Public and Industrial Water Supplies In a Part of Northern Mississippi

JOE W. LANG AND ERNEST H. BOSWELL

(U. S. Geological Survey)

Prepared by the United States Geological Survey in cooperation with the Mississippi Board of Water Commissioners and the Mississippi Geological Survey.

BULLETIN 90

MISSISSIPPI GEOLOGICAL SURVEY

TRACY WALLACE LUSK

DIRECTOR AND STATE GEOLOGIST

UNIVERSITY, MISSISSIPPI

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LETTER OF TRANSMITTAL

Office of the Mississippi Geological Survey
University, Mississippi
December 9, 1960

Hon. Henry N. Toler, Chairman and
Members of the Geological Survey Board

Gentlemen:

Herewith is Mississippi Geological Survey Bulletin 90, Public and Industrial Water Supplies in a Part of Northern Mississippi, by Joe W. Lang and Ernest H. Boswell.

This report was submitted for publication by the Ground-Water Branch, U. S. Geological Survey, through their cooperative program with the Mississippi Board of Water Commissioners.

The excellent cooperation of the Mississippi Board of Water Commissioners and the North Mississippi Development Association is sincerely acknowledged. Their genuine interest is reflected in their purchase of 500 and 800 copies respectively of the bulletin—thus making publication possible.

The area covered by the report includes all or parts of 28 counties which comprises more than one-fourth of the total area of Mississippi. Water-supply information is presented first on an area basis and second on a county by county basis. In addition to the basic data on surface and ground waters many chemical analyses are presented.

The information contained in the report will obviously provide many answers to both public and industrial users of water, thereby aiding the industrial growth of Mississippi.

Respectfully submitted,

Tracy W. Lusk
Director and State Geologist

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PUBLIC AND INDUSTRIAL WATER SUPPLIES IN A PART OF NORTHERN MISSISSIPPI

JOE W. LANG AND ERNEST H. BOSWELL

ABSTRACT

Ground water furnishes the public and industrial supplies for all the communities except Columbus in the 28 counties in northern Mississippi constituting the region of this report. Approximately 210,000 people are supplied by the 66 municipal water systems and the wells of smaller communities, two universities, and several Government installations. The total average daily pumpage for public use is about 21½ million gallons, of which an average of about 2½ mgd (million gallons a day) is pumped by Columbus from Luxapalila Creek. Industrial pumpage from wells (12 mgd) is equivalent to more than half the total public pumpage. The increasing use of water during the past 15 years has been accelerated since 1955 as a result of the growing industrial economy, and future water needs promise to increase year by year.

The region lies on the east flank of the Mississippi embayment of the Gulf Coastal Plain, and is underlain for the most part by marine and continental sediments ranging in age from Cretaceous to Recent. Paleozoic rocks crop out in a narrow band in the northeastern part of the State and form the bottom of the large downwarped and faulted trough of the embayment to the west. Cretaceous and younger sediments of sand, gravel, clay, lignite, chalk, and limestone, which reach a total thickness of 3,000 feet or more occupy the trough. Major rock divisions crop out in bands of varying width across the surface and the formations dip westward from their outcrops at an average rate of about 25 feet to the mile, most of them thickening and increasing in dip in the direction of the embayment.

Aquifers in the hard rocks of Paleozoic age have been developed very little in northeastern Mississippi except for domestic and farm supplies, mostly on or near the outcrop in Tishomingo County. They remain potentially an important source of small to moderately large water supplies in several places in the extreme northeastern part of the region. Electric logs of borings for oil indicate that the Lower Cretaceous series may contain substantial unused aquifers beneath an area extending

from northern Noxubee County northwestward across parts of Lowndes, Oktibbeha, and Clay Counties.

Sand and gravel of the Tuscaloosa group and sand of the Eutaw formation, of Late Cretaceous age, store vast quantities of fresh water within the Tombigbee River basin and adjacent areas on the north and west and are the principal sources of water supply in these areas. In the lowlands of the Tombigbee, these rocks yield artesian flows ranging from a few gallons per minute to more than 500 gpm to wells 200 to 1,800 feet deep. The water is soft and of low to moderate mineralization. At Macon, the sands of the Coker formation yield large supplies of soft water for municipal and industrial uses; when drilled in 1954 one well had a flow of 250 gpm. Many small-diameter wells have been flowing continuously for many years in the lowlands of the Tombigbee River basin. The Coffee sand of the Selma group yields small to moderate supplies to many drilled domestic and farm wells and a few industrial and municipal wells north of Tupelo to the Tennessee line. The Ripley formation furnishes moderately hard to hard water of low to moderate mineral content to many artesian wells both shallow and deep from southern Chickasaw County northward to the Tennessee line.

Tertiary rocks are the principal source of water supply throughout most of the central and western parts of the report region. Sands of the Wilcox group, the Meridian sand member of the Tallahatta formation, and the Sparta sand are excellent aquifers, each yielding soft water requiring little or no treatment for municipal and industrial supplies. Locally iron may be a problem. The shallow alluvium, of Quaternary age, is highly productive of hard water of moderate mineral content in the Yazoo Delta of Panola and Tallahatchie Counties. The nearly constant year-round temperature of the water from the alluvium (about 63° to 64°F) makes it especially suitable for heat-exchange uses.

The substantial flows in several of the streams in the region, particularly the Tombigbee at Columbus and the Tallahatchie at Batesville, represent a valuable resource that can be developed. Large amounts of water could be made available for water supplies at several other places by the construction of dams and other facilities. The four principal surface-water reservoirs in Mississippi are located in the western part of the area; they are Arkabutla reservoir on the Coldwater River, Enid reservoir on the Yocona River, Grenada reservoir on the Yalobusha River, and Sardis reservoir on the Tallahatchie River. Although they were built primarily for flood control, appropriation of water from the reservoirs is subject to approval by the Corps of Engineers, U. S. Army, and the Mississippi Board of Water Commissioners.

Chemical analyses of untreated ground waters show them to be generally soft and of suitable quality, except for local problems associated with excessive concentrations of iron and carbon dioxide and a low pH. Water from the Ripley formation, except in the deeper wells far downdip, ranges upward in the hardness to more than 200 parts per million, and generally is exceeded in hardness only by water from the shallow alluvium of the Yazoo Delta. Chemical analyses of surface water indicate that, at base flow, the mineral constituents, the concentration of dissolved solids, and the hardness of surface waters are similar to those of the local ground waters.

INTRODUCTION

PURPOSE AND SCOPE OF INVESTIGATION

This report is a general appraisal of the public and industrial water supplies of a large region of northern Mississippi. It is based mostly on studies begun in July 1956 and carried out as a part of the program of ground-water investigations being made in Mississippi by the U. S. Geological Survey in cooperation with the Mississippi Board of Water Commissioners. Some work in the region had been done earlier under a cooperative arrangement between the State and Federal Geological Surveys. The chief purpose of the overall long-term investigation is to make areal studies of the geology of the Cretaceous formations in northeastern Mississippi, with special reference to the existence and thickness of the water-bearing formations and the quality, quantity, and availability of the ground-water supplies in them. On request by State and local officials, the investigation was expanded to include an inventory of public and industrial water supplies from wells tapping the post-Cretaceous formations; the results are given in this report. The program is under the supervision of the senior author, who is district geologist of the Ground Water Branch, U. S. Geological Survey, Jackson, Mississippi.

Adequate water supplies are essential to the industrial development and high standards of living of the people anywhere in the Nation. The ground-water resources of northern Mississippi are one of the principal natural assets of the region. All the public and industrial water supplies are derived from wells or springs except the Columbus municipal supply, which is obtained from Luxapalila Creek. During the summer of 1957 numerous requests for ground-water information indicated the need for a compilation of data into a report on existing municipal and industrial water supplies, the results of which are given in this report.

The 66 towns and cities inventoried in the report region had a combined population of about 180,000 in 1957, according to estimates made by the Bureau of Public Administration, University of Mississippi. They use an estimated total of 18½ mgd (million gallons per day) on the average. In addition, many smaller communities, two universities and several colleges, a large Air Force base, a Corps of Engineers, U. S. Army installation, and many rural schools (in all representing about 30,000 people) are dependent on ground-water supplies. The total average daily pumpage for all public uses is estimated to be 21½ mgd, of which about 2½ mgd is taken by Columbus from Luxapalila Creek. Industrial plants pump a little more than half this amount (12 mgd) from wells.

The use of water, particularly ground water, has increased substantially in the past 15 years, and the demand continues to increase each year. Availability of water may become a critical factor in the future development of presently expanding industrial projects such as those in the Tombigbee River basin and others. This report is for the purpose of helping fill the need for basic water information in connection with industrial site planning and plant expansions, and to encourage waterworks improvements by municipalities and others within the region. Immediate objectives include the presentation of such basic information on public and industrial water supplies as location, depth, water level, and yield of wells, quantities of water used, chemical analyses, and data on potential sources of water. Other reports that deal with special phases of water resources are planned for separate publication in order to facilitate the safe and orderly development of water. The need for additional studies is indicated by the numerous requests for information on water that are being received by State and local officials.

LOCATION AND EXTENT OF REGION

The part of northern Mississippi covered by this report includes about 14,300 square miles, representing all or parts of 28 counties served by the North Mississippi Industrial Development Association. The region is 150 miles long by 115 miles wide, and lies approximately between latitudes 32°35' and 35°00' north and longitudes 88°10' and 90°5' west. It is bordered on the north by Tennessee and on the east by Alabama (Figure 1). Principal cities and transportation centers are Columbus, Tupelo, and Corinth with populations of 24,625, 17,247, and 11,452 respectively (1960 U. S. Census, preliminary figures). Other places having 5,000 to 10,000 inhabitants are Aberdeen, Louisville, Oxford, Philadelphia, Starkville, and West Point.

PREVIOUS REPORTS

Wailes in 1854 authored the first officially prepared geological report of Mississippi. In it he briefly discussed the water supplies and included data on water wells in Lowndes, Monroe, and Noxubee Counties. Hilgard's classic report in 1860 on the geology and agriculture of Mississippi presented excellent background information on springs and wells; including some chemical analyses of the various waters and soils.

Some of the most important later reports that contain information on water resources in the region of this report include "Underground Waters of Mississippi," by W. N. Logan and W. R. Perkins, published in 1905; "Summary of the Underground Water Resources of Mississippi," by A. F. Crider and L. C. Johnson, published in 1906; and "The Ground-Water Resources of Mississippi," by L. W. Stephenson, W. N. Logan, and G. A. Waring, published in 1928, which has remained a most valuable reference to the present time. (See selected bibliography, p. 57.)

Detailed investigations of the ground-water resources by areas, counties, or localities have not been made prior to this study, of which the present report represents a part. Another report, "Ground-Water Resources of Prentiss County, Mississippi," by B. E. Ellison and E. H. Boswell, published earlier in

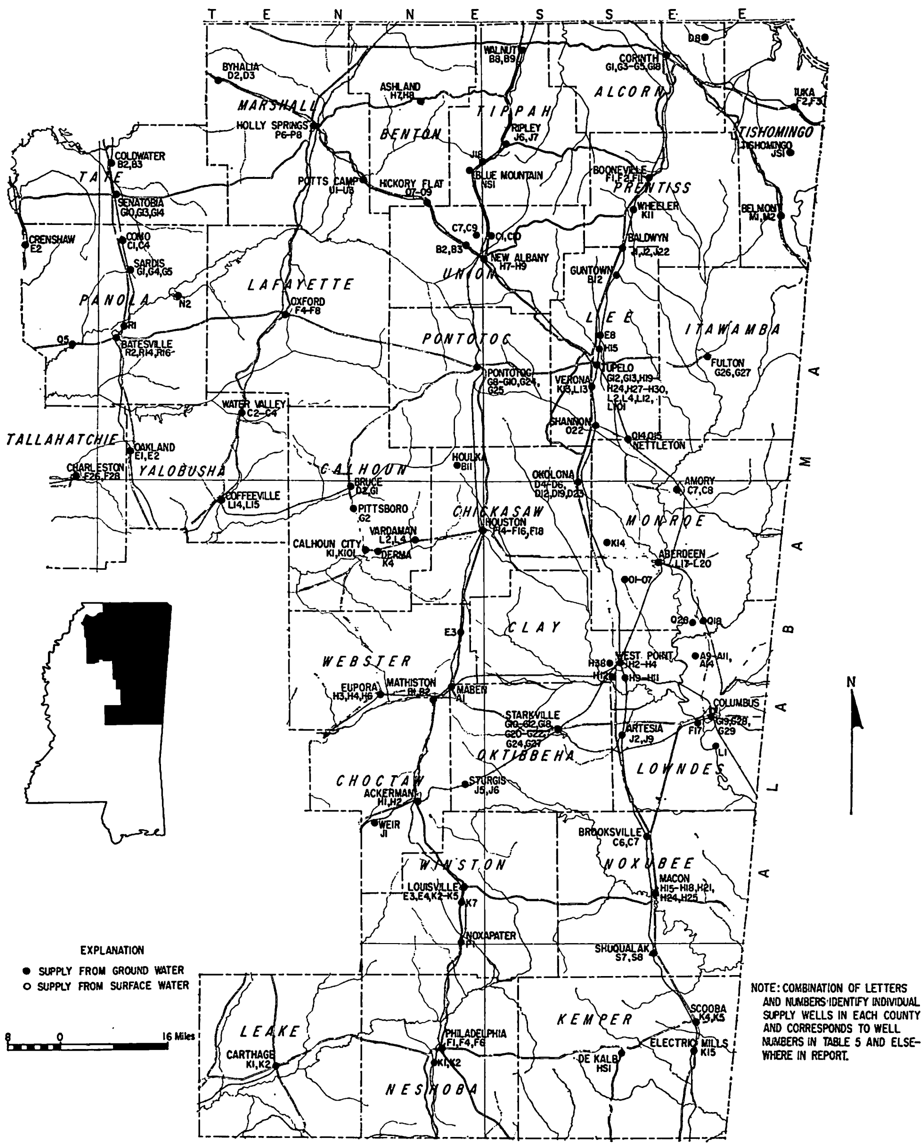

FIGURE 1.–PUBLIC AND INDUSTRIAL WATER SUPPLIES IN A PART OF NORTHERN MISSISSIPPI.

1960, resulted from the study. Some needed information was presented in a short open-file report by the present authors on ground-water conditions in the Aberdeen-Columbus area released in 1957. The most pertinent reports are included in the selected bibliography.

FIELD WORK AND PRESENTATION OF DATA

Some of the information presented here was gathered in 1954-56 by members of the U. S. Geological Survey in connection with intermittent areal study of Cretaceous aquifers. Field work was systematically begun after the North Mississippi Industrial Development Association made a formal request both to the Mississippi Board of Water Commissioners and the local U. S. Geological Survey office. In addition to the region covered by the study of the Cretaceous aquifers, information was needed for several adjacent counties making up the membership of the association. Reconnaissance information was collected and compiled for these counties and forms a part of the report. Most of the field work was completed by October 1958, but a little additional work was done during the following 6 months. Each of the public and industrial water supplies in the region was visited and information was obtained from appropriate officials.

Available information for each community or plant installations is itemized in condensed form in this report under the section "Water-Supply Information by Counties," and Table 5 gives records for a few representative public and industrial supply wells. Maps showing geologic areas and location of sites of source data, and a geologic section based upon data collected during the study and which shows the position and thickness of the water-bearing formations along a line from Itawamba County to Grenada County are included in the report.

In order to determine the chemical nature of water from the different rock formations in the different counties of the region, samples were collected from 85 wells for chemical analysis. Several additional analyses were obtained from other sources and pertinent ones are presented.

Eighteen water samples were collected from six rivers at different rates of discharge and the analyses are included in a table of the report.

WELL-NUMBERING SYSTEM

The well-numbering system used in this report is a simple grid system based on a master grid previously set up for each county of the State. On a county map the grid areas are designated alphabetically, beginning with the letter A in the upper left corner and progressing to the right and downward in normal reading order. To avoid confusion the letter I is not used. The grid lines usually are along township lines, except for irregular areas, which are included in an adjoining grid area thereby creating divisions that may be from 6 x 6 miles to anything up to 9 x 9 miles in area. Each well has been numbered with the appropriate grid-area letter and a numeral beginning with 1 in the upper left corner of each subdivision and proceeding as above — for example, A1, A2, A3, etc. As additional wells are inventoried in each grid they will be numbered as inventoried, continuing with the next available numeral preceded by the grid letter.

ACKNOWLEDGMENTS

Assistance given by city and waterworks officials, who furnished most of the information on their water-supply systems, is gratefully acknowledged. Well-drilling contractors, consulting engineers, and others gave freely of their information. Most of the chemical analyses were made in a Quality of Water laboratory of the U. S. Geological Survey. Special thanks are due Mr. J. E. Johnston, State Sanitary Engineer, Mississippi Board of Health, for several chemical analyses and other assistance in compilation of the report. Acknowledgment is made also to the State Chemical Laboratory and others for some of the analyses presented. Mr. Charles Henderson of the North Mississippi Industrial Development Association aided in the collection of some of the basic data.

GEOGRAPHIC FEATURES

PHYSICAL GEOGRAPHY AND DRAINAGE

The subject region lies on the east flank of the Mississippi embayment part of the Gulf Coastal Plain. It can be divided into several distinct north-south-trending belts characterized by different landforms that have resulted from erosion of the rock materials underlying the surface. From east to west these belts are the Tombigbee Hills, Black Prairies, Pontotoc Ridge, Flatwoods, North Central Hills, Bluff (Loess) Hills, and Mississippi alluvial plain (Yazoo Delta). (See Figure 2.)

In northeastern Mississippi the outcrop of the predominantly sandy strata of the Tuscaloosa group and Eutaw formation and the small areas underlain by Paleozoic rocks is characterized by hills and valleys to which the name Tombigbee Hills is applied. Most of this area lies within the eastern part of the drainage basin of the Tombigbee River, but about two-thirds of Tishomingo County and a small part of eastern Alcorn County are drained by the Tennessee River. The land surface is highest along the Alabama line, where altitudes range from 400 feet above sea level on some of the hills and ridges of Monroe and Itawamba Counties to 700 feet or more in Tishomingo County. An isolated hill in Tishomingo County, 806 feet high, is the highest point in Mississippi. The Tombigbee Hills, including their eastward extension into Alabama, form the catchment area for the water-bearing sands of the Tuscaloosa group and the Eutaw formation. From the higher elevations in the hills the westward-dipping strata develop sufficient hydrostatic pressure to produce flows from many wells in the lowlands of the Tombigbee River valley. Most of the streams that head in the Tombigbee Hills are fed by springs that sustain the streamflow throughout the year.

West of the Tombigbee Hills lies a belt of subdued topography known as the Black Prairies. The surface of the area ranges from plains to low rolling hills rising to a maximum height of about 40 feet above the broad valleys. The altitudes above sea level range from less than 200 feet in the southern part in Noxubee County to more than 500 feet in the northern part in Prentiss and Alcorn Counties. The belt ranges in width from about 25 miles on the Lowndes-Noxubee County line to 4 to 5 miles in west-central Prentiss County. It corresponds closely to the outcrop of the chalky part of the Selma group, which does not readily absorb water, and rainfall runs off quickly. Streams that head in the Black Prairies are intermittent and characterized by high peak discharge during rains, often accompanied by flooding, and little or no discharge during periods of no rainfall. The larger tributaries to the Tombigbee River in this belt are Tibbee, Chiwapa, Oldtown, and Coonewah Creeks.

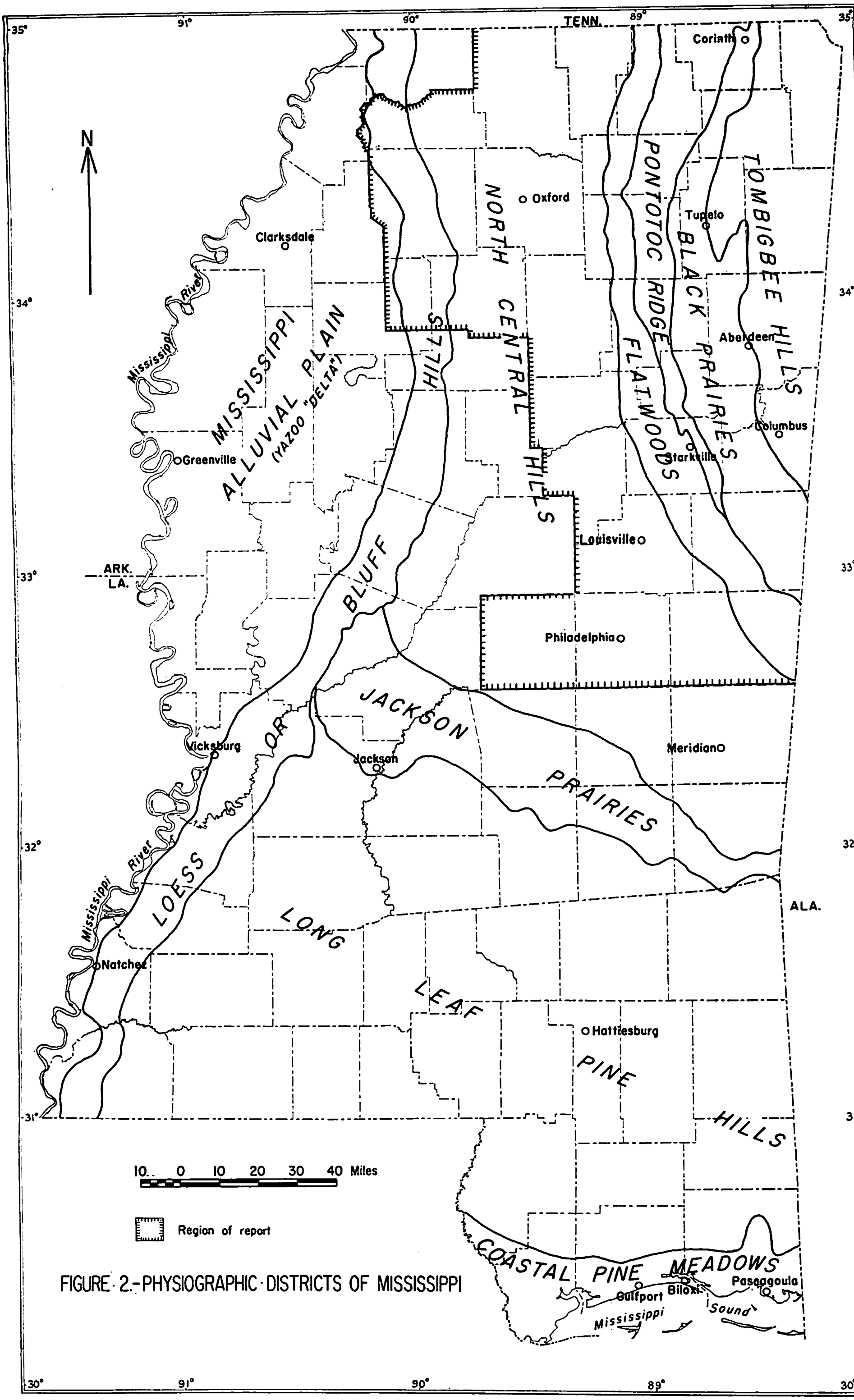

FIGURE 2.-PHYSIOGRAPHIC DISTRICTS OF MISSISSIPPI

The Pontotoc Ridge is a belt of rugged hills that borders the Black Prairies on the west (Figure 2). The area extends from northwestern Noxubee County, where it is only 2 to 3 miles wide, to the Tennessee line in Alcorn and Tippah Counties, where it is about 20 miles wide. The Pontotoc Ridge consists mostly of north-south parallel ridges having steep slopes and local relief of as much as 250 feet. Narrow valleys with steep sides are found in the eastern part of the area and hills 40 to 50 feet high, with gentle slopes, in the western part. The topography is the result of differential weathering of the westward-dipping beds of impure sand, chalk, and limestone of the upper part of the Selma group and the overlying Clayton formation. The recharge area for the outcropping sandy parts of the Ripley formation is in this belt of hills, and the westward-dipping subsurface extensions of these beds yield water to wells from southern Chickasaw County northward into Tennessee. The hills form the divide between the Tombigbee River system on the east and the streams that flow into the Mississippi River on the west. In Tippah and Alcorn Counties, the Pontotoc Ridge area is drained by the headwaters of the Hatchie River, which flows across southwestern Tennessee into the Mississippi.

The Flatwoods is a narrow wooded belt of low relief that extends from the Alabama line northwestward across Kemper County and western Noxubee and Oktibbeha Counties and then northward on the west side of the Pontotoc Ridge to the Tennessee line in Tippah County (Figure 2). The surface is underlain by the dense, impervious, dark-colored Porters Creek clay, whose lack of resistance to weathering has produced wide stream terraces and low, rounded hills. Springs are uncommon and small, and streams that head in the southern part of the Flatwoods have no flow except during and immediately after rains. Owing to the low altitudes of the Flatwoods as compared with the high hills of the Pontotoc Ridge on the east, artesian conditions are created in the water-bearing sands of the Ripley formation, which crop out in the hills and dip beneath the relatively impervious formations to the west, and serve as the principle source of water supply in a wide belt extending from Chickasaw County northward 80 miles to the Tennessee line.

The North Central Hills is a wide belt bounded on the east by the Flatwoods and extending westward to the Bluff Hills, which border the Mississippi alluvial plain, the Delta. Underlain by sands, silts, and clays of the Wilcox and Claiborne groups of the Eocene, the surface of the North Central Hills area is eroded into steep-sided hills and valleys. The hills rise 50 to 225 feet or more above the valleys and have elevations of 375 to 600 feet above sea level. A part of the recharge area for each of the more valuable Eocene aquifers of this report is located within these hills, and since many of the valleys have lower altitudes than the outcrops of the sandy beds in the hills artesian conditions are favorable for obtaining flowing wells. Headwaters of the Pearl and Big Black Rivers are in the south-central part of the belt. Most of the drainage areas of the Yalobusha, Yocona, Tallahatchie, and Coldwater Rivers, which flow into the Yazoo River are in the North Central Hills.

The loess-covered Bluff Hills extend northward as a strip 8 to 15 miles wide across Yalobusha, Panola, and Tate Counties. The area marks the border of the upland portion of the report region and the eastern margin of the bottom lands of the Mississippi River. Characterized by steep hills and narrow ridges and valleys, the strip is marked on the west by an abrupt escarpment which rises 100 to 200 feet or more above the bottom lands of the Mississippi alluvial plain.

The Mississippi alluvial plain below the Bluff Hills is called the Yazoo Delta (Figure 2). Only a small part of the region in Panola, Tallahatchie, and Tate Counties lies within this broad expanse of level, poorly drained, fertile bottom land which is underlain by shallow alluvial deposits that store large quantities of water. Deeply buried Eocene sands which crop out in the North Central Hills area yield artesian flows to many wells in the Delta.

CLIMATE

Northern and eastern Mississippi has a humid temperature climate influenced strongly by the Gulf of Mexico. According to the U. S. Weather Bureau, for the 39 years prior to 1952 the mean monthly temperature at Columbus ranged from 45.1°F in January to 81.6°F in July, and the mean annual temperature was 63.7°F. At Corinth, in the northeastern part of the region, a 40-year period of record prior to 1952 showed a range in temperature from 41.4°F in January to 79.8°F in July, the mean annual temperature being 61.0°. At Batesville, in the west-central part of the region, the mean temperature in January was 43.0°F and the mean temperature in July was 80.2°F in 40 years of record. These temperatures are fairly representative for the different parts of the region. The climate is favorable for the growth of many kinds of crops. The length of the growing season at Starkville, according to the U. S. Weather Bureau, is 225 days, determined by the average dates on which the latest and earliest killing frosts are recorded.

Precipitation ranges from about 49 inches in a narrow belt along the Bluff Hills and in central Pontotoc and Union Counties to about 56 inches in the Oxford and Philadelphia areas, and from about 51 to 53 inches along much of the Tombigbee River valley. The table that follows gives the mean monthly and annual precipitation at several stations in northern Mississippi. Late summer and early autumn are the driest seasons, and early spring the wettest. There is commonly much cloudy weather in winter. Because the winter rains are usually gentle and steady and because evapotranspiration is low, much of the water slowly soaks into the ground and percolates downward to increase the ground-water storage, particularly in the outcrop areas of the aquifers. In the spring and summer much of the rainfall is in the form of heavy, sporadic showers, runoff through surface streams is usually large, and much of the soil moisture is later evaporated and transpired.

MEAN MONTHLY AND ANNUAL PRECIPITATION, IN INCHES, AT SEVERAL STATIONS IN NORTHERN MISSISSIPPI FOR THE PERIOD 1931-52

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Batesville	6.46	4.71	6.35	4.77	3.70	3.51	4.23	3.63	2.76	2.66	4.73	5.76	53.27
Columbus	5.84	5.26	5.93	3.88	3.22	3.61	5.15	3.19	3.68	2.42	3.82	4.91	50.91
Corinth	6.48	5.24	5.72	4.44	3.91	3.77	4.02	3.72	3.32	3.05	4.89	5.03	53.59
Eupora	5.77	4.96	6.20	3.89	3.30	4.16	5.07	3.56	2.50	2.47	4.11	4.94	50.93
Holly Spgs.	7.03	5.30	6.30	4.27	3.64	3.88	4.59	3.26	3.96	2.99	4.94	5.32	55.48
Louisville	5.90	6.00	6.48	4.21	3.69	3.53	6.35	3.59	3.40	2.11	4.14	5.13	54.53
Tupelo	5.87	5.50	6.95	3.89	3.82	3.87	4.51	2.88	3.02	2.84	4.50	5.36	53.01

From Climatic Summary of the United States, Supplement for 1931 through 1952, U. S. Dept. of Commerce, Weather Bureau.

AGRICULTURE AND INDUSTRY

Until recently, northern Mississippi's economic development was based principally on agriculture, and progress in cotton culture marked the economic growth of the region until the 1920's. Periods of industrial progress came only when the growing of cotton became difficult as a result of crop failures or low prices. Lumber was the only industry to which many people could turn for a livelihood. In 1925, two-thirds of the nonfarm workers of the State were employed in lumber mills, according to a report by the Temporary Fact-Finding Committee on the Development of Mississippi's Resources made in December 1957 to the Governor, legislature, and people of Mississippi.

The development of diversified farming has been a boon to the region, and today the economy, although still agricultural, is supported by industries relating to livestock and livestock products, timber and timber products, and cotton. The region has profited by the State's program to balance agriculture with industry, begun in the late 1930's. To balance the economy, new industry has been encouraged to locate in the different areas, and several industries both heavy and small have been established throughout the region in recent years. Among these are chemical plants near Columbus and Aberdeen; meat-products plants at Amory, Belmont, West Point, and Columbus; furniture and wood-products plants at Columbus, New Albany, Tupelo, Okolona, and Amory; electrical-equipment plants at Columbus, Tupelo, Holly Springs, and Corinth; and apparel and textile plants at Tupelo, Ackerman, Amory, Baldwyn, Calhoun City, Fulton, and many other places. Cottonseed-oil and soybean-oil mills, fertilizer plants, and many medium to small plants of various kinds are scattered throughout the region. A paper mill is under construction in Tennessee a few miles north of Corinth and another is in the planning stage for the Columbus area. Eight major pipelines, of 22- to 30-inch diameter, traverse the region carrying natural gas and petroleum products from southern Mississippi, Louisiana, and Texas to markets in the Ohio valley and eastern United States.

The Tombigbee River basin, with its natural resources, including natural gas and oil, the abundance of water and electricity (supplied by the Tennessee Valley Authority system), a large labor supply, and good transportation facilities is a desirable area for the location of many kinds of industries on the choice sites that are available. The western part of the region, at the edge of the Yazoo Delta, and other areas also have similar attractions to offer various industrial prospects. Demands will continue for information on water resources for use in planning for the expected future industrial growth, as well as for solving many water-supply problems associated with the growing economy.

GROUND WATER

AVAILABILITY

Water from wells or springs furnishes the supply for all the communities in the region of this report except Columbus, which gets its supply from Luxapalila Creek. The quantity of water obtainable from wells differs considerably from place to place and at different depths, depending upon the geologic and hydrologic conditions. In seeking permeable sands and gravels which yield water readily to wells, a driller may drill through several hundred feet of nonwater-bearing beds in some places. Many thousand small-diameter wells have been sunk throughout the region to furnish water for private domestic and ordinary farm uses. The cities, towns, and smaller communities of northern Mississippi have found it possible to obtain water from larger diameter wells in sufficient quantities to meet both their domestic and industrial needs, and numerous industries, colleges, and Government installations have found it practical to develop their own ground-water supplies.

The locations of typical wells are indicated on the map (Figure 1), and pertinent data are given in the well table (Table 5) at the end of the report. The numbers shown on the map correspond to those shown in the table, where the individual wells are listed by counties in alphabetical order.

In places, the quantity of water available from wells is very large. The most permeable sands and gravels of the Cretaceous formations store and yield vast quantities of water, particularly in the Tombigbee River basin and adjacent localities. These, together with several water-bearing beds in the younger Tertiary formations to the west, constitute a natural resource of incalculable value. One well at Macon, Noxubee County, for example, had an artesian flow of 250 gpm when drilled in 1954;

and several supply wells in the Columbus and Aberdeen localities are pumped at rates of 400 to 500 gpm. Some artesian wells in the lowlands of the Tombigbee River basin have been flowing continuously for many years (Figure 3). A total of several million gallons a day of water of excellent quality is being discharged from such wells.

Figure 4 shows 1 of 4 artesian wells which furnish the water supply for a recently built chemical plant near the Tombigbee River in Monroe County. Although large ground-water withdrawals such as this (Figure 4) almost immediately result in declining water levels that locally may cause formerly flowing wells to cease flowing or to be reduced in flow, it does not necessarily mean that the supply is being exhausted. It may mean that pumps will have to be installed in order to obtain the desired amount of water. The artesian aquifer functions as a conduit between the recharge area and the places of discharge. As the drawdown effects of water withdrawal in this case reaches the outcrop area just east of the Alabama-Mississippi line the rate of water-level decline caused by the withdrawal will become less because water will then be taken from storage in the water-table area where replenishment is taking place. The decline in water level in the artesian reservoir may eventually cease if the lowering of the water table in the outcrop area causes a sufficient increase in recharge or a decrease in the natural discharge from seeps and springs.

In some places the quantity of ground water down to depths of several hundred feet is relatively small and even insufficient for single family supplies. For example, most of the Flatwoods surface is underlain by thick beds of dense, impervious Porters Creek clay and from Chickasaw County northward for 80 miles, water supplies in the Flatwood belt are obtained mostly from wells in the Ripley formation, which underlies the Prairie Bluff chalk and the Porters Creek clay. However, from Chickasaw County southeastward for 60 miles the Ripley formation is not water-bearing and good water can be reached only by drilling several hundred feet below the Ripley and into deeper Upper Cretaceous formations. At Maben and Sturgis in western Oktibbeha County satisfactory public supplies were developed only after reaching depths greater than 2,000 feet.

Figure 3.—Artesian well flowing continuously in Itawamba County. Depth, 140 feet in sand and gravel of Tuscaloosa group; rate of flow, about 50 gpm; temperature of water, 62° F.

Figure 4.—Well in the Gordo formation in Monroe County. Four such wells averaging about 415 feet deep furnish the water supply for plant in background. Wells flowed 500 gpm or more each when installed, and are pumped at rate of about 1,000 gpm each.

GENERAL GEOLOGY

Knowledge of the geologic history is important for a clear interpretation of the occurrence of ground water in this or any other region. It is important also in the understanding of certain streamflow characteristics, in that some streams in the region have substantial and sustained low flows whereas others become dry after short periods of storm runoff. The geologic processes involved in the development of the rock formations explain the presence of the important water-bearing sands and gravels and help to indicate the distribution of the underground water reservoirs.

Northern Mississippi is in the Mississippi embayment, a part of the Gulf Coastal Plain. The embayment is a broad arm of the coastal plain that extends about 350 miles up the Mississippi River valley as far as southern Illinois. Formed by downwarped and faulted Paleozoic rocks, the resulting large syncline, or trough, whose axis roughly conform to the present course of the Mississippi River, became filled to the level of the present surface with sediments ranging in age from Cretaceous to Recent. The sediments, consisting of sand, gravel, lignite, clay, chalk, and limestone, were deposited during a complicated history of advancing and retreating seas. They range in total thickness from a featheredge in extreme northeastern Mississippi to 3,000 feet or more in the western part of the region of this report.

The geologic map (Figure 5) shows that the major rock divisions crop out as bands of varying width across the surface of the region. The direction of strike of the formations is northwest in the southern part but swings toward the north in the central part and slightly east of north in the tier of counties bordering Tennessee. Plate 1 is a geologic section from Itawamba County to Grenada County, almost through the middle of the region, and shows the stratigraphy and attitude of the rock units. The formations dip gently toward the west and southwest, the older strata passing under successively younger strata as one travels from east to west. In the east-central part of the region from the Alabama line to eastern Chickasaw County the average dip of the Cretaceous rocks is about 25 feet to the mile. The dip becomes progressively greater and most of the formations thicken in the downdip direction, especially in the southern part of the area. The Tertiary deposits also steepen somewhat in dip and become thicker as the structural axis of the Mississippi embayment is approached on the west.

Paleozoic basement rocks crop out in small areas in Tishomingo County. They are overlapped on the west and southwest by Upper Cretaceous formations which include, in ascending order, the Tuscaloosa group, including the Coker and Gordo formations; the Eutaw formation; the Selma group, consisting of the Coffee sand, Mooreville chalk, Demopolis chalk, Ripley formation (including the McNairy sand member), and the Prairie Bluff chalk. The outcrop belts are shown on the geologic map (Figure 5). Stephenson and Monroe (1940) mapped the surface outcrops and described the Upper Cretaceous deposits in considerable detail. The Upper Cretaceous outcrops include all of 7 counties and parts of 8 others. Younger Paleocene and Eocene deposits overlap the Cretaceous and form the surface throughout the remainder of the region of the report, except where Pleistocene and Recent sediments mantle the older rocks.

Table 1 gives a generalized description of the geologic units in northern Mississippi including the thickness and physical character of each unit and a brief summary of the water-bearing properties.

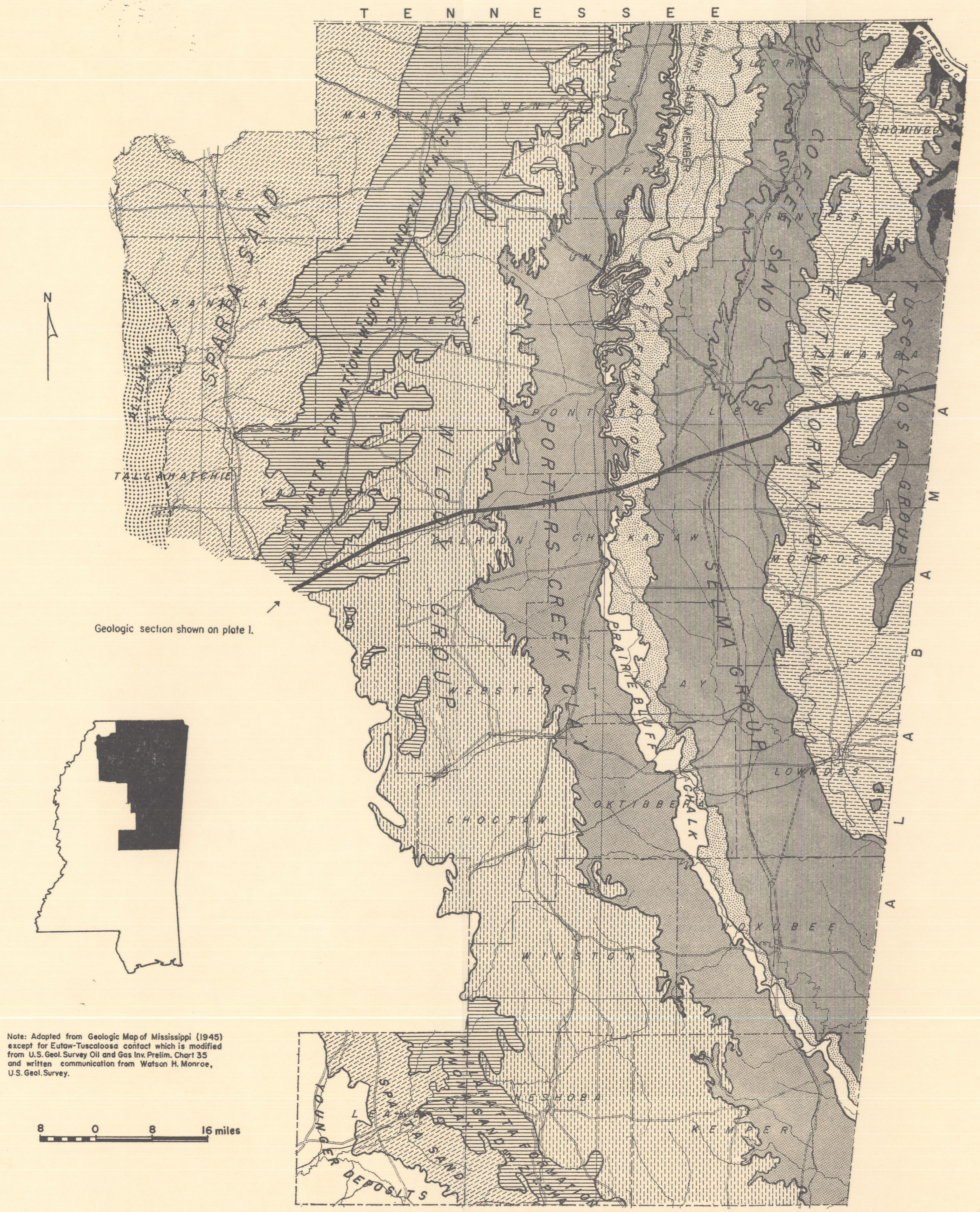

FIGURE 5.—GEOLOGIC MAP OF A PART OF NORTHERN MISSISSIPPI.

TABLE 1.—GENERALIZED SECTION OF THE GEOLOGIC UNITS IN NORTHERN MISSISSIPPI, AND THEIR WATER-BEARING PROPERTIES

(SEE GEOLOGIC MAP, FIG. 5, FOR OUTCROP AREAS)

Era	System	Series	Group	Stratigraphic unit	Symbol	Thickness (feet)	Lithologic character	Water-bearing properties
Cenozoic	Quaternary	Recent		Alluvium	Qal	0-60	Clay, silt, sand, and gravel.	Yields water to shallow dug, bored, and driven wells in flood plains of major streams and tributaries. Quality is variable but usually good. Highly productive of hard water in western Panola and Tallahatchie Counties in Yazoo Delta.
		Pleistocene		Loess and Terrace deposits	Qt	0-50	Clay, silt, sand, and gravel.	Yields small to moderate supplies to domestic and farm wells. Quality is variable but usually good.
	Tertiary	Eocene	Claiborne	Sparta sand	Es	200-400	Sand, shale, and clay, locally lignitic, highly lenticular; layers of quartzitic sandstone and siltstone.	An excellent aquifer, yielding moderate to large supplies to shallow and deep artesian wells in the western part of the region. Water generally of excellent quality, usually requiring no treatment for municipal use.
				Zilpha clay	Ez	15-75	Carbonaceous shale and clay and lenses of silt and sand.	Not a source of ground water.
				Winona sand	Ex	25-60	Beds of fine to coarse glauconitic, fossiliferous sand, and calcareous ledges.	A good aquifer in western part of the area; furnishes moderately mineralized water to many shallow and artesian wells for domestic and farm uses. In some places fluoride content is higher than standard set by Public Health Service for drinking water.
				Tallahatta formation: Neshoba sand member	Etn	0-60	Fine sand, micaceous, locally glauconitic; lenses of clay and shale.	Yields small to moderate supplies for domestic and farm use. Quality is generally good. Areal extent has not been determined.
				Tallahatta formation: Basic City shale member	Et	50-115	Beds of claystone, siltstone, and clay and thin layers of sandstone; carbonaceous and white shale inter-bedded with silt and sand is found in northern part of the region.	In northern part of region supplies water to shallow wells for domestic and farm use. Not an aquifer in the southern part of region.
				Tallahatta formation: Meridian sand member	Etm	0-125+	Massive to crossbedded medium to coarse micaceous sand, locally lignitic and shaly.	A highly productive aquifer yielding large quantities of excellent water for municipal and industrial uses to deep artesian wells in western part of region. Water is soft and requires little or no treatment.
			Wilcox	Undifferentiated rocks	Ew	400-1,000	Sand, shale, silt, and clay, variably lignitic; very lenticular and irregular except for a fairly persistent bed of medium to very coarse sand near the base.	Generally yields moderate to large supplies. The basal sand is highly productive and is the source for many large-capacity wells for industrial, municipal, and farm uses. Quality is excellent, but locally water may be high in iron.

Table 1.—(Continued)

Era	System	Series	Group	Stratigraphic unit	Symbol	Thickness (feet)	Lithologic character	Water-bearing properties
Cenozoic	Tertiary	Paleocene	Midway	Naheola formation	Pan	100±	Laminated fine-to medium-grained yellow and gray sand, sandy clay, and dark clay.	Locally furnishes fair supply of water to dug or shallow bored wells for domestic and farm use. Not known to yield large supplies.
				Porters Creek clay	Pap	200-500	Hard blue to black massive clay; sandy marl in upper 10 feet. Includes the Tippah sand lentil in Tippah County.	Not considered an aquifer. The Tippah sand lentil may be a source of water supply for a few shallow dug or bored wells in Tippah County.
				Clayton formation	Pac	30±	Yellowish fossiliferous limestone and marl; sandy glauconitic marl in places.	Not known to be a source of water supply in Mississippi.
Mesozoic	Upper Cretaceous	Gulf	Selma	Prairie Bluff Chalk and Owl Creek formation	Ksp	50±	Prairie Bluff chalk is a hard, brittle fossiliferous chalk. Northward from Union County it grades into the Owl Creek formation, a very fossiliferous sandy marl.	Relatively impervious and not known to be a source of water supply in Mississippi.
				Ripley formation	Ksr	50-300	Compact to loose sand, sandstone, and sandy limestone. Sand is fine to coarse grained, micaceous, glauconitic, and calcareous; includes interbedded clay and sandy laminated clay. A sandy cavernous limestone occurs at the top of the section in northern part of region. South of Clay County the entire formation thins and becomes increasingly calcareous.	Abundantly water bearing north of southern Chickasaw County; furnishes moderately hard to hard water of low to moderate mineral content to many shallow and deep artesian wells for domestic and farm use and for several towns. Water becomes softer with increasing depth. Yields little or no water south of Clay County. McNairy sand member is an important aquifer in Tippah County.
				Demopolis chalk Mooreville chalk Coffee sand	Ksd Ksm Ksc	700±	Range from pure chalk and limestone to very argillaceous and sandy chalk. The Coffee sand, northward from central Lee County, is a fine-to medium-grained calcareous, glauconitic sand.	The Demopolis and Mooreville chalks are relatively impermeable and yield little or no ground water. The Coffee sand yields small to moderate supplies to many drilled domestic and farm wells and larger supplies to a few industrial and municipal wells. Not important as an aquifer south of central Lee and Pontotoc Counties.
				Eutaw formation: Tombigbee sand member (Ket) at top. Otherwise undifferentiated.	Ke	200-400	Massive and crossbedded sand, fine-to medium-grained, glauconitic, calcareous, and micaceous; gray clay and shale, in places lignitic and bentonitic; laminated sand and clay in lower part.	A very good aquifer of major importance; supplies water of excellent quality to drilled artesian wells in central part of region; water is moderately hard in northern part of region and moderately to highly mineralized in the southern and downdip parts, particularly in Kemper County. Locally may be comparatively high in fluoride.

Table 1.—(Continued)

Era	System	Series	Group	Stratigraphic unit	Symbol	Thickness (feet)	Lithologic character	Water-bearing properties
Mesozoic	Upper Cretaceous	Gulf	Tuscaloosa	Gordo formation	Ktg	0-400+	Irregularly bedded clay, shale, sand, and gravel; top part usually marked by pink or red clay. Chert gravel and coarse sand make up basal part of formation. Not present in extreme northern counties west of Alcorn and Prentiss Counties.	An excellent aquifer of major importance; supplies moderate to large quantities of water of generally excellent quality to drilled artesian wells; iron is troublesome in shallower updip areas. Furnishes water supplies for many municipalities and industries. Water is brackish in extreme southern part of area. Downdip limit of potable water not known.
				Coker formation	Ktc	800±	Beds of clay, shale, and sand; a thick basal bed of medium-to-coarse-grained sand and gravel is present in southern part of the region. Northward from Noxubee County and in updip direction, basal sand thins, becomes shaly, or is overlapped by sandy clay, shale, and sand.	Basal sand yields large supplies of water to artesian wells for municipal and industrial uses in Noxubee County; natural flows up to 250 gpm were measured from a supply well at Macon when drilled. Water is soft and of excellent chemical quality. Developed for public use as far west as Vardaman, Calhoun County. Potentially a valuable source of large water supplies in other parts of northeastern Mississippi.
	Lower Cretaceous	Comanchean		Undifferentiated rocks	Klc	0-?	A wedge of buried rocks penetrated by several oil test wells in the area from northern Oktibbeha and southern Monroe Counties southward, and considered by most geologists to be of Early Cretaceous age. Consists of calcareous clay, shale, sand, and quartz and chert gravel. These rocks, presumably overlapped by beds of the Tuscaloosa group, are present south of a line running from southern Monroe County through central Chickasaw, Calhoun, Yalobusha, and Tallahatchie Counties.	No water-supply wells are known to penetrate to these rocks. Data from oil test drillings, however, indicate that large fresh-water reserves may be present in them, at least locally and especially where sands and gravels of the Tuscaloosa group may be in hydraulic connection with the sands of the Lower Cretaceous. Downdip extent of potable water, if any is present, is not known.
Paleozoic	Devonian, Mississippian, and Pennsylvanian			Undifferentiated rocks	P	1,000±	Sandstone, chert, shaly and oolitic limestone, and varicolored clay. Encountered in wells in several counties in northeastern part of the State, but exposed only in the northeast corner.	Part of municipal supply at Corinth is obtained from wells in a light-gray chert, probably Devonian in age; supply wells at Gulf Interstate Gas Co. northeast of Corinth also derive water from the same type of formation. At Gattman, Monroe County, on the Alabama line, a 623-foot artesian well yields water of excellent quality from sandstone of probable Pennsylvanian age. Many shallow and deep domestic and farm wells in a belt along the Tennessee River yield water from various Paleozoic rocks. Electric logs of borings for oil indicate the possibility of unused aquifers in these beds throughout all or parts of several counties in northeastern Mississippi.

WATER-BEARING FORMATIONS

Paleozoic rocks, consisting of sandstone, chert, limestone, and clay, are known to be utilized as sources of public and industrial ground-water supplies at Corinth and at the Gulf Interstate Gas Co. station, Alcorn County. A 623-foot well at Gattman, Monroe County, yields water of excellent quality from Paleozoic sandstone, probably of Pennsylvanian age, to supply a few families. The well formerly supplied water for locomotive boilers. Many domestic and farm supplies in a belt along the Tennessee River are derived from wells in Paleozoic rocks. The water is of good quality. Although the water bearing capacities of the various Paleozoic formations are not well known so far as the large municipal or industrial supplies are concerned, electric logs of borings for oil and gas indicate that several untouched or practically untouched aquifers in them await development in all or parts of several counties in northeastern Mississippi.

Lower Cretaceous (Comanche) rocks do not crop out in Mississippi; they are overlapped by younger Upper Cretaceous sediments. They have been penetrated by several borings for oil south of a line running from southern Monroe and Chickasaw Counties through central Calhoun, Yalobusha, and Tallahatchie Counties, according to Nunnally and Fowler (1954). The deposits are not present throughout most or all of the 13 counties lying north of that line. Where present, the Lower Cretaceous beds in the area of discussion are unconformably overlain by the basal conglomeratic sands of the Tuscaloosa group. The Lower Cretaceous rocks were extensively eroded and in many places south of the line mentioned were completely removed or left as remnants prior to the deposition of the Tuscaloosa. The sediments may be present in wells Yalobusha 8 and 9 and Grenada 1 on Plate 1; however, no attempt was made here to separate them from the Tuscaloosa group because little or no hydrologic importance is attached to their exact correlation.

No water wells are known to penetrate the Lower Cretaceous rocks. Because of their depth and the fact that sufficient water has been found available in overlying formations to date, no testing has been attempted for development of water supplies from the deeper rocks. Electric logs indicate large fresh-water reserves in thick beds of sand and gravel in the Lower Cretaceous in some places. Thus a belt extending across parts of southern Lowndes and northern Noxubee Counties into Oktibbeha and Clay Counties and possibly farther to the northwest and southeast may contain large artesian aquifers. This could be true especially where sandy Lower Cretaceous deposits are in contact with sand and gravel of the overlying Tuscaloosa group. The extent downdip, as well as along the strike, of possible potable water in the Lower Cretaceous is not known; this will be revealed by future test drilling, sampling, and water analysis.

For convenience in summarizing the geologic sources of major ground water supplies in Upper Cretaceous and younger rocks, the region of the report has been divided into several subdivisions as shown in Figure 6. The most important sources of ground water are sands of the Tuscaloosa group, the Eutaw formation, the Coffee sand, and the Ripley formation, all of Late Cretaceous age, in the eastern and central parts of the region; and sands of the Wilcox and Claiborne groups of Tertiary age in the south-central and western parts. In addition to showing the approximate areal extent of each of the major geologic sources of water, Figure 6 shows the location of towns and cities that derive water supplies from them.

Upper Cretaceous (Gulf) rocks contain some of the most productive water-bearing units in the region. Sand and gravel of the Tuscaloosa group have been developed as a source of water for 19 public supplies and at least 10 industrial plants. Sands in the Eutaw formation have been developed for 22 public supplies and 10 industries. The Ripley formation furnishes water for about 8 public and industrial supplies in or adjacent to the outcrop in the north-central part of the report area from the Tennessee line southward to Houston, Miss. The Ripley does not contain permeable water-bearing beds south of the southern part of Chickasaw County.

The Coffee sand, which does not extend as an aquifer south of the latitude of west-central Lee County, is the source of water supply for several industries and smaller communities in the subdivisions shown on Figure 6 as "Eutaw formation and Coffee sand." It is a fine to medium quartz sand which, according to Mellen (1958), gives way abruptly to deposits of argillaceous silty chalk or marl equivalent to the typical lower part of the Selma group. The Coffee sand has been developed in a few wells

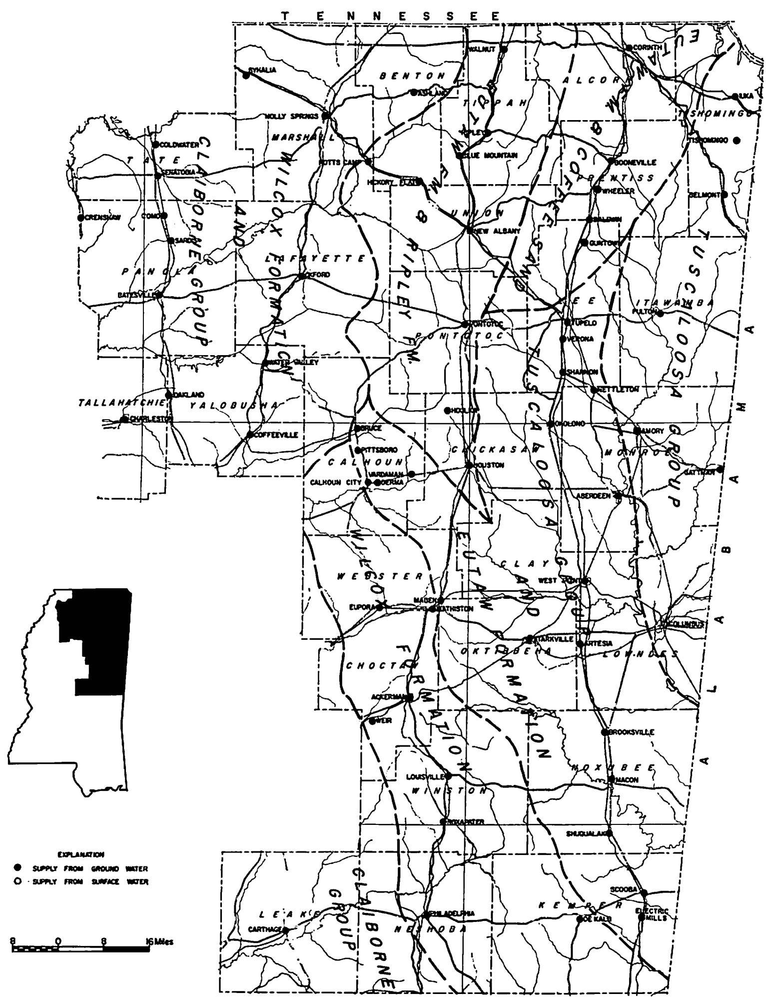

FIGURE 6.—GEOLOGIC SOURCES OF MAJOR GROUND-WATER SUPPLIES IN A PART OF NORTHERN MISSISSIPPI

as far west as New Albany and Ripley. Several water supplies are derived from more than one geologic formation. For example, at New Albany the municipal supply comes from the Eutaw formation, whereas most of the industrial supplies come from the Ripley formation and the Coffee sand; and at Houston the municipal supply is derived from sands in both the Eutaw and Ripley formations.

In the belt lying along the Alabama line (Figure 6), all the ground water used for public and industrial supplies, except at Gattman, is obtained from sand and gravel of the Tuscaloosa group. In the vicinity of Columbus, the Columbus Air Force Base, a chemical plant, and several other industrial plants use a total daily average of about 5 million gallons. A plentiful supply of water was developed in 1957-58 at a chemical plant between Columbus and Aberdeen from four wells ranging in depth from 405 to 423 feet in the Tuscaloosa. The natural flow ranged from 500 to 800 gpm. During performance tests, while the wells were being pumped at the rate of 1,000 gpm, the drawdown in them ranged from 30 to 60 feet. Except for iron in solution, which exists in considerable amounts in places in the northern half of this belt, the water from the Tuscaloosa is soft and of excellent quality.

In the adjoining subdivisions on the west and southwest (Figure 6), both the sands and gravels of the Tuscaloosa group and sands of the Eutaw formation are the sources of the major water supplies. The largest municipal development from Cretaceous sands are found in this belt, among which are those at Aberdeen, New Albany, Macon, Starkville, and Tupelo. At Tupelo, for example, an average of 1,725,000 gpd is pumped from 9 wells in the Eutaw formation to supply the city, and in addition several private wells and a U. S. Fish and Wildlife station obtain water supplies from the formation. At Macon, Noxubee County, soft water of excellent quality flows or is pumped from 3 wells about 1,800 feet deep in the Coker formation at the base of the Tuscaloosa group. When drilled in 1954 one of the wells flowed at the rate of 250 gpm. In other parts of the area where the Coker is present it has not been developed because good water-bearing formations are generally available at shallower depths. It is not known how far downdip potable water exists in the Coker. South of Macon, in southern Noxubee and eastern Kemper Counties, the ground water in the Eutaw formation and

Tuscaloosa group becomes increasingly high in dissolved solids, and at Scooba it is unsuited for some uses. (See Scooba, Kemper County, in "Water-Supply Information by Counties.") Throughout the remainder of this subdivision the ground-water in the Cretaceous aquifers is generally of good quality and soft.

Some of the deepest public-supply wells in Mississippi have been put down at Calhoun City, Derma, Maben, Sturgis, and Vardaman along the west edge of the subdivision (Figure 6), where wells ranging in depth from 1,900 to 2,166 feet have been developed in sands of the Tuscaloosa group. These wells are about 50 miles downdip from the outcrop of the water-bearing sands. Water rises under artesian head to within 40 to 60 feet of the surface at Calhoun City and Derma, respectively and yields of the wells range from 100 to 200 gallons a minute each. Analyses show the water to be very soft. The range in dissolved solids is from 500 to 641 parts per million. The quality is considerably better than that of water in the shallower sands of the Eutaw formation.

In the area immediately north of the locality of Tupelo and extending to the Tennessee line, the Eutaw formation and the Coffee sand (Figure 6) contain the most important aquifers. Sands of the Eutaw furnish all the water supplies for Baldwyn and Booneville and a part of the supply for Corinth, as well as many private domestic and some industrial supplies of the area. The Coffee sand of the lower part of the Selma group yields small to moderate water supplies to many drilled domestic and farm wells and a few of the smaller public and industrial wells. Both the Eutaw formation and the Coffee sand offer good possibilities for additional development of medium to fairly large supplies of soft to moderately hard water. A large area bordering the above subdivision on the west and southwest derives water supplies mostly from sands in the Ripley and Eutaw formations. (Figure 6). In addition, the Coffee sand furnishes water for the Tennessee Gas Transmission Co. station north of New Albany and offers possibilities for further development of water supplies, particularly between New Albany and the Tennessee line. In quality, water from the Ripley in the latitude of Walnut has a moderate mineral content and is hard, ranging in hardness from 156 to 170 parts per million in samples analyzed; the water from the Eutaw is softer, ranging from 112 to 121 ppm in the samples analyzed. Water in the Ripley becomes considerably softer downdip, and at Hickory Flat and Potts Camp the hardness is only 39 and 20 ppm respectively.

Tertiary formations are developed for 26 public water supplies, and sands of these formations constitute the source of ground-water supply in all or parts of 14 counties in the western part of the region. Because the history of deposition of the formations is so complicated, involving several advances and retreats of the sea and resulting in the gradation of marine beds into beds of continental origin, the formations have not everywhere been satisfactorily differentiated one from the other. Consequently, most correlations have been based on lithologic similarity, certain characteristics on electric logs, and field relationships.

At Philadelphia, Neshoba County, a 782-foot city well yields water from sands in the lower part of the Wilcox group and had a reported yield when drilled of 730 gpm. At Noxapater and Louisville, Winston County, the city-owned wells are in sands of the same age and have yields ranging from 350 to 700 gpm each. The supply wells at Ackerman, Choctaw County, and Eupora, Webster County, are probably in the middle and lower parts of the Wilcox. Two wells in sands of the lower part of the Wilcox group at Batesville, Panola County, 1,034 and 1,036 feet deep, yield 200 and 500 gpm of very soft water. A 1,420-foot well at Crenshaw, also in Panola County and in sands of the lower part of the Wilcox group, had a flow of 200 gpm in 1954.

At Carthage, Leake County, the two municipal wells are 602 and 612 feet deep in the Meridian sand member of the Tallahatta formation and have yields of about 200 and 400 gpm. The water from each of the supply wells is of excellent quality and very soft. In the northwestern part of the area, in Lafayette, Marshall, Panola, and Yalobusha Counties and eastern Tallahatchie and Tate Counties, the principal source of water supply is the Meridian sand member. At Water Valley, Yalobusha County, wells only 75 to 80 feet deep in the Meridian sand member yield 500 to 800 gpm each of excellent soft water. At Holly Springs, Marshall County, wells 340 to 360 feet deep in the Meridian sand member yield 500 to 700 gpm each; the analyses of a water sample shows a dissolved-solids content of 158 ppm and a hardness of 54 ppm. The municipal wells at Charleston, Tallahatchie

County, are 560 feet deep, penetrate the Meridian sand member, and are pumped at rates up to 500 gpm.

Many privately owned deep artesian wells are found along the foot of the Bluff Hills in Panola and Tallahatchie Counties, which penetrate to the soft waters in the Meridian sand member or sands in the lower part of the Wilcox group. Data on many wells in the Yazoo Delta part of this region are given in a report by Brown (1947) on the geology and artesian water of the alluvial plain in northwestern Mississippi.

Wells in Panola County that range in depth from 177 feet at Como and about 220 feet at Sardis, to 620 feet at the Tennessee Gas Transmission Co. plant 8 miles west of Batesville, are in sands of the lower part of the Claiborne group. The Sparta (Kosciusko) sand of the upper part of the Claiborne group is a very important source of ground-water supply in the central and western parts of Tate County and the northern and western parts of Panola County. The municipalities of Como, Coldwater, and Senatobia obtain water supplies from the Sparta, as do many plantations and smaller farms. At Senatobia, a 140-foot well installed in 1958 has a yield of 550 gpm; the water has a concentration of dissolved solids of 94 ppm and a hardness of 41 ppm.

A small part of the report region, lying at the foot of the Bluff Hills in western Panola and Tallahatchie Counties, is underlain by the shallow alluvium of the Yazoo Delta (Figure 5). The very permeable sand and gravel yield large quantities of water to wells. The water, which is of the calcium bicarbonate type, is hard and contains a concentration of dissolved solids ranging from about 250 to 400 ppm. The relatively low and nearly constant year-round temperature of the water (about 63° to 64°F makes it especially suitable for air conditioning and other heat-exchange uses.

Table 1 briefly summarizes the water-bearing properties of the different geologic formations in northern Mississippi and Table 3 gives information on the significance of common minerals in solution and physical properties of the waters. Details about individual supplies are given in the section "Water-Supply Information by Counties" and in Table 5.

SURFACE WATER

The future wise utilization, development, and conservation of water resources in Mississippi requires a better understanding of the basic interrelations of ground water and surface water. Seasonal changes in ground-water levels and river stages are related to precipitation as well as to water developments.

An adequate supply of either ground water or surface water, or both, is often a prime requisite in the selection of sites for industrial plants. Efficient use of the water resources in northern and northeastern Mississippi, including the proper planning of storage facilities and the disposal of floodwaters, requires adequate knowledge of the quantity and quality of those resources. For this reason there is presented here, in addition to the ground-water information, some of the results of streamflow investigations.

The average annual precipitation in the region covered by this report is about 51 inches. Late summer and early autumn are usually the driest seasons, and winter and early spring the wettest. March, with an average rainfall of about 5½ inches, is ordinarily the wettest month; and October, with an average of about 2½ inches is the driest. The distribution of streamflow during the year is closely related to the rainfall pattern. Streamflow is highest in winter and early spring and lowest in late summer and autumn.

The northeastern part of the region is drained by the Tennessee, Tuscumbia, and Hatchie Rivers; the north-central part by the Coldwater, Tallahatchie, Yalobusha, and Yocona Rivers (all tributaries of the Yazoo) and by the Big Black River; water in all these streams reaches the Gulf of Mexico by way of the Mississippi River. The eastern and southern parts of the region are drained by the Tombigbee and Pearl Rivers, which flow directly to the Gulf. During periods of high rainfall the rivers commonly overflow, and drainage and flood protection are of primary concern along most of the streams.

Overland runoff during periods of intensive rain represents a very substantial part of the precipitation on the watersheds in the region. Ponds built by private landowners and a few lakes, such as Choctaw Lake in Choctaw County and Bluff Lake

15 miles northwest of Macon, store a small percentage of the runoff and provide recreational opportunities. The four principal reservoirs in Mississippi are in the hills just above the Yazoo Delta area. They are Arkabutla reservoir on the Coldwater River, Sardis reservoir on the Tallahatchie River, Enid reservoir on the Yocona River, and Grenada reservoir on the Yalobusha River (Figure 9). All are in the Yazoo River basin. Built during the period 1939-53 by the Corps of Engineers, U. S. Army, they are designed principally for flood control on the Mississippi alluvial plain (the Delta) in northwestern Mississippi. A secondary benefit derived from the reservoirs is an increased water supply downstream from the dams during the low-flow season, because sufficient water can be released from the reservoirs to maintain larger flows in the streams. In addition, the lake provide fine recreational facilities.

Although the primary purpose of the four reservoirs is flood control, the Corps of Engineers, U. S. Army, has developed a license (following requests made in 1954 to take water from Arkabutla reservoir) which permits the installation of pumping equipment and pipelines to take water from the reservoirs and transport it across Government-owned land that surrounds the reservoirs. Water can be taken from the reservoirs for irrigation, industrial, and other uses down to conservation-pool level. The pumping and release of water through the dams are coordinated so that the levels are drawn down gradually to conservation-pool level only a few weeks before the rainy season, which usually begins about mid-November. Development of water from the reservoirs is subject to approval by the Mississippi Board of Water Commissioners, as is that of all surface waters in the State.

Surface waters are not generally used as a source of water supply in the region of this report, but are used extensively for the disposal and dilution of wastes. In addition, they provide important recreational facilities, and the Tennessee River provides water transportation for the extreme northeastern part of the area (Figure 7). Adequate supplies of ground water for domestic, municipal, and industrial needs can be developed at most places. However, Columbus, the largest city in the area, obtains its water supply, averaging about 2½ million gallons a day, from Luxapalila Creek (Figure 8).

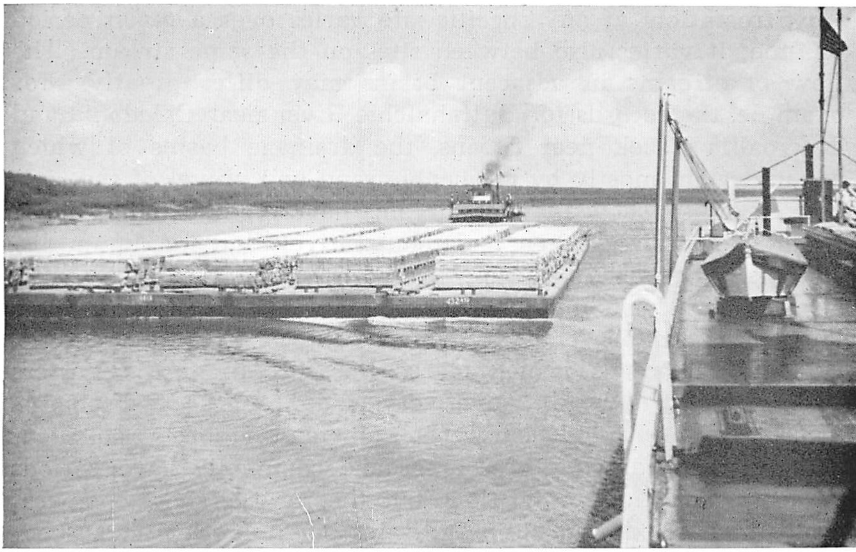

Figure 7.—Tennessee River provides barge transportation and recreational facilities for northeastern Mississippi. Studies are being made of the feasibility of connecting the upper Tombigbee River to the Tennessee by locks to provide water transportation to the Gulf of Mexico. Photo courtesy of Mississippi Agricultural & Industrial Board.

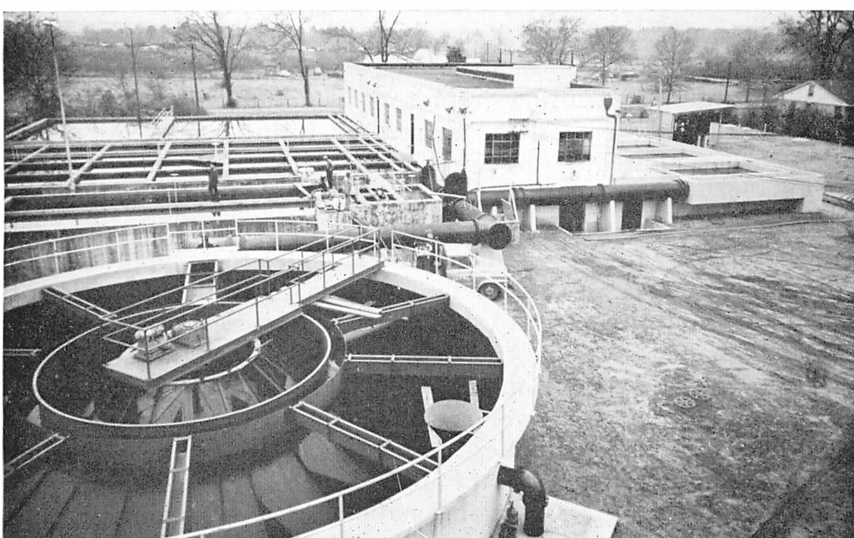

Figure 8.—Modern water-treatment plant at Columbus, Mississippi. Source of supply is Luxapalila Creek. Round basin in foreground is 5-mgd upflow clarifier which, together with four 1-mgd filters at right of building constitute a recent plant expansion. The plant formerly had a 4-mgd capacity. Photo courtesy of Columbus Water Department.

Streamflow at any specific site varies over a given period of time; it varies also between sites on the same stream. The flow of streams in adjacent basins may differ greatly. For example, the records for Buttahatchie River near Caledonia and Luxapalila Creek near Steens, the drainage basins of which are underlain mostly by permeable sand and gravel of the Tuscaloosa group, show that the streams have high sustained flows per unit of drainage area, and comparatively low maximum discharges. (See Table 2, Nos. 15 and 20.) On the other hand, streams that head in the Black Prairies belt, which is underlain by impervious chalk and marly clay of the Selma group, and the Flatwoods, which marks the outcrop of the Porters Creek clay (Figure 5), have very wide ranges of discharge. Chookatonchee Creek near West Point and Tibbee Creek near Tibbee drain parts of these areas and commonly have periods of very small flow or no flow, but the records show comparatively high maximum discharge rates per unit area, and flooding during periods of heavy rains (Table 2, Nos. 17 and 18).

The best simple indication of the amount of water available at any site without storage is the minimum flow of the stream at the site. The average streamflow does not indicate the adequacy of a surface-water supply, and the maximum flows are indicative of flood damage and drainage problems; average and maximum streamflows represent potential sources of supply only if such waters can be stored for future use. Flow-duration curves, plotted by the Surface Water Branch of the Geological Survey where sufficient data have been obtained, are in the open file and show at a glance the percentage of time that the streamflow at a measuring site is equal to or greater than a given value. The substantial flows in many of the streams in this region represent a very valuable resource to be developed and managed wisely, particularly the larger flows such as in Tombigbee River at Columbus and Tallahatchie River at Batesville. In addition, large volumes of surface water could be made available for water supplies at several places by the construction of dams and the necessary appurtenances. Data on minimum flows at several stream-gaging stations in northern Mississippi are available in a report by W. H. Robinson and John Skelton published in 1960 by the Mississippi Board of Water Commissioners. It contains minimum flows by years for periods of 7, 15, 30, 60, 120 and 183 days, which are valuable data for indicating the amount of surface water that could be developed with storage.

Figure 9 shows the location of gaging stations where basic data are available on the flow of streams in the region. Stations have been operated at the sites shown for varying periods of time under cooperative programs with the Mississippi Board of Water Commissioners and other agencies. Detailed basic data have been published in various water-supply papers of the U. S. Geological Survey and in a report of the Mississippi Geological Survey, "Surface Waters of Mississippi," 1950, by I. E. Anderson. Space does not permit including detailed information in this report, therefore, only the averages and extremes of stream discharge are presented.

Table 2 gives the averages and extremes of discharge, in cubic feet per second (cfs), that have occurred during the period of record at the sites shown by reference numbers on the map (Figure 9) and identified in the table. In addition, it gives the drainage area, in square miles, for the basin above each station, the period of record for which data are available, and pertinent remarks. The information given in Table 2 is not comparable in every case because the period of record for many stations is relatively short and the years included vary from station to station. Fortunately, measurements are available for most stations for the extremely dry years 1943 and 1954 and are included in the table. It is not likely that the streamflow will often reach or fall below that recorded during the late summer and in the fall of these years. Likewise, the floods of January 1949, March 1951, and March 1955 were quite severe and probably will seldom be exceeded.

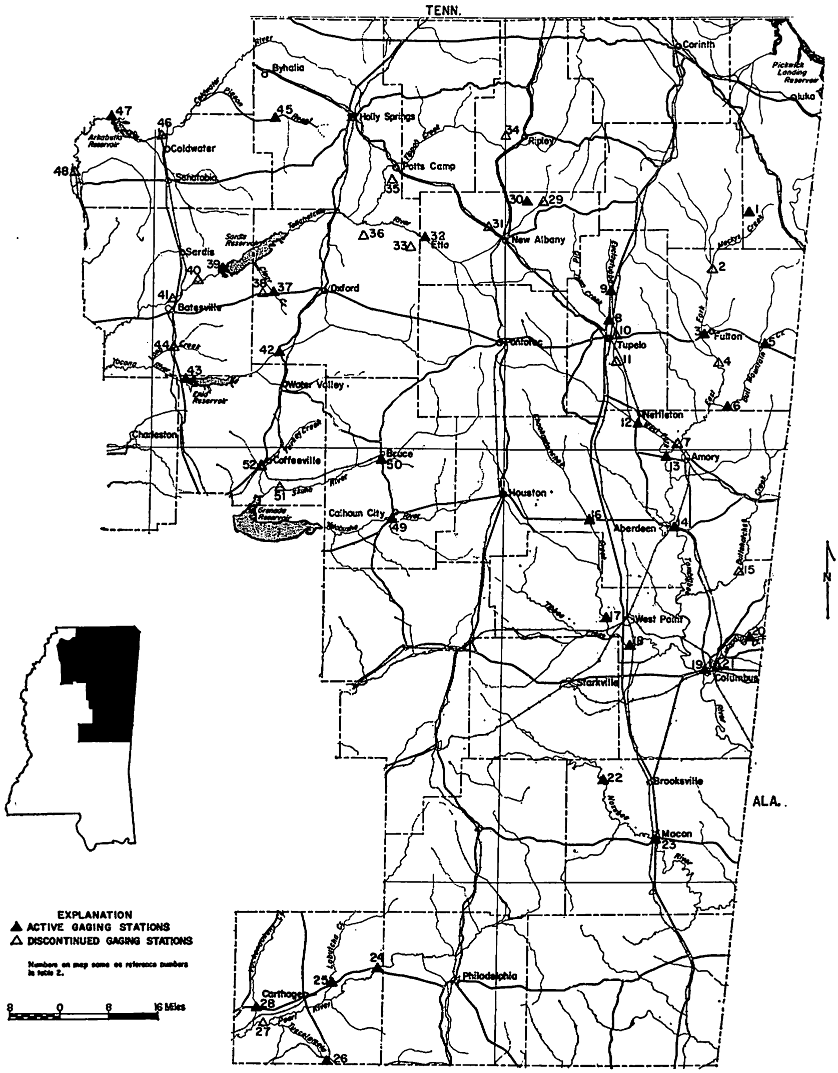

FIGURE 9—LOCATION OF STREAM GAGING STATIONS IN A PART OF NORTHERN MISSISSIPPI

TABLE 2.—SUMMARY OF DATA FROM STREAM-GAGING STATIONS IN A PART OF NORTHERN MISSISSIPPI
(SEE LOCATION MAP, FIG. 9)

Ref. No.	Stream and location	Drainage area (sq. mi.)	Records available[1]	Discharge in cubic feet per second (cfs): Average discharge Years	Average discharge (cfs)	Minimum daily discharge (cfs)	Minimum daily discharge Date	Maximum discharge (cfs)	Maximum discharge Date	Remarks
	TOMBIGBEE RIVER BASIN									
1	Mackys Creek near Dennis	66	1938-58	20	109	8.8	Aug. 22-Sept. 2, 1943	16,300	Mar. 21, 1955	Minimum since 1944.
2	East Fork Tombigbee River near Marietta	305	1938-58	13	502	10	Sept. 3-10, 1954	Not determined	Feb. 13, 1948	Discontinued 1950. (Min. 1943-50).
3	East Fork Tombigbee River near Fulton	605	1928-58	30	908	12	Aug. 31-Sept. 2, 1943	82,200	Mar. 22, 1955	
4	E. Fork Tombigbee River at Beans Ferry near Fulton	699	1937-47	11	1,034	14	Aug. 31-Sept. 1, 1943	30,300	Mar. 29, 1944	Discontinued 1947.
5	Bull Mountain Creek at Tremont	120	1943-58	15	210	5.0	Sept. 13-17, 1954	Not determined	Mar. 21, 1955	
6	Bull Mtn. Creek near Smithville	335	1940-58	18	530	19	Aug. 28-Sept. 3, 1943 Sept. 14, 15, 1954	Not determined	Mar. 22, 1955	
7	East Fork Tombigbee River at Bigbee	1,194	1944-54	10	2,157	39	Sept. 13, 1954	52,800	Feb. 15, 1948	Discontinued 1954.
8	Old Town Creek at Tupelo	112	1944-46 1951-58	9	190	0	Various times	23,000	Mar. 21, 1955	
9	Euclautubba Creek at Saltillo	19.7	1951-58	7	29.4	0	Many days each year	5,750	Mar. 21, 1955	
10	Mud Creek at Tupelo	92	1944-46	2	180	0.2	Oct. 20, 1944	8,610	Feb. 9, 1946	Discontinued 1946.

TABLE 2.—(Continued)

Ref. No.	Stream and location	Drainage area (sq. mi.)	Records available[1]	Discharge in cubic feet per second (cfs)						Remarks
				Average discharge		Minimum daily discharge		Maximum discharge		
				Years	(cfs)	(cfs)	Date	(cfs)	Date	
11	Old Town Creek near Verona	263	1943-47	4	489	2.0	Sept. 27, Oct. 31, Nov. 5, 6, 1944	20,300	Jan. 8, 1946	Discontinued 1947.
12	West Fork Tombigbee River near Nettleton	617	1939-58	19	921	1.0	Sept. 14, 1942	151,000	Mar. 22, 1955	
13	Tombigbee River at Amory	1,941	1937-58	21	3,032	48	Sept. 1, 2, 1943	126,000	Mar. 22, 1955	
14	Tombigbee River at Aberdeen	2,210	1928-58	30	3,129	58	Sept. 1, 1943	106,000	Mar. 23, 1955	
15	Buttahatchee River near Caledonia	823	1928-32 1938-51	17	1,263	79	Aug. 28, 29, 1943	30,800	Jan. 6, 1959	Discontinued 1951.
16	Chookatonchee Creek near Egypt	170	1951-58	7	210	0	Many days each year	Not determined	Mar. 21, 1955	
17	Chookatonchee Creek near West Point	514	1943-46 1948-58	14	786	0	do	45,800	Mar. 29, 1951	
18	Tibbee Creek near Tibbee	928	1928-29 1940-58	19	1,222	0	do	75,200	Mar. 29, 1951	
19	Tombigbee River at Columbus	4,490	1900-04 1905-12 1928-58	41	6,114	140	Sept. 16-20, 1954	148,000	Jan. 7, 1949	
20	Luxapalila Creek at Steens	309	1943-47 1949-58	13	468	24	Aug. 12-14, 1954	12,700	Mar. 30, 1951	
21	Luxapalila Creek near Columbus	726	1928-30	2	1,000	Not determined		17,500	Nov. 15, 1929	Discontinued 1930.

TABLE 2.—(Continued)

Ref. No.	Stream and location	Drainage area (sq. mi.)	Records available[1]	Discharge in cubic feet per second (cfs): Average discharge Years	Average discharge (cfs)	Minimum daily discharge (cfs)	Minimum daily discharge Date	Maximum discharge (cfs)	Maximum discharge Date	Remarks
22	Noxubee River near Brooksville	440	1940-42 1944-58	15	585	0	Various days 1952-54	55,000	Mar. 29, 1951	
23	Noxubee River at Macon	812	1928-32 1938-58	23	894	23	Aug. 26, 1943	52,000	Mar. 30, 1951	
PEARL RIVER BASIN										
24	Pearl River at Edinburg	898	1928-58	30	1,039	2.2	Oct. 5, 1954	31,400	Mar. 8, 1935	
25	Lobutcha Creek near Carthage	313	1937-58	19	391	6.0	Aug. 24-28, 1943	19,100	Mar. 29, 1951	
26	Tuscolameta Creek at Walnut Grove	411	1939-58	19	475	2.7	Oct. 2, 1954	34,600	Jan. 7, 1950	
27	Pearl River at Lena	1,995	1936-53	17	2,371	40	Aug. 27, 28, 1943	46,500	Jan. 8, 1950	Discontinued 1953.
28	Yockanookany River near Ofahoma	484	1943-58	15	662	5.3	Aug. 20, Sept. 11, 1954	20,700	Mar. 31, 1951	
YAZOO RIVER BASIN										
29	Upper Tallahatchie River near New Albany	23.9	1939-41	1	35.2	8.0	Oct. 7, 1940 June 24, 26, 1941	6,700	May 22, 1939	Discontinued 1941.
30	Cane Creek near New Albany	22.2	1939-41 1950-58	9	39.2	0	Sept. 5-7, 1954	8,680	Mar. 21, 1955	
31	Hell Creek near New Albany	27.3	1939, 1941-42	1	30.9	0	At times each year	3,600	June 17, 1939	Discontinued 1942.

TABLE 2.—(Continued)

Ref. No.	Stream and location	Drainage area (sq. mi.)	Records available[1]	Average discharge: Years	Average discharge: (cfs)	Minimum daily discharge: (cfs)	Minimum daily discharge: Date	Maximum discharge: (cfs)	Maximum discharge: Date	Remarks
32	Tallahatchie River at Etta	526	1938-58	20	800	4.1	Oct. 3, 16, 1938	79,000	Mar. 22, 1955	
33	Cypress Creek at Etta	28.5	1939-42	3	25.3	1.5	Oct. 24, 1939	3,920	June 17, 1939	Discontinued 1942.
34	N. Tippah Creek near Ripley	20.0	1939-42	3	17.5	0	At times, Sept., Oct., 1940; July, Aug., Sept., 1942	1,980	Apr. 9, 1942	Do
35	Potts Creek near Potts Camp	8.26	1939-41	1	5.32	0	Many days each year	535	Apr. 4, 1940	Discontinued 1941.
36	Bagley Creek near Abbeville	9.96	1939-41	1	5.72	0.4	Oct. 13, 1939	394	Dec. 15, 1940	Do
37	Clear Creek near Oxford	10.3	1939-41 1950-58	9	14.8	3.0	July 20, 21, 1939	3,980	Apr. 4, 1957	
38	Hudson Creek near Oxford	9.35	1939-41	1	3.58	0.1	Many times	1,550	Jan. 29, 1939	Discontinued 1941.
39	Tallahatchie River at Sardis Dam	1,545	1940-58	18	2,336	0	Many times	5,780	June 24, 1956	Regulated.
40	Tallahatchie River near Sardis	1,680	1928-42	14	2,093	16	Sept. 19, 1942	65,300	Jan. 15, 1932	Discontinued. Regulated since Sept. 1939.
41	Tallahatchie River at Batesville	1,750	1906-13	6	2,621	260	Oct. 11, 1911	14,200	Apr. 20, 1911	Discontinued 1913.
42	Yocona River near Oxford	262	1946-58	12	392	5.5	Sept. 16, 1954	44,100	Mar. 21, 1955	

TABLE 2.—(Continued)

Ref. No.	Stream and location	Drainage area (sq. mi.)	Records available[1]	Discharge in cubic feet per second (cfs): Average discharge Years	Average discharge (cfs)	Minimum daily discharge (cfs)	Minimum daily discharge Date	Maximum discharge (cfs)	Maximum discharge Date	Remarks
43	Yocona River at Enid Dam	560	1928-58	30	836	34 0	Sept. 28, 1931 Many times since 1951	36,300	Feb. 14, 1948	Regulated since 1951.
44	Long Creek near Courtland	63.3	1940-42	2	53.2	1.3	Sept. 23, 1942	13,500	Apr. 9, 1942	Discontinued 1942.
45	Pigeonroost Creek at Byhalia	116	1940-42	2	91.5	18	Oct. 13, 1941	24,500	Apr. 9, 1942	Do
46	Coldwater River near Coldwater	617	1928-42	14	756	69	Sept. 30, 1929	79,500	Jan. 21, 1935	Do
47	Coldwater River at Arkabutla Dam	1,000	1937-58	20	1,376	0	Many times	30,200	Jan. 22, 1938	Regulated since 1942.
48	Coldwater River at Savage	1,225	1908-12 1936-42	10	1,458	0	Many times (backwater)	45,800	Jan. 25, 1937	Discontinued 1942.
49	Yalobusha River at Calhoun City	305	1950-55	5	269	0	Many times each year	23,000	Mar. 29, 1951	
50	Skuna River at Bruce	254	1947-58	11	396	1.0	Aug. 18-20, 1954	61,400	Mar. 21, 1955	
51	Skuna River near Coffeeville	435	1939-49	10	620	6.0	Oct. 4, 5, 1943	44,000	Mar. 29, 1944	Discontinued 1949.
52	Turkey-Cypress Creek near Coffeeville	223	1941-42	1	27.1	1.8	Various times	2,760	Dec. 27, 1942	Discontinued 1942.

Table compiled by Surface Water Branch.
[1]Records incomplete for some of the years listed, Records collected since September 30, 1958, not computed as of February 1960.

WATER QUALITY AND USE

Water is the universal solvent. It can dissolve more different substances in larger quantities than any other solvent. Even before rainfall reaches the ground it has dissolved small amounts of gases and mineral matter from the atmosphere. As soon as the water from rain or melting snow comes in contact with the soil and rocks it begins to dissolve minerals from them. If the water runs off into streams quickly it may dissolve only a small amount of material per unit quantity of water, but if it travels more slowly on the surface or infiltrates to the ground-water reservoirs it takes into solution greater amounts of minerals. Ground water, by the time it is discharged into streams by seeps and springs or is pumped from wells, usually has become more mineralized than water that runs off directly over the surface in storms.

The chemical and physical character of surface water may fluctuate widely whereas that of ground water generally is relatively constant. The amount and kind of dissolved matter contained in ground water differ greatly from place to place as a result of many factors, such as the type of organic material in the soil, the kind of rocks through and over which the water moves, the amount of time of contact with soil or rocks, and the temperature of the water.

The chemical quality of water often is the limiting factor in determining the effective utility or value of a water supply to the consumer. Hardness, which is caused mostly by compounds of calcium and magnesium, generally receives the most attention in waters to be used for industrial and domestic purposes. Water that has a hardness of less than 60 ppm (parts per million) is usually rated as soft and is suitable for many purposes without treatment. Hardness of more than about 120 ppm causes the waste of considerable soap, and it is economically feasible to soften the water for many uses. Most of the analyses included in this report show that the waters sampled have a hardness less than 60 ppm; some show a range from 60 to 120 ppm, and only a few show more than 120 ppm.

For domestic uses a water supply should be clear, pleasant to the taste, neither corrosive nor scale forming, and bacteriologically safe. A few supplies for places recorded in this report contain more than 1,000 ppm of dissolved solids, some of them contain 500 to 1,000 ppm, but most of the supplies have less than 300 ppm and many of them less than 100 ppm. The only nationwide standards for quality of potable water supplies are the Drinking Water Standards of the U. S. Public Health Service (1946). Although they apply only to waters used for drinking and culinary purposes on aircraft, railroads, and carriers in interstate traffic, they have been adopted by the American Water Works Association and by many States as recommended standards for public supplies. A paper by Hem (1959) on applications of quality-of-water data contains, among other things, discussions of the importance of water sampling, aspects of chemical analysis including the units of measurement commonly used, the basic chemistry of constituents and properties of natural waters, and the relationship of quality to water use. A report by Lohr and Love (1954) presents many facts on water quality and discusses the industrial utility of public water supplies in the United States.

Industries use water in many ways, and often quality may be of more concern than quantity, especially if costly treatment is involved. In processing and in the manufacture of high-grade paper and pharmaceuticals, for example, water almost as low in dissolved solids as distilled water is required; and, for certain food processing, water of low concentration of dissolved solids is needed. On the other hand, for certain condensing or cooling uses, or for the concentration of mineral ores, chemical quality is not particularly critical, and almost any water may be used. Uniformity in quality is important, for it not only simplifies treatment, but is of importance in special uses of the water. Constant temperature may be the important consideration for certain industrial plants.

The mineral quality of ground water tends to be relatively uniform, which simplifies any necessary treatment; the two most common objectionable features, high iron content and hardness, usually can be reduced at reasonable cost. Surface water, although generally less mineralized than ground water, may fluctuate widely in quality, principally according to rainfall-runoff and low-flow characteristics. This variation, together with sediment content, complicates the treatment of a surface-water supply. Whereas ground water is of almost constant temperature, surface water generally has a wide range in seasonal fluctuation. In some areas, notably the Louisville area, Kentucky industries have recharged aquifers with cold water taken from surface streams during the winter and then the cool stored water is withdrawn in the summer when the regularly used surface water is too warm.

Table 3 summarizes the source and significance of the common mineral constituents in solution, the physical properties and characteristics of water, and how these affect the public and industrial utility of water. It also very briefly summarizes the common minerals in solution and the physical properties of waters that were sampled in a part of northern Mississippi. Where applicable, the Drinking Water Standards are given for the different chemical constituents described in Table 3.

Information on the chemical composition of the ground water in the region reported on is given in the section of this report entitled "Water-Supply Information by Counties." In addition to the mineral analyses, descriptions are given of the sources of water supply, including the temperature of water from each well where available, and the date of sampling.

TABLE 3.—SIGNIFICANCE OF COMMON MINERALS IN SOLUTION AND PHYSICAL PROPERTIES OF WATER IN A PART OF NORTHERN MISSISSIPPI

Source and significance of mineral constituents

Aluminum (Al).—Although present in many rocks, aluminum precipitates readily. There is no evidence that it affects use of water for most purposes. Acid waters (low pH) often contain greater amounts of aluminum. In boiler feed such water is troublesome in the formation of scale deposit. It is reported here in only a few analyses.

Silica (SiO_2).—Silica, dissolved from practically all rocks, does not affect use of water for domestic purposes. Affects industrial use of water because it contributes to formation of boiler scale and helps cement other scale-forming substances and may cause damage in a short time. Well waters generally contain more silica than surface waters, but no available analysis for this report shows more than 27 ppm; the lowest quantity was about 5 and the average is about 8 ppm.

Iron (Fe).—Iron is dissolved from practically all rocks and soils, and nearly all natural waters contain some iron. Water having a low pH tends to be corrosive and may dissolve iron in objectionable quantities from piping. Iron precipitates on exposure of water to air, forming an insoluble hydrated oxide which results in reddishbrown stains on fixtures and on clothing washed in iron-bearing water. In large amounts iron imparts taste and makes water unsuitable for manufacture of food, paper, ice, and other products. It may cause trouble by supporting growth of iron-depositing bacteria, which clog screens and gravel packing around wells. U. S. Public Health Service standards set a limit of 0.3 ppm of manganese and iron combined for public supplies. Iron can be removed by aeration, sedimentation, and filtration; by precipitation during removal of hardness; or by ion exchange. Municipal and industrial waters sampled contained 0 to 14 ppm of iron.

Calcium (Ca) and Magnesium (Mg).—Calcium and magnesium are dissolved mostly from limestones, dolomite, and calcareous sand, and locally from gypsum, by water containing carbon dioxide. Calcium and magnesium are the principal cause of hardness in water and contribute to the formation of scale in boilers, hot-water heaters, and pipes and to the objectionable curd in the presence of soap. These mineral constituents and hardness greatly affect the value of waters for public and industrial uses. The analyses indicate that the calcium ranged from 0.3 to 74 ppm and the magnesium from 0 to 11 ppm in the waters sampled.

Sodium (Na) and Potassium (K).—Compounds of sodium and potassium are abundant in nature and highly soluble in water. Some ground waters that contain moderate amounts of dissolved material and are hard may, in passing through rock formations, undergo base exchange and become soft at greater depths. Potassium was present in small amounts but sodium was present in amounts above 50 ppm in 33 of the supplies analyzed. Water containing more than 50 ppm of the two combined may cause foaming in boilers; usually not objectionable in drinking water until the quantity is sufficient to affect the taste.

Bicarbonate (HCO_3) and Carbonate (CO_3).—Bicarbonate and carbonate in natural water result from the action of carbon dioxide-bearing waters on rock materials, principally limestone and dolomite. Carbonate is present in only a few natural waters. Three of the analyses presented in this report indicates its presence. Bicarbonate is of little significance in public supplies except in large amounts where taste is affected or where the alkalinity affects the corrosiveness of the water. Large amounts of sodium bicarbonate cause foaming and priming in boilers. Except in 4 samples, the bicarbonate content of the ground waters analyzed did not exceed 300 ppm, and in 90 percent it was less than 200 ppm. Of 18 river-water analyses shown, all but 3 had less than 100 ppm of bicarbonate.

Sulfate (SO_4).—Sulfate is dissolved mostly from soils and beds of shale and gypsum, but some results from the oxidation of sulfides of iron. In combination with calcium and magnesium it contributes to formation of hard scale and affects the use of water for other industrial uses. U. S. Public Health Service Drinking Water Standards recommends a limit of 250 ppm on sulfate. The sulfate content of the water supplies analyzed ranges from 0.2 to 33 ppm except for 1 sample which had 132 ppm. None of the river samples was above 25 ppm in sulfate content.

Chloride (Cl).—Chloride is found in nearly all water in varying amounts. It is dissolved from soils and rocks over or through which the water passes. The chlorides of calcium, magnesium, sodium, and potassium are readily soluble. Drainage from sewage, salt springs, and oil fields and other industrial wastes may add large amounts of chloride to streams and ground-water reservoirs. Small quantities of chloride have little effect on the use of water. Sodium chloride imparts a salty taste which may be detectable when the chloride exceeds 100 ppm, although in some waters 500 ppm may not be noticeable. U. S. Public Health Service Drinking Water Standards recommends a limit of 250 ppm of chloride. Although most of the ground waters analyzed contained only small amounts of chloride, 7 samples contained more than 250 ppm. The river samples contained from 3.0 to 16 ppm of chloride.

Fluoride (F).—In nature fluoride occurs in the minerals fluorspar and cryolite, as well as in other fluoride-bearing minerals. Most natural water contains a little fluoride. U. S. Public Health Service Drinking Water Standards set a limit of 1.5 ppm of fluoride; in larger amounts it may cause mottling of children's teeth, according to Dean (1936). Water having about 1 ppm of flouride may substantially reduce tooth decay in children who have used the water during calcification of teeth. Flouride content may be of little importance in industrial use of water. Of 90 ground-water samples analyzed for flouride, 17 contained no fluoride and 70 contained 0.1 ppm or more but less than 1.5 ppm; 3 samples from the Eutaw formation contained 2.0, 4.0, and 5.0 ppm. The fluoride content for 18 river samples ranged from 0.1 to 0.5 ppm.

Nitrate (NO_3).—Nitrate in water represents the final oxidation product of organic nitrogen compounds. Its presence may indicate pollution, and in high concentration it may be an indicator of sewage or other organic matter. In amounts less than 5 ppm as (NO_3), nitrate has no effect on the value of water for ordinary uses. A National Research Council report by Maxcy (1950) concludes that nitrate content in excess of 44 ppm should be regarded as unsafe for infant feeding. It may be a contributing factor to nitrate cyanosis ("blue-baby disease") in such unusual amounts. The ground-water analyses presented range in nitrate content from 0 to 8.8 ppm, except for water from 3 wells which contained 15, 17, and 41 ppm. Analyses for 18 river samples show a range in nitrate from 0 to 4.1 ppm.

Dissolved solids.—The dissolved solids represents the total quantity of dissolved mineral constituents, and includes any organic matter present and some water of crystallization. The amount and character of the solids depend on the solubility and type of rocks with which the water has been in contact. The taste of the water often is affected by the amount of dissolved solids. The Drinking Water Standards set a limit of 500 ppm as satisfactory for most domestic uses, although if such water is not available 1,000 ppm may be permitted. The dissolved solids reported here ranged from 20 to 500 ppm, except for 11 samples which ranged from 530 to 1,080 ppm, all but one being from deep wells in the Eutaw formation.

Physical properties and characteristics

Color.—Color refers to the appearance of water that is free of suspended matter. It results almost entirely from extraction of coloring matter from decaying organic materials such as roots and leaves in bodies of surface waters or in the ground. Natural color of 10 units or less usually goes unnoticed and even in larger amounts is harmless for drinking. Color is objectionable in the use of water for many industrial purposes. It may be removed from water by coagulation, sedimentation, and filtration. Of 86 analyses of ground water given, 78 show a color range from 0 to 10; the highest was 45. For 18 surface-water samples, 8 show a range from 5 to 10, and the highest was 70.

Hydrogen-ion concentration (pH).—The hydrogen-ion concentration of water, expressed as the pH, is a measure of the relative acidity or alkalinity. A pH of 7.0 indicates a neutral water. Values progressively lower than 7.0 denote increasing acidity, and those above 7.0 denote increasing alkalinity. The pH indicates the activity of the water toward metal—as it increases the corrosiveness normally decreases, although excessively alkaline water may be corrosive to some metal surfaces. The pH values of public supplies have an important bearing on the utility of the supplies for many industrial purposes.

Specific conductance (micromhos at 25° C).—Specific conductance is a measure of the ability of a water to conduct an electric current, and furnishes a rough measure of the mineral content of the water. It gives no indication of the relative quantities of the different constituents in solution. It is useful in making comparisons of the estimated total mineral content of different waters, and of following changes in the total minerals in water in a stream through a series of samples.

Turbidity.—Water turbidity is attributable to suspended matter such as clay, silt, fine fragments of organic matter, and similar material. It shows up as a cloudy effect in water and for this reason alone is objectionable in domestic and many industrial water supplies. Filtered waters are free from noticeable turbidity. Unfiltered supplies, including those that contain enough iron to give an appreciable precipitate on exposure to air, may show turbidity. In surface-water supplies turbidity is usually a more variable quantity than dissolved solids.

Temperature.—The temperatures shown in the analyses are in degrees Fahrenheit and represent the temperature of the water at the time of sampling. Most measurements were made at the well head after sufficient water had been withdrawn to represent the approximate formation temperature. Ground water in a given locality is generally of constant temperature, varying but very little during the year. The average temperature at depths of a few tens of feet generally is about the same as the mean annual air temperature. It increases with depth at the rate of about 1 degree for each 50 to 100 feet. The temperature of surface water fluctuates widely.

Corrosiveness.—A water that has the property of aggressiveness to metal is said to be corrosive. It frequently results in "red water" caused by solution of iron; not all "red water," however, may be the result of corrosion. Water from some formations contains considerable iron in solution which, on being exposed to the air, precipitates readily and gives a red-water effect. Agents capable of causing corrosion are acids including carbonic and oxygen, and hydrogen sulfide which, together with a low pH, support electro-chemical processes that cause deterioration of water pipes, steam boilers, and water-heating equipment. Preventive measures involve the problem of controlling these active agents or minimizing their effects, and includes maintaining proper alkalinity, pH, and stability in the treated water. Cathode protection inside steel reservoirs and protective coating on metal surfaces also are methods in use for protection against corrosion. Free carbon dioxide and other gases normally are removed by aeration and, if necessary, neutralized by the addition of either lime or soda ash.

Hardness.—In the development of a water supply for industrial or domestic uses, hardness is one of the most important single factors to be considered. It is caused principally by the sum of calcium and magnesium in solution and is generally reported as the amount of calcium carbonate equivalent to the calcium and magnesium. Carbonate hardness, as shown in the analyses, refers to hardness caused by the calcium and magnesium equivalent to the bicarbonate and is called "temporary" hardness, as it can be removed by boiling the water. "Permanent" or noncarbonate hardness is caused by the combination of calcium and magnesium with sulfate, chloride, and nitrate. Scale caused by carbonate hardness usually is porous and easily removed, but that caused by noncarbonate hardness is hard and difficult to remove. Hardness is usually recognized in water by the increased quantity of soap required to make a permanent lather, and as it increases, soap consumption rises sharply. It results in the formation of objectionable curd as soap is used.

Water having a hardness of less than 60 ppm, expressed as $CaCO_3$, is generally recognized as soft and suitable for ordinary use. Water having a hardness of 60 to 120 ppm is considered moderately hard, but still usable without need for softening except for certain industrial applications and laundering. Water having a hardness of more than 120 ppm is considered hard. Of the 123 ground-water analyses presented, 88 fall within the range of soft water (less than 60 ppm) and 11 are classed as hard waters (above 120 ppm); the highest value was 208 ppm for water from a well in the Ripley formation. Of the 18 river-water samples, 12 were soft, 3 moderately hard, and 3 hard, the harder waters being from streams draining the outcrop of the Ripley formation.

Table 4 gives the information available on the quality of the surface waters. Descriptions and chemical analyses of samples collected at different rates of streamflow are shown for six sampling sites. Except for Tallahatchie River at Sardis Dam (39), the sampling for October 1958 was during a period of base flow when here was only a small amount of direct runoff, the June 1959 sampling was done when surface runoff was moderately large, and the March sampling during a period when storm waters constituted most of the streamflow. The comparatively high concentrations of dissolved solids and high hardness of the samples collected from West Fork Tombigbee River near Nettleton may indicate that wastes are discharged into the streams above the sampling site. Too, the concentrations may be in the spring water in the tributary streams from the west and northwest that discharges from a part of the Ripley formation, which is known to contain comparatively hard water in some places.

The analyses given in this report (see Table 4 and "Water-Supply Information by Counties") show the dissolved mineral constituents that determine the fitness of the water for industrial, agricultural, and domestic uses without reference to the bacteriological conditions. Most analyses were made by laboratories of the U. S. Geological Survey, by methods in general use. Analyses from other sources also were used as indicated, and the names of the laboratories making or furnishing the analyses are given for the individual supplies or samples. Quantities of dissolved substances are reported in parts per million; color, temperature, pH, and specific conductance are reported in standard units as indicated.

TABLE 4.—CHEMICAL ANALYSES OF WATER SAMPLES FROM STREAMS IN A PART OF NORTHERN MISSISSIPPI
(ANALYTICAL RESULTS IN PARTS PER MILLION, EXCEPT AS INDICATED)
(ANALYSES BY U. S. GEOLOGICAL SURVEY)

															Dissolved solids		Hardness as $CaCO_3$				
Date and hour of collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Residue on Evaporation at 180°C	Sum	Calcium Magnesium	Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
East Fork Tombigbee River near Fulton (3)[b]																					
Oct. 20, 1958 (9:10A)	168	59	3.2	0.40	9.2	2.1	2.1	1.5	39	0	2.4	3.2	0.1	0.8	66	44	32	0	84	6.7	14
Mar. 3, 1959 (2:15P)	665	50	1.9	.04	11	.8	2.3	1.0	31	0	7.2	3.5	.2	.0	56	43	31	6	79	6.8	8
June 24, 1959 (11:30A)	185	73	2.6	.11	16	2.3	2.9	1.1	51	0	7.0	4.2	.1	1.3	74	63	50	8	116	7.0	20
West Fork Tombigbee River near Nettleton (12)																					
Oct. 20, 1958 (10:15A)	70	64	3.0	.14	54	4.7	15	0.8	172	0	17	16	.1	2.0	220	198	154	13	339	7.3	15
Mar. 4, 1959 (12:50P)	260	53	1.0	.00	44	2.6	7.8	1.2	120	0	25	9.2	.3	1.3	168	151	120	22	260	7.2	7
June 24, 1959 (3:30P)	152	84	2.0	.00	54	4.1	12	2.1	162	0	21	12	.4	4.1	200	192	152	18	329	7.4	10
Tombigbee River at Columbus (19)																					
Mar. 25, 1958 (1:10P)	10,700	53	3.0	.00	18	2.7	4.0	1.6	58	0	11	4.2	.3	.5	106	74	56	8	137	7.0	15
June 17, 1958 (3:55P)	3,010	79	9.4	.14	15	1.3	3.7	1.8	49	0	4.2	3.8	.5	1.7	80	66	43	3	113	7.0	50
Oct. 20, 1958 (11:45A)	1,080	66	3.3	.35	14	1.9	3.2	1.1	51	0	3.0	4.5	.1	.6	84	57	43	1	97	6.9	14
Noxubee River at Macon (23)																					
Oct. 20, 1958 (1:00P)	78	65	3.2	.32	7.6	1.9	3.1	1.6	34	0	3.1	3.5	.1	.9	45	42	27	0	76	7.0	5
Mar. 2, 1959 (3:40P)	336	52	2.0	.52	13	2.6	5.0	1.3	39	0	15	5.2	.2	.8	84	65	43	11	111	7.0	22
June 25, 1959 (11:05A)	105	80	2.6	.20	11	2.2	4.0	1.3	40	0	7.6	4.0	.1	1.5	70	54	36	4	103	6.8	40
Tallahatchie River at Etta (32)																					
Oct. 22, 1958 (11:20A)	66	68	2.7	.04	29	3.6	6.7	1.4	98	0	12	8.5	.1	.4	128	112	88	7	197	7.4	10
Mar. 30, 1959 (2:15P)	321	57	1.8	.19	23	3.2	5.7	1.0	66	0	18	7.0	.2	.2	116	93	70	16	164	7.3	15
June 3, 1959 (2:40P)	133	83	2.8	.04	24	3.8	6.5	1.5	71	0	20	8.0	.2	.8	122	103	76	18	185	7.1	10
Tallahatchie River at Sardis Dam (39)																					
Oct. 23, 1958 (1:30P)	2,850	69	2.0	.22	4.6	1.5	2.3	2.0	20	0	5.0	3.0	.1	.6	36	31	18	1	52	6.7	5
Mar. 10, 1959 (1:35P)	1,960	53	1.6	.10	7.2	1.4	2.8	2.2	26	0	3.6	3.8	.2	.4	54	36	24	2	69	6.5	5
June 22, 1959 (3:30P)	4,080	80	1.3	.22	7.2	1.6	3.3	1.8	24	0	7.6	4.2	.2	1.2	48	41	24	5	80	6.6	70

[a]Discharges reported are either daily mean discharges or discharges for the time at which samples were collected, computed from a stage-discharge relation or from a measurement.

[b]Reference number in Table 2 and on location map, Fig. 9.

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WATER-SUPPLY INFORMATION BY COUNTIES

Information about the individual public and industrial water supplies in the region of this report is given by counties alphabetically on the pages that follow. In general, representatives of the larger communities and industrial plants were able to furnish the most complete data while some of the smaller localities and plants had limited data. The information presented is itemized in condensed form as follows: population; name of official who supplied data; ownership of waterworks, whether private or municipal; source of supply and amount of water used; facilities for storage and treatment; and chemical analyses and physical properties of the water. A part of the information on pumpage was taken from a 1955 compilation made by the Mississippi Water Policy Commission, but most of it was collected during the period of this survey, 1955-58.

The geologic names given under "Source of supply" were determined from the available geologic data including well records and indicate the geologic source of the ground water. The letter and numeral in parentheses following the formation name and at the head of the columns in the analyses tables form the well numbers and are used to indicate specific wells in Table 5 and on the map, Figure 1.

In addition to the chemical analyses, where available, a description is given which includes color, pH, specific conductance, and temperature. The temperatures are representative of the water from the respective depths and aquifers shown and were measured at the wells when the samples were collected.

The population shown for cities of more than 10,000 is from the preliminary figures of the U. S. Census for 1960. Population figures for towns up to 10,000 were not available from the U. S. Census and were taken from "A Directory of Mississippi Municipalities", compiled in 1957 by the Bureau of Public Administration, University of Mississippi.

ALCORN COUNTY

Corinth. Population: 11,452 (U. S. Census, 1960). Ownership: Municipal.

Source of information: Tom Clifton, water superintendent.

Source of supply: Five drilled wells; one in the Eutaw formation (G4), four in Paleozoic rocks (G1, G3, G5, G18).

Average daily pumpage: 1,000,000 gallons. Storage: Reservoir, 185,000 gallons; elevated tank, 200,000 gallons.

Treatment: Aeration, sedimentation, filtration, softening and chlorination.

Industrial wells: Gulf Interstate Gas Co., 6 miles northeast of Corinth; three drilled wells in Paleozoic rocks (D8).

ANALYSES, IN PARTS PER MILLION, BY U. S. GEOLOGICAL SURVEY

	Gulf Int. Gas Co. Well D8	Composite[a]	Corinth Well G3[b]	Well G18
Aluminum (Al)	----	0.6	----	----
Silica (SiO_2)	----	13	9.7	17.8
Iron (Fe)	0.30	.09	15	Trace
Calcium (Ca)	25	20	8.6	24.09
Magnesium (Mg)	5.3	4.9	2.4	7.38
Sodium (Na)	10	22	2.2	81.65
Potassium (K)	2.8	3.4	4.7	
Bicarbonate (HCO_3)	110	79	38	----
Sulfate (SO_4)	9.4	7.2	8.4	11.85
Chloride (Cl)	5.5	34	1.0	100
Fluoride (F)	.3	.4	.0	.7
Nitrate (NO_3)	.2	.2	.0	----
Dissolved solids	113	146	70	311.32
Hardness as $CACO_3$:				
Total	84	70	31	90
Noncarbonate	0	5	0	----
Color	5	4	5	0
pH	7.6	8.0	6.4	7.4
Specific conductance (micromhos at 25°C)	212	244	89.4	----
Temperature (°F)	----	65	65	----
Date of collection	10-4-56	5-21-51	6-23-54	4-17-59

[a]As delivered to customers from Corinth city water plant.

[b]Sample taken from well before it was deepened and is from the Eutaw formation.

BENTON COUNTY

Ashland. Population: 384. Ownership: Municipal.

Source of information: J. C. Sample.

Source of supply: Two drilled wells in Meridian sand member of Tallahatta formation (H7, H8).

Average daily pumpage: 35,000 gallons. Storage: Elevated tank, 30,000 gallons.

Treatment: Soda-ash.

Hickory Flat. Population: 360. Owner: Roy Hall.

Source of information: Roy Hall.

Source of supply: Three drilled wells in Ripley formation (07-09).

Average daily pumpage: Estimated 30,000 gallons. Storage: Elevated tank, 2,300 gallons.

Treatment: None.

ANALYSES, IN PARTS PER MILLION, BY U. S. GEOLOGICAL SURVEY

	Ashland	Hickory Flat	
	Well H8	Well N1[a]	Well O9
Aluminum (Al)	----	----	----
Silica (SiO_2)	4.4	----	4.9
Iron (Fe)	.04	0.01	.06
Calcium (Ca)	3.3	9.4	9.9
Magnesium (Mg)	1.1	3.0	3.5
Sodium (Na)	5.6	72	52
Potassium (K)	.9	5.0	4.7
Bicarbonate (HCO_3)	10	226	180
Sulfate (SO_4)	.4	4.2	10
Chloride (Cl)	6.2	5.8	1.2
Fluoride (F)	.2	.8	.3
Nitrate (NO_3)	8.8	2.8	2.0
Dissolved solids	52	237	192
Hardness as $CaCO_3$:			
Total	12	36	39
Noncarbonate	4	0	0
Color	3	----	1
pH	6.8	8.2	8.1
Specific conductance (micromhos at 25°C)	54	389	270
Temperature (°F)	----	----	----
Date of collection	11-25-58	7-30-57	11-25-58

[a]G. W. Stanton well, 3 miles west of Hickory Flat; 685 feet deep in Ripley formation.

CALHOUN COUNTY

Bruce. Population: 1,895. Ownership: Municipal.

Source of information: Mr. Mayhan, Supt., E. L. Bruce, Co.

Source of supply: One drilled well in Gordo formation (D2).

Average daily pumpage: 100,000 gallons. Storage: Reservoir, 120,000 gallons; elevated tank, 50,000 gallons.

Treatment: Chlorination.

Industrial wells: E. L. Bruce Lumber Co., one drilled well in Gordo formation (G1). Well G1 supplied water for the town of Bruce until 1959.

Calhoun City. Population: 2,000. Ownership: Municipal.

Source of information: J. M. Robertson, water superintendent.

Source of supply: Two drilled wells in Gordo formation (K1, K101).

Average daily pumpage: 125,000 gallons. Storage: Elevated tank, 50,000 gallons.

Treatment: Fluoridation.

Derma. Population: 500. Ownership: Municipal.

Source of information: Ratliff Drilling Co.

Source of supply: One drilled well in Gordo formation (K4).

Average daily pumpage: 20,000 gallons. Storage: Ground pressure tank, 2,500 gallons.

Treatment: None.

Pittsboro. Population: 275. Ownership: Layne-Central Company.

Source of information: E. Q. Bullard, Mayor.

Source of supply: One drilled well in lower part of Gordo formation (G2).

Average daily pumpage: 120,000 gallons. Storage: Ground pressure tank, 4,000 gallons.

Treatment: None.

Vardaman. Population: 750. Ownership: Municipal.

Source of information: Bob Gable, water superintendent.

Source of supply: Two drilled wells in the Coker formation (L2, L4).

Average daily pumpage: 60,000 gallons. Storage: Elevated tank, 25,000 gallons.

Treatment: None.

ANALYSES, IN PARTS PER MILLION, BY U. S. GEOLOGICAL SURVEY

	Bruce		Calhoun City	
	Well D2	Well G1	Well K1	Well K101
Aluminum (Al)	----	----	----	----
Silica (SiO_2)	7.3	8.9	6.3	10
Iron (Fe)	.12	.19	.00	.49
Calcium (Ca)	14	13	18	13
Magnesium (Mg)	3.5	2.2	1.5	2.1
Sodium (Na)	165	178	202	225
Potassium (K)	7.0	4.1	7.4	4.0
Bicarbonate (HCO_3)	132	148	156	182
Sulfate (SO_4)	.8	.4	.0	.4
Chloride (Cl)	215	230	270	280
Fluoride (F)	.0	.0	.4	.4
Nitrate (NO_3)	.2	.5	.9	.7
Dissolved solids	533	530	667	641
Hardness as $CaCO_3$:				
Total	50	42	51	41
Noncarbonate	0	0	0	0
Color	10	5	5	10
pH	7.5	7.5	7.5	7.7
Specific conductance (micromhos at 25°C)	902	987	1,150	1,210
Temperature (°F)	----	89	----	89
Date of collection	6-11-60	6-25-54	10-2-59	9-8-54

	Derma	Pittsboro	Vardaman	
	Well K4	Well G2	Well L2	Well L4
Aluminum (Al)	----	----	----	----
Silica (SiO_2)	8.1	9.4	6.2	6.8
Iron (Fe)	.10	.33	1.0	0
Calcium (Ca)	19	5.2	20	23
Magnesium (Mg)	3.6	2.3	4.3	3.1
Sodium (Na)	198	206	165	146
Potassium (K)	7.9	5.4	5.1	6.2
Bicarbonate (HCO_3)	150	227	[a]149	140
Sulfate (SO_4)	.4	2.0	1.2	.2
Chloride (Cl)	265	210	210	200
Fluoride (F)	.0	.4	.0	.3
Nitrate (NO_3)	.2	1.4	1.0	1.6
Dissolved solids	629	563	500	495
Hardness as $CaCO_3$:				
Total	62	22	68	70
Noncarbonate	0	0	0	0
Color	5	5	4	5
pH	7.9	7.9	8.5	7.3
Specific conductance (micromhos at 25°C)	1,100	1,020	934	885
Temperature (°F)	89	85	85	86
Date of collection	6-11-60	7-28-55	6-25-54	10-2-59

[a]Includes the equivalent of 7 ppm of carbonate (CO_3).

CHICKASAW COUNTY

Houlka. Population: 700. Ownership: Municipal.
Source of information: A. A. Collum, alderman.
Source of supply: One drilled well in Eutaw formation (B11).
Average daily pumpage: 45,000 gallons. Storage: Pressure tank, 11,000 gallons.
Treatment: None.

Houston. Population: 2,550. Ownership: Municipal.
Source of information: K. B. Davis, water superintendent.
Source of supply: Four drilled wells; two in the Ripley formation (F15, F18), two in the Eutaw formation (F14, F16).
Average daily pumpage: 425,000 gallons. Storage: Reservoir, 150,000 gallons; elevated tank, 75,000 gallons.
Treatment: Chlorination.

Okolona. Population: 2,750. Ownership: Municipal.
Source of information: H. L. Morrison, Mayor.
Source of supply: Six drilled wells in Eutaw formation (D4, D5, D6, D12, D19, D23).
Average daily pumpage: 190,000 gallons. Storage: Reservoir, 150,000 gallons; elevated tank, 110,000 gallons.
Treatment: Chlorination.

ANALYSES, IN PARTS PER MILLION, BY U. S. GEOLOGICAL SURVEY

	Houlka Well B11	Well F14	Houston Well F16	Well F18	Okolona Well D5
Aluminum (Al)	----	----	0.0	----	----
Silica (SiO_2)	8.9	6.2	14	9.5	9.0
Iron (Fe)	.21	.05	.03	1.1	.22
Calcium (Ca)	3.5	5.2	9.0	23	9.7
Magnesium (Mg)	.9	2.0	1.3	12	2.3
Sodium (Na)	102	106	110	130	83
Potassium (K)	2.5	4.3	4.6	6.9	4.0
Bicarbonate (HCO_3)	148	169	168	308	128
Sulfate (SO_4)	3.6	.0	.5	132	3.4
Chloride (Cl)	74	84	96	9.0	77
Fluoride (F)	.4	.4	.2	.9	.4
Nitrate (NO_3)	1.1	2.3	1.9	4.4	.5
Dissolved solids	286	325	315	489	260
Hardness as $CaCO_3$:					
Total	12	21	28	107	34
Noncarbonate	0	0	0	0	0
Color	5	0	2	6	5
pH	7.6	7.8	8.0	7.5	7.3
Specific conductance (micromhos at 25°C)	493	538	565	711	466
Temperature (°F)	74	75	74	----	68
Date of collection	12-3-54	10-2-59	10-27-54	7-18-58	12-2-54

CHOCTAW COUNTY

Ackerman. Population: 1,800. Ownership: Municipal.

Source of information: J. G. Weaver, water superintendent.

Source of supply: Two drilled wells in sands of the Wilcox group, (H1, H2).

Average daily pumpage: 200,000 gallons. Storage: Reservoir, 24,000 gallons; elevated tank, 60,000 gallons.

Treatment: Chlorination, aeration.

Weir. Population: 570. Ownership: Municipal.

Source of information: L. H. Burris, city clerk.

Source of supply: One drilled well in sands of the Wilcox group, (J1).

Average daily pumpage: 32,000 gallons. Storage: Elevated tank, 75,000 gallons.

Treatment: Chlorination.

ANALYSES, IN PARTS PER MILLION, BY U. S. GEOLOGICAL SURVEY

	Ackerman Well H1	Weir Well J1
Aluminum (Al)	----	----
Silica (SiO_2)	9.8	----
Iron (Fe)	.21	0.02
Calcium (Ca)	3.5	4.0
Magnesium (Mg)	1.6	2.1
Sodium (Na)	6.0	5.7
Potassium (K)	1.8	1.0
Bicarbonate (HCO_3)	9.0	16
Sulfate (SO_4)	1.8	.6
Chloride (Cl)	10	12
Fluoride (F)	.1	0
Nitrate (NO_3)	6.3	1.4
Dissolved solids	66	66
Hardness as $CaCO_3$:		
Total	15	19
Noncarbonate	8	6
Color	5	7
pH	5.5	6.0
Specific conductance (micromhos at 25°C)	72.9	72.5
Temperature (°F)	64	64
Date of collection	1-16-57	1-16-57

CLAY COUNTY

West Point. Population: 9,250. Ownership: Municipal.

Source of information: J. H. Millsaps, water superintendent.

Source of supply: Three drilled wells in Eutaw formation (H2-H4).

Average daily pumpage: 700,000 gallons. Storage: Reservoir, 360,000 gallons; elevated tank, 250,000 gallons.

Treatment: None.

Industrial wells: Bryan Brothers Packing Co., three drilled wells, one in Eutaw formation and two in Gordo formation (H9-H11). Sanders Cotton Mill, one drilled well in Eutaw formation (H38).

ANALYSES, IN PARTS PER MILLION, BY U. S. GEOLOGICAL SURVEY

	West Point Well H3	Burgin Bros. Well H12[a]
Aluminum (Al)	----	----
Silica (SiO_2)	5.9	----
Iron (Fe)	.22	0.70
Calcium (Ca)	9.9	8.3
Magnesium (Mg)	2.0	2.4
Sodium (Na)	106	22
Potassium (K)	4.7	5.6
Bicarbonate (HCO_3)	216	90
Sulfate (SO_4)	3.0	3.1
Chloride (Cl)	58	3.0
Fluoride (F)	.5	.3
Nitrate (NO_3)	.0	.7
Dissolved solids	302	108
Hardness as $CaCO_3$:		
Total	32	31
Noncarbonate	0	0
Color	5	40
pH	7.9	7.6
Specific conductance (micromhos at 25°C)	512	157
Temperature (°F)	65	67
Date of collection	11-3-54	11-4-54

[a]Domestic well, 700 feet deep in Gordo formation.

ITAWAMBA COUNTY

Fulton. Population: 2,250. Ownership: Municipal.

Source of information: V. H. Pate, Jr., water superintendent.

Source of supply: Two drilled wells in Gordo formation (G26, G27).

Average daily pumpage: 240,000 gallons. Storage: Reservoir, 100,000 gallons; elevated tank, 90,000 gallons.

Treatment: Chlorination, aeration, filtration.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Fulton	
	Well G26	Well G27
Aluminum (Al)	----	0.6
Silica (SiO_2)	7.7	7.9
Iron (Fe)	5.2	11
Calcium (Ca)	7.4	8.4
Magnesium (Mg)	2.4	1.5
Sodium (Na)	.9	1.5
Potassium (K)	1.4	3.6
Bicarbonate (HCO_3)	30	30
Sulfate (SO_4)	4.4	5.9
Chloride (Cl)	2.0	1.8
Fluoride (F)	.2	.1
Nitrate (NO_3)	.0	.4
Dissolved solids	44	44
Hardness as $CaCO_3$:		
Total	28	27
Noncarbonate	4	2
Color	5	3
pH	6.0	6.3
Specific conductance (micromhos at 25°C)	72.1	68.8
Temperature (°F)	63	63
Date of collection	9-8-54	9-26-54

KEMPER COUNTY

DeKalb. Population: 975. Ownership: Municipal.
Source of information: N. W. Golden, water superintendent.
Source of supply: Flow from several springs collected in reservoir. Town uses about 60% of available flow, (HS1).
Average daily pumpage: 110,000 gallons. Storage: Reservoir, 70,000 gallons; elevated tank, 50,000 gallons.
Treatment: None.

Electric Mills. Population: 1,205. Owner: E. A. Temple.
Source of information: E. A. Temple.
Source of supply: One drilled well in Eutaw formation (K15).
Average daily pumpage: 10,000 gallons, estimated. Storage: Elevated tank, 20,000 gallons, estimated.
Treatment: None.

Scooba. Population: 750. Ownership: Municipal.
Source of information: W. N. Johnson, water superintendent.
Source of supply: Two drilled wells in Eutaw formation (K4, K5).
Average daily pumpage: 80,000 gallons. Storage: Elevated tank, 25,000 gallons.
Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	DeKalb Spring HS1	Electric Mills Well K15	Scooba Well K5
Aluminum (Al)	----	----	----
Silica (SiO_2)	----	----	7.8
Iron (Fe)	0.37	0.21	.30
Calcium (Ca)	1.0	3.2	2.6
Magnesium (Mg)	.4	.6	1.1
Sodium (Na)	1.5	420	383
Potassium (K)	.6	4.8	4.7
Bicarbonate (HCO_3)	5	420	366
Sulfate (SO_4)	1.5	5.4	1.2
Chloride (Cl)	2.0	400	370
Fluoride (F)	.1	4.0	2.0
Nitrate (NO_3)	.2	7.6	.7
Dissolved solids	20	1,080	959
Hardness as $CaCO_3$:			
Total	4	10	11
Noncarbonate	0	0	0
Color	5	5	5
pH	5.7	8.1	8.1
Specific conductance (micromhos at 25°C)	29.7	1,910	1,710
Temperature (°F)	65	75	85
Date of collection	11-4-54	11-4-54	11-4-54

LAFAYETTE COUNTY

Oxford. Population: 6,000. Ownership: Municipal.

Source of information: C. E. Harrison, water superintendent.

Source of supply: Two drilled wells in the Meridian sand member of Tallahatta formation (F7, F8).

Average daily pumpage: 460,000 gallons. Storage: Reservoir, 200,000 gallons; elevated tank, 65,000 gallons.

Treatment: Aeration.

University of Mississippi. Owner: University of Mississippi.

Source of information: J. W. White, Director of Physical Plant.

Source of supply: Three drilled wells in the Meridian sand member of Tallahatta formation (F4-F6).

Average daily pumpage: 540,000 gallons. Storage: Reservoir, 150,000 gallons; elevated tank, 300,000 gallons.

Treatment: Aeration.

ANALYSES, IN PARTS PER MILLION.

	Oxford Well F7[a]	Univ. of Miss. Well F5[b]
Aluminum (Al)	0.0	----
Silica (SiO_2)	13	----
Iron (Fe)	.0	0.0
Calcium (Ca)	5.6	----
Magnesium (Mg)	2.7	----
Sodium (Na)	7.5	----
Potassium (K)	3.2	----
Bicarbonate (HCO_3)	14	12
Sulfate (SO_4)	6.9	----
Chloride (Cl)	11	7
Fluoride (F)	.0	----
Nitrate (NO_3)	15	----
Dissolved solids	74	33
Hardness as $CaCO_3$:		
Total	25	22
Noncarbonate	14	----
Color	2	----
pH	6.6	5.3
Specific conductance (micromhos at 25°C)	104	----
Temperature (°F)	63	----
Date of collection	10-26-54	6-13-46

[a]Analysis by U. S. Geological Survey

[b]Analysis by Miss. State Chemical Laboratory

LEAKE COUNTY

Carthage. Population: 2,500. Ownership: Municipal.

Source of information: Central Electric Power Association.

Source of supply: Two drilled wells in Meridian sand member of Tallahatta formation (K1, K2).

Average daily pumpage: 150,000 gallons estimated. Storage: Reservoir, 100,000 gallons; elevated tank, 120,000 gallons.

Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Carthage Well K2
Aluminum (Al)	----
Silica (SiO_2)	6.2
Iron (Fe)	.32
Calcium (Ca)	.3
Magnesium (Mg)	.1
Sodium (Na)	61
Potassium (K)	1.7
Bicarbonate (HCO_3)	145
Sulfate (SO_4)	11
Chloride (Cl)	2.0
Fluoride (F)	.5
Nitrate (NO_3)	1.6
Dissolved solids	172
Hardness as $CaCO_3$:	
Total	1
Noncarbonate	0
Color	22
pH	7.5
Specific conductance (micromhos at 25°C)	250
Temperature (°F)	71
Date of collection	1-28-57

LEE COUNTY

Guntown. Population: 300. Ownership: Community.

Source of information: J. R. Ford, Mayor.

Source of supply: One drilled well in Eutaw formation (B12).

Average daily pumpage: 25,000 gallons, estimated. Ground pressure tank. No distribution system but well is for public use.

Treatment: None.

Nettleton. Population: 1,500. Ownership: Municipal.

Source of information: C. T. Roberts, Mayor.

Source of supply: Two drilled wells; one in Gordo formation (O14), one in Eutaw formation (O15).

Average daily pumpage: 75,000 gallons. Storage: Elevated tank, 60,000 gallons.

Treatment: Aeration, lime.

Shannon. Population: 600. Ownership: Municipal.

Source of information: H. P. Herndon, driller.

Source of supply: One drilled well in Eutaw formation (O22).

Average daily pumpage: 30,000 gallons, estimated. Storage: Ground pressure tank.

Treatment: None.

Tupelo. Population: 17,247 (1960 U. S. Census). Ownership: Municipal.

Source of information: A. R. Aycock, water superintendent.

Source of supply: Eight drilled wells in city of Tupelo, one drilled well in East Tupelo, all in Eutaw formation (G12, G13; H19-H22, H28, L2, L4). Well L4 draws from both the Eutaw and Gordo formations.

Average daily pumpage: 1,725,000 gallons. Storage: Reservoir, 230,000 gallons, elevated tank, 100,000 gallons.

Treatment: None.

Industrial wells: Blue Bell Manufacturing Co. (H15); Carnation Milk Co., (H23, H24); Tupelo Ice & Cold Storage Co. (H27); Mid-South Packing Co., (H29, H30).

Others: U. S. Fish and Wildlife Service (L101, L12); Natchez Trace Parkway, 5 miles north (E8). All in the Eutaw formation.

Verona. Population: 800. Ownership: Municipal.

Source of information: H. P. Herndon, driller.

Source of supply: Two drilled wells in Eutaw formation (K13, L13).

Average daily pumpage: 30,000 gallons, estimated. Storage: Elevated tank, 50,000 gallons.

Treatment: None.

Analyses, in parts per million by U. S. Geological Survey

	Nettleton		Tupelo	
	Well O14	Well O15	Well H19	a
Aluminum (Al)	----	0.0	1.3	1.2
Silica (SiO_2)	7.0	20	17	16
Iron (Fe)	10	.2	.03	.06
Calcium (Ca)	14	50	29	33
Magnesium (Mg)	3.4	6.8	5.6	5.2
Sodium (Na)	5.2	13	46	45
Potassium (K)	3.8	6.0	4.6	7
Bicarbonate (HCO_3)	62	176	122	104
Sulfate (SO_4)	8.8	34	8.1	16
Chloride (Cl)	5.0	4.0	65	71
Fluoride (F)	.3	.0	.0	.0
Nitrate (NO_3)	1.1	.0	1.2	.5
Dissolved solids	86	217	230	240
Hardness as $CaCO_3$				
Total	49	153	95	104
Noncarbonate	0	8	0	19
Color	15	0	5	5
pH	6.5	7.4	7.6	7.7
Specific conductance (micromhos at 25°C)	136	362	405	429
Temperature (°F)	68	64	66	----
Date of collection	12-2-54	8-10-55	5-21-51	5-21-51

	Guntown	Shannon	Verona	
	Well B12	Well O22	Well L13	Well K13
Silica (SiO_2)	4.9	----	4.1	5.8
Iron (Fe)	.11	0.04	.00	.05
Calcium (Ca)	27	23	37	33
Magnesium (Mg)	5.4	4.6	7.7	5.6
Sodium (Na)	28	58	52	54
Potassium (K)	4.3	5.3	5.3	6.4
Bicarbonate (HCO_3)	164	116	130	126
Sulfate (SO_4)	10	4.2	3.8	4.2
Chloride (Cl)	7.5	74	92	85
Fluoride (F)	.3	.7	.3	.0
Nitrate (NO_3)	1.8	.9	.1	.4
Dissolved solids	185	228	291	267
Hardness as $CaCO_3$				
Total	90	76	124	106
Noncarbonate	0	0	18	2
Color	1	10	5	3
pH	7.8	8.0	8.0	7.9
Specific conductance (micromhos at 25°C)	281	441	487	474
Temperature (°F)	----	----	67	67
Date of collection	11-24-58	7-25-57	7-22-58	6-10-60

[a]Water as delivered from plant

LOWNDES COUNTY

Artesia. Population: 594. Ownership: Municipal.

Source of information: W. L. Adams, GM&O RR agent.

Source of supply: Two drilled wells in Gordo formation (J2, J9).

Average daily pumpage: 52,000 gallons. Storage: Elevated tank, 27,000 gallons.

Treatment: None.

Columbus. Population: 24,625 (1960 U. S. Census). Ownership: Municipal.

Source of information: W. P. Gearheiser, water and light superintendent.

Source of supply: Luxapalila Creek.

Average daily pumpage: 2,500,000 gallons. Storage: Reservoir, 600,000 gallons; elevated tank, 1,100,000 gallons.

Treatment: Alum-lime, chlorination, flouridation.

Industrial wells: Hooker Chemical Co., 4 miles south, (L1); E. L. Bruce Lumber Co., (F17); T. G. Owen & Sons (G19); Seminole Manufacturing Co., (G28); Columbus Ice Cream & Ice Co., (G29). All industrial wells are in the Gordo formation.

Columbus Air Force Base. Owner: U. S. Air Force.

Source of information: C. S. Wade, health and sanitation engineer, Columbus Air Force Base.

Source of supply: Four drilled wells in Gordo formation (A9-A11, A14).

Average daily pumpage: 500,000 gallons (1954). Storage: Reservoir, 10,000 gallons; elevated tank, 400,000 gallons.

Treatment: Aeration, chlorination, filtration, lime.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Artesia Well J2	Hooker Co. Well L1[b]	Columbus c	Columbus d	U. S. Air Force Base Well A9	U. S. Air Force Base e
Aluminum (Al)	----	----	1.5	0.3	----	----
Silica (SiO_2)	35	----	8.3	8.0	6.8	3.4
Iron (Fe)	.22	1.5	1.6	.08	14	.26
Calcium (Ca)	3.6	14	2.1	14	6.9	25
Magnesium (Mg)	1.3	4.0	1.0	1.2	2.5	1.4
Sodium (Na)	37	----	1.6	1.4	4.5	4.2
Potassium (K)		—	1.8		5.0	5.3
Bicarbonate (HCO_3)	[a]100	99	11	[a]24	47	95
Sulfate (SO_4)	4.4	11	1.4	12	.6	1.0
Chloride (Cl)	5.9	1.0	2.0	7.5	2.0	2.8
Fluoride (F)	----	----	.1	0	.1	.2
Nitrate (NO_3)	.44	----	4.0	3.6	.4	.4
Dissolved solids	133	----	38	77	58	97
Hardness as $CaCO_3$:						
Total	14	50	9	40	28	68
Noncarbonate	----	----	0	20	0	0
Color	----	----	45	8	5	5
pH	----	7.1	6.5	9.1	6.9	7.2
Specific conductance (micromhos at 25°C)	----	----	28.6	95.2	93.4	166
Temperature (°F)	----	----	----	----	64	70
Date of collection	1919	1953	5-21-51	5-21-51	7-8-54	7-8-54

[a]Includes the equivalent of less than 5 ppm of Carbonate (CO_3).
[b]Analysis supplied by Hooker Chemical Co.
[c]Raw water from Luxapalila Creek.
[d]Finished water from Columbus Water Works.
[e]Finished water from filter No. 1 at Air Force Base.

MARSHALL COUNTY

Byhalia. Population: 650. Ownership: Municipal.
Source of information: A. N. Jones, town clerk.
Source of supply: Two drilled wells, probably in the Meridian sand member of Tallahatta formation (D2, D3).
Average daily pumpage: 100,000 gallons. Storage: Elevated tank, 25,000 gallons.
Treatment: None.
Holly Springs. Population: 4,000. Ownership: Municipal.
Source of information: S. G. Winter, water superintendent.
Source of supply: Three drilled wells in Meridian sand member of Tallahatta formation (P6-P8).
Average daily pumpage: 367,000 gallons. Storage: Reservoir, 250,000 gallons; elevated tank, 100,000 gallons.
Treatment: Aeration, chlorination, and lime.
Potts Camp. Population: 500. Ownership: Municipal.
Source of information: Harry Jones.
Source of supply: Three drilled wells in Ripley formation (U1-U3).
Average daily pumpage: 90,000 gallons estimated. Storage: Reservoir, 20,000 gallons; elevated tank, 30,000 gallons.
Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Byhalia Well D2[a]	Holly Springs Well P8	Potts Camp Well U3
Aluminum (Al)	----	----	----
Silica (SiO_2)	----	5.6	5.5
Iron (Fe)	0.2	.00	.11
Calcium (Ca)	2.0	14	5.6
Magnesium (Mg)	1.6	4.7	1.4
Sodium (Na)	----	15	84
Potassium (K)	----	4.1	3.4
Bicarbonate (HCO_3)	[b]9	24	240
Sulfate (SO_4)	----	20	7.8
Chloride (Cl)	0	26	1.5
Fluoride (F)	----	.1	.5
Nitrate (NO_3)	.2	17	2.3
Dissolved solids	----	158	255
Hardness as $CaCO_3$:			
Total	12	54	20
Noncarbonate	----	35	0
Color	----	0	0
pH	5.6	6.8	8.3
Specific conductance (micromhos at 25°C)	----	212	363
Temperature (°F)	----	----	----
Date of collection	----	11-25-58	11-25-58

[a]Analyzed by Mississippi State Board of Health.
[b]Total alkalinity as determined by Methyl orange indicator.

MONROE COUNTY

Aberdeen. Population: 5,290. Ownership: Municipal.

Source of information: C. E. Lingenfelder, water superintendent.

Source of supply: Four drilled wells in Eutaw formation (L17-L20).

Average daily pumpage: 757,000 gallons, 1954. Storage: Elevated tank, 1,000,000 gallons.

Treatment: None.

Industrial wells: Texas Eastern Transmission Corp., 8 miles northwest, drilled well in Eutaw formation (K14); T. G. Owen & Sons, 10 miles southeast, drilled well in Gordo formation (Q18); American Potash & Chemical Co., 9 miles southeast, near Hamilton, drilled wells in Gordo formation (Q28).

Amory. Population: 6,000. Ownership: Municipal.

Source of information: Wilson Ruff, water superintendent.

Source of supply: Two drilled wells in Gordo formation (C7, C8).

Average daily pumpage: 475,000 gallons. Storage: Reservoir, 700,000 gallons, elevated tank, 100,000 gallons.

Treatment: Aeration, chlorination, filtration.

Prairie. U. S. Air Force Vehicle Storage Depot (formerly Gulf Ordnance Plant).

Owner: U. S. Government.

Source of information: Karl V. Sigler, plant superintendent, maintenance division.

Source of supply: Seven drilled wells in Eutaw formation (O1-O7). Five wells in operation in 1958.

Average daily pumpage: 236,000 gallons (1954); 1,000,000 gallons in 1943.

Storage: Elevated tank, 504,000 gallons.

Treatment: Chlorination.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Aberdeen Well L17[a]	Aberdeen Well L19[b]	Aberdeen Well L20	Amory Well C7	Amory Well C8[a]
Aluminum (Al)	----	----	----	----	----
Silica (SiO_2)	4.4	----	8.3	8.3	4.0
Iron (Fe)	.2	----	.10	4.5	12
Calcium (Ca)	19.39	----	19	4.7	11
Magnesium (Mg)	4.27	----	3.7	1.4	0
Sodium (Na)	30.36 (Na + K)	----	49	3.5	2.6 (Na + K)
Potassium (K)		----	5.5	1.5	
Bicarbonate (HCO_3)	[c]125	170	163	29	[c]42
Sulfate (SO_4)	6.42	----	6.8	1.4	5.6
Chloride (Cl)	18	31	22	2.5	5.0
Fluoride (F)	.2	----	.4	.2	0
Nitrate (NO_3)	----	0	1.1	.0	0
Dissolved solids	159	196	200	42	65
Hardness as $CaCO_3$:					
Total	66	43	63	17	49
Noncarbonate	----	----	0	0	----
Color	----	----	5	5	0
pH	7.4	8.1	7.8	5.9	6.1
Specific conductance (micromhos at 25°C)	----	----	332	69.7	----
Temperature (°F)	----	----	65	64	----
Date of collection	4-6-60	5-24-57	11-3-54	9-8-54	7-26-56

	Prairie. U.S.A.F. Vehicle Storage Depot Well O1	Well O2	Well O4	Well O5	Well O6
Aluminum (Al)	----	----	----	----	----
Silica (SiO_2)	6.3	4.8	7.1	6.7	7.3
Iron (Fe)	.04	.62	.17	.30	.39
Calcium (Ca)	11	11	11	12	12
Magnesium (Mg)	2.4	3.0	3.2	2.5	2.3
Sodium (Na)	79	78	69	76	43
Potassium (K)	4.4	4.4	4.8	4.8	4.5
Bicarbonate (HCO_3)	168	162	160	170	130
Sulfate (SO_4)	.2	.2	.4	.4	.2
Chloride (Cl)	56	56	46	52	20
Fluoride (F)	.3	.3	.3	.3	.2
Nitrate (NO_3)	.7	1.0	.7	.5	.3
Dissolved solids	249	246	224	242	154
Hardness as $CaCO_3$:					
Total	37	39	41	40	39
Noncarbonate	0	0	0	0	0
Color	5	5	5	5	10
pH	7.9	7.8	8.2	7.6	7.6
Specific conductance (micromhos at 25°C)	445	440	397	434	271
Temperature (°F)	71	72	72	70	72
Date of collection	8-24-54	8-24-54	8-24-54	8-24-54	8-24-54

[a]Analysis by Mississippi State Board of Health.

[b]Analysis by Mississippi State Chemical Laboratory.

[c]Total alkalinity as determined by Methyl orange indicator.

NESHOBA COUNTY

Philadelphia. Population: 5,500. Ownership: Municipal.

Source of information: George Sowell, manager of utilities.

Source of supply: Three drilled wells in sands of the Wilcox group (F1, F4, F6).

Average daily pumpage: 500,000 gallons. Storage: 275,000 gallons.

Treatment: Chlorination, aeration, filtration.

Industrial wells: DeWeese Lumber Co., 2 miles south, two drilled wells in sands of the Wilcox group (K1, K2).

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Philadelphia		
	Well F1	Well F4	Well F6[a]
Aluminum (Al)	----	----	----
Silica (SiO_2)	----	8.0	4.4
Iron (Fe)	0.10	6.3	0
Calcium (Ca)	6.4	7.0	6.0
Magnesium (Mg)	4.8	1.5	5.8
Sodium (Na)	13	10	} 5.2
Potassium (K)	2.4	4.4	
Bicarbonate (HCO_3)	11	50	[b]8
Sulfate (SO_4)	4.6	2.8	7.7
Chloride (Cl)	16	3.5	24
Fluoride (F)	.0	.0	0
Nitrate (NO_3)	41	.2	0
Dissolved solids	116	71	58
Hardness as $CaCO_3$:			
Total	36	24	39
Noncarbonate	27	0	----
Color	5	5	0
pH	5.7	6.6	5.3
Specific conductance (micromhos at 25°C)	154	106	----
Temperature (°F)	66	----	----
Date of collection	1-17-57	1-17-57	9-22-52

[a]Analysis by Mississippi State Board of Health.

[b]Total alkalinity as determined by Methyl orange indicator.

NOXUBEE COUNTY

Brooksville. Population: 819. Ownership: Municipal.

Source of information: Leon Bean, water superintendent.

Source of supply: One drilled well in Eutaw formation (C7). One unused well in Gordo formation (C6).

Average daily pumpage: 75,000 gallons. Storage: Reservoir, 40,000 gallons; elevated tank, 35,000 gallons.

Treatment: None.

Macon. Population: 2,500. Ownership: Municipal.

Source of information: W. P. Heflin, water superintendent.

Source of supply: Two drilled wells in Coker formation (H15, H16); one unused well in Gordo formation (H21).

Average daily pumpage: 200,000 gallons. Storage: Elevated tank, 100,000 gallons.

Treatment: None.

Industrial wells: Borden Food Products Company, one drilled well in Coker formation (H17), one in Gordo formation (H18); Imperial Cotton Oil Company, two drilled wells in Gordo formation (H24, H25).

Shuqualak. Population: 725. Ownership: Municipal.

Source of information: Mrs. Elizabeth Combs, city clerk.

Source of supply: One drilled well in Gordo formation (S7); one emergency well in lower part of Eutaw formation (S8).

Average daily pumpage: 54,000 gallons. Storage: Elevated tank, 35,000 gallons.

Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Brooksville		Macon	
	Well C6[a]	Well C7	Well H15[b]	Well H16
Aluminum (Al)	----	----	----	----
Silica (SiO_2)	27	----	----	5.3
Iron (Fe)	.35	0.10	----	.37
Calcium (Ca)	4.4	.6	----	12
Magnesium (Mg)	4.8	.1	----	2.3
Sodium (Na)	67	81	----	34
Potassium (K)		1.6	----	4.2
Bicarbonate (HCO_3)	178	[c]186	102	95
Sulfate (SO_4)	16	5.2	----	1.6
Chloride (Cl)	8	13	22	25
Fluoride (F)	----	----	----	.3
Nitrate (NO_3)	.6	.7	0	.1
Dissolved solids	227	209	140	142
Hardness as $CaCO_3$:				
Total	31	2	34	39
Noncarbonate	0	0	----	0
Color	----	5	----	10
pH	----	8.3	8.1	8.0
Specific conductance (micromhos at 25°C)	----	338	----	235
Temperature (°F)	----	----	----	80
Date of collection	1911	11-4-54	7-25-53	11-4-54

	Borden Company		Shuqualak	
	Well H17[b]	Well H18	Well S7	Well S8[d]
Aluminum (Al)	----	----	----	0.4
Silica (SiO_2)	----	7.1	----	12
Iron (Fe)	----	.42	0.33	1.0
Calcium (Ca)	----	8.1	4.4	4.4
Magnesium (Mg)	----	2.3	1.3	0
Sodium (Na)	----	206	301	409
Potassium (K)	----	4.3	4.8	----
Bicarbonate (HCO_3)	112	142	226	284
Sulfate (SO_4)	----	1.6	1.6	2.4
Chloride (Cl)	22	255	335	454
Fluoride (F)	----	.5	1.1	----
Nitrate (NO_3)	0	.1	.8	----
Dissolved solids	149	531	784	1,078
Hardness as $CaCO_3$:				
Total	33	30	16	15
Noncarbonate	----	0	0	----
Color	----	7	5	----
pH	7.6	7.9	7.7	7.6
Specific conductance (micromhos at 25°C)	----	1,080	1,420	----
Temperature (°F)	----	78	78	----
Date of collection	8-26-54	2-3-55	11-4-54	7-12-48

[a]Analysis No. 4, Water-Supply Paper 576.
[b]Analysis by Mississippi State Chemical Laboratory.
[c]Includes equivalent of 4 ppm of Carbonate (CO_3).
[d]Analysis by Pittsburgh Testing Laboratory.

OKTIBBEHA COUNTY

Maben. Population: 700. Ownership: Municipal.

Source of information: R. H. Collins, Mayor.

Source of supply: One drilled well in Gordo formation (A1). Town was supplied by springs until 1954.

Average daily pumpage: 50,000 gallons. Storage: Elevated tank, 65,000 gallons.

Treatment: None.

Mississippi State University. Owner: Mississippi State University.

Source of information: E. E. Cooley, superintendent of utilities.

Source of supply: Two drilled wells in Gordo formation (G18, G20).

Average daily pumpage: 682,000 gallons. Storage: Reservoir, 350,000 Gallons; elevated tank, 60,000.

Treatment: None.

Starkville. Population: 8,500. Ownership: Municipal.

Source of information: John Turner, water superintendent.

Source of supply: Four drilled wells, three in Gordo formation (G21, G24, G27), one reserve well in Eutaw formation (G22).

Average daily pumpage: 900,000 gallons. Storage: Reservoir, 300,000 gallons; elevated tank, 60,000 gallons.

Treatment: None.

Industrial wells: Sanders Cotton Mill (G10). Borden Company (G11, G12). All industrial wells in Gordo formation.

Sturgis. Population: 498. Ownership: Municipal.

Source of information: J. A. McKinnon, town clerk.

Source of supply: One drilled well in Gordo formation (J5). Sturgis Consolidated School is supplied by a separate well in the Gordo formation (J6).

Average daily pumpage: 25,000 gallons. Storage: Ground pressure tank, 5,000 gallons.

Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Maben Well A1	Miss. State U. Well G20[a]	Borden Co. Well G12[a]	Starkville b	Starkville Well G22	Sturgis Well J5
Aluminum (Al)	----	----	----	0.4	----	----
Silica (SiO_2)	9.7	8.2	----	24	7.3	9.9
Iron (Fe)	.17	.43	----	.15	.18	.29
Calcium (Ca)	15	6.3	----	6.6	5.2	7.9
Magnesium (Mg)	2.8	1.2	----	2.0	1.2	1.6
Sodium (Na)	202	36 (Na + K)	----	33	299	292
Potassium (K)	4.5		----	2.4	4.6	4.4
Bicarbonate (HCO_3)	145	98	110	106	479	248
Sulfate (SO_4)	2.2	1.1	----	1.6	1.6	2.5
Chloride (Cl)	252	12	12	9.8	198	315
Fluoride (F)	.3	----	----	.1	5.0	.9
Nitrate (NO_3)	1.2	.08	0	.8	.5	1.9
Dissolved solids	574	113	116	124	742	722
Hardness as $CaCO_3$:						
Total	49	----	26	25	18	26
Noncarbonate	0	----	----	0	0	0
Color	5	----	----	6	5	5
pH	7.6	----	8.5	7.6	8.1	7.7
Specific conductance (micromhos at 25°C)	1,060	----	----	194	1,290	1,390
Temperature (°F)	----	----	----	----	68	79
Date of collection	10-27-54	8-8-30	1-13-51	5-21-51	11-3-54	11-3-54

[a]Analysis by Mississippi State Chemical Laboratory.

[b]Composite sample of raw water as delivered from plant.

PANOLA COUNTY

Batesville. Population: 4,000. Ownership: Municipal.

Source of information: Murray Meek, asst. water superintendent.

Source of supply: Two drilled wells in sands of lower part of Wilcox group (R2, R14); one unused well in sands of Tallahatta formation (R16).

Average daily pumpage: Minimum, 225,000 gallons; maximum 280,000 gallons. Storage: Reservoir, 100,000 gallons; elevated tank, 50,000 gallons.

Treatment: None.

Industrial wells: Tennessee Gas Transmission Corporation, 8 miles west, well in sands of Tallahatta formation (Q5). Big M Metal Products Co., 1 mile northeast, 1 drilled well in sands of the Wilcox group (R1).

Como. Population: 800. Ownership: Municipal.

Source of information: Mississippi State Board of Health.

Source of supply: Two drilled wells in sand and gravel, probably in Sparta sand (C1, C4).

Average daily pumpage: 150,000 gallons. Storage: Reservoir, 35,000 gallons; elevated tank, 50,000 gallons.

Treatment: Aeration, lime, chlorination, fluoridation.

Crenshaw. Population: 1,240. Ownership: Municipal.

Source of information: B. F. Knox, city clerk.

Source of supply: One drilled well in sands of the Wilcox group (E2).

Average daily pumpage: 200,000 gallons. Storage: Reservoir, 50,000 gallons; elevated tank, 100,000 gallons.

Treatment: None.

Sardis. Population: 1,936. Ownership: Municipal.

Source of information: R. W. Thomas, water superintendent.

Source of supply: Three drilled wells in Tallahatta formation (G1, G4, G5).

Average daily pumpage: 300,000 gallons. Storage: Reservoir, 100,000 gallons; elevated tank, 60,000 gallons.

Treatment: Aeration, chlorination, lime.

Sardis Reservoir. Ownership: U. S. Government.

Source of information: Reservoir superintendent.

Source of supply: One drilled well for main supply (N2); eleven other wells in public areas on reservation; all in sands of Tallahatta formation.

Average daily pumpage: Not available. Storage: Reservoir, 5,000 gallons.

Treatment: Filtration, chlorination.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Batesville Well R2	Batesville Well R16[a]	Como Well C1	Crenshaw Well E2	Sardis Well G1
Aluminum (Al)	----	----	----	----	----
Silica (SiO_2)	3.3	12	----	6.2	3.7
Iron (Fe)	.08	2.5	0.00	.42	.13
Calcium (Ca)	1.3	5.0	6.2	1.4	3.8
Magnesium (Mg)	.1	2.0	2.8	.8	1.1
Sodium (Na)	83	14 (Na + K)	----	91	9.8
Potassium (K)	1.5		----	1.8	.7
Bicarbonate (HCO_3)	208	59	25	204	23
Sulfate (SO_4)	1.0	3.5	----	2.0	1.8
Chloride (Cl)	12	5.0	10	29	8.8
Fluoride (F)	.1	----	----	.2	.0
Nitrate (NO_3)	1.2	----	2.6	.5	2.4
Dissolved solids	225	68	----	266	70
Hardness as $CaCO_3$:					
Total	4	----	27	7	14
Noncarbonate	0	----	----	0	0
Color	6	----	----	24	6
pH	7.4	----	5.7	7.8	6.2
Specific conductance (micromhos at 25°C)	325	----	----	388	81
Temperature (°F)	75	64	----	----	64
Date of collection	8-15-58	11-9-37	3-8-39	11-24-58	8-18-58

[a]Analysis by Mississippi State Chemical Laboratory.

PONTOTOC COUNTY

Pontotoc. Population: 2,025. Ownership: Municipal.

Source of information: H. A. Grisham, water plant operator.

Source of supply: Three drilled wells; two in Eutaw formation (G9, G10), one in the Ripley formation (G8).

Average daily pumpage: 300,000 gallons. Storage: Reservoir, 110,000 gallons; elevated tank, 100,000 gallons.

Treatment: None.

Industrial wells: Pontotoc Cotton Oil Co., two drilled wells; one in Eutaw formation (G24), one in Ripley formation (G25).

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Well G8[a]	Pontotoc Well G9[b]	Well G10[c]
Aluminum (Al)	----	----	----
Silica (SiO_2)	8.4	9.8	7.1
Iron (Fe)	.2	.7	.22
Calcium (Ca)	74	23	24
Magnesium (Mg)	5.6	3.6	5.9
Sodium (Na)	8.8 (Na + K)	79 (Na + K)	85
Potassium (K)			4.7
Bicarbonate (HCO_3)	[d]190	142	138
Sulfate (SO_4)	29	2.5	.8
Chloride (Cl)	3	96	120
Fluoride (F)	----	----	.1
Nitrate (NO_3)	----	----	1.2
Dissolved solids	241	284	324
Hardness as $CaCO_3$:			
Total	207	----	84
Noncarbonate	----	----	0
Color	20	----	5
pH	8.4	----	7.5
Specific conductance (micromhos at 25°C)	----	----	604
Temperature (°F)	----	----	73
Date of collection	10-1-41	12-8-37	6-25-54

[a]Analysis by Mississippi State Board of Health.

[b]Analysis by Mississippi State Chemical Laboratory.

[c]Analysis by U. S. Geological Survey.

[d]Total alkalinity as determined by methyl orange indicator.

PRENTISS COUNTY

Baldwyn. Population: 1,800. Ownership: Municipal.

Source of information: G. B. McVey, manager.

Source of supply: Three drilled wells in Eutaw formation (J1, J2, J22).

Average daily pumpage: 150,000 gallons. Storage: Reservoir, 34,000 gallons; elevated tank, 50,000 gallons.

Treatment: None.

Booneville. Population: 4,000. Ownership: Municipal.

Source of information: J. E. Scott, water superintendent.

Source of supply: Three drilled wells in Eutaw formation (F1, F2, F11).

Average daily pumpage: 330,000 gallons. Storage: Reservoir, 35,000 gallons; elevated tank, 100,000 gallons.

Treatment: Chlorination.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Baldwyn		Booneville			Wheeler School Well
	a	Well J22	Well F1	Well F2	Well F11	K11
Aluminum (Al)	----	----	----	----	----	----
Silica (SiO_2)	8.6	4.3	8.9	4.2	1.1	6.4
Iron (Fe)	.17	.04	1.3	.04	1.4	.64
Calcium (Ca)	29	30	33	39	35	32
Magnesium (Mg)	5.5	7.4	6.9	6.8	7.4	6.1
Sodium (Na)	22	17	5.2	6.5	8.7	14
Potassium (K)	3.7	4.0	3.5	4.0	4.2	3.6
Bicarbonate (HCO_3)	136	140	137	148	148	148
Sulfate (SO_4)	7.4	7.0	12	11	.2	8.6
Chloride (Cl)	19	19	2.5	7.0	13	4.8
Fluoride (F)	.3	.2	.1	.2	.1	.2
Nitrate (NO_3)	.3	.8	.0	.6	.3	1.1
Dissolved solids	172	168	155	166	146	167
Hardness as $CaCO_3$:						
Total	95	106	111	126	118	105
Noncarbonate	0	0	0	4	0	0
Color	5	5	5	0	0	0
pH	7.9	7.8	7.5	7.9	8.1	8.1
Specific conductance (micromhos at 25°C)	291	276	249	268	266	249
Temperature (°F)	63	64	64	65	64	63
Date of collection	12-2-54	4-28-59	6-23-54	4-7-59	4-7-59	11-26-58

[a]Composite sample from wells J1 and J2.

TALLAHATCHIE COUNTY

Charleston. Population: 2,800. Owner: Union Water Company.

Source of information: J. H. Lindsey, water superintendent.

Source of supply: Two drilled wells in Meridian sand member of Tallahatta formation (F26, F28).

Average daily pumpage: 281,300 gallons. Storage: Reservoir, 100,000 gallons; elevated tank, 50,000 gallons.

Treatment: Aeration, chlorination.

ANALYSES, IN PARTS PER MILLION BY MISSISSIPPI STATE BOARD OF HEALTH

	Charleston	
	Well F26	Well F28
Aluminum (Al)	----	----
Silica (SiO_2)	20	4.0
Iron (Fe)	3.6	.7
Calcium (Ca)	1.6	4.3
Magnesium (Mg)	0	1.9
Sodium (Na), Potassium (K)	56	62
Bicarbonate (HCO_3)	150	146
Sulfate (SO_4)	.6	2.5
Chloride (Cl)	7.0	4.0
Fluoride (F)	.3	----
Nitrate (NO_3)	0	0
Dissolved solids	163	167
Hardness as $CaCO_3$:		
Total	10	20
Noncarbonate	----	----
Color	----	20
pH	7.0	7.3
Specific conductance (micromhos at 25°C)	----	----
Temperature (°F)	----	----
Date of collection	10-14-52	4-7-47

TATE COUNTY

Coldwater. Population: 1,200. Ownership: Municipal.

Source of information. C. F. Rushing, water superintendent.

Source of supply: Two drilled wells in Sparta sand (B2, B3).

Average daily pumpage: 75,000 gallons. Storage: Elevated tank, 50,000 gallons.

Treatment: None.

Senatobia. Population: 3,000. Ownership: Municipal.

Source of information: E. A. Henry, water superintendent.

Source of supply: Three drilled wells in Sparta sand (G10, G13, G14).

Average daily pumpage: 250,000 gallons. Storage: Reservoir, 100,000 gallons; elevated tank, 100,000 gallons.

Treatment: Aeration, chlorination, lime.

ANALYSES, IN PARTS PER MILLION.

	Coldwater	Senatobia	
	Well B2[a]	Well G10[b]	Well G14[b]
Aluminum (Al)	----	----	----
Silica (SiO_2)	5.4	0	0
Iron (Fe)	.15	0	0
Calcium (Ca)	5.7	10	10
Magnesium (Mg)	2.1	2.3	2.2
Sodium (Na)	10	22 (Na + K)	18 (Na + K)
Potassium (K)	.9		
Bicarbonate (HCO_3)	37	35	35
Sulfate (SO_4)	1.0	17	8.4
Chloride (Cl)	10	21	21
Fluoride (F)	.1	c	c
Nitrate (NO_3)	1.4	----	----
Dissolved solids	75	94	81
Hardness as $CaCO_3$:			
Total	22	41	40
Noncarbonate	0	----	----
Color	7	----	----
pH	6.6	5.6	5.6
Specific conductance (micromhos at 25°C)	107	----	----
Temperature (°F)	63	----	----
Date of collection	8-14-58	8-27-59	8-27-59

[a]Analysis by U. S. Geological Survey.

[b]Analysis by Mississippi State Board of Health.

[c]Less than 0.1 ppm.

TIPPAH COUNTY

Blue Mountain. Population: 900. Ownership: Municipal.
Source of information: G. O. Stanford, Mayor.
Source of supply: Springs in basal sands of Wilcox group (NS1).
Average daily pumpage: 131,000 gallons. Storage: Reservoir, 60,000 gallons.
Treatment: None.
Industrial wells: Wyandotte Chemicals Corp., 2 miles NE, drilled well in McNairy sand member, Ripley formation (J18).

Ripley. Population: 2,750. Ownership: Municipal.
Source of information: W. W. Childers, water superintendent.
Source of supply: Two drilled wells in Eutaw formation (J6-J7).
Average daily pumpage: 700,000 gallons. Storage: Reservoir, 65,000 gallons; elevated tank, 75,000 gallons.
Treatment: None.

Walnut. Population: 600. Owner: Mrs. Lassye Wilbanks.
Source of information: Mrs. Lassye Wilbanks.
Source of supply: Two drilled wells in McNairy sand member of Ripley formation (B8, B9).
Average daily pumpage: 42,000 gallons. Storage: Elevated tank, 40,000 gallons.
Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Blue Mountain		Ripley		Walnut	
	Well J18[a]	Spring NS1[b]	Well J6	Well J7	Well B8	Well B9
Aluminum (Al)	----	----	----	----	----	----
Silica (SiO_2)	9.9	8.9	7.1	4.5	19	----
Iron (Fe)	.77	.1	.18	.04	.30	----
Calcium (Ca)	55	2.0	32	32	50	----
Magnesium (Mg)	4.6	1.3	8.2	8.6	8.8	----
Sodium (Na)	3.3	.4	18	16	3.4	----
Potassium (K)	1.1	----	4.2	4.6	1.9	----
Bicarbonate (HCO_3)	182	9.0	167	168	186	204
Sulfate (SO_4)	8.8	.2	15	16	6.8	----
Chloride (Cl)	2.0	1.4	4.0	4.0	5.0	3.0
Fluoride (F)	.1	----	.2	.1	.4	.2
Nitrate (NO_3)	.4	.3	1.4	.8	.0	----
Dissolved solids	194	20	176	175	190	170
Hardness as $CaCO_3$:						
Total	156	11	114	116	161	170
Noncarbonate	7	----	0	0	9	----
Color	5	0	5	5	10	----
pH	7.3	6.0	8.0	7.9	8.0	8.2
Specific conductance (micromhos at 25°C)	300	----	300	287	342	299
Temperature (°F)	----	----	----	----	----	----
Date of collection	10-13-56	1-1-37	12-2-54	2-23-60	12-2-54	2-23-60

[a]Wyandotte Chemicals Corp., 2 miles NE of Blue Mountain.
[b]Analysis by Chemistry Department, Southwestern University.

TISHOMINGO COUNTY

Belmont. Population: 1,000. Ownership: Municipal.
Source of information: E. F. White, water superintendent.
Source of supply: Two drilled wells in sands of Tuscaloosa group (M1, M2).
Average daily pumpage: 71,000 gallons. Storage: Elevated tank, 100,000 gallons.
Treatment: Chlorination, lime.

Iuka. Population: 1,900. Ownership: Municipal.
Source of information: H. M. Biggs, water superintendent.
Source of supply: Two drilled wells in sands of Tuscaloosa group (F2, F3).
Average daily pumpage: 65,000 gallons. Storage: Elevated tank, 70,000 gallons.
Treatment: None.

Tishomingo. Population: 400. Ownership: Municipal.
Source of information: W. W. Flurry, marshal.
Source of supply: Springs in sands of Tuscaloosa group (JS1).
Average daily pumpage: 35,000 gallons, estimated. Storage: Elevated tank, 30,000 gallons.
Treatment: Chlorination.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Belmont Well M2	Iuka Well F2	Tishomingo Springs JS1
Aluminum (Al)	----	----	----
Silica (SiO_2)	5.3	7.2	4.5
Iron (Fe)	.18	.09	.00
Calcium (Ca)	1.2	2.2	1.6
Magnesium (Mg)	.7	1.3	.5
Sodium (Na)	2.2	1.2	1.3
Potassium (K)	.3	.7	.5
Bicarbonate (HCO_3)	9	10	7.0
Sulfate (SO_4)	1.6	1.2	1.0
Chloride (Cl)	1.8	1.8	1.8
Fluoride (F)	.1	.1	.1
Nitrate (NO_3)	.2	3.0	2.0
Dissolved solids	27	35	24
Hardness as $CaCO_3$:			
Total	6	11	6
Noncarbonate	0	3	0
Color	5	4	15
pH	8.0	6.2	5.7
Specific conductance (micromhos at 25°C)	30.8	36	19.3
Temperature (°F)	63	61	60
Date of collection	6-24-54	6-24-54	1-12-56

UNION COUNTY

New Albany. Population: 3,900. Ownership: Municipal.

Source of information: N. J. Miller, water superintendent.

Source of supply: Three drilled wells in Eutaw formation (H7, H8, H9).

Average daily pumpage: 500,000 gallons. Storage: Reservoir, 200,000 gallons; elevated tank, 100,000 gallons.

Treatment: None.

Industrial wells: Stratford Furniture Co., 3 miles NW, two drilled wells, one in Ripley formation (B2), and one in Coffee sand (B3). Tennessee Gas Transmission Corp., 3 miles N, two drilled wells in Coffee sand (C1, C10). National Impacted Metal Corp., 3 miles N, one drilled well in Coffee sand (C7). Mississippi Federated Cooperative, one drilled well in Coffee sand (C9).

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	New Albany Well H8	New Albany Well H9[a]	Stratford Co. Well B2	Tenn. Gas Well C1
Aluminum (Al)	----	----	----	----
Silica (SiO_2)	14	11	1.8	2.1
Iron (Fe)	.27	0	.11	.07
Calcium (Ca)	27	36	4.5	5.6
Magnesium (Mg)	11	7.7	1.1	1.1
Sodium (Na)	85	86 (Na + K)	104	65
Potassium (K)	5.2		3.2	2.5
Bicarbonate (HCO_3)	150	[b]119	288	184
Sulfate (SO_4)	6.0	5.8	3.6	8.8
Chloride (Cl)	130	130	1.5	3.2
Fluoride (F)	.4	.6	1.3	.3
Nitrate (NO_3)	.1	0	1.2	.9
Dissolved solids	358	348	287	196
Hardness as $CaCO_3$:				
Total	112	121	16	18
Noncarbonate	0	0	0	0
Color	5	0	6	6
pH	7.7	7.0	8.2	7.9
Specific conductance (micromhos at 25°C)	716	----	438	305
Temperature (°F)	68	----	64	67
Date of collection	12-2-54	9-30-54	5-18-59	5-18-59

[a]Analysis by Mississippi State Board of Health.

[b]Total alkalinity as determined by Methyl orange indicator.

WEBSTER COUNTY

Eupora. Population: 1,300. Ownership: Municipal.
Source of information: Robert Curry, water superintendent.
Source of supply: Three drilled wells in basal sands of Wilcox group, (H3, H4, H6).
Average daily pumpage: 150,000 gallons. Storage: Reservoir, 100,000 gallons; elevated tank, 100,000 gallons.
Treatment: None.

Mathiston. Population: 600. Ownership: Municipal.
Source of information: Tom Carden, water superintendent.
Source of supply: Two drilled wells in sands of the Wilcox group (B1, B2)[a].
Average daily pumpage: 50,000 gallons. Storage: Elevated tank, 75,000 gallons.
Treatment: Chlorination.
Others: Natchez Trace Parkway, 10 miles northeast, one drilled well in Gordo formation (E3).

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Eupora Well H4	Mathiston Well B2	Natchez Trace Well E3[c]
Aluminum (Al)	----	----	----
Silica (SiO_2)	17	----	----
Iron (Fe)	.28	0	----
Calcium (Ca)	5.1	7.7	----
Magnesium (Mg)	1.7	1.0	----
Sodium (Na)	46	16	----
Potassium (K)	2.5	1.4	----
Bicarbonate (HCO_3)	[b]137	26	137
Sulfate (SO_4)	.8	18	----
Chloride (Cl)	4.5	14	206
Fluoride (F)	.1	.0	----
Nitrate (NO_3)	.3	.6	0
Dissolved solids	170	104	458
Hardness as $CaCO_3$:			
Total	20	23	60
Noncarbonate	0	2	----
Color	7	7	----
pH	8.3	6.2	8.2
Specific conductance (micromhos at 25°C)	225	132	----
Temperature (°F)	63	62	----
Date of collection	1-18-57	1-18-57	11-19-57

[a]Wells B1 and B2 are located south of Mathiston in Choctaw County.
[b]Includes equivalent of 2 ppm of carbonate (CO_3).
[c]Analysis by Mississippi State Chemical Laboratory.

WINSTON COUNTY

Louisville. Population: 6,000. Ownership: Municipal.
Source of information: H. C. Coggin, water superintendent.
Source of supply: Three drilled wells in sands of the lower part of Wilcox group, (K2, K3, K4).
Average daily pumpage: 400,000 gallons. Storage: Reservoir, 250,000 gallons; elevated tank, 50,000 gallons.
Treatment: Aeration, filtration.
Industrial wells: Mitchell Ice Co., (E3), Southern Natural Gas Co. (E4), D. L. Fair Lumber Co. (K5). All industrial wells are in sands of the Wilcox group.
Others: W. A. Taylor Farm, 4 miles S (K7), one drilled well in sands of the Wilcox group.

Noxapater. Population: 625. Ownership: Municipal.
Source of information: B. F. Whisnant, city clerk; Layne-Central Co.
Source of supply: One drilled well in sands of the lower part of Wilcox group (P1).
Average daily pumpage: 70,000 gallons. Storage: Elevated tank, 60,000 gallons.
Treatment: Aeration, lime, chlorination.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Louisville Well K3	Noxapater Well P1
Aluminum (Al)	----	----
Silica (SiO_2)	12	----
Iron (Fe)	3.4	14
Calcium (Ca)	3.3	6.2
Magnesium (Mg)	2.1	3.2
Sodium (Na)	8.8	7.8
Potassium (K)	2.2	2.6
Bicarbonate (HCO_3)	29	48
Sulfate (SO_4)	5.6	4.6
Chloride (Cl)	5.0	3.0
Fluoride (F)	.1	.0
Nitrate (NO_3)	.3	.3
Dissolved solids	70	84
Hardness as $CaCO_3$:		
Total	17	29
Noncarbonate	0	0
Color	10	7
pH	6.4	6.7
Specific conductance (micromhos at 25°C)	77.4	93.6
Temperature (°F)	66	----
Date of collection	1-17-57	1-17-57

YALOBUSHA COUNTY

Coffeeville. Population: 1,000. Ownership: Municipal.
Source of information: S. D. McRee, Mayor.
Source of supply: Two drilled wells in sands of the Wilcox group (L14, L15).
Average daily pumpage: 90,000 gallons. Storage: Reservoir, 75,000 gallons; elevated tank, 50,000 gallons.
Treatment: None.

Oakland. Population: 517. Ownership: Municipal.
Source of information: B. I. Toole, water superintendent.
Source of supply: Two drilled wells in sands of Tallahatta formation (E1, E2).
Average daily pumpage: 67,000 gallons. Storage: Reservoir, 8,000 gallons; elevated tank, 30,000 gallons.
Treatment: Aeration.

Water Valley. Population: 3,500. Ownership: Municipal.
Source of information: T. H. Hutson, water superintendent.
Source of supply: Three drilled wells in Tallahatta formation, probably in Meridian sand member (C2-C4).
Average daily pumpage: 500,000 gallons. Storage: Reservoir, 300,000 gallons; elevated tank, 120,360 gallons.
Treatment: None.

ANALYSES, IN PARTS PER MILLION BY U. S. GEOLOGICAL SURVEY

	Coffeeville	Oakland	Water Valley	
	Well L15[a]	Well E1	Well C3[a]	Well C4
Aluminum (Al)	----	----	----	----
Silica (SiO_2)	14	5.6	16	3.8
Iron (Fe)	.1	5.4	0	.07
Calcium (Ca)	2.1	3.2	2.1	2.2
Magnesium (Mg)	.5	1.8	1.0	.7
Sodium (Na)	60	17	7.7	4.2
Potassium (K)		4.4		1.1
Bicarbonate (HCO_3)	[c]125	55	9	10
Sulfate (SO_4)	5.6	11	12	3.6
Chloride (Cl)	5	2.0	3	4.8
Fluoride (F)	.1	.1	b	.0
Nitrate (NO_3)	----	.3	----	1.0
Dissolved solids	162	104	47	48
Hardness as $CaCO_3$:				
Total	8.6	16	12	8
Noncarbonate	----	0	----	0
Color	0	6	0	6
pH	8.0	6.4	5.3	5.7
Specific conductance (micromhos at 25°C)	----	110	----	48
Temperature (°F)	----	67	----	64
Date of collection	9-16-59	8-15-58	10-1-59	8-15-58

[a]Analysis by Mississippi State Board of Health.
[b]Less than 0.1 ppm.
[c]Total alkalinity as determined by Methyl orange indicator.

RECORDS OF WELLS

Pertinent data for a few representative wells are given in Table 5, and will serve as useful guides in planning ground-water developments in each of the counties in the report region. Many more data, including information on private domestic and stock wells and oil-test borings, are in the open file of the U. S. Geological Survey for public reference.

Table 5 gives, among other things, the following items for each well, as available: owner, driller, year completed, depth, diameter, geologic source of the water, water level, and rate of pumping on a specified date.

TABLE 5.—REPRESENTATIVE PUBLIC AND INDUSTRIAL SUPPLY WELLS IN A PART OF NORTHERN MISSISSIPPI

Geologic source: Qal, alluvium; Qt, terrace deposits; Es, Sparta sand; Ex, Winona sand; Et, Tallahatta formation; Etn, Neshoba sand member of Tallahatta formation; Etm, Meridian sand member of Tallahatta formation; Ew, Wilcox group; Ksr, Ripley formation undifferentiated; Ksrm, McNairy sand member of Ripley formation; Ksc, Coffee sand; Ke, Eutaw formation; Kt, Tuscaloosa group undifferentiated; Ktg, Gordo formation of Tuscaloosa group; Ktc, Coker formation of Tuscaloosa group; Pz, Paleozoic rocks undifferentiated.

Water level: In feet with reference to land-surface datum. Measured if given to tenth of foot; otherwise reported.

Construction and production data as reported by owner or driller.

Use of water: P, public supply; I, industrial; Ir, irrigation; N, none.

Additional data, including analyses of water samples, are given in section entitled *Water-Supply Information by Counties.*

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				ALCORN COUNTY									
D8	Corinth, 6 mi. NE	Gulf Interstate Gas Co.	Carloss Well Co.	1956	521	6	Pz	60	1956	100	1956	I	Wells of similar construction nearby.
G1	Corinth	City of Corinth	Layne-Central Co.	1920	453	10	Pz	27	1954	135	1954	P	
G3	do	do	do	1960	455	18x8	Pz	63	1960	----	----	P	Well deepened from 375 ft. in 1960.
G4	do	do	do	1947	300	12	Ke	----	----	845	1947	P	
G5	do	do	do	1954	457	12x8	Pz	----	----	800	1954	P	
G18	do	do	do	1959	520	16	Pz	106	1960	750	1960	P	
				BENTON COUNTY									
H7	Ashland	Town of Ashland	Layne-Central Co.	1948	174	6x4	Etm	132	1948	62	1948	P	
H8	do	do	Atkinson Bros.	1955	190	6x5	Etm	150	1956	75	1955	P	
O7	Hickory Flat	Roy Hall	J. G. Maxey	1939	599	4	Ksr	30	1954	85	1954	P	
O8	do	do	do	1951	615	4	Ksr	62	1951	8	1957	P	
O9	do	do	O. C. Webb	1954	612	5x4	Ksr	10	1954	180	1954	P	
				CALHOUN COUNTY									
D2	Bruce	Town of Bruce	Layne-Central Co.	1959	1,825	16x10	Ktg	----	----	----	----	P	
G1	do	E. L. Bruce Co.	Carloss Well Co.	1927	1,724	8	Ktg	35	1955	700	1954	I	Supplied Town of Bruce until 1959.
G2	Pittsboro	Layne-Central Co.	do	1955	1,771	8x6	Ktg	157	1955	105	1955	P	Leased to Town of Pittsboro.
K1	Calhoun City	Calhoun City	do	1928	1,902	8x6	Ktg	38	1958	167	1954	P	
K101	do	do	do	1954	1,899	18x6	Ktg	45	1958	112	1954	P	
K4	Derma	Town of Derma	Robert Ratliff	1956	1,990	8x4	Ktg	60	1956	150	1957	P	
L2	Vardaman	Town of Vardaman	Layne-Central Co.	1931	1,971	6x2½	Ktc	43	1940	105	1954	P	
L4	do	do	Delta Drilling Co.	1957	1,906	8x4	Ktc	----	----	200	1957	P	

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				CHICKASAW COUNTY									
B11	Houlka	Town of Houlka	Layne-Central Co.	1946	1,010	8x6	Ke	150	....			P	
D4	Okolona	City of Okolona	American Well Wks.	1899	550	10	Ke	125	....	216	1940	P	
D5	do	do	George Crawford	1914	550	10	Ke	125		244	1940	P	
D6	do	GM&O RR	—	1899	389	10x8	Ke	110.6	10-17-56	....	..	P	Leased to City of Okolona. Drilled to 1,000 ft., plugged at 389 ft. in 1917.
D12	do	City of Okolona	Carloss Well Co.	1958	563	10	Ke	....	....	....	....	P	
D19	do	do	do	1958	570	12	Ke	....	....			P	
D23	do	do	do	1958	525	8	Ke	..	....	350	1958	P	Supplies city park and pool.
F14	Houston	Town of Houston	do	1958	1,063	18x12	Ke	....	....	....	....	P	
F15	do	do	R. S. Ashby	1947	155	8	Ksr			60	1947	P	Supplies park and pool.
F16	do	do	Layne-Central Co.	1931	1,076	10x6	Ke	104.6	7-10-40	300	1954	P	
F18	do	do	do	1942	130	8	Ksr	....	....	250	1954	P	
				CHOCTAW COUNTY									
B1	Mathiston ½ mile S	Town of Mathiston	Lexington Lbr. Co.	1949	34	6	Ew	8	1949	25	1939	P	Town of Mathiston is in Webster Co., wells in Choctaw Co., immediately south of town.
B2	do	do	do	1956	44	6	Ew	8	1956	75	1956	P	
H1	Ackerman	Town of Ackerman	Layne-Central Co.	1938	95	24	Ew	14	1954	350	1954	P	
H2	do	do	do	1946	95	24	Ew	14	1954	350	1954	P	
J1	Weir	Town of Weir	Peerson Drilling Co.	1951	130	10	Ew	60	1957	51	1957	P	
				CLAY COUNTY									
H2	West Point	City of West Point	Layne-Central Co.	1925	388	14x12	Ke		1954	560	1954	P	City No. 1.
H3	do	do	do	1943	422	20x12	Ke	85	1944	680	1953	P	City No. 2.
H4	do	do	do	1953	397		Ke	99	1953	578	1953	P	City No. 3
H9	West Point 1 mi. S	Bryan Bros. Packing Co.	do	1950	864	12x8	Ktg	10	1952	384	1952	I	
H10	West Point 1 mi. S	Bryan Bros. Packing Co.	Layne-Central Co.	1954	341	8	Ke	40	1954	100	1954	I	
H11	do	do	do	1955	610	12	Ktg	16	1955	400	1955	I	
H12	West Point 2 mi. S	Burgin Brothers	C. R. Tribble	1937	700	4	Ktg	+11.0 6.9	6-6-40 10-22-59	10	1940	D	Flowed until 1959.
H38	West Point	Sanders Cotton Mill	do	1925	405	18x10	Ke	84	1944	636	....	I	

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				ITAWAMBA COUNTY									
G26	Fulton	Town of Fulton	Layne-Central Co.	1945	186	10	Ktg	30	1954	189	1954	P	
G27	do	do	do	1953	215	10	Ktg	50	1953	210	1953	P	
				KEMPER COUNTY									
HS1	DeKalb 1 mi. NW	Town of DeKalb	—	....	....	....	Ew	....	....	200	1954	P	Three springs.
K4	Scooba	Town of Scooba	Jack Smith	1927	1,150	4x2	Ke	40	1954	27	....	P	
K5	do	do	Enloe Tool Co.	1949	1,295	8x4	Ke	12	1949	65	....	P	
K15	Electric Mills	E. A. Temple	Layne-Bowler Co.	1911	1,388	6	Ke	14	1928	200	1911	P	
				LAFAYETTE COUNTY									
F4	Oxford	University of Mississippi	Layne-Central Co.	1948	131	16	Etm	....	....	....	....	P	
F5	do	do	—	1946	115	....	Etm	80	1946	600	1946	P	
F6	do	do	Layne-Central Co.	1950	198	16	Etm	138	1957	554	1954	P	
F7	do	City of Oxford	do	1935	132	18	Etm	80	1936	490	1954	P	
F8	do	do	do	1930	112	18	Etm	85	1936	410	1950	P	
				LEAKE COUNTY									
K1	Carthage	Town of Carthage	Gray Artesian Well Co.	1929	602	8	Etm	9	1929	219	1929	P	
K2	do	do	do	1940	612	10	Etm	18	1941	406	1941	P	
				LEE COUNTY									
B12	Guntown	Town of Guntown	Webb Bros.	1945	500	4	Ke	60	1958	10	1958	P	No storage reservoir. Average use est. about 7,000 gpd.
G12	Tupelo	City of Tupelo	Layne-Central Co.	1954	556	12	Ke	120		525	1954	P	City No. 8.
G13	do	do	Peerson Drilling	1949	543	12x8	Ke	100	1949	770	1949	P	City No. 6.
H15	do	Blue Bell Mfg. Co.	Carloss Well Co.	1956	589	10x6	Ke	18	1956	234	1956	I	
H19	do	City of Tupelo	J. W. Webb & Sons	1919	450	12	Ke	....	....	300	1940	P	City No. 2.
H20	do	do	do	1919	450	12	Ke			450	1940	P	City No. 3.
H21	do	do	Layne-Central Co.	1935	468	12	Ke	130	1958	656	1958	P	City No. 4.
H22	do	do	do	1945	430	12	Ke	120	1954	440	1954	P	City No. 5.
H23	do	Carnation Milk Co.	do	1927	385	8	Ke	33	1927	469	1958	I	Plant No. 1.
H24	do	do	J. W. Webb & Sons	1927	400	6	Ke	....	....	100	1957	I	Plant No. 2; No. 3 is similar.

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
H27	do	Tupelo Ice & Cold Storage Co.	do	1926	450	12	Ke	90	1956	200	1957	I	
H28	East Tupelo	City of Tupelo	Layne-Central Co.	1939	380	12	Ke	32	1939	80	1939	P	
H29	Tupelo	Mid-South Packing Co.	J. W. Webb & Sons	1955	517	12	Ke	90	1954	250	1958	I	Plant No. 1.
H30	do	do	O. C. Webb	1957	512	12	Ke	109.4	8-27-57	250	1958	I	Plant No. 2.
K13	Verona	Town of Verona	Layne-Central Co.	1960	522	10	Ke	..	.	150	1960	P	
L2	Tupelo	City of Tupelo	do	1952	546	12x8	Ke	110	1952	560	1958	P	City No. 7
L4	do	do	do	1960	580	12	Ke, Ktg	90	1960	700	1960	P	Well is screened in Eutaw and Gordo formations.
L12	do	U. S. Fish & Wildlife Service	R. E. Herndon	1959	406	6	Ke	128	1959	....	....	Lakes	Supply for fish hatchery.
L13	Verona	Town of Verona	H. P. Herndon & Son	1949	470	6	Ke	90	1949	75	1949	P	
L101	Tupelo	U. S. Fish & Wildlife Service	Layne-Central Co.	1937	412	10x6	Ke	83.6	12-5-54	480	1954	Lakes	Supply for fish hatchery.
O14	Nettleton	Town of Nettleton	Mercer-Runyon Drilling Co.	1937	612	8	Ktg	23.1	7-15-40	150	1940	P	Town No. 1. Emergency use only.
O15	do	do	Layne-Central Co.	1955	282	....	Ke	20	1958	230	1958	P	Town No. 2.
O22	Shannon	Town of Shannon	H. P. Herndon & Son	1955	485	6	Ke	35	1957	200	1957	P	
				LOWNDES COUNTY									
A9	Columbus 8 mi. N	Columbus Air Force Base	Layne-Central Co.	1941	475	18x10	Ktg	+19	1941	500	1942	P	Base No. 1.
A10	do	do	do	1941	473	18x10	Ktg	+19	1941	366	1941	P	Base No. 2.
A11	do	do	do	1941	497	18x10	Ktg	+	1941	450	1955	P	Base No. 3.
A14	do	do	do	1949	456	12	Ktg	+	1959	266	1959	P	Yield was natural flow.
F17	Columbus	E. L. Bruce Lbr. Co.	—	1952	576	8	Ktg	+10	1951	15	1957	I	Flows
G19	do	T. G. Owen & Sons	Layne-Central Co.	1953	574	8x6	Ktg	+	1954	350	1953	I	Do
G28	do	Seminole Mfg. Co.	do	1953	542	8x6	Ktg	+	1953	360	1953	I	Do
G29	do	Columbus Ice Cream Co.	Davis & Berry	1947	568	6x4	Ktg	....	....	220	1947	I	
—	do	City of Columbus	—	....	....	....	—	....	....	....	....		Entire municipal supply is obtained from Luxapalila Creek.
J2	Artesia	Town of Artesia	American Well Co.	1906	1,300	8	Ktg	16	1919	400	1919	P	Formerly owned by GM&O RR.
J9	do	do	—	1935	1,100	6	Ktg	40.8	3-19-59	....	..	P	
L1	Columbus 4 mi. S	Hooker Chemical Co.	Layne-Central Co.	1953	558	12x8	Ktg	....	....	570	1953	I	Several similar wells in operation.

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				MARSHALL COUNTY									
D2	Byhalia	Town of Byhalia	Carloss Well Co.	1942	490	6	Etm	..	....	....	....	P	
D3	do	do	Layne-Central Co.	1933	403	8x6	Etm	56	1933	200	1933	P	
P6	Holly Springs	City of Holly Sprgs.	do	1929	354	8	Etm	180	1929	620	1958	P	
P7	do	do	do	1934	360	8	Etm	176	1958	527	1958	P	
P8	do	do	do	1954	344	10	Etm	150	1954	700	1958	P	
U1	Potts Camp	Town of Potts Camp	do	1941	730	10x4	Ksr	+10	1941	136	1941	I	Flows. Formerly belonged to S.L.&S.F. R.R.
U2	do	do	J. G. Maxey	1930	735	4x2	Ksr	+18	1946	86	1946	P	Flows.
U3	do	do	A. P. Roach	1912	718	4x2	Ksr	+35	1912	15	1957	P	Flow, 15 gpm in 1957. Reworked 1946; depth, 730 ft.
				MONROE COUNTY									
C7	Amory	City of Amory	Carloss Well Co.	1951	357	18	Ktg	5	1945	463	....	P	City No. 1.
C8	do	do	Layne-Central Co.	1954	400	18x10	Ktg	4	1954	500	..	P	
K14	Aberdeen 8 mi. NW	Texas Eastern Transmission Corp.	do	1955	376	10x6	Ke	....	....	60	1955	I	
L17	Aberdeen	City of Aberdeen	Carloss Well Co.	1926	160	12	Ke	75	1958	525	1954	P	
L18	do	do	do	1942	180	12	Ke	75	1958	200	1954	P	
L19	do	do	do	1952	135	12	Ke	75	1958	300	1954	P	
L20	do	do	do	1953	170	12	Ke	75	1958	475	1954	P	
O1	Prairie	USAF Vehicle Storage Depot	do	1942	481	12x6	Ke	128	1958	500	1942	I	Plant No. 1
O2	do	do	do	1942	485	12x6	Ke	148	1958	540	1942	I	Plant No. 2.
O3	do	do	do	1942	451	12x6	Ke	114	1942	540	1942	N	Plant No. 3. Not on U. S. Government property 1958.
O4	do	do	do	1942	496	12x6	Ke	142	1958	560	1942	I	Plant No. 4.
O5	do	do	do	1942	456	12x6	Ke	131	1958	550	1942	I	Plant No. 5.
O6	do	do	do	1942	486	12x6	Ke	115	1942	550	1942	I	Plant No. 6.
O7	do	do	do	1942	511	12x6	Ke	110	1958	550	1942	I	Plant No. 7.
Q18	Hamilton 3 mi. SE	T. G. Owen & Sons	Layne-Central Co.	1956	390	16x8	Ktg	+	1956	850	1956	Ir	Nursery. Flows.
Q28	Hamilton 4 mi. SE	American Potash & Chemical Co.	do	1957	423	16x10	Ktg	+	1958	1,000	1958	I	Flow, 500 gpm in 1957. Company has 3 other wells of similar depth and yield, completed in 1958.

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				NESHOBA COUNTY									
F1	Philadelphia	City of Philadelphia	Layne-Central Co.	1954	52	36x16	Ew	4	1955	349	1955	P	
F4	do	do	do	1947	782	12x9	Ew	60	1956	730	1948	P	
F6	do	do	do	1934	28	36	Ew	4	1955	150	1957	P	
K1	Philadelphia 2 mi. S.	DeWeese Lbr. Co.	Terry Drilling Co.	1942	160	4	Ew	20	1942	60	1942	I	
K2	do	do	do	1951	447	6x4	Ew	40	1951	75	1951	I	
				NOXUBEE COUNTY									
C6	Brooksville	Town of Brooksville	—	1911	1,187	8x6	Ktg	50	1911	250	1911	N	Unused, 1954.
C7	do	do	Layne-Central Co.	1949	942	8	Ke	84	1954	80	1954	P	
H15	Macon	City of Macon	do	1953	1,820	10x8	Ktc	12	1953	566	1953	P	
H16	do	do	do	1948	1,815	10x8	Ktc	+	1948	447	1948	P	Flowed when drilled.
H17	do	Borden Food Products Co.	do	1954	1,807	10	Ktc	+31	1954	942	1954	I	Flowed 250 gpm in 1954.
H18	do	do	do	1928	1,307	18x12	Ktg	11	1953	300	1954	I	Emergency use.
H21	do	City of Macon	do	1921	1,309	8	Ktg	+ 6	1954	20	1954	N	Unused 1954.
H24	do	Imperial Cotton Oil Co.	Terry Drilling Co.	1929	1,312	6	Ktg	+	1929	....	....	I	Flowed 45 gpm in 1929.
H25	do	do	do	1944	1,300	6	Ktg	+ 2	1955	....	....	I	Flowed 20 gpm in 1944.
S7	Shuqualak	Town of Shuqualak	Peerson Drilling Co.	1948	1,395	8x6x4	Ktg	34	1948	120	1948	P	
S8	do	do	Terry Drilling Co.	1938	1,212	6x4	Ke	41	1957	200	1938	P	Emergency use.
				OKTIBBEHA COUNTY									
A1	Maben	Town of Maben	Herndon & Berry	1954	2,074	6x4	Ktg	180	1954	130	1954	P	Additional well planned.
G10	Starkville	Sanders Cotton Mill	—	1933	1,400	8x6	Ktg			150	1940	I	
G11	do	Borden Food Products Co.	Layne-Central Co.	1926	1,450	16x10	Ktg	158.2	5-15-40	500	1940	I	
G12	do	do	do	1951	1,416	16x10x6	Ktg	160	1951	572	1951	I	
G18	do	Miss. State Univ.	do	1939	1,430	12	Ktg	160	1952	1,050	1939	P	
G20	do	do	do	1929	1,415	16x10	Ktg	142	1929	650	1952	P	
G21	do	City of Starkville	do	1929	1,460	16x10	Ktg	130	1929	635	1954	P	
G22	do	do	—	1915	950	10x8	Ke	200	1954	260	1954	P	Emergency use.
G24	do	do	Layne-Central Co.	1947	1,440	16x10	Ktg	165	1954	840	1954	P	
G27	do	do	Carloss Well Co.	1960	1,523	16x?	Ktg			800	1960	P	
J5	Sturgis	Town of Sturgis	Enloe & Davis	1950	2,122	8	Ktg	126	1950	165	1950	P	
J6	do	Sturgis Con. School	Berry & McMurtray	1948	2,166	4x3½x2½	Ktg	115	1948	33	1948	P	School well.

TABLE 5.—(Continued)

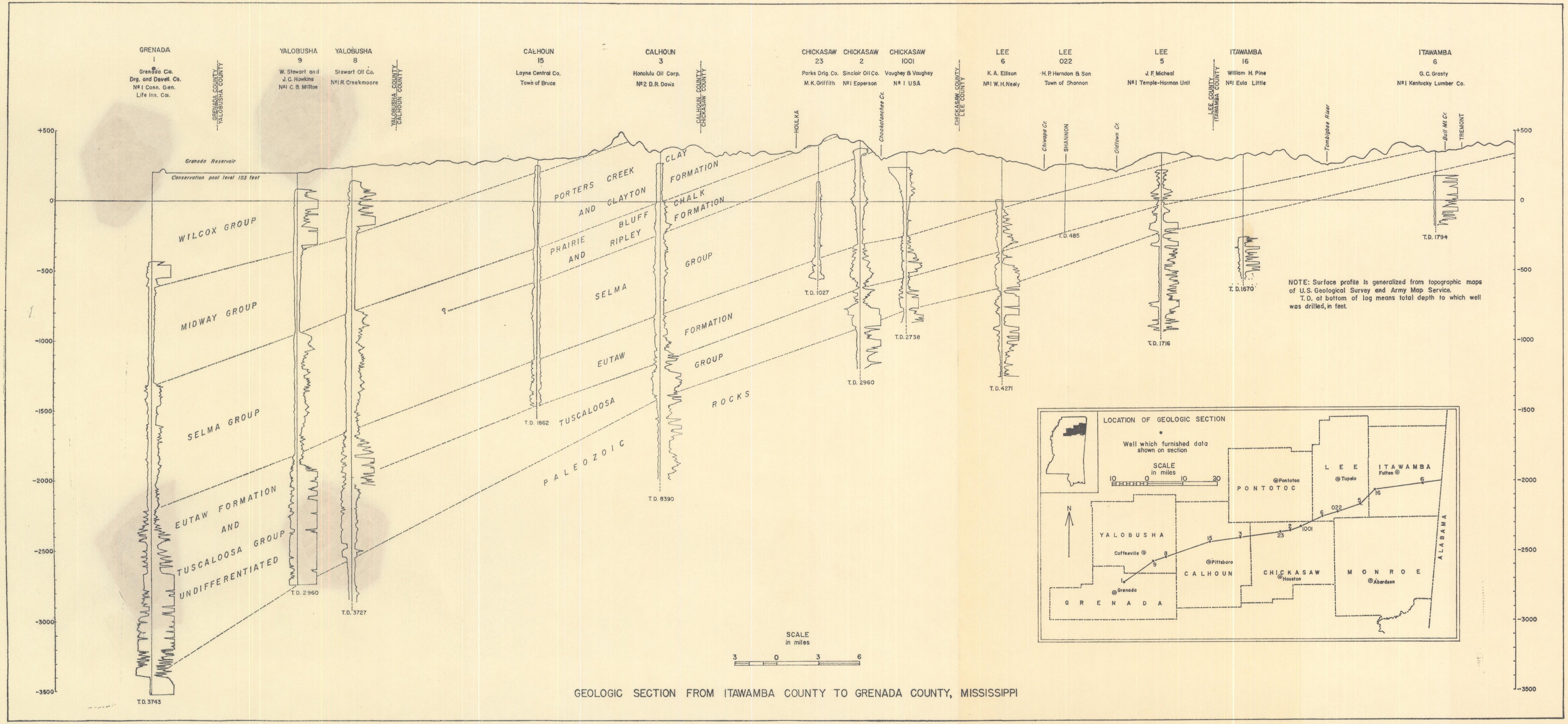
Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				PANOLA COUNTY									
C1	Como	Town of Como	Carloss Well Co.	1938	177	8	Es	...	...	200	1938	P	
C4	do	do	Layne-Central Co.	1944	181	12	Es	92	1945	300	1945	P	
E2	Crenshaw	Town of Crenshaw	do	1925	1,420	10	Ew	+29.7	7-11-39	200	1954	P	Static level +41 ft.; flow, 250 gpm in 1925.
G1	Sardis	Town of Sardis	do	1954	214	12x8	Et	118	1954	150	1954	P	
G4	do	do	do	1947	223	12x8	Et	124	1947	374	1947	P	
G5	do	do	—	1940	225	....	Et	....	....	....	....	P	
N2	Sardis Reservoir	U. S. Government	—	....	220	4	Et	....	....	....	....	P	Eleven small wells in public areas.
Q5	Batesville 8 mi. W.	Tennessee Gas Trans. Corp.	Blevins Water Wells	1948	620	....	Et	+....	1948	....	....	I	Test hole to 2,457 ft.
R1	Batesville 1 mi. NE	Big M Metal Products Co.	Layne-Central Co.	1959	1,065	....	Ew	....	....	....	....	I	
R2	Batesville	City of Batesville	do	1954	1,034	10x6	Ew	....	1954	500	1958	P	
R14	do	do	do	1938	1,036	8x6	Ew	+15	1938	200	1958	P	Flows.
R16	do	do	do	....	260	6	Et	+ 5.3	2-22-40	8	1958	N	Unused; flowing in 1958.
				PONTOTOC COUNTY									
G8	Pontotoc	City of Pontotoc	Layne-Central Co.	1930	180	10	Ksr	85	1954	200	1952	P	Emergency use only.
G9	do	do	do	1937	1,090	10x8	Ke	186	7-11-40	210	1958	P	
G10	do	do	Carloss Well Co.	1946	1,115	8	Ke	....	....	200	1954	P	
G24	do	Pontotoc Cotton Oil Co.	Layne-Central Co.	1948	1,197	8x4	Ke	....	....	110	1948	I	
G25	do	do	do	1947	196	8x6	Ksr	106	1947	....	....	I	
				PRENTISS COUNTY									
F1	Booneville	City of Booneville	Layne-Central Co.	1931	419	12	Ke	157	1932	150	1940	P	
F2	do	do	do	1950	491	16	Ke	183	1950	310	1950	P	
F11	do	do	Carloss Well Co.	1956	506	12	Ke	160	1956	500	1956	P	
J1	Baldwyn	Town of Baldwyn	—	1912	496	6	Ke	65	1954	90	1954	P	
J2	do	do	—	1912	496	6	Ke	65	1954	90	1954	P	
J22	do	do	Layne-Central Co.	1956	426	10	Ke	....	....	300	1956	P	
K11	Wheeler	Wheeler Pub. Sch.	J. W. Webb	1955	365	6	Ke	....	....	....	....	P	
				TALLAHATCHIE COUNTY									
F26	Charleston	Union Water Co.	—	1953	560	8x6	Etm	....	....	360	1953	P	
F28	do	do	—	1938	560	8	Etm	....	....	500	1940	P	

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				TATE COUNTY									
B2	Coldwater	Town of Coldwater	—	1955	160	10	Es	....	....	280	1955	P	
B3	do	do	—	1946	160	10	Es		....	250	1946	P	
G10	Senatobia	City of Senatobia	—	1958	140	..	Es	37	1958	550	1958	P	
G13	do	do	Layne-Central Co.	1920	135	10	Es	35	1954	410	1954	P	
G14	do	do	do	1937	135	8	Es	35	1954	273	1954	P	
				TIPPAH COUNTY									
B8	Walnut	Mrs. Lassye Wilbanks	Layne-Central Co.	1938	150	6	Ksrm	64	1954	80	1954	P	
B9	do	do	do	1956	145	6	Ksrm	....	....	110	1956	P	
J6	Ripley	City of Ripley	do	1946	974	12x8	Ksc	150	1946	275	1946	P	
J7	do	do	do	1950	996	18x8	Ksc	175	1950	335	1950	P	
J18	Blue Mountain 2 mi. NE	Wyandotte Chemical Co.	Watson Drilling Co.	1955	244	6	Ksrm	....	....	....	....	I	Flows.
NS1	Blue Mountain	Town of Blue Mountain	do	....	....	....	Ew	....	....	....	....	P	Springs.
				TISHOMINGO COUNTY									
F2	Iuka	Town of Iuka	Layne-Central Co.	1927	138	10	Ktg	38	1942	95	1954	P	
F3	do	do	do	1955	119	10	Ktg	....	1955	100		P	
JS1	Tishomingo	Town of Tishomingo	—	....	....	....	Kt	....	....	200	1954	P	Springs.
M1	Belmont	Town of Belmont	Mercer-Runyon Co.	1937	140	8	Ktg			45	1954	P	
M2	do	do	Peerson Drilling Co.	1953	221	8	Ktg	85	1953	122	1954	P	
				UNION COUNTY									
B2	New Albany 3 mi. NW	Stratford Furniture Co.	Layne-Central Co.	1956	326	....	Ksr	....	....	100	1956	I	Test hole to 715 ft.
B3	do	do	do	1959	800	14x8	Ksc	80	1959	250	1959	I	
C1	New Albany 3 mi. N.	Tennessee Gas Trans. Corp.	do	1956	781	12x8	Ksc	83	1956	350	1956	I	Test hole to 1,176 ft.
C7	New Albany	National Impacted Metal Corp.	do	1958	635	8	Ksc	....	....	....	....	I	
C9	do	Miss. Federated Cooperative	do	1958	635	10	Ksc	....	....	160	1958	I	
C10	do	Tennessee Gas Trans. Corp.	—	1954	750	12	Ksc	90	1954	....	....	I	
H7	do	City of New Albany	Layne-Central Co.	1927	1,047	15x8	Ke	95.9	7-26-40	460	1940	P	
H8	do	do	do	1936	1,035	18x8	Ke			296	1936	P	
H9	do	do	do	1952	1,083	16x10	Ke	163	1953	412	1953	P	

TABLE 5.—(Continued)

Well No.	Location	Owner	Driller	Year completed	Depth of well (ft.)	Diameter of well (in.)	Geologic source	Water level: Above + or below lsd (ft.)	Water level: Date	Pumping Rate: Rate (gpm)	Pumping Rate: Date	Use of Water	Remarks
				WEBSTER COUNTY									
E3	Dancy	Natchez Trace Parkway	Bailey Drilling Co.	1957	1,753	6x4½	Ktg	....	....	....	....	P	
H3	Eupora	Town of Eupora	Carloss Well Co.	1938	190	8	Ew	50	1938	75	1954	P	
H4	do	do	Layne-Central Co.	1947	175	12x8	Ew	23	1957	99	1954	P	
	Mathiston	Town of Mathiston	(See Choctaw County)										
				WINSTON COUNTY									
E3	Louisville	Mitchell Ice Co.	Layne-Central Co.	1942	425	12	Ew	....	....	125	1942	I	
E4	do	Southern Natural Gas Co.	do	1949	433	8x6	Ew	....	....	170	1949	I	
K2	Louisville	City of Louisville	do	1925	356	12	Ew	....	....	....	....	P	City No. 2.
K3	do	do	do	1948	356	12	Ew	79.5	9-13-57	517	1948	P	City No. 3.
K4	do	do	do	1953	314	16	Ew	92	1953	500	1953	P	City No. 4.
K5	do	D. L. Fair Lbr. Co.	do	1951	306	....	Ew	88	1951	300	1951	I	
K7	Louisville 5 mi. SW	W. A. Taylor	do	1954	398	10x8	Ew	70	1954	547	1954	Ir	
P1	Noxapater	Town of Noxapater	do	1955	532	8x6	Ew	153	1954	700	1954	P	
				YALOBUSHA COUNTY									
C2	Water Valley	City of Water Valley	—	1928	80	....	Etm	12	1955	450	1955	P	
C3	do	do	—	1956	77	....	Etm	12	1955	800	1955	P	
C4	do	do	—	1938	80	....	Etm	12	1955	500	1955	P	
E1	Oakland	Town of Oakland	—	1930	541	10x6	Et	139	1954	90	1954	P	
E2	do	do	—	1938	421	8	Et	149	1952	90	1952	P	
L14	Coffeeville	Town of Coffeeville	Layne-Central Co.	1936	468	8x4	Ew	....	....	100	....	P	
L15	do	do	Paulk Brothers	1952	468	8	Ew	24	1952	280	1952	P	



GEOLOGIC SECTION FROM ITAWAMBA COUNTY TO GRENADA COUNTY, MISSISSIPPI