Chemours™

The Chemours Company
Fluoroproducts
22828 NC Highway 87 W
Fayetteville, NC 28306-7332

910-483-4681 o
chemours.com

June 29, 2018

Michael E. Scott
NC DEQ - Division of Waste Management
217 West Jones Street
Raleigh, North Carolina 27699

Re: Evaluation of Permanent Alternative Water Supply - Chemours Company-Fayetteville Works Bladen County

Dear Mr. Scott,

As requested in your May 24, 2018 letter, Chemours has evaluated the possible installation of municipal water connections to impacted residences in the vicinity of the Fayetteville Works. Attached please find the Feasibility Study Report (the "FS Report") for Public Water Services, Chemours Fayetteville Works Fayetteville, North Carolina, prepared by Parsons on behalf of Chemours.

As you know, it has been Chemours' view that whole-house granulated activated carbon systems are a highly effective, readily implementable and long term solution to the underlying concerns here. Our view has been reinforced by unequivocally positive results of pilot testing to date. Notwithstanding that view, and pursuant to DEQ's request, we have asked Parsons to explore comprehensively the extent to which municipal water connections are feasible for the impacted homes. We also remain in active discussions with officials from both Bladen and Cumberland Counties about the potential for connections to their respective systems.

As you will see in the FS Report, as a result of differences in existing municipal water infrastructure, geography, and home density, the analysis focuses separately on each of four areas: (1) Bladen County west of the Cape Fear River, (2) Bladen County east of the Cape Fear River, (3) Cumberland County west of the Cape Fear River and, (4) Cumberland County east of the Cape Fear River. The report evaluates the extent to which the provision of municipal water to homes in these areas is technically feasible, and addresses the availability of existing infrastructure and whether water of sufficient quality could be provided. It also assesses whether the installation of municipal water is cost-effective, applying the standard that, Chemours understands, the State is using in another matter (involving Duke Energy). Also considered are the current state of the municipalities' planning, and, relatedly, whether municipal water can be installed in a timely fashion in each area. The FS Report notes that public acceptance of municipal water connections will affect both feasibility and cost. As noted above, Chemours had a

number of discussions with officials for both Bladen and Cumberland counties; the FS Report reflects those discussions.

In sum, the report suggests that municipal water connections for homes in Bladen County west of the river are likely technically feasible and, while expensive, not cost prohibitive, provided that at least 90% of the households request a municipal water connection. For homes in Cumberland County west of the river, the lack of existing infrastructure and a definitive source of water means that the provision of municipal water is not currently feasible and is cost prohibitive. However, Cumberland County is evaluating its plans for expanding municipal water to this area, and if additional infrastructure is developed, it could affect both feasibility and cost.

In both Bladen and Cumberland Counties on the east side of the river, municipal water is not technically feasible: there is no existing source for water, the long distance between possible sources and the low density of houses means that there would be poor water quality, and as there is little to no infrastructure it would be many years before municipal water could be installed. These challenges also result in costs that are prohibitive. Carbon filtration systems can be installed much more quickly and cost-effectively at all locations in Cumberland County and east of the Cape Fear River in Bladen County.

If you would like to discuss this matter further, please contact me.

Sincerely,

Christel Compton

PARSONS

FEASIBILITY STUDY REPORT FOR PUBLIC WATER SERVICES

CHEMOURS FAYETTEVILLE WORKS
FAYETTEVILLE, NORTH CAROLINA

Prepared for:

The Chemours Company FC, LLC
Corporate Remediation Group
1007 Market Street, Room 13116A
Wilmington, Delaware 19899

Prepared by:

PARSONS
4701 Hedgemore Drive
Charlotte, North Carolina 28209

June 2018

Parsons PN 449338

PROFESSIONAL SIGNATURES AND SEALS

Professional Engineer

Name	NC Engineer License number	Expiration date
Michael G. Robinson	034781	12/31/2018

Telephone number	FAX number	E-mail
(704) 558-4255		Michael.Robinson@parsons.com

DOCUMENT:

FEASIBILITY STUDY REPORT FOR PUBLIC WATER SERVICES
CHEMOURS FAYETTEVILLE WORKS
FAYETTEVILLE, NORTH CAROLINA

Seals, as applicable:

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS

Acronym	Definition / Description
bgs	Below ground surface
Chemours	The Chemours Company FC, LLC
DuPont	E. I. du Pont de Nemours and Company
FS	Feasibility study
GAC	Granular activated carbon
HFPO-DA	Hexafluoropropylene oxide dimer acid
LCFWSA	Lower Cape Fear Water and Sewer Authority
LF	Linear foot/feet
MSL	Mean sea level
NCDEQ	North Carolina Department of Environmental Quality
PER	Preliminary engineering report
PPA	Polymer Processing Area
ppt	Part(s) per trillion
PVF	Polyvinyl fluoride
PWC	Public Works Commission
PWS	Public Water System

1.0 INTRODUCTION

In a letter dated May 24, 2018, The North Carolina Department of Environmental Quality (NCDEQ) requested that The Chemours Company FC, LLC (Chemours) work with Bladen, Cumberland, and other counties to develop a plan to install public water at homes with private wells in which hexafluoropropylene oxide dimer acid (HFPO-DA) has been detected above the State's provisional health goal for drinking water.

Parsons has prepared this Feasibility Study (FS) Report to evaluate the potential for extending existing public water systems (PWSs) into the area around the Chemours Fayetteville Works Plant located near Duart Township in Bladen County, North Carolina (the Site). Expanding public drinking water access to impacted areas around the Site and providing connections to homes is a possible measure to address exceedances of the provisional health goal for HFPO-DA in private wells. Chemours, in coordination with NCDEQ, is also conducting a pilot program on the effectiveness of granular activated (GAC) filtration systems in removing HFPO-DA from water. The initial results from the pilot program demonstrate that the GAC system is highly effective at removing HFPO-DA and can be effectively utilized if either (i) the homeowner prefers the GAC system or (ii) the extension of the PWS to that homeowner is not cost effective.

Chemours has had several meetings and phone calls with representatives of Bladen and Cumberland Counties to discuss issues and timing related to possible connections of impacted homeowners to municipal water. Most recently, on June 21, 2018, Chemours met with County officials, including the County Administrators for Bladen and Cumberland Counties to share information about such potential connections. The Counties and Chemours agreed to continue to work together on the feasibility, scope and implementation of connection to PWS.

2.0 BACKGROUND AND OBJECTIVES

The Site is located on NC Highway 87, 15 miles southeast of the City of Fayetteville and south of the Bladen-Cumberland county line. The Site encompasses 2,177 acres of relatively flat, undeveloped open land and woodland bounded on the east by the Cape Fear River, on the west by NC Highway 87, and on the north and south by farmland (**Figure 1**).

E.I. du Pont de Nemours and Company (DuPont) purchased the property in parcels from several families in 1970. A former manufacturing area, which was sold in 1992, produced nylon strapping and elastomeric tape.

DuPont sold its Butacite® and SentryGlas® manufacturing units to Kuraray America Inc. in June 2014. On July 1, 2015, DuPont separated its specialty chemicals business into a new publicly-traded company named The Chemours Company FC, LLC. With this separation, Chemours became the owner of the entire 2,177 acres of the Fayetteville Works along with the fluoromonomers, Nafion™ membranes, and Polymer Processing Area (PPA) manufacturing units. The polyvinyl fluoride (PVF) resin manufacturing unit remains with DuPont.

2.1 Regional Topography, Geology and Hydrogeology

The region surrounding the Site is generally level to gently sloping. However, surface topography steepens when approaching the Cape Fear River and its tributaries.

The Chemours Site is in the northwestern portion of Bladen County at the southern border of Cumberland County. Cumberland and Bladen Counties are situated within the Coastal Plain Physiographic Province, which consists of a seaward thickening wedge of sedimentary deposits ranging in age from Cretaceous to Recent. Paleozoic, metamorphic and igneous rocks underlie these deposits. In the northern portion of Bladen County these "basement" rocks are approximately 400 feet below ground surface (bgs). Based on the Geologic Map of North Carolina[1], Bladen and Cumberland counties is underlain by the Black Creek Formation. The Black Creek Formation is characterized by lignitic clay, gray to black, and contains thin beds and laminae of fine-grained micaceous sand as well as thick lenses of cross-bedded sand. The upper portion of the formation may also contain glauconitic, fossiliferous clayey sand lenses. The Black Creek Formation and surficial deposits are the principal potable water aquifers in the region. Shallow groundwater is generally encountered between 15 and 40 feet below grade.

The soil in Bladen and Cumberland counties falls within the Norfolk-Goldsboro-Raines general classification[2]. These soils are located on old, high stream terraces in the northern part of Bladen County and are generally poorly drained soils that have a sandy or loamy surface layer and loamy subsoil. Based on the lithology logged during on-site investigations, the Site is underlain by a fine- to medium-grained sand unit with thin discontinuous interbedded silt/clay lenses. The sand extends to a depth of approximately 65 feet bgs (elevation of +80 feet mean sea level [MSL]). The saturated portion of this unit has been identified as the Surficial Aquifer. Beneath this unit is a 7- to 15-foot-thick, laterally-continuous dense clay that has been identified as the Black Creek Confining Unit.

2.2 Feasibility Study Objectives

The purpose of this FS is to:

1. Analyze the potential for expanding public drinking water access to homes with private wells having concentrations exceeding the North Carolina provisional health goal for HFPO-DA.
2. Provide a plan for providing required access where such expansion is determined to be feasible.

This report presents the potential options for providing public drinking water to impacted homes around the plant, provides the estimated cost and timeframe to construct the systems, and evaluates the ability to implement the options presented.

[1] North Carolina Geological Survey. 1985.

[2] Leab, Robert J. 1990. Soil Survey of Bladen County. United States Department of Agriculture, Soil Conservation Service.

3.0 PROPOSED SERVICE AREAS AND WATER SOURCES

To facilitate the analysis, the area around the plant was divided into four proposed service areas (based on geography and proximity to water sources) as shown on **Figure 2**:

1. Bladen County West of Cape Fear River
2. Bladen County East of Cape Fear River
3. Cumberland County West of Cape Fear River
4. Cumberland County East of Cape Fear River

Each area is discussed in detail below. In addition, there are three potential water sources for serving the four areas analyzed below.

3.1 Bladen County (Groundwater)

Bladen County operates a public water system that draws water from groundwater and that currently serves select areas of the county as well as providing wholesale water to Cumberland County to service a small neighborhood in southwestern Cumberland County (SouthPoint). Bladen County has several wells located around the county. The system is divided into geographic areas, and service is currently available in the northwestern portion of the county and a small area in southwestern Cumberland County. Parsons has been working with the county to obtain maps and determine requirements for expanding the existing systems. Two proposals were provided by Bladen County to Chemours in late 2017 for providing service to the area west of the Cape Fear River (**Appendix A**).

3.2 Cumberland County (Groundwater or Surface Water)

Cumberland County currently operates a small public water system serving the SouthPoint neighborhood located off Chicken Foot Road in southwest Cumberland county. The county purchases water from Bladen County to service this small neighborhood of less than 50 homes. The County has identified the expansion of municipal water as a priority and is conducting an evaluation of such an expansion. Currently, the only water service in southern Cumberland County is in the South Point neighborhood. While Cumberland County operates the system, wholesale water is purchased from Bladen County for this small system.

Cumberland County evaluated expanding municipal water to residences as part of a proposed bond issue, prepared a preliminary engineering report (PER) for providing public drinking water to various areas of the county not currently served by the utility (Cumberland County Rural Water Feasibility Study Preliminary Engineering Report, August 2009; see **Appendix B**). The PER outlined the cost to expand the system to rural areas located outside the current areas of service**.** Three potential water sources for the proposed water system were analyzed in the PER:

- Option 1 - developing a County-owned surface water supply;
- Option 2- developing a County-owned groundwater supply; and
- Option 3 - negotiating a purchase contract with an existing provider.

Two alternative water sources were evaluated as part of Option 3: (a) Fayetteville Public Works Commission (PWC) and (b) Lower Cape Fear Water and Sewer Authority (LCFWSA). The results of the study indicated that "existing supplies preclude the necessity for Cumberland County developing their own County water supply system (surface or groundwater)." Purchasing water from the Fayetteville PWC was determined to be the most economical option. The Fayetteville PWC uses surface water as its source. The report divides the areas into sub-sections and included population growth estimates.

Parsons has been in discussions with representatives from Cumberland County about this study, which is being updated. The County is updating the study to reflect current population estimates and updated growth projections and to add provisions for fire protection service (instead of the rural water service previously proposed). Based on Parsons' discussions with the county, we expect that Cumberland County may decide to purchase water from the Fayetteville PWC or from Bladen County. We understand, from discussions with the County, that it working to complete the updated study before October 15, 2018.

3.3 Source 3: Lower Cape Fear Water and Sewer Authority (Surface Water)

The LCFWSA operates a surface water treatment plant in Tar Heel, North Carolina, approximately 5.5 miles south of the Site entrance. The treatment plant uses water from the Cape Fear River. Parsons has determined that there are no water lines extending north of the treatment plant. Therefore, the use of this plant as a source was considered impractical given that other sources are significantly closer to the Site. In addition, this system could not practically or cost-effectively serve areas east of the Cape Fear River.

4.0 ASSUMPTIONS

This study relies on publicly-available data, discussions with the Counties, and system information and piping layouts provided to Parsons by the County utilities. Parsons evaluated the available data to determine the most efficient, feasible, and implementable solutions for providing public drinking water to the area. Several assumptions were made while performing the evaluation:

1. The hydraulics of a new delivery system were not analyzed. Parsons assumed that the systems and pipe sizes proposed by Cumberland and Bladen Counties will provide suitable flow and pressure to the homeowners.
2. Proposed costs were based on the costs provided in the PER (adjusted for inflation), cost estimates provided by Bladen County, and professional judgement. The PER can be found in **Appendix B**. The costs are intended to provide a rough estimate for each option so that a preliminary determination of the cost effectiveness of each alternative could be made. The actual cost may be higher or lower.
3. No cost contingency has been included.
4. Parsons assumed cooperation between the water utility suppliers. Negotiation for intercounty water licenses is not included.

5. The proposed system is for providing drinking water to affected residences and does not include fire suppression protection.
6. Piping will be installed with 3.5 feet of cover for freeze protection. Dewatering of excavation pits is not required.
7. Piping can be installed outside paved areas.
8. The construction schedule assumes an average production rate of 300 feet of pipe laid per day and working 5-day weeks, with 36 weeks of construction time per year.
9. Parsons assumed that the counties will use their powers of eminent domain to obtain the property necessary for implementation of municipal water and that Chemours will not be responsible for purchasing property.
10. This study assumes that water mains will be installed directly to the impacted areas (i.e., it does not include the buildout of other areas the transmission main may pass through).
11. Parsons also reviewed the public record related to the implementation of municipal water connections by Duke Energy to identify issues and evaluate the estimated timeline for implementation of the options reviewed in this study.

5.0 PROCESS OVERVIEW

This section describes the general process that would be followed to determine whether and how Chemours would provide certain homeowners with connections to PWSs. How that general process would be applied to specific geographic areas is discussed in subsequent sections.

For each owner of a home with well water concentrations above the provisional health goal, Chemours will determine in coordination with DEQ whether a connection to public water would be feasible, assuming sufficient acceptance by homeowners. Such a connection would be considered feasible if the respective County is willing to make public water available to that homeowner, and the cost to Chemours of doing so is cost-effective. Based on our understanding of the State's practice in other situations, to assess whether it is cost effective to provide public water to each service area, the cost per home needs to be calculated. Extension of public water was initially deemed "cost-prohibitive" by the State for connections by Duke Energy when the cost exceeded $35,000 per home. It is our understanding that this value was increased by the State this year to $75,000 per home. For purposes of this report, it is assumed that connections costing over $75,000 per home are not cost effective. For reference, we understand that the cost to install a GAC filtration system is approximately $10,000 per home.

If providing water service to an area is determined to be potentially feasible, Chemours will contact the owner of each home with well water concentrations above the provisional health goal to request their preference for municipal water or a GAC filtration system. Based on their preference, Chemours will obtain the necessary access agreement. If the homeowner prefers municipal water, Chemours will request that they create an account for municipal water (where existing service is available). This process is similar to the one used by Duke Energy for extending public water service to homes around their facilities. Chemours estimates, based on the Duke Energy experience, that most homes will complete these prerequisite steps within one year. Chemours also anticipates that

there will be several homes that will lag behind, but that these should not impact the general construction schedule unless they are at the outer limit of any municipal water line.

For areas not currently serviced by an existing public water service, the PWS would only be extended if a sufficient percentage of the homes in that area select the PWS solution and the extension of service was determined to be cost effective. Otherwise, it will not be possible to deliver water of sufficient quality for drinking. The exact number of homes needed to justify the system and provide adequate water quality will be determined based on hydraulic modeling and assistance from the Counties. In addition, some homes may require minor system expansions (e.g., extension of a 2-inch water main). These homes will be evaluated on a case-by-case basis (based on factors such as the ability to obtain rights-of-way and available water supply system capacity).

6.0 PROPOSED MUNICIPAL WATER EXPANSIONS BY LOCATION

As discussed above, this report focuses on four proposed service areas. The feasibility and implementability of servicing each area based on cost, ability to provide adequate water quality, and schedule is discussed in more detail below.

6.1 Bladen County

As previously mentioned, Parsons has been working with each county to obtain maps and determine requirements for expanding the existing systems. Bladen County provided two proposals in late 2017 to provide service to the area west of the Cape Fear River (**Appendix A**). Parsons used these proposals and updated sampling results to determine the size and location of water mains necessary to service homes in this area. Bladen County is evaluating expanding both drinking water and fire suppression services to all homes in this area.

In the most recent discussions with Bladen County, Chemours and Bladen County agreed to continue to coordinate on the expansion of municipal water connections west of the Cape Fear River. The next meeting will be scheduled after Bladen County has had an opportunity to review this municipal water plan.

6.1.1 Bladen County West of Cape Fear River

As shown on **Figure 3**, there are 47 residences whose drinking water sampling results are at or above 140 parts per trillion (ppt) within this area. It is anticipated that municipal water could be expeditiously provided to impacted homes in this area, since existing water service lines are already present in much of the area, and only moderate water main additions are necessary to extend the water service lines to all impacted homes. The existing and proposed extension of water service lines is shown on **Figure 3**. Water would be provided by an existing groundwater well (Tobermory Road) along with a proposed new well (location to be determined).

The existing Bladen County water supply well is reportedly nearing capacity, and the expansion of municipal water service to additional homes likely will require drilling a new well. According to Bladen County officials, the proposed well would have sufficient capacity to serve both this area of Bladen County and homes exceeding the HFPO-DA advisory level in the Cumberland County area to the north (also west of the Cape Fear River).

Estimated Cost

Chemours estimates the cost of installing municipal water to all 47 homes in Bladen County east of the Cape Fear River at $3,480,000 -- approximately $74,000 per home. The costs are summarized in **Table 1**, and a detailed breakdown of the estimated costs is provided in **Appendix C**. The new well accounts for approximately 25% of the total cost for extending service in Bladen County west of the river.

Estimated Schedule

For homes that already have a water line to serve the house (i.e., the home just needs a service connection to the existing line), a homeowner selecting municipal water will simply be connected to the line. Accordingly, the schedule for installation in this area is shorter than in other areas, given the existence of water service to much of the area. Installation of municipal water for most homes in this area can be completed in approximately two to four years. This assumes these households provide an access agreement and complete any other activities required by the county in a timely manner. The schedule details are provided in **Table 2**. As Chemours continues to coordinate with the County, it plans to explore ways by which this timeline can be shortened.

Conclusion

Based on the foregoing analysis, Chemours has informed Parsons that it is prepared to proceed, subject to further discussions with Bladen County, with installation of municipal water to the 47 homes west of the Cape Fear River in Bladen County, even though the $73,400 per residence is substantially more than the cost to provide a GAC filtration system. Chemours is willing to install municipal water in this area, contingent on approximately 90 percent of the homeowners selecting municipal water, so that the implementation costs do not become cost prohibitive.

6.1.2 Bladen County East of Cape Fear River

As shown on **Figure 4**, there are only four residences whose drinking water sampling results are at or above 140 ppt within this area. To provide service to Bladen County east of the Cape Fear River from existing sources, installation of an approximately 16,100 linear foot (LF), 6-inch water main would be required to bring water to the area from the existing water service on River Road (**Figure 4**). An existing groundwater well feeds this system and is assumed to be sufficient for the limited number of homes (four) at which the health advisory level has been exceeded. As an alternative, a water line could be extended from the existing Bladen County system west of the Cape Fear River. However, the length of the line, the need to acquire significant right-of-way, and the cost of drilling underneath the Cape Fear River make this option infeasible. Regardless, the long water main and limited number of customers would require that flushing hydrants be installed to maintain the water quality. The flushing hydrants would result in wasting significant amounts of water. The hydraulics and system capacity indicate that it would be extremely difficult to maintain appropriate water quality over this distance given the number of homes.

Estimated Costs

The construction of a new and long water main to carry water to the four homes in Bladen County east of the Cape Fear River, along with connecting the four homes, is estimated to cost $1,770,000 – approximately $442,500 per house. The cost details are

summarized in **Table 1**, and a detailed breakdown of the estimated costs is provided in **Appendix C**.

Estimated Schedule

Although there are only four homes in this area, the need to construct a new and long water main to reach these households would take considerable time. Therefore, installation of municipal water to these houses would take about the same time as is required for the west side of the river. As shown on **Table 2**, Parsons estimates that installation would take approximately two to four years.

Conclusion

It is not feasible, technically or in terms of cost and timeliness, to install municipal water east of the Cape Fear River in Bladen County. Given the distance to the nearest water mains and the lower density of homes, servicing these areas from the existing PWS will require long dead-end water mains that add significant cost to the system and may not provide a water supply of adequate quality. The combination of a long water main and so few houses means that it will be difficult, if not impossible, to maintain the quality of the water in the municipal system. Further, it would take approximately two to four years to install municipal water, at a cost of approximately $442,500 per house, which is not cost effective. The installation and operation of GAC filter systems at these households is cost effective, and the systems can be installed much more quickly.

6.2 Cumberland County

As previously discussed, Cumberland County is currently evaluating the expansion of municipal water to residences in this portion of the county. Parsons used the current residential sampling data (samples collected through May 16, 2018) and the 2009 PER prepared by Cumberland County (**Appendix B**) to determine the size and location of water mains necessary to service homes in this area. As in Bladen County, Cumberland County's feasibility study is focused on providing water and fire suppression services to all homes in this area. Chemours has committed to continue working with Cumberland County.

6.2.1 Cumberland County West of Cape Fear River

In reviewing potential water sources for Cumberland County west of the Cape Fear River, it was determined that two water source options are available to provide municipal water to the 75 residences with water above 140 ppt threshold. This area could either be serviced by extending water from the Fayetteville PWC (Option 1), or water could be provided from the Bladen County groundwater system (Option 2). Each is described below:

- Option 1 (**Figure 5**): Extension of water mains from Fayetteville PWC to the south. This option includes the installation of approximately 11,000 LF of 16-inch water main along Highway 87 from the nearest existing main (located on Highway 87 just south of U Tyson Road) to bring water to the service area.
- Option 2 (**Figure 6**): Water provided from Bladen County groundwater system located south of the area. For this option, approximately 6,000 LF of 12-inch water main would be extended south into Bladen County to connect with the proposed water mains and new well proposed for providing service to the area

west of the Cape Fear River as described above. This shorter 12-inch line would be in lieu of the 11,000 LF of 16-inch water main required by Option 1.

Estimated Costs

The estimated cost of Option 1 (bringing water from Fayetteville PWC south to these 75 residences) is $15,730,000. This is approximately $209,700 per home. The estimated cost of Option 2 (obtaining water from Bladen County for these 75 residences) is $7,230,000. This is approximately $96,400 per home. The cost details are summarized in **Table 1,** and a detailed breakdown of the estimated costs is provided in **Appendix C**.

Estimated Schedule

As shown on **Table 2**, the schedule for installation of municipal water under Option 1 would be approximately six to 10 years. This is due to the extensive network of water mains that must be installed and the long main running down Highway 87 to service the area. Parsons estimates that the period for installation for Option 2 would be somewhat less given the shorter distance from the water source. As shown on **Table 2**, this option is estimated to take approximately five to eight years.

Conclusion

It is technically feasible to extend public water service to the homes in Cumberland County west of the Cape Fear River due to the density of homes combined with the availability of a nearby water source. However, it would take a considerable period of time (six to 10 years) to accomplish this, which raises serious concerns about the implementability of this option. Moreover, the cost per home under either option would appear to be significantly greater than $75,000. Because Cumberland County is already evaluating bringing municipal water to this area, it may be that if the County's plans proceed sufficiently, the costs needed to implement connections for the homeowners with impacted wells will significantly decline and that such connections could become cost effective in the future. Chemours will continue to work cooperatively with the County to evaluate the feasibility and implementability of these connections.

6.2.2 Cumberland County East of Cape Fear River

As shown on **Figure 7**, there are 35 residences whose drinking water sampling results are at or above 140 ppt within this area. To provide municipal water to these homes, a water main must be extended from Fayetteville PWC to the south. This service area would require extending a 31,500 LF, 12-inch main from the intersection of NC 210 and Cedar Creek Road (in addition to the smaller mains to service the homes). The long water main and limited number of customers may result in water quality issues within the service area. Parsons's initial analysis indicates that appropriate water quality would be difficult to maintain, given the hydraulics and capacity of the system.

As an alternative, a water line could be extended underneath the river from the proposed system west of the Cape Fear River. However, the length of the line, the need to acquire significant right-of-way, and the cost of drilling underneath the Cape Fear River make this option infeasible.

Estimated Costs

The estimated cost of providing municipal water to the 35 residences in Cumberland County east of the Cape Fear River, is $11,960,000. This is approximately $341,700 per

house. The main cost driver is the long distance from an existing public water source. The cost details are summarized in **Table 1**, and a detailed breakdown of the estimated costs is provided in **Appendix C**.

Estimated Schedule

Given the current lack of municipal water infrastructure, a new and long water main must be constructed to reach these 35 households. As shown on **Table 2**, Parsons estimates that such installation, as with the west side of the River, would take approximately five to eight years.

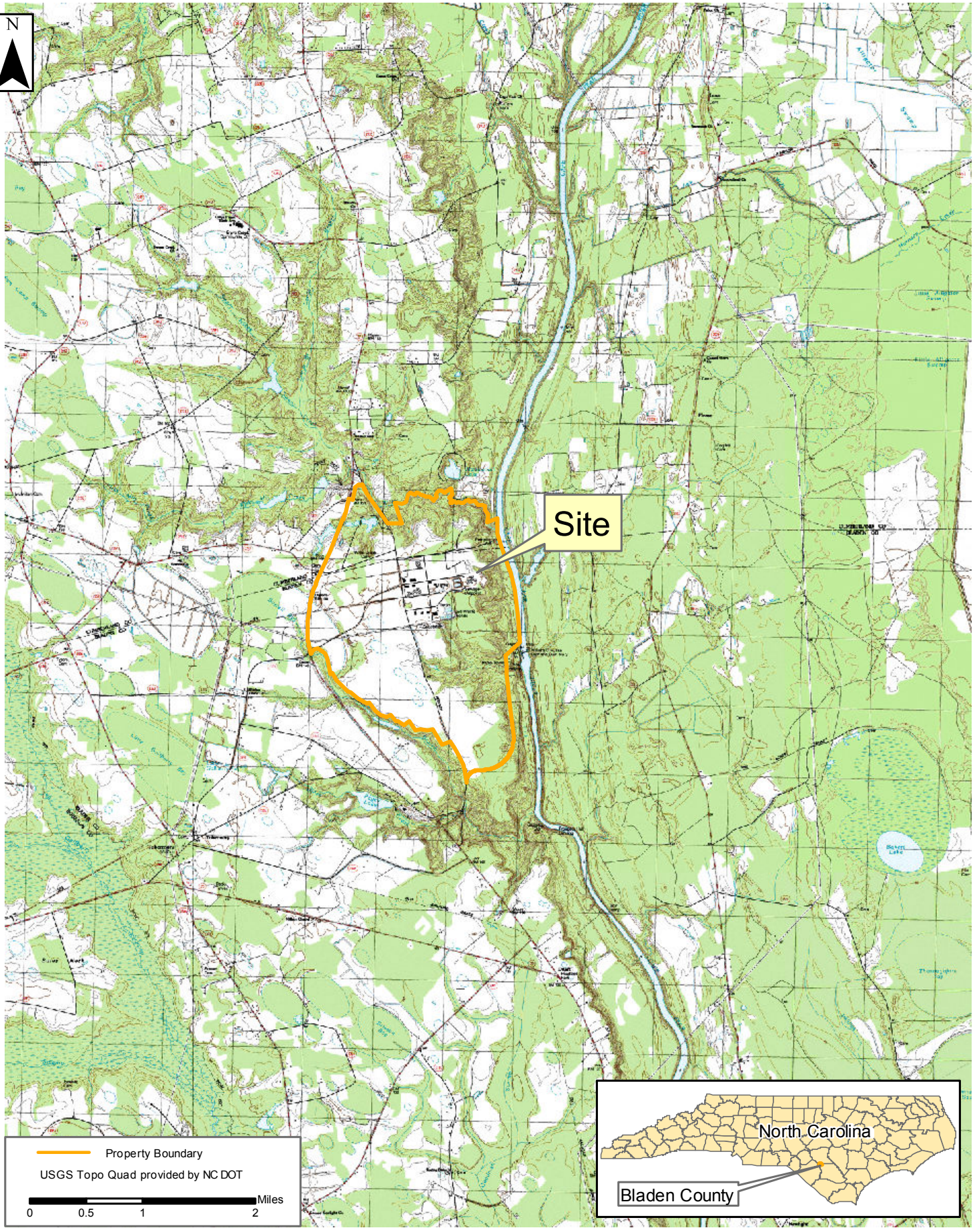
Conclusion

It is not feasible, technically or in terms of cost and timeliness, to install municipal water east of the Cape Fear River in Cumberland County. Given the existing lack of municipal water infrastructure, distance to the nearest water mains, and the lower density of homes, installing municipal water means that these residences will be on bottled water for years. Further, servicing these areas from the existing PWS will require long dead-end water mains that add significant cost to the system and may not provide a water supply of adequate quality. Further, it would take approximately five to eight years to install municipal water, at a cost of approximately $341,700 per home, which is not cost effective. The installation and operation of GAC filter systems at these households is cost effective, and the systems can be installed much more quickly.

7.0 NEXT STEPS

Parsons recommends that Chemours continue to coordinate with both Bladen and Cumberland Counties to act in the most timely and cost-effective way. The path forward will depend significantly on the actions that the Counties take to expand their municipal water systems.

FIGURES



PARSONS

PE&I
4701 Hedgemore Dr.
Charlotte, NC 28209

Site Location Map
Feasibility Study Report Public Water Services
Chemours Fayetteville Works
Fayetteville, North Carolina

Drawn:	Date:	File Project Number:
C. Oneal	1/29/2018	449338.01050
Revision: 1	Figure Number: 1	
Name: Fay_Fig_1_Site_Loc		

D:\GIS\Fayetvle\GisProject_figures\2017\SiteInvestigation\Fay_Fig_1_Site_Loc.mxd

Legend

State Sampling Exceedances:

- Equal to or Above 140 ng/L

Chemours Sampling Exceedances:

- Equal to or Above 140 ng/L
- Round 4 Sampling Boundary
- Cumberland County Parcel
- Bladen County Parcel
- Service Area Border
- Approximate Plant Border
- Existing 2 inch Water Main
- Existing 4 inch Water Main
- Existing 6 inch Water Main
- Existing 8 inch Water Main
- Existing 12 inch Water Main
- Flushing Hydrant
- Water Meter

Proposed Water Mains:

- 16"
- 12"
- 8"
- 6"
- 4"
- 2"

N

0 0.5 1 1.5 2 2.5 3 3.5 Miles

Cumberland County West of the Cape Fear River

Cumberland County East of the Cape Fear River

Bladen County East of the Cape Fear River

Bladen County West of the Cape Fear River

Cape Fear River

Single exceedance in Robeson County not part of this study. Water service is available on NC Hwy 20 across the RR tracks.

Proposed Service Area

Fayetteville Works Facility
Fayetteville, North Carolina

PARSONS
4704 Hedgemore Drive
Charlotte, North Carolina 28209

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
450768.04020	6/25/2018	RAH	MR	2

Document Path: F:\GIS\Fayetteville\Gis\Project_figures\2018 Sampling\Exceedance Maps (2018)\Overall Exceedance Map with Proposed Water Main Additions.mxd

Bladen County
West of the Cape Fear River
Fayetteville Works Facility
Fayetteville, North Carolina

PARSONS
4704 Hedgemore Drive
Charlotte, North Carolina 28209

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
450768.04020	6/25/2018	RAH	MR	3

Legend

State Sampling Exceedances:
- Equal to or Above 140 ng/L

Chemours Sampling Exceedances:
- Equal to or Above 140 ng/L
- Flushing Hydrant
- Water Meter
- Cumberland County Parcel
- Bladen County Parcel
- Service Area Border
- Approximate Plant Border
- Existing 2 inch Water Main
- Existing 4 inch Water Main
- Existing 6 inch Water Main
- Existing 8 inch Water Main
- Existing 12 inch Water Main

Proposed Water Mains:
- 16"
- 12"
- 8"
- 6"
- 4"
- 2"

N

0 0.5 1 Miles

Cape Fear River

6"

Single exceedance in Robeson County not part of this study.
Water service is available on NC Hwy 20 across the RR tracks.

Document Path: F:\GIS\Fayetteville\Gis\Project_figures\2018 Sampling\Exceedance Maps (2018)\Bladen West Exceedance Map.mxd

N

0 0.5 1 Miles

Legend

State Sampling Exceedances:
- Equal to or Above 140 ng/L

Chemours Sampling Exceedances:
- Equal to or Above 140 ng/L
- Cumberland County Parcel
- Bladen County Parcel
- Service Area Border
- Approximate Plant Border
- Existing 2 inch Water Main
- Existing 4 inch Water Main
- Existing 6 inch Water Main
- Existing 8 inch Water Main
- Existing 12 inch Water Main
- Flushing Hydrant

Proposed Water Mains:
- 16"
- 12"
- 8"
- 6"
- 4"
- 2"

Cape Fear River

Pole Acres Rd

Livingston Farm Rd

Privateer Farm Rd

Bakers Lake

6 inch proposed water main continued approximately 16,100' south to existing 6 inch main

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), Mapmyindia, NGCC, ...

Bladen County
East of the Cape Fear River
Fayetteville Works Facility
Fayetteville, North Carolina

PARSONS
4704 Hedgemore Drive
Charlotte, North Carolina 28209

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
450768.04020	6/20/2018	RAH	MR	4

Document Path: F:\GIS\Fayetteville\Gis\Project_figures\2018 Sampling\Exceedance Maps (2018)\Bladen East Exceedance Map.mxd

Cumberland County West of the Cape Fear River - Option 1

Fayetteville Works Facility
Fayetteville, North Carolina

PARSONS
4704 Hedgemore Drive
Charlotte, North Carolina 28209

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
450768.04020	6/20/2018	RAH	MR	5

Nearest Cumberland County Water Main on Hwy 87 approximately 11,000 LF north of Alderman Road (located just south of U Tyson Road) and proposed 16" ties in at Schreiber Drive, approx 8000' north of Alderman Road

Legend

State Sampling Exceedances:
- Equal to or Above 140 ng/L

Chemours Sampling Exceedances:
- Equal to or Above 140 ng/L
- Cumberland County Parcel
- Bladen County Parcel
- Service Area Border
- Approximate Plant Border
- Existing 2 inch Water Main
- Existing 4 inch Water Main
- Existing 6 inch Water Main
- Existing 8 inch Water Main
- Existing 12 inch Water Main

Proposed Water Mains:
- 16"
- 12"
- 8"
- 6"
- 4"
- 2"

N

0 0.5 1 Miles

Document Path: F:\GIS\Fayetteville\Gis\Project_figures\2018 Sampling\Exceedance Maps (2018)\Cumberland West Exceedance Map Option 1.mxd

Cumberland County West of the Cape Fear River - Option 2

Fayetteville Works Facility
Fayetteville, North Carolina

PARSONS
4704 Hedgemore Drive
Charlotte, North Carolina 28209

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
450768.04020	6/20/2018	RAH	MR	6

Legend

State Sampling Exceedances:
- Equal to or Above 140 ng/L

Chemours Sampling Exceedances:
- Equal to or Above 140 ng/L
- Cumberland County Parcel
- Bladen County Parcel
- Service Area Border
- Approximate Plant Border
- Existing 2 inch Water Main
- Existing 4 inch Water Main
- Existing 6 inch Water Main
- Existing 8 inch Water Main
- Existing 12 inch Water Main
- Water Meter

Proposed Water Mains:
- 16"
- 12"
- 8"
- 6"
- 4"
- 2"

N

0 0.5 1 Miles

Document Path: F:\GIS\Fayetteville\Gis\Project_figures\2018 Sampling\Exceedance Maps (2018)\Cumberland West Exceedance Map Option 2.mxd

12 inch water main continues 31,500 feet to existing water main located at NC210 and Cedar Creek Road

N

0 0.5 1 Miles

Legend

State Sampling Exceedances:
- Equal to or Above 140 ng/L

Chemours Sampling Exceedances:
- Equal to or Above 140 ng/L
- Cumberland County Parcel
- Bladen County Parcel
- Service Area Border
- Approximate Plant Border
- Existing 2 inch Water Main
- Existing 4 inch Water Main
- Existing 6 inch Water Main
- Existing 8 inch Water Main
- Existing 12 inch Water Main

Proposed Water Mains:
- 16"
- 12"
- 8"
- 6"
- 4"
- 2"

Cumberland County
East of the Cape Fear River
Fayetteville Works Facility
Fayetteville, North Carolina

PARSONS
4704 Hedgemore Drive
Charlotte, North Carolina 28209

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
450768.04020	6/20/2018	RAH	MR	7

Document Path: F:\GIS\Fayetteville\Gis\Project_figures\2018 Sampling\Exceedance Maps (2018)\Cumberland East Exceedance Map.mxd

TABLES

Table 1
Estimated Costs Summary

DESCRIPTION	ESTIMATED COST	HOMES SERVED	COST PER HOME
Bladen County West of the CFR (Source: Exist. / New Well)	$3,480,000	47	$74,043
Bladen County East of the CFR (Source: Exist. Bladen Co. Well)	$1,770,00	4	$442,500
Cumberland County West of CFR (Source: Fay PWC)	$15,730,000	75	$209,733
Cumberland County West of CFR (Source: New Bladen Co, Well)	$7,230,000	75	$96,400
Cumberland County East of CFR (Source: Fay PWC)	$11,680,000	35	$341,714

Table 2
Estimated Schedule (Years)

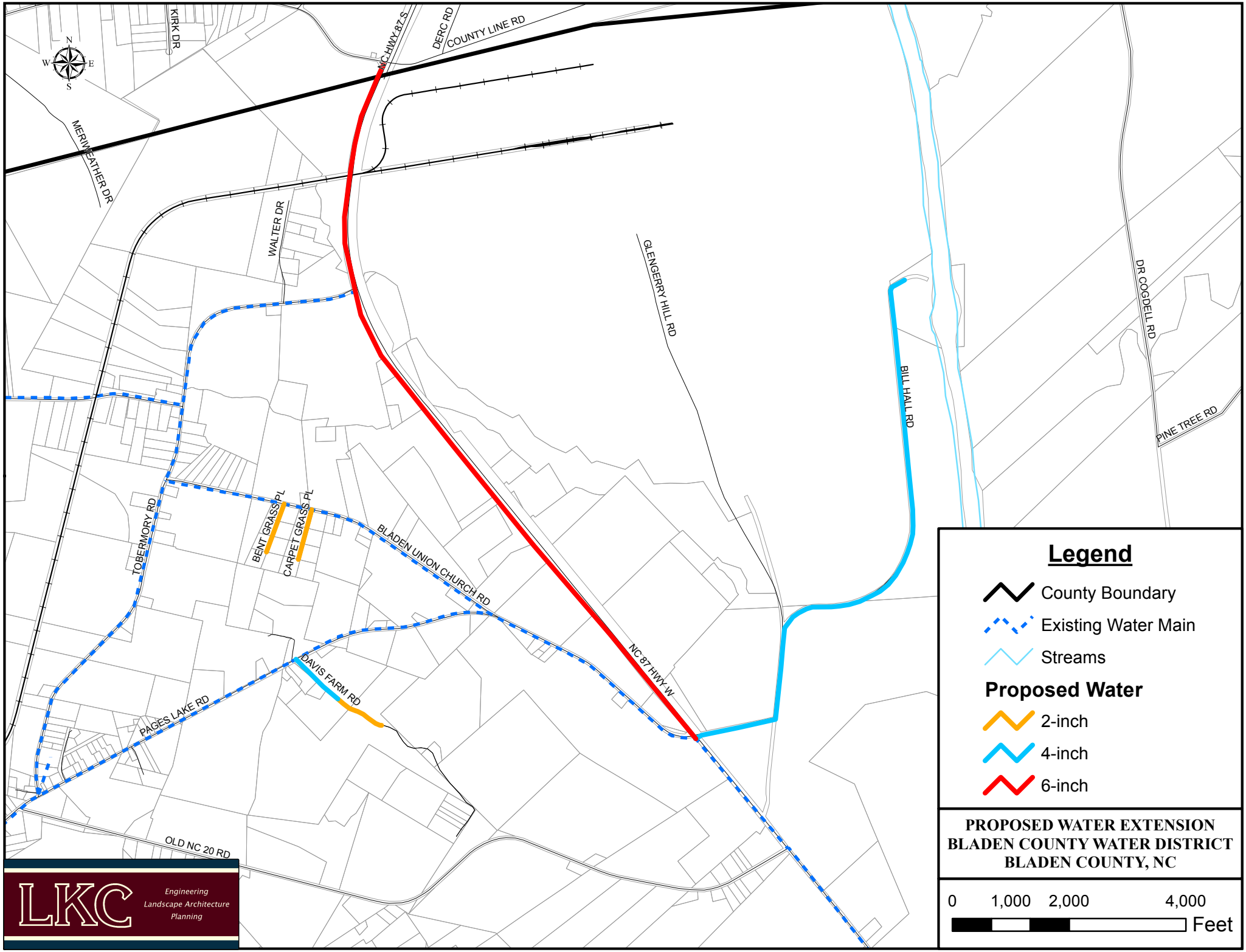
SERVICE AREA	HOMEOWNER NEGOTIATIONS	DESIGN AND PERMITTING	OBTAIN RIGHTS-OF-WAY	CONSTRUCTION	TOTAL
Bladen West	0.5 - 1	0.5 - 1	0.5 - 1	0.5 - 1	2 – 4
Bladen East	0.5 - 1	0.5 - 1	0.5 - 1	0.5 - 1	2 – 4
Cumberland West– Option 1	1 - 2	1 – 2	2 – 3	2 – 3	6 – 10
Cumberland West – Option 2	1 – 2	1	1 – 2	2 – 3	5 – 8
Cumberland East	1 – 2	1 – 2	1 – 2	2	5 – 8

APPENDIX A
BLADEN COUNTY DOCUMENTS

APPENDIX B
2009 PRELIMINARY ENGINEERING REPORT
CUMBERLAND COUNTY

APPENDIX C
COST ESTIMATES

APPENDIX A
BLADEN COUNTY DOCUMENTS


KIRK DR
NC HWY 87 S
DERC RD
COUNTY LINE RD
MERRIWEATHER DR
WALTER DR
GLENGERRY HILL RD
BILL HALL RD
DR COGDELL RD
PINE TREE RD
TOBERMORY RD
BENT GRASS PL
CARPET GRASS PL
BLADEN UNION CHURCH RD
NC 87 HWY W
DAVIS FARM RD
PAGES LAKE RD
OLD NC 20 RD
Legend
County Boundary
Existing Water Main
Streams
Proposed Water
2-inch
4-inch
6-inch
PROPOSED WATER EXTENSION
BLADEN COUNTY WATER DISTRICT
BLADEN COUNTY, NC
0
1,000
2,000
4,000
Feet
LKC
Engineering
Landscape Architecture
Planning

BLADEN COUNTY WATER DISTRICT
Bladen County Water Main Extension
PRELIMINARY COST ESTIMATE

Description	Diameter	Length (ft)	Cost
Hwy 87 to County Line	6-inch	13,800	$460,050.00
Davis Farm	4 & 2-inch	2,000	$37,775.00
Bent Grass Place	2-inch	900	$23,750.00
Carpet Grass Place	2-inch	900	$23,750.00
Glenjerry Road	4-inch	10,500	$217,950.00
New Production Well			$540,000.00
	Total Length:	28,100	
Construction Subtotal:			**$1,303,300.00**
Contingencies & Engineering (25%)			$325,800.00
Railroad Encroachment			$15,000.00
Land Acquisition and 3-Phase Power for Well Site			$30,000.00
Permit Fees, Advertisements, Misc			$3,000.00
TOTAL COST ESTIMATE:			**$1,677,100.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

6" Water Main Extension along Hwy 87 from Bladen Union Church Road to County Line Road

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	12,500	LF	$18.00	$225,000.00
2.	6" Class 350 DIP Water Main	700	LF	$35.00	$24,500.00
3.	6" Class 350 RJ DIP Water Main	100	LF	$45.00	$4,500.00
4.	4" SDR21 PVC Water Main	0	LF	$14.00	$0.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	0	LF	$9.00	$0.00
8.	12" Steel Casing Installed by Jack and Bore	330	LF	$195.00	$64,350.00
9.	8" Steel Casing Installed by Jack and Bore	0	LF	$150.00	$0.00
10.	8" HDPE Water Main Installed by Directional Bore	500	LF	$120.00	$60,000.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	14	EA	$950.00	$13,300.00
13.	4" Gate Valve	0	EA	$875.00	$0.00
14.	2" Gate Valve	0	EA	$750.00	$0.00
15.	6" DI Bends	16	EA	$600.00	$9,600.00
16.	4" DI Bends	0	EA	$550.00	$0.00
17.	2" DI Bends	0	EA	$500.00	$0.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	0	EA	$1,200.00	$0.00
24.	Fire Hydrant Assembly	7	EA	$3,200.00	$22,400.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	0	TN	$35.00	$0.00
28.	Water Main Cleanup and Testing	13,800	LF	$2.00	$27,600.00
29.	Connection to Existing Water Main	2	EA	$3,500.00	$7,000.00
				SUBTOTAL:	**$460,050.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

4" & 2" Water Main Extension along Davis Farm Road

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	1,000	LF	$14.00	$14,000.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	1,000	LF	$9.00	$9,000.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	0	LF	$150.00	$0.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	1	EA	$875.00	$875.00
14.	2" Gate Valve	1	EA	$750.00	$750.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	2	EA	$550.00	$1,100.00
17.	2" DI Bends	2	EA	$500.00	$1,000.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	1	EA	$200.00	$200.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	10	TN	$35.00	$350.00
28.	Water Main Cleanup and Testing	2,000	LF	$2.00	$4,000.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$37,775.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

2" Water Main Extension along Bent Grass Place

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	0	LF	$14.00	$0.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	900	LF	$9.00	$8,100.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	30	LF	$150.00	$4,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	0	EA	$875.00	$0.00
14.	2" Gate Valve	2	EA	$750.00	$1,500.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	0	EA	$550.00	$0.00
17.	2" DI Bends	2	EA	$500.00	$1,000.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	10	TN	$35.00	$350.00
28.	Water Main Cleanup and Testing	900	LF	$2.00	$1,800.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$23,750.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

2" Water Main Extension along Carpet Grass Place

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	0	LF	$14.00	$0.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	900	LF	$9.00	$8,100.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	30	LF	$150.00	$4,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	0	EA	$875.00	$0.00
14.	2" Gate Valve	2	EA	$750.00	$1,500.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	0	EA	$550.00	$0.00
17.	2" DI Bends	2	EA	$500.00	$1,000.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	10	TN	$35.00	$350.00
28.	Water Main Cleanup and Testing	900	LF	$2.00	$1,800.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$23,750.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

4" Water Main Extension along Glenjerry Road

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	10,350	LF	$14.00	$144,900.00
5.	4" Class 350 DIP Water Main	150	LF	$30.00	$4,500.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	0	LF	$9.00	$0.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	150	LF	$150.00	$22,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	12	EA	$875.00	$10,500.00
14.	2" Gate Valve	0	EA	$750.00	$0.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	12	EA	$550.00	$6,600.00
17.	2" DI Bends	0	EA	$500.00	$0.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	15	SY	$50.00	$750.00
27.	Gravel Driveway Repair	20	TN	$35.00	$700.00
28.	Water Main Cleanup and Testing	10,500	LF	$2.00	$21,000.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$217,950.00**

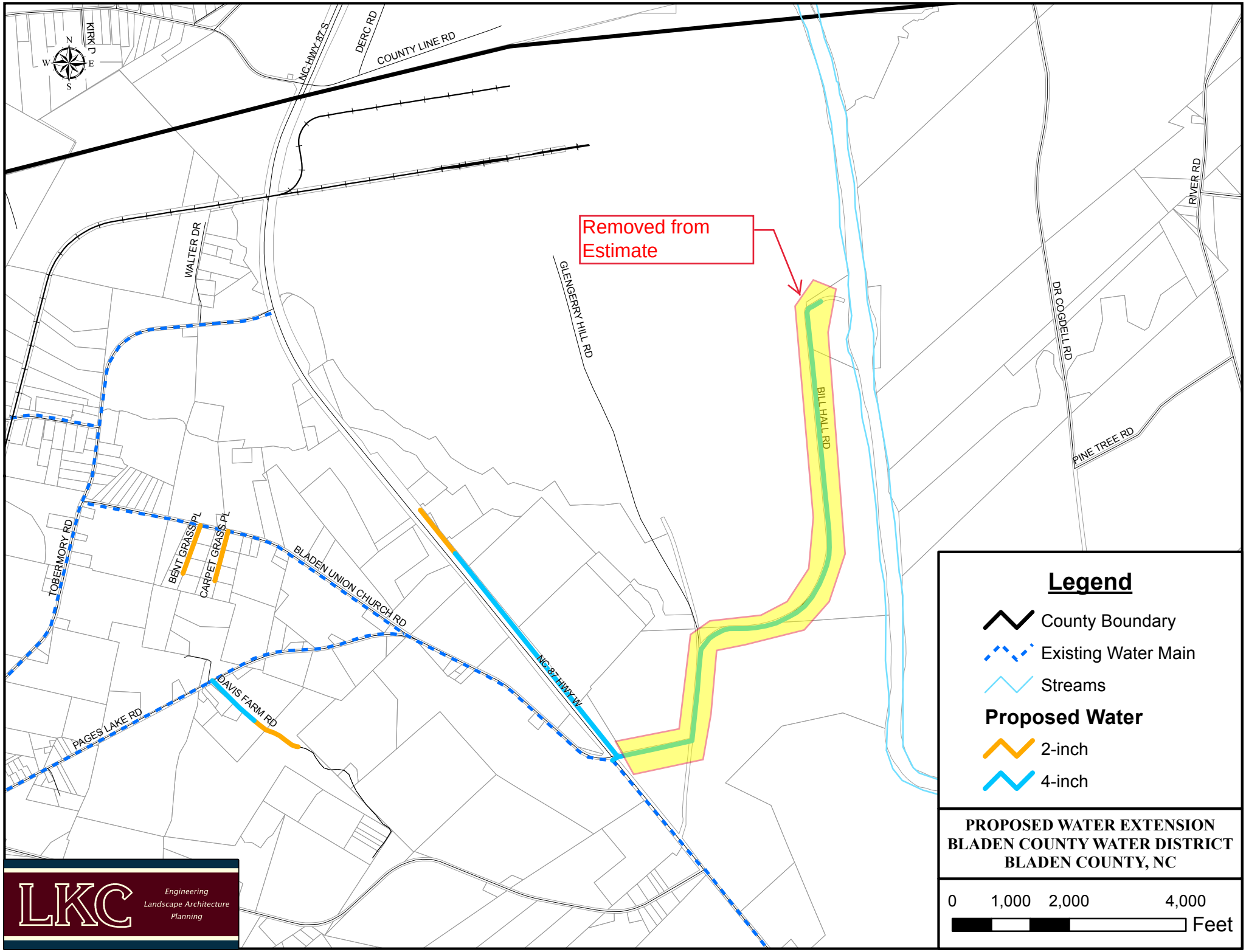
BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

New Production Well

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	Aquifer & Pump Test	1	EA	$45,000.00	$45,000.00
2.	New Well Construction	1	EA	$95,000.00	$95,000.00
3.	Treatment Works & Well House	1	EA	$150,000.00	$150,000.00
4.	Site Electrical	1	EA	$25,000.00	$25,000.00
5.	Iron Treatment System	1	EA	$225,000.00	$225,000.00
				SUBTOTAL:	**$540,000.00**


KIRK D
N
W
E
S
NC HWY 87 S
DERC RD
COUNTY LINE RD
WALTER DR
GLENGERRY HILL RD
Removed from Estimate
BILL HALL RD
DR COGDELL RD
RIVER RD
PINE TREE RD
TOBERMORY RD
BENT GRASS PL
CARPET GRASS PL
BLADEN UNION CHURCH RD
NC 87 HWY W
DAVIS FARM RD
PAGES LAKE RD
LKC
Engineering
Landscape Architecture
Planning
Legend
County Boundary
Existing Water Main
Streams
Proposed Water
2-inch
4-inch
PROPOSED WATER EXTENSION
BLADEN COUNTY WATER DISTRICT
BLADEN COUNTY, NC
0
1,000
2,000
4,000
Feet

BLADEN COUNTY WATER DISTRICT
Bladen County Water Main Extension
PRELIMINARY COST ESTIMATE

Description	Diameter	Length (ft)	Cost	
Hwy 87	4 & 2-inch	5,550	$101,325.00	
Davis Farm Road	4 & 2-inch	2,000	$37,775.00	
Bent Grass Place	2-inch	900	$23,750.00	
Carpet Grass Place	2-inch	900	$23,750.00	
~~Glenjerry Road~~	~~4-inch~~	~~10,500~~	~~$217,950.00~~	
New Production Well			$540,000.00	
	Total Length:	19,850		
Construction Subtotal:			~~**$944,600.00**~~	$726,650
Contingencies & Engineering (25%)			~~$236,200.00~~	$181,700
Railroad Encroachment			$15,000.00	
Land Acquisition and 3-Phase Power for Well Site			$30,000.00	
Permit Fees, Advertisements, Misc			$3,000.00	
TOTAL COST ESTIMATE:			~~**$1,228,800.00**~~	$956,350

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

4" & 2" Water Main Extension along Hwy 87 from Bladen Union Church Road

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	4,500	LF	$14.00	$63,000.00
5.	4" Class 350 DIP Water Main	50	LF	$30.00	$1,500.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	1,000	LF	$9.00	$9,000.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	50	LF	$150.00	$7,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	5	EA	$875.00	$4,375.00
14.	2" Gate Valve	1	EA	$750.00	$750.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	2	EA	$550.00	$1,100.00
17.	2" DI Bends	1	EA	$500.00	$500.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	1	EA	$400.00	$400.00
21.	Tapping Sleeve & Valve	0	EA	$1,800.00	$0.00
22.	4" Plug Tapped for 2" NPT	1	EA	$200.00	$200.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	20	TN	$35.00	$700.00
28.	Water Main Cleanup and Testing	5,550	LF	$2.00	$11,100.00
29.	Connection to Existing Water Main	0	EA	$3,500.00	$0.00
				SUBTOTAL:	**$101,325.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

4" & 2" Water Main Extension along Davis Farm Road

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	1,000	LF	$14.00	$14,000.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	1,000	LF	$9.00	$9,000.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	0	LF	$150.00	$0.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	1	EA	$875.00	$875.00
14.	2" Gate Valve	1	EA	$750.00	$750.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	2	EA	$550.00	$1,100.00
17.	2" DI Bends	2	EA	$500.00	$1,000.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	1	EA	$200.00	$200.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	10	TN	$35.00	$350.00
28.	Water Main Cleanup and Testing	2,000	LF	$2.00	$4,000.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$37,775.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

2" Water Main Extension along Bent Grass Place

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	0	LF	$14.00	$0.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	900	LF	$9.00	$8,100.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	30	LF	$150.00	$4,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	0	EA	$875.00	$0.00
14.	2" Gate Valve	2	EA	$750.00	$1,500.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	0	EA	$550.00	$0.00
17.	2" DI Bends	2	EA	$500.00	$1,000.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	10	TN	$35.00	$350.00
28.	Water Main Cleanup and Testing	900	LF	$2.00	$1,800.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$23,750.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

2" Water Main Extension along Carpet Grass Place

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	0	LF	$14.00	$0.00
5.	4" Class 350 DIP Water Main	0	LF	$30.00	$0.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	900	LF	$9.00	$8,100.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	30	LF	$150.00	$4,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	0	EA	$875.00	$0.00
14.	2" Gate Valve	2	EA	$750.00	$1,500.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	0	EA	$550.00	$0.00
17.	2" DI Bends	2	EA	$500.00	$1,000.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	0	SY	$50.00	$0.00
27.	Gravel Driveway Repair	10	TN	$35.00	$350.00
28.	Water Main Cleanup and Testing	900	LF	$2.00	$1,800.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$23,750.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

4" Water Main Extension along Glenjerry Road

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	6" SDR21 PVC Water Main	0	LF	$18.00	$0.00
2.	6" Class 350 DIP Water Main	0	LF	$35.00	$0.00
3.	6" Class 350 RJ DIP Water Main	0	LF	$45.00	$0.00
4.	4" SDR21 PVC Water Main	10,350	LF	$14.00	$144,900.00
5.	4" Class 350 DIP Water Main	150	LF	$30.00	$4,500.00
6.	4" Class 350 RJ DIP Water Main	0	LF	$40.00	$0.00
7.	2" SDR21 PVC Water Main	0	LF	$9.00	$0.00
8.	12" Steel Casing Installed by Jack and Bore	0	LF	$195.00	$0.00
9.	8" Steel Casing Installed by Jack and Bore	150	LF	$150.00	$22,500.00
10.	8" HDPE Water Main Installed by Directional Bore	0	LF	$120.00	$0.00
11.	6" HDPE Water Main Installed by Directional Bore	0	LF	$100.00	$0.00
12.	6" Gate Valve	0	EA	$950.00	$0.00
13.	4" Gate Valve	12	EA	$875.00	$10,500.00
14.	2" Gate Valve	0	EA	$750.00	$0.00
15.	6" DI Bends	0	EA	$600.00	$0.00
16.	4" DI Bends	12	EA	$550.00	$6,600.00
17.	2" DI Bends	0	EA	$500.00	$0.00
18.	6" x 6" Tee	0	EA	$500.00	$0.00
19.	6" x 4" Tee	0	EA	$450.00	$0.00
20.	4" x 4" Tee	0	EA	$400.00	$0.00
21.	Tapping Sleeve & Valve	1	EA	$1,800.00	$1,800.00
22.	4" Plug Tapped for 2" NPT	0	EA	$200.00	$0.00
23.	Blowoff Assembly	1	EA	$1,200.00	$1,200.00
24.	Fire Hydrant Assembly	0	EA	$3,200.00	$0.00
25.	Concrete Driveway Repair	0	SY	$60.00	$0.00
26.	Asphalt Driveway Repair	15	SY	$50.00	$750.00
27.	Gravel Driveway Repair	20	TN	$35.00	$700.00
28.	Water Main Cleanup and Testing	10,500	LF	$2.00	$21,000.00
29.	Connection to Existing Water Main	1	EA	$3,500.00	$3,500.00
				SUBTOTAL:	**$217,950.00**

BLADEN COUNTY WATER DISTRICT

Bladen County Water Main Extension

PRELIMINARY COST ESTIMATE

New Production Well

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	Aquifer & Pump Test	1	EA	$45,000.00	$45,000.00
2.	New Well Construction	1	EA	$95,000.00	$95,000.00
3.	Treatment Works & Well House	1	EA	$150,000.00	$150,000.00
4.	Site Electrical	1	EA	$25,000.00	$25,000.00
5.	Iron Treatment System	1	EA	$225,000.00	$225,000.00
				SUBTOTAL:	**$540,000.00**

APPENDIX B
2009 PRELIMINARY ENGINEERING REPORT
CUMBERLAND COUNTY

CUMBERLAND COUNTY
RURAL WATER FEASIBILITY STUDY

PRELIMINARY
ENGINEERING REPORT

Prepared By:
Marziano & McGougan, P.A.
Asheboro, North Carolina
Conway, South Carolina

In Partnership With:

Koonce, Noble & Associates, Inc.
Lumberton, North Carolina

Final Report - August 19, 2009

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

MARZIANO & MCGOUGAN, P.A.
consulting engineers

August 19, 2009

Mr. Thomas B. Cooney III, P.E.
Cumberland County Public Utilities Department
130 Gillespie Street, Room 215
Fayetteville, NC 28301

RE: Cumberland County Rural Water Feasibility Study
Final Report Transmittal

Dear Mr. Cooney:

Please find enclosed thirty (30) copies of the Final Report, dated August 19, 2009, for the Cumberland County Rural Water Feasibility Study. All comments from the Board of Commissioners and other reviewing parties have been addressed in this final document.

On behalf of Marziano & McGougan, P.A. and Koonce, Noble & Associates, Inc., we sincerely appreciate the opportunity to work with Cumberland County on this vital project. We are pleased to assist in any further discussions contained within this report, and we can provide additional information and details about specific procedures as the County proceeds with the development of the Grays Creek (Southwest) Water & Sewer District.

Thank you for the opportunity to serve Cumberland County with this important study. Please contact Hiram Marziano, Lacy Koonce, or myself should you have any questions about the information presented in this report.

Sincerely,

Brian Sexton, P.E.

Marziano &
McGougan, P.A.

1300 Second Avenue
Suite 211
Conway, SC 29526

Phone: 843-488-0124
Fax: 843-488-0129

Table of Contents

Report Tables

Appendices

Appendix A - Project Maps

- Map #1 - Municipal Influence Areas and Existing Water Districts in Cumberland County
- Map #2 - Existing Water Systems in the Region
- Map #3 - Proposed Water Districts and Infrastructure
- Map #4 - Proposed Water Districts Relative to IBT Boundaries
- Map #5 - Proposed Southwest Water District
- Map #6 - Proposed Linden Water District
- Map #7 - Proposed East Central Water District
- Map #8 - Proposed Southeast Water District
- Map #9 - Proposed Northeast Water District
- Map #10 – Southwest Water District: Water Main Sizes and Potential Supply Interconnection Points

Appendix B – Water Demand & Population Projections

- Table B.1 - Population Projection Methodologies
- Table B.2 - Water Demand Projections
- Table B.3 – Potential Water Supplier Scenarios
- Table B.4 – Proposed Water District Summary

Appendix C – Construction Cost Estimates

- County-Wide Water System Cost Summary
- Estimated Annual O&M Costs and Average Monthly Water Bill - Alternative #1-3
- Water Supply Construction Cost Estimate - Alternative #1-3
- Southwest District – Water Distribution Construction Cost Estimate
    - Southwest Phase 1 (Initial Target Area)
    - Remaining Areas Inside District (Excludes Phase 1)
    - Areas Inside Hope Mills MIA
- Linden Water District – Water Distribution Construction Cost Estimate
- East Central Water District – Water Distribution Construction Cost Estimate
- Southeast Water District – Water Distribution Construction Cost Estimate
- Northeast Water District – Water Distribution Construction Cost Estimate

Appendix D – Supporting Documents

- Current Bulk Water and User Rates from PWC
- Existing Bulk Water/O&M Contract Between Stedman and PWC
- Existing Bulk Water/O&M Contract Between Spring Lake and PWC
- Existing Bulk Water/O&M Contract Between Linden Water and Sewer District and Harnett County Public Utilities

EXECUTIVE SUMMARY

1.0 General

North Carolina counties are charged with the responsibility of providing for the health, safety and welfare of their citizens. Hence, the counties have created health departments, inspection departments, social programs and other agencies for the security of the public. Likewise, provision of safe drinking water and other utilities such as wastewater fall under these county responsibilities.

This study, prepared by Marziano & McGougan, P.A. of Asheboro, North Carolina, in partnership with Koonce, Noble & Associates, Inc. of Lumberton, North Carolina, represents a continuing effort by the Cumberland County Board of Commissioners to determine the most feasible method of developing a county-wide water system to serve its citizens. The primary focus of potential water service is the rural areas located outside of the various Municipal Influence Areas (MIAs) and the Fort Bragg Military Base.

The following articles in this executive summary describe the report findings relative to formation of a county-wide water system. This executive summary should be read with the idea in mind of reading the entire report in detail to develop a thorough understanding of the methodology used to develop recommendations.

2.0 Methodologies

The following methodology was used in developing the recommendations contained in this report:

1. Analysis of existing population trends was performed. From that analysis standard techniques were used to develop population projections for a 20-year planning period.

2. The County areas lying outside of the MIAs were divided into sub-section areas based upon existing township and census tract areas. This allowed the sub-sections to be studied both from a social/economic and census perspective. For the purposes of this report, these sub-sections are referred to as "Districts."

3. The population projections were used to develop water projections on a District basis. Water usage factors were applied to the area population along with allowances for commercial/industrial growth and unaccounted "lost" water to develop the final water demand projections for the planning period.

4. Existing water systems in the Cumberland County area and adjoining areas were researched to determine potential for providing potable water supply to the County regions. This analysis and discussion included existing municipal water systems that have a presence and are providing potable water to their specific customer base. The discussions further segregated the water supply availability between surface water systems and groundwater systems. A discussion on the available surface water and groundwater in Cumberland County follows in Section 5 of this report.

5. Once the water projections were determined along with a picture of the available water supply in Cumberland County, the Districts outlined in item 2 above were further analyzed to determine if there was sufficient population to support a central water system. From this analysis the areas were defined as described in item 2 above and the data reduced to a cost basis. Priorities were determined for each area based upon the cost per customer to develop the water system.

6. A county-wide water system is essentially made up of two major parts: a water supply source; and a water distribution system. Determination of the water distribution system is fairly simple in that it requires following existing rights of way to serve known locations of customers. The major decision making for the distribution system relates to proper sizing of water lines to transmit the required quantity of water through the system for the planning period. Determining a water supply source for a long-term supply is not quite as simple. This is because the water supply source must be available for the planning period and well beyond.

7. To develop a recommendation for the potable water supply to the County water system, alternatives were developed and analyzed. The alternatives in Section 6 of this report include the following alternatives:

    - "No Action" Alternative
    - Alternative #1: Developing a County-Owned Surface Water Supply
    - Alternative #2: Developing a County-Owned Groundwater Supply
    - Alternative #3: Negotiate a Purchase Contract with an Existing Provider
        - Alternative #3a: Public Works Commission of Fayetteville
        - Alternative #3b: Lower Cape Fear Water & Sewer Authority

    Each alternative was discussed based on its relative merits. A preliminary cost analysis was performed to determine the most cost-effective alternative with regard to water supply. The water distribution cost component of the analysis was kept the same for each alternative because it does not change appreciably for any of the supply alternatives analyzed. Finally, a comparison matrix was developed that compared various facets of each alternative from a social/economic, political and environmental standpoint. Each facet was given a point rating and the alternative with the lowest point rating (least adverse impact) was selected as the most feasible alternative for source water supply.

8. The engineers researched current financing alternatives available for funding a county-wide water system. Additionally, the engineer's experience with other county water systems was used to recommend a long-term financing plan that should provide the best opportunity for Cumberland County to develop a county-wide water system on a district by district basis.

9. All the data contained in the items listed above was compiled and the engineers made recommendations based on their findings and opinions.

3.0 Findings

This report found that a central water system could be developed on a district by district basis in Cumberland County. However, development of the water system would depend upon obtaining adequate financing once an area exhibited the proper population density in order to keep user charges at a feasible level. Several adequate water supplies are available to Cumberland County for providing potable water. The existing supplies preclude the necessity for Cumberland County developing their own County water supply system (surface or groundwater).

Initially, the area of Cumberland County with the highest population density is located within the Southwest District. Because the Southwest District is relatively large and contains nearly 5,000 potential customers, the entire Southwest Water District cannot be served in a single project phase. Phase 1 has been identified as the area in the Southwest District with the highest number of customers per mile of road and the area with the greatest critical health need, specifically Southpoint. Other areas for consideration in the Southwest District include the high-density areas located within the Hope Mills MIA and the areas along the NC-87 corridor.

SOUTHWEST (GRAYS CREEK) RURAL WATER DISTRICT

DISTRICT-WIDE WATER SYSTEM COST SUMMARY

Preferred Alternative = Alternative #3a
Purchase Contract with PWC for 5 mgd Capacity

1.	Southwest Water District		**$27,759,000**
	a. Interconnection Fees/Upgrades	$3,400,000	
	b. Phase 1 (Southpoint area)	$6,432,000	
	c. Remaining Areas Inside District	$11,053,000	
	d. Areas Inside Hope Mills MIA	$6,874,000	

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

The decision to outsource the water supply will require solid thinking on the part of the elected officials of Cumberland County. Final selection of the water supply source will depend in part upon successful negotiation of a feasible contract arrangement with an outside entity. Long-term financing for rural water systems is available to Cumberland County. Grants are also available to Cumberland County for some of the proposed Districts because of their lower income levels. Any grant funds would lessen the end user cost as presented in this report.

This report estimates that Phase 1 of the Southwest Water District could have a potential customer base of 1,500 connections and an average daily demand of 1.0 mgd for the first phase of water system construction. A potable water supply contract purchased from PWC (Alternative #3a) is considered the most economical method of water supply for Phase 1 of the Southwest District. The following assumptions are used to calculate the monthly water bill for a Phase 1 customer in the Southwest Water District:

- Southwest District is constructed as first phase in rural water system
- Cost for first phase of water transmission/distribution/storage is $6.4 million
- Cost for initial capacity fees and interconnection requirements is $3.4 million
- Zero grant contribution for each alternative (100% loan)
- Full loan amount borrowed over 40-year term, 4.0% interest
- Average daily water demand of 1.0 mgd
- 1,500 water customers (100% connection rate)
- Per 1,000 gallon rate for water supply established by PWC ($2.00 per 1,000)
- Per 1,000 gallon rate for O&M service established by PWC ($0.50 per 1,000)

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #3a - Purchase Contract with PWC for 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$496,747**
	a. Initial Capital Costs			
	Interconnection Fees/Upgrades	$3,400,000		
	SW Phase 1 Distribution System	$6,432,000		
		$9,832,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$730,000**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons (PWC)	$2.00		
3.	Annual O&M Charges			**$182,500**
	a. Cost per 1,000 gallons (PWC)	$0.50		

Total Annual Costs	**$1,409,247**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$78.29**

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

4.0 Recommendations

Final recommendations for developing a county-wide water system are contained in Section 8 of this report. These recommendations are based upon the engineer's best judgment obtained from experience with other similar systems in the region. The recommendations are only for consideration by the elected officials of Cumberland County and may be varied to suit the County's social and/or political needs within reasonable guidelines. Specific recommendations in this report are as follows:

- Develop a county-wide water system based upon the priorities shown in this report, beginning with the Southwest portion of the County. Set up this designated area as the Southwest Water and Sewer District.
- Utilize the USDA-RD as the primary source of financing for the county owned water facilities. Utilize NCDENR-DWSRF and other state agencies as practical for additional/supplemental funding.
- Utilize water supply from PWC as the primary source of supply if a mutually beneficial agreement can be reached. Meet with additional water purveyors such as Harnett County and the Lower Cape Fear Water and Sewer Authority for additional supply as warranted during negotiations.
- Outsource the water system operation and maintenance with the chosen water purveyor if a mutually beneficial agreement can be reached.

5.0 Implementation

A plan of action must be developed to generate the necessary contacts, contracts and other data required for financing, permitting, designing, operating and maintaining a county wide water system. A generalized list of the action items for implementation follows:

1. After review and acceptance of the findings in this report, begin preparations for developing a County owned water system in the proposed Southwest Water and Sewer District. Prepare necessary legal documents, hold public hearings and form the Southwest Water and Sewer District. Additionally, the other districts contained in this report can be formed at this time or at a later date as desired.

2. Set up meetings with USDA and NCDENR for the purposes of beginning applications for financing of the selected project. After meeting with USDA, determine the type of bonds to be implemented for project financing.

3. Set up meetings with PWC to begin negotiations for outsourcing of water supply. Additionally, continue discussions with Harnett County and the Lower Cape Fear Water and Sewer Authority to ascertain the feasibility of obtaining additional water supply.

4. Develop a detailed, Preliminary Engineering Report along with an Environmental Assessment for the Southwest Water and Sewer District water system. Submit the Preliminary Engineering Report along with application for federal assistance to USDA. Prepare additional applications for SRF and other agency funding as may be appropriate.

5. Approach citizens in the Southwest Water and Sewer District area to operate as a steering committee to assist in acquiring sign-ups for the use of the water system, provide public information to the potential water users in the District, and assist the County in moving forward with the development of the water system.

6. Depending upon the status of the applications for financing, begin preparations for obtaining bonds to pay the project cost.

7. When financing plans are complete and a sufficient number of sign-ups have been obtained to meet the financing requirements, obtain the services of a qualified engineering firm to develop plans and specifications for the proposed water system.

The above items generally describe the important steps in implementing a County owned water system for the proposed Southwest Water and Sewer District. The exact order of the steps may vary from that shown above. Several official meetings to discuss the formulation of new policies will be necessary prior to disseminating any information to the public. The purpose of these policy meetings will be to provide the most current, accurate information to the Cumberland County Board of Commissioners. The timing of total project implementation for a single District can vary from as little as six months to over two years.

6.0 Engineer's Comments

First of all, the engineers at Marziano & McGougan, P.A. and Koonce Noble & Associates, Inc. wish to express their appreciation to Cumberland County staff and officials for having the opportunity to assist in the potential formation of a much needed county-wide water system. Our firms have worked on many county-wide water and sewer systems in North Carolina over the past 40 years and stand ready to assist officials of Cumberland County in any way possible as they endeavor to create a successful county-wide water system.

The engineers feel that Cumberland County has substantial justification to develop a county-wide water system. Again, we must stress that sufficient customer density in project areas must be obtained before a system can feasibly support a water system from a financial standpoint. At this time, only one proposed water and sewer district meets these criteria. Even so, construction cost for the Southwest Water and Sewer District will generate significant user charges for the water customers. The engineers maintain that acquisition of grants to lower the user charges will be almost mandatory for feasible development of the Southwest Water and Sewer District. Our recommendations in the report body do not account for any grants. However, we can provide grant scenarios to Cumberland County in separate documents for feasibility comparison. Meetings with USDA-RD will assist in determining the actual grant eligibility for any of the Districts.

The engineers have recommended the primary source of funding as the U.S. Department of Agriculture specifically because project financing can be spread over a 40 year period. Additionally, USDA can provide grants to the Southwest Water and Sewer District for up to 45% of the construction cost with a maximum not to exceed $2 million on a project by project basis. Additional grants may be available if significant potential for public health issues can be mitigated by construction of a central water system.

Also, innovative financing techniques such as special assessments, low interest loans and other means can be utilized along with the USDA financing to further reduce debt service costs. Some of the difficult decisions to be made by the elected officials include:

- Requiring mandatory sign up for the water system; or in the lieu of that, developing a "dry tap fee" wherein a potential customer that does not sign up for water service will have to pay their share of the debt service cost.
- Determining whether or not the County is willing to provide budgeted financing from county funds to reduce user charges until such time as additional customers are created to the point where the system can pay back the funds provided by the County.
- Developing a "view to the future" attitude that will enhance County officials' long-term decision making.

The engineers also feel that Cumberland County has developed a sufficient track record with PWC and other water purveyors in the area that qualifies them to make the difficult decisions necessary to develop a county-wide water system. The problems that exist today that have led to the necessity to prepare this study, along with other studies in the past, will not go away. History has shown that as areas become more densely populated, central water and sewer utilities become more mandated. The burden for provision of these facilities in the case of Cumberland County falls upon the County's shoulders. Development of a well designed, feasible water system will help safeguard the public health, safety and welfare well into the future. Other ordinances regulating locations of septic tanks and/or extension of nearby sewer lines will also assist in protection of the public.

Finally, the engineers feel that they have provided sufficient physical data for the formation of water and sewer districts to allow county officials to determine the feasibility and potential performance of a water system. The data is prepared in such a manner that it may be easily updated and/or slight changes made in the districts to allow for "what if" analysis scenarios. We urge the County officials to read the document carefully in its entirety and ask any questions of us that may arise. We will provide answers in a timely manner.

PRELIMINARY ENGINEERING REPORT

1.0 Introduction

The purpose of this Preliminary Engineering Report (PER) is to provide a water service plan for rural areas of Cumberland County, North Carolina. The primary focus of potential water service is the rural area located outside of the various Municipal Influence Areas (MIAs) and the Fort Bragg Military Base. This focus isolates a crescent-shaped area that extends from the Spring Lake MIA in the north, eastward to the Sampson County boundary, southward to the Bladen County Boundary, and westward to the Hope Mills MIA, excluding the urban areas surrounding Fayetteville and Fort Bragg.

Marziano & McGougan, P.A. of Asheboro, North Carolina, partnered with Koonce, Noble & Associates, Inc. of Lumberton, North Carolina, have been contracted by Cumberland County to develop this PER and make formal recommendations regarding the "no action" alternative, the potential development of water supply sources available to the County, and the potential negotiation of water purchase contracts with other entities.

Once completed, Cumberland County officials should review this PER to determine if any additions/revisions will be necessary to augment or reorganize any of the recommendations contained herein. This PER will address the following issues related to the development of viable rural water service in Cumberland County:

- Discuss the existing water systems and water supply resources relevant to the potential water service areas
- Delineate potential water service areas with accepted boundaries that can be interpreted easily by potential funding agencies; these potential water service areas will be referred to as Districts in this PER
- Assess the water demand needs of each District
- Evaluate the "no action" alternative
- Analyze any alternatives that will lead to a feasible plan of water service for each District
- Recommend water supply actions on a District-specific level
- Ready the County to apply for funding from various organizations, public and private, such as USDA Rural Development Administration

1.1 Project Need

A centralized, sealed, public water system serves two primary purposes: the provision of safe drinking water to customers, and water quality/quantity monitoring for the management of the resource. Koonce Noble & Associates and Marziano & McGougan have investigated the potential solutions for providing a public water supply to Cumberland County residents in rural areas. These rural residents utilize an at-risk resource that may not be adequate to fulfill the long term needs of the County and its residents.

Considering the projected population increase, BRAC actions, and the potential water resources available to Cumberland County (purchased water, groundwater, and surface water), it is evident that a sustainable water supply resource is both needed and available to support the incoming population to rural areas of the County. Although continued use of private wells is an option, it is the opinion of Koonce Noble & Associates and Marziano & McGougan that Cumberland County needs to secure a water supply resource immediately for its residents if the County intends to construct a viable, rural county-wide project in the future.

At the present time, there is no centralized form of water supply for the majority of southern and eastern Cumberland County. Only the relatively small areas within and adjacent to the municipal limits of Godwin, Falcon, Wade, Eastover, and Stedman are served with a public water supply. The remainder of the rural County areas, approximately 242 square miles excluding the MIAs, are forced to obtain their water from private wells ranging from 50-ft to 200-ft in depth. Most of the private wells obtain water from the shallowest aquifer available, the surficial aquifer. The average depth of the surficial water table in the area is 20-30 feet.

Many of the wells in the County lack the necessary filter capabilities to ensure adequate water quality. Therefore, the water extracted from such wells has higher concentrations of sulfates, organics, iron, and other impurities and are more susceptible to pollution and contamination. With the predominant land use in rural areas being agriculture, the consistent use of pesticides and fertilizers will only serve to deteriorate the quality of the groundwater above a certain depth before the natural filtration of the soil can have an effect. The soil is also naturally acidic, and the water extracted generally has an acidic pH in the range of 6.0-6.5.

In the Southpoint community, located within the Grays Creek Township, a petroleum contamination plume from leaking underground storage tanks has reached private wells and raised significant concerns over the safety and quality of groundwater in this region. Additionally, there is only a limited service area with centralized wastewater collection for the majority of southern and eastern Cumberland County. The exception is the Town of Stedman and the North Cumberland Regional Sewer System (NORCRESS) which serves the municipalities of Godwin, Falcon, Wade, and Eastover; consequently, these areas are served with a public water supply to minimize the risk of pollution to individual wells within proximity to the public sewer system. The vast majority of County residents treat their sewage with septic tanks and on-site nitrification trenches. Even the newest septic tanks in good condition can be installed within close proximity to private wells. There are also an undocumented number of septic tank systems that are failing and rely on the natural in-situ soils for their treatment capabilities. These failing septic systems are the prime suspect for the higher concentrations of organics and sulfates in the extracted well water.

1.2 Fort Bragg & Pope AFB – Base Realignment And Closure (BRAC)

The Base Realignment and Closure (BRAC) commission report was signed into law in 2005 and the commission's recommendations were a result of strategic planning that intends to restructure America's military bases and personnel. The BRAC Regional Task Force (RTF) Final Comprehensive Regional Growth Plan provides an assessment of the impact to population and infrastructure in the counties surrounding Fort Bragg and Pope Air Force Base due to the military's BRAC program. This Regional Growth Plan is the tool that assists local communities in the assessment, planning and preparation for the impacts of BRAC actions at Fort Bragg and Pope AFB. An estimated 8,700 military-related personnel are expected to relocate to the region by 2013; the local population is surrounding counties is expected to increase by an estimated 40,000 by the year 2013.

The BRAC RTF Final Comprehensive Regional Growth Plan provides detailed assessments of the following effects within Cumberland County, as well as the surrounding region: military investments in the region, normal population growth, expected population growth, economic impacts, housing, education, workforce development, transportation, water/sewer utilities, information technology, public safety, health care, etc. These issues, along with recommended actions, are detailed in the Regional Growth Plan and clearly indicate the need for immediate infrastructure planning and construction to support this large influx of people.

2.0 Population and Water Demand Projections

2.1 Historic Population Data

The following table was produced from data published by the NC Office of State Planning (NCOSPL). It is the engineer's opinion that this data does not account for the entirety of the scope of the BRAC commission's recent recommendations for troop realignments to Fort Bragg and Pope AFB. Although some of the additional growth from the BRAC program is accounted for in the State's published projections, the recent developments between Fort Bragg and its regional utility partners has poised the region centered about Fort Bragg and Cumberland County for intensive growth that could be above current projections. A description of the BRAC commission's report is located in the following sections and details the nature and scope of the surge in population expected in the vicinity of Fort Bragg. See **Appendix B** for more specific estimates of the population projections for rural Cumberland County.

Table 1 – Historic Population and Future Projections for Cumberland County (published data from NCOSPL)

Cumberland County			
Year	Total Population	Increase	% Growth
1970	212,042	-	-
1980	247,160	35,118	16.56%
1990	274,713	27,553	11.15%
2000	303,060	28,347	10.32%
2007	313,616	10,556	3.48%
2009	315,955	2,339	0.75%
2014	324,140	8,185	2.59%
2019	332,006	7,866	2.43%
2024	339,397	7,391	2.23%
2029	345,757	6,360	1.87%
Total Growth	-	29,802	9.43%

2.2 Population Projections

M&M/KNA has performed a detailed examination of the historic population data for Cumberland County. Using the population records from the 1970 U.S. Census through the 2007 NCOSPL county estimates, future population projection models have been developed in an effort to give Cumberland County officials multiple growth scenarios that will suit the County's future infrastructure planning needs. These population projection methods are as follows: published data available from the NCOSPL, linear regression (straight line) model using 1970 through 2007 population data, and 2nd order polynomial (parabolic) model using 1970 through 2007 population data.

From these three projection models, the 2nd order polynomial model projects the lowest population for Cumberland County in the year 2029 (341,586 persons), NCOSPL published data projects the next greatest population in the year 2029 (345,757 persons), and linear regression projects the highest population in the year 2029 (379,920 persons). The following table summarizes these population projection findings. Graphical representations of these modeling techniques, as well as a chart comparison of the total population projection models, can be found in **Appendix B**.

For the purposes of this report, the linear regression model is considered the best model to project the future populations and water demands in Cumberland County with an overall growth rate of 17.09% over 20 years. The linear regression model provides the highest population projection that takes into account localized growth and economic stimulation factors driven by Fort Bragg's expansion and other local economic factors such as the I-295 corridor, etc.

Table 2 - Total Population Projection Methodologies for Cumberland County Population

2nd Order Polynomial				Published NCOSPL Data			Linear Regression		
Year	Total Population	Increase per Year	% Growth	Total Population	Increase per Year	% Growth	Total Population	Increase per Year	% Growth
1970	212,042	-	-	212,042	-	-	212,042	-	-
1980	247,160	35,118	16.56%	247,160	35,118	16.56%	247,160	35,118	16.56%
1990	274,713	27,553	11.15%	274,713	27,553	11.15%	274,713	27,553	11.15%
2000	303,060	28,347	10.32%	303,060	28,347	10.32%	303,060	28,347	10.32%
2007	313,616	10,556	3.48%	313,616	10,556	3.48%	313,616	10,556	3.48%
2009	318,160	4,544	1.45%	315,955	2,339	0.75%	324,464	10,848	3.46%
2014	325,990	7,829	2.46%	324,140	8,185	2.59%	338,328	13,864	4.27%
2019	332,504	6,514	2.00%	332,006	7,866	2.43%	352,192	13,864	4.10%
2024	337,702	5,199	1.56%	339,397	7,391	2.23%	366,056	13,864	3.94%
2029	341,586	3,883	1.15%	345,757	6,360	1.87%	379,920	13,864	3.79%
Total 20-Year Growth	-	**23,425**	**7.36%**	-	**29,802**	**9.43%**	-	**55,456**	**17.09%**

2.3 Population Projections for Rural Areas

In order to accurately project the 20-year population increase for rural areas of Cumberland County, the rural areas must be isolated from the entire County projections by making a simple assumption about the municipal growth in Cumberland County. The rural population is assumed to be the difference between the total county population and the municipal estimates as calculated by NCOSPL. Unfortunately, no official governmental entity maintains municipal projections beyond two years into the future due to the higher volatility of these population growth rates (due to annexation, local employment, geography, etc.).

M&M/KNA has adopted the percent growth rate from the NCOSPL growth model for future municipal population projections in Cumberland County. In this assumption, municipal populations will continue to grow at the same percent growth rate over 20 years that NCOSPL published for the entire County. The overall growth rate of 9.43% over 20 years is assigned to the municipalities within Cumberland County. This translates to a municipal population projection of 231,793 persons in the year 2029. Additionally, this assumption allows some degree of "correction" for the surge in municipal population experienced when Fayetteville annexed westward to the County boundary in 2005.

In 2009, the estimate population living in rural (unincorporated) areas of Cumberland County was 112,650 persons. In 2029, the difference between total County population and municipal population is estimated to be 148,127 persons, an overall growth rate of 31.49% over 20 years and an increase of 35,477 persons moving into rural Cumberland County. The following table summarizes these population projection findings. Graphical representations of these modeling techniques, as well as a chart comparison of the total population projection models, can be found in **Appendix B**.

Table 3 - Rural Population Projections for Cumberland County

Whole County (Linear Growth Rate)				Municipal Estimates (NCOSPL Growth Rate)			Rural Cumberland County (Difference)		
Year	Total Population	Increase per Year	% Growth	Total Population	Increase per Year	% Growth	Total Population	Increase per Year	% Growth
2000	303,060	28,347	10.32%	147,648	52,516	55.20%	155,412	-24,169	-13.46%
2007	313,616	10,556	3.48%	210,246	62,598	42.40%	103,370	-52,042	-33.49%
2009	324,464	10,848	3.46%	211,814	1,568	0.75%	112,650	9,280	8.98%
2014	338,328	13,864	4.27%	217,301	5,487	2.59%	121,027	8,377	7.44%
2019	352,192	13,864	4.10%	222,575	5,273	2.43%	129,618	8,591	7.10%
2024	366,056	13,864	3.94%	227,529	4,955	2.23%	138,527	8,909	6.87%
2029	379,920	13,864	3.79%	231,793	4,264	1.87%	148,127	9,600	6.93%
Total 20-Year Growth	-	**55,456**	**17.09%**	-	**19,979**	**9.43%**	-	**35,477**	**31.49%**

2.4 Water Demand Projections

In this report, the water demands for the rural Cumberland County water service area are projected over the 20-year planning period to aid Cumberland County in the justification of water purchase contracts and/or the development of County-owned sources. The following assumptions are made for these water demand projections:

- Residential water demand = 175 gpd per customer
- Commercial/Industrial reserve water demand = 20% of residential demand
- Water loss in the system = 10% of total water demand
- Peak Day Water Demand Factor = 1.5 (constant for the planning period)
- Potential customers that are located within MIAs (i.e. Hope Mills, Stedman, etc.) can be served by the new Water Districts
- Assume 85% connection rate to the water system in each District (and MIAs)
- Assume customer base will grow at a rate equal to rural Cumberland County (31.49% over 20 years)
- Beginning in 2010, a new Water District will be constructed every three years, constructed in the following order of priority:
  - Southwest
  - Linden
  - East Central
  - Southeast
  - Northeast

Average daily water demand in 2010 (Year 1) is estimated to be 1.1 mgd (peak demand of 1.7 mgd) after the construction of the Southwest Water District. After the construction of all proposed Districts, Average daily water demand in 2029 (Year 20) is estimated to be 3.2 mgd (peak demand of 4.8 mgd), a 190% increase from the initial year's average daily water demand. This large increase is due to the construction of five (5) rural Water Districts within the planning period. This translates to a projected customer base of 13,726 water customers (85% connection rate) with a service population of 36,375 persons. The following table summarizes these water demand projections, see **Appendix B**.

Table 4 - Water Demand Projections for Cumberland County Rural Water Service Area
Linear Growth Model

Year	Potential Water Customer Base (Rural Cumberland County)	Potential Service Population (Rural Cumberland County)	District Water Demand (GPD)	20% Commercial & Industrial Reserve (GPD)	10% Estimated Daily Unaccounted Water (GPD)	Total Average Daily Water Demand	Total Peak Daily Water Demand (P.F. = 1.5)
2009	0	0	0	0	0	0	0
2010	4,940	13,092	864,535	172,907	103,744	1,141,186	1,711,779
2011	5,022	13,309	878,865	175,773	105,464	1,160,102	1,740,153
2012	5,104	13,526	893,195	178,639	107,183	1,179,017	1,768,526
2013	6,258	16,583	1,095,080	219,016	131,410	1,445,506	2,168,259
2014	6,357	16,845	1,112,406	222,481	133,489	1,468,376	2,202,565
2015	6,456	17,107	1,129,733	225,947	135,568	1,491,247	2,236,871
2016	8,550	22,658	1,496,273	299,255	179,553	1,975,080	2,962,621
2017	8,680	23,002	1,519,010	303,802	182,281	2,005,093	3,007,640
2018	8,810	23,346	1,541,747	308,349	185,010	2,035,106	3,052,659
2019	11,430	30,290	2,000,269	400,054	240,032	2,640,356	3,960,533
2020	11,598	30,734	2,029,618	405,924	243,554	2,679,095	4,018,643
2021	11,766	31,179	2,058,966	411,793	247,076	2,717,835	4,076,753
2022	12,493	33,107	2,186,294	437,259	262,355	2,885,907	4,328,861
2023	12,669	33,574	2,217,125	443,425	266,055	2,926,605	4,389,907
2024	12,845	34,040	2,247,956	449,591	269,755	2,967,302	4,450,953
2025	13,022	34,507	2,278,788	455,758	273,455	3,008,000	4,511,999
2026	13,198	34,974	2,309,619	461,924	277,154	3,048,697	4,573,046
2027	13,374	35,441	2,340,450	468,090	280,854	3,089,394	4,634,092
2028	13,550	35,908	2,371,282	474,256	284,554	3,130,092	4,695,138
2029	13,726	36,375	2,402,113	480,423	288,254	3,170,789	4,756,184

3.0 Existing Water Systems in the Region

This section discusses the existing water systems that are considered viable water supply sources for various portions of rural Cumberland County. The intent of this discussion is to provide information to determine the capacity, current sales partnerships, and water supply resources available to proposed service areas within Cumberland County.

3.1 Surface Water Systems

3.1.1 Fayetteville PWC

The Fayetteville Public Works Commission's (PWC) water system serves all areas within the City limits of Fayetteville and other developed areas outside the City limits. PWC provides retail service to residential, commercial, industrial and governmental customers. In 1998, PWC merged with the Town of Hope Mills to consolidate water services in the region. The Fayetteville PWC water system provides service to the City of Fayetteville, Hope Mills, Spring Lake, Fort Bragg, Eastover, Stedman, and portions of eastern Hoke County.

In 2008, there were approximately 78,000 active water customers with a total service population of approximately 185,000 residents. Average daily water use is estimated to be 24.1 mgd with maximum daily water use estimated to be 42.3 mgd. The system is comprised of 1,284 miles of water mains and 13 storage tanks with an effective storage capacity of 36.1 mgd.

Fayetteville PWC treats potable water at two separate facilities. The Glenville Lake WTP was originally constructed in 1942 and has a current treatment capacity of 18 mgd. Glenville Lake WTP receives raw water supplied from an intake on Glenville Lake as well as transfer capability from the Cape Fear River and Cross Creek. A 36" raw water transmission main from the Cape Fear River to Glenville Lake WTP allows the transfer of additional raw water to this facility for treatment during periods of high demand within the water system. In 2003, this facility switched from chlorine disinfection to chloramination disinfection in order to reduce the amount of disinfection byproducts in the finished water. In 2008, this facility had an average daily production of 8.4 mgd.

The P.O. Hoffer WTP was originally constructed in 1969 and has a current treatment capacity of 39.5 mgd. Identical to the Glenville Lake WTP, in 2003 the P.O. Hoffer WTP switched from chlorine disinfection to chloramination disinfection in order to reduce the amount of disinfection byproducts in the finished water. P.O. Hoffer WTP receives raw water exclusively from the Cape Fear River. In 2008, this facility had an average daily production of 16.9 mgd.

3.1.2 Eastover Sanitary District

The Eastover Sanitary District (ESD) is a USDA Rural Development Water District located east of the Cape Fear River and encompasses the Town of Eastover and portions of the I-95 corridor. The Town of Eastover was incorporated on July 26, 2007, after the formulation and implementation of ESD Phase 1. ESD Phase 1 began operation in 2004 and is supplied by the PWC water system. ESD Phase 1 serves approximately 3,600 persons and purchases approximately 0.30 mgd from PWC.

ESD Phase 1 was constructed of approximately 50 miles of 2-inch through 16-inch water mains that were funded primarily through USDA monies. This project was a success through the high percentage of residents that initially signed up for water service. ESD currently serves approximately 90 to 95% of the residences located within the Phase 1 service area. The elevated tank on Clinton Road (NC-24) and the elevated tank on Eastern Boulevard (near the intersection of NC-87 and I-95 Business) serve ESD Phase 1. These tanks are located within the low pressure zone of the PWC water system.

No master meters exist between ESD Phase 1 and PWC. All ESD customers are metered individually and billed by PWC. The current agreement between ESD and PWC requires that all water system supply, operation, maintenance, meter reading, billing, and other accounting services will be handled through the PWC Operations Center in Fayetteville. ESD does not have a department of public works or any hired personnel to oversee the daily operations of the water system. ESD owns the Phase 1 water system, the customer base which it serves, and the bonded debt attributed to the water system. A second ESD phase is in the final design phase and has received funding commitments from USDA Rural Development. It is intended that ESD Phase 2 continue the water service and O&M relationship with PWC due the financial economy that PWC provides to district customers.

3.1.3 Town of Hope Mills

As previously discussed, the Town of Hope Mills merged all water and sewer utility services with PWC in 1998. Hope Mills is an extension of the PWC system and all utility assets within the Town are part of the PWC utility system. This merger was a positive step for the residents of Hope Mills because of the financial benefit of joining with a larger utility. In the decision to merge with PWC, it was shown that PWC was capable of providing identical utility services at a lower cost to the user. As of 2007, Hope Mills had a population of approximately 12,843 residents.

3.1.4 Town of Stedman

In the past, the Town of Stedman operated several wells that served as the sole supply to residents. In 2004, Stedman entered into an agreement with PWC to supply and maintain the water system; Stedman owns the water utility assets within its jurisdiction. PWC installed a 12-inch water transmission main from the eastern perimeter of the distribution system and extended along NC-24 to

the Stedman water system. This transmission main now serves the 806 residents of Stedman.

3.1.5 Town of Spring Lake

The Town of Spring Lake water system serves all areas within the town limits. The Spring Lake water system has approximately 2,800 residential, commercial and industrial water connections that serve a total population of approximately 9,000 residents. The Town of Spring Lake owns, maintains, and administers its water distribution system in its entirety, approximately 96 miles of pipeline. Spring Lake is supplied exclusively through purchased water connections with PWC and Harnett County.

3.1.6 Fort Bragg

Currently, Fort Bragg operates an 8.0 mgd water treatment facility that obtains its raw water from the Lower Little River in northwest Cumberland County. In 2007, American States Utility Services, Inc. of Costa Mesa, California purchased the water and wastewater facilities of Fort Bragg and Pope AFB. This privatization action consolidates the water and wastewater utilities (treatment and distribution systems) at Fort Bragg and Pope AFB under singular ownership. Under the performance agreement with the new owners, the existing Fort Bragg WTP will continue to operate until 2009-2010 when PWC and Harnett County construct water transmission mains to the Fort Bragg WTP site.

The purpose of these large transmission mains will be to decommission the Fort Bragg WTP and allow the Fort Bragg water distribution network to be supplied by two primary suppliers: PWC and Harnett County. The contract between the Department of Defense, the new utility owner, PWC, and Harnett County allows for equal water supplies to be purchased from each supplier on alternating days. In the event of an emergency at either supplier, the other supplier will be capable of transferring the maximum daily water demand to Fort Bragg via the newly constructed transmission mains.

As a condition of the transfer of utility assets from military ownership to privatization, American States Utility Services, Inc. must maintain the Fort Bragg water distribution system in compliance through the following measures: satisfactory operation and maintenance of the water distribution system, capital water loss reduction program, water main replacements and/or rehabilitations, routine water main inspection, as well as storage tank and pump station maintenance and upgrades.

3.1.7 Town of Falcon

The Town of Falcon water system serves all areas within the town limits as well as rural roads on the perimeter of town. The Falcon water system serves approximately 319 residents, approximately 250 customers. Falcon owns, maintains, and administers its water distribution system and is supplied exclusively through purchased water from the City of Dunn.

3.1.8 Town of Godwin

The Town of Godwin water system serves all areas within the town limits as well as rural roads on the perimeter of town. The Godwin water system serves approximately 121 residents, approximately 100 customers. Godwin owns, maintains, and administers its water distribution system and is supplied exclusively through purchased water from the Town of Falcon.

3.1.9 Linden Water & Sewer District

The Linden Water & Sewer District was formed in February of 2003 by the Cumberland County Board of Commissioners. At present, this relatively new District has limited water infrastructure located within the town limits of Linden along with distribution mains along US-401 and NC-217. The Town of Linden, population of 142 persons, owns and operates the existing distribution system separate from the Linden Water & Sewer District.

All water is supplied to the District by Harnett County Public Utilities. Water is currently supplied to this system from an elevated tank (South Central Tank #3) located along Elliott Farm Road. Currently, there are no existing sewer collection or treatment facilities in the District; all domestic wastewater is treated through individual septic tanks.

Currently, Linden Water & Sewer District is in the final planning stages to begin construction of Phase 1A: approximately 10 miles of water distribution mains to serve approximately 200 rural customers located within the District. This project is considered a stepping stone for the construction of rural water service in northern Cumberland County. According to the preliminary engineering report prepared for this project, water purchased from Harnett County Department of Public Utilities is the most economically beneficial to the customers located in this District due to the presence of water supply mains from the Harnett County water system. Phase 1A of the Linden Water & Sewer District is expected to begin construction in 2010 and be operational in 2011.

3.1.10 Harnett County Public Utilities

The Harnett County WTP area is supplied exclusively from the run-of-river intake located on the Cape Fear River in Lillington approximately 1,000 feet upstream of the US-401 Bridge. Harnett County provides potable water to all of the incorporated municipalities in Harnett County with the exception of the City of Dunn. Outside of the municipal limits, Harnett County's water system extends throughout virtually all of the public roads in Harnett County with approximately 98% of available roads served with potable water. Similar to Fayetteville PWC, in 2003 this facility switched from chlorine disinfection to chloramination disinfection in order to reduce the amount of disinfection byproducts in the finished water.

Outside of Harnett County, other areas that are served with potable water produced from the Harnett County WTP include the Towns of Fuquay-Varina and Holly Springs in southern Wake County, portions of western Johnston County, portions of eastern Moore County, portions of eastern Lee County, and portions of northern Cumberland County (Northern Franchise Area) including the Town of Linden (via the Linden Water & Sewer District). The Northern Franchise Area is located within the Spring Lake MIA and serves approximately 1,500 water customers in the residential developments along the US-401 Corridor, Elliott Bridge Road and Elliott Farm Road.

In 2008, there were approximately 30,000 active water customers with a total service population of approximately 60,000 residents. Average daily water use is estimated to be 13 mgd with maximum daily water use estimated to be 18 mgd. The system is comprised of over 1,500 miles of water mains and 23 storage tanks. By the end of 2009, Harnett County WTP will be upgraded to a capacity of 24 mgd and Harnett County will begin to serve the Fort Bragg Military Base. With the ongoing construction to increase the Harnett County WTP's capacity to 24 mgd, critical treatment components are designed to treat up to 36 mgd. This has been planned due to the fact that increased water sales to Holly Springs, Johnston County, and other partners in the surrounding region are experiencing significant growth and water demand is expected to increase substantially. Harnett County WTP's upgrade to 36 mgd is expected to be operational in 2011.

3.1.11 City of Dunn

The City of Dunn owns and operates the 8.0 mgd Archie Uzzle WTP that obtains raw water from the Cape Fear River. The Dunn water system serves approximately 4,600 residential, commercial and industrial water connections with a total service population of approximately 10,088 residents. Average daily water use is estimated to be 4 mgd with maximum daily water use estimated to be 6 mgd. The City of Dunn owns, maintains, and administers its water distribution system in its entirety, approximately 85 miles of pipeline. Currently, Dunn sells water to the Town of Falcon, Town of Benson, Sampson County, and portions of the Southeast Harnett County Water District.

3.1.12 City of Lumberton

The City of Lumberton owns and operates the 16 mgd Lumberton WTP that obtains raw water from the Lumber River. Also, the Lumberton WTP obtains raw water from several wells located near the Lumber River with yields that are influenced by the nearby presence of surface water. The Lumberton water system serves approximately 10,000 residential, commercial and industrial water connections with a total service population of approximately 22,929 residents. Average daily water use is estimated to be 5 mgd with maximum daily water use estimated to be 8 mgd. The City of Lumberton owns, maintains, and administers its water distribution system in its entirety, approximately 225 miles of pipeline. Currently, Lumberton sells water to a small portion of the Robeson County water system.

3.1.13 Lower Cape Fear Water & Sewer Authority

In 1972, Bladen County, Brunswick County, Columbus County, New Hanover County, Pender County, and the City of Wilmington formed the Lower Cape Fear Water & Sewer Authority (LCFWASA) in order to assess regional water needs within the service area of the region served by these entities. LCFWASA is a non-profit public agency that owns and operates the raw water intake, pumping station and transmission pipeline systems that transfer up to 45 mgd to the Brunswick County owned Northwest WTP and the City of Wilmington owned Sweeney WTP. The Authority also provides service to industry located on US Highway 421 in the County of New Hanover. The LCFWASA intake is located on the Cape Fear River behind Lock and Dam #1 in Bladen County (King's Bluff). This is the closest source of salt free surface water to coastal Southeastern North Carolina.

Currently, LCFWASA is in the final planning stages to begin construction of a new raw water intake, pumping station and treatment facilities at the Bladen Bluffs site located near Tarheel in Bladen County. The new Bladen Bluffs Regional WTP is a cooperative effort among LCFWASA, NC Environmental Management Commission, NC Division of Water Resources, and the Lumber River Council of Governments to shift current groundwater users to surface water resources, thereby reducing the current groundwater consumption in the Central Coastal Plain Capacity Use Area (CCPCUA). The ultimate goals of this new facility are to provide sustainable surface water supply and regional aquifer conservation among the participants in the facility. Initially, the primary user of the Bladen Bluffs Regional WTP will be Smithfield Foods Packaging Company. Smithfield Foods is one of the largest employers in the region, with approximately 5,000 employees at its Tarheel facility. The Bladen Bluffs Regional WTP will have an initial treatment capacity of 4 mgd with an intake pumping capacity up to 30 mgd. The Bladen Bluffs Regional WTP is expected to be operational by the end of 2012.

3.2 Groundwater Systems

3.2.1 Town of Wade

The Town of Wade is the only groundwater system in eastern Cumberland County. It supplies its 450 residents through the use of three groundwater wells in the Upper Cape Fear Aquifer, ranging in depth from 35' to 50'. A 75,000 gallon elevated storage tank pressurizes the Wade water system. Average daily demand is approximately 0.035 mgd with peak day demand approximately 0.045 mgd. The combined safe yield of the three active wells is estimated to be 0.194 mgd. This is considered extremely high for wells in this region.

3.2.2 Hoke County

The Hoke County Regional Water System consists of 16 wells, eight well treatment facilities with a total capacity of 2.19 mgd based on 12 hours of pumping per day, eight elevated water storage tanks, and approximately 11,000 service connections. The system also receives water from the McCain Prison and from Fayetteville PWC through two booster pump stations. The total capacity available from PWC is 1.83 mgd, and the available capacity from McCain is 0.10 mgd. Therefore, the total water available is 4.12 mgd. In 2007, the average water produced and purchased was 1.90 mgd and the maximum daily production and purchase was 2.65 mgd.

Hoke County has begun the installation of test wells for a USDA funded Phase V project. Phase V of the Hoke Regional Water System will install 14 wells and five well treatment facilities with a total capacity of 1.37 mgd based on 12 hours of pumping per day. This will bring the total system capacity to 5.49 mgd.

3.2.3 Robeson County

The Robeson County water system currently consists of approximately 1,720 miles of water mains, 23,500 metered connections, 17 elevated water storage tanks, one ground storage tank, 14 well water treatment facilities and 31 production wells. Total storage including the ground storage is 7.85 million gallons. There are two elevated storage tanks and three wells under construction. Additionally, one well treatment facility is under design and production wells have been proposed for funding.

If Robeson County were to serve the project area, the water would be primarily produced by the Parkton, St. Pauls East, and Rocco Well Treatment Facilities depending on varying hydraulic conditions. Additional water storage would be provided by the Shaw Mill Elevated Water Storage Tanks and a proposed 200,000 gallon in the Greensprings area. The Lumber Bridge facility could also possibly provide water, however the water from this facility is already obligated to Mountaire Farms and other existing demands.

The Parkton Facility is located on US 301 East of Parkton and consists of a well, well pump, aeration basin, two high service pumps, chemical feed system (fluoride, caustic, polyphosphate and chlorination), two pressure filters, and a 100,000 gallon elevated water storage tank

The St. Pauls Facility is located on NC 20 on the East side of St. Pauls and consists of a well, well pump, aeration basin, two high service pumps, chemical feed system (fluoride, caustic, polyphosphate and chlorination), two pressure filters, and a 200,000 gallon elevated water storage tank.

The Rocco Facility is located on NC 20 East of the St. Pauls Facility and across from the Prestage Turkey Plant. This facility consists of four wells, chemical feed system (fluoride, caustic, polyphosphate and chlorination), two high service pumps, a 2 mgd concrete treatment structure, infiltration backwash lagoon, a 750,000 gallon ground storage tank and a 500,000 gallon elevated

storage tank. The concrete treatment structure consists of an aeration basin, a gravity filter with four cells, and a clearwell. The Shaw Mill elevated storage tank is a 500,000-gallon tank located off of Balance Farm Road approximately 2,500 feet north of Shaw Mill Road.

There are several locations Cumberland County could connect to the Robeson distribution system. One point currently proposed as a possible connection to serve the Southpoint Subdivision is two existing 8" diameter water mains that connect at the intersection of Parkton Tobemory Road and Balance Farm Road. Static pressures were recorded at this location from July 3, 2008 through July 13, 2008 and from 45 to 70 psi. Robeson County also has an 8-inch water main that currently extends into Cumberland County on Roslin Farm Road. On the West side of I-95, there is an existing 6-inch water main on Leeper/Parkton Road.

3.2.4 Sampson County

The Sampson County water system consists of District 1 and District 2. Current projects underway include District 2, Phase 3 and Phase 4. All districts are governed by the Sampson County Board of Commissioners sitting as the Sampson County Water District Board of Directors. Sampson County is in the process of installing four potable water wells to supply its growing customer base and has expressed interest in selling water to inter-local communities.

Currently, Sampson County District 1 purchases all water from the following source providers: Autryville, Clinton, Roseboro, and Turkey. Total water purchase contracts are estimated to be 0.370 mgd. District 1 has approximately 1,200 water customers and an average daily demand of 0.150 mgd. Currently, Sampson County District 2 purchases all water from the following source providers: Clinton, Dunn, and Garland. Total water purchase contracts are estimated to be 1.120 mgd. District 2 has approximately 1,500 water customers and an average daily demand of 0.175 mgd.

3.2.5 Bladen County

The Bladen County water system is divided into two districts: East Bladen and West Bladen. The East Bladen District is located to the east of the Cape Fear River and the West Bladen District is located to the west of the Cape Fear River. Based on the 2007 Water Supply Plan, East Bladen has approximately 60 miles of water mains consisting primarily in size of 6-inch to 12-inch diameter. There are 796 residential connections and five commercial connections. This district is served by two wells with a total capacity of 0.271 mgd based on 12 hours of pumping per day. Projected demand for the year 2010 is 0.193 mgd.

Based on the 2007 Water Supply Plan, West Bladen has 260 miles of water main ranging primarily in size from 6 inch to 12 inch diameter. There are 3,959 residential connections and 5 commercial connections. The district is served by three wells with a total capacity of 0.799 mgd based on 12 hours of pumping

per day. Additionally, the West District also purchased an average of 0.185 mgd from Elizabethtown in 2007. Projected demand for 2010 is 0.210 mgd. The Lumber River Council of Government completed a Comprehensive Groundwater Study and Assessment that estimated that the aquifers had the following capacities in Bladen County:

- Peedee Aquifer 2.70 mgd
- Black Creek Aquifer 4.10 mgd
- Upper Cape Fear Aquifer 1.23 mgd
- Lower Cape Fear Aquifer 0.73 mgd
- Total Safe Yield from Groundwater Sources 8.76 mgd

3.2.6 Private Water Systems

Numerous private groundwater systems are located throughout rural Cumberland County and serve a wide range of residential customers including mobile home communities, multi-family developments, and single–family developments. For systems serving more than 15 connections, these systems are considered to be "community" systems. Minimum design standards of community water systems are mandated by NCDENR-Public Water Supply. The vast majority of private, residential water systems were designed with the minimum capacity (i.e. pipe sizes, well diameter, pumping capability, etc.) required to serve the anticipated number of homes within their respective development. This was to keep the up-front costs of the development as low as possible and resulted in small-scale water systems with virtually zero reserve capacity for growth in adjacent areas. Therefore, private, community water systems do not have a sphere of influence that can be extended for significant distances outside of the residential development.

The focus of this study is to enable Cumberland County to secure a reliable, long-term source of water supply to provide rural water service to a phased county-wide rural water system. It would be extremely difficult and costly for the County to attempt to secure the use of private groundwater supply systems to supply the quantity of water needed to serve its long-term vision of a large water system with a broad customer base. Additionally, the assets under the control of various homeowner's associations and private water operators have been in service for years and are at risk to the inherent liabilities that aging water systems develop over time. Cumberland County could attempt to acquire private water systems in an effort to boost the customer base of the overall rural system. However, depending upon the operation and maintenance of the private system, Cumberland County could assume private water systems laden with problems that range from well-known and documented failures, to issues that have gone unreported, unknown, and/or unaddressed for many years. This significant risk would come with marginal benefit for potential source water supply and additional customers to the overall system. In general, the relatively small scale and the risk of pre-existing conditions preclude private water systems from consideration as a long-term source of raw water supply.

4.0 Proposed Rural Water Districts

Delineating a potential service area boundary is one of the first priorities that Cumberland County faces in its evaluation of rural water feasibility. Due to the presence of numerous municipalities and other entities located within Cumberland County, any proposed boundaries must be accepted along jurisdictional, political, and environmental fronts. The potential water service areas identified in this report will be referred to as Districts.

4.1 Southwest Water District

The proposed Southwest District is located in the extreme southwestern portion of Cumberland County within the Grays Creek and Rockfish Townships. The eastern boundary of the District borders the Cape Fear River, the southern boundary of the District borders Bladen County, and the western boundary of the District borders Robeson County. The northern boundary is generally defined as the limits of the PWC water service area (NC-87 to Bullard Road to Braxton Road). The proposed District boundary can be seen on the maps provided in Appendix A.

The Southwest District is considered a top priority given the higher density of customers located within this part of the County, as well as the ongoing groundwater pollution concerns in the Southpoint Community. The following summarizes the critical attributes of this proposed Water District:

- Total Service Area = 46.5 square miles, 5,812 existing homes
- Total Service Area includes 10.0 square miles within the Hope Mills MIA
- Total Service Area includes 2,470 existing homes within the Hope Mills MIA
- 85% Connection Rate = 4,940 projected water customers
- 117 miles of water pipeline to serve this customer base (estimated NCDOT roads only)
- 42 customers per mile of NCDOT roads
- Start-Up Year 2010: Projected Water Demand = 1.141 mgd, avg. day; 1.711 mgd, peak day
- 842 existing homes (14% of total residences) are located in the Lumber River Basin

4.1.1 Existing Water Supply Alternatives

Due to the District's proximity to multiple water systems in the region, the most viable water supply alternatives include surface water and groundwater. PWC, LCFWASA, and the City of Lumberton all have existing water treatment capacity to sell potable surface water to this District. Additionally, the location of approximately 2,470 residences within the Hope Mills MIA creates the possibility that Hope Mills could sell water supplied from PWC to Cumberland County if these customers were to be served by the proposed Southwest District.

PWC is the closest surface water system and has a large transmission system that can provide water to the Southwest District with relatively lower start-up construction costs. LCFWASA and the City of Lumberton would have to construct many miles of water transmission systems that cross County boundaries in order to provide water to the Southwest District. It should be

noted that LCFWASA is planning for the Bladen Bluffs Regional WTP to be operational in 2012. Potential IBT issues related to surface water transfers to customers located within the Lumber River Basin are discussed in Section 5.2.

Groundwater systems that could provide water service to the Southwest District include Robeson County, Bladen County, and Hoke County. Koonce, Noble & Associates, Inc. is currently evaluating the costs for Robeson County and Bladen County to provide water service to the Southpoint community. During this analysis, it has become evident that each of these systems would have to develop additional groundwater supply wells and treatment capacity to provide the long-term water demand for the Southwest District. Although Hoke County is the furthest from the District, a water main could be constructed south of Rockfish Creek to serve the District. Similar to Robeson and Bladen Counties, it would be necessary for Hoke County to construct more wells and treatment capacity in order to sell the projected volume of water to the Southwest District.

4.2 Linden Water & Sewer District

The Linden Water & Sewer District was formed in February of 2003 by the Cumberland County Board of Commissioners. The Linden District is located in the north central portion of Cumberland County within the Carvers Creek Township. The northern boundary of the District borders the Lower Little River (Harnett County boundary), and the eastern and southern boundaries of the District border the Cape Fear River. The western boundary is generally defined as the limits of the Fayetteville and Spring Lake MIAs.

When it was formed in 2003, the District had an area of approximately 37.6 square miles (24,084 acres). Incidentally, there is a gap between the service areas of the current Linden District boundary and the Fayetteville MIA that spans an area of approximately 6.7 square miles. This gap is along Slocumb Road and McBryde Street from the Cape Fear River to US-401. In this report, it is recommended that this gap in potential service area be served through the expansion of the Linden District boundaries to meet the Fayetteville MIA. The proposed Linden District boundary can be seen on the maps provided in Appendix A.

At present, this relatively new District has limited water infrastructure located within the town limits of Linden along with distribution mains along US-401 and NC-217. The Town of Linden owns and operates the existing distribution system separate from the Linden Water & Sewer District. Harnett County operates a separate water system, the Northern Franchise Area, in northern Cumberland County. The Northern Franchise Area is located within the Spring Lake MIA and serves approximately 1,500 water customers in the residential developments along the US-401 Corridor, Elliott Bridge Road and Elliott Farm Road.

Currently, Linden Water & Sewer District is in the final planning stages to begin construction of Phase 1A: approximately 10 miles of water distribution mains to serve approximately 200 rural customers located within the District. This project is considered a stepping stone for the construction of rural water service in northern

Cumberland County. These current plans for construction make the Linden District a high priority for Cumberland County to consider future water infrastructure projects within the District. The following summarizes the critical attributes of this proposed Water District:

- Total Service Area = 44.3 square miles, 1,204 existing homes
- Total Service Area includes 4.4 square miles within the Linden MIA
- Total Service Area includes less than 50 existing homes within the Linden MIA
- 85% Connection Rate = 1,023 projected water customers
- 39 miles of water pipeline to serve this customer base (estimated NCDOT roads only)
- 26 customers per mile of NCDOT roads
- Start-Up Year 2013: Projected Water Demand = 0.247 mgd, avg. day; 0.371 mgd, peak day

4.2.1 Existing Water Supply Alternatives

According to the preliminary engineering report prepared for the Phase 1A Linden project, water purchased from Harnett County Public Utilities is the most economically beneficial to the customers located in this District due to the presence of water supply mains from the Harnett County water system. Phase 1A of the Linden Water & Sewer District is expected to begin construction in 2010 and be operational in 2011.

Due to the District's location, the most viable water supply alternative is limited to surface water. Harnett County, PWC, and City of Dunn all have existing water treatment capacity to sell potable surface water to this District. Additionally, the location of the Town of Spring Lake creates the possibility that Spring Lake could sell water supplied from PWC and/or Harnett County to portions of the Linden District.

4.3 East Central Water District

The proposed East Central District is located in the eastern portion of Cumberland County in the Cedar Creek Township. The eastern boundary of the District borders the South River (Sampson County boundary), the southern boundary of the District borders NC-210 and Ava Road, the western boundary of the District borders John B. Carter Road, and the northern boundary of the District borders Maxwell Road. It should be noted that the proposed East Central District boundary is equivalent to Cumberland County U.S. Census Tract #28 (37051002800). The proposed District boundary can be seen on the maps provided in Appendix A.

The East Central District is considered as the third priority given the relatively high density of customers located within this part of the County, as well as the high number of customers located within the Bethany Community. The following summarizes the critical attributes of this proposed Water District:

- Total Service Area = 41.6 square miles, 2,145 existing homes
- Total Service Area includes 13.6 square miles within the Stedman MIA
- Total Service Area includes 535 existing homes within the Stedman MIA
- 85% Connection Rate = 1,823 projected water customers
- 57 miles of water pipeline to serve this customer base (estimated NCDOT roads only)
- 32 customers per mile of NCDOT roads
- Start-Up Year 2016: Projected Water Demand = 0.461 mgd, avg. day; 0.691 mgd, peak day
- 1,754 existing homes (96% of total residences) are located in the South River Basin

4.3.1 Existing Water Supply Alternatives

Due to the District's proximity to multiple water systems in the region, the most viable water supply alternatives include surface water and groundwater. PWC, LCFWASA, and Harnett County all have existing water treatment capacity to sell potable surface water to this District. Additionally, the location of approximately 535 residences within the Stedman MIA creates the possibility that Stedman could sell water supplied from PWC to Cumberland County if these customers were to be served by the proposed East Central District. Eastover Sanitary District is capable of selling water to the East Central District after construction of its second phase. ESD Phase 2 is expected to be under construction in 2009 and operational in 2010.

PWC is the closest surface water system and has a water transmission system that currently provides water to the Town of Stedman and Eastover Sanitary District. However, this is on the eastern perimeter of the PWC system and the ability to transfer water to the East Central Water District may require significant start-up construction costs. LCFWASA and Harnett County would have to construct many miles of water transmission mains that cross County boundaries in order to provide water to the East Central District. Potential IBT issues related to surface water transfers to customers located within the South River Basin (Cape Fear River Sub-Basin 2-4) are discussed in Section 5.2.

Groundwater systems that could provide water service to the East Central District are limited to Sampson County. Similar to Robeson and Bladen Counties, it may be necessary for Sampson County to construct more wells and treatment capacity in order to sell the projected volume of water to the East Central District.

4.4 Southeast Water District

The proposed Southeast District is located in the extreme southeastern portion of Cumberland County in the Beaverdam and Cedar Creek Townships. The eastern boundary of the District borders the South River (Sampson County boundary), the southern boundary of the District borders Bladen County, the western boundary of the District borders the Cape Fear River, and the northern boundary of the District borders NC-210 and Ava Road. It should be noted that the proposed Southeast District

boundary is equivalent to Cumberland County U.S. Census Tract #29 (37051002900). The proposed District boundary can be seen on the maps provided in Appendix A.

The Southeast District is considered as the fourth priority given the relatively lower density of customers located within this part of the County, as well as the large scale of the District and its sparse road network. The following summarizes the critical attributes of this proposed Water District:

- Total Service Area = 119.2 square miles, 2,566 existing homes
- Total Service Area includes 0.0 square miles within municipal MIAs
- 85% Connection Rate = 2,181 projected water customers
- 119 miles of water pipeline to serve this customer base (estimated NCDOT roads only)
- 18 customers per mile of NCDOT roads
- Start-Up Year 2019: Projected Water Demand = 0.575 mgd, avg. day; 0.863 mgd, peak day
- 850 existing homes (33% of total residences) are located in the South River Basin

4.4.1 Existing Water Supply Alternatives

Due to the District's proximity to multiple water systems in the region, the most viable water supply alternatives include surface water and groundwater. PWC, LCFWASA, and the City of Lumberton all have existing water treatment capacity to sell potable surface water to this District. Eastover Sanitary District is capable of selling water to the East Central District after construction of its second phase. ESD Phase 2 is expected to be under construction in 2009 and operational in 2010.

Similar to the East Central District, PWC is the closest surface water system to the Southeast District and has a water transmission system that currently provides water to the Town of Stedman and Eastover Sanitary District. PWC's ability to transfer water to the Southeast District may require significant start-up construction costs. LCFWASA and Lumberton would have to construct many miles of water transmission mains that cross County boundaries in order to provide water to the Southeast District. Potential IBT issues related to surface water transfers to customers located within the South River Basin (Cape Fear River Sub-Basin 2-4) are discussed in Section 5.2.

Groundwater systems that could provide water service to the Southeast District are limited to Sampson County and Bladen County. It will be necessary for Sampson County and Bladen County to construct more wells and treatment capacity in order to sell the projected volume of water to the Southeast District.

4.5 Northeast Water District

The proposed Northeast District is located in the extreme northeastern portion of Cumberland County in the Black River and Eastover Townships. The northern boundary of the District borders Harnett County, the eastern boundary of the District borders the South River (Sampson County boundary), the western boundary of the District borders the Cape Fear River. The southern boundary is generally defined as the limits of the Eastover Sanitary District service area, which was recently expanded for the ESD Phase 2 project. The Northeast is considered as a lower priority given the relatively lower density of customers located within this part of the County, as well as the presence of multiple water systems that are relatively isolated east of the Cape Fear River. The following summarizes the critical attributes of this proposed Water District:

- Total Service Area = 40.1 square miles, 554 existing homes
- Total Service Area includes 21.6 square miles within municipal MIAs of Wade, Godwin, and Falcon
- 85% Connection Rate = 471 projected water customers
- 37 miles of water pipeline to serve this customer base (estimated NCDOT roads only)
- 13 customers per mile of NCDOT roads
- Start-Up Year 2022: Projected Water Demand = 0.129 mgd, avg. day; 0.194 mgd, peak day
- 324 existing homes (58% of total residences) are located in the South River Basin

4.5.1 Existing Water Supply Alternatives

Due to the District's proximity to multiple water systems in the region, the most viable water supply alternatives include surface water and groundwater. PWC, Eastover Sanitary District, Harnett County, and City of Dunn each have existing water treatment capacity to sell potable surface water to this District. Eastover Sanitary District is capable of selling water to the East Central District after construction of its second phase. ESD Phase 2 is expected to be under construction in 2009 and operational in 2010. Similarly, the Towns of Falcon and Godwin could sell water supplied from Dunn to portions of the Northeast District.

The City of Dunn and Harnett County are the closest surface water supply systems. Dunn owns a water transmission system that currently provides water to the Towns of Falcon and Godwin, while Harnett County supplies the Linden Water & Sewer District located across the Cape Fear River. Harnett County's ability to transfer water to the Northeast District may require significant start-up construction costs. Potential IBT issues related to surface water transfers to customers located within the South River Basin (Cape Fear River Sub-Basin 2-4) are discussed in Section 5.2. Groundwater systems that could provide water service to the Northeast District are limited to Sampson County and the Town of Wade. It will be necessary for Sampson County and Wade to construct more wells and treatment capacity in order to sell the projected volume of water to the Northeast District.

5.0 Water Supply Resources in the Region

This section discusses the existing raw water supply resources in the region. Many of these resources are currently utilized by other water users, including private citizens, private water corporations, and a wide array of municipal and county governments. These resources are considered as viable water supply alternatives for potable water supply that could be developed, sold, or allocated for Cumberland County's needs.

5.1 Available Surface Water Supply

The discussion of available surface water supply is limited to major streams, rivers, or existing impoundments within the region. All of these supplies are currently utilized by other water users and the withdrawal of any surface water for public use must be reviewed and approved by NCDENR Division of Water Resources, among other agencies, during the environmental review process.

5.1.1 Cape Fear River

The Cape Fear River serves as the primary water supply source for the largest water users in the region including Harnett County, City of Dunn, Fayetteville PWC, and LCFWASA. For each of the raw water intakes located along this segment of the Cape Fear River, the water source is classified as WS-IV. PWC estimates the drainage area of the watershed to be approximately 4,360 square miles at the point of withdrawal.

The US Geologic Surveys' latest 7Q10 flow statistic for the Cape Fear River at Fayetteville is 625 cfs (404 mgd). Twenty percent of the 7Q10 flow for the Cape Fear River at Fayetteville is equal to 125 cfs (80.8 mgd). However, PWC's 2002 Local Water Supply Plan indicates that the safe yield of the Cape Fear River at the raw water intake is 85.8 mgd. Therefore, this higher safe yield will be referenced in this report.

5.1.1.1 Jordan Lake Water Supply Storage Allocations

According to the "Jordan Lake Water Supply Storage Allocation Round Three Hearing Officer's Report," published in June 2002, numerous applicants located within the Cape Fear River and Jordan Lake watersheds applied for water supply storage allocation in the latest round (Round Three) of water supply allocations. According to this report, the Round Three allocations are effective until 2030. NCDENR Division of Water Resources has calculated that the total water supply pool of Jordan Lake can provide a safe yield of 100 mgd. As of 2002, 63 mgd has been allocated to the participating applicants: Cary/Apex, Chatham County, Durham, Holly Springs, Morrisville, Orange County, OWASA, and Wake County-RTP. Although Harnett County and PWC applied for 18 mgd and 10 mgd respectively, none of the Jordan Lake water supply storage was allocated to either party in Round Three.

For this report, it is important to examine how the final 2002 allocations in Jordan Lake were determined by NCDENR-DWR as they relate to two potential water suppliers to Cumberland

County: Fayetteville PWC and Harnett County. NCDENR-DWR used the water demand projections provided by applicants to determine the projected 2050 water supply needs of each applicant. PWC projected the 2050 water supply withdrawal from the Cape Fear River could be as much as 79 mgd and 114 mgd, average and maximum day demands, respectively. Similarly, Harnett County projected the 2050 water supply withdrawal from the Cape Fear River could be as much as 36 mgd and 54 mgd, average and maximum day demands, respectively.

According to NCDENR-DWR, under all model scenarios through 2050, Harnett County and PWC's water demands were completely satisfied on a daily basis through utilization of the existing water resources available. It is important to note that this excludes drought management of any kind anywhere in the Cape Fear River Basin and despite a projected increase in total upstream (from Fayetteville) withdrawals of 161% compared with 2000. Therefore, NCDENR-DWR has determined that the Cape Fear River is an adequate water source for Harnett County and PWC despite the combined use of all water utilities in the Cape Fear River Basin through 2050.

5.1.1.2 Intake Capacity Limitations Relative to 7Q10 Streamflow

The following discussion is from the "Jordan Lake Water Supply Storage Allocation Round Three Hearing Officer's Report," published in June 2002, page 24. The US Geologic Surveys' latest 7Q10 flow statistic for the Cape Fear River at Fayetteville is 625 cfs (404 mgd). Twenty percent of the 7Q10 flow for the Cape Fear River at Fayetteville is equal to 125 cfs (80.8 mgd). The administrative rules for the NC Environmental Policy Act (SEPA) require environmental documentation for expansions of water treatment plants that increase capacity by 1.0 mgd or more or result in a design withdrawal equal to or greater than 20% of the 7Q10 flow of the contributing stream (15A NCAC 01C.0504(3)). This is a requirement for study and environmental documentation, **not a limit on water withdrawals.**

Fayetteville PWC and/or Harnett County may be required to provide environmental documentation before expanding their water treatment plant or water supply intake on the Cape Fear River for future capacity upgrades. However, according to all the information available to the NCDENR-DWR, the amount of water available during the 7Q10 streamflow event from the Cape Fear River will not be the limiting factor for future water supply withdrawals for PWC or Harnett County.

5.1.2 South River

The eastern boundary of Cumberland County is the South River. The South River is a relatively small, swampy, and darkly stained river. Below Big Swamp, the South River is supplementary classified as an Outstanding Resource Water (ORW) by NCDENR-DWQ. ORW is a supplemental classification intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance. To qualify, waters must be rated "excellent" by DWQ *and* have one of the following outstanding resource values: outstanding fish habitat or fisheries, unusually high level of water-based recreation, some special designation such as NC or National Wild/Scenic/Natural/Recreational River, National Wildlife Refuge, etc., important component of state or national park or forest, or special ecological or scientific significance (rare or endangered species habitat, research or educational areas).

5.1.3 Glenville Lake (Little Cross Creek Watershed)

Glenville Lake is the southernmost lake within the Little Cross Creek watershed area. The four lakes located within the Little Cross Creek watershed are in the following downstream order: Bonnie Doone Lake, Kornbow Lake, Mintz Pond, and Glenville Lake. Glenville Lake WTP receives raw water supplied from an intake on Glenville Lake as well as transfer capability from the Cape Fear River and Cross Creek. A 36" raw water transmission main from the Cape Fear River to Glenville Lake WTP allows the transfer of additional raw water to this facility for treatment during periods of high demand within the water system. PWC estimates that the Little Cross Creek impoundments, including Glenville Lake, have a watershed drainage area of approximately 15 square miles with a combined safe yield of approximately 5 mgd.

5.1.4 Big Cross Creek Watershed

The Cross Creek watershed is a highly urbanized watershed that drains mush of northern Fayetteville. During periods of severe drought, Cross Creek has been utilized as a supplemental raw water source for the Glenville Lake WTP. PWC estimates the drainage area of the watershed to be approximately 9.0 square miles at the point of withdrawal with a maximum withdrawal capacity of 2 mgd.

5.2 Interbasin Transfer of Surface Water to Serve Cumberland County Districts

The main stem of the Cape Fear River, where PWC, Harnett County, and LCFWASA withdraw their current water supply, is located within the Cape Fear Sub-Basin 2-3. An Interbasin Transfer (IBT) Certificate is required for a new transfer of 2 mgd (maximum day demand, net) or more between major river basins and river sub-basins. Therefore, IBT will be a major factor in determining the most advantageous water source to serve the rural customers located in separate river basins (and sub-basins) from the region's largest water supply, the Cape Fear River.

This is significant for Cumberland County to consider because it means that large water sellers that utilize the Cape Fear River for source water, PWC for example, will not be allowed to sell more than 2 mgd (maximum day demand, net) to all water customers, existing and proposed, located across the South River Sub-Basin boundary without returning a significant amount of wastewater for treatment and discharge back into the Cape Fear River or obtaining an IBT Certificate. Net (total) IBT is calculated as follows:

Net IBT = Withdrawal from Source Basin – (Consumptive Losses to Source Basin + Wastewater Discharge to Source Basin).

5.2.1 IBT from Cape Fear River Basin to South River Basin

The South River, along with large areas of rural eastern Cumberland County, is located in a separate Sub-Basin 2-4 known as the South River Sub-Basin. The boundary between these two sub-basins is located along the ridgeline just a few miles east of the I-95 corridor for the northern half of the County; the boundary continues to NC-24 before turning southeastward and running along the ridge between Beaver Dam Church Road and Old Fayetteville Road and leaves Cumberland County. This basin boundary can be seen on the maps provided in Appendix A.

The water system information provided by PWC indicates that a 24" water main runs along NC-24 between Fayetteville and Stedman. The 24" reaches the ridgeline, reduces to a 12" diameter water main, and then enters a pumping/metering station that fills the elevated tank in Stedman. Downstream of this metering station, the water main continues approximately four miles to the Town of Stedman. The capacity of this 12" pipeline is less than 2 mgd (approximately 1.3 mgd at 2.5' of friction headloss per 1,000' of pipeline). Therefore, PWC does not require an IBT Certificate to operate this water main because the system is limited to transfer less than 2 mgd (maximum day demand) between Sub-Basin 2-3 (main stem of the Cape Fear River) and Sub-Basin 2-4 (South River).

Currently, PWC sells water to a single bulk customer in the South River Basin, Stedman. PWC also receives wastewater from Stedman which balances the Net IBT equation. In the near future, significant portions of Eastover Sanitary District Phase 2 will purchase from PWC and these rural customers, served by septic tanks, will result in a net loss of water from the Cape Fear River Basin 2-3. In the future, the Net IBT in the region may require a more detailed analysis to determine the extent of PWC's viable water service area in eastern Cumberland County. Although PWC receives wastewater from NORCRESS, this flow is primarily from customers located in the Cape Fear River Basin 2-3.

In 2009, there were approximately 2,928 potential County water customers located within the South River Basin. Using the same water demand projection methods as discussed in Section 2.4, this translates to an average daily demand of 0.9 mgd (maximum daily demand of 1.3 mgd) inside the South River Basin within 20 years. The following table illustrates the amount of

water that could potentially be sold to these customers from PWC, Harnett County, or LCFWASA; water sales of this quantity that are not returned to the source basin may result in an increased Net IBT that could push any one of these water systems closer to the threshold of requiring an IBT Certificate.

Table 5 - 20-Year Water Demand Projections for Customers in South River Basin

Proposed Water District	Potential Customers (2009)	Residential Water Demand (2029)	20% Commercial & Industrial Reserve	10% Estimated Daily Unaccounted Water	Total Average Daily Water Demand	Total Peak Daily Water Demand (P.F. = 1.5)
Northeast	324	74,557	14,911	8,947	98,415	147,622
East Central	1,754	403,618	80,724	48,434	532,776	799,163
Southeast	850	195,596	39,119	23,472	258,187	387,280
Totals	**2,928**	**673,771**	**134,754**	**80,852**	**889,377**	**1,334,065**

It is important to note that the IBT legislation only covers surface water transfers. The utilization of groundwater resources in the region could be a way for Cumberland County to alleviate any IBT concerns that are raised during discussions with potential surface water providers.

5.2.2 IBT from Cape Fear River Basin to Lumber River Basin

A small segment of southwestern Cumberland County is located in the Lumber River Basin (DWR 9-1). The boundary between the Cape Fear River basin and the Lumber River Basin is located along the ridgeline that follows Chickenfoot Road to the I-95 corridor; the boundary reaches the Roslin community and turns westward and runs along the ridge that makes up McDonald Road and Upchurch Pond Road before leaving the County. This basin boundary can be seen on the maps provided in Appendix A.

The water system information provided by PWC indicates that a few existing residential water mains cross this boundary and serve a small number of customers located within the Lumber River Basin (along Chickenfoot Road). This small customer base represents a low water volume that is returned to PWC via wastewater collection mains and is not a major IBT consideration.

In 2009, there were approximately 842 potential County water customers located within the Lumber River Basin. Using the same water demand projection methods as discussed in Section 2.4, this translates to an average daily demand of 0.26 mgd (maximum daily demand of 0.38 mgd) inside the Lumber River Basin within 20 years. The following table illustrates the amount of water that could potentially be sold to these customers from PWC, LCFWASA, or City of Lumberton; water sales of this quantity are not likely to adversely affect the Net IBT of any surface water systems in the region.

Table 6 - 20-Year Water Demand Projections for Customers in Lumber River Basin

Proposed Water District	Potential Customers (2009)	Residential Water Demand (2029)	20% Commercial & Industrial Reserve	10% Estimated Daily Unaccounted Water	Total Average Daily Water Demand	Total Peak Daily Water Demand (P.F. = 1.5)
Southwest	842	193,755	38,751	23,251	255,757	383,635

5.3 Available Groundwater Supply

In 1991, the Lumber River Council of Governments (LRCOG) and the US Geological Survey (USGS) sponsored an effort to monitor ground water levels in the LRCOG's four-county region. The initiative to further analyze the groundwater resources in the region resulted in the creation of the Southern Coastal Plain Ground Water Program (SCPGWP) is a regional, multi-stakeholder effort to examine ground water in the counties of Scotland, Hoke, Robeson, Columbus, Bladen, and Sampson Counties. In 1998, the LRCOG adopted a five-year plan that was designed to undertake research and development in the following key areas: groundwater supply & demand, quality, water level monitoring, hydrogeologic framework, and the development of ground water planning resources. In 2003, the Wooten Company published the final draft of the "*Southern Coastal Plain Ground Water Resource Strategic Plan*" that is considered the most comprehensive groundwater evaluation for the Southern Coastal Plain region.

There are five major aquifers that underlie Cumberland County that can be considered available for source development, listed from the deepest to the shallowest as follows: Bedrock, Lower Cape Fear, Upper Cape Fear, Black Creek, and Surficial. It is the opinion of Koonce Noble & Associates and Marziano & McGougan that the Upper Cape Fear and the Black Creek aquifers are the most suitable potential groundwater supply source for Cumberland County to consider viable for this type of rural county-wide project. This is based on many years of experience with the design, construction, and ongoing expansion of groundwater supplied well systems in Hoke and Robeson Counties and other clients that utilize groundwater well systems. Additionally, our numerous contacts within the well drilling industry agree with the opinion that the Upper Cape Fear and the Black Creek aquifers are the only viable source of groundwater development available to Cumberland County.

5.3.1 Bedrock Aquifer

The bedrock is composed of massive, impermeable rocks and depth to bedrock generally ranges from 100 feet to 350. The potential of the Bedrock Aquifer as a source of water supply is considered low with well yields typically around 5 to 35 gpm. Therefore, this aquifer cannot be considered a significant water source for Cumberland County. It could be utilized to supplement wells pulling water from other aquifers.

5.3.2 Lower Cape Fear Aquifer

The Lower Cape Fear Aquifer occurs directly above the Bedrock Aquifer and is overlain by the Lower Cape Fear Confining Unit. It is not present in Hoke, Scotland, and Robeson Counties, and only occurs in Cumberland in the Southeast corner of the county. The cities of Elizabethtown in Bladen County and Clinton in Sampson County use water from this aquifer. Salt water intrusion has been detected in this aquifer East of Elizabethtown. Due to the intrusion, the Lower Cape Fear Aquifer would not be considered a good water supply source for Cumberland County.

5.3.3 Upper Cape Fear Aquifer

The Upper Cape Fear Aquifer is located throughout Cumberland, Bladen, Columbus, Hoke, Robeson, Sampson, and Scotland Counties. It is confined beneath the Upper Cape Fear Confining Unit and well yields typically range from 200 to 400 gpm. This aquifer ranges in depth from 50 feet below sea level in central Cumberland County to 450 feet below sea level in Columbus County. Thickness of the aquifer under Cumberland County ranges from 110 to 120 feet. Saltwater intrusion has been detected in southeastern Bladen and eastern Columbus Counties.

The "Southern Coastal Plain Capacity Use Investigation" by the North Carolina Division of Water Resources, June 2004 indicates that there are two areas where large cones of depression have occurred due to ground water withdrawals. One area is near Tar Heel in Bladen County and the other is near Elizabethtown also in Bladen County. The cone of depression near Tar Heel covers all of western Bladen County, part of eastern Robeson County and extends into southwestern Cumberland County.

The Upper Cape Fear Aquifer serves as a principal source of water supply, especially in Bladen and Sampson Counties. In contrast, the aquifer is relatively under-developed in Hoke, Robeson, and Scotland Counties, where the Black Creek Aquifer accounts for nearly all ground water withdrawals. There could be future limitations on the quantity of water available, but the Upper Cape Fear should be considered a good source of water supply for Cumberland County since it is spread throughout the county and has good quality and yield.

5.3.4 Black Creek Aquifer

The Black Creek Aquifer is present throughout the Southern Coastal Plain. The Black Creek Aquifer becomes semi-confined to unconfined in northern/northwestern portions of Robeson County, and throughout Hoke and Scotland Counties, as the aquifer becomes shallower. The only area where the Black Creek Aquifer is confined in Cumberland County is to the east of the Cape Fear River. This aquifer is up to 200 feet thick, and wells produce from 200 to 600 gpm of relatively high quality water. The water from this aquifer often has high iron content, which is treatable with filtration.

The Black Creek Aquifer is heavily used in Robeson County. The Robeson County County-wide Water System has approximately 32 wells in the Black Creek Aquifer and withdraws 11 to 16 mgd. Several towns and industries in Robeson County also have wells in the Black Creek Aquifer. The City of Lumberton has four wells in the Black Creek Aquifer that pull 3.6 mgd, but these wells are subject to river recharge. Water levels in the aquifer in Robeson County are not being severely impacted due to a high recharge rate and high transmissivity. Areas where utilization is high and water levels are relatively unaffected include Hoke and Scotland Counties and northwestern portions of Robeson County. The Black Creek Aquifer could serve as a water source for Cumberland County. The water should be of good quality but could require filtration to remove iron.

5.3.5 Surficial Aquifer

The Superficial Aquifer is an unconfined aquifer, which is present throughout Cumberland County. This aquifer is the shallowest aquifer in the area and is not generally used by municipalities because it susceptible to droughts and pollution. The resource potential of the Surficial Aquifer is considered to be too limited to serve the projected needs of Cumberland County.

6.0 Alternatives to Provide Potable Water Supply to Districts

An alternatives analysis has been prepared to determine the best path to provide long-term water supply to the rural residents of Cumberland County. The selected alternative is critical in determining the most environmentally friendly and cost effective alternative for initial and future projects to be successful. In this report, the Southwest Water District is considered the highest priority due to its high potential customer density. See **Appendix C** for construction cost estimates of each alternative to serve the Southwest Water District.

6.1 No Action Alternative

The first alternative to be analyzed in this report is the decision to take no action. A no action alternative by Cumberland County would be contrary to the purpose of this study. A no action alternative would ignore the growth in future years due to the projected growth rate from normal growth patterns as well as the accelerated growth from BRAC. Cumberland County would defer any responsibility to serve residents within the rural areas of Cumberland County to other entities.

In the past, Cumberland County officials have been reactive to public needs relative to water distribution and supply. The purpose of this study is to develop a proactive scheme whereby, the County can participate in providing water supply and distribution to its rural citizens. Prior to this study, Cumberland County officials has engaged and financed other studies to be performed by other engineering firms dating back many years. To date, no significant implementation of any recommendations from these previous studies has been performed by Cumberland County. As a result, the demand for water service has continued to rise over time without a regional water system put into service. An example of this is the formation of the Linden Water & Sewer District in northern Cumberland County. During its initial formation in 2003, there was enough public pressure to cause the district to be formed. However, there was not enough public support for the passage of a bond referendum in order to finance the first phase of a water distribution project.

Additionally, septic tank failures in Cumberland County continue to occur at a regular rate. These failures coupled with shallow wells in relatively sandy soils and also during drought periods generate a great deal of insecurity among the County's citizens. Failing septic tanks can cause groundwater contamination and require construction of new wells in addition to septic tank replacement. This is a significant financial burden on the citizens and places further demands on the existing groundwater supplies. For these reasons, the engineers do not believe that a "No Action Alternative" would serve the long-term interest of Cumberland County and its citizens.

6.2 Alternative #1 - Develop County-Owned Surface Water Supply

A feasible alternative for Cumberland County to provide water supply to its citizens would be to construct a new surface water treatment facility that would be owned and operated by Cumberland County. This alternative would require Cumberland County to perform the following:

- Form a fully staffed and equipped water utility department. A variation of this would be to keep the existing public utility department for administrative purposes only and outsource the operation and maintenance of the surface water utility.
- Construct a new 5.0 mgd water treatment facility located on the Cape Fear River (or South River) with a properly sized raw water intake, finished water storage facilities, and high service pumping facilities.

A benefit of this alternative would be that Cumberland County would be fully self sustaining with regard to the projected water supply and treatment needs for the 20-year planning period. Therefore, Cumberland County would be in complete control of its water expansion needs for the foreseeable future and no major inter-local agreements or water purchase agreements would be necessary to develop or acquire source water supply. Also, this would eliminate the need to renew or renegotiate these water purchase contracts as conditions potentially change over time with regard to water requirements.

A disadvantage of this alternative would be that Cumberland County would need to construct a surface water treatment plant with a much larger capacity than is needed in the initial years of implementation. To construct a new surface water treatment facility at an economically sustainable price, the facility must be constructed to supply a 20-year demand cycle and be capable of supplying the projected maximum daily flow during that period of time. Therefore, the initial phase of the Cumberland County water system would require the construction of a 5.0 mgd facility to supply the first phase of the Southwest Water District. The cost of this extra capacity must be borne by the initial users and would require significantly higher end user charges via their monthly water bills and/or capacity fees.

6.3 Alternative #2 - Develop County-Owned Groundwater Supply

Another feasible alternative for Cumberland County to provide water supply to its citizens would be to construct a new water treatment facility that would receive its supply from existing groundwater sources. As discussed in Section 5.3, Cumberland County has five levels of aquifers within the county. Two of these aquifers (Cape Fear and Black River) appear to have sufficient supplies to provide the projected 5.0 mgd of water supply during the planning period.

The development of this alternative would rely heavily on approximations of the capacity of groundwater wells before they are constructed. For this report, we will assume that a minimum 200 gpm well can be achieved as justified in technical documents and surrounding water systems that utilize these aquifers. A 5.0 mgd water demand translates to a total of 35 wells that would need to be constructed in various areas of the county as new districts are developed and water distribution lines are constructed in new phases. Assuming these wells would be constructed in 1.0 mgd production increments, there would need to be an estimated five well fields in various parts of Cumberland County (approximately seven wells per field). It is assumed that each separate well field would be spaced sufficiently far apart to justify its own specialized treatment system to remove iron, sulfides, organics, hardness, and other pollutants.

The benefit of this alternative is similar to that of Alternative #2 with regard to being fully self sustaining. A disadvantage of this alternative is the use of groundwater wells for a significant supply to a growing customer base. Groundwater resources in the Cape Fear and Black River aquifers are being used significantly by joining counties which will probably have negative effects on the groundwater supply in the long term. Additionally, the presence of the Central Coastal Plain Capacity Use Area (CCPCUA) in nearby counties is an indication of the extreme sensitivity of groundwater aquifers in this region. The CCPCUA may also be a potential indication of future groundwater use reductions that could advance inland due to over development of these resources.

6.4 Alternative #3 - Water Purchase Contract from Existing Provider

This alternative would require Cumberland County to enter into a contract with an existing water system for the purposes of purchasing potable water to supply the County's potential customer base. Cumberland County is fortunate that there are several large purveyors of water nearby to the proposed District service areas. The major providers of potable water available to Cumberland County include: Public Works Commission of Fayetteville, Harnett County Department of Public Utilities, and the Lower Cape Fear Water and Sewer Authority. Of these three major water purveyors, only PWC is strategically located to serve all the proposed water districts in Cumberland County. This is due to PWC's central location in the County and the proposed District locations along the outer perimeter of the County from the north to the southwest in a crescent shaped area. Currently, preliminary water cost data is available from PWC to make a financial feasibility analysis of the cost-effectiveness for this alternative. For this reason, this report will evaluate PWC as Alternative #3a using the per 1,000 gallon rate charged by PWC for water supply and O&M costs. For comparative reasons, Alternative #3b will evaluate Lower Cape Fear Water & Sewer Authority using identical per 1,000 gallon rates for water supply and O&M costs but with an additional capital cost for the 56,000 linear feet of transmission main that must be installed to connect with this potential supplier. Further discussions with Lower Cape Fear Water & Sewer Authority (or other provider such as Harnett County) may lead to a more economical solution in specific districts if the proposed per 1,000 gallon rate charged for water supply and O&M costs is more affordable than the preliminary rates offered by PWC.

6.5 Cost Comparison of the Feasible Water Supply Alternatives

Each of the three feasible supply alternatives is compared on the basis of an end-user (residential) monthly water bill. The capital cost for the three feasible supply alternatives is developed by determining the amount of monies required to implement the following water system components: raw water supply, treatment system, capacity fees, existing system upgrades/interconnections, and the transmission, distribution, and storage system to carry the water to the end users. Once the capital cost is developed for the alternatives, the annual debt service for each alternative is calculated for a 100% loan on equal financing terms. Finally, the annual cost for water supply and operation and maintenance of the system is calculated for each alternative, and the total annual budget is to be repaid by the initial customer base with a zero fund balance. The following cost summaries illustrate the projected user rates for Alternative #1, #2, and #3 to serve the Southwest Water District. See **Appendix C** for construction cost estimates of each alternative to serve the Southwest Water District.

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #1 - New 5 mgd Surface WTP

1.	Annual Debt Service Payment (A/P,i,n)			**$1,156,786**
	a. Initial Capital Costs			
	Surface WTP Construction	$16,464,000		
	SW Phase 1 Distribution System	$6,432,000		
		$22,896,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$0**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons	$0.00		
3.	Annual O&M Charges			**$456,250**
	a. Cost per 1,000 gallons	$1.25		

Total Annual Costs	**$1,613,036**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$89.61**

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #2 - New Groundwater Wells with 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$1,052,505**
	a. Initial Capital Costs			
	Groundwater Wells/Treatment System	$14,400,000		
	SW Phase 1 Distribution System	$6,432,000		
		$20,832,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$0**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons	$0.00		
3.	Annual O&M Charges			**$584,000**
	a. Cost per 1,000 gallons	$1.60		

Total Annual Costs	**$1,636,505**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$90.92**

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #3a - Purchase Contract with PWC for 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$496,747**
	a. Initial Capital Costs			
	Interconnection Fees/Upgrades	$3,400,000		
	SW Phase 1 Distribution System	$6,432,000		
		$9,832,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$730,000**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons (PWC)	$2.00		
3.	Annual O&M Charges			**$182,500**
	a. Cost per 1,000 gallons (PWC)	$0.50		

Total Annual Costs	**$1,409,247**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$78.29**

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #3b - Purchase Contract with LCFWASA for 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$666,506**
	a. Initial Capital Costs			
	Interconnection Fees/Upgrades	$6,760,000		
	SW Phase 1 Distribution System	$6,432,000		
		$13,192,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$730,000**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons (LCFWASA)	$2.00		
3.	Annual O&M Charges			**$182,500**
	a. Cost per 1,000 gallons (LCFWASA)	$0.50		

Total Annual Costs	**$1,579,006**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$87.72**

MARZIANO & MCGOUGAN, P.A.
consulting engineers

KOONCE, NOBLE & ASSOCIATES, INC.

Initially, the Cumberland County water system with the highest feasibility is the Southwest District. Because the Southwest District is relatively large and contains nearly 5,000 potential customers, the entire Southwest Water District cannot be served in a single project phase. This report uses an estimated Phase 1 water customer base of 1,500 connections and an average daily demand of 1.0 mgd for the first phase of water system construction. The following assumptions are used to calculate the monthly water bill for a Phase 1 customer in the Southwest Water District (Alternative #1, #2, and #3):

- Southwest District is constructed as first phase in rural water system
- Cost for first phase of water transmission/distribution/storage is $6.4 million
- Cost for initial capacity fees and interconnection requirements is $3.4 million
- Zero grant contribution for each alternative (100% loan)
- Full loan amount borrowed over 40-year term, 4.0% interest
- Average daily water demand of 1.0 mgd
- 1,500 water customers (100% connection rate)
- Per 1,000 gallon rate for water supply established by PWC ($2.00 per 1,000)
- Per 1,000 gallon rate for O&M service established by PWC ($0.50 per 1,000)

In Alternative #1 and #2, the cost per 1,000 gallons for the bulk water charge and the cost per 1,000 gallons for the O&M charge is based upon comparable charges from similar water systems in the region. As discussed in Section 6.4, Alternative #3 charges for bulk water and O&M utilize the prevailing PWC rates. Capital cost for water supply and treatment facilities are based upon current market trends for raw materials, manufactured hardware/supplies, and labor in the construction industry.

Alternative #1 and #2 have a higher capital cost when compared to Alternative #3. Alternative #1 assumes that the capital cost allows for the construction of a 5.0 mgd supply system. This is because a new county-owned surface water treatment facility would require construction of a plant with the capacity to meet the projected water needs for the 20-year planning period (5.0 mgd). In the case of Alternative #2 and #3, it would be possible to phase the capital cost of the supply system since it would not be necessary to construct all of the required well fields and/or purchase capacity from outside sources until such capacity was needed. Therefore, when inspecting the following tables for each of the three alternatives described above, it can be seen that Alternative #3 yields both the lowest capital cost and the lowest estimated monthly water bill to the customer.

6.6 Selection of Recommended Water Supply Alternative

One of the most important recommendations to be developed in this rural water is the selection of a long-term water supply method to be implemented by Cumberland County. A matrix chart is presented below that lists important considerations in selecting the most advantageous water supply method. A point system is used in the matrix that indicates the alternative that would create the least impact on Cumberland County resources, political, social, and economic. A score of 1 is considered the least adverse impact among the alternatives and a score of 3 is considered the greatest adverse impact among the alternatives.

Table 7 – Feasibility Matrix for Water Supply Resource

Consideration	Alternative #1	Alternative #2	Alternative #3
Capital Cost	3	2	1
O&M Cost	2	3	1
User Charge (Rate)	3	2	1
Environmental	3	2	1
Political/Social	1	2	3
Economy of Scale	3	2	1
TOTAL	**15**	**13**	**8**

Based on the feasibility matrix above, Alternative #3 is the recommended alternative for the water supply to Cumberland County (all proposed districts). This is because Alternative #3 presents the least amount of adverse impacts to the points of consideration that are fundamental to the implementation of a new water system of this scale. If the Cumberland County Board of Commissioners elects to adopt Alternative #3, negotiations should begin immediately with PWC to determine their level of interest in providing all of the water supply for the proposed water and sewer districts. There are other feasible variations to this alternative available to Cumberland County as follows:

- Negotiate with the Lower Cape Fear Water & Sewer Authority for provision of potable water to portions of the proposed Cumberland County water system.
- Negotiate with Harnett County for provision of potable water to portions of the proposed Cumberland County water system.
- Negotiate with all three entities to determine if there would be a combination that would yield more economical results to the Cumberland County's water supply needs. IBT may be a key component in the consideration to diversify water providers to different Districts.

6.7 Summary

Cumberland County officials and citizens are fortunate to have available several sources of water supply that can be used in developing a county-wide water distribution. The capital cost analysis, monthly water rates, and water supply feasibility matrix set forth selection criteria that the engineers deem appropriate in selecting the best water supply alternative. Cumberland County staff and officials must use their best judgment when selecting the most feasible long-term water supply alternative. Additional criteria can be added to the feasibility matrix to tailor it in such a way that it meets the county's needs for further consideration of each alternative.

7.0 Infrastructure Financing Alternatives

Major contributions to this section were excerpted from the previous study entitled, *"Cumberland County: Rural Water Feasibility Study, April 2002,"* as performed by Camp, Dresser and McKee consulting engineers. Additional information is excerpted from the NC Rural Center Funding Source Guide, USDA Funding Guidance, and U.S. Department of Commerce data.

Several funding options are available to Cumberland County for obtaining financing for water infrastructure projects. This section provides a generalized account of local, federal and state funding programs available to qualified applicants in North Carolina. Section 8.1 provides a final recommendation for financing any projects that may develop as a result of this study

Federal funding agencies that provide funds for water projects include the United States Department of Agriculture - Office of Rural Development (formerly the Farmers Home Administration) and the United States Department of Commerce - Office of Economic Development Administration. State funding agencies that provide funds for water projects include the North Carolina Department of Environment and Natural Resources - Division of Water Quality and the Division of Environmental Health, the North Carolina Department of Commerce - Division of Community Assistance and the Commerce Finance Center, and the North Carolina Clean Water Management Trust Fund. The Rural Economic Development Center is a State funded non-profit organization that also provides planning and construction grants to local governments for infrastructure projects.

The Clean Water Bond Act of 1998 was a referendum that provided a total of $465 million in grants and another $335 million in loans for water and sewer projects that are managed by the following four state agencies: NCDENR, NC Department of Commerce, NC Clean Water Management Trust Fund, and the NC Rural Economic Development Center.

7.1 Department of Environment and Natural Resources

The Department of Environment and Natural Resources manages the majority of the funds ($330 million in grants and $335 million in loans), equally divided between the Division of Environmental Health - Public Water Supply Section and the Division of Water Quality - Construction Grants and Loan Section.

7.1.1 Division of Environmental Health

Within the Division of Environmental Health, the Public Water Supply Section manages three separate financing programs: N. C. Drinking Water State Revolving Fund (DWSRF) Loans; State Bond Loan; and High Unit Cost grants.

The purpose of these funds is to finance projects for planning, designing, and construction of water systems. Eligible applicants include local government units such as counties, cities, towns, incorporated villages, sanitary districts, metropolitan water districts, county water and sewer districts, and water and sewer authorities. Applicants are judged on a priority point's basis. There is a $3.0 million per fiscal year loan limit and a $3.0 million limit every third fiscal year for grants.

The average annual residential water and sewer charge must exceed 1.5% of the applicant's most recent Median Household Income (MHI) to qualify for a grant. The user charge must exceed 0.75% if only one utility (water or sewer) will be present at project completion. Repayment terms of loan funds are determined by the Local Government Commission, but cannot exceed 20 years. The interest rate for the SRF loans is one-half of the Bond Buyers Index adjusted semi-annually with the maximum rate being 4.0%. The interest rate for the State Bond loan funds is the State's current interest rate plus administrative expenses.

7.1.2 Division of Water Quality – Construction Grants & Loans

Within the Construction Grants and Loan Section, there are three separate financing programs: High Unit Cost Grants, State Bond Loan Fund, and the State Revolving Fund (SRF). The loans and grants from the CG&L Section are for wastewater infrastructure and are not pertinent to this water study.

7.2 North Carolina Department of Commerce Finance Center

Each year, the North Carolina Department of Commerce designates all 100 counties in North Carolina as a Tier 1, Tier 2, or Tier 3 County. These rankings are based on an assessment of each county's unemployment rate, median household income, population growth, and assessed property value per capita. The recently amended tier designation laws require that the 40 most distressed counties are considered Tier 1 counties, the middle 40 counties are considered Tier 2 and the 20 most prosperous counties are considered Tier 3 counties.

In 2009, Cumberland County was designated a Tier 1 County, among the 40 most financially distressed Counties in the State. County tier designations determine the available amount of tax credits for job creation and business property investment in a list of eligible industries. They include manufacturing, motorsports, aircraft maintenance and repair, air courier services, warehousing, customer service call centers, research and development, electronic shopping and mail order houses, wholesale trade and information technology. Eligible businesses that locate in lower-tiered counties are eligible for larger tax credits than those that locate in higher-ranked areas. As part of the application process, eligible companies are required to offer employees subsidized health insurance, have clean tax records and environmental compliance. In Tier 2 and Tier 3 counties, companies must pay adequate wages.

The Clean Water Bond Act of 1998 provided $20 million to be used for economic development. The Department of Commerce through the Commerce Finance Center administers these funds. The Act provides that the funds will be awarded in the same manner as the State's Industrial Development Fund (IDF) program. The funds are to be used to make grants to local governments (municipal and county) to pay the cost of clean water projects for the location or expansion of industries in the State. The funds are for grants, as opposed to loans. Grants will be awarded for projects that will have a favorable impact on North Carolina's clean water objectives. Projects may address new or existing water or sewer lines or equipment, construction of or improvements that will expand the capacity of existing wastewater treatment or water supply systems.

Economic Development Bond funds may be used only in economically distressed counties or in counties with a population of less than 50,000.

7.2.1 Division of Community Assistance (CDBG Infrastructure Program)

North Carolina Department of Commerce - Division of Community Assistance administers another grant program called the Small Cities Community Development Block Grant (CDBG) Infrastructure Program. The purpose of this program is to provide infrastructure funds for water and wastewater disposal systems for low and moderate income people, thereby creating viable communities with suitable living conditions to residents.

With the exception of 22 entitlement cities and two urban counties that receive funds directly from the U.S. Department of Housing and Urban Development (HUD), all municipalities and counties are eligible to receive Small Cities CDBG funds. The maximum infrastructure grant available per community per project per year is $850,000. Multiple jurisdictions can apply jointly for funds.

The City of Fayetteville is one of the entitlement cities and Cumberland County is one of the urban counties that receive funds directly from HUD, with the one exception that the Town of Linden may apply directly for CDBG funding. Applications are accepted only upon official announcement of program specifications and details by the Division of Community Assistance.

7.2.2 Commerce Finance Center (CDBG Economic Development Resources Program)

Similar to the CDBG infrastructure program is the CDBG Economic Development Resources Program administered through the Commerce Finance Center. Economic Development applicants may apply for CDBG assistance for public water and sewer facilities to serve a specific business, direct loans for the purchase of private business equipment, or for new expansion construction. Public facility projects may involve grants for up to 75% of the proposed facility cost, with 25% to be paid by the local government applicant.

Except for 22 entitlement cities and two urban counties that receive funds directly from HUD, all municipalities and counties are eligible to receive small cities CDBG funds. Multiple jurisdictions can apply jointly for funds. CDBG assisted activities must demonstrate benefit to Low and Moderate Income (LMI) persons. The same conditions apply to the City of Fayetteville, Cumberland County, and the Town of Linden as cited above.

7.3 Clean Water Management Trust Fund

The purpose of the Clean Water Management Trust Fund is to provide financing for projects that specifically address water pollution problems. Eligible entities include Local Government Units and other political subdivisions of the State and non-profit corporations that have as their primary purpose the conservation, preservation, and

restoration of the State's environmental and natural resources. Grant funds are used to enhance and preserve surface water quality.

Projects must enhance or restore degraded waters, protect unpolluted waters and/or contribute towards a network of riparian buffers and greenways for environmental, educational, and recreational benefits. Trustees favor projects which have the highest benefit to cost ratio and are supported by and integrated with local community programs, are timely, supplement other water quality initiatives, and which do not have sources of sufficient funding.

7.4 North Carolina Rural Economic Development Center

Through the 1998 Clean Water Bond Act, the Rural Center administers three separate programs: the Capacity Building Grants Program, the Supplemental Grants Program, and the Unsewered Communities Grants Program. All three are grant programs targeted to assist rural, distressed local governments with critical environmental or economic development priorities. Currently, Cumberland County is not eligible to apply for these funds because it is considered one of the fifteen "urban" counties as defined by the NC Legislature. This is due to the population and urban environment present in the City of Fayetteville.

7.4.1 Capacity Building Grants

The purpose of this program is to provide matching funds for units of local government to plan for needed infrastructure projects through development of Capital Improvements Plans, Preliminary Engineering Reports, Rate Studies, etc. Capacity Building Grants are limited only to municipal and county units of government in economically distressed areas of North Carolina. Applicants must address local economic development or capacity concerns. Priority is given to projects that address water and sewer infrastructure planning needs. The maximum grant amount is $40,000. The limited amount of money remaining from the 1998 bond referendum is distributed as capacity building grants for study purposes only.

7.4.2 Supplemental Grants

The purpose of the Supplemental Grant Program is to provide funds to match federal, state, and other loan or grant program funds for projects that improve physical infrastructure and strengthen prospects for economic development in distressed areas of North Carolina. Eligibility for Supplemental Grants is limited to units of local government and qualified non-profit organizations for projects in economically distressed areas of North Carolina. For example, projects in Tier 1 counties as designated by the North Carolina Department of Commerce receive priority points over those located in Tier 2 or Tier 3 counties. Special emphasis is given to projects that upgrade or expand existing water and sewer faculties or develop new facilities where permanent jobs are created or retained. Grants normally will not exceed $400,000 and will not represent more than 50 % of the total project cost.

7.4.3 Unsewered Communities Grants

The purpose of the Unsewered Communities Grants Program is to provide funds for development of wastewater collection and treatment utilities in unsewered communities. In order to be eligible for this funding, the applicant must be a unit of local government with population less than 5,000 persons. The applicant must have a MHI less than 90% of the national MHI, as provided by the most recent U.S. Census data. Priority will be given to applications demonstrating most cost-effective alternatives given the severity of need. The maximum grant amount available is $3 million per project not to exceed 90% of the total project cost.

7.5 U.S. Department of Agriculture - Rural Development

It is the engineer's opinion that USDA has been the most consistent source of infrastructure funding for the past 40 years. The USDA water and wastewater programs are administered in North Carolina by the Office of Rural Development (RD). The purpose of the Water and Wastewater Loan and Grant Program is to construct, enlarge, extend, or otherwise improve water or waste disposal facilities providing essential services primarily to rural residents and rural businesses. Eligibility is limited to rural areas and towns up to 10,000 in population. Eligible entities include public bodies such as towns, counties, districts, authorities and other political subdivisions of the state, non-profit organizations and Indian tribes. Applicants must provide evidence that they cannot finance desired facilities from their own resources or through other sources at reasonable terms.

The loan repayment period must not exceed the useful life of the facility being financed or 40 years, whichever is less. There are three different interest rates based upon the median household income of the area served by the facility to be financed. Median household income is derived from the most recent U.S. Census data. Loans to public bodies are secured by General Obligation Bonds, which require a vote by the public. If the County is approved for issuance of Revenue Bonds then a bond referendum is not required.

Loans to "not for profit" organizations are secured by Deeds of Trust on fixed assets constructed or improved with loan funds and pledges of system revenues. Grants of up to 45% of the total eligible project cost (depending upon the MHI) are available in conjunction with loans for the purpose of reducing average user charges to a reasonable level based on comparable systems. In recent funding cycles, the maximum grant per project is around 40-45%, up to a $2 million cap in order to spread the available funds to the most qualified applicants. Grants are not available to applicants where the median household income of the service area exceeds North Carolina's MHI.

7.6 U.S. Department of Commerce - Economic Development Administration

The purpose of the Public Works and Development Facilities Grant Program within EDA is to assist communities with the funding of public works and development facilities that contribute to the creation or retention of private sector jobs and alleviation of unemployment and under employment. Eligible entities include public bodies such as towns, counties, districts, authorities and other political subdivisions of the state, non-profit organizations and Indian tribes. Projects must be consistent with

the EDA approved overall Economic Development Program for the area in which it will be located.

Projects must be in areas suffering from economic distress, i.e., unemployment rates exceeding the national average and PCI of 80% or less of U.S. average. Generally grants cannot exceed 50% of the eligible project cost; however, in some cases grants may be made not to exceed 80% of the project cost.

7.7 Financing Options Applicable to Cumberland County

Of the multiple financing options discussed above, there are several sources of both grant and loan financing that are applicable to Cumberland County's rural water needs. USDA has both grant and loan funds available for the type of rural water project proposed in this study. Grant funding is dependent upon the median household income for Cumberland County or a smaller, defined subdivisions of the county (townships, US Census tracts, US Census blocks, etc.). Specific areas of Cumberland County are below the threshold for grant funding consideration and are therefore eligible to apply for USDA grant monies. The remaining areas of Cumberland County are not grant eligible, but are qualified to apply for USDA loan monies.

In order to secure a USDA grant, the County must also apply for a loan to cover the non-grant eligible portion of cost. USDA-RUS rates are competitive and attractive due to the ability to finance the project loan costs over a 40-year period. Application for project financing is made through the USDA regional office, located in Lumberton and managed by Steve Smith. Funding is on a first come, first serve basis. The USDA funding program is a worthwhile application process with a favorable outlook for obtaining both grant and loan proceeds to apply toward the initial project recommended in this study, as well as potential future phases.

In an effort to increase economic activity during the current recession, the federal government has channeled federal stimulus monies through established state and federal agencies that traditionally fund infrastructure projects. These funds are part of the 2009 American Recovery and Reinvestment Act (commonly referred to as the federal stimulus package). Loans made in the first round of project funding are set to repay principal only (0% interest); the first round is currently underway, and shovel-ready projects are the complete focus of this first round in order to create jobs in the immediate future. Cumberland County may be able to apply for these types of zero-interest funds in the future if the funds are still available, study recommendations are well-received, water supply is secured, and all of the required action items recommended in this study are completed in an expeditious time frame.

Other "conventional" federal funds for Safe Drinking Water Act projects are directed to NCDENR-Division of Environmental Health: Public Water Supply Branch. The Drinking Water State Revolving Fund (DWSRF) program is an immediate source of loan financing because of the low interest rates being offered to applicants, typically 2.0%. The yearly allocation per project is $3.0 million for water projects. The potential to receive monies from the DWSRF program and USDA could provide sufficient funding for the initial projects recommended in this study.

The Federal Economic Development Administration is another agency that routinely makes Federal grants to projects provided the project is coupled with job creation or job retention, which can be accomplished in special situations. Grants for a single project are generally less than $1.5 million. However, Cumberland County could request a greater sum, particularly if there are sufficient jobs involved or if the project cost is large enough to need a higher level of grant financing. Each project is considered on a case-by-case basis.

Other potential grant funding sources include the State's Commerce Finance Center and the CDBG Economic Development Program, both of which are based on the creation of jobs. That is to say, there must be an industry locating within the County or expanding its existing operation that will provide or create new jobs. While neither of these agencies are primary targets at this time, the County should remain aware of such programs and look for opportunities to capitalize on the availability of these funds.

8.0 Final Recommendations

8.1 Recommended Project Financing Plan

It is the engineer's opinion that the best financing program available to Cumberland County is administered by the USDA-RD. Federal funding in rural areas has been consistent over the past four decades and the likelihood of future funding is high due to the continuing need throughout rural North Carolina and the United States for a safe, reliable, public water supply. North Carolina officials have been aggressive in promoting rural water projects and the federal allocation to the State has been above the national average. Funding is made on a first come first served basis; the likelihood of receiving a loan and/or a grant is very high provided there is a proven critical health need and a sufficient customer base to make the proposed project economically viable.

Koonce Noble & Associates and Marziano & McGougan recommend that Cumberland County's primary funding strategy be geared toward the scope and cost that USDA-RD is accustomed to reviewing and financing. The following summarizes a typical USDA project that would most likely receive USDA-RD funding:

- Critical health needs in rural areas that are evident and supported
- Optimum project size is approximately $5 million
- Customer density of approximately 15-20 houses per mile
- Total customer base of approximately 1,000 customers
- Recently, the maximum grant per project is around 45%, up to a $2 million cap

It is also recommended that Cumberland County consider pursuing additional funding sources to supplement the funds available from USDA-RD. The most suitable source of these additional funds can be leveraged from the following funding programs:

- Drinking Water SRF Low Interest Loans
  - Competition is high for these loans
  - Critical health need must be present
  - Interest rates are typically one half the current market rate (2.0 %)
  - Maximum yearly allocation per project is $3.0 million for water projects.

- Economic Development Administration Grants
  - Competition is high for these grants
  - Primary focus of this program is the creation/retention of private sector jobs
  - Residents within the project's feasible service area can benefit indirectly from these types of projects
  - Typical grant awards cannot exceed 50% of the eligible project cost
  - Maximum yearly allocation per project is $3.0 million for water projects

- Community Development Block Grants
  - Competition is high for these grants
  - Cumberland County receives grant funds directly from HUD
  - Cumberland County can channel part of annual allocation to a rural water project
  - Critical health need must be present
  - Project area must meet economic hardship criteria

8.2 Organization of Proposed Districts

This report has demonstrated that rural residents in Cumberland County can benefit from a public water system. Because of the large expanse of the rural sections of Cumberland County, the physical barrier of the Cape Fear River, natural topography, and the location of multiple water systems and MIAs, the potential rural water service area must be subdivided into small sub-sections. Cumberland County must delineate potential water service areas with accepted boundaries (i.e. townships, census tracts) that can be interpreted easily by potential funding agencies.

Another advantage of using defined, accepted boundaries for these sub-sections is that these boundaries will remain relatively unchanged over time and they can be updated with future population and income data when it becomes available. As described earlier in this report, these sub-sections of potential water service areas are referred to as "Districts" in this PER. The purpose of dividing the County into "Districts" is to facilitate the following:

- Create a project scale that is not too large in scope for practical funding consideration and engineering feasibility
- Determine the number of potential customers by District
- Use the Median Household Income published for each District
- Median Household Income is a primary factor in determining whether or not an area is eligible for grants and/or loans from state and federal agencies
- Determining priorities for service which include overall feasibility relative to capital cost
- Project future water demands and service populations
- Increase the variety of potential water suppliers to strengthen Cumberland County's position as a potential bulk water customer

North Carolina is fortunate to have a wide range of organizational structures available that allow the provision of water and sewer services to the public. In the case of Cumberland County, the engineers feel that the form of organization to be used for providing water service to the County residents should be one that does not necessarily create another level of government between the County residents and the government of Cumberland County. Also, the organizational structure must enable the County to obtain public/private financing including grants based upon the revenues that will be generated from utilization of the water system.

With the above in mind, previous studies prepared for Cumberland County have itemized the various organizational structures that are available for the provision of water and/or sewer. One of the more common organizational structures and one that is currently in use in Cumberland County is known as a Water and Sewer District. A Water and Sewer District is a County service district that is established by the County Board of Commissioners, described by a meets and bounds document, and is considered a separate unit of government. However, the Water and Sewer District, as established by the County Board of Commissioners, is administered by County Board of Commissioners as the governing body. This eliminates the need for an additional layer of government at the county level.

Having a master plan that indicates the County's intention to form districts and analyze feasibility on the basis of districts provides an additional level of comfort to lending agencies when applications are made for funding. It also allows the County to assign priorities for service based on changes in growth patterns or environmental conditions. Water and Sewer Districts can apply for and obtain grants from state and federal agencies. Water and Sewer Districts can hold bond referendums and/or borrow money per General Statutes of the State of North Carolina. Additionally, County commissioners can levy a tax if necessary to support the water system, although this is a very rare requirement to support a financially insolvent water project.

Cumberland County has already undergone the experience of creating a formal District during the 2003 establishment of the existing Linden Water and Sewer District (previously discussed in Section 3.1.9 of this report). This project was considered a stepping stone for the construction of rural water service in northern Cumberland County and could be viewed as a successful precedent in the establishment of a new water oriented unit of government in Cumberland County. Additionally, the engineers understand that the County is contemplating forming another such district in the Over Hills subdivision area near Spring Lake for the purpose of providing wastewater service to those residents.

To facilitate the continuing involvement of the County Commissioners, Water and Sewer District steering committees can be formed in each district. The steering committees would be made up of citizens from that district that would be interested in actively pursuing installation of water facilities. Each steering committee would be managed by the Director of Public Utilities and periodic reports could be made to the County Commissioners that update the findings in this report or other changes that relate to the feasibility for construction of water facilities. At such time as it becomes apparent that installation of water service to a particular district becomes feasible, the Department of Public Utilities can update the County Commissioners and receive their approval to begin application for funding and subsequent environmental permitting and facility design.

8.3 Potable Water Supply

Cumberland County is somewhat unique in North Carolina because Fort Bragg and the City of Fayetteville are urbanized areas in the County while the remainder of the County (approximately 242 square miles or 37% of the entire County) has maintained a very rural and agricultural nature. Also, PWC is a major purveyor of water in the County and has the available supply to provide potable water to all rural residents in Cumberland County through the 20-year planning period. Section 6 of this report discussed the various water supply alternatives available to Cumberland County. The conclusion of this report, with regard to water supply, is that the primary focus for Cumberland County should be to pursue negotiations with PWC to supply the potable water for any public system that may be constructed on a district by district basis in Cumberland County. PWC has been the long term purveyor of water in Cumberland County and has worked closely with the County on previous projects in the past. Currently, Cumberland County does not have a water purchase agreement with PWC. Such an agreement will need to be negotiated prior to final implementation of this recommendation.

Also, as mentioned in section 6, there are other variations for water supply available to Cumberland County. Harnett County has a fairly strong presence in northern Cumberland County by virtue of having been granted a franchise area by Cumberland County in the 1980s. Currently, there are in excess of 1,500 customers served by the Harnett County water system in northern Cumberland County. Additionally, Cumberland County serves the Town of Linden with potable water. The Town of Linden owns the water system and contracts all operation and maintenance to Harnett County. A copy of the operation and maintenance agreement between Harnett County and the Town of Linden is contained in the Appendix D of this report. Therefore, it would be prudent to contact representatives of Harnett County to determine if there is interest in providing water supply to the northern portion of Cumberland County.

Also being planned is a new water treatment plant in Bladen County known as the Bladen Bluffs WTP. This new facility is being constructed by the Lower Cape Fear Water and Sewer Authority and is expected to be operational before the end of 2011. The new water treatment plant would be capable of supplying the southern portion of Cumberland County as indicated in Section 4 of this report. The engineers have met with officials of the LCFWASA and their engineers have requested additional information. It is expected that potential bulk water rates will be forthcoming before May 30, 2009. Additional meetings with representatives of LCFWASA will be necessary if the proposed water rates could provide a potential savings to the County.

Other scenarios in which water providers could potentially sell water to specific districts within the County are provided in Table B.3 in Appendix B, "Potential Water Supplier Scenarios." This table summarizes the water providers considered as viable sources for the varying district locations proposed in the County. The intent of this summary information is to increase the variety of available potential water suppliers in order to strengthen Cumberland County's position as a potential bulk water customer. Using the district-specific information provided, Cumberland County has the tools to gage water demand needs, negotiate potential water sales partnerships, and water supply resources available to proposed districts within the County.

8.4 Project Priority

Priorities for construction of water distribution systems on a district by district basis have been given in Section 4 this report. The basis for selection of project priority is dependent upon the cost per customer and the number of customers per mile of roadway. By prioritizing the districts in this manner, the most cost-effective project will allow for the most users at the least capital cost. This means that user rates and initial capital cost will be kept to a minimum while serving the greatest number of customers in initial phases. With the above in mind, the priority list for construction of water system to serve each district is as follows:

- Priority 1 - Southwest District
- Priority 2 - Linden District
- Priority 3 - East Central District
- Priority 4 - Southeast District
- Priority 5 - Northeast District

Tables B.2, B.3, and B.4 presented in Appendix B provide physical data for each of the proposed districts itemized above. The timeline to construct the water system in each district will be based upon several factors. They include district growth, availability of funds, construction market, user charges, and last but not least environmental factors related to the health and safety of the public. If the only funding made available to a particular district were in the form of loan monies, the district that appears to be the most financially feasible at this time is the Southwest District. However, discussions should be entered into with the USDA-RD to determine if sufficient grants would be available to lower the user charges to an acceptable level.

8.5 Water System Operation & Maintenance

When the County constructs a central water system in a water and sewer district, that district must be operated and maintained in State/Federal compliance for the entire service life of the system. The operation and maintenance of the water system includes many components, such as:

- Operational personnel for testing, flushing, inspection and repair of system facilities
- Administrative personnel for billing, training, management and overall responsibility
- Construction equipment such as backhoes, trenching and boring machines for day-to-day construction operations of the system
- Integration into the County's administrative system for providing employee benefits, training and other items associated with employment/labor laws
- Physical plant facilities for housing of equipment and storage of materials and office facilities for operational personnel to include computer facilities and software necessary for billing and day-to-day contact with the systems customers

Selection of the most desirable operational and management scheme for Cumberland County may require the most diligent thinking of the County staff and elected officials. In the following discussion, the engineers will draw upon their experience with other systems in an effort to provide adequate information to Cumberland County in selecting a desirable operational scheme.

Many County systems that have started essentially from scratch have developed their own operational and management system and assets. However, Cumberland County is somewhat unique because of the significant diversity between rural and metropolitan type areas within the County. In other words, Cumberland County has within its boundaries a significant supply of potable water and existing operational facilities that are operated by others such as PWC and Harnett County (and LCFWASA).

Emerging trends within existing water systems in North Carolina include outsourcing all the various water system operations such as, billing, water treatment plant operation and, on a smaller scale, maintenance of water distribution systems (i.e. Eastover Sanitary District). Therefore, the engineers feel that Cumberland County officials should include negotiations with the major water purveyors in the area for system operation and maintenance when negotiating for water supply. There would be two agreements necessary for negotiation:

- Water purchase agreement for the purpose of setting charges, and other contracts or arrangements for supplying potable water to the county's water infrastructure
- System operational agreement for the purpose of operating and maintaining the system

If USDA-RD funds be utilized for construction of the system, the term of the agreement will need to be 40 years. In making the assessment of these two potential contracts, the engineers are working from the philosophy that "joining" with an existing entity such as PWC carries with it a fairly large scale of economy. That means that Cumberland County's water districts would be part of a larger entity and fluctuations in commodities such as electricity, chemicals, unfunded regulations and other unforeseen items pertinent to the system could be absorbed with less financial impacts to the County's customers. The engineers stand ready to further discuss these items with the County staff and officials at their convenience and provide any additional information to assist in their decision.

8.6 Summary

The following summarizes the engineer's recommendations relative to proceeding with implementation of developing a county-wide water system:

- The primary source of funding is recommended to be the USDA-RD. General Obligation (GO) bonds have historically been the recommended source of financing from the USDA. However, revenue bonds are also acceptable and have recently gained much more acceptance in the USDA-RD North Carolina regional offices.
- The engineers recommend that the County continue to form water and sewer districts, as previously done in the Linden Water & Sewer District, along the lines shown on the various maps in this report. These districts can be managed by the existing board of County commissioners. Close contact between the Commissioners and the operation of the districts can be maintained by utilizing the County's Department of Public Utilities and setting up district steering committees of interested citizens.
- The engineers recommend that the County actively seek a potable water supply, primarily from PWC. Additional negotiations should be held with officials of Harnett County and the Lower Cape Fear Water and Sewer Authority to determine the feasibility of supplying all or part of the County's water needs. The variation would be to analyze the feasibility of using a combination of these available water supplies.
- Project priority is listed in the above section on a district by district basis. Priority is based upon obtaining the largest number of users for the least amount of capital cost. Under the current physical data available for the proposed districts, it appears that the Southwest District provides the best opportunity for establishing a county owned water distribution system.
- The engineers recommend that the County negotiate with the existing suppliers of potable water to determine the feasibility of obtaining the operation and maintenance of the County's future water distribution facilities from other existing operations.

9.0 References

"Bladen Bluffs Regional Surface Water System: Annual Newsletter, Year in Review"; Lower Cape Fear Water & Sewer Authority, 2008. http://www.lcfwasa.org/newsletter/default.asp

"BRAC Actions." BRAC Regional Task Force Website: Welcome to North Carolina. http://www.bracrtf.com/actions.html

"Cape Fear River Basin Basinwide Assessment Report; North Carolina Department of Environmental and Natural Resources (NCDENR) – Division of Water Quality (DWQ); Environmental Sciences Section; August 2004.

"Cape Fear River Basinwide Water Quality Plan 2005"; North Carolina Department of Environmental and Natural Resources (NCDENR) – Division of Water Quality (DWQ); October 2005.

"Cumberland County Municipal Influence Areas"; Cumberland County GIS Department; 2009.

"Cumberland County, North Carolina"; U.S. Census Bureau; American Factfinder; http://factfinder.census.gov/.

"Cumberland County: Rural Water Feasibility Study: Preliminary Engineering Report (PER)"; Camp, Dresser & McKee (CDM); April 2002.

"Eastover Sanitary District Phase 2 District Expansion & Water Extensions: Preliminary Engineering Report (PER)"; Hobbs, Upchurch, & Associates, P.A.; 2005.

"Fayetteville Public Works Commission: About Our Water Facilities"; 2009. http://www.faypwc.com/about_fac_water.htm

"Hoke County Regional Water System Phase V: Preliminary Engineering Report (PER)"; Koonce, Noble & Associates, P.A.; December 2006.

"Jordan Lake Water Supply Storage Allocation: Round Three Hearing Officer's Report"; NCDENR Division of Water Resources; Environmental Management Commission; June 2002.

"North Carolina Aquifer Characteristics"; North Carolina Department of Environmental and Natural Resources (NCDENR) - Division of Water Resources (DWR); http://www.ncwater.org/Education_and_Technical_Assistance/Ground_Water/AquiferCharacteristics/.

"Projected Annual Population Totals – By County;" North Carolina State Demographics Office; from http://demog.state.nc.us/.

"The Southern Coastal Plain Comprehensive Ground Water Study & Assessment Technical Report"; Lumber River Council of Governments; December 2003.

Appendix A

Project Maps

- Map #1 - Municipal Influence Areas and Existing Water Districts in Cumberland County
- Map #2 - Existing Water Systems in the Region
- Map #3 - Proposed Water Districts and Infrastructure
- Map #4 - Proposed Water Districts Relative to IBT Boundaries
- Map #5 - Proposed Southwest Water District
- Map #6 - Proposed Linden Water District
- Map #7 - Proposed East Central Water District
- Map #8 - Proposed Southeast Water District
- Map #9 - Proposed Northeast Water District
- Map #10 – Southwest Water District: Water Main Sizes and Potential Supply Interconnection Points

Cumberland County Rural Water Feasibility
Map #1 - Municipal Influence Areas and Existing Water Districts in Cumberland County

Municipal Limits
Fort Bragg
Municipal Influence Areas
Vander Water & Sewer District
Linden Water & Sewer District
Eastover Sanitary District

Harnett County
Linden
Godwin
Falcon
Moore County
Spring Lake
Wade
Eastover
Fayetteville
Sampson County
Hoke County
Stedman
Autryville
Salemburg
Clinton
Roseboro
Hope Mills
Parkton
Lumber Bridge
Robeson County
Bladen County

0 1 2 4 6 8 10 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #2 - Existing Water Systems in the Region

- Existing Water Systems with PWC Service
- Existing Municipal Water Systems
- Municipal Influence Areas
- PWC Service Area
- Fort Bragg
- Vander Water & Sewer District
- Linden Water & Sewer District
- Eastover Sanitary District

Harnett County
Linden
Godwin
Falcon
Moore County
Spring Lake
Wade
Eastover
Sampson County
Fayetteville
Stedman
Salemburg
Autryville
Clinton
Hoke County
Hope Mills
Roseboro
Parkton
Lumber Bridge
Robeson County
Bladen County

0 1 2 4 6 8 10 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #3 - Proposed Water Districts & Infrastructure

Harnett County
Linden
Godwin
Falcon
Moore County
Spring Lake
Wade
Eastover
Fayetteville
Sampson County
Stedman
Salemburg
Autryville
Clinton
Hoke County
Hope Mills
Roseboro
Parkton
Lumber Bridge
Robeson County
Bladen County

- Cumberland Co. Potential Water Mains
- Existing Water Systems with PWC Service
- ESD Phase 2 Water Lines
- Existing Municipal Water Systems
- Municipal Influence Areas
- PWC Service Area
- Fort Bragg
- Linden Water & Sewer District
- Eastover Sanitary District

Proposed Cumberland County Water District

- East Central
- Northeast
- Southeast
- Southwest

0 1 2 4 6 8 10 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #4 Proposed Water Districts
Relative to IBT Boundaries

- Cape Fear River Sub-basin 2-4
- Lumber River Sub-basin 9-1
- Cumberland Co. Potential Water Mains
- Existing Water Systems with PWC Service
- ESD Phase 2 Water Lines
- Existing Municipal Water Systems
- Municipal Influence Areas
- Municipal Limits
- PWC Service Area
- Fort Bragg
- Linden Water & Sewer District
- Eastover Sanitary District

Proposed Cumberland County Water District

- East Central
- Northeast
- Southeast
- Southwest

Harnett County
Dunn
Linden
Godwin
Falcon
Moore County
Spring Lake
Wade
Eastover
Sampson County
Fayetteville
Stedman
Autryville
Hoke County
Hope Mills
Roseboro
Parkton
Lumber Bridge
Robeson County
Saint Pauls
Bladen County

0 1 2 4 6 8 10 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #5 - Proposed Southwest Water District

Houses in District Service Areas
Existing Water Systems with PWC Service
ESD Phase 2 Water Lines
Existing Municipal Water Systems
Municipal Influence Areas
PWC Service Area
Fort Bragg
Linden Water & Sewer District
Eastover Sanitary District

Proposed Cumberland County Water District
East Central
Northeast
Southeast
Southwest

2" Water Main
4" Water Main
6" Water Main
8" Water Main
12" Water Main
16" Water Main

Hoke County
Robeson County
Bladen County
Parkton
Hope Mills
Fayetteville

0 0.5 1 2 3 4 5 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #6 - Existing Linden Water & Sewer District

Harnett County

Linden

Wade

Eastover

Favetteville

LINDEN RD
MILL RD
DYNASTY LN
LOOP RD
CLERVIE DR
PINE ST
W THORNTON RD
MORRIS RD
BIG BAY RD
W REEVES BRIDGE RD
E REEVES BRIDGE RD
CHICKAPEE DR
COATS RD
GILES RD
RUSTY RD
DURANT NIXON RD
VAULT FIELD RD
HAWKINS RD
COLLIERS CHAPEL CHURCH RD
GRIMBLE DR
DUSTY LN
NANTAHALA DR
WILD HORSE RD
RODEO DR
PREDONIA DR
FOXCROFT DR
FOXLAIR DR
FOXTRAIL DR
GAUWOOD DR
RAMSEY ST
TUDOR RD
DEERFOOT DR
FLYERS DR
PALESTINE RD
MCARTANS FORD
RABBIT DR
MCBRYDE ST
LUCINDA LN
CANAL ST
LANE RD
CARLOS RD
HONEYBEE DR
LAURA RAY RD
BEND RD
MORAY ST
CAROWIND DR
SLOCOMB RD
ELLIOT BRIDGE RD
ELLIOT FARM RD
SPURGE DR
WILKINS DR
BIENVILLE DR
CURRIN ST
RACHEL RD
TRACTOR RD
WOLFPOINT EXT
LOU DR
HOLDER LN
PLOTTS DR
BETHUNE DR
MCCLOSKEY RD
ST THOMAS RD
WELSTONE DR
RIVER RIDGE RD
ST JOHNSON
ANDREWS RD
CARVERS FALLS RD
I-295 S
I-295 N
CALLIE RD
RIVER RD
GAME RD
DAUGHTRY RD
SWAMP RD
RICH WALKER RD
JACKIE LEE RD
LOVICK RD
HOUSE ST
THIRD ST
POWELL ST
MAIN ST
COVINGTON LN
I-95 N
I-95 S
ELVA WALLACE RD
SISK CULBRETH RD
BOXPINE RD
DUNN RD
GORDON
WADE-STEDMAN RD
TWO RANCH LN
GOLDSBORO
EASC
BAR

0 0.5 1 2 3 4 5 Miles

Houses in District Service Areas
Existing Water Systems with PWC Service
ESD Phase 2 Water Lines
Existing Municipal Water Systems
Municipal Influence Areas
PWC Service Area
Fort Bragg
Linden Water & Sewer District
Eastover Sanitary District

Proposed Cumberland County Water District
East Central
Northeast
Southeast
Southwest

2"
4"
6"
8"
12"
16"

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #7 - Proposed East Central Water District

- Houses in District Service Areas
- Existing Water Systems with PWC Service
- ESD Phase 2 Water Lines
- Existing Municipal Water Systems
- Municipal Influence Areas
- PWC Service Area
- Fort Bragg
- Linden Water & Sewer District
- Eastover Sanitary District

Proposed Cumberland County Water District

- East Central
- Northeast
- Southeast
- Southwest

- 2"
- 4"
- 6"
- 8"
- 12"
- 16"

Eastover
Fayetteville
Stedman
Autryville
Sampson County

I-95 S BUS
I-95 BUS S
I-95 S
I-95 N
I-95
DUNN RD
MURPHY RD
ORVILLE ST
WILBUR ST
BUN BRADY RD
WADE-STEDMAN RD
MAXWELL RD
FARRIER LN
SANDY CREEK RD
DENNIS DR
PAGE RD
MCCALL DR
MINNIE VADA LN
AL RAY RD
RINGWOOD RD
JIMREE AVE
ROCK HILL RD
BUCKLAND DR
BLUEBERRY RD
SARA LN
RAFE AVE
JERRY DR
SANDEROSA RD
BENT GRASS DR
BOBBY JONES DR
FOUR WOOD DR
HUMMINGBIRD PL
KAREN ST
BAYWOOD RD
BRENNAN CIR
MCNEIL RD
WHITEHEAD RD
DOWNING RD
NC HWY 24
NC HWY 24 ACCESS
CLINTON RD
BLADEN CIR
MOBILS RD
SHELTON BEARD RD
MAGNOLIA CHURCH RD
JAKE RD
OBERSHEA LN
MARY MCCALE RD
THOR LN
JOHN NUNNERY RD
SUNNYSIDE SCHOOL RD
BAT CAVE DR
OLD VANDER RD
SIDS MILL RD
L A DUNHAM RD
NUFFIELD RD
HUDSON CHURCH RD
DECENT RD
SIMMONS CARTER RD
ROB RD
BLAVELL ST
BLAKE RD
FORTE RD
BAINBRIDGE RD
AURORA ST
FRED HALL RD
AZELIA DR
JAYCEE ST
CLETA DR
AUTRY RD
CAROL ST
TRIPP RD
MACEDONIA CHURCH RD
COOPER ST
GRANT AVE
A B CARTER RD
CLARK-WEST RD
EVANS DAIRY RD
CEDAR CREEK RD
FIELDS RD
SEABROOK SCHOOL RD
STANWORTH DR
CARL FREEMAN RD
LUMMIE RD
NC HWY 210 S
STEDMAN-CEDAR CREEK RD
ARMELIA DR
CASHWELL RD
BEAVER DAM RD
AVA RD
HOLLOW BRIDGE RD
RAY'S LANDING RD
POLLY ISLAND RD
DOE HILL RD
BOGIE ISLAND RD
JOHN HALL RD
CULBRETH RD
TURKEY DR
WILLIE LN
MYRTLE LN
OWLS HEAD RD
GAINEY RD
MCFAYDEN RD

0 0.5 1 2 3 4 5 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #8 - Proposed Southeast Water District

Houses in District Service Areas
Existing Water Systems with PWC Service
ESD Phase 2 Water Lines
Existing Municipal Water Systems
Municipal Influence Areas
PWC Service Area
Fort Bragg
Linden Water & Sewer District
Eastover Sanitary District

Proposed Cumberland County Water District
East Central
Northeast
Southeast
Southwest

2"
4"
6"
8"
12"
16"

Stedman
Autryville
Sampson County
Bladen County

CECIL ST
CLINTON RD
OLD VANDER RD
ROB RD
BLAWELL ST
BLAKE RD
NORTH ST
MARY MCCALL RD
JOHN NUNNERY RD
CLETADOR
AUTRY RD
AZELIA DR
KETTERING ST
SIDS MILL RD
MACEDONIA CHURCH RD
A B CARTER RD
EVANS DAIRY RD
CLARK-WEST RD
CARL FREEMAN RD
WHITE BOND DR
STANWORTH DR
JOHN HALL RD
CULBRETH RD
NC HWY 210 S
STEDMAN-CEDAR CREEK RD
BEAVER DAM RD
AVA RD
HOLLOWBRIDGE RD
OWEN HEAD RD
GAINEY RD
H CLARK RD
BUTLER NURSERY RD
NASH RD
RIVERLAND DR
CEDAR CREEK RD
MCKINNON RD
TURNBULL RD
DOE HILL RD
MEINLOCK LN
POLLY ISLAND RD
RUTH VINSON RD
SPENCER RD
NORRIS RD
SUNNY DALE DR
KANSAS CT
JOHNSON RD
HAIR RD
DUDLEY RD
TROY FISHER RD
GIP RD
INGRAM RD
BEAVER DAM CHURCH RD
BROADWATER BRIDGE RD
TABOR CHURCH RD
TOM BURNS RD
MELVIN RD
FAYLAND DR
LUDHORNE RD
MATT HAIR RD
AVERY RD
SHARON CHURCH RD
NC HWY 242
C S FAIRCLOTH RD

0 0.5 1 2 3 4 5 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Cumberland County Rural Water Feasibility
Map #9 - Proposed Northeast Water District

Houses in District Service Areas
Existing Water Systems with PWC Service
ESD Phase 2 Water Lines
Existing Municipal Water Systems
Municipal Influence Areas
PWC Service Area
Fort Bragg
Linden Water & Sewer District
Eastover Sanitary District

Proposed Cumberland County Water District
East Central
Northeast
Southeast
Southwest

2"
4"
6"
8"
12"
16"

Harnett County
Sampson County
Linden
Godwin
Falcon
Wade
Eastover

LINDEN RD
GREEN ST
DYNASTY LN
CLERVIE DR
PINE ST
LOOP RD
GILES RD
RUSTY RD
DURANT NIXON RD
VAULT FIELD RD
HAWKINS RD
COLLIERS CHAPEL CHURCH RD
FLYERS DR
MCBRYDE ST
LUCINDA LN
CARLOS RD
CANAL ST
LANE RD
SLOCOMB RD
HONEYBEE DR
CAROWIND DR
LAURA RAY RD
MORAY ST
BEND RD
RIVER RD
DAUGHTRY RD
SWAMP RD
POWELL ST
HOUSE ST
THIRD ST
MAIN ST
COVINGTON LN
I-95 S
ELVA WALLACE RD
MATTHEWS RD
RICH WALKER RD
JACKIE LEE RD
LOVICK RD
COLEMAN RD
I-295 N
I-295 S
CALLIE RD
DUNN RD
BUD GEDDIE RD
WITHORNTON RD
NORRIS RD
BURNETT RD
JULIAN RD
MCLELLAN RD
CANNERY DR
RHODES POND RD
MAIN ST
LEITHA LN
BEND OF RIVER RD
SISK CULBRETH RD
DUNN RD
BOXPINE RD
GORDON WILLIAMS RD
SHERRILL BAGGETT RD
N WEST ST
S WEST ST
ALLIEMAR LN
ALLIE COOPER RD
BLUMAN RD
KESH CT
STEWART RD
SMITHFIELD RD
WADE-STEDMAN RD
TWO RANCH LN
SCOTTIE GODWIN RD
HERB FARM RD
EASON RD
GOLDSBORO RD
BAREFOOT RD
KENNEL RD
COLLIER RD

0 0.5 1 2 3 4 5 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

Multiple Supply Point Interconnections with PWC

Elevated Storage Tank & Master Meter Located @ PWC Interconnection

LCFWASA 16" Supply Point @ NC-87 & Alderman Road

LCFWASA 16" Alternate Supply Point Location @ Southpoint

Storage Tank & Master Meter Located @ County Line Interconnection with LCFWASA

Proposed 16" Interconnect with LCFWASA
35,000' from WTP to County Line
50,000' from WTP to Southpoint
56,000' from WTP to Alderman Road

Future Bladen Bluffs WTP Construction by LCFWASA

Robeson County

Cumberland County

Bladen County

NC-87

NC-20

Cumberland County Rural Water Feasibility Map #10 - Southwest Water District Phase 1 Water Mains and Potential Supply Points

- Future Site of Bladen Bluffs WTP
- Bladen Bluffs 16" Interconnect
- Existing Water Systems with PWC Service
- Existing Municipal Water Systems
- Municipal Influence Areas
- PWC Service Area

Proposed Cumberland County Water District

- East Central
- Northeast
- Southeast
- Southwest

Southwest Phase 1 Water Mains

- 2"
- 4"
- 6"
- 8"
- 12"
- 16"

0 0.5 1 2 3 4 Miles

Koonce, Noble & Associates, Inc.

Marziano & McGougan, P.A.
consulting engineers

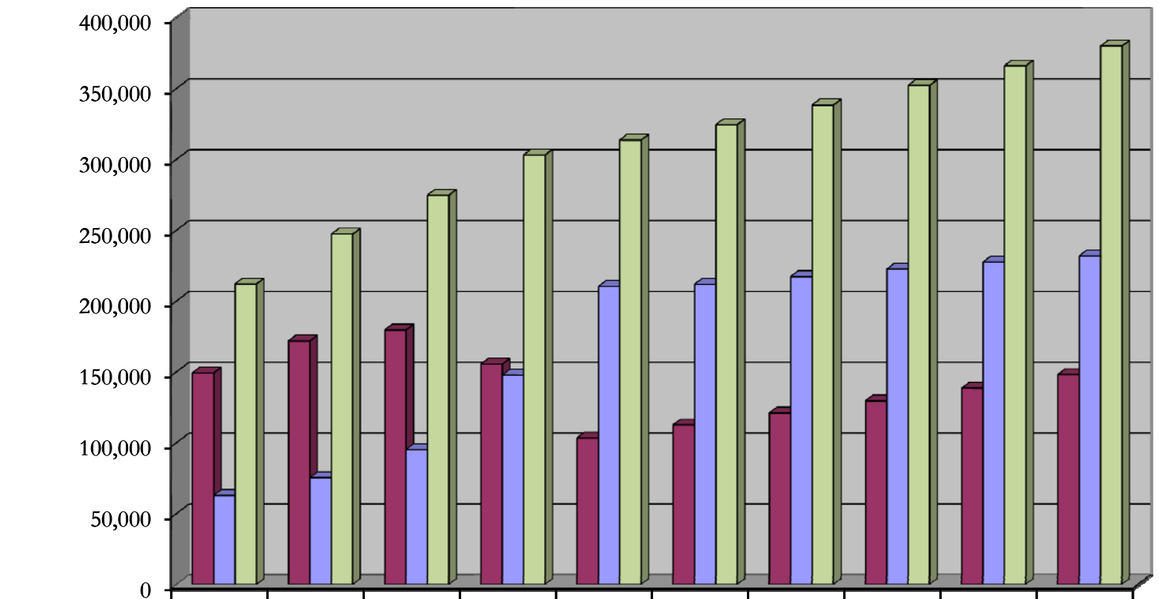
Appendix B

Water Demand & Population Projections

- Table B.1 - Population Projection Methodologies
- Table B.2 - Water Demand Projections
- Table B.3 – Potential Water Supplier Scenarios
- Table B.4 – Proposed Water District Summary

CUMBERLAND COUNTY PUBLIC UTILITIES - RURAL WATER SYSTEM FEASIBILITY
TABLE 1 - POPULATION PROJECTION METHODS

Whole County (Linear Growth Rate)				Municipal Estimates (NCOSPL Growth Rate)			Rural Cumberland County (Difference)		
Year	Total Population	Increase per Year	% Growth	Total Population	Increase per Year	% Growth	Total Population	Increase per Year	% Growth
1970	212,042	-	-	62,825	-	-	149,217	-	-
1980	247,160	35,118	16.56%	75,306	12,481	19.87%	171,854	22,637	15.17%
1990	274,713	27,553	11.15%	95,132	19,826	26.33%	179,581	7,727	4.50%
2000	303,060	28,347	10.32%	147,648	52,516	55.20%	155,412	-24,169	-13.46%
2007	313,616	10,556	3.48%	210,246	62,598	42.40%	103,370	-52,042	-33.49%
2009	324,464	10,848	3.46%	211,814	1,568	0.75%	112,650	9,280	8.98%
2014	338,328	13,864	4.27%	217,301	5,487	2.59%	121,027	8,377	7.44%
2019	352,192	13,864	4.10%	222,575	5,273	2.43%	129,618	8,591	7.10%
2024	366,056	13,864	3.94%	227,529	4,955	2.23%	138,527	8,909	6.87%
2029	379,920	13,864	3.79%	231,793	4,264	1.87%	148,127	9,600	6.93%
Total 20-Year Growth	-	55,456	17.09%	-	19,979	9.43%	-	35,477	31.49%



	1970	1980	1990	2000	2007	2009	2014	2019	2024	2029
Rural County	149,217	171,854	179,581	155,412	103,370	112,650	121,027	129,618	138,527	148,127
Municipal	62,825	75,306	95,132	147,648	210,246	211,814	217,301	222,575	227,529	231,793
Whole County	212,042	247,160	274,713	303,060	313,616	324,464	338,328	352,192	366,056	379,920

CUMBERLAND COUNTY PUBLIC UTILITIES - RURAL WATER SYSTEM FEASIBILITY
TABLE 2 - ESTIMATED WATER DEMANDS IN THE PROPOSED DISTRICTS
BASED ON EXISTING HOUSE COUNT ESTIMATES

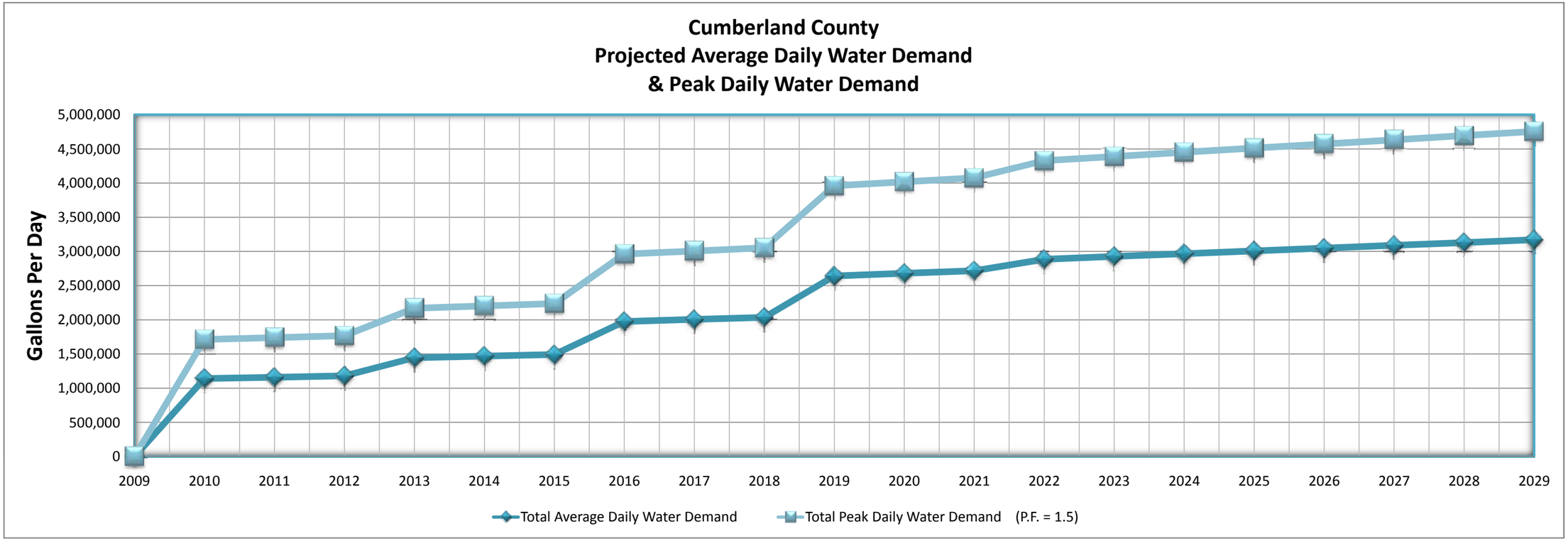
					Priority 1	Priority 2	Priority 3	Priority 4	Priority 5				
	Year	GPD per Customer	Potential Water Customer Base (Rural Cumberland County)	Potential Service Population (Rural Cumberland County)	South West District Water Demand (GPD)	Linden (North) District Water Demand (GPD)	East Central District Water Demand (GPD)	South East District Water Demand (GPD)	North East District Water Demand (GPD)	20% Commercial & Industrial Reserve (GPD)	Estimated Daily Unaccounted Water (GPD)	Total Average Daily Water Demand	Total Peak Daily Water Demand (P.F. = 1.5)
0	2009	175	0	0	0	0	0	0	0	0	0	0	0
1	2010	175	4,940	13,092	864,535	0	0	0	0	172,907	103,744	1,141,186	1,711,779
2	2011	175	5,022	13,309	878,865	0	0	0	0	175,773	105,464	1,160,102	1,740,153
3	2012	175	5,104	13,526	893,195	0	0	0	0	178,639	107,183	1,179,017	1,768,526
4	2013	175	6,258	16,583	907,525	187,555	0	0	0	219,016	131,410	1,445,506	2,168,259
5	2014	175	6,357	16,845	921,855	190,552	0	0	0	222,481	133,489	1,468,376	2,202,565
6	2015	175	6,456	17,107	936,185	193,548	0	0	0	225,947	135,568	1,491,247	2,236,871
7	2016	175	8,550	22,658	950,514	196,545	349,214	0	0	299,255	179,553	1,975,080	2,962,621
8	2017	175	8,680	23,002	964,844	199,541	354,625	0	0	303,802	182,281	2,005,093	3,007,640
9	2018	175	8,810	23,346	979,174	202,537	360,035	0	0	308,349	185,010	2,035,106	3,052,659
10	2019	175	11,430	30,290	993,504	205,534	365,446	435,785	0	400,054	240,032	2,640,356	3,960,533
11	2020	175	11,598	30,734	1,007,834	208,530	370,857	442,397	0	405,924	243,554	2,679,095	4,018,643
12	2021	175	11,766	31,179	1,022,164	211,526	376,268	449,008	0	411,793	247,076	2,717,835	4,076,753
13	2022	175	12,493	33,107	1,036,494	214,523	381,678	455,620	97,979	437,259	262,355	2,885,907	4,328,861
14	2023	175	12,669	33,574	1,050,824	217,519	387,089	462,231	99,462	443,425	266,055	2,926,605	4,389,907
15	2024	175	12,845	34,040	1,065,154	220,516	392,500	468,842	100,945	449,591	269,755	2,967,302	4,450,953
16	2025	175	13,022	34,507	1,079,484	223,512	397,910	475,454	102,428	455,758	273,455	3,008,000	4,511,999
17	2026	175	13,198	34,974	1,093,814	226,508	403,321	482,065	103,911	461,924	277,154	3,048,697	4,573,046
18	2027	175	13,374	35,441	1,108,143	229,505	408,732	488,676	105,394	468,090	280,854	3,089,394	4,634,092
19	2028	175	13,550	35,908	1,122,473	232,501	414,142	495,288	106,877	474,256	284,554	3,130,092	4,695,138
20	2029	175	13,726	36,375	1,136,803	235,497	419,553	501,899	108,360	480,423	288,254	3,170,789	4,756,184

CUMBERLAND COUNTY PUBLIC UTILITIES - RURAL WATER SYSTEM FEASIBILITY
TABLE 3 - POTENTIAL WATER SUPPLIER SCENARIOS

			Priority 1	Priority 2	Priority 3	Priority 4	Priority 5				
Potential Water Supplier	**Potential Water Customer Base (Rural Cumberland County)**	**Potential Service Population (Rural Cumberland County)**	**South West District Water Demand (GPD)**	**Linden (North) District Water Demand (GPD)**	**East Central District Water Demand (GPD)**	**South East District Water Demand (GPD)**	**North East District Water Demand (GPD)**	**20% Commercial & Industrial Reserve (GPD)**	**Estimated Daily Unaccounted Water (GPD)**	**Total Average Daily Water Demand**	**Total Peak Daily Water Demand (P.F. = 1.5)**
SURFACE WATER											
PWC	10,439	27,663	1,136,803	235,497	419,553	501,899	108,360	480,423	288,254	3,170,789	4,756,184
Lower Cape Fear WASA	8,945	23,703	1,136,803	-	419,553	501,899	-	411,651	246,991	2,716,897	4,075,346
City of Lumberton	8,378	22,202	1,136,803	-	-	501,899	-	327,740	196,644	2,163,087	3,244,631
Town of Hope Mills	4,940	13,092	1,136,803	-	-	-	-	227,361	136,416	1,500,580	2,250,870
Eastover Sanitary District	4,475	11,859	-	-	419,553	501,899	108,360	205,962	123,577	1,359,352	2,039,028
Harnett County	3,318	8,792	-	235,497	419,553	-	108,360	152,682	91,609	1,007,702	1,511,553
Town of Stedman	1,823	4,832	-	-	419,553	-	-	83,911	50,346	553,810	830,715
City of Dunn	1,494	3,960	-	235,497	-	-	108,360	68,772	41,263	453,892	680,838
Town of Spring Lake	1,023	2,712	-	235,497	-	-	-	47,099	28,260	310,857	466,285
Town of Falcon	471	1,248	-	-	-	-	108,360	21,672	13,003	143,035	214,553
Town of Godwin	471	1,248	-	-	-	-	108,360	21,672	13,003	143,035	214,553
GROUND WATER											
Robeson County	7,121	18,871	1,136,803	-	-	501,899	-	327,740	196,644	2,163,087	3,244,631
Bladen County	7,121	18,871	1,136,803	-	-	501,899	-	327,740	196,644	2,163,087	3,244,631
Hoke County	4,940	13,092	1,136,803	-	-	-	-	227,361	136,416	1,500,580	2,250,870
Sampson County	4,004	10,612	-	-	419,553	501,899	-	184,290	110,574	1,216,317	1,824,475
Town of Wade	471	1,248	-	-	-	-	108,360	21,672	13,003	143,035	214,553

TABLE 4 - PROPOSED WATER DISTRICT SUMMARY

District Name	**Gross Area Including MIA Areas (sq mi)**	**Net Area Excluding MIA Areas (sq mi)**	**Gross Area 911 House Count (Excluding Municipal Limits & Existing Water)**	**85% Hookup Rate**	**Miles of Proposed Water Pipeline**	**Cost per Mile (turn-key installation)**	**Total District Cost**	**Cost per Customer**	**Customer per Mile of NCDOT Road**	**Priority Rank**	**Recommended Surface Water Supplier**
South West	46.5	36.5	5,812	4,940	184	$ 150,864	$ 27,759,000	$ 5,619	27	**1**	PWC, Lumberton, LCFWASA
Linden (North)	44.3	39.9	1,204	1,023	63	$ 111,159	$ 7,003,000	$ 6,843	16	**2**	Harnett, Dunn, PWC
East Central	41.6	28.0	2,145	1,823	80	$ 121,663	$ 9,733,000	$ 5,338	23	**3**	PWC, ESD, Lumb., LCFWASA
South East	119.2	119.2	2,566	2,181	153	$ 131,059	$ 20,052,000	$ 9,194	14	**4**	PWC, ESD, Lumb., LCFWASA
North East	40.1	18.5	554	471	41	$ 126,390	$ 5,182,000	$ 11,004	11	**5**	Harnett, Dunn, PWC, ESD
TOTAL/AVG.	**292**	**242**	**12,281**	**10,439**	**521**	**$ 128,227**	**$ 69,729,000**	**$ 7,600**	**18**	**-**	**-**


Cumberland County
Projected Average Daily Water Demand
& Peak Daily Water Demand
Gallons Per Day
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
Total Average Daily Water Demand
Total Peak Daily Water Demand (P.F. = 1.5)

Appendix C

Construction Cost Estimates

- County-Wide Water System Cost Summary
- Monthly Water Bill Summary
- Estimated Annual O&M Costs and Average Monthly Water Bill - Alternative #1-3
- Water Supply Construction Cost Estimate - Alternative #1-3
- Southwest District – Water Distribution Construction Cost Estimate
  - Southwest Phase 1 (Initial Target Area)
  - Remaining Areas Inside District (Excludes Phase 1)
  - Areas Inside Hope Mills MIA
- Linden Water District – Water Distribution Construction Cost Estimate
- East Central Water District – Water Distribution Construction Cost Estimate
- Southeast Water District – Water Distribution Construction Cost Estimate
- Northeast Water District – Water Distribution Construction Cost Estimate

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

COUNTY-WIDE WATER SYSTEM COST SUMMARY

1.	Southwest Water District		**$27,759,000**
	a. Interconnection Fees/Upgrades	$3,400,000	
	b. Phase 1 (Southpoint area)	$6,432,000	
	c. Remaining Areas Inside District	$11,053,000	
	d. Areas Inside Hope Mills MIA	$6,874,000	
2.	Linden Water & Sewer District		**$7,003,000**
3.	East Central Water District		**$9,733,000**
4.	Southeast Water District		**$20,052,000**
5.	Northeast Water District		**$5,182,000**
	Total Project Costs for County-Wide Water Service		**$69,729,000**

MONTHLY WATER BILL SUMMARY

Preferred Alternative Based on Average Monthly Residential Water Bill = Alternative #3a

Purchase Contract with PWC for 5 mgd Capacity

1.	Alternative #1 - New 5 mgd Surface WTP	**$89.61**
2.	Alternative #2 - New Groundwater Wells with 5 mgd Capacity	**$90.92**
3.	Alternative #3a - Purchase Contract with PWC for 5 mgd Capacity	**$78.29**
4.	Alternative #3b - Purchase Contract with LCFWASA for 5 mgd Capacity	**$87.72**
	Minimum Monthly Rate = Preferred Alternative #3a	**$78.29**

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #1 - New 5 mgd Surface WTP

1.	Annual Debt Service Payment (A/P,i,n)			**$1,156,786**
	a. Initial Capital Costs			
	Surface WTP Construction	$16,464,000		
	SW Phase 1 Distribution System	$6,432,000		
		$22,896,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$0**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons	$0.00		
3.	Annual O&M Charges			**$456,250**
	a. Cost per 1,000 gallons	$1.25		

Total Annual Costs	**$1,613,036**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$89.61**

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #2 - New Groundwater Wells with 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$1,052,505**
	a. Initial Capital Costs			
	Groundwater Wells/Treatment System	$14,400,000		
	SW Phase 1 Distribution System	$6,432,000		
		$20,832,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$0**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons	$0.00		
3.	Annual O&M Charges			**$584,000**
	a. Cost per 1,000 gallons	$1.60		

Total Annual Costs	**$1,636,505**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$90.92**

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #3a - Purchase Contract with PWC for 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$496,747**
	a. Initial Capital Costs			
	Interconnection Fees/Upgrades	$3,400,000		
	SW Phase 1 Distribution System	$6,432,000		
		$9,832,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$730,000**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons (PWC)	$2.00		
3.	Annual O&M Charges			**$182,500**
	a. Cost per 1,000 gallons (PWC)	$0.50		

Total Annual Costs	**$1,409,247**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$78.29**

CUMBERLAND COUNTY PUBLIC UTILITIES

RURAL WATER FEASIBILITY STUDY

ESTIMATED ANNUAL O&M COSTS AND MONTHLY WATER BILLS

Alternative #3b - Purchase Contract with LCFWASA for 5 mgd Capacity

1.	Annual Debt Service Payment (A/P,i,n)			**$666,506**
	a. Initial Capital Costs			
	Interconnection Fees/Upgrades	$6,760,000		
	SW Phase 1 Distribution System	$6,432,000		
		$13,192,000		
	b. Annual Interest Rate	4.0%		
	c. Number of Years	40		
	d. Calculated A/P Factor	0.05052		
2.	Annual Bulk Water Charges			**$730,000**
	a. Average Daily Water Use	1.0	mgd	
	b. Total Annual Water Use	365.0	mgd	
	c. Cost per 1,000 gallons (LCFWASA)	$2.00		
3.	Annual O&M Charges			**$182,500**
	a. Cost per 1,000 gallons (LCFWASA)	$0.50		

Total Annual Costs	**$1,579,006**
Estimated Water Customers	**1,500**
Estimated Monthly Water Bill to Cover Expenses ($0 Reserve)	**$87.72**

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER SUPPLY CONSTRUCTION COST ESTIMATE

Alternative #1 - New 5 mgd Surface Water Capacity and Treatment (Conventional Filtration)

Part A - WTP Construction Costs

A	Project Description	Quantity	Unit	Extended Cost
1.	Bonds, Insurance, Mobilization, and Overhead	1	LS	$900,000
2.	Site Work	1	LS	$100,000
3.	Site Piping	1	LS	$400,000
4.	New 5 MGD Flash Mix	1	LS	$150,000
5.	New 5 MGD Flocculator	1	LS	$300,000
6.	New 5 MGD Lamella Plate Sedimentation Basin	1	LS	$750,000
7.	New 5 MGD Conventional Filters	1	LS	$1,800,000
8.	New 5 MGD GAC Contactor	1	LS	$750,000
9.	2 MG Clearwell	1	LS	$1,250,000
10.	Finished Water Pump Station	1	LS	$1,300,000
11.	Sludge Handling	1	LS	$800,000
12.	Bulk Chemical Storage	1	LS	$300,000
13.	Chemical Feed Systems	1	LS	$400,000
14.	Instrumentation and SCADA	1	LS	$500,000
15.	Electrical	1	LS	$800,000
SUB-TOTAL OF CONSTRUCTION COSTS (A)				$10,500,000

Part B - Raw Water Intake & Pump Station Construction Costs

B	Project Description	Quantity	Unit	Extended Cost
1.	Bonds, Insurance, Mobilization and Overhead	1	LS	$150,000
2.	Site Work	1	LS	$70,000
3.	Site Piping	1	LS	$100,000
4.	Intake Structure and Screens	1	LS	$300,000
5.	Cast-in-Place Wet Well	1	LS	$900,000
6.	Pumps and Equipment	1	LS	$600,000
7.	Electrical, Instrumentation	1	LS	$300,000
	SUB-TOTAL OF CONSTRUCTION COSTS (B)			$2,420,000

Part C - New Raw Water Impoundment

C	New Raw Water Impoundment	1	LS	$800,000
	SUB-TOTAL OF ENGINEERING COSTS (C)			$800,000

Part D - Engineering Design, Inspection & Other Costs

D	Design, Construction Admin./Observation, Contingency		$2,744,000
	SUB-TOTAL OF OTHER COSTS (D)		$2,744,000

TOTAL PROJECT COSTS = (A+B+C+D)	$16,464,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER SUPPLY CONSTRUCTION COST ESTIMATE

Alternative #2 - New 5 mgd Groundwater Well Capacity and Treatment

Part A - 1.0 mgd Well Field Construction Costs

	Project Description	Quantity	Unit	Extended Cost
1.	Bonds, Insurance, Mobilization, and Overhead	1	LS	$100,000
2.	Seven Groundwater Wells per Field	1	LS	$1,000,000
3.	Well House	1	LS	$150,000
4.	Treatment System	1	LS	$1,000,000
5.	Instrumentation, SCADA, and Electrical	1	LS	$150,000
	SUB-TOTAL OF CONSTRUCTION COSTS (1.0 mgd)			$2,400,000

A	Five (5) Well Fields (with treatment) to Reach 5.0 mgd Capacity	$12,000,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency		$2,400,000

TOTAL PROJECT COSTS = (A+B)	$14,400,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER SUPPLY CONSTRUCTION COST ESTIMATE

Alternative #3a - Purchase Contract for 5 mgd Water Supply from PWC

Part A - PWC Fees/Upgrades, Engineering Design, Inspection & Other Costs

1.	Estimated Capacity Fee	1	LS	1	$1,000,000
2.	Estimated Water System Upgrades @ Interconnection Point (Master Meter, SCADA, Elevated Storage Tank, Pump Station)	1	LS	1	$2,000,000
3.	Design, Construction Admin./Observation, Contingency	1	LS	1	$400,000
	TOTAL PROJECT COST =				**$3,400,000**

Alternative #3b - Purchase Contract for 5 mgd Water Supply from LCFWASA

Part A - PWC Fees/Upgrades, Engineering Design, Inspection & Other Costs

1.	Estimated Capacity Fee	1	LS	1	$1,000,000
2.	Estimated Water System Upgrades @ WTP Site and Interconnection Point (Master Meter, SCADA, Elevated Storage Tank, Pump Station)	1	LS	1	$2,000,000
1.	16" Ductile Iron Water Main	56,000	LF	$50	$2,800,000
3.	Design, Construction Admin./Observation, Contingency	1	LS	1	$960,000
	TOTAL PROJECT COST =				**$6,760,000**

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

Southwest Water District - Phase 1

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	11,000	LF	$50	$550,000
2.	12" PVC Water Main	42,000	LF	$35	$1,470,000
3.	8" PVC Water Main	38,000	LF	$25	$950,000
4.	6" PVC Water Main	77,000	LF	$20	$1,540,000
5.	4" PVC Water Main	50,000	LF	$12	$600,000
6.	2" PVC Water Main	25,000	LF	$10	$250,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$5,360,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$1,072,000

TOTAL PROJECT COSTS = (A+B)	$6,432,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

Southwest Water District - Remaining Areas Inside District (Excludes Phase 1)

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	20,500	LF	$50	$1,025,000
2.	12" PVC Water Main	29,000	LF	$35	$1,015,000
3.	8" PVC Water Main	85,000	LF	$25	$2,125,000
4.	6" PVC Water Main	190,000	LF	$20	$3,800,000
5.	4" PVC Water Main	83,000	LF	$12	$996,000
6.	2" PVC Water Main	25,000	LF	$10	$250,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$9,211,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$1,842,000

TOTAL PROJECT COSTS = (A+B)	**$11,053,000**

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

Southwest Water District - Areas Inside Hope Mills MIA

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	0	LF	$50	$0
2.	12" PVC Water Main	30,000	LF	$35	$1,050,000
3.	8" PVC Water Main	34,000	LF	$25	$850,000
4.	6" PVC Water Main	135,000	LF	$20	$2,700,000
5.	4" PVC Water Main	69,000	LF	$12	$828,000
6.	2" PVC Water Main	30,000	LF	$10	$300,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$5,728,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$1,146,000

TOTAL PROJECT COSTS = (A+B)	$6,874,000

TOTAL SOUTHWEST DISTRICT PROJECT COSTS =	$24,359,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

Linden Water & Sewer District

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	0	LF	$50	$0
2.	12" PVC Water Main	0	LF	$35	$0
3.	8" PVC Water Main	30,000	LF	$25	$750,000
4.	6" PVC Water Main	192,000	LF	$20	$3,840,000
5.	4" PVC Water Main	83,000	LF	$12	$996,000
6.	2" PVC Water Main	25,000	LF	$10	$250,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$5,836,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$1,167,000

TOTAL PROJECT COSTS = (A+B)	$7,003,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

East Central Water District

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	0	LF	$50	$0
2.	12" PVC Water Main	23,000	LF	$35	$805,000
3.	8" PVC Water Main	80,000	LF	$25	$2,000,000
4.	6" PVC Water Main	198,000	LF	$20	$3,960,000
5.	4" PVC Water Main	78,000	LF	$12	$936,000
6.	2" PVC Water Main	41,000	LF	$10	$410,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$8,111,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$1,622,000

TOTAL PROJECT COSTS = (A+B)	$9,733,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

Southeast Water District

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	0	LF	$50	$0
2.	12" PVC Water Main	30,000	LF	$35	$1,050,000
3.	8" PVC Water Main	200,000	LF	$25	$5,000,000
4.	6" PVC Water Main	475,000	LF	$20	$9,500,000
5.	4" PVC Water Main	75,000	LF	$12	$900,000
6.	2" PVC Water Main	26,000	LF	$10	$260,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$16,710,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$3,342,000

TOTAL PROJECT COSTS = (A+B)	$20,052,000

CUMBERLAND COUNTY PUBLIC UTILITIES
WATER DISTRIBUTION CONSTRUCTION COST ESTIMATE

Northeast Water District

Part A - Water Transmission, Distribution & Storage Facilities

A	Project Description	Quantity	Unit	Unit Cost	Extended Cost
1.	16" Ductile Iron Water Main	0	LF	$50	$0
2.	12" PVC Water Main	0	LF	$35	$0
3.	8" PVC Water Main	48,000	LF	$25	$1,200,000
4.	6" PVC Water Main	142,000	LF	$20	$2,840,000
5.	4" PVC Water Main	19,000	LF	$12	$228,000
6.	2" PVC Water Main	5,000	LF	$10	$50,000
	SUB-TOTAL OF CONSTRUCTION COSTS				$4,318,000

Part B - Engineering Design, Inspection & Other Costs

B	Design, Construction Admin./Observation, Contingency	1	LS	1	$864,000

TOTAL PROJECT COSTS = (A+B)	$5,182,000

Appendix D

Supporting Documents

- Current Bulk Water and User Rates from PWC
- Existing Bulk Water/O&M Contract Between Stedman and PWC
- Existing Bulk Water/O&M Contract Between Spring Lake and PWC
- Existing Bulk Water/O&M Contract Between Linden Water and Sewer District and Harnett County Public Utilities

630.05

LARGE WATER USER

(This schedule applies to rates 313,314,350,351)

AVAILABILITY - Available throughout the territory served by the Public Works Commission, in accordance with the Commission's established service regulations.

APPLICABILITY - Applicable, at the option of the customer, to water supplied where monthly water consumption exceeds 1,000 MGAL at least three times during a twelve month consecutive billing period, at a single point of delivery through a single meter.

CHARACTER OF SERVICE - The volume of water flow and residual pressure at the point of delivery shall be in accordance with the Commission's approved flow standards.

MONTHLY RATE - The monthly rate shall be the greater of the Usage Charge plus the Basic Facilities Charge.

Basic Facilities Charge

Meter Size	Inside Monthly Charge	Outside Monthly Charge
5/8 " and ¾"	$ 5.24	$ 6.81
1"	$ 7.96	$10.35
1 ½"	$14.19	$18.44
2"	$ 21.97	$28.56
3"	$40.25	$52.33
4"	$ 66.31	$86.21
6"	$130.89	$170.15
8"	$ 208.69	$271.29

Usage Charge

For all MGAL $1.84 per MGAL or $0.00184 per gallon

CONTRACT PERIOD - The contract period shall be continuous from the date of connection through the date of disconnection.

WATER SHORTAGE ORDINANCE-Should the Commission declare/proclaim a water shortage, this rate is subject to change by adding a Second block (all usage over 5 MGAL) and the usage charge will be 15% higher than the prevailing usage charge.

PAYMENTS - Bills are due when rendered and are payable within 15 days. If a bill is not so paid, PWC has the right to suspend service in accordance with the Service Regulations.

SCHEDULE WSLU (Rev. 6)
Adopted: March 11, 2009
Effective: May 1, 2009

630.06

RESIDENTIAL WATER SERVICE - INSIDE CITY

(This schedule applies to rates 300, 353, 397)

AVAILABILITY - Available throughout the territory served by the Public Works Commission, inside the limits of the City of Fayetteville, in accordance with the Commission's established service regulations.

APPLICABILITY - To water supplied for residential purposes at a single point of delivery through a single meter.

CHARACTER OF SERVICE - The volume of water flow and residual pressure at the point of delivery shall be in accordance with the Commission's approved flow standards.

MONTHLY RATE - The monthly rate shall be the Usage Charge plus the Basic Facilities Charge plus the Backflow Prevention Assembly Inspection Charge, where applicable.

Basic Facilities Charge

Meter Size	Monthly Charge
5/8 " and ¾"	$ 5.24
1"	$ 7.96
1 ½"	$14.19
2"	$21.97
3"	$40.25
4"	$66.31
6"	$130.89
8"	$208.69

Usage Charge

Block 1: First 2,000 gallons ***$2.10*** per MGAL or $0.00210 per gallon

Block 2: Next 3,000 gallons (usage 2,001 – 5,000 gallons) ***$2.52*** per MGAL or $0.00252 per gallon

Block 3: *Next 5,000 gallons* (usage 5,001 – 10,000 gallons) ***$3.47*** per MGAL or $0.00347 per gallon

Block 4: *Each additional gallon* ***$4.17*** per MGAL or $0.00417 per gallon

In instances where a split tap is done on the customer's side of the meter, there is a backflow prevention assembly inspection monthly charge of $0.90.

CONTRACT PERIOD - The contract period shall be continuous from the date of connection through the date of disconnection.

WATER SHORTAGE ORDINANCE-Should the Commission declare/proclaim a water shortage, this rate is subject to change by adding a 15% surcharge to Block 2 and 3.

PAYMENTS - Bills are due when rendered and are payable within 15 days. If a bill is not so paid, PWC has the right to suspend service in accordance with the Service Regulations.

SCHEDULE WSIC (Rev. 21)
Adopted: March 11, 2009
Effective: May 1, 2009

RESIDENTIAL WATER SERVICE - OUTSIDE CITY

(This schedule applies to rate 301, 354, 398)

AVAILABILITY - Available throughout the territory served by the Public Works Commission, outside the limits of the City of Fayetteville, in accordance with the Commission's established service regulations.

APPLICABILITY - To water supplied for residential purposes at a single point of delivery through a single meter.

CHARACTER OF SERVICE - The volume of water flow and residual pressure at the point of delivery shall be in accordance with the Commission's approved flow standards.

MONTHLY RATE - The monthly rate shall be the Usage Charge plus the Basic Facilities Charge plus the Backflow Prevention Assembly Inspection Charge, where applicable.

Basic Facilities Charge

Meter Size	Monthly Charge
5/8 " and ¾"	$ 6.81
1"	$ 10.35
1 ½"	$18.44
2"	$28.56
3"	$52.33
4"	$86.21
6"	$170.15
8"	$271.29

Usage Charge

Block 1: First 2,000 gallons ***$2.73*** / MGAL or $0.00273 / gallon

Block 2: Next 3,000 gallons (usage 2,001 – 5,000 gallons) ***$3.28*** / MGAL or $$0.00328 / gallon

Block 3: *Next 5,000 gallons* (usage 5,001 – 10,000 gallons) ***$4.51*** / MGAL or $0.00451 / gallon

Block 4: *Each additional gallon* ***$5.42*** / MGAL or $0.00542 / gallon

In instances where a split tap is done on the customer's side of the meter, there is a backflow prevention assembly inspection monthly charge of $0.90.

CONTRACT PERIOD - The contract period shall be continuous from the date of connection through the date of disconnection.

WATER SHORTAGE ORDINANCE-Should the Commission declare/proclaim a water shortage, this rate is subject to change by adding a 15% surcharge to Block 2 and 3.

PAYMENTS - Bills are due when rendered and are payable within 15 days. If a bill is not so paid, PWC has the right to suspend service in accordance with the Service Regulations.

SCHEDULE WSOC (Rev. 17)
Adopted: March 11, 2009
Effective: May 1, 2009

STATE OF NORTH CAROLINA
COUNTY OF CUMBERLAND

PWC/TOWN OF STEDMAN
WATER SERVICE AGREEMENT

THIS AGREEMENT made and entered into this 22nd day of May, 2001 by and between the City of Fayetteville, acting through its Public Works Commission of the City of Fayetteville, North Carolina (both hereinafter referred to as Commission) and the Town of Stedman, North Carolina (hereinafter referred to as Customer).

WITNESSETH

WHEREAS, Customer wishes to purchase all or part of its supply of water from Commission's water system as needed for the operation of Customer's rural water system located within Cumberland County, North Carolina; and

WHEREAS, Commission agrees to provide to Customer that amount of water as requested annually by Customer, all according to the following terms and conditions:

1. Minimum Monthly Requirement:

   The initial amount of water requested by Customer and agreed to be furnished by Commission is not less than one million thirty-five thousand (1,035,000) gallons per month and shall not exceed five million (5,000,000) gallons per month unless otherwise agreed by Commission.

2. Delivery of Water Requirement:

   A. Water supplied hereunder shall be at Commission's standard water system static water pressure in this area, approximately 50 p.s.i., and delivery shall not exceed a demand flow in gallons per minute (gpm) in excess of maximum flow for 8-inch fireline water meter. The maintenance by Commission of water services available to Customer in the above form and in the quantity applied for at the points of delivery designated below shall constitute delivery by Commission of water applied for, whether or not Customer makes any use thereof.

   B. The initial point of delivery for water service applied for hereunder will be at the metering point constructed at customer's expense along Clinton Road at a point to be agreed by both Customer and Commission.

3. Monthly Billing for Water Service

A. Commission's water meter(s) serving Customer will be read, as nearly as possible, at regular intervals. The period of time between meter readings shall not be less than twenty-seven (27) and not more than thirty-three (33) days.

B. If Commission is unable to read Customer's water meter(s) for any reason, the water use may be estimated by Commission on the basis of Customer's water use the preceding billing period for which readings were obtained. Bills rendered on the basis of such estimates shall be as valid as if made from actual meter readings, and appropriate adjustment of Customer's bill shall be made at first actual reading of the meter subsequent to estimate.

C. The term "month" or "monthly" refers to the interval(s) transpiring between the previous meter reading date and the current meter reading date, and bills shall be rendered accordingly.

D. Monthly bills shall be rendered to Customer by Commission as computed by multiplying the water use by Customer, expressed in thousand (M) gallons, by the rate per thousand (M) gallons. The rate per thousand (M) gallons shall be subject to change annually as set forth in Paragraph 4 below.

E. The monthly billing for water use shall be based on actual use by Customer, but in no event shall billing be for less than the Contract Quantity stated in Paragraph 1.

F. The billing rate for water use ($ per M Gallons [dollars per thousand gallons]) shall be the Commission's cost per thousand gallons of water delivered to wholesale customers. The Commission's cost per thousand of gallons of water shall be determined as a part of the Commission's water and sanitary sewer cost of service study which is described in Paragraph 4.

G. The billing rate shall take effect on the first day of January of each year of the contract and shall remain constant for the rest of the calendar year.

4. Cost of Service Study:

A. Commission will annually perform an allocated cost of service study to determine the costs which are applicable to serving the Commission's various classes of water and sanitary sewer service. Among those classes of service will be wholesale water, a class which includes Customer.

B. Commission will use an audited balance sheet, income statement, and other financial information from its most recently completed fiscal year (the "test" fiscal year) as the basis for the cost of service study. However, Commission may, at its option, adjust audited financial data for changes to such financial data known or expected to occur during the year in which the billing rate will be in effect.

C. Commission will endeavor to follow generally accepted cost of service and rate making principles as prescribed by such organizations as the American Water Works Association (AWWA). All costs including operating and maintenance, depreciation, interest, and general administrative costs will be subject to allocation to the Customer's class of service. In addition, the billing rate shall be set such that the Commission would earn a return on the sum of its net investments, as described in Paragraph 4, subparagraph E.

D. Commission's return on the sum of its net investments (or return on rate base) shall be determined by multiplying the total rate base assigned to Customer's class of service by a rate of return determined as Commission's weighted average bond coupon rate, in percent, on all of its outstanding revenue bond issues plus two and twenty-five hundredths percent (2.25%).

E. The total cost of service for Customer's class of service shall be computed by adding all applicable allocated expenses to the applicable allocated return on rate base as described in Paragraph 4, subparagraph D.

F. The billing rate shall be computed by dividing the total cost of service, described in Paragraph 4, subparagraph E, by the total M gallons delivered to Customer's class of service during the test fiscal year.

5. Future Main Extensions:

Customer will participate in the future extension of Commission's water transmission system to points of interconnection with Customer's rural system where such extension requests are initiated by Customer. The location of such interconnecting points are to be agreed upon by Commission and Customer. Such participation may include payment to Commission in advance for constructing and connecting mains in addition to those now planned for Cumberland County or for the cost of oversizing planned mains to meet the additional requirements as may be imposed by Customer's forecasted daily water needs.

Customer may also participate in main extensions as proposed by Commission where such extensions are beneficial in meeting Customer's existing or future system needs. Participation in Commission initiated projects is optional by Customer and will be considered on a case-by-case basis. However, not participating in future projects that would benefit Customer may limit Commission's ability to provide Customer's long term future water system needs.

6. Groundwater Pumping Stations:

In order to maximize the infrastructure being installed for the purpose of serving Customer, Customer does agree not to construct (unless otherwise approved by Commission) additional groundwater pumping stations to serve requirements within the area being defined as Customer's Service District.

7. Cross Connection Control Ordinance:

Customer will adopt and maintain a Cross Connection Control Ordinance similar to that in effect within Commission's service area. Customer shall enact or update the Cross Connection Ordinance not later than six (6) months from execution of this Agreement. Such Ordinance may not be less restrictive or wider in scope as the Cross Connection Ordinance of the City of Fayetteville in effect at the time this Contract shall be executed. Any additional restrictions implemented and subsequent revisions of the City of Fayetteville's Cross Connection Control Ordinance must be adopted into Customer's Cross Connection Control Ordinance not later than six (6) months following execution of the revision or sooner if required by governmental agencies having jurisdiction over such matters. Any revisions made to Customer's Cross Connection Control Ordinance must have prior review and approval from Commission. Whenever Customer amends or adopts its Cross Connection Control Ordinance, it will immediately notify Commission which, for the purpose of this Agreement, will be within five (5) business days following enactment thereof.

8. Facility Investment Fees:

Customer is responsible for payment of a one-time Facility Investment Fee based on the appropriate meter size for each interconnection point. As in the case of the metering point to be installed along Clinton Road, the current FIF for an 8" meter will result in a one-time fee of $93,180. Such fee shall be paid prior to meter being set unless financing

arrangements acceptable to Customer and Commission are reached prior to execution of this agreement by Commission. Commission may also consider upon request an agreement whereby Customer collects and reimburses Commission facility investment fees based on the approximate meter size for individual customers.

9. Continuance of Service and Liability:

A. Commission does not guarantee continuous water service at standard pressure but shall use reasonable diligence to provide such service, and having used reasonable diligence to provide such service, shall not be liable to Customer for damage(s), for failure in, interruptions to, or suspension of water service. Commission reserves the right to suspend water service, without liability on its part, at such times and for such periods and in such manner as it may deem advisable for the purpose of making adjustments to, changes in, or repairs on its water mains, plants, and facilities. Commission does guarantee that Customer will be given the same priority for water service as all other wholesale customers of Commission.

B. Customer assumes responsibility for and shall indemnify, defend, and save Commission harmless against all liability, claims, judgments, losses, costs and expense for injury, loss, or damage to persons or property, including fines by any Federal or State agency, and also including personal injury or property damage to the Town of Stedman, its employees, water customers, and citizens on account of operation of Customer's water system, including any defective construction or equipment of Customer's water system, on the Customer's side of the point of delivery of water service (metering point). Commission assumes responsibility for and shall indemnify, defend, and save Customer harmless against all liability, claims, judgments, losses, costs and expenses for injury, loss, or damage to persons or property including fines by federal or state agency and also including personal injury or property damage to water customers and citizens caused by the negligent or willful misconduct by Commission or its employees on Commission's side of the point of delivery of water service (metering point).

10. Annual Notification of Anticipated Usage and Restrictions:

A. Customer shall advise Commission of its anticipated growth annually in number of connections to its water system, population served, and anticipated volume of

water usage. Customer will do so each year on the anniversary date of this agreement. Commission reserves the right and authority to limit the annual increase in usage by Customer to an amount not greater than one hundred twenty percent (120%) of the previous calendar year's usage. However, additional limits may be imposed if an outside agency having jurisdiction over the treatment of facilities requires restriction on increases in usage on the Commission's system.

B. Any limitations or restrictions on water usage due to situations beyond Commission's control will also apply to Customer. Customer will be responsible to ensure that individual water consumers on its systems comply with these restrictions or limitations.

11. Suspension or Termination of Water Service:

A. Commission, in addition to all other legal remedies, may either terminate this Agreement or suspend delivery of water to Customer for:

1) any default or breach of Agreement by Customer;
2) Fraudulent or unauthorized use of water or use of water in such manner as to circumvent Commission's water meter(s) service by Customer.
3) Failure to pay monthly water bills when due and payable. No such termination or suspension, however, will be made by Commission without thirty (30) days written notice delivered to Customer personally or by mail, except that no such notice need be given in the instances set forth in Item 2 above.

B. Any suspension of delivery of water by Commission or termination of this Agreement upon any authorized grounds shall in no way relieve Customer of (a) its liability for the payment for water service to the date of suspension or termination of this Agreement, nor (b) its liability for any actual damages sustained by Commission.

12. Payment:

Monthly bills rendered for the water service supplied hereunder are payable within ten (10) days from date thereof at Commission's office at 955 Old Wilmington Road, Fayetteville, North Carolina, 28301, or its successors. A late payment charge of one percent (1%) per month from final payment date shall be applicable to all bills rendered to Commission pursuant to this Agreement.

13. Term of Agreement:

The term of this Agreement may be amended only by written agreement by Commission and Customer. The term of this Agreement is for ten (10) years from May 23, 2001 until May 23, 2010, and at the end of each calendar year thereafter shall automatically extend for an additional period of one (1) year each, unless terminated pursuant to the terms of Paragraph 10, or by said parties giving not less than one (1) year's written notice to the other party, including the initial term, or by mutual consent of both parties.

Binding Effect:

This contract shall be binding upon and inure to the benefit of the parties hereto, their heirs, successors and assigns.

Entire Agreement:

This contract contains the entire agreement of the parties and there are no representations, inducements, or other provisions other than those expressed in writing.

City Joinder:

The City of Fayetteville joins in execution of this contract for the purpose of evidencing the authority of PWC to negotiate for it and to ratify this contract.

Governing Law:

This contract shall be governed by the laws of the State of North Carolina.

IN WITNESS WHEREOF, the parties hereto, through their duly authorized officers, have executed this contract as to the date and year first above written.

TOWN OF STEDMAN

By: Billy D. Horne

ATTEST:

Connie F. Spell

PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE

By: Robert W. Saunders
Chairman

ATTEST:

Secretary

CITY OF FAYETTEVILLE

By: Mitch McFadyen

ATTEST:

Janet C. Jones

APPROVED, as to form this 16TH day of May, 2001.

R. M. Lewis, Jr.
Richard M. Lewis, Jr.
Public Works Commission Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

5/24/01
J. Dwight Miller, Chief Financial Officer
Public Works Commission

FIRST AMENDMENT
TO TOWN OF STEDMAN
WATER SERVICE AGREEMENT

This FIRST AMENDMENT to the Water Service Agreement ("First Amendment") is made and entered into this 24th day of March, 2003, by and between the City of Fayetteville, a North Carolina municipal corporation, acting by and through its Public Works Commission, a Commission of the City of Fayetteville, (hereinafter referred to as COMMISSION) and the Town of Stedman, North Carolina (hereinafter referred to as CUSTOMER).

WITNESSETH

WHEREAS, COMMISSION and CUSTOMER entered into a Water Service Agreement dated May 23, 2001; and

WHEREAS, COMMISSION is participating in a water main extension project initially designed primarily for the Town of Stedman as approved by COMMISSION on September 13, 2000; and

WHEREAS, COMMISSION is now working with the County of Cumberland on a regional approach to providing water service to rural areas of Cumberland County; and

WHEREAS, as part of the regional approach, modifications in the original design for the booster station and water system extension project for the Town of Stedman is being modified to accommodate the more regional approach as approved by COMMISSION on October 23, 2002; and

WHEREAS, COMMISSION and CUSTOMER feel it will be beneficial for both parties and potential future water customers to clarify various issues, particularly as they relate to ownership and operation of the proposed water system improvements; and

WHEREAS, said official agencies are authorized to enter into interlocal agreements.

NOW THEREFORE, in consideration of the mutual promises contained in this First Amendment pursuant to NCGS 160A-460 et, the parties agree to amend the Agreement as follows:

1. The original water system improvement project has an estimated cost of $1,090,000, of which CUSTOMER's portion is $652,300. The revised regional approach will increase the total project cost to $1,350,100. CUSTOMER's financial contribution towards the revised regional approach will not increase from $652,300 with COMMISSION being responsible for the balance of the project cost as approved in its meeting of October 23, 2002.

2. CUSTOMER shall, upon completion of the water system improvement project, retain physical ownership of the master meter facility as shown on the attached map labeled Exhibit "A" and the approximate 16,000 linear feet of 12" water main that extends from the CUSTOMER master meter facility to the existing

CUSTOMER water main located on NC Highway 24 near its intersection with SR 1843. CUSTOMER shall also be responsible for securing easements, encroachments, and/or real property as may be required to construct the CUSTOMER master meter facility and that portion of the 12" water main that extends from the CUSTOMER master meter facility to CUSTOMER's existing main.

3. COMMISSION shall, upon completion of the water system project, retain physical ownership of the water booster pumping station and the approximate 3,000 feet of 12" water main that extends from the current terminus of an existing COMMISSION main in an eastwardly direction along NC Highway 24 to CUSTOMER's master meter facility. The location of such water system improvements being as shown approximately on the attached map labeled Exhibit "A". COMMISSION will be responsible for securing easements, encroachments, and/or real property as may be associated with construction of the water booster station and that portion of the proposed water main that is to extend from COMMISSION's existing main to CUSTOMER's master meter facility.

4. The water system improvements to be installed will be in accordance with plans and specifications as approved by COMMISSION and CUSTOMER.

5. Except as expressly stated and agreed in this First Amendment, all other terms and conditions as set forth in the original Agreement shall remain in full force and effect.

IN WITNESS WHEREOF, COMMISSION and CUSTOMER have executed this First Amendment as of the date first above written.

TOWN OF STEDMAN, NORTH CAROLINA

By: Billy D. Hawes
Mayor

ATTEST:

Connie Spell
Town Clerk

PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE

By: Vance B. Neal
Vance B. Neal, Chairman

ATTEST:

Robert W. Saunders
Robert W. Saunders, Secretary

CITY OF FAYETTEVILLE

By:
Marshall B. Pitts, Jr., Mayor

ATTEST:

Janet C. Jones
Janet C. Jones, City Clerk

APPROVED, as to form this 19TH day of FEB., 2003.

R. M. Lewis, Jr.
Richard M. Lewis, Jr.
Public Works Commission Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act

J. Dwight Miller 2/13/03
J. Dwight Miller, Chief Financial Officer
Public Works Commission

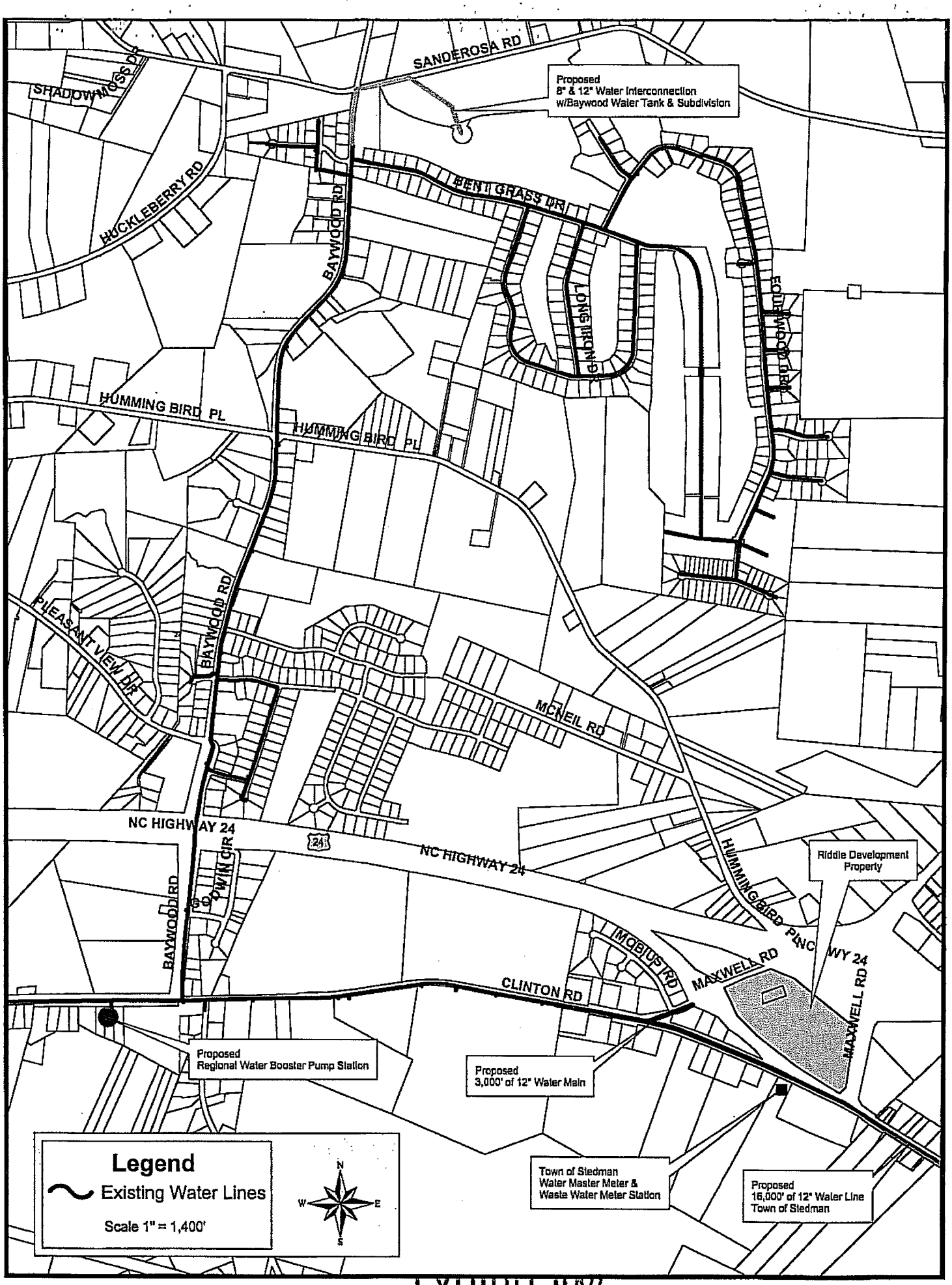

SANDEROSA RD
SHADOWMOSS D
HUCKLEBERRY RD
BAYWOOD RD
BENT GRASS DR
LONG RANGE
FOUNTWOOD DR
HUMMING BIRD PL
HUMMING BIRD PL
PLEASANT VIEW DR
BAYWOOD RD
MCNEIL RD
NC HIGHWAY 24
24
NC HIGHWAY 24
BAYWOOD RD
PWN CIR
HUMMINGBIRD PLNC
WY 24
MOBIUS RD
MAXWELL RD
CLINTON RD
MAXWELL RD
Proposed
8" & 12" Water Interconnection
w/Baywood Water Tank & Subdivision
Riddle Development
Property
Proposed
Regional Water Booster Pump Station
Proposed
3,000' of 12" Water Main
Town of Stedman
Water Master Meter &
Waste Water Meter Station
Proposed
16,000' of 12" Water Line
Town of Stedman
Legend
Existing Water Lines
Scale 1" = 1,400'
N
W
E
S

EXHIBIT "A"

NORTH CAROLINA
CUMBERLAND COUNTY

PUBLIC WORKS COMMISSION WATER UTILITY
OPERATION AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made this 23rd day of May, 2001 by and between the Town of Stedman (hereinafter referred to as "Customer"); and Public Works Commission of the City of Fayetteville, North Carolina (hereinafter referred to as "Commission").

WITNESSETH THAT

WHEREAS, Customer has contracted with Commission to furnish water service to Customer as per an agreement dated May 23, 2001; and

WHEREAS, both Commission and Customer recognize the complexity of providing water utility service; and

WHEREAS, Customer requests Commission operate and maintain Customer's proposed water distribution system; and

WHEREAS, Commission is in agreement to operate and maintain said water distribution system.

NOW THEREFORE, and in consideration of the benefits each shall derive, it is mutually agreed as follows:

I. SERVICES PROVIDED BY COMMISSION:

A. Basic Operation and System Maintenance to include:

(1) Repair damaged, deteriorated, or broken water mains, not to include outright system replacement of large segments of the water distribution system which cannot be repaired due to structural failure, natural or manmade disasters, or were not installed with approved plans and specifications;

(2) Repair damaged, deteriorated, or broken water service laterals from the main to edge of road right-of-way or easement;

(3) Routine maintenance and repair of booster pump station equipment, if any, not to include replacement of major components;

(4) Other routine maintenance and repairs as needed;

(5) Administrative and engineering support of above, as required;

(6) 24 hours, 7 days per week on call dispatch with appropriate response forces;

(7) Respond to inquiries by existing and potential users of water service to include flushing mains as required to maintain water quality;

(8) Investigate and work to resolve complaint issues;

(9) Keep Customer abreast of upcoming or changes in regulations concerning water utility services;

(10) Responsible for metered electric service at water booster station as well as chemicals associated with maintaining water quality and routine sampling requirements. The cost of metered electric service shall be a recoverable expense to be included in the itemized statement as set forth in Paragraph II-A.

II. BASIC MONTHLY OPERATION AND MAINTENANCE COST - A minimum monthly billing of $1,000 is established for having access to Engineering, Inspection, Special Projects, as well as Administrative and Construction forces necessary to operate and maintain the water utility system. An itemized statement will be submitted on a monthly basis for the actual cost associated with duties performed by PWC at the appropriate regular hourly or overtime rate for labor, equipment, and materials to include an amount for all direct and indirect charges plus profit at 10%. Actual billing will be adjusted to reflect the total sum of such cost that exceeds the minimum monthly billing of $1,000.

III. OTHER SERVICES – Available upon request but are not included in I-A. An itemized statement will be submitted on a monthly basis for the actual cost associated with other services performed by PWC at the appropriate regular hourly or overtime rate for labor, equipment, and materials to include an amount for all direct and indirect charges plus profit at 10%. A partial list of the other services that may be available to Customer include the following:

(1) Plan review by Commission engineering staff of Customer's plans and/or plans submitted to Customer by others if so requested by Customer to ensure utility extensions are designed to meet PWC specifications and are compatible with Customer's goals and objectives for meeting overall system needs;

(2) Promote participation agreements with other benefited parties;

(3) Preparation and administration of utility extension contracts;

(4) Right-of-way acquisition services for land and easement requirements to be secured in the name of Customer within the limits permitted by law but not to include actions in eminent domain;

(5) Rate Analysis;

(6) Inspection services during construction;

(7) Meter reading and billing;

(8) Implementation and/or administration of Cross Connection Control Ordinance;

(9) Miscellaneous services such as GIS mapping as requested;

(10) Water meter replacement and related metering services;

(11) Elevated water storage tank maintenance.

IV. REPAIRS -Commission shall not be responsible for any repairs or cost of repairs needed to the water distribution system unless such repairs are due to negligence of Commission or its employees. However, Commission will repair or arrange for all repair services and will submit invoices to Customer. Commission will receive prior approval from Customer if the anticipated cost of such repairs exceeds $500 unless delay in making repairs will cause an emergency creating or prolonging discontinuance of water utility services, create unsafe conditions for customers, Commission's employees or other persons, or create environmental hazards. For repairs performed by Commission employees, Commission shall be paid at the appropriate regular hourly or overtime rate for labor, equipment, and materials to include an amount for all direct and indirect charges plus profit at 10%.

V. PAYMENT OF VENDORS AND COMMISSION INVOICING - Commission shall provide Customer an itemized statement of all bills paid by Commission to vendors on a monthly basis along with an invoice for that amount. In addition, Commission shall provide to Customer monthly an invoice for all Commission's labor associated with maintenance and repair including materials and supplies. Bills and invoices shall be in such form that Customer will be able to evaluate the charges.

VI. PAYMENT - Monthly bills rendered for services as provided hereunder are payable within 10 days from the date thereof at Commission's office located at the Robert C. Williams Business Center at 201 Hay Street, (28301) P.O. Box 7000, Fayetteville, NC 28302. A late charge of one percent per month from final payment date shall apply to all bills rendered to Commission pursuant to this Agreement.

VII. TERMS OF AGREEMENT - Customer and Commission mutually agree that the term of this Agreement will be for ten years from the date of Commission signing and for annual terms thereafter until terminated by either party by giving to the other written notice of its intention to so terminate at least three months prior to the end of such annual term.

VIII. TERMINATION OF AGREEMENT - If Customer or Commission fails to fulfill in a timely and proper manner the obligations under this Agreement, either party shall have the right to terminate this Agreement by specifying the reasons for termination and the date of

termination in written notice to the other party at least 60 days prior to the date of termination.

IX. AMENDMENTS -This Agreement shall not be modified, amended, or changed in any respect except in writing, duly singed by the parties hereto, and each party hereby waives any right to amend the Agreement in any other way,

X. ASSIGNMENT - This Agreement shall be binding upon and shall inure to the benefit of Customer and its successors and assigns. Commission may only assign this agreement with the written consent of Customer.

XI. LIABILITY - Commission shall not be liable for injury or damage to Customer or persons or property, unless such injury or damage was caused by the negligence or willful misconduct by Commission or its employees. Commission shall not be responsible for any injuries or damages resulting from acts, omissions, or occurrences which occurred prior to the date Commission began operations pursuant to this Agreement. Customer shall indemnify, defend, and save Commission harmless against all liability, claims, judgments, losses, costs and expenses for injury, loss, or damage to persons or property, including fines by any federal or state agency, and also including personal injury or property damage to the Customer, its employees, water customers, and citizens on account of operation and maintenance of Customer's water system, including any defective construction (other than by Commission or its agents) or equipment of Customer's water system, on the Customer's side of the point of delivery from Commission's facilities or on its water customers' side of the service lateral. Commission assumes responsibility for and shall indemnify, defend, and save Customer harmless against all liability, claims, judgments, losses, costs and expenses for injury loss, or damage to persons or property, including fines by any federal or state agency, and also including personal injury or property damage to water customers and citizens on account of operation of Customer's water system on the Customer's side of the point of delivery of water service (metering point) due to the fault of Commission.

XII. ENTIRE AGREEMENT - This writing embodies the entire Agreement and understanding between the parties hereto and there are no other agreements or understandings, oral or written, with reference to the subject matter hereof that are not merged herein and superseded hereby.

IN TESTIMONY WHEREOF, Customer has executed this instrument by its Mayor and Commission has executed this instrument by its Chairman, each being duly authorized to execute this Agreement.

TOWN OF STEDMAN

Billy D. Horne
Mayor

ATTEST:

Connie F Spell
Town Clerk

PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE, NC

Robert W Saunders
Chairman

ATTEST:

Secretary

APPROVED as to form this 16TH day of May, 2001

R. M. Lewis Jr.
Richard M. Lewis, Jr.
Public Works Commission Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

5/24/01
Signature of finance officer

NORTH CAROLINA – CUMBERLAND COUNTY

I, Cheryl E. Crabb, a Notary Public of said County and State do hereby certify that Connie Spell personally appeared before me this day and acknowledged that he/she is the Town Clerk of the Town of Stedman, North Carolina, and that the authority duly given and as the act of said, the foregoing instrument was signed in its name by its Mayor, sealed with its corporate seal, and attested by himself/herself as its Town Clerk.

WITNESS my hand and Notarial Seal, this the 11TH day of MAY, 2001.

My Commission Expires: 6-19-2002 Cheryl E. Crabb
Notary Public

NORTH CAROLINA - CUMBERLAND COUNTY

I, _____, a Notary Public of said County and State do hereby certify that _____, personally appeared before me this day and acknowledged that he is Secretary of The Public Works Commission, an agency of the City of Fayetteville, North Carolina, and that the authority duly given and as the act of the agency, the foregoing instrument was signed in its name by its Chairman, sealed with its seal, and attested by himself as its Secretary.

WITNESS my hand and Notarial Seal, this the _____ day of _____, 2001.

My Commission Expires: _____
Notary Public

FIRST AMENDMENT
TO TOWN OF STEDMAN WATER UTILITY
OPERATION AND MAINTENANCE AGREEMENT

This FIRST AMENDMENT to the Water Utility Operation and Maintenance Agreement ("First Amendment") is made and entered into this 24th day of October, 2005, by and between the Town of Stedman (hereinafter referred to as CUSTOMER) and Public Works Commission of the City of Fayetteville, North Carolina (hereinafter referred to as COMMISSION).

WITNESSETH

WHEREAS, COMMISSION and CUSTOMER entered into an agreement dated May 23, 2001 for the operation and maintenance of the water system to serve the Town of Stedman; and

WHEREAS, Item (3) of Article I., "Services Provided by Commission", Section A., "Basic Operation and System Maintenance", of the Operation and Maintenance Agreement requires the COMMISSION to perform, "Routine maintenance and repair of booster pump station equipment, if any, not to include replacement of major components", hereinafter referred to as "Section (3)"; and

WHEREAS, after the Operation and Maintenance Agreement was executed, it was determined to upsize to a regional booster station to serve other areas as well and, therefore, COMMISSION will not be billing CUSTOMER for basic operation and maintenance of the booster station.

NOW THEREFORE, in consideration of the mutual promises contained in this First Amendment, the parties agree to delete the aforementioned "Section (3)" of the Operation and Maintenance Agreement in its entirety.

Except as expressly stated and agreed in this First Amendment, all other terms and conditions as set forth in the original Agreement shall remain in full force and effect.

IN WITNESS WHEREOF, COMMISSION and CUSTOMER have executed this First Amendment as of the date first above written.

TOWN OF STEDMAN

Billy D. Horne, Mayor

ATTEST:

Connie Spell, Town Administrator

APPROVED, as to form this 6 day of October, 2005.

John Jackson
Town of Stedman Attorney

PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE

Terri Union, Chairman

ATTEST:

Michael G. Lallier, Secretary

APPROVED, as to form this 14th day of Oct., 2005.

Richard M. Lewis, Jr.
Public Works Commission Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act

J. Dwight Miller, Chief Financial Officer
Public Works Commission

STATE OF NORTH CAROLINA
COUNTY OF CUMBERLAND

WATER SERVICE AGREEMENT

THIS AGREEMENT made and entered into this 8th day of December, 2008 by and between the City of Fayetteville acting by and through its Public Works Commission of the City of Fayetteville (hereinafter referred to as "COMMISSION") and the Town of Spring Lake (hereinafter referred to as "CUSTOMER").

W I T N E S S E T H

THAT WHEREAS, CUSTOMER wishes to contract with COMMISSION to supply water from the COMMISSION as needed for the operation of the CUSTOMER'S municipal water system located in and adjacent to the Town of Spring Lake; and

WHEREAS, COMMISSION has agreed to provide water to CUSTOMER, and CUSTOMER has agreed to purchase not less than thirteen million (13,000,000) gallons per month.

NOW, THEREFORE, in consideration of the mutual benefits each of the parties shall derive from this service agreement, they agree as follows:

1. This Water Service Agreement supersedes the Application for Supply of Water to Town of Spring Lake, North Carolina dated August 14, 1981 and the First Amendment to Town of Spring Lake Water Service Agreement dated March 24, 2003.
2. The point of delivery for water purchase applied for hereunder will be at the metering point(s) as shown on Rose & Purcell, Inc. Drawing Number 550 dated April 22, 1981, attached hereto as Exhibit A. The metering point(s) will be relocated in the future as a part of the installation of a new water transmission line to serve Ft. Bragg and CUSTOMER.
3. Monthly Billing for Water Use:
    a. COMMISSION water meter(s) serving CUSTOMER will be read, as nearly as possible, at regular intervals. The time period between meter readings shall not be less than twenty-five (25) days and not more than thirty-five (35) days.
    b. If COMMISSION is unable to read water meter(s), for any reason, the water use may be estimated by COMMISSION on the basis of water use from the preceding billing periods for which readings were obtained. Bills rendered on the basis of such estimates shall be valid as if made from actual meter readings.

c. The term "month" or "monthly" refers to the interval(s) transpiring between the previous meter reading date and the current meter reading date, and bills shall be rendered accordingly.

d. The billing rate (hereinafter referred to as "billing rate") for water use shall be a three tier rate. The CUSTOMER agrees to a minimum purchase of thirteen million gallons (13,000,000) at the Tier I rate, except during DECLARED water conservation stages, by either COMMISSION and/or the CUSTOMER; all additional consumption shall be:

Tier I. 13,000,000 – 20,000,000 gallons at $1.9159 per thousand

Tier II. 20,000,001 – 24,000,000 gallons at $2.5730 per thousand

Tier III. Over 24,000,000 gallons at 2.7990 per thousand

e. Monthly bills rendered for the total water use supplied hereunder are payable within twenty (20) days from date thereof, at COMMISSION office in Fayetteville, North Carolina. A late payment of one percent (1%) per month is assessed one day after the due date shall be applicable to all bills rendered to CUSTOMER pursuant to this Agreement, except for monthly bills in dispute and notice has been given to COMMISSION of the dispute, within 15 days of receipt.

4. The billing rate for water use shall be the COMMISSION's cost per thousand gallons of water delivered to wholesale customers. The COMMISSION's cost per thousand gallons of water shall be determined as a part of the COMMISSION's water and sanitary sewer cost of service analysis. The billing rate shall take effect on the first day of July of each year of the contract and shall remain constant for the rest of the fiscal year. Notice of rate changes shall be provided 120 days or more prior to their effective date.

a. The COMMISSION will annually perform an allocated cost of service analysis to determine the costs, which are applicable to serving the COMMISSION's various classes of water and sanitary sewer services. The CUSTOMER will be classified as a wholesale rate customer for this purpose.

b. COMMISSION will use audited financial statements, COMMISSION budget, and other financial information from its most recently completed fiscal year as the basis for the cost of service analysis. However, COMMISSION may, at its option, adjust

audited financial data for changes to such financial data known or expected to occur during the year in which the billing rate will be in effect.

c. COMMISSION will endeavor to follow accepted cost of service and ratemaking principles as prescribed by such organizations as the American Water Works Association. All costs including operating and maintenance, depreciation, interest, and general administrative costs will be subject to allocation to the CUSTOMER class of service.

d. COMMISSION reserves the right to adjust the billing rate at any time during the tenure of this contract as a result of federal or state imposed regulations, directives or orders that immediately affect the cost of services and which rate changes are to be implemented for all COMMISSION wholesale customers, and agrees, to give CUSTOMER ninety (90) days notice for any proposed billing rate change required as a result of federal or state imposed regulations, directives or orders.

5. Continuance of Service and Liability:

a. COMMISSION shall use reasonable diligence to provide such service and, having used reasonable diligence, shall not be liable to CUSTOMER or the customers served for damage or damages for failure in or for interruptions or suspension of water service. COMMISSION reserves the right to suspend water service without liability on its part at such times and for such periods and in such manner as it may deem advisable for the purpose of making adjustments to, changes in, or repairs on water mains, plants, and facilities. COMMISSION does guarantee CUSTOMER will be given the same priority for water service as other customers of COMMISSION.

b. CUSTOMER assumes responsibility for and shall indemnify, defend, and save COMMISSION harmless against all liability, claims, judgments, losses, cost and expense, or injury, loss, or damage to any person or property and also including personal injury or property damage to CUSTOMER water customers and citizens on account of defective construction or equipment of CUSTOMER within the CUSTOMER` delineated service area.

c. COMMISSION assumes responsibility for and shall indemnify, defend, and save CUSTOMER harmless against all liability, claims, judgments, losses, cost and expense, or injury, loss, or damage to any person or property and also including

personal injury or property damage to COMMISSION water customers and citizens on account of defective construction or equipment of COMMISSION within the COMMISSION's delineated service area.

d. This agreement does not include maintenance and repair of the water system caused by acts of God; fire; acts of terrorism; insurrection; riot or civil disorder; or an order from any federal, state, county, municipal, or other public authority.

6. Quality of Service:

COMMISSION endeavors to furnish water that meets the standards of the U.S. Environmental Protection Agency (EPA). COMMISSION attempts to maintain a high quality of drinking water to its customers. This being said, however, there are some times when every system in the U.S. will experience water that might be discolored due to breaks in the line, construction, fires or regular flushing activities to keep the lines viable, failure of lines due to age or condition, problems within the customer's own service line and other causes not within the control of COMMISSION. COMMISSION attempts to maintain and replace its lines in a regular and orderly manner, based upon customer complaints, but COMMISSION is not in a position to undertake major infrastructure renovations to its system without substantially increasing the cost of its services to its customers. COMMISSION attempts to be fiscally responsible in its maintenance and replacement policies as well as providing for water that meets the federal and state standards.

COMMISSION only warrants that its water meets EPA enforceable standards under the Safe Drinking Water Act and does not warrant or represent that its water is fit for any other purpose. COMMISSION explicitly excludes any warranty under the Uniform Commercial Code including, but not limited to, an implied warranty of fitness for a particular purpose or an implied warranty for merchantability. Customers who use COMMISSION water for purposes other than drinking do so at their own risk and COMMISSION will not be responsible for water that is used for any purpose other than drinking water. Any customers using COMMISSION water for any purpose other than drinking water should provide for their own filtration and/or treatment of the water in order to assure that it meets the specific needs and quality standards that are necessary for their particular usage. The CUSTOMER assumes responsibility for all facilities on the

CUSTOMER's side of the point of delivery. As such, the CUSTOMER and the CUSTOMER's employees shall hold COMMISSION harmless against all forms of liability and expense for injury, loss or damage on account of defective construction or equipment on the CUSTOMER's side of the point of delivery.

All drinking water, including bottled water, may reasonably be expected to contain at least a small amount of contaminants. The presence of contaminants does not per se indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained through the EPA.

Certain people may be vulnerable to contaminants in drinking water. Immuno compromised individuals – such as people with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, the elderly and infants – can be particularly at risk for infections. These people should seek advice from their health care providers about drinking COMMISSION's water.

7. CUSTOMER agrees to develop and enforce water conservation programs and policies at least as stringent as those used by the COMMISSION, and set forth in City of Fayetteville, NC Code, Part II, Chapter 28, Article V Water Shortage Response, Ordinance Number S2008-018 adopted September 9, 2008.

8. Annual Notification of Anticipated Usage and Restriction:

   a. CUSTOMER shall advise COMMISSION of its anticipated growth annually and number of connections to its water system, population served, and anticipated future development. CUSTOMER will do so each year, no later than July 1st. COMMISSION reserves the right and authority to limit the annual increase in usage by CUSTOMER to an amount not greater than twenty percent (20%) of the previous calendar year's 12 MONTH AVERAGE. However, additional limits may be imposed if an outside agency having jurisdiction over the treatment facilities requires restrictions on increases in usage on the COMMISSION's system. Consideration will be given on a case-by-case basis to address anticipated water needs in excess of the above-stated twenty percent (20%) increase.

b. Any limitations or restrictions on water usage due to situations beyond COMMISSION's control will also apply to CUSTOMER. CUSTOMER will be responsible to ensure the individual water customers on its system comply with these restrictions or limitations.

9. The initial term of this Agreement is for five (5) years from the __1st__ day of _January__, 2009 and shall automatically renew for subsequent five (5) year terms. The Agreement shall remain in effect for an initial term of five (5) years, and for subsequent additional terms of five (5) years each. In order for the contract to expire at the end of the term, written notice of such intention from either party to the other must be received at least six (6) months prior to the expiration date of the initial term or subsequent term. However, in no event shall the Agreement expire prior to the expiration of the initial term. This agreement may be terminated upon consent of both parties.

10. *Severability:* It is hereby declared to be the intention of COMMISSION and CUSTOMER that the paragraphs, sentences, clauses, and phrases of this Agreement are severable. If one or more paragraphs, sections, sentences, clauses, or phrases shall be declared void, invalid, or otherwise unenforceable for any reason by valid and final judgment or decree of any court of competent jurisdiction, such judgment or decree shall not affect the remaining provisions of this Agreement and the same shall continue to be fully effective and enforceable on the basis that said remaining provisions would have been agreed to by COMMISSION and CUSTOMER without the incorporation of such void, invalid, or otherwise unenforceable paragraph, section, sentence, clause, or phrase.

11. *Notices*: Whenever written notices are required under this Agreement, said notice shall be in writing and shall be delivered personally or shall be sent by prepaid registered or certified mail.

If notice is mailed to COMMISSION, it should be addressed as follows:

General Manager
Public Works Commission
P.O. Drawer 1089
Fayetteville, N.C. 28302-1089

If notice is mailed to CUSTOMER, it should be addressed as follows:

Town Manager
Spring Lake
P.O. Box 617
Spring Lake, N.C. 28390-0617

Either party may change its mailing address by giving written notice of the new address. Unless so changed, the addresses set forth above shall apply.

12. *Binding Effect*: This contract shall be binding upon and inure to the benefit of the parties hereto, their heirs, successors, and assigns.

13. *Entire Agreement*: This contract contains the entire agreement of the parties and there are no representations, inducements, or other provisions other than those expressed in writing.

14. *Governing Law*: This contract shall be governed by the laws of the State of North Carolina.

IN WITNESS WHEREOF, the parties hereto through their duly authorized officers have executed this contract as to the date and year first above written.

PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE

By: _____
Wilson A. Lacy, Chairman

ATTEST: _____
Luis J. Olivera, Secretary

APPROVED, as to form this 28TH day of January, 2008.

_____
Richard M. Lewis, Jr.
Public Works Commission Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

_____ 1/14/09
J. Dwight Miller
PWC Chief Financial Officer

TOWN OF SPRING LAKE

By: _____
Ethel Clark, Mayor

TOWN OF SPRING LAKE SEAL NORTH CAROLINA

ATTEST: _____
Rhonda Webb, Town Clerk

APPROVED for Legal Sufficiency
Town Attorney

_____
John Jackson
Town Attorney

This instrument has been preaudited in the manner required by the Local Governmental Budget and Fiscal Control Act.

_____
Allen L. Coats, CLGFO
Town Finance Director

UTILITY SERVICE AGREEMENT
BETWEEN
THE COUNTY OF Harnett County
AND
THE TOWN OF LINDEN

THIS AGREEMENT is made and entered into this _____ day of January, 2004, by and between the COUNTY OF HARNETT (hereinafter sometimes referred to as "COUNTY"), and the TOWN OF LINDEN (hereinafter sometimes referred to as "TOWN").

WITNESSETH:

THAT WHEREAS, County is a body politic organized and existing under the laws of the State of North Carolina and as a part of its governmental functions operates the Harnett County Department of Public Utilities; and

WHEREAS, Town is a municipal corporation duly organized and existing under the laws of the State of North Carolina; and

WHEREAS, Town has requested that County, through its Department of Public Utilities perform certain tasks and services for Town with respect to the operations of Town's water system; and

WHEREAS, County, through its Department of Public Utilities, has agreed to perform such tasks and services as are herein described; and

WHEREAS, A prior agreement between the Town and County has terminated, and the parties desire to enter into a new agreement; and

WHEREAS, County and Town now desire to set forth the terms and conditions of their agreements regarding these matters.

NOW, THEREFORE, in consideration of the foregoing and the mutual agreements hereinafter set forth, County and Town agree as follows:

SECTION I: METER READING:

County agrees to provide meter reading services to Town and Town agrees to accept such services upon the following terms and conditions:

A. Each meter through which Town supplies and sells water shall be read on a monthly basis by the County. The time each month when such readings shall be made shall be administratively determined by the appropriate representatives of Town and County.

B. Within ten (10) days after the meter readings have been completed, the County shall deliver the results of said readings in written form to Town.

C. Town agrees to pay to County, upon monthly billing by County, the amount of $1.25 per meter read for each meter reading cycle. In the event that a meter re-reading should be requested by Town, the cost of such re-reading shall be twelve ($12.00) dollars for each meter re-read, provided however, that no charge shall be made for a re-reading when it is determined that County erred in the original reading.

D. Billings for meter reading services and payment therefor shall be made pursuant to and in accordance with Section Three of this Agreement.

SECTION TWO: OTHER SERVICES:

County agrees to provide new water tap installation service, twenty-four (24) hour emergency repair service, meter installation service (the installation of a meter in an existing meter housing unit), water cut off and cut on service and operation and maintenance service for the chlorination system located at the meter facility (through which water is supplied to Town by County) to Town and Town agrees to accept such services based upon the following terms and conditions:

A. County agrees to provide the above described services to Town, upon notice by Town of the requirement therefor, in accordance with the following schedules of costs to be paid by Town:

Labor/Equipment	Regular Time	Overtime
1 man	$30.00/hr.	$40.00/hr.
2 man crew	$37.00/hr.	$50.00/hr.
3 man crew	$44.00/hr.	$61.00/hr.
Backhoe	$55.00/hr.	$55.00/hr.
Trucks and Other Equipment	$40.00/hr.	$40.00/hr.

Materials and Chemicals will be invoiced to Town at County's cost, plus 5%.

B. Cut offs and cut ons will be made at a cost of ten ($10.00) dollars per cut on or cut off made.

C. Services for new water tap installations shall be performed by County within thirty (30) days after notice of the requirement therefor from Town is made to County. Services for meter installations and water cut ons and cut offs shall be performed by County within two (2) working days after written notice of the requirement therefor from Town is made to County. Scheduled repairs or maintenance shall be performed by the County upon mutual agreement with the Town.

D. General inspection shall be provided twice each week at the rate applicable for one-half (1/2) man hour per visit or a minimum amount equal to the rate applicable for one (1) man hour per week.

E. Notice to perform the services described in this Section shall be made by Town by telephonic communication to County, followed by a written statement regarding the same mailed to County.

F. Services provided by County as set forth in this Section shall be completed in a good and workmanlike manner.

G. Billings for the services set forth in this Section and payment therefor shall be made pursuant to and in accordance with Section Three of this Agreement.

SECTION THREE: BILLING AND PAYMENTS:

A. County will furnish Town not later than the tenth (10^{th}) day of each month with an itemized statement of the costs for meter reading and other services provided by County to Town for the preceding month.

B. Town agrees to pay County, not later than the twentieth (20^{th}) day of each month, the amount due as set forth on the itemized statement described in subsection A above.

SECTION FOUR: GENERAL PROVISIONS:

A. Term. The term of this Agreement shall commence as of the date the same has been executed by both Town and County and shall extend for a term of five (5) years, and thereafter may be renewed or extended for such term, or terms, as may be agreed upon by County and Town. In the event Town determines at any time during the initial term or any extension of this Agreement that it shall cause the services herein described to be performed by Town employee, upon sixty (60) days written notice to County, Town may terminate this Agreement. In the event of such termination, any materials and chemicals purchased by County for the exclusion use by it in the performance of this Agreement with Town, shall be purchased by Town at the Costs hereinabove set forth.

B. Modification of Agreement. The provisions of the Agreement pertaining to the costs to be paid by Town for services provided by County shall be subject to modification at the end of each year period. Should cost increases be required by County, notice thereof shall be supplied to Town as soon as practicable. Any increase or decrease in cost shall be based on a demonstrable increase or decrease in the costs of performance hereunder Modifications to this Agreement may also be made by mutual written agreement of the parties.

C. Regulatory Agencies. This Agreement is subject to such rules, regulations, statutes and/or laws as may be applicable to such or similar agreements in this State and the parties hereto agree to collaborate when necessary to obtain such permits, certifications, or the like, as may be required to comply therewith.

D. Notices. Any notice or other writing to be provided hereunder to Town shall be mailed by first class mail to the Town of Linden at the following address:

Post Office 130
Linden, NC 28356

Any notice or other writing to be provided hereunder to County shall be mailed be first class mail to the Harnett County Department of Public Utilities at the following address:

Post Office Box 1119
Lillington, NC 27546

E. Authority. The County and the Town represent and warrant, each to the other, the existence of all capacity, authority, resolutions and actions necessary to execute this Agreement.

F. Duplicate Originals. This Agreement is executed in duplicate originals, one of which is retained by each party hereto.

Executed by County of Harnett, this_____day of January, 2004.

County of Harnett

By:_____
Beatrice Hill, Vice Chairman
Harnett County Board of Commissioners

Attest:

_____
Kay Blanchard, Clerk
Harnett County Board of Commissioners

Executed by Town of Linden, this_____day of January, 2004

Town of Linden

By:_____
Leo Kelly, Mayor
Town of Linden

Attest:

_____
Sue Giles, Clerk
Town of Linden

APPENDIX C
COST ESTIMATES

Bladen County - West of the Cape Fear River
Source: Bladen County Groundwater System

Item	Unit	Number	Rate	Cost
New Well				
Aquifer and Pump Test	LS			$45,000
New Well Construction	LS			$95,000
Treatment Works and Well House	LS			$150,000
Site Electrical	LS			$25,000
Iron Treatment System	LS			$225,000
Land Acquisiation and 3-phase Power	LS			$30,000
Permit Fee, misc	LS			$3,000
			Subtotal	$573,000
General Conditions (25%)	%	$573,000	25%	$143,250
Contractor Overhead (15%) and Profit (10%)	%	$573,000	25%	$143,250
Contingency	%	$573,000	0%	$0
			Subtotal	$859,500
Permitting	%	$859,500	2%	$17,190
Project Management	%	$859,500	6%	$51,570
Design	%	$859,500	10%	$85,950
Construction Oversight and QA	%	$859,500	8%	$68,760
			New Bladen County Well	$1,082,970
Distribution System				
16" Ductile Iron Pipe (DIP) Water Main (Installed)	LF	0	$90.00	$0
12" PVC Water Main (Installed)	LF	4,500	$42.00	$189,000
8" PVC Water Main (Installed)	LF	0	$30.00	$0
6" PVC Water Main (Installed)	LF	32,500	$24.00	$780,000
4" PVC Water Main (Installed)	LF	6,200	$15.00	$93,000
2" PVC Water Main (Installed)	LF	5,000	$12.00	$60,000
1" PVC Water Main (Installed) - House Connections**	LF	7,050	$10.00	$70,500
Tapping Fees	EA	47	$400.00	$18,800
12-inch Steel Casing (Jack and Bore) for RR Crossing	LF	330	$195.00	$64,350
6-inch DIP Water Main for Water Main (Installed)	LF	330	$45.00	$14,850
House Connections - Meters and Installation	EA	330	$500.00	$165,000
			Subtotal	$1,455,500
Contractor Overhead (15%) and Profit (10%)	%	$1,455,500	25%	$363,875
Contingency	%	$1,455,500	0%	$0
			Subtotal	$1,819,375
Permitting	%	$1,819,375	2%	$36,388
Project Management	%	$1,819,375	6%	$109,163
Design	%	$1,819,375	10%	$181,938
Surveying	%	$1,819,375	2%	$36,388
Erosion and Sedimentation Control	%	$1,819,375	4%	$72,775
Contractor Management	%	$1,819,375	8%	$145,550
			Distribution System Total	$2,401,575
			Total System Capital Cost	**$3,480,000**

* Master meter, SCADA, Elevated Storage Tank, and Pump Station

** Assumes 150 LF per house avg.

Bladen County East of the Cape Fear River
Source: Bladen County Groundwater System

Item	Unit	Number	Rate	Cost
Distribution System				
16" Ductile Iron Pipe (DIP) Water Main (Installed)	LF	0	$90.00	$0
12" PVC Water Main (Installed)	LF	0	$42.00	$0
8" PVC Water Main (Installed)	LF	0	$30.00	$0
6" PVC Water Main (Installed)	LF	44,000	$24.00	$1,056,000
4" PVC Water Main (Installed)	LF	0	$15.00	$0
2" PVC Water Main (Installed)	LF	0	$12.00	$0
Flushing Hydrant	EA	2	$5,000.00	$10,000
1" PVC Water Main (Installed) - House Connections*	LF	600	$10.00	$6,000
Tapping Fees	EA	4	$400.00	$1,600
House Connections - Meters and Installation	EA	4	$500.00	$2,000
			Subtotal	$1,075,600
Contractor Overhead (15%) and Profit (10%)	%	$1,075,600	25%	$268,900
Contingency	%	$1,075,600	0%	$0
			Subtotal	$1,344,500
Permitting	%	$1,344,500	2%	$26,890
Project Management	%	$1,344,500	6%	$80,670
Design	%	$1,344,500	10%	$134,450
Surveying	%	$1,344,500	2%	$26,890
Erosion and Sedimentation Control	%	$1,344,500	4%	$53,780
Contractor Management	%	$1,344,500	8%	$107,560
			Distribution System Total	$1,770,000

* Assumes 150 LF per house avg.

Cumberland County West of the Cape Fear River
Option 1 - Fayetteville PWC

Item	Unit	Number	Rate	Cost
Interconnection to PWC				
Estimated Capacity Fee	LS			$1,200,000
Estimated Water System Upgrades at PWC connection)*	LS			$2,400,000
			Subtotal	$3,600,000
General Conditions (25%)	%	$3,600,000	25%	$900,000
Contractor Overhead (15%) and Profit (10%)	%	$3,600,000	25%	$900,000
Contingency	%	$3,600,000	0%	$0
			Subtotal	$5,400,000
Permitting	%	$5,400,000	2%	$108,000
Project Management	%	$5,400,000	6%	$324,000
Design	%	$5,400,000	10%	$540,000
Construction Oversight and QA	%	$5,400,000	8%	$432,000
			Interconnection to PWC Total	$6,804,000
Distribution System				
16" Ductile Iron Water Main (Installed)	LF	31,000	$90.00	$2,790,000
12" PVC Water Main (Installed)	LF	15,000	$42.00	$630,000
8" PVC Water Main (Installed)	LF	19,000	$30.00	$570,000
6" PVC Water Main (Installed)	LF	30,000	$24.00	$720,000
4" PVC Water Main (Installed)	LF	12,500	$15.00	$187,500
2" PVC Water Main (Installed)	LF	11,000	$12.00	$132,000
1" PVC Water Main (Installed) - House Connections**	LF	11,250	$10.00	$112,500
Tapping Fees	EA	75	$400.00	$30,000
House Connections - Meters and Installation	EA	75	$500.00	$37,500
Right of Way Acquisition	LS			$200,000
			Subtotal	$5,409,500
Contractor Overhead (15%) and Profit (10%)	%	$5,409,500	25%	$1,352,375
Contingency	%	$5,409,500	0%	$0
			Subtotal	$6,761,875
Permitting	%	$6,761,875	2%	$135,238
Project Management	%	$6,761,875	6%	$405,713
Design	%	$6,761,875	10%	$676,188
Surveying	%	$6,761,875	2%	$135,238
Erosion and Sedimentation Control	%	$6,761,875	4%	$270,475
Contractor Management	%	$6,761,875	8%	$540,950
			Distribution System Total	$8,925,675
			Total System Capital Cost	**$15,730,000**

* Master meter, SCADA, Elevated Storage Tank, and Pump Station

** Assumes 150 LF per house avg.

Cumberland County West of the Cape Fear River
Option 2 - Water Provided by Bladen County
Assumes New Well Installed to serve Area C has capacity for Area A

Item	Unit	Number	Rate	Cost
Interconnection Bladen/Cumberland Counties				
Estimated Water System Upgrades at County Line)*	LS			$100,000
			Subtotal	$100,000
General Conditions (25%)	%	$100,000	25%	$25,000
Contractor Overhead (15%) and Profit (10%)	%	$100,000	25%	$25,000
Contingency	%	$100,000	0%	$0
			Subtotal	$150,000
Permitting	%	$150,000	2%	$3,000
Project Management	%	$150,000	6%	$9,000
Design	%	$150,000	10%	$15,000
Construction Oversight and QA	%	$150,000	8%	$12,000
			Interconnection to PWC Total	$189,000
Distribution System				
16" Ductile Iron Water Main (Installed)	LF	16,000	$90.00	$1,440,000
12" PVC Water Main (Installed)	LF	20,000	$42.00	$840,000
8" PVC Water Main (Installed)	LF	19,000	$30.00	$570,000
6" PVC Water Main (Installed)	LF	30,000	$24.00	$720,000
4" PVC Water Main (Installed)	LF	12,500	$15.00	$187,500
2" PVC Water Main (Installed)	LF	11,000	$12.00	$132,000
1" PVC Water Main (Installed) - House Connections**	LF	11,250	$10.00	$112,500
Tapping Fees	EA	75	$400.00	$30,000
House Connections - Meters and Installation	EA	75	$500.00	$37,500
Right of Way Acquisition (Marshwood Lake)	LS			$200,000
			Subtotal	$4,269,500
Contractor Overhead (15%) and Profit (10%)	%	$4,269,500	25%	$1,067,375
Contingency	%	$4,269,500	0%	$0
			Subtotal	$5,336,875
Permitting	%	$5,336,875	2%	$106,738
Project Management	%	$5,336,875	6%	$320,213
Design	%	$5,336,875	10%	$533,688
Surveying	%	$5,336,875	2%	$106,738
Erosion and Sedimentation Control	%	$5,336,875	4%	$213,475
Contractor Management	%	$5,336,875	8%	$426,950
			Distribution System Total	$7,044,675
			Total System Capital Cost	**$7,230,000**

* Master meter, SCADA
** Assumes 150 LF per house avg.

Cumberland County East of the Cape Fear River
Fayetteville PWC Source

Item	Unit	Number	Rate	Cost
Interconnection to PWC				
Estimated Capacity Fee	LS			$1,200,000
Estimated Water System Upgrades at PWC connection)*	LS			$2,400,000
			Subtotal	$3,600,000
General Conditions (25%)	%	$3,600,000	25%	$900,000
Contractor Overhead (15%) and Profit (10%)	%	$3,600,000	25%	$900,000
Contingency	%	$3,600,000	0%	$0
			Subtotal	$5,400,000
Permitting	%	$5,400,000	2%	$108,000
Project Management	%	$5,400,000	6%	$324,000
Design	%	$5,400,000	10%	$540,000
Construction Oversight and QA	%	$5,400,000	8%	$432,000
			Interconnection to PWC Total	$6,804,000
Distribution System				
16" Ductile Iron Water Main (Installed)	LF	0	$90.00	$0
12" PVC Water Main (Installed)	LF	22,000	$42.00	$924,000
8" PVC Water Main (Installed)	LF	29,000	$30.00	$870,000
6" PVC Water Main (Installed)	LF	50,000	$24.00	$1,200,000
4" PVC Water Main (Installed)	LF	0	$15.00	$0
2" PVC Water Main (Installed)	LF	4,000	$12.00	$48,000
1" PVC Water Main (Installed) - House Connections**	LF	5,250	$10.00	$52,500
Tapping Fees	EA	35	$400.00	$14,000
House Connections - Meters and Installation	EA	35	$500.00	$17,500
			Subtotal	$3,126,000
Contractor Overhead (15%) and Profit (10%)	%	$3,126,000	25%	$781,500
Contingency	%	$3,126,000	0%	$0
			Subtotal	$3,907,500
Permitting	%	$3,907,500	2%	$78,150
Project Management	%	$3,907,500	6%	$234,450
Design	%	$3,907,500	10%	$390,750
Surveying	%	$3,907,500	2%	$78,150
Erosion and Sedimentation Control	%	$3,907,500	4%	$156,300
Contractor Management	%	$3,907,500	8%	$312,600
			Distribution System Total	$5,157,900
			Total System Capital Cost	**$11,960,000**

* Master meter, SCADA, Elevated Storage Tank, and Pump Station
** Assumes 150 LF per house avg.