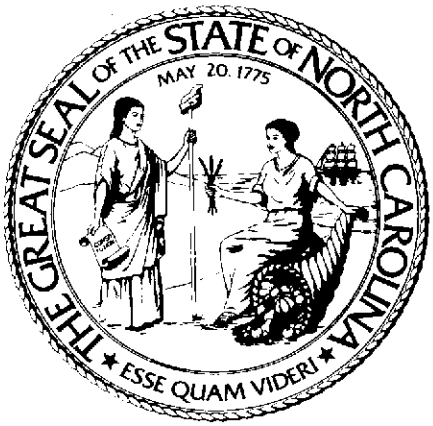
STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT

SANDHILLS
CAPACITY USE STUDY



RALEIGH, N. C.
JANUARY, 1979

State of North Carolina
Department of Natural Resources and Community Development
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S U M M A R Y R E P O R T

Moore County, particularly the Town of Southern Pines, is seeking additional water supply sources to meet forecasted requirements expected for the remainder of this century and into the twenty-first century. A number of alternatives have been identified. Some of these alternatives or a combination of these alternatives will meet the water supply needs for the Moore County area. However, the staff believes that downstream uses will be affected if water is withdrawn during drought conditions without adequate safeguards. Most alternatives involve the transfer of water from one basin to another. The establishment of such a system could unnecessarily set in motion trends that over the long range will cause water use conflicts. In other words, in the Moore County area, adequate water is currently available. However, unless it is used properly, conflicts between users and potential users will emerge. The potential problems become more evident when considering long range development.

Under the authority of the Water Use Act of 1967 (G.S. 143-215.11-22) the Environmental Management Commission may declare and delineate capacity use areas where it finds that the use of groundwater, surface water, or both require coordination and limited regulation for the protection of interests and rights of residents or property owners or for protection of the public interest. A capacity use area is defined as one where "...the aggregate uses of groundwater or surface water, or both, in or affecting said area (i) have developed or threaten to develop to a degree which require coordination and regulation, or (ii) exceed or threaten to exceed, or otherwise threaten or impair, the renewal or replenishment of such waters or any part of them." (G.S. 143-215.13(b)). The EMC may declare

and delineate capacity use areas in accordance with a set of seven procedures found in Section 13(c) of the Act. The first procedure describes the situation under which authorization to proceed with a capacity use investigation should be given:

> (1) Whenever the Environmental Management Commission believes that a capacity use situation exists or may be emerging in any area of the State, it may direct the Department to investigate and report to the Environmental Management Commission thereon.

The approximate location of this proposed Sandhills Area capacity use study area is shown on Plate A. The major towns within the area include Southern Pines, Aberdeen and Pinehurst. Drowning Creek and Little River are the two major drainage basins within this area.

The former basin covers an area of 307 square miles while the latter includes approximately 260. The average flow of Drowning Creek at the U.S. Highway 1 Bridge (Drainage area 178 square miles) is 263 cubic feet per second (cfs) or 170 million gallons per day (MGD) while the 7 day-10 year low flow (7Q10) is 43 cfs (28 MGD). The average flow of Little River near Mt. Pleasant (drainage area 259 square miles) is 315 cfs (204 MGD) while the 7Q10 is 21 cfs (14 MGD). The yields of wells in this area are moderate, ranging from about 75,000 to 350,000 gallons per day (gpd).

The Moore County 201 Planning Area, which includes the Towns of Southern Pines, Pinehurst and Aberdeen, plus several other smaller communities, is served by a new wastewater treatment plant that will discharge into Aberdeen Creek approximately one mile upstream from where it enters Drowning Creek.

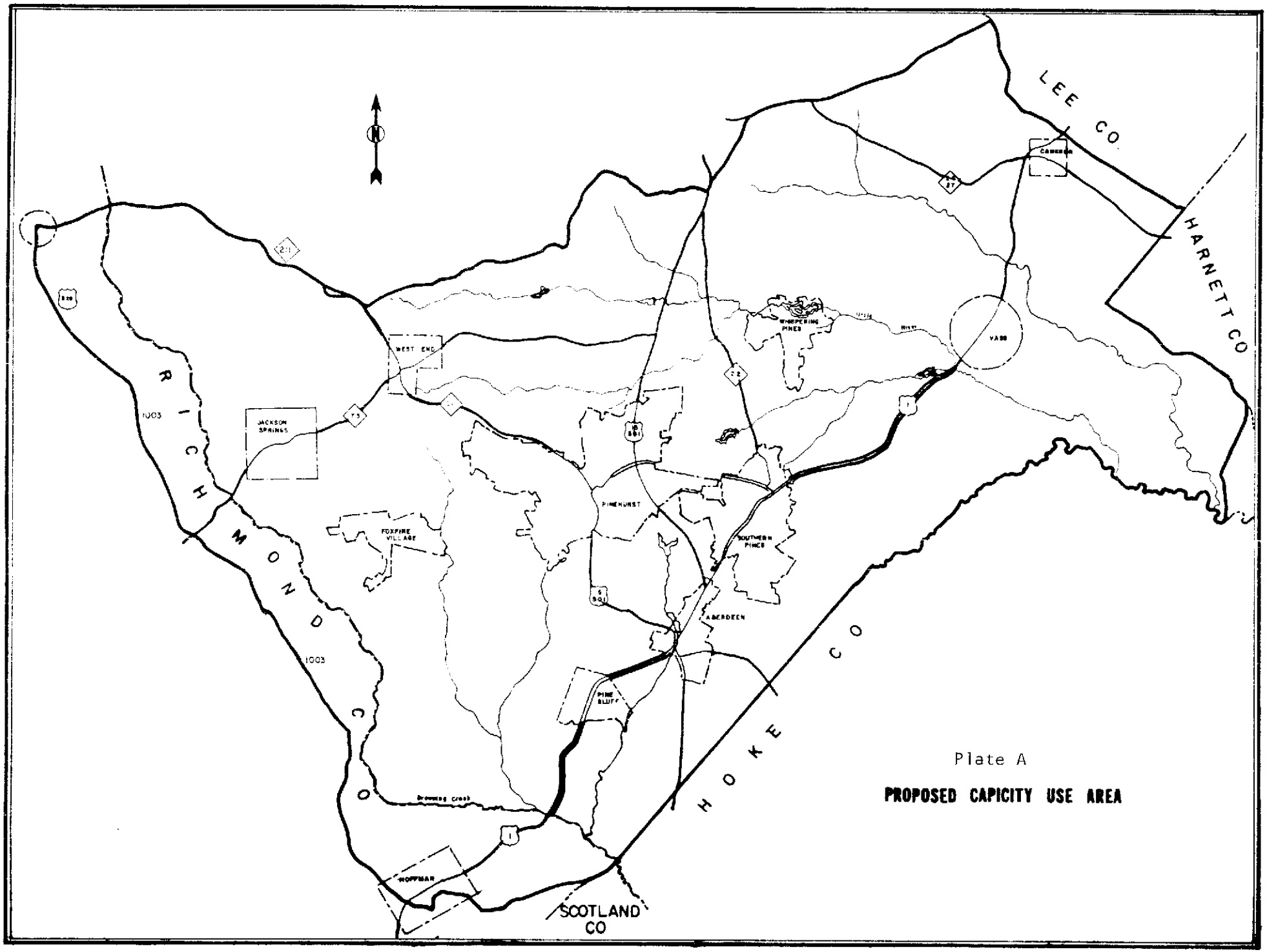


Plate A

PROPOSED CAPICITY USE AREA

A water supply withdrawal from Drowning Creek upstream from U.S. Highway 1 is being proposed for the City of Southern Pines and the region around it, including the Towns of Pinehurst, Aberdeen and Whispering Pines. The water use by these communities averaged approximately 2.6 MGD in 1976. The table following shows three preliminary sets of water use projections: the low is based on historical trends continuing into the future for the four communities; the high projection is based on accelerated growth in the Southern Pines region; and the county-wide includes the high projection plus the transfer of water to other communities in Moore County. (Note: Usage by communities in counties other than Moore is not included in these projections nor has usage for agriculture, self-supplied industrial or livestock been included.)

WATER USE PROJECTIONS
SANDHILLS AREA MUNICIPALITIES
(in MGD)

	1980	1990	2000	2010	2020
Low	3.1	4.2	6.0	8.7	12.6
High	5.0	8.6	12.2	15.7	19.1
County-wide	6.2	10.3	14.4	18.7	22.9

The engineers for Southern Pines have determined that when the water demand reaches 18 MGD, an impoundment should be built on Drowning Creek; until that point is reached only a low weir would suffice. The engineers also have investigated water supply alternatives on Little River, Nick's Creek, Mill Creek and James Creek, all in the Little River Basin.

In September, 1976 the Moore County Commissioners officially requested the EMC to reclassify Horse Creek and its tributaries and a segment of Drowning Creek from Horse Creek to U.S. Highway 1 Bridge from C to A-II.

Moore County was at that time planning to use these streams as sources of raw water for a county-wide water system. In April, 1977 the county bond issue that was to finance this project failed. As a result of the bond issue failure, further action on the Moore County request was suspended until the funding question was resolved. On December 2, 1977, however, the Division of Environmental Management received an unofficial request from the Town of Southern Pines to reclassify to A-II Drowning Creek and all its tributaries from approximately 1,000 feet above U.S. Highway 1 upstream to their sources. (Note: Since Drowning Creek and its tributaries are already classified A-II upstream of Horse Creek, this latter request is almost identical to the Moore County request.) As a result of this request, a water quality sampling program has been completed in the watershed, and the staff will be requesting authorization to proceed with public hearings at a future Commission meeting.

Capacity Use Investigation--Whether or not a capacity use situation exists or is emerging in the Sandhills area depends upon the answers to the following questions:

1. How will the proposed withdrawals affect the assimilative capacity in Drowning Creek below Aberdeen Creek and ultimately the effluent limitations placed on the Aberdeen Creek regional wastewater treatment plant?

2. Is there enough water in Drowning Creek to supply the projected water supply demands of Southern Pines and the surrounding area, and maintain sufficient low flows downstream?

3. What groundwater resources are available and to what extent could they meet the projected demands?

The Division of Environmental Management has investigated these questions and has consulted with all interested persons, groups and agencies, and as a result has prepared this report to the Environmental Management Commission. The report presents findings and recommendations concerning the water problems of the area.

Future municipal water supply requirements in the Pinehurst, Southern Pines, Aberdeen area, as determined by the Comprehensive Water Planning Branch, should increase from a current 2.5 million gallons per day (MGD) to about 10 MGD by the year 2020, an increase of 7.5 MGD. This estimate is based on a projected increase in the aggregate population served by these towns from about 13,400 in 1975 to about 35,000 in 2020. However, with extensive resort development, water use requirements could be over 26 MGD by the year 2020. This projection is speculative and may be considered the upper limit of water use in planning for water resource development in the next 40 years.

Although utilization of the area's groundwater resources as a source for expanding water supplies was not offered as an alternative in the Henningson, Durham & Richardson feasibility report, it should be seriously considered. Its dependability is evidenced by the high base flow of streams in the area. Base flow is defined as the streamflow sustained by groundwater discharge between rainfall events in the drainage basin. Base flow of streams in the Sandhills area is calculated to be equivalent to the average flow, or the flow equaled or exceeded 30 percent of the time. Groundwater discharge as base flow is estimated to be about 1.3 cubic feet per second per square mile; a value which suggests a high potential for development through properly located and designed well fields.

Our assessment of the area's groundwater resources indicates that groundwater sources are adequate to meet the immediate needs of the Sandhills region. Detailed groundwater studies of the area will be completed in 1979.

Drowning Creek and the Little River with its associated tributaries presently provides a high value fishery resource for Moore County and the region.

The past regime of water use as it has developed on these streams has produced a historic 7Q10 which has not adversely affected the fish species. The implementation of any alternative which will cause an extended 7Q10 flow condition can be expected to negatively impact the fishery resource.

The 7Q10 flows are not even considered adequate for fisheries. Extended low flow conditions will result in a reduction in fish habitat, concentration of pollutants, and an increase in water temperature. This will result in a lower year round carrying capacity and lower fish populations. The magnitude of this impact cannot be determined without further detailed study for each stream.

According to the staff of the Wildlife Resources Commission "Both Drowning Creek and Little River produce important fisheries resources and sustain wetlands of high value to wildlife.

"Data presented indicate that the area has sufficient water to support substantial growth but how this water is to be obtained, and released after use, could have a severely adverse impact upon fish and wildlife resources.

"Many of the alternatives proposed for meeting water supply needs appear to have a potential for strongly adverse impact upon fish and wildlife conservation in that no consideration has been given to sustaining stream flows sufficient to support endemic biota".

Each of the alternatives proposed have potentially severe impacts on the water resources of the area. The projects on the small streams in the Little River Basin utilizing reservoirs result in prolonged periods of flows equaling only the seven day 10 year flow (7Q10). Projects on these same streams without reservoirs result in reduced flows more often than currently expected. The table below provides a summary of these projects and an estimation of the length of drought period.

SUMMARY OF EFFECTS ON STREAMFLOWS IN THE LITTLE RIVER BASIN WHEN CONSIDERING PROPOSED WATER SUPPLY ALTERNATIVES FOR SOUTHERN PINES AND VICINITY

Reservoir Site (Drainage Area)	Average Flow (MGD)	USGS 7Q10 (MGD)	Total Draft (MGD)	Percent of Average Flow	Water Supply Draft (MGD)	Water Supply Storage (Ac-ft)	Length of Drought[1] (Days)
Little River (56 sq. mi.)	45.2	4.72	5	11.1	5*	0	-
			8.25	18.3	3.53	550	135
			22.7	50.2	17.08	6,440	360
Mill Creek (15.4 sq.mi.)	12.3	2.45	5.4	43.9	2.95	1,380	245
			6.2	50.4	3.75	1,800	295
Nicks Creek (26.6 sq.mi.)	22.0	2.26	8.0	36.4	5.74	1,410	290
			5.0	22.7	5.0*	0	-
			10.8	49.1	8.54	2,800	355
James Creek (20.0 sq.mi.)	16.8	2.71	5.8	34.5	3.09	1,110	175
			8.0	47.6	5.29	2,760	270

[1]Based on 20 year recurrence interval.

*No minimum release maintained below site.

On Drowning Creek, each of the alternatives propose an intake structure only with withdrawals ranging from 6 MGD to 30 MGD. Without a storage reservoir to maintain the 7Q10 during low flow periods the flows would be severely reduced causing problems with the proposed Aberdeen Creek waste treatment facility.

A reservoir on Drowning Creek to yield 30 MGD for water supply and 27.8 MGD for low flow releases would require storage of 5,000 acre-feet. The 7Q10 would be the only flow in the stream for approximately 175 days based on a 20 year drought. For an 18 MGD water supply yield, the storage required would be 2,147 acre feet and the 7Q10 be released for approximately 120 days.

The Aberdeen Creek regional wastewater treatment plant discharges to Aberdeen Creek approximately 1.4 miles above the confluence with Drowning Creek. At a design capacity of 6.7 MGD, the minimum dissolved oxygen concentration resulting from the wastewater discharge would occur in Drowning Creek approximately 4.0 miles below the confluence with Aberdeen Creek during low flow periods. For this reason, an analysis was performed to determine what effects the proposed withdrawal would have on the assimilative capacity of Drowning Creek and the resultant treatment requirements necessary to protect water quality in the affected portions of Drowning Creek. The analysis indicated that the existing 6.7 MGD regional wastewater treatment plant on Aberdeen Creek would be able to protect water quality in Drowning Creek even with a diversion of 6 MGD upstream. Increased withdrawals of water beyond 6 MGD will necessitate higher levels of treatment on the part of the Aberdeen Creek wastewater treatment plant in order to protect water quality standards in Drowning Creek; however, future expansions of the wastewater treatment plant to increase capacity in concert with increased

diversion flows to the water treatment plant can be designed to meet the more stringent effluent limits.

The withdrawal of 30.0 MGD from Drowning Creek will result in dry stream conditions in Drowning Creek between the proposed diversion site near U.S. Highway 1 and the confluence with Aberdeen Creek, a distance of approximately 1.8 miles. This would effectively preclude the designated use of that portion of Drowning Creek, namely, providing for the protection and propagation of fish and wildlife, as well as fishing, secondary recreation, and other uses. This is in violation of 40 CFR Section 130.17 Water Quality Standards which states in part in (c)(2) that "the State shall maintain those water uses which are currently being attained", and in (c)(3) "at a minimum, the State shall maintain those water uses which are currently designated in water quality standards...".

Relative to a proposed withdrawal in the Little River Drainage Basin from impoundments on Nick's Creek and on the Little River just below Nick's Creek and for minimum releases from those impoundments equivalent to the 7Q10 low flow, effluent limits for downstream dischargers will not change as a result of the impoundments. The first major wastewater discharge into the Little River (Ft. Bragg, Qw = 8.0 MGD) is approximately 36 miles below the proposed impoundment sites on Nicks Creek and on the Little River near Nick's Creek. The effects of prolonged periods of low flow on water quality over this great a distance has not as yet been determined, but certainly, water quality would be reduced, not only below wastewater discharges, but also in the intervening stream reaches between the impoundments and the discharge. While water quality may be reduced down to minimum acceptable levels, the designated best uses of the streams would be protected.

Based on our study, we believe the use of the water in this area will require coordination and limited regulation for protection of the public interest. The aggregate uses of water in this area have threatened to develop to a degree which requires coordination and regulation.

As such, the staff believes that a capacity use declaration is appropriate.

INTRODUCTION

The Sandhills Capacity Use Study was begun in early 1978 to evaluate the potential effects of proposed water supply alternatives for the Sandhills area. Both quantity and quality are addressed.

Description of Study Area

Location

The study area includes those parts of Moore, Hoke, Richmond, Scotland and Montgomery Counties lying within the Sandhills physiographic area and the drainage basins of Little River and Drowning Creek. The towns of Southern Pines, Pinehurst and Aberdeen lie at the center of the area. (The study area is comprised of that part of the Little River and Drowning Creek sub-basins lying within Moore County (Plate 1).)

Physiography

The Sandhills area lies at the inner margin of the Coastal Plain Physiographic Province. It is characterized by relatively flat-topped hills which range in altitude from about 600 feet on the west to about 250 feet on the east. The major streams are the Little River and Drowning Creek which flow generally eastward across the area in broad, well-defined valleys.

Climate

The study area is in the humid subtropical zone which prevails throughout the southeastern United States. This zone is characterized by long, hot, humid summers and relatively short mild winters. The growing season averages 214 days. Precipitation averages 50 inches per year with the majority of rainfall occurring during the summer months. Snowfall averages 4.3 inches per year. The humidity at 1:30 p.m. averages 50 percent

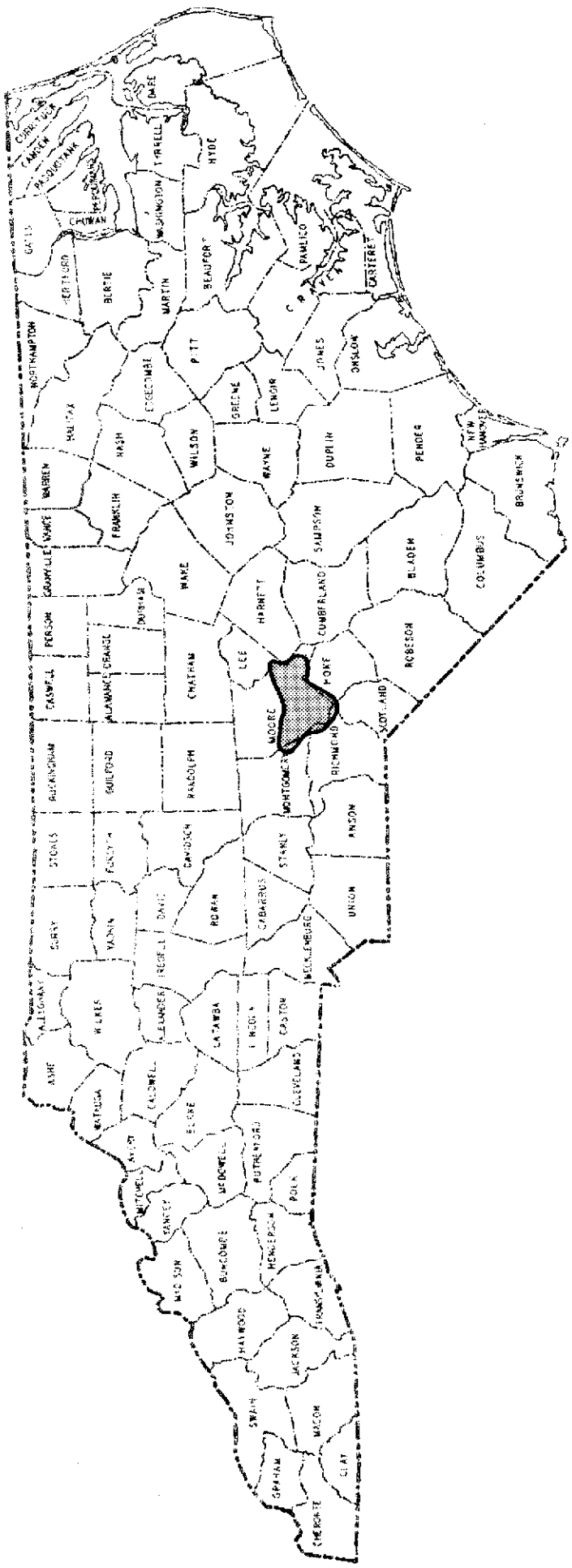


PLATE 1
SANDHILLS CAPACITY USE
STUDY AREA

for the whole year. Mean temperature is 61.6°F. Mean maximum and minimum temperatures are 73.4°F and 49.5°F, respectively. Average temperature range is 24.5°F. Clear skies prevail an average of 177 days per year while the skies are partly cloudy 92 days per year and cloudy 96 days per year.

Population and Economy

Major centers of population in the area are Southern Pines, Pinehurst, Aberdeen, Pine Bluff, Vass, and Whispering Pines.

The population of cities and towns within the study area, according to the 1970 census, and approximate 1977 maximum seasonal or service area population figures are:

	1970	1977 (max. seasonal)
Southern Pines	5937	9200
Pinehurst	1056	3000
Aberdeen	1592	2700
Vass	885	970
Whispering Pines	362	562
Pine Bluff	570	670

Textiles and lumber are the principal industries in the area. Most of the industrial development has been concentrated along NC 5 east of Aberdeen and between US 1 and the Seaboard Railroad north of Southern Pines.

Much of the growth in the area since the 1950's has been in the development of resorts and planned residential communities centering around Pinehurst and Southern Pines.

Water and sewerage utilities are provided by Pinehurst, Southern Pines and Aberdeen. Vass, Whispering Pines, Pine Bluff and the Taylortown

Sanitary District have water systems but no sewerage.

Water Resources - Surface Water

The Sandhills area is drained by two major river basins, the Cape Fear and the Lumber. Drainage to the Cape Fear is through the Little River sub-basin and to the Lumber by the Drowning Creek sub-basin. The boundaries of these sub-basins are shown in Plate 2.

Little River Sub-Basin

The Little River originates in Moore County near Eastwood and flows in an easterly direction for approximately 45 miles where it joins the Cape Fear River in Harnett County. The Towns of Vass, Southern Pines and Carthage are currently using the Little River or its tributaries for water supply.

The U.S.G.S. gaging station on the Little River with the longest period of record is located at Linden. This station was in operation from December 1928 until October 1971. The average discharge for the period of record is 568 cfs. The maximum discharge was 13,500 cfs recorded on September 18, 1945 and the minimum discharge was 26 cfs recorded on October 14, 1940. The drainage area at this station is 460 square miles.

There are 18 sites on the Little River and its tributaries in Moore County at which discharge measurements have been made or flow characteristics estimated. These are listed in Table 1 and their locations are shown in Plate 3.

Significant sources of pollution in the Little River sub-basin in Moore County are the Towns of Pinehurst, Southern Pines, and Vass. In addition, three private sources of point-source discharge are located on the streams. These sources are listed in Table 2 and their locations are

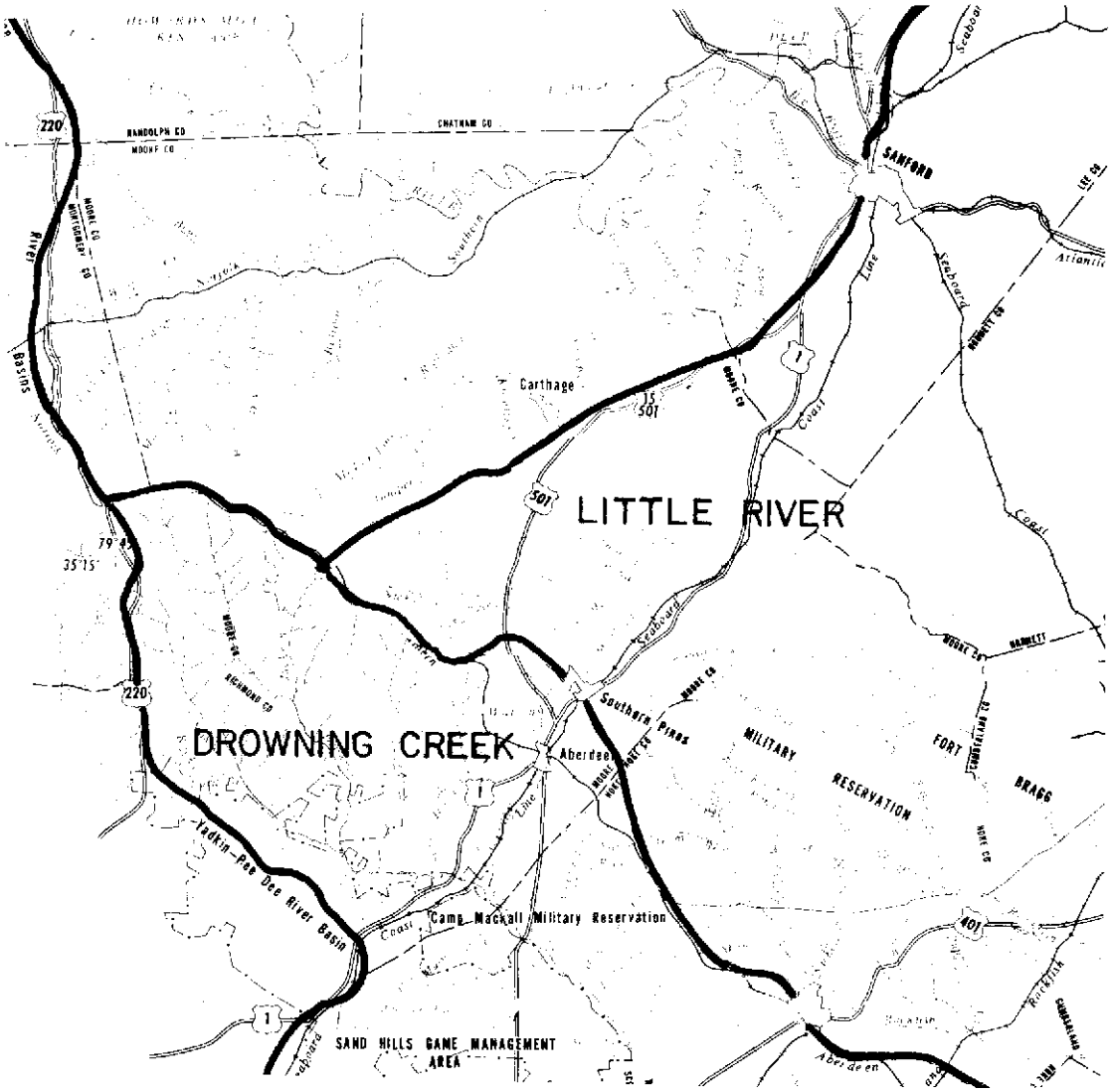


PLATE 2

SANDHILLS CAPACITY USE
SUB-BASINS

Table 1

USGS GAGING STATIONS
LITTLE RIVER SUB-BASIN

Map No.	USGS No.	Location	Drainage Area (Sq. Mi.)	Average Discharge (cfs)	7d/10y Low Flow (cfs)
1	02-1027.09	Little River nr. Eastwood	26	33	3.4
2	02-1027.14	Jones Fork nr. Pinehurst	3.41	3.5-4.5	0.9-1.9
3	02-1027.3080	McLeods Br. .4 mi at mouth nr. Pinehurst	0.9	-	0.37
4	02-1027-31	McLeods Br. nr. Pinehurst	0.96	1.1-1.6	0.05-0.2
5	02-1027.3120	Jones Fork .1 mi. below McLeods Br. nr. Pinehurst	4.5	-	1.6
6	02-1027.78	Nicks Cr. nr. Eastwood	20.5	22-31	1.8-3.6
7	02-1027.91	Nicks Cr. nr. Southern Pines	20.6	34	3.5
8	02-1027.93	Little River nr. Niagara	56	70	7.3
9	02-1027.94	Little River at Dam at Whispering Pines	64	80	8.3
10	02-1028.1355	McDeeds Cr. nr. Manly	2.9	3.4-4.2	0.8-2.2
11	02-1028.49	McDeeds Cr. nr. Niagara	7.2	6-10	1.6-4.8
12	02-1028.5880	Mill Cr. bel. McDeeds Cr. nr. Niagara	15	19	3.8
13	02-1028.96	Little River nr. Vass	99	124	12
14	02-1029.0150	James Cr. at Carrols Br. nr. Hog Island	11.7	12-16	2-4
15	02-1029.05	James Cr. nr. Hog Island	20	26	4.2
16	02-1029.30	Crane Cr. nr. Vass	32.5	-	0
17	02-1029.41	Crane Cr. nr. Lobelia	94.7	90-138	0.4
18	02-1029.4201	Little River bel. Crane Cr. nr. Mt. Pleasant	259	315	21

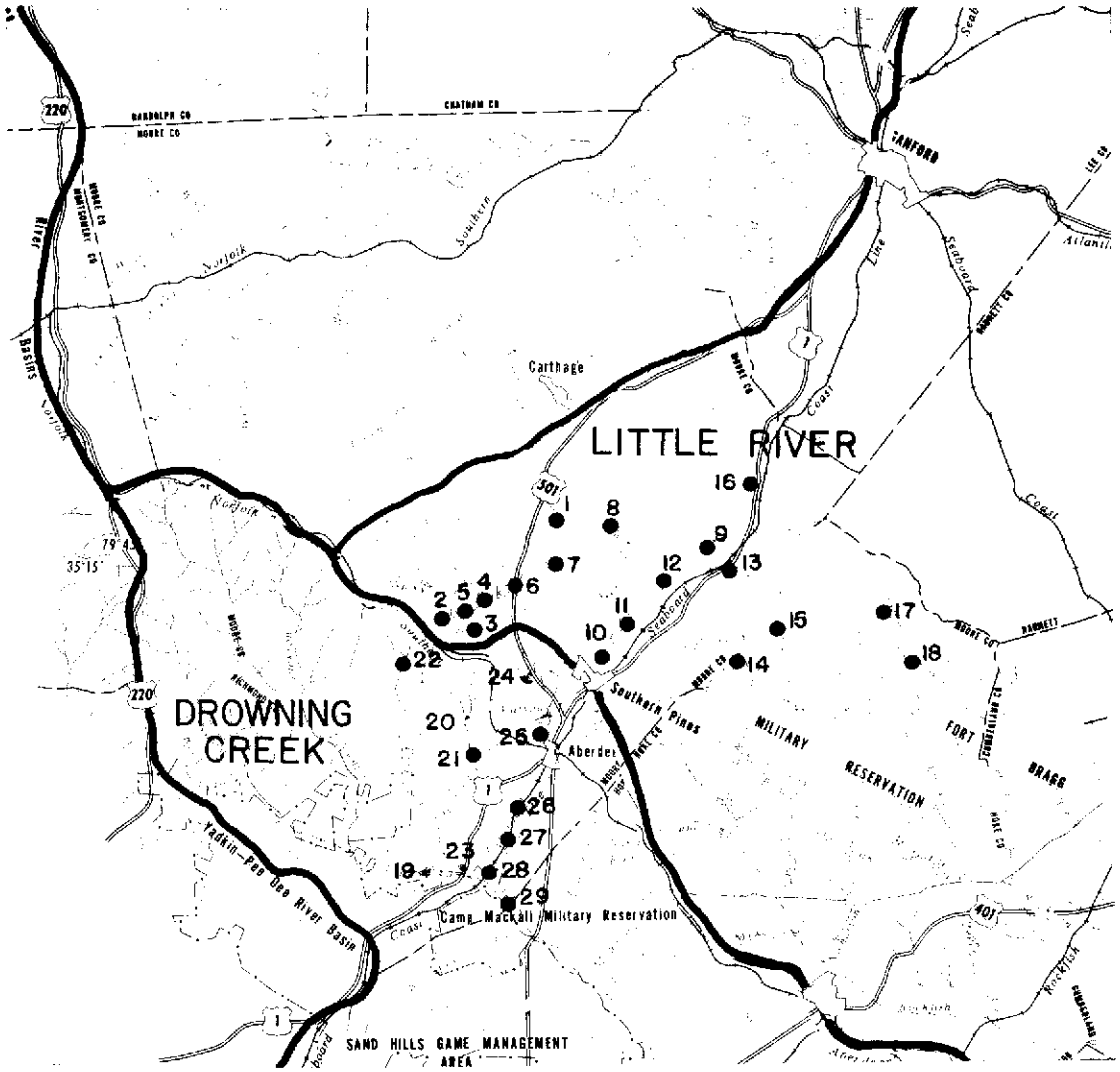


PLATE 3

USGS GAGING STATIONS

shown on Plate 4. Stream classifications for the Little River sub-basin are listed in Table A-1.

Table 2

POINT SOURCE POLLUTION DISCHARGES
LITTLE RIVER SUB-BASIN

Map No.	Community-Facility	Type	Receiving Stream
1	Davis Laundrymat	Private	Joes Fork Creek
2	Pinehurst Town--Diamondhead Corp.	SV	Broad Branch
3	Vass Town - Water Treatment Plant	Municipal	UT Little River
4	Carthage Town - Carthage Fiber	Private	UT Durham Creek

Drowning Creek Sub-Basin

Drowning Creek forms a portion of the Moore County western and southern boundary. The creek originates below Samarcand and joins the Lumber River in Robeson County. Approximately 150 square miles of the Moore County land area is contained in the Drowning Creek drainage basin. The stream is a Class A-II stream from Drowning Creek origin to the Samarcand Manor water supply intake. From Samarcand Manor intake to the Lumber River the stream has a C classification.

A USGS stream gaging station located in Richmond County near Hoffman has been in operation since October 1939. The station is approximately two miles upstream from the Moore County line and has a drainage area of 178 square miles at this point. Average discharge over the 28-year period had been 264 cfs with a maximum discharge of 10,900 cfs recorded on September 18, 1945 and the minimum discharge of 28 cfs recorded on August 4.

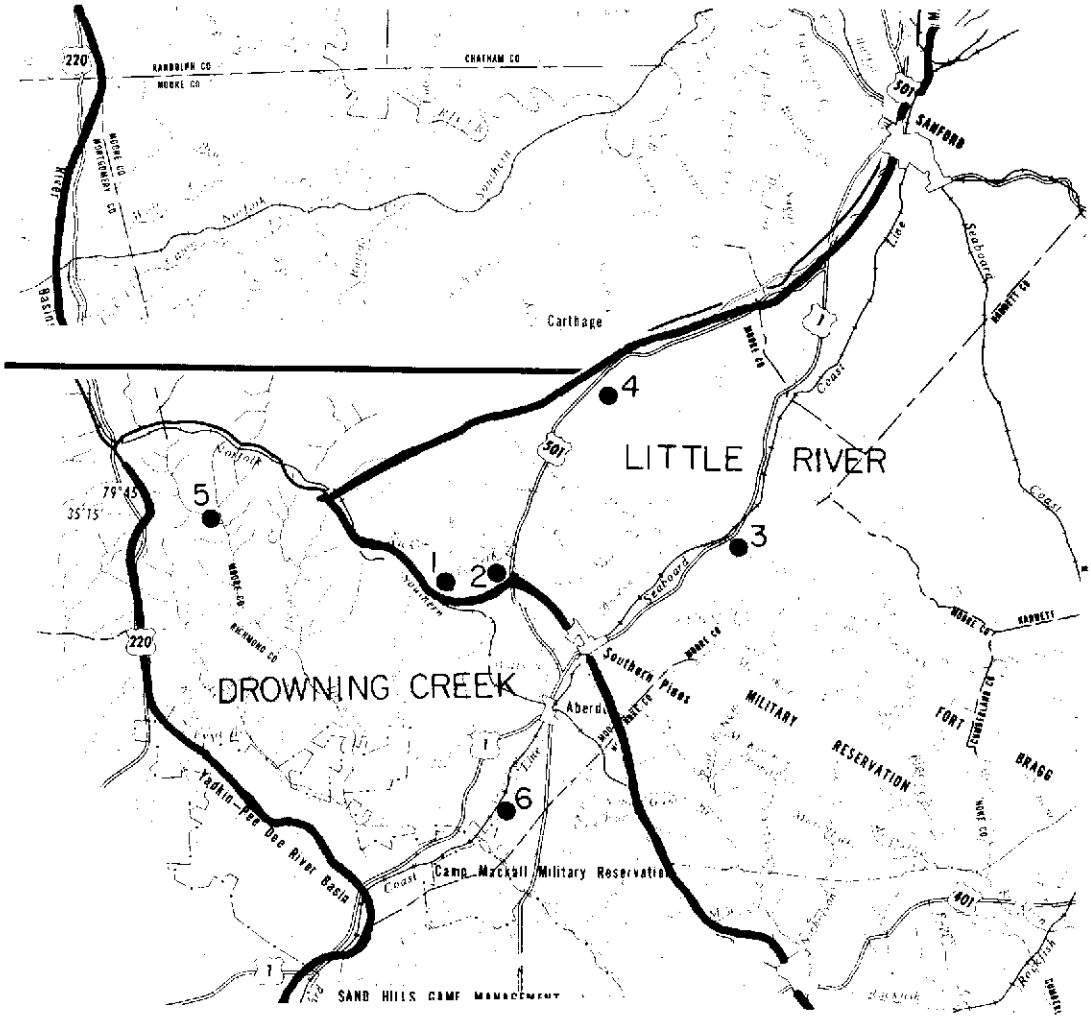


PLATE 4

POINT SOURCE POLLUTION DISCHARGES

1940. There are 11 USGS gaging stations located in the Drowning Creek sub-basin in Moore County at which discharge measurements have been made or flow characteristics have been estimated. These sites are listed in Table 3 and their locations are shown on Plate 3.

Table 3

USGS GAGING STATIONS
DROWNING CREEK SUB-BASIN

Map No.	USGS No.	Location	Drainage Area (Sq. Mi.)	Average Discharge (cfs)	7d/10y Low Flow (cfs)
19	02-1329.8666	Drowning Cr. 0.1 mi. upstream from Horse Cr.	140	202	32
20	02-1329.8755	Horse Cr. nr. Pineland at SR 1115	4.6	6.1	2.8
21	02-1329.88	Horse Cr. at Roseland at SR 1112	10.5	14.7	6.8
22	02-1329.9350	Deep Cr. 1 mi. above SR 1122	3.1	4.2	1.1
23	02-1335.00	Drowning Cr. nr. Hoffman	178	263	43
24	02-1335.04	Aberdeen Cr. nr. Pinehurst at SR 1205	3.9	5.1	1.1
25	02-1335.0550	Aberdeen Cr. below McCallum Br. at Aberdeen	13	15	4.4
26	02-1335.51	Aberdeen Cr. nr. Aberdeen	14.4	32	10
27	02-1335.53	Aberdeen Cr. nr. Pine Bluff	28.4	-	-
28	02-1335.71	Aberdeen Cr. nr. Addor at Mouth	37.7	51	17
29	02-1335.7105	Drowning Cr. nr. Keyser	218	330	59

Significant sources of pollution to the creek in Moore County are the municipal wastes of Samarcand, Pinehurst, and Aberdeen. Lucks, Inc. and Aberdeen Packing Company are the largest contributors of industrial waste to Drowning Creek. In addition, the Moore County regional sewer system dis-

charges into Aberdeen Creek. These discharges are listed in Table 4 and their locations are shown on Plate 4. Stream classifications for the Drowning Creek sub-basin are listed in Table A-1.

In 1972 there were 97 ponds of five acres or larger identified in Moore County. The largest of which is Lake Surf, which covers approximately 1,050 acres. These lakes are listed in Table A-2. Considering general information on soil, geology, watershed hydrology, presence of serious pollutants and general economic feasibility, a list of 81 sites for potential impoundment of better than average size (14 acres) was made for Moore County. This list is presented in Table A-3.

Table 4

POINT SOURCE POLLUTION DISCHARGES
DROWNING CREEK SUB-BASIN

Map No.	Community - Facility	Type	Receiving Stream
5	Samarcand	Municipal	Drowning Creek
6	Moore County Regional	Municipal	Aberdeen Creek

Water Resources - Groundwater

All industries and towns in the study area, with the exception of Southern Pines, rely on groundwater as a source of supply. Southern Pines obtains its supply from a lake and has recently completed the construction of two wells.

The study area is underlain by the Sandhills hydrogeologic unit which consists chiefly of unconsolidated sands, clayey or silty sands, clays

and gravel. These sediments lie unconformably upon the Carolina Slate Belt Metavolcanics (felsic) hydrogeologic unit. The contact between the sediments and the crystalline "basement" rocks is at approximately elevation +275 (MSL) and slopes gently eastward. Depending upon the topography, the thickness of the sedimentary material ranges from 50 to 325 feet.

General Hydrology

Sands and gravels of the Sandhills Hydrogeologic unit form the principal aquifer system in the area. The underlying metavolcanics, because of their extremely low permeability, form a hydrologic boundary isolating the sedimentary aquifer and restricting the downward movement of groundwater.

Although some groundwater may enter the area from the west as underflow, most is derived from local precipitation. Rainfall which does not run off as overland flow, or is not lost to evapotranspiration, enters the saturated zone (the surface of which forms the water table) and moves along the hydraulic gradient, towards the stream valleys. Some water continues moving downward to provide recharge to deeper water-bearing units. Available information indicates that recharge is impeded by a clay unit that occurs about 160 feet below the tops of the higher hills. Water moving laterally along the surface of this unit discharges on the slopes to form springs and creeks tributary to the major streams. Some groundwater passes vertically through the aquitard to recharge the underlying sands. These sands, in turn, discharge groundwater to creeks and streams in the area.

Groundwater - Surface Water Relationships

In an effort to determine the approximate productivity of the aquifer system, the relationship between groundwater and surface waters was analyzed. Groundwater levels in a well near Pine Bluff were compared to stream stage records during periods of base flow in Flat Creek near Inverness.

Based on the size of the drainage area and the drainage characteristics of the soils, base flow was identified as the lowest stream flow occurring at least three days after the peak flow following a storm event and before the rise attributable to a subsequent event. The data were plotted and analyzed graphically (see Plate 5). Base flow calculations were then compared with actual streamflow measurements and the difference determined. The comparison showed "base flow" to be that flow equalled or exceeded 31 percent of the time. The average flow, calculated by averaging daily flows over the period of record, is equalled or exceeded approximately 29 percent of the time (see Plate 6). As the base flow and average flow are approximately the same, it can be assumed that the groundwater contribution to the streamflow is equivalent to the average flow. As the average streamflow (base flow) is about 1.3 cfs/mi^2 in the study area, this value represents the amount of groundwater which could be obtained under existing groundwater gradients.

Well Hydraulics

Preliminary analyses of pumping test data obtained from two recently constructed wells in Southern Pines indicate that the lower sand unit has a coefficient of transmissivity of approximately 8000 gpd/ft. and a coefficient of storage of 1.5×10^{-4} (dimensionless). The wells are located about 8000 feet apart at elevations of about 600 feet. They were tested at pumping rates of 158 gpm and 208 gpm.

Using the aquifer coefficients noted above, and assuming a pumping rate of 200 gpm a distance drawdown graph was constructed for periods of one and thirty days continuous pumping (Plate 7). Inspection of the graph reveals that wells having characteristics similar to those used in the graph should be spaced approximately 5000 ft. apart to avoid excessive interference.

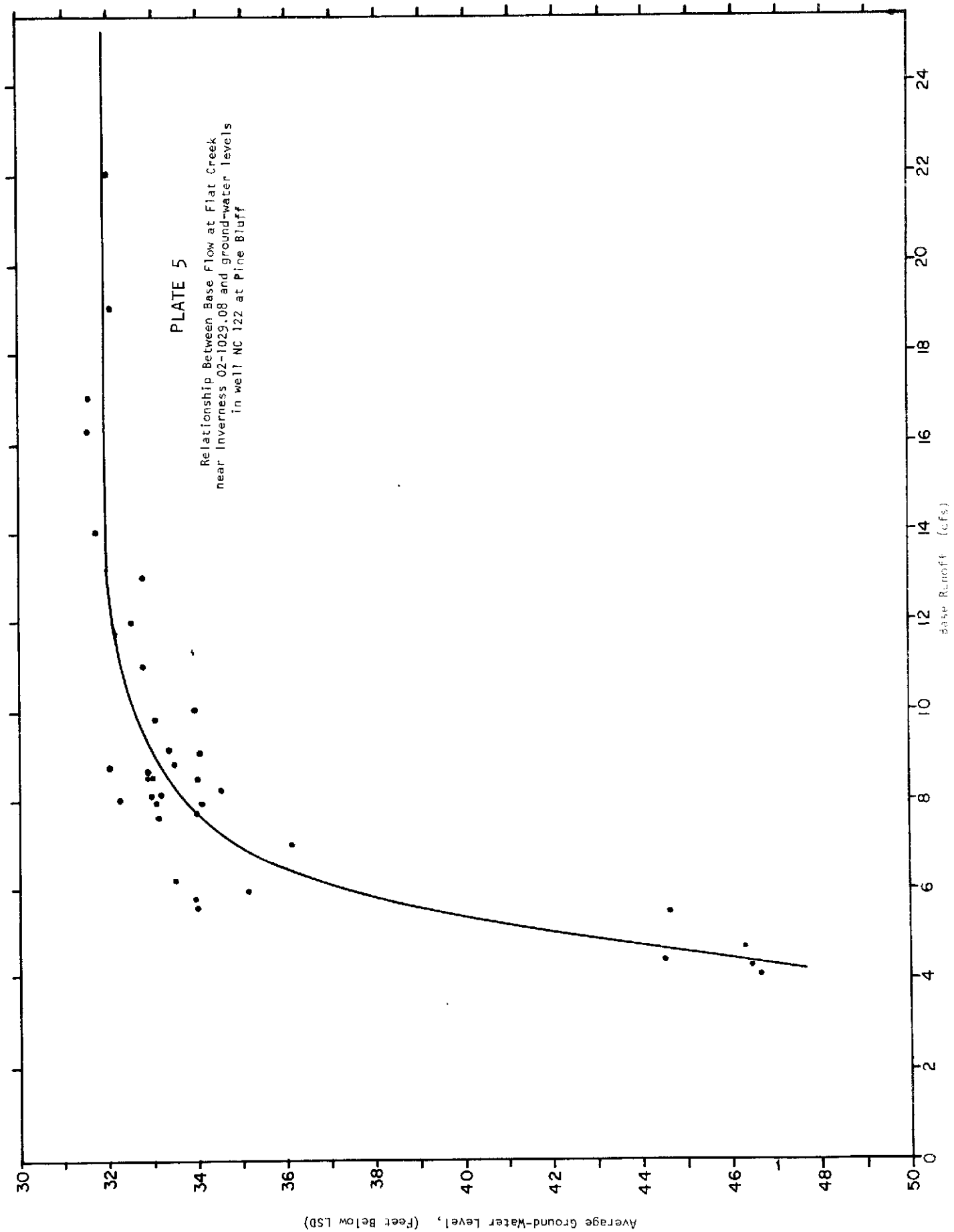


PLATE 5
Relationship Between Base Flow at Flat Creek
near Inverness 02-1029.08 and ground-water levels
in well NC 122 at Pine Bluff
Average Ground-Water Level, (Feet Below LSD)
30
32
34
36
38
40
42
44
46
48
50
0
2
4
6
8
10
12
14
16
18
20
22
24
Base Runoff (cfs)

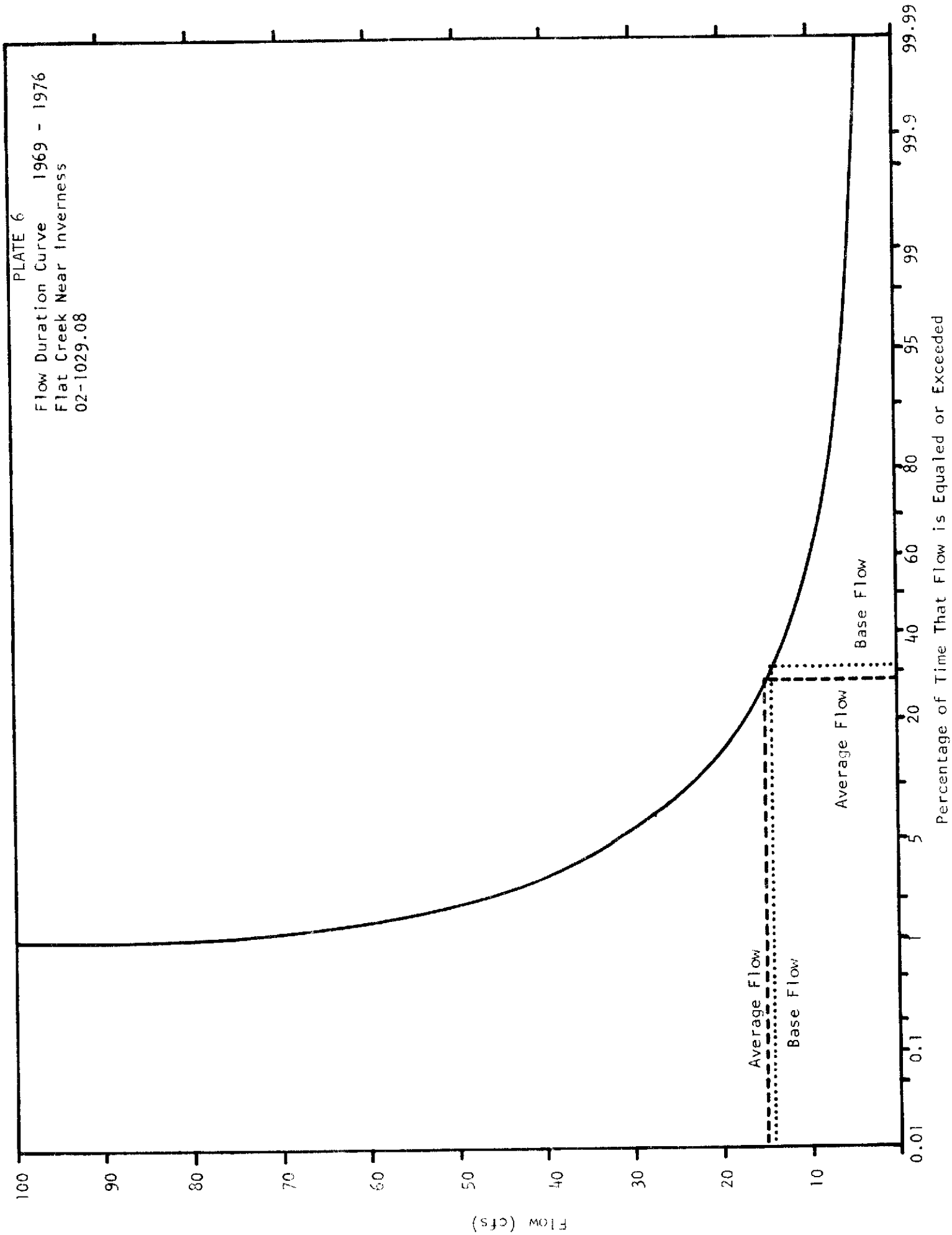
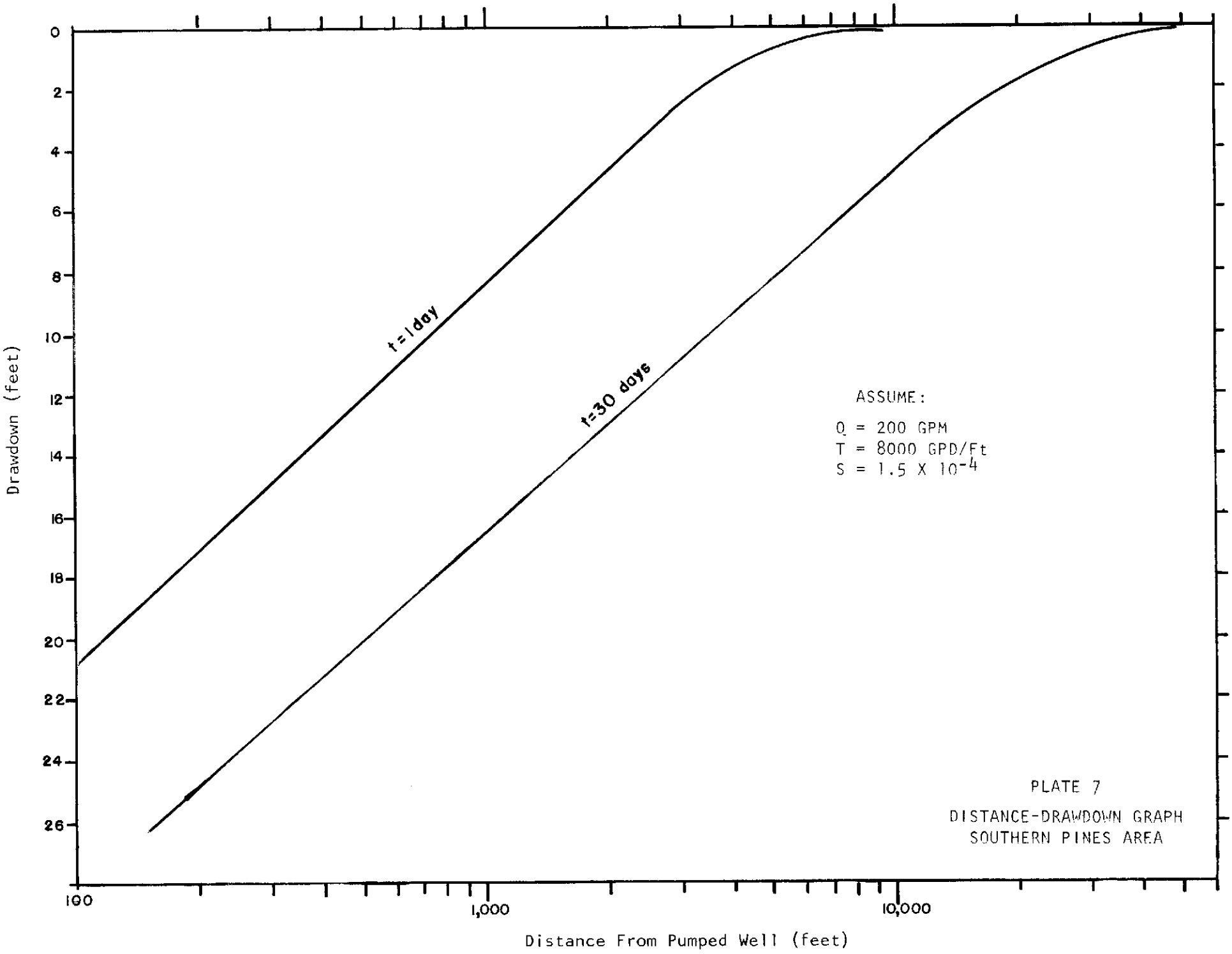


PLATE 6
Flow Duration Curve 1969 - 1976
Flat Creek Near Inverness
02-1029.08
Flow (cfs)
100
90
80
70
60
50
40
30
20
10
0.01
0.1
1
5
20
40
60
80
95
99
99.9
99.99
Percentage of Time That Flow is Equaled or Exceeded
Average Flow
Base Flow
Average Flow
Base Flow


0
2
4
6
8
10
12
14
16
18
20
22
24
26
Drawdown (feet)
t=1 day
t=30 days
ASSUME:
Q = 200 GPM
T = 8000 GPD/Ft
S = 1.5 X 10-4
PLATE 7
DISTANCE-DRAWDOWN GRAPH
SOUTHERN PINES AREA
100
1,000
10,000
Distance From Pumped Well (feet)

Existing Water Supply and Demand

There are 7 public water supply systems within the study area serving approximately 17,000 people. They are Aberdeen, Pine Bluff, Pinehurst, Southern Pines, Taylortown Sanitary District, Vass and Whispering Pines. Carthage, although not in the study area, derives part of its water supply from Nick's Creek in the Little River sub-basin. A brief description of these systems is given as follows:

Aberdeen - The Town of Aberdeen had a population of 1,592 according to the 1970 Census. The North Carolina Department of Administration estimated that the 1975 population was 2,010 people. The water system serves the entire town, plus a fringe population of 600, which are served by 1,015 metered connections. The Town of Aberdeen abandoned its surface water supplies in 1967 for a completely groundwater supplied system consisting of seven gravel-packed wells. Information on these wells is presented in Table 5.

Table 5

ABERDEEN WELL DATA

Well No.	Well Type	Casing Dia. (in.)	Well Depth (ft.)	Well Yield (gpm)	Pump Cap. (gpm)
1	Drilled	10	210	150	175
2	Drilled	8	192	200	175
3	Drilled	8	193	215	200
4	Drilled	8	187	200	190
5	Drilled	8	212	225	225
6	Drilled	8	200	200	95
7	Drilled	8	230	150	90

Water use is now averaging around 500,000 gpd with maximum use reaching as high as 1.0 million gpd. There are two main water-using industries on the system, Howe Enterprises and J. P. Stevens Company. The capacity of the system is about 1.7 MGD based on a 24 hr. pumping period.

The Town of Carthage currently receives its raw water from two sources, Nick's Creek and the Town Pond. Town Pond is used as an impoundment for overflow from springs. Town Pond has a storage capacity of some 22 million gallons and a raw water pumping capacity of 0.5 mgd. Water is drawn from Nick's Creek through a submerged intake without a dam and the raw water pumping capacity at that location is 0.50 mgd. The intake is approximately six miles south of Carthage and has a drainage area of approximately 26.6 square miles. Water from Nick's Creek can be pumped to either the water treatment plant or to Town Pond #1.

Water use within the water service area averages about 0.189 mgd, with a maximum consumption of about 0.300 mgd. The safe yield 20 for the system is 1.8 mgd while the safe yield 50 is 1.5 mgd.

Pine Bluff - According to the 1970 Census, the Town of Pine Bluff had a population of 570 people. Present estimate shows the population to be 670. The system serves about 850 persons through 300 connections.

Pine Bluff has a unique water supply in that it is served by two wells and five springs. Well No. 1 has a depth of 58 feet and has an estimated safe yield of 60 gpm. Well No. 2 is 120 feet deep, and yields 175 gpm. Water use averages 100,000 gallons per day.

Pinehurst - Pinehurst has the largest non-municipal water system in Moore County. In 1973, Pinehurst phased out all of its surface water supplies and converted to groundwater as a water source. Pinehurst well data is presented in Table 6.

Table 6

PINEHURST WELL DATA

Well No.	Year Constructed	Casing Diameter (in.)	Well Depth (ft.)	Well Yield (gpm)
1	1915	10	610	Not used
2	1968	6	90	Not used
3	1969 #1	8	172	115
4	1969 #2	8	151	225
5	1973	8	154	100
6	1973	8	140	150
7	1973	8	158	190
8	1978	8	130	150
9	1978	8	130	100

There is no industrial usage; however, commercial usage associated with the hotel and golf course is high. No accurate records are kept of the quantities of water pumped into the water system; however, an estimate of the amount of water pumped into the distribution system was calcualted using the data available. The annual volume was estimated to be 288 mg or an average of 450,000 gpd during 1976. Water use records were available through August, 1977. The recorded use during this period of time averaged 382,330 gpd. The Pinehurst water system has a safe yield of 1.2 mgd.

Southern Pines - The Town of Southern Pines was reported in the 1970 Census to have a population of 5,937 people. It has been estimated by the North Carolina Department of Administration that the 1975 population is about 6,680 persons. The water distribution and treatment system is the most extensive municipal system in Moore County with 3,025 service connections serving an estimated user population of nearly 8,200 people. Water use, according to 1976 figures, was 1.15 mgd. The system is completely

metered. The service area for the water distribution system includes the corporate limit area of town and the surrounding fringe area.

Southern Pines water supply is obtained from Mill Creek. The intake, approximately one mile north of Southern Pines, drains an area of approximately 1.9 square miles, with the reservoir covering approximately 59 acres. The reservoir has a total storage capacity of approximately 269 million gallons. Southern Pines recently signed a five-year contract with Carthage which is to supply them with a million gallons a day of raw untreated water from their Nick's Creek supply. The town has recently added two wells to its water supply.

Taylortown Sanitary District - The Taylortown Sanitary District is located about two miles west of Pinehurst in southern Moore County. The estimated population of the Sanitary District is about 600 people through a total of 200 area connections, all of which are metered.

The Taylortown Sanitary District obtains its water from a total of three drilled wells. Data on these wells are shown in Table 7.

Water use within the Taylortown service area averages 58,000 gpd. Maximum daily consumption figures are unavailable.

Table 7

TAYLORTOWN SANITARY DISTRICT WELL DATA

Well No.	Well Type	Casing Diameter (in.)	Well Depth (ft.)	Well Yield (gpm)	Pump Cap. (gpm)
1	Drilled	4	60	30	40
2*	Drilled	6	45	30	26
3	Drilled	6	93	60	60

*Well #2 has not been operated since 1975.

Vass - The Town of Vass was reported in the 1970 Census to have a population of 885 people. It has been estimated by the North Carolina Department of Administration that the 1975 population was 970 persons.

The water distribution and treatment system for Vass serves an estimated user population of 1,020 persons through 313 service connections, 311 of which are metered.

Vass's safe water supply is from the Upper Little River. Water is taken from the river by means of a low diversion dam. No information is available on the estimated safe yield of the stream at this point. Raw water pumping capacity at this location is 0.30 mgd.

Water use within the water service area averages about 0.043 mgd. The maximum consumption cannot be determined.

Whispering Pines - Whispering Pines, Incorporated, owns and operates the water system. The water system is supplied with water from seven deep wells. Available well data is given in Table 8. The combined yield of these wells is reported to be 350 gpm.

There were 562 taps on the water system in 1976. No records are kept of daily usage, total usage or maximum daily usage. The daily flow is estimated to be about 100,000 gallons. Maximum daily usage is estimated to be 1.5 to 2 times the average daily consumption.

Table 8

WHISPERING PINES WELL DATA

Well No.	Year Constructed	Casing Diameter (inc.)	Well Depth (ft.)	Well Yield (gpm)
1	1959	10	169	55
2	1960	10	234	60
3	1961	10	362	30
4	1962	10	285	35
5	1968	8	244	50
6	1971	6	641	30
7	1974	6	453	90

FUTURE DEVELOPMENT

Population and Water Use Projections

Population projections are based on the fact that change can occur in three ways; births increase the population; deaths decrease the population; migration can either increase or decrease the population depending upon the direction. Any population projection is implicitly or explicitly based upon assumptions as to future changes in these variables. For the country as a whole, birth rates and death rates are the most important considerations. For smaller areas such as counties, migration often becomes the most important factor. Since migration at a county level is quite unstable, county projections are subject to higher margins of error than State or national projections.

One method of projecting population for a small area is to make specific assumptions on births, deaths, and migration to compute the population. Another method involves computation of a trend line reflecting past demographic data and projecting this trend into the future. All trend projections are based on the assumption that future trends have such a close relationship to the past, that mathematical relationships that accurately describe the past will be a good measure of future changes.

Table 9 shows the Moore County population and its relationship to the State.

Table 9

RELATIONSHIP OF MOORE COUNTY POPULATION
TO STATE POPULATION

Year	Moore	N. C.	Moore Share
1950	33,129	4,061,929	.008156
1960	36,733	4,556,155	.008062
1970	39,048	5,084,411	.007680
1975	42,600	5,441,000	.007829

As can be seen, in 1950 Moore had about 0.82 of one percent of the State population. This declined to .77 of one percent in 1970. Since 1970, it has risen slightly.

The projections prepared by the Department for water and sewer planning utilize both approaches. The State population used comes from the OBERS program. This program has projected populations for North Carolina and all other States. It assumes that the low level of fertility of the last few years will continue. Migration is not dealt with explicitly, but is implied through employment projections. On this basis North Carolina is assumed to have in-migration. This contrasts with past decades when the State had out-migration.

A projection of Moore County's share of the State was applied to the OBERS projection for the State to arrive at the county projection. The result is shown in Column 3 of Table 10. This method of computation results in a higher population than an arithmetic trend based on 1950-1975 experience. The county share is trended upward, despite the decline from 1950-1970, on the basis of 1970-1975 experience.

The engineering firm of Henningson, Durham, and Richardson has pre-

pared population projections for the county based on professional judgment. They show what the population would be on historic trends and what it would be if new development succeeds. These projections are shown in Columns 1 and 2 of Table 10. It is their contention that the growth in Moore County in the future cannot be based on past growth trends. This argument assumes that changes in the socio-economic characteristics of the county will be so great that past trends will lead to inaccurate estimates of future growth. In the case of Moore County, the reason for this change is contemplated growth of the county in recreation, tourism, second homes and retirement communities.

The 1975 population estimates would seem to indicate that population in the county will be higher than the historic trend projection but lower than the development projection.

Since the 1960-1970 growth in the county was based largely on recreation, retirement, etc., it is reflected to some extent in the HDR historic projection. The development projection, therefore, assumes a very large acceleration in development activity.

There are several large, well financed, development firms actively engaged in Moore County. The HDR projections assume that these firms will be successful in achieving their sales objectives. The trend projections of the Department implicitly assume that this development will occur at rates commensurate with recent experience.

There is no basis to evaluate the realism of developer estimates. It can be noted that the pool of persons that constitute the main market for Moore County developers is not unlimited, nor is Moore County the only area competing for this market. It is reasonable to believe that some such developments will reach their objectives and others fail.

Finally, it would be noted that Department projections are based on Census population. This does not include guests at motels and resorts and owners of second homes who reside part of the year in Moore, but have legal residences elsewhere. Any projection of water needs in Moore County must make allowance for this group. Table 10 presents a summary of the various population projections for Moore County. Table 11 shows the population projections for the communities within the 201 Planning Region and the communities listed in the Comprehensive Planning Branch's Water Supply Model.

Table 10

MOORE COUNTY
POPULATION PROJECTIONS

	(1)	(2)	(3)
1980	43,425	62,185	49,500
1990	48,020	93,270	56,500
2000	42,820	118,500	63,100
2010	57,480	141,970	-
2020		(155,000)	(75,900)

(1) Henningson, Durham & Richardson - Feasibility Wastewater Facilities 1973 - Historic

(2) HDR - Resort Devel. Used for 201

(3) NRCD - Projections

Table 11

MOORE COUNTY 201 FACILITIES PLAN
POPULATION PROJECTIONS

	1975	1985	1995	2010
Pinehurst	6,936	22,001	40,556	68,200
Southern Pines	6,393	7,305	8,225	9,600
Aberdeen	1,721	1,925	2,105	2,425
Pine Bluff	620	720	820	975
Addor	493	558	655	755
Rem 201 Area	8,527	10,702	11,891	13,636
TOTAL	22,810	43,266	64,252	95,697
From HDR Adjustment	21,317	42,708	63,597	94,942
		Water Supply - Model		
Pinehurst[1]	1,500	2,300	3,300	5,500
Southern Pines[2]	9,200	11,000	13,600	20,000
Aberdeen[2]	2,700	3,500	4,600	6,500

[1] Does not include hotel guests, etc.

[2] Service Area.

Water use projections have been made for the Towns of Aberdeen, Carthage, Southern Pines and Pinehurst. A summary of these projections is given in Table 12 along with a comparison of this demand to the existing water supply capacity. Table 13 provides a comparison of the water use projections for the Towns of Aberdeen, Pinehurst and Southern Pines as determined by Henningson, Durham & Richardson and the Water Resources Planning Branch.

Table 12

PROJECTED WATER DEMANDS AND DEFICIENCIES[1]

Projected Demand (MGD)	Year					
	1970	1980	1990	2000	2010	2020
Aberdeen						
Industrial	0.1	0.7	0.9	1.2	1.6	2.1
Municipal	0.2	0.3	0.4	0.6	0.9	1.2
Total	0.3	1.0	1.3	1.8	2.5	3.3
Adequacy or Deficiency based on Safe Yield	0.9	0.2	-0.1	-0.6	-1.3	-1.8
Carthage						
Industrial	0.0	0.0	0.1	0.1	0.1	0.1
Municipal	0.1	0.2	0.2	0.2	0.3	0.5
Total	0.1	0.2	0.3	0.3	0.4	0.6
Adequacy or Deficiency based on						
SY_{20}	1.6	1.6	1.5	1.4	1.3	1.2
SY_{50}	1.3	1.3	1.2	1.1	1.0	0.9
Southern Pines						
Industrial	0.1	0.2	0.3	0.4	0.5	0.6
Municipal	1.0	1.2	1.7	2.5	3.5	5.1
Total	1.1	1.4	2.0	2.9	4.0	5.7
Adequacy or Deficiency based on						
SY_{20}	0.4	0.2	-0.5	-1.4	-2.5	-4.2
SY_{50}	0.1	-0.1	-0.8	-1.7	-2.8	-4.5
Pinehurst						
Industrial	0	0	0	0	0	0
Municipal	0.4	0.5	0.8	1.2	1.8	2.5
Total	0.4	0.5	0.8	1.2	1.8	2.5
Adequacy or Deficiency based on Safe Yield	0.9	0.7	0.5	0	-0.6	-1.3

[1] Numbers may not add due to rounding.

Table 13

WATER USE PROJECTIONS
SANDHILLS AREA MUNICIPALITIES[1]

(MGD)

	1980	1990	2000	2010	2010
HDR	5	8.6	12.2	15.7	19.1
WRP1 NRCD	2.2	-	4.7	-	9.4
WRP2 NRCD	3.8	-	14.1	-	26.1
Mid Range Estimate	3.1	-	6.0	-	12.6

HDR = Henningson, Durham & Richardson

WRP1 = Water Resources Planning (NRCD) Trend Option

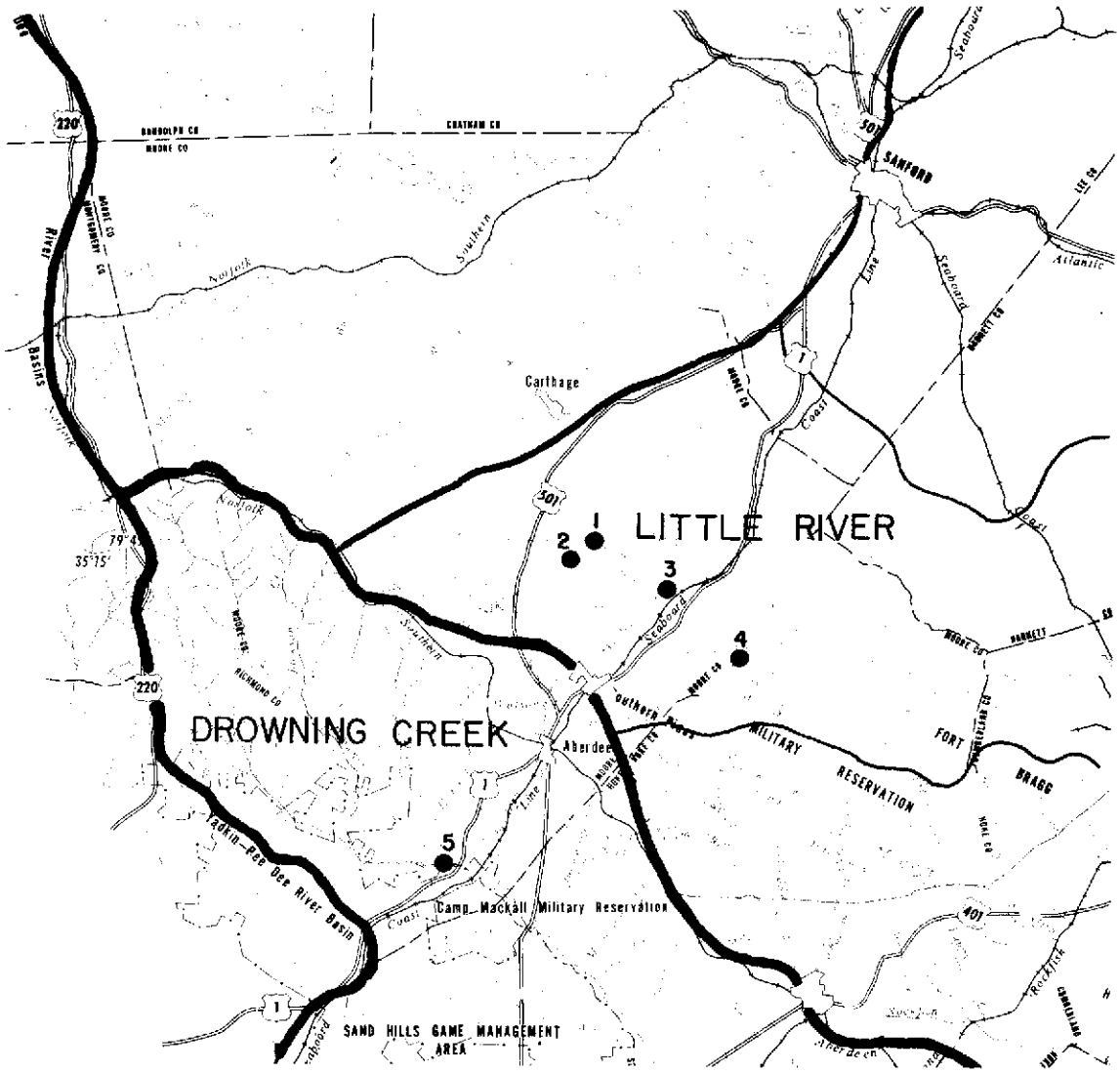
WRP2 = Water Resources Planning (NRCD) Extensive Resort Development Option

[1] Aberdeen, Pinehurst, Southern Pines

Proposed Water Supply Alternatives

Seven alternatives have been proposed by Henningson, Durham & Richardson (HDR) for the Town of Southern Pines along with four regional alternatives to serve the Towns of Aberdeen, Pinehurst, and Whispering Pines in addition to Southern Pines. A brief description of each alternative is given below. Plate 8 shows the location of the proposed sites.

Alternative 1 - This project consists of a low head dam on the Little River at SR 1840 with - water supply draft of 5 MGD. Due to the insignificant storage associated with this type of dam, no minimum release will be maintained below the site. Water is to be pumped to the existing



Legend

1. Little R at SR 1840
2. Nicks Cr. at NC 22
3. Mill Cr. at SR 1853
4. James Cr. at SR 2023
5. Drowning Cr. at US 1

PLATE 8
PROPOSED WATER SUPPLY
INTAKE POINTS

Southern Pines Reservoir, which would be the only source utilized during periods of low flow.

Alternative 2 - This project consists of a reservoir on Mill Creek at SR 1853 with a water supply storage of 1,380 acre feet and a total draft of 5.4 MGD. A minimum release of the $7Q_{10}$ would be maintained below the project. The $7Q_{10}$ is estimated by HDR to be 1.27 MGD, leaving a water supply yield of 4.13 MGD. The U.S. Geological Survey (USGS) estimates the $7Q_{10}$ to be 2.45 MGD which leaves a water supply yield of 2.95 MGD.

Alternative 3 - This project consists of a reservoir on Little River at SR 1840 with a water supply storage of 550 acre feet and a total draft of 8.25 MGD. A minimum release of the $7Q_{10}$ would be maintained below the reservoir. The $7Q_{10}$ is estimated by HDR to be 4.67 MGD leaving a water supply yield of 3.58 MGD. The USGS estimates the $7Q_{10}$ to be 4.72 MGD which leaves a water supply yield of 3.53 MGD.

Alternative 4 - This project consists of a reservoir on Nick's Creek at NC 22 with a water supply storage of 1,410 acre feet and a total draft of 8 MGD. A minimum release of the $7Q_{10}$ would be maintained below the reservoir. The $7Q_{10}$ is estimated by HDR to be 2.2 MGD which leaves a water supply yield of 5.74 MGD. The USGS estimates the $7Q_{10}$ to be 2.26 MGD which leaves a water supply yield of 5.74 MGD.

Alternative 5 - This project consists of an intake on Drowning Creek at US 1 to pump 6 MGD from the creek. No storage is planned at this site. The $7Q_{10}$ is estimated at 27.8 MGD by the USGS.

Alternative 6 - This project consists of a reservoir on James Creek at SR 2023 with a water supply storage of 1,110 acre-feet and a

total draft of 5.8 MGD. A minimum release of the $7Q_{10}$ would be maintained below the reservoir. The $7Q_{10}$ is estimated by HDR to be 1.67 MGD leaving a water supply yield of 4.13 MGD. The USGS estimates the $7Q_{10}$ to be 2.71 MGD which leaves a water supply yield of 3.09 MGD.

Alternative 7 - This project consists of a low head dam on Nick's Creek at NC 22 with a water supply draft of 5 MGD. Due to the insignificant storage associated with this type of project no minimum release would be maintained below the site. Water is to be pumped to the existing Southern Pines Reservoir which would be the only source utilized during periods of low flow.

Alternative R-1 - This project consists of a reservoir on the Little River at SR 1840 impounding 6,440 acre feet and yielding a total of 22.7 MGD. A minimum release of the $7Q_{10}$ is to be maintained below the site. The $7Q_{10}$ is estimated to be 4.67 MGD by HDR and 4.72 MGD by the USGS. This leaves a water supply yield of 18.03 MGD and 17.98 MGD, respectively.

Alternative R-2 - This proposal calls for an intake to be located on Drowning Creek at US 1 with an initial capacity of 12 MGD with an ultimate capacity of 30 MGD. No impoundment is proposed at this site and no minimum flow will be maintained below the intake. The $7Q_{10}$ is estimated by the USGS as 27.8 MGD. The safe yield 20 is estimated at 20 MGD.

Alternative R-3 - This proposal calls for reservoirs to be constructed on Nick's Creek at NC 22, Mill Creek at SR 1853, and James Creek at SR 2023.

The Nick's Creek Reservoir would have a storage of 2,800 acre feet and a total draft of 10.8 MGD. The $7Q_{10}$ is estimated to be 2.2 MGD by HDR and 2.36 MGD by the USGS. The water supply yield is 8.54 MGD to 8.6 MGD.

The Mill Creek Reservoir would have a storage of 1,800 acre feet and a total draft of 6.2 MGD. The $7Q_{10}$ is estimated to be 1.27 MGD by HDR and 2.45 MGD by the USGS. This leaves a water supply yield of 3.75 MGD to 4.93 MGD.

The James Creek Reservoir would have a storage of 2,760 acre feet and a total draft of 8 MGD. A minimum release of the $7Q_{10}$ would be maintained below this site. The $7Q_{10}$ is estimated to be 1.67 MGD by HDR and 2.71 MGD by the USGS. The water supply yield would be 5.29 MGD to 6.33 MGD.

Alternative R-4 - This proposal calls for a reservoir on Nick's Creek, an intake on Drowning Creek and an offline reservoir for the Drowning Creek intake. The Nick's Creek site data is identical to that for Alternative R-3.

The Drowning Creek intake is designed for 18 MGD with a 613 acre feet offstream reservoir. No minimum release is to be maintained below the site. The $7Q_{10}$ is estimated to be 27.8 MGD by the USGS.

CONCLUSIONS

The capacity of existing municipal or community water supply sources to meet current demand is marginal. Additional withdrawals from surface sources will result in extended periods of low stream flow.

Estimates of future water requirements are based on population projections which vary widely. Future demands in the Pinehurst, Southern Pines, Aberdeen area, as determined by the Comprehensive Water Planning Branch, should increase from a current 2.5 MGD to about 10 MGD by the year 2020, an increase of 7.5 MGD. This estimate is based on a projected increase in the aggregate population served by these towns from about 13,400 in 1975 to about 35,000 in 2020. However, with extensive resort development water use requirements could be over 26 MGD by the year 2020. This projection is speculative and may be considered the upper limit of water use in planning for water resource development.

Although utilization of the area's groundwater resources as a source for expanding water supplies was not offered as an alternative in the Henningson, Durham & Richardson feasibility report, it should be seriously considered. Its dependability is evidenced by the high base flow of streams in the area. Base flow is defined as the streamflow sustained by groundwater discharge between rainfall events in the drainage basin. Base flow of streams in the Sandhills area is calculated to be equivalent to the average flow, or the flow equaled or exceeded 30% of the time. Groundwater discharge as base flow is estimated to be about 1.3 cubic feet per second per square mile; a value which suggests a high potential for development through properly located and designed well fields.

Table 14

SUMMARY OF WATER SUPPLY ALTERNATIVES FOR SOUTHERN PINES AND VICINITY

Reservoir Site	Drainage Area (Sq. Mi.)	Average Flow (MGD)	HDR 7Q10 (MGD)	USGS 7Q10 (MGD)	Total Draft (MGD)	Percent of Average	Water Supply Draft [1] (MGD)	Water Supply Draft [2] (MGD)	Water Supply Storage (Ac-ft)	Length of Drought [3] (Days)
Little River	56	45.2	4.67	4.72	5	11.1	5*	5*	0	-
Little River	56	45.2	4.67	4.72	8.25	18.3	3.58	3.53	550	135
Little River	56	45.2	4.67	4.72	22.7	50.2	18.03	17.08	6,440	360
Mill Creek	15.4	12.3	1.27	2.45	5.4	43.9	4.13	2.95	1,380	245
Mill Creek	15.4	12.3	1.27	2.45	6.2	50.4	4.93	3.75	1,800	295
Nicks Creek	26.6	22.0	2.2	2.26	8.0	36.4	5.8	5.74	1,410	290
Nicks Creek	26.6	22.0	2.2	2.26	5.0	22.7	5.0*	5.0*	0	-
Nicks Creek	26.6	22.0	2.2	2.26	10.8	49.1	8.6	8.54	2,800	355
James Creek	20.0	16.8	1.67	2.71	5.8	34.5	4.13	3.09	1,110	175
James Creek	20.0	16.8	1.67	2.71	8.0	47.6	6.33	5.29	2,760	270

[1] Total draft less $7Q_{10}$ as estimated by HDR.

[2] Total draft less $7Q_{10}$ as estimated by USGS.

[3] Based on 20 year recurrence interval.

*No minimum release maintained below site.

Each of the alternatives proposed have potentially severe impacts on the water resources of the area. The projects on the small streams utilizing reservoirs result in prolonged periods of flows equaling only the $7Q_{10}$. Projects on these same streams without reservoirs result in reduced flows more often than currently expected. Table 14 provides a summary of these projects and an estimation of the length of drought period.

Drowning Creek and the Little River with its associated tributaries presently provides a high value fishery resource for Moore County and the region. The ecological classifications, game fish species, and a qualitative fishing evaluation are given for each stream in Table 15.

Table 15

FISHERY RESOURCES OF STREAMS WITH POSSIBLE EXTENDED LOW FLOW CONDITIONS

Stream	Ecological Classification	Typical Species	Fishing Evaluation
Drowning Creek	Robin-Warmouth	Chain and redfin pickerel, warmouth redbreast sunfish	Excellent
Little River	Redfin-Warmouth	Pickerel, warmouth redbreast sunfish, largemouth	Good
Mill Creek	Robin-Warmouth	Largemouth, sunfishes	Good
Nicks Creek	Largemouth-Pickerel	Redfin pickerel, bluegill and redear sunfish	Fair
James Creek	Redfin-Warmouth	Redfin pickerel, warmouth, redbreast sunfish	Fair

Source: Fish, Frederic F. A Catalogue of the Inland Fishing Waters in North Carolina. Division of Inland Fisheries, N. C. Wildlife Resources Commission, Raleigh 1968.

The past regime of water use as it has developed on these streams has produced a historic $7Q_{10}$ which has not adversely affected the fish species. The implementation of any alternative which will cause an extended $7Q_{10}$ flow condition can be expected to negatively impact the fishery resource.

The $7Q_{10}$ flows are not even considered adequate for fisheries. Extended low flow conditions will result in a reduction in fish habitat, concentration of pollutants, and an increase in water temperature. This will result in a lower year round carrying capacity and lower fish populations. The magnitude of this impact cannot be determined without further detailed study for each stream.

On Drowning Creek, each of the alternatives propose an intake structure only with withdrawals ranging from 6 MGD to 30 MGD. Without a storage reservoir to maintain the $7Q_{10}$ during low flow periods the flows would be severely reduced causing problems with the proposed Aberdeen Creek waste treatment facility.

Table 16 shows the effect on 20 year low flows of the withdrawal of 6 MGD from Drowning Creek.

Table 16

FLOW REDUCTION BASED ON A 6 MGD WITHDRAWAL

	$1Q_{20}$	$3Q_{20}$	$7Q_{20}$	$15Q_{20}$	$30Q_{20}$	$60Q_{20}$	$90Q_{20}$	$120Q_{20}$
Avg. Streamflow (MGD)	20.8	21.6	23.1	25.0	29.0	33.7	42.7	47.5
Draft Rate (MGD)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Avg. Flow Rem. (MGD)	14.8	15.6	17.1	19.0	23.0	27.7	36.7	41.5
% Reduction	28.8	27.8	26.0	24.0	20.0	17.8	14.1	12.6
$7Q_{10}$ (MGD)	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
% $7Q_{10}$ in River	53.2	56.1	61.5	68.3	82.7	100	132	149

For a draft of 6 MGD the flow would be below the $7Q_{10}$ for approximately 60 days during the 20 year drought and the flows would be reduced by as much as 28.8 percent upstream from Aberdeen Creek. Below Aberdeen Creek the stream-

flow would return to its pre-withdrawal levels by augmentation with the discharge from the regional waste treatment plant.

Table 17 shows the effect on 20 year low flows of the withdrawal of 18 MGD from Drowning Creek. This alternative includes an offline reservoir with a storage of 200 MG.

Table 17

FLOW REDUCTIONS BASED ON AN 18 MGD WITHDRAWAL

	$1Q_{20}$	$3Q_{20}$	$7Q_{20}$	$15Q_{20}$	$30Q_{20}$	$60Q_{20}$	$90Q_{20}$	$120Q_{20}$
Avg. Streamflow (MGD)	20.8	21.6	23.1	25.0	29.0	33.7	42.7	47.5
Draft Rate (MGD)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Flow Rem. (MGD)	2.8	3.6	5.1	7.0	11.0	15.7	24.7	29.5
Avg. % Reduction	86.5	83.3	77.9	72.0	62.1	53.4	42.1	37.9

For a draft rate of 18 MGD the river flows would be below the $7Q_{10}$ for a period of approximately 110 days. For this period the flow would be reduced by approximately 35 percent. However, this flow would be returned to the stream through the regional waste treatment facility. Utilizing the 200 MG storage some augmentation of the flows could occur at extreme low flows.

Table 18 shows the effect on 20 year low flows of the withdrawal of 30 MGD from Drowning Creek.

Table 18

FLOW REDUCTIONS BASED ON A 30 MGD WITHDRAWAL

	$1Q_{20}$	$3Q_{20}$	$7Q_{20}$	$15Q_{20}$	$30Q_{20}$	$60Q_{20}$	$90Q_{20}$	$120Q_{20}$
Avg. Streamflow (MGD)	20.8	21.6	23.1	25.0	29.0	33.7	42.7	47.5
Draft Rate (MGD)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Flow Rem. (MGD)	-	-	-	-	-	3.7	12.7	17.5
Avg. % Reduction	100	100	100	100	100	89.0	70.3	63.2

A draft rate of 30 MGD is not available during the 20 year drought. During a drought this severe a maximum of 20 MGD is available from the river for a one day period. A shortage of an average of 5 MGD would be experienced for a two week period. All of these shortages assume that all available flow in the river is utilized. These flows would be returned to the stream below Aberdeen Creek through the regional waste treatment plant.

A reservoir on Drowning Creek to yield 30 MGD for water supply and 27.8 MGD for low flow releases would require storage of 5,000 acre-feet. The $7Q_{10}$ would be the only flow in the stream for approximately 175 days based on a 20 year drought. For an 18 MGD water supply yield, the storage required would be 2,147 acre feet and the $7Q_{10}$ would be released for approximately 120 days.

The Aberdeen Creek regional wastewater treatment plant discharges to Aberdeen Creek approximately 1.4 miles above the confluence with Drowning Creek. At a design capacity of 6.7 MGD, the minimum dissolved oxygen concentration resulting from the wastewater discharge would occur in Drowning Creek approximately 4.0 miles below the confluence with Aberdeen Creek during low flow periods. For this reason, an analysis was performed to determine what effects the proposed withdrawal would have on the assimilative capacity of Drowning Creek and the resultant treatment requirements necessary to protect water quality in the affected protions of Drowning Creek. The analysis indicated that the existing 6.7 MGD regional wastewater treatment plant on Aberdeen Creek would not degrade water quality in Drowning Creek even with a diversion of 6 mgd upstream. Increased withdrawals of water beyond 6 MGD will necessitate higher levels of treatment on the part of the Aberdeen Creek WWTP in order to protect water quality standards in

Drowning Creek; however, future expansions of the wastewater treatment plant to increase capacity in concert with increased diversion flows to the water treatment plant can be designed to meet the more stringent effluent limits.

The withdrawal of 30.0 MGD from Drowning Creek will result in dry stream conditions in Drowning Creek between the proposed diversion site near U.S. Highway 1 and the confluence with Aberdeen Creek, a distance of approximately 1.8 miles. This would effectively preclude the designated use of that portion of Drowning Creek, namely, providing for the protection and propagation of fish and wildlife, as well as fishing, secondary recreation, and other uses. This is in violation of 40 CFR Section 130.17 Water Quality Standards which states in part in (c)(2) that "the State shall maintain those water uses which are currently being attained", and in (c)(3) "at a minimum, the State shall maintain those water uses which are currently designated in water quality standards...".

At the present time, water quality in Drowning Creek is suitable as a source of raw water for a public water supply as determined from a water quality sampling program conducted during January and February 1978. A similar survey conducted by the Division of Health Services, Department of Human Resources, reinforced these findings.

Relative to a proposed withdrawal in the Little River Drainage Basin from impoundments on Nick's Creek and on the Little River just below Nick's Creek and for minimum releases from those impoundments equivalent to the $7Q_{10}$ low flow, effluent limits for downstream dischargers will not change as a result of the impoundments. The first major wastewater discharge into the Little River (Ft. Bragg, Qw = 8.0 MGD) is approximately 36 miles below the proposed impoundment sites on Nicks Creek and on the Little River near Nick's Creek. The effects of prolonged periods of low flow on water

quality over this great a distance has not as yet been determined, but certainly, water quality would be reduced, not only below wastewater discharges, but also in the intervening stream reaches between the impoundments and the discharge. While water quality may be reduced down to minimum acceptable levels, the designated best uses of the streams would be protected.

Water quality in Nick's Creek and the Little River is good to excellent, providing adequate protection of the streams as a source of raw water for a public water supply.

The proposed impoundment sites on Mill Creek and on James Creek are also upstream of major wastewater discharges. Water quality standards below these discharges would not be violated due to the impoundment provided that a minimum release equivalent to $7Q_{10}$ was required.

Recommendations

In order to protect the water resources of the Sandhills area and provide for their most beneficial use, and to insure that these resources are equitably shared and conserved for future users, it is recommended that a Capacity Use Area be declared, and that regulations governing water use be drafted promptly for consideration by the Commission.

The boundaries of the proposed Capacity Use Area are based on the basin divides and are as follows:

That area bounded by a line beginning at the intersection of Drowning Creek and the county lines of Moore, Hoke, Scotland and Richmond County, and proceeding in a southwest direction along Richmond-Scotland County line to SR 1601;

thence along the center line of SR 1601 in a southwest direction to the intersection of SR 1474;

thence south along the center line of SR 1474 to the intersection of SR 1602;

thence north along the center line of SR 1602 to the intersection of SR 1475;

thence along the center line of SR 1475 in a northwest direction to the intersection of SR 1003;

thence along the center line of SR 1003 in a northwest direction to the intersection of SR 1521;

thence west along the center line of SR 1521 to the intersection of US 220;

thence along the center line of US 220 in a northwest direction to the intersection of NC 211;

thence east along the center line of NC 211 to the intersection of SR 1239;

thence along the center line of SR 1239 in a northeast direction to the intersection of SR 1229;

thence along the center line of SR 1229 in a northeast direction to the intersection of SR 1248;

thence east along the center line of SR 1248 to the intersection of SR 1252;

thence along the center line of SR 1252 in a northeast direction to the intersection of SR 1833;

thence along the center line of SR 1833 in a southeast direction to the intersection of US 15-501;

thence along the center line of US 15-501 in a northeast direction to the intersection of SR 1007;

thence along the center line of SR 1007 in a southeast direction to the intersection of the Moore-Lee County line;

thence east along the Moore-Lee County line to the intersection of SR 1172;

thence along the center line of SR 1172 in a southeast direction to the intersection of the Harnett-Moore County line;

thence along the Harnett-Moore County line in a southwest direction to the intersection of SR 1825;

thence along the center line of SR 1825 in a southeast direction to the intersection of the Harnett-Moore County line;

thence along the Harnett-Moore County line in a southeast direction to the intersection of SR 2018;

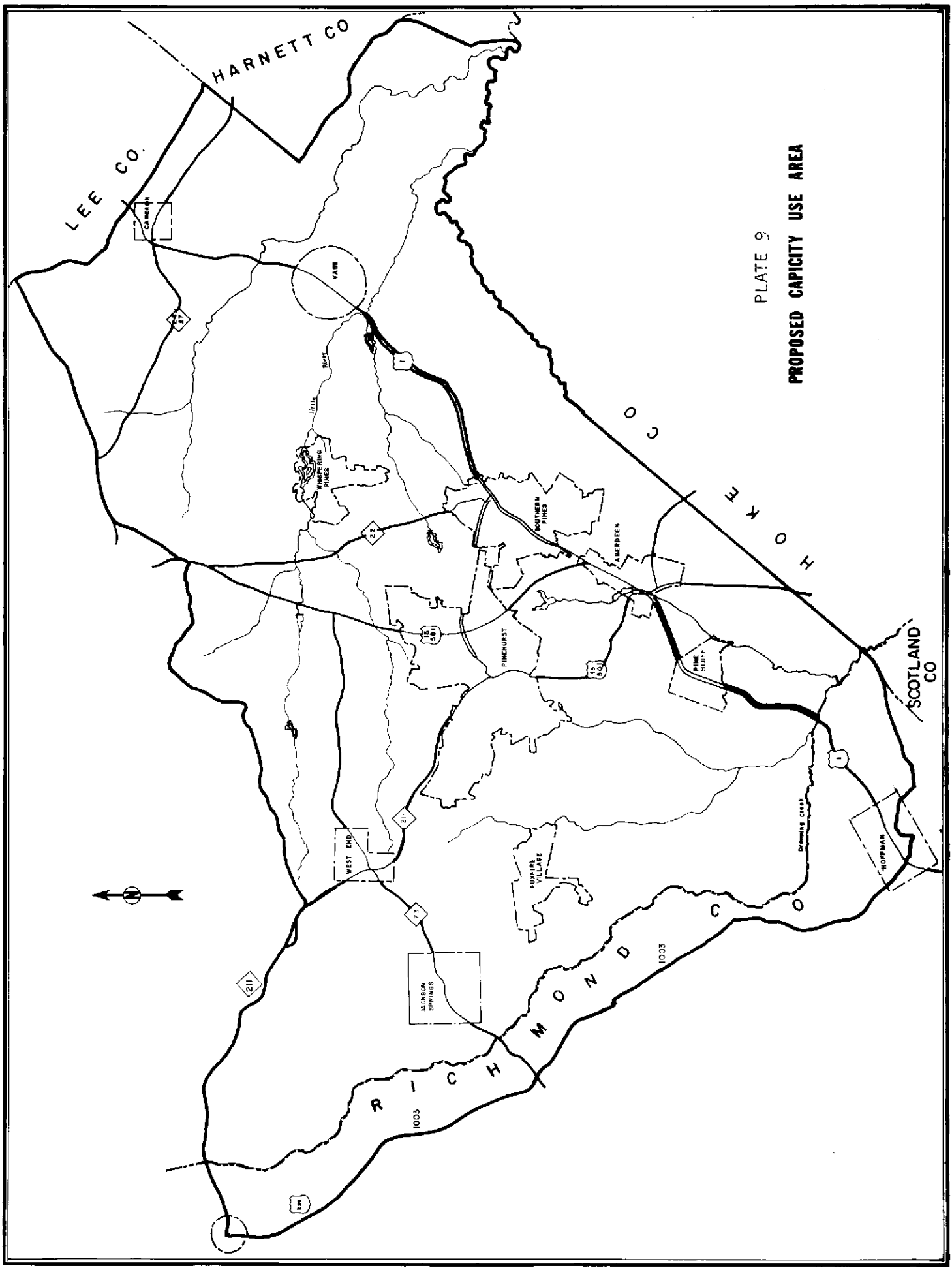
thence along the center line of SR 2018 in a southwest direction to the intersection of Crains Creek;

thence downstream on the left bank of Crains Creek along the 100-year flood contour to the Little River;

thence upstream on the right side of the Little River along the 100-year flood contour to the intersection of the Hoke-Moore County line;

thence along the Hoke-Moore County line in a southwest direction to the starting point.

A map of the proposed Capacity Use Area is shown in Plate 9.


HARNETT CO
LEE CO.
MOORE CO
SCOTLAND CO
RICHMOND CO
PLATE 9
PROPOSED CAPICITY USE AREA
CAMERON
VASS
WHISPERING PINES
SOUTHERN PINES
ABERDEEN
PINEHURST
PINE BLUFF
WEST END
FOXFIRE VILLAGE
JACKSON SPRINGS
HOFFMAN
Little River
Drowning Creek
1003
1003

APPENDICES

APPENDIX A

Table A-1 [1]

INVENTORY OF STREAM CLASSIFICATIONS

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
		Lumber River Drainage Area		
Drowning Creek	Bensalem Twnp. County Line	From source to Horse Creek 27 miles	Clean, clear A-II	Wood Ag.
Drowning Creek	Mineral Springs & Sandhill Twnp. County Line	From Horse Creek to Lumber River 14 miles	Clear, minimum daily flow 11 million gallons C	Wood, limited agriculture
Jackson Creek	Mineral Springs Township	From source to Drowning Creek 8 miles	Clear A-II	Wood, Ag., Residential
Horse Creek	Sandhills Twnp.	From source to Drowning Creek 9 miles	Clean, clear excellent flow C	Wood, Agriculture
Deep Creek	Sandhills Twnp.	From source to a point 3,500 feet upstream of Moore County SR 1122 4 miles	Clean , clear excellent flow B	Wood, Ag.
Deep Creek		From a point 3,500 feet upstream of Moore County SR 1122 to Horse Creek 4 miles	C	
Sandy Run	West of Pinehurst	From source to Deep Creek 2.5 miles	C	Wood, Ag.
Rays Big Branch	West of Pinehurst	From source to Deep Creek 2 miles	Clear C	Wood
Aberdeen Creek	North of Aberdeen	From source (at dam at Watson Lake) to Backwaters of Aberdeen Lake (Pages Lake) at Normal Lake Elevation 1.6 miles	Continuous flow some pollution A-II	Residential, Wood
Watsons Lake	North of Aberdeen	Entire Lake 75 acres	Some Pollution B	Residential

1 An Appraisal of Potentials for Outdoor Recreational Development in Moore County, North Carolina , Soil Conservation Service, U.S. Dept. of Agriculture, Raleigh, North Carolina 1975

2 See attached sheet

Table A-1 (con't)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
Aberdeen Creek	Sandhills Twnp.	From Forked Creek to Drowning Creek 3 miles	Polluted C	Woodland, Ag.
Forked Creek	Sandhills Twnp.	From source to dam at Pinebluff Municipal Lake 2 miles	Some pollution B	Residential, Recreation
Forked Creek	Sandhills Twnp.	From dam at Pinebluff Municipal Lake to Aberdeen Creek 0.7 miles	Some pollution C	Woodland
		Cape Fear River Basin		
Deep River	Northeastern Part of Co.	From Cox's Dam near Cedar Falls to the mouth of Big Governors Creek 24 miles	Sediment Pollution C	Wood, Agriculture
Bear Creek	Sheffields Township	From Randolph Moore Co. Line to Robbins Water Supply Intake 11 miles	Polluted A-II	Wood, Ag.
Unnamed Creek	Sheffields Township	From source to Bear Creek 6 miles	Clear A-II	Woodland, Ag.
Cabin Creek	Bensalem Township	From N. C. Hwy. 27 to Bear Creek 10 miles	Clear, clean A-II	Woodland
Cotton Creek	Sheffields Township	From source to mouth of Lick Creek 2 miles	Polluted, Mill & sewage C	Woodland, Ag., Residential
Lick Creek	Sheffields Township	From source to Cotton Creek 1.5 miles	Fairly clean C	Woodland, Ag., Residential
Cotton Creek	Sheffields Township	From mouth of Lick Creek to Cabin Creek 2 miles	Polluted, Mills & sewage A-II	Woodland, Ag.
Mill Creek	Bensalem Township	From source to Cabin Creek 8 miles	Clean, clear A-II	Woods, Ag.
Wet Creek	Bensalem Township	From source to Cabin Creek 8 miles	Clean, clear A-II	Wood

[2] See attached sheet

Table A-1 (con't)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class[2]	Present Use
Devils Gut Creek	East of Pinehurst	From source to Moore Co. Secondary Road 1205 2.5 miles	Clear C	Woodland
Muster Branch	East of Pinehurst	From source to Devils Gut Creek 1.1 miles	Clear C	Wood & Residential
Devils Gut Creek	Sandhills Township	From Moore Co. Secondary Rd. 1205 to backwaters at Watsons Lake at normal lake elevation 0.1 miles	Clear B	Recreation, Wood
Unnamed Tributary	Source west of Southern Pines	From source to Moore Co. Secondary Rd. 1205	Some pollution C	Woodland, Residential.
Unnamed Tributary	Source West of Southern Pines	From Moore Co. Secondary Rd. 1205 to backwaters of Watsons Lake at normal lake elevation. 0.2 miles	Some pollution B	Recreation, Wood
McCallum Branch	North of Aberdeen	From source to Aberdeen Creek 2 miles	Clear, clean A-II	Sand pits, Woodland, Residential
Unnamed Tributary	North of Aberdeen	From source to Aberdeen Creek (including present Aberdeen Water Supply) 1 mile	Clear, clean A-II	Wood, Residential
Aberdeen Creek	In Aberdeen	From backwaters of Aberdeen Lake (Pages Lake) at normal lake elevation to dam of Aberdeen Lake (Pages Lake) 0.6 miles	Weedy, some pollution B	Recreation, Residential
Aberdeen Creek	In Aberdeen	From dam at Aberdeen Lake (Pages Lake) to Forked Creek 3 miles	Weedy, some pollution C	Residential
Devils Gut Branch	In Aberdeen	From source to Aberdeen Creek 3 miles	Some pollution C	Residential

[2] See attached sheet

Table A-1 (con't.)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
Unnamed Tributary at Aberdeen Packing Co.	In Aberdeen	From source to Devils Gut Branch 1.5 miles	Some pollution C	Residential, Wood
Sings Creek	Bensalem Township	From source to Wet Creek 2.5 miles	Clean, clear A-II	Wood
Dry Creek	Bensalem Township	From source to Cabin Ceeek 5 miles	Clean, clear A-II	Wood, Ag.
Horse Creek	Bensalem Township	From source to Dry Creek 1.5 miles	Clean A-II	Wood, Ag.
Bear Creek	Sheffield Township	From Robbins Water Supply to Deep River 5 miles	Clear, some pollution C	Wood
Falls Creek	Ritters Township	From source to Deep River 3 miles	Clean C	Wood, Ag.
Buffalo Creek	Ritters Township	From source to Deep River 10 miles	Generally muddy C	Wood, Ag., Residential
Meadow Creek	Carthage Township	From source to Buffalo Creek 4 miles	Clear C	Woodland, Ag.
McLendons Creek	Sensalem, Carthage & Deep River Townships	From source to Deep River 21 miles	Muddy, flat meandering C	Woodland
Suck Creek	Bensalem Township	From source to Moore Co. SR -1210 3 miles	Clean, Good flow B	B.S.A. Camp, Woodland
Haystack Creek	Bensalem Township	From source to Suck Creek 1 mile	Clean, clear B	B.S.A. Camp
Suck Creek	Carthage Township	From Moore Co. SR 1210 to McLendons Creek 8 miles	Muddy after rain C	Woodland, Ag.
Juniper Creek	Carthage Township	From source to McLendons Creek 8 miles	Clear, clean C	Woodland, Ag.

[2] See attached sheet

Table A-1 (con't.)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
Little Juniper Creek	Carthage Township	From source to Juniper Creek 2 miles	Clear, clogged with woodland debris C	Woodland
Killets Creek	Carthage Township	From source to dam at Carthage sewage lagoons 1 mile	Clear, clean A-II	Woodland
Killets Creek	Carthage Township	From dam at Carthage sewage lagoons to McLendons Creek 3 miles	Generally muddy somewhat polluted C	Woodland
Unnamed Tributary (at Carthage Imhoff tank)	Carthage Township	From source to Killets Creek 1 mile	Somewhat polluted C	Residential
Unnamed tributary (at Brooklyn St. Ext.)	Carthage Township	From source to Killets Creek 0.5 miles	Somewhat polluted C	Residential
Little Creek	Carthage Township	From source to McLendons Creek 2 miles	Muddy C	Woods, Residential, Ag.
Richland Creek	Bensalem Township	From source to Moore Co. SR 1264 0.5 miles	Muddy B	Woodland
Richland Creek	Carthage Township	From Moore Co. SR 1264 to McLendons Creek 10 miles	Muddy, flat grade C	Woodland
Big Governors Creek	Greenwood & Deep River Townships	From source to Deep River 8 miles	Muddy C	Wood, Ag.
McIntosh Creek	Carthage Township	From source to Big Governors Creek 4 miles	Muddy C	Woodland
Crawley Creek	Deep River Township	From source to Big Governors Creek 6 miles	Muddy C	Wood, Ag.
Little Governors Cr.	Co. Line - Lee County	From source to Big Governors Creek 6 miles	Muddy C	Woodland
Deep River	Co. Line - Lee County	From mouth of Big Governors to Secondary Rd. #1007 at bridge crossing at Gulf 4 miles	Polluted A-II	Wood, Ag.

[2] See attached sheet

Table A-1 (con't.)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
Mill Creek	McNeill Township	From dam at Southern Pines water supply to dam at Crystal Lake, including Recreational Lake on the property of Mill Creek Development Co. and Crystal Lake. 6 miles	Excellent flow Clear, clean above juncture with McDeeds Cr., Crystal Lake polluted B	Wood., Residential Agriculture
McDeeds Creek	McNeill Township	From source to Mill Creek 5 miles	Serious pollution from sewage C	Residential, Ag., Woodland
Unnamed Tributary	In Southern Pines (Swann Lake)	From source to McDeeds Creek 0.5 miles	Muddy B	Residential
Mill Creek	McNeill Township	From dam at Crystal Lake to Little River 0.5 miles	Polluted, excellent flow C	Woodland
James Creek	Boundary with Fort Bragg	From source to Little River 9 miles	Clear, clean A-II	Wood., Ag., Residential
Mill Creek	Highland Trails Development	From source to James Creek 2 miles	Clear A-II	Residential, Ag., Woodland
Silver Run	McNeill Township	From source to James Creek 1.5 miles	Clear, clean A-II	Woodland, Recreation
Carrols Branch	McNeill Township	From source to James Creek 1.5 miles	Clear, clean A-II	Woodland, Recreation
Tuchkahoe Creek	McNeill Township	From source to James Creek 4.5 miles	Clear, clean A-II	Woodland, Recreation
Polecat Creek	McNeill Township	From source to Tuckahoe Creek 1 mile	Clear, clean A-II	Woodland, recreation
Horse Creek	McNeill Township	From source to Little River 2 miles	Clear, clean A-II	Residential, Recreation
Flat Creek	McNeill Township	From source to Little River 1 mile	Clear, clean A-II	Residential Recreation
Crane Creek	Greenwood Township	From source to mouth of Beaver Creek 11 mile	Fairly clear and clear C	Ag., Woodland

[2] See attached sheet

Table A-1 (con't)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
Little River (Lower)	McNeill & Little River Townships	From source to dam at water supply at Fort Bragg, including Thaggards Pond (Lake) which is classified both "A-II" and "B" 25 miles	Somewhat polluted flat grade A-II	Wood., Ag.
Wads Creek	6 miles S. of Carthage	From source to Little River 4 miles	intermittent Clear, clean A-II	Wood., Ag.
Nicks Creek	Mineral Springs & McNeill Townships	From source to Little River 11 miles	Clear, clean Continuous flow A-II	Wood., Ag., Residential
Joes Fork	North edge of Pinehurst	From source to Nicks Creek 3.5 miles	Continuous flow Slightly polluted C	Residential, Wood
Board Branch	North edge of Pinehurst	From source to Joes Fork 1 mile	Slightly polluted C	Residential, Wood.
Rattlesnake Creek	NE of Pinehurst	From source to Joes Fork 1.5 miles	Clear, clean A-II	Residential, Wood.
Juniper Branch	NE of Pinehurst	From source to Nicks Creek 2 miles	Continuous flow A-II	Recreation, Wood. Residential
Unnamed Tributary	Mineral Springs Township	From source to Nicks Creek 1 mile	Clear A-II	Woodland, Ag.
McLean Branch	Mineral Springs Township	From source to Little River 1 mile	Clear A-II	Woodland, Ag.
Ponds Branch	Mineral Springs Township	From source to Little River 1 mile	Clear A-II	Woodland, Ag.
Mill Creek	McNeills Township	From source to dam at Southern Pines water supply 2 miles	Clean, clear A-II	Woodland
Dunham Creek	Carthage Township	From source to dam at Carthage #1 Reservoir 0.5 miles	Intermittent A-II	Ag., Wood., Residential
Dunham Creek	Carthage Township	From dam at Carthage #1 Reservoir to Crane Creek 4 miles	Nearly continuous flow C	Ag., Woodland

[2] See attached sheet

Table A-1 (Con't)

Name of Stream	Location (Township)	Size (Length)	Description of Water & Class [2]	Present Use
Herds Creek	Greenwood Township	From source to Crane Creek 6 miles	Clear, clean C	Woodland, Ag.
White Oak Creek	Greenwood Township	From source to Crane Creek 1 mile	Nearly continuous flow C	Woodland, Ag.
Big Branch	Greenwood Township	From source to Crane Creek 2 miles	Nearly continuous flow C	Woodland, ag., Residential
Roundabout Branch	Greenwood Township	From source to Crane Creek 6 miles	Nearly continuous flow C	Woodland, Ag.
Slash Branch	Greenwood Township	From source to Roundabout Branch 1 mile	Nearly continuous flow C	Woodland, Ag.
Crane Creek	Little River Township	From mouth of Beaver Creek to Little River 8 miles	Clear, clean A-II	Woodland, Recreation Residential
Beaver Creek	Greenwood Township	From source to Crane Creek 8 miles	Clear, clean A-II	Woodland, Ag.
Wildcat Branch	Greenwood Township	From source to Beaver Creek 2 miles	Clear, clean A-II	Woodland, Ag.

[2] See attached sheet

2 Classification of streams as shown is in accord with information furnished by the Division of Environmental Management, North Carolina Department of Natural Resources and Community Development, Raleigh, North Carolina.

a. Classification and Water Quality Standards Assigned to the Waters of the Cape Fear Rivers; amended effective March 1, 1977.

A brief explanation of the "best usage" as adopted by the North Carolina Board of Water and Air Resources on October 13, 1970, and filed in the Office of the Secretary of State of North Carolina for which the waters in each class must be protected is given as follows:

Fresh Waters

Class A-I - Suitable as source of water supply for drinking, culinary, or food processing purposes after treatment by approved disinfection only, and any other usage requiring waters of lower quality.

Class A-II - Suitable as a source of water supply for drinking, culinary or food processing purposes after approved treatment equal to coagulation, sedimentation, filtration, and disinfection, etc., and any other usage requiring waters of lower quality.

Class B - Suitable for outdoor bathing, boating, and wading and any other usage requiring waters of lower quality.

Class C - Suitable for fish and wildlife propagation; also suitable for boating, wading and other uses requiring waters of lower quality.

Tidal Salt Waters

Class SA: Suitable for shellfishing for market purposes and any other usage requiring waters of lower quality.

Class SB: Suitable for bathing and any other usage except shellfishing for market purposes.

Class SC: Suitable for fishing and any other usage except bathing and shellfishing for market purposes.

Table A-2

INVENTORY OF LAKES, PONDS, RESERVOIRS
MOORE COUNTY [1]

Name of Water	Location	Size (Area or Length	Description of Water (All considered as warm water)	Present Use
1. Dr. Tracy Hussey	4 miles W. of Spies; ½ mile N. of SR 1002	5 Acres	Fairly Clear, Well Maintained	Recreation
2. Ed Harris	Near Montg. Co. Line on SR 1280; 3000' N. of NC 211	9 Acres	Clear, Clean	Irrigation
3. Ed Harris	3/4 mile from Montg. Co. Line N. of NC 211	8 Acres	Clear, Clean	Irrigation
4. Ed Harris	Below (3). Dam on SR 1143 N. side of NC 211	10 Acres	Clear, Clean	Irrigation
5. Mack Shappel	S. of NC 211, joins Drowning Creek N. of SR 1145	7 Acres	Clear, Clean	Irrigation
6. Upper Pompelli Pond	At Samarcand East side of SR 1143	11 Acres	Clear, Clean, Well Maintained	Irrig., Recreation
7. Lower Pompelli Pond	At Samarcand	5 Acres	Clear, Clean	Recreation
8. Dr. Sheppard	Below Pompelli Lakes at Samarcand	24 Acres	Clear, Clean	Recreation
9. Samarcand Manor	3 miles S. of Eagle Springs	6 Acres	Clear, Clean, Well Managed	Irrig., Recreation
10. McDuffie	On Mill Creek just above SR 1143 N. of Eagle Springs	11 Acres	Clear, Clean	Recreation
11. Williams	W. of SR 1275; 1.5 miles N. of Eagle Springs	18 Acres	Clear, Clean, Well Managed	Recreation
12. Lewis	W. of SR 1275; 1¼ miles N. of Eagle Springs	8 Acres	Clear, Clean, Well Managed	Recreation
13. Williams	At A. Williams home 1 mile N. of Eagle Springs	11 Acres	Clear, Clean, Well Managed Excellent Fishpond	Recreation, Irrig.

[1] An Appraisal of Potentials for Outdoor Recreational Development in Moore County, North Carolina Soil Conservation Service, U.S. Dept. of Agriculture, Raleigh, North Carolina 1975

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description of Water (All considered as warm water)	Present Use
14. Williams	At Samarcand, East side Pompelli ponds	10 Acres	Clear, Clean	Recreation
15. Williams	At Samarcand, East at Pompelli ponds	10 Acres	Clear, Clean	Recreation
16. Bengston	3 miles N. of Jackson Springs, E. of SR 1137	7 Acres	Clear, Clean	Recreation
17. Bengston	3 miles N. of Jackson Springs, E. of SR 1137	13 Acres	Clear, Clean	Recreation
18. Bengston	3 miles N. of Jackson Springs, E. of SR 1137	8 Acres	Clear, Clean	Recreation
19. Mill Pond	In Robbins	5 Acres	Muddy	Industrial
20. Ewing	3 miles N. of West End near intersection of NC 211 & SR 1239	7 Acres	Clear	Irrigation
21. Foxfire	4 miles S. of West End on SR 1004	15 Acres	Clear, Clean	Irrigation
22. Johnson	On SR 1229, 1 mile N. of West End	7 Acres	Clear, Clean	Recreation
23. McKeithen	On SR 1004, 9 miles S. of West End	7 Acres	Clear, Clean	Recreation
24. Boy Scout	8 miles W. of Carthage on trib. of McLendons Creek	55 Acres	Fairly Clear, Clean	Recreation
25. Boy Scout	8 miles W. of Carthage on trib. of McLendons Creek	29 Acres	Fairly Clear, Clean	Recreation
26. McDonald	2 miles W. of Thomas X Road	6 Acres	Clear	Irrigation

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description of Water (All considered as warm water)	Present Use
27. VanCannon	3/4 miles E. of SR 1004 on trib. of Deep Creek	7 Acres	Clear, Clean	Recreation
28. Sandy Woods	3 miles W. of Pinehurst off SR 1115	16 Acres	Clear, Clean	Recreation
29. Pine Lake Shooting	On Little River, 4-5 miles West of Eastwood, N. of NC 73	30 Acres	Clear, Clean	Recreation
30. Pinewild	At head of Joes Fork 2 miles W. of Pinehurst on NC 211	40 Acres	Clear, Clean, Well Managed	Recreation
31. McCallum	1½ miles W. of Pinehurst, S. of Linden Road	7 Acres	Clear, Clean	Recreation
32. L. Tufts	On head of Horse Creek SW edge of Pinehurst	7 Acres	Clear	Recreation
33. W. Williams	W. of Vina Vista, N. of SR 1115	6 Acres	Clear, Clean	Recreation
34. Garner	W. of Vina Vista, N. of SR 1115	6 Acres	Clear, Clean	Recreation
35. Dr. Rankin	2 miles S. of SR 1102 near Drowning Creek	13 Acres	Clear, Clean	Irrigation
36. Pinehurst	In Pinehurst due West of Racetrack; W. side of NC 5	7 Acres	Clear, Clean	Irrigation
37. Taylor	2 miles NW of Aberdeen East of NC 5	7 Acres	Clear, Clean	Recreation
38. Fry	W. of Aberdeen, West of SR 1103 & "County Acres"	6 Acres	Clear, Clean	Recreation

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description of Water (All considered as warm water)	Present Use
39. Rowe	2 miles W. of Aberdeen behind Standard Trucking on NC 5	5 Acres	Clear	Livestock
40. Cardinal Club	½ mile South of Pinebluff on U.S. #1	8 Acres	Clear, Clean	Recreation
41. Blue-Freeman	Upstream from Cardinal Club on U.S. #1	5 Acres	Clear, Clean	Recreation
42. Municipal Lake	Pinebluff	6 Acres	Clear	Recreation
43. Colony Lakes	East of U.S. #1, 2 miles S. of Pinebluff	9 Acres	Clear, Clean	Irrigation
44. Leavitts Lake	1 mile N. of Eastwood, W. of U.S. 15-501	21 Acres	Clear, Clean, Weedy	Recreation
45. Sheffield	At Eastwood, East of U.S. 15-501	12 Acres	Clear, Clean	Recreation
46. Black	At Eastwood, S. of NC 73	5 Acres	Clear	Livestock, Irrigation
47. Pinehurst Camp	On U.S. 15-501, 2 miles	5 Acres	Clear, Weedy	Recreation
48. Monroe-Pinehurst	2 miles N. of Pinehurst U.S. 15-501 East	10 Acres	Clear	Recreation
49. Tufts	Near Pinehurst traffic circle on U.S. 15-501	6 Acres	Clear, Clean	Recreation
50. Gilmore	Behind Pinecrest High School, W. of Southern Pines, N. of U.S. 15-501	8 Acres	Clear, Clean	Recreation
51. Country Club of North Carolina	North of Aberdeen and U.S. 15-501 at junction with SR 1205	19 Acres	Clear, some pollution	Environmental Improvement

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description of Water (All considered as warm water	Present Use
52. Watson's Lake, Country Club of N.C.	At Country Club of N.C. between Aberdeen & Pinehurst U.S. 15-501	75 Acres	Clear, some pollution	Environmental Improvement and Irrigation
53. Pleasants	At Pleasants Sand Pit 1 mile N. of Aberdeen East of NC 5	21 Acres	Clear, only partially cleared of trees	Washing Sand & Gravel
54. Aberdeen	In Aberdeen	35 Acres	Clear, weedy, some pollution	Recreation
55. Hight	On U.S. 15-501, 1 mile S. of Aberdeen	5 Acres	Clear	Recreation
56. Stainback	3 miles S. of Aberdeen on Bull Branch, E. of U.S. 15-501	20 Acres	Clear, partially cleared of trees	Recreation
57. Town Pond	S. edge of Carthage W. of U.S. 15-501	8 Acres	Clear, Clean	Recreation
58. Town Pond	E. of Carthage, E. of U.S. 15-501	8 Acres	Clear, Clean	Recreation
59. Riddle	2 miles S. of Carthage on SR 1803 (Vass Road)	8 Acres	Clear, Clean	Irrigation
60. Fly Rod Lake	At Whispering Pines N. side of SR 1841	7 Acres	Fairly Clear	Environmental Improvement
61. Spring Valley Lake	At Whispering Pines S. side of SR 1841	120 Acres	Clear	Environmental Improvement
62. Blue	Near Airport West of SR 1842	8 Acres	Clear, Clean	Irrigation
63. Presnell	N. of Airport E. of NC 22	7 Acres	Clear	Recreation
64. Warrior Woods	On Mill Creek, below NC 22 1 mile N. of Southern Pines	40 Acres	Clear	Environmental Improvement

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description (All considered as warm water	Present Use
65. Southern Pines	On Mill Creek, above NC 22 1 mile N. of Southern Pines	60 Acres	Clear, Clean	Municipal Water Supply
66. Tate	At head of Mill Creek above Southern Pines Lake	6 Acres	Clear	Recreation
67. Mid-Pines	At juncture of U.S. #1 and NC 2	17 Acres	Murky, Sediment Pollution	Irrigation
68. Swan Lake	At juncture of U.S. #1 and NC 2	5 Acres	Muddy, Sediment Pollution	None
69. Morris	On Bethesda Road, 1 mile N. of Bethesda	18 Acres	Fairly Clear, Very Weedy	Recreation
70. Matthews	4 miles S. of Carthage on SR 1802	7 Acres	Fairly Clear	Irrigation
71. Thaggards	At Whispering Pines	300 Acres	Clear	Recreation
72. Pine Lake	At Whispering Pines SR 1802	42 Acres	Clear	Environmental Improvement
73. East Lake	At Whispering Pines SR 1802	15 Acres	Clear	Environmental Improvement
74. Matthews-Rogers	SE of Junction of SR 1803 & 1802 (Matthew Market)	6 Acres	Clear	Irrigation
75. Loch McPhaul	At Highland Trails near Ft. Bragg Mil. Reservation	13 Acres	Clear	Environmental Improvement
76. Governor's Lake	Near Lee County Line off SR 1625	16 Acres	Fairly Clear	Environmental Improvement
77. Crystal Lake	At Lakeview	60 Acres	Polluted from Southern Pines sewage treatment Water Clear	Industrial

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description of Water (All considered as warm water)	Present Use
78. Futrell	Between U.S. #1 and railroad at Skyline	9 Acres	Clear, Clean	Recreation
79. Causey	E. of U.S. #1, N. of SR 2026 near Skyline	5 Acres	Clear, Clean	Recreation
80. Simpson	1 mile South of Lakeview off SR 2025	5 Acres	Clear, Clean	Recreation
81.	Head of James Creek on Ft. Bragg line	25 Acres	Clear, Clean	Unknown
82. Bud Evans	3 miles N. of Vass off SR 1827	5 Acres	Clear, Clean	Recreation
83. Thurlows	1 mile N. of Vass on SR 1826	16 Acres	Clear, Clean	Recreation
84. Taylor	W. edge of Vass on SR 1803	8 Acres	Clear, Clean	Multi-purpose
85. Forrest-Causey	1.5 miles S. of Lakeview at end of SR 2025	10 Acres	Clear, Clean	Recreation
86. Griffin	1 mile S. of Vass SR 1853	9 Acres	Clear, Clean	Recreation
87. Lake Bay	5 miles E. of Southern Pines on SR 2026 (Hog Island)	40 Acres	Clear, Clean	None, dam partially destroyed
88. J-Bar Ranch	1 mile N. of Vass, E. of U.S. #1	6 Acres	Clear, Clean	Irrigation
89. Harbour	1 mile E. of Vass on SR 2005	6 Acres	Clear, Clean	Irrigation
90. River Bend	On James Creek, 5 miles SE of Lakeview	10-65 Acres	Clear, Clean	Unknown - only partially cleared of trees
91. Thomas	2½ miles SE of Cameron at end of SR 2006	6 Acres	Clear, Clean	Irrigation

Table A-2 (Con't)

Name of Water	Location	Size (Area or Length)	Description of Water (All considered as warm water)	Present Use
92. McKeithen	3 miles E. of Vass on SR 1001	5 Acres	Clear, Clean	Multiple Use
93. McKeithen	3 miles E. of Vass on SR 1001	5 Acres	Clear, Clean	Multiple Use
94. Lake Surf	On Crains Creek at Lobelia	105$4^{\pm}$ Acres	Under Construction	Recreation
95. Muse	2½ miles E. of Lobelia at Mt. Pleasant Church	7 Acres	Murky	Irrigation
96. Simpson	3½ miles E. of Lobelia on SR 1001	18 Acres	Clear, Clean	Irrigation
97. H. Duncan	On Bull Branch E. of U.S. 15-501	25 Acres	Clear	Recreation

Table A-3

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Trib. of Bear Creek 1	3b-11	Just upstream from SR 1411	30	30	360	3,427	Intermittent Sedimentation Problem Class A-11	Pasture 75% and Woodland 25%
Bear Creek 2	3b-11	App. ½ mile upstream from SR 1410	25	30	300	2,788	Intermittent minor sedimentation Class A-11	Woodland and very small amt. cropland
Trib. of Bear Creek 3	3b-11	App. 500' upstream from SR 1403	45	30	540	4,986	Intermittent minor sedimentation Class A-11	Pasture, Cropland Woodland
Trib. of Bear Creek 4	3b-11	App. 1000' upstream from jct. with Bear Creek	54	30	648	5,984	Intermittent some sedimentation Class A-11	Woodland, Pasture Quarry
Wolf Creek 5	3b-11	App. 2000' upstream from SR 1403	40	30	480	4,538	Intermittent some sedimentation Class A-11	Woodland, Cropland
Cabin Creek 6	3b-11	App. 1000' upstream from jct. with Trib.	60	30	720	6,714	Continuous flow, some sedimentation Class A-11	Cropland, Woodland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Cabin Creek 7	3b-11	App. 1000' upstream from SR 1281	140	30	1,680	15,710	Continuous flow, Clear Class A-II	Cropland, Woodland
Trib. of Cabin Creek 8	3b-11	App. 1000' upstream from SR 1400	67	30	804	7,410	Continuous flow, Clear Class A-II	Woodland
Mill Creek 9	3b-11	App. 750' upstream from NC 27	60	30	720	6,630	Continuous Flow, Clear Class A-II	Woodland
Trib. of Drowning Creek - 10	5d1-47	Just upstream from SR 1141	137	30	1,644	5,290	Continuous flow, Clear Class D	Woodland, Pasture
Wolf Creek 11	3b-11	App. 500' upstream from jct. with Bear Creek	80	30	960	8,855	Intermittent sedimentation problem	Co. Route, Woodland, Cropland Neglig.
Wet Creek 12	3b-11	Just upstream from SR 1270	48	30	576	5,283	Continuous flow, Clean, Clear Class A-II	Woodland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Jackson Creek 13	5d1-47	App. ½ mile upstream from creek	87	30	1,044	3,366	Continuous flow, Clear Class - D	Woodland
Jackson Creek 14	5d1-47	App. 1000' upstream from NC 73	256	30	3,072	9,856	Continuous flow, Clear Class - D	Woodland, Cropland SR 1129
Jackson Creek 15	5d1-47	App. 1 mile stream from SR 1122	318	30	3,816	12,262	Continuous flow, Clear Class - D	Woodland, SR 1122
Trib. of Jackson Creek 16	5d1-47	App. 1 mile upstream from jct. with Jackson Creek	108	30	1,300	4,150	Continuous flow, Clear Class - D	Woodland
Trib. Drowning Creek - 17	5d1-47	App. 3000' upstream with Drowning Creek	46	30	552	1,790	Continuous flow, Clear Class - D	Woodland, Cropland
Trib. of Deep River 18	3b-11	App. 500' upstream from SR 1003	25	30	300	2,750	Intermittent Sedimentation problem Class - D	Cropland, Woodland Pasture

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Cabin Creek 19	3b-11	App. 750' upstream from SR 1002	464	30	5,568	51,665	Continuous flow, Some pollution from Biscoe sewage Class A-II	Wildlife, (Idle Cropland)
Bear Creek 20	3b-11	App. 1500' upstream from RR	(RB 575) 220	30	2,640	24,360	Continuous flow, Some Sedimentation Class A-II	Woodland, Cropland, Pasture
McLendons Creek 21	3b-11	App. 1.5 miles down-stream from SR 1241	152	30	1,825	5,880	Continuous flow, Clear Class - D	Woodland
Buffalo Creek 22	3b-11	App. 1000' upstream NC 27	31	30	372	3,456	Almost continuous flow, some sedi-mentation Class - D	Woodland possibly small amt. Cropland
Meadow Creek 23	3b-11	App. 1000' upstream from SR 1477	25	30	300	2,840	Intermittent flow, some sedimentation Class - D	Woodland, Cropland, Elect. Trans. Line
McLendons Creek 24	3b-11	App. 1000' upstream from SR 1210	230	30	2,760	8,838	Continuous flow, Clear Class - D	Woodland, Pasture

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Sources & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Big Juniper Creek 25	3b-11	Downstream from SR 1240	38	30	456	1,490	Continuous flow, Clear Class - D	Woodland, SR 1240 Pasture
Sandy Run 26	5d1-47	App. ½ mile downstream from SR 1122	78	30	936	3,000	Continuous flow, Clear Class - D	Woodland, Pasture Homes, SR 1122
Deep Creek 27	5d1-47	App. 1.0 miles downstream from SR 1122	128	30	1,536	4,930	Continuous flow, Clear Class - D	Woodland
Deep Creek 28	5d1-47	App. ½ mile upstream from SR 1112	272	30	3,264	10,470	Continuous flow, Clear Class - D	Woodland
Deep Creek 29	5d1-47	App. ½ mile do downstream from SR 1112	300	30	3,600	11,590	Continuous flow, Clear Class - D	Woodland Cropland, SR 1112
Deep Creek 30	5d1-47	App. ½ mile downstream from SR 1113	350	30	4,200	13,510	Continuous flow, Clear Class - D	Woodland, SR 1113
Richland Creek 31	3b-11	App. 2000' upstream from SR 1262	118	30	1,416	4,540	Intermittent minor sediment Class - D	Pasture, Cropland Woodland

TABLE A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN
MOORE COUNTY 1

Identity of Site		Location	Estimated Size			Sources & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
McLendons Creek 32	3b-11	Downstream of of McLendon & Scout Branch	358	30	4,296	13,790	Continuous flow, minor sedimentation	Woodland, Pasture Cropland
Big Juniper Creek 33	3b-11	Just upstream from McLendons Creek	207	30	2,484	7,970	Continuous flow, Clear Class - D	Woodland, Pasture
McLendons Creek 34	3b-11	App. 2000' upstream SR 1261 & just above division in creek	626	30	7,510	24,080	Continuous flow, Fairly clear Class - D	Woodland
Big Juniper Creek 35	3b-11	App. 1000' upstream from SR 1240	152	30	1,824	5,875	Continuous flow, Clear Class - D	Woodland, Pasture
Big Juniper Creek 36	3b-11	App. 7 miles upstream from SR 1240	142	30	1,700	5,490	Continuous flow, Clear Class - D	Woodland
Big Juniper Creek 37	3b-11	Just upstream from SR 1210	85	30	1,020	3,258	Continuous flow, Clear Class - D	Woodland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Sources & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Nick's Creek 38	3-18	App. 1 mile upstream from SR 1210	78	30	936	3,030	Continuous flow, Clear Class A-II	Woodland
Nick's Creek 39	3-18	Just upstream from SR 1210	104	30	1,248	4,030	Continuous flow, Clear Class A-II	Woodland, Cropland
Horse Creek 40	5d1-47	App. 3000' downstream from SR 1115	74 220	20	592	3,880	Continuous flow Clear Class - D	Woodland
Horse Creek 41	5d1-47	App. 1 mile upstream from jct. with Deep Creek	220	30	2,640	8,490	Continuous flow Clear Class - D	Woodland
Richland Creek 42	3b-11	Just upstream from SR 1640	413	30	4,956	15,913	Nearly continuous Muddy Class - D	Woodland Cropland
Richland Creek 43	3b-11	App. 1.6 miles upstream from SR 1640	304	30	3,648	11,715	Nearly continuous flow, muddy Class - D	Woodland
McLendons Creek 44	3b-11	App. 1 mile from jct. with Richland Creek	1,100	30	13,200	42,870	Continuous flow, Muddy Class - D	Woodland, Cropland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Trib. of Richland Creek - 45	3b-11	App. 1000' upstream from jct. with Richland Creek	66	30	792	2,560	Intermittent Class - D	Woodland
Richland Creek 46	3b-11	App. 1.4 miles miles downstream from NC 27	204	30	2,448	7,884	Nearly continuous flow, muddy Class - D	Woodland
McLendons Creek 47	3b-11	App. 1 mile up from SR 1642	1,000	30	12,000	39,700	Continuous flow Muddy Class - D	Woodland Pasture, SR 1640
McLendons Creek 48	3b-11	App. 1500' upstream	744	30	8,930	28,640	Continuous flow, Muddy Class - D	Woodland, Cropland
Little Creek 49	3b-11	App. 1000' upstream from SR 1261	71	30	852	2,742	Intermittent, Muddy, Sedimentation, may be some contamination Class - D	Woodland Cropland
Killetts Creek 50	3b-11	App. 1500' upstream from SR 1261	135	30	1,620	5,184	Intermittent, muddy, receives effluent from Carthage sewage lagoons Class A-II	Woodland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Sources & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	
			Acres	Depth	Ac. Ft.	Acres		
Wads Creek 51	3-18	App. 1000' upstream from U.S. 15-501	114	30	1,368	4,410	Intermittent flow Clear Class A-II	Woodland
Joes Creek 52	3-18	Just upstream from SR 1209	52	30	624	2,020	Continuous flow, clear, probable contamination from septic tanks	Woodland, Cropland, Powerline
Trib. of Joes Creek 53	3-18	App. 1000' upstream from jct. with Joes Creek	14	30	168	512	Continuous flow, clear receives effluent Pinehurst sewage Class - D	Woodland, Housing development, Power Line
Joes Creek 54	3-18	App. ½ mile upstream from SR 1216	75	30	900	2,880	Continuous flow, clear sewage eff. Class - D	Woodland, Cropland Shooting Preserve
Trib. of Joes Creek 55	3-18	App. 1000' upstream from SR 1845	35	30	420	1,340	Continuous flow, Clear Class A-II	Woodland, Housing SR 1845
Aberdeen Creek 56	5d1-47	Upstream from SR 1205	22	10	88	2,820	Continuous flow, Clear Class - D	Woodland, Gas Trans. Line

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Trib. of Aberdeen Creek 57	5d1-47	Upstream from NC 211	55	25	550	2,050	Continuous flow, high BoD county Clear Class - D	Woodland
Trib. of Aberdeen Creek 58	5d1-47	App. 1000' upstream from jct. with Aberdeen Creek	53	30	636	2,050	Continuous flow, Clear Class A-II	Woodland, Golf Course, Housing, Lake
Trib. of Quewiffle Creek-Bull 59	5d1-47	App. 1000' upstream from County Line and ½ mile E. of jct. of SR 1105 and U.S. 15-501	40	30	480	1,545	Continuous flow, Clear Class - D	Woodland (Possibly Stainback 20 acre lake)
McLendons Creek 60	3b-11	App. 3/4 mile upstream from SR 1006	1,600	30	19,200	63,459	Continuous flow, Muddy Class - D	Woodland, SR 1628
McLendons Creek 61	3b-11	Just upstream from jct. with River	1,685	30	20,200	64,832	Continuous flow, Muddy Class - D	Woodland, SR 1006
Crawley Creek 62	3b-12	App. ½ mile upstream from jct. in Creeks	43	30	516	1,665	Intermittent, Muddy Class - D	Woodland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Sources & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Unnamed Creek 63	3b-12	App. 1 mile upstream from jct. in Creeks	216	30	2,592	8,320	Intermittent, muddy Class - D	Woodland
McIntosh Creek 64	3b-12	App. 1000' upstream from SR 1658	83	30	996	3,200	Intermittent, Class - D	Woodland
Governors Creek 65	3b-12	App. 1000' upstream from SR 1651	126	30	1,512	4,865	Intermittent Class - D	Woodland
Durhams Creek 66	3b-18	App. 1000' upstream from SR 1832	173	30	2,076	6,660	Intermittent flow, Clear Class - D	Woodland, purpose youth camp
Nicks Creek 67	3-18	App. ½ mile upsdream from NC 22	146	10	584	16,410	Continuous flow, Clear Class D	Woodland, site of Chandler Mill Pond & present water supply for Carthage
Mill Creek 68	3-18	App. 3000' upstream from SR 1802	86	30	1,032	3,330	Continuous flow, Clear Class B	Woodland, Warrior Woods, Lake & Housing, Pasture
McDeeds Creek 69	3-18	App. 1500' upstream from SR 1902	62	30	744	2,370	Continuous flow, Contaminated, S. Pines Sewage Treatment Plant Class D	Woodland, Pasture

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Source & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
McDeeds Creek 70	3-18	Just up-stream from SR 1853	92	30	1,104	3,520	Continuous flow, contaminated Class D	Woodland
Mill Creek 71	3-18	App. 750' downstream from SR 1853	248	30	2,976	9,540	Continuous flow, rec. cont. from McDeeds Creek	Woodland, Cropland SR 1853
Trib. of James Creek 72	3-18	App. ½ mile upstream from SR 2026	110	30	1,320	4,220	Continuous flow, Clear Class A-II	Woodland, Cropland Fox Hunt, site of ex. 35 ac. lake
Herds Creek 73	3-18	Just upstream from SR 1663	59	30	708	2,300	Intermittent, Clear Class D	Woodland
Herds Creek 74	3-18	App. 1500' upstream from NC 24 & 27	200	30	2,400	7,680	Continuous flow, Clear Class D	Woodland
Crains Creek 75	3-18	App. ½ mile upstream from jct. with Herds Creek	354	30	4,248	13,620	Nearly continuous Clear Class D	Woodland, Cropland Gas Trans Line
Crains Creek 76	3-18	App. 3000' upstream from U. S. 1	235	30	2,820	26,100	Continuous flow, Clear Class D	Woodland, Cropland

Table A-3 (Con't)

INVENTORY OF POTENTIAL IMPOUNDMENT SITES IN MOORE COUNTY [1]

Identity of Site		Location	Estimated Size			Sources & Condition of Water		Present Use
Name	Watershed		Area		Volume	Drainage Area	Flow	
1	2	3	4		5	6	7	8
			Acres	Depth	Ac. Ft.	Acres		
Beaver Creek 77	3-18	App. ½ mile upstream	100	30	1,200	3,800	Continuous flow, Clear Class A	Woodland, Cropland County road line
Beaver Creek 78	3-18	App. 3000' upstream	200	30	2,400	7,690	Continuous flow, Clear, Class A	Woodland
Beaver Creek 79	3-18	App. 2000' upstream from jct. with Crains Creek	232	30	2,784	8,930	Continuous flow, Clear, Class A	Woodland, Pasture
Nicks Creek 80	3-18	App. ½ mile upstream from jct. with Joes Creek	188	30	2,256	7,230	Continuous flow Clear Class D	Woodland
Little River 81	3-18	App. 1000' upstream from SR 1210	127	30	1,524	4,900	Continuous flow Clear Class A	Woodland

APPENDIX B

APPENDIX B

LEGAL REQUIREMENT FOR CAPACITY USE STUDY

A) The Environmental Management Commission may declare and delineate capacity use areas.

Procedure:

1) EMC directs the Department to investigate and report to the EMC its findings.
    A) Department shall consult with all interested persons
    B) Consider all factors relevant to the conservation and use of water in the area
    C) Report to EMC its findings and recommendations (including boundaries)

2) Following review of the Department report the EMC may declare said areas as a capacity use area. Prior to adopting said order the EMC shall give notice of its actions and hold one or more public hearings.
    A) The notice shall be given not less than 30 days before the date of such hearing and shall state the date, time, and place of the hearing, and the action which the EMC proposes to take.
    B) Any notice shall be published at least once in one newspaper of general circulation circulated in each county of the State in which the capacity use area is located. A copy of such notice shall be mailed to each person on the mailing list kept by DNR&CD pursuant to provision of G.S. 143-215.15.
    C) Persons wishing to be heard shall give notice to the EMC in writing on or before the first date set for the hearing. The EMC shall permit anyone who so desires to file a written argument or other statement with the EMC in relation to any proposed action of the EMC any time within 30 days following the conclusion of any public hearing.

D) Upon completion of hearings and consideration of all evidence and arguments the EMC shall adopt its final action and shall publish its final action as part of its official regulations.

B) The EMC may conduct a public hearing pursuant to the provisions of G.S. 143-215.4 in any area of the State, whether or not a capacity use area has been declared.

1) Provided it has reason to believe that the withdrawal of water from or the discharge of water pollutants to the waters in such area is having an unreasonably adverse effect upon such waters.

A) If the EMC determines, pursuant to a hearing, that water quality or quantity is sufficiently reduced they may issue orders restricting water discharges or withdrawal.

B) The determination of the EMC shall be supported by detailed findings of fact and conclusions set forth in the order and based upon competent evidence of record.

2) Notice setting forth the time, place and purpose of the hearing and a description by geographical or political boundaries of the area affected shall be given.

A) By publication at least once a week for two successive weeks in a newspaper or newspapers having general circulation within the area. The date of the first publication to be at least 20 days prior to the date of hearing.

B) By mailing copies of the notice by registered or certified mail at least 20 days in advance of hearing to the governing body of every county, city, town, and affected political subdivision lying in whole or in part within the area and to every affected or interested State and Federal agency.

C) By posting a copy of the notice at the courthouse in every county lying in whole or in part within the area.

3) Upon issuance of any order by the EMC pursuant to this subsection, notification shall be the same as two above.

4) After publication of notice is completed any person violating any provision of such order after the effective date thereof shall be subject to the penalties and proceedings set forth in G.S. 143-215.17.

5) Any person who is adversely affected by an order of the EMC issued pursuant to this subsection may seek judicial review of the order pursuant to the provisions of G.S. 143-215.5; and the order shall not be stayed by appeal.

APPENDIX C

APPENDIX C

NORTH CAROLINA GENERAL STATUTES

Chapter 143 - Article 21

Part 2. Regulation of Use of Water Resources

143-215.11. Short title. This Part shall be known and may be cited as the Water Use Act of 1967. (1967, c 933, s 1.)

143-215.12. Declaration of purpose. It is hereby declared that the general welfare and public interest require that the water resources of the State be put to beneficial use to the fullest extent to which they are capable, subject to reasonable regulation in order to conserve these resources and to provide and maintain conditions which are conducive to the development and use of water resources.

143-215.13. Declaration of capacity use areas. (a) The Environmental Management Commission may declare and delineate from time to time, and may modify, capacity use areas of the State where it finds that the use of groundwater or surface water or both require coordination and limited regulation for protection of the interests and rights of residents or property owners of such areas or of the public interest.

(b) Within the meaning of this Part "a capacity use area" is one where the Environmental Management Commission finds that the aggregate uses of groundwater or surface water, or both, in or affecting said area (i) have developed or threatened to develop to a degree which requires coordination and regulation, or (ii) exceed or threaten to exceed, or otherwise threaten or impair, the renewal or replenishment of such waters or any part of them.

(c) The Environmental Management Commission may declare and delineate capacity use areas in accordance with the following procedures:

(1) Whenever the Environmental Management Commission believes that a capacity use situation exists or may be emerging in any area of the State, it may direct the Department to investigate and report to the Environmental Management Commission thereon.

(2) In conducting its investigation the Department shall consult with all interested persons, groups and agencies; may retain consultants; and shall consider all factors relevant to the conservation and use of water in the area, including established or pending water classifications under the Stream Sanitation Law and the criteria for such classifications. Following its investigation the Department shall render a written report to the Environmental Management Commission. This report shall include the Department's findings and recommendations as to whether the water use problems of the area involve surface waters, groundwaters, or both; whether effective measures can be employed limited to surface water or to groundwater; and whether timely action by any agency or person may preclude the need for additional regulation at that time. The report shall also include such other findings and recommendations as the Department

deems appropriate, including recommended boundaries for any capacity use area that may be proposed.

(3) If the Environmental Management Commission finds, following its review of the departmental report (or thereafter following its evaluation of measures taken falling short of regulation) that a capacity use area should be declared, it may adopt an order declaring said capacity use area. Prior to adopting such an order the Environmental Management Commission shall give notice of its proposed action and shall conduct one or more public hearings with respect to such proposed action.

(4) Such notice shall be given not less than 30 days before the date of such hearing and shall state the date, time, and place of hearing, the subject of the hearing, and the action which the Environmental Management Commission proposes to take. The notice shall either include details of such proposed action, or where such proposed action is too lengthy for publication the notice shall specify that copies of such detailed proposed action shall be obtained on request from the Department of Natural and Economic Resources in sufficient quantity to satisfy the requests of all interested persons.

(5) Any such notice shall be published at least once in one newspaper of general circulation circulated in each county of the State in which the water area affected is located, and a copy of such notice shall be mailed to each person on the mailing list required to be kept by the Department of Natural and Economic Resources pursuant to the provisions of G.S. 143-215.15.

(6) Any person who desires to be heard at any such public hearing shall give notice thereof in writing to the Environmental Management Commission on or before the first date set for the hearing. The Environmental Management Commission is authorized to set reasonable time limits for the oral presentation of views by any one person at any such public hearing. The Environmental Management Commission shall permit anyone who so desires to file a written argument or other statement with the Environmental Management Commission in relation to any proposed action of the Environmental Management Commission any time within 30 days following the conclusion of any public hearing or within any such additional time as the Environmental Management Commission may allow by notice given as prescribed in this section.

(7) Upon completion of hearings and consideration of submitted evidence and arguments with respect to any proposed action by the Environmental Management Commission pursuant to this paragraph, the Environmental Management Commission shall adopt its final action with respect thereto and shall publish such final action as part of its official regulations. The Environmental Management Commission is empowered to modify or revoke from time to time any final action previously taken by it pursuant to the provisions of this section, any such modification or revocation, however, to be subject to the procedural requirements of this Part, including notice and hearing.

If the Environmental Management Commission finds and orders that a capacity use area shall be declared, its order shall include a delineation of the boundary of said area, and the Department of Natural and Economic Resources shall instruct the Secretary of the Department to prepare proposed regulations consistent with the provisions of this Part and commensurate with the degree of control needed from among the classes of permissible regulations set forth in G.S. 143-215.14.

(d) The Environmental Management Commission may conduct a public hearing pursuant to the provisions of G.S. 143-215.4 in any area of the State, whether or not a capacity use area has been declared, when it has reason to believe that the withdrawal of water from or the discharge of water pollutants to the waters in such area is having an unreasonably adverse effect upon such waters. If the Environmental Management Commission determines, pursuant to a hearing, that withdrawals of water from or discharge of water pollutants to the waters within such area has resulted or probably will result in a generalized condition of water depletion or water pollution within the area to the extent that the availability or fitness for use of such water has been impaired for existing or proposed uses and that injury to the public health, safety or welfare will result if increased or additional withdrawals or discharges occur, the Environmental Management Commission may issue an order:

(1) Prohibiting any person withdrawing waters in excess of 100,000 gallons per day from increasing the amount of the withdrawal above such limit as may be established in the order.

(2) Prohibiting any person from constructing, installing or operating any new well or withdrawal facilities having a capacity in excess of a rate established in the order; but such prohibition shall not extend to any new well or facility having a capacity of less than 10,000 gallons per day.

(3) Prohibiting any person discharging water pollutants to the waters from increasing the rate of discharge in excess of the rate established in the order.

(4) Prohibiting any person from constructing, installing or operating any facility that will or may result in the discharge of water pollutants to the waters in excess of the rate established in the order.

(5) Prohibiting any agency or political subdivision of the State from issuing any permit or similar document for the construction, installation, or operation of any new or existing facilities for withdrawing water from or discharging water pollutants to the waters in such area in excess of the rates established in the order.

The determination of the Environmental Management Commission shall be supported by detailed findings of fact and conclusions set forth in the order and based upon competent evidence of record. The order shall describe the geographical area of the State affected thereby with particularity and shall provide that the prohibitions set forth therein shall continue pending a determination by the Environmental Management Commission that the generalized condition of water depletion or water pollution within the area has ceased.

Notice setting forth the time, place and purpose of the hearing and a description by geographical or political boundaries of the area affected shall be given:

(1) By publication at least once a week for two successive weeks in a newspaper or newspapers having general circulation within the area, the date of the first publication to be at least 20 days prior to the date of hearing;

(2) By mailing copies of the notice by registered or certified mail at least 20 days in advance of hearing to the governing body of every county, city, town, and affected political subdivision lying in whole or in part within the area and to every affected or interested State and federal agency; and

(3) By posting a copy of the notice at the courthouse in every county lying in whole or in part, within the area.

The Environmental Management Commission is also authorized, in the exercise of its discretion, to mail copies of notice by first-class mail to any person who it believes will or may be interested in or affected by the hearing.

Upon issuance of any order by the Environmental Management Commission pursuant to this subsection, a certified copy of such order shall be mailed by registered or certified mail to the governing body of every county, city, town, and affected political subdivision lying, in whole or in part, within the area and to every affected or interested State and federal agency. A certified copy of the order shall be posted at the courthouse in every county lying, in whole or in part within the area, and a notice setting forth the substantive provisions and effective date of the order shall be published once a week for two successive weeks in a newspaper or newspaper having general circulation within the area. After publication of notice is completed, any person violating any provision of such order after the effective date thereof shall be subject to the penalties and proceedings set forth in G.S. 143-215.17.

Any person who is adversely affected by an order of the Environmental Management Commission issued pursuant to this subsection may seek judicial review of the order pursuant to the provisions of G.S. 143-215.5; and the order shall not be stayed by the appeal. (1967, c. 933, s 3; 1973, c. 698, s 14; c 1262, s 23.)

143-215.14. Regulations within capacity use areas; scope and procedures.
(a) Following the declaration of a capacity use area by the Environmental Management Commission, it shall prepare proposed regulations to be applied in said area, containing such of the following provisions as the Environmental Management Commission finds appropriate concerning the use of surface waters or groundwaters or both:

(1) Provisions requiring water users within the area to submit reports not more frequently than at 30-day intervals concerning quantity of water used or withdrawn, sources of water and the nature of the use thereof.

(2) With respect to surface waters, groundwaters, or both: provisions concerning the timing of withdrawals; provisions to protect against or abate salt water encroachment; provisions to protect against or

abate unreasonable adverse effects on other water users within the area, including but not limited to adverse effects on public use.

(3) With respect to groundwaters: provisions concerning well-spacing controls; and provisions establishing a range of prescribed pumping levels (elevations below which water may not be pumped) or maximum pumping rates, or both, in wells or for the aquifer or for any part thereof based on the capacities and characteristics of the aquifer.

(4) Such other provisions not inconsistent with this Part as the Environmental Management Commission finds necessary to implement the purposes of this Part.

(b) The Environmental Management Commission shall conduct one or more hearings upon the proposed regulations, upon notice, in accordance with the requirements of subdivisions (4)-(6) of G.S. 143-215.13(c). Upon completion of the hearings and consideration of submitted evidence and arguments with respect to any proposed regulation, the Environmental Management Commission shall adopt its final action with respect thereto, and shall publish such final action as part of its official regulations. The Environmental Management Commission is empowered to modify or revoke from time to time any final action previously taken by it pursuant to the provisions of this section, any such modifications or revocations, however, to be subject to the procedural requirements of this Part, including notice and hearing. (1967, c. 938, s 4; 1973, c. 1262, s 23.)

143-215.15. Permits for water use within capacity use areas procedures.
(a) In areas declared by the Environmental Management Commission to be capacity use areas no person shall (after the expiration of such period, not in excess of six months, as the Environmental Management Commission may designate) withdraw, obtain, or utilize surface waters or groundwaters or both, as the case may be, in excess of 100,000 gallons per day for any purpose unless such person shall first obtain a permit therefor from the Environmental Management Commission.

(b) When sufficient evidence is provided by the applicant that the water withdrawn or used from a stream or the ground is not consumptively used, a permit therefor shall be issued by the Environmental Management Commission without a hearing and without the conditions provided in subsection (c) of this section. Applications for such permits shall set forth such facts as the Environmental Management Commission shall deem necessary to enable it to establish and maintain adequate records of all water uses within the capacity use area.

(c) In all cases in which sufficient evidence of a nonconsumptive use is not presented the Department of Natural and Economic Resources shall notify each person required by this Part to secure a permit of the Environmental Management Commission's proposed action concerning such permit, and shall transmit with such notice a copy of any permit it proposes to issue to such persons, which permit will become final unless a request for a hearing is made within 15 days from the date of service of such notice. The Environmental Management Commission shall have the power: (i) to grant such permit with conditions as the Environmental Management Commission deems necessary to implement the regulations adopted pursuant to G.S. 143-215.14; (ii) to grant any temporary permit for such period of time as the Environmental Management Commission shall specify where conditions make such temporary permit essential, even though the action allowed by such permit may not be consistent with the Environmental Management Commission's regulations applicable to such capacity use area; (iii) to modify or revoke any permit upon not less than 60 days' written notice

to any person affected; and (iv) to deny such permit if the application therefor or the effect of the water use proposed or described therein upon the water resources of the area is found to be contrary to public interest. Any water user wishing to contest the proposed action shall be entitled to a hearing upon request therefor.

(d) In any proceeding pursuant to this section or G.S. 143-215.16 the Environmental Management Commission shall give notice with respect to all steps of the proceeding only to each person directly affected by such proceeding who shall be made a party thereto. In all proceedings pursuant to G.S.1 143-215.13 or 143-215.14 the Environmental Management Commission shall give notice as provided by these sections, and it shall also give notice of all its official acts (such as the adoption of regulations or rules of procedure) which have, or are intended to have, general application and effect, to all persons on its mailing list on the date when such action is taken. It shall be the duty of the Department of Natural and Economic Resources to keep such a mailing list on which it shall record the name and address of each person who requests listing thereon, together with the date of receipt of such request. Any person may, by written request to the Department of Natural and Economic Resources ask to be permanently recorded on such mailing list.

(e) All notices which are required to be given by the Environmental Management Commission or the Department or by any party to a proceeding shall be given by registered or certified mail to all persons entitled thereto, including the Environmental Management Commission. The date of receipt or refusal for such registered or certified mail shall be the date when such notice is deemed to have been given. Notice by the Environmental Management Commission or the Department may be given to any person upon whom a summons may be served in accordance with the provisions of law covering civil actions in the superior courts of this State. The Environmental Management Commission may prescribe the form and content of any particular notice.

(f) The following provisions shall be applicable in connection with hearings pursuant to this Part:

(1) Any hearing held pursuant to this section or G.S. 143-215.16, whether called at the instance of the Environmental Management Commission or of any person, shall be held upon not less than 30 days' written notice given by the Environmental Management Commission to any person who is a party to the proceedings with respect to which such hearing is to be held, unless a shorter notice is agreed upon by all such parties.

(2) All hearings under this Part shall be before the Environmental Management Commission, or before one or more of its own members or before one or more qualified employees of the Department, and shall be open to the public, Any member of the Commission or employee of the Department of Natural and Economic Resources to whom a delegation of power is made to conduct a hearing shall report the hearing with its evidence and record to the Commission for decision.

(3) A full and complete record of all proceedings at any hearing under this Part shall be taken by a reporter designated by the Department or by other method approved by the Attorney General. Any party to a proceeding shall be entitled to a copy of such record upon the

payment of the reasonable cost thereof as determined by the Department of Natural and Economic Resources.

(4) The Environmental Management Commission and its duly authorized agents shall follow generally the procedures applicable in civil actions in the superior court insofar as practicable, including rules and procedures with regard to the taking and use of depositions, the making and use of stipulations, and the entering into of agreed settlements and consent orders.

(5) The Environmental Management Commission, or the duly authorized agent of such Environmental Management Commission, may administer oaths and may issue subpoenas for the attendance of witnesses and the production of books, papers, and other documents belonging to said person.

(6) Subpoenas issued by the Environmental Management Commission, in connection with any hearing under this Part shall be directed to any officer authorized by law to serve process, and the further procedures and rules of law applicable with respect thereto shall be prescribed in connection with subpoenas to the same extent as if issued by a court of record. In case of a refusal to obey a subpoena issued by the Environmental Management Commission, application may be made to the superior court of the appropriate county for enforcement thereof.

(7) The burden of proof at any hearing under this Part shall be upon the person or the Environmental Management Commission, as the case may be, at whose instance the hearing is being held.

(8) No decision or order of the Environmental Management Commission shall be made in any proceeding unless the same is supported by competent, material and substantial evidence upon consideration of the whole record.

(9) Following any hearing, the Environmental Management Commission shall afford the parties thereto a reasonable opportunity to submit within 30 days or within such additional time as prescribed by the Environmental Management Commission, proposed findings of fact and conclusions of law and any brief in connection therewith.

(10) All orders and decisions of the Environmental Management Commission shall set forth separately the Environmental Management Commission's findings of fact and conclusions of law and shall, wherever necessary, cite the appropriate provision of law or other source of authority on which any action or decision of the Environmental Management Commission is based.

(11) The Department of Natural and Economic Resources shall have the authority to adopt a seal which shall be the seal of said Environmental Management Commission and which shall be judicially noticed by the courts of the State. Any document, proceeding, order, decree, special order, rule, regulation, rule of procedure or any other official act or records of the Environmental Management Commission or its minutes may be certified by the Secretary of the Department under his hand and seal of the Department of Natural and Economic Resources and

when so certified shall be received in evidence in all actions or proceedings in the courts of the State without further proof of the identity of the same if such records are competent, relevant and material in any such action or proceeding. The Environmental Management Commission shall have the right to take judicial notice of all studies, reports, statistical data or any other official reports or records of the federal government or of any sister state and all such records, reports and data may be placed in evidence by the Environmental Management Commission or by any other person or interested party where material, relevant and competent.

(g) Any person against whom any final order or decision has been made except where no appeal is allowed as provided by G.S. 143-215.2(j) shall have a right of appeal to the Superior Count of Wake County or of the county where the order or decision is effective within 30 days after such order or decision has become final. Upon such appeal the Department of Natural and Economic Resources shall send a certified transcript of all testimony and exhibits introduced before the Environmental Management Commission, the order or decision, and the notice of appeal to the superior court. The matter on appeal shall be heard and determined de novo on the transcript certified to the court and any evidence or additional evidence as shall be competent under rules of evidence then applicable to trials in the superior court without a jury upon any question of fact; provided, the court shall allow any party to introduce evidence or additional evidence upon any question of fact. At the conclusion of the hearing, the judge shall make findings of fact and enter his decision thereto. Appeals from the judgment and orders of the superior court shall lie to the appellate division. No bond shall be required of the Environmental Management Commission to the appellate division.

(1) Upon appeal filed by any party, the Department of Natural and Economic Resources shall forthwith furnish each party to the proceeding with a copy of the certified transcript and exhibits filed with the Environmental Management Commission. A reasonable charge shall be paid the Department of Natural and Economic Resources for said copies.

(2) Within 15 days after receipt of copy of certified transcript and exhibits, any party may file with the court exceptions to the accuracy or omissions of any evidence or exhibits included in or excluded from said transcript.

(h) In adopting any regulations pursuant to the provisions of G.S. 143-215.14, and in considering permit applications, revocations or modifications under this section, the Environmental Management Commission shall consider:

(1) The number of persons using an aquifer or stream and the object, extent and necessity of their respective withdrawals or uses;

(2) The nature and size of the stream or aquifer;

(3) The physical and chemical nature of any impairment of the aquifer or stream, adversely affecting its availability or fitness for other water uses (including public use);

(4) The probable severity and duration of such impairment under forseeable conditions;

(5) The injury to public health, safety or welfare which would result if such impairment were not prevented or abated;

(6) The kinds of businesses or activities to which the various uses are related;

(7) The importance and necessity of the uses claimed by permit applicants (under this section), or of the water uses of the area (under G.S. 143-215.14) and the extent of any injury or detriment caused or expected to be caused to other water uses (including public use);

(8) Diversion from or reduction of flows in other watercourses or aquifers; and

(9) Any other relevant factors. (1967, c. 933, s. 5; 1973, c. 108, s. 89; c. 698, s. 15; c. 1262, s. 23.)

143-215.16. Permits for water use within capacity use areas - duration, transfer, reporting, measurement, present use, fees and penalties. (a) No permit under G.S. 143-215.15 shall be issued for a longer period than the longest of the following: (i) 10 years, or (ii) the duration of the existence of a capacity use area, or (iii) the period found by the Environmental Management Commission to be necessary for reasonable amortization of the applicant's water-withdrawal and water-using facilities. Permits may be renewed following their expiration upon compliance with the provisions of G.S. 143-215.15.

(b) Permits shall not be transferred except with the approval of the Environmental Management Commission.

(c) Every person in a capacity use area who is required by this Part to secure a permit shall file with the Environmental Management Commission in the manner prescribed by the Environmental Management Commission a certified statement of quantities of water used and withdrawn, sources of water, and the nature of the use thereof not more frequently than 30-day intervals. Such statements shall be filed on forms furnished by the Department of Natural and Economic Resources within 90 days after the adoption of an order by the Environmental Management Commission declaring a capacity use area. Water users in a capacity use area not required to secure a permit shall comply with procedures established to protect and manage the water resources of the area. Such procedures shall be adapted to the specific needs of the area, shall be within the provisions of this and other North Carolina water resource acts, and shall be adopted after public hearing in the area. The requirements embodies in the two preceding sentences shall not apply to individual domestic water use.

(d) If any person who is required to secure a permit under this Part is unable to furnish accurate information concerning amounts of water being withdrawn or used, or if there is evidence that his certified statement is false or inaccurate or that he is withdrawing or using a larger quantity of water or under different conditions than has been authorized by the Environmental Management Commission, the Environmental Management Commission shall have the authority to require such person to install water meters, or some other more economic means for measuring

water use acceptable to the Environmental Management Commission. In determining the amount of water being withdrawn or used by a permit holder or applicant the Environmental Management Commission may use the rated capacity of his pumps, the rated capacity of his cooling system, data furnished by the applicant, or the standards or methods employed by the United States Geological Survey in determining such quantities or by any other accepted method.

(e) In any case where a permit applicant can prove to the Environmental Management Commission's satisfaction that the applicant was withdrawing or using water prior to the date of declaration of a capacity use area, the Environmental Management Commission shall take into consideration the extent to which such prior use or withdrawal was reasonably necessary in the judgment of the Environmental Management Commission to meet its needs, and shall grant a permit which shall meet those reasonable needs. Provided, however, that the granting of such permit shall not have unreasonably adverse effects upon other water uses in the area, including public use, and including potential as well as present use.

(f) The Environmental Management Commission shall also take into consideration in the granting of any permit the prior investments of any person in lands, and plans for the usage of water in connection with such lands which plans have been submitted to the Environmental Management Commission within a reasonable time after June 27, 1967. Provided, however, that the granting of such permit shall not have unreasonably adverse effects upon other water uses in the area, including public use, and including potential as well as present use. (1973, c. 1262, s. 23.)

143-215.17. Enforcement procedures. (a) Criminal Penalties.- Any person who shall be adjudged to have violated any provision of this Part shall be guilty of a misdemeanor and shall be liable to a penalty of not less than one hundred dollars ($100.00) nor more than one thousand dollars ($1,000) for each violation. In addition, if any person is adjudged to have committed such violation willfully, the court may determine that each day during which such violation continued constitutes a separate violation subject to the foregoing penalty.

(b) Civil Penalties. -

(1) The Environmental Management Commission may assess a civil penalty of not less than one hundred dollars ($100.00) nor more than two hundred fifty dollars ($250.00) against any person who violates any provisions of, or any order issued pursuant to this Part, or who violates any duly adopted regulations of the Commission implementing the provisions of this Part.

(2) If any action or failure to act for which a penalty may be assessed under this Part is willful, the Commission may assess a penalty not to exceed two hundred fifty dollars ($250.00) per day for each day of violation.

(3) In determining the amount of the penalty the Commission shall consider the degree and extent of harm caused by the violation and the cost of rectifying the damage.

(4) Any person assessed shall be notified of the assessment by registered or certified mail, and the notice shall specify the reasons for the

assessment. If the person assessed fails to pay the amount of the assessment to the Department of Natural and Economic Resources within 30 days after receipt of notice, the Commission may request the Attorney General to institute a civil action in the superior court of the county or counties in which the person assessed resides or has his or its principal place of business, to recover the amount of the assessment. In any such civil action, the scope of the court's review of the Commission's action (which shall include a review of the amount of the assessment) shall be as provided in G.S. 150A-51.

(c) Injunctive Relief. - Upon violation of any of the provisions of, or any order issued pursuant to this Part, or duly adopted regulation of the Commission or its predecessor implementing the provisions of this Part, the Secretary of the Department of Natural and Economic Resources may, either before or after the institution of proceedings for the collection of the penalty imposed by this Part for such violations, request the Attorney General to institute a civil action in the superior court of the county or counties where the violation occurred in the name of the State upon the relation of the Department of Natural and Economic Resources for injunctive relief to restrain the violation or require corrective action, and for such other or further relief in the premises as said court shall deem proper. Neither the institution of the action nor any of the proceedings thereon shall relieve any party to such proceedings from the penalty prescribed by this Part for any violation of same. (1967, c. 933, s. 7; 1973, c. 698, s. 16; c. 1262, s. 23; 1975, c. 842, s. 2.)

143.215.18. Map or description of boundaries of capacity use areas. (a) The Environmental Management Commission in designating and the Department in recommending the boundaries of any capacity use area may define such boundaries by showing them on a map or drawings, by a written description, or by any combination thereof, to be designated appropriately and filed permanently with the Department. Alterations in these lines shall be indicated by appropriate entries upon or additions to such map or description, certified by the Secretary of Natural and Economic Resources, shall be admitted in evidence in all courts and shall have the same force and effect as would the original map or description. If the boundaries are changed pursuant to provisions of this Part, the Department may provide for the redrawing of any such map. A redrawn map shall supersede for all purposes the earlier map or all maps which it is designated to replace.

(b) The Department shall file with the Secretary of State a certified copy of the map, drawings, description or combination thereof, showing the boundaries of any capacity use area designated by the Environmental Management Commission; and a certified copy of any redrawn or altered map or drawing, and of amendments or additions to written descriptions, showing alterations to said boundaries. The filings required by this subsection shall constitute compliance with the requirements of Article 18 of Chapter 143 of the General Statutes. (1967, c. 933, s. 8; 1973, c. 1262, s. 23.)

143-215.19. Rights of investigation, entry, access and inspection. The Environmental Management Commission shall have the right to direct the conduct of such investigations as may reasonably be necessary to carry out its duties prescribed in this Part, and for this purpose to enter at reasonable times upon any property, public or private, for the purpose of investigating the condition, withdrawal or use

of any waters, investigating water sources, or investigating the installation or operation of any well or surface water withdrawal or use facility, and to require written statements or the filing of reports under oath, with respect to pertinent questions relating to the installation or operation of any well or surface water withdrawal or use facility; provided, that no person shall be required to disclose any secret formula, processes or methods used in any manufacturing operation or any confidential supervision. No person shall refuse entry or access to any authorized representative of the Environmental Management Commission or Department who requests entry for purposes of a lawful inspection, and who presents appropriate credentials, nor shall any person obstruct, hamper or interfere with any such representative while in the process of carrying out his official duties consistent with the provisions of this Part. (1967, c. 933, s. 9; 1973, c. 1262, s. 23.)

143-215.20. Rules and regulations. The Environmental Management Commission may adopt and modify from time to time rules and regulations consistent with the provisions of this Part to implement the provisions of thie Part. All such rules and regulations, and modifications thereof, shall be filed with the Secretary of State as required by Article 18 of Chapter 143 of the General Statutes. (1967, c. 933, s. 10; 1973, c. 1262, s. 23)

143-215.21. Definitions. Unless the context otherwise required, the following terms as used in this Part are defined as follows:

(1) "Area of the State" means any municipality or county or portion thereof or other substantial geographical area of the State as may be designed by the Environmental Management Commission.

(2) "Commission" means the Environmental Management Commission, or its successor.

(4) "Department" means the Department of Natural and Economic Resources, or its successor.

(5) "Nonconsumptive use" means (i) the use of water withdrawn from a stream in such a manner that it is returned to the stream without substantial diminution in quantity at or near the point from which it was taken; or if the user owns both sides of the stream at the point of withdrawal, the water is returned to the stream upstream of the next property below the point of diversion on either side of the stream; (ii) the use of water withdrawn from a groundwater system or aquifer in such a manner that it is returned to the groundwater system or aquifer from which it was withdrawn without substantial diminution in quantity or substantial impairment in quality at or near the point from which it was withdrawn; (iii) provided, however, that (in determining whether a use of groundwater is nonconsumptive) the Environmental Management Commission may take into consideration whether any material injury or detriment to other water users of the area by reason of reduction of water pressure in the aquifer or system has not been adequately compensated by the permit applicant who caused or substantially contributed to such injury or detriment. (1973, c. 1262, s. 23.)

143-215.22. Law of Riparian rights not changed. Nothing contained in this part shall change or modify existing common or statutory law with respect to the relative rights or riparian owners concerning the use of surface water in this State.

APPENDIX D

APPENDIX D

SANDHILLS CAPACITY USE STUDY

SUMMARY OF SOUTHERN PINES PUBLIC MEETING

A public meeting was held June 22, 1978 at 7:30 P.M. at the Southern Pines Middle School, 255 May Street, Southern Pines, N. C. The meeting notice was carried by all the major newspapers in the study area to insure that people in the study area were aware of the public meeting. The purpose of the meeting was to determine the local interest in the study and to gather all the useful information that the local people could supply. The State of North Carolina was represented at the meeting by the people listed in Table D-2. Forty-one people interested in the study were at the public meeting. They are listed in Table D-1.

John Wray, Head of the Water Resources Planning Branch of DNRCD, chaired the meeting. He explained the purpose of the meeting and why the Capacity Use Study was being done. He went over a handout with the audience giving them background information on the study. Paul Wilms of the Water Quality Branch presented the water quality aspects that were to be covered in the study, and Bill Bright of the Groundwater Section addressed the groundwater issues.

Five people from the audience made public statements at the meeting. A brief summary of their concerns are as follows:

Mayor Douglas - Due to problems in getting all the municipalities together, he feels that Southern Pines should go with the cheapest alternative, even if it means an interbasin transfer of water.

Jasper L. Memory - He was worried about the low flow conditions in the Lumber River and about the sewage that was being dumped into the river by Moore County Waste Treatment Plant.

Howard S. Muse, Jr. - He expressed concern as to what development may do to the county. He also said that Nick Creek would be preferred over Drowning Creek, and he expressed concern over flow conditions between the inflow and outfall location if the system was located on Drowning Creek.

David Bobbitt - He prefers to use the rivers for water supply only in emergency situations. He doesn't want to see future development of high water consuming industries.

J. H. Carter III - He doesn't believe that an adequate environmental assessment was done for the area before the 201 plant was built. He supports development of Nick Creek/ Little River over Drowning Creek. He also pointed out that there were several endangered species located in the Drowning Creek subbasin.

After a general question-answer period the meeting was adjourned.

STATEMENTS

Mayor Douglas

I'm very interested in Southern Pines. I been going along with this regional idea for a good while but look like we're spinning our wheels and I think most of the people here tonight are witness to the fact of just what has taken place so far - that is, about nothing - I mean getting these municipalities together. Therefore we are mighty interested in trying to do something for Southern Pines the cheapest, the closest that we can get it done and that's the reason we're talking about interbasin water. Now when you talk about going to Drowning Creek for an abundance of water, yes, it's true, but the exposure we had according to price tag - it's out of sight and we don't tend to gain anything from going there since we are doing it on our own. We would actually make a real gift of water to somebody that's not even interested in joining in with us on the water seemingly, if you'd bring it right through our _____(?) So I'm saying if you go to the northern edge of _____(?) for the water, say the Little River or somethere like that, we would have 5 areas in which we could serve water coming to Southern Pines which is going to need water. So therefore it's more logical to us to look to what we can do for the communities that's in the rural more than we; yet we would get our source of water in a fashion we could serve them, coming in from 22 sides. Whether or not we need more than 6 or 8 million gallons, that's to be decided by your engineers, but the point is, it's no use in us going to expensive layout of 35 or 40 million dollars to get a town of 8,000 people some water, and I think that's audacious if you start talking in terms like that. And I'm talking still.(?).I don't want to take up a whole lot of time.

Jasper L. Memory

Gentlemen, my name is Jasper L. Memory, M-E-M-O-R-Y, very easily remembered if you have any memory. I'm professor emeritus at Wake Forest University where I have taught 42 years. I have a son who's associate dean of the school of physical and mathematical sciences at NCSU at Raleigh who someday will own the 300 acres that I own now fronting (?) on the river and so the 3 miles frontage on the river that I paid taxes on for a good many years. I don't hear too well; I did hear my friend over here make a statement a minute ago and I've quoted him, because he said one thing that I certainly was for - I may agree with all that he's said - but I don't want to take too long, but I want to make just one or two very clear points, and I want to make them clearly. First of all, I'd like to introduce the people that I came with...Mrs. Catherine Johnson Jackson, the lady you asked the question... Stand up, Catherine. She's a granddaughter of the man who, for whom Livingston Johnson Riverton Park was named, and she owns it - this young lady right there does. And then there's a couple over here... Mr. Lindsay Pratt and his wife... if you all will stand, I'll appreciate it. Mr. Pratt is a very successful and highly regarded businessman, mayor, who paddles a lot and fishes a lot on the river, and he's conversant with all problems concerned with it, and I'll cheerfully subscribe to anything he says even before he says it. I, having said that, just want to put forth(?) one or two very simple points: One is, that river gets mighty, mighty low during droughts. I'm 77 years old, going on 78, and I have seen calves - I've got cattle on that river - I've seen calves wade across it without swimming when it got so low, and I've seen children wade across it and I'm just wondering what will happen if in this lovely section of the State up here - I'm for Southern Pines & Moore County - I've got hundreds of friends all over the place and I'm very devoted to them and I know they have to have water, and an abundance of it, and I'd like for them to get it in the most favorable manner. But I hope there's some way for them to be accommodated without our having the sewage from this good section dumped on us. That's putting it bluntly, but that's exactly what I mean. That river is one of the scenic spots of the world. Up above Winston-Salem New River has been saved by legislation - you read about it - you had a hand in it, some of you - and I hope the precious Lumbee River - we call it Lumbee now -- John _____

Jasper L. Memory (continued)

Deal(?), our poet down there, went to the Legislature and had a bill passed changing the name of the river from Drowning Creek to Lumbee River...He wrote many beautiful verses about it in his two books of poetry, Verse from Cotton-land and Songs Merry and Sad. I could quote you a dozen of them now - I won't, but if I were to, it would warm your hearts -- I do hope that river will continue to be beautiful and pure and clean. We drink it. I have many a time, I've drunk the water after being in a field of rye and oats, you know, go down to the river and swim and drink it, and I never was damaged by it, but I'd hate to drink after the sewage from this area regardless of what the technicians say about it being pure after the stuff's been dumped into it - I'm sure they've got the facts on it; I wouldn't question it at all - but I just wouldn't want to drink it and I don't know how much authority we've got. I understood you to say we could bring civil action if we wanted to if we were displeased...did you say that, Mr. Wray, awhile ago? (Wray: You could certainly bring civil action...) If we bring civil action, I'd gladly be a party to it and pay a handsome sum to block any movement to dump sewage down into the precious Rivertown community of Scotland County. We appreciate the opportunity to have been heard and Mr. Pratt will have something to say in a minute. But I hope so much that this matter can be concluded happily without having to send a sewer down our way.

(Additional remarks made by someone else in room - indecipherable)

Thank you Mr. Wray and ladies and gentlemen. For better or worse, I represent the Sierra Club and we're especially interested in the future of Drowning Creek. We can see that there'll probably be development and perhaps a lot of it in this county and that there certainly is a real need for additional water, especially for Southern Pines. But I think what we want is water that will serve our needs and not necessarily act as a stimulus to further development. I don't know if the commission and the members of the management group are aware of it, but last year there was a vote on a water bond issue in Moore County for a county-wide system and it went down to defeat by a 3 to 1 margin. And I think there were several factors involved, but one of them was the fact that people did not want a county-wide system that would stimulate further heavy industrial development in the county. They prefer the county like it is and not as it might be developed. I guess if we had our druthers we'd prefer an impoundment somewhere on Nicks Creek, although this might, ah, this would probably be an interbasin transfer of water and we're just not quite sure of that. But we're glad to see that you're looking into it. And no matter what happens, we hope that you have a thorough investigation of the low flow problems concerned with Drowning Creek and look into the possibility that Drowning Creek between a proposed system and the present regional water/sewage plant might go dry. I think that's certainly an area that needs to be looked into. And that's about what we've got to say.

David Bobbitt

I'm here representing the Sandhills Industrial Park. We're presently 67 acres and we're locating industry just outside of Aberdeen on highway 5. It is our goal to locate industry in a compact area. We are presently paying higher insurance rates because of the lack of water that we have and this doesn't faze us in that we don't mind it. We want to keep Drowning Creek/ Little River, the scenic routes and areas on the river, just as they are but we are greatly worried about future development in the area outside our own uses. We are worried about industry moving in and using hundreds of gallons of water per day. I'm sure there are very many environmentalists here - I am one myself - and our biggest concern is the use of water by Southern Pines and Pinehurst. Aberdeen has for a number of years been able to supply its own water; the other two areas have in the past borrowed or bought water from Aberdeen. The people living there and the resorts in the area need the access to water at certain periods of the year which they naturally don't have access to. Hopefully, some method can be worked out where the rivers can be used for emergency purposes. I don't think that it would be economically sound to use them only for economic purposes when the other cities are at the drought stage, but we hope that a situation can be worked out where those cities when need be can use those rivers supply for emergency situations. Thank you.

J. H. Carter III

Thank you. I have several rather random statements to make which I hope to tie together. The first is that about two years ago I became involved with the local Sierra Club and on my own interest as a private consulting biologist with the regional wastewater treatment system. At that time a number of conversations - this was a period of one to two years ago - were held with individuals, I believe there was the Environmental Management Commission and EPA, about this facility which was under construction on Aberdeen Creek. At that time it became apparent to me and my opinion and an opinion of others that an adequate environmental assessment or environmental impact statement had never been done on this particular facility, and, in fact, that at the time that the fund-letting by EPA was accomplished, such a review was not required. However, it appears today that if this same plant was to be designed and funded the same way, that it very well might not pass the current EPA regulations. I spent one day earlier this week with the Federal Wetlands Team of the U. S. Fish and Wildlife Service in Raleigh, and they indicated that there was a distinct possibility that any withdrawal from Drowning Creek would require a Section 404 permit under the 1977 Clean Water Act which very likely at this point in time would require a full Environmental Impact Statement of which Corps of Engineers would be in charge. My personal feelings about this is that Drowning Creek is a wild river, it's one of the least polluted, least disturbed stream systems in North Carolina; I think it's a shame that the 201 system was installed on Drowning Creek with inadequate study (in my opinion). I think it would be compounding an error to develop a withdrawal system on Drowning Creek which would - if a water plant was built down there - would almost commit further development as the county did develop. About a year ago I attended a meeting of the Sierra Club here where Mr. Charles Mussleman(?), who is the county, or at that time was with the county economic development committee, indicated that if a regional water system on Drowning Creek was developed, that the county was considering zoning that part of the county for industrial development. Needless to say, if this did occur the impacts on Drowning Creek would be even more severe. At this time the local Sierra Club and a group known as the citizens for a Better Moore County are supporting a study and petition to have Drowning Creek from Moore County south to the South Carolina line (somewhere in between it becomes the Lumber River) studied for inclusion

in a State wild and scenic rivers system. I have attended one meeting in Raleigh, N.C. held by the federal agency, former _____(?) which is now the Heritage Conservation and Recreation Service and Drowning Creek and Lumber River were added to their list of streams to be studied for federal protection under the Wild and Scenic Rivers system. Those of you who are interested in this, I would advise you to get ahold of me before I get out of here so I can give you some information on people to write about that. From my personal knowledge of Drowning Creek and Nicks Creek and the Little River systems, I believe that the development of reservoirs on Little River and/or Nicks Creek would be less environmentally damaging than even an intake on Drowning Creek. As I say, I say that because if an intake is put on Drowning Creek to say, take out 6 million gallons a day and a water treatment plant is built there, that almost definitely commits further development and withdrawals from Drowning Creek, and only when a critical situation is reached when the population projections reach somewhere around the year 200, then we'd have to develop these other water resources anyway. Nicks Creek and Little River - the floodplains of these areas are already severely disturbed - they have been distrubed from frequent timber harvesting, they have been disturbed from extensive siltation from surrounding agricultural lands. This is not true for much of the Drowning Creek and Lumber River drainage basins. Also, there are very few endangered species or rare species sites known in the Little River and Nicks Creek areas. The same is not true for Drowning Creek: there are a few species of fish in Drowning Creek that occur only in the Drowning Creek system and nowhere else in the world. These fish would be adversely affected by further development of the creek. There are also several colonies of the federally and state designated endangered species red cockaded woodpecker in the southern part of Moore County and according to the Federal Wetlands Team and the regional advisor of Fish and Wildlife Service these areas, even not adjacent to the creek, would have to be considered as under a secondary impacts clause meaning that if the Drowning Creek was further developed, the water that this would undoubtedly bring in more industry and more residential development in the southern part of the county; this would adversely affect the endangered species in adjacent uplands and as a result this would have to be considered before any withdrawal was made from Drowning Creek. I think all this added together summed up both professionally and personally indicate that I would prefer to see

Nicks Creek and Little River areas developed if the development is necessary and reports I've read also indicate that the groundwater possibilities seem to be very good for this area. There's one handout from you people back a couple of months ago when it came up before the Environmental Management Commission to continue the study, there was a groundwater handout that indicated that the groundwater possibilities here had not been fully evaluated and looked very good. And so I think that's, ah, before the lights go out, all I have to say.

QUESTIONS

What was the estimate of yield of groundwater per square mile?

Are we running into a water shortage generally for this area?

Who would issue the permit?

Then this could mean that what we go through is a combination of sources of water rather than one particular one?

Do you have the environmental law on how much water must be allowed to remain in the Little River ___(?)___ Creek?

I noticed that the 7-day 1-year low flow in a number of these alternatives would be experienced a good portion of the year. Can streams live with that?

Does this mean you withdraw your former conclusion that interbasin transfer of water will not be the most desirable situation?

Is there not a possibility of interbasin transfer of water?

I would like to make a point at this time that around Southern Pines which is the largest water user (2 million gallons per day last summer in the dry period) is currently involved in interbasin transfer, the water source being Mill Creek part of the Little River drainage and the water being proposed from Drowning Creek drainage so interbasin transfer is already a fact in this area.

Is recreational use of the streams being taken into consideration?

TABLE D-1

PUBLIC MEETING ATTENDANCE LIST

Emanuel S. Douglass	Mayor, Southern Pines
J. H. Carter III	Southern Pines
Jasper L. Memory	Winston-Salem
Howard S. Muse, Jr.	Chairman, Sandhill Sierra Club
Edith Smith	Southern Pines
David Bobbitt	Pinehurst
Marvin Collins	Town Planner, Southern Pines
Jerry D. Dueke	Councilman, Southern Pines
Les Hall	Henningson, Durham, Richardson
Eleanor Carter	Southern Pines
Betty Cox	Assist. Dir. Pee Dee COG
Worth Chesson	Exec. Dir. Pee Dee COG
Anthony Harrington	Southern Pines
Lisa Tillson	Laurinburg
Larry Bailey	Laurinburg
Joseph A. Grieshaber	Ecol. Sciences, Inc.
Mary L. Reiser	Ecol. Sciences, Inc.
Gary L. Frick	Supt. Moore Cty. Public Works
Hope Brogden	Mayor Pro Tem, Southern Pines
Jennifer Caldwell	Southern Pines
Renee T. Frazier	Moore County Economic Development Commission
Glenn Sides	Southern Pines
William Wilson	Dir. Public Works, Southern Pines
Lindsay Pratt	Wagram
John Pincomb	Southern Pines
Martha Pratt	Wagram
Catherine Jackson	Winston-Salem

Virginia T. Lester	Program Coordinator, Moore County Parks & Recreation
Tom Howard	Southern Pines
L. M. Goodwin, Jr.	Supt. Weymouth Wood - SNP
Mrs. A. H. Aldridge	Pinehurst
Margaret Miller	Southern Pines
Bruce W. Anderson	Sanitation Branch, Fort Bragg
James M. Craven	Aberdeen
Elliott Horner	New Bern
Andy Upshow	Aberdeen
Herman Gattis	Pinehurst
Jack Carter	Southern Pines
R. E. Morrison	Aberdeen
Pat Steven	Carrboro
Barbara Winn	Laurinburg

TABLE D-2

STATE PERSONNEL PRESENT AT THE SOUTHERN PINES PUBLIC MEETING

John Wray	Head, Water Resources Planning Branch, Raleigh
Lafayette Jones	Office Manager, NRCD, Fayetteville Field Office
Bill Bright	Groundwater, Fayetteville
Dennis Ramsey	Water Quality, Fayetteville
Paul Wilms	Water Quality, Raleigh
Bennie Goetze	Water Resources Planning, Raleigh
Arthur Mouberry	" " "
Rosalyn Snyder	" " "
Hai Tang	" " "
Don Sherry	" " "
Bill Bland	" " "
Susan Johnson	Groundwater, Raleigh

APPENDIX E

APPENDIX E

113-D Westgate Circle
Winston-Salem, N.C. 27106
March 17, 1978

Mr. John Wray
Department of Water Resources
Raleigh, N.C. 27601

Dear Mr. Wray:

As owner of the land on which the Livingston Johnson Riverton Park is located, I have been disturbed to hear rumors of more "tampering" with the Lumbee River on the part of Moore County.

I want to join with the residents of Riverton in urging that you monitor the flow of water in the Lumbee for a full year before deciding to allow any steps that might make this beautiful river unfit for recreational use.

Thanking you for your consideration of this matter, I a

Yours very truly,

Mrs. E.W. Jackson

Route 1 Box 245
Wagram, N.C 28396
June 12, 1978

N.C. Department of Natural Resources
+ Community Development
P.O. Box 27687
Raleigh, N.C. 27611

Attn. Ms Rosalyn B. Snyder

Dear Ms Snyder:

I appreciate notification of the public meeting on use of Lumber River water. On the evening of June 22 I will be in Bangor, Maine as one of the Professor in charge of a tour conducted by Pembroke State University. In spite of the absence I do want a place on the list of participants appearing at the hearing. Please give the attached statement to Mr. Wray or Mr. Peek and ask that it be read at the hearing as a statement of my position on the use of any water from any stream or other body of water.

yours truly

W.R. Bullard Jr.

Route 1, Box 245
Wagram, North Carolina 28396
June 12, 1978

To Whom It May Concern:

I urge approval of the request of the City of Southern Pines or any other residents of Moore county for the use of water from Drowning creek(Lumber River) provided the two following conditions are met:

1. That the withdrawal of water shall never exceed one-half the volume of stream flow during low water conditions.
2. That the intake system shall be placed on the downstream side of the discharge of all Moore county wastewater treatment plants.

Application of the preceding conditions to this request for water use and to all future requests regardless of the nature or status of the potential user will serve to eliminate over 90% of all concerns over the impact on the environment. Additionally, users of water would be so careful about the quality of wastewater returned to streams that most of the cost of public policing of water standards could be eliminated.

This proposition is so simple that it boggles the mind and makes us wonder why it has not used before. It is automatically self policing! It requires no additional bureaus or commissions to supervise or control water use.

While we are thinking along these lines why don't we also think about requiring any user who contemplates any major modification such as revising, rebuilding, or upgrading an existing system, to comply with the same conditions when the modifications are completed.

Yours truly,

William R. Bullard Jr.

William R. Bullard Jr.

WRBjr./sd