or met with each participating water system owner to gather information and discuss the system's current situation and future needs. Based on data provided by each system owner, the public water systems in the County had a total average daily demand of approximately **6.85 million gallons per day (MGD)** in 2006. In

addition, the sum of each system's maximum monthly average demands totaled approximately **9.10 MGD** in 2006. Nearly all systems reported that maximum monthly average production occurred during the months of June, July, August, or September.

Population and water demand projections were also performed for each system for a 50-year planning period based on information obtained from the NCSDC and local planning departments. Each system owner was provided a copy of the projections in draft format and given the opportunity to review and comment. The results of this analysis indicate that the total average daily demands are estimated to increase to approximately **17.44 MGD** with maximum monthly average demands of approximately **22.84 MGD** by the year 2056. The total quantity of water currently available to supply the systems within the County is approximately **15.7 MGD**. Consequently, additional water sources are projected to be necessary in the future to supply the County's increased demands.

Groundwater Resources Summary

As part of this study, McGill Associates reviewed previous reports and studies regarding the aquifers that underlie Moore County in addition to new studies conducted by the United States Geological Survey (USGS) and North Carolina Department of Environment and Natural Resources. Meetings were also held with each system owner that utilizes groundwater as a water source to discuss current issues related to the use of groundwater in their respective systems.

Groundwater has historically been used by many public water system owners in Moore County as a potable water supply source, primarily because it is an economical source and the County lacks major surface water supplies in most areas. Unfortunately, groundwater resources in Moore County have become increasingly unreliable to system owners and numerous wells have been removed from service in recent years. As an example, MCPU has removed twenty (20) wells from service since 1997, citing contamination, low yields, and casing failures as the primary reasons. Removal of these wells has eliminated more than 750,000 gallons per day (GPD) of water that were previously available to the County.

Due to well closures and decreased supplies, some system owners have been forced to operate wells in excess of the State's allowable 12-hours of pumping time per day in order to meet current demands. System owners have also found that it is becoming more difficult to locate wells that generate adequate capacity to develop as water supply wells, and the numerous private irrigation wells in the County are likely impacting the yield of public water supply wells.

McGill Associates believes that groundwater will continue to be an important source of potable water for many system owners in Moore County in the future. However, its value and long term reliability can be preserved only if local governments are willing and able to take aggressive actions to protect the source.

Surface Water Resources Summary

McGill Associates also evaluated the use of surface water as a water supply source in Moore County for this study. Streamflow data was obtained from the USGS for existing and potential surface water sources in the County, which confirmed that many of the existing surface water bodies have historically had little or no flow during dry weather conditions.

Table ES-1 summarizes the "7Q10" flows provided by the USGS for existing water sources in Moore County in both cubic feet per second (CFS) and MGD. The 7Q10 flow is defined as the lowest average streamflow for seven (7) consecutive days that occurs once every ten (10) years.

TABLE ES-1: "7Q10" Flows for Water Bodies in Moore County, North Carolina

Source	*7Q10 Flow (CFS)*	*7Q10 Flow (MGD)*
Drowning Creek	**31.0***	**20***
Nick's Creek	**0.1**	**0.065**
Bear Creek	**0.4**	**0.26**
McLendons Creek	**0**	**0**
Crane Creek	**0**	**0**
Little River	**2.0**	**1.3**
Deep River	**18.0**	**11.6**

*USGS indicates "data trend issues" with flows for Drowning Creek

As shown in Table ES-1, Drowning Creek and the Deep River are the largest surface water sources in the County. The Town of Southern Pines is currently permitted to withdraw up to 8.0 MGD from Drowning Creek or up to 14.0 MGD if a minimum streamflow of 56 CFS (36 MGD) is maintained in the creek downstream of the Town's intake.

The largest surface water resource that is not currently used as a potable water supply source in Moore County is the Deep River. The lucrative flows within the Deep River make it an attractive source of water for the future, but several factors are present that may limit the river's use in Moore County, including:

- The Deep River is not in close proximity to areas with high water demands in Moore County, increasing the costs required to distribute the water throughout the County.
- Current regulations in North Carolina limit the amount of water that can be used from the Deep River in other portions of the County without obtaining a certificate from the Environmental Management Commission (EMC).
- Flows within the river are contingent upon what is released from the Randleman Dam located upstream of Moore County.

The lack of abundant surface water sources within Moore County increases the need for raw water storage facilities to provide reliability during drought conditions. The Town of Southern Pines is proceeding with the development of a 140 million gallon "off-stream" raw water reservoir, and additional reservoirs should be planned in the future. Based on the lengthy process that has historically been required to obtain regulatory approval and construct an "in-stream" reservoir, McGill Associates considers the construction of an in-stream reservoir only feasible for the long term.

Purchased Water Resources Summary

In addition to the evaluation of groundwater and surface water sources in Moore County, the alternatives of purchasing water from other systems within the County and outside of Moore County were also evaluated. McGill Associates met with viable water purveyors in neighboring

counties to determine the interest and feasibility of providing water from their respective systems to systems within Moore County.

It has been McGill Associates' experience that some water system owners are hesitant to purchase water from other entities because they may give up control over certain aspects of the water source and may not be an active participant in discussions affecting their water supply in the future. While these concerns are certainly valid, the reality in Moore County is that several system owners will likely need to rely on their neighbors for potable water service for many years to come. This conclusion is primarily based on the fact that many neighboring counties have much more lucrative and reliable sources of water than the sources available in Moore County. In most cases, interconnections with other systems can also be implemented in a shorter time frame than developing a new potable water supply source.

Inter-Basin Transfer Laws Summary

One of the most important factors that must be considered in public water system planning is the ability to obtain regulatory permits and approvals for proposed improvements. Perhaps the most critical regulation that currently affects Moore County is the State of North Carolina's current laws regarding "Inter-Basin Transfers" or IBTs. These laws regulate the amount of water that can be transferred between the State's eighteen (18) major river basins and the sub-basins that are located within each basin. Since Moore County is located in three (3) of the State's river sub-basins, McGill Associates met with representatives from the North Carolina Division of Water Resources in Raleigh to discuss the current laws and how they specifically apply to the future of Moore County.

The IBT regulations were originally implemented in 1994, and were most recently modified in August 2007. The current regulations define an IBT as the movement of surface water from one river basin to another and state that no person shall initiate an IBT of 2.0 million gallons or more of water in any given day without first obtaining a certificate from the EMC. The most recent modification to these laws has created a difficult, lengthy, and expensive process for entities to obtain an IBT certificate, and approval of a certificate is contingent upon numerous environmental and regulatory criteria.

The State of North Carolina is also currently conducting a major "water allocation" study that includes an evaluation of the IBT process, review and possible modification to the current river basin and sub-basin maps, and will include recommendations related to the future of the IBT regulations. Because these laws will significantly impact the future water sources obtained within Moore County, McGill Associates highly recommends that county, municipal, and community leaders attend upcoming public meetings for the study to voice concerns over how the current laws impact the County's future.

Conclusions/Recommendations

Based on the evaluations that are completed in this report, McGill Associates provides the following recommendations to the water distribution system owners in Moore County. These recommendations are not listed in order of priority, but are divided into "Short Term" and "Long Term" sections. Short Term recommendations are those that are needed either immediately or in the near future, while the Long Term recommendations provide goals for water resource planning over the course of many years.

Short Term Recommendations

1) MCPU begin planning and engineering design work to extend a new 12-inch diameter water distribution line along North Carolina Highway 211 to connect Montgomery County's water distribution system with the MCPU Seven Lakes system. This important project will provide an alternate water source to the Seven Lakes system, which is currently supplied almost exclusively by the MCPU Pinehurst water system.

   The total estimated project cost for this recommendation is $2.75 million, including costs that have been requested by Montgomery County for projects to improve the reliability of their water distribution system.

2) MCPU partner with the Town of Robbins to return the 1.5 MGD Robbins water treatment plant to service. Prior to beginning design work on improvements to the facility, the recommended first step is to conduct a thorough evaluation of the existing

plant to determine the needed improvements and costs necessary to achieve an efficiently operating facility.

McGill Associates believes that returning the Robbins plant to service provides both immediate returns and long term value to both the Town of Robbins and Moore County. The plant can be used to supply water to the Town of Robbins, the MCPU Seven Lakes system, and the northwestern portion of Moore County, including Westmoore Elementary School, which has been identified as having a need for a connection to a public water supply. The Town's existing 120 million gallon reservoir provides additional reliability to this plant during drought conditions.

Rehabilitating this plant also places a water treatment facility into service that is located in relatively close proximity to the Deep River, and creates the potential for a future intake along the Deep River with an expansion to the plant. The quantity of water obtained from the Deep River in the long term may be limited by the County's desire and ability to obtain an IBT certificate from the EMC and/or permit an in-stream reservoir on the river.

The Town of Robbins recently received a planning grant from the North Carolina Rural Economic Development Center to conduct an evaluation of the existing facility. The evaluation of the facility is currently scheduled to be complete by December 2008.

3) In conjunction with returning the Robbins water treatment plant to service, MCPU should begin planning and engineering design work to extend a 12-inch diameter water distribution line from the Robbins water distribution system to the MCPU Seven Lakes system. This project will provide additional water resources to the rapidly growing Seven Lakes area.

   The total estimated project cost for this recommendation is $3.6 million.

4) In conjunction with returning the Robbins water treatment plant to service, Foxfire Village should begin planning and engineering design work to extend an 8-inch diameter water distribution line from the MCPU Seven Lakes system to the Village's water

distribution system. Recent testing on four (4) of the Village's existing groundwater wells indicated elevated levels of radium in the water, and the long term use of these wells as a potable water supply source is unknown at this time. Recent studies completed by engineers for the Village have recommended a connection to another public water distribution system.

The total estimated project cost for this recommendation is $820,000.

5) MCPU design and construct distribution system improvements to eliminate the "bottleneck" that currently limits the transfer of water from Southern Pines to the MCPU Pinehurst water distribution system to approximately 700,000 GPD.

   Hydraulic modeling and the preparation of cost estimates for this recommendation are currently being performed by the MCPU department.

6) Town of Pinebluff begin planning and design engineering to construct an emergency water interconnection with the Town of Southern Pines' water distribution system. Recent testing on two (2) of Pinebluff's existing wells indicated elevated levels of radium in the water, and the long term use of these wells as a potable water supply source is unknown at this time.

   The Town of Southern Pines' water distribution system currently extends through the Town of Pinebluff on U.S. Highway 1, and the close proximity of this line makes it a logical point for an interconnection. The total estimated project cost to interconnect the two (2) systems is $350,000.

7) Begin planning and design work to connect the City of Sanford's water distribution system to the Town of Cameron's water distribution system. The Town of Cameron has indicated a desire to interconnect with another public system, and the City of Sanford currently has an excess supply to provide to this area.

   The total estimated project cost for this interconnection is $71,000.

8) Encourage county, municipal, and community leaders to attend upcoming public meetings related to the Water Allocation study to express concerns over the current laws that significantly impact Moore County.

9) Monitor the City of Laurinburg's ongoing study regarding the existing 7.0 MGD raw water intake located on the Lumber River that previously served the now-closed WestPoint Stevens textile facility. Obtaining water from the Lumber River basin should be a long term goal for the Town of Southern Pines and Moore County, and each entity should carefully monitor this study and aggressively pursue an equity position in the facility if it proves to have value.

10) All system owners are encouraged to perform a legal and technical review of all existing water purchase agreements. Numerous agreements that are currently in place appear to have expired, and many purchases are currently exceeding the maximum amounts allowed by the agreements. It is recommended that these agreements be renewed and maximum purchase quantities be modified as necessary.

11) All system owners are encouraged to evaluate the quantity of "unaccounted for" water in their respective water distribution systems and become proactive in reducing the amount to less than the State's targeted goal of 10%.

12) MCPU carefully consider the impacts of the IBT regulations prior to removing the 60,000 GPD Vass wastewater treatment plant (WWTP) from service. Flows treated at this plant are quickly approaching its permitted capacity and MCPU has considered constructing a lift station at the site to pump the wastewater to a collection system within the Town of Southern Pines. Wastewater pumped by the lift station would ultimately be treated at the Moore County Water Pollution Control Facility in Addor.

    Retaining the Vass WWTP may be a valuable component for the County to comply with current IBT regulations, which impacts future water resources in the County. Since the assimilative capacity of the Little River is unknown at this time, a detailed evaluation is warranted to study the potential capacity of the plant, treatment processes that may be

utilized at the plant, effluent discharge options, and estimated capital costs to complete the expansion.

13) County and local municipalities should aggressively promote and support wastewater reclamation and reuse systems. Incentives that are financially attractive should be created to encourage the use of reclaimed water by golf courses and major irrigation users in the County. Reuse water provides environmental benefits by helping to recharge and extend the life of the local groundwater aquifers.

14) Re-assess the status of water resources in Moore County after the State's Water Allocation study is released in 2009. The State's study may potentially develop new river basin and sub-basin maps, and place new laws into effect regarding the IBT process that significantly impact the County and its water systems. It is also recommended that the study include an updated analysis of the underlying aquifer to determine the potential for the development of new wells in the County.

Long Term Goals

In addition to the fourteen (14) recommendations provided above, McGill Associates has generated the following long term planning goals. These goals are based on current IBT laws and assume that an IBT certificate will not be granted to the County by the EMC. Modifications to the current IBT regulations may significantly alter these recommendations in the future.

1) Construct a 2.0 MGD "run of river" intake on the Deep River and expand the capacity of the Robbins water treatment plant to 3.5 MGD. Water demand projections indicate that 85% of future capacities may be exceeded in peak summer months by approximately 2035, with additional capacity required by approximately 2043.

2) Increase the permitted capacity of the Southern Pines water treatment plant to match the plant's hydraulic capacity of 11.0 MGD. Water demand projections indicate that 85% of the 8.0 MGD plant capacity may be exceeded in peak summer months by approximately 2026, with additional capacity needed by approximately 2044. These

figures assume that the Town continues to grow and supply water to numerous other systems in the County, including the MCPU Pinehurst system.

3) Moore County partner with the Town of Southern Pines to provide a reliable source of water to the MCPU Pinehurst water distribution system in the future. Water demand projections indicate that the Town of Aberdeen may be forced to reduce the amount of water sold to MCPU by approximately 2016, and may not be capable of supplying water to the Pinehurst system by approximately 2022 due to increasing demands within their own system unless additional wells or other sources are developed. The Town of Southern Pines appears to be capable of increasing water sales to MCPU in the future to replace the water currently provided by Aberdeen.

The information and recommendations provided herein were generated based on information provided by each water distribution system owner. In addition, the preparation of this study included the formation of a project oversight group (POG) that was staffed by senior management officials from participating local governments. Acting as a direct link between the planning process and each municipality's elected officials, the POG played a vital role in completing this study by working closely with McGill Associates to provide coordination, involvement, and support for this document. The POG also monitored the progress of the study and provided valuable feedback to McGill Associates during its preparation.

SECTION 1.0 INTRODUCTION

Moore County is located in the Sandhills Region of central North Carolina, and is well known for its local golf courses, pottery, and horse farms. The County was host to the PGA Men's U.S. Open Golf Championship at the Pinehurst Resort in 1999 and 2005, and most recently hosted the LPGA Women's U.S. Open Golf Championship at the Pine Needles Resort in 2007. The Pinehurst Resort has also been selected to host the Men's U.S. Open Championship in 2014.

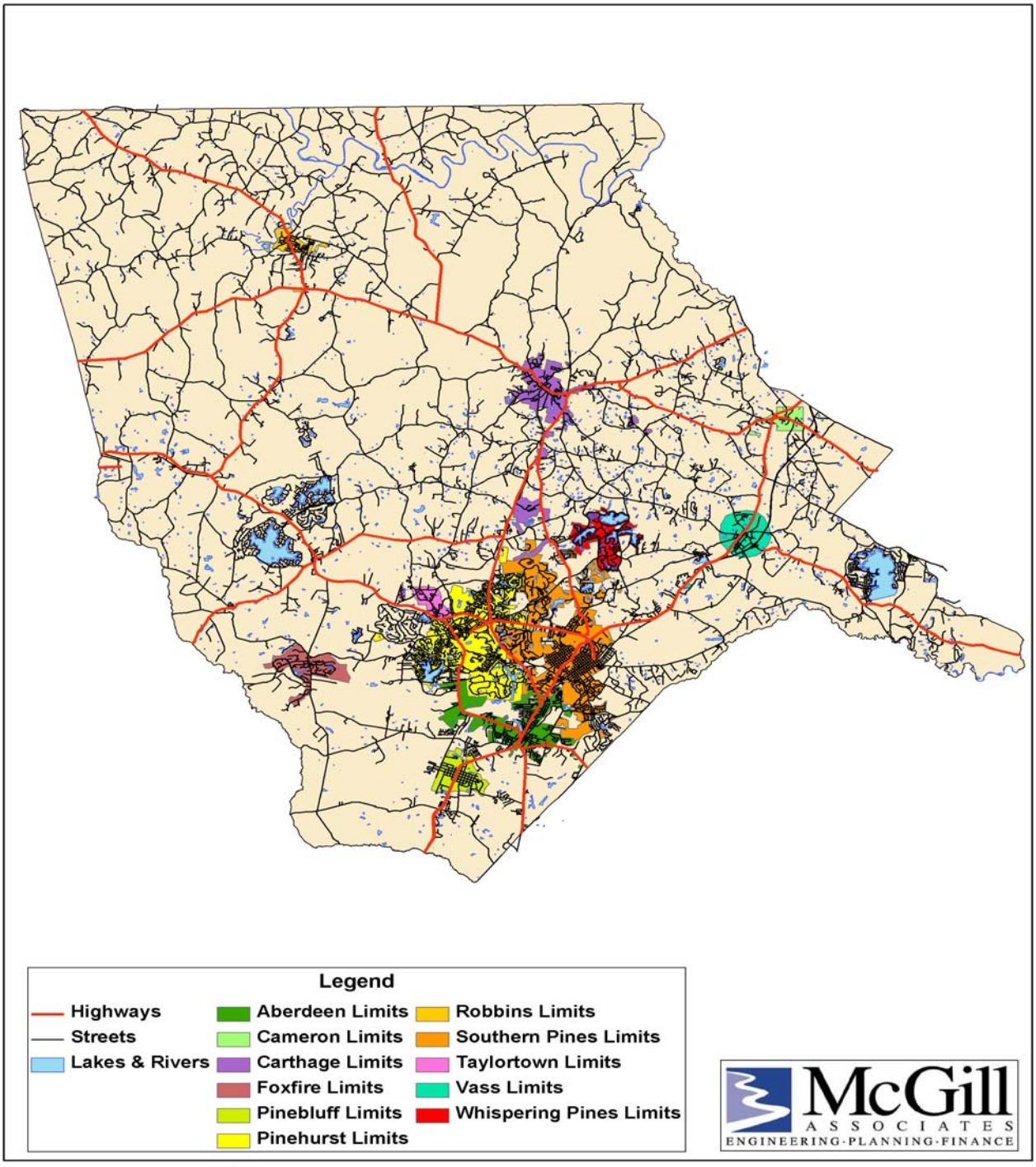
The North Carolina State Data Center (NCSDC) estimates that the Moore County population in 2006 was 82,292 residents. The County contains eleven (11) incorporated Towns and "Villages" ranging in size from 300 residents to nearly 12,000 residents. A map indicating the location of each municipal area is shown in Figure 1-1 and the population breakdown within each Town or Village is provided in Table 1-1.

TABLE 1-1: Municipal Populations in Moore County, North Carolina – 2006

Municipality	*2006 Population*
Town of Southern Pines	**11,990**
Village of Pinehurst	**11,316**
Town of Aberdeen	**4,434**
Village of Whispering Pines	**2,358**
Town of Carthage	**2,211**
Town of Pinebluff	**1,317**
Town of Robbins	**1,275**
Town of Taylortown	**947**
Town of Vass	**792**
Foxfire Village	**531**
Town of Cameron	**300**

Note: Estimated populations by NCSDC.

FIGURE 1-1


Legend
Highways
Streets
Lakes & Rivers
Aberdeen Limits
Cameron Limits
Carthage Limits
Foxfire Limits
Pinebluff Limits
Pinehurst Limits
Robbins Limits
Southern Pines Limits
Taylortown Limits
Vass Limits
Whispering Pines Limits
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The Moore County Public Utilities (MCPU) Department, East Moore Water District, and nine (9) additional municipalities in the County provide potable water service to residents in their respective service areas. The sources of water obtained for these systems include groundwater wells, surface water treatment plants, and purchases from other entities located both within Moore County and outside of Moore County. Various rural areas in the County do not currently have access to a municipal water system.

Moore County is currently experiencing considerable population growth. One of the major planning issues the County faces today is the procurement of safe and dependable sources for drinking water to accommodate this growth. Water bodies that produce the highest yield in the County include the Deep River in the northern portion of the County and Drowning Creek along the County's southern border, but these bodies do not generate the quantities of water that are present in surface water sources in neighboring counties.

In addition, Moore County is located in two (2) of the State of North Carolina's eighteen (18) major river basins. The majority of the County is located in the "Cape Fear" basin, while the southwestern portion of the County is located in the "Lumber" basin. Furthermore, the portion of the County located in the Cape Fear basin is divided into two "sub-basins." River basin and sub-basin locations are important aspects of water source planning due to the State of North Carolina's current rules regarding the transfer of water between basins or inter-basin transfers (IBTs). IBTs are currently regulated under North Carolina General Statutes, and their impacts on water source planning in Moore County are discussed throughout this report.

In the summer of 2002, North Carolina experienced a statewide drought due to years of below normal rainfall. During this time period, many of the water providers in Moore County were forced to assess voluntary and mandatory restrictions in order to conserve water. Though these restrictions were eventually lifted, the County continues to experience water supply shortages in certain areas. Due to additional drought conditions experienced in the summer of 2007, MCPU placed mandatory water restrictions in the Village of Pinehurst, and unincorporated Pinewild, Seven Lakes and West End communities, and eventually prohibited customers from irrigating

lawns and gardens in these areas. The Towns of Carthage, Southern Pines, and Aberdeen also imposed water restrictions during this time period, but on a voluntary basis.

One of the main issues currently facing several of the water providers in the County is the presence of contaminant levels in well water that exceed current drinking water standards. The most common contaminant being discovered in the existing wells is radium. Radium is a radioactive element that exists naturally in the Earth's crust, and therefore occurs in some drinking water sources. Water system owners are required to monitor for radium, in addition to many other contaminants. The current federal and state drinking water standard for combined radium (Radium-226 and Radium-228) has been established at five (5) pico-curies per liter (pCi/l). Water obtained from numerous wells in Moore County has recently exceeded this limit, forcing water providers to remove the wells from operation.

The purpose of this study is to prepare the County for the future procurement of safe and dependable drinking water sources. Recent drought conditions show that the underlying aquifer and existing surface water sources within the County are highly susceptible to the lack of rainfall. In addition, the number of reliable wells is getting smaller and the population of the County is getting larger. These factors combined are a cause for great concern. As a result, many of the water sources that are presently relied upon have limitations or are not predictable beyond the short term. This plan identifies and provides recommendations for the County's short term and long term needs for water.

The objectives of this study are to:

- Anticipate future user needs and demands for drinking water
- Identify practical and technically sound solutions that address regional priorities
- Carefully consider the economic implications of all alternatives
- Establish a clear path for implementing the proposed plan

Providing adequate and reliable water sources to support future community needs is a multi-jurisdictional issue affecting all local governments within the County. As a result, there are strong intergovernmental considerations that have been implemented into this study. The

majority of the water suppliers within the County have chosen to participate in this study, and have provided vital information and support for this document.

During the preparation of this study, a project oversight group (POG) was also created and staffed by senior management officials from participating local governments. Acting as a direct link between the planning process and each municipality's elected officials, the POG worked closely with McGill Associates to provide coordination, involvement, and support for this document. The POG also monitored the progress of the study, provided valuable feedback to McGill Associates during its preparation, and has therefore played a vital role in completing this report.

SECTION 2.0 EXISTING WATER SYSTEMS

MCPU operates seven (7) separate water distribution systems throughout the County, which vary in size from serving several dozen residents to several thousand residents. These systems obtain water from groundwater wells and via interconnections and water purchase agreements (WPAs) with other local governments.

In 2000, the County also created the East Moore Water District, which currently provides potable water service to rural areas in the eastern portion of the County. The East Moore Water District purchases surface water from neighboring Harnett County, and is currently constructing a major infrastructure project that will substantially expand the service area of the District.

The County also created the North West Moore Water District in 2000 in an attempt to provide water service to rural areas in the northwestern portion of the County. Due to lack of interest from residences and businesses in the area, no infrastructure has been constructed within the North West District to date. Future water service will be dependent on interest from local residents in the District.

In addition to the County systems and East Moore Water District System, there are nine (9) municipalities that own individual water distribution systems throughout the County. In completing this study, McGill Associates obtained water usage data from each system owner. A description of each system is detailed further in this section.

Average daily flow figures are provided, in addition to maximum monthly average demands, which are the largest monthly average demands reported by each system owner. The maximum monthly average demands for most systems occurred in June, July, August, or September and are most likely the direct result of increased irrigation demands in warm weather months. Peak daily demands have also been provided where available.

2.01 Moore County Public Utilities

MCPU operates seven (7) separate water distribution systems throughout Moore County. These systems include an estimated 225 miles of water distribution piping, six (6) elevated water storage tanks, and two (2) ground level storage tanks with a total storage capacity of 2.7 million gallons. The seven (7) MCPU systems provide potable water service to an estimated 21,300 County residents.

A description of each system is as follows:

A. Pinehurst System

The Pinehurst system is the largest system operated by MCPU, and serves approximately 15,000 residents located in the Village of Pinehurst and in the Pinewild and Jackson Hamlet communities. In 2006, average daily water demands for this system were approximately 1.76 million gallons per day (MGD), with a maximum monthly average demand of approximately 2.31 MGD. MCPU reports that current maximum daily demands for this system are approximately 3.33 MGD.

Water is provided to the Pinehurst system using both groundwater and surface water sources. The County currently operates eighteen (18) active groundwater wells in the system that provide a 12-hour safe yield of approximately 1.35 MGD. Disinfection is provided at each well using chlorine.

In 2006, two (2) wells (Well #5 and Well #9) were removed from the Pinehurst system due to radium concentrations in the well water that exceed the 5.0 pCi/l limit imposed by state and federal drinking water standards. MCPU recently drilled a new well (#5A) and plans to blend the water obtained from this well with water from Well #9, and return Well #9 to service in the near future. Once these two wells are placed into operation, the total 12-hour safe yield in the system will increase to approximately 1.57 MGD.

Current water demands require MCPU to operate the wells in the Pinehurst system for more than 12-hours per day during the summer months. To supplement these wells, MCPU also purchases surface water from the Town of Southern Pines and groundwater from the Town of Aberdeen. Agreements have been executed with both towns that detail the provisions associated with the water purchases.

The County's current agreement with the Town of Southern Pines is dated February 21st, 2005, and requires MCPU to purchase a minimum of 125,000 gallons per day (GPD) of water from the Town each month. Water purchased can be utilized in the MCPU Pinehurst system, the MCPU Addor system, or the MCPU Carolina system. Southern Pines is required by the agreement to provide up to 250,000 GPD for the County's use in all three (3) systems. In 2006, the County purchased approximately 172,600 GPD of water from the Town of Southern Pines for the MCPU Pinehurst system, including a maximum monthly purchase of 365,900 GPD in July 2006.

Southern Pines currently sells the water to the County at a monthly availability charge of $5,370 and an additional volume charge of $1.14 per 1,000 gallons consumed. Additional availability charges apply if the County exceeds the purchase limit of 250,000 GPD. The Town of Southern Pines reserves the right to adjust the rate each July in accordance with their current bulk water rate structure. The current agreement expires on June 30th, 2012.

The County's current agreement with the Town of Aberdeen is dated May 15th, 2006, and requires MCPU to purchase a minimum of 73 million gallons of water per year from the Town, or an average of 200,000 GPD. Aberdeen is required by the agreement to provide up to 400,000 GPD for the County's use. In 2006, the County purchased approximately 388,000 GPD of water from the Town of Aberdeen (97% of contract maximum), including a maximum monthly purchase of 680,700 GPD in August 2006.

Aberdeen currently sells the water to the County with no monthly availability fee, and at a volume charge of $2.00 per 1,000 gallons consumed. The current agreement is valid for three (3) years, and expires in May 2009.

The Pinehurst system includes three (3) elevated finished water storage tanks and two (2) ground level finished water storage tanks that provide a total storage capacity of 2.3 million gallons. The County is currently in the planning stages of constructing a new 500,000 gallon elevated tank in the system. This tank was originally planned to be constructed on property owned by the County near the Pinehurst Harness Track, but recent concerns over inadequate soils at the site has forced the County to investigate additional sites.

The Pinehurst system also currently supplies water to the MCPU "Seven Lakes" water distribution system via a booster pump station located along North Carolina Highway 211 to the west of the Village of Pinehurst. In 2006, the system provided approximately 410,000 GPD to the Seven Lakes system. The booster pump station currently contains two (2) pumps that are capable of pumping approximately 700 gallons per minute (GPM) or approximately 1.0 MGD of water to the Seven Lakes system with both pumps in operation.

Plans were recently approved by the North Carolina Public Water Supply Section to construct a new larger booster pump station adjacent to the existing station that would increase the amount of water supplied to the Seven Lakes system. The new station is designed to include two (2) pumps that will each be capable of delivering approximately 800 GPM to Seven Lakes. Due to concerns over the impacts the new station would have to the Pinehurst system, the construction schedule for the new booster station has not yet been established.

Providing adequate water to meet current demands in the summer months continues to be a challenge for MCPU staff in the Pinehurst system. Drought conditions experienced in the summer of 2007 have recently exacerbated matters. MCPU implemented Stage 1 voluntary water restrictions to customers in the Pinehurst system in the early summer of 2007, but these restrictions were unsuccessful in reducing water consumption to the County's goals. As a result, the County subsequently implemented Stage 2 mandatory restrictions in August 2007.

As the drought conditions continued to intensify and water supplies continued to be reduced, Stage 3 mandatory restrictions were eventually implemented by the County in October 2007. These restrictions were the result of reported drops in the water supply aquifer level

(approximately 3.23 feet), and a considerable lack of rainfall in the area. Stage 3 restrictions prohibit customers from watering lawns and gardens, filling swimming pools, and consuming water for any commercial or public nonessential use.

Additional water supplies are currently planned to be available for the MCPU Pinehurst System in mid-2008. Construction is currently underway on a major water infrastructure project in the East Moore Water District, including an interconnection that has the capability to supply up to 1.15 MGD of additional water to the Pinehurst system. The source of this water is the Cape Fear River, and will be treated at Harnett County's water treatment plant in Lillington. Additional information regarding the East Moore project is provided later in this report.

B. Seven Lakes System

The Seven Lakes system is the second largest system operated by MCPU, and serves approximately 5,000 residents located in the western portion of the county, including the Seven Lakes, West End, Love Grove, and McLendon Hills communities. In 2006, average daily water demands for this system were approximately 470,000 GPD, with maximum monthly average demands of approximately 670,000 GPD. MCPU reports that current peak daily demands within the Seven Lakes system are approximately 870,000 GPD.

Water is currently provided to the Seven Lakes system using three (3) groundwater wells, and by pumping water from the MCPU "Pinehurst" water system. Disinfection is provided at the three (3) wells using chlorine. The County has thirteen (13) additional wells that were used at one time to provide water to the Seven Lakes system, but are currently out of service. MCPU reports that five (5) of these wells were removed due to elevated radium concentrations, four (4) were removed due to low water production, two (2) were removed due to gasoline contamination, and two (2) were removed for high levels of iron and manganese. The total 12-hour yield of the three (3) wells that are currently in service is approximately 60,000 GPD.

To supplement the demand, water is pumped from the Pinehurst system to the Seven Lakes system using a booster pump station that is located along North Carolina Highway 211. MCPU recently replaced the impellers in the pumps, which increased the current capacity of the booster pump station to approximately 700 GPM (1.0 MGD) with both pumps in operation. As previously mentioned, the County recently completed the design and received a permit to construct a larger booster station to serve the Seven Lakes system. See Section 2.01-A of this report for additional details.

Due to current demands on the system, the three (3) wells in the Seven Lakes system are typically operated more than 12-hours per day during the peak summer months in order to produce the necessary water volumes. In addition, both pumps in the Highway 211 booster pump station must operate nearly continuously in order to supply the necessary water to meet system demands.

The Seven Lakes system has two (2) elevated finished water storage tanks that provide a total storage capacity of 300,000 gallons. These tanks provide less than a half of day of storage during periods of high demand in peak summer months.

Within the Seven Lakes system, providing adequate water to meet current demands in the summer months continues to be a challenging task for MCPU staff. Drought conditions experienced in the summer of 2007 have recently exacerbated matters. MCPU implemented Stage 1 voluntary water restrictions to customers in the Seven Lakes system in the early summer of 2007, but these restrictions were unsuccessful in reducing water consumption to the County's goals. As a result, the County subsequently implemented Stage 2 mandatory restrictions in August 2007.

As the drought conditions continued to intensify and water supplies continued to be reduced, Stage 3 mandatory restrictions were eventually implemented by the County in October 2007. These restrictions were the result of reported drops in the water supply aquifer level (approximately 3.23 feet), and a considerable lack of rainfall in the area. Stage 3 restrictions prohibit customers from watering lawns and gardens, filling swimming pools, and consuming water for any commercial or public nonessential use.

C. Vass System

The Vass system is the third largest system operated by MCPU, and serves approximately 850 residents located in and around the Town of Vass. In 2006, average daily water demands for this system were approximately 124,000 GPD, with maximum monthly average demands of approximately 210,000 GPD.

Water is currently provided to the Vass system from the East Moore Water District. The East Moore Water District purchases surface water from Harnett County, and then provides water to MCPU for the Vass system at a bulk water rate of $2.10 per 1,000 gallons. The East Moore Water District currently holds an agreement with Harnett County that allows the purchase of up to 2.0 MGD. No agreement is in place between the East Moore Water District and MCPU for the sale of water to the Vass system.

In addition to the Town, the Vass system supplies water to Skyline Estates, a mobile home park with approximately 75 units located near Vass. The park includes a 2-inch master meter that records all flow consumed in the mobile home park. Sales to the park currently average approximately 12,600 GPD.

The Vass system was previously served by a 288,000 GPD water treatment plant that included a raw water intake along the Little River. After the completion of the "Phase 1" project that constructed new water lines throughout the East Moore Water District in 2003, this plant was removed from service and is no longer in use.

The Vass system includes one (1) finished water elevated storage tank that provides a total storage capacity of 100,000 gallons.

D. Hyland Hills/Niagara System

The Hyland Hills/Niagara system is the fourth largest system operated by MCPU, and serves approximately 310 residents located in the Hyland Hills Golf Club and the Stars Charter School. In 2006, average water demands for this system were approximately 23,600 GPD, with maximum monthly average demands of approximately 32,900 GPD.

Water is currently provided to the Hyland Hills/Niagara system using one (1) groundwater well (Well #1A). Disinfection is provided to the groundwater using chlorine. This system also includes a 6,000 gallon hydropneumatic water tank to maintain adequate pressure in the system. The Hyland Hills/Niagara system does not contain any finished water storage tanks, and does not provide fire protection to the residents in the system. The 12-hour yield for Well #1A is approximately 36,000 GPD.

Recently, water obtained from Well #1A has exceeded the federal and state drinking water standard limit for Radium 226 & 228. MCPU had previously removed a second well (Well #2) from operation as a result of radium contamination. Due to the recent levels of radium discovered in Well #1A, MCPU is currently under an administrative order from the North Carolina Department of Environment and Natural Resources (DENR) to connect the Hyland Hills/Niagara system to new water lines being constructed in the East Moore Water District. The connection to East Moore is currently scheduled to take place in 2008. Once the connection has been made, existing Well #1A will be taken out of service.

E. Addor System

The Addor system is the fifth largest system operated by MCPU, and serves approximately 80 residents in the Addor community located in the southern portion of the County. The Addor system also provides potable water service to the Moore County Water Pollution Control Facility (WPCF) for various buildings and hand washing stations throughout the plant. Process water used at the facility is primarily provided by a non-potable effluent water system. Current average daily water demands for this system are approximately 14,300 GPD, with maximum monthly average demands of approximately 21,000 GPD.

MCPU currently purchases water from the Town of Southern Pines to serve the Addor system in accordance with an agreement dated February 21st, 2005. This agreement covers the sale of water from Southern Pines to the MCPU Pinehurst, Addor, and Carolina water systems. Additional information regarding the provisions of this agreement are included in Section 2.01-A of this report.

The Addor system does not include any finished water storage tanks. Fire protection is provided to the residents in the area due to system pressure provided by the Town of Southern Pines' water distribution system.

F. Robbins CDBG System

The Robbins CDBG system is the sixth largest system operated by MCPU, and serves approximately 45 residents and a community center located in Davis community along North Carolina Highway 705 to the north of the Town of Robbins. In 2006, average daily water demands for this system were approximately 12,600 GPD, with maximum monthly average demands of approximately 18,800 GPD.

MCPU currently purchases water from the Town of Robbins to serve the Robbins CDBG system. The County's agreement with the Town is dated July 17th, 2003, and allows the County to purchase up to 100,000 GPD of water from the Town at a rate of $2.00 per 1,000 gallons. The agreement was valid for a term of two (2) years from the date of execution; therefore it expired in July 2005. Though no renewal appears to have taken place, water continues to be sold at a rate of $2.00 per 1,000 gallons.

The Robbins CDBG system does not include any finished water storage facilities. Fire protection is provided to the residents in the area due to system pressure provided by the Town of Robbins' water distribution system.

G. The Carolina System

The Carolina system is the smallest system operated by MCPU, and serves approximately 23 residents located in The Carolina Golf Course community along Airport Road. In 2006, average daily water demands for this system were approximately 12,300 GPD, with maximum monthly average demands of approximately 23,900 GPD. The majority of this demand is flushing water that is wasted from the system to maintain water quality.

MCPU currently purchases water from the Town of Southern Pines to serve the Carolina system in accordance with an agreement dated February 21st, 2005. This agreement covers the sale of water from Southern Pines to the MCPU Pinehurst, Addor, and Carolina systems. Additional information regarding the provisions of this agreement are included in Section 2.01-A of this report.

The Carolina system does not include any finished water storage tanks. Fire protection is provided to the residents in the area due to system pressure provided by the Town of Southern Pines' water distribution system.

2.02 East Moore Water District

The East Moore Water District was formed in 2000 and currently provides potable water service to approximately 1,275 residents in the rural areas of eastern Moore County. In 2006, average daily water demands for this system were approximately 94,000 GPD, with maximum monthly average demands of approximately 112,000 GPD.

The East Moore Water District purchases water from Harnett County in accordance with a WPA that was originally executed in November 1999, with subsequent amendments in December 2001 and March 2003. This contract has a term of forty (40) years, and requires Harnett County to furnish up to 2.0 MGD to the District at an interconnection located near the County line. The District currently purchases water from Harnett County at a rate of $1.85 per 1,000 gallons.

Harnett County owns and operates a surface water treatment facility that treats water obtained from the Cape Fear River. The facility has a current capacity to treat 18.0 MGD of water, and the County plans to expand to a capacity of 36.0 MGD in the near future. The plant uses chloramines to disinfect the water prior to pumping to the County's distribution system.

The District currently does not operate any water storage facilities, as adequate pressure is provided from the Harnett County system. Harnett County staff reports that their current distribution system does not have the hydraulic capacity to supply more than 2.0 MGD to the District. Future purchases in excess of 2.0 MGD would therefore require major upgrades to the Harnett County distribution system.

The East Moore Water District currently supplies water to the MCPU "Vass" water distribution system via an interconnection located on North Carolina Highway 690 to the east of the U.S. Highway 1 bypass. In 2006, the District provided approximately 124,000 GPD to the Vass system, with maximum monthly average supplies of approximately 210,000 GPD. No agreement is currently in place for this water transfer, since both entities are owned by Moore County.

Construction is currently underway on a major water infrastructure project that will substantially increase the customer base within the District. This "Phase II" project consists of the installation of approximately 84 miles of new water distribution piping, one (1) new 500,000 gallon elevated finished water storage tank, two (2) booster pump stations, and related appurtenances.

MCPU reports that they have received approximately 1,600 applications for water service in response to the Phase II project. As mentioned in Section 2.01-A of this report, the project also includes an interconnection that will provide up to approximately 1.15 MGD of additional water to the MCPU Pinehurst Water System.

2.03 Town of Southern Pines

The Town of Southern Pines is currently the largest municipality in Moore County, and is located in the southern portion of the County near the convergence of U.S. Highway 1 and North Carolina Highway 2. According to the NCSDC, the estimated population of Southern Pines in 2006 was 11,990 residents.

The Town of Southern Pines owns a raw water intake along Drowning Creek that is permitted to withdraw up to 8.0 MGD from the creek at all times. According to a letter from the DENR Division of Water Resources (DWR) dated January 5, 1995, this withdrawal may be increased to as much as 14.0 MGD as long as 56 cubic feet per second (CFS) of streamflow (approximately 36 MGD) is maintained at the United States Geological Survey (USGS) monitoring gauge located downstream of the intake.

Raw water is currently pumped from the intake to a 20 million gallon raw water reservoir located adjacent to the Town's water treatment plant. The Town also has an 110,000 GPD well in the vicinity of the plant that can provide additional water to the reservoir as needed. The treatment plant can hydraulically produce up to 11.0 MGD of finished water for the Town's distribution system, and uses chloramines as a method of disinfection. The water treatment plant also includes a two (2) million gallon clearwell, and the distribution system includes four (4) additional finished water storage tanks that provide a total storage capacity of 5.5 million gallons.

In 2006, the Town's water treatment plant produced an average of 3.00 MGD, with maximum monthly average demands of approximately 4.20 MGD. These water volumes were consumed within the Town of Southern Pines and in other municipalities through purchases from the Town. The portion of the water that was consumed in the Town's water system was approximately 2.53 MGD in average months and approximately 3.45 MGD during the peak summer month.

A unique feature of the Town's water system is that it is located in two (2) of the State of North Carolina's eighteen (18) major river basins. The Town's water source (Drowning Creek) is

located in the "Lumber" River Basin, but a large portion of the Town's water customers are located in the "Cape Fear" basin. Most of the water used by the Town's water system is returned as wastewater to the Lumber River basin and discharged to Aberdeen Creek after treatment at the Moore County WPCF. Wastewater that is not returned to the Lumber Basin for disposal is subject to North Carolina laws regarding IBTs.

The Town currently has plans to construct a 140 million gallon "drought relief" raw water reservoir on property located near its existing water treatment plant site. The Town has acquired the necessary land, and is currently in the permitting phase for the new reservoir. Town leaders are hopeful that the reservoir will be constructed and placed into operation by 2010.

The Town of Southern Pines currently sells potable water to several municipalities in surrounding areas. A summary of these sales are as follows:

- Moore County Public Utilities (for Pinehurst, Addor, and Carolina systems) – minimum purchase of 125,000 GPD, maximum purchase of 250,000 GPD, availability charge of $5,370 plus volume charge of $1.14 per 1,000 gallons (see Section 2.01-A of this report for additional information).
- Carolina Water Service (for Village of Whispering Pines) – minimum purchase of 100,000 GPD, maximum purchase of 200,000 GPD, availability charge of $4,296 plus volume charge of $1.14 per 1,000 gallons.
- Camp Mackall – no minimum or maximum purchase, no availability charge, volume charge of $5.70 per 1,000 gallons plus monthly meter fees of $926.40.
- Town of Pinebluff (for Oakwood Hills Subdivision) – no minimum or maximum purchase, no availability charge, volume charge of $2.85 per 1,000 gallons plus monthly meter fees of $926.40.

During the statewide drought in the summer of 2002, the Town's intake along Drowning Creek went dry, requiring mandatory water restrictions throughout the Town, including its bulk water customers. As a result of the drought, the Town installed emergency interconnections with both

the Town of Aberdeen and the Town of Carthage. These interconnections are currently available as a backup source of water for the Town in an emergency situation.

An agreement is currently in place with the Town of Aberdeen that was executed in February 2003. In entering this agreement, both municipalities agreed to make available 500,000 GPD of finished water for the other if an adequate supply is available in one Town but is not available in the other. Pumping costs are to be paid by the purchaser, and the bulk water rate is determined on an annual basis.

An agreement with the Town of Carthage was also executed in February 2003. This agreement allows the Town of Carthage to obtain raw water from Southern Pines' old water source (Reservoir Park Lake) during times when additional water is needed to supplement water in Carthage. In addition, both municipalities agreed to make available 500,000 GPD of finished water to the other if the water supply is adequate in one Town but not available in the other. Finished water is provided at the prevailing bulk water rate established by Southern Pines.

The drought also caused the Town of Southern Pines to return three (3) groundwater wells into service that had previously been removed as a source to the system. These wells are currently available to the Town to be used as an emergency water supply, and have a total 12-hour yield of approximately 390,000 GPD. The Town exercises these wells regularly, but does not supply any water into the distribution system under normal operating conditions.

2.04 Town of Aberdeen

The Town of Aberdeen is located in the southern portion of Moore County at the convergence of U.S. Highway 1 with North Carolina Highway 5 and U.S. Highway 15/501. According to the NCSDC, the estimated population of Aberdeen in 2006 was 4,434 residents.

The Town of Aberdeen owns and operates a municipal water distribution system consisting of seventeen (17) groundwater wells that have a total 12-hour safe yield of approximately 1.9 MGD. Disinfection is provided to the groundwater using chlorine. The system also includes five (5) finished water elevated storage tanks that provide a total storage capacity of 1.85 million gallons. The distribution system operates on five (5) separate pressure zones due to the varying overflow elevations of the tanks. In 2006, average daily water demands for this system were approximately 812,000 GPD, with maximum monthly average demands of approximately 957,000 GPD.

The Town currently sells water to the MCPU Pinehurst system through an interconnection located along North Carolina Highway 5 near the intersection with Dawkins Street. In 2006, MCPU purchased an average of 387,700 GPD from the Town of Aberdeen, with a maximum monthly purchase of approximately 681,000 GPD.

The Town of Aberdeen has entered into an agreement with MCPU dated May 15th, 2006 that allows the County to purchase up to 400,000 GPD of water from the Town at a total rate of $2.00 per 1,000 gallons. The minimum purchase allowed by the agreement is 73 million gallons per year or 200,000 GPD. No monthly availability fee is charged to the County, and the water is utilized in the MCPU Pinehurst system. The current agreement will expire in May 2009.

The Town of Aberdeen also has an "emergency" interconnection with the Town of Southern Pines that allows water to be transferred from one system to the other during emergency conditions. The agreement with Southern Pines was executed in February 2003. In entering this agreement, both municipalities agreed to make available 500,000 GPD of finished water for the other if the available water supply is adequate in one Town, but not available in the other.

Pumping costs are to be paid by the purchaser, and the bulk water rate is determined on an annual basis.

The Town of Aberdeen's existing Well #12 was recently removed from service due to levels of radium in the groundwater that exceed the 5.0 pCi/L standard for drinking water. This well has a yield of approximately 200 GPM or a 12-hour safe yield of 143,000 GPD. The Town is currently exploring the options available for returning this well to operation.

Historically, the Town has also experienced contamination in its water sources from lindane and has been required to remove some wells from the system due to lindane contamination. The contamination likely stemmed from the Aberdeen Pesticide Dumps and/or the Geigy Chemical Corporation plant which are both listed on the United States Environmental Protection Agency's (USEPA's) superfund sites National Priorities List. Lindane was listed as a contaminant present at both sites along with other harmful pollutants in the USEPA reports. The Town's existing Well #13 also had high concentrations of lindane when tested, and now includes a carbon filter to treat the water prior to sending it to the distribution system.

During the statewide drought in 2002, Aberdeen was the only town in Moore County that did not impose mandatory restrictions to its water customers. Voluntary restrictions were placed into effect, but ample water remained available from the groundwater system to meet daily demands. In the summer of 2007, the Town once again requested voluntary conservation from its customers in an effort to conserve water due to increasing demands and dry weather.

2.05 Village of Whispering Pines

The Village of Whispering Pines is located in the central portion of Moore County to the north of the Town of Southern Pines. According to the NCSDC, the estimated population of Whispering Pines in 2006 was 2,358 residents.

Water is provided to the residents of Whispering Pines by a water distribution system that is owned and operated by Carolina Water Service (CWS). CWS is a private utility that purchases water from the Town of Southern Pines to serve the customers in the Village. The CWS system currently has three (3) interconnection points with the Town's water system. In 2006, average daily water demands for the CWS system were approximately 240,000 GPD, with maximum monthly average demands of approximately 349,700 GPD.

CWS and the Town of Southern Pines entered into an agreement in May 1997 that allows the purchase of up to 200,000 GPD of water from the Town's system. The contract also provides a provision to annually adjust the "contract amount" to an amount equal to or greater than the amount used in the previous year. Any increases to the contract amount are subject to available capacity at the Southern Pines water treatment plant. The Town of Southern Pines charges a monthly availability charge of $4,296, plus a volume charge of $1.14 per 1,000 gallons to CWS for the water purchase.

Storage is provided to the system by one (1) elevated finished water storage tank that has a capacity of 300,000 gallons. The CWS system also includes one (1) well (Well #9) that can be placed into operation as a backup source in emergency situations.

2.06 Town of Carthage

The Town of Carthage is located in the northeastern portion of Moore County at the convergence of U.S. Highways 15/501 and North Carolina Highways 24/27. According to the NCSDC, the estimated population of Carthage in 2006 was 2,211 residents.

The Town of Carthage owns a municipal water distribution system consisting of a 1.0 MGD raw water intake and surface water treatment facility, a 20 million gallon raw water reservoir, and two (2) finished water storage tanks that provide a total storage capacity of 300,000 gallons. The water plant also includes a one (1) million gallon clearwell that provides additional finished water storage to the system. Disinfection is provided at the water plant using chlorine.

The Town's raw water intake is located on Nick's Creek on North Carolina Highway 22 to the south of the Carthage town limits. Current average daily water demands for this system are approximately 300,000 GPD, with maximum monthly average demands of approximately 350,000 GPD. Operators report that the Town currently uses approximately 50,000 GPD of water produced as process water and irrigation water for the water treatment plant site.

The Town recently constructed a new 300,000 gallon elevated finished water storage tank at its existing water treatment plant site. This tank includes an overflow elevation that is approximately 20 feet higher than the overflow elevations of the Town's previously used tanks in order to increase pressures throughout the system. After construction of the new tank was completed, the Town reported that they intend to fill the two (2) previously used finished water tanks with water for fire protection, but does not plan to utilize the tanks in the system under normal conditions.

During the statewide drought in the summer of 2002, the Town's intake along Nick's Creek went dry, requiring mandatory water restrictions to be implemented throughout the Town. As a result of the drought, the Town of Carthage installed an emergency interconnection with the Town of Southern Pines that is currently available as a backup source of water for either Town in an

emergency situation. The Town eventually lifted the mandatory restrictions, but has remained under voluntary water restrictions since 2002.

The Town of Carthage entered into an agreement with the Town of Southern Pines in February 2003 that allows Carthage to obtain raw water from Southern Pines' Reservoir Park Lake when it is necessary to supplement water from its own intake and reservoir. The agreement also states that both municipalities (Southern Pines and Carthage) will provide up to 500,000 GPD of finished water to the other municipality if an adequate supply is available in one system, but an adequate supply is not available in the other system. Finished water will be provided at the prevailing bulk volume rate established by the Town of Southern Pines.

2.07 Town of Pinebluff

The Town of Pinebluff is located along U.S. Highway 1 in the southern portion of Moore County. According to the NCSDC, the estimated population of Pinebluff in 2006 was 1,317 residents.

The Town owns and operates a municipal water distribution system consisting of five (5) groundwater wells and one (1) 300,000 gallon elevated finished water storage tank. Disinfection is provided to the groundwater using chlorine. The five wells currently provide a 12-hour safe yield of approximately 590,000 GPD. In 2006, average daily water demands for the well-based system were approximately 132,000 GPD, with maximum monthly average demands of approximately 163,000 GPD.

The Town of Pinebluff also purchases water from the Town of Southern Pines to serve the Oakwood Hills subdivision, which is located to the south of the Pinebluff town limits. The water distribution system that serves the Oakwood Hills subdivision does not physically connect to the Town of Pinebluff's main water distribution system. Current water demands for the Oakwood Hills subdivision are approximately 10,000 GPD, with average daily demands during summer months of approximately 13,900 GPD.

Testing recently indicated elevated levels of radium in two (2) of the Town's five (5) existing wells that exceed the 5.0 pCi/L limit provided by state and federal drinking water standards. All wells currently remain in service because follow-up testing has indicated levels below the standard limit. The Town continues to monitor radium levels in all wells on a quarterly basis.

2.08 Town of Robbins

The Town of Robbins is located in the northwestern portion of Moore County just to the north of the convergence of North Carolina Highways 705 and 24/27. According to the NCSDC, the estimated population of Robbins in 2006 was 1,275 residents.

The Town currently obtains potable water from Montgomery County through a 10-inch diameter interconnection line located on Spies Road. This line was constructed following the 2002 statewide drought when the Town's previous water supply went dry. The Town entered into an agreement with Montgomery County in December 2004 that requires the Town to purchase a minimum of 100,000 GPD through the Spies Road line. In 2006, average daily water demands for this system were approximately 167,000 GPD, with maximum monthly average demands of approximately 231,000 GPD.

The Town of Robbins also owns a surface water treatment plant that is capable of treating water from Bear Creek. According to the Engineering Evaluation of the Existing Water and Sewer System for the Town of Robbins report completed by McGill Associates in April 2005, plant operators reported that the 1.5 MGD plant was unable to treat more than approximately 1.0 MGD of water due to inefficiencies with the existing treatment equipment. The study recommended major improvements to the plant that would increase the reliability of the equipment and improve safety conditions for plant operators. Due to the lack of necessary funds to construct the improvements and operate the facility, the Town ceased the operation of the plant in July 2007. Town leaders are currently planning to return the plant to service when funds are available to make repairs and efficiently operate the facility.

The Town's intake for the water treatment facility is located along Bear Creek near the confluence of Bear Creek with Cabin Creek. Water is pumped from the intake to the 120 million gallon Charles B. Brooks raw water reservoir, and then pumped from the reservoir to the water treatment facility. Since the water treatment plant is currently off-line, the intake, pump stations, and reservoir are currently not in active use.

The Town of Robbins also owns a municipal water distribution system consisting of distribution lines and three (3) elevated finished water storage tanks that provide a total storage capacity of 700,000 gallons. The system is divided into two (2) pressure zones with the Milliken Park and the Tracy Brown water tanks serving one zone, and the South Tank serving a second zone. Due to the minimal water demands in the area served by the South tank, the Town has recently explored the possibility of installing improvements to the water distribution system that would allow all tanks to operate on the same hydraulic grade line.

The Town of Robbins sells water to MCPU for use in the MCPU Robbins CDBG water distribution system. This system is located along North Carolina Highway 705 to the north of the Town, and provides service to approximately 45 residents and a community center located in the Davis community. In 2006, the Town sold an average water volume of 12,600 GPD to MCPU for this system, with average daily demands during summer months of 18,800 GPD.

2.09 Town of Taylortown

The Town of Taylortown is located along North Carolina Highway 211 in the southern portion of Moore County between the Village of Pinehurst and the Seven Lakes community. According to the NCSDC, the estimated population of Taylortown in 2006 was 947 residents.

The Town of Taylortown elected not to participate in this study, but has been included in the report to account for current and future water usage. According to the Town's 2002 Local Water Supply Plan (LWSP), the Town owns and operates a municipal water distribution system consisting of six (6) groundwater wells and one (1) 475,000 gallon finished water elevated storage tank.

Current average daily demands in the system per the 2002 LWSP are approximately 49,000 GPD, with maximum monthly average demands of approximately 57,000 GPD. The well system that is currently in place has a 12-hour safe yield of approximately 175,000 GPD.

2.10 Foxfire Village

Foxfire Village is located in the southwestern portion of Moore County near the border with Richmond County. According to the NCSDC, the estimated population of Foxfire in 2006 was 531 residents.

Foxfire Village owns and operates a municipal water distribution system consisting of seven (7) groundwater wells and one (1) 200,000 gallon elevated finished water storage tank. The wells have a total 12-hour safe yield of 142,600 GPD, and disinfection is provided to the groundwater using chlorine. According to the Water Source Alternatives Study prepared by Hydrostructures, PA in July 2007, the average daily production in the system in 2006 was 63,635 GPD, with a maximum monthly average production of 79,700 GPD.

The Water Source Alternatives Study also indicates that excessive levels of radium were recently discovered in four (4) of the Village's seven (7) wells. These wells continue to remain in service, but their reliability as a long-term source to the Village is unclear at this time. The study recommends that the Village begin planning for an interconnection with another local system in the future to meet its long term water source needs.

2.11 Town of Cameron

The Town of Cameron is located in the eastern portion of Moore County along U.S. Highway 1 at the border with Lee County. According to the NCSDC, the estimated population of Cameron in 2006 was 300 residents.

The Town owns and operates a municipal water distribution system consisting of three (3) active groundwater wells and one (1) 100,000 gallon elevated finished water storage tank. Two (2) of the three (3) wells are currently operated on a regular basis, with the third well available for use during emergencies or periods of high demand. The two (2) active wells have a 12-hour safe yield of approximately 86,400 GPD. Disinfection of the groundwater is provided using chlorine. Current average daily demands in the system are approximately 34,800 GPD, with maximum monthly average demands of approximately 45,000 GPD.

The Town reports that both active wells have historically produced water with elevated concentrations of iron. As a result, both wells currently have filter systems in place to remove iron from the water. Operators report that approximately 98% of the iron is removed from the water prior to pumping to the Town's distribution system.

Phase II of the East Moore Water District includes the construction of new water lines that are in close proximity to the Town of Cameron's existing water system. New lines in the East Moore District located on Atkins Road and Dalrymple Road will be constructed next to the Town's water lines, creating the potential for an interconnection between the two (2) systems.

2.12 Summary Tables

Based on the data provided by each water system owner, the municipal water systems in the County had a total average daily demand of approximately **6.85 MGD** in 2006. A summary of the average daily water demands for each of the municipal water systems currently in use in Moore County is provided in Table 2-1.

TABLE 2-1: Summary of Average Daily Demands in All Systems

System	*Water Generated (MGD)*	*Water Purchased (MGD)*	*Water Sold (MGD)*	*Total Usage in System (MGD)*
MCPU - Pinehurst	**1.612**	**0.560**	**0.410**	**1.762**
MCPU - Seven Lakes	**0.060**	**0.410**	**0**	**0.470**
MCPU - Vass	**0**	**0.124**	**0**	**0.124**
MCPU - Hyland Hills	**0.024**	**0**	**0**	**0.024**
MCPU - Addor	**0**	**0.014**	**0**	**0.014**
MCPU - Robbins CDBG	**0**	**0.013**	**0**	**0.013**
MCPU - Carolina	**0**	**0.012**	**0**	**0.012**
East Moore Water District	**0**	**0.218**	**0.124**	**0.094**
Southern Pines	**3.000**	**0**	**0.474**	**2.526**
Aberdeen	**1.200**	**0**	**0.388**	**0.812**
Whispering Pines	**0**	**0.240**	**0**	**0.240**
Carthage	**0.300**	**0**	**0**	**0.300**
Pinebluff	**0.132**	**0.010**	**0**	**0.142**
Robbins	**0**	**0.180**	**0.013**	**0.167**
Taylortown	**0.049**	**0**	**0**	**0.049**
Foxfire	**0.064**	**0**	**0**	**0.064**
Cameron	**0.035**	**0**	**0**	**0.035**
TOTAL	**6.476**	**1.781**	**1.409**	**6.848**

In addition, based on the data provided by each water system owner, the municipal water systems in the County had maximum monthly average demands of approximately **9.10 MGD** in 2006. It should be noted that these demands did not occur in the same month of the year, but that most systems reported maximum monthly demands in the summer months of June, July, August, or September. Table 2-2 summarizes each system's maximum monthly average demand.

TABLE 2-2: Summary of Maximum Monthly Average Demands in All Systems

System	*Maximum Monthly Usage (MGD)*
MCPU - Pinehurst	**2.314**
MCPU - Seven Lakes	**0.670**
MCPU - Vass	**0.210**
MCPU - Hyland Hills	**0.033**
MCPU - Addor	**0.021**
MCPU - Robbins CDBG	**0.019**
MCPU - Carolina	**0.024**
East Moore Water District	**0.112**
Southern Pines	**3.451**
Aberdeen	**0.957**
Whispering Pines	**0.350**
Carthage	**0.350**
Pinebluff	**0.177**
Robbins	**0.231**
Taylortown	**0.057**
Foxfire	**0.080**
Cameron	**0.045**
TOTAL	**9.101**

SECTION 3.0 FUTURE WATER DEMANDS

3.01 Historical Populations and Trends

Moore County and the incorporated areas within the County have historically experienced steady growths in population. According to the United States Census Bureau (USCB), the population in the County was 59,000 residents when the census was conducted in 1990, and increased to 74,769 residents when the most recent census was conducted in 2000. This population increase equates to an average growth rate of approximately 2.4% per year between 1990 and 2000.

The State Demographics Unit of the NCSDC recently published updated estimates for all counties and municipalities in North Carolina for 2006 on its website (http://demog.state.nc.us). These estimates indicate that the population in Moore County had increased to 82,292 residents in 2006. This additional increase in population equates to a growth rate between 2000 and 2006 of approximately 1.6% per year. The historical populations and annual growth rates per the USCB and NCSDC are summarized in Table 3-1.

TABLE 3-1: Historical Population of Moore County, North Carolina

	1990	*2000*	*2006*
Population	**59,000***	**74,769***	**82,292****
% Growth/Year		**2.4%**	**1.6%**

*Actual population per USCB data.
**Estimated population by NCSDC.

In addition to the County growth rate, all of the municipalities in the County have historically experienced growths in population. Table 3-2 summarizes the population in each municipality based on the 1990 and 2000 census, the estimated population in 2006 per the NCSDC, and the annual growth rates associated with these increases in population. In addition to the incorporated areas, the unincorporated Seven Lakes community has been included in the table due to its considerable population, increasing historical growth rates, and large water demands from the MCPU Seven Lakes system. Figure 3-1 provides a graphical representation of the table.

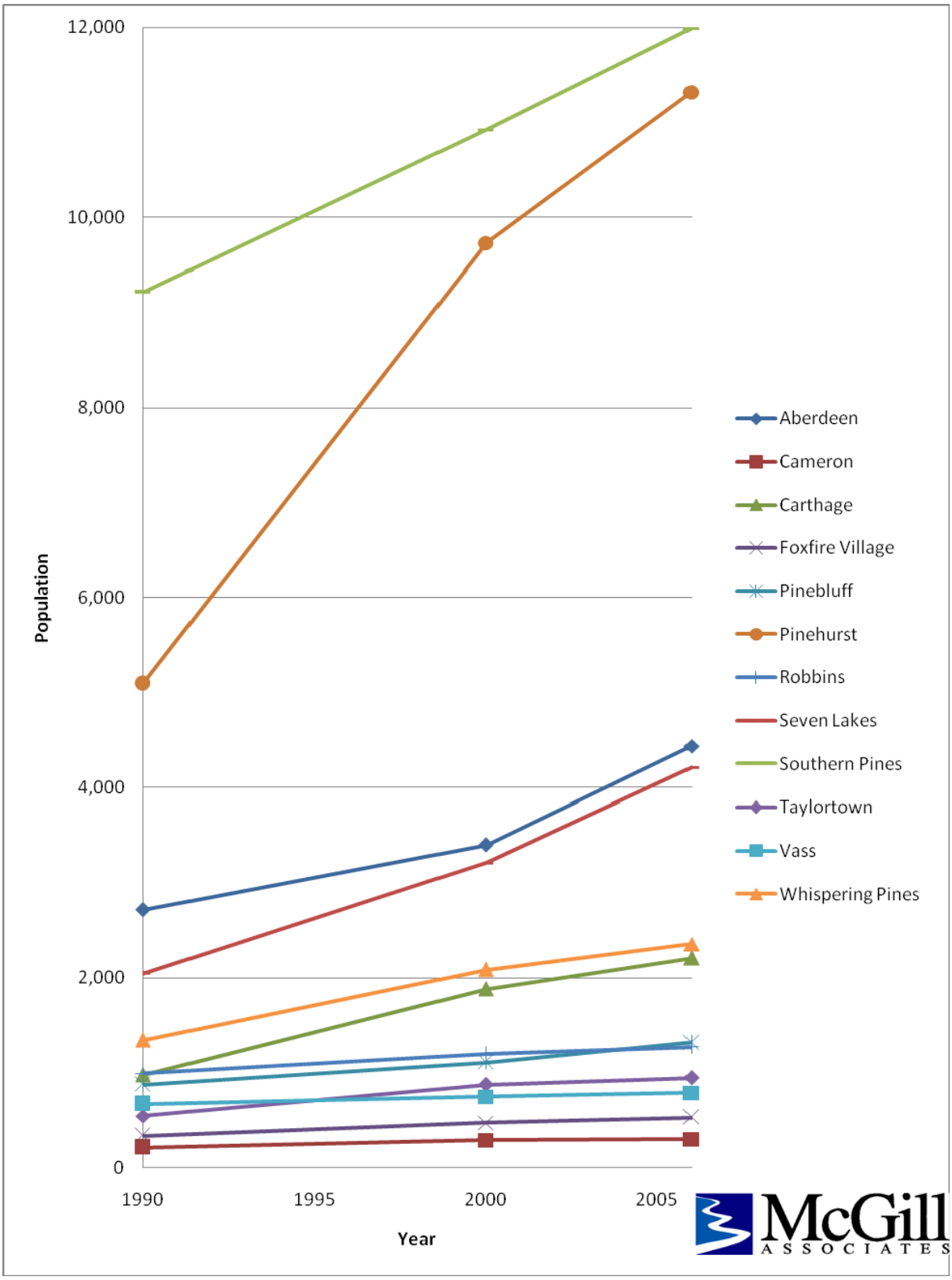
TABLE 3-2: Historical Populations for Moore County, North Carolina

Municipality or Area	**1990 Population*	**2000 Population*	***2006 Population*	*Average Annual Growth Rate (1990 – 2000)*	*Average Annual Growth Rate (2000 – 2006)*
Aberdeen	**2,717**	**3,400**	**4,434**	**2.3%**	**4.5%**
Cameron	**215**	**293**	**300**	**3.1%**	**0.4%**
Carthage	**976**	**1,884**	**2,211**	**6.8%**	**2.7%**
Foxfire Village	**334**	**474**	**531**	**3.6%**	**1.9%**
Pinebluff	**876**	**1,109**	**1,317**	**2.4%**	**2.9%**
Pinehurst	**5,091**	**9,729**	**11,316**	**6.7%**	**2.6%**
Robbins	**995**	**1,195**	**1,275**	**1.8%**	**1.1%**
Seven Lakes**	**2,049**	**3,214**	**4,210**	**4.6%**	**4.6%**
Southern Pines	**9,213**	**10,918**	**11,990**	**1.7%**	**1.6%**
Taylortown	**545**	**875**	**947**	**4.8%**	**1.3%**
Vass	**670**	**750**	**792**	**1.1%**	**0.9%**
Whispering Pines	**1,346**	**2,090**	**2,358**	**4.5%**	**2.0%**
Unincorporated	**33,973**	**38,838**	**40,611**	**1.3%**	**0.7%**
Moore County Total	**59,000**	**74,769**	**82,292**	**2.4%**	**1.6%**

*Actual population per USCB data.

**Estimated population by NCSDC. (Except for Seven Lakes where no data was available. 2006 population for Seven Lakes is estimated based on historical growth trends and number of water service connections.)

FIGURE 3-1: Historical Populations for Moore County, North Carolina



3.02 Future Populations and Growth Areas

In addition to providing population estimates for all counties and municipalities in the year 2006, the NCSDC website provides population projections for all counties (not for municipalities) within North Carolina to the year 2030. According to the website, Moore County is expected to experience "modest growth" in the future, and the County's population is projected to surpass 100,000 residents by the year 2020. Table 3-3 summarizes the projections that the NCSDC has published for Moore County.

TABLE 3-3: Population Projections for Moore County, North Carolina

	2006	*2010*	*2020*	*2030*
Population	**82,292**	**87,816**	**100,824**	**113,638**
% Growth/Year		**1.6%**	**1.4%**	**1.2%**

Note: Estimated populations by NCSDC.

The annual population growth rates projected by the NCSDC (1.2% - 1.6%) are less than the historical growth rates experienced by the County since 1990 (approximately 2.2% per year). In preparing this study, McGill Associates has discussed future population projections with County and municipal leaders and planning departments, as well as the Moore County School System and North Carolina Department of Transportation (DOT), to determine planned infrastructure improvements to accommodate future growth. The general consensus among most community planners and leaders is that the County's population will grow at a rate faster than projected by the NCSDC.

One of the reasons for potential increased growth rates is the Base Realignment and Closure (BRAC) Act that was recently implemented by the United States Department of Defense. This act will close numerous existing military bases throughout the country, and re-align military personnel to different bases. Fort Bragg and Pope Air Force base are located in Cumberland and Hoke Counties, to the southeast of Moore County, and recent military estimates indicate that BRAC will bring approximately 40,000 people to the Sandhills region and surrounding areas of North Carolina within the next five (5) years. A large portion of this population increase is

expected to occur in Moore County, and the BRAC program is expected to have a tremendous impact on both future population and water demands throughout the County.

Another reason that local leaders are expecting increases in population is that County and municipal planning personnel have reported substantial increases in the number of requests for new subdivisions and homesites throughout the County. In addition to normal residential growth being experienced in the community, many "large" subdivisions are currently being proposed in various locations throughout the County. Specific subdivisions that have already been planned, discussed, or approved are described in further detail in the following section of this report.

The Moore County School System has paid close attention to the steady growth in the County and recently published a 2006-2018 Facilities Master Plan that details the system's needs to accommodate the additional growth. The plan indicates that the school system is currently experiencing an increase of approximately 193 students each year, and the number is expected to rise in the future. According to the plan, current enrollment in the school system is approximately 12,000 students, and the enrollment is projected to increase by 17% to more than 14,000 students by the 2015-2016 school year.

The school's master plan indicates that the Pinecrest High School district will be responsible for approximately sixty (60) percent of the growth seen by the system in the coming years. This district includes the Pinehurst, Southern Pines, Aberdeen, Pinebluff, Seven Lakes, Foxfire, and Taylortown sections of the County. The Union Pines High School District, which includes Cameron, Carthage, Vass, and Whispering Pines, is expected to accommodate approximately thirty (30) percent of this growth.

The following section summarizes the historical population trends, current estimated service population, future potential for population increases, and population and water demand projections to the year 2056. An analysis of each system's current potential to meet current and future water demands is also provided.

3.03 Municipal Population and Water Demand Projections

Using the current water demands provided by each system owner and population projections performed for each system, McGill Associates has calculated water demand projections for a 50-year planning period. In completing these projections, each system owner was provided with a "preliminary" copy to provide comments and feedback on the calculations. Projections were then revised in accordance with the comments received from each system owner.

The results of the projections are provided in the following sections:

A. MCPU Pinehurst System

According to USCB data, the Village of Pinehurst experienced rapid growths in population of approximately 6.7% per year between 1990 and 2000. Growth in the Village stabilized to approximately 2.6% per year between 2000 and 2006; however, the Village continues to be one of the fastest growing areas in Moore County.

As of March 2008, Village planning staff reports that there are 2,158 vacant lots within the Village of Pinehurst limits and 879 vacant lots within the Village Extra-Territorial Jurisdiction (ETJ). In addition, Village staff reports that there are approximately 380 vacant lots in the Pinewild community, which is not currently located in the Village limits, but is served by the MCPU Pinehurst system.

In April 2003, the Village adopted a Comprehensive Long Range Village Plan that included a demographic analysis of the Village, and projected future population growths of approximately 4,000 residents per decade. These projections are similar to the historical population growths within the Village, and have been used as the basis for the population and water demand projections included in this study.

Table 3-4 summarizes the estimated service population and water demand projections for the MCPU Pinehurst system from 2006 to the year 2056.

TABLE 3-4: Projections for MCPU – Pinehurst Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**15,000**	**1.76**	**2.31**
2016	**19,500**	**2.28**	**2.99**
2026	**24,000**	**2.81**	**3.68**
2036	**28,500**	**3.33**	**4.36**
2046	**33,000**	**3.86**	**5.06**
2056	**37,500**	**4.39**	**5.75**

Notes: Estimated Service Population includes Pinehurst, Pinewild, and Jackson Hamlet.
Water Demand Figures do not include transfers to the MCPU Seven Lakes system.

Analysis: Current water sources available to the MCPU for the Pinehurst system include groundwater wells (1.35 MGD 12-hour safe yield), the Town of Aberdeen (up to 400,000 GPD per contract), and the Town of Southern Pines (up to 250,000 GPD per contract). The total amount available per these sources is therefore 2.0 MGD. However, since this system currently provides approximately 410,000 GPD of water to the MCPU Seven Lakes water system, the net amount of water available to the Pinehurst system is currently only 1.59 MGD.

The 2006 average daily water demands (1.76 MGD) exceeded the existing production capacity of the system, and total demands for 2007 exceeded the demands from 2006. In order to supply water to meet average daily and peak daily demands, MCPU has been forced to operate wells for longer than 12-hours per day, and purchase quantities of water that exceed existing contract amounts from the Towns of Southern Pines and Aberdeen. Due to water shortages during drought conditions, MCPU also implemented Stage 3 mandatory water conservation measures for the Pinehurst system in October 2007.

As the population served by the MPCU Pinehurst system continues to grow, there is a critical need for additional water sources. The fact that two (2) existing wells in the Pinehurst area were previously removed from service due to radium contamination is also a cause for concern, and may impact the long term reliability of the remaining groundwater wells currently serving this system.

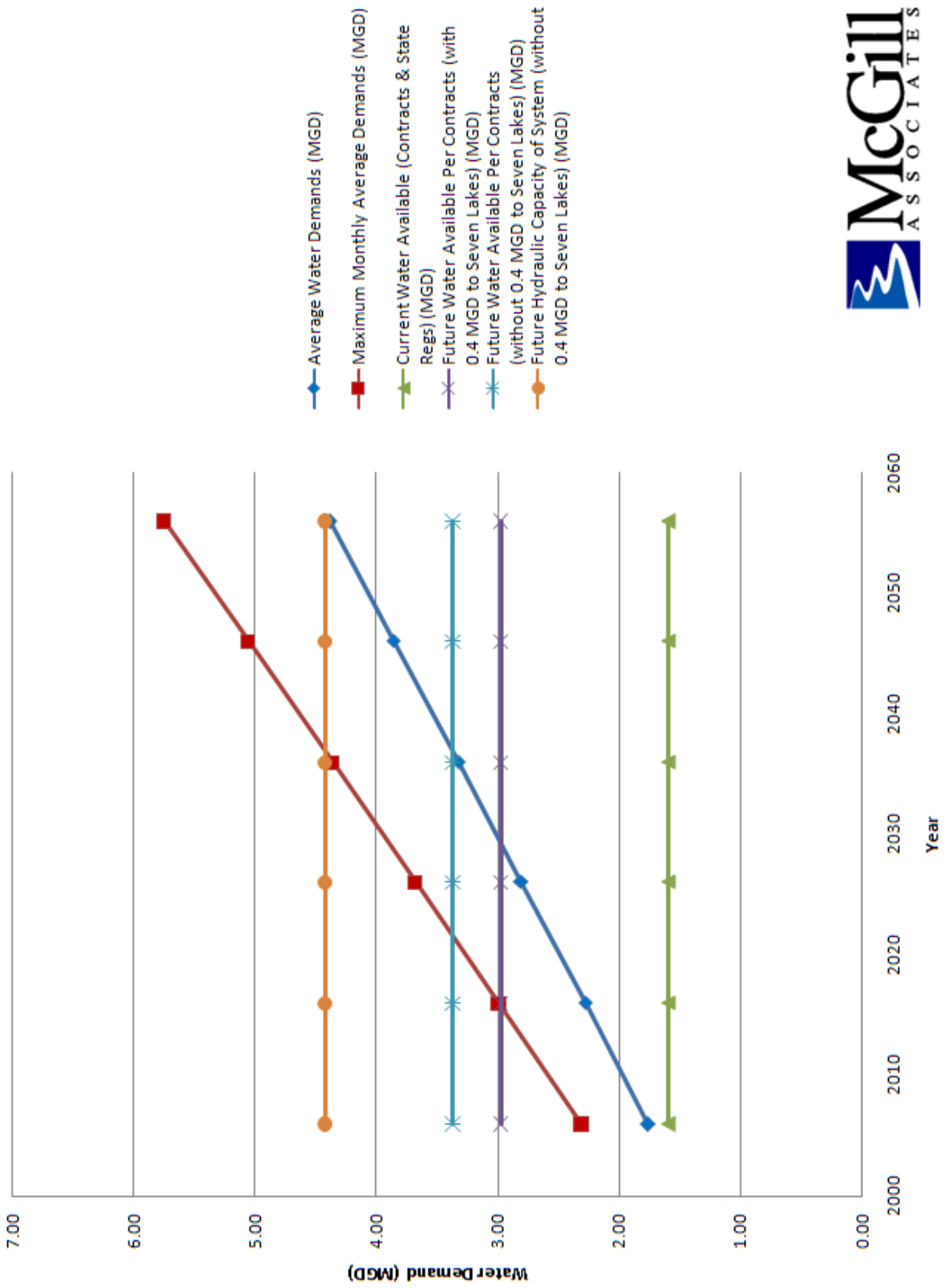
MCPU is currently implementing several projects that will increase supplies to the Pinehurst system. The Well 5A and 9 project will place two (2) additional wells on line that will add approximately 0.22 MGD of additional supply, and the Phase II project for the East Moore Water District includes an 800 GPM booster pumping station that will allow MCPU to supply an additional 1.15 MGD to the Pinehurst system. Both projects are currently scheduled to be complete in 2008, and will add a total additional supply of 1.37 MGD. Once these projects are complete, the total net quantity of water available to supply the system increases to 2.97 MGD. The County also has included the construction of additional wells in their Capital Improvement Plan (CIP).

In order to further increase water supplies in the Pinehurst system, an alternative source of water for the MCPU Seven Lakes system is needed. The recent replacement of impellers in the Highway 211 booster station allow MCPU the capability to supply up to 1.0 MGD of water to the Seven Lakes system, which significantly impacts the ability to meet current demands in Pinehurst, particularly in summer months. Developing an additional water supply source for the Seven Lakes system would remove the current 410,000 GPD that is currently being supplied from Pinehurst, and would further increase total supplies available in Pinehurst to 3.38 MGD.

MCPU also reports that the hydraulic capacities of the existing water distribution system allow the County to obtain more than 250,000 GPD from Southern Pines and approximately 400,000 GPD from Aberdeen if necessary. Currently, the system is hydraulically capable of obtaining approximately 700,000 GPD from Southern Pines and approximately 1.0 MGD from Aberdeen. These figures allow the County the potential to purchase up to 1.7 MGD from the two (2) Towns in lieu of the 0.65 MGD included in the existing contracts. The total hydraulic capacity of the system is therefore approximately 4.43 MGD.

A graphical representation of the current and future water demands identified in Table 3-4 and the current and future capacities of the system are shown in Figure 3-2.

FIGURE 3-2: Water Demands and Supplies - MCPU Pinehurst Water System



Based on the information shown in Figure 3-2, the future water supplies currently planned for the Pinehurst system (3.38 MGD) will allow MCPU to meet average daily demands for the system to approximately 2037, if an additional supply source can be located for the MPCU Seven Lakes system. In addition, this quantity will allow MCPU to supply monthly maximum monthly average demand to the year 2021, assuming Seven Lakes is supplied by another source and that the contracts with Southern Pines and Aberdeen remain in their current quantities. Additional supplies will therefore be needed in the future as population and water demands continue to grow.

An additional concern related to the Pinehurst system is the Town of Aberdeen's capability to supply water to the system in the future. Aberdeen is currently experiencing significant growth and projections indicate that the Town may be unable to provide water to Pinehurst within the next ten (10) years, unless additional sources of water are obtained by Aberdeen.

Furthermore, future water resources in the Pinehurst system must be carefully planned to comply with the state of North Carolina's current laws regarding IBTs. These laws currently limit the amount of surface water that can be transferred between river basins and sub-basins without obtaining a certificate.

In consideration of these laws, the Town of Southern Pines is a source of water that requires strong consideration for future supply to the Pinehurst system. Since the Southern Pines' current water source (Drowning Creek) is located in the same river basin as Pinehurst's wastewater disposal location (Aberdeen Creek), most of the water supplied by Southern Pines to Pinehurst is not subject to IBT regulations. These systems are currently connected, but a "bottleneck" in the system limits the flows to approximately 700,000 GPD. MCPU is currently working on a hydraulic and cost analysis to correct this bottleneck, and allow the transfer of more water as necessary in the future.

B. MCPU Seven Lakes System

According to USCB data, the Seven Lakes community experienced rapid growths in population of approximately 4.6% per year between 1990 and 2000. Because this area is unincorporated, updated population estimates for Seven Lakes to the year 2006 are not currently available from either the USCB or the NCSDC. However, County planning staff believes that the Seven Lakes community and surrounding areas continue to be some of the fastest growing areas in Moore County. The DOT has recognized the potential growth in the area, and has included the widening of North Carolina Highway 211 between Pinehurst and Seven Lakes in its current transportation improvements program.

According to the Moore County Planning Department, there are currently more than 1,200 vacant lots within the Seven Lakes community. The planning department also has received information regarding several large developments in the area that could add 700 lots or more to the Seven Lakes area. Based on the historical growth rates and future development plans, the potential for future growth in the Seven Lakes area appears to be substantial.

Table 3-5 summarizes the estimated service population and water demand projections for the MCPU Seven Lakes system to the year 2056.

TABLE 3-5: Projections for MCPU – Seven Lakes Water Distribution System

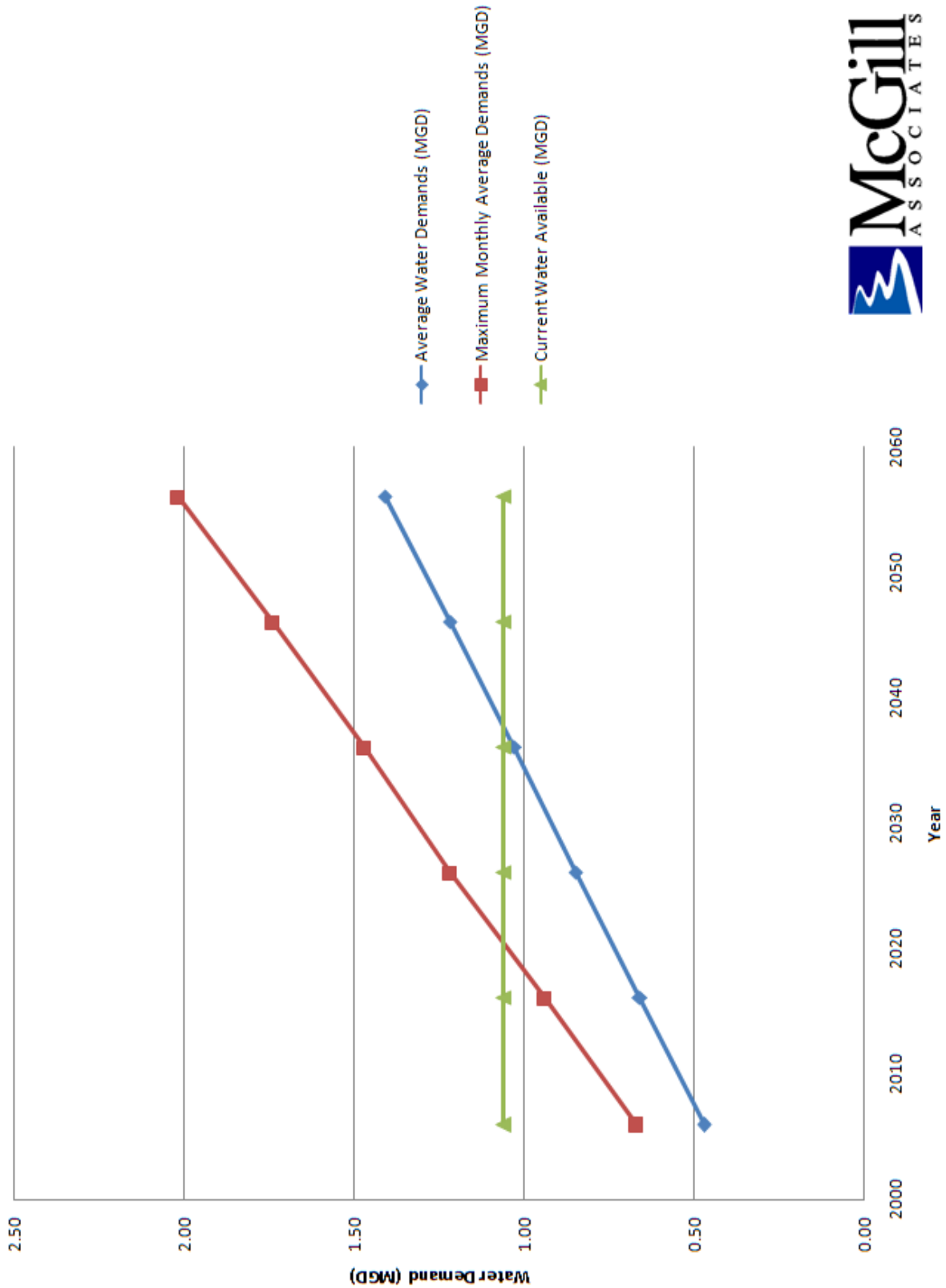
Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**5,000**	**0.47**	**0.67**
2016	**7,000**	**0.66**	**0.94**
2026	**9,000**	**0.85**	**1.22**
2036	**11,000**	**1.03**	**1.47**
2046	**13,000**	**1.22**	**1.74**
2056	**15,000**	**1.41**	**2.02**

Note: Estimated service population includes Seven Lakes, McLendon Hills, West End, and Love Grove communities.

Analysis: Current water sources available to the Seven Lakes system include three (3) groundwater wells (60,000 GPD current 12-hour safe yield), and a booster pump station located along North Carolina Highway 211 that pumps water from the MCPU Pinehurst system (current capacity of 1.0 MGD with both pumps running). The total amount of water available to supply the system is therefore approximately 1.06 MGD.

A graphical representation of the current and future water demands identified in Table 3-5 and the current and future capacities of the system are shown in Figure 3-3.

FIGURE 3-3: Water Demands and Supplies - MCPU Seven Lakes Water System



As shown in Figure 3-3, the 2006 average daily water demands (470,000 GPD) and maximum monthly average demands (670,000 GPD) are within the current capacity of the system. However, recent maximum daily demands (870,000 GPD) are more than 80% of the total capacity of the system.

The potential for considerable growth in the Seven Lakes area, the inability of the water system to produce more than 1.06 MGD, and the lack of a backup source in place to the existing 211 booster pump station, creates an immediate need for additional water resources in the Seven Lakes system. Drilling additional groundwater wells in the area does not appear to be a viable solution, and the reliability of the three (3) remaining wells in use is not predictable beyond the short term. MCPU has previously closed thirteen (13) wells due to various contamination and flow-related problems.

The Seven Lakes system also has a need for additional water storage facilities. The two (2) existing elevated storage tanks provide 300,000 gallons of storage, or approximately fifteen (15) hours of storage at current average daily flows. During recent peak daily flows of approximately 870,000 GPD, the existing tanks provide only eight (8) hours of storage. As the population and water demands in the Seven Lakes area continue to grow, additional storage facilities are needed to improve the reliability and fire protection provided by the current system.

Two (2) areas that have been identified as potential sources of water for the Seven Lakes area are Montgomery County and the Town of Robbins.

Montgomery County lies to the west of Seven Lakes and County leaders have committed to providing up to 500,000 GPD of water to the Seven Lakes area. Montgomery County's system includes an elevated water storage tank near the County's border with Moore County on Highway 211 that operates at a higher hydraulic grade than the Seven Lakes system. Constructing an interconnection between the two (2) systems would therefore consist of the installation of a new distribution system pipe and metering facility along Highway 211.

The Town of Robbins recently ceased operation of the Town's existing 1.5 MGD water treatment plant and 120 million gallon Charles B. Brooks reservoir. The plant is in need of a major upgrade but could be a potential source of water to the Seven Lakes area upon completion of the upgrade. Connection of the Robbins system to the Seven Lakes system would also require distribution piping and a booster pumping facility.

The potential also exists to supply water from both Montgomery County and the Town of Robbins to the Seven Lakes area by interconnecting the Robbins and Seven Lakes systems. In this scenario, water from Montgomery County would be supplied to Robbins and Seven Lakes through the existing 10-inch diameter Spies Road line and additional infrastructure constructed between Robbins and Seven Lakes. This alternative could eliminate the need for an extension from Montgomery County's system along North Carolina Highway 211, and would require a detailed hydraulic evaluation of the existing Montgomery County and Robbins water distribution systems.

C. MCPU Vass System

According to the USCB and NCSDC, the Town of Vass has experienced growth rates of approximately 0.9% to 1.1% per year since the census was conducted in 1990. Vass is currently one of the slower growing areas in the County, but the Town appears to have the potential for increased growth in the future due to the recent construction of the U.S. Highway 1 bypass around the Town. This new bypass has provided easier access to surrounding areas both inside and outside of Moore County.

Table 3-6 summarizes the estimated service population and water demand projections for the MCPU Vass system to the year 2056.

TABLE 3-6: Projections for MCPU – Vass Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**850**	**0.124**	**0.210**
2016	**940**	**0.137**	**0.231**
2026	**1,040**	**0.152**	**0.257**
2036	**1,150**	**0.168**	**0.284**
2046	**1,270**	**0.185**	**0.313**
2056	**1,400**	**0.204**	**0.345**

Analysis: The Town of Vass is not limited to a maximum purchase from the East Moore Water District because no contract is currently in place. The District has a contract with Harnett County that allows the purchase of up to 2.0 MGD of water. This capacity is currently adequate to supply water to meet average and peak demands in the MCPU Vass system. As Harnett County water continues to be utilized in other parts of the County, the 2.0 MGD capacity will need to be re-evaluated and increased in the future if necessary.

Another factor that must be considered with the Vass system is the State's current laws regarding IBTs. Recently, MCPU has considered eliminating the Vass WWTP from operation and pumping all wastewater from the Vass plant site to Southern Pines, where it eventually will be

treated at the Moore County WPCF in Addor. This scenario would result in an IBT between the Cape Fear and Lumber River basins, and would need to be closely monitored by County staff to comply with current regulations.

D. Hyland Hills/Niagara System

The Hyland Hills subdivision and water distribution system is currently located in the Town of Southern Pines ETJ, but is not located within the corporate limits of the Town. On average, this water system has grown by approximately three (3) new service connections per year in recent years.

Table 3-7 summarizes the estimated service population and water demand projections for the MCPU Hyland Hills/Niagara system to the year 2056.

TABLE 3-7: Projections for MCPU – Hyland Hills/Niagara Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (MGD)*
2006	**310**	**23,600**	**32,900**
2016	**385**	**29,300**	**41,000**
2026	**460**	**35,000**	**49,000**
2036	**535**	**40,700**	**57,000**
2046	**610**	**46,400**	**65,000**
2056	**685**	**52,000**	**72,800**

Analysis: The 12-hour yield for the system's lone water source, Well #1A, is approximately 36,000 GPD. Though this well currently has adequate capacity to serve the system, it recently violated the drinking water standard for radium, and MCPU is under an administrative order from DENR to connect this system to the Phase II improvements of the East Moore Water District. This connection is scheduled to take place in 2008, and will convert the water supply from groundwater to surface water provided by Harnett County. The Hyland Hills/Niagara system is not planned to be limited to a maximum purchase amount from the District because no agreement is planned to be placed into effect.

Once the connection to the East Moore District is made, the Hyland Hills/Niagara system will have a more reliable water source than its current source. The District has an existing contract with Harnett County that allows the purchase of up to 2.0 MGD of water from the County. This

capacity is currently adequate to supply average and peak water demands in the MCPU Hyland Hills/Niagara system. As Harnett County water continues to be utilized in other parts of the County, this 2.0 MGD capacity will need to be re-evaluated and increased in the future as necessary.

E. Addor System

The Addor system is located in an unincorporated area of Moore County, to the south of the Town of Pinebluff. This system has historically seen little growth, and currently averages approximately one (1) new water service connection each year. The majority of the water usage on the system is potable water provided to the Moore County WPCF located on Addor Road.

Moore County recently received a Community Development Block Grant (CDBG) from the United States Department of Housing and Urban Development that will extend both water and sewer service to approximately sixteen (16) additional homes in this community. The population served by the water system will therefore increase once the new water system is in place.

Table 3-8 summarizes the estimated service population and water demand projections for the MCPU Addor system to the year 2056.

TABLE 3-8: Projections for MCPU – Addor Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (MGD)*
2006	**80**	**14,300**	**21,000**
2016	**145**	**17,600**	**25,800**
2026	**170**	**18,900**	**27,800**
2036	**195**	**20,200**	**29,700**
2046	**220**	**21,500**	**31,600**
2056	**245**	**22,800**	**33,500**

Analysis: The current water source for the Addor system is the Town of Southern Pines through an existing WPA with MCPU. The current maximum purchase amount of 250,000 GPD covers the MCPU Pinehurst, Addor, and Carolina Water systems.

The Addor system currently has a reliable water source in the Town of Southern Pines. The Town owns an 8.0 MGD water treatment facility, and is currently in the planning stages of a new 140 million gallon drought relief raw water reservoir that will increase the storage capacity and

reliability of the system in the occurrence of a drought. The Southern Pines water treatment plant has adequate capacity to supply this system in the future. Assuming that an agreement by all parties can remain in effect for this purchase, the Addor system appears to have sufficient water supply to meet current and future needs.

F. Robbins CDBG System

The Robbins CDBG system is located in an unincorporated area of Moore County to the north of the Town of Robbins along North Carolina Highway 705. The system has historically experienced little or no growth. In fact, County records indicate that the number of service connections within the system has decreased in recent years. For the purposes of this study, it has been assumed that no additional growth will be observed in this system.

Table 3-9 summarizes the estimated service population and water demand projections for the MCPU Robbins CDBG system to the year 2056.

TABLE 3-9: Projections for MCPU – Robbins CDBG Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (MGD)*
2006	**45**	**12,600**	**18,800**
2016	**45**	**12,600**	**18,800**
2026	**45**	**12,600**	**18,800**
2036	**45**	**12,600**	**18,800**
2046	**45**	**12,600**	**18,800**
2056	**45**	**12,600**	**18,800**

Analysis: The current water source for the Robbins CDBG system is the Town of Robbins through an existing WPA with MCPU. The current agreement allows the purchase of up to 100,000 GPD. As shown above, current water purchases are much less than allowed by the agreement.

The Robbins CDBG system currently has a reliable water source in the Town of Robbins. Robbins has a WPA with Montgomery County that allows the purchase of up to 360,000 GPD, and is using approximately half of this amount on an average daily basis. Assuming that the existing agreement will be renewed, and will remain in place for this purchase in the future, the Robbins CDBG system appears to have sufficient water supply to meet current and future needs.

G. The Carolina System

The Carolina Golf Course community is located in the Town of Southern Pines ETJ, but is not located within the corporate limits of the Town. This system has historically seen little residential growth, and currently averages approximately one (1) new water service connection each year. The majority of the system demand is water that is flushed from the system by MCPU to maintain water quality.

Table 3-10 summarizes the estimated service population and water demand projections for the MCPU Carolina system to the year 2056.

TABLE 3-10: Projections for MCPU – Carolina Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (MGD)*
2006	**23**	**12,300**	**23,900**
2016	**43**	**14,300**	**27,000**
2026	**63**	**16,300**	**31,000**
2036	**83**	**18,300**	**35,000**
2046	**103**	**20,300**	**39,000**
2056	**123**	**22,300**	**42,500**

Analysis: The current water source for the MCPU Carolina system is the Town of Southern Pines through an existing WPA with MCPU. The current maximum purchase amount of 250,000 GPD covers the MCPU Pinehurst, Addor, and Carolina systems.

The Carolina system currently has a reliable water source in the Town of Southern Pines. The Town of Southern Pines has adequate water treatment plant capacity, and the previously discussed drought relief reservoir will assist the future supply of water to this area. Assuming that an agreement by all parties can remain in place for this purchase, the Carolina system appears to have sufficient water supply to meet current and future needs.

H. East Moore Water District

The East Moore Water District provides water service to unincorporated areas in the eastern portion of Moore County and to the MCPU Vass water distribution system. Future projections for the MCPU Vass system were previously discussed in Section 3.03-C of this report.

The District is currently constructing a major infrastructure project that will substantially increase the service population within the District. The County reports that it has received approximately 1,600 applications for water service connections in response to the Phase II project, and the presence of potable water service in the eastern portion of the County is expected to accelerate development and population growth in the area.

Table 3-11 summarizes the estimated service population and water demand projections for the East Moore Water District to the year 2056.

TABLE 3-11: Projections for MCPU – East Moore Water District Distribution System

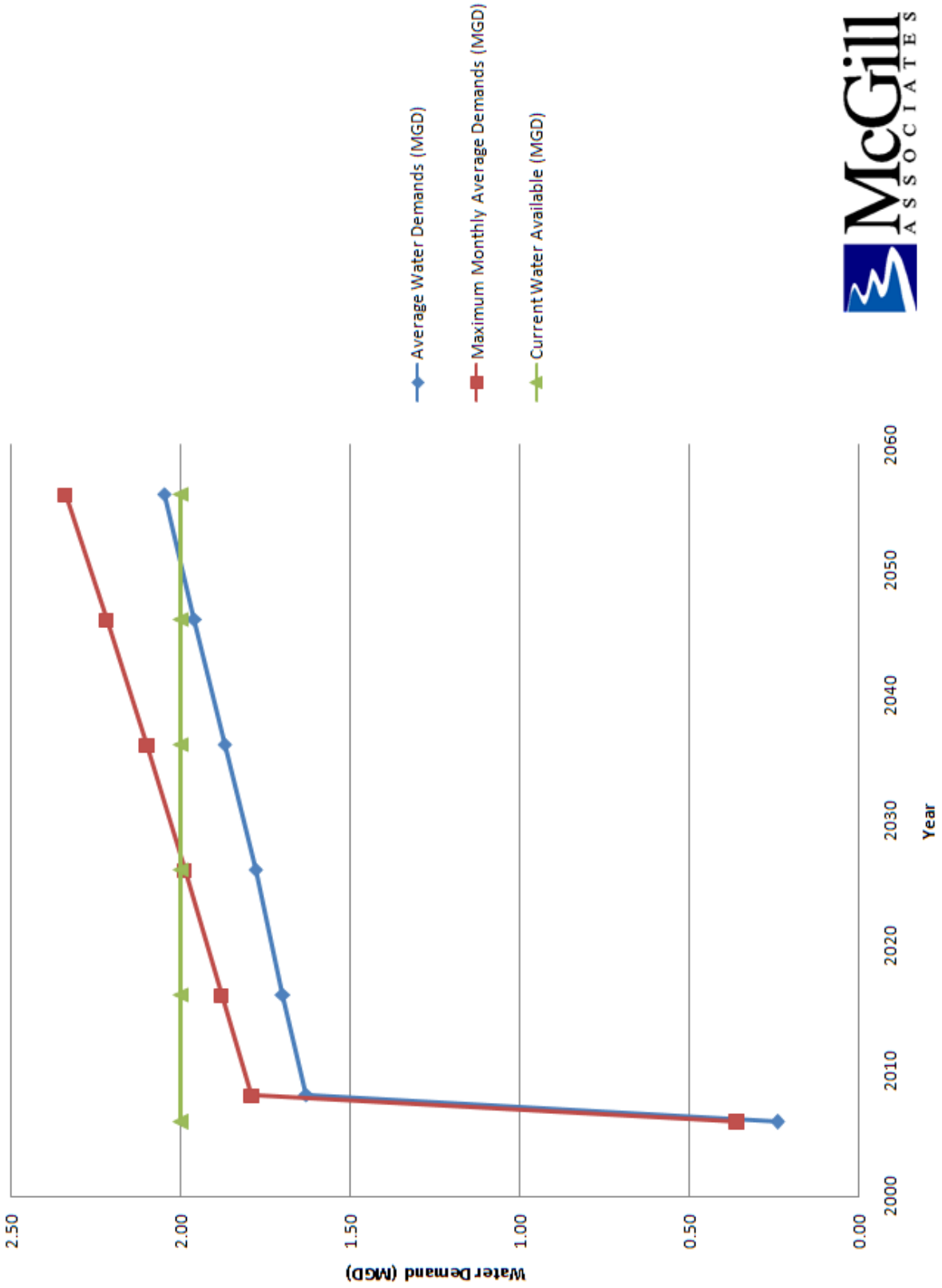
Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**1,275**	**0.094**	**0.112**
2016	**5,100**	**0.382**	**0.458**
2026	**5,900**	**0.443**	**0.532**
2036	**6,800**	**0.510**	**0.612**
2046	**7,700**	**0.578**	**0.694**
2056	**8,600**	**0.645**	**0.774**

Note: Water Demand Figures do not include transfers to the MCPU Vass or Pinehurst systems.

Analysis: The East Moore Water District currently holds an agreement with Harnett County that allows the District to purchase up to 2.0 MGD of water from the County. Harnett County treats water obtained from the Cape Fear River at an 18.0 MGD water treatment facility, and has plans to expand the facility to at least 36.0 MGD in the future. Harnett County staff reports that future purchases by Moore County that exceed 2.0 MGD will require significant infrastructure improvements within Harnett County to adequately distribute the water to Moore County.

In addition to the East Moore Water District, the 2.0 MGD purchased from Harnett County will supply water to the Town of Vass and the MCPU Pinehurst and Hyland Hills water systems. A graphical representation of the combined current and future water demands for all systems supplied by Harnett County is shown in Figure 3-4. The demands increase dramatically in 2008 due to the implementation of the Phase II project that will increase the customer base in the District and supply up to 1.15 MGD of water to the MCPU Pinehurst system.

FIGURE 3-4: Water Demands and Supplies – Harnett County Water Purchases



Due to the large volume of water contained in the Cape Fear River, the future capacity of the Harnett County water treatment plant, the long-term contract currently in place, and Harnett County's desire to provide water service to Moore County, the current source for the East Moore Water District appears to be very reliable. Harnett County has also offered Moore County the opportunity to "purchase capacity" in the County's upcoming water treatment plant expansion that would further guarantee a reliable source of water for the East Moore Water District in the future. The alternative of purchasing capacity is discussed later in this report.

Figure 3-4 indicates average daily demands can be met with 2.0 MGD from Harnett County to approximately 2050 and that maximum monthly average demands can be met to approximately 2026. As demands continue to increase, future water quantities obtained from Harnett County will need to be re-evaluated and increased as necessary, and IBT regulations will need to be considered in the evaluation.

I. Town of Southern Pines

According to the USCB and the NCSDC, the Town of Southern Pines has experienced annual population growth rates in the range of 1.6% to 1.7% per year since the census was conducted in 1990. For the purposes of this study, it is assumed that future growth rates in the Town will be similar to the historical rates.

Table 3-12 summarizes the estimated service population and water demand projections for the Town of Southern Pines to the year 2056.

TABLE 3-12: Projections for Southern Pines Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**14,000**	**2.53**	**3.45**
2016	**17,200**	**3.11**	**4.24**
2026	**21,800**	**3.94**	**5.37**
2036	**23,800**	**4.30**	**5.87**
2046	**25,800**	**4.66**	**6.36**
2056	**27,800**	**5.02**	**6.85**

Note: Demands do not include sales to other systems. Population includes Southern Pines system only and not customers located in additional systems.

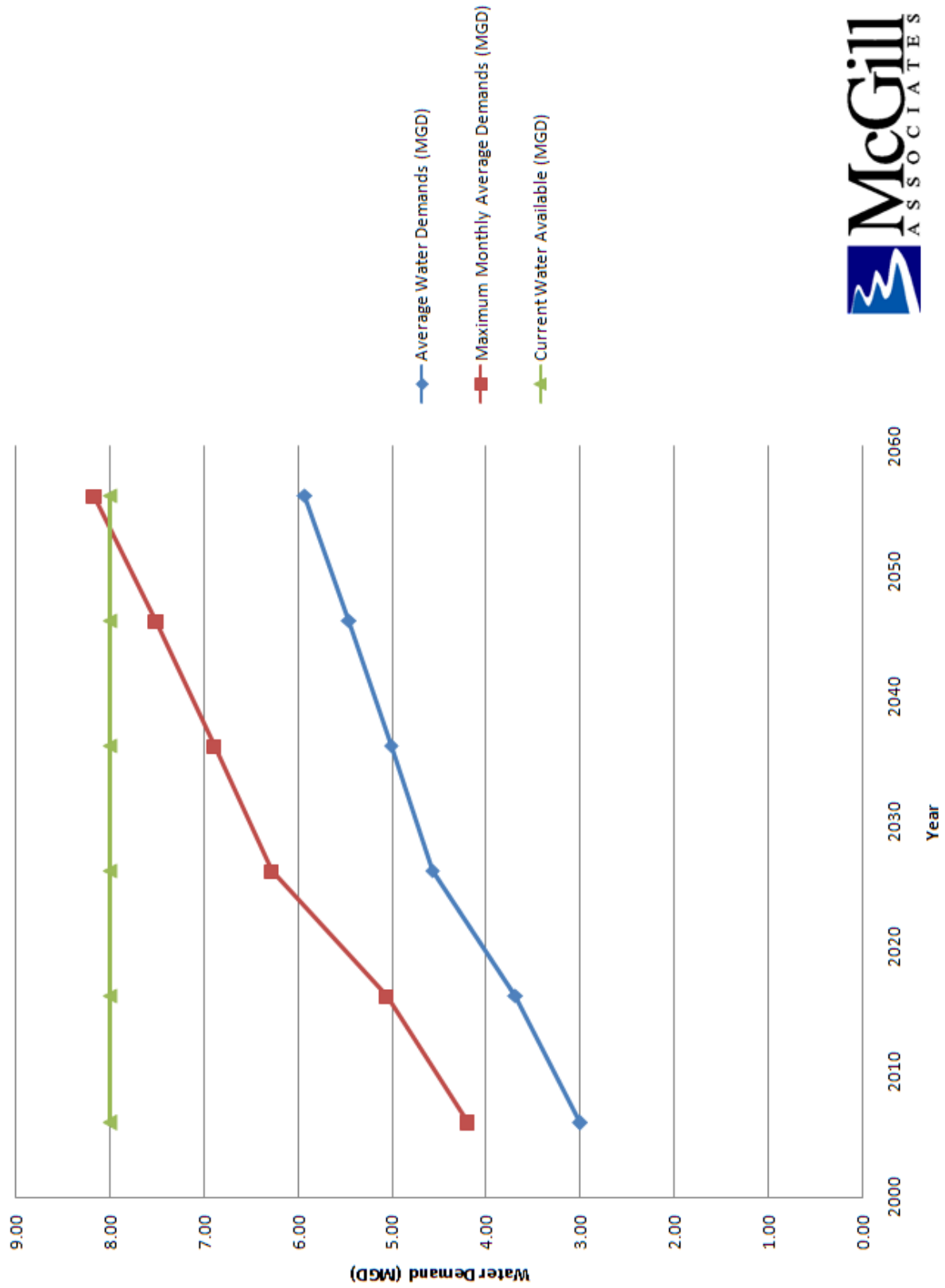
Analysis: The Town currently owns a water treatment facility that treats surface water obtained from Drowning Creek. The plant has the hydraulic capacity to produce up to 11.0 MGD according to Town staff, but the Town is only permitted to withdraw 8.0 MGD from the creek unless 36 MGD of streamflow is maintained downstream of the intake. The maximum withdrawal from the creek according to the permit is 14.0 MGD if the downstream streamflow requirements are met.

The Town is in the planning stages of constructing a new 140 million gallon drought relief raw water reservoir that will provide additional water storage to the system and improve the reliability of the system during drought conditions. The Town also has three (3) wells, an

interconnection with the Town of Aberdeen, and an interconnection with the Town of Carthage that can provide additional water in emergency conditions.

In addition to the Town, the 8.0 MGD water treatment facility provides potable water service to three MCPU systems (Pinehurst, Addor, and Carolina), CWS (for Whispering Pines), Camp Mackall, and the Oakwood Hills subdivision near Pinebluff. A graphical representation of the combined current and future water demands for all systems supplied by Southern Pines is shown in Figure 3-5. It is assumed in this figure that a no more than 0.25 MGD will be supplied to the MCPU Pinehurst system since that is the current amount allowed in the contract between Southern Pines and MCPU.

FIGURE 3-5: Water Demands and Supplies – Town of Southern Pines Water Plant



Based on the information provided in Figure 3-5, the Town of Southern Pines has the infrastructure in place to provide potable water to a significant portion of Moore County in the future. Adequate treatment capacity remains in the plant and permitted withdrawal rate for Drowning Creek to treat and supply additional water to the Town and additional customers in the future, assuming that adequate streamflows are maintained in Drowning Creek.

A major advantage to the Town of Southern Pines' water source (Drowning Creek) is that the creek is located in the same drainage basin as the Moore County WPCF. This is an important aspect of water source planning due to the State of North Carolina's current laws regulating IBTs. Water that is returned to its source basin as wastewater is not subject to these regulations. IBTs are discussed further in Section 7 of this report.

Because of the IBT laws, it was previously discussed in this report that the Town of Southern Pines is a potential source of water for the MCPU Pinehurst water system that must be strongly considered in the future. Currently, the Town's agreement with MCPU limits the transfer between the systems to 250,000 GPD, and a hydraulic bottleneck in the MCPU distribution system limits the current transfer to approximately 700,000 GPD. MCPU is currently in the process of evaluating the options available to correct this bottleneck to allow more water to be transferred in the future as necessary.

J. Town of Aberdeen

According to USCB data, the Town of Aberdeen experienced population growth rates of approximately 2.3% per year between 1990 and 2000. Recent estimates published by the NCSDC indicate that this growth rate has increased to approximately 4.5% per year between 2000 and 2006. This information indicates that the Town of Aberdeen is one of the fastest growing areas in Moore County.

Town planning staff estimates that there are approximately 1,000 lots that are either under construction or shown on preliminary or final plats for new subdivisions. The majority of these proposed lots are located in the Legacy Lakes subdivision, which is located to the southeast of Town and served by the Town's water system. The Legacy Lakes subdivision has a current projected build-out of 720 units.

Due to the Town's close proximity to Fort Bragg, the BRAC program previously discussed in this report is expected to contribute to accelerated population growth in and around the Town of Aberdeen. Town planning staff expects to receive requests for approval of as many as 2,000 additional housing units as a result of additional growth in the near future.

Table 3-13 summarizes the population and water demand projections for the Town of Aberdeen water distribution system to the year 2056.

TABLE 3-13: Projections for Aberdeen Water Distribution System

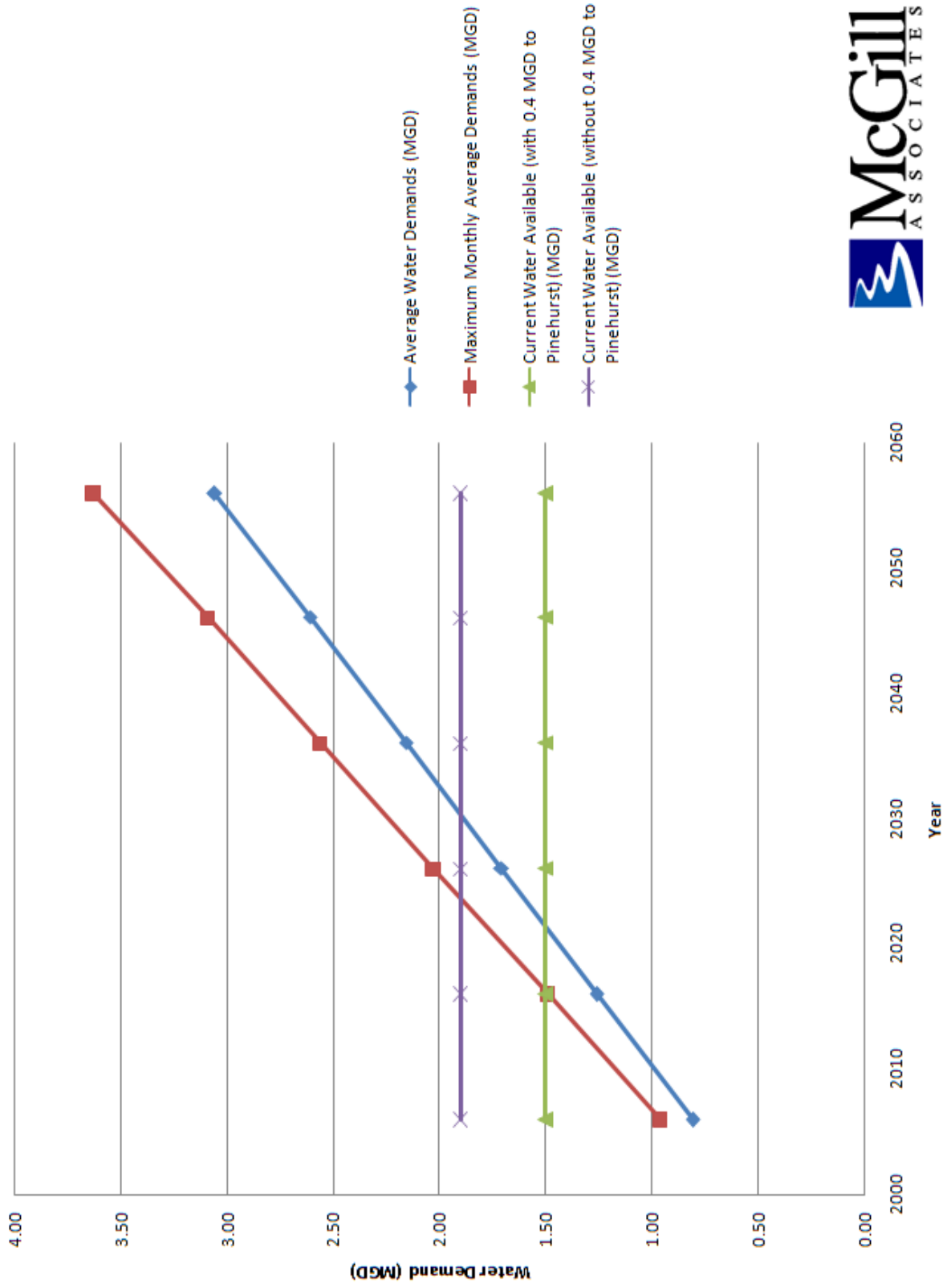
Year	*Estimated Service Population*	*Average Water Demands (MGD)**	*Maximum Monthly Average Demands (MGD)**
2006	**4,500**	**0.81**	**0.96**
2016	**7,000**	**1.26**	**1.49**
2026	**9,500**	**1.71**	**2.03**
2036	**12,000**	**2.16**	**2.56**
2046	**14,500**	**2.61**	**3.09**
2056	**17,000**	**3.06**	**3.63**

Note: Demands do not include sales to the MCPU Pinehurst water system.

Analysis: Current water sources available to the Town of Aberdeen include seventeen (17) groundwater wells that have a total 12-hour safe yield of approximately 1.9 MGD. In 2006, average daily water demands for the Town were approximately 812,000 GPD, in addition to approximately 388,000 GPD of water that the Town sold to the MCPU Pinehurst system. Total demands for the system therefore totaled approximately 1.2 MGD.

A graphical representation of the current and future water demands for the Aberdeen system plus the supply of 0.40 MGD to the MCPU Pinehurst water system is provided in Figure 3-6.

FIGURE 3-6: Water Demands and Supplies – Town of Aberdeen



As shown in Figure 3-6, the Town's existing well system currently has sufficient capacity to meet the Town's current demands on an average daily basis and provide up to 400,000 GPD of water to MCPU per the existing agreement. Projections in Table 3-13 indicate that the existing system is capable of supplying 400,000 GPD to Pinehurst, with enough water to meet Aberdeen's average daily demands to approximately 2022, and maximum monthly average demands to approximately 2016.

These projections assume that no new wells will be placed into service, and that no existing wells will be taken out of service by the Town. The future reliability of the well system is somewhat unpredictable due to radium levels in the groundwater that have caused the Town and other system owners in the County to remove numerous wells from operation. However, several previously completed studies related to the aquifers in Moore County have concluded that well yields in the southern portion of the County near Aberdeen are typically more substantial than nearly all other areas in the County. Additional information on the aquifers and well yields within the County is included in Section 4 of this report.

It should be noted that these projections also assume that MCPU will not exceed the 400,000 GPD quantity provided in the WPA on any given day. Due to increasing demands in the Pinehurst system, MCPU has recently exceeded this amount on numerous occasions. Town of Aberdeen staff reports that maximum daily water production had increased to approximately 2.1 MGD in 2007, with as much as 1.0 MGD of water being supplied to MCPU. The well system must be operated in excess of 12-hours per day to meet these requirements.

Based on the population and water demand projections provided in Table 3-13, Aberdeen will likely need to construct additional wells or obtain alternative sources of water as demands continue to rise in the future. In addition, increasing demands may result in the Town being unable to supply water to the MCPU Pinehurst system if additional sources are not developed. It is recommended that both system owners closely monitor the demands in each system and plan accordingly as demands continue to increase.

K. Village of Whispering Pines (Carolina Water Service)

According to USCB data, the Village of Whispering Pines experienced growths in population of approximately 4.5% per year between 1990 and 2000. The NCSDC indicates that the Village's growth rate was approximately 2.0% per year between 2000 and 2006, and the Village reports that there are currently several proposed subdivisions in the Whispering Pines area that will allow the Village to continue to grow. Water service is currently provided to the Village of Whispering Pines by CWS.

Table 3-14 summarizes the estimated service population and water demand projections for the Village of Whispering Pines/CWS system to the year 2056.

TABLE 3-14: Projections for Whispering Pines/ CWS Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**2,400**	**0.240**	**0.349**
2016	**2,800**	**0.280**	**0.406**
2026	**3,200**	**0.320**	**0.464**
2036	**3,600**	**0.360**	**0.522**
2046	**4,000**	**0.400**	**0.580**
2056	**4,400**	**0.440**	**0.638**

Analysis: The existing agreement between CWS and the Town of Southern Pines originally allowed CWS to purchase up to 200,000 GPD from the Town's water system. An appendix to the contract allows this amount to be adjusted annually to an amount equal to or greater than the amount used in the previous year. Any increases in the contract amount are subject to capacity being available in the Southern Pines water treatment plant. Table 3-14 indicates that current purchases by CWS exceed the original agreement amount, and future purchases are expected to further increase.

Neither Whispering Pines, Southern Pines, nor CWS have reported any hardships that have been created toward any entity thus far by exceeding the original contract amount, because the Town

of Southern Pines currently has an adequate supply to provide water additional water to the Village. The Town also appears to have the capacity to supply future demands to the Village, and appears to be a reliable long-term supplier from a water production perspective. This assumes that an adequate WPA can be agreed upon and followed by both parties in the future.

One factor that needs to be considered regarding CWS's future water purchases from Southern Pines is the State of North Carolina's current regulations regarding IBTs. The Town of Southern Pines obtains water from Drowning Creek, which is located in the "Lumber" River basin. All water consumed in the Village is discharged to the "Cape Fear" basin as wastewater through subsurface septic systems. The transfer of water between basins is highly regulated, and should be monitored closely by all parties. Additional information regarding the current IBT laws is provided in Section 7 of this report.

L. Town of Carthage

According to USCB data, the Town of Carthage's population more than doubled between 1990 and 2000, and increased at a rate of approximately 6.8% per year. The Town's growth rate was reduced to approximately 2.7% per year between 2000 and 2006 according to the NCSDC, but the Town reports that developers have numerous proposed projects that are expected to increase both population and water demands within the Town in the future.

The largest potential growth area for the Town appears to be the Little River Golf Resort, which is located along U.S. Highway 15/501 between Pinehurst and Carthage. Water is provided to the resort area by the Town of Carthage's water distribution system. The resort has plans for a large development expansion in the future, including as many as 1,000 new homesites and a large commercial area with a shopping mall and outdoor theatre.

In addition to the resort, Town staff indicates that there are several additional developments currently under construction in and around the Town of Carthage that have the potential to increase future populations and water demands in the Town.

Table 3-15 summarizes the estimated service population and water demand projections for the Town of Carthage water system to the year 2056.

TABLE 3-15: Projections for Town of Carthage Water Distribution System

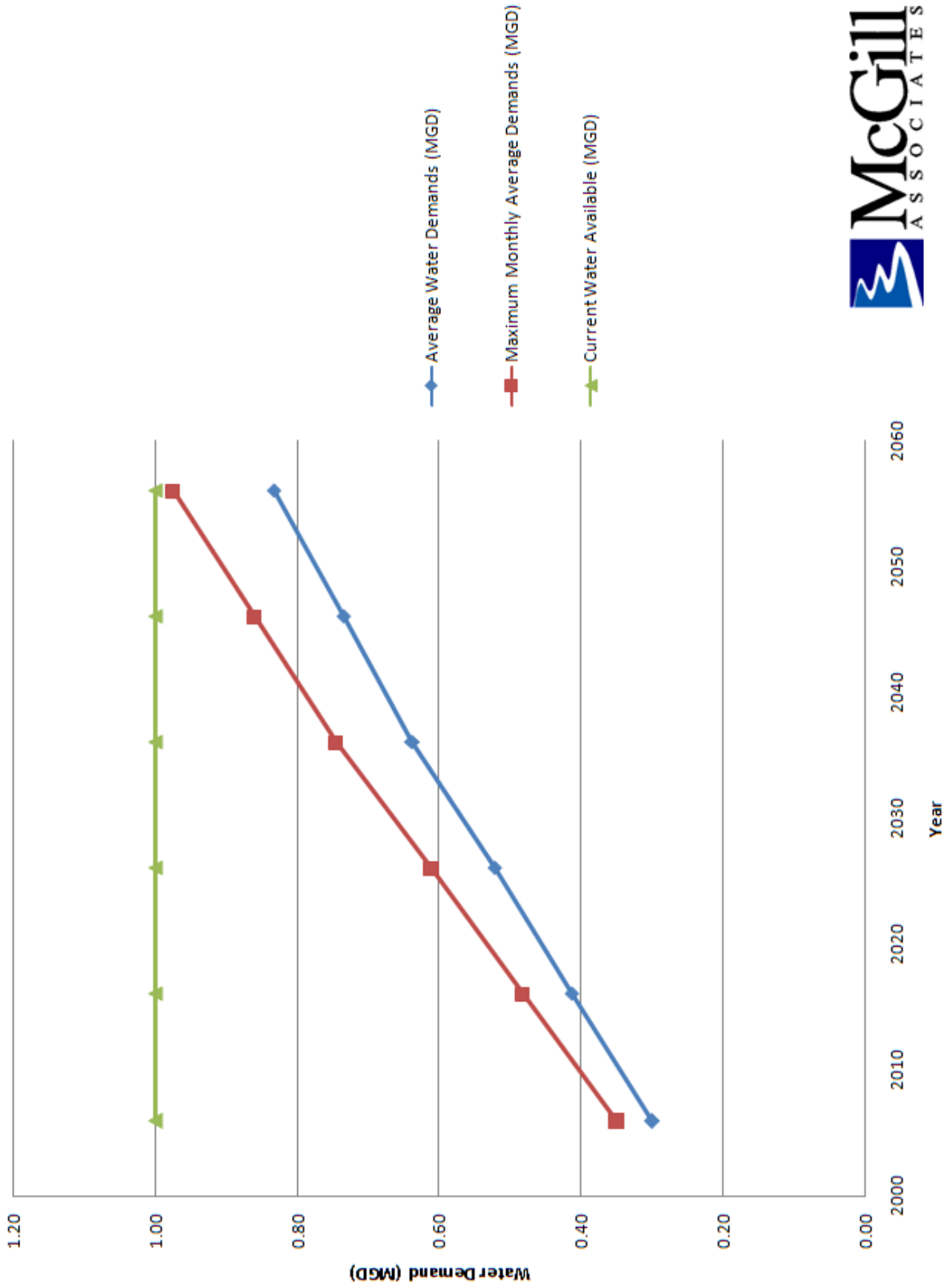
Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**2,300**	**0.300**	**0.350**
2016	**2,950**	**0.413**	**0.483**
2026	**3,600**	**0.522**	**0.611**
2036	**4,250**	**0.638**	**0.746**
2046	**4,900**	**0.735**	**0.860**
2056	**5,550**	**0.833**	**0.975**

Analysis: As shown in Table 3-15, the Town of Carthage currently has adequate capacity in the existing 1.0 MGD water treatment plant to meet current and future demands. The plant includes a 20 million gallon raw water reservoir that provides additional storage during drought conditions, and the Town has entered into an agreement with the Town of Southern Pines that allows Carthage to obtain water from Southern Pines' Reservoir Park Lake as an emergency source whenever necessary.

Town leaders have indicated long term plans to expand the existing 1.0 MGD water treatment plant whenever necessary in the future. The schedule for this expansion will likely be triggered by increases in water demands as a result of population growth in the Town.

A graphical representation of the current and future water demands for the Carthage system is provided in Figure 3-7.

FIGURE 3-7: Water Demands and Supplies – Town of Carthage



M. Town of Pinebluff

According to the USCB and the NCSDC, the Town of Pinebluff has experienced steady growths in population of approximately 2.4% to 2.9% per year since the census was conducted in 1990. For the purposes of this study, it is assumed that the steady growth rate historically experienced by the Town will continue to remain constant in the future.

Table 3-16 summarizes the estimated service population and water demand projections for the Town of Pinebluff system to the year 2056.

TABLE 3-16: Projections for Town of Pinebluff Water Distribution System

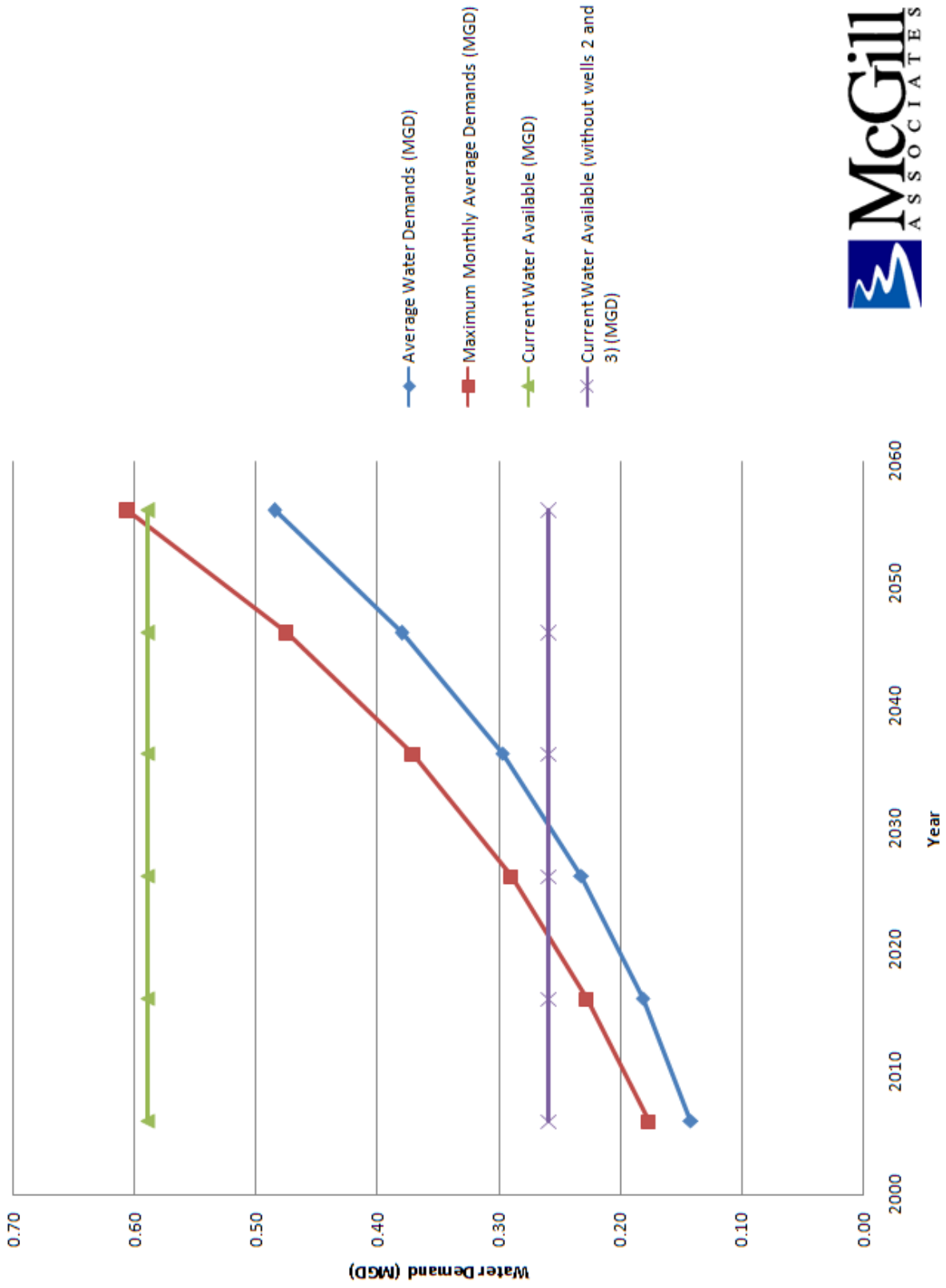
Year	*Estimated Service Population**	*Average Water Demands (MGD)**	*Maximum Monthly Average Demands (MGD)**
2006	**1,400**	**0.142**	**0.177**
2016	**1,800**	**0.182**	**0.228**
2026	**2,300**	**0.232**	**0.290**
2036	**2,940**	**0.297**	**0.371**
2046	**3,760**	**0.380**	**0.475**
2056	**4,800**	**0.485**	**0.606**

*Includes Oakwood Hills subdivision.

Analysis: The Town of Pinebluff's water distribution system includes five (5) groundwater wells that have a total 12-hour safe yield of 590,000 GPD. However, recent testing results from two (2) of the five (5) wells (Wells #2 and #3) have indicated levels of radium in the groundwater that exceed the current drinking water standard of 5.0 pCi/L. If the Town were required to remove these two wells from service, the 12-hour safe yield of the three (3) remaining wells would be reduced to approximately 259,000 GPD.

A graphical representation of the current safe yield of the well system, the reduced safe yield if Wells #2 and #3 are required to be removed, and the current and future water demands shown in Table 3-16 is provided in Figure 3-8.

FIGURE 3-8: Water Demands and Supplies – Town of Pinebluff



Based on the projections in Table 3-16, the current well system provides adequate capacity to supply average daily demands for the 50-year planning period and maximum monthly demands until approximately 2054. However, if Wells #2 and #3 are removed from service, the system will only be capable of meeting average daily demands until approximately 2030 and maximum monthly demands until approximately 2021.

While the water quantities obtained from the well system may be capable of supplying demands for many years, the future reliability of the system is unpredictable due to the testing results in Wells #2 and #3. Recent follow-up testing conducted by the Town has indicated that radium levels in the groundwater have been reduced to below the standard limit. The Town continues to closely monitor the radium levels in their system.

The Town of Pinebluff currently does not have an additional source of potable water, either for emergency purposes or as a primary source in the event of future well contamination. As a result, McGill Associates believes that an interconnection with another local municipal system is needed to provide a reliable backup source of potable water to the Town. Town leaders have reportedly discussed an interconnection with other system owners, but have not committed to constructing an interconnection at this time.

N. Town of Robbins

According to USCB data, the population in the Town of Robbins grew at a rate of approximately 1.8% per year between 1990 and 2000. The NCSDC estimates that the Town's growth rate declined to approximately 1.1% per year between 2000 and 2006, which is likely the direct result of several industrial plant closings in the Town in recent years. The Perdue chicken plant was the Town's largest water customer prior to its closing in March 2003, and consumed approximately 600,000 GPD of water from the Town's distribution system.

The Town of Robbins appears to have the potential to experience increased growth rates in the future. The Town recently welcomed the opening of the American Growler plant, a manufacturer of vehicles for the United States military, and Town leaders are hopeful that this new facility will encourage further industrial growth in this area of the County.

Table 3-17 summarizes the estimated population and water demand projections for the Town of Robbins system to the year 2056.

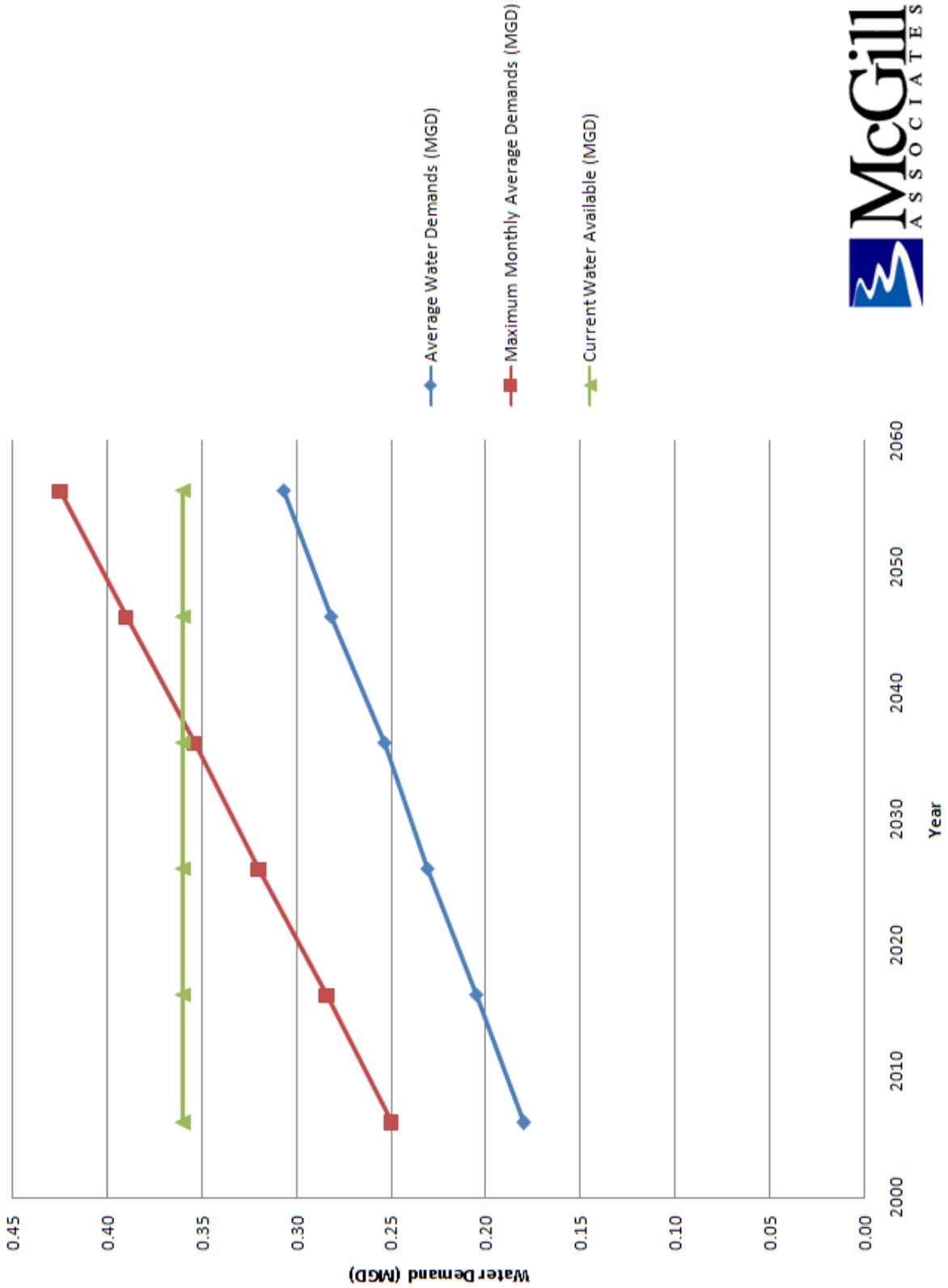
TABLE 3-17: Projections for Town of Robbins Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**1,300**	**0.167**	**0.231**
2016	**1,500**	**0.192**	**0.265**
2026	**1,700**	**0.218**	**0.301**
2036	**1,900**	**0.243**	**0.335**
2046	**2,100**	**0.269**	**0.371**
2056	**2,300**	**0.294**	**0.406**

Note: Demands do not include sales to the MCPU Robbins CDBG Water System.

Analysis: The Town of Robbins currently has an agreement with Montgomery County that allows the Town to purchase a maximum of 360,000 GPD from the County over a 24-hour period. A graphical representation of the current maximum purchase amount and the current and future water demands for the system, including sales to the MCPU Robbins CDBG system is provided in Figure 3-9.

FIGURE 3-9: Water Demands and Supplies – Town of Robbins



Based on the information provided in Figure 3-9 and Table 3-17, Montgomery County appears to be a sufficient supplier of water to the Town of Robbins for many years, assuming that the agreement continues to be renewed and that the conditions of the agreement remain satisfactory to both parties. The current 0.36 MGD contract can supply the Town's average daily demands for the 50-year planning period and the maximum monthly demands to approximately 2036.

In addition, Town leaders have expressed a desire to return the Town of Robbins water treatment plant and raw water reservoir to service when adequate funds become available to upgrade the treatment facility. When operating efficiently, the Town's water plant, intake, and 120 million gallon raw water reservoir will have the potential to supply potable water service to the Town and surrounding areas.

With current water shortages and restrictions in effect in other parts of Moore County, McGill Associates believes that the excess raw water and treatment capacity within the Town of Robbins should be considered as a future source of water to other portions of the County. It was previously noted in this report that the Robbins water plant should be strongly considered as an additional source of supply for the MCPU Seven Lakes system which currently has a critical need for additional water sources.

O. Town of Taylortown

According to USCB data, the Town of Taylortown grew at a rate of approximately 4.8% per year between 1990 and 2000. The NCSDC estimates that the Town's growth rate has been reduced to approximately 1.3% per year between 2000 and 2006.

Table 3-18 summarizes the estimated service population and water demand projections for the Town of Taylortown system to the year 2056.

TABLE 3-18: Projections for Town of Taylortown Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (MGD)*
2006	**950**	**49,000**	**57,000**
2016	**1,070**	**56,000**	**65,000**
2026	**1,190**	**62,000**	**71,000**
2036	**1,310**	**68,000**	**78,000**
2046	**1,430**	**74,000**	**85,000**
2056	**1,550**	**81,000**	**93,000**

Analysis: The Town of Taylortown has elected not to participate in this study, but has been included in this section to account for existing and future water demands consumed within the Town's distribution system.

P. Foxfire Village

According to USCB data, population in Foxfire Village grew at a rate of approximately 3.6% per year between 1990 and 2000. The NCSDC estimates that the growth rate declined to approximately 1.9% per year between 2000 and 2006.

The Water Source Alternatives Study completed by Hydrostructures, PA in July 2007, indicates that future growth rates within the Village are expected to be considerably higher than historical growth rates. Based on a review of certificates of occupancy that were issued within the Village in 2006 and 2007, the population and water demand projections included in the Water Source Alternatives Study were estimated to grow at a rate of 3.7% per year.

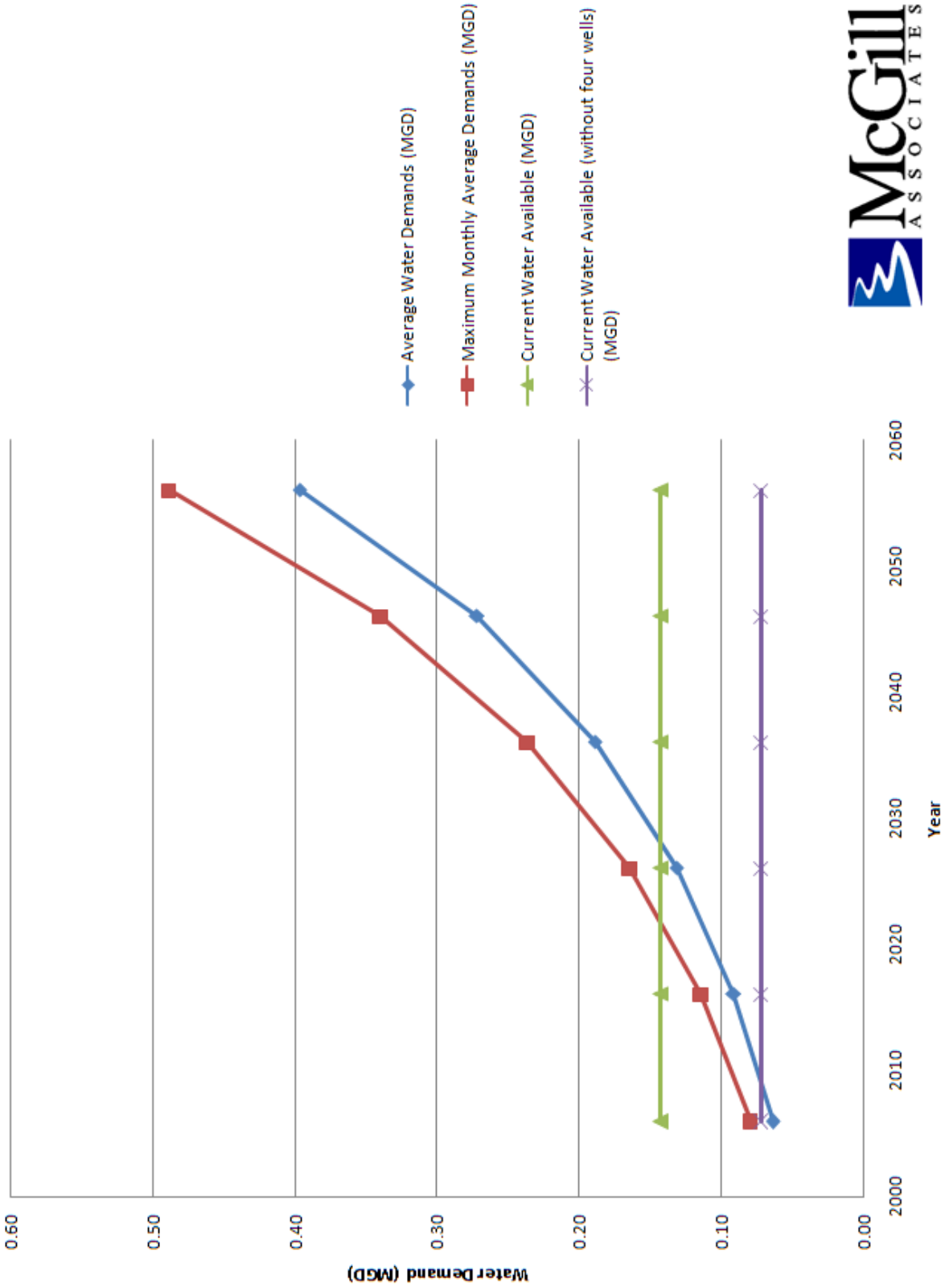
Table 3-19 summarizes the estimated service population and water demand projections for the Foxfire Village system to the year 2056 using a growth rate of 3.7% per year.

TABLE 3-19: Projections for Foxfire Village Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (GPD)*
2006	**531**	**63,600**	**79,700**
2016	**764**	**91,500**	**114,400**
2026	**1,098**	**131,500**	**164,400**
2036	**1,579**	**189,200**	**236,500**
2046	**2,271**	**272,000**	**340,000**
2056	**3,266**	**391,000**	**488,800**

Analysis: Foxfire Village currently operates seven (7) groundwater wells that have a total 12-hour safe yield of 142,600 GPD. However, recent testing on four (4) of the wells indicated levels of radium that exceed the current drinking water standard of 5.0 pCi/L. If the Village removes these wells from service, the 12-hour safe yield of the remaining system would be reduced to approximately 72,000 GPD. A graphical representation of the current safe yield of the well system, the reduced safe yield if the four (4) wells are required to be removed, and the current and future water demands shown in Table 3-19 is provided in Figure 3-10.

FIGURE 3-10: Water Demands and Supplies – Foxfire Village



Based on the projections shown in Table 3-19, the existing well system is capable of providing water to meet the Village's average daily demands to the year 2028, and maximum monthly average demands to the year 2022. This assumes that no additional wells will be added to the system, and that no existing wells will be removed from service.

However, if the four (4) wells that recently reported elevated levels of radium from the groundwater are removed from operation, the reduced yield of the system will be capable of providing water to meet the Village's average daily demands to just 2009, and the Village's maximum monthly demands already exceed this amount. Future well closures due to radium contamination would therefore have significant impacts on the system's ability to meet current and future demands.

As a result, the future reliability of the Foxfire well system is unpredictable at this time. McGill Associates believes that the Village has a critical need for an alternative source of water, either for emergency purposes or as a potential primary source in the future. An interconnection with another local municipal system is recommended to provide this additional source. Potential sources previously evaluated in the Water Source Alternatives Study include MCPU, Montgomery County, and Richmond County. A recommendation regarding an interconnection with another system is provided in Section 9 of this report.

Q. Town of Cameron

According to USCB data, the population in the Town of Cameron grew at a rate of approximately 3.1% per year between 1990 and 2000. Growth within the Town has declined to approximately 0.4% per year between 2000 and 2006 according to the census data, and Cameron is currently one of the slower growing areas in Moore County.

While historical growth rates within the Town have been minimal, Town leaders are optimistic that population growth rates will increase in the future. The recent construction of the U.S. Highway 1 bypass around the Town has improved access for residents to surrounding areas both inside and outside of Moore County.

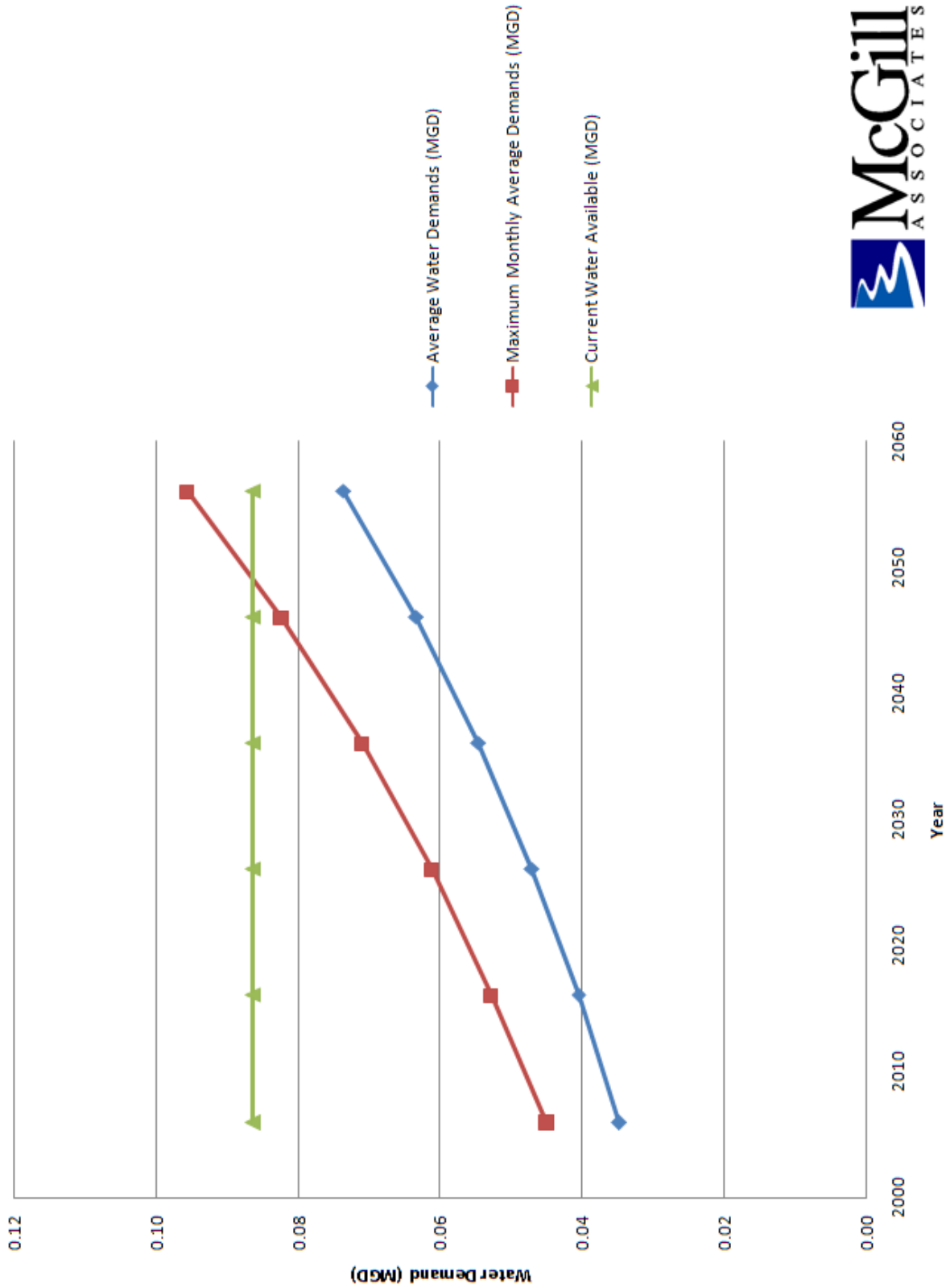
Table 3-20 summarizes the estimated population projections and projected water demands for the Town of Cameron system to the year 2056.

TABLE 3-20: Projections for Cameron Water Distribution System

Year	*Estimated Service Population*	*Average Water Demands (GPD)*	*Maximum Monthly Average Demands (GPD)*
2006	**460**	**34,800**	**45,000**
2016	**534**	**40,600**	**52,800**
2026	**620**	**47,100**	**61,200**
2036	**719**	**54,600**	**71,000**
2046	**834**	**63,400**	**82,400**
2056	**968**	**73,600**	**95,700**

Analysis: The Town of Cameron currently owns and operates a groundwater well system that has a 12-hour safe yield of 86,400 GPD. A graphical representation of the current safe yield of the well system and the current and future water demands shown in Table 3-20 is provided in Figure 3-11.

FIGURE 3-11: Water Demands and Supplies – Town of Cameron



Based on the projections in Table 3-20, the existing well system appears to be adequate to meet current and future average daily demands, and can meet future maximum monthly average demands to approximately 2049. However, Town leaders have expressed interest in removing the well system from operation, and constructing an interconnection with another municipal system as a permanent source of water. Both the East Moore Water District and the City of Sanford operate water distribution systems that are located in close proximity to the Town, and both entities have expressed interest in providing water to the Town on a permanent basis.

The East Moore Water District is currently in the process of constructing a major "Phase II" infrastructure project that will provide water service to numerous customers in the eastern portion of the County. Several of the proposed water mains included in this project will be located in close proximity to the Town's existing water system. As a result, the East Moore District appears to be a potential source of water to the Town with the construction of an interconnection.

In addition, the City of Sanford's existing water system extends to the border of Lee County and Moore County and is located approximately 1,800 feet from the Town of Cameron's system. City of Sanford staff report that system operators must currently waste a substantial quantity of water from the system to maintain quality, and are therefore very interested in increasing customer base in the area by serving the Town of Cameron. According to the Town of Cameron leaders, an interconnection between the two (2) systems was previously designed and permitted but never constructed.

3.04 Summary

Table 3-21 summarizes the total projected average daily water demands and maximum monthly average demands for County and municipal systems in Moore County to the year 2056.

TABLE 3-21: Projected Average Daily and Maximum Monthly Average Demands for Public Systems

Year	*Average Water Demands (MGD)*	*Maximum Monthly Average Demands (MGD)*
2006	**6.85**	**9.10**
2016	**9.16**	**12.08**
2026	**11.52**	**15.18**
2036	**13.44**	**17.66**
2046	**15.41**	**20.21**
2056	**17.44**	**22.84**

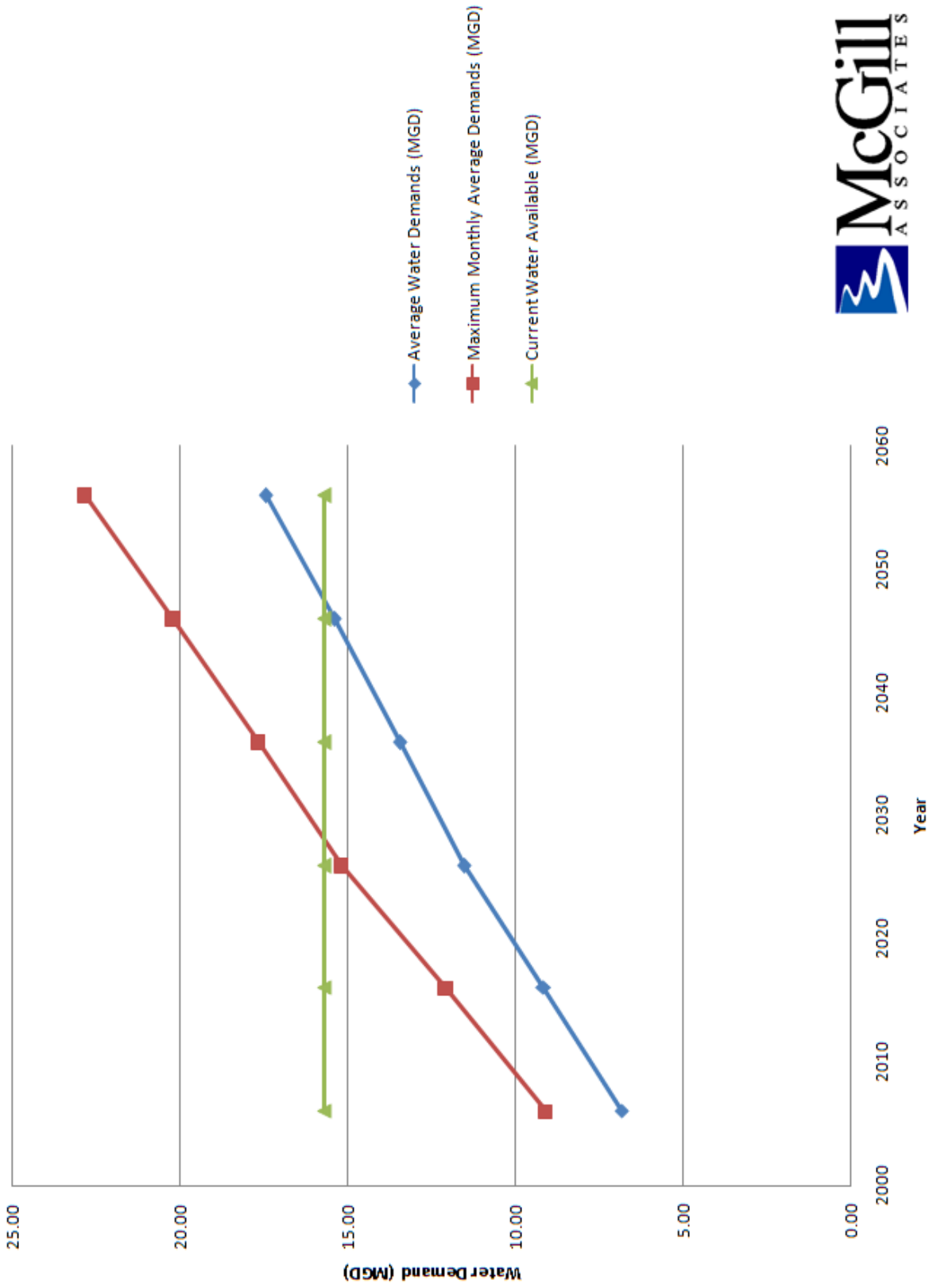
Current sources of water being utilized to supply existing demands within the County include:

- 59 groundwater wells with a total 12-hour safe yield of **4.34 MGD**.
- 2 water treatment plants with a total permitted capacity of **9.00 MGD** (Note: This includes 8.0 MGD for the Southern Pines Water Treatment Plant based on the Town's existing permit to withdraw from Drowning Creek).
- 2 WPAs from neighboring Counties (Montgomery and Harnett) that have a maximum purchase amount of **2.36 MGD**.

The current water available to supply the systems within the County is therefore **15.7 MGD**.

Figure 3-12 provides a graphical representation of the average daily demand projections, maximum monthly average demand projections, and current available water resources for all public system owners in Moore County.

FIGURE 3-12: Current Water Demands and Supplies – Moore County, North Carolina



Based on the projections shown in Figure 3-12, additional water sources are expected to be needed to supply systems in Moore County in the future. In addition, several systems within the County have a critical need for immediate water sources because:

- Maximum daily demands in some systems are nearly double the system's average daily demands.
- Several systems are currently operating with unreliable and unpredictable sources and no backup facilities.
- In some cases, the existing distribution systems do not allow water to be transferred to areas with high demands.
- The State of North Carolina's laws regarding IBTs currently limit the amount of water that can be transferred between the State's major river basins and sub-basins without obtaining an IBT certificate.
- Current water purchase agreements have expiration dates with no guarantee of future water supplies.

The following sections (4.0 through 6.0) provide evaluations of the use of groundwater, surface water and purchased water to provide the additional sources necessary for the future.

SECTION 4.0 GROUNDWATER SOURCE ANALYSIS

4.01 Introduction

Groundwater has historically been utilized by many of the water distribution system owners in Moore County as a potable water supply source. As mentioned in the previous section, there are currently 59 public wells in use within the County that provide a total 12-hour safe yield of approximately 4.34 MGD.

The use of groundwater is appealing to many system owners because it is generally less expensive to obtain water from an underground aquifer by drilling a well than it is to obtain and treat water at a surface water treatment facility. Many municipalities in Moore County have also historically used groundwater as a potable water source due to the lack of a major surface water supply source in close proximity to their respective distribution systems.

According to the Rules Governing Public Water Systems published by the DENR, the combined yield of all wells serving a water distribution system must be capable of supplying the system's average daily demand in 12-hours pumping time. Most water distribution systems in Moore County are capable of meeting this requirement when the average daily flows are calculated over a 12-month period, but some systems must currently operate well pumps in excess of 12-hours per day in summer months in order to meet current demands. Operating well systems in this manner can create problems because the underground aquifer has less opportunity to "recharge" or replenish its supply.

Additional information regarding the aquifer that currently underlies Moore County, the use of groundwater as a potable water supply source in the County, and recent problems reported by system owners that use groundwater in the County is provided in the following pages.

4.02 Description of Aquifers

Local residents and water system owners have traditionally referred to the primary aquifer that underlies Moore County as the "Middendorf" aquifer or the "Sandhills" aquifer. Many local groundwater experts contend that the term "Middendorf" is not technically correct for this area, but the name has continued to be used by locals for many years. Recent studies published by the USGS refer to the primary aquifer in Moore County as the "Black Creek" aquifer.

Regardless of its name, previous studies and local experts have generally agreed on the following:

- The surficial aquifer (groundwater table) supplies a significant portion of water to the "Middendorf" aquifer.
- As a result, the "Middendorf" aquifer is highly susceptible to contamination and highly sensitive to variations in rainfall.
- Well yields in the County generally range from approximately 25 GPM to as much as 200 GPM.
- The aquifer produces a substantial quantity of base flow for local streams and creeks, which contributes to low surface water flows during drought conditions.
- The southern and southeastern portions of the County provide the highest yielding wells, while the western and northeastern sections of the county produce the lowest well yields.
- Proper well separation and wellhead protection are critical to maintain the aquifer as a potable water supply source.

A review of data available on the DWR website confirms the effects of dry weather on the aquifer in Moore County. The Division currently operates fourteen (14) monitoring wells within the County, and data collected from these wells indicates that aquifer levels dropped by as much as fifteen (15) feet between 1998 and 2002. The State of North Carolina entered into an exceptional drought in 2002 due to years of below average rainfall.

4.03 Groundwater Recharge

Since the aquifers in Moore County are highly impacted by rainfall, re-charging the aquifer is an important component of water system planning. In a natural setting, precipitation infiltrates into the soil and recharges the aquifer. As the aquifer recharges, well yields increase, water quality can improve, and base flows in surface water bodies increase.

As areas develop and more impervious areas are constructed, there is less of an opportunity for aquifers to naturally recharge. Instead, precipitation that lands on impervious surfaces is not allowed to infiltrate the soils, and is routed to stormwater collection devices. The runoff eventually enters streams and creeks in a much quicker manner than in the natural setting.

Solutions are available to help recharge aquifers in areas of high development and during drought conditions. These solutions include:

- Infiltration basins and wet detention ponds
- Injection wells
- Wastewater reuse by drip irrigation or spray irrigation
- Underground septic systems

Providing devices that will allow the aquifer to recharge is important to the future of the public water supply in Moore County. In addition, measures shall also be taken to reduce the potential for contamination of the aquifer from oil on road surfaces and inadequately treated wastewater.

4.04 Groundwater Problems in Moore County

System owners in Moore County that utilize groundwater as a public water supply source reported numerous problems to McGill Associates during the preparation of this study. These problems are summarized in the following pages.

Well Closures

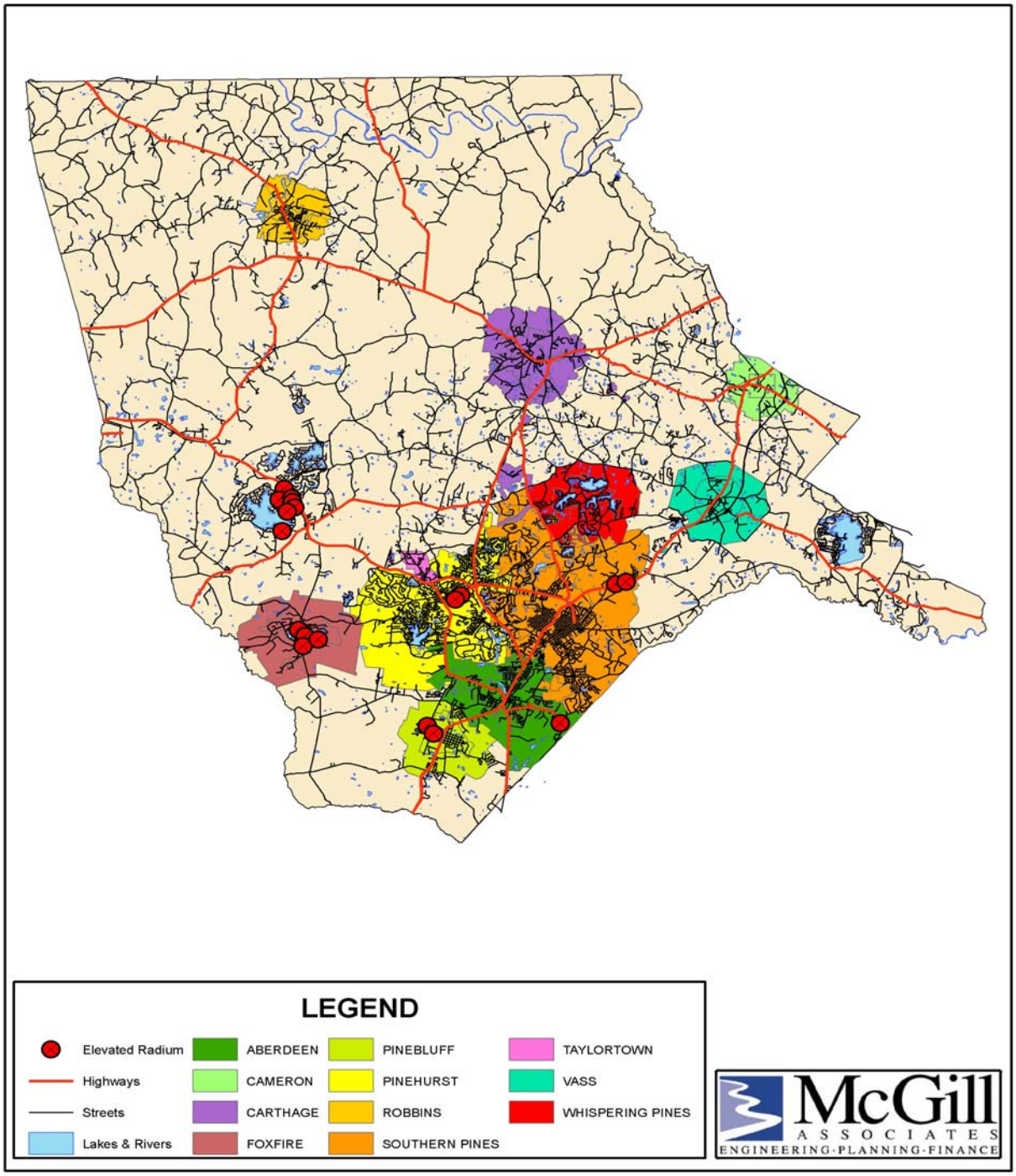
Public Well closures due to contamination, low yields, casing failures, etc., continue to be present within Moore County. As an example, MCPU reports that twenty (20) wells have been taken out of service for various reasons since 1997. These closures have reduced the water production capability for the County by 762,000 GPD, based on the 12-hour safe yield of the wells. Additionally, MCPU well #1A in the Hyland Hills subdivision is under an administrative order to be removed from service upon completion of water distribution system improvements in the East Moore Water District.

Radium Contamination

One of the most common reasons given for the abandonment of wells in Moore County has been the presence of radium in groundwater. Radium is a naturally occurring element that is formed during the decay of uranium (radium-226) or thorium (radium-228 and -224), and is present, albeit in very low levels, in practically all rock, soil, plants, animals, and water. Radium is highly radioactive, and produces radon gas as a by-product of its decay. According to the USEPA, ingested exposure to radium increases the risk of developing diseases such as lymphoma, bone cancer, and various hematological diseases. USEPA also reports that external exposure to radium increases the risk of cancer in all organs and tissues to varying degrees.

The current drinking water standard set by the USEPA is 5.0 pCi/l for radium-226 and -228 and 15.0 pCi/l for radium-224. Public wells have been abandoned throughout Moore County due to radium concentrations exceeding these amounts, and several system owners are currently "blending" water in their system to reduce the radium levels in the groundwater. Figure 4-1 provides a map showing the existing wells in Moore County where groundwater testing has indicated levels of radium above the current drinking water standard.

FIGURE 4-1


LEGEND
Elevated Radium
Highways
Streets
Lakes & Rivers
ABERDEEN
CAMERON
CARTHAGE
FOXFIRE
PINEBLUFF
PINEHURST
ROBBINS
SOUTHERN PINES
TAYLORTOWN
VASS
WHISPERING PINES
McGill
ASSOCIATES
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As previously mentioned, several utility owners have explored the alternative of "blending" water from radium contaminated wells with water from non-contaminated wells in order to reduce the radium concentration to below the 5.0 pCi/l limit and eliminate the need to abandon the contaminated well. Another option that has been considered is the installation of radium treatment equipment, to reduce the quantity of radium to below the 5.0 pCi/l limit prior to sending water to the distribution system.

For the purposes of this study, McGill Associates evaluated the costs associated with the installation of radium treatment equipment at two (2) existing wells where high levels of radium have been reported. Equipment cost estimates were obtained from treatment system manufacturers, in addition to annual costs required to remove and dispose of radium contaminated media from each site. The analysis concluded the following:

Well: Well #9 in MCPU Pinehurst System
Well Yield: 135 GPM or 97,200 GPD 12-hour safe yield
Estimated Capital Cost: $260,000
Estimated Annual Media Removal Cost: $15,000/year

Well: Well #2 in Pinebluff System
Well Yield: 300 GPM or 216,000 GPD 12-hour safe yield
Estimated Capital Cost: $600,000
Estimated Annual Media Removal Cost: $29,000/year

McGill Associates concludes that costs to install and maintain radium removal equipment at single well-sites are substantial, and that the installation of such equipment appears to be a more appropriate solution when groundwater from numerous wells can be filtered through a single treatment system.

Lindane Contamination

An additional contaminant reported in some groundwater wells in Moore County is lindane. Lindane is a chemical that is harmful to the environment and to human health, and was

previously discovered in the Town of Aberdeen's groundwater system. This contamination is likely the result of a previous chemical plant and pesticide dump site that was located within the Town. Both of these sites are currently listed on the USEPA's Superfund National Priorities List, and groundwater remediation has been recommended to continue at both sites in the future. The presence of lindane is currently being closely monitored by the Town of Aberdeen and should continue to be monitored in the future.

Impact of Irrigation Wells

In order to supplement the loss of water supply due to well closures, utility owners in Moore County are continuously searching for additional well sites. Unfortunately, municipalities have recently had difficulty obtaining sites that produce an adequate yield of water, which may be attributed in part to the number of municipal wells and private irrigation wells that are already present within the County. Some local officials estimate that as many as 1,000 private irrigation wells may be constructed in the County, many of which are located in close proximity to existing municipal wells. The irrigation wells affect the public supply by pulling water from the same aquifer for irrigation, and can impact the "cone of depression" and safe yield of the public wells.

In addition to affecting the supply of municipal wells, system owners suspect that many irrigation wells are not constructed to the same quality as municipal wells due to the lack of previous irrigation well regulations. As a result, some irrigation wells have the potential to contaminate the aquifer and the local public water supply wells. Since many of these irrigation wells were constructed without a permit, their size, depth, location, and overall impact to the public water supply systems are unknown at this time.

4.05 Conclusion

Groundwater has historically been a significant source of potable water for many municipal water system owners in Moore County. McGill Associates believes that groundwater will continue to be an important source of potable water in the County, but its value and long term reliability can be preserved only if local governments are willing and able to take aggressive actions to protect the source. Such actions include:

- Development and updating of wellhead protection plans.
- Limiting private irrigation wells to a minimum.
- Utilizing proper installation, inspection, and maintenance techniques for all public and private wells in the County.

If the source is adequately protected, the drilling of additional public wells appears to be a feasible source of potable water in certain portions of the County for many years to come.

SECTION 5.0 SURFACE WATER SOURCE ANALYSIS

5.01 Introduction

Surface water is a resource that is currently utilized by several system owners in Moore County as a potable water supply source. Existing surface water supplies within Moore County include Drowning Creek (utilized by the Town of Southern Pines), Nick's Creek (utilized by the Town of Carthage), and Bear Creek (potential to be utilized by the Town of Robbins).

Moore County is not currently blessed with abundant surface water resources as compared to many of its neighboring counties. Resources available in neighboring counties include Lake Tillery in Montgomery County, the Cape Fear River in both Harnett and Lee Counties, the Pee Dee River in Richmond County, Jordan Lake in Chatham County, and Randleman Lake in Randolph County.

Surface water bodies are typically quantified using a flow measurement threshold referred to as the "7Q10" flow. A water body's 7Q10 flow is defined as the lowest average streamflow for seven (7) consecutive days that occurs once every ten (10) years. In completing this study, McGill Associates obtained 7Q10 flows for existing and potential surface water sources within Moore County from the USGS.

Water is obtained from surface water sources using an "intake" structure, and is referred to as "raw water" until it is treated and considered suitable for human consumption. One method of obtaining water from a source is to construct a "run of river" intake, which obtains water directly from the natural flow of the stream channel. Current North Carolina regulations limit run of river intakes to 20% of a source's 7Q10 flow unless an Aquatic Habitat Evaluation and stream modeling confirms no adverse impacts to aquatic habitat downstream of the intake.

One method for increasing the capacity of a surface water source beyond 20% of the 7Q10 flow is to construct an in-stream "reservoir" on the source. In-stream reservoirs are created by

constructing an “impoundment” or “dam” within the source’s main channel, and allowing the natural streamflow conditions to fill the reservoir to capacity. The construction of in-stream reservoirs also includes a “spillway” which allows water to exit the reservoir once the full capacity has been reached. In-stream reservoirs can be valuable components of water systems because they provide additional water storage for use during drought conditions.

The process of developing an in-stream reservoir typically requires a large capital investment and many years to plan, design, permit, and construct. At a minimum, tasks that are generally required to complete this process include preliminary engineering reports and planning, site evaluation and selection, environmental impact studies and review, design engineering, site acquisition, regulatory permitting, and construction. After construction of the dam structure is completed, additional time is then required to fill the reservoir to capacity and construct water treatment facilities and distribution system improvements to utilize the new water source.

Due to the scope of work required to develop an in-stream reservoir, regulatory personnel estimate that a minimum of thirty (30) years should be expected to complete the process. This time requirement can vary substantially depending on the environmental consequences and magnitude of opposition generated towards the project.

An alternative to in-stream reservoirs is the development of “off-stream” raw water reservoirs. Off-stream reservoirs are typically earthen structures constructed away from water courses that require pump stations and/or piping facilities to fill to capacity. The Towns of Southern Pines, Carthage, and Robbins currently own off-stream raw water reservoirs to augment their treatment and distribution systems.

Off-stream reservoir locations are generally more flexible than in-stream reservoirs because they are not constructed within stream channels. As a result, these reservoirs can typically be developed in a much shorter time frame and have less environmental impacts to stream channels as compared to in-stream reservoirs. Locating an adequate site with minimal environmental impacts is a key component to expediting the development of an off-stream reservoir.

5.02 Existing Surface Water Sources

The following sections provide additional information and evaluations of the existing surface water sources being utilized in Moore County.

Drowning Creek

The Town of Southern Pines currently obtains water from Drowning Creek, which flows along the southern border of Moore County with Richmond County. Since 1939, the USGS has operated a flow monitoring station on Drowning Creek that is located downstream of the Southern Pines raw water intake near U.S. Highway 1. The Town is currently permitted to withdraw up to 8.0 MGD from the creek, with additional capability to withdraw up to 14.0 MGD if a minimum streamflow of 56.0 CFS (36.0 MGD) is maintained at the USGS station.

Data obtained from USGS indicates that the 7Q10 flow of Drowning Creek at the monitoring station is 31.0 CFS (20 MGD). Additional data provided on the USGS Waterwatch website (http://water.usgs.gov/waterwatch) indicates that the average streamflow in Drowning Creek since 1939 has been approximately 248 CFS (160 MGD).

The USGS data confirms that flows within Drowning Creek are substantially impacted by rainfall. Data collected by the monitoring station indicates that the creek dried up during the statewide drought in the summer of 2002. According to the Waterwatch website, the station recorded a streamflow at or near zero (0) CFS during the week of August 10 to August 17, 2002. Town leaders confirm that the creek went dry during this time period, prompting strict mandatory water restrictions in the Town.

Water is currently pumped from the creek to a 20 million gallon off-stream raw water reservoir that is located at the Town of Southern Pines water treatment plant. This reservoir provides additional storage to the Town during drought conditions. To increase the system's available raw water storage, the Town is currently in the process of developing a 140 million gallon "drought relief" off-stream reservoir that will be located in close proximity to Drowning Creek and the Town's water treatment plant.

Conclusion: Drowning Creek has historically been a reliable and quality water source for the Town of Southern Pines, and currently supplies water to other municipal systems in Moore County through purchase agreements with the Town. On average, the creek supplies adequate water to meet current demands, with additional capacity present to supply increased demands in the future.

Drowning Creek's susceptibility to rainfall and previous low flows of zero (0) CFS in August 2002 are a cause for concern, but this susceptibility will be offset somewhat by the construction of a new 140 million gallon off-stream reservoir. The new reservoir will improve the reliability of the Town's water system, and could be expanded in the future to further improve this reliability. Drowning Creek has recently provided adequate water flows to supply the Town and the additional systems supplied to by the Town during the "exceptional drought" Moore County experienced in the summer of 2007.

An additional advantage to Drowning Creek is that it is located in the same river basin (Lumber) as the wastewater discharge from the Moore County WPCF located in the Addor community. Returning treated wastewater to the same basin from which the raw water was obtained is an important aspect of water source planning due to current laws in North Carolina regarding IBTs. It is therefore recommended that water obtained from Drowning Creek be utilized in municipal systems that discharge to the treatment facility in Addor whenever possible.

Nick's Creek

The Town of Carthage obtains water from Nick's Creek, which begins in the western portion of the County near West End. Nick's Creek flows to the east through the central portion of Moore County and empties into the Little River near the Village of Whispering Pines. Carthage is currently permitted to withdraw up to 1.0 MGD from the creek at an intake along North Carolina Highway 22. Water is pumped from the intake structure to a 20 million gallon off-stream raw water reservoir that is located at the Town's water treatment plant site.

Data obtained from USGS indicates that the 7Q10 flow of Nick's Creek is approximately 0.1 CFS (65,000 GPD). Town leaders report that the creek completely dried up during the 2002

statewide drought, requiring the Town to implement mandatory water restrictions. As a result of the drought, the Town of Carthage entered into an agreement with the Town of Southern Pines that allows Carthage to obtain raw water from Southern Pines' Reservoir Park Lake during emergency conditions.

Conclusion: Nick's Creek has historically provided the Town of Carthage with an adequate and reliable water supply, with the exception of the statewide drought in 2002. The Town's subsequent agreement with Southern Pines gives the Town a reliable backup water source. These two (2) sources appear to meet the current and future needs for the Town of Carthage.

Due to the minimal 7Q10 flows within Nick's Creek, additional intake facilities on the creek are not recommended in the future.

Bear Creek/Cabin Creek

The Town of Robbins has the capability to obtain water from Bear Creek, near the confluence with Cabin Creek. Bear Creek begins in northwest Moore County, flows southeast to Robbins, and eventually empties into the Deep River. Cabin Creek's headwaters are located in eastern Montgomery County, and it flows to the east where the creek joins with Bear Creek near Robbins.

Due to inefficiencies at their existing water treatment facility, the Town of Robbins ceased operation of the plant in the summer of 2007, and currently purchases all potable water from neighboring Montgomery County. Town leaders are hopeful that the plant and raw water intake along Bear Creek will eventually be returned to service once improvements are made to the facilities.

Data obtained from USGS indicates that the 7Q10 flow of Bear Creek in Robbins is approximately 0.40 CFS (258,000 GPD). The Town's raw water intake is located at an impoundment along Bear Creek, and DENR reports that the creek has a safe yield of 1.5 MGD at this location. The Town is currently permitted to withdraw up to 1.5 MGD from the creek at the intake structure.

Raw water is pumped from the intake to the 120 million gallon Charles B. Brooks raw water reservoir. Since the water plant is currently not in operation, this reservoir is currently not utilized as a water source to the residents of Robbins or Moore County. When operating, this reservoir provides approximately 80 days of storage at the plant capacity of 1.5 MGD.

Town leaders recall that Bear Creek dried up during the statewide drought in the summer of 2002 and that the Town's reservoir was reduced to approximately twenty (20) days of supply. As a result, mandatory water restrictions were implemented by the Town. At the time, average water demands in the Town exceeded 800,000 GPD, primarily due to approximately 600,000 GPD of demand at the Perdue Farms chicken plant. The Perdue plant closed in March 2003, and current average daily water demands within the Town are less than 200,000 GPD.

Conclusion: McGill Associates believes that the existing intake, raw water reservoir, and water treatment plant in Robbins are facilities that should be strongly considered to provide potable water service to portions of Moore County where water demands are approaching or exceeding current supplies. When operating properly, these facilities have the capability to supply up to 1.5 MGD of water from Bear Creek and include the largest raw water reservoir currently permitted for use in the County.

Based on the future water projections for the Town of Robbins detailed in Table 3-17, more than 1.0 MGD of water could be treated by the plant and consumed in other portions of the County during the 50-year planning period. One potential area to be served by the Robbins facilities is the Seven Lakes community, which currently has a critical need for additional water resources and is located in closer proximity to Robbins than most other water systems in the County.

Prior to proceeding with the option of utilizing water from Bear Creek in other portions of the County, a detailed study is recommended to be performed on the closed Robbins water treatment plant and reservoir to determine the improvements needed to return the plant to service and the estimated costs associated with the improvements.

5.03 Potential Surface Water Sources and Reservoirs in Moore County

In addition to existing sources, other creeks and rivers are present within Moore County that may or may not have the potential to be developed into potable water sources. A summary of the largest unused water bodies are highlighted in the following sections:

McLendons Creek

McLendons Creek begins to the north of the Seven Lakes community and flows through Moore County to the northeast where it empties into the Deep River near the border with Lee County. USGS reports that the 7Q10 flow of McLendons Creek is zero (0) CFS.

Conclusion: McLendons Creek is not considered a viable water source option due to its low flow characteristics and the 7Q10 flow being zero.

Crane Creek

Crane Creek begins in the northeastern portion of Moore County between the Towns of Carthage and Cameron and flows to the southeast into Wood Lake (previously referred to as Lake Surf). USGS reports that the 7Q10 flow of Crane Creek is zero (0) CFS.

Conclusion: Crane Creek is not considered a viable water source option due to its low flow characteristics and the 7Q10 flow being zero.

Little River

The Little River's headwaters are located near the Seven Lakes community in the western portion of Moore County. The river flows to the east into Thagards Lake in the Village of Whispering Pines and then continues to the southeast through the Town of Vass. The river then continues along the border with Hoke County and into Cumberland County near the Fort Bragg Military Reservation.

USGS reports that the Little River provides a wide range of 7Q10 flows as the soils and geology transition from the headwaters near Seven Lakes to further downstream areas in Cumberland

County. The 7Q10 flow for the river near Vass is estimated by USGS to be approximately 2.0 CFS (1.3 MGD), but the 7Q10 flow increases outside of Moore County to approximately 35.0 CFS (22.6 MGD) in the unincorporated Manchester community located to the east of Fort Bragg in Cumberland County.

MCPU previously owned and operated a 288,000 GPD water treatment facility on the Little River that provided potable water service to the Town of Vass until 2003. This plant was closed when water from Harnett County was made available to the eastern portion of Moore County as part of the East Moore Water District. MCPU staff reports that one of the main factors contributing to the closing of the Vass plant was the unreliable quantity of streamflows within the Little River during summer months. MCPU staff and USGS publications also recall that the County was required to truck in thousands of gallons of bottled drinking water to the Vass community in 2002 because the Little River dried up.

Conclusion: Flows within the Little River have historically been minimal during dry conditions and the 7Q10 flow published by USGS limit the source without the use of a reservoir. Potable water is currently provided to the eastern portion of Moore County by Harnett County, which has a much more lucrative source in the Cape Fear River. As a result, the Little River does not appear to be a surface water source that needs to be utilized by Moore County system owners in the future.

Deep River

The Deep River is the largest surface water body located in Moore County, and is currently not utilized as a potable water supply source by any water system owner in the County. The Deep River begins in Guilford County and flows through Randolph County prior to entering Moore County. The river flows to the east in the northern portion of Moore County and exits the County to define the Chatham/Lee County border. The river eventually empties into the Cape Fear River in the southeastern portion of Chatham County.

The USGS operates several monitoring stations on the Deep River, and estimates that the 7Q10 flow of the river within Moore County is approximately 18.0 CFS (11.6 MGD). However, one

factor that may impact future flows in the river is the recent construction of the Randleman Dam upstream of Moore County that has created a 3,000 acre in-stream reservoir in Randolph and Guilford Counties. Construction of this reservoir cost a reported $140 million, and involved a partnership between six (6) units of government. These municipalities are also planning the construction of a $60 million 12.0 MGD water treatment facility on the new reservoir that is currently scheduled to be placed on-line by 2011.

According to a 1992 report from the North Carolina Environmental Management Commission (EMC), the construction of the Randleman Reservoir was expected to increase minimum downstream flows within the Deep River. Prior to construction, the 7Q10 flow at the Randleman Dam site was estimated as slightly less than 10.0 CFS (6.5 MGD) and the new reservoir is required to release a flow of 30.0 CFS under normal conditions. This release amount may be reduced to 20.0 CFS and 10.0 CFS in stages during "extreme dry periods", but the lowest release amount allowed remains greater than the 7Q10 flow at the dam site. As a result, the EMC concludes that construction of the Randleman Reservoir will result in a positive impact on downstream water supply facilities.

Conclusion: The lucrative flows in the Deep River make it a source that must be considered for future public water supplies in Moore County. Previous studies have identified potential sites for in-stream reservoirs along the river, but recent discussions with DWR create doubt as to whether an additional dam would be permitted on the river due to expected opposition over environmental impacts.

If a permit could be obtained, McGill Associates estimates that the cost to plan, design, permit, and construct a reservoir on the Deep River could be in the range of $100 million to $120 million. In addition to these costs the County would be required to obtain an IBT certificate from the EMC if more than 2.0 MGD of water were transferred out of the Deep River sub-basin.

Construction of a run of river intake along the Deep River appears to be a more cost effective solution to obtain water from this attractive source. A run of river intake could also be

implemented in a shorter time period than an in-stream reservoir and could potentially be utilized in conjunction with a future expansion to the Robbins water treatment facility.

Lake Auman

Lake Auman is located in the Seven Lakes "West" development to the south of Highway 211. Previous studies have eliminated the potential to use Lake Auman as a potable water supply source for various reasons, including:

- Proximity of residential development and septic systems to the lake
- The lake is privately owned and not controlled by the County
- The lake is extremely sensitive to losses from evaporation
- A new raw water intake and water treatment facility would be required to use the lake as a potable water source

Conclusion: Lake Auman is located in close proximity to areas that need additional sources of potable water, but the lake appears to have too many obstacles to be considered as a potential potable water source.

5.04 Summary

The 7Q10 flows obtained from USGS confirm the lack of abundant surface water resources in Moore County. These flows are at or near zero (0) CFS for many water bodies in the County, limiting the potential for the development of new run of river raw water intakes. It is important that water system owners in Moore County continue to protect and maintain the surface water sources that are in use to provide safe and reliable potable water sources in the future.

The lack of surface water resources in the County increases the need for raw water storage facilities, which improve system reliability during drought conditions. Due to the lengthy permitting process previously described in this report, McGill Associates considers the development of an in-stream reservoir a solution that should only be considered for the long term. Many areas in Moore County have immediate needs for additional water sources, and cannot afford to wait on the development of an in-stream reservoir.

SECTION 6.0 PURCHASED POTABLE WATER ANALYSIS

6.01 Introduction

The purchase of potable water by one system owner from another is a practice that has been utilized in Moore County for many years. These purchases allow water to be transferred from one distribution system that has excess supply to another distribution system that needs the water to meet current demands. In addition to the water purchases that are currently occurring between system owners within Moore County, two (2) system owners (the East Moore Water District and the Town of Robbins) currently purchase water from outside counties (Harnett and Montgomery, respectively) in accordance with the terms set forth in WPAs.

In many cases, system owners find that the capital costs required to construct interconnections with other systems are less than the capital costs required to develop a new potable water source within their own system. Typical capital costs include the installation of pumps, piping, and/or metering facilities to interconnect the systems, and may also include additional costs necessary to upgrade the seller's distribution system to adequately supply the necessary quantities of water. Some system owners also find that they can purchase water from another entity at a lower volumetric rate than it costs to operate and maintain a water treatment facility in their own system.

The most important component of water purchases between entities is the development and execution of a clear and enforceable WPA. These agreements should be executed by both the buyer and the seller and should clearly state all terms associated with the purchase. Typical items that should be addressed in WPAs include minimum and maximum purchase quantities, availability charges, volumetric rates, responsibilities of the buyer and the seller, effective and expiration dates, etc. In addition, the agreement should clearly state how water sales will be handled during periods when the seller experiences water shortages or implements water restrictions to its customers.

It has been the experience of McGill Associates that some water system owners are hesitant to purchase water from other entities because they may give up control over certain aspects of their water source. Concerns also arise over a system's reliance on another entity to supply water, particularly during drought conditions. In addition, most of the WPAs that are currently in place within Moore County have a term of five (5) years or less, making the sources unpredictable and potentially unreliable beyond the short term. Though these agreements have historically been renewed when they expire, the rates to purchase water are generally subject to change each time the agreement is renewed.

One method that system owners can potentially utilize to improve the reliability of a water source is to "purchase capacity" in another entity's water treatment facility. Some system owners consider those who have purchased capacity in their plant as "partners" rather than customers, and provide partners with additional guarantees of reliable water in the future. The purchase of capacity in another system's plant is therefore an option that may provide system owners in Moore County with a more reliable water source than can be provided with a WPA.

6.02 Existing Water Purchases Within Moore County

Table 6-1 summarizes the existing water purchases between system owners within Moore County. All of the purchases listed in this table are regulated by WPAs with the exception of the East Moore Water District sale to MCPU. The WPAs that are in effect include short term contracts which in some cases have expired and have not been renewed. As a result, the agreements may not represent a long term source of water for the purchaser.

TABLE 6-1: Existing Water Purchases within Moore County, North Carolina

Seller	*Purchaser*	*Minimum Purchase (GPD)**	*Maximum Purchase (GPD)**	*Rate*
Southern Pines	**MCPU**	**125,000**	**250,000**	**$5,370 availability charge + $1.14/1,000 gallons**
Southern Pines	**CWS**	**100,000**	**200,000**	**$4,296 availability charge + $1.14/1,000 gallons**
Southern Pines	**Pinebluff**	**0**	**0**	**$926.40 meter fees + $2.85/1,000 gallons**
Aberdeen	**MCPU**	**200,000**	**400,000**	**$2.00/1,000 gallons**
EMWD	**MCPU**	**0**	**0**	**$2.10/1,000 gallons**
Robbins	**MCPU**	**0**	**100,000**	**$2.00/1,000 gallons**

*Minimum and Maximum Purchases are per contracts that are in place.

In addition to the contracts listed in Table 6-1, the Town of Southern Pines has entered into agreements with the Town of Carthage and the Town of Aberdeen that allow water to be supplied between Southern Pines and each town's municipal system during emergency conditions. These contracts have terms not to exceed fifty (50) years, and therefore appear to be long term solutions during emergency conditions.

6.03 Existing Water Purchases From Outside of Moore County

Two (2) system owners within Moore County currently purchase water from sources located outside of the county border. These purchases are summarized in Table 6-2 and WPAs are currently in place for both purchases. The agreement between Montgomery County and the Town of Robbins is scheduled to expire in December 2009, and the agreement between Harnett County and the East Moore Water District has a 40-year term that is scheduled to expire in 2041.

TABLE 6-2: Existing Water Purchases from Outside Moore County, North Carolina

Seller	*Purchaser*	*Minimum Purchase (GPD)**	*Maximum Purchase (GPD)**	*Rate*
Harnett County	**East Moore Water Dist.**	**0**	**2,000,000**	**$1.95/1,000 gallons + pumping costs**
Montgomery County	**Robbins**	**100,000**	**360,000**	**$1.75/1,000 gallons ****

*Minimum and Maximum Purchases are per contracts that are in place.
** The Town of Robbins was recently notified that the rate to purchase water from Montgomery County will increase to $2.25/1,000 gallons in 2008.

6.04 Potential Future Water Sources Outside of Moore County

As water demands within Moore County continue to increase, additional purchases from system owners in neighboring counties will likely be necessary. In completing this study, McGill Associates has evaluated potential purchases from several system owners outside of Moore County and discussed the feasibility of obtaining water from these system owners as an alternative. As a result of these discussions, the following system owners have been identified as potential sources of water to areas of Moore County in the future:

- Montgomery County
- Harnett County
- City of Sanford
- Richmond County
- City of Laurinburg

An analysis of each potential system owner is provided on the following pages.

A. Montgomery County

Montgomery County is located to the west of Moore County and currently owns and operates a surface water treatment plant that is permitted to withdraw up to 6.0 MGD from Lake Tillery. County staff reports that the plant currently produces an average daily flow of approximately 4.1 MGD with the maximum daily flows of approximately 5.2 MGD. These figures include approximately 180,000 GPD of water that is currently sold to the Town of Robbins through a WPA as shown in Table 6-2.

Montgomery County plans to expand their facility to a capacity of 12.0 MGD in the future. Though the completion date for the plant expansion has not yet been established, County leaders have expressed their willingness to supply up to 500,000 GPD of water to the MCPU Seven Lakes system prior to completion of the expansion. If 500,000 GPD is provided by constructing an interconnection along Highway 211, Montgomery County has asked that Moore County provide a capital contribution of $433,000 to help fund pump station and tank upgrades within the Montgomery County system.

It also may be feasible to increase Montgomery County's existing supply to the Town of Robbins, and distribute water to Seven Lakes and the surrounding areas by constructing an interconnection between Robbins and Seven Lakes. Montgomery County has indicated that a detailed hydraulic analysis would be required to determine the improvements and resultant costs associated with upgrading their system to supply more than 360,000 GPD water to Robbins. This detailed analysis has not been performed as of the writing of this report and the total costs associated with the transfer of water from Montgomery County through Robbins to Seven Lakes are therefore unknown at this time.

Montgomery County also recently completed a water rate study that evaluated volumetric charges to all bulk customers served by their system. Moore County and the Town of Robbins both report that the rate is expected to increase to $2.25 per 1,000 gallons in 2008.

Conclusion: Due to its reliable water source and its proximity to the Seven Lakes community, Montgomery County is an attractive future source of water for the MCPU Seven Lakes water distribution system. As previously discussed, a critical need exists for the development of an additional source for the Seven Lakes area, and this additional source will also benefit the MCPU Pinehurst system.

Proposed improvements necessary to connect the Montgomery County system with the MCPU Seven Lakes system along NC Highway 211 include the installation of approximately eight (8) miles of water distribution piping. Though Montgomery County has committed to provide up to 500,000 GPD of water to Seven Lakes at this time, the option of increasing the pipe diameter to accommodate future purchases is also possible.

The portion of the Montgomery County system that would supply water to Seven Lakes includes a tank with an overflow elevation (El. 860 per County staff) that is 133.5 feet higher than the overflow elevation of the two (2) Seven Lakes tanks (El. 726.5 per MCPU). As a result, an interconnection appears to be feasible without the use of pumping facilities.

Table 6-3 summarizes the approximate water quantities that could be supplied from Montgomery County to Seven Lakes along Highway 211 in various pipe sizes without the use of pumping facilities.

TABLE 6-3: Hydraulic Capacities for Montgomery County/Seven Lakes Interconnect

Pipe Size	*Approximate Capacity (MGD)*
8”	**0.50**
12”	**1.48**
16”	**3.13**

B. Harnett County

Harnett County is located to the east of Moore County and currently owns and operates an 18.0 MGD surface water treatment plant that obtains water from the Cape Fear River. County staff reports that the plant currently produces an average daily flow of approximately 12.0 MGD and a maximum daily demand of approximately 18.0 MGD (100% of plant capacity). These flow quantities include water that is currently sold to the East Moore Water District through a WPA as shown in Table 6-2.

The current agreement between Harnett County and the East Moore Water District was originally executed in November 1999, and has a term of forty (40) years from the date of the initial delivery of water. This agreement requires Harnett County to supply up to 2.0 MGD of water to the District, but allows the County to eliminate service to the District during drought conditions "for such reasonable period of time as may be necessary to restore service". It should be noted that Harnett County did not reduce the available water supply to the District during the 2002 statewide drought or the recent drought in the summer of 2007.

Harnett County currently has plans to expand the facility to a capacity of at least 36.0 MGD in the near future, with construction scheduled to be completed by December 2009. According to County leaders, all plant capacity associated with the expansion has been allocated to the Town of Holly Springs, the Fort Bragg military base, and Johnston County. Harnett County has offered Moore County the ability to purchase additional capacity in their plant at a rate of $1.75 to $2.00 per gallon of capacity.

In return for purchasing capacity in the plant expansion, Harnett County officials have also offered to reduce the water rates charged to the East Moore Water District to $1.55 per 1,000 gallons plus pumping costs. This reduction equates to $0.40 per 1,000 gallons less than the current rate of $1.95 per 1,000 gallons.

As previously discussed, construction is currently underway on a major infrastructure project that will significantly expand the service area of the East Moore Water District. The project

includes an interconnection that will be capable of supplying approximately 1.0 MGD of water from Harnett County through the East Moore Water District to the MCPU Pinehurst water system. Water transferred from Harnett County to Pinehurst is subject to current IBT rules because the source water basin (Cape Fear) differs from the discharge water basin (Lumber).

Harnett County officials report that hydraulic limitations exist within their current water distribution system that only allow a transfer of 2.0 MGD of water to customers in Moore County, on a consistent basis. As a result, any future increases to the 2.0 MGD purchase quantity would require distribution system improvements in Harnett County to supply the additional water. Recent correspondence from Harnett County indicates that an increase in capacity to approximately 4.5 MGD would require a $1.2 million capital contribution from Moore County to cover the cost of distribution system improvements in Harnett County.

Conclusion: Due to its reliable water source and history of providing ample water supply during drought conditions, McGill Associates believes that Harnett County will continue to be a major source of water for the East Moore Water District and the MCPU Pinehurst water system in the future. Harnett County has provided Moore County with several alternatives related to the purchase of water including:

<u>Operate under current 40-year agreement</u>
Water Purchase Capacity: 2.0 MGD
Additional Capital Costs Required: $0
Water Purchase Rate: $1.95 per 1,000 gallons plus pumping costs

<u>Purchase 2.5 MGD of Capacity in Plant Expansion</u>
Water Purchase Capacity: 4.5 MGD
(2.5 MGD “owned” in plant expansion plus 2.0 MGD from current WPA)
Additional Capital Costs Required: $5.58 million
(2.5 MGD x $1.75/Gallon + $1.2 million for upgrades to Harnett County distribution system)
Water Purchase Rate: $1.55 per 1,000 gallons plus pumping costs

One of the main factors that Moore County must consider regarding future purchases from Harnett County is the State of North Carolina's current laws regarding IBTs. Water supplied by Harnett County is generated in the Cape Fear river basin, and all water that is not returned as wastewater to the Cape Fear basin is subject to IBT regulations. Moore County's largest wastewater treatment facility is located in the Addor community in the Lumber River basin, and nearly all water transferred to the MCPU Pinehurst system is treated and disposed at this facility. Current laws limit this transfer to 2.0 MGD without an IBT certificate. The current IBT regulations are discussed in greater detail in Section 7 of this report.

C. City of Sanford

The City of Sanford is located in Lee County to the northeast of Moore County and currently owns and operates a 12.0 MGD surface water treatment plant that obtains water from the Cape Fear River. City staff reports that the plant currently produces an average daily flow of approximately 7.0 MGD and a maximum daily flow of approximately 10.0 MGD.

The City owns and operates a water distribution system that serves various rural sections of Lee County, including the southwestern portion of the County near Cameron. Sanford's system in this area includes an elevated storage tank that supplies water to a small number of residences. As a result, City officials report that they are currently wasting approximately 200,000 GPD of water from the distribution system in an effort to maintain water quality.

Sanford is currently in the process of completing a water rate study that will evaluate and recommend volumetric charges to all bulk customers served by their system. The completion date for the study has not yet been determined, but City leaders indicate that the current bulk rate of $2.15 per 1,000 gallons may be reduced for Moore County in an effort to sell water that is currently being wasted from the system.

Conclusion: The City of Sanford has a reliable water source in the Cape Fear River and is currently wasting a substantial quantity of finished water in order to maintain water quality in rural areas near Moore County. As a result, McGill Associates believes that the City of Sanford should be considered by system owners in Moore County as a potential source of water in the future. Due to their proximity to Sanford, the two (2) existing systems that appear to have the highest potential for an interconnection with the City are the Town of Cameron and the East Moore Water District.

The Town of Cameron is located near the Moore County border with Lee County. The City of Sanford's water distribution system extends to the County border in this area, and is located approximately 1,800 feet from the Town's water system. Town officials report that a water main extension to connect to Sanford's system was previously designed and permitted, but never

constructed. The extension of water from Sanford to Cameron appears to remain as a feasible alternative if the Town intends to interconnect with another system.

The East Moore Water District currently has a 40-year contract with Harnett County that will supply up to 2.0 MGD from the County to the District. Demand projections previously provided in this report conclude that the existing contract with Harnett County will be sufficient for several decades. As a result, the City of Sanford does not appear to be a potential source to the District in the short term. A future interconnection between the systems would require a detailed hydraulic analysis to determine the infrastructure upgrades and estimated costs associated with the interconnection.

D. Richmond County

Richmond County is located to the southwest of Moore County and currently owns and operates a 6.75 MGD surface water treatment plant that obtains water from the Pee Dee River. County staff reports that the plant currently has a maximum daily demand of approximately 6.0 MGD, with an additional 500,000 GPD that has been allocated to a new industrial facility that will come on-line in 2008.

The County is currently in the design phase of a project that will expand the plant capacity to 10.75 MGD. County leaders indicate that a funding source for the plant expansion has not been established and a completion date for the expansion is therefore unknown at this time.

Conclusion: With limited capacity remaining in their existing water treatment plant, Richmond County does not appear to be a feasible water source for system owners in Moore County at this time. Due to their lucrative raw water source, Richmond County should be re-evaluated and considered once their treatment plant expansion has been completed in the future.

E. City of Laurinburg

The City of Laurinburg is located in Scotland County to the south of Moore County and currently owns and operates an 8.0 MGD groundwater treatment plant that obtains water from a system of 18 wells. City staff reports that the plant currently produces an average daily flow of approximately 4.0 MGD and a maximum daily demand of approximately 6.0 MGD.

The City's existing water distribution system includes a 300,000 gallon elevated water storage tank that serves the Deercroft Golf Club and subdivision area along Highway 15/501 to the north of the City. This tank is located approximately ten (10) miles to the south of the Town of Aberdeen's existing water distribution system. The City therefore appears to be a potential source of water to Aberdeen in the future by extending approximately ten (10) miles of water mains. The connection would also require booster pumping facilities due to the hydraulic grade differences between the two systems. (475.5 at Deercroft and 571 in Aberdeen)

The City of Laurinburg is also in the process of studying the feasibility of constructing a new surface water treatment plant in conjunction with an existing 7.0 MGD raw water intake located on the Lumber River. This intake previously provided raw water to the former WestPoint Stevens textile plant, which used the water in its textile process. The plant ceased operation in 2007, but the intake structure remains a potential means for drawing raw water from the river.

Conclusion: The City of Laurinburg should be monitored closely as a potential source of water to the Town of Aberdeen if needed in the future. The estimated cost associated with an extension from Laurinburg to Aberdeen is approximately $3 million in 2008 dollars.

McGill Associates also sees potential in developing a surface water treatment plant on the Lumber River at the West Point Stevens facility. The distance between the existing intake structure and Moore County is substantial (approximately 18 miles to the town of Southern Pines water plant), but the intake is located in the same river basin (Lumber River) as the Moore County WPCF. Water obtained from this intake would therefore not be subject to current IBT rules if it is consumed in an area that discharges to the WPCF

6.05 Summary

McGill Associates believes that purchasing water from other entities both inside and outside of Moore County will continue to be an important source of potable water for some system owners in the County. Concerns raised by several system owners regarding the loss of control over a purchased water source are certainly valid, but the reality in Moore County is that many neighboring counties have much more lucrative and reliable sources of water than the sources available in Moore County. In addition, interconnections with other systems can generally be implemented in a shorter time frame than developing a new potable water supply source, making them a more attractive option for systems seeking an immediate additional source.

The utilization of WPAs among system owners throughout the County has been a useful option for those without a nearby water source. However, several of the existing agreements provided to McGill Associates appear to have expired, and some purchases are currently exceeding the maximum amounts allowed by the agreements. McGill Associates believes that WPAs should be renewed and maximum purchase quantities be modified as necessary within each system.

SECTION 7.0 REGULATORY ISSUES

7.01 Introduction

One of the most important factors that must be considered in municipal water system planning is the ability to obtain regulatory permits and approvals for proposed improvements. In the State of North Carolina, water system owners cannot construct raw water intakes, water treatment facilities, raw water reservoirs, and distribution system improvements such as pump stations, elevated tanks, and water lines without first obtaining a permit and/or Authorization to Construct from all applicable regulatory agencies. Projects that impact waterways, wetlands, and other sensitive areas are also typically required to undergo an extensive environmental review to determine that no significant impacts are created by the project.

In addition, the State of North Carolina has laws that limit the amount of water that can be transferred between the State's eighteen (18) major river basins and the sub-basins that are located within each basin. Such transfers are referred to as "inter-basin transfers" or IBTs and the significance of these laws to future water resources in Moore County have been noted throughout this report. A detailed summary of the current IBT laws is provided in Section 7.02.

System owners are also required to disinfect water and monitor levels of total residual chlorine within their respective distribution systems. Recent research has shown that blending finished waters that have been disinfected using different chemicals has the potential to negatively impact the total residual chlorine level in the blended water. Specifically, blending water disinfected with chlorine with water disinfected with chloramines has recently been publicized as a cause for concern. This issue is discussed in greater detail in Section 7.03.

7.02 Inter-basin Transfer Regulations

A river basin is generally defined as the extent of land surface where precipitation drains downhill into a river. Each basin includes the creeks, streams, and rivers that convey the water and the land surfaces from which water drains into those channels. The land surface collects all the water within the area covered and channels it into a waterway. Each river basin is separated topographically from adjacent basins by ridges, hills, or mountains.

The State of North Carolina is divided into eighteen (18) major river basins. In addition to the division lines between basins, most of the river basins also include "sub-basin" lines which further define watersheds that contribute to different branches or tributaries of a river. A Major River Basin and Sub-Basin Map of North Carolina is provided in Figure 7-1. The location of Moore County is highlighted in yellow on the map.

As shown in Figure 7-1, Moore County is located in two (2) of the State's major river basins. The Cape Fear River Basin (Section 2 on map in Figure 7-1) makes up the northeastern portion of the County and the Lumber River Basin (Section 9 on map in Figure 7-1) makes up the southwestern portion of the County. The map further indicates that the portion of the Cape Fear River Basin located in Moore County is divided into two (2) sub-basins. The Deep River Sub-Basin (Section 2-2) encompasses the northern portion of the County and the Cape Fear River Sub-Basin (Section 2-3) encompasses the southeastern portion of the County. A map further detailing the location of the basins and sub-basins within Moore County is included as Figure 7-2.

FIGURE 7-1: Major River Basin and Sub-Basin Map for North Carolina

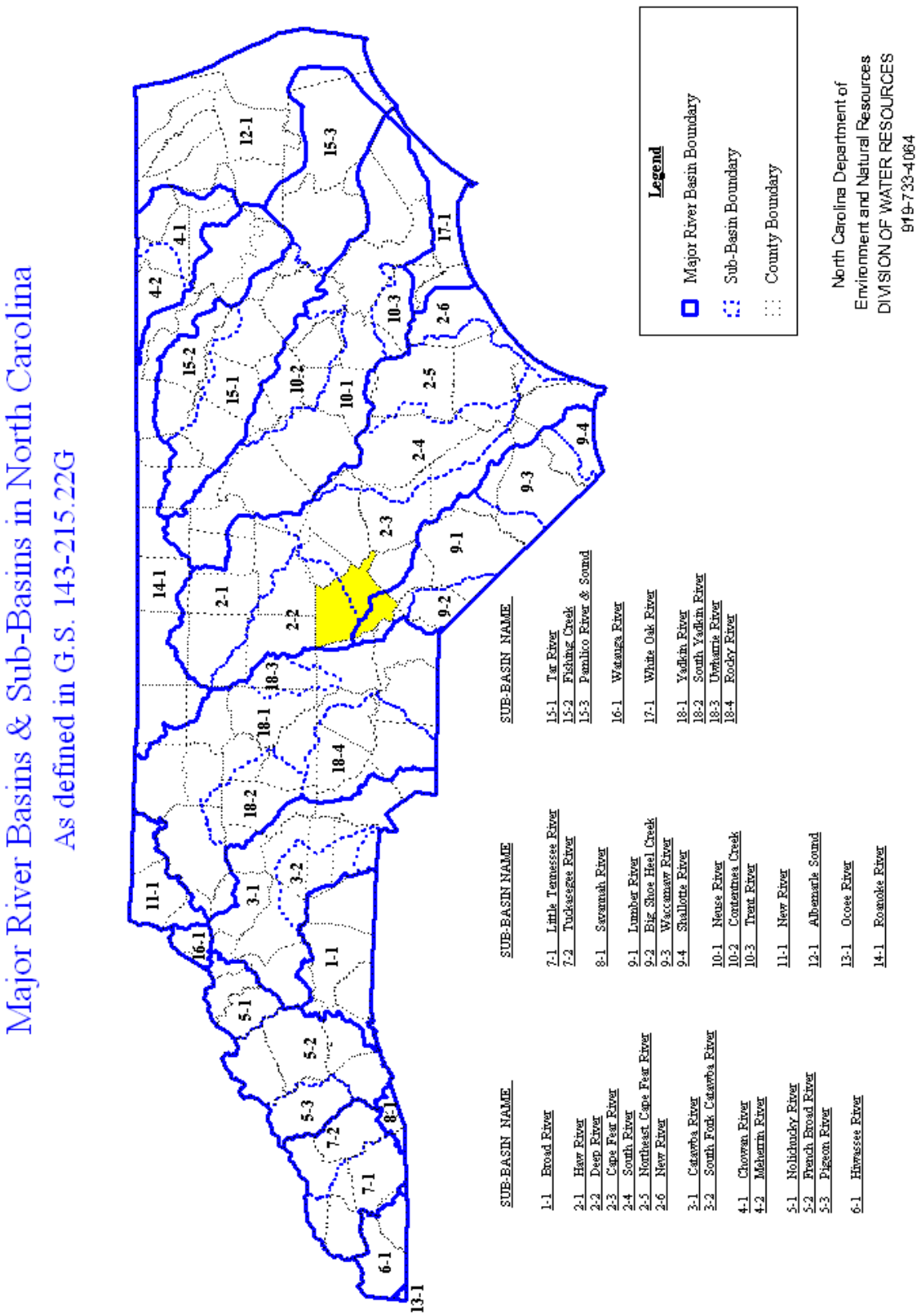
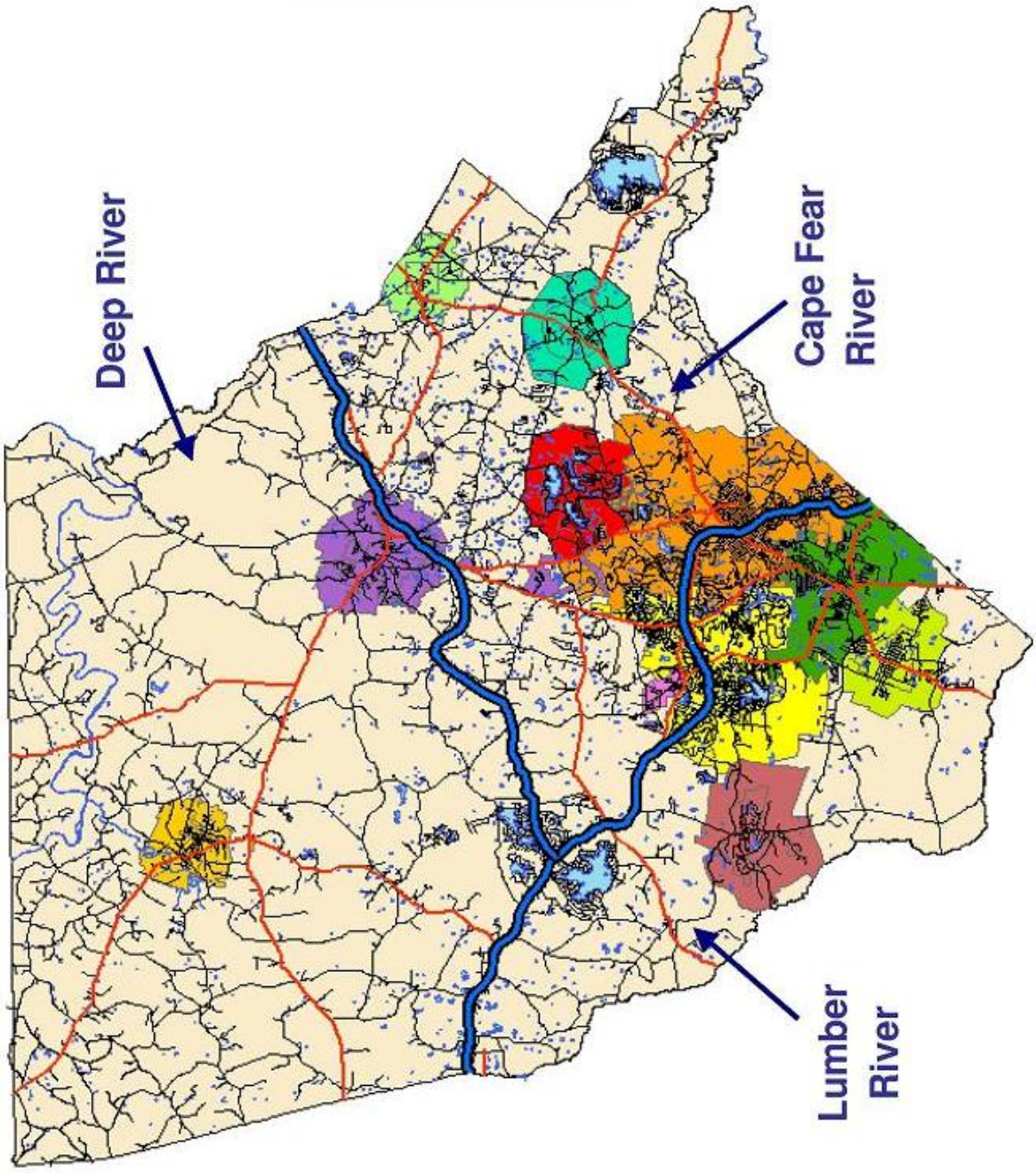


FIGURE 7-2: Moore County with River Basin Boundaries



An IBT is defined by the State of North Carolina as the movement of surface water from one river basin into another. The river basin lines and sub-basin lines shown in Figures 7-1 and 7-2 are important to help establish when an IBT is occurring. The limitations on the amount of water that can be transferred between basins were created when the State Legislature adopted the Regulation of Surface Water Transfer Act in 1993 under General Statute 143-215.22I. This regulation has been modified several times since, and the most recent revision was by House Bill 820 in August 2007, where it was rewritten and became General Statute 143-215.22L.

The current regulations state that no person shall initiate an IBT of 2.0 million gallons or more of water in any given day without first obtaining a certificate from the EMC. The regulations require the person or entity that owns the pipe or other conveyance that carries the water across the river basin boundary to be the party responsible for obtaining the certificate. Facilities that transferred or were under construction to transfer more than 2.0 MGD prior to July 1, 1993 can be "grandfathered" from this rule and can transfer increased amounts without a certificate by completing a Grandfathered Interbasin Transfer Worksheet and submitting it to DWR for review and approval.

House Bill 820 requires system owners to undergo a detailed, lengthy, and expensive process to obtain an IBT certificate from the EMC. This process includes holding numerous public meetings to receive public comment and the creation of environmental documents to complete an environmental impact statement (EIS). The EIS document is created to study the impacts, alternatives, and mitigation processes related to the proposed transfer. All costs for obtaining the IBT certificate are the responsibility of the applicant. The final determination of the IBT is performed by the EMC and is based on environmental impacts, mitigation efforts of any impacts, benefits of the transfer, and consideration of all reasonable alternatives.

In order to obtain information on the impacts of the current IBT regulations to Moore County, McGill Associates met with representatives from DWR in September 2007 in Raleigh. During this meeting, numerous scenarios were presented to the Division with maps of the County to discuss the IBT regulations associated with each scenario. Representatives from DWR requested that questions associated with each scenario be formally submitted by letter to receive a formal

written response from the Division. A copy of the letter that was submitted to DWR and a copy of the response letter is provided in Appendix A of this report.

An additional provision of House Bill 820 includes the preparation of a "Water Allocation" Study by the Environmental Review Commission to review the current laws regulating surface water resources in North Carolina, review of the current river basin and sub-basin maps, and propose changes to the current IBT regulations and process. The study is currently scheduled for completion by 2009 and may result in regulatory modifications that significantly impact the future of water resources in Moore County. County and municipal leaders are encouraged to monitor the progress of this study and attend public meetings related to the study whenever possible.

7.03 Disinfection

Groundwater and surface water are normally disinfected to control bacterial growth prior to releasing the finished water to a distribution system for public consumption. The two (2) primary chemicals currently used by system owners within Moore County to disinfect treated water are free chlorine and chloramines.

Both methods of disinfection are commonly used in municipal water systems. However, studies have shown that adverse chemical reactions can occur when water disinfected with free chlorine is blended with water disinfected with chloramines. According to the **Alternative Disinfectants and Oxidants Guidance Manual** published by the United States Environmental Protection Agency (EPA) in April 1999, "Caution should be used in using monochloramine in distribution systems where water sources using free chlorine are also used." EPA reports that combining water that has been disinfected with the different chemicals can cause taste and odor problems, and in some cases results in the entire residual being depleted.

Reduction or removal of disinfectant residuals can have serious impacts to public water distribution systems, including bacterial growth that can lead to sicknesses among customers. In systems where such blending is occurring, studies should be performed to determine the effects of mixing the chemicals with proper precautions placed into effect. In addition, the residuals must be monitored regularly with additional disinfectant facilities installed in the system when necessary.

Blending waters disinfected with chlorine and chloramines is currently occurring in the MCPU Pinehurst water system. Chlorinated water from the County's well system and chlorinated water purchased from Aberdeen is mixed with chloraminated water purchased from Southern Pines. Additional water disinfected with chloramines in Harnett County is planned to be introduced to the MCPU Pinehurst system in 2008.

MCPU staff reports no complaints related to taste and odor and continuously monitors residual levels in the system. Currently, no substantial reductions in residual levels have been reported.

These residual values should continue to be monitored on a regular basis after chlorinated water from Harnett County is introduced into the Pinehurst system. Should reductions in residuals occur in the future, proper treatment equipment must be installed within the distribution system to increase the residuals to safe levels.

7.04 Conclusion

Current regulations must be considered when performing future water resource planning in Moore County. The recent issuance of House Bill 820 has created a difficult, lengthy, and expensive process for entities to obtain an IBT certificate from the EMC, and Moore County's inclusion in three (3) river sub-basins limits the amount of water that can be transferred throughout the county without a certificate. Any alternate to be implemented that requires an IBT certificate shall be carefully evaluated and allotted adequate time and funding to complete the process.

Mixing water that has been disinfected with different chemicals must continue to be monitored with additional treatment facilities installed as necessary. Once Harnett County water is introduced into the Pinehurst water system, additional analysis should be undertaken to confirm no harmful impacts to the residuals.

SECTION 8.0 WATER RECLAMATION AND REUSE

8.01 Water Reclamation and Reuse Description

Water reclamation is generally defined as the act of treating wastewater to a high level and reusing it for a beneficial manner in the community. This high level of treatment, called tertiary treatment, typically yields a higher quality effluent than effluent discharged to streams. The use of water reclamation is highly regulated in the State of North Carolina to protect public health and the environment, but can result in benefits to the environment such as recharging aquifers and water conservation.

In addition to tertiary treatment, current regulations require water reclamation systems to include a five (5) day storage pond, which is utilized when the effluent turbidity standards or fecal coliform standards are not in compliance. Treated effluent can be routed to this detention pond and sent back through the treatment process whenever necessary.

Once the wastewater is properly treated, it is generally transferred through a distribution system designated only for reclaimed water. This system is typically color coded by purple pipe and labeled to notify that it contains reclaimed water that is not intended for drinking. The color coding and labeling help to prevent cross connections between the reclaimed water and potable water systems.

The use of reclaimed water is an important component of water system planning because it conserves potable water supplies by using treated effluent in non-potable applications. Potential uses for reclaimed water include landscape irrigation in parks, gardens, cemeteries, golf courses, and highway medians, agricultural irrigation of non-food crops, industrial process water such as cooling, and toilet flushing. Due to the potential to conserve water and offset increasing demands, the use of reclaimed water is encouraged by many regulatory and funding agencies. Some municipalities have also been successful in selling reclaimed water at a cheaper rate than potable water to encourage its use in these applications.

When implementing a reuse program, public education is essential to address the perceptions and fears associated with utilizing treated wastewater in society. Education about the treatment process, distribution system, and proper applications can assist with gaining acceptance from the public, and have helped numerous units of government develop reuse and reclamation projects.

The Moore County WPCF is located in the Addor community in the southernmost portion of the County. The isolated location of the plant provides many benefits to the County, but is not conducive to developing a wastewater reuse program in the areas of dense population. Costs to treat and transfer effluent to other portions of the County appear to be cost prohibitive at this time. County staff reports that several developers are in the process or have expressed interest in developing a reuse program within future proposed subdivisions. In these cases, wastewater would be collected from each home in the development and transferred to a central wastewater treatment facility. Upon completion of the tertiary treatment process, the effluent would be re-used for golf course irrigation, landscape irrigation, and other non-potable uses.

The future of wastewater reclamation and reuse in Moore County is more likely to involve smaller wastewater treatment facilities in new developments than utilizing treated effluent from the County's WPCF. Due to the lack of water sources in the County, McGill Associates believes that reuse and reclamation is a process that should be allowed and promoted by County and municipal leaders. Proper design, permitting, operation, and maintenance techniques must be incorporated into each system to ensure minimal impacts to the environment.

SECTION 9.0 RECOMMENDATIONS AND CONCLUSIONS

Based on information received from the various water distribution system owners in Moore County and the evaluations that were completed in the previous sections of this report, McGill Associates has generated the following recommendations related to future water resources in the County. These recommendations are not listed in order of priority, but have been divided into "Short Term" and "Long Term" sections. Short term recommendations are those that are needed in the immediate future, while the long term recommendations provide goals for future water resource planning over the course of many years.

Where applicable, total estimated project costs and project schedules for implementation have been provided for each recommendation.

9.01 Short Term Recommendations

Recommendation No. 1 – Interconnect Montgomery Co. and MCPU Seven Lakes Systems

Recommendation No. 1 includes an interconnection between the Montgomery County and MCPU Seven Lakes water systems. This important project will provide an alternate water source to the Seven Lakes area, which is currently supplied almost exclusively by the MCPU Pinehurst water system. McGill Associates therefore believes that an interconnection with Montgomery County will provide benefits to both the Seven Lakes and Pinehurst systems.

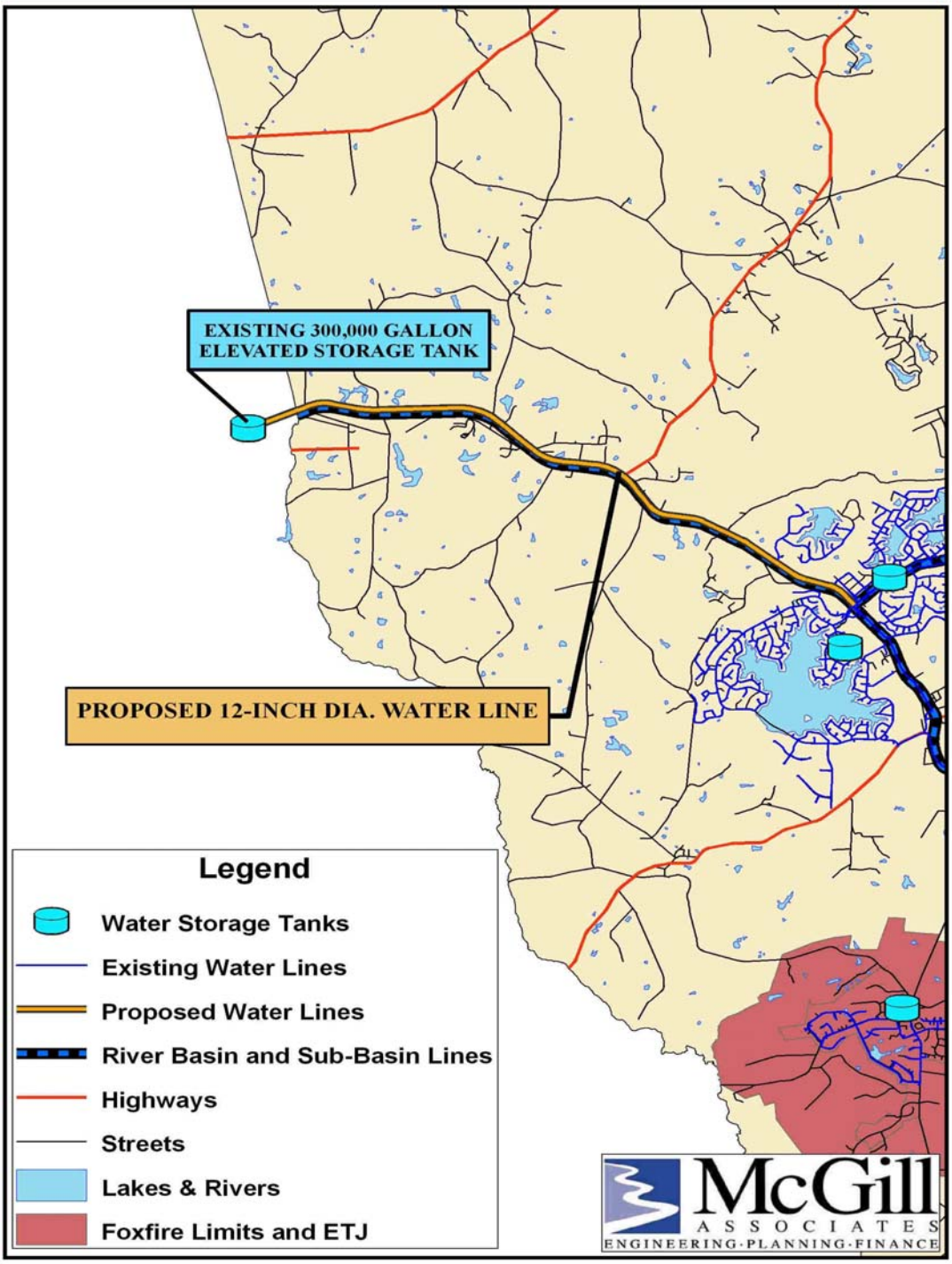
The simplest method for constructing this interconnection involves the installation of approximately eight (8) miles of water line and related appurtenances along North Carolina Highway 211. Based on the hydraulic analysis previously provided in Table 6-3, McGill Associates recommends installing a minimum pipe diameter of 12-inches for this application. The proposed 12-inch line will have the capacity to supply up to approximately 1.5 MGD of water to the Seven Lakes area from Montgomery County without the need for pumping facilities.

Representatives from Montgomery County have committed to provide Moore County with up to 500,000 GPD of water prior to their future water plant expansion, with the potential to provide additional water in the future. Future transfers obtained from Montgomery County in excess of 500,000 GPD will be highly contingent upon future North Carolina laws regarding IBTs and Montgomery County's willingness and ability to obtain an IBT Certificate from the EMC.

The total estimated project cost, including soft costs, for Recommendation No. 1 is $2.75 million. This amount includes $433,000 in pump station and storage tank improvements to the Montgomery County water distribution system that have been requested by County officials to supply 0.5 MGD to Seven Lakes on a consistent basis. An itemized breakdown of this estimate is provided in Appendix B. Due to the immediate need for additional water supplies in the Seven Lakes area, it is recommended that this project be implemented in fiscal year 2008-2009.

A map showing the proposed improvements that are included in Recommendation No. 1 is shown in Figure 9-1.

FIGURE 9-1


EXISTING 300,000 GALLON ELEVATED STORAGE TANK
PROPOSED 12-INCH DIA. WATER LINE
Legend
Water Storage Tanks
Existing Water Lines
Proposed Water Lines
River Basin and Sub-Basin Lines
Highways
Streets
Lakes & Rivers
Foxfire Limits and ETJ
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Recommendation No. 2 – Return Robbins Water Treatment Plant To Service

Recommendation No. 2 involves the rehabilitation of the Town of Robbins' existing 1.5 MGD Water Treatment Plant, and the return of the plant to operation. Prior to beginning design work the plant rehabilitation, McGill Associates recommends that a thorough evaluation be conducted at the facility to identify the necessary improvements and costs associated with returning the plant to service. The Town of Robbins recently received a grant from the North Carolina Rural Center to conduct this evaluation, and the study is currently scheduled to be completed by December 2008.

McGill Associates believes that returning the Robbins plant to operation provides both immediate returns and long term value to both the Town of Robbins and Moore County. The plant has the potential to supply water to the Town of Robbins, the MCPU Seven Lakes system, and the northwestern portion of Moore County, including Westmoore Elementary School, which has been identified as having a need for a connection to a public water supply. In addition, the Town's existing 120 million gallon reservoir provides additional reliability to the system during drought conditions.

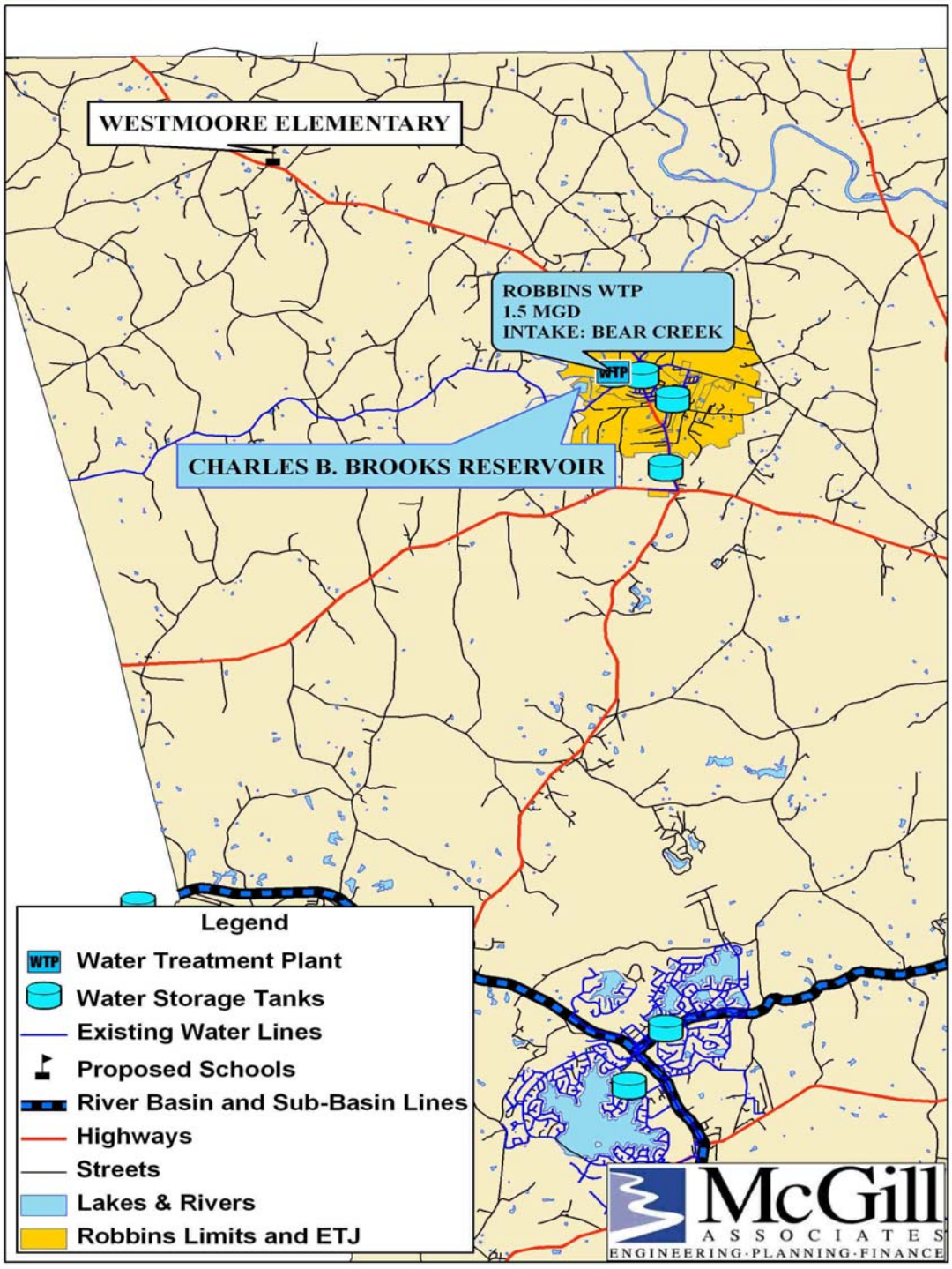
Rehabilitating this plant also places a water treatment facility into operation that is located in relatively close proximity to the Deep River, and creates the potential for a future intake along the Deep River with an expansion to the plant. The quantity of water obtained from the Deep River in the long term may be limited by the County's desire and ability to obtain an IBT certificate from the EMC and/or permit an in-stream reservoir on the river.

Because this recommendation could benefit both the Town of Robbins and Moore County, a partnership between the two (2) units of government will likely be necessary. Various decisions will need to be made regarding this partnership, including the owner of the facility, operator of the facility, water rates charged by one entity to another, etc. It is recommended that the Town of Robbins and Moore County work together to rehabilitate the facility in a manner that is beneficial and acceptable to both units of government. If necessary, a third party could be

retained to facilitate these discussions and assist both units with the execution of the partnership and any inter-local agreements necessary to form the partnership.

A map showing the location of the existing Robbins Water Treatment Plant, Charles B. Brooks Reservoir, and Westmoore Elementary School is provided in Figure 9-2. The total estimated cost associated with the plant rehabilitation is unknown at this time, and will be determined upon completion of the facility evaluation. For planning purposes, it is recommended that the plant be scheduled for a return to operation in the 2010-2011 fiscal year.

FIGURE 9-2


WESTMOORE ELEMENTARY
ROBBINS WTP
1.5 MGD
INTAKE: BEAR CREEK
WTP
CHARLES B. BROOKS RESERVOIR
Legend
WTP Water Treatment Plant
Water Storage Tanks
Existing Water Lines
Proposed Schools
River Basin and Sub-Basin Lines
Highways
Streets
Lakes & Rivers
Robbins Limits and ETJ
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Recommendation No. 3 – Interconnect the Robbins and MCPU Seven Lakes Systems

Recommendation No. 3 involves an interconnection between the Town of Robbins water distribution system and the MCPU Seven Lakes system. The purpose of this installation is to supply additional water from Robbins to Seven Lakes after rehabilitating the Robbins water treatment plant and returning it to service as described in Recommendation No. 2. The project would also supplement the 500,000 GPD of water supplied by Montgomery County to Seven Lakes described in Recommendation No. 1.

McGill Associates has identified two (2) potential routes for connecting the Robbins and Seven Lakes systems. The first route involves the installation of a new transmission main from the existing "South" tank in Robbins along Highway 705 to Highway 211. This main would be connected to the new 12-inch water line installed between Montgomery County and Seven Lakes along Highway 211 as described in Recommendation No. 1, and would provide one (1) main supply line into the Seven Lakes system. Because the overflow elevation of the Robbins South tank (approx. 600) is lower than the overflow elevation of the Seven Lakes tanks (726.5), booster pumping facilities would also be required.

This option consists of the installation of approximately 49,000 lineal feet of 12-inch diameter water main with booster pumping facilities and related appurtenances. The total estimated cost associated with this installation is $2.6 million.

The second option that has been identified for this interconnection involves the installation of a new transmission main from the existing South tank along several NCDOT roads, including Highway 24/27, Mount Carmel Church Road, Dowd Road, Carthage Road, and Seven Lakes Boulevard. This option would provide an alternate supply line to the transmission main from Montgomery County described in Recommendation No. 1, which would significantly improve the reliability of the system. As with the previous option, booster pumping facilities would be required due to the difference in hydraulic grades of each system.

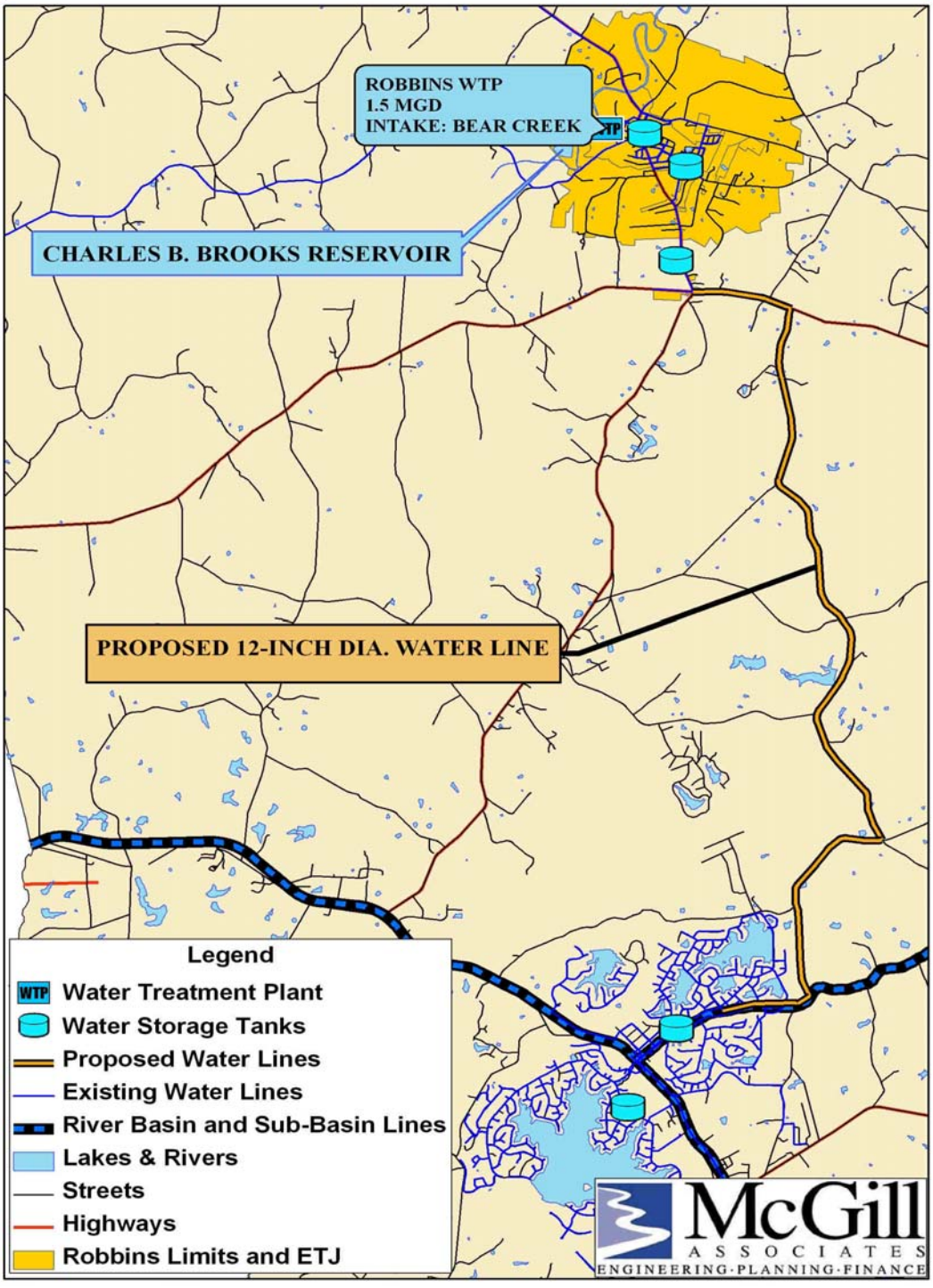
This option consists of the installation of approximately 63,000 lineal feet of 12-inch diameter water main with booster pumping facilities and related appurtenances. The total estimated cost associated with the installation is $3.6 million. Though the length of pipe and capital cost associated with this option will be higher, McGill Associates recommends that this option be included in the County's Capital Improvement Plan because it provides a secondary supply "loop" to the Seven Lakes area. This secondary feed could prove to be extremely important in the event that problems develop with a single feed along Highway 211.

An itemized breakdown of the cost estimate for this recommendation is provided in Appendix B. It is assumed that this project would be implemented after the Robbins water treatment plant is returned to operation, and it has therefore assumed to be implemented in fiscal year 2011-2012. A map showing the location of the proposed main is shown in Figure 9-3.

Since Montgomery County currently supplies water to the Robbins system, an additional option for consideration is to extend a water transmission main from Robbins to Seven Lakes, and transfer Montgomery County and Robbins water to Seven Lakes through the new main. In this scenario, Montgomery County water could be transferred through Robbins to Seven Lakes while the Robbins water plant is being rehabilitated, and then a combination of water from the two (2) systems could be transferred after the plant is returned to operation.

Currently, Montgomery County is required to supply up to 360,000 GPD of water to the Town of Robbins over a 24-hour period. McGill Associates contacted Montgomery County representatives about the system's ability to supply more than this amount, and were informed that a detailed hydraulic analysis would be required on the Montgomery County system to determine if this was a feasible alternative. This analysis has not been conducted as of the writing of this report, therefore the costs associated with this alternative are unknown at this time.

FIGURE 9-3



Note: An adequate site for a booster pumping facility would also be required.

Recommendation No. 4 – Interconnect the MCPU Seven Lakes and Foxfire Water Systems

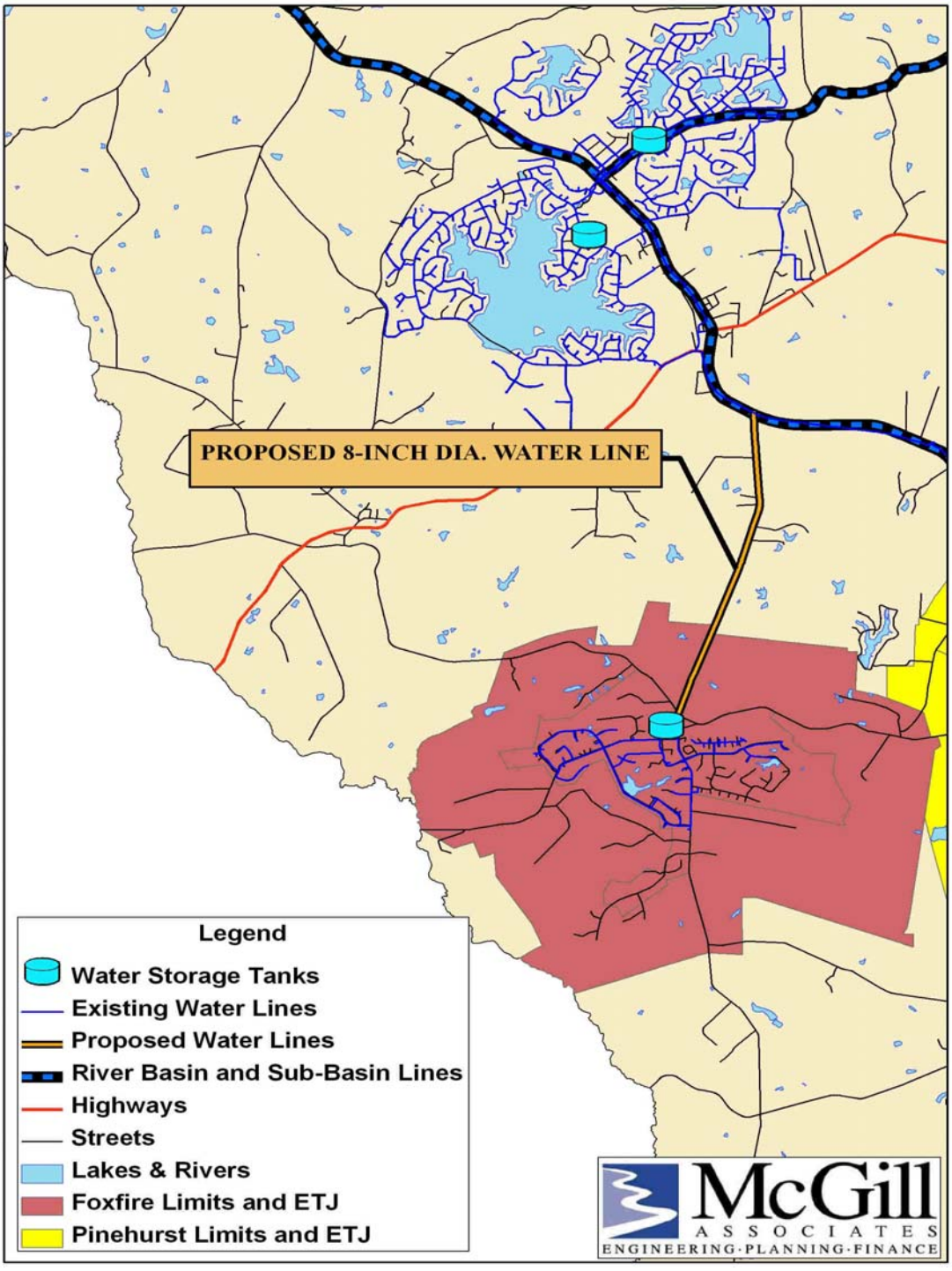
Recommendation No. 4 includes an interconnection between the MCPU Seven Lakes and Village of Foxfire water systems. This important project will provide an alternate water source to the Foxfire area, which has recently obtained testing results that indicate elevated levels of radium in several groundwater supply wells. The elevated radium levels are a cause for concern for the future reliability of the Foxfire system, and it is therefore recommended that an interconnection with another system be implemented to provide an additional source of water for the Village residents.

The proposed project involves the installation of approximately 18,000 lineal feet of 8-inch diameter water line from North Carolina Highway 211 along Hoffman Road to the existing water storage tank in Foxfire. A "skeleton" hydraulic model of this area prepared by McGill Associates indicates that approximately 350,000 GPD of water can be supplied to Foxfire from Seven Lakes with an 8-inch diameter line and no pumping facilities. Based on the projections provided in Table 3-19, this would supply the Village's average daily demands to approximately 2052 and maximum monthly demands to approximately 2047.

The total estimated project cost for Recommendation No. 4, including soft costs, for Recommendation No. 4 is $820,000. This estimate assumes that pumping facilities would not be constructed at this time. An itemized breakdown of this estimate is provided in Appendix B, and a map of the proposed project is shown in Figure 9-4.

Prior to implementation of this recommendation, it is recommended that the interconnections with Montgomery County and Robbins be implemented with the Seven Lakes system to ensure adequate supply is available to Foxfire. The projected date for this interconnection to be completed is therefore 2012-2013.

FIGURE 9-4


PROPOSED 8-INCH DIA. WATER LINE
Legend
Water Storage Tanks
Existing Water Lines
Proposed Water Lines
River Basin and Sub-Basin Lines
Highways
Streets
Lakes & Rivers
Foxfire Limits and ETJ
Pinehurst Limits and ETJ
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Recommendation No. 5 – Improve Connection Between Southern Pines and MCPU Pinehurst Water Distribution Systems

Recommendation No. 5 includes distribution system improvements to the MCPU Pinehurst water system to eliminate the "bottleneck" that currently limits the quantity of water that can be transferred from the Town of Southern Pines to approximately 700,000 GPD. MCPU staff reports that small diameter pipes within the Pinehurst Trace subdivision are the reason for the current limitation.

The existing WPA between the system owners only requires the Town of Southern Pines to provide up to 250,000 GPD to the County for use in the Pinehurst system. However, Town leaders have expressed an interest in increasing this contact amount, and the current regulations regarding IBTs make the Town a logical and practical source of water for Pinehurst in the future. It is therefore recommended that this bottleneck be corrected to supply a minimum quantity of 1.0 MGD in the future.

Hydraulic modeling and cost estimates are currently being prepared to correct this bottleneck by MCPU staff. The total cost associated with this project is therefore not provided in this study, and can be determined upon completion of the MCPU analysis.

Recommendation No. 6 – Interconnect the Town of Pinebluff and Town of Southern Pines Water Distribution Systems

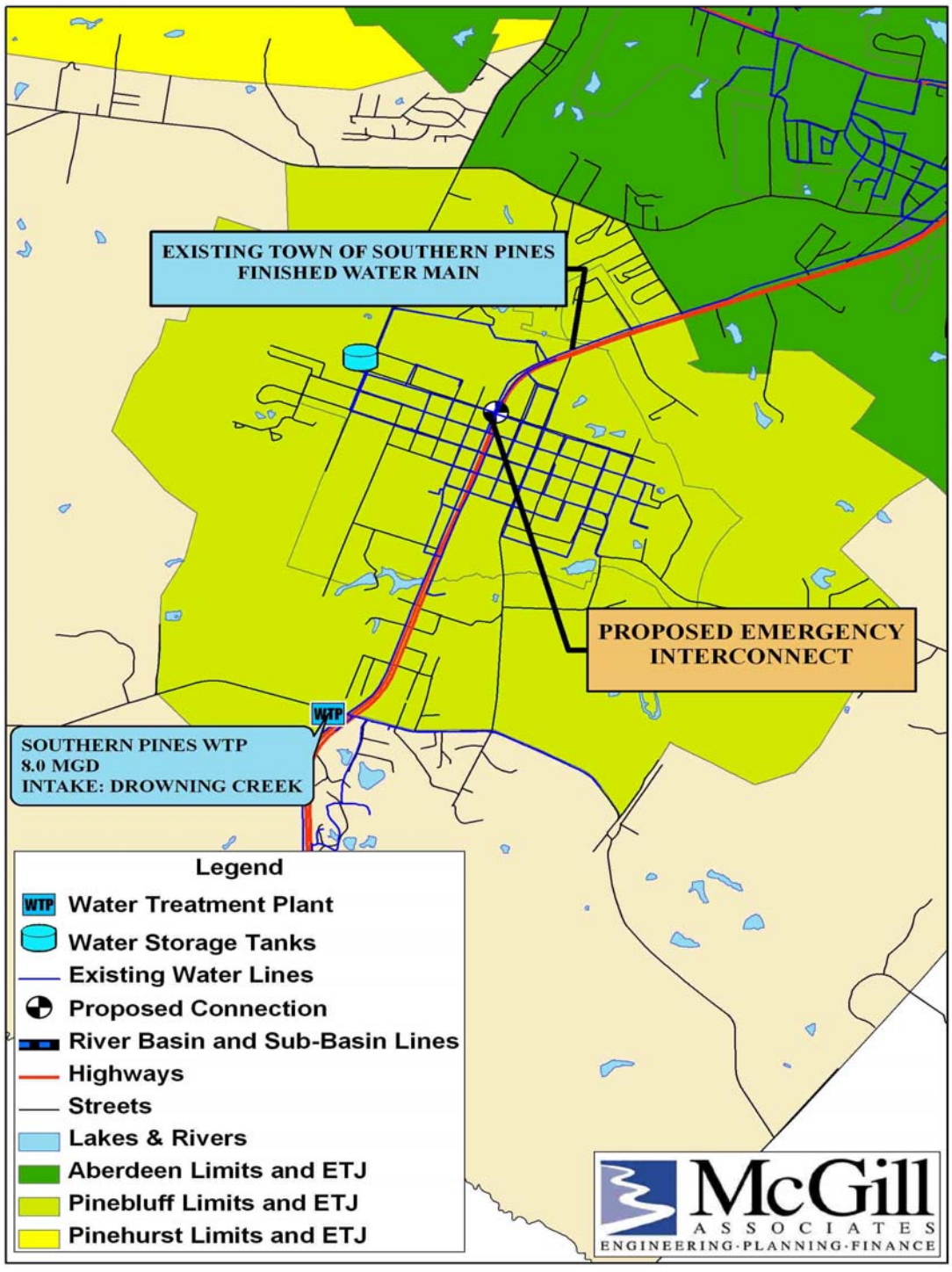
Recommendation No. 6 involves the construction of an emergency interconnection between the Town of Pinebluff and Town of Southern Pines water distribution systems. The need for this interconnection was identified based on recent laboratory results indicating increased levels of radium in two (2) of Pinebluff's existing groundwater supply wells. The Town reports that subsequent testing has revealed that radium levels have decreased to below state and federal drinking water standards, but the system continues to operate without a backup supply of water.

Several alternatives appear to exist for the Town to interconnect with another system. McGill Associates believes that an interconnection with Southern Pines is the most practical because the Southern Pines system includes an 18-inch diameter finished water main that currently extends from the Southern Pines water plant through the Town of Pinebluff corporate limits on U.S. Highway 1. As a result, this interconnection can be made with minimal infrastructure requirements, resulting in lower costs than interconnecting with other systems.

The proposed project includes the installation of a booster pumping station and piping modifications along U.S. Highway 1 to connect the Southern Pines system with the Pinebluff system. It is anticipated that this interconnection would only be used to supply the Town of Pinebluff in an emergency situation.

The total estimated project cost for Recommendation No. 6, including soft costs is $350,000. An itemized breakdown of this estimate is provided in Appendix B, and a map of the proposed project is shown in Figure 9-5. It is recommended that the Town of Pinebluff seek funding for this interconnection and implement it as funds become available.

FIGURE 9-5


EXISTING TOWN OF SOUTHERN PINES
FINISHED WATER MAIN
PROPOSED EMERGENCY
INTERCONNECT
WTP
SOUTHERN PINES WTP
8.0 MGD
INTAKE: DROWNING CREEK
Legend
Water Treatment Plant
Water Storage Tanks
Existing Water Lines
Proposed Connection
River Basin and Sub-Basin Lines
Highways
Streets
Lakes & Rivers
Aberdeen Limits and ETJ
Pinebluff Limits and ETJ
Pinehurst Limits and ETJ
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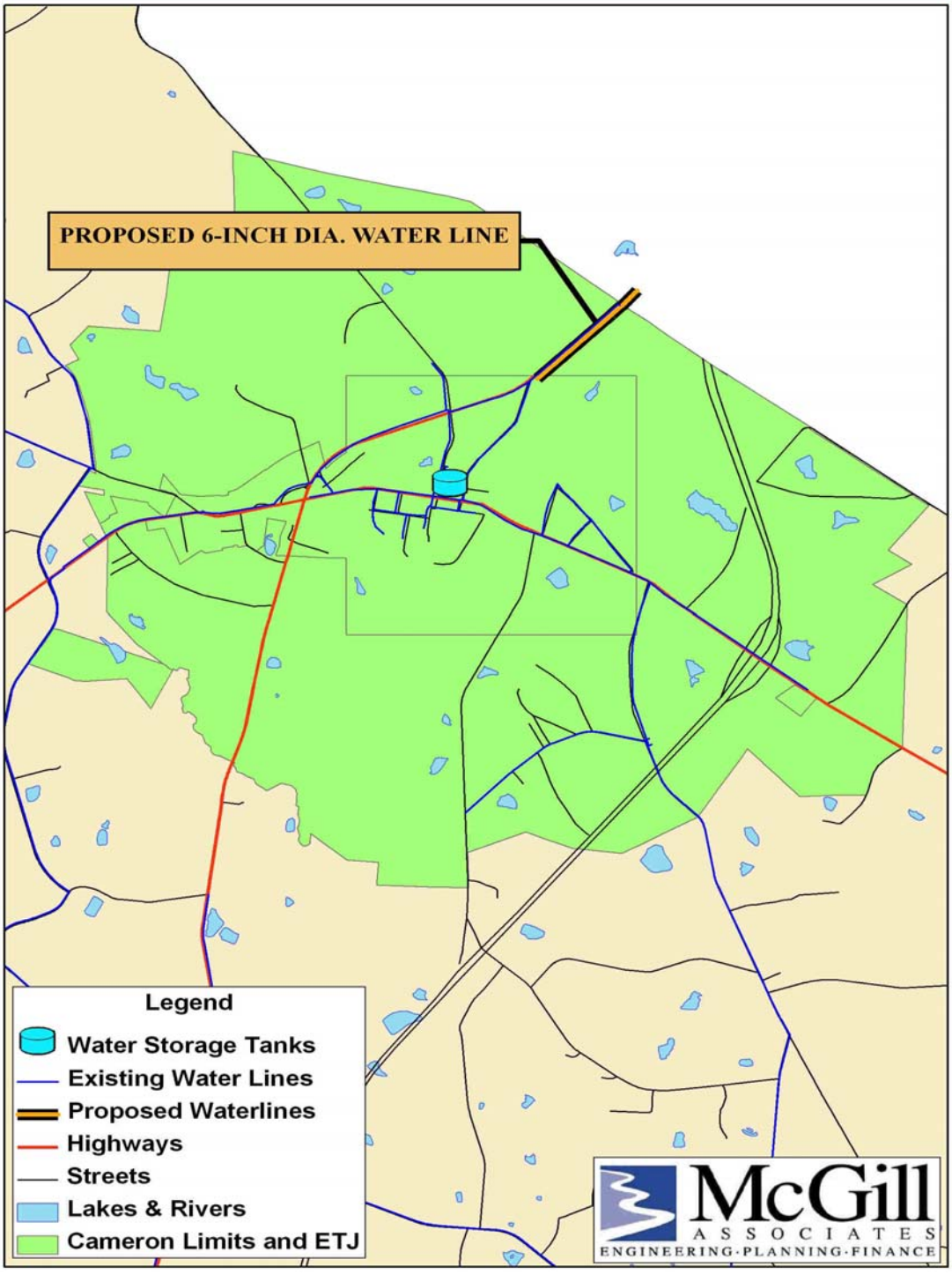
Recommendation No. 7 – Interconnect the City of Sanford and Town of Cameron Water Distribution Systems

Recommendation No. 7 involves the construction of an interconnection between the City of Sanford and Town of Cameron water distribution systems. During meetings with McGill Associates, Town of Cameron leaders expressed interest in eliminating the use of the Town's existing water supply wells. An interconnection with Sanford would allow the Town to abandon the wells, and purchase water directly from the City. Sanford officials report a surplus of water in the southwestern portion of Lee County near the Cameron Town limits, and are currently wasting approximately 200,000 GPD from the system to maintain water quality in the area.

The proposed project includes the installation of approximately 1,800 lineal feet of 6-inch diameter water main with related appurtenances to connect the two (2) distribution systems. Town leaders report that this interconnection was previously designed and permitted but never constructed.

The total estimated project cost for Recommendation No. 7, including soft costs is $71,000. An itemized breakdown of this estimate is provided in Appendix B, and a map of the proposed project is shown in Figure 9-6. It is recommended that the Town of Cameron seek funding for this interconnection and implement it as funds become available.

FIGURE 9-6


PROPOSED 6-INCH DIA. WATER LINE
Legend
Water Storage Tanks
Existing Water Lines
Proposed Waterlines
Highways
Streets
Lakes & Rivers
Cameron Limits and ETJ
McGill
ASSOCIATES
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Recommendation No. 8 – Closely Monitor Ongoing Water Allocation Study

The North Carolina Environmental Review Commission (ERC) is currently in the process of conducting a major Water Allocation Study that will evaluate water resources throughout the State of North Carolina. This study was mandated as part of the recent issuance of House Bill 820, and includes an evaluation of the existing IBT regulations, the process for obtaining an IBT certificate, and the State's current River Basin and Sub-Basin maps. It is highly likely that the results of this study will modify the current IBT regulatory process and the existing basin maps.

Since Moore County is located in two (2) major river basins and three (3) sub-basins, the IBT regulations are a major component of future water resource planning in the County. As a result, Recommendation No. 8 is that county, municipal, and local leaders throughout the community monitor the progress of the ERC's Water Allocation study and attend public meetings related to the study as they are scheduled. A first round of public information meetings was held in December 2007 and January 2008, and additional meetings will be scheduled in the future to report progress on the study.

The final results of the Water Allocation Study are currently scheduled to be presented to the North Carolina General Assembly in 2009.

Recommendation No. 9 – Review Results of City of Laurinburg Study

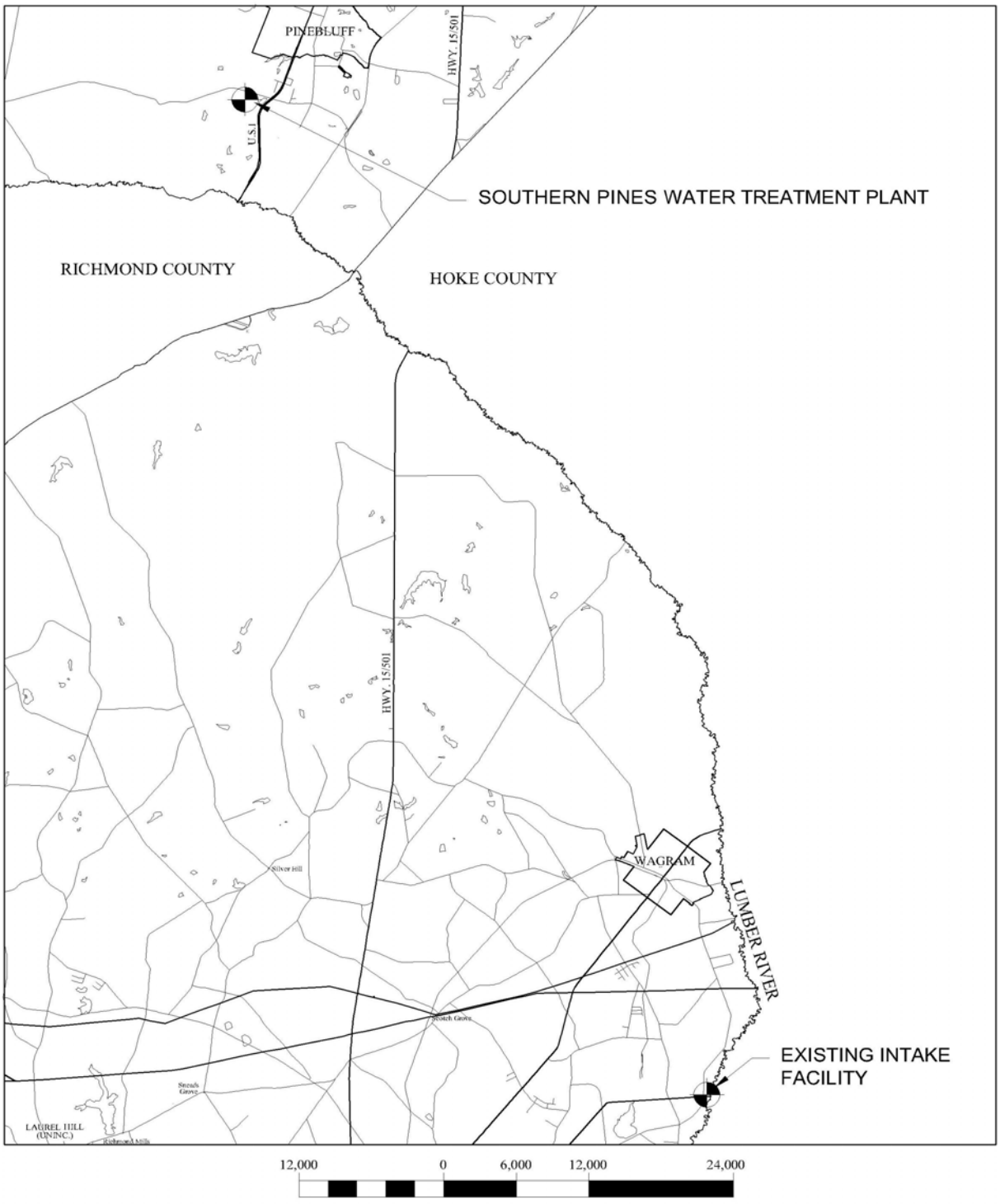
The City of Laurinburg is in the process of completing a study that will evaluate the feasibility of utilizing an existing 7.0 MGD raw water intake on the Lumber River as a potable water supply source. This intake previously supplied non-potable process water to the WestPoint Stevens textile plant, which ceased operation in 2007. The existing raw water intake structure may provide a means to withdraw raw water from the river, supply the water to a new or existing water treatment facility, and supply finished potable water to system owners in Moore County.

Recommendation No. 9 is that county, municipal, and local leaders in Moore County review the results of the City of Laurinburg's study to determine if the intake has the potential to supply water to customers in Moore County in the future. Partnerships between units of government in Moore County and units of government in Scotland County may be necessary to develop this scenario and to fund the capital costs associated with treatment and distribution of the water obtained from the intake structure.

The benefit of supplying water to Moore County from the Lumber River is that the Moore County WPCF is located and discharges treated effluent to the Lumber River basin. Water consumed in municipalities that discharge wastewater to the Lumber basin (Southern Pines, Pinehurst, Aberdeen, Carthage, Pinebluff, and Foxfire) is therefore not subject to current IBT regulations, with the exception of any "consumptive" losses outside of the Lumber River Basin. It is recommended that Moore County leaders review the Laurinburg study upon its completion and contact City leaders to determine its long term value to Moore County.

A map showing the location of the existing intake in relation to Moore County is provided in Figure 9-7.

FIGURE 9-7: WESTPOINT STEVENS/ INTAKE LOCATION MAP



Recommendation No. 10 – Review Existing Water Purchase Agreements

In completing this study, McGill Associates requested copies of all existing WPAs that are currently being utilized by system owners in the County to determine the minimum and maximum purchase requirements associated with each agreement. In reviewing each agreement, we noted the following:

- WPAs are in place that appear to have expired
- The maximum quantities of water allowed by some WPAs are being exceeded by the purchasing system

Recommendation No. 10 is that all system owners in Moore County perform a detailed technical and legal review of all existing water purchase agreements. Agreements that have expired should be renewed or re-developed as necessary, and agreements that contain inadequate purchase quantities should be modified in a manner that is acceptable to all parties involved. The modification of these agreements should prove to be beneficial should a dispute over water sales and purchases develop in the future.

Recommendation No. 11 – Evaluate "Unaccounted For Water" in Each System

"Unaccounted For Water" is generally defined as the difference between the amount of water that a system produces or purchases, and the amount that is sold to all customers. Sources of unaccounted for water include leaks in the distribution system, un-metered usage, inaccurate water meters, and illegal water service taps. The State of North Carolina has created a target "goal" for system owners to reduce their unaccounted for water quantities to below 10% of all water produced or purchased.

With recent drought conditions and water restrictions in effect throughout Moore County, reducing the amount of water that is unaccounted for in a distribution system is an important part of future water resource planning. In completing this study, some existing system owners acknowledged that the amount of water that cannot be accounted for in their systems well exceeds the State's targeted goal of 10%.

Recommendation No. 11 is that each system owner evaluate the amount of unaccounted for water in their respective system. The steps required to complete the evaluation will be necessary to complete each system's upcoming update to their Local Water Supply Plans. Water utilized in system processes at water treatment facilities and water used to periodically "flush" distribution systems should also be incorporated into the analysis. System owners that experience large quantities of unaccounted for water are encouraged to develop leak detection programs, meter replacement programs, and meter installation programs (on un-metered users) to reduce the amount of unaccounted for water within the State's target goal.

Recommendation No. 12 – Consider IBT with Future of Vass WWTP

The current IBT regulations have been discussed throughout this report, and their impact on the options available to obtain future water resources in Moore County is immense. As a result, the location that wastewater is discharged to the environment, either through subsurface septic systems or wastewater treatment plant discharges must be carefully reviewed to ensure compliance with current regulations.

In addition to the 6.7 MGD WPCF located in the Addor community, MCPU owns and operates a 60,000 GPD "package-type" WWTP that provides service to many residents in the Town of Vass. This plant discharges treated effluent to the Lower Little River. Wastewater flows are approaching the permitted capacity of the plant, and additional flows that have been allocated to subdivisions and a new school are forcing MCPU to look at options for expanding the capacity of the wastewater system in the near future.

Options that are currently being considered to increase the capacity of the system include a WWTP expansion, and the installation of a lift station and force main system that will pump the wastewater from Vass to the Town of Southern Pines. In the lift station/force main option, wastewater currently treated at the Vass WWTP would instead be treated at the County's WPCF in Addor, and the Vass WWTP would be abandoned. Since the source water basin (Cape Fear) is different than the discharge basin (Lumber), all wastewater transferred from Vass to Southern Pines is subject to current IBT regulations.

MCPU and the Town of Vass are in the process of attempting to obtain funding through various grant agencies to construct the lift station and force main option. This option provides potential environmental benefits because it eliminates an existing WWTP discharge on the Lower Little River, and the existing WPCF in Addor will soon be converted to a tertiary facility that will be capable of treating wastewater at a much higher level than the existing Vass facility. Costs to operate the lift station/force main system would also be substantially less than costs to operate the WWTP.

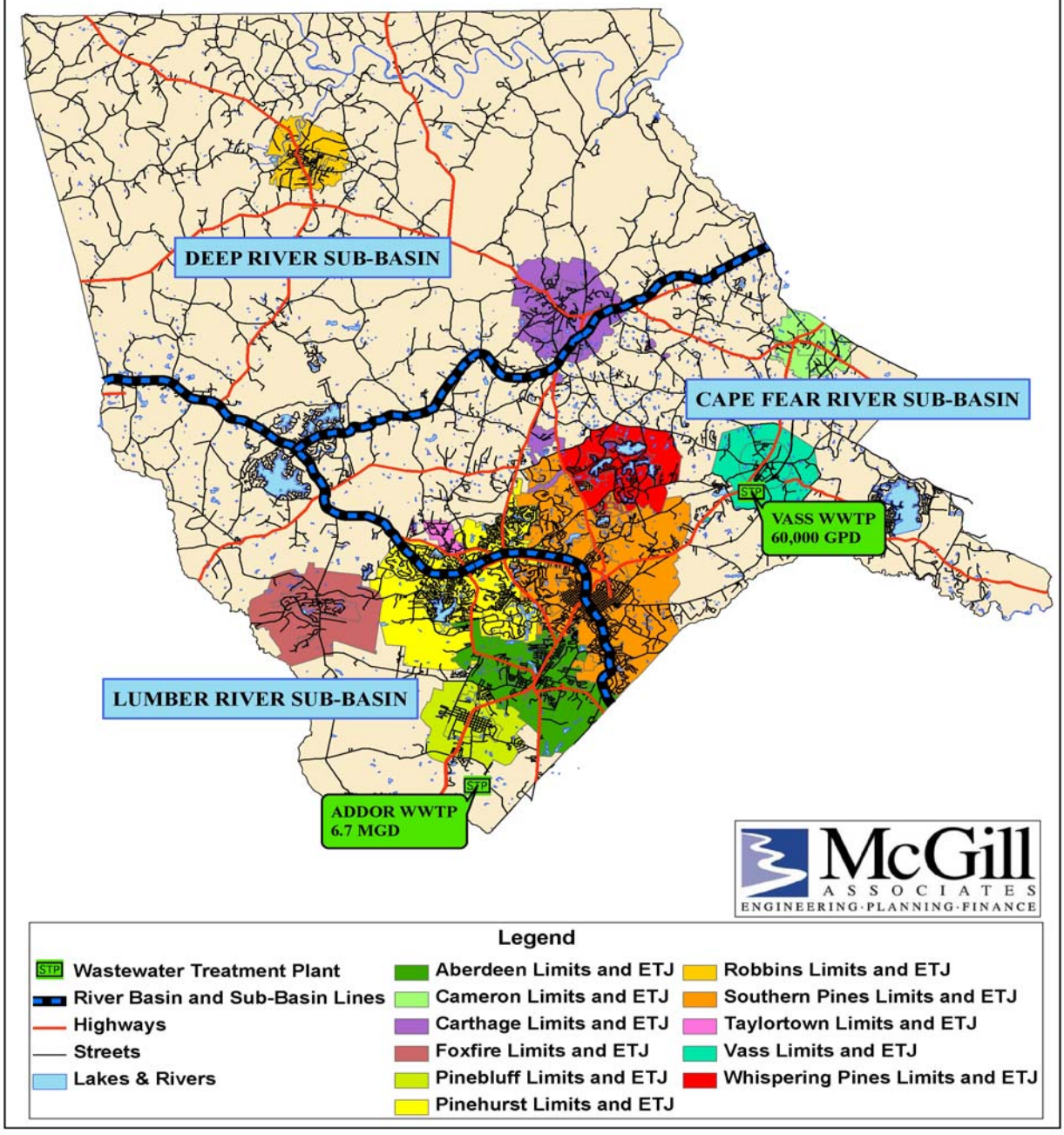
Retaining and expanding the Vass WWTP plant in lieu of constructing the lift station/force main option may be a valuable component in allowing the County to comply with current IBT regulations. The presence of a wastewater disposal facility in the Cape Fear River basin offers much more flexibility and additional options in the future for purchasing water from system owners that obtain water from the Cape Fear basin, such as Harnett County or the City of Sanford. Discharging water obtained from the Cape Fear basin at an expanded facility in Vass is not subject to the current IBT regulations.

Recommendation No. 12 is that Moore County include the impacts of the IBT regulations in an evaluation prior to selecting a final method for expanding the capacity of the wastewater disposal system in Vass. Speculative effluent discharge limits should be obtained for the Lower Little River to determine the assimilative capacity of the river, and a more detailed analysis is warranted to study the potential capacity of the Vass WWTP, treatment processes that may be utilized to meet the speculative limits, effluent discharge options (including land application), and estimated capital costs to complete an expansion. A final decision on the alternative to be implemented should be based on numerous components, including:

- Financial (Grant monies available, capital costs, and operational costs)
- Environmental (Elimination of discharge permits, treatment levels at each plant)
- Regulatory (IBT regulations)

A map indicating the location of the Vass WWTP, the MCPU WPCF in Addor, and the current river sub-basin lines is shown for reference in Figure 9-8.

FIGURE 9-8


DEEP RIVER SUB-BASIN
CAPE FEAR RIVER SUB-BASIN
LUMBER RIVER SUB-BASIN
VASS WWTP
60,000 GPD
ADDOR WWTP
6.7 MGD
McGill
ASSOCIATES
ENGINEERING·PLANNING·FINANCE
Legend
Wastewater Treatment Plant
River Basin and Sub-Basin Lines
Highways
Streets
Lakes & Rivers
Aberdeen Limits and ETJ
Cameron Limits and ETJ
Carthage Limits and ETJ
Foxfire Limits and ETJ
Pinebluff Limits and ETJ
Pinehurst Limits and ETJ
Robbins Limits and ETJ
Southern Pines Limits and ETJ
Taylortown Limits and ETJ
Vass Limits and ETJ
Whispering Pines Limits and ETJ

Recommendation No. 13 – Promote and Support Water Reclamation and Reuse

Water reclamation and reuse was summarized in Section 8 of this report, and is a technique that can be used to recharge aquifers and conserve water by using treated effluent in lieu of potable water for irrigation and other non-potable uses. Recent drought conditions and water restrictions in Moore County only further the need for the development of reclamation and reuse systems in the County, and many regulatory and funding agencies have increased their support and participation level in these types of systems.

Recommendation No. 13 is for County and municipal leaders to aggressively promote and support wastewater reclamation and reuse systems in the County. When planned, designed, permitted, and operated properly, reuse systems can have positive impacts on the environment and on public water supplies.

Many areas throughout the United States have recently begun to study and implement incentives for developers and residents that utilize reclamation and reuse systems. In order to be effective, these incentives must be financially attractive to the public. Such incentives appear to have the potential to be successful in Moore County, due to the quantity of golf courses and major irrigation users.

Recommendation No. 14 – Revisit Water Resources After Study is Released

The North Carolina ERC is currently in the process of conducting a major Water Allocation Study that will evaluate and make recommendations related to future water resources throughout the entire state. As previously stated in this report, the results of the Allocation study could have major impacts on the future of water resources in Moore County because modifications will likely be made to the current regulatory process for obtaining an IBT certificate and the current major River Basin and Sub-Basin maps.

Recommendation No. 14 is therefore to closely review the results of the Water Allocation Study when it has been released (currently scheduled for 2009), and re-assess the status of water resources in Moore County. The level of work required to complete this re-assessment will be determined by the modifications made to current regulations, and the impacts that the modifications will have on the community. The recommendations that have been provided in this report are based on current IBT regulations, and major modifications to the existing laws may substantially alter these recommendations in the future.

9.02 Long Term Recommendations

In addition to the fourteen (14) short term recommendations described in Section 9.01, McGill Associates has generated three (3) long term planning "goals" that are included with our recommendations. These goals have been generated based on our understanding of the current IBT regulations, and the assumption that an IBT certificate will not be granted to the County or any municipality in the County by the EMC.

Modifications to the current IBT regulations as a result of the ongoing Water Allocation Study may significantly alter these recommendations in the future.

Long Term Recommendation No. 1 – Construct a Raw Water Intake on the Deep River

The Deep River is Moore County's largest source of water, and is currently not utilized by any system owner in the County due to its proximity from the areas of high demand. However, McGill Associates believes that the Deep River is a source that will eventually need to be utilized to accommodate future population and water demands.

Short Term Recommendations No. 2, 3, and 4 of this report were to rehabilitate the existing Town of Robbins 1.5 MGD water treatment plant, install an interconnection between the Robbins system and the Seven Lakes system, and install an interconnection between the Seven Lakes and Foxfire water systems. Water obtained from Montgomery County (0.5 MGD future and 0.36 MGD existing) and the rehabilitated Robbins water plant (1.5 MGD) equate to a capacity of approximately 2.36 MGD to serve the areas in the western portion of Moore County.

Table 9-1 summarizes the maximum monthly water demand projections that have been generated in this report for the Robbins, Seven Lakes, and Foxfire water distribution systems. A graphical representation of the 2.36 MGD capacity and Table 9-1 is provided in Figure 9-9.

TABLE 9-1: Max Monthly Projection Summary for Western Moore County

Year	*Seven Lakes System (MGD)*	*Robbins System* (MGD)*	*Foxfire System (MGD)*	*Total (MGD)*
2006	**0.67**	**0.250**	**0.080**	**1.00**
2016	**0.94**	**0.284**	**0.114**	**1.34**
2026	**1.22**	**0.320**	**0.164**	**1.70**
2036	**1.47**	**0.354**	**0.237**	**2.06**
2046	**1.74**	**0.390**	**0.340**	**2.47**
2056	**2.02**	**0.425**	**0.489**	**2.93**

*Robbins includes Robbins CDBG System

FIGURE 9-9: Future Water Resources for Western Moore County

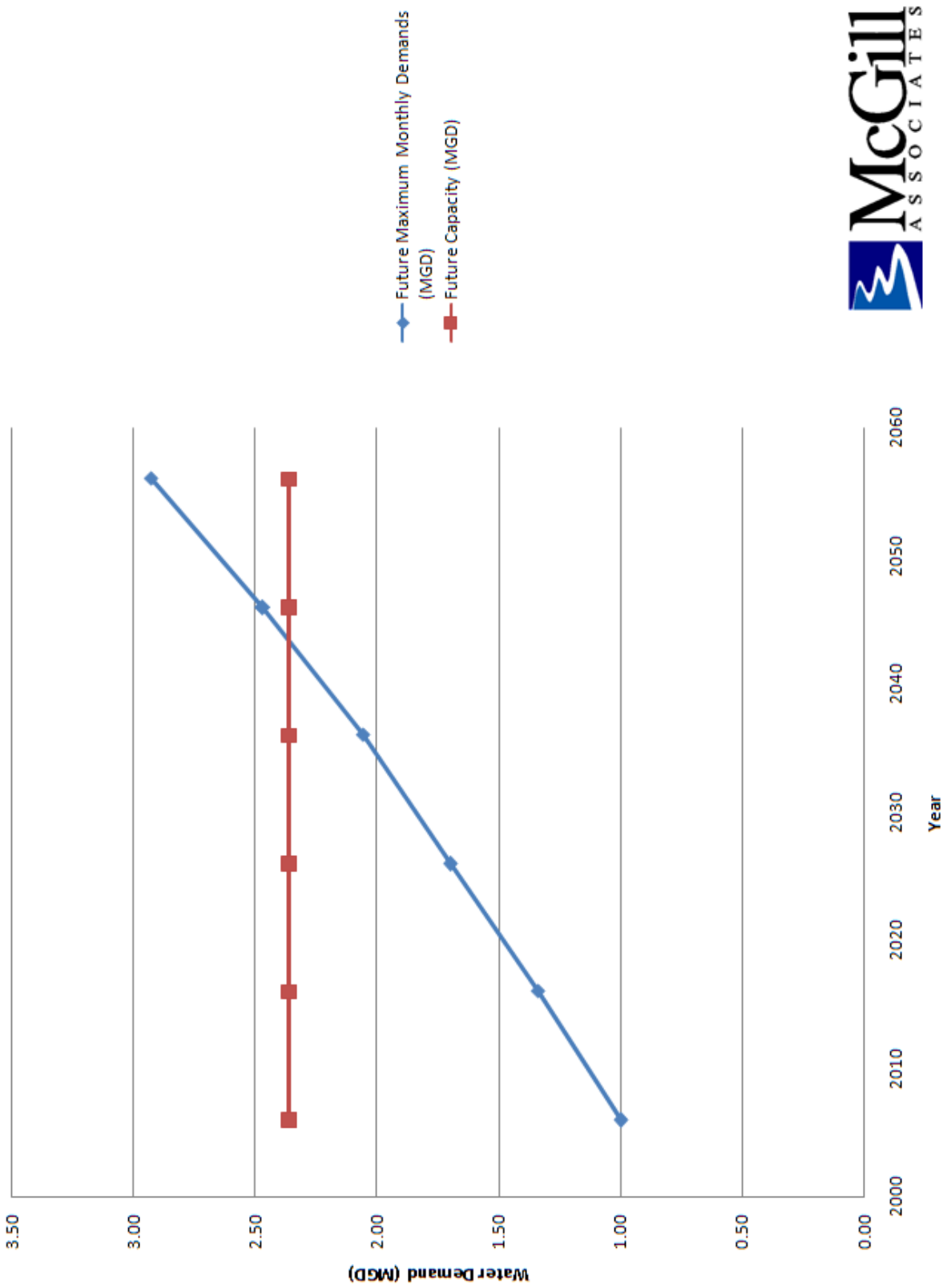


Figure 9-9 indicates that the 2.36 MGD future capacity for the western portion of Moore County will be adequate to supply maximum monthly demands to the area until approximately 2043. These numbers assume that Foxfire Village will connect to the MCPU Seven Lakes system and eliminate the use of their existing wells and that the North West Moore Water District will not be developed. If the North West District is developed in the future, additional water resources would likely be necessary before 2043.

In order to supply the additional capacity, Long Term Recommendation No. 1 is to construct a "run of river" intake on the Deep River and expand the capacity of the Robbins water treatment plant to 3.5 MGD. This would allow the County's most lucrative water source to be utilized in the northern and western portion of the county. Under current laws, any water not returned to the Deep River sub-basin would be subject to the State's current IBT regulations. The amount of water transferred outside of the basin (to Foxfire and portions of Seven Lakes) will therefore need to be monitored to comply with the IBT laws.

Water demand projections indicate that 85% of the plant capacity will be exceeded by approximately 2035. Proper planning will be necessary to ensure that the plant expansion will be constructed prior to exceeding the capacity.

Long Term Recommendation No. 2 – Increase Southern Pines WTP to 11.0 MGD

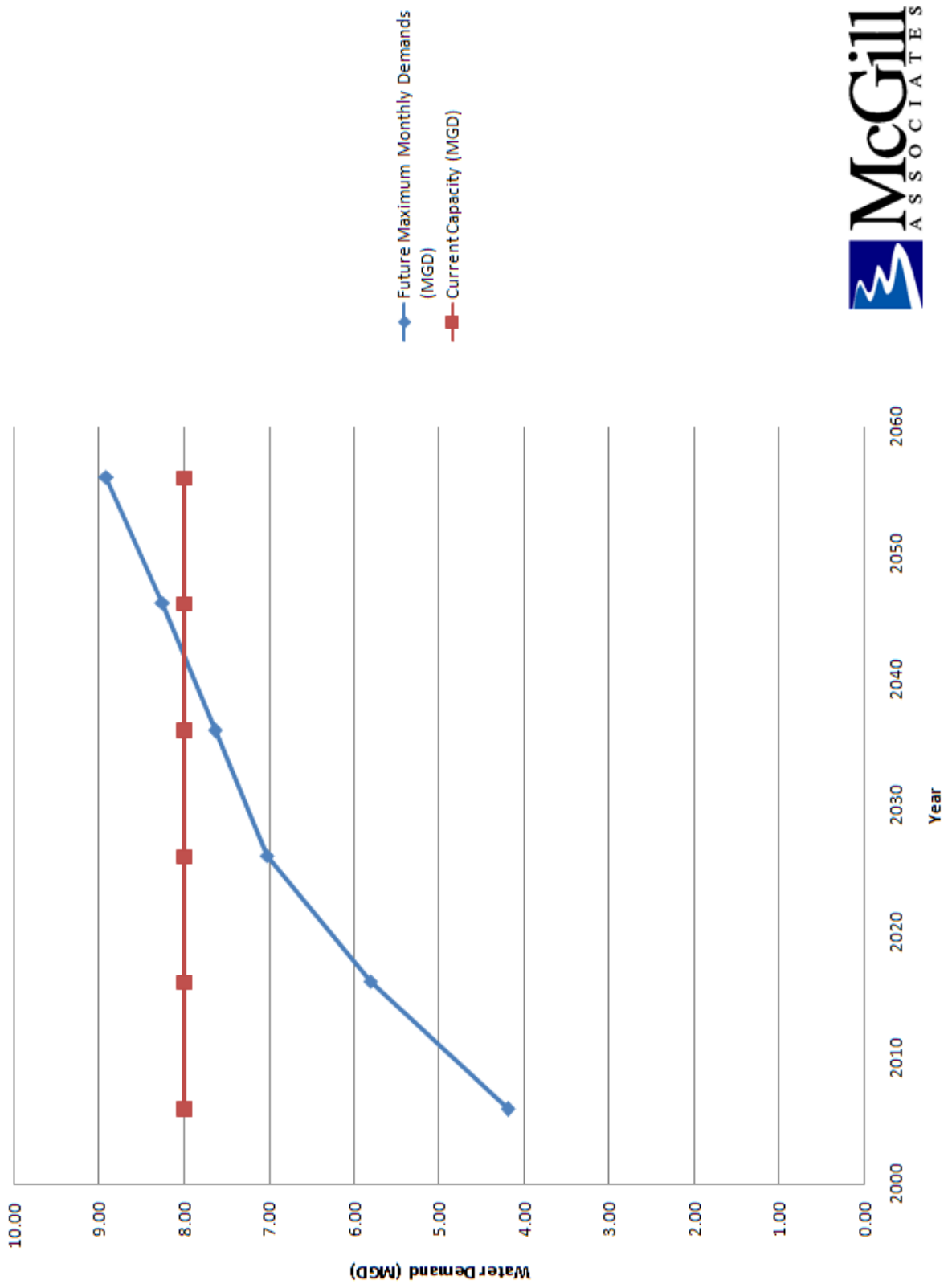
The Town of Southern Pines currently supplies water to the Town residents and several additional systems, including CWS, Camp Mackall, MCPU, and the Town of Pinebluff. Previous projections completed for this report (Table 3-12 and Figure 3-5) indicate that the Town's 8.0 MGD water treatment plant has remaining capacity to provide water to the Town and additional areas in the future. Furthermore, the Town's ability to supply reliable water during drought conditions will be significantly enhanced by the development of a 140 million gallon drought relief reservoir, due to the Drowning Creek's susceptibility to rainfall.

Long Term Recommendation No. 2 is to increase the permitted capacity of the Southern Pines water treatment plant to match the plant's hydraulic capacity of 11.0 MGD. It was previously recommended that a hydraulic "bottleneck" be corrected that will allow up to 1.0 MGD of water to be transferred from Southern Pines to Pinehurst. Table 9-2 provides the maximum monthly demands for each system currently served by Southern Pines and an increase to MCPU from 0.25 MGD to 1.0 MGD. Figure 9-10 shows a graphical analysis of these demands plus the current plan capacity of 8.0 MGD.

TABLE 9-2: Max Monthly Projection Summary for Town of Southern Pines

Year	*MCPU (MGD)*	*Southern Pines (MGD)*	*Camp Mackall (MGD)*	*CWS (MGD)*	*Oakwood Hills (MGD)*	*Total (MGD)*
2006	**0.25**	**3.45**	**0.033**	**0.350**	**0.010**	**4.09**
2016	**1.00**	**4.24**	**0.050**	**0.406**	**0.015**	**5.71**
2026	**1.00**	**5.37**	**0.074**	**0.464**	**0.023**	**6.93**
2036	**1.00**	**5.87**	**0.111**	**0.522**	**0.034**	**7.54**
2046	**1.00**	**6.36**	**0.167**	**0.580**	**0.051**	**8.16**
2056	**1.00**	**6.85**	**0.251**	**0.638**	**0.076**	**8.82**

FIGURE 9-10: Future Water Resources for Southern Pines



The information provided in Table 9-2 and Figure 9-10 project that the Town of Southern Pines water treatment plant will surpass 85% of its capacity during peak summer months by approximately 2026 if the Town increases sales to MCPU to 1.0 MGD. In addition, the plant is shown to surpass its entire 8.0 MGD capacity be approximately 2044. Revising the plant's rated capacity to 11.0 MGD will allow the Town to supply more water as needed in accordance with current regulations. Proper planning shall be performed to ensure that the increased capacity to 11.0 MGD is implemented prior to exceeding plant capacity.

Long Term Recommendation No. 3 – Partnership Between MCPU and Southern Pines

Long Term Recommendation No. 3 is that Moore County and the Town of Southern Pines form a long-term partnership in the interest of supplying water to Southern Pines and Pinehurst in the future. Water demand projections completed for this study indicate that the Town of Aberdeen may be forced to reduce or eliminate water sold to MCPU by approximately 2016 if additional supplies are not developed. As a result, MCPU may be required to increase purchased water quantities from Southern Pines to meet increasing demands.

A partnership between the two (2) units of government could include the following items.

- Increase sales from Southern Pines to MCPU from 250,000 GPD to 1.0 MGD
- Partner with the construction of future reservoirs to increase supplies and reliability of the water source
- Partner to expand the capacity of the Southern Pines water treatment plant to the current permitted maximum withdrawal from Drowning Creek of 14.0 MGD

A partnership between Southern Pines and Pinehurst is logical to comply with current IBT regulations. Since both entities discharge wastewater to the Lumber River basin, the long term goal of working together will allow both units of government to supply water to customers and comply with current laws. Specific projects will need to be determined as demands in each system continue to rise.

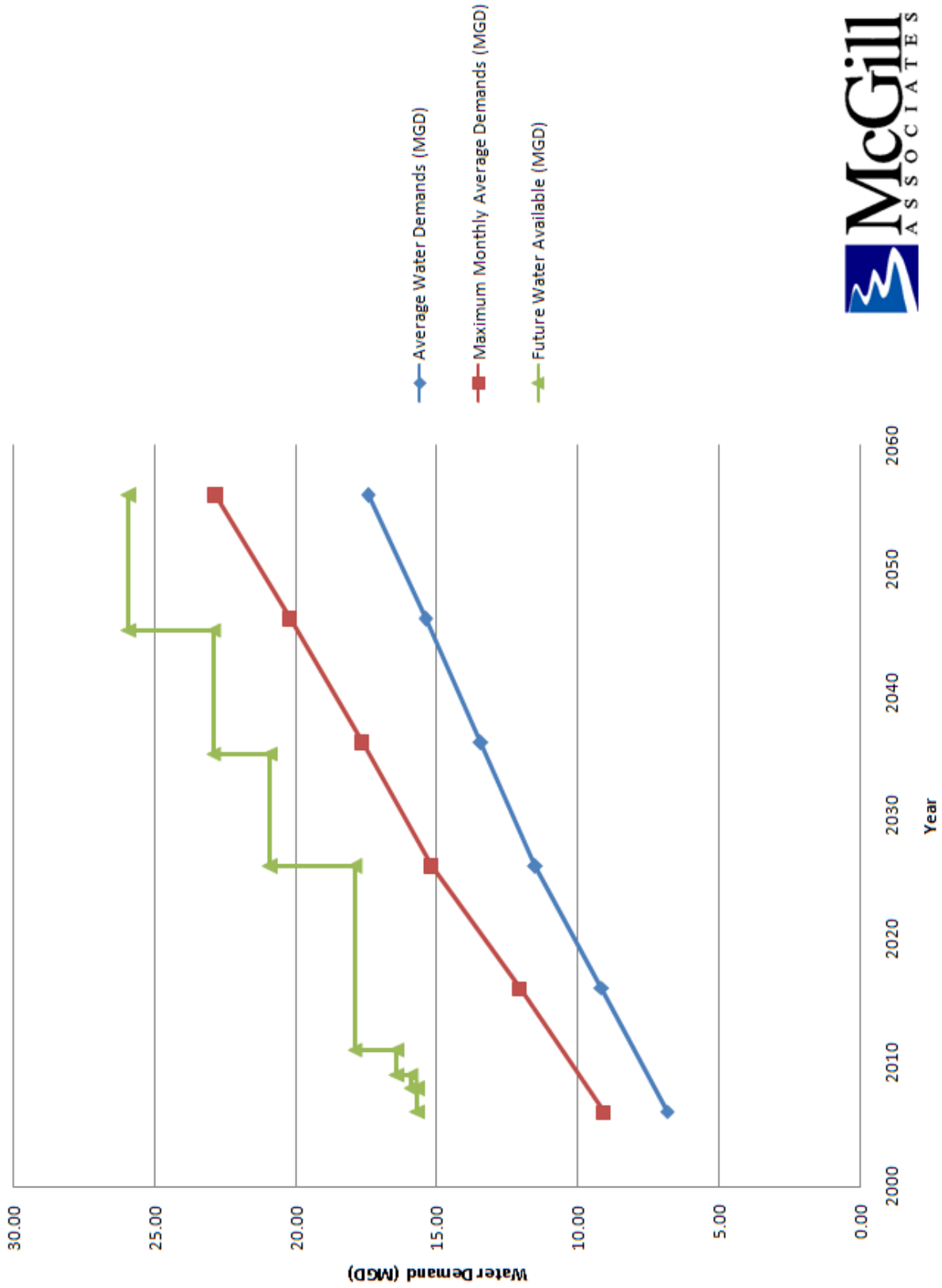
9.03 Summary and Conclusions

Figure 9-11 summarizes the water demand projections for the entire County as previously shown in Figure 3-12, with additional supplies shown for the future as described in the report. Future supplies include:

- 0.22 MGD in 2008 for wells 5A and 9 in the MCPU Pinehurst system
- 0.5 MGD from Montgomery County in 2009
- 1.5 MGD from the rehabilitated Robbins water treatment plant in 2011
- 3.0 MGD of additional capacity in the Southern Pines water treatment plant in 2026 (increased capacity to 11.0 MGD)
- 2.0 MGD intake on the Deep River in 2035
- 3.0 MGD of additional capacity in Southern Pines water treatment plant in 2045 (increased capacity to 14.0 MGD)

Due to the unpredictable nature of future groundwater resources in Moore County, Figure 9-11 assumes no net increase or decrease in water supplied by municipal wells except for wells 5A and 9. The location of additional groundwater resources has been encouraged in this study and will further increase water resources available to system owners. Conversely, future wells that are removed from service due to radium and other contamination issues would reduce the overall water available to system owners.

FIGURE 9-11: Future Water Demands and Supplies – Moore County, North Carolina



SECTION 10.0 FINANCIAL EVALUATION

Introduction

As part of McGill Associates' requested scope of services on this project, we have examined Moore County's existing Public Utilities fund rates, reviewed CIP, and projected the financial impact that the recommended projects would have on the Public Utilities fund and its users. This financial analysis has been performed by Martin-McGill, Inc.

In preparing this analysis, certain assumptions were made with respect to future conditions. While these assumptions are reasonable for the purposes of this study, they are dependent upon future events and actual conditions may differ from those assumed. In addition, information has been used and relied upon which has been provided by others. This information includes, but is not limited to, audited financial statements, annual operating budgets, capital improvement projects plans, and customer billing information. While this information is deemed reliable, the information has not been independently verified and no assurances are offered with respect thereto. To the extent that actual future conditions differ from those assumed herein or provided by others, the actual results may differ from those forecasted.

Revenue Requirement

The yearly required revenue for the MCPU fund is comprised of all the expenditures necessary to ensure consistent, quality water and sewer service to all users. These expenditures ensure proper operation and maintenance of equipment, development and perpetuation of the system, and maintenance of the utilities' financial integrity. These cost components can be divided into the following categories:

- Salaries and Benefits
- Operations and Maintenance
- Repairs and Maintenance
- Debt Service
- Capital Outlay

The total of all the above items is the required revenue for the County's Public Utilities fund as shown in the following table for the last audited fiscal year, FY 2007:

TABLE 10-1: Moore County Public Utilities Fund Revenue Requirement

CATEGORY	FY 2007 COST
Salaries and Benefits	$ 1,833,197
Operations and Maintenance	$ 3,016,630
Repairs and Maintenance	$ 488,008
Debt Service	$ 804,343
Capital Outlay	$ 3,493,645
REVENUE REQUIREMENT	$ 9,635,823

The total water and sewer costs represent the system revenue requirements. The water revenue requirement includes the operation and maintenance costs associated with water treatment, purchases, testing, flushing, and transmission, debt service and capital outlays paid for improvements to the water distribution system. The sewer revenue requirement includes the operation and maintenance costs associated with sewer collection, debt service and capital outlays paid for improvements to the sewer system. A summary of the funds for each system are provided in Table 10-2.

TABLE 10-2: MCPU Fund FY 2007 Cost Allocation of Water and Sewer

REVENUES			EXPENDITURES		
			SALARIES AND BENEFITS	1,063,254	
WATER FEES	3,618,879		OPERATIONAL EXPENDITURES	1,373,157	
TAP FEES	282,523		BULK WATER	648,000	
IMPACT FEES	310,654		PROFESSIONAL FEES	559	
INVESTMENTS	134,327		REPAIRS AND MAINTENANCE	283,045	
OTHER	235,034		CAPITAL OUTLAY	1,909,874	
TRANSFERS (IN)	324,500		DEBT	441,654	
WATER SUBTOTAL	**4,905,916**	**58.96%**	**WATER SUBTOTAL**	**5,719,542**	**59.36%**
WASTEWATER FEES	2,195,007				
WWTP MANAGEMENT FEE	117,000		SALARIES AND BENEFITS	769,943	
TAP FEES	282,523		OPERATIONAL EXPENDITURES	994,355	
IMPACT FEES	310,654		PROFESSIONAL FEES	559	
INVESTMENTS	134,327		REPAIRS AND MAINTENANCE	204,963	
OTHER	51,230		CAPITAL OUTLAY	1,583,771	
TRANSFERS (IN)	324,500		DEBT	362,690	
SEWER SUBTOTAL	**3,415,240**	**41.04%**	**SEWER SUBTOTAL**	**3,916,281**	**40.64%**
TOTAL REVENUES	**8,321,155**	**100.00%**	**TOTAL EXPENDITURES**	**9,635,823**	**100.00%**

The revenues generated from water and sewer users should meet or exceed the respective revenue requirements in order to avoid funding by others. Neither water nor sewer users are subsidizing each other because the percentage of total revenues generated from water users is 59%, which matches the percentage of expenditures related to water service. Likewise, the percentage of total revenues generated from sewer users is 41%, which matches the percentage of expenditures related to sewer service. However, due to large capital outlays in FY 2007, both water and sewer revenues were less than their respective expenditures by a total of $1.3 million.

Financial Analysis

In conducting the financial analysis, Martin-McGill gathered Moore County's audited financial statements from FY 2002 through FY 2007 along with the Year-To-Date and budget figures for FY 2008 and FY 2009 respectively. Capital outlays were separated to ensure the figures used for projections were consistent with prior years. Historical trends for each of the line items were analyzed to anticipate how each revenue and expenditure would change over the next ten (10) years. After calculating the growth trends, Martin-McGill projected that revenues would grow by 3% annually. Regarding expenditures, it was projected that salaries and benefits would grow by an average annual rate of 5%, operational expenditures would grow by an average annual rate of 4%, and Professional Fees and Repairs and Maintenance would grow by an average annual rate of 3%.

Capital Improvements Plan

The CIP reflects proposed or planned water capital improvements for the next ten (10) years. A copy of this plan is provided in Appendix C. The plan includes sixteen (16) projects for administration, nineteen (19) projects for water, and seven (7) projects for sewer collection. The cost of the projects total approximately $31 million.

Due to the financial hardships that these projects would place upon the fund, the analysis assumes that each improvement is planned to be paid either by a capital outlay in a specific fiscal year or by debt resulting in an annual debt service payment. The projected yearly spending exceeds $2 million during some years, which may place excessive pressure upon the enterprise fund's budget. The largest projects include:

- $5,550,380 for Old Town sewer rehabilitation.
- $4,004,010 for lift station repairs and upgrades.
- $3,600,000 for Robbins to Seven Lakes water interconnect.
- $2,750,000 for Montgomery County to Seven Lakes water interconnect.

Debt Service Requirements

The Public Utilities fund had four (4) outstanding debt obligations in FY 2007. All four (4) of the debts are installment loans, three (3) assumed from Moore County Water and Sewer Authority and one (1) issued by the County. The debts financed water and sewer lines in Seven Lakes and Pinehurst, the Central Office, and the Cannon Park Tower. Two (2) of the debts mature in FY 2010 and FY 2011 while the remaining two (2) debts mature in FY 2014 and FY 2018. Each of the debt obligations and their total yearly payments over the next ten (10) years are shown in the Debt Service Summary provided in Appendix C.

In order to maintain a positive net income with large capital improvement projects, the analysis assumes that funds will be acquired by borrowing capital. The remaining yearly capital requirements over the next ten (10) years will be paid by annual capital outlays that range from

$250,000 in FY 2013 to $2,144,506 in FY 2009. The planned method to finance the improvements in the CIP is shown in Table 10-3.

TABLE 10-3: Moore County Public Utilities Fund Proposed Debt Packages

YEAR	TYPE	PRINCIPAL	YEARLY PAYMENT	RATE	TERM (YEARS)
2009	160A-20 & REVENUE BONDS	$ 15,890,000	$ 1,566,642	5.5%	15
2010	160A-20	$ 2,777,352	$ 221,278	5%	20
2012	160A-20	$ 3,600,000	$ 311,489	6%	20

When including the debt package into the combined financial analysis, we concluded that net income would remain positive over at least seven (7) of the next ten (10) years. The impact on the fund is shown in the Financial Analysis provided in Appendix C. As discussed next, the proposed rate increases over the next ten (10) years are high enough to yield feasible operations for the entire enterprise fund, yet not so high as to create excessive cumulative balances of unrestricted net assets. An unrestricted net assets to total expenditures ratio of 20-25% is deemed minimal for an enterprise fund and a higher level is desirable to meet future contingencies.

Water and Sewer Rate Review

The County recently changed its water and sewer rates and charges in FY 2009 to generate more revenue for the program. The changes include higher fixed rates, two (2) additional residential usage blocks, and the creation of new rates for sewer, commercial, and irrigation users. The proposed rate structure will shift much of the responsibility of financing the program toward high volume and commercial users while not changing the charges paid by residential, low-usage water customers. High volume residential users and most commercial users connected to the County's system utilize more of the system's capacity because they have larger meters and greater flows. As a result, more infrastructure and program costs must be devoted to serving the needs of a these users. Table 10-4 shows the FY 2008 and FY 2009 rates.

TABLE 10-4: Moore County Public Utilities Fund FY 2008 and FY 2009 Rates

	2008	2009
VOLUME RATES		
Water		
Residential		
0 - 2,000 VOLUME CHARGE	$3.05	$3.05
2,001 - 4,000 VOLUME CHARGE	$3.05	$4.00
4,001 - 8,000 VOLUME CHARGE	$3.55	$4.60
8,001 - 12,000 VOLUME CHARGE	$4.30	$5.00
> 12,000 VOLUME CHARGE	$4.30	$7.00
Irrigation		
0 - 4,000 VOLUME CHARGE		$4.60
> 4,000 VOLUME CHARGE		$7.00
Commercial		
0 - 4,000 VOLUME CHARGE	$3.05	$4.10
4,001 - 8,000 VOLUME CHARGE	$3.55	$4.80
> 8,000 VOLUME CHARGE	$4.30	$5.80
Bulk		
0 - 4,000 VOLUME CHARGE	$5.70	$5.70
> 4,000 VOLUME CHARGE	$4.80	$4.80
Sewer		
Residential		
0 - 2,000 VOLUME CHARGE	$3.05	$3.65
2,001 - 4,000 VOLUME CHARGE	$3.05	$4.60
4,001 - 8,000 VOLUME CHARGE	$3.55	$5.20
8,001 - 12,000 VOLUME CHARGE	$4.30	$5.60
> 12,000 VOLUME CHARGE	$4.30	$7.60
Commercial		
0 - 4,000 VOLUME CHARGE	$3.05	$4.70
4,001 - 8,000 VOLUME CHARGE	$3.55	$5.40
> 8,000 VOLUME CHARGE	$4.30	$6.40
MONTHLY BASE RATES FOR WATER, SEWER, IRRIGATION		
METER SIZE		
0.75	$4.55	$6.10
1	$5.75	$7.70
1.5	$7.35	$9.85
2	$11.90	$15.95
3	$45.00	$60.30
4	$57.30	$76.80
6	$85.90	$115.10
BULK WATER BASE RATE	$138.20	$138.20
FIRE PROTECTION 4 IN BASE RATE	$3.00	$3.00
FIRE PROTECTION 6 IN BASE RATE	$4.55	$4.55
FIRE PROTECTION 8 IN BASE RATE		$6.42

As a result of our analysis of the fund's financial trends and future capital needs, we have modeled the following water and sewer revenue increases for the next ten (10) years. These increases would only affect usage charges and not tap or impact fees. These two revenue increases are arranged in time to minimize the impact to most users yet maintain fund solvency, as shown below.

- 2% water and 10% sewer revenue increase in FY 2010.
- 2% water and 10% sewer revenue increase in FY 2012.

The following illustrates a rate schedule that generates the above revenue increases. The schedule maintains the structure proposed by the County for FY 2009 and closely maintains water/sewer equity. The rate schedule and charges for four (4) sample users are shown in Tables 10-5 and 10-6.

TABLE 10-5: Moore County Public Utilities Fund FY 2008 – FY 2012 Rates

	2008	2009	2010	2012
VOLUME RATES				
Water				
Residential				
0 - 2,000 VOLUME CHARGE	$3.05	$3.05	$3.15	$3.25
2,001 - 4,000 VOLUME CHARGE	$3.05	$4.00	$4.10	$4.20
4,001 - 8,000 VOLUME CHARGE	$3.55	$4.60	$4.70	$4.80
8,001 - 12,000 VOLUME CHARGE	$4.30	$5.00	$5.10	$5.25
> 12,000 VOLUME CHARGE	$4.30	$7.00	$7.15	$7.30
Irrigation				
0 - 4,000 VOLUME CHARGE		$4.60	$4.70	$4.80
> 4,000 VOLUME CHARGE		$7.00	$7.15	$7.30
Commercial				
0 - 4,000 VOLUME CHARGE	$3.05	$4.10	$4.20	$4.30
4,001 - 8,000 VOLUME CHARGE	$3.55	$4.80	$4.90	$5.00
> 8,000 VOLUME CHARGE	$4.30	$5.80	$5.95	$6.10
Bulk				
0 - 4,000 VOLUME CHARGE	$5.70	$5.70	$5.85	$6.00
> 4,000 VOLUME CHARGE	$4.80	$4.80	$4.90	$5.00
Sewer				
Residential				
0 - 2,000 VOLUME CHARGE	$3.05	$3.65	$4.05	$4.50
2,001 - 4,000 VOLUME CHARGE	$3.05	$4.60	$5.10	$5.65
4,001 - 8,000 VOLUME CHARGE	$3.55	$5.20	$5.75	$6.35
8,001 - 12,000 VOLUME CHARGE	$4.30	$5.60	$6.20	$6.85
> 12,000 VOLUME CHARGE	$4.30	$7.60	$8.40	$9.25
Commercial				
0 - 4,000 VOLUME CHARGE	$3.05	$4.70	$5.20	$5.75
4,001 - 8,000 VOLUME CHARGE	$3.55	$5.40	$5.95	$6.55
> 8,000 VOLUME CHARGE	$4.30	$6.40	$7.05	$7.80
MONTHLY BASE RATES FOR WATER, SEWER, IRRIGATION				
METER SIZE				
0.75	$4.55	$6.10	$6.45	$6.80
1	$5.75	$7.70	$8.10	$8.55
1.5	$7.35	$9.85	$10.35	$10.90
2	$11.90	$15.95	$16.75	$17.60
3	$45.00	$60.30	$63.35	$66.55
4	$57.30	$76.80	$80.65	$84.70
6	$85.90	$115.10	$120.90	$126.95
BULK WATER BASE RATE	$138.20	$138.20	$141.00	$143.85
FIRE PROTECTION 4 IN BASE RATE	$3.00	$3.00	$3.10	$3.20
FIRE PROTECTION 6 IN BASE RATE	$4.55	$4.55	$4.65	$4.75
FIRE PROTECTION 8 IN BASE RATE		$6.42	$6.55	$6.70

TABLE 10-6: Moore County Public Utilities Fund FY 2008 – FY 2012 Charges

MONTHLY CHARGES	2008	2009	2010	2012
RESIDENTIAL 4,000 GALLONS (3/4-IN METER)	$33.50	$42.80	$45.70	$48.80
RESIDENTIAL 10,000 GALLONS (3/4-IN METER)	$79.10	$103.20	$110.10	$117.60
COMMERCIAL 10,000 GALLONS (1-IN METER)	$81.50	$115.80	$123.20	$131.30
COMMERCIAL 50,000 GALLONS (1-IN METER)	$425.50	$603.80	$643.20	$687.30

Conclusions

As in FY 2007, the fund is not expected to generate enough revenue to pay for its operating costs in FY 2008. If left unchanged, this financial position will likely deteriorate as a result of increasing operating costs that exceed revenues and planned capital costs. In addition, the costs associated with the planned WPCF upgrade will have a substantial impact on the fund. Though the cost of the project will be realized in the Wastewater Treatment fund, the debt service will be paid by groups that use its service, including the Public Utilities fund. Any change to the project's approach, timing, or cost can greatly affect the fund. Below are the WWTP assumptions for this study:

- The Public Utilities fund will pay a prorated share of the debt payments based on sewer flow, which is assumed to be 40%.
- Debt issuances are assumed to begin in FY 2010 of $15 million that will increase to $45 million by FY 2012.
- The cost and term of the debt are assumed to be 5% over 20 years.

New revenues are projected through rate increases in fiscal years 2009, 2010, and 2012 for the program to operate profitably with the aforementioned expenses and to grow. In doing so, the Unrestricted Net Assets balance will remain healthy and the fund will remain fiscally sound. However, since any significant change in rates can affect demand in unpredictable ways, it is recommended that the impact of the new charges in FY 2009 be re-assessed in 12 months following implementation with adjustments made as necessary in the future.

SECTION 11.0 IMPLEMENTATION STRATEGY

This Water Source Evaluation and Plan is the first phase of a multi-step process to increase water resources in Moore County. In order to proceed with the recommendations provided, a strategy must be implemented to fully execute and develop each capital improvement project. Typically, projects of this nature are implemented in the following four (4) major phases:

1. Planning
2. Project Financing
3. Engineering Design
4. Construction

Phase 1 – Planning

The first step in the planning phase has been completed by establishing a POG and preparing this Water Source Evaluation and Plan. In addition, the Moore County Summit (a joint effort of the Moore County Chamber of Commerce, Pinehurst Civic Group, and Pilot newspaper) has recently recommended the creation of a Local Water Task Force comprised of representatives from all units of local government and key representatives from the community.

The purpose of this group is to foster cooperation between local governments and discuss key issues related to future water resources in Moore County. The Task Force intends to meet on a regular basis and is an important step in the planning phase.

An additional step in the planning process is to develop new or revise existing intergovernmental agreements related to water sales and purchases, or partnerships between units of government. To implement the recommendations in this study, cooperation between numerous local governments will be necessary, including:

- Montgomery County and Moore County
- Town of Robbins and Moore County

- Foxfire Village and Moore County
- Town of Southern Pines and Moore County
- Town of Pinebluff and Town of Southern Pines
- Town of Cameron and City of Sanford

These units of governments should meet during the planning phase of the project to clearly identify the components needed to execute agreements, create partnerships, and develop the necessary infrastructure improvements.

Phase 2 – Project Financing

Determining the most economical method to fund capital improvement projects is a key component in water resource planning. Numerous funding agencies are in existence that offer financial assistance (grants and/or low interest loans) to units of government for projects that are similar to those identified in this study.

The Town of Robbins recently received a grant from the North Carolina Rural Economic Development Center that will help fund the water treatment plant evaluation described in Recommendation #2. Additional projects identified in this report also appear to be eligible for grant funding if a "critical health need" can be identified. The existence of contaminated wells in many water systems can assist in achieving this need.

All system owners are strongly encouraged to explore the various funding assistance programs in place to obtain grant or low interest loan funding for future infrastructure improvements when eligible.

Phase 3 – Engineering Design

The engineering design phase of a project involves the generation of technical documents necessary to move the project towards construction. Within this phase, numerous tasks must be completed, including:

- Preliminary Site Analysis and Engineering

- Topographical Surveying
- Development of Plans and Specifications
- Securing Permits from Regulatory Agencies
- Easement Acquisition
- Finalizing Cost Estimates
- Bidding and Award

Many funding agencies have specific requirements that must be followed during the design phase to qualify for funding programs. It is therefore essential to obtain a working knowledge of these programs and their specific requirements to ensure that the project is appropriately designed, permitted, and approved.

Phase 4 – Construction

Once the lowest responsive, responsible bidder has been selected, construction of the project can begin. As with the engineering design phase, the construction phase includes numerous tasks, including:

- Preparation of Contract Documents
- Pre-Construction Conference with the contractor
- Monthly progress meetings
- Shop Drawing Review
- Administration of loan and grant programs
- Construction field observation
- Final inspection
- Preparation of Record drawings
- Final engineering certifications
- Warranty inspections and implementation

In conclusion, the development of additional water resources in Moore County is a multi-phased process that requires a substantial amount of time and effort to implement. The County and its

municipalities have wisely taken the first step in this process by preparing this study, and should continue with the planning phase and additional phases to ensure that the residents of the County continue to have safe and reliable sources of drinking water.

APPENDICES

APPENDIX A

INTER-BASIN TRANSFER CORRESPONDENCE

McGill
ASSOCIATES

October 5, 2007

Mr. Tom Fransen
River Basin Management Section Chief
North Carolina Division of Water Resources
1611 Mail Service Center
Raleigh, North Carolina 27699-1611

RE: Water Source Evaluation and Plan
Moore County, North Carolina

Dear Mr. Fransen:

I would like to thank you and your staff for taking the time to meet with Forrest Westall and me last week to discuss the Water Source Evaluation and Plan that McGill Associates is currently completing for Moore County. The purpose of our meeting was to discuss the current laws regarding inter-basin transfers (IBTs) of water between river basins and the impacts that the recently ratified House Bill 820 has on the IBT process. As we discussed at the meeting, Moore County is unique in that it is located within three (3) of the state's river "sub-basins" (the Cape Fear, Deep, and Lumber River sub-basins), and the location of these sub-basins plays a critical role in future water planning.

One of the topics that we are evaluating in our report is the potential to obtain water from neighboring counties to Moore County. During our meeting, we presented you and your staff with several potential scenarios regarding water transfers from other entities, and asked for an opinion as to whether an IBT certificate would be necessary in each scenario. As requested, this letter will summarize each scenario and includes a sketch of each scenario that will supplement the map that was provided to your office prior to the meeting.

The following alternatives summarize the scenarios presented at our meeting.

Alternative No. 1 – Purchase From Montgomery County

Montgomery County borders Moore County to the west, and owns a 6.0 million gallon per day (MGD) intake and water treatment plant along Lake Tillery in the Yadkin River sub-basin. Montgomery County currently sells water to three (3) separate municipalities (the Towns of Robbins, Star, and Candor) that discharge wastewater into the Deep River sub-basin. Montgomery County estimates that sales to these three (3) systems will average 0.526 MGD by 2030.

McGill Associates, P.A. • 6 Regional Drive, Suite D, Pinehurst, NC 28374
910-295-3159 • Fax: 910-295-3647

One of the scenarios that we are evaluating in our study is the potential to supply water from Montgomery County to the Moore County Seven Lakes water distribution system and the Foxfire Village water distribution system located in Moore County. The Seven Lakes community is located in and discharges wastewater to three (3) river sub-basins (the Deep, Cape Fear, and Lumber River sub-basins) and Foxfire Village is located in and discharges wastewater to the Lumber River sub-basin.

A schematic of the existing water systems, source sub-basins, and discharge sub-basins is shown in the attached Figure 1. Based on the information shown in Figure 1, we have the following questions regarding the transfer of water from Montgomery County.

1. Does the water that Montgomery County sells to the Towns of Star, Robbins, and Candor impact the amount of water that Moore County can purchase from Montgomery County without an IBT certificate for the portion of the Seven Lakes water system located in the Deep River sub-basin?

2. Does the water that Montgomery County sells to the Towns of Star, Robbins, and Candor impact the amount of water that Moore County can purchase from Montgomery County without an IBT certificate for the portion of the Seven Lakes water system located in the Lumber or Cape Fear sub-basins?

3. Does the water that Montgomery County sells to the Towns of Star, Robbins, and Candor impact the amount of water that Foxfire Village can purchase without an IBT certificate?

4. Do future sales from Montgomery County to the Moore County Seven Lakes system impact the amount of water that Foxfire Village can purchase without an IBT certificate?

5. Since the Seven Lakes community is located in three (3) separate river sub-basins, would it be possible to construct one pipe from Montgomery County to Seven Lakes, transfer 6.0 MGD through the line, and distribute 2.0 MGD to each of the Seven Lakes communities without an IBT certificate?

Alternative No. 2 – Purchase From Harnett County and City of Sanford

Harnett County borders Moore County to the east, and owns an 18.0 MGD intake and water treatment plant along the Cape Fear River. Harnett County currently sells water to numerous entities, including the East Moore Water District, which currently serves rural areas in the eastern portion of Moore County. Nearly all of the water provided from Harnett County to the East Moore area is currently discharged into the source sub-basin (Cape Fear).

In addition to serving its own customers, the East Moore Water District sells water to the Moore County Vass water distribution system. All water sold to the Vass system is currently returned to the source basin (Cape Fear) either via subsurface septic systems or as a surface water discharge at the 60,000 GPD Vass Wastewater Treatment Plant (WWTP). Moore County has previously considered abandoning the Vass WWTP and constructing a lift station to transfer the flow to the County's 6.7 MGD Water Pollution Control Facility (WPCF), which discharges treated effluent to the Aberdeen Creek in the Lumber River basin.

Construction is underway on a project that will substantially expand the service area of the East Moore Water District. Once complete, water will be transferred from Harnett County to rural areas in the Deep River sub-basin, and to the Moore County Pinehurst system, which discharges wastewater to the Lumber sub-basin. Current plans are to limit the transfer to the Pinehurst system to approximately 1.0 MGD.

The City of Sanford is located in Lee County, which borders Moore County to the northeast, and has expressed an interest in providing water to Moore County in the future. The City owns a 12.0 MGD intake and water treatment plant that obtains and treats water from the same source as Harnett County (the Cape Fear River). Sanford currently does not provide water to any system located in Moore County.

Furthermore, the Town of Carthage is located within Moore County and owns a 1.0 MGD intake and water treatment plant that obtains and treats water from Nicks Creek. This source is located in the same sub-basin (Cape Fear) as the Harnett County and Sanford sources. Water consumed within the system is treated at the Moore County Wastewater Treatment Plant, located in the Lumber River sub-basin.

A schematic of the existing water systems, source sub-basins, and discharge sub-basins is shown in the attached Figure 2. Based on the information shown in Figure 2, we have the following questions regarding the transfer of water from Harnett County and the City of Sanford.

1. Can Moore County obtain up to 2.0 MGD from Harnett County and 2.0 MGD from the City of Sanford (total of 4.0 MGD) and discharge the wastewater into the Lumber River sub-basin without needing to obtain an IBT certificate?

2. Does the fact that the Town of Carthage currently transfers water from the Cape Fear sub-basin to the Lumber River sub-basin impact the amount of water that Moore County can transfer from the Cape Fear to the Lumber without obtaining in IBT certificate?

3. Does the amount of water transferred from Harnett County into the Deep River sub-basin impact the amount of water that can be transferred from Harnett County into the Lumber River sub-basin without obtaining an IBT certificate?

4. If Moore County elects to abandon the Vass WWTP in the future and transfer the wastewater generated in Vass to the WPCF in the Lumber basin, does this impact how

much water can be transferred from Harnett County to the Moore County Pinehurst system without an IBT certificate?

Mr. Fransen, I would like to thank you again for your attention to this important matter, and we look forward to your responses to the questions above. Once you have had a chance to review this information, we would be happy to meet with you and your staff again in Raleigh to discuss these topics further.

In the meantime, if you have any questions or comments related to this letter, please feel free to contact me at 910-295-3159.

Sincerely,

MCGILL ASSOCIATES, P.A.

Michael S. Apke

MICHAEL S. APKE, P.E.
Project Manager

Enclosures

Cc: Cary McSwain, County Manager
Dennis Brobst, Public Works Director
Ben Vaughn, P.E., Moore County Public Utilities
Lex Kelly, P.E., Moore County Public Utilities
David White, Town of Southern Pines
Don Rayno, Division of Water Resources
Phil Fragapane, P.E., Division of Water Resources
Forrest Westall, P.E., McGill Associates
Andy Lovingood, P.E. McGill Associates

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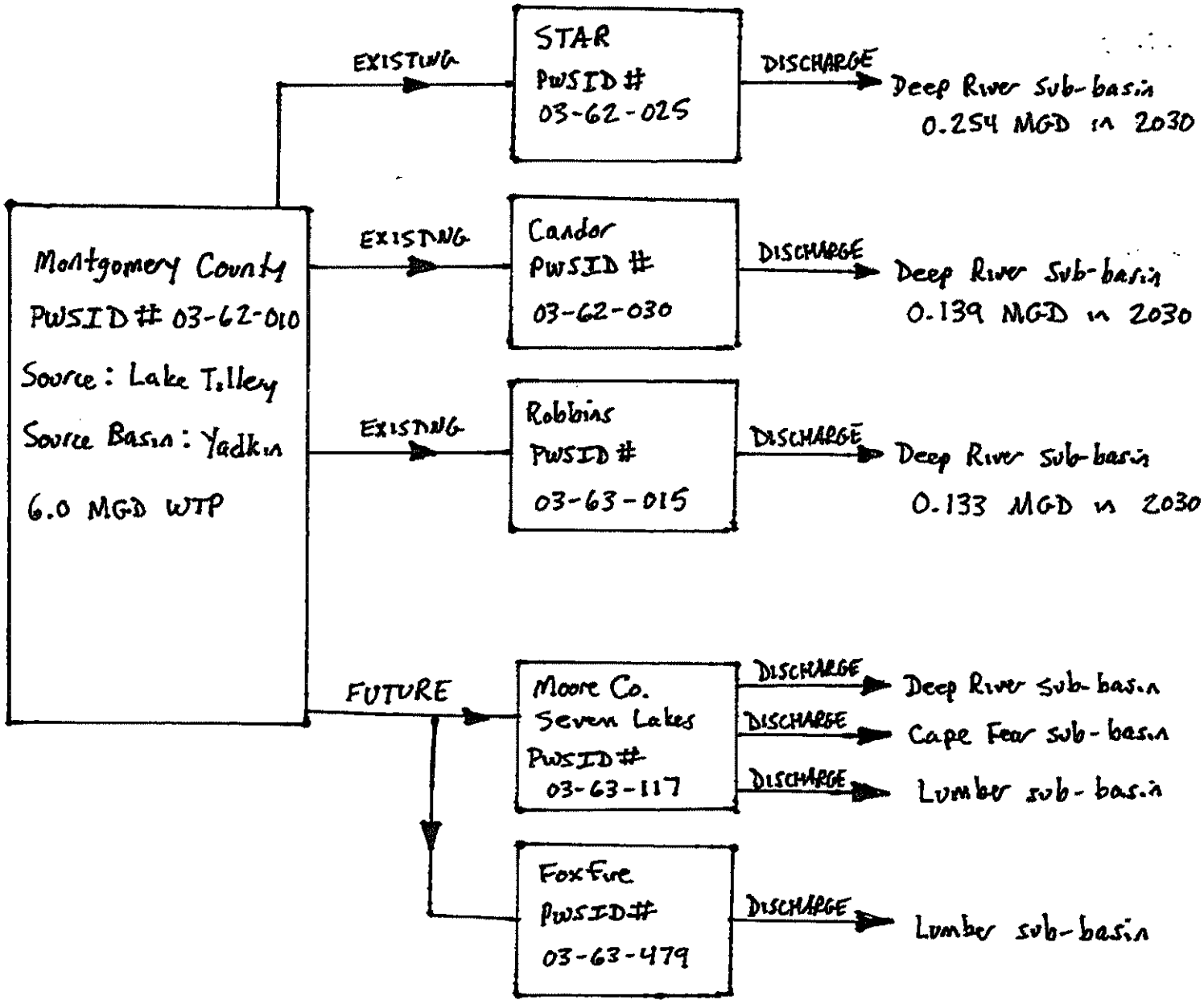
Montgomery County
PWSID # 03-62-010
Source: Lake Tillery
Source Basin: Yadkin
6.0 MGD WTP
EXISTING
STAR
PWSID #
03-62-025
DISCHARGE
Deep River sub-basin
0.254 MGD in 2030
EXISTING
Candor
PWSID #
03-62-030
DISCHARGE
Deep River sub-basin
0.139 MGD in 2030
EXISTING
Robbins
PWSID #
03-63-015
DISCHARGE
Deep River sub-basin
0.133 MGD in 2030
FUTURE
Moore Co.
Seven Lakes
PWSID #
03-63-117
DISCHARGE
Deep River sub-basin
DISCHARGE
Cape Fear sub-basin
DISCHARGE
Lumber sub-basin
FoxFire
PWSID #
03-63-479
DISCHARGE
Lumber sub-basin

FIGURE 1

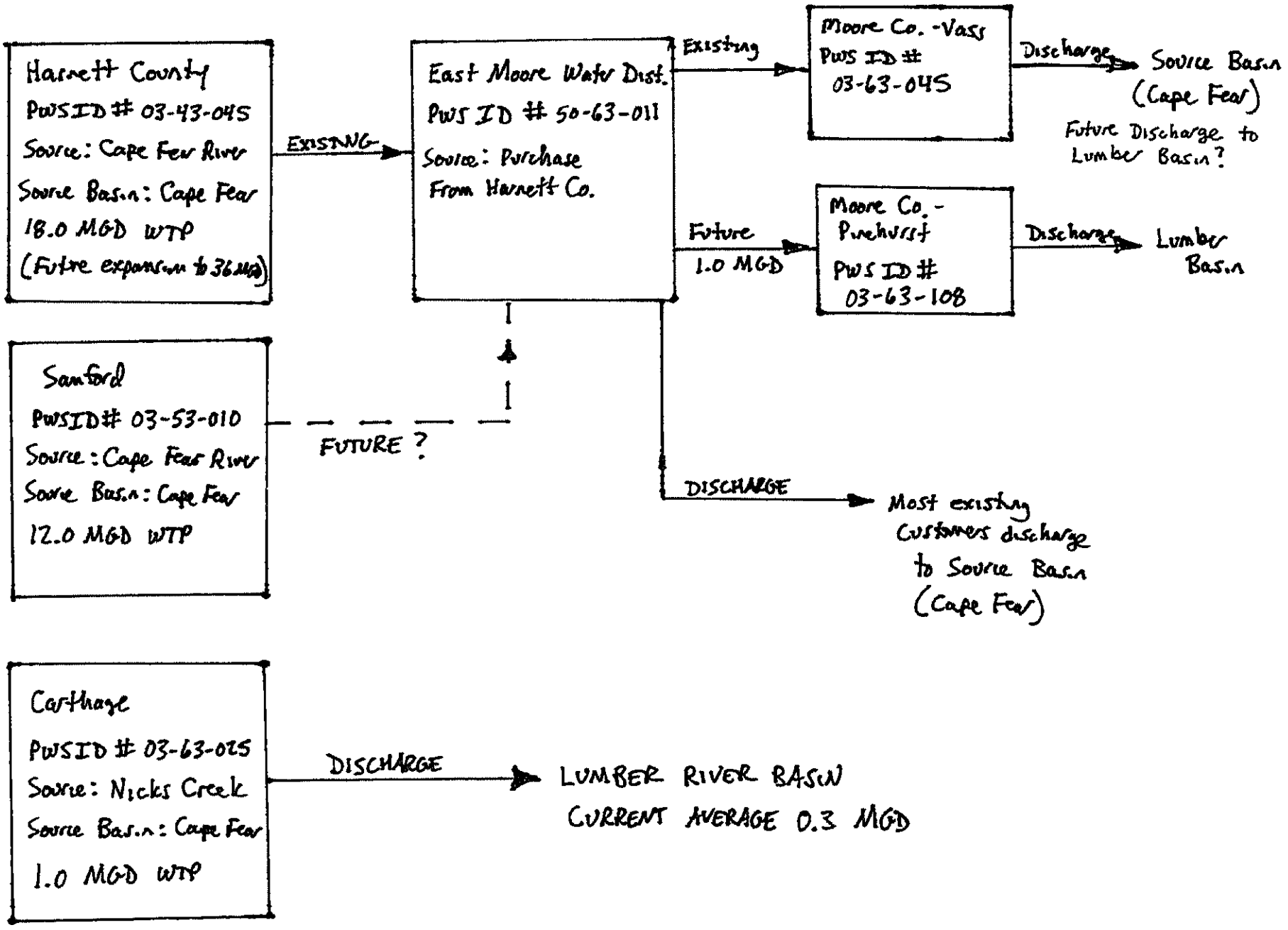
Harnett County
PWSID # 03-43-045
Source: Cape Fear River
Source Basin: Cape Fear
18.0 MGD WTP
(Future expansion to 36 MGD)
EXISTING
East Moore Water Dist.
PWS ID # 50-63-011
Source: Purchase
From Harnett Co.
Existing
Moore Co. -Vass
PWS ID #
03-63-045
Discharge
Source Basin
(Cape Fear)
Future Discharge to
Lumber Basin?
Future
1.0 MGD
Moore Co. -
Pinehurst
PWS ID #
03-63-108
Discharge
Lumber
Basin
Sanford
PWSID # 03-53-010
Source: Cape Fear River
Source Basin: Cape Fear
12.0 MGD WTP
FUTURE ?
DISCHARGE
Most existing
Customers discharge
to Source Basin
(Cape Fear)
Carthage
PWSID # 03-63-025
Source: Nicks Creek
Source Basin: Cape Fear
1.0 MGD WTP
DISCHARGE
LUMBER RIVER BASIN
CURRENT AVERAGE 0.3 MGD

FIGURE 2

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary
John Morris, Director

November 28, 2007

Mr. Micheal S. Apke, PE
McGill Associates
6 Regional Drive, Suite D
Pinehurst, NC 28374

RE: Water Source Evaluation and Plan, Moore County, NC

Dear Mr. Apke:

Thank you for your letter of October 5th asking a number of questions about Moore County alternatives for future water supply.

IBT law defines a transfer as "the withdrawal, diversion, or pumping of surface water from one river basin and discharge of all or any part of the water in a river basin different from the origin." For the purposes of estimating an IBT amount, the law does not distinguish between major river basins and sub-river basins.

The Division of Water Resources estimates the quantity of an interbasin transfer (IBT) by estimating the quantity of water removed from the source river basin and not returned to the source river basin. The IBT amount estimate does not depend on how many different recipients of the water there are or how many different receiving basins are involved. However, in the case that an IBT certificate is required, the law says that all users of the IBT water must be a co-applicant for the certificate, whether the user withdraws the water from the source basin or purchases the IBT water.

In response to your questions:

Alternative No. 1 – Purchase from Montgomery County

1. Does the water that Montgomery County sells to the Towns of Star, Robbins, and Candor impact the amount of water that Moore County can purchase from Montgomery County without an IBT certificate for the portion of the Seven Lakes water system located in the Deep River sub-basin?

Response

Yes, it has an impact. Montgomery County has a grandfathered capacity to transfer up to 2.03 million gallons per day (mgd) to transfer from the

Yadkin River Basin. In order to transfer more than 2.03 mgd out of the Yadkin basin on any day, an IBT certificate would be required. The portion of the water sold to Star, Robbins, and Candor that is not returned to the Yadkin basin is an IBT and would be counted in the estimate of Montgomery County's IBT amount.

2. Does the water that Montgomery County sells to the Towns of Star, Robbins, and Candor impact the amount of water that Moore County can purchase from Montgomery County without an IBT certificate for the portion of the Seven Lakes water system located in the Lumber or Cape Fear River sub-basin?

Response

Yes, see the response to question 1.

3. Does the water that Montgomery County sells to the Towns of Star, Robbins, and Candor impact the amount of water that Foxfire Village can purchase without an IBT certificate?

Response

Yes, see the response to question 1.

4. Do future sales from Montgomery County to Moore County Seven Lakes system impact the amount of water that Foxfire Village can purchase without an IBT certificate?

Response

Yes, Montgomery County's sales to Moore County not returned to the source basin are counted in the IBT amount estimate from the Yadkin basin. A certificate is required when the IBT amount reaches 2.03 mgd.

5. Since the Seven Lakes community is located in three (3) separate river sub-basins, would it be possible to construct one pipe from Montgomery County to Seven Lakes, transfer 6.0 mgd through the line, and distribute 2.0 mgd to each of the Seven Lakes communities without an IBT certificate?

Response

No, an IBT certificate would be required for Montgomery County to transfer more than 2.03 mgd out of the Yadkin Basin.

Alternative No. 2 – Purchase from Harnett County and City of Sanford

1. Can Moore County obtain up to 2.0 mgd from Harnett County and 2.0 mgd from the City of Sanford (total of 4.0 mgd) and discharge the wastewater into the Lumber River sub-basin without needing to obtain an IBT certificate?

Response

No, Moore County may transfer up to 2 mgd out of Cape Fear River Basin without requiring a certificate, regardless of how many different suppliers of water are involved. Therefore, Moore County's IBT amount would be the combined total of the purchase amounts from Harnett County and Sanford minus any quantity returned to the source Cape Fear Basin.

2. Does the fact that the Town of Carthage currently transfers water from the Cape Fear sub-basin to the Lumber River sub-basin impact the amount of water that Moore County can transfer from the Cape Fear to the Lumber without obtaining an IBT certificate?

Response

No, it would not affect Moore County's IBT limits unless Moore County and Carthage together agree to be considered as a regional water system for the purposes of IBT monitoring.

3. Does the amount of water transferred from Harnett County to the Deep River sub-basin impact the amount of water that can be transferred from Harnett County into the Lumber River sub-basin without obtaining an IBT certificate?

Response

Yes, Harnett County would need an IBT certificate to transfer more than 2 mgd out of the Cape Fear River Basin, regardless of how many receiving basins are involved in the transfers.

4. If Moore County elects to abandon the Vass WWTP in the future and transfer the wastewater generated in Vass to the WPCF in the Lumber basin, does this impact how much water can be transferred from Harnett County to the Moore County Pinehurst system without an IBT certificate?

Response

Yes, Moore County is limited to transferring 2 mgd out of the source Cape Fear River Basin. Discharges to the WPCF are considered transfers out of the source basin and would count in the estimate of Moore County's IBT amount.

Please contact either me or Tom Fransen with questions or comments.

Phil Fragapane

Phil Fragapane

cc: John Morris, DWR
Forrest Westall, McGill Associates

1611 Mail Service Center, Raleigh, North Carolina 27699-1611
Phone: 919-733-4064 \ FAX: 919-733-3558 \ Internet: www.ncwater.org

APPENDIX B

RECOMMENDED PROJECT COST ESTIMATES

PRELIMINARY OPINION OF PROBABLE COST - RECOMMENDATION #1
INTERCONNECTION BETWEEN MONTGOMERY COUNTY AND SEVEN LAKES
WATER SOURCE EVALUATION AND PLAN
MOORE COUNTY, NORTH CAROLINA
JULY 2008

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization (3.0%)	1	LS	3%	$66,000
2	Improvements to Montgomery County System	1	LS	$433,000	$433,000
3	Flow Meter and SCADA	1	LS	$25,000	$25,000
4	12" PVC Water Main	44,000	LF	$30.00	$1,320,000
5	12" DIP Water Main	1,500	LF	$40.00	$60,000
6	24" Stl. Casing bore & jacked	500	LF	$200.00	$100,000
7	12" Gate valve, Box & Collar	22	EA	$2,000.00	$44,000
8	8" Gate Valve, Box & Collar	6	EA	$1,500.00	$9,000
9	Fire Hydrant w/Valve	22	EA	$4,000.00	$88,000
10	Miscellaneous DIP Fittings	7,000	LB	$4.00	$28,000
11	Air Release Valve	4	EA	$3,000.00	$12,000
12	Gravel Drive Repair	300	LF	$10.00	$3,000
13	Concrete Drive Repair	50	LF	$50.00	$2,500
14	Asphalt Drive Repair	300	LF	$40.00	$12,000
15	Rip Rap Check Dams	100	EA	$175.00	$17,500
16	Silt Fence	10,000	LF	$2.15	$21,500
17	Tie to Existing Water Main	2	EA	$6,000.00	$12,000
18	1" house service tap & Meter	50	EA	$500.00	$25,000
CONSTRUCTION SUBTOTAL					**$2,278,500**
10% CONSTRUCTION CONTINGENCY					$227,900
ENGINEERING DESIGN, PERMITTING, BID, AND AWARD					$148,600
CONSTRUCTION OBSERVATION AND ADMINISTRATION					$95,000
TOTAL PROJECT COST ESTIMATE					**$2,750,000**

Notes:

1. This preliminary opinion of probable cost includes the construction of a new 12-inch water line within the Highway 2 right of way from the existing elevated storage tank near Candor to the intersection of Seven Lakes Boulevard and Highway 211 in Seven Lakes.

2. It has been assumed in this estimate that adequate easement area exists to construct the new line, and no costs for additional easement acquisition have been included in the estimate.

3. All estimated costs are in 2008 dollars. This estimate of costs represents our judgment as professionals familiar with the construction industry. We cannot and do not guarantee that bids will not vary from this estimate.

PRELIMINARY OPINION OF PROBABLE COST - RECOMMENDATION #3
INTERCONNECTION BETWEEN ROBBINS AND SEVEN LAKES
WATER SOURCE EVALUATION AND PLAN
MOORE COUNTY, NORTH CAROLINA
JULY 2008

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization (3.0%)	1	LS	3%	$87,300
2	12" PVC Water Main	63,000	LF	$30.00	$1,890,000
3	12" DIP Water Main	1,000	LF	$40.00	$40,000
4	24" Stl. Casing bore & jacked	300	LF	$200.00	$60,000
5	12" Gate valve, Box & Collar	40	EA	$2,000.00	$80,000
6	Directional Bore HDPE	600	LF	$350.00	$210,000
7	8" Gate Valve, Box & Collar	3	EA	$1,500.00	$4,500
8	6" Gate Valve, Box & Collar	6	EA	$800.00	$4,800
9	Fire Hydrant w/Valve	40	EA	$4,000.00	$160,000
10	Miscellaneous DIP Fittings	10,000	LB	$4.00	$40,000
11	Air Release Valve	2	EA	$5,000.00	$10,000
12	Gravel Drive Repair	800	LF	$10.00	$8,000
13	Open, Cut & Patch Concrete	100	LF	$50.00	$5,000
14	Open, Cut & Patch Asphalt (4"deep)	200	LF	$40.00	$8,000
15	Booster Pump Station with flow meter and SCADA	1	LS	$350,000.00	$350,000
16	Tie to Existing Water Main	2	EA	$6,000.00	$12,000
17	1" house service tap & Meter	60	EA	$500.00	$30,000
CONSTRUCTION SUBTOTAL					**$2,999,600**
10% CONSTRUCTION CONTINGENCY					$300,000
ENGINEERING DESIGN, PERMITTING, BID, AND AWARD					$180,000
CONSTRUCTION OBSERVATION AND ADMINISTRATION					$120,400
TOTAL PROJECT COST ESTIMATE					**$3,600,000**

Notes:

1. This preliminary opinion of probable cost includes the construction of a new 12-inch PVC and ductile iron water line within the existing NC Hwy. 24-27, Mt. Carmel Church Road (SR1210), Dowd Road (SR1240), Carthage Road (SR1229), and Seven lakes Blvd. (SR1239) right of ways.

2. It has been assumed in this estimate that adequate right of way area exists to construct the new line, and no costs f additional easement acquisition have been included in the estimate.

3. All estimated costs are in 2008 dollars. This estimate of costs represents our judgment as professionals familiar with the construction industry. We cannot and do not guarantee that bids will not vary from this estimate.

PRELIMINARY OPINION OF PROBABLE COST - RECOMMENDATION #4
INTERCONNECTION BETWEEN SEVEN LAKES AND FOXFIRE VILLAGE
WATER SOURCE EVALUATION AND PLAN
MOORE COUNTY, NORTH CAROLINA
JULY 2008

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization (3.0%)	1	LS	3%	$19,000
2	8" PVC Water Main	17,500	LF	$25.00	$437,500
3	8" DIP Water Main	500	LF	$40.00	$20,000
4	18" Stl. Casing railroad bore	100	LF	$400.00	$40,000
5	18" Stl. Casing bore & jacked	150	LF	$180.00	$27,000
6	8" Gate Valve, Box & Collar	3	EA	$1,500.00	$4,500
7	12"x8" Tapping Sleeve & Valve	1	EA	$6,000.00	$6,000
8	Fire Hydrant w/Valve	10	EA	$4,000.00	$40,000
9	Miscellaneous DIP Fittings	3,000	LB	$4.00	$12,000
10	Air Release Valve	1	EA	$5,000.00	$5,000
11	Gravel Road Repair	200	LF	$10.00	$2,000
12	Concrete Road Repair	50	LF	$50.00	$2,500
13	Asphalt Road Repair	100	LF	$40.00	$4,000
14	Silt Fence	5,000	LF	$2.20	$11,000
15	Sediment Basin	8	EA	$900.00	$7,200
16	Tie to Existing Water Main	1	EA	$5,000.00	$5,000
17	1" house service tap & Meter	20	EA	$500.00	$10,000
CONSTRUCTION SUBTOTAL					**$652,700**
10% CONSTRUCTION CONTINGENCY					$65,000
ENGINEERING DESIGN, PERMITTING, BID, AND AWARD					$58,000
CONSTRUCTION OBSERVATION AND ADMINISTRATION					$44,300
TOTAL PROJECT COST ESTIMATE					**$820,000**

Notes:

1. This preliminary opinion of probable cost includes the construction of a new 8-inch PVC water main along the NCDOT right-of-way of Hoffman Road from Highway 211 to the existing Foxfire Village water system.

2. It has been assumed in this estimate that adequate right of way area exists to construct the new line, and costs for additional rail road easement acquisition have not been included in the estimate.

3. All estimated costs are in 2008 dollars. This estimate of costs represents our judgment as professionals familiar wi the construction industry. We cannot and do not guarantee that bids will not vary from this estimate.

PRELIMINARY OPINION OF PROBABLE COST - RECOMMENDATION #6
INTERCONNECTION BETWEEN SOUTHERN PINES AND PINEBLUFF
WATER SOURCE EVALUATION AND PLAN
MOORE COUNTY, NORTH CAROLINA
JULY 2008

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization (3.0%)	1	LS	3%	$8,000
2	Booster Pump Station with Vault and Meter	1	LS	$255,000.00	$255,000
3	10" Piping Connections	100	LF	$30.00	$3,000
4	18"x10" Tapping Sleeve and Valve	1	EA	$10,000.00	$10,000
5	10" Gate Valve and Box	1	EA	$2,500.00	$2,500
CONSTRUCTION SUBTOTAL					**$278,500**
10% CONSTRUCTION CONTINGENCY					$27,900
ENGINEERING DESIGN, PERMITTING, BID, AND AWARD					$28,000
CONSTRUCTION OBSERVATION AND ADMINISTRATION					$15,600
TOTAL PROJECT COST ESTIMATE					**$350,000**

Notes:

1. This preliminary opinion of probable cost includes the construction of an interconnection between the Southern Pines and Pinebluff water systems near the intersection of Boston Avenue and US Highway 1.

2. Estimate does not include property acquisition or easement acquisition costs.

3. All estimated costs are in 2008 dollars. This estimate of costs represents our judgment as professionals familiar with the construction industry. We cannot and do not guarantee that bids will not vary from this estimate.

PRELIMINARY OPINION OF PROBABLE COST - RECOMMENDATION #7
INTERCONNECTION BETWEEN SANFORD AND CAMERON
WATER SOURCE EVALUATION AND PLAN
MOORE COUNTY, NORTH CAROLINA
JULY 2008

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization (3.0%)	1	LS	3%	$1,000
2	6" PVC Water Main	1,800	LF	$20.00	$36,000
3	6" Gate Valve, Box & Collar	1	EA	$800.00	$800
4	Miscellaneous DIP Fittings	200	LB	$4.00	$800
5	Gravel Drive Repair	100	LF	$10.00	$1,000
6	Tie to Existing Water Main	2	EA	$4,000.00	$8,000
7	Metering Station with Bypass	1	EA	$15,000.00	$15,000
CONSTRUCTION SUBTOTAL					**$62,600**
10% CONSTRUCTION CONTINGENCY					$6,300
CONSTRUCTION OBSERVATION AND ADMINISTRATION					$2,100
TOTAL PROJECT COST ESTIMATE					**$71,000**

Notes:

1. This preliminary opinion of probable cost includes the construction of a new 6-inch water main to interconnect the City of Sanford and Town of Cameron water systems along Old US Highway 1. The Town reports that the extension has already been designed and permitted, therefore no costs for engineering design or permitting have been included. It is assumed that the permits previously issued are still valid.

2. It has been assumed in this estimate that adequate right of way area exists to construct the new line, and no costs for additional easement acquisition have been included in the estimate.

3. All estimated costs are in 2008 dollars. This estimate of costs represents our judgment as professionals familiar with the construction industry. We cannot and do not guarantee that bids will not vary from this estimate.

APPENDIX C

FINANCIAL ANALYSIS DOCUMENTS

MOORE COUNTY PUBLIC UTILITIES FUND
CAPITAL IMPROVEMENTS PLAN

CATEGORY / IMPROVEMENT	COST	ESTIMATE 2008	YEAR 1 2009	YEAR 2 2010	YEAR 3 2011	YEAR 4 2012	YEAR 5 2013	YEAR 6 2014	YEAR 7 2015	YEAR 8 2016	YEAR 9 2017	YEAR 10 2018
UTILITY FUND												
ADMINISTRATION												
GIS MAPPING	$200,000		$50,000	$50,000	$50,000	$50,000						
ROOF	$60,000							$60,000				
WATER SOURCE STUDY	$44,000	$10,494	$33,506									
HVAC	$80,000			$80,000								
CARPET AND VCT FLOOR	$20,000					$20,000						
BACKHOE	$69,750	$69,750										
GENERATOR	$575,800	$300,800	$275,000									
PUMP	$28,713	$3,713	$25,000									
RADIO READ METERS	$1,053,052	$13,052	$1,040,000									
RADIO READ METERS	$273,052	$13,052	$260,000									
UTILITY TRUCK WITH BOOM	$119,550	$119,550										
VAC TRUCK	$288,115	$288,115										
EXCAVATOR	$45,000		$45,000									
EQUIPMENT TRAILER	$7,320	$7,320										
TAMPER	$29,800	$29,800										
BRUSH CHIPPER	$27,331	$27,331										
WATER SUPPLY												
MONTGOMERY COUNTY TO SEVEN LAKES INTERCONNECT	$2,750,000		$2,750,000									
ROBBINS WATER TREATMENT PLANT	$2,000,000			$1,000,000	$1,000,000							
ROBBINS TO SEVEN LAKES INTERCONNECT	$3,600,000				$1,800,000	$1,800,000						
WELL REHABILITATION	$943,658	$10,306	$156,000	$777,352								
WELL SITE ACQUISITION	$70,000		$70,000									
NEW WELLS	$500,000		$500,000									
GROUNDWATER MANAGEMENT	$60,000		$60,000									
PINEHURST WELL 13 WELL HOUSE REPLACEMENT	$50,000		$50,000									
WATER STORAGE												
SCADA SYSTEM (INCLUDING TELEMETRY & PINEHURST AUTO FILL CONTROL)	$150,000		$50,000	$50,000	$50,000							
PINEHURST TANK	$1,600,000		$1,600,000									
REHAB 100,000 GAL ELEVATED TANK IN VASS	$75,000			$75,000								
REHAB MCLEAN ROAD TANK	$250,000			$250,000								
WELL TANK SITE FENCING	$35,000		$35,000									
SEVEN LAKES WATER TANK	$70,367	$70,367										
WATER TRANSMISSION												
GENERAL EXTENSIONS OF SERVICE	$1,215,994	$15,994	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$150,000	$150,000	$150,000	$150,000
WATER LINE & HYDRANT REPAIR & REPLACEMENT	$1,300,000			$350,000		$350,000				$300,000	$300,000	
OLD TOWN UPGRADES	$350,000		$350,000									
US 15 / 501 WATER MAIN	$755,615	$755,615										
US 211 WATER MAIN	$3,110	$3,110										
SEWER COLLECTION												
GENERAL EXTENSIONS OF SERVICE	$1,200,000			$100,000	$100,000	$100,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
LIFT STATION REPAIRS AND UPGRADES	$4,004,010	$204,010	$3,800,000									
LIFT STATION GENERATORS	$185,000			$185,000								
OLD TOWN SEWER REHAB	$5,550,380	$50,380	$5,500,000									
LAKE PINEHURST REPAIRS	$1,318,930	$118,930	$1,200,000									
PINEHURST LIFT STATION 14-5 BUILDING REPLACEMENT	$50,000		$50,000									
LIFT STATION FENCING	$35,000		$35,000									
UTILITY FUND SUBTOTAL	**$31,043,547**	**$2,111,689**	**$18,034,506**	**$3,017,352**	**$3,100,000**	**$2,420,000**	**$250,000**	**$310,000**	**$300,000**	**$600,000**	**$600,000**	**$300,000**

		DEBT PKG 1	DEBT PKG 2		DEBT PKG 3						
DEBT PACKAGES		$15,890,000	$2,777,352		$3,600,000						
ANNUAL DEBT	**$0**	**$15,890,000**	**$1,777,352**	**$2,800,000**	**$1,800,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
GRANTS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
ANNUAL CAPITAL OUTLAY	**$2,111,689**	**$2,144,506**	**$1,240,000**	**$300,000**	**$620,000**	**$250,000**	**$310,000**	**$300,000**	**$600,000**	**$600,000**	**$300,000**
RELATED NEW OPERATING COSTS											

MOORE COUNTY PUBLIC UTILITIES FUND
DEBT SERVICE SUMMARY

RATE	TYPE		NAME	BALANCE AS OF (6/30/07)	2007	ESTIMATE 2008	YEAR 1 2009	YEAR 2 2010	YEAR 3 2011	YEAR 4 2012	YEAR 5 2013	YEAR 6 2014	YEAR 7 2015	YEAR 8 2016	YEAR 9 2017	YEAR 10 2018
4.57%	WATER & SEWER	INSTALLMENT	SEVEN LAKES (MOWASA)	412,273	127,964	127,964	127,964	127,964	62,570							
4.54%	WATER & SEWER	INSTALLMENT	PINEHURST (MOWASA)	2,868,616	452,590	452,590	452,590	452,590	452,590	452,590	452,590	211,891				
3.79%	WATER & SEWER	INSTALLMENT	CENTRAL OFFICE (MOWASA)	254,467	100,479	100,479	100,479	66,986								
4.58%	WATER	INSTALLMENT	CANNON PARK TOWER	630,676	78,965	78,965	78,965	78,965	78,965	78,965	78,965	78,965	78,965	78,965	78,965	4,489
TOTAL				**4,166,032**	**804,343**	**759,998**	**759,998**	**726,505**	**594,126**	**531,555**	**531,555**	**290,856**	**78,965**	**78,965**	**78,965**	**4,489**
WATER SUBTOTAL				**2,083,016**	**441,654**	**419,482**	**419,482**	**402,735**	**336,545**	**305,260**	**305,260**	**184,910**	**78,965**	**78,965**	**78,965**	**4,489**
SEWER SUBTOTAL				**1,767,678**	**362,689**	**340,517**	**340,517**	**323,770**	**257,580**	**226,295**	**226,295**	**105,945**	**0**	**0**	**0**	**0**
WATER %				**50.00%**	**54.91%**	**55.20%**	**55.20%**	**55.43%**	**56.65%**	**57.43%**	**57.43%**	**63.57%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

MOORE COUNTY PUBLIC UTILITIES FUND
FINANCIAL ANALYSIS

LINE ITEM	AUDIT 2002	AUDIT 2003	AUDIT 2004	AUDIT 2005	AUDIT 2006	AUDIT 2007	ESTIMATE 2008	YEAR 1 2009	YEAR 2 2010	YEAR 3 2011	YEAR 4 2012	YEAR 5 2013	YEAR 6 2014	YEAR 7 2015	YEAR 8 2016	YEAR 9 2017	YEAR 10 2018
REVENUES:																	
USER FEES	5,716,492	5,212,180	5,829,641	6,099,104	6,828,145	7,401,285											
WATER FEES							3,113,000	5,472,000	5,636,160	5,805,245	5,979,402	6,158,784	6,343,548	6,533,854	6,729,870	6,931,766	7,139,719
WASTEWATER FEES							1,999,000	3,573,000	3,680,190	3,790,596	3,904,314	4,021,443	4,142,086	4,266,349	4,394,339	4,526,170	4,661,955
EAST MOORE MANAGEMENT FEE									170,000	175,100	180,353	185,764	191,336	197,077	202,989	209,079	215,351
WWTP MANAGEMENT FEE							117,000	138,000	142,140	146,404	150,796	155,320	159,980	164,779	169,723	174,814	180,059
UTILITY BILLING FEE							80,000	75,000	77,250	79,568	81,955	84,413	86,946	89,554	92,241	95,008	97,858
TAP FEES							385,000	676,000	500,000	505,000	510,050	515,151	520,302	525,505	530,760	536,068	541,428
IMPACT FEES							359,000	647,000	500,000	505,000	510,050	515,151	520,302	525,505	530,760	536,068	541,428
NONOPERATING INCOME:																	
INVESTMENTS	60,991	48,181	31,306	72,632	195,317	268,653	181,000	160,000	150,000	140,000	150,000	140,000	150,000	160,000	180,000	180,000	190,000
NOTES PAYABLE	850,000																
GRANTS							376,055										
OTHER	0	19,758	11,519	0	3,574	2,217	166,000	177,000	178,770	180,558	182,363	184,187	186,029	187,889	189,768	191,666	193,582
TRANSFERS (IN)	0	2,204,492				649,000	26,114										
TOTAL REVENUES	6,627,483	7,484,611	5,872,466	6,171,736	7,027,036	8,321,155	6,802,169	10,918,000	11,034,510	11,327,470	11,649,283	11,960,212	12,300,529	12,650,512	13,020,449	13,380,637	13,761,380
NEW SOURCES OF REVENUE:																	
WATER RATE INCREASE									112,723	116,105	241,568	248,815	256,279	263,968	271,887	280,043	288,445
PERCENTAGE NEW REVENUE									2%		2%						
WASTEWATER RATE INCREASE									368,019	379,060	819,906	844,503	869,838	895,933	922,811	950,496	979,010
PERCENTAGE NEW REVENUE									10%		10%						
TOTAL REVENUES	6,627,483	7,484,611	5,872,466	6,171,736	7,027,036	8,321,155	6,802,169	10,918,000	11,515,252	11,822,634	12,710,757	13,053,530	13,426,646	13,810,413	14,215,147	14,611,176	15,028,835
OPERATING EXPENDITURES:																	
SALARIES & BENEFITS	1,344,367	1,321,359	1,324,202	1,338,231	1,584,170	1,833,197	1,930,000	2,311,000	2,426,550	2,547,878	2,675,271	2,809,035	2,949,487	3,096,961	3,251,809	3,414,400	3,585,120
OPERATIONAL EXPENDITURES	1,891,262	2,067,552	2,367,650	2,167,716	2,012,146	2,367,512	2,164,000	2,919,000	3,035,760	3,157,190	3,283,478	3,414,817	3,551,410	3,693,466	3,841,205	3,994,853	4,154,647
BULK WATER PURCHASES					592,000	648,000	538,712	1,014,500	1,098,160	1,150,203	1,204,796	1,262,068	1,322,151	1,385,185	1,451,317	1,520,703	1,593,505
PROFESSIONAL FEES	51,761	40,914	193,594	76,270	61,956	1,118	12,000	21,000	21,630	22,279	22,947	23,636	24,345	25,075	25,827	26,602	27,400
REPAIRS AND MAINTENANCE	522,688	502,987	288,930	303,648	341,005	488,008	505,000	850,000	875,500	901,765	928,818	956,682	985,383	1,014,944	1,045,393	1,076,755	1,109,057
EAST MOORE EXPENDITURES									170,000	175,100	180,353	185,764	191,336	197,077	202,989	209,079	215,351
TOTAL OPERATING EXPENDITURES	3,810,078	3,932,812	4,174,376	3,885,865	4,591,277	5,337,835	5,149,712	7,115,500	7,627,600	7,954,414	8,295,664	8,652,002	9,024,111	9,412,708	9,818,540	10,242,391	10,685,080
CAPITAL OUTLAY	427,210	700,604	21,496	48,474	326,537	3,493,645	2,111,689	2,144,506	1,240,000	300,000	620,000	250,000	310,000	300,000	600,000	600,000	300,000
EXISTING DEBT SERVICE	959,148	1,064,214	1,032,663	963,835	850,515	804,343	759,998	759,998	726,505	594,126	531,555	531,555	290,856	78,965	78,965	78,965	4,489
NEW DEBT SERVICE								1,566,642	1,677,281	1,787,920	1,943,665	2,099,410	2,099,410	2,099,410	2,099,410	2,099,410	2,099,410
ASSUMED PRORATE DEBT SERVICE FOR WWTP									480,000	960,000	1,440,000	1,440,000	1,440,000	1,440,000	1,440,000	1,440,000	1,440,000
TRANSFERS OUT				151,252													
TOTAL EXPENDITURES	5,196,436	5,697,630	5,228,535	5,049,426	5,768,329	9,635,823	8,021,399	11,586,646	11,751,386	11,596,461	12,830,884	12,972,966	13,164,377	13,331,083	14,036,915	14,460,766	14,528,978
REVENUES OVER EXPENDITURES	1,431,047	1,786,981	643,931	1,122,310	1,258,707	-1,314,668	-1,219,230	-668,646	-236,134	226,174	-120,128	80,564	262,269	479,330	178,232	150,410	499,857
ACCRUAL ADJUSTMENTS	-427,783	631,670	-49,344	15,634													
NET INCOME	1,003,264	2,418,651	594,587	1,137,944	1,258,707	-1,314,668	-1,219,230	-668,646	-236,134	226,174	-120,128	80,564	262,269	479,330	178,232	150,410	499,857
DEBT ASSUMPTIONS:																	
LOAN AMOUNT								15,890,000	2,777,352		3,600,000						
PAYMENT								783,321	110,639		155,745						
ANNUAL PAYMENTS								1,566,642	221,278		311,489						
RATE								5.47%	5.00%		6.00%						
TERM								15	20		20						
OTHER ASSUMPTIONS:																	
YEAR 1 REVENUES & EXPENDITURES FROM DRAFT COUNTY BUDGET ON 6/9/08.																	
UNRESTRICTED NET ASSETS						5,621,158	4,401,928	3,733,282	3,497,148	3,723,322	3,603,194	3,683,758	3,946,027	4,425,357	4,603,589	4,753,999	5,253,857
UNRESTRICTED NET ASSETS / TOTAL EXPENDITURES						58%	55%	32%	30%	32%	28%	28%	30%	33%	33%	33%	36%

WWTP DEBT SERVICE ASSUMED TO BE FINANCED OVER 20 YEARS AT 5%. CUMULATIVE DEBT OF $15 MIL IN 2010, $30 MIL IN 2011, AND $45 MIL IN 2012. PUBLIC UTILITIES FUND PAYS 40% OF PAYMENTS.

MOORE COUNTY PUBLIC UTILITIES FUND
FINANCIAL ANALYSIS

LINE ITEM	AUDIT 2002	AUDIT 2003	AUDIT 2004	AUDIT 2005	AUDIT 2006	AUDIT 2007	ESTIMATE 2008	YEAR 1 2009	YEAR 2 2010	YEAR 3 2011	YEAR 4 2012	YEAR 5 2013	YEAR 6 2014	YEAR 7 2015	YEAR 8 2016	YEAR 9 2017	YEAR 10 2018
BULK WATER PURCHASES FROM S PINES																	
PINEHURST			65,359,263	55,670,976	81,444,034	62,957,366	52,727,472	92,509,000	95,284,270	98,142,798	101,087,082	104,119,695	107,243,285	110,460,584	113,774,401	117,187,633	120,703,262
CAROLINA			2,895,705	2,895,705	778,987	938,912	658,348	4,300,000	4,429,000	4,561,870	4,698,726	4,839,688	4,984,879	5,134,425	5,288,458	5,447,111	5,610,525
ADDOR			612,536	889,904	715,773	3,901,246	5,089,325	6,100,000	6,283,000	6,471,490	6,665,635	6,865,604	7,071,572	7,283,719	7,502,231	7,727,297	7,959,116
SYSTEM FLUSHING			11,349,365	9,798,445	3,358,547	4,988,877	3,533,668	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000
TOTAL PURCHASES FROM S PINES			80,216,869	69,255,030	86,297,341	72,786,401	62,008,814	106,409,000	109,496,270	112,676,158	115,951,443	119,324,986	122,799,736	126,378,728	130,065,090	133,862,042	137,772,904
				29%													
SOUTHERN PINES VOLUME RATE			$1.14	$1.14	$1.14	$1.14	$1.14	$1.16	$1.19	$1.21	$1.23	$1.26	$1.28	$1.31	$1.34	$1.36	$1.39
SOUTHERN PINES ANNUAL FIXED CHARGE			193,332	64,440	64,440	64,440	64,440	65,729	67,043	68,384	69,752	71,147	72,570	74,021	75,502	77,012	78,552
TOTAL S PINES CHARGE			284,779	143,391	162,819	147,416	135,130	189,461	196,912	204,697	212,833	221,336	230,223	239,514	249,229	259,386	270,009
BULK WATER PURCHASES FROM ABERDEEN																	
PINEHURST			78,806,100	86,168,100	142,258,100	156,224,100	119,045,018	146,000,000	150,380,000	154,891,400	159,538,142	164,324,286	169,254,015	174,331,635	179,561,584	184,948,432	190,496,885
ABERDEEN VOLUME RATE			$2.00	$2.00	$2.00	$2.00	$2.00	$2.04	$2.08	$2.12	$2.16	$2.21	$2.25	$2.30	$2.34	$2.39	$2.44
TOTAL ABERDEEN CHARGE			157,612	172,336	284,516	312,448	238,090	297,840	312,911	328,744	345,378	362,855	381,215	400,505	420,770	442,061	464,429
BULK WATER PURCHASES FROM ROBBINS																	
ROBBINS			1,429,300	905,400	898,150	902,120	1,503,818	1,500,000	1,530,000	1,560,600	1,591,812	1,623,648	1,656,121	1,689,244	1,723,029	1,757,489	1,792,639
FLUSHING			4,730,400	2,365,200	3,006,850	3,608,480	2,639,127	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000
TOTAL PURCHASES FROM ROBBINS			6,159,700	3,270,600	3,905,000	4,510,600	4,142,945	4,100,000	4,130,000	4,160,600	4,191,812	4,223,648	4,256,121	4,289,244	4,323,029	4,357,489	4,392,639
ROBBINS VOLUME RATE			$2.00	$2.00	$2.00	$2.00	$2.00	$2.05	$2.09	$2.13	$2.18	$2.22	$2.26	$2.31	$2.35	$2.40	$2.45
ROBBINS ANNUAL FIXED CHARGE			96	96	96	96	96	98	100	102	104	106	108	110	112	115	117
TOTAL ROBBINS CHARGE			12,415	6,637	7,906	9,117	8,382	8,503	8,736	8,976	9,223	9,478	9,741	10,013	10,292	10,581	10,879
BULK WATER PURCHASES FROM HARNETT CO																	
EAST MOORE			18,640,983	23,760,000	17,898,903	28,184,070	21,926,250	22,000,000	22,660,000	23,339,800	24,039,994	24,761,194	25,504,030	26,269,151	27,057,225	27,868,942	28,705,010
VASS			26,117,051	26,378,222	28,969,654	31,549,313	26,770,934										
UNBILLED USAGE (SYSTEM FLUSHING)			26,524,536	26,524,536	19,944,893	27,795,957	26,116,925										
TOTAL PURCHASES FROM HARNETT CO			71,282,570	76,662,758	66,813,450	87,529,340	74,814,110	22,000,000	22,660,000	23,339,800	24,039,994	24,761,194	25,504,030	26,269,151	27,057,225	27,868,942	28,705,010
HARNETT COUNTY VOLUME RATE			$1.90	$2.05	$2.05	$2.05	$2.10	$2.10	$2.14	$2.18	$2.23	$2.27	$2.32	$2.36	$2.41	$2.46	$2.51
TOTAL HARNETT CO CHARGE			135,437	157,159	136,968	179,435	157,110	46,200	48,538	50,994	53,574	56,285	59,133	62,125	65,269	68,571	72,041
BULK WATER PURCHASES FROM EAST MOORE																	
VASS								27,000,000	27,810,000	28,644,300	29,503,629	30,388,738	31,300,400	32,239,412	33,206,594	34,202,792	35,228,876
HYLAND HILLS								8,800,000	9,064,000	9,335,920	9,615,998	9,904,478	10,201,612	10,507,660	10,822,890	11,147,577	11,482,004
PINEHURST								169,750,000	174,842,500	180,087,775	185,490,408	191,055,120	196,786,774	202,690,377	208,771,089	215,034,221	221,485,248
UNBILLED USAGE								10,000,000	10,300,000	10,609,000	10,927,270	11,255,088	11,592,741	11,940,523	12,298,739	12,667,701	13,047,732
TOTAL PURCHASES FROM EAST MOORE								215,550,000	222,016,500	228,676,995	235,537,305	242,603,424	249,881,527	257,377,973	265,099,312	273,052,291	281,243,860
EAST MOORE VOLUME RATE							$2.35	$2.35	$2.39	$2.43	$2.48	$2.52	$2.57	$2.61	$2.66	$2.71	$2.76
TOTAL EAST MOORE CHARGE							0	506,543	531,063	556,792	583,788	612,115	641,838	673,028	705,758	740,104	776,147
TOTAL BULK WATER VOLUME			236,465,239	235,356,488	299,273,891	321,050,441	260,010,888	494,059,000	508,682,770	523,744,953	539,258,696	555,237,538	571,695,428	588,646,730	606,106,239	624,089,196	642,611,297
TOTAL BULK WATER CHARGES			590,244	479,523	592,209	648,417	538,712	1,048,547	1,098,160	1,150,203	1,204,796	1,262,068	1,322,151	1,385,185	1,451,317	1,520,703	1,593,505
NEW PUMPING COST				$0.11	$0.12	$0.12	$0.13	$0.13	$0.14	$0.14	$0.15	$0.15	$0.16	$0.17	$0.17	$0.18	$0.19
NEW TANK MAINTENANCE COST				$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.02	$0.02	$0.02	$0.02	$0.02
NEW CHEMICALS COST				$0.03	$0.03	$0.03	$0.03	$0.03	$0.03	$0.03	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04
WELL FLOW				820,441,420	594,102,500	646,864,100	593,352,764	405,941,000	418,317,230	431,065,047	444,195,304	457,720,462	471,651,572	486,000,270	500,779,761	516,003,804	531,684,703
TOTAL WELL AND BULK WATER FLOW				1,055,797,908	893,376,391	967,914,541	853,363,651	900,000,000	927,000,000	954,810,000	983,454,000	1,012,958,000	1,043,347,000	1,074,647,000	1,106,886,000	1,140,093,000	1,174,296,000