REVISED DRAFT
May 2001

Jordan Lake Water Supply Allocation Application

for

PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE

Prepared by

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PWC

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May 29, 2001

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DIVISION OF
WATER RESOURCES

Mr. Thomas C. Fransen, P.E.
Chief, Hydrology & Management Section
Division of Water Resources
Department of Environment and Natural Resources
1611 Mail Service Center
Raleigh, North Carolina 27699-1611

Re: **JORDAN LAKE WATER SUPPLY STORAGE APPLICATION**

Dear Mr. Fransen:

The Public Works Commission of the City of Fayetteville (PWC) is pleased to submit this revised draft application to the Division of Water Resources (DWR) for a water supply storage allocation from Jordan Lake. Please note that, in revising our application, we have considered all of DWR's March 2, 2001 comments on our December 2000 draft application.

The original authorization for Jordan Lake considered municipal and industrial water supply as an expected use of water released for downstream low flow augmentation. However, as PWC water demands grow, our Cape Fear River withdrawals may expand to the point where they meet or exceed levels considered to be available at Fayetteville by the State. The on-going development of a Cape Fear River Available Supply policy, and associated water quality modeling efforts, are expected to help to define our available supply. Depending on how the final State policy is developed and implemented, PWC could require a Jordan Lake water supply allocation to ensure that flows are released from Jordan Lake in sufficient quantity to allow PWC to meet its future demands. For purposes of this revised application, we have assumed that this will be the case.

Although we have worked diligently on this revised application, we are not yet in a position to finalize our application since the Round Three analysis associated with development of a Cape Fear River Available Supply policy has not been completed. One of the key objectives of the ongoing QUAL2E water quality modeling effort, which involves DWR and the Division of Water Quality along with Cary and PWC, is to help define our available supply. Since this issue is still unresolved, we can not yet quantify what available Cape Fear River supply should be used in our application. This, in turn, prevents us from forecasting supply deficits and developing a complete alternatives analysis in which alternatives are sized and evaluated on the basis of specific deficits.

Although we are still in the process of developing an updated water system master plan, we have made our best effort at updating our demand projections based on the most current information available. We will certainly advise DWR if any further changes occur in our demand forecasts.

In closing, PWC is prepared to enter into an agreement with the State that would commit us to those financial obligations related to PWC receiving an allocation from Jordan Lake. However, for the various reasons outlined in this letter, our Level I and Level II water supply storage allocation requests can still not be quantified.

Thank you for your consideration of our revised application.

Sincerely,

PUBLIC WORKS COMMISSION

M. J. Noland, P.E.
Chief Operating Officer
Water Resources Division

c: Sydney Miller
Steve Blanchard
Paul Peterson

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Attachment 1 – Fayetteville PWC Local Water Supply Plan Update

Attachment 2 – Correspondence Regarding Water Demands and Sales to the Town of Spring Lake and Hoke County

1.0 WATER DEMAND FORECAST

In 2000, Fayetteville Public Works Commission (PWC) and Cumberland County initiated a water supply master plan study to update the 1995 *Water System Master Plan* and project future growth and water demands for Cumberland County and the PWC service area through 2050. Results from the master plan study have been documented in a draft Technical Memorandum entitled, *PWC Water Master Plan and Cumberland County Rural Water Study: Water Demands and Preliminary Water District Evaluation (Camp Dresser & McKee, May 2001)*.

For the Master Plan Update, the PWC customer base was categorized into four categories, including:

- Residential
- Commercial
- Industrial
- Bulk Water Sales.

Residential customers consist of single-family housing units as well as multi-family housing units. Multi-family residential units include apartment complexes, mobile home parks, duplexes, townhouses, and condominiums. Commercial customers include commercial establishments, hospitals, and institutions. In addition, interdepartmental and City of Fayetteville water usage was also categorized as commercial. City of Fayetteville water use includes all water used by City Hall, departments, parks, and recreational facilities. Industrial customers include all industries, as categorized by the Standard Industrial Classification (SIC) code. PWC currently serves thirteen industries that employ approximately 8,800 full-time employees and 700 part-time employees. Bulk water sale customers include customers who have existing agreements for purchase of bulk water from PWC, whether for regular or emergency use.

1.1 HISTORICAL DEMANDS

In the PWC Master Plan Update, historical demand data from 1994 though 2000 were reviewed to help develop demand projections. Table 1-1 summarizes the historical demand data by PWC customer category. It should be noted that some multi-family housing units are included in PWC's "commercial" billing category. As described in Section 1.2, the number of multi-family residential customers in the "commercial" category were estimated and recategorized as residential for future demand projections. Therefore, the actual residential demand is higher than shown in Table 1-1 and the commercial demand is lower than shown. Table 1-1 also shows the industrial demand has declined in the last two years due to the loss of a couple of major industries; however, the Fayetteville Area Economic Development Corporation has re-organized and is actively recruiting new industry as explained in Section 1.2.

TABLE 1-1

Fayetteville PWC Historical Water Demands by Customer Category

Fiscal Year (1)	Residential		Commercial (2)		Industrial		Town of Spring Lake/Fort Bragg (3)	
	Total Demand (gal)	Daily Average Demand (MGD)	Total Demand (gal)	Daily Average Demand (MGD)	Total Demand (gal)	Daily Average Demand (MGD)	Total Demand (gal)	Daily Average Demand (MGD)
1994	4,179,018,000	11.4	1,826,528,000	5.0	1,188,106,000	3.3	106,959,000	0.3
1995	4,003,835,000	11.0	1,942,381,000	5.3	1,178,476,000	3.2	84,917,000	0.2
1996	4,030,993,000	11.0	1,967,276,000	5.4	1,297,045,000	3.5	77,231,000	0.2
1997	4,002,237,000	11.0	1,982,347,000	5.4	1,848,841,000	5.1	116,201,000	0.3
1998	4,143,343,000	11.4	2,057,389,000	5.6	1,821,141,000	5.0	102,621,000	0.3
1999	4,657,955,000	12.8	2,204,366,000	6.0	1,724,381,000	4.7	166,252,000	0.5
2000	4,454,345,000	12.2	2,390,129,000	6.5	1,417,465,000	3.9	210,268,000	0.6

(1) A fiscal year is from July of the previous year through June of the year listed.

(2) Commercial water users include the following billing categories: commercial, interdepartmental, and City of Fayetteville.

(3) Fort Bragg has not received emergency water from PWC since 1997.

1.2 DEMAND PROJECTIONS

Residential Water Demand Projections

<u>Population Projections</u>

For the Master Plan Update, the PWC service area projections were calculated by first estimating the base year (2000) service area population and the corresponding percentage that the PWC service area population is of the entire Cumberland County population. The future service area population was then estimated by multiplying the Cumberland County population projection by the estimated percentage of the Cumberland County population that PWC would serve for each horizon year. The future service area population projections excluded Fort Bragg, which has recently signed a 50-year private water service agreement. A copy of the existing PWC service area map is provided in Appendix A of the Local Water Supply Plan (Attachment 1) for reference.

The Cumberland County population was projected based on extrapolation of fifty years of historical population data for Cumberland County obtained from the North Carolina Office of State Planning. Figure 1-1 shows a linear extrapolation of these data projected out 50 years as well as the Office of State Planning Projections through 2020. As shown on Figure 1-1, the Office of State Planning projections are significantly below the 50-year linear extrapolation.

When projecting out 50 years, it is important to look at least 50 years back to take into account all population trends. As shown on Figure 1-1, Cumberland County experienced a very high rate of population growth between 1950 and 1970 which has not continued in the last 30 years, but which statistically could happen again in the future. Therefore, for the PWC Master Plan Update, 2050 population projections were estimated based on a 50-year linear extrapolation of the historical population data. As shown on Figure 1-1, the resulting Master Plan Population Projection is a linear projection from the existing Year 2000 population to the projected Year 2050 population. Based on this methodology, the 2050 Cumberland County population is projected to be 542,000 persons.

The 2050 Cumberland County population projection was cross-checked by comparing the projected population against the estimated Buildout population for Cumberland County to ensure that the population projections did not exceed the Buildout population. The Buildout population for Cumberland County is estimated in the Master Plan Update to be between 815,000 and 930,000 persons. As shown in Figure 1-1, the Buildout population range is well above the estimated Year 2050 population of 542,000 persons.

The existing (Year 2000) PWC service area population was estimated based on PWC billing data from 1989 through 2000 and the Chamber of Commerce's 2000 population estimate for the City of Fayetteville. Because some of PWC's multi-family housing customers were categorized as "residential" while others were categorized as "commercial" in the PWC billing records, the number of multi-family housing units had to be estimated. Therefore, the existing residential population (both single and multi-family home) was estimated based on an assumed number of single family and multi-family housing units in PWC's "residential" billing category. Two estimates were made. In the first estimate, it was conservatively assumed that all of PWC's "residential" customers were single-family units. For the

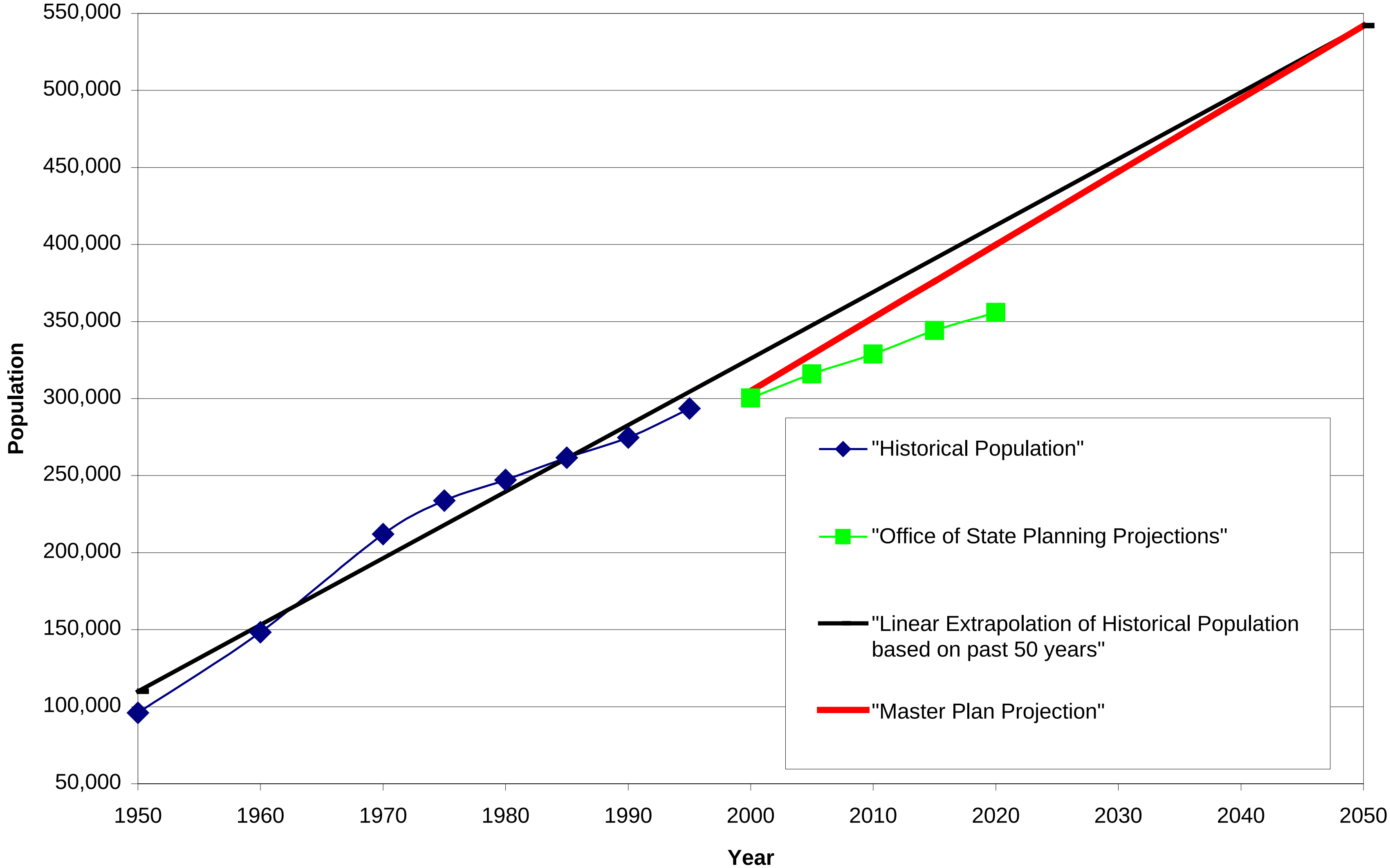


Figure 1-1
Cumberland County Population Projections

second estimate, the percentage of mulit-family units was estimated by assuming that all of PWC's "residential" customers with meters greater than 5/8 inch were multi-family customers. For both estimates, the number of people per housing unit was estimated to be 2.47 people per household inside the City and 2.77 people per household outside the City based on 1990 U.S. Census data for the City of Fayetteville and Cumberland County. The single family home residential population, based on the average of the two described methods, is estimated to be 154,400 persons. Of the total single family home population, 117,300 persons are estimated to reside in the City of Fayetteville. The multi-family housing population was then calculated to be 23,700 persons, based on the difference between the total city population (141,000 as reported by the Chamber of Commerce) and the number of single family residents that reside in the City (117,300). Based on this methodology, the existing (Year 2000) PWC service area population is estimated to be 178,200 persons, with an estimated 141,000 persons residing within the City of Fayetteville and 37,200 persons residing outside the City.

Based on the Year 2000 service area and county populations, PWC currently serves approximately 58% of the Year 2000 Cumberland County population. Except for Fort Bragg, which recently signed a 50-year private water service agreement, PWC anticipates that it will serve nearly all of the County by 2030, or 90 percent of the Cumberland County population. Much of the 10 percent that PWC is not projected to serve includes Fort Bragg. However, some of the 10 percent accounts for other areas of the County for which there is uncertainty whether PWC will provide future service. Linear expansion of the service area was assumed between Year 2000 and 2030. PWC service area population projections through 2050 are shown on Table 1-2.

TABLE 1-2
PWC FUTURE SERVICE AREA POPULATION PROJECTIONS

Year	Cumberland County Population	Percent of County Served[1]	PWC Service Area Population[2]
2000	303,000[3]	58%	178,200
2005	328,700	64%	210,370
2010	352,400	69%	243,160
2015	376,100	74%	278,310
2020	399,800	79%	315,840
2025	423,500	84%	355,740
2030	447,200	90%	402,480
2035	470,900	90%	423,810
2040	494,600	90%	445,140
2045	518,300	90%	466,470
2050	542,000	90%	487,800

[1]Assumes that PWC service area will be expanded to 90% of Cumberland County by 2030 and that linear service area expansion will occur between 2000 and 2030.
[2] Calculated by multiplying Cumberland County Population by Percent of County Served.
[3]Year 2000 Cumberland County Population data shown is based on the just-released 2000 Census data for North Carolina. All demand projections included in this application were based on a Year 2000 County population estimate of 305,000. Because the difference between the estimated and actual population was less than 0.7%, the demand projections were not modified.

Residential Usage Rates

Residential water demands were calculated by multiplying the PWC service area population projections shown in Table 1-2 by the projected per capita usage rate. Usage rates were established based on an analysis of PWC historical and current usage rates and potential reductions from water conservation measures and replacement savings.

DWR's October 2000 Jordan Lake Application Guidelines state that Applicants must "express the usage rate for the Residential Sector on per capita and per household bases". Current residential usage rates are shown on a per capita and per household basis. However, future residential demand projections were calculated by multiplying future service area population by the per capita usage rates. This method avoided speculation on future household sizes.

Historical usage rates were estimated by dividing the residential service water sales by the estimated service area population. Accurate data were unavailable to disaggregate demand between single-family and multi-family use. Therefore, as allowed by DWR's Application Guidelines, a combined residential usage rate including both single and multi-family homes was estimated. Based on this analysis, the current (Year 2000) residential usage rate was estimated to be 79 gallons per capita per day (gpcd) (approximately 200 gallons per household or 187.9 gpd per 5/8th inch meter equivalent).

In general, the residential usage rate has decreased by approximately 10 gpcd over the last ten years. In addition, with continued implementation of water conservation measures, the usage rate is expected to continue to decrease in the future. Future usage rates were projected by accounting for savings from installation of low-flow and ultra low-flow plumbing fixtures in newer housing developments and retrofit of plumbing fixtures in older housing developments. To account for installation of lower flow plumbing fixtures, the PWC residential population was subdivided by age of homes and estimated water usage based on estimated savings from installation of low-flow plumbing fixtures. Under this methodology, it was determined that homes built prior to 1983 have a per capita water usage of 85 gpd, homes built between 1983 and 1994 have a usage rate of 70 gpcd, and homes built after 1994 have a usage rate of 59 gpcd. Based on Sate plumbing codes for ultra-low flow toilets and showers, all new development was assumed to have a water usage of 59 gpcd. Without accounting for replacement savings from retrofit of older homes, the average usage rate is expected to decline from 79 gpcd in 2000 to 70 gpcd in 2050.

To account for plumbing retrofit of older homes, it was assumed that all of the homes in the current PWC service area built prior to 1994 would be retrofitted with ultra-low flow plumbing by 2050. Based on this assumption, the estimated replacement rate is 1.3 percent per year for homes built prior to 1983 and 0.5 percent for home built between 1983 and 1994. Replacement savings were estimated by assuming that replacing high-flow (pre-1983 homes) with ultra-low flow plumbing would provide 26 gpcd savings, and that replacing low flow (homes built between 1983 and 1994) with ultra-low flow plumbing would provide 11 gpcd savings (based on water conservation estimates provided in a 1993 AWWA report titled, *Water Conservation Guidebook for Small and Medium Sized Utilities*).

Demand Projections

Table 1-3 shows the resulting residential water demand projections through 2050 for the PWC service area based on the population projections and usage rates described above. Figure 1-2 illustrates the decrease in residential demand projections associated with conservation savings from both new home usage rates and replacement savings. With conservation savings associated with new home development and replacement programs, the residential usage rate is projected to decrease to 63 gpcd by 2050.

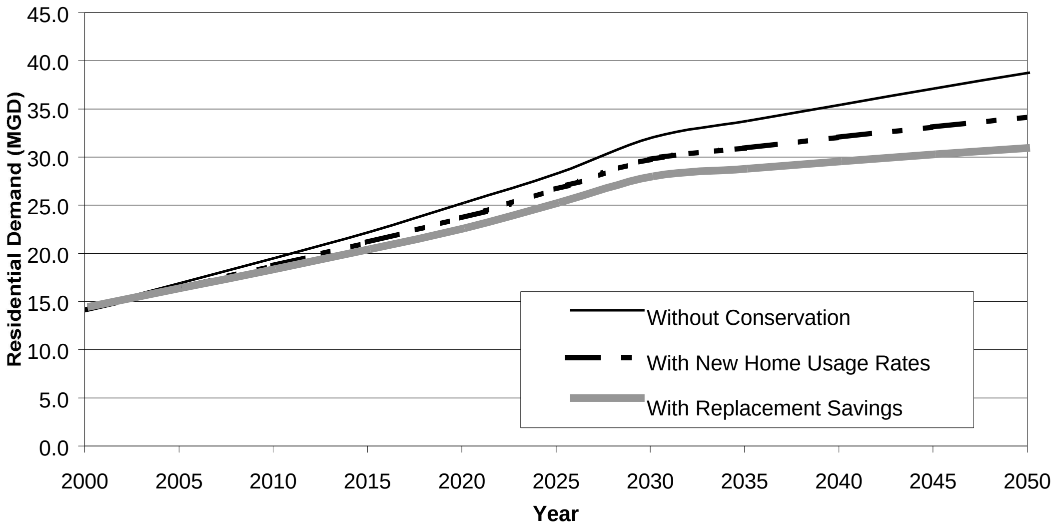
Because accurate data were not available to disaggregate historical single-family and multi-family usage rates, residential demands projections were estimated based on a combined single-family and multi-family home usage rate. This methodology eliminated the need to speculate on future household size and the relative mix of single and multi-family homes throughout the planning horizon. A 2050 combined residential usage rate of 63 gpcd is considered a conservatively low rate for the projected service area.

TABLE 1-3
RESIDENTIAL WATER DEMAND PROJECTIONS

Year	PWC Population *(1)*	Usage Rate Gpcd *(2)*	Residential Demand with new home usage rates (MGD)	Replacement Savings *(3)*	Residential Demand with replacement savings MGD *(4)*
2000	178,200	79	14.0	0.0	14.0
2005	210,370	77	16.2	0.4	15.8
2010	243,160	76	18.5	0.7	17.8
2015	278,310	75	20.9	1.1	19.8
2020	315,840	74	23.4	1.4	22.0
2025	355,740	73	26.1	1.8	24.3
2030	402,480	72	29.1	2.1	27.0
2035	423,810	72	30.4	2.5	27.9
2040	445,140	71	31.7	2.8	28.8
2045	466,470	71	32.9	3.2	29.7
2050	487,800	70	34.2	3.6	30.6

(1) From Table 1-2.
(2) Assumes usage rate of 85 gpcd for homes built before 1983, 70 gpcd for homes built between 1983 and 1994 and 59 gpcd for homes built after1994.
(3) Assumes replacement rate of 1.3 % per year for homes built prior to 1983 and 0.5 % for home built between 1983 and 1994.
(4) Demand minus replacement savings.

Figure 1-2 – Comparison of Residential Water Demands With and Without Conservation



Commercial Growth

Insufficient data were available for the PWC Master Plan Update to estimate commercial demand on a per acre basis. Therefore, the non-residential portion of the commercial demand was estimated in the Master Plan Update based on commercial employee projections and historical water consumption.

The current (Year 2000) number of commercial employees in Cumberland County was estimated based on a linear extrapolation of the number of employees reported in the 1990 U.S. Census data and the number projected for 2010 by the Cumberland County Planning Department. The number of employees located within the PWC service area was then estimated based on an overlay of the service area boundary on the County employee projection. Industrial employees were subtracted from these estimates to develop the commercial employment estimates. Based on this methodology, the current number of commercial employees in the PWC service area is 64,000, or approximately 36 percent of the PWC residential population. In comparison, the number of commercial employees in Cumberland County is approximately 30 percent of the total residential population (based on Employment Securities Commission data between 1993 and 1999).

Commercial employee projections for the PWC service area were estimated based on the following assumptions:

- Commercial employees will become more evenly distributed throughout the County.
- By 2030, when the PWC service area is anticipated to include 90% of the Cumberland County population, the number of commercial employees in the PWC service area will be 30 percent of the service area population.

DWR stated in its October 2000 Application Guidelines that DWR will provide Applicants with "usage rates for each sector based on historic information and reasonable standards, accounting for best practices and conservation." However, this information has not yet been provided. Absent this information, PWC estimated commercial usage rates based on best available information. A unit flow factor (gpd/employee) was established for the non-residential component of PWC's commercial demand based on Year 2000 commercial water demand and commercial employee data. The unit flow factor for the Year 2000 was calculated to be 72.7 gpd/employee (419.9 gpd per 5/8th inch meter equivalent). It should be noted that this commercial use rate is lower than previous years as a result of conservation measures, and is comparable and, in some cases, less than experienced by other utilities in this region of the nation.

Table 1-4 summarizes the commercial demand projections. Water demand projections were developed by multiplying this unit flow factor by the projected number of commercial employees in the service area.

Industrial Growth

PWC currently serves thirteen industries, including Black & Decker, Borden Chemical, Cargill, Carolace, Chrome Rite Plating, Cutler Hammer, Kelly Springfield Tire Company, M.J. Soffe, Purolator, Valley Protein/Cape Fear Feeds, National Uniform, Rental Uniform, and Perdue. In Fiscal Year 2000, these thirteen industries had a combined water demand of 3.9 mgd. As shown in Table 1-1, the industrial demand has declined in the last two years due to the loss of a couple of major industries; however, the Fayetteville Area Economic Development Corporation (FAEDC) is working to bring new industries into Cumberland County. Despite slow industrial growth in the 1990s, the FAEDC projects that a new wave of industrial growth in Cumberland County will begin in the near future and will continue throughout the next fifty years.

Although PWC's industrial water demand has decreased over the last two years, the location of only one water intensive industry in the PWC service area would reverse this trend and substantially increase PWC's industrial demand. For example, separate power producers are currently discussing with PWC the possible construction of large-scale power generation plants that may require water service from PWC. Any one of these facilities could have water needs in the range of 10 to 20 mgd. There are other water-intensive industries such as pharmaceutical and semiconductor manufacturing facilities which have recently located or expanded in North Carolina and Virginia that will use between 4 and 10 mgd each. In projecting industrial demand, PWC did account for the potential location of a water-intensive industry, such as the current power generation prospects.

Industrial demand projections were estimated in the Master Plan Update based on existing industrial use and taking into account future industrial growth projected by the FAEDC. Existing industrial use data were used to establish a per acre industrial usage rate of 2,200 gpd/acre (7,529.0 gpd per 5/8th inch meter equivalent). Future industrial usage was then estimated by applying the 2,200 gpd/acre usage rate to the projected industrial acreage. Initially, future industrial sites were estimated by assuming that all of the industrial sites that the FAEDC projected would be developed within the next 20-years would actually be served water over a 50-year planning period. However, it was found that this assumption was overly optimistic when compared to residential growth projections. Therefore, the projected industrial acres were reduced to 50% of FAEDC's projection. This methodology would account for the location of water-intensive industry, such as the power generation plants discussed above. Table 1-5 summarizes the

TABLE 1-4

Commercial Water Demand Projections

Year	PWC Service Area Population (1)	% Commercial Employees (2)	# Commercial Employees in Service Area	GPD/Employee (3)	Commercial Water Demand (MGD) (4)
2000	178,000	36	64,000	73	4.7
2005	210,000	35	74,000	73	5.4
2010	243,000	34	83,000	73	6.0
2015	278,000	33	92,000	73	6.7
2020	316,000	32	101,000	73	7.3
2025	356,000	31	110,000	73	8.0
2030	402,000	30	121,000	73	8.8
2035	424,000	30	127,000	73	9.2
2040	445,000	30	134,000	73	9.7
2045	466,000	30	140,000	73	10.2
2050	488,000	30	146,000	73	10.6

(1) From Table 1-2.

(2) Based on an interpolation between 1990 U.S. Census data and Cumberland County's 2010 projections, the number of commercial employees in the PWC service area in year 2000 was estimated to be 64,000 (36% of the County population). Per county wide U.S. census estimates, commercial employees comprise 30% of the residential population; however, this does not currently hold true because most people work within the City limits. As buildout occurs, the percent commercial employees in the PWC service area population is expected to become 30%. Thus, commercial employee projections were adjusted to reflect this.

(3) GPD/employee based on year 2000 commercial water use which includes all customer categories except residential, industrial, and bulk water sales.

(4) Commercial water demand = (# Commercial Employees in Service Area) * (GPD/Employee)/10^6

projected PWC industrial demands. The projected industrial acreage projected for 2050 is about half of the estimated industrial Buildout capacity.

TABLE 1-5
INDUSTRIAL WATER DEMAND PROJECTIONS

Year	Total Acres Developed for Industrial Use (1)	Projected Industrial Water Demand (mgd) (2)
2000	1,800	3.9
2005	2,500	5.5
2010	3,500	7.7
2015	4,500	9.9
2020	5,400	11.9
2025	6,300	13.8
2030	7,200	15.8
2035	8,000	17.6
2040	8,900	19.5
2045	10,000	22.1
2050	11,200	24.6

(1) Includes existing industrial acreage plus estimates on future development. Estimates were based on information provided by the FAEDC.
(2) Projected Industrial Water Demand was based on a unit flow factor of 2200 gpd/acre.

The FAEDC reports multiple benefits that the Fayetteville / Cumberland County area provides to support the projected industrial growth. These benefits include:

- Cumberland County is strategically positioned along Interstate I-95 and, having rail service through Norfolk Southern and CSX railroads, Cumberland County offers a variety of transportation benefits.
- Excellent utilities, including inexpensive water and sewer service.
- Skilled labor force. With Fort Bragg, a large military base, located within the County, ex-military personnel provide an excellent source of multi-skilled labor for industries. Currently, the Employment Security Commission is working to identify and place ex-military personnel in jobs in Cumberland County.
- Economic incentives.

The FAEDC is actively working with Fayetteville PWC and Cumberland County to identify and develop sites for future industrial development.

Bulk Water Sales

PWC has existing bulk water sale contracts with the Town of Spring Lake and Fort Bragg. In addition, PWC has entered into a water sale agreement with Hoke County for future water purchase.

The Town of Spring Lake owns and operates its own water supply system; however, the capacity of its water supply is inadequate to meet the demands of the system. Therefore, the Town of Spring Lake has an agreement to purchase additional water from PWC to meet the system demands. As per the existing service agreement between PWC and the Town of Spring Lake, the minimum allocation to the Town is 0.4 mgd. In Fiscal Year 2000, the Town of Spring Lake purchased an average of 0.6 mgd. It should be noted, however, that a new flow meter was installed in 2001 for the Town of Spring Lake connection. The new flow meter has reported 1.2 mgd service to Spring Lake.

Spring Lake has entered into an agreement with Harnett County for construction a 12-inch water transmission main to provide a future supplemental water supply. However, as per an April 19, 2001 letter from The Town of Spring Lake's Town Manager (provided in Attachment 2 for reference), the Town of Spring Lake still projects "… a major portion of Spring Lake's water demands being met by PWC during the next fifty years." Therefore, for future projections, it was conservatively assumed that Spring Lake's demand would be maintained at 0.6 mgd until the Town is annexed into the PWC service area between 2010 and 2015.

PWC's contract with Fort Bragg is for emergency use. It is anticipated that Fort Bragg will maintain this emergency supply contract under its new 50-year private water service agreement. Fort Bragg has not purchased water from PWC since 1997. For future projections, it was assumed that Fort Bragg would not purchase water from PWC.

In April 1999, PWC entered into a bulk water sale agreement with Hoke County. The agreement states that PWC will initially provide between 4 and 6 million gallons per month to serve the eastern Hoke County rural water system. As of December 2000, no water has been served; however, service is expected to start up before 2005. The Hoke County Manager issued a letter, dated May 7, 2001, (provided in Attachment 2 for reference), that indicates that Hoke County will depend on PWC to provide water to the eastern portion of Hoke County. Based on current growth rates in Hoke County, Hoke County predicts that they may need to purchase as much as 7 mgd or more from PWC to meet their 2050 water demands. Therefore, projected bulk water sales to Hoke County were included in PWC's water demand projections. Based on the information provided by Hoke County, it was assumed that PWC will provide 0.2 mgd (6 million gallons per month) to Hoke County starting in 2005 and that average sales will grow in linear fashion to 7 mgd by 2050. This procedure for factoring in sales to Hoke County is consistent with guidance provided to PWC in a March 2, 2001 letter from DWR.

System Processes and Unaccounted-For-Water

In PWC's Master Plan Update, PWC water supply data were analyzed to estimate water demand associated with system processes and unaccounted-for-water (UFW). The amount of system process water used by PWC was assumed to be the difference between the amount of water treated at the P.O.

Hoffer and Glenville WTF and the amount actually pumped to the distribution system. The UFW level was then calculated as the difference between the amount of water pumped to the distribution system and the metered water sales.

Table 1-6 summarizes an analysis of system process and UFW levels for the PWC system between 1994 and 2000 (Fiscal Years 1995 through 1999). Although UFW levels varied from year-to-year, the combined system process and UFW levels varied only between 10 and 16 percent each year, with an average combined demand of 14 percent of metered water sales. For the demand projections, it was assumed that the UFW and system process demands would be maintained at 6 percent and 8 percent, respectively. The 8% system process demand also provides an allowance for County Fire Department water usage and flushing program water losses.

TABLE 1-6
ANALYSIS OF SYSTEM PROCESS AND UNACCOUNTED-FOR-WATER

Fiscal Year	Withdrawal (MGD)	Pumped (MGD)	System Process (MGD)	Metered Sales (MGD)	System Process (MGD)	UFW (MGD)	Percent of Water Sales		
							System Process	UFW	Combined
1995	23.5	22.1	1.4	20.4	1.4	1.7	6.9%	8.4%	15.4%
1996	24.3	22.6	1.7	20.9	1.7	1.7	8.1%	7.9%	16.0%
1997	24.8	23.0	1.8	22.5	1.8	0.5	7.8%	2.2%	10.0%
1998	26.6	25.3	1.3	23.1	1.3	2.1	5.8%	9.2%	15.0%
1999	27.4	24.9	2.5	24.4	2.5	0.5	10.1%	2.0%	12.0%
						AVERAGE	**7.7%**	**5.9%**	**13.7%**

Total Demand Forecast

Table 1-7 summarizes the average and peak daily demands PWC projections through 2050. Peak daily demands were assumed to be 1.6 times the average daily demand. The maximum day to average day demand peaking factor was established in the ongoing *PWC Water Master Plan and Cumberland County Rural Water Study* (CDM, May 2001 draft).

TABLE 1-7

Average and Peak Day Water Demand Projections

Year	Residential Demand MGD (1)	Commercial Demand MGD (2)	Industrial Demand MGD (3)	Subtotal of Base Demand MGD	Bulk Water Sales MGD (4)	Subtotal of Demand MGD	System Process MGD (5)	Unaccounted--for-water MGD (5)	**Average Daily Water Supply Required (MGD)**	**Peak Daily Water Demand (MGD) (6)**
2000	14.0	4.7	3.9	22.6	0.6	23.2	1.9	1.4	**26.5**	**42.4**
2005	15.9	5.4	5.5	26.8	0.8	27.6	2.2	1.7	**31.4**	**50.3**
2010	17.8	6.0	7.7	31.4	1.6	33.0	2.6	2.0	**37.7**	**60.3**
2015	19.8	6.7	9.9	36.4	1.7	38.1	3.0	2.3	**43.4**	**69.5**
2020	22.0	7.3	11.9	41.1	2.5	43.6	3.5	2.6	**49.8**	**79.6**
2025	24.3	8.0	13.8	46.1	3.2	49.3	3.9	3.0	**56.2**	**90.0**
2030	27.0	8.8	15.8	51.6	4.0	55.6	4.4	3.3	**63.4**	**101.5**
2035	27.9	9.2	17.6	54.7	4.7	59.4	4.7	3.6	**67.7**	**108.3**
2040	28.8	9.7	19.5	58.1	5.5	63.6	5.1	3.8	**72.5**	**115.9**
2045	29.7	10.2	22.1	62.0	6.2	68.2	5.5	4.1	**77.7**	**124.3**
2050	30.6	10.6	24.6	65.8	7.0	72.8	5.8	4.4	**83.0**	**132.7**

(1) From Table 1-3 - Residential Water Demand Projections (Including Conservation Savings)

(2) From Table 1-4 - Commercial Water Demand Projections

(3) From Table 1-5 - Industrial Water Demand Projections

(4) Based on existing flows provided to Spring Lake assuming Spring Lake is acquired between 2010 and 2015. (Note current agreement is for 0.4 MGD; however, revisions are in process. Bulk sales to Spring Lake have exceeded the agreement for two years.) Also assumes service to a portion of Hoke County per existing agreement of 0.2 MGD starting in 2005 and increasing in linear fashion to 7 mgd by 2050 based on Hoke County projection.

(5) Based on historical average of 14% for system process and unaccounted-for-water combined. Approximate average of 8% for system process water and 6% for UFW.

(6) Based on peak day/ average day peaking factor of 1.6 calculated based on the average annual peaking factor experienced by PWC between 1995 and 1999.

2.0 CONSERVATION AND DEMAND MANAGEMENT

The PWC maintains an active water conservation and maintenance program that consists of the following elements:

- UFW Reduction Programs – One of PWC's goals is to ensure that UFW levels are maintained below 10%. To meet this goal, PWC maintains a proactive maintenance program, which includes an on-going meter repair and replacement effort and ensures rapid responses to identified leaks. All meters in the PWC service area are tested, repaired, or replaced based on the following schedule:
  - Residential meters (mostly 5/8th inch meters): every 12 years
  - 1 ½ inch meters: every 5 years
  - 2 inch meters: every 3 years
  - 3 inch meters: every 4 years
  - 4, 6, and 8-inch meters: every 12 months.

  PWC is currently converting all of its meters to a radio/read system. Under this program, all PWC meters will be retrofitted or replaced over the next three years. Upon upgrade of each meter, the regularly scheduled maintenance program will again be followed.

- Local Water Shortage Ordinance – The PWC has adopted a local Water Shortage Response Ordinance (Appendix B of Attachment 1 – 2000 Local Water Supply Plan)
- Public Education – The PWC continually distributes educational materials to the public regarding water conservation. In addition, PWC observes National Drinking Water week with promotions on the radio and in the Newspaper. This educational effort will continue in the future.
- Wastewater reuse – Reuse systems are in service at both wastewater treatment facilities for irrigation and equipment washdown. Opportunities for reuse in the service area are discussed in Section 5 of this Application.
- Odd-Even Landscape Irrigation Program – Beginning in 1994, the PWC has conducted a program each summer to encourage residents to irrigate only on odd calendar dates if their address ends in an odd number and only on even calendar dates if their address ends in an even number. The objective of this program is to reduce peak water demands.
- Waterwise Garden Demonstration Project – PWC, in conjunction with the Fayetteville Botanical Gardens, constructed a demonstration project in 1996 that provides the typical homeowner with practical, low-cost suggestions for reducing residential landscape irrigation requirements and encourage responsible irrigation practices. This program is part of PWC's on-going conservation public education programs and is funded annually for maintenance and issuance of brochures encouraging water conservation.
- A rate structure analysis is currently being conducted for PWC. Part of this study includes an analysis of how rates will affect water use. PWC currently has an ascending rate structure for

residential customers and flat rate structure for commercial and industrial categories. A copy of PWC's current rate structure is provided in Appendix C of Attachment 1.

3.0 CURRENT WATER SUPPLY

Fayetteville PWC's current water supply sources consist of two major surface water sources, the Cape Fear River and Lake Impoundments on Little Cross Creek. In addition, Big Cross Creek, a smaller surface water source, is used as a supplemental raw water supply. PWC's existing raw water supplies are summarized in Table 3-1. A description of each of these water supply sources is provided below.

TABLE 3-1
CURRENT WATER SUPPLY SOURCES FOR FAYETTEVILE PWC

Source	County	Basin	Source Type	Safe-Yield (mgd)	Water Quality
Cape Fear River	Cumberland	Cape Fear	Surface	TBD	Good
Glenville Lake	Cumberland	Cape Fear	Surface	5[1]	Good
Big Cross Creek	Cumberland	Cape Fear	Surface	0.9[2]	Good

TBD: To meet determined.
[1]20 and 50-year safe yield.
[2]20% of the estimated 7Q10 flow.

Cape Fear River

The PWC relies on the Cape Fear as its major raw water supply. The segment of the Cape Fear River used as a water source is classified as a WS-IV segment. The PWC has two raw water intake / pump stations located on the Cape Fear River. The first pump station is used to provide a supplemental water supply source to the Glenville Lake WTF. This pump station has a design capacity of 32 mgd and a firm capacity of 16 mgd. The second pump station supplies raw water to the P.O. Hoffer WTF. The Cape Fear River is the sole raw water source for the P.O. Hoffer WTF. This pump station has a design capacity of 60 mgd and a firm capacity of 42 mgd.

On December 4, 2000, DWR issued a proposed policy for calculating available supply from the Cape Fear River. This proposed policy is currently under review. The basic policy is to define available supply as the lesser of either: (a) 20% of the 7Q10 flow or (b) the minimum recorded daily flow (these statistics are computed using flow records for the period since Jordan Lake became fully operational). The proposed policy also states that the available supply may be reduced based on the following additional parameters:

1. "Withdrawals from the Cape Fear River… will not exceed a quantity that significantly diminishes the reliability of the Jordan Lake water quality pool."

2. “Withdrawals from the Cape Fear River… will not exceed a quantity that significantly impacts the state’s D.O. standard. The NC Division of Water Quality will make such a determination. ”

In the 1997 Water Supply Plan, the estimated safe yield for the Cape Fear River was estimated as 84.8 mgd. This yield was based on 20% of a minimum target flow for the Cape Fear River at the Cross Creek WWTP (657 cfs), which is located just downstream of the Hoffer Water Treatment Facility. This target flow for the Cape Fear River at Fayetteville was calculated assuming a 550 cfs minimum target flow at Lillington. At the December 12, 2000 Cape Fear River Withdrawal Work Group meeting, the USGS indicated that a pending USGS report would set the 7Q10 flow at Lillington at 530 cfs (20 cfs lower than 550 cfs). Therefore, the allowable yield for the Cape Fear River would need to be reduced accordingly. Assuming a 20 cfs reduction for the target flow for the Cape Fear River at Cross Creek (reduced from 657 to 637 cfs), the estimated safe yield value for the Cape Fear River would be reduced to 82.3 mgd. It is critical to note that the validity of this safe yield is uncertain until ongoing water quality modeling evaluations for the Cape Fear River are completed and the available supply policy is finalized. Depending on the results from the ongoing water quality modeling efforts, this estimated safe yield could change based on water quality criteria. Therefore, PWC has chosen not to specify a safe yield value for its Cape Fear River withdrawals in this revised draft application. Instead, PWC will incorporate the as yet to be finalized safe yield information in its final application.

Lake Impoundments on Little Cross Creek

The second major surface water source is a series of four lake impoundments on Little Cross Creek, including Bonnie Doone Lake, Kornbow lake, Mintz Pond, and Glenville Lake. Raw water from the Little Cross Creek Basin is treated at the Glenville Lake Water Treatment Facility (Glenville WTF). The raw water intake for the Glenville WTF is located on Glenville Lake. Little Cross Creek is classified as a WS-IV watershed.

Based on a 1989 report entitled, *Report on the Upgrade of the Glenville Lake Water Treatment Plant and the Cape Fear Raw Water Pumping Facilities* (Black & Veatch, 1989), the 20 and 50-year safe yield for Little Cross Creek is estimated to be 5 mgd.

Big Cross Creek (Supplemental Supply)

Big Cross Creek, a WS-IV classified watershed, serves as a smaller, supplemental water source for the Glenville WTF. In 1997, this raw water source was used 263 days at an average withdrawal rate of 1.765 mgd. The maximum withdrawal capacity for the Big Cross Creek is estimated to be 2 mgd.

The safe yield for Big Cross Creek was estimated, as per DWR’s Round Three Application Guidelines, as the lesser of either 20% of the 7Q10 flow or minimum recorded daily flow. Fayetteville PWC staff have determined the drainage area above the Big Cross Creek intake to be approximately 15.1 square miles. There is no streamflow gaging station on Big Cross Creek. Therefore, low flow statistics were reviewed for two surrogate gages in the local region with relatively small drainage areas, as shown in Table 3-2:

TABLE 3-2
LOW FLOW STATISTICS FOR SURROGATE GAGES

Gaging Station		Drainage Area	Lowest Daily Mean Flow (cfs)	7Q10 Flow (cfs)
Flat Creek near Inverness	Full Drainage Area	7.63	2.2	3.6
	Per Square Mile	1.0	0.29	0.47
Rockfish Creek at Raeford	Full Drainage Area	93.1	34	41.8
	Per Square Mile	1.0	0.37	0.45

Applying these per square mile low flow statistics to the Big Cross Creek intake results in an estimated minimum daily flow of between 4.4 and 5.6 cfs and estimated 7Q10 flow of between 6.8 and 7.1 cfs. Based on DWR's Round Three Application Guidelines, available supply for unregulated streams can be estimated as the lesser amount of 20 percent of the 7Q10 flow, or the minimum flow of record. For the two surrogate gages, 20 percent of the 7Q10 flow would be less than the minimum daily flow. Therefore, available supply at the Big Cross Creek intake is estimated to be 1.4 cfs (0.9 mgd), which is 20 percent of an estimated 7Q10 flow of 6.8 to 7.1 cfs.

4.0 FUTURE WATER SUPPLY NEEDS

Table 4-1 provides a summary PWC's average and maximum day projected demands through 2050. As explained in Section 3, because determination of the safe yield for the Cape Fear River will be contingent upon finalization of the available supply policy for the Cape Fear River and results of the on-going water quality modeling efforts, PWC's current available supply cannot be estimated at this time. Since the current available PWC supply is unknown, deficit projections could not be calculated for this revised draft application.

TABLE 4-1
DEFICIT PROJECTIONS FOR FAYETTEVILLE PWC

Year	Average Daily Demand (mgd)	Maximum Daily Demand (mgd)	Current Available Supply (mgd)	Deficit (mgd)
2000	26.5	42.4	TBD	TBD
2005	31.4	50.3	TBD	TBD
2010	37.7	60.3	TBD	TBD
2015	43.4	69.5	TBD	TBD
2020	49.8	79.6	TBD	TBD
2025	56.2	90.0	TBD	TBD
2030	63.4	101.5	TBD	TBD
2035	67.7	108.3	TBD	TBD
2040	72.5	115.9	TBD	TBD
2045	77.7	124.3	TBD	TBD
2050	83.0	132.7	TBD	TBD

TBD: To be determined.

5.0 COMPARISON OF ALTERNATIVE WATER SUPPLIES

As discussed in Section 4, PWC's projected demand deficits could not be calculated for this revised draft application. However, an evaluation of alternative water supplies was still performed to assess potential long-term water supply alternatives for the PWC. Because demand deficits cannot be determined, sizing of the alternatives could not be performed. As such, costs estimates are not included in this draft application.

The following water supply alternatives are included this evaluation:

- Jordan Lake Allocation (via Cape Fear River Withdrawal Facilities)
- New Reservoir in Cumberland County
- Interbasin Transfer (IBT) from Lumber River Basin
- Interbasin Transfer from Reservoir Located on Yadkin-Pee Dee River
- Groundwater Sources
- Offstream Storage in Local Quarry
- Aquifer Storage and Recovery (ASR)
- Non-Potable Reuse
- Bulk Water Purchase.

A fatal flaw analysis was performed to determine the feasibility of each of the above water supply alternatives. The results from this evaluation are presented in Section 5.1. An alternatives evaluation was then performed for each of the feasible water supply options using the evaluation criteria provided in the Jordan Lake Allocation Application Guidelines. This alternatives evaluation is presented in Section 5.2.

5.1 FEASIBILITY ANALYSIS OF WATER SUPPLY ALTERNATIVES

Jordan Lake Allocation (via Cape Fear River Withdrawal Facilities)

As PWC water demands grow, Cape Fear River withdrawals by PWC may expand to the point where they meet or exceed levels considered to be available at Fayetteville by the State. The development of a Cape Fear River Available Supply policy is currently underway as well as water quality modeling efforts to support that policy. Depending on how the final State policy is developed and implemented, PWC could require a Jordan Lake water supply allocation to ensure that flows are released from Jordan Lake in sufficient quantity to allow PWC to meet future demands. For purposes of this draft application, it has been assumed that this would indeed be the case. This alternative will also require some improvements to PWC's existing Cape Fear River withdrawal facilities in order to ensure that adequate quantities can be withdrawn from the River.

The U.S. Army Corps of Engineers has estimated that the safe yield of the Jordan Lake water supply pool is approximately 100 mgd. To date, 35 mgd of the total supply has been allocated to surrounding water systems. If DWR's recommendations for the Round 2 Jordan Lake Water Allocation are implemented, then 44 mgd would be allocated. If PWC were granted its requested water supply allocation for Jordan Lake, the additional supply would be withdrawn from the Cape Fear River using existing intakes. PWC has two raw water intake / pump stations located on the Cape Fear River. The first pump station, which is pumped to the Glenville Lake WTF through a 36-inch raw water main, has a design capacity of 32 mgd. This pump station can also provide raw water to the P.O. Hoffer WTF through a separate 36-inch raw water main and is used as a back-up pump station for this facility. The second pump station supplies raw water to the P.O. Hoffer WTF through a 36-inch raw water main and has a design capacity of 60 mgd.

If an allocation were granted, then the PWC would need to upgrade its existing withdrawal facilities to accommodate the 2050 peak demand of 133 mgd. This upgrade would include installation of new pumps to increase the design and firm pumping capacity of the intake pump station and modifications to the existing transmission line so that both of the 36-inch transmission lines to the P.O. Hoffer WTF could be utilized for raw water transmission. Based on a preliminary evaluation of the intake facilities and raw water pumping capacity, the intake structure is adequately sized to accommodate peak flows through 2040 and the raw water pump station has sufficient capacity to accommodate the projected peak demand through 2025. However, additional pumps would still need to be installed to increase the firm capacity of the intake pump stations to accommodate peak demands through 2025. Overall, these upgrades and modifications would be a minor capital investment in comparison to the other raw water supply alternatives. In addition, with the nearby location of the raw water source and the benefit of existing infrastructure, this alternative would also be the easiest to implement.

The majority of Cumberland County and eastern Hoke County is within the Cape Fear River Basin. A very small portion of the southwestern part of Cumberland County lies within the Lumber River Basin and the eastern portion of Cumberland County lies within the South River Basin. Although all of the PWC's wastewater treatment facilities discharge treated effluent to the Cape Fear River Basin, some consumptive losses would be expected to occur within the Lumber River and South River Basins if the PWC service area comprises the majority of Cumberland County. These consumptive losses would constitute an interbasin transfer if the total loss exceeded 2 mgd. However, it should be noted that the majority of transfer would probably occur within the South River basin, which drains to the Cape Fear River downstream of Fayetteville. Therefore, the potential for significant interbasin transfer outside of the Cape Fear River Basin would be small.

New Reservoir in Cumberland County

This alternative consists of creating a multi-purpose reservoir within Cumberland County that would be designed to serve as both a recreational facility and as a supplemental raw water source for the PWC during peak water demands. Cumberland County and the PWC collaborated to evaluate the feasibility and potential siting of a reservoir in Cumberland County. The results from this evaluation are reported in the *Cumberland County Preliminary Siting and Reservoir Feasibility Study* (Geometrics Engineering, January 2000). The purpose of this study was to determine the feasibility of locating a reservoir in Cumberland County given the local water resources and environmental issues.

The results from this investigation indicated that development of a new reservoir is feasible, provided that additional studies are conducted to validate stream flows and environmental impacts. It was assumed that the reservoir would be used to provide a maximum supplemental potable water supply of 9 mgd. The Cape Fear River itself was not considered as a potential reservoir site since major uncertainties exist about whether such a facility could be permitted in today's regulatory environment. Excluding the Cape Fear River, Rockfish Creek and the Little River were the only other local surface water sources identified to have sufficient drought flows (7Q10 flows) to support the proposed reservoir. However, it was found that the Little River would be only marginally adequate in supporting the proposed reservoir and that excessive drawdown of the reservoir water level could occur during periods of severe drought and peak water demand. Alternatively, a reservoir located on Rockfish Creek would be capable of providing a raw water supply above 9 mgd. The most favorable location for the proposed reservoir was found to be near the Town of Hope Mills near the confluence of Little Rockfish Creek and Rockfish Creek. The reservoir would cover a surface area of approximately 1,500 acres with an average depth of 18 feet (27,000 acre-feet of storage). It was noted in the Reservoir Feasibility Study that locating the reservoir at Rockfish Creek would result in flooding of existing roadways, farmlands, forest and residential sites and that a detailed environmental impact study would be required. Based on inspection of U.S. Fish and Wildlife Service National Wetland Inventory Maps, it was estimated that the reservoir could impact approximately 200 acres of wetlands. However, no ground truthing has been conducted to verify wetland boundaries and acreage.

The available supply from the proposed reservoir was estimated using two methods. In the first method, a draft-storage relationship for the Rockfish Creek station near Hope Mills, provided in the 1975 USGS Publication, *Evaluation of Reservoir Sites in North Carolina*, was utilized to estimate the available storage. The total storage volume for a 1,500 acre reservoir at Rockfish Creek is estimated to be 27,000 acre-ft based on an average depth of 18 feet reported in the Reservoir Feasibility Study. According to the draft-storage relations provided in the 1975 USGS Reservoir Evaluation, this storage volume would provide a 50-year total draft rate of 226 cfs. Accounting for evaporation (estimated as 1.5 cfs, or 1 mgd, based on an assumed net evaporation rate of 10 inches/year from the reservoir surface) and infiltration (5 cfs maximum assumed in the Reservoir Feasibility Study), one would conclude that a net available draft of 219 cfs (141 mgd) is available for reservoir release and water demand consumption. It is unknown what the minimum spillway overflow requirement would be for this reservoir. In the Jordan Lake Application Guidelines, the DWR indicates that it will provide guidance in estimating the minimum release for proposed reservoirs. If it assumed that the minimum reservoir release would be the 90% exceedance flow (116 cfs or 75 mgd), then the yield for the reservoir would be approximately 106 cfs (66 mgd).

Because the validity of the reservoir yield estimate using data from the 1975 USGS Reservoir Evaluation is unknown, a simple spreadsheet model, set-up using a daily time step methodology, was also used to estimate the safe yield. This model also provided flexibility to test various reservoir operating rules, including minimum release practices. Reservoir inflows through basin runoff were assumed to equal the daily stream flow records for Rockfish Creek near Hope Mills, NC. The period of record for this gage station includes April 1929 to December 1931 and March 1939 to December 1954. It was assumed that 25% of the total storage volume of 27,000 acre-feet would be storage reserve to account for the following:

- More severe drought conditions than modeled
- Future storage losses through sedimentation
- Protection of raw water quality
- Protection of fisheries
- Some protection of recreational use.

Net evaporation was estimated using 10 inches/year for net evaporation from the reservoir surface to simulate dry year conditions. At this evaporation rate, the net evaporation during drought conditions is estimated to be 1.0 mgd. Seepage losses were estimated to be 3 mgd based on data provided in the Cumberland County Preliminary Siting and Reservoir Feasibility Study.

Based on the above assumptions, the safe yield was estimated assuming three minimum reservoir releases. In the first case, the minimum reservoir release was set at 0 mgd to compare the safe yield projected by the model to the safe yield estimated using the USGS methodology. The resulting safe yield estimate for this scenario is 137 mgd, which is consistent with the 141 mgd safe yield projected by the USGS methodology.

The second and third scenarios considered the effects of various reservoir release schedules on the safe yield. In the second scenario, the minimum reservoir release was defined as the greater of two-thirds of the previous daily inflow or the 90% exceedance flow (116 cfs or 75 mgd). Figures 5-1 and 5-2 illustrate the results of this model run. As shown on Figure 5-1, at this release rate, the safe yield of the reservoir was estimated to be 38 mgd. For the third case, the minimum reservoir release was defined as the lesser of the previous daily inflow or the 50% exceedance flow (342 cfs or 221 mgd). This more stringent reservoir release schedule would significantly reduce the available yield to 14 mgd. These case scenarios highlight the sensitivity of the safe yield estimate to the minimum release schedule.

In its March 2, 2001 letter summarizing comments on PWC's December 2000 Draft Application, DWR stated that PWC should use the minimum release defined in the second scenario for purposes of the Jordan Lake Application, which would correspond to a safe yield of 38 mgd. If this alternative were developed in the future, a more site-specific study would be required to determine actual minimum releases.

In its March 2, 2001 comments, DWR asked if any existing reservoirs in Cumberland County could be utilized as an alternative water supply. There are several existing reservoirs in Cumberland County, including a reservoir on Little Rockfish Creek in the Town of Hope Mills (Hope Mills Lake) and a reservoir on Rockfish Creek (Upchurch Pond). Based on data in DWQ's Cape Fear River Basinwide Assessment Report, Hope Mills Lake has a volume of approximately 1,100 acre-feet (360 MG). Based on a surface area of 200 acres and an average estimated depth of between 5 and 12 feet, Upchurch Pond has an estimated volume of between 1,000 and 2,400 acre-feet (326 to 782 MG). In comparison to the new reservoir alternative, which has a total storage volume of 27,000 acre-feet (8,800 MG), both of these existing reservoirs are more than an order of magnitude smaller in volume. Based on this evaluation, it is concluded that existing reservoirs in Cumberland County would not be large enough to provide an adequate supply to PWC.

FIGURE 5-1

SIMULATED ROCKFISH CREEK RESERVOIR STORAGE HISTORY (MAR 1939 - DEC 1954)

Demand = 38 MGD; Minimum Release = Greater of 2/3 of Previous Daily Inflow or 90% Exceedance Flow

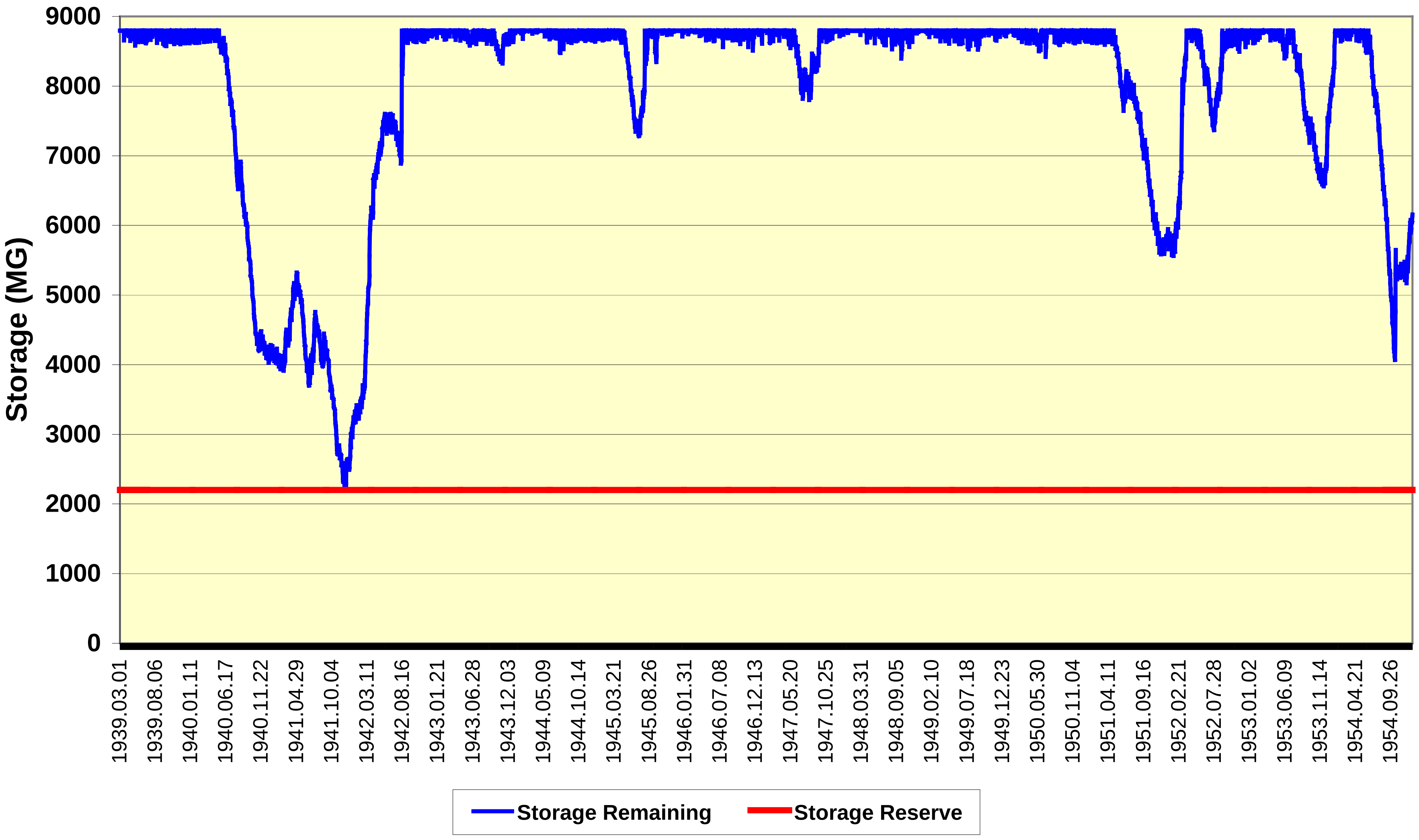
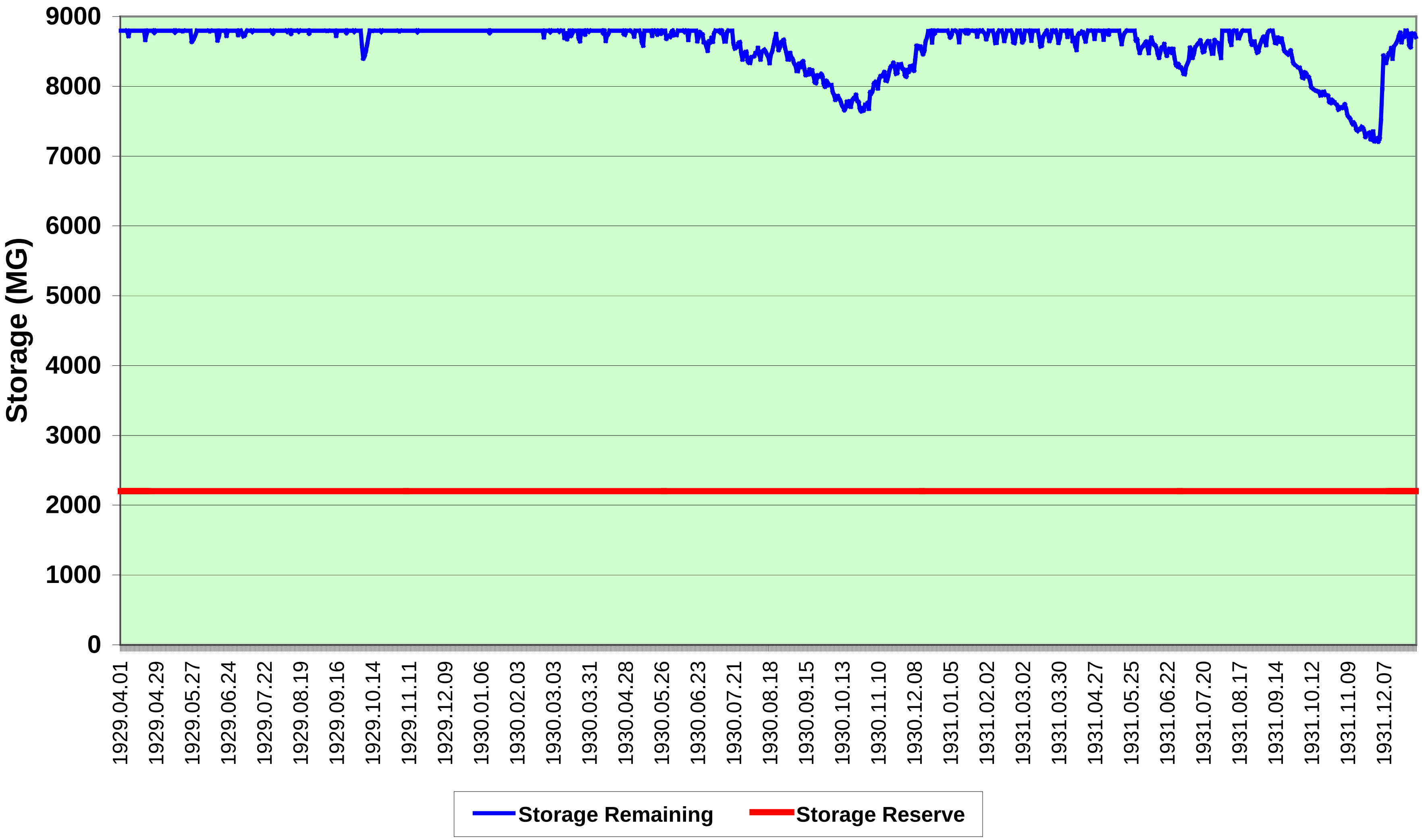


FIGURE 5-2

SIMULATED ROCKFISH CREEK RESERVOIR STORAGE HISTORY (APR 1929 - DEC 1931)

Demand = 38 MGD; Minimum Release = Greater of 2/3 of Previous Daily Inflow or 90% Exceedance Flow



Interbasin Transfer from the Lumber River Basin

This alternative considers supplementing PWC's existing raw water supply by transmission of raw water from another river basin. The closest surface water source to PWC that is not part of the Cape Fear River Basin is the Lumber River Basin. The Neuse River is the closest surface water source east of Fayetteville, but it is located substantially farther away from the PWC service area than the Lumber River. It is estimated that this alternative would require installation of approximately 33-miles of transmission line along the I-95 corridor between Fayetteville and the town of Lumberton. Because the Lumber River is not flow regulated, allowable withdrawals would be constrained by low-flow (drought) conditions. The closest available flow data for the Lumber River is a gage station located near Maxton, NC. At this station, the Lumber River is reported to have 365 mi^2 of drainage area. Based on flow data from 1987 through 1999, the lowest daily mean flow and annual 7-day minimum flow at this gage station were reported to be 75 cfs (1999) and 79 cfs (1999), respectively. Much lower flows probably occurred at this station in 1968, based on lower flows reported at another gage station in Boardman, NC (68 cfs lowest daily mean flow and 72 cfs annual 7-day minimum flow) with a significantly larger drainage area of 1,228 mi^2. These flows are so low that substantial drawdown would occur to satisfy PWC's demand. In addition, parts of the Lumber River, located both upstream and downstream of the proposed withdrawal location, have been designated, based on recommendations from the National Park Service, as a National Wild and Scenic River System. In addition, the Lumber River has also been designated by the State as a North Carolina Natural and Scenic River. As such, excessive drawdown would be unacceptable to preserving the river's scenic designation. For these reasons, the Lumber River is not considered a viable water supply option for the PWC.

Interbasin Transfer from Reservoir Located on Yadkin-Pee Dee River

In addition to siting a new reservoir, the PWC has also investigated transferring raw water from existing reservoirs located on the Yadkin-Pee Dee River. Although there are multiple reservoirs located on the Yadkin-Pee Dee River, only the more closely located reservoirs were considered for PWC. There are three consecutive reservoirs that are part of the Yadkin Chain lakes that are located west of the PWC service area. These reservoirs include:

- Badin Lake on the Yadkin River (farthest upstream).
- Lake Tillery on the Pee Dee River.
- Blewett Falls Lake on the Pee Dee River (farther downstream).

All three of these reservoirs are large impoundments used by either Carolina Power and Light (CP&L) or Yadkin, Inc. for power generation. Table 5-1 shows reported hydrologic data for the three reservoirs.

TABLE 5-1
HYDROLOGIC DATA FOR YADKIN CHAIN LAKES[1]

Reservoir	Drainage Area (sq. miles)	Total Capacity (acre-ft)	Usable Capacity (acre-ft)	Surface Area (acres)
Badin Lake	4,180	241,000	129,000	5,350
Lake Tillery	4,600	167,000	136,000	5,264
Blewett Falls Lake	6,830	97,000	42,500	2,570

[1]Data from NC Water Resources Data Report (USGS, Water Year 1999) and the 1998 Yadkin-Pee Dee River Basinwide Water Quality Management Plan.

Transmission of additional water supply from any of these reservoirs would require installation of a new raw water intake, pump stations, and a transmission line between Fayetteville and the reservoir. Of the three reservoirs, Blewett Falls is the closest to Fayetteville and would require the least linear footage of transmission line. It is estimated that a transmission line between Fayetteville and Blewett Falls would require installation of approximately 70 miles of transmission line. Because almost all of Montgomery County east of Badin Lake and Lake Tillery is designated as national forest, routing of a raw water transmission line to these reservoirs would be more difficult in comparison to routing to Blewett Falls. To avoid routing the transmission line through the national forest, an additional 20 to 40 miles of transmission line would be required to reach Badin Lake or Lake Tillery above the 70 miles of transmission line required to reach Blewett Falls.

Based on available location and potential environmental and institutional impacts, Blewett Falls Lake appears to be the most favorable reservoir on the Yadkin-Pee Dee River for PWC to use as a supplemental raw water supply. Therefore, a preliminary evaluation of reservoir and stream data was performed to determine if Blewett Falls Lake would have sufficient storage to support the withdrawal rates the PWC would likely need. Based on USGS data (Water Years 1928 – 1999) for the Pee Dee River near Rockingham, NC, the following data were reported for the Pee Dee River just downstream of Blewett Falls Dam:

- 6,863 mi^2 of drainage area.
- Lowest daily mean flow: 58 cfs (1951).
- Annual 7-Day minimum flow: 185 cfs (1985).
- 90% exceedance flow: 1,750 cfs.

As shown in Table 5-1, Blewett Falls Lake has 31.6 billion gallons (97,000 acre-ft) of total storage volume and 13.8 billion gallons (42,500 acre-ft) of usable volume. In addition, based on stream flow data, flows just downstream of the dam exceed 1,131 mgd (1,750 cfs) 90% of the time. The large storage buffer of the lake should provide ample supply for the periods when extreme low flow events occur. Even with minimum inflows to the lake, 13.8 billion gallons would provide hundreds of days of supply at the withdrawal rate that PWC would likely need. Therefore, it can be concluded that Blewett Falls Lake is large enough to provide adequate supply to PWC, even during periods of minimum inflow to the lake.

Because use of Blewett Falls Lake would be considered an IBT, two sub-alternatives will be evaluated in the alternatives analysis. The first will consider only transferring raw water from Blewett Falls Lake to the P.O. Hoffer WTF. The second sub-alternative will also include a second transmission line for returning wastewater treatment effluent back to the Pee Dee River Basin to minimize impacts of the IBT.

Groundwater Sources

This alternative consists of pumping groundwater from local aquifers to supplement the Cape Fear River raw water surface supply. In evaluating groundwater supplies, two main issues must be addressed. First, the aquifers must provide an adequate safe yield to support the water demand. Second, the new wells must not result in a significant drawdown of groundwater levels in regional aquifer formations.

In 1997, the PWC performed a preliminary ASR evaluation. The results from this evaluation are documented in a Preliminary Engineering Report, *Implementation of an Aquifer Storage and Recovery System* (Hazen and Sawyer, 1997). As part of this evaluation, local hydrogeologic conditions were evaluated. Supporting data for the following groundwater evaluation are provided in the ASR evaluation.

Fayetteville is situated 50 miles east of the western border of the North Carolina Coastal Plain. The two main aquifer formations located in the vicinity of the Fayetteville area are the Black Creek aquifer and the Cape Fear aquifer. From the 1997 Fayetteville hydrogeologic evaluation, it was concluded that the local hydrogeologic framework is highly variable and that most of the aquifers in the PWC service area are low yielding. The three main aquifers in the PWC service area include the surficial sand aquifer, the Cretaceous sand aquifer (which includes the Black Creek Aquifer), and the Cretaceous clay aquifer. Although the surficial aquifer is permeable, because of the relative thinness of this aquifer, sustainable yields from this aquifer are less than 50 gpm (0.072 mgd). The Cretaceous sand aquifer is the most productive aquifer in the Cumberland County area and is capable of achieving yields in excess of 100 gpm (0.144 mgd). In its 1992 Local Water Supply Plan, the Town of Spring Lake reported 24-hour yields of 142 gpm (0.205 mgd) and 172 gpm (0.247 mgd) for its two regularly operated groundwater wells in the Black Creek Aquifer. The Cretaceous clay aquifer, the least productive of the three aquifers, generally achieves yields of less than 20 gpm (0.029 mgd).

Parts of the North Carolina Coastal Plain, particularly the central and eastern sections, have experienced substantial decreases in potentiometric surfaces of several aquifers in areas where the groundwater demand exceeds the demands. A 1991 USGS Simulation of Ground Water Flow in the Coastal Plain Aquifer System on North Carolina indicated that, based on existing well systems, drawdowns in the western part of the Black Creek and Upper Cape Fear aquifers in the vicinity of the PWC service area are not substantial. However, it is unknown what a substantial increase in the groundwater pumping system would have on the groundwater aquifers in the western region of the Coastal Plain.

In summary, based on local hydrogeologic conditions in the Fayetteville area, groundwater yields are too low to support long-term water supply needs for the PWC. In addition, it is unclear what a substantial increase groundwater demand in the western region of the North Carolina Coastal Plain would have on regional drawdowns, particularly when central and eastern sections of the regional aquifers are already showing evidence of depletion.

Offstream Storage in Local Quarry

In 1998, the PWC performed a site feasibility study for a raw water impoundment for the P.O. Hoffer Plant (CDM, 1998) for water quality management. One of the potential storage sites was an existing water quarry owned by the City of Fayetteville and located about two miles north of the P.O. Hoffer WTF near the west bank of the Cape Fear River. The quarry was reported to have a surface area of 12 acres and an average depth of 10 feet. Based on these values, the total storage capacity of this quarry is 120 acre-ft or 39 million gallons. This quarry was ultimately eliminated as a potential raw water storage impoundment for several reasons, including the fact that the quarry was being considered for an alternative use and the quarry was found to under the direct influence of groundwater.

A preliminary evaluation of other quarries in Cumberland County was performed to identify potential sites for offstream raw water storage. Based on information from NC DENR's Division of Land Resources' 1999 mine location maps and data tables for North Carolina, two large, inactive sand/gravel quarries were found to be located south of Fayetteville within a few miles of the Cape Fear River. These quarries included Holmes Pit, a 39.6 acre quarry and W.J. Construction Company Pit, a 18.5 acre quarry. A detailed feasibility analysis would need to be conducted to confirm the storage volume and assess the suitability of these quarries for raw water storage. An initial evaluation, however, indicates that these quarries would provide small storage volumes (on the order of less than 100 to 200 million gallons) that would be capable of providing only a few days of supply to PWC during low flow periods. Therefore, it is concluded that there is not a local quarry large enough to store a large enough supply to justify this option as a long-term water supply alternative.

Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) is the injection and storage of potable water in the ground for later retrieval. A preliminary ASR evaluation was performed for the PWC and is reported in a Preliminary Engineering Report titled, *Implementation of an Aquifer Storage and Recovery System* (Hazen and Sawyer, 1997). Results from this evaluation indicated that insufficient hydrologic data were available to determine the aquifer storage capacity. In addition, yield capacity for existing wells were found to be highly variable throughout the Fayetteville service area, ranging from low yields of less than 20 gpm to higher, more productive yields of greater than 100 gpm. Results from this investigation also indicated that permitting for ASR would be difficult. In addition, it was found that injection of treated surface water into the aquifers could result in several potentially negative geochemical reactions, including dissolution of iron and precipitation of iron hydroxides and potential swelling of clays. For these reasons, ASR is not at this time considered a viable long-term water supply option for PWC.

Non-Potable Reuse

Non-potable reuse, or water reclamation, is the use of highly treated wastewater to satisfy non-potable demands for water. Potential non-potable water users in the PWC service area include large industrial users and the PWC co-generation facility. The PWC has not formally evaluated the feasibility of implementing a wastewater reclamation and reuse program within the service area. Based on a review of the industries within the PWC service area and their associated water consumption and wastewater discharge data, M.J. Soffe Company, a textile manufacturer, appears to have the largest non-potable industrial water demand (greater than 700,000 gallons per day). In order to implement non potable reuse, PWC would have to upgrade one of its wastewater treatment facilities to include advanced wastewater treatment. At a minimum, effluent filtration would need to be installed to reduce effluent total suspended solids concentrations to levels suitable for non-potable reuse.

Another potential non-potable reuse candidate would be PWC's co-generation facility. This facility uses a non-contact cooling tower, that during full-operation, uses approximately 1,200 gallons per minute of PWC water. Because this facility is an emergency generation facility, it only operates during peak demand periods. Therefore, reuse at this facility would only help to reduce peak water demands, assuming that peak energy demand periods coincide with peak water demands. Evaluation of cooling tower operations, however, indicates that a tertiary treated effluent would significantly reduce the cycles of concentration that can be achieved in the cooling tower and would overall increase the cooling tower make-up water demand. Therefore, reuse at the this facility would not be beneficial.

A preliminary evaluation of reuse alternatives indicates that the water demand savings that would be achieved by reuse at current industries would not be substantial enough to be considered an alternative water supply option. However, with the potential for future industrial growth in the PWC service area, more opportunities for reuse may arise in the future. Therefore, it would be beneficial for the PWC to conduct reuse evaluations for new industries that develop in the PWC service area.

Bulk Water Purchase

As the primary purveyor of water to Cumberland County, the PWC is the only significant water supplier in the Fayetteville region. Harnett County, located upstream of the PWC, is the second largest water supplier in the neighboring counties. However, Harnett County also relies on the Cape Fear River for its raw water supply. As supported by its Round 2 Jordan Lake Water Supply Allocation Request of 12 mgd, Harnett County, like the PWC, also projects the need for additional water supply beyond its current allocation. In the September 2000, Round 2 Jordan Lake Water Supply Storage Allocation and IBT Recommendations, DWR did not recommend granting any additional water supply storage allocation to Harnett County. This decision was based on DWR's projection that Harnett County would still have a 19-mgd supply surplus in 2015. However, it should be noted that the 2015 supply surplus was based on substantially reducing the County's demand projections and maintaining the 600 ±50 cfs minimum target flow at the Lillington gage station on the Cape Fear River. Because flows at Lillington have frequently dropped below the minimum target, Harnett's "surplus" is considered uncertain at this time. In addition, given that Harnett County is waiting for analysis of available Cape Fear River supply to be completed, bulk water purchase from Harnett County is not considered a feasible alternative for the PWC.

5.2 COMPARISON OF FEASIBLE ALTERNATIVE WATER SUPPLIES

Based on the above analysis of potential alternative water supply options for the PWC, feasible long-term water supply options were identified that could be used to supplement PWC's existing surface water supply. Based on the feasibility analysis, the following water supply options were considered for further evaluation:

- Jordan Lake Allocation (via Cape Fear River Withdrawal Facilities).
- New Reservoir in Cumberland County.
- Blewett Falls Lake.

Table 5-2 provides a summary of the alternatives evaluation. A discussion of the evaluation criteria is provided below.

Available Supply

All three water supply alternatives would provide a large enough water supply to be considered a stand-alone water supply option for providing a supplemental water supply to PWC.

As explained previously, the U.S. Army Corps of Engineers has estimated that the safe yield of the Jordan Lake water supply pool is approximately 100 mgd. If DWR's recommendations for the Round 2 Jordan Lake Water Allocation are implemented, then 44 mgd of the 100 mgd Jordan Lake supply would be allocated. Based on these numbers, the maximum available unallocated supply would be 56 mgd. To protect the yield of Jordan Lake for water supply and water quality purposes, the current rules limit allocations that will result in diversions out of Jordan Lake's watershed to 50 percent of the 100 mgd estimated total water supply yield, or 50 mgd. This provision is specific to the Lake's watershed because water returned below the dam does not replenish the reservoir's water supply and water quality pools.

The total estimated diversion out of the Lake's watershed, based on 2015 demand projections and DWR's recommended Round 2 allocation amounts, is 28 mgd of the total recommended allocation of 44 mgd. This leaves 22 mgd of the water supply storage still available for future allocations outside the Lake's watershed under the current 50 mgd limit. An allocation for PWC would have to come out of that 22 mgd remaining supply. While the PWC is requesting a supply allocation, the amount of this allocation cannot be determined at this time since PWC's deficit projections cannot yet be made. Therefore, the total available supply for this alternative is shown in Table 5-2 as 22 mgd.

Based on data from NC Water Resources Data Report (USGS, Water Year 1999), Blewett Falls Lake has a usable capacity of approximately 13.8 billion gallons (42,500 acre-ft). Based on this usable capacity and stream data just down stream of the reservoir, it is estimated that Blewett Falls Lake would be capable of providing a supplemental water supply in excess of 30 mgd even during sustained low-flow periods.

As described in Section 5.1, the safe yield for the Cumberland County reservoir alternative is estimated to be 38 mgd based on an assumed minimum release defined as the greater of two-thirds of the previous daily inflow or the 90% exceedance flow (116 cfs or 75 mgd).

Environmental Impacts

Of the three alternatives, the Cape Fear River withdrawal facilities expansion would have the least environmental impact. Expansion of the Cape Fear River withdrawal facilities would only require

TABLE 5-2
EVALUATION OF WATER SUPPLY ALTERNATIVES FOR FAYETTEVILLE PUBLIC WORKS COMMISSION

Evaluation Criteria	Alternative 1: Jordan Lake (via Cape Fear River Withdrawal Facilities)	Alternative 2: New Reservoir in Cumberland County	Alternative 3a: Interbasin Transfer - Blewett Falls Lake (with no return)	Alternative 3b: Interbasin Transfer - Blewett Falls Lake (with wastewater effluent return)
Total Supply (mgd)	22	38	>30	>30
Environmental Impacts	Low	High	Moderate	Moderate
Water Quality Classification	WS-IV	WS-IV	WS-IV and B	WS-IV and B
Timing	< 2 years, once allocation granted	10-20 year planning horizon	10 years	10 years
Interbasin Transfer (mgd)	TBD[1]	TBD[1]	TBD	TBD
Regional Partnerships	No	Yes	Yes	Yes
Technical Complexity	Not Complex	Very Complex	Complex	Complex
Institutional Complexity	Not Complex	Very Complex	Very Complex	Very Complex
Political Complexity	Not Complex	Very Complex	Very Complex	Very Complex
Public Benefits (Besides Water Supply)	None	Many	None	None
Consistency with Local Plans	Yes	TBD	TBD	TBD
Relative Cost[2]	Low	High	High	High

TBD: To be determined.
[1]Because small portions of Cumberland County are located outside the Cape Fear River Basin (in the Lumber River Basin and South River Basin), some consumptive losses would be expected to occur outside the Cape Fear River Basin. These consumptive losses would constitute an interbasin transfer if the total exceeded 2 mgd. However, the quantities cannot be quantified until the PWC's available supply is determined.
[2]Capital and unit costs will be completed for the final application.

installation of new pumps to increase the design and firm pumping capacity and minor modifications to existing transmission lines. No in-stream construction would be required.

Siting of a Cumberland County reservoir near Hope Mills would significantly impact wetlands and also will result in flooding of existing roadways, farmlands, forest and residential sites, including a cemetery and golf-course. Of the three likely alternatives, siting of a new reservoir would have the most significant environment impacts and would likely require preparation of an extensive environmental impact statement.

The environmental impacts of using Blewett Falls Lake as a raw water source are considered moderate in comparison to the other two alternatives. This alternative would require construction of a raw water intake, pumping stations, and an approximate 70-mile transmission line. An environmental assessment or environmental impact statement would be required to determine the impacts of this alternative. Since this alternative would result in substantial transfer of water from the Yadkin-Pee Dee River Basin to the Cape Fear River Basin, an IBT certificate would also be required.

Water Quality Classification

All potential alternative water supply sources are classified as WS-IV, which is the same classification as all existing raw water sources for PWC.

Timing

The Cape Fear River withdrawal facilities expansion could be implemented in a very short period (less than two years), once an allocation is granted. Conversely, siting of a reservoir would require a significantly longer planning period. The permitting period alone for a new reservoir can require in excess of 10 years for some reservoirs. Therefore, it was assumed that the new reservoir alternative would require between a 10 and 20 year planning horizon. CP&L's FERC license for Blewett Falls Lake is up for reissuance in 2008. The planning period for the license renewal is five years. The proposed interbasin transfer would be an integral part of the license renewal process. The total time to permit and implement the Blewett Falls Lake alternative is estimated to be on the order of 10 years given the FERC re-licensing schedule.

Interbasin Transfer

As previously discussed, the majority of Cumberland County and eastern Hoke County lie within the Cape Fear River Basin, and PWC discharges its treated wastewater effluent to the Cape Fear River Basin. Therefore, continued PWC use of Jordan Lake releases via Cape Fear River withdrawals would probably not result in significant interbasin transfer (IBT). In addition, because the Cumberland County reservoir would be supported by a tributary of the Cape Fear River Basin, this alternative would also likely not result in significant IBT. The only alternative that would result in significant IBT would be transmitting water from Blewett Falls Lake. Even if wastewater effluent were discharged back to the Blewett Falls Lake, some IBT would occur. The IBT quantities could not be estimated since these values are dependent on PWC's yet unquantified deficit. Once the available PWC supply is known, and the deficits are determined, then the IBT quantities can be estimated for this alternative.

Regional Partnerships

While no regional partnerships would be organized as part of the Cape Fear withdrawal expansion, a regional partnership with Cumberland County and local governments would be an integral part of developing a Cumberland County Reservoir on Rockfish Creek. In addition, if Blewett Falls Lake were used as a supplemental raw water supply, then tie-ins to the transmission line could be coordinated with other regional communities.

Technical, Institutional, and Political Complexity

As explained in Section 5.1, expansion of Cape Fear River withdrawals by PWC beyond what is considered the “available supply” at Fayetteville could require a Jordan Lake water supply allocation. Apart from the allocation, this alternative would be considered the easiest to implement technically and institutionally. Because the expansion would require minimal upgrades (installation of new pumps), no disturbance to the river is expected.

Siting and development of a Cumberland County Reservoir is considered technically, institutionally, and politically very complex. Planning for this reservoir would require coordination with several state and federal agencies to complete the required environmental impact studies. In addition, zoning and permitting would require cooperation with the local authorities (particularly the Town of Hope Mills), the County, and the State.

Use of Blewett Falls Lake is considered complex from a technical viewpoint, given the long distance of the transmission line. Environmental impact studies would require coordination will several state and federal agencies. In addition, an interbasin transfer certificate would be required from the EMC. Therefore, this alternative is considered institutionally and politically very complex.

Public Benefits

Of the three alternatives, the Cumberland County reservoir is the only alternative that would provide additional public benefits beyond the addition of raw water supply for the PWC service area. The reservoir alternative would be sized to provide recreational benefits in addition to water storage.

Consistency with Local Plans

Continued use of Cape Fear River withdrawals is consistent with Fayetteville area plans. However, for the other two alternatives, this information will be provided in the final application once PWC’s deficit projections are known and alternatives can be appropriately sized and evaluated in more detail.

Cost

Detailed construction and operating costs were not developed for the draft application. However, relative project costs are compared. Of the three alternatives, the Cape Fear River withdrawal facilities would be the most cost effective and would be expected to be a fraction of the cost of the other alternatives. Conversely, the cost for developing a Cumberland County Reservoir would be substantial (tens of million dollar investment). The costs of installing a 70-mile transmission line from Blewett Falls Lake to the

PWC water system would also be substantial (i.e., several orders of magnitude higher) in comparison to expansion of Cape Fear River withdrawal facilities.

5.3 ALTERNATIVES SUMMARY

As described in the above alternatives analysis, the Cape Fear River is the most favorable and viable water supply for the Fayetteville PWC. Other alternatives (Cumberland County Reservoir on Rockfish Creek and Blewett Falls Lake) would require significantly longer planning horizons, development of environmental impact statements, significant mitigation of environmental impacts (Cumberland County Reservoir alternative) and major capital investments. In addition, the continued use of the Cape Fear River would minimize the need for potential IBT for the PWC service area. The PWC currently relies on the Cape Fear River for its raw water source, and analysis of long-term water supply alternatives indicates that the PWC should continue to use the Cape Fear as its major raw water source.

6.0 PLANS TO USE JORDAN LAKE

The PWC is requesting a supply allocation from the Jordan Lake water supply pool to meet long-term water demands. Because the current water supply available to PWC is contingent upon finalizing a Cape Fear River available supply policy along with associated results from on-going water quality modeling efforts, the quantity of the allocation request cannot be determined for this revised draft application.

If PWC were granted an allocation, the raw water would be withdrawn from the existing Cape Fear River intakes. Upgrades to the existing PWC withdrawal facilities would be minimal and would be limited to installation of new pumps to increase the design and firm capacity and possible minor modifications to existing transmission lines.

Since PWC would continue to make use of Cape Fear River withdrawals, rather than direct withdrawals from Jordan Lake, monitoring of Jordan Lake water quality would not be necessary to establish raw water quality suitability for PWC. However, all raw and finished water that PWC uses from the Cape Fear River Basin are and will continue to be monitored in accordance with the EPA and NC DENR regulations. PWC operates the Cross Creek laboratory, which is a state certified laboratory capable of performing most of the required raw and finished water quality monitoring. Analysis of parameters for which the laboratory is not certified is contracted out to various environmental testing laboratories.

Attachment 1

Fayetteville PWC
Local Water Supply Plan Update

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

LOCAL WATER SUPPLY PLAN for JORDAN LAKE ALLOCATION APPLICATION 2000-2001
Part 1: Water Supply System Report for Calendar Year 2000

Completed By: Malcolm Pirnie, Inc. Date: May 29, 2001

SECTION 1: GENERAL INFORMATION

1-A. Water System: Public Works Commission of the City of Fayetteville 1-B. PWS Identification #: 03-26-010

1-C. River Sub-Basin(s): Cape Fear River (Upper)

1-D. County(s): Cumberland

1-E. Contact Person: M. J. Noland, P.E. Title: Chief Operating Officer, Water Resources Division

1-F. Mailing Address: P.O. Box 1089 CITY Fayetteville, NC ZIP 28302-1089

1-G. Phone: (910) 223-4733 1-H. Fax: (910) 829-0207 1-I. E-mail: mick.noland@faypwc.com

1-J. Type of Ownership (Check One): ⊗ Municipality County Authority District Non-Profit Association For-Profit Business State Federal Other__________________

SECTION 2: WATER USE INFORMATION

2-A. Population Served in 2000 Year-Round ____178,200__

Seasonal (if applicable) _____N/A_____ For Months of _________N/A____________________

2-B. Total Water Use for 2000 including all purchased water: ____9,749_____ Million Gallons (MG)

2-C. Average Annual Daily Water Use in 2000: _____26.6_____ Million Gallons per Day (MGD)

2-D. List 2000 Average Annual Daily Water Use by Type in Million Gallons per Day (MGD): (Water use based on Fiscal Year 2000: July 1999 – June 2000)

	Metered Connections		Non-Metered Connections		Total
Type of Use	Number	Average Use (MGD)	Number	Estimated Average Use (MGD)	Average Use (MGD)
(1) Residential	63,850	14.0	-	-	14.0
(2) Commercial	4,710	4.70	-	-	4.70
(3) Industrial	14	3.88	-	-	3.88
(4) Institutional	-	-	-	-	-
				(5) Sales to other Systems	0.58
				(6) System Processes	1.79
				(7) Subtotal [sum (1) thru (6)]	25.0
				(8) Average Annual Daily Water Use [Item 2-C]	26.6
				(9) Unaccounted-for water [(8) - (7)]	1.6

2-E. List the Average Daily and Maximum Dy Water Use by Month for 2000 in Million Gallons per Day (MGD):

	Average Daily Use	Maximum Day Use	Max/Ave Ratio		Average Daily Use	Maximum Day Use	Max/Ave Ratio		Average Daily Use	Maximum Day Use	Max/Ave Ratio
Jan	21.597	25.703	1.190	May	31.210	37.825	1.212	Sep	24.080	28.328	1.176
Feb	21.194	25.229	1.190	Jun	30.115	35.828	1.190	Oct	24.430	27.469	1.124
Mar	22.324	25.175	1.128	Jul	27.201	30.849	1.134	Nov	23.512	27.136	1.154
Apr	23.201	26.563	1.145	Aug	26.306	30.868	1.173	Dec	22.256	24.779	1.113

2-F. List the system's 10 Largest Water Users and their Average Annual Daily Use in Million Gallons per Day (MGD) for 2000: (include sales to other systems)

Water User	Average Daily Use	Water User	Average Daily Use
M.J. Soffe	1.44	Kelly Springfield Tire	0.27
Cape Fear Feed Products	0.81	Black & Decker	0.22
Town of Spring Lake	0.57*	Borden Packaging	0.198
Cargill	0.32	National Linen	0.18
PWC Generation Plant	0.28	Purolator Products	0.18

*In 2001, a new water meter was installed for the Town of Spring Lake. The new meter reported 1.2 mgd service to Spring Lake.

2-G. WATER SALES TO OTHER WATER SYSTEMS IN 2000 List all systems that can be supplied water through existing interconnections (regular and emergency). Mark the locations of connections on the System Map.

1 Water supplied to:		2 Average Daily Amount		3 Contract Amount		4 Pipe Size(s)	5* R or E
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	
Fort Bragg	03-26-344	-	0	3.02	Indefinite	16	E
Town of Spring Lake	03-26-020	0.58*	365	0.4	Annually	16	R

***NOTE** Column 5 **R=**Regular Use, **E=**Emergency Use

*In 2001, a new water meter was installed for the Town of Spring Lake. The new meter reported 1.2 mgd service to Spring Lake

2-H. What is the Total Amount of Sales Contracts for Regular Use? 0.40 MGD

SYSTEM NAME Public Works Commission of the City of Fayetteville PWSID 03-26-010

SECTION 3: WATER SUPPLY SOURCES

3-A. SURFACE WATER List surface water source information. Mark and label locations of intakes on the System Map.

1 Name of Stream and/or Reservoir	2 Drainage Area	3 Is Withdrawal Metered?	4 Sub-Basin	5 Average Daily Withdrawal for days used		6 Maximum Day Withdrawal	7* Available Supply		8* System Component Limiting Daily Output		9 Useable On-Stream Raw Water Supply Storage Million Gallons	10* R or E
	Square Miles	Y / N		MGD	# of Days	MGD	MGD	Qualifier	Capacity MGD	System Component		
Cape Fear River – 1	4,360	Y	03-06-15	17.3	365	26.9	TBD	F	40[1]	T	0	R
Cape Fear River – 2	4,360	Y	03-06-15	10.6	117	14.6	TBD	F	18	T	0	R
Glenville Lake	9.41	Y	03-06-15	8.6	249	20.4	5	SY20/50	18	T	50	R
Big Cross Creek	15.1	N	03-06-15	-	-	-	0.9	F	1.5	R	0	R
TBD: To be determined.							TBD	Totals	58			

[1]**Design capacity increase from 32 mgd to 40 mgd for the Hoffer WTF has been conditionally approved by the State.**

***NOTES** Column 7 Supply Qualifiers: **C=**Contract amount, **SY20=2**0-year Safe Yield, **SY50=**50-year Safe Yield, **F=**20% of 7Q10 or other instream flow requirement, **T=**Treatment plant capacity, O=Other (specify) ______

Column 8 Component: **R=**Raw water pumps, **T=**Treatment facilities, **M=**Transmission main, **D=**Distribution system, **O=**Other (specify)______

Column 10 **R=**Regular Use, **E=**Emergency Use

3-B. What is the Total Surface Water Supply available for Regular Use? _TBD_ MGD

3-C. Does this system have off-stream raw water supply storage? ⊗ No Yes Useable Capacity ____________ Million Gallons

3-D. WATER PURCHASES FROM OTHER WATER SYSTEMS IN 2000
List all systems that can supply water to this system through existing interconnections (regular and emergency). Mark the locations of the connections on the System Map.

1 Water supplied by:		2 Average Daily Amount		3 Contract Amount		4 Pipe Size(s)	5* R or E
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	
N/A							

***NOTE** Column 5 **R=**Regular Use, **E=**Emergency Use

3-E. What is the Total Amount of Purchase Contracts available for Regular Use? ____0____MGD (Do not include emergency use connections in total)

SYSTEM NAME ___Public Works Commission of the City of Fayetteville___ PWSID ____03-26-010____

3-F. GROUND WATER List well information. ***Mark and label the location of all wells on the System Map.***

1 Name or Number of Well	2 Well Depth	3 Casing Depth	4 Screen Depth		5 Well Diameter	6 Pump Intake Depth	7 Is Well Metered?	8 Average Daily Withdrawal for Days Used		9 Maximum Day Withdrawal	10 12-Hour Supply	11* System Component Limiting Daily Output		12* R or E
	Feet	Feet	Top Feet	Bottom Feet	Inches	Feet	Y / N	MGD	# of Days	MGD	Million Gallons	Capacity MGD	System Component	
N/A														

***NOTES** Column 11 Component: **R=**Raw water pumps, **T=**Treatment facilities, **M=**Transmission main, **D=**Distribution system, **O=**Other (specify)______________________________________
Column 12 **R=**Regular Use, **E=**Emergency Use

3-G. What is the Total 12-Hour Supply of all wells available for Regular Use? _______N/A_____ million gallons

3-H. Are ground water levels monitored? No Yes How often? ______________________________

3-I. Does this system have a wellhead protection program No Yes Under development

SYSTEM NAME ___Public Works Commission of the City of Fayetteville____________________ PWSID _____03-26-010________

3-J. WATER TREATMENT PLANTS List all WTPs, including any under construction, as of 12/31/2000. ***Mark and label locations on the System Map***.

Water Treatment Plant Name	Permitted Capacity MGD	Source(s)
Glenville Lake Water Treatment Facility	18	Cape Fear River, Glenville Lake, and Big Cross Creek
P.O. Hoffer Water Treatment Facility	40	Cape Fear River

3-K. What is the system's finished water storage capacity? ________36______ Million Gallons

SECTION 4: WASTEWATER INFORMATION

4-A. List Average Daily Wastewater Discharges by Month for 2000 in Million Gallons per Day (MGD)

	Average Daily Discharge		Average Daily Discharge		Average Daily Discharge		Average Daily Discharge
Jan	25.0	Apr	23.3	Jul	23.4	Oct	23.4
Feb	27.6	May	22.9	Aug	23.8	Nov	22.9
Mar	24.8	Jun	23.2	Sep	23.9	Dec	21.6

4-B. List all Wastewater Discharge and/or Land Application Permits held by the system. ***Mark and label points of discharge and land application sites on the System Map***.

1 NPDES or Land Application Permit Number	2 Permitted Capacity Dec. 31,2000 MGD	3 Design Capacity MGD	4 Average Annual Daily Discharge MGD	5 Name of Receiving Stream	6 Sub-Basin	7 Maximum Daily Discharge MGD
NC0023957	22 mgd	25 mgd	11.7 mgd	Cape Fear River	03-06-15	19.2 mgd
NC0050105	14 mgd	14 mgd	10.6 mgd	Cape Fear River	03-06-15	16.0 mgd
NC0000527	N/A	N/A	1.45 mgd	Cape Fear River	03-06-15	2.54 mgd

SYSTEM NAME ___Public Works Commission of the City of Fayetteville___ PWSID ___03-26-010___

4-C. List all Wastewater Discharge Connections with other systems. Mark and label the locations of connections on the System Map.

1 Wastewater Discharger		2 Wastewater Receiver		3 Average Daily Amount Discharged or Received		4 Contract Maximum
Name	PWSID	Name	PWSID	MGD	# of Days	MGD
N/A						

4-D. Number of sewer service connections: 52,891

4-E. Number of water service connections with septic systems: 12,573______ (Number in Sub-basin 1 12,573 Number in Sub-basin 2 ____ Number in Sub-basin 3 ____)

4-F. Are there plans to build or expand wastewater treatment facilities in the next 10 years? No ⊗Yes Please explain. Cross Creek WRF will be expanded to 25 mgd upon completion of construction upgrades in March 2001. Rockfish WRF is undergoing a multi-phase expansion. Phase I upgrades are expected to be completed in March 2001 and will increase the capacity to 16 mgd. Phase II construction, which will expand the Rockfish WRF to 21 mgd, is estimated to start in January 2002 and would be completed by 2005.

SECTION 5: WATER CONSERVATION and DEMAND MANAGEMENT ACTIVITIES

5-A. What is the estimated total miles of distribution system lines? __1,102_ miles

5-B. List the primary types and sizes of distribution lines:

	Asbestos Cement (AC)	Cast Iron (CI)	Ductile Iron (DI)	Galvanized Iron (GI)	Polyvinyl Chloride(PVC)	Other
Size Range	2 in – 16 in	4 in – 30 in	4 in - 48 in	2 in	2 in – 16 in	
Estimated % of lines	21%	23%	22%	1%	33%	

5-C. Were any lines replaced in 2000? No ⊗ Yes ___17,192__ linear feet

5-D. Were any new water mains added in 2000? No ⊗ Yes ___128,894__ linear feet

5-E. Does this system have a program to work or flush hydrants? No ⊗ Yes How often? Annually, or as needed

5-F. Does this system have a valve exercise program? No ⊗ Yes How often? Annually___________

SYSTEM NAME ___Public Works Commission of the City of Fayetteville___________________ PWSID _____03-26-010_______

5-G. Does this system have a cross-connection control program? No ⊗ Yes

5-H. Has water pressure been inadequate in any part of the system? ⊗ No Yes Please explain. Customers are guaranteed 20 psi at the meter.

5-I. Does this system have a leak detection program? ⊗ No Yes What type of equipment or methods are used? ____________

5-J. Has water use ever been restricted since 1992? ⊗ No Yes Please explain. There have not been any mandatory restrictions. There have been infrequent water conservation requests due to drought conditions.

5-K. Does this system have a water conservation plan? No ⊗ Yes Please attach a copy.

5-L. Did this system distribute water conservation information in 2000? No ⊗ Yes

5-M. Are there any local requirements on plumbing fixture water use which are stricter than the NC State Building Code? ⊗ No Yes Please explain. ____________

5-N. Does this system have a program to encourage replacement or retrofit of older, higher water-use plumbing fixtures? ⊗ No Yes

5-O. Does this system have a water shortage or drought response plan? No ⊗ Yes Please attach a copy.

5-P. Is raw water metered? No ⊗ Yes

5-Q. Is finished water output metered? No ⊗ Yes

5-R. Do you have a meter replacement program? No ⊗ Yes

5-S. How many meters were replaced in 2000? 3,500-4,000 meters

5-T. How old are the oldest meters in the system? 30 years

5-U. What type of rate structure is used? Decreasing Block Flat Rate Increasing Block Seasonally Adjusted ⊗Other Increasing block – residential; flat rate for commercial and industrial customers.

Attach a detailed description of the rate structure to this document.

5-V. Are there meters for outdoor water use, such as irrigation, which are not billed for sewer services? No ⊗ Yes # of meters 3,852

5-W. Does this system use reclaimed water or plan to use it within the next five years? ⊗ No Yes # of connections _______ ; ________ MGD

SECTION 6: SYSTEM MAP

Review, correct, and return the enclosed system map Check Plot to show the present boundaries of the water distribution system service area, points of intake and discharge, wells, water and wastewater treatment facilities, and water and wastewater interconnections with other systems. Also, show any proposed points of intake or discharge, wells, water and wastewater facilities, water and wastewater interconnections, and future service area extensions. Use symbols shown on the attached map.

LOCAL WATER SUPPLY PLAN for JORDAN LAKE ALLOCATION APPLICATION 2000-2001
Part 2: Water Supply Planning Report

Completed By: Malcolm Pirnie, Inc. Date: May 29, 2001

WATER SYSTEM: Public Works Commission of the City of Fayetteville PWSID: 03-26-010

SECTION 7: WATER DEMAND PROJECTIONS

7-A. Population to be Served	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Year-Round	178,200	210,370	243,160	278,310	315,840	355,740	402,480	423,810	445,140	466,470	487,800
Seasonal (if applicable)*	No	0	0	0	0	0	0	0	0	0	0

*Please list the months of seasonal demand: _____N/A_____ Attach a detailed explanation of how projections were calculated (See Section 1 of Application).

Table 7-B. Projected Average Daily Service Area Demand in Million Gallons per Day (MGD). (Does not include sales to other systems)
Sub-divide each water use type as needed for projecting future water demands.

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Residential	14.0	15.9	17.8	19.8	22.0	24.3	27.0	27.9	28.8	29.7	30.6
(2) Commercial	4.7	5.4	6.0	6.7	7.3	8.0	8.8	9.2	9.7	10.2	10.6
(3) Industrial	3.9	5.5	7.7	9.9	11.9	13.8	15.8	17.6	19.5	22.1	24.6
(4) Institutional											
(5) System Processes	1.9	2.2	2.6	3.0	3.5	3.9	4.4	4.7	5.1	5.5	5.8
(6) Unaccounted-for water	1.4	1.7	2.0	2.3	2.6	3.0	3.3	3.6	3.8	4.1	4.4
(7) Total Service Area Demand [sum (1) thru (6)]	25.9	30.6	36.1	41.7	47.3	53.0	59.4	63.0	67.0	71.5	76.0

7-C. Is non-residential water use expected to change significantly through 2050 from current levels of use? No ⊗ Yes
If yes, please explain; Commercial growth will occur through expansion of PWC Service Area. In addition, Industrial growth is anticipated to occur in Cumberland County over the next 50 years.

Table 7-D. FUTURE SUPPLIES List all new sources or facilities which were under development as of December 31, 2000 and mark locations on the System Map.

Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply MGD	Development Time years	Year Online
N/A							

***NOTE** **R=**Regular Use, **E=**Emergency Use

7-E. What is the Total Amount of Future Supplies available for Regular Use? ___0_ MGD

Table 7-F. FUTURE SALES CONTRACTS that have been already agreed to. List new sales to be made to other systems.

1 Water supplied to:		2 Contract Amount and Duration			3 Pipe Size(s) Inches	4* R or E
System Name	PWSID[1]	MGD	Year Begin	Year End		
Hoke County	03-47-10 03-47-30, 03-47-35, 03-47-25	0.2	2005	Indefinite	8	R

***NOTE** **R=**Regular Use, **E=**Emergency Use

[1]Because Hoke County does not operate as an integrated system, several PWSID's have been assigned throughout the County. As the current Water Sale Agreement with Hoke County does not specify which area of Hoke County would be served, several potential service areas are listed.

7-G. What is the total amount of existing Future Sales Contracts for Regular Use? ____0.2_____ MGD

SECTION 8: FUTURE WATER SUPPLY NEEDS

Local governments should maintain adequate water supplies to ensure that average daily water demands do not exceed 80% of the available supply. Completion of the following table will demonstrate whether existing supplies are adequate to satisfy this requirement and when additional water supply will be needed.

Table 8-A. AVERAGE DAILY DEMAND AS PERCENT OF SUPPLY Show all quantities in MGD.

Available Supply, MGD		2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Existing Surface Water Supply	(Item 3-B)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(2) Existing Ground Water Supply	(Item 3-G)	0	0	0	0	0	0	0	0	0	0	0
(3) Existing Purchase Contracts	(Item 3-E)	0	0	0	0	0	0	0	0	0	0	0
(4) Future Supplies	(Item 7-E)	0	0	0	0	0	0	0	0	0	0	0
(5) **Total Available Supply**	[sum (1) thru (4)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Average Daily Demand, MGD												
(6) Service Area Demand	(Item 7-B, Line 7)	25.9	30.6	36.1	41.7	47.3	53.0	59.4	63.0	67.0	71.5	76.0
(7) Existing Sales Contracts	(Item 2-H)	0.4	0.4	0.4	-	-	-	-	-	-	-	-
(8) Future Sales Contracts	(Item 7-G)	0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
(9) **Total Average Daily Demand**	[sum (6) thru (8)]	26.3	31.2	36.6	41.9	47.5	53.2	59.6	63.2	67.2	71.7	76.2
(10) Demand as Percent of Supply	[(9) / (5)] x 100	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(11) **Supply Needed to maintain 80%**	**[(9) / 0.8] - (5)**	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Additional Information for Jordan Lake Allocation												
(12) Sales Under Existing Contracts		0.6	0.6	0.6	-	-	-	-	-	-	-	-
(13) Expected Sales Under Future Contracts		0	0.2	1.0	1.7	2.5	3.2	4.0	4.7	5.5	6.2	7.0
(14) Demand in each planning period	[(6)+(12)+(13)]	26.5	31.4	37.7	43.4	49.8	56.2	63.4	67.7	72.5	77.7	83.0
(15) Supply minus Demand	[(5) - (14)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TBD indicates "to be determined".

8-B. Does Line 10 above indicate that demand will exceed 80% of available supply before the year 2030? No Yes - TBD
If yes, your Jordan Lake Water Supply Storage Allocation Application should include the following items:

SYSTEM NAME __Public Works Commission of the City of Fayetteville__________ PWSID ___30-26-010___

(1) Alternatives for obtaining additional water supply to meet future demands. Use the following tables to summarize the various future water supply alternatives available to your system. Attach a detailed description of each water supply project shown in each alternative. The sooner the additional supply will be needed, the more specific your plans need to be.

(2) A demand management program to ensure efficient use of your available water supply. A program should include: conducting water audits at least annually to closely monitor water use; targeting large water customers for increased efficiency; modifying water rate structures; identifying and reducing the amount of leaks and unaccounted-for water; and reusing reclaimed water for non-potable uses.

(3) Restrictive measures to control demand if the additional supply is not available when demand exceeds 80% of available supply, such as placing a moratorium on additional water connections until the additional supply is available or amending or developing your water shortage response ordinance to trigger mandatory water conservation as water demand approaches the available supply.

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#1) – Jordan Lake Allocation (via Cape Fear River Withdrawal Facilities)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(2) Available supply from Project 1 (Jordan Lake – Available Supply)	0	22	22	22	22	22	22	22	22	22	22
Available supply from Project 2	0	0	0	0	0	0	0	0	0	0	0
Available supply from Project 3	0	0	0	0	0	0	0	0	0	0	0
(3) Supply available for future needs [(1) + (2)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(4) Total discharge to Source Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(5) Consumptive Use in Source Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(6) Total discharge to Receiving Basin	0	0	0	0	0	0	0	0	0	0	0
(7) Consumptive Use in Receiving Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(8) Amount not returned to Source Basin [(6) + (7)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Note: TBD indicates "to be determined".

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation (via Cape Fear River Withdrawal Facilities)	N/A	Surface Water	03-06-15	WS-IV	22	< 2 years	TBD

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#2)Cumberland County Reservoir on Rockfish Creek	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(2) Available supply from Project 1 (describe)	0	0	0	0	38	38	38	38	38	38	38
Available supply from Project 2 (describe)	0	0	0	0	0	0	0	0	0	0	0
Available supply from Project 3 (describe)	0	0	0	0	0	0	0	0	0	0	0
(3) Supply available for future needs [(1) + (2)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(4) Total discharge to Source Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(5) Consumptive Use in Source Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(6) Total discharge to Receiving Basin	0	0	0	0	0	0	0	0	0	0	0
(7) Consumptive Use in Receiving Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(8) Amount not returned to Source Basin [(6) + (7)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Note: TBD indicates "to be determined".

List details of the future supply options include in this alternative in the table below.

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Cumberland County Reservoir on Rockfish Creek	N/A	Surface Water	03-06-15	WS-IV	38	10 – 20 years	2020

Attach additional pages as needed to summarize all alternatives.

-

-Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#3) – Blewett Falls Lake	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(2) Available supply from Project 1 (describe)	0	0	0	>30	>30	>30	>30	>30	>30	>30	>30
Available supply from Project 2 (describe)	0	0	0	0	0	0	0	0	0	0	0
Available supply from Project 3 (describe)	0	0	0	0	0	0	0	0	0	0	0
(3) Supply available for future needs [(1) + (2)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(4) Total discharge to Source Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(5) Consumptive Use in Source Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(6) Total discharge to Receiving Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(7) Consumptive Use in Receiving Basin	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(8) Amount not returned to Source Basin [(6) + (7)]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Note: TBD indicates "to be determined".

List details of the future supply options include in this alternative in the table below.

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Blewett Falls Lake	N/A	Surface Water	03-07-10	WS-IV & B	>30 mgd	10 years	2015

Attach additional pages as needed to summarize all alternatives.

8-C. Are peak day demands expected to exceed the water treatment plant capacity by 2010? ⊗ No Yes
If yes, what are your plans for increasing water treatment capacity?

8-D. Does this system have an interconnection with another system capable of providing water in an emergency? ⊗No Yes If not, what are your plans for interconnecting (or please explain why an interconnection is not feasible or not necessary).
Fayetteville PWC is the primary purveyor of water in Cumberland County. Harnett County is the second largest supplier in nearby areas. However, bulk water purchase from Harnett County is not considered a feasible alternative for PWC for the reasons outlined in PWC's May 2001 Revised Draft Application for a Jordan Lake Allocation.

8-E. Has this system participated in regional water supply or water use planning? No ⊗ Yes Please describe. In 2000, PWC and Cumberland County jointly initiated a rural water feasibility study for Cumberland County and updated water system master plan for PWC.

8-F. List the major water supply reports or studies used for planning. Draft Technical Memorandum entitled PWC Water Master Plan and Cumberland County Rural Water Study: Water Demands and Preliminary Rural Water District Evaluation (Camp Dresser and McKee, May 2001), Water Supply Master Plan (CDM, December 1995); Cumberland County Preliminary Siting and Reservoir Feasibility Study (Geometrics Engineering, January 2000); Implementation of an Aquifer Storage and Recovery System, Preliminary Engineering Report (Hazen and Sawyer, May 1997); Site Feasibility Study for the P.O. Hoffer Raw Water Impoundment (CDM, July 1998)

SYSTEM NAME Public Works Commission of the City of Fayetteville PWSID 30-26-010

SECTION 9: TECHNICAL ASSISTANCE NEEDS

Is technical assistance needed:

9-A. to develop a local water supply plan? ⊗ No Yes

9-B. with a leak detection program? ⊗ No Yes

9-C. with a demand management or water conservation program? ⊗ No Yes

9-D. with a water shortage response plan? ⊗ No Yes

9-E. to identify alternative or future water supply sources? ⊗ No Yes

9-F. with a capacity development plan? ⊗ No Yes

9-G. with a wellhead or source water protection plan? ⊗ No Yes

9-H. with water system compliance or operational problems? ⊗ No Yes

9-I. with Consumer Confidence Reports? ⊗ No Yes

9-J. Please describe any other needs or issues regarding your water supply sources, any water system deficiencies or needed improvements (storage, treatment, etc.), or your ability to meet present and future water needs. Include both quantity and quality considerations, as well as financial, technical, managerial, permitting, and compliance issues.

As discussed in the introductory letter of the draft Jordan Lake Water Supply Allocation Application, an analysis of available supply from the Cape Fear River is currently on-going. The results from this analysis will establish PWC's total available water supply, and, in turn, determine its future water supply deficiencies. Until this analysis is completed, predictions cannot be made on PWC's future water supply needs.

Appendix A

Existing
Fayetteville PWC Service Area Map

Appendix B

PWC Local Water Shortage Response Ordinance

Appendix C

Fayetteville PWC Water Rate Structure

Attachment 2

Correspondence Regarding Water Demands and Sales to the Town of Spring Lake and Hoke County