APPENDIX A

B. Everett Jordan Dam and Lake
Cape Fear River Basin, NC
DROUGHT CONTINGENCY PLAN
Updated May 2008

EXHIBIT B

B. EVERETT JORDAN LAKE
CAPE FEAR RIVER BASIN, NORTH CAROLINA
DROUGHT CONTINGENCY PLAN
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INTRODUCTION

The purpose of this report is to (1) provide a platform from which to make decisions on implementation of water conservation measures during future droughts, (2) review the operational flexibility of the Jordan Water Control Plan in a drought, and (3) address the potential problems associated with an extreme drought. A severe drought in the Cape Fear River basin develops over a fairly long period of time and may have a typical duration of 6-12 months. However, the severe drought which climaxed in 2002 may have begun as early as 1996. Adequate time will be available to plan specific details of a drought operation. Therefore, this plan is an outline of water management measures and coordination actions to be considered when a severe drought occurs. Details of particular water management measures and the timing of their application will be determined as the drought progresses. This plan is part of the Water Control Manual for B. Everett Jordan Dam and Lake.

BACKGROUND

Usually, the demand for water is the greatest when the natural supply is the least. Jordan Lake has been drawn below elevation 210 feet, MSL on four separate occasions since completion of permanent impoundment on February 4, 1982. (Normal level is 216 ft, MSL). During this time period, no water supply withdrawals were made. The only releases were for water quality needs downstream. Table 1 shows the minimum lake elevation for each year since inception of the project.

These elevations indicate that the 1980's decade was a dry period. The potential for a serious drought did exist in 1983, 1986, and 1988 due to the time of year and the minimum elevation that occurred.

TABLE 1

Minimum Elevation at Jordan Lake since Permanent Impoundment

Calendar Year	Date	Elevation (ft. MSL)
1982	September 28	213.95
1983	October 23	208.85
1984	November 28	212.55
1985	November 3	213.25
1986	November 12	207.85
1987	November 26	210.60
1988	August 29	210.23
1989	September 16	215.63
1990	October 10	209.59
1991	December 26	212.69
1992	October 29	213.80
1993	November 26	210.80
1994	October 13	214.75
1995	August 26	214.87
1996	July 23	215.18
1997	October 18	213.65
1998	December 8	210.31
1999	August 24	212.56
2000	December 15	212.95
2001	December 31	210.89
2002	August 24	209.87
2003	September 14	215.88
2004	March 22	215.76
2005	November 20	212.13
2006	August 30	215.34
2007	October 24	210.19

Historical surface water use(in 1987) by municipalities and industries downstream of Jordan Dam as tabulated by the U. S. Geological Survey is provided in table 2. This table illustrates that the required water supply is signifigant and will likely continue to increase.

TABLE 2

Cape Fear River Basin Water Supply Users below Jordan Dam

Municipality	Source of Supply	Amount of Withdrawal MGD	Population (1987) Served
Vass	Little River	0.14	900
Carthage	Nicks Creek	0.26	1,500
Sanford	Cape Fear River	3.34	18,000
Northeast Metro Water District (Harnett Co.)	Cape Fear River	0.75	5,000
Dunn	Cape Fear River	2.35	9,450
Fayetteville	Cape Fear River	16.25	118,604
Fort Bragg	Little River	7.94	121,828
Wilmington	Cape Fear River	9.72	52,000

Industry	Source of Supply	Average Annual Withdrawal in MGD(1987)
Chembond Corp.	Haw River	0.22
Honeywell	Haw River	0.32
Moncure Fiberboard Plant	Shaddox Creek	0.34
Sanford Group	Several Ponds	0.08
Elliott Gravel Pit	Several Ponds	0.20
Burlington Industries Erwin Plant	Cape Fear River	2.0
Dupont (Cumberland Co.)	Cape Fear River	9.0
Monsanto (Cumberland Co.)	Cape Fear River	1.3
Cape Fear Feed Products	Cape Fear River	0.05
Federal Paper Board Co.	Cape Fear River	43.25
Wright Chemical Corp	Livingston Creek	0.2
Dupont (Brunswick Co.)	Cape Fear River	7.3
Occidental Chemical Corp.	Cape Fear River	0.29
Dixie Cement	Cape Fear River (2 intakes)	1.2

Lake access is available during periods of low lake levels. This is illustrated in table 3 which gives the bottom elevation of boat ramps at current and future access areas. The top elevation of boat ramps at Jordan Lake is approximately 227 feet MSL. However, operational experience during this period showed that recreational use of the lake began to suffer once the elevation fell below 212-213 feet MSL. Numerous complaints were received at both the Resource Manager's Office and Crosswinds Marina during low elevation periods primarily regarding shoals and navigational hazards within the lake. While the facilities at Crosswinds Marina were designed to function at elevations lower than what occurred, there was very little recreational use observed when Jordan Lake fell below elevation 212 feet MSL. While recreational use of the lake is significantly impacted at elevation 212 feet MSL and below, serious problems are also encountered at Crosswinds Marina once the elevation drops to 205.0

MSL. The problem at Crosswinds Marina is the bracings on the finger pier system which require approximately 6 feet of water to remain in place.

TABLE 3
Bottom Elevation of Public Boat Ramps at Jordan Lake
May 2008

Location	Lanes	Bottom of Ramp Elevation (ft. MSL)
Access Currently Available:		
Ebenezer	2 Lanes	202.0
	4 Lanes	206.0
Vista Point	2 Lanes	202.0
	2 Lanes	206.0
Parkers Creek	2 Lanes	210.0
Farrington	2 Lanes	202.0
	2 Lanes	206.0
	2 Lanes	208.0
Crosswinds Ramp	4 Lanes	212.0
	2 Lanes	202.0
Crosswinds Marina	2 Lanes	202.0
	2 Lanes	208.0
Poes Ridge	4 Lanes	210.0
Poplar Point	4 Lanes	210.0
Seaforth	3 Lanes	205.0
	3 Lanes	210.0
Crosswinds Campground	2 Lanes	207.0
Robeson Creek	2 Lanes	202.0
New Hope Overlook	2 Lanes	202.0
	4 Lanes	208.0

Note: All boat ramps were constructed prior to impoundment of Jordan Lake. The top elevation of all ramps is approximately 227 feet, MSL.

SUMMARY OF EXISTING WATER CONTROL PLAN

The authorized purposes of Jordan Lake are to provide for flood control, water supply, water quality control, recreation, and fish and wildlife conservation. The top of the conservation pool is at elevation 216.0 feet MSL. At that elevation, the mean depth of the lake is 15 feet and the maximum depth is about 66 feet. Allocated storages for Jordan Lake are shown in table 4.

TABLE 4

Storage Allocation

	Elevation (Ft. MSL)	**Area (Ac.)**	**Capacity/Jun85 (Ac-Ft)**
Top of flood control pool	240	31,811	753,560
Flood control storage	216-240		538,430
Top of conservation pool	216	13,942	215,130
Bottom of conservation pool	202	6,658	74,700
Conservation pool storage	202-216		140,430
Water Supply			45,810
Water Quality (Low Flow)			94,620
Sediment storage	155-202		74,700

The plan of operation for Jordan Lake project provides for maintaining a normal pool at elevation 216 feet MSL on a year round basis. This is accomplished during periods of normal flow by releasing inflow. During flood periods, releases are based on a combination of downstream flow conditions and lake levels to minimize flood damages downstream. During normal and low-flow conditions, flows are released to maintain a minimum target flow of 600 cubic feet per second (c.f.s.) at the Lillington gage with an allowable range of 550 to 650 c.f.s.. A minimum instantaneous flow of 40 c.f.s. is maintained immediately below the dam. The conservation pool storage is divided with 67.38 percent allocated for water quality releases downstream and 32.62 percent contracted by the State of North Carolina for water supply.

Regulation flexibility is very limited under existing authority. When the lake elevation is in the conservation pool, the project will be operated to meet water supply requirements and water quality low flow releases. The only available flexibility from a regulation viewpoint in this situation would be that the State of North Carolina water quality release requirements and/or water supply withdrawals.

Storage-use flexibility between the conservation and flood control pools is not a viable option within the guidelines authorizing the project. Flexibility within the conservation pool between water supply and water quality would have to be initiated and addressed by the State of North Carolina.

ANALYSIS OF DROUGHT OPERATION

Dry periods occur randomly during any time period. There is no major indicator to distinguish "normal" dry periods from severe droughts during the early stages. Conditions may vary depending on the time of year, length of time the lake is below elevation 216 feet MSL, and water supply and water quality requirements. However, a water budget (which will be generated and maintained by the Wilmington District) outlining water quality and water supply storage remaining will be used to initiate action.

The Drought Management Committee shall consist of the Wilmington District and other Federal agencies as required. Advisors to the committee will be representatives from the State of North Carolina and local governments. Coordination activities shall include but not be limited to initiation of the Drought Contingency Plan, alerting recreation interests within the lake, issuing forecasts of water supply and water quality storage remaining, implementing conservation measures, and making public information releases.

The Division of Water Resources with the Department of Environment and Natural Resources will act as the point of contact for the State of North Carolina, and as the responsible party for notifying all related concerned interests. The Operations Manager for Jordan Lake will be responsible for notifying all related concerned interests within the lake (marina operation, recreation use areas, etc.) of the current status, forecast of drawdown and for performing duties in conjunction with state agencies as described in the "Operational Management Plan" for B. Everett Jordan Lake. Wilmington District Water Management personnel shall prepare a water budget consisting of water supply, water quality storage remaining and a forecast of time remaining at the current usage rate for water quality and water supply. This forecast and water budget shall be updated as needed and furnished to the Operations Manager at Jordan Lake and the Director of Water Resources with the State.

Public press releases shall be made on an "as-needed" basis through the Public Affairs Office (PAO) in the Wilmington District. These statements shall provide the public with a full explanation of drought operations and forecasts of expected conditions in an effort to reduce inquiries from recreation and concerned interests.

A drought situation report for Jordan and other projects within the Wilmington District shall be prepared as appropriate by the Reservoir Regulation Section of the Wilmington District. This report shall provide detailed information on current and forecast situations for informational purposes of District and South Atlantic Division elements.

DROUGHT MANAGEMENT PLAN

This plan may be initiated by the Chief, Coastal, Hydrology and Hydraulics Section of the Wilmington District Corps of Engineers when the elevation at Jordan is below 216 ft., MSL. The Drought Management Plan focuses on waters contained in the conservation pool (202-216 ft, MSL) of Jordan Lake. The said conservation pool contains water to meet congressionally approved water supply and water quality purposes. The Drought Management Plan emphasizes increased coordination and consultation with stakeholders when either water supply or water quality pool storage declines to 80 percent remaining. Due to capacity and outflow requirements, the water quality pool is the controlling entity in management of drought releases.

The drought release schedule from Jordan Dam is listed in table 5 below.

Table 5: Drought Release Schedule

Drought Level	Water Quality Storage Remaining (%)	Jordan Dam Minimum Release* (cfs)	Jordan Dam Maximum Release (cfs)	Lillington Daily Average Flow Target (cfs)
0	>= 80	40+	600	600 +/- 50
1	60 – 80	40+	Lillington target	450 - 600 +/- 50
2	40 – 60	40+	Lillington target	300 - 450 +/- 50
3	20 – 40	40+	200+ *	None**
4	0 – 20	40+	100-200+ *	None**

* Water quality release plus any required downstream water supply releases.
** Lillington flow will be total of Jordan Dam release plus local inflow.

1. A water budget shall be initiated by the Wilmington District (retroactive to the date that the lake first dropped below elevation 216.0 feet MSL). The State of North Carolina shall be updated by the Wilmington District, U.S. Army Corps of Engineers, on a weekly basis regarding water quality and water supply storage remaining. Based on the budget and storage remaining the following operations from BE Jordan Dam and Lake will be taken:

A. Drought level 0: flow target at Lillington remains at 600 +/- 50 cfs
B. Drought level 1: flow target at Lillington ranges from 450 – 600 +/- 50 cfs
C. Drought level 2: flow target at Lillington ranges from 300 – 450 +/- 50 cfs
D. Drought level 3: no flow target set at Lillington. A maximum release rate of 200 cfs from BE Jordan Dam and Lake, plus any required downstream water supply releases.
E. Drought level 4: no flow target set at Lillington. A maximum release rate of 100-200 cfs from BE Jordan Dam and Lake, plus any required downstream water supply releases

Note that for drought levels 0-2, the flow target is a range of flow targets at Lillington. The range of flows result from collaboration and coordination on a variety of parameters such as stakeholder input, short and long term weather outlook, project gate status, influences on stream flows downstream, and local inflows to both Jordan Lake and reaches below the dam. In addition the minimal flows immediately below B. Everett Jordan Dam and Lake is 40 cfs for all drought levels.

Note that for drought level 3 – 4, no flow target is set for Lillington. The flow rate is a mostly constant release set from B. Everett Jordan Dam and Lake. Level 4 releases between 100-200 c.f.s. will be set based on consultation with the state of NC and other stakeholders. Temporary reductions can be made as long as flows at Lillington can be maintained at 300 c.f.s. or greater.

For all release modes listed, in table 5 above, the release operation will be made for a minimum of seven (7) days in conjunction with the monitoring of the river system, made by NCDWQ and other agencies.

Conversely, with increasing water quality storage, the sequence of operation will generally be reversed; however, consideration of limited watershed inflows, precipitation forecasts, or other factors with appropriate stakeholder consultation may warrant continued reduced flow targets at Lillington.

2. Once drought level 4 has passed and no water quality storage remains, the plan of action will depend on decisions that must be made by the State of North Carolina, since all storage within the conservation pool at Jordan Lake has been allocated to water supply and water quality. Potential alternatives available to the State of North Carolina once drought level 4 of the management plan has been met include, but are not limited to, the following:

a. Implement restrictive water use measures for personal and emergency use only (no water for lawns, gardens, pools, car washes, etc.)

b. Temporarily relax State standards for water quality requirements in the river below Jordan Lake to permit continued operation of industrial and municipal waste treatment facilities, and conserve remaining water quality storage.

c. Reallocate any surplus water supply storage for the duration of the drought to supplement water quality storage and/or provide relief in those areas of greatest need.

3. Should the elevation of Jordan Lake fall below lake elevation 202 ft, MSL or all water supply or water quality storage become depleted, potential alternatives include but are not limited to:

a. Emergency reallocation(s) by the Corps under PL 78-534 of remaining storage volume within the Sediment Pool.

b. Declaration by the State of North Carolina of a water emergency as authorized by G.S. 143-355.3. After a water emergency has been declared by the Governor, State of North Carolina, the Secretary, Department of Environmental and Natural Resources, can order emergency diversions to meet the essential water uses of water systems experiencing water shortage emergencies. The Division of Water Resources along with other agencies within the Department of Environmental and Natural Resources will assess water supply problems and recommend actions to the Secretary under this statute.

SELECTED FEDERAL EMERGENCY AUTHORITIES PROVIDING DROUGHT ASSISTANCE

The responsibility for providing an adequate supply of water to inhabitants of any area is basically non-Federal. Corps assistance to provide emergency water supplies will only be

considered when non-Federal interests have exhausted reasonable means for securing necessary water supplies, including assistance and support from other Federal agencies.

Assistance may be available from the Corps through PL 84-99 as amended by PL 95-51. Before Corps assistance is considered under PL 95-51, the applicability of other Federal assistance authorities should be evaluated. If these programs cannot provide the needed assistance, then maximum coordination should be made with appropriate agencies in implementing Corps assistance. The applicability of programs administered by the following Federal agencies, as a minimum, will be determined prior to consideration of Corps assistance.

1. Small Business Administration (SBA).

2. Farmers Home Administration (FmHA).

3. Economic Development Administration (EDA).

Corps Authority for Drought Assistance

The Corps authority for Drought Assistance is contained in Chapter 6, "Emergency Water Supplies and Drought Assistance" of Engineering Regulation 500-1-1 Natural Disaster Procedures (1983). Under this authority, the Chief of Engineers, acting for the Secretary of the Army, can construct wells and transport water to farmers, ranchers, and political subdivisions within areas he determines to be drought-distressed.