GEOLOGY AND GROUND-WATER RESOURCES OF ST. CLAIR COUNTY, ALABAMA

A Reconnaissance

By Lawson V. Causey

GEOLOGICAL SURVEY OF ALABAMA *BULLETIN 73*

GEOLOGICAL SURVEY OF ALABAMA
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BULLETIN 73

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By Lawson V. Causey

Prepared by the
United States Geological Survey
in cooperation with the
Geological Survey of Alabama

UNIVERSITY, ALABAMA

1963

University, Alabama
March 14, 1963

Honorable George C. Wallace
Governor of Alabama
Montgomery, Alabama

Dear Governor Wallace:

I have the honor to transmit the manuscript of a report entitled "Geology and Ground-Water Resources of St. Clair County, Alabama, a Reconnaissance" by Lawson V. Causey, with the request that it be printed as Bulletin 73 of the Geological Survey of Alabama.

According to the report, the chief sources of water for wells and springs in the county are the Conasauga Formation, Cambrian and Ordovician dolomites, Floyd Shale, and Pottsville Formation. The Ordovician limestones, Fort Payne Chert, Ste. Genevieve Limestone, Gasper Formation, Hartselle Sandstone, and Bangor Limestone, which have smaller areal extent, also yield large quantities of ground water to wells and springs. The quality of the ground waters is generally good; however, the hardness of water from some of the aquifers, the sulfurous odor of water from a few wells that penetrate the Conasauga Formation, and the high iron content of water from the Floyd Shale and Pottsville Formation may require treatment of the water for some purposes.

Ground water from wells and springs is the source for most domestic, stock, industrial, and public supplies in St. Clair County. The estimated daily average ground-water withdrawal in 1960 was 1,825,000 gallons.

Respectfully,

Philip E. LaMoreaux
State Geologist

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GEOLOGY AND GROUND-WATER RESOURCES OF ST. CLAIR COUNTY, ALABAMA

A Reconnaissance

By Lawson V. Causey

ABSTRACT

St. Clair County, in northeastern Alabama, includes an area of 641 square miles in the Tennessee section of the Valley and Ridge physiographic province. A small area in the northwestern part of the county is in the Cumberland Plateau section of the Appalachian Plateaus. Geologic formations that crop out in the county range in age from Early Cambrian to Pennsylvanian and consist chiefly of sandstone, shale, dolomite, and limestone.

Most of the wells and springs yield water from the Conasauga Formation, dolomites of Cambrian and Ordovician age, Floyd Shale, and Pottsville Formation. However, the Ordovician limestones; Fort Payne Chert; Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone undifferentiated; and Bangor Limestone, which have relatively smaller areal extent, yield large quantities of ground water to wells and springs.

The Conasauga generally yields less than 10 gpm (gallons per minute) of water to wells, and as much as 470 gpm to springs. The Cambrian and Ordovician dolomites yield as much as 150 gpm of water to wells, and as much as 2,200 gpm to springs. The Ordovician limestones yield as much as 100 gpm of water to wells, and as much as 400 gpm to springs. The Ste. Genevieve, Gasper, and Hartselle undifferentiated yield as much as 250 gpm of water to wells, and as much as 1,500 gpm to springs. The Bangor yields adequate water to wells for domestic and stock supplies, and as much as 1,500 gpm to springs. The Floyd yields as much as 30 gpm of water to wells. The Pottsville yields as much as 130 gpm but generally less than 50 gpm of water to wells.

Ground water from wells and springs is the source for most domestic, stock, industrial, and public supplies. The estimated daily average ground-water usage from wells and springs in St. Clair County in 1960 was 1,825,000 gallons. Domestic and stock use was about 450,000 gpd (gallons per day), industrial use, 396,000 gpd, public supply was about 967,000 gpd, and rural school use about 12,000 gpd.

The quality of ground water from the principal aquifers in St. Clair County is suitable for many uses; however, the hardness of water from some of the aquifers, the sulfurous odor of water from a few wells that penetrate the Conasauga Formation, and the high iron content of water from the Floyd Shale and Pottsville

Formation may require treatment for some uses. The median hardness of waters from the aquifers ranges from 45 to 200 ppm (parts per million). The iron content of 4 water samples from the Pottsville Formation ranges from 0.59 to 3.4 ppm. The median temperature of ground water from wells and springs in St. Clair County is 61°F.

INTRODUCTION

A continuing study of the ground-water resources of Alabama is being made by the U.S. Geological Survey in cooperation with the Geological Survey of Alabama. An important phase of this program is a series of reconnaissances being made to obtain general information on the geology and the occurrence, availability, and quality of ground water. This report gives the results of one of these investigations. Data in this report should be of particular interest to those responsible for planning the development of ground-water resources. For example, information is given that will aid industries in the preliminary investigation of potential plant sites, municipalities in the development of additional ground-water supplies, and water-well drillers.

Ground water from wells and springs is the source for most domestic, stock, industrial, and public supplies in St. Clair County. Ground water is the principal source of industrial water supply for Avondale Mills at Pell City, Ragland Brick Co. and National Cement Co. at Ragland, and municipal water supply at Acmar, Ashville, Branchville, Margaret, Odenville, Pell City, Pinedale Shores, Ragland, Springville, and Steele. A part of the municipal supply for Leeds in Jefferson County is obtained from spring Z-7 in St. Clair County.

Geologic formations that crop out in St. Clair County range in age from Early Cambrian to Pennsylvanian and consist chiefly of sandstone, shale, dolomite, and limestone. The Conasauga Formation, Cambrian and Ordovician dolomites, Floyd Shale, and Pottsville Formation, which have large areal extents in the county, are the sources of water for most of the wells and springs. However, the Ordovician limestones; Fort Payne Chert; Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone undifferentiated; and Bangor Limestone, which have relatively small areas of outcrop, yield large quantities of ground water to wells and springs.

LOCATION AND ECONOMY OF AREA

St. Clair County, in northeastern Alabama, has an area of 641 square miles and in 1960 had a population of 25,388 (fig. 1). The principal municipalities are Ashville, the county seat, Pell City, Ragland, Springville, and Odenville.

The economy of St. Clair County is based on agriculture and industry. The principal crops are corn, cotton, truck crops, and timber. Dairying and cattle farming are of increasing importance to the economy of the area. Avondale Mills at Pell City, Ragland Brick Co. and National Cement Co. at Ragland are the principal industries in the county; however, many residents of St. Clair County commute to work in Calhoun, Etowah, and Jefferson Counties.

PURPOSE AND SCOPE

The purpose of the investigation in St. Clair County was to determine the occurrence, use, and quality of ground water, and to describe the relation of ground water to geology. The objectives of the study were to:

1. Inventory all industrial, municipal, school, and selected domestic wells to determine their location, construction, depth, source of supply, water level, yield, and use (pl. 1, table 3).
2. Inventory selected springs to determine their location, source of supply, discharge, water temperature, and use (pl. 1, table 3).
3. Make periodic measurements of water levels in wells and maintain continuous water-level gages on wells to determine seasonal fluctuations (figs. 5-7).
4. Make periodic measurements of discharge from spring M-8 at Springville to determine seasonal fluctuations (fig. 8).
5. Compile a generalized geologic map of St. Clair County (pl. 2).
6. Determine the thickness, character, and water-bearing properties of the formations (table 2).
7. Make a study of the chemical quality of ground water in St. Clair County (fig. 9 and tables 1 and 3).
8. Obtain generalized data on economic geology.

This investigation was begun in July 1960 by the U.S. Geological Survey in cooperation with the Geological Survey of Alabama. The work was under the direct supervision of W. J. Powell, district geologist in charge of ground-water investigations in Alabama.

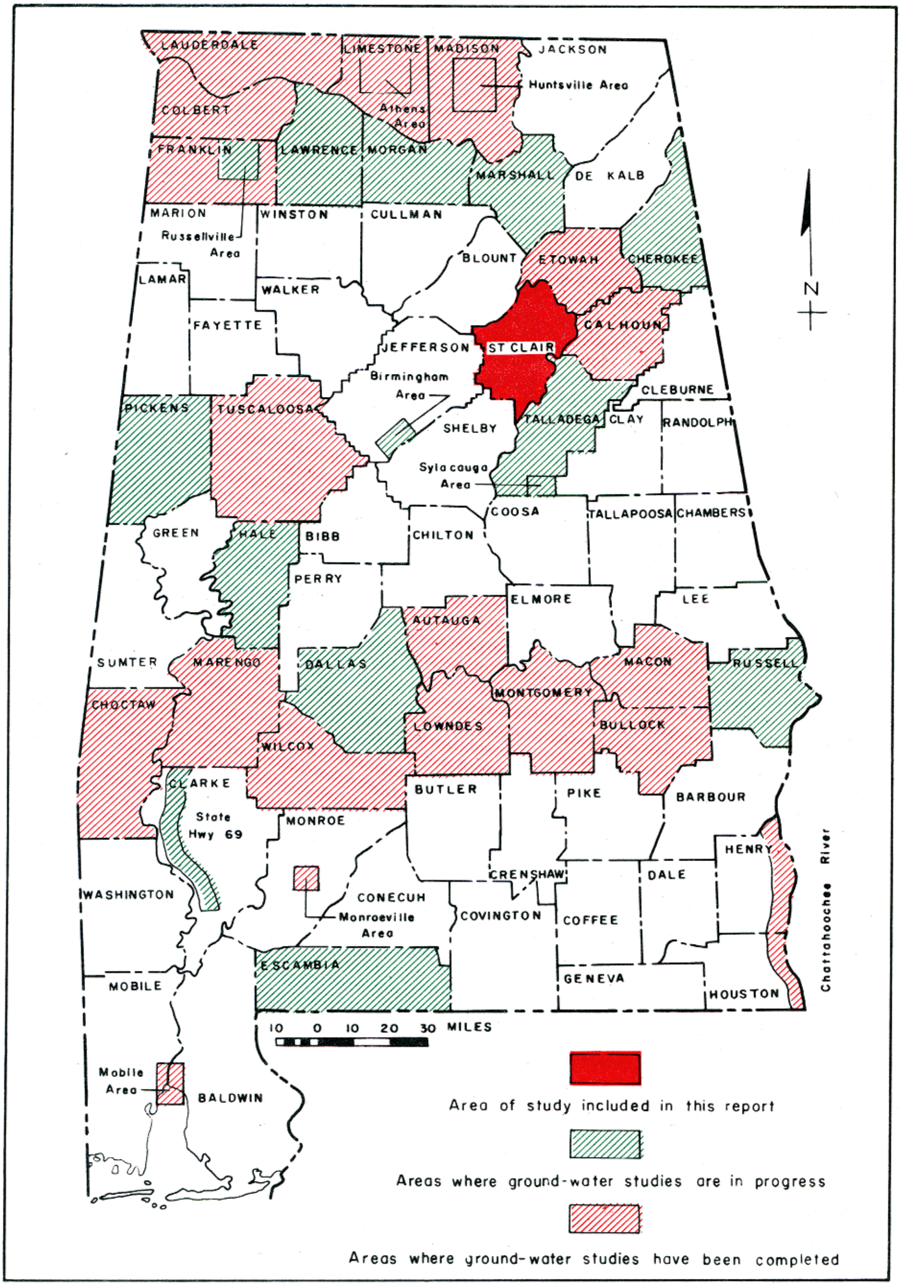


Figure 1.—Area studied and areas of other ground-water studies in Alabama.

PREVIOUS INVESTIGATIONS

A reconnaissance of ground water in northern Alabama was made by W. D. Johnston in 1928-29. The results of this study were published in 1933 as Alabama Geological Survey Special Report 16, "Ground Water in the Paleozoic Rocks of Northern Alabama," which contains data on 48 wells and 19 springs in St. Clair County.

Reports describing the geology of St. Clair County include four reports of the Alabama Geological Survey–Special Report 9, "The Valley Regions of Alabama, Part II, on the Coosa Valley Region," by Henry McCalley; Special Report 14, "Geology of Alabama," by G. I. Adams, Charles Butts, L. W. Stephenson, and C. Wythe Cooke; Special Report 19, "Iron Ore Outcrops of the Red Mountain Formation in Northeast Alabama," by Ernest F. Burchard and Thomas G. Andrews; and Bulletin 61, "Geology and Coal Resources of the Northeast Part of the Coosa Coal Field, St. Clair County, Alabama," by Howard E. Rothrock–and U.S. Geological Survey Bulletin 1087-E, "Stratigraphy and Uranium Content of the Chattanooga Shale in Northeastern Alabama, Northwestern Georgia, and Eastern Tennessee," by Lynn Glover.

TOPOGRAPHY AND DRAINAGE

St. Clair County lies almost entirely within the Tennessee section of the Valley and Ridge province. A small area in the northwestern part of the county is in the Cumberland Plateau section of the Appalachian Plateaus (U.S. Geol. Survey, 1946).

The topography ranges from rolling to hilly terrain in the southeastern part of the county, to valleys and ridges that trend northeastward in the central and northwestern part. The rolling to hilly terrain is underlain by dolomite and shale; and the valleys are underlain almost entirely by limestone and shale. The ridges are composed chiefly of resistant sandstone and chert. Maximum relief in the county is about 1,000 feet, and the highest points are about 1,500 feet above sea level in the northwestern part of the county.

The county is drained by the Coosa, Cahaba, and Little Cahaba Rivers and their tributaries (pl. 1). The northwestern, northern, and northeastern parts are drained northeastward by Big Canoe and Permeter Creeks and their tributaries; the eastern and southeastern parts are drained eastward and southeastward by Beaver, Shoal, Bridge, Trout, Broken Arrow, Fishing, and Dye Creeks and their tributaries; the southern part is drained southward by Kelly Creek and its tributaries. The creeks listed above are tributaries of the Coosa River. The Coosa River flows southwestward along the southeast edge of the county and forms a common boundary between St. Clair County and Calhoun and Talladega Counties to the east.

The southwestern and western parts of the county are drained southwestward by the Little Cahaba River, Little Black, Big Black, and Black Creeks, tributaries of the Cahaba River. The Cahaba River flows for a short distance through the southwestern part of the county, and the Little Cahaba River heads in the valley northeast of Leeds and flows southwestward and out of the county to the Cahaba River.

CLIMATE

The climate of St. Clair County is mild, characterized by relatively large amounts of rainfall, high humidity (except during autumn), and temperatures that are moderately high during the summer. The average annual precipitation, determined from 41 years of record at the U.S. Weather Bureau station near Ashville, is 55.39 inches. The rainfall is relatively uniform throughout the year; monthly averages exceed 3 inches.

WELL- AND SPRING-NUMBERING SYSTEM

The numbering of wells and springs in St. Clair County is based on the Federal system of land subdivision which divided the public land into townships approximately 36 square miles in area. In the well- and spring-numbering system used in this report, the townships of St. Clair County are designated by letters, in alphabetical order, beginning with "A" in the northeast township. The wells and springs within a township are numbered consecutively, each number being prefixed by the letter identifying the township; for example, F-1, F-2, F-3 (fig. 2).

ACKNOWLEDGMENTS

Acknowledgment is made to the employees of the St. Clair County Board of Education for supplying information on school wells, and to the owners and the officials of the water departments of Acmar, Ashville, Branchville, Leeds, Margaret, Markeeta, Odenville, Pell City, Pinedale Shores, Ragland, Springville, Steele,

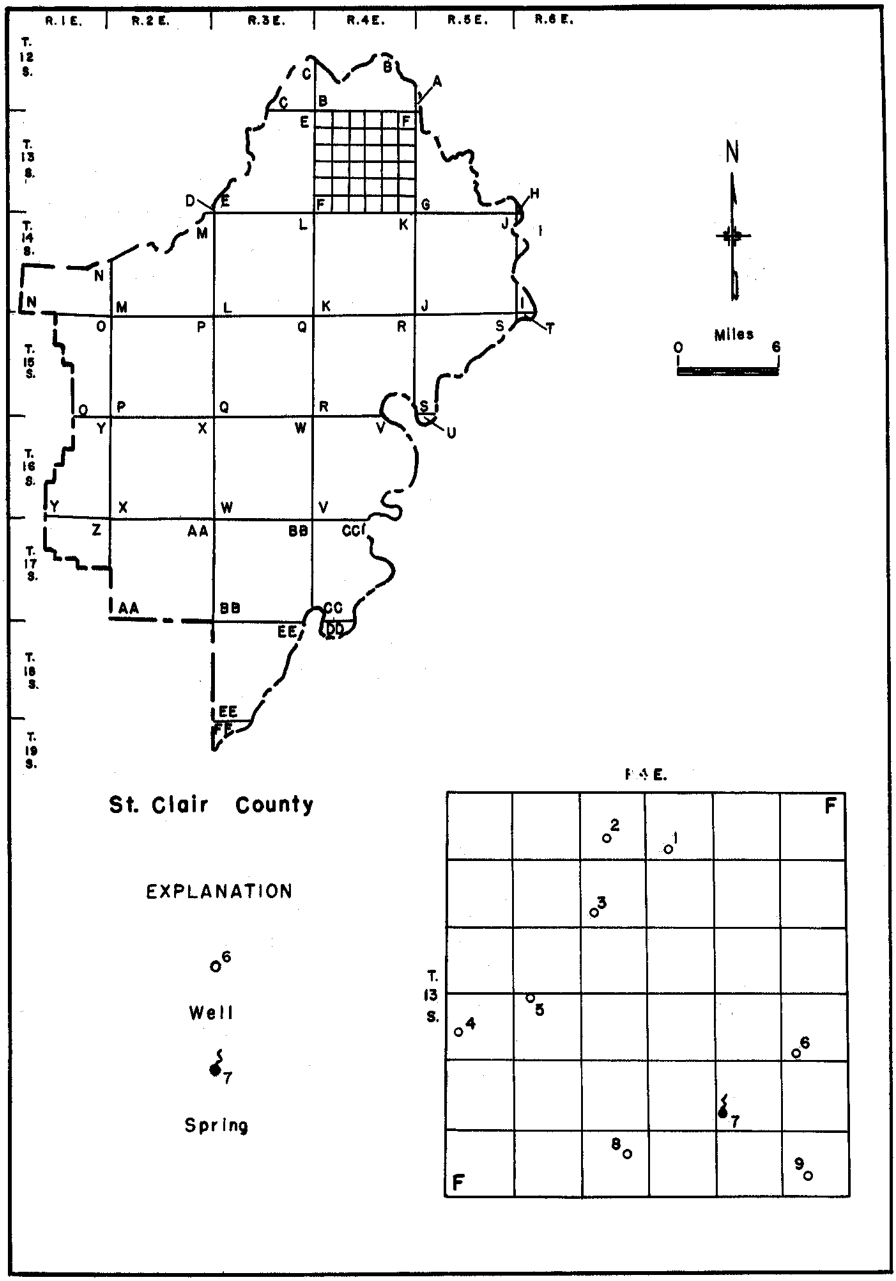


Figure 2.–Well- and spring-numbering system used in this report.

Avondale Mills, National Cement Co., and Ragland Brick Co. for furnishing information on wells and springs and use of water.

Acknowledgment is made also to H. W. Peerson Drilling Supply Co. and W. C. Chapman Drilling Co. of Birmingham, Virginia Well and Supply Co. of Atlanta, Ga., and C. R. Killian Drilling Co. of Boaz for supplying driller's logs and other information on wells, and to the many residents of St. Clair County who supplied information on wells and springs, use of water, and other pertinent data.

GROUND WATER

SOURCE

Ground water is the water below the land surface that occurs in the zone of saturation—a zone in which all the pore spaces and voids of a rock are filled with water. Ground water is derived from precipitation, and in St. Clair County the precipitation consists of rainfall and occasionally small amounts of hail, sleet, or snow. Part of the precipitation is carried away by surface streams, part is evaporated directly, and part seeps downward into the soil to become subsurface water. Some of the water entering the soil is returned to the atmosphere by evaporation or transpiration, and some moves downward to the zone of saturation to become ground water.

Water seeping down through the soil first enters a zone of aeration, which lies between the land surface and the zone of saturation (fig. 3). A part of the water entering the zone of aeration is used to satisfy soil-moisture requirements, being held in this zone by molecular forces, which counteract the force of gravity, and a part seeps downward into the zone of saturation. All openings in the zone of saturation are filled with water, and it is from this zone that wells and springs yield water.

OCCURRENCE AND MOVEMENT

Ground water occupies pores, fractures, and solution openings in the rocks. The size, shape, and distribution of the openings differ greatly from place to place, and they control the storage and movement of ground water.

The porosity or percentage of open space in soil and rock determines the amount of water the material will hold. Porosity

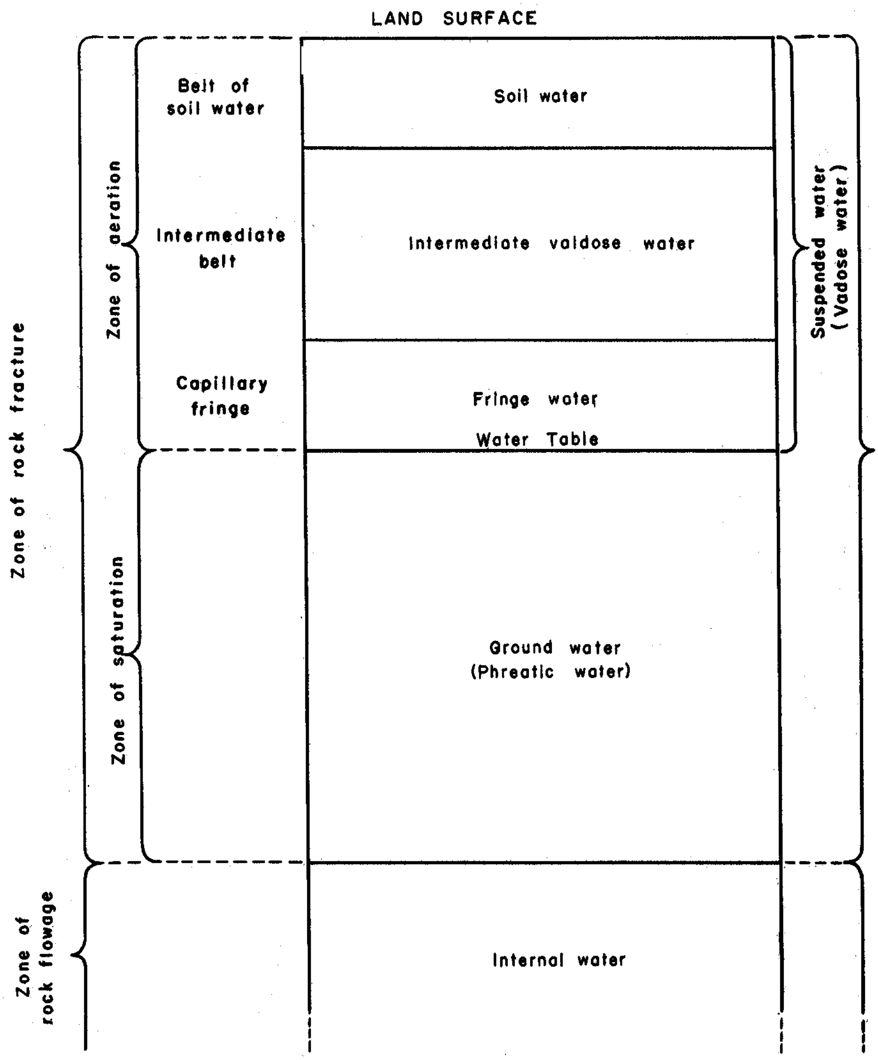


Figure 3.—Divisions of subsurface water.

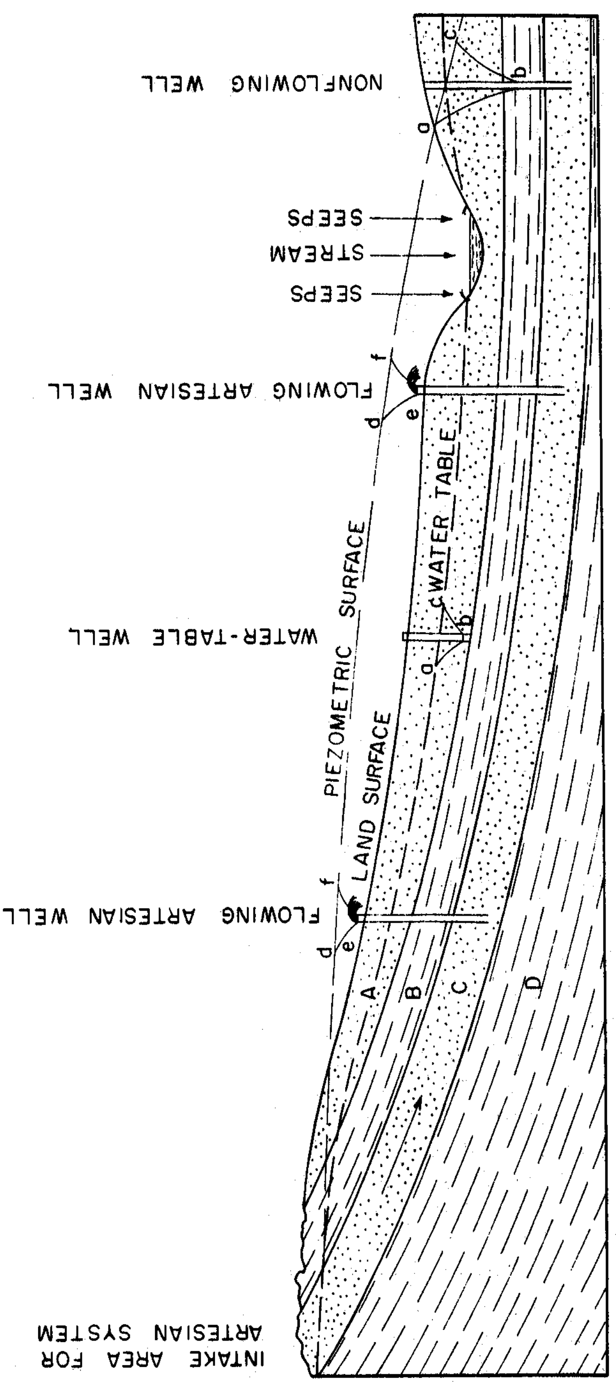
depends upon the shape, arrangement, degree of sorting, cementation, and compaction of particles in a deposit. In consolidated rocks, it depends also on the extent to which mineral matter has been precipitated or removed through solution by seeping water, and on the number of joint cracks and other openings a rock contains.

The permeability of a rock is a measure of the rate at which water is transmitted through a unit cross section under a unit hydraulic gradient. Clay generally has a high porosity but a low permeability because its pore spaces, though numerous, are very small. Sand and gravel have a lower porosity than clay but have a higher permeability because the interconnected open spaces are larger.

Ground water moves in response to gravity and differences in head, and is retarded primarily by friction and molecular attraction. The movement of ground water is generally in the direction of regional dip of geologic formations. Ground water in St. Clair County moves generally southeastward; however, there are many local variations caused by pumping or structural and hydrologic irregularities.

WATER-TABLE AND ARTESIAN CONDITIONS

Water is contained in a water-bearing unit or aquifer under either water-table or artesian conditions (fig. 4). Under water-table conditions water in an aquifer is unconfined and is under atmospheric pressure. The aquifer functions much like a storage reservoir. Precipitation may enter the water-table aquifer directly in areas of outcrop, causing a rise in water level and a temporary increase in storage. The upper surface of the zone of saturation is called the water table. This surface is not level but is sloping and has irregularities comparable with those of the land surface. The shape and fluctuations of the water table are dependent upon the topography, rock structure, porosity, permeability, the amount and distribution of recharge and discharge to the system, and other factors. Water that enters an aquifer in its outcrop area seeps slowly downward to the water table in response to gravity. Within the aquifer, the water may move through inclined beds and become confined above and below by relatively impermeable beds, thus there is a change from water-table to artesian conditions. However, artesian aquifers need not crop out at the land surface, as they may receive recharge by interaquifer movement of water. The water



A. Permeable surficial material B. Upper confining bed C Artesian aquifer D. Lower confining bed

abc Cone of depression caused by pumping a water-table or a nonflowing artesian well.

def Cone of depression caused by natural discharge from flowing artesian well

Figure 4.--Water-table and artesian conditions.

in an artesian aquifer is under pressure, the head being equal to the weight of the vertical column of water that extends from the water table to the point at which the head is being measured, less the losses due to friction. Artesian wells do not necessarily flow; they flow only when the altitude of the land surface is lower than that of the piezometric surface. The piezometric surface is the surface to which the water from a given aquifer will rise under its full head.

Artesian conditions prevail in most parts of St. Clair County and flowing wells can be developed in topographically low areas of outcrop of the Pottsville Formation. Data were obtained for five wells, R-5, S-9, S-10, W-5, and X-18, which have flows of 5 gpm or less (table 3).

WATER-LEVEL FLUCTUATIONS

Fluctuations of water level in wells and changes in discharge from springs are caused by precipitation, pumpage from wells and springs, changes in atmospheric pressure, earthquakes, earth and ocean tides, and loading of the land surface.

Water-level fluctuations in wells in St. Clair County are, in most cases, seasonal or cyclic and are related directly to precipitation. Water levels in areas unaffected by pumpage are highest during late winter or early spring because of the continuous and large amount of recharge from precipitation and the low evaporation rate. Water levels are generally lowest during autumn because of the small amount of precipitation and the high rate of evaporation and transpiration.

During the investigation in St. Clair County, water levels were measured in four wells to determine the fluctuations. A recording gage was maintained on well S-2 (fig. 5), which taps shale and sandstone beds of the Pottsville Formation, at Ragland Brick Co. in Ragland. The water level in the well fluctuates in response to precipitation and pumping in the area. The water level in the well begins a gradual rise about 2 to 4 hours after precipitation occurs. Steep abnormal declines of the water level, shown in figure 5, reflect pumpage from nearby well S-14. A recording gage was also maintained on well BB-2 (fig. 6), which is finished in a fault zone in limestone and shale at Avondale Mills in Pell City. The water level in this well fluctuates mainly in response to precipitation, which causes an immediate rise of the water level—after precipitation ceases the water level declines but at a slower rate.

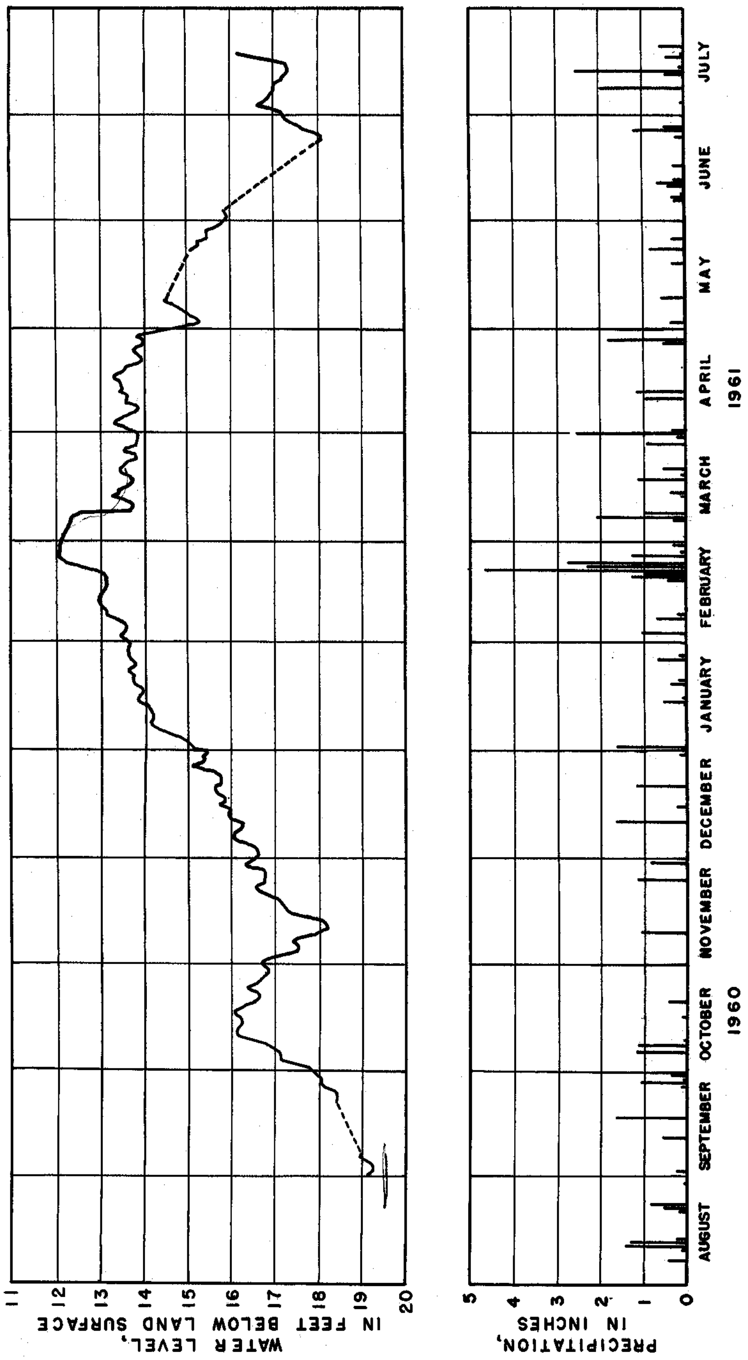


Figure 5.--Changes in water level in well S-2 at Ragland and precipitation at Ashville.

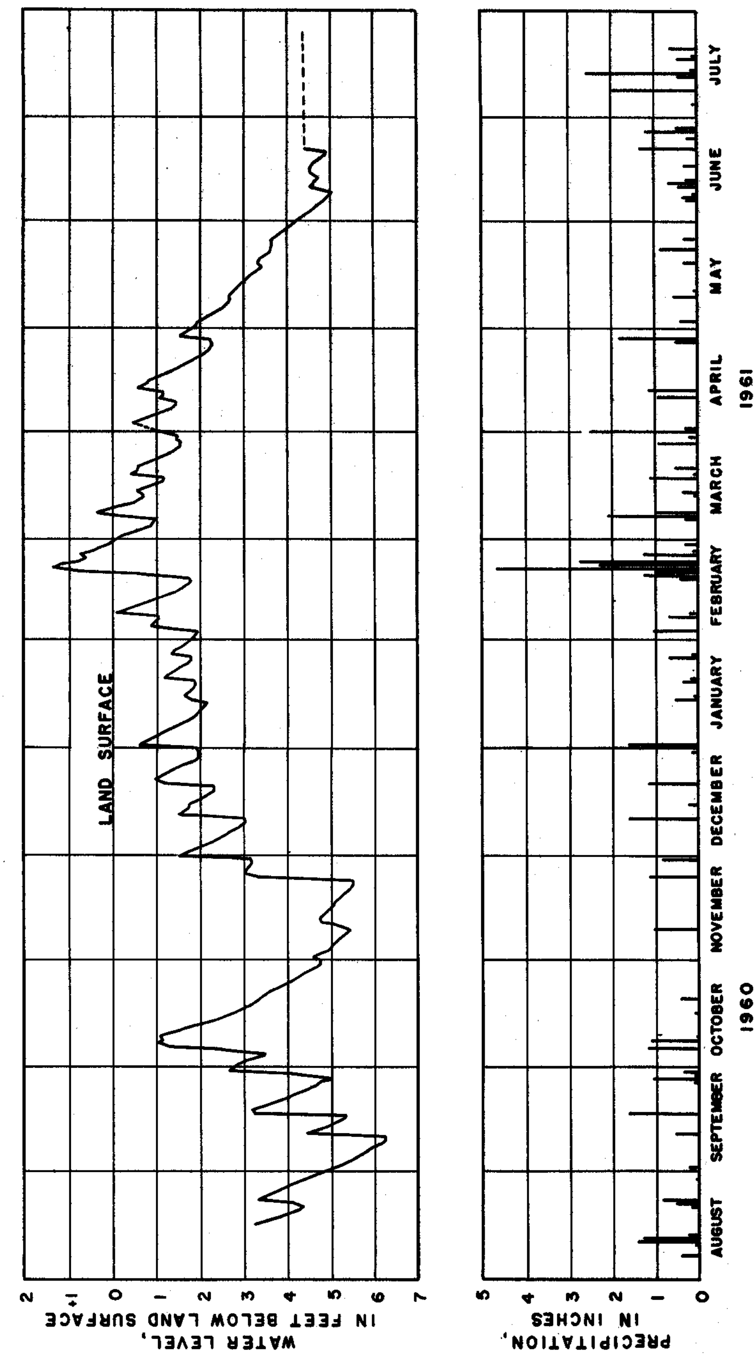


Figure 6.–Changes in water level in well BB-2 at Pell City and precipitation at Ashville.

Periodic water-level measurements were made in wells W-2 and BB-3 (fig. 7). The water levels in wells W-2 and BB-3, which are developed in the Floyd Shale, fluctuate chiefly in response to precipitation. However, the sharp declines of the water level in well W-2 in March and June 1961 (fig. 7) are attributed to the withdrawal of water from the well.

The discharge from most of the springs in St. Clair County varies considerably in response to precipitation. The discharge from spring M-8 (fig. 8) at Springville ranged from 900 gpm (gallons per minute) on October 26, 1960 to 2,200 gpm on April 5, 1961.

RECOVERY OF WATER

Ground water is discharged in St. Clair County by pumping from wells and flows from wells and springs. Wells in the area are commonly drilled but there are also many dug wells. The quantity of water available from wells depends on the penetration of water-bearing fractures or other openings in the bedrock.

Under natural conditions a state of dynamic equilibrium exists in an aquifer, developed over a long period of time in response to natural recharge and discharge. Pumping from a well penetrating the aquifer creates artificial discharge and the aquifer must adjust as a result of this condition. As pumping lowers the water level in the well, water from the surrounding aquifer moves toward the well and produces a cone of depression with the pumped well at the center (fig. 4). The lowering of the water level may be rapid when pumping is started, but it gradually declines until the pumping water level becomes nearly stationary, provided the well is pumped at a rate within the capacity of the aquifer to transmit water. If this capacity is exceeded, the water level will continue to lower and the yield will decrease to the capacity of the aquifer. Data for 248 wells and 25 springs are given in table 3 and their locations are shown on plate 1.

DRILLED WELLS

Most of the ground-water data in this report were obtained from a study of 197 selected drilled wells. Wells are commonly 6 inches in diameter but range from 2½ to 10 inches in diameter. Depths range from 25 to 875 feet; however, only about 15 percent of the wells exceed 200 feet in depth. Casing is commonly installed through the soil zone and seated in bedrock, and the

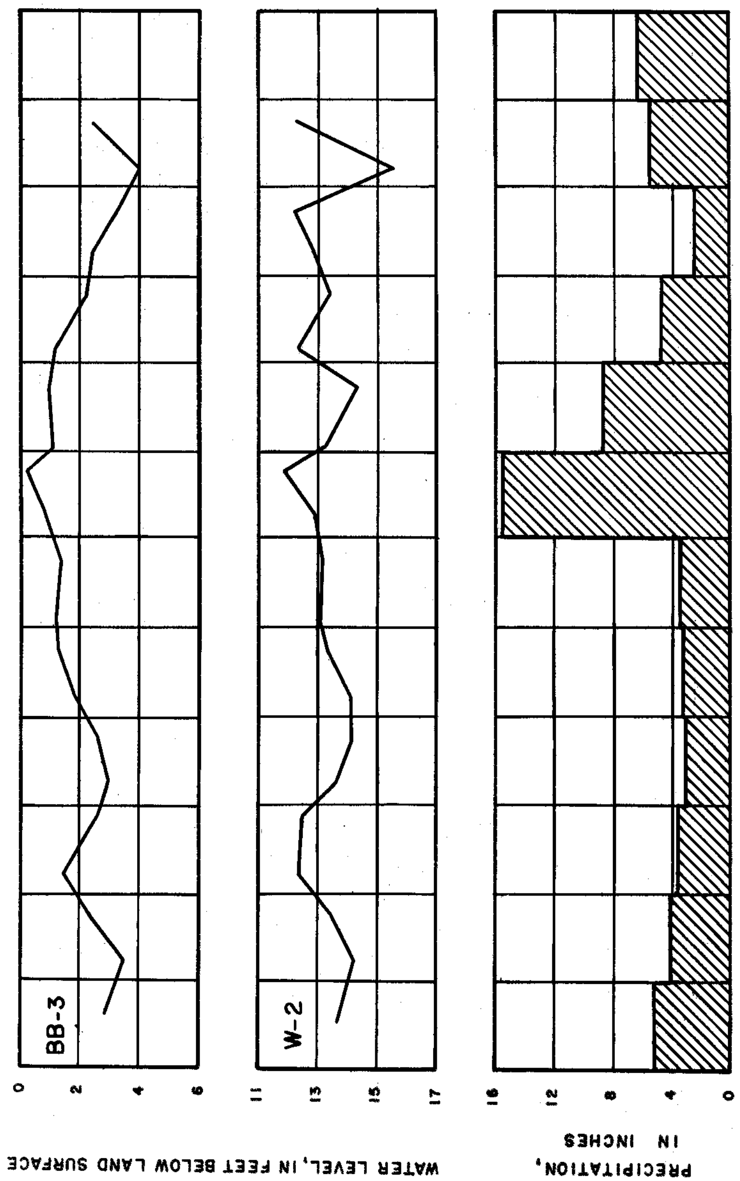


Figure 7.--Changes in water level in wells W-2 and BB-3 and precipitation at Ashville.

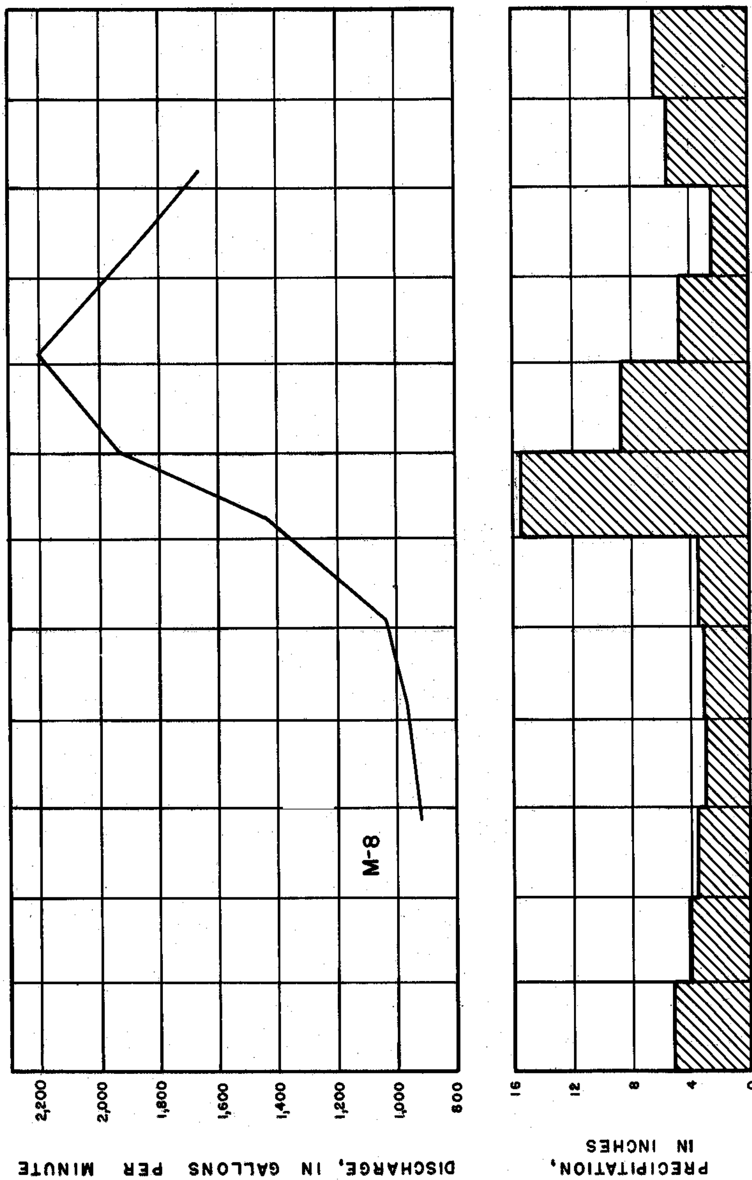


Figure 8.--Changes in discharge from spring M-8 at Springville and precipitation at Ashville.

lower part of the well is left open. Some wells drilled in fractured zones are cased completely and may include some perforated casing. Sample logs for wells S-7, S-8, R-5, and BB-3 are given in table 4, and drillers' logs for 18 wells are given in table 5.

The yields from 21 wells in the county, determined from 6 bailing tests, 11 pumping tests, and 4 reports, range from 2 to 250 gpm. The information concerning the yields from these wells is as follows:

Well	Yield (gpm)	Method of determination [1]	Drawdown (feet)	Length of test (hours)	Date
B- 3	250	P	83	24	9- -57
B- 5	150	P	60	24	3-26-54
C- 5	65	B	4	--	7- -60
S- 2	7	B	160	--	-----
S- 3	100	P	110	24	6- -53
S- 4	80	P	90	1	-----
S- 7	110-130	P	84	24	12-28-55
S- 8	90-100	P	80	24	12- 7-55
S-12	30	R	--	--	-----
S-13	17	R	--	--	-----
S-14	26	P	130	24	-----
W-14	2	B	--	--	12-30-41
W-15	2	B	--	--	12- 4-41
W-16	30	P	--	--	3-16-44
AA- 7	18	R	--	--	5-26-47
AA- 9	15-20	R	--	--	1960
AA-10	24	B	--	--	3-17-57
BB- 1	150	P	--	48	3- -42
BB- 2	200-250	P	30-40	120	-----
BB- 3	26	P	157	24	2-25-46
CC- 7	20	B	--	--	1956

[1] Method of determination: P, pumping test; B, bailing test; R, reported.

DUG WELLS

Dug wells supply a large part of the ground water used for domestic and stock supplies in rural parts of the county; however, many of these wells fail to supply sufficient water during late summer and fall. Data were collected for 51 dug wells. They are of large dimensions, generally 2 to 3 feet in diameter, and are excavated in unconsolidated deposits to depths that range from 11 to 50 feet. These wells may or may not be lined (or cased) depending on the character of the material penetrated; however, unlined wells tend to cave and are more subject to pollution from surface seepage.

Some of the dug wells have been deepened or replaced by deeper drilled wells during the past 10 years in order to obtain sufficient water.

SPRINGS

Springs are numerous in St. Clair County, and many flow more than 200 gpm. Springs are a source of public water supplies at Acmar, Ashville, Branchville, Leeds in Jefferson County, Markeeta, Pell City, and Springville. Thirteen of 25 springs inventoried during the investigation discharge from openings in the Cambrian and Ordovician dolomites. Based on periodic measurements made during this investigation, spring M-8 at Springville had a minimum discharge of 900 gpm on October 26, 1960, and a maximum discharge of 2,200 gpm on April 5, 1961 (fig. 8). It discharges from the Cambrian and Ordovician dolomites and is the largest known spring in the county. The discharges from 25 selected springs and dates of measurements or estimates are as follows:

Spring	Discharge (gpm)	Method of determination [1]	Date
E- 5	1,500	M	6- 8-61
E- 8	230	M	6- 8-61
F- 7	75	E	10-27-60
J- 9	630	M	6- 8-61
J-11	1,500	M	6- 8-61
K- 1	470	M	6- 8-61
K- 3	670	M	6- 8-61
L- 9	25	E	11-22-60
M- 1	50	E	9-14-60
M- 6	80	M	6- 8-61
M- 8	1,670	M	6- 7-61
M-10	690	M	6- 8-61
N- 1	50	E	12- 6-60
O- 1	700	M	6- 7-61
P- 1	10	E	11-15-60
P- 2	240	M	6- 8-61
V- 2	60	M	6- 8-61
V- 9	200-400	R	. . . .
W- 8	125-250	R	. . . .
X- 2	80	M	6- 7-61
Y- 5	20-60	R	. . . .
Z- 3	8-20	R	. . . .
Z- 7	400	E	6- 7-61
BB- 6	300	E	8-16-60
BB-12	800	E	8-16-60

[1] Method of determination: M, measured; E, estimated; R, reported.

USE OF WATER

Ground water from wells and springs is the source of most domestic, stock, industrial, and public supplies in St. Clair County. In most parts of the county ground-water supplies are adequate for present needs; however, demands for water at Acmar, Markeeta, and Pinedale Shores exceed the quantities available during the dry season. The estimated average use of ground water in St. Clair County in 1960, in gallons per day, is as follows:

Domestic and stock supplies		450,000
	Subtotal	450,000
Industrial supplies		
Avondale Mills		250,000
National Cement Co.		90,000
Ragland Brick Co.		6,000
Others		50,000
	Subtotal	396,000
Public supplies		
Acmar		22,000
Ashville		100,000
Branchville		6,000
*Leeds (Jefferson County)		320,000
Margaret		25,000
Markeeta		8,000
Odenville		22,000
Pell City		275,000
Pinedale Shores		6,000
Ragland		81,000
Springville		65,000
Steele		27,000
Others		10,000
	Subtotal	967,000
Rural school supplies		
Chandler Mountain		1,700
Coal City		2,000
Greenfield		1,500
Moody		6,500
Riverside		300
	Subtotal	12,000
	Total	1,825,000

* Partial supply from spring in St. Clair County. Additional supply from wells in Jefferson County.

The National Cement Co. at Ragland is the only known industrial consumer of water from streams in St. Clair County. Their daily use of surface water during 1960 was about 470,000 gallons.

QUALITY OF WATER

All natural waters contain dissolved mineral matter. Precipitation, even before it reaches the ground, dissolves small quantities of gases from the atmosphere. After reaching the ground, it begins to dissolve minerals from the soil and rocks. The amount and kind of minerals dissolved in ground water may vary greatly from place to place, depending primarily on the types of minerals in the soil and rocks over or through which the water moves, the presence of carbon dioxide or oxygen, the temperature of the water, and the length of time the water has been in contact with the rock. The most common mineral constituents in ground water are silica, aluminum, iron, manganese, calcium, magnesium, sodium, potassium, bicarbonate, carbonate, sulfate, chloride, fluoride, and nitrate (table 1).

Drinking water standards have been established by the U.S. Public Health Service (1962) for interstate carriers; these or similar standards, have been adopted by many states. Water conforming to these standards is suitable for many uses. The following discussion, which is not inclusive, summarizes briefly the chemical properties and mineral constituents of water that are usually considered in selecting a supply for drinking water.

Iron or manganese in water, even in small quantities, is objectionable because they stain plumbing fixtures and laundry yellowish brown to reddish brown or black. A concentration of more than 0.3 ppm (part per million) of iron or 0.05 ppm of manganese is considered excessive in drinking water or public water supplies.

Magnesium contributes to the hardness of a water and salts of magnesium in excessive quantities will have a laxative effect on persons not accustomed to drinking the water. Magnesium should not exceed 125 ppm.

Sulfate should not exceed 250 ppm. Salts of sulfate are a laxative and a quantity equal to that in 1 liter of water containing 1,000 to 2,000 ppm sulfate constitutes an average dose (Rainwater and Thatcher, 1960, p. 279).

Chloride in large concentrations makes the water unfit for many uses. Chloride should not exceed 250 ppm.

Fluoride is a minor constituent of ground water; however, it may cause mottling of children's teeth. According to U.S. Public Health Service standards (1962), supplies should not contain more than 0.8 to 1.7 ppm of fluoride depending on the annual average of maximum daily air temperatures.

Nitrate in water has considerable significance as an indication of pollution and it may be a contributing factor to a condition in babies known as methemoglobinemia (Maxcy, 1950, p. 265). The U.S. Public Health Service standard (1962) lists 45 ppm as the maximum concentration that should be present in a water supply.

Hardness is a property of water attributable chiefly to alkaline earths, principally calcium and magnesium. Hardness is an indication of the soap-consuming capacity of the water and, indirectly, an indicator of the scale-forming tendency of the water when used in boilers. Water having a hardness less than 61 ppm, is soft; 61 to 120 ppm, is moderately hard; 121 to 180 ppm, is hard; and in excess of 181 ppm, is very hard.

Specific conductance is the ability of a solution to conduct an electric current, and is a general indication of the amount of mineral matter dissolved in a water. The dissolved solids, in parts per million, in natural waters of moderate mineral content may be computed approximately by multiplying the specific conductance by 0.6. Dissolved solids should not exceed 500 ppm.

The pH is a measure of the water's acidity or alkalinity. Theoretically, a neutral water has a pH of 7.0. Progressive values on the pH scale below 7.0 denote increasing acidity and progressive values above 7.0 denote increasing alkalinity.

CHEMICAL ANALYSES

The hardness and chloride concentration of water were determined by field chemical analyses for 221 samples from wells and springs in St. Clair County (table 3). Chemical analyses were made of water from 10 wells and springs by the U.S. Geological Survey, Quality of Water Branch Laboratory at Ocala, Fla., and analyses by private laboratories were available of water from 5 wells (table 1). Field analyses are only approximations and may have some error; however, they are useful in a general comparison of hardness and chloride content of water from different geologic formations. Any apparent discrepancies in values of hardness and chloride between table 1 and table 3 are due in part to seasonal changes in the quality of the water caused by changes in ground-water recharge and to differences in laboratory and field techniques. The information obtained from the chemical analyses indicates:

1. The quality of ground water from the principal aquifers in St. Clair County is suitable for many uses; however, because of the hardness and the high iron content of water from some of the aquifers, treatment may be required for some uses. A sulfurous odor is reported from some waters from the Conasauga Formation.

2. The iron content of water from 15 wells and springs ranges from 0.02 to 3.4 ppm (table 1). Water from the Pottsville Formation generally has iron in excessive amounts. In some parts of the county, the Hartselle Sandstone yields water that contains objectionable amounts of iron, an example is water from well B-3 which contains 1.8 ppm of iron.

3. The chloride content of water from wells and springs in St. Clair County is relatively low (tables 1 and 3). The median chloride content of water from each of the aquifers is 7 ppm or less (fig. 9). The maximum chloride concentration of 131 ppm in water from well V-1, which is finished in the Floyd Shale, is considerably less than the limit recommended by the U.S. Public Health Service (1962).

4. The fluoride content of water from 12 wells and springs is low. It ranges from a trace in water from wells S-7 and S-8 to 0.5 ppm in water from well C-3 (table 1).

5. The hardness of water from wells and springs sampled ranges from 10 ppm in water from the Pottsville Formation to 2,870 ppm in water from the Floyd Shale (tables 1 and 3). The median hardness of water from the aquifers ranges from 45 ppm in the Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone undifferentiated, to 200 ppm in the Conasauga Formation (fig. 9).

6. The magnesium and nitrate contents reported in table 1 are less than the recommended limits of the U.S. Public Health Service (1962). The concentration of sulfate and dissolved solids exceeds the recommended limits in well C-3.

Table 1.—*Chemical analyses of water from selected wells and springs in St. Clair County, Ala.*

Well or spring: Numbers correspond with those in plate 1 and table 3.

Water-bearing formation: -Єc, Conasauga Formation; OЄu, Ketona(?), Copper Ridge, and Chepultepec Dolomites undifferentiated; Olm, Mosheim, Lenoir, and Little Oak Limestones; Srm, Red Mountain Formation; Mfm, Maury Formation and Fort Payne Chert; Mtm, Maury Formation, Fort Payne Chert, and Tuscumbia Limestone; Mhs, Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone; Mf, Floyd Shale; IPpv, Pottsville Formation.

Well or spring	Date of collection	Water-bearing formation	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance in micromhos at 25°C	pH	Temperature (°F)
			Parts per million																		
[1] B- 3	10-29-57	Mhs	21.2	0.4	1.8	.....	41.8	2.5	....	...	54.5	0.0	2.8	3.6	.....	.....	[2] 120.7	.....	.....	7.6	..
C- 3	2- 8-61	Mtm, Srm	....	...	2.0	.....	248	24	69	...	218	0	656	2.0	0.5	1.0	718	539	1,450	7.8	..
K- 3	2- 8-61	OЄu	....	...	.03	.....	41	12	2.5	...	172	0	2.4	3.0	.1	7.5	152	11	295	7.9	60
K-12	2- 8-61	-Єc	....	...	.15	.....	95	17	8.5	...	348	0	10	13	.1	9.5	307	22	574	7.7	..
M- 8	2- 8-61	OЄu	....	...	.02	.....	30	13	1.2	...	150	0	2.0	1.0	.1	.2	128	6	238	7.5	59
O- 1	2- 8-61	OЄu	....	...	.04	.....	31	11	.9	...	144	0	2.4	.0	.1	1.3	122	4	232	7.9	59
R- 5	2- 8-61	IPpv	....	...	.59	.....	30	10	22	...	194	0	1.6	1.0	.2	.1	116	0	297	7.8	..
[1] S- 3	6-27-53	IPpv	34.5	...	3.4	.....	16.7	11.4	16.9	...	56.5	0	25.9	13.3	.....	.....	[2] 98.5	.....	.....	6.6	..
[3] S- 7	12-29-55	IPpv	18.1	1.2	.6	Trace	2.9	1.1	103.6	0.9	285.2	0	4.3	9.1	Trace	2.0	[2] 19.4	11.7	.....	8.1	..
[3] S- 8	12- 9-55	IPpv	12.6	2.0	2.1	Trace	3.9	3.5	87.9	1.2	240.4	10.5	6.1	7.0	Trace	1.1	[2] 39.0	24.1	.....	8.3	..
V- 7	2- 8-61	OЄu	....	...	.04	.....	21	12	.6	...	122	0	.8	.5	.1	.0	102	2	194	7.6	..
W- 2	2- 8-61	Mf	....	...	.30	.....	56	18	15	...	246	0	7.6	21	.3	.1	214	12	450	8.0	61
W- 8	2- 8-61	Mfm	....	...	.05	.....	48	2.9	1.2	...	152	0	4.0	1.0	.1	.2	132	8	248	7.9	59
X- 7	2- 8-61	Olm	....	...	.03	.....	59	5.1	1.4	...	196	0	5.6	2.0	.1	.3	168	8	318	7.8	56
[3] BB- 3	3- 2-46	Mf	14.2	1.1	.2	0.1	35.5	14.6	36.6	2.7	241.0	7.5	17.3	7.2	.....	Trace	155.2	148.7	.....	8.4	..

[1] Southern Testing Laboratories, Inc., Birmingham, Ala.

[2] Total hardness.

[3] The Picard Testing Laboratories, Birmingham, Ala.

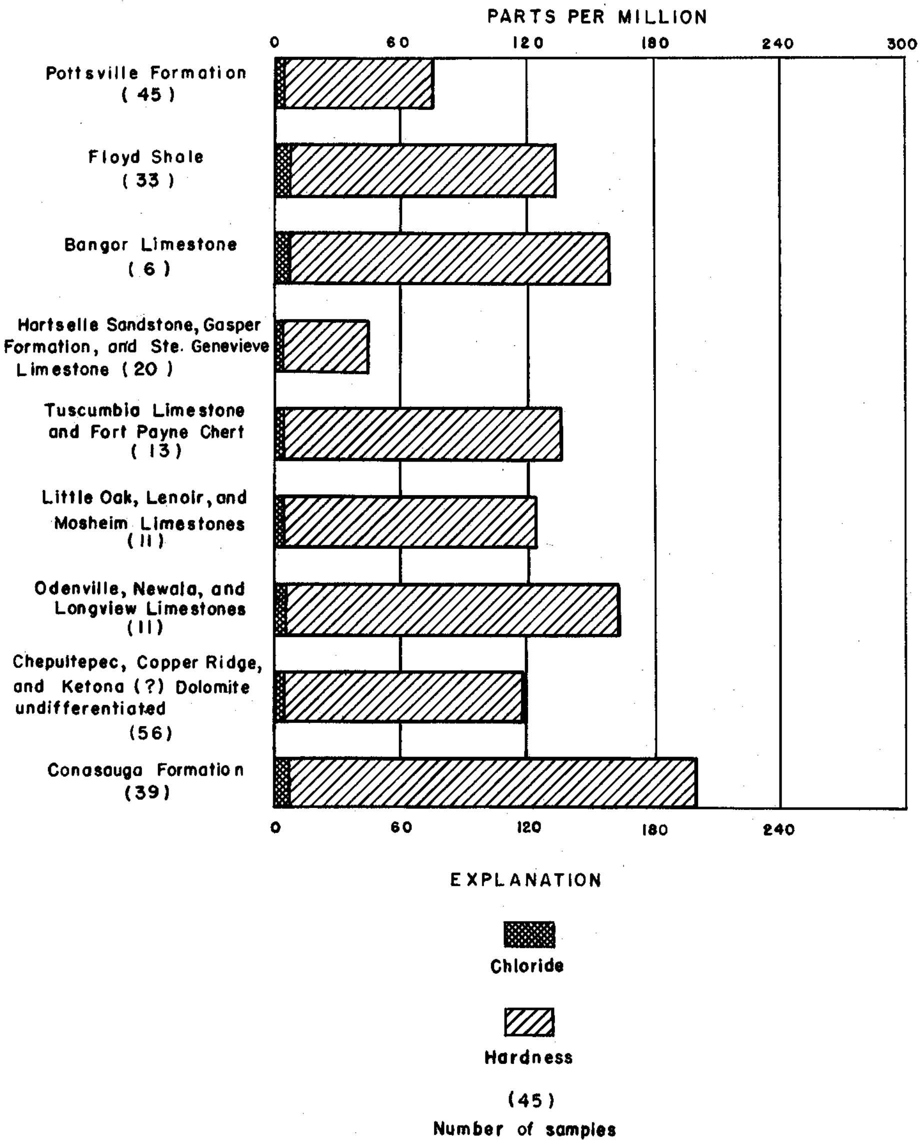


Figure 9.—Median hardness and chloride content of water from wells and springs in St. Clair County.

7. The median temperature of ground water in St. Clair County is 61 °F (tables 1 and 3).

GEOLOGY

The generalized geologic map of St. Clair County (pl. 2) was modified from the geologic map of Alabama (Adams and others, 1926), the geologic map and sections of Greasy Cove, Ala. (Burchard and Andrews, 1947, pl. 2), and the geologic map of a part of the Coosa coal field and adjacent areas, St. Clair County, Ala. (Rothrock, 1949), by reconnaissance geologic mapping done on U.S. Geological Survey topographic quadrangles.

The consolidated rocks that crop out in St. Clair County range in age from Early Cambrian to Pennsylvanian. The rocks have been gently folded into northeastward-trending anticlines and synclines complicated by thrust faults. The complete Ordovician section is not present everywhere, as the Cahaba Barrier, described by Butts (Adams and others, 1926, p. 118 and pl. 27), extends from southwest to northeast across the center of the county. The Chickamauga Limestone is the only formation of Ordovician age present northwest of the barrier. A more complete section of the Ordovician occurs southeast of the barrier. The Cahaba fault (pl. 2), which probably has a displacement of several thousand feet, is in the approximate position of the Cahaba Barrier. The fault has brought the Rome Formation of Early Cambrian Age in contact with the Pottsville Formation of Pennsylvanian age.

The unconsolidated deposits of clay, sand, and gravel adjacent to the Coosa River are not mapped.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

A generalized section of the geologic formations in St. Clair County and their water-bearing properties is given in table 2.

CAMBRIAN SYSTEM

ROME FORMATION

The Rome Formation of Early Cambrian Age consists of red and green shale interbedded with green to tan thin-bedded sandstone. It crops out in a narrow band which extends from the county line 2 miles north of Greensport southwestward to about 2 miles

Table 2.—*Generalized section of the geologic formations in St. Clair County and their water-bearing properties*

System	Geologic map symbol	Stratigraphic unit	Thickness (feet)	Rock character	Water-bearing properties
Pennsylvanian	IPpv	Pottsville Formation	600-1,300+	Sandstone, tan to gray, thin- to thick-bedded; tan to dark-gray shale; and many coal beds	In places, wells yield as much as 130 gpm but generally less than 50 gpm. Supplies water to flowing wells (pl. 1). Water is generally high in iron content. The median hardness of water is 74 ppm (fig. 9).
Mississippian	Mpp	Parkwood Formation	400-700	Sandstone, light-gray to white, fine-grained, thin- to medium-bedded, and well cemented.	Yields water to one drilled well (E-3). Supply is short during dry season.
		Pennington Formation	0-25	Shale, red and tan.	
	Mf	Floyd Shale	15-2,000	Shale, gray to black, light-brown, and dull green; fine-grained thin-bedded sandstone; siltstone and thin ferruginous beds.	Yields water to domestic wells. Supplies from dug wells usually are adequate during the dry season. The median hardness of water is 134 ppm (fig. 9).
	Mb	Bangor Limestone	400-500	Limestone, gray to dark blue-gray, medium- to thick-bedded, crystalline, fossiliferous, and nodules of dark-gray chert.	Yields adequate water to wells for domestic use, and as much as 1,500 gpm to springs. The median hardness of water is 158 ppm (fig. 9).
	Mhs	Hartselle Sandstone	200	Siltstone, weathers brown in the lower part; and light-gray fine-grained thin- to medium-bedded laminated sandstone in the upper part.	Yields as much as 250 gpm to wells, and as much as 1,500 gpm to springs. The median hardness of water is 45 ppm (fig. 9).
		Gasper Formation	50-200	Shale, dark-gray to black or dark-brown, and many ferruginous lenses and thin ferruginous beds.	
		Ste. Genevieve Limestone	?	Limestone, gray to blue, medium- to thick-bedded, dense to coarsely crystalline, and fossiliferous and interbedded gray shale.	
	Mtm	Tuscumbia Limestone	15-25	Limestone, gray, and chert.	Yields adequate water to wells for domestic use. Source for springs that yield as much as 400 gpm. The median hardness of water is 136 ppm (fig. 9).
	Mfm	Fort Payne Chert	120	Limestone, light-gray or white, thin- to medium-bedded, siliceous, and nodules of light-gray to dark-gray chert.	
		Maury Formation	2-5	Claystone, green, red, and gray, glauconitic, pyritiferous, and phosphate nodules.	Relatively impermeable, and not an aquifer.

Devonian	Dc	Chattanooga Shale	6-35	Shale, gray to black, organic, pyritiferous, marine, and sparsely fossiliferous.	Relatively impermeable, and not an aquifer.
	Dfm	Frog Mountain Sandstone	20-50	Sandstone, tan, gray, or gray with red stain, thin- to medium-bedded, and sandy shale.	No wells or springs are known to yield water from this formation.
Silurian	Srm	Red Mountain Formation	50-500	Shale, brown, red, and green, includes ferruginous beds in the lower half and brown fine-grained thin- to thick-bedded sandstone in the upper half of the formation. The formation becomes thinner southeastward in the county.	Yields adequate water to wells for domestic use that is often of poor quality.
Ordovician	Oc	Chickamauga Limestone	200-650	Shale, red and (or) green; red coarse-grained sandstone; and gray thin- to thick-bedded limestone. In the northern part of the county, the basal part contains a layer of conglomerate containing chert gravel.	No wells or springs are known to yield water from this formation.
	Olm	Little Oak Limestone	50-500	Limestone, dark-gray, thick-bedded, coarsely crystalline.	Wells and springs yield from 2 to 400 gpm that is used for domestic, stock, industrial, and public supplies. The median hardness of water is 124 ppm (fig. 9).
		Lenoir Limestone	500	Limestone, dark-gray, medium thick-bedded, finely crystalline.	
		Mosheim Limestone	50±	Limestone, blue-gray, thick-bedded, compact, and brittle.	
	Ool	Odenville Limestone	50±	Limestone, dark-gray, fine-grained, siliceous, cherty, impure, and argillaceous.	Yields adequate water to wells for domestic use and will probably yield large quantities to wells that penetrate fractures and solution openings. The median hardness of water is 164 ppm (fig. 9).
		Newala Limestone	?	Limestone, dark- to pearl-gray, thick-bedded and very little dolomite.	
		Longview Limestone	?	Limestone and dolomite, light-gray, thick-bedded, cherty.	
Ordovician and Cambrian	O€u	Chepultepec, Copper Ridge, and Ketona(?) Dolomites	?	Dolomite, light- to dark-gray, medium- to thick-bedded; weathers to a cherty clayey subsoil.	Source of water for many wells and springs. Wells yield as much as 150 gpm and springs as much as 2,200 gpm. The median hardness of water is 119 ppm (fig. 9).
Cambrian	€c	Conasauga Formation	1,000±	Shale, gray and dark-green interbedded with thin layers of gray limestone and dolomite.	Most drilled wells yield sufficient water for domestic use that is commonly of poor quality. Wells generally produce little additional water below 200 feet in depth. The median hardness of water is 200 ppm (fig. 9).
	€r	Rome Formation	?	Shale, red and green interbedded with green to tan thin-bedded sandstone.	No wells or springs are known to yield water from this formation.

north of Leeds (pl. 2). The Rome is exposed in a road cut along county road 20 about 2 miles northwest of Greensport. No wells or springs in St. Clair County are known to yield water from the Rome Formation.

CONASAUGA FORMATION

The Conasauga Formation of Middle and Late Cambrian Age overlies the Rome Formation and consists of about 1,000 feet of gray and dark-green shale interbedded with thin layers of gray limestone and dolomite. It crops out in the northeastern part of the county in two broad bands (pl. 2). The soils formed on the Conasauga Formation are generally clayey and poorly drained, and the topography is flat to gently rolling. Dug wells penetrating the subsoil generally have small yields and some become dry in late summer or fall. Most drilled wells that penetrate layers of limestone and dolomite yield sufficient water for domestic supplies. Most of the water developed in the Conasauga Formation occurs at a depth of less than 200 feet. Five drilled wells at Pinedale Shores fail to supply sufficient water during the summer. The wells yield from about 5 to 30 gpm. Springs K-1 and P-2 flow from openings in the Conasauga and discharged 470 and 240 gpm on June 8, 1961; these large flows probably are due to local structure. Wells L-4, L-10, L-19, M-5, and spring P-1 yield water that has a sulfurous odor. The hardness of water from the Conasauga Formation ranges from 20 to 598 ppm and has a median of 200 ppm, determined from 39 analyses (fig. 9).

CAMBRIAN AND ORDOVICIAN SYSTEMS

KETONA(?), COPPER RIDGE, AND CHEPULTEPEC DOLOMITES UNDIFFERENTIATED

The Cambrian and Ordovician dolomites, which overlie the Conasauga Formation in St. Clair County, include the Ketona(?), Copper Ridge, and Chepultepec Dolomites. They consist of light- to dark-gray medium- to thick-bedded dolomite, which weathers to a cherty clayey subsoil. The water-bearing properties and lithologies of the dolomites are similar, and are undifferentiated in this report. The Cambrian and Ordovician dolomites crop out in several northeastward-trending bands in the northwestern half of the county and in a broad area adjacent to the Coosa River in the southeastern part. The Pell City fault, southeast of Pell City, has a maximum displacement of 2,500 feet (McCalley, 1897, pt. 2, p. 32) and rocks of Cambrian and Ordovician age are in contact with the Floyd Shale of Mississippian age (pl. 2). The dolomites contain chert which is abundant in the residuum overlying bedrock.

Thirteen of 25 springs and many of the wells inventoried during the investigation yield water from openings in the dolomites. Springs flowing from the dolomites are F-7, K-3, L-9, M-6, M-8, M-10, N-1, O-1, X-2, Y-5, Z-3, BB-6, and BB-12. Flows range from about 8 to 2,200 gpm. The town of Springville obtains its water supply from spring M-8, which between October 1960 and June 1961 had a minimum flow of 900 gpm on October 26, 1960, and a maximum flow of 2,200 gpm on April 5, 1961. Acmar, Ashville, Branchville, Markeeta, Pell City, and Avondale Mills at Pell City, also obtain their water supplies from springs issuing from the dolomites. The town of Steele obtains its water supply from a drilled well that yields 150 gpm of water from fractures and solution cavities in the dolomites. The hardness of water from the Cambrian and Ordovician dolomites ranges from 12 to 408 ppm and has a median of 119 ppm, determined from 56 analyses (fig. 9).

ORDOVICIAN SYSTEM

LONGVIEW, NEWALA, AND ODENVILLE LIMESTONES

The Longview, Newala, and Odenville Limestones of Early Ordovician Age are mapped as one unit in this report (pl. 2). The Longview and Newala are present in a narrow valley that extends northeastward from Leeds in southwest St. Clair County through Odenville to Greensport. The only known outcrop of Odenville Limestone in the county is in the same valley one-third mile east of Odenville.

The Longview overlies the Cambrian and Ordovician dolomites and is composed of light-gray thick-bedded cherty limestone and dolomite. Overlying it is the Newala, a pure dark- to pearl-gray thick-bedded limestone containing some dolomite. The pearl-gray color predominates and is characteristic of the Newala in St. Clair County. The Odenville Limestone, which overlies the Newala, consists of about 50 feet of argillaceous and siliceous dark-gray fine-grained cherty limestone. The Longview, Newala, and Odenville Limestones yield adequate water for domestic supplies and will probably yield larger quantities of water to wells that penetrate fractures and solution cavities. The hardness of water from the limestones ranges from 14 to 294 ppm and has a median of 164 ppm, determined from 11 analyses (fig. 9)

MOSHEIM, LENOIR, AND LITTLE OAK LIMESTONES

The lower Ordovician Mosheim, Lenoir, and Little Oak Limestones are mapped as one unit in this report (pl. 2). These formations are present in the valley from Leeds to Odenville, and the Lenoir continues northeastward to Greensport. The Little Oak also is present in the valleys and along the northwestern flanks of the ridges southeast of Ragland and northwest of Pell City. Where the Mosheim is present it overlies the Odenville and consists of about 50 feet of blue-gray thick-bedded compact and brittle limestone. The texture of the Mosheim is a typical vaughanite as seen in a railroad cut half a mile west of Odenville. The Lenoir unconformably overlies the Mosheim southwest of Odenville and unconformably overlies the Newala northeast of Odenville. The Lenoir may be seen along the northwestern flank of a ridge at Greensport and in a railroad cut 1 mile east of Odenville. It consists of about 500 feet of dark-gray medium thick-bedded finely crystalline limestone. The Little Oak Limestone unconformably overlies the Lenoir Limestone southwest of Odenville and unconformably overlies the Frog Mountain Sandstone of Devonian age along the ridges southeast of Ragland. The Little Oak in St. Clair County is composed of 50 to 500 feet of dark-gray thick-bedded coarsely crystalline limestone. It may be seen in a quarry 1½ miles southwest of Ragland. The National Cement Co. at Ragland pumps about 100,000 gpd (gallons per day) of water from the quarry.

The city of Leeds in Jefferson County obtains a part of its water supply from spring Z-7 in St. Clair County. The spring issues from openings in the Lenoir or Little Oak Limestone and has a reported yield of about 400 gpm. Wells P-11, P-12, and P-13 at Odenville yield water from the Lenoir Limestone. In 1928, well P-11 was "***pumped at 10 gallons a minute without a noticeable drawdown." and well P-13 "***yielded 40 gallons a minute for 50 hours with a maximum drawdown of 20 feet." (Johnston, 1933, p. 303). The town of Odenville obtains its water supply from well P-12 which has a reported yield of about 100 gpm. The hardness of water from the Mosheim, Lenoir, and Little Oak Limestones ranges from 34 to 216 ppm and has a median of 124 ppm, determined from 11 analyses (fig. 9).

CHICKAMAUGA LIMESTONE

The Chickamauga Limestone of Ordovician age crops out in narrow bands in many places throughout the northwestern half of St. Clair County (pl. 2). The Chickamauga differs considerably in lithology from place to place in the county. In the central part it consists of about 200 feet of red and (or) green shale, red coarse-grained sandstone, and gray thin- to thick-bedded argillaceous limestone. North of Steele, the Chickamauga is 650 feet thick and the basal part includes a layer of conglomerate containing chert gravel (Adams and others, 1926, p. 120). This layer is known as the Attalla Chert Conglomerate Member. No wells or springs in St. Clair County are known to yield water from the Chickamauga Limestone.

SILURIAN SYSTEM

RED MOUNTAIN FORMATION

The Red Mountain Formation of Silurian age crops out in five areas in the northwestern part of St. Clair County (pl. 2). The formation varies considerably in lithology and thickness but it generally becomes thinner southeastward in the county. In the northern part of the county, the Red Mountain consists of 400 to 500 feet of brown, red, and green shale containing ferruginous beds in the lower half of the formation and brown fine-grained thin- to thick-bedded sandstone in the upper half. Along the crest of a ridge 3 miles southeast of Ashville, it consists of about 50 feet of gray to tan thin- to thick-bedded sandstone that is stained brown and interbedded with shale.

Wells C-3 and M-7 yield water from the Red Mountain Formation. Well C-3 was drilled to a depth of 875 feet to explore iron ore. It had a reported flow of 4 gpm and a reported water level of 6 feet above the land surface in the fall of 1946. Although the water is being used, it is undesirable for domestic use because of the mineral content–iron 2.0 ppm, calcium 248 ppm, sulfate 656 ppm, and hardness 718 ppm (table 1). The hardness of water from well M-7 is 216 ppm (table 3).

DEVONIAN SYSTEM

FROG MOUNTAIN SANDSTONE

The Frog Mountain Sandstone of Devonian age consists of 20 to 50 feet of tan, gray, or gray with red stain, thin- to medium-bedded sandstone and sandy shale. It is present in a ridge 3½ miles southeast of Ashville and in the ridges 2 miles southeast of Ragland. No wells or springs yield water from the Frog Mountain Sandstone in St. Clair County.

CHATTANOOGA SHALE

The Chattanooga Shale of Devonian age consists of 6 to 35 feet of gray to black organic pyritiferous marine shale that is sparsely fossiliferous. It is absent in the southeastern part of the county but is present in some of the ridges northwest of the Cahaba fault (pl. 2). The shale becomes thicker northward in St. Clair County and attains a thickness of 35 feet 3½ miles northwest of Steele. The Chattanooga Shale is not an aquifer in St. Clair County.

MISSISSIPPIAN SYSTEM

MAURY FORMATION

The Maury Formation is included with the Fort Payne Chert on the geologic map (pl. 2). The Maury has been considered by earlier workers in Alabama to be a part of the Chattanooga Shale of Devonian age; however, it is now considered to be Early Mississippian (Hass, 1956, p. 7, 13). The Maury unconformably overlies the Frog Mountain Sandstone southeast of the Cahaba fault (pl. 2) and conformably overlies the Chattanooga Shale northwest of the fault. The Maury consists of 2 to 5 feet of green, red, and gray claystone that is glauconitic, pyritiferous, and contains phosphate nodules. The Maury is not an aquifer in St. Clair County.

FORT PAYNE CHERT AND TUSCUMBIA LIMESTONE

The Fort Payne Chert and the Tuscumbia Limestone of Mississippian age are mapped as one unit in this report (pl. 2). The Fort Payne is present throughout the county in the many conspicuous ridges formed in part by its highly resistant and steeply inclined beds, which generally strike northeastward. The Fort Payne overlies the Maury Formation and consists of about 120 feet of light-gray or white thin- to medium-bedded siliceous limestone and nodules of light- to dark-gray chert. The formations weather to a fossiliferous cherty rubble containing abundant crinoid stems. The highly fossiliferous chert is a characteristic by which the Fort Payne may be readily distinguished from the sparsely fossiliferous cherts of the Cambrian and Ordovician dolomites.

The Tuscumbia Limestone is composed of 15 to 25 feet of gray limestone and chert. It overlies the Fort Payne in the northwestern part of the county and is absent southeast of the Eden fault (pl. 2). Water in the Fort Payne and Tuscumbia occurs in openings along joints and bedding planes and many of these openings have become enlarged by the solvent action of ground water. Springs issuing from openings in the Fort Payne and Tuscumbia yield from 60 to about 400 gpm, and wells that penetrate openings may yield similar quantities. Springs E-8, V-2, V-9, and W-8 yield water from the Fort Payne and the Tuscumbia. The hardness of water from the Fort Payne Chert and Tuscumbia Limestone ranges from 16 to 784 ppm and has a median of 136 ppm, determined from 13 analyses (fig. 9).

STE. GENEVIEVE LIMESTONE, GASPER FORMATION, AND HARTSELLE SANDSTONE

The Ste. Genevieve Limestone, the Gasper Formation, and the Hartselle Sandstone of Mississippian age are mapped as one unit (pl. 2). The Ste. Genevieve, where present in St. Clair County, overlies the Tuscumbia Limestone. It is composed of gray to blue medium- to thick-bedded dense to coarsely crystalline fossiliferous limestone and interbedded with gray shale. There are many exposures along Little Canoe Creek in the northern part of the county, particularly in the NW¼ sec. 21, T. 12 S., R. 4 E. The Gasper is composed of 50 to 200 feet of dark-gray to black or dark-brown shale containing many thin ferruginous layers. It is exposed along some of the road cuts in the ridges northwest of Shoal Creek and along State Highway 174, 2½ miles south of Odenville. The Hartselle conformably overlies the Gasper, and, in most parts of the county, is composed of about 200 feet of brown weathering siltstone in the lower part and light-gray fine-grained thin- to medium-bedded laminated sandstone in the upper part. A good exposure of the Hartselle can be seen in a road cut along State Highway 174, 2½ miles south of Odenville. The sandstone yields adequate quantities of water to wells for domestic and stock supplies and locally yields much larger supplies. Well B-3 is reported to have been tested in September 1957 at 250 gpm. Springs J-9 and J-11 issue from openings in the sandstone and on June 8, 1961, had measured flows of 630 gpm and 1,500 gpm, respectively. The hardness of water from the Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone undifferentiated ranges from 12 to 228 ppm and has a median of 45 ppm, determined from 20 analyses (fig. 9).

BANGOR LIMESTONE

The Bangor Limestone of Mississippian age crops out in the northern and northwestern parts of the county (pl. 2). It is composed of about 400 to 500 feet of gray to dark blue-gray medium- to thick-bedded crystalline and fossiliferous limestone, and nodules of dark-gray chert. The limestone yields adequate water to domestic wells and will probably yield large quantities of water to wells that penetrate fractures and solution cavities. Spring E-5, which issues from the Bangor, flowed 1,500 gpm on June 8, 1961. The hardness of water from the Bangor Limestone ranges from 136 to 230 ppm and has a median of 158 ppm, determined from 6 analyses (fig. 9).

FLOYD SHALE

The Floyd Shale of Mississippian age crops out in two bands which trend northeastward southeast of the Cahaba fault (pl. 2). The western band of Floyd overlies the Hartselle Sandstone and the eastern band overlies the Fort Payne Chert. The Floyd thickens southward and eastward of the Cahaba Barrier, where it includes beds equivalent to the Bangor Limestone, Hartselle Sandstone, and the Gasper Formation to form a homogenous shale body which extends from the base of the Ste. Genevieve Limestone to the base of the Parkwood Formation (Adams and others, 1926, p. 204). The Floyd consists of about 15 to 2,000 feet of gray to black, light-brown, and dull green shale; fine-grained thin-bedded sandstone; and siltstone interbedded with thin ferruginous beds. In places, the lower part of the Floyd contains layers of limestone. The Floyd yields small quantities of water to many domestic and stock wells and for a short period as much as 250 gpm to industrial test wells in Pell City; however, the industrial wells were abandoned because of declining yields and the development of sinkholes within the area influenced by pumping. Well BB-3, former source of supply for the town of Eden—now a part of Pell City, yielded 26 gpm of water on February 25, 1946. Water from the Floyd generally contains excessive amounts of iron and locally may be highly mineralized. The hardness of water from the Floyd Shale ranges from 12 to 2,870 ppm and has a median of 134 ppm, determined from 33 analyses (fig. 9).

PENNINGTON AND PARKWOOD FORMATIONS

The Pennington Formation of Mississippian age is composed of 25 feet or less of interbedded red and tan shale. For the purpose of this report, the Pennington was included with the Parkwood Formation on plate 2. The Parkwood Formation of Mississippian age overlies the Pennington Formation and underlies the Pottsville Formation of Pennsylvanian age. It crops out in narrow bands along the lower slopes of upland areas and ridges capped by the Pottsville. The Parkwood is 400 to 700 feet thick and is composed of light-gray to white fine-grained thin- to medium-bedded moderately well cemented sandstone in the basal part of the formation, and gray or greenish-gray shaly siltstone in the upper part. The formation weathers brown. The Pennington and Parkwood Formations are poor aquifers in St. Clair County. Well E-3 yields water from the Pennington or Parkwood Formation but the supply is inadequate during the dry season.

PENNSYLVANIAN SYSTEM

POTTSVILLE FORMATION

Overlying the Parkwood Formation is the Pottsville Formation of Pennsylvanian age, which is composed of about 600 to more than 1,300 feet of tan to gray thin- to thick-bedded sandstone, tan to dark-gray shale, and many coal beds. Ridges are formed by resistant beds, which are most common in the lower part of the formation, and valleys are underlain by the less resistant beds. The Pottsville crops out in three large areas in the county and along the Blount-St. Clair County line (pl. 2). Artesian conditions are favorable for flowing wells in topographically low areas of the Pottsville outcrop, and these areas are shown on plate 2.

Data were obtained for five wells that flow 5 gpm or less (table 3). Based on reported data, wells that penetrate openings in the Pottsville yield as much as 130 gpm; however, yields are generally less than 50 gpm. Water obtained from the Pottsville generally contains an excessive amount of iron. The hardness of water from the Pottsville Formation ranges from 10 to 208 ppm and has a median of 74 ppm, determined from 45 analyses (fig. 9).

ECONOMIC GEOLOGY

Minerals and rocks that are of economic importance in St. Clair County include: coal, clay and shale, limestone, chert, and iron ore. The locations of mines, pits, and quarries are shown on plate 1.

COAL

The Cahaba Basin and the Coosa Basin are two important coal fields in St. Clair County. The Cahaba Basin is in west-central St. Clair County, in the outcrop of the Pottsville Formation, and is bounded on the southeast by the Cahaba fault (pl. 2). Coal is mined in the Cahaba Basin in the vicinity of Acmar and Margaret by the stripping method. Only small quantities of coal are mined from shaft mines because of high labor cost. The Coosa Basin is southeast of the Cahaba fault in the outcrop of a broad band of Pottsville. Relatively small quantities of coal are being mined from shaft mines in the Coosa Basin. Most of the coal is mined by stripping in the vicinity of Wattsville. The reserves of coal reported here were computed by Rothrock (1949) to represent the quantity of coal in the ground, a figure that must be reduced to indicate the tonnage that may be extracted. The northeastern part of the Coosa coal field in St. Clair County has reserves of 19,397,000 short tons of coal in place in coal beds 20 inches or more thick, and reserves of 11,323,000 short tons of coal in place in coal beds from 14 to 19 inches in thickness. The coal in the Coosa coal field in St. Clair County is of the high volatile bituminous A, and medium volatile bituminous ranks (Rothrock, 1949, p. 80). It has been used for domestic purposes, for generating steam, and for making coke, although, because of the generally high sulfur and ash content, it is unsuited for making metallurgical coke.

CLAY AND SHALE

Clays and shales are widely distributed, being found in practically every county in the State and in most of the geologic formations. The most abundant types are the brick clays and shales because common brick can be made from practically any plastic clay or shale that is free from particles of limestone or dolomite. Clay and shale suitable for the manufacture of brick are interbedded with layers of sandstone and coal in the Pottsville Formation. The Ragland Brick Co. at Ragland manufactures about 50,000 common bricks daily from shale in the Pottsville Formation.

Fire clays, used in making refractory clays and fire bricks, are those which do not fuse unless subjected to a very high temperature. Clay approaching fire clay in quality is exposed in a railroad cut in the NW¼ sec. 31, T. 15 S., R. 4 E. (Rothrock, 1949, p. 92).

LIMESTONE

Limestone is quarried in large quantities from the Little Oak Limestone in St. Clair County and is used to manufacture cement at Ragland. The present quarry of the National Cement Co. is 1½ miles south of Ragland (pl. 1). The limestone in the Little Oak is sufficient for long-term quarrying.

CHERT

Many chert quarries are in the outcrops of the Cambrian and Ordovician dolomites and the Fort Payne Chert. Chert is used extensively as a road base in St. Clair County. The locations of the principal chert quarries in the county are shown on plate 1.

IRON ORE

Red iron ore crops out in St. Clair County northwest of U.S. Highway 11 in the ridges formed by the resistant sandstone of the Red Mountain Formation. The thickness of the ore beds ranges from 1 inch or less to a maximum of 7½ feet, but the thickness in most places is less than 2 feet (Burchard and Andrews, 1947, p. 44). Iron ore was extracted from several mines northeast of Odenville during World War II; however, there are no mines known to be operating in St. Clair County at present. Detailed information on iron ore in St. Clair County is given in Alabama Geological Survey Special Report 19, "Iron Ore Outcrops of the Red Mountain Formation in Northeast Alabama," by Ernest F. Burchard and Thomas G. Andrews

SUMMARY

Ground water from wells and springs is the source for most domestic, stock, industrial, and public supplies. Shallow dug wells, which fail to furnish adequate quantities of water for domestic and stock supplies, can be supplemented with deeper drilled wells in most parts of the county. Public water supplies are adequate for present needs, except at Acmar, Markeeta, and Pinedale Shores.

The Conasauga Formation, the Cambrian and Ordovician dolomites, the Floyd Shale, and the Pottsville Formation are the sources of water for most wells and springs in the county. Wells generally yield small quantities of water from the Conasauga; 20 to 150 gpm from the Cambrian and Ordovician dolomites; 65 to 250 gpm from the Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone; 2 to 30 gpm from the Floyd Shale; and 7 to 130 gpm from the Pottsville Formation.

Springs yield 10 to 470 gpm of water from the Conasauga Formation; 8 to 2,200 gpm from the Cambrian and Ordovician dolomites; as much as 400 gpm from the Ordovician limestones; 60 to 400 gpm from the Fort Payne Chert; as much as 1,500 gpm from the Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone undifferentiated; and 50 to 1,500 gpm from the Bangor Limestone.

The estimated daily average ground-water usage from wells and springs in St. Clair County in 1960 was 1,825,000 gallons.

The quality of ground water is generally good, except for the hardness of water from some of the aquifers, the sulfurous odor of some water from the Conasauga Formation, and the excessive iron content of water from the Floyd Shale and the Pottsville Formation. The median hardness of water from the aquifers ranges from 45 ppm in the Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone undifferentiated to 200 ppm in the Conasauga Formation (fig. 9). The iron content of water from 4 wells in the Pottsville ranges from 0.59 to 3.4 ppm. The median temperature of ground water in St. Clair County is 61°F.

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BASIC DATA

Table 3.–*Records of wells and springs in St. Clair County, Ala.*

Well or spring no.: Numbers correspond to those in plate 1 and table 1; asterisk indicates chemical analysis given in table 1.
Type: D, drilled well; Du, dug well; S, spring.
Depth of well and water level: Reported depths are given in feet; measured depths are given in feet and tenths.
Altitude: Altitudes determined by aneroid barometer.
Method of lift: C, cylinder; F, flows; J, jet; M, manual; N, none; S, submergible; T, turbine.
Use of water: D, domestic; I, industrial; N, not used; P, public supply; S, stock.

Water-bearing formation: Єc, Conasauga Formation; OЄu, Ketona(?), Copper Ridge, and Chepultepec Dolomites undifferentiated; Ool, Longview, Newala, and Odenville Limestones; Olm, Mosheim, Lenoir, and Little Oak Limestones; Srm, Red Mountain Formation; Dfm, Frog Mountain Sandstone; Mfm, Maury Formation and Fort Payne Chert; Mtm, Maury Formation, Fort Payne Chert, and Tuscumbia Limestone; Mhs, Ste. Genevieve Limestone, Gasper Formation, and Hartselle Sandstone; Mb, Bangor Limestone; Mf, Floyd Shale; Mpp, Pennington and Parkwood Formations; IPpv, Pottsville Formation.

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
B- 1	J. T. Gaines	....	Du	29.5	24	OЄu	604	17.2	9-19-60	M	D	61	11	18	Terra-cotta casing to 29 ft. Supplies 1 family. Dug in 1925.
B- 2	Guy Bynum	....	D	38.7	6	IPpv	1,334	26.3	8-17-60	M	D	59	35	34	Cased to 6 ft. Supplies 1 family.
*B- 3	Camp Sumatanga...	C. R. Killian ...	D	258	8	Mhs	772	27	9- -57	T	P	..	..	..	Cased to 190 ft. Supplies church camp. Reported drawdown, 83 ft. after 24 hrs. pumping 250 gpm in Sept. 1957. Water contains excessive iron.

B- 4	Chandler Mountain School.	W. C. Chapman. .	D	160	6	IPpv	1,280	9.2	8-17-60	J	P	. .	7	20	Supplies 110 students, 4 teachers, and 1 family. Water contains excessive iron.
B- 5	Town of Steele	Carl Pace	D	250	8	O€u	640	40	3-25-54	T	P	. .	4	192	Cased to 165 ft. Supplies 194 customers. Reported drawdown, 60 ft. after 24 hrs. pumping 150 gpm on 3-26-54.
B- 6	Lonnie Willingham. .	. . . .	D	. . . . .	6	O€u	589	16.5	9-19-60	J	D	. .	7	150	Supplies 1 family and cafe-service station.
C- 1	J. C. Conn	. . . .	D	32.1	6	Mtm	836	13.6	9- 1-60	M	N	65	7	60	
C- 2	. . .do	C. R. Killian. . . .	D	108	6	Mtm	841	15.1	9- 1-60	J	D	. .	4	90	Supplies 4 families. Reported yield, 60 gpm in 1954.
*C- 3	Paul Jones.	U.S. Bureau of Mines.	D	875	3	Mtm Srm	848	1.8	9- 1-60	J	D,S	. .	7	784	Cased to 300 ft. Supplies 3 families, 35,000 chickens, and several head of stock. Reported water level, 6 ft. above land surface in 1946. Drilled to explore iron. See driller's log in table 5.
C- 4	Camp Sumatanga . . .	C. R. Killian. . .	D	158	6	Mhs	831	77.5	9- 6-60	J	P,D	. .	4	142	Cased to 90 ft. Supplies church camp and 1 family.
C- 5	. . .do	. . .do	D	280	8	Mhs	789	37.8	9- 6-60	T	P	. .	. .	. . .	Cased to 90 ft. Supplies church camp. Reported yield, 65 gpm in July 1960. Water contains excessive iron. See driller's log in table 5.
E- 1	Willie Smith	. . . .	D	30.7	6	Mhs	820	14.5	9- 1-60	M	D	63	4	42	Supplies 1 family.
E- 2	Virgil Nelson.	R. M. Towns	D	48.7	8	Mb	675	23.3	9- 6-60	M	D	61	14	230	Do.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
E- 3	John Awtrey......	....	D	107.3	6	Mpp	697	71.9	9- 6-60	J	D	..	11	204	Cased to 25 ft. Inadequate supply.
E- 4	J. S. Burttram.....	....	D	50	6	Mb	675	22.4	9-14-60	J	D	..	4	186	Supplies 1 family. Water contains iron.
E- 5	John Awtrey......	....	S	......	..	Mb	605	....	....	F	S	58	4	148	Known as Muckleroy Spring. Measured flow, 1,500 gpm on 6-8-61.
E- 6	Jack Partlow.....	....	Du	15.4	36	Єc	624	13.8	9-21-60	M	D	62	4	246	Rock curbing. Supplies 1 family.
E- 7	W. W. Bowlin.....	....	D	37.2	6	Єc	584	15.1	9-21-60	J	D	..	7	216	Supplies 2 families. Can be pumped dry.
E- 8	Mrs. Minnie Early .	....	S	......	...	Mtm	643	....	....	F	S	59	4	118	Known as Early Spring. Measured flow, 230 gpm on 6-8-61.
E- 9	J. E. Rickles.....	B. M. Rickles ..	D	75	6	Mb	736	18.6	9-14-60	N	N	..	..	...	
E-10	B. L. Sloan.......	....	D	96	6	Mb	749	33.2	9-14-60	J	D,S	..	7	142	Supplies 2 families and 12,000 chickens.
E-11	Quince Roberson..	C. R. Killian...	D	59.7	6	Mb	721	38.8	11- 9-60	M	D	61	18	136	Cased to 60 ft. Supplies 1 family.
E-12	R. C. Burnett.....	....	Du	23.0	24	Єc	628	10.3	11-14-60	P	D	..	2	188	Cased to 21 ft. Supplies 1 family.
E-13	Charlie Partlow...	....	Du	17.2	36	Єc	614	14.4	11-14-60	M	D	61	11	170	Supplies 1 family.
E-14	Mrs. J. H. Sheffield	....	Du	18.9	30	Єc	590	12.8	9-21-60	N	N	..	..	...	Not cased.

F- 1	Quint Hollingsworth	J. H. Beard	D	100	6	€c	600	24.4	9-19-60	M	D	61	7	204	Cased to 27 ft. Supplies 1 family. Bedrock at 25 ft.
F- 2	Mrs. Nellie Hallmark.	....	D	48.2	6	Mhs	677	22.8	8-17-60	M	D	62	18	228	Supplies 1 family. Water contains excessive iron.
F- 3	Harleston Hollingsworth.	C. R. Killian ...	D	65	6	O€u	614	11.4	9-19-60	J	D	..	4	194	Cased to 65 ft. Supplies 1 family. Flows during wet season.
F- 4	Pauline Conn.....	....	D	80	6	O€u	620	25.3	9-19-60	J	D	..	7	164	Cased to 80 ft. Supplies 1 family.
F- 5	Jesse Jones......	C. R. Killian ...	D	130	6	€c	578	40.8	9-19-60	J	D	..	14	44	Cased to 42 ft. Supplies 1 family.
F- 6	L. C. Ingle.......	....	D	...	6	€c	550	20.8	10-27-60	J	D	..	4	142	Supplies 1 family.
F- 7	M. O. Mashburn ...	....	S	...	..	O€u	532	....	....	F	D	60	4	196	Known as Mashburn Spring. Supplies 3 families. Estimated flow, 75 gpm on 10-27-60.
F- 8	B. L. Martin......	....	Du	29.1	36	€c	549	7.7	10-27-60	J	D,S	66	11	20	Lined with rock. Supplies 1 family and 18 head of stock.
F- 9	Bill Bragg........	....	Du	33.9	36	Mtm	599	31.4	11-21-60	J	D	..	25	16	Lined with rock. Supplies 1 family.
G- 1	R. H. Fields......	J. H. Beard	D	227	6	O€u	531	34.4	11-21-60	J	D	..	..	...	Cased to 42 ft. Supplies 1 family.
G- 2	R. B. Patton......	......do	D	58.9	6	€c	530	10.1	10-27-60	J	D,S	..	7	230	Supplies 1 family and 2 head of stock.
G- 3	W. A. J. Swann....	....	Du	30.0	36	€c	532	20.2	10-27-60	J	D,S	..	14	172	Not cased. Supplies 1 family and 20 head of stock.
G- 4	Paul Bearden.....	J. H. Beard	D	96.5	6	Srm (?)	640	26.1	11-21-60	N	N	..	..	...	Cased to 9 ft.
G- 5	A. D. Jester......	E. C. Standfield	D	51	6	Mtm	558	10.2	12- 7-60	C	D	..	4	188	Cased to 25 ft- Supplies 2 families.
G- 6	J. H. McEntyre....	....	Du	28.4	30	€c	538	16.0	12- 7-60	M	D	61	50	148	Not cased. Supplies 1 family.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
G- 7	T. C. Ford........	....	Du	24.4	24	€c	537	17.4	12- 7-60	M	D	62	21	150	Supplies 1 family; inadequate during dry season.
G- 8	Otis Jester.......	....	D	...	6	Mtm	549	22.2	12- 7-60	J	D	..	2	154	Supplies 1 family.
G- 9	A. B. Reeves	....	D	72.1	6	Mtm	625	23.1	11-21-60	C	D	..	7	196	Supplies 1 family.
G-10	--Shirley.........	....	Du	17.0	36	€c	524	14.9	12- 8-60	M	D	60	4	212	Do.
J- 1	Mrs. P. A. Green ..	....	Du	20.8	24	Ool	499	17.2	12- 7-60	C	D	..	5	248	Rock lined. Supplies 1 family. Dug about 1850.
J- 2	Ernest Ostrowski..	Fords Valley Drilling Co.	D	102	6	O€u	528	34.7	12- 8-60	J	D,S	..	11	120	Supplies 1 family, dairy, and 26 cows.
J- 3	Mrs. Mable Morris..	....	Du	35.0	30	O€u	527	30.1	12- 8-60	J	D	..	39	52	Not cased. Supplies 1 family.
J- 4	Mrs. D. W. Dye....	....	Du	30.2	30	O€u	565	12.2	12-14-60	M	D	62	7	154	Rock lined. Supplies 1 family; inadequate during dry season.
J- 5	H. D. Bowlings....	....	Du	26.1	30	O€u	540	19.3	12-14-60	M	D	58	11	22	Supplies 1 family.
J- 6	David Green	....	D	83.7	6	Mhs	536	17.1	12- 7-60	N	N	..	..	...	
J- 7	John E. Gupton....	....	Du	41.1	30	Mf	580	34.4	12- 8-60	M	D	61	35	92	Not cased. Supplies 1 family.
J- 8	James C. Sanders..	Fords Valley Drilling Co.	D	82	6	Mf	543	15.3	12- 7-60	J	D	..	2	58	Supplies 1 family. Water contains excessive iron. Well equipped with water conditioner.

J- 9	C. D. Wilson......	....	S	...	..	Mhs	531	...	....	F	D	61	2	152	Known as Wilson Spring. Supplies 1 family. Measured flow, 630 gpm on 6-8-61.
J-10	H. A. O'Donnell...	W. C. Chapman..	D	75	6	Mf	542	4.7	11- 3-60	J	D	..	0	106	Cased to 14 ft. Supplies store-service station. Water contains excessive iron.
J-11	Mrs. J. L. Sanders.	....	S	...	..	Mhs	551	...	....	F	D,S	62	4	160	Known as Sanders Spring. Supplies 1 family and 6 head of stock. Measured flow, 1,500 gpm on 6-8-61.
J-12	R. L. Wilson......	W. C. Chapman..	D	75	6	Mf	583	19.5	11- 3-60	J	D	..	7	38	Cased to 38 ft. Supplies 1 family. Water contains excessive iron. Well equipped with water conditioner.
J-13	Free Will Baptist Church.	....	D	79	6	Mf	608	14.0	11- 3-60	J	P	..	2	88	
J-14	Hughie Echols	W. C. Chapman..	D	101	6	IPpv	768	31.6	11- 3-60	J	D	..	0	74	Cased to about 20 ft. Supplies 1 family. See driller's log in table 5.
K- 1	Robert F. Davis...	....	S	...	..	Ꞓc	579	...	....	F	S	60	2	144	Known as Davis Spring. Measured flow, 470 gpm on 6-8-61.
K- 2	E. T. McBrayer....	--Brown.......	D	123	6	Ꞓc	607	20.2	11-22-60	J	D	..	7	182	Cased to 50 ft. Supplies 1 family. Water contains some iron.
*K- 3	Town of Ashville..	....	S	...	..	OꞒu	544	...	....	F	P	63	7	172	Known as Ashville Spring. Supplies 285 customers. Measured flow, 670 gpm on 6-8-61.
K- 4	--Henry..........	....	D	62.0	6	Ꞓc	581	10.9	9-21-60	N	N	..	..	...	
K- 5	John Ramsey......	....	Du	28.0	36	OꞒu	583	22.0	11- 9-60	M	D	59	7	38	Lined with rock. Supplies 1 family.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
K- 6	George W. Franklin	....	Du	17.2	48	€c	633	8.2	11-22-60	M	D	60	4	114	Not cased. Supplies 1 family.
K- 7	J. C. Wooten......	....	Du	20.8	24	O€u	579	18.7	11-21-60	M	D	63	4	214	Lined with rock. Supplies 1 family.
K- 8	C. D. Bigham.....	....	Du	13.8	24	€c	566	6.6	11-21-60	C	D	61	42	284	Lined with rock. Supplies 1 family; inadequate during summers of 1955-57.
K- 9	James Swindall....	....	Du	28.7	24	O€u	590	23.2	12-14-60	M	D	59	7	28	Cased with concrete tile. Supplies 1 family; inadequate during dry season.
K-10	Fitzgerald Yarbrough.	E. C. Standfield	D	175	6	O€u	601	34.8	11- 7-60	J	D	..	2	12	Cased to about 170 ft. Supplies 1 family.
K-11	S. P. McLendon...	....	Du	36.3	36	O€u	641	20.8	11- 7-60	M	N	61	4	16	Lined with rock. Reported almost dry in 1954.
*K-12	T. E. Jones	--Brown.......	D	84	6	€c	614	23.1	9-22-60	J	P	..	11	334	Cased to 34 ft. Supplies cafe.
K-13	Manley Cox, Jr....	....	Du	32.1	30	O€u	610	28.2	11- 7-60	J	D	..	32	94	Cased to concrete tile. Supplies 1 family.
K-14	Cecil Monroe	....	Du	35.2	30	O€u	603	24.2	11- 7-60	M	D	62	78	60	Cased with concrete tile. Supplies 1 family.

K-15	W. M. Franklin....	....	Du	34.4	36	Mhs	590	25.6	11- 3-60	M	D	60	11	12	Not cased. Supplies 2 families. Water contains some iron.
K-16	L. B. White........	W. C. Chapman..	D	62	6	Mhs	595	33.8	11- 3-60	J	D	..	4	18	Supplies 1 family.
K-17	W. A. Johnson.....	Fords Valley Drilling Co.	D	88	6	Mhs	641	8.0	11- 7-60	J	D	..	2	28	Cased to 82 ft. Supplies 1 family. Flowed for about 2 weeks after drilled.
K-18	Edgar Smith	....	Du	24.1	36	Mhs	614	21.0	11-10-60	M	D	61	14	14	Not cased. Supplies 1 family.
L- 1	Pinedale Shores Co.	....	D	...	8	Ꞓc	564	12.7	9-22-60	S	P	..	11	230	Well no. 1. Yields about 10 gpm. Supply inadequate.
L- 2	...do............	....	D	...	8	Ꞓc	564	13.7	9-22-60	C	P	..	11	230	Well no. 2. Yields about 5 gpm. Supply inadequate.
L- 3	...do............	....	D	...	8	Ꞓc	575	20.3	9-22-60	J	P	..	..	...	Well no. 3. Yields about 5 gpm. Supply inadequate.
L- 4	...do............	....	D	...	8	Ꞓc	574	...	....	T	P	..	25	156	Well no. 4. Yields about 30 gpm. Water has sulfurous odor. Supply inadequate.
L- 5	J. D. Moore.......	....	Du	24.9	24	Ꞓc	634	6.6	9-22-60	C	D	..	4	28	Terra-cotta casing. Supplies store and service station.
L- 6	W. M. Burttrum....	C. E. Wilks	D	220	6	Ꞓc	631	34.1	10- 6-60	S	D	..	28	140	Cased to 50 ft. Supplies 1 family. Reported yield, 1 gpm.
L- 7	Pinedale Shores Co.	....	D	...	8	Ꞓc	571	14.9	9-22-60	J	P	..	7	324	Well no. 5. Yields about 10 gpm. Supply inadequate.
L- 8	O. R. Brooks	....	Du	25.5	36	Ꞓc	584	18.6	11- 9-60	J	D	..	11	228	Not cased. Supplies 1 family.
L- 9	B. H. Stevens	....	S	...	..	OꞒu	610	...	....	F	D	..	..	...	Known as Roberson Spring. Supplies 1 family. Estimated flow, 25 gpm on 11-22-60.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
L-10	C. D. Whittington	....	D	80	6	Єc	594	19.8	11- 9-60	J	D	..	46	324	Supplies 1 family. Water contains sulfurous odor and excessive iron.
L-11	P. H. McCorkle	....	D	40	6	Єc	625	11.2	10- 6-60	C	N	62	14	324	Cited as W. L. McCorkle well (Johnston, 1933, pt. 2, table 37, no, 11). Measured water level, 9.8 ft. 10-6-28.
L-12	Bud Washington	....	Du	18.1	48	Єc	618	13.5	11-14-60	C	N	..	..	...	
L-13	W. G. Swindall	C. E. Wilks	D	150	6	Єc	604	18.8	11-14-60	J	D	..	2	246	Cased to 29 ft. Supplies 1 family.
L-14	J. T. Swindall	....	Du	25.6	36	OЄu	581	19.7	11-14-60	J	D	..	2	172	Not cased. Supplies 1 family and store; inadequate during summer of 1959.
L-15	Fred Blaxton	....	Du	37.6	36	Єc	583	17.1	11-14-60	M	N	60	4	598	Lined with rock.
L-16	...do	O. L. Lee	D	110.9	6	Єc	583	19.6	11-14-60	N	N	..	..	...	Cased to 25 ft. Yields very little water.
L-17	...do	...do	D	177	6	Єc	583	16.5	11-14-60	N	N	..	..	...	
L-18	Ray Wyatt	....	D	155	6	OЄu	673	79.7	10-27-60	J	N	..	..	...	Cased to 18 ft.
L-19	B. D. Smith	....	D	85	6	Єc	614	16.8	11-15-60	J	D	..	4	266	Cased to 42 ft. Supplies 2 families. Water has sulfurous odor and excessive iron content.

L-20	George Williams ..	....	D	62	6	€c	686	17.3	11-14-60	J	D	..	11	362	Supplies 2 families. Water contains some iron.
L-21	L. Russell.......	W. C. Chapman.	D	85	6	O€u	612	43.5	11-22-60	J	D	..	5	208	Supplies 2 families.
L-22	W. M. Stancil.....	....	Du	23.0	42	€c	692	13.0	11-14-60	J	D	..	4	210	Lined with brick. Supplies 1 family. Water contains some iron.
L-23	L. H. Cash	....	Du	27.4	30	O€u	631	17.1	11-10-60	C	D,S	..	2	112	Lined with rock. Supplies 1 family and 700 chickens.
L-24	Clyde Thomas....	....	Du	24.6	36	O€u	620	16.6	11-10-60	C	D	..	4	98	Not cased. Supplies 2 families.
M- 1	Ted Holder.......	....	S	...	..	Mb	677	...	....	F	D,S	59	7	168	Supplies 2 families. Unnamed spring flowing about 50 gpm on 9-14-60.
M- 2	J. E. McCullough..	....	D	150	6	Mhs	690	42.5	11- 9-60	J	D,S	..	7	66	Cased to 40 ft. Supplies 1 family and 10,000 chickens. Water has sulfurous odor.
M- 3	H. E. Lankford....	A. C. Roberson	D	172	6	Mhs	636	18.3	11- 9-60	J	D	..	7	38	Supplies 1 family.
M- 4	L. F. McGinnis ...	O. L. Lee......	D	145	6	Mhs	662	35	1952	J	D,S	..	7	18	Cased to 35 ft. Supplies 1 family, dairy, and 40 cows. Water had sulfurous odor for 1 year after completion in 1952.
M- 5	George Oakes.....	W. C. Chapman .	D	270	6	€c	648	34.9	10- 6-60	C	D,S	..	14	170	Cased to 105 ft. Supplies 1 family and 41 head of stock. Water has sulfurous odor.
M- 6	E. W. Riley.......	....	S	..	..	€c	654	...	....	F	D	61	2	142	Supplies 1 family and fish pond. Unnamed spring flowing 80 gpm on 6-8-61.
M- 7	J. W. Wise........	....	D	93	6	Srm (?)	879	62.0	11- 9-60	J	D	..	11	216	Supplies 1 family.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
*M- 8	Town of Springville.	....	S	..	..	O€u	710	..	....	F	P	62	4	158	Known as Springville Spring. Supplies 65,000 gpd to 300 services. Measured flow, 900 to 2.200 gpm (fig. 8).
M- 9	George Rankin....	....	D	59.9	6	Mhs (?)	705	8.7	12- 6-60	J	D	..	4	70	Supplies 1 family.
M-10	Minnie Woodall Estate.	....	S	...	..	€c	667	...	....	F	S	60	4	174	Unnamed spring flowing 690 gpm on 6-8-61.
N- 1	Perkins McClenden	....	S	...	..	O€u	732	...	....	F	D	59	2	118	Known as McClenden Spring. Supplies 3 families. Estimated flow, 50 gpm on 12-6-60.
N- 2	L. L. Terry.......	W. C. Chapman.	D	400	6	O€u	868	100	1- -60	S	D	..	11	286	Cased to 42 ft. Supplies 1 family. Reported yield, 3 gpm in January 1960.
*O- 1	John T. House....	....	S	..	..	O€u	713	...	....	F	S	60	2	148	Known as Trevenor Spring. Measured flow, 700 gpm on 6-7-61 with 8-inch flow pipe capped.

O- 2	L. E. Welch......	....	D	32.1	6	O€u	843	10.3	10-26-60	J	N	..	..	...	
O- 3	...do...........	....	D	124.2	6	O€u	843	10.8	10-26-60	J	D	..	4	22	Supplies 1 family.
O- 4	William R. Hyman.	C. E. Wilks....	D	83	6	O€u	776	37.0	11-17-60	J	D	..	2	116	Do.
O- 5	N. F. Bush.......	...do.........	D	355	6	O€u	866	27.0	11-17-60	J	D	..	2	174	Cased to 21 ft. Supplies 1 family and store. Reported yield, 100 gallons per hour in October 1960.
O- 6	Joe Leopard.....	Paul Barontine.	D	73	6	O€u	823	16.0	11-17-60	J	D	..	2	146	Cased to 73 ft. Supplies 1 family. Can be pumped dry.
O- 7	--Fuller.........	--Owens.....	D	41.5	6	IPpv	774	25.6	12-27-60	M	D	61	4	10	Cased to 9 ft. Supplies 1 family; inadequate during dry season. Water contains excessive iron.
P- 1	E. W. Riley.......	....	S	...	..	€c	640	...	....	F	N	60	7	200	Known as St. Clair Spring. Estimated flow, 10 gpm on 11-15-60. Water has sulfurous odor.
P- 2	...do...........	....	S	..	..	€c	632	...	....	F	N	61	4	162	Known as Big Spring. Measured flow, 240 gpm on 6-8-61.
P- 3	Dr. L. E. Kirby...	....	D	70.0	6	Mhs	697	38.5	11-17-60	J	D	..	5	156	Supplies 3 families.
P- 4	Hubert W. Jones...	C. E. Wilks....	D	76	6	Mhs	693	1	10- -59	J	D	..	4	48	Cased to 40 ft. Supplies 1 family. Reported, water contains 5 ppm iron and 6.2 pH. Well equipped with water conditioner.
P- 5	Farris Washington.	...do.........	D	106.9	6	Mhs	674	23.7	11-17-60	J	D	..	4	118	Cased to 71 ft. Supplies 2 families.
P- 6	L. A. Banks......	....	D	53.1	6	IPpv	943	29.3	12-27-60	M	D	60	7	118	Cased to 20 ft. Supplies 1 family.
P- 7	Andy Walker......	....	D	57.8	6	IPpv	860	11.4	12-27-60	M	D	62	4	142	Supplies 1 family. Water contains excessive iron.

Table 3.— *Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
P- 8	O. L. Robertson...	....	D	90	6	Ool	700	18.7	12- 6-60	J	D	..	4	184	Supplies 1 family and service station.
P- 9	C. E. James......	....	D	300	6	IPpv	656	...	....	N	P	..	..	...	Cased to 20 ft. Reserve supply for the town of Margaret.
P-10	...do............	....	D	325	6	IPpv	662	25	1960	T	P	..	4	96	Cased to 20 ft. Supplies 25,000 gpd for the town of Margaret. Reported yield, 35-50 gpm.
P-11	R. A. Bodiford....	....	D	285	2½	Olm	729	20.6	10-10-60	N	N	..	..	...	Cited as J. T. Bradshaw well (Johnston, 1933, pt. 2, table 37, no. 27). Water level of 25 ft. 10-8-28. Drilled to explore coal.
P-12	Town of Odenville.	R. M. Towns...	D	200	10	Olm	731	25	1960	T	P	..	4	216	Cased to 65 ft. Supplies the town of Odenville with 22,000 gpd. Cavity from 50 to 62 ft. Reported yield, about 100 gpm.
P-13	Seaboard Air Line Railroad.	....	D	187	10	Olm	731	..	....	N	N	..	..	...	Well plugged. Reported yield, 70 gpm (Johnston, 1933, pt. 2, table 37, no. 28).

Q- 1	R. E. Franklin....	F. O. Pugh....	D	80	6	Mfm	630	35.5	10-27-60	J	D	..	0	136	Cased to 42 ft. Supplies 2 families.
Q- 2	R. C. Trousedale..	....	Du	13.1	36	Ool	639	8.8	11-14-60	J	D	..	21	94	Not cased. Supplies 2 families.
Q- 3	Evergreen Methodist Church.	....	Du	46.5	30	O€u	674	38.7	11-15-60	N	P	..	..	...	Lined with rock to 46 ft.
Q- 4	P. F. Self Estate..	....	D	86.1	6	€c	659	18.7	11-15-60	M	D	61	4	188	Supplies 1 family.
Q- 5	H. H. Thomas.....	....	D	90	6	Ool	650	18.6	11-10-60	J	D	..	7	164	Do.
Q- 6	J. W. Bice, Jr.....	....	Du	39.9	36	Mhs	668	37.9	11-10-60	M	D	60	4	20	Not cased. Supplies 1 family; inadequate during dry season. Water contains some iron.
Q- 7	J. W. Bice, Sr.....	....	Du	30.8	30	Mhs	659	25.2	11-10-60	M	D	60	14	16	Not cased. Supplies 1 family.
Q- 8	C. T. Waters......	W. C. Chapman.	D	...	6	Mhs	691	13.6	11-10-60	J	D	..	4	16	Supplies 1 family.
Q- 9	J. W. Carter	C. E. Wilks....	D	215	6	Olm	709	40	11- -57	J	D	..	11	34	Drilled 78 ft. and cased to 35 ft. in April 1957 with cavity at 70-78 ft. Cased to 78 ft. and deepened in November 1957. Supplies 1 family.
Q-10	H. G. Hammock ...	--Perkins.....	D	89.7	6	Olm	703	29.4	12-19-60	M	D	61	4	58	Supplies 1 family. Water becomes muddy after rains.
Q-11	J. D. Lane.......	F. O. Pugh....	D	105.2	6	IPpv	628	69.7	10-27-60	J	D	..	4	116	Supplies 1 family. Water contains excessive iron.
Q-12	Foreman Estate...	....	Du	26.5	30	Olm	689	14.2	12-19-60	M	D	61	4	40	Not cased. Supplies 1 family; inadequate during dry season. Muddy after heavy rain.
Q-13	Ralph Youngblood.	T. W. Cole & Son, Well Drillers.	D	75	6	IPpv (?)	567	8.8	9-15-60	J	D	..	14	208	Supplies 1 family. Water contains excessive iron. Drilled through layer of coal.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

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R- 1	Mrs. Jim Bice.....	....	D	99.5	6	IPpv	722	44.6	9-21-60	M	D	62	4	164	Supplies 1 family.
R- 2	Alvirtis Day......	Harvey M. Richardson.	D	64.8	6	IPpv	612	29.6	12- 8-60	M	D	62	2	62	Cased to 30 ft. Supplies 1 family. Water contains excessive iron.
R- 3	Billy Alverson	....	D	34.5	6	IPpv	573	30.2	12- 8-60	M	D	62	2	34	Supplies 1 family; inadequate during dry season. Water becomes muddy when low.
R- 4	Hoyt Edge........	....	D	45.8	5	IPpv	564	22.0	12- 8-60	M	D	63	2	40	Supplies 1 family.
*R- 5	Chester Savage....	Pennsylvania Drilling Co.	D	563	2½	IPpv	545	...	....	F,J	D	..	4	118	Cited as core drill hole no. 9-20-CA (Rothrock, 1949, pt. 1, p. 117-119) Drilled to explore coal. Supplies 1 family. Reported flow, 1 to 2 gpm. Core description in table 4.
R- 6	Earnest Collins ...	W. C. Chapman.	D	42	6	Mf	495	23.8	10-12-60	J	D	..	14	36	Cased to 28 ft. Supplies 2 families.
R- 7	Mrs. Clifford Day..	...do.........	D	40	6	Mf	504	9.1	10-12-60	J	D	..	7	210	Cased to 15 ft. Supplies 1 family.
R- 8	M. T. Barber......	F. O. Pugh	D	60	6	Mf	521	20.2	10-12-60	J	D	..	4	148	Supplies 1 family.
R- 9	Luther Sweet......	J. H. Beard....	D	45	6	Mf	508	4.8	10-12-60	J	D	..	25	1,700	Do.

S- 1	L. J. Grizzell.....	....	Du	26	48	IPpv	699	22.7	11- 3-60	J	D	..	4	20	Supplies 2 families.
S- 2	Ragland Brick Co..	Virginia Well and Supply Co.	D	379	6	IPpv	519	19.1	8-31-60	N	N	..	..	...	Cased to 131 ft. Reported bail test, 7 gpm with 160 ft. of drawdown. See driller's log in table 5.
*S- 3	City of Ragland. ..	H. W. Peerson Drilling Supply Co.	D	406	6	IPpv	517	40	6- -53	T	P	..	11	98	Reported drawdown of 110 ft. after 24 hrs. pumping 100 gpm May 1953. Yield reported 35 gpm of clear water, 10-5-53. See driller's log in table 5.
S- 4	...do............	...do.........	D	300	6	IPpv	530	25	10-12-43	T	P	..	5	86	Cased to 20 ft. Reported yield, 20 gpm during dry season. See driller's log in table 5.
S- 5	...do............	....	D	200	6	IPpv	566	69.1	8-30-60	N	N	..	..	...	Cited as Town of Ragland well (Johnston, 1933, pt. 2, table 37, no. 33). Reported yield, 10 gpm in 1928. Supply became inadequate.
S- 6	...do............	National Cement Co.	D	350	4	IPpv	573	...	....	N	N	..	..	...	Supply became inadequate. Drilled through layer of coal.
*S- 7	...do............	H. W. Peerson Drilling Supply Co.	D	320	8	IPpv	488	6	12-28-55	T	P	64	7	62	Cased to 25 ft. Reported drawdown of 84 ft. after 24 hrs. pumping 110-130 gpm, 12-28-55. See sample log in table 4 and driller's log in table 5.
*S- 8	...do............	...do.........	D	305	8	IPpv	487	8	12- 7-55	T	P	..	11	28	Cased to 26.5 ft. Reported drawdown of 80 ft. after 24 hrs. pumping 90-100 gpm, 12-7-55. See sample log in table 4 and driller's log in table 5.

Table 3.– *Records of wells and springs in St. Clair County, Ala.*–Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
S- 9	Lowell Mozley	W. C. Chapman.	D	110	6	IPpv	569	+1.2	12- 8-60	F,J	D	61	2	156	Cased to 19 ft. Supplies 2 families and service station. Water contains excessive iron. Measured flow, 2 gallons per hour 12-8-60. Water enters well at 101 ft.
S-10	George Campbell ..	...do........	D	24.7	6	IPpv	545	+.3	12- 8-60	F,J	N	61	2	58	Water contains excessive iron. Measured flow, 8 to 10 gallons per hour 12-8-60.
S-11	National Cement Co.	National Cement Co.	D	...	6	IPpv	500	20	1959	T	I	..	..	...	Reported yield, 100 gpm. Supplementary supply used during extended droughts. Water reported to be unfit for drinking.
S-12	...do...........	...do.........	D	325	6	IPpv	509	25	1959	T	I	69	9	180	Cased to 40 ft. Reported yield, 30 gpm. Supplementary supply used during extended droughts.

S-13	...do...........	...do.........	D	125	6	IPpv	511	..	....	T	I	69	2	116	Reported yield, 17 gpm. Reported small amount of natural gas discharges from well. Supplementary supply used during extended droughts.
S-14	Ragland Brick Co.	Virginia Well and Supply Co.	D	200	6	IPpv	521	20	1953	T	I	..	2	166	Cased to 79 ft. Supplies about 6,000 gpd for lime and clay mix. Reported drawdown of 130 ft. after 24 hrs. pumping 26 gpm. See driller's log in table 5.
S-15	Billie F. Shivers ..	W. C. Chapman.	D	155	6	Mf	513	38.3	10-12-60	J	D	..	14	236	Cased to 30 ft. Supplies 1 family and store; inadequate during dry season.
S-16	Marvin Daffy......	....	Du	36.8	30	Mf	547	23.9	12-14-60	M	D	59	4	12	Supplies 1 family.
V- 1	Viola Darrah......	....	D	75.1	6	Mf	517	10.7	9-29-60	M	D	63	131	2,870	Supplies 1 family. Water contains excessive iron.
V- 2	Viola Simmons	....	S	...	..	Mfm	475	...	....	F,J	D	61	4	154	Unnamed spring supplies 3 families. Measured flow, 60 gpm on 6-8-61.
V- 3	Stanley Sullivan...	Harvey M. Richardson.	D	95	6	OЄu	518	15.1	9-29-60	J	D	..	18	408	Cased to 18 ft. Supplies 2 families. Water contains some iron.
V- 4	E. L. Beasley.....	W. C. Chapman.	D	92	5	Mf	534	8.2	10- 4-60	J	D	..	4	242	Cased to about 12 ft. Supplies 1 family. Water contains some iron.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
V- 5	Robert Washington	F. O. Pugh	D	52	6	Mf	599	6.9	9-29-60	J	D	..	4	44	Cased to 21 ft. Supplies 2 families. Water contains excessive iron. Well equipped with water conditioner.
V- 6	G. W. Bannister	...do	D	67	8	O€u	493	50.5	9-29-60	J	D	..	4	158	Supplies 1 family.
*V- 7	Coleman and Stewart Farms.	....	D	150	6	O€u	481	48.2	9-29-60	J	D,S	..	0	116	Supplies 4 families, 27,000 chickens, egg washing room, and 300 cows.
V- 8	Riverside School	W. C. Chapman	D	100	6	O€u	502	...	....	C	P	..	0	40	Supplies 25 students and 1 teacher.
V- 9	Avondale Mills	....	S	...	..	Mfm	537	...	....	C	I	..	..	...	Known as Pump Station Spring. Reported yield, 200-400 gpm. Supplementary supply for mill.
V-10	Ledford Harmon	....	Du	27.0	36	O€u	513	13.5	10- 4-60	M	D	67	28	222	Not cased. Supplies 1 family.
V-11	J. H. Bukacek	....	D	82.9	5	O€u	474	40.4	10- 4-60	J	D	..	11	310	Supplies 1 family.
W- 1	Coal City Junior High School.	F. O. Pugh	D	125	6	Mf	542	19.1	9-15-60	J	P	..	18	434	Supplies 127 students, 4 teachers, lunchroom, and bathrooms. Water contains excessive iron.

*W- 2	W. W. Crump	....	D	41	6	Mf	539	13.7	8-17-60	M	D	64	21	224	Cased to 20 ft. Supplies 2 families.
W- 3	Jack A. Franklin ..	F. O. Pugh....	D	..	6	IPpv	568	27.2	10-14-60	J	D	..	32	72	Supplies 1 family. Water contains excessive iron; well equipped with water conditioner.
W- 4	W. E. Williams	....	D	40.7	6	IPpv	754	35.0	1-10-61	M	D	60	7	90	Cased to 48 ft. Small yield; supplies 1 family. Water contains excessive iron. Drilled through layer of coal.
W- 5	Miss Myrtle Stewart	W. C. Chapman.	D	40	6	IPpv	553	...	10-14-60	F,J	D	61	4	108	Cased to 21 ft. Supplies 1 family. Water contains excessive iron. Estimated flow, 5 gpm outside of casing on 10-14-60.
W- 6	Mrs. Faye Prather..	...do.........	D	91	6	Mf	587	13.6	9-15-60	J	D	..	7	212	Cased to 42 ft. Supplies 3 families.
W- 7	J. T. Dillard......	....	D	...	6	Mf	603	13.7	9-15-60	J	D	..	4	44	Supplies 1 family. Water contains excessive iron; unfit for washing and cooking.
*W- 8	Town of Pell City .	....	S	...	..	Mfm	535	...	....	C	P	59	4	136	Known as Hinesman Spring. Reported average withdrawal, 235 gpm for 16 hrs. per day. Supply inadequate; supplemental supply obtained from spring BB-12.
W- 9	James Mize.......	--Cole........	D	75	6	IPpv	549	9.3	1-10-61	J	D	..	7	30	Supplies 2 families. Water contains excessive iron; well equipped with water conditioner.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
W-10	Mrs. Maze Jones...	....	D	104.3	6	IPpv	653	11.5	1-11-61	N	N	..	..	...	
W-11	L. B. Kirby.......	W. C. Chapman.	D	52	6	IPpv	762	25.8	1-11-61	J	D	..	11	10	Cased to 20 ft. Supplies 1 family; inadequate during dry season. Water contains excessive iron.
W-12	--Starnes.........	....	D	...	6	IPpv	627	32.1	1-12-61	J	D	..	4	56	Supplies 1 family. Water contains excessive iron.
W-13	W. R. Richey......	....	D	34.5	6	Mf (?)	532	8.4	1-10-61	J	D	..	11	16	Do.
W-14	Avondale Mills....	H. W. Peerson Drilling Supply Co.	D	247	6	Mf	565	....	....	N	N	..	..	...	Avondale test well 2. Estimated yield, 2 gpm. Abandoned. See driller's log in table 5.
W-15	...do...........	...do.........	D	575	6	Mf	566	....	....	N	N	..	..	...	Avondale test well 1. Yield 2 gpm. Abandoned. See driller's log in table 5.
W-16	...do...........	...do.........	D	307	6	Mf	566	....	....	N	N	..	..	...	Avondale test well 5. Well tested at 30 gpm. Abandoned. See driller's log in table 5.
X- 1	A. V. Densmore ...	J. H. Beard....	D	81	6	Ool	734	46.4	1-10-61	J	D	..	11	294	Cased to 81 ft. Supplies 1 family.

X- 2	W. D. Hosley......	....	S	...	..	O-Єu	790	....	....	F	P	61	5	98	Cited as Town Spring (Johnston, 1933, pt. 2, table 38, no. 63). Supplies 25-30 families in Branchville by gravity flow. Measured flow, 75 gpm on 10-8-28 and 80 gpm on 6-7-61.
X- 3	Roy E. Vann......	T. W. Cole & Son, Well Drillers.	D	62	6	IPpv	748	22.7	12-27-60	M	D	61	11	190	Cased to 25 ft. Supplies 1 family. 4-in. layer of coal at 17 ft.
X- 4	Dr. E. H. Edwards..	...do.........	D	67	6	IPpv	718	32.5	12-27-60	J	D,S	..	11	14	Cased to 42 ft. Supplies 1 family and 36 head of stock. Reported 30-in. layer of coal at about 35 ft.
X- 5	J. W. Hodges......	....	D	111	6	Ool	772	83.4	1-10-61	J	D	..	4	42	Cased to 111 ft. Supplies 2 families.
X- 6	J. D. Cobb........	....	D	25.8	6	Olm	731	10.4	10-10-60	M	N	63	4	164	
*X- 7	M. S. Riddle	C. E. Wilks....	D	87	6	Olm	744	5.7	10-10-60	M	D	69	4	124	Cased to 42 ft. Supplies 1 family. Becomes muddy after rains.
X- 8	W. F. Roberson....	....	D	115	6	Mf	838	40-55	1959	J	D	..	4	152	Supplies 1 family. Water contains excessive iron.
X- 9	Herbert Hardwick..	C. E. Wilks....	D	100	6	Ool	720	30	7- -57	J	D	..	7	14	Cased to 100 ft. Supplies 3 families.
X-10	Emmett Coupland..	Hoyt Dalrymple	D	84	6	Ool	710	10.0	1-11-61	J	D	..	2	174	Cased to 21 ft. Supplies 2 families. Bedrock at 20 ft. and a cavity at 80 ft.
X-11	James Brasher	....	Du	20.5	30	IPpv	587	15.0	1-11-61	M	D	60	4	14	Supplies 1 family; inadequate during dry season.
X-12	J. R. Brunson.....	J. H. Beard....	D	200	6	Dfm, Olm	799	111.5	1-11-61	S	D	..	4	120	Supplies 1 family.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
X-13	J. R. Brunson.....	....	D	53.4	6	Olm	716	16.9	1-11-61	N	N	..	..	...	
X-14	W. J. Taylor......	....	D	95	6	Olm	693	13.9	1-17-61	J	D	..	7	122	Supplies 1 family.
X-15	Paul Eves........	....	D	70	6	Mf	711	11.4	1-11-61	N	N	..	..	...	Water has high iron content and is unsatisfactory for domestic use.
X-16	Lewis Polk.......	....	D	...	6	IPpv	623	37.8	1-11-61	J	D	..	4	62	Supplies 1 family. Water contains excessive iron.
X-17	John Hannah......	Arthur Roberts.	D	62	6	IPpv	696	39.1	1-12-61	J	D	..	4	34	Cased to 55 ft. Supplies 1 family; inadequate during dry season. Water contains excessive iron; well equipped with water conditioner.
X-18	....	Alabama Fuel and Iron Co.	D	1,000 (?)	2½	IPpv	719	....	....	F	N	61	..	...	Drilled to explore coal. Estimated flow, 5 gpm 5-4-62.
Y- 1	Ed Roper.........	--Morris	D	103	6	IPpv	632	41.2	1-17-61	N	N	..	..	...	Water contains excessive iron.
Y- 2	...do............	--Stone.......	D	150	6	IPpv	632	45	1960	C	D	..	4	88	Cased to 18 ft. Supplies 3 families.
Y- 3	T. L. Taylor.....	....	D	55.1	6	IPpv	689	43.3	1-17-61	N	N	..	..	...	Water is reported to contain excessive iron.

Y- 4	Mrs. Louise Webb .	W. C. Chapman.	D	111.1	6	IPpv	707	103.2	1-17-61	N	N	..	..	...	Drilled to a depth of 163 ft. Water contains excessive iron.
Y- 5	C. E. James......	....	S	...	..	O€u	636	...	....	F,C	P	..	5	160	Known as Braggsville Spring. Reported yield, 20-40 gpm. Supplies Acmar with 22,000 gpd.
Y- 6	Moody School.....	W. C. Chapman.	D	127	6	O€u	727	70	12- -60	J	P	--	11	142	Moody School well no. 1. Supplies 415 students and 15 teachers.
Y- 7	...do............	H. W. Peerson Drilling Supply Co.	D	319	6	O€u	734	81	12- -60	S	N	..	..	...	Moody School well no 2. Cased to 110 ft. Reported yield, 8 gpm at 81 ft.
Z- 1	Mrs. Mavis D. Cross.	....	D	95	6	Olm	683	35	1952	J	D	..	35	212	Cited as the A. J. Copeland well (Johnston, 1933, pt. 2, table 37, no. 47). Supplies 1 family. Water level of 31.8 ft. on 10-8-28.
Z- 2	--Lollars	....	D	35.6	6	Ool	662	3.3	1-23-61	J	D	..	7	168	Supplies 2 families.
Z- 3	C. E. James......	....	S	...	..	O€u	614	....	....	F,C	P	..	4	212	Known as Markeeta Spring. Reported yield, 8-20 gpm. Supplies Markeeta with 8,000 gpd.
Z- 4	Mrs. Bert Little...	....	D	124	6	Ool	637	7.9	1-23-61	N	N	..	..	...	Cased to 10 ft. Bedrock at 4 ft.
Z- 5	C. E. Malone	....	D	60	6	Mf	740	15.9	1-23-61	J	D	..	2	134	Supplies 2 families.
Z- 6	G. D. Whitfield....	T. W. Cole & Son, Well Drillers.	D	86	6	Mf	735	7.1	1-23-61	J	D	..	..	...	Cased to 86 ft. Supplies 1 family and service station. Water contains excessive iron; well equipped with water conditioner.
Z- 7	City of Leeds.....	....	S	...	..	Olm	648	....	....	F,C	P	62	5	136	Estimated flow, 400 gpm on 6-7-61. Supplies the city of Leeds with 320,000 gpd.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
AA- 1	F. L. Keahey.....	W. C. Chapman	D	75	6	IPpv	563	19.2	1-12-61	J	D	..	4	98	Supplies 2 families. Water contains slight amount of iron.
AA- 2	John W. McDaniel.	...do........	D	107	6	Mf	734	43.4	1-11-61	J	D	..	4	14	Cased to 107 ft. Supplies 1 family. Water contains excessive iron.
AA- 3	C. D. Salmon.....	E. L. Graves..	D	72	6	IPpv	603	43.2	1-12-61	J	D	..	4	74	Cased to 12 ft. Supplies 1 family.
AA- 4	St. Clair Nursing Home.	...do........	D	124	6	IPpv	557	36.6	1-12-61	J	P	..	4	116	Supplies water for laundry, kitchen, steam heating, and 70 people. Water contains excessive iron.
AA- 5	Camp Winnataska .	H. W. Peerson Drilling Supply Co.	D	210	6	IPpv	565	....	....	J	P	..	2	38	Well no. 2.
AA- 6	...do...........	...do........	D	186.1	6	IPpv	519	6.2	1-12-61	N	N	..	..	...	Well no. 3, near mud hut. Abandoned, insufficient supply.
AA- 7	...do...........	...do........	D	200	6	IPpv	523	40.8	1-12-61	J	P	..	..	...	Well no. 4, near mess hall. Cased to 14½ feet. Reported yield, 18 gpm and a water level of 18 ft. on 5-26-47. See driller's log in table 5.

AA- 8	...do..........	...do........	D	210	6	IPpv	563	....	....	C	P	..	..	...	Well no. 1. See driller's log in table 5.
AA- 9	...do..........	...do........	D	210	6	IPpv	548	....	....	J	P	..	..	...	Well no. 6, rear of chapel.
AA-10	...do..........	...do........	D	125	6	IPpv	536	50	3-17-57	C	P	..	2	58	Well no. 5, near lake. Cased to 48½ft. Reported yield, 24 gpm on 3-17-57. See driller's log in table 5.
AA-11	Mrs. W. C. Partridge.	W. C. Chapman	D	55	6	Mf	472	8.8	2-10-61	J	D	..	7	52	Cased to 20 ft. Supplies 1 family. Water contains excessive iron. Bail tested at 7 gpm in 1958.
AA-12	Mrs. Nancy Wilkerson.	...do........	D	150	6	Mf	485	6.2	2-10-61	J	D	..	..	...	Supplies 1 family. Water contains excessive iron; well equipped with water conditioner.
AA-13	R. F. Partridge...	W. H. Bland...	D	65	6	Mf	492	12.9	2-10-61	J	D	..	14	132	Supplies 1 family. Water contains excessive iron.
AA-14	W. C. Allen......	....	Du	29.6	30	Mf	518	19.7	2-10-61	M	D	59	2	30	Supplies 1 family; inadequate during dry season.
BB- 1	Avondale Mills ...	H. W. Peerson Drilling Supply Co.	D	250	6	Mf	552	15	5- -46	N	N	..	..	...	Avondale test well 4 drilled in March 1942. Air-lift test, 150 gpm for 48 hrs.; yield reduced later to less than 5 gpm. Well plugged. See driller's log in table 5.
BB- 2	...do..........	...do........	D	209	10	Mf	548	2.8	8-15-60	N	N	..	..	...	Avondale test well 3 drilled in February 1942. Air-lift test, 200-250 gpm for 120 hrs. with 30-40 ft. drawdown. Abandoned because of surface sinks. See figure 6 and driller's log in table 5.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
*BB-3	E. R. Blair.......	H. W. Peerson Drilling Supply Co.	D	300	8	Mf	523	2.9	8-18-60	N	N	..	..	...	Cased to 40 ft. Former supply for town of Eden. Measured drawdown, 157 ft. after 24 hrs. pumping 26 gpm on 2-25-46. See sample log in table 4 and driller's log in table 5.
BB- 4	A. B. Griffin	W. C. Chapman	D	90	6	Mf	518	7.6	2-10-61	J	D	59	4	180	Cased to 28 ft. Supplies 1 family. Reported drawdown, 20 ft. after ½ hr. bailing 20 gpm in 1959.
BB- 5	G. C. Walker	....	D	65	6	Mf	521	2.7	2-10-61	N	N	..	..	...	Supply adequate for 1 family. Water contains excessive iron.
BB- 6	....	....	S	...	..	O€u	468	...	....	F	S	..	..	...	Known as Blue Spring. Estimated flow, 300 gpm on 8-16-60.
BB- 7	Texas Smith......	....	Du	23.0	30	Mf	535	12.9	2-14-61	M	D	58	7	56	Not cased. Supplies 2 families; inadequate during dry season. Water contains excessive iron.

BB- 8	Mrs. John Goddard	....	D	80	6	Mf	521	11.5	2-10-61	J	D	..	18	170	Cased to 20 ft. Supplies 1 family. Water contains excessive iron. Water enters at 40 ft.
BB- 9	Fred Castleberry..	W. H. Bland...	D	75	6	Mf	503	5.6	2-10-61	J	D	..	7	138	Supplies 1 family. Water contains excessive iron.
BB-10	Max Smith........	....	Du	25.5	36	OꞒu	530	3.7	4-17-61	J	D	57	..	...	Not cased. Supplies 2 families.
BB-11	S. F. Johnson	....	Du	30.2	36	Mf	538	20.5	2-14-61	J	D	..	67	798	Not cased. Mineralized water, unfit for drinking and cooking.
BB-12	Avondale Mills ...	....	S	...	..	OꞒu	436	...	....	F,C	D,I, P,S	62	..	...	Known as Waite Spring. Estimated flow, 800 gpm on 8-16-60. Supplies about 250,000 gallons per day for mill and supplemental supply for Pell City. The spring will become flooded upon completion of a dam on the Coosa River near Kelly Creek.
CC- 1	Lester Dickey....	F. O. Pugh ...	D	99	6	OꞒu	520	36.0	4-17-61	J	D	..	4	100	Cased to 61 ft. Supplies 1 family.
CC- 2	Mrs. Bobbie Sue Fraim.	....	D	66.3	6	OꞒu	523	21.7	3-23-61	N	N	..	..	...	
CC- 3	Joe E. Yates.....	....	D	...	6	OꞒu	495	13.6	3-27-61	J	D,S	..	7	98	Supplies 1 family and 1,200 chickens.
CC- 4	Greenfield School.	F. O. Pugh ...	D	...	6	OꞒu	503	...	....	C	P	..	4	70	Supplies 113 students and 3 teachers.
CC- 5	Turner Thunderbird.	....	D	90	6	OꞒu	531	23.7	3-27-61	J	N	..	..	...	
CC- 6	Warren Lee.......	....	D	...	6	OꞒu	456	25.7	3-23-61	J	D	..	35	28	Supplies 1 family.

Table 3.—*Records of wells and springs in St. Clair County, Ala.*—Continued

Well or spring	Owner	Driller	Type	Depth of well (feet)	Diameter of well (inches)	Water-bearing unit	Altitude of land surface (feet)	Water level: Above (+) or below land surface (feet)	Water level: Date of measurement	Method of lift	Use of water	Field determinations: Temperature (°F)	Field determinations: Chloride (Cl) (ppm)	Field determinations: Hardness as $CaCO_3$ (ppm)	Remarks
CC- 7	Mrs. Bobbie Sue Fraim.	Alabama-Pennsylvania Drilling Co.	D	..	6	O€u	468	...	....	J	D	..	4	184	Supplies 1 family. Bail tested at 20 gpm in 1956.
CC- 8	Thomas H. Wilson .	Abernathy Drilling Co.	D	147	6	O€u	503	72.4	3-27-61	T	D	..	4	136	Supplies 3 families.
EE- 1	Edward J. Walker. .	Arthur Roberts .	D	40	6	O€u	482	3.5	3-27-61	J	D	..	7	92	Supplies 1 family and service station.
EE- 2	Leslie F. Broadus	....	Du	11.4	24	Mf	519	3.4	2-14-61	M	D	59	67	96	Supplies 1 family all year and several families during summer. Dug about 1928.
EE- 3	Sam Smith Estate . .	....	D	166.9	6	Ool	508	38.6	2-14-61	J	N	..	..	...	
EE- 4	E. C. Martin.	....	Du	49.5	24	O€u	501	12.1	2-14-61	M	D	60	18	20	Lined with rock. Supplies 1 family.
EE- 5	Albert Perry.	F. O. Pugh. . . .	D	91	6	O€u	499	42.7	3-23-61	J	D	..	4	46	Supplies 1 family.
EE- 6	Frank Lacey, Jr. . .	....	Du	44.2	42	O€u	456	6.5	3-23-61	J	D	58	7	44	Not cased. Supplies 1 family.
EE- 7	Ernest Williamson .	....	Du	26.3	48	O€u	439	5.5	3-23-61	J	D	..	21	36	Supplies 1 family; inadequate during dry season.
EE- 8	J. W. Goodgame. . .	Alabama-Pennsylvania Drilling Co.	D	120	6	Ool	468	29.4	2-14-61	J	D,I	..	2	104	Supplies 1 family, 2 service stations, and cafe.
EE- 9	Leslie Beavers . . .	....	D	...	6	Ool	464	47.7	2-14-61	C	D	..	2	130	Supplies 1 family.
EE-10	David Treadwell. .	W. C. Chapman .	D	84	6	O€u	463	56.5	3-27-61	J	D,S	..	4	48	Cased to 80 ft. Supplies 2 families and 200 hogs.

Table 4.—*Sample logs of wells in St. Clair County, Ala.*

	Thickness		Depth	
	feet	inches	feet	inches
Well R-5[1]				
Owner: Chester Savage Driller: Pennsylvania Drilling Co.				
Weathered rock	6	0	6	0
Silty weathered claystone	6	0	12	0
Siltstone and claystone	5	0	17	0
Shaly and silty claystone; dip 15°-20°	6	6	23	6
Coal (no core recovered). Gann coal bed	0	10	24	4
Thin-bedded siltstone with sandy zones; dip 20°	21	8	46	0
Sandstone with streaks of pyrite and carbonized plant fragments	0	6	46	6
Siltstone (25 in. core recovered, mostly clay)	0	4	46	0
Bony coal (Higginbotham coal bed)	0	3	47	1
Broken coal (Higginbotham coal bed)	0	4	47	5
Bony coal (Higginbotham coal bed)	0	2	47	7
Claystone	1	5	49	0
Carbonaceous claystone	0	10	49	0
Claystone with sandy streaks	0	11	50	9
Claystone with sandy streaks	0	9	51	6
Silty claystone	1	1	52	7
Sandstone; streaks of coal at 56 ft. 9 in. and 65 ft. 6 in.	13	2	65	9
Shale and sandstone	1	0	66	9
Medium-grained sandstone with occasional shale fragments and carbonaceous partings	16	3	83	0
Sandstone; many clay pellets and fragments of ferruginous concretions and fossil plants	3	0	86	0
Medium-grained sandstone	19	0	105	0
Claystone	5	10	110	0
Coal (5½ in. core recovered) (Fairview coal bed (adjusted to conform to the laboratory analysis))	1	8	112	6
Clay and coal (12½ in. core recovered)	0	7	113	1
Coal, thin clay partings (12½ in. core recovered)	1	1	114	2
Clay, streaks of coal	0	7	114	9
Carbonaceous claystone; streak of coal near base	0	6	115	3
Carbonaceous slickensided claystone	2	0	117	3
Claystone	1	9	119	0
Thin-bedded shaly siltstone with lenticular sandy partings	21	6	140	6
Shaly claystone	10	0	150	6
Fine-grained sandstone	16	0	166	6
Clayey siltstone with lenticular sandy partings	25	6	192	0
Sandstone	10	4	202	4

Table 4.—*Sample logs of wells in St. Clair County, Ala.*—Continued

	Thickness		Depth	
	feet	inches	feet	inches
Well R-5—Continued				
Shaly claystone with scattered sandy partings	11	2	213	6
Thin-bedded sandstone and shale	23	0	236	6
Medium-grained sandstone with fragments of ferruginous concretions in the top and bottom	5	6	242	0
Shaly claystone, sandy at base	12	0	254	0
Sandstone with occasional silty partings and pellets of claystone	10	0	264	0
Claystone	1	6	265	6
Siltstone	1	6	267	0
Shaly claystone with scattered ferruginous concretions	11	10	278	10
Coal, with thin clayey partings (9 in. core recovered) } New coal bed	1	4	280	2
Clay and coal (no coal recovered) } New coal bed	0	2	280	4
Shaly claystone with scattered streaks of sand and ferruginous concretions; slickensides at 305 ft.	30	8	311	0
Sandstone with scattered claystone pellets	5	0	316	0
Shaly claystone	9	0	325	0
Shale with sandy partings	6	0	331	0
Sandstone with shaly partings in the lower 3 ft.	14	0	345	0
Shaly claystone with sandy lenticular partings; scattered ferruginous concretions	48	0	393	0
Thin-bedded sandstone with silty partings	8	0	401	0
Thin-bedded claystone and sandstone	16	0	417	0
Shaly claystone; ferruginous concretions; sandy partings in middle and bottom	16	6	433	6
Thin-bedded claystone and sandstone	9	6	443	0
Shaly claystone; ferruginous concretions and scattered silty partings	13	6	456	6
Coal (12 in. core recovered) Upper Chapman coal bed	1	4	457	10
Claystone	13	2	471	0
Thin-bedded siltstone	6	6	477	6
Fine-grained thick-bedded sandstone with scattered claystone partings	57	0	534	6
Shaly claystone, silty in the lower part	23	11	558	5
Coal Lower Chapman coal bed	0	7	559	0
Clay	0	1	559	1
Clay and coal	0	4	559	5
Claystone	1	7	561	0
Siltstone	2	0	563	0
Total depth 563 feet.				

[1] Log of core drill hole (Rothrock, 1949, p. 117-119)

Table 4.—*Sample logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well S-7		
Owner: Town of Ragland		
Driller: H. W. Peerson Drilling Supply Co.		
Pottsville Formation		
No record	10	10
Shale, dark-gray; moderate brown fine-grained ferruginous sandstone	10	20
Shale, dark-gray, sandy	15	35
Shale, dark-gray; ferruginous concretions	5	40
Shale, dark-gray, sandy, soft	20	60
Sandstone, light greenish-gray, very fine grained; dark-gray shale	40	100
Shale, dark-gray, slightly carbonaceous, slickensided; light greenish-gray very fine grained sandstone	5	105
Sandstone, light brownish-gray, fine-grained, ferruginous; dark-gray shale	5	110
Sandstone, light greenish-gray, fine-grained; dark-gray slickensided shale	5	115
Shale, dark-gray	15	130
Shale, dark-gray; light greenish-gray very fine grained sandstone	10	140
Shale, dark-gray; sandy clay	20	160
Shale, dark-gray; light greenish-gray siltstone	10	170
Shale, dark-gray; sandy clay	5	175
Shale, dark-gray; light greenish-gray very fine grained sandstone	5	180
Siltstone, light brownish-gray, pyritiferous; dark-gray shale	5	185
Sandstone, light greenish-gray, fine-grained; dark-gray shale	5	190
Shale, dark-gray; coal	15	205
Shale, dark-gray; olive-green siltstone; coal	10	215
Shale, grayish-black, carbonaceous, slickensided	5	220
Siltstone, dark-gray, hard	15	235
Shale, dark-gray, hard	10	245
Shale, grayish-black, carbonaceous; coal	15	260
Siltstone, dark-gray; dark-gray shale	5	265
Sandstone, light greenish-gray, fine- to medium-grained, weathering to sand; gray shale; coal	15	280
Sandstone, light greenish-gray, fine- to medium-grained, weathering to sand	20	300
Sandstone, light greenish-gray, very fine grained; medium dark-gray shale	10	310
Shale, dark-gray	5	315
Shale, dark-gray; medium-gray siltstone	5	320

Table 4.—*Sample logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well S-8		
Owner: Town of Ragland		
Driller: H. W. Peerson Drilling Supply Co.		
Pottsville Formation		
No sample	10	10
Shale, medium-gray; very thin layer limonite	20	30
Shale, dark-gray	10	40
Shale, medium dark-gray, ferruginous	5	45
Shale, medium dark-gray; medium-gray fine-grained sandstone	15	60
Shale, dark-gray; medium-gray fine-grained hard sandstone	10	70
Shale, dark-gray; light-gray fine-grained sandstone	5	75
Sandstone, light-gray, fine- to medium- grained; medium-gray hard shale	5	80
Shale, dark-gray; light-gray sandy clay	15	95
Shale, dark-gray	10	105
Shale, dark-gray; medium-gray fine-grained sandstone	10	115
Sandstone, light-gray, very fine to fine-grained; dark-gray shale; light-gray sandy clay	5	120
Sandstone, light- to medium-gray, very fine to fine-grained, pyritiferous, ferruginous; dark-gray shale	5	125
Shale, medium dark-gray; coal	5	130
Sandstone, medium-gray, very fine to fine-grained; very thin layers of limonite	5	135
Shale, dark-gray; medium-gray very fine grained sandstone	5	140
Shale, dark-gray	5	145
Sandstone, medium-gray, very fine grained	5	150
Shale, dark-gray; medium-gray very fine grained sandstone	10	160
Shale, dark-gray; medium-gray fine-grained sandstone; calcite	10	170
Shale, dark-gray; calcite	10	180
Shale, dark-gray; coal	10	190
Shale, dark-gray; very light gray sandy clay	25	215
Shale, medium-gray	5	220
Shale, medium dark-gray; medium-gray sandstone; calcite	5	225
Shale, medium-gray; calcite	10	235
Shale, dark-gray, hard	25	260
Shale, grayish-black, hard	15	275
Shale, dark-gray; coal	10	285
Shale, dark-gray	20	305

Table 4.—*Sample logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well BB-3		
Owner: E. R. Blair Driller: H. W. Peerson Drilling Supply Co.		
Floyd Shale		
Soil, dark	5	5
Shale, grayish-black, micaceous, hard, with thin calcite veins	35	40
Shale, grayish-black, micaceous, contains pyrite, calcite, and flint particles	70	110
Shale, grayish-black, contains pyrite, calcite, and thin veins of calcite	35	145
No samples	155	300

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*

	Thickness (feet)	Depth (feet)
Well C-3		
Owner: Paul Jones Driller: Bureau of Mines		
Sand and clay, unconsolidated	56	56
Limestone	71	127
Chert	224	351
Shale	23	374
(no log from 374 ft. to 875 ft.)		
Well C-5		
Owner: Camp Sumatanga Driller: C. R. Killian		
Clay, orange, sandy, soft	15	15
Boulder, orange, hard	3	18
Limestone, blue, hard	21	39
Shale, blue, soft (water, approximately 4 gpm)	7	46
Limestone, blue, hard	3	49
Shale, blue, soft	4.5	53.5
Sandstone, gray, hard	2.5	56

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well C-5—Continued		
Shale, blue, medium hard	6.5	62.5
Sandstone, gray, hard	67.5	130
Sandstone, brown, very hard	19	149
Shale, blue, hard	67	216
Limestone, gray, hard (pumped at 65 gpm with drawdown of 4 feet)	50	266
Limestone, gray, hard	15	281
Well J-14		
Owner: Hughie Echols Driller: W. C. Chapman		
Soil	20	20
Shale, gray	40	60
Sandstone, blue	41	101
Well S-2		
Owner: Ragland Brick Co. Driller: Virginia Well and Supply Co.		
Shale, brown	10	10
Coal	2	12
Shale, blue	8	20
Shale, blue	50	70
Shale, blue and clay balls	45	115
Clay, gray	2	117
Shale, blue and clay balls	8	125
Shale, blue	45	170
Shale, blue and clay balls	37	207
Shale, blue	120	327
Limestone	25	352
Shale, blue	27	379
Well S-3		
Owner: Town of Ragland Driller: H. W. Peerson Drilling Supply Co.		
Clay, yellow, sticky	5	5
Shale	17	22

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well S-3—Continued		
Shale, sandy (water at 64 ft.)	80	102
Shale, sandy	27	129
Shale	25	154
Shale, hard	31	185
Shale (water level rose from 60 to 42 ft.)	31	216
Shale	27	243
Shale, hard	2	245
Shale, sandy, hard	11	256
Shale, hard	10	266
?	50	316
Shale	34	350
Sandstone, blue	15	365
Sandstone	5	370
Sand, blue	6	376
Sandstone and shale	30	406

Well S-4

Owner: Town of Ragland
Driller: H. W. Peerson Drilling Supply Co.

	Thickness (feet)	Depth (feet)
Clay	10	10
Shale, blue	15	25
Shale	23	48
Sandstone (water at 45-51 ft.)	3	51
Shale, sandy	49	100
Shale and sandstone (more water)	5	105
Shale	20	125
Sandstone, hard	22	147
Shale	10	157
Sandstone, hard	2	159
Shale, sandy	33	192
Sandstone, hard	18	210
Sandstone	8	218
Sandstone, hard	12	230
Shale, sandy (more water)	10	240
Shale	35	275
Shale, sandy	25	300

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well S-7		
Owner: Town of Ragland Driller: H. W. Peerson Drilling Supply Co.		
Clay	11	11
Shale, sandy, hard (water at 15 ft.)	44	55
Shale, gummy	5	60
Shale, sandy, hard, soft streaks 95-100 ft.	65	125
Shale, soft (more water; water level rose from 18 to 8 ft.)	15	140
Shale, sandy, hard (bailer test for 30 minutes at a depth of 170 ft. Could not lower water level below 18 ft.)	40	180
Shale, soft	20	200
Shale, sandy, hard	10	210
Shale, soft	45	255
Shale, sandy, hard	45	300
Sandstone	5	305
Shale (bailer test for 45 minutes and could not lower water level below 18 ft.)	15	320
Static water level 6 ft.		
Well S-8		
Owner: Town of Ragland Driller: H. W. Peerson Drilling Supply Co.		
Clay	8	8
Shale (water at 18-20 ft. and 38-40 ft.)	107	115
Sandstone	10	125
Shale, sandy, hard	55	180
Shale, sandy, soft streak at 235-245 ft. (bailer test at 40-50 gpm for 45 minutes with drawdown of 17 ft.)	125	305
Static water level 8 ft.		
Well S-14		
Owner: Ragland Brick Co. Driller: Virginia Well and Supply Co.		
Shale and clay, brown	15	15
Shale and clay, blue	11	26
Shale and clay, blue	4	30
Shale, blue	10	40
Shale and clay, blue	20	60

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well S-14—Continued		
Shale, blue	60	120
Shale and clay, blue	16	136
Sandstone	4	140
Shale, blue	10	150
Shale and clay, blue	10	160
Shale and clay, blue	40	200
Well W-14		
Owner: Avondale Mills Driller: H. W. Peerson Drilling Supply Co.		
Clay	10	10
Shale	26	36
Limestone, hard	3	39
Shale	56	95
Limestone and chert	4	99
Limestone boulders	2	101
Limestone	5	106
Shale	29	135
Shale, hard with chert	14	149
Limestone, blue	10	159
Shale and limestone, hard	20	179
Limestone, blue	11	190
Shale, soft	3	193
Shale and limestone, very hard	8	201
Limestone, blue	9	210
Limestone and chert, hard	16	226
Limestone	21	247
Well W-15		
Owner: Avondale Mills Driller: H. W. Peerson Drilling Supply Co.		
Clay, yellow	5	5
Shale	166	171
Shale, sandy	89	260
Shale and limestone	167	427
Limestone, hard	37	464
Crevice	0.5	464.5
Limestone and flint, very hard	15.5	480

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well W-15—Continued		
Crevice	1	481
Limestone	5	486
Crevice	1	487
Limestone	10	497
Crevice	1	498
Limestone, test showed 2 gpm	5	503
Limestone, porous shelly streak	6	509
Limestone, hard and solid	66	575
Well W-16		
Owner: Avondale Mills Driller: H. W. Peerson Drilling Supply Co.		
Clay, yellow	18	18
Boulders	6	24
Limestone, solid	39	63
Limestone, soft streaks	18	81
Limestone, solid	21	102
Shale, solid	205	307
Well AA-7		
Owner: Camp Winnataska Driller: H. W. Peerson Drilling Supply Co.		
Shale, sandy	8	8
Clay, sandy	1	9
Sand, hard	9	18
Sandstone, gray	42	60
Shale, sandy	38	98
Sandstone, gray	20	118
Shale, sandy	27	145
Sandstone, gray	43	188
Shale, sandy	12	200

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well AA-8		
Owner: Camp Winnataska		
Driller: H. W. Peerson Drilling Supply Co.		
Clay and sandstone	25	25
Sandstone	25	50
Shale	20	70
Sandstone	30	100
Shale	15	115
Shale, sandy	17	132
Shale	15	147
Sandstone, hard	11	158
Sandstone	10	168
(No log from 168 ft. to 210 ft.)		
Well AA-10		
Owner: Camp Winnataska		
Driller: H. W. Peerson Drilling Supply Co.		
Clay and sand, red	10	10
Clay and sand, yellow	9	19
Boulder	1	20
Clay	7	27
Gravel with clay	8	35
Shale, hard	19	54
Shale	37	91
Shale, sandy	8	99
Sand with little shale	12	111
Sand, blue	14	125
Well BB-1		
Owner: Avondale Mills		
Driller: H. W. Peerson Drilling Supply Co.		
Clay, yellow, sticky	12	12
Clay, yellow with boulders	9	21
Clay, yellow with boulders, some water	5	26
Limestone and chert boulders with clay	2	28
Limestone	6	34
Limestone, honeycomb, and mud	1	35
Chert and limestone	5	40
Chert, hard	16	56

Table 5.—*Drillers' logs of wells in St. Clair County, Ala.*—Continued

	Thickness (feet)	Depth (feet)
Well BB-1—Continued		
Limestone, honeycomb, and mud	10	66
Limestone, and chert	9	75
Limestone, hard	20	95
Limestone and chert	79	174
Crevice	1	175
Limestone and chert	30	205
Limestone	20	225
Limestone and chert, hard	13	238
Limestone boulders	4	242
Limestone, honeycomb	8	250

Well BB-2

Owner: Avondale Mills
Driller: H. W. Peerson Drilling Supply Co.

	Thickness (feet)	Depth (feet)
Soil	2	2
Clay and mud, yellow	10	12
Limestone boulders, solid at 19 ft.	7	19
Limestone, very hard	25	44
Limestone with soft streaks, some water	10	54
Limestone, hard	13	67
Crevice, more water	1	68
Limestone, solid	141	209

Well BB-3

Owner: E. R. Blair
Driller: H. W. Peerson Drilling Supply Co.

	Thickness (feet)	Depth (feet)
Soil	2	2
Shale, soft	8	10
Shale, black, solid	2	12
Shale, black, sandy (approximately 1½ gpm at 22 ft.)	20	32
Shale, black (reduced hole from 10-inch to 8-inch at 39 ft.)	28	60
Shale, black with soft streaks	28	88
Shale, black with streaks of flint	87	175
Shale and flint, black (crevice with water at 192 ft.)	25	200
Shale, black, soft at 215 ft., probably more water (6-hour test indicated 30 to 40 gpm)	25	225
Shale, black	58	283
Shale, black, fine-grained	3	286
Shale, black with hard and soft streaks	14	300