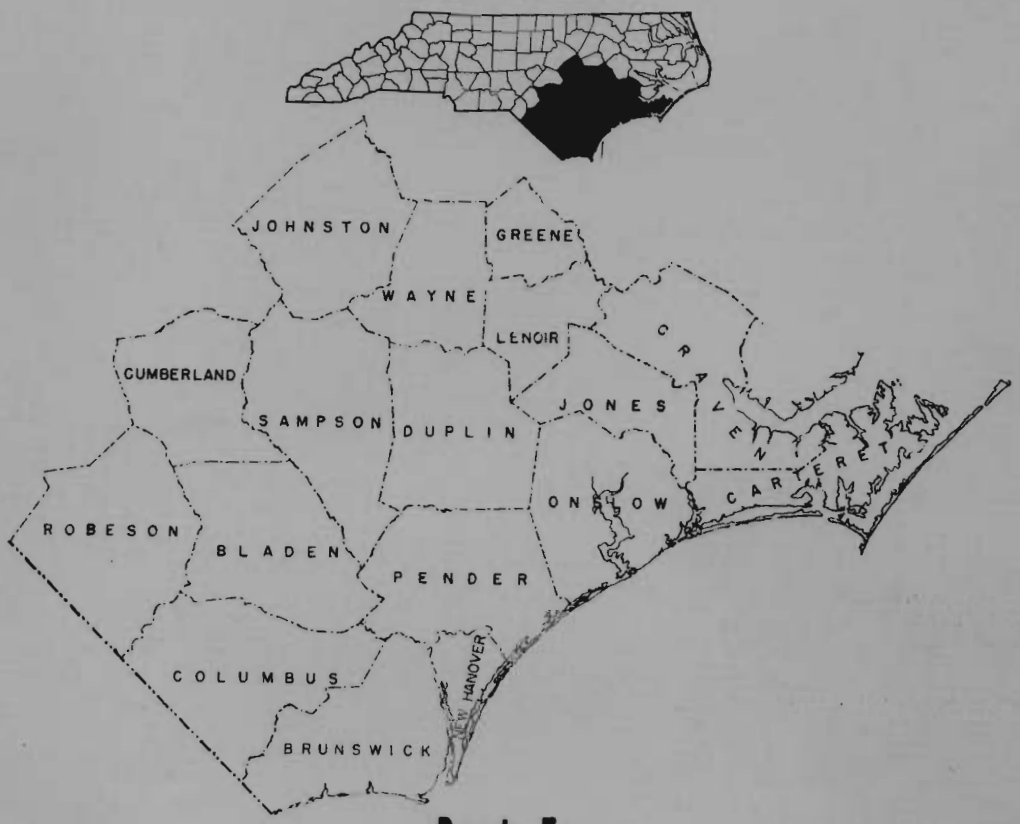
STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

PUBLIC WATER SUPPLIES OF NORTH CAROLINA



Part 5
SOUTHERN COASTAL PLAIN

By

T. M. Robison and L. T. Mann, Jr.

Prepared by

United States Department of the Interior
Geological Survey
In Cooperation with the
North Carolina Department of Natural Resources and Community Development

Raleigh, N.C
JULY 1977

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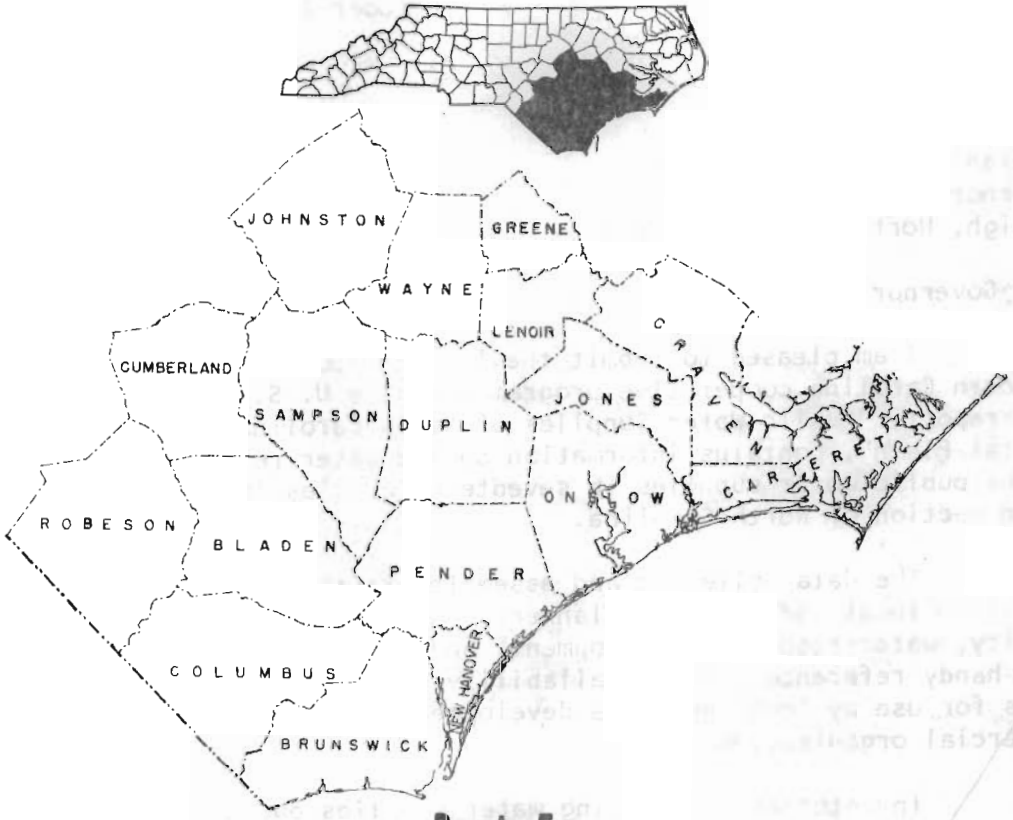

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North Carolina Department of Natural Resources & Community Development
James B. Hunt, Jr., Governor
Howard N. Lee, Secretary

October 1, 1977

Honorable James B. Hunt, Jr.
Governor
Raleigh, North Carolina 27611

Dear Governor Hunt:

I am pleased to submit the latest report resulting from the State of North Carolina cooperative program with the U. S. Geological Survey. This report, "Public Water Supplies of North Carolina, Part 5, Southern Coastal Plain", contains information on the water resources and inventories of the public water supplies in seventeen counties in the Southern Coastal Plain section of North Carolina.

The data collected and assembled in this report are especially useful to local and regional planners concerned with water-supply availability, water-resources development, and water quality. It will also serve as a handy reference on the availability and quality of municipal water supplies for use by local and area development groups and for industrial and commercial organizations.

Inventories of existing water supplies and assembly of pertinent water resources data are a continuing activity to assure that data needed for planning the utilization of our water resources are available.

Sincerely,

Howard N. Lee

Attachment

PUBLIC WATER SUPPLIES OF NORTH CAROLINA

Part 5

SOUTHERN COASTAL PLAIN

By

T. M. Robison
&
L. T. Mann, Jr.

PREFACE

Interest in data on public water supplies of North Carolina has existed for many years. In 1947 the U.S. Geological Survey prepared Progress Report 1 on public supplies derived from surface-water sources and in 1949 Progress Report No. 2 on the public supplies derived from ground-water sources; both reports resulted from cooperative studies with the North Carolina Board of Health. In 1961, Bulletin 2 of the North Carolina Department of Water Resources titled, "Chemical and Physical Character of Municipal Water Supplies in North Carolina" was published. This Bulletin reported the results of chemical analyses and rather brief information on source and pumpage or consumption of the water supplies of 324 cities and towns in North Carolina. The work was done by the U.S. Geological Survey in cooperation with the North Carolina Department of Water Resources. From 1961 to 1965 three supplements to Bulletin 2 were prepared under the continuing cooperative agreement to include new chemical analyses and changes in public water supplies. In 1969 all the data collected between 1960 and 1965 were published in Bulletin 3.

The rather brief information collected under these programs was determined to be inadequate to meet long-range planning needs. Accordingly, the program has been enlarged to include a complete inventory and general comments on present and potential development of all public water supplies in North Carolina with 500 or more customers.

The enlarged scope of the program and fund limitations preclude collection and timely release of data on all water supplies in one volume. Therefore, the State has been divided into five areas, with approximately 60 public water systems in each. The division was made along county boundaries and is shown on the map in figure 1.

Inventory data on the public water supplies in each area have been collected and are being published, in one volume on each area, at the rate of one volume annually.

This volume contains data on the southern Coastal Plain, the fifth area to be studied.

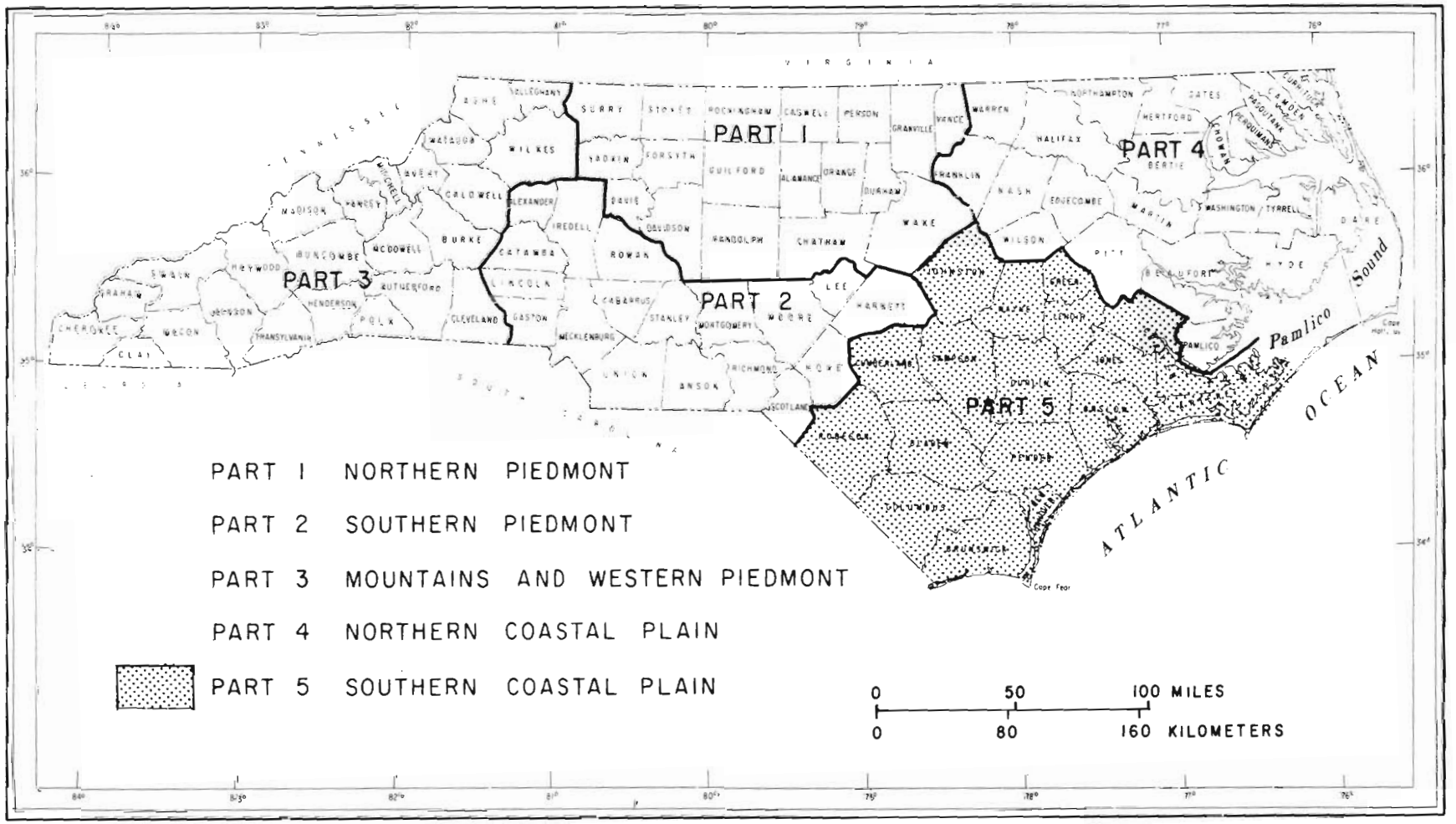

Figure 1.--Map of North Carolina showing how the State was divided for the public water-supply inventory.

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For use of those readers who may prefer metric units rather than English units, the conversion factors for the terms used in this report are listed below:

Multiply English unit	by	to obtain metric unit
inches (in)	$2.540\times10^{+1}$	millimeters (mm)
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)
square miles (mi^2)	2.590	square kilometers (km^2)
gallons (gal)	3.785	liters (L)
gallons per minute (gal/min)	6.309×10^{-2}	liters per second (L/s)
million gallons per day (Mgal/d)	4.381×10^{-2}	cubic meters per second (m^3/s)
million gallons per day per square mile [(Mgal/d)/mi^2]	1.692×10^{-2}	cubic meters per second per square kilometer [(m^3/s)/km^2]
acre-feet per square mile (acre-feet/mi^2)	476	cubic meters per square kilometer (m^3/km^2)
Cubic feet per second per square mile [(ft^3/s)/mi^2]	1.093×10^{-2}	liters per second per square kilometer [(L/s)/km^2]

PUBLIC WATER SUPPLIES OF NORTH CAROLINA

PART 5

SOUTHERN COASTAL PLAIN

T. M. Robison and L. T. Mann, Jr.
U.S. Geological Survey

ABSTRACT

This report contains information on the water resources and the larger public water supplies in 17 counties in the southern Coastal Plain section of North Carolina for the use of planners and water managers concerned with water-supply availability, water-resources development, and water quality.

The report is divided into two sections. The first describes the method of investigation, an explanation of the information reported for each water supply and its significance to planning, a discussion of the chemical analyses included in the report, and a discussion of some of the problems noted during the investigation. The second includes a water-resources appraisal and a map of each county showing the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers. Water supplies for large military bases have been included in the study. Data presented in the second section includes: (a) the population served, (b) the adjacent communities served, (c) the number of customers, (d) the source of water, (e) estimated allowable draft, (f) total and industrial water use, (g) raw- and finished-water storage, (h) raw- and finished-water pumping capacity, (i) future plans, (j) a water-resources appraisal in the immediate vicinity of the supply and, (k) the results of chemical analyses of raw and finished water.

INTRODUCTION

North Carolina is a water-rich State. The municipal water systems of the State have done an excellent job of supplying their customers with an adequate supply of safe water. Occasionally, water use has been curtailed during very dry years, but these instances have been relatively rare. To maintain this fine record, local managers should continuously evaluate their water systems, anticipate future requirements, and plan and pursue any required expansion. Even though the State is water-rich, the supply is not limitless. Regional planners should insure that the available water resources are properly developed and wisely used.

To aid in the planning, development, and utilization of the municipal supplies in the State, an inventory of the municipal water supplies in North Carolina with 500 or more customers was undertaken in 1970 as a part of the cooperative program between the U.S. Geological Survey and the North Carolina Office of Water and Air Resources, later the North Carolina Department of Natural and Economic Resources, now the North Carolina Department of Natural Resources and Community Development.

Planning to meet future water requirements is a continuous job and oftentimes a frustrating one. The population growth, industrialization, and water requirements have to be projected into the future. The yield of the source(s) of water must be estimated. From these projections and estimates should come the plans to insure a safe, dependable water supply. Implementation of plans can be frustrated by a lack of financing. Only when water managers do a poor job are they recognized, because no one thinks about water until there is a shortage.

This report is the fifth in a series, each of which contains information on approximately one-fifth of the municipal water supplies in the State. Data on municipal systems in Part 5 were collected from June 1975 to August 1976.

Information is reported on a county basis and includes a general appraisal of the surface-water and ground-water resources, a map showing the approximate area served by municipal systems, an inventory of each municipal system with 500 or more customers, and results of chemical analyses of samples of raw and finished water from each water system.

The surface-water appraisals contain information on streams draining the county, including estimates of average and minimum flows. The ground-water appraisals include a summary of the ground-water conditions, data on reported well depths and yields, and a general statement on the chemical quality of ground water.

The inventory of the municipal system in each county includes information on the population served, source of supply, raw and finished water storage, estimated allowable draft, total use, industrial use, pumping capacity, treatment and treatment capacity, and an appraisal of the surface-water and ground-water resources in the immediate vicinity of the municipality.

The results of chemical analyses include the results of an analysis of the chemical constituents most commonly found in water, called a standard complete analysis, and an analysis for a selected group of minor elements.

This report also includes a discussion of the method of investigation, brief descriptions of water-treatment processes, the significance of the data as related to planning, and general comments concerning problems noted.

COOPERATION AND ACKNOWLEDGMENTS

The study of the public water supplies in North Carolina is being made by the U.S. Geological Survey, in cooperation with the Water Resources Planning Branch, North Carolina Department of Natural Resources and Community Development. The inventory data were reviewed by personnel of this Department and by the Division of Health Services of the North Carolina Department of Human Resources. Needless to say, most of the data contained in this report could not have been collected without the generous cooperation of municipal officials and engineering consultants, who supplied information on the water-supply installations.

This report is published by the North Carolina Department of Natural Resources and Community Development in the interest of making the information available to all concerned with the development and utilization of municipal water supplies in the State.

METHOD OF INVESTIGATION

Each municipality in the southern Coastal Plain section of North Carolina with 500 customers or more was visited by hydrologists of the U.S. Geological Survey. Large military bases were also visited. The purpose of these visits was to obtain data on the major components of the water system and to collect water samples for chemical analysis. Where possible, consulting engineers for the individual system were visited to obtain additional information, and available water-system appraisal reports by consultants were reviewed. The general appraisal of the surface-water and ground-water resources in each county and in the vicinity of each municipality was made largely on the basis of information in published reports or in the files of the Geological Survey.

The collection of streamflow data and the study of streamflow characteristics is a continuing activity of the Geological Survey. Streamflow data in this report were developed from streamflow records collected at more than 2,500 sites in the State. Extensive use was made of a report prepared by Goddard (1963), which contains data on average discharge, flow-duration, low-flow frequency, and draft-storage frequency based on streamflow records collected through 1956. The results of similar studies based on additional records collected since the publication of Goddard's report were also used in making the surface-water appraisals.

Appraisals of ground-water conditions of counties and municipalities were based on reports of reconnaissance ground-water investigations published in a series of State-published bulletins having the general title "Geology and Ground Water Conditions in the _____ area North Carolina." Figure 2 is an index map of North Carolina showing locations of reconnaissance ground-water investigations. The purpose of these investigations was to compile data on the ground-water resources, including data on use, availability, chemical quality, and geologic controls of ground water.

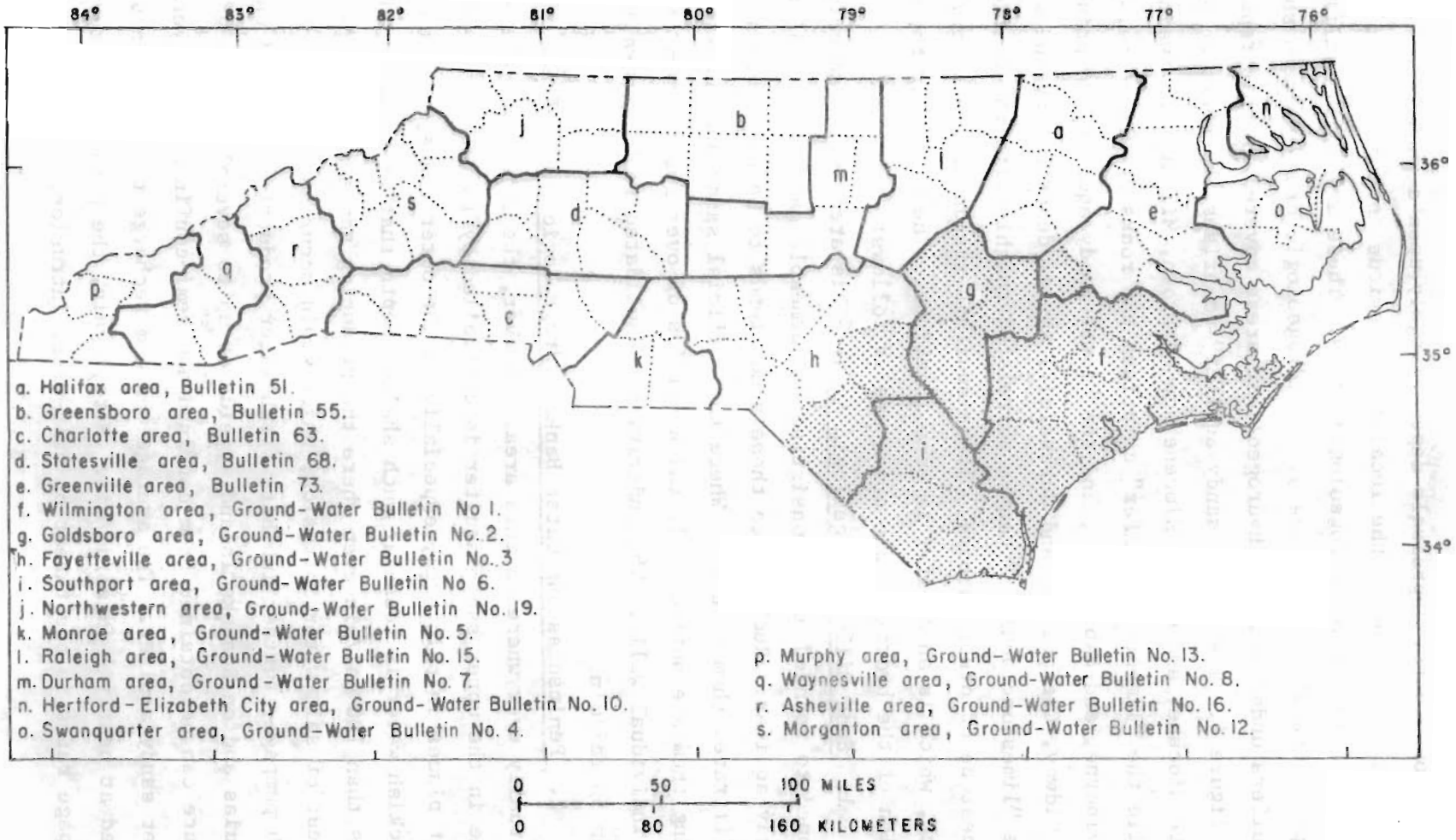

Figure 2.--Areas covered by reconnaissance ground-water investigations. Shaded area is part 5.

Ground-water appraisals depend largely upon a knowledge of the hydrogeologic conditions of the locality. Previous investigators have divided the State into five hydrogeologic areas. These areas, as modified for this report, are shown on figure 3. A hydrogeologic cross-section showing the aquifers underlying the hydrogeologic areas covered in this report is given on figure 4. The "upper sandy aquifer" comprises the rocks of post-Miocene, late Miocene, and middle Miocene age of Brown, Miller, and Swain (1972); while the "limestone aquifer" comprises the rocks of Oligocene, Jackson, Claiborne, and Sabine age, and the "lower sandy aquifer" comprises the rocks of Midway, Cretaceous, and Jurassic(?) age as described by the same authors. The "limestone aquifer" can be correlated roughly with the Castle Hayne Limestone of other authors. These aquifers are underlain by crystalline rock, which is an aquifer in some locations. The basis for the differentiation of the hydrogeologic areas are as follows:

1. Sand Hills Hydrogeologic Area.--This area is characterized by flat-topped to rounded hills consisting of permeable sand, mostly of the lower sandy aquifer. Recharge to these sands tends to be high because rainfall infiltrates them readily. Where the surficial sands and the sands underlying them are sufficiently thick, yields of over 100 gal/min can be obtained by individual wells. The underlying consolidated rocks generally yield less than 50 gal/min.

2. Peninsulas and Outer Banks Hydrogeologic Area.--Fresh water occurs virtually everywhere in this area. However, the thickness of the fresh-water zone in the upper sandy aquifer is controlled by the depth to salt water. In most places in this area, especially on the outer banks, sea water or brackish water is found at such shallow depth that fresh-water yields are less than 100 gal/min even where the producing sands are very permeable. The threat of salt-water intrusion, which would occur as a result of sustained high pumpage, further inhibits fresh-water production. Inland on the peninsulas and on Roanoke Island, yields of up to several hundred gallons per minute can be obtained from confined and semi-confined sand layers in the upper sandy aquifer. The average maximum recharge to these sands is estimated at nearly 1 $(Mgal/d)/mi^2$. Here, again, the principal deterrent to high pumpage rates is the threat of salt-water intrusion.

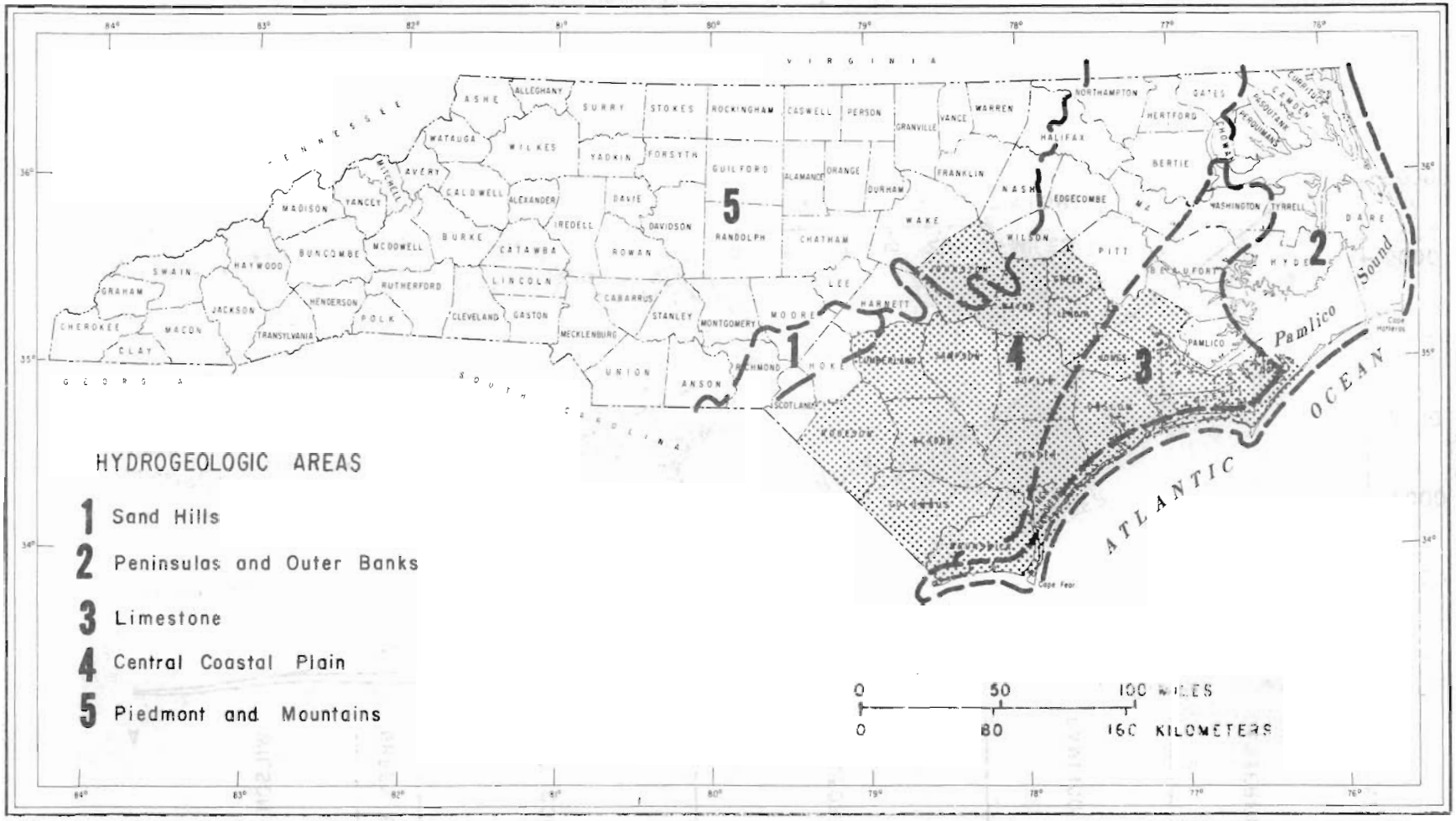

Figure 3.--The five hydrogeologic areas in North Carolina. Shaded area is part 5.

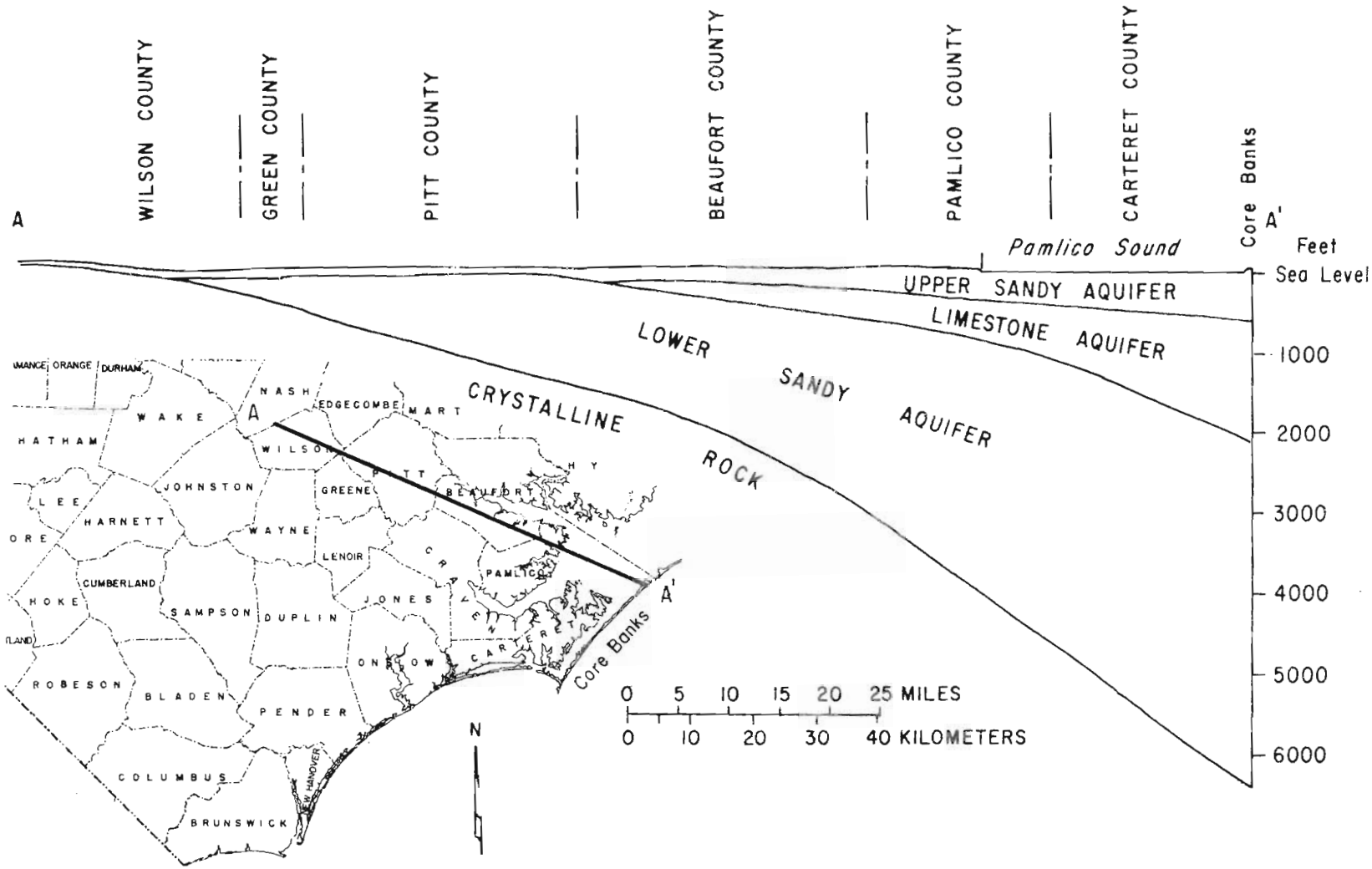

Figure 4.--Generalized cross section showing the major aquifers in the North Carolina Coastal Plain region.

3. Limestone Hydrogeologic Area.--The limestone aquifer is the most prolific aquifer in the State. It ranges in thickness from zero near the western boundary of the limestone hydrogeologic area shown on figure 3 to a maximum thickness of about 1,250 feet in Carteret County. However, the aquifer contains fresh water only to the eastern boundary shown on figure 3. Where the fresh-water zone is thick, well yields of several thousand gallons per minute of fresh water are obtainable. The average maximum recharge that can be induced to this aquifer is estimated to be 0.63 $(Mgal/d)/mi^2$. The relation of this aquifer to the other aquifers in the area is shown on figure 4.

4. Central Coastal Plain Hydrogeologic Area.--This area is underlain by moderately permeable sands interbedded with less-permeable silts and clays. These deposits thicken eastward from the Piedmont area. Here, the thin surficial deposits of the upper sandy aquifer lie directly upon the lower sandy aquifer. The lower sandy aquifer contains only a relatively small amount of freshwater east of the boundary between this area and area 3.

Although the Central Coastal Plain deposits have a much lower average permeability than the limestone aquifer, they have an aggregate thickness in some places that permits well yields of over 1,000 gal/min of freshwater. However, the maximum recharge that can be induced to the deeper parts of these deposits is estimated to range from 0.007 to 0.06 $(Mgal/d)/mi^2$. With such a small potential recharge it is desirable to space production wells adequately in order to minimize well interference.

5. Piedmont and Mountain Hydrogeologic Area.--In the Piedmont and Mountain section, ground water is stored between the individual grains in the soil and weathered rock and in the fractures of the underlying crystalline bedrock. Simply speaking, the saturated spaces in the soil form a reservoir of stored water, and the bedrock fractures serve as pipe lines tapping the reservoir. Therefore, the best wells are usually those drilled where the overlying soil is thickest and the bedrock contains numerous fractures. The locations of fractures or the exact thickness of the soil cover are impossible to determine without drilling a test hole. However, an examination of the surface features and a knowledge of the type of bedrock underlying the area greatly improves the chance of drilling a successful well. For a more

complete discussion see "Ground Water of the Piedmont and Blue Ridge Province in the Southeastern States" by LeGrand (1967).

EXPLANATION OF INVENTORY DATA

The function of a water-supply system is to produce continuously an adequate supply of water that is wholesome and palatable. A knowledge of the present and potential capacity of the various components (source, treatment plant, distribution lines) of the water system is required if water managers and planners are to insure that the water-supply systems of North Carolina will fulfill this primary function. The information collected for each water-supply system and the purpose or significance of the information, except where self evident, follows.

Ownership

The owner listed is the municipality, water association, private individual, or private company that owns and operates the water facility. Also included in this section is the approximate population supplied and the number of customers inside and outside corporate limits.

Source

The source(s) of the raw water and location of the intake(s) are given for surface-water supplies. For ground-water supplies, the location of the wells and pertinent data on the construction and operation of the wells and the aquifer tapped are given. For some ground-water supplies, a value is listed for well yield. This is the predicted amount of water the well should yield based on a drawdown test. In contrast, pump capacity is the pumping rate of the pump on the well at the time data were obtained on the water-supply system. Well-construction data and well-operation data are generally not available. It is recommended that this information be collected and retained by all systems using wells.

Raw-Water Storage

Minimum flows of all but the largest streams are inadequate to meet the daily demand of most public water supplies, and flood waters must be stored in sufficient volume to assure a continuous supply. Storage reservoirs may be "on river" or "off river." On-river storage is created by construction of a dam on the main channel of the river, whereas off-river storage is a reservoir not on the main channel. Off-river reservoirs are normally filled by pumping water from the stream to the reservoir. Such reservoirs are generally smaller than on-river reservoirs but have an advantage in that the water-plant operator can be selective, from a water-quality standpoint, in filling the reservoir. In places where conflicting estimates of storage were obtained, the listed storage is that considered the most reliable.

Estimated Allowable Draft

Allowable draft is the maximum rate at which water can be withdrawn continuously, either from the stream or from storage, without exhausting the supply. Draft estimates are based on minimum streamflows that can be expected to occur once in 20 years on the average. Thus, the flow of the stream or the flow supplemented by storage should provide the estimated draft rate 19 years out of 20, on the average.

All methods used to determine draft rates are based on records of streamflow. Unfortunately, many reservoirs and water intakes are on streams where no records of streamflow are available. Therefore, flow of ungaged streams was estimated using streamflow data from nearby gaged streams.

The regional relation of the 7-day, 2-year minimum flow to allowable draft developed by McMaster and Hubbard (1970), reproduced here as figure 5 was used to estimate allowable draft rates for each system.

The curves shown in figure 5 are averages of draft-storage frequency data published by Goddard (1963). The accuracy of draft rates computed using figure 5 depends on the scatter of the values used to determine the average curve and the accuracy of the estimate of the 7-day, 2-year minimum flow used to enter the relation. The standard error of estimate (a measure of the scatter of the points used to define the relation curves) of the draft rates shown in figure 5 are as follows:

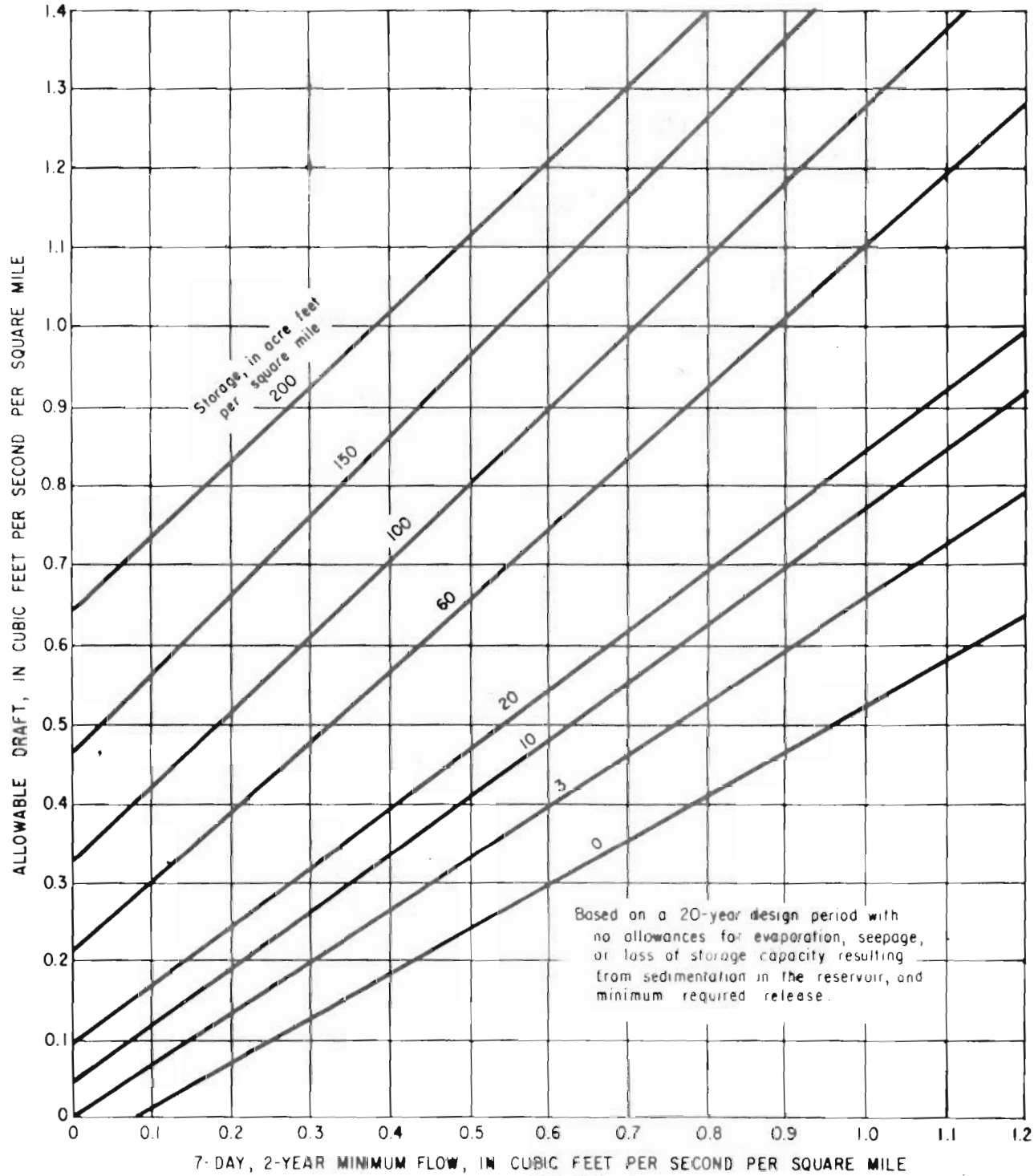

Figure 5.--Relation for estimating the allowable draft of a stream reservoir using the 7-day, 2-year minimum flow of the stream as an index. To convert cubic feet per second per square mile to million gallons per day per square mile multiply by 0.646 (from McMaster and Hubbard, 1970).

Storage (acre-feet/mi^2)	Standard error [(ft^3/s)/mi^2]
200	0.21
150	.14
100	.10
60	.07
20	.08
10	.06
3	.05
0	.05

The relation is general, and draft rates determined using the relation should be considered as planning guides only and not as exact values.

Allowable draft rates should include allowances or adjustments for evaporation, seepage, and loss of storage capacity resulting from sedimentation in the reservoir. Seepage losses or gains depend on a detailed knowledge of the type and construction of the dam and analysis of the geologic features of the reservoir, both of which are beyond the scope of this report. However, siltation rates and evaporation losses can be estimated with some certainty, and these adjustments were made, as described in the following paragraphs.

Losses due to sedimentation were estimated using data on annual loss rates for North Carolina reservoirs reported by Dendy and Champion (1969, p. 5, 6). The total loss was computed using a loss rate experienced in similar types of basins, and the time span used was from the time of the last volume determination of the reservoir to 1984. The volume loss thus estimated was subtracted from the reported storage before entering the relation in figure 5.

Minimum flows and maximum water demands generally coincide during the summer and early fall in North Carolina. Estimates of evaporation losses for this period were made based on the average daily land-pan evaporation during the months of August, September, and October, adjusted by a coefficient of 0.75. Evaporation data from the pan nearest each reservoir was used. A small amount of lake-evaporation data is available and was used in some evaporation estimates. Evaporation losses constitute a demand or additional draft on the source and were subtracted from the allowable draft obtained

from the regional relation. The relation shown in figure 5 is applicable only to reservoirs where within-year storage will supply the demand. For within-year storage to supply the demand, the reservoir must refill each year. Average streamflow in North Carolina is variable and the average for some years can be as little as 50 percent of the long-term average. Therefore, if the draft rate exceeds 50 percent of the long-term average streamflow there will be some years when the reservoir will not refill. The water remaining in storage will be carried over and will have to be sufficient, in combination with subsequent inflow, to supply the demand of the next year.

In reports on the Piedmont and mountains (parts 1 to 3 of this series), draft rates for reservoirs were not estimated when carry-over storage was involved because of the lengthy analysis then required. A report by Arteaga and Hubbard (1975) contains a simple method for determining allowable drafts when carry-over storage is involved. That report can be used for determining storage capacity of reservoirs when a need for carry-over storage is anticipated.

Total Use

Average daily use and maximum daily use are given. Water usage varies from hour to hour, day to day, and season to season. In general, the smaller the community, the greater the variation in its demand for water. Water systems, of course, must have sufficient capacity to meet the peaks in demand. The ratio of the maximum daily use versus the average daily use is one design criterion used in sizing the various components of a water system, particularly the storage component.

Industrial Use

The amount of water used by industry is estimated. These estimates are based on actual metering of the larger users plus an estimated value for smaller industrial users. Where two or more industries use a significant amount of water, each is listed.

Industrial water use often accounts for more than 50 percent of the total demand on a water supply. Obviously, a new industry, an expansion of an existing industry, a change in the manufacturing process that requires

more or less water, or the closing of an industry, can greatly affect the water needs of a community. Good planning should include an analysis of present and future industrial water requirements.

Treatment

The treatment given to each water supply is listed in this section. Some raw waters are satisfactory in quality for all municipal uses. Most, however, require disinfection and purification before they can be used. The treatment given depends on the quality of the raw water being treated. Briefly, some of the processes and their purposes that are used in water-treatment plants are as follows:

Aeration.--is a process in which water is brought in intimate contact with air for the purpose of changing the concentrations of volatile substances contained in the water. It reduces the amount of free carbon dioxide and hydrogen sulfide and supplies oxygen to those waters that are deficient in oxygen. Aeration is generally associated with iron and manganese removal and taste and odor control.

Prechlorination.--is the application of chlorine at any stage in the treatment prior to filtration. The primary purpose of chlorination is to kill disease-producing bacteria. However, prechlorination not only disinfects but also improves coagulation in those waters that contain objectionable amounts of color and iron, retards decomposition of organic matter in the coagulation basin, removes certain tastes and odors by oxidizing organic matter, and controls the growth of plants and microscopic organisms that could produce undesirable tastes and odors and reduce filter-bed efficiency.

Coagulation.--is a process that involves the formation of chemical flocs that adsorb, entrap, or otherwise bring together colloidal and other finely-divided matter suspended in the water. These flocs, which resemble cotton candy, slowly settle and drag down the suspended matter.

Sedimentation.--Particles suspended in water tend to move downward under the influence of gravity regardless of size, shape, or weight. Flowing water tends to hold particles in suspension. Sedimentation is a process whereby the sediment-carrying power of flowing water is reduced by slowing the linear velocity of water until suspended matter will settle out. Coarse sediments

may settle in hours, whereas fine sediments may require weeks to settle completely. Coagulation, as outlined above, speeds the rate at which fine sediments settle.

Taste and odor control with carbon.--The two major sources of undesirable tastes and odors are: (1) decaying vegetation, live and dead algae, and bacterial slimes and (2) sewage and industrial wastes. Practically all steps in the treatment process combat undesirable tastes and odors. Activated carbon is a chemical added primarily to adsorb taste-, odor-, and color-producing substances from water supplies. After adsorbing undesirable substances, the carbon is either settled or filtered out.

Filtration.--is the act of passing the water through a porous material in such a manner as to effectively remove suspended matter. A filter is, in essence, a strainer that physically traps the suspended material. The porous material (filter media) consists of one or more layers of gravel, sand, carbon, anthracite, or coke. The standard gravity filtration rate per square foot of filter area is 2 gallons per minute. Pressure filtration rates may be much higher.

Softening.--Hard water can be softened by the use of natural or artificial base-exchange media called zeolites. In this process, the hardness-causing calcium and magnesium ions in the water are replaced by sodium ions.

Corrosion control.--The objectives of corrosion control are: (1) to increase the life of the distribution system, (2) to decrease pumping costs, and (3) to protect the potability of the water. The most popular method of control is the addition of sodium hexametaphosphate in the treatment process. It is not entirely clear how polyphosphate conditioners operate, but the current theory is that a thin, protective film is deposited over the pipe's inner surface. Polyphosphates such as sodium hexametaphosphate also will hold iron and calcium in solution.

Probably the most effective method of controlling corrosion is either physically coating iron pipes with a protective coating, such as cement, or the use of nonmetallic pipes. However, sometimes factors such as workability, cost, and strength reduction may make these methods impractical.

Adjustment of pH.--pH is a number used to express the free hydrogen ion concentration of a solution. The free hydrogen ion concentration determines whether a solution is acid, neutral, or basic and is one of the most

important chemical properties of water. The degree of acidity or basicity of a water frequently determines whether it is suitable for a particular purpose, whether it will be corrosive and whether it will respond to a certain type of treatment. For these reasons, the pH of the water is adjusted in the treatment process.

Postchlorination.--The addition of chlorine at any time after filtration is called postchlorination. Sufficient chlorine is added to the water to ensure that bacterial growth is suppressed from the time the water leaves the treatment plant until it flows from the tap.

Fluoridation.--is the adjustment of the fluoride concentration of water. Fluoride in certain concentrations in water has been shown to reduce dental decay among children significantly. The North Carolina State Board of Health policy states that fluoridation of water is approved and recommended for public and institutional supplies serving communities where there is a strong public demand, and where the decision to fluoridate the water supply is in concurrence with the local dental society, the local medical society, and the local or district health officer, provided that public and institutional supplies adhere to the required procedures for fluoridation.

Rated Capacity of Treatment Plant

The rated capacity of each treatment plant, expressed in million gallons per day, is given in this report. Water treatment may consist of any one of several processes, singly or in various combinations, such as coagulation, sedimentation, filtration, and disinfection. Treatment facilities, ideally, are of sufficient size to provide, without interruption, treated water to meet the demands of the system. The component of the system having the least capacity determines the capacity of the entire system.

Many cities, particularly those using ground water or surface water from protected watersheds, provide limited treatment without having what is normally recognized as a treatment plant. In these cases, chemicals are added usually in the line near the source or at the pumping station, and treatment plant capacity is shown as "None."

Pumping Capacity

The raw water and finished water pumping capacities are listed. In relatively new systems or in systems that have recently pumped water at capacity, the pumping capacities listed are accurate. In older systems, where additions or alterations to the system have been made, the pumping capacities listed often are simply the sum of the rated capacities of the pumps. The latter method is not entirely correct because many factors, such as the condition of the pumps and the head on the pumps, control the pumping capacity. In addition, all water systems have standby pumps, which are normally used in case of a pump failure or when maintenance is performed on the regular pumps but can be used in conjunction with the regular pumps if needed, provided the distribution system can withstand the increased pressure.

Finished Water Storage

Finished water is stored in distribution reservoirs for the purpose of leveling off peaks in demand. Water usage during some hours of the day greatly exceed the capacity of the treatment plant or well pumps, and these demands are met with water stored during periods of low demand. Distribution reservoirs are generally classed as elevated storage or ground storage. Clear water storage reservoirs, or clear wells, are terms often used to describe finished water storage at a water treatment plant. These are either mentioned separately and called clear wells or are included as part of the ground storage for some water systems in this report. The storage capacity in each type of reservoir is given.

Future Plans

Included in this section are plans for alterations or additions to the major components of the water-supply system. Minor changes in the distribution system are not included.

Water-Resources Appraisals

The quantity of water available in a particular locality is an important factor in the economic growth of the locality. The selection of a source for water supply, whether surface water or ground water, depends on the quantity available and the economic factors involved in developing the source. The water-resources appraisals are a summary of water-supply characteristics of streams and a summary of available information on ground-water conditions in the immediate vicinity of each municipality, including:

Surface water.--The magnitude and frequency of low flows and the average discharge are indicative of the amount of water available for development. In the water-resources appraisals, values for the average discharge and the average 7-day, 2-year minimum flows are listed. In addition, references are made to minimum flow or to the low-flow yield of streams. These references to low flows generally refer to the average 7-day, 20-year minimum flows. Each appraisal also mentions streams for potential future development or includes a comment on the possibilities of further development of the present source.

Ground water.--Ground-water appraisals include a general evaluation of aquifers at or near the community, reported well depths and yields, and a general statement of the quality of ground water in the area. Where a ground-water constituent is stated as being "excessive" the following criteria were used: acidity--pH less than 5.0; alkalinity--pH greater than 9.0; chloride--more than 250 mg/L (also the criterion for "salty"); dissolved solids--more than 500 mg/L; iron--more than 0.3 mg/L; manganese--more than 0.05 mg/L; and fluoride--more than 1.0 mg/L. The dividing line here between "hard" and "soft" is 60 mg/L of hardness as $CaCO_3$ and between "acid" and "alkaline" is pH 7.0. The appraisals also include the estimated potential yield of wells drilled in the immediate vicinity.

CHEMICAL ANALYSES

Water is referred to as the universal solvent because it has the capacity to dissolve at least minute amounts of nearly every substance it touches. Some of the substances dissolved in water, if present in sufficient concentrations, affect the use of the water for public supplies and for some

industrial processes. Thus, an important segment of a public water-supply inventory is the determination of the kinds and amounts of substances dissolved in the water. In the earlier public water-supply inventories only a standard complete analysis of water samples was made. The standard complete analysis included determination of the following constituents and properties of both the raw and finished water:

- Silica (SiO_2)
- Aluminum (Al)
- Iron (Fe)
- Manganese (Mn)
- Calcium (Ca)
- Magnesium (Mg)
- Sodium (Na)
- Potassium (K)
- Bicarbonate (HCO_3)
- Carbonate (CO_3
- Sulfate (SO_4)
- Chloride (Cl)
- Fluoride (F)
- Nitrate (NO_3)
- Nitrite + Nitrate as Nitrogen ($NO_2 + NO_3$ as N)
- Dissolved solids
- Hardness as $CaCO_3$:
  - Total
  - Noncarbonate
- Alkalinity as $CaCO_3$
- Specific conductance
- pH
- Color
- Temperature

Currently, a great deal of research and general interest centers on minor elements and their possible detrimental or beneficial effect on man's health. No one knows when another element will be found to be beneficial, as for example fluoride in reducing dental decay, or when another element will produce a controversy such as that raised by the discovery of excessive mercury concentrations in some waters (Environmental Protection Agency, 1972).

At present, there is a small amount of data on minor-element concentrations in the public water supplies of North Carolina. Some State and Federal agencies have recently started making these determinations, and a base of information is developing. The complexity in making the determinations and the sophisticated equipment required almost rules out these determinations in all but the larger municipal water-treatment laboratories. For these reasons, a decision was made to perform an analysis of selected minor elements in water samples from each public water-supply system. The problem remained as to which analyses to perform.

Rather complete minor-element analyses on samples from Raleigh's surface-water supply, and New Bern's ground-water supply were made to determine which minor elements might be found in North Carolina waters.

Based on the results of these analyses and a study of reports in various professional journals, the following list was selected:

Surface-Water Source		Ground-Water Source	
Barium	Iron	Barium	Cyanide
Boron	Lead	Boron	Iron
Cadmium	Lithium	Cadmium	Lithium
Chloride	Manganese	Chloride	Manganese
Chromium	Mercury	Chromium	Strontium
Cobalt	Strontium	Cobalt	Zinc
Copper	Zinc	Copper	
Cyanide			

The list was reviewed after completion of parts 1 and 2, and one substitution was made. Arsenic was added to the list, and cyanide was deleted. Cyanide was not detected in any of the samples collected. Arsenic, however, has been detected in samples collected for other studies, and it ranged in concentration from 0.001 to 1.1 mg/L (milligrams per litre). The sample containing 1.1 mg/L arsenic was from a stream carrying a large waste load, apparently an extreme situation.

Although minor elements have been added to the analyses contained in this series of reports, this is not to say that the standard complete analyses contained in the former reports are not still valuable to waterworks operators and planners. Therefore, the latest standard complete analysis made by the Geological Survey and contained in earlier reports, or a new standard complete analysis if the source of water has changed, is included for each water-supply system.

The point of collection of water samples depends on the source of supply. For surface supplies, raw-water samples were collected either at the impoundment, from the stream, or from the raw-water tap in the water-treatment plant. Samples of finished water were collected from taps at the water-treatment plant or from the distribution system. For ground-water supplies, raw-water samples were collected directly from the well pump or, when no outlets were available at the pump, from the tap nearest the well. Samples of finished ground-water were collected from taps in the water-treatment plant or in the distribution system. Water samples for minor-element

analyses were, in most cases, collected only from the principal surface-water source or a single well.

The analytical data presented are for one sample at one point in time. In the course of a year, many samples are collected and analyzed by water-works personnel and by the State Board of Health to insure that the water is of acceptable chemical and bacteriological quality. Those interested can obtain more complete data from either of these sources.

COMMON PROBLEMS

Some problems were noted with water-supply record-keeping procedures during this inventory of municipal water supplies. One problem noted, especially in the small water-treatment plants, is a lack of records. The value of accurate records in a water plant cannot be overemphasized. Accurate and complete records are essential to the efficient operation of the water plant and in making projections for future expansion.

The most common problem is the lack of data concerning the dependability of the source of supply, whether surface water or ground water. For small systems on large rivers, there is little worry about the adequacy of the supply, but for systems that impound or store water for use during periods of low streamflow, the adequacy of the supply should be evaluated continuously. Storage reservoirs continuously lose some of their capacity due to siltation, yet most municipalities list the capacity of their reservoirs as being the same as when they were constructed. The reduction in the storage capacity of reservoirs because of siltation, and the minimum flow of the streams that feed the reservoirs should be determined in order to evaluate the adequacy of a supply.

Efficient operation of a ground-water system is not possible without well data. Collection and maintenance of complete records of well construction and operation are standard procedures for properly-run municipal systems using ground water. Analysis of these records can point out potential problems before a failure occurs and may indicate the need for additional wells.

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BLADEN COUNTY

WATER-RESOURCES APPRAISAL

Bladen County is in the southeastern part of the North Carolina Coastal Plain. The topography is flat with many swamps and small lakes. Most of the county is drained by the Cape Fear River and its tributaries. The southwestern part of the county and narrow strips along the western and southern boundaries are drained by tributaries of the Waccamaw River. The average stream discharge in the county is 0.7 $(Mgal/d)/mi^2$. Minimum streamflows range from 0.0022 to 0.041 $(Mgal/d)/mi^2$ and average 0.013 $(Mgal/d)/mi^2$. Streams with drainage areas larger than 100 square miles have been observed to go dry. The 7-day, 2-year low flows range from 0.014 to 0.11 $(Mgal/d)/mi^2$ and average 0.054 $(Mgal/d)/mi^2$. Two public water supplies in the county have 500 or more customers: Elizabethtown and White Lake. These and smaller public and individual supplies are obtained from ground water. The population of the county was 26,477 in 1970.

The county is underlain by a few tens of feet of upper sandy aquifer. This aquifer is underlain by the lower sandy aquifer, which thickens in a southeasterly direction. In the northwestern part of the county, the thickness is about 300 feet thickening to about 700 feet in the southeast. This aquifer can probably yield from a few hundred to a thousand gallons per minute to wells depending upon the thickness. In a small area in the southeastern part of the county the depth to salt water is less than 100 feet. Here, much smaller fresh-water yields could be expected. The maximum ground-water yield in the county is estimated at 0.9 $(Mgal/d)/mi^2$. The maximum recharge to the deeper parts of the lower sandy aquifer is about 0.06 $(Mgal/d)/mi^2$. The water from the lower sandy aquifer ranges from hard to soft. The water that is soft also tends to be very alkaline. In the southeast corner of the county, excessive concentrations of chloride and dissolved solids, even in relatively shallow wells, pose a problem.

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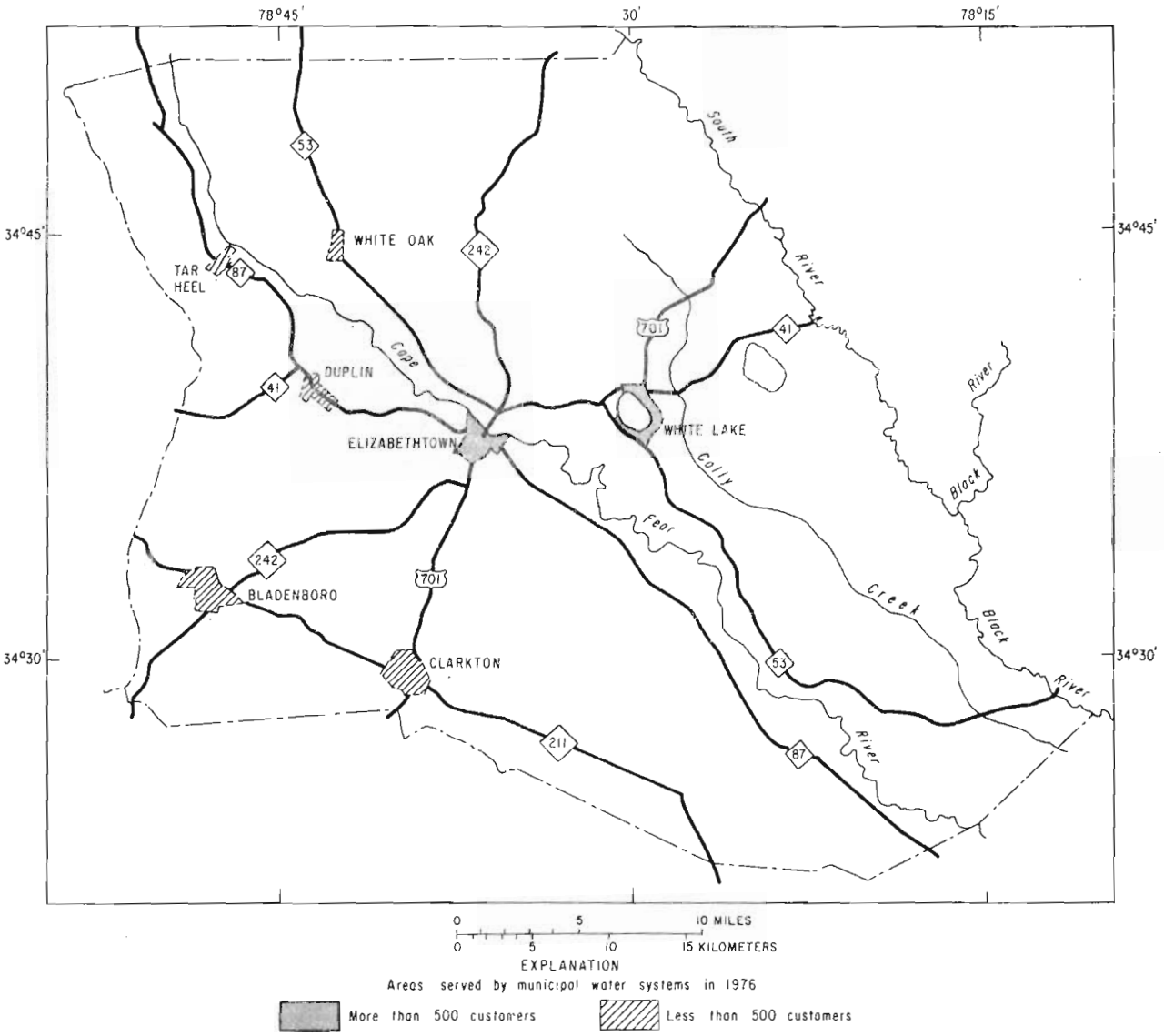
BLADEN COUNTY



EXPLANATION

Areas served by municipal water systems in 1976

More than 500 customers

Less than 500 customers

ELIZABETHTOWN, BLADEN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,800 in 1975. (1,089 metered customers, about 500 of whom live in suburban areas).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1 (Swanzy St., between Hill and Hall Sts.), Bl-74, located at lat 34°37'26", long 78°36'03". Driller: Carolina Drilling and Equipment Co. Date drilled: 1960. Total depth: about 500 ft. Diam: _____. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 125 ft. Static water level: _____. Pump capacity: 320 gal/min. Type pump: turbine.

Well No. 2 (Swanzy St. near fire station), Bl-73, located at lat 34°37'39", long 78°36'46". Driller: Charles R. Underwood. Date drilled: _____. Total depth: 514 ft. Diam: _____. Cased to: 180 ft. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 120 ft. Static water level: 60 ft below land surface. Pump setting: 140 ft. Pump capacity: 600 gal/min. Type pump: turbine.

TOTAL USE:

0.41 Mgal/d, estimated; maximum daily not determined.

INDUSTRIAL USE:

0.15 Mgal/d, estimated. Principal users include Veeder-Root, Inc., Singletary Construction Co., D and H Manufacturers, Cape Craftsmen, Inc., Elizabethtown Lingerie Co., and Bladen Sportswear.

TREATMENT:

Aeration, chlorination, and carbon filtration for removal of iron, taste, and odor. Each well has treatment plant.

RATED CAPACITY OF TREATMENT PLANTS:

Not determined, but considered adequate for any anticipated need.

PUMPING CAPACITY:

Raw water, 1.16 Mgal/d; finished water, 1.16 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two clear wells of about 38,000 gallons each; one elevated tank, 300,000 gallons.

FUTURE PLANS:

Will expand system to include an area to be annexed.

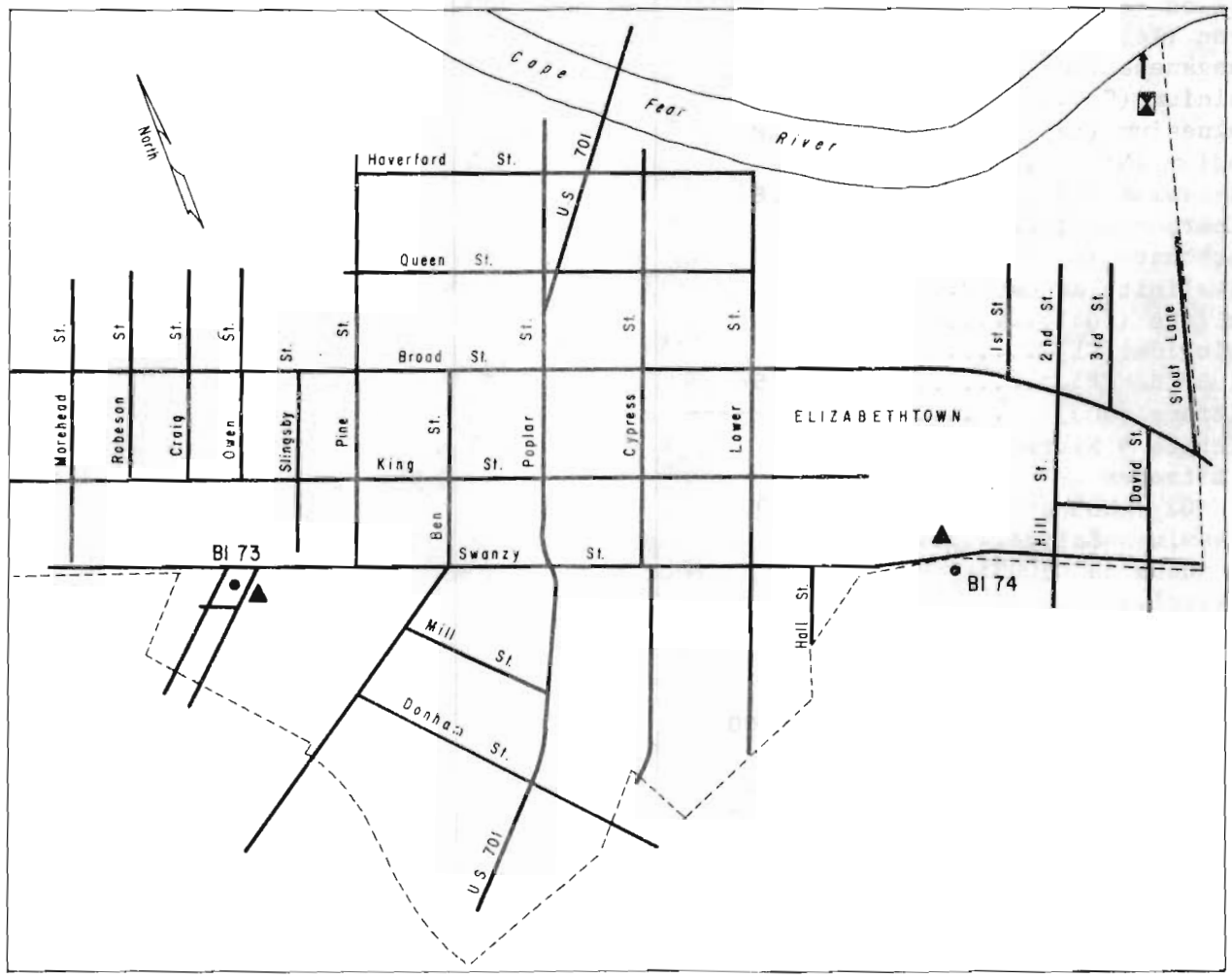
ELIZABETHTOWN, BLADEN COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Elizabethtown is in central Bladen County on the west side of the Cape Fear River. The river could readily provide more than enough water for any foreseeable need of the town.

Ground water: Elizabethtown is underlain at a shallow depth by the lower sandy aquifer, which has a thickness of about 500 feet here. This aquifer can yield up to 1,000 gal/min to wells. Water from deep wells in the lower sandy aquifer tends to be soft, with a moderate dissolved-solids concentration, and may have high alkalinity.

TOWN OF ELIZABETHTOWN



ELIZABETHTOWN, BLADEN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Composite 1/ Finished			
Date of collection.....	11-19-75			
Silica (SiO_2).....	29			
Iron (Fe).....	.12			
Manganese (Mn).....	.000			
Calcium (Ca).....	3.6			
Magnesium (Mg).....	.8			
Sodium (Na).....	84			
Potassium (K).....	5.8			
Bicarbonate (HCO_3).....	180			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	150			
Sulfate (SO_4).....	17			
Chloride (Cl).....	36			
Fluoride (F).....	.5			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.06			
Dissolved Solids.....	263			
Hardness as $CaCO_3$:				
Total.....	12			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	430			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.31			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.014			
Lead (Pb).....	----------			
Lithium (Li).....	.01			
Mercury (Hg).....	----------			
Strontium (Sr).....	.06			
Zinc (Zn).....	.01			
pH (units).....	8.1			
Temperature (°C).....	----------			

1/ Composite sample of wells no. 1 and 2.

WHITE LAKE, BLADEN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 350 in winter and 3,000 in summer in 1975 (750 metered customers, 50 of whom are in suburban areas).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1, Bl-75, located at lat 34°37'13", long 78°29'42". Driller: _____. Date drilled: 1961. Total depth: 450 ft. Diam: 10 in. Cased to: 350 ft. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 75 ft. Static water level: _____. Pump capacity: 550 gal/min. Type pump: turbine.

Well No. 2 (auxiliary well), Bl-76, located at lat 34°37'51", long 78°29'48". Driller: _____. Date drilled: 1961. Total depth: 450 ft. Diam: 10 in. Cased to: 350 ft. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 70 ft. Static water level: _____. Pump capacity: 575 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975) summer, 0.125 Mgal/day; winter, 0.045 Mgal/d, estimated. Maximum daily (July 4, 1975), 1.4 million gallons, estimated.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination.

RATED CAPACITY OF TREATMENT PLANTS:

Demand chlorination at each well; not rated.

PUMPING CAPACITY:

Raw water, 1.6 Mgal/d; finished water, 1.6 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 75,000 gallons.

FUTURE PLANS:

Will extend water lines completely around lake.

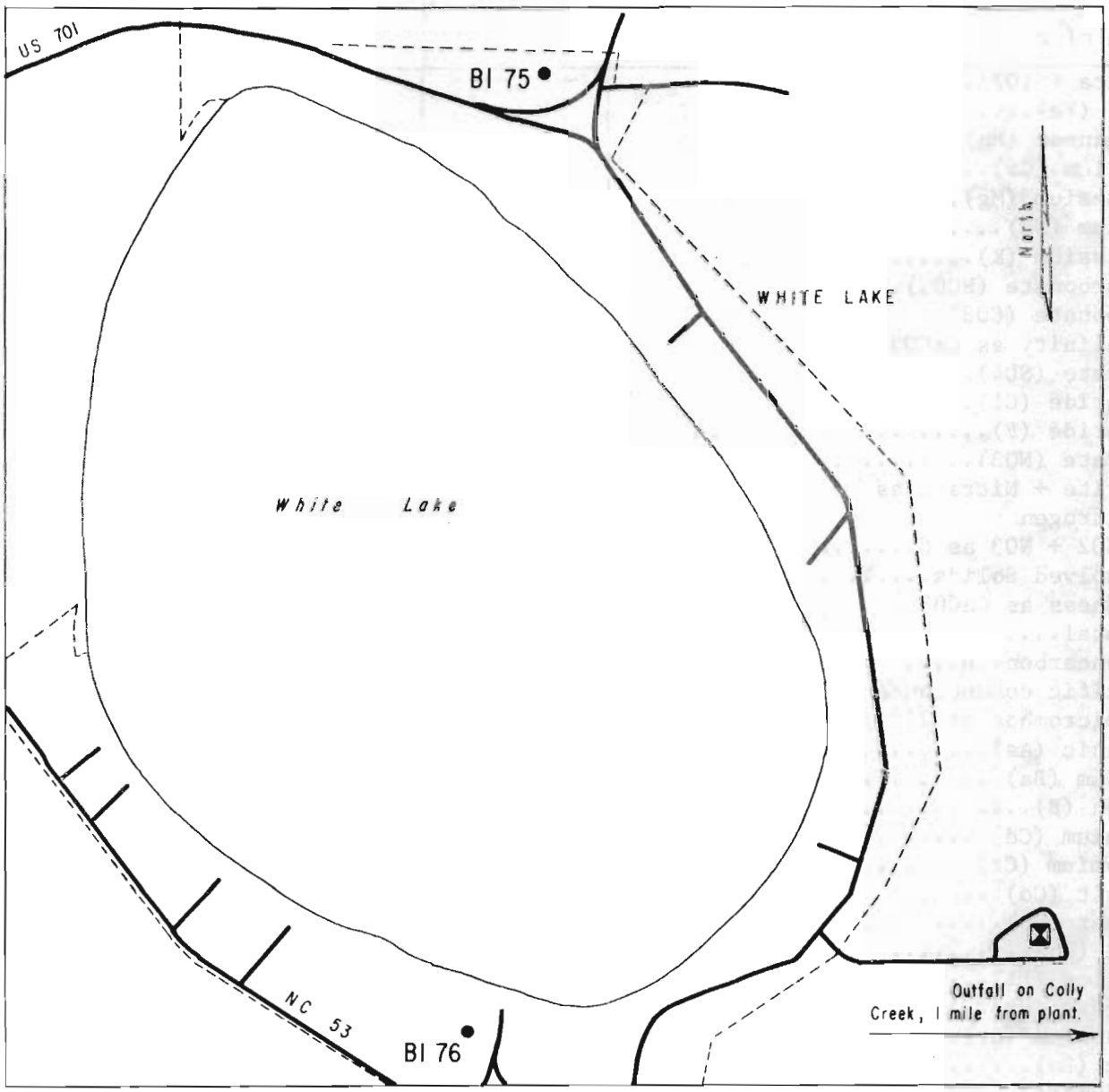
WHITE LAKE, BLADEN COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The town of White Lake is on White Lake in central Bladen County. The town is within two miles of the Cape Fear River, which could supply more than enough water for any foreseeable need. White Lake itself could probably supply the town's needs.

Ground water: The town is underlain at a shallow depth by the lower sandy aquifer. This aquifer is almost 500 feet thick here and could yield up to 1,000 gal/min to wells. The water from the lower sandy aquifer is soft, has a high dissolved-solids concentration, and may have high alkalinity.

TOWN OF WHITE LAKE



WHITE LAKE, BLADEN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 1 Raw	Well No. 1 Raw		
Date of collection	6-8-65	12-9-75		
Silica (SiO_2)	17	---		
Iron (Fe)	.17	0.10		
Manganese (Mn)	.06	.050		
Calcium (Ca)	14	---		
Magnesium (Mg)	5.9	---		
Sodium (Na)	150	---		
Potassium (K)	12	---		
Bicarbonate (HCO_3)	270	---		
Carbonate (CO_3)	0	---		
Alkalinity as $CaCO_3$	220	---		
Sulfate (SO_4)	33	---		
Chloride (Cl)	98	63		
Fluoride (F)	.4	---		
Nitrate (NO_3)	.1	---		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	---	---		
Dissolved Solids	464	---		
Hardness as $CaCO_3$:				
Total	58	---		
Noncarbonate	0	---		
Specific conductance (micromhos at 25°C)	750	605		
Arsenic (As)	---	.001		
Barium (Ba)	---	.0		
Boron (B)	---	.30		
Cadmium (Cd)	---	.000		
Chromium (Cr)	---	.000		
Cobalt (Co)	---	.000		
Copper (Cu)	---	.005		
Lead (Pb)	---	---		
Lithium (Li)	---	.00		
Mercury (Hg)	---	---		
Strontium (Sr)	---	.13		
Zinc (Zn)	---	.00		
pH (units)	7.6	---		
Temperature (°C)	19.5	---		

BRUNSWICK COUNTY

WATER-RESOURCES APPRAISAL

Brunswick County is in the southeastern part of the North Carolina Coastal Plain. The topography is flat and swampy. Offshore strands line the Atlantic Coast and streams are estuarine in their lower reaches. The northeastern and east-central parts of the county are drained by the Cape Fear River and its tributaries. The west-central part of the county is drained by the Waccamaw River. Small streams that drain the southern part of the county empty directly into the ocean. The average stream discharge ranges from 0.6 $(Mgal/d)/mi^2$ in the western part of the county to 1.0 $(Mgal/d)/mi^2$ in the eastern part. Minimum flows in the county tend to be low, ranging from 0.0003 to 0.08 $(Mgal/d)/mi^2$ and averaging 0.02 $(Mgal/d)/mi^2$. Streams with drainage areas as large as 22 square miles have been observed to go dry. The 7-day, 2-year low flows range from 0.006 to 0.12 $(Mgal/d)/mi^2$ and average 0.04 $(Mgal/d)/mi^2$. Three public water supplies in the county have 500 or more customers: Long Beach, Ocean Isle Beach, and Southport. These supplies and smaller public and private supplies are from ground-water sources. The population of the county was 24,223 in 1970.

The county is underlain by sedimentary deposits that generally thicken to the southeast. The uppermost of these deposits, the upper sandy aquifer, ranges in thickness from 20 to 80 feet; however, it shows no systematic thickening. In the southeastern part of the county, the upper sandy aquifer is underlain by the limestone aquifer, which reaches a maximum thickness of about 170 feet in the extreme southeastern part of the county. The limestone aquifer probably contains only fresh water except at some coastal locations. This aquifer, where thickest, might produce up to 2,000 gal/min to wells. However, the possibility of vertical or horizontal salt-water encroachment would make much smaller yields advisable. In the northern part of the county, the lower sandy aquifer directly underlies the upper sandy aquifer. The thickness of the lower sandy aquifer ranges from 800 feet in the northern part of the county to over 1,400 feet in the southeast. The fresh-water yields that can be obtained from this aquifer vary with the thickness of the fresh-water zone in the upper part of the aquifer. In the northwestern part of the county the depth to salt water is as much as 400 feet, and well yields of as much as 1,000 gal/min probably could be obtained. In the northeastern part of the county the depth to salt water is less than 200 feet and yields from this aquifer would be correspondingly less. In the coastal areas, the fresh-water zone in the lower sandy aquifer, where it underlies the limestone aquifer, may be very thin or nonexistent. The maximum ground-water yield is estimated at 1.0 $(Mgal/d)/mi^2$. The maximum recharge to the deeper parts of the lower sandy aquifer is estimated at 0.5 $(Mgal/d)/mi^2$. The water from the limestone aquifer tends to be hard, may have excessive iron and dissolved-solids concentrations and moderate chloride concentration. Some of the deeper wells in the lower sandy aquifer may yield soft water containing high to excessive concentrations of chloride and dissolved solids.

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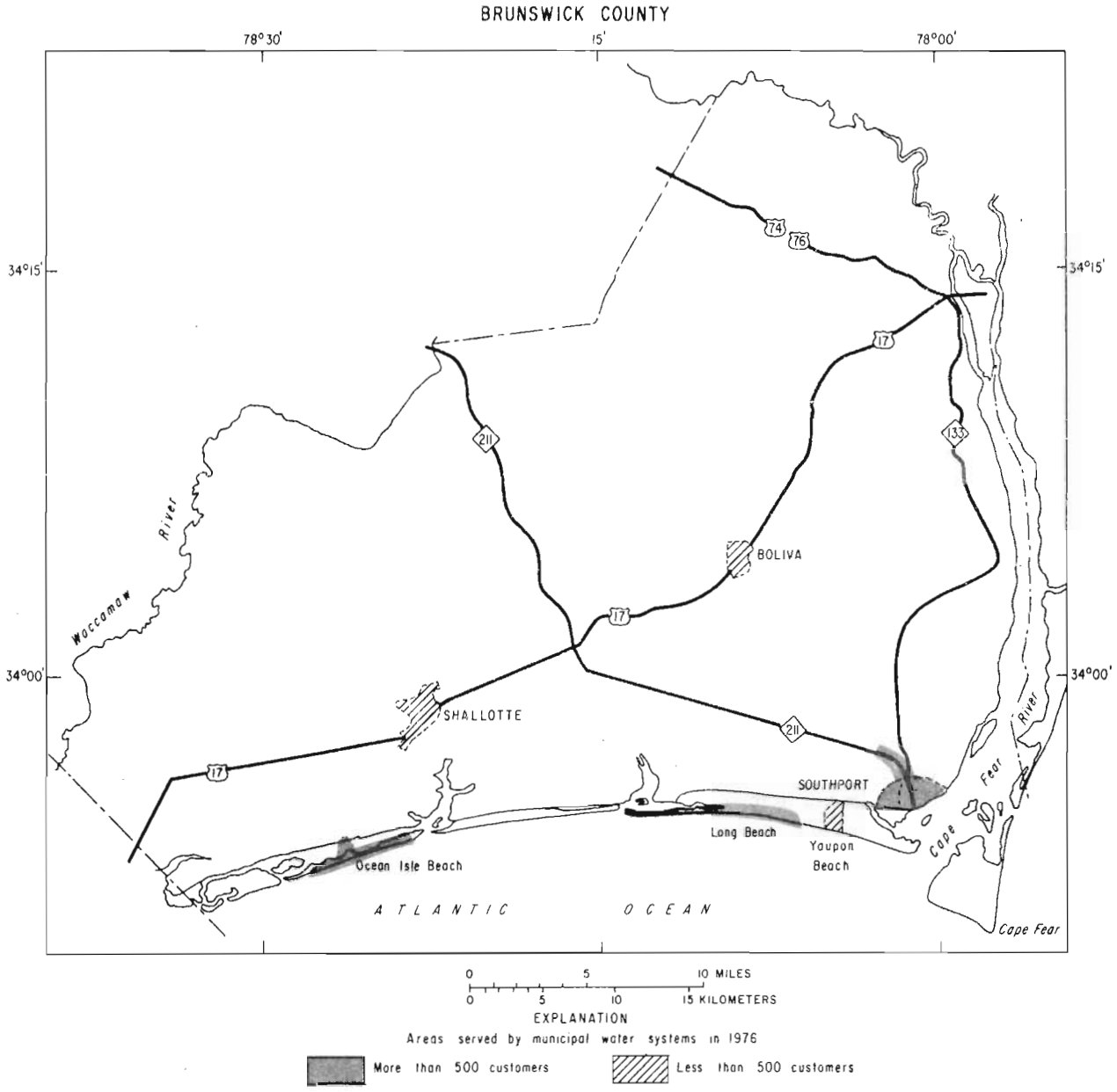

BRUNSWICK COUNTY
78°30'
15'
78°00'
34°15'
34°00'
74
76
17
211
133
Waccamaw River
BOLIVA
SHALLOTTE
SOUTHPORT
Long Beach
Yaupon Beach
Ocean Isle Beach
ATLANTIC OCEAN
Cape Fear River
Cape Fear
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

LONG BEACH, BRUNSWICK COUNTY

OWNERSHIP:

Municipal. Total population supplied (1975), about 5,000 (about 600 metered customers).

SOURCE:

Four wells (Nos. 1-4).

Well No. 1 (46th St. East), Br-73, located at lat 33°54'47", long 78°07'23". Driller: S. Deese. Date drilled: 1960. Total depth: 181 ft. Diam: 6 in. Cased to: 50 ft. Type of finish: open end. Topography: flat. Aquifer: limestone. Altitude of land surface: about 10 ft. Static water level: 20 ft below land surface. Pump setting: 100 ft. Pump capacity: 140 gal/min. Type pump: turbine.

Well No. 2 (27th St. West), Br-74, located at lat 33°54'55", long 78°10'53". Driller: S. Deese. Date drilled: 1960. Total depth: 145 ft. Diam: 6 in. Cased to: _____. Type of finish: open end. Topography: flat. Aquifer: limestone. Altitude of land surface: about 5 ft. Static water level: 40 ft below land surface. Pump setting: 100 ft. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 3 (1st St. West), Br-75, loacted at lat 33°55'11", long 78°09'45". Driller: W. Pickard. Date drilled: about 1965. Total depth: 168 ft. Diam: 8 in. Cased to: 100 ft. Type of finish: open end. Topography: flat. Aquifer: limestone. Altitude of land surface: 15 ft. Static water level: 25 ft below land surface. Pump setting: 100 ft. Pump capacity: 200 gal/min. Type pump: submersible.

Well No. 4 (2nd St. East), Br-76, located at lat 33°55'10", long 78°09'35". Driller: W. Pickard. Date drilled: June 1969. Total depth: 149 ft. Diam: 8 in. Cased to: 88 ft. Type of finish: open end. Topography: flat. Aquifer: limestone. Altitude of land surface: 17 ft. Static water level: 17 ft below land surface. Pump setting: 100 ft. Pump capacity: 175 gal/min. Type pump: turbine.

TOTAL USE:

0.7 Mgal/d, estimated; maximum daily, not available.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination and adjustment of pH with soda ash at each well.

PUMPING CAPACITY:

Finished water, 0.96 Mgal/d.

RAW-WATER STORAGE:

None.

LONG BEACH, BRUNSWICK COUNTY

FINISHED-WATER STORAGE:

Four pressure tanks (one at each well), 8,500 gallons each.

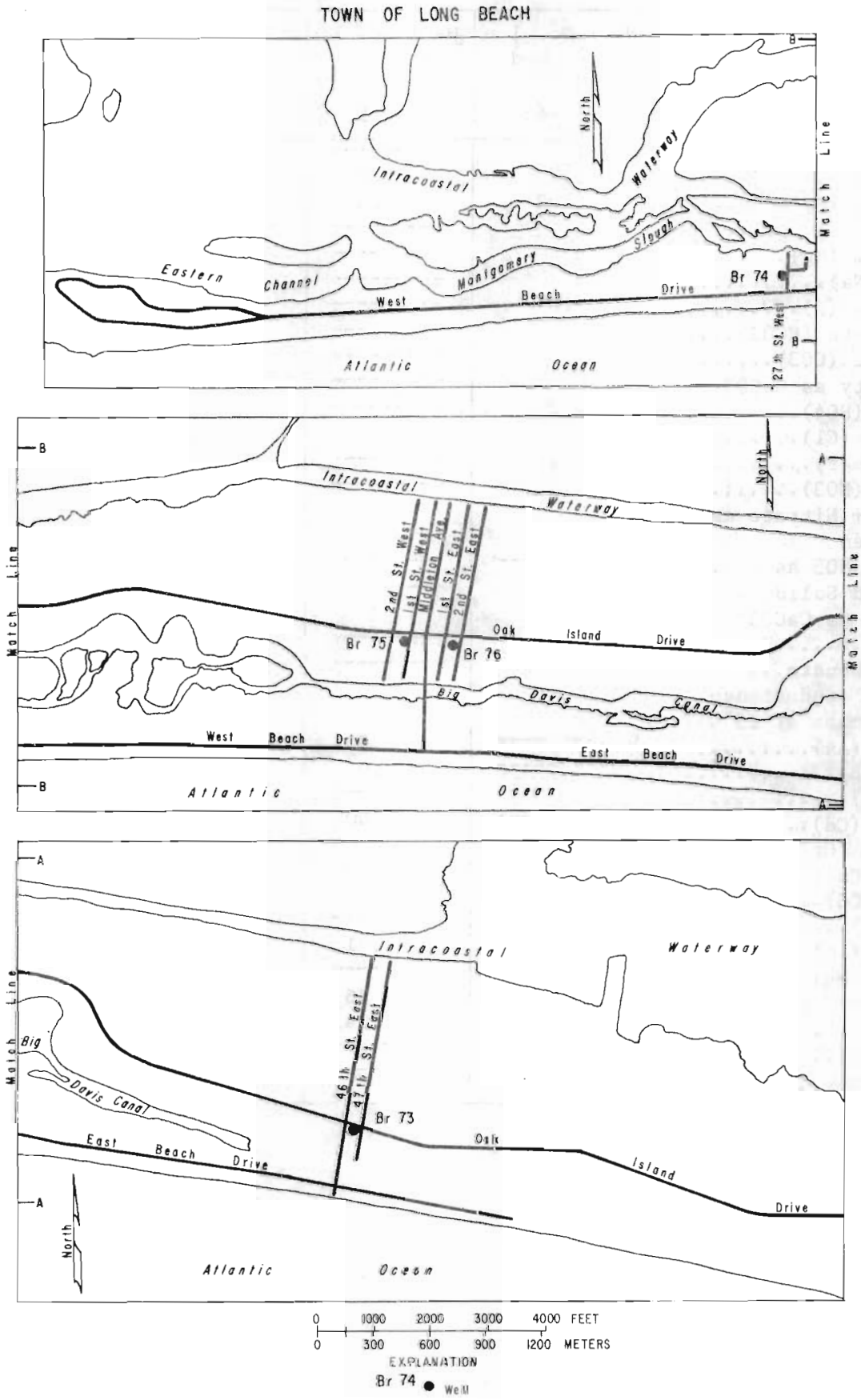
FUTURE PLANS:

Will tie into county-wide system.

WATER-RESOURCES APPRAISAL:

Surface water: Long Beach is south of the Intracoastal Waterway on the southern coast of Brunswick County. The topography is flat except where sand dunes are present. There are no discernible drains except in the tidal flats and swamps. These drains are estuarine and salty. No minimum or low-flow information is available for this area. Under present conditions there appears to be no economically feasible way of developing an adequate surface-water supply.

Ground water: Long Beach is underlain at a few tens of feet by the limestone aquifer. This aquifer is over 100 feet thick and is capable of yielding up to a few hundred gallons per minute to wells. Much lower yields are advisable because of the threat of vertical or lateral salt-water encroachment. The water from the limestone aquifer tends to be hard and may have excessive concentrations of iron and dissolved solids.


TOWN OF LONG BEACH
Intracoastal
Waterway
North
Match Line
Eastern
Channel
Montgomery
Slough
West
Beach
Drive
Br 74
27th St. West
Atlantic
Ocean
B
B
Intracoastal
Waterway
North
A
2nd St. West
1st St. West
Median Ave.
1st St. East
2nd St. East
Match Line
Match Line
Oak
Island
Drive
Br 75
Br 76
Big
Davis
Canal
West
Beach
Drive
East
Beach
Drive
B
Atlantic
Ocean
A
A
Intracoastal
Waterway
Match Line
Big
Davis Canal
46th St. East
47th St. East
Br 73
East
Beach
Drive
Oak
Island
Drive
A
North
Atlantic
Ocean
0
1000
2000
3000
4000 FEET
0
300
600
900
1200 METERS
EXPLANATION
Br 74
Well

LONG BEACH, BRUNSWICK COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Finished	Well No. 1 Raw		
Date of collection.....	9-8-66	8-20-75		
Silica (SiO2).....	22	---		
Iron (Fe).....	2.7	2.4		
Manganese (Mn).....	.02	.010		
Calcium (Ca).....	100	---		
Magnesium (Mg).....	4.9	---		
Sodium (Na).....	82	---		
Potassium (K).....	4.6	---		
Bicarbonate (HCO3).....	340	---		
Carbonate (CO3).....	0	---		
Alkalinity as CaCO3.....	280	---		
Sulfate (SO4).....	3.2	---		
Chloride (Cl).....	130	110		
Fluoride (F).....	.2	---		
Nitrate (NO3).....	.2	---		
Nitrite + Nitrate as Nitrogen (NO2 + NO3 as N).....	---	---		
Dissolved Solids.....	518	---		
Hardness as CaCO3:				
Total.....	280	---		
Noncarbonate.....	0	---		
Specific conductance (micromhos at 25°C)....	912	873		
Arsenic (As).....	---	.001		
Barium (Ba).....	---	.0		
Boron (B).....	---	---		
Cadmium (Cd).....	---	.000		
Chromium (Cr).....	---	.000		
Cobalt (Co).....	---	.000		
Copper (Cu).....	---	.000		
Lead (Pb).....	---	---		
Lithium (Li).....	---	.01		
Mercury (Hg).....	---	---		
Strontium (Sr).....	---	.46		
Zinc (Zn).....	---	.04		
pH (units).....	7.3	---		
Temperature (°C).....	21.0	---		

OCEAN ISLE BEACH, BRUNSWICK COUNTY

OWNERSHIP:

Municipal. Total population supplied (1974), about 200 permanent, 2,000 to 3,000 seasonal (500 customers).

SOURCE:

Four horizontal collector wells constructed in late 1973 by Skipper's Well Drilling. Each collector consists of two opposed laterals supplying 8-inch diameter headers equipped with submersible pumps. The laterals are a series of 20-foot lengths of pipe separated by 3-foot polyvinyl-chloride screens. They are 12 to 13 feet deep and are surrounded by 2-foot square gravel packs. The laterals of wells 1 and 4 are 2 inches in diameter, while those of wells 2 and 3 are 3 inches. Each of wells 1, 2, and 3 have laterals containing 10 screens, totaling 30 feet. Accordingly, the calculated length of the laterals is about 230 feet; however their reported lengths are 200 feet. The combined length of the laterals in well 4 is reported as being 200 feet with, presumably, each lateral being 100 feet long. The total number of 3-foot screens in well 4 is not known. The pump capacity of wells 1, 2, and 3 are reported to be 60 gal/min each, while that of well 4 is reported to be 45 gal/min. The approximate location of the headers is as follows: Well No. 1, Br-69, lat 33°52'57", long 78°27'22"; Well No. 2, Br-70, 33°52'59", long 78°27'12"; Well No. 3, Br-71, lat 33°53'51", long 78°23'34"; Well No. 4, Br-72, lat 33°53'52", long 78°23'24". Depths to water are reported to be from 1 to 1.5 feet below land surface.

TOTAL USE:

Average use (summer), 0.15 Mgal/d, estimated; (winter), 0.025 Mgal/d, estimated. Maximum daily (July 1975), 0.2 Mgal/d, estimated.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination at each well.

PUMPING CAPACITY:

Finished water, 0.3 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 200,000 gallons.

FUTURE PLANS:

None.

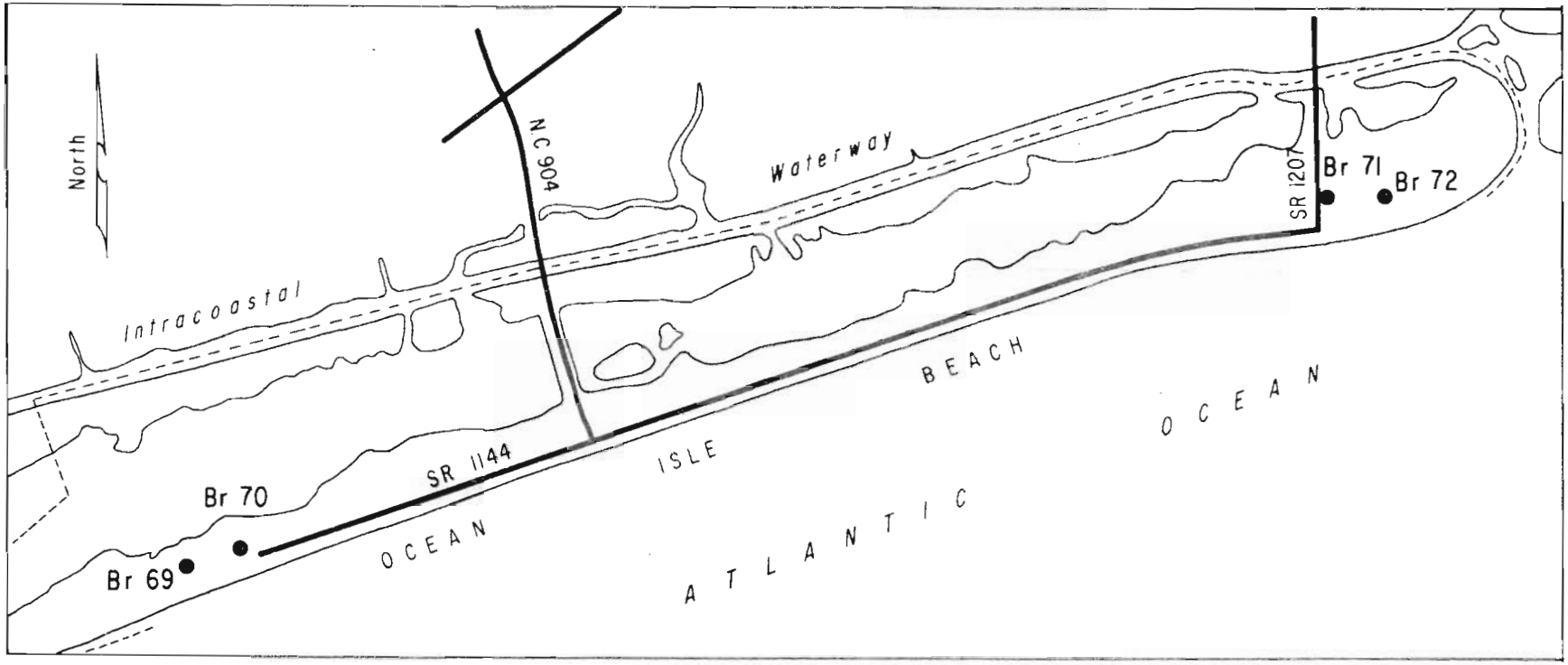
OCEAN ISLE BEACH, BRUNSWICK COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Ocean Isle Beach is on an offshore strand off the southern coast of the county. Sand dunes typify the part of the town on the ocean, while swamps and tidal flats dominate the side toward the mainland. The dune areas have no discernible drainage. The swamp area does have drains and these are largely estuarine and salty. Some of the swamp area has been reclaimed by dredging and filling. No minimum or low-flow data is available for the area. Under present conditions, there is no apparent way of developing an adequate surface-water supply in the area.

Ground water: The town is underlain to a depth of a few tens of feet by the upper sandy aquifer. The lack of discernible drains indicates that recharge to these sands is quite high. The upper sandy aquifer is underlain by over 1,300 feet of deposits belonging to the lower sandy aquifer. However, the depth to salt water in the lower sandy aquifer is not known. The water from the upper sandy aquifer is hard, and has a moderate chloride concentration and an excessive dissolved-solids concentration.

TOWN OF OCEAN ISLE BEACH



0 1 2 MILES

0 1 2 3 KILOMETERS

EXPLANATION

Br 72 ● Well

OCEAN ISLE BEACH, BRUNSWICK COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Wells 3 and 4 Finished			
Date of collection	8-20-75			
Silica (SiO_2)	18			
Iron (Fe)	.02			
Manganese (Mn)	.020			
Calcium (Ca)	45			
Magnesium (Mg)	24			
Sodium (Na)	96			
Potassium (K)	10			
Bicarbonate (HCO_3)	180			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	150			
Sulfate (SO_4)	48			
Chloride (Cl)	150			
Fluoride (F)	.5			
Nitrate (NO_3)	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.25			
Dissolved Solids	484			
Hardness as $CaCO_3$:				
Total	210			
Noncarbonate	60			
Specific conductance (micromhos at 25°C)	882			
Arsenic (As)	.004			
Barium (Ba)	.0			
Boron (B)	.09			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)	---			
Lithium (Li)	.00			
Mercury (Hg)	---			
Strontium (Sr)	.30			
Zinc (Zn)	.02			
pH (units)	7.6			
Temperature (°C)	---			

SOUTHPORT, BRUNSWICK COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,500 in 1975 (984 metered customers, about 50 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 1, 2, and 3).

Well No. 1 (Franklin Park), Br-9, located at lat 33°55'12", long 78°01'12". Driller: A. Moore. Date drilled: 1957. Total depth: 176 ft. Diam: 10 in. Cased to: 70 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 24 ft below land surface. Pump capacity: 350 gal/min. Type pump: turbine.

Well No. 2 (City garage), Br-77, located at lat 33°55'51", long 78°01'21". Driller: _____. Date drilled: _____. Total depth: about 100 ft. Diam: 4 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: limestone. Altitude of land surface: 20 ft. Static water level: _____. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 3 (Leonard St. at Willis Dr.), Br-68, located at lat 33°55'31", long 78°01'03". Driller: Heater Well Co. Date drilled: 1962. Total depth: 174 ft. Diam: 8 in. Cased to: 55 ft. Type of finish: _____. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 19 ft below land surface. Pump capacity: 300 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.25 Mgal/d, estimated; maximum daily, 0.3 million gallons, estimated.

INDUSTRIAL USE:

0.01 Mgal/d, estimated.

TREATMENT:

Chlorination at each well.

PUMPING CAPACITY:

1.15 Mgal/d.

FINISHED-WATER STORAGE:

One clear well, 100,000 gallons; one elevated tank, 150,000 gallons.

FUTURE PLANS:

Will tie into county-wide water system.

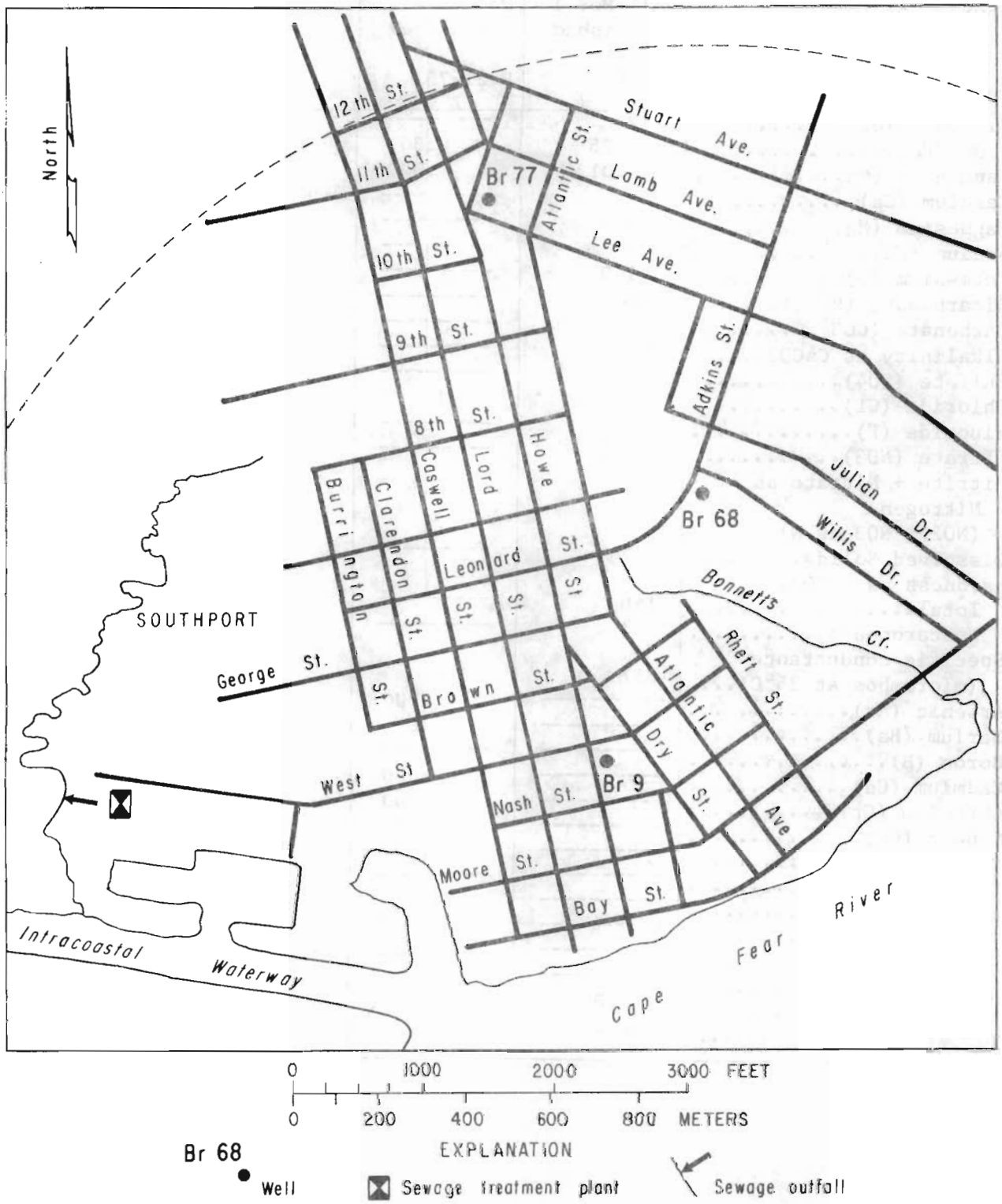
SOUTHPORT, BRUNSWICK COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Southport is in southeastern Brunswick County on the west side of the Cape Fear River estuary. The estuary at this point is always salty. The larger streams in the area are also estuarine to several miles upstream. The topography is flat and low. The average stream discharge in the area is 1.0 $(Mgal/d)/mi^2$. No minimum-flow or low-flow data are available for the area. An adequate surface-water supply could only be developed with much effort and expense.

Ground water: The limestone aquifer underlies the area at a depth of a few tens of feet. The limestone aquifer is over 100 feet thick here. Well yields of a few hundred gallons per minute can be obtained from this aquifer. The limestone is underlain by the lower sandy aquifer; however, it is not known if the lower sandy aquifer contains fresh water here. The water from the limestone aquifer tends to be hard with a moderate dissolved-solids concentration and a high iron concentration.

CITY OF SOUTHPORT



SOUTHPORT, BRUNSWICK COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Finished	Well No. 1 Finished		
Date of collection.....	9-2-66	8-21-75		
Silica (SiO_2).....	12	---		
Iron (Fe).....	.35	.36		
Manganese (Mn).....	.01	.020		
Calcium (Ca).....	57	---		
Magnesium (Mg).....	3.5	---		
Sodium (Na).....	14	---		
Potassium (K).....	1.3	---		
Bicarbonate (HCO_3).....	190	---		
Carbonate (CO_3).....	0	---		
Alkalinity as $CaCO_3$.....	150	---		
Sulfate (SO_4).....	1.0	---		
Chloride (Cl).....	23	21		
Fluoride (F).....	.1	---		
Nitrate (NO_3).....	.2	---		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....				
Dissolved Solids.....	205	---		
Hardness as $CaCO_3$:				
Total.....	160	---		
Noncarbonate.....	3	---		
Specific conductance (micromhos at 25°C)....	357	382		
Arsenic (As).....	---	.000		
Barium (Ba).....	---	.0		
Boron (B).....	---	---		
Cadmium (Cd).....	---	.000		
Chromium (Cr).....	---	.000		
Cobalt (Co).....	---	.000		
Copper (Cu).....	---	.000		
Lead (Pb).....	---	---		
Lithium (Li).....	---	.00		
Mercury (Hg).....	---	---		
Strontium (Sr).....	---	.40		
Zinc (Zn).....	---	.02		
pH (units).....	7.8	---		
Temperature (°C).....	20.0	---		

CARTERET COUNTY

WATER-RESOURCES APPRAISAL

Carteret County is in the south-central part of the North Carolina Coastal Plain. The topography is flat and largely swampy. The county includes offshore strands and part of Pamlico Sound. The central part of the county mainland is drained by the Newport and North Rivers and their tributaries. The western margin is drained by the White Oak River, which also forms the western boundary. The streams in the northeastern part of the county mainland drain to the Neuse River estuary and Pamlico Sound. The offshore strands consist mostly of sand dunes and swamps with poorly-defined drainage. The average discharge of streams on the mainland is 0.9 $(Mgal/d)/mi^2$. Minimum flows average 0.04 $(Mgal/d)/mi^2$. Streams with drainage areas as large as 16 square miles have been observed to go dry. The average 7-day, 2-year low flow is 0.2 $(Mgal/d)/mi^2$. Five public water supplies, Atlantic Beach, Beaufort, Bogue Banks Water Association, Morehead City, and Newport, have 500 or more customers. These and the smaller public and industrial water supplies are obtained from groundwater. The population of the county was 31,603 in 1970.

The county is underlain by an eastward-thickening wedge of sedimentary deposits. The deposits are over 2,000 feet thick in the western part of the county and are almost 6,000 feet thick beneath the eastern mainland part of the county. The deposits are nearly 7,000 feet thick beneath the eastermost part of the offshore strand. The shallowest deposits are the upper sandy aquifer. These deposits are about 30 feet thick in the western part of the county and could be expected to yield only small amounts of water to wells. However, in the eastern part of the county the deposits are over 400 feet thick and are capable of fresh-water yields to wells as much as several hundred gallons per minute, provided the deposits do not contain salt water at shallow depth.

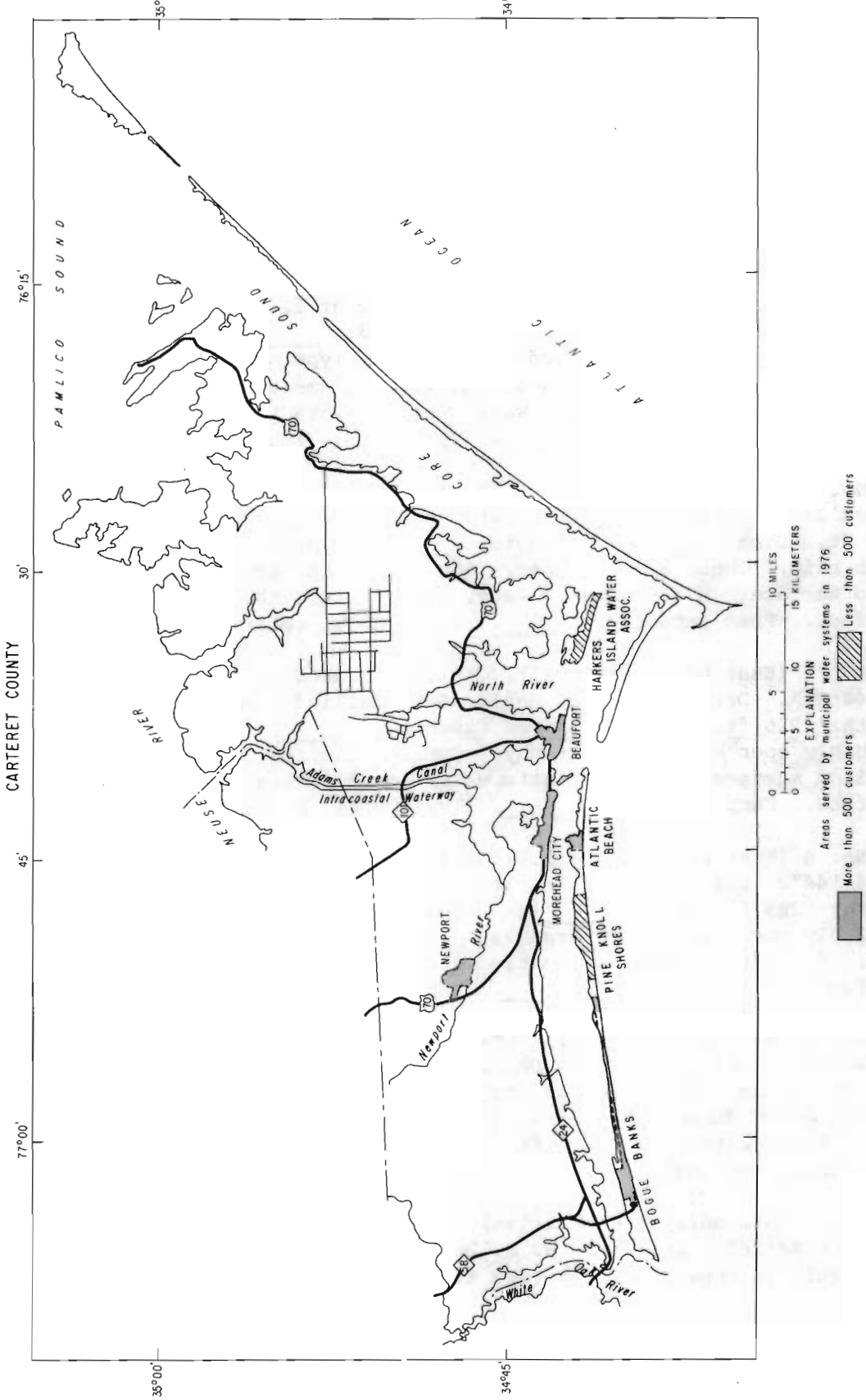
The upper sandy aquifer is underlain by the limestone aquifer. The limestone aquifer is about 600 feet thick in the western part of the county and thickens to about 1,400 feet at the eastern end of the mainland. Potential well yields may be estimated using three factors: the thickening to the east, the increasing depth to the top of the aquifer eastward, and the decreasing depth of the fresh-water zone to the east and toward the coast. When all of these factors are considered, potential yields to individual wells are estimated to be as great as several thousand gallons per minute in the western and central parts of the county's mainland and diminishing to a few hundred gallons per minute along the eastern margin of the mainland. Practical well yields of up to a few hundred gallons can be obtained on the offshore islands on the south side of the county. Fresh-water might be produced from the limestone aquifer on the offshore islands on the east side of the county.

CARTERET COUNTY

WATER-RESOURCES APPRAISAL

The thickness of the lower sandy aquifer ranges from over 1,400 feet in the western part of the county to over 4,000 feet in the east. However, this aquifer is probably entirely occupied by salt water throughout the area and is not considered as a fresh-water source.

The maximum ground-water yield in the upper sandy aquifer is 1.0 (Mgal/d)/mi^2, and is 0.6 (Mgal/d)/mi^2 in the limestone aquifer. The water from the limestone aquifer is hard and, in some places, may contain excessive iron. The quality of the water from the upper sandy aquifer is unknown but is probably similar to that of the limestone aquifer.


CARTERET COUNTY
PAMLICO SOUND
OCEAN
ATLANTIC
CORE SOUND
NEUSE RIVER
North River
Adams Creek Canal
Intracoastal Waterway
Newport River
Newport
White Oak River
BEAUFORT
HARKERS ISLAND WATER ASSOC.
MOREHEAD CITY
ATLANTIC BEACH
PINE KNOLL SHORES
NEWPORT
BOGUE BANKS
35°00'
34°45'
76°15'
30'
45'
77°00'
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

ATLANTIC BEACH, CARTERET COUNTY

OWNERSHIP:

S. A. Horton. Total population supplied about 2,000 in 1975 (about 600 metered customers).

SOURCE:

Eight wells (Nos. 1-8).

Well No. 1 (Horton's Motel), Ct-114, located at lat 34°41'53", long 76°44'24". Driller: _____. Date drilled: _____. Total depth: 233 ft. Diam: _____. Cased to: _____. Type of finish: probably open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 8 ft. Static water level: less than 6 ft below land surface. Pump capacity: _____. Type pump: rotary.

Well No. 2 (Horton's Motel), Ct-115, located at lat 34°41'53", long 76°44'24". Driller: _____. Date drilled: _____. Total depth: 225 ft. Diam: _____. Cased to: _____. Type of finish: probably open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 8 ft. Static water level: less than 6 ft below land surface. Pump capacity: _____. Type pump: rotary.

Well No. 3 (East Boardwalk well), Ct-116, located at lat 34°41'52", long 76°44'05". Driller: H. E. Dail. Date drilled: about 1968. Total depth: 225 ft. Diam: _____. Cased to: _____. Type of finish: probably open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 7 ft. Static water level: less than 6 ft below land surface. Pump capacity: _____. Type pump: rotary.

Well No. 4 (West Boardwalk well), Ct-117, located at lat 34°41'54", long 76°44'44". Driller: H. E. Dail. Date drilled: about 1968. Total depth: 225 ft. Diam: _____. Cased to: _____. Type of finish: probably open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: less than 6 ft below land surface: Pump capacity: _____. Type pump: rotary.

Well No. 5 (Kinston Ave. well), Ct-118, located at lat 34°42'17", long 76°44'30". Driller: H. E. Dail. Date drilled: Aug. 1972. Total depth: 195 ft. Diam: 4 in. Cased to: 160 ft. Type of finish: open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 4 ft. Static water level: 5 ft below land surface. Pump capacity: _____. Type pump: rotary.

Well No. 6 (old well on Pond Drive), Ct-119, located at lat 34°42'22", long 76°44'28". Driller: H. E. Dail. Date drilled: about 1972. This well is reported to be very similar to Well No. 7.

ATLANTIC BEACH, CARTERET COUNTY

Well No. 7 (new well on Pond Drive), Ct-120, located at lat 34°42'22", long 76°44'29". Driller: H. E. Dail. Date drilled: June 1974. Total depth: 195 ft. Diam: 3 in. Cased to 151 ft. Type of finish: open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 4 ft. Static water level: 4 ft below land surface. Pump capacity: _____. Type pump: rotary.

Well No. 8 (Smith Street well), Ct-121, located at lat 34°42'32", long 76°44'23". Driller: H. E. Dail. Date drilled: about 1970. Total depth: 225 ft. Diam: 3 in. Cased to: _____. Type of finish: open hole. Topography: dunes. Aquifer: limestone. Altitude of land surface: 4 ft. Static water level: 4 ft below land surface. Pump setting: 42 ft. Pump capacity: _____. Type pump: rotary.

TOTAL USE:

Unknown.

INDUSTRIAL USE:

None.

TREATMENT:

None.

PUMPING CAPACITY:

Unknown.

WATER STORAGE:

Nine pressure tanks, three of 2,500 gallons, five of 350 gallons, and one of 2,000 gallons.

FUTURE PLANS:

None.

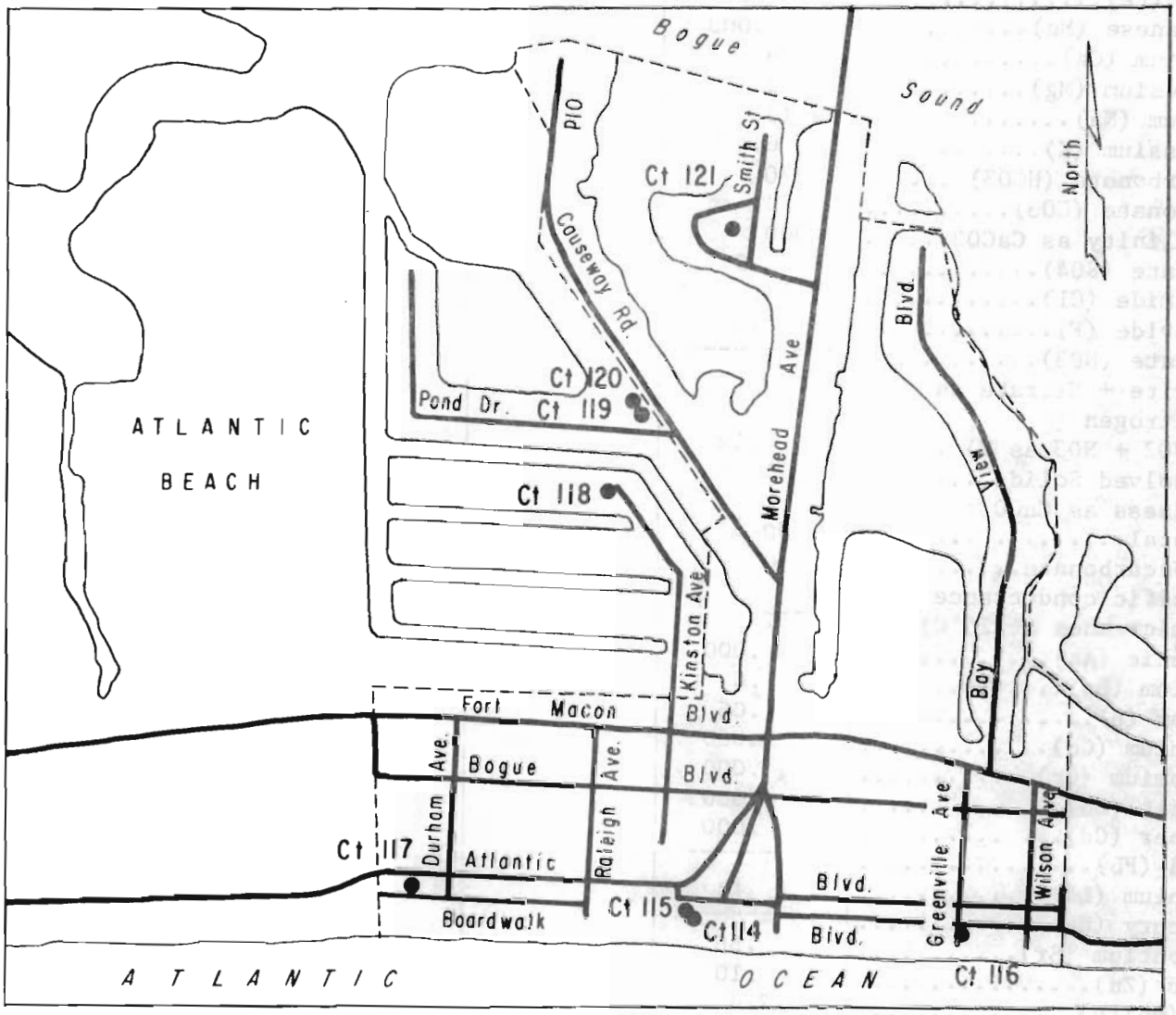
ATLANTIC BEACH, CARTERET COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The town is near the eastern end of Bogue Banks, which is offshore of southern Carteret County. The topography consists of sand dunes on the Atlantic Ocean side of the island and flat, swampy areas on the Bogue Sound side of the island. Because of the ability of the dunes to absorb rainfall, there are few discernible streams in the dune areas. The few streams in the swampy area are estuarine. Much of the swamp area in the vicinity of the town has been dredged and filled to form canals and building property. No large surface-water supply can be developed in this area.

Ground water: The upper aquifer is about 150 feet thick here. It may contain salty water at a shallow depth, especially near the ocean or sound. However, the underlying limestone aquifer may contain fresh water to a depth of 400 feet or more. At both extreme ends of the island, salt water has been found in the limestone aquifer at shallower depths. Even so, fresh-water well yields of up to a few thousand gallons per minute might be possible in the area; however, vertical or lateral salt-water encroachment would result. Therefore, using several wells at much lower pumping rates would seem to be the more practical alternative. The water from the limestone aquifer is hard and may contain excessive iron.

TOWN OF ATLANTIC BEACH



ATLANTIC BEACH, CARTERET COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Kinston Ave. Well Raw			
Date of collection.....	9-30-75			
Silica (SiO_2).....	46			
Iron (Fe).....	.17			
Manganese (Mn).....	.003			
Calcium (Ca).....	96			
Magnesium (Mg).....	12			
Sodium (Na).....	13			
Potassium (K).....	6.4			
Bicarbonate (HCO_3).....	370			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	300			
Sulfate (SO_4).....	.9			
Chloride (Cl).....	15			
Fluoride (F).....	.4			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.02			
Dissolved Solids.....	371			
Hardness as $CaCO_3$:				
Total.....	290			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	582			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.06			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.01			
Mercury (Hg).....	----------			
Strontium (Sr).....	.56			
Zinc (Zn).....	.10			
pH (units).....	7.4			
Temperature (°C).....	----------			

BEAUFORT, CARTERET COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,500 in 1975 (1,422 metered customers).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1 (auxiliary well), Ct-124, located at lat 34°43'00", long 76°39'14". Driller: Layne-Atlantic Company. Date drilled: March 1950. Total depth: 297 ft. Diam: 8 in. Cased to: 191 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 10 ft below land surface. Pump capacity: 430 gal/min. Type pump: turbine.

Well No. 2, Ct-126, located at lat 34°43'04", long 76°39'21". Driller: Layne-Atlantic Company. Date drilled: July 1976. Total depth: 390 ft. Diam: 8 in. Cased to: 278 ft. Type of finish: screened (gravel-packed). Screened intervals: 278-298, 330-340, 355-365, and 380-385 ft. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 12 ft below land surface. Well yield: 450 gal/min. Pump capacity: 400 gal/min. Pump type: turbine.

TOTAL USE:

Average (1975) 0.30 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

None

TREATMENT:

Aeration for removal of hydrogen sulfide and chlorination.

RATED CAPACITY OF TREATMENT PLANT:

In excess of 1.4 Mgal/d.

PUMPING CAPACITY:

Raw water, 1.1 Mgal/d; finished water, 1.1 Mgal/d.

RAW-WATER STORAGE:

One ground tank, 10,000 gallons.

FINISHED-WATER STORAGE:

Two elevated tanks, one of 100,000 and another of 200,000 gallons.

BEAUFORT, CARTERET COUNTY

FUTURE PLANS:

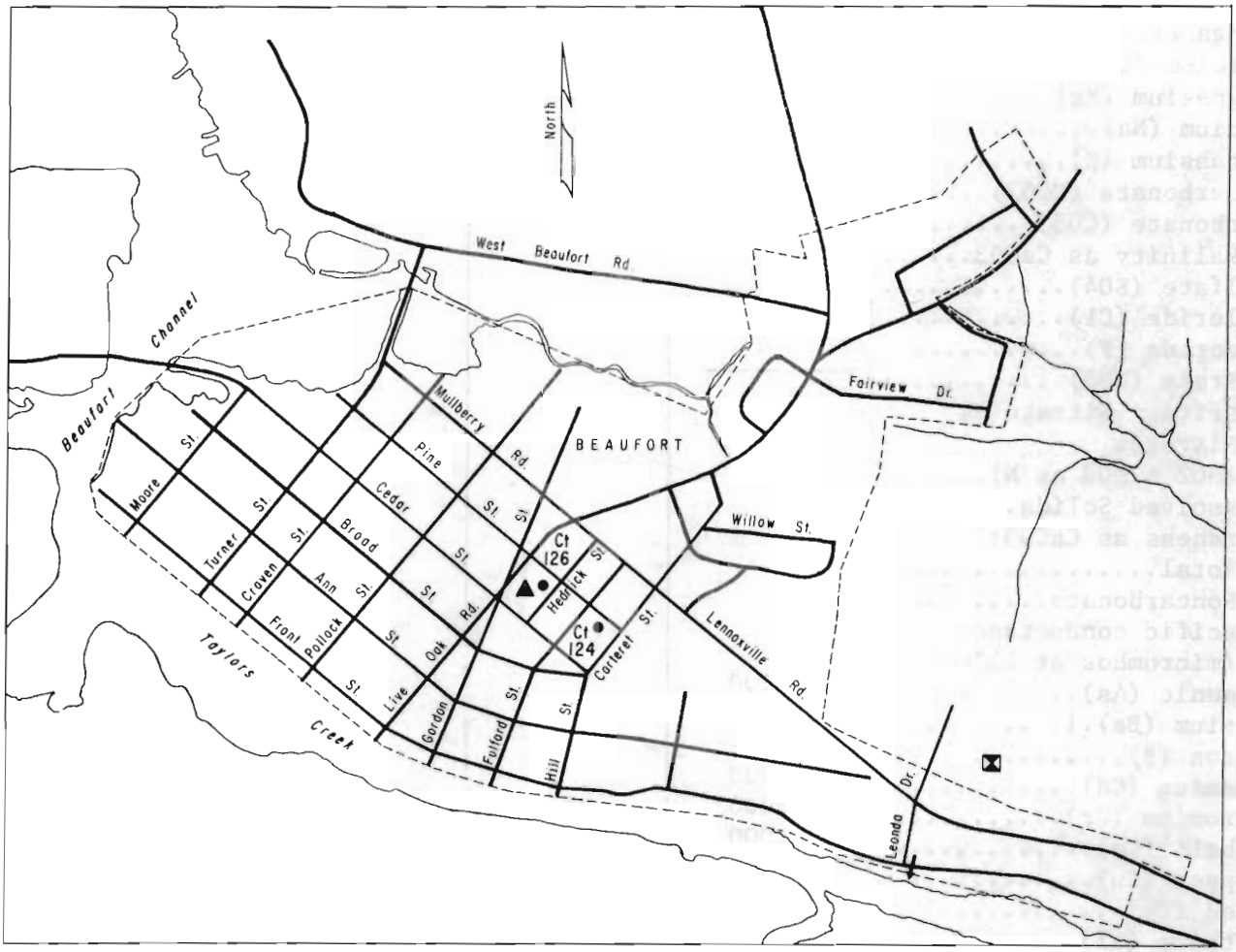
Will extend water lines to newly-annexed area.

WATER-RESOURCES APPRAISAL:

Surface water: Beaufort is in south-central Carteret County at the mouth of the Newport River estuary. The topography is low and flat. The average discharge of streams in the area is estimated at 0.9 (Mgal/d)/mi^2. The minimum discharges of the streams in the area are not known. The streams are estuarine and brackish in their lower reaches. A moderate supply of water might be obtained from the drainage-ditch system to the north of the town, but this water would be difficult to treat.

Ground water: Beaufort is underlain by the limestone aquifer at a depth of about 200 feet. This aquifer is about 1,300 feet thick here. However, only the upper 200 feet or so contain fresh water. Although this aquifer is capable of providing up to several thousand gallons per minute of fresh water to a well, the threat of vertical or lateral salt water encroachment would make a much lower pumping rate more prudent. The water from this aquifer is hard and may contain excessive amounts of iron or hydrogen sulfide.

TOWN OF BEAUFORT



BEAUFORT, CARTERET COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 2 Raw			
Date of collection	9-18-75			
Silica (SiO_2)	44			
Iron (Fe)	.12			
Manganese (Mn)	.010			
Calcium (Ca)	82			
Magnesium (Mg)	18			
Sodium (Na)	17			
Potassium (K)	7.5			
Bicarbonate (HCO_3)	380			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	310			
Sulfate (SO_4)	1.1			
Chloride (Cl)	8.2			
Fluoride (F)	.7			
Nitrate (NO_3)	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.03			
Dissolved Solids	366			
Hardness as $CaCO_3$:				
Total	280			
Noncarbonate	0			
Specific conductance (micromhos at 25°C)	600			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.11			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)	----------			
Lithium (Li)	.01			
Mercury (Hg)	----------			
Strontium (Sr)	.83			
Zinc (Zn)	.02			
pH (units)	7.1			
Temperature (°C)	----------			

BOGUE BANKS WATER ASSOCIATION, CARTERET COUNTY

OWNERSHIP:

Water association. Total population supplied (1975) varies from a few hundred in winter to 5,000 in summer (905 metered customers).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1 (Emerald Drive at 7th St.), Ct-112, located at lat 34°40'54", long 76°55'21". Driller: Craven Well Drilling Co. Date drilled: 1969. Total depth: 310 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: dunes. Aquifer: limestone. Altitude of land surface: 20 ft. Static water level: 27 ft below land surface. Pump capacity: 220 gal/min. Type pump: turbine.

Well No. 2 (Emerald Drive at Blackskimmer Rd.), Ct-113, located at lat 34°40'00", long 77°01'36". Driller: Craven Well Drilling Co. Date drilled: 1969. Total depth: 297 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: dunes. Aquifer: limestone. Altitude of land surface: 15 ft. Static water level: _____. Pump capacity: 220 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.22 Mgal/d (summer), 0.10 Mgal/d (winter), estimated; maximum daily (9-1-75), 0.7 million gallons, extimated.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination at each well.

PUMPING CAPACITY:

Finished water 0.63 Mgal/d.

FINISHED-WATER STORAGE:

Two elevated tanks of 60,000 gallons each.

FUTURE PLANS:

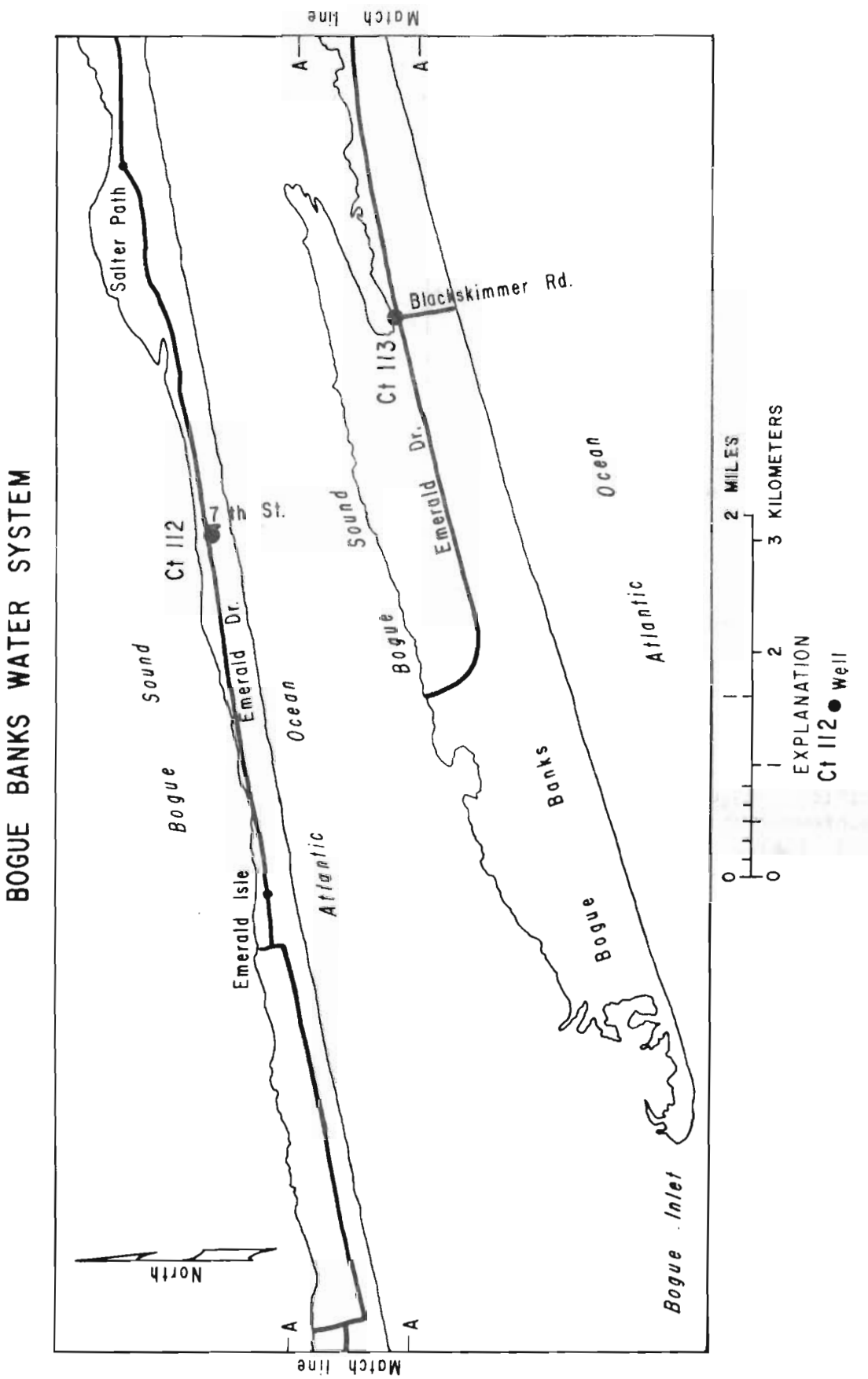
Will construct a new well and a 100,000-gallon tank.

BOGUE BANKS WATER ASSOCIATION, CARTERET COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The Bogue Banks Water Association serves most of the western half of Bogue Banks, which lies offshore from southern Carteret County. The topography consists largely of sand dunes, except on the Bogue Sound side of the island, where there are some flat, swampy areas. The dunes soak up rainfall, resulting in little or no runoff. The only discernible drains are in the swampy areas. These streams are estuarine and are brackish most of the time. An adequate surface-water supply would be extremely difficult to develop.

Ground water: Within the service area of the association, the limestone aquifer is found at a depth of less than 100 feet. The depth to salt water may be 400 feet or more in the area. If so, fresh-water well yields of up to a few thousand gallons might be obtainable in the area; however, vertical or horizontal encroachment would result at such a high pumping rate. Using several wells at much lower pumping rates would seem to be more prudent. The water from the limestone aquifer is hard and may contain excessive iron.


BOGUE BANKS WATER SYSTEM
Match line
A
A
Salter Path
Ct 112
7th St.
Emerald Dr.
Emerald Isle
Sound
Bogue
Ocean
Atlantic
Ct 113
Blackskimmer Rd.
Sound
Bogue
Emerald Dr.
Ocean
Atlantic
Banks
Bogue
Bogue Inlet
North
0
0
1
2
2 MILES
3 KILOMETERS
EXPLANATION
Ct 112 ● Well

BOGUE BANKS WATER ASSOCIATION, CARTERET COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 2 Raw			
Date of collection	9-30-75			
Silica (SiO_2)	32			
Iron (Fe)	.30			
Manganese (Mn)	.000			
Calcium (Ca)	85			
Magnesium (Mg)	3.4			
Sodium (Na)	9.0			
Potassium (K)	3.0			
Bicarbonate (HCO_3)	280			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	230			
Sulfate (SO_4)	.8			
Chloride (Cl)	11			
Fluoride (F)	.4			
Nitrate (NO_3)	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.69			
Dissolved Solids	289			
Hardness as $CaCO_3$:				
Total	230			
Noncarbonate	0			
Specific conductance (micromhos at 25°C)	468			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.04			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.002			
Lead (Pb)	----------			
Lithium (Li)	.00			
Mercury (Hg)	----------			
Strontium (Sr)	.54			
Zinc (Zn)	.00			
pH (units)	7.2			
Temperature (°C)	----------			

MOREHEAD CITY, CARTERET COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 5,400 in 1975 (1,820 metered customers, 72 of whom are in suburban areas).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1, Ct-122, located at lat 34°43'28", long 76°44'09". Driller: Layne Atlantic Company. Date drilled: _____. Total depth: 410 ft. Diam: 10 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: probably limestone. Altitude of land surface: 17 ft. Static water level: 40 ft below land surface. Pump capacity: 550 gal/min. Type pump: turbine.

Well No. 2, Ct-123, located at lat 34°43'16", long 76°42'32". Driller: Layne Atlantic Company. Date drilled: 1958. Total depth: 381 ft. Diam: 10 in. Cased to: 70 ft. Type of finish: _____. Topography: flat. Aquifer: probably limestone. Altitude of land surface: 8 ft. Static water level: 40 ft below land surface. Pump setting: 60 ft. Pump capacity: 550 gal/min. Type pump: turbine.

TOTAL USE:

Average (Sept. 1974-Aug. 1975) 0.68 Mgal/d, metered; maximum daily (7-9-75) 0.91 million gallons, metered.

Average daily water use (Mgal/d), Sept. 1974-Aug. 1975

Sept. 1974--0.718	Jan. 1975--0.638	May 1975--0.693
Oct. 1974--0.677	Feb. 1975--0.576	June 1975--0.762
Nov. 1974--0.700	Mar. 1975--0.599	July 1975--0.746
Dec. 1974--0.633	Apr. 1975--0.622	Aug. 1975--0.786

INDUSTRIAL USE:

0.15 Mgal/d, estimated. Principal users include the North Carolina State Ports Authority and Lloyd A. Fry Roofing Company.

TREATMENT:

Chlorination.

RATED CAPACITY OF TREATMENT PLANTS:

Demand chlorinators at each well. Not rated.

PUMPING CAPACITY:

Raw water, 1.3 Mgal/d, finished-water, 1.3 Mgal/d.

MOREHEAD CITY, CARTERET COUNTY

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 60,000 gallons; one standpipe 120,000 gallons.

FUTURE PLANS:

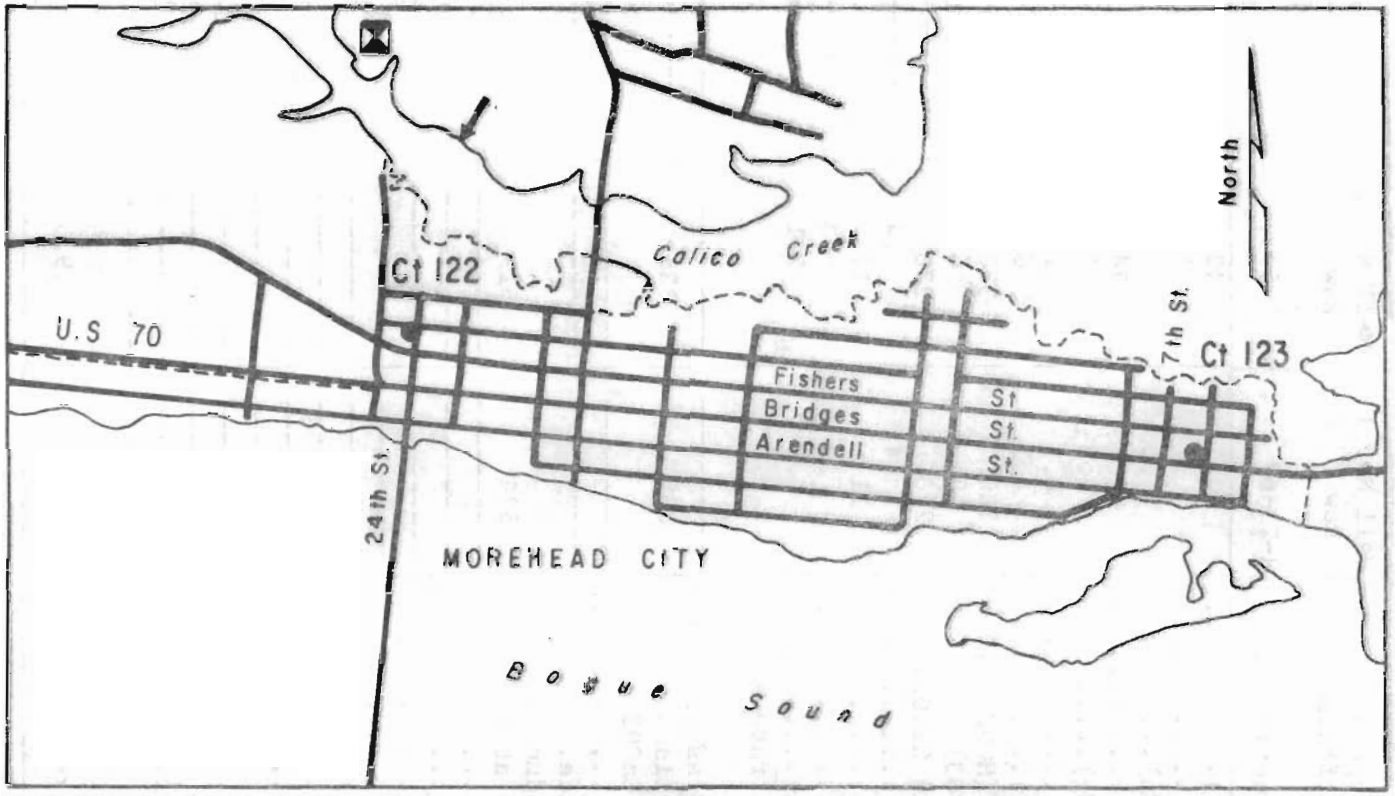
A new 500,000-gallon elevated tank will be erected. Standpipe will be abandoned.

WATER-RESOURCES APPRAISAL:

Surface water: Morehead City is in south-central Carteret County. The town occupies a peninsula having Bogue Sound on the south, Calico Creek estuary on the north, and Newport River estuary on the east. The topography is flat and low. The estuaries and sound contain brackish water. The average discharge of streams in the area is estimated at 0.9 $(Mgal/d)/mi^2$. There are no data on the minimum discharge of nearby streams. The drainage areas of the fresh-water streams in the area are so small that an adequate surface-water supply could not be developed.

Ground water: The limestone aquifer lies at a depth of about 150 feet beneath the town. This aquifer is about 1,000 feet thick, but only the upper part contains fresh water. The depth to salt water here is greater than 400 feet. Fresh-water well yields of several thousand gallons per minute could probably be obtained if the full thickness of the fresh water zone were utilized; however, to prevent vertical or horizontal salt water encroachment, it would be advisable to complete the well considerably above the salt-water zone and to pump the well at less than 1,000 gal/min. The water from the limestone aquifer is hard and may contain excessive iron.

TOWN OF MOREHEAD CITY



MOREHEAD CITY, CARTERET COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Raw	Well No. 2 Raw	Combined 1/ Finished	
Date of collection.....	8-29-67	8-29-67	9-19-75	
Silica (SiO_2).....	40	40	---	
Iron (Fe).....	.13	1.6	0.06	
Manganese (Mn).....	.00	.01	.010	
Calcium (Ca).....	99	74	---	
Magnesium (Mg).....	6.8	17	---	
Sodium (Na).....	8.5	11	---	
Potassium (K).....	4.1	6.6	---	
Bicarbonate (HCO_3).....	330	320	---	
Carbonate (CO_3).....	0	0	---	
Alkalinity as $CaCO_3$.....	270	270	---	
Sulfate (SO_4).....	.4	.4	---	
Chloride (Cl).....	11	12	19	
Fluoride (F).....	.3	.3	---	
Nitrate (NO_3).....	.3	2.1	---	
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	---	---	---	
Dissolved Solids.....	335	325	---	
Hardness as $CaCO_3$:				
Total.....	---	---	---	
Noncarbonate.....	---	---	---	
Specific conductance (micromhos at 25°C)....	524	519	545	
Arsenic (As).....	---	---	.000	
Barium (Ba).....	---	---	.0	
Boron (B).....	---	---	.06	
Cadmium (Cd).....	---	---	.000	
Chromium (Cr).....	---	---	.000	
Cobalt (Co).....	---	---	.000	
Copper (Cu).....	---	---	.007	
Lead (Pb).....	---	---	---	
Lithium (Li).....	---	---	.01	
Mercury (Hg).....	---	---	---	
Strontium (Sr).....	---	---	.76	
Zinc (Zn).....	---	---	.03	
pH (units).....	7.6	7.6	---	
Temperature (°C).....	21.0	19.5	---	

1/ Combined sample of wells no. 1 and 2.

NEWPORT, CARTERET COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,900 in 1975 (613 metered customers, one of whom is in a suburban area).

SOURCE:

Two wells (Nos. 1 and 2). Third well (No. 3) drilled but not yet in operation.

Well No. 1 (Verdun St. at end of Hill St., near water tank), Ct-13, located at lat 34°47'18", long 76°51'50". Driller: Heater Well Co. Date drilled: 1952. Total depth: 160 ft. Diam: 8 in. Cased to: 90 ft. Type of finish: _____. Topography: flat. Aquifer: limestone. Altitude of land surface: 31 ft. Static water level: 20 ft below land surface. Pump capacity: 220 gal/min. Type pump: turbine.

Well No. 2 (Johnson St. between E. Forest Dr. and Railroad Blvd.), Ct-116, located at lat 34°47'29", long 76°51'51". Driller: Heater Well Co. Date drilled: Dec. 1964. Total depth: 122 ft. Diam: 16 in to 10 in. Cased to: 105 ft. Type of finish: gravel-filled from 105 ft to 122 ft. Topography: flat. Aquifer: limestone. Altitude of land surface: 30 ft. Static water level: 42 ft below land surface. Pump capacity: 170 gal/min. Type pump: turbine.

Well No. 3(Railroad Blvd. between Lake View St. and Johnston St.), Ct-117, located at lat 34°47'39", long 76°51'58". Driller: Heater Well Co. Date drilled: Feb. 1975. Total depth: 123 ft. Diam: 8 in. Cased to: 94 ft. Type of finish: open end. Topography: flat. Aquifer: limestone. Altitude of land surface: 30 ft. Static water level: 15 ft below land surface. Well yield: 500 gal/min. Pump capacity: _____. Type pump: turbine.

TOTAL USE:

Average (Nov. 1974 - Aug. 1975), 0.157 Mgal/d, metered; maximum daily (1-25-75), 0.311 million gallons.

Average daily water use (Mgal/d), Sept. 1974 - Aug. 1975

Sept. 1974--0.152	Jan. 1975--0.215	May 1975--0.172
Oct. 1974--0.147	Feb. 1975--0.148	June 1975--0.160
Nov. 1974--0.150	Mar. 1975--0.139	July 1975--0.161
Dec. 1974--0.145	Apr. 1975--0.139	Aug. 1975--0.152

INDUSTRIAL USE:

0.004 Mgal/d, estimated. Principal users include Connor Industries, Inc. and Newport Manufacturing Co.

NEWPORT, CARTERET COUNTY

TREATMENT:

Chlorination and addition of phosphate compound at each well.

PUMPING CAPACITY:

Finished water, 0.56 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 100,000 gallons.

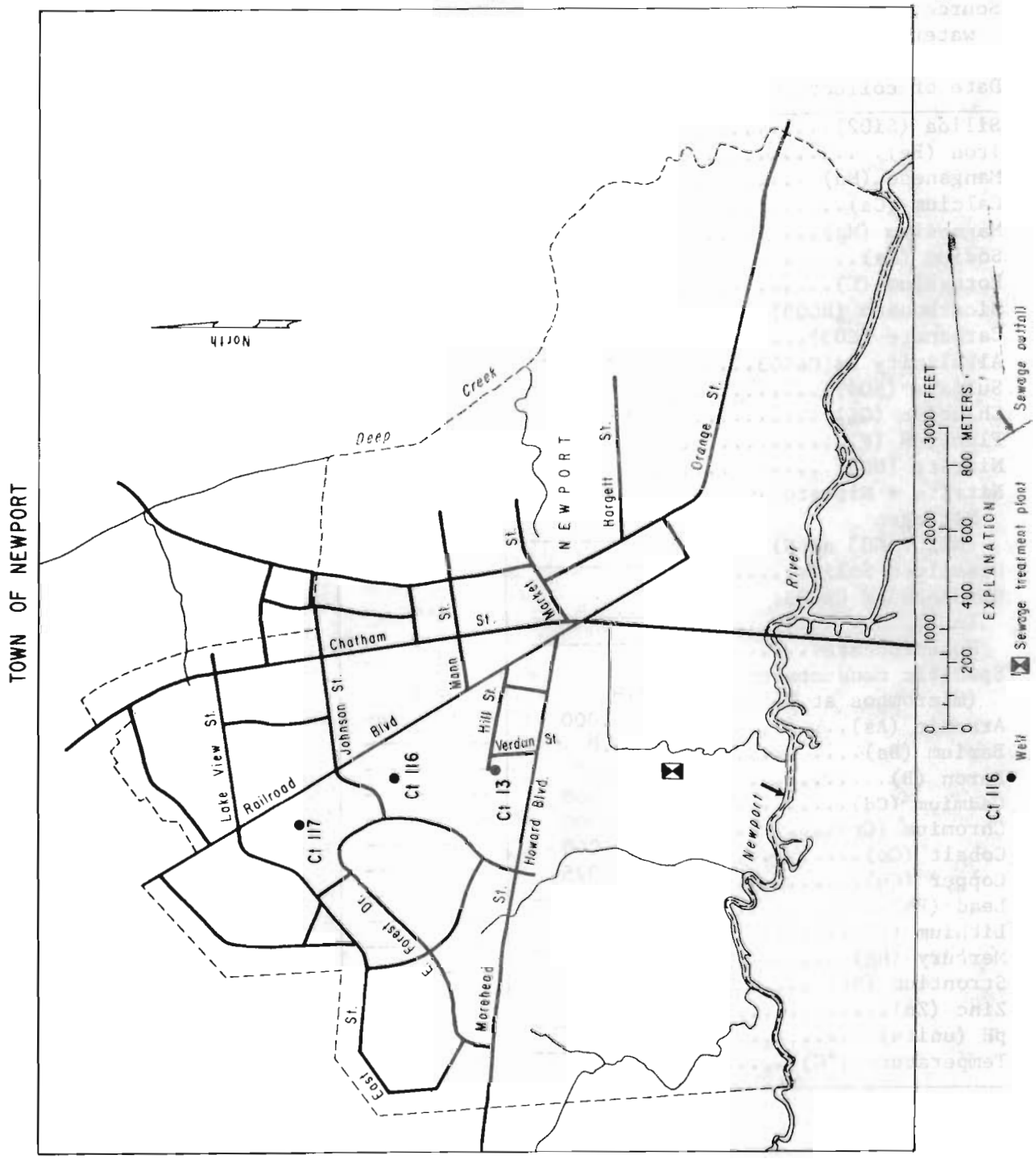
FUTURE PLANS:

Will connect well No. 3 to the system.

WATER-RESOURCES APPRAISAL:

Surface water: Newport is in west-central Carteret County, at the confluence of Newport River and Deep Creek. The topography is flat. Swamps are common in the area, particularly in the stream bottomlands. The average discharge of streams in the area is about 0.9 $(Mgal/d)/mi^2$. Minimum flows range from 0.02 to 0.06 $(Mgal/d)/mi^2$ and average 0.04 $(Mgal/d)/mi^2$. The 7-day, 2-year low flows range from 0.1 to 0.2 $(Mgal/d)/mi^2$ and average 0.2 $(Mgal/d)/mi^2$.

Ground water: The town is underlain by the limestone aquifer at a depth of about 75 feet. This aquifer is more than 800 feet thick, but only the upper part contains fresh water. The depth to salt water here is believed to be greater than 400 feet. If so, fresh-water well yields of several thousand gallons per minute can probably be obtained. However, the threat of vertical salt-water encroachment would cause shallower wells and much lower pumping rates to be advisable. The water from the limestone aquifer is hard and may contain excessive iron.


TOWN OF NEWPORT
North
Deep Creek
NEWPORT
Orange St.
Hargett St.
River
Chatham St.
Mann St.
Johnson St.
Blvd
Lake View St.
Railroad
Hill St.
Verdun St.
Howard Blvd.
Ct 116
Ct 117
Ct 13
Forest Dr.
Morehead St.
Newport
EXPLANATION
Sewage treatment plant
Sewage outfall
Well
0 200 400 600 800 METERS
0 1000 2000 3000 FEET

NEWPORT, CARTERET COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 2 Raw	Well No. 2 Raw		
Date of collection.....	10-1-75	12-64		
Silica (SiO_2).....	----------	14		
Iron (Fe).....	0.29	----------		
Manganese (Mn).....	.030	----------		
Calcium (Ca).....	----------	97		
Magnesium (Mg).....	----------	3.7		
Sodium (Na).....	----------	8.1		
Potassium (K).....	----------	1.0		
Bicarbonate (HCO_3).....	----------	310		
Carbonate (CO_3).....	----------	0		
Alkalinity as $CaCO_3$.....	----------	250		
Sulfate (SO_4).....	----------	1.6		
Chloride (Cl).....	12	11		
Fluoride (F).....	----------	.1		
Nitrate (NO_3).....	----------	.0		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------		
Dissolved Solids.....	----------	294		
Hardness as $CaCO_3$:				
Total.....	----------	260		
Noncarbonate.....	----------	4		
Specific conductance (micromhos at 25°C)....	478	450		
Arsenic (As).....	.000	----------		
Barium (Ba).....	.0	----------		
Boron (B).....	.02	----------		
Cadmium (Cd).....	.000	----------		
Chromium (Cr).....	.000	----------		
Cobalt (Co).....	.000	----------		
Copper (Cu).....	.025	----------		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.01	----------		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.45	----------		
Zinc (Zn).....	.04	----------		
pH (units).....	----------	7.4		
Temperature (°C).....	----------	----------		

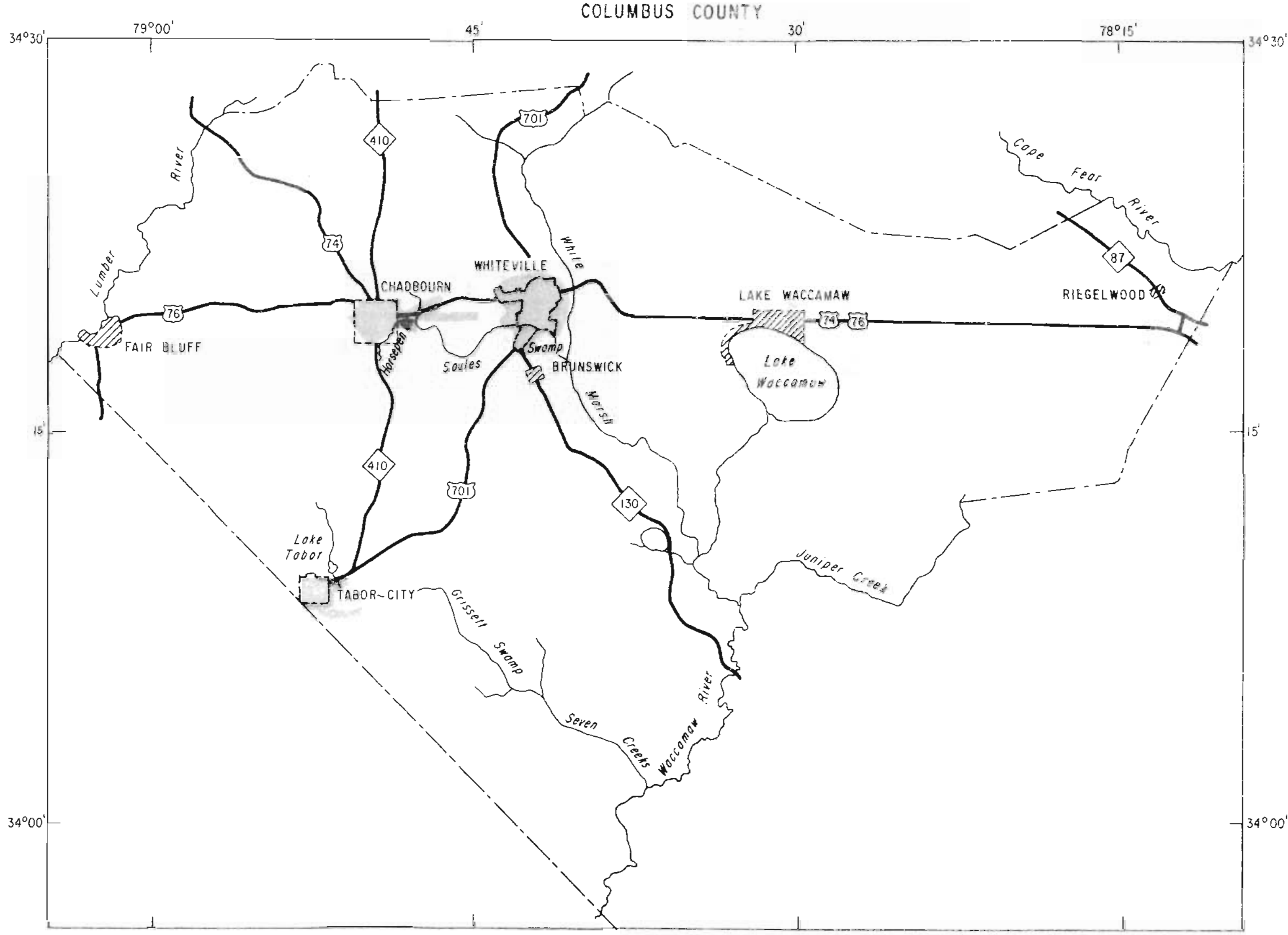
COLUMBUS COUNTY

WATER-RESOURCES APPRAISAL

Columbus County is in the southeastern part of the North Carolina Coastal Plain. The topography is flat and swampy. The county is drained by the Waccamaw River and its tributaries except for the northeast corner, which is drained by the Cape Fear River. The average discharge of streams in the county is 0.6 $(Mgal/d)/mi^2$, except for the northeast corner, where it is 0.9 $(Mgal/d)/mi^2$. Minimum flows average 0.014 $(Mgal/d)/mi^2$. The 7-day, 2-year low flow averages 0.047 $(Mgal/d)/mi^2$. Many streams go dry in the area, some very frequently. Streams with drainage areas as large as 170 square miles have gone dry. Three public water supplies in the county have 500 or more customers: Chadbourn, Tabor City, and Whiteville. These, all individual supplies, and all except one smaller public supply are from ground water. The population of the county was 46,937 in 1970.

The upper sandy aquifer is only a few tens of feet thick in the county and is underlain by the lower sandy aquifer. The lower sandy aquifer increases in thickness from about 600 feet in the northwest to about 1,000 feet in the southeast. In the northwestern part of the county, the lower sandy aquifer contains fresh water throughout its entire thickness, and fresh-water yields of over 1,000 gal/min should be obtainable. As the thickness of the aquifer increases to the southeast, the obtainable yields should also increase. However, along a line trending northeast, about two-thirds of the way to the southeastern boundary of the county, salt water is found at the base of the aquifer. The depth to salt water is progressively smaller southeast of this line, and the fresh-water yields to wells become correspondingly smaller. At some places near the Waccamaw and Cape Fear Rivers, salt water has been found at depths of less than 200 feet. The maximum ground-water yield is estimated at 0.95 $(Mgal/d)/mi^2$. The maximum recharge to the deeper parts of the lower sandy aquifer is estimated at 0.06 $(Mgal/d)/mi^2$. The water from the lower sandy aquifer ranges from soft to hard, with moderate to excessive dissolved-solids concentrations, and moderate to high alkalinities. As suggested above, chlorides can be a problem in the southeastern part of the county.

COLUMBUS COUNTY



EXPLANATION

Areas served by municipal water systems in 1976

More than 500 customers

Less than 500 customers

CHADBOURN, COLUMBUS COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,600 in 1975 (about 800 metered customers, 50 of whom are in suburban areas). Also serves the Chadbourn Rural Water Association.

SOURCE:

Three wells (Nos. 1-3)

Well No. 1 (Smith St. near Mill St.), Co-58, located at lat 34°19'01", long 78°49'22". Driller: _____. Date drilled: 1957 (?). Total depth: 166 ft. Diam: 16 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 95 ft. Static water level: 19 ft below land surface. Pump capacity: _____. Type pump: turbine.

Well No. 2 (Wilkes St. near Chappin St.), Co-80, located at lat 34°19'45", long 78°49'53". Driller: Charles R. Underwood. Date drilled: April 1970. Total depth: 442 ft. Diam: 10 in to 8 in. Cased to: 121 ft. Type of finish: screened (gravel-packed). Screened intervals: 121-126, 145-150, 160-170, 205-210, 302-312, 321-326, 377-382, and 398-403 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 105 ft. Static water level: 24 ft below land surface: Well yield: 530 gal/min. Pump capacity: _____. Type pump: turbine.

Well No. 3 (Elm St. at Third St.), Co-81, located at lat 34°19'30", long 78°49'03". Driller: Charles R. Underwood. Date drilled: May 1971. Total depth: 160 ft. Diam: 8 in. Cased to: 102 ft. Type of finish: screened. Screened intervals: 102-112 and 131-141 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 95 ft. Static water level: 23 ft below land surface. Well yield: 260 gal/min. Pump capacity: _____. Type pump: turbine.

TOTAL USE:

Average (1975), 0.5 Mgal/d, estimated; maximum daily (summer 1974), 0.75 million gallons.

INDUSTRIAL USE:

0.31 Mgal/d. Principal users include Devereux Industries and the Georgia-Pacific Corp.

TREATMENT:

None

CHADBOURN, COLUMBUS COUNTY

PUMPING CAPACITY:

1.4 Mgal/d, estimated.

FINISHED-WATER STORAGE:

One elevated tank, 60,000 gallons.

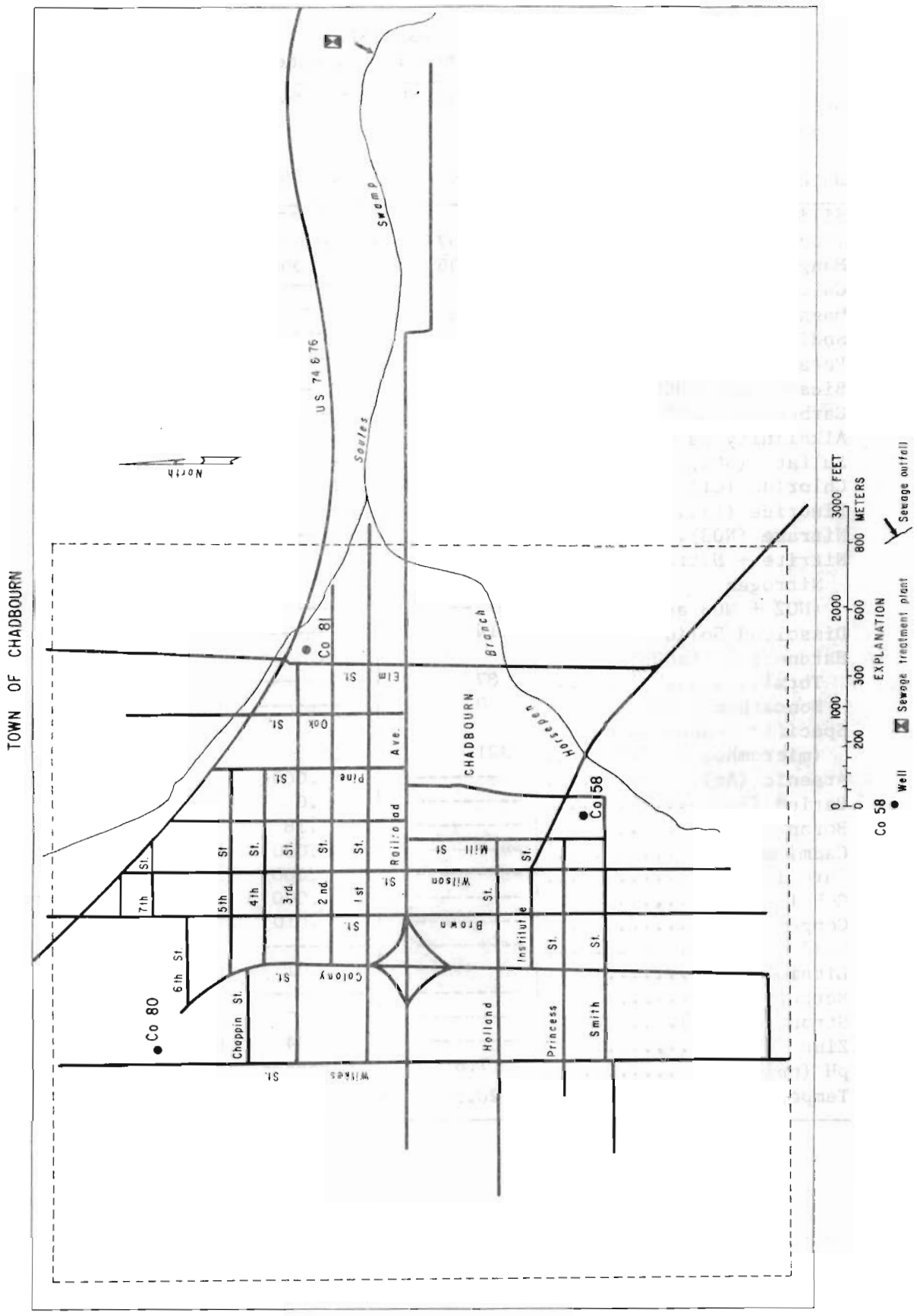
FUTURE PLANS:

To build a new elevated tank and to chlorinate water.

WATER-RESOURCES APPRAISAL:

Surface water: Chadbourn is in a flat area that is at the headwaters of several streams that flow radially outward from the town. These streams have, therefore, very small drainage areas. The average discharge in the area is 0.6 $(Mgal/d)/mi^2$. It would be very difficult to develop an adequate surface-water supply in this area.

Ground water: The lower sandy aquifer is at a shallow depth beneath the town. This aquifer is about 700 feet thick and should be capable of producing more than 1,000 gal/min to wells. The water from this aquifer is hard, with moderate alkalinity and moderate dissolved-solids concentration.


TOWN OF CHADBOURN
North
US 74 & 76
Swamp
Soules
Co 81
Co 58
Co 80
CHADBOURN
Branch
Horsepen
Elm St.
Oak St.
Ave.
Pine St.
Railroad St.
Mill St.
Wilson St.
Brown St.
Institute St.
1st St.
2nd St.
3rd St.
4th St.
5th St.
6th St.
7th St.
Colony St.
Chappin St.
Wilkes St.
Holland St.
Princess St.
Smith St.
EXPLANATION
Well
Sewage treatment plant
Sewage outfall
0 200 1000 3000 FEET
0 300 2000 800 METERS

CHADBOURN, COLUMBUS COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1	Well No. 3		
Date of collection.....	9-2-66	11-18-75		
Silica (SiO_2).....	30	---		
Iron (Fe).....	.07	0.02		
Manganese (Mn).....	.05	.000		
Calcium (Ca).....	27	---		
Magnesium (Mg).....	4.8	---		
Sodium (Na).....	32	---		
Potassium (K).....	5.0	---		
Bicarbonate (HCO_3).....	180	---		
Carbonate (CO_3).....	0	---		
Alkalinity as $CaCO_3$.....	150	---		
Sulfate (SO_4).....	.8	---		
Chloride (Cl).....	11	10		
Fluoride (F).....	.2	---		
Nitrate (NO_3).....	.3	---		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	---	---		
Dissolved Solids.....	214	---		
Hardness as $CaCO_3$:				
Total.....	87	---		
Noncarbonate.....	0	---		
Specific conductance (micromhos at 25°C)....	321	315		
Arsenic (As).....	---	.000		
Barium (Ba).....	---	.0		
Boron (B).....	---	.18		
Cadmium (Cd).....	---	.000		
Chromium (Cr).....	---	.000		
Cobalt (Co).....	---	.000		
Copper (Cu).....	---	.010		
Lead (Pb).....	---	---		
Lithium (Li).....	---	.01		
Mercury (Hg).....	---	---		
Strontium (Sr).....	---	.17		
Zinc (Zn).....	---	.04		
pH (units).....	7.8	---		
Temperature (°C).....	20.5	---		

TABOR CITY, COLUMBUS COUNTY

OWNERSHIP:

Municipal. Total population supplied about 2,500 in 1975 (1,000 customers).

SOURCE:

Three wells (Nos. 1-3).

Well No. 1 (7th and Wall Streets), Co-82, located at lat 34°09'04", long 78°52'34". Driller: Sydnor Hydrodynamics, Inc. Date drilled: Aug. 1971. Total depth: 400 ft. Diam: 10 in to 8 in. Cased to: 256 ft. Type of finish: screened (gravel-packed). Screened intervals: 256-266, 272-282, 302-312, 322-332, and 366-376 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 104 ft. Static water level: 67 ft below land surface. Pump setting: 180 ft. Well yield: 530 gal/min. Pump capacity: 450 gal/min. Type pump: turbine.

Well No. 2 (Burns and Elizabeth Streets), Co-83, located at lat 34°08'45", long 78°52'14". Driller: Hildebrand. Date drilled: 1956. Total depth: 345 ft. Diam: 8 in. Cased to: _____. Type of finish: screened. Screened intervals: 8 screens totaling 85 ft, depths unknown. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 80 ft. Static water level: 35 ft below land surface. Pump setting: 120 ft. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 3 (Jones St. at Heath St.), Co-84, located at lat 34°09'19", long 78°52'06". Driller: Hildebrand. Date drilled: 1960. Total depth: 375 ft. Diam: 10 in. Cased to: _____. Type of finish: screened. Screened intervals: about 80 ft of screens, depths unknown. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 85 ft. Static water level: _____. Pump capacity: 350 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.25 Mgal/d estimated; maximum daily, not available.

INDUSTRIAL USE:

0.04 Mgal/d, estimated. Principal users include AAA Bumper Co., Grainger Block Co., Penn Ventilator Co., Tabor Products Co., Tabor City Freezer Co., and Waccamaw Lumber Co.

TREATMENT:

None.

PUMPING CAPACITY:

1.9 Mgal/d.

TABOR CITY, COLUMBUS COUNTY

FINISHED-WATER STORAGE:

One elevated tank, 300,000 gallons.

FUTURE PLANS:

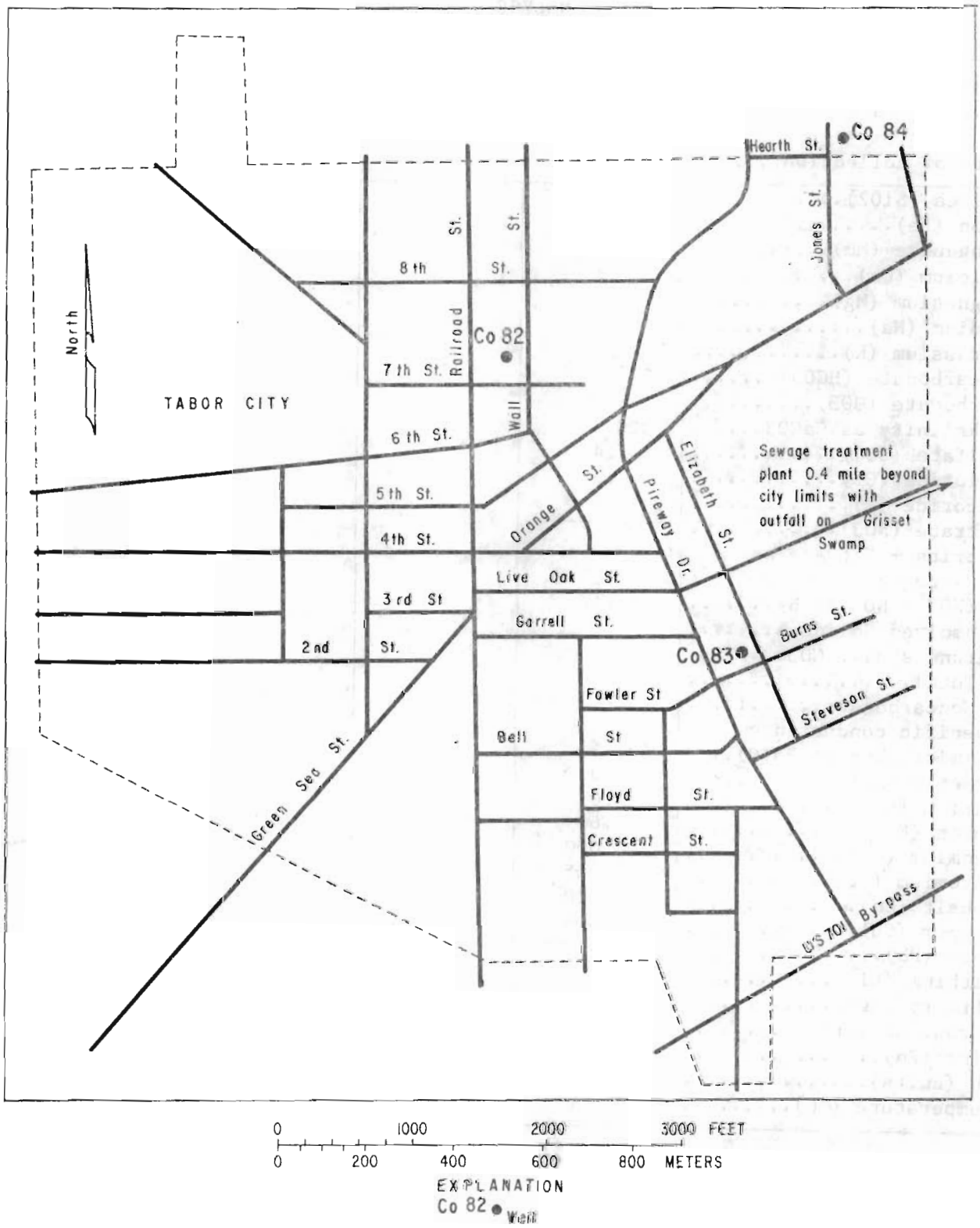
To extend service to annexed area.

WATER-RESOURCES APPRAISAL:

Surface water: Tabor City is on Grissett Swamp. The topography is flat and swamps are common in the surrounding area. There is a small recreational impoundment (Lake Tabor) on Grissett Swamp. The Grissett Swamp drain has been observed to go dry, as have other streams in the area. The average discharge of the streams in the area is 0.6 $(Mgal/d)/mi^2$. Much greater water-storage capacity than that provided by Lake Tabor would be needed to provide an adequate surface-water supply for the town.

Ground water: The town is underlain at a few tens of feet by the lower sandy aquifer. This aquifer is over 800 feet thick here and probably contains fresh water to its base. If so, a fully-penetrating well might be able to produce up to 2,000 gal/min of fresh water to a well. The water produced by this aquifer is soft and alkaline, has a moderate to high dissolved-solids concentration, and has a high fluoride concentration.

TOWN OF TABOR CITY



TABOR CITY, COLUMBUS COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw; finished)	Well No.1			
Date of collection	11-18-75			
Silica (SiO_2)	17			
Iron (Fe)	.05			
Manganese (Mn)	.000			
Calcium (Ca)	.4			
Magnesium (Mg)	.3			
Sodium (Na)	110			
Potassium (K)	9.5			
Bicarbonate (HCO_3)	270			
Carbonate (CO_3)	5			
Alkalinity as $CaCO_3$	220			
Sulfate (SO_4)	1.4			
Chloride (Cl)	8.6			
Fluoride (F)	.8			
Nitrate (NO_3)	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.17			
Dissolved Solids	291			
Hardness as $CaCO_3$:				
Total	2			
Noncarbonate	0			
Specific conductance (micromhos at 25°C)	491			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.60			
Cadmium (Cd)	.000			
Chromium (Cr)	.005			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)	---			
Lithium (Li)	.01			
Mercury (Hg)	---			
Strontium (Sr)	.04			
Zinc (Zn)	.01			
pH (units)	8.5			
Temperature (°C)	---			

WHITEVILLE, COLUMBUS COUNTY

OWNERSHIP:

Municipal. Total population supplied about 5,500 in 1975 (1975 metered customers, 75 of whom are in suburban areas).

SOURCE:

Four wells (Nos. 1-4).

Well No. 1 (Wyche St., between Lee and Madison Streets), Co-55, located at lat 35°20'14", long 78°42'19". Driller: Hildebrand. Date drilled: _____. Total depth: 290 ft. Diam: 8 in. Cased to: _____. Type of finish: screened. Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 85 ft. Static water level: _____. Pump capacity: 300 gal/min. Type pump: turbine.

Well No. 2 (So. Powell Blvd, between Lewis and Phillips Streets), Co-85, located at lat 34°19'43", long 78°42'31". Driller: Carolina Well and Pump Co. Date drilled: 1956 or 1957. Total depth: about 340 ft. Diam: 8 in. Cased to: about 200 ft. Type of finish: screened (gravel-packed). Screen intervals: five 10-foot sections, depths unknown. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 75 ft. Static water level: _____. Pump setting: 70 ft. Pump capacity: 325 gal/min. Type pump: turbine.

Well No. 3 (No. Powell Blvd near Smith St.), Co-86, located at lat 34°20'11", long 78°42'29". Driller: Hildebrand. Date drilled: 1957. Total depth: 281 ft. Diam: 10 in. Cased to: 125 ft. Type of finish: screened. Screened intervals: 125-145, 155-165, 175-185, 240-260, and 270-280 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 75 ft. Static water level: 20 ft below land surface. Pump capacity: 400 gal/min. Type pump: turbine.

Well No. 4 (Hay St. off So. Madison St.), Co-87, located at lat 34°18'25", long 78°42'37". Driller: Carolina Well and Pump Co. Date drilled: Nov. 1972. Total depth: 477 ft. Diam: 10 in. Cased to: 145 ft. Type of finish: screened (gravel-packed). Screened intervals: 145-150, 180-195, 205-220, 235-240, 270-280, and 294-304 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 72 ft. Static water level: 23 ft below land surface. Pump setting: 163 ft. Well yield: 600 gal/min. Pump capacity: 530 gal/min. Type pump: turbine.

TOTAL USE:

0.23 Mgal/d, estimated; maximum daily (3-2-75) 0.5 million gallons, estimated.

WHITEVILLE, COLUMBUS COUNTY

INDUSTRIAL USE:

0.04 Mgal/d, estimated. Principal users include Southeastern Meat Processors, Blue Jeans Corp., Dixie Plating Co., and Fieldcrest Mills, Inc.

TREATMENT:

Chlorination. Wells 1 and 2 are chlorinated at each well. Wells 3 and 4 pump to a ground-storage tank; water is chlorinated as it is withdrawn.

RATED CAPACITY OF TREATMENT PLANT:

Automatic feeder can meet any demand.

PUMPING CAPACITY:

Finished water 2.24 Mgal/d.

RAW-WATER STORAGE:

One ground tank, 100,000 gallons.

FINISHED-WATER STORAGE:

Two elevated tanks of 300,000 gallons each.

FUTURE PLANS:

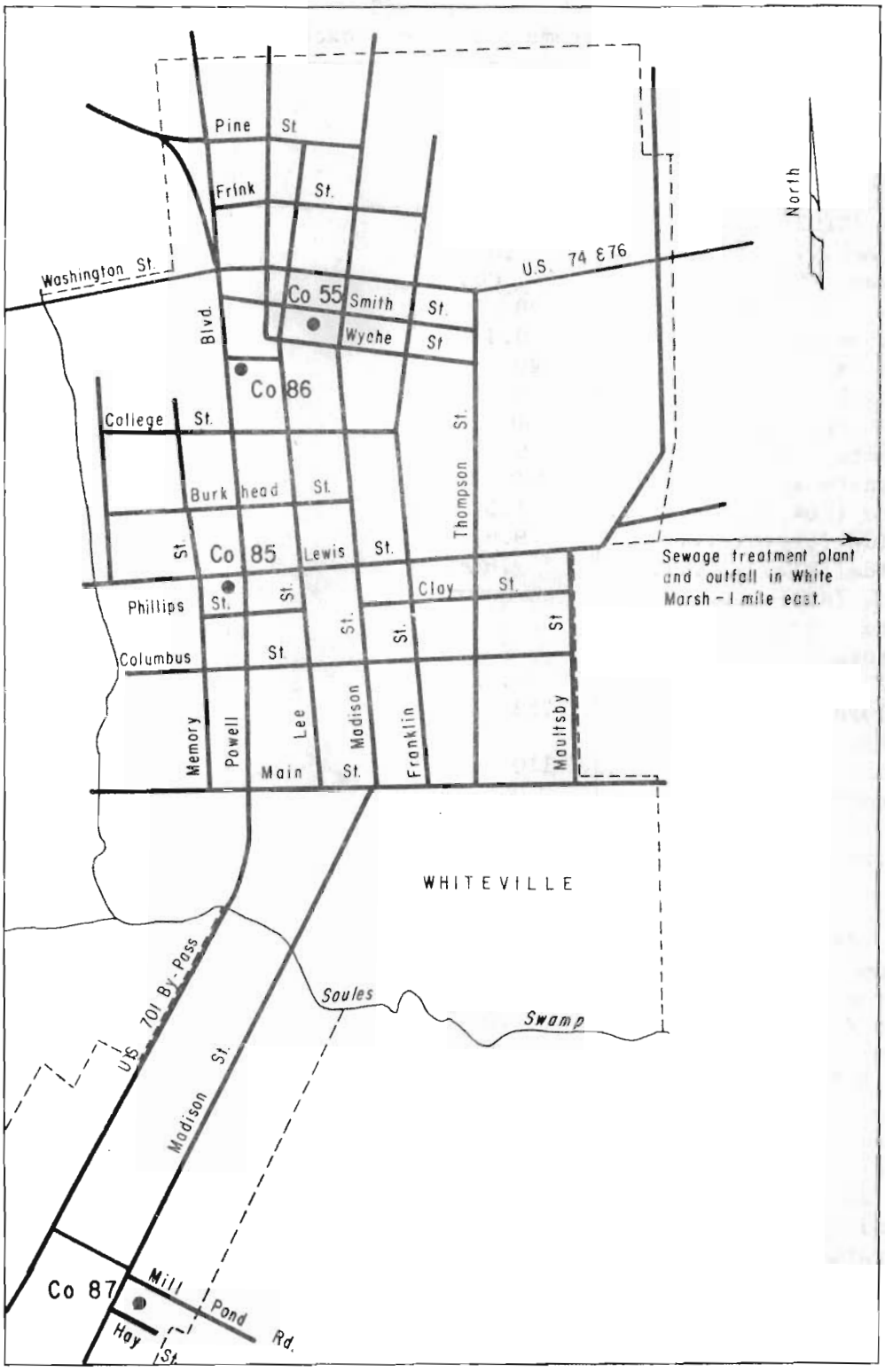
To upgrade the water-line system throughout the town.

WATER-RESOURCES APPRAISAL:

Surface water: Whiteville is at the confluence of Soules Swamp and White Marsh. The topography is flat and swamps are common in the area. The Soules Swamp drain goes dry at times. The flow characteristics of the White Marsh drain are not known. The average stream discharge for the area is 0.6 $(Mgal/d)/mi^2$. One or more impoundments would be necessary to develop an adequate surface-water supply.

Ground water: Whiteville is underlain at a depth of about 20 feet by the lower sandy aquifer. This aquifer is about 700 feet thick here. With this thickness, the lower sandy aquifer should be capable of yielding up to 1,500 gal/min to wells. The water from this aquifer is hard, with moderate alkalinity, and has a moderate dissolved-solids concentration.

TOWN OF WHITEVILLE



WHITEVILLE, COLUMBUS COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 4			
Date of collection.....	11-19-75			
Silica (SiO_2).....	32			
Iron (Fe).....	.02			
Manganese (Mn).....	.000			
Calcium (Ca).....	28			
Magnesium (Mg).....	8.4			
Sodium (Na).....	40			
Potassium (K).....	13			
Bicarbonate (HCO_3).....	240			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	200			
Sulfate (SO_4).....	1.3			
Chloride (Cl).....	9.6			
Fluoride (F).....	.6			
Nitrate (NO_3).....	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	253			
Hardness as $CaCO_3$:				
Total.....	110			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	380			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.13			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.006			
Lead (Pb).....	---			
Lithium (Li).....	.01			
Mercury (Hg).....	---			
Strontium (Sr).....	.84			
Zinc (Zn).....	.01			
pH (units).....	7.6			
Temperature (°C).....	---			

CRAVEN COUNTY

WATER-RESOURCES APPRIASAL

Craven County is in the south-central part of the North Carolina Coastal Plain. The topography is flat with large swampy areas. The county is drained by the Neuse River and its tributaries. The Neuse River and its downstream tributaries are estuarine in their lower reaches. The average discharge of streams in the county is 0.8 (Mgal/d)/mi^2. Minimum flows of streams tend to be very small, ranging from 0.0004 to 0.005 (Mgal/d)/mi^2, and averaging 0.002 (Mgal/d)/mi^2. Streams with drainage areas as large as 26 square miles have been observed to go dry. The 7-day, 2-year low flows range from 0.005 to 0.03 (Mgal/d)/mi^2 and average 0.02 (Mgal/d)/mi^2. Three public water supplies in the county have 500 or more customers, Havelock, New Bern, and the Cherry Point Marine Corps Air Station. Although the air station does not have customers in the strict sense of the word, it was included in this study because of the large population served there. All of the above supplies are obtained from ground water. The county population in 1970 was 62,554.

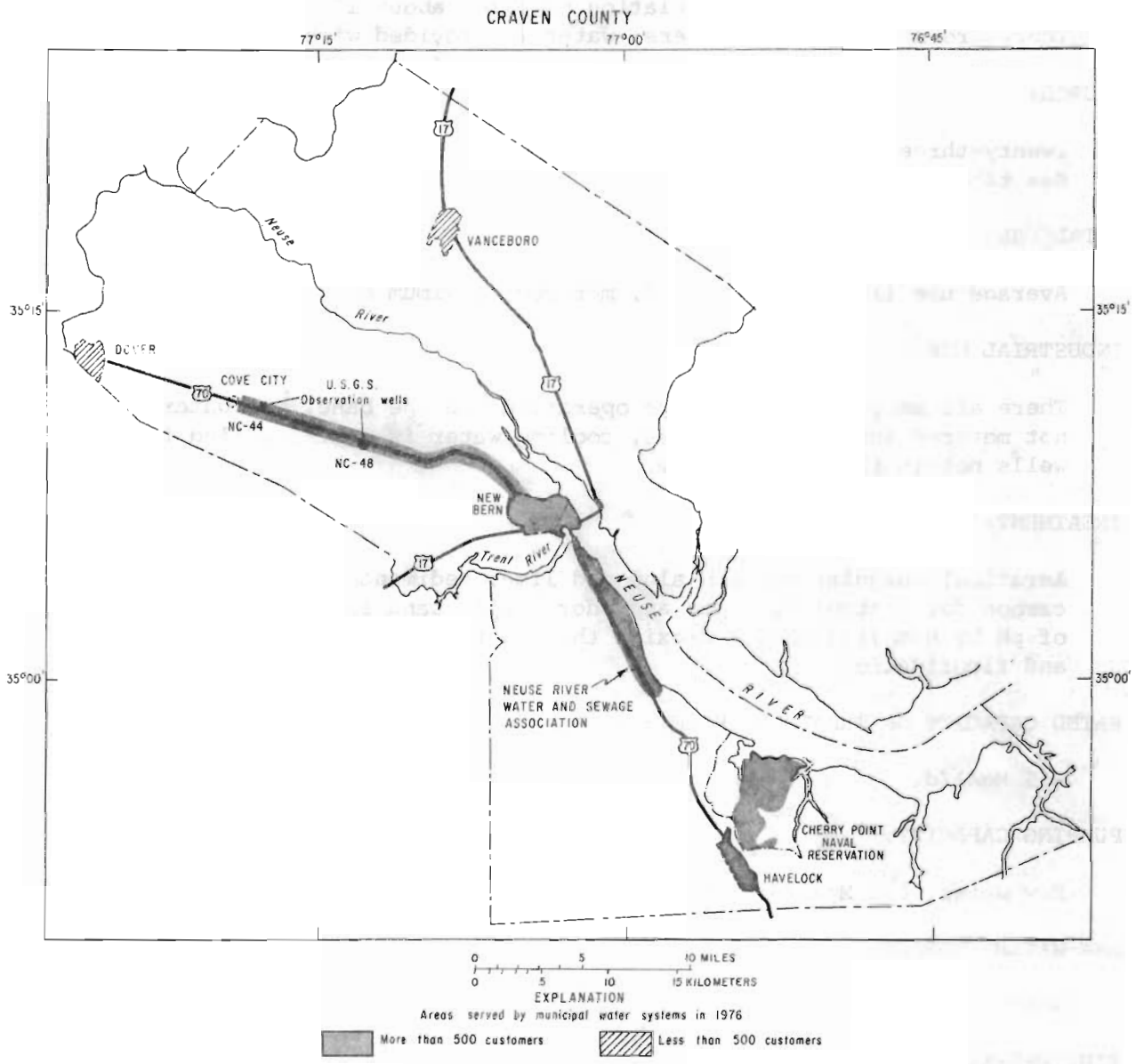
The county is underlain by sedimentary deposits that thicken to the east, increasing in thickness from about 900 feet in the western part of the county to about 4,000 feet in the east. The shallowest of these deposits, the upper sandy aquifer, is only about 30 feet thick in the western part of the county, but reaches a thickness of about 150 feet in the east. Where thickest these deposits could yield up to 100 gal/min of fresh water to wells, except in the immediate vicinity of the estuaries where salt water might be found at shallow depth. The estimated maximum recharge to the upper sandy aquifer is 1.0 (Mgal/d)/mi^2. The limestone aquifer underlies the upper sandy aquifer. The limestone is very thin or absent in the western part of the county, but thickens to about 900 feet in the east. This aquifer is very permeable and, where thickest, could yield many thousands of gallons per minute to wells. Fresh-water production is limited by the presence of salt water in the lower part of this aquifer. Although the thickness of the fresh-water zone in the aquifer is sufficient to afford yields of a few thousand gallons per minute, the threat of vertical or lateral encroachment by salt water would make lower yields more advisable. The estimated maximum recharge to the limestone aquifer is 0.6 (Mgal/d)/mi^2. The limestone aquifer is underlain by the lower sandy aquifer.

CRAVEN COUNTY

WATER-RESOURCES APPRAISAL

The lower sandy aquifer is about 800 feet thick in the western part of the county and about 3,000 feet thick in the east. The ability of this aquifer to yield fresh water does not increase uniformly from west to east, in spite of the west to east thickening, because the aquifer is deeper and the fresh-water zone is shallower in the eastern part of the county. In the western half of the county, where the aquifer is either free of salt water or the depth to salt water is great, fresh-water well yields of a few thousand gallons per minute can be obtained. In the eastern half of the county, all or most of the aquifer is filled with salt water. The maximum estimated recharge to the lower sandy aquifer is 0.05 $(Mgal/d)/mi^2$. Water levels in the lower sandy aquifer in parts of Craven County and surrounding counties are gradually declining in response to regional pumping of ground water from the aquifer. Records collected from the U.S. Geological Survey water-level observation well NC-48 at Tuscarora show the water level in the upper part of the lower sandy aquifer has declined at a rate of 0.5 feet per year since 1966. Also, at water-level observation well NC-44, which is at the Cove City well field of the City of New Bern, water levels in the lower sandy aquifer were declining at a rate of about 2 feet per year prior to the start of pumping in 1968. Since 1968, the rate of decline in well NC-44 increased to about 7 feet per year mainly in response to withdrawals from the Cove City well field which have increased from about 1 Mgal/d in 1968 to 3 Mgal/d in 1976. Regional water levels are expected to decline gradually, and water levels near well fields such as Cove City will continue to decline as long as ground-water withdrawals continue to increase.

The water from the limestone aquifer and the uppermost beds of the lower sandy aquifer is hard and contains excessive iron. Water from the deeper beds of the lower sandy aquifer may contain excessive fluoride.


CRAVEN COUNTY
77°15'
77°00'
76°45'
35°15'
35°00'
VANCEBORO
Neuse River
DOVER
COVE CITY
U.S.G.S. Observation wells
NC-44
NC-48
NEW BERN
Trent River
NEUSE RIVER
NEUSE RIVER WATER AND SEWAGE ASSOCIATION
CHERRY POINT NAVAL RESERVATION
HAVELOCK
17
70
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

CHERRY POINT MARINE CORPS AIR STATION, CRAVEN COUNTY

OWNERSHIP:

U.S. Government. Total population supplied about 13,000 in 1976. There are no metered customers; water is provided without charge.

SOURCE:

Twenty-three wells (Nos. 1-23).
See table on following page.

TOTAL USE:

Average use (1975), 2.8 Mgal/d, metered; maximum daily not available.

INDUSTRIAL USE:

There are many industrial-type operations on the base, but water use is not metered and, in many cases, cooling water is self-supplied from wells not in the water system.

TREATMENT:

Aeration, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, adjustment of pH by bubbling carbon dioxide through the water, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

4.5 Mgal/d.

PUMPING CAPACITY:

Raw water, 6.6 Mgal/d; finished water, 4.6 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Five elevated tanks: two of 500,000 gallons and three of 300,000 gallons. Four ground storage tanks, 500,000 gallons each.

FUTURE PLANS:

Will expand area served.

Well data for Cherry Point Marine Corps Air Station, Craven County

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Altitude of land surface (ft)	Static water level below land surface (ft)	Pump setting (ft)	Pump capacity (gal/min)
1	101	Cr-392	34°54'44"	76°53'42"	1942	240	8	222	21	22	54	200
2	102	Cr-458	34°54'47"	76°53'54"		242	8	228	21	24	54	200
3	103	Cr-459	34°54'49"	76°54'05"	1942	230	8	213	24	22	54	200
4	104	Cr-386	34°54'51"	76°54'17"	1942	308	8	294	21	21	54	200
5	105	Cr-460	34°55'19"	76°54'05"		223	8	211	11	6	54	200
6	106	Cr-461	34°55'09"	76°54'09"	1942	329	8	303	25	12	54	200
7	107	Cr-462	34°55'00"	76°54'14"		251	8	239	17	16	54	200
8	108	Cr-463	34°54'40"	76°54'20"	1941	195	8	189	21	22	54	200
9	11	Cr-464	34°54'25"	76°54'08"		299	8	248	24	22	55	200
10	109	Cr-387	34°54'25"	76°54'21"	1942	369	8		22	21	55	200
11	111	Cr-465	34°54'16"	76°54'21"	1942	219	8	215	25	22	55	200
12	112	Cr-466	34°54'06"	76°54'24"	1941	268	6	256	23	24	57	150
13	110	Cr-381	34°54'18"	76°54'35"	1941	207	6	180	21	19	56	150
14	113	Cr-467	34°53'57"	76°54'21"	1942	214	8	207	22	22	56	200
15	7	Cr-388	34°53'47"	76°54'20"		220	8	203	19	17	56	200
16	8	Cr-468	34°53'37"	76°54'18"		232	8	226	6	14	57	200
17	12	CR-469	34°53'27"	76°54'13"		250	8	231	24	20	57	200
18	9	Cr-380	34°53'53"	76°54'35"	1941	215	6	211	21	20	58	150
19	10	Cr-470	34°54'04"	76°54'35"	1941	309	8	282	21	22	56	200
20	13	Cr-382	34°54'57"	76°54'27"		275	6	275	16	11	55	150

Well data for Cherry Point Marine Corps Air Station, Craven County--Continued

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump setting (ft)	Pump capacity (gal/min)
21	3522	Cr-471	34°55'37"	76°54'00"	1969	265	8		10			250
22	3523	Cr-472	34°55'27"	76°53'57"	1969	265	8		25			250
23	3524	Cr-473	34°55'23"	76°53'48"	1969	265	8		21			250

Note: Well Nos. 1-20 are believed to have been completed either open end or open hole. Depths shown are original depths. In some cases caving or filling may have caused them to be become somewhat shallower. All wells are equipped with turbines. The depths for well Nos. 21-23 are approximate. All wells are completed in the limestone aquifer.

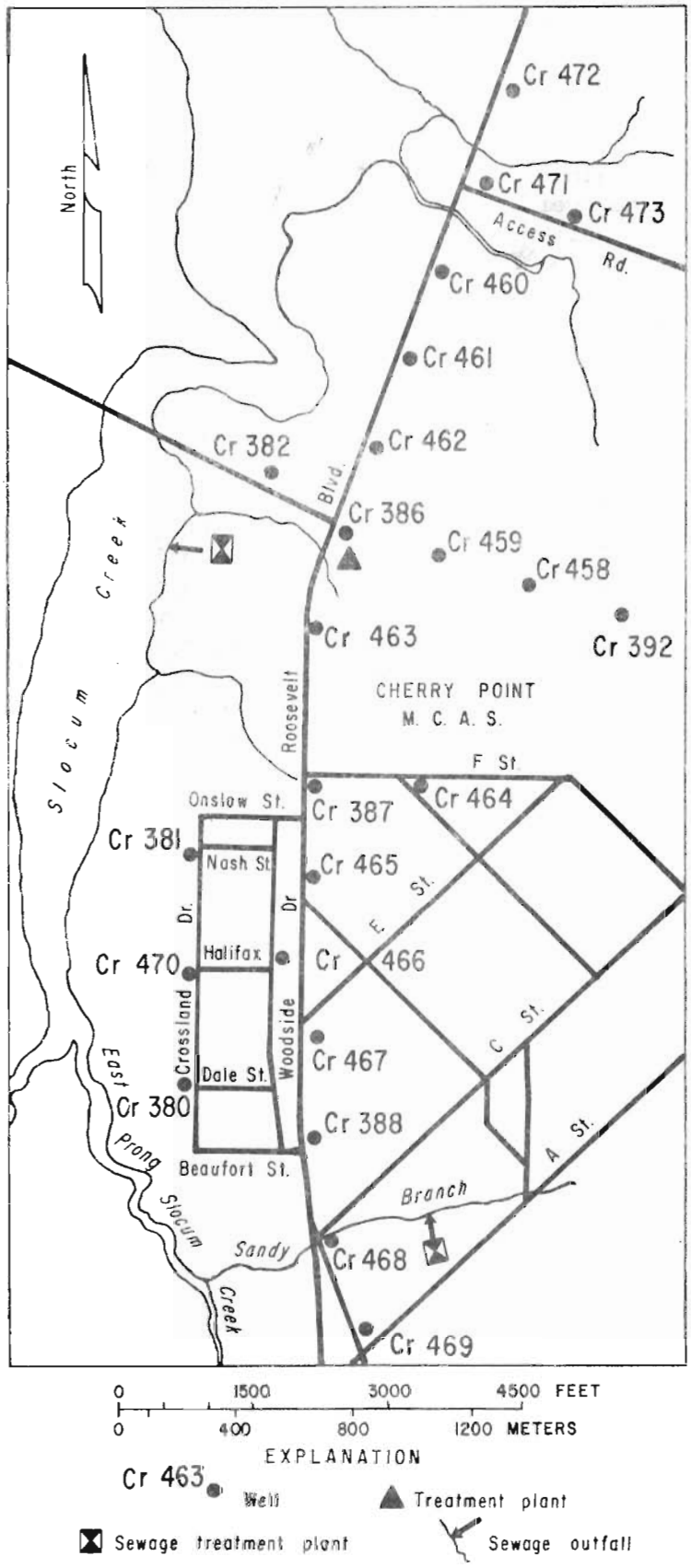
CHERRY POINT MARINE CORPS AIR STATION, CRAVEN COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The air station is in southeastern Craven County at the confluence of Slocum Creek and Neuse River. The topography is low and flat. The average discharge of streams in the area is about 0.8 $(Mgal/d)/mi^2$. Although the minimum flow of streams in the area is not known, some have been observed to go dry. The estuaries never go dry, but they contain brackish water all or most of the time. It is unlikely that an adequate surface-water supply can be developed in the immediate vicinity of the base except at a high cost.

Ground water: The base is underlain at a depth of less than 100 feet by the limestone aquifer. Although this aquifer is several hundred feet thick at this location, the bottom part of the aquifer is filled with salt water. The depth to salt water is probably greater than 400 feet. Fresh-water well yields of several thousand gallons per minute are possible from this aquifer, but would probably cause vertical or lateral salt-water encroachment. The air station's present system of using numerous, widely-spaced wells pumped at a few hundred gallons per minute is a prudent compromise. The use of much higher pumping rates would require a chloride-monitoring system. The water from the limestone aquifer is hard and contains excessive iron.

CHERRY POINT MARINE CORPS AIR STATION



CHERRY POINT MARINE CORPS AIR STATION, CRAVEN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	7 Wells 1/ Raw	7 Wells 1/ Finished		
Date of collection	3-16-76	3-16-76		
Silica (SiO_2)	33	19		
Iron (Fe)	2.9	----------		
Manganese (Mn)	.050	----------		
Calcium (Ca)	81	19		
Magnesium (Mg)	2.2	1.6		
Sodium (Na)	19	18		
Potassium (K)	3.8	3.6		
Bicarbonate (HCO_3)	280	34		
Carbonate (CO_3)	0	0		
Alkalinity as $CaCO_3$	230	28		
Sulfate (SO_4)	1.5	32		
Chloride (Cl)	13	20		
Fluoride (F)	.3	.4		
Nitrate (NO_3)	----------	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.01	.01		
Dissolved Solids	294	130		
Hardness as $CaCO_3$:				
Total	210	54		
Noncarbonate	0	26		
Specific conductance (micromhos at 25°C)	468	208		
Arsenic (As)	.000	----------		
Barium (Ba)	.0	----------		
Boron (B)	.03	----------		
Cadmium (Cd)	.000	----------		
Chromium (Cr)	.000	----------		
Cobalt (Co)	.000	----------		
Copper (Cu)	.000	----------		
Lead (Pb)	----------	----------		
Lithium (Li)	.01	----------		
Mercury (Hg)	----------	----------		
Strontium (Sr)	.36	----------		
Zinc (Zn)	.05	----------		
pH (units)	7.0	6.8		
Temperature (°C)	----------	----------		

1/ Combined sample of wells no. 1, 3, 6, 8, 18, 22 and 23.

HAVELOCK, CRAVEN COUNTY

OWNERSHIP:

Municipal. Total population supplied about 5,000 in 1975 (1,050 metered customers, 4 of whom are in suburban areas).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1, Cr-530, located at lat 34°53'43", long 76°55'23". Driller: Sydnor Hydrodynamics, Inc. Date drilled: 1968. Total depth: 260 ft. Diam: 10 in. Cased to: 144 ft. Type of finish: screened (gravel-packed). Screened intervals: 148-153 and 163-209 ft. Topography: flat. Aquifer: limestone. Altitude of land surface: 26 ft. Static water level: 5 ft below land surface. Pump capacity: 375 gal/min. Type pump: turbine.

Well No. 2, Cr-531, located at lat 34°53'41", long 76°55'21". Driller: Sydnor Hydrodynamics, Inc. Date drilled: 1968. Total depth: 240 ft. Diam: 10 in. Cased to: 150 ft. Type of finish: screened (gravel-packed). Screened intervals: 157-162 and 170-216 ft. Topography: flat. Aquifer: limestone. Altitude of land surface: 21 ft. Static water level: 11 ft below land surface. Pump capacity: 375 gal/min. Type pump: turbine.

TOTAL USE:

Average (Oct. 1974 - Sept. 1975) 0.46 Mgal/d, metered; maximum daily (8-19-75) 0.71 million gallons, metered.

Average daily water use (Mgal/d), Oct. 1974 - Sept. 1975

Oct. 1974--0.409*	Feb. 1975--0.437	June 1975--0.522
Nov. 1974--0.409*	Mar. 1975--0.453	July 1975--0.484
Dec. 1974--0.398	Apr. 1975--0.470	Aug. 1975--0.578
Jan. 1975--0.408	May 1975--0.482	Sept.1975--0.520

*Average for Oct.-Nov. 1974.

INDUSTRIAL USE:

None.

TREATMENT:

Aeration, softening by ion-exchange, anthracite-gravel pressure filtration, and chlorination.

HAVELOCK, CRAVEN COUNTY

RATED CAPACITY OF TREATMENT PLANT:

1.6 Mgal/d.

PUMPING CAPACITY:

Raw water, 1.1 Mgal/d; finished water, 0.94 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 300,000 gallons.

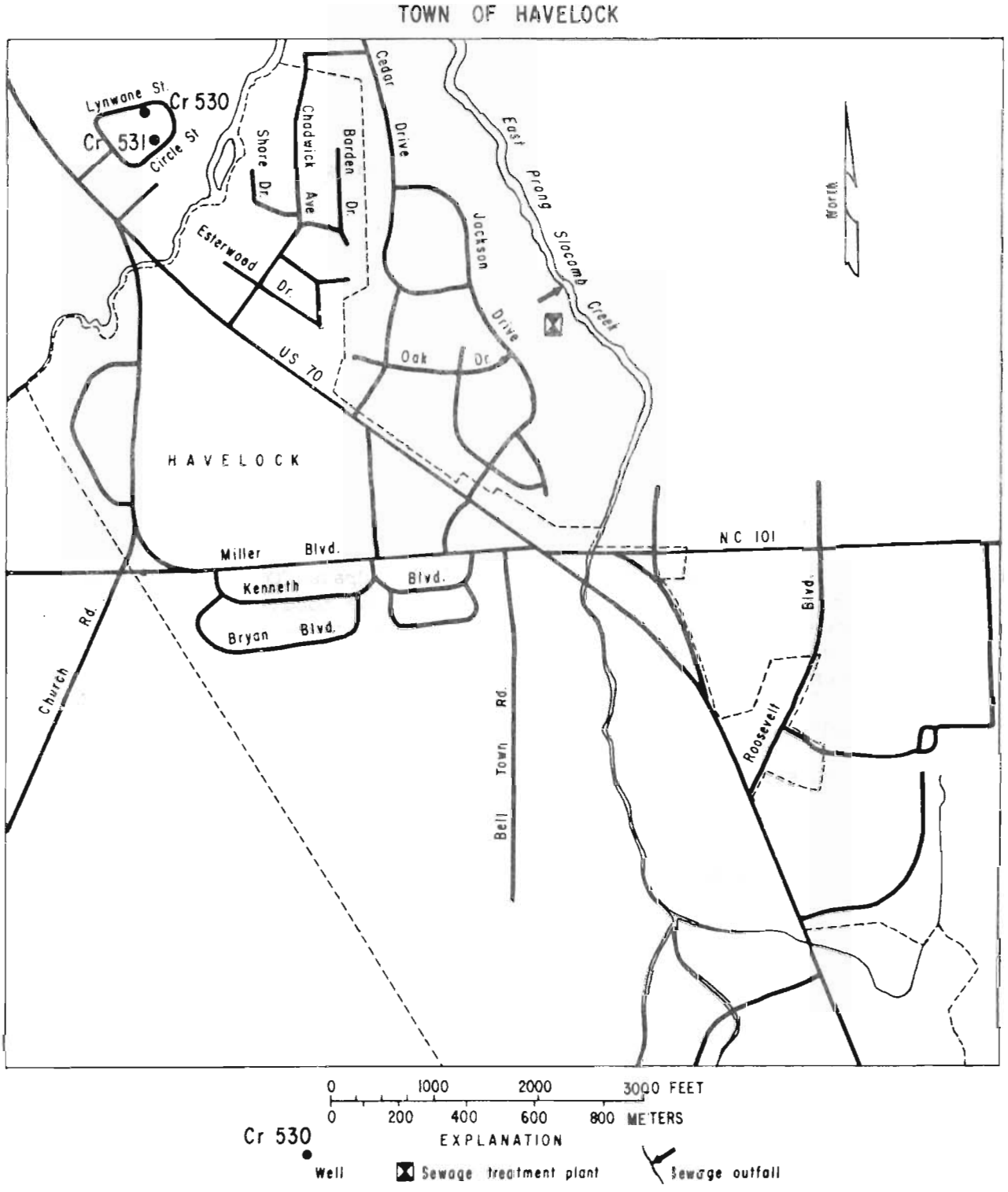
FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Havelock is in southeastern Craven County on the west side of brackish East Prong of Slocum Creek. The topography is low and flat. The average discharge of streams in the area is about 0.8 $(Mgal/d)/mi^2$. The average minimum flow of nearby streams is not known. However, some of them go dry occasionally. It is unlikely that an adequate surface-water supply could be obtained in the immediate area without considerable storage.

Ground water: Havelock is underlain by the limestone aquifer at a shallow depth. Although the bottom part of the aquifer contains salt water, the upper part can supply several hundred gallons per minute of fresh water to wells, with low probability of salt-water encroachment. The water from the limestone aquifer is hard and contains excessive iron.


TOWN OF HAVELOCK
Lynwone St.
Cr 530
Cr 531
Circle St
Shore Dr.
Chadwick Ave
Borden Dr.
Cedar Drive
East prong Slocomb Creek
Esterwood Dr.
Jackson Drive
Oak Dr.
US 70
HAVELOCK
North
Miller Blvd.
Kenneth Blvd.
Bryan Blvd.
NC 101
Church Rd.
Bell Town Rd.
Roosevelt Blvd.
0 1000 2000 3000 FEET
0 200 400 600 800 METERS
EXPLANATION
Cr 530
Well
Sewage treatment plant
Sewage outfall

HAVELOCK, CRAVEN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 2 Raw			
Date of collection	10-1-75			
Silica (SiO_2)	32			
Iron (Fe)	2.1			
Manganese (Mn)	.040			
Calcium (Ca)	81			
Magnesium (Mg)	1.4			
Sodium (Na)	6.0			
Potassium (K)	2.0			
Bicarbonate (HCO_3)	250			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	200			
Sulfate (SO_4)	2.3			
Chloride (Cl)	7.2			
Fluoride (F)	.3			
Nitrate (NO_3)				
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.01			
Dissolved Solids	257			
Hardness as $CaCO_3$:				
Total	210			
Noncarbonate	5			
Specific conductance (micromhos at 25°C)	400			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.03			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)				
Lithium (Li)	.00			
Mercury (Hg)				
Strontium (Sr)	.38			
Zinc (Zn)	.01			
pH (units)	7.2			
Temperature (°C)				

NEW BERN, CRAVEN COUNTY

OWNERSHIP:

Municipal. Total population supplied about 17,000 in 1975 (5,600 metered customers, 250 of whom are in suburban areas). Also supplies the Neuse River Water and Sewage Association (about 700 customers).

SOURCE:

Three wells (Nos. 1-3). Well field located near Cove City.

Well No. 1, Cr-431, located at lat 35°10'48", long 77°17'45". Driller: Layne-Atlantic Co. Date drilled: Mar. 1965. Total depth: 842 ft. Diam: 10 in. Cased to: 490 ft. Type of finish: screened (gravel-packed). Screened intervals: 490-510, 568-573, 595-600, 653-658, 673-678, 697-737, 803-818, and 832-837 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 40 ft. Static water level: 12 ft below land surface. Pump setting: 120 ft. Pump capacity: 1,400 gal/min. Type pump: turbine.

Well No. 2, Cr-455, located at lat 35°11'02", long 77°18'26". Driller: Layne-Atlantic Co. Date drilled: Nov. 1966. Total depth: 820 ft. Diam: 10 in. Cased to: 460 ft. Type of finish: screened (gravel-packed). Screened intervals: 460-500, 555-585, 674-704, and 810-815 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 34 ft. Static water level: 9 ft below land surface. Pump setting: 120 ft. Pump capacity: 1,400 gal/min. Type pump: turbine.

Well No. 3, Cr-456, located at lat 35°11'08", long 77°19'06". Driller: Layne-Atlantic Co. Date drilled: July 1966. Total depth: 796 ft. Diam: 10 in. Cased to: 465 ft. Type of finish: screened (gravel-packed). Screened intervals: 465-485, 510-520, 571-581, 669-689, 717-722, 732-737, 744-764, and 774-779 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 45 ft. Static water level: _____. Pump setting: 120 ft. Pump capacity: 1,400 gal/min. Type pump: turbine.

TOTAL USE:

Average (Mar. 1975 - Feb. 1976), 3.13 Mgal/d, metered; maximum daily not determined.

Average daily water use (Mgal/d), Mar. 1975 - Feb. 1976

Mar. 1975--2.79	July 1975--3.36	Nov. 1975--3.25
Apr. 1975--2.79	Aug. 1975--3.45	Dec. 1975--3.06
May 1975--3.06	Sept. 1975--3.18	Jan. 1976--3.08
June 1975--3.44	Oct. 1975--3.12	Feb. 1976--2.93

NEW BERN, CRAVEN COUNTY

INDUSTRIAL USE:

0.73 Mgal/d. Principal users include Texfi Industries, Maola Dairy, and Stanley Tool Co.

TREATMENT:

Chlorination and fluoridation at each well.

RATED CAPACITY OF TREATMENT PLANTS:

Demand-type feeders. Not rated.

PUMPING CAPACITY:

Raw water, 6.0 Mgal/d; finished water, 10.0 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks of 500,000 gallons each; two ground storage tanks 1,000,000 and 300,000 gallons.

FUTURE PLANS:

Will construct a 4,000,000-gallon ground tank and will drill two more wells. Plan to lower well pumps 60 feet deeper when new wells are drilled.

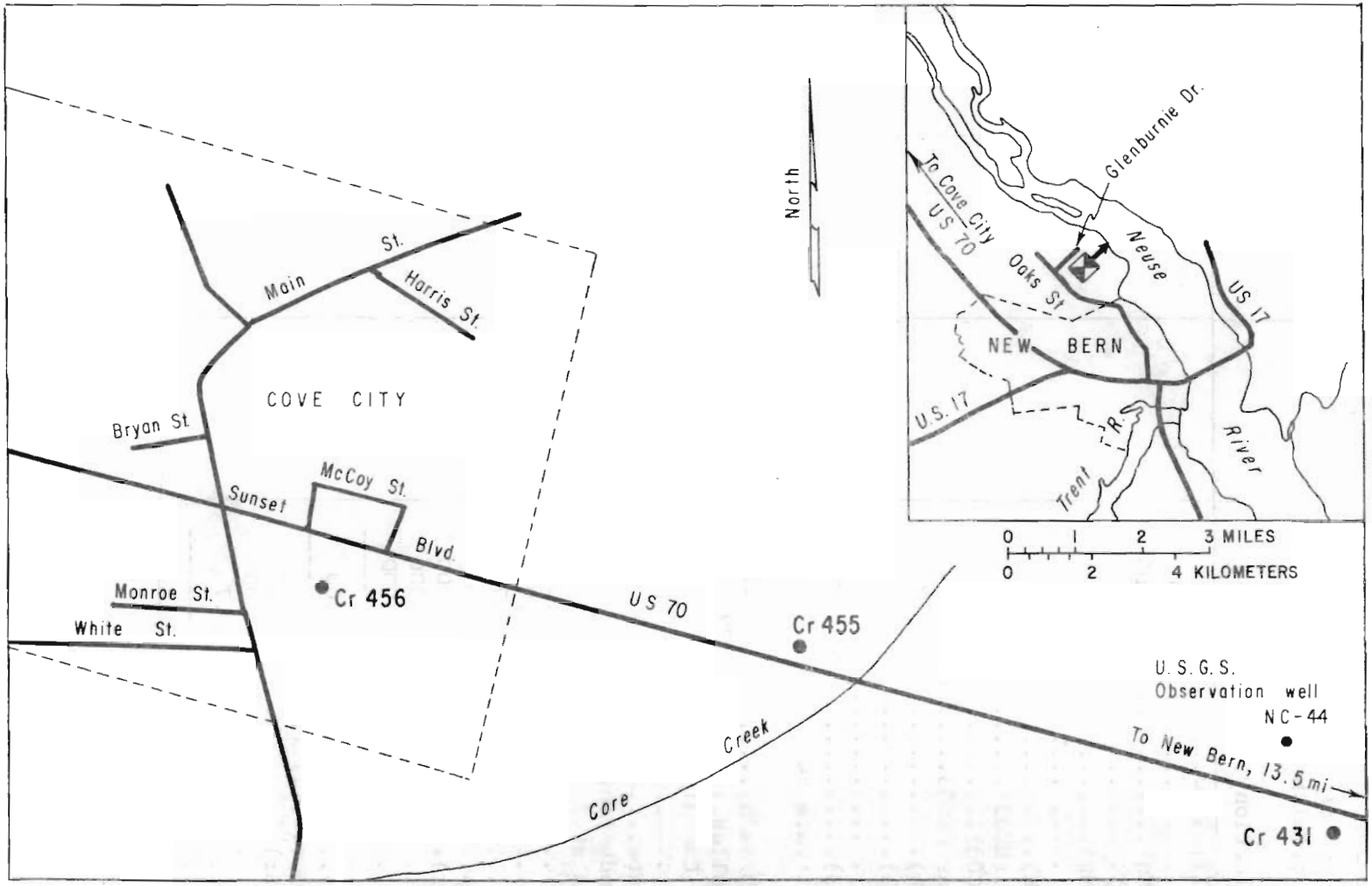
NEW BERN, CRAVEN COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: New Bern is at the confluence of the Trent and Neuse River estuaries in central Craven County. The topography is low and flat. Several miles upstream, where it is non-estuarine and invariably fresh, the Neuse River could provide more than enough water for the city's needs.

Ground water: The limestone aquifer, which underlies the city at shallow depth, can yield the quantity of water to supply the city's needs. However, the city has had chemical-quality problems with the water from this aquifer. The old city wells were close to the estuary and became contaminated with salt water. New wells were drilled at a considerable distance from the estuary, but yielded water that was excessively hard and contained excessive iron. The cost of treating the water was so great that the wells were abandoned. New wells were drilled into the lower sandy aquifer near Cove City, about 15 miles northwest of the city. The quality of the new supply is excellent. The well field at Cove City should be adequate to supply New Bern's needs for many years; however, long-range water plans should take into consideration the declining water levels in the lower sandy aquifer at the well field resulting from the steadily increasing pumpage.

CITY OF NEW BERN
(Wells at Cove City)



NEW BERN, CRAVEN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

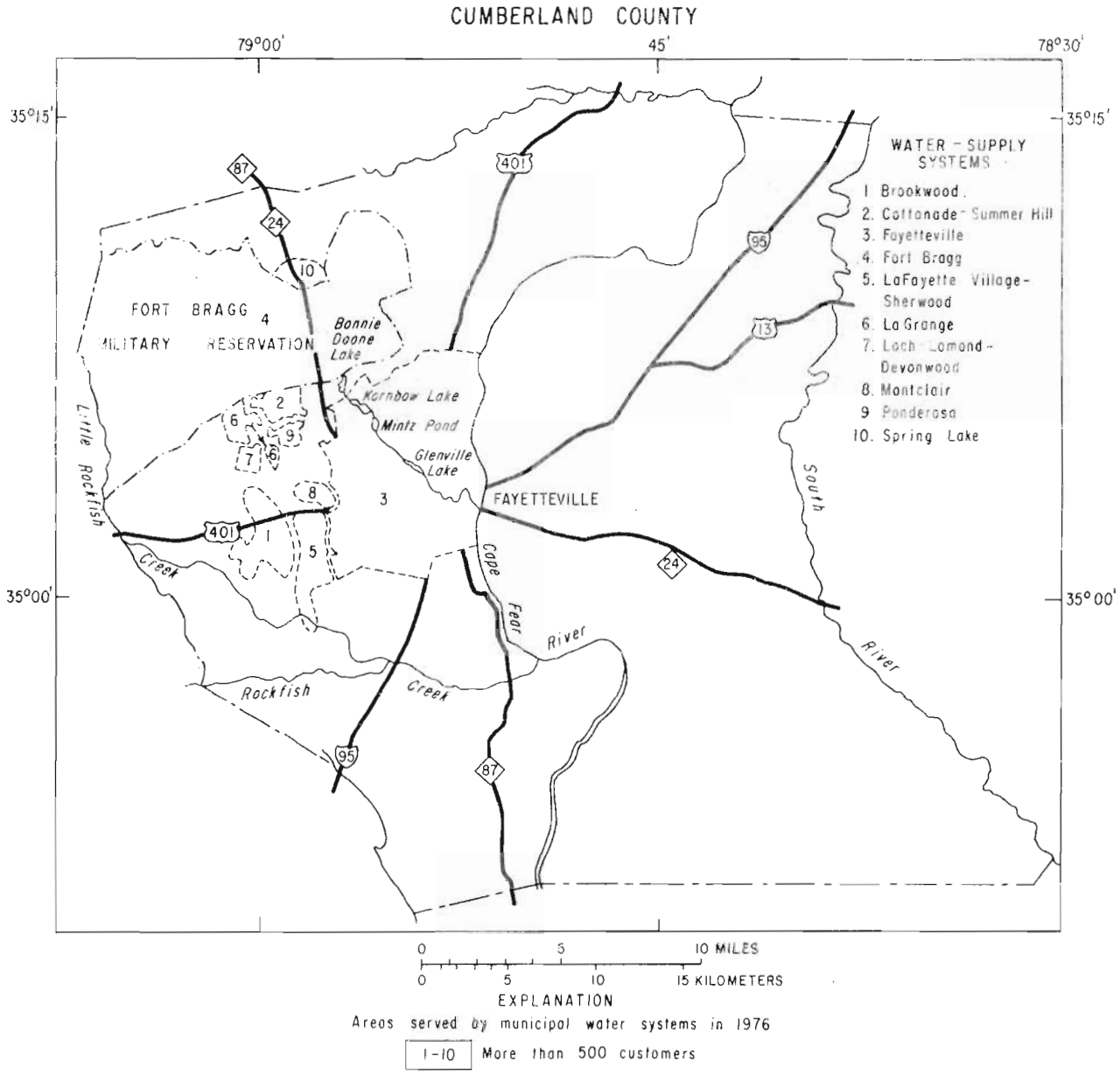
Source, or type of water (raw;finished)...	Well No. 1 Raw			
Date of collection.....	3-17-76			
Silica (SiO_2).....	11			
Iron (Fe).....	.00			
Manganese (Mn).....	.000			
Calcium (Ca).....	.5			
Magnesium (Mg).....	.5			
Sodium (Na).....	130			
Potassium (K).....	5.5			
Bicarbonate (HCO_3).....	290			
Carbonate (CO_3).....	12			
Alkalinity as $CaCO_3$.....	260			
Sulfate (SO_4).....	3.7			
Chloride (Cl).....	24			
Fluoride (F).....	.7			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	329			
Hardness as $CaCO_3$:				
Total.....	3			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	556			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.71			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.02			
Zinc (Zn).....	.00			
pH (units).....	8.7			
Temperature (°C).....	----------			

CUMBERLAND COUNTY

WATER-RESOURCES APPRAISAL

Cumberland County is in the southwestern part of the North Carolina Coastal Plain. The topography is flat and swampy in the eastern half of the county and gently rolling in the western half. The county is drained by the Cape Fear River and its tributaries except for a very small area in the southwestern part of the county, which is drained by a tributary of the Lumber River. The average stream discharge is estimated at 0.8 $(Mgal/d)/mi^2$. Minimum streamflows range from zero to 0.3 $(Mgal/d)/mi^2$ and average 0.12 $(Mgal/d)/mi^2$. Streams having drainage areas as large as 50 square miles have been observed to go dry. The 7-day, 2-year low flow ranges from 0.001 to 0.4 $(Mgal/d)/mi^2$ and averages 0.2 $(Mgal/d)/mi^2$. Ten public water supplies in the county have 500 or more customers: Brookwood water system, Cottonade-Summer Hill water system, Fayetteville, Fort Bragg, Lafayette Village-Sherwood water system, LaGrange water system, Loch Lomond-Devonwood water system, Montclair water system, Ponderosa water system, and Spring Lake. Fort Bragg does not have customers in the usual sense but was included because it serves a large population. All of these public water supplies are obtained from ground water, except Fayetteville and Fort Bragg, which obtain their supplies from surface water. Most of the smaller public and individual supplies are obtained from ground water. The county population in 1970 was 212,042.

The upper sandy aquifer averages less than 20 feet thick in the western part of the county and more than 40 feet thick in the eastern part. The underlying lower sandy aquifer is usually less than 150 feet thick in the western part of the county but may reach a thickness of 350 feet in the southeastern part of the county. Where thickest, such as in the southeastern part of the county, yields of up to 1,000 gal/min might be obtained from this aquifer. However, most of the ground-water use is in the western part of the county. Although the aquifer generally yields less than 100 gal/min to individual wells in the western part of the county, well yields of over 200 gal/min have been obtained. A few wells have been completed in the crystalline rock which underlies the lower sandy aquifer, and these wells yield a few tens of gallons per minute. The maximum ground-water yield in the county is estimated at 0.9 $(Mgal/d)/mi^2$. The ground water is soft, has a low dissolved-solids concentration, and is highly to excessively acid.


CUMBERLAND COUNTY
79°00'
45'
78°30'
35°15'
35°00'
WATER - SUPPLY SYSTEMS
1. Brookwood
2. Cottonade - Summer Hill
3. Fayetteville
4. Fort Bragg
5. LaFayette Village - Sherwood
6. La Grange
7. Loch - Lomond - Devonwood
8. Montclair
9. Ponderosa
10. Spring Lake
FORT BRAGG MILITARY RESERVATION
Bonnie Doone Lake
Kornbow Lake
Mintz Pond
Glenville Lake
FAYETTEVILLE
Little Rockfish Creek
Rockfish Creek
Cape Fear River
South River
401
87
24
10
95
13
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
1-10 More than 500 customers

BROOKWOOD WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

Brookwood Water Corporation. Total population supplied about 7,000 in 1976. There are 1,928 metered customers. Areas serviced include Arron Hills, Arron Lake, Arron Park, Brentwood, Brookwood, Emerald Gardens (sections I, II and III), Hollywood Heights, Meadowwood, Shenandoah, Southwood, Westhill and several mobile home parks.

SOURCE:

Eighteen wells (Nos. 3, 5-13, 15, 19-24, and 26). See table on following page.

TOTAL USE:

Average estimated use (1975), 0.4 Mgal/d; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

Well Nos. 3, 7, 8, 11, 12, 13, 19, 20 and 24 have feeders for adjustment of pH with soda ash. Remaining wells do not have feeders.

RATED CAPACITY OF TREATMENT PLANT:

Demand-type feeders. Not rated.

PUMP CAPACITY:

Raw-water, 3.12 Mgal/d; finished-water, 3.12 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks: one of 500,000 gallons and one of 65,000 gallons. Five stand-pipe tanks: three of 20,000 gallons, one of 10,000 gallons, and one of 30,000 gallons.

FUTURE PLANS:

Will expand system.

Well data for Brookwood water system, Cumberland County

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump setting (ft)	Well yield (gal/min)
3	Cu-98	35°02'22"	78°58'53"		1963	60	8				204			
5	Cu-99	35°01'51"	78°59'16"	N. M. Bill	4/1975	78	8	44	gravel, screen	44-64	213	33		58
6	Cu-100	35°01'58"	78°59'33"	N. M. Bill	7/1972	79	8	52	gravel, screen	52-66	217	37		
7	Cu-101	35°01'42"	78°59'16"		1966	60	8				212			
8	Cu-102	35°01'32"	79°00'04"		1966	62	6				212			
9	Cu-103	35°03'04"	79°00'04"	Graham Bros.	3/1967	49	8	44	gravel, screen	44-49	226	25.5	46	
10	Cu-104	35°02'36"	78°59'40"		1967	73	8				220			
11	Cu-105	35°01'58"	78°59'59"		1967	54	8				212			
12	Cu-106	35°02'45"	78°59'49"	N. M. Bill	5/1971	69	8	39	gravel, screen	39-57	219	36		
13	Cu-107	35°01'06"	79°58'49"		1968	374	8				202			
15	Cu-108	35°01'23"	79°00'09"		1968	400	8				209			
19	Cu-109	35°01'24"	79°00'22"	N. M. Bill	3/1971	75	8	44		44-64	213	29		
20	Cu-110	35°01'00"	79°00'14"	N. M. Bill	5/1971	85	8	24	gravel, screen	24-32,44-50, 66-72	205	28		
21	Cu-111	35°02'59"	78°59'49"	N. M. Bill	5/1971	73	8	32	gravel, screen	32-40,44-54, 55-58,60-63	221	32		
22	Cu-112	35°01'36"	78°59'25"	N. M. Bill	7/1972	75	8	43.5	gravel, screen	43.5-64.5	210	26		195
23	Cu-113	35°01'07"	78°59'03"	N. M. Bill	6/1973	80	8	48	gravel, screen	48-68	200	24		
24	Cu-114	35°01'34"	78°58'40"	N. M. Bill	8/1972	83	8	51	gravel, screen	51-71	200	47		44

Well data for Brookwood water system, Cumberland County--Continued

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump setting (ft)	Well yield (gal/min)
26	Cu-115	35°01'27"	79°00'52"	N. M. Bill	6/1974	72	8	41	gravel, screen	41-61	213	24		

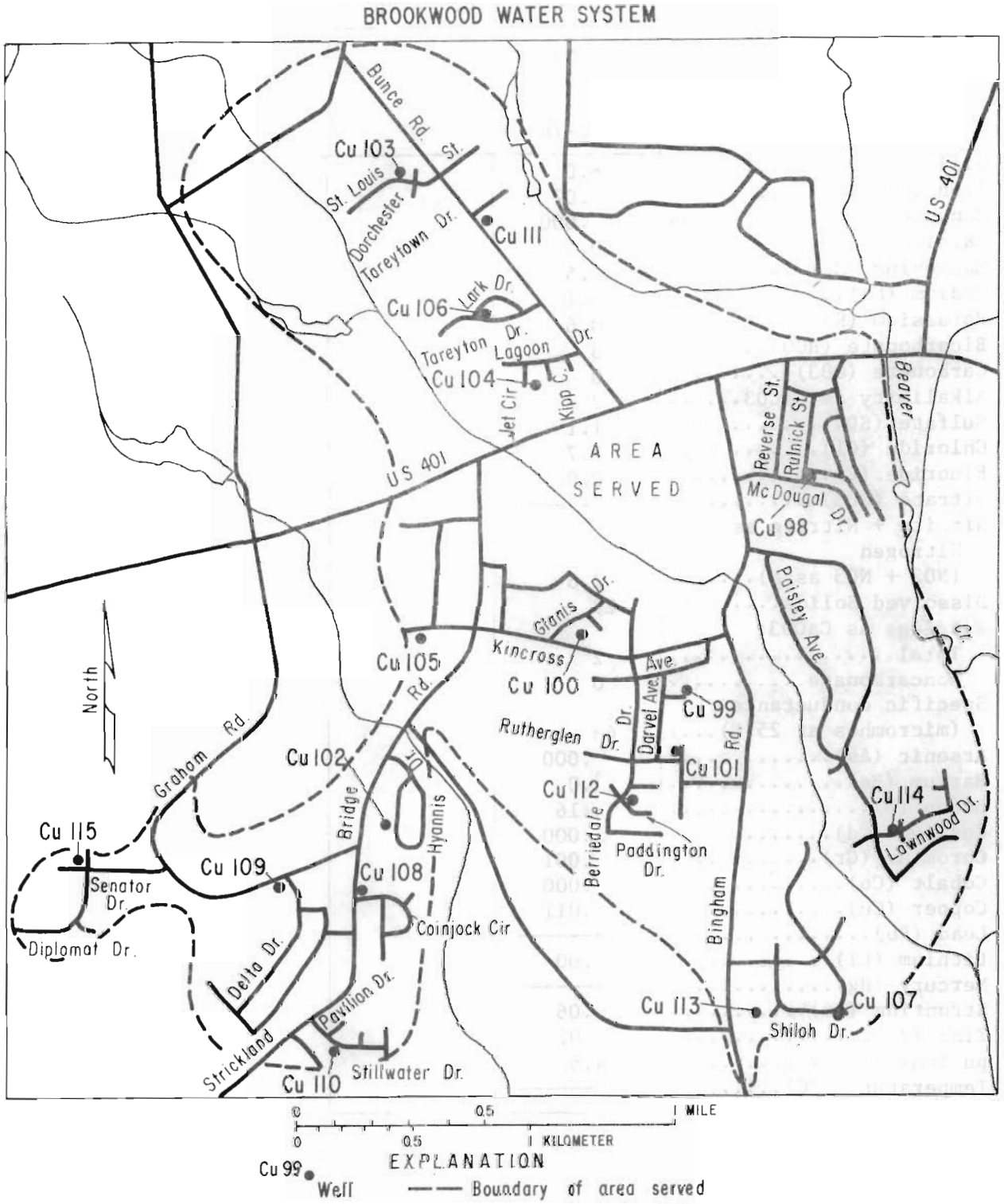
Note: All wells are in flat areas and are equipped with submersible pumps. All wells produce from the lower sandy aquifer except well Nos. 13 and 15 which are believed to produce from crystalline rock.

BROOKWOOD WATER SYSTEM, CUMBERLAND COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The topography of the area is characterized by broad, flat-topped hills dissected by streams having swampy flood plains. These streams have numerous small impoundments in the vicinity. The average stream discharge is estimated at 0.8 (Mgal/d)/mi^2. The water system lies less than one mile northeast of Little Rockfish Creek. The 7-day, 2-year low flow of this stream is 0.6 (Mgal/d)/mi^2. This stream has a minimum flow of 0.4 (Mgal/d)/mi^2 and could supply the system's water needs without impoundment. An alternative would be to purchase water from the City of Fayetteville.

Ground water: The area is underlain by the upper sandy aquifer, which has a thickness of about 20 feet. The lower sandy aquifer underlies the upper sandy aquifer and may be as much as 200 feet thick. For some reason the deeper part of the lower sandy aquifer is not utilized in the area. Nevertheless, well yields of up to 200 gal/min could be achieved. The underlying crystalline rock could yield a few tens of gallons to wells. The ground water in this area is soft, has a low dissolved-solids concentration and is highly to excessively acid.


BROOKWOOD WATER SYSTEM
Bunce Rd.
Cu 103
St. Louis St.
Dorchester
Tareytown Dr.
Cu 111
Cu 106
Lark Dr.
Tareyton Dr.
Lagoon Dr.
Cu 104
Jet Cir
Kipp Dr.
US 401
AREA SERVED
US 401
Beaver
Reverse St.
Rulnick St.
Mc Dougal Dr.
Cu 98
Paisley Ave
Granis Dr.
Kincross Ave.
Cu 105
Rd.
Cu 100
Darvel Ave.
Cu 99
Rutherglen Dr.
Rd.
Cu 101
Cu 112
Berriedale
Paddington Dr.
Cu 114
Lawnwood Dr.
North
Graham Rd.
Cu 102
Bridge
Hyannis
Cu 115
Senator Dr.
Cu 109
Cu 108
Coinjock Cir
Diplomat Dr.
Delta Dr.
Pavilion Dr.
Bingham
Cu 113
Cu 107
Shiloh Dr.
Strickland
Cu 110
Stillwater Dr.
0 0.5 1 MILE
0 0.5 1 KILOMETER
EXPLANATION
Cu 99 Well
Boundary of area served

BROOKWOOD WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 22 Raw			
Date of collection.....	5-27-76			
Silica (SiO_2).....	6.0			
Iron (Fe).....	.07			
Manganese (Mn).....	.000			
Calcium (Ca).....	0.1			
Magnesium (Mg).....	0.5			
Sodium (Na).....	4.1			
Potassium (K).....	0.6			
Bicarbonate (HCO_3).....	3			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	2			
Sulfate (SO_4).....	1.1			
Chloride (Cl).....	3.7			
Fluoride (F).....	0.0			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	2.6			
Dissolved Solids.....	29			
Hardness as $CaCO_3$:				
Total.....	2			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	43			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.16			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.001			
Cobalt (Co).....	.000			
Copper (Cu).....	.011			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.06			
Zinc (Zn).....	.02			
pH (units).....	4.6			
Temperature (°C).....	----------			

COTTONADE-SUMMER HILL WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

LaFayette Water Corporation. Total population supplied about 3,700 in 1976. There are 1,058 metered customers.

SOURCE:

Fourteen wells. See table on following page.

TOTAL USE:

Average use (1975), 0.29 Mgal/d; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

Adjustment of pH with caustic soda by feeders at each well.

RATED CAPACITY OF TREATMENT PLANT:

Demand-type feeders. Not rated.

PUMPING CAPACITY:

Raw-water, 2.0 Mgal/d; finished-water, 2.0 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank of 250,000 gallons.

FUTURE PLANS:

Newly-drilled well to be added to system and another well to be drilled. Will extend service area.

Well data for Cottonade-Summer Hill Water System, Cumberland County

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)
C-1	Cu-144	35°06'21"	78°59'35"			80					262		
C-1A	Cu-145	35°06'20"	78°59'34"			80					259		
C-2	Cu-146	35°06'24"	78°59'08"			90	8				255		
C-3	Cu-147	35°06'23"	78°59'05"			90	8				250		
C-4	Cu-148	35°06'26"	78°59'00"			100	8				245		
S-1	Cu-149	35°05'56"	78°59'48"			85					250		
S-2	Cu-150	35°05'49"	78°59'46"			80					242		
S-3	Cu-151	35°05'46"	78°59'56"	C. R. Underwood	5/1968	70	8	35	gravel, screen	35-40,45-50, 59-64	230	15	
S-4	Cu-152	35°06'03"	79°00'10"	C. R. Underwood	9/1969	91	8	42	gravel, screen	42-47,68-73, 81-86	260	37	
S-5	Cu-153	35°06'07"	79°00'11"	C. R. Underwood	7/1969	85	8	37	gravel, screen	37-47,75-80	253	33	
S-6	Cu-154	35°06'06"	79°00'19"	C. R. Underwood	6/1972	90	8	50	gravel, screen	50-55,65-75, 80-85	260	36	
S-7	Cu-155	35°06'03"	79°00'17"	C. R. Underwood	4/1972	80	8	50	gravel, screen	50-55,60-75	251	26	
S-8	Cu-156	35°06'00"	79°00'35"	C. R. Underwood	6/1973	76	8	55	gravel, screen	50-70	281	36.5	200
S-9	Cu-157	35°05'55"	79°00'34"	C. R. Underwood	4/1973	95	8	60	gravel, screen	60-65,80-90	286	36	200

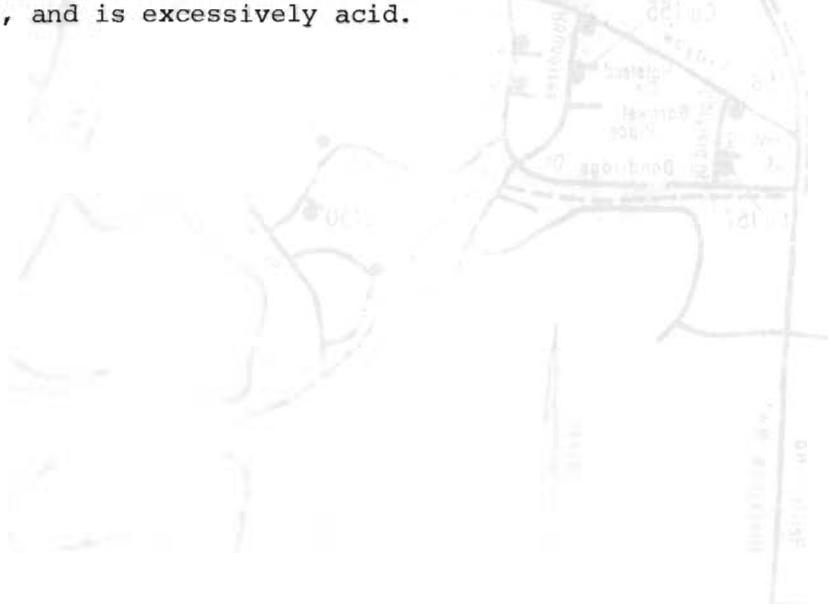
Note: All wells are located in areas of flat topography, produce from lower sandy aquifer, and are equipped with turbine pumps.

COTTONADE-SUMMER HILL WATER SYSTEM, CUMBERLAND COUNTY

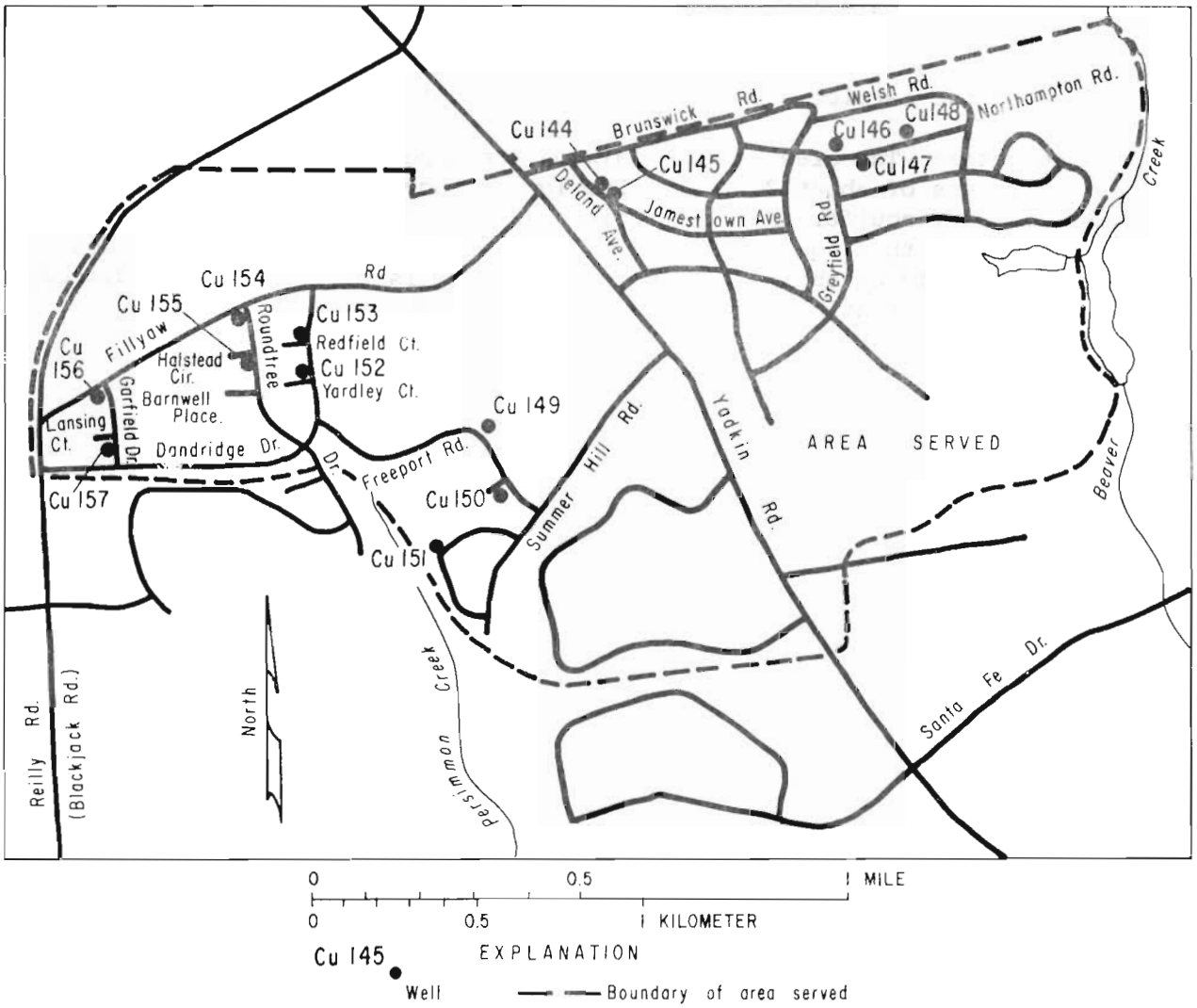
WATER-RESOURCES APPRAISAL:

Surface water: The topography consists of broad, flat uplands between swampy flood plains. There are numerous small impoundments on the streams. The average discharge of streams in the vicinity is estimated at 0.8 $(Mgal/d)/mi^2$. The low-flow characteristics of the nearby streams are not known but are believed to be excellent. It is possible that an adequate water supply could be obtained without impoundments. Water could also be obtained from the Cape Fear River, which is about 5 miles east of the service area, or purchased from the City of Fayetteville.

Ground water: The area is underlain by the upper sandy aquifer which has a thickness of about 20 feet. The lower sandy aquifer underlies the upper sandy aquifer and has a thickness of a little over 100 feet. Even though this aquifer is not thick, well yields of as much as 200 gal/min could be obtained. The ground water is soft, has a low dissolved-solids concentration, and is excessively acid.



COTTONADE-SUMMER HILL WATER SYSTEM



COTTONADE-SUMMER HILL WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Composite of wells Finished			
Date of collection.....	8-5-76			
Silica (SiO_2).....	6.0			
Iron (Fe).....	.00			
Manganese (Mn).....	.010			
Calcium (Ca).....	.3			
Magnesium (Mg).....	.1			
Sodium (Na).....	2.0			
Potassium (K).....	.4			
Bicarbonate (HCO_3).....	6			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	5			
Sulfate (SO_4).....	.2			
Chloride (Cl).....	2.6			
Fluoride (F).....	.0			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.79			
Dissolved Solids.....	19			
Hardness as $CaCO_3$:				
Total.....	1			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	24			
Arsenic (As).....	.000			
Barium (Ba).....	.1			
Boron (B).....	.00			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.001			
Copper (Cu).....	1.2			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.03			
Zinc (Zn).....	.03			
pH (units).....	4.9			
Temperature (°C).....	----------			

FAYETTEVILLE, CUMBERLAND COUNTY

OWNERSHIP:

Municipal. Also supplies Hope Mills. Total population supplied, about 70,000 in 1976 (20,446 metered customers, 3,281 of whom are in suburban areas, including Hope Mills, which has 1,070 metered customers).

SOURCES:

Cape Fear River: the intake is on the west bank of the Cape Fear River about 1,000 feet southeast of the Hoffer treatment plant at lat 35°04'58", long 78°51'52". The drainage area at the intake is 4,330 square miles, approximately.

Little Cross Creek impounded in Bonnie Doone Lake, Kornbow Lake, Mintz Pond, and Glenville Lake: the intake is at the Glenville Lake Dam about 400 feet west of the Glenville treatment plant at lat 35°04'09", long 78°53'50". The drainage area at the intake is 9.71 square miles.

Cross Creek (emergency supply): the intake is about 200 feet upstream from Langdon Street at lat 35°04'48", long 78°53'19". The drainage area at the intake is 14.7 square miles.

RAW-WATER STORAGE:

Bonnie Doone Lake, 75 million gallons; Kornbow Lake, 150 million gallons; Mintz Pond, 25 million gallons; Glenville Lake, 125 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft of Cape Fear River is 96 Mgal/d with no storage. Estimated allowable draft of Little Cross Creek is 5.6 Mgal/d with an adjusted (for sedimentation, etc.) storage of 361 million gallons. Estimated allowable draft of Cross Creek is 3.1 Mgal/d with no storage.

TOTAL USE:

Average (Apr. 1975 - Mar. 1976), 10.76 Mgal/d, metered; maximum daily (Apr. 29, 1976), 14.90 million gallons, metered.

Average daily water use (Mgal/d), Apr. 1975 - Mar. 1976

Apr. 1975--10.22	Aug. 1975--12.12	Dec. 1975-- 9.99
May 1975--10.53	Sept. 1975--11.12	Jan. 1976-- 9.80
June 1975--12.14	Oct. 1975--10.62	Feb. 1976--10.40
July 1975--11.10	Nov. 1975--10.48	Mar. 1976--10.58

FAYETTEVILLE, CUMBERLAND COUNTY

INDUSTRIAL USE:

2.5 Mgal/d, estimated. Principal users include Fayetteville Finishing, Borden Chemicals, Cargill Corp., Black and Decker, Purolator Corp., and Kelly-Springfield Corp.

TREATMENT:

Glenville plant - prechlorination, coagulation, with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, postchlorination, and fluoridation.

Hoffer plant - prechlorination, coagulation with alum and caustic soda, sedimentation, addition of carbon for control of taste and odor, rapid mixed-media filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, postchlorination and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Glenville plant, 12 Mgal/d; Hoffer plant, 8 Mgal/d.

PUMPING CAPACITY:

Glenville plant: raw water, 22.0 Mgal/d; finished water, 18.0 Mgal/d.
Hoffer plant: raw water, 18.0 Mgal/d; finished water, 20.0 Mgal/d.

FINISHED-WATER STORAGE:

Three clear wells, 5,000,000, 2,000,000, and 1,000,000 gallons; three elevated tanks of 1,000,000 gallons each.

FUTURE PLANS:

The capacity of the Hoffer plant will be increased. The clear-well capacity at this plant will be increased to 12 million gallons. Water lines will be extended.

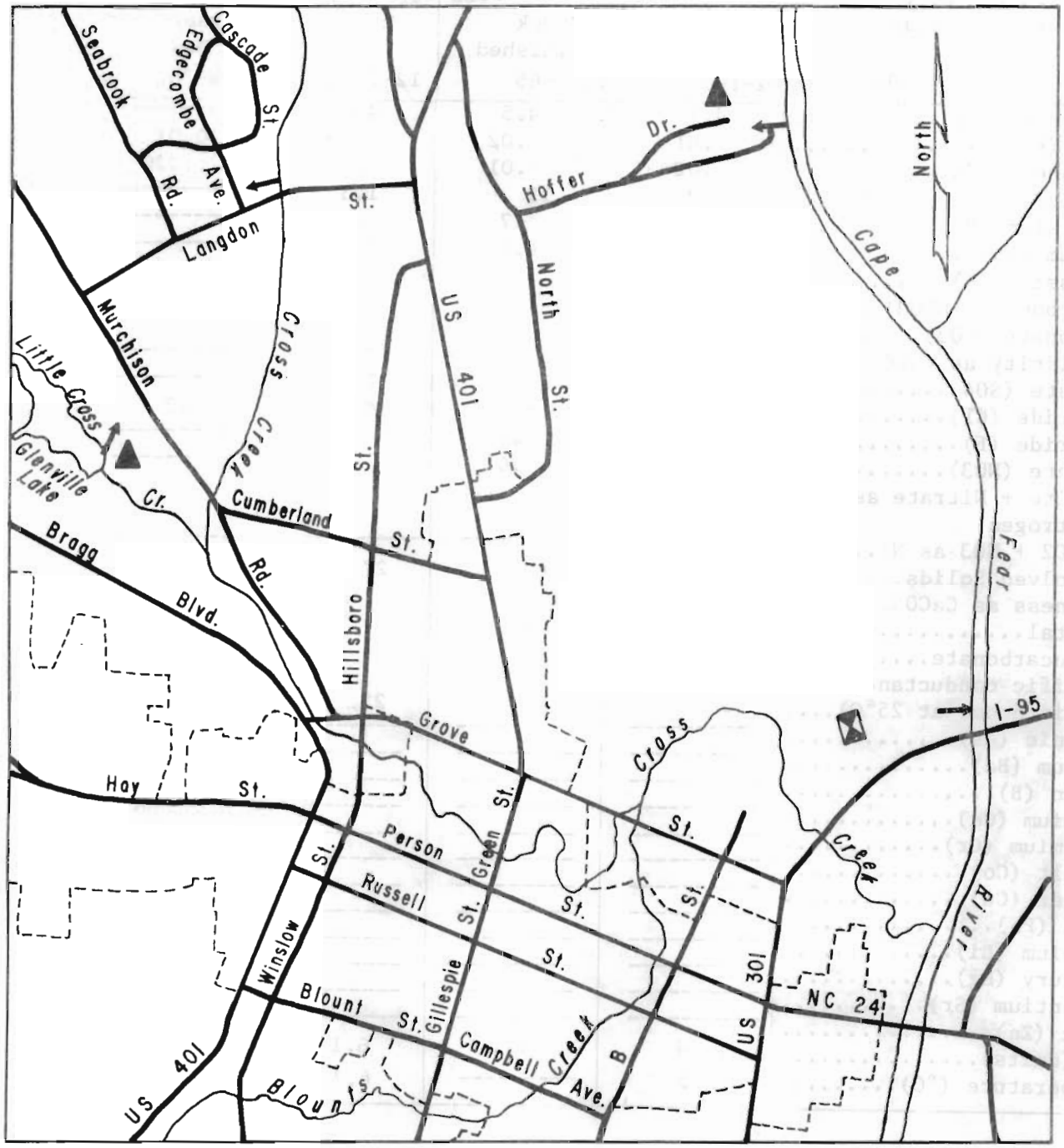
FAYETTEVILLE, CUMBERLAND COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Fayetteville is on the Cape Fear River, which can provide enough water for any foreseeable need of the city.

Ground water: Fayetteville is underlain by the upper sandy aquifer, which is generally less than 40 feet thick. The lower sandy aquifer underlies the upper sandy aquifer and is about 150 feet thick. Considering its thickness, the lower sandy aquifer should be capable of yielding about 200 gal/min to wells, but the meager data available indicate that well yields from this aquifer would be much smaller here. Most wells in the city obtain their water from the crystalline rock which underlies the lower sandy aquifer. A few tens of gallons per minute can be obtained from these wells. One well in the crystalline rock yielded water that was soft, had a high dissolved-solids concentration, and had a high alkalinity.

CITY OF FAYETTEVILLE



FAYETTEVILLE, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Little Cross Creek Raw	Little Cross Creek Finished	Cross Creek Raw	Little Cross Creek Raw
Date of collection.....	12-1-65	12-1-65	12-1-65	5-19-76
Silica (SiO_2).....	4.1	4.5	4.6	----------
Iron (Fe).....	.81	.02	.65	0.01
Manganese (Mn).....	.02	.01	.01	.020
Calcium (Ca).....	4.2	12	1.3	----------
Magnesium (Mg).....	.5	.7	.2	----------
Sodium (Na).....	3.5	4.0	2.2	----------
Potassium (K).....	1.3	1.4	.6	----------
Bicarbonate (HCO_3).....	11	18	5	----------
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	9	15	4	----------
Sulfate (SO_4).....	4.4	14	1.8	----------
Chloride (Cl).....	7.0	8.7	4.4	5.2
Fluoride (F).....	.0	.7	.1	----------
Nitrate (NO_3).....	.9	.6	.7	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	44	62	27	----------
Hardness as $CaCO_3$:				
Total.....	14	34	5	----------
Noncarbonate.....	5	18	1	----------
Specific conductance (micromhos at 25°C)....	50	97	23	46
Arsenic (As).....	----------	----------	----------	.002
Barium (Ba).....	----------	----------	----------	.0
Boron (B).....	----------	----------	----------	.02
Cadmium (Cd).....	----------	----------	----------	.000
Chromium (Cr).....	----------	----------	----------	.000
Cobalt (Co).....	----------	----------	----------	.000
Copper (Cu).....	----------	----------	----------	.031
Lead (Pb).....	----------	----------	----------	.000
Lithium (Li).....	----------	----------	----------	.00
Mercury (Hg).....	----------	----------	----------	.0005
Strontium (Sr).....	----------	----------	----------	.05
Zinc (Zn).....	----------	----------	----------	.00
pH (units).....	6.4	7.1	6.1	6.0
Temperature (°C).....	15.5	----------	6.7	----------

FAYETTEVILLE, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Cape Fear River Raw	Cape Fear River Finished		
Date of collection.....	5-19-76	5-19-76		
Silica (SiO_2).....	9.0	8.7		
Iron (Fe).....	.21	.04		
Manganese (Mn).....	.040	.030		
Calcium (Ca).....	3.1	3.0		
Magnesium (Mg).....	1.1	.9		
Sodium (Na).....	12	25		
Potassium (K).....	2.1	2.0		
Bicarbonate (HCO_3).....	20	22		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	16	18		
Sulfate (SO_4).....	9.9	26		
Chloride (Cl).....	10	15		
Fluoride (F).....	.2	1.0		
Nitrate (NO_3).....	----------	---------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.92	.80		
Dissolved Solids.....	62	96		
Hardness as $CaCO_3$:				
Total.....	12	11		
Noncarbonate.....	0	0		
Specific conductance (micromhos at 25°C)....	103	169		
Arsenic (As).....	.002	---------		
Barium (Ba).....	.0	---------		
Boron (B).....	.09	---------		
Cadmium (Cd).....	.000	---------		
Chromium (Cr).....	.000	---------		
Cobalt (Co).....	.000	---------		
Copper (Cu).....	.057	---------		
Lead (Pb).....	.002	---------		
Lithium (Li).....	.00	---------		
Mercury (Hg).....	.0005	---------		
Strontium (Sr).....	.08	---------		
Zinc (Zn).....	.00	---------		
pH (units).....	6.4	7.2		
Temperature (°C).....	----------	---------		

Mark Hume

FORT BRAGG, CUMBERLAND COUNTY

OWNERSHIP:

U. S. Government. Population served 46,995 in 1970. There are no metered customers. Also supplies Pope Air Force Base.

SOURCE:

Little River: Two dams, known as the upper dam and the lower dam, provide limited storage. The purpose of the upper dam is to provide head for gravity flow through a pipe to the water treatment plant. The purpose of the lower dam is to provide a pumping pool at the plant.

The intake at the upper dam is located at lat 35°10'54", long 79°02'17". The drainage area at this dam is 320 square miles, approximately. The intake at the lower dam is located at lat 35°10'37", long 79°01'36". The drainage area at this dam is 325 square miles, approximately.

RAW-WATER STORAGE:

The storage capacity at the lower dam is estimated at 40 million gallons. The storage capacity of the upper dam is unknown.

ALLOWABLE DRAFT:

The estimated allowable draft is 20 Mgal/d.

TOTAL USE:

Average (1975), 7.3 Mgal/d, metered; maximum daily not available.

INDUSTRIAL USE:

Industrial-type operations are on the base, but water use is not metered.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, rapid dual-media filtration, addition of phosphate compounds for corrosion control, ammoniation, adjustment of pH with lime, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

11.75 Mgal/d.

PUMPING CAPACITY OF TREATMENT PLANT:

Raw water, 11.0 Mgal/d; finished water, 15.1 Mgal/d.

FORT BRAGG, CUMBERLAND COUNTY

FINISHED-WATER STORAGE:

Three clear wells, 500,000, 1,000,000, and 1,000,000 gallons; four elevated tanks, 300,000, 300,000, 500,000, and 1,000,000 gallons; one standpipe, 500,000 gallons.

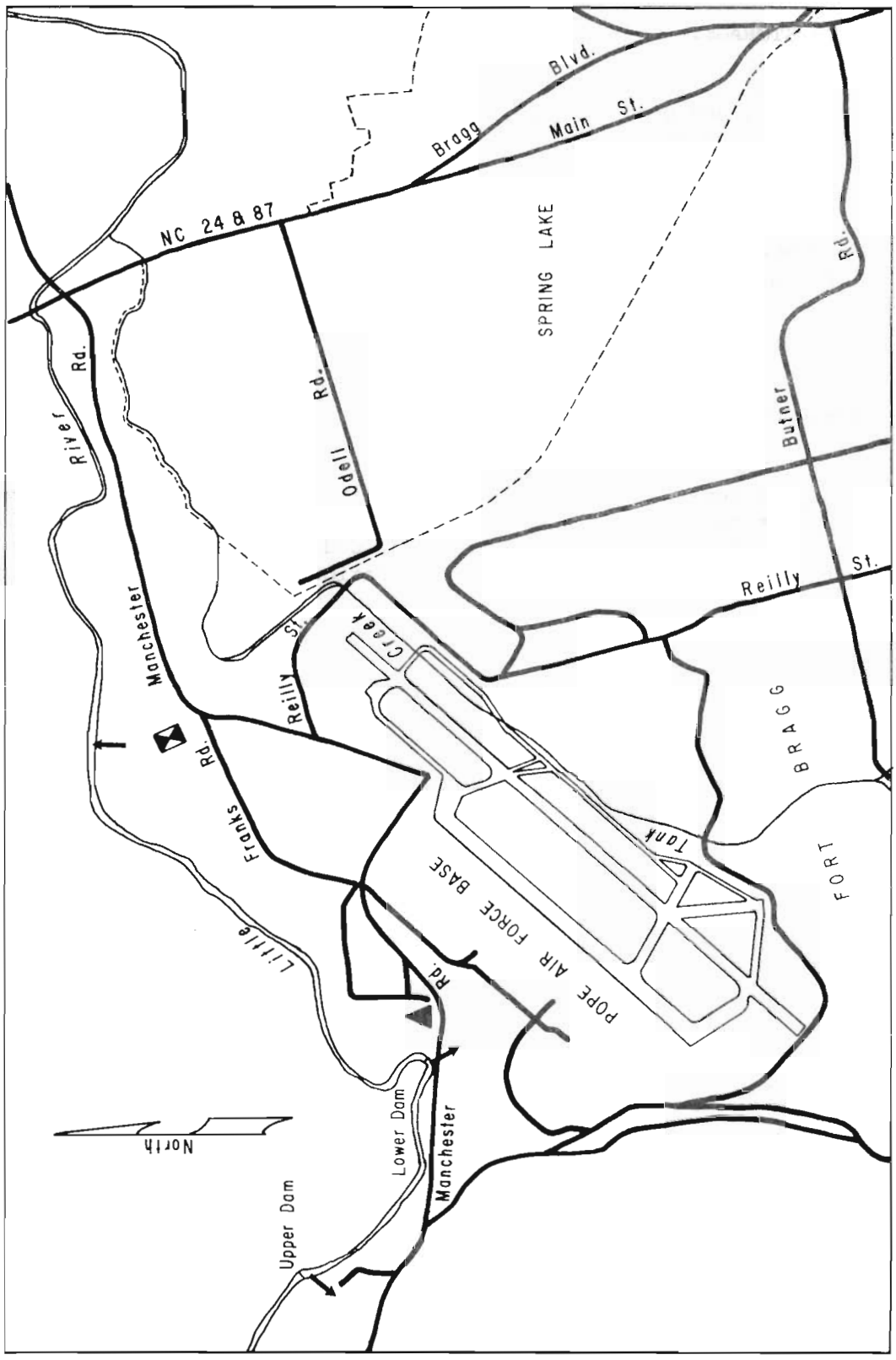
FUTURE PLANS:

A new raw-water line to the plant will be built; one raw-water pump will be replaced by one having a larger capacity.

WATER-RESOURCES APPRAISAL:

Surface water: Fort Bragg is on Little River. This river can supply any foreseeable need of the base.

Ground water: The upper sandy aquifer is 20 to 30 feet thick in this area. The underlying lower sandy aquifer ranges from 100 to 150 feet in thickness. In most areas on the base, the lower sandy aquifer probably will yield 100 to 250 gal/min to wells. The ground water here is probably soft, with a low dissolved-solids concentration, and might be excessively acidic.


FORT BRAGG WATER SYSTEM
NC 24 & 87
Bragg Blvd.
Main St.
SPRING LAKE
River Rd.
Manchester Rd.
Odell Rd.
Reilly St.
Butner Rd.
Reilly St.
Cross Creek
Franks Trail
POPE AIR FORCE BASE
Tank Rd.
BRAGG
FORT
Lower Dam
Upper Dam
Manchester
North
0 0.5 1 MILE
0 0.5 1 KILOMETER
EXPLANATION
Intake
Treatment plant
Sewage treament plant
Sewage outfall

FORT BRAGG, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Little River Raw	Little River Finished		
Date of collection.....	6-2-76	6-2-76		
Silica (SiO_2).....	3.5	3.7		
Iron (Fe).....	.27	.07		
Manganese (Mn).....	.020	.020		
Calcium (Ca).....	.8	9.5		
Magnesium (Mg).....	.2	.1		
Sodium (Na).....	2.2	2.9		
Potassium (K).....	.6	.7		
Bicarbonate (HCO_3).....	3	10		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	2	8		
Sulfate (SO_4).....	3.0	14		
Chloride (Cl).....	2.8	10		
Fluoride (F).....	.2	.8		
Nitrate (NO_3).....	---	---		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.00	.11		
Dissolved Solids.....	15	47		
Hardness as $CaCO_3$:				
Total.....	3	24		
Noncarbonate.....	0	16		
Specific conductance (micromhos at 25°C)....	21	79		
Arsenic (As).....	.000	---		
Barium (Ba).....	.1	---		
Boron (B).....	.06	---		
Cadmium (Cd).....	.000	---		
Chromium (Cr).....	.000	---		
Cobalt (Co).....	.000	---		
Copper (Cu).....	.005	---		
Lead (Pb).....	.000	---		
Lithium (Li).....	.00	---		
Mercury (Hg).....	.000	---		
Strontium (Sr).....	.04	---		
Zinc (Zn).....	.00	---		
pH (units).....	5.4	7.2		
Temperature (°C).....	---	---		

LAFAYETTE VILLAGE-SHERWOOD WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

LaFayette Water Corporation. Total population supplied about 12,800 in 1976. There are 3,800 metered customers. Service area includes Ashton Forest, Barwin Estates, Darwindale, Drake Park, Evergreen Estates, Gallup Acres, Iris Gardens, LaFayette Village, Montclair subdivision (sections 1-4), Pleasant Valley, Quail Ridge, Queensdale, Sedgefield, Sherwood, and Sunny Acres.

SOURCE:

Seventeen wells. See table on following page.

TOTAL USE:

Average use (1975), 0.76 Mgal/d, metered; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

Adjustment of pH with caustic soda by feeders at each well.

RATED CAPACITY OF TREATMENT PLANT:

Demand feeders.

PUMP CAPACITY:

Raw-water, 2.7 Mgal/d; finished-water, 2.7 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks: one of 50,000 gallons and one of 70,000 gallons. One ground tank of 500,000 gallons.

FUTURE PLANS:

Will drill a new well, expand system, and tie into the Crystal Springs system (2 wells).

Well data for LaFayette Village-Sherwood Water System, Cumberland County

USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump capacity (gal/min)	Remarks
Cu-127	35°02'16"	78°58'08"								206			
Cu-128	35°02'13"	78°58'07"								203			
Cu-129	35°02'11"	78°58'07"								204			
Cu-130	35°02'23"	78°57'46"			60					212			
Cu-131	35°02'22"	78°57'46"			60					212			
Cu-132	35°02'16"	78°57'44"		1962	66					212		150	
Cu-133	35°01'50"	78°58'00"		1968						175			
Cu-134	35°01'49"	78°58'01"		1968						170			
Cu-135	35°01'04"	78°58'05"	C. R. Underwood	3/1969	67	8	46	gravel, screened	46-61	192	41	200	
Cu-136	35°00'25"	78°57'37"		1969	78					188		100	
Cu-137	35°00'58"	78°56'41"		1962	59					163		75	
Cu-138	35°00'59"	78°56'39"		1962	61					175			No pump
Cu-139	35°01'32"	78°56'49"								192			
Cu-140	35°01'34"	78°56'46"								188		100	
Cu-141	35°01'35"	78°56'46"								188		100	
Cu-142	35°01'49"	78°56'34"								176			
Cu-143	35°01'50"	78°56'33"								181			

Note: All wells are equipped with turbine pumps and are located in topographically flat areas. All wells showing total depth produce from the lower sandy aquifer.

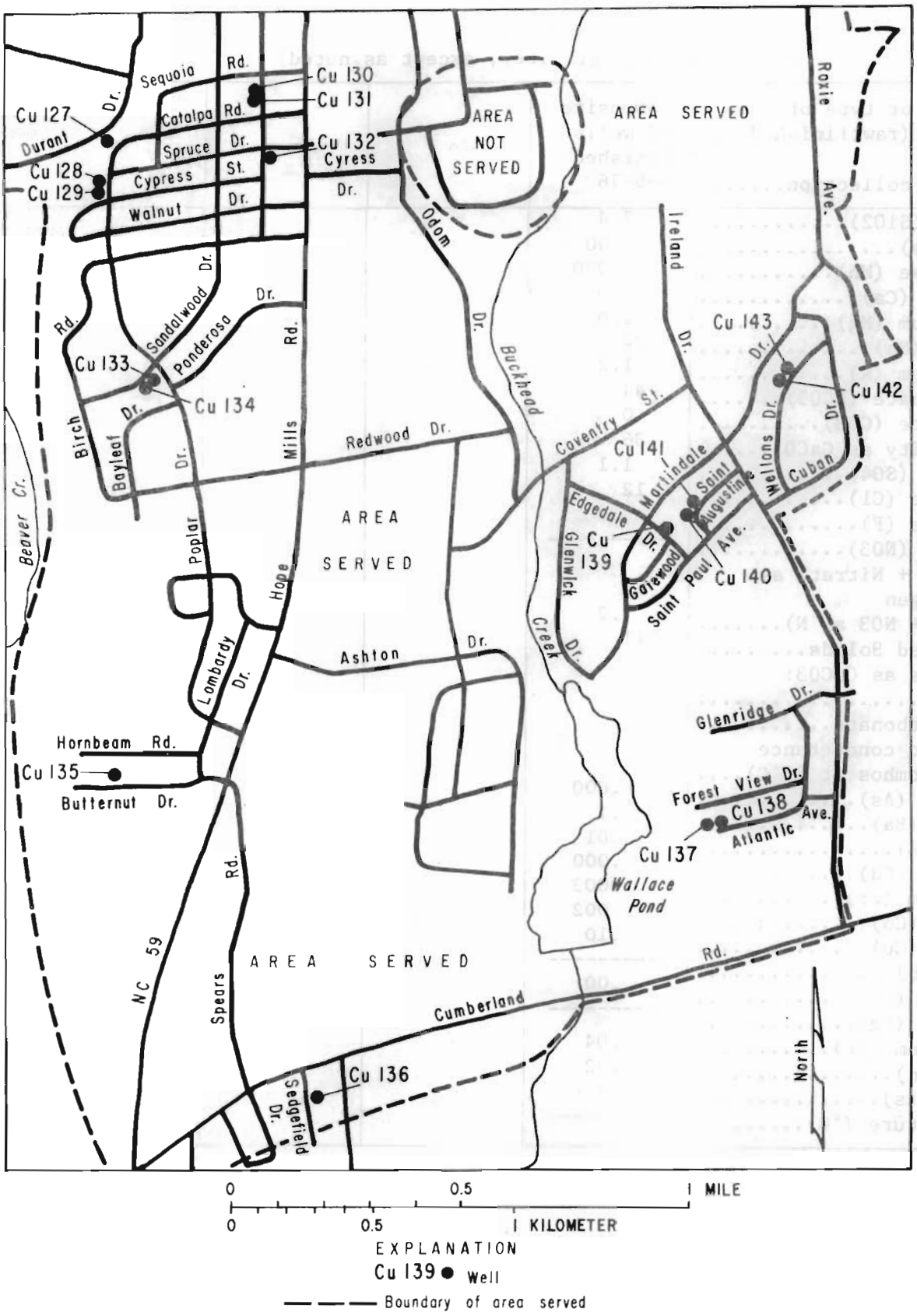
LAFAYETTE VILLAGE-SHERWOOD WATER SYSTEM, CUMBERLAND COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The topography here is characterized by broad flat hills between streams having broad swampy flood plains and many small impoundments. The average stream discharge in the area is estimated at 0.8 $(Mgal/d)/mi^2$. This water system lies just east of Beaver Creek, which could provide an adequate supply of water for the system without the need for an impoundment. Also, water could be obtained from the Cape Fear River, which is about 5 miles distant, or could be obtained by purchase from the City of Fayetteville.

Ground water: The upper sandy aquifer is about 25 feet thick here. It is underlain by the lower sandy aquifer which is about 150 feet thick. This aquifer is capable of yielding up to 200 gal/min to wells. The water produced from this aquifer is soft, has a low dissolved-solids concentration and is excessively acid.

LAFAYETTE VILLAGE - SHERWOOD WATER SYSTEM



LAFAYETTE VILLAGE-SHERWOOD WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Composite of wells Finished			
Date of collection.....	8-5-76			
Silica (SiO_2).....	7.4			
Iron (Fe).....	.00			
Manganese (Mn).....	.000			
Calcium (Ca).....	2.0			
Magnesium (Mg).....	1.0			
Sodium (Na).....	32			
Potassium (K).....	1.2			
Bicarbonate (HCO_3).....	44			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	36			
Sulfate (SO_4).....	1.1			
Chloride (Cl).....	12			
Fluoride (F).....	.0			
Nitrate (NO_3).....	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	7.2			
Dissolved Solids.....	111			
Hardness as $CaCO_3$:				
Total.....	9			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	159			
Arsenic (As).....	.000			
Barium (Ba).....	.1			
Boron (B).....	.01			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.003			
Cobalt (Co).....	.002			
Copper (Cu).....	.10			
Lead (Pb).....	---			
Lithium (Li).....	.00			
Mercury (Hg).....	---			
Strontium (Sr).....	.04			
Zinc (Zn).....	.02			
pH (units).....	6.3			
Temperature (°C).....	---			

LAGRANGE WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

LaGrange Waterworks Corporation. Total population supplied about 3,600 in 1976. There are 892 metered customers. Service area includes Deerwood, LaGrange, Murray Fork, Northshore Estates, and Valley Forge.

SOURCE:

Twelve wells (Nos. 1-9; 11-13). See table on following page.

TOTAL USE:

Average use (1975), 0.28 Mgal/d, metered; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

All wells have chlorinators and caustic soda feeders except well number 6, which does not require caustic soda.

RATED CAPACITY OF TREATMENT PLANT:

Demand-type feeders. Not rated.

PUMPING CAPACITY:

Raw-water, 0.73 Mgal/d; finished-water, 0.73 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks: one of 65,000 gallons and one of 125,000 gallons. Four pressure tanks: two of 4,000 gallons, one of 2,000 gallons and one of 6,000 gallons.

FUTURE PLANS:

Will drill new well and extend water lines.

Well data for LaGrange Water System, Cumberland County

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump capacity (gal/min)
1	Cu-86	35°05'53"	79°00'52"							280		39
2	Cu-87	35°05'57"	79°00'58"							240		88
3	Cu-88	35°05'35"	79°01'13"							259		20
4	Cu-89	35°05'46"	79°00'38"	N. M. Bill	5/1969	96	8	76	76-96	292	59	20
5	Cu-90	35°05'33"	79°00'53"							285		31
6	Cu-91	35°05'45"	79°01'18"							270		61
7	Cu-92	35°05'49"	79°00'08"	N. M. Bill	4/1972	75	8	35	35-45,48-68	250	35	40
8	Cu-93	35°05'20"	79°01'13"	N. M. Bill	11/1972	90	8	55	55-75	295	33.5	31
9	Cu-94	35°04'48"	79°00'26"							244		44
11	Cu-95	35°04'45"	78°59'33"							230		23
12	Cu-96	35°05'37"	79°00'29"	N. M. Bill	6/1974	85	8	56	56-66	274	23	62
13	Cu-97	35°05'44"	79°00'05"	N. M. Bill	6/1974	100	8	64	64-84	240	31	50

Note: All wells are in topographically flat areas and are equipped with submersible pumps. All the wells that have a total depth shown above are completed with screens in the lower sandy aquifer.

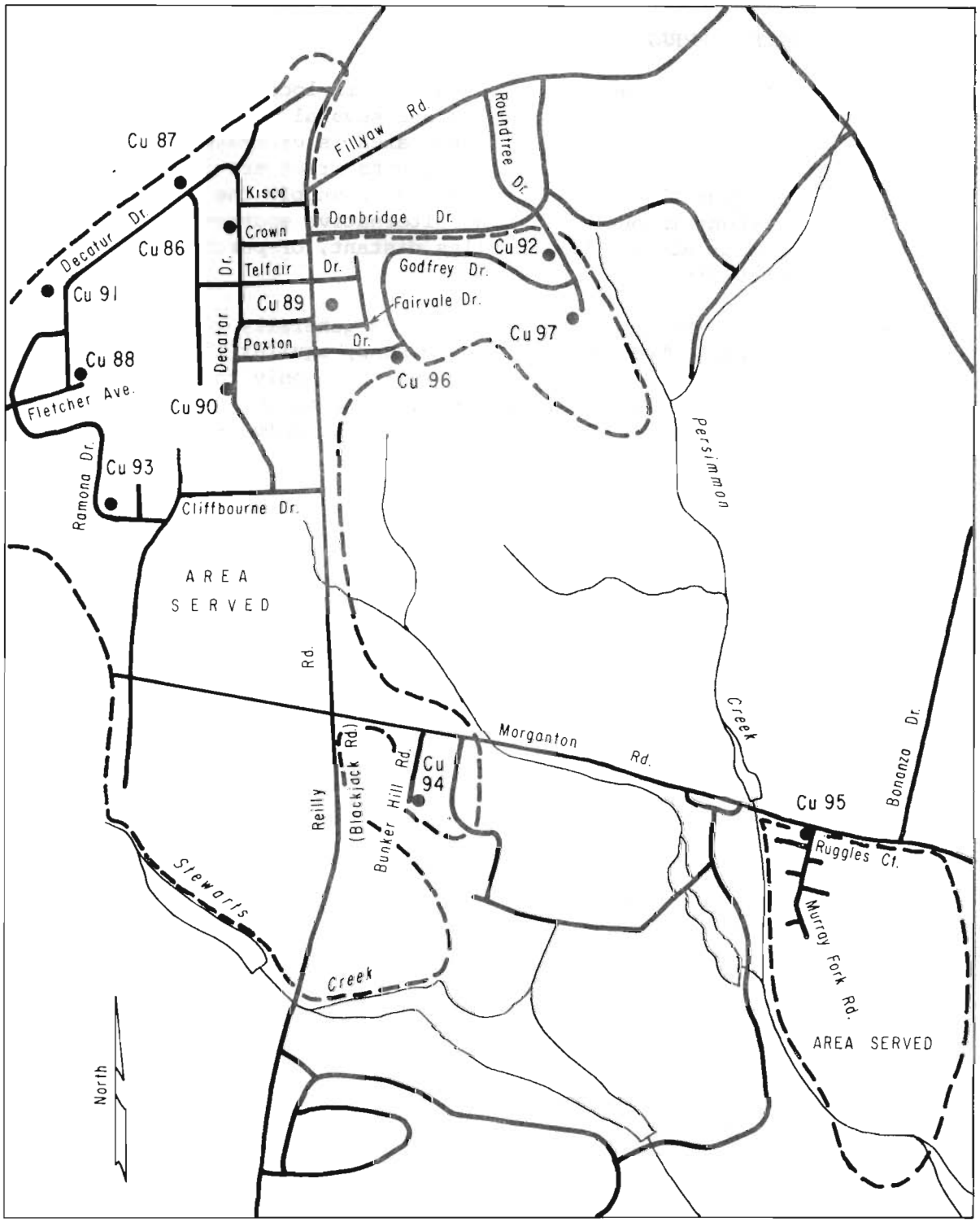
LAGRANGE WATER SYSTEM, CUMBERLAND COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The LaGrange water system is located on a broad, flat hill above Stewarts Creek. There are several small impoundments nearby. The average stream discharge in the area is estimated at 0.8 $(Mgal/d)/mi^2$. The low-flow characteristics of Stewarts Creek are not known with certainty, but the stream probably could supply the water needs of the system without impoundment. Two alternative sources of water would be the Cape Fear River, about 5 miles distant, or purchases from the City of Fayetteville.

Ground water: The upper sandy aquifer is generally 20 to 30 feet thick in this area. The underlying lower sandy aquifer is about 150 feet thick. The LaGrange water system wells tap only the upper half of the lower sandy aquifer, and well yields of up to 100 gal/min are obtained. The ground water here is soft, has a low dissolved-solids concentration and tends to be excessively acid.

LAGRANGE WATER SYSTEM



LAGRANGE WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 13 Raw			
Date of collection.....	5-27-76			
Silica (SiO2).....	6.3			
Iron (Fe).....	.06			
Manganese (Mn).....	.000			
Calcium (Ca).....	.2			
Magnesium (Mg).....	.1			
Sodium (Na).....	4.0			
Potassium (K).....	.3			
Bicarbonate (HCO3).....	3			
Carbonate (CO3).....	0			
Alkalinity as CaCO3.....	2			
Sulfate (SO4).....	.1			
Chloride (Cl).....	3.0			
Fluoride (F).....	.0			
Nitrate (NO3).....	----------			
Nitrite + Nitrate as Nitrogen (NO2 + NO3 as N).....	---------- 1.6			
Dissolved Solids.....	23			
Hardness as CaCO3:				
Total.....	1			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	31			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.01			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.003			
Cobalt (Co).....	.000			
Copper (Cu).....	.013			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....				
Strontium (Sr).....	.02			
Zinc (Zn).....	.01			
pH (units).....	4.8			
Temperature (°C).....	----------			

LOCH LOMOND-DEVONWOOD WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

Montclair Water Corporation. Total population supplied, about 2,600 in 1975 (757 metered customers). Service area includes Devonwood (284 customers), Gardens of Loch Lomond (34 customers), and Loch Lomond (439 customers) subdivisions.

SOURCE:

Eleven wells (Loch Lomond Nos. 1-3 and 5-8; Devonwood Nos. 1-4).

Loch Lomond Well No. 1, Cu-75, located at lat 35°04'06", long 79°00'40". Driller: _____. Date drilled: _____. Total depth: 60 ft. Diam: 10 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 243 ft. Static water level: _____. Pump capacity: 25 gal/min. Type pump: submersible.

Loch Lomond Well No. 2, Cu-76, located at lat 35°04'06", long 79°00'28". Driller: N. M. Bill. Date drilled: March 1972. Total depth: 264 ft. Diam: 6 in. Cased to: 226 ft. Type of finish: screen (gravel-packed). Screened interval: 226-256 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 244 ft. Static water level: 149 ft below land surface. Pump capacity: 40 gal/min. Type pump: submersible.

Loch Lomond Well No. 3, Cu-77, located at lat 35°04'09", long 79°00'13". Driller: Graham Brothers. Date drilled: May 1967. Total depth: 363 ft. Diam: 8 in. Cased to: 253 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 216 ft. Static water level: 69 ft below land surface. Pump capacity: 100 gal/min. Type pump: submersible.

Loch Lomond Well No. 5, Cu-78, located at lat 35°04'04", long 79°00'39". Driller: Bainbridge & Dance Well Drilling Corp. Date drilled: 1969. Total depth: 460 ft. Diam: 6.25 in. Cased to: 281 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 242 ft. Static water level: 80 ft below land surface. Pump capacity: 25 gal/min. Type pump: submersible.

Loch Lomond Well No. 6, Cu-79, located at lat 35°03'57", long 79°00'48". Driller: N. M. Bill. Date drilled: Oct. 1969. Total depth: 69 ft. Diam: 8 in. Cased to: 37 ft. Type of finish: screened (gravel-packed). Screened interval: 37-57 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 236 ft. Static water level: 7 ft below land surface. Pump capacity: 35 gal/min. Type pump: submersible.

LOCH LOMOND-DEVONWOOD WATER SYSTEM, CUMBERLAND COUNTY

Loch Lomond Well No. 7, Cu-80, located at lat 35°03'58", long 79°00'26". Driller: N. M. Bill. Date drilled: Aug. 1970. Total depth: 429 ft. Diam: 6 in. Cased to: 256 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 238 ft. Static water level: 149 ft below land surface. Pump capacity: 35 gal/min. Type pump: submersible.

Loch Lomond Well No. 8, Cu-81, located at lat 35°03'48", long 79°00'46". Driller: N. M. Bill. Date drilled: Dec. 1972. Total depth: 79 ft. Diam: 8 in. Cased to: 44 ft. Type of finish: screened (gravel-packed). Screened interval: 44-64 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 231 ft. Static water level: 15 ft below land surface. Well yield: 101 gal/min. Pump capacity: 20 gal/min. Type pump: submersible.

Devonwood Well No. 1, Cu-82, located at lat 35°04'42", long 78°59'45". Driller: _____. Date drilled: 1968. Total depth: 424 ft. Diam: 8 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 215 ft. Static water level: _____. Pump capacity: 100 gal/min. Type of pump: submersible.

Devonwood Well No. 2, Cu-83, located at lat 35°04'21", long 78°59'45". Driller: Graham Brothers. Date drilled: Dec. 1967. Total depth: 447 ft. Diam: 8 in. Cased to: 266 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 223 ft. Static water level: 96 ft below land surface. Pump capacity: 25 gal/min. Type pump: submersible.

Devonwood Well No. 3, Cu-84, located at lat 35°04'10", long 78°59'40". Driller: N. M. Bill. Date drilled: Apr. 1969. Total depth: 72 ft. Diam: 8 in. Cased to: 32 ft. Type of finish: screen (gravel-packed). Screened intervals: 32-35 ft and 52-62 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 214 ft. Static water level: 44 ft below land surface. Well yield: 30 gal/min. Pump capacity: 25 gal/min. Type pump: submersible.

Devonwood Well No. 4, Cu-85, located at lat 35°04'39", long 79°00'18". Driller: _____. Date drilled: 1973. Total depth: 120 ft. Diam: 8 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 240 ft. Static water level: _____. Pump capacity: 25 gal/min. Type pump: submersible.

TOTAL USE:

Average (1975), 0.14 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

None

LOCH LOMOND-DEVONWOOD WATER SYSTEM, CUMBERLAND COUNTY

TREATMENT:

None

PUMPING CAPACITY:

0.66 Mgal/d.

RAW-WATER STORAGE:

One 250,000 gallon elevated tank; three 20,000 and one 15,000 gallon standpipes.

FUTURE PLANS:

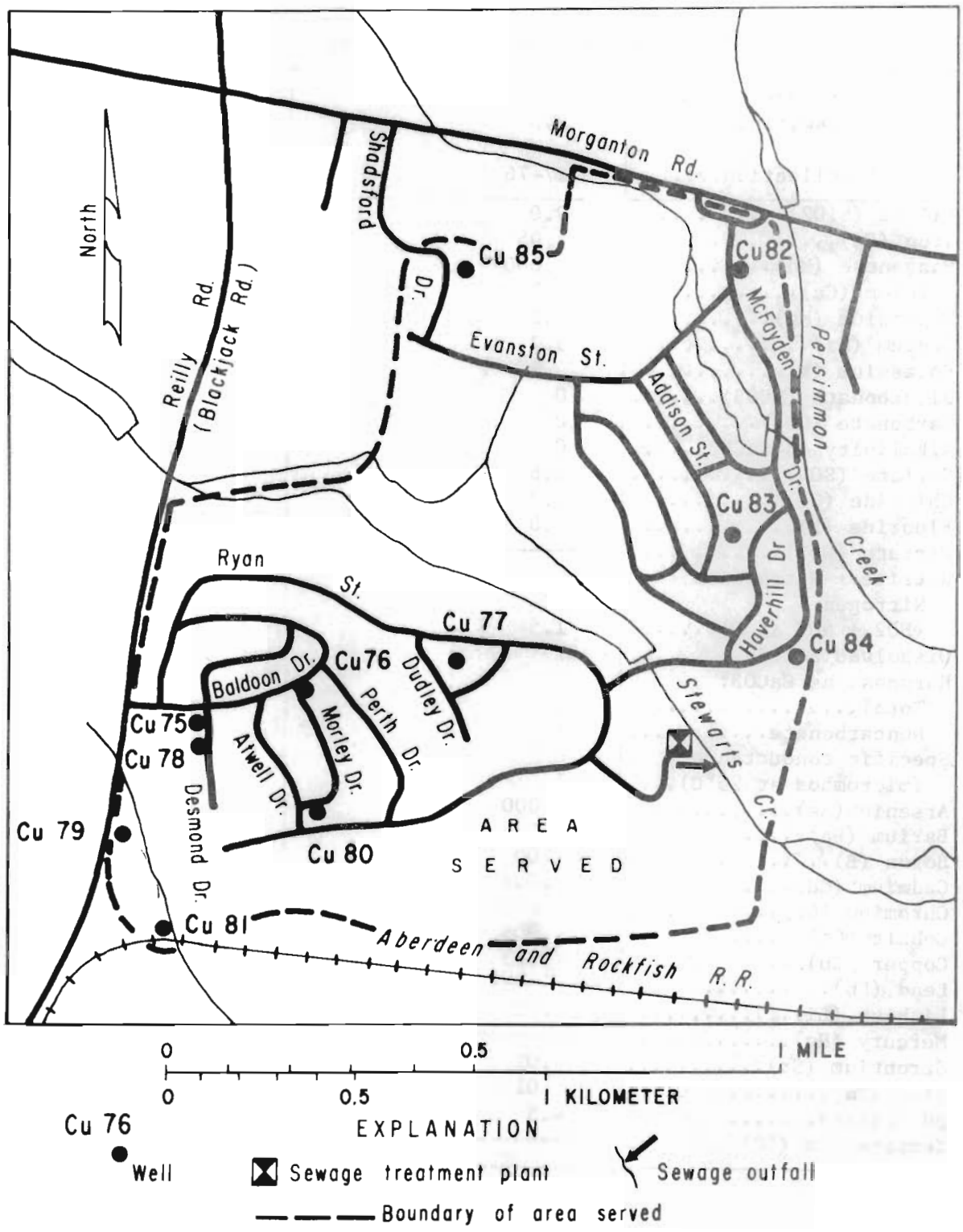
None.

WATER-RESOURCES APPRAISAL:

Surface water: This water system is located on two flat-topped hills bisected by Stewarts Creek. A small impoundment separates the Loch Lomond and Devonwood subdivisions. Several more small impoundments are in the vicinity. The average stream discharge in the area is estimated at 0.8 $(Mgal/d)/mi^2$. Stewarts Creek is believed to have excellent low-flow characteristics and could probably supply enough water to meet the system's needs without additional impoundment. As another alternative, water could be purchased from the City of Fayetteville.

Ground water: The upper sandy aquifer is generally about 20 to 30 feet thick. The underlying lower sandy aquifer is about 150 feet thick. The lower sandy aquifer contains more clay here than in most other places. Consequently, well yields from this aquifer are normally less than 100 gal/min. The crystalline rock is also used as an aquifer here and yields a few tens of gallons per minute. The ground water is soft, has a low dissolved-solids concentration, and is highly to excessively acid.

LOCH LOMOND-DEVONWOOD WATER SYSTEM



LOCH LOMOND-DEVONWOOD WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No.LL-6 Raw			
Date of collection.....	5-27-76			
Silica (SiO2).....	9.0			
Iron (Fe).....	.05			
Manganese (Mn).....	.000			
Calcium (Ca).....	.2			
Magnesium (Mg).....	.1			
Sodium (Na).....	3.7			
Potassium (K).....	.8			
Bicarbonate (HCO3).....	0			
Carbonate (CO3).....	0			
Alkalinity as CaCO3.....	0			
Sulfate (SO4).....	2.6			
Chloride (Cl).....	3.7			
Fluoride (F).....	.0			
Nitrate (NO3).....	----------			
Nitrite + Nitrate as Nitrogen (NO2 + NO3 as N).....	1.5			
Dissolved Solids.....	27			
Hardness as CaCO3:				
Total.....	1			
Noncarbonate.....	1			
Specific conductance (micromhos at 25°C)....	41			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.00			
Cadmium (Cd).....	.007			
Chromium (Cr).....	.003			
Cobalt (Co).....	.009			
Copper (Cu).....	.013			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.02			
Zinc (Zn).....	.01			
pH (units).....	4.5			
Temperature (°C).....	----------			

MONTCLAIR WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

Montclair Water Corporation. Total population supplied, about 4,600 in 1975 (1,363 metered customers). Service area includes Montclair subdivision (564 customers), Brittany Place (120 customers), Chestnut Hill (152 customers), Leisureburg (325 customers), and Woodstream (202 customers) subdivisions.

SOURCE:

Five wells (Nos. 1-5).

Well No. 1, Cu-70, located at lat 35°02'53", long 78°57'32". Driller: _____. Date drilled: _____. Total depth: 58 ft. Diam: 8 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 214 ft. Static water level: _____. Pump capacity: 100 gal/min. Type pump: turbine.

Well No. 2, Cu-71, located at lat 35°03'04", long 78°57'21". Driller: _____. Date drilled: _____. Total depth: 64 ft. Diam: 8 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 222 ft. Static water level: _____. Pump capacity: 100 gal/min. Type pump: turbine.

Well No. 3, Cu-72, located at lat 35°03'02", long 78°57'47". Driller: Standard Well & Pump Co. Date drilled: Aug. 1966. Total depth: 72 ft. Diam: 8 in. Cased to: 42 ft. Type of finish: screened (gravel-packed). Screened intervals: 42-52 and 58-68 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 213 ft. Static water level: _____. Pump capacity: 90 gal/min. Type pump: turbine.

Well No. 4, Cu-73, located at lat 35°03'13", long 78°57'58". Driller: N. M. Bill. Date drilled: Nov. 1969. Total depth: 62 ft. Diam: 8 in. Cased to: 40 ft. Type of finish: screened (gravel-packed). Screened interval: 40-50 ft. Topography: slope. Aquifer: lower sandy. Altitude of land surface: 210 ft. Static water level: 19 ft below land surface. Pump capacity: 110 gal/min. Type pump: turbine.

Well No. 5, Cu-74, located at lat 35°03'06", long 78°57'59". Driller: N. M. Bill. Date drilled: Mar. 1972. Total depth: 70 ft. Diam: 8 in. Cased to: 41 ft. Type of finish: screened (gravel-packed). Screened interval: 41-61 ft. Topography: slope. Aquifer: lower sandy. Altitude of land surface: 205 ft. Static water level: 33 ft below land surface. Pump capacity: 180 gal/min. Type pump: submersible.

TOTAL USE:

Average (1975), 0.25 Mgal/d, estimated; maximum daily not available.

MONTCLAIR WATER SYSTEM, CUMBERLAND COUNTY

INDUSTRIAL USE:

None.

TREATMENT:

Adjustment of pH with soda ash (all except Well No. 5).

RATED CAPACITY OF TREATMENT PLANTS:

Demand-type feeders. Not rated.

PUMPING CAPACITY:

Raw water, 0.8 Mgal/d; finished water, 0.8 Mgal/d.

RAW WATER-STORAGE:

None.

FINISHED-WATER STORAGE:

One 500,000 gallon elevated tank; one 30,000 gallon pneumatic tank.

FUTURE PLANS:

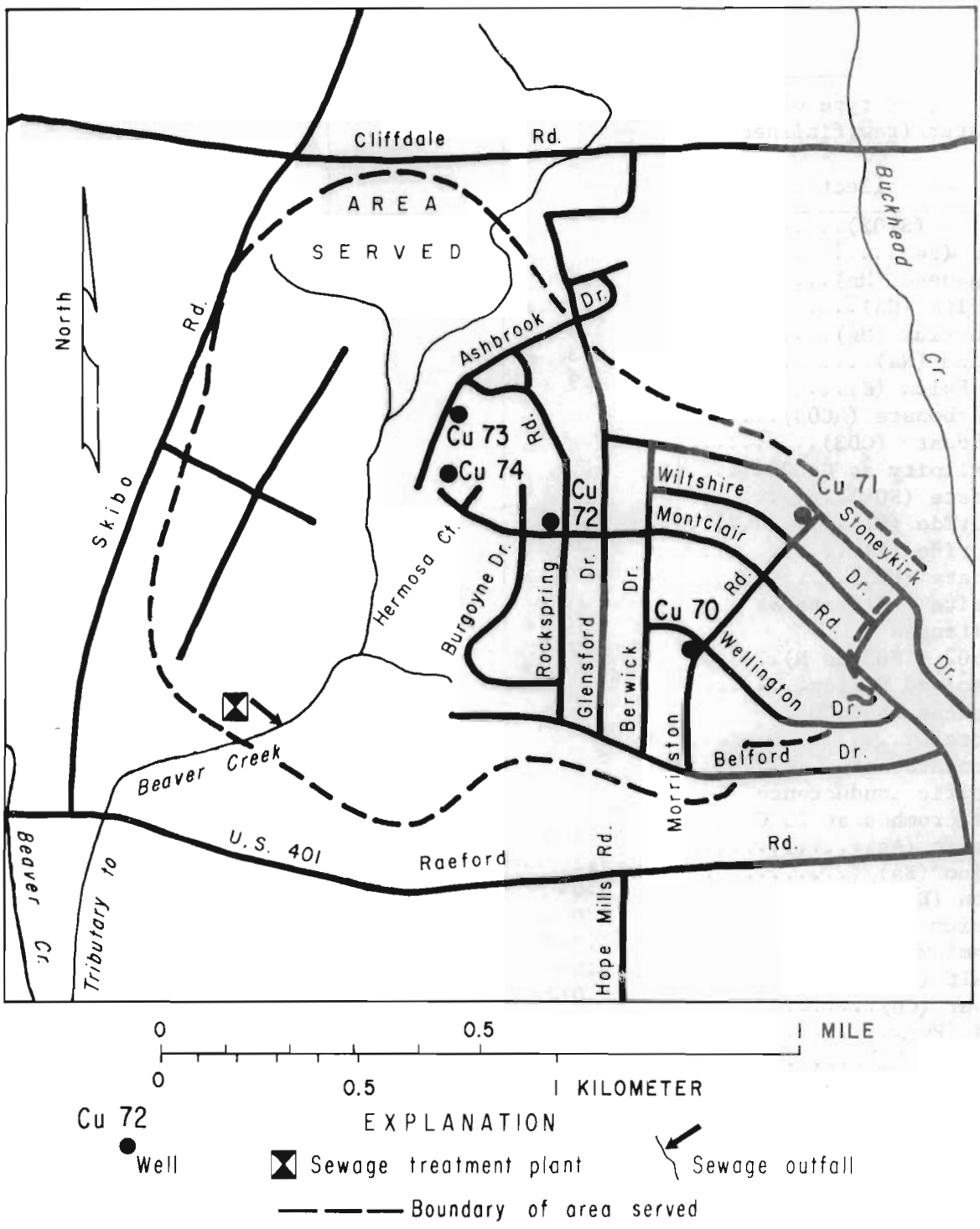
Will drill new well.

WATER-RESOURCES APPRAISAL:

Surface water: The Montclair water system is on a broad, flat hill between Buckhead Creek and Beaver Creek. The flood plains of the streams are broad and swampy. The average discharge of streams in the area is estimated at 0.8 $(Mgal/d)/mi^2$. Beaver Creek has excellent low-flow characteristics and could provide adequate water for this system without impoundment. Water could also be obtained from the Cape Fear River, which is about 5 miles distant. Another alternative would be to purchase water from the City of Fayetteville.

Ground water: The upper sandy aquifer is generally about 20 to 30 feet thick here. The underlying lower sandy aquifer is about 150 feet thick and can yield up to 200 gal/min to wells. The ground water is soft, has a low dissolved-solids concentration, and is excessively acid.

MONTCLAIR WATER SYSTEM



MONTCLAIR WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 5 Raw			
Date of collection.....	6-3-76			
Silica (SiO_2).....	6.6			
Iron (Fe).....	.04			
Manganese (Mn).....	.000			
Calcium (Ca).....	.1			
Magnesium (Mg).....	1.1			
Sodium (Na).....	9.3			
Potassium (K).....	.9			
Bicarbonate (HCO_3).....	2			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	2			
Sulfate (SO_4).....	.1			
Chloride (Cl).....	8.7			
Fluoride (F).....	.0			
Nitrate (NO_3).....	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	4.7			
Dissolved Solids.....	49			
Hardness as $CaCO_3$:				
Total.....	5			
Noncarbonate.....	3			
Specific conductance (micromhos at 25°C)....	81			
Arsenic (As).....	.000			
Barium (Ba).....	.1			
Boron (B).....	.04			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.012			
Lead (Pb).....	---			
Lithium (Li).....	.00			
Mercury (Hg).....	---			
Strontium (Sr).....	.04			
Zinc (Zn).....	.01			
pH (units).....	4.4			
Temperature (°C).....	---			

PONDEROSA WATER SYSTEM, CUMBERLAND COUNTY

OWNERSHIP:

Cumberland Water Company. Total population supplied, about 5,800 in 1976. There are 1,666 metered customers.

SOURCE:

Ten wells (Nos. 1, 2, and 5-12). See table on following page.

TOTAL USE:

Average use (1975), 0.48 Mgal/d, metered; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

All wells have caustic soda feeders.

RATED CAPACITY OF TREATMENT PLANT:

Demand-type feeders. Not rated.

PUMPING CAPACITY:

Raw water, 1.5 Mgal/d; finished water, 1.5 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks: one of 500,000 and one of 100,000 gallons.

FUTURE PLANS:

None

Well data for Ponderosa water system, Cumberland County

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Cased to (ft)	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump capacity (gal/min)
1	Cu-116	35°05'23"	78°58'45"		1964	62			241		55
2	Cu-117	35°05'27"	78°58'39"	C. Underwood	9/1968	80	45	45-55 60-65 67-72 74-78	241	28.5	45
5	Cu-118	35°05'40"	78°58'51"		1967	72			253		45
6	Cu-119	35°05'27"	78°59'15"		1968	101	42	42-47 49-54 60-65 70-75 80-85 90-95	259	38	200
7	Cu-120	35°04'57"	78°58'57"	C. Underwood	11/1968	88	47	47-52 63-78	239	28	55
8	Cu-121	35°05'19"	78°59'22"	C. Underwood	9/1969	91	68	68-88	252	39.2	200
9	Cu-122	35°05'45"	78°59'03"	C. Underwood	2/1972	78	54	54-74	255	34	55
10	Cu-123	35°05'20"	78°59'38"	C. Underwood	3/1972	75	50	50-55 60-70	240	34	60
11	Cu-124	35°05'31"	78°59'39"	C. Underwood	5/1972	76	50	50-70	221	20.8	125
12	Cu-125	35°05'33"	78°59'26"	C. Underwood	7/1972	84	52	52-57 60-65 70-80	245	30.3	220

Note: All wells are of 8-inch diameter, equipped with trubine pumps, located in areas of flat topography, and completed with screen in the lower sandy aquifer.

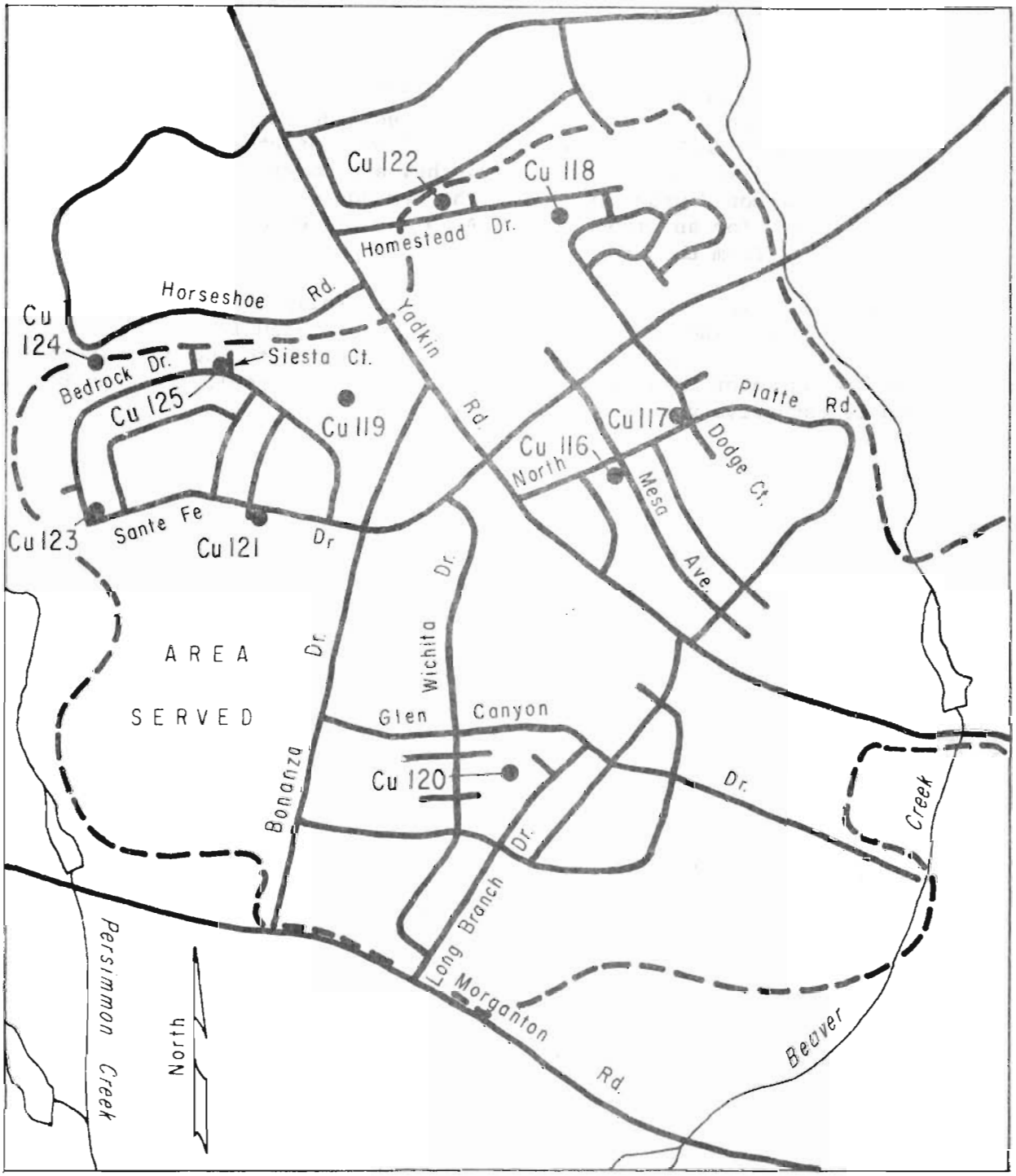
PONDEROSA WATER SYSTEM, CUMBERLAND COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The Ponderosa water system is on a broad, flat hill above Beaver Creek. Numerous, small impoundments are on small streams in the surrounding area. The average stream discharge in the area is estimated at 0.8 (Mgal/d)/mi^2. Although the low-flow characteristics of Beaver Creek are not known with certainty, they are considered to be excellent. This stream could probably supply the demands of this water system without the need for an impoundment. An alternative source would be to purchase water from the City of Fayetteville.

Ground water: The upper sandy aquifer is generally about 20 to 30 ft thick and the underlying lower sandy aquifer is about 150 ft thick in this area. The lower sandy aquifer is capable of yielding up to 200 gal/min to wells. The ground water here is soft, has a low dissolved-solids concentration, and is excessively acid.

PONDEROSA WATER SYSTEM



PONDEROSA WATER SYSTEM, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 10 Raw			
Date of collection.....	5-27-76			
Silica (SiO_2).....	6.5			
Iron (Fe).....	.01			
Manganese (Mn).....	.000			
Calcium (Ca).....	.2			
Magnesium (Mg).....	.1			
Sodium (Na).....	3.4			
Potassium (K).....	.5			
Bicarbonate (HCO_3).....	2			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	2			
Sulfate (SO_4).....	.0			
Chloride (Cl).....	3.3			
Fluoride (F).....	.0			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	2.0			
Dissolved Solids.....	24			
Hardness as $CaCO_3$:				
Total.....	1			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	35			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.01			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.003			
Cobalt (Co).....	.000			
Copper (Cu).....	.012			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.02			
Zinc (Zn).....	.01			
pH (units).....	4.9			
Temperature (°C).....	----------			

SPRING LAKE, CUMBERLAND COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 11,000 in 1975 (2,582 metered customers, 890 of whom are in suburban areas).

SOURCE:

Six wells (Nos. 1, 3-5, and 8-9).

Well No. 1, Cu-67, located at lat 35°09'56", long 78°58'12". Driller: _____. Date drilled: _____. Total depth: 155 ft. Diam: 8 in. Cased to: _____. Type of finish: probably screened. Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 292 ft. Static water level: _____. Pump capacity: 100 gal/min. Type pump: turbine.

Well No. 3, Cu-126, located at lat 35°09'53", long 78°58'07". Driller: _____. Date drilled: _____. Total depth: probably about 100 ft. Diam: _____. Cased to: _____. Type of finish: probably screened. Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 302 ft. Static water level: _____. Pump capacity: 100 gal/min. Type pump: turbine.

Well No. 4, Cu-68, located at lat 35°09'53", long 78°58'04". Driller: _____. Date drilled: _____. Total depth: 123 ft. Diam: _____. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 300 ft. Static water level: 71 ft below land surface. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 5, Cu-69, located at lat 35°09'52", long 78°58'04". Driller: Gaines Drilling Co. Date drilled: 1951. Total depth: 107 ft. Diam: 8 in. Cased to: _____. Type of finish: screened. Screened interval: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 300 ft. Static water level: _____. Pump capacity: 60 gal/min. Type pump: turbine.

Well No. 8, Cu-65, located at lat 35°10'52", long 78°59'36". Driller: Chas. R. Underwood, Date drilled: June 1968. Total depth: 53 ft. Diam: 8 in. Cased to: 32 ft. Type of finish: screened. Screened intervals: 32-37 and 37-47 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 190 ft. Static water level: 12 ft. Well yield: 250 gal/min. Pump capacity: _____. Type pump: turbine.

Well No. 9, Cu-66, located at lat 35°10'50", long 78°59'47". Driller: Chas. R. Underwood, Date drilled: Dec. 1968. Total depth: 58 ft. Diam: 8 in. Cased to: 36 ft. Type of finish: screened. Screened intervals: 36-41 and 41-51 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 190 ft. Static water level: 19 ft. Pump capacity: 250 gal/min. Type pump: turbine.

SPRING LAKE, CUMBERLAND COUNTY

TOTAL USE:

Average (1975) 0.6 Mgal/d, estimated: maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

Addition of phosphate compounds for corrosion control and adjustment of pH with caustic soda at well No. 9 only. Other wells have no treatment facilities.

RATED CAPACITY OF TREATMENT PLANT:

Demand-type feeders on well No. 9.

PUMPING CAPACITY:

1.3 Mgal/d.

FINISHED-WATER STORAGE:

One standpipe, 780,000 gallons.

FUTURE PLANS:

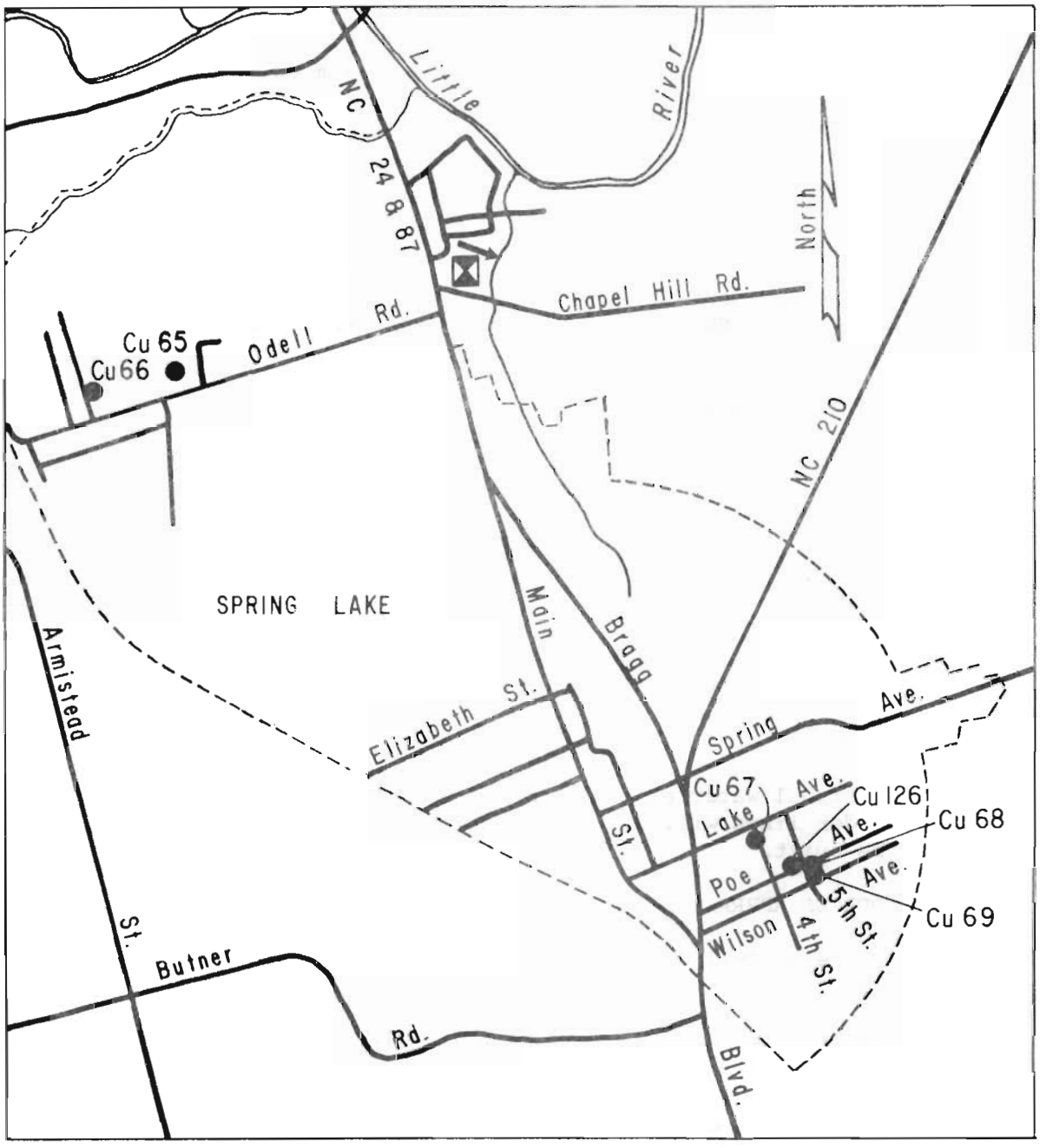
An additional water tank will be built, new lines will be added, and some older lines will be replaced. A central water-treatment plant will be built.

WATER-RESOURCES APPRAISAL:

Surface water: Spring Lake is located on Little River, which could supply any foreseeable water need of the town.

Ground water: The upper sandy aquifer is about 20 feet thick here. The underlying lower sandy aquifer is a little over 100 feet thick and is capable of yielding over 250 gal/min to wells. The ground water here is soft, has a low dissolved-solids concentration, and is slightly acid.

TOWN OF SPRING LAKE



SPRING LAKE, CUMBERLAND COUNTY

ANALYSES
(In milligrams per liter, except as noted)

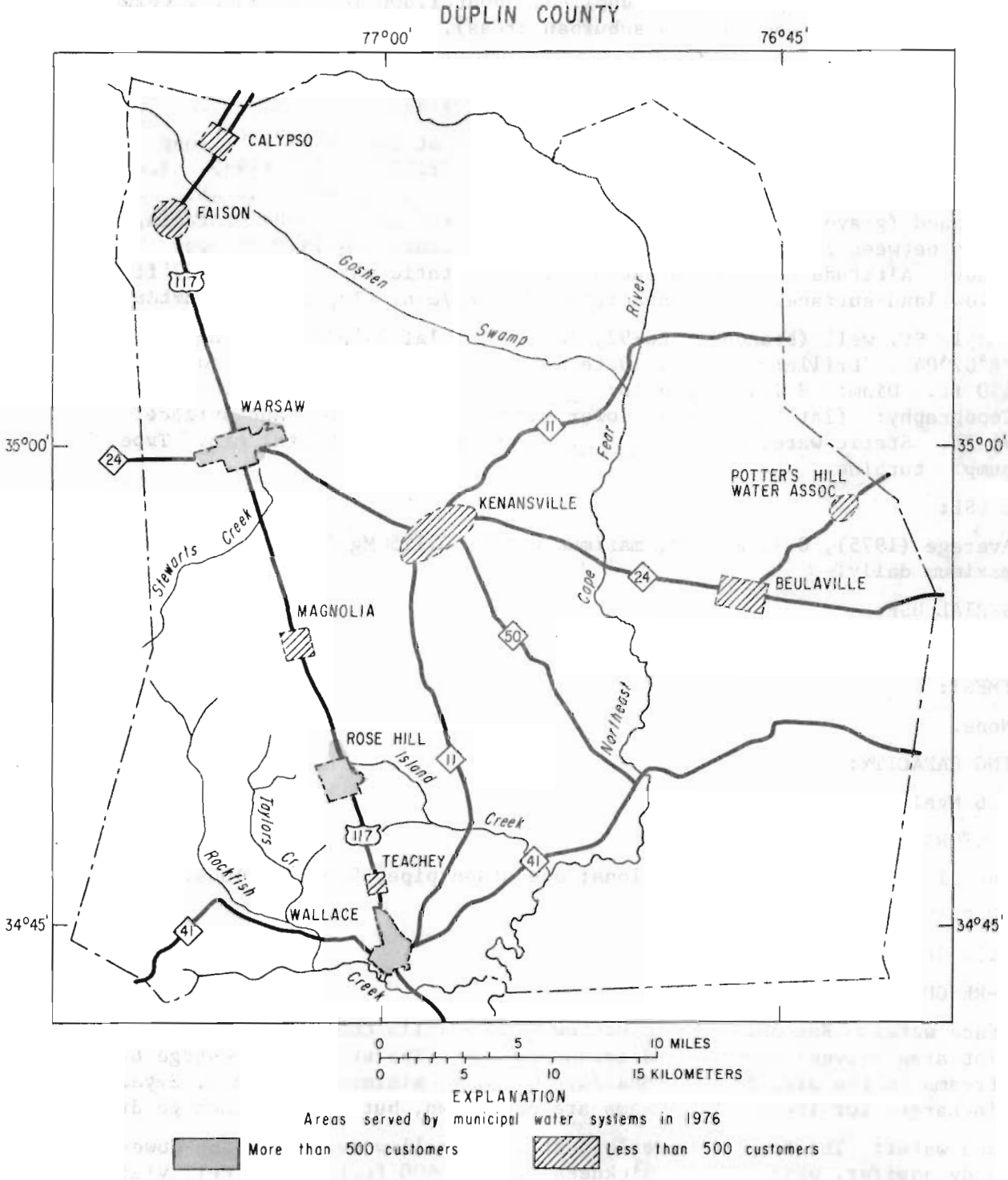
Source, or type of water (raw;finished)...	Well No. 9 Finished			
Date of collection.....	12-10-75			
Silica (SiO_2).....	5.5			
Iron (Fe).....	.01			
Manganese (Mn).....	.020			
Calcium (Ca).....	2.8			
Magnesium (Mg).....	1.3			
Sodium (Na).....	30			
Potassium (K).....	1.3			
Bicarbonate (HCO_3).....	66			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	54			
Sulfate (SO_4).....	6.4			
Chloride (Cl).....	5.7			
Fluoride (F).....	1.4			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	2.2			
Dissolved Solids.....	97			
Hardness as $CaCO_3$:				
Total.....	12			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	162			
Arsenic (As).....	.001			
Barium (Ba).....	.0			
Boron (B).....	.00			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.06			
Zinc (Zn).....	.00			
pH (units).....	6.6			
Temperature (°C).....	----------			

DUPLIN COUNTY

WATER-RESOURCES APPRAISAL

Duplin County is in the south-central part of the North Carolina Coastal Plain. The topography of the county is flat with swampy stream courses. The county is drained by tributaries of the Cape Fear River, principally the Northeast Cape Fear River. The average stream discharge ranges from 0.8 (Mgal/d)/mi^2 in the northern two-thirds of the county to 0.9 (Mgal/d)/mi^2 in the southern third. Minimum flows range from 0.00027 to 0.03 (Mgal/d)/mi^2 and average 0.014 (Mgal/d)/mi^2. Streams with drainage areas as large as 66 square miles have been observed to go dry. The 7-day, 2-year low flows range from 0.005 to 0.068 (Mgal/d)/mi^2 and average 0.031 (Mgal/d)/mi^2. Three public water supplies have 500 or more customers: Wallace, Rose Hill, and Warsaw. These, as well as smaller public and individual supplies, are obtained from ground water. The county population in 1970 was 38,015.

The upper sandy aquifer is thin in Duplin County, having a maximum thickness of about 40 feet. The limestone aquifer is present in the southeastern corner of the county. Here, it may be as much as 50 feet thick. Where thickest, this aquifer may yield as much as a few hundred gallons per minute of water to wells. The lower sandy aquifer forms the base of the sedimentary deposits in the county. It is about 300 feet thick in the northwestern part of the county, thickening to over 800 feet in the southeast. In the northwest, this aquifer can yield a few hundred gallons per minute to wells, while in the southeast yields as much as 2,000 gal/min can probably be obtained. The maximum ground-water yield is estimated to be 0.90 (Mgal/d)/mi^2. The maximum recharge to the deeper parts of the lower sandy aquifer is estimated to be 0.06 (Mgal/d)/mi^2. The ground water from representative wells is soft in the northwestern part of the county and becomes hard in the southeast. In any part of the county, ground water having excessive iron may be encountered. Water from the deepest part of the lower sandy aquifer may be soft and also could contain excessive chlorides.


DUPLIN COUNTY
77°00'
76°45'
35°00'
34°45'
CALYPSO
FAISON
WARSAW
KENANSVILLE
POTTER'S HILL WATER ASSOC.
BEULAVILLE
MAGNOLIA
ROSE HILL
TEACHEY
WALLACE
Goshen Swamp
Fear River
Stewarts Creek
Cape Fear
Northeast
Island Creek
Taylors Cr.
Rockfish Creek
117
24
11
50
41
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

ROSE HILL, DUPLIN COUNTY

OWNERHSIP:

Municipal. Total population supplied, about 1,800 in 1976 (600 metered customers, 10 of whom are in suburban areas).

SOURCE:

Two wells (Mallard Alley and N. Maple St. wells).

Mallard Alley (Town Hall) well, Du-91, located at lat 34°49'28", long 78°01'42". Driller: Emmitte Fields. Date drilled: June 1959. Total depth: 302 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: nine screens totaling 45 ft between 192 and 296 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 95 ft. Static water level: 27 ft below land surface. Pump capacity: 325 gal/min. Type pump: turbine.

N. Maple St. well (standby), Du-92, located at lat 34°49'24", long 78°02'04". Driller: _____. Date drilled: June 1950. Total depth: 190 ft. Diam: 8 in. Cased to: _____. Type of finish: open-hole(?). Topography: flat. Aquifer: lower sandy. Altitude of land surface: 95 ft. Static water level: _____. Pump capacity: 90 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.11 Mgal/d; maximum daily, 0.125 Mgal/d. No date for maximum daily.

INDUSTRIAL USE:

0.006 Mgal/d.

TREATMENT:

None.

PUMPING CAPACITY:

0.6 Mgal/d.

WATER STORAGE:

One elevated tank, 75,000 gallons; one stand pipe, 5,000 gallons.

FUTURE PLANS:

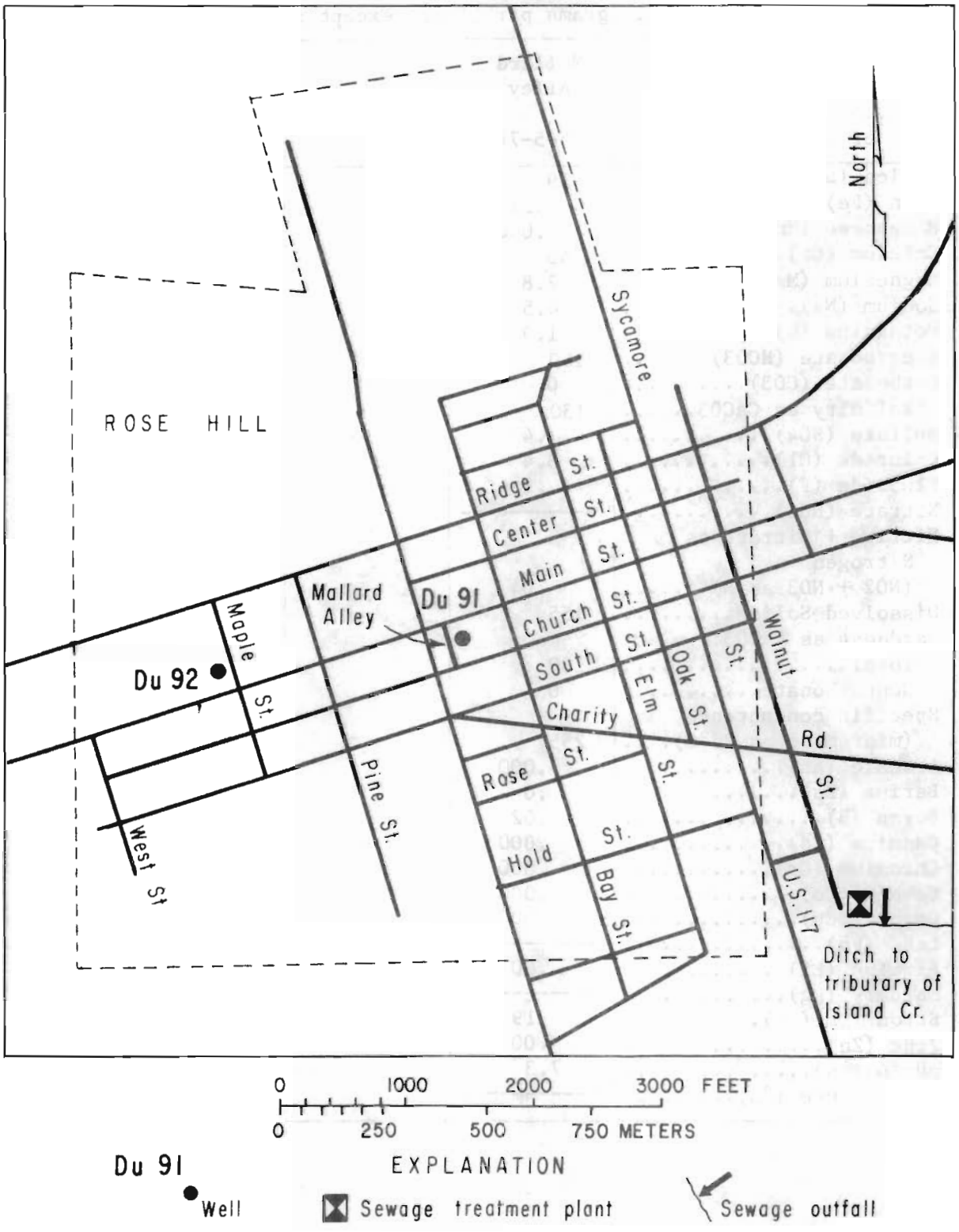
Will drill new well.

WATER-RESOURCES APPRAISAL:

Surface water: Rose Hill is in southwestern Duplin County. It is on a flat area between Taylors and Island Creeks. The average discharge of streams in the area is 0.9 $(Mgal/d)/mi^2$. The minimum and 7-day, 2-year discharges for the local streams are not known, but many of them go dry.

Ground water: The town is underlain at very shallow depths by the lower sandy aquifer, which has a thickness of over 600 feet here. Well yields of over 1,000 gal/min can probably be obtained from this aquifer. The water is hard and may contain excessive iron or manganese.

TOWN OF ROSE HILL



ROSE HILL, DUPLIN COUNTY

ANALYSES
(In milligrams per liter except as noted)

Source, or type of water (raw; finished)	Mallard Alley			
Date of collection	5-5-76			
Silica (SiO_2)	19			
Iron (Fe)	.21			
Manganese (Mn)	.050			
Calcium (Ca)	46			
Magnesium (Mg)	2.8			
Sodium (Na)	4.5			
Potassium (K)	1.9			
Bicarbonate (HCO_3)	160			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	130			
Sulfate (SO_4)	.4			
Chloride (Cl)	3.4			
Fluoride (F)	.1			
Nitrate (NO_3)	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.04			
Dissolved Solids	155			
Hardness as $CaCO_3$:				
Total	130			
Noncarbonate	0			
Specific conductance (micromhos at 25°C)	255			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.02			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)	----------			
Lithium (Li)	.00			
Mercury (Hg)	----------			
Strontium (Sr)	.19			
Zinc (Zn)	.00			
pH (units)	7.3			
Temperature (°C)	----------			

WALLACE, DUPLIN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,100 in 1976. (2,000 metered customers, about 100 of whom are in suburban areas).

SOURCE:

Ten wells (Nos. 3-12).
See table next page.

TOTAL USE:

Average (1975), 3.8 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

3.5 Mgal/d, estimated. Principal users include J. P. Stevens Co., Wallace Sewing Co., and Band R Frozen Foods, Inc.

TREATMENT:

None.

PUMPING CAPACITY:

6.0 Mgal/d.

WATER STORAGE:

One ground tank, 1,000,000; two elevated tanks, 300,000 gallons each.

FUTURE PLANS:

Will drill new well.

WATER-RESOURCES APPRAISAL:

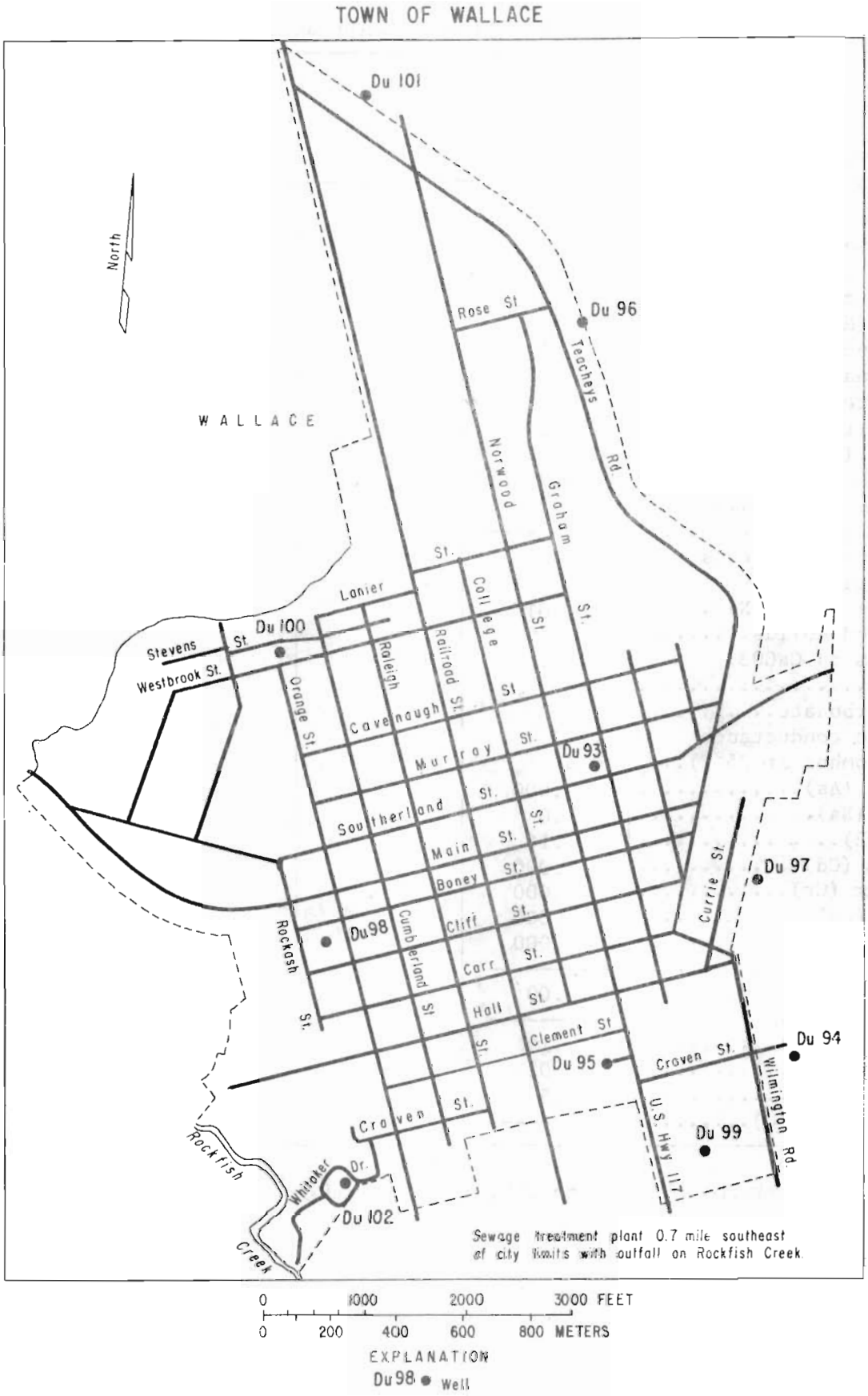
Surface water: Wallace is in southwestern Duplin County on Rockfish Creek. The average discharge of streams in the area is 0.9 (Mgal/d)/mi^2. Minimum stream discharges average 0.0008 (Mgal/d)/mi^2. The 7-day, 2-year low flows average 0.019 (Mgal/d)/mi^2. The nearby streams could not provide adequate surface water for Wallace's needs without impoundments. However, the Northeast Cape Fear River, about 5 miles east of town, could provide an ample supply.

Ground water: Wallace is underlain at very shallow depths by the lower sandy aquifer, which is over 600 feet thick. Well yields of over 1,000 gal/min can be obtained from this aquifer. Water from wells in this aquifer is hard and may contain excessive iron.

Well data for Wallace, Duplin County

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump setting (ft)	Pump capacity (gal/min)
3	Du-93	34°44'16"	77°59'33"	Carolina Well	1956	379	6	110		-			350
4	Du-94	34°43'47"	77°59'08"	Carolina Well	1957	360	6	120		-	60e		300
5	Du-95	34°43'45"	77°59'30"	Hartsfield Water	1964	375	6	110		-	45e		300
6	Du-96	34°44'59"	77°59'38"	Hartsfield Water	1965	360	6	100		-	60e		350
7	Du-97	34°44'03"	77°59'15"	Hartsfield Water	1968	360	10	120		-	70e		500
8	Du-98	34°43'55"	78°00'04"	Sydnor Hydro.	2/ 2/68	360	10	242	242-252 264-274 278-288 312-322 343-353	50	35		550
9	Du-99	34°43'38"	77°59'20"	Sydnor Hydro.	5/16/69	319	10	234	234-264 278-288 304-314	-	48	215	550
10	Du-100	34°44'24"	78°00'11"	Sydnor Hydro.	1970	385	10	212		50	80e		525
11	Du-101	34°45'20"	78°00'06"	Hartsfield Water	12/15/69	390	10/8	170	13 screens between 170-384 totaling 64 ft	68	50		550
12	Du-102	34°43'32"	78°00'00"	C. R. Underwood	11/ 5/71	365	10	150	9 screens between 150-350 totaling 60 ft	32	42		525

e Estimated. Note: All wells are in flat areas, are screened and gravel-packed, are in the lower sandy aquifer, and are equipped with turbine pumps.


TOWN OF WALLACE
Du 101
North
Rose St
Du 96
Teacheys Rd.
WALLACE
Norwood
Graham
St.
Lanier
College St
Du 100
Stevens St
Westbrook St.
Raleigh
Railroad St
Orange St
Cavenaugh St
Murray St
Du 93
Southerland St
Main St
Boney St
Cliff St
Carr St
Hall St
Clement St
Du 97
Currie St
Du98
Rockash St
Cumberland St
Du 95
Craven St
Du 94
Wilmington Rd.
U.S. Hwy 117
Du 99
Craven St
Rockfish Creek
Whitaker Dr.
Du 102
Sewage treatment plant 0.7 mile southeast of city limits with outfall on Rockfish Creek.
0 1000 2000 3000 FEET
0 200 400 600 800 METERS
EXPLANATION
Du98 Well

WALLACE, DUPLIN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Composite[1/]			
Date of collection.....	5-5-76			
Silica (SiO_2).....	15			
Iron (Fe).....	.01			
Manganese (Mn).....	.030			
Calcium (Ca).....	29			
Magnesium (Mg).....	5.6			
Sodium (Na).....	31			
Potassium (K).....	8.5			
Bicarbonate (HCO_3).....	200			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	170			
Sulfate (SO_4).....	.9			
Chloride (Cl).....	3.7			
Fluoride (F).....	.3			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	194			
Hardness as $CaCO_3$:				
Total.....	96			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	324			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.16			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.19			
Zinc (Zn).....	.02			
pH (units).....	7.5			
Temperature (°C).....	----------			

[1/] Composite sample of wells nos. 5, 6, 7, 8, and 9.

WARSAW, DUPLIN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,000 in 1976 (1,200 metered customers, about 12 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 1-3).

Well No. 1 (near old water tank), Du-88, located at lat 35°00'06", long 78°05'55". Driller: Heater Well Co. Date drilled: 1960. Total depth: 140 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 155 ft. Static water level: 45 ft below land surface. Pump setting: 100 ft. Pump capacity: 350 gal/min. Type pump: turbine.

Well No. 2 (Jordan St. well), Du-89, located at lat 34°59'53", long 78°05'55". Driller: Heater Well Co. Date drilled: 1966. Total depth: 144 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 153 ft. Static water level: 46 ft below land surface. Pump setting: 90 ft. Pump capacity: 215 gal/min. Type pump: turbine.

Well No. 3 (at new tank), Du-90, located at lat 35°00'40", long 78°05'34". Driller: Heater Well Co. Date drilled: April 1972. Total depth: 255 ft. Diam: 8 in. Cased to: 112 ft. Type of finish: screened (gravel-packed). Screened intervals: 112-124, 160-180, 187-191, and 239-243 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 150 ft. Static water level: 44 ft below land surface. Pump capacity: 215 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.28 Mgal/d, estimated; maximum daily not determined.

INDUSTRIAL USE:

Negligible.

TREATMENT:

Chlorination at each well.

RATED CAPACITY OF TREATMENT PLANTS:

Demand-type feeders; not rated

PUMPING CAPACITY:

Raw water, 1.1 Mgal/d; finished water, 1.1 Mgal/d.

RAW-WATER STORAGE:

None.

WARSAW, DUPLIN COUNTY

FINISHED-WATER STORAGE:

Two elevated tanks, 75,000 and 300,000 gallons.

FUTURE PLANS:

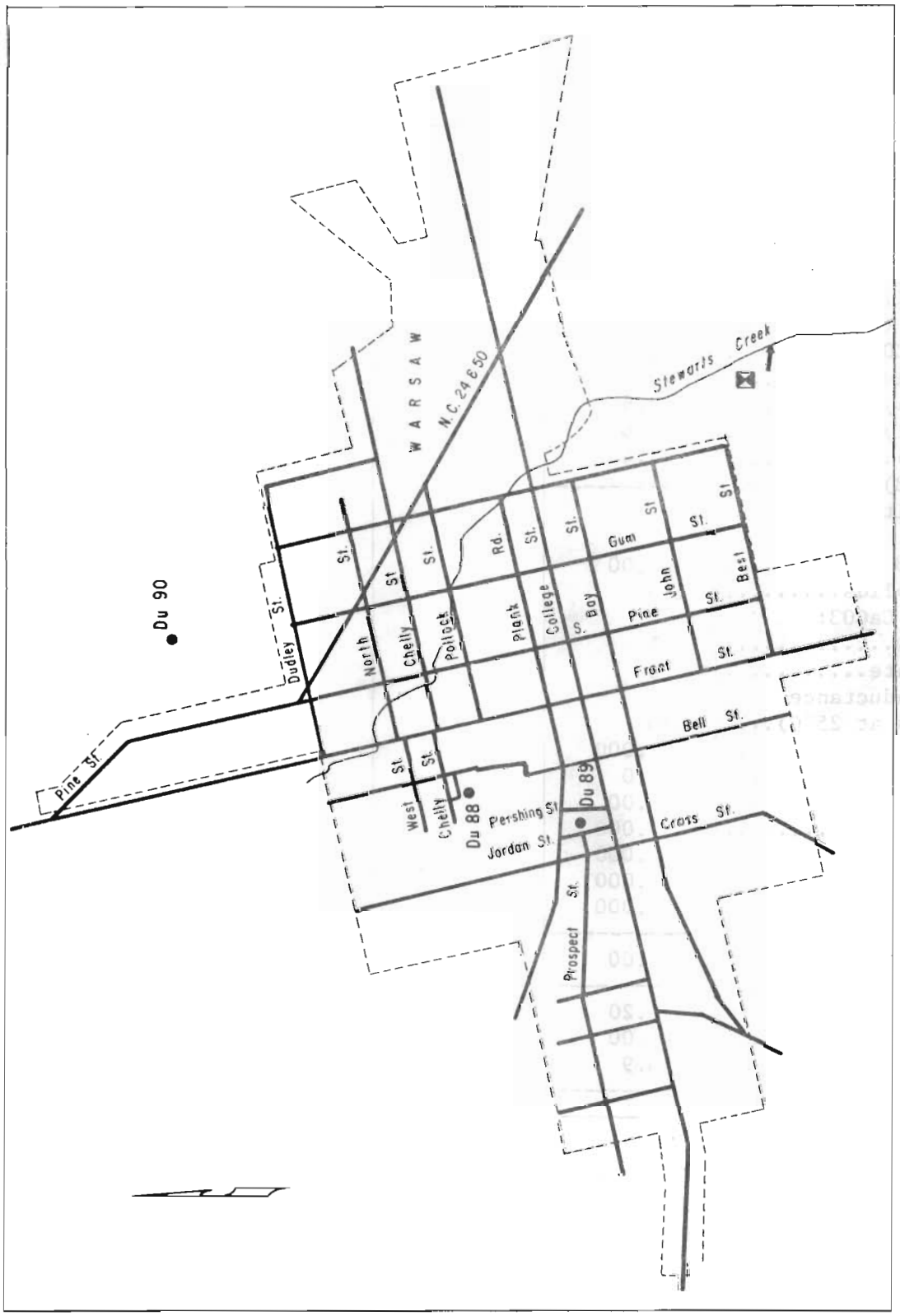
Fluoridation of water supply.

WATER-RESOURCES APPRAISAL:

Surface water: Warsaw is in west-central Duplin County. No streams of any consequence are near the town. It is, rather, the headwater area for several streams, which radiate in all directions from the town. The average discharge of streams in the area is 0.8 $(Mgal/d)/mi^2$. Nothing is known about the low-flow characteristics of the streams, except that some of them probably go dry. It is unlikely that an adequate surface-water supply could be obtained near town without numerous impoundments.

Ground water: The lower sandy aquifer is found at shallow depths beneath Warsaw and has a thickness of about 500 feet. The aquifer should be capable of yielding several hundred gallons per minute to wells. The water from this aquifer may range from soft to hard and may contain excessive iron and manganese.

TOWN OF WARSAW



WARSAW, DUPLIN COUNTY

ANALYSES
(In milligrams per liter, except as noted)

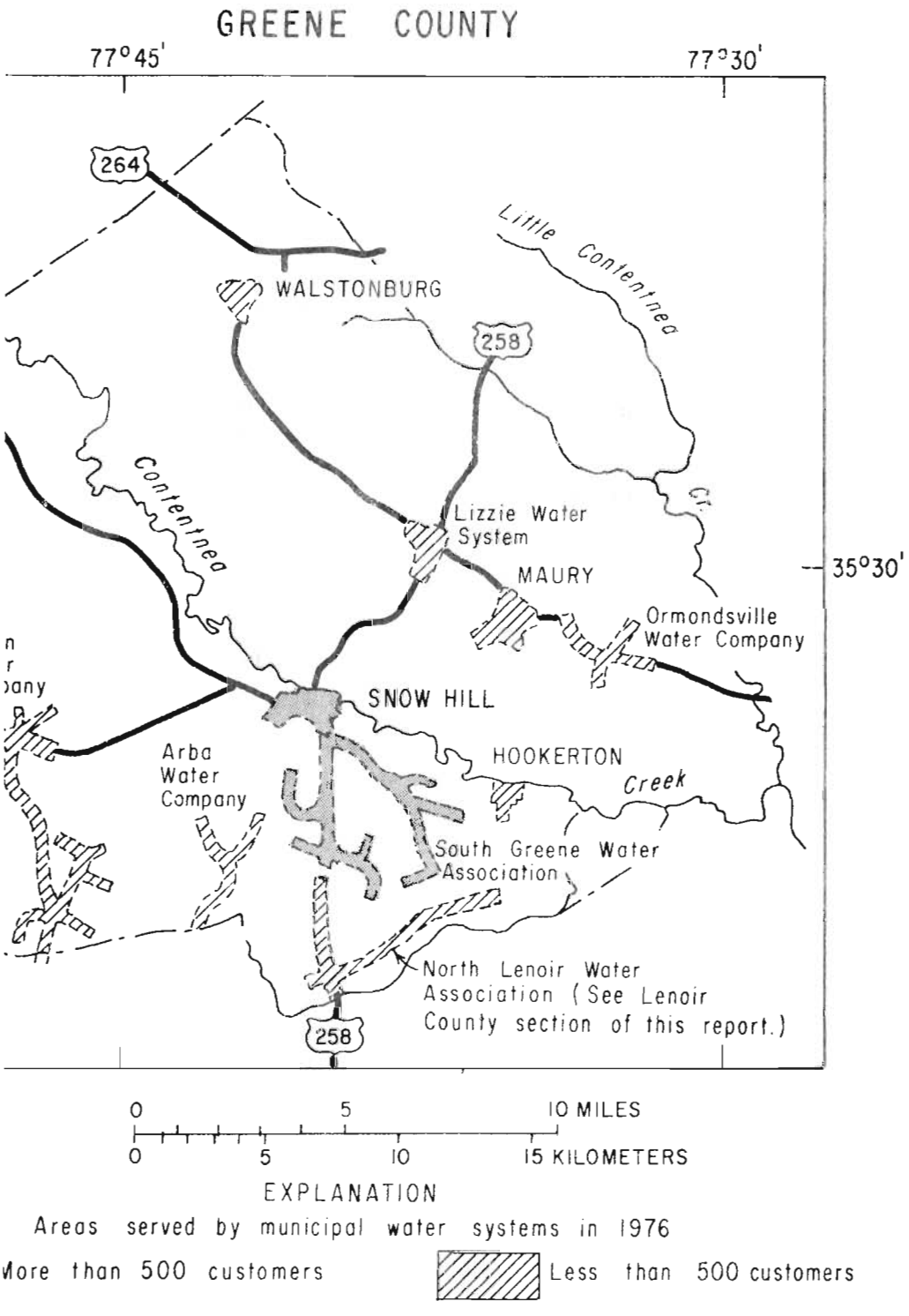
Source, or type of water (raw;finished)...	Well No. 3 Raw			
Date of collection.....	5-6-76			
Silica (SiO2).....	26			
Iron (Fe).....	1.3			
Manganese (Mn).....	.11			
Calcium (Ca).....	20			
Magnesium (Mg).....	.3			
Sodium (Na).....	3.3			
Potassium (K).....	2.2			
Bicarbonate (HCO3).....	91			
Carbonate (CO3).....	0			
Alkalinity as CaCO3.....	75			
Sulfate (SO4).....	3.6			
Chloride (Cl).....	3.6			
Fluoride (F).....	.4			
Nitrate (NO3).....	----------			
Nitrite + Nitrate as Nitrogen (NO2 + NO3 as N).....	.00			
Dissolved Solids.....	106			
Hardness as CaCO3:				
Total.....	51			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	170			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.00			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.20			
Zinc (Zn).....	.00			
pH (units).....	6.9			
Temperature (°C).....	----------			

GREENE COUNTY

WATER-RESOURCES APPRAISAL

Greene County is in the west-central part of the North Carolina Coastal Plain. The topography of the county is characterized by flat interstream areas and wide, flat stream valleys. Low bluffs mark the edges of many of the major stream valleys. The county is drained by tributaries of the Neuse River, particularly Contentnea and Little Contentnea Creeks. The average stream discharge is 0.8 (Mgal/d)/mi^2. Minimum flows range from 0.003 to 0.36 (Mgal/d)/mi^2 and average 0.07 (Mgal/d)/mi^2. Streams having drainage areas as large as 4 square miles occasionally go dry. The 7-day, 2-year low flow ranges from 0.031 to 0.47 (Mgal/d)/mi^2 and average 0.13 (Mgal/d)/mi^2. The only public water supply having 500 or more customers is at Snow Hill. This supply and the smaller public water supplies are all obtained from ground water. The county's population in 1970 was 14,967.

The county is underlain by sedimentary deposits that thicken in a southeasterly direction. The thickness of these deposits is about 200 feet in the northwestern part of the county and over 700 feet in the southeast. The upper sandy aquifer ranges from less than 20 to perhaps 75 feet in thickness and is not considered a significant aquifer. The lower sandy aquifer occupies the remainder of the sedimentary section. This aquifer could yield a few hundred gallons per minute to wells in the northwestern part of the county and over 1,000 gal/min to wells in the southeastern part. The maximum estimated ground-water yield is 0.8 (Mgal/d)/mi^2. However, the maximum estimated recharge to the deeper parts of the lower sandy aquifer is only 0.05 (Mgal/d)/mi^2. The water from deep wells tends to be soft to hard.


GREENE COUNTY
77°45'
77°30'
35°30'
264
WALSTONBURG
258
Little Contentnea
Contentnea
Cr.
Lizzie Water System
MAURY
Ormondsville Water Company
SNOW HILL
HOOKERTON
Creek
Arba Water Company
South Greene Water Association
North Lenoir Water Association (See Lenoir County section of this report.)
258
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

SNOW HILL, GREENE COUNTY

OWNERSHIP:

Municipal. Also supplies the South Greene County Water Association. Total population supplied, about 3,500 in 1976 (550 metered customers in Snow Hill and 565 metered customers in the South Greene County Water Association).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1, Gr-57, located at lat 35°25'39", long 77°39'54". Driller: Layne-Atlantic Co. Date drilled: 1964. Total depth: 290 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 110 ft. Static water level: 117 ft below land surface. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 2, Gr-58, located at lat 35°26'58", long 77°40'50". Driller: Hartsfield Water Co. Date drilled: 1973. Total depth: over 300 ft. Diam: 10 in. Cased to: below 200 ft. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 75 ft. Static water level: _____. Pump capacity: 550 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.35 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

0.04 Mgal/d, estimated. Principal users include GSH Corp., J. P. Stevens and Co., Snow Hill Metal Crafts, Inc., Granet Glove Corp., and the Snow Hill Tape Corp.

TREATMENT:

None.

PUMPING CAPACITY:

1.5 Mgal/d.

WATER STORAGE:

Two elevated tanks, 500,000 and 150,000 gallons.

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Snow Hill is on Contentnea Creek. This stream can supply more than enough water for any foreseeable need of the town.

Ground water: The top of the lower sandy aquifer is at shallow depths beneath the town and is about 350 feet thick. This aquifer can yield several hundred gallons per minute to wells. The water from this aquifer is soft and alkaline.

TOWN OF SNOW HILL

SNOW HILL, GREENE COUNTY

ANALYSES
(In milligrams per liter, except as noted)

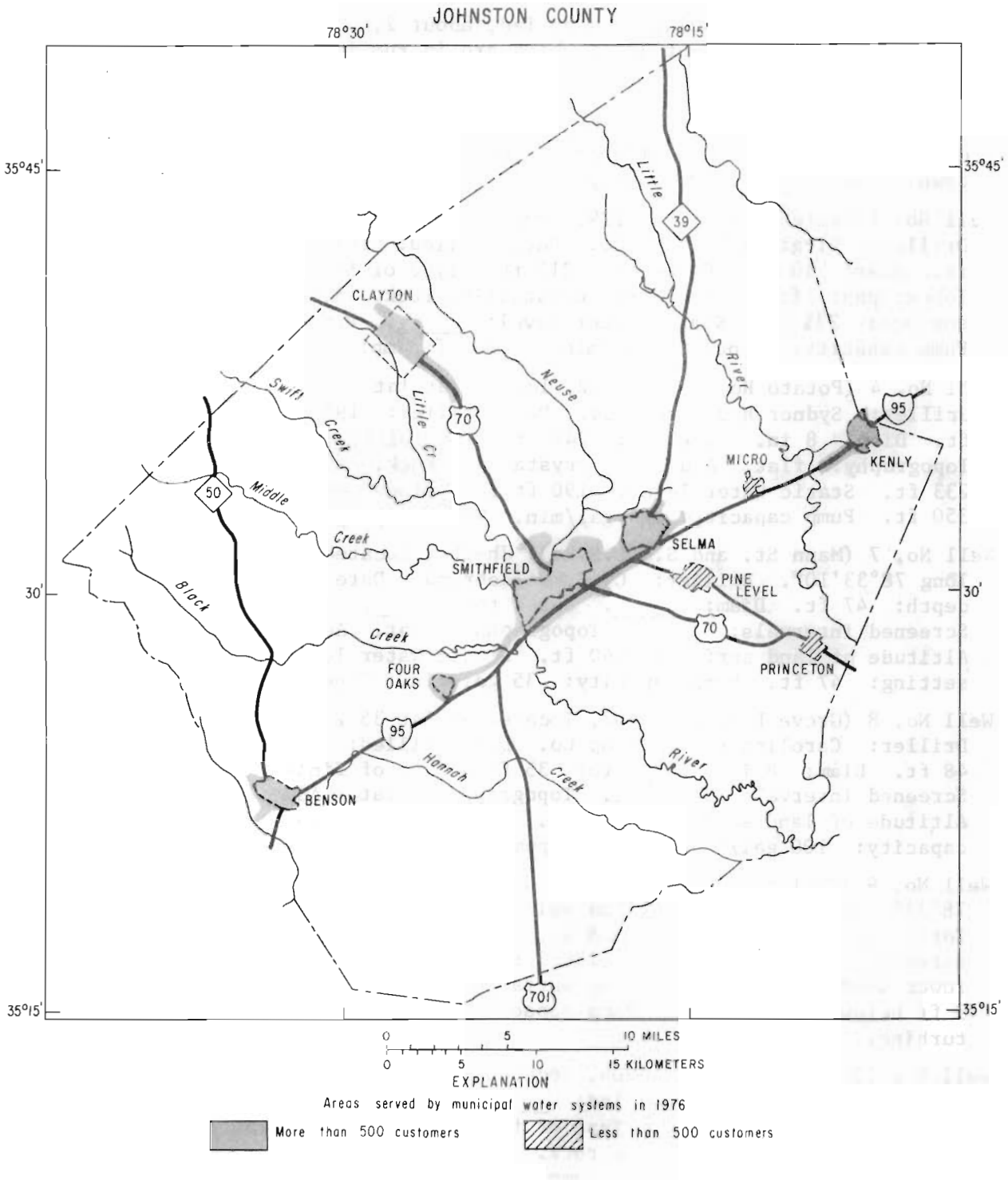
Source, or type of water (raw;finished)...	Well No. 1 Raw	Well No. 1 Raw		
Date of collection.....	4-20-76	3-31-66		
Silica (SiO_2).....	----------	12		
Iron (Fe).....	0.01	----------		
Manganese (Mn).....	.000	----------		
Calcium (Ca).....	----------	4.8		
Magnesium (Mg).....	----------	2.7		
Sodium (Na).....	----------	76		
Potassium (K).....	----------	7.1		
Bicarbonate (HCO_3).....	----------	180		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	----------	150		
Sulfate (SO_4).....	----------	13		
Chloride (Cl).....	25	25		
Fluoride (F).....	----------	.6		
Nitrate (NO_3).....	----------	.0		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------		
Dissolved Solids.....	----------	230		
Hardness as $CaCO_3$:				
Total.....	----------	24		
Noncarbonate.....	----------	0		
Specific conductance (micromhos at 25°C)....	394	376		
Arsenic (As).....	.000	----------		
Barium (Ba).....	.2	----------		
Boron (B).....	.10	----------		
Cadmium (Cd).....	.000	----------		
Chromium (Cr).....	.000	----------		
Cobalt (Co).....	.000	----------		
Copper (Cu).....	.010	----------		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.00	----------		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.06	----------		
Zinc (Zn).....	.00	----------		
pH (units).....	7.7	8.1		
Temperature (°C).....	----------	14		

JOHNSTON COUNTY

WATER-RESOURCES APPRAISAL

Approximately the southern quarter of Johnston County is in the west-central part of the North Carolina Coastal Plain. The remainder of the county is in the Piedmont Province. The topography of the Coastal Plain part is flat, while the Piedmont Province part is characterized by a gently rolling land surface. The county is drained by the Neuse River, except for a small area on the county's southwest boundary that is drained by tributaries of the Cape Fear River. The average discharge of streams ranges from 0.7 (Mgal/d)/mi^2 in the northern part of the county to 0.8 (Mgal/d)/mi^2 in the southern part. Minimum flows range from 0.00026 to 0.011 (Mgal/d)/mi^2 and average 0.0054 (Mgal/d)/mi^2. Streams having drainage areas as large as 80 square miles occasionally go dry. The 7-day, 2-year low flows range from 0.0009 to 0.10 (Mgal/d)/mi^2 and average 0.05 (Mgal/d)/mi^2. Five public water supplies in the county have 500 or more customers: Benson, Smithfield, Clayton, Kenly, and Selma. With the exception of Smithfield, all of the public and private supplies in the county are obtained from ground water. Smithfield uses a surface-water supply. The county population in 1970 was 61,737.

The upper sandy aquifer generally ranges in thickness from 20 to 40 feet. In the northern part of the county, the upper sandy aquifer rests directly upon the crystalline rock. The lower sandy aquifer is found only in the southern part of the county, where it is discontinuous. It lies between the upper sandy aquifer and the crystalline rock. In the southwestern part of the county the lower sandy aquifer is generally 50 feet or less in thickness. In the southeastern part of the county, this aquifer may reach a thickness of 150 feet. The combined upper and lower sandy aquifers probably can yield over 200 gal/min where they are thickest, but yields below 100 gal/min are more common in the southern part of the county. The crystalline rock is also an aquifer. Well yields are extremely variable in the crystalline rock, ranging from virtually nothing to as much as 200 gal/min. The water from the upper and lower sandy aquifers tends to be soft, excessively acid, has a low dissolved-solids concentration, and may have an excessive concentration of iron. The water from the crystalline rock ranges from soft to hard, has a moderate dissolved-solids concentration, and also may contain excessive iron. The maximum estimated ground-water yield in the county is 0.7 (Mgal/d)/mi^2.


JOHNSTON COUNTY
78°30'
78°15'
35°45'
35°15'
30'
CLAYTON
SMITHFIELD
SELMA
PINE LEVEL
KENLY
MICRO
FOUR OAKS
BENSON
PRINCETON
Little
Neuse
River
Swift
Creek
Little Cr
Middle
Creek
Black
Creek
Hannah
Creek
River
39
70
50
95
95
70
701
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

BENSON, JOHNSTON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,400 in 1976 (1,346 metered customers, about 30 of which are in rural areas).

SOURCE:

Nine wells (Nos. 1, 4, 7-13; Nos. 4, 7, 9, 12, and 13 are for emergencies only). Also 0.2 Mgal/d of finished water is purchased from the town of Dunn in Harnett County.

Well No. 1 (Water Plant), Jh-129, located at lat 35°23'05", long 78°32'40". Driller: Virginia Machine Co. Date drilled: 1917. Total depth: 550 ft. Diam: 10 in. Cased to: 212 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 231 ft. Static water level: _____. Pump setting: 350+ ft. Pump capacity: about 25 gal/min. Type of pump: submersible.

Well No. 4 (Potato House), Jh-132, located at lat 35°22'38", long 78°32'19". Driller: Sydnor Hydrodynamics. Date drilled: 1955. Total depth: 375 ft. Diam: 8 in. Cased to: 241 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 233 ft. Static water level: 190 ft below land surface. Pump setting: 350 ft. Pump capacity: 15 gal/min. Type of pump: submersible.

Well No. 7 (Mann St. and S.C.L.R.R.), Jh-206, located at lat 35°22'35", long 78°33'10". Driller: C. C. Hildebrand. Date drilled: 1958. Total depth: 47 ft. Diam: _____. Cased to: _____. Type of finish: screen. Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 240 ft. Static water level: _____. Pump setting: 47 ft. Pump capacity: 35 gal/min. Type of pump: turbine.

Well No. 8 (Grove Park), Jh-207, located at lat 35°22'43", long 78°32'42". Driller: Carolina Well & Pump Co. Date drilled: 1964. Total depth: 48 ft. Diam: 8 in. Cased to: 35 ft. Type of finish: screen. Screened interval: 35-48 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 235 ft. Static water level: _____. Pump capacity: 100 gal/min. Type of pump: turbine.

Well No. 9 (National Guard Armory), Jh-208, located at lat 35°22'29", long 78°32'57". Driller: Carolina Well & Pump Co. Date drilled: 1965. Total depth: 53 ft. Diam: 8 in. Cased to: 23 ft. Type of finish: screen. Screened interval: 23-53 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 241 ft. Static water level: 9 ft below land surface. Pump capacity: 35 gal/min. Type of pump: turbine.

Well No. 10 (Ice Plant), Jh-209, located at lat 35°22'43", long 78°33'04". Driller: _____. Date drilled: _____. Total depth: _____. Diam: _____. Cased to: _____. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 242 ft. Static water level: _____. Pump setting: 200+ ft. Pump capacity: 37 gal/min. Type of pump: submersible.

BENSON, JOHNSTON COUNTY

Well No. 11 (Lee St.), Jh-210, located at lat 35°22'36", long 78°32'46". Driller: Carolina Well & Pump Co. Date drilled: 1965. Total depth: 67 ft. Diam: 8 in. Cased to: 23 ft. Type of finish: screen. Screened interval: 23-38 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 241 ft. Static water level: 14 ft below land surface. Pump capacity: 28 gal/min. Type of pump: turbine.

Well No. 12 (Bostic), Jh-211, located at lat 35°22'40", long 78°33'20". Driller: Carolina Well & Pump Co. Date drilled: 1967. Total depth: 67 ft. Diam: 8 in. Cased to: 26 ft. Type of finish: screen. Screened interval: 26-67 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 245 ft. Static water level: ____. Pump capacity: 7 gal/min. Type of pump: turbine.

Well No. 13 (Dutch Inn), Jh-225, located at lat 35°22'24", long 78°32'34". Driller: Charles R. Underwood. Date drilled: 1973. Total depth: 52 ft. Diam: 8 in. Cased to: 32 ft. Type of finish: screen. Screened interval: 32-47 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 238 ft. Static water level: 3.5 ft below land surface. Pump capacity: 102 gal/min. Type of pump: turbine.

TOTAL USE:

Average (1975), 0.3 Mgal/d, estimated (0.1 Mgal/d from plant and 0.2 Mgal/d purchased from Dunn); maximum daily (7-30-76), 0.4 Mgal/d, estimated.

INDUSTRIAL USE:

0.01 Mgal/d, estimated. Principal users are Southland Manufacturing Co. (two plants) and Chicopee Manufacturing Co.

TREATMENT:

Aeration, prechlorination, pressure anthracite and manganese zeolite, sedimentation, zeolite process for softening, and addition of phosphate compounds for corrosion control. When needed wells 4 and 13 pump directly into system. Well no. 13 has chlorination at site.

RATED CAPACITY OF TREATMENT PLANT:

Not rated, but maximum on filters is 0.72 Mgal/d.

PUMP CAPACITY:

Raw water, 0.55 Mgal/d; finished water, 0.72 Mgal/d.

RAW-WATER STORAGE:

One 100,000 gallon surface tank.

FINISHED-WATER STORAGE:

Two elevated tanks, 300,000 and 100,000 gallons.

FUTURE PLANS:

None.

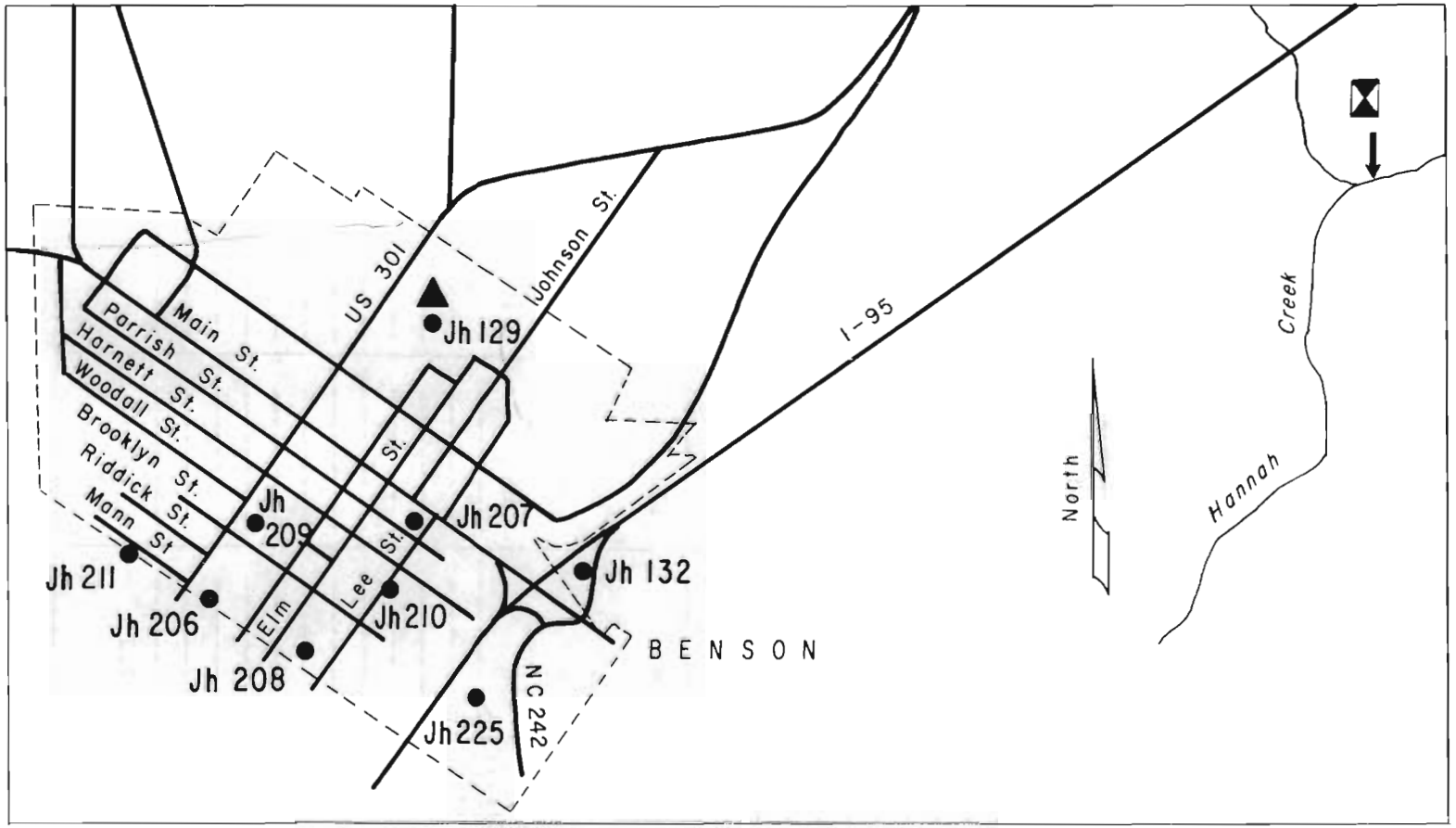
BENSON, JOHNSTON COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: There are no large streams near Benson. Considerable storage would be required to develop an adequate surface-water supply. Most of the streams in the area go dry occasionally. The average stream discharge for the Benson area is 0.7 $(Mgal/d)/mi^2$.

Ground water: The combined thickness of the upper sandy and lower sandy aquifers is probably less than 70 feet here. The two aquifers as a unit can yield more than 100 gal/min to wells. The crystalline rock also serves as an aquifer. One 700-foot well was reported to have a yield of 200 gal/min. More typical yields from the crystalline rock are much less than this. The water from both sandy aquifers is soft, has a low dissolved-solids concentration, is excessively acidic, and contains excessive iron. The water from the crystalline rock ranges from soft to hard, has a moderate dissolved-solids concentration, and may contain excessive iron.

TOWN OF BENSON



0 0.5 1 MILE

0 0.5 1 KILOMETER

EXPLANATION

Jh 207 ● Well

▲ Treatment plant

⧓ Sewage treatment plant

Sewage outfall

BENSON, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Jh-129 Raw	Well No. 4 Jh-132 Raw	Well No. 7 Jh-206 Raw	Well No. 8 Jh-207 Raw
Date of collection.....	4-3-69	4-3-69	4-3-69	4-3-69
Silica (SiO_2).....	14	14	22	12
Iron (Fe).....	----------	----------	----------	----------
Manganese (Mn).....	----------	----------	----------	----------
Calcium (Ca).....	19	10	3.1	1.8
Magnesium (Mg).....	8.1	7.8	3.6	2.3
Sodium (Na).....	54	27	5.3	11
Potassium (K).....	3.5	2.9	2.3	1.1
Bicarbonate (HCO_3).....	130	130	0 [1/]	0 [1/]
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	100	110	0	0
Sulfate (SO_4).....	19	4.0	24	18
Chloride (Cl).....	52	9.1	22	23
Fluoride (F).....	.1	.2	.1	.1
Nitrate (NO_3).....	.2	.0	1.8	.3
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	224	139	84	75
Hardness as $CaCO_3$:				
Total.....	81	57	22	14
Noncarbonate.....	0	0	22	14
Specific conductance (micromhos at 25°C)....	400	226	132	153
Arsenic (As).....	----------	----------	----------	----------
Barium (Ba).....	----------	----------	----------	----------
Boron (B).....	----------	----------	----------	----------
Cadmium (Cd).....	----------	----------	----------	----------
Chromium (Cr).....	----------	----------	----------	----------
Cobalt (Co).....	----------	----------	----------	----------
Copper (Cu).....	----------	----------	----------	----------
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	----------
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	----------
Zinc (Zn).....	7.2	7.5	3.8	3.8
pH (units).....	18	18	17	18
Temperature (°C).....				

[1/] Acidity as H+

BENSON, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 9 Jh-208 Raw	Well No. 10 Jh-209 Raw	Well No. 12 Jh-211 Raw	Wells No. 1, 8, 10, 11 Raw
Date of collection.....	4-3-69	4-3-69	4-3-69	8-11-76
Silica (SiO_2).....	16	14	15	15
Iron (Fe).....	----------	----------	----------	6.4
Manganese (Mn).....	----------	----------	----------	.19
Calcium (Ca).....	1.6	17	1.1	18
Magnesium (Mg).....	1.9	8.6	1.1	7.1
Sodium (Na).....	5.4	31	4.7	26
Potassium (K).....	1.0	3.2	.7	2.9
Bicarbonate (HCO_3).....	0 1/	140	0 1/	20
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	0	110	0	16
Sulfate (SO_4).....	16	12	9.2	61
Chloride (Cl).....	8.6	21	7.5	31
Fluoride (F).....	.1	.2	.1	.1
Nitrate (NO_3).....	1.4	.4	.3	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	.00
Dissolved Solids.....	57	168	41	179
Hardness as $CaCO_3$:				
Total.....	12	78	7	75
Noncarbonate.....	12	0	0	58
Specific conductance (micromhos at 25°C)....	84	298	56	310
Arsenic (As).....	----------	----------	----------	.002
Barium (Ba).....	----------	----------	----------	.4
Boron (B).....	----------	----------	----------	.04
Cadmium (Cd).....	----------	----------	----------	----------
Chromium (Cr).....	----------	----------	----------	.000
Cobalt (Co).....	----------	----------	----------	.013
Copper (Cu).....	----------	----------	----------	.007
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	.01
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	.21
Zinc (Zn).....	----------	----------	----------	.02
pH (units).....	4.1	7.5	4.5	5.7
Temperature (°C).....	17.	18	17	----------

BENSON, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Wells No. 1, 8, 10, 11 Finished			
Date of collection.....	8-11-76			
Silica (SiO_2).....	14			
Iron (Fe).....	.03			
Manganese (Mn).....	.10			
Calcium (Ca).....	15			
Magnesium (Mg).....	6.5			
Sodium (Na).....	26			
Potassium (K).....	2.9			
Bicarbonate (HCO_3).....	28			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	23			
Sulfate (SO_4).....	57			
Chloride (Cl).....	30			
Fluoride (F).....	.2			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	166			
Hardness as $CaCO_3$:				
Total.....	64			
Noncarbonate.....	41			
Specific conductance (micromhos at 25°C)....	276			
Arsenic (As).....	----------			
Barium (Ba).....	----------			
Boron (B).....	----------			
Cadmium (Cd).....	----------			
Chromium (Cr).....	----------			
Cobalt (Co).....	----------			
Copper (Cu).....	----------			
Lead (Pb).....	----------			
Lithium (Li).....	----------			
Mercury (Hg).....	----------			
Strontium (Sr).....	----------			
Zinc (Zn).....				
pH (units).....	6.4			
Temperature (°C).....	----------			

CLAYTON, JOHNSTON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 4,300 in 1976 (1,500 metered customers).

SOURCE:

Sixteen wells (Nos. 1-6, 8, and 10-18. No. 8 - emergency only).

Well No. 1, Jh-23, located at lat 35°38'48", long 78°28'06". Driller: Sydnor Pump. Date drilled: 1914. Total depth: 185 ft. Diam: 12 in. Cased to: 30 ft. Type of finish: open hole. Topography: valley flat. aquifer: crystalline rock. Altitude of land surface: 245 ft. Static water level: _____. Pump setting: 174 ft. Pump capacity: 40 gal/min. Type pump: submersible.

Well No. 2, Jh-21, located at lat 35°38'50", long 078°28'08". Driller: Sydnor Pump. Date drilled: _____. Total depth: 185 ft. Diam: 10 in. Cased to: 30 ft. Type of finish: open hole. Topography: valley flat. Aquifer: crystalline rock. Altitude of land surface: 247 ft. Static water level: _____. Pump setting: 172 ft. Pump capacity: 30 gal/min. Type pump: submersible.

Well No. 3, Jh-200, located at lat 35°38'48", long 78°28'09". Driller: Master Well Company. Date drilled: 1969. Total depth: 200 ft. Diam: 6 in. Cased to: 60 ft. Type of finish: open hole. Topography: valley flat. Aquifer: crystalline rock. Altitude of land surface: 243 ft. Static water level: _____. Pump setting: 150 ft. Pump capacity: 50 gal/min. Type pump: submersible.

Well No. 4 (Old water tank), Jh-19, located at lat 35°39'09", long 78°27'42". Driller: Sydnor Pump & Well. Date drilled: 1928. Total depth: 325 ft. Diam: 10 in. Cased to: about 50 ft. Type of finish: open hole. Topography: flat. Aquifer: Crystalline rock. Altitude of land surface: 342 ft. Static water level: _____. Pump setting: 260 ft. Pump capacity: 20 gal/min. Type pump: submersible.

Well No. 5 (O'Neil and Whitacker Sts.), Jh-20, located at lat 35°39'20", long 78°27'32". Driller: Sydnor Pump and Well. Date drilled: 1939. Total depth: 210 ft. Diam: 8 in. Cased to: 90 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 335 ft. Static water level: _____. Pump setting: 200 ft. Pump capacity: 30 gal/min. Type pump: submersible.

Well No. 6 (Church St.), Jh-25, located at lat 35°39'13", long 78°27'22". Driller: Sydnor Pump and Well. Date drilled: 1920. Total depth: 250 ft. Diam: 10 in. Cased to: 100 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 315 ft. Static water level: _____. Pump setting: 220 ft. Pump capacity: 42 gal/min. Type pump: submersible.

Well No. 8 (Turner Vinson: emergency only), Jh-27, located at lat 35°38'36", long 78°27'00". Driller: Heater Well Company. Date drilled: 1953. Total depth: 195 ft. Diam: 8 in. Cased to: 31 ft. Type of

CLAYTON, JOHNSTON COUNTY

finish: open hole. Topography: undulating. Aquifer: crystalline rock. Altitude of land surface: 303 ft. Static water level: _____. Pump setting: 185 ft. Pump capacity: 28 gal/min. Type pump: submersible.

Well No. 10 (Hardee and Horne Sts.), Jh-202, located at lat 35°38'55", long 78°27'25". Driller: Poole Bros. Well Drilling Company. Date drilled: 1962. Total depth: 125 ft. Diam: 8 in. Cased to: 40 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 300 ft. Static water level: _____. Pump setting: 125 ft. Pump capacity: _____. Type pump: submersible.

Well No. 11 (Maplewood Cemetery), Jh-205, located at lat 35°38'32", long 78°27'44". Driller: _____. Date drilled: 1962. Total depth: 195 ft. Diam: 8 in. Cased to: about 50 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 265 ft. Static water level: _____. Pump capacity: 28 gal/min. Type pump: submersible.

Well No. 12 (Robertson and Horne Sts.), Jh-201, located at lat 35°39'13", long 78°27'55". Driller: _____. Date drilled: 1955. Total depth: 360 ft. Diam: 8 in. Cased to: about 50 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 301 ft. Static water level: _____. Pump setting: 300 ft. Pump capacity: 85 gal/min. Type pump: submersible.

Well No. 13 (O'Neil and Wilson Sts.), Jh-203, located at lat 35°39'27", long 78°27'18". Driller: Poole Bros. Well Drilling Company. Date drilled: 1966. Total depth: 292 ft. Diam: 6 in. Cased to: 50 ft. Type of finish: open hole. Topography: hilltop. Aquifer: crystalline rock. Altitude of land surface: 343 ft. Static water level: _____. Pump setting: 280 ft. Pump capacity: 50 gal/min. Type pump: submersible.

Well No. 14 (Hamby and Starling Sts.), Jh-204, located at lat 35°38'44", long 78°27'36". Driller: Flowers-Master Well Drilling Co. Date drilled: 1968. Total depth: 180 ft. Diam: 6 in. Cased to: 50 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 282 ft. Static water level: _____. Pump setting: 150 ft. Pump capacity: 80 gal/min. Type pump: submersible.

Well No. 15 (Champion St.), Jh-220, located at lat 35°38'12", long 78°27'18". Driller: Master Well Co. Date drilled: 7/17/74. Total depth: 306 ft. Diam: 8 in. Cased to 124 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 327 ft. Static water level: 24.2 ft below land surface. Pump capacity: 60 gal/min. Type pump: submersible.

Well No. 16 (Primary School), Jh-221, located at lat 35°38'42", long 78°28'09". Driller: Poole Bros. Well Drilling and Boring. Date drilled: 8/8/73. Total depth: 300 ft. Diam: 6 1/4 in. Cased to: 70 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 270 ft. Static water

CLAYTON, JOHNSTON COUNTY

level: 18.5 ft below land surface. Pump capacity: 10 gal/min. Type pump: submersible.

Well No. 17 (Starmount-Lake Drive), Jh-222, located at lat 35°39'49", long 78°27'23". Driller: Master Well Co. Date drilled: 7/23/74. Total depth: 306 ft. Diam: 6 1/2 in. Cased to: 111.5 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock. Altitude of land surface: 248 ft. Static water level: 36.7 ft below land surface. Pump capacity: 60 gal/min. Type pump: submersible.

Well No. 18 (Pecan Lane), Jh-223, located at lat 35°38'26", long 78°26'34". Driller: Heater Well Co. Date drilled: probably 1960. Total depth: 258 ft. Diam: 8 in. Cased to: _____. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 332 ft. Static water level: _____. Pump capacity: about 25 gal/min. Type pump: submersible.

TOTAL USE:

Average (1975), 0.45 Mgal/d, metered; maximum daily not available.

INDUSTRIAL USE:

0.05 Mgal/d. Principal users include Cutter Laboratories, Oneida Molded Plastics Corp., and Norwich Mills.

TREATMENT:

Only water from wells 1, 2, and 3 is chlorinated at water plant.

RATED CAPACITY OF TREATMENT PLANTS:

Demand-type feeders, not rated.

PUMPING CAPACITY:

0.72 Mgal/d.

WATER STORAGE:

Two elevated tanks, 100,000 and 500,000 gallons; two ground tanks 200,000 and 150,000 gallons.

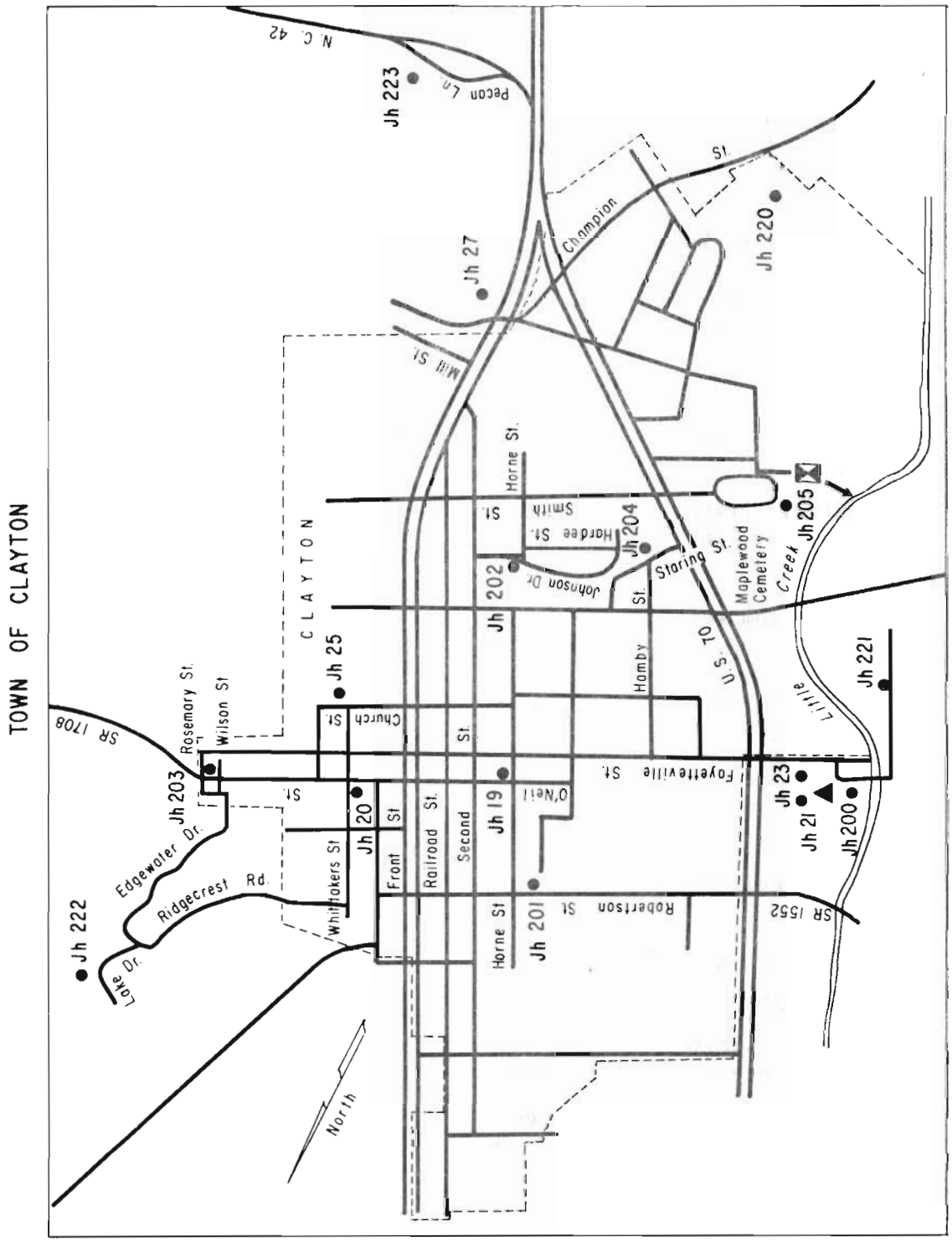
FUTURE PLANS:

May tie into county-wide system.

WATER-RESOURCES APPRAISAL:

Surface water: Clayton is less than two miles from the Neuse River, which can provide more than enough water for any foreseeable need of the town.

Ground water: The upper sandy aquifer is very thin at Clayton. It is underlain by crystalline rock. Well yields from the crystalline rock have a wide range; the better wells yield a few tens of gallons per minute. The water from the crystalline rock is soft to hard and may contain excessive iron.


TOWN OF CLAYTON
CLAYTON
N. C. 42
Pecan Ln.
Jh 223
Champion
St.
Jh 27
Jh 220
Mill St.
Horne St.
Smith St.
Hardee St.
Jh 204
Johnson Dr.
Jh 202
Staring St.
Maplewood Cemetery
Creek
Jh 205
Church St.
Jh 25
Rosemary St.
Wilson St
SR 1708
Jh 203
Edgewater Dr.
Ridgecrest Rd.
Lake Dr.
Jh 222
Whittakers St
Front St
Railroad St.
Second St.
Jh 20
Jh 19
O'Neil
Hamby
U.S. 70
Little
Jh 221
Fayetteville St.
Jh 23
Jh 21
Jh 200
Roberson St
Horne St
Jh 201
SR 1552
North
0 0 200 1000 400 2000 600 800 METERS 3000 FEET
EXPLANATION
Sewage outfall
Treatment plant
Sewage treatment plant
Jh 202
Well

CLAYTON, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 3 Jh-200 Raw	Well No. 4 Jh-19 Raw	Well No. 5 Jh-20 Raw	Well No. 10 Jh-202 Raw
Date of collection.....	4-1-69	4-1-69	4-1-69	4-1-69
Silica (SiO_2).....	27	32	35	37
Iron (Fe).....	----------	----------	----------	----------
Manganese (Mn).....	----------	----------	----------	----------
Calcium (Ca).....	32	8.0	13	16
Magnesium (Mg).....	7.2	1.8	3.0	6.6
Sodium (Na).....	11	7.3	13	9.1
Potassium (K).....	2.4	1.9	1.3	1.8
Bicarbonate (HCO_3).....	140	39	40	80
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	120	32	33	66
Sulfate (SO_4).....	7.8	.8	3.2	4.4
Chloride (Cl).....	7.6	5.4	18	11
Fluoride (F).....	.2	.1	.1	.1
Nitrate (NO_3).....	.3	6.9	20	6.2
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	167	83	128	131
Hardness as $CaCO_3$:				
Total.....	110	28	45	67
Noncarbonate.....	0	0	12	2
Specific conductance (micromhos at 25°C)....	261	89	169	182
Arsenic (As).....	----------	----------	----------	----------
Barium (Ba).....	----------	----------	----------	----------
Boron (B).....	----------	----------	----------	----------
Cadmium (Cd).....	----------	----------	----------	----------
Chromium (Cr).....	----------	----------	----------	----------
Cobalt (Co).....	----------	----------	----------	----------
Copper (Cu).....	----------	----------	----------	----------
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	----------
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	----------
Zinc (Zn).....	----------	----------	----------	----------
pH (units).....	6.8	6.2	6.3	6.5
Temperature (°C).....	16	----------	----------	----------

CLAYTON, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw; finished	Well No.13 JH-203 Raw	Well No. 13 JH-203 Raw	Well No. 14 JH-204	
Date of collection	2-19-76	4-1-69	4-1-69	
Silica (SiO_2)	----------	32	37	
Iron (Fe)	0.00	----------	----------	
Manganese (Mn)	.000	----------	----------	
Calcium (Ca)	----------	20	11	
Magnesium (Mg)	----------	3.9	6.0	
Sodium (Na)	----------	9.3	8.5	
Potassium (K)	----------	1.2	1.4	
Bicarbonate (HCO_3)	----------	93	75	
Carbonate (CO_3)	0	0	0	
Alkalinity as $CaCO_3$	----------	76	62	
Sulfate (SO_4)	----------	2.4	1.6	
Chloride (Cl)	3.8	4.1	4.6	
Fluoride (F)	----------	.1	.1	
Nitrate (NO_3)	----------	3.7	2.8	
Nitrite + Nitrate as Nitrogen ($NO_2 + NO_3$ as N)	----------	----------	----------	
Dissolved Solids	----------	123	110	
Hardness as $CaCO_3$:				
Total	----------	66	52	
Noncarbonate	----------	0	0	
Specific conductance (micromhos at 25°C)	168	174	142	
Arsenic (As)	.000	----------	----------	
Barium (Ba)	.0	----------	----------	
Boron (B)	.02	----------	----------	
Cadmium (Cd)	.002	----------	----------	
Chromium (Cr)	.000	----------	----------	
Cobalt (Co)	.002	----------	----------	
Copper (Cu)	.007	----------	----------	
Lead (Pb)	----------	----------	----------	
Lithium (Li)	.01	----------	----------	
Mercury (Hg)	----------	----------	----------	
Strontium (Sr)	.10	----------	----------	
Zinc (Zn)	.01			
pH (units)	7.2	6.9	6.7	
Temperature (°C)	----------	----------	----------	

KENLY, JOHNSTON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,400 in 1974 (about 600 customers, 2 of whom are in suburban areas).

SOURCE:

Five wells (Nos. 1-4 and 7th Street well).

Well No. 1 (S. Railroad St.), Jh-44, located at lat 35°35'33", long 78°07'41". Driller: Heater Well Co. Date drilled: 1953. Total depth: 200 ft. Diam: 8 in. Cased to: 46 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 198 ft. Static water level: 8 ft below land surface. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 2 (Library), Jh-46, located at lat 35°35'26", long 78°07'31". Driller: Heater Well Co. Date drilled: 1939. Total depth: 110 ft. Diam: _____. Cased to: about 50 ft. Type of finish: open hold. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 196 ft. Static water level: _____. Pump capacity: 65 gal/min. Type pump: turbine.

Well No. 3 (N. Railroad St.), Jh-217, located at lat 35°35'39", long 78°07'18". Driller: Bainbridge and Dance Well Drilling Contractors, Inc. Date drilled: 1969. Total depth: 300 ft. Diam: 8 in. Cased to: 65 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 204 ft. Static water level: _____. Pump setting: 220 ft. Pump capacity: 100 gal/min. Type pump: turbine.

Well No. 4 (I-95), Jh-219, located at lat 35°34'57", long 78°08'54". Driller: Bainbridge and Dance Well Drilling Contractors, Inc. Date drilled: 1969. Total depth: 300 ft. Diam: 6 in. Cased to: 43 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 198 ft. Static water level: _____. Pump setting: 215 ft. Pump capacity: 50 gal/min. Type pump: turbine.

Well No. 5 (7th Street well - not yet in operation), Wi-368, located at lat 35°36'10", long 78°07'16". Driller: Bainbridge and Dance Well Drilling Contractors, Inc. Date drilled: June 1973. Total depth: 300 ft. Diam: 6 in. Cased to: 63 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 198 ft. Static water level: 14 ft below land surface. Pump capacity: 120 gal/min. Type pump: submersible.

TOTAL USE:

Average (1975), 0.10 Mgal/d, estimated; maximum daily (summer 1975), 0.18 Mgal/d estimated.

KENLY, JOHNSTON COUNTY

INDUSTRIAL USE:

0.007 Mgal/d. Principal users include the Overton Corp. and the Servodyne Corp.

TREATMENT:

All wells are chlorinated. All wells except No. 4 have pH adjustment with soda ash. Well No. 3 also has a pressure greensand filter for iron removal. Treatment is provided at each well.

RATED CAPACITY OF TREATMENT PLANTS:

Demand-type feeders. Not rated.

PUMPING CAPACITY:

The four wells presently in the system have a total capacity of 0.41 Mgal/d. The addition of the 7th Street well will increase the total capacity to 0.63 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks, 200,000 and 100,000 gallons.

FUTURE PLANS:

Will put the 7th Street well in operation. This well will have the same treatment as Well No. 3.

WATER-RESOURCES APPRAISAL:

Surface water: Kenly is near Little River. The low-flow characteristics of this stream are not known, but with adequate storage it would serve as a reliable surface-water supply for the town. The average discharge of streams in the area is estimated at 0.7 $(Mgal/d)/mi^2$.

Ground water: The town is underlain by crystalline rock at shallow depths. Well yields from the crystalline rock range from a few gallons per minute to over 100 gal/min. The water from the crystalline rock is soft and acidic, and may contain excessive iron.

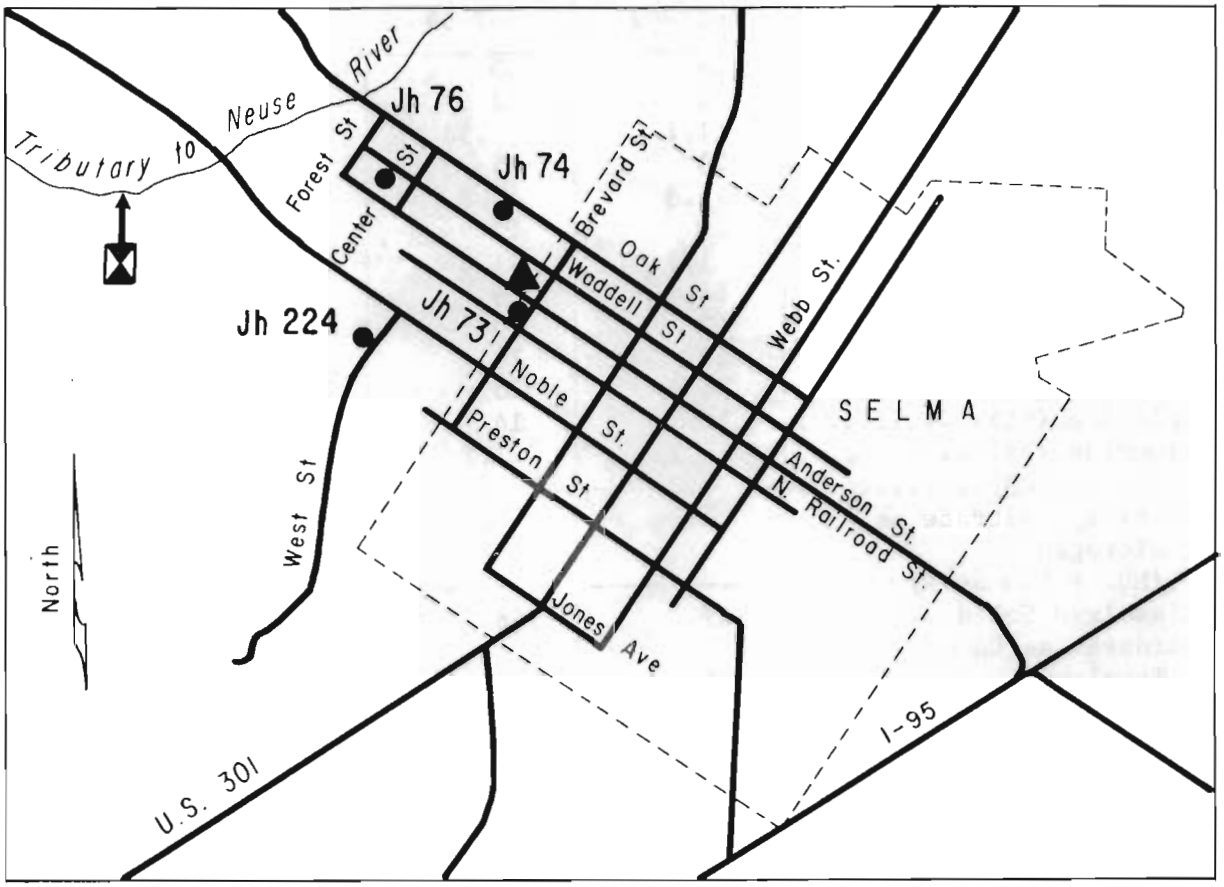
TOWN OF KENLY

KENLY, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw; finished)	S. Railroad St. Well Raw
Date of collection	2-19-76
Silica (SiO_2)	23
Iron (Fe)	.03
Manganese (Mn)	.030
Calcium (Ca)	7.8
Magnesium (Mg)	8.3
Sodium (Na)	10
Potassium (K)	.4
Bicarbonate (HCO_3)	35
Carbonate (CO_3)	0
Alkalinity as $CaCO_3$	29
Sulfate (SO_4)	8.5
Chloride (Cl)	15
Fluoride (F)	.1
Nitrate (NO_3)	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	3.0
Dissolved Solids	104
Hardness as $CaCO_3$:	
Total	54
Noncarbonate	25
Specific conductance (micromhos at 25°C)	154
Arsenic (As)	.001
Barium (Ba)	.0
Boron (B)	.00
Cadmium (Cd)	.000
Chromium (Cr)	.000
Cobalt (Co)	.000
Copper (Cu)	.002
Lead (Pb)	----------
Lithium (Li)	.00
Mercury (Hg)	----------
Strontium (Sr)	.09
Zinc (Zn)	.01
pH (units)	5.8
Temperature (°C)	----------

TOWN OF SELMA



SELMA, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Raw	Well No. 2 Raw	Well No. 3 Raw	Well No. 4 Raw
Date of collection.....	4-12-69	4-7-69	4-7-69	2-19-76
Silica (SiO_2).....	19	35	30	33
Iron (Fe).....	5.6	2.8	1.4	2.1
Manganese (Mn).....	1.1	.58	.72	.53
Calcium (Ca).....	23	24	40	26
Magnesium (Mg).....	4.3	4.8	6.6	2.6
Sodium (Na).....	16	13	87	12
Potassium (K).....	1.7	1.6	2.0	1.6
Bicarbonate (HCO_3).....	64	89	100	76
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	52	73	83	62
Sulfate (SO_4).....	36	20	26	21
Chloride (Cl).....	16	14	150	11
Fluoride (F).....	.1	.1	.0	.1
Nitrate (NO_3).....	.2	.4	.2	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	.02
Dissolved Solids.....	167	158	417	148
Hardness as $CaCO_3$:				
Total.....	76	80	130	76
Noncarbonate.....	23	6	44	14
Specific conductance (micromhos at 25°C)....	242	226	694	210
Arsenic (As).....	----------	----------	----------	.001
Barium (Ba).....	----------	----------	----------	.0
Boron (B).....	----------	----------	----------	.00
Cadmium (Cd).....	----------	----------	----------	.000
Chromium (Cr).....	----------	----------	----------	.000
Cobalt (Co).....	----------	----------	----------	.000
Copper (Cu).....	----------	----------	----------	.001
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	.00
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	.21
Zinc (Zn).....	----------	----------	----------	.09
pH (units).....	6.4	6.6	6.9	6.6
Temperature (°C).....	----------	18	18	----------

SELMA, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 4 Finished			
Date of collection.....	2-19-76			
Silica (SiO_2).....	31			
Iron (Fe).....	.01			
Manganese (Mn).....	.80			
Calcium (Ca).....	25			
Magnesium (Mg).....	3.4			
Sodium (Na).....	29			
Potassium (K).....	2.2			
Bicarbonate (HCO_3).....	110			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	94			
Sulfate (SO_4).....	22			
Chloride (Cl).....	11			
Fluoride (F).....	.8			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.00			
Dissolved Solids.....	182			
Hardness as $CaCO_3$:				
Total.....	77			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	269			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.02			
Cadmium (Cd).....	.001			
Chromium (Cr).....	.000			
Cobalt (Co).....	.002			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.01			
Mercury (Hg).....	----------			
Strontium (Sr).....	.26			
Zinc (Zn).....	.00			
pH (units).....	7.9			
Temperature (°C).....	----------			

SMITHFIELD, JOHNSTON COUNTY

OWNERSHIP:

Municipal. Also supplies the West Smithfield Sanitary District, Four Oaks, and Selma. Total population supplied, about 15,000 in 1976 (2,681 metered customers, 75 of whom are in suburban areas).

SOURCE:

Neuse River impounded in an off-river pretreatment basin: the intake is about 1,500 feet northwest of the treatment plant, which is on Second Street (extended) at lat 35°31'12", long 78°20'58". The drainage area at the intake is 1,200 square miles, approximately.

RAW-WATER STORAGE:

Pretreatment basin, approximately 23 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 40 Mgal/d with storage of 23 million gallons.

TOTAL USE:

Average (1975), 1.2 Mgal/d, estimated (includes about 0.4 Mgal/d purchased by Four Oaks, Selma, and West Smithfield Sanitary District); maximum daily (date undetermined), 2.0 million gallons, estimated.

INDUSTRIAL USE:

0.27 Mgal/d. Principal users include Burlington Industries, Sylvania Electric, Fieldcrest Mills, Smithfield Lumber Company, and Guy C. Lee Lumber Company.

TREATMENT:

Prechlorination, coagulation with alum and caustic soda, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

4.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 8.0 Mgal/d; finished water, 4.0 Mgal/d.

SMITHFIELD, JOHNSTON COUNTY

FINISHED-WATER STORAGE:

Two clear wells, 250,000 and 1,000,000 gallons; two elevated tanks, 100,000 and 300,000 gallons.

FUTURE PLANS:

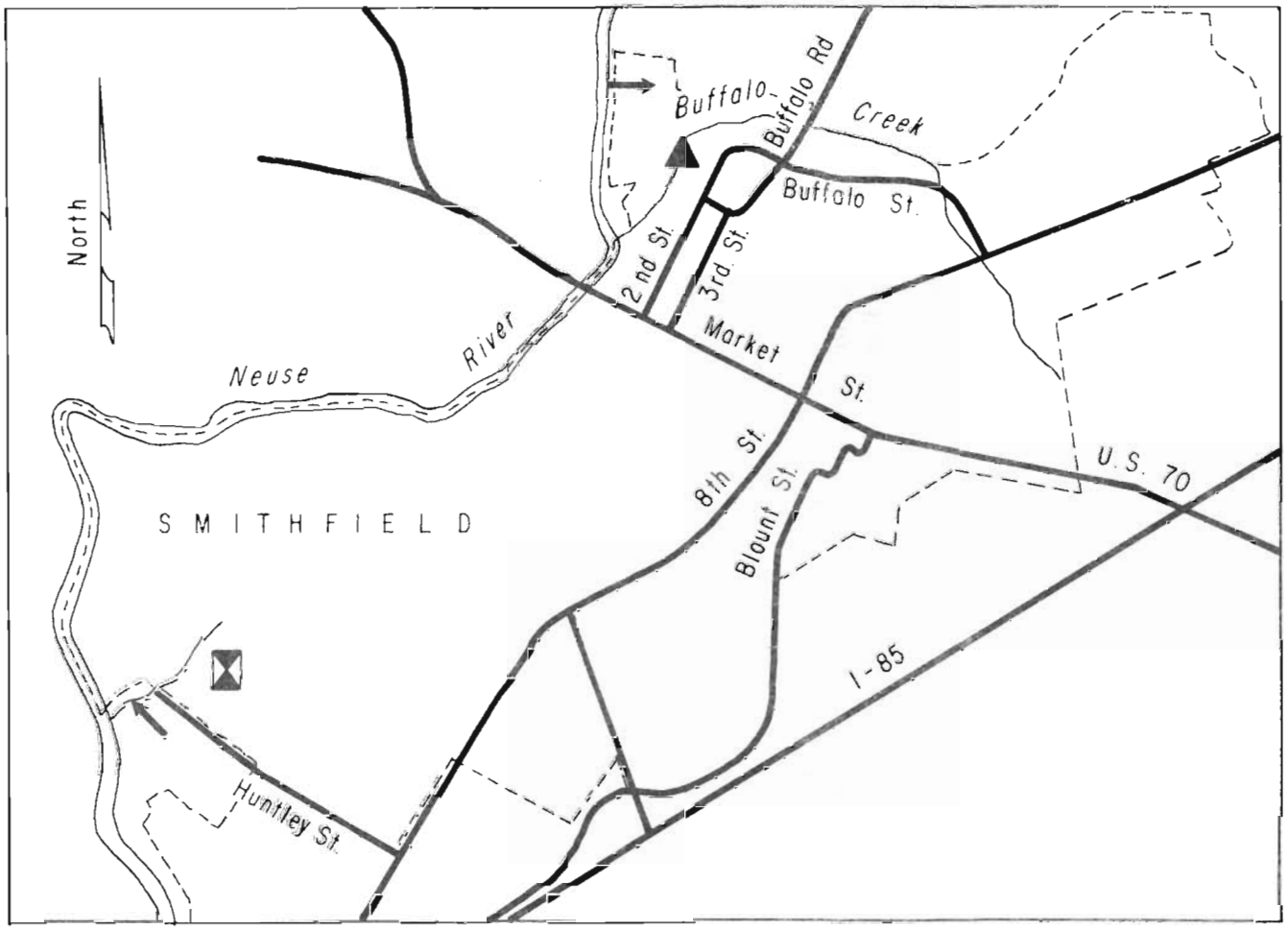
Water line will be extended to Kenly.

WATER-RESOURCES APPRAISAL:

Surface water: Smithfield is on the Neuse River, which can supply any foreseeable water need of the town.

Ground water: The town is underlain by a few feet of upper sandy aquifer, which is in turn underlain by crystalline rock. The crystalline rock is capable of yielding up to a few tens of gallons per minute to wells. The quality of the ground water is not known here but would probably be soft and might contain excessive iron.

TOWN OF SMITHFIELD



SMITHFIELD, JOHNSTON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Neuse River Raw	Neuse River Finished		
Date of collection.....	4-22-76	4-22-76		
Silica (SiO_2).....	13	13		
Iron (Fe).....	.08	.05		
Manganese (Mn).....	.000	.000		
Calcium (Ca).....	7.0	9.9		
Magnesium (Mg).....	2.5	2.3		
Sodium (Na).....	13	23		
Potassium (K).....	2.5	2.4		
Bicarbonate (HCO_3).....	30	38		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	25	31		
Sulfate (SO_4).....	8.0	20		
Chloride (Cl).....	12	18		
Fluoride (F).....	.5	.7		
Nitrate (NO_3).....	----------	---------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	1.0	.77		
Dissolved Solids.....	78	112		
Hardness as $CaCO_3$:				
Total.....	28	34		
Noncarbonate.....	3	3		
Specific conductance (micromhos at 25°C)....	124	180		
Arsenic (As).....	.000	---------		
Barium (Ba).....	.0	---------		
Boron (B).....	.03	---------		
Cadmium (Cd).....	.002	---------		
Chromium (Cr).....	.000	---------		
Cobalt (Co).....	.000	---------		
Copper (Cu).....	.024	---------		
Lead (Pb).....	----------	---------		
Lithium (Li).....	.00	---------		
Mercury (Hg).....	----------	---------		
Strontium (Sr).....	.08	---------		
Zinc (Zn).....	.02	---------		
pH (units).....	6.5	7.0		
Temperature (°C).....	----------	---------		

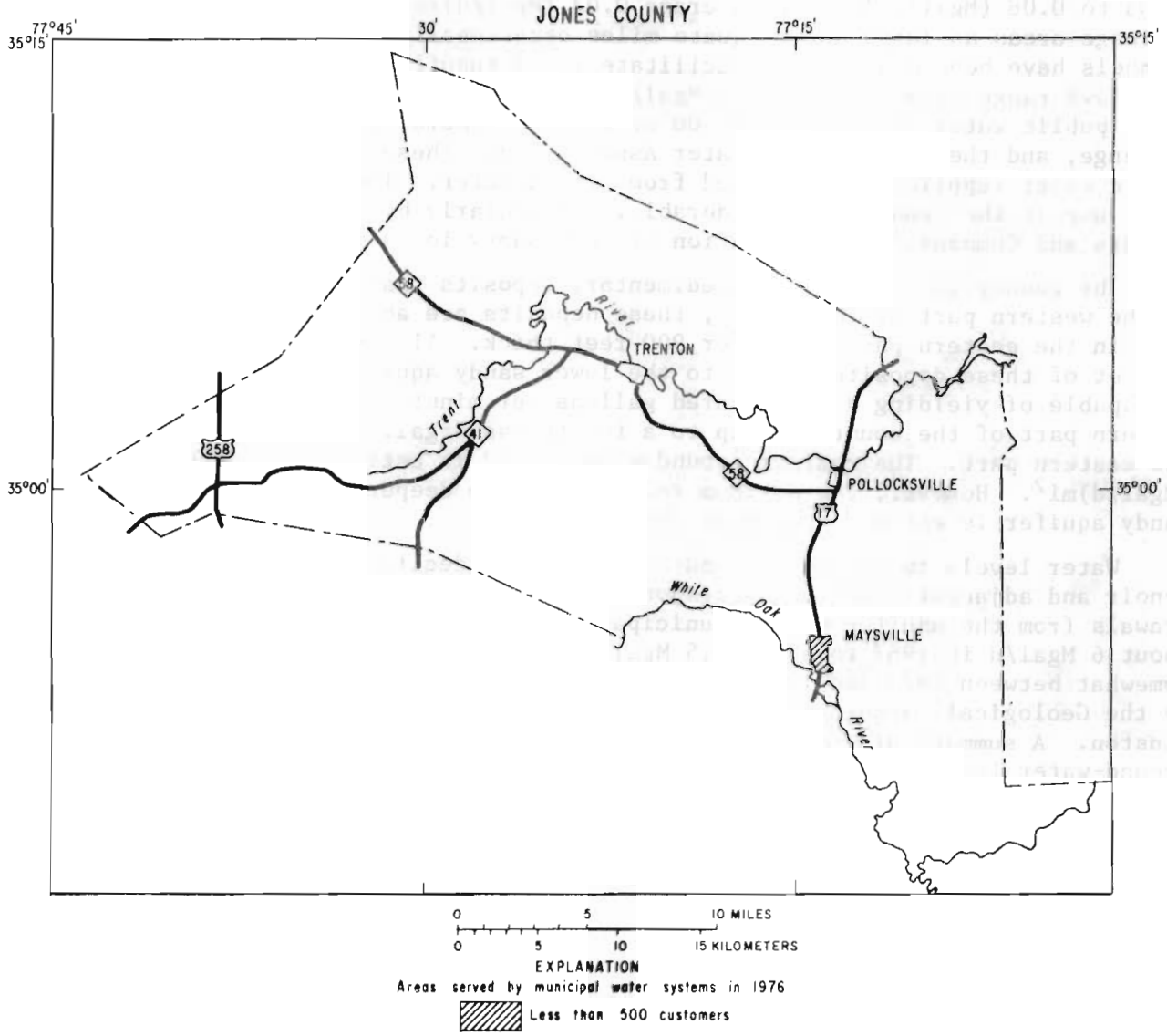
JONES COUNTY

WATER-RESOURCES APPRAISAL

Jones County is in the south-central part of the North Carolina Coastal Plain. The topography is flat and swamps are common. Most of the county is drained by the Trent River and its tributaries. A narrow band along the northern boundary of the county is drained by tributaries of the Neuse River, and the southeast corner of the county is drained by the White Oak River. The average discharge of streams in the county is 0.8 $(Mgal/d)/mi^2$. Minimum flows of streams range from 0.001 to 0.008 $(Mgal/d)/mi^2$ and average 0.006 $(Mgal/d)/mi^2$. Streams having drainage areas as large as 23 square miles have been observed to go dry. The 7-day, 2-year low flows range from 0.01 to 0.06 $(Mgal/d)/mi^2$ and average 0.035 $(Mgal/d)/mi^2$. No public water supplies in the county have 500 or more customers. The smaller public and individual supplies are obtained from ground water. The 1970 population of the county was 9,779.

The county is underlain by an eastward-thickening wedge of sedimentary deposits. In the northwestern part of the county, the deposits are about 800 feet thick; while in the southeastern part they are about 1400 feet thick. Within this wedge, beneath a sandy cover from 20 to 40 feet thick (upper sandy aquifer), the very permeable limestone aquifer reaches a thickness of about 600 feet in the southeast but does not exist in the extreme west of the county. Beneath the limestone aquifer is the lower sandy aquifer having a thickness of about 800 feet in the west and 1400 feet in the east of the county. Either of these aquifers should be able to supply more than 2,000 gal/min to wells. In the west, where the limestone is thin or absent, the lower sandy aquifer would be the first choice. In the east, the lower sandy aquifer is at considerable depth and contains only salty water. There, the limestone aquifer is at shallow depths, is thick and highly permeable, and contains fresh water to a depth of over 400 feet. The maximum ground-water yield of the limestone aquifer is estimated at 1.0 $(Mgal/d)/mi^2$. However, the maximum yield of the lower sandy aquifer is estimated at 0.06 $(Mgal/d)/mi^2$.

The ground water in the limestone aquifer and upper part of the lower sandy aquifer is generally hard and may contain excessive iron. Water from very deep wells in the lower sandy aquifer might be much softer but also might contain excessive concentrations of fluoride and dissolved solids.


JONES COUNTY
77°45'
30'
77°15'
35°15'
35°15'
35°00'
35°00'
TRENTON
POLLOCKSVILLE
MAYSVILLE
Trent River
White Oak River
258
41
70
58
17
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
Less than 500 customers

LENOIR COUNTY

WATER-RESOURCES APPRAISAL

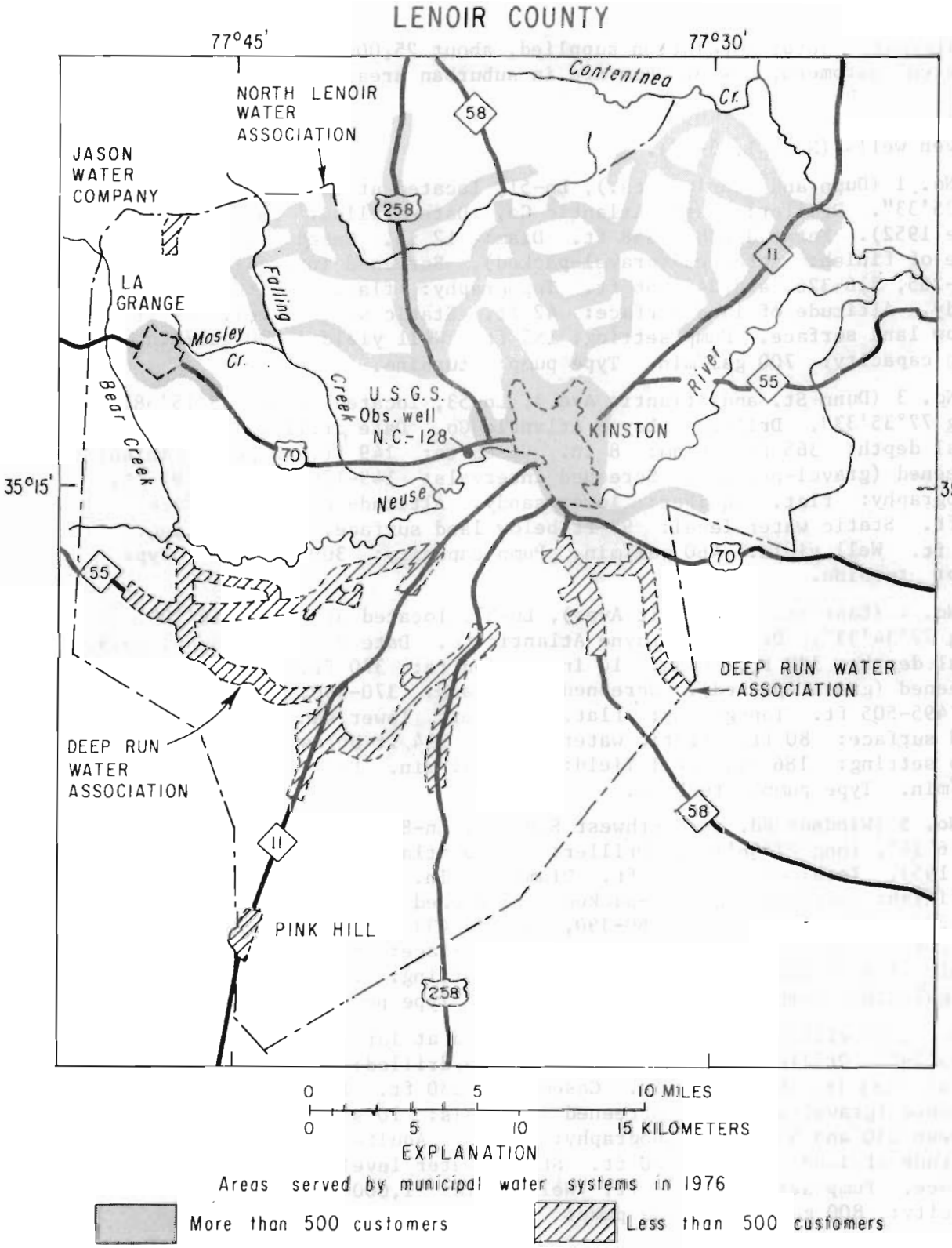
Lenoir County is in the central part of the North Carolina Coastal Plain. The topography is flat and large streams have broad swampy flood plains. The county is drained by the Neuse River and its tributaries. The average discharge of streams is 0.8 (Mgal/d)/mi^2. Minimum flows range from 0.003 to 0.08 (Mgal/d)/mi^2 and average 0.03 (Mgal/d)/mi^2. Streams having drainage areas as large as 50 square miles occasionally go dry unless their channels have been deepened to facilitate flood runoff. The 7-day, 2-year low flows range from 0.03 to 0.18 Mgal/d)/mi^2 and average 0.08 (Mgal/d)mi^2. Three public water supplies have 500 or more customers; these are Kinston, LaGrange, and the North Lenoir Water Association. These and the smaller public water supplies are obtained from ground water. Industrial ground-water use in the county is considerable, particularly by E.I. du Pont de Nemours and Company. The population of the county in 1970 was 55,204.

The county is underlain by sedimentary deposits that thicken eastward. In the western part of the county, these deposits are about 300 feet thick and, in the eastern part, are over 900 feet thick. All but the upper 10 to 20 feet of these deposits belong to the lower sandy aquifer. This aquifer is capable of yielding a few hundred gallons per minute to wells in the western part of the county and up to a few thousand gallons per minute in the eastern part. The maximum ground-water yield is estimated at 0.9 (Mgal/d)mi^2. However, the maximum recharge to the deeper parts of the lower sandy aquifer is estimated at 0.05 (Mgal/d)/mi^2.

Water levels in the lower sandy aquifer have declined in parts of Lenoir and adjacent counties in response to ground-water withdrawals. Withdrawals from the aquifer by all municipalities and industries increased from about 6 Mgal/d in 1967 to about 9.5 Mgal/d in 1973. Withdrawals decreased somewhat between 1973 and 1976. Changes in ground-water level are measured by the Geological Survey at observation well NC-128 on the west side of Kinston. A summary of withdrawals by the City of Kinston and the decline in ground-water level is shown in the following table.

Year	Withdrawals (Mgal/d)	Decline of yearly average water level (ft)
1968	2.91	-
1969	3.11	-
1970	3.48	3.6
1971	3.62	1.2
1972	4.31	5.5
1973	5.08	6.2
1974	4.70	3.9
1975	4.66	3.5
1976	4.66	.7

In general, water from wells of less than about 200 feet in depth is hard, whereas water from deeper wells is soft.


LENOIR COUNTY
77°45'
77°30'
35°15'
35°15'
NORTH LENOIR WATER ASSOCIATION
JASON WATER COMPANY
LA GRANGE
Mosley Cr.
Falling Creek
Bear Creek
Contentnea Cr.
U.S.G.S. Obs. well N.C.-128
KINSTON
Neuse River
DEEP RUN WATER ASSOCIATION
DEEP RUN WATER ASSOCIATION
PINK HILL
58
258
11
55
70
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

KINSTON, LENOIR COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 25,000 in 1976 (8,496 metered customers, 684 of whom are in suburban areas).

SOURCE:

Eleven wells (Nos. 1, 3-12).

Well No. 1 (Dunn and Manning Sts.), Ln-51, located at lat 35°15'55", long 77°35'33". Driller: Layne Atlantic Co. Date drilled: 1926 (reworked June 1952). Total depth: 358 ft. Diam: 12 in. Cased to: 205 ft. Type of finish: screened (gravel-packed). Screened intervals: 205-225, 245-265, 316-326, and 346-356 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 42 ft. Static water level: 87 ft below land surface. Pump setting: 155 ft. Well yield: 900 gal/min. Pump capacity: 700 gal/min. Type pump: turbine.

Well No. 3 (Dunn St. and Atlantic Ave.), Ln-53, located at lat 35°15'58", long 77°35'33". Driller: Layne Atlantic Co. Date drilled: Nov. 1945. Total depth: 365 ft. Diam: 8 in. Cased to: 149 ft. Type of finish: screened (gravel-packed). Screened intervals: 149-179 and 189-199 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 43 ft. Static water level: 90 ft below land surface. Pump setting: 186 ft. Well yield: 460 gal/min. Pump capacity: 300 gal/min. Type pump: turbine.

Well No. 4 (East St. and Summit Ave.), Ln-57, located at lat 35°16'20", long 77°34'33". Driller: Layne Atlantic Co. Date drilled: Sept. 1949. Total depth: 520 ft. Diam: 10 in. Cased to: 370 ft. Type of finish: screened (gravel-packed). Screened intervals: 370-390, 400-405, 465-485, and 495-505 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 80 ft. Static water level: 134 ft below land surface. Pump setting: 186 ft. Well Yield: 750 gal/min. Pump capacity: 550 gal/min. Type pump: turbine.

Well No. 5 (Windsor Rd. at Northwest School), Ln-85, located at lat 35°16'36", long 77°36'16". Driller: Layne Atlantic Co. Date drilled: May 1953. Total depth: 443 ft. Diam: 10 in. Cased to: 230 ft. Type of finish: screened (gravel-packed). Screened intervals: 230-240, 268-278, 290-300, 335-350, 360-390, and 428-433 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 68 ft. Static water level: 125 ft below land surface. Pump setting: 212 ft. Well yield: 820 gal/min. Pump capacity: 750 gal/min. Type pump: turbine.

Well No. 6 (Lovitt Hines Park), Ln-58, located at lat 35°15'35", long 77°33'59". Driller: Heater Well Co. Date drilled: Sept. 1955. Total depth: 483 ft. Diam: 10 in. Cased to: 230 ft. Type of finish: screened (gravel-packed). Screened intervals: 10 screens totaling 65 ft between 230 and 447 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 30 ft. Static water level: 84 ft below land surface. Pump setting: 138 ft. Well yield: 1,000 gal/min. Pump capacity: 800 gal/min. Type pump: turbine.

KINSTON, LENOIR COUNTY

Well No. 7 (Center Blvd. at fire station), Ln-86, located at lat 35°17'01", long 77°34'59". Driller: Heater Well Co. Date drilled: Dec. 1957. Total depth: 445 ft. Diam: 10 in. Cased to: 215 ft. Type of finish: screened (gravel-packed). Screened intervals: 13 screens totaling 65 ft between 215 and 440 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 57 ft. Static water level: 115 ft below land surface. Pump setting: 181 ft. Well yield: 1,000 gal/min. Pump capacity: 800 gal/min. Type pump: turbine.

Well No. 8 (SR 1804 near U.S. 70 East), Ln-89, located at lat 35°14'08", long 77°33'01". Driller: Hartsfields Water Co. Date drilled: July 1967. Total depth: 500 ft. Diam: 10 in. Cased to: 316 ft. Type of finish: screened (gravel-packed). Screened intervals: nine screens totaling 96 ft between 316 and 482 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 47 ft. Static water level: 86 ft below land surface. Pump setting: 201 ft. Well yield: 1,100 gal/min. Pump capacity: 950 gal/min. Type pump: turbine.

Well No. 9 (Cunningham Rd. near NC-55), Ln-90, located at lat 35°17'23". long 77°33'14". Driller: Hartsfield Water Co. Date drilled: April 1970. Total depth: 485 ft. Diam: 10 in. Cased to: 272 ft. Type of finish: screened (gravel-packed). Screened intervals: eight screens totaling 100 ft between 272 and 482 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 74 ft. Static water level: 136 ft below land surface. Pump setting: 224 ft. Well yield: 1,000 gal/min. Pump capacity: 850 gal/min. Type pump: turbine.

Well No. 10 (Airport Rd. near airport), Ln-91, located at lat 35°19'20", long 77°36'38". Driller: Hartsfield Water Co. Date drilled: about 1970. Total depth: 415 ft. Diam: 10 in. Cased to: 250 ft. Type of finish: screened (gravel-packed). Screened intervals: ten screens totaling 100 ft between 250 and 412 feet. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 84 ft. Static water level: 109 ft below land surface. Pump setting: 249 ft. Well yield: 1,000 gal/min. Pump capacity: 850 gal/min. Type pump: turbine.

Well No. 11 (Darden Dr.), Ln-92, located at lat 35°14'19", long 77°35'11". Driller: Singer-Layne Atlantic Co. Date drilled: 1975. Total depth: 545 ft. Diam: 10 in. Cased to: 257 ft. Type of finish: screened (gravel-packed). Screened intervals: 5 screens totaling 98 ft between 322 and 420 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 41 ft. Static water level: 76 ft below land surface. Pump setting: 247 ft. Pump capacity: 1,000 gal/min. Type pump: turbine.

Well No. 12 (SR 1819 near SR 1804), Ln-93, located at lat 35°14'44", long 77°30'41". Driller: Singer-Layne Atlantic Co. Date drilled: 1975. Total depth: 485 ft. Diam: 10 in. Cased to: 257 ft. Type of finish: screened (gravel-packed). Screened intervals: 6 screens totaling 100 ft between 280 and 485 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 38 ft. Static water level: 75 ft below land surface. Pump setting: 238 ft. Pump capacity: 1,000 gal/min. Type pump: turbine.

KINSTON, LENOIR COUNTY

TOTAL USE:

Average (1975), 4.7 Mgal/d, estimated: maximum daily not available.

INDUSTRIAL USE:

2.0 Mgal/d. Principal users include Texfi Knitting, Glen Raven Mills, and Frosty Morn Meats, Inc.

TREATMENT:

None.

PUMPING CAPACITY:

12.2 Mgal/d.

WATER STORAGE:

Five elevated tanks, 500,000 gallons each; one ground storage tank, 1,000,000 gallons.

FUTURE PLANS:

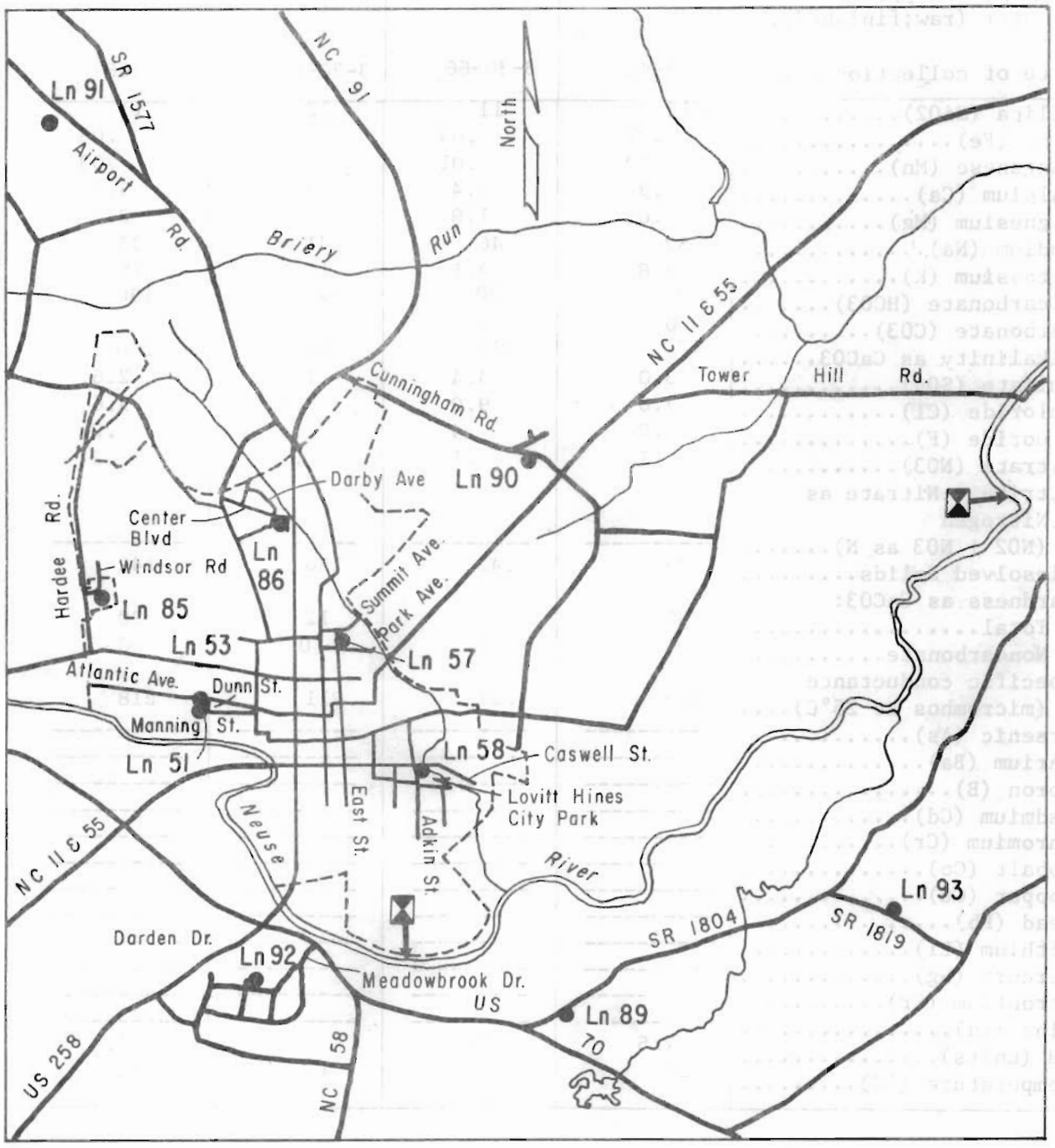
Will drill two more wells; will extend lines and increase line sizes.

WATER-RESOURCES APPRAISAL:

Surface water: Kinston is on the Neuse River in the eastern part of Lenoir County. The Neuse River is capable of supplying not only the foreseeable water needs of Kinston but the needs of the entire county.

Ground water: Kinston is underlain at very shallow depths by the lower sandy aquifer. Here, the lower sandy aquifer is about 600 feet thick. Well yields of over 1,000 gal/min can be obtained. Static water levels in the Kinston area are presently (1976) about one hundred feet below land surface. These depressed water levels are caused by drawdowns produced by the city's supply wells and industrial wells northeast of the city. The decline in the water levels is continuing. However, the rate of decline has decreased since 1973 when withdrawals were reduced. The immediate consequence of this head decline are higher pumping costs, but an eventual consequence could be declining well yields. The lower sandy aquifer yields soft water at Kinston.

CITY OF KINSTON



KINSTON, LENOIR COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1	Well No. 3	Well No. 4	Well No. 5
Date of collection.....	3-30-66	3-30-66	3-30-66	3-30-66
Silica (SiO_2).....	12	11	10	11
Iron (Fe).....	.07	.04	.08	.03
Manganese (Mn).....	.02	.01	.02	.03
Calcium (Ca).....	9.9	3.4	3.5	3.7
Magnesium (Mg).....	2.6	1.8	.7	2.7
Sodium (Na).....	32	46	41	33
Potassium (K).....	8.8	9.1	10	15
Bicarbonate (HCO_3).....	130	130	120	130
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	100	110	99	100
Sulfate (SO_4).....	3.0	3.4	1.8	2.6
Chloride (Cl).....	7.0	9.0	7.0	3.6
Fluoride (F).....	.2	.4	.3	.2
Nitrate (NO_3).....	.1	.1	.1	.2
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	139	142	136	142
Hardness as $CaCO_3$:				
Total.....	38	16	12	20
Noncarbonate.....	0	0	0	0
Specific conductance (micromhos at 25°C)....	219	227	211	218
Arsenic (As).....	----------	----------	----------	----------
Barium (Ba).....	----------	----------	----------	----------
Boron (B).....	----------	----------	----------	----------
Cadmium (Cd).....	----------	----------	----------	----------
Chromium (Cr).....	----------	----------	----------	----------
Cobalt (Co).....	----------	----------	----------	----------
Copper (Cu).....	----------	----------	----------	----------
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	----------
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	----------
Zinc (Zn).....	----------	----------	----------	----------
pH (units).....	7.5	7.5	7.4	7.4
Temperature (°C).....	18	18	18	18

KINSTON, LENOIR COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 6	Well No. 7	Well No. 9 Raw
Date of collection	3-30-66	3-30-66	3-17-76
Silica (SiO2)	11	9.7	12
Iron (Fe)	.04	.04	.03
Manganese (Mn)	.01	.03	.000
Calcium (Ca)	2.2	5.3	0.8
Magnesium (Mg)	.4	3.6	0.4
Sodium (Na)	43	34	50
Potassium (K)	9.6	19	8.0
Bicarbonate (HCO3)	120	150	120
Carbonate (CO3)	0	0	0
Alkalinity as CaCO3	96	120	100
Sulfate (SO4)	4.8	1.2	4.0
Chloride (Cl)	8.8	3.0	8.1
Fluoride (F)	.2	.2	.4
Nitrate (NO3)	.2	.2	----------
Nitrite + Nitrate as Nitrogen (NO2 + NO3 as N)	----------	----------	.01
Dissolved Solids	146	157	145
Hardness as CaCO3:			
Total	7	28	4
Noncarbonate	0	0	0
Specific conductance (micromhos at 25°C)	219	248	240
Arsenic (As)	----------	----------	.000
Barium (Ba)	----------	----------	.0
Boron (B)	----------	----------	.30
Cadmium (Cd)	----------	----------	.000
Chromium (Cr)	----------	----------	.000
Cobalt (Co)	----------	----------	.000
Copper (Cu)	----------	----------	.000
Lead (Pb)	----------	----------	----------
Lithium (Li)	----------	----------	.00
Mercury (Hg)	----------	----------	----------
Strontium (Sr)	----------	----------	.01
Zinc (Zn)	----------	----------	.00
pH (units)	7.8	7.5	8.3
Temperature (°C)	16	18	----------

LA GRANGE, LENOIR COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,000 in 1973 (1,084 metered customers, 13 of whom are in suburban areas).

SOURCE:

Two wells (No. 1 and No. 2).

Well No. 1 (Blue Bell), Ln-88, located at lat 35°17'13", long 77°45'20". Driller: Hartsfield Water Co. Date drilled: Dec. 1966. Total depth: 364 ft. Diam: 10 in. Cased to: 200 ft. Type of finish: screened (gravel-packed). Screened intervals: 10 screens totalling 52 ft between 200 and 354 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 99 ft. Static water level: 47 ft below land surface. Well yield: 500 gal/min. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 2 (Wooten St., standby only), Ln-87, located at lat 35°18'24", long 77°47'07". Driller: Layne Atlantic Co. Date drilled: 1954. Total depth: 321 ft. Diam: 10 in. Cased to: _____. Type of finish: screened. Screened intervals: _____. Topography: _____. Aquifer: lower sandy. Altitude of land surface: 105 ft. Static water level: _____. Pump capacity: 200 gal/min. Type pump: turbine.

TOTAL USE:

0.35 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

0.11 Mgal/d, estimated. Principal users include Joy Manufacturing Co., Blue Bell Industries, and Hardy and Newsom, Inc.

TREATMENT:

Aeration, chlorination, addition of phosphate compounds for corrosion control, and adjustment of pH with lime.

RATED CAPACITY OF TREATMENT PLANT:

0.72 Mgal/d.

PUMPING CAPACITY:

Raw water, 1.0 Mgal/d; finished water, 0.86 Mgal/d.

LA GRANGE, LENOIR COUNTY

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks, 100,000 and 200,000 gallons.

FUTURE PLANS:

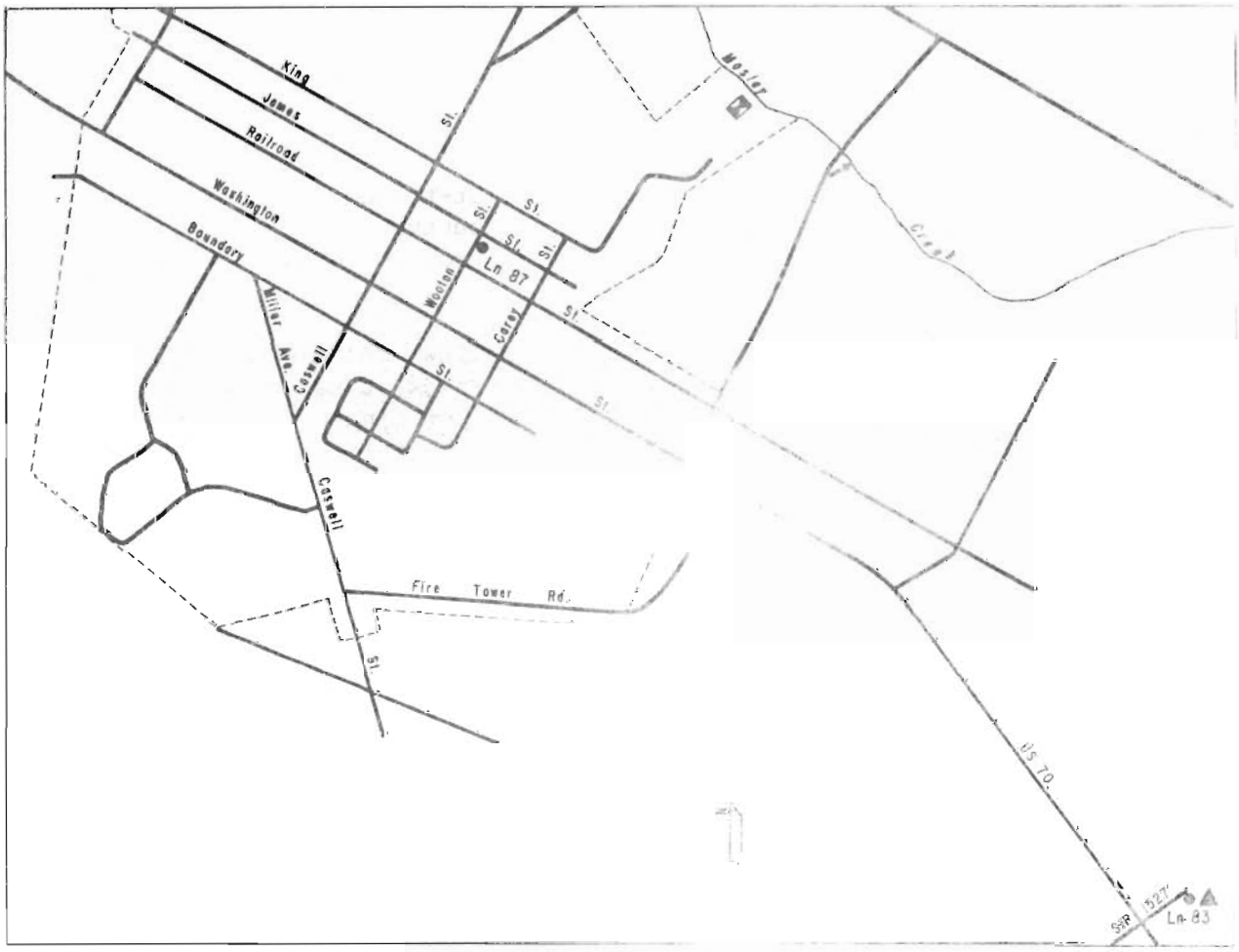
May drill another well.

WATER-RESOURCES APPRAISAL:

Surface water: La Grange is located on a flat-topped hill between Bear and Mosley Creeks in northwestern Lenoir County. Bear Creek has excellent low flow characteristics and could easily provide enough water for La Grange's foreseeable needs.

Ground water: La Grange is underlain at shallow depths by the lower sandy aquifer. This aquifer is almost 400 feet thick at La Grange and is capable of supplying a few hundred gallons per minute of water to wells. The water from this aquifer is soft and is regarded as being corrosive.

TOWN OF LA GRANGE



1000 2000

250 500 750

EXPLANATION

Ln 87
Well

Treatment plant

Sewage treatment plant

Sewage outfall

LA GRANGE, LENOIR COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Blue Bell Well Raw	Blue Bell Well Finished		
Date of collection.....	3-18-76	3-18-76		
Silica (SiO_2).....	32	28		
Iron (Fe).....	.08	----------		
Manganese (Mn).....	.010	----------		
Calcium (Ca).....	5.8	6.2		
Magnesium (Mg).....	3.0	3.5		
Sodium (Na).....	11	15		
Potassium (K).....	6.5	7.0		
Bicarbonate (HCO_3).....	60	71		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	49	58		
Sulfate (SO_4).....	3.1	3.7		
Chloride (Cl).....	3.0	5.9		
Fluoride (F).....	.3	.6		
Nitrate (NO_3).....	----------	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01	.00		
Dissolved Solids.....	95	105		
Hardness as $CaCO_3$:				
Total.....	27	30		
Noncarbonate.....	0	0		
Specific conductance (micromhos at 25°C)....	126	141		
Arsenic (As).....	.000	----------		
Barium (Ba).....	.0	----------		
Boron (B).....	.06	----------		
Cadmium (Cd).....	.000	----------		
Chromium (Cr).....	.000	----------		
Cobalt (Co).....	.000	----------		
Copper (Cu).....	.000	----------		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.01	----------		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.06	----------		
Zinc (Zn).....	.03	----------		
pH (units).....	6.7	6.9		
Temperature (°C).....	----------	----------		

NORTH LENOIR WATER ASSOCIATION, LENOIR COUNTY

OWNERSHIP:

Water association. Total population supplied, about 4,000 in 1976 (1,180 metered customers).

SOURCE:

Seven wells (Nos. 1-7).

Well No. 1 (Ruritan Bldg.), Ln-93, located at lat 35°20'34", long 77°39'26". Driller: Hartsfield Water Co. Date drilled: 1972. Total depth: 346 ft. Diam: 6 in. Cased to: 306 ft. Type of finish: screened (gravel-packed). Screened intervals: 306-316, 320-325, and 341-346 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 103 ft. Static water level: 90 ft below land surface. Pump capacity: 100 gal/min. Type pump: submersible.

Well No. 2 (NC-58, Wooten's Crossroads), Ln-94, located at lat 35°21'27", long 77°36'11". Driller: Hartsfield Water Co. Date drilled: Oct. 1970. Total depth: 358 ft. Diam: 6 in. Cased to: 320 ft. Type of finish: screened (gravel-packed). Screened intervals: 320-330, 342-347, and 353-358 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 80 ft. Static water level: 81 ft below land surface. Well yield: 110 gal/min. Pump capacity: 100 gal/min. Type pump: submersible.

Well No. 3 (Don Eubanks), Ln-95, located at lat 35°21'15", long 77°33'23". Driller: Hartsfield Water Co. Date drilled: Mar. 1970. Total depth: 355 ft. Diam: 6 in. Cased to: 315 ft. Type of finish: screened (gravel-packed). Screened intervals: 315-320, 333-338, and 350-355 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 74 ft. Static water level: 105 ft below land surface. Well yield: 110 gal/min. Pump capacity: 100 gal/min. Type pump: submersible.

Well No. 4 (Institute), Ln-96, located at lat 35°20'43", long 77°42'25". Driller: Hartsfield Water Co. Date drilled: Mar. 1971. Total depth: 393 ft. Diam: 6 in. Cased to: 320 ft. Type of finish: screened (gravel-packed). Screened intervals: 320-330, 345-350, 360-370, and 385-390 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 112 ft. Static water level: 92 ft below land surface. Pump capacity: 200 gal/min. Type pump: submersible.

Well No. 5 (Poole's), Ln-97, located at lat 35°18'40", long 77°39'02". Driller: Hartsfield Water Co. Date drilled: Apr. 1971. Total depth: 385 ft. Diam: 6 in. Cased to: 300 ft. Type of finish: screened (gravel-packed). Screened intervals: 300-310, 320-325, 332-337, and 370-380 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 108 ft. Static water level: 97 ft below land surface. Pump capacity: 175 gal/min. Type pump: submersible.

NORTH LENOIR WATER ASSOCIATION, LENOIR COUNTY

Well No. 6 (Humphrey's store, Field's mill), Ln-98, located at lat 35°19'22", long 77°33'56". Driller: R. L. Magette Co. Date drilled: Nov. 1972. Total depth: 356 ft. Diam: 6 in. Cased to: 308 ft. Type of finish: screened (gravel-packed). Screened intervals: 308-316, 330-338, and 348-356 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 74 ft. Static water level: 110 ft below land surface. Pump capacity: 100 gal/min. Type pump: submersible.

Well No. 7 (Grainger's Station), Ln-99, located at lat 35°19'36", long 77°30'10". Driller: R. L. Magette Co. Date drilled: May 1973. Total depth: 358 ft. Diam: 6 in. Cased to: 308 ft. Type of finish: screened (gravel-packed). Screened intervals: 308-324 and 350-358 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 75 ft. Static water level: 90 ft below land surface. Pump capacity: 100 gal/min. Type pump: submersible.

TOTAL USE:

Average (1975), 0.2 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

None.

PUMPING CAPACITY:

1.2 Mgal/d.

WATER STORAGE:

One elevated tank, 75,000 gallons; seven pressure tanks totaling 47,000 gallons.

FUTURE PLANS:

Will install new elevated tank and will extend lines.

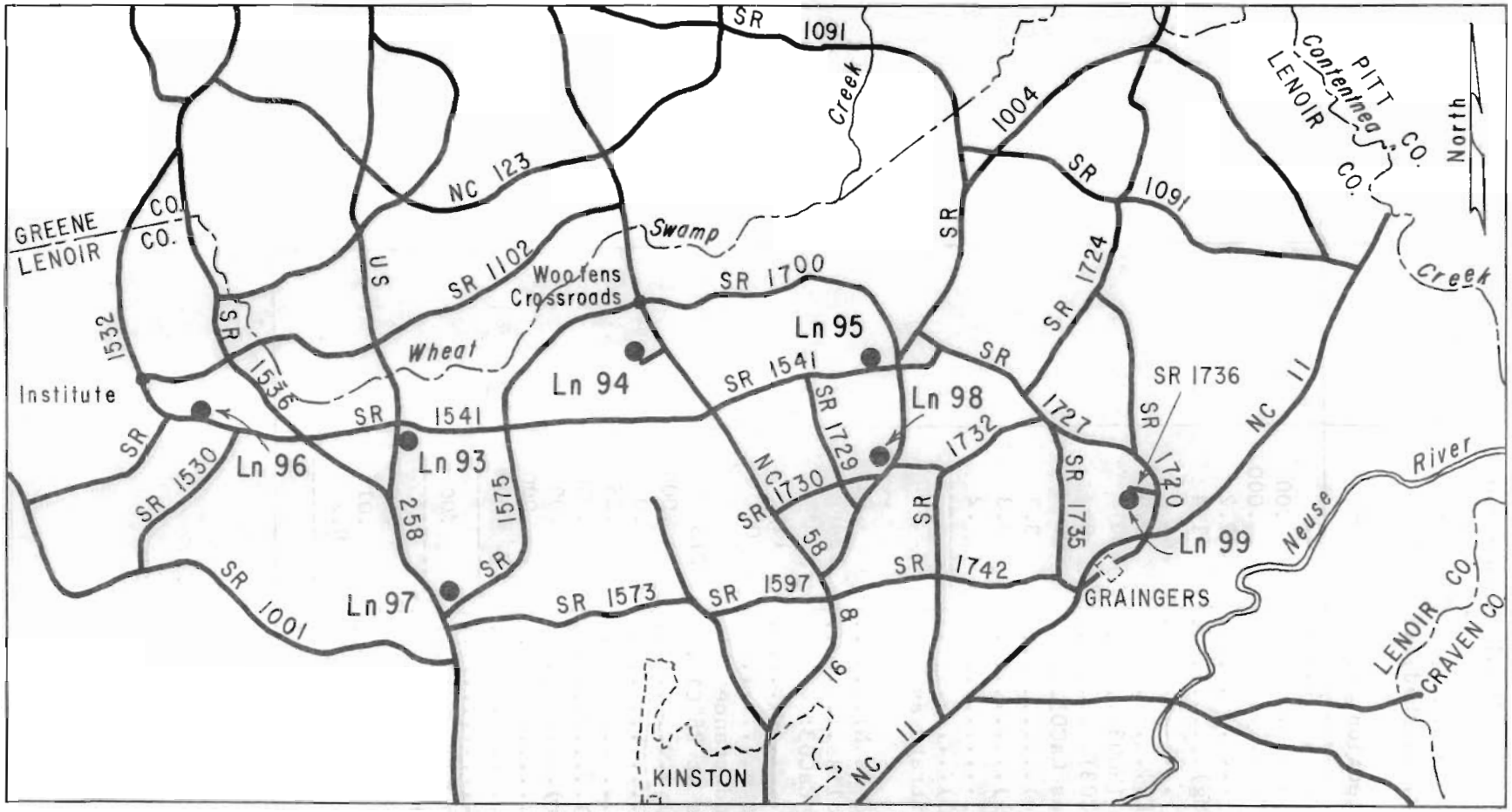
NORTH LENOIR WATER ASSOCIATION, LENOIR COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The North Lenoir Water Association's service area occupies much of the northern third of Lenoir County. The topography is flat. The average discharge of streams in the area is 0.8 (Mgal/d)/mi^2. Minimum flows of streams in the area range from 0.003 to 0.025 (Mgal/d)/mi^2 and average 0.010 (Mgal/d)/mi^2. The 7-day, 2-year discharges of the area's streams range from 0.027 to 0.10 (Mgal/d)/mi^2 and average 0.06 (Mgal/d)/mi^2. Although no single stream could supply the Association's needs, all of the streams together could. In addition, the Association's lines extend to within less than a mile of the Neuse River, which would afford a more than ample supply of water.

Ground water: The North Lenoir Water Association's service area is underlain at shallow depths by the lower sandy aquifer. The thickness in the western part is about 400 feet and is about 900 feet in the eastern part. This aquifer is capable of yielding a few hundred gallons per minute to wells in the western part to over 1,000 gal/min in the eastern part. The static water levels in the aquifer average almost 100 feet below the land surface. These depressed water levels are largely the result of well interference from Kinston's wells to the south and the industrial wells to the east. The water from the lower sandy aquifer is soft throughout most of the area.

NORTH LENOIR WATER SYSTEM



NORTH LENOIR WATER ASSOCIATION, LENOIR COUNTY

ANALYSES
(In milligrams per liter, except as noted)

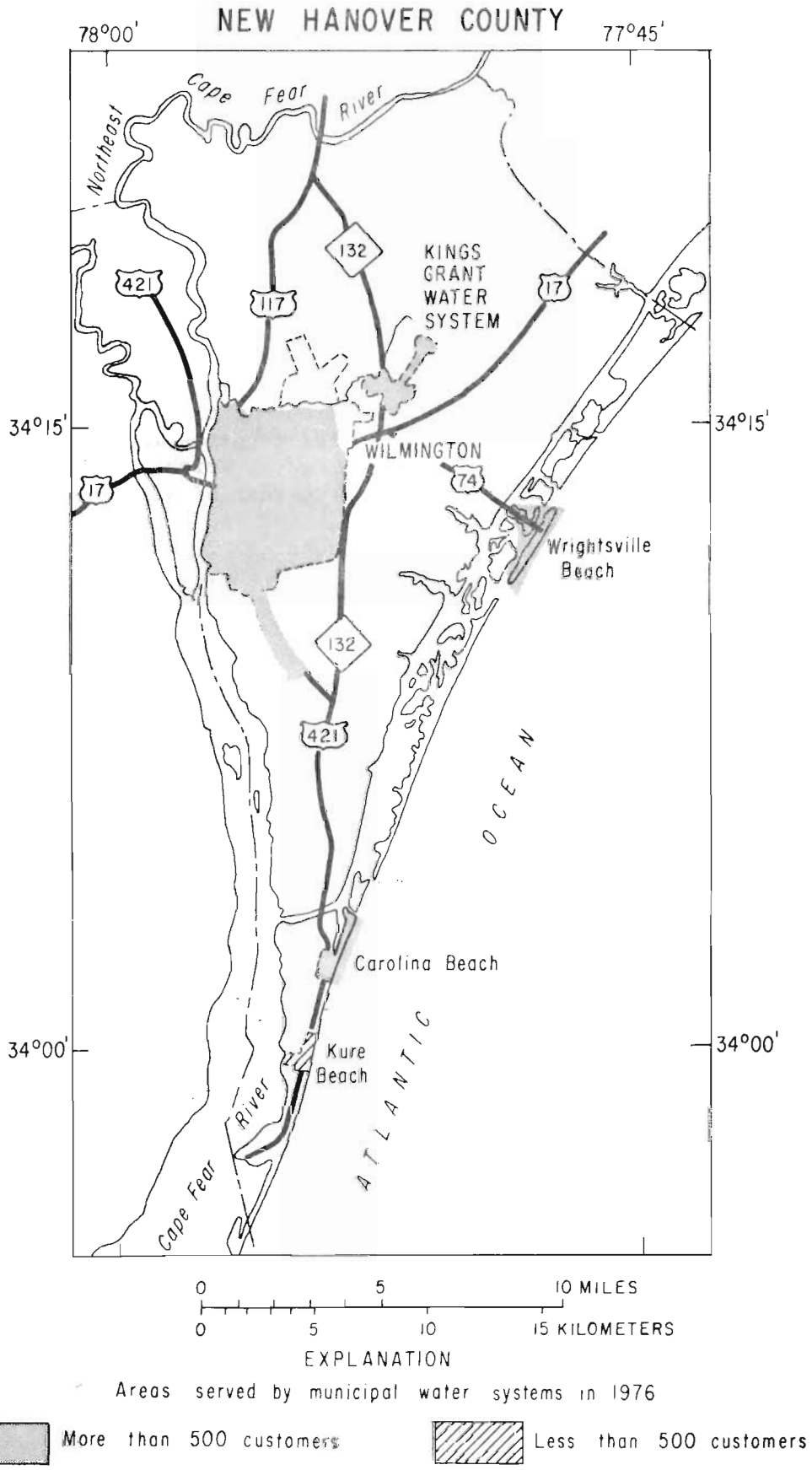
Source, or type of water (raw;finished)...	Well No. 5 Raw			
Date of collection.....	3-18-76			
Silica (SiO_2).....	12			
Iron (Fe).....	.00			
Manganese (Mn).....	.000			
Calcium (Ca).....	2.2			
Magnesium (Mg).....	1.4			
Sodium (Na).....	41			
Potassium (K).....	9.0			
Bicarbonate (HCO_3).....	120			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	100			
Sulfate (SO_4).....	3.7			
Chloride (Cl).....	3.3			
Fluoride (F).....	.2			
Nitrate (NO_3).....	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	134			
Hardness as $CaCO_3$:				
Total.....	11			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	213			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.25			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	---			
Lithium (Li).....	.00			
Mercury (Hg).....	---			
Strontium (Sr).....	.03			
Zinc (Zn).....	.01			
pH (units).....	8.2			
Temperature (°C).....	---			

NEW HANOVER COUNTY

WATER-RESOURCES APPRAISAL

New Hanover County is in the southeastern part of the North Carolina Coastal Plain. The topography is flat and low with many swampy areas. The western and northern parts of the county are drained by the Cape Fear River and its tributaries. This river also forms the western boundary of the county. The Cape Fear River and its major tributaries are estuarine and salty in the county. The eastern part of the county is drained by streams that flow to the Atlantic Ocean, which forms the eastern boundary of the county. The average discharge of streams in the county is 1.0 $(Mgal/d)/mi^2$. Minimum flow and 7-day, 2-year low flow data are not available for the county. However, streams with drainage areas up to 10 square miles have been observed to go dry. Four public water supplies in the county have 500 or more customers: Wilmington, Carolina Beach, Wrightsville Beach, and Kings Grant. All of these supplies, except that of Wilmington, are from ground water. In addition, smaller public and individual water supplies and large industrial water supplies are obtained from ground water in the county. The county population in 1970 was 82,996.

The county is underlain by sedimentary deposits that thicken in a southeasterly direction. The upper sandy aquifer averages only about 50 feet in thickness. Except for a small area in northwest New Hanover County, the upper sandy aquifer is underlain by the limestone aquifer. Where present the limestone aquifer is about 50 feet thick in the northern part of the county and reaches a thickness of over 150 feet in the southern part of the county. Even where this highly-permeable aquifer is thin, well yields of a few hundred gallons per minute are obtainable. Where it is thickest, well yields of over 1,000 gal/min can be obtained. The limestone aquifer is underlain by the lower sandy aquifer. The lower sandy aquifer is about 1,000 feet thick in the northwestern part of the county increasing to about 1,300 feet in thickness in the southeast. However, the fresh-water part of the aquifer is relatively thin. The occurrence of salt water in New Hanover County is erratic, especially in the coastal areas and off-shore strands. The lower sandy aquifer might be able to produce a few hundred gallons per minute to wells at some places in these areas, but lower yields would be more prudent in order to avoid salt-water encroachment. The same statement would apply to the limestone aquifer in the coastal areas. There is an isolated occurrence of salt water in the extreme northwest corner of the county where the depth to salt water can be less than 200 feet. In this area, the lower sandy aquifer might yield only 100 gal/min of fresh water to wells. The maximum ground-water yield in the county is estimated at 1.0 $(Mgal/d)/mi^2$. The ground water is usually hard and may contain excessive iron or hydrogen sulfide.


NEW HANOVER COUNTY
78°00'
77°45'
34°15'
34°00'
Cape Fear River
Northeast
132
421
117
17
KINGS GRANT WATER SYSTEM
WILMINGTON
74
Wrightsville Beach
Carolina Beach
Kure Beach
Cape Fear River
ATLANTIC OCEAN
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

CAROLINA BEACH, NEW HANOVER COUNTY

OWNERSHIP:

Municipal. Total population supplied about 5,000 in 1975 (1,800 metered customers, 12 of whom are in suburban areas).

SOURCE:

Six wells (Nos. 1 - 6).

Well No. 1 (Atlantic Ave. at school), Nh-94, located at lat 34°01'53", long 77°54'02". Driller: Butler. Date drilled: 1941. Total depth: 195 ft. Diam: 8 in. Cased to: _____. Type of finish: screened. Screened intervals: _____. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 2 ft below land surface. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 2 (U.S. 421 at Carolina Lake), Nh-95, located at lat 34°01'41", long 77°53'44". Driller: _____. Date drilled: 1938. Total depth: 195 ft. Diam: 8 in. Cased to: 125 ft. Type of finish: screened (?). Topography: flat. Aquifer: limestone. Altitude of land surface: 5 ft. Static water level: _____. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 3 (between elevated tank and ground storage tank), Nh-416, located at lat 34°02'05", long 77°53'50". Driller: _____. Date drilled: 1938. Total depth: 195 ft. Diam: 8 in. Cased to: 122 ft. Type of finish: screened (?). Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: _____. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 4 (landfill area off Dow Rd.), Nh-417, located at lat 34°01'57", long 77°54'36". Driller: _____. Date drilled: 1943. Total depth: 150 ft. Diam: 8 in. Cased to: 112 ft. Type of finish: screened (?). Topography: flat. Aquifer: limestone. Altitude of land surface: 20 ft. Static water level: _____. Pump capacity: 150 gal/min. Type pump: turbine.

Well No. 5 (Wilson Ave., between 3rd and 4th Sts.), Nh-89, located at lat 34°02'13", long 77°53'49". Driller: _____. Date drilled: 1945. Total depth: 201 ft. Diam: 8 in. Cased to: 90 ft. Type of finish: screened (?). Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 10 ft below land surface. Pump capacity: 150 gal/min. Type pump: turbine.

CAROLINA BEACH, NEW HANOVER COUNTY

Well No. 6 (Clarendon Ave.), Nh-418, located at lat 34°01'55", long 77°54'19". Driller: _____. Date drilled: 1954. Total depth: 191 ft. Diam: 10 in. Cased to: 135 ft. Type of finish: screened (?). Topography: flat. Aquifer: limestone. Altitude of land surface: 15 ft. Static water level: _____. Pump capacity: 150 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.4 Mgal/d, estimated; maximum daily (summer), 1.0 million gallons, estimated.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination at each well during off-season. Chlorination at tank reservoir during busy season.

PUMPING CAPACITY:

Raw water, 1.3 Mgal/d; finished water, 1.3 Mgal/d.

RAW-WATER STORAGE:

One ground storage tank, 1,000,000 gallons.

FINISHED-WATER STORAGE:

One elevated tank, 100,000 gallons.

FUTURE PLANS:

A new well is under construction. The planned pump capacity is 150 gal/min. A new treatment facility will be built using aeration, prechlorination, settling, softening, and postchlorination. The present ground storage tank will be used for settling flocculated iron.

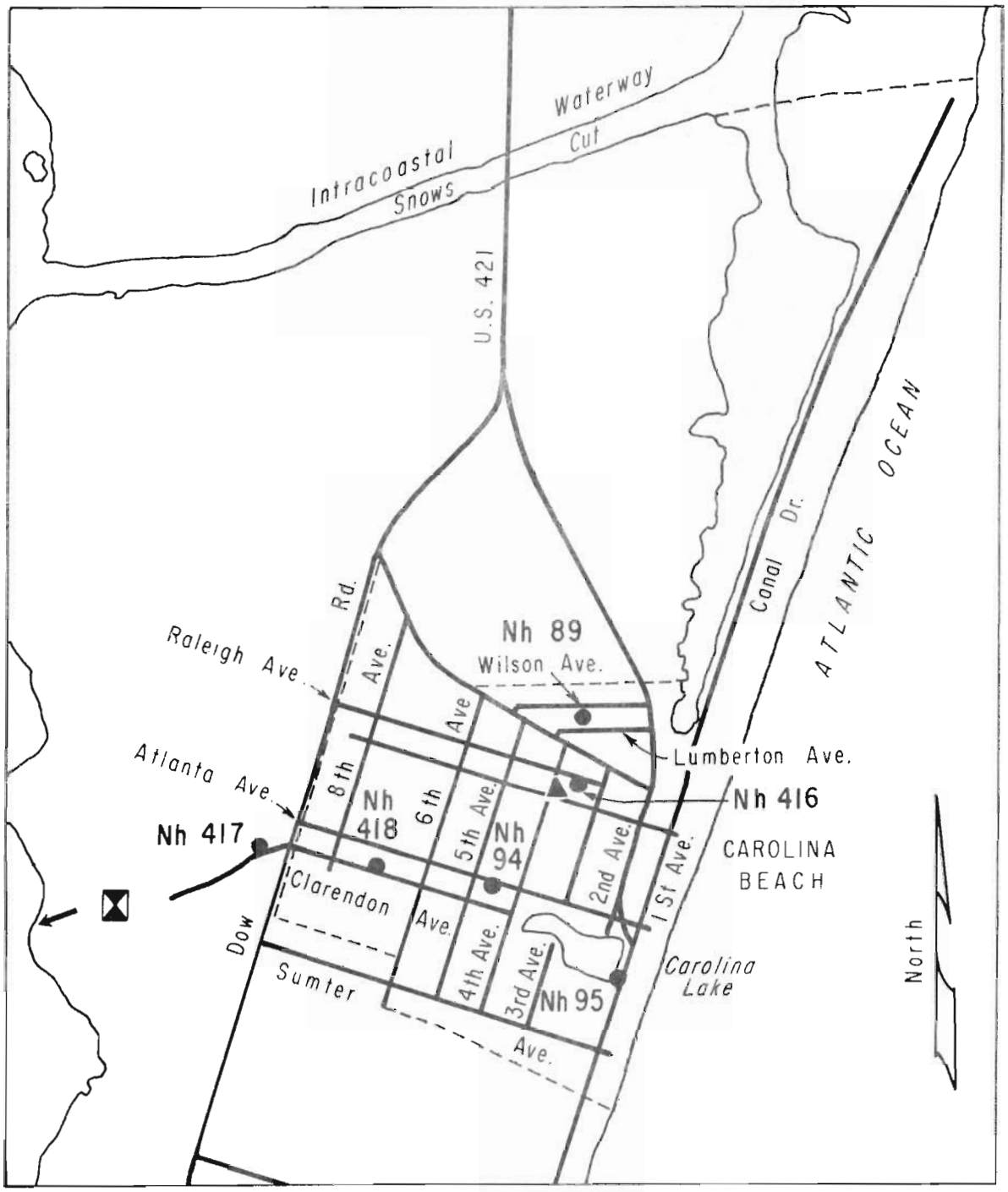
CAROLINA BEACH, NEW HANOVER COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Carolina Beach is on the coast in southern New Hanover County. The topography is flat except for a few dunes in the beach area. There are few discernible streams, many of which have been ditched, and swamps are common in the environs. The capacity and water quality of Carolina Lake, which lies within the town, are unknown. It is unlikely that an adequate and economically viable surface-water supply could be developed near the town.

Ground water: Carolina Beach is underlain by the limestone aquifer at a depth of about 60 feet. This aquifer is over 100 feet thick here. Although this aquifer might be capable of yielding over 1,000 gal/min to wells, the threat of vertical or lateral salt-water encroachment would make much smaller yields more practical. The depth to salt water here is unknown but is greater than 200 feet. This indicates that there may be a fresh-water zone in the underlying lower sandy aquifer. Practical well yields probably would be very low in this aquifer. The maximum ground-water yield in this area is 1.0 $(Mgal/d)/mi^2$. The water from wells in the limestone aquifer is hard, has a moderate dissolved-solids concentration, and may contain excessive iron.

TOWN OF CAROLINA BEACH



CAROLINA BEACH, NEW HANOVER COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 3 Finished	Well No. 3 Raw		
Date of collection.....	9-1-66	8-21-75		
Silica (SiO_2).....	27	----------		
Iron (Fe).....	.21	0.19		
Manganese (Mn).....	.02	.010		
Calcium (Ca).....	38	----------		
Magnesium (Mg).....	25	----------		
Sodium (Na).....	25	----------		
Potassium (K).....	20	----------		
Bicarbonate (HCO_3).....	240	----------		
Carbonate (CO_3).....	0	----------		
Alkalinity as $CaCO_3$.....	200	----------		
Sulfate (SO_4).....	.2	----------		
Chloride (Cl).....	50	47		
Fluoride (F).....	.2	----------		
Nitrate (NO_3).....	.5	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------		
Dissolved Solids.....	310	----------		
Hardness as $CaCO_3$:				
Total.....	200	----------		
Noncarbonate.....	2	----------		
Specific conductance (micromhos at 25°C)....	540	421		
Arsenic (As).....	----------	.000		
Barium (Ba).....	----------	.0		
Boron (B).....	----------	----------		
Cadmium (Cd).....	----------	.000		
Chromium (Cr).....	----------	.000		
Cobalt (Co).....	----------	.000		
Copper (Cu).....	----------	.000		
Lead (Pb).....	----------	----------		
Lithium (Li).....	----------	.00		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	----------	.24		
Zinc (Zn).....	----------	.05		
pH (units).....	7.8	----------		
Temperature (°C).....	21	----------		

KINGS GRANT WATER SYSTEM, NEW HANOVER COUNTY

OWNERSHIP:

Kings Grant Water Co. Total population supplied, about 2,800 in 1975 (830 metered customers).

SOURCE:

Three wells (Nos. 1-3).

Well No. 1 (Lord Tennyson Rd.), Nh-419, located at lat 34°15'32", long 77°51'47". Driller: Bill Dobo. Date drilled: 1968. Total depth: 143 ft. Diam: 8 in. Cased to: _____. Type of finish: open hole. Topography: flat. Aquifer: limestone and lower sandy (?). Altitude of land surface: 38 ft. Static water level: _____. Pump capacity: 250 gal/min. Type pump: turbine.

Well No. 2 (Fitzgerald Dr.), Nh-420, located at lat 34°15'51", long 77°51'19". Driller: Bill Dobo. Date drilled: 1969. Total depth: 135 ft. Diam: 8 in. Cased to: _____. Type of finish: open hole. Topography: flat. Aquifer: _____. Altitude of land surface: 38 ft. Static water level: about 15 ft below land surface. Pump setting: 95 ft. Pump capacity: 250 gal/min. Type pump: turbine.

Well No. 3 (Parkwood), Nh-421, located at lat 34°16'56", long 77°51'03". Driller: Bill Dobo. Date drilled: about 1972. Total depth: 160 ft. Diam: 8 in. Cased to: 126 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone and lower sandy (?). Altitude of land surface: 43 ft. Static water level: _____. Pump capacity: 250 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.22 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination.

RATED CAPACITY OF TREATMENT PLANT:

Each well has demand-type feeder, not rated.

KINGS GRANT WATER SYSTEM, NEW HANOVER COUNTY

PUMPING CAPACITY:

1.1 Mgal/d, estimated.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 200,000 gallons; two pneumatic tanks, 5,000 and 3,000 gallons.

FUTURE PLANS:

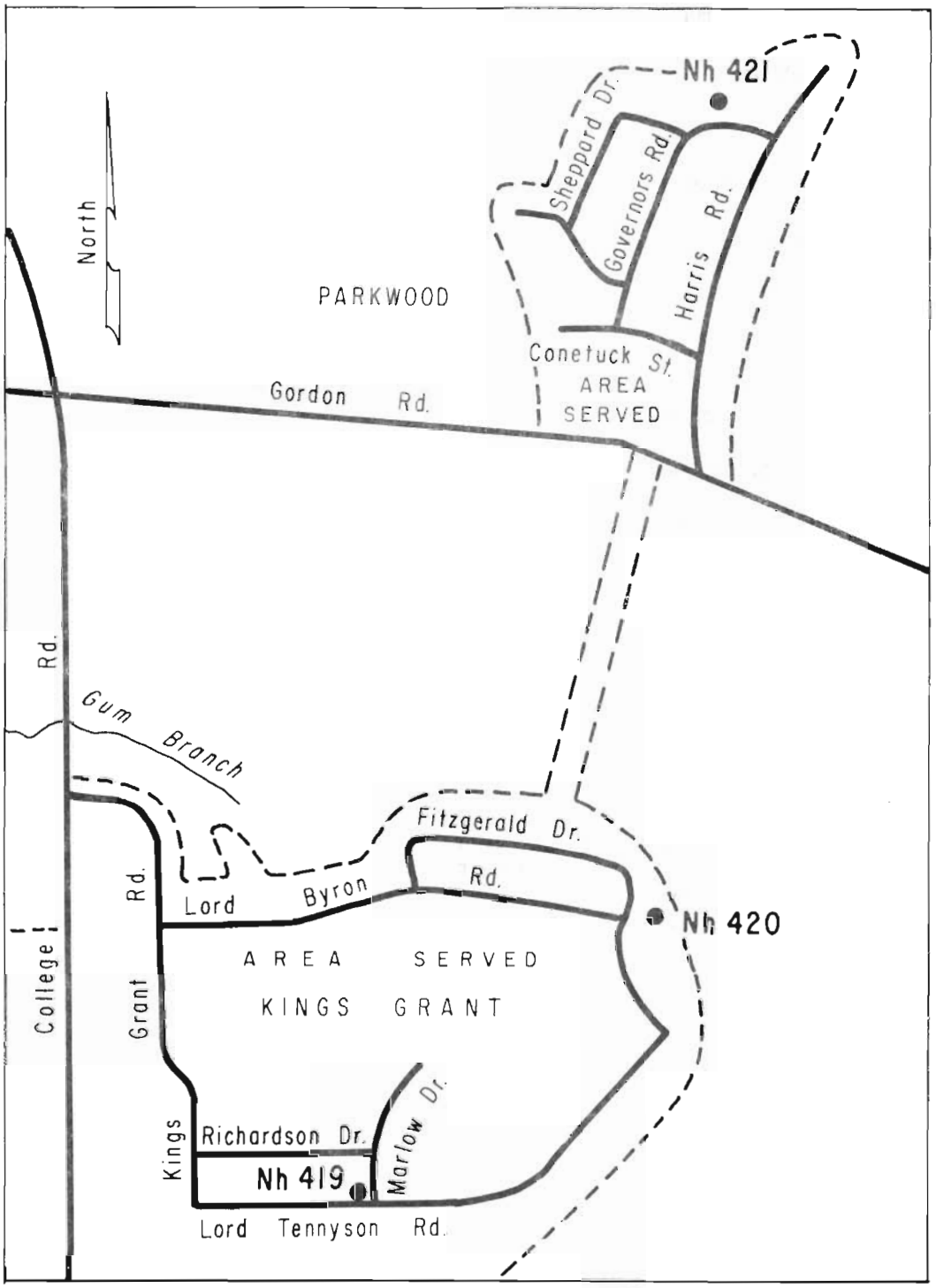
Will connect a newly drilled well into the system and will expand system to include two schools.

WATER-RESOURCES APPRAISAL:

Surface water: The Kings Grant Water Company's service area lies northeast of Wilmington near Smith Creek. The topography is flat. The average discharge of streams in the area is 1.0 (Mgal/d)/mi^2. The minimum flows and 7-day, 2-year low flows for the nearby streams are unknown. If desired, the water company could obtain its water supply from Wilmington.

Ground water: The service area is underlain at a few tens of feet by the limestone aquifer. Here the limestone aquifer is less than 100 feet thick but probably is capable of yielding over 1,000 gal/min to wells. The limestone aquifer is underlain by the lower sandy aquifer. The lower sandy aquifer is over 1,000 feet thick but only the upper 100 to 200 feet contain fresh water. Fresh-water yields of up to a few hundred gallons per minute could probably be obtained from this aquifer, but the threat of vertical salt-water encroachment would make lower yields more advisable. The water from the limestone aquifer is hard and has a moderate dissolved-solids concentration.

KINGS GRANT WATER SYSTEM



KINGS GRANT WATER SYSTEM, NEW HANOVER COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw; finished)...	Well No. 2 Finished			
Date of collection.....	5-4-76			
Silica (SiO_2).....	18			
Iron (Fe).....	.00			
Manganese (Mn).....	.000			
Calcium (Ca).....	69			
Magnesium (Mg).....	7.3			
Sodium (Na).....	21			
Potassium (K).....	2.6			
Bicarbonate (HCO_3).....	240			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	200			
Sulfate (SO_4).....	1.9			
Chloride (Cl).....	31			
Fluoride (F).....	.2			
Nitrate (NO_3).....				
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.02			
Dissolved Solids.....	271			
Hardness as $CaCO_3$:				
Total.....	200			
Noncarbonate.....	3			
Specific conductance (micromhos at 25°C)....	474			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.08			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....				
Lithium (Li).....	.00			
Mercury (Hg).....				
Strontium (Sr).....	.2[illegible]			
Zinc (Zn).....	.00			
pH (units).....	7.7			
Temperature (°C).....				

WILMINGTON, NEW HANOVER COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 47,000 in 1975 (13,500 metered customers, 5 of whom are in suburban areas).

SOURCES:

Cape Fear River. The intakes for the Kings Bluff pumping station are on a canal diversion from the south bank of the river above Lock No. 1, about 28 miles northwest of Wilmington at lat 34°24'08", long 78°17'47". The storage provided by the lock is considered to be negligible compared to the flow of the river. The drainage area at the intake is 5,220 square miles, approximately.

Northeast Cape Fear River (emergency only). The intakes for the Hilton pumping station are at the filtration plant at lat 34°15'29", long 77°56'52". The drainage area at the intake is 1,738 square miles, approximately.

Cape Fear River (emergency only). The intakes for the Toomers Creek pumping station are about 600 feet from the north bank of the river and about 2 miles west of the filtration plant at lat 34°15'43", long 77°59'02". The drainage area at the intake is 7,060 square miles, approximately.

RAW-WATER STORAGE:

Negligible.

ALLOWABLE DRAFT:

Estimated allowable draft is 180 Mgal/d with no storage.

TOTAL USE:

Average (1975), 8.5 Mgal/d, metered; maximum daily (8-22-71), 11.7 million gallons, metered.

INDUSTRIAL USE:

2.0 Mgal/d, estimated. Principal users include Timme Corp., Babcock and Wilson, Inc., and Seaboard Coastline Railroad.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor when needed, rapid sand filtration, addition of phosphate compounds for corrosion control, adjust of pH with caustic soda, postchlorination and fluoridation.

WILMINGTON, NEW HANOVER COUNTY

RATED CAPACITY OF TREATMENT PLANT:

12.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 12.0 Mgal/d; finished water, 21.0 Mgal/d.

FINISHED-WATER STORAGE:

Three clear wells, 12.0 million, 4.0 million, and 1.0 million gallons; three elevated tanks, 1.5 million, 1.5 million, and 500,000 gallons.

FUTURE PLANS:

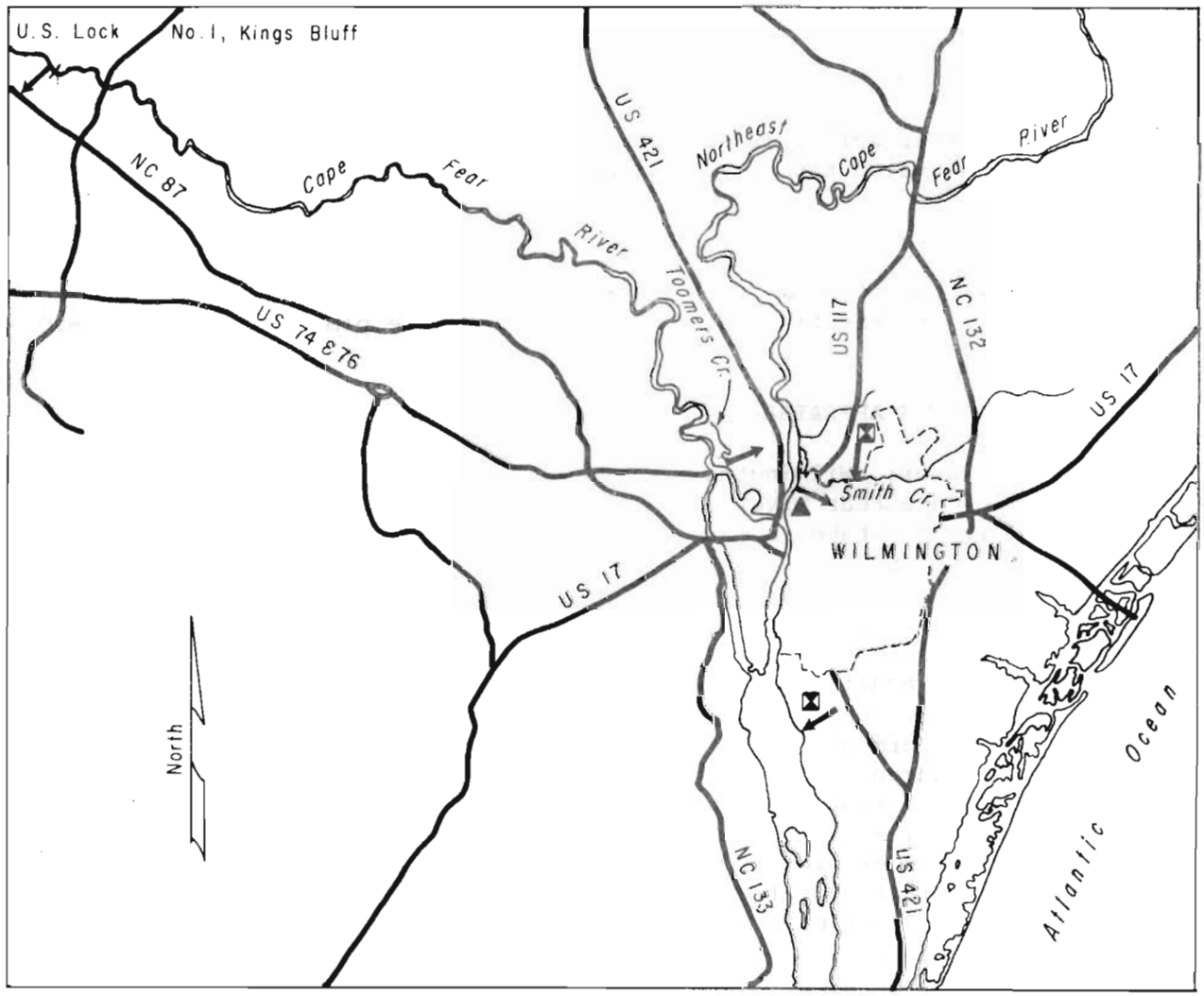
Master-plan study of county-wide system to be made. Will double the capacity of the filter beds and will increase plant capacity to 18.0 Mgal/d.

WATER-RESOURCES APPRAISAL:

Surface water: Wilmington is in northern New Hanover County on the estuary of the Cape Fear River. The topography is flat. The allowable draft at the city's intake is more than 20 times present usage and is more than ample for any foreseeable need.

Ground water: Wilmington is underlain by the upper sandy aquifer, which has a thickness of 20 to 40 feet. This aquifer is underlain by the limestone aquifer in the southeastern part of the city. The limestone aquifer may reach a thickness of a few tens of feet. Even though thin, the high permeability of this aquifer might afford well yields of up to a few hundred gallons per minute. To the south and to the east of the city, the limestone aquifer thickens and higher yields can be obtained. Where the limestone aquifer is missing, the upper sandy aquifer is directly underlain by the lower sandy aquifer. Otherwise, the lower sandy aquifer underlies the limestone aquifer. The lower sandy aquifer is over 1,300 feet thick beneath the city, but only the upper two hundred feet or so of the aquifer contain fresh water. Well yields of several hundred gallons per minute can be obtained from this aquifer. The ground water at Wilmington is hard and may contain excessive iron or manganese.

CITY OF WILMINGTON



WILMINGTON, NEW HANOVER COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Cape Fear River, Lock #1	Cape Fear River, Lock #1	Cape Fear River, Lock #1	Cape Fear River, Lock #1
Date of collection.....	Raw 8-12-75	Finished 5-3-65	Raw 8-19-75	Finished 8-19-75
Silica (SiO_2).....	8.9	8.3	----------	----------
Iron (Fe).....	----------	.01	0.32	0.08
Manganese (Mn).....	----------	.01	.030	.010
Calcium (Ca).....	3.4	13	----------	----------
Magnesium (Mg).....	1.3	1.1	----------	----------
Sodium (Na).....	5.8	16	----------	----------
Potassium (K).....	1.8	1.5	----------	----------
Bicarbonate (HCO_3).....	13	37	----------	----------
Carbonate (CO_3).....	0	0	----------	----------
Alkalinity as $CaCO_3$.....	11	30	----------	----------
Sulfate (SO_4).....	6.4	21	----------	----------
Chloride (Cl).....	5.7	14	14	----------
Fluoride (F).....	.2	1.4	----------	----------
Nitrate (NO_3).....	----------	1.2	----------	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.43	----------	----------	----------
Dissolved Solids.....	40	97	----------	----------
Hardness as $CaCO_3$:				
Total.....	14	38	----------	----------
Noncarbonate.....	3	8	----------	----------
Specific conductance (micromhos at 25°C)....	63	155	87	----------
Arsenic (As).....	----------	----------	.001	.000
Barium (Ba).....	----------	----------	.0	.0
Boron (B).....	----------	----------	----------	----------
Cadmium (Cd).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.000	.000
Cobalt (Co).....	----------	----------	.000	.000
Copper (Cu).....	----------	----------	.140	.034
Lead (Pb).....	----------	----------	.002	.001
Lithium (Li).....	----------	----------	.00	.00
Mercury (Hg).....	----------	----------	.0005	.0005
Strontium (Sr).....	----------	----------	.18	.18
Zinc (Zn).....	----------	----------	.06	.11
pH (units).....	6.4	7.3	----------	----------
Temperature (°C).....	26.5	----------	----------	----------

WRIGHTSVILLE BEACH, NEW HANOVER COUNTY

OWNERSHIP:

Municipal. Total population supplied (1975), about 3,800 permanent, 18,000 seasonal (1,200 customers).

SOURCE:

Eight wells.

Crane St. well, Nh-255, located at lat 34°13'03", long 77°47'21". Driller: Carolina Drilling and Equipment Co. Date drilled: June 1953. Total depth: 179 ft. Diam: 8 in. Cased to: 163 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone and lower sandy (?). Altitude of land surface: 7 ft. Static water level: 8 ft below land surface. Pump capacity: 100 gal/min. Type pump: turbine.

Raleigh St. well (emergency only), Nh-257, located at lat 34°12'41", long 77°47'39". Driller: Wilmington Well and Pump Co. Date drilled: Mar. 1948. Total depth: 172 ft. Diam: 6 in. Cased to: 156 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 5 ft. Static water level: 4 ft below land surface. Well yield: 117 gal/min. Pump capacity: 150 gal/min. Type pump: turbine.

Station One well, Nh-258, located at lat 34°12'29", long 77°47'49". Driller: Carolina Drilling and Equipment Co. Date drilled: 1959. Total depth: 182 ft. Diam: 8 in. Cased to: 163 ft. Type of finish: open hole. Topography: flat. Aquifer: probably limestone. Altitude of land surface: 10 ft. Static water level: 8 ft below land surface. Pump capacity: 115 gal/min. Type pump: turbine.

Hotel (or Snyder St., or Ocean Terrace) well, Nh-259, located at lat 34°12'14", long 77°47'48". Driller: Carolina Drilling and Equipment Co. Date drilled: Jan. 1960. Total depth: 180 ft. Diam: 8 in. Cased to: about 150 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 7 ft. Static water level: 8 ft below land surface. Pump capacity: 175 gal/min. Type pump: turbine.

Corbett St. well (emergency only), Nh-262, located at lat 34°11'30", long 77°48'34". Driller: Heater Well Co. Date drilled: May 1953. Total depth: 166 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened interval: _____. Topography: flat. Aquifer: limestone. Altitude of land surface: 5 ft. Static water level: 5 ft below land surface. Pump capacity: 100 gal/min. Type pump: turbine

WRIGHTSVILLE BEACH, NEW HANOVER COUNTY

Causeway Bridge (Highway 74) well, Nh-413, located at lat 34°13'02", long 77°48'35". Driller: Carolina Well and Pump Co. Date drilled: 1967. Total depth: 163 ft. Diam: 8 in. Cased to: 141 ft. Type of finish: screened (gravel-packed). Screened interval: 141-163 ft. Topography: flat. Aquifer: limestone. Altitude of land surface: 7 ft. Static water level: _____. Pump setting: about 105 ft. Well yield: 175 gal/min. Pump capacity: 150 gal/min. Type pump: turbine.

Marina St. well, Nh-415, located at lat 34°12'56", long 77°48'47". Driller: Carolina Well and Pump Co. Date drilled: 1970. Total depth: 163 ft. Diam: 8 in. Cased to: 140 ft. Type of finish: screened. Screened interval: 140-162 ft. Topography: flat. Aquifer: limestone. Altitude of land surface: 7 ft. Static water level: _____. Well yield: 175 gal/min. Pump capacity: 150 gal/min. Type pump: turbine.

Saline-water plant well, Nh-414, located at lat 34°12'49", long 77°48'14". Driller: Carolina Well and Pump Co. Date drilled: June 1973. Total depth: 157 ft. Diam: 8 in. Cased to: 143 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 12 ft below land surface. Well Yield: 150 gal/min. Pump capacity: 150 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.5 Mgal/d, estimated; maximum daily (summer 1975), 0.75 Mgal/d, estimated.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination at each well.

PUMPING CAPACITY:

Raw and finished water, 1.6 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks, 75,000 and 300,000 gallons.

WRIGHTSVILLE BEACH, NEW HANOVER COUNTY

FUTURE PLANS:

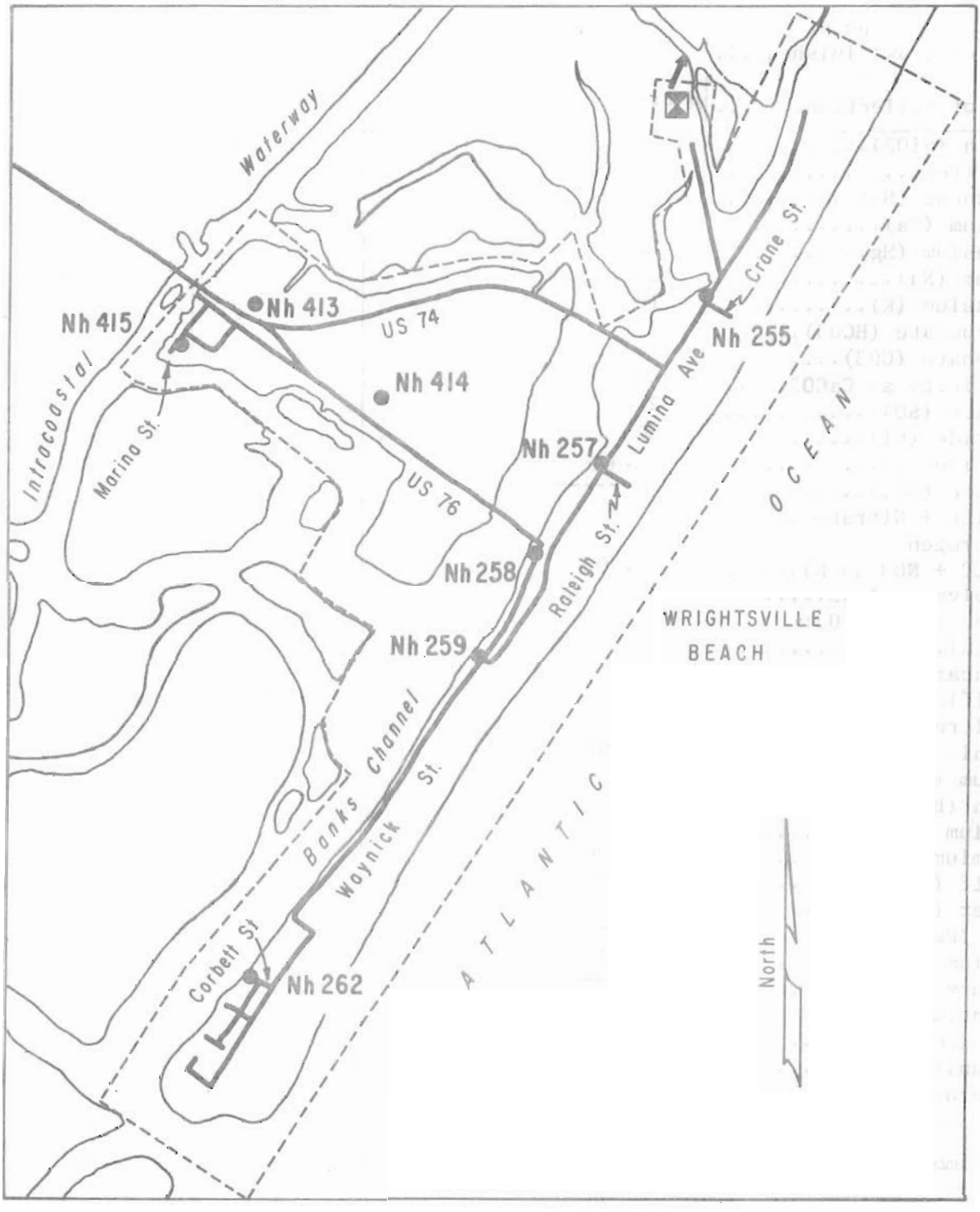
To construct a 1-million gallon ground-storage tank with aeration equipment.

WATER-RESOURCES APPRAISAL:

Surface water: Wrightsville Beach is on an offshore strand in northern New Hanover County. The topography is flat except for sand dunes in the beach area. Owing to the ability of the upper sandy aquifer to soak up water, there are few discernible drains except in nearby tidal flats. There is probably no practical means of developing a large surface-water supply in this area.

Ground water: Wrightsville Beach is underlain at very shallow depth by the limestone aquifer, which is about 150 feet thick. This aquifer could yield over 1,000 gal/min to a well, but the possibility of vertical or lateral salt-water encroachment make much smaller yields prudent. The underlying lower sandy aquifer has a fresh-water zone of unknown thickness, but even greater care would have to be exercised in developing this aquifer to prevent salt-water encroachment. The water from the limestone is hard and has high to excessive concentrations of both dissolved solids and chlorides.

TOWN OF WRIGHTSVILLE BEACH



WRIGHTSVILLE BEACH, NEW HANOVER COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw; finished)	Combined 1/ Finished			
Date of collection	8-21-75			
Silica (SiO_2)	18			
Iron (Fe)	.03			
Manganese (Mn)	.010			
Calcium (Ca)	50			
Magnesium (Mg)	14			
Sodium (Na)	120			
Potassium (K)	12			
Bicarbonate (HCO_3)	210			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	170			
Sulfate (SO_4)	20			
Chloride (Cl)	160			
Fluoride (F)	.4			
Nitrate (NO_3)				
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.00			
Dissolved Solids	499			
Hardness as $CaCO_3$:				
Total	180			
Noncarbonate	10			
Specific conductance (micromhos at 25°C)	885			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.21			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)				
Lithium (Li)	.01			
Mercury (Hg)				
Strontium (Sr)	.31			
Zinc (Zn)	.05			
pH (units)	7.4			
Temperature (°C)				

1/ Combined sample of wells no. Nh 255, Nh 258, Nh 259, Nh 262 and Nh 413-415.

ONSLOW COUNTY

WATER-RESOURCES APPRAISAL

Onslow County is in the southeastern part of the North Carolina Coastal Plain. The topography is flat and swamps are common. The central part of the county is drained by the New River and its tributaries. The western one-quarter of the county is drained by tributaries of the Northeast Cape Fear River, and the eastern one-quarter is drained by the White Oak River and its tributaries. A very small area in the north-central part of the county is drained by a tributary of the Neuse River. The average stream discharge ranges from 0.80 (Mgal/d)/mi^2 in the extreme north to 0.97 (Mgal/d)/mi^2 in the extreme south, and the overall average for the county is 0.93 (Mgal/d)/mi^2. Drainage basins as large as 27 square miles may go dry in drought. Minimum flows of other streams range from 0.006 to 0.13 (Mgal/d)/mi^2 and average 0.04 (Mgal/d)/mi^2. The 7-day, 2-year low flow ranges between 0.001 and 0.3 (Mgal/d)/mi^2 and averages 0.1 (Mgal/d)/mi^2.

Two public water supplies in the county have 500 or more customers, Jacksonville and Camp Lejeune. Actually, Camp Lejeune has no water customers in the strict sense of the word, but was included in this study because of the large size of the water systems there. Only the largest of the several water systems on the base was inventoried for this report. All of the public water supplies in the county depend solely upon ground water. The county population in 1970 was 103,126.

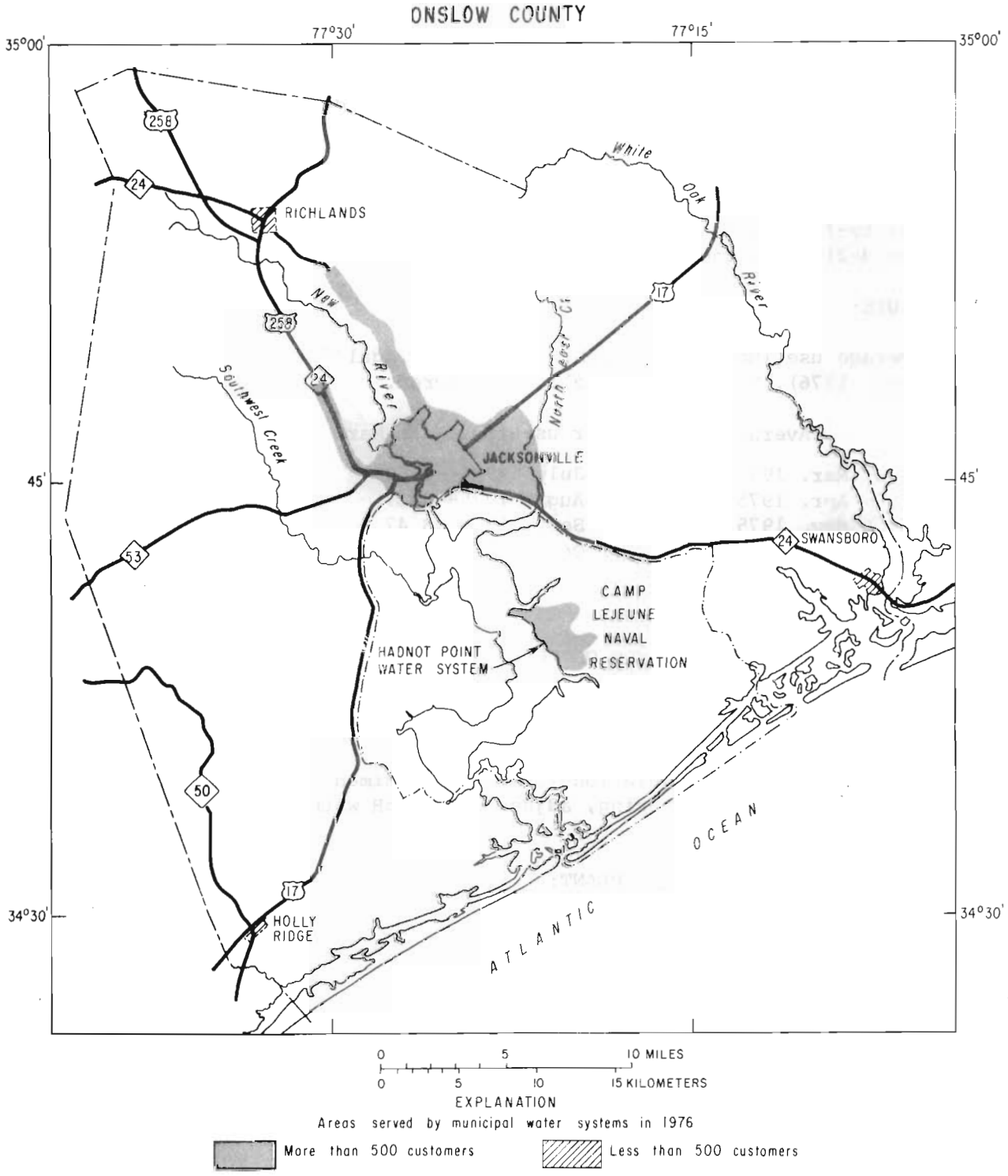
ONSLOW COUNTY

WATER-RESOURCES APPRAISAL

The county is underlain by an eastward-thickening wedge of sedimentary deposits. The upper sandy aquifer has a thickness of about 20 feet in the northwestern part of the county and about 80 feet in the eastern part. These deposits are underlain by the limestone aquifer. This limestone is very thin in the northwestern part of the county and thickens eastward to about 700 feet in the eastern part of the county. The limestone is very permeable. The ability of this aquifer to yield fresh water varies with its thickness and the depth to salt water. Where the limestone is saturated with fresh water to several hundred feet as in the eastern part of the county, well yields of a few thousand gallons per minute are possible. However, the possibility of upward or lateral migration of salt water to wells, makes lower pumping rates more practical. The depths to salt water tend to be erratic in the county. The depth to salt water in the western and southern part of the county exceeds 600 feet. In the remainder of the county the depth to salt water is about 500 feet, except near the New River estuary, where salt water has been encountered at less than 200 feet in places. Salt water also may be found at shallow depths near the seacoast and on the offshore islands.

The limestone is underlain by the lower sandy aquifer which is about 800 feet thick in the western part of the county and 1,500 feet thick in the eastern part. In the west, the full thickness of the aquifer may contain fresh water. Here fresh-water yields to wells can probably be as much as 2,000 gal/min. In the eastern third of the county, these sands contain only salt water. The average available yield of ground water in Onslow County is estimated to be 1.0 (Mgal/d)/mi^2. However, the maximum recharge to the deeper parts of the lower sandy aquifer is estimated to be 0.06 (Mgal/d)/mi^2.

Water from the upper sandy and limestone aquifers is hard and contains objectionable amounts of iron and hydrogen sulfide in the eastern part of the county. The lower sandy aquifer in the western part of the county yields soft to slightly hard water. Some wells in either aquifer yield water having an excessive fluoride concentration.


ONSLOW COUNTY
35°00'
77°30'
77°15'
RICHLANDS
JACKSONVILLE
SWANSBORO
CAMP LEJEUNE NAVAL RESERVATION
HADNOT POINT WATER SYSTEM
HOLLY RIDGE
White Oak River
New River
Southwest Creek
North Fork Creek
ATLANTIC OCEAN
258
24
17
53
50
45'
34°30'
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

CAMP LEJEUNE (HADNOT POINT WATER SYSTEM), ONSLOW COUNTY

OWNERSHIP:

U.S. Government. Population served by all 9 of the water systems on the base was 34,549 in 1970. The Hadnot Point water system provides almost half of the base's water needs. There are no metered customers; water is provided without charge.

SOURCE:

Thirty-five wells (Nos. 1-3, 6, 8-17, 19-21, 25-27, 32-42, 51-52, M-1 and M-2). See table on following page.

TOTAL USE:

Average use (Mar. 1975 - Feb. 1976), 3.41 Mgal/d, metered; maximum daily (Feb. 1976), 3.89 million gallons, metered.

Average daily water use (Mgal/d), Mar. 1975-Feb. 1976

Mar. 1975--3.65	July 1975--3.50	Nov. 1975--3.51
Apr. 1975--3.00	Aug. 1975--3.37	Dec. 1975--3.52
May 1975 -3.01	Sept. 1975--3.47	Jan. 1976--3.56
June 1975--3.21	Oct. 1975--3.34	Feb. 1976--3.81

INDUSTRIAL USE:

There are industrial-type operations on the base, but water use is not metered.

TREATMENT:

Prechlorination, coagulation with lime, sedimentation, rapid sand filtration, lime process for softening, adjustment of pH with lime, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

5.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 5.5 Mgal/d; finished water, 4.6 Mgal/d.

RAW-WATER STORAGE:

One ground-storage tank, 500,000 gallons.

Well data for Camp Lejeune (Hadnot Point), Onslow County

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)	Pump capacity (gal/min)	Remarks
1	601	On-142	34 40 18	077 20 20	Layne Atlantic	9/1941	195	8	45	gravel, screen	45-60 95-100 115-130 175-195	22	9			
2	602	On-143	34 40 27	077 20 07		1941e	160	8	70	gravel, screen	70-80 100-105 120-125 145-150 155-160	25	13			
3	603	On-144	34 40 10	077 20 32		1941e	195	8	70	gravel, screen	70-80 100-110 130-140 160-170 190-195	22	13			
6	606	On-145	34 39 49	077 19 10	Layne Atlantic	12/1941	210	8	80	gravel, screen	80-90 110-120 140-150 170-180 200-210	20	14.5			
8	608	On-146	34 39 53	077 20 19	Layne Atlantic	3/1941	161.5	8	61.5	gravel, screen	61.5 - 81.5 91.5 - 101.5 121.5 - 131.5 151.5 - 161.5	27	20			
9	609	On-147	34 39 26	077 18 54		1942e	150	8	65	gravel,	65-80 100-110 130-150	19	17.3			

e - estimated

Well data for Camp Lejeune (Hadnot Point), Onslow County--continued

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)	Pump capacity (gal/min)	Remarks
10	610	On-148	35 41 12	077 19 54	Layne Atlantic	4/1942	190	8	60	gravel, screen	60-70 90-110 130-140 180-190	20	16			
11	611	On-149	35 42 09	077 21 07	Layne Atlantic	6/1942	161	8	61	gravel, screen	61-71 91-101 121-136 156-161	31	15.5			
12	612	On-150	34 42 26	077 20 48	Layne Atlantic	6/1942	190	8	60	gravel, screen	60-70 90-95 115-120 140-145 155-160 170-175 185-190	31	16.85			
13	613	On-151	34 42 29	077 20 20	Layne Atlantic	5/1942	150	8	60	gravel, screen	60-70 90-95 115-120 130-135 145-150	21	12			
14	614	On-152	34 42 37	077 21 21								32				No data
15	615	On-153	34 42 45	077 21 02	Layne Atlantic	6/1942	158	8	58	gravel, screen	58-68 88-98 108-128 148-158	32	16			
16	616	On-154	34 42 47	077 20 28	Layne Atlantic	7/1942	170	8	95	gravel, screen	95-115 130-140 160-170	32	20			

Well data for Camp Lejeune (Hadnot Point), Onslow County--continued

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)	Pump capacity (gal/min)	Remarks
17	617	On-155	34 42 28	077 19 49								32				No data
19	619	On-156	34 42 08	077 19 25								30				No data
20	620	On-157	34 42 30	077 18 52	Layne ? Atlantic	9/1944e	54	18	46 1/3	open, end		35	21			
21	621	On-158	34 42 53	077 19 16	Layne Atlantic	10/1942	77	8	57	gravel, screen	57-77	41	20			
25	625	On-159	34 39 08	077 19 05								35				No data
26	626	On-160	34 39 04	077 18 38			159	8	58	screen	58-63 82-92 108-123 129-139 144-154 154-159	30	16			
27	627	On-161	34 38 37	077 18 19			158	8	65	screen	65-75 92-102 117-122 133-158	30	18.3			
32	632	On-162	34 37 11	077 17 36		1957						35	10			
33	633	On-163	34 41 58	077 20 06		1959	205	8	55	screen	55-65 75-80 95-105 123-133 138-143 158-168 178-183 195-205	25				

e - estimated

Well data for Camp Lejeune (Hadnot Point), Onslow County--continued

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)	Pump capacity (gal/min)	Remarks
34	634	On-164	34 40 30	077 19 35		1959e	225	8	65	gravel, screen	65-70 73-78 83-88 93-98 107-117 124-129 135-140 153-163 170-175 195-200 215-225	30	14			
35	635	On-165	34 40 55	077 19 33		1959e	215	8	65	gravel, screen	65-75 93-108 122-127 136-146 150-155 170-175 185-190 210-215	16	15			
36	636	On-166	34 41 19	077 19 29		1959e	227	8	90	gravel, screen	90-100 115-120 130-135 140-150 158-163 170-175 185-190 200-210 222-227	29	13			

e - estimated

Well data for Camp Lejeune (Hadnot Point), Onslow County--continued

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)	Pump capacity (gal/min)	Remarks
37	637	On-167	34 40 39	077 19 54	Hartsfield	1969	172	8	90	gravel, screen	90-98 102-114 120-128 140-148 156-172	26	35	150	150	
38	638	On-168	34 39 12	077 19 43	Hartsfield	1969	196	8	106	gravel, screen	106-114 126-134 150-158 162-170 176-184 188-196	26	19.5	200	180	
39	639	On-169	34 38 05	077 18 00	Hartsfield	1969	176	8	62	gravel, screen	62-70 85-93 120-132 136-148 155-163 168-176	23	4	180	180	
40	640	On-170	34 37 38	077 17 46	Hartsfield	1969	176	8	64	gravel, screen	64-72 76-80 92-100 112-120 130-134 140-148 157-165 172-176	30	9.5	298	290	
41	641	On-171	34 42 29	077 19 22								32				No data
42	642	On-172	34 40 10	077 19 24								30				No data

Well data for Camp Lejeune (Hadnot Point), Onslow County--continued

Well No.	Bldg. No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Diam. (in)	Cased to (ft)	Type of finish	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Well yield (gal/min)	Pump capacity (gal/min)	Remarks
51	651	On-173	34 41 41	077 19 27								31				No data
52	652	On-174	34 40 19	077 18 47								30				No data
M-1	LCH 4007	On-176	34 43 11	077 19 53	Layne Atlantic	1946e	145.2	8	49.5	screen	49.5-59.5 69-99 120-130 140-145	41	23.7			
M-2	LCH 4006	On-175	34 43 27	077 20 17	Layne Atlantic	194le	125	8	25	screen	25-40 60-70 75-95 115-125	33	16			

e - estimated

Note: All the wells are located in a flat area, have turbine pumps, and are completed in the limestone aquifer. A few wells may also tap the upper sandy aquifer.

CAMP LEJEUNE (HADNOT POINT WATER SYSTEM), ONSLOW COUNTY

FINISHED-WATER STORAGE:

Two clear wells, 75,000 and 2,000,000 gallons; four elevated tanks, 300,000 gallons each.

FUTURE PLANS:

Presently rebuilding filters.

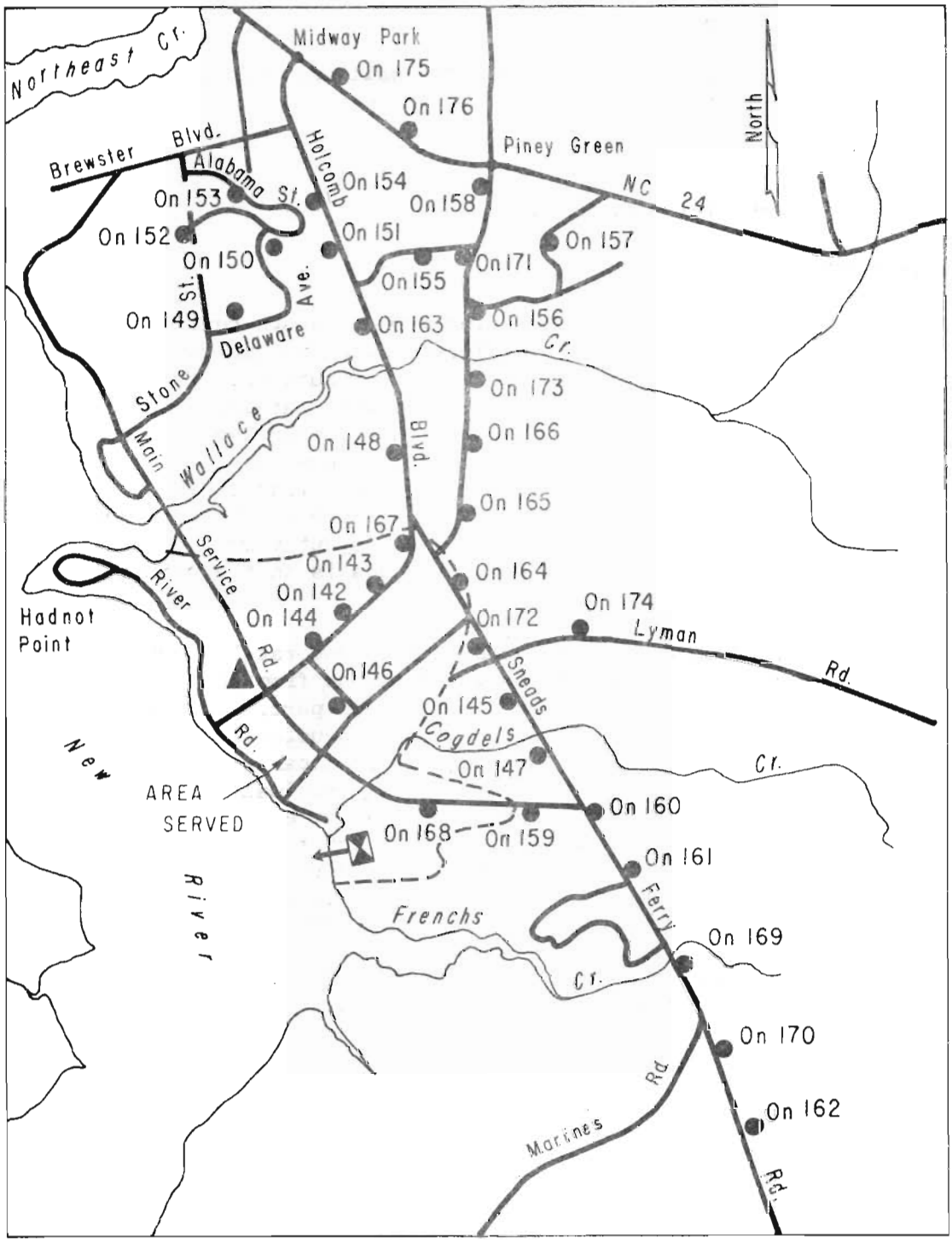
WATER-RESOURCES APPRAISAL:

Surface water: Camp Lejeune occupies much of south-central Onslow County. The topography is flat and, in places, swampy. The camp is bisected by the New River estuary and is drained by tributaries of the estuary. The estuary is always salty except in its upper reaches, where it is variably salty. The tributaries to the estuary are themselves estuarine in their lower reaches and are variably salty. The average stream discharge is 0.9 $(Mgal/d)/mi^2$. The minimum flows on Southwest Creek and Northeast Creek are 0.008 and 0.021 $(Mgal/d)/mi^2$, respectively. Their 7-day, 2-year low flows are 0.046 and 0.08 $(Mgal/d)/mi^2$, respectively. No surface water supply adequate for the camp's water needs is in the immediate vicinity of the camp.

Ground water: Camp Lejeune is underlain by moderately permeable sands of the upper sandy aquifer ranging in thickness from 20 feet in the northern part of the camp to 80 feet in the southern part. These deposits are underlain by the very permeable limestone aquifer, which ranges from 350 to 500 feet in thickness. This aquifer is capable of yielding over 2,000 gal/min to wells. However, the threat of vertical or lateral salt-water encroachment, particularly near the New River estuary or the coast line, makes lower yields more prudent. The limestone aquifer is underlain by moderately-permeable sands of the lower sandy aquifer. The lower sandy aquifer is over 1,000 feet thick. Most of this aquifer contains salt water, and any exploitation would require considerable testing.

The water from wells in the camp area is hard and may contain excessive concentrations of iron, hydrogen sulfide, and fluoride.

CAMP LEJEUNE MARINE CORPS BASE
(Hadnot Point Water System)



CAMP LEJEUNE (HADNOT POINT WATER SYSTEM), ONSLOW COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Hadnot Pt* Well Raw	Hadnot Pt* Well Finished		
Date of collection.....	3-2-76	3-2-76		
Silica (SiO_2).....	14	14		
Iron (Fe).....	.00	----------		
Manganese (Mn).....	.000	----------		
Calcium (Ca).....	62	26		
Magnesium (Mg).....	1.3	1.8		
Sodium (Na).....	6.0	7.0		
Potassium (K).....	1.2	1.2		
Bicarbonate (HCO_3).....	180	75		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	150	62		
Sulfate (SO_4).....	6.9	8.1		
Chloride (Cl).....	10	11		
Fluoride (F).....	.4	1.0		
Nitrate (NO_3).....	----------	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.04	.02		
Dissolved Solids.....	191	107		
Hardness as $CaCO_3$:				
Total.....	160	72		
Noncarbonate.....	12	11		
Specific conductance (micromhos at 25°C)....	321	173		
Arsenic (As).....	.000	----------		
Barium (Ba).....	.0	----------		
Boron (B).....	.00	----------		
Cadmium (Cd).....	.000	----------		
Chromium (Cr).....	.000	----------		
Cobalt (Co).....	.000	----------		
Copper (Cu).....	.000	----------		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.00	----------		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.12	----------		
Zinc (Zn).....	.00	----------		
pH (units).....	7.5	8.3		
Temperature (°C).....	----------	----------		

*Wells 8, 10-15, 20, 21, M-1, 26, 27, 32, 35-37, 39, 41, 42, 51.

JACKSONVILLE, ONSLOW COUNTY

OWNERSHIP:

Municipal. Also supplies the Brynn Marr subdivision. Total population supplied, about 17,000 in 1975 (5,517 metered customers, 426 of whom are in suburban areas).

SOURCE:

Ten wells (Nos. 1-3, 3a, 4, 5; site 1, Nos. 1 and 2; site 2, Nos. 3 and 4).

Well No. 1 (U.S. 258 well field), On-128, located at lat 34°47'48", long 77°30'02". Driller: Layne Atlantic Co. Date drilled: _____. Total depth: 655 ft. Diam: 10 in. Cased to: 298 ft. Type of finish: screened (gravel-packed). Screened intervals: 10 screens totaling 105 ft between 298 and 645 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 46 ft. Static water level: 250. Pump capacity: 300 gal/min. Type pump: turbine.

Well No. 2 (U.S. 258 well field), On-129, located at lat 34°47'52", long 77°29'49". Driller: Layne Atlantic Co. Altitude of land surface: 45 ft. This well is reported to be very similar to well No. 1. The well is equipped with a turbine pump which pumps 300 gal/min.

Well No. 3 (U.S. 258 well field), On-130, located at lat 34°48'04", long 77°29'42". Altitude of land surface: 39 ft. This well is reported to be very similar to well No. 1. The well is equipped with a turbine pump which pumps 190 gal/min.

Well No. 3a (U.S. 258 well field), On-131, located at lat 34°48'05", long 77°29'42". Driller: _____. Date drilled: _____. Total depth: about 300 ft. Diam: 10 in. Cased to: _____. Type of finish: _____. Topography: flat. Aquifer: probably limestone. Altitude of land surface: 39 ft. Static water level: _____. Pump capacity: 115 gal/min. Type pump: turbine.

Well No. 4 (U.S. 258 well field), On-132, located at lat 34°48'15", long 77°29'31". Driller: Hartsfield Water Co. Date drilled: _____. Total depth: 635 ft. Diam: 10 in. Cased to: 300 ft. Type of finish: screened (gravel-packed). Screened interval: 12 screens totaling 105 ft between 300 and 625 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 33 ft. Static water level: 250. Pump capacity: 220 gal/min. Type pump: turbine.

Well No. 5 (U.S. 258 well field), On-133, located at lat 34°48'25", long 77°29'23". Altitude of land surface: 36 ft. This well is reported to be very similar to well No. 1. The well is equipped with a turbine pump which pumps 300 gal/min.

JACKSONVILLE, ONSLOW COUNTY

Well No. 1, Site 1 (Gum Branch well field), On-124, located at lat 34°51'56", long 77°30'04". Driller: Singer-Layne Atlantic Co. Date drilled: Oct. 1974. Total depth: 601 ft. Diam: 8 in. Cased to: 526 ft. Type of finish: screened (gravel-packed). Screened intervals: 526-596 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 37 ft. Static water level: 25 ft below land surface. Well yield: 500 gal/min. Pump capacity: _____. Type pump: turbine.

Well No. 2, Site 1 (Gum Branch well field), On-125 located at lat 34°51'56", long 77°30'04". Driller: Singer-Layne Atlantic Co. Date drilled: Oct. 1974. Total depth: 395 ft. Diam: 10 in. Cased to: 264 ft. Type of finish: screened (gravel-packed). Screened intervals: 264-304, 310-340, and 350-390 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 37 ft. Static water level: 53 ft below land surface. Well yield: 150 gal/min. Pump capacity: _____. Type pump: turbine.

Well No. 3, Site 2 (Gum Branch well field), On-126, located at lat 35°51'10", long 77°29'15". Driller: Singer-Layne Atlantic Co. Date drilled: Nov. 1974. Total depth: 620 ft. Diam: 6 in. Cased to: 545 ft. Type of finish: screened (gravel-packed). Screened interval: 545-615 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 37 ft. Static water level: 26 ft below land surface. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 4, Site 2 (Gum Branch well field), On-127, located at lat 34°51'10", long 77°29'15". Driller: Singer-Layne Atlantic Co. Date drilled: Nov. 1974. Total depth: 395 ft. Diam: 10 in. Cased to: 274 ft. Type of finish: screened (gravel-packed). Screened intervals: 274-334 and 340-390 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 37 ft. Static water level: 19 ft below land surface. Well yield: 150 gal/min. Pump capacity: _____. Type pump: turbine.

TOTAL USE:

Average use (Sept. 1974-Aug. 1975), 1.87 Mgal/d, metered; maximum daily (Aug. 1975), 2.35 million gallons, metered.

Average daily water use (Mgal/d), Sept. 1974-Aug. 1975

Sept. 1974--1.94	Jan. 1975--1.73	May 1975--1.94
Oct. 1974--1.82	Feb. 1975--1.72	June 1975--2.11
Nov. 1974--1.82	Mar. 1975--1.74	July 1975--1.96
Dec. 1974--1.72	Apr. 1975--1.81	Aug. 1975--2.11

INDUSTRIAL USE:

None.

JACKSONVILLE, ONSLOW COUNTY

TREATMENT:

Chlorination.

RATED CAPACITY OF TREATMENT PLANTS:

Not determined.

PUMPING CAPACITY:

Raw water, 3.9 Mgal/d; finished water, 3.9 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two clear wells, 500,000 gallons each; five elevated tanks, 250,000, 200,000, and three of 500,000 gallons.

FUTURE PLANS:

None.

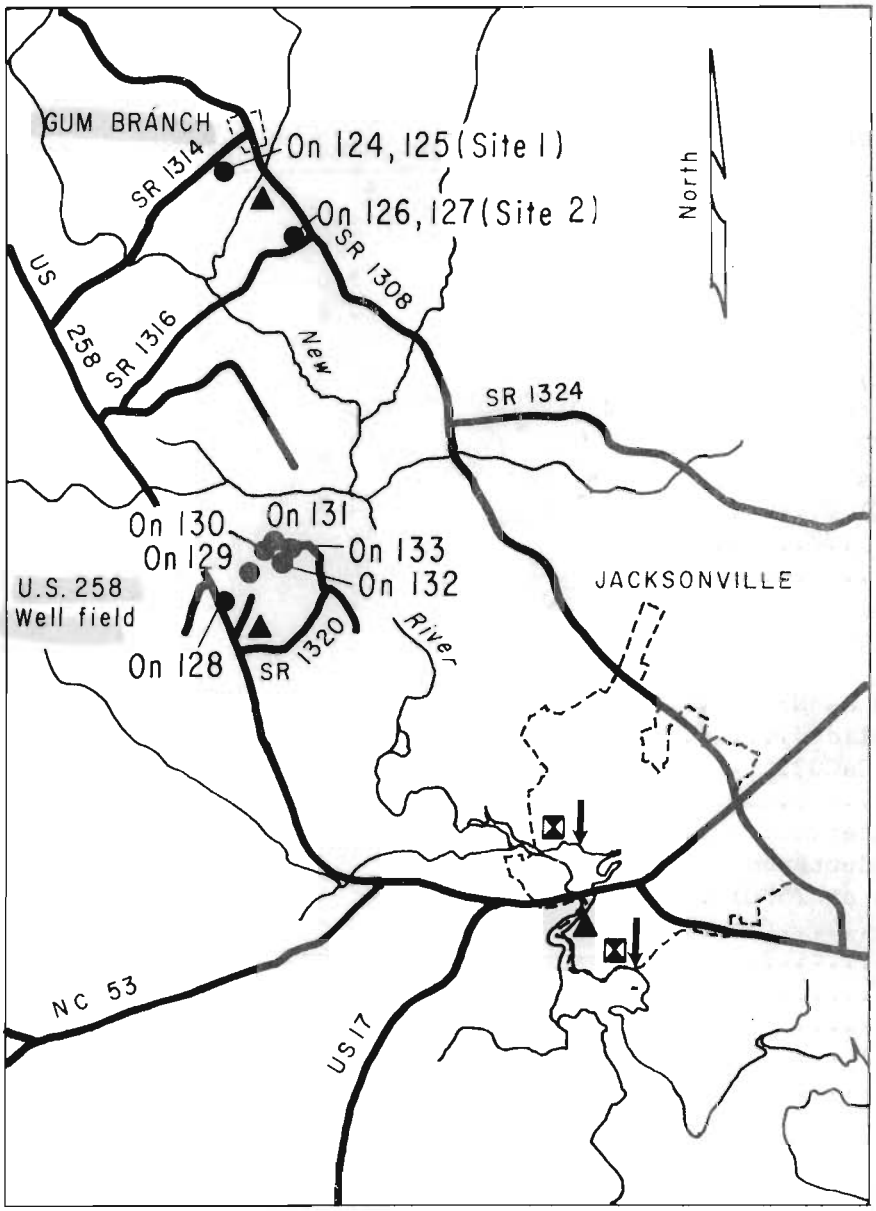
WATER-RESOURCES APPRAISAL:

Surface water: Jacksonville is located on the upper reaches of the New River estuary. The topography is flat. The average stream discharge in the area is 0.9 $(Mgal/d)/mi^2$. The 7-day, 2-year low flow of the New River is 0.09 $(Mgal/d)/mi^2$ and the minimum flow is 0.023 $(Mgal/d)/mi^2$. It is unlikely that the New River could meet Jacksonville's water requirements without considerable storage.

Ground water: The Jacksonville area is underlain at shallow depths by the limestone aquifer. This aquifer is over 300 feet thick and is capable of yielding up to 500 gal/min to wells. The limestone aquifer is underlain by the lower sandy aquifer. The lower sandy aquifer is about 1,000 feet thick; however, in the city area, salt water occupies most, if not all, of the aquifer. North of the city, the fresh-water lens in the lower sandy aquifer is several hundreds of feet thick. Here, well yields in excess of 500 gal/min to wells are obtainable.

The water from the limestone aquifer tends to be hard. The water from the lower sandy aquifer tends to be soft, but may contain excessive concentrations of fluoride or dissolved solids.

CITY OF JACKSONVILLE



JACKSONVILLE, ONSLOW COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 2 Finished	Well No. 3 Finished	Well No. 3A Finished	Combined 1/ Finished
Date of collection.....	10-23-64	10-23-64	5-3-65	10-2-75
Silica (SiO2).....	15	11	32	11
Iron (Fe).....	.02	.01	.06	.04
Manganese (Mn).....	.00	.00	.06	.006
Calcium (Ca).....	12	5.0	64	7.7
Magnesium (Mg).....	2.4	2.8	4.8	.4
Sodium (Na).....	160	165	6.6	160
Potassium (K).....	10	17	4.7	7.0
Bicarbonate (HCO3).....	420	420	230	360
Carbonate (CO3).....	0	0	0	40
Alkalinity as CaCO3.....	340	350	190	360
Sulfate (SO4).....	1.2	2.8	.8	2.1
Chloride (Cl).....	38	26	4.6	20
Fluoride (F).....	1.1	1.5	.2	.2
Nitrate (NO3).....	.0	.0	.1	----------
Nitrite + Nitrate as Nitrogen (NO2 + NO3 as N).....	----------	----------	----------	.02
Dissolved Solids.....	449	441	237	427
Hardness as CaCO3:	----------	----------	----------	----------
Total.....	40	24	180	21
Noncarbonate.....	0	0	0	0
Specific conductance (micromhos at 25°C)....	700	670	385	655
Arsenic (As).....	----------	----------	----------	.000
Barium (Ba).....	----------	----------	----------	.0
Boron (B).....	----------	----------	----------	1.0
Cadmium (Cd).....	----------	----------	----------	.000
Chromium (Cr).....	----------	----------	----------	.001
Cobalt (Co).....	----------	----------	----------	.000
Copper (Cu).....	----------	----------	----------	.004
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	.00
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	.09
Zinc (Zn).....	----------	----------	----------	.00
pH (units).....	8.2	8.2	8.0	8.5
Temperature (°C).....	21	20	----------	----------

1/ Combined sample of wells no. 1 - 4.

JACKSONVILLE, ONSLOW COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Combined 1/ Finished			
Date of collection.....	10-2-75			
Silica (SiO_2).....	---			
Iron (Fe).....	0.03			
Manganese (Mn).....	.007			
Calcium (Ca).....	---			
Magnesium (Mg).....	---			
Sodium (Na).....	---			
Potassium (K).....	---			
Bicarbonate (HCO_3).....	---			
Carbonate (CO_3).....	---			
Alkalinity as $CaCO_3$.....	---			
Sulfate (SO_4).....	---			
Chloride (Cl).....	36			
Fluoride (F).....	---			
Nitrate (NO_3).....	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	---			
Dissolved Solids.....	---			
Hardness as $CaCO_3$:				
Total.....	---			
Noncarbonate.....	---			
Specific conductance (micromhos at 25°C)....	731			
Arsenic (As).....	.000			
Barium (Ba).....	.00			
Boron (B).....	1.3			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.005			
Lead (Pb).....	---			
Lithium (Li).....	.01			
Mercury (Hg).....	---			
Strontium (Sr).....	.09			
Zinc (Zn).....	.01			
pH (units).....	---			
Temperature (°C).....	---			

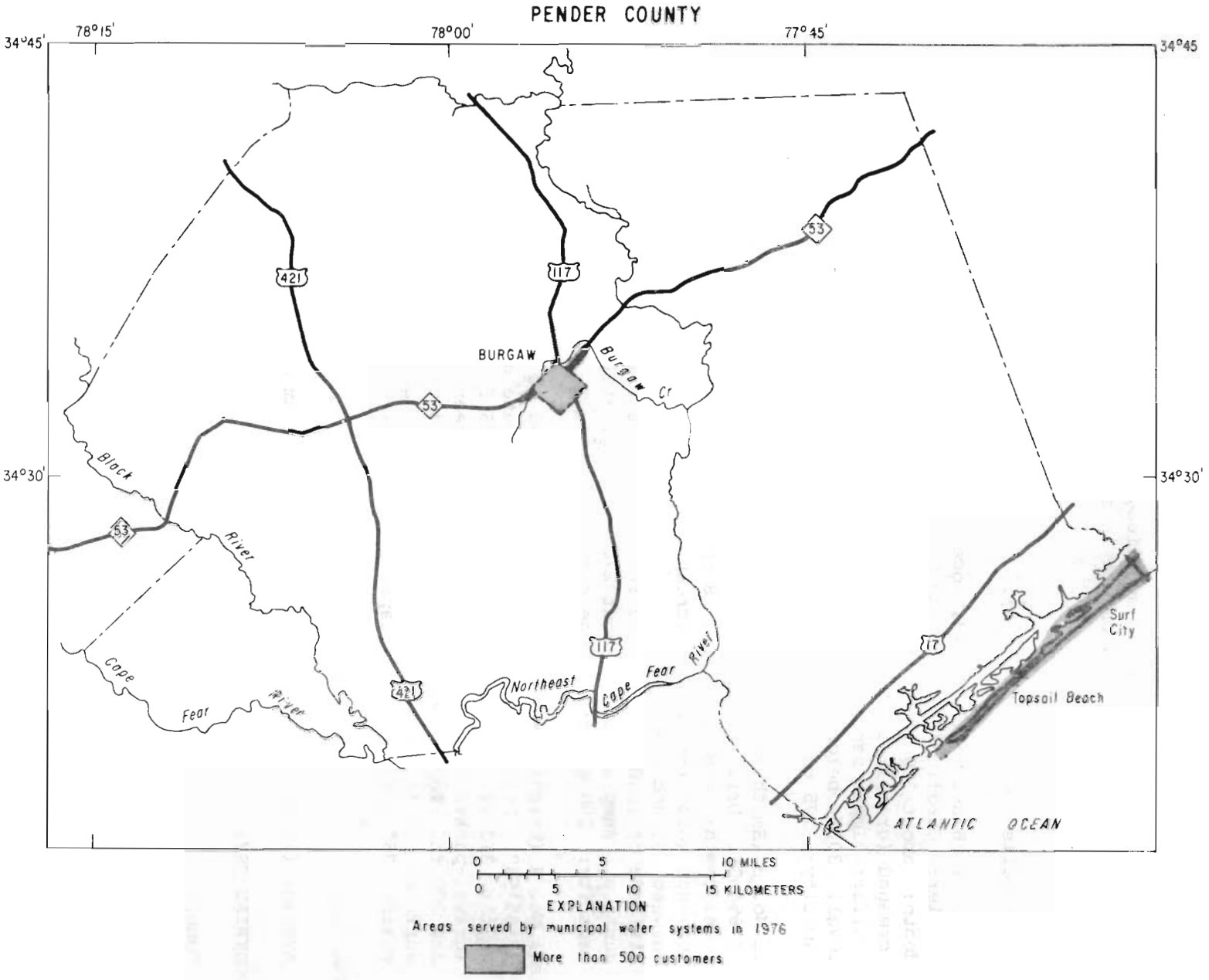
1/ Combined sample of wells no. 1-5.

PENDER COUNTY

WATER-RESOURCES APPRAISAL

Pender County is in the southeast part of the North Carolina Coastal Plain. The topography is flat and swamps are common. The county is drained by the Cape Fear River and its tributaries, except for a narrow coastal corridor where the streams discharge directly to the sea. The average stream discharge is 1.0 $(Mgal/d)/mi^2$ in the eastern two-thirds of the county, but may be as little as 0.8 $(Mgal/d)/mi^2$ along the western edge of the county. No minimum-flow data are available for streams in the county, but many streams, even those having drainage areas as large as 100 square miles, have been observed to go dry. The 7-day, 2-year average low flow is 0.008 $(Mgal/d)/mi^2$. Three public water supplies have 500 or more customers: Burgaw, Surf City, and Topsail Beach. These, as well as individual and industrial supplies are derived from ground water. The population of the county in 1970 was 18,149.

The county is underlain by a wedge of sedimentary deposits that thicken to the southeast. The upper sandy aquifer is very thin in the county, reaching a maximum thickness of a few tens of feet. The limestone aquifer is present only in the eastern half of the county where it reaches a maximum thickness of about 250 feet near the coastline. Where thickest this aquifer could yield a few thousand gallons per minute to a well. However, in the coastal area the possibility of vertical or lateral salt-water encroachment at high pumping rates should be considered. The lower sandy aquifer ranges in thickness from over 600 feet in the northwestern part of the county to about 1,400 feet in the southeast. The ability of this aquifer to produce fresh water is determined more by the depth to salt water than by the thickness of the aquifer. In the northwest corner of the county, where the lower sandy aquifer contains only fresh water, well yields of over 1,000 gal/min can be obtained. However, near the Cape Fear River where the depth to salt water is less than 200 feet, and along the Northeast Cape Fear River where brackish water has been reported (LeGrand, 1960, p. 78) at depths less than 300 feet, fresh-water well yields of only a few hundred gallons per minute are obtainable. The estimated maximum ground-water yield in the county is 1.0 $(Mgal/d)/mi^2$. The maximum recharge to the deeper parts of lower sandy aquifer is estimated at 0.06 $(Mgal/d)/mi^2$. The water from the limestone aquifer is hard and may contain excessive iron. The water from the shallower wells in the lower sandy aquifer is usually hard. Wells in this aquifer having depths greater than about 250 feet, however, yield water that is usually soft but may have a high pH, a high dissolved-solids concentration, and an excessive fluoride concentration.


PENDER COUNTY
78°15'
78°00'
77°45'
34°45'
34°30'
421
117
53
BURGAW
Burgaw Cr.
Black River
Cape Fear River
Northeast Cape Fear River
Surf City
Topsail Beach
ATLANTIC OCEAN
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers

BURGAW, PENDER COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,000 in 1975 (about 800 metered customers, 40 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 1, 3, and 4).

Well No. 1 (Blake well), Pe-73, located at lat 34°33'08", long 77°56'07". Driller: Carolina Drilling and Equipment Co. Date drilled: 1958. Total depth: about 350 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 45 ft. Static water level: 30 ft below land surface. Pump setting: about 275 ft. Pump capacity: 275 gal/min. Type pump: turbine.

Well No. 3 (Smith Street well), Pe-74, located at lat 34°32'39", long 77°55'50". Driller: Chas. R. Underwood. Date drilled: Nov. 1967. Total depth: 458 ft. Diam: 8 in. Cased to: 205 ft. Type of finish: screened (gravel-packed). Screened intervals: 7 screens totaling 50 ft between 205 and 446 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 45 ft. Static water level: 12 ft below land surface. Pump setting: about 270 ft. Well yield: 350 gal/min. Pump capacity: 250 gal/min. Type pump: turbine.

Well No. 4 (Wright Street well), Pe-75, located at lat 34°33'36", long 77°55'54". Driller: Chas. R. Underwood. Date drilled: May 1971. Total depth: 310 ft. Diam: 8 in. Cased to: 195 ft. Type of finish: screened (gravel-packed). Screened intervals: 8 screens totaling 55 ft between 195 and 300 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 40 ft. Static water level: 15 ft below land surface. Well yield: 350 gal/min. Pump capacity: 250 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.23 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

None.

TREATMENT:

None.

BURGAW, PENDER COUNTY

PUMPING CAPACITY:

1.1 Mgal/d.

WATER STORAGE:

Two elevated tanks, 75,000 and 100,000 gallons.

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Burgaw lies in a flat area surrounded by swamps and small streams. The average stream discharge in the area is 1.0 $(Mgal/d)/mi^2$. The minimum and 7-day, 2-year discharges for the area have not been determined. The local streams could not provide an adequate supply without numerous impoundments. However, the Northeast Cape Fear River is about 4 miles from Burgaw and could provide more than enough water to meet the town's foreseeable needs.

Ground water: The lower sandy aquifer lies at very shallow depths below Burgaw and is about 900 feet thick. The depth to salt water is believed to be about 500 feet here. The aquifer is capable of producing up to several hundred gallons per minute to a well. The water is usually soft, has a high pH and a high dissolved-solids concentration, and may contain excessive fluoride.

TOWN OF BURGAW

BURGAW, PENDER COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 4 Raw			
Date of collection.....	8-22-75			
Silica (SiO_2).....	10			
Iron (Fe).....	.02			
Manganese (Mn).....	.010			
Calcium (Ca).....	2.1			
Magnesium (Mg).....	.6			
Sodium (Na).....	160			
Potassium (K).....	7.6			
Bicarbonate (HCO_3).....	360			
Carbonate (CO_3).....	40			
Alkalinity as $CaCO_3$.....	360			
Sulfate (SO_4).....	1.5			
Chloride (Cl).....	7.4			
Fluoride (F).....	1.3			
Nitrate (NO_3).....				
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	407			
Hardness as $CaCO_3$:				
Total.....	8			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	617			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	1.6			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....				
Lithium (Li).....	.00			
Mercury (Hg).....				
Strontium (Sr).....	.07			
Zinc (Zn).....	.01			
pH (units).....	8.8			
Temperature (°C).....				

SURF CITY, PENDER COUNTY

OWNERSHIP:

Municipal. Total population supplied (1975), about 400 in winter, 3,000 in summer (about 500 metered customers, 5 of whom are in suburban areas). Surf City supplies Topsail Beach with semi-finished water.

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1, Pe-71, located at lat 34°26'26", long 77°33'31". Driller: Long Beach Well and Pump Co. Date drilled: May 1968. Total depth: 164 ft. Diam: 8 in. Cased to: 103 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 10 ft. Static water level: 3 ft below land surface. Pump setting: about 60 ft. Pump capacity: 350 gal/min. Type pump: turbine.

Well No. 2, Pe-72, located at lat 34°26'40", long 77°33'33". Driller: Long Beach Well and Pump Co. Date drilled: May 1968. Total depth: 166 ft. Diam: 8 in. Cased to: 106 ft. Type of finish: open hole. Topography: flat. Aquifer: limestone. Altitude of land surface: 30 ft. Static water level: 20 ft below land surface. Pump setting: about 60 ft. Pump capacity: 400 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.25 Mgal/d, estimated; maximum daily (summer, 1975), 0.5 Mgal/d, estimated.

INDUSTRIAL USE:

None.

TREATMENT:

Chlorination at each well.

RATED CAPACITY OF TREATMENT PLANTS:

Demand feeder at each well. Not rated.

PUMPING CAPACITY:

Raw water, 1.1 Mgal/d; finished water, 1.1 Mgal/d.

SURF CITY, PENDER COUNTY

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One clear well, 100,000 gallons; one elevated tank, 100,000 gallons.

FUTURE PLANS:

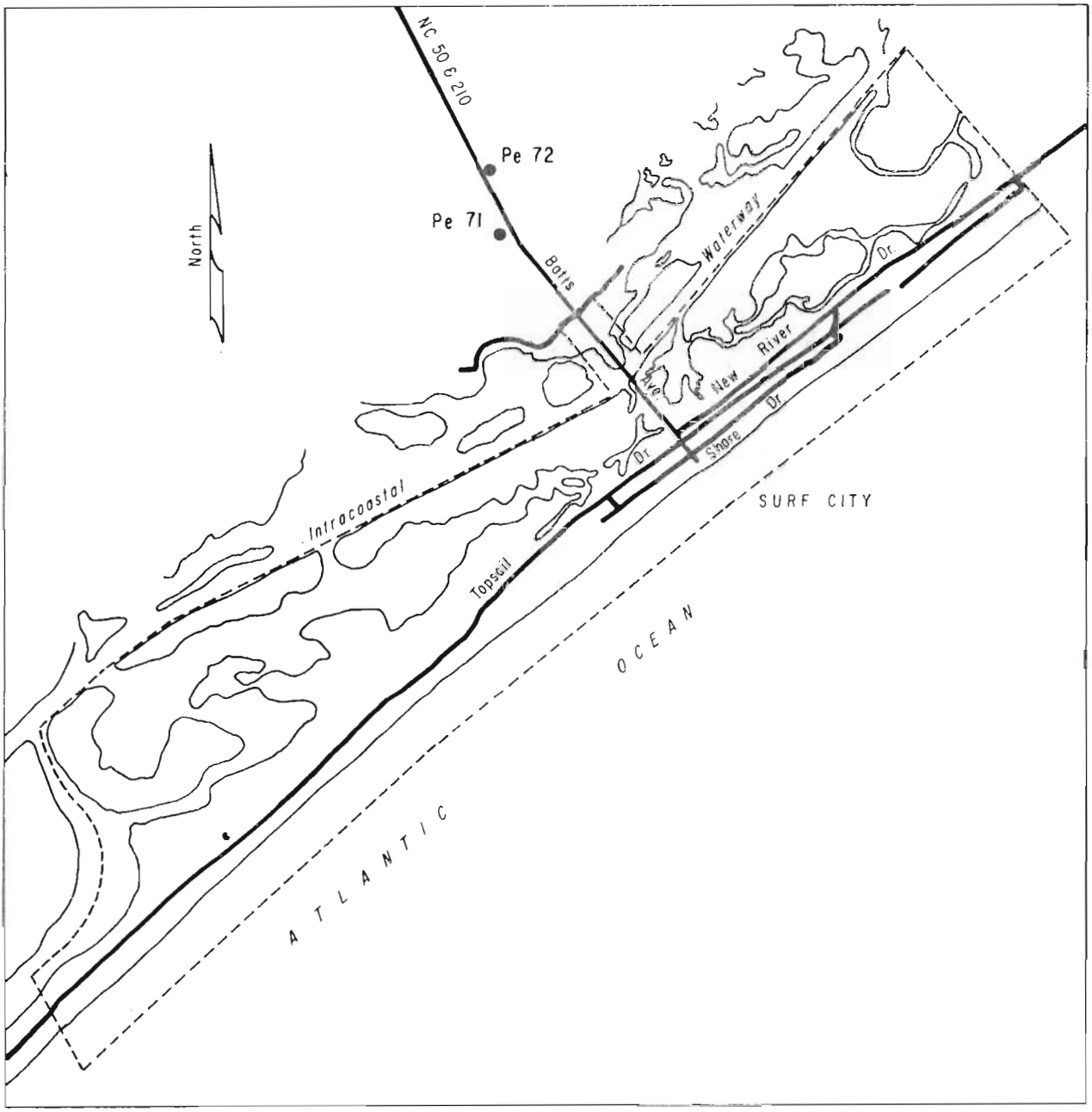
None.

WATER-RESOURCES APPRAISAL:

Surface water: Surf City is on an off-shore strand. The ocean side of the strand is characterized by beaches and sand dunes. The other side of the island consists largely of swamps and tidal flats. The few discernible streams are in the swampy areas and are estuarine and brackish. There is no practical way of developing an adequate, fresh, surface-water supply near town.

Ground water: Surf City is underlain by the limestone aquifer at shallow depths. The aquifer is about 250 feet thick here and should be able to provide up to a few thousand gallons per minute to wells. The depth to salt water is unknown here, but it may be greater than 400 feet. If so, there would be fresh water in the upper part of the underlying lower sandy aquifer, which could then provide up to a few hundred gallons per minute. The water from the limestone aquifer is hard with a moderate dissolved-solids concentration and may contain excessive iron.

TOWN OF SURF CITY



0 1 2 MILES
0 1 2 3 KILOMETERS

EXPLANATION

Pe 72 ● Well

SURF CITY, PENDER COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 1 Raw			
Date of collection	10-3-75			
Silica (SiO_2)	15			
Iron (Fe)	.29			
Manganese (Mn)	.010			
Calcium (Ca)	55			
Magnesium (Mg)	1.9			
Sodium (Na)	12			
Potassium (K)	1.2			
Bicarbonate (HCO_3)	170			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	140			
Sulfate (SO_4)	3.3			
Chloride (Cl)	19			
Fluoride (F)	.4			
Nitrate (NO_3)				
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.01			
Dissolved Solids	194			
Hardness as $CaCO_3$:				
Total	150			
Noncarbonate	3			
Specific conductance (micromhos at 25°C)	340			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.02			
Cadmium (Cd)	.000			
Chromium (Cr)	.001			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)				
Lithium (Li)	.00			
Mercury (Hg)				
Strontium (Sr)	.15			
Zinc (Zn)	.03			
pH (units)	7.6			
Temperature (°C)				

TOPSAIL BEACH, PENDER COUNTY

OWNERSHIP:

Municipal. Total population supplied (1975), about 5,000 in summer, 150 in winter (500 customers).

SOURCE:

Purchased from the Surf City, North Carolina, municipal supply. New well under construction - to be in operation November 1975.

TOTAL USE:

Average (Sept. 1974 - Aug. 1975), 0.067 Mgal/d, metered; maximum daily not determined.

Average daily water use (Mgal/d), Sept. 1974 - Aug. 1975

Sept. 1974--0.083	Jan. 1975--0.016	May 1975--0.065
Oct. 1974--0.052	Feb. 1975--0.020	June 1975--0.132
Nov. 1974--0.043	Mar. 1975--0.018	July 1975--0.151
Dec. 1974--0.018	Apr. 1975--0.048	Aug. 1975--0.152

INDUSTRIAL USE:

None.

TREATMENT:

Aeration and chlorination.

RATED CAPACITY OF TREATMENT PLANT:

Not determined. Adequate for present needs.

PUMPING CAPACITY:

1.0 Mgal/d.

FINISHED WATER STORAGE:

One ground-storage tank, 100,000 gallons; one elevated tank, 75,000 gallons.

FUTURE PLANS:

Well under construction at lat 34°23'34", long 77°35'42".

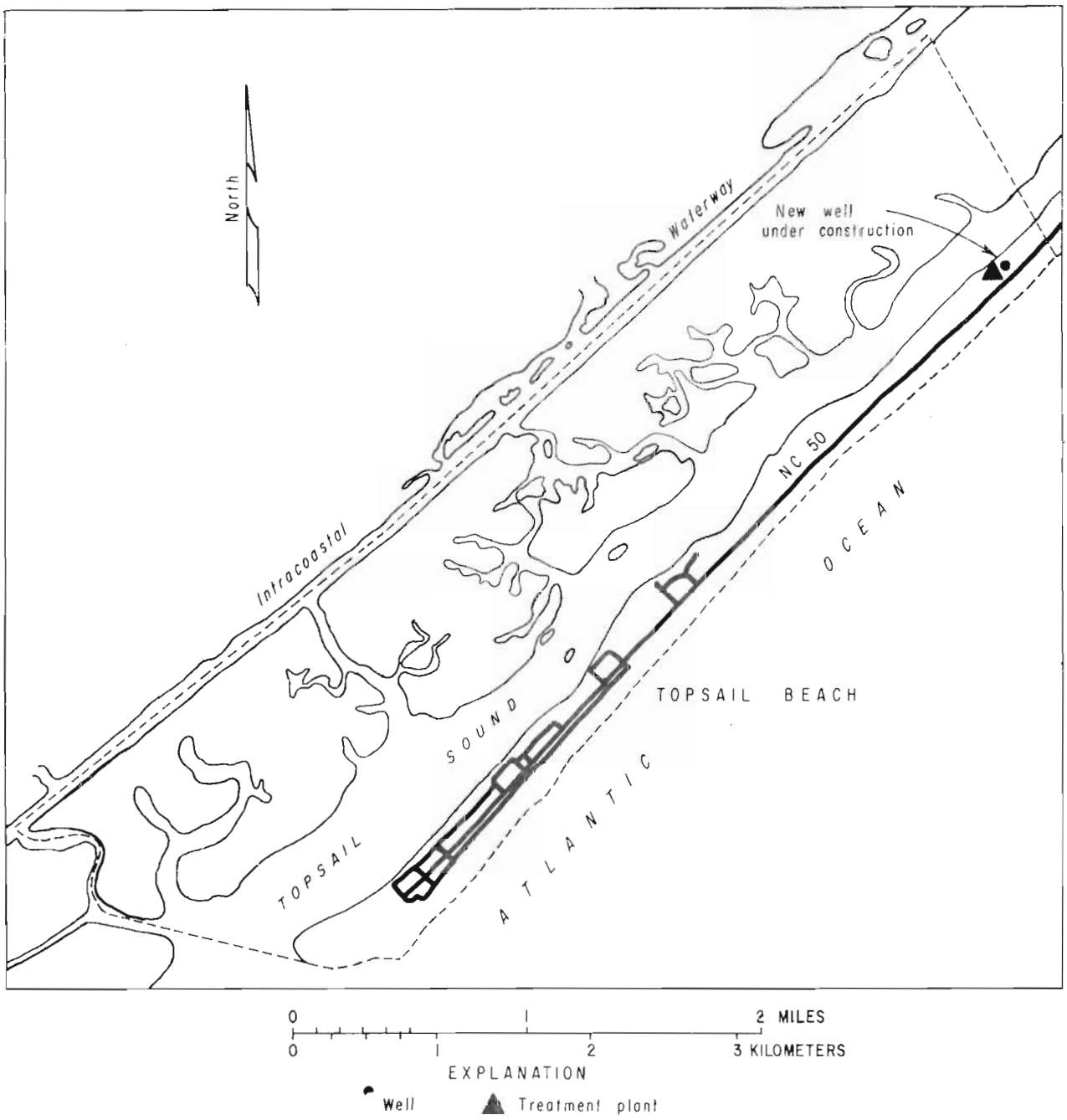
TOPSAIL BEACH, PENDER COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Topsail Beach is on an off-shore strand. The ocean side of the strand has beaches and sand dunes while the side toward the mainland tends to be swampy. There are no discernible streams in the area. There is no practical means of developing an adequate, fresh, surface-water supply near the town.

Ground water: Topsail Beach is underlain by the limestone aquifer at very shallow depths. This aquifer is about 250 feet thick beneath the town. Well yields of up to a few thousand gallons per minute should be obtainable from this aquifer. The depth to salt water may be over 400 feet. If so, well yields of up to a few hundred gallons per minute might be obtained from the underlying lower sandy aquifer. The water from the limestone aquifer is hard with a moderate dissolved-solids concentration.

TOWN OF TOPSAIL BEACH

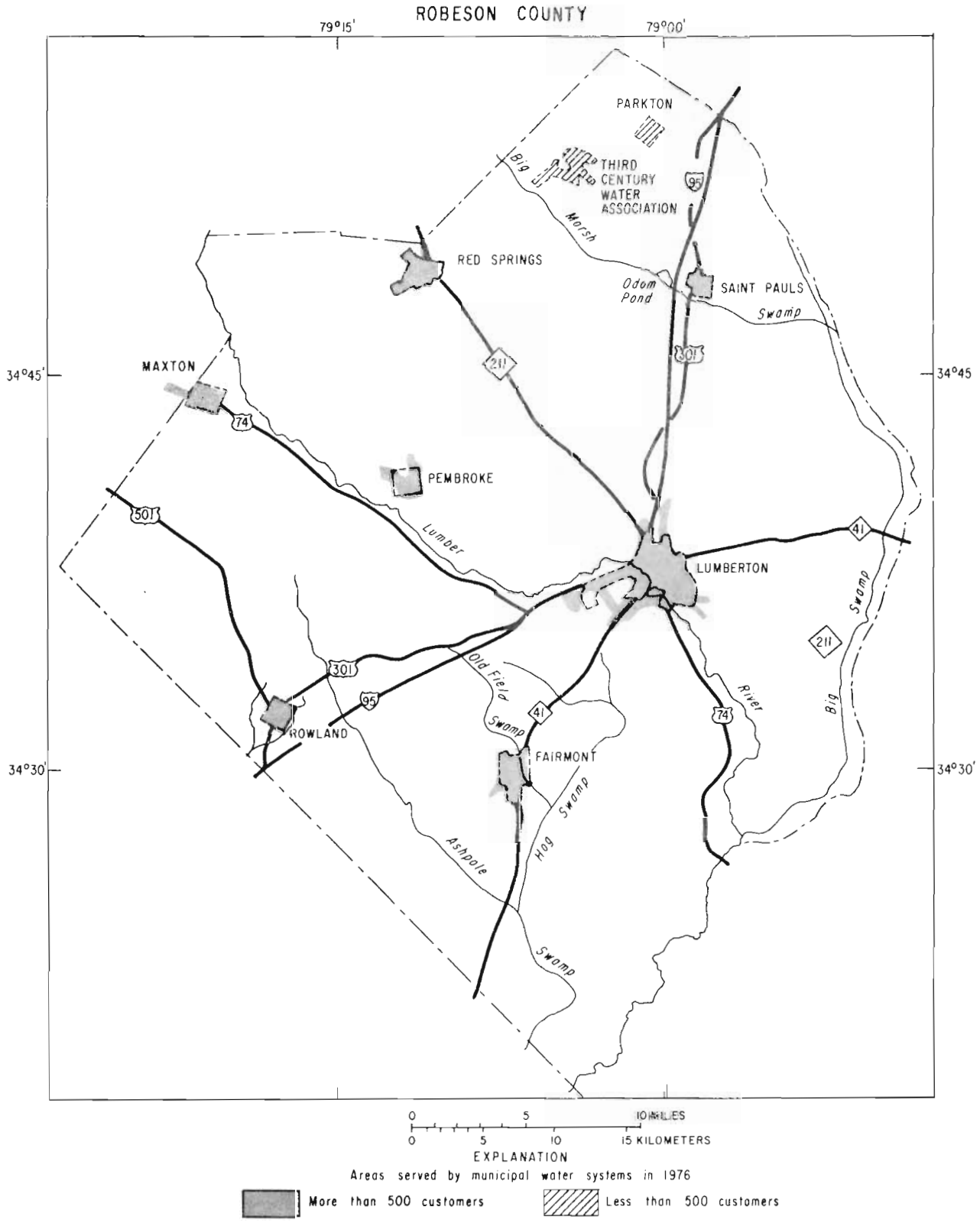


ROBESON COUNTY

WATER-RESOURCES APPRAISAL

Robeson County is in the southwest part of the North Carolina Coastal Plain. The topography is flat. The streams have wide, swampy flood plains. The county is drained by tributaries of the Little Pee Dee River including the Lumber River. The average stream discharge ranges from 0.6 (Mgal/d)/mi^2 in the southern part of the county to 0.8 (Mgal/d)/mi^2 in the northern part of the county. Minimum stream flows range from 0.0005 to 0.20 (Mgal/d)/mi^2 and average 0.047 (Mgal/d)/mi^2. Streams with drainage areas as large as 380 square miles have been observed to go dry. The 7-day, 2-year low flows range from 0.008 to 0.35 (Mgal/d)/mi^2 and average 0.10 (Mgal/d)/mi^2. Seven public water supplies in the county have 500 or more customers: Fairmont, Lumberton, Maxton, Pembroke, Red Springs, Rowland, and Saint Pauls. All of these water supplies are derived from ground water except Lumberton, which has a surface-water supply. Smaller public and individual supplies are also derived from ground water. The county population in 1970 was 84,842.

The county is underlain by the upper sandy aquifer, which has a thickness that ranges from less than 20 feet to perhaps 90 feet. This aquifer is underlain by the lower sandy aquifer. The lower sandy aquifer thickens to the southeast, being about 300 feet thick in the northwestern part of the county and about 600 feet thick in the southeast. Depending upon the thickness, this aquifer should be capable of yielding from several hundred to over 1,000 gal/min to wells. The maximum estimated ground-water yield in the area is 0.9 (Mgal/d)/mi^2. The maximum recharge to the lower part of the lower sandy aquifer is estimated to be 0.06 (Mgal/d)/mi^2. The ground water is usually soft, moderately to excessively acid, and may contain excessive iron.


ROBESON COUNTY
79°15'
79°00'
34°45'
34°30'
PARKTON
THIRD CENTURY WATER ASSOCIATION
RED SPRINGS
SAINT PAULS
MAXTON
PEMBROKE
LUMBERTON
ROWLAND
FAIRMONT
Big Marsh
Odom Pond
Swamp
Lumber
Old Field Swamp
Hog Swamp
Ashpole Swamp
River
Big Swamp
74
211
301
95
41
0 5 10 15 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

FAIRMONT, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,100 in 1975 (1,050 metered customers).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1 (Gertrude St. near Walnut St.), Rb-82, located at lat 34°29'25", long 79°06'50". Driller: Carolina Well and Pump Co. Date drilled: 1962. Total depth: about 400 ft. Diam: 8 in. Cased to: below 150 ft. Type of finish: screened. Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 131 ft. Static water level: _____. Pump capacity: 83 gal/min. Type pump: turbine.

No. 2 (old ice plant on Morro St.), Rb-83, located at lat 34°29'50", long 79°06'38". Driller: Carolina Well and Pump Co. Date drilled: Aug. 1969. Total depth: 320 ft. Diam: 8 in. Cased to: 138 ft. Type of finish: screened. Screened intervals: 138-153, 163-168, 178-193, 205-215, 236-240, and 253-257 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 120 ft. Static water level: 19 ft below land surface. Pump setting: 100 ft. Pump capacity: 100 gal/min. Type pump: turbine.

TOTAL USE:

Average use (1975), 0.1 Mgal/d, estimated; maximum daily, not available.

INDUSTRIAL USE:

0.015 Mgal/d. Principal users include Fairmont Knitting Co., South Robeson Knitting Co., and Fairmont Boat Works, Inc.

TREATMENT:

Aeration, chlorination, coke-bed filtration, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

Not available.

PUMPING CAPACITY:

Raw water, 0.3 Mgal/d; finished water, 0.3 Mgal/d.

FAIRMONT, ROBESON COUNTY

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two clear wells 100,000 gallons each; two elevated tanks 60,000 gallons and 100,000 gallons.

FUTURE PLANS:

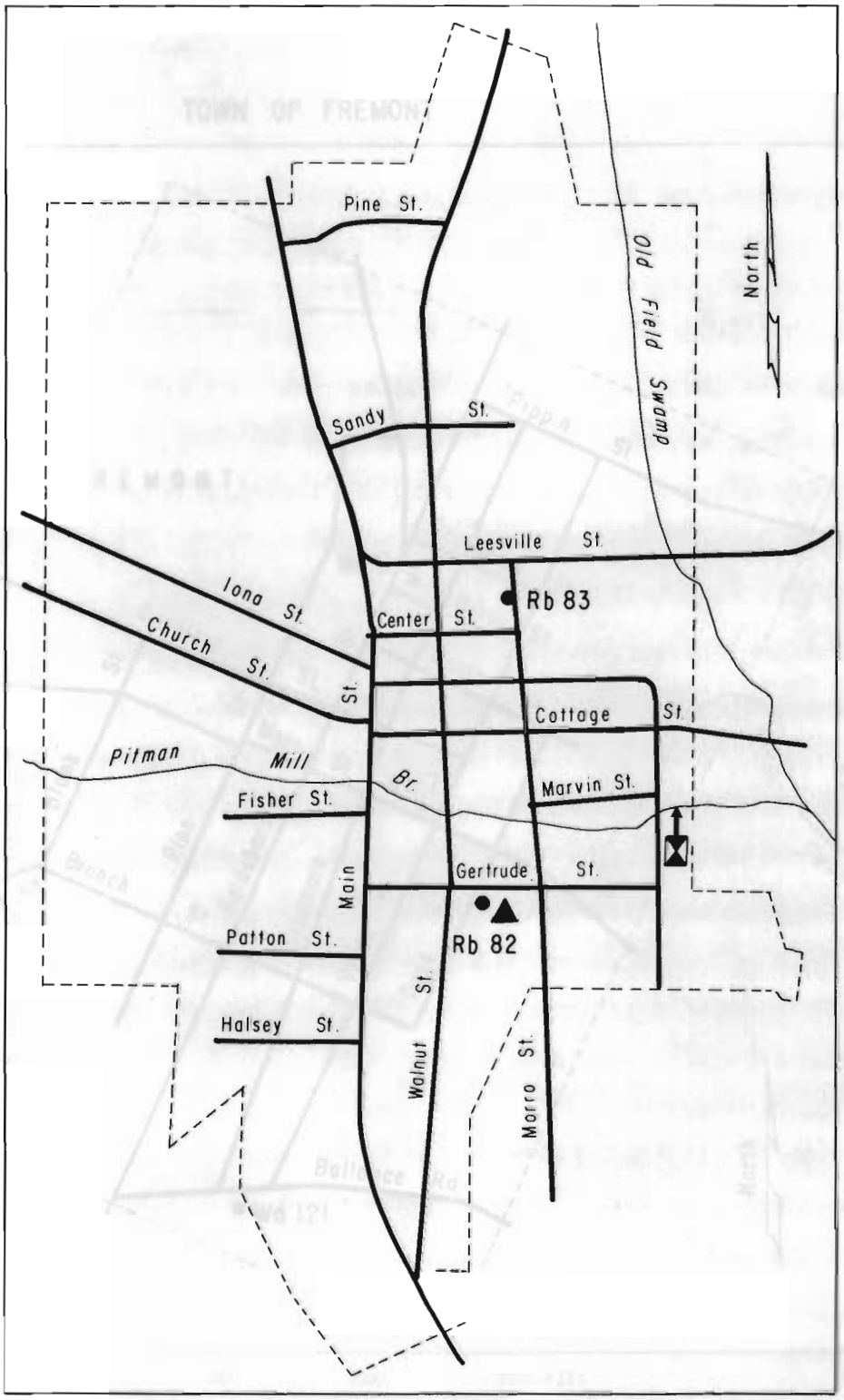
To construct a new well, a 500,000-gallon clear well and a 500,000-gallon elevated tank. Water lines will be extended into annexed areas. Replacement of older lines and hydrant installations.

WATER-RESOURCES APPRAISAL:

Surface water: Fairmont is on Old Field Swamp at its junction with Pitman Mill Branch. The topography is flat. The stream flood plains are wide and swampy. The low-flow characteristics of nearby streams are not known, but some of the streams go dry at times. The average discharge of streams in the area is 0.6 $(Mgal/d)/mi^2$. Impoundments would be required to assure an adequate surface-water supply.

Ground water: The town is underlain by the lower sandy aquifer at a depth of a few tens of feet. The lower sandy aquifer is over 500 feet thick here and can yield over 1,000 gal/min to wells. The water from this aquifer is soft and may contain excessive iron.

TOWN OF FAIRMONT



FAIRMONT, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 2 Raw			
Date of collection	11-20-75			
Silica (SiO_2)	36			
Iron (Fe)	.31			
Manganese (Mn)	.008			
Calcium (Ca)	3.1			
Magnesium (Mg)	2.1			
Sodium (Na)	21			
Potassium (K)	3.4			
Bicarbonate (HCO_3)	78			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	64			
Sulfate (SO_4)	1.9			
Chloride (Cl)	3.3			
Fluoride (F)	.2			
Nitrate (NO_3)	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.00			
Dissolved Solids	110			
Hardness as $CaCO_3$:				
Total	17			
Noncarbonate	0			
Specific conductance (micromhos at 25°C)	136			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.04			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.004			
Lead (Pb)	----------			
Lithium (Li)	.01			
Mercury (Hg)	----------			
Strontium (Sr)	.07			
Zinc (Zn)	.01			
pH (units)	6.6			
Temperature (°C)	----------			

LUMBERTON, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 18,500 in 1975 (7,052 metered customers, 50 of whom are in suburban areas).

SOURCES:

Lumber River and one well.

Lumber River: the intake is on the south side of the river, at the end of J. Cox Road and about 0.3 miles northwest of I-95, at lat 34°38'01", long 79°02'34". The drainage area at the intake is 674 square miles, approximately.

Well at the filtration plant for emergency use only, Rb-55, located at lat 34°37'16", long 79°00'39". Driller: Carolina Well and Pump Co. Date drilled: 1950. Total depth: 540 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: river bank. Aquifer: lower sandy. Altitude of land surface: 130 ft. Static water level: 7 ft below land surface. Pump capacity: 700 gal/min. Type pump: turbine.

ALLOWABLE DRAFT:

Estimated allowable draft is 47 Mgal/d without storage.

TOTAL USE:

Average (1975), 3.5 Mgal/d, estimated; maximum daily (summer, 1970), 5.2 million gallons.

INDUSTRIAL USE:

2.0 Mgal/d, estimated. Principal users include Textured Fibers, Inc., and Alpha Cellulose and Textile Fibers, Inc.

TREATMENT:

Coagulation with alum, lime and sodium aluminate; sedimentation; rapid sand filtration; addition of phosphate compounds for corrosion control; adjustment of pH with lime; post chlorination; and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

10.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 10.0 Mgal/d; finished water, 30.4 Mgal/d.

LUMBERTON, ROBESON COUNTY

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two clear wells, 750,000 and 2,000,000 gallons; four elevated tanks, one of 300,000 gallons and three of 1,000,000 gallons.

FUTURE PLANS:

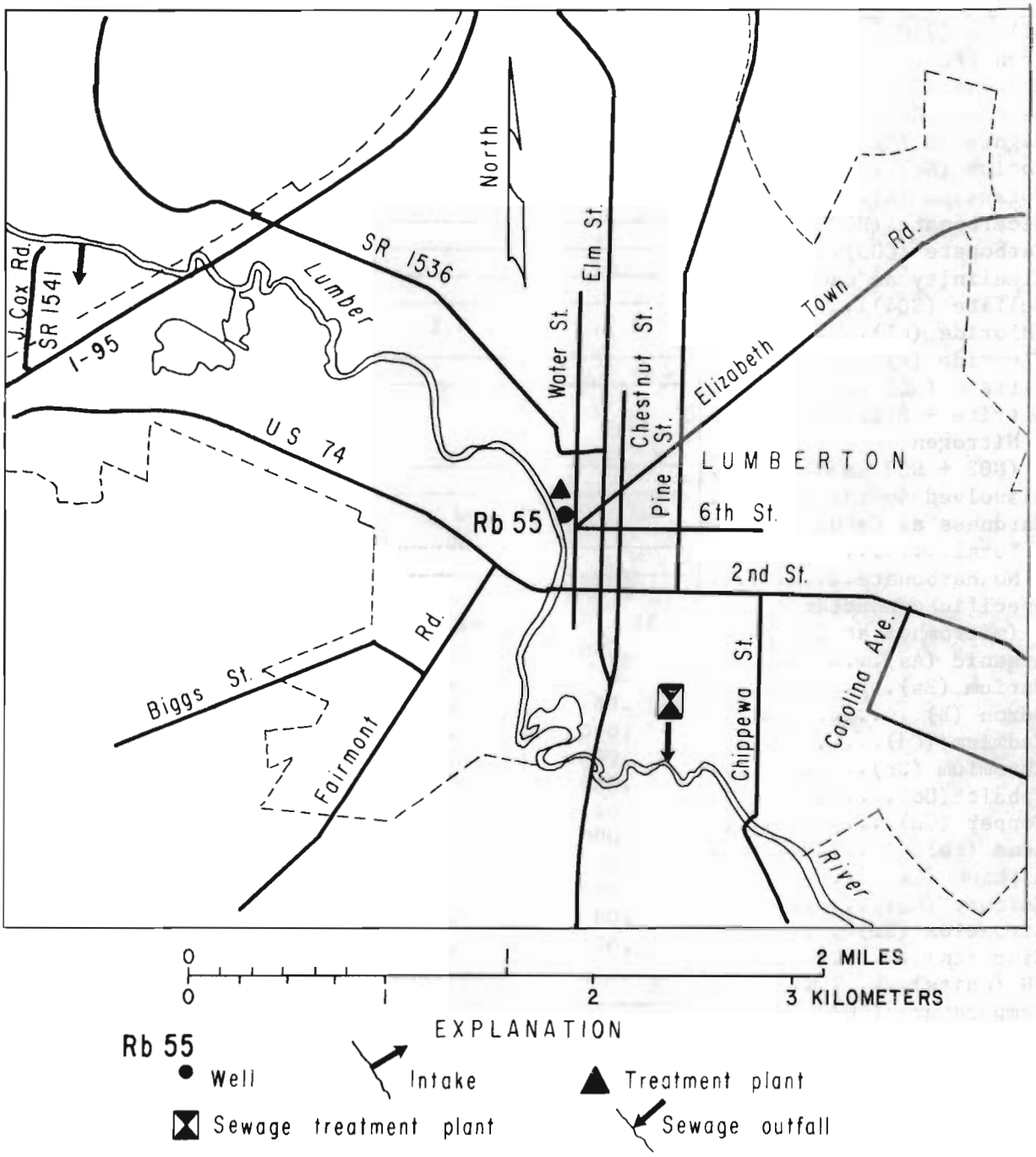
None.

WATER-RESOURCES APPRAISAL:

Surface water: Lumberton is on the Lumber River. The allowable draft is over 13 times present average consumption and should be more than adequate for any foreseeable need.

Ground water: Lumberton is underlain by the lower sandy aquifer at a few tens of feet. The thickness of this aquifer is about 500 feet here. Well yields of over 1,000 gal/min can be obtained. The water from this aquifer may be soft or hard, very alkaline to very acidic, and may contain excessive iron.

CITY OF LUMBERTON



LUMBERTON, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Lumber River Raw	Lumber River Finished	Lumber River Raw	Lumber River Finished
Date of collection.....	11-20-75	11-20-75	4-20-70	11-13-61
Silica (SiO_2).....	----------	----------	.8	6.4
Iron (Fe).....	0.39	0.00	----------	----------
Manganese (Mn).....	.010	.006	----------	----------
Calcium (Ca).....	----------	----------	1.1	4.7
Magnesium (Mg).....	----------	----------	1.2	.6
Sodium (Na).....	----------	----------	5.4	4.2
Potassium (K).....	----------	----------	1.0	.5
Bicarbonate (HCO_3).....	----------	----------	4	11
Carbonate (CO_3).....	----------	----------	0	0
Alkalinity as $CaCO_3$.....	----------	----------	3	9
Sulfate (SO_4).....	----------	----------	2.8	6.8
Chloride (Cl).....	4.9	6.1	8.1	5.3
Fluoride (F).....	----------	----------	.1	1.2
Nitrate (NO_3).....	----------	----------	1.7	.1
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	----------	----------	160	39
Hardness as $CaCO_3$:				
Total.....	----------	----------	4	15
Noncarbonate.....	----------	----------	2	6
Specific conductance (micromhos at 25°C)....	35	94	42	59
Arsenic (As).....	.000	.000	----------	----------
Barium (Ba).....	.0	.0	----------	----------
Boron (B).....	.06	.01	----------	----------
Cadmium (Cd).....	.000	.000	----------	----------
Chromium (Cr).....	.000	.000	----------	----------
Cobalt (Co).....	.000	.000	----------	----------
Copper (Cu).....	.029	.005	----------	----------
Lead (Pb).....	.000	.000	----------	----------
Lithium (Li).....	.00	.00	----------	----------
Mercury (Hg).....	.000	.000	----------	----------
Strontium (Sr).....	.04	.05	----------	----------
Zinc (Zn).....	.02	.00	----------	----------
pH (units).....	----------	----------	5.3	7.1
Temperature (°C).....	----------	----------		

LUMBERTON, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well Rb-55 Raw			
Date of collection	2-12-69			
Silica (SiO_2)	18			
Iron (Fe)	----------			
Manganese (Mn)	----------			
Calcium (Ca)	36			
Magnesium (Mg)	1.5			
Sodium (Na)	18			
Potassium (K)	2.1			
Bicarbonate (HCO_3)	160			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	----------			
Sulfate (SO_4)	2.2			
Chloride (Cl)	4.3			
Fluoride (F)	.1			
Nitrate (NO_3)	.1			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	----------			
Dissolved Solids	160			
Hardness as $CaCO_3$:				
Total	96			
Noncarbonate	0			
Specific conductance (micromhos at 25°C)	255			
Arsenic (As)	----------			
Barium (Ba)	----------			
Boron (B)	----------			
Cadmium (Cd)	----------			
Chromium (Cr)	----------			
Cobalt (Co)	----------			
Copper (Cu)	----------			
Lead (Pb)	----------			
Lithium (Li)	----------			
Mercury (Hg)	----------			
Strontium (Sr)	----------			
Zinc (Zn)	----------			
pH (units)	7.3			
Temperature (°C)	----------			

MAXTON, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,000 in 1975 (542 metered customers, about 30 of whom are in suburban areas).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1 (Elm Street well), Rb-88, located at lat 34°44'21", long 79°21'04". Driller: Carolina Drilling & Equipment Co. Date drilled: about 1947. Total depth: 110 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 195 ft. Static water level: 8 ft below land surface. Pump setting: 80 ft. Pump capacity: 240 gal/min. Type pump: turbine.

Well No. 2 (Graham Street well), Rb-89, located at lat 34°44'19", long 79°20'57". Driller: _____. Date drilled: early 1930's. Total depth: 160 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 195 ft. Static water level: 20 ft below land surface. Pump setting: 80 ft. Pump capacity: 200 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.18 Mgal/d, estimated; maximum daily use occurred in August 1974, 1.0 million gallons, estimated.

INDUSTRIAL USE:

0.001 Mgal/d, estimated. Principal users include Maxton Oil and Fertilizer Company and Hasty Plywood Company.

TREATMENT:

Aeration, addition of phosphate compounds to suspend iron, adjustment of pH with caustic soda.

RATED CAPACITY OF TREATMENT PLANT:

1.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 0.7 Mgal/d; finished water, 1.22 Mgal/d.

MAXTON, ROBESON COUNTY

RAW-WATER STORAGE:

One ground tank, 200,000 gallons.

FINISHED-WATER STORAGE:

One elevated tank, 100,000 gallons.

FUTURE PLANS:

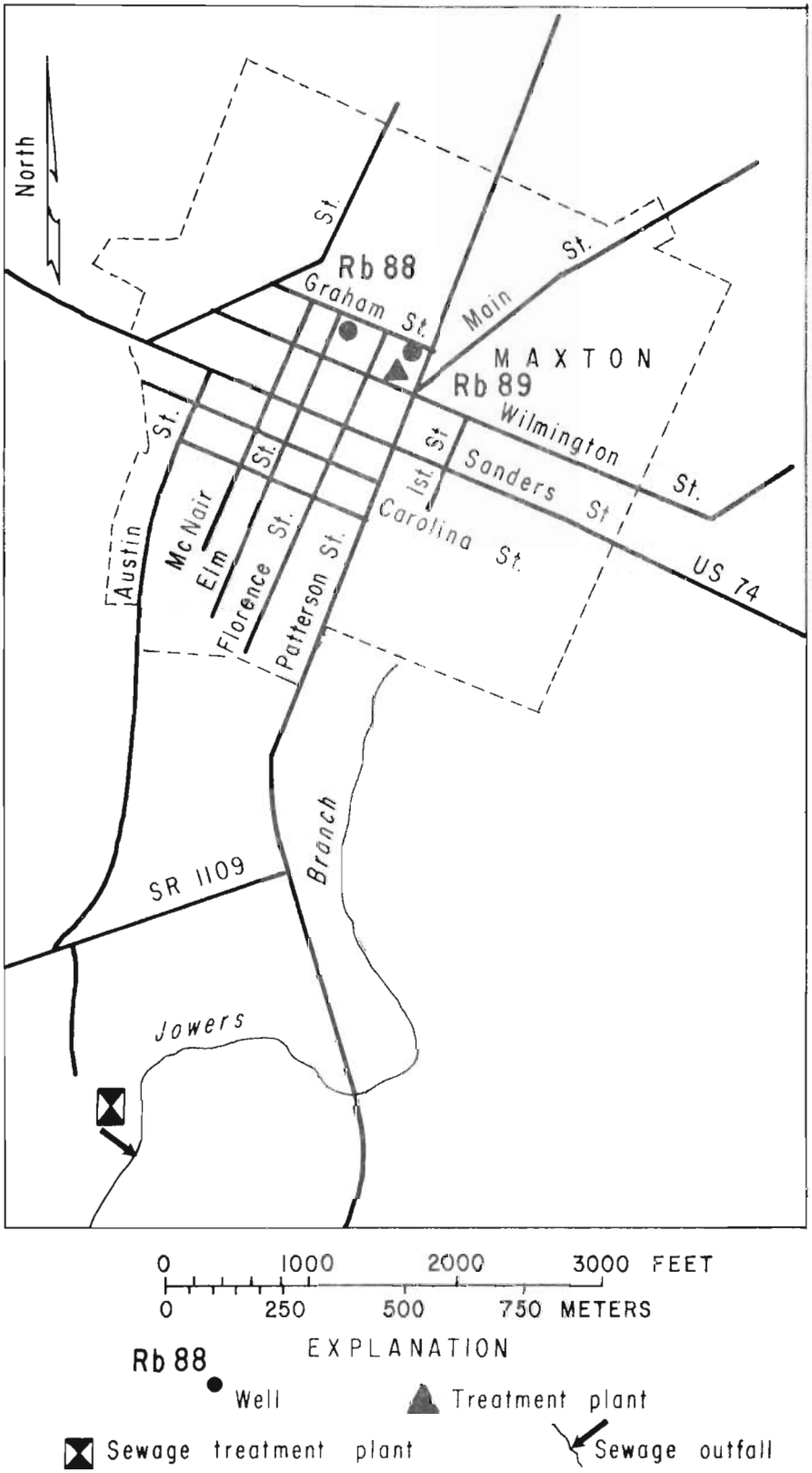
Will lay an emergency supply line from the Laurinburg-Maxton airport in Scotland County and will drill a new well.

WATER-RESOURCES APPRAISAL:

Surface water: Maxton is 1 mile from the Lumber River, which could provide more than enough water for any foreseeable need of the town.

Ground water: The upper sandy aquifer is about 50 feet thick at Maxton. The upper sandy aquifer is underlain by the lower sandy aquifer, which is over 300 feet thick. The lower sandy aquifer is capable of yielding up to several hundred gallons per minute to wells. The water from this aquifer is soft, with a very low dissolved-solids concentration, and is moderately to excessively acidic.

TOWN OF MAXTON



MAXTON, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Raw	Well No. 2 Raw	Combined [1] Finished	Combined [1] Finished
Date of collection.....	8-22-66	8-22-66	8-22-66	12-10-75
Silica (SiO_2).....	6.9	8.6	8.4	----------
Iron (Fe).....	1.3	.39	.18	0.18
Manganese (Mn).....	.08	.02	.01	.010
Calcium (Ca).....	1.5	1.8	1.8	----------
Magnesium (Mg).....	.7	.4	.7	----------
Sodium (Na).....	4.3	4.3	12	----------
Potassium (K).....	.5	.6	.6	----------
Bicarbonate (HCO_3).....	0	1	23	----------
Carbonate (CO_3).....	0	0	0	----------
Alkalinity as $CaCO_3$.....	0	1	19	----------
Sulfate (SO_4).....	6.8	5.4	5.2	----------
Chloride (Cl).....	6.3	6.2	7.1	6.6
Fluoride (F).....	.0	.0	.1	----------
Nitrate (NO_3).....	2.0	3.1	2.7	----------
Nitrite + Nitrate as Nitrogen ($NO_2 + NO_3$ as N).....	----------	----------	----------	----------
Dissolved Solids.....	34	37	52	----------
Hardness as $CaCO_3$:				
Total.....	7	6	8	----------
Noncarbonate.....	7	5	0	----------
Specific conductance (micromhos at 25°C)....	57	49	74	81
Arsenic (As).....	----------	----------	----------	.000
Barium (Ba).....	----------	----------	----------	.5
Boron (B).....	----------	----------	----------	.00
Cadmium (Cd).....	----------	----------	----------	.000
Chromium (Cr).....	----------	----------	----------	.000
Cobalt (Co).....	----------	----------	----------	.000
Copper (Cu).....	----------	----------	----------	.025
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	.00
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	.05
Zinc (Zn).....	----------	----------	----------	1.4
pH (units).....	4.5	4.8	6.9	----------
Temperature (°C).....	20	19	22	----------

1/ Combined sample of wells no. 1 and 2.

PEMBROKE, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,900 in 1975 (about 600 metered customers, 40 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 1-3).

Well No. 1 (east of town on NC-711), Rb-26, located at lat 34°40'38", long 79°11'22". Driller: Heater Well Co. Date drilled: _____. Total depth: 93 ft. Diam: 8 in. Cased to: 83 ft. Type of finish: screened. Screened interval: 83-93 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 170 ft. Static water level: _____. Pump capacity: 400 gal/min. Type pump: turbine.

Well No. 2 (Maynard Manor Housing Area), Rb-86, located at lat 34°40'46", long 79°11'20". Driller: Dillon Supply Co. Date drilled: 1950. Total depth: 135 ft. Diam: 6 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 170 ft. Static water level: 5 ft below land surface. Pump setting: about 130 ft. Pump capacity: 400 gal/min. Type pump: turbine.

Well No. 3 (northeast of Third St. at Pine St.), Rb-87, located at lat 34°40'53", long 79°11'44". Driller: Heater Well Co. Date drilled: July 1955. Total depth: 250 ft. Diam: 10 in to 8 in. Cased to: 78 ft. Type of finish: slotted pipe and screens (gravel-packed). Open intervals: screens, 78-80, 112-114, 164-174, 185-200, and 211-216 ft; slotted pipe, 216-250 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 175 ft. Static water level: 12 ft below land surface. Pump capacity: 400 gal/min. Type pump: turbine.

TOTAL USE:

Average use (1975), 0.28 Mgal/d, estimated; maximum daily (day unknown - 1973), 0.4 Mgal/d.

INDUSTRIAL USE:

0.003 Mgal/d. Principal users include Housing by Vogue and Indian Maid, Inc.

TREATMENT:

Aeration, filtration through coke, zeolite process for softening, adjustment of pH with soda ash, and chlorination.

PEMBROKE, ROBESON COUNTY

RATED CAPACITY OF TREATMENT PLANTS:

Two plants, 0.25 Mgal/d each.

PUMPING CAPACITY:

Raw water, 1.7 Mgal/d; finished water, 2.9 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One clear well, 90,000 gallons; three elevated tanks, 75,000, 100,000, and 250,000 gallons.

FUTURE PLANS:

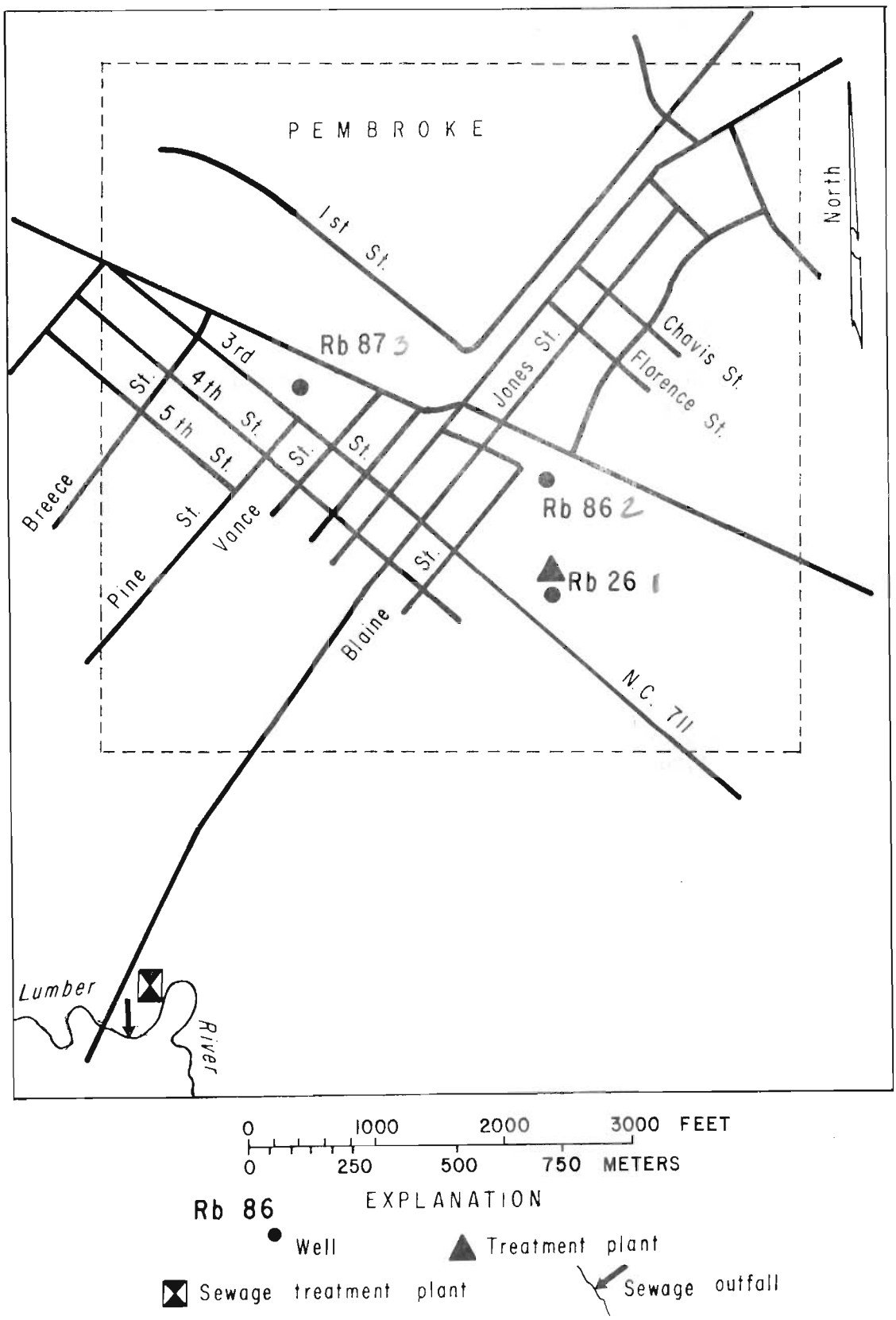
To build an additional water treatment plant.

WATER-RESOURCES APPRAISAL:

Surface water: Pembroke is less than one mile from the Lumber River, which could provide more than enough water for any anticipated need of the town.

Ground water: The town is underlain at a depth of a few tens of feet by the lower sandy aquifer, which is over 400 feet thick here. This aquifer can yield over 1,000 gal/min to wells. The water from the lower sandy aquifer is soft, has a low dissolved-solids concentration, and is very acidic.

TOWN OF PEMBROKE



PEMBROKE, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)	Well No. 3 Raw			
Date of collection	11-21-75			
Silica (SiO_2)	15			
Iron (Fe)	.75			
Manganese (Mn)	.010			
Calcium (Ca)	5.6			
Magnesium (Mg)	.2			
Sodium (Na)	2.7			
Potassium (K)	1.6			
Bicarbonate (HCO_3)	12			
Carbonate (CO_3)	0			
Alkalinity as $CaCO_3$	10			
Sulfate (SO_4)	2.1			
Chloride (Cl)	3.0			
Fluoride (F)	.5			
Nitrate (NO_3)	---			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N)	.00			
Dissolved Solids	37			
Hardness as $CaCO_3$:				
Total	15			
Noncarbonate	5			
Specific conductance (micromhos at 25°C)	37			
Arsenic (As)	.000			
Barium (Ba)	.0			
Boron (B)	.00			
Cadmium (Cd)	.000			
Chromium (Cr)	.000			
Cobalt (Co)	.000			
Copper (Cu)	.000			
Lead (Pb)	---			
Lithium (Li)	.01			
Mercury (Hg)	---			
Strontium (Sr)	.05			
Zinc (Zn)	.01			
pH (units)	5.6			
Temperature (°C)	---			

RED SPRINGS, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,300 in 1975 (1,093 metered customers, 15 of whom are in suburban areas).

SOURCE:

Four wells (Nos. 1-4).

Well No. 1 (Buie Street across from water plant), Rb-93 located at lat 34°48'22", long 79°11'36". Driller: Chas. R. Underwood. Date drilled: July 1971. Total depth: 350 ft. Diam: 8 in. Cased to: 74 ft. Type of finish: screened (gravel-packed). Screened intervals: 74-84, 115-125, 132-142, 169-174, and 330-340 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 205 ft. Static water level: 19 ft below land surface. Pump setting: 80 ft. Well yield: 610 gal/min. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 2 (near Liberty Street), Rb-6, located at lat 34°48'52", long 79°11'24". Driller: Carolina Well and Pump Co. Date drilled: Oct. 1949. Total depth: 435 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 208 ft. Static water level: 14 ft below land surface. Pump capacity: _____. Type pump: turbine.

Well No. 3 (near Johnson and Maness Streets), Rb-94, located at lat 34°48'25", long 79°11'49". Driller: Chas. R. Underwood. Date drilled: _____. Total depth: _____. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 205 ft. Static water level: _____. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 4 (Peterson Street), Rb-95, located at lat 34°48'32", long 79°11'34". Driller: Chas. R. Underwood. Date drilled: 1967. Total depth: 375 ft. Diam: 8 in. Cased to: 120 ft. Type of finish: screened (gravel-packed). Screened intervals: 120-135, 139-149, 175-185, 215-220, 305-310, 335-340, and 353-363 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 205 ft. Static water level: 13 ft below land surface: Well yield: 710 gal/min. Pump capacity: 500 gal/min. Type pump: turbine.

TOTAL USE:

Average use (1975), 0.6 Mgal/d; maximum daily occurred in 1973 at 0.8 Mgal/d (fire).

RED SPRINGS, ROBESON COUNTY

INDUSTRIAL USE:

0.15 Mgal/d, estimated. Principal users include Red Springs Mill and Celluknit Corp.

TREATMENT:

Aeration, chlorination, coagulation with alum and lime, sedimentation, pressure sand-and-gravel filtration, adjustment of pH with soda ash, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

1.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 2.6 Mgal/d; finished water, 1.25 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One clear well, 200,000 gallons; three elevated tanks 75,000, 100,000, and 200,000 gallons.

FUTURE PLANS:

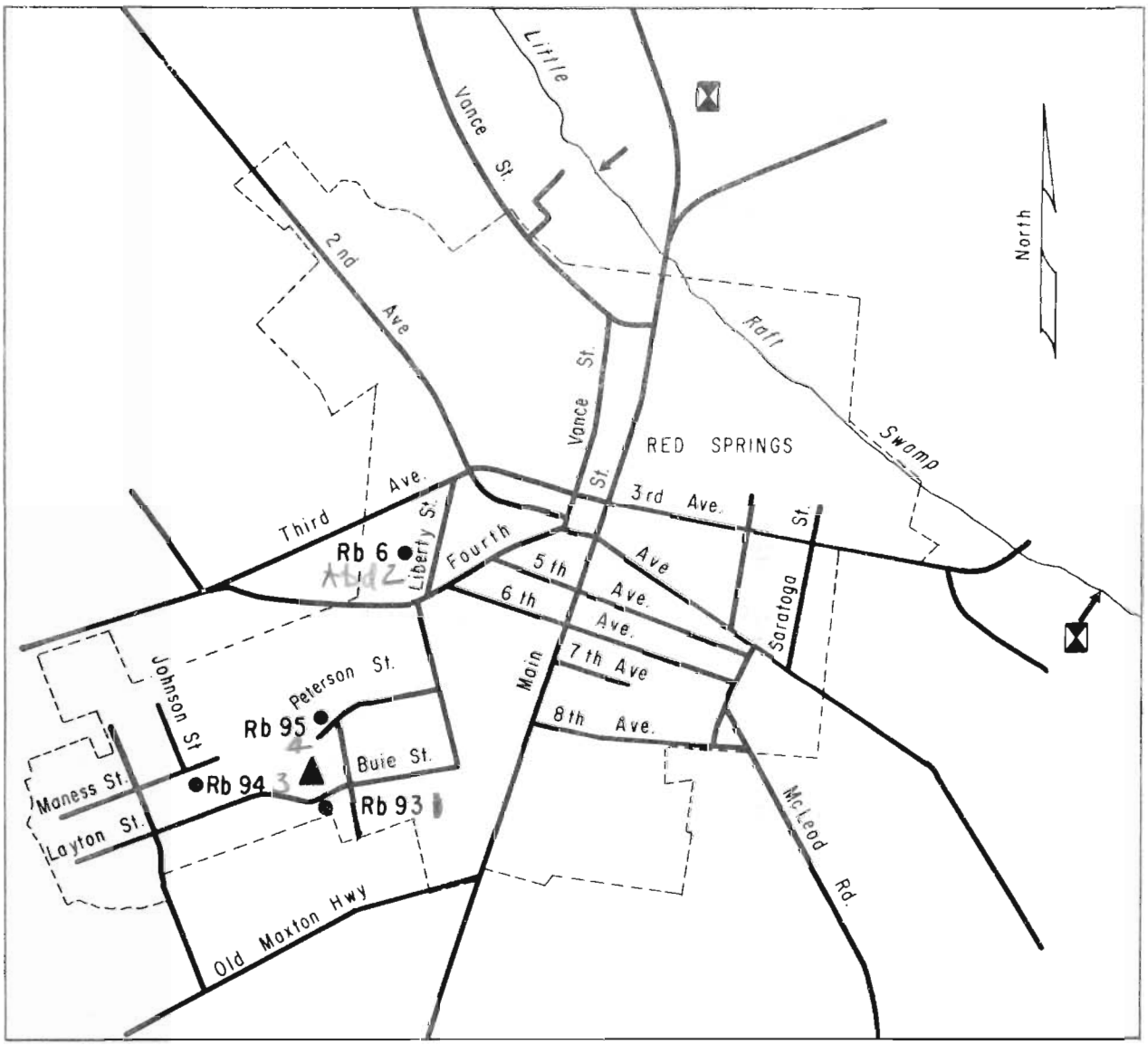
None.

WATER-RESOURCES APPRAISAL:

Surface water: The town is on Little Raft Swamp. The topography is low and swamps are common in the surrounding area. The average discharge of streams in the area is estimated at 0.8 $(Mgal/d)/mi^2$. The low-flow characteristics of these streams are not known, but some of the streams occasionally go dry. One or more impoundments would be required to assure an adequate surface-water supply.

Ground water: The town is underlain by the upper sandy aquifer, which is about 50 feet thick here. The upper sandy aquifer is underlain by the lower sandy aquifer, which is about 400 feet thick. The lower sandy aquifer can provide over 1,000 gal/min to wells. The water from this aquifer is soft, with excessive acidity and excessive iron.

TOWN OF RED SPRINGS



RED SPRINGS, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Combined[1/] Raw	Combined[1/] Finished		
Date of collection.....	12-10-75	12-10-75		
Silica (SiO_2).....	----------	10		
Iron (Fe).....	0.42	----------		
Manganese (Mn).....	.010	----------		
Calcium (Ca).....	----------	14		
Magnesium (Mg).....	----------	.5		
Sodium (Na).....	----------	6.3		
Potassium (K).....	----------	.6		
Bicarbonate (HCO_3).....	----------	30		
Carbonate (CO_3).....	----------	0		
Alkalinity as $CaCO_3$.....	----------	25		
Sulfate (SO_4).....	----------	9.3		
Chloride (Cl).....	7.2	7.6		
Fluoride (F).....	----------	1.0		
Nitrate (NO_3).....	----------	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	.06		
Dissolved Solids.....	----------	64		
Hardness as $CaCO_3$:				
Total.....	----------	37		
Noncarbonate.....	----------	12		
Specific conductance (micromhos at 25°C)....	59	106		
Arsenic (As).....	.001	----------		
Barium (Ba).....	.0	----------		
Boron (B).....	.00	----------		
Cadmium (Cd).....	.000	----------		
Chromium (Cr).....	.000	----------		
Cobalt (Co).....	.000	----------		
Copper (Cu).....	.340	----------		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.00	----------		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.04	----------		
Zinc (Zn).....	.01	----------		
pH (units).....	----------	6.6		
Temperature (°C).....	----------	----------		

[1/] Combined sample of wells no. 1,2 and 4.

ROWLAND, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,400 (500 customers).

SOURCE:

Two wells (Nos. 1 and 2).

Well No. 1 (water-treatment plant at end of Mulberry Street), Rb-84, located at lat 34°32'33", long 79°17'39". Driller: Carolina Well Drilling Co. Date drilled: 1974. Total depth: 287 ft. Diam: 8 in. Cased to: 120 ft. Type of finish: screened (gravel-packed). Screened intervals: 120-130, 155-160, 170-175, 180-185, 210-220, 240-245, and 265-270. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 150 ft. Static water level: _____. Pump setting: 75 ft. Pump capacity: 250 gal/min. Type pump: turbine.

Well No. 2 (North Railroad Street, north of Peach Street), Rb-85, located at lat 34°32'28", long 79°17'26". Driller: Carolina Well Drilling Co. Date drilled: about 1961. Total depth: 300 ft. Diam: 8 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: six 5-foot screens, depths unknown. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 150 ft. Static water level: _____. Pump setting: 75 ft. Pump capacity: 650 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.18 Mgal/d estimated; maximum daily (2-1-74), 0.3 million gallons, estimated.

INDUSTRIAL USE:

0.003 Mgal/d, estimated. Principal users include Block Manufacturing Co. and Rowland Plywood Co.

TREATMENT:

Aeration, carbon filtration, chlorination, pressure sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash.

RATED CAPACITY OF TREATMENT PLANT:

Not available. Adequate for anticipated needs.

PUMPING CAPACITY:

Raw water, 1.15 Mgal/d; finished water, 0.5 Mgal/d.

ROWLAND, ROBESON COUNTY

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One clear well, 150,000 gallons; one elevated tank, 150,000 gallons.

FUTURE PLANS:

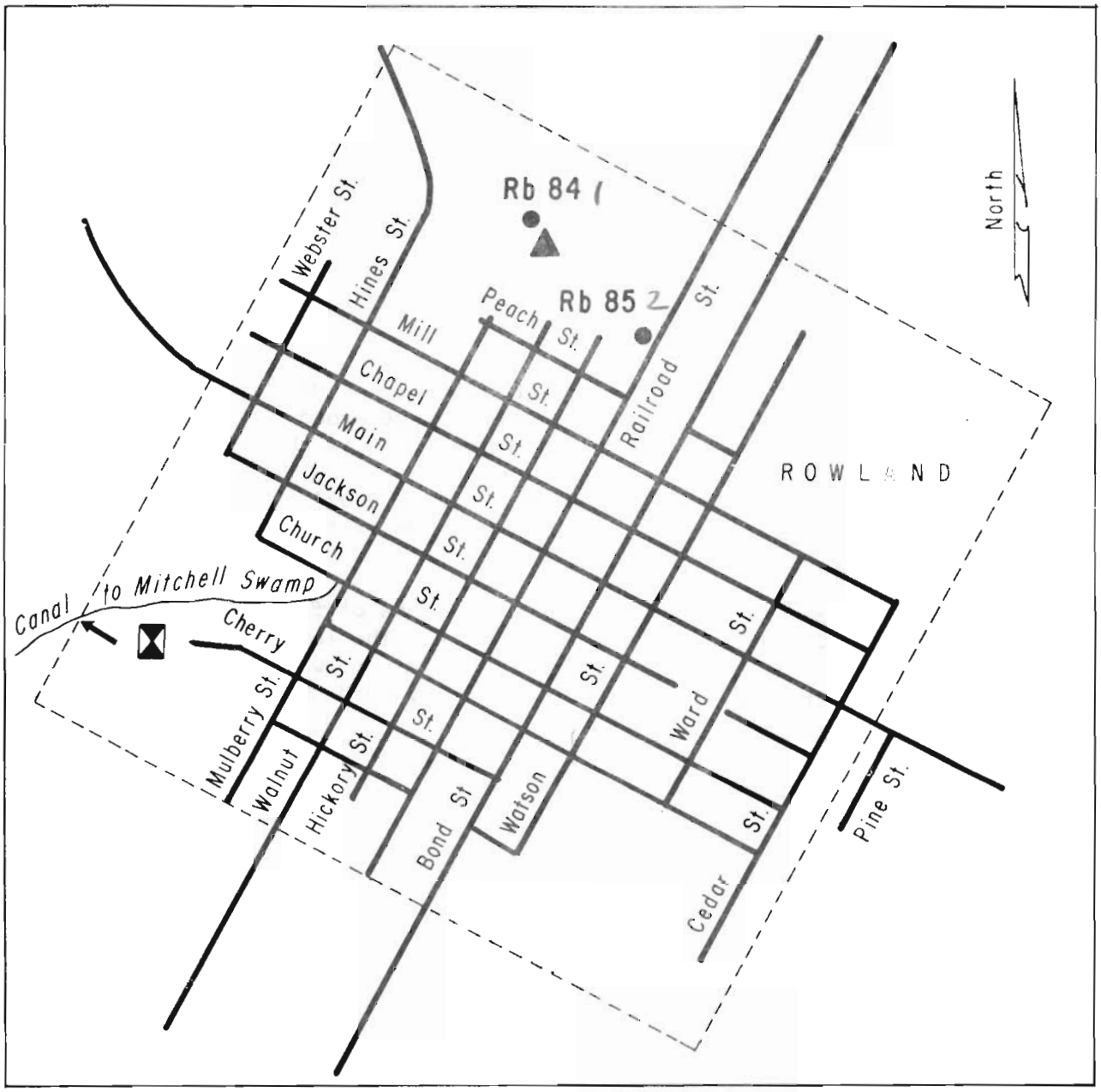
To expand water lines.

WATER-RESOURCES APPRAISAL:

Surface water: Rowland is on an unnamed tributary of Mitchell Swamp. The topography is flat. The nearby streams have broad swampy flood plains. The average stream discharge in the area is about 0.6 (Mgal/d) mi^2. Mitchell Swamp has a minimum flow of about 0.0026 (Mgal/d)/mi^2. The 7-day, 2-year low flow of Mitchell Swamp is 0.024 (Mgal/d)/mi^2. This stream could not provide the present needs of the town without an impoundment.

Ground water: The town is underlain at a few tens of feet by the lower sandy aquifer, which is about 500 feet thick. The lower sandy aquifer should be capable of yielding over 1,000 gal/min to wells. The water from this aquifer ranges from soft to slightly hard and may contain excessive iron.

TOWN OF ROWLAND



ROWLAND, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Raw			
Date of collection.....	11-20-75			
Silica (SiO_2).....	14			
Iron (Fe).....	3.5			
Manganese (Mn).....	.070			
Calcium (Ca).....	23			
Magnesium (Mg).....	1.8			
Sodium (Na).....	4.5			
Potassium (K).....	1.6			
Bicarbonate (HCO_3).....	81			
Carbonate (CO_3).....	0			
Alkalinity as $CaCO_3$.....	66			
Sulfate (SO_4).....	7.3			
Chloride (Cl).....	3.9			
Fluoride (F).....	.6			
Nitrate (NO_3).....	----------			
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01			
Dissolved Solids.....	100			
Hardness as $CaCO_3$:				
Total.....	65			
Noncarbonate.....	0			
Specific conductance (micromhos at 25°C)....	165			
Arsenic (As).....	.000			
Barium (Ba).....	.0			
Boron (B).....	.02			
Cadmium (Cd).....	.000			
Chromium (Cr).....	.000			
Cobalt (Co).....	.000			
Copper (Cu).....	.000			
Lead (Pb).....	----------			
Lithium (Li).....	.00			
Mercury (Hg).....	----------			
Strontium (Sr).....	.20			
Zinc (Zn).....	.02			
pH (units).....	7.1			
Temperature (°C).....	----------			

SAINT PAULS, ROBESON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,500 in 1975 (735 metered customers, 25 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 1-3).

Well No. 1, Rb-90, located at lat 34°48'17", long 78°58'21". Driller: Chas. R. Underwood. Date drilled: Sept. 1966. Total depth: 311 ft. Diam: 8 in. Cased to: 87 ft. Type of finish: screened (gravel-packed). Screened intervals: 87-92, 99-109, 115-125, 218-223, and 291-301 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 165 ft. Static water level: 17 ft below land surface. Pump capacity: about 300 gal/min. Type pump: turbine.

Well No. 2, Rb-91, located at lat 34°48'05", long 78°58'26". Driller: Chas. R. Underwood. Date drilled: Jan. 1968. Total depth: 317 ft. Diam: 8 in. Cased to: 97 ft. Type of finish: screen (gravel-packed). Screened intervals: unknown number of screens totaling 40 ft in length set between 97 and 301 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 160 ft. Static water level: 17 ft below land surface. Pump capacity: about 300 gal/min. Type pump: turbine.

Well No. 3, Rb-92, located at lat 34°48'30", long 78°59'05". Driller: Chas. R. Underwood. Date drilled: Oct. 1969. Total depth: 330 ft. Diam: 8 in. Cased to: 94 ft. Type of finish: screened (gravel-packed). Screened intervals: 94-99, 108-118, 124-129, 136-146, and 313-323 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 160 ft. Static water level: 21 ft below land surface. Pump capacity: about 300 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.3 Mgal/d, estimated; maximum daily use occurred in June 1973, 0.4 million gallons, estimated.

INDUSTRIAL USE:

0.07 Mgal/d, estimated. Principal users include Burlington Industries, Inc., The Manning Corp., and Colonial Frozen Foods.

TREATMENT:

Aeration, filtration through coke, addition of phosphate compounds to suspend iron, adjustment of pH with lime, and fluoridation.

SAINT PAULS, ROBESON COUNTY

RATED CAPACITY OF TREATMENT PLANT:

0.5 Mgal/d.

PUMPING CAPACITY:

Raw water, about 1.3 Mgal/d; finished water, 0.86 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One clear well, 75,000 gallons, and one elevated tank, 200,000 gallons.

FUTURE PLANS:

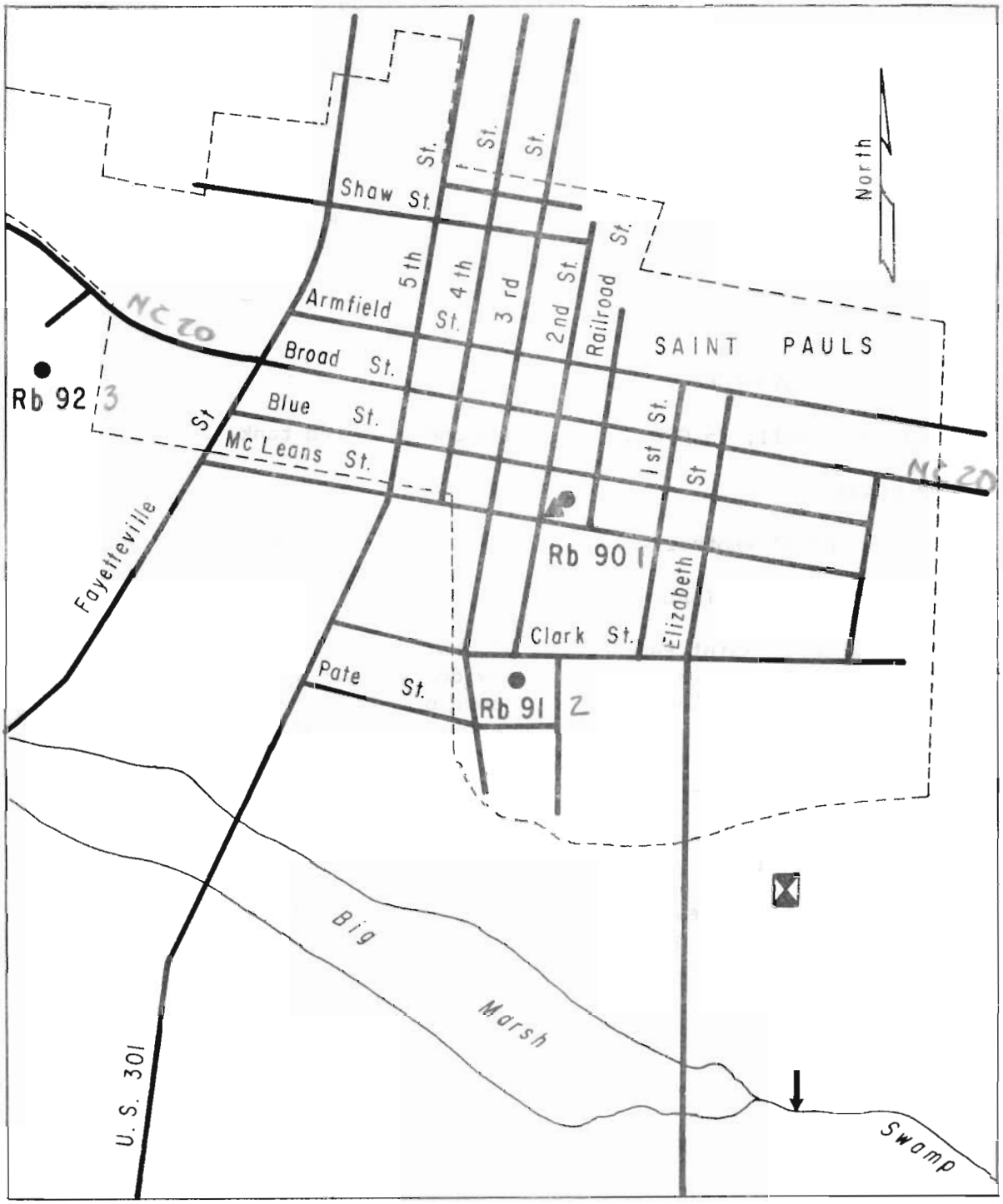
Plan to drill another well and to extend water lines.

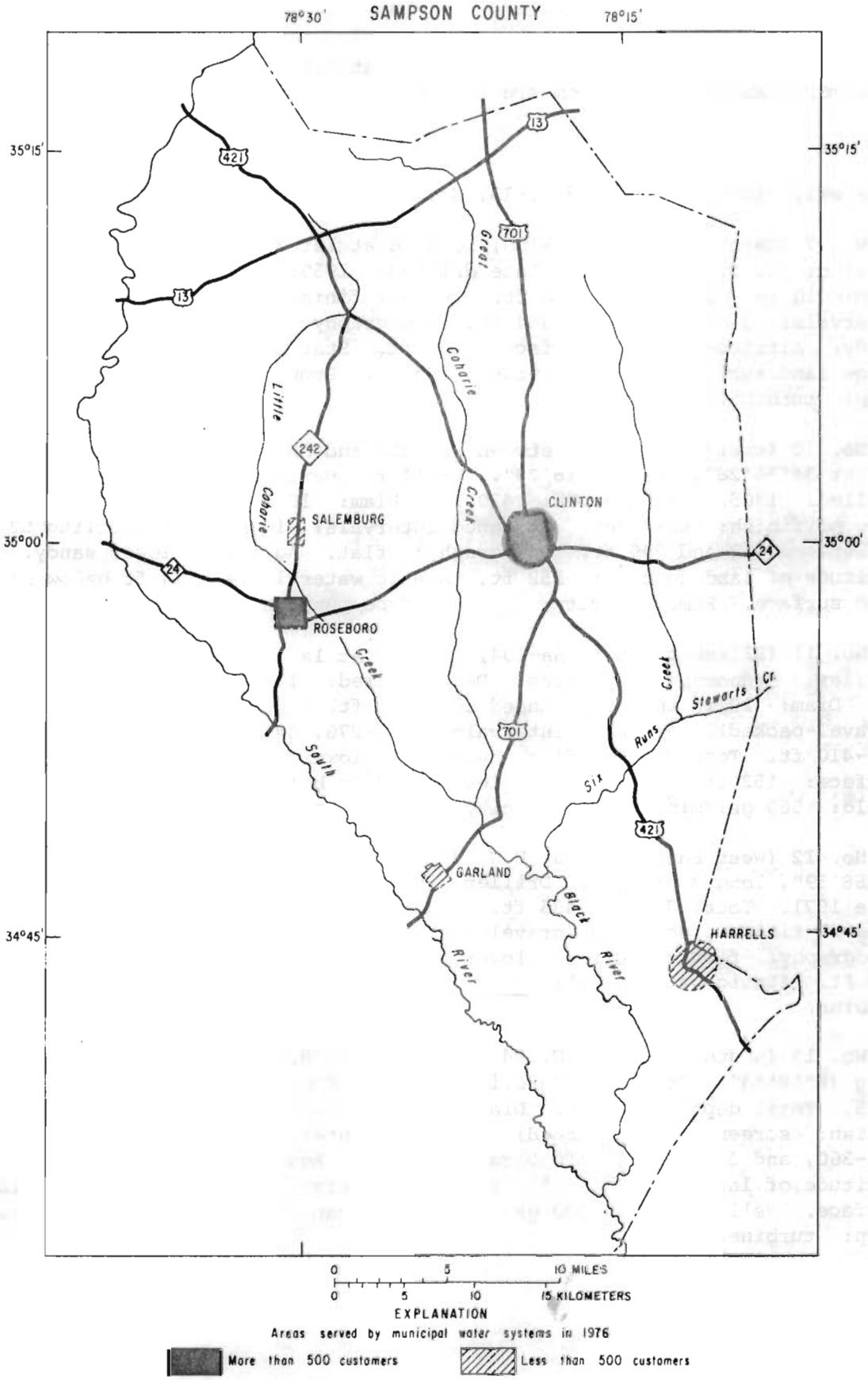
WATER-RESOURCES APPRAISAL:

Surface water: Saint Pauls is on Big Marsh Swamp. The topography is flat. The streams in the area have very wide and swampy flood plains. An impoundment called Odom Pond is west of town on Big Marsh Swamp. The capacity of the impoundment is unknown. The estimated average discharge of streams in the area is 0.8 $(Mgal/d)/mi^2$. The low-flow characteristics of the nearby streams are not known, but one or more impoundments almost certainly would be required to assure an adequate surface-water supply.

Ground water: The town is underlain at a depth of a few tens of feet by the lower sandy aquifer. The lower sandy aquifer is about 350 feet thick here. Wells in this aquifer can yield 1,000 gal/min. The water from this aquifer if soft, has a low dissolved-solids concentration, is highly to excessively acidic, and may contain excessive iron.

TOWN OF SAINT PAULS




SAMPSON COUNTY
78°30'
78°15'
35°15'
35°00'
34°45'
421
13
701
242
24
Great Coharie
Little Coharie
Coharie Creek
CLINTON
SALEMBURG
ROSEBORO
South Creek
Six Runs Creek
Stewarts Cr.
GARLAND
Black River
HARRELLS
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

CLINTON, SAMPSON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 8,600 in 1976 (2,744 metered customers, about 350 of whom are in suburban areas).

SOURCE:

Five wells (Nos. 7, 10, and 11-13; No. 10 is for emergencies only).

Well No. 7 (Carolina Ave.), Sa-100, located at lat 35°00'23", long 78°18'47". Driller: C. C. Hildebrand. Date drilled: 1959. Total depth: 364 ft. Diam: 10 in. Cased to: 310 ft. Type of finish: screened. Screened intervals: 310-325 and 354-364 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 150 ft. Static water level: 71 ft below land surface. Pump setting: 245 ft. Pump capacity: _____. Type pump: turbine.

Well No. 10 (emergency only, between SR 1264 and SR 1226), Sa-103, located at lat 34°58'28", long 78°18'24". Driller: Hartsfield Water Co. Date drilled: 1965. Total depth: 420 ft. Diam: 10 in. Cased to: 252 ft. Type of finish: screened. Screened intervals: 10 screens totaling 52 ft between 252 and 396 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 152 ft. Static water level: 74 ft below land surface. Pump capacity: _____. Type pump: turbine.

Well No. 11 (Elizabeth St.), Sa-104, located at lat 34°59'23", long 78°19'40". Driller: Sydnor Hydrodynamics. Date drilled: 1968. Total depth: 415 ft. Diam: 10 in to 8 in. Cased to: 266 ft. Type of finish: screened (gravel-packed). Screened intervals: 266-276, 340-350, 362-372, and 390-410 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 152 ft. Static water level: 87 ft below land surface. Well yield: 560 gal/min. Pump capacity: _____. Type pump: turbine.

Well No. 12 (West Butler St. at U.S. 701-421), Sa-107, located at lat 34°58'59", long 78°19'15". Driller: Hartsfield Water Co. Date drilled: June 1971. Total depth: 435 ft. Diam: _____. Cased to: 200 ft. Type of finish: screened (gravel-packed). Screened intervals: _____. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 150 ft. Static water level: _____. Pump capacity: _____. Type pump: turbine.

Well No. 13 (South Blvd. - N.C. 24 Bypass), Sa-108, located at lat 34°59'17", long 78°18'53". Driller: Carolina Well and Pump Co. Date drilled: Aug. 1975. Total depth: 400 ft. Diam: 10 in. Cased to: 270 ft. Type of finish: screened (sand-packed). Screened intervals: 270-298, 307-322, 356-360, and 374-380 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 155 ft. Static water level: 111 ft below land surface. Well yield: 1,000 gal/min. Pump capacity: 685 gal/min. Type pump: turbine.

CLINTON, SAMPSON COUNTY

TOTAL USE:

Average (1975), 1.5 Mgal/d, estimated; maximum daily, not available.

INDUSTRIAL USE:

1.0 Mgal/d, estimated. Principal users include Beaunit Corp., Hamilton-Beach Industries, and L.O.F. Thermopane Corp.

TREATMENT:

Chlorination and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Demand feeders on each well. Capacity not determined.

PUMPING CAPACITY:

3.0 Mgal/d, estimated.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Three elevated tanks, 500,000, 250,000, and 200,000 gallons.

FUTURE PLANS:

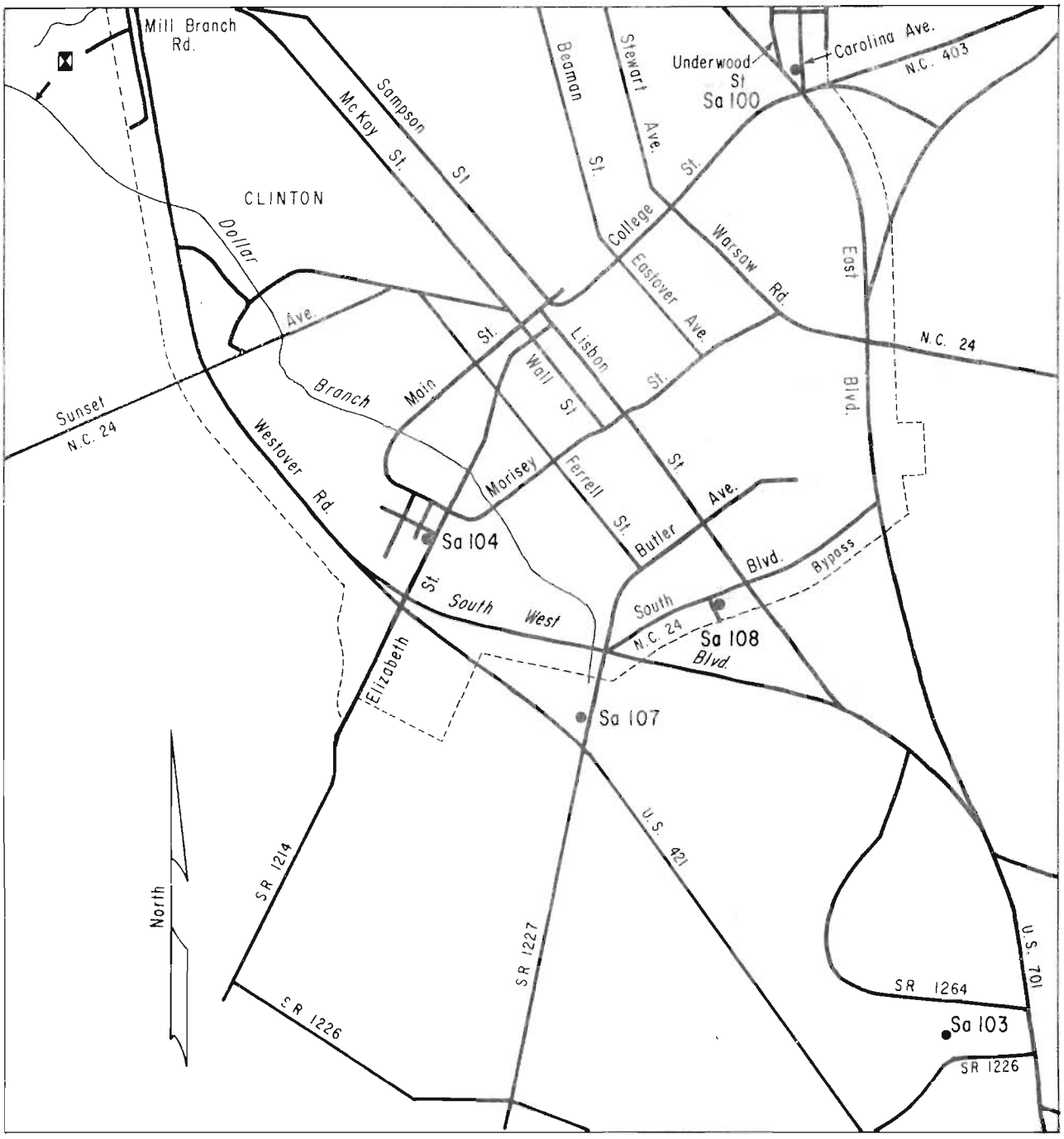
None.

WATER-RESOURCES APPRAISAL:

Surface water: Clinton is about 2 miles east of Great Coharie Creek. This stream might be able to supply Clinton's current needs without storage. However, an impoundment would increase both the reliability and capability of the supply. The average stream discharge in the area is 0.7 (Mgal/d)/mi^2.

Ground water: The upper sandy aquifer is a few tens of feet thick beneath the town. It is underlain by the lower sandy aquifer, which is about 400 feet thick. The lower sandy aquifer is capable of yielding as much as 1,000 gal/min to wells. The water from this aquifer is usually hard and has a moderate to high alkalinity.

TOWN OF CLINTON



CLINTON, SAMPSON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 7 Finished	Well No.10 Raw	Well No.11 Raw	Well No. 7 Raw
Date of collection.....	3-29-66	5-6-69	5-6-69	5-6-76
Silica (SiO_2).....	15	25	12	----------
Iron (Fe).....	.26	1.4	.04	0.06
Manganese (Mn).....	.10	.23	.04	.030
Calcium (Ca).....	14	16	9.8	----------
Magnesium (Mg).....	8.5	5.2	10	----------
Sodium (Na).....	27	13	41	----------
Potassium (K).....	13	6.5	18	----------
Bicarbonate (HCO_3).....	150	110	180	----------
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	19	87	150	----------
Sulfate (SO_4).....	6.4	4.4	6.0	----------
Chloride (Cl).....	10	5.8	15	5.0
Fluoride (F).....	.2	.2	.2	----------
Nitrate (NO_3).....	.2	.4	.7	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	168	129	201	----------
Hardness as $CaCO_3$:				
Total.....	70	63	65	----------
Noncarbonate.....	0	0	0	----------
Specific conductance (micromhos at 25°C)....	285	173	339	218
Arsenic (As).....	----------	----------	----------	.000
Barium (Ba).....	----------	----------	----------	.0
Boron (B).....	----------	----------	----------	.51
Cadmium (Cd).....	----------	----------	----------	.001
Chromium (Cr).....	----------	----------	----------	.000
Cobalt (Co).....	----------	----------	----------	.000
Copper (Cu).....	----------	----------	----------	.003
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	.00
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	.14
Zinc (Zn).....	----------	----------	----------	.01
pH (units).....	7.6	7.5	8.1	7.5
Temperature (°C).....	18	18	19	----------

ROSEBORO, SAMPSON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,400 in 1976 (530 metered customers, 50 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 1-3).

Well No. 1 (standby), Sa-38, located at lat 34°57'05", long 78°30'41". Driller: Layne-Atlantic Co. Date drilled: 1955. Total depth: about 340 ft. Diam: 8 in. Cased to: 226 ft. Type of finish: screened (gravel-packed). Screened intervals: 226-231, 265-270, 300-310, and 328-338 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 132 ft. Static water level: 29 ft below land surface. Pump capacity: 200 gal/min. Type pump: turbine.

Well No. 2, Sa-106, located at lat 34°57'30", long 78°30'18". Driller: Carolina Drilling and Equipment Co. Date drilled: 1960. Total depth: 337 ft. Diam: 8 in. Cased to: 115 ft. Type of finish: screened (gravel-packed). Screened intervals: 115-120, 148-158, 241-246, 266-276, and 288-298 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 110 ft. Static water level: 28 ft below land surface. Pump setting: 120 ft. Pump capacity: 300 gal/min. Type pump: turbine.

Well No. 3, Sa-109, located at lat 34°56'52", long 78°30'20". Driller: Singer-Layne Atlantic Co. Date drilled: 1972. Total depth: about 320 ft. Diam: 10 in. Cased to: _____. Type of finish: screened (gravel-packed). Screened intervals: 40 ft of screens at unknown depths. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 128 ft. Static water level: 4 ft below land surface. Pump capacity: 325 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 0.23 Mgal/d, metered; maximum daily, not available.

INDUSTRIAL USE:

0.02 Mgal/d, estimated. Principal users include Piedmont Manufacturing Co., and Roseboro Spinning Mill.

TREATMENT:

Aeration, gravity filtration through coke, chlorination, and pressure sand filtration.

ROSEBORO, SAMPSON COUNTY

RATED CAPACITY OF TREATMENT PLANT:

0.44 Mgal/d.

PUMPING CAPACITY:

Raw water, 1.2 Mgal/d; finished water, 0.43 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

One elevated tank, 200,000 gallons.

FUTURE PLANS:

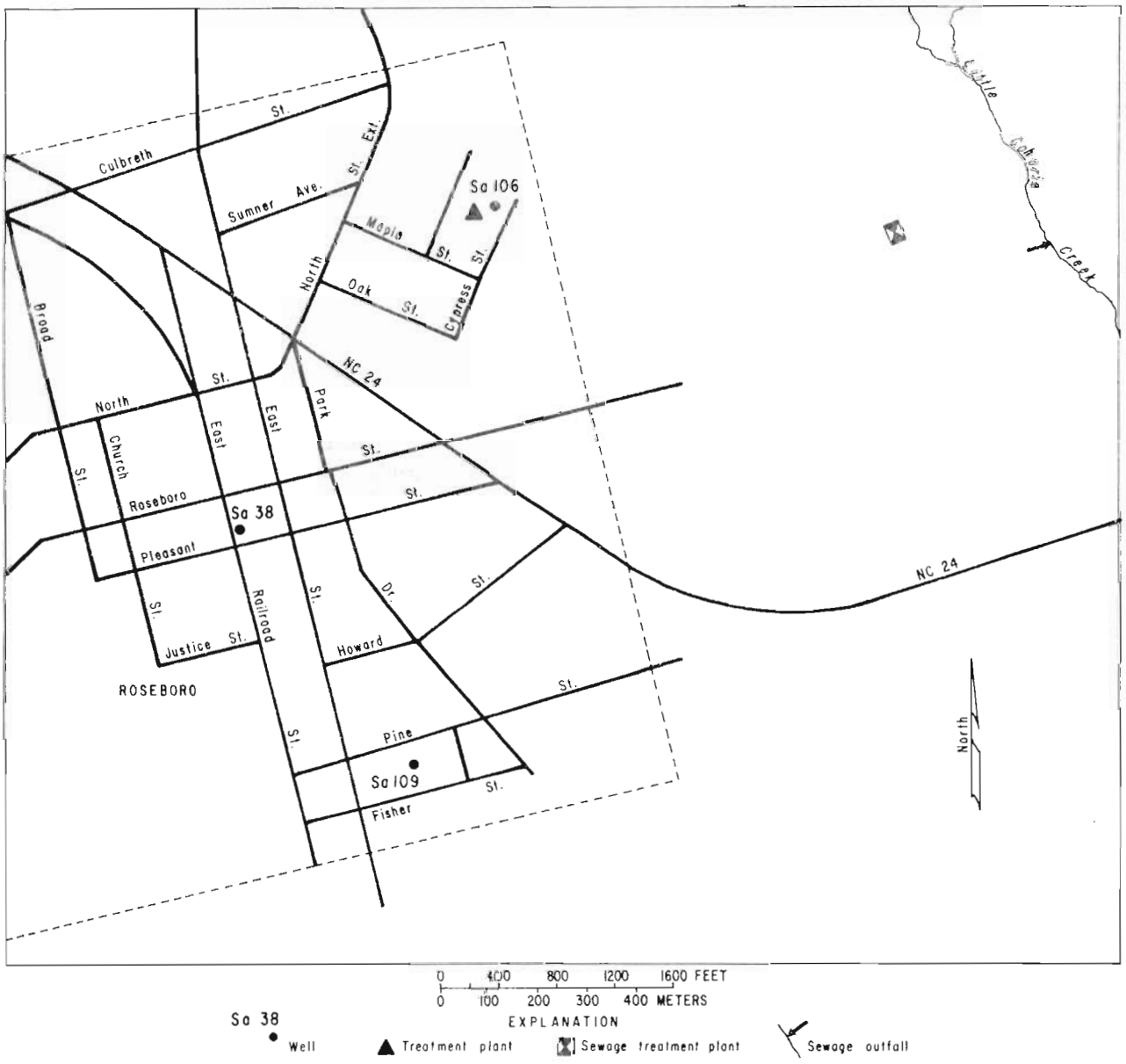
None.

WATER-RESOURCES APPRAISAL:

Surface water: Roseboro is located on Little Coharie Creek. This stream could probably supply the town's present needs, and moderately expanded future needs, without storage. The average stream discharge for this area is 0.7 $(Mgal/d)/mi^2$.

Ground water: The town is underlain by the upper sandy aquifer, which is only a few tens of feet thick. The upper sandy aquifer is underlain by the lower sandy aquifer, which is about 300 feet thick. The lower sandy aquifer is capable of yielding a few hundred gallons per minute to wells. The water from the town wells is soft with moderate alkalinity, moderate to excessive dissolved-solids concentration, and contains excessive iron.

TOWN OF ROSEBORO



ROSEBORO, SAMPSON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

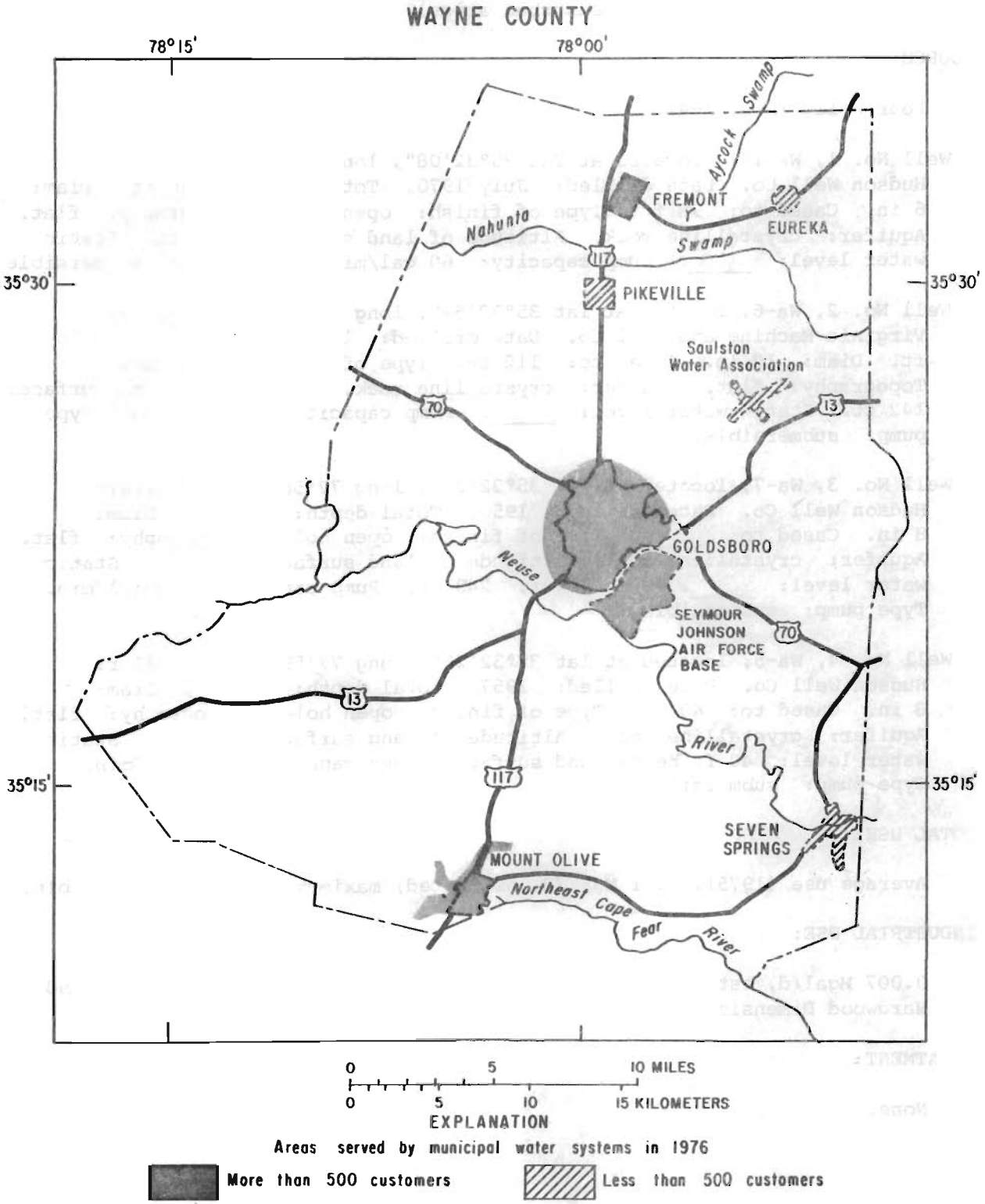
Source, or type of water (raw;finished)...	Well No. 1 Raw	Well No. 2 Raw	Well No. 2 Raw	
Date of collection.....	5-6-69	5-6-69	6-2-76	
Silica (SiO_2).....	28	39	----------	
Iron (Fe).....	.46	.50	0.77	
Manganese (Mn).....	.03	.03	.020	
Calcium (Ca).....	2.3	4.5	----------	
Magnesium (Mg).....	1.6	1.7	----------	
Sodium (Na).....	131	58	----------	
Potassium (K).....	9.5	5.6	----------	
Bicarbonate (HCO_3).....	220	130	----------	
Carbonate (CO_3).....	----------	0	0	
Alkalinity as $CaCO_3$.....	180	100	----------	
Sulfate (SO_4).....	24	12	----------	
Chloride (Cl).....	63	22	4.8	
Fluoride (F).....	.6	.8	----------	
Nitrate (NO_3).....	.3	.3	----------	
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	
Dissolved Solids.....	372	208	----------	
Hardness as $CaCO_3$:				
Total.....	12	8	----------	
Noncarbonate.....	0	0	----------	
Specific conductance (micromhos at 25°C)....	581	303	117	
Arsenic (As).....	----------	----------	.000	
Barium (Ba).....	----------	----------	.2	
Boron (B).....	----------	----------	.10	
Cadmium (Cd).....	----------	----------	.000	
Chromium (Cr).....	----------	----------	.004	
Cobalt (Co).....	----------	----------	.000	
Copper (Cu).....	----------	----------	.003	
Lead (Pb).....	----------	----------	----------	
Lithium (Li).....	----------	----------	.01	
Mercury (Hg).....	----------	----------	----------	
Strontium (Sr).....	----------	----------	.10	
Zinc (Zn).....	----------	----------	.01	
pH (units).....	7.8	7.3	6.5	
Temperature (°C).....	19	18	----------	

WAYNE COUNTY

WATER-RESOURCES APPRAISAL

Almost all of Wayne County is in the west-central part of the North Carolina Coastal Plain; however, a small area in the west-central part of the county lies in the Piedmont Province. The topography is characterized by broad, flat hills between streams having broad flood plains. In the southern part of the county, the flood plains are swampy. The county is drained by the Neuse River and its tributaries except for a small area in the southeastern part of the county which is drained by the Northeast Cape Fear River and its tributaries. The average discharge of streams ranges from less than 0.7 $(Mgal/d)/mi^2$ in the northern part of the county to more than 0.8 $(Mgal/d)/mi^2$ in the southern part. Minimum flows range from 0.0019 to 0.27 $(Mgal/d)/mi^2$ and average 0.06 $(Mgal/d)/mi^2$. Streams having drainage areas as large as 40 square miles occasionally go dry. The 7-day, 2-year low flows range from 0.05 to 0.5 $(Mgal/d)/mi^2$ and average 0.16 $(Mgal/d)/mi^2$. Four public water supplies in the county have 500 or more customers. Three of these, Fremont, Mount Olive, and Seymour Johnson Air Force Base, obtain their supply from ground water, while the fourth, Goldsboro, obtains its supply from surface water. The smaller public and private water supplies are obtained from ground water. Seymour Johnson Air Force Base does not have water customers in the usual sense of the word, but was included in this study because it has a large public water supply. The population of the county in 1970 was 85,408.

The county is underlain by the upper sandy aquifer, which has a thickness ranging from virtually zero to a maximum of, perhaps, 50 feet. The lower sandy aquifer is missing in much of the northwestern quarter of the county. Here, the upper sandy aquifer lies directly on crystalline rock. In the remainder of the county, the upper sandy aquifer is underlain by the lower sandy aquifer, which reaches a maximum thickness of about 350 feet in the southeastern corner of the county. Where thickest, this aquifer can yield up to several hundred gallons per minute to wells. Water from the upper and lower sandy aquifers tends to be soft and acidic and may contain excessive iron. Well yields in the crystalline rocks are low. Water in the crystalline rock is usually hard, has high iron concentration, and, in very deep wells, may be salty. The maximum ground-water yield is estimated at 0.7 $(Mgal/d)/mi^2$.


WAYNE COUNTY
78°15'
78°00'
35°30'
35°15'
Swamp
Aycock
FREMONT
EUREKA
Nahunta
Swamp
117
PIKEVILLE
Saulston
Water Association
70
13
GOLDSBORO
Neuse
SEYMOUR
JOHNSON
AIR FORCE
BASE
River
MOUNT OLIVE
SEVEN
SPRINGS
Northeast Cape
Fear
River
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Areas served by municipal water systems in 1976
More than 500 customers
Less than 500 customers

FREMONT, WAYNE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,600 in 1976 (735 metered customers, 33 of whom are suburban areas).

SOURCE:

Four wells (Nos. 1-4).

Well No. 1, Wa-121, located at lat 35°32'08", long 77°58'37". Driller: Hudson Well Co. Date drilled: July 1970. Total depth: 200 ft. Diam: 6 in. Cased to: 98 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 155 ft. Static water level: _____. Pump capacity: 60 gal/min. Type pump: submersible.

Well No. 2, Wa-6, located at lat 35°32'53", long 77°58'23". Driller: Virginia Machine and Well Co. Date drilled: 1922. Total depth: 596 ft. Diam: 10 in. Cased to: 112 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 142 ft. Static water level: _____. Pump capacity: 65 gal/min. Type pump: submersible.

Well No. 3, Wa-7, located at lat 35°32'35", long 77°58'22". Driller: Hudson Well Co. Date drilled: 1950. Total depth: 252 ft. Diam: 8 in. Cased to: _____. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 143 ft. Static water level: _____. Pump level: 240 ft. Pump capacity: 30 gal/min. Type pump: submersible.

Well No. 4, Wa-5, located at lat 35°32'28", long 77°59'09". Driller: Hudson Well Co. Date drilled: 1957. Total depth: 250 ft. Diam: 8 in. Cased to: 40 ft. Type of finish: open hole. Topography: flat. Aquifer: crystalline rock. Altitude of land surface: 142 ft. Static water level: 40 ft below land surface. Pump capacity: 42 gal/min. Type pump: submersible.

TOTAL USE:

Average use (1975), 0.11 Mgal/d, estimated; maximum daily, not available.

INDUSTRIAL USE:

0.007 Mgal/d, estimated. Principal users include Acme United Corp. and Hardwood Dimensions, Inc.

TREATMENT:

None.

FREMONT, WAYNE COUNTY

PUMPING CAPACITY:

0.26 Mgal/d.

WATER STORAGE:

Two elevated tanks, 100,000 and 75,000 gallons.

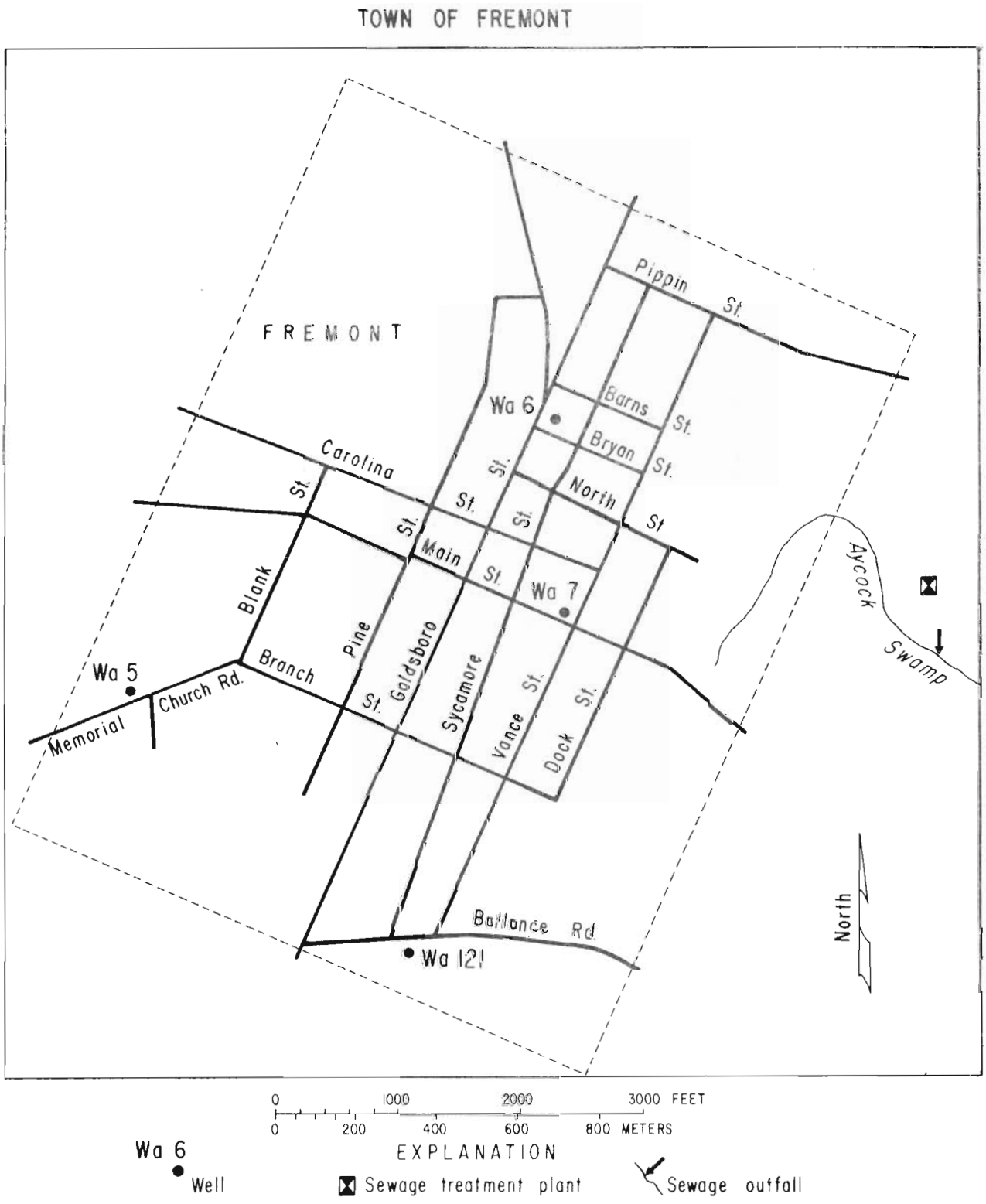
FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Fremont is about 2 miles north of Nahunta Swamp. This stream would probably be adequate for the town's present needs without storage. An impoundment would increase both the reliability and capability of the source. The minimum flow and 7-day, 2-year low flow for this stream are 0.014 and 0.09 (Mgal/d)/mi^2, respectively. The average discharge of streams in the area is 0.7 (Mgal/d)/mi^2.

Ground water: The principal aquifer here is crystalline rock. The upper sandy aquifer is a few tens of feet thick, and the lower sandy aquifer, if present, is very thin. Well yields in the crystalline rock range from about 10 to 70 gal/min. The water from the crystalline rock is hard. The dissolved-solids and chloride concentrations increase with well depth.


TOWN OF FREMONT
FREMONT
Pippin St.
Barns St.
Bryan St.
North St
Wa 6
Carolina St.
St.
St.
St.
St.
Main St.
Wa 7
Aycock Swamp
Blank St.
Pine St.
Goldsboro St.
Sycamore St.
Vance St.
Dock St.
Branch
Wa 5
Church Rd.
Memorial
Ballance Rd
Wa 121
North
0 1000 2000 3000 FEET
0 200 400 600 800 METERS
EXPLANATION
Wa 6
Well
Sewage treatment plant
Sewage outfall

FREMONT, WAYNE COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 2 Raw	Well No. 3 Raw	Well No. 4 Raw	Well No. 3 Raw
Date of collection.....	4-17-69	4-17-69	4-17-69	4-22-76
Silica (SiO_2).....	16	17	21	----------
Iron (Fe).....	.19	.17	.09	0.10
Manganese (Mn).....	.04	.07	.04	.080
Calcium (Ca).....	67	43	52	----------
Magnesium (Mg).....	18	17	8.4	----------
Sodium (Na).....	190	42	13	----------
Potassium (K).....	14	14	4.2	----------
Bicarbonate (HCO_3).....	180	210	230	----------
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	150	180	190	----------
Sulfate (SO_4).....	210	35	12	----------
Chloride (Cl).....	210	58	3.9	58
Fluoride (F).....	.4	.2	.2	----------
Nitrate (NO_3).....	.3	.1	.1	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	----------	----------	----------
Dissolved Solids.....	829	332	230	----------
Hardness as $CaCO_3$:				
Total.....	240	180	164	----------
Noncarbonate.....	90	1	0	----------
Specific conductance (micromhos at 25°C)....	1370	573	387	630
Arsenic (As).....	----------	----------	----------	.000
Barium (Ba).....	----------	----------	----------	.4
Boron (B).....	----------	----------	----------	.00
Cadmium (Cd).....	----------	----------	----------	.002
Chromium (Cr).....	----------	----------	----------	.000
Cobalt (Co).....	----------	----------	----------	.000
Copper (Cu).....	----------	----------	----------	.007
Lead (Pb).....	----------	----------	----------	----------
Lithium (Li).....	----------	----------	----------	.00
Mercury (Hg).....	----------	----------	----------	----------
Strontium (Sr).....	----------	----------	----------	.38
Zinc (Zn).....	----------	----------	----------	.30
pH (units).....	7.4	7.3	7.5	7.5
Temperature (°C).....	18	18	17	----------

GOLDSBORO, WAYNE COUNTY

OWNERSHIP:

Municipal. Total pupulation supplied, about 31,000 in 1975 (8,950 metered customers, 648 of whom are in suburban areas).

SOURCES:

Neuse River: The intakes are on the north bank approximately 2.2 miles southwest of the water-treatment plant at lat 35°22'31", long 78"01'57". The drainage area at the intake is 2,050 square miles, approximately.

Little River (emergency supply) impounded by a low dam (pumping pool only): The intake is at the water-treatment plant at lat 35°24'13", long 78°00'39". The drainage area is 310 square miles, approximately.

RAW-WATER STORAGE:

Pre-settling reservoir at Neuse River, 35 million gallons.

ALLOWABLE DRAFT: (UNADJUSTED)

Estimated allowable draft of Neuse River is 56 Mgal/d with negligible storage. Estimated allowable draft of Little River is 3.2 Mgal/d with negligible storage.

TOTAL USE:

Average (1975), 4.0 Mgal/d, estimated; maximum daily (summer 1972), 5.0 million gallons, estimated.

INDUSTRIAL USE:

0.55 Mgal/d, estimated. Principal users include Texfi Impression, Celutex Corp., Hevi-Duty Electric, and Textilease Corp.

TREATMENT:

Prechlorination, coagulation with alum and caustic soda, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

10 Mgal/d.

GOLDSBORO, WAYNE COUNTY

PUMPING CAPACITY:

Raw water, 10 Mgal/d; finished water, 13 Mgal/d.

FINISHED-WATER STORAGE:

Three clear wells, 250,000, 500,000, and 2,750,000 gallons; three elevated tanks, 1,000,000 gallons each.

FUTURE PLANS:

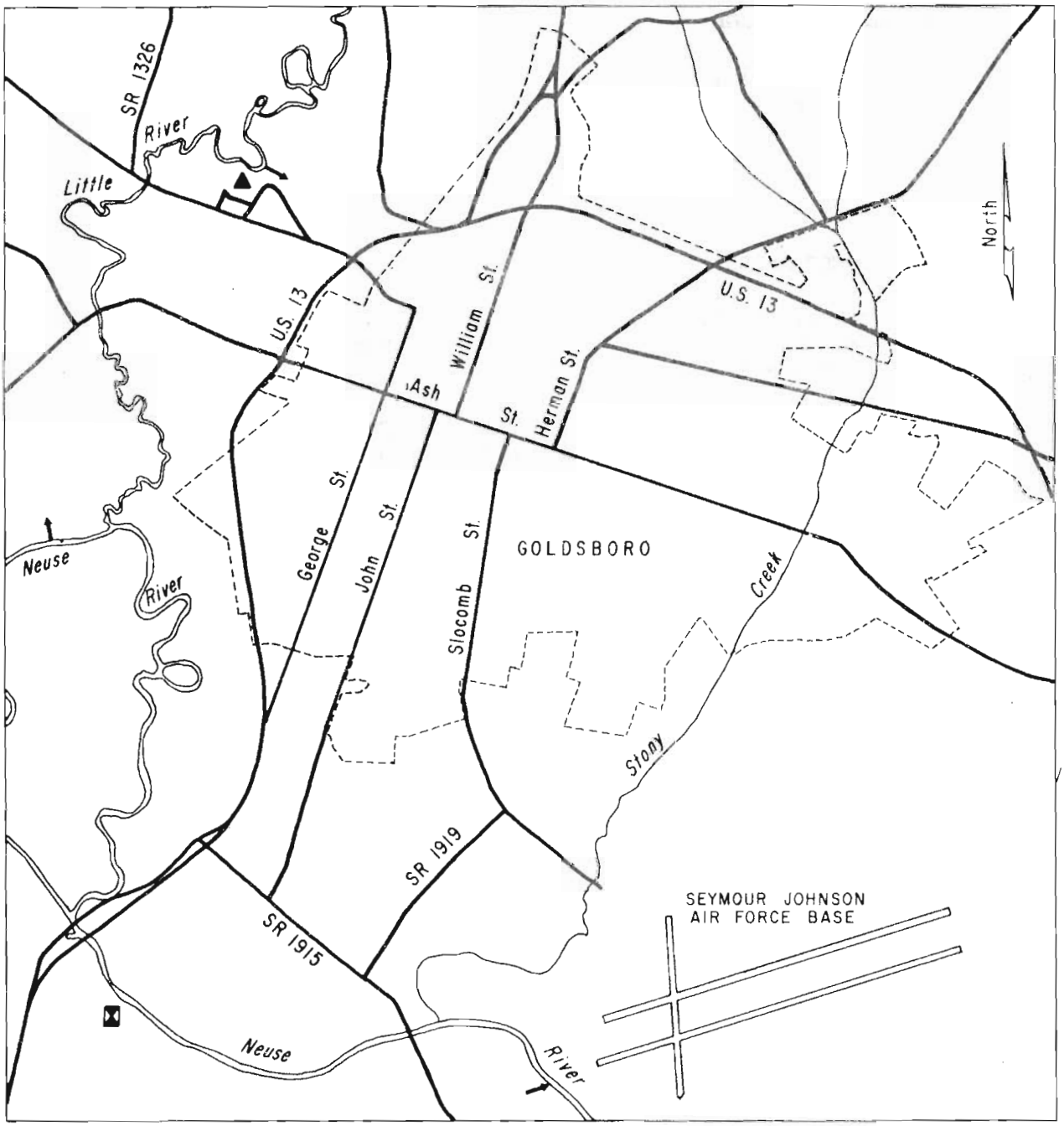
None

WATER-RESOURCES APPRAISAL:

Surface water: Goldsboro is located on the Neuse River. The allowable draft from the river is 14 times present average use and is more than adequate for any foreseeable need.

Ground water: The city is underlain at a depth of less than 20 feet by the lower sandy aquifer. The lower sandy aquifer is about 100 feet thick here. This aquifer alone can yield 100 gal/min to wells. Where a weathered zone is present in the underlying crystalline rock, a well penetrating both aquifers might yield up to several hundred gallons per minute as is the case at nearby Seymour Johnson Air Force Base. The water from the lower sandy aquifer ranges from soft to hard. The water from the weathered crystalline rock would be similar except that it might contain excessive iron.

CITY OF GOLDSBORO



GOLDSBORO, WAYNE COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Little River Raw	Neuse River Raw	Neuse River Finished
Date of collection.....	2-28-69	3-19-76	3-19-76
Silica (SiO_2).....	9.3	9.5	9.8
Iron (Fe).....	.52	.31	----------
Manganese (Mn).....	.01	.000	----------
Calcium (Ca).....	2.6	4.8	5.7
Magnesium (Mg).....	1.3	1.7	1.7
Sodium (Na).....	6.5	7.8	20
Potassium (K).....	.8	2.0	2.1
Bicarbonate (HCO_3).....	11	23	23
Carbonate (CO_3).....	0	0	0
Alkalinity as $CaCO_3$.....	9	19	19
Sulfate (SO_4).....	8.6	7.0	26
Chloride (Cl).....	6.8	9.1	14
Fluoride (F).....	.1	.2	1.1
Nitrate (NO_3).....	.9	----------	----------
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	----------	.65	.69
Dissolved Solids.....	55	57	95
Hardness as $CaCO_3$:			
Total.....	12	19	21
Noncarbonate.....	3	0	2
Specific conductance (micromhos at 25°C)....	58	87	156
Arsenic (As).....	----------	.001	----------
Barium (Ba).....	----------	.0	----------
Boron (B).....	----------	.03	----------
Cadmium (Cd).....	----------	.001	----------
Chromium (Cr).....	----------	.000	----------
Cobalt (Co).....	----------	.000	----------
Copper (Cu).....	----------	.052	----------
Lead (Pb).....	----------	.003	----------
Lithium (Li).....	----------	.00	----------
Mercury (Hg).....	----------	.000	----------
Strontium (Sr).....	----------	.09	----------
Zinc (Zn).....	----------	.01	----------
pH (units).....	5.9	6.8	6.9
Temperature (°C).....	10	----------	----------

MOUNT OLIVE, WAYNE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 6,500 in 1976 (1,975 metered customers, 405 of whom are in suburban areas).

SOURCE:

Three wells (Nos. 2, 3 and a new well).

Well No. 2, Wa-151, located at lat 35°12'11", long 78°03'46". Driller: Hartsfield Water Co. Date drilled: 1968. Total depth: 277 ft. Diam: 10 in. Cased to: 160 ft. Type of finish: screened (gravel-packed). Screened intervals: eight screens totaling 56 ft in length between 196 and 274 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 165 ft. Static water level: 38 ft below land surface. Pump setting: 100 ft. Pump capacity: 500 gal/min. Type pump: turbine.

Well No. 3, Wa-152, located at lat 35°13'02", long 78°03'14". Driller: Hartsfield Water Co. Date drilled: Aug. 1968. Total depth: 295 ft. Diam: 10 in. Cased to: 158 ft. Type of finish: screened (gravel-packed). Screened intervals: 158-166, 176-184, 200-224, 232-240, 256-276, and 282-290 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: 155 ft. Static water level: 32 ft below land surface. Pump setting: 100 ft. Pump capacity: 800 gal/min. Type pump: turbine.

New (Gordon and Pollock St.) well, Wa-153, located at lat 35°11'23", long 78°03'49". Driller: Sydnor Hydrodynamics, Inc. Date drilled: June 1976. Total depth: 378 ft. Diam: 16 in. Cased to: 145 ft. Type of finish: screen (gravel-packed). Screened intervals: 145-160, 172-190, 202-210, 226-252, and 265-273 ft. Topography: flat. Aquifer: lower sandy. Altitude of land surface: _____. Static water level: 41 ft below land surface. Well yield: 800 gal/min. Pump capacity: 800 gal/min. Type pump: turbine.

TOTAL USE:

Average (1975), 1.0 Mgal/d, estimated; maximum daily not available.

INDUSTRIAL USE:

0.16 Mgal/d, estimated. Principal users include Boling Chair Co., Mt. Olive Pickle Co., Burlington Industries, and Young Squires, Inc.

MOUNT OLIVE, WAYNE COUNTY

TREATMENT:

Well No. 2: aeration, pressure sand filtration, adjustment of pH with soda ash, chlorination, and fluoridation.

Well No. 3: pressure greensand filtration, iron removal by ion-exchange, adjustment of pH with caustic soda, chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Not rated.

PUMPING CAPACITY:

Raw water, 1.9 Mgal/d; finished water, 1.9 Mgal/d.

RAW-WATER STORAGE:

Ground tank, 130,000 gallons at Well No. 2.

FINISHED-WATER STORAGE:

Two elevated tanks, 200,000 and 300,000 gallons.

FUTURE PLANS:

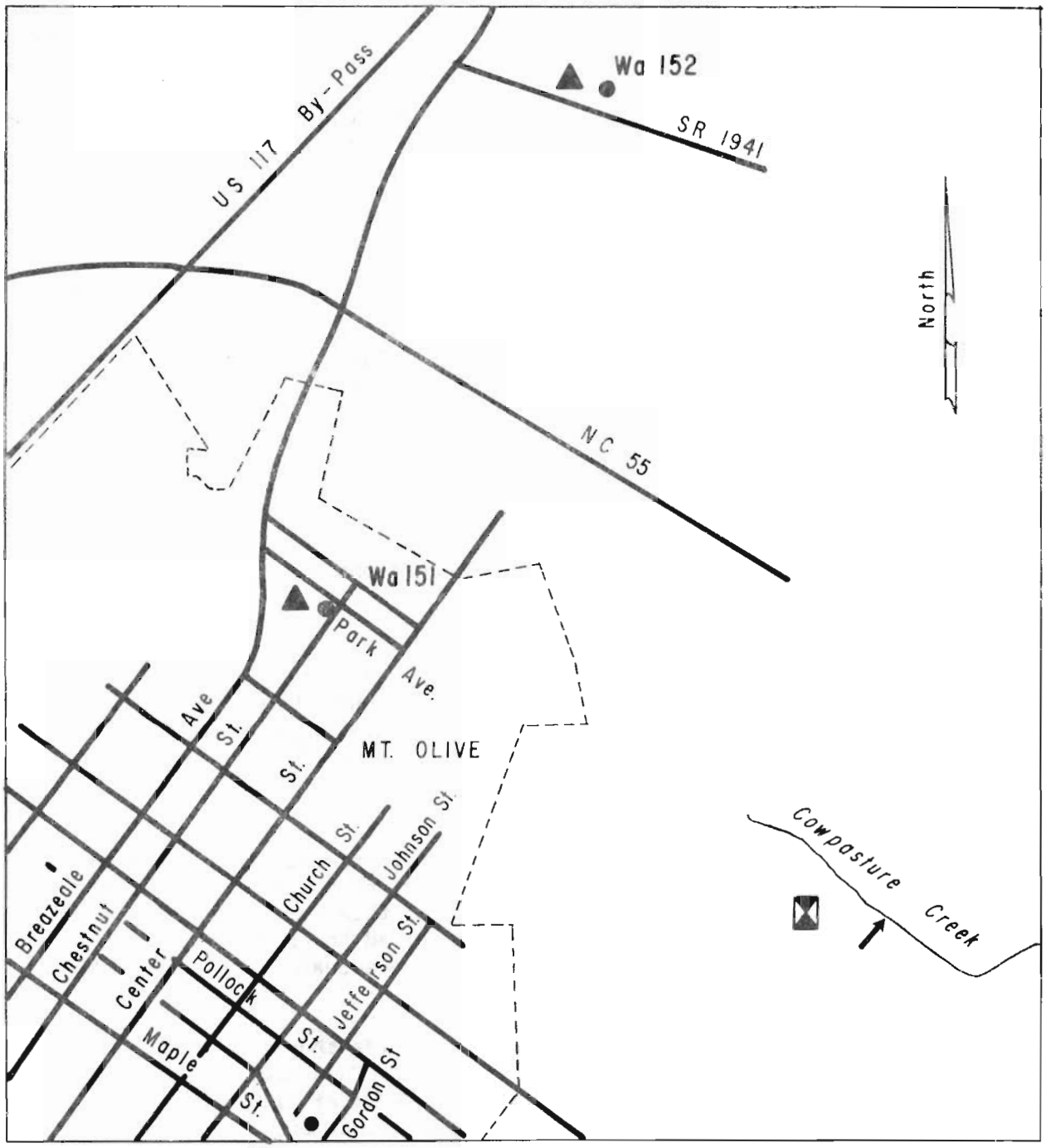
A 500,000-gallon elevated tank will be erected. New treatment plant is under construction, which will have 4 greensand filters and a capacity of 1.15 Mgal/d. Both tank and treatment plant are being constructed near new (Gordon and Pollock St.) well.

WATER-RESOURCES APPRAISAL:

Surface water: The only stream of any size in the vicinity of Mount Olive is Goshen Swamp, which is in Duplin County and about 5 miles south of the town. The low-flow characteristics of this stream are not known, but an impoundment probably would be required to provide an adequate water supply from this source. The average stream discharge in the area is about 0.8 $(Mgal/d)/mi^2$.

Ground water: The lower sandy aquifer underlies the town at a depth of only a few feet and is over 300 feet thick. This aquifer is capable of yielding up to 1,000 gal/min to wells. The water from the aquifer is soft, with a low dissolved-solids concentration, and may have an excessive iron concentration.

TOWN OF MOUNT OLIVE



MOUNT OLIVE, WAYNE COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 2 Raw	Well No. 3 Raw	Well No. 2 Raw	Well No. 2 Finished
Date of collection.....	5-1-69	5-1-69	4-21-76	4-21-76
Silica (SiO_2).....	33	32	---	33
Iron (Fe).....	2.1	2.3	2.2	.67
Manganese (Mn).....	.05	.07	.030	.040
Calcium (Ca).....	5.9	10	---	7.1
Magnesium (Mg).....	.8	.7	---	0.6
Sodium (Na).....	5.1	4.6	---	7.1
Potassium (K).....	2.1	2.3	---	2.4
Bicarbonate (HCO_3).....	30	39	---	30
Carbonate (CO_3).....	0	0	0	0
Alkalinity as $CaCO_3$.....	25	32	---	25
Sulfate (SO_4).....	3.6	6.4	---	3.7
Chloride (Cl).....	4.0	3.8	4.9	5.7
Fluoride (F).....	.1	.2	---	.8
Nitrate (NO_3).....	.3	.3	---	---
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	---	---	---	.00
Dissolved Solids.....	72	82	---	76
Hardness as $CaCO_3$:				
Total.....	18	28		20
Noncarbonate.....	0	0	---	0
Specific conductance (micromhos at 25°C)....	65	84	70	82
Arsenic (As).....	---	---	.000	---
Barium (Ba).....	---	---	.0	---
Boron (B).....	---	---	.20	---
Cadmium (Cd).....	---	---	.002	---
Chromium (Cr).....	---	---	.000	---
Cobalt (Co).....	---	---	.000	---
Copper (Cu).....	---	---	.006	---
Lead (Pb).....	---	---	---	---
Lithium (Li).....	---	---	.00	---
Mercury (Hg).....	---	---	---	---
Strontium (Sr).....	---	---	.04	---
Zinc (Zn).....	---	---	.01	---
pH (units).....	6.5	6.9	6.0	6.7
Temperature (°C).....	18	18	---	---

SEYMOUR JOHNSON AIR FORCE BASE, WAYNE COUNTY

OWNERSHIP:

U.S. Government. Population served, about 8,800 in 1976. There are no metered customers.

SOURCE:

Fourteen wells, three of which are for emergency use only. See well-data table.

TOTAL USE:

Average (Mar. 1975 - Feb. 1976), 1.279 Mgal/d, metered; maximum daily (6-26-75), 2.102 million gallons, metered.

Average daily water use (Mgal/d), Mar. 1975 - Feb. 1976

Mar. 1975--1.067	July 1975--1.456	Nov. 1975--1.128
Apr. 1975--1.169	Aug. 1975--1.627	Dec. 1975--1.060
May 1975--1.454	Sept. 1975--1.357	Jan. 1976--1.125
June 1975--1.618	Oct. 1975--1.194	Feb. 1976--1.095

INDUSTRIAL USE:

There are industrial-type operations on the base, but water use is not metered.

TREATMENT:

Aeration, coagulation with lime, sedimentation, pressure sand and gravel filtration, adjustment of pH with lime, chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

2.0 Mgal/d.

PUMPING CAPACITY:

Raw water, 2.3 Mgal/d; finished water, 12.5 Mgal/d.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two clear wells, 500,000 gallons each; one elevated tank, 500,000 gallons; and one ground tank, 500,000 gallons.

FUTURE PLANS:

None.

Well data for Seymour Johnson Air Force Base, Wayne County

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Cased to (ft)	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump setting (ft)	Pump capacity (gal/min)
4-64	Wa-122	35°19'25"	77°58'16"	Sydnor Hydro-dynamics	1960	195	47	47-52 59-64 175-195	61	25	96	190
5-73	Wa-123	35°19'59"	77°59'00"	Sydnor Hydro-dynamics	5/73	114	48	48-68 74-84	50	16.3	92	170
7-73	Wa-124	35°19'47"	77°58'14"	Sydnor Hydro-dynamics	4/73	122	62	62-92	64	3	107	60
8-73	Wa-125	35°19'37"	77°58'14"	Sydnor Hydro-dynamics	4/73	124	58	58-78 84-94	62	6	102	195
9-73	Wa-126	35°19'28"	77°58'12"	Sydnor Hydro-dynamics	1973	115	48	48-58 62-72 75-85	63	12.9	42	190
10-60	Wa-127	35°19'54"	77°58'51"	Sydnor Hydro-dynamics	12/ 1/59	140	110	110-140	54	25	-	200
11-60	Wa-128	35°20'09"	77°59'08"	Sydnor Hydro-dynamics	1959	140	70	70-100	61	23.3	-	160
13-73	Wa-129	35°20'19"	77°59'31	Sydnor Hydro-dynamics	1973	120	70	70-90	62	19.5	115	145
14-69	Wa-130	35°19'22"	77°58'11"	Carolina Well & Pump	11/69	186	48	48-63 73-93 177.5-182.5	61	18.7	92	155
15-71	Wa-131	35°19'20"	77°58'14"	Sydnor Hydro-dynamics	11/23/71	112	45	45-55 65-75	55	10.8	102	180
16-73	Wa-132	35°19'47"	77°58'46"	Sydnor Hydro-dynamics	5/73	118	56	56-67 72-88	51	12.7	102	130
1-63	Wa-133	35°19'46"	77°58'24"						61			
2-60	Wa-134	35°19'40"	77°58'30"						61			

Well data for Seymour Johnson Air Force Base, Wayne County--Continued

Well No.	USGS No.	Latitude	Longitude	Driller	Date drilled	Total depth (ft)	Cased to (ft)	Screened intervals (ft)	Altitude of land surface (ft)	Static water level below land surface(ft)	Pump setting (ft)	Pump capacity (gal/min)
3-64	Wa-135	35°19'37"	77°58'35"						50			

Note: All wells are in flat areas, are equipped with turbine pumps, are of 8-inch diameter, and are screened and gravel-packed. Screened intervals above about 120-foot depth derive water from the lower sandy aquifer, below that from weathered crystalline rock. Wells 1-63, 2-60, and 3-64 are for emergency use only.

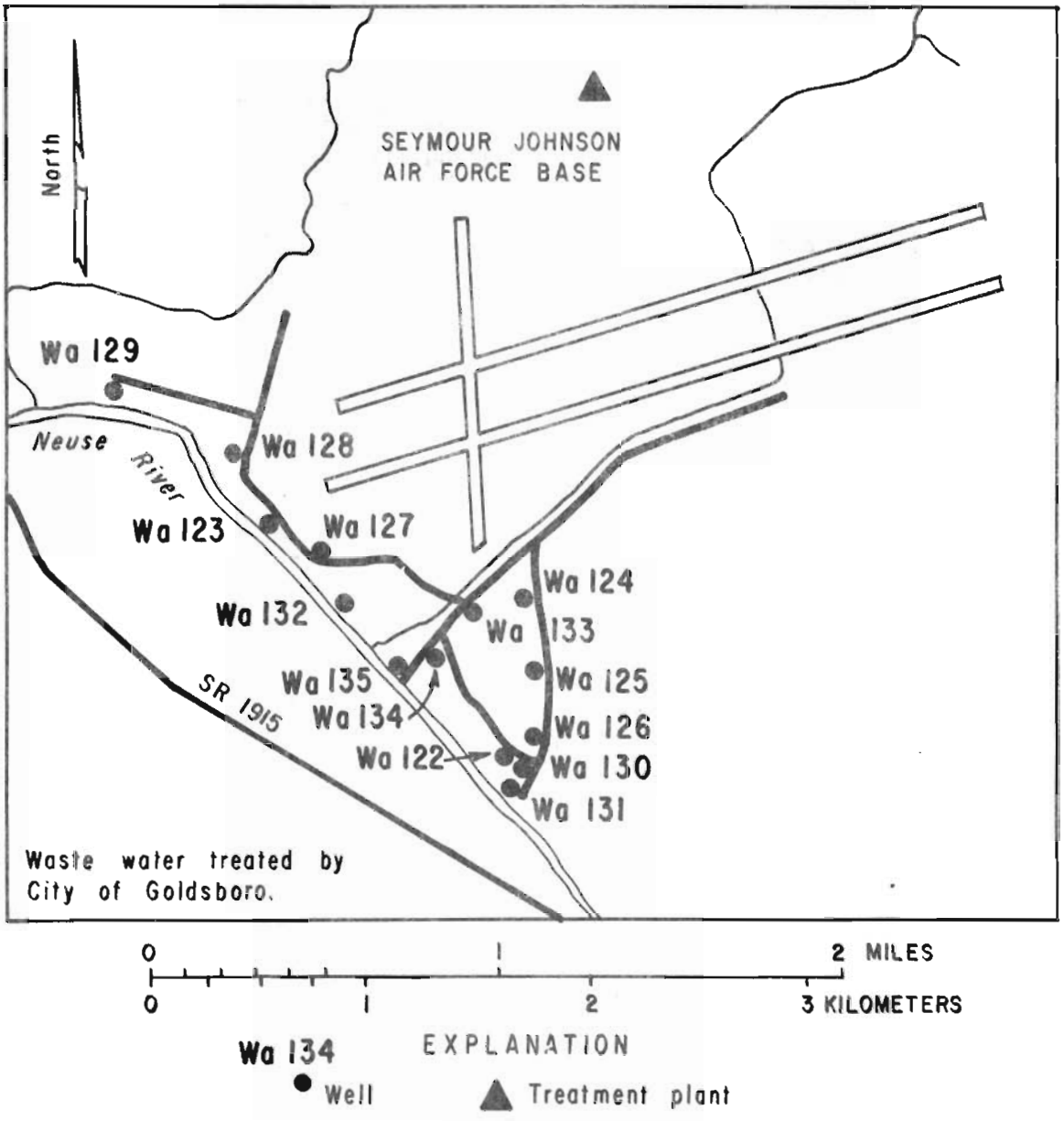
SEYMOUR JOHNSON AIR FORCE BASE, WAYNE COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Seymour Johnson Air Force Base is located on the Neuse River, the flow of which could easily meet any anticipated water-supply need of the base.

Ground water: The upper sandy aquifer is less than 20 feet thick at the air base. It is underlain by the lower sandy aquifer, which is about 100 feet thick. The lower sandy aquifer overlies the crystalline rock, which is deeply weathered here. Wells penetrating both the lower sandy aquifer and the weathered crystalline rock can yield up to several hundred gallons per minute. The ground water is soft, but contains excessive iron.

SEYMOUR JOHNSON AIR FORCE BASE



SEYMOUR JOHNSON AIR FORCE BASE, WAYNE COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Combined[1/] Raw	Combined[1/] Finished		
Date of collection.....	4-21-76	4-21-76		
Silica (SiO_2).....	21	21		
Iron (Fe).....	1.7	.01		
Manganese (Mn).....	.070	.000		
Calcium (Ca).....	14	19		
Magnesium (Mg).....	3.0	2.8		
Sodium (Na).....	11	13		
Potassium (K).....	3.4	3.3		
Bicarbonate (HCO_3).....	41	50		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	34	41		
Sulfate (SO_4).....	23	23		
Chloride (Cl).....	10	13		
Fluoride (F).....	.1	1.3		
Nitrate (NO_3).....	----------	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.01	.01		
Dissolved Solids.....	109	121		
Hardness as $CaCO_3$:				
Total.....	48	59		
Noncarbonate.....	14	18		
Specific conductance (micromhos at 25°C)....	165	200		
Arsenic (As).....	.000	----------		
Barium (Ba).....	.2	----------		
Boron (B).....	.04	----------		
Cadmium (Cd).....	.003	----------		
Chromium (Cr).....	.000	----------		
Cobalt (Co).....	.000	----------		
Copper (Cu).....	.007	----------		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.01	----------		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.12	----------		
Zinc (Zn).....	.79	----------		
pH (units).....	6.5	7.1		
Temperature (°C).....	----------	----------		

[1/] Combined sample from wells no. 5, 7, 8, 9, 10, 11, 13, 14, 15 and 16.

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Johnston County Manager
County Courthouse
Smithfield, N. C. 27577

Mr. Daniel W. Eller
New Hanover County Manager
320 Chestnut Street
Wilmington, N. C. 28401

Mr. Paul Graham
Robeson County Manager
P. O. Box 699
Lumberton, N. C. 28358

5. Federal Agencies

Engineering and Watershed Unit
Soil Conservation Service
P. O. Box 11222
Fort Worth,
Texas 76110

U. S. Department of Health, Education, & Welfare, PHC
SSB, NE Technical Service Unit
C. B. Center Building S-26
Davisville, Rhode Island 02854

Chairman
Ohio River Basin Commission
1427 Fourth & Walnut Building
Cincinnati, Ohio 45202

District Engineer
U. S. Army Engineer District
Charleston
P. O. Box 919
Charleston,
South Carolina 29402

E.P.A. Office of Water Programs
Ohio Basin Region
4676 Columbia Parkway
Room 100
Cincinnati,
Ohio 45226

U. S. Department of Interior
Fish and Wildlife Service
Bureau of Sports Fish. & Wildlife
Peachtree-Seventh Building
Atlanta, Georgia 30323

Librarian
Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D. C. 20006

Division Engineer
U. S. Army Engineer Division
South Atlantic
510 Title Building
30 Pryor Street, S.W.
Atlanta, Georgia 30301

Field Supervisor
Bureau of Sports Fish. & Wildlife
Department of the Interior
Division of River Basin Studies
310 New Bern Avenue - Room 468
Raleigh, N. C. 27611

Director
Division of Water Control Planning
408 Evans Building
Tennessee Valley Authority
Knoxville, Tennessee 37902

U. S. Department of Agriculture
Soil and Water Cons. Res. Div.
P. O. Box 469
Athens, Georgia 30601

District Engineer
U. S. Army Engineer District
Wilmington
P. O. Box 1890
Wilmington,
North Carolina 28402

U. S. Geological Survey Library
Building 25
Denver Federal Center
Denver, Colorado 80225

Library
Env. Control Administration
Cincinnati Laboratories
5555 Ridge Avenue
Cincinnati, Ohio 45213

Meterologist-In-Charge
National Weather Service
Forecast Office
Raleigh-Durham Airport
P. O. Box 165
Morrisville, N. C. 27560

State Conservationist
U. S. Soil Conservation Service
P. O. Box 27307
Raleigh, N. C. 27611

State Climatologist
National Weather Service, NOAA
U. S. Department of Commerce
P. O. Box 5030
Raleigh, N. C. 27607

District Engineer
U. S. Army Engineer District
Norfolk
803 Front Street
Norfolk, Virginia 23510

Mr. Raymond L. Howe
Area Sanitary Engineer
Dept. of Housing & Urban Dev.
415 N. Edgeworth St.
Greensboro, N. C. 27401

U. S. Forest Service
1720 Peachtree Road, N.W.
Room 716
Atlanta, Georgia 30304

Executive Director
Water Resources Council
2120 L Street, N.W.
Washington,
D. C. 20005

Regional Engineer
Federal Power
Commission
730 Peachtree Building
Atlanta,
Georgia 30308

Chief, Div. of Power Operations
Southeastern Power Admin.
U. S. Department of Interior
Elberton, Georgia 30635

State Director
Farmers Home Administration
310 New Bern Avenue
Raleigh,
North Carolina 27611

River Basin Planning
Soil Conservation Service
P. O. Box 10026
Richmond,
Virginia 23240

District Chief, WRD
U. S. Geological Survey
P. O. Box 2857
Raleigh, N. C. 27602

Director
U. S. Department of Agriculture
Agricultural Research Service
Water Quality Management Lab.
Durrant, Oklahoma 74701

Mr. Lee Tebo
Pollution Surveillance Branch
Environmental Protection Agency
Southeast Water Laboratory
Athens,
Georgia 30601

Mr. F. E. Kimball, Jr.
Water Resources Engineer-E.P.A.
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Environmental Protection Agency
Region IV
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309
Attention: Librarian

Economic Research Service
River Basin Studies
P. O. Box 27307
Raleigh,
North Carolina 27611

6. Other States - State Agencies

Executive Director
S. C. Water Resources Commission
3830 Forest Drive
P. O. Box 4515
Columbia, S. C. 29240

Documents Department
Clemson University Library
Clemson, S. C. 29631

Walter Library
University Libraries
Minneapolis,
Minnesota 55455

Director
Water Resources Center
Georgia Institute of Technology
Atlanta, Georgia 30332

The Center for Research Libraries
Documents Department
5721 Cottage Grove Avenue
Chicago, Illinois 60637

Geological Survey of Alabama
P. O. Drawer O
University of Alabama
Tuscaloosa,
Alabama 35486

University of Delaware
The University Library
Newark, Delaware 19711

Water Resources Coordinator
Tennessee State Planning Office
301 Seventh Avenue, North
Nashville, Tennessee 37219

Acquisitions Department
Price Gilbert Memorial Library
Georgia Institute of Technology
Atlanta, Georgia 30332

Technical Report Center
University Library
Texas A & M University
College Station, Texas 77843

Commissioner
Georgia Department of Natural
Resources
270 Washington Street
Atlanta, Georgia 30334

Documents Division
University of Illinois Library
Urbana, Illinois 61801

Director
Virginia State Water Control Board
P. O. Box 11143
Richmond, Virginia 23230

State Documents
University of Georgia
Libraries
Athens, Georgia 30602

7. Private Organizations, Business and Industry

Mrs. Harry Caldwell, Master
N. C. State Grange
Box H-1
Greensboro, N. C. 27402

Virginia Electric & Power Co.
Ninth and Franklin Streets
Richmond, Virginia 23219
Attention: Mr. C. M. Stallings & Librarian

Wiley and Wilson
Consulting Engineers
P. O. Box 877
Lynchburg, Virginia 24505

Librarian
Metcalf and Eddy
Statler Office Building
Boston, Massachusetts 02116

J. N. Pease Associates
Architects-Engineers
P. O. Box 12755
Charlotte,
North Carolina 28205

L. E. Wooten and Company
120 North Boylan Avenue
Raleigh, N. C. 27603
Attention: Willis D. Barlow

Charles T. Main, Inc.
Library
Prudential Center
Boston, Massachusetts 02199

Rivers and Associates, Inc.
Consulting Engineers
P. O. Box 929
107 E. Second Street
Greenville, N. C. 27834

Mr. Doug Tilley
William F. Freeman Assoc.
P. O. Box 2103
High Point, N. C. 27261

Ms. Gloria Martin
Odell Associates
201 N. Elm Street
Greensboro, N. C. 27401

Mr. W. E. Godwin
LaFayette Village - Sherwood Water System
5130 Raeford Rd.
Fayetteville, N. C. 28304

N. C. Association of County Commissioners
P. O. Box 1488
Raleigh, N. C. 27602

Executive Director
N. C. League of Municipalities
P. O. Box 3069
Raleigh,
North Carolina 27602

Duke Power Company
422 Church Street
P. O. Box 2178
Charlotte, N. C. 28201

Moore, Gardner & Associates, Inc.
Consulting Engineers
P. O. Box 10294
Greensboro, N. C. 27404

W. M. Piatt and Company
Consulting Engineers
P. O. Drawer 971
Durham, N. C. 27702
Attention: Mr. P. D. Davis

Hazen and Sawyer Engineers
P. O. Box 30428
Raleigh,
North Carolina 27612

Henry Von Oesen & Associates
P. O. Drawer 2087
Wilmington,
North Carolina 28401

McDavid Associates, Inc.
Engineers-Planners-Land Surveyors
P. O. Drawer 49
120 N. Main Street
Farmville, N. C. 27828

Mr. Rick Underhill
Malcolm Pirnie Engineers, Inc.
12284 Warwick Blvd.
Newport News, Va. 23606

Mr. Max Frazier
Moore-Gardner & Assoc.
110 W. Walker Avenue
Asheboro, N. C. 27203

Mr. David P. Bruton
LaGrange Water System
271 Reilly Rd.
Fayetteville,
North Carolina 28303

Publisher
N. C. Citizens Association, Inc.
14th Floor Durham Life Building
Raleigh, N. C. 27611

Mr. W. V. Coley
Carolina Power & Light Company
Raleigh,
North Carolina 27602

Charles T. Main, Inc.
5950 Fairview Road
Charlotte,
North Carolina 28210

Olsen Associates
Engineers & Architects
P. O. Box 10666
Raleigh, N. C. 27605

Stone and Webster Engineering Contractors
Technical Library
225 Franklin Street
Boston, Massachusetts 02107

Henningson, Durham & Richardson
6230 Fairview Road
P. O. Box 11257
Charlotte, N. C. 28209

Averette & King Engineering Co., P. A.
4634 Yadkin Rd.
Fayetteville, N. C. 28303

Mr. Jim Billups
Progressive Design Collaborative
Consulting Engineers
P. O. Box 10621
Raleigh, N. C. 27605

Mr. Lloyd Tyler
Wiggins - Riner & Assoc.
P. O. Box 8678
Durham, N. C. 27707

Mr. Daniel M. Blackstock
Manager, Montclair Water System
6465 Yadkin Rd.
Fayetteville, N. C. 28303

Mr. R. A. Rumbough
Ponderosa Water System
P. O. Box 53646
2102? Vancouver Dr.
Fayetteville, N. C. 28303

8. Other

Mr. Horace P. Morgan
Resources Advisory Board
Southeast River Basins
Walton Building Suite 402
Atlanta, Georgia 30303

Coastal Plains Regional Commission
215 East Bay Street
Charleston,
South Carolina 29401

ST. PAULS, ROBESON COUNTY

ANALYSES
(In milligrams per liter, except as noted)

Source, or type of water (raw;finished)...	Well No. 1 Raw	Combined 1/ Finished		
Date of collection.....	12-11-75	12-11-75		
Silica (SiO_2).....	11	10		
Iron (Fe).....	1.0	.04		
Manganese (Mn).....	.020	.010		
Calcium (Ca).....	.5	4.0		
Magnesium (Mg).....	6	1.2		
Sodium (Na).....	6.0	6.3		
Potassium (K).....	1.3	1.6		
Bicarbonate (HCO_3).....	1	22		
Carbonate (CO_3).....	0	0		
Alkalinity as $CaCO_3$.....	1	18		
Sulfate (SO_4).....	14	7.6		
Chloride (Cl).....	7.7	6.7		
Fluoride (F).....	.1	.0		
Nitrate (NO_3).....	----------	----------		
Nitrite + Nitrate as Nitrogen (NO_2 + NO_3 as N).....	.03	.05		
Dissolved Solids.....	43	49		
Hardness as $CaCO_3$:				
Total.....	4	15		
Noncarbonate.....	3	0		
Specific conductance (micromhos at 25°C)....	87	74		
Arsenic (As).....	.000	.000		
Barium (Ba).....	.1	.0		
Boron (B).....	.00	.00		
Cadmium (Cd).....	.000	.000		
Chromium (Cr).....	.000	.000		
Cobalt (Co).....	.000	.000		
Copper (Cu).....	.031	.000		
Lead (Pb).....	----------	----------		
Lithium (Li).....	.00	.00		
Mercury (Hg).....	----------	----------		
Strontium (Sr).....	.05	.05		
Zinc (Zn).....	.16	.01		
pH (units).....	4.0	8.3		
Temperature (°C).....	----------	----------		

1/ Combined sample from wells no. 1, 2, and 3.

SAMPSON COUNTY

WATER-RESOURCES APPRAISAL

Sampson County is in the south-central part of the North Carolina Coastal Plain. The topography is characterized by broad flat interstream areas and wide, swampy flood plains. The county is drained by tributaries of the Cape Fear River, primarily South River. The average stream discharge is 0.8 $(Mgal/d)/mi^2$. Minimum flows range from 0.00025 to 0.030 $(Mgal/d)/mi^2$ and average 0.014 $(Mgal/d)/mi^2$. Streams having drainage areas as large as 140 square miles occasionally go dry. The 7-day, 2-year low flows range from 0.008 to 0.13 $(Mgal/d)/mi^2$ and average 0.074 $(Mgal/d)/mi^2$. Two public water supplies in the county, Clinton and Roseboro, have 500 or more customers. These and the smaller public and private water supplies in the county are obtained from ground water. The 1970 population of the county was 44,954.

The county is immediately underlain by the upper sandy aquifer, which generally has a thickness of between 20 and 40 feet. The underlying lower sandy aquifer thickens to the southeast from about 100 feet in the northwestern part of the county to over 600 feet in the extreme southeast corner of the county. Well yields in the lower sandy aquifer are usually proportional to the aquifer's thickness. Well yields of 100 gal/min or less could be anticipated in the northwest, and yields of over 1,000 gal/min could be anticipated in the southeast. The maximum ground-water yield is estimated to be 0.9 $(Mgal/d)/mi^2$. The water from the lower sandy aquifer ranges from soft to hard and may contain excessive amounts of iron and hydrogen sulfide.