GROUND-WATER RESOURCES of MARTIN COUNTY, NORTH CAROLINA

Division of Ground Water

GROUND-WATER BULLETIN NUMBER 9

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STATE OF NORTH CAROLINA

DEPARTMENT OF WATER RESOURCES

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November 9, 1966

The Honorable Dan K. Moore
Governor of North Carolina
Raleigh, North Carolina

Dear Governor Moore:

I am pleased to submit Ground-Water Bulletin Number 9, "The Ground-Water Resources of Martin County, North Carolina" by Granville G. Wyrick, Geologist, U. S. Geological Survey.

This report contains the results of a detailed study of the ground-water resources made by the U. S. Geological Survey in cooperation with the Martin County Board of Commissioners and the North Carolina Department of Water Resources. It should prove to be of much value toward the economic and industrial development of the County.

Respectfully submitted,

George E. Pickett

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NORTH CAROLINA

By

Granville G. Wyrick

ABSTRACT

Martin County is in the north-central part of the North Carolina Coastal Plain and is underlain by sedimentary rocks that thicken from about 400 feet in the western part of the county to about 1,000 feet in the eastern part. The sediments, ranging in age from Cretaceous to Recent, are composed chiefly of clay, sand, shell, and limestone that were deposited on crystalline basement rock. Pre-Miocene sediments strike north-northeast and dip to the southeast whereas Miocene and younger sediments are essentially horizontal.

Within the sedimentary section are seven sand, shell, or limestone beds which are the principal aquifers in the county. Water in the lower six of the aquifers occurs under artesian conditions, and in the seventh, under non-artesian conditions. The average transmissibility of the artesian aquifers ranges from 4,000 gallons per day per foot in Aquifer Number 4 to 18,000 gallons per day per foot, in Aquifer Number 3. The average daily recharge to the artesian aquifers in the county is computed as 22 million gallons per day for aquifers between 100 feet and 300 feet below land surface.

Sufficient quantities of water of chemical quality suitable for most purposes are available in the aquifers underlying Martin County. However, in many places wells yield water of unsuitable quality or insufficient quantity, largely due to the methods of well construction. Four principal problems of water supply apparently are related to this cause: (1) Water containing concentrations of chloride in excess of 250 parts per million is obtained from wells that are drilled to depths greater than 450 feet, after passing through aquifers containing water of usable quality; (2) water containing iron in concentrations greater than 0.5 parts per million is obtained from wells completed in the non-artesian aquifer, but water of better quality is available at slightly greater depths; (3) wells are finished in shell or limestone aquifers which generally produce

water with a hardness in excess of 200 parts per million; (4) the specific capacities of wells in the county on the basis of yield are below the specific capacities calculated on the basis of aquifer transmissibilities. Aquifer characteristics determined during this investigation indicate that these four problems may be minimized by drilling wells that tap aquifers containing water of acceptable chemical quality, and by the use of screen sizes and screen lengths that are adapted to specific aquifers.

INTRODUCTION

Ground water is one of the most important natural resources of the Coastal Plain of North Carolina. Ground water is also, perhaps, one of the least understood natural resources of the area. In some places, the development of adequate water supplies from wells has been a problem due to the lack of detailed geologic and hydrologic data. In other places, where wells do yield adequate quantities of water, the chemical quality of the water may be undesirable because of high concentrations of dissolved minerals.

The ground-water resources of Martin County are being developed at an increasing rate. With an increase in per capita use of water and an emphasis on industrial growth, this trend is likely to continue. All of the water used for domestic purposes in Martin County is ground water. A large portion of the water used for irrigation, stock, and industry also is ground water. With an increase in the use of ground water in Martin County there is an increasing urgency to understand the factors controlling the ground-water resources of the county so that both individual water supplies and the ground-water resources as a whole may be wisely and economically developed.

The Martin County Board of Commissioners under the direction of their Chairman, John H. Edwards, recognized the need for a study of the ground-water resources of the county, and in 1958 requested that the U. S. Geological Survey undertake a detailed ground-water investigation.

This investigation, the first detailed county-wide ground-water investigation in North Carolina, was financed by county funds that were matched by the U. S. Geological Survey over a 4-year period beginning in 1958. This report contains the results of that investigation.

The principal phases of the investigation included the following:

1. An inventory of most existing, particularly deep, wells to determine their location, depth, diameter, yield, and other pertinent data.
2. The drilling of test wells and auger holes in selected areas where sufficient information could not be obtained from existing wells.
3. Geologic studies to determine the character and extent of the various geologic formations as they influence and control the occurrence of ground water.

4. The determination of the water-transmitting and water-storage capacities of the aquifers.
5. The collection and chemical analysis of water samples to determine specific chemical characteristics of the ground water.
6. The analysis of data collected during the investigation and the preparation of this report for the Board of Commissioners.

The field work for the investigation began in December 1958. The author has worked on the project since that time. Other personnel who assisted on the project for short periods of time included John L. Snider and Stephen E. Kesler. Most of the paleontological determinations were made by Philip M. Brown.

Previous Investigations

The geology and ground-water resources of Martin County have been discussed briefly in several reports published by the U. S. Geological Survey and the North Carolina Department of Conservation and Development.

Mundorff (1945, p. 41-58) describes the general geology of the North Carolina Coastal Plain. Brown (1958, p. 34-35) gives detailed geologic and paleontologic descriptions of the material from three wells in Martin County. Brown (1959, p. 70-77) discusses the geology and occurrence of ground water in Martin County. That report, based on a reconnaissance study, includes records of the data collected from 73 wells, with a detailed log of one well, and the chemical analyses of water samples from 22 wells. Wyrick and Floyd (1961, p. 1-11) discuss the water-transmitting characteristics of the Castle Hayne Limestone in areas of discharge and non-discharge at selected sites in Martin County.

Acknowledgments

Many residents of Martin County cooperated in furnishing information about their wells during the investigation. The Hartsfield Water Company, Layne-Atlantic Company, and R. L. Magette Well Company were helpful in furnishing data from wells that they drilled during the investigation. County and municipal officials, including officials of the Williamston Water Department, the Martin County Industrial Development Commission, and Martin County Health Department were very cooperative.

The investigation was made under the direct supervision of Philip M. Brown, district geologist, and under the general supervision of

P. E. La Moreaux, former chief of the Ground Water Branch, and O. M. Hackett, chief of the Ground Water Branch, U. S. Geological Survey.

GEOGRAPHY

Martin County is in the north-central part of the Coastal Plain of North Carolina (fig. 1). It is bounded on the north by the Roanoke River, on the east by Welsh Creek, on the south by Beaufort and Pitt Counties, and on the west by Edgecombe and Halifax Counties. The county area is 481 square miles.

Williamston is the largest town and the county seat. Other municipalities include Beargrass, Everetts, Gold Point, Hamilton, Hassell, Jamesville, Oak City, Parmele, and Robersonville.

Climate

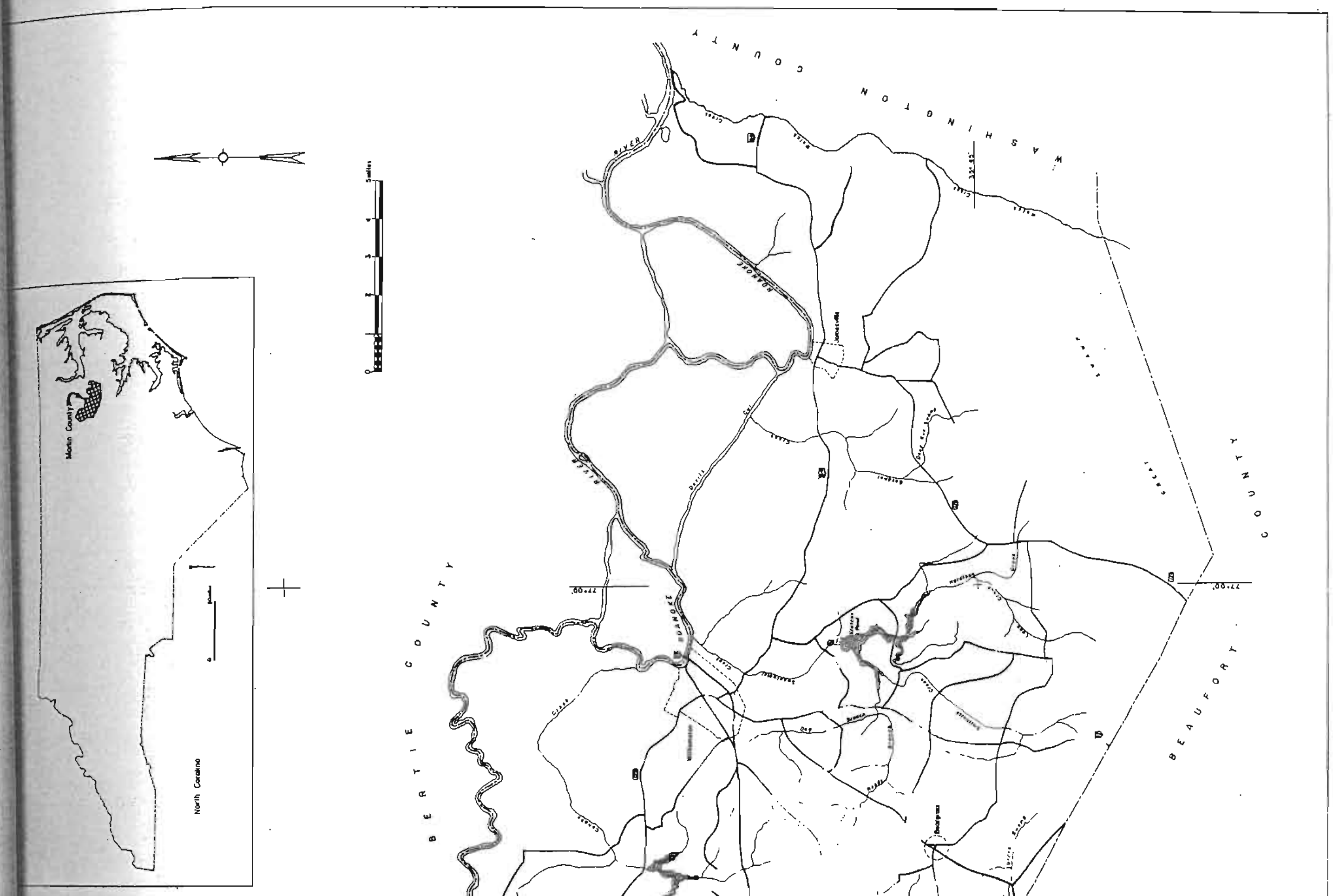
The normal average annual precipitation for Martin County during the 29-year period from 1933 to 1962 was approximately 47 inches, according to the U. S. Weather Bureau. Figure 2 shows the distribution by months, of average annual precipitation for this period. The rainfall is heaviest during the summer, but is fairly well distributed throughout the rest of the year. Records of the temperature in Martin County have been kept for nine years. The U. S. Weather Bureau does not consider this a sufficient period for calculation of the long-term mean annual temperature. However, the mean temperature for 1959 was approximately 62° F. and for 1960 it was about 61° F.

Population

Martin County had a total population of 27,139 in 1960 according to the U. S. Bureau of the Census. The census indicated that approximately 74 percent of the population is classified as farm-rural. There are approximately 4,800 homes within the county. Of these about 3,700 are rural and the owners must provide their own water supplies. On the average, one well supplies slightly more than two homes in the rural areas.

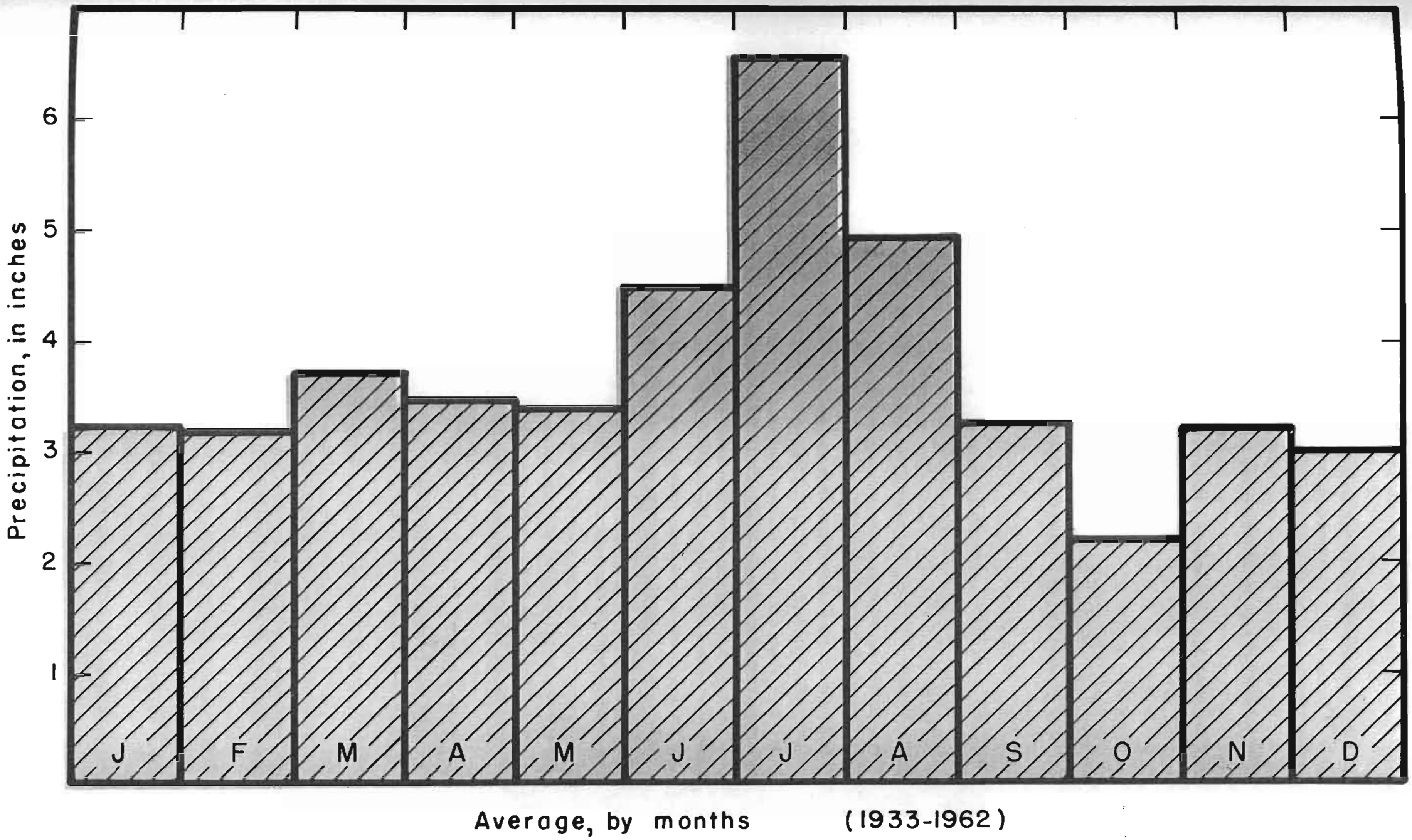
Economy

The economy of Martin County is basically agricultural. The growing and processing of tobacco and peanuts account for most of the farm income. In recent years livestock raising has become increasingly important to the economy. Also, according to the Martin County Industrial



INDEX MAP OF MARTIN COUNTY, NORTH CAROLINA

FIGURE 1



AVERAGE PRECIPITATION OF WILLIAMSTON FOR 29 YEAR PERIOD OF RECORD

FIGURE 2

Development Commission, there are 24 industries in the county. For the most part, these industries are concerned with the manufacturing of wood products, textiles and textile products, and of processing food, chemicals, and pulp.

Physiography

Martin County lies within the Atlantic Coastal Plain province. Parts of the Coastal Plain have been submerged since Miocene time. Whenever the level of the sea was relatively static, in relation to adjacent land masses, for a long period, waves and currents leveled the sea floor, forming a general flat surface or plane. As land masses emerged, a plane emerged as essentially a flat land surface.

In Martin County there is evidence of three former submerged surfaces. One surface occurs at an altitude between 25 and 50 feet above mean sea level (msl), another between 50 and 75 feet above msl, and the third between 75 and 100 feet above msl (fig. 3).

The land surface in Martin County has been dissected by streams which drain north and east toward the Roanoke River and south and east toward the Pamlico River (fig. 1). In the eastern part of the county, drainage is poorly developed and large swamps occur. In the central and western parts of the county, drainage is well developed and there are few swamps.

The principal streams which drain into the Roanoke River are Conoho Creek, Sweet Water Creek, and Welch Creek. The principal streams which drain into the Pamlico River are Collie Creek and Turkey Creek. Approximately 75 percent of the county is drained by the Roanoke River.

GEOLOGY

A study of the geology of an area is essential to the study of its ground-water resources. Geologic formations of high permeability may readily store and transmit ground water, whereas, geologic formations of low permeability may retard the movements of ground water. Thus, the occurrence and movement of ground water depends, among other factors, upon the size, shape, and physical characteristics of the geologic formations. In addition, ground water may dissolve from or deposit chemicals in the material through which it moves. Thus the chemical quality of ground water is dependent upon the geology of an area.

The geology of Martin County has been studied by two principal methods. One method consisted of the collection, preparation, and examination of cuttings from wells and auger holes. The second method consisted of the collection and examination of geophysical data, including electric and gamma-ray logs from wells and test holes.

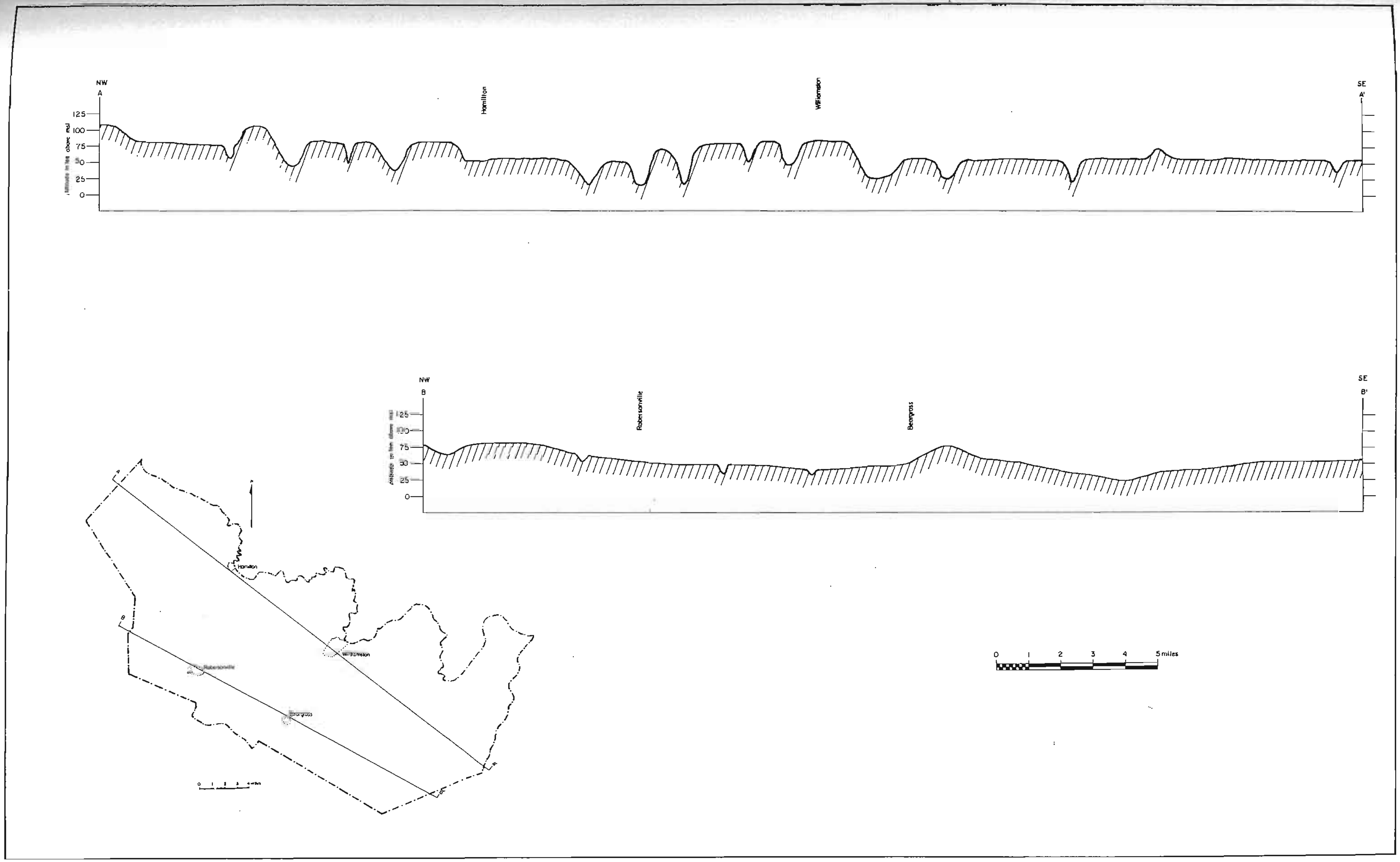
Test and Auger Holes

Geologic data were collected from 20 wells in and near Martin County. These data were supplemented by data obtained during the augering of 38 holes and the drilling of two deep test holes (fig. 4).

A correlation of the geological and geophysical data collected from eight wells is shown in figure 5. The formation boundaries were picked on the basis of microfaunal assemblages, lithology, and geophysical characteristics. The seven principal water-bearing zones are correlated on the basis of resistivity characteristics shown on electric logs and on lithology. A synthesis of all of the geological and geophysical data from the wells located on figure 4 is the basis for defining the structure of the geologic formations and the water-bearing zones in Martin County.

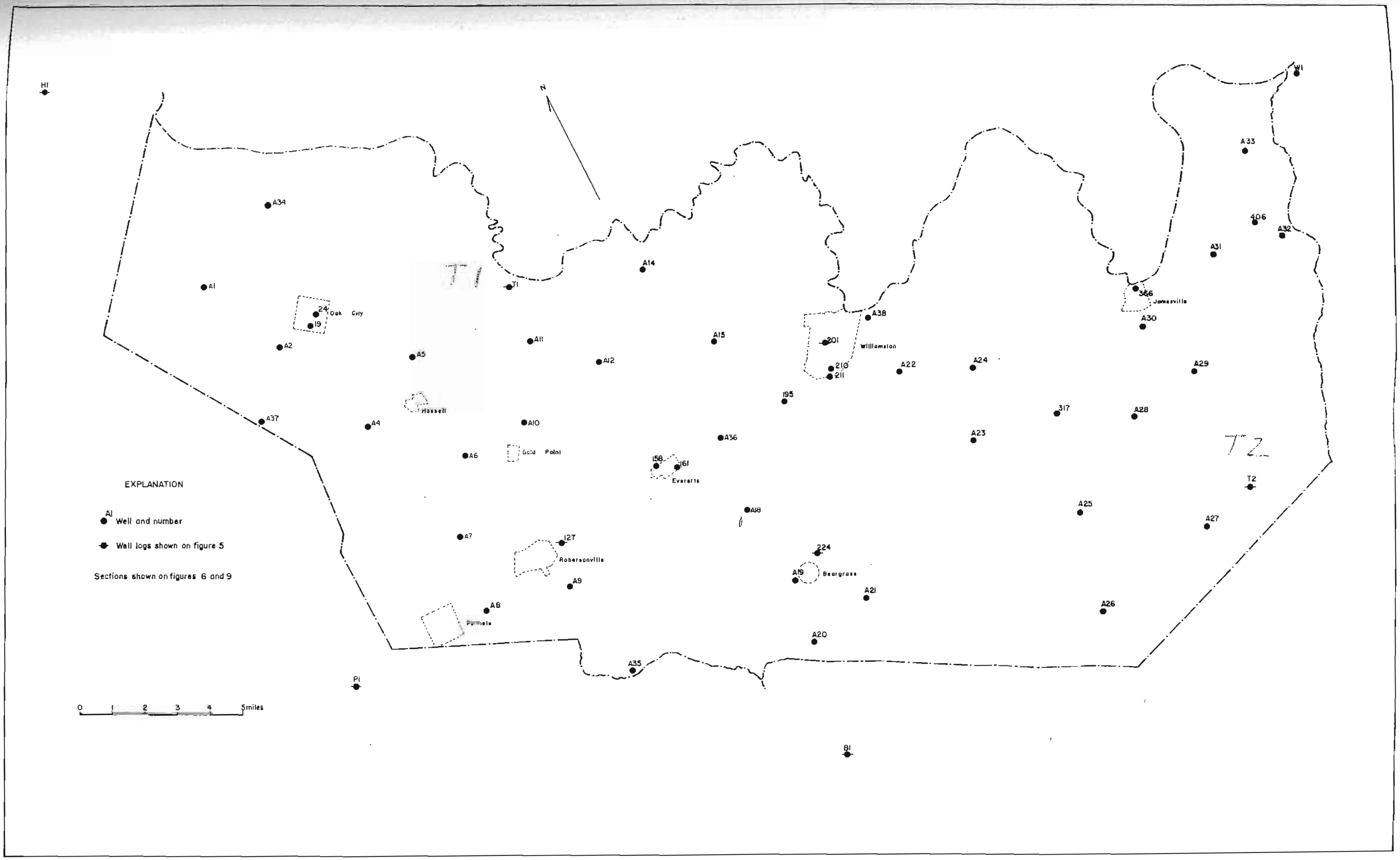
General Geology

Martin County is underlain by clay, silt, sand, and limestone beds which were deposited on crystalline basement rocks. These sedimentary beds generally slope to the southeast in Martin County. They were, for the most part, deposited in shallow seas. The sedimentary beds contain material that was weathered from crystalline rocks and transported by streams to the seas, mixed with marine materials such as seashells and chemical precipitates, sorted by wave and current action and deposited



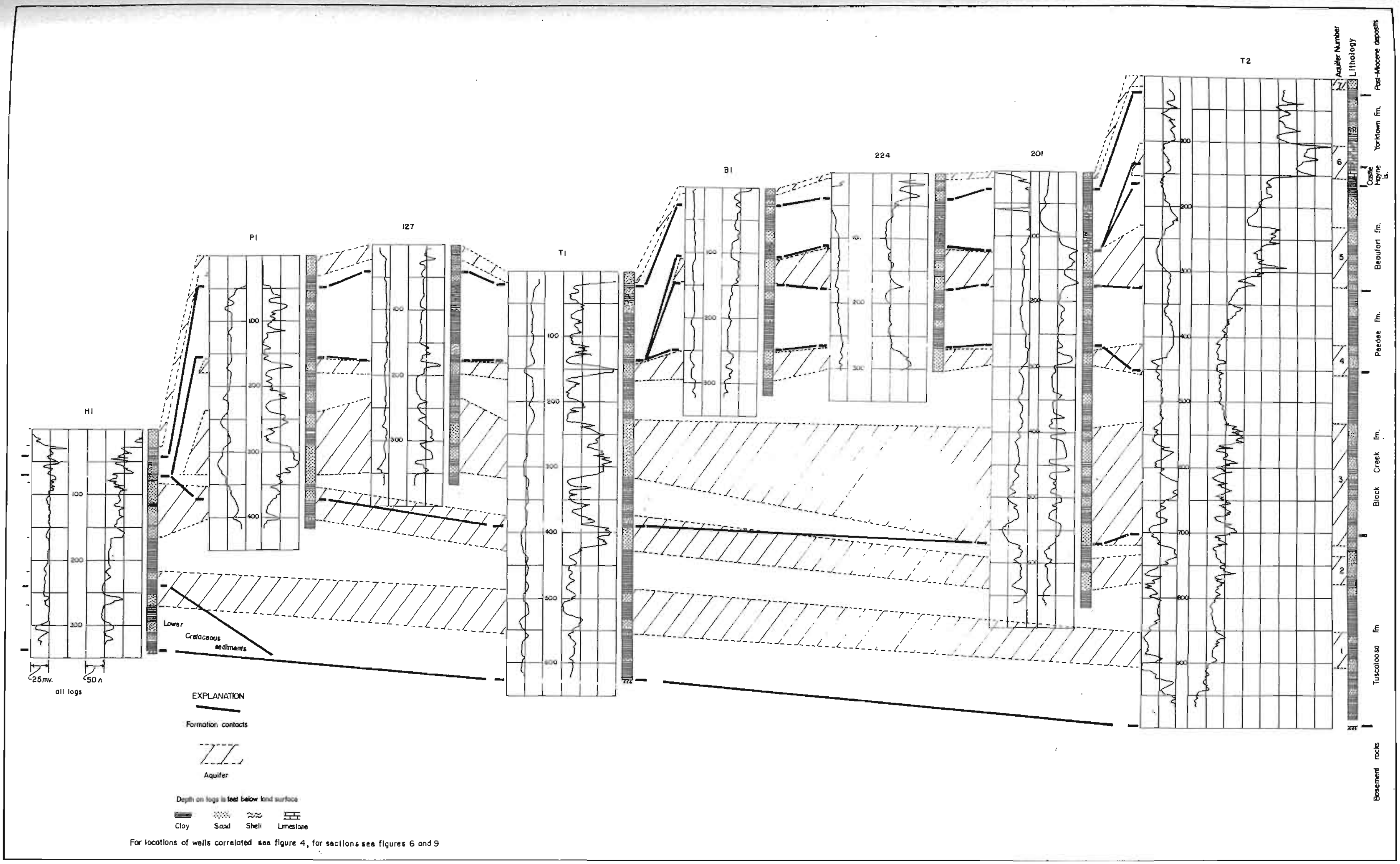
LAND-SURFACE PROFILES

FIGURE 3



LOCATIONS OF GEOLOGIC AND GEOPHYSICAL DATA
CONTROL WELLS

FIGURE 4



CORRELATION OF GEOLOGIC AND GEOPHYSICAL DATA

FIGURE 5

on the sea bottom, and covered by later sediments. The sequence of deposition was not continuous. Sea level fluctuated in relation to adjacent land masses. During the periods when sea level was relatively lower than adjacent land masses, the sediments, previously deposited, were above sea level, and were exposed to weathering and erosion processes. With a subsequent lowering of land masses, these eroded surfaces were inundated and more sediments were deposited upon them.

The sedimentary layers have been subdivided into formations, or other units, which consist of material of similar lithic composition, deposited during a given period of geologic time. These formations, or units, are identified by their position in the sequence of sediments, their lithic composition, and their fossil content. The surfaces that separate the formations are referred to as contacts. If there was no significant lapse between the deposition of two formations, their contact is said to be conformable; if there was a period of nondeposition or erosion between formations their contact is said to represent an unconformity. An unconformity represents a period of nondeposition or erosion and its surface is usually an undulating plane. When the layers of a formation above an unconformity are parallel to the layers of the formation below, the contact is a disconformity. When the layers of the formations above and below an unconformity are not parallel, the contact is a nonconformity. The contact relationship of the various geologic formations may greatly influence the movements of ground water between formations. These relationships (fig. 6), and the relationships of these formations to the aquifers (fig. 5), are discussed in the ground-water section.

Land surfaces adjacent to an active depositional basin slowly sink, rise, or remain static during the geologic epochs associated with the formation of the basin. When land surfaces sink, the adjacent sea encroaches on the land. This encroachment is called a transgression. When land surfaces rise, the adjacent sea recedes from the land. This recession of the sea is called a regression. In any one area, in general, fine-grained sediments are deposited during transgressions, whereas coarse-grained sediments are deposited during regressions.

Geologic Formations

The geologic formations in Martin County consist of sediments of Cretaceous age which were deposited on crystalline basement rocks, and of Tertiary and Quaternary sediments which overlie the Cretaceous deposits. Regionally, these formations form a large arc open to the east. North of Martin County the formations generally strike east; south of the county they generally strike north. Martin County's position on the arc is such that the formations within the county strike generally northeast and dip to the southeast.

The basement rocks are composed of crystalline rocks of Precambrian or early Paleozoic age; the surface cut on these rocks dips to the southeast (fig. 6).

Sediments of both Early and Late Cretaceous age unconformably overlie the basement rocks. Sediments of Early Cretaceous age are recognized in several wells in Halifax County adjacent to the northwestern corner of Martin County, and they undoubtedly extend into Martin County. Throughout the rest of the county, basement rock is overlain unconformably by the Tuscaloosa Formation of Late Cretaceous age (fig. 6).

The Tuscaloosa Formation, the lower part of the Black Creek Formation, and post-Miocene sediments were deposited during periods of regression. Parts of the Black Creek Formation, the Peedee Formation, the Beaufort Formation, and the Yorktown Formation were deposited during periods of transgression. The Castle Hayne Limestone was deposited during a static stage of basin development, when the land surface was neither sinking nor rising. Chemical precipitates predominate during static stages in this area.

Three formations of Late Cretaceous age occur in Martin County. The Tuscaloosa Formation is overlain by the Black Creek Formation which, in turn, is overlain by the Peedee Formation. The contacts between these three formations are unconformable.

The Beaufort Formation of Paleocene age overlies the Peedee Formation and, in turn, is overlain by the Castle Hayne Limestone of middle and late Eocene age. Their contact relationships also are unconformable. The base of the Yorktown Formation of late Miocene age appears as a horizontal line in figure 6 because of vertical scale exaggeration. However, since the Yorktown Formation was deposited on a highly eroded

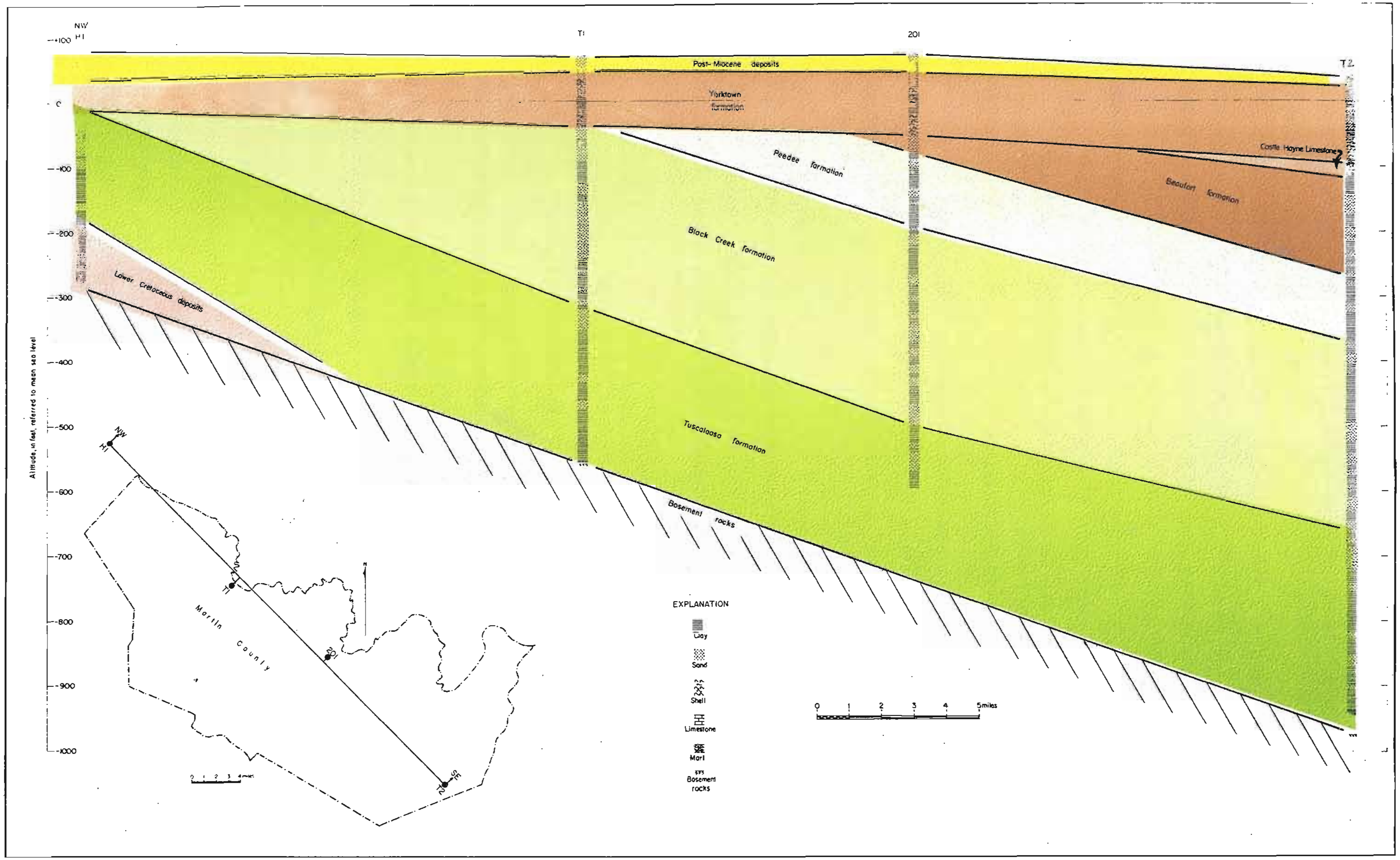


FIGURE 6

GEOLOGICAL FORMATIONS PENETRATED BY WELLS uneven surface, the contact between the Yorktown Formation and the older formations is not a horizontal plane (fig. 7).

The Yorktown Formation is blanketed by thin deposits of post-Miocene age. These deposits contain no diagnostic fauna but are of undoubted Quaternary age because they are part of the regional shoreline deposits laid down during static stages of a regressive cycle in Pleistocene or Recent epochs.

Each formation has distinctive structural, lithic, or paleontological characteristics that are discussed in detail in the following sections.

Basement rocks

The crystalline basement rocks are of granitic composition and contain an abundance of green mica. The upper 5 to 10 feet of the basement is weathered to a clay containing mica, feldspar, and disseminated quartz grains.

In the western part of the county, basement rock is approximately 400 feet below land surface, whereas, in the eastern part it is approximately 1,000 feet below land surface (table 1). The basement surface strikes N. 50° E. and dips about 17 feet per mile (fig. 6).

Cretaceous System

Lower Cretaceous Series

Sediments of Albian age are recognized in wells drilled in adjoining Halifax and Pitt Counties (Swain and Brown, 1963, p. 4). Because of the updip pinchout of a marine facies, caused by a structural high, Lower Cretaceous sediments, if present in Martin County, are nonmarine equivalents and have little importance as water-bearing units.

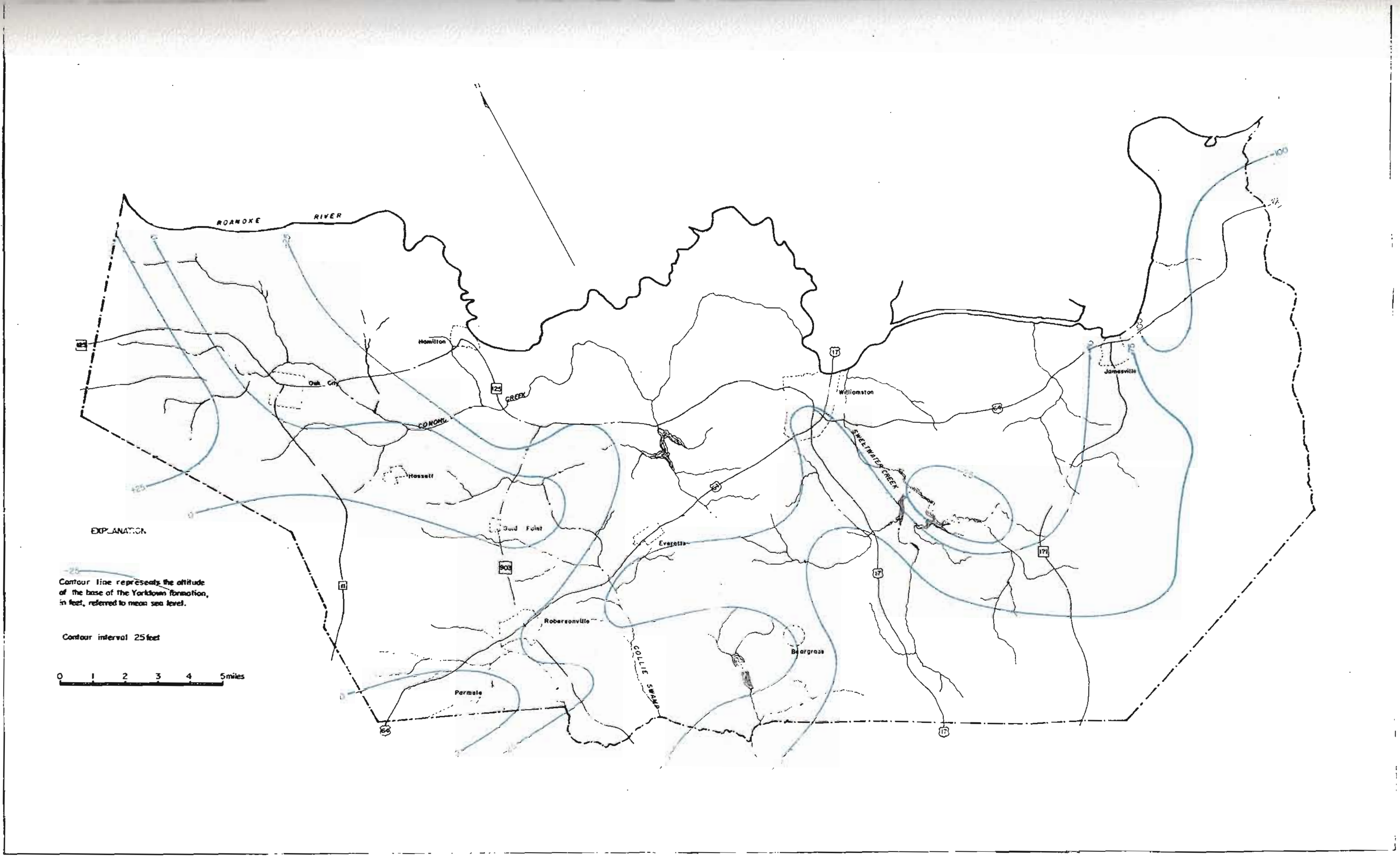
Upper Cretaceous Series

Tuscaloosa Formation.— The Tuscaloosa Formation unconformably overlies crystalline rock in most of Martin County. In the remainder of the county it overlies Lower Cretaceous sediments. The top of the formation strikes N. 51° E. and dips approximately 16 feet per mile to the southeast. The formation thickens toward the southeast, is approximately 200 feet thick in the western part of the county, and is approximately 300 feet thick in the eastern part.

Table 1. Depths Below Land Surface of Geologic Formations in Martin County

b indicates bottom depth of well

Well Number	Quaternary Sediments	Miocene Yorktown Formation	Eocene Castle Hayne Limestone	Paleocene Beaufort Formation	Upper Cretaceous Peedee Formation	Upper Cretaceous Black Creek Formation	Upper Cretaceous Tuscaloosa Formation	Lower Cretaceous	Crystalline Basement Rock
T1	0-20	20-112	----------	----------	----------	112-390	390-624	----------	624b
T2	0-15	15-132	132-163	163-312	312-450	450-696	696-975b		
A1	0-15	15-44b							
A2	0-10	10-70	----------	----------	----------	70-103b			
A4	0-10	10-85b							
A5	0-10	10-43	----------	43-63b					
A6	0-15	15-80	----------	80-87b					
A7	0-5	5-83b							
A8	0-15	15-47	----------	----------	----------	47-97b			
A9	0-20	20-89	----------	----------	89b				
A10	0-24	24-51	----------	----------	51-77b				
A11	0-20	20-75	----------	----------	75-103b				
A12	0-25	25-80	----------	80-91	91-103b				
A14	0-30	30-110	----------	110-117b					
A15	0-20	20-90b							
A18	0-30	30-35b							
A19	0-20	20-90b							
A20	0-35	35-42b							
A21	0-30	30-35b							
A22	0-15	15-65	65-71	71-97b					
A23	0-15	15-45	----------	45-107b					
A24	0-20	20-65	65-75	75-97b					
A25	0-20	20-22b							
A26	0-5	5-70	70-96	96-127b					
A27	0-8	8-122	122-124b						
A28	0-10	10-110	110-115b						
A29	0-30	30-95b							
A30	0-35	35-97	97-100b						
A31	0-15	15-118	118-147b						
A32	0-45	45-145b							
A33	0-15	15-96	96-97b						
A34	0-20	20-55	----------	----------	----------	55-95b			
A35	0-20	20-74	----------	----------	74-112b				
A36	0-20	20-79	----------	----------	79-107b				
A37	0-20	20-80	----------	----------	----------	80-107b			
A38	0-30b								
[illegible]	0-40	40-60	----------	----------	----------	----------	60-245	245-335b	
[illegible]	0-50	50-155	----------	----------	----------	155-370	370-415b		
[illegible]	0-25	25-105	----------	105-150	150-245	245-320b			
[illegible]	0-45	45-120	120-160b						
[illegible]	0-70	70-110	----------	----------	----------	110-2[illegible]5b			
24	0-70	70-105	----------	----------	----------	105-123b			
127	0-31	31-113	----------	----------	----------	113-225	225-369b		
[illegible]	0-35	35-125	----------	----------	125-201b				
[illegible]	0-40	40-130	----------	----------	130-250	250-290b			
[illegible]	0-30	30-125	----------	125-150	150-275	275-300b			
[illegible]	0-40	40-115	----------	115-180	180-260	260-320b			
[illegible]	0-27	27-125	----------	125-152	152-281	281-573	573-702b		
210	0-25	25-125	----------	125-150	150-290	290-360b			
211	0-20	20-120	----------	120-160	160-300	300-360b			
217	0-[illegible]	[illegible]	68-92b						
306	0-15	15-67	67-90b						
406	0-40	40-120	120-160b						



MAP SHOWING CONTOURS ON THE BASE OF THE YORKTOWN FORMATION

FIGURE 7

The Tuscaloosa Formation consists of layers of white to red clay interbedded with layers of gray micaceous sand. Generally, the basal part of the formation is a massive clay bed about 75 feet thick. The center part consists of approximately 50 feet of interbedded sand and clay layers, and the upper part consists of 100 to 150 feet of clay overlain by 10 to 30 feet of sand (fig. 6).

Aquifer 1 is near the center of the Tuscaloosa Formation (fig. 5). Aquifer 2 occurs along the contact between the Tuscaloosa Formation and the Black Creek Formation.

In the western part of the county the chemical quality of water from these aquifers generally is acceptable for most uses. In the central and eastern parts of the county the water from Aquifers 1 and 2 contains high concentrations of chloride and, therefore, is too salty for most uses.

Black Creek Formation. -- The Black Creek Formation unconformably overlies the Tuscaloosa Formation in Martin County. The surface of the Black Creek Formation strikes N. 50° E. and dips about 14 feet per mile (figs. 5 and 6). The formation, which is approximately 325 feet thick throughout the central and eastern parts of the county, pinches out west of the Martin-Halifax County line (fig. 6). A projection of subsurface contacts indicates that the lower part of the Black Creek Formation crops out at Palmyra Landing, in Halifax County, in a cut along the south bank of the Roanoke River.

In Martin County the Black Creek Formation consists of interbedded layers of gray to brown clay and gray sand. The accessory minerals include: muscovite, pyrite, hematite, and glauconite. Lignitized wood fragments and shell fragments also are common in the samples.

A thick sand bed, designated Aquifer 3, occurs near the center of the Black Creek Formation. This aquifer is one of the most productive in the county. Another aquifer, designated Aquifer 4 occurs along the contact between the Black Creek Formation and the overlying Peedee Formation. Generally, water from both Aquifers 3 and 4 is of acceptable chemical quality for most domestic uses.

Peedee Formation. -- The Peedee Formation in Martin County overlies the Black Creek Formation and underlies the Beaufort and Yorktown Formations (fig. 6). The surface of the Peedee Formation strikes N. 50° E.

Depth (feet)	
250-266	Silt, gray, with sand, quartz, clear, very fine to fine-grained, rounded, 70 percent; sand, glauconitic, green, fine to medium-grained, rounded, 30 percent.
266-281	Sand, quartz, clear, very fine to fine-grained, rounded, 70 percent; sand, glauconitic, green, fine to medium-grained, rounded, 30 percent, with angular, medium-grained, brown quartz sand and few pyrite crystals.
281-296	Sand, quartz, clear, very fine to fine-grained, rounded, 55 percent; sand, quartz, brown, medium-grained, angular, with few pyrite crystals, 15 percent; sand, glauconitic, green, fine- to medium-grained rounded, 30 percent.
296-301	Silt, gray, with rounded very fine to fine-grained clear quartz sand, 55 percent; sand, quartz, brown, medium-grained, angular, with few pyrite crystals, 15 percent; sand glauconitic, green, fine to medium-grained, rounded, 30 percent.
301-312	Sand, quartz, clear, very fine to fine-grained, rounded, 55 percent; sand, quartz, brown, medium-grained, angular, with few pyrite crystals, 15 percent; sand, glauconitic, green, fine to medium-grained, rounded, 30 percent. Ostracoda identified from the 163-312 foot interval include: *Brachycythere interrasilis* Alexander *Trachyleberis midwayensis* (Alexander) *Trachyleberis prestwichiana* (Jones and Sherborn)
	Upper Cretaceous - Peedee Formation
312-317	Clay, black, with rounded, very fine to fine-grained clear quartz sand, 55 percent; sand, quartz, brown, medium-grained, angular, with few pyrite crystals, 15 percent; sand, glauconitic, green, fine to medium-grained, rounded, 30 percent.

Depth (feet)	
317-327	Sand, quartz, clear, very fine to fine-grained, rounded, 55 percent; sand, quartz, brown, medium-grained, angular, with few pyrite crystals, 15 percent; sand glauconite, green, fine to medium-grained, rounded, 30 percent.
327-353	Clay, dark brown, with rounded, very fine to fine-grained, clear quartz sand, 55 percent; sand, quartz, brown, medium-grained, angular, with few pyrite crystals, 15 percent; sand, glauconitic, green, fine to medium-grained, rounded, 30 percent.
353-358	Sand, quartz, clear, very fine to fine-grained, rounded, 55 percent; sand, quartz, brown, medium-grained, with few pyrite crystals, 15 percent; sand, glauconitic, green, fine to medium-grained, rounded, 30 percent.
358-368	Sand, quartz, white, very fine to coarse-grained, angular to well rounded, 90 percent; sand, glauconite, and phosphatic, fine-grained, with muscovite flakes, 10 percent.
368-409	Clay, dark brown, with trace of angular to well rounded, very fine to coarse-grained white quartz sand, 90 percent; sand, glauconite, fine-grained, 10 percent; with trace of phosphatic sand, pyrite crystals, and muscovite flakes.
409-419	Sand, quartz, white, very fine to coarse-grained, angular to well rounded, 90 percent; sand, glauconite, fine-grained, 10 percent; with trace of phosphatic sand, pyrite crystals, and muscovite flakes.
419-424	Clay, brown, with trace of angular to well rounded, very fine to coarse-grained, white quartz sand, 90 percent; sand, glauconite, fine-grained, 10 percent; with trace of phosphatic sand, pyrite crystals, and muscovite flakes.

Depth (feet)	
424-440	Sand, quartz, white, very fine to medium-coarse-grained, angular to well rounded, 90 percent; sand, glauconite, fine-grained, 10 percent; with trace of phosphatic sand, pyrite crystals, and muscovite flakes.
440-445	Sand, quartz, white, very fine to fine-grained, subangular, 80 percent; sand, glauconite, green, fine-grained, 20 percent; trace muscovite. Ostracoda identified from the 312-445 foot interval include: Brachycythere rhomboidalis (Berry) Cytherella herricki Brown Cytheridea (Haplocytheridea) councilli Brown Cythereis pidgeoni (Berry) Eucythere curta Jennings Velarocythere cacumenata Brown Velarocythere eikonata Brown
	Upper Cretaceous - Black Creek Formation
445-476	Clay, dark brown, with trace of subangular, very fine to fine-grained, white quartz sand, 80 percent; sand, glauconite, green, fine-grained, 20 percent; trace muscovite.
476-527	Clay, verigated, cream to brown, with trace of subangular, very fine to fine-grained white, quartz sand, 80 percent; sand, glauconite, green, fine-grained, 20 percent; trace muscovite with few shell fragments.
527-553	Sand, quartz, white, fine to medium-grained, angular to subrounded, 90 percent; sand, glauconite, green, fine-grained, 10 percent; trace marcasite crystals, muscovite flakes, chlorite, and lignitized wood.
553-568	Sand, quartz, white, medium to coarse-grained, angular to subangular; trace muscovite flakes, marcasite crystals, lignitized wood.
568-573	Clay, cream to tan.

Depth (feet)	
573-578	Sand, quartz, white, fine to coarse-grained, angular to subangular; trace muscovite flakes, marcasite crystals, lignitized wood.
578-583	Clay, tan
583-599	Sand, quartz, white, fine to coarse-grained, angular to subangular; trace muscovite flakes, marcasite crystals, lignitized wood.
599-604	Clay, brown.
604-614	Sand, quartz, white, very fine to medium-grained, subangular to subrounded; few muscovite flakes.
614-619	Clay, brown.
619-624	Sand, quartz, white, very fine to medium-grained, subangular to subrounded; few muscovite flakes.
624-629	Clay, brown.
629-640	Sand, quartz, white, very fine to medium-grained, subangular to subrounded; few muscovite flakes.
640-645	Clay, tan to brown.
645-660	Sand, quartz, white, very fine to medium-grained, subangular to subrounded; with few muscovite flakes and trace of shell fragments.
660-676	Sand, quartz, white, very fine to medium-grained, subangular to subrounded; with few muscovite flakes, trace of shell fragments, marcasite crystals, and 3 percent green, fine-grained glauconite.
676-686	Silt, gray, with trace of subangular to subrounded, very fine to medium-grained white quartz sand, few muscovite flakes, and marcasite crystals.

Depth (feet)

686-696 Sand, quartz, white, very fine to medium-grained, subangular to subrounded, with few muscovite flakes, and marcasite crystals. Ostracoda identified from the 445-696 foot interval include:

Brachycythere ledaforma (Israelsky)
Brachycythere nausiformis Swain
Brachycythere sphenoides (Reuss)
Cytheridea (Haplocytheridea) monouthensis (Berry)
Cytheropteron (Eocytheropteron) striatum Brown
Orthonotacythere sulcata Brown

Upper Cretaceous - Tuscaloosa Formation

696-706 Sand, quartz, white, very fine to medium-grained, subangular to subrounded, with few muscovite flakes, and marcasite crystals.

706-711 Clay, red to gray, with trace of subangular, very fine to coarse-grained white quartz sand, abraded shell fragments, marcasite crystals, chlorite, and few quartz crystals ranging in color from white through yellow, green, brown, and smoky.

711-722 Sand, quartz, white, very fine to coarse-grained, subangular, with abraded shell fragments, marcasite crystals, chlorite, and a few quartz crystals ranging in color from white through yellow, green, brown, and smoky.

722-728 Clay, gray, and variegated red and white, with trace of subangular, very fine to very coarse-grained, white quartz sand, abraded shell fragments, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky.

728-737 Sand, quartz, white, very fine to very coarse-grained, subangular with abraded shell fragments, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky.

Depth (feet)	
737-768	Sand, quartz, white, very fine to very coarse-grained, subangular, with abraded shell fragments, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood fragments.
768-773	Clay, reddish brown, with trace of subangular, very fine to medium-grained, white, quartz sand, abraded shell fragments, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood fragments.
773-778	Sand, quartz, white, very fine to medium-grained, subangular, with abraded shell fragments, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood fragments.
778-783	Clay, reddish brown with trace of subangular, very fine to medium-grained, white, quartz sand, abraded shell fragments, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood.
783-793	Sand, quartz, white, very fine to medium-grained, subangular, with abraded shell fragments, marcasite crystal, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood.
793-799	Sand, quartz, white, very fine to medium-grained, subangular with marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood.
799-855	Clay, reddish brown, with trace of subangular, very fine to medium-grained, white, quartz sand, marcasite crystals, chlorite, few quartz crystals ranging in color from white through yellow, green, brown, and smoky, with lignitized wood.

Depth (feet)	
855-860	Sand, quartz, white, very fine to fine-grained, subangular, with numerous hematite grains, few glauconite grains.
860-865	Sand, quartz, white, very fine to fine-grained, subangular, with numerous hematite grains, few glauconite grains, and shell fragments.
865-891	Clay, gray to brown, with trace of subangular, very fine to fine-grained, white, quartz sand, numerous hematite grains, few glauconite grains and shell fragments.
891-901	Sand, quartz, white to red, fine to very coarse-grained, angular to subrounded, with numerous medium to coarse-grained hematite grains, few abraded shell fragments.
901-911	Sand, quartz, white, very fine to fine-grained, subangular to subrounded, with few fine-grained hematite grains, few muscovite flakes.
911-916	Clay, red, with trace of sand, quartz, white, very fine to fine-grained, subangular to subrounded, with few fine-grained hematite grains, few muscovite flakes.
916-922	Sand, quartz, white, very fine to fine-grained, subangular to subrounded, with few fine-grained hematite grains, few muscovite flakes.
922-927	Clay, red, with trace of subangular to subrounded, very fine to fine-grained white, quartz sand, few fine-grained hematite grains, few muscovite flakes.
927-932	Sand, quartz, white, very fine to fine-grained, subangular to subrounded, with few fine-grained hematite grains, few muscovite flakes.
932-937	Clay, red, with trace of subangular to subrounded, very fine to fine-grained, white, quartz sand, few fine-grained hematite grains, few muscovite flakes.

Depth (feet)	
937-942	Sand, quartz, white, very fine to fine-grained, subangular to subrounded, with few medium-grained quartz grains, few fine-grained hematite grains, few muscovite flakes.
942-957	Clay, cream to brown, with trace of subangular to subrounded, very fine to fine-grained white, quartz sand, few medium-grained, quartz grains, fine-grained hematite grains, and muscovite flakes.
957-963	Sand, quartz, white, very fine to coarse-grained, well sorted, subangular to subrounded, with few fine-grained hematite grains, few muscovite flakes.
963-973	Clay, cream to red, with trace of subangular to subrounded, very fine to coarse-grained, white quartz sand, few fine-grained hematite grains, few muscovite flakes.
973-983 (bottom)	Sand, quartz, white, very fine to coarse-grained, subangular to subrounded, with few fine-grained hematite grains, few muscovite flakes, chlorite, and few white, yellow and pink clay fragments. No microfauna in 696-983 foot interval.

HYDROLOGY

Hydrologic Cycle

The supply of water on earth is kept in endless circulation between the land, seas, and atmosphere by energy supplied from the sun. This circulation has been termed the hydrologic cycle and the study of its various phases is the science of hydrology. In the hydrologic cycle, water is evaporated mostly from bodies of water and carried by the atmosphere until it condenses and falls as precipitation. Of the precipitation that falls over land surfaces, part is returned to the atmosphere by evaporation and the transpiration of plants, part drains overland into lakes and streams and returns to the oceans, and part seeps into the ground.

Ground Water

Some of the water which seeps into the ground is evaporated or transpired by plants and some percolates downward to the zone of saturation. Water in the zone of saturation, the zone in which all of the pore spaces are filled with water under positive hydrostatic head, is termed ground water.

In the zone of saturation, ground water moves under the influence of gravity toward general areas of discharge, such as stream channels and the ocean, and to points of discharge, such as springs or wells. Where ground water only partially fills a permeable formation, its surface, which is at atmospheric pressure, is free to rise and fall, and the water is said to be under non-artesian or water-table conditions. The water table is the surface of the non-artesian ground water. Where ground water completely fills a permeable bed that is underlain and overlain by relatively impermeable beds, its surface is not free to rise and fall and the water is said to be under artesian conditions. The piezometric surface is the surface which represents the height to which water will rise in wells tapping a given artesian aquifer. The term "artesian" is applied to water that is under sufficient pressure to rise above the top of the permeable formation containing it, although not necessarily above land surface. Thus, all flowing wells would be artesian but all non-flowing wells would not necessarily be non-artesian wells.

A unit in the zone of saturation that is permeable enough to transmit usable quantities of water to wells or springs is called an aquifer. Aquifer is a relative term used to denote that the lithic unit is more permeable than overlying or underlying units and that it will transmit sufficient quantities of water for specific purposes. In this report, aquifers are permeable zones which will furnish to wells, at a minimum, sufficient quantities of water for most domestic purposes. Aquifers are separated by beds of low permeability which are called confining beds or aquicludes. Areas in which aquifers are replenished are called recharge areas and areas in which water is lost from aquifers are called discharge areas.

Ground water moves from recharge areas to discharge areas. Water moves from a place where its surface is high toward a place where its surface is low. Thus, water would move in the non-artesian aquifer from a place where the water-table is high toward a place where it is relatively lower and in an artesian aquifer water would move from a piezometric high toward a piezometric low. In addition to the movements of water within an aquifer, there would be an interchange of water from aquifer to aquifer if the intervening confining layers were permeable enough and if the head differences between aquifers were great enough. Aquifers, confining layers, recharge areas, and discharge areas are illustrated in figure 8. The figure also shows the directions in which ground water would flow in response to the head differences in aquifers and between aquifers. Wells A1, A2, and A3, on the left side of figure 8, are in a recharge area. The water table stands higher than the piezometric surface of the lower two artesian zones so the movement of water would be downward, through the confining layers. Wells C1, C2, and C3 are in a discharge area. Here the water table is lower than the piezometric surfaces and the water would tend to move upward from the artesian zones into the water table aquifer and seep into the stream. In this illustration the flow of water would be along the lines of the dashed arrows. This is a highly generalized section of the conditions found in Martin County where there are numerous recharge and discharge areas and several major artesian aquifers.

Artesian aquifers

There are seven principal aquifers in Martin County, numbered 1 through 7. Aquifers 1 through 6 are artesian. The aquifers are numbered for ease of reference because some aquifers include parts of more than one geologic formation, and some formations include more than one aquifer. The aquifers are numbered consecutively from basement rock upward. Thus, Aquifer 1 is the first aquifer above basement rock and Aquifer 7 the topmost aquifer in the county. The aquifers are described in the following sections and are shown diagrammatically and in section on figures 5 and 9. The artesian aquifers, except Aquifer 1, pinch out along the highly permeable basal Yorktown unit. Therefore, water percolating through the Yorktown clay layers may readily move toward and into the upper aquifers. Because of this interconnection of aquifers, one piezometric map is satisfactory in depicting artesian head for the zone between depths of about 100 to 300 feet below the surface.

Aquifer 1

Aquifer 1 occurs near the middle of the Tuscaloosa Formation. It strikes N. 51° E. and dips to the southeast at approximately 16 feet per mile. The thickness of Aquifer 1 ranges from about 25 feet in the eastern part of the county to about 30 feet in the western part of the county. Its top is about 400 feet below land surface in the western part of the county and about 850 feet below land surface in the eastern part.

Aquifer 1 is composed of two sand beds and an intervening clay layer that thickens and thins across the county and may not be continuous throughout the county. The upper sand bed contains white, very fine to fine, subangular, poorly sorted quartz sand. The lower sand bed is composed of white, very fine to fine, subangular to subrounded, poorly sorted quartz sand. The optimum screen openings for naturally developed screened wells tapping Aquifer 1 is from 7/1000 to 10/1000 of an inch (slot size 7-10). The specific capacity of properly constructed, naturally developed (See p. 44), 2-inch diameter wells tapping Aquifer 1 is calculated as 0.6 gallons per foot of drawdown at the end of one day of pumping. Throughout most of the county, the water from Aquifer 1 contains high concentrations of chloride which makes it undesirable for most uses.

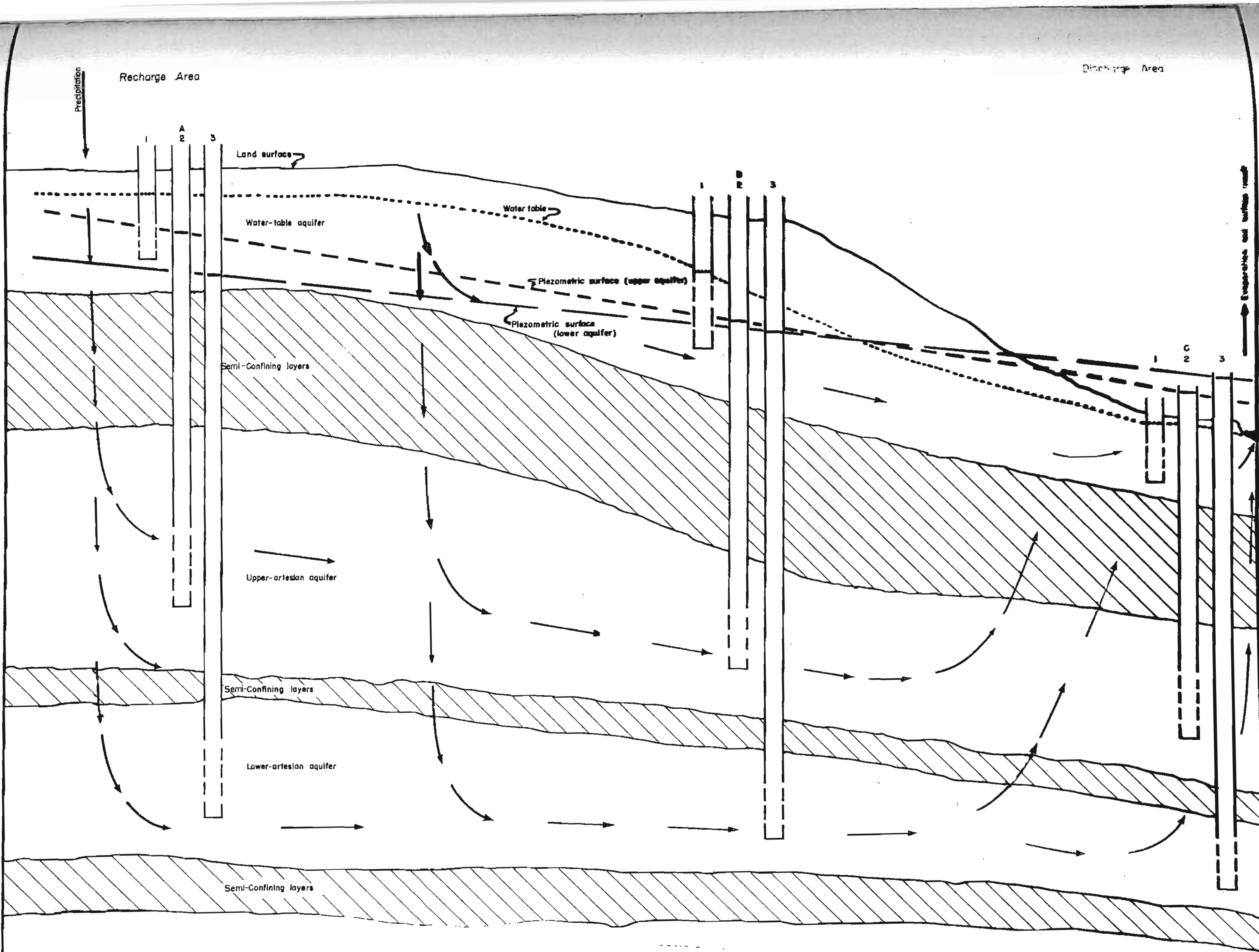
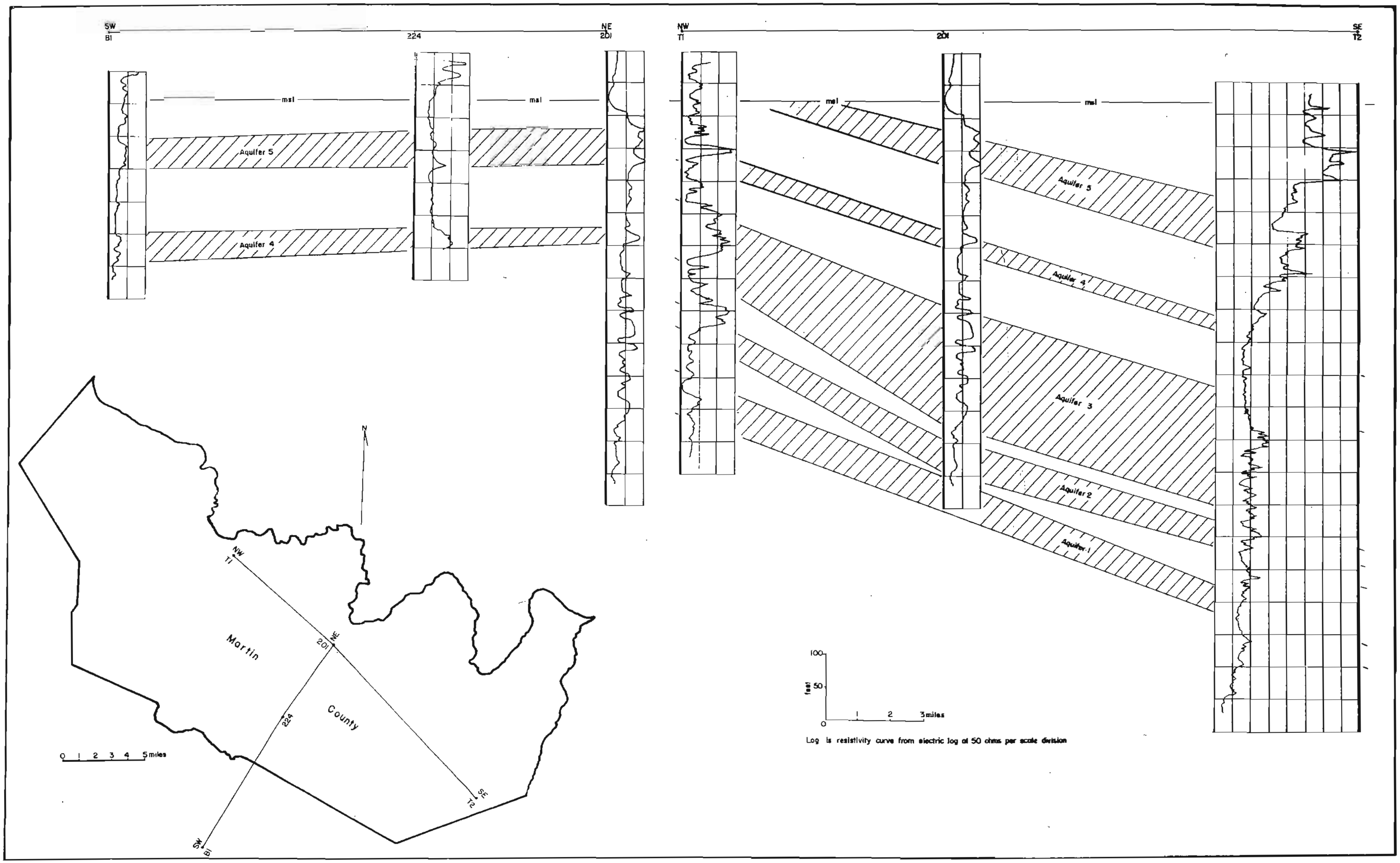


DIAGRAM SHOWING GENERAL HYDROLOGIC PRINCIPLES IN MARTIN COUNTY

FIGURE 8



CORRELATION OF AQUIFERS BY ELECTRIC LOGS

FIGURE 9

Aquifer 2

Aquifer 2 includes the base of the Black Creek Formation in the western part of the county, and the upper part of the Tuscaloosa Formation in the eastern part.

Aquifer 2 strikes N. 49° E. and dips at about 14 feet per mile to the southeast. Aquifer 2 is about 60 feet thick in the western part of the county and about 45 feet thick in the eastern part. Its top is about 350 feet below land surface in the western part of the county and about 675 feet below land surface in the eastern part.

Aquifer 2, a sand bed containing a few thin clay stringers, is composed of white, very fine to medium, subrounded to subangular, poorly sorted quartz sand. The sand includes a small percentage of muscovite flakes and fine-grained marcasite crystals. The optimum screen openings for naturally developed screened wells tapping Aquifer 2 should be about 12/1000 inch (slot size 12). The specific capacity of properly-constructed, naturally developed, 2-inch diameter wells tapping Aquifer 2 is calculated as 0.7 gallons per foot of drawdown at the end of one day of pumping. Aquifer 2 is tapped by few wells because the water contains concentrations of chloride in excess of 400 parts per million throughout most of the county.

Aquifer 3

Aquifer 3 is perhaps the most productive and widely used aquifer in Martin County. Figure 5 shows that this aquifer in the central and western sections of the county is in part of the Black Creek Formation, and in the eastern section, is in the upper part of the Tuscaloosa Formation.

Aquifer 3 strikes N. 50° E. and dips toward the southeast at about 14 feet per mile. Aquifer 3 is about 80 feet thick in the western and central parts of the county. From the central part to the eastern part of the county, this zone thickens and reaches a thickness of about 150 feet along the eastern edge of the county. A map, figure 10, has been prepared to show the depths, below land surface, of the tops and bottoms of the principal aquifers. The top of Aquifer 3 crops out along the Roanoke River in the northwestern part of the county and is about 550 feet below land surface in the southeastern part.

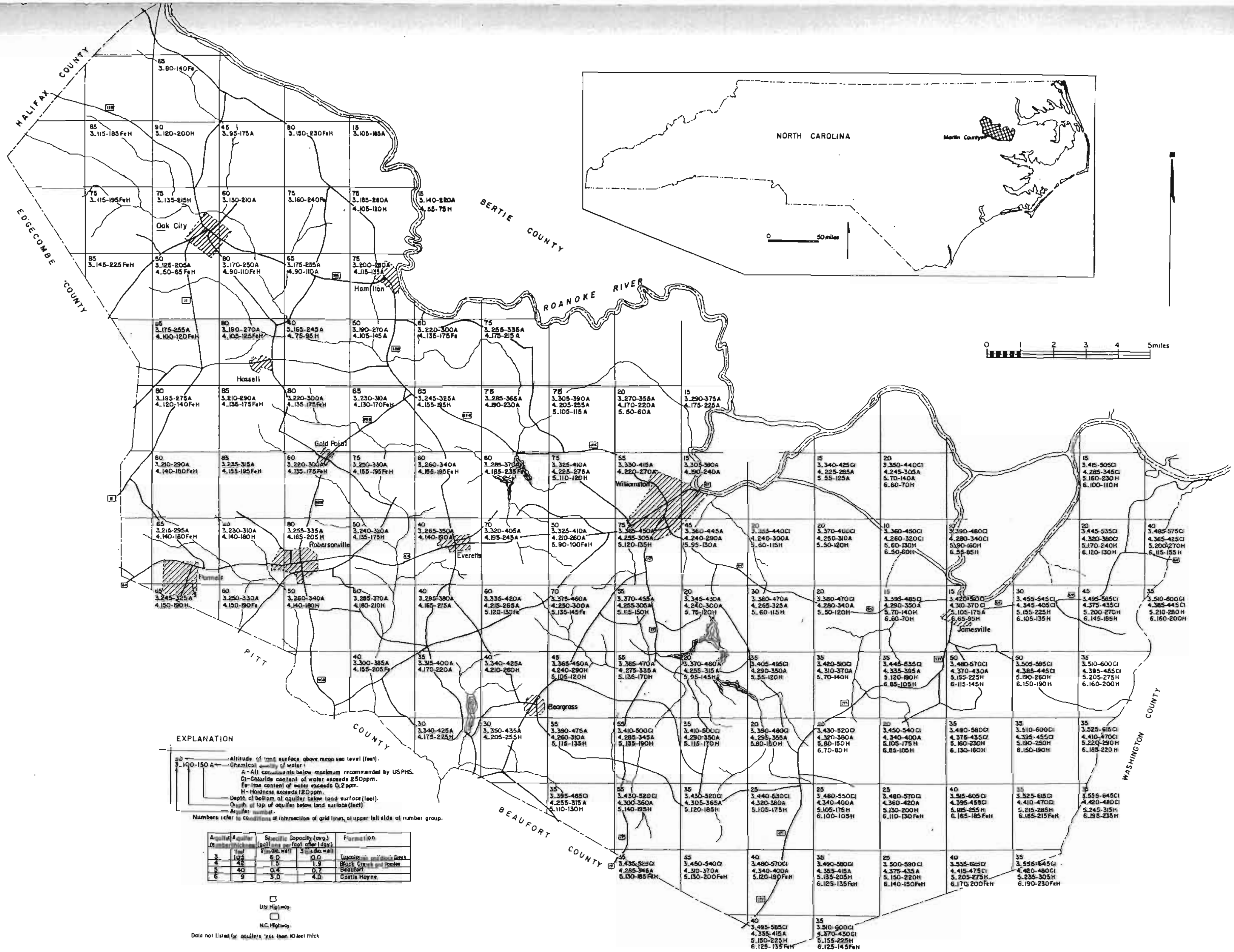
Aquifer 3 is composed of thick sand beds containing numerous thin clay layers. The sand in the top 50 feet of the aquifer is white, medium to coarse grained, angular to subangular, poorly sorted, quartz sand containing a trace of muscovite flakes, marcasite crystals and lignitized wood fragments. The lower part of the aquifer is composed of the same material except that the sand grains are smaller and range from medium to very fine grained. The optimum screen openings for naturally developed screened wells tapping the upper part of Aquifer 3 should be 20/1000 inch (slot size 20). The screen openings for the lower part of Aquifer 3 should be about 12/1000 inch (slot size 12). The specific capacity of a properly-constructed, naturally developed, 2-inch diameter well tapping Aquifer 3 is calculated as 6.0 gallons per foot of drawdown at the end of one day of pumping.

The chemical quality of water from Aquifer 3 generally is acceptable for most uses in the western and central parts of the county. In the eastern part of the county, water from this aquifer usually contains concentrations of chloride in excess of 400 parts per million and is not desirable for most uses.

Aquifer 4

Aquifer 4 occurs along the Black Creek-Peedee Formation contact. In the eastern part of the county, the upper part of Aquifer 4 is in the base of the Peedee Formation but in the remainder of the county Aquifer 4 is in the Black Creek Formation. The strike averages about N. 50° E. and dip of Aquifer 4 to the southeast averages about 14 feet per mile. Aquifer 4 ranges in thickness from about 40 feet in the western part of the county to about 60 feet in the eastern part. The top of Aquifer 4 pinches out along the base of the Yorktown Formation, just west of Oak City, in the western part of the county. In the eastern part, the top of the aquifer is about 400 feet below land surface. The depths of the top and bottom of Aquifer 4, below land surface, are given in figure 10.

The aquifer is composed of a thick sand bed, overlain and underlain by massive clay beds. The sand in this aquifer is white, very fine to coarse, angular to subangular, poorly sorted quartz sand containing a trace of phosphatic and glauconitic sand, pyrite crystals



Depths of Principal Aquifers in Martin County, North Carolina

DEPTH OF PRINCIPAL AQUIFERS IN MARTIN COUNTY

and muscovite flakes. The optimum screen openings for naturally developed, screened wells tapping this aquifer is about 16/1000 inch (slot size 16). The specific capacity of properly-constructed, naturally developed, 2-inch diameter wells tapping Aquifer 4 is calculated as 1.5 gallons per foot of drawdown after one day of pumping. The chemical quality of water from Aquifer 4 generally is acceptable for most uses.

Aquifer 5

Aquifer 5 occurs in and includes most of the Beaufort Formation. The aquifer ranges in thickness from less than a foot along the basal pinchout to approximately 100 feet in the eastern part of the county. The aquifer strikes approximately N. 40° E. and dips at about 20 feet per mile to the southeast. The base of the aquifer pinches out along an undulating, north-south line which passes through Everetts, in the central part of the county. The top of the aquifer pinches out along a line, roughly parallel to the strike, which passes approximately half way between Williamston and Jamesville. The depth of the top and bottom of Aquifer 5 below land surface is shown in figure 10.

Aquifer 5 is composed of about 60 percent, silt-sized to medium-grained, green to black, glauconite sand and about 40 percent, silt-size to fine-grained, clear quartz sand. The sands are poorly sorted. The proper screen openings for naturally developed, screened wells tapping Aquifer 5 is about 8/1000 inch (slot size 8). The specific capacity of a properly constructed, naturally developed, 2-inch diameter well tapping Aquifer 5 at its greatest thickness, is calculated as 0.4 gallons per foot of drawdown after one day of pumping. The chemical quality of the water generally is acceptable for most uses.

Aquifer 6

Aquifer 6 occurs in and includes most of the Castle Hayne Limestone, and, where the Castle Hayne is overlain by the Yorktown Formation, it also includes a basal shell bed in the Yorktown Formation. The base of Aquifer 6 pinches out along an undulating, north-south line which passes just east of Williamston. The thickness of the aquifer ranges from less than a foot along the pinchout to about 40 feet along the eastern edge of the county. The top of Aquifer 6 strikes approximately N. 45° E. and dips toward the southeast at about 18 feet per mile. The depths of the top and bottom of Aquifer 6 below land surface is shown in figure 10.

Aquifer 6 is composed of shell and shell limestone beds. The limestone is sufficiently indurated so that open-end wells may be constructed. The specific capacity of open-end, 2-inch diameter wells, where Aquifer 6 is 10 feet thick, is calculated as 3.0 gallons per foot of drawdown after one day of pumping. The water from Aquifer 6 generally is hard to very hard, otherwise it is of acceptable chemical quality for most uses. Aquifer 6 is the uppermost of the artesian aquifers in Martin County. Overlying these artesian aquifers are confining layers consisting of massive clay beds of the Yorktown Formation. The Yorktown Formation is overlain by sediments of post-Miocene age that are the non-artesian aquifer.

Non-artesian (water-table) Aquifer

Aquifer 7

Aquifer 7, the non-artesian aquifer, is composed of sand, silt, and clay of post-Miocene age. The aquifer extends from land surface to depths ranging from 5 to 70 feet in the county. Sand and silt beds predominate, but there are numerous clay lenses and clay is disseminated through the sand beds.

The sand beds in Aquifer 7 are composed of very fine to coarse-grained, well-rounded to angular, quartz sand that is frequently stained by iron oxides. The sand beds are heterogeneous and lack continuity; therefore, it is not practical to determine a standard screen size for wells tapping this aquifer. The optimum screen size should be determined, individually, for each well constructed.

Many 2-inch wells have a specific capacity of less than 0.1 gallon per foot of drawdown and none had a specific capacity of more than 0.3 gallon per foot of drawdown after one day of pumping. Therefore, the use of Aquifer 7 is limited to small diameter wells having small yields or large diameter wells that have a large reservoir storage capacity. Most farm ponds in the area that have no surface inflow or outflow, are essentially large diameter wells developed in Aquifer 7.

Aquifer 7 contains water having two objectionable characteristics. The water may have high concentrations of dissolved iron. This results in the staining of laundry, plumbing fixtures, and cooking utensils. The second objectionable characteristic is that water from Aquifer 7 is easily polluted by organic and inorganic sources such as septic tanks or chemical fertilizers.

Quantitative Studies

The quantitative studies of ground water in Martin County were divided into two major phases. The first phase, which included pumping tests to determine the water transmitting and water storage characteristics of various aquifers, was designed to determine the availability of ground water and the best method for developing water supplies. The second phase, using data obtained from the first phase and piezometric maps, was designed to calculate the areas and amounts of recharge and discharge within the county. The result is a calculation of how much ground water is available to both the individual supply well and to the area as a whole.

Water Storage and Water Transmitting Capacities of Aquifers

The water-transmitting capacity (coefficient of transmissibility) and the water-storage capacity (coefficient of storage) for the principal aquifers in Martin County were calculated from pumping and recovery tests. The coefficient of transmissibility is the quantity of water, in gallons per day, that will move through a vertical section of the aquifer one foot wide and extending the full saturated thickness under a hydrologic gradient of one foot per foot at the prevailing temperature of the water. The coefficient of storage is defined by the Geological Survey as the volume of water the aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface. Determination of the transmissibility and storage coefficients for an aquifer may be used to calculate the water yielding capacity of individual wells tapping the aquifer for any reasonable period of pumping and the effect of drawdown in relation to distance from the pumped well.

The withdrawal of water from an aquifer causes water levels to decline in the vicinity of the pumped well. As a result of this decline, the water table or piezometric surface assumes the approximate shape of an inverted cone having its apex at the center of withdrawal (fig. 11). The shape, size, and rate of growth of this "cone of depression" depends upon several factors. Among these are: (1) the transmissibility and storage coefficients of the aquifer; (2) the rate of pumping; (3) the duration of pumping; and (4) the natural discharge salvaged by increased recharge resulting from the decline in water levels near recharge areas. The vertical distance that water levels are lowered at any point by pumping is the "drawdown". The specific capacity of a well is the amount of water in gallons per minute that the well will yield for each foot of drawdown in the well for a specified period of pumping. As amount of drawdown is approximately proportional to the pumping rate, a well may be evaluated according to its specific capacity. The theoretical specific capacity of a well is the amount of water in gallons per minute that the well should yield for each foot of drawdown within the well, for a specified period of pumping if there are no well losses (B fig. 11). The specific capacity of a well is usually somewhat less than the theoretical specific capacity of the well due to head losses caused by turbulent flow through the well screens or poor well development or construction (C fig. 11).

Aquifer Studies

Pumping tests were conducted using wells tapping each aquifer in Martin County. The pumping tests ranged from elaborate, long-term tests to simple measurements of yield and drawdown during the construction of domestic wells. Table 2 gives the average hydrologic properties obtained from the tests, for each aquifer in the county except Aquifer 7, the water-table aquifer, for which the maximum rather than average properties are given. The table lists values for the theoretical specific capacities for 2-inch diameter wells and 36-inch gravel pack wells, assuming no well losses. These diameters were selected because most domestic wells are between $1\frac{1}{4}$-inches and 3-inches in diameter and most municipal or industrial wells are gravel packed to approximately 36 inches.

The theoretical specific capacities of wells tapping more than one zone may be determined by adding the capacities of the zones tapped. For example, a 2-inch diameter well tapping Aquifers 5 and 6 should have a theoretical specific capacity of 3.4 gallons per foot of drawdown (table 2).

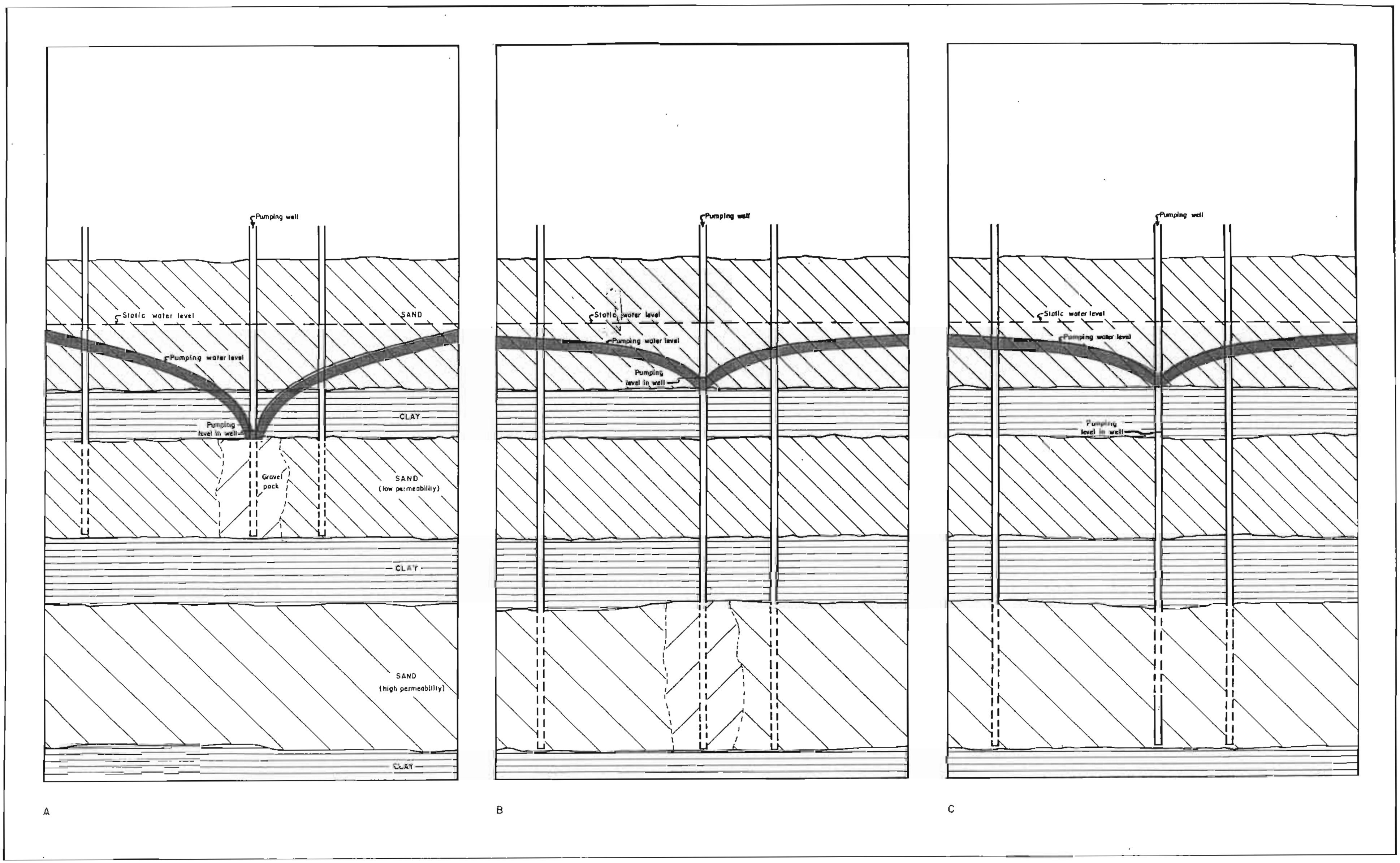


DIAGRAM SHOWING CONE OF DEPRESSION FORMED DURING PUMPING

TABLE 2. Average Quantitive Values for Aquifers in Martin County (Assuming no well losses)

Aquifer	T	Aquifer Thickness (feet)	Pf	Theoretical Specific Capacity 2" diameter well	36" diameter well
1	1,400	30	47	0.6	1.1
2	1,600	50	32	0.7	1.2
3	18,000	105	171	6.0	10
4	4,000	42	95	1.5	1.9
5	1,200	40	30	0.4	0.6
6	10,000	9	1,100	3.0	4.0
7*	700	26	27	0.3	0.5

* Maximum measurement

T - Transmissibility

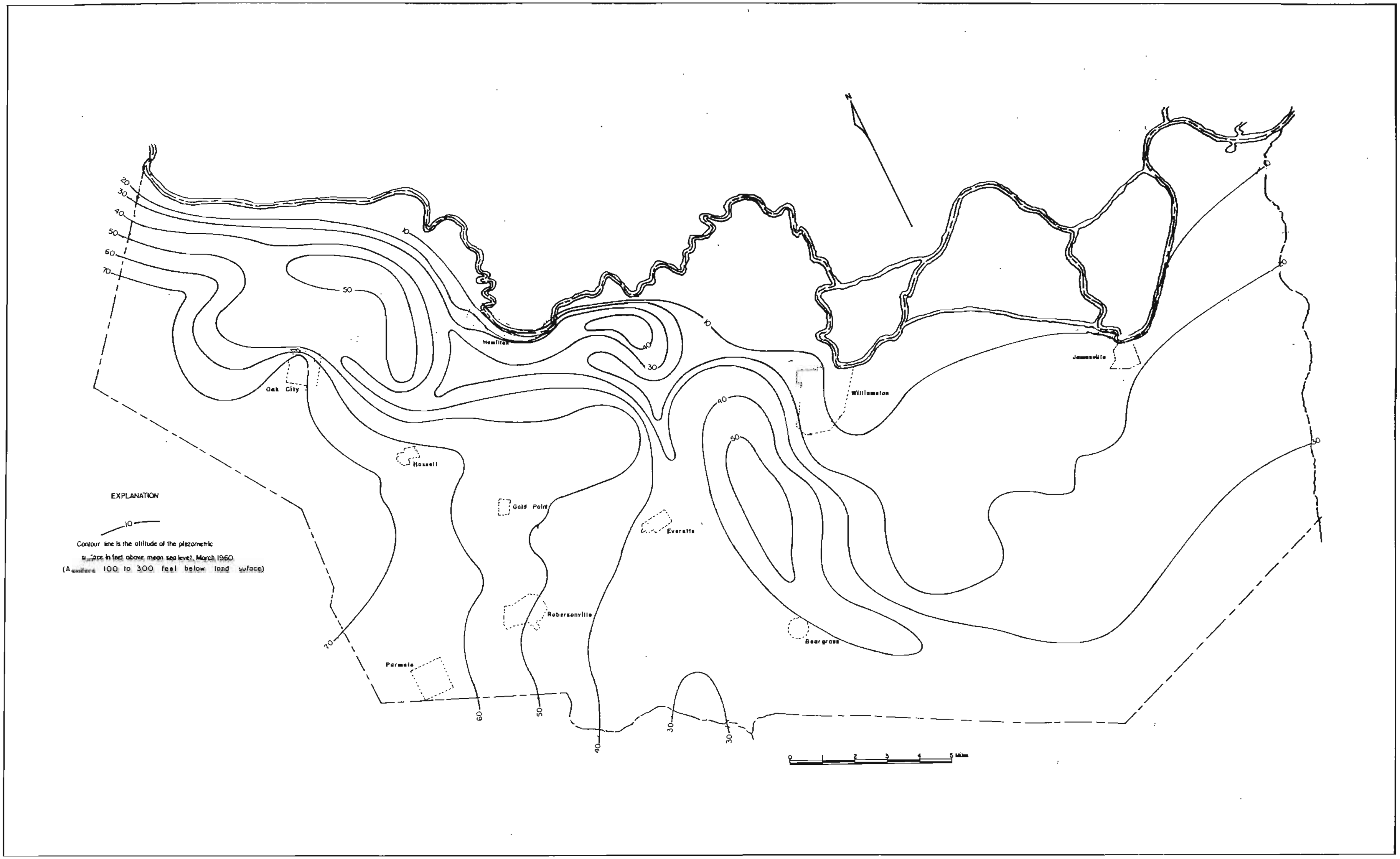
PF - Field Permeability

The table may be used to compare the head losses of a well already constructed to a theoretically perfect well or it may be used to determine what zones to tap in constructing a new well. One may compare the losses of a well already constructed with a theoretically perfectly constructed well by measuring the drawdown and discharge of the well for a few hours to one day and calculating the specific capacity of the well. The specific capacity may be determined by dividing the discharge, in gallons per minute, of the well by the drawdown, in feet, in the well. If the specific capacity is much lower, due to losses, than the theoretical specific capacity listed for an aquifer, frequently, additional well development by the driller will considerably improve the yield of the well.

The quantitative studies in Martin County were designed to determine the average daily recharge to and discharge from the artesian aquifers between 100 feet and 300 feet below land surface in the county. The recharge or discharge for an area may be calculated by determining the size, shape, and transmissibility of the aquifers and the differences in head within the aquifers. In Martin County the size and shape of the aquifers were determined by geologic studies, the transmissibility was determined for the aquifers by conducting pumping tests and the head differences were determined by constructing a piezometric map of the county during a period when water levels were approximately average.

The piezometric map (fig. 12) was constructed by measuring and referring the water levels in wells to a common datum plane, mean sea level. As may be seen in figure 12, there are areas in the county where high-level contours close partially in Martin County and partially in adjacent counties. These areas of high piezometric surface are recharge areas where water is percolating downward into the artesian aquifers. The areas of low piezometric surface are discharge areas where water is leaking upward into swamps and streams. In the aquifers water flows from piezometric highs to piezometric lows as a result of the force of gravity.

The average daily recharge is calculated by determining the amount of water moving away from recharge areas within the county. The average daily recharge in Martin County was calculated on the basis of



PIEZOMETRIC MAP OF MARTIN COUNTY, MARCH 1960

FIGURE

differences of piezometric head shown on figure 12 and the distribution of areas of recharge shown on figure 13. The figure calculated for recharge to aquifers between 100 feet and 300 feet below land surface in Martin County is 22 million gallons per day (mgd). This figure represents only recharge from precipitation and probably is conservative at that. It does not include the volume of water in the overlying nonartesian aquifer which could be induced to move downward by additional development of the artesian aquifers.

The average daily discharge for the same aquifers, calculated by determining the amount of water moving into discharge areas in the county is 21 mgd. The figures for recharge and discharge should be approximately equal if there is no outflow through the aquifer to other areas. From the piezometric map there appears to be one area near Parmele where there is outflow through the aquifer into Pitt County. The outflow and water use probably accounts for the discharge rate calculated being slightly less than the recharge rate calculated.

Comparison of average daily recharge to the aquifers between 100 and 300 feet below land surface datum and the volume of precipitation on the recharge areas (fig. 13) indicates that at least one quarter of the precipitation on the recharge areas is recharged to the 100 to 300 foot zone. In areas of discharge and transmission (fig. 13) little or no precipitation reaches the artesian aquifers; rather, any precipitation that reaches the zone of saturation moves through the water-table aquifer to points of discharge.

The protection of recharge areas is vital to the development of ground-water supplies in the county. Extensive drainage in these areas would affect substantially the total amount of ground water available for development. Also, long-lived contaminants should not be introduced into the recharge areas. For example, if soluble contaminants were introduced in area "E" (fig. 13), they could reach the Williamston municipal well field, located about 3 miles northeast of area "E", in approximately 80 years under present hydrologic conditions.

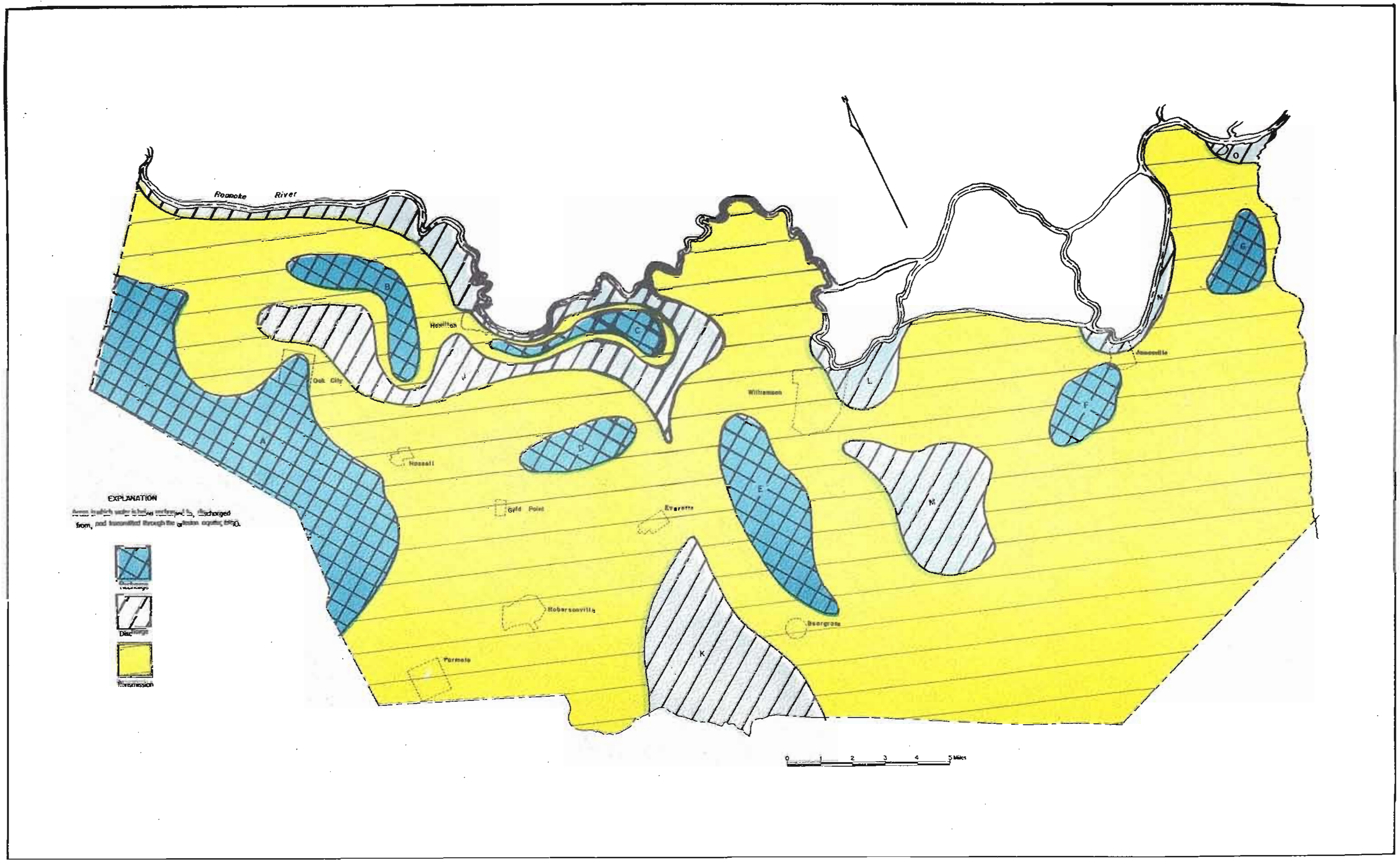
The drainage of areas between the recharge and discharge areas would probably result in the salvage of some of the runoff in recharge areas. The drainage of discharge areas would increase the flow from recharge to discharge areas by increasing the head differences, and, very likely, drainage would be difficult if not nearly impossible. For example, Sweet Water Swamp, Area "M" in figure 13, could be drained only with the greatest difficulty. The drainage of this area would require a system of ditches capable of handling about 6 mgd of base flow in addition to the total average daily rainfall for that area.

Generally, in Martin County it is more desirable to develop wells or well fields in the discharge areas. By developing in discharge areas a part of the normal leakage from the aquifer is utilized. Also, ground water in the discharge areas is usually of more desirable chemical quality than the water from recharge areas; this apparently anomalous relationship is discussed in sections on "Iron" and "Hardness".

Wells

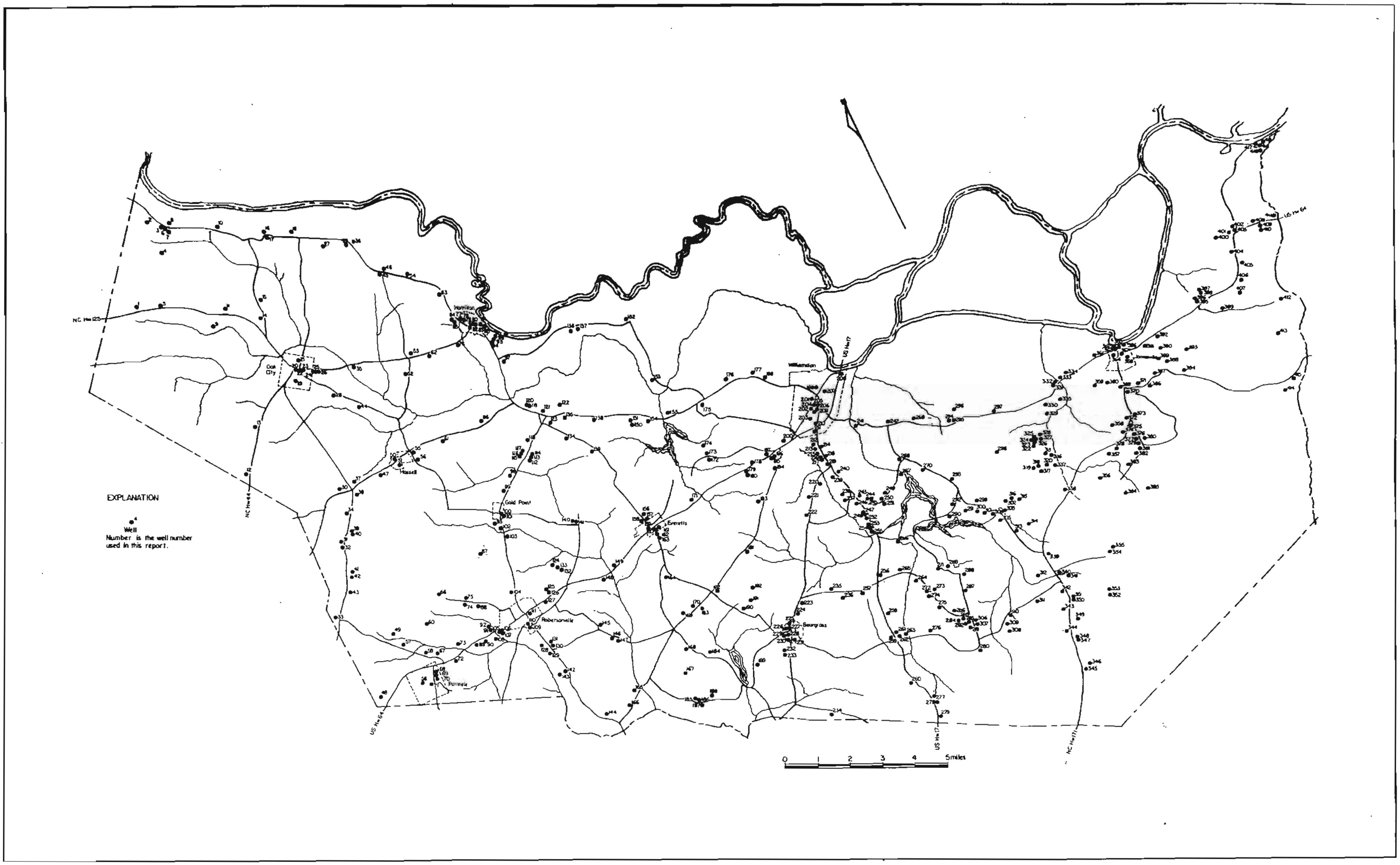
Domestic, municipal, and industrial wells were the source of most of the hydrologic and geochemical data collected in Martin County. Approximately 420 wells were inventoried. They are located in figure 14. The data from these wells are given in tables 3 and 4. Table 3 contains the physical data and table 4 contains the results of chemical analysis of water samples from the wells.

Generally, the wells are numbered from west to east across the county for the convenience of the reader in locating them on the map (fig. 14). Approximately 70 percent of the artesian wells in the county were inventoried, and the inventory network was designed to give comprehensive coverage, both areal, and with depth. A study of the data from the well inventory indicates some of the reasons why problems are encountered in obtaining wells capable of yielding adequate quantities of water of good chemical quality. Frequently, wells have a low specific capacity because of inadequate construction or development methods even though they tap very productive aquifers. Also, wells may produce water of undesirable chemical quality because they tap the least desirable of several aquifers in a given area. The following section on well construction is included to help minimize some of these problems.



AREAS OF RECHARGE, DISCHARGE, AND TRANSMISSION IN THE ARTESIAN AQUIFERS

FIGURE 13



WELLS INVENTORIED IN MARTIN COUNTY

FIGURE 14

Well construction

The types of wells constructed are governed by the relationship between the requirements of well owner and the cost of the well. The requirements of the owner include both quantity and quality of water required. Generally, there is no place in Martin County where an adequate well, yielding water of desirable quality, for most purposes cannot be developed. Since the individual must determine what his requirements are, the following section will describe the various methods of well construction along with advantages and disadvantages of each. For the purpose of this discussion, the following classifications are used: Cost: low - $10.00 to $250.00; medium - $250.00 to $1,000.00; high - more than $1,000.00. Yield: low - 1 to 10 gpm; medium - 10 to 40 gpm; high - more than 40 gpm. Quality: good - does not require treatment for most domestic use; poor - requires some type of treatment for most domestic uses.

The types of wells generally constructed in Martin County are shown in figure 15. These wells fall into three general categories; dug or bored wells, driven wells, and drilled wells. In figure 15 the well on the left is a dug or bored well, the next well is a driven well, and the remainder of the wells in the illustration are drilled wells.

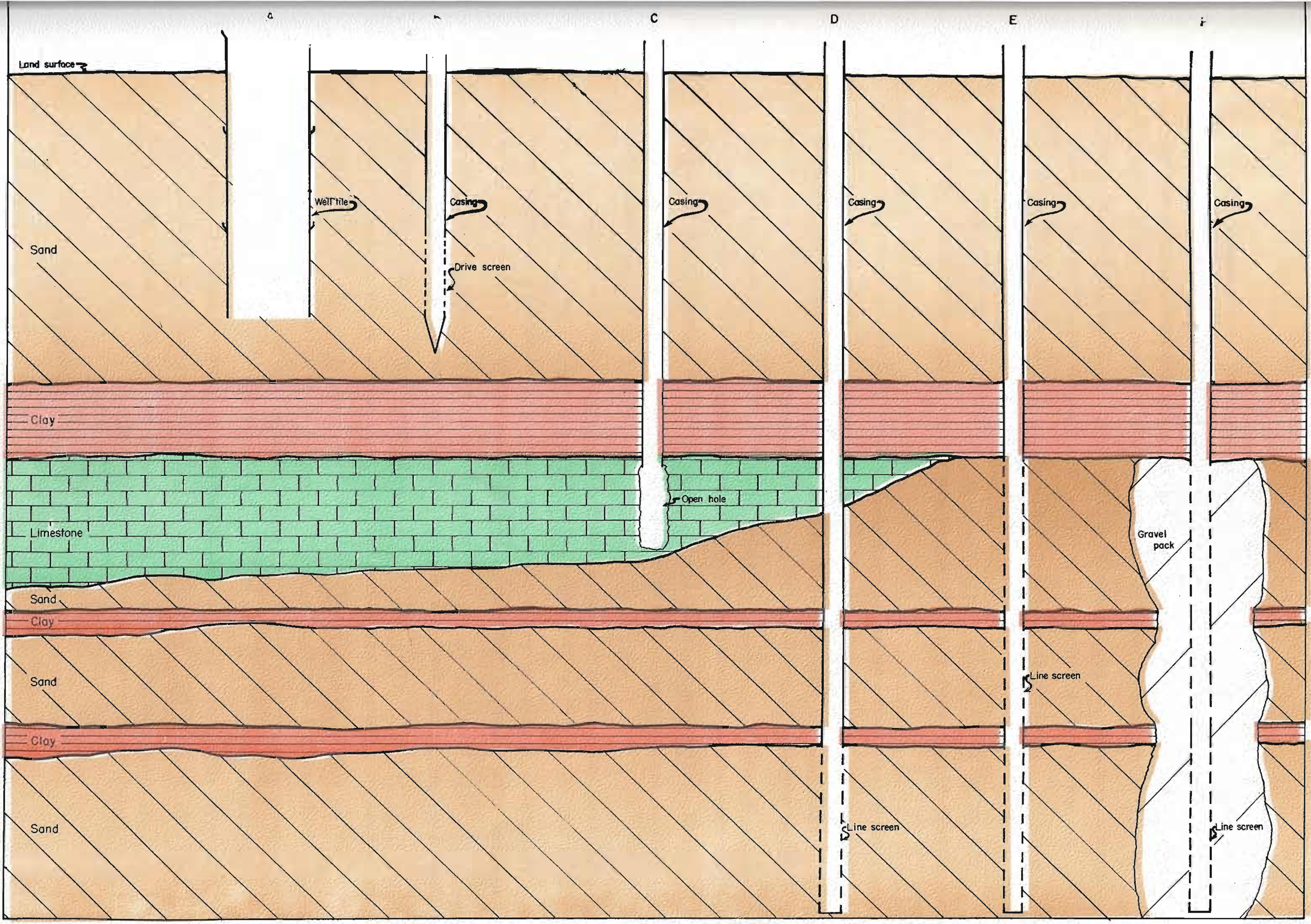
Dug or bored wells are constructed by digging or boring a large diameter hole, casing the hole with lengths of concrete or tile casing, grouting around the outside of the casing, and installing a pump. These wells range in depth from 10 to about 50 feet in Martin County. Usually they are 24, 30, or 36 inches in diameter. The price of these is low, the yield is generally low, and the quality of water is usually poor. Dug wells are usually constructed where high yield and good quality of water may be sacrificed for economy.

Driven wells are constructed by equipping a length of steel well casing with a special pointed drive screen which is driven down into a sandy water-bearing zone, surged to clear the fine sandy material from the screen, and then equipped with a pump. Driven wells in Martin County are usually $1\frac{1}{4}$ to 2 inches in diameter and range from 10 to 50 feet in depth. These are low cost wells, usually having a low yield and poor quality of water. Driven wells, like dug wells, are usually constructed where high yield and good quality of water may be sacrificed for economy.

Drilled wells are constructed by several methods in Martin County. Among these methods are: 1. the open-end method, 2. the single-screen natural-development method, 3. the multiple-screen natural-development method, and 4. the multiple-screen gravel-pack method. The type of well resulting from these methods of construction are shown in figure 15. Single-screen wells may also be gravel packed but none of this type were inventoried.

Well "C" in figure 15 illustrates the open-end type of well construction used in Martin County. In this method of construction, a hole is drilled from land surface into consolidated rock, such as limestone, a steel casing is set to the top of the consolidated rock and grouted in place, and the well is cleaned by pumping. This type of construction is restricted to areas which are underlain by sediments consolidated sufficiently that the hole will remain open below the bottom of the casing. Only the eastern one-third of Martin County is underlain by this type of formation. Here the Castle Hayne Limestone (Aquifer 6) underlies the area and numerous open-end wells tap this formation. The open-end wells are medium cost wells, usually of medium to high yield and the water is generally of poor quality. Water from open-end wells in the county is generally hard to very hard. The open-end wells are usually constructed in the eastern part of the county where medium to high yield is required and where hardness of water is relatively unimportant or is remedied by use of water softeners.

The single-screen naturally developed well is illustrated by Well "D" in figure 15. In this method of construction a hole is drilled from land surface down through a sandy aquifer, a steel casing with a screen on the lower end is set in the hole so that the screen is in the sandy aquifer, and the well is developed to wash fine sand and clay out of the aquifer around the screen. In this method of construction it is important that the screen openings are large enough to allow about 50 percent to 80 percent of the fine sand in the aquifer to wash into the well. By developing the well with pumping and surging, the fine material of the aquifer is washed out of the well and formation,



TYPES OF WELLS CONSTRUCTED IN MARTIN COUNTY

FIGURE 15

leaving coarse, more permeable material packed around the screen. This type of construction should produce a well of medium cost, usually of medium yield, producing water of good chemical quality, if properly constructed. The common problems in the construction of this type of well usually include: 1. poor well development due to improper screen size or insufficient surging and pumping, 2. setting the screen so that part of the screen openings are blocked by clay layers, 3. screen set in aquifer containing water of poor chemical quality.

Most of the single-screen, naturally-developed wells in Martin County are 2 inches in diameter and range from 125 feet to 350 feet in depth.

Multiple-screen naturally developed wells are constructed in the same manner as single-screen naturally developed wells except that screens are placed in the casing to tap more than one aquifer (see Well "E", figure 15). This type of construction should produce wells of medium cost, high yield and good chemical quality of water in Martin County. The problems of this type of construction are same as those of constructing single-screen naturally developed wells. Wells of this type in Martin County are usually 2 inches to 6 inches in diameter and range from 150 feet to 450 feet in depth.

Multiple-screen gravel-packed wells are illustrated by Well "F" in figure 15. This type of well is constructed by drilling a hole from land surface through several aquifers, reaming or washing a large diameter hole in each aquifer to be screened, setting a casing with screens spaced in the casing at each reamed aquifer, pumping gravel into the large diameter holes outside of the screens and developing the well to remove drilling clay and fine material from the graveled zones. The gravel packing effectively increases the radius of the well in each aquifer which, in turn, increases the specific capacity of the well. The cost of constructing this type of well is high but the yield of the wells is high and the chemical quality of water is usually good. Generally, only high yield municipal or industrial wells are constructed in this manner because of the cost. In Martin County, this type of well is usually 6 inches to 12 inches in diameter, 300 feet to 450 feet deep, and yields 400 to 600 gpm of water of good chemical quality.

GEOCHEMISTRY

All of the ground water in Martin County contains some dissolved matter which imparts certain chemical characteristics to the water. The amount and type of dissolved matter in a water sample is determined by chemical analysis of the water. The information obtained from approximately 400 chemical analyses of water, from the different aquifers, at various places within an area, may be related to the chemical composition of the aquifers and to the rate and direction of movement of water through the aquifers. The study which relates water chemistry to geology and hydrology is termed geochemistry.

A study of geochemistry in Martin County is important because it allows the development of aquifers in which water has the most desirable chemical characteristics and because it helps in tracing the movement of ground water within the county.

Quality of Water

Rainfall over the recharge areas of Martin County is relatively free of dissolved solids but does contain absorbed gasses, such as carbon dioxide and oxygen, which makes the water slightly acid or corrosive. The slightly acid water is capable of dissolving certain solids from the host rock through which it flows.

The salts of the common metals make up a large percentage of the dissolved solids in ground water. The chemical analysis of a water sample measures the individual constituents present in the solution. The proportionate amounts and chemical relationships of the ions in the solution determines such reported factors as hardness, specific conductance, and hydrogen-ion concentration. The following discussion concerns the more important chemical constituents in ground water in Martin County, as normally reported in water analyses.

Iron (Fe)

Iron compounds are common in the surficial sands in the county and iron is readily dissolved by the slightly acid water in the water table. Water containing less than 0.3 ppm of iron is generally acceptable for most uses. Concentrations of iron in excess of 0.3 ppm will usually stain laundry, food, utensils, and plumbing fixtures.

The iron stain, a reddish-brown deposit, forms when the water containing iron salt is exposed to the air. The dissolved iron may usually be removed from domestic supplies by using commercial type filters in the pumping system.

In Martin County the water-table aquifer yields water with objectionable amounts of dissolved iron. Almost all water-table wells yield water with iron concentrations ranging from 0.5 to 10 ppm. Therefore, this is the greatest objection to using dug or driven water-table wells.

The concentration of dissolved iron in water from aquifers between 100 feet and 300 feet below land surface is shown in figure 16. The water having greatest concentrations of dissolved iron occurs immediately under recharge areas (fig. 13). This is because water from the water-table aquifer, containing high concentrations of dissolved iron, is moving downward in these areas to recharge the artesian aquifers. In the downward and outward movement from the recharge areas, the water dissolves calcareous material from the aquifers and becomes more alkaline. As the water becomes basic, the iron is precipitated in the aquifers and the concentration of dissolved iron in the water becomes very low. In the discharge areas (fig. 13) the concentrations of dissolved iron are less than 0.1 ppm (fig. 16). Wells tapping aquifers at depths greater than 300 feet below land surface generally produce water with concentrations less than those in figure 16, at any given location in the county. The concentrations of dissolved iron in water samples collected from all aquifers in Martin County are given in table 4.

Calcium and magnesium (Ca and Mg)

Compounds of calcium and magnesium are common in the limestone, shell beds, and calcareous sands and clays in Martin County. Ground water, especially water of low pH, passing through these sediments will dissolve calcium and magnesium. Most of the calcium and magnesium goes into solution as a bicarbonate salt. The salts of calcium and magnesium are responsible for most of the hardness effect in ground water. Hardness of water is discussed in a separate section. The calcium and magnesium content of water from wells in Martin County is given in table 4.

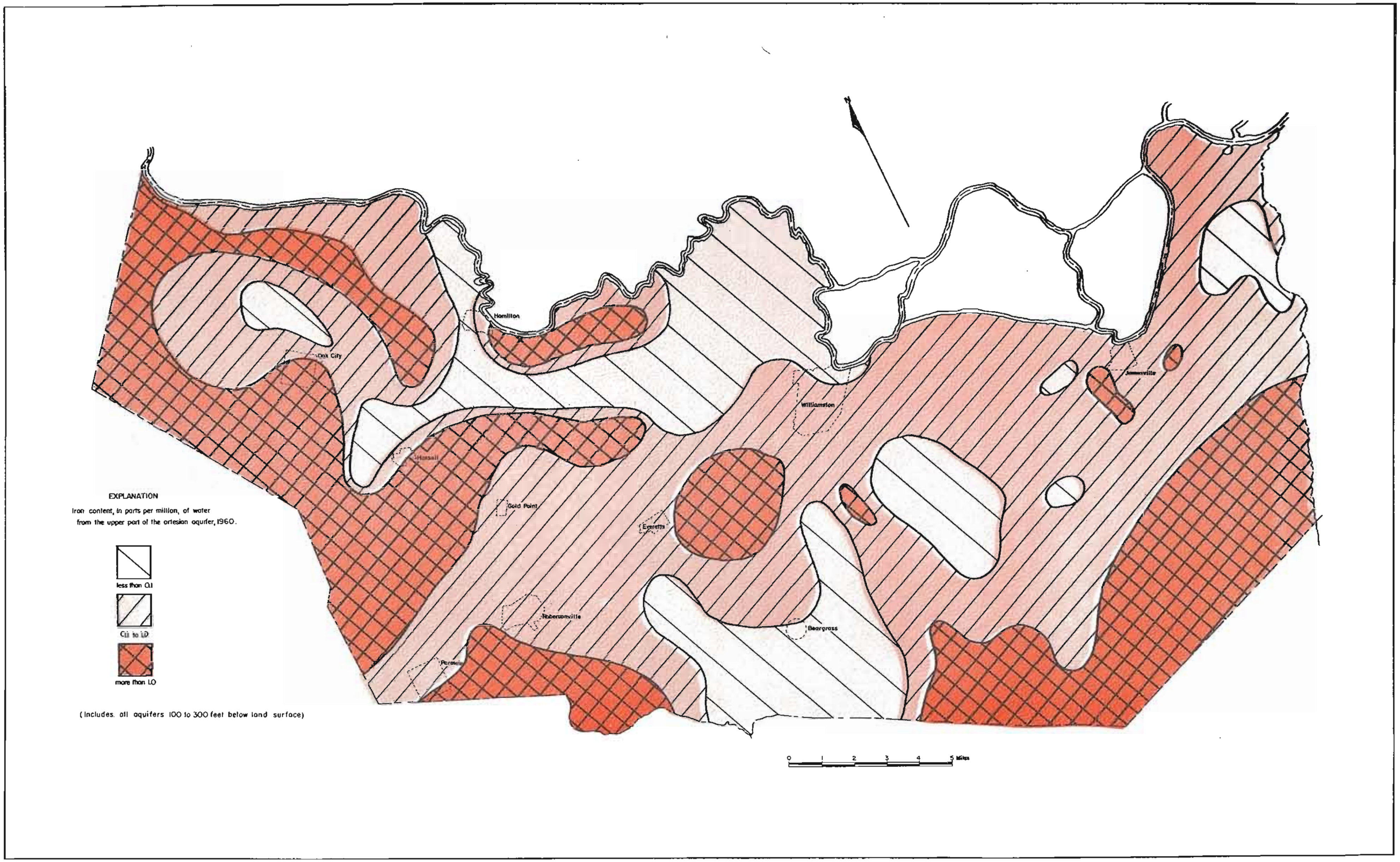
Bicarbonate and carbonate (HCO_3 and CO_3)

Laboratory analyses of water from wells in Martin County frequently report both the bicarbonate and the carbonate content of water. Field analyses, however, indicate that the bicarbonate type is dominant and the carbonates reported in laboratory analyses generally result from an alteration of the bicarbonates when the water sample is subjected to aeration or to changes in temperature and pressure. The bicarbonate water contains principally cations of calcium and magnesium or of sodium and potassium. Where the cations are calcium and magnesium, the water is usually considered hard but where the cations are principally sodium and potassium the water is very soft. Bicarbonate has little effect on the domestic utilization of water, it may cause boiler foaming or scale deposits in some industrial uses. Zeolite softeners are frequently used on domestic supplies to change calcium and magnesium bicarbonate waters to sodium bicarbonate waters, thus changing hard water to soft water. The bicarbonate content of water from wells in Martin County is given in table 4.

Sulfate (SO_4)

Minerals containing sulfate are frequently present in shell and limestone beds. These minerals, commonly including calcium and nagnesium sulfate, are soluble in ground water and are probably the main source of sulfate ions in the water from artesian wells in Martin County. The sulfate concentrations in water in the county was not high enough to be objectionable for most uses. However, sulfate ions may be reduced by bacterial action to produce hydrogen sulfide and sulfur. Hydrogen sulfide, a gas, has a disagreeable odor and when dissolved in water forms a weak acid which may make the water corrosive.

In the Williamston water system, bacterial action reduces sulfates to sulfides during summer months. The water has a disagreeable odor and corrodes the water system, dissolving some of the iron from iron pipes. This situation could be remedied by the chlorination of the waters to prevent bacterial growth.



IRON CONTENT OF WATER FROM UPPER PART OF ARTESIAN AQUIFERS

FIGURE 16

Chloride (Cl)

More than 90 percent of the dissolved solids in ocean water are chloride salts. The concentration of chloride ions in sea water averages between 19,000 ppm and 20,000 ppm. In ground water in Martin County the chloride content of the water ranges from about 5 ppm to about 1,400 ppm. Most of the chloride is probably derived from the sea water in which the sedimentary formations in the county were deposited. After deposition, the formations were flushed by fresh water to depths of 350 feet to 450 feet below land surface. Generally, all of the aquifers above a depth of 400 feet contain water with less than 250 ppm of chloride. A few water-table wells yield water having concentrations of chloride greater than 250 ppm, indicating that the water has been contaminated by surface pollution. There is no evidence of either lateral or vertical encroachment of salt water into fresh water aquifers in Martin County. There is no economically feasible method of removing chloride from water for domestic purposes. The concentration of chlorides in water from wells is shown in table 4.

Fluoride (F)

Fluoride in ground water is due to the solution of fluoride-bearing minerals such as the apatites, the fluorapatites, the phosphates, the micas, and the hornblendes, and organic matter such as shells. Of these, the micas, the phosphates, and the shells are most prevalent in the sediments in this area, and are thought to account for most of the fluoride in the ground water.

Fluoride in concentrations between 1.0 and 1.5 ppm in drinking water aids in reducing tooth decay in children. Fluoride in concentrations in excess of 1.5 ppm may cause permanent mottling of the teeth (dental fluorosis) when used by children (Maier, 1950, p. 1120-1132).

The higher concentrations of fluoride in water in Martin County seem to be restricted to certain geologic formations (see fig. 17). All of the water samples having concentrations of fluoride greater than 1.5 ppm were from aquifers in the Black Creek Formation or along the Black Creek-Peedee Formation contact (see table 4).

Hardness

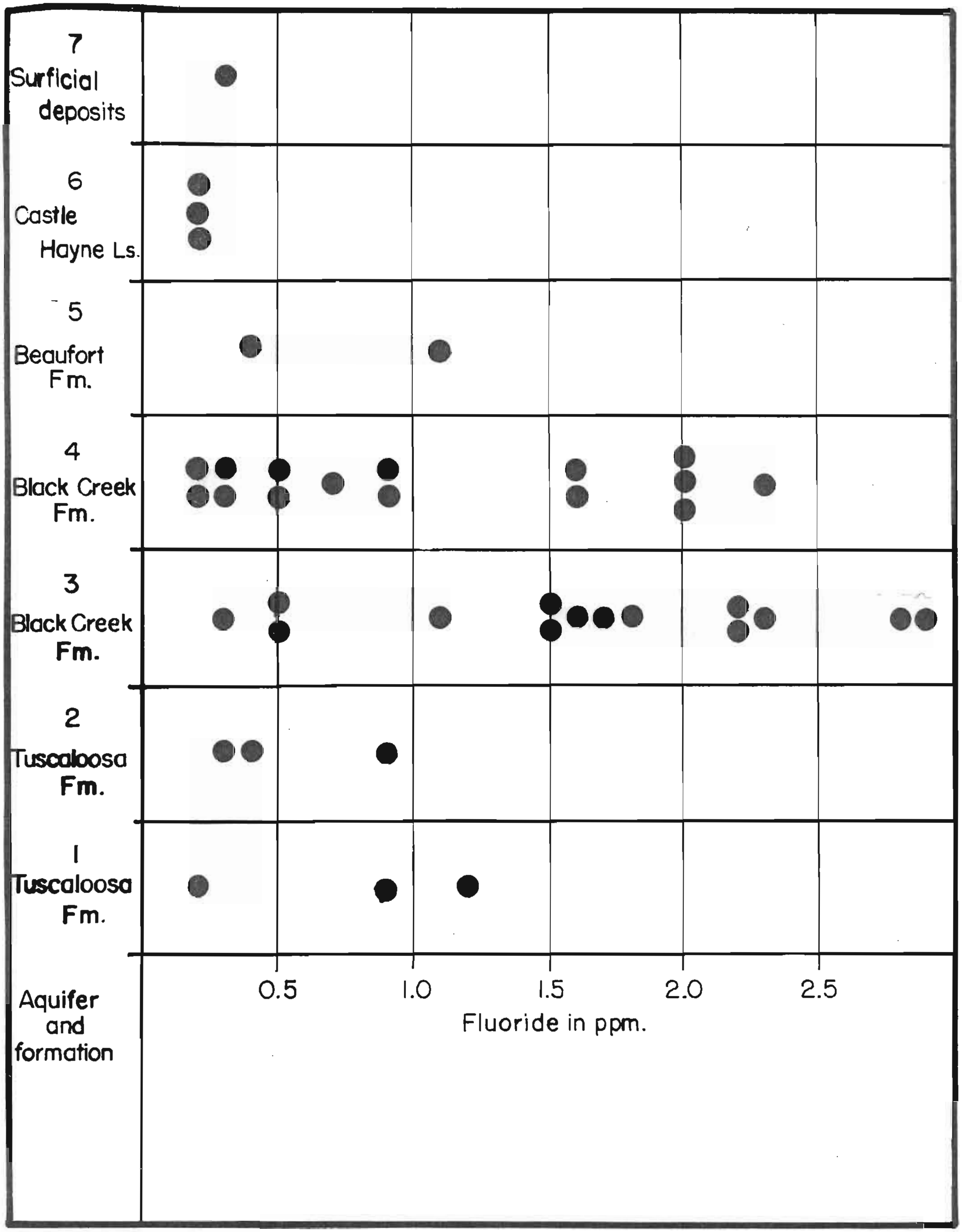
Hardness of water is usually recognized by the increased amount of soap necessary to form and maintain a lather. Hard water is objectionable not only because of its soap-consuming properties but also because it forms scale in boilers and, to a lesser degree, encrustations in cooking utensils. The principal chemical constituents that produce hardness in ground waters are calcium and magnesium. The following classification of water hardness is used by the U. S. Geological Survey:

Hardness as $CaCO_3$ (ppm)	Classification
0-60	Soft water
61-120	Moderately hard water
121-200	Hard water
200+	Very hard water

Figure 18 is a map showing the concentrations of hardness in water from wells tapping aquifers from 100 feet to 300 feet below land surface in Martin County. Wells in discharge areas or tapping zones below 300 feet generally produce water of the sodium bicarbonate (soft) type rather than the calcium and magnesium bicarbonate type and do not require treatment for hardness. The hardness of water from samples in Martin County is given in table 4.

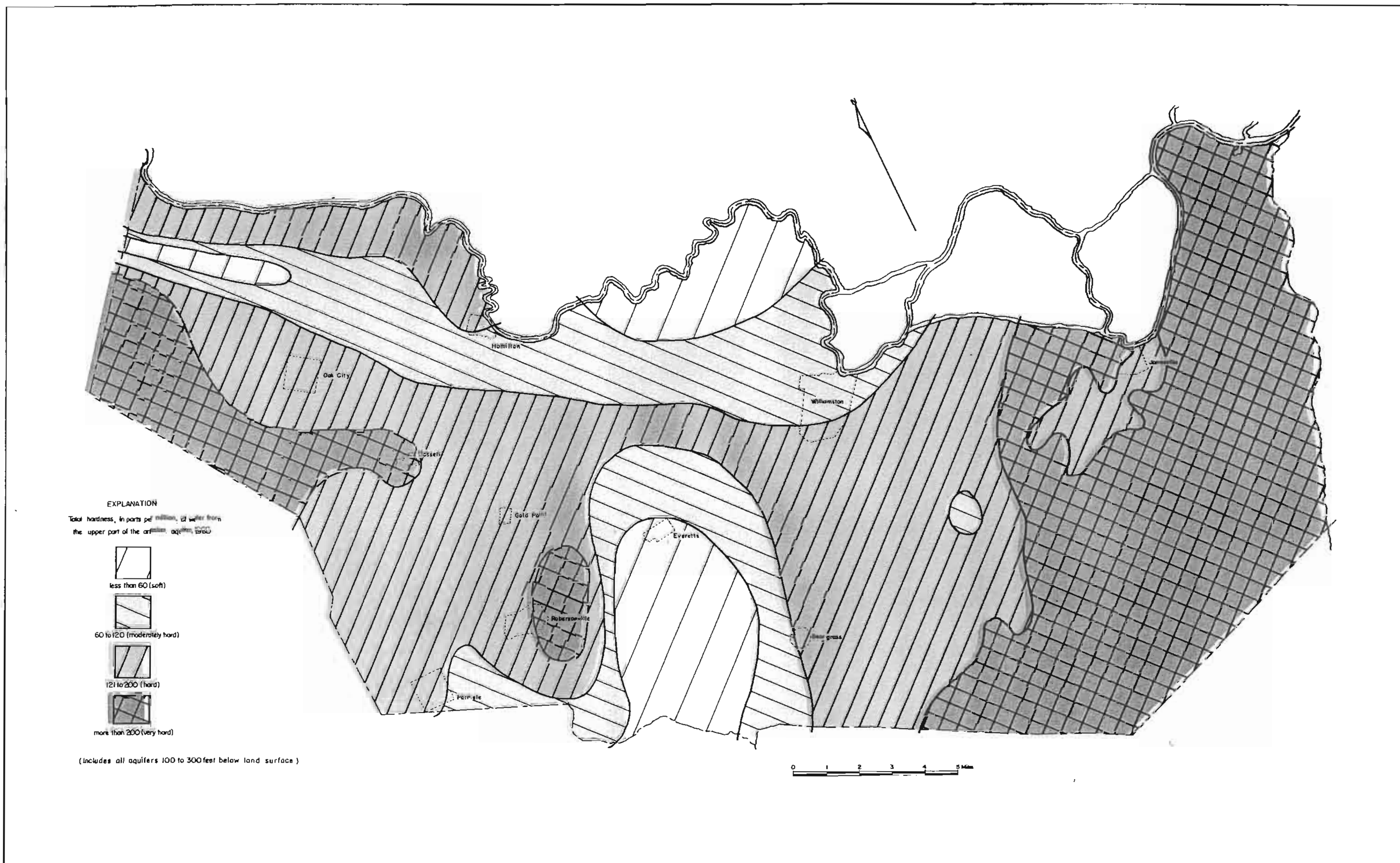
Hydrogen-ion concentration (pH)

The hydrogen-ion concentration, expressed as the pH, is a measure of the degree of acidity or alkalinity of the water. The pH of a solution is represented by a number which is the negative logarithm of the concentration of hydrogen ions in moles per liter. Numerically, the pH scale extends from 0-14. A water having a pH value of 7 is assumed to be neutral and the concentration of hydrogen ions is equal to the concentration of the hydroxyl ions. A water with a pH value less than 7 is said to be acid (the concentration of H^+ ions is greater than the concentration of OH^- ions), and the acidity increases as the numerical pH value decreases toward 0. A water with a pH value greater than 7 is said to be basic (the concentration of OH^- ions is greater than the concentration of H^+ ions) and the basicity increases as the numerical pH value increases toward 14. Inasmuch as the pH values are the



FLUORIDE CONTENT OF WATER FROM FORMATIONS

FIGURE 17



HARDNESS OF WATER FROM UPPER PART OF ARTESIAN AQUIFERS

FIGURE 18

numerical change to the logarithmic base, a water with a pH of 3 is ten times as acid as water with a pH of 4, and conversely a water with a pH of 9 is ten times as basic as a water with a pH of 8.

The pH values given for ground waters are important as an indication of their corrosive potential. Generally speaking, acid waters have a much greater corrosive potential than do the basic waters.

In Martin County water from the water-table aquifer generally has a pH value less than 7.0. The lowest pH measured was 3.4, from a water-table well in an area where the aquifer was contaminated by acid fertilizers. Generally, water from artesian aquifers had a pH value greater than 7.0. The pH of water from wells in Martin County is given in table 4.

CONCLUSIONS

Martin County is underlain by sediments ranging in age from Cretaceous to Recent. The geologic formations from oldest to youngest are the Tuscaloosa, Black Creek, and Peedee Formations of Cretaceous age, the Beaufort Formation of Paleocene age, the Castle Hayne Limestone of middle and late Eocene age, the Yorktown Formation of late Miocene age and the undifferentiated sediments of post Miocene age.

Ground water occurs in seven major aquifers, six of which are artesian and one non-artesian. Massive clay beds of the Yorktown Formation constitute the principal aquiclude in the county. The sediments which underlie the Yorktown Formation contain six major aquifers composed of continuous sand, shell, or limestone beds. The artesian aquifers are separated by clay or silt beds that retard, but do not prohibit, the movement of water from aquifer to aquifer. Aquifers 2 through 6 pinch out along a basal shell bed in the Yorktown Formation which hydrologically interconnects the pinched out ends of the aquifers.

Quantitative studies indicate that most recharge is from precipitation that seeps into the water-table aquifer and, where the water table is higher than the piezometric surface, percolates through the confining layers into the artesian aquifers. Average daily recharge to the artesian aquifers 100 feet to 300 feet deep is calculated to be about 22 million gallons per day, under present hydrologic conditions. The average daily discharge, natural and artificial, is computed to be about 21 million gallons per day. Individual wells will yield 5 to 500 gallons per minute, depending on well construction, well size, and the aquifers tapped by the wells.

Most wells in Martin County could be greatly improved by the use of screen sizes which are designed for use in specific aquifers and by better development of the wells. Municipal and industrial wells should be of the multiple-screen, gravel-pack type to assure high well efficiency and high yield.

Obtaining ground water of good chemical quality may be a frequent problem in Martin County. Generally, wells tapping the water-table aquifer yield water containing concentrations of dissolved iron in excess of 0.5 ppm. Except in recharge areas, artesian water generally has less than 0.3 ppm of dissolved iron. Wells greater than 450 to 500 feet in depth usually produce water with chloride concentrations greater than 250 ppm. Artesian wells less than about 400 feet deep usually produce water with concentrations of chloride ranging from 25 to 50 ppm. The hardness of water from wells tapping shell or limestone aquifers usually exceeds 200 ppm. Generally wells greater than 300 feet deep produce water with hardness of less than 150 ppm.

Wells capable of producing 350 to 450 gallons per minute of water of acceptable chemical quality for most uses may be obtained anywhere in Martin County, if the wells are properly constructed.

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TABLE 3. Record of Wells in Martin County

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
1	5 miles NW of Oak City	C. T. Flanagan	Dug	35	24	35	7	------	-----
2	6 miles NNW of Oak City	J. E. Copeland	---do---	20	24	20	7	------	5
3	---Do---	J. A. Everetts	---do---	12	48	12	7	-4.51	-----
4	5 miles NNW of Oak City	B. Anthony	Screen	296	4	296	1	------	-----
5	5 miles NW of Oak City	J. L. Mizelle	---do---	106	4	106	3	-9.15	-----
6	6 miles NNW of Oak City	J. A. Everetts	---do---	165	4	165	2	-48.81	-----
7	---Do---	---do---	Dug	21	24	21	7	-8.20	-----
8	---Do---	C. W. Copeland	---do---	17	24	17	7	-7.65	-----
9	2.5 miles NW of Oak City	Martin Co. Brd. of Educ.	Screen	119	4	119	3	-33.90	-----
10	5 miles N of Oak City	Swamplawn Farm	---do---	150	4	150	3	------	-----
11	2.3 miles NW of Oak City	D. Brown	---do---	30	$1\frac{1}{4}$	30	7	------	-----
12	3 miles SW of Oak City	H. B. Clarkson	Dug	20	24	20	7	-0.80	-----
13	1.2 miles SW of Oak City	L. Ross	Screen	100	4	100	4	-5.62	8
14	1.3 miles N of Oak City	L. L. Harrell, Sr.	---do---	145	2	145	3	-50	-----
15	1.5 miles N of Oak City	M. Hyman	Dug	20	24	20	7	-6.05	-----
16	3.7 miles N of Oak City	W. R. Everetts	Screen	160	4	160	3	-46.10	-----
17	---Do---	H. A. Early	---do---	147	6	147	3	-60	-----
18	---Do---	A. T. Winslow	Dug	30	24	30	7	-5.12	10
19	Oak City	Martin Co. Brd. of Educ.	Screen	295	3	295	2	-38.95	10
20	---Do---	Hyman	---do---	100	4	100	4	------	-----
21	---Do---	Wesley, Ayers, and Pittman	---do---	100	5	100	4	-11.0	7
22	---Do---	Town of Oak City	---do---	374	8	374	1	-45.23	-----
23	---Do---	J. B. Whitfield	---do---	225	4	225	2	------	12
24	---Do---	Martin Co. Brd. of Educ.	---do---	125	4	125	4	------	15
25	---Do---	---do---	---do---	88	4	88	4	-12.82	-----
26	---Do---	---do---	Dug	14	42	14	7	-3.27	-----
27	3.5 miles NNE of Oak City	F. Bell	Screen	30	2	30	7	------	-----
28	1 mile SE of Oak City	F. Keel	Dug	20	24	20	7	-3.25	-----
29	3.7 miles NE of Oak City	P. E. Manning	Screen	180	6	180	3	------	-----
30	3.3 miles S of Oak City	H. Keale	Dug	11	48	11	7	-0.99	-----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
31	5 miles S of Oak City	W. E. Purvis	Screen	15	$1\frac{1}{4}$	15	7	------	-----
32	---Do---	---do---	Dug	15	24	15	7	-2.73	-----
33	7 miles S of Oak City	L. L. Lewis	---do---	22	24	22	7	-3.62	-----
34	2 miles W of Hassell	M. K. Blount	---do---	31	24	31	7	-2.55	-----
35	1.3 miles E of Oak City	W. Alexander	Screen	75	6	75	4	-1.40	40
36	3.7 miles SE of Oak City	P. E. Manning	Dug	17	24	17	7	-3.68	-----
37	1.2 miles W of Hassell	Martin Co. Brd. of Educ.	Screen	215	4	215	3	-7.65	4
38	---Do---	H. K. Blount	Dug	11	60	11	7	-1.25	-----
39	2.4 miles SW of Hassell	E. R. Edmonson	Screen	97	2	97	4	------	-----
40	---Do---	---do---	---do---	65	2	65	4	------	-----
41	3.5 miles SW of Hassell	H. R. Purvis	---do---	105	----	105	4	------	-----
42	---Do---	---do---	---do---	132	2	132	3	-10	-----
43	4 miles SW of Hassell	J. B. Purvis	Dug	13	60	13	7	-5.80	-----
44	1.8 miles N of Hassell	R. A. Haislip	---do---	20	48	20	7	-6.08	-----
45	3.3 miles NE of Oak City	G. A. Oglesby	---do---	16	36	16	7	-2.91	-----
46	---Do---	---do---	Screen	71	5	71	3	-28.98	-----
47	0.5 miles W of Hassell	T. L. Etheridge	---do---	105	2	105	4	------	-----
48	1 mile W of Parmele	R. Carson	Open end	99	----	99	4	------	-----
49	1.4 miles N of Parmele	P. Mathey	Dug	18	24	18	7	-2.31	-----
50	Hassell	R. H. Salisbury	Screen	165	4	165	4	-11.82	-----
51	---Do---	Mr. Ramsey	Dug	9	24	9	7	-3.63	-----
52	2.4 miles NNE of Hassell	F. F. Pollard	Screen	97	4	97	4	-20.92	-----
53	3 miles NNE of Hassell	J. S. Ayers	Dug	16	24	16	7	-2.60	-----
54	5.5 miles NNE of Hassell	J. Edmonsen	Screen	35	$1\frac{1}{4}$	35	7	------	-----
55	0.1 mile E of Hassell	J. A. Haislip	Dug	15	24	15	7	-2.35	-----
56	---Do---	N. C. Forestry Dept.	---do---	17	24	17	7	-3.94	-----
57	1.0 mile N of Parmele	E. North	Dug	12	24	12	7	-3.01	-----
58	Parmele	Martin Co. Brd. of Educ.	Screen	300	5	300	3	------	-----
59	0.3 miles N of Parmele	J. Dixon	Dug	24	24	24	7	-4.05	-----
60	1.2 miles N of Parmele	W. M. Heichmer	---do---	20	60	20	7	-2.73	-----

61	1.0 miles E of Hassell	H. Banks	---do---	15	24	15	7	-2.88	6
62	1.3 miles W of Hamilton	Farmers Feed and Grain Co.	---do---	22	24	22	7	-3.52	------
63	1.0 miles N of Hamilton	B. Abbitt	---do---	12	------	12	7	-2.93	------
64	0.2 miles W of Hamilton	C. Everett	---do---	19	60	19	7	-8.05	------
65	---Do	---do	Screen	150	------	150	4	------	------
66	2.0 miles NW of Robersonville	H. T. Highsmith	---do---	110	$1\frac{1}{4}$	110	4	+0.38	------
67	0.2 miles N of Parmele	G. D. James	---do---	18	2	18	7	------	------
68	Parmele	B. Roberson	---do---	20	$1\frac{1}{4}$	20	7	------	------
69	---Do	H. W. Ford	---do---	293	3	293	3	-20	------
70	---Do	S. G. Bradley	---do---	98	4	98	4	-4.27	------
71	---Do	A.C.L. Railroad	---do---	114	4	114	4	-7.18	------
72	0.5 miles E of Parmele	T.L. Roebuck	---do---	165	4	165	4	-16.5	------
73	0.9 miles E of Parmele	A. O. Ward	---do---	265	2	265	3	------	------
74	2.0 miles NE of Parmele	M. Everetts	---do---	470	4	470	2	-9.60	------
75	1.2 miles NW of Robersonville	---do	Dug	10	60	10	7	------	------
76	0.3 miles W of Hamilton	W. E. Thomas	Screen	280	4	280	3	------	5
77	Hamilton	G. A. Oglesby	---do---	100	4	100	4	------	5
78	---Do	F. Everett	---do---	218	4	218	3	-39.44	------
79	---Do	City of Hamilton	---do---	180	6	180	4	-26.50	540
80	---Do	W. J. Beach	---do---	150	4	150	4	-46.49	5
81	---Do	City of Hamilton	---do---	135	5	135	4	------	------
82	---Do	---do	---do---	150	2	150	4	------	10
83	---Do	---do	---do---	140	$1\frac{1}{4}$	140	4	------	7
84	---Do	---do	---do---	295	8	295	3	-43	400
85	---Do	Martin Co. Board of Educ.	Screen	120	4	120	4		6
86	2.4 miles E of Hassell	P. C. Epston	Dug	32	24	32	7	-2.83	------
87	1.0 miles SSW of Gold Point	H. Warren	Screen	90	2	90	4	------	------
88	0.6 miles NW of Robersonville	C. Evans	---do---	228	4	228	3	------	------
89	0.9 miles W of Robersonville	E. Roberson	Open end	155	4	155	4	-9	------
90	0.4 miles W of Robersonville	G. Rowlin	Dug	14	24	14	7	-1.57	------

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
91	0.2 miles W of Robersonville	C. D. Jenkins	Screen	138	1¼	138	4	----	----
92	Do	do	do	155	1¼	155	4	----	----
93	0.1 miles S of Gold Point	A. E. Vandiford	do	40	1½	40	7	+4.09	1.5
94	Hamilton	Beaunit Textile Company	Drilled	310	8,10	310	3,4	-43.48	350
95	Do	do	do	320	8,10	320	3,4	-40	350
96	Do	do	do	310	8,10	310	3,4	-41	350
97	1 mile S of Hamilton	A. B. Bullock	Dug	34	24	35	7	----	----
98	1 mile SE of Gold Point	R. James	Screen	80	----	80	4	----	----
99	0.5 miles SE of Gold Point	J. Perkins	do	75	1¼	75	4	----	----
100	Gold Point	H. F. Brown	Dug	16	24	16	7	-3.23	----
101	Do	do	Screen	110	----	110	4	----	----
102	0.3 miles S of Gold Point	J. Everett	do	60	2	60	5	+4.70	0.4
103	0.6 miles S of Gold Point	S. H. Grimes	Dug	19	24	19	7	-8.56	----
104	0.4 miles N of Robersonville	H. Roberson	do	31	24	31	7	-3.01	----
105	Robersonville	Grimes Dairy	Screen	121	1¼	121	4	+2.17	3
106	Do	do	do	115	----	115	4	+4.45	0.2
107	Do	D. Grimes	do	115	1¼	115	5	----	----
108	0.2 miles SW of Robersonville	H. A. Jenkins	Screen	165	1¼	165	4	----	----
109	Robersonville	City of Robersonville	do	390	10,8	390	2	-35	125
110	Do	do	do	390	10,8	390	2	-35	75
111	Do	Robersonville Ice and Coal Company	do	300	6	300	3	----	60
112	1.5 miles NE of Gold Point	W. W. Taylor	Dug	18	24	18	7	-6.59	----
113	Do	do	Screen	90	6	90	4	----	----
114	Do	do	do	90	6	90	4	----	----
115	Do	do	do	60	2	60	4	+4.88	16

116	---Do---	---do---	---do---	60	----	60	4	+4.05	10
117	---Do---	---do---	---do---	95	$1\frac{1}{4}$	95	4	+2.31	5
118	2 miles NE of Gold Point---	N. C. Everetts, Jr.---	---do---	68	$1\frac{1}{2}$	68	7	------	-----
119	3 miles NE of Gold Point---	J. H. Lillard---	---do---	145	6	145	4	------	-----
120	2.5 miles S of Hamilton---	---do---	Dug	24	36	24	7	-6.14	-----
121	3 miles SSE of Hamilton---	V. G. Taylor---	---do---	20	24	20	7	-7.71	-----
122	3 miles SE of Hamilton---	Taylors Dairy---	Screen	75	$1\frac{1}{4}$	75	5	------	-----
123	3 miles NE of Gold Point---	C. W. Winchester---	---do---	65	4	65	5	-10.04	-----
124	1.3 miles NE of Roberson-ville---	P. Roberson---	Dug	37	24	37	7	-6.15	-----
125	0.5 miles E of Roberson-ville---	Thurmond Stalls---	Screen	330	2	330	3	-43.48	-----
126	---Do---	---do---	Open pit	13	30	13	7	-2.35	-----
127	3 miles E of Rober-sonville	Smithfield Packing Co.---	Drilled	240	3	240	3	------	50
128	0.5 miles S of Rober-sonville---	D. A. Brown---	Dug	13	24	13	7	-1.89	-----
129	0.9 miles S of Rober-sonville---	J. Whitfield---	Screen	357	4	357	2	------	-----
130	1 mile S of Robersonville	S. Cherry---	Dug	23	40	23	7	-16.2	-----
131	1 mile S of Robersonville	Robersonville Milling Co.-	Screen	64	4	64	5	-5.72	-----
132	1.2 miles ENE of Rober-sonville---	T. M. Keel---	---do---	100	$1\frac{1}{4}$	100	4	------	-----
133	---Do---	H. Bunting---	Dug	60	24	60	4	-3.50	-----
134	2.7 miles NE of Gold Point---	S. R. White---	Screen	90	----	90	5	------	-----
135	3.2 miles NE of Gold Point---	L. G. Taylor---	---do---	160	----	160	4	------	-----
136	2.5 miles ESE of Hamilton	D. M. Matthews---	---do---	275	4	275	3	-35.95	-----
137	---Do---	---do---	Dug	44	60	44	7	-30.33	-----
138	3.5 miles N of Everetts---	C. O. Edwards---	---do---	18	60	18	7	-2.06	-----
139	2.7 miles N of Everetts---	S. White---	---do---	14	----	14	7	-3.30	-----
140	2 miles SE of Gold Point---	J. Edwards---	Screen	85	$1\frac{1}{4}$	85	5	------	3
141	---Do---	---do---	---do---	90	4	90	5	------	-----
142	1.7 miles S of Roberson-ville---	L. S. Roberson---	Dug	18	24	18	7	------	-----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diam-eter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
143	1.7 miles S of Robersonville	L. S. Roberson	Screen	80	1¼	80	5	------	-----
144	3.5 miles S of Robersonville	C. A. Roberson	---do---	90	5	90	4	------	-----
145	2 miles ESE of Robersonville	R. S. Everett	---do---	400	4,3	400	2	------	-----
146	2.4 miles SE of Robersonville	S. T. Everett	---do---	162	4	162	4	-9.02	-----
147	2.5 miles SE of Robersonville	S. Everett	---do---	185	1¼	185	4	------	0.5
148	2 miles W of Everetts	V. Bunton	Dug	12	24	12	7	-2.32	15
149	1.2 miles W of Everetts	---do	Screen	180	3	180	4	-2.60	3
150	3 miles N of Everetts	W. M. Hardison	---do---	77	4	77	5	-7.03	-----
151	3.1 miles N of Everetts	---do	Dug	15	24	15	7	-4.60	-----
152	5.4 miles NW of Williamston	I. L. Murphy	Screen	239	4	239	4	------	-----
153	4.1 miles NNE of Everetts	T. Parker	Screen	15	1¼	15	7	------	-----
154	2.7 miles NNE of Everetts	J. R. Everett	---do---	200	4	200	4	-33.74	-----
155	3 miles NE of Everetts	B. Abbitt	Dug	43	24	43	7	-12.54	-----
156	0.2 miles N of Everetts	Martin Co. Board of Educ.	Screen	320	4	320	3	-42.97	30
157	Everetts	Barnhill	Dug	15	24	15	7	-3.23	-----
158	---Do	Martin Co. Board of Educ.	Screen	201	4	201	4	-23.35	-----
159	---Do	Martin Co. Bottling Co.	---do---	300	6	300	3	-57.12	-----
160	---Do	Martin Co. Board of Educ.	---do---	325	4	325	3	------	-----
161	---Do	W. C. Bullock	---do---	315	4	315	3	------	-----
162	---Do	H. Clarks	---do---	315	4	315	3	------	-----
163	---Do	A. R. Roberson	---do---	315	4	315	3	------	-----
164	---Do	B. Wynn	Dug	35	24	33	7	-7.81	-----
165	4.6 miles SSW of Everetts	H. T. Highsmith	Screen	110	1¼	110	4	-0.26	-----
166	4.8 miles SSW of Everetts	T. Warren	Dug	27	24	27	7	-4.75	-----
167	4.2 miles S of Everetts	E. Rogerson	Screen	112	4	112	5	------	-----

168	3.6 miles S of Everetts	G. Jones	---do---	206	----	206	4	------	-----
169	2.5 miles S of Everetts	W. A. Mobley	---do---	130	6	130	5	------	-----
170	---Do---	---do---	Dug	31	24	31	7	-6.09	-----
171	1 mile E of Everetts	P. Dickson	Screen	55	$1\frac{1}{4}$	55	5	------	-----
172	3.5 miles W of Williamston	Mrs. Rogers	Dug	14	24	14	7	-2	-----
173	---Do---	Arthur Slade	---do---	12	24	12	7	-3.45	-----
174	Williamston	Martin Co. Board of Educ.	Drilled	112	4	108	5	-20.41	-----
175	3.5 miles N of Williamston	Howell Warren	Dug	16	24	16	7	-8.40	-----
176	3 miles N of Williamston	C. E. Jenkins	Bored	28	24	28	7	-9.34	-----
177	2.2 miles NW of Williamston	W. L. Lassiter	---do---	25	24	25	7	-3.46	-----
178	2.7 miles W of Williamston	Joseph Williams	---do---	25	24	25	7	-2.17	-----
179	3.0 miles W of Williamston	John A. Roberson	Jetted	200	2	----	4	------	-----
180	---Do---	R. L. Smith & Sons	Drilled	200	2	----	4	+ .03	$\frac{1}{2}$
181	2.9 miles NW of Beargrass	Lester Bryant	Dug	21	24	21	7	-5.82	-----
182	2.8 miles SE of Everetts	Rufus Wynn	Bored	34	24	34	7	-5.25	-----
183	2.9 miles S of Everetts	W. A. Mobley	Drilled	137	6	----	5	------	-----
184	4.3 miles S of Everetts	John B. Leggett	Dug	15	24	15	7	-8	-----
185	5.6 miles S of Everetts	W. L. Ausborn	Drilled	233	4	----	4	-13.18	-----
186	---Do---	---do---	---do---	236	4	123	4	-7.16	-----
187	---Do---	W. Earl Mobley	---do---	100	$1\frac{1}{2}$	----	4	------	-----
188	---Do---	Paul Leggett	Dug	14	24	14	7	-3.52	-----
189	1.5 miles W of Beargrass	G. Harrison	Drilled	400	$2\frac{1}{2}$	----	3	------	-----
190	1.6 miles NW of Beargrass	George Taylor	---do---	427	4	427	3	------	-----
191	1.7 miles NW of Beargrass	H. A. Boyd	---do---	275	4	----	3	------	-----
192	1.9 miles NW of Beargrass	W. S. Gurganus	---do---	454	----	----	3	------	-----
193	3.7 miles SW of Williamston	Milton Nicholson	---do---	290	2	----	4	------	-----
194	2.6 miles SW of Williamston	Prison Camp 019	---do---	165	6	165	4	------	-----
195	2.3 miles SW of Williamston	Martin County Home	---do---	300	6	----	4	------	-----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
196	2.3 miles SW of Williamston	Martin County Home	Drilled	444	4	----	4	------	-----
197	Do	Mrs. Van Taylor	do	280	4	272	4	------	-----
198	1.7 miles NW of Williamston	John Whitley	do	278	5	268	4	------	-----
199	Williamston	H. E. Harrington	do	305	2	280	4	-66.24	16
200	1.7 miles W center of Williamston	T. R. Coltrane	do	441	4	431	3	-59.25	-----
201	Williamston	Town of Williamston	do	460	12	----	3	-62	55
202	Do	do	do	450	6	450	3	------	85
203	Do	do	do	450	8,10	450	3,4	-37	700
204	Do	do	do	440	6	440	3	------	85
205	Do	do	do	440	6	440	3	------	85
206	Do	do	do	470	20	----	3	------	-----
207	Do	do	do	500	18	500	3	------	300
208	Do	Mathison Chemical Co.	do	370	8	----	4	+1.3	100
209	Do	Town of Williamston	do	460	8	460	3	------	-----
210	Do	do	do	360	20	360	4	------	-----
211	Do	do	do	360	8	360	4	------	-----
212	1.5 miles S center of Williamston	Southern Motel	do	452	4	----	3	------	-----
213	1.6 miles S center of Williamston	Ross Motel	do	452	4	----	3	------	-----
214	1.7 miles S center of Williamston	Elmo Lilly	Driven	25	$1\frac{1}{4}$	----	7	------	-----
215	1.8 miles S center of Williamston	Ned Everette	do	25	$1\frac{1}{4}$	----	7	------	-----
216	2.0 miles S center of Williamston	Roanoke Country Club	Drilled	421	----	----	3	------	400

217	---Do---	---do---	---do--	421	4	----	3	-41.60	-----
218	---Do---	A. Boyce---	Dug	14	4	----	7	-10.1	-----
219	2.1 miles S center of Williamston---	C. F. Harris---	Drilled	435	----	----	3	------	-----
220	2.7 miles SW of Williamston---	John G. Corey---	---do---	423	4	423	3	-35.55	85
221	3.2 miles SW of Williamston---	Hubert Biggs---	---do---	198	4	----	4	-34	-----
222	3.7 miles SW of Williamston---	John Hadley---	---do---	196	4	196	5	-35	-----
223	0.9 miles N of Beargrass---	J. L. Ward---	---do---	305	4	145	5	-24.78	0
224	0.5 miles N of Beargrass---	Jack Robinson---	Drilled	300	2	----	4	-26.40	20
225	Beargrass---	Beargrass Public School---	Drilled	235	4	----	4	-25.07	-----
226	---Do---	Mrs. Effie Rogers---	---do---	360	4	----	3	-30	-----
227	---Do---	Rogers Supply Company---	Driven	30	2	----	7	------	-----
228	---Do---	A. B. Ayers---	Dug	28	----	----	7	------	-----
229	---Do---	---do---	Drilled	291	4	291	3	-33.9	-----
230	---Do---	J. R. Rogers---	---do---	304	4	----	4	-29.21	-----
231	---Do---	Leroy Harrison---	---do---	170	2	154	5	------	-----
232	0.8 miles S of Beargrass---	Noah Rogerson---	Dug	20	24	24	7	-3.40	-----
233	0.9 miles S of Beargrass---	---do---	Drilled	315	4	----	4	-17.74	-----
234	2.8 miles S of Beargrass---	Esther L. Harris---	Bored	30	24	----	7	-5.03	-----
235	1.7 miles E of Beargrass---	Bill Harrison---	Drilled	310	4	310	4	-40	-----
236	1.8 miles E of Beargrass---	N. C. Green---	---do---	198	----	----	5	-28.05	-----
237	3.2 miles S of Williamston---	Edward A. Hunter---	---do---	112	2	----	5	------	-----
238	3.1 miles S of Williamston---	K. B. Kaylor---	Jetted	95	2	95	5	-41.67	-----
239	2.6 miles S of Williamston---	A. D. Harris---	Drilled	441	----	----	3	------	-----
240	2.5 miles S of Williamston---	Moose Lodge---	---do---	454	4	----	3	-38.67	-----
241	1.5 miles SE of Williamston---	Melvid Godard---	---do---	95	2	----	5	-12.88	-----
242	2.3 miles SE of Williamston---	A. W. Hardinson---	---do---	150	2	----	5	-21.18	-----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
243	3.3 miles S of Williamston	Mrs. Blanche Hopkins	Drilled	100	—	—	5	—	—
244	3.6 miles S of Williamston	Noah D. Griffin	do	90	2	—	5	—	—
245	Do	N. D. Griffin, Jr.	do	89	2	—	5	-13.15	—
246	Do	Conway's Motel	do	100	4	—	5	—	—
247	3.8 miles S of Williamston	Charles E. Edwards	Driven	22	$1\frac{1}{4}$	—	7	—	—
248	3.9 miles S of Williamston	A. C. Moore	Drilled	90	2	—	5	—	—
249	3.7 miles SE of Williamston	John T. Gorkin	do	69	2	—	5	-7.92	—
250	3.8 miles SE of Williamston	Ira Jones	do	135	4	—	5	—	—
251	3.9 miles SE of Williamston	John T. Gurkin	do	135	—	—	5	—	—
252	3.0 miles S of Williamston	A. C. Moore	do	100	2	—	5	—	—
253	3.2 miles S of Williamston	Arthur D. Coltrain	Driven	85	2	—	5	—	—
254	3.3 miles S of Williamston	do	do	85	2	—	5	—	—
255	3.4 miles S of Williamston	do	do	85	2	—	5	—	—
256	3.2 miles E of Beargrass	J. S. Holliday	Drilled	103	2	92	5	—	—
257	2.5 miles E of Beargrass	Wheeler Rogerson	Dug	15	24	—	7	-1.55	—
258	2.0 miles E of Beargrass	W. C. Hadley	do	17	24	—	7	-1.25	—
259	2.0 miles SE of Beargrass	W. O. Peale	Bored	31	24	—	7	-1.71	—
260	3.0 miles SE of Beargrass	Jasper C. Griffin	Dug	16	24	—	7	—	—
261	3.1 miles SE of Beargrass	W. O. Peale	Drilled	112	4	—	5	-17.56	—

262	3.2 miles SE of Beargrass	L. J. Peele	do	105	4	----	5	-6.62	----
263	3.3 miles SE of Beargrass	Herman U. Peale	do	110	2	110	5	+2.70	$1\frac{1}{2}$
264	4.1 miles E of Beargrass	P. B. Lilly	do	110	----	----	5	----	----
265	3.8 miles E of Beargrass	Perlie Rogers	do	110	4	103	5	-19.96	----
266	5.2 miles S of Williamston	Hoyt Coltrane	do	100	----	----	5	----	----
267	3.5 miles SE of Williamston	J. H. Jones	Driven	89	$1\frac{1}{4}$	----	5	----	----
268	3.2 miles SE of Williamston	Mrs. W. L. Manning	Drilled	90	2	----	5	----	----
269	3.1 miles E of Williamston	Frank Hopkins	do	120	2	87	6	----	----
270	3.9 miles SE of Williamston	Annie Roberson	Jetted	45	$1\frac{1}{4}$	----	7	----	----
271	4.8 miles E of Beargrass	D. C. Gurkin	Drilled	100	4	----	5	----	----
272	4.4 miles E of Beargrass	Hardison	do	110	4	----	5	-24.70	----
273	4.5 miles E of Beargrass	J. Leroy Griffin	do	120	4	102	5	-17.14	----
274	4.3 miles E of Beargrass	Charley W. Gurkin	do	109	4	$99\frac{1}{2}$	5	----	----
275	4.5 miles E of Beargrass	Herman L. Griffin	do	110	4	100	5	----	----
276	4.2 miles E of Beargrass	R. H. Peele	do	100	----	----	5	----	----
277	4.7 miles SE of Beargrass	David Hodges	do	175	2	----	5	----	----
278	4.8 miles SE of Beargrass	Charlie Ann Holliday	Jetted	65	$1\frac{1}{4}$	----	5	----	----
279	5.2 miles SE of Beargrass	M. C. Ward	Dug	16	----	----	7	-7.80	----
280	5.8 miles SE of Beargrass	Smithwick Creek Baptist Church	Drilled	100	2	----	5	-7.33	----
281	5.4 miles E of Beargrass	W. Jesse Griffin	do	118	2	----	5	----	----
282	5.3 miles E of Beargrass	J. Andrew Griffin	do	120	----	----	5	----	----
283	Do	do	do	120	----	----	5	----	----
284	5.1 miles E of Beargrass	John A. Revels	Dug	11	----	----	7	-1.75	----
285	5.3 miles E of Beargrass	do	Drilled	110	4	----	5	-10.09	----
286	5.0 miles E of Beargrass	do	Jetted	20	2	----	7	----	----
287	5.4 miles E of Beargrass	Coy Griffin	Drilled	115	4	95	5	----	----
288	5.6 miles E of Beargrass	Clarence Hopkins	do	110	4	98	5	----	----
289	5.1 miles E of Beargrass	Albert I. Gurkin	do	110	4	----	5	----	----
290	5.4 miles SE of Williamston	Paul Herrington	do	110	----	----	5	----	----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
291	5.6 miles SE of Williamston	Havley Hardinson	Drilled	115	----	----	5	----	----
292	5.1 miles SE of Williamston	Clarence Hopkins	do	110	----	----	5	----	----
293	4.8 miles E of Williamston	Joe L. Coltrain	do	113	2	----	5	----	----
294	4.0 miles E of Williamston	Grady Goddard	do	95	4	85	6	----	----
295	4.3 miles E of Williamston	do	Dug	20	24	----	7	-6.43	----
296	Do	Martin County Schools	Drilled	130	5	128	5	-7.70	----
297	4.2 miles W of Jamesville	James Jones	do	110	----	----	6	----	----
298	4.8 miles W of Jamesville	Henry Bell	do	131	4	98	5	----	----
299	5.8 miles SE of Williamston	Jimmie G. Tyre	do	130	2	----	5	----	----
300	6.0 miles SE of Williamston	Albert G. Tyre	do	130	4	----	5	----	----
301	6.3 miles SE of Williamston	W. Howar Tyre	do	120	2	----	5	----	----
302	5.8 miles SW of Jamesville	Miss Lizzie Taylor	Dug	20	24	----	7	-6.11	----
303	6.0 miles SE of Jamesville	Clarence Hopkins	Drilled	98	2	----	5	-5.17	----
304	6.3 miles SW of Jamesville	E. D. Rogers	do	96	2	----	5	----	----
305	Do	Henry F. Williams	do	100	----	----	5	----	----
306	5.6 miles E of Beargrass	Hugh B. Griffin	do	90	----	----	5	----	----
307	Do	J. T. Griffin	do	117	----	----	5	----	----
308	9.1 miles SW of Jamesville	Thomas Tice	do	115	----	----	6	----	----

309	9.0 miles SW of Jamesville	Mrs. Oscar Tice	---do---	100	$1\frac{1}{2}$	----	6	------	-----
310	8.8 miles SW of Jamesville	Harry M. Peale	---do---	125	2	----	6	------	-----
311	8.1 miles SW of Jamesville	Piney Grove Church	---do---	110	----	----	6	------	-----
312	7.2 miles SW of Jamesville	Simon Coltrain	---do---	115	$1\frac{1}{4}$	95	6	+3.83	6
313	6.3 miles SW of Jamesville	John T. Smithwick	---do---	125	----	----	6	------	-----
314	6.0 miles SW of Jamesville	Ira Jones	---do---	100	2	----	6	------	-----
315	5.5 miles SW of Jamesville	J. T. Heath	---do---	100	2	----	6	-1.12	-----
316	5.6 miles SW of Jamesville	---do---	---do---	100	2	90	6	------	-----
317	4.4 miles SW of Jamesville	Major Gardner	---do---	82	2	68	6	-4.57	-----
318	4.3 miles SW of Jamesville	---do---	---do---	116	2	80	6	-14.86	-----
319	4.5 miles SW of Jamesville	Fairview Church	---do---	115	2	80	6	------	-----
320	4.9 miles SW of Jamesville	Major Gardner	---do---	100	2	80	6	-9.90	-----
321	3.9 miles SW of Jamesville	C. B. Gardner	---do---	100	2	80	6	------	-----
322	4.0 miles SW of Jamesville	J. H. Perry	---do---	110	13/4	----	6	------	-----
323	3.8 miles SW of Jamesville	---do---	---do---	110	$1\frac{1}{4}$	90	6	------	-----
324	3.9 miles SW of Jamesville	Milton P. Bennett	---do---	110	13/4	90	6	------	-----
325	3.8 miles SW of Jamesville	---do---	---do---	110	2	----	6	------	-----
326	3.6 miles SW of Jamesville	---do---	---do---	120	13/4	----	6	------	-----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
327	3.6 miles SW of Jamesville	J. H. Perry	Drilled	110	13/4	90	6	—	—
328	3.5 miles SW of Jamesville	Walter Gardner	do	117	$1\frac{1}{4}$	100	6	—	—
329	2.9 miles SW of Jamesville	David Medlin	do	90	$1\frac{1}{4}$	85	6	+7.09	3
330	2.8 miles W of Jamesville	do	do	100	—	—	7	—	—
331	2.3 miles W of Jamesville	Lelon Roberson	do	110	$1\frac{1}{4}$	90	6	—	—
332	3.2 miles W of Jamesville	Monroe Whittington	do	90	$1\frac{1}{4}$	70	6	—	—
333	2.0 miles W of Jamesville	Boy Scout Troop 127	do	—	—	—	6	—	—
334	1.9 miles W of Jamesville	Hubert & Robert Hardinson	do	85	$1\frac{1}{4}$	—	6	+0.50	$7\frac{1}{2}$
335	2.4 miles W of Jamesville	Asa Moore	do	150	2	—	6	—	—
336	3.8 miles SW of Jamesville	C. B. Gardner	do	85	2	60	6	+7.32	30
337	4.0 miles SW of Jamesville	Major Gardner	do	98	2	78	6	+1.55	12
338	4.4 miles SW of Jamesville	Walter Goddard	do	110	$1\frac{1}{4}$	90	6	-10.58	$7\frac{1}{4}$
339	6.5 miles SW of Jamesville	George E. Roberson	do	100	$1\frac{1}{4}$	—	6	—	—
340	7.0 miles SW of Jamesville	M. Gurkin	Jetted	120	2	90	6	—	—
341	Do	Noah Roberson	Drilled	—	2	134	6	+1.19	$2\frac{1}{2}$
342	7.5 miles SW of Jamesville	H. L. Manning	do	110	13/4	90	6	—	—
343	8.0 miles SW of Jamesville	Arthur Roberson	do	—	2	90	6	+3.54	1
344	8.8 miles SW of Jamesville	J. T. Lilly	do	150	$1\frac{1}{4}$	—	6	—	—
345	9.8 miles SW of Jamesville	James Willis Gay	do	120	3/4	—	6	-12.19	—

346	9.7 miles SW of Jamesville	Ottis Wainwright	---do---	120	$1\frac{1}{4}$	100	6	------	-----
347	9.9 miles SW of Jamesville	Coy J. Roberson	---do---	130	2	100	6	------	-----
348	8.9 miles SW of Jamesville	---do---	Jetted	20	2	----	7	------	-----
349	8.4 miles SW of Jamesville	Mack Roberson	Drilled	140	2	140	6	+1.40	5
350	7.8 miles SW of Jamesville	Ira Hardison	---do---	90	----	----	6	------	-----
351	7.7 miles SW of Jamesville	I. T. Hardison	Dug	13	36	18	7	-11.6	-----
352	7.5 miles S of Jamesville	Pete Hardison	Drilled	120	$1\frac{1}{4}$	----	6	------	-----
353	7.3 miles S of Jamesville	---do---	Driven	37	$1\frac{1}{4}$	35	7	-7.00	-----
354	6.3 miles S of Jamesville	A. E. Manning	Drilled	130	$1\frac{1}{4}$	90	6	------	-----
355	6.1 miles S of Jamesville	---do---	---do---	100	$1\frac{1}{4}$	90	6	-13.54	3
356	3.8 miles SW of Jamesville	---do---	---do---	130	2	0	6	------	-----
357	3.7 miles S of Jamesville	H. A. Pierce	---do---	100	2	80	6	------	-----
358	2.3 miles S of Jamesville	Willy Mae Gardner	---do---	100	2	63	6	+3.05	30
359	1.2 miles SW of Jamesville	J. Church Mobley	---do---	145	13/4	----	6	------	-----
360	1.0 miles SW of Jamesville	---do---	---do---	140	2	120	6	------	-----
361	0.8 miles W of Jamesville	Martin Co. Brd. of Educ.	---do---	131	4	----	6	-30.15	-----
362	Jamesville	Hardison	---do---	127	$1\frac{1}{4}$	127	6	+1.2	-----
363	---Do---	---do---	---do---	140	$1\frac{1}{4}$	140	6	-16	-----
364	---Do---	Town School	---do---	180	4	126	6	-15	-----
365	---Do---	A. R. Robinson	---do---	79	4	----	6	+7.01	16
366	---Do---	Roanoke Lumber Co.	---do---	90	2	----	6	+7.01	18
367	---Do---	Community Fire Department	---do---	100	2	100	6	-19.86	-----
368	---Do---	Mt. Carmel Church	Dug	19	24	----	7	-15.00	-----
369	1.1 miles S of Jamesville	Mrs. Susan A. Brown	Drilled	135	2	----	6	------	-----
370	1.2 miles S of Jamesville	Luther H. Hardison	---do---	135	2	----	6	------	-----
371	1.1 miles S of Jamesville	P. J. Modlin	---do---	195	$1\frac{1}{4}$	98	6	------	-----
372	1.9 miles S of Jamesville	Carl Griffin	---do---	130	----	----	6	------	-----

TABLE 3. Record of Wells in Martin County (Continued)

Well No.	Location	Owner	Type of Well	Depth	Diameter (in)	Depth of casing (ft)	Water-bearing zone	Water level (ft)	Yield (gpm)
373	1.9 miles S of Jamesville	Cedar Branch Baptist Ch.	Driven	16	1-3/4	16	7	-8.88	-----
374	2.3 miles S of Jamesville	L. H. Lilly	Drilled	130	$1\frac{1}{4}$	80	6	-----	-----
375	2.2 miles S of Jamesville	Milton Griffin	---do---	100	4	----	6	-----	-----
376	2.5 miles S of Jamesville	Edwin Lilly	---do---	110	2	----	6	-----	-----
377	2.6 miles S of Jamesville	Archie Lilly	---do---	114	$1\frac{1}{4}$	108	6	-23.40	-----
378	2.8 miles S of Jamesville	Glenn Price	---do---	90	$1\frac{1}{4}$	102	6	-10.17	-----
379	---Do---	Mrs. Annie May Lilly	---do---	100	$1\frac{1}{4}$	----	6	-----	-----
380	2.7 miles S of Jamesville	L. H. Hardison	---do---	100	2	87	6	-----	-----
381	2.9 miles S of Jamesville	C. N. Martin	---do---	129	2	95	6	-----	-----
382	3.0 miles S of Jamesville	---do---	---do---	125	$1\frac{1}{4}$	95	6	-----	-----
383	3.4 miles S of Jamesville	Frosty and George Martin	---do---	140	$1\frac{1}{4}$	100	6	-----	-----
384	4.2 miles S of Jamesville	Paul Barber	---do---	100	$1\frac{1}{4}$	----	6	-----	-----
385	---Do---	C. W. Moore	Driven	37	1-3/8	----	7	-7.50	-----
386	1.4 miles SE of Jamesville	George F. Cordon	Drilled	150	2	142	6	-----	-----
387	1.2 miles SE of Jamesville	T. W. Holliday	---do---	125	4	105	6	-21.23	-----
388	1.5 miles E of Jamesville	B. N. Holliday	---do---	160	$1\frac{1}{4}$	----	6	-----	-----
389	1.2 miles E of Jamesville	Dennis Mizelle	---do---	122	$1\frac{1}{4}$	----	6	-----	-----
390	---Do---	D. B. Holliday	---do---	120	2	----	6	-----	-----
391	0.8 miles E of Jamesville	Oliver P. Wolfe	---do---	125	$1\frac{1}{4}$	----	6	-----	-----
392	1.2 miles E of Jamesville	Robert E. Hamilton	---do---	150	2	75	6	-----	-----
393	2.0 miles E of Jamesville	James D. Modlin	---do---	100	$1\frac{1}{4}$	----	6	-----	-----
394	2.0 miles SE of Jamesville	Archie Perry	---do---	168	2	----	6	-----	-----
395	2.9 miles NE of Jamesville	W. M. Davis	Dug	20	24	18	7	-11.70	-----
396	2.8 miles NE of Jamesville	---do---	Drilled	162	2	----	6	-----	-----

397	3.0 miles NE of Jamesville	Bert Lee Roberson	do	175	2	140	6	---	---
398	Do	do	Dug	27	24	---	7	-11.52	---
399	3.4 miles E of Jamesville	C. A. Lilly	Drilled	150	---	120	6	---	---
400	4.6 miles NE of Jamesville	Stephen F. Davis	do	130	2	---	6	---	---
401	5.0 miles NE of Jamesville	Grover Lilly	do	190	---	---	6	---	---
402	5.2 miles NE of Jamesville	H. E. Daniels	do	180	2	---	6	---	---
403	Do	do	Dug	14	24	---	7	-10.47	---
404	4.6 miles NE of Jamesville	D. O. Coburn	Drilled	200	2	175	6	---	---
405	4.6 miles E of Jamesville	E. E. Brown & Phillip Swenson	do	130	2	110	6	---	---
406	4.4 miles E of Jamesville	W. Cherry	Jetted	165	2	165	6	---	---
407	4.1 miles E of Jamesville	H. L. Davis	Drilled	165	2	155	6	---	---
408	5.8 miles NE of Jamesville	B. A. Daniels	do	190	---	---	6	---	---
409	Do	J. H. Davenport	do	---	$2\frac{1}{2}$	300	5	---	---
410	5.7 miles NE of Jamesville	do	do	160	2	150	6	---	---
411	6.3 miles NE of Jamesville	Mrs. Sarah Williams	do	170	2	---	6	---	---
412	5.2 miles E of Jamesville	Uniontown Church	do	175	---	125	6	---	---
413	5.0 miles E of Jamesville	Rev. Joseph James	do	190	---	---	6	---	---
414	5.1 miles SE of Jamesville	Jessie C. Ange	do	190	2	---	6	---	---
415	5.3 miles SE of Jamesville	Gilbert Ange	do	189	3	---	6	---	---
416	7.5 miles NE of Jamesville	N. C. Pulp Company	do	---	---	---	6	---	500
417	7.6 miles NE of Jamesville	do	do	---	---	---	6	---	275
418	Do	do	do	---	---	---	6	---	200
419	7.8 miles NE of Jamesville	do	do	30	8	---	6	-5.97	660

TABLE 4. Chemical Analyses of Ground Water From Martin County

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
1	8-60	0.33	16	5.3	35	13	40	----	61	6.0	7
2	8-60	0.11	15	9.9	51	19	134	----	77	5.3	7
3	7-60	0.07	10	9.8	36	7.0	26	----	65	5.2	7
4	7-60	0.61	13	26	352	2.6	8.8	----	42	6.8	1
5	7-60	0.27	56	16	311	0.6	7.2	----	206	7.8	3
6	7-60	2.4	41	13	183	2.0	7.6	----	144	6.8	2
7	7-60	0.04	22	22	189	2.5	5.4	----	83	9.50	7
8	8-60	0.36	9.9	10	200	0.5	104	----	66	5.30	7
9	7-60	0.64	45	6.4	244	35	6.6	----	132	8.8	7
10	8-60	0.51	45	19	218	43	7.8	----	173	6.70	3
11	8-60	0.24	9.8	3.6	36	0.60	77	----	39	5.10	7
12	8-60	3.54	34	13	104	8.9	212	----	139	----	7
13	7-60	2.5	38	10	176	2.8	7.2	----	130	8.9	4
14	7-60	0.4	22	22	189	2.5	5.4	----	127	7.50	3
15	8-60	0.10	42	0.6	32	8.4	68	----	52	4.61	7
16	8-60	1.0	31	27	222	2.5	7.4	----	164	7.24	3
17	8-60	1.1	26	19	227	0.8	5.6	----	125	7.10	3
18	7-60	0.08	13	26	29	12	14	----	139	4.69	7
19	8-60	----	----	----	279	1	4	.3	111	7.8	2
20	8-60	1.3	46	0.3	199	2.7	8	----	145	7.50	4
21	8-60	----	----	----	----	----	----	----	----	7.52	4
22	8-60	1.1	28	9	211	7	4.8	.2	120	8.6	1
23	----	----	----	----	----	----	----	----	----	----	2
24	----	----	----	----	----	----	----	----	----	----	4
25	8-60	3.3	----	----	----	----	----	----	----	7.80	4
26	8-60	0.33	12	17	490	375	1400	.3	100	5.80	1

27	8-60	5.1	21	2.3	19	52	16	----	41	5.85	7
28	7-60	0.20	12	14	22	7.0	61	----	87	2.80	7
29	6-60	1.0	24	21	286	2.5	6.2	----	129	7.2	3
30	7-60	0.40	15	9.8	117	1.3	53	----	78	6.00	7
31	8-60	----	----	----	----	----	----	----	----	6.8	7
32	7-60	0.90	37	0	32	3.0	45	----	43	5.10	7
33	7-60	0.27	11	6.6	73	4.6	18	----	54	6.20	7
34	7-60	0.09	80	18	64	10	268	----	274	4.10	7
35	8-60	0.19	32	4.8	184	3.3	6.2	----	131	7.12	4
36	7-60	0.14	21	4.3	28	86	26	----	69	6.8	7
37	7-60	0.02	11	21	359	3.8	8	----	97	7.09	3
38	8-60	0.38	11	11	59	4.8	173	----	75	5.00	7
39	8-60	0.88	48	16	263	1	13	----	174	7.00	4
40	8-60	2.5	7.2	3.5	48	2	16	----	29	6.00	4
41	8-60	3.0	----	----	----	----	25	----	86	5.00	4
42	7-60	1.5	45	4.9	389	3.1	6.0	----	134	7.00	3
43	7-60	0.33	19	11	32	1.9	48	----	93	5.20	7
44	7-60	0.16	13	2.6	51	0.9	59	----	39	5.47	7
45	7-60	0.03	16	5.0	28	6.6	49	----	60	6.9	7
46	7-60	0.24	24	11	170	6.0	6.2	----	97	7.6	3
47	8-60	0.50	41	38	384	0.2	11	----	263	6.18	4
48	7-60	0.43	73	6.0	218	0.6	6.8	----	156	6.80	4
49	8-60	3.52	12	5.3	79	9.9	12	----	53	6.7	7
50	7-60	1.2	58	21	314	0.1	10	----	228	6.85	4
51	8-60	1.1	13	2.3	47	7.5	28	----	41	5.20	7
52	8-60	0.34	4.3	2.5	133	7	14	----	116	7.50	4
53	8-60	1.3	10	0.7	44	20	11	----	28	4.71	7
54	7-60	0.09	47	17	94	138	34	----	23	5.13	7
55	8-60	0.84	4.8	3.6	11	16	204	----	28	5.00	7
56	7-60	14.0	9.2	2.0	20	5	117	----	29	5.40	7
57	7-60	0.80	13	6.5	6.5	3.8	114	----	56	5.31	7
58	7-60	.43	2.2	2.0	2.0	19	28	1.6	14	8.00	3
59	7-60	0.47	9.8	6.3	6.3	3.5	46	----	51	5.20	7
60	7-60	1.80	22	0	0	5.4	23	----	20	5.30	7
61	7-60	0.10	12	8.5	8.5	3.2	16	----	64	5.50	7

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

TABLE 4. Chemical Analyses of Ground Water From Martin County (Continued)

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
62	8-60	1.4	7.9	15	15	10	16	----	80	4.71	5
63	8-60	2.4	10	8.6	8.6	25	34	----	61	4.06	7
64	8-60	0.81	15	28	28	1.0	277	----	157	6.9	7
65	8-60	0.76	52	3.6	3.6	10.0	27	----	148	7.4	4
66	8-60	0.41	64	11	11	1	14	----	195	7.10	4
67	7-60	1.1	27	5.1	5.1	4.5	82	----	89	4.85	7
68	8-60	1.5	----	----	----	----	63	----	103	6.8	7
69	7-60	0.1	----	----	----	----	63	----	17	7.9	3
70	7-60	0.1	----	----	----	----	38	----	154	7.5	4
71	8-60	0.39	48	24	24	0.6	8.8	----	218	7.0	4
72	7-60	0.28	20	5.4	5.4	1.8	8.2	----	71	7.11	4
73	8-60	0.34	16	2.6	2.6	2.3	9.6	----	118	6.82	3
74	7-60	0.68	----	----	----	----	50	----	154	6.50	2
75	7-60	1.1	----	----	----	60	37	----	0.2	5.30	7
76	8-60	0.02	16	14	14	20	44	----	98	3.91	3
77	8-60	0.04	----	----	----	----	25	----	171	8.5	4
78	7-60	----	----	----	----	----	----	----	----	8.2	3
79	7-60	----	----	----	----	----	----	----	----	8.0	3
80	7-60	0.20	26	26	26	5.0	8.8	----	148	8.6	4
81	----	----	----	----	----	----	----	----	----	----	4
82	8-60	0.35	9.6	4.4	4.4	2	5.5	.5	42	7.8	4
83	8-60	0.31	38	9.2	9.2	9	3	.2	128	7.9	4
84	8-60	1.1	4.9	4.7	4.7	2.1	6	.5	37	7.31	3
85	8-60	0.1	----	----	----	----	25	----	157	8.5	4
86	8-60	0.75	56	21	73	14	174	----	228	5.48	7
87	8-60	2.51	52	.9	148	1.5	6.6	----	135	----	4

88	7-60	0.48	12	6.5	444	2.5	10	-----	56	7.15	3
89	7-60	2.68	51	10	259	1.7	15	-----	169	7.06	4
90	8-60	0.65	15	1.2	59	8.9	100	-----	44	7.0	7
91	8-60	1.24	36	6.2	309	0.5	10	.3	116	8.3	4
92	8-60	0.19	48	10	329	0.6	10	-----	161	7.3	4
93	8-60	0.44	59	36	212	1.3	8.4	-----	162	7.78	7
94	7-60	.20	5.6	6.6	364	1.8	5.2	.5	42	7.6	3,4
95	8-60	.09	----	----	378	----	4.4	-----	----	7.6	3,4
96	7-60	.08	5.0	6.6	370	4.4	3.6	-----	40	7.6	3,4
97	7-60	0.11	17	6.9	68	0.9	10	-----	72	5.30	7
98	8-60	0.36	52	9.8	192	9.7	38	-----	133	7.80	4
99	7-60	0.50	44	0.9	148	2.5	6.2	-----	113	7.76	4
100	7-60	0.1	----	----	----	----	237	-----	51	6.4	7
101	8-60	0.24	27	7.7	128	5.1	6.4	-----	98	7.61	4
102	8-60	0.4	----	----	----	----	25	-----	171	8.9	5
103	8-60	0.80	8.2	5.6	39	1.0	22	-----	44	----	7
104	8-60	2.1	24	0.3	8.8	6.0	202	-----	202	5.40	7
105	8-60	1.30	36	11	349	0.2	9.6	.3	136	8.1	4
106	7-60	0.32	44	6.3	333	0.2	9.0	-----	135	7.09	4
107	8-60	0.1	----	----	----	----	37	-----	120	----	5
108	7-60	0.64	40	6.3	317	0.6	9.2	-----	128	6.79	4
109	7-60	0.39	2	3.7	444	156	235	.9	20	7.49	2
110	8-60	0.13	1.3	.5	404	----	50	-----	6	8.00	2
111	7-60	0.21	0.1	----	----	----	50	-----	17	6.90	3
112	7-60	0.19	15	0.5	192	144	9.0	-----	39	6.9	7
113	7-60	0.1	----	----	----	----	25	-----	137	7.4	4
114	7-60	0.44	18	24	43	2.0	6.6	-----	143	7.40	4
115	7-60	0.84	42	26	147	1.0	7.6	-----	113	7.68	4
116	7-60	0.82	40	24	155	1.4	7.6	-----	120	7.48	4
117	7-60	0.1	----	----	----	----	38	-----	120	7.2	4
118	8-60	2.88	24	0	195	3.5	7.8	-----	55	6.21	7
119	7-60	0.04	30	20	312	0.4	9.8	-----	160	7.18	4
120	8-60	0.28	21	33	30	3.8	67	-----	188	6.2	7
121	8-60	0.10	13	3.2	79	13	78	-----	47	5.10	7
122	8-60	0.06	4.6	5.1	221	0.9	6.6	-----	137	7.52	5
123	7-60	1.2	41	10	187	2.1	6.4	-----	146	7.45	5

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

TABLE 4. Chemical Analyses of Ground Water From Martin County (Continued)

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (Cl)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
124	8-60	0.86	4.6	18	52	18	2.2	----	59	5.80	7
125	7-60	0.3	----	----	----	----	50	----	17	7.31	3
126	7-60	0.34	5.2	6.0	430	7	16	----	33	5.00	7
127	----	----	----	----	----	----	----	----	----	----	3
128	8-60	1.5	14	17	81	52	47	----	90	5.40	7
129	7-60	1.2	52	1.2	332	12	104	----	18	7.10	2
130	----	----	----	----	----	----	----	----	----	----	7
131	8-60	0.14	71	10	336	0.5	11	----	212	7.40	5
132	8-60	0.30	62	15	291	11	13	----	203	7.00	4
133	8-60	1.4	63	40	39	12	61	----	136	6.00	4
134	8-60	1.1	24	19	224	1.3	11	----	135	7.28	5
135	7-60	0.36	7.6	----	217	1.8	----	----	53	7.55	4
136	8-60	0.75	56	21	73	14	174	----	228	5.48	3
137	7-60	1.2	2.4	.8	7.5	2	33	----	8	5.50	7
138	8-60	0.24	12	14	60	3.2	132	----	89	4.35	7
139	8-60	0.02	25	10	60	6.1	66	----	102	4.79	7
140	----	----	----	----	----	----	----	----	----	----	5
141	----	----	----	----	----	----	----	----	----	----	5
142	8-60	1.3	8.9	12	12	22	103	----	126	5.40	7
143	8-60	2.2	9.2	2.0	229	0.5	13	----	170	7.30	5
144	7-60	2.2	28	5.8	117	7.0	10	----	89	7.20	4
145	7-60	0.1	----	----	----	----	88	----	34	----	2
146	8-60	0.31	16	2.4	375	3.3	8.4	----	49	7.80	4
147	7-60	0.1	----	----	370	4	3	1.6	18	8.8	4
148	8-60	1.2	27	0	44	3.3	23	----	61	5.40	7
149	8-60	0.29	2.4	2.8	392	4	12	.7	15	8.00	4
150	7-60	1.4	24	10	60	6.1	66	----	102	4.79	5

151	8-60	0.13	28	17	48	5.2	34	------	138	4.10	7
152	7-60	1.2	9.6	----	363	2.6	15	------	25	7.45	4
153	8-60	6.7	24	12	50	2.8	120	------	109	5.80	3
154	----	----	----	----	----	----	----	------	----	----	4
155	8-60	0.04	71	23	340	3.1	26	------	27	6.85	7
156	7-60	.03	13	.3	374	25	24	2.2	5	8.00	3
157	8-60	0.10	14	2.5	36	1.6	86	------	46	5.40	7
158	7-60	0.65	22	1.0	357	1.3	8.6	------	58	8.45	4
159	8-60	0.11	----	----	358	30	7	2.8	16	7.50	3
160	8-60	.59	1.0	.6	389	10	30	1.8	5	7.82	3
161	7-60	0.60	----	----	----	----	63	------	17	7.30	3
162	7-60	0.07	----	----	----	----	75	------	17	7.20	3
163	8-60	0.55	----	----	----	----	75	------	17	7.30	3
164	8-60	0.18	23	27	55	6.0	19	------	168	5.40	7
165	8-60	1.5	9.6	12	423	7	14	------	62	7.40	4
166	8-60	0.2	16	7.6	19	14	125	------	65	5.50	7
167	8-60	0.35	15	21	551	4.2	13	------	124	7.06	5
168	8-60	0.01	19	----	540	4.6	9.0	------	48	7.82	4
169	8-60	0.01	16	3.9	311	1.6	5.0	------	57	7.70	5
170	8-60	0.03	27	23	42	30	82	------	163	5.45	7
171	8-60	3.1	19	2.1	53	1.6	9.8	------	56	5.10	5
172	8-60	0.43	24	10	17	50	47	------	92	5.30	7
173	8-60	3.9	16	6.0	20	24	177	------	60	5.90	7
174	7-60	0.1	----	----	----	----	25	------	120	8.6	5
175	7-60	0.26	13	4.6	21	0.9	13	------	51	5.45	7
176	7-60	0.19	21	2.4	31	5.7	37	------	85	5.22	7
177	7-60	0.09	29	2.7	58	9.2	25	------	83	5.95	7
178	7-60	1.6	42	2.5	108	8	19	------	113	6.50	7
179	7-60	2.8	32	33	13	1	15	------	189	7.25	4
180	7-60	4.2	32	5.5	104	2	18	------	97	7.20	4
181	8-60	0.03	26	17	37	18	42	------	136	5.10	7
182	8-60	0.31	27	17	56	7.1	243	------	139	5.00	7
183	8-60	0.21	21	69	300	1.0	8.2	------	81	7.60	5
184	8-60	0.50	21	8.2	55	3.4	32	------	85	4.70	7
185	8-60	0.10	19	4.1	561	18	28	------	65	7.58	4
186	8-60	1.6	32	0	504	----	----	------	68	8.00	4

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

TABLE 4. Chemical Analyses of Ground Water From Martin County (Continued)

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
187	8-60	0.01	13	20	365	0.9	8.6	----	116	8.10	4
188	8-60	0.36	38	20	76	24	221	----	178	----	7
189	8-60	0.1	----	----	----	----	275	----	----	8.4	3
190	8-60	0.1	----	----	----	----	75	----	34	7.9	3
191	8-60	0.15	21	3.1	472	16	----	----	60	8.0	3
192	7-60	0.1	----	----	----	----	38	----	120	8.1	3
193	8-60	0.10	32	16	4.4	0.9	9.6	----	148	7.48	4
194	7-60	0.98	8.9	12	383	2	11	.9	63	7.70	4
195	8-60	----	----	----	387	2	3	.9	22	7.9	4
196	8-60	0.97	4.4	3.0	396	5	185	----	21	7.41	4
197	8-60	0.20	4.0	1.5	394	1	15	----	14	7.58	4
198	7-60	0.28	18	8.5	388	3.6	8.6	----	81	7.80	4
199	8-60	1.0	6.8	2.7	362	145	162	----	31	----	4
200	8-60	0.95	----	----	----	----	----	----	----	7.55	3
201	7-60	.3	2	1.3	368	29	137	2.2	10	8.10	3
202	7-60	.04	2.2	1.3	376	4.4	62	1.1	11	8.2	3
203	----	----	----	----	----	----	----	----	----	----	3,4
204	----	----	----	----	----	----	----	----	----	----	3
205	----	----	----	----	----	----	----	----	----	----	3
206	8-60	.27	1.6	1.3	373	27	115	.3	10	7.98	2
207	8-60	0.50	1.8	2.7	368	63	250	1.5	16	7.84	3
208	8-60	.16	1.1	.5	363	42	146	2.0	5	7.99	4
209	7-60	.65	22	15	181	13	23	.5	114	7.61	3
210	8-60	0.07	1.1	1.2	365	4.8	7.5	2.0	8	8.25	4
211	8-60	.09	2.8	1.5	386	3.3	7	2.3	13	7.61	4
212	8-60	0.16	----	----	----	----	188	----	17	7.40	3
213	7-60	0.03	16	6.4	404	21	109	----	53	7.85	3

214	7-60	3.3	14	10	22	22	19	-----	63	6.20	7
215	7-60	12	38	----	74	39	71	-----	51	7.00	7
216	8-60	0.1	----	----	----	----	187	-----	17	8.8	3
217	7-60	0.44	1.1	.9	387	37	96	2.3	7	7.92	3
218	----	----	----	----	----	----	----	-----	----	6.7	7
219	7-60	0.08	----	----	----	----	63	-----	17	7.50	3
220	7-60	0.17	1.4	1.0	392	30	99	1.7	8	7.50	3
221	7-60	0.54	70	8.5	316	.7	8	-----	168	7.80	3
222	7-60	0.05	60	11	344	.5	7	.4	156	8.00	5
223	7-60	0.10	----	----	----	----	----	-----	----	7.99	5
224	8-60	1.2	19	24	32	0.8	8.8	-----	74	6.30	7
225	8-60	0.12	32	15	206	0	9.2	.5	136	7.50	4
226	8-60	0.25	----	----	----	----	50	-----	17	7.60	3
227	8-60	3.9	27	5.9	42	0.6	22	-----	92	6.60	7
228	8-60	0.1	----	----	----	----	63	-----	76	7.80	7
229	8-60	0.05	23	4.9	496	6.0	14	-----	----	7.90	3
230	7-60	0.02	----	----	----	----	388	-----	144	7.30	4
231	8-60	0.02	34	15	280	0.5	9.6	-----	88	5.50	5
232	8-60	1.1	13	14	43	145	48	-----	----	7.70	7
233	8-60	0.33	----	----	----	----	63	-----	17	7.80	4
234	8-60	0.71	----	----	----	----	63	-----	34	5.45	7
235	7-60	0.1	----	----	----	----	25	-----	205	8.5	4
236	----	----	----	----	----	----	----	-----	----	----	5
237	7-59	0.30	40	17	247	2	13	-----	159	7.5	5
238	7-59	1.28	31	8.0	208	22	12	-----	104	7.61	5
239	7-60	0.02	----	----	----	----	183	-----	17	7.75	3
240	7-60	0.71	----	----	----	----	183	-----	17	7.80	3
241	7-60	0.16	43	16	381	12	10	-----	160	7.81	5
242	7-60	0.27	60	18	374	2	11	-----	208	7.70	5
243	7-60	0.13	50	12	200	7	9	-----	140	7.55	5
244	7-60	0.06	52	12	232	7	7	-----	144	8.00	5
245	7-60	0.13	10	39	216	5	8	-----	148	7.91	5
246	7-60	0.30	60	8.5	256	2	8	-----	148	7.55	5
247	7-59	0.68	1.6	7.0	9	10	19	-----	29	7.2	7
248	7-59	0.23	36	14	203	16	12	-----	136	7.3	5
249	7-60	0.08	30	22	250	8	8	-----	132	7.90	5

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

TABLE 4. Chemical Analyses of Ground Water From Martin County (Continued)

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
250	1-60	0.04	50	13	264	5.5	7	-----	140	8.01	5
251	7-60	0.08	42	17	260	9.0	7	-----	140	8.00	5
252	7-60	0.48	47	15	273	7	13	-----	166	7.3	5
253	7-59	1.88	52	5.5	264	.5	11	-----	148	7.3	5
254	7-59	0.28	27	21	298	0	16	-----	136	7.3	5
255	7-59	0.30	29	18	280	0	12	-----	130	7.3	5
256	7-60	1.1	43	16	226	1	13	-----	160	7.1	5
257	8-60	0.10	35	14	20	7.0	31	-----	144	5.9	7
258	7-59	0.87	2.0	1.5	14	10	56	-----	9.6	5.7	7
259	7-60	1.5	23	34	148	30	23	-----	196	5.80	7
260	8-60	0.22	2.0	32	36	4.0	78	-----	136	6.1	7
261	7-59	0.68	2.0	1.5	234	3	15	-----	179	7.1	5
262	1-59	0.35	51	12	224	0	14	-----	166	7.7	5
263	7-60	0.24	50	19	252	1	15	-----	184	8.8	5
264	7-59	0.26	43	34	255	0.7	14	-----	214	----	5
265	7-59	0.35	38	16	203	3	11	-----	148	----	5
266	7-60	0.26	40	16	236	6.0	8	-----	132	----	5
267	7-60	0.07	32	19	312	7.0	6	-----	128	7.85	5
268	7-60	0.02	30	11	268	9.0	8	-----	98	7.88	5
269	7-60	0.25	45	15	492	12	14	-----	194	7.40	6
270	7-60	19	----	----	----	----	50	-----	68	6.53	7
271	7-60	0.67	60	19	288	2.5	8	-----	184	----	5
272	7-59	0.30	50	17	246	0	17	-----	182	----	5
273	7-59	0.20	40	22	254	0.5	12	-----	173	----	5
274	7-59	0.21	52	18	255	0.5	13	-----	190	----	5
275	7-59	0.12	58	19	284	0.3	9	-----	180	7.8	5
276	7-59	1.6	44	24	246	4	20	-----	189	7.3	5
277	7-59	1.3	77	7.3	276	0	14	-----	216	7.30	5
278	7-59	1.6	77	5.2	241	0.5	19	-----	210	7.12	5
279	7-59	1.7	1.2	5.9	15	3	90	-----	22	5.60	7

280	7-59	1.4	59	4.2	208	0	15	-----	160	7.4	5
281	7-59	0.24	43	26	266	0	15	-----	192	7.3	5
282	7-59	0.28	38	27	292	0	16	-----	182	7.8	5
283	7-59	0.18	39	27	284	0	15	-----	184	7.4	5
284	7-59	1.3	14	16	33	37	244	-----	88	----	7
285	7-59	2.2	51	26	301	2	14	-----	212	7.3	5
286	7-59	0.46	1.2	39	14	1	30	-----	13	5.9	7
287	7-60	0.19	60	16	292	1.7	7	-----	182	----	5
288	7-60	0.05	68	16	292	4.0	10	-----	228	----	5
289	1-60	0.02	26	36	284	4.0	9	-----	172	----	5
290	7-60	0.10	18	10	332	9.0	19	-----	68	----	5
291	7-60	6.20	8.0	3.7	29	10.0	12	-----	28	7.1	5
292	7-60	0.01	12	12	336	7.0	11	-----	64	----	5
293	7-60	0.05	24	15	388	7.5	10	-----	96	----	5
294	7-60	0.44	27	16	480	14	13	-----	120	7.55	6
295	7-60	7.4	32	6.0	34	1.5	7.0	-----	28	6.95	7
296	7-60	1.5	24	16	436	1	18	-----	112	7.63	5
297	7-60	0.14	53	45	388	8	14	-----	280	7.38	6
298	7-60	0.42	66	15	324	0.1	11	-----	224	7.41	5
299	7-60	0.04	21	12	336	1.4	10	-----	92	----	5
300	7-60	0.18	14	15	350	2	16	-----	84	----	5
301	7-60	0.06	21	13	362	1.5	10	-----	96	----	5
302	8-60	0.82	19	15	212	84	154	-----	108	7.5	7
303	7-60	0.16	24	13	310	2	10	-----	104	----	5
304	7-60	0.07	17	12	316	2	10	-----	80	----	5
305	7-60	0.13	30	19	260	1.4	10	-----	140	7.2	5
306	7-59	0.32	45	29	276	0	14	-----	206	7.3	5
307	7-59	0.26	45	29	258	0	24	-----	206	7.3	5
308	7-59	1.3	70	8.8	246	.5	16	-----	203	7.3	6
309	7-59	0.32	59	7.5	234	0	14	-----	173	7.3	6
310	7-59	0.26	56	11	222	0	12	-----	177	7.2	6
311	7-59	0.32	67	12	280	0	16	-----	207	7.3	6
312	7-60	0.25	80	12	280	3.0	8	-----	200	8.2	6
313	7-60	0.20	42	89	316	5.0	12	-----	376	----	6
314	7-60	0.37	18	57	356	5.5	12	-----	224	----	6
315	8-60	----	----	----	----	----	----	-----	----	8.1	6

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

TABLE 4. Chemical Analyses of Ground Water From Martin County (Continued)

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
316	7-60	0.17	51	26	332	3	12	-----	214	----	6
317	7-60	0.24	50	30	389	8.7	20	-----	224	----	6
318	7-60	0.48	43	28	356	5.5	13	-----	200	7.8	6
319	7-60	0.98	50	32	380	9	22	-----	228	----	6
320	7-60	0.14	50	47	391	8	13	-----	280	----	6
321	7-60	0.30	42	30	386	8	25	-----	204	----	6
322	7-60	0.19	20	53	404	11	33	-----	216	----	6
323	7-60	0.84	60	30	400	10	30	-----	220	----	6
324	7-60	0.03	46	27	448	11	43	-----	180	----	6
325	7-60	----	59	24	392	12	37	-----	196	7.8	6
326	7-60	0.26	45	36	364	14	35	-----	204	----	6
327	7-60	0.42	69	26	404	12	24	-----	224	----	6
328	7-60	0.60	77	18	383	8.5	25	-----	212	----	6
329	7-60	0.16	34	26	335	31	40	-----	168	7.65	6
330	7-60	0.12	37	23	422	9	37	-----	168	7.51	6
331	7-60	0.09	37	33	400	14	35	-----	200	7.50	6
332	7-60	0.06	35	27	410	14	44	-----	176	7.59	6
333	7-60	0.07	37	30	408	18	47	-----	192	7.57	6
334	7-60	0.06	49	24	394	6	21	-----	198	7.38	6
335	7-60	0.14	19	36	422	12	45	-----	166	7.60	6
336	7-60	0.13	46	26	396	18	32	-----	200	----	6
337	7-60	0.21	56	27	376	9	19	-----	188	----	6
338	8-60	0.09	48	63	364	0.6	16	-----	276	8.2	6
339	7-60	0.22	78	15	284	6.5	8	-----	204	----	6
340	7-60	0.13	90	12	292	.1	11	.2	220	8.7	6
341	7-60	0.64	100	6	300	4.2	10	-----	220	8.2	6
342	7-60	0.76	44	15	292	5.5	11	-----	216	----	6
343	7-60	0.16	90	12	308	0.4	10	-----	220	8.0	6
344	7-60	0.23	74	28	348	5.5	11	-----	240	8.1	6
345	8-60	1.95	96	11	391	2.0	9.4	-----	268	6.73	6

346	8-60	1.19	87	30	426	1.6	9.4	-----	292	6.60	6
347	8-60	0.52	70	29	360	3.5	10	-----	268	8.7	6
348	8-60	----	----	----	----	----	15	-----	90	----	7
349	7-60	0.64	98	18	352	2.5	13	-----	216	8.2	6
350	7-60	0.35	52	35	304	4.6	15	-----	220	7.9	6
351	8-60	2.00	14	2.9	38	18	13	-----	48	----	7
352	8-60	2.57	63	44	371	3.5	18	-----	336	7.00	6
353	8-60	1.95	82	4.9	272	3.0	13	-----	224	----	7
354	8-60	0.31	58	39	379	0.7	11	-----	304	7.14	6
355	8-60	1.52	35	48	344	1.0	12	-----	284	----	6
356	8-60	0.20	66	60	410	1.4	10	-----	412	7.19	6
357	8-60	0.20	53	54	408	0.4	11.0	-----	352	7.35	6
358	7-60	0.35	69	10	369	1.1	12	-----	236	----	6
359	7-60	1.30	69	9.9	312	0.1	10	-----	212	7.31	6
360	7-60	1.10	38	22	256	2.4	9.8	-----	188	7.37	6
361	7-60	0.14	75	27	387	9.0	27	-----	240	7.40	6
362	7-60	0.57	74	23	282	6.5	18	-----	225	7.40	6
363	7-60	0.84	50	32	284	5.5	12	-----	7.40	6	
364	7-60	0.72	82	7.9	230	11	13	-----	194	8.4	6
365	7-60	1.1	64	10	251	1	17	.2	192	9.0	6
366	7-60	1.5	57	12	237	2	16	-----	180	9.2	6
367	7-60	0.00	53	5.2	100	4.5	90	-----	123	7.50	6
368	8-60	20	2.0	11	75	----	8.0	-----	48	6.29	7
369	7-60	0.48	45	38	274	9.0	9.6	-----	214	----	6
370	7-60	0.57	78	18	276	12	13	-----	214	----	6
371	7-60	2.20	9	53	280	8.0	9.6	-----	192	----	6
372	7-60	1.40	70	0	268	0.1	9.2	-----	176	7.21	6
373	8-60	1.57	56	8.8	232	4.0	11	-----	176	7.45	7
374	8-60	0.38	38	29	319	0.7	9.2	-----	216	7.18	6
375	7-60	0.56	90	0	340	0.1	11	-----	224	7.28	6
376	7-60	0.26	70	9.9	308	0.1	10	-----	216	7.36	6
377	7-60	0.30	92	0	328	0.1	9.4	-----	232	7.25	6
378	8-60	0.14	34	42	378	0.3	14	-----	256	7.11	6
379	7-60	0.35	80	2.7	308	0.1	8.8	-----	212	7.20	6
380	7-60	0.18	82	5.8	332	0.1	9.6	-----	228	7.20	6
381	7-60	0.15	52	26	348	0.1	11	-----	232	7.00	6

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

TABLE 4. Chemical Analyses of Ground Water From Martin County (Continued)

(Parts per million)

Well No.	Date of Collection	Iron (Fe) in Total	Calcium (Ca)	Magnesium (Mg)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Hardness as ($CaCO_3$)	pH	Water bearing Zone
382	7-60	0.21	72	9.9	336	0.1	9.2	-----	220	7.37	6
383	7-60	0.86	36	33	324	5.6	9.8	-----	224	7.60	6
384	7-60	0.15	64	26	368	5.6	11	-----	264	----	6
385	7-60	4.50	18	1.9	80	0.1	19	-----	52	----	7
386	7-60	0.21	13	61	296	10	9.4	-----	225	----	6
387	7-60	0.03	69	26	101	9	9.6	-----	223	7.9	6
388	7-60	1.1	75	23	279	11	9.0	-----	225	7.49	6
389	7-60	0.17	84	11	332	6.5	11	-----	255	----	6
390	7-60	0.48	87	27	334	9.0	14	-----	209	----	6
391	7-60	1.3	16	36	264	16	8.6	-----	192	7.25	6
392	7-60	0.74	46	28	356	8.7	13	-----	232	7.33	6
393	7-60	0.20	96	0	348	5.6	9.4	-----	236	----	6
394	7-60	0.16	76	7.9	316	0.1	12	-----	220	7.49	6
395	7-60	0.00	13	8.8	42	28	7.4	-----	68	5.60	7
396	7-60	0.32	76	8.8	404	5.6	9.0	-----	224	7.05	6
397	7-60	0.10	111	0	408	5.6	10	-----	264	7.09	6
398	7-60	0.01	----	----	----	----	----	-----	----	5.20	7
399	7-60	0.30	96	12	388	6.5	9.4	-----	288	7.60	6
400	8-60	0.00	75	24	356	3.2	12	-----	288	7.21	6
401	8-60	0.00	55	23	327	3.5	10	-----	236	7.38	6
402	8-60	0.07	58	24	308	43	14	-----	244	7.21	6
403	8-60	0.17	9.6	26	28	7.0	9.7	-----	132	6.40	7
404	7-60	0.10	32	41	380	9.7	15	-----	248	7.45	6
405	7-60	0.00	84	11	384	9.7	15	-----	252	7.40	6
406	7-60	0.14	14	60	384	0.1	15	-----	280	7.29	6
407	7-60	0.18	58	38	408	6.5	9.2	-----	3--	7.30	6

408	8-60	0.00	64	29	332	1.5	14	-----	256	7.60	6
409	----	----	----	----	----	----	----	-----	----	----	5
410	8-60	0.10	48	27	317	0.0	17	-----	232	7.41	6
411	8-60	0.75	75	30	348	1.5	46	-----	212	7.50	6
412	8-60	0.07	58	20	284	0.5	9.4	-----	224	7.60	6
413	8-60	0.16	77	24	376	0.4	13	-----	292	7.70	6
414	8-60	2.8	87	3.9	314	0.5	11	-----	232	7.35	6
415	8-60	1.1	72	32	344	0.6	11	-----	312	7.50	6
416	8-60	6.0	41	26	266	----	160	-----	137	7.5	6
417	7-60	0.1	----	----	----	----	188	-----	171	7.6	6
418	7-60	0.1	----	----	----	----	188	-----	171	----	6
419	7-60	0.1	----	----	----	----	188	-----	171	----	6

Analyzed by the Quality of Water Branch, U. S. Geological Survey.