GEOHYDROLOGY AND SUSCEPTIBILITY OF MAJOR AQUIFERS TO SURFACE CONTAMINATION IN ALABAMA; AREA 9

by Robert E. Kidd

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CONVERSION FACTORS

For use of readers who prefer to use metric (International System) units, conversion factors for inch-pound units used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level of 1929."

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ABSTRACT

The U.S. Geological Survey, in cooperation with the Alabama Department of Environmental Management, is conducting a series of geohydrologic studies to delineate the major aquifers and their susceptibility to contamination in Alabama. This report delineates and describes the geohydrology and susceptibility of the major aquifers to contamination in Area 9--Barbour, Bullock, Macon, Pike, and Russell Counties.

The major aquifers in the study area are the Tuscaloosa, Eutaw, and Providence-Ripley aquifers of Cretaceous age; and the Nanafalia-Clayton aquifer of Tertiary age. The five counties constitute the primary recharge area for the aquifers which are the source of public supplies in the study area. The total withdrawals of ground water for all uses in 1986 were estimated to be about 14 million gallons per day.

Areas of water-level declines in the Tuscaloosa aquifer have developed near Eufaula and Union Springs. Water levels in the Eutaw aquifer have declined at Union Springs.

All recharge areas for the major aquifers are susceptible to contamination from the surface. Shallow wells in the outcrop area are most susceptible.

INTRODUCTION

The Alabama Department of Environmental Management (ADEM) is developing a comprehensive program to protect aquifers in Alabama from surface contamination that are defined by the U.S. Environmental Protection Agency (EPA) as "Class I and II" aquifers (U.S. Environmental Protection Agency, 1984). The U.S. Geological Survey, in cooperation with ADEM, is conducting a series of geohydrologic studies to delineate the major aquifers in Alabama, their recharge areas, and areas susceptible to contamination. This report summarizes these factors for major aquifers in Area 9--Barbour, Bullock, Macon, Pike, and Russell Counties (see plate 1).

Purpose and Scope

The purpose of this report is to describe the geohydrology of the major aquifers and their susceptibility to contamination from the surface. Geologic and hydrologic data compiled as part of previous investigations provided about 75 percent of the data used to evaluate the major aquifers in the area. All wells used for municipal and rural public water supplies were inventoried (table 1). Data on water use were compiled during the well inventory. Water-level data were used to compile generalized potentiometric maps of the aquifers. Areas susceptible to contamination from the surface were delineated partly from topographic maps and other available data, and partly from field investigation.

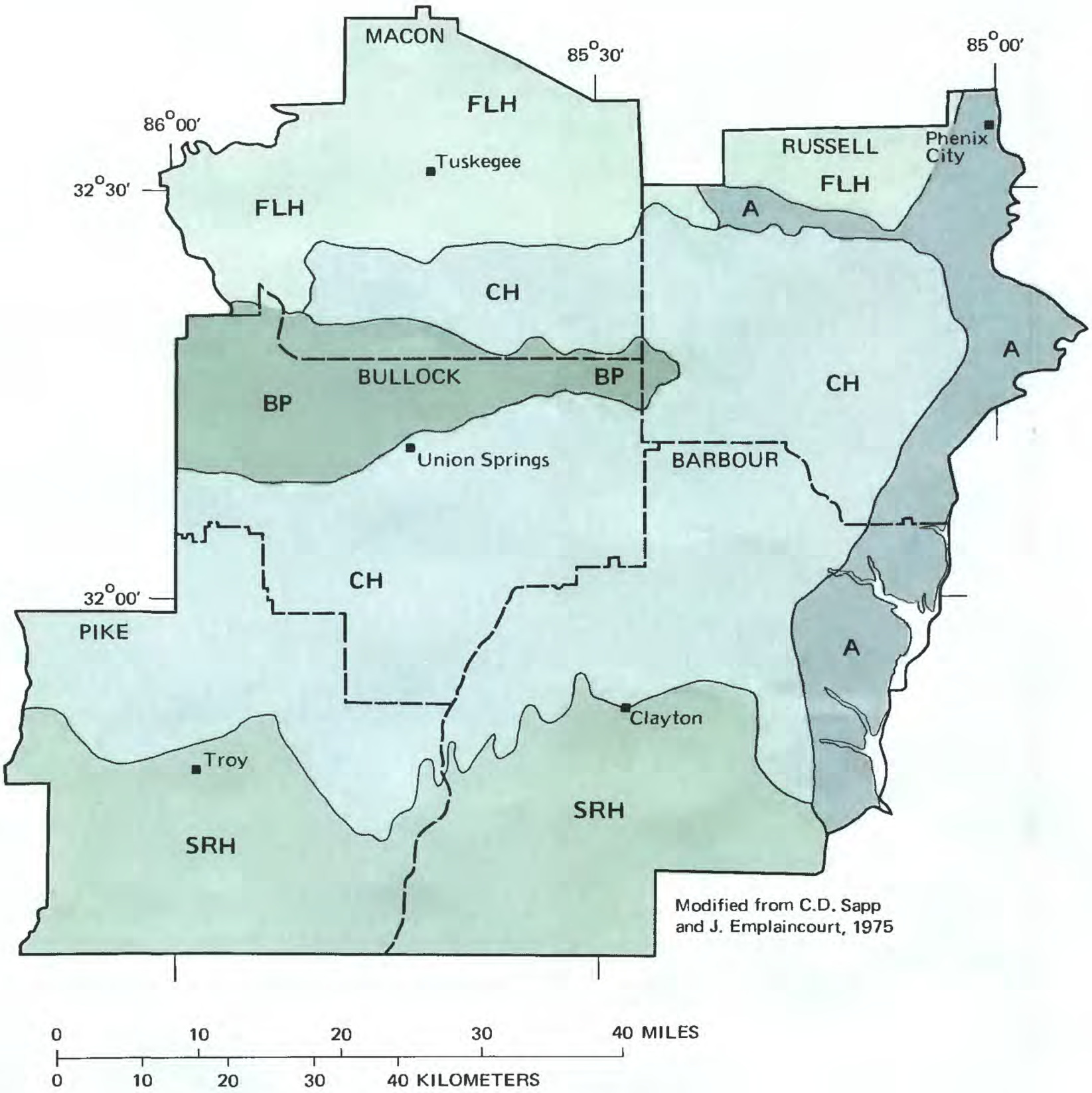
Location and Extent of the Area

The study area is in east-central Alabama and encompasses an area of about 3,430 mi^2 (square miles). It includes the cities of Phenix City, Tuskegee, Union Springs, Troy, Eufaula, Clayton, Brundidge, and numerous other small towns and communities (plate 1). The total population of the five-county area was 136,080 in 1982 (Alabama Department of Economic and Community Affairs, 1984). The area is primarily rural with suburban and urban areas. A large part of the population is dependent on ground water.

Physical Features

The study area is in several physiographic districts of the East Gulf Coastal Plain physiographic province (Sapp and Emplaincourt, 1975). The northern part of Russell and all but the southern part of Macon County are in the Fall-Line Hills district (fig. 1). This area consist mainly of flat to moderately-rolling sandy, uplands dissected by deeply-entrenched streams that generally flow east to the Chattahoochee River and west to the Tallapoosa River. The altitude of land surface generally ranges from 300 to 650 feet above sea level. Local relief usually is less than 100 feet.

The Black Prairie district extends from the west across extreme southern Macon County, northern Bullock County, and into small areas of southwestern Russell County. The Black Prairie, named for the black soil that occurs in



EXPLANATION

PHYSIOGRAPHIC DISTRICTS IN THE EAST GULF COASTAL PLAIN PHYSIOGRAPHIC SECTION

FLH	Fall Line Hills
CH	Chunnenuggee Hills
SRH	Southern Red Hills
A	Alluvial Plain
BP	Black Prairie

Location of study area

Figure 1.--Physiographic districts in the study area.

the area, is a gently- to moderately-rolling prairie that is characterized by extensive grasslands. The land surface in the area generally ranges in altitude from 250 to 400 ft above sea level. Drainage in the Black Prairie is north and northwest to the Tallapoosa River.

The Chunnenuggee Hills district covers much of Area 9, extending from southern Macon County eastward across most of Russell County and southward from near Union Springs in Bullock County to north of Troy in Pike County and Clayton in Barbour County. This district is characterized by five sandy cuestas that have fairly steep northward-facing escarpments and gently- to moderately-rolling backslopes. The land surface ranges in altitude from about 350 to 700 ft above sea level. Drainage in the Chunnenuggee Hills district is northward along the escarpment of the cuestas and southward along the backslopes. Drainage is generally southeastward to the Chattahoochee River and south and southwestward to the Conecuh and Pea Rivers.

The Southern Red Hills district extends across southern Pike and Barbour Counties. The district is characterized by sand hills dissected by southward and southwestward-flowing streams. Drainage is primarily to the Conecuh, Pea, and Chattahoochee Rivers.

The Alluvial Plain district in Area 9 is in and adjacent to the valleys of the Chattahoochee, Tallapoosa, Conecuh, Pea, and Choctawhatchee Rivers and the larger creeks. These areas are characterized by flat flood plains and terraces. The land surface ranges in altitude from less than 200 to near 500 feet above sea level on terraces.

Previous Geologic and Hydrologic Studies

Numerous reports describing the geology and hydrology of the study area have been published. Information on the geology of the area was published as early as 1858 in the second biennial report of the Geological Survey of Alabama by Michael Toumey, the first State Geologist. A detailed description of the geology of Alabama and a revised geologic map were published by the Geological Survey of Alabama in 1926 (Adams and others, 1926).

The first information on ground water in the area was published in 1907 (Smith, 1907). Other reports that contain information on the geology and ground-water resources of the area are "Notes on Deposits of Selma and Ripley Age in Alabama" (Monroe, 1941), "The Cretaceous of East-Central Alabama" (Eargle, 1948), "Geologic Map of the Selma Group in Eastern Alabama" (Eargle, 1950), "Ground-Water Resources of Macon County, Alabama" (Scott, 1960), "Ground-Water Resources of Bullock County, Alabama" (Scott, 1962), "Ground-Water Resources of Russell County, Alabama" (Scott, 1964), "Water Availability, Barbour County, Alabama" (Newton and others, 1966), "Water Availability Map of Pike County, Alabama" (Shamburger and others, 1968), "Geologic Map of Pike County, Alabama" (Shamburger, 1968), and "Geologic Map of Barbour County, Alabama" (Newton, 1966).

A series of maps published by the U.S. Geological Survey in 1986 (Williams and others, 1986a and 1986b) provide information on potentiometric surface, ground-water withdrawals, and recharge areas in Cretaceous and Tertiary aquifers in Area 9.

Acknowledgments

The author thanks N.A. Derryberry, J.E. Crownover, and R.H. Cobb for their assistance during the field investigations and preparation of this report. Special appreciation is extended to the water works managers of the ground-water systems in the study area who helped locate public-supply wells and furnished information on well construction and water use.

GEOHYDROLOGY OF THE STUDY AREA

Geologic formations that crop out in and underlie the study area range in age from Precambrian to Quaternary (fig. 2). Metamorphic and igneous rocks crop out in stream valleys in northern Macon County and in Russell County in channels of the Chattahoochee River and adjacent streams in the vicinity of Phenix City. Unconsolidated sedimentary deposits of Late Cretaceous age crop out in most of Macon, Russell, Bullock, northern Pike, and northern Barbour Counties. Sedimentary deposits of Tertiary age crop out in southern Pike and southern Barbour Counties. Alluvial and terrace deposits overlie older rocks in and adjacent to the flood plains of the major streams and their tributaries in the study area. A generalized subsurface section of formations that underlie the study area is shown in figure 3. The location of this north-south section is shown in figure 2. A summary of the thickness, lithology, and water-bearing properties of each geologic unit underlying the study area is given in table 2.

Igneous and Metamorphic Rocks

The igneous and metamorphic rocks exposed in the study area range in age from Precambrian to Triassic (Eargle, 1955), and consist mainly of schist, gneiss, marble, quartzite, and granite. These rocks crop out in stream valleys in northern Macon and Russell Counties, however, the outcrops are so small that they are not included in figure 2. The upper surface of these rocks dips south-southwestward from 30 to 75 ft/mi (feet per mile) (Scott, 1960; 1964).

The igneous and metamorphic rocks, except for marble, are relatively impermeable, and do not comprise a major aquifer in the study area. Wells developed in these rocks generally produce less than 20 gal/min (gallons per minute). The city of Notasulga in Macon County formerly used two wells in the igneous and metamorphic rocks, but were abandoned because of insufficient amounts of water (Scott, 1960).

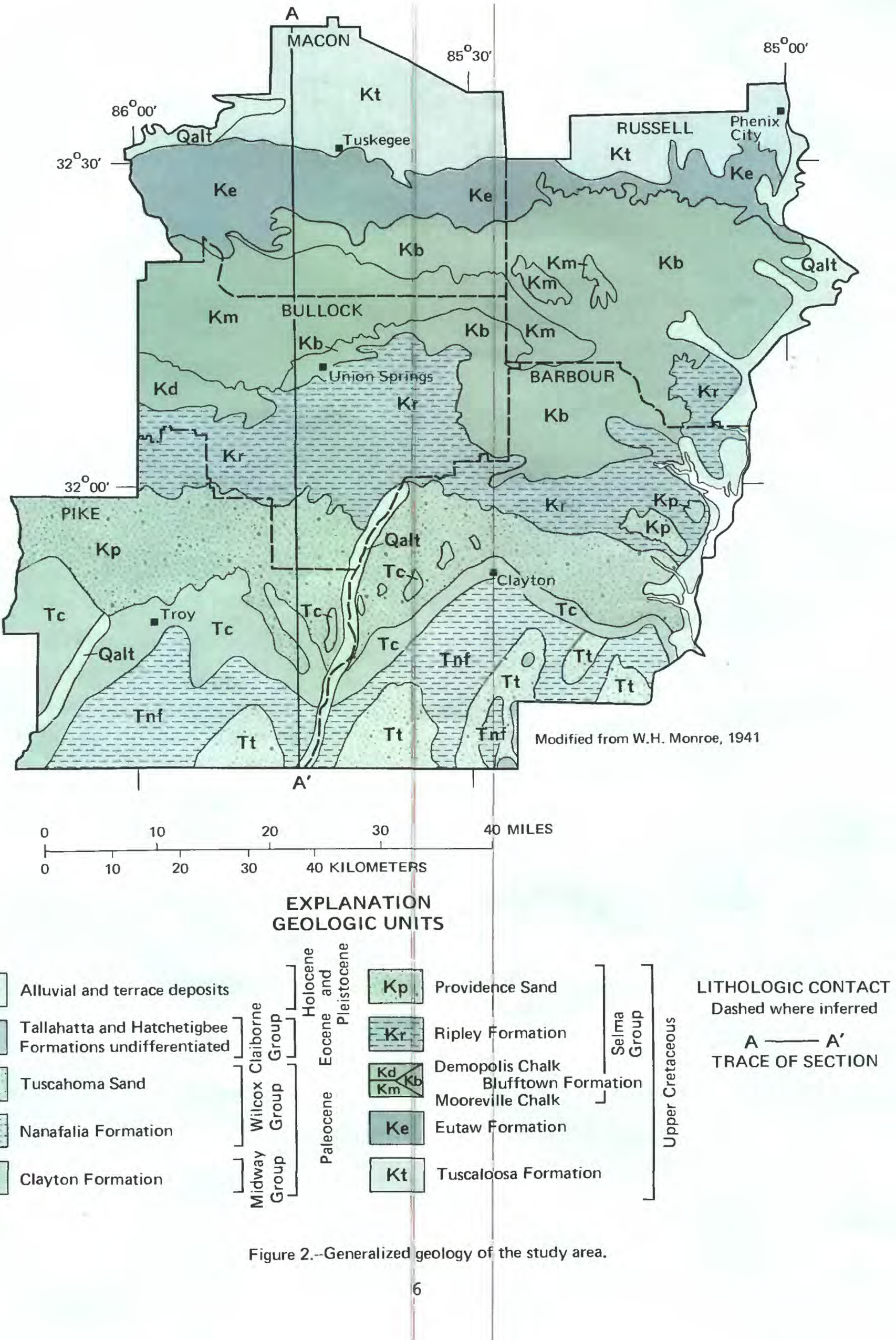
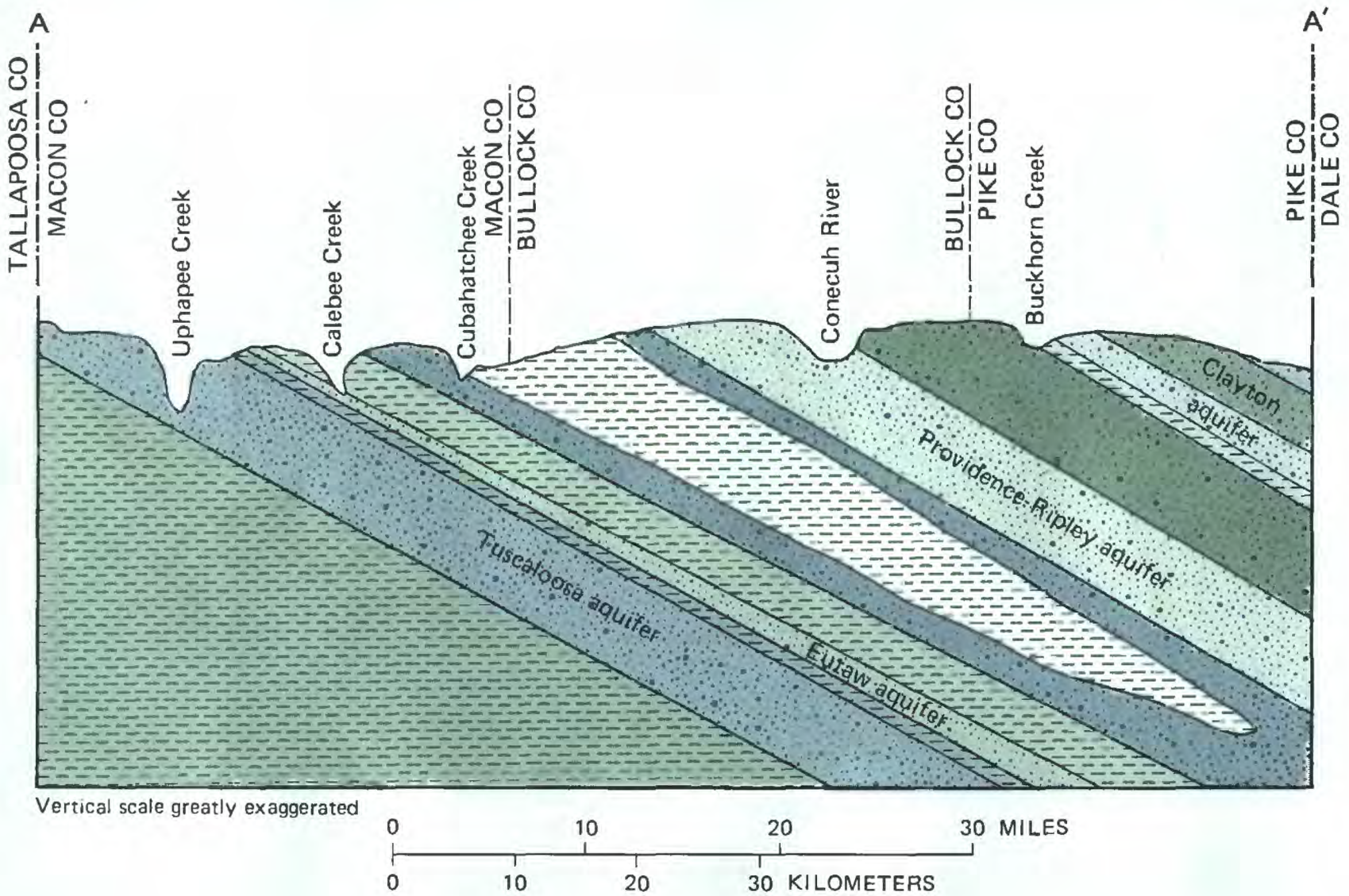


Figure 2.--Generalized geology of the study area.



EXPLANATION

GEOLOGIC UNITS

- Ripley Formation
- Blufftown Formation
- Eutaw Formation
- Tuscaloosa Formation
- Pre-Cretaceous rocks
- Tuscahoma Sand
- Nanafalia Formation
- Clayton Formation
- Providence Sand
- AQUIFER
- CONFINING UNIT

Figure 3.--Generalized subsurface section of the major aquifers in the central part of the study area.

Cretaceous Units

Sedimentary deposits of Late Cretaceous age overlie the metamorphic and igneous rocks throughout most of the study area (figs. 2 and 3). These include, from oldest to youngest, the Tuscaloosa Formation; the Eutaw Formation; and the Selma Group, which comprises the Blufftown Formation, the Mooreville Chalk, the Demopolis Chalk, the Ripley Formation, and the Providence Sand (Scott, 1960, 1961, 1962, 1964; Shamburger and others, 1968; Newton and others, 1966). The rocks generally strike east-west and dip south-southwest about 35 ft/mi (fig. 2). Because the dip of the beds is greater than the slope of the land surface, the formations lie at progressively greater depths south of the areas of outcrop (fig. 3).

Tuscaloosa Formation

The Tuscaloosa Formation unconformably overlies the pre-Cretaceous igneous and metamorphic rocks and crops out in a broad band in northern Macon and Russell Counties (fig. 2). The formation underlies all of the study area south of its outcrop, and is one of the major aquifers in the study area.

The Tuscaloosa Formation consists of sand and gravel interbedded with clay and some thin beds of sandstone. The formation ranges in thickness from less than 50 feet in the northern part of the study area to more than 1,300 feet in the southern part (Scott, 1962). The Tuscaloosa Formation, west of the study area is divided into the marine Coker Formation and the overlying nonmarine Gordo Formation of the Tuscaloosa Group (Scott, 1960). This division is not made in the study area because of the absence of distinctive marine deposits.

Sands in the Tuscaloosa Formation are developed for public water supplies for the towns of Eufaula, Troy, Midway, Union Springs, Ladonia-Crawford, and Fort Mitchell; and for Cowikee Water Authority, Russell County Utility Board, Macon County Water Authority, Alabama Highway Department, Macon Academy, Tuskegee Institute, Dixie High School, St. Joseph Missionary School, and Alabama Kraft Company.

The Tuscaloosa aquifer has not been developped as a source of water supply in the southern one-third of Barbour County. Available data indicate that the Tuscaloosa may be a source of potable water throughout Pike County, but probably has a high chloride content greater than 1,000 mg/L in parts of southern Barbour County (Shamburger and others, 1968; Newton and others, 1966).

Eutaw Formation

The Eutaw Formation overlies the Tuscaloosa Formation and crops out immediately south of the Tuscaloosa Formation in central Macon County and in a narrow belt in northern Russell County (fig. 2). The Eutaw consists of 150 to 325 feet of marine sand, clay, and calcareous fossiliferous sandstone. The

lower part of the formation is predominantly sand, which grades upward into calcareous sandy clay. The basal sand beds in the formation thicken and are more permeable downdip (Scott, 1960).

The Eutaw Formation is a major aquifer in central and southern Macon and Russell Counties and throughout most of the study area. The formation is a potential source of 1 Mgal/d (million gallons per day) per well in Pike County. The Eutaw aquifer is the source of public water supplies for the towns of Union Springs, Midway, Troy, Fort Mitchell and Hurtsboro, and also for South Bullock Water Authority and WBIC Radio Station.

Blufftown Formation

The Blufftown Formation crops out in southern Macon, and most of the southern two-thirds of Russell County, and in a narrow band in Bullock County extending from near Union Springs east-northeastward into southwestern Russell County (fig. 2). The Blufftown increases in thickness from about 30 feet in the western part of the study area to more than 500 feet in the eastern part. In the eastern part of the study area the lower part of the formation consists of about 200 feet of fine- to coarse-grained sand and sandy clay and the upper part consists of 200 to 300 feet of calcareous sandy clay containing some thin beds of sand and calcareous sandstone.

The Blufftown Formation intertongues with the Mooreville Chalk in Macon, Bullock, and Russell Counties (fig. 3). In Macon County, near Hardaway, the Blufftown merges laterally westward into the lower part of the overlying Mooreville Chalk (Scott, 1960). In the western part of Russell County, the lower part of the Blufftown merges with an eastward extending tongue of the Mooreville Chalk. The Mooreville is not distinguishable east of Hatchechubbee (Scott, 1964). In Bullock County, the lower part of the Blufftown underlies and partially replaces the Mooreville and the upper part intertongues with the upper part of the Mooreville southwest of Union Springs and thickens toward the east as the Mooreville thins. The upper and lower parts are known as the "upper and lower tongues" of the Blufftown. This intermergence results in parts of the Blufftown both underlying and overlying the Mooreville Chalk in the eastern two-thirds of Bullock County (Scott, 1962).

The formation generally will yield 10 gal/min in and south of its outcrop. Yields of 100 gal/min may be obtained in some areas of Russell County. The only public supply well that obtains water from the Blufftown Formation is the St. Joseph Missionary Cenacle at Holy Trinity in eastern Russell County, which had a reported yield of 150 gal/min in 1949 (Scott, 1964). The Blufftown is not considered a major aquifer and is included with the Ripley Formation and Providence Sand as the lower part of the Providence-Ripley aquifer (table 2).

Mooreville Chalk

The Mooreville Chalk crops out in southern Macon and northern Bullock Counties and extends eastward in a narrowing belt to southwestern Russell County. The Mooreville overlies the Eutaw in the western part of the study

area where the Blufftown Formation equivalent is included in the Mooreville, and overlies the lower tongue of the Blufftown elsewhere in the study area (fig. 3). The Mooreville consists of about 500 feet of silty chalk and calcareous clay interbedded with thin layers of limestone and calcareous sandstone. The Mooreville Chalk is relatively impermeable and is not a source of water in the study area.

Demopolis Chalk

The Demopolis Chalk crops out in the west-central part of Bullock County and strikes eastward to the vicinity of Union Springs, where it merges with the Ripley Formation (fig. 2). It is about 240 feet thick at the western edge of the study area and thins eastward. The Demopolis overlies the Mooreville in the western part of the study area and the Blufftown Formation in central and eastern parts. It consists of sandy micaceous calcareous clay that grades eastward into sandy clay. The Demopolis is relatively impermeable and generally is not a source of water in the study area. Small yields are obtained from a few dug wells in Bullock County.

Ripley Formation

The Ripley Formation crops out in an eastward trending belt across the central and southern parts of Bullock County and the northern panhandle of Pike County where the formation overlies the Demopolis Chalk. The outcrop of the Ripley continues eastward across from central Bullock, northern Barbour, and southeastern Russell Counties, and overlies the Blufftown Formation in these areas (fig. 2).

The Ripley is not divided into a lower Cusseta Sand Member and an upper unnamed member in this report. The Prairie Bluff Chalk, if present in the western part of the study area, is included with the Ripley. The Ripley ranges in thickness from 270 to 500 feet. The formation consists of fine- to coarse-grained sand, carbonaceous clay, sandy clay, and thin beds of gravelly sand and limestone.

The sand beds in the Ripley Formation are part of the Providence-Ripley aquifer that is a major aquifer in the southern halves of Pike and Barbour Counties where yields of 0.5 to 1.0 Mgal/d per well may be obtained (table 2).

Public water supplies for the towns of Banks, Brundidge, Troy, and Clayton; and for the Pike County Water Authority and the West Barbour County Water System are produced from the Providence-Ripley aquifer.

Providence Sand

The Providence Sand overlies the Ripley Formation and crops out in northern Pike, southern Bullock, and central Barbour Counties (fig. 2). The Providence consists of fine- to coarse-grained sand that is micaceous and carbonaceous; and laminated to thin-bedded silty clay and massive, lignitic and kaolinitic clay.

The Providence Sand, the uppermost part of the Providence-Ripley aquifer, is a potential source of 0.5 Mgal/d per well in southern Pike and Barbour Counties (table 2). The Providence is tapped by wells that supply the towns of Brundidge, Goshen, Louisville, and Clio; and the South Alabama Electrical Co-op.

Tertiary Units

Tertiary deposits in the study area overlie the Cretaceous rocks throughout the study area (fig. 2). These deposits include, from oldest to youngest, the Clayton Formation, the Nanafalia Formation, and the Tuscahoma Sand of Paleocene age; and the Hatchetigbee and Tallahatta Formations undifferentiated of Eocene age. The formations generally strike east-west and dip south-southeast from about 35 ft/mi in their outcrop area to about 15 ft/mi in the southern part of the study area (Newton and others, 1966).

Clayton Formation

The Clayton Formation overlies the Providence Sand and crops out in central and southern parts of Pike and Barbour Counties (fig. 2). The Clayton ranges in thickness from about 70 feet at the northern limits of the outcrop to 180 ft in the southern part of the study area. Erosion of the Clayton before deposition of the overlying Nanafalia Formation and solution of limestone after deposition of the Nanafalia have caused the thickness of the Clayton to vary locally as much as 40 feet (Shamburger, 1968; Newton, 1966).

In the outcrop areas, the lower part of the formation consists of 5 to 15 feet of fine- to coarse-grained sand that locally contains gravel, lignite and clay pebbles. The base of the bed generally has a thin layer of sandstone. In the subsurface the basal sand grades upward into sand overlain by sandy to clayey fossiliferous limestone that may be as much as 25 feet thick. The Clayton grades into sandy limestone in downdip areas.

The Clayton Formation is included with the Nanafalia Formation as part of the Nanafalia-Clayton aquifer. The Nanafalia-Clayton aquifer is considered a major aquifer in the study area (table 2). The Clayton will yield about 10 gal/min in most areas south of its outcrop. Yields of 0.5 Mgal/d may be available in the central and southern parts of Pike and Barbour Counties from the limestone. The Pike County Water Authority and the towns of Baker Hill, Brundidge, Elamville, and Louisville obtain public water supplies from the Clayton Formation.

Nanafalia Formation

The Nanafalia Formation overlies the Clayton Formation and crops out in parts of southern Pike and Barbour Counties (fig. 2). The formation is generally 80 to 130 feet thick but locally thickens and thins along the irregular top of the underlying Clayton. Overlying the basal fine- to very

coarse-grained sand are irregular beds of micaceous sand, sandy clay, bauxite and bauxitic clay. Locally, the entire formation consists of gravelly sand. In some downdip areas the basal sand is overlain by calcareous siltstone (Newton, 1966; Shamburger, 1968). Gibson (1982) redefined the Nanafalia Formation in Barbour County and southwestern Georgia, and named the updip beds containing bauxite and bauxitic clay the Baker Hill Formation. For this report, however, the Baker Hill Formation is included with the Nanafalia Formation.

The Nanafalia is not a major aquifer, but the basal sand of the formation is the uppermost part of the Nanafalia-Clayton aquifer, which is a major aquifer in the study area. The Nanafalia-Clayton aquifer is a potential source for municipal supplies in southern Pike and Barbour Counties (table 2).

Tuscahoma Sand

The Tuscahoma Sand overlies the Nanafalia Formation and crops out in the southernmost part of Barbour County and as outliers on hills in southern Pike County (fig. 2). The formation generally is 80 to 110 feet thick, but locally is much thinner. The Tuscahoma consists of fine- to coarse-grained, locally gravelly, sand; silt and gravel (Newton, 1966; Shamburger, 1968).

The Tuscahoma Sand is not a major aquifer in the study area. Locally the Tuscahoma will yield 10 gal/min or more in the southernmost part of the study area.

Hatchetigbee and Tallahatta Formations, Undifferentiated

The Hatchetigbee and Tallahatta Formations undifferentiated overlie the Tuscahoma Sand and crop out in outliers in the southernmost part of Barbour County (fig. 2). Their thickness generally does not exceed 50 feet. The formations consist of sand and clay with sandstone fragments (Newton, 1966).

The formations are not a major source of ground water in the study area. Locally, yields from wells in the formations are 5 to 10 gal/min (table 2).

Quaternary Deposits

Alluvial and terrace deposits of Pleistocene to Holocene age overlie older formations in and adjacent to the valleys of the larger streams in the study area. The alluvial and terrace deposits generally are indistinguishable and are mapped as a single unit (fig. 2). These deposits generally consist of 5 to 50 feet of sand, gravel, boulders, and clay.

The alluvial and terrace deposits are a potential source of ground water, but are not developed for public water supplies in the study area. Yields of 100 gal/min probably can be obtained from terrace sand and gravel in some areas (Scott, 1964). Larger yields may be obtained in alluvial deposits along flood plains.

HYDROLOGY OF THE MAJOR AQUIFERS

The major aquifers in the study area are, in descending order, the Nanafalia-Clayton aquifer, Providence-Ripley aquifer, Eutaw aquifer, and the Tuscaloosa aquifer (table 2). These aquifers crop out in and underlie most of the study area. Water in these aquifers occurs under artesian conditions in most parts of the study area. Recharge for the major aquifers and areas susceptible to surface contamination are shown on plate 1. Also shown on plate 1 are locations of public water-supply wells. Construction of wells, water levels, and other pertinent well data are given in table 1.

Recharge and Movement of Ground Water

The source of recharge to the major aquifers is rainfall. Average annual rainfall is about 52 in/yr (inches per year). A large part of the rainfall runs off to streams during and immediately after rainstorms. Most of the remainder is returned to the atmosphere by evaporation and transpiration of vegetation; a small part infiltrates to the water table to recharge aquifers. The recharge area for each aquifer is roughly equivalent to its outcrop area (plate 1).

Alluvial and terrace deposits along major streams overlie parts of the recharge areas for other aquifers. These permeable deposits enhance infiltration and increase recharge to the aquifers, especially where the potentiometric surface of the water in the aquifer is lowered by withdrawals of ground water.

The recharge areas for the Nanafalia-Clayton aquifer are in the southern part of the study area in southern Pike and southern Barbour Counties. The Providence-Ripley aquifer receives recharge from outcrop areas that include parts of each county in the study area from southern Macon and central Russell Counties to northern Pike and northern Barbour Counties. The recharge areas for the Eutaw aquifer are in Macon and Russell Counties.

The recharge area for the Tuscaloosa aquifer extends from where the Cretaceous sediments contact the pre-Cretaceous consolidated rocks just north of the study areas in Lee and Tallapoosa Counties to the outcrop of the Eutaw Formation in Macon and Russell Counties. Figures 4, 5, 6, and 7 provide generalized depictions of the potentiometric surfaces of the major aquifers in the study area based primarily on water level measurements made in the fall of 1982 (Williams, DeJarnette, and Planert, 1986a, 1986b; Williams, Planert, and DeJarnette, 1986a, 1986b).

The potentiometric surface maps illustrate, by means of contour lines, the altitude of the water table or the altitude to which water would rise in tightly cased wells tapping a confined aquifer. The potentiometric surface depicted generally represents averages for the aquifers; the water-level altitude in any particular well may differ from the average to some extent depending on well depth and local geology. The orientation and shape of the contour lines are influenced by the geologic structure of the aquifer, the rate at which water moves through the aquifers, and the location of discharge points. Ground-water flow in the aquifers is approximately perpendicular to the contour lines.

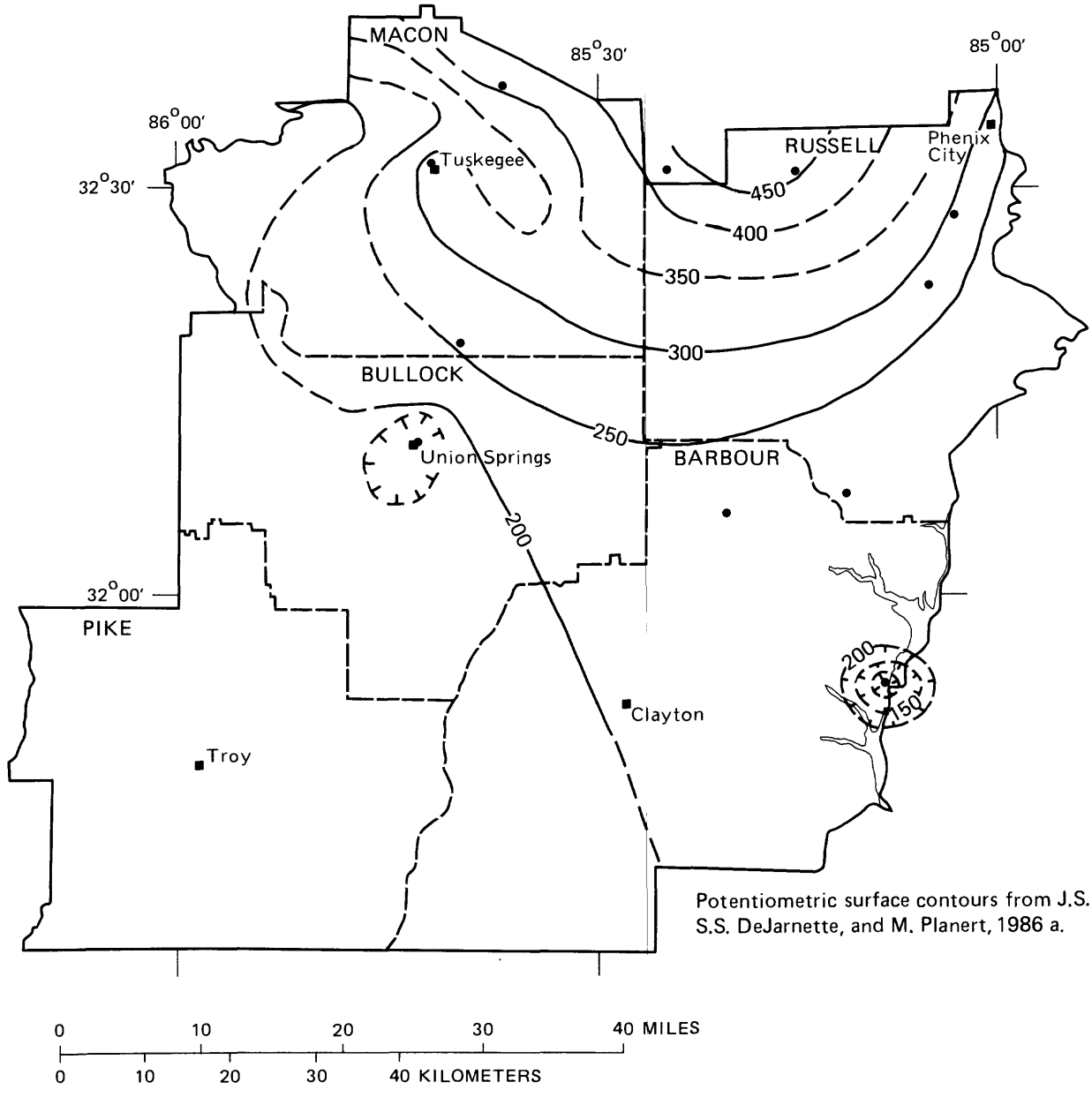


Figure 4.--Configuration of the potentiometric surface and withdrawals for the Tuscaloosa aquifer, Fall 1982.

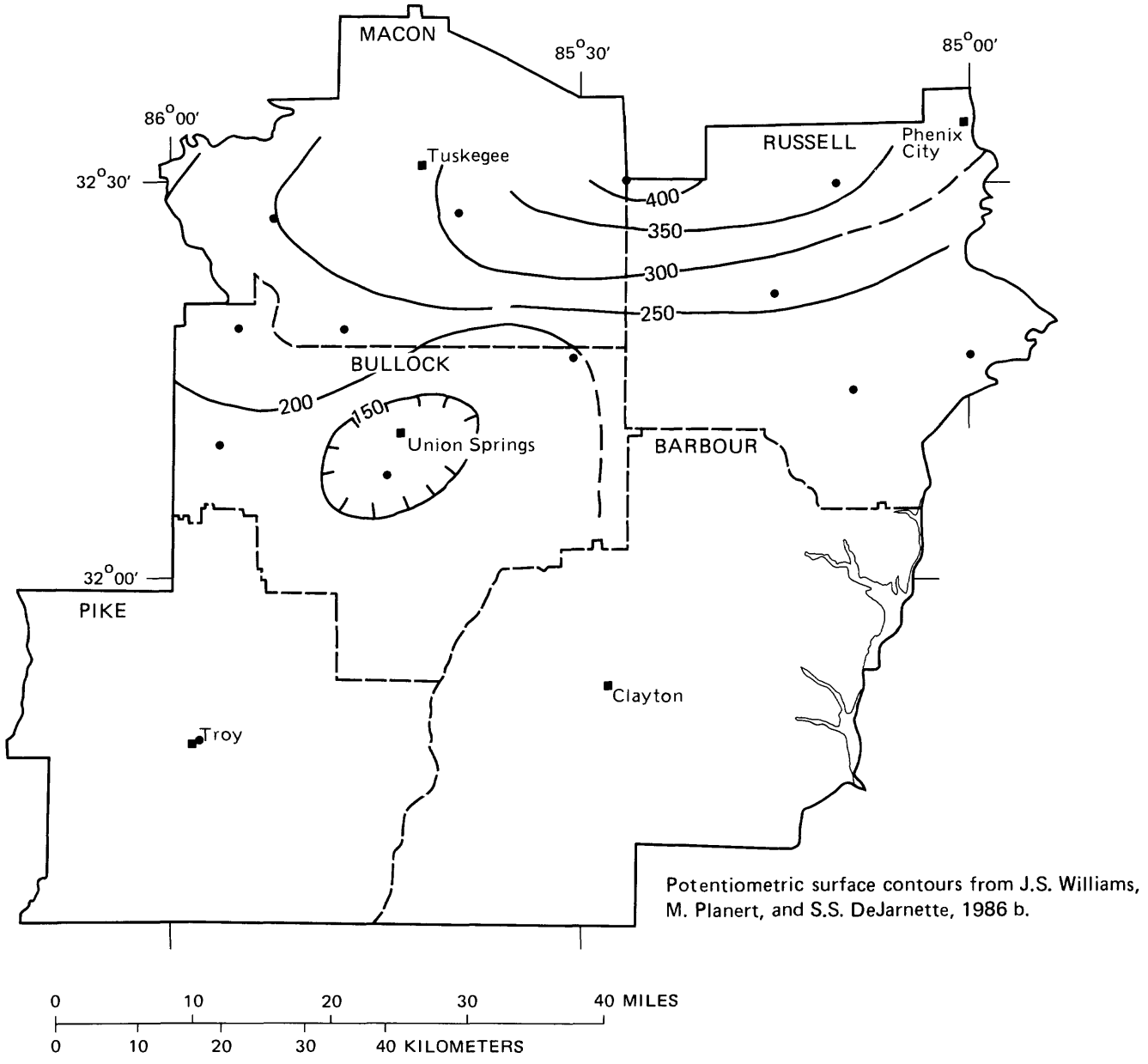


Figure 5.—Configuration of the potentiometric surface and withdrawals for the Eutaw aquifer, Fall 1982.

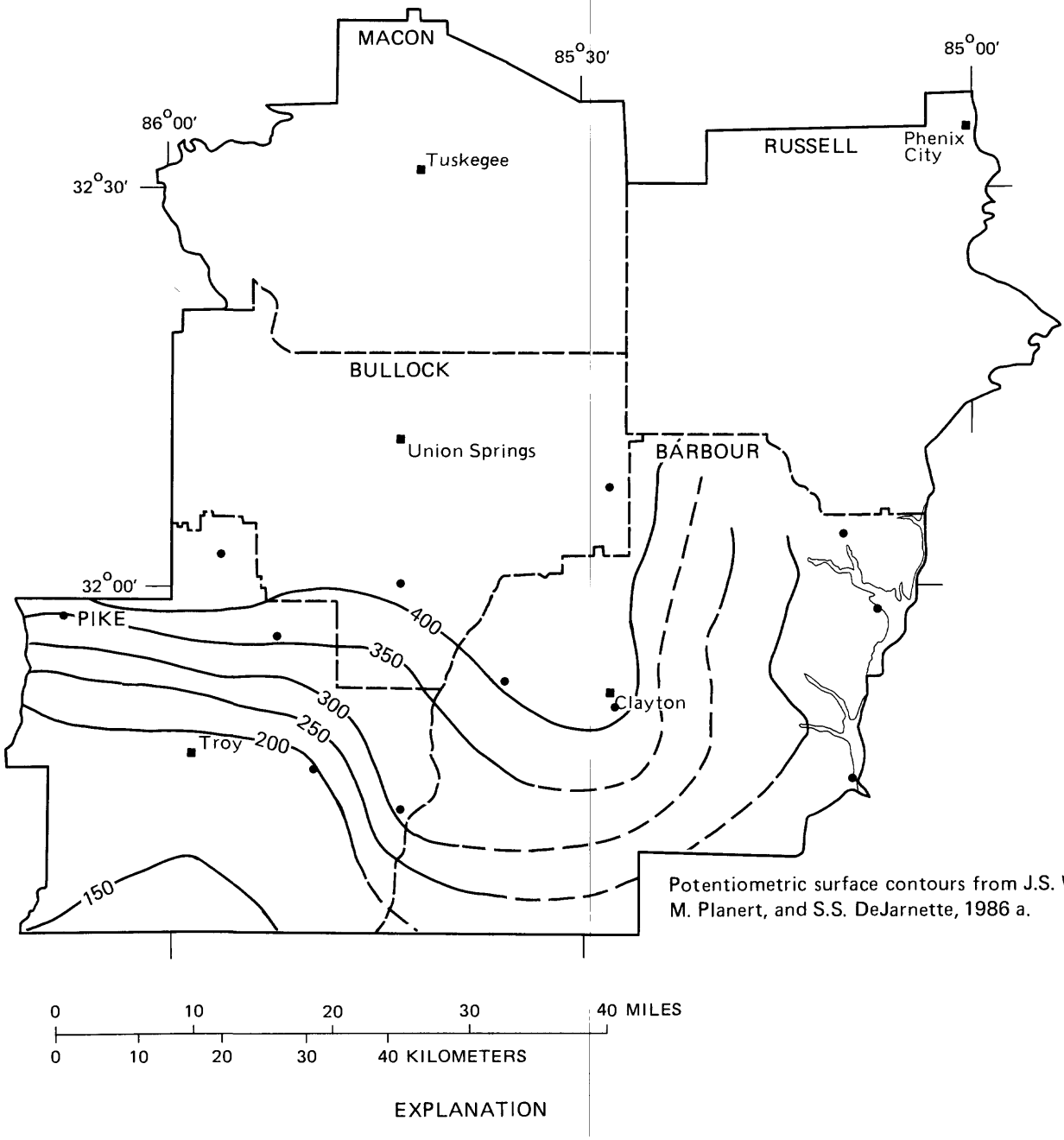


Figure 6.--Configuration of the potentiometric surface and withdrawals for the Providence—Ripley aquifer, Fall 1982.

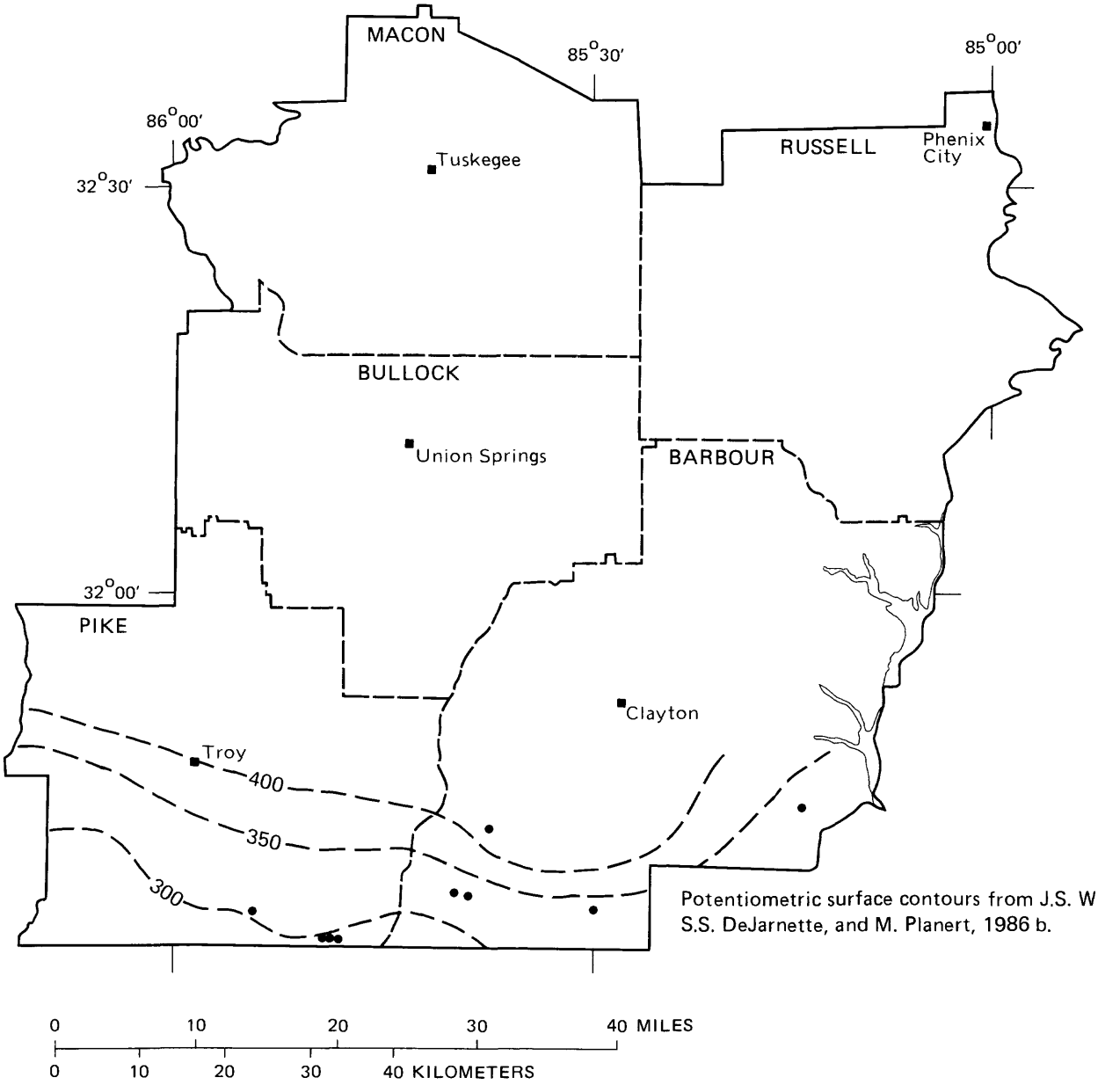


Figure 7.--Configuration of the potentiometric surface and withdrawals for the Nanafalia–Clayton aquifer, Fall 1982.

Natural Discharge and Ground-Water Withdrawals

Discharge from the aquifers may occur as: leakage upward or downward to adjacent aquifers, emergence at land surface as springs, withdrawals from wells, and drainage to streams.

Large streams and rivers in the study area drain significant amounts of water from the aquifer, and influence flow patterns. The Chattahoochee and Tallapoosa Rivers affect the flow patterns of the Tuscaloosa aquifer (fig. 4) and the Eutaw aquifer (fig. 5). The Chattahoochee River and, to a lesser degree, the Conecuh River influence the Providence-Ripley aquifer (fig. 6).

Water entering the aquifer that is not immediately intercepted by streams in the recharge area or by pumpage will continue to flow downdip through the confined part of the aquifer beyond the limits of the study area.

The largest pumping centers in the study area producing from the Tuscaloosa aquifer are Union Springs, Troy, Ladonia-Crawford, and Eufaula (fig. 4). Union Springs and Troy also pump water from the Eutaw aquifer (fig. 5). Major pumping centers in the Providence-Ripley aquifer in the study area are Troy, Brundidge, and Clio (fig. 6). Baker Hill is the largest pumping center for the Nanafalia-Clayton aquifer (fig. 7).

Ground-water withdrawals in million gallons per day for public water systems in the study area in 1985 by county were: Barbour, 3.10; Bullock, 1.47; Macon, 0.00; Pike, 3.46; and Russell, 0.92. Water is also discharged by wells used for domestic, stock, industrial, and irrigation purposes. The total amount of ground water used for these purposes in the study area is 4.75 Mgal/d. The total withdrawals of ground water for all users in the study area in 1985 were estimated to be about 14 Mgal/d (Baker and Mooty, 1987).

Effects of Withdrawals from the Aquifers

Large long-term withdrawals of water from aquifers may result in the formation of depressions on the potentiometric surfaces of the aquifers. Depressions have formed in the Tuscaloosa aquifer near Eufaula and Union Springs (fig. 4). A depression in the Eutaw aquifer has formed at Union Springs (fig. 5). Other less extensive depressions probably occur around other pumping centers in the study area, but their effects are more localized.

SUSCEPTIBILITY OF THE AQUIFERS TO SURFACE CONTAMINATION

All of the areas of recharge for the major aquifers in the study area are susceptible to surface contamination (plate 1). However, throughout most of the study area, the recharge areas are in rural terrains that are used for timberlands, farms, or pastures. Usually the depth of the water-producing zone being tapped and its horizontal distance from the aquifers outcrop provide some buffer from surface contamination (see plate 1 and table 1). Shallow wells in outcrop areas are more susceptible to contamination, but none are considered highly susceptible.

The alluvial and terrace deposits overlie and recharge the major aquifers along streams in the study area. The alluvial sediments permit water to move downward from the land surface to the aquifers, especially areas where the potentiometric surface in the aquifers being recharged has been lowered by pumpage.

In the study area, the depressions formed by pumpage on the potentiometric surfaces of the major aquifers are not in direct contact with alluvial aquifers. Figure 4 shows a depression in the potentiometric surface of the Tuscaloosa aquifer at Eufaula, however, figure 2 shows that the alluvium overlies the Ripley Formation and the Providence Sand near Eufaula. The sediments between the Tuscaloosa aquifer and the alluvial aquifers should prevent or retard vertical movement of water or contaminants in this and similar areas.

SUMMARY AND CONCLUSIONS

The major aquifers in Area 9 in east-central Alabama are the Tuscaloosa, Eutaw, Providence-Ripley and the Nanafalia-Clayton aquifers. The recharge areas for these aquifers are primarily in Macon, Russell, Bullock, Pike, and Barbour Counties. The aquifers underlie most of the study area. The aquifers consist of sand and gravel beds, and limestone, and water in the aquifers occurs under artesian conditions in most parts of the area.

The Tuscaloosa and Eutaw aquifers are major sources of public water supplies throughout the study area. Union Springs and Troy produce water from both aquifers. Eufaula and Ladonia-Crawford produce from the Tuscaloosa aquifer.

The Providence-Ripley aquifer is a major aquifer in southern Bullock and northern Pike and Barbour Counties. Troy, Brundidge, and Clio are major pumping centers for this aquifer.

The Nanafalia-Clayton aquifer is a major aquifer in the southernmost part of the study area. The towns of Baker Hill, Elamville, and Louisville obtain public water supplies from the aquifer.

Areas of water-level declines in the Tuscaloosa aquifer have developed near Eufaula and Union Springs. Water levels in the Eutaw aquifer have declined at Union Springs.

All the recharge areas for the major aquifers are susceptible to surface contamination. Throughout most of the study area, however, the recharge areas are in rural terrains that are used for timberlands, farms, and pastures. Usually the depth to the zone being tapped and the horizontal distance from the outcrop to the well provide a buffer from surface contamination.

Other potential areas susceptible to surface contamination are the permeable alluvial and terrace deposits if the potentiometric surface in the underlying aquifer has been depressed. The alluvial deposits are usually in areas of discharge, but if pumpage has caused a decline in the potentiometric surface of the underlying aquifer the alluvial aquifer will become a source of recharge.

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Table 1.--Records of public water-supply wells in the study area

NOTE: Well numbers correspond to those shown on plate 1.

Geographic coordinate number: Lat (DDMMSS) Long (DDMMSS) sequential number (xx).

Depth of well and water level: Depth of well given in feet; reported water levels are in feet above (-) or below land surface; measured water levels are in feet and tenths.

Well diameter: casing diameter in inches.

Water-bearing unit: pK, pre-Cretaceous rocks; Kt, Tuscaloosa Formation; Ke, Eutaw Formation; Kb, Blufftown Formation; Kr, Ripley Formation; Kp, Providence Sand; Tc, Clayton Formation.

Altitude of land surface: Altitudes given in feet above sea level, from topographic map or determined by aneroid barometer; altitudes given in feet and tenths determined by instrumental leveling.

Method of lift: N, none; S, submergible; T, turbine; J, jet.

Use of well: N, none; P, public water supply; S, stock.

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
1	323340085403301	Notasulga	--	260	6	pK	531	--	--	N	N	
2	323054085330601	Loachapoka W.S. and FPA	--	--	-	pK	360	--	--	-	P	1,400 gal/min Jim Silavent Spring
3	322958085364801	Alabama Highway Department	1973	50	4	Kt	372	33.50	6-73	J	N	Wire Road rest area. Casing: 4 in. from 0 to 20 ft. Screened from 20 to 50 ft.
4	322947085364701	Alabama Highway Department	1973	130	4	Kt	399	80.72	8-83	-	-	Wire Road rest area. Casing: 4 in. from 0 to 80 ft, 125 to 130 ft. Screened from 80 to 100 ft and 105 to 125 ft.
5	322650085153101	Dixie High School	--	61	6	Kt	469	14.0 22.69 16.64 17.90 21.10 14.40 22.17 18.20	6-61 10-81 4-82 11-82 11-83 5-84 11-84 5-85	J	P	5 gal/min (1961)
6	322537085540501	Macon County Water Authority	Weldon	360	-	Kt	210	44.00	2-86	-	P	Well no. 2.
7	322547085421901	Tuskegee Institute	--	--	-	Kt	-	58	2-86	T	P	
8	322550085421001	Tuskegee Institute	Layne Central	355	18 8	Kt	395	54.4	11-82	T	P	Casing: 18 in. 0 to 216 ft; 8 in. 216 to 315 ft. Screened 8 in. 315 to 355 ft.
9	322540085052801	Russell County Utility Board	Graves	--	-	Kt	346	141.0	2-86	T	P	Well no. 3. Ladonia-Crawford well.
10	322528085051401	Russell County Utility Board	T. Smith	301	12 6 4	Kt	301	--	--	T	P	Well no. 2. Ladonia-Crawford well. 151 gal/min. Casing: 12 in. 0 to 238 ft. 6 in. 198 to 238 ft. 4 in. 238 to 247 ft, 272 to 278 ft, 283 to 291 ft. Screened 247 to 272 ft and 278 to 283 ft and 291 to 301 ft.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
11	322440085053701	Russell County Utility Board	T. Smith 1972	286	12 6 4	Kt	300	+600	6-73	T	P	Well no. 1. Ladonia-Crawford well. 187 gal/min. Casing: 12 in. 0 to 232 ft. 6 in. 167 to 216 ft. 4 in. 216 to 237 ft, 252 to 266 ft. Screened 237 to 252 ft, 266 to 286 ft.
12	322230085394201	Macon Academy	T. Smith	420	-	Kt	340	--	--	-	-	138 gal/min.
13	322235085392401	WBIC Radio Station	Watson Drilling 1956	100	4	Ke	336	11.58	8-82	N	N	Casing: 4 in. 0 to 90 ft. Screened 4 in. 90 to 100 ft.
14	322242085044801	Russell County Utility Board	Graves 1981	377	24 16 10	Kt	265	46.50	6-81	T	P	Well no. 4. Ladonia-Crawford well. Casing: 24 in. 0 to 29 ft. 16 in. 0 to 268 ft. 10 in. 233 to 276 ft; 296 to 303 ft; 323 to 344 ft, 364 to 372 ft. Screened 279 to 296 ft, 303 to 323 ft, 344 to 364 ft, and 372 to 377 ft.
15	321856085010501	Fort Mitchell	Layne Central 1970	210	12 6	Ke Kt	230	4.5 46.5 48	1-71 11-82 1-86	T	P	Well no. 1. Casing: 0 to 140 ft. 6 in. 140 to 142 ft; 152 to 162 ft; 172 to 200 ft. 180 gal/min. Screened 142 to 152 ft, 162 to 172 ft, and 200 to 210 ft.
16	321629085371601	Macon County Water Authority	Weldon 1986	551	10 6	Kt	-	88.54	2-86	-	P	Well no. 1. Screened 6 in. 476 to 551 ft.
17	321650085023001	Yuchi Pines Institute	T. Smith	520	4	Kt	428	138.4	9-61	T	P	Screened: 500 to 520 ft. 6 gal/min.
18	321650085023002	Yuchi Pines Institute	--	360	-	Ke	--	--	--	-	-	15 gal/min.
19	321653085001401	Fort Mitchell	Layne Central 1969	409	12	Kt	330	100	12-69	T	P	Well no. 2. Casing: 0 to 354 ft. 8 in. 294 to 354 ft. 6 in. 354 to 357 ft; 372 to 381 ft; 386 to 404 ft. Screened 357 to 372 ft, 381 to 386 ft, and 404 to 409 ft. 160 gal/min
20	321424085250101	Hurtsboro	Layne Central 1962	492	10 6	Ke	346	111.0 212	3-62 11-82	T	P	Well no. 1. 94 gal/min. Casing: 10 in. 0 to 440 ft. 6 in. 390 to 445 ft. Screened 445 to 460 ft and 487 to 492 ft.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
21	321433085250201	Hurtsboro	Acme 1974	486	8 4	Ke	350	134.0	2-74	S	P	Well. no. 2. 303 gal/min. Casing: 8 in. 0 to 442 ft. 4 in. 401 to 442 ft; 483 to 486 ft. Screened 442 to 483 ft.
22	321034085531201	South Bullock Water and Fire	Acme 1976	688	6 2.5	Ke	285	129.2	1-86	S	P	Greenwood well. Screened 584 to 590 ft, 637 to 643 ft, 672 to 688 ft. 57 gal/min.
23	321332085002401	Holy Trinity Cenacle	Layne Central 1949	320	12 6	Kb	374	135.80 143.50 141.93	3-62 8-82 11-82	S	P	Screened from 302 to 320 ft. 150 gal/min.
24	321348085000401	Holy Trinity Cenacle	--	37.5	30	Kb	310	29.1 30.24	8-82 11-82	-	S	Casing: 30 in. +1.5 ft above surface to 37.5 ft. (farm well)
25	321325085002301	Holy Trinity Cenacle	--	--	-	Kb(?)	330	--	--	-	-	
26	321320085001801	St. Joseph Missionary Cenacle	W. J. Radford	460	4	Kb Ke(?)	--	--	--	N	N	(Well originally flowed.)
27	321325085002501	St. Joseph Missionary Cenacle	--	900	6	Kt	--	--	--	N	N	
28	321223084594701	Blessed Trinity School	--	300	-	Kb(?)	--	--	--	-	-	
29	321032085014902	Alabama Kraft Co.	--	925	-	Kt	298	--	--	-	-	300 gal/min
30	321032085014901	Alabama Kraft Co.	--	900	-	Kt	298	--	--	-	P	200 gal/min.
31	320835085430601	Union Springs	Layne Central	1105	16	Ke Kt	492	289.6	3-61	T	P	Well no. 2. Screened 855 to 890 ft, 925 to 940 ft, 955 to 975 ft, 1,025 to 1,105 ft. 200 gal/min.
32	320818085432101	Union Springs	Layne Central 1959	1231	16 8	Kt	509	312.3 369.58 397.0 379.2	3-61 11-82 11-84 4-85	T	P	Well no. 3. Casing: 16 in. 0 to 983 ft. 8 in. 963 to 968 ft; 1,028 to 1,046 ft; 1,126 to 1,209 ft. Screened 968 to 1,028 ft, 1,046 to 1,126 ft, and 1,209 to 1,231 ft.
33	320813085422601	Union Springs	Gray Artesian	1278	12	Ke Kt	492	289.6	3-61	T	P	Casing: 12 in. 0 to 840 ft; 850 to 920 ft; 950 to 1009 ft. Screened 840 to 850 ft, 920 to 950 ft, 1,009 to 1,049 ft, 1,248 to 1,253 ft, and 1,268 to 1,278 ft.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
34	320821085415701	Union Springs	Layne Central 1968	1270	16 8	Kt	540	398	5-68	T	P	Casing: 16 in. 0 to 873 ft. 8 in. 873 to 878 ft; 893 to 910 ft; 920 to 940 ft; 950 to 970 ft; 980 to 1025 ft; 1,035 to 1,042 ft; 1,052 to 1,062 ft; 1,077 to 1,102 ft; 1,112 to 1,120 ft; 1,130 to 1,150 ft; 1,160 to 1,200 ft. Screened 878 to 893 ft, 910 to 920 ft, 940 to 950 ft, 970 to 980 ft, 1025 to 1,035 ft, 1,042 to 1,052 ft, 1,062 to 1,077 ft, 1,102 to 1,112 ft, 1,120 to 1,130 ft, 1,150 to 1,160 ft, and 1,200 to 1,270 ft.
35	320723085422401	Union Springs	Layne Central 1978	1335	16 8	Kt	496	320	9-78	T	P	Well no. 5. Screened 830 to 850 ft, 856 to 871 ft, 892 to 902 ft, 918 to 928 ft, 940 to 970 ft, 1002 to 1,012 ft, 1,022 to 1,032 ft, 1,042 to 1,057 ft, 1,078 to 1,088 ft, 1,100 to 1,110 ft, 1,140 to 1,145 ft, 1,152 to 1,157 ft, 2,267 to 1,187 ft, 1,198 to 1,208 ft, 1,222 to 1,232 ft, 1,238 to 1,243 ft, 1,270 to 1,280 ft, and 1,290 to 1,320 ft. 503 gal/min.
36	320617085231801	Cowikee Water and Fire Protection Authority	D. Smith	950	16 8 4	Kt	459	242.0	11-83	T	P	Screened 895 to 905 ft and 915 to 935 ft. 190 gal/min.
37	320513085452801	South Bullock Water and Fire	Layne Cental 1974	1119	12 6	Ke	503	325.0	3-74	T	P	Sardis well. Screened 938 to 968 ft, 990 to 1,010 ft, 1,022 to 1,032 ft, 1,066 to 1,094 ft. 300 gal/min.
38	320506085305501	Midway Water Works	Layne Central 1973	1312	16 8	Kt	--	330 302.7	4-73 11-82	T	P	Well no. 2. Casing: 16 in. 0 to 960 ft. 8 in. 840 to 965 ft; 985 to 1,114 ft; 1,124 to 1,140 ft; 1,150 to 1,157 ft. Screened 965 to 985 ft, 1,114 to 1,124 ft, 1,140 to 1,150 ft, 1,157 to 1,167 ft, 1,182 to 1,212 ft, 1,277 to 1,287 ft, and 1,302 to 1,312 ft. 250 gal/min.
39	320419085311201	Midway Water Works	Layne Central	1083	8	Ke Kt	554	313.4	1-61	T	P	Well no. 1. (near school) Casing: 0 to 1,043 ft. 46 gal/min.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
40	315515085085501	Eufaula	Singer-Layne	1584	24 18 8	Kt	294	120	--	-	P	Well no. 5. 508 gal/min.
41	315236085274701	Clayton Water Works	Layne Central	200	18 8	Kp	567	--	--	T	P	Casing: 18 in. 0 to 100 ft. 8 in. 100 to 140 ft. 150 gal/min.
42	315235085274701	Clayton Water Works	Layne Central	204	18 10	Kp	567	143 147.6	1946 11-83	T	P	Casing: 18 in. 0 to 150 ft. 10 in. 150 to 160 ft.
43	315236085274701	West Barbour County Water	--	-	-	-	--	--	--	-	P	College well. 90 gal/min.
44	315237085265401	West Barbour County Water	--	-	-	-	--	--	--	-	-	Church well. 90 gal/min.
45	315235085265701	Clayton Water Works	Layne Central	200	18	Kp	554	130 86.40	1962 11-82	T	P	Well no. 3. Casing: 18 in. 0 to 175 ft. 175 gal/min.
46	315244085100401	Eufaula	Layne Central	1582	18 8	Kt Ke (?)	210	29	1961	-	P	Well no. 2. Casing: 18 in. 0 to 1,254 with 217 ft of 8 in. inter-casing. Screened 1,256 to 1,296 ft, 1,380 to 1405 ft, 1,420 to 1,445 ft, and 1,477 to 1,582. 508 gal/min.
47	315314085091201	Eufaula	--	1768	-	Kt	290	--	--	-	-	(V-9)
48	315324085085301	Eufaula	Layne Central	1752	18	Kt	255	74 161.4	1962 1984	-	P	Well no. 3. Screened 1,278 to 1,283 ft, 1,298 to 1,308 ft, 1,314 to 1,324 ft, 1,343 to 1,348 ft, 1,358 to 1,363 ft, 1,405 to 1,425 ft, 1,500 to 1,510 ft, 1,520 to 1,530 ft, 1,555 to 1,565 ft, 1,574 to 1,609 ft, 1,618 to 1,628 ft, 1,648 to 1,668 ft, 1,696 to 1,706 ft, 1,718 to 1,728 ft, and 1,742 to 1,752 ft. 508 gal/min.
49	315230085091401	Eufaula	Layne Central	1438	24 18	Kt Ke (?)	252	35	1-56	T	N	Well no. 1. Casing: 24 in. 0 to 35 ft. 18 in. 35 to 1,318 ft. Screened 1,323 to 1,333 ft, 1,345 to 1,355 ft, 1,372 to 1,392 ft, and 1,428 to 1,438 ft.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
50	315137085085401	Eufaula	Layne Central 1970	1633	24 18 8	Kt	250	87	1970	T	P	Well no. 4. Casing: 0 to 1,421 ft. Screened 1,335 to 1,365 ft, 1,380 to 1,400 ft, 1,440 to 1,455 ft, 1,480 to 1,500 ft, 1,506 to 1,521 ft, and 1,533 to 1,633 ft. 508 gal/min.
51	315122085084301	Eufaula	Layne Central 1975	1680	24 18 8	Kt	250	130	1976	T	P	Well no. 6. Screened 1,350 to 1,375 ft, 1,384 to 1,394 ft, 1,405 to 1,420 ft, 1,430 to 1,440 ft, 1,466 to 1,481 ft, 1,494 to 1,504 ft, 1,510 to 1,550 ft, 1,576 to 1,581 ft, 1,635 to 1,650 ft, and 1,566 to 1,680 ft. 108 gal/min.
52	315030085593401	Troy	Layne Central	234	24 10	Kr	333	68 84.20	1-40 5-84	T	P	Well no. 1. Casing: 24 in. 0 to 132 ft. 10 in. 132 to 174 ft. 200 gal/min. Screened 174 to 234 ft.
53	314955085564401	Troy	Layne Central	478	-	Kt	520	--	--	-	-	Well no. 5. 300 gal/min.
54	314932085422301	Pike County Water Authority	Weldon 1978	544	6 4	Kr	480	152	10-78	S	P	Josie well Casing: 6 in. 0 to 500 ft. 4 in. 484 to 524 ft. 150 gal/min. Screened 524 to 544 ft.
55	314959085342001	West Barbour County Water	Graves 1982	576	12 6	Kr	--	260.25	9-82	T	P	Sweetgum well. Well no. 1. Screened 513 to 573 ft. 225 gal/min.
56	314817086033501	Pike County Water Authority	Smith 1984	300	8 6 4	Kr	332	164	8-84	S	P	Carter well Casing: 8 in. 0 to 225 ft. 6 in. 218 to 239 ft. 4 in. 259 to 269 ft; 279 to 300 ft. 150 gal/min. Screened 239 to 249 ft, 249 to 259 ft, and 269 to 279 ft.
57	314832085580601	Troy	Layne Central	560	18	Kr	539	280 345	1945 8-62	T	P	400 gal/min.
58	314821085500701	Banks	Layne Central	476	16 6	Kr	540	318 344.59	10-68 11-82	S	P	Well no. 1. Casing: 16 in. 0 to 42 ft. 6 in. 0 to 446 ft. Screened 446 to 476 ft.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
59	314704085340901	Louisville	Gray Artesian	170	8	Tc	537	--	--	-	N	210 gal/min.
60	314703085340801	Louisville	Gray Artesian	307	8	Tc	537	138	1946	T	N	180 gal/min.
61	314658085333501	Louisville	Layne Central 1967	299.0	12 8	Kp	555	210.64	2-86	T	P	Well no. 2. Screened 269.00 to 299 ft. 154 gal/min.
62	314658085331401	Louisville	Layne Central 1967	305.0	12 8	Kp	539	--	--	T	P	Well no. 1. Screened from 275 to 305 ft.
63	314703085183601	U.S.A.F. Eufaula Adj. Ctr	Layne Central	1730	12	Kt	410	--	--	-	-	20 gal/min.
64	314651085181701	Baker Hill Water and Fire	Acme 1967	145.0	6 4	Tc	539	84.0	6-67	S	P	Well no. 1. Screened 130 to 145 ft. 75 gal/min.
65	314651085181801	Baker Hill Water and Fire	D. Smith 1975	296.0	8 4	Tc(?) Kp(?)	541	182.0	10-75	T	P	Well no. 2. Screened from 265 to 295 ft. 87 gal/min.
66	314703085594701	Troy	Layne Central 1981	2240	18 10	Kt	510	352 359.4	2-81 11-82	T	P	Well no. 6. Casing: 18 in. 0 to 1,796. 10 in. 1,604 to 1,802 ft; 1,827 to 1,875 ft; 1,895 to 1,982 ft; 2,002 to 2,007 ft. Screened 1,802 to 1,827 ft, 1,875 to 1,895 ft, 1,982 to 2,002 ft, 2,007 to 2,012 ft, 2,051 to 2,061 ft, 2,082 to 2,112 ft, 2,128 to 2,133 ft, 2,145 to 2,150 ft, and 2,220 to 2,240 ft. 1,300 gal/min.
67	314724085574801	Troy	Layne Central	618	18	Kr	530	349.0	8-62	T	P	Well no. 3. 600 gal/min.
68	314700085564901	Troy	Layne Central	1988	18	Ke	485	300.0	12-71	T	P	Well no. 9. Casing: 18 in. 0 to 1,773. 10 in. 1,696 to 1,801 ft; 1,826 to 1,836 ft; 1,841 to 1,846 ft; 1,851 to 1,859 ft; 1,864 to 1,874 ft; 1,909 to 1,937 ft; 1,972 to 1,978 ft; 1,988 to 1,998 ft. Screened 1,801 to 1,826 ft, 1,836 to 1,841 ft, 1,846 to 1,851 ft, 1,859 to 1,869 ft, 1,874 to 1,909 ft, 1,937 to 1,972 ft and 1,978 to 1,988 ft. 800 gal/min.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
69	314606085542901	South Alabama Co-op	Foy English 1965	565	6	Kp	516	299.4 367.24 355.12 351.30 351.60 363.40	3-65 11-81 4-82 11-82 11-83 11-84	S	P	Casing: 6 in. 0 to 497 ft.
70	31432086072301	Goshen	Graves Drilling 1973	194	12 6	Kp	341	39.6	2-86	T	P	Casing: 12 in. 0 to 107 ft. 6 in. 0 to 132 ft; 137 to 155 ft; 160 to 164 ft; 178 to 194 ft. 125 gal/min. Screened from 132 to 137 ft, 155 to 160 ft, and 169 to 178 ft.
71	314316086072801	Goshen	Alton Powell	243	4	Kp	324	--	--	-	-	21 gal/min.
72	314358085490801	Brundidge	Layne Central 1968	645	16 8	Kr	510	320	12-68	T	P	Barn well Casing: 16 in. 0 to 580 ft. 8 in. 529 to 585 ft; 635 to 645 ft. Screened from 585 to 635 ft. 508 gal/min.
73	314324085485601	Brundidge	Layne Central 1948	632	16 8	Kr	480	213 354.09	1948 2-86	T	P	College Street well Casing: 16 in. 0 to 462 ft. 8 in. 370 to 578 ft. Screened 578 to 628 ft.
74	314318085484601	Brundidge	Gray Artesian Well Co.	256	8	Tc Kp	465	20	1945	T	P	Casing: 8 in. 0 to 139 ft.
75	314313085484801	Brundidge	Gray Artesian Well Co.	250	8	Kp	466	20 92.5 95.24 93.79 94.00 91.57 92.22 94.60 94.10	1945 5-65 11-81 4-82 11-82 11-83 5-84 11-84 4-85	T	N	Casing: 8 in. 0 to 220 ft.
76	314319085160701	Baker Hill Water and Fire	A. Powell 1977	309	12 10 6	Tc(?) Kp(?)	523	184.0	1977	T	P	Well no. 3. Screened 222 to 249 ft and 286 to 309 ft. 250 gal/min.
77	313952085484201	Pike County Water Authority	Smith 1984	330	8 6	Tc	480	144	9-84	S	P	Senn well Casing: 8 in. 0 to 263 ft. 6 in. 253 to 270 ft; 290 to 299 ft; 304 to 308 ft; 313 to 330 ft. 150 gal/min. Screened 270 to 290 ft, 299 to 304 ft, and 308 to 313 ft.
78	313953085384901	Elamville Water and Fire	D. Smith 1983	440	12 8	Tc	575	298.0	1-83	T	P	Screened from 307 to 310 ft, 315 to 318 ft, 330 to 335 ft, 345 to 348 ft, 404 to 410 ft, and 420 to 440 ft. 125 gal/min.

Table 1.--Records of public water-supply wells in the study area--Continued

Well number	Geographic coordinate number	Well owner	Driller and year drilled	Well depth (feet)	Well diam. (inches)	Water bearing unit	Altitude of land surface	Water level above (-) or below Land Surface Datum	Date of measurement	Method of lift	Use of well	Remarks
79	314038085365401	Clio Water Works	Smith Well Co.	655	10	Kp Kr (?)	565	305	6-79	T	P	Well no. 3. Screened 538 to 548 ft and 570 to 650 ft. 220 gal/min.
80	314126085364601	Clio Water Works	Layne Central	440	8	Kp	534	200	1966	T	N	Well no. 2. Screened 345 to 440 ft.
81	313956085310201	Blue Spring Water Works	A. Powell 1975	200	12 8	Tc	418	120.0	3-75	S	P	Screened 166.7 to 200 ft. 104 gal/min.

Table 2.--Generalized geohydrologic units and their water-bearing properties

Period	Epoch	Hydrogeologic unit	Group	Geologic unit	Thickness (feet)	Lithology	Water-bearing propreties
Quaternary	Holocene and Pleistocene	Alluvial and terrace aquifers		Alluvial and terrace deposits	5-50	Sand, poorly sorted; clay, varicolored; gravel	Yields adequate for domestic and stock use.
Tertiary	Eocene	Tallahatta-Hatchetigbee aquifer	Claiborne	Tallahatta and Hatchetigbee formations undifferentiated	50±	Clay, gray, galuconitic and sandy; sand, coarse-grained, gravelly at base	Locally will yield about 10 gal/min in southern parts of Barbour County.
	Paleocene	Tuscahoma aquifer	Wilcox	Tuscahoma Sand	80-110	Sand, yellowish gray to medium-gray, fine- to coarse-grained; clay; gravel	Locally will yield about 10 gal/min in southern parts of Barbour and Pike Counties.
		Nanafalia-Clayton aquifer	Wilcox	Nanafalia Formation	80-130	Sand, varicolored, poorly-sorted; clay, grayish-green; silt and gravel	Yields 10 gal/min in southern parts of Pike and Barbour Counties.
			Midway	Clayton Formation	70-180	Clay, gray, massive; limestone, gray, sandy, fossiliferous; sand, silty to fine-grained; sand, coarse-grained, gravelly at base	Yields 0.5 Mgal/d from central Barbour and southern Pike Counties southward.
Cretaceous	Upper Cretaceous	Providence-Ripley aquifer	Selma	Providence Sand	160-300	Sand, varicolored, fine- to coarse-grained, gravelly in places; clay, micaceous, carbonaceous, sandy	Potential source of 0.5 Mgal/d per well in southern parts of Pike and Barbour Counties.
				Ripley Formation	270-500	Sand, varicolored, fine- to coarse-grained; clay, gray, sandy, silty	Yields about 10 gal/min in southern Bullock and Russell Counties. Yields of 1 Mgal/d possible in southern Pike and Barbour Counties.
				Demopolis Chalk	240±	Chalk, sandy, micaceous grading eastward into sandy clay interbedded with thin layers of calcareous sandstone and limestone	Not a potential source of water.
				Blufftown Formation (upper part)	30-300	Sand, olive-gray to greenish-gray, fine- to coarse-grained, silty, calcareous; clay, yellowish-orange to dark-gray, sandy, carbonaceous, calcareous	Yields of 10 gal/min.
				Mooreville Chalk	500±	Chalk, olive-gray, silty; gray calcareous sandy clay interbedded with thin layers of gray limestone and calcareous sandstone	Not a potential source of water.
				Blufftown Formation (lower part)	200±	Sand, olive gray to greenish-gray, fine- to coarse-grained, silty, calcareous; clay, yellowish-orange to dark-gray, sandy, carboaceous, calcareous	Yields of 100 gal/min may be obtained in areas of Russell County. Yields of 10 gal/min generally in Barbour, Bullock, Macon, and Pike Counties.
		Eutaw aquifer		Eutaw Formation	150-325	Sand, gray to yellowish-brown, fine- to very coarse-grained, calcareous; clay, gray, calcareous, silty; sandstone; limestone	Major source of ground water in study area. Source of 1 Mgal/d per well.
		Tuscaloosa aquifer		Tuscaloosa Formation	50-1360	Sand, yellowish-orange to gray, fine- to very coarse-grained; clay, varicolored, gravelly, sandy; sandstone	Major source of ground water in study area.
pre-Cretaceous		pre-Cretaceous		pre-Creteceous	--	Schist, gneiss, quartzite, and marble	Yields small to moderate amounts of water in northeastern Russell County.