Progress Report

ON

Ground-Water Investigations

IN

South Carolina

BY
G. E. SIPLE

BULLETIN NO. 15

RESEARCH, PLANNING AND DEVELOPMENT BOARD

Prepared in cooperation with the Geological Survey, United States Department of the Interior

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RESEARCH, PLANNING AND DEVELOPMENT BOARD
STATE OF SOUTH CAROLINA
COLUMBIA

October 15, 1947

R. M. COOPER
Director

To His Excellency Governor J. Strom Thurmond:

The Research, Planning and Development Board presents this Bulletin as a progress report on GROUND-WATER INVESTIGATIONS IN SOUTH CAROLINA.

This report, being the first published on a work of this nature, should be of much value to the agricultural and industrial economy of the State.

Other investigations on the waters of the State are now in progress through this agency in cooperation with the United States Department of the Interior, Geological Survey. They will include: (a) Chemical Character of Surface Waters; (b) Surface Water Discharge Data.

These companion reports will be ready for publication after January 1, 1948. The report is submitted in the hope that it will make possible a wider and more economical use of one of our most valuable natural resources.

Sincerely,

R. M. Cooper,
Director.

PROGRESS REPORT ON GROUND-WATER INVESTIGATIONS IN SOUTH CAROLINA

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Abstract

A cooperative investigation of ground-water supplies and resources of South Carolina was begun in October, 1945, as a result of an agreement between the South Carolina Research, Planning, and Development Board and the Geological Survey, U. S. Department of the Interior.

One of the first objectives was the accumulation of hydrologic data on each municipality that obtains its public water supply from wells or springs. Most of these data are included in the accompanying tables containing the descriptions of 741 wells and springs. Data on 117 municipal supplies were recorded, 30 in the Piedmont and 87 in the Coastal Plain.

The general relations between an aquifer and the quality and quantity of water in it are briefly discussed.

Physiographically and geologically the State is divided into three major units or provinces. The extreme northwestern edge is in the Blue Ridge province, which is not discussed in this report; the area between the Blue Ridge and the Fall Zone comprises the Piedmont Province; and that between the Fall Zone and the sea is in the Coastal Plain province.

The geology of the Piedmont is that of a complexly folded series of metamorphic rocks intersected by a large number of igneous intrusions. The formations of this area do not yield as plentiful a supply of water as those of the Coastal Plain. A considerable number of wells in the Piedmont yield 50 to 100 gallons per minute and some yield from 200 to 300 gallons per minute. Few wells yield as much as 300 gallons per minute and none more than that amount. The yield of the springs used for public water supplies ranged from 5 to 189 gallons per minute.

The schists, heavily-weather slates, and fractured granites appeared to be the most productive aquifers, and the massive granites and other igneous intrusions, and some gneisses and schists, are much less productive.

The quality of the water differs from one area to another but the hardest samples tested were from wells in the granites or slates and the softest water came from wells in the schists.

Wells in the Coastal Plain generally yield larger amounts of water than wells in the Piedmont. Yields ranging from 200

to 600 gallons per minute are rather common and a considerable number range from 1,000 to 2,000 gallons per minute. Most of the larger yields are usually from the Tuscaloosa, Black Creek, and Peedee formations of Cretaceous age; and the Ocala formation or its equivalent, the Cooper-Santee unit, of Eocene age. These formations are the source of water for most of the drilled wells in the Coastal Plain.

The quality of the water and the depth and type of well depend on the nature and structure of the formation.

Soft water can be obtained at various depths almost anywhere in the State, but the greatest concentration of hard water in municipal supplies is in the southern triangle of the State, from Barnwell, Orangeburg, and Berkeley Counties southward. From this triangle came about three-fourths of the samples of hard water analysed for the entire State and all of the hard-water samples analysed from the Coastal Plain.

The water from the Cretaceous formations is the softest in the State. Wells penetrating or receiving water from the calcareous sediments of Eocene and Miocene age commonly yield hard waters.

The chloride content of the ground waters is highest near the coast, or in areas that previously represented coast lines, and decreases rapidly inland away from the coast. The relatively high fluoride content in ground water follows generally the same distribution.

The presence of iron in ground water is very irregular throughout the entire area, but in general the amount of iron decreases with depth. Of 77 samples of water from wells in the Coastal Plain, more than half contained over 0.30 part per million.

The Coastal Plain sediments are described individually with respect to their composition and structure and the quality of their water.

Also included in the body of the report are cross-sections of the Coastal Plain sediments showing their thickness and structure, a map showing hardness of municipal ground-water supplies, a geologic map of the State, and tables and graphs showing the chemical characteristics of the ground water.

Introduction

In the evaluation of the natural resources of South Carolina, ground water must be considered as one of primary importance. Of a total of 166 cities and towns having public water-supply systems, 115 or about seven-tenths use ground water. Approximately 98 percent of the rural population obtain their water from wells, as do a large part of the industrial plants.

A major item in the cost of obtaining ground water is in the digging or drilling of the well, and of primary concern to the individuals involved is the prevention of needless expense that results from insufficient consideration of the specific ground-water conditions in the vicinity.

In the Coastal Plain region, where many wells flow, consideration should also be given to the conservation of the artesion flow and prevention of waste of water from unused wells.

With these broad objectives in view a cooperative investigation of ground-water supplies and resources of the State was begun in October, 1945, as the result of an agreement between the South Carolina Research, Planning, and Development Board and the Geological Survey, U. S. Department of the Interior. The program has been under the general direction of O. E. Meinzer and A. N. Sayre, successive chiefs of the Ground Water Division of the U. S. Geological Survey, and personnel of the South Carolina Research, Planning and Development Board. The work is under the supervision of M. J. Mundorff, of the Geological Survey.

The objectives of this investigation were: (1) To obtain as much information as possible on the occurrence, quantity, and quality of the water in the geologic formations underlying the State; primarily from the standpoint of municipal supplies and secondarily from that of industrial supplies; (2) to determine, insofar as possible, methods of choosing favorable locations for drilling wells, and to determine areas where supplies sufficiently large for industrial use might be obtained; (3) to ascertain the general ground-water conditions and problems throughout the State.

There have been no previous systematic ground-water investigations throughout the State. Cooke[1] described the water-

[1] Cooke, C. W., Geology of the Coastal Plain of South Carolina: U. S. Geol. Survey Bull. 867, pp. 162-188, 1936.

bearing properties of the geologic formations in the Coastal Plain and included information on 234 wells in 22 counties, with chemical analyses of the water from 104 of the wells. Most of the well data were obtained in 1917.

Other reports that contain some reference to ground water in South Carolina are those of Darton[2], Glenn[3], and Tuomey[4].

At the direction of the South Carolina Legislature, the Commissioner of Agriculture published in 1941 a report "To Investigate Artesian Water Supply in South Carolina." This report contains the results of a canvass of well owners and drillers regarding the status of artesian water levels and flows, and it gives suggestions for remedying the declines in head and flow. Information as to depth, year drilled, rate of flow, and amount of casing is given for 100 wells.

In order to obtain an over-all picture of the ground-water conditions and problems in various sections of the State it was decided that a preliminary survey of the entire State would be preferable to the investigation of any area or group of areas within the State. The present report gives the results of this preliminary survey.

Physiographically and geologically the State is divided into three major units or provinces, the Blue Ridge, the Piedmont, and the Coastal Plain. The extreme northwestern edge of the State is in the Blue Ridge province, the area between the Blue Ridge and the Fall Zone comprises the Piedmont province, and that between the Fall Zone and the sea is known as the Coastal Plain province. The contact between the Piedmont and Coastal Plain provinces is designated the "Fall Zone," owing to the numerous rapids or falls in streams which flow from the hard granites, gneisses, and schists of the Piedmont province to the softer, unconsolidated clays and sands of the Coastal Plain.

Superimposed on all the older sediments in the Coastal Plain are seven separate Pleistocene formations (sand, clay, and gravel) representing different invasions and retreats of the sea. Each deposit is defined on the landward side by the level shore line of the sea and its estuaries and on the seaward side by the

[2] Darton, N. H., Artesian well prospects in the Atlantic Coastal Plain Region: U. S. Geol. Survey Bull. 138, 1896.

[3] Glenn, L. C., Underground waters of eastern United States: U. S. Geol. Survey Water-Supply Paper 114, pp. 140-152, 1905.

[4] Tuomey, Michael, Report on the geology of South Carolina, 1848.

shore line of the next invasion of the sea. The surface of each of these Pleistocene formations forms a terrace of the same name.

In addition to the terraces, the Coastal Plain has been divided into the physiographic divisions known as the Aiken Plateau, the Richland red hills, the High Hills of Santee, and the Congaree sand hills.

ACKNOWLEDGMENT

I wish to express my sincere thanks to the many municipal engineers and other officials engaged in the supervision of municipal water supplies who extended wholehearted cooperation in furnishing essential data and water samples. Also appreciated is the information received from industrial firms, from the post engineers and public works officers of the Army and Navy establishments throughout the State, and from many individuals, too numerous to name here. Particularly helpful, too, were the well drillers of the State.

To Dr. C.W. Cooke I am indebted for his helpful review of the report.

To the State Geologist, Stephen Taber; the Senior Sanitary Engineer, D. F. Frick; and Albert Johnson, of the Surface Water Division, U. S. Geological Survey, I express my thanks for their help.

Finally, to Maurice J. Mundorff, associate geologist, U. S. Geological Survey, I wish to express my deepest thanks for his thoughtful direction and help in supervising the survey and subsequent preparation of the report.

RELATION OF GEOLOGY TO THE OCCURRENCE OF GROUND WATER

Ground water may be separated into two classes, that in the interstices and fractures of the rocks and that in the earth's interior where the pressure of the rocks is so great that interstices cannot exist and the water is in some sort of rock solution.

The ground water in the interstices and fractures in the zone of saturation is that with which this report is concerned.

The upper surface of the zone of saturation is known as the water table[1]. This surface has a vertical range in the State from a few feet to more than 100 feet below the ground surface. The water table is not everywhere a stationary surface but fluctuates as water is added to the rocks from rainfall or streams and is discharged from the rocks through evaporation, use by vegetation (transpiration), and entrance into streams or into the ocean.

The quantity of water in any rock formation depends upon the characteristics of the rock known as porosity, permeability, and specific yield.

The porosity of a rock is the amount of pore space in proportion to the total volume and is expressed as a percentage. If all the particles making up a sand or soil were perfect spheres of uniform size and were arranged in the most compact way, it can be calculated mathematically that the volume of the pore space would be about 26 percent of the total volume[2]. Because of irregularities in the shapes and sizes of the particles, most material has a porosity greater than 26 percent. In sand of fairly uniform size it may range from 35 to 40 percent, and in clays it may be from 40 to more than 50 percent. Consolidated sedimentary rocks and rocks of igneous or metamorphic origin have much lower porosities and joints and fissures make up the greater part of the pore space.

Of more importance in an aquifer than the porosity is the specific yield, which is defined as the ratio of (1) the volume of water a rock will yield by gravity after being saturated, to (2) the total volume of the rock.

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[1] For more detailed descriptions and definitions of ground-water terms, see U. S. Geol. Survey Water-Supply Papers 489 and 494.

[2] Lahee, F. H., Field geology, 3d ed., 1931, p. 62.

One of the most important characteristics of a water-bearing material is its permeability, or ability to transmit water. A permeable rock has connecting interstices of capillary size or greater. The permeability of a rock may be expressed as the rate at which it will transmit water through a unit cross section under unit hydraulic gradient[1].

Factors influencing the permeability are the size and distribution of the individual particles and the resultant character of the pore space. Thus some materials, such as clay, may have a relatively high porosity but low permeability because of the small size of the individual pore spaces and of the adhesion of water to the walls of the interstices; whereas a less porous but fractured rock may contain less water and yet yield more than the clay.

The field coefficient of permeability used by the Geological Survey is expressed as the number of gallons of water a day that percolates under prevailing conditions through each mile of water-bearing bed under investigation (measured at right angles to the direction of flow) for each foot of thickness of the bed and for each foot per mile of hydraulic gradient.

Theis[2] introduced the terms "coefficient of transmissibility", which is the product of the field coefficient of permeability and the thickness of the saturated portion of the aquifer, in feet.

The definition of the coefficient of storage as given by Wenzel[3] is the volume of water, in cubic feet, that will be released from each vertical column of the acquifer with a base one foot square when the water level falls one foot. For water-table conditions the coefficient of storage is essentially equal to the specific yield of the material unwatered during the pumping.

By means of formulas developed by Hazen, Theim, Theis, Wenzel, and others, the velocity of movement of water, quantity of water available, safe yield, and effects of pumping on the water levels in selected areas may be computed and predicted. The computations are subject to certain limitations,

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1 Meinzel, O. E., The occurrence of ground water in the United States; U. S. Geol. Survey Water-Supply Paper 489, p. 28, 1923.

2 Theis, C. V., The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage: Am. Geophys. Union Trans. 1935, p. 520.

3 Wenzel, L. K., Methods for determining permeability of water-bearing materials, with special reference to discharging-well methods. U. S. Geol. Survey Water-Supply Paper 887, p. 87, 1942.

owing to local conditions. However, by obtaining sufficient data the effects of differences in natural conditions from those assumed in the basic formulas may be determined.

An aquifer is a formation, group of formations, or part of a formation that is water-bearing[1]. The three major classes of rocks—igneous, sedimentary, and metamorphic—have a wide range in their characteristics as aquifers. In general, the igneous and metamorphic rocks in South Carolina are much less productive than the sedimentary rocks. However, decomposition, fracturing, and jointing as the result of weathering or crustal stresses make it possible for these rocks to store considerable quantities of potable water. The unweathered igneous rocks of massive character yield very little water. Granites that have been shattered or decomposed are fairly good aquifers. Marble, quartzite, and slate yield substantial quantities of water only if fractured and jointed. Similarly, the gneisses and schists will yield fairly large amounts of water where fractured, especially if they have reached an advanced stage of weathering.

Sandstones may be very good or very poor aquifers, depending upon their texture and composition. Some are almost impermeable whereas others are very permeable. Where the water passes through the interstices between sand grains and not along crevices it is effectively filtered and purified.

Limestones can also be very productive aquifers if their porosity and permeability is favorable; that is, if the solution channels and caverns so frequently observed in limestones are interconnected instead of isolated. Dense limestones of low permeability of course form poor sources of ground water.

Clays and shales, because of their fine-grained texture, are generally poor aquifers. However, some hard, fractured shales yield relatively large quantities of water.

Some of the most productive aquifers are permeable sands and gravels, which store and transmit large quantities of water. Their ability to filter the water is also important. Very fine-grained, compact sands, of course, are not highly productive. Marine near-shore deposits, stream channels filled with permeable material, lake beds, and glacial drift are excellent aquifers in many places.

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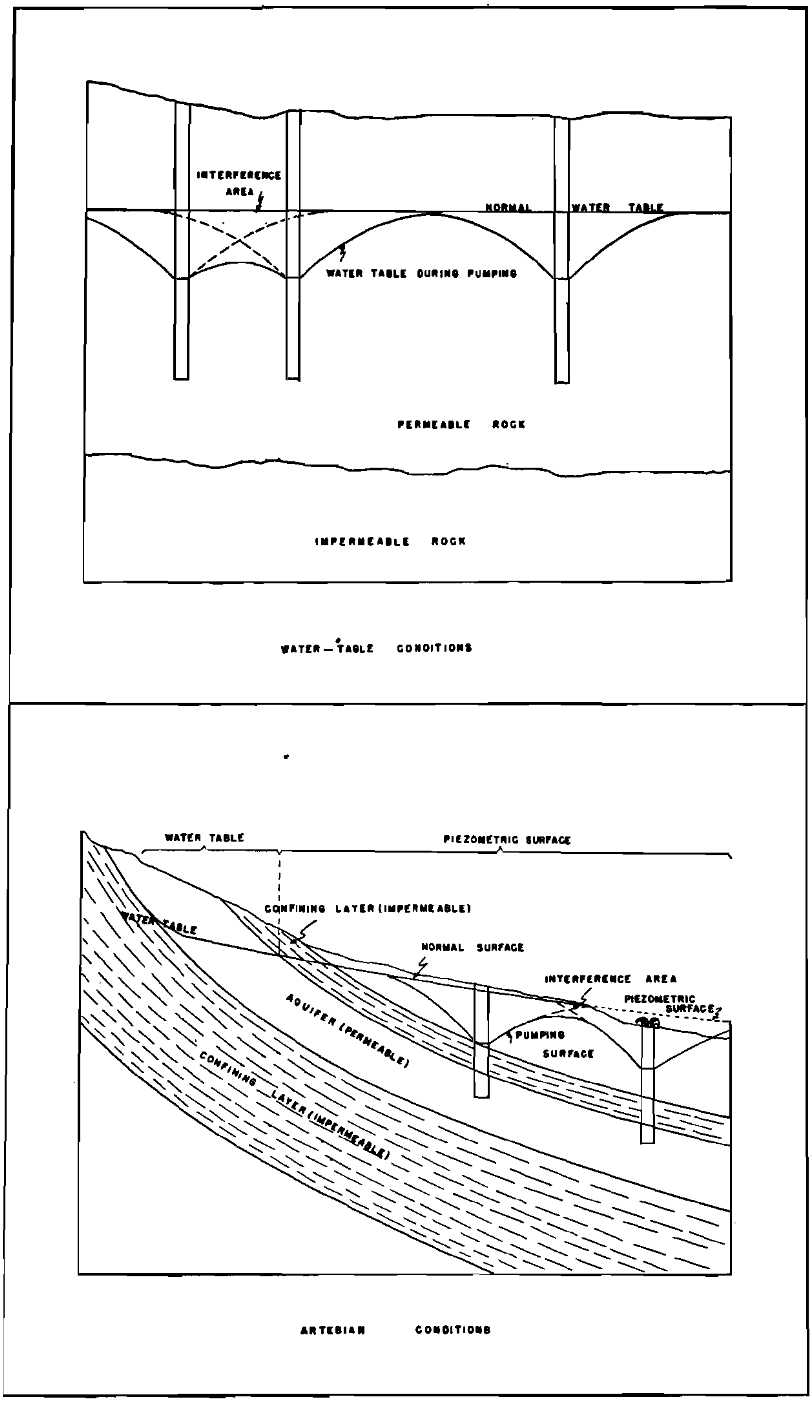
[1] Meinzer, O. E., Outline of ground-water hydrology: U. S. Geol. Survey Water-Supply Paper 494, p. 30, 1923.



WATER — TABLE CONDITIONS

ARTESIAN CONDITIONS

FIGURE 1

The ultimate source of the greater part of the ground water is rain water transmitted to the water table by means of infiltration of water from rain, or melting snow and ice, or from streams or lakes.

Water-table conditions are said to exist where the water-bearing formation is not overlain by a relatively impermeable bed that confines the water under pressure in the permeable rocks. Under such conditions the water table fluctuates under the influence of the recharge and discharge, as mentioned previously. The discharge takes place through the movement of the water away from the recharge area to surface streams and springs. Where the water table is near the land surface some of the ground water may be discharged through evaporation and transpiration.

An Artesian aquifer is one in which the water is under sufficient pressure to cause it to rise above the surface of the zone of saturation. The water may or may not rise to the land surface.

The piezometric surface of an aquifer is an imaginary surface that everywhere coincides with the static level of the water in the aquifer[1]. If the surface of the ground and the mouth of a well are below the piezometric surface, water will flow from the well under artesian pressure.

The water levels in artesian wells usually do not fluctuate as rapidly with precipitation as do those in water-table wells. The largest fluctuations of artesian pressure caused by recharge are in or near the recharge areas. In general, the magnitude of the fluctuations decreases with distance from the recharge areas.

Fluctuations in water levels and artesian pressure are likewise induced by the effect of discharge of water from wells through pumping or artesian flow. This effect is transmitted laterally more rapidly in artesian aquifers. Also, changes in atmospheric pressure may affect water levels in artesian areas, and in water-table areas where temporary confined conditions are created by such factors as freezing of the soil or downward movement of water over a large area after a heavy rain.

The removal of water from a well by pumping or natural flow causes a decrease in pressure at the well and water moves towards the well from all directions. The water table or piezometric surface in the vicinity of the well assumes a shape similar

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[1] Meinzer, O. E., op. cit., p. 38.

to that of an inverted cone, known as the "cone of depression". This cone will deepen and expand until sufficient water enters it to balance the withdrawal, when a condition of equilibrium is said to exist.

If two or more wells in the same area are in such close proximity that their cones of depression overlap, they interfere with one another and their yields are lowered.

In some rather densely populated areas it may not be possible to space wells at such distances as would prevent mutual interference. In such areas the cost of reduced efficiency and greater pumping lift must be balanced against the cost of greater separation.

GEOLOGY AND GROUND WATER IN THE PIEDMONT PROVINCE

The Piedmont province consists essentially of a broad plateau averaging 400-500 feet above sea level at its southeastern edge and rising to 1,000 feet above sea level at the northwestern edge. This plateau is dissected by streams whose valleys range in depth from 50 to 200 feet. The general trend of the streams is toward the southeast.

The Piedmont rocks consist of highly metamorphosed gneisses and schists intruded by granites and cut by many dikes, most of which are diabase or diorite. The gneisses and schists are classified as pre-Cambrian in age. They have undergone profound and repeated metamorphism, to such an extent that the original character and bedding planes have been obliterated. They strike in a general northeast-southwest direction. The planes of schistosity have a similar strike and dip generally to the northwest. Some rocks are of sedimentary origin, others igneous. In some places the degree of metamorphism is so intense that it is impossible to discern the origial nature of the rock, whether sedimentary or igneous.

Keith[1] describes the metamorphic rocks of sedimentary origin as consisting of gneisses and schists, the principal types of which are those containing muscovite or biotite mica, garnet, kyanite, staurolite, chlorite, sericite, ottrelite and, in some places, quartz and calcite.

[1] Keith, Arthur, and Sterret, O. B., Description of the Gaffney and Kings Mountain quadrangles: U. S. Geol. Survey Folio 222.

The matemorphosed igneous rocks include schistose and gneissoid rocks of granitic, dioritic, and volcanic origin.

Such rocks as granite, pyroxenite, peridotite, porphyries, diorite, diabase, and gabbro occur as batholiths, sills, and dikes or as surface flows.

Oligoclase-biotite schist, albite-chlorite schist, and their equivalents with igneous injections crop out in considerable amount in the northwest half of the Piedmont. In the area from the western part of Pickens County to the western part of Lancaster County are scattered outcrops of granite, gabbro, and hornblende gneiss of pre-Cambrian age. In the northwestern parts of Oconee and Pickens Counties is a mylonitized granite gneiss and hornblende gneiss. A similar gneiss, possibly not of the same age, occurs in the belt of the Spartanburg and Cherokee formations.

The granites range in texture from fine-grained to coarsely crystalline to porphyritic. Some are probably of pre-Cambrian age; others may be Carboniferous.

Watson[1] classifies the granites as mixtures of quartz and feldspar with biotite as the third essential component. On the basis of mineral composition he groups the granites of South Carolina into (1) biotite granite that may contain little or no muscovite, and which includes the greater part of the granites of the State; (2) muscovite-bearing granites, of which there are only a few representatives; and (3) muscovite granite.

A good example of the porphyritic granite may be seen in and around Greenville.

Apolite and pegmatite dikes are present in scattered localities.

According to Watson[1] a majority of the joints in the granites belong to two sets, one of which strikes northeast and the second of which strikes northwest.

Quartz veins are especially noticeable in the highly weathered and decomposed slates and are sometimes found in granitic exposures.

Along the southeast border, striking also in a northeast-southwest direction, occurs a quite extensive assortment of volcanic rocks, generally lumped together under the designation "slate

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1 Watson, T. E., Granites of the southeastern Atlantic States: U. S. Geol. Survey Bulletin, 426, p. 173, 1910.

unit", ranging from variegated and thinly varved tuffs to hard sericite schists.

A geologic map of the area is included as plate 7. It will be noted that much of the geology is taken from the map compiled by A. I. Jonas[1], but I have altered the boundaries of the formations in several places. The most conspicuous change was the designation of slate for a considerable area previously mapped as granite. The boundaries of this slate unit are only approximate, however, and not intended to be an exact representation.

GEOLOGIC HISTORY OF THE PIEDMONT

The original sedimentary and igneous rocks of pre-Cambrian time were subjected to intense metamorphism, after which an extensive period of erosion exposed the igneous masses that had intruded the area at different periods throughout pre-Cambrian time.

The erosional period was interrupted by volcanic activity, during which lavas were extruded and large amounts of tuffs were deposited, many of them in water. These deposits were, in turn, uplifted and eroded from extensive areas.

At the beginning of the Paleozoic time the Appalachian and Piedmont provinces were depressed below sea level and sand, gravel, silt, and limestone were deposited. During late Paleozoic (Carboniferous) time, a large amount of granite was intruded into the schists, gneisses, and slates. At the end of Paleozoic time occurred another period of intensive metamorphism with folding, faulting and brecciation.

Following an extensive period of erosion at the end of the Paleozoic period, an inland basin was formed and, during the Triassic period, deposition of additional sediments from the surrounding hills took place.

Following Triassic time the area was reduced to a peneplane and tilted in a southeastern direction, so that with the coming of Cretaceous time the northwestern part of this plain was dissected and the material was washed down onto the southeastern part, which now underlies the present Coastal Plain.

During the last period of deposition, from Lower Cretaceous time to Recent time, the Coastal Plain sediments were laid down over the basal crystalline complex.

[1] Jonas, A. I., Geologic map of the United States; U. S. Geol. Survey, 1932.

OCCURRENCE OF GROUND WATER IN THE PIEDMONT

The mantle of decomposed rock covering the greater part of the Piedmont province is an important factor in the ground-water resources of that region. The precipitation is retained within this mantle to a much greater extent than would be possible if the hard, unweathered rock were exposed generally. Thus it serves as a water reservoir and makes for a more even discharge through streams. The weathered and decomposed granites are especially effective in this regard. The contact of this weathered material with the underlying hard rock is marked by many springs, usually with water free of undesirable mineral content.

Health resorts are located at several mineral springs scattered throughout the province.

Numerous dug wells are used throughout the area, especially in the rural districts. These wells usually are dug into the weathered mantle or to the bedrock. A few of the wells penetrate a few feet of the rock. These wells are subject to contamination if they are not adequately protected from polluted surface water.

Deeper wells of the drilled type usually penerate a considerable amount of decomposed rock and enter the hard rock or are drilled as much as a few hundred feet into the hard rock in order to obtain water from the faults, joints, and fracture zones through which water circulates. Wells drilled into rocks with many fractures per unit area are naturally more productive than those drilled into rocks in which the fractures are less abundant.

In rocks of sedimentary origin that are not too greatly altered by metamorphism, water occurs along bedding planes. If, through folding or shearing, these planes open up, the pore space and water-bearing capacity of the rock are thereby increased.

When rocks in the earth's crust are subjected to intense metamorphism, great stresses are set up within the rocks. When the stresses are relieved, it is by movement or slippage along parallel planes, producing the structure known as schistosity. The planes of schistosity may, because of subsequent stresses in various directions, become opened up so as to provide channels for the collection and movement of ground water.

Veins occur where openings formed in a rock have been subsequently filled, partially or entirely, by mineral matter deposited by percolating waters or mineralizing gases. Most of the veins in the Piedmont are quartz, which is a rather brittle material and upon fracturing becomes a productive aquifer.

Dikes consist of rock injected into crevices in a viscous or molten condition. Both dikes and veins occur in fissures that are narrow in comparison to their other dimensions. The dikes, either because of stresses during formation or because of subsequent application of similar forces, may be fractured and broken, thus facilitating the accumulation and movement of ground water.

Included in the accompanying table of wells (page 74) is a column showing their topographic location; that is, whether they are on hills, slopes, plains, or in valleys. These topographic features are developed as a result of differential erosion, which in turn is dependent largely upon the resistance of the rock to erosion. Thus, other things being equal, the more resistant rock would occupy the hills or higher features and the less resistant would underlie the valleys and draws. The rock may be similar in both high and low areas except that the rock in the hills may be less fractured than that underlying the valleys. In general, the slopes and valleys are more satisfactory locations for wells than are the hills.

It might be interesting to note here that, with regard to wells in a draw or valley, the most productive wells are situated at least a short distance from the head of the valley, whereas the less productive appear to be located at the immediate head of the valley.

In the process of selecting a favorable area for wells, all the above-mentioned factors should be taken into consideration. These include the general character of the underlying rock, its permeability, texture, and bedding; the presence or absence of fracture zones, joints, faults, dikes, and veins; the topographic location, and the amount of weather mantle overlying the bedrock; the average yield and drawdown of wells in the surrounding area; and the depth to the water table.

In areas underlain by granitic rocks the water occurs, as mentioned above, either in the interstices of the weathered mantle at comparatively shallow depths or in the joints that extend to greater depths. In most of the granite in the area there is a horizontal system of joints intersected by a high-angle or almost vertical system.

In general, little or no water is available at depths of more than 300 feet in the granite because the number and size of joints decrease with depth. However, at some places in South Carolina adequate supplies of potable water are obtained at depths of more than 300 feet in the granite. The following table lists examples of such wells:

Table of Deep Wells Drilled Into Granite

No.	County	Depth (feet)	Yield (gallons per minute)
72	Edgefield	720	120
73	Edgefield	380	20-35
74	Edgefield	700	18
129	Greenville	387	55
130	Greenville	455	15
132	Greenville	368	83
133	Greenville	370	40
171D	Kershaw	600	20
174	Laurens	523	50
176	Laurens	326	50
177	Laurens	370	25
178	Laurens	420	45
179	Laurens	470	55
180	Laurens	450	11
316	York	810	40

Of course it is not definitely known that the total yield in all of the above cases was obtained from the total depths.

Although, in general, the character and structure of the crystalline rock eliminates the possibility of deep artesian aquifers in the Piedmont, there are a few small areas where artesian conditions exist. For example, well 246, an 8-inch well 301 feet deep, owned by the Mayfair Cotton Mills in Arcadia, Spartanburg County, yields 35 gallons per minute by artesian flow and 165 gallons per minute when pumped. Well 137, a 6-inch well 255 feet deep, located at the Brandon Mills in Greenville, yields 80 gallons per minute by natural flow. A well at the Spartan Mills, Spartanburg, has been flowing for the past 35 or 40 years.

The average yield of 166 drilled municipal and industrial wells in granite was 40 gallons per minute. The average yield of 33 wells drilled into gneiss was 35 gallons per minute. The average yield of 33 wells in schist was 28 gallons per minute, and the average yield of 29 wells drilled in slate was 26 gallons per minute.

Gneiss and schist are softer than the granites and thus the size of their fractures, joints, and cleavage planes diminishes more rapidly with depth.

Of the occurrence of water in schists and gneisses, Ellis[1] notes that the marked development of horizontal joints characteristic of granite is lacking in these rocks and that the derivation of a supply from the fractures parallel to the schistosity, which would have their greatest development near the surface, would account for the relative shallowness of the wells in schist.

The slates are not very good aquifers except where there are many fractures and the cleavage planes tend to open up.

A considerable number of industrial plants are located in the Piedmont, principally along a belt extending from Cherokee and Spartanburg Counties on the north through Union, Laurens, Greenville, Anderson, and Abbeville Counties. This is a continuation of the same northeast-southwest belt in North Carolina and parallels more or less the railway trunk lines from Atlanta and points south to Washington and points northeast.

Whether these industrial plants are located within a town or a city or where they constitute a community by themselves, most of them maintain their own water supply. Some of these supplies are connected to municipal mains with valve controls so that in case of emergency both systems would operate as a unit. Such a system is operated by the Belton Cotton Mills, in Anderson County, which furnishes a domestic water supply for about 250 company-owned houses.

Some of the other plants that maintain water supplies derived from wells in this industrial belt are the Abbeville Mill Corporation and Calhoun Mills, Inc., in Abbeville County; the Appleton Company, Pelzer Mills, and Equinox Mill, in Anderson County; the Addison Plant (Kendall), in Edgefield County; Matthew's Mill and Panola Mills, in Greenwood County; the

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1 Ellis, E. E., Occurrence of water in crystalline rocks: U. S. Geol. Survey Water-Supply Paper 160, p. 27, 1906.

Monaghan Mills, Mills Mills, Inc., and Woodside Cotton Mills, in Greenville County; the Joanna Cotton Mills in Laurens County; the Kenneth Cotton Mills, in Oconee County; the Alice Mfg. Co., Norris Cotton Mills, and Easley Cotton Mills, in Pickens County; and the Mayfair Cotton Mills, Saxon Mills, Riverside Mills, Inman Mill, Pacolet Mfg. Company, Jackson Mills, Wallace Mfg. Co., and Monarch Mills, in Spartanburg and Union Counties.

Almost all of these plants are engaged in textile processing. The largest concentration of industrial activity is in Spartanburg and Greenville Counties.

Some of the largest yields recorded for industrial wells in the Piedmont are for wells in and around Greenville, which are drilled into a dense, hard porphyritic granite. Among the wells recorded in that area are the following: a well of the Ballentine Packing Company at Greenville, 387 feet deep, with a yield of 55 gallons per minute; the 212-foot and 280-foot wells of Mills Mills, Inc., with yields of 100 and 85 gallons per minute, respectively; and a 208-foot well of the Greenville Sewage Disposal Plant, with a yield of 110 gallons per minute. These records indicate that the granite is more highly fractured at depth than would appear from surface exposures.

Another method of obtaining ground water used by several municipalities and industrial concerns is that known in some sections as the "Knox system". This name has been applied by drillers to the practice of sinking a battery of several shallow, small-diameter wells and connecting them to one or more pumps —usually suction pumps of the triplex piston type.

Besides those using drilled and driven wells for municipal supplies, six communities in the Piedmont use springs.

Meinzer[1] gives a classification of gravity springs divided into depression springs, contact springs, and fracture and tubular springs. A depression spring is one whose water flows to the surface from permeable material because the surface extends down to the water table. A contact spring is one whose water flows to the surface from a permeable bed over the outcrop of less permeable material that deflects the water to the surface.

[1] Meinzer, O. E., Outline of ground-water hydrology: U. S. Geol. Survey Water-Supply Paper 494, 1923.

Fracture springs and tubular springs are those whose water flows from rather large openings in the rocks.

Three of the above-mentioned municipal springs have been classified as contact springs, one as a depression spring, and one as a fracture spring. The smallest yield recorded was 2 to 5 gallons per minute and the largest was 189 gallons per minute. The water was of good quality as far as the mineral content was concerned and all was soft except for that of the Blacksburg spring, which had a hardness of 93 parts per million.

QUALITY OF WATER IN THE PIEDMONT

The quality of water in the Piedmont province compares rather favorably with that of other sections of the country except perhaps for the occasional hard waters.

The hardness and iron content of water are the characteristics that usually receive most attention with regard to municipal use. Hardness is evidenced by the greater amounts of soap required to form a lather and also by the residue of insoluble salts formed after a hard water has been evaporated. The hardness is caused chiefly by the calcium and magnesium.

Bicarbonates of calcium and magnesium produce alkalinity and hardness and, when the water is evaporated or loses carbon dioxide through heating, deposits of calcium and magnesium carbonates are formed, producing scale in boilers. Magnesium sulfate produces hardness and forms scale in boilers. The scale formed by calcium and magnesium sulfates is harder than that formed by the carbonates.

Sodium chloride gives a salty taste when it exceeds 400 parts per million, and water with more than 3,000 parts per million cannot be consumed regularly by human beings.

The following table summarizes the hardness of 40 samples from municipal ground-water supplies in the Piedmont. The analyses are given in a table at the end of this report.

Hardness of Ground Water from Formations in the Piedmont Area

TOTAL HARDNESS AS CaCO3
(Parts per million)

Source	Highest	Average	Lowest	Number of analyses
Granite	(578)*	(81)*	(20)*	30
	294	64	20	29
Schists	44	28	14	6
Slates	130	62	24	4

* Includes well 65 in Chester County. The next line gives data for wells in granite exclusive of well 65.

In the above table the highest hardness in granitic aquifers is shown as 578 parts per million. This is for a well in Chester, No. 65, which may be affected at depth by the porphyritic dikes of diorite and diabase that are common in the area. Of these Fuller[1] notes ". . . there are considerable areas of diabase or diorite that on weathering produce a close-grained clay soil that is abundanlty charged with lime and magnesium. The springs and wells of these areas are accordingly of hard water."

The presence of excessive amounts of iron in water is more common in the deep-well sources than in shallow supplies. The iron is usually present in the form of ferrous bicarbonate. When the water is exposed to the air, the oxygen changes the iron into insoluble oxides, giving the water a rusty color and staining fixtures and clothing.

Some iron is dissolved from practically all kinds of rocks, but the source may also be iron or steel pipes when the water contains enough oxygen or carbon dioxide to dissolve the metal.

Almost all of the iron is removed in municipal or industrial water purification plants that have aeration and sedimentation equipment.

The quantity of iron that is considered excessive by the U. S. Public Health Service is more than 0.3 part per million. Of 50 samples analysed for the Piedmont area, nine contained more than that amount. The maximum iron content was 5.4 parts per million in a well 171 feet deep, penetrating a mica-schist aquifer in Spartanburg county. The minimum was 0.0 part per million for a 120-foot well in granite in Abbeville County. Of the

[1] Fuller, M. L., Underground waters of Eastern U. S.: U. S. Geol. Survey Water-Supply Paper 114, pp. 145-146, 1905.

wells showing an iron content greater than 0.3 part per million, one was in Anderson County, in a gravel; one in Kershaw County, in granite; one in gneiss in Pickens County; and one in a granite in the same county. In Spartanburg county there were five recorded wells whose samples revealed a content of iron greater than 0.3 part per million. Two were drilled in granite and three in schist.

Manganese is found in objectionable amounts in ground waters less often than iron. Waters containing excessive manganese are treated in the same manner as those with iron, but it is more difficult to remove the manganese than the iron.

Some waters contain the dissolved gas, hydrogen sulfide, which gives the water a disagreeable odor like that of rotten eggs. In small concentrations it is objectionable but not harmful. This gas can be removed by aeration.

Carbon dioxide dissolved in water forms carbonic acid, which converts insoluble calcium and magnesium carbonates and compounds of iron and manganese into soluble bicarbonates.

Of the municipal water supplies of the Piedmont, 18 were analysed for fluoride. None were found to contain an amount in excess of the limit recommended by the Public Health Service, 1 part per million. The maximum fluoride content of the samples examined was 0.3 part per million in a sample from a 400-foot well in Chester County. In eight of the samples the content was 0.0 part per million.

TEMPERATURE OF GROUND WATER IN THE PIEDMONT

Between the northwestern or Blue Ridge province of the State and the southeastern or Coastal Plain area there is a difference in mean annual air temperature amounting to several degrees Fahrenheit. The average mean atmospheric temperature of the Piedmont is reported by the Weather Bureau to be 61.7° F. The average for the Coastal Plain is 64.2° F. In general, the temperature of shallow ground water may be expected to be slightly higher than the mean annual temperature of the air.

However, the temperature of the ground water in the Piedmont as recorded in most places was 60° F. or lower. Another factor that must be considered is the fact that measurements were made during the winter months, which undoubtedly affected the results.

OBSERVATIONS OF WATER LEVELS IN THE PIEDMONT

The average annual precipitation in South Carolina, as recorded by the Weather Bureau, U. S. Department of Commerce, is 47.59 inches. It ranges from 44 inches in the center of the State, in the vicinity of Richland and Lexington Counties, to 48 to 50 inches in the coastal areas and 76 inches in the extreme northwestern or Blue Ridge area of the State.

In the areas where ground water occurs under water-table conditions, there is a fairly close correlation between the ground-water levels and precipitation. This is illustrated in South Carolina by the data obtained from observation wells establish in the Tiger River area in Spartanburg and Greenville Counties in July, 1934, by the U. S. Geological Survey and the Soil Conservation Service. Although this program began with the observation of 28 wells, drought conditions caused the drying-up of 25 wells; and when the program was discontinued in July 1942 only three wells were being measured. In the water-level reports[1] covering this period, the data are summarized thus: "The observation well program was started in the spring of 1934 when the water levels in wells were at comparatively low stages as a result of low precipitation during 1933 and the first part of 1934. The water levels fluctuated through only a small range in 1935, but they rose markedly in 1936 and 1937 when the precipitation was above normal. In the summer of 1937 the water levels in the wells of the Tiger River area began to decline progressively, owing to deficient precipitation, and this decline continued through 1941. All but three of the wells were dry during this 4½ year period of drought and the records of only these three can be used readily for interpretation. The water levels in these wells continued to decline during the period of their measurment in 1942, and on July 2, when they were last measured, they were lower than they were on July 2, 1941."

The depths of the above wells ranged from 6 to 65 feet.

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1 Wenzel, L. K., and Ireland, D. M., Water levels and artesian pressure in observation wells in the United States, Part 2, Southeastern States, U. S. Geol. Survey Water-Supply Papers 937, p. 89, 1941; and 945, p. 118, 1942.

Geology of the Coastal Plain

INTRODUCTION

In contrast to the more or less hard igneous and metamorphic crystalline rocks of the Piedmont, the formations of the Coastal Plain consist of unconsolidated or partially consolidated sediments, including gravels, sands, clays, limestones, marls, coquina, shales, and shell-packed clays. Furthermore, the structure of these beds is much simpler than that of the complexly folded Piedmont province.

The following table shows the stratigraphic column of the geologic formations of the Coastal Plain together, with descriptions of their water-bearing properties.

The sedimentary formations of the Coastal Plain consist of Upper Cretaceous, Tertiary, and Pleistocene sediments that strike in a general northeast-southwest direction and dipping from 12 to 30 feet per mile in a south-southeasterly direction. The dips represent, for the most part, a flat or even structure except for the warping of the northeastern section to form the Great Carolina Ridge of Cape Fear Arch.

Geologic Units of the Coastal Plain of South Carolina and Their Water-Bearing Properties

System	Series	Formation	Thickness (feet)	Character of Material	Quality of Water
Quaternary	Pleistocene	Pamlico	25	Reddish-brown, orange, gray, and and white sands and clays.	Water of good quality, moderately hard; relatively high in sulfate and nitrate and low in fluoride; good yields.
		Talbot	17		
		Penholoway	28		
		Wicomico	30		
		Sunderland	70		
		Coharie	45		
		Brandywine	55		
Tertiary	Pliocene	Waccamaw	1-58	Soft limestone and loose gray to buff fine quartz sands.	Water usually hard. Fairly large yields.
	Miocene	Duplin marl	0-41	Buff granular, friable, sandy marl with numerous shells.	Water rather hard.
		Hawthorn	30-160	Limestone, marl, shale, Fuller's earth.	Few available data indicate small yields. Hard water.

Tertiary	Oligocene	Flint River	50±	Yellow to reddish-brown sand and silicified limestone.	No data.
	Eocene	Cooper marl	1-175	Grayish-green plastic marl.	Average yield of recorded wells 464 gallons per minute. Water quite hard and rather high in iron, low in fluoride.
		Barnwell sand*	100-200	Fine to coarse pebbly reddish sand.	Large yields of water. Water soft, with moderate to large amounts of iron; low in fluoride.
		Santee limestone	1-230	Light-colored limestone and marls.	Same as Cooper marl.
		McBean	0 to 225 (700?)	Laminated green and red clays, glauconitic marls and sand.	Soft water, low in iron.
Tertiary	Eocene	Black Mingo	1-125	Dark brittle clays or shales interbedded with red and brown sands.	Water rather hard and high in iron.

* The Cooper-Santee unit is considered the time equivalent of the Barnwell sand.

System	Series	Formation	Thickness (feet)	Character of Material	Quality of Water
Cretaceous	Upper Cretaceous	Peedee	1-810	Dark gray sandy marl, argillaceous, micaceous sands, and limestone layers.	Large yields recorded average 215 gallons per minute per well). Water is soft and high in bicarbonate, fluoride, and iron.
		Black Creek	1-570	Very dark gray unctuous shaly clays with interlaminated thin, micaceous, fine-grained sands.	Large yields (recorded average 215 gallons per minute per well.) Very soft water, rather high in iron and quite high in fluoride and bicarbonate.
		Tuscaloosa	1-784	Light-gray, tan, red, and purple cross-bedded sands, clays, and kaolin.	Large yields (recorded average 253 gallons per minute per well). Water mostly very soft (hard in southwest), low in fluoride and bicarbonate; rather high in iron in northwestern counties, low in southwestern. High nitrate in northeast.

A description of the subsurface stratigraphy was obtained from the examination of cuttings from a well 1½ miles west of Marine Corps Headquarters, Parris Island, Beaufort County, completed in November, 1940. Inasmuch as this constitutes the most complete log of coastal sediments in the South Carolina Coastal Plain, the log is reproduced herewith. The paleontologic information was taken from reports by John B. Reeside, Jr., Joseph A. Cushman, and Horace G. Richards.

Although there has been some difference of opinion in some of the classifications—notably the early Eocene and Upper Cretaceous—an attempt has been made here to give a composite record of the thickness and description of the formations.

LOG OF WELL AT PARRIS ISLAND

Depth	Descripiton	Formation and Age	Fauna
0- 100	No samples.		
100- 650	Light-gray finely granular, sandy limestone.	Eocene (Jackson age-Ocala limestone) (equivalent of Santee-Cooper units)	*Corbula* sp., *Pecten* sp., *Bolivina jacksonensis* Cushman and Applin, *Textularia recta*, Cushman, *Cancris*, n. sp.
650- 875	Light yellowish-gray calcareous sandstone.	Eocene (Claiborne group-McBean formation)	Few species, poorly preserved.
875-1165	Light-gray to cream-colored sandy limestone.	Eocene (Wilcox group-Black Mingo? formation)	*Nucula* sp.; few species, poorly preserved.
1165-1335	Light-gray, fine-grained calcareous standstone.	Paleocene (Midway group)	*Robulus midwayensis* (Plummer), *Dantalina gardnerae* (Plummer).
1335-1925	Medium-gray silt, clay and shale.	Upper Cretaceous (Peedee formation)	*Exogyra* sp., *Inoceramus* prisms, *Ostrea* sp., *Dentalina alternata*, *Bolivina cretosa*, *Robulus pondi*.

1925-2395	Medium gray silt, clay, shale and shell fragments.	Upper Cretaceous (Black Creek formation)	*Terebratulina* cf. *T. guadalupe* (Roemer), *Serpula* cf. *S. cretacea* Conrad, *Karmulus onyx* Morton, *Spirolucina simplex.*
2395-2670	Olive-gray clay with layers of soft micaceous sandstone.	Upper Cretaceous (Eutaw? formation)	*Cardium* sp., *Ostrea cretacea* Morton, *Vaginulina texana.*
2670-3115	Greenish-gray, maroon, and purple waxy clay.	Upper Cretaceous (Tuscaloosa formation)	*Plicatula* sp., *Ostrea* sp., *Nodosaria affinis.*
3115-3245	Medium-gray clay with fine light gray sand and shell fragments.	Upper Cretaceous (Tuscaloosa formation)	*Cardium* cf., *C. pauperculum* Meek, *Ostrea* sp., *Corbula* sp., *Dentalina alternata.*
3245-3454	Red, purple, and greenish gray waxy clay with coarse sand and grit.	Upper Cretaceous (Tuscaloosa formation)	

GEOLOGIC HISTORY OF THE COASTAL PLAIN

The exact sequence of events or geologic history of the area now comprising the Coastal Plain prior to Upper Cretaceous time is not completely known. For an indefinite period of time it was probably a land mass forming an eastern segment of the old continent of Appalachia. However, during Triassic time the underlying rocks of the area appear to have been partially fractured and intruded by basic lava dikes as illustrated by the diabasic material and red shale, possibly of the Newark group, penetrated by wells in Florence. Cooke[1] regarded the section between 1580 feet and 2470 feet in a well at Summerville as Triassic but Mansfield[2] regarded it as Cretaceous in age.

At the end of Lower Cretaceous time continental warping occurred, with tilting of the southeastern edge of Appalachia and a rise of the northwestern part. The sea then encroached, probably as far as the present Fall Line. Then followed a period during which the crystalline rocks were weathered and the decomposed mineral particles were carried down the streams and deposited on the tilted surface of the crystalline basement, forming the Tuscaloosa formation. Then, during another transgression of the sea, dark brownish-black gray laminated clay and fine sand were deposited—the Black Creek formation.

An emergency and period of erosion in the latter part of Black Creek time is indicated by the absence of beds equivalent to the basal beds of the overlying Peedee formation, which are present in North Carolina. Following the end of Cretaceous time further uplift caused the emergence of the area excluding most of Paleocene Midway deposition from the western part, although deposits were formed in what is now the coastal area, as shown by the Parris Island well, which had a Midway layer between 1165 and 1335 feet.

Later, in Eocene time, the land was again inundated and the deposits known as the Black Mingo formation were laid down. They consisted of glauconitic sands, fossiliferous sandstone, and clay. These deposits are of the same age as the Wilcox deposits of Alabama and adjacent States.

Then, after a period of recession and transgression of the sea, there followed, in middle Eocene (Claiborne) time, the deposition of sand, laminated clay, glauconitic marl, and limestone

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1 Op. cit.

2 Mansfield, W. C., Deep Wells near the Atlantic Coast in Virginia and the Carolinas: U. S. Geol. Survey Prof. Paper 186, 1937.

designated as the McBean formation. This sea, however, apparently did not occupy the northern and eastern parts of the area because no deposits of this age have been found east of the Wateree and Santee Rivers.

With the advent of late Eocene (Jackson) time a crustal warping, centered around the area of the Cape Fear River in North Carolina, causing an uplift or anticline with an axis running approximately northwest-southeast, and thus an uplift of the northeastern section of the Coastal Plain so that the beds dip southward or southwestward. This is referred to as the "Cape Fear Arch" or the "Great Carolina Ridge". (See p. 29.) The sea then inundated the area around this ridge, depositing the Barnwell sand near shore and seaward the Santee limestone and Cooper marl, the sand and limy deposits interfingering. The end of Eocene time brought another emergence with consequent erosion, and during the following transgression of the sea, in late Oligocene time, the Flint River formation was deposited. Erosion subsequently removed the Flint River formation except for an area in Allendale County. Following this the Hawthorn formation, consisting of fine sand, limestone, and marl, was laid down in Miocene time. Small patches of Duplin marl were deposited in the middle part of late Miocene time, and a little later more extensive deposits of the Duplin marl were laid down, indicating a submergence of the Carolina Ridge in that time.

A belt perhaps 15 to 20 miles wide, extending inland from the present shore line, was the depositional area in Pliocene time for the sand and shell marl of the Waccamaw formation.

With the Pleistocene or glacial epoch came alternating transgession and regression of the sea and deposition of sands and clays forming a series of terraces from an initial altitude of 270 feet above the present mean sea level to the last stage 25 feet above. The cause of this rise and fall of the sea has been attributed to a combination of deep crustal movements in ocean bottoms, causing a lowering of the water level, and the accumulation and melting of ice in the glaciated areas. Thus the accumulation of ice in a glacial stage would cause a lowered sea level and the melting of the ice masses in an interglacial stage would cause a rise in the water level. From the highest, 270-foot level down, these deposits have been designated the Brandywine, Coharie, Sunderland, Wicomico, Penholoway, Talbot, and Pamlico formations. The surfaces of these deposits form terraces that bear the same names as the underlying formations.

AREAL GEOLOGY AND STRUCTURE OF THE COASTAL PLAIN SEDIMENTS

The structure of the region represents the sum total of geologic processes that have taken place in the past, as outlined above.

Previous to the deposition of the Cretaceous and Tertiary formations there was a broad plain of crystalline rocks, much the same as in the present Piedmont, sloping gently southeastward to the sea. The Cretaceous deposits were then laid down in three nearly parallel bands across the State, with a southwest-northeast strike and a southeast dip. The crustal tilting that ushered in Jackson (upper Eocene) time uplifted the northeastern part of these deposits, resulting in south-southwestern dip in the affected area.

The Tuscaloosa formation crops out in an almost continuous belt from Aiken through Columbia, Camden, and Cheraw. The Black Creek and Peedee formations are exposed in belts confined to the upper and eastern parts of the Coastal Plain. In the south and southwest they are buried beneath later deposits.

North of the Santee River and east of the Wateree River widespread but thin deposits of the Black Mingo formation lie unconformably upon the Upper Cretaceous beds and have a slight southward dip. South and west of the Congaree River the McBean formation, of Claiborne age, lies above the Tuscaloosa and probably other Cretaceous deposits and has approximately the same southward slope.

The Barnwell sand, of Jackson age, unconformably overlies the McBean formation and, to the northwest, the Tuscaloosa formation. This sedimentation followed the upheaval of the Great Carolina Arch, which depressed the formations on the southern and western flanks, thus admitting the sea beyond the former deposits and into the Piedmont. Shoreward the Barnwell is sandy, but seaward it grades into and interfingers with a limestone below (Santee limestone) and a marl above (Cooper marl). The latter deposits strike almost east-west except in the western part of their belt where they strike southwest.

Some differential downwarping of the southern part of the plain may have contributed to the deposition of Oligocene sediments (Flint River formation) in the lower part of Allendale County.

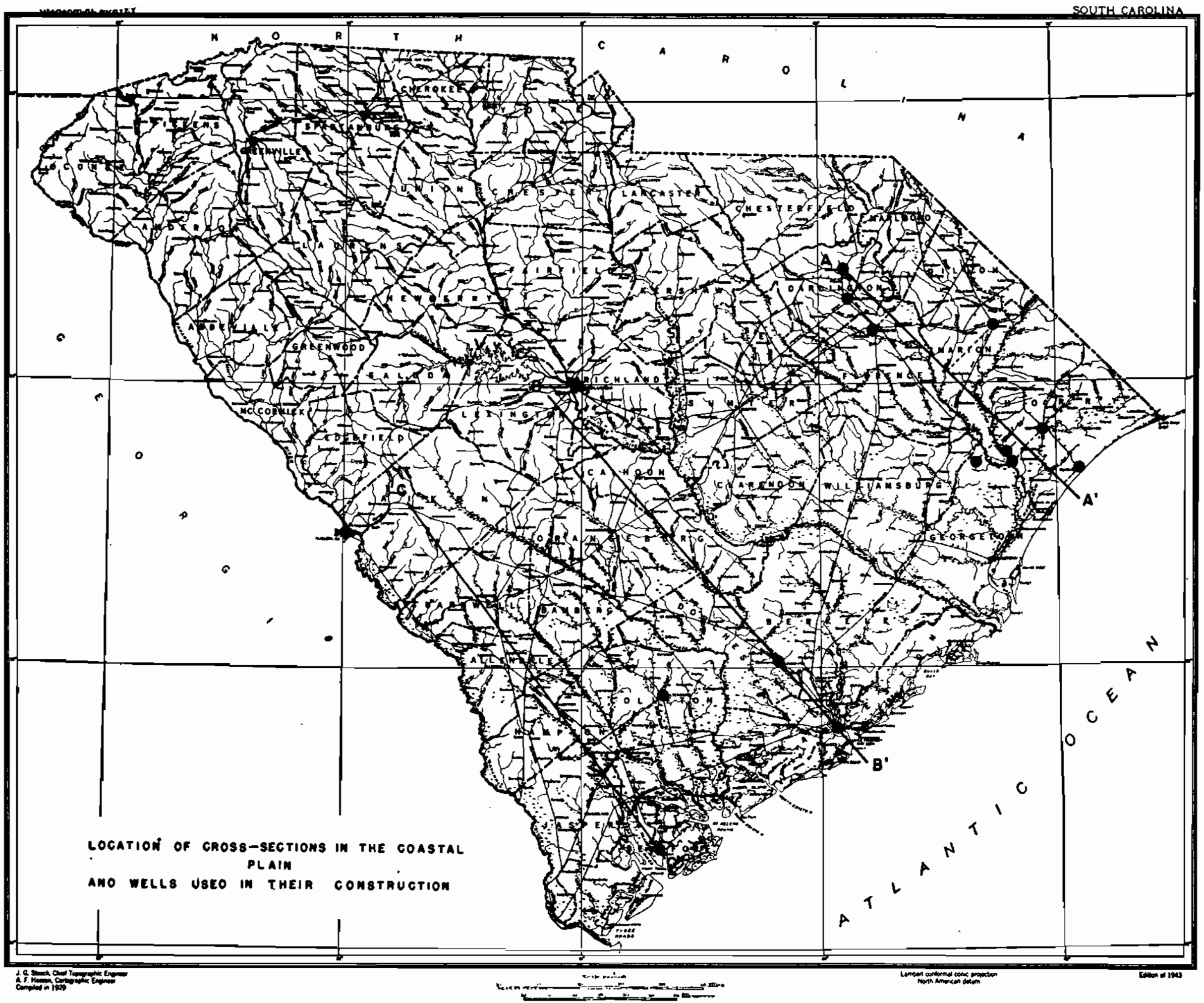
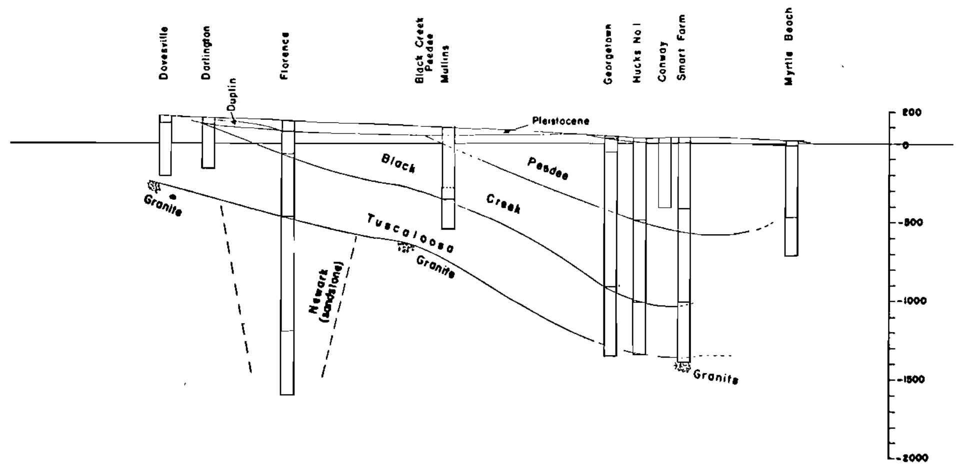


Plate 9—United States Department of the Interior, Geogolical Survey in Cooperation with South Carolina Research, Planning and Development Board

FIGURE 2



CROSS-SECTION ALONG LINE A—A'

SCALE

0 5 10 15 20 25 Miles

Although Cooke[1] indicates that the "Great Carolina Ridge" was formed during late Eocene time, there is some evidence that the disturbance might have begun earlier, as indicated by the lensing-out of the Tuscaloosa formation at Wilmington, North Carolina, where the base of the Black Creek formation is only a little above the basement rocks. Also, it is possible that two movements were involved, the first and less intensive following Tuscaloosa deposition, and the second just before Jackson time.

The phosphatic sands and marls of the Hawthorn formation extend from the Savannah River in Hampton County across the southern part of the State to the eastern part of Berkeley County, in an arc similar to that of the late Eocene formations. They thin out toward the north and dip slightly to the southeast.

The greatest accumulation of upper Miocene deposits, the Duplin marl, is located on the flanks of the Carolina ridge, where it was deposited during the subsidence of this area. The outcrop area includes parts of Sumter, Lee, Darlington, Marion, Florence, Williamsburg, and Clarendon Counties. Scattered remnants also appear in Dillon, Berkeley, and Dorchester Counties.

The Waccamaw formation, named by Dall[2], is represented by few distinct outcrops, but it probably extends from the North Carolina line southwestward along the coast to a point near the Black River, unconformably overlying the Cretaceous and Eocene formations. A smaller patch of the Waccamaw formation described by Cooke crosses the Cooper River and Goose Creek in Berkeley County, possibly extending a short distance into Charleston County.

At the beginning of the Pleistocene time the sea inundated most of the Coastal Plain, and the Savannah, Edisto, Broad, Wateree, and Pee Dee Valleys formed estuaries and bays as they subsided beneath the sea. During the period of maximum submergence the sea was approximately 270 feet above present mean sea level.

During the Pleistocene time sea level fluctuated during successive invasions and retreats. Terraces were formed successively at elevations of approximately 270, 215, 170, 100, 70, 42, and 25

[1] Op. cit.

[2] Dall, W. H., Contributions to the Tertiary fauna of Florida: Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 209, 1892.

FIGURE 3

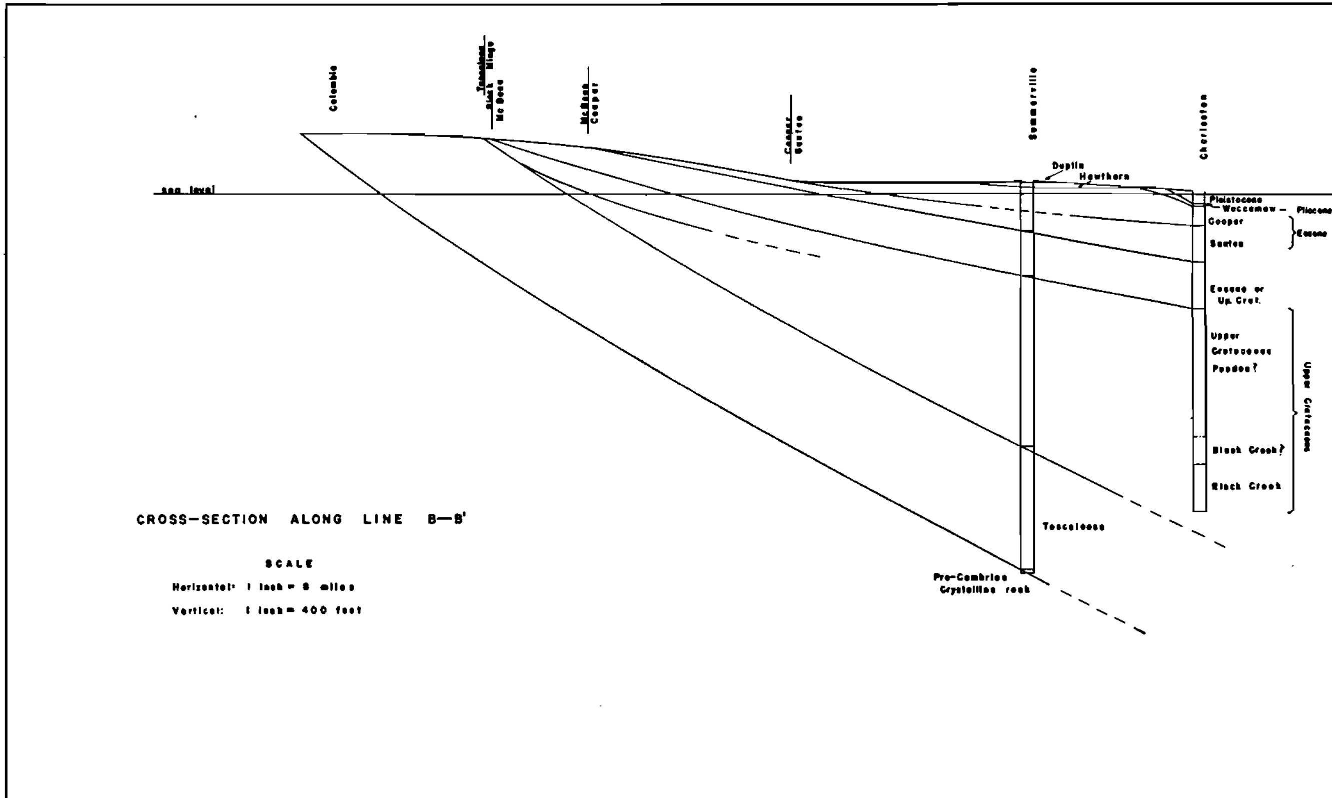
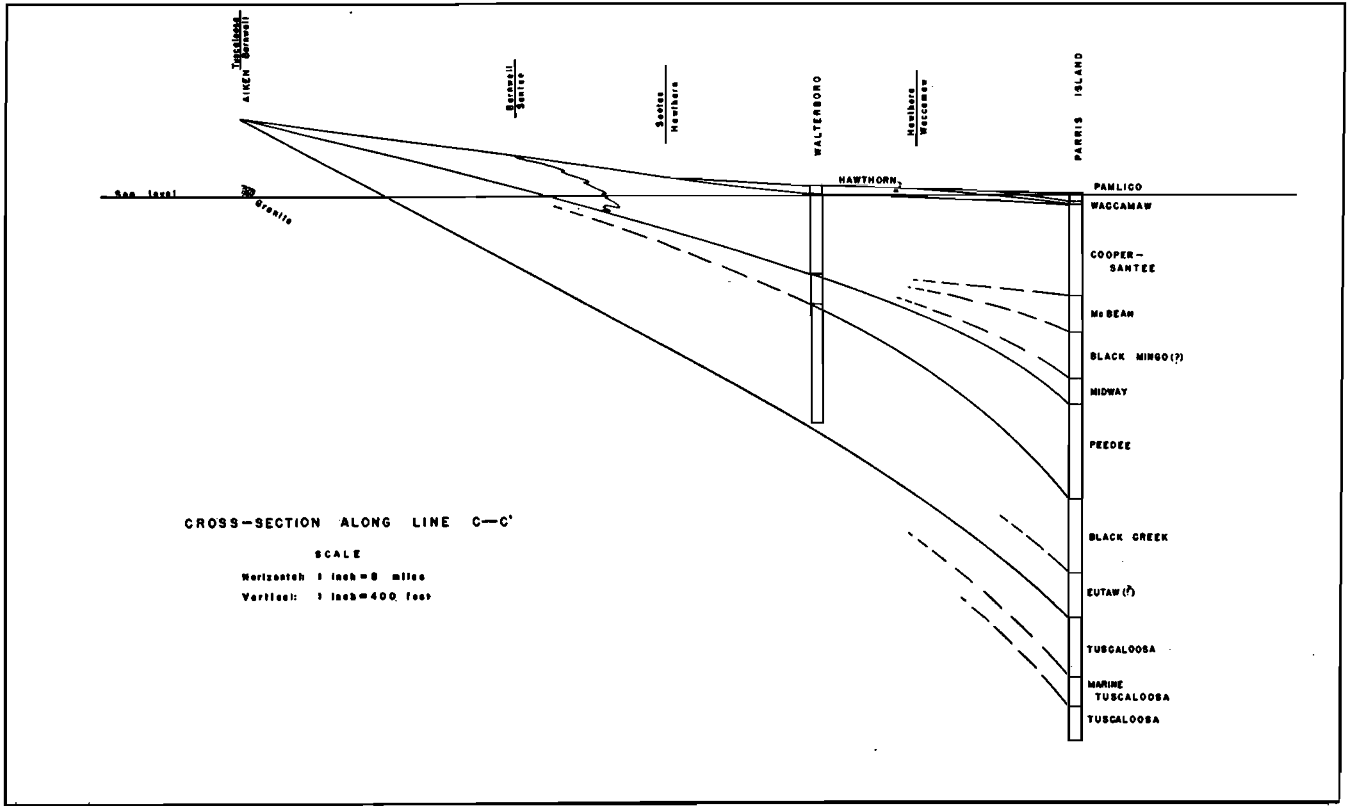

Columbia
Black Mingo
Mc Bean
McBean
Cooper
Cooper
Santee
Summerville
Charleston
sea level
Duplin
Hawthorn
Pleistocene
Waccamaw
Pliocene
Cooper
Santee
Eocene
Eocene or
Up. Cret.
Upper
Cretaceous
Peedee ?
Black Creek ?
Black Creek
Upper Cretaceous
Tuscaloosa
Pre-Cambrian
Crystalline rock
CROSS-SECTION ALONG LINE B—B'
SCALE
Horizontal: 1 inch = 8 miles
Vertical: 1 inch = 400 feet

FIGURE 4


Tuscaloosa
Barnwell
AIKEN
Barnwell
Santee
Santee
Hawthorn
WALTERBORO
Hawthorn
Waccamaw
PARRIS ISLAND
Sea level
Granite
HAWTHORN
PAMLICO
WACCAMAW
COOPER-
SANTEE
McBEAN
BLACK MINGO (?)
MIDWAY
PEEDEE
BLACK CREEK
EUTAW (?)
TUSCALOOSA
MARINE
TUSCALOOSA
TUSCALOOSA
CROSS-SECTION ALONG LINE C—C'
SCALE
Horizontal: 1 inch = 8 miles
Vertical: 1 inch = 400 feet

feet, respectively, above present mean sea level. Thus, over almost all the earlier Cretaceous and Tertiary deposits were deposited the Pleistocene sands and clays, forming mantles from about 5 to 40 feet thick.

One characteristic of the structure of the Coastal Plains sediments may be noted from figures 2 and 4, which show how the gentle slope of the formations break sharply and increases in gradient along a line approximately joining Mullins and Summerville. This break in slope is likewise evident in the North Carolina structure. One feature likely to confuse the picture is the effect that the Great Carolina Ridge has on a down-dip cross-section, as shown especially in figure 2. That is, there appears to be another break in slope between Conway and Myrtle Beach, resulting in a more gentle dip. This is due to the fact that the wells of Myrtle Beach are actually several miles up the southwestern flank of the arch and their sections were projected down to the cross-section line.

Ground Water in the Coastal Plain

INTRODUCTION

Ground water is much more abundant in the Coastal Plain than in the Piedmont. The rocks are more permeable, and artesian conditions exist in more than two-thirds of the Coastal Plain. The rocks are generally much softer than those in the Piedmont; thus drilling, digging, and jetting in them is relatively easy and inexpensive.

Yields of 300,000 gallons per day or more per well are quite common in most of the Coastal Plain, and in many places supplies totaling more than 3,000,000 gallons per day can be obtained from several wells. The Tuscaloosa, Black Creek, Peedee, and Ocala (equivalent of the Santee-Cooper unit) formations are the source of water for most of the drilled wells in the Coastal Plain.

Soft water can be obtained almost anywhere in the area, although it occurs at different depths in different areas. The greatest concentration of hard water used for municipal supply is in the southern triangle of the State, from Barnwell, Orangeburg, and Berkeley Counties southward. Of all the analyses made for this report, no indication of hard water in municipal supplies was found outside of this area. However, hard waters are present at some other places in the Coastal Plain usually, though not always, at shallow depths.

COASTAL PLAIN FORMATIONS AND THEIR WATER-BEARING CHARACTERISTICS

Upper Cretaceous Series

Tuscaloosa Formation.—The Tuscaloosa, the basal Upper Cretaceous formation in South Carolina, is the deepest and the most productive aquifer in the Coastal Plain. It consists of light-gray, tan, and white sands interbedded and cross-bedded with white, pink, and purplish clays and lenses of kaolin. It is generally 300 to 400 feet thick, although in the Parris Island well[1] a 784-foot interval has been classified as Tuscaloosa by J. B. Reeside, Jr., Horace G. Richards, and others[2].

The outcrop belt of the Tuscaloosa formation extends across the State from Augusta beyond the North Carolina State line. The outcrop ranges in width from about 8 miles at Augusta to about 50 miles near the northern border of the State and, together with the probable areas of infiltration underlying places where the overlapping Black Creek, Black Mingo, McBean, Barnwell, and Duplin formations are relatively thin, forms a very favorable recharge area. From Columbia to Summerville the Tuscaloosa has an average dip of 28 feet per mile to the southeast. From Aiken to Parris Island the average southeastward dip is also 28 feet per mile, and from Dovesville to Conway it is 18.1 feet per mile (see pl. 9.)

Of 74 wells 5 inches in diameter or larger, drilled into the Tuscaloosa, the average recorded yield was 253 gallons per minute. The maximum yield from one well was about 1,700 gallons per minute.

The water derived from the Tuscaloosa is soft. Up-dip toward the outcrop area it contains comparatively little mineral matter, but the content increases down-dip to the maximum near the coast.

Black Creek Formation.—The Black Creek formation, which is of Upper Cretaceous age, crops out in the lower parts of Darlington and Marlboro Counties, the northern parts of Marion and Florence Counties and most of Dillon County. It dips

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1 See figure 4.

2 Richards, H. G., Subsurface stratigraphy of Atlantic Coastal Plain between New Jersey and Georgia: Am. Assoc. Petroleum Geologists Bull. vol. 29, No. 7, p. 919, 1945.

PLATE 1

A. Tuscaloosa formation 2 miles northeast of Middendorf. Photograph by W. S. Pike.

B. Close-up of same locality showing typical cross-bedding and local unconformity. Photograph by H. G. Richards.

south and southeast. From Mullins to Myrtle Beach the average dip is 13.5 feet per mile. The thickness ranges from 140 feet at Florence to 570 feet near Conway.

Sloan[1] described the Black Creek as "unctuous black shaly clays enclosing interlaminations of extremely thin micaceous seams and occasional fine-grained sand."

Typically it has a rather shaly appearance, consisting of dark-gray semi-indurated clay layers with laminae of light to dark fine-grained micaceous sands.

The Black Creek formation lies unconformably on the Tuscaloosa strata. Stephenson[2] designated the upper part of the Black Creek formation the "Snow Hill" marl. In contrast with the lower part of the formation, this interval carries a prolific and characteristic marine fauna.

The hydrostatic head of the artesian water in the Black Creek formation is less than that of the Tuscaloosa, because of the lower altitude of the recharge area.

In most of the wells, the water from the Black Creek formation is soft, but it carries more mineral matter than that of the Tuscaloosa and almost everywhere has a higher bicarbonate content.

Of 47 wells more than 5 inches in diameter penetrating the Black Creek, the average yield per well was recorded as 251 gallons per minute. The maximum yield from a single well was 1,200 gallons per minute and the minimum 35 gallons per minute.

Peedee Formation.—The Peedee formation is of Upper Cretaceous age. Its area of outcrop extends from the North Carolina line southwestward in a belt across more than half of Horry County, the southern halves of Marion and Florence Counties, the eastern corner of Williamsburg County, and approximately the northern sixth of Georgetown County. In Williamsburg, Florence, and Marion Counties a thin layer of Miocene deposits, in addition to the Peistocene deposits, covers the Peedee.

The Peedee formation consists of fine to coarse sands and dark-gray to tan-gray sandy marls with interbedded thin layers of

[1] Sloan, Earle, Catalogue of the mineral localities of South Carolina: South Carolina Geol. Survey, ser. 4, Bull. 2, p. 442, 1908.

[2] Stephenson, L. W., Cretaceous formation of North Carolina, Part 1, Invertebrate fossils of the Upper Cretaceous formations: North Carolina Geol. and Econ. Survey, vol. 5, pt. 1, p. 9, 1923.

PLATE 2

A. Stratified sandy clays of continental (?) Black Creek formation and Sunderland terrace deposits just north of Cashua Ferry road, 8 miles northeast of Darlington. Photograph by W. S. Pike.

B. Laminated dark brown arenaceous clays of Black Creek formation at Floyd's Mill, 7 miles northeast of Darlington. Photograph by H. G. Richards.

hard marl rock or coquina. Because it is generally overlain by a thin mantle of Eocene, Miocene, Pliocene, or Pleistocene deposits, the Peedee crops out mainly in the beds of waterways such as the Pee Dee River or the Intercoastal Canal.

The recharge area or outcrop belt of the Peedee formation is down-dip from those of the Tuscaloosa and the Black Creek formations and consequently the artesian water has a lower hydrostatic head.

From a point southeast of Mullins to a well near Conway, the Peedee formation dips about 16 feet per mile southeastward. From Walterboro to Parris Island it dips approximately 25 feet per mile to the southeast.

The thickness ranges from 190 feet at Walterboro, Colleton County, to 590 feet at Parris Island, Beaufort County, and 808 feet at Charleston.

The average yield of 16 wells tapping water in the Peedee formation was 215 gallons per minute. The maximum yield for any single well in this formation was 700 gallons per minute and the minimum yield was 60 gallons per minute. A number of wells penetrating the Peedee also penetrated other aquifers, and it was not possible to determine how much of the water was obtained from the Peedee.

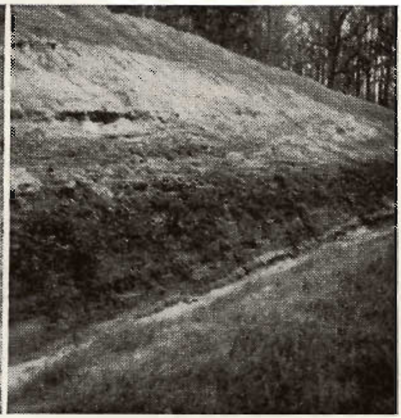
Water from the Peedee formation is usually soft but high in bicarbonate.

Eocene Series

Black Mingo Formation.—The Black Mingo formation, of lower Eocene age, is at or near the surface in a wide area from the western half of Georgetown County to the eastern two-thirds of Lee and Sumter Counties and in some parts of eastern Richland County. It is composed of dark-brown to black brittle clays or shales interbedded with yellow, red, and brown sands or sandy clays. It ranges in thickness from a feather edge to 125 feet and dips gently to the southeast.

Many small wells used for domestic and agricultural purposes tap water in the Black Mingo formation. With regard to larger wells used by municipalities or industrial concerns, an average yield of 188 gallons per minute was recorded for six wells. The largest yield of this group was 450 gallons per minute and the smallest was 50 gallons per minute.

PLATE 3



A. Laminated black shaly clay and sand of Black Creek formation in cut at new bridge over Pee Dee River 11 miles east of Florence.

B. Same formation as (a) with view looking east instead of west.

C. Silicified fossil tree trunks removed from the Black Creek formation at location shown in (A) and (B).

McBean Formation.—The McBean formation, of middle Eocene age, consists of thin glauconitic marls of a greenish tinge, light and reddish-colored sands, fuller's earth, and lenses of limestone indurated with silica. Gray to greenish-colored shales or brittle clays are also found in the section.

The thickness of the McBean formation was recorded as about 225 feet in the Parris Island well, No. 387, and probably ranges between 75 and 225 feet throughout its extent. In an oil test well 6 miles northwest of Savannah, Georgia, the McBean had a thickness of 450 feet.

The average yield of 10 wells penetrating the McBean was 193 gallons per minute, with a maximum yield for a single well of 300 gallons per minute and a minimum of 21 gallons per minute. The average hardness of water from five wells in the McBean formation was 56 parts per million, which is relatively low.

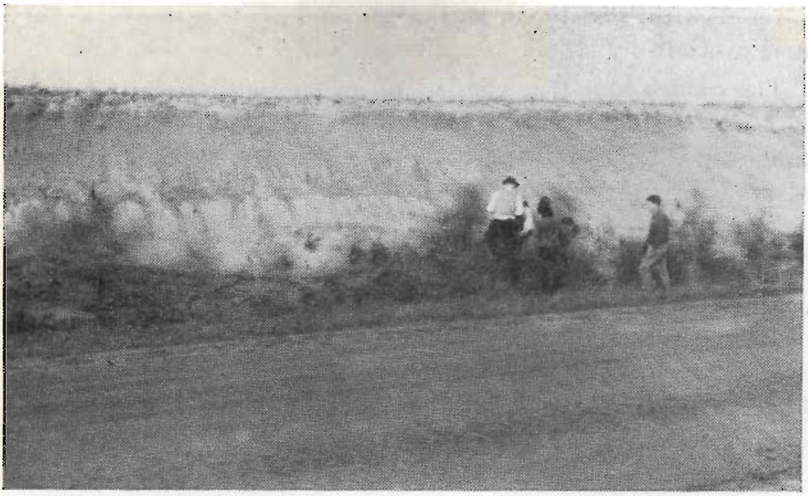
Barnwell Sand.—The Barnwell sand, of upper Eocene age, lies near the surface in the area of Aiken, Barnwell, Allendale, and Bamberg Counties. It consists of red, gray, and greenish-yellow interbedded sands and clays. The Barnwell sand ranges from 100 to 200 feet in thickness in the thickest sections, but in most of South Carolina it rarely exceeds 100 feet in thickness. It dips gently to the southeast.

The average yield of 14 wells penetrating the Barnwell was 175 gallons per minute. The maximum yield for a single well in this aquifer was 400 gallons per minute and the minimum was 84 gallons per minute. The average hardness of four samples of water from the Barnwell sand was 28 parts per million, which represents a rather soft water.

Cooper-Santee Unit and Its Equivalent, the Ocala Formation.—The Cooper-Santee unit, which is of upper Eocene age and is the equivalent of the Ocala limestone in Georgia and Florida and of the Castle Hayne marl in North Carolina, extends over a wide triangle in the southern part of South Carolina, from the western part of Allendale County on the Savannah River to Creston, Calhoun County, on the north, and Santee, Charleston County, on the east.

In South Carolina the term Cooper-Santee is used for the most part for the formation where it crops out, whereas the name Ocala has been used to designate the correlated subsurface occurrences of the unit.

PLATE 4



A. Laminated, glauconitic, fossiliferous, green, brown, and red sand of McBean formation on Bellville road 4.5 miles northwest of Creston. Photograph by W. S. Pike.

B. Santee limestone formation in abandoned pit near Holly Hill, Orangeburg County. Photograph by H. C. Richards.

In the northern part of its belt the Cooper-Santee unit is covered with Pleistocene sediments and in the southern part it is overlain by Oligocene, Miocene, and Pliocene deposits.

The Santee limestone consists of a limestone which is usually soft but in places forms hard ledges of indurated rock. It ranges in color from a pure white to a coffee-brown. In many places there are inclusions of light green glauconitic grains.

The Cooper marl consists of a grayish-green marl, plastic to hard, depending upon its moisture content.

The Cooper-Santee unit is considered the seaward equivalent of the coarser-grained Barnwell sand. The thickness of the unit is 500 feet at Walterboro and 364 feet at Charleston, and at Parris Island in Beaufort Couny it is 550 feet. It dips to the southeast from 5 to 9 feet per mile.

The average yield of 32 wells drilled into the Cooper-Santee unit was 464 gallons per minute, but the yield covered a wide range, from a minimum of 5 gallons per minute to a maximum of 2,000 gallons per minute.

The water from the Cooper-Santee unit (Ocala) is usually moderately hard and high in bicarbonate content and in some wells it has a high iron content. In Beaufort County was found the hardest water, one analysis showing 216 parts per million. The softest water found in this formation was in well 668 (see tables of well data), which showed a hardness of 90 parts per million. The average hardness of all samples taken from the formation was 141 parts per million, which represents a hard water. This, of course, is to be expected in an aquifer made up largely of calcareous material.

In iron content the water of the Santee-Cooper unit exceeds the recommended limit of 0.3 part per million set by the Public Health Service. The average iron content of 11 samples from wells in this unit was 0.59 part per million. The highest iron content, 1.6 parts per million, was in well 360 in Beaufort County.

Because of its proximity to salt water in Charleston and Beaufort Counties, the water in the Cooper-Santee unit in some places contains an excessive amount of chloride, especially where the fresh-water head has been lowered excessively by pumping.

Oligocene Series

Flint River Formation.—The Flint River formation is the only deposit of Oligocene age yet found in South Carolina. Consisting of yellowish to reddish-brown sand and silicified limestone, it is confined in extent to the southwestern part of Allendale County, along the Savannah River. It is approximately 50 feet thick.

Data on wells in this formation are not available, but it probably is not an important aquifer either from the standpoint of quantity of water available or from that of the number of users involved.

Miocene Series

Hawthorn Formation.—The Hawthorn formation, of lower Miocene age, consists of limestone, marl, phosphatic sands, and fuller's earth, and extends over an area comprising the greater parts of Hampton and Colleton Counties, the northern parts of Jasper, Beaufort, and Charleston Counties, and the southern parts of Dorchester and Berkeley Counties. It underlies a thin veneer of Pleistocene sediments and ranges from 30 to 160 feet in thickness.

A small amount of data concerning the yield of wells in the Hawthorn formation is available. The average yield of the few wells noted was 6 gallons per minute. However, the data are far too few to permit using this figure as representative. The available information on the chemical character of the water is likewise meager.

Duplin Marl.—The Duplin marl, of upper Miocene age, underlies parts of Darlington, Lee, Sumter, Clarendon, Williamsburg, Florence, and Marion Counties, and ranges in thickness from 12 to 40 feet. At Darlington it is about 20 feet thick.

The Duplin marl overlies the eroded surface of the deposits of Upper Cretaceous to lower Miocene age. It represents an inundation by the sea over a wide area during late Miocene time. The resulting deposit was rather thin and subsequently most of it has been washed away, leaving the remnants as they now appear.

The only municipal well obtaining water from the Duplin marl is in Sumter County and yields 25 gallons per minute.

PLATE 5

East bank of Intercoastal Canal 8¾ miles northeast of Myrtle Beach showing the Peedee formation cropping out at water level over-lain by the Pliocene and Pleistocene formations. Photograph by W. S. Pike.

Pliocene Series

Waccamaw Formation.—The Waccamaw formation, of Pliocene age, underlies a more or less narrow belt from the northern border of Horry County southwest to the vicinity west of Charleston. It is also quite thin. In the northeastern part of its belt it lies unconformably upon the Upper Cretaceous deposits and in the southern part it lies on the Upper Cretaceous and lower and upper Eocene sediments. Where it does not actually crop out, it is overlain by Pleistocene or Recent terrace deposits. It ranges in thickness from 15 feet at Parris Island to 30 feet at Summerville and 58 feet at Charleston. It dips gently to the south-southeast.

The water in the Waccamaw formation is usually hard. The average yield of four municipal wells tapping this aquifer was 51 gallons per minute, with a maximum of 132 gallons per minute and a minimum of 20 gallons per minute.

Pleistocene Series

Pleistocene Formations.—The Pleistocene deposits cover a large part of the Coastal Plain as a mantle of sand, gravel and, in the Pamlico formation, clay.

From an elevation of 270 feet above sea level down to sea level, the Pleistocene deposits underlie seven different terraces. Listed in order from oldest to youngest, the terraces and underlying Pleistocene deposits are named the Brandywine, Coharie, Sunderland, Wicomico, Penholoway, Talbot, and Pamlico.

The water from these formations is usually of a good quality, from rather soft to moderately hard and with a bicarbonate content considerably lower than that of water from the older deposits. Their close proximity to the surface, however, makes their water subject to pollution, and periodic bacteriological analyses of water from wells penetrating them should be made.

The average yield of 64 wells penetrating Pleistocene deposits was found to be 44 gallons per minute, with a maximum yield of 130 gallons per minute and a minimum of 10 gallons per minute.

The average hardness of water in the Pleistocene sands was 80 parts per million, which is classified as moderately hard. In comparison with water from the Cretaceous and Tertiary deposits, that of the Pleistocene deposits is rather high in sulfate and nitrate. However, it contains less fluoride than the water from any other beds, except possibly the Barnwell sands.

The iron contained in water from Pleistocene deposits, is, on the average, higher than the desirable limit set up by the U. S. Public Health Service.

Quality of Water in the Coastal Plain

Many of the general statements on the chemical character of ground waters in the Piedmont are equally applicable to the Coastal Plain. However, in general, the waters from sedimentary rocks are more variable in quality and in places are more highly mineralized than those in areas of crystalline rocks.

The mineral constituents of most importance as far as the Coastal Plain is concerned are chloride, iron, fluoride, hardness, and total solids. The chloride content in ground water may be derived from one or more of several sources. It may be derived from a connate body of water, that is, water that was enclosed in the sediment as it was deposited in the sea. Along with this might be mentioned the salt water that has entered a formation subsequent to its deposition but previous to the present time. This cannot accurately be called connate water, but it does represent a body of saline water older than the present sea water. Such a body may result from lateral intrusion of water from a saline body through a permeable layer.

In most places undiluted connate water contains more calcium than magnesium. Undiluted sea water or recently-intruded water has more magnesium than calcium. Thus, the amounts of these constituents in water from any particular area might serve to indicate the source of the water or the amount of intrusion of sea water that has taken place recently.

About 1900, Herzberg[1] in Germany derived a formula for expressing the relation between fresh and salt water in the case of a land mass surrounded by salt water. This has been known as the Ghyben-Herzberg theory, and the equation is stated as

$$h = \frac{t}{g-1}$$

where g is the specific gravity of salt water, t the height of the water table above the mean sea level, and h the depth from mean sea level to the salt water-fresh water contact. As the specific gravity of sea water is about 1.025, at a place where the fresh-water head is 2 feet above mean sea level, the fresh water would extend to a depth of 80 feet below sea level. Withdrawal of water by pumping or artesian flow from wells causes the water level to drop and the salt water to "cone" up under the well, and if the head is reduced to sea level, the salt water will eventually rise to sea level.

In the case of a seaward-dipping artesian aquifer near the sea, salt water will move up the aquifer if the artesian pressure is less than the head of the sea water at the submarine outcrop of the aquifer. If the pressure of sea water at the submarine outcrop is less than the head of fresh water in the aquifer, fresh water will discharge from the aquifer at the outcrop.

To predict accurately the depth to salty water in any locality in South Carolina requires intensive study of local conditions and collection of hydrologic data. However, in general, the salt content increases with depth and down-dip toward the sea.

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1 Herzberg, Baurat, Die Wasserversorgung einiger Nordeseebader: Jour. Gasbeleuchtung und Wasserversorgung, Jahrg. 44, Munich, 1901.

Mundorff[1] has shown that, in North Carolina, water with a relatively high chloride content occurs adjacent to or underlying old bays or drainage areas, some of which have subsequently been changed or filled with sediments. Similar conditions appear to exist in a few scattered localities in South Carolina.

The U. S. Public Health Service standards recommend a water supply with a maximum chloride content of 250 parts per million. Several areas in South Carolina, principally along the coast, have ground waters with excessive chloride content. Some of the old city wells of Charleston yield water with about 1,500 parts per million. These wells yield water from the Peedee formation or the Ocala limestone. However, wells in the same locality that penetrate the Black Creek formation yield water with a much smaller chloride content. This may be due either to the greater hydrostatic head of the artesian water in the Black Creek aquifer or to the absence of a submarine contact with the sea water. Inland from the coast, however, those formations with a high saline content on the coast yield water with an appreciably lower chloride content. In the area around Parris Island and Beaufort highly saline water is obtained from wells drilled into the Ocala and some of the deeper formations, but there too the chlorine content decreases rapidly up-dip or away from the shore line. In wells penetrating the upper limestone members of the Ocala, the salinity is due to lateral intrusion of sea water, whereas in the deeper formations it may be due to connate water or water that has entered the rocks in the past, subsequent to their deposition.

In the deep well at Parris Island the water is taken from the lower part of the Black Creek formation and upper part of the Tuscaloosa formation and has a chloride content of 42 parts per million.

A study of the chloride content of waters at shallow depths in several coastal States[2] indicates the isochlors (or lines of equal chloride content) are approximately parallel to the coast. The relatively high chloride of a sample of water from a well at

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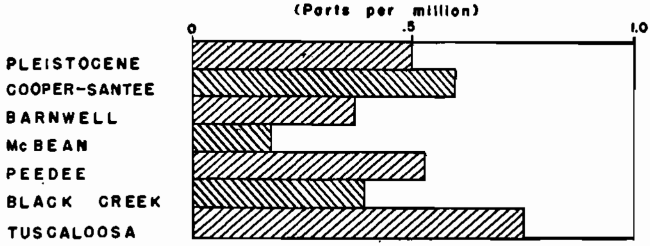
1 Mundorff, M. J., Progress reoprt on ground water in North Carolina: N. C. Dept. Conservation and Development Bull. 47, p. 34, 1945.

2 Brown, John S., A study of coastal ground water: U. S. Geol. Survey Water-Supply Paper 537, 1925.

Williston, Smith, Lee, and Foote, Report on examination of Connecticut water supplies: Conn. Bd. Health, 14th Rept., 1891.

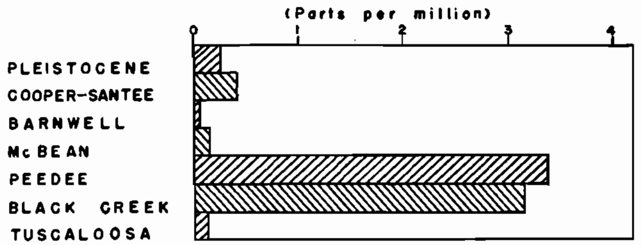
PLATE 6

AVERAGE IRON CONTENT OF COASTAL PLAIN AQUIFERS



A

AVERAGE FLUORIDE CONTENT OF COASTAL PLAIN AQUIFERS



B

Loris, in Horry County, about 20 miles from the present coast but within about 4 miles of the older Pliocene embayment may be due to water that occupied an estuary in the Pliocene sea.

Chloride is a characteristic constituent of household wastes and sewage. However, its presence in water in amounts greater than normal does not necessarily indicate pollution because of the many sources of chloride other than human wastes, such as salt deposits or sea water.

Iron.—Iron is present in some form in almost every type of rock. Waters with high iron contents may be found in all parts of the Coastal Plain. Generally the amount of iron in well waters decreases with depth, but some relatively deep wells also yield waters with excessive amounts of iron.

The U. S. Public Health Service has set the figure of 0.3 part per million as the maximum desirable amount of iron (or of iron and manganese together where manganese is present). The attached table of chemical analyses shows that the iron content of untreated water from many wells in Coastal Plain sediments exceeds this limit.

Of 77 samples of water from wells in Coastal Plain sediments, 41 contained more than 0.3 part per million of iron. In Beaufort County an 84-foot well in the Ocala formation yields water with an iron content of 1.6 parts per million. In the same county water from a 125-foot well had 0.54 part per million. In the city of Florence water from a 735-foot well in the Tuscaloosa formation had 3.0 parts per million, whereas water from another well in Florence, 650 feet deep, also in the Tuscaloosa, had an iron content of only 0.35 part per million. These records indicate that in the same locality and in the same aquifer there may be substantial differences in the iron content.

The iron content of surface-water supplies is usually quite low and is generally reduced still further in the process of filtration that is usually necessary.

Ground waters may contain a large amount of iron, usually in the form of iron bicarbonate. Upon exposure to the air, the iron is oxidized and reddish-colored iron oxide is precipitated.

The municipal supply of Columbia, taken from the Broad and Saluda Rivers, contained 0.14 part per million of iron. That of Florence, from wells in the Black Creek and Tuscaloosa formations, had 1.0 part per million. That of Spartanburg, from

South Pacolet River, had 0.08 part per million, and that of Sumter, from shallow wells in the Black Mingo formation, contained 0.40 part per million of iron.

Other analyses showing iron contents in excess of 0.3 part per million are those for a 70-foot well in Lexington County, penetrating the Barnwell sand, showing 0.81 part per million; a 2,001-foot well in Charleston, tapping the Black Creek formation and yielding water with 1.0 part per million; a 500-foot well in the town of Rockville, Charleston County, in the Ocala formation, showing 0.72 part per million; an 832-foot well in Hampton, in the Tuscaloosa formation, showing 0.42 part per million; a 35-foot well in Blenheim, Marlboro County, in Pleistocene sands, showing 0.50 part per million; a 365-foot well in Loris, Horry County, in the Peedee-Black Creek unit, showing 0.82 part per million; and a 65-foot well in Lane, Williamsburg County, in the Ocala (?), showing 1.00 part per million.

The maximum recorded iron content, 4.90 parts per million, was in a sample of water from a well 180 feet deep in Berkeley County. Apparently the water is from the Black Mingo formation. The minimum iron content, 0.10 part per million, was in samples from wells in the Ocala formation in Beaufort County and in the Barnwell sand in Aiken County.

Waters with high iron contents are objectionable because of the staining of clothing in laundering and of bathroom fixtures. It also forms a scale and sludge in water pipes and tanks.

Water containing considerable free carbon dioxide is corrosive and will dissolve iron from pipes, pumps, and tanks.

Hardness.—In many places the waters at shallow depths are harder than the waters from deeper sources because of base exchange, in which sodium and potassium in the sediments are exchanged for calcium and magnesium in the water as it moves downward. In a few places, waters were observed to be hard at or near the outcrop areas of the Tuscaloosa, Black Creek, and Peedee formations but were observed to be quite soft near the coast.

Wells penetrating or receiving water from the calcareous sediments of Eocene and Miocene age commonly yield hard waters.

Waters from the Cretaceous formation are usually soft. However, where these formations are overlain by Eocene and Mio-

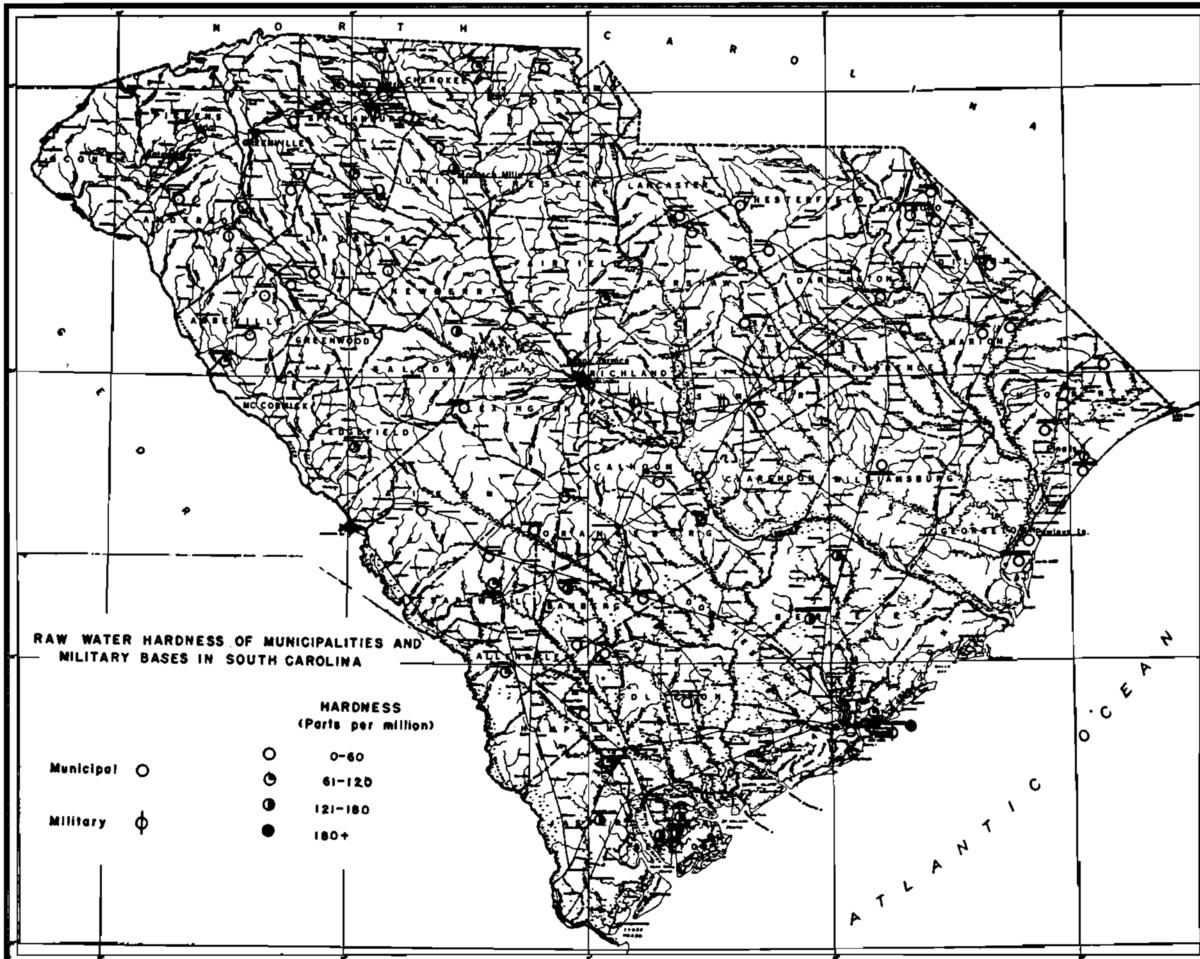


Plate 10—United States Department of the Interior, Geogolical Survey in Cooperation with South Carolina Research, Planning and Development Board

cene calcareous sediments, the waters are hard near the contact and soften with depth, probably again as a result of base exchange.

A sample of water from an 87-foot well in the Ocala formation in Beaufort County had a hardness of 123 parts per million but a sample from a 1,400-foot well in Dale, Beaufort County, in the Peedee formation, had a hardness of only 21 parts per million. In Moncks Corner, Berkeley County, a sample from a well 188 feet deep in the Peedee formation had a hardness of 182 parts per million.

In Charleston, a 425-foot well in the Ocala formation yielded water with a hardness of 180 parts per million, a 1,260-foot well in the Peedee formation showed a hardness of 69 parts per million, but a 2,001-foot well in the Black Creek formation showed a hardness of only 9 parts per million.

In other areas it has been shown that the hardness decreases with depth as a result of base exchange by silicates as, for instance, in the Tertiary deposits of Montana as described by Renick[1]. He summarizes this as follows: "Studies of ground water in an area of Lance (Tertiary ?) and Fort Union (Tertiary) formations in east-central Montana, in the Great Plains province, show that near the surface the water is relatively high in calcium and magnesium, which, with increasing depth, are exchanged for sodium (and potassium ?), the result being a natural softening. The minerals of the leverrierite group, which are plentiful though disseminated in these formations and are believed to be derived from the decomposition in place of the glassy constituents of rock fragments, are considered the principal agents in effecting this change of bases, though the exchange may be aided by such minerals as kaolinite, feldspar, and mica, which are also present in these rocks." This vertical exchange may be characteristic of the softening process in the South Carolina Coastal Plain but it also seems probably that a lateral movement of the water and consequent base exchange by silicates would be a contributing factor.

The amount of carbon dioxide is one of the controlling factors in the hardness of ground water. Waters with relatively large

[1] Renick, B. Coleman, Base exchange in ground water by silicates as illustrated in Montana: U. S. Geol. Survey Water-Supply Paper 520-D, pp. 53-72, 1925.

amounts of carbon dioxide will dissolve greater amounts of calcium and magnesium carbonates.

The hardest water was from the Ocala formation. The average for this formation was 141 parts per million. The next hardest was that of the Pleistocene deposits, which averaged 80 parts per million. The softest waters analysed were those from the Black Creek formation and Tuscaloosa formations, with averages of 18 and 20 parts per million, respectively.

Dissolved Solids.—In the survey of municipal supplies in the Coastal Plain no separate test was made for total dissolved solids. However, data from other sources indicate that the most highly mineralized water is in the Charleston County area, where the content of dissolved solids ranges from 300 to about 3,500 parts per million. In this locality some very soft waters are present, so that the mineralization is reflected in high sodium and potassium ratios.

Fluoride.—Drinking water containing more than 1 part per million of fluoride may cause permanent mottling of teeth when used continuously by young children. The teeth are flaked and pitted and develop a brown staining which may result in their permanent injury. These extreme effects, however, occur only where the fluoride content rises to several parts per million. When it is present in the amount of 1 part per million or less, however, fluoride is thought to be beneficial in the prevention of tooth decay. In the recent Nation-wide survey, Van Burkalaw[1] states ". . . for it has been demonstrated that a small amount of fluorine, about one part per million, is necessary for optimum dental health. Where the fluorine content is much less than this, the dental-caries experience rates are high; where it is greater, the disfigurement known as dental fluorosis or mottled enamel is endemic."

In the Nation-wide survey mentioned above, only sparse information was available for the South Carolina public supplies. Five or more analyses were made for Horry County, and for the remaining coastal counties only one to four analyses were available. The data showed, for Horry County, the maximum fluoride content as 1.5 parts per million or more, and for the remaining coastal counties the content was shown as ranging

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[1] Van Burkalaw, Anastasia; Fluorine in United States water supplies: Georgraphical Review, vol. 36, No. 2, p. 177, Apr. 1946.

from 0.5 to 0.9 part per million. As may be seen from the table of analyses, page 112, the water from some wells in these counties contains much larger amounts of fluoride.

According to the table of analyses, the occurrence of fluoride in amounts greater than 1 part per million is restricted to wells 290 feet or deeper and penetrating the Peedee, Black Creek, McBean, and Ocala formations as aquifers. In these wells the highest fluoride content was 7.0 parts per million, from the interval between 2,600 and 2,811 feet in a test well at Parris Island, Beaufort County, representing the base of the Black Creek and top of the Tuscaloosa formation. This interval is the probable equivalent of the Eutaw formation.

In the Coastal Plain region one generally recognized source of fluoride in ground water is the phosphatic material found in some of the sediments. The Eutaw formation of Mississippi and Alabama is composed of volcanic and phosphatic material and lignite. In Alabama it is considered to be the chief source of fluoride in the ground-water supplies[1]. It is signifcent to note that, in Beaufort County, the highest recorded amount of fluoride, 7.0 parts per million, was in water from the interval that probably represents the Eutaw formation.

The high-fluoride waters of Florida are ascribed to the volcanic and phosphatic composition of the Hawthorn formation[2].

In South Carolina the Hawthorn formation occurs in the western or inland part of the high-fluoride areas south of the Santee River. However, this formation is absent north of the river in Horry and Georgetown Counties, where there are also high-fluoride waters.

All the analyses from points west of counties bordering or near the coast show less than 1.0 part per million of fluoride.

Some investigators[3] have found a correlation between the amount of fluoride and the amount of bicarbonate in the water. This correlation holds true in the South Carolina Coastal Plain, but only roughly. It is also possible, as suggested by Mundorff[4]

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1 Carlson, C. W., Fluoride in the ground water of the Cretaceous area of Alabama: Alabama Geol. Survey Bull. 52, pp. 16-20, 1942.

2 Black, A. P., Stearnes, T. W., McClane, H. H., and McClane, T. K., Fluorine in Florida waters: Am. Water Works Assoc., Fla. section, Proc. 9th Ann. Convention, pp. 22-35 (mimeographed), 1935.

3 Carlston, C. W., op. cit.

4 Op. cit.

for North Carolina, that the relation is one of time and distance traveled, the fluoride being derived from the phosphates and glauconite or other material that causes base exchange.

The following table shows well whose water contains more than 1.0 part per million of fluoride.

WELLS YIELDING WATER WITH MORE THAN 1 PART PER MILLION OF FLUORIDE

No.	LOCATION	Depth (feet)	AQUIFER	Distance in miles from the nearest area of salty ground water (some distances uncertain)	MINERAL CONTENT Parts Per Million HCO_3	Cl	F
358	Burton	750	McBean ?	13	335	14	3.8
363	Dale	1,400	Peedee	19	683	87	2.8
387	Parris Island	2,600-2,800	Tuscaloosa-Black Creek (Eutaw ?)	—1	1,316	82	7.0
420	Charleston	1,970	Black Creek	—1	752	178	5.0
474	Walterboro	2,000	Tuscaloosa-Black Creek	32	190	5.5	1.2
531	Georgetown	720	Black Creek	14	477	38	1.2
535	Murrel's Inlet	480	Black Creek	—1	639	34	4.6
536	Pawley's Island	660	Black Creek	—1	657	42	4.4
562	Conway	438	Peedee	14	595	68	3.6
563	Conway	400	Peedee	1	592	50	4.0
565	Conway	290	Peedee	1	609	35	4.6
578	Loris	397	Peedee	21	566	290	3.5
584	Myrtle Beach	548	Black Creek	—1	688	57	5.0
586	Myrtle Beach	571	Black Creek	1	609	90	3.6
592	Myrtle Beach	504	Black Creek	1	656	107	4.8
596	Myrtle Beach	555	Black Creek	1	591	86	4.6
597	Myrtle Beach	548	Black Creek	1	663	67	4.6
601	Pine Island	450	Peedee	—1	629	37	4.4
602	Pine Island	——	——	—1	694	57	5.0
716	Kingstree	630	Black Creek	38	183	5	1.8

Temperature of Ground Water in the Coastal Plain

As stated in the section on quality of water in the Piedmont, the temperature of the shallow ground water is usually a few degrees higher than the mean annual temperature of the atmosphere. The average atmospheric temperature for the Coastal Plain, as reported by the Weather Bureau, is 64.2° F. The average ground-water temperature in this area was 66.5° F. These temperatures were measured during the warm spring months.

The temperature of ground water increases with increase in depth. The rate of increase is designated as the thermal gradient of the area and in general is about 1° F. for each 50 to 100 feet of increase in depth. It might be noted here that temperatures of 100° F. were observed in several of the deeper wells in Charleston and Beaufort Counties.

In a well at Parris Island the water from a depth of 2,700 feet has a temperature of 103.5° F. The shallow ground water of the area has a temperature of 67° F. The difference in temperature of 36.5° F. and the difference in depth of 2,700 feet give a thermal gradient in this area of 74 feet per degree.

Observations of Water Levels in the Coastal Plain

An observation-well program was begun in 1939 in Beaufort and Jasper Counties, South Carolina, as part of an investigation of the ground-water conditions in the heavily-pumped artesian area centering in Savannah, Georgia. This program included 10 wells, nine in Beaufort County and one in Jasper County. These wells ranged in depth from 76 to 503 feet. In the last published report on these observations, Warren[1] states that "The artesian water levels in the southern part of Jasper County and that part of Beaufort County west of Port Royal Sound continued to decline in 1943 owing to the continued heavy pumpage in the industrial section of the Savannah area. This pumpage was estimated to average 3½ to 4 million gallons a day more in 1943 than in 1942. The greatest decline in water level in the South Carolina part of the Savannah area occurred in the wells situated nearest the city of Savannah."

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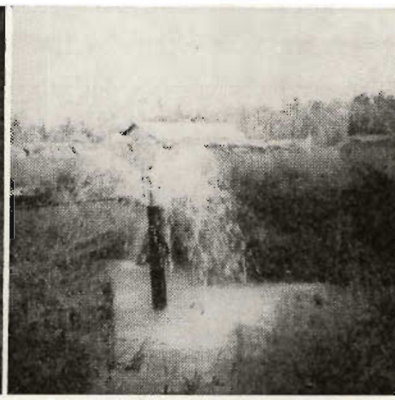
1 Warren, M. A., Water levels and artesian pressure in observation wells in the United States in 1943, Part 2, Southeastern States: U. S. Geol. Survey Water-Supply Paper 987, p. 135, 1945.

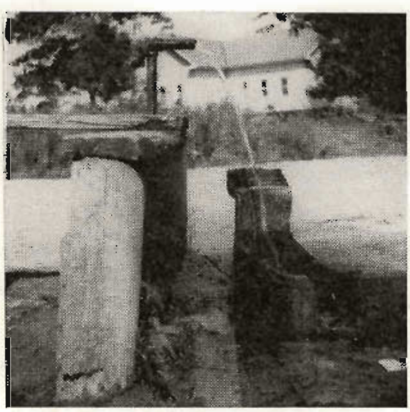
These comments are not presented as representative of the ground-water levels throughout the entire Coastal Plain but merely those applicable to restricted areas of heavy withdrawal.

In the present cooperative ground-water program, plans are being made to maintain observation wells in order to obtain current data on ground-water levels throughout the State.

PLATE 7



A. Flowing well near Sumter, Sumter County. B. Flowing well near Fairfax, Allendale County.



C. Flowing well near Conway, Horry County.

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RECORDS OF DRILLED WELLS IN THE PIEDMONT

Well No. LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
Abbeville County:									
1. Abbeville	City	....	60	6	......	40	Granite	Slope	See analysis.
2. Abbeville	City	....	40	6	......	40	Granite	Valley	
3. Abbeville	City	....	30	6	......	40	Granite	Valley	
4. Abbeville	Abbeville Mill Corporation	....	120	6	......	40	Granite	Flat	See analysis.
5. Abbeville	Abbeville Mill Corporation	....	112	6	......	40	Granite	Flat	
6. Abbeville	Abbeville Mill Corporation	....	90	6	......	40	Granite	Flat	
7. Calhoun Falls	Town	....	187	8	*40	125	Granite gneiss	Slope	See analysis.
8. Calhoun Falls	Town	....	187	8	*40	40	Granite gneiss	Valley	
9. Calhoun Falls	Calhoun Mills, Inc.	....	95	4	......	29½	Granite gneiss	Flat	
10. Calhoun Falls	Calhoun Mills, Inc.	....	87	6	......	58	Granite gneiss	Flat	Flows after standing 2-3 hours.
11. Calhoun Falls	Calhoun Mills, Inc.	....	15–20	2	......	40	Mantle	Valley	Residual clay derived from granite.
12. Calhoun Falls	Calhoun Mills, Inc.	....	15	2	......	40	Weathered granite	Draw	
13. Due West	Town	Robbins	125	5⅝	*31	30	Granite	Slope	Temperature 60° F. See analysis.
14. Due West	Town	Robbins	56	5⅝	*10	100	Granite	Draw	
15. Due West	Town	Robbins	70–82	5⅝	*0–3	100	Granite	Slope	Battery of 4 wells.
16. Due West	Town	Robbins	125–180	5⅝	*10	100	Granite	Draw	Battery of 3 wells.
17. Due West	Town	Robbins	175	5⅝	*35	20	Granite	Draw	
18. Due West	Town	Robbins	135	5⅝	*35	20	Granite	Hill	
19. Due West	Town	Robbins	127	5⅝	......	10	Granite	Valley	
20. Due West	Town	Robbins	148	5⅝	......	...	Granite	Valley	Abandoned.
21. Due West	Town	Robbins	140	5⅝	......	4–5	Granite	Valley	Abandoned.
22. Due West	Town	Robbins	175	5⅝	......	4–5	Granite	Slope	Abandoned.
Anderson County:									
23. Anderson	Appleton Company	....	152	6	......	25	Oligoclase biotite schist	Flat	

24.	Anderson	Appleton Company	....	152	2	......	25	Oligoclase biotite schist	Flat	
25.	Anderson	Appleton Company	....	152	2	......	25	Oligoclase biotite schist	Flat	
26.	Anderson	Equinox Mill	Robbins	200	6	*10	30	Blue granite	Slope	Drawdown 18 feet after 22 hours pumping at 30 gallons per minute. See analysis.
27.	Anderson	Equinox Mill	....	128	6	*0	30	Oligoclase biotite schist	Slope	
28.	Anderson	Equinox Mill	....	203	6	......	30	Oligoclase biotite schist	Slope	
29.	Anderson	Equinox Mill	....	50	2	......	60	Oligoclase biotite schist	Draw	Drilled in 1918.
30.	Anderson	Anderson Fertilizer Plant	....	240	6	*20	20–40 (?)	Granite	Flat	
31.	Belton	Town	B. S. Harris	263	6	......	175	Granite	Slope	Drawdown 263 feet in less than 1 hour at 175 gallons per minute. Abandoned.
32.	Belton	Town	Robbins	215	6	*60	58	Granite	Slope	Drawdown 45 feet at 58 gallons per minute. See analysis.
33.	Belton	Town	Hubbell	60–90	2	*3	60–70	Granite	Draw	Drawdown 9 feet at 60-70 gallons per minute.
34.	Belton	Town	....	135	6	*40	17	Granite	Hill	Drawdown 10 feet in 2-3 hours at 17 gallons per minute.
35.	Belton	Belton Cotton Mills, Inc.	Robbins	175	6	*20	35–40	Granite	Flat	Drawdown 110 feet at 35 gallons per minute.
36.	Belton	Belton Cotton Mills, Inc.	Robbins	179	6	*6	58	Granite	Slope	Drawdown 74 feet at 58 gallons per minute.
37.	Belton	Belton Cotton Mills, Inc.	....	200	6	......	11	Granite	Flat	
38.	Honea Path	Town	....	185	6	......	35	Granite	Flat	
39.	Honea Path	Town	....	86	6	......	15	Granite	....	
40.	Honea Path	Town	....	36–56	2	......	15	Granite	Flat	Group of 5 wells.

RECORDS OF DRILLED WELLS IN THE PIEDMONT—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
41.	Honea Path	Town	....	125	6	......	15	Granite	Flat	
42.	Honea Path	Town	....	18	6	......	115	Gravel	Slope	See analysis.
43.	Honea Path	Town	....	125	6	......	35	Granite	Flat	
44.	Honea Path	Town	....	12-40	2	......	35	Sand	Flat	Group of 4 wells.
45.	Honea Path	Honea Path Mills	....	112	6	......	50	Granite	Draw	pH 6.1.
46.	Honea Path	Honea Path Mills	....	106	6	......	50	Granite	Draw	pH 6.1.
47.	Honea Path	Honea Path Mills	Robbins	169	6	*18	75	Granite	Slope	pH 6.6.
48.	Honea Path	Honea Path Mills	Robbins	163	6	*20	70	Granite	Slope	pH 6.6.
49.	Pelzer	Pelzer Mills	....	50-100	6	......	50	Granite gneiss	Slope	See analysis.
50.	Pelzer	Pelzer Mills	Warren G. Gardiner	179	6	*13	90	Granite gneiss	Flat	Temperature 60° F. Cl and pH checked twice a day.
51.	Pelzer	Pelzer Mills	Warren G. Gardiner	89	6	*17	100	Granite gneiss	Valley	Chlorinated.
52.	Pelzer	Pelzer Mills	Warren G. Gardiner	30	4	......	55	Granite gneiss	Slope	Chlorinated.
53.	Pelzer	Pelzer Mills	Warren G. Gardiner	30	3	......	50	Granite gneiss	Slope	Chlorinated.
54.	Pendleton	Town	Robbins	100	6	......	35	Granite gneiss	Draw	
55.	Pendleton	Town	....	90	6	*10-15	30-35	Granite	Draw	
56.	Pendleton	Town	....	110	8	*10-15	90	Granite	Draw	Temperature 61° F. See analysis.
Cherokee County:										
57.	Blacksburg	Burton-Dixie Mills, Inc.	....	90	6	......	17	Sandy clay	Slope	See analysis of town springs.
58.	Blacksburg	Burton-Dixie Mills, Inc.	....	90	6	......	17	Sandy clay	Slope	
Chester County:										
59.	Chester	Eureka Mill	Vir. Mach. & Well Co.	500	8	*20	80	Granite	Slope	Too much lime for boiler.
60.	Chester	Chester State Park	Vir. Mach. & Well Co.	400+	6	......	21	Granite	Slope	See analysis.
61.	Chester	U.S.C.C.C. Camp	Vir. Mach. & Well Co.	400+	6	......	19	Granite	Slope	Cased 100 feet.
62.	Chester	American Legion	Vir. Mach. & Well Co.	400+	6	......	40	Granite	Slope	Cased 60 feet.
63.	Chester	U. S. Air Field	W. A. Darby	156	3	......	40	Granite	Flat	Cased 105 feet. Abandoned.
64.	Chester	City Theater	W. A. Darby	59	3	......	50	Granite	Slope	Cased 45 feet.
65.	Chester	Chester Ice & Fuel Co.	....	90	3	......	...	Diorite (?)	Hill	See analysis.
66.	Chester	Chester Ice & Fuel Co.	....	90	3	......	40-50	Diorite (?)	Hill	Operates 24 hours.
67.	Chester	Chester Tower Site	....	114	...	......	...	Sand	....	

68. Lando	Manetta Mills, Inc.	....	80	4	......	8	Granite	Slope	
69. Teeds	Cunningham Estate	W. A. Darby	89	6	......	4	Granite	Flat	Cased 20 feet.
70. Loury	Federal Rehabilitation Project	W. A. Darby	100	6	......	56	Granite	Flat	
71. Richburg	Richburg Public School	....	...	2	......	15–20	....	Flat	
Chesterfield County:									
71A. Jefferson	Town	Harwood Beebe	205	8	......	25–30	Variegated slates	Slope	See analysis.
Edgefield County:									
72. Edgefield	City	....	720	10	......	120	Granite	Flat	Water hard; see analysis.
73. Edgefield	City	....	380	10	......	20–35	Granite	Hill	Cased 100 feet.
74. Edgefield	City	....	700	10	......	18	Granite	Slope	Cased 100 feet.
75. Edgefield	City	....	220	10	......	9	Granite	Draw	Cased 100 feet.
76. Edgefield	City	....	220	10	......	15	Granite	Draw	
77. Edgefield	Addison Plant (Kendall Mills Div.)	Sydnor Pump & Well Co.	140	5⅝	†21	70	Decomposed granite	Draw	Drawdown 2 feet after 3 hours pumping at 50 gallons per minute.
78. Johnston	Mr. With	Mr. Z. Duffy	50	5⅝	......	24	Clayey sand	Flat	Cased 50 feet.
79. Johnston	Town	Vir. Mach. & Well Co.	182	8	......	18	Granite	Flat	
Fairfield County:									
80. Ridgeway	Town	Hughes Well Co.	200+	8	......	10–20	Slate unit	Draw	Formerly yielded 35-40 gallons per minute.
81. Ridgeway	Town	....	303	3	......	8–10	Slate unit	Draw	
82. Ridgeway	Town	Charles Lee	185	6	......	15–20	Slate unit	Draw	See analysis.
83. Ridgeway	Town	Hickory Pump Co.	...	8	......	...	Slate unit	Draw	Cased 59 feet.
84. Ridgeway	Williams & McKeitham Lumber Co.	....	120	2	......	...	Slate unit	....	
85. Rion	Winnsboro Granite Corp.	....	190	6	†41.83	2–3	Granite	Hill	
86. Rion	Winnsboro Granite Corp.	Mr. Frick	200	6	*12	Very large	Granite	Valley	Cased 40 feet.
87. Anderson	Winnsboro Granite Corp.	....	187	6	......	8–10	Granite	Valley	Drawdown 3 feet after 24 hours pumping.
88. Anderson	Winnsboro Granite Corp.	....	70	6	......	1–2	Granite	Slope	Can be pumped dry.
89. Blackstock	Blackstock School	....	80	2	......	3–5	Granite	Slope	
90. Blackstock	Blackstock Ginnery	S. L. Robbins	80	2	*40	6	Granite	Slope	
91. Blackstock	Mr. Ware	Robbins	176	2	......	6	Granite	Slope	
92. Blackstock	Mr. Kennedy	J. A. Young	130	6	......	6–8	Granite	Flat	
93. Salem Cross Roads	Salem Cross Roads School	Mr. Lee	135	6	*95	10–20	Granite	Slope	Supplies school and Superintendent's house.
94. Strother	Brown Lumber Co.	....	160	3	......	27	Granite	Hill	
95. Strother	Brown's Dairy	....	82	4	......	10	Granite	Slope	
96. Simpson	Simpson Tower Site	....	88½	2	......	...	Sand	....	See log.

RECORDS OF DRILLED WELLS IN THE PIEDMONT—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
Greenwood County:										
97.	Greenwood	Matthew's Mill, Inc.	A. B. Kelly	150	6	......	20	Granite	Slope	See analysis.
98.	Greenwood	Matthew's Mill, Inc.	A. B. Kelly	160	5⅝	......	22	Granite	Hill	Serves 27 houses.
99.	Greenwood	Matthew's Mill, Inc.	A. B. Kelly	120	6	......	30	Granite	Hill	
100.	Greenwood	Matthew's Mill, Inc.	A. B. Kelly	150	6	......	30–40	Granite	Hill	
101.	Greenwood	Matthew's Mill, Inc.	A. B. Kelly	160	6	......	20–30	Granite	Slope	
102.	Greenwood	Panola Mills, Inc.	A. B. Kelly	158	6	*100	36	Granite	Flat	
103.	Greenwood	Panola Mills, Inc.	A. B. Kelly	177	6	*43	32	Granite	Flat	
104.	Greenwood	Panola Mills, Inc.	A. B. Kelly	120	6	*60	32	Granite	Flat	
105.	Greenwood	Greenwood Lumber Co.	A. B. Kelly	200	6	*18	18–25	Granite	Slope	Cased 100 feet.
106.	Greenwood	Maxwell Orphanage	A. B. Kelly	67	6	......	±40	Decomposed granite	Draw	
107.	Hodges	Southern Cotton Oil Co.	....	100	6	......	5–10	Clayey sand	Draw	
108.	Hodges	Mr. Tinesley	....	100	6	*8	25–35	Granite	Flat	Sometimes flows in winter months. See analysis.
109.	Shoals Junction	State of South Carolina	Mitchell Well & Pump Co.	128	4	......	20–30	Granite	Hill	
110.	Bradley	Mr. Steefe	A. B. Kelly	185	6	†30	13	Decomposed gneiss	Slope	
111.	Greenwood	R. M. and J. F. Rush, Inc.	....	250	6	......	5–10	....	....	
112.	Greenwood	Mr. Gabriel Cannon	....	369	...	......	18	....	....	
Greenville County:										
113.	Berea	John Henry Smith (c)	Harris	126	6	......	7	Decomposed granite	....	Cased 45 feet.
114.	Cleveland	B. N. Pope	Harris	100	6	......	6–7	Granite gneiss	Slope	Cased 37 feet.
115.	Fork Shoals Road	W. H. Williman	Harris	211	6	......	8	Gray granite	Slope	
116.	Fork Shoals Tower Site	State of South Carolina	Harris	91	2	......	...	Gray granite	....	
117.	Fountain Inn	Town	....	180	6	......	...	Gneissoid schist	Flat	
118.	Fountain Inn	Town	....	225	6	......	...	Gneissoid schist	Flat	
119.	Fountain Inn	Town	....	180	6	......	...	Gneissoid schist	Slope	Cased 60 feet.

120.	Fountain Inn	Town	....	195	6	......	...	Gneissoid schist	Slope	Temperature 63.5° F. See analysis.
121.	Fountain Inn	Town	....	160	6	......	...	Gneissoid schist	Draw	
122.	Fountain Inn	Town	....	185	6	......	...	Gneissoid schist	Flat	Cased 60 feet.
123.	Fountain Inn	Town	....	141	8	......	...	Gneissoid schist	Flat	
124.	Gantt	George C. Albright	Harris	165	6	......	6	Schist	Flat	Cased 68 feet.
125.	Greenville	State of South Carolina	....	106	2	......	...	Granite (?)	Slope	Paris Mountain Tower Site.
126.	Greenville	Town	....	83	6	......	10	Disintegrated granite gneiss	Flat	City Airport.
127.	Greenville	Walter A. Roper	Harris	113	6	......	7	Disintegrated granite gneiss	Slope	
128.	Greenville	W. F. Watson	Harris	105	6	......	10	Disintegrated granite gneiss	Slope	
129.	Greenville	Ballentine Packing Co.	Robbins	387	5⅝	*165	55	Porphyritic granite	Flat	
130.	Greenville	Ballentine Packing Co.	Robbins	455	5⅝	*165	15	Porphyritic granite	Flat	Abandoned.
131.	Greenville	Duke Power Co.	Robbins	298	6	*25	50	Porphyritic granite	Flat	
132.	Greenville	Claussen Bakery	Robbins	368	6	*50	83	Porphyritic granite	Flat	
133.	Greenville	Town	Robbins	370	6	*60-65	40	Porphyritic granite	Hill	Sewage disposal plant.
134.	Greenville	Town	Robbins	180	8	*25	85	Porphyritic granite	Slope	Sewage disposal plant.
135.	Greenville	Town	Robbins	208	8	......	110	Porphyritic granite	Draw	Sewage disposal plant. Cased 110 feet.
136.	Greenville	Gantt School	Robbins	145	6	......	25	Porphyritic granite	Flat	Cased 65 feet.
137.	Greenville	Brandon Mills, Inc.	Robbins	255	6	Artesian	80	Porphyritic granite	Slope	Cased 20 feet.
138.	Greenville	Monaghan Mills	Robbins	200	6	......	50	Porphyritic granite	Slope	
139.	Greenville	Monaghan Mills	Robbins	200	?	......	30	Porphyritic granite	Flat	
140.	Greenville	Southern Weaving Co.	....	217	6	*8	45	Porphyritic granite	Draw	Cased 45 feet.

RECORDS OF DRILLED WELLS IN THE PIEDMONT—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
141.	Greenville	Southern Weaving Co.	Robbins	225	6	*11	32	Porphyritic granite	Draw	
142.	Greenville	Mills Mills, Inc.	....	140-160	6	......	60	Porphyritic granite	Draw	Cased 58 feet.
143.	Greenville	Mills Mills, Inc.	Robbins	212	8	*1¾	100	Porphyritic granite	Draw	See analysis. Cased 107 feet.
144.	Greenville	Mills Mills, Inc.	Robbins	280	8	......	85	Porphyritic granite	Flat	Cased 115 feet.
145.	Greenville	J. H. Eshew	Harris	82	6	......	8	Granitoid schist	Slope	Cased 12 feet.
146.	Greenville	J. Spaulding, Jr.	Harris	215	6	......	12	Granitoid schist	Slope	Cased 62 feet.
147.	Greenville	Harry Stevens	Harris	167	6	......	7-8	Granitoid schist	Slope	Cased 45 feet.
148.	Greenville	Henry Theodore	Harris	179	6	......	6	Granitoid schist	Slope	Cased 84 feet.
149.	Greenville	U. S. Army Air Base	Harris	185	6	......	8-15	Granitoid schist	Flat	Milky color. Cased 160 feet.
150.	Greenville	Thomas P. Boling	Harris	160	6	......	8	Granitoid schist	Slope	Cased 60 feet.
151.	Greenville	Flat Rock School	Harris	85	5⅝	......	12-15	Decomposed granite	Slope	Cased 10 feet.
152.	Greenville	W. L. Howell	Harris	135	6	......	8	Decomposed granite	Slope	Cased 60 feet.
153.	Greenville	H. C. Jackson	Harris	140	6	......	10	Decomposed granite	Slope	
154.	Greenville	E. Howard	Harris	110	6	......	6	Decomposed granite	Slope	
155.	Greenville	John McDieLaw	Harris	113	6	......	5-6	Decomposed granite	Slope	Cased 90 feet.
156.	Greer	Audrey Long	Harris	202	6	......	10	Sand	Slope	Cased 130 feet.
157.	Greer	D. M. Frierson	Harris	200	6	......	3-5	Granite	Hill	Cased 4 feet.
158.	Greer	W. D. Holiday	Harris	138	6	......	8	Schist	Slope	Cased 100 feet.
159.	Mauldin	J. M. Griffin	Harris	146	6	......	15	Disintegrated granite gneiss	Slope	Cased 95 feet.

160.	Mauldin	T. C. Alexander	Harris	103	6	......	7	Schist	Slope	
161.	Simpsonville	Town	....	165	8	*25-30	30	Granite gneiss	Flat	
162.	Simpsonville	Town	....	120	6	*25-30	20	Granite gneiss	Flat	Temperature 62° F. See analysis.
163.	Simpsonville	Town	....	120	6	*25-30	20	Granite gneiss	Flat	
164.	Simpsonville	Town	....	109	6	*30-35	15+	Granite gneiss	Flat	
165.	Simpsonville	Woodside Cotton Mills	....	80	8	......	35	Granite gneiss	Flat	Cased 30 feet.
166.	Simpsonville	Woodside Cotton Mills	....	100	8	......	5-10	Granite gneiss	Slope	
167.	Simpsonville	Woodside Mill	....	110	8	......	5-10	Granite gneiss	Slope	
168.	Simpsonville	Woodside Mill	....	110	8	......	5-10	Granite gneiss	Slope	
169.	Traveler's Rest	T. E. Coleman	Harris	100	6	......	10	Granite gneiss	Slope	Cased 64 feet.
170.	Simpsonville	C. C. McKinney	Harris	222	6	......	5	Hard granite	Flat	
171.	Simpsonville	Martin Dairy	Harris	199	6	......	10	Hard granite	Flat	Cased 40 feet.
Kershaw County:										
171A.	Kershaw	Town	J. R. Connolly	244	8	*29	69	Granite	Slope	Cased 78 feet.
171B.	Kershaw	Town	....	152	8	*33	69	Granite	Hill	See analysis. Cased 82 feet.
171C.	Kershaw	Town	....	242	8	......	50	Granite	Slope	
171D.	Kershaw	Springs Cotton Mills	....	600	10	*60	20	Granite	Hill	Cased 85 feet.
171E.	Kershaw	Springs Cotton Mills	Vir. Mach & Well Co.	281	6	*50	25	Granite	Slope	Cased 96 feet.
171F.	Kershaw	Springs Cotton Mills	Vir. Mach. & Well Co.	214	4	......	30	Granite	Draw	
171G.	Liberty Hill	Tower Site	....	35	60	......	...	Granite	....	Dug well. See log.
Lancaster County:										
172.	Lancaster	Mullis Lumber Co.	Claude Hoke	165	6	......	15+	Slate unit	....	
173.	Heath Springs	Town	....	140	6	*65	40±	Granite	Flat	Temperature 62° F. See analysis.
Laurens County:										See analysis.
174.	Goldville	Joanna Cotton Mills	....	523	8	......	50	Granite	Flat	
175.	Goldville	Joanna Cotton Mills	....	278	6	*20-25	...	Granite	Flat	
176.	Goldville	Joanna Cotton Mills	....	326	8	......	50	Granite	Flat	
177.	Goldville	Joanna Cotton Mills	....	370	8	......	25	Granite	Flat	
178.	Goldville	Joanna Cotton Mills	....	420	8	......	45	Granite	Flat	
179.	Goldville	Joanna Cotton Mills	....	470	8	......	55	Granite	Flat	
180.	Goldville	Quarantine Hospital	....	450	6	......	11	Granite	Flat	
181.	Graycourt	A. W. Wallace	Harris	179	6	......	6	Gray granite	Slope	Cased 12 feet.
Lexington County:										
182.	Cayce	American Agricultural Chemical Co.	....	300?	6	......	...	....	....	
183.	Irmo	Public School	Frick	137	4½	......	...	Slate unit	Slope	Good quantity.
184.	Irmo	Public High School	Frick	138	4½	......	...	Slate unit	Slope	
185.	Irmo	Mrs. Mathais	Frick	110-120	4½	......	5	Shale	Hill	Supplies 5 families.
186.	Lake Murray	South Carolina Electric and Gas Co.	Dam Rig	120	6	*70	30	Clay and rotten gneiss	Hill	Serves 12 houses and power house.
187.	Lake Murray	Dr. H. T. Moore	J. R. Connolly	158	6	......	10	Gneiss	Hill	
188.	Lake Murray	Mr. Z. Hayward	J. R. Connolly	100	6	......	5	Gneiss	Hill	

RECORDS OF DRILLED WELLS IN THE PIEDMONT—Continued

Well No. LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
McCormick County:									
189. McCormick	M. G. & J. J. Dorn Co.	A. B. Kelley	320	6	......	20–25	Limestone (?)	Draw	Lime.
190. McCormick	M. G. & J. J. Dorn Co.	A. B. Kelley	250	4	......	10–20	Limestone (?)	Flat	No lime.
191. McCormick	M. G. & J. J. Dorn Co.	J. K. Ivy (Deceased)	175	6	......	20–30	Shale	Flat	
Newberry County:									
192. Little Mountain	L. C. Derrick, Inc.	Frick	137	6	......	2	Trap rock	Hill	
193. Little Mountain	Mr. Scheeley	Frick	141	6	......	3	Gneiss and dyke rock	Flat	Hard rock at 65 feet.
194. Little Mountain	L. C. Derrick	Frick	140	6	......	12	Gneiss and dyke rock	Flat	
195. Little Mountain	C. & L. Railroad	....	180	6	......	40–50	Slate unit	Slope	
196. Prosperity	Town	Layne Atlantic Co.	125	8	......	35–40	Slate unit	Hill	See analysis. Cased 100 feet.
197. Newberry	Kendall Mills, Inc.	McDowell	200	5	......	52	Granite	Flat	See analysis.
198. Newberry	Newberry Lumber Co.	....	96	3	......	(?)	Granite	Slope	
199. Newberry, NW of	Whitner Lumber Co.	....	46	6	......	20	Slate unit	Slope	Cased 41 feet.
200. Newberry, NW of	Vance & Dwiggins, Inc.	Duffy	128	6	......	4	Granite	Slope	Cased 40 feet.
201. Prosperity	Town	....	90	8	......	35–40	Slate unit	Hill	
202. Whitmire	Aragon-Baldwin Mill Co.	J. W. Watts	280	4	......	40–50	Granite	Slope	
203. Whitmire	Aragon-Baldwin Mill Co.	....	320?	8	......	35–40	Granite	Slope	
204. Whitmire	Rev. C. T. Bryant	....	38	36	......	55	Granite	Hill	Dug well.
205. Whitmire	Mr. J. V. Livisy	....	101	6	*16	30–40	Granite	Slope	Cased 15 feet.
Oconee County:									
206. Oconee State Park	State of South Carolina	....	480	6	......	30	Schist	Slope	
207. Sumter National Park	U. S. Forest Service	....	120	6	......	10–20	Schist	Hill	Cased 80 feet.
208. Sumter National Park	U. S. Forest Service	....	...	8	......	...	Schist	Hill	
209. Walhalla	Kenneth Cotton Mills	....	60	...	......	...	Disintegrated granite gneiss	Slope	
210. Walhalla	Kenneth Cotton Mills	....	570	6	*145	20	Granite gneiss	Slope	Temperature 65° F. See analysis.

Pickens County:									
211. Arial	Alice Mfg. Co.	....	240	6	......	30–40	Granite gneiss	Draw	Cased 90 feet.
212. Arial	Alice Mfg. Co.	....	240	6	......	30	Granite gneiss	Flat	
213. Arial	Alice Mfg. Co.	....	240	6	*20–30	30	....	Flat	
214. Arial	Alice Mfg. Co.	....	240	6	......	40	Granite gneiss	Slope	
215. Arial	Alice Mfg. Co.	....	240	6	......	40	Granite gneiss	Draw	
216. Arial	Alice Mfg. Co.	....	240	6	......	30	Granite gneiss	Valley	Temperature 60° F. See analysis.
217. Arial	Alice Mfg. Co.	....	240	6	......	15–18	Granite gneiss	Flat	
218. Cateechee	Norris Cotton Mills	Robbins	270	6	*30	10	Blue granite	Slope	Temperature 60° F. See analysis.
219. Cateechee	Norris Cotton Mills	Robbins	140	6	......	8	Blue granite	Slope	
220. Cateechee	Norris Cotton Mills	Robbins	180–200	6	......	22	Blue granite	Slope	
221. Easley	Easley Cotton Mill	....	70	4	*12	300	Sand	Swamp	Temperature 63° F. 6 wells together. See analysis.
222. Easley	Easley Cotton Mill	....	260	6	*12	200	Granite gneiss	Slope	Cased 240 feet.
223. Easley	J. A. Jones, Cannery	Robbins	130	6	*30	15	Granite gneiss	Flat	Temperature 61° F. See analysis.
224. Easley	J. A. Jones, Cannery	....	20	2	*15	8	Weathered granite and Sand	Slope	Two wells. Cased 10 feet.
225. Easley	J. A. Jones, Cannery	....	20	2	*15	8	Weathered granite and Sand	Slope	Two wells. Cased 10 feet.
226. Easley	J. A. Jones, Cannery	....	20	2	*15	10	Weathered granite and Sand	Slope	Three wells.
227. Easley	Mr. Cox	....	130	6	......	...	Gneiss	Slope	Well being drilled.
228. Six-Mile	Stewart Lumber Co.	....	30	36	......	...	Sand	Slope	Dug well.
229. Six-Mile	Stewart Lumber Co.	....	25	96	......	...	Sand	Valley	Used for boilers. Dug well.
Richland County:									
230. Ballentine	Mr. Ballentine	....	102	4	......	10?	Slate unit	Flat	
231. Blythewood	School	I. L. Kerr	108	4	......	10	Slate	Flat	
232. Blythewood	Tower Site	....	26	...	......	...	....	....	See log.
233. Blythewood	Mr. Davis	I. L. Kerr	102	4	......	15–20	Slate	Slope	
234. Columbia	Fairwold Dairy	....	60	2	......	...	Granite (?)	Slope	
235. Columbia, NW of	Harbison College	....	225	4	......	30–40	Slate	Slope	
236. Columbia, NW of	Harbison College	....	250	4	......	30–40	Slate	Flat	
237. Dutch Fork	Dutch Fork Grammar School	Frick	110	4	......	15–25	Weathered slate	Flat	Cased 110 feet.
238. White Rock	Lowman Home	Frick	125	6	......	30	Slate	Slope	Water hard.
239. White Rock	Lowman Home	Frick	98	6	......	30	Slate	Hill	

RECORDS OF DRILLED WELLS IN THE PIEDMONT—Continued

Well No. LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
Saluda County:									
240. Mayson	B. C. Wise	Z. Duffie	85	6	......	2-5	Slate	Flat	Cased 30 feet.
241. Mine Creek	Mine Creek Catholic Church	....	43	6	......	5	Slate	Slope	Serves church, school, convent and parsonage.
242. Philippi	Mr. Javas Black	....	34	...	*33	2-5	Slate	Hill	Dug well.
243. Ridge Springs	Methodist Church	....	70	...	......	2-5	Granite (?)	Slope	Serves church and parsonage.
244. Ridge Springs	E. E. Buffington	....	30	36	......	5-10	Sand	Slope	Dug well.
245. Ridge Springs	Mr. Watson	....	165	4	......	5	Granite	Flat	
Spartanburg County:									
246. Arcadia	Mayfair Cotton Mills	Geo. Lee	301	8	*+3-4	165	Granite	Flat	Temperature 60° F. See analysis. Cased 10 feet. Flows 35 gallons per minute.
247. Arcadia	Mayfair Cotton Mills	....	438	8	*30	45	Granite	Flat	Cased 18 feet.
248. Arcadia	Saxon Mills	....	40	2	......	50	Sand and gravel	Draw	Temperature 60° F. See analysis.
249. Arcadia	Saxon Mills	....	40	2	......	50	Sand and gravel	Draw	
250. Chesnee	Saxon Mills	....	...	...	......	300	....	Valley	
251. Chesnee	Saxon Mills	....	...	2	......	150	....	Valley	
252. Chesnee	Town	....	206	8	......	20	Granite	Hill	
253. Chesnee	Town	Geo. Lee	231	8	......	20	Granite	Hill	
254. Chesnee	Town	Geo. Lee	151	8	......	40	Granite	Draw	See analysis.
255. Chesnee	Town	Geo. Lee	219	8	......	8	Granite	Slope	Not in use.
256. Cowpens	Town	Mr. Eastler	369½	6	......	45-50	Granite	Flat	Cased 100 feet. See analysis.
257. Cowpens	Town	Mr. Eastler	275	6	......	45-50	Granite	Hill	Cased 80 feet.
258. Enoree	Riverside Mills, Inc.	....	70	6	*64	22	Gneissoid schists	Valley	
259. Enoree	Riverside Mills, Inc.	Harris	250	6	......	20	Gneissoid slates and schists	Valley	

260.	Enoree	Riverside Mills, Inc.	....	20	2	......	32	Gneissoid slates and schists	Valley	Driven wells (5).
261.	Enoree	Riverside Mills, Inc.	Hubbel	35-40	2	......	35	Gneissoid slates and schists	Valley	Driven wells (7). Temperature 62° F. See analysis.
262.	Enoree	Riverside Mills, Inc.	Hubbel	35	2	......	85	Gneissoid slates and schists	Flat	Driven wells (5). Brackish water.
263.	Enoree	Riverside Mills, Inc.	Hubbel	27-35	2	......	85	Gneissoid slates and schists	Hill	Driven wells (6). Water hard.
264.	Enoree	Riverside Mills, Inc.	Harris	202	8	*67	50	Gneissoid slates and schists	Slope	Abandoned—too much iron.
265.	Enoree	Riverside Mills, Inc.	Harris	318	8	......	7	Gneissoid slates and schists	Slope	Abandoned.
266.	Inman	Town	....	80	2	......	125	Mica schist	Hill	Driven wells (5). See analysis.
267.	Inman	Town	....	70	2	......	78	Mica schist	Hill	Driven wells (2).
268.	Inman	Town	....	85-100	2	......	...	Mica schist	Level	Driven wells (6).
269.	Inman	Inman Mill	....	150	5	......	15	Mica schist	Slope	
270.	Inman	Inman Mill	....	250	6	......	10	Mica schist	Slope	
271.	Inman	Inman Mill	....	150	6	*50	15	Mica schist	Slope	
272.	Inman	Southern Railroad	....	*165	5⅝	......	25	Mica schist	Slope	*In process of drilling 1-16-46.
273.	Pacolet	Pacolet Mfg. Co.	C. G. Hubbel	60-125	2	*6-8	50	Granite	Draw	Driven wells (5).
274.	Pacolet	Pacolet Mfg. Co.	C. G. Hubbel	60-125	2	......	50	Granite	Slope	Driven wells (8).
275.	Pacolet	Pacolet Mfg. Co.	C. G. Hubbel	60-100	2	......	35	Granite	Flat	Driven wells (7).
276.	Pacolet	Pacolet Mfg. Co.	C. G. Hubbel	60-100	2	*10	35	Granite	Flat	Driven wells (5).
277.	Pacolet	Pacolet Mfg. Co.	C. G. Hubbel	50-60	2	*15	22	Granite	Valley	Driven wells (4). Temperature 59° F. See analysis.
278.	Pacolet	Pacolet Mfg. Co.	C. G. Hubbel	50-60	2	......	35	Granite	Flat	Driven wells (6).
279.	Spartanburg Metropolitan Subdistrict B	Town	Lee Bros.	480	8	*30	100	Granite	Slope	Temperature 60° F. See analysis. Cased 120 feet.
280.	Spartanburg Metropolitan Subdistrict B	Town	Lee Bros.	512	6	......	50	Granite	Hill	Cased 120 feet.
281.	Camp Croft, Spartanburg	U. S. Army	....	170½	6	......	40	Mica schist	Hill	Temperature 59° F. See analysis.
282.	Camp Croft, Spartanburg	U. S. Army	....	600	8	......	22	Mica schist	Flat	About 400 feet of casing.

RECORDS OF DRILLED WELLS IN THE PIEDMONT—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Yield (gallons per minute)	AQUIFER	Topographic Location	REMARKS
283.	Camp Croft, Spartanburg	U. S. Army	....	440	6	......	...	Mica schist	....	Dry hole.
284.	Wellford	Jackson Mill	....	218	4	......	30	Granite (?)	Flat	See analysis.
285.	Wellford	Jackson Mill	....	508	8	......	40	Schist granite	Flat	
286.	Woodruff	Town	C. G. Hubbel	40–70	2	......	37	Disintegrated hornblende gneiss	Draw	Driven wells (6).
287.	Woodruff	Town	C. G. Hubbel	50–65	2	Artesian at times	37	Disintegrated hornblende gneiss	Draw	Driven wells (7).
288.	Woodruff	Town	C. G. Hubbel	45–75	2	......	38	Disintegrated hornblende gneiss	Draw	Driven wells (8).
289.	Woodruff	Town	C. G. Hubbel	90	2	......	30	Disintegrated hornblende gneiss	Draw	Driven wells (2).
290.	Woodruff	Town	C. G. Hubbel	60	2	......	30	Disintegrated hornblende gneiss	Draw	Driven wells (3).
291.	Woodruff	Town	C. G. Hubbel	70–75	2	......	30	Disintegrated hornblende gneiss	Draw	Temperature 63° F. Driven wells (4).
292.	Woodruff	Town	C. G. Hubbel	40–60	2	......	32	Disintegrated hornblende gneiss	Draw	Driven wells (5).
293.	Woodruff	Town	C. G. Hubbel	40–60	2	......	75	Disintegrated hornblende gneiss	Draw	Driven wells (9).
294.	Woodruff	Town	Greer	402	8	*60–100	85	Blue granite	Hill	Temperature 63° F. See analysis.
Union County:										
295.	Jonesville	Wallace Mfg. Co.	....	100	3¼	*30	15	Granite	Flat	
296.	Jonesville	Wallace Mfg. Co.	....	100	3¼	*30	15	Granite	Flat	
297.	Jonesville	Wallace Mfg. Co.	....	60	2¼	*20	9½	Granite	Hill	
298.	Jonesville	Wallace Mfg. Co.	....	60	2¼	*20	9½	Granite	Hill	

299.	Jonesville	Town	....	180	8	*50–60	20	Granite	Flat	Cased 75 feet. See analysis.
300.	Jonesville	Town	....	150	8	*50–60	35	Granite	Flat	
301.	Jonesville	Town	Robbins Bros.	110	8	*50–60	30	Granite	Valley	
302.	Monarch	Monarch Mills	Sydnor Pump & Well Co.	270	8	......	120–125		Slope	Temperature 57° F. See analysis.
303.	Monarch	Monarch Mills	Sydnor Pump & Well Co.	250?	6	......	32	Granite	Draw	
304.	Monarch	Monarch Mills	Sydnor Pump & Well Co.	200	6	......	32	Granite	Slope	
York County:										
305.	Bowling Green	W. B. Dulin	....	110	5⅝	......	20	Granite	Slope	
206.	Bowling Green	Ben Adams	....	40	5⅝	*17½	25	Granite	Draw	
307.	Clover	Town	Greer	125-200	6	*30	200	Granite Granite	Slope	Six wells; 65 feet to hard rock.
308.	Clover	Town	....	40	8	......	9?	Granite	Slope	
309.	Clover	Town	....	96	6	......	40?	Granite	Slope	
310.	Clover	Town	....	70	6	......	40?	Granite	Valley	
311.	Clover	Town	....	40	6	......	20	Granite	Valley	Temperature 60° F. See analysis.
312.	Clover	Town	....	180	6	......	7–8	Granite	Slope	
313.	Clover	Town	....	59	6	......	20	Granite	Slope	
314.	Clover	Town	....	105	6	*30–40	15	Granite	Slope	
315.	Clover	Town	....	100	6	......	10	Granite	Slope	
316.	Clover	Clover Spinning Mill	....	810	8	*26	40	Granite	Slope	

RECORDS OF MUNICIPAL SPRINGS IN THE PIEDMONT

Spring No.	LOCATION	OWNER	Yield (gallons per minute)	CHIEF AQUIFER	Topographical Location	REMARKS
	Cherokee County:					
A.	Blacksburg	Town	189	Carolina schist or Whiteside granite	Valley	Contact spring. See analysis.
	Chester County:					
B.	Lando	Manetta Mills, Inc.	20	Decomposed granite	Valley	Contact spring. Serves 152 houses. See analysis.
	Greenville County:					
C.	Greer	City	120	Granite mica and schist	Draw	Two contact springs. See analysis.
	Greenwood County:					
D.	Shoals Junction	Mr. L. B. Dunn	2–5	Sands and mica schist	Valley	Depression spring. Serves several houses. See analysis.
E.	Ware Shoals	Mr. J. C. Cook	30	Granite	Draw	Fracture spring. Serves 30 houses and stores. See analysis.

CHEMICAL ANALYSES FOR WELLS IN THE PIEDMONT

Analysed by William L. Lamar, Evelyn Holloman, V. T. McNamara and Janie James
(Numbers refer to wells described in table of well data)

(Parts Per Million)

COUNTY	No.	Depth (feet)	AQUIFER	Date of collection	Iron (Fe)	Bicar-bonate (HCO_3)*	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
Abbeville	1	60	Granite	10-24-45	.....	54	2	6	0.2	0.0	40
Abbeville	4	120	Granite	10-24-45	0.0	154	17	5	.0	5.1	140
Abbeville	7	187	Granite-gneiss	10-24-45	.10	62	10	20	.1	5.5	78
Abbeville	13	125	Granite	11-29-45	.09	42	2	3	.....	3.5	39
Anderson	26	200	Granite	11- 2-45	.10	69	16	11	.0	3.8	78
Anderson	32	215	Granite	11- 2-45	.19	71	2	6	.2	6.6	54
Anderson	42	18	Gravel	11- 3-45	.70	14	4	4	.0	6.8	8
Anderson	49	50-100	Granite-gneiss	11-30-45	.12	73	17	9	.....	13	48
Anderson	56	110	Granite	1- 4-46	.11	53	4	6	.....	9.4	.....
Chester	60	400	Granite	10-22-45	.3	252	80	30	.3	1.0	294
Chester	65	90	May be porphyritic diorite	10-22-45	.12	255	90	177	.0	45	578
Chesterfield	71-A	205	Variegated slates	12- 5-45	.31	20	4	10	.....	6.8	28
Edgefield	72	720	Granite	10-26-45	.2	121	14	20	.2	7.5	105
Fairfield	82	185	Slate unit	10-11-45	.15	59	1	10	.0	16	64
Greenwood	97	150	Granite	10-23-45	.15	64	18	9	.0	1.2	78
Greenwood	108	100	Granite	10-30-45	.28	47	4	17	.0	14	80
Greenville	120	195	Gneissoid schist	12- 8-45	0.9	30	4	5	.....	9.0	32
Greenville	143	212	Porphyritic granite	1-12-46	.31	14	1	6	.....	12	24
Greenville	162	120	Granite-gneiss	12- 8-45	.23	31	2	8	.....	17	34
Kershaw	171-B	152	Granite	11- 6-45	.28	28	13	6	.1	9.2	24
Lancaster	173	140	Granite	1-17-46	2.7	38	8	6	.....	.0	30
Laurens	174	523	Granite	10-17-45	.08	29	1	4	.1	5.2	22
Newberry	196	125	Slate unit	10-16-45	.08	33	4	90	.0	3.5	130
Newberry	197	200	Granite	10-16-45	.05	27	1	4	.2	8.6	30
Oconee	210	570	Granite-gneiss	1- 9-46	.19	51	12	3	.....	.1	48
Pickens	216	240	Granite-gneiss	1-11-46	.49	41	1	2	.....	1.8	32
Pickens	218	270	Blue granite	1-11-46	.40	37	10	4	.....	.1	34
Pickens	221	70	Sand	1- 8-46	.11	19	4	5	.....	6.6	22
Pickens	223	130	Granite-gneiss	1-11-46	.12	14	1	3	.....	7.4	20
Spartanburg	246	301	Granite	1-16-46	1.3	74	18	3	.....	.2	58

* Includes Carbonate content.

CHEMICAL ANALYSES FOR WELLS IN THE PIEDMONT—Continued

Analysed by William L. Lamar, Evelyn Holloman, V. T. McNamara and Janie James

(Numbers refer to wells described in table of well data)

(Parts Per Million)

COUNTY	No.	Depth (feet)	AQUIFER	Date of collection	Iron (Fe)	Bicarbonate (HCO_3)*	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
Spartanburg	248	40	Sand and gravel	1-16-46	.23	8	1	6	.....	6.4	16
Spartanburg	254	151	Granite	12-26-45	.34	54	8	2	.....	.4	50
Spartanburg	256	369½	Granite	12-26-45	.61	71	10	3	.....	.1	58
Spartanburg	261	35-40	Gneissoid schists and slates	12- 7-45	.58	33	3	3	.....	.5	24
Spartanburg	266	80	Mica schist	1-16-46	.07	26	2	4	.....	1.4	21
Spartanburg	277	50-60	Mica schist	12-24-45	.56	7.0	3	4	.....	4.5	14
Spartanburg	279	480	Granite	1-16-46	0.07	72	8	2	.....	0.0	52
Spartanburg	281	170.5	Mica-schist	1-15-46	5.4	48	2	7	.....	.3	36
Spartanburg	284	218	Mica-schist ?	1-14-46	.19	56	4	2	.....	1.7	44
Spartanburg	294	402	Blue granite	12- 7-45	.11	90	50	4	.....	.4	98
Union	299	180	Granite	12-17-45	.09	89	7	13	.....	15	58
Union	302	270	Granite	12-17-45	.09	93	60	9	.....	2.6	123
York	311	40	Granite	1- 3-46	.22	19	3	17	.....	29	34

CHEMICAL ANALYSES FOR SPRINGS IN THE PIEDMONT

Analysed by William L. Lamar, Evelyn Holloman, V. T. McNamara, and Janie James
(Letters refer to springs in table of spring data)

(Parts Per Million)

No.	COUNTY	AQUIFER	Date of collection	Iron (Fe)	Bicarbonate (HCO_3)*	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
A	Cherokee	Carolina schist or Whiteside granite	12-21-45	0.20	117	5	3	.....	0.1	93
B	Chester	Decomposed granite	12-11-45	.27	31	2	7	.....	7.0	28
C	Greenville	Granite and mica schist	12-18-45	.09	7.0	2	4	.....	8.5	12
D	Greenwood	Sands and mica schist	10-30-45	.....	24	3	2	.1	.2	22
E	Greenwood	Granite	10-30-45	.12	15	2	4	.1	5.0	24

RECORDS OF WELLS IN THE COASTAL PLAINS

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
Aiken County:										
317.	Bath	Bath Mills, Inc.	....	140	5	*90	89	45	Tuscaloosa formation	Cased 130 feet.
318.	Bath	Bath Mills, Inc.	....	135	6	*90	89	50	Tuscaloosa formation	Cased 135 feet.
319.	Bath	Bath Mills, Inc.	Layne-Atlantic	120	8	*60	119	200	Tuscaloosa formation	Cased 90 feet; screen 5 feet.
320.	Langley	Langley Co.	Layne-Atlantic	106	8	.....	....	200	Tuscaloosa formation	Screen 20 feet; 190 feet to granite.
321.	Salley	Town	....	322	6	*172	305	258	Peedee (?) formation	Screen 12 feet.
322.	Salley	Town	....	142	2	*50	327	33	Black Mingo formation	
323.	Wagener	Town	....	176	8	.....	....	400	Barnwell sand	
324.	Wagener	Town	....	176	6	.....	....	250	Barnwell sand	
325.	Warrenville	Graniteville Mill	....	39	6	*15	210	36	Tuscaloosa formation	Temperature 65° F. Cased 35 feet; Screen 4 feet.
326.	Warrenville	Graniteville Mill	....	42	6	*15	210	12	Tuscaloosa formation	Temperature 65° F. Cased 38 feet; Screen 4 feet.
327.	Warrenville	Graniteville Mill	....	36	6	*15	210	32	Tuscaloosa formation	Temperature 65° F. Cased 32 feet; Screen 4 feet.
328.	Warrenville	Graniteville Mill	....	30	6	*15	210	12	Tuscaloosa formation	Temperature 65° F. Cased 26 feet; Screen 4 feet.
Allendale County:										
329.	Allendale	Peoples Water Service Co.	....	800	10	*30	146	300	Tuscaloosa formation	Temperature 67° F. See analysis.
330.	Allendale	Peoples Water Service Co.	South Carolina Power Co.	180	6	*22	154	200	Cooper marl (?)	
331.	Fairfax	Town	Hampton-Jennings	750	6	Artesian	....	230	Tuscaloosa formation	Drilled in 1918.
332.	Fairfax	Mr. Marshall	....	1000	6	+23	213±	50?-	Tuscaloosa formation	Sulfurous. Good for boilers.
Bamberg County:										
333.	Bamberg	Town	J. R. Connolly	200	12	*20	142	250	Cooper marl	Temperature 66° F. See analysis. Cased 110 feet.
334.	Bamberg	Town	J. R. Connolly	200	12	*20	140	250	Cooper marl	Temperature 66° F.
335.	Bamberg	Town	J. R. Connolly	585	12	+12	174	100	Tuscaloosa formation	Abandoned; yields only 30 gallons per minute at present.
336.	Bamberg	Town	Paul Argo	435	12	+12	173	100	Tuscaloosa formation	Now yields only 20 gallons per minute.

337. Bamberg	Santee-Textile Mills	....	500–550	8	+2.5	163	4-6	Tuscaloosa formation	Flowing since 1908. Temperature 68.5° F.
338. Denmark	Town	....	240	10	†75	173	300	Barnwell McBean	Temperature 67° F.
339. Denmark	Town	....	240	10	.....	....	150	Barnwell McBean	
340. Denmark	Town	....	240	8	.....	....	150	Barnwell McBean	Temperature 67° F. See analysis.
341. Ehrhardt	Town	Gavin	596	8	+18	163	60	Tuscaloosa formation	Originally 120 gallons per minute. See analysis.
342. Ehrhardt	Ehrhardt Cooperage Co.	....	596	3½	Artesian	....	20–30 (?)	Tuscaloosa formation	
343. Olar	Town	J. R. Connolly	170	10	.....	....	55	Cooper marl	Information obtained from Health Department files; none other obtainable.
Barnwell County:									
344. W. Dunbarton	State of South Carolina	....	243	2	.....	....	...	Barnwell McBean (?) Tuscaloosa (?)	
345. Barnwell	Town	J. R. Connolly	200	10	*40	147	150	Barnwell formation	
346. Barnwell	Town	J. R. Connolly	180	10	†44.1	166	100	Barnwell formation	See analysis.
347. Barnwell	Town	J. R. Connolly	180	10	*40	147	150	Barnwell formation	
348. Blackville	Town	Boyce Drilling Co.	200+	6	†26 (?)	259 (?)	100 (?)	Barnwell (?)	
349. Blackville	Town	Boyce Drilling Co.	300+	6	†35 (?)	255 (?)	200 (?)	McBean	
350. Blackville	Southern Railroad Co.	J. R. Connolly	300+	6	*30–40	255–265	60(?)	McBean	
351. Williston	Town	Hughes Drilling Co.	150	6	.....	....	100	Barnwell formation	
352. Williston	Town	J. R. Connolly	150	6	.....	....	200	Barnwell formation	See analysis.
353. Williston	Town	J. R. Connolly	150	6	*15	337	200	Barnwell formation	
354. Williston	Barnwell Air Base	J. R. Connolly	200	8	.....	....	84	Barnwell McBean	Calcium 8.2 parts per million, Silica 11.0 parts per million, pH 6.2
Beaufort County:									
355. Beaufort	Town	....	90±	10	†8.5	5.6	200+	Ocala limestone	Chloride 168 parts per million.
356. Beaufort	Town	Pickney	87	8	†8.2	....	240	Ocala limestone	See analysis.
357. Beaufort	Town	Pickney	80	6	.....	....	750	Ocala limestone	
358. Burton	Enterprise Ice Co.	J. R. Connolly	750	4	*14–15	....	21	McBean (?)	See analysis.
359. Burton	Enterprise Ice Co.	....	70	6	†18.2	+2.05	...	Ocala	Abandoned. Chloride 332 parts per million.
360. Burton Well 1	U. S. Gov't	....	84	12	†11.23	0.39	1400	Ocala	See analysis.
361. Burton (test well)	U. S. Gov't	....	(?)	6	†15.17	—1.85	...	(?)	
362. Burton Well 2	U. S. Gov't	....	84	12	.....	....	500	Ocala	
363. Dale	Coosaw Plantation	....	1400(?)	6	.....	....	...	Peedee (?)	See analysis.
364. Frogmore	Oyster Packing Plant	Pickney	74	3	†6.05	3.65	...	Ocala Hawthorn	
365. Grays Hill	J. R. Woods	Pickney	240	3	†20.26	19.08	...	Ocala	See analysis.
366. Grays Hill	Joe Patterson	....	148	6	†5.5	8.1	50	Ocala	Flows 50 gallons per minute.
367. Horse Island	U. S. Gov't	....	626	5	.....	....	...	Ocala	All water-bearing horizons salty.
368. Jasper Station	A. White	Frank Geethe	184	2	†14.35	7.15	...	Ocala	See analysis.

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
369.	Jericho Pt.	Alice H. Wright	....	90	2	†18.53	+1.17	...	Ocala	
370.	Jericho Pt. Well 1	U. S. Gov't	....	125(?)	(?)	22.31	+4.32	...	Ocala (?)	Gravel wall well.
371.	Jericho Pt. Well 2	U. S. Gov't	Layne-Atlantic	190(?)	(?)	20.23	+1.25	...	Ocala	Gravel wall well.
372.	Jericho Pt. Well 3	U. S. Gov't	....	87	12	†19.26	+0.2	500	Limestone (Hawthorn ?)	
373.	Jericho Pt. Well 4	U. S. Gov't	....	108	8	.....	....	...	Ocala	
374.	Jericho Pt. Well 5	U. S. Gov't	....	90	10	.....	....	...	Ocala (?)	
375.	Naval Air Station	U. S. Gov't	Feltwell	80	12	†14.13	11.37	350	Ocala limestone	
376.	Naval Air Station	U. S. Gov't	Feltwell	62	12	†5.60	7.90	300+	Limestone	See analysis.
377.	Naval Air Station	U. S. Gov't	Feltwell	98	8	†8.15	26.85	300+	Ocala	
378.	Parris Island Officers Mess	U. S. Gov't	U.S.M.C.	84+	12	.....	....	300	Ocala	Chloride 4,900 parts per million.
379.	Parris Island Power House	U. S. Gov't	U.S.M.C.	315	12	.....	....	1800	Ocala	Chloride 3,000 parts per million.
380.	Parris Island Swimming Pool	U. S. Gov't	U.S.M.C.	112	12	.....	....	1000	Ocala	Chloride 1,350 parts per million.
381.	Parris Island Well 7	U. S. Gov't	U.S.M.C.	112	12	.....	....	750	Ocala	Chloride 3,000± parts per million.
382.	Parris Island Well 7A	U. S. Gov't	U.S.M.C.	112	12	.....	....	350	Ocala	Chloride 3,000± parts per million.
383.	Parris Island Well 37	U. S. Gov't	U.S.M.C.	90±	7	†16.74	—2.06	...	Ocala (?)	
384.	Parris Island Rifle Range	U. S. Gov't	U.S.M.C.	134	12	†17.74	+0.83	1000	Ocala	Chloride 1,500 parts per million.
385.	Parris Island 4EE Rifle Range	U. S. Gov't	U.S.M.C.	90	12	.....	....	1000	Ocala (?)	Chloride 1,100 parts per million now; 18 when drilled.

386.	Parris Island 4FF Rifle Range	U. S. Gov't	U.S.M.C.	100	12	.....	....	2000	Ocala	Chloride 5,920 parts per million.
387.	Parris Island Rifle Range	U. S. Gov't	U.S.M.C.	3450	12	†+156	—140	80	Tuscaloosa	Pressure head 68 pounds. See analysis.
388.	Parris Island Water Plant	U. S. Gov't	Layne-Atlantic	2700 (?)	18	†+156	—138	50	Tuscaloosa	Temperature 103° F.
389.	Parris Island test well at Water Plant	U. S. Gov't	....	725	12	.....	....	...	McBean	Chloride 1,300 parts per million at 415 feet.
390.	Parris Island Incinerator	U. S. Gov't	....	66	12	.....	....	700	Ocala	Chloride 9,640 parts per million.
391.	Port Royal	Town	Hughes	50	8	†11.67	+2.32	...	Ocala (?)	See analysis.
392.	Port Royal	Crab Factory	....	75	6	.....	....	300	Ocala	
393.	Port Royal	U. S. Gov't	....	86	6	.....	....	300	Ocala	Eight wells, abandoned.
394.	Jericho Pt.	U. S. Gov't	....	85	6	†20.84	+0.19	...	Ocala	Test well.
395.	Pritchardville	W. C. Graves	W. C. Graves	165	3	†12.08	53	...	Ocala	
396.	Sheldon	B. D. Gatch	Pinkney	753	3	.....	....	...	McBean	Poor yields, reported satisfactory.
Berkeley County:										
397.	Moncks Corner	U. S. Gov't	Connolly	200	10	.....	....	225	Cooper-Santee	
398.	Moncks Corner	U. S. Gov't	Connolly	177	10	.....	....	225	Cooper-Santee	
399.	Moncks Corner	Town	Connolly	160	8	*23	30	60	Cooper-Santee	Temperature 67° F.
400.	Moncks Corner	Town	Connolly	160	8	*23	31	110	Cooper-Santee	Temperature 66.5° F. See analysis.
401.	Moncks Corner	H. W. Rueger	W. P. Addison	186	4	*25	28	6	Santee-Cooper Peedee (?)	Temperature 66.5° F. See analysis.
402.	Moncks Corner	Atlantic Coast Line R. R.	Connolly	140(?)	8	.....	....	60 (?)	Santee Cooper	
403.	St. Stephens	Town	Va. Bridge & Well Co.	180	8	.....	....	450	Black Mingo (?)	Temperature 68.5° F. See analysis.
404.	St Stephens	Santee River Hardwood Co.	....	150	4	Artesian	....	...	Black Mingo	
405.	St. Stephens	Santee River Hardwood Co.	....	175	2½	.....	....	...	Black Mingo	
406.	St. Stephens	Santee River Hardwood Co.	....	900	6	†20.6	46.5	...	Peedee-Black Mingo	Not in use.
407.	St. Stephens	Santee River Hardwood Co.	....	150	2	*100	—33	...	Black Mingo (?)	Serves mill village.
Calhoun County:										
408.	Cameron	Town	....	90	10	.....	....	100	Black Mingo or Santee	
409.	Cameron	Town	....	285	10	.....	....	85	Peedee Black Creek (?)	
410.	Cameron	Town	....	.....	4	.....	....	...		
411.	St. Matthews	Town	J. R. Connolly	110	8	*15–20	(?)	300	McBean (?)	See analysis.
412.	St. Matthews	Town	J. R. Connolly	100	6	.....	....	200	McBean (?)	

U.S.M.C.=United States Marine Corps.

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
413.	St. Matthews	Town	Mr. Oliver	100	6	Artesian	....	200	McBean-Black Mingo (?)	
414.	St. Matthews	Town	....	100	6	†7.5	....	200	McBean-Black Mingo	
Charleston County:										
415.	Charleston	Atlantic Coast Line R. R.	W. R. McGraw	400	4½	*23	—13	...	Cooper	
416.	Charleston	S. C. Power & Light Co.	....	2007	...	Artesian *70+	+80	Flows 350	Black Creek	Published in U. S. Geol. Survey Professional Paper 90H.
417.	Charleston	City		Several hundred	...	‡Artesian 20-30	....	...	(?)	‡Drilled in 1817. Location lost.
418.	Charleston	City	....	1260	...	Artesian +25	+35	Small	Peedee	Drilled in 1823-49. First well drilled by City Council.
419.	Charleston	City	....	1230	...	.....	....	Small	Peedee	Drilled in 1856.
420.	Charleston	City	Flemming Spangler	1970	...	Artesian *46+	56	465	Black Creek	Temperature 97° F. Drilled in 1878, still being used. See analysis.
421.	Charleston	City	W. H. Gray & Co., Chicago	1945	20	Artesian	....	700	Black Creek	Flows 350 gallons per minute. Drilled in 1885.
422.	Charleston	City	J. P. Miller & Co., Chicago	2000	...	.....	....	...	Black Creek (?)	
423.	Charleston	City	....	600-700	...	.....	....	...	Santee or Peedee	Windemere well. Very high in chloride. Abandoned.
424.	North Folly Beach	Town	....	510	8	.....	....	65	Santee or Peedee	
425.	Ft. Moultrie	U. S. Gov't	Layne-Atlantic	2067	12	Artesian	....	365	Black Creek	Flows 95 gallons per minute, 264-foot draw-down after 10 minutes pumping 365 gallons per minute.
426.	Ft. Moultrie	U. S. Gov't	....	1865	...	Artesian +81.5	+91.5	350	Black Creek	Originally 1920 feet deep, originally flowed 200 gallons per minute, 95° F. See analysis.
427.	Ft. Moultrie	U. S. Gov't	....	1385	12	Artesian	....	2	Peedee	Original flow 200 gallons per minute; now 200-foot drawdown pumping 110 gallons per minute. Chloride 900 parts per million. Abandoned.

428. Isle of Palms	J. C. Long	....	Shallow	1½	.....	....	1666	Pleistocene sands	Thirteen wells, 65.5° F. See analysis.
429. Johns Island Tower Site	State of South Carolina	....	505	2	.....	....	...	Santee or Peedee	
430. Johns Island	U. S. Engineers	....	575	...	.....	....	220	Peedee (?)	
431. Johns Island Airport	Town	C. G. Hay	510	10	.....	....	...	Santee or Peedee	
432. Mt. Pleasant	Town	....	50	4	*10	5	50	Pleistocene sands	Temperature 65.5° F. (6 wells.) See analysis.
433. Mt. Pleasant	Town	....	50	4	*10	5	50	Pleistocene sands	
434. Mt. Pleasant	Town	....	50	4	*10	5	50	Pleistocene sands	
435. Mt. Pleasant	Town	....	24	48	.....	....	10	Pleistocene sands	Dug well, not in use.
436. Mt. Pleasant	Town	....	340	6	*15	0	5	Santee	
437. Mt. Pleasant	Town	Layne-Atlantic	45	8	*9	+6	40	Pleistocene sands	
438. Mt. Pleasant	Town	Layne-Atlantic	45	8	*9	+6	40	Pleistocene sands	
439. Mt. Pleasant	Town	Layne-Atlantic	45	8	.....	....	40	Pleistocene sands	Chloride increased from 300 to 1,200 parts per million. Abandoned.
440. Mt. Pleasant	Town	....	340	6	.....	....	50	Santee	
441. Navy Yard	U. S. Gov't	....	375	6	25	—15	20	Cooper	Brackish. High B. coli index.
442. Navy Yard	U. S. Gov't	Layne-Atlantic	2136	20	Artesian	....	500+	Black Creek	Temperature 94° F.
443. Sullivan's Island	Town	....	25	6	*3.5	6.5	50	Pleistocene sands	Three wells.
444. Sullivan's Island	Town	....	25	6	*3.5	6.5	50	Pleistocene sands	Three wells.
445. Sullivan's Island	Town	....	25	6	*3	7	60	Pleistocene sands	Four wells.
446. Sullivan's Island	Town	....	25	6	*3.5	6.5	50	Pleistocene sands	Three wells.
Chesterfield County:									
447. McBee	Town	Hickory Pump Co.	188	10	.....	....	45	Tuscaloosa	
448. McBee	Town	C. M. Davis	190	6	.....	....	10	Tuscaloosa	Temperature 66° F. See analysis.
449. McBee	Town	....	190	6	.....	....	10	Tuscaloosa	
Clarendon County:									
450. Alcolu	Geo. W. Burke	Dory Green	300–400	2	Artesian	....	5	Peedee-Black Creek (?)	
451. Alcolu	Alderman Lumber Co.	....	(?)	4	* 5 to 6	....	250		
452. Manning	Town	Hughes	480	6	Artesian +20	90	250	Tuscaloosa	Original flow 60 gallons per minute; now flows 45 gallons per minute.
453. Manning	Town	Hughes	600	8	Artesian	....	250	Tuscaloosa	Crocodile's tooth from depth of 500 feet.
454. Manning	Town	....	300	2	Artesian	....	15	Peedee-Black Creek	
455. Manning	Town	....	270	2	Artesian	....	3-4	Peedee-Black Creek	
456. Manning	Town	....	375	2	.....	....	3-4	Peedee-Black Creek	Ceased flowing after 10-12 years.
457. New Zion Tower Site	State of South Carolina	....	296	2	.....	....	...	Peedee-Black Creek	

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
Colleton County:										
458.	Cane Branch Tower Site	South Carolina	....	678	2	.....	....	...	Peedee (?)	
459.	Cherokee Plantation	W. R. Coe	....	(?)	2	†8.98	9.42	...	(?)	
460.	Cherokee Plantation	W. R. Coe	Hughes	550(?)	8(?)	.....	....	...	Peedee (?)	Chloride 5 parts per million.
461.	Cherokee Plantation	W. R. Coe	Frank Goethe	700±	6	1.3+	5.7	7	Peedee (?)	Chloride 5 parts per million. Temperature 73° F.
462.	Cherokee Plantation	W. R. Coe	Hughes	900	12	.....	....	50	Black Creek (?)	
463.	Cherokee Plantation	W. R. Coe	....	60	2	†1.26	12.24	5½	Hawthorn	Chloride 6 parts per million. Temperature 66.5° F.
464.	Cherokee Plantation	W. R. Coe	Marion Connolly	585	3	†0.5	....	...	Peedee (?)	
465.	Combahee River and Hwy. 17	....	....	100	4	2.6	5.4	7	Ocala	Chloride 8 parts per million. Temperature 67° F.
466.	Green Pond	*Atlantic Coast Line R. R.*	W. R. McGraw	650	10	10	15±	...	McBean (?) Peedee (?)	
467.	Green Pond	State of South Carolina	....	586	3	.....	....	...	McBean (?)	
468.	Jacksonboro Camp	State of South Carolina	....	417	6	.....	....	...	McBean	
469.	Lodge	Town	Hughes	600	6	Artesian	....	...	Peedee (?)	See analysis.
470.	Lodge	Town	Hughes	599	3	Artesian	....	290	Peedee	Drilled in 1897.
471.	Lodge Tower Site	State of South *Carolina*	....	650	3	.....	....	...	Peedee (?)	
472.	Smoaks	Town	Hughes	722	4½	Artesian *40	146	120	Peedee, Tuscaloosa	
473.	Walterboro	Town	Hughes	528	6	30	41	250	McBean or Peedee (?)	
474.	Walterboro	Town	Hughes	1500–2500	8	*28	43	135	Tuscaloosa or Black Creek	See analysis.
475.	Walterboro	Town	....	1500(?)	10	.....	....	...	Black Creek (?)	Dynamited and collapsed; not in use.
476.	Walterboro	W. P. Rampey	....	600	6	*16	....	200	Peedee (?)	High in sulphur; used for swimming pool.

477. Walterboro Air Base	U. S. Gov't	Vir. Mach. & Well Co.	628	10	*56	....	240	Peedee (?)	Drawdown 14 feet.
478. Walterboro Air Base	U. S. Gov't	Vir. Mach. & Well Co.	550	10	.....	....	175	Peedee (?)	
479. Walterboro Air Base	U. S. Gov't	Vir. Mach. & Well Co.	550	6	.....	....	75	Peedee (?)	
Darlington County:									
480. Darlington	Carolina Utilities	Sydnor Pump & Well Co.	317 5/6	10	*22	....	250	Tuscaloosa	
481. Darlington	Carolina Utilities	Hughes	320	6	.....	....	360	Tuscaloosa	
482. Near Darlington	Dovesville Camp Site	....	380	3	.....	....	...	Tuscaloosa	
483. Darlington	Town	....	317	6	*28	127±	335	Tuscaloosa	
484. Darlington	Town	Sydnor Pump & Well Co.	315	8	*23	132±	250	Tuscaloosa	See analysis. Temperature 66° F
485. Darlington	Town	Paul Argo	570	6	*45–50	....	225	Tuscaloosa	
486. Darlington	Langston Ice & Fuel Co.	....	200±	8	.....	....	250	Tuscaloosa	Gravel wall well.
487. Darlington	Langston Ice & Fuel Co.	....	300	6	†31.8	119.2	...	Tuscaloosa	Abandoned.
488. Darlington	Dixie Cup Co.	J. R. Connolly	311	6	.....	....	60	Tuscaloosa	
489. Hartsville	Hartsville Oil Mill	....	160–170	4	*40	145±	40(?)	Tuscaloosa	
490. Hartsville	Sonoco Corp.	Garland	160–180	4	Artesian	....	...	Tuscaloosa	Six wells.
491. Hartsville	City	Layne-Atlantic Co.	240	20	Artesian 20+	239±	814	Tuscaloosa	Flows 350 gallons per minute, temperature 64° F. Chloride 3 parts per million. Granite at 440 feet.
492. Hartsville	City	....	185	12	Artesian 20	239±	(?)	Tuscaloosa	
493. Hartsville	City	Layne-Atlantic Co.	155	12	Artesian	....	(?)	Tuscaloosa	Temperature 64° F.
494. Hartsville	City	Layne-Atlantic Co.	384	4	Artesian 20	239±	(?)	Tuscaloosa	Temperature 64° F.
495. Hartsville	City	Layne-Atlantic Co.	384	4	Artesian 20	239±	(?)	Tuscaloosa	Temperature 64° F.
496. Hartsville	City	Layne-Atlantic Co.	384	4	Artesian 20	239±	(?)	Tuscaloosa	
497. Hartsville	City	Layne-Atlantic Co.	384	4	Artesian	....	...	Tuscaloosa	
498. Hartsville	City	....	.....	2	Artesian	....	9–14	(?)	Temperature 64° F. Public fountain.
499. Lamar	Town	....	285	6	.....	....	120	Tuscaloosa	
500. Society Hill	Town	Sydnor Pump & Well Co.	360	8	*160(?)	5(?)	70	Tuscaloosa	
501. Society Hill	Palmetto Chair Co.	....	37	1¼	*15	125	5	Pleistocene	
502. Society Hill	Georgia-Carolina Tile & Brick Co.	....	65	1½	*60	30±	8	Black Creek	

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No. LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
503. Society Hill	Georgia-Carolina Tile & Brick Co.	....	(?)	2	Artesian	....	2	(?)	Temperature 65° F.
Dillon County:									
504. Dillon	Town	Layne-Atlantic Co.	280	12	*25.1	88.9	250–300	Tuscaloosa	Temperature 65.5° F.
505. Dillon	Town	Vir. Well & Pump Co.	288	10	*12.5	101.5	375–400	Tuscaloosa	Temperature 65.5° F. Drawdown 27 feet pumping 400 gallons per minute, one hour; see analysis.
506. Dillon	Town	....	40	2	.....	....	55	Black Creek	Two driven wells.
507. Dillon	Carolina Textiles, Inc.	Company driller	21	1¾	*6	108±	60	Pleistocene-Black Creek	Temperature 66° F. Twelve driven wells.
508. Dillon	Carolina Textiles, Inc.	Company driller	21	1¼	*6	108±	50	Pleistocene-Black Creek	Six driven wells.
509. Latta	Town	(?)	360	10	*20–25	81–86	75	Black Creek Tuscaloosa	Temperature 66° F.
Dorchester County:									
510. Harleyville	Aluminum Corp.	Hughes	482	13	Artesian *18+	108	700	Peedee	Drawdown 40 feet after 24 hours pumping at 700 gallons per minute.
511. St. George	Peoples Water Service Co.	Hughes	1000	8	*28	75±	60	Peedee-Black Creek	
512. St. George	Peoples Water Service Co.	Hughes	600	6	.....	....	150	Peedee	
Florence County:									
513. Florence	Town	Layne-Atlantic Co.	700±	12	.....	....	...	Tuscaloosa	Gravel wall well. Drilled in 1926, abandoned in 1937.
514. Florence	Town	Layne-Atlantic Co.	700±	12	.....	....	...	Tuscaloosa	Abandoned in 1944. Yielded 450 gallons per minute in 1938.
515. Florence	Town	Layne-Atlantic Co.	735	16	*51	91±	925	Tuscaloosa and Black Creek	Hardness 48 parts per million, chloride 23 parts per million, iron 3 parts per million; see later analysis. Originally yielded 1,300 gallons per minute.
516. Florence	Town	Layne-Atlantic Co.	728	18	.....	....	560	Tuscaloosa	Originally yielded 1,184 gallons per minute.

517. Florence	Town	Layne-Atlantic Co.	768	20	*87	55±	705	Tuscaloosa	Drawdown 111 feet at 691 gallons per minute, 121 feet at 750 gallons per minute.
518. Florence	Amer. Lumber & Treating Co.	Heater	200	8	*32	110±	100	Black Creek	Hardness 31 parts per million, chloride 10 parts per million, iron 23 parts per million.
519. Florence	Amer. Lumber & Treating Co.	Heater	300	8	*72	70±	70	Black Creek	Hardness 26 parts per million, iron trace, bicarbonate 19 parts per million.
520. Johnsonville	Town	Connolly	210	10	*30	+5	17	Tuscaloosa and Black Creek	
521. Lake City	Imperial Tob. Co.	....	.....	5	.....	....	...	(?)	Depth several hundred feet.
522. Lake City	Town	....	310(?)	10	*26	47	240	Black Creek	
523. Lake City	Town	....	460(?)	8	*20	53	145	Black Creek and Tuscaloosa	
524. Pamplico	Town	....	180	6	.....	....	75	Black Creek	Temperature 66° F.
525. Pamplico	Town	....	80	4	.....	....	50	Black Creek	Temperature 66° F.
526. Timmonsville	Town	Layne-Atlantic Co.	170	8	*8	83	350	Black Creek and Tuscaloosa	
527. Timmonsville	Silk Mill	....	150	6	.....	....	300	Black Creek and Tuscaloosa	
Georgetown County:									
528. Bag View	J. C. Long	....	90	3	*14	+4	20	Pliocene and Pleistocene	Two wells.
529. Bag View	J. C. Long	....	90	6	*22-23	+3	20	Pliocene and Pleistocene	
530. Near Georgetown	U. S. Marine Base	Miami Drilling Co.	806-814	12	.....	....	150	Black Creek	
531. Georgetown	City	Hughes	720	6	†49.2	—39.2	225	Black Creek	See analysis. Temperature 67.5° F.
532. Georgetown	City	Layne-Atlantic Co.	840	14	.....	....	255	Black Creek	
533. Georgetown	City	Layne-Atlantic Co.	923	20	Artesian	....	430	Black Creek	Flows 15 gallons per minute.
534. Maryville Heights	G. E. Sharpton	Mr. Sing	630	4	Artesian	....	14	Black Creek	Flows 14 gallons per minute.
535. Murrels Inlet	Alex Sing	Mr. Sing	480±	3	Artesian 24+	24	...	Black Creek	See analysis. Temperature 72.5° F.
536. Pawley's Island	N. G. Anderson	Mr. Sing	660	3	Artesian	....	75	Black Creek	Temperature 73° F. Flows 40 gallons per minute, formerly 70 gallons per minute. See analysis.
537. Pawley's Island	N. G. Anderson	Mr. Sing	550	2	Artesian	....	(?)	Black Creek	Flows 25 gallons per minute.
538. Winyah Bay Tower Site	State of South Carolina	....	25	2	.....	....	...	Pliocene and Pleistocene	

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
Hampton County:										
539.	Early Branch	Town	Dewey Rivers	980	3	Artesian 21.9+	99.9	...	Black Creek	
540.	Estill	Town	....	850-950	6	Artesian	....	...	Black Creek	
541.	Estill	Town	....	850-900	6	Artesian	....	...	Black Creek	
542.	Estill	Town	....	230	6	.....	....	50±	Ocala	
543.	Estill	Coca-cola Mfg. Co.	....	230	4	.....	....	50	Ocala	
544.	Garnett	J. W. Chisolm	Jennings	1000-1100	3	Artesian *126.5	202.5	...	Black Creek Tuscaloosa	*Reported as of 1898.
545.	Hampton	Town	Rivers	825-850	6	Artesian	....	100	Black Creek	
546.	Hampton	Town	Jennings	825-850	6	Artesian	....	100	Black Creek	
547.	Hampton	Town	Rivers	825-850	6	Artesian	....	134	Black Creek	
548.	Hampton	Plywood Plastics Corp.	D. L. Rivers	820	6	Artesian	....	...	Black Creek	
549.	Hampton	Plywood Plastics Corp.	D. L. Rivers	850	8	Artesian	....	...	Black Creek	Temperature 80° F. Fluctuates in flow.
550.	Varnville	Town	Connolly	870	8	Artesian	....	60	Black Creek	See analysis.
551.	Varnville	Town	....	900	3	Artesian	....	...	Black Creek	
552.	Varnville	Salkehatchie Cypress Co.	Hughes	917	12	Artesian 90+	191	1200	Black Creek	
553.	Varnville	Atlantic Coast Line R. R.	....	900±	3	Artesian 5.5	106.5	3	Black Creek (?)	
554.	Yemassee	Town	....	635	10	†36.7	10.1	150	McBean (?)	
555.	Yemassee	B. M. Nixon	....	112	...	†17.5	11.5	...	Ocala	
556.	Yemassee	Gregory Estate	....	.....	3	†20.7	11.5	...	....	
557.	Yemassee	U. S. Gov't	W.P.A.	.....	4	Artesian †9.8	34.0	...	(?)	
558.	Yemassee	South Carolina Highway Dept.	Highway Dept.	27	2	Artesian †2.8	17.8	...	Pleistocene	
559.	Yemassee	Atlantic Coast Line R. R.	W. R. McGraw	170	10	.....	....	...	Ocala	
560.	Yemassee	Town	Rivers & Hampton	667	8	*20	10±	125	McBean (?)	See analysis.
Horry County:										
561.	Cherry Grove Beach	C. D. Nixon	....	100	2	.....	....	132	Pliocene or Pleistocene	

562.	Conway	Town	Layne-Atlantic Co.	438	18	Artesian	....	275	Peedee	Flowed 65 gallons per minute in 1941, 40 gallons per minute in 1946. See analysis.
563.	Conway	Town	Vir. Mach. & Well. Co.	400	10	Artesian	....	125	Peedee	Flows 125 gallons per minute. See analysis.
564.	Conway	Town	A. T. Sing	305	3	Artesian	....	25	Peedee	Flows 25 gallons per minute.
565.	Conway	Town	R. W. Jones	290	2	Artesian	....	30	Peedee	Flows 30 gallons per minute. See analysis.
566.	Conway	Town	....	400	2	Artesian	....	Small	Peedee	Flowed 50 gallons per minute in 1941.
567.	Conway	Veneer Mfg. Co.	Alec Sing	300	4	Artesian	....	25	Peedee	Flows 25 gallons per minute.
568.	Conway	Veneer Mfg. Co. No. 1	....	.....	2	Artesian	....	3-5	(?)	
569.	Conway	Veneer Mfg. Co. No. 1	....	.....	2	Artesian	....	3-4	(?)	
570.	Conway	Stilly Plywood Co.	Mr. E. Nixon	225-275	2	Artesian	....	10	Peedee	Temperature 66° F. Flows 10 gallons per minute.
571.	Conway	Ingram Mill	R. W. Jones	300	2	Artesian	....	10-15	Peedee	Temperature 66° F. Flows 10-15 gallons per minute.
572.	Conway	Ingram Mill	R. W. Jones	300	2	Artesian	....	15	Peedee	Flows 15 gallons per minute.
573.	Conway	Ingram Mill	R. W. Jones	300	4	Artesian	....	40(?)	Peedee	Temperature 66.5° F. Flows about 40 gallons per minute.
574.	Conway	Moore's Gas Station	....	.....	2	Artesian	....	10-15	(?)	Temperature 67° F. Flows about 10-15 gallons per minute.
575.	Crescent Beach	Mrs. R. T. Havens	....	.....	3	.....	....	163	(?)	Five wells together.
576.	Daisy	Macedonia Church	Bert Stevens	80	1¼	.....	....	...	Pliocene or Pleistocene	Temperature 64° F.
577.	Little River	Tilgham Corp.	....	.....	10	.....	....	100	(?)	
578.	Loris	Town	Vir. Mach & Well Co.	397	8	†37	57	120	Peedee	Temperature 64° F. See analysis. Drawdown 22 feet after pumping 20 hours at 80 gallons per minute.
579.	Loris	Atlantic Coast Line R. R.	....	.....	3	.....	....	...	....	Temperature 65.5° F.
580.	Loris	Loris Ice Co.	Carolina Ice & Fuel Co.	58	6	7	87±	50	Pliocene or Pleistocene	Drawdown 10 feet after 48 hours at 50 gallons per minute.
581.	Loris	Bert Stevens	Bert Stevens	90	1¼	9.9	84.1±	...	Pliocene or Pleistocene	
582.	Loris	....	....	.....	1¼	.....	....	...	....	See analysis; near water tank.
583.	Murrells Inlet	Mrs. Sing	J. C. Miller	15	1¼	.....	....	...	....	Temperature 61° F. See analysis.
584.	Near Myrtle Beach	W. L. Bailey	Alex Sing	500	3	Artesian	....	...	Peedee-Black Creek	Temperature 71°F.; see analysis; flows 2.7 gallons per minute 2½ feet above ground.
585.	Myrtle Beach	Town	Layne-Atlantic Co.	548	14	Artesian	....	470	Black Creek	Drawdown 113 feet pumping 470 gallons per minute.
586.	Myrtle Beach	Town	Layne-Atlantic Co.	571	18	Artesian	....	515	Black Creek	Flows 60 gallons per minute; 94 feet of drawdown pumping 515 gallons per minute. Temperature 73.5° F. See analysis.

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
587.	Myrtle Beach	Town	Layne-Atlantic Co.	.....	...	Artesian	....	...	....	
588.	Myrtle Beach Bombing Range	U. S. Gov't	....	572	12	.....	....	120	Black Creek (?)	
589.	Myrtle Beach Bombing Range	U. S. Gov't	J. R. Connolly	565	10	Artesian	....	190	Black Creek	Drawdown 24 feet.
590.	Myrtle Beach Bombing Range	U. S. Gov't	....	.....	...	.....	.....	130	....	Drawdown 30 feet.
591.	Mrytle Beach Bombing Range	U. S. Gov't	....	.....	...	Artesian	....	120	....	Drawdown 10 feet.
592.	Myrtle Beach Bombing Range	U. S. Gov't	Varnville Well Drilling Co.	504	12	Artesian	....	120	Black Creek (?)	Drawdown 55 feet. See analysis.
593.	Myrtle Beach Bombing Range	U. S. Gov't	Varnville Well Drilling Co.	560	12	Artesian	....	80	Black Creek (?)	
594.	Myrtle Beach Bombing Range	U. S. Gov't	J. R. Connolly	604	10	Artesian	....	130	Black Creek (?)	Flows 20 gallons per minute; drawdown 160 feet pumping 130 gallons per minute.
595.	Myrtle Beach Bombing Range	U. S. Gov't	Varnville Well Drilling Co.	732	10	.....	....	...	....	Dry hole.
596.	Myrtle Beach	**South Carolina** Utilities	Layne-Atlantic Co.	555	...	Artesian	....	360	Black Creek (?)	Temperature 73.5° F. See analysis; flows 125 gallons per minute.
597.	Myrtle Beach	South Carolina Utilities	Layne-Atlantic Co.	548	6	Artesian +14	+35	300	Black Creek (?)	Temperature 73.5° F. See analysis, specific capacity 3. gallons per foot of drawdown; flows 30-50 gallons per minute.
598.	Myrtle Beach	E. K. McDaniel	E. K. McDaniel	29	1¼	.....	....	...	Pliocene and Pleistocene	Good flow; temperature 65° F.
599.	Myrtle Beach	U. S. Gov't (Inland Waterway)	U. S. Gov't	.....	8	Artesian	+8	15	(?)	Flows 15 gallons per minute about 8 feet above average high tide.

600.	Ocean Drive	Ocean Drive Light & Waterway	....	75–125	2	*15	0	150–200	Peedee	Five wells.
601.	Pine Island	State Highway Department	....	400–500	3	†7	35	20	Peedee	Flows 3.5 gallons per minute at 35 feet drawdown; temperature 72° F. See analysis.
602.	Pine Island	Myrtle Farms, Inc.	Zander Cox	.....	2	*5	30	...	(?)	See analysis.
603.	Pine Island	Atlantic Coast Line R. R.	A. L. Granger	15	1¼	*5–8	30–33	...	Pliocene and Pleistocene	See analysis.
604.	Pine Island	Myrtle Farms, Inc.	....	22	1¼	*5–8	30–33	...	Pliocene and Pleistocene	Temperature 58.5° F. See analysis.
605.	Socastee	Socastee School	....	48	6	*6	....	...	Pliocene and Pleistocene	Temperature 60° F.
Jasper County:										
606.	Coosawhatchie	L. M. Wall	Frank Goethe	140	3	Artesian †+5.5	17.9	...	Hawthorn	Temperature 67° F.
607.	Coosawhatchie	Mrs. H. E. Cleland	W. Roberts	100±	2½	Artesian †+5.52	18.17	...	Hawthorn	
608.	Coosawhatchie	Mrs. H. E. Cleland	....	100±	3	Artesian †+5.0	18.3	...	Hawthorn	
609.	Good Hope Plantation	H. L. Pratt	....	.....	3	Artesian †2+	8	...	(?)	Temperature 68° F.
610.	Good Hope Plantation	H. L. Pratt	W. Smith	125	4	Artesian †+1.8	7.3	...	Hawthorn	
611.	Good Hope Plantation	H. L. Pratt	Frank Goethe	135	6	†+2.8	7.3	...	Hawthorn	
612.	Hardeeville	W. O. Hubbard	Frank Goethe	240	3	†21.2	—0.2	...	Hawthorn or Ocala	
613.	Hardeeville	Argent Lumber Co.	Argent Lumber Co.	200±	6	†5	16±	...	Hawthorn or Ocala	
614.	Ridgeland	Atlantic Coast Line R. R.	W. R. McGraw	200	3	†40	+17	...	Hawthorn or Ocala	
615.	Ridgeland	Atlantic Coast Line R. R.	W. R. McGraw	185	3	†15	+42	...	Hawthorn or Ocala	
616.	Ridgeland	Town	....	400±	12	*40	+17±	925	Ocala	Two wells. See analysis 6-inch well 125 gallons per minute; 12-inch well 800 gallons per minute.
617.	Ridgeland	Town	J. R. Connolly	365	12	*40–45	12–17	...	Ocala	
618.	Ridgeland	Town	J. R. Connolly	.....	6	.....	....	...	(?)	
619.	Near Savannah	W. W. White	Frank Goethe	260	3	†10.7	....	...	Ocala	
620.	Near Savannah	U. S. Fish and Wildlife Service	J. A. Showalter	503	6–8	†23.75	13.00	...	Black Creek (?)	
621.	Tillman	W. M. Little Lumber Co.	J. A. Showalter	424	8	*10	—22	...	Black Creek (?)	
Kershaw County:										
622.	Bethune	Town	....	165	6	†115	+154	125	Tuscaloosa	Temperature 66° F. Drawdown 35 feet after 5 hours at 125 gallons per minute. See analysis.

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No. LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
623. Blaney Tower Site	State of South Carolina	....	105	(?)	.....	....	...	Tuscaloosa	
624. Camden	Powe Veneer Co.	....	26	120	—20	+185	50	Pleistocene	Dug well.
625. Camden Tower Site	State of South Carolina	....	70	...	.....	....	...	Tuscaloosa	
Lee County:									
626. Ashwood School	U. S. Gov't	....	150	4	.....	....	125	Tuscaloosa	Temperature 65° F. See analysis.
627. Near Bishopville	State of South Carolina	....	65	2	.....	....	...	Tuscaloosa	
628. Near Bishopville	State of South Carolina	....	69	1½	.....	....	...	Tuscaloosa	
629. Bishopville	Town	....	200	6	.....	....	350	Tuscaloosa	See analysis.
630. Bishopville	Town	....	200	6	.....	....	...	Tuscaloosa	Not in use.
631. Lee State Park	State of South Carolina	....	132	3	.....	....	...	Tuscaloosa	
632. Lee State Park	State of South Carolina	....	111	2	.....	....	...	Tuscaloosa	
633. Lee State Park	State of South Carolina	....	114	3	.....	....	...	Tuscaloosa	
634. Lee State Park	State of South Carolina	....	118	2	.....	....	...	Tuscaloosa	
635. Lynchburg	Town	....	400	8	.....	....	167	Tuscaloosa	Temperature 66° F.
636. Lynchburg	Town	....	400	8	.....	....	167	Tuscaloosa	Temperature 64.5° F.
Lexington County:									
637. Leesville	Town	....	70	6	.....	....	110	Barnwell	See analysis.
638. Leesville	Leesville Ginnery	Leesville Ginnery	43	7½	.....	....	...	Barnwell	
639. Swansea	Lexington County High School	T. L. Smith	45	2	.....	....	5-8	Tuscaloosa (?)	
640. Swansea	Lexington County High School	T. L. Smith	45	2	.....	....	5-8	Tuscaloosa (?)	Cased 41 feet.

Marion County:									
641. Marion	Town	....	150	6	*30	+38	180	Black Creek	Temperature 57° F. See analysis.
642. Marion	Town	....	80	8	*30	+38	80	Black Creek	
643. Marion	Town	....	80	6	*30	+38	200	Black Creek	
644. Marion	Marion Cotton Oil Company	....	77	4	*30	+35	...	Black Creek	
645. Marion	American Wood Products Co.	....	12	96	.....	....	30	Pleistocene	Dug well with drilled well in bottom.
646. Mullins	Town	Hughes	370	8	*60	43±	150	Black Creek	Screen 20 feet.
647. Mullins	Town	Sydnor	370	10	*60	43±	250	Black Creek	Cased 370 feet; screen 36 feet.
648. Mullins	Town	Vir. Mach. & Well Co.	380	8	†65	+33	350	Black Creek	Temperature 68.5 F. See analysis.
649. Mullins (?)	Atlantic Coast Line R. R.	E. M. Smith	101	6	*14	+84	35	Black Creek	
650. Mullins	Mullins Lumber Co.	Vir. Mach. & Well Co.	657	...	.....	....	...	Tuscaloosa	
Marlboro County:									
651. Bennettsville	Town	Car. Drl. & Eng. Co.	300	8	*25	+125	300	Tuscaloosa	Gravel wall well.
652. Bennettsville	Town	Car. Drl. & Eng. Co.	350	8	.....	....	300	Tuscaloosa	Gravel wall well.
653. Bennettsville	Town	Car. Drl. & Eng. Co.	45–60	4	*19	+131	200	Pleistocene-Sunderland (?)	Five driven wells.
654. Bennettsville	Town	Car. Drl. & Eng. Co.	45–60	3	*19	+131	200	Pleistocene-Sunderland (?)	Eight driven wells. Temperature 64° F. See analysis.
655. Bennettsville	Kirkwood Gin	....	35	4	.....	....	...	Pleistocene-Sunderland (?)	
656. Clio	Town	Hickory Drilling Co.	160	8	.....	....	300	Tuscaloosa	Temperature 60° F. See analysis.
657. Clio	Town	....	85	4	.....	....	80	Tuscaloosa	
658. McColl	Town	....	90–100	8	*19	+170	150	Tuscaloosa	Temperature 65° F. See analysis.
659. McColl	Town	....	90–100	8	*19	+170	35	Tuscaloosa	
660. McColl	Town	Hickory Drilling Co.	120	8	*19	+170	100	Tuscaloosa	
661. McColl	Town	....	90–100	8	†26.7	+141.3	35	Tuscaloosa	Not in use.
662. McColl	Town	....	.....	...	†28.2	+140.8	...	Tuscaloosa (?)	Abandoned.
663. McColl	Plymouth Mfg. Co.	Hickory Well & Pump Co.	85	8	*20	+149	98	Tuscaloosa (?)	Temperature 65° F.
664. McColl	Plymouth Mfg. Co.	Hickory Well & Pump Co.	85	8	*20	+149	70	Tuscaloosa (?)	Temperature 65° F.
665. McColl	Plymouth Mfg. Co.	....	85	8	*20	+149	31	Tuscaloosa	
Orangeburg County:									
666. Brandeville	Town	J. R. Connolly	800	8	Artesian	....	60	Tuscaloosa	Original flow 60 gallons per minute; see analysis.

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No.	LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
667.	Brandeville	Town	J. R. Connolly	120	6	*13	+112	(?)	Ocala	
668.	Elloree	Town	....	135	...	.....	....	105	Ocala	See analysis.
669.	Holly Hill	Town	Vir. Bridge & Well Co.	278	8	*20	+83	250	Ocala	
670.	Holly Hill	Town	Vir. Bridge & Well Co.	278	8	*12	+91	250	Ocala	
671.	North	Town	....	125	10	†50	+224	100	McBean-Black Mingo (?)	
672.	North	Town	....	135	10	†50	+224	100	McBean-Black Mingo (?)	Temperature 60° F. See analysis.
673.	Norway	Town	J. R. Connolly	250	10	.....	....	125	Black Mingo-Santee (?)	
674.	Springfield	Town	J. R. Connolly	138	8	*35	+263	200	McBean or Tuscaloosa	Temperature 61° F. See analysis.
675.	Springfield	Town	J. R. Connolly	100-120	8	*35	+263	200	McBean or Tuscaloosa	
Richland County:										
676.	Near Columbia	Clemson College	....	80	6	.....	....	10	McBean or Tuscaloosa	
677.	Near Columbia	Camp Jackson Tower Site	....	205	2	.....	....	...	McBean or Tuscaloosa	
678.	Congaree Air Field	U. S. Gov't	....	150-200	6	.....	....	150	Tuscaloosa	Temperature 67° F. See analysis.
679.	Congaree Air Field	U. S. Gov't	....	150-200	6	.....	....	150	Tuscaloosa	
680.	Denny Terrace	L. A. Denny	Watson Wallace	208	4	.....	....	30	Tuscaloosa of decomposed granite	See analysis.
681.	Denny Terrace	L. A. Denny	Watson Wallace	108	4	.....	....	30	Tuscaloosa	
682.	Denny Terrace	L. A. Denny	Watson Wallace	98	4	.....	....	30	Tuscaloosa	
683.	Denny Terrace	L. A. Denny	Watson Wallace	92	4	.....	....	30	Tuscaloosa	
684.	Denny Terrace	L. A. Denny	Watson Wallace	83	4	.....	....	30	Tuscaloosa	
685.	Denny Terrace	L. A. Denny	Watson Wallace	198	4	.....	....	30	Tuscaloosa or decomposed granite.	
686.	Near Eastover	Tower Site	....	21	...	.....	....	...	Tuscaloosa or Pleistocene	
687.	Fort Jackson	U. S. Gov't	J. R. Connolly	180	8	.....	....	100	Tuscaloosa	Temperature 67° F. See analysis.
688.	Fort Jackson	U. S. Gov't	J. R. Connolly	225	8	.....	....	40	Tuscaloosa	
689.	Fort Jackson	U. S. Gov't	....	80	6	.....	....	10-12	Tuscaloosa	
690.	Fort Jackson	U. S. Gov't	....	80	6	.....	....	10-12	Tuscaloosa	

Sumter County:									
691. Mayesville	Town	Mr. Ellis	53	2	*15	+130	25	Duplin (?)	
692. Mayesville	Town	....	180	...	.....	....	75	Black Mingo-Tuscaloosa	
693. Parkwood Estate	Town	Mr. Ellis	42	2	*10	+159(?)	20	Pleistocene	Temperature 65.5° F.
694. Parkwood Estate	Town	....	42	2	*10	159±	20	Pleistocene	
695. Pinewood	Town	Connolly	44	2	*20	+173	...	Black Mingo	
696. Pinewood	Town	Connolly	180	6	*20	+173	60	Tuscaloosa	
697. Pocala Springs	Mr. Hill	....	180–350	3	Artesian	....	483	Tuscaloosa	Supplies swimming pool and water for tourist cabins; 11 wells together.
698. Pocala Springs	Mr. Hill	....	100	8	.....	....	240	Black Mingo	Four wells together.
699. Shaw Field	U. S. Gov't	Layne-Atlantic Co.	290	18	*76	+174	750	Tuscaloosa	Temperature 67° F. Pipe 170 feet; screen 54 feet; see analysis.
700. Shaw Field	U. S. Gov't	Layne-Atlantic Co.	165	18	*77.5	+178.5	350	Tuscaloosa	Gravel pack well; pipe 132 feet; screen 31 feet.
701. Sumter	Coca-Cola Co.	Layne-Atlantic Co.	48	6	*16	+153(?)	50	Black Mingo	Original yield 90 gallons per minute.
702. Sumter	State Forestry Department	....	190	4	.....	....	...	Tuscaloosa	
703. Sumter	State Forestry Department	....	397	3	.....	....	...	Tuscaloosa	
704. Sumter	State Forestry Department	....	190	4	.....	....	...	Tuscaloosa	
705. Sumter	State Forestry Department	....	193.5	4	.....	....	...	Tuscaloosa	
706. Sumter	State Forestry Department	....	65	4	.....	....	...	Black Mingo	
707. Sumter	State Nursery	....	190	4	.....	....	...	Tuscaloosa	
708. Sumter	City	Layne-Atlantic Co.	737	18	†24	+145(?)	1580	Tuscaloosa	Temperature 68° F. See analysis. Gravel wall well; 91 feet drawdown.
709. Sumter	City	Layne-Atlantic Co.	625	18	*24	145±	1400	Tuscaloosa	Gravel wall well.
710. Sumter	City	Layne-Atlantic Co.	711	15	*26	143±	1691	Tuscaloosa	Yield 2200 gallons per minute at ground level. Well collapsed; not in use.
711. Sumter	City	....	55	24	*18–26	....	1250–1300	Black Mingo	*Fluctuates with rainfall; screen 12 feet; 6 wells. Temperature 65.5° F.
712. Sumter	City	Layne-Atlantic	418	18	*26	143±	750	Tuscaloosa	Excessive amount of iron; not in use.
713. Sumter	City		120	2	Artesian +20	....	2	Tuscaloosa	
714. Sumter	City	....	120	2	+ 1.5	....	12	Tuscaloosa	Filled in at airport. Not used.

RECORDS OF WELLS IN THE COASTAL PLAINS—Continued

Well No. LOCATION	OWNER	DRILLER	Depth (feet)	Diameter (inches)	Depth to water (feet)	Altitude	Yield (gallons per minute)	CHIEF AQUIFER	REMARKS
Williamsburg County:									
715. Hemingway	Town	....	453	10	Artesian	....	40	Black Creek	Flows 7.5 gallons per minute.
716. Kingstree	Town	Layne Atlantic Co.	630	18	Artesian *+13	+72	1100	Black Creek	Gravel wall well; temperature 66° F. See analysis; 160 feet drawdown, 4 hours, 1400-1800 gallons per minute; flows 80 gallons per minute.
717. Kingstree	Town	Hughes	550	6	Artesian	....	225	Black Creek	Flows 15-20 gallons per minute.
718. Kingstree	Town	Hughes	550	6	Artesian	....	150	Black Creek	
719. Kingstree	Town	Hughes	450	4	.....	....	150	Black Creek	
720.	Atlantic Coast Line R. R.	W. R. McGraw	200	12	*15	....	...	Peedee (?)	

RECORDS OF MUNICIPAL SPRINGS IN THE COASTAL PLAIN

No.	LOCATION	OWNER	Yield (Gallons per minute)	CHIEF AQUIFER	Topographic location	REMARKS
Aiken County:						
F.	Aiken	Town	1042	Barnwell sand	Valley	Series of filtration springs with collection basin; see analysis; serves 1,600 houses; temperature 65° F.
G.	Graniteville	Town	400	Tuscaloosa	Valley	Series of 12 filtration springs with collection basin; serves 102 houses; temperature 58° F.
H.	Langley	The Langley Co.	70	Tuscaloosa	Draw	Brick collecting basin for filtration spring; serves 316 houses; no treatment.
I.	North Augusta	Town	85	Tuscaloosa	Valley	Filtration spring with square cement collection basin; temperature 59° F.; one spring.
J.	North Augusta	Town	22	Tuscaloosa	Valley	Seepage springs; temperature 59° F.; five springs; emptying into collection basin.
K.	North Augusta	Town	90	Tuscaloosa	Valley	Filtration springs (3).
L.	Warrenville	Graniteville Mill	32	Tuscaloosa	Slope	Contact spring; little annual fluctuation in yield; chlorinated.

CHEMICAL ANALYSES FOR WELLS IN THE COASTAL PLAIN

Analysed by William L. Lamar, Evelyn Holloman, N. K. McShane, and N. A. Talvitie
(Numbers refer to wells described in table of well data)

(Parts Per Million)

COUNTY	No.	Depth (feet)	AQUIFERS	Date of collection	Iron (Fe)	Bicar-bonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
Allendale	329	800	Tuscaloosa	3-8-46	0.22	127	10	5.5	0.2	0.1	108
Bamberg	333	200	Cooper marl	2-12-46	1.46	156	15	23	.1	.1	147
Bamberg	341	596	Tuscaloosa	3-6-46	1.60	33	13	4	.2	.1	39
Barnwell	346	180	Barnwell	3-7-46	.25	85	1	4	.1	.1	70
Barnwell	352	150	Barnwell	3-7-46	.13	14	1	4	.1	1.0	15
Beaufort	356*	87	Ocala	4-17-44	.....	118	4	18	.....	.....	123
Beaufort	358*	750	McBean ?	4-11-44	.4	335	3	14	3.8	.....	96
Beaufort	360*	84	Ocala	5-5-43	1.6	238	12	14	.....	.....	216
Beaufort	363*	1400±	Peedee ?	4-12-44	.....	683[1]	36	87	2.8	.....	26
Beaufort	365*	240	Ocala	4-12-44	.....	148	1	8	.....	.....	126
Beaufort	368-371*	90-190	Ocala	5-5-43	.10	208	4	20	.....	.....	137
Beaufort	376*	62	Ocala	4-5-44	.....	183	1	9	.....	.....	144
Beaufort	387*	3450	Black Creek Tuscaloosa	10-10-39	.....	1316	.....	82	7	.....	.....
Beaufort	391*	50	Ocala	4-11-44	.....	168	1	53	.....	.....	159

*Note similarity among 535, 562, 563, 565, 566, 601, 602.

Note similarity between 603, 604.

[1]Includes the equivalent of 28 parts of carbonate (CO_3).

CHEMICAL ANALYSES FOR WELLS IN THE COASTAL PLAIN—(Continued)

Analysed by William L. Lamar, Evelyn Holloman, N. K. McShane, N. A. Talvitie

(Numbers refer to wells described in table of well data)

(Parts Per Million)

COUNTY	No.	Depth (feet)	AQUIFERS	Date of collection	Iron (Fe)	Bicar-bonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
Berkeley	400	160	Santee-Cooper	3-15-46	0.58	227	1	16	1.0	0.6	138
Berkeley	403	180	Black Mingo ?	3-15-46	4.9	176	1	8	.2	.1	130
Calhoun	411	110	McBean ?	3-16-46	.13	52	1	5.5	.0	2.6	51
Charleston	420	1970	Black Creek	3-21-46	.50	812[1]	1	178	5.0	.1	18
Charleston	426	1865	Black Creek	4- 3-46	.22	1120[2]	1	270	4.8	1.8	18
Charleston	428	Shallow	Pleistocene	4- 3-46	.59	225	20	97	.5	1.0	189
Charleston	432	50	Pleistocene	4- 3-46	.18	122	17	24	.3	.1	108
Chesterfield	448	190	Tuscaloosa	3-30-46	.50	4	1	12	.1	5.8	12
Colleton	469	600	Peedee ?	3- 6-46	.56	106	8	4	.7	.1	33
Colleton	474	1500–2500	Tuscaloosa Black Creek	3- 9-46	.21	190	10	5.5	1.2	.4	15
Darlington	484	315	Tuscaloosa	2- 8-46	.91	2.0	7	3.5	.1	.1	9
Dillon	505	288	Tuscaloosa	2- 6-46	.15	4.0	3	13	.1	12	24
Florence	515	735	Tuscaloosa and Black Creek	3-21-45	3.0	.....	.....	23	.....	.....	48
				2- 9-46	2.2	23	3	30	.4	.1	34
Georgetown	531	720	Black Creek	4-23-41	.....	539	1	38	.9	.....	10
				3-23-46	1.6	519[3]	1	30	1.2	.2	14

[1]Includes the equivalent of 30 parts of carbonate (CO_3).

[2]Includes the equivalent of 41 parts of carbonate (CO_3).

[1]Includes the equivalent of 28 parts of carbonate (CO_3).

CHEMICAL ANALYSES FOR WELLS IN THE COASTAL PLAIN—(Continued)

Analysed by William L. Lamar, Evelyn Holloman, N. K. McShane, N. A. Talvitie

(Numbers refer to wells described in table of well data)

(Parts Per Million)

COUNTY	No.	Depth (feet)	AQUIFERS	Date of collection	Iron (Fe)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
Georgetown	535*	480±	Black Creek	4-24-41	.....	691[1]	1	34	4.6	.....	10
Georgetown	535*	660	Black Creek	3-23-46	.23	657	1	42	4.4	.7	15
Hampton	550	870	Black Creek	3- 8-46	.13	144	10	4.0	.8	.2	18
Hampton	560	667	McBean (?)	4-21-44	.....	183	2	4	.....	.....	98
Horry	562*	438	Peedee	4-24-41	.....	595	1	68	3.6	.....	14
Horry	563*	400	Peedee	4-24-41	.....	592	1	50	4.0	.....	12
Horry	565*	290	Peedee	4-24-41	.....	609	1	35	4.6	.....	14
Horry	578	397	Peedee	4-25-41	.....	568	17	285	3.4	.....	34
				2-20-46	.81	566	27	290	3.6	.5	44
Horry	584*	500	Black Creek-Peedee (?)	4-24-41	.....	688	1	57	5.0	.....	16
Horry	586	571	Black Creek	4- 2-46	.30	651[2]	1	90	3.6	.4	15
Horry	592	504	Black Creek (?)	4- 2-46	.95	700[3]	1	107	4.8	.4	27
Horry	596*	555	Black Creek (?)	4-24-41	.....	691	1	86	4.6	.....	14
Horry	597*	548	Black Creek (?)	4-24-41	.....	663	1	67	4.6	.....	16
Horry	601*	400-500	Peedee	4-24-41	.....	629	1	37	4.4	.....	12
Horry	602*	?	(?)	4-24-41	.....	694	1	57	5.0	.....	18
Horry	603*	15	Pleistocene	4-24-41	.....	51	1	16	.2	.....	50

*Note similarity among 535, 562, 563, 565, 566, 601, 602.
Note similarity between 603 and 604.

[1]Includes the equivalent of 17 parts of carbonate (CO_3).

[2]Includes the equivalent of 21 parts of carbonate (CO_3).

[3]Includes the equivalent of 22 parts of carbonate (CO_2).

CHEMICAL ANALYSES FOR WELLS IN THE COASTAL PLAIN—(Continued)

Analysed by William L. Lamar, Evelyn Holloman, N. K. McShane, N. A. Talvitie
(Numbers refer to wells described in table of well data)

(Parts Per Million)

COUNTY	No.	Depth (feet)	AQUIFERS	Date of collection	Iron (Fe)	Bicar-bonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$
Horry	604*	22±	Pleistocene	4-24-41	.....	31	1	16	0.2	.....	40
Jasper	616*	370±	Ocala	4-21-41	.....	187	2	7	.....	.....	129
Kershaw	622	165	Tuscaloosa	3-30-46	.23	3	1	4.0	.1	1.4	6
Lee	626	150	Tuscaloosa	3-30-46	.64	1	1	4.5	.1	3.1	4
Lee	629	200	Tuscaloosa	3-30-46	.25	2	1	5	.1	.2	6
Lexington	637	70	Barnwell	10-18-45	.81	3.0	1	9.0	.0	28.0	22
Marion	641	150	Black Creek	2- 4-46	.15	103	2	4.5	.2	.1	39
Marion	648	380	Black Creek	2- 6-46	.11	117	3	7.0	1.0	.1	9
Marlboro	654	45-60	Pleistocene Sunderland (?)	2- 7-46	.23	2.0	1	17	.1	15.0	15
Marlboro	656	160	Tuscaloosa	2- 7-46	.57	9.0	6	4	.1	.1	15
Marlboro	658	90-100	Tuscaloosa and Pleistocene	2- 7-46	.12	4.0	2	12	.1	12.0	15
Orangeburg	666	800	Tuscaloosa	3- 6-46	1.1	36	10	4	.1	.1	33
Orangeburg	668	135	Ocala	3-16-46	.70	109	8	8	.1	.1	90
Orangeburg	672	135	McBean-Black Mingo	1-29-46	.23	8.0	1	5	.4	4.4	9
Orangeburg	674	138	McBean-Tuscaloosa	1-29-46	.33	24	1	6	.1	.4	27
Richland	678	150-200	Tuscaloosa	3-29-46	0.34	5	1	3.5	0.1	3.2	10
Richland	680	208	Tuscaloosa or decomposed granite	10-15-45	.07	16	1	4	.1	.0	10
Richland	687	180	Tuscaloosa	3-27-46	.31	7	1	5	.1	4.5	9
Sumter	699	290	Tuscaloosa	3-29-46	.47	1	5	4	.2	1.2	3
Sumter	708	737	Tuscaloosa	3-13-46	2.0	2	5	5	.1	.1	10
Williamsburg	716	630	Black Creek	3-15-46	0.5	209[1]	7	5	1.8	.2	12

[1]Includes the equivalent of 13 parts of carbonate (CO_3).

CHEMICAL ANALYSIS FOR A SPRING IN THE COASTAL PLAIN

Analysed by William L. Lamar, Evelyn Holloman, N. K. McShane, N. A. Talvitie
(Letter refers to spring described in table of spring data)

(Parts Per Million)

No.	COUNTY	AQUIFER	Date of collection	Iron (Fe)	Bicarbonate (HCO_3)	Sufate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCo_3$
F.	Aiken	Barnwell	......	0.10	4	1	4	0.0	2.9	6