INFORMATION CIRCULAR **47**

GEOLOGY AND GROUND-WATER RESOURCES OF GORDON, WHITFIELD, AND MURRAY COUNTIES, GEORGIA

by

C. W. Cressler

STATE OF GEORGIA
DEPARTMENT OF NATURAL RESOURCES
Joe D. Tanner, Commissioner

EARTH AND WATER DIVISION
THE GEOLOGICAL SURVEY OF GEORGIA
Sam M. Pickering, State Geologist and Division Director

Prepared in cooperation with the U. S. Geological Survey

ATLANTA
1974

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GEOLOGY AND GROUND-WATER RESOURCES OF GORDON, WHITFIELD, AND MURRAY COUNTIES, GEORGIA

by

Charles W. Cressler[1]

ABSTRACT

Gordon, Whitfield, and Murray Counties lie mainly in the Valley and Ridge physiographic province of northwest Georgia, where rocks range from Early Cambrian to Mississippian in age. The east edge of the tri-county area extends into the Blue Ridge and Piedmont Provinces and is underlain by metasedimentary and igneous rocks of Precambrian and possible Cambrian age.

Mapping of the Paleozoic rocks resulted in the following: (1) recognition of sediments classed as the Chilhowee Group in northwest Georgia; (2) placement of broad belts of shale in the Conasauga Formation that previous workers had mapped as part of the Rome Formation; (3) finding of fossils (including *Ceratopea unquis* Yochelson and Bridge) in the Newala Limestone in Murray County that shows it to be equivalent to the youngest known Newala and younger than the Mascot Dolomite in Tennessee; and (4) discovery of graptolites in the Athens Shale in Murray County that indicate it is probably the same age as the Rockmart Slate in Polk County, Georgia.

An inventory of 850 wells revealed that moderately mineralized water in quantities of 3 to 20 gpm (gallons per minute) suitable for domestic and farm supply can be obtained at depths less than 300 feet nearly everywhere in the three counties, except on steep slopes and narrow ridges. Larger yield industrial or municipal wells have been developed only in small areas underlain by carbonate rocks. Only 16 wells supply more than 50 gpm. The largest yield obtained thus far (1971) has been 300 gpm from limestone at the top of the Conasauga Formation. In adjacent counties, yields of 300 to 1,000 gpm are produced by wells less than 350 feet deep along the larger intermittent streams that drain the Knox Group. Broad exposures of the Knox in the report area contain many sites that should supply more than 300 gpm. Well water from the Knox generally is moderately mineralized, but it can be used for many purposes without treatment.

Large supplies of ground water are available from springs. Twenty-six springs in the area have minimum recorded flows of 200 gpm; seven of these discharge more than 500 gpm, and one flows more than 4,000 gpm. As of May 1971, 20 of these springs, having a combined flow of 15,400 gpm, were unused. Most of the spring water is moderately hard to hard, has a low iron content and can be used with little or no treatment.

INTRODUCTION

Gordon, Whitfield, and Murray are populous and growing counties in northwest Georgia (Fig. 1). They are important centers of business, industrv.

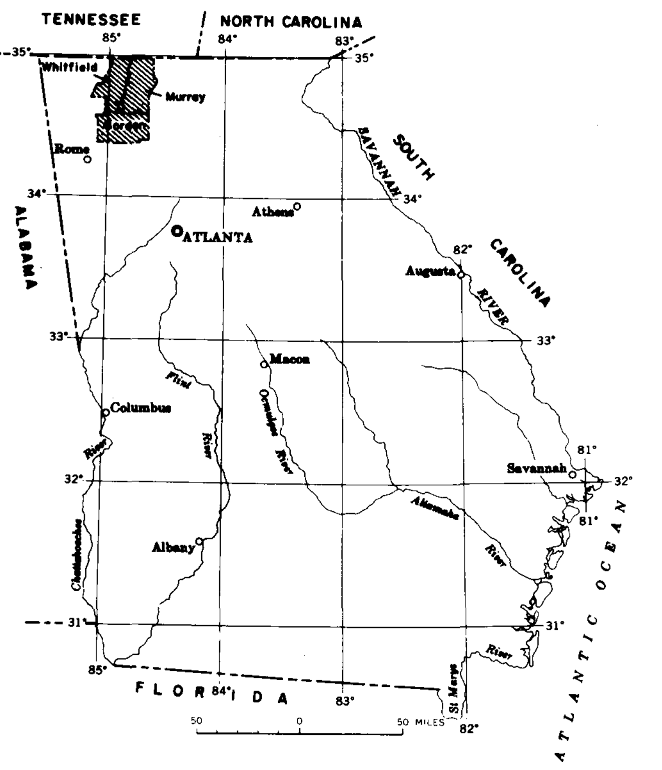

Figure 1.—Map of Georgia showing location of Gordon, Whitfield, and Murray Counties.

[1] U.S. Geological Survey

and agriculture. Textiles and carpets are among the chief products of the area. Dalton, the seat of Whitfield County and largest city in the area, is known as "The Carpet Capital of the World." Although carpet manufacturing and related industries are a principal source of revenue in all three counties, other important products include miscellaneous clay, crushed rock, talc, limestone, pulpwood, broiler chickens, cattle and cotton.

During the past decade (1960-70), the three counties have experienced a very rapid influx of industry. This industrialization has led to an unprecedented demand for water supplies, but their development has been hampered by a lack of knowledge about the water resources of the area. To help overcome this lack of knowledge, an investigation of the ground-water resources was undertaken by the U. S. Geological Survey in cooperation with the Georgia Department of Mines, Mining, and Geology (now the Georgia Department of Natural Resources, Earth and Water Division). The investigation was part of a statewide appraisal of ground-water resources.

PURPOSE, SCOPE, AND METHODS OF INVESTIGATION

The purpose of this investigation was to determine the occurrence and chemical quality of ground water that is available in Gordon, Whitfield, and Murray Counties, to describe and delineate the aquifers from which it comes, and to correct any errors found in the identification or correlation of the geologic formations.

The study included an inventory of more than 850 wells to determine the range in well depth, the depth to the water table, and the quality and quantity of the water available (well tables listed in Appendix). Periodic measurements were made in several wells to indicate the range in seasonal fluctuation of the water table.

All known springs were inventoried and their rate of flow measured or estimated. The temperature of the spring water was recorded, and the reliability of the sustained flow, the degree of fluctuation and the quality of the spring water was ascertained, where possible. Water samples were collected from 27 wells and 14 springs for chemical analyses by the Quality of Water Laboratory, U. S. Geological Survey, Ocala, Florida.

To delineate the various aquifers and determine their lithologic character and thickenss, the geology of the counties was mapped on aerial photographs. Fossils were used, wherever possible, to determine biostratigraphic correlation as an indication of geologic age.

WELL AND SPRING NUMBERING SYSTEM

Wells in this report are numbered according to a system based on the 7½-minute topographic quadrangle maps of the U. S. Geological Survey. Each quadrangle in the State has been given a number and a letter designation according to its location. The numbers begin in the southwest corner of the State and increase numerically eastward. The letters begin in the same place, but progress alphabetically to the north, following the rule of "read right up". Because the alphabet contains fewer letters than there are quadrangles, those in the northern part of the State have double-letter designations, as in 5HH.

The quadrangles covering the report area are shown in Plates 1, 2 and 3. Wells in each are numbered consecutively, beginning with number one, as in 5HH-1. Springs in each quadrangle are numbered similarly except that the letter "S" is added to distinguish them from wells, as in 5HH-S1.

PREVIOUS INVESTIGATIONS

The most comprehensive publication dealing with the geology of northwest Georgia was by Butts (1948). Because earlier work was reviewed by Butts, no such thorough review is given here. Several reports dealing with specific aspects of the geology and mineral resources of the area have since been published as bulletins of the Georgia Geological Survey; a list of the ones available can be obtained from the Georgia Department of Natural Resources, Earth and Water Division, 19 Hunter Street, S.W., Atlanta, Georgia 30334. Other detailed works by graduate students of Emory University are available in unpublished theses.

Reports also have been published about the geology and ground-water resources of seven nearby counties in the Paleozoic rock area of northwest Georgia. The counties reported on are Bartow (Croft, 1963), Catoosa (Cressler, 1963), Chattooga (Cressler, 1964), Dade (Croft, 1964), Floyd and Polk (Cressler, 1970), and Walker (Cressler, 1964).

ACKNOWLEDGMENTS

The author wishes to express his appreciation to the citizens of Gordon, Whitfield and Murray Counties for their cooperation in furnishing information for the well inventory and for their aid in the collection of water samples for chemical analyses.

Special acknowledgment is given Dr. Ellis L. Yochelson of the U. S. Geological Survey. Dr. Yochelson visited the study area to collect fossils from the Newala Limestone and to help correlate it with rocks of the same age in other parts of Georgia and the United States.

Dr. Allison R. Palmer, formerly of the U. S. Geological Survey, identified Cambrian trilobites and determined their ages. Dr. William B. N. Berry of the University of California at Berkeley identified graptolites collected from the Athens Shale in Murray County.

Mr. Thomas J. Crawford of West Georgia College told the writer of a Cambrian trilobite locality he had discovered in Bartow County, Georgia.

Mr. Harry E. Blanchard, hydraulic engineering technician, did the complete well and spring inventory for this report. He also collected water samples for chemical analyses.

This investigation began under the direct supervision of A. N. Cameron, former district chief, Water Resources Division. It was completed under John R. George, district chief, Water Resources Division, Georgia District, U. S. Geological Survey.

The photograph of *Ceratopea* in the report was prepared by the Paleontology and Stratigraphy Branch of the U. S. Geological Survey under the direction of Dr. Ellis L. Yochelson.

CLIMATE, PHYSIOGRAPHY, AND DRAINAGE

Gordon, Whitfield and Murray Counties have a mild climate. The frost-free season averages about 190 days. The average annual precipitation is 54 inches, including a small amount of snow. Precipitation is heaviest in winter and midsummer and lightest in autumn.

Most of the report area lies in the Valley and Ridge Physiographic Province. The east edge of Murray County, however, extends into the Blue Ridge Province, and eastern Gordon County is in the Piedmont Province. The Valley and Ridge Province is separated from the others by the Great Smoky Fault.

The Valley and Ridge Province is dominated by northward-trending valleys separated by low, rounded ridges and by high, steep-sided ridges. Most of the valley areas have an elevation of 650 to 800 feet. The intervening ridges range from about 1,050 feet to as much as 1,600 feet above sea level.

The part of Murray County in the Blue Ridge Province includes rugged mountain peaks that rise 3,000 feet above sea level and stand about 2,200 feet above the adjacent Valley and Ridge Province, separated by a sharp fault escarpment. The eastern part of Gordon County in the Piedmont Province is an irregular and deeply dissected upland that has narrow valleys and rounded interstream areas ranging from about 1,000 to 1,500 feet above sea level.

The northwestern part of the study area is drained by the Tennessee River, and the remainder is drained by the Conasauga and Oostanaula Rivers. During dry weather the base flow is maintained by ground-water discharge and by springs. The streams are actively downcutting and have erosional flood plains on which the bedrock is covered by only a few feet of alluvium. Streams east of the Conasauga River in Murray County were superimposed on alluvium, which gave them an unusual westward flow across the strike of the rocks.

OCCURRENCE OF GROUND WATER

The most important sources of ground water in the report area are the joints, fractures and other secondary openings in sedimentary rocks. Soft rock, such as shale, tends to have tight joints that can hold and release only small volumes of water; wells in shale generally yield less that 10 gpm (gallons per minute). Harder rocks, such as sandstone, chert and graywacke, have larger and better connected openings and supply 10 to 100 gpm to wells. Soluble rocks, such as limestone and dolomite, have joints that are enlarged by solution, giving greatly increased storage capacity. Wells in carbonate rock can supply as much as 1,000 gpm, and some springs discharge as much as 5,000 gpm.

As a rule, joints and fractures in all kinds of rock become fewer and smaller with depth. For this reason, most ground water is stored in the upper 150 feet in shale and in the upper 250 feet in most other kinds of rock, including thinly bedded and shaly limestone. Because of this, deep drilling in these sediments for water is rarely successful. Almost always, if the required yield has not been obatined by the time a well reaches a depth of 150 feet in shale, or 250 feet in most other kinds of rock, it is expedient to try another location. Two wells 200 feet deep are far more likely to obtain the needed volume of water than a single well 400 feet deep.

Massively bedded limestone may contain sizable interconnected openings deeper than 350 feet. A few wells are reported to pump from limestone openings as deep as 500 feet. However, odds against finding water in limestone below 350 feet in northwest Georgia are so great that deeper drilling is a poor gamble.

Unconsolidated sediment is not an important aquifer in the report area. Most of the stream alluvium is thin and has low permeability. Small areas in Murray County are covered by alluvium possibly 50 feet thick, but it does not seem to yield much water.

The availability of water in any type of rock depends to a large extent on the topography. As a rule in the Valley and Ridge area, wells in broad, low areas yield more water than ones on hilltops, steep slopes, or in "V"-shaped valleys. Part of the reason for this is that low areas are covered by thick soil. Where the soil is thick, the water table commonly lies in it, and the volume of water stored in the soil is much greater than could be held in the rock openings along. Water in the soil is available to drain into the underlying fractures and to sustain large well yields.

WATER-LEVEL FLUCTUATIONS

Periodic water-level measurements show that in flat-lying areas having only minor stream dissection, the water table has a seasonal fluctuation of between 5 and 15 feet. In more hilly areas, the fluctuation ranges from about 10 to 50 feet. The water levels generally are highest during April and May and recede slowly to their lowest levels in November, December, or January.

Regional water levels have remained nearly the same for the past 20 years. This finding is based on the depth of water in old dug wells and other well-inventory data. Only in areas near heavily pumped wells have water levels declined.

USE OF GROUND WATER

Even though public utilities distribute water in and around the towns and along the main roads, ground water, mostly from wells, is used by several thousand rural residents in the three-county area. Most rural areas are totally dependent on ground water for water supplies. Dairies, chicken houses, farms, churches and some small industries commonly rely on wells and springs.

The first major industries to locate in the study area centered near the larger springs, e.g. Crown Cotton Mill and American Thread Co. in Dalton and Echota Cotton Mill in Calhoun. Once the springs were utilized, new industries were forced to turn to public utilities for water. The demand for water was so great that Chatsworth had to expand its system by acquiring James Spring (7NN-S4), and Calhoun abandoned its well and spring supply and built a filtration plant to use water from the Oostanaula River. The capacity of Dalton's system was greatly increased, and Fairmount, Gordon County, had to supplement its wells with surface water. Yet, with all this expansion, supplies have barely kept up with demand.

The influx of new industries and the expansion of old ones continues to place heavy demands on public water supplies. Industries once again are turning to springs and wells for water supplies. Jeager Spring (5MM-S4), for example, is now being used for industrial cooling, and other industries are investigating the use of Deep Spring (7PP-S1) and Freeman Spring (5NN-S1).

During the past 10 years, several industries in the area have successfully developed well supplies. Some have done so because ground water is relatively inexpensive, but others have drilled extensively without obtaining the necessary yield and were forced to purchase water from a public utility. A few industries that require ground water for its comparatively constant temperature and chemical quality, or for its low cost, have been unable to locate in the report area because they could not develop an adequate well supply.

Specialized industries that use very large amounts of water of nearly constant temperature and chemical quality have inquired about the availability of springs in the area. Municipalities, such as Calhoun, are planning to use spring water to supplement their supplies. Many industries continue to develop well supplies. If this trend continues, the next decade or two will see nearly all of the large springs in the area being used and most of the high-yield well sites developed for industrial water supplies.

POLLUTION OF WELLS AND SPRINGS

The ground-water reservoir throughout most of the study area is protected from pollution by a soil cover that filters out bacteria and other contaminants. Ground-water pollution rarely occurs where the soil remains undistrubed unless pollutants gain access to the ground through a natural breach, such as a sinkhole, joints in exposed rock or a leaky well casing.

Septic tanks can be a major cause of ground-water pollution. Where their construction disturbs the soil cover down to bedrock, bacteria can pass unfiltered into bedrock openings. Once in the bedrock, bacteria can travel hundreds of feet to a well or spring (Cressler, 1970, p. 45). Bacteria that enter carbonate rock may be swept along by fast-moving water and appear in a spring several thousand feet away.

A large spring in Gordon County (Roes Spring, 7LL-S1) is polluted by bacteria that are being transported by moving water from a septic tank nearly half a mile away. The pollution was discovered when the city of Calhoun tried to use Roes Spring to supplement its water supply. As the spring water had a reputation of being of good quality, the only treatment planned for the water was chlorination. But tests by the Georgia Department of Public Health showed that the bacteria content of the water was too high to be used with disinfection alone.

Three samples of water taken from Roes Spring on January 12, 1971, each had a total coliform density of 430 per 100 milliliters of sample and a fecal coliform density of 430, 91 and 31 per 100 milliliters (All coliform densities are for 100 milliliters of sample). Three samples gathered February 3, 1971, had a total coliform density of 2,300, 460 and 240 and a maximum fecal coliform density of 43. Additional samples obatined February 11, 1971, had an average total coliform density of 1,100 and a maximum fecal coliform density of 15. Regulations of the Georgia Department of Public Health stipulate that water for use as a public supply, treated by chlorination only, can have a coliform density no greater than 50 per 100 milliliters, or a fecal coliform density no greater than 20 per 100 milliliters. As the bacteria content of this water far exceeded these limits, Roes Spring was unsuitable for use by the city.

Nearly all spring water, of course, is subject to pollution. Initial testing and repeated testing is necessary to detect pollution and to monitor it. Spring water that for years has been safe to drink may suddenly become polluted by cattle upgradient or septic tanks more than a quater of a mile away.

Although it is not generally recognized, well pollution is more common than spring pollution. A large number of wells are polluted because they are too close to septic tanks and other sources of filth, such as barnyards, hog lots and chicken houses. Faulty well construction, poorly protected wells, deterioration of plumbing and unsanitary conditions are other causes of well pollution. A study of domestic water supplies in Bartow County, Ga., just south of the report area and in the same kind of rock, showed that of 194 private water supplies sampled, 50.5 percent were polluted (Davis and Stephenson, 1970).

It is general practice to locate wells for convenience and economy rather than for safety of the water supply. Wells are commonly placed as closely as possible to houses or barns without regard to the nearness of septic tanks or other sources of pollutants. Many wells located in this manner eventually give trouble.

A residential well can become polluted without the owner suspecting. The first indication may be intestinal upsets that quickly pass, as family members acquire an immunity. Visitors to the home also are effected, but the water is rarely suspected. The water in a well polluted by a septic tank may remain clear and seem normal in every way, or it may have a bad smell and begin to foam. Water in wells that are polluted by unfiltered surface water commonly gets cloudy or even muddy during wet weather or after an especially heavy rain.

Drilling sites as far as practicable on the uphill side of potential sources of pollution are safest, as are sites as far across the strike as possible and updip, where the underlying rock strata are inclined. Sealing the well casing against surface water and fitting pump caps tightly to keep out insects, rodents, trash and other impurities are also efficient safety measures.

Standard practice is to sterilize a new well and test for bacterial contamination. Nearly all well water is found to be safe when the well is new, but the danger of pollution increases as the well is used. Lowering the water table by pumping may eventually draw septic-tank effluent to the well intake. Also, lowering the water table in limestone terrane occasionally causes sinkholes to form, allowing surface water to reach the ground-water reservoir. Some sinks begin as a small hole and may go unnoticed. A hole of this kind in a barnyard, for example, can quickly ruin a water supply. Periodic testing to assure that a well continues to be safe has been indicated to be necessary.

CHEMICAL QUALITY OF GROUND WATER

In general, all the spring water sampled in the area is dolomitic ($Ca\text{-}MgHCO_3$) water (Table 1), having a pH range of 7.1-8.2 and a dissolved solids range of 85-190 mg/l (milligrams per liter). Most of the spring water is similar in character because it is from a common source, the Knox Group. There

Table 1.—*Chemical analyses*[1] *of spring water, Gordon, Whitfield, and Murray Counties, Ga.*

Spring name or owner	Spring number	County	Date of collection	Water-bearing unit	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids: Residue	Dissolved solids: Sum	Hardness[2] as $CaCO_3$: Calcium, magnesium	Hardness[2] as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
U.S. PUBLIC HEALTH SERVICE DRINKING-WATER STANDARDS						0.3						250	250	1.0	45	500						
Johnson Spring	5KK-S1	Gordon	3-25-65	Mississippian	6.3	.05	11	0.1	0.8	0.7	32	3.0	1.5	0.2	0.1	–	40	28	2	61	7.2	5
Hufstetler Spring	6KK-S2	do	2- 6-67	Knox	8.8	.06	26	13	.7	.8	141	.4	1.5	.1	1.3	116	122	118	3	220	7.1	0
Dews (Big) Spring	7KK-S1	do	6- 9-37	do	5.8	.02	26	15	1.0	.6	150	2.7	1.5	.0	2.8	128	129	126	--	–	–	–
Dews (Big) Spring	7KK-S1	do	3-25-65	do	7.8	.18	32	8.8	.9	1.0	140	.4	1.7	.1	1.9	--	124	116	2	219	7.2	0
Elks BPOE Club	6LL-S1	do	2-19-62	Knox and Conasauga	9.4	.30	27	11	1.3	1.0	132	.8	1.5	.1	1.6	118	119	112	4	210	7.4	2
City of Calhoun	6LL-S2	do	3-12-59	Knox	8.6	.11	22	12	1.4	.0	127	2.4	1.5	.0	3.0	120	114	104	0	200	8.2	3
Roe (Crane Eater) Spring	7LL-S1	do	3-25-65	do	7.3	.06	26	8.5	1.3	.8	118	1.2	2.5	.2	3.7	–	109	100	4	193	7.2	5
Nances Spring	6LL-S4	Whitfield	11- 6-63	Rome	17	.06	16	7.1	1.7	2.8	82	6.2	1.7	.1	.1	104	93	69	2	145	7.1	0
American Thread Co.	6MM-S1	do	3-13-59	Knox	5.8	.08	30	13	.5	.2	161	1.6	2	.0	1.3	140	138	145	18	242	7.9	3
Anderson Spring	6MM-S2	do	11-18-64	Knox and Conasauga	7.6	.02	35	20	20	.8	182	2.0	38	.0	3.8	–	217	168	19	383	7.5	–
Freeman Spring	5NN-S1	do	3-24-65	Knox	7.8	.08	34	6.8	.4	.6	138	.8	1.0	.2	.4	–	120	113	0	211	7.4	0
Crown Cotton Mill	6NN-S1	do	11-17-64	Knox and Bays	8.5	.01	37	13	2.5	.7	171	.4	5.3	.0	5.4	–	160	148	8	282	7.5	--
Cohutta Fish Hatchery	6PP-S1	do	2-19-62	Knox	8.4	.14	24	11	1.2	.5	128	4.0	1.5	.0	1.4	120	115	105	0	200	7.7	2
Seymour Spring	6PP-S8	do	3-23-65	do	7.7	.01	26	9.7	.4	.5	128	.0	.5	.1	0	–	108	105	0	191	7.3	0
Deep Spring	7PP-S1	do	3-23-65	do	6.9	.06	17	9.4	.7	.6	98	.5	.8	.0	.7	--	85	81	0	150	7.5	5
Gallman Spring	8MM-S1	Murray	11- 6-63	Conasauga	15	.05	50	14	.8	1.2	213	2.4	1.4	.4	.0	88	190	182	8	320	7.7	5
Bradford Spring	7NN-S1	do	2-19-62	Knox	8.5	.26	22	12	1.1	.8	123	.4	1	.0	3.5	109	110	104	4	205	7.6	2
O'Neill Spring	7NN-S3	do	2- 8-67	do	9.1	.15	26	12	1.0	.9	136	.4	1.5	.1	3.4	120	122	114	3	219	7.4	0
James Spring	7NN-S4	do	3-24-65	Conasauga	8.8	.56	26	7.5	1.4	1.1	110	2.8	2.6	.1	3.4	–	107	96	6	183	7.3	0
City of Chatsworth	8NN-S2	do	3-12-59	Metamorphic rocks	13	.09	2.6	.2	2.4	.2	14	3.2	1.2	.0	.6	38	30	8	0	33	6.3	5
Coffee Spring	8PP-S1	do	11- 6-63	Chota	4.0	.09	7.0	2.1	3.0	.5	23	12	1.5	.2	.1	54	51	26	7	72	6.6	5

[1] Analyses by U. S. Geological Survey.

[2] Water having a $CaCO_3$ hardness of 0 to 60 mg/l is classified, "soft"; 61 to 120 mg/l, "moderately hard"; 121 to 180 mg/l, "hard"; and more than 181 mg/l, "very hard".

are some exceptions, however. Water from spring 8NN-S2, which flows from metamorphic rock, and 8PP-S1 from the Chota Formation, had a pH of 6.3 and 6.6, respectively, low dissolved-solids content and high sulfate content. Water from spring 5KK-S1, from the Fort Payne Chert-Floyd Shale aquifer, had a pH of 7.2, low dissolved solids and high sulfate content. Water from spring 6MM-S2, which discharges from the Knox Group and shale of the Conasauga Formation, had a high sodium chloride content.

Water sampled from wells 7MM-38, 8NN-1, 6NN-40 and 6LL-1 on the east side of the study area (Table 2), ranged in pH from 7.6 to 7.9 and had a high bicarbonate and dissolved-solids content. These wells are in silty shale and possibly a small amount of limestone. Samples of water from sandstone, siltstone and chert aquifers had low dissolved solids and variable composition except that from 5NN-31, which had high dissolved solids and high bicarbonate. Samples from many wells in shale have a slightly higher sodium content than those from typical wells in limestone.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

The Valley and Ridge portions of Gordon, Whitfield and Murray Counties are underlain by geologic formations of Paleozoic age, which have an aggregate thickness of about 17,000 feet. The formations originally were horizontal but later were compressed into a series of faulted folds. Erosion of the folded and faulted rocks produced the varied outcrop patterns and the alternating ridges and valleys that exist today.

Appraising the ground-water resources of an area requires a knowledge of the lithology, thickness, and topographic setting of the geologic formations. This information for Gordon, Whitfield and Murray Counties is summarized in Table 3 and is discussed in more detail in the text that follows. The generalized availability of ground water in the counties is shown in Figure 2. Detailed outcrop patterns of the formations and structural cross sections are given on the accompanying geologic maps, Plates 1, 2 and 3.

PRECAMBRIAN OR CAMBRIAN

METAMORPHIC AND IGNEOUS ROCKS, UNDIVIDED

The metamorphic rock area of easternmost Gordon and Murray Counties is underlain by a thick sequence of metamorphosed sedimentary rock that probably belongs to the Ocoee Series (this usage preferred by the Geological Survey of Georgia) of Precambrian age. In Murray County the Ocoee rocks either overlie or are thrust above a thick sequence of igneous and metasedimentary rocks of unknown age (Furcron and Teague, 1947, p. 6-12). The various rock units were not divided in the present study. The only recent detailed mapping of these rocks was done by Salisbury (1961) in northern Murray County.

Lithology and thickness.—The principal rock types in the area are slate, phyllite, quartzite, graywacke, sub-graywacke, mica schist, biotite gneiss, talc and granite. The different types occur in layers, ranging from a few feet to several hundred feet thick. Although the composite thickness has not been determined accurately, it may be between 20 and 30 thousand feet.

Hydrology.—The metamorphic rock area of Murray County is dominated by the rugged Cohutta, Grassy and Fort Mountains. A few families live in the intermountain valleys. These families are supplied by water from small springs and from dug or shallow drilled wells. Most sources furnish less than 10 gpm.

The only well of large yield found in the area (8NN-5) is at Fort Mountain State Park. According to park officials, the well is 404 feet deep and yields 45 gpm. The well water is soft and has a slight iron taste.

Supplies of 5 or 10 gpm can probably be developed from wells in the valleys that are wide enough to have a soil cover. Yields of 20 to 50 gpm should be available in the small mountain-top areas that are fairly flat, have a deep soil cover and are crossed by one or more perennial streams.

The metamorphic rock area in Gordon County is a dissected upland. Five wells inventoried there range in depth from 70 to 218 feet, and 3 of the wells were reported to yield more than 10 gpm. The water is probably soft to moderately hard and is generally of drinkable quality. Yields of 5 to 20 gpm can be developed in most low lying areas, and domestic and farm supplies should be available everywhere except on the highest hills and steepest slopes.

Industrial supplies of 50 to 75 gpm may be obtainable from relatively broad valleys that are covered by 15 or more feet of soil. In such valleys, the bedrock is generally deeply weathered and is porous and permeable enough to store and transmit large volumes of ground water.

Table 2.—*Chemical analyses*[1] *of well water, Gordon, Whitfield, and Murray Counties, Ga.*

Well number	County	Date of collection	Water-bearing unit	Depth (feet)	Milligrams per liter													Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
					Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids[2] Residue	Dissolved solids[2] Sum	Calcium, magnesium	Non-carbonate			
U. S. PUBLIC HEALTH SERVICE DRINKING-WATER STANDARDS												250	250	1.0	45	500						15
5KK-53	Gordon	11-18-64	Rome Fm.	67	11	0.18	11	3.5	0.7	1.5	46	2.2	0.9	0.4	0.7	–	55	42	4	86	6.9	–
6KK-1	do	11- 5-63	do	--	20	.00	1.6	1.5	1.2	2.3	16	.0	1.8	.3	3.0	46	40	10	0	42	6.5	5
6KK-2	do	11- 4-63	Conasauga Fm.	120	8.6	.00	32	2.2	1.6	.2	99	.4	3.0	.2	4.6	106	102	89	8	120	7.3	5
7KK-1	do	3-25-63	Knox Group	100	7.9	.05	42	16	1.5	1.3	200	2.4	2.6	.1	5.8	–	179	172	8	312	7.6	5
8KK-1	do	11-16-64	Conasauga Fm.	180	19	.34	68	11	14	.3	208	55	7.0	.6	.0	–	277	216	46	430	7.6	–
8KK-2	do	11-16-64	do	500	7.7	.19	56	11	14	.4	216	11	6.0	.4	4.9	--	217	183	6	370	7.6	–
8KK-31	do	9-30-58	do	136	9.9	.05	64	3.0	7.0	.6	200	5.6	16	.1	11	213	216	172	8	376	7.9	4
5LL-31	do	11- 5-63	Floyd Shale	58	13	.42	75	3.2	2.8	.2	230	8.0	10	.2	.0	226	225	200	12	375	7.9	5
6LL-1	do	11-15-64	Conasauga Fm.	60	16	.18	141	8.8	9.5	.3	436	16	22	.1	10	–	439	388	30	745	7.6	–
8LL-1	do	11- 6-63	do	82	8.1	.08	34	8.3	1.0	.2	126	13	1.5	.3	.2	130	129	119	16	223	7.4	5
5MM-1	Whitfield	3-25-65	Bays Fm.	60	10	.50	36	12	2.2	.4	173	.4	1.4	.1	2.2	–	150	140	0	262	7.9	5
5MM-14	do	3-25-65	Mississippian chert	55	6.3	.42	16	1.0	4.3	1.1	47	6.4	3.0	.0	9.0	–	70	44	6	120	7.0	10
6MM-13	do	11-18-64	do	55	6.6	.03	2.8	.2	1.0	.6	6	.0	2.2	.0	1.6	–	18	8	3	29	5.9	–
5NN-31	do	11- 6-63	Rome Fm.	80	18	.08	53	4.4	3.8	.5	149	4.4	14	.2	11	212	182	150	28	300	7.6	0
5NN-32	do	11- 5-63	Rome and Moccasin	144	28	.04	1.8	.9	1.7	4.7	22	.0	1.0	.2	.1	40	49	8	0	41	6.5	0
6NN-2	do	3-23-65	Bays Fm.	60	4.2	.50	5	1.8	5.7	4.8	0	22	7.0	.1	10	–	61	20	20	112	4.6	20
6NN-40	do	11- 5-63	Conasauga Fm.	79	19	.19	91	8	5.0	.2	296	11	6.8	.1	.0	280	287	260	18	450	7.9	0
6PP-1	do	3-24-65	do	125	11	.77	44	14	5.8	1.5	196	10	6.0	.0	9.8	–	199	168	4	339	7.6	5
6PP-6	do	11-17-64	Holston Ls.	116	10	.17	29	2.6	1.1	.3	98	0	1.1	.0	1.5	–	94	83	2	160	7.2	--
7MM-1	Murray	3-23-65	Maynardville Ls.	110	12	.10	40	16	.7	.7	205	2.0	.0	.3	.0	--	173	165	0	296	7.9	5
7MM-38	do	11-16-64	Conasauga Fm.	55	18	.02	98	15	9.7	.3	284	27	39	.1	.7	–	348	308	76	565	7.8	–
8MM-12	do	11- 6-63	do	246	17	.03	26	3.6	3.9	.6	91	7.6	2.8	.1	2.5	112	109	80	6	160	7.2	5
8NN-1	do	11-16-64	do	97	23	.41	102	16	20	.3	265	88	30	.1	.0	--	410	320	–	635	7.6	–
8PP-1	do	11- 6-63	Athens Shale	80	16	.11	62	8.6	10	.7	230	6.8	7.0	.3	2.0	226	226	190	2	378	7.6	–
8PP-3	do	11-17-64	Chota Fm.	26	6.9	.10	2.8	.2	1.4	.4	5	.2	2.8	.0	6.7	–	24	8	4	30	5.8	–
8PP-4	do	11-16-64	Newala Ls.	104	9.3	.14	34	18	.8	1.2	184	.4	1.4	.1	1.7	–	158	157	6	280	7.5	–

[1] Chemical analyses by U. S. Geological Survey.

[2] Water having a $CaCO_3$ hardness of 0 to 60 mg/l is classified, "soft"; 61 to 120 mg/l, "moderately hard"; 121 to 180 mg/l, "hard"; and more than 181 mg/l, "very hard".

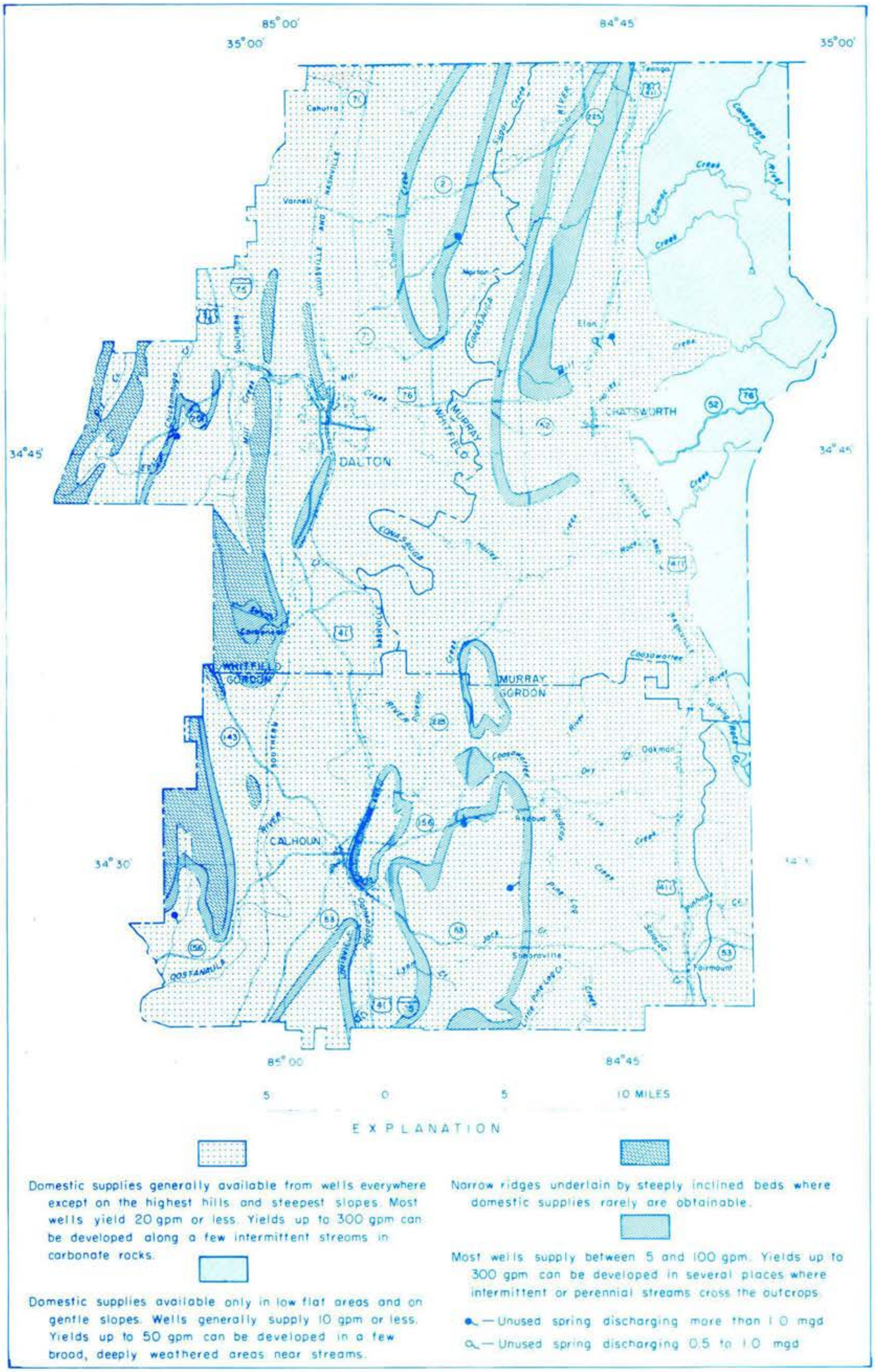

Figure 2.—Generalized availability of water to wells.

Table 3.--Geologic formations and their water-bearing properties in Gordon, Whitfield and Murray Counties, Ga.

System		Geologic unit	Thickness (feet)	Lithology	Hydrologic properties
Mississippian	Upper	Floyd Shale; includes limestone unit at base	100-500+	Silt and clay shale, thin-bedded siltstone and sandstone. Massively bedded limestone at or near the base.	Wells in shale and thin sandstone generally are less than 150 feet deep, and yield from 3 to 20 gpm (gallons per minute). The water is soft to moderately hard, and water from nearly half of the wells has a high iron content (see table 2). Most wells in the basal limestone unit probably will yield between 5 and 25 gpm, though some will supply more than 50 gpm. Most wells are less than 150 feet deep. One large spring discharges from the formation.
	Lower	Fort Payne Chert	100-200+	Thinly to thickly bedded chert	Wells on gentle slopes and low ridges yield 5 to 50 gpm from depths less than 150 feet. In valleys near sources of recharge, yields may be as high as 100 gpm. The water is soft and low in iron content except where it is contaminated by the Chattanooga Shale. A few small springs discharge from the formation.
		Lavendar Shale Member of Fort Payne Chert	0-200	Shale; massively bedded mudstone and impure limestone	Wells generally supply less than 10 gpm from depths of 50 to 150 feet. The water is soft to moderately hard, and much has a high iron content.
Devonian	Upper	Chattanooga Shale with Maury Member at top.	5-15	Black and brown shale; greenish clay containing phosphatic nodules.	Not an aquifer. Contains iron and sulfides and should be cased off from wells. Failure to case off may contaminate otherwise good water from the Fort Payne Chert and the Armuchee Chert.
	Middle & Lower	Armuchee Chert	60	Thinly to thickly bedded chert.	Same as the Fort Payne Chert.
Silurian		Red Mountain Formation	600-1,200	Mainly shale and thin-bedded sandstone and siltstone. Thickly to massively bedded sandstone, quartzite, and conglomerate occur near the base.	Well supplies generally are not available. Yields of 2 to possibly 10 gpm may be obtained on the few places where the ridges have broad crests, or greater slopes.
Ordovician	Middle	Bays Formation	1,000	Red and yellow mudrock, thinly bedded sandstone, siltstone, quartzite, and a little conglomerate.	Wells in flat lying areas and gentle slopes supply 2 to 10 gpm and where sandstone and siltstone are thickly developed, yields up to 20 gpm are obtained. Nearly all wells are less than 150 feet deep. Much of the water has a high iron content.
		Moccasin Formation	200-500	Red and yellow argillaceous calcareous rock that weathers to red and yellow mudrock. Some limestone beds also occur.	This formation yields about 5 gpm to wells less than 150 feet deep, unless limestone layers are penetrated from which as much as 20 gpm may be obtained. The water probably will tend to have a high iron content.
		Ottosee Shale	500	Chiefly yellow and red clay shale; some soft siltstone; limestone at the base.	Wells will supply up to 10 gpm from shale; possibly as much as 20 gpm from limestone. The water will be soft to hard and some will have high levels of iron.
		Holston Limestone (Includes Lenoir Limestone at base)	100	Medium to dark reddish, thinly to massively bedded coarsely crystalline limestone.	Wells range in depth from 24 to 120 feet. The highest reported yield was 10 gpm, but wells near streams and in low areas probably will yield 50 gpm or more. Some wells may have declining yields. Most of the well water will be hard and some will have a high iron content.
		Chota Formation	1,500	Crossbedded quartzose calcarenite that is gray with a reddish cast. Typically it consists of about 60 percent calcite and 35 percent quartz. A little quartz-free limestone also occurs. The basal 125 feet and the upper 375 feet of the formation consists of calcareous sandstone.	The sandstone parts of the Chota will furnish up to 20 gpm along streams and in low areas, but dry or failing wells can be expected on steep slopes and hills. The calcarenite beds will supply 2 to 25 gpm to wells in all areas except higher elevations, and the wells generally are less than 100 feet deep. The water will be hard and tends to have a high iron content.
		Athens Shale	3,000-4,000	Calcareous clay and silt shale, siltstone and feldspathic sandstone.	In low areas the shale will supply up to 10 gpm, but dry wells and failing wells can be expected in elevated areas. The sandstone will supply up to 20 gpm in low places receiving recharge, but over most of the outcrop area dry wells will occur due to the steepness of the slopes. The water is moderately hard to hard, and contains a moderate to high concentration of iron.
	Lower	Newala Limestone	300-400	Thinly to massively bedded limestone and dolomite.	Yields are reported to range from 2 to 68 gpm, but near permanent streams it may be possible to obtain as much as 300 gpm from wells. Nearly all wells inventoried in the Newala are less than 200 feet deep. The water is hard but normally is low in iron content.
		Knox Group	3,000-4,000	Thickly to massively bedded siliceous dolomite and a little limestone, mainly in the upper part.	Wells in bedrock range from 40 to 400 feet deep, and most yield between 5 and 25 gpm; one well supplies 88 gpm. Wells at the mouth of an intermittent stream that has a large catchment area on the Knox may furnish 50 to as much as 1,000 gpm. Most of the well water is hard, but low in iron content. Wells in residuum generally are less than 150 feet deep and yield from about 1 gpm to as much as 10 or rarely 15 gpm. The water is soft and normally of good quality. Several unused springs in the Knox discharge from about 0.5 mgd (million gallons per day) to more than 5 mgd.
Cambrian	Upper				
	Middle	(Maynardville Limestone Member at top) Conasauga Formation	3,000-5,000 (maximum thickness unknown)	The formation consists of alternating units of shale and limestone that vary in thickness and relative proportion from place to place. In some areas the formation is mainly shale.	Wells in shale yield up to 5 gpm, or in some locations 17 gpm; and dry wells also occur. Wells in limestone normally supply between 5 and 25 gpm and ones properly located with respect to the drainage will furnish up to 300 gpm. Most wells are less than 300 feet deep, though some extend to a depth of 500 feet. Wells penetrating shale and limestone mixed generally supply from about 2 to 20 gpm, but some yield up to 100 gpm if they are near a source of recharge. The well water varies from soft to hard and has a low to moderate iron content. Some large springs have openings in the Conasauga, but discharge water from the Knox Group.
	Lower	Rome Formation	300-1,000	Interbedded shale, siltstone, sandstone, and quartzite.	Dry wells or ones yielding less than 1 gpm are the rule on ridge crests and steep slopes. Supplies of 1 or 2 gpm can be obtained from wells penetrating shale, and 2 to 15 gpm can be derived from wells where siltstone and sandstone are common. Most water from the Rome is soft, but some has a high iron content.
		Chilhowee Group	300	Conglomerate, quartzite	Wells may yield 5 to 10 gpm maximum. No data available.
Cambrian (?) and/or Precambrian (?)		Metamorphic and igneous rocks, undifferentiated	5,000+ (maximum thickness unknown)	Slate, sandstone, quartzite, metagraywacke, mica schist, biotite gneiss, and granite.	Wells range from 70 to 400 feet deep; supply 5 to 50 gpm. Largest yields are from valleys and gentle slopes. Brittle rocks such as quartzite, granite are best aquifers. Water generally is of good quality.

CAMBRIAN SYSTEM

CHILHOWEE GROUP

Name.—The Chilhowee was named for exposures on Chilhowee Mountain in Knox and Loudon Counties, Tenn. This Early Cambrian sequence was later subdivided into five formations, and the name Chilhowee is now used as a group term (Rodgers 1953, p. 35).

Lithology, thickness, and distribution.—Rock identified as Chilhowee Group forms Camp Ground Mountain, which is 0.5 mile east of Eton, Murray County. The Chilhowee here consists of about 300 feet of thickly to massively bedded quartz-pebble conglomerate, thickly bedded quartzite and some greenish siltstone. This sequence is unique in the report area.

Correlation.—According to Munyan (1951, p. 18), P. B. King examined the Camp Ground Mountain section and concluded that it belongs to the Cochran Formation of the Chilhowee Group. The author concurs with King's correlation and assigns the section to the Chilhowee Group. Further study is needed, however, before the rock sequence is assigned to a particular formation.

Hydrology.—No wells are known in the Chilhowee, as Camp Ground Mountain is uninhabited. Only in the few places along the mountain that are flat enough to have a soil cover is the formation likely to yield sufficient water for a dependable domestic supply. Water from the Chilhowee is probably soft to moderately hard, with a moderate to high iron content.

ROME FORMATION

Name.—The Rome Formation was named for an exposure south of Rome, Floyd County, Ga.

Lithology and thickness.—At its type locality, the Rome consists of between 500 and 1,000 feet of interbedded shale, siltstone, sandstone, and quartzite. Shale and siltstone are the main constiuents of the formation, but thin- and thick-layered sandstone and quartzite are major constituents in the upper half and are very abundant near the top of the formation. Most of the shale and much of the thin-bedded sandstone and siltstone are colored in bright hues of maroon, purple, green, yellow and brown, whereas the thick-bedded sandstone and the quartzite are very light gray and tan. Alternating layers of the varicolored rocks give the Rome a striking appearance unique in the study area.

In western Whitfield County, the formation retains much the same character and thickness as it has at the type locality. But to the east, in Gordon County, it is thinner—between 300 and 500 feet thick—and contains far less sandstone. The sandstone beds rarely are more than 1 or 2 inches thick. The formation, however, does retain its distinctive coloration, and its outcrop belt can easily be traced across Gordon County to the Nances Spring area in southern-most Whitfield County. Farther northward, the coloration and lithology typical of the Rome are absent, as this belt of the formation disappears beneath shale of the Conasauga Formation.

The Rome is exposed in western Whitfield County along the paved road east of Trickum. The section is folded and faulted, and probably repeated.

In addition to the above outcrop belts, Butts (1948) and Munyan (1951) mapped broad exposures of the Rome in Whitfield and Murray Counties and in eastern Gordon County. Evidence indicates, however, that the rock they mapped as Rome rightfully belongs in the Conasauga Formation. The evidence for this is twofold: first, the rocks they mapped as Rome lack the distinctive coloration and other features that characterize the Rome. They resemble, instead, the lower Conasauga in other parts of Georgia (Cressler, 1970) and Tennessee (Swingle, 1959). Second, all fossils found in these rocks are characteristic of Middle and Late Cambrian age, which is the age of the Conasauga Formation. (These fossils are discussed in the section dealing with the Conasauga.) Thus, because of their character and age, nearly all rocks that Butts and Munyan mapped as Rome in Murray, eastern Whitfield and eastern Gordon Counties, herein are included as a basal unit of the Conasauga Formation.

Concerning these disputed rocks, Butts (1948, p. 12) stated that the bright red colors occur only in the area west of the meridian of Resaca in Gordon County and that in the easternmost belts the rocks consist only of pinkish and gray shale. This statement, however, is incorrect. Exposures in northern and central Murray County (Pl. 3) are indistinguishable in color and content from the type Rome. They show that the formation retains its usual character to the eastern edge of the Paleozoic rock area.

Fauna and correlation.—The contact of the Rome Formation with the Conasauga Formation is exposed in the first large cut west of Camp Creek on the paved road west out of Resaca in

Gordon County. The maroon and tan shale of the Rome is succeeded by tan silty shale containing the trilobites *Alokistocare* sp. and *Zacanthoides* sp. This assemblage is considered to be early Middle Cambrian and certainly is no older than the very top of the Rome.

The Rome in Whitfield County, about 2 miles west of the town of Rocky Face, yielded two fossil collections: The first (U.S.G.S. Colln. No. 4277-CO), taken near a dolomite outcrop in the upper part of the formation, contained *Olenellus* cf. *O. thompsoni* (Hall). This form of *Olenellus* seems to be characteristic of the younger part of the Lower Cambrian and definitely is a different species than the only named Rome olenellid, *O. romensis*. The second collection came from light colored shale and siltstone slightly higher in the section than the one above. It included *Clavaspidella?* sp., *Kootenia* sp., a fauna that should be younger than collection 4277-CO (above). A fauna with *Anoria* is reported from the upper part of the Rome, and it would seem that this collection is probably from that part of the formation. The *Clavaspidella?* is interesting because it is similar to forms described from the lower Middle Cambrian of northwest Greenland. This collection is probably about the same age as the one from the top of the Rome Formation west of Resaca.

Hydrology.—Wells in the Rome Formation range from about 50 to 150 feet deep. Those that penetrate mainly shale yield between 1 to 5 gpm. Those in siltstone and sandstone yield 5, 10, or rarely, 20 gpm.

Well yields adequate for a home or farm can be obtained in most places in the Rome but may not be available on high hills, narrow ridges and upland areas. The largest yields in the formation, regardless of the type of rock involved, come from flat, low-lying areas covered by deep soil where interconnecting rock fractures are available to store water and transmit it to wells.

The construction of Interstate 75 revealed that the shades of green and maroon that typify the Rome may be a product of weathering rather than a primary character of the rock. The deep cut 0.6 mile north of the exit closest to Resaca revealed that when first exposed, the Rome is bluish gray. Three years passed before the rock began to show faint colors, and 6 years were required for it to develop bright shades of maroon and green.

Distribution.—The Rome Formation forms a low ridge that enters southwest Gordon County near Plainville. The ridge extends northward across the county, passes just west of Calhoun and Resaca, and crosses into Whitfield County, where it terminates near Nances Spring. Another belt of the Rome passes through Tunnel Hill and crosses the west side of Whitfield County. The Rome also forms a short ridge in the northern part of Murray County. A thin slice of the formation is faulted next to Camp Ground Mountain, north of Chatsworth.

The Rome is well exposed in the cut of the paved road that goes west out of Resaca and in the first cut on I-75 north of Resaca. Another good exposure is on Georgia Highway 143 about 2 miles northwest of Calhoun, Gordon County. The formation is partly exposed along Georgia Highway 156, 0.5 mile west of Calhoun and on the paved road 1 mile west of Plainville. Red shale of the Rome is prominently displayed along U.S. Highway 41 north of Resaca.

Most well water in the Rome is reported to be soft. Some that comes from calcareous shale is hard. The water commonly contains enough iron to be tasted and to discolor porcelain fixtures and clothes. Samples of water from 4 wells in the formation ranged in calcium carbonate hardness from 8 to 150 mg/l. Their iron content ranged from zero to 8.18 mg/l. (See Table 2).

CONASAUGA FORMATION

Name.—The Conasauga Formation of Middle and Late Cambrian age was named by C. W. Hayes (1891, p. 143, 144-148) for exposures in the valley of the Conasauga River in Whitfield and Murray Counties, Ga.

In Tennessee, where it has been divided into formations, the Conasauga is used as a group term. In Georgia, where it has not been accurately subdivided, it is treated as a formation.

Lithology, thickness and distribution.—The Conasauga is a complex formation that varies greatly in composition from one place to another. Facies changes are so rapid that what constitutes a major unit in one place may be missing altogether a few miles away, or be so changed that it is barely recognizable. Because it is so complicated and undergoes many changes about the area, the Conasauga herein is divided into three main units. Each unit is described as it appears at the type locality and as it occurs in the belts to the west and south.

The lower unit of the Conasauga at the type locality is about 1,000 feet thick. It consists of olive-green, tan and pale red sandy and silty shale that includes siltstone beds 1 to 4 inches thick and a few lenses of medium-gray limestone. To the west the unit remains about the same thickness, but becomes more sandy; at the Catoosa County line it contains siltstone beds 6 inches thick and sandstone beds 4 inches thick. This sandy facies is nearly identical to the lowest Conasauga unit exposed in Floyd County, Ga. (Cressler, 1970).

To the south, in southern Murray County and in central and eastern Gordon County, on the other hand, the siltstone content of the lower unit decreases, and it becomes chiefly a silty shale that weathers to tan and brick red. The remaining siltstone beds are generally less than 0.25 inch thick. A lack of key beds prevents exact knowledge of the unit south of the type area, but it seems to thicken rapidly. In central and eastern Gordon County it probably attains a thickness of several thousand feet.

The middle unit in the type area is composed of about 1,000 feet of light green and yellowish clay shale containg thin layers and lenses of blue limestone. Some silty shale also is present, but in much smaller quantities than in the lower unit. To the west, at Dalton, the middle unit contains limestone lenses as thick as 50 feet. In western Whitfield County, at Red Clay, limestone is a major constituent and occurs in layers 200 to possibly 500 feet thick (Swingle, 1959, p. 18-19).

Southward from the type area in central and eastern Gordon County, the middle unit is mainly clay shale containing limestone layers and lenses 50 feet or more thick. But in southwestern Gordon County the limestone layers become more prominent. The unit there is made up of alternating shale and limestone layers thick enough to produce a topography of alternating shale ridges and limestone valleys.

The Maynardville Limestone Member of the Conasauga Formation is very persistent and retains nearly the same character everywhere it crops out. Its biggest change, normally, is a slight increase or decrease in dolomite content. The only place the Maynardville is appreciably different is in southernmost Gordon County, where massive gray dolomite and calcareous dark-gray shale account for a large part of its total thickness.

Fauna and correlation.—Broad belts of shale in Whitfield and Murray Counties and in eastern Gordon County that Butts (1948) and Munyan (1951) mapped as Rome Formation in this report are being placed in the Conasauga Formation. This is being done largely because fossils show that the shale is younger than the Rome. Shale in the road cut 3.35 miles southeast of Red Bud, Gordon County, (U.S.G.S. Colln. No. 6337-CO) yielded the trilobites *Baltognostus?* sp. and an undetermined ptychoparioid. Brick-red shale 1.1 miles northeast of the center of Pine Log, Bartow County, (U.S.G.S. Colln. No. 6338-CO) contained *Olenoides* cf, *O. curticei* Walcott and an undetermined ptychoparioid, cf. Marjumiidae. Both of these collections are from upper Middle Cambrian beds and correlate with the Conasauga Formation. As this shale is of upper Middel Cambrian age and it resembles the lower unit of the Consasuga in other parts of Georgia (Cressler, 1970) and Tennessee (Swingle, 1959), it is placed in the Conasauga as its lower unit in this report.

Hydrology.—Although most wells in the Conasauga penetrate both shale and limestone, a few wells penetrate only shale and a few only limestone. For this reason, the water-bearing character of shale and limestone are given separately and in combination.

Wells in shale range from 27 to 400 feet deep. (See Pls. 1, 2, and 3.) Most are less than 120 feet deep. Their yields are reported to range from 1 to 17 gpm. All but a few of the wells furnish enough water for domestic and farm needs.

Because the shale is generally calcareous at depth, the well water tends to be hard. Water from well 8KK-1 had a calcium carbonate hardness of 216 mg/l and an iron content of 0.34 mg/l.

Wells in limestone ranged from 30 to 500 feet deep. Most are less than 300 feet deep. Although a few wells were reported to be nearly dry, most yield between 5 and 10 gpm. The highest yield reported was 300 gpm.

The quantity of water available from the limestone depends to a great extent on the topographic setting of the well site. Yields of 2 to 10 gpm can be obtained almost anywhere, but supplies of 50 to 100 gpm are generally found only on broad, low areas that are covered by deep soil. The most productive areas slope gently and carry surface water during wet periods (Fig. 3).

Industrial water supplies of 100 to more than 300 gpm can probably be developed in the Maynardville Limestone Member, where it is crossed by intermittent streams that drain the Knox Group. The Knox is internally drained and has large quantities of water constantly moving underground from upland areas to streams in the nearby valleys. Much of this water moves through master conduits beneath the larger intermittent streams and flows through the Maynardville. A well drilled in the Maynardville close to the channel of one of these streams may tap a master conduit and supply 300 gpm or more.

At McDaniels, 3.5 miles south of the town of

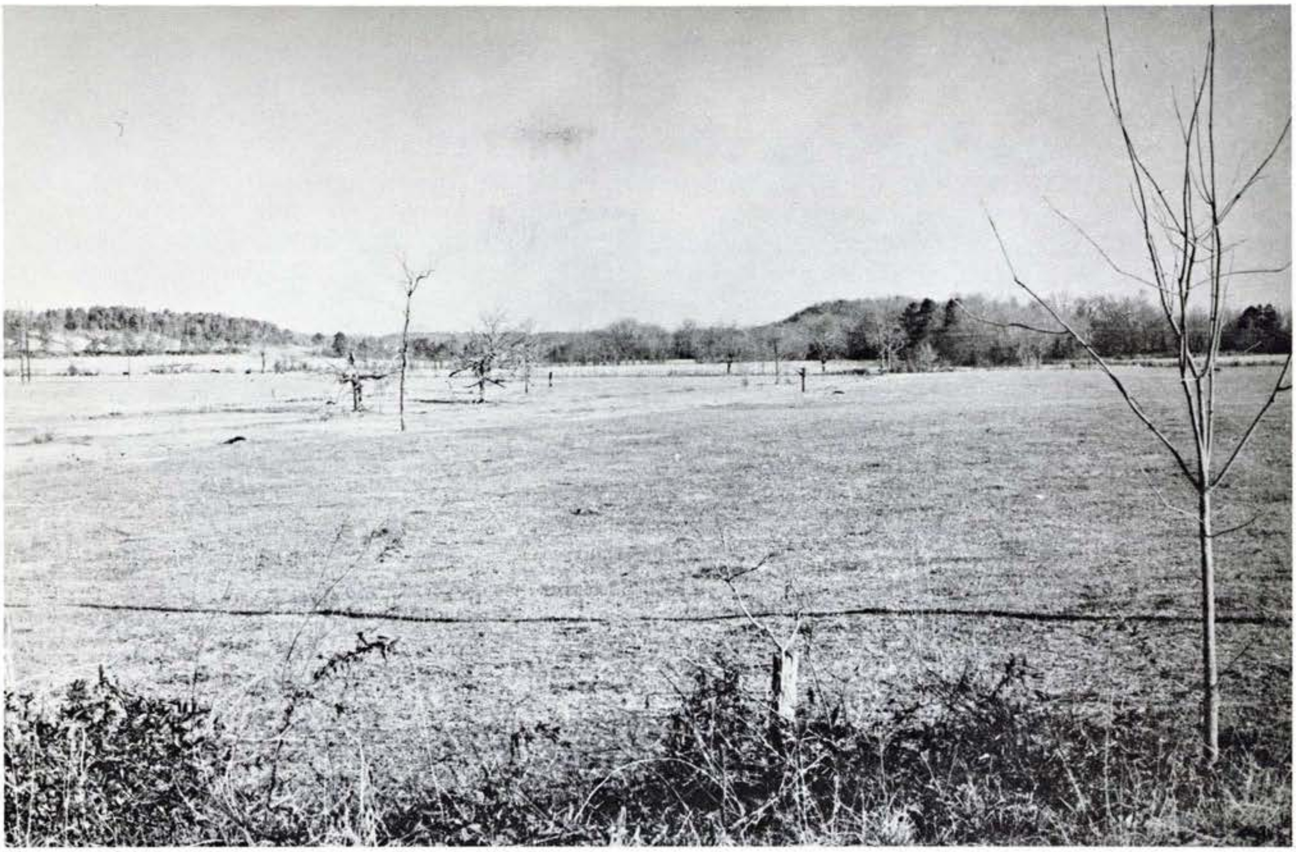

Figure 3. Broad valleys of this type developed on limestone units in the Conasauga Formation commonly are covered by deep soil and will yield 50 to 100 gpm to a well.

Calhoun in Gordon County, an industry drilled four wells at various places on the rolling land east of the railroad, one within a few feet of Oothkalooga Creek. None of the wells produced more than 30 gpm. Finally, a well was drilled into the Maynardville Limestone Member next to the narrow channel of an intermittent stream flowing off the Knox. It yielded more than 300 gpm from less than 350 feet. Several similar streams cross the Maynardville along its outcrop belt, offering the potential of high-yielding wells.

Water from the limestone is moderately hard to hard and has a low to moderate iron content. Water sampled from 5 wells had a calcium carbonate hardness of 80 to 183 mg/l and an iron content of 0.18 mg/l or less.

Wells that penetrate both shale and limestone are generally less than 250 feet deep, but a few are 400 to 500 feet deep. Nearly all of the inventoried wells are used for residential supply and furnish between 2 and 20 gpm. Seven wells were reported to yield more than 50 gpm. The largest yields undoubtedly are from wells that penetrate thick lenses of limestone and derive water from solution openings just above the lower contact with shale.

As would be expected from an aquifer containing both shale and limestone, the well water varies from soft to very hard. Water from well 6MM-13 had a calcium carbonate hardness of only 8 mg/l, whereas a sample from well 6LL-1 contained 388 mg/l. Water from the latter well contained 439 mg/l dissolved solids, which approaches the maximum recommended by the U.S. Public Health Service drinking water standards (See Table 2). The iron content of water sampled from this aquifer ranged from 0.02 to 0.41 mg/l.

CAMBRIAN AND ORDOVICIAN SYSTEMS

KNOX GROUP

Name.—The Knox Group of Late Cambrian and Early Ordovician age was named for Knox County, Tenn. In Georgia, the Knox includes three formations: the Copper Ridge Dolomite of Late Cambrian age, and the Chepultepec Dolomite and Longview Limestone of Early Ordovician age (Butts, 1948, p. 16). The formations overlie the Conasauga Shale and underlie the Newala Limestone.

Lithology and thickness.—The Knox Group is so poorly exposed in the report area that its lithology could not be determined; the rock is highly siliceous and weathers to chert and clay in such abundance that it covers nearly all the bedrock. The nearest place the Knox is exposed is in Catoosa County, Ga., about 8 miles to the west. The three formations in the group are described from that locality. Even though some difference is bound to exist, the thickness and general character of the formations in the report area should be nearly the same as they are in Catoosa County.

The Copper Ridge Colomite is between 2,000 and 3,000 feet thick and consists of thickly to massively bedded light- to medium-gray dolomite and brownish-gray dolomite that has a distinctive hydrogen sulfide (rotten egg) odor on fresh breaks. The brownish-gray dolomite dominates the upper half. Chert weathering from the Copper Ridge occurs both as layers and as boulderlike masses. The chert is light to dark gray, vitreous, and very hard, and has a distinctive jagged surface.

The Chepultepec Dolomite is about 500 feet thick and consists mainly of thickly bedded light- to medium-gray dolomite. Interbedded with the dolomite are a few beds of gray limestone and very fine-grained tan limestone. Thin-bedded sandstone occurs near the base and close to the top of the formation. Chert in the residuum of the Chepultepec is much softer than that in the Copper Ridge and has rounded, rather than jagged surfaces. The weathered chert commonly is full of holes and resembles worm-eaten wood.

The Longview Limestone is made up of massively bedded medium- to light-gray dolomite interbedded with meduim- to light-gray very fine-grained to medium-grained thickly bedded limestone. The formation is about 500 feet thick. The residuum over the Longview is covered by small pieces of hard chert that have flat surfaces. In some belts the Longview contains chert layers more than 6 feet thick that break up and leave boulder-size chunks on the landscape.

Distribution.—The Knox Group occupies broad belts in western, central, and eastern Whitfield County and central Murray County. It forms one ridge that passes through Calhoun in Gordon County and another than extends southward from Calhoun into Bartow County.

Bedrock outcrops along these belts are rare. A section of cherty gray dolomite about 25 feet thick is exposed in Gordon County at Dew's Spring (7KK-S1). This outcrop is in the lower Knox and probably belongs to the Copper Ridge Dolomite. Brownish-gray and dark-gray dolomite of the Copper Ridge also occur in spring 7PP-S6 near Gregory's Mill, Murray County. Munyan (1951, p. 45) reported brownish-gray dolomite of the Copper Ridge (now under water) in Deep Spring (7PP-S1), Whitfield County. A thin section of gray dolomite uncovered in the cut of the paved road just west of Cohutta seems to be part of the lower Knox and possibly is Copper Ridge.

The Knox Group generally produces a moderately high ridge covered by cherty soil that makes it easy to distinguish from the overlying Newala Limestone. However, at Spring Place in Murray County, the Knox does not form a ridge, and its soil is practically free of chert. The lack of relief and the absence of cherty soil make it virtually impossible to separate the Knox from the Newala.

Munyan (1951, pp. 75-80) found that the area around Spring Place and a large part of Murray County east of the Conasauga River once was covered by a superficial blanket of alluvium. The alluvium probably derived from erosion and redeposition of materials from the Cohutta Mountains during the Tertiary. Remnants of this blanket still occupy the interstream areas around Spring Place and cover much of the outcrop belts of the Knox and the Newala. The presence of the alluvium prevented development of relief and the production of cherty soil so that the contact between the Knox and the Newala is obscured.

Fauna and correlation.—In order to interpret the geologic structure in some localities, it is necessary to know which formation of the Knox Group is present in a particular outcrop. The only reliable way to identify isolated outcrops of the Knox is to find biostratigraphically significant fossils. Fossils were used during this study to determine the presence of a major fault between the Knox Group and the Bays Formation.

In the cut of U. S. Highway 41, just west of the I-75 exit in Mill Creek Gap, the Knox Group is in contact with red mudstone of the Bays Formation (Fig. 3). Although the Bays in many areas lies in normal contact with the Longview Limestone in the upper part of the Knox, the narrowness of this particular outcrop of the Knox suggested that the sequence might be faulted. Fossils were collected to learn the age of the exposed Knox and determine whether the contact is normal or faulted.

Large gastropods (Fig. 4) taken from chert in the cut were identified by Ellis L. Yochelson as

Ophileta, and probably *Ophileta complanata* (Vanuxem). About these fossils, Dr. Yochelson states, "Even if this particular specific name is not correctly applied, the alternative species to which this material might be referred all have been described from rocks about the same age. I am reasonably certain that this particular outcrop of the Knox Group is part of the Chepultepec Dolomite." This identification showed that the Longview Limestone is missing and that a fault probably exists between the Chepultepec and the Bays Formation (Fig. 5).

Hydrology.—The Knox Group is covered by a residual mantle that generally is between 50 and 150 feet thick and in many places is as thick as 300 feet. Many wells in the Knox obtain water from this residuum. Most wells, however, are cased through the residuum and obtain water from an open hole in bedrock. Wells penetrating bedrock normally yield more water than can be obtained from the residuum and are less affected by seasonal droughts. For this reason they are preferred where large sustained yields are needed or where a high degree of dependability is required.

Bedrock wells range in depth from about 40 to 400 feet, and most yield between 5 and 25 gpm. The largest yield reported was 88 gpm, but experience in other parts of northwest Georgia has shown that the Knox normally will supply far greater quantities to wells in selected sites.

For example, a yield of 1,000 gpm was obtained at Kensington in Walker County from a well drilled into the top of the Knox. The well was located at the point where an intermittent stream that drains broad areas of the Knox upland empties onto the flood plain of a perennial stream. In other Georgia counties, yields of up to 500 gpm are obtained from the lower and middle parts of the Knox by wells drilled along intermittent streams.

Large yields are available along the intermittent streams in the Knox because the valley bottom environment tends to increase permeability and localize ground-water drains and conduits. Joints located beneath topographic lows have the greatest enlargement and carry the most ground water. This increased permeability and the concentration of ground water into master drains and conduits

Figure 4. *Ophileta complanata* (Vanuxem) from the Knox Group in a cut of U. S. Highway 41, just west of the I-75 exit at Mill Creek Gap.

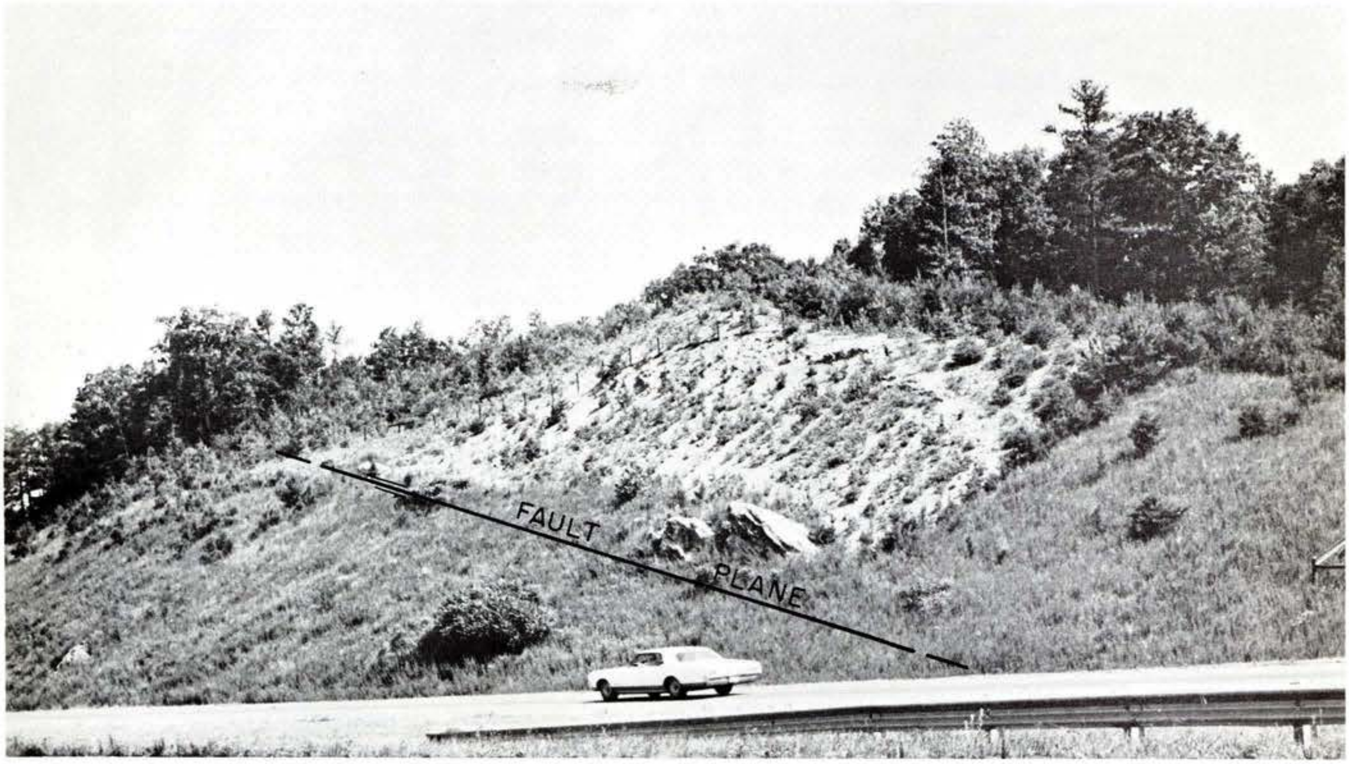

Figure 5. Chepultepec Dolomite of the Knox Group faulted against the Bays Formation, in the cut of I-75 north of U. S. Highway 41 exit in Mill Creek Gap.

makes the valleys of large intermittent streams excellent sites for high capacity wells (Fig. 6).

Bedrock wells in all areas of the Knox Group can be expected to supply enough water for a residence or a farm. Industrial supplies of 100 to 1,000 gpm may be obtainable from wells along large intermittent streams that drain the uplands of the Knox.

Water from the bedrock generally is moderately hard to hard and has a low iron content. Only a few wells were reported to yield water having a high iron content. Samples of water from 3 wells ranged in calcium carbonate hardness from 27 mg/l to 175 mg/l and in iron content from 0.05 to 1.80 mg/l.

Wells in residuum generally yield between 1 and 15 gpm. On steep slopes where soil creep has occurred and in depressions into which it has been transported, the upper part of the residuum is a heterogeneous mass of cherty, silty clay having low permeability; wells in this material generally yield only 1 or 2 gpm. The undisturbed residuum, on the other hand, contains well-defined permeable layers of silt, sand, jointed sandstone and broken chert, the latter probably resulting from the break-up of thick chert (Fig. 7). These layers generally have wide lateral extent, and the ones that are water bearing have yields ranging from 5 to as much as 15 gpm.

Although wells in the residuum generally give satisfactory service, a few have declining yields or fail completely because they were poorly constructed. A common method of developing a well in residuum is to drill until a water-bearing layer is reached, then to make a short pumping test. If the yield is adequate, the well is cased to total depth, leaving only the open hole at the end of the pipe to admit water. Some of these wells eventually give trouble, as sand, broken chert and other loose material from the water-bearing layer get sucked into the casing, forming a partial plug that reduces the yield. An expensive cleaning operation is required to restore the well's yield.

Plugging of this type can generally be prevented by the use of slotted casing and gravel packing in well construction. Wells constructed by these

Table 4.—*Flow of springs in Gordon, Whitfield, and Murray Counties, Ga.*

Spring number	Name or owner	Geologic source	Date measured or estimated	Flow (mgd)
		Gordon County		
5KK-S1	Johnson Spring	Floyd Shale	10-29-50 11- 5-69	2.4 1.2
-S2	Ga. Cumberland Academy	do	7-23-65	.14
5LL-S7	Billy Muse	do	7-20-65	.01 e
-S9	Billy Muse	do	12- 8-67	.42
5KK-S3	J. M. Able	Fort Payne and Armuchee Chert	7-21-65	.01 e
-S4	Wesley Smith and John Milan	do	7-21-65	.01 e
5LL-S5	Howard Duval	do	7-20-65	.01 e
-S8	Mrs. R. A. Brown	do	7-20-65	.01 e
6KK-S8	Amacanada Spring	Knox Group	11- 5-69	.7 to .8 rept.
-S9	J. R. Fain	do	7- 7-66	.01 e
-S11	Blackwood Spring	do	12-18-70	.1 e
7KK-S1	Dews Spring	do	4-15-49 4-19-49 11- 5-69	4.5 4.5 6.0
6KK-S2	A. W. Hufstetler	Knox and Conasauga	11- 5-69	.59
6LL-S2	City of Calhoun	do	12-18-70	.1 e
7LL-S1	Roes Spring (Crane Eater)	do	10-26-50 1-14-69 11- 5-69	3.7 1.5 1.7
6LL-S1	BPOE Elks Club	do	11- 5-69	.3
6KK-S6,7	Gardner Springs	do	9-15-65	.03 e
5LL-S6	D. C. Holsomback	Conasauga Formation	7-20-65	.01 e
6KK-S1	Prater Baxter	do	9- 8-65	.01 e
-S3	Hugh Prather	do	9- 2-65	.01 e
-S4	Hugh Prather	do	9- 2-65	.01 e
-S5	James Beamer	do	9-16-65	.02 e
-S10	Jessie Cox	do	7- 7-66	.01 e
7LL-S2	Lum Moss	do	6-14-65	.01 e
7KK-S2	Paul Hogan	do	9-16-65	.01 e
-S3	Henry West	do	9-16-65	.01 e
-S4	Robert Ellis	do	7-13-66	.01 e
-S5	E. T. Sheppard	do	7-11-66	.01 e
-S6	Arthur Henson	do	7-14-66	.01 e
8KK-S2	Charlie Foster	do	7-20-66	.01 e
8LL-S2	S. H. Leatherwoods	do	7-20-66	.01 e
8LL-S1	Charles Owens	Metamorphic rocks and Conasauga	7-20-66	.01 e
		Whitfield County		
5MM-S4	Crown Cotton Mill	Fort Payne and Armuchee Chert	9- 3-70 11- 5-71	.4 e .3 e
5MM-S1	C. W. Masters	Bays Formation	11- 2-67	.02 e
-S2	C. W. Masters	do	11- 2-67	.02 e
-S3	Troy Cleghorn	do	11- 2-67	.01 e
5NN-S3	H. P. McArthur	do	11- 2-62	.01 e
6NN-S1	Crown Cotton Mill	do	11-17-50	.34
6PP-S5	W. E. Maples	Holston Limestone		.05 e
6MM-S1	American Thread Co.	Knox Group	11-17-50 3-13-59	.57 .57
6PP-S6	Dr. Wood	do	10-31-67	.01 e
-S8	Seymour Spring	do	1-15-69 11- 5-69	.25 .29

Table 4.—*Flow of springs in Gordon, Whitfield, and Murray Counties, Ga.* (Continued)

Spring number	Name or owner	Geologic source	Date measured or estimated	Flow (mgd)
		Whitfield County (Continued)		
7PP-S1	Deep Spring	Knox Group	11-16-50 12-30-68 11- 5-69	2.2 2.2 1.5
5NN-S1	Freeman Spring	Knox and Conasauga	11-29-50 12-30-68 11- 5-69	2.2 1.65 2.1
6MM-S2	James Anderson	do	11-18-64	.01 e
-S3	Frank Mayo	do	5-25-67	.3
6PP-S1	Cohutta Fish Hatchery U.S. Dept. of Interior	do	11-16-50 2-19-62 10-21-69	.66 .65 .38
-S7	U.S. Dept. of Interior	do	11-28-50 11- 3-67	.62 .5 e
6NN-S2	Dalton Country Club	Conasauga Formation	11- 5-69	.02 e
6PP-S2	Jess Cline	do	11-18-67	.01 e
-S3	Lee Sugart (Estelle Spr.)	do	7-18-67	.01 e
-S4	Clifton Farmer (Sand Spr.)	do	7-18-67	.01 e
-S9	P. C. Henderson	do	11- 2-67	.01 e
-S10	Southern Railway	do	11- 2-67	.05 e
-S11	Wheeler Estate	do	11- 5-69	.05
7PP-S2	L. W. Deverall	do	5-29-67	.01
-S3	Millard Deverall	do	5-25-67	.02 e
5NN-S2	J. B. Griffin	Rome Formation	11-29-50 11- 3-67	.11 .10
6MM-S4	Nance Spring	do	11- 5-69	.2 e
		Murray County		
8PP-S1	Carlton Petty	Chota Formation	7-28-66	.02 e
S2	Carlton Petty	do	7-28-66	.02 e
7NN-S7	A. L. Keith	Newala Limestone	10-11-66	.01 e
7PP-S4	Mrs. Syble Bryant	do	10-10-66	.01 e
7NN-S1	Dr. James Bradford	Knox Group	11-15-50 2-19-62	.07 .07
-S2	Troy McCamy	do	10-11-66	.02 e
-S5	Lula Bailey	do	10-11-66	.01 e
-S6	Dr. Gregory	do	11-15-50 7-15-70	.43 .32
7PP-S2	Howard Phillips	do	8- 2-66	.02 e
-S5	Jessie Dunn	do	10-11-66	.02 e
-S6	Colvard Spring	do	7-15-70	.50
7NN-S3	O'Neill Spring	Knox and Conasauga	-50 1-13-69	.47 .80
-S4	James Spring	Knox(?) and Conasauga	11-15-50 1- 9-67	.95 1.3
8MM-S1	Mrs. Mary Barnett	Conasauga Formation	10-25-66	.01 e
7PP-S3	S. A. Stafford	Rome Formation		.01
8NN-S1	U.S. Dept. of Argiculture	Metamorphic rocks	8- 2-66	.02 e

Figure 6. Typical intermittent stream valley in the Knox Group where high-yielding wells commonly are obtainable.

methods can draw water from an entire water-bearing zone or from several zones, thereby producing higher yields.

Water from the residuum is soft and contains little iron. It is called "freestone" water by local residents, and many prefer it to the hard water that comes from wells in bedrock.

Most springs in the report area discharge water either directly or indirectly from the Knox Group (Table 4). Some of the largest springs (7KK-S1, 7PP,S1) have openings in the bedrock of the Knox, whereas many small ones (6PP-S8) seep from the residuum.

Water from the Knox also discharges from springs in the formations above and below the Knox. Springs 5NN-S1 and 7NN-S3, for example, empty from caves in the Maynardville Limestone, and spring 6NN-S1 has its opening in the Bays Formation.

During the annual low-flow period, 15 springs discharge a total of about 15.5 mgd from the Knox Group. These springs range in size from about 0.3 to 5.0 mgd. The individual springs and their rates of flow are listed in Table 4.

Water sampled from 14 of these springs ranged in calcium carbonate hardness from 81 to 165 mg/l. Iron content ranged from 0.01 to 0.3 mg/l, and most of the water contains less than 0.1 mg/l.

ORDOVICIAN SYSTEM

NEWALA LIMESTONE

Name.—The Newala Limestone of Early Ordovician age was named by Butts for Newala Post Office in Shelby County, Ala. He later extended the unit into Georgia (Butts, 1948, p. 19).

Lithology, thickness and distribution.—The Newala occurs in the study area only in Murray County, where it occupies a single belt paralleling the west side of Sumac Ridge. Exposures along this belt are so limited that the character of only the upper half of the formation is known.

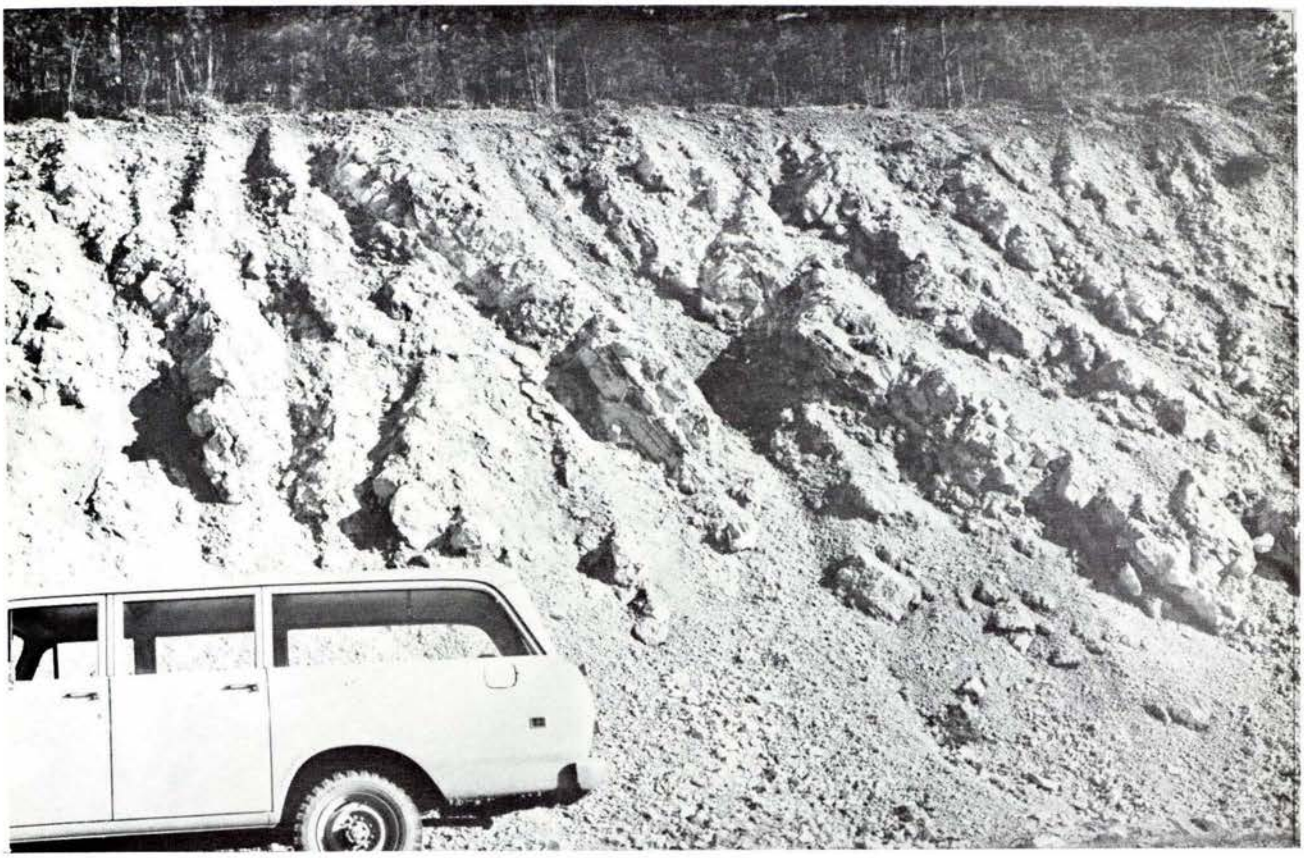

Figure 7. Chert layers of this type in the Knox Group are highly jointed and transmit water to wells.

The lowest rock exposed, probably from just below the middle of the Newala, was dug up and piled beside the paved road east of Franklin School. It is light-brown to tan dolomite interbedded with medium-gray dolomite and a little gray limestone that contains a variety of high-spired gastropods.

The middle part of the Newala crops out only along Pinhook Creek and the small unnamed stream 1.8 miles south of Gregorys Mill. It consists of fine- to medium-grained thickly to massively bedded, light-gray limestone and dolomite, interbedded with a few thin beds of very dark-gray microcrystalline limestone.

The upper part of the Newala is comparatively well exposed and can be seen at several places along the roads and streams near the west bank of Sumac Ridge. The upper few feet of the formation crop out south of the paved road 1 mile east of Franklin School, at the base of Sumac Ridge in the woods on either side of the Eton-Mt. Carmel Church Road and on both sides of Georgia Highway 2, just west of Sumac Ridge. The upper part of the formation is composed of alternating layers of dolomite and limestone. The dolomite varies from light gray and medium light gray to gray mottled with pale shades of pink. Most of it is massively bedded, but thinner beds also occur. The limestone is light to medium gray, thickly bedded, and much of it is dolomitic. Some of the limestone contains silt and clay impurities that cause it to weather into tabular plates. Other beds are very pure and develop either a fluted or a very smooth surface. A few of these pure beds are extremely fine-grained and contain clear calcite crystals that make them resemble the Mosheim Member of the Lenoir Limestone.

At Georgia Highway 2, these extremely fine-grained beds dominate a section about 20 feet thick and were identified by Munyan (1951, p. 60) as Mosheim Limestone Member. The presence of *Ceratopea* sp. in these beds shows, however, that nearly all of this limestone section is Early Ordovician in age and belongs to the Newala; only the uppermost 5 feet may be Mosheim Limestone.

The thickness of the Newala could not be measured because it is so poorly exposed. The scattered outcrops along the unnamed stream 1.8 miles south of Gregorys Mill were measured and found to be 230 feet thick, but there is no way to tell how much of the formation these rocks represent. Based on the width of its outcrop, the Newala is estimated to be between 300 and 400 feet thick.

Fauna and correlation.—Opercula of the gastropod *Ceratopea* are very distinctive fossils confined to Lower Ordovician rocks and are considered to be a guide to the middle and upper strata of the Lower Ordovician series (Yochelson and Bridge, 1957, p. 281). In Georgia, *Ceratopea* occurs only in the Newala Limestone and is most useful in separating the Newala from rocks of similar lithology but different age. Moreover, several species of *Ceratopea* have a very limited stratigraphic range and are confined to narrow zones within the Newala and equivalent rocks.

Several specimens of *Ceratopea* were collected in Murray County during this study (Fig. 8). *Ceratopea buttsi* Yochelson and Bridge was taken from a limestone bed a few feet below the top of the Newala. The limestone bed is in a small stream near the west edge of Sumac Ridge, just south of the Eton-Mt. Carmel Church road (U.S.G.S. Colln. No. 6787-CO). *Ceratopea hami* Yochelson and Bridge came from another limestone bed 150 feet downstream from the one above and 5 or 6 feet lower in the section (U.S.G.S. Colln. No. 6788-CO). *Ceratopea buttsi* Yochelson and Bridge was found in the highest exposed limestone bed just north of the paved road, 1.0 mile east of Franklin School (U.S.G.S. Colln. No. 7502-CO). *Ceratopea hami* Yochelson and Bridge was removed from dolomitic limestone about 20 feet stratigraphically below the base of the Athens Shale, on the west slope of Sumac Ridge, just north of Georgia Highway 2, near Cisco (U.S.G.S. Colln. No. 7503-CO). Another *Ceratopea* tentatively identified in the field by Dr. Yochelson as the same species occurs in the highest bed of Newala Limestone, 1.45 miles northeast of Fashion. This bed contains numerous clay partings and had been mistaken for Lenoir Limestone before the fossil was discovered.

The occurrence of *Ceratopea hami* shows that the Newala in Murray County is among the youngest known, whereas only the lower half of the Newala is present in Polk, Walker, and Catoosa Counties, Ga. This probably means that in the western part of the State the upper half of the Newala was eroded prior to deposition of the Lenior Limestone.

Hydrology.—The Newala is normally a productive aquifer, but its potential in the report area could not be determined, as only nine wells were inventoried. These wells ranged in depth from 40 to 97 feet and were reported to yield from 8 to 68 gpm. The static water level in the wells ranged from 20 to 59 feet below land surface.

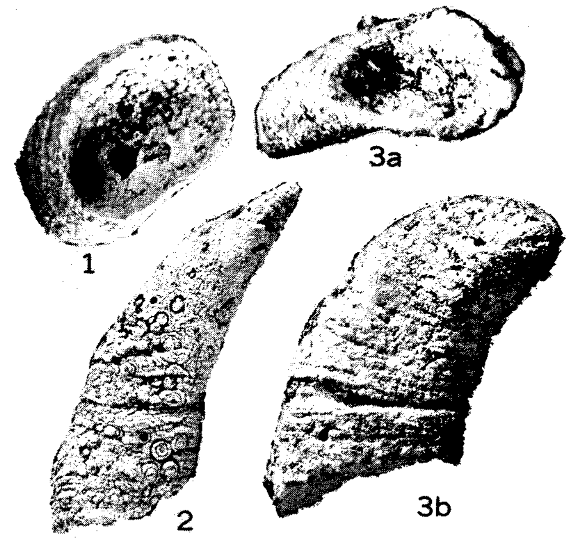

Figure 8. Opercula of late Early Ordovician gastropods from Murray County. All illustrations one and one half times natural size. 1. View of attachment surface of *Ceratopea buttsi* Yochelson and Bridge, U. S. National Museum 183760 (Mu-17); 2. Side view of another specimen, U. S. National Museum 183761 (M-1); 3a, 3b. Oblique view of attachment surface and side view of *Ceratopea hami* Yochelson and Bridge, U. S. National Museum 183762 (Mu-5).

As the relief on the Newala is low, domestic and farm water supplies probably can be developed almost anywhere. Wells randomly located should furnish between 5 and 20 gpm from depths less than 250 feet. But smaller yields and possible dry holes can be anticipated along the extreme edge of the Newala outcrop where the Athens Shale interferes with percolation of water into the limestone.

Industrial supplies of 100 to 300 gpm may be available where the Newala is crossed by Mill Creek and its tributaries. Other likely places for yields of this size are along Pinhook Creek, Sumac Creek and its tributaries, McIntire Branch and Campbell Branch.

Water from the Newala is generally hard and has a low iron content. However, some wells may furnish water high in iron content, as the alluvium that covers part of the formation contains large amounts of iron. A sample taken from well 8PP-4 had a total hardness of 163 mg/l and an iron content of 0.14 mg/l.

Although springs are common in the Newala across northwest Georgia, none are known to occur in that formation in Murray County. This is because most springs in the Newala discharge water that collects on the adjacent uplands of the Knox Group. In Murray County, however, the Knox is downgradient from the Newala and cannot supply water to springs. It is downgradient because the alluvial blanket that once covered eastern Murray County established a westward drainage across the strike of the formations, placing the Knox downgradient from the Newala. (See Knox Group.) Water falling on the Knox flows downstream away from the Newala, leaving none to supply springs.

LENOIR LIMESTONE

Name.—The Lenoir Limestone of Middle Ordovician age was named for exposures at Lenoir City, Loudon County, Tenn. The name was extended to Georgia by Butts (1948, p. 24).

Lithology, distribution and thickness.—The best exposure of the Lenoir occurs in Tennessee about 1 mile north of the study area, just east of Tennessee Highway 60 (Georgia Highway 71). There the Lenoir consists of medium-gray, mostly medium grained, massively bedded limestone which contains clay partings that cause it to weather into thin irregular slabs. The rock is very fossiliferous and displays a variety of species, including abundant calcified and poorly silicified specimens of *Maclurites magnus* Lesueur that measure up to 4 inches across.

From this locality the limestone strikes southward, and Munyan (1951, p. 60) cites evidence that it is about 20 feet thick at the Georgia line. It probably remains that thick for some distance into Georgia, but exposures are so poor that neither its thickness nor its areal extent could be determined.

Hydrology.—The Lenoir is probably too thin to be an important aquifer, although it may augment supplies from the enclosing formations. Wells beginning in the lower part of the Holston Limestone probably derive some water from the Lenoir.

ATHENS SHALE

Name.—The Athens Shale was named for exposures at Athens, Tenn. The name has been used for various black graptolite-containing shales of different ages which are unlike anything at the type locality. For this reason, most of its usefulness as a stratigraphic term has been lost, and Neuman (1955, p. 148, 149) suggested the name be applied only to rock comparable with that at the type locality.

Although Athens is not a good name for the graptolite shale in Murray County, to rename it would require more knowledge of its age and correlation than is available. Therefore, the name Athens is being retained in this report but is restricted, so as not to imply a correlation with the rock at Athens, Tenn.

Lithology and thickness.—The Athens of this report includes between 3,000 and 4,000 feet of calcareous clayey and silty shale, siltstone and sandstone. The clayey shale is dark gray to olive gray where fresh, but upon exposure rapidly alters to tan or yellowish orange. The silty shale and thin bedded siltstone are generally tan, brown or olive gray and weather to tan with an orange cast.

The sandstone is fine to medium grained, thinly to thickly bedded and is generally grayish brown or reddish orange. Much of the sandstone contains feldspar grains easily visible in a hand specimen.

Distribution.—The Athens forms Sumac Ridge and underlies part of the valley east of that ridge. The best exposures of the formation are along the roads that cross Sumac Ridge.

Fauna and correlation.—Graptolites were collected from the base of the Athens, 1.52 miles northeast of Fashion (U.S.G.S. Colln. No. 01371-CO). They were identified by William B. N. Berry, of the University of California, and assigned to his zones (Berry, 1960).

Climacograptus cf. *C. riddellensis* Harris
Climacograptus n. sp. (of the *C. marathonensis* type)
Glyptograptus cf. *G. euglyphus* (Lapworth)
Glyptograptus aff. *G. teretiusculus* (Hisinger)
Glyptograptus cf. *G. teretiusculus* (Hisinger)
Glyptograptus aff. *G. teretiusculus* var. *siccatus* (Ellis and Wood)
Retiograptus cf. *R. speciosus* Harris (this specimen identical to some from a highest Darriwil age locality *(Glyptograptus teretiusculus* Zone) in Victoria, Australia.

Age: Middle Ordovician - *Glyptograptus tereticusculus* Zone (Zone 10) probably; although the age might be as young as the *Climacograptus bicornis* Zone (Zone 12).

Concerning this collection, Dr. Berry states, "Again, the joint association of climacograptids like *C. riddellensis* with *G. teretiusculus* and *G.*

euglyphus kinds of glyptograptids and a *Retiograptus* like *R. speciosus* strongly suggest a Zone 10 age interpretation."

If, in the light of additional collections, the Zone 10 age proves correct, the lowermost Athens in Murray County is the same age as the Rockmart Slate in Polk County, Ga. On the other hand, should the Zone 12 age prove correct, the Athens is younger than the Rockmart Slate. Additional collecting is needed to establish the age of the entire formation. Further work may show that the sandstone in the upper part of the Athens corresponds to the Tellico Formation of Neuman (1955).

Hydrology.—The outcrop belt of the Athens is sparsely populated, so little well data were obtained. Three wells inventoried ranged in depth from 70 to 100 feet and were reported to yield up to 10 gpm.

The yields available from the formation depend largely upon the topographic position of the well site, its relation to local drainage, and the quantity of sandstone present. Wells in low areas underlain by sandstone will probably supply between 5 and 20 gpm, whereas wells in shale and thin-bedded siltstone may yield less than 5 gpm and some may be nearly dry.

The chemical quality of the well water was reported to be satisfactory for domestic use and stock watering. Water from well 8PP-1 had an iron content of 0.11 mg/l and a total hardness of 192 mg/l, suggesting that the water was derived from a calcareous shale or sandstone.

HOLSTON LIMESTONE

Name.—The Holston Limestone was named for exposures along and near the Holston River, near Knoxville, Tenn. However, according to Cooper (1956, p. 67-68), this type of limestone is produced by an accumulation of animal debris, and is likely to have local development and significance.

Lithology, thickness, and distribution.—The Holston includes two distinct types of limestone, one occurring above the other. The lower limestone is medium to dark red, very coarsely crystalline, massively bedded, and is composed mainly of fossil fragments. Bryozoans and brachiopods are the most abundant types recognized. The upper limestone is medium-dark red, thinly to thickly bedded, more finely crystalline than the lower limestone, and contains smaller fossil fragments.

Munyan (1951, p. 61-62) states that the lower limestone locally has definite reef structure and that the thin-bedded upper limestone thins across the top of the reef. The upper limestone apparently was formed largely of material eroded from the reef and has cross-bedding that converges toward the crest of the reef mound.

The Holston is thickly developed east of Georgia Highway 71, Whitfield County, in the valley that extends from the Tennessee state line to within about 6 miles of Dalton. Although exposures are comparatively rare owing to deep weathering of the limestone, the outcrop belt is conspicuously marked by deep, dense, dark-red soil. The width of the outcrop indicates that the Holston probably attains a thickness of at least 100 feet.

One of the best exposures of the limestone is in and near an abandoned quarry 0.25 mile east of Georgia Highway 71, and 1.25 miles southeast of the center of Cohutta. Other exposures occur north of Georgia Highway 2, at the intersection of a dirt road, 0.6 mile west of Georgia Highway 71.

Hydrology.—Drilled wells inventoried in the Holston ranged in depth from 24 to 120 feet. The highest yield reported was 10 gpm, but quantities up to 50 gpm may be obtainable where the topography and drainage are favorable.

Water from the limestone is moderately hard to hard, and, because of the ferruginous character of the rock, the water generally has a moderate to high iron content. A sample from well 6PP-6 had a calcium carbonate hardness of 83 mg/l and an iron content of 0.17 mg/l.

OTTOSEE SHALE

Name.—The Ottosee Shale was named for Ottosee Lake, Knoxville, Tenn. Butts (1948, p. 29) introduced the name into Georgia and Munyan (1951, p. 62, 63, 71, and 72) continued its use in the Dalton quadrangle.

Lithology, thickness and distribution.—The Ottosee Shale consists chiefly of yellow and red clay shale but also includes some soft, thinly laminated siltstone and a little mottled gray limestone at the base. It overlies the Holston Limestone in the belt east of Cohutta, in the isolated fault block at the Tennessee line, and in the Hamilton Mountain section.

Exposures are so small and scattered that the Ottosee's thickness cannot be accurately measured. Munyan (1951, p. 62-66) was able to measure a section on Hamilton Mountain north of Dalton but this section now is obscured by slump. He found the Ottosee in that exposure to be 530 feet thick.

Hydrology.—No wells were found in the Ottosee Shale, but, as it is chiefly clay shale, wells are unlikely to produce much more than 10 gpm. Wells reaching the lower part of the formation, where limestone occurs, may yield up to 20 gpm. Wells beginning in the lower part of the Ottosee in the valley east of Cohutta can pass through the shale and get increased yields from the Holston Limestone.

Water from the Ottosee will probably vary from soft to hard, depending on the presence or absence of limestone lenses, and have a moderate to high iron content.

CHOTA FORMATION

Name.—The Chota Formation of Middle Ordovician age was named for Chota School in Monroe County, Tenn. Neuman (1955, p. 157) believes that the Chota is the quartzose equivalent of the Holston Limestone.

Salisbury (1961, p. 18) extended the name Chota into Georgia and applied it to the upper part of the Middle Ordovician section in Murray County because the rocks are nearly identical to the type Chota. The Chota includes rocks that Butts (1948) mapped as Tellico Formation.

Lithology and thickness.—The Chota Formation consists of crossbedded sandy limestone, calcareous sandstone and a little quartz-free limestone. The limestone is about 1,000 feet thick and lies in the middle of the formation. It is underlain by 125 feet and overlain by 375 feet of calcareous sandstone (Salisbury, 1961, p. 20).

Typical beds of sandy limestone are composed of 61 percent calcite and 36 percent quartz sand (Salisbury, 1961, p. 20). The limestone is medium gray, with a reddish cast where fresh, but becomes darker gray and redder upon weathering.

The calcareous sandstone at the base and top of the formation is light brown, medium to coarse grained and crossbedded. So far as can be determined from hand specimens, the sandstone does not contain any feldspar, making it easy to distinguish from the feldspathic sandstone in the Athens Shale.

At various horizons within the middle part of the Chota are beds of coarse limestone-pebble conglomerate. One of these beds was described by Kellberg and Grant (1956, p. 713, 714), who state that 77.7 percent of the pebbles are limestone, 10.2 percent sandstone, and the remainder quartzite, chert, siltstone, vein quartz, and dolomite. The conglomerate matrix is red, slightly calcareous, quartzose, medium-grained sandstone. Conglomerates of similar character occur in the clastic upper part of the Rockmart Slate in Polk County, Ga. (Cressler, 1970).

Distribution.—The Chota Formation occupies a single belt 0.6 mile wide east of Cisco. The belt extends from the Tennessee line southward about 4.5 miles into Georgia. Deeply weathered exposures of the Chota can be seen on the road east of Cisco. Fresher outcrops occur on the low ridges east of Cisco and in the Woods east of Tennga.

Hydrology.—The area underlain by the Chota Formation is sparsely settled. The only well inventoried (8PP-3) was hand dug, 26 feet deep, and supplies a residence. A sample of this water had a calcium carbonate hardness of 8.0 mg/l and an iron content of 0.10 mg/l. Water from limestone and calcareous sandstone will generally be moderately hard to hard and is likely to have a moderate to high iron content.

Wells in limestone should yield from about 2 gpm on higher elevations to as much as 25 gpm in stream valleys. This means that residential supplies can probably be developed in most areas having moderate slopes and elevations. Some wells will require long periods of pumping to clear them of sand. The well water will be hard and in general will be of good quality.

The sandstone at the base of the formation will probably supply 5 to 20 gpm to wells located close to a perennial stream and may furnish enough water for a residential supply in other areas of low elevation. The sandstone at the top of the formation in general will be less productive, as it underlies more rugged terrain. Water from the sandstone will tend to be hard because the rock is calcareous and may have a moderate iron content.

MOCCASIN FORMATION

Name.—The Moccasin Formation was named for exposure along Moccasin Creek, at Scott Run, Va. Butts (1948, p. 30, 31) used the name Moccasin for all the rocks of Middle Ordovician age between Dick Ridge, at the west edge of Whitfield County, and Dalton. In this report, however, the name Moccasin is used only for the rocks in the belt adjacent to Dick Ridge. The rocks in the more eastern belts are considered to be Bays Formation.

Lithology and thickness.—The Moccasin consists of between 200 and 500 feet of calcareous red and yellow argillaceous rock that weathers to red and yellow mudstone. Thick-bedded blue limestone and some impure, yellow-weathering limestone also make up part of the formation. Exposures are too poor to reveal how much of the formation is carbonate.

Hydrology.—Two wells inventoried in the formation are about 100 feet deep and provided adequate domestic water supplies. The water is said to be drinkable.

The makeup of the Moccasin indicates that wells in low, gently rolling areas will provide yields adequate for a domestic or farm supply. Where limestone beds are present, the formation may produce 20 gpm. Wells located on steep slopes or hilltops are likely to be nearly dry.

BAYS FORMATION

Name.—The name Bays Formation was given to exposures in the Bays Mountains of Hawkins and Greene Counties, Tenn. According to Cattermole (1955), the Bays correlates, at least in part, with the Moccasin Formation of the northwestern part of the Valley and Ridge province. Munyan (1951, p. 73) tentatively identified rocks on Hamilton Mountain, which is north of Dalton, as Bays.

Lithology and thickness.—The Bays Formation consists of maroon and yellow calcareous mudstone and siltstone, a little impure limestone in the lower part, and gray to rusty-brown sandstone and quartz-pebble conglomerate in the upper part. The mudstone closely resembles that in the Moccasin Formation but differs by having a higher silt content and by being interbedded with much more siltstone. In a few places the siltstone is hundreds of feet thick and produces sizable ridges, such as the one east of the Mill Creek bridge on U. S. Highway 41, west of Dalton.

A very distinctive constituent of the Bays is metabentonite, which was produced by the fall of volcanic ash into the Middle Ordovician sea. Metabentonite is exposed on the south side of U. S. Highway 41 east of Mill Creek Gap through Rocky Face Mountain.

The Bays as used in this report is about 980 feet thick. The thickness includes 560 feet of section that Munyan (1951, p. 63-66) identified as Bays plus 420 feet that he tentatively identified as Sevier Shale. Because these two sections have similar lithology, the author is including them both in the Bays.

Hydrology.—West of Rocky Face Mountain wells inventoried in the lower, chiefly mudstone part of the Bays Formation range in depth from about 49 to 131 feet. They are reported to yield up to 20 gpm, though 5 or 10 gpm is normal. A few domestic wells pump dry with heavy use, probably because they do not penetrate limestone lenses. Well drillers occasionally report not finding water on steep hillsides or hilltops.

Few wells have been drilled in the middle and upper parts of the formation, as they mainly underlie steep slopes and ridges. It is doubtful that a year-round supply could be developed in most of the outcrop area. But where they underlie water gaps, such as Mill Creek Gap, the middle and upper parts of the Bays should supply 5 to 20 gpm to a well less than 200 feet deep.

Most well owners consider water from the Bays to be satisfactory for drinking and for household use, although some complain that the water has an iron taste and will stain sinks and laundry. The water probably ranges from moderately hard to hard. Water from well 5MM-1 had a calcium carbonate hardness of 140 mg/l and an iron content of 0.5 mg/l.

SILURIAN SYSTEM

RED MOUNTAIN FORMATION

Name.—The Red Mountain Formation of Silurian age was named for Red Mountain east of Birmingham, Ala. The formation is an important source of iron ore in Alabama and has been worked on a moderate scale in Georgia, but never in the study area.

Lithology and thickness.—The Red Mountain Formation is composed of sandstone, shale and conglomerate. Depending on local structure, its thickness ranges between 600 and 1,200 feet. The base of the formation consists of about 100 feet of medium gray coarse-grained sandstone and quartzite and quartz-pebble conglomerate. The conglomerate contains well-rounded quartz pebbles up to 0.5 inch in diameter, scattered in a matrix of medium and coarse-grained sand. Bedding in the basal unit is massive and generally ranges between 4 and 6 feet thick.

Above the massive basal beds, the formation is made up of interbedded sandstone and shale in approximately equal proportions. Throughout most of the section, the brown-weathering sandstone is coarse grained and occurs in beds 1 to 4 feet thick. In the upper 300 feet or so, the sandstone becomes very fine to fine grained and is in beds ranging from a few inches to 2 feet thick. The individual beds of sandstone are separated by differing thicknesses of dark-gray clayey and silty shale that becomes olive green or tan upon weathering.

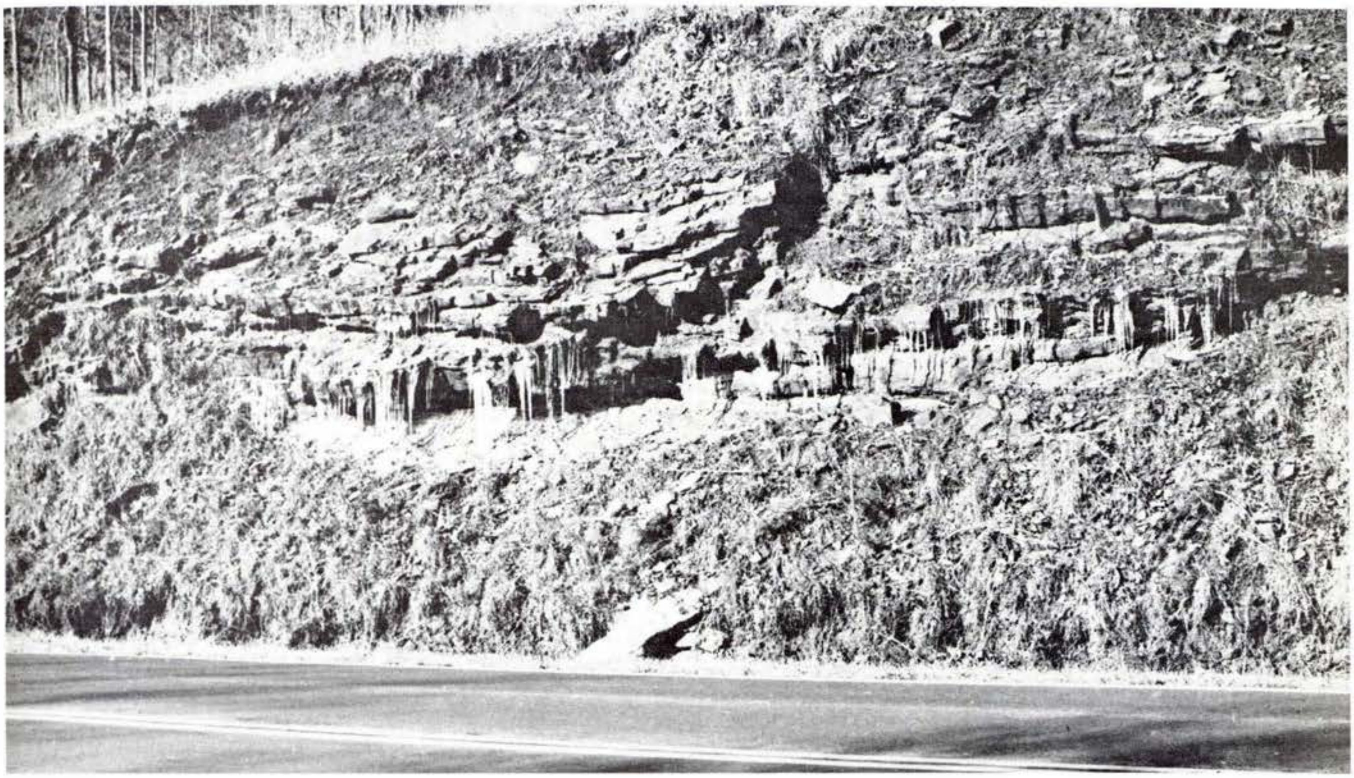

Figure 9. Icicles form where ground water leaks out of the Red Mountain Formation along steeply inclined bedding plane openings.

Distribution.—The Red Mountain Formation crops out only west of the Rome Fault in western Gordon and Whitfield Counties. Because the formation is very resistant to erosion, it forms the highest ridges in the report area west of the Great Smoky Fault. Some of the ridges rise more than 1,500 feet above sea level. Among the more prominent ridges are Rocky Face, Horn, Chestnut and Mill Creek Mountains, and Dick and Taylor Ridges. The formation is well exposed along the roads that cross Horn Mountain, west of Sugar Valley, and Rocky Face Mountain through Dug Gap, southwest of Dalton.

Hydrology.—The Red Mountain Formation is a poor aquifer because it forms steep-sided, narrow-crested ridges, in which the strata are inclined 20 to 60 degrees. Most rainfall on ridges runs off before it can percolate, and any water that does reach bedrock is quickly lost down the steeply inclined bedding-plane openings (Fig. 9). Ridges of this shape and structure catch and hold very little water.

The Red Mountain is not used as an aquifer in the report area, so its water-bearing character is known only from adjacent counties. In those areas, the formation will yield 5 or 10 gpm to wells on gentle slopes, such as at the foot of a ridge. Yields of 10 to 50 gpm can be obtained in the few places the formation is crossed by a stream. In general, the Red Mountain is a poor aquifer, and in most areas it cannot furnish enough water for a domestic supply

Water from the Red Mountain is generally soft, but much of it contains undesirable quantities of iron. The iron is so concentrated in some of the water that treatment is needed to make it drinkable.

DEVONIAN SYSTEM

ARMUCHEE CHERT

Name.—The Armuchee Chert of Early and Middle Devonian age was named for exposures near Armuchee in Floyd County, Ga. The type section is presumably along and near Armuchee Creek, where it crosses the end of Lavender Mountain.

Lithology.—The Armuchee is composed chiefly of medium- to dark-gray chert that locally is sandy and ferruginous. In most weathered outcrops the chert is light gray, but where freshly exposed it may have a rusty or reddish-brown surface. Most of the chert is thin bedded, although thick to massive beds do occur. In a few places the highly weathered chert is nodular. It is not unusual for the formation to contain scattered layers of ferruginous sandstone or very sandy chert which may or may not be feldspathic.

Distribution and thickness.—The Armuchee crops out as a low ridge along the dip slope of the high ridges upheld by the Red Mountain Formation of Silurian age. One of the best displays of the Armuchee is along the road over Horn Mountain west of Sugar Valley in Gordon County. The exposed section is about 60 feet thick, and the upper and lower contacts of the formation can be seen.

Another exposure of the Armuchee showing its upper contact occurs in the cut of Georgia Highway 143 about 3 miles northwest of Sugar Valley, just north of the junction with the paved road going to Resaca.

Hydrology.—Because the Fort Payne Chert is widespread above the Armuchee Chert, wells rarely derive water solely from the Armuchee. Most wells in the Armuchee begin in the overlying Fort Payne Chert and obtain water from both formations. For this reason and because the formations have similar lithologies, the hydrology of the Armuchee is discussed further in the section dealing with the Fort Payne Chert.

CHATTANOOGA SHALE AND MAURY MEMBER

Name.—The Chattanooga Shale of Devonian and Mississippian age was named for exposures at Chattanooga, Tenn. The Maury Member of the Chattanooga is of Early Mississippian age and was named for Maury County, Tenn. In the area of this report, the Chattanooga overlies the Armuchee Chert and underlies the Fort Payne Chert.

Lithology and thickness.—In Georgia, the Chattanooga Shale consists of up to 40 feet of black highly fissile clay and silty shale. Locally it contains thin layers of siltstone and fine-grained sandstone. The Chattanooga gradually thins toward the south and southeast, and in Gordon County it ranges in thickness from about 15 to 30 feet. Upon exposure, the shale slowly changes from black to brown and finally to purplish brown or tan. In a highly weathered state its appearance is similar to that of long-exposed Lavender Shale Member of the Fort Payne Chert.

At the top of the Chattanooga is a 2- to 3-foot layer of greenish, glauconitic shale or clay named the Maury Member. The Maury is unusual because it contains phosphatic nodules ¼ inch to 6 inches in diameter. As nodules of this type do not occur in other formations, they enable identification of the Maury, where the stratigraphic structure is indeterminate.

The Maury invariably overlies the Chattanooga and, thereby, provides a valuable top and bottom criterion. In places where exposures are very poor, the attitude of the Chattanooga would remain in doubt were it not for the Maury indicating the top.

Distribution.—The Chattanooga Shale forms a line of outcrops along the dip slopes of all the ridges of Red Mountain Formation and crops out in a few of the deeper drainage courses. Good exposures of the Chattanooga showing the contact with the Armuchee Chert and the Fort Payne Chert occur along the road over Horn Mountain west of Sugar Valley in Gordon County. The formation also can be seen in a cut on Georgia Highway 143 about 4 miles northwest of Sugar Valley and just north of the intersection with the paved road to Resaca.

Hydrology.—The Chattanooga Shale is unimportant as an aquifer because it is thin and has very low permeability. It does, however, affect local ground-water conditions. For example, the shale forms a confining layer over the Armuchee Chert and produces flowing wells. But, of more importance, ground water coming into contact with the Chattanooga generally becomes charged with iron and hydrogen sulfide and may pick up small concentrations of uranium, making it necessary to case off the Chattanooga. If the Chattanooga is not cased off, ground water of good quality from the Fort Payne and the Armuchee may be sufficiently contaminated to render the entire supply unfit for use.

MISSISSIPPIAN SYSTEM

FORT PAYNE CHERT

Name.—The Fort Payne Chert of Early Mississippian age was named for exposures at Fort Payne in DeKalb County, Ala.

Lithology and thickness.—The Fort Payne Chert exposed in Gordon and Whitfield Counties consists of between 100 and 200 feet of thin- to thick-bedded chert. The chert is dark gray to nearly black where fresh, but on most outcrops it is weathered to light gray or purple. The chert beds range from less than 1 inch to more than 2 feet thick. The individual beds are strikingly uniform and extend for hundreds of feet without noticeable variation in thickness (Fig. 10).

Unweathered, Fort Payne Chert is a siliceous carbonate rock. It contains both dolomite and limestone, which develop solution openings similar to those in nearly pure carbonate rocks.

Distribution.—The Fort Payne Chert follows a line of outcrop for miles along the dip slopes of all the ridges of the Red Mountain Formation, but it rarely is well exposed. There seems to be no place in the study area where the entire formation is displayed. The lower part and the contact with the underlying Chattanooga Shale crops out along the road over Horn Mountain west of Sugar Valley in Gordon County and in a cut of Georgia Highway 143 about 4 miles northwest of Sugar Valley, north of the junction with the road going east to Resaca.

Fauna and correlation.—Where the Chattanooga Shale is unexposed and other criteria are wanting, it is difficult to distinguish the Fort Payne Chert from the Armuchee Chert. However, the presence of large crinoid stem plates identify the chert as Fort Payne. According to Butts (1948, p. 45), large crinoid stems are common to the Fort Payne of Alabama and Kentucky and are an infallible criterion for distinguishing the Fort Payne from older formations. These large crinoid stems, which are 0.5 inch or more in diameter, occur at the north end of Houston Valley in Whitfield County.

Hydrology.—As previously explained, the hydrology of the Fort Payne Chert and the Armuchee Chert is being discussed in one unit because they are nearly identical. Wells commonly derive water simultaneously from both. Rarely is it known whether well water comes from one or both formations.

Wells in the chert range in depth from 42 to more than 300 feet and most yield from 5 to 20 gpm. Well 5LL-25 flows steadily at the rate of 3

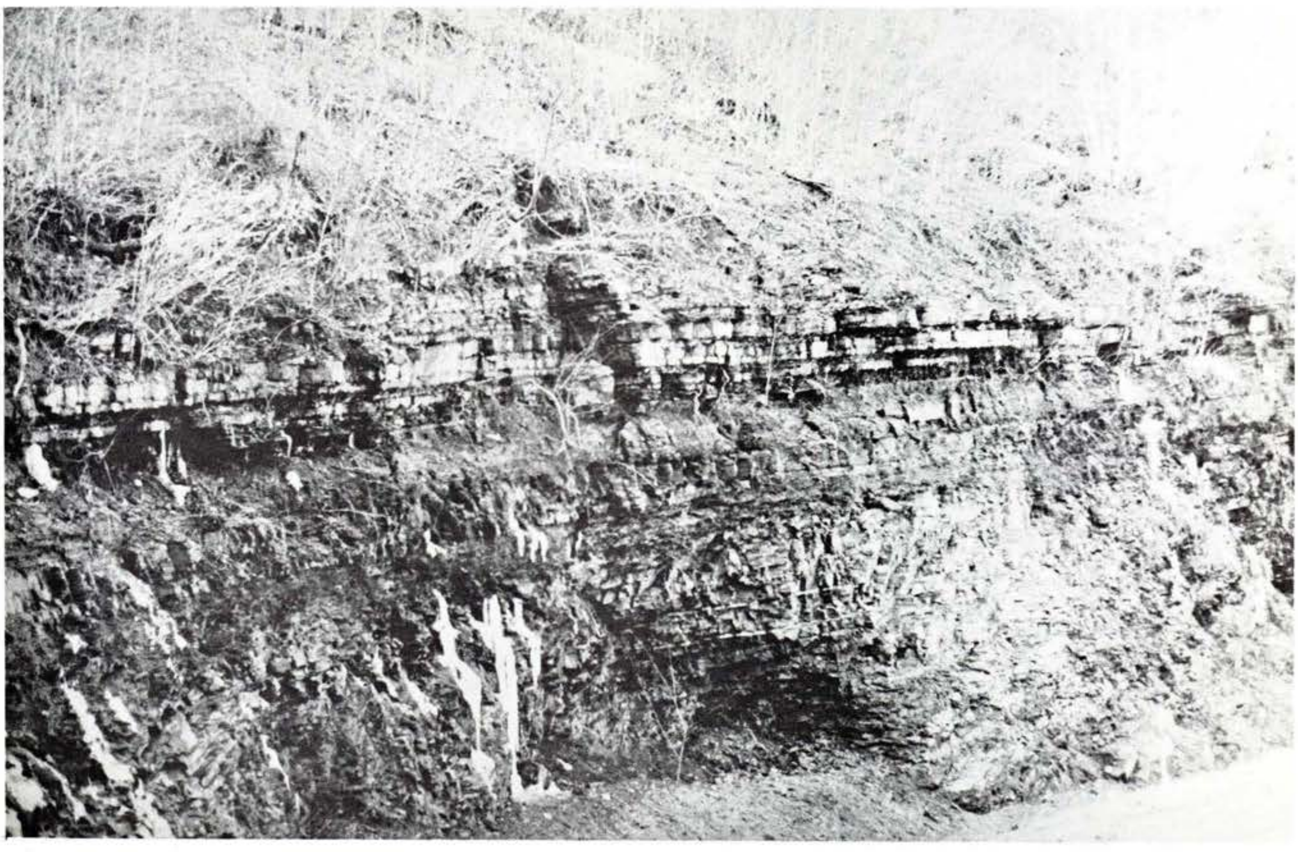

Figure 10. Individual chert beds in the Fort Payne are very uniform and extend hundreds of feet without noticeable variation in thickness.

gpm. The largest yield reported was 22 gpm, but the formation should supply more than that in many places. In adjacent counties, for example, wells located close to major streams yield from 50 to more than 100 gpm.

Water from the chert is generally of good chemical quality. It is reported to be soft, and people commonly refer to it as "freestone" water. The significant quality problems originate with the Chattanooga Shale, which lies between the two formations. Wells passing through the Chattanooga pick up iron and sulfide. Some wells penetrating the Chattanooga have been so badly contaminated that they could not be used until the shale was cased off. Water from well 5MM-14 had a calcium carbonate hardness of 44 mg/l and contained 0.42 mg/l iron, which is very high and probably comes from the Chattanooga.

Several springs discharge from the Fort Payne and the Armuchee but most flow only a few gallons per minute. One exception is Johnson Spring (5KK-S1) in western Gordon County, which flows at the rate of 1.1 mgd. Although the opening of Johnson Spring is in the Floyd Shale, an analysis of the water (Table 1) shows that it probably comes from the Fort Payne Chert. Spring 6LL-S2 east of Hill City in Gordon County may discharge water from the Fort Payne through an opening in the Conasauga Formation.

LAVENDER SHALE MEMBER OF FORT PAYNE CHERT

Name.—The Lavender Shale Member of the Fort Payne Chert was named for exposures along the Central of Georgia Railway 0.5 mile west of Lavender Station in Floyd County, Ga. The name has been adopted by the U. S. Geological Survey (Cressler, 1970, p. 45-47).

Lithology, thickness, and distribution.—The Lavender Shale Member consists of interbedded dark-gray to nearly black highly impure limestone, calcareous claystone, and siltstone. A few layers of noncalcareous siltstone also occur. Discontinuous layers and nodules of dark gray chert, rarely more than 2.5 inches thick, and geodes up to 6 inches in diameter lined with quartz and calcite crystals are scattered throughout the section.

Exposed Lavender Shale weathers rapidly, and the rock changes from dark gray to light gray, medium gray or bluish gray and finally becomes tan or tan with an orange cast. As the rock decomposes, it breaks down into small irregularly shaped pieces that have rough bedding surfaces. The more silty pieces are similar in appearance to the chips of siltstone found over the Floyd Shale. However, the geodes in the Lavender are unique to it (and to the Fort Payne Chert), enabling weathered Lavender Shale Member to be distinguished from the Floyd Shale.

Houston Valley in western Whitfield County contains the only thick development of Lavender Shale Member in the report area. It crops out along the roads in the valley, but no section suitable for measuring was found. Its thickness is estimated to be 100 feet.

Hydrology.—The only well inventoried in the Lavender Shale (4NN-1) is 100 feet deep and supplies a house. Other wells can be expected to yield 5 to 10 gpm from depths less than 100 feet. Should a larger volume be needed, it may be practical to drill through the Lavender and tap the underlying Fort Payne Chert.

Water from the Lavender (depending on the type of rock from which it comes) will vary from soft to moderately hard. Most of the well water will contain moderate to high concentrations of iron.

FLOYD SHALE

Name.—The Floyd Shale of Mississippian age was named for outcrops in Floyd County, Ga.

Lithology.—The Floyd Shale consists mainly of silty micaceous shale that has a dull and rather rough bedding surface. Layers of brown-weathering siltstone and fine-grained sandstone less than 2 inches thick are commonly interlayered with the shale. Clay shale that has a waxy surface is abundant locally.

Much of the shale in the Floyd is highly carbonaceous, and on fresh exposure it is very dark gray to nearly black. Weathering bleaches it to light gray, then alters it to light brown, chocolate brown, or purplish brown and finally to pinkish purple. Limonite box works are abundant and remain in the soil after the shale has decomposed.

Included in the Floyd is an unnamed unit of rather pure, thickly to massively bedded medium-gray limestone at or very near the base of the formation. It crops out in Gordon County beside Georgia Highway 156 east of Horn Mountain. Red soil at that horizon indicates that the limestone extends northward along the east side of Horn and Baugh Mountains and continues northward past Sugar Valley. Red soil in the valley of Rocky Branch, west of Horn Mountain, is probably from this limestone.

Thickness.—Poor exposures and folding in the shale make measurement of the Floyd impracticable. Its thickness, estimated from outcrop widths and partial sections, seems to be between 100 and 300 feet in Whitfield County and between 300 and 500 feet in Gordon County.

Hydrology.—Wells in nearly all areas of the Floyd Shale yield enough water for a home or farm. Larger amounts of water are avilable from the basal limestone. Wells in the shale generally yield from 3 to 30 gpm and range from about 40 to 200 feet deep. The deepest well inventoried (5LL-6) is 232 feet deep. Wells inventoried in the basal limestone average less than 200 feet deep and yield 5 to 25 gpm. Yields up to 200 gpm can probably be obtained where the limestone is crossed by an intermittent stream.

The well water varies from good to very poor in quality. Wells in the limestone and about half of those in the shale yield moderately hard to hard water of good quality. However, other wells yield water so high in iron content that it must be treated before use. Water samples from well 5LL-31 had a very high iron content of 0.42 mg/l.

The quantity of iron in the water does not seem to be related to the depth of the well, the part of the formation penetrated, or to the topographic setting. No way is known to predict the occurrence or iron.

A few small springs discharge from the Floyd, and some are used for stock watering. Johnson Spring (5KK-S1), which discharges 1.1 mgd, is in the Floyd, but its chemical content (Table 1) indicates the water probably comes from the nearby Fort Payne Chert.

MAJOR GEOLOGIC STRUCTURES

The eastern edge of the report area, in the Blue Ridge and Piedmont Provinces, is essentially homoclinal. Excepting local folds and granite intrusions, the rocks dip east and southeast at 20 to 45 degrees.

The major part of the area in the Valley and Ridge Province, lying east of the Rome Fault (Fig. 11) is characterized by broad open folds and minor faults that produce low rounded ridges and flat valleys. To the west, however, the rocks are closely folded and faulted; the eastward dipping limbs of faulted anticlines form homoclinal ridges that dominate the topography.

ROME FAULT

The Rome Fault, so named because it passes through Rome, Ga., is one of the major thrust faults of the folded Appalachians. It extends for hundreds of miles across Tennessee, Georgia and Alabama. The fault uplifts the Middle Cambrian Conasauga Formation into contact with the Mississippian Floyd Shale, which means it has a stratigraphic throw of at least 7,000 feet. Remnants of the thrust sheet indicate that the fault displaced the rocks westward 5 and possibly as much as 10 miles.

The Rome Fault is a flat-lying bedding-plane thrust that originated in shale of the Conasauga or Rome Formations. The fault developed a frontal prow that angled steeply upward, cutting through the overlying formations until it reached the weak Floyd Shale. There it flattened out and continued its westward slide. (See cross section, Pl. 1). The Conasauga, having been uplifted 7,000 feet along the frontal prow of the fault, continued to push westward as a flat thrust sheet. Even with all this movement, the fault zone in most places consists of only 1 or 2 inches of claylike gouge.

Sometime after the thrusting was complete, the area folded and the rocks, including the Rome thrust sheet, were cast into the major folds that exist today. (A remnant of the thrust sheet preserved in the syncline west of Horseleg Mountain, Floyd County, shows that thrusting predated the folding.) Uplifting followed, and ensuing erosion removed much of the folded thrust sheet, leaving the fault with an irregular trace, such as it has in Gordon County. The trace is much straighter in Whitfield County because it is close to the frontal prow, where the fault plane dips steeply and was little folded.

COOSA FAULT

The Coosa Fault, given that name because it lies along the southeast edge of the Coosa Valley, is a second major thrust fault in the area. Considerably shorter than the Rome Fault, it extends from northern Alabama across Georgia, only into the southern edge of Whitfield County, where, so far as exposures reveal, it either dies out or flattens out beneath the shales of the Conasauga Formation.

The Coosa Fault is much straighter than the Rome Fault because it has a steep dip of 30 to 50 degrees. Like the Rome Fault, it seems to be a bedding-plane thrust, but it has been so deeply eroded that the flat thrust sheet is completely removed, and only the steep-dipping frontal prow is exposed. As it cut upward, the Coosa Fault sliced through the Rome thrust sheet (cross section, Pl.

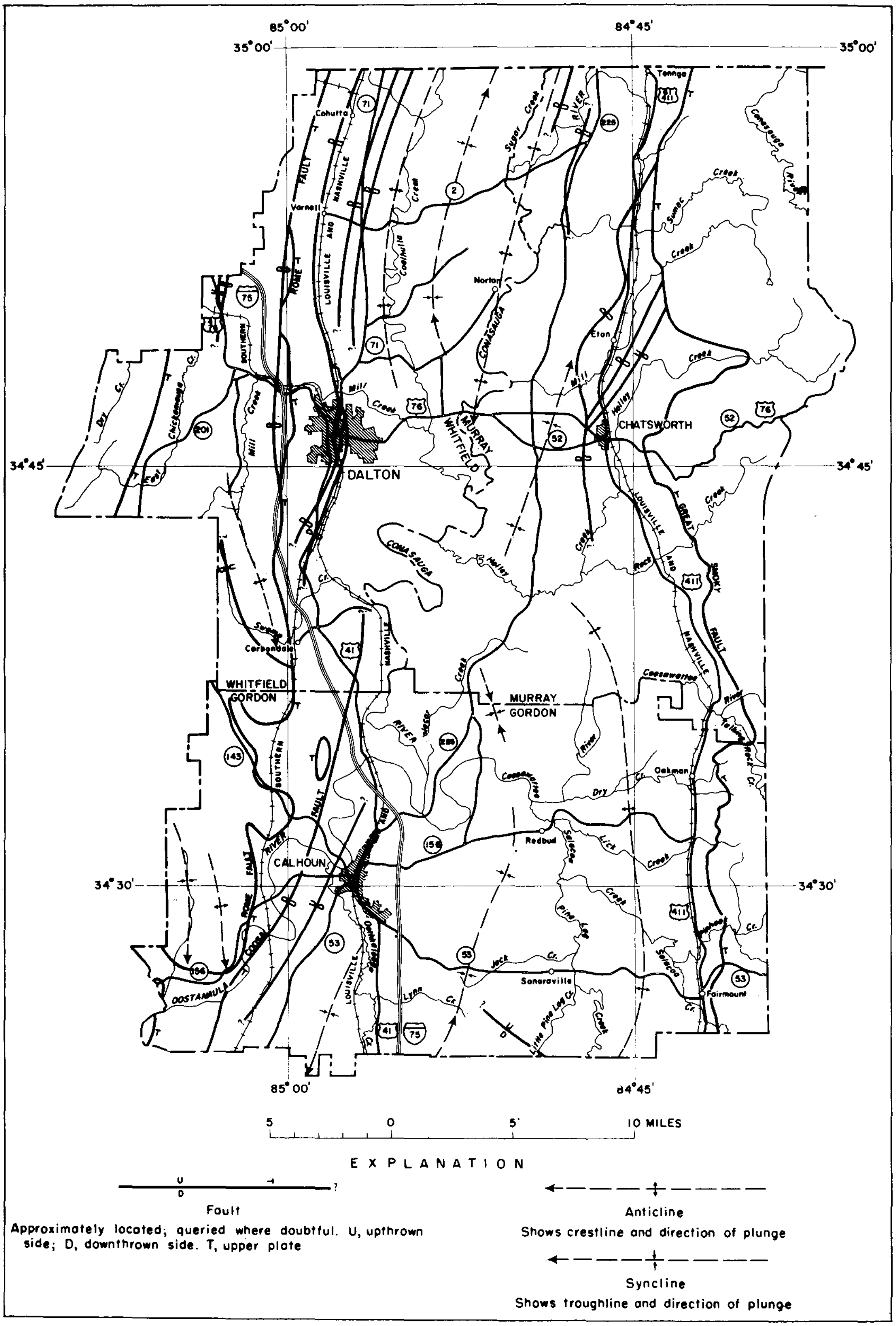

Figure 11 —Map of Gordon, Whitfield, and Murray Counties showing major geologic structures.

1), thereby showing that it developed at a later time, after the major folding in the area had been completed.

GREAT SMOKY FAULT

The third major thrust fault in the area, the Great Smoky Fault, passes along the eastern part of Murray and Gordon Counties. It brings the metamorphic rocks of the Blue Ridge and Piedmont provinces into contact with Paleozoic rocks of the Valley and Ridge. The displacement produced a fault zone more than 100 feet thick that contains a mixture of quartzite, phyllite, shale, and limestone, generally of low permeability.

HIGH ANGLE FAULTS

The area north and west of Dalton and north of Chatsworth is cut by high-angle reverse faults of small displacement. These faults are of special interest, because, unlike the major thrust faults which are mainly in shale, these involve formations that are largely of carbonate composition. Displacement of one carbonate body over another can produce fracturing that will substantially increase the permeability of the rock.

RELATION OF GEOLOGIC STRUCTURE TO HYDROLOGY

Aside from determining the outcrop patterns of the different rock units, the major geologic structures in the report area seem to have little control over the occurrence of ground water. Except where beds dip very steeply, no indication was found, for example, that well yields in any particular formation differ on an anticline, a syncline or a homocline. Nor do most of the faults seem to have much influence on the occurrence of ground water.

The Rome and Coosa Faults have little effect on the availability of ground water because they mainly thrust shale against shale or shale against chert, resulting in thin, tight fault zones. Rather than increase the quantity of water available, they probably lessen it by placing an impervious layer over the productive Fort Payne Chert.

The other major thrust fault in the area, the Great Smoky, has a thick fault zone, but it also is tight and nearly dry. Although some thick limestone layers in the Conasauga Formation were extensively fractured close to the fault, no large supplies of ground water have been found there.

Only the high-angle reverse faults north of Dalton and Chatsworth seem likely to have appreciable fault-zone storage. The formations they displace contain massive carbonate layers which would tend to shatter under stress and to create a permeable fault zone. The possibility of sizable fault-zone storage along the faults involving the Knox, the Newala and the Holston seems to warrent exploratory drilling.

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APPENDIX

Table 5.--Record of wells in Gordon County, Georgia

Geologic symbol: Mfs, Floyd Shale; MDc, chert of Mississippian and Devonian age; Srm, Red Mountain Formation; Om, Moccasin Formation; OꞒk, Knox Group; Ꞓcm, Maynardville Limestone Member of the Conasauga Formation; Ꞓcsl, shale and limestone of Conasauga; Ꞓcls, limestone and shale of the Conasauga; Ꞓcl, limestone unit of the Conasauga; Ꞓr, Rome Formation; miu, metasedimentary and igneous rocks, undivided.

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
5KK22	Jim Bunch	Dug	Hilltop	Ꞓcls	36	51.2	None	39.34	5-19-65	---	Domestic	
23	Aubrey Gazaway	do	do	Ꞓcsl	48	41.5	do	31.50	5-19-65	---	do	
24	D. E. Ayer	Drilled	Flat valley	Ꞓcsl	6	110	48	39.08	7-23-65	10	Domestic and stock	
25	Plainville Brick Co.	do	Hilltop	Ꞓcsl	6	64	---	34.97	8-13-43	---	Domestic	
26	do	do	do	Ꞓcsl	6	97	---	36.39	8-13-43	---	do	
27	C. A. Bennett	do	Valley	Ꞓcls	3	54	6	6.00	8-11-43	---	do	
28	Bessie B. Smith	do	Hillside	Ꞓcm	6	85	45	12.49	7-23-65	10+	Domestic and stock	
29	Mrs. W. L. Swain	do	Valley bottom	Ꞓr	6	130	---	---	---	---	Domestic	
30	C. B. Wood	do	Hillside	Ꞓr	6	81	19	51.99	7-22-65	---	Domestic and stock	
31	West Union Baptist Church	do	Hilltop	Mfs	6	64	45	20	Reported	---	Domestic	
32	Stonewall King	Dug	Valley	Mfs	48	19	None	9.75	7-21-65	---	do	
33	Philip Cagle	Drilled	Local depression	Ꞓcsl	6	45	22.5	9.18	5-18-65	---	Domestic and stock	
34	C. L. Fuller	do	Flat valley	Mfs	6	78	24	20	Reported	---	Domestic	High iron
35	Lamar Scott	do	Hillside	Mfs	6	190	---	40	do	---	Domestic and stock	do
36	J. M. House	do	Hilltop	Ꞓcsl	6	75	50	15	do	---	do	
37	V. D. Pulliam	Dug	Hillside	Ꞓcsl	48	30.3	None	18.74	7-21-65	---	Domestic	
38	Dennis Walraven	Drilled	Hilltop	Ꞓcsl	6	151	---	25.78	7-21-65	---	do	
39	E. H. House	do	Local depression	Ꞓcsl	6	75	26.7	20	Reported	5	Domestic and stock	High iron
40	Doyl Fowler	do	Hilltop	Ꞓcsl	6	102	18	20	do	---	do	
41	Gordon Evans	do	Hillside	Mdc	6	103	80	20	do	10	Domestic	
42	J. A. King	do	do	Mfs	6	180	---	43.62	7-22-65	20±	Domestic and stock	
43	Claude Bennett	do	do	Ꞓcls	6	69	21.5	15	Reported	20	do	
44	Horace Patterson	do	Flat valley	Ꞓcsl	6	65	50	10	do	---	Domestic	
45	Hollis Patterson	do	do	Ꞓr	6	95	47	15	do	---	Domestic and stock	
46	Ernest Avery	do	do	Ꞓcsl	6	81.5	43	5.00	7-15-65	---	do	
47	Milton Squires	Drilled	Flat valley	Ꞓcsl	6	67.5	60	12	Reported	---	Domestic	
48	do	do	do	Ꞓcsl	6	93	83	21	do	---	do	Water muddies
49	Gordon County Bd. of Ed.	do	do	Ꞓcsl	6	80	---	5	do	---	do	
50	John Cayle	do	do	Ꞓcsl	6	82	70	9.12	7-30-43	4	do	
51	James Holland	do	Hillside	Ꞓcsl	6	53	52	4	Reported	10	Domestic and stock	
52	William Scott	do	Flat valley	Ꞓcsl	6	129	29	12	do	10+	Domestic	
53	G. D. Hazelwood	do	Hillside	Ꞓr	6	67	16	15	do	8	do	QW analyses
6KK1	James Rickett	Drilled	Hillside	Ꞓv	6	87	50	30	do	10+	do	do
2	Harold Slayton	do	Valley	Ꞓcls	6	120	12	15	do	10+	do	do
3	Roy Bennett	do	Hilltop	OꞒk	6	95.7	77	91.32	9-08-43	---	do	
4	Dolph Fuller	do	do	Ꞓr	6	115	20	50	Reported	---	do	
5	Gordon County Bd. of Ed.	do	Valley	Ꞓcs	6	112	12	12	do	5	do	
6	A. P. Beamer	do	Hilltop	Ꞓcs	6	119	119	60	do	---	do	Slotted casing
7	Mt Alto Bedspread Co.	do	Flat valley	Ꞓcsl	8	309	30	15.16	7-27-43	100	None	
8	G. L. Fox	do	do	Ꞓcsl	6	79.8	---	14.60	8-21-43	---	do	
9	J. B. Fox	do	do	Ꞓcsl	6	70.9	---	20.07	8-21-43	---	do	
10	G. L. Fox	do	Foot of high hill above valley	Ꞓcsl	6	341	30	25.84	8-21-43	---	do	
11	Mrs. P. H. Gazaway	do	Flat valley	Ꞓcsl + Ꞓcls	6	202	20	12	Reported	---	do	

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6KK12	C. W. Fox	do	do	Єcsl	6	212	36	---	---	---	do	
13	Herbert Page	do	do	Єcls	6	48	---	---	---	---	do	
14	Cline Fox	do	do	Єcls	6	40.5	30	23.20	8-21-43	---	do	
15	Wayne Cook	do	Hillside	Єcls	6	104	84	---	---	---	Domestic and stock	
16	Gordon County Bd. of Ed.	do	Hilltop	Єcl	6	135	135	30	Reported	---	Domestic	
17	Blackwood Spring Church	do	Foot of hill	Єcm	6	85	85	---	---	---	do	
18	John Groggan	do	do	OЄk	6	117	---	87.85	9-07-43	---	do	
19	J. H. Boston	do	Hilltop	Єcm	6	109	---	36	Reported	---	Domestic and stock	
20	D. M. King	do	Hillside	OЄk	6	148	98	---	---	10+	do	
21	Mrs. Lucile Woodring	do	Flat valley	OЄk	8	110	---	78.71	9-02-65	---	Domestic	
22	Olin Towe	do	Hillside	OЄk	6	130	130	55	Reported	---	do	
23	R. E. & R. L. Keown	do	Flat surface	OЄk	6	175	70	21.85	9-02-65	---	do	
24	Clayton Kinmon	do	Hillside	OЄk	6	130	120	91.49	9-02-65	---	do	
25	Mrs. Harry Lemons	do	Flat surface	OЄk	6	168	167	---	---	---	do	
26	James Sullivan	Drilled	Hillside	OЄk	6	112	---	---	---	---	Domestic	
27	T. P. Holcomb	do	do	Єcm	6	52	52	26	Reported	---	do	21 feet of slotted casing
28	Mrs. Margaret Henderson	do	do	OЄk	6	110	110	40.38	9-15-66	---	Stock	
29	R. L. Mitchell	do	Flat valley	Єcm	6	52	42	14.30	9-03-65	---	Domestic and stock	
30	Mildred Holcomb	do	do	Єcls	6	42	21	12	Reported	---	Domestic	
31	Louis Darby	do	do	Єcsl	6	60	60	9.55	9-10-65	---	Domestic and stock	End of casing open
32	do	do	Hilltop	OЄk	6	140	---	115	Reported	10+	Stock	
33	Fred Hall	Dug	Hillside	Єck	48	23	None	19.15	9-08-65	---	Domestic	
34	A. L. Shaw	Drilled	do	Єcs	6	90	25	---	---	10+	Domestic and stock	
35	Carl Fisher	do	Flat valley	Єcls	6	40	40	---	---	---	Stock	End of casing open
36	P. M. Cochran	do	Hillside	Єcs	6	100	53	26.52	9-10-65	---	do	
37	V. E. Saunders	do	do	OЄk	6	186	45	---	---	---	Domestic and stock	
38	G. V. Cate	do	do	OЄk	6	95	93	30	Reported	---	Domestic	
39	Sam Williams	do	Hilltop	Єcm	6	87	68	57.34	9-09-65	15	do	
40	Roy L. Holland	do	Flat valley	Єcs	6	50	30	20	Reported	---	Stock	
41	Austin Knight	do	do	Єcs	6	60	50	---	---	---	Domestic and stock	
42	Edna Durham	do	do	Єcls	6	39	---	14.02	9-10-65	---	Domestic	
43	J. M. Owen	do	Flat surface	Єcsl	6	60.5	37	18	Reported	20+	Domestic and stock	
44	Ford Sexton	do	Flat valley	Єcls	6	62	9.5	42	do	---	Domestic	
45	Charles Holcomb	do	do	Єcls	6	60	22	14.69	9-15-65	---	Domestic and stock	
46	Alton Holcomb	do	do	Єcls	6	102	50	12	Reported	---	Domestic	
47	do	do	do	Єcls	6	135	50	---	---	---	do	
48	Marvin Taylor	do	Flat surface	Єcls-Єcl(?)	6	108	15	15	Reported	---	Domestic and stock	
49	do	do	do	Єcls-Єcl(?)	6	50	11	15	Reported	---	do	
50	Carl Sampler	do	Hilltop	Єcsl	6	110	---	---	---	20+	Domestic	

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6KK51	Andy Payne	Drilled	Flat valley	Ꞓcls	6	50	50	23.95	9-14-65	---	Domestic	End of casing open
52	E. E. Dilbeck	do	Hillside	Ꞓcls	6	100	39	37	Reported	---	Domestic and stock	
53	Sara Martin	Dug	Flat valley	Ꞓcsl	48	56.2	None	56.64	9-15-65	---	Domestic	
54	R. A. Owen	Drilled	do	Ꞓcsl	6	89	18	10	Reported	---	do	
55	Paul Dixon	do	Flat surface	Ꞓcl	6	57	---	10	do	---	do	Well flows in winter
56	Carl Chadwick	do	Hillside	Ꞓcl	6	47	20	17	do	---	do	
57	M. L. Johnson	do	do	Ꞓcls	6	128	None	27	do	---	do	Water enters well from crevice in rock at 38 feet and 78 feet
58	Mrs. Nettie Bradley	do	do	Ꞓcsl	6	80	30	26.54	9-15-65	28	do	
59	Paul & Bernice Pasley	do	do	OꞒk	6	80	60	47.71	9-15-65	---	do	
60	Judge Pascall	Dug	Flat valley	OꞒk	60	19.2	None	13.26	9-15-65	---	do	
61	J. H. Williams	Drilled	Local depression	OꞒk	6	73	73	10	Reported	---	do	21 feet of casing perforated
62	Hershal Greeson	do	Hillside	OꞒk	6	66.8	---	28.08	9-16-65	---	do	
63	Mrs. Hugh Smith	do	Flat valley	OꞒk	6	57	14	4	Reported	---	do	
64	Ernest Cochran	do	Hillside	OꞒk	6	181	180	50	do	---	do	
65	Harlan Greeson	do	Hilltop	Ꞓcsl	6	102	33	---	---	---	Domestic and stock	
66	Bill Campbell	do	Hillside	Ꞓcls	6	509	30	30	Reported	20+	do	2-foot fractures in rock, 507 to 509 feet
67	Richard Varner	do	Flat surface	Ꞓcsl	6	72	42	---	---	---	Domestic	
68	Walter Dobson	do	Hilltop	OꞒk	6	225	75	80	Reported	---	do	
69	Carl Long	do	Flat surface	OꞒk	6	111.5	111.5	30	do	---	do	21 feet of casing perforated
70	William Cooper	do	do	OꞒk	6	100	100	25	do	---	do	do
71	A. P. Beamer	do	Foot of hill	Ꞓr	6	86	65	40	do	---	do	
72	do	do	Hillside	Ꞓr	8	100	12	17.94	9-15-65	---	do	
73	J. R. Fain	do	do	OꞒk	6	102	45	15	Reported	---	do	
74	G. D. Sheriff	do	do	OꞒk	6	134	6.2	61.87	7-08-66	---	Domestic and stock	
75	Jessie Cox	do	do	OꞒk+Ꞓcm(?)	8	197	65	30	Reported	20	do	
76	G. A. Holbrook	do	do	OꞒk	6	147	147	45	do	---	Domestic	21 feet of casing perforated
77	J. C. Fox, Jr.	do	do	Ꞓcm	6	88	---	---	---	---	do	
78	J. E. Southerland	do	Flat surface	Ꞓcls	6	39	21	5	Reported	21	None	High iron
79	C. J. Freeman	do	Hillside		6	95	95	45	do	---	Domestic and stock	21 feet of perforated casing
7KK1	M. D. McDaniel	do	Flat valley	OꞒk	6	100	32	9	do	20+	do	QW analyses
2	J. H. Starr	do	Hilltop	OꞒk	6	115	115	6	do	12	do	Slotted casing
3	J. R. Silvers	do	Flat surface	OꞒk	6	100	84	---	---	---	do	
4	Hollis Hammond	do	Local depression	Ꞓcm	6	115	30	38	Reported	---	do	
5	T. Butler	do	Foot of hill	Ꞓcm	6	98	50	48	do	---	do	
6	L. M. McEntyre	do	Hillside	OꞒk	6	50	40	25	do	---	Stock	
7	do	do	do	OꞒk	6	110	55	92	do	---	Domestic and stock	Small yield
8	Sam Boston	do	Hilltop	OꞒk	6	114.4	---	56.43	8-20-43	---	do	
9	W. L. Dew	do	do	OꞒk	6	84	63	56.40	9-17-63	---	Observation	
10	W. B. Silks	do	Flat surface	Ꞓcsl	6	67	---	---	---	---	Domestic	
11	B. T. Rickett	do	Hilltop	Ꞓcsl	6	58.4	25	24.58	9-11-43	---	Domestic and stock	
12	Mr. Thacker	do	Hillside	Ꞓcls	6	25.3	---	14.78	9-16-43	---	Domestic	
13	Allen Woody	do	Hilltop	Ꞓcls	6	30	---	20.56	9-16-43	---	do	
14	Harmon Farm	do	do	Ꞓcs	6	79.7	---	46.57	9-17-43	---	do	
15	Mrs. Whitner	do	Valley	OꞒk	6	50	---	---	---	---	do	
16	R. T. Butler	do	Hillside	Ꞓcm	6	116	45	---	---	---	do	Dingy at times, near sink holes

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
7KK17	A. W. Erwin	Drilled	Local depression	OЄk	6	105	35	55.30 Pumping	9-17-65	30+	Domestic and stock	
18	Reece Benard	do	Flat valley	OЄk	6	193	193	50	Reported	10	do	End of casing open
19	Pat Erwin	do	Hillside	OЄk	6	117	116	70	do	20	Domestic	
20	J. H. Erwin	do	Hilltop	OЄk	6	201	90	100	do	---	Domestic and stock	
21	W. B. Williams	do	Hillside	OЄk	6	111	90	65	do	---	do	
22	W. L. Baker	do	Hilltop	Єcsl	6	40	---	18.31	9-16-65	---	Domestic	
23	M. C. Thomas	do	Hillside	Єcsl	6	104	62	---	---	---	Domestic and stock	
24	J. E. Stone	Dug	do	Єcsl	42	37	19	22.62	9-16-65	---	Domestic	
25	W. T. Lewis	do	do	Єcsl	36	45	None	38.[illegible]	9-16-65	---	do	
26	L. B. Gilreath	Drilled	Hilltop	OЄk-Єcm(?)	6	184	90	50	Reported	---	do	
27	David Reeve	do	Local depression	Єcm	6	219	18	32.00	9-17-65	---	do	
28	Joe Callaway	do	Hillside	OЄk	6	114	114	40	Reported	---	do	21 feet of perforated casing
29	Virland Dixon	do	do	OЄk	6	154	78	78	do	6	do	
30	Wayne Moore	do	do	OЄk	6	116	116	---	---	---	Domestic and stock	End of casing open
31	Billy Stone	do	do	OЄk	6	127	70	---	---	---	do	
32	Robert Darnell	do	do	OЄk	6	146	115	---	---	---	do	
33	Jack Hall	do	do	OЄk	6	79	78	16.27	7-12-66	---	Domestic	
34	Guy Stewart	do	do	OЄk	6	67	35	16	Reported	---	Domestic and stock	
35	J. B. Crump	do	do	OЄk	6	80	46	26.10	7-12-66	---	do	
36	W. B. Crump	do	Flat surface	OЄk	6	70	70	---	---	---	do	End of casing open
37	Mrs. Annie Mae Blalock	do	Hillside	OЄk	6	94	94	24.68	7-12-66	---	do	21 feet of perforated casing
38	J. F. Mathis	do	Flat surface	OЄk	6	104	88	---	---	---	do	
39	Henry J. West	do	Hillside	Єcsl	6	85	65	30	Reported	10+	do	
40	A. B. Jarrett	do	do	Єcsl	6	74	20	25	do	10	do	
41	Dan McReynolds	do	do	Єcsl	6	99	30	39	do	---	Domestic	
42	W. W. Johnson	do	do	Єcl	6	65	28	15	do	10+	Domestic and stock	
43	R. H. Acree	do	do	Єcsl	6	63	50	34.78	7-12-66	10	do	
44	Mrs. Aline Boston	do	Hilltop	Єcsl	6	64	---	47.00	7-12-66	---	Domestic	
45	R. H. Acree	do	Hillside	Єcsl	6	90	---	40	Reported	---	Domestic and stock	
46	W. T. Barton	do	Hilltop	Єcsl	6	140	15	40.53	7-12-66	---	Domestic	
47	do	do	Foot of hill	Єcsl	6	280	15	105.10	7-12-66	20	Domestic and stock	
48	Vernon Cowart	do	Hilltop	Єcsl	6	125	20	20	Reported	---	Domestic	
49	A. B. Jarrett	do	do	Єcsl	6	47	47	29	do	10+	Domestic and stock	Casing perforated
50	do	Dug	Flat surface	Єcsl	48	27	None	25.29	7-15-66	---	Domestic	
51	W. W. Garland	do	Hillside	Єcsl	48	23	None	13.36	7-13-66	---	do	
52	Mrs. Mary Ruth Fox	Drilled	do	Єcsl	6	90	90	---	---	---	do	Casing perforated
53	A. O. Wood	do	do	Єcm	6	215	75	75	Reported	---	do	
54	Theodore Butler	do	do	Єcsl(?)	6	100	90	30	do	10	Domestic and stock	
55	Joe Ward	do	Hilltop	OЄk	6	101	70	85	do	---	Domestic	
56	M. C. Stone	do	Hillside	OЄk	6	140	70	28	do	---	do	
57	Dewey Gowers	do	do	Єcm	6	70	30	---	---	---	Domestic and stock	
58	Herbert Henson	do	Hilltop	Єcsl	6	47	42	---	---	---	Domestic	
59	Howard Young	do	Hillside	Єcsl	6	260	75	21.90	7-14-66	20	Domestic and stock	
60	do	do	Hilltop	Єcs	6	100	---	20	Reported	---	None	
61	J. A. Wasson	Dug	do	Єcs	48	27	None	20.00	7-13-66	---	do	
62	Concord Baptist Church	Drilled	Hillside	Єcsl	6	54.5	---	9.10	7-14-66	---	Domestic	
63	S. L. Johnson	do	Flat surface	Єcsl	6	100	80	20	Reported	---	do	

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
8KK1	J. W. Beal	Drilled	Hillside	€cs	6	180	20	40	Reported	8	Domestic and stock	
2	City of Fairmount	do	do	€cls	8	500	80	25	do	20	City	QW analyses
3	John Shelhorse	do	do	€cls	6	110	---	59.18	2-03-50	---	None	
4	L. A. Dean	do	Valley	€cls	6	55.5	30	28	Reported	---	do	
5	J. H. Austin	do	do	€cls	6	99.7	---	12.44	9-17-43	---	do	
6	Andrew and Winnie Clark	do	Hilltop	€cls	6	99.6	---	36.10	9-17-43	---	do	
7	Mrs. C. O. Bird	do	do	€cls	6	126.5	27	20.87	9-17-43	---	do	
8	J. B. Richardson	do	Valley	€cls	6	300	27	14	Reported	---	do	
9	Lumber Co.	do	do	€cls	6	250	60	---	---	5	do	
10	Philip Tate	do	do	€cls	6	387	66	27.29	2-03-50	---	do	
11	W. S. Wilson	do	do	€cls	6	190	40	30.30	9-17-43	---	do	
12	Dave Vaughn Estate	do	Hilltop	€cls	6	181	---	75.31	9-17-43	---	Domestic	
13	do	do	do	€cls	6	400±	---	70	Reported	---	None	
14	Sam Powers	do	Hillside	€cls	6	143	24	---	---	20	Domestic	Water muddies
15	Homer Warlick	do	Valley	€cls	6	46.6	---	27.43	9-16-43	---	do	
16	Sam Hunt	do	do	€cs-€cls(?)	6	37	---	25.27	9-11-43	---	do	
17	do	do	do	€cs-€cls(?)	6	28.2	---	18.56	9-11-43	---	do	
18	Edna Tate Estate	do	do	€cls	6	77	---	27.50	9-11-43	---	None	
19	Bobby Arnold	do	do	€cls	6	69.6	---	16.28	9-11-43	---	Domestic	
20	Allen Woody	do	Hillside	€cls	6	16[illegible].5	---	68.40	9-16-43	---	do	
21	J. M. Nicholson	do	Foot of hill	€cls	6	101	43	29.52	7-14-66	10+	do	
22	H. A. Boling	do	Hillside	miu	6	90	---	60	Reported	10+	Domestic and stock	
23	do	do	do	miu	6	200	40	10	do	10+	do	
24	W. H. Gibson	do	do	miu	6	218	30	60	do	10+	do	
25	Onice Young	do	do	miu	6	101	20	50	do	---	do	
26	V. F. Phillips	do	do	miu	6	70	---	---	---	---	do	
[illegible]	Gordon Craig	do	do	€cls	6	140	21	26.13	7-20-66	---	do	
28	Brady Champion	do	do	€cls	6	183	45	---	---	---	Domestic	
29	City of Fiarmount	do	do	€cls	10-8	450	---	149	Reported	50	City	
30	W. A. Pagett	do	Valley	€cls	6	173.5	---	23	do	---	Domestic	
31	City of Fairmount	do	do	€cls	6	136	21	23	do	100	City	QW analyses
5LL4	Harry Copeland	do	do	Mfs	4	42.9	---	11.67	7-30-43	---	None	
5	Gordon County Bd. of Ed.	do	do	€csl	6	51	51	21	Reported	---	None	
6	R. F. Jones	do	Hilltop	Mfs	6	232	28	27	do	6	Domestic	
[illegible]	Inus Brown	do	Flat valley	Mfs	6	50	50	25	do	---	do	End of casing open
8	Robert Couch	do	do	MDc	6	85	74	---	---	22	do	
9	Ralph Sitton	do	do	€csl	6	80	26	3	Reported	---	do	
10	Thomas Mullins	do	Hilltop	€csl	6	105	---	---	---	---	do	
11	C[illegible]es Baker	do	Hillside	€csl	6	53	50	20	Reported	---	do	
12	Glender Brown	do	do	€csl	6	107	---	---	---	---	do	

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
5LL13	Robert Seritt	Drilled	Flat valley	MDc	6	77	69	48	Reported	---	Domestic	
14	Dan and Roxie Brown	do	Hilltop	MDc	6	67	67	---	---	---	None	Small yield, would pump dry
15	M. P. Davis	do	Flat surface	Mfs	6	155	19	---	---	---	Domestic and stock	
16	William Langley	do	Hillside	MDc	6	81	27	4	Reported	---	Domestic	
17	Bill West	do	Flat valley	MDc	6	85	84	34	7-20-65	---	do	
18	J. M. Muse	do	do	MDc	6	358	---	16.8	7-31-43	---	None	
19	A. R. Hutchinson	do	Hillside	Mfs	6	100	82	---	---	---	Domestic and stock	
20	Joe, Bob and Roy Russell	do	do	MDc	6	160	---	---	---	---	Domestic	
21	Raymond Albright	do	do	Mfs	6	110	110	25	Reported	---	do	Perforated casing
22	W. M. Patterson	do	do	Ꞓcsl	6	100	56	16	do	---	do	
23	J. H. Byerley	do	Hilltop	Ꞓcsl	6	95	83.5	47.57	7-15-65	---	do	
24	Harley Defoor	do	Flat valley	MDc	6	144	144	6	Reported	---	Domestic and stock	
25	Roy Brown	do	Foot of mountain	MDc	3	156	---	Flows	7-15-65	3	None	High iron
26	Maud Harbour	do	Hillside	Mfs	6	42	16	---	---	---	Domestic	
27	J. W. & R. L. Russell	do	do	Ꞓcsl	6	120	80	---	---	---	Stock	
28	Mrs. G. M. Jones	do	do	Ꞓcsl	4	74	60	5	Reported	3	Domestic	
29	S. L. Hawkins	do	do	Ꞓcsl-Mfs(?)	6	100	65	---	---	---	Domestic and stock	
30	Rice O. Herrington	do	do	Ꞓcsl	6	126	53	50	Reported	---	do	
31	F. F. Waldrop	do	Valley	Mfs	6	58	50	20	do	60	Domestic	QW analyses
32	Myrtle Brown	do	Hillside	Mfs	4	64.8	59	50.48	7-31-43	---	None	
33	Jimmie Floyd	do	do	Ꞓcsl	4	40	35	10	Reported	---	None	
34	G. H. Faulkinberry	do	do	Mfs	4	60.7	20	20.54	7-30-43	---	do	
35	Ed. Deans	do	Hilltop	Mfs	6	80.4	75	73.14	7-31-43	---	do	
36	J. C. Malone	do	Hillside	Ꞓcsl	4	42	38	13	Reported	16	do	
6LL1	Carlton Poarch	do	do	Ꞓcsl	6	60	10	25	do	8	Domestic	QW analyses
2	J. W. Moss, Jr.	do	Flat valley	Ꞓcsl	6	125	56	20	do	---	Domestic and stock	
3	Marvin Roberts	do	Valley	Ꞓcsl	5	27	40	13.4	8-16-43	---	do	Original depth 40 feet
4	Remes Lackey	do	Local depression	Ꞓcsl	5	34.3	---	9.4	8-17-43	---	do	
5	J. C. Blackstock	do	Hillside	Ꞓcsl	5	45.2	30	22.00	8-16-43	---	do	
6	Mrs. Flora Stansell	do	Hilltop	Ꞓcsl	5	50.6	---	17.26	8-16-43	---	do	
7	A. L. Taylor	do	Valley	Ꞓcls	8	35	12	5	Reported	---	None	Well destroyed
8	D. T. Davis	do	do	Ꞓcls	4	44	20	22	do	---	Domestic	
9	Gordon County Bd. of Ed.	do	do	Ꞓcsl	6	125	125	15	do	---	do	
10	E. W. Chitwood	Dug	do	Ꞓcs	48	23.9	None	19.25	8-30-44	---	None	
11	May Norrell	Drilled	Hillside	Ꞓcls	6	57.7	54	33.00	7-28-43	---	do	
12	A. B. David	do	Valley	Ꞓcsl	6	125	35	40	Reported	---	Domestic	
13	J. B. Holland	do	do	Ꞓcls	6	56.4	3	4.48	5-18-65	---	None	
14	Echota Cotton Mill	do	do	Ꞓcsl	8	316	60	5	Reported	70	do	
15	do	do	do	Ꞓcsl	8	385	80	16	do	80	do	
16	Cherokee Candlewick Inc.	do	do	Ꞓcsl	8	202	40	4.5	do	60	do	
17	City of Calhoun	do	do	Ꞓcsl	8	298	105	5	do	100	None	Well went dry when pumped at 200 gpm for 5 weeks. Well destroyed
18	do	do	do	Ꞓcsl	10	401	65	5	do	200	Domestic	
19	M. T. Cook	do	Flat surface	Ꞓcsl	6	50	14	10	do	---	do	
20	B. K. Kincaid	do	Hillside	Ꞓcsl	6	105	24	18.30	6-16-65	15+	do	
21	Dennis Owens	do	do	Ꞓcsl	6	100	22	18.50	6-17-65	---	Domestic and stock	
22	Mrs. Otis Russell	do	do	Ꞓcsl	6	108	10	9.27	6-17-65	---	Domestic	
23	J. C. Caldwell	do	Valley	Ꞓcsl	6	100	100	20	Reported	---	do	

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6LL24	H. O. Stanley	Drilled	Hillside	Ꞓcls	6	100	6	40	Reported	---	Domestic	
25	R. E. Blackstock	do	do	Ꞓcsl	6	100	---	40	do	---	do	
26	Dock Sesson	do	Flat surface	Ꞓcsl	6	100	57	15	do	---	Domestic and stock	
27	Lloyd Bowen, Jr.	do	do	Ꞓcsl	6	102	33	17	do	---	Domestic	
28	Buford Chitwood	do	Hillside	Ꞓcsl	6	102	21	32.00	6-24-65	14	do	
29	do	do	Flat surface	Ꞓcsl	6	92	42	16	Reported	---	Stock	
30	Mack Rudledge	Dug	Hillside	Ꞓcsl	42	31	None	10.65	6-24-65	---	do	
31	H. E. Hall	do	do	Ꞓcs	36	50	do	37.90	6-24-65	---	Domestic	
32	C. L. Moss	do	Valley	Ꞓcsl	48	31.4	do	22.14	6-18-65	---	do	
33	James Sloam	Drilled	Hillside	Ꞓr	6	100	75	---	---	---	None	Well muddies
34	S. R. Sloan	Dug	do	Ꞓr	60	54.3	None	31.50	6-18-65	---	do	
35	Frank Craig	Drilled	Valley	Ꞓcsl	6	88	88	30.00	6-18-65	---	Domestic and stock	End of casing open
36	do	do	do	Ꞓcm	6	68	68	20	Reported	---	do	do
37	Gus Moore	do	Hillside	Ꞓcsl	6	100	50	45	do	10+	Stock	
38	do	do	do	Ꞓcsl	6	120	70	50	do	10+	Domestic	
39	Earl Greezon	do	Hilltop	OꞒk	6	108	---	22	do	---	do	
40	Dennis Chastain	do	Hillside	Ꞓcm	6	60	60	43.18	7-07-65	---	do	
41	Ernest Gee, Jr.	do	do	OꞒk	6	125	95	37.00	7-07-65	10+	Domestic and stock	
42	Ernest Gee, Sr.	do	do	Ꞓcm	6	240	---	141.57	7-07-65	2	do	Pumps dry
43	do	do	do	Ꞓcl	6	102	102	10	Reported	---	do	Flows during wet periods
44	H. L. Lening	do	do	Ꞓcsl	6	45	14	6	do	---	None	
45	Fred Caldwell	do	Flat surface	Ꞓcsl	6	91	30	18	do	---	Domestic	
46	Albert Gallman	do	Valley	Ꞓcl	6	112	---	22	do	---	do	
47	Zeb Thompson	do	do	Ꞓcl	6	59	---	20.75	10-02-43	---	do	
48	Robert Casey	do	Hillside	Ꞓcsl	6	80	24	29.95	7-08-65	---	do	
49	J. L. Greenway	do	Flat surface	Ꞓcsl	6	79	65	---	---	---	Domestic and stock	
50	Freeman Roberts	do	Hillside	Ꞓcsl-Ꞓr(?)	6	100	87	---	---	---	do	
51	Jim McRee	do	do	Ꞓcsl	6	100	54	31.50	7-08-65	---	do	
52	C. L. Hall	do	do	Ꞓcsl	6	75	75	48	Reported	---	Domestic	21 feet of perforated casing
53	C. L. Jones	do	do	MDc	6	75	75	29	do	---	do	do
54	do	do	do	Ꞓcsl	6	75	75	13.12	7-08-65	---	do	High iron
55	Grady Burns	do	do	Ꞓcsl	6	96	96	12.74	7-08-65	---	do	21 feet of perforated casing
56	R. F. Hogan	do	Flat surface	MDc	6	95	90	39	Reported	---	do	
57	G. H. Blackstock	do	do	MDc	6	100	100	45	do	---	Domestic and stock	21 feet of perforated casing muddies after rain
58	John Blair	do	do	MDc	6	155	---	12.44	7-08-65	---	do	High iron
59	W. M. King	do	Hilltop	MDc	6	90	87.5	42.66	7-13-65	---	Domestic	
60	do	do	do	MDc	6	102	102	41.82	7-13-65	---	None	Water muddied
61	B. T. Brown	do	Flat valley	Ꞓcsl	6	60	35	20	Reported	---	Domestic	
62	Mrs. O. J. Amos	do	Flat surface	MDc	6	78	25	---	---	---	do	
63	W. S. Wheat	Dug	do	Ꞓcsl	30	48.5	48.5	31.28	7-13-65	---	do	End of casing open
64	Claude Walraven	do	Hillside	Ꞓcsl	30	20.6	None	12.04	7-13-65	---	None	
65	S. J. Dopson	do	Flat valley	Ꞓcsl	30	17.9	do	10.33	7-13-65	---	Domestic	
66	Rayford McDaniel	do	do	Ꞓcsl	36	36.4	None	26.61	7-13-65	---	None	
67	J. W. Brown	Drilled	do	Ꞓr	6	103	63	26.36	7-13-65	---	do	
68	Hubert Greeson	do	Hillside	Ꞓcsl	6	150	59	19.77	7-13-65	---	Domestic and stock	
69	R. T. Miller	do	do	Ꞓcsl	6	105	105	45	Reported	10+	Domestic	Perforated casing

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6LL70	M. D. Casey	Drilled	Hillside	Єcsl	6	158	158	30	Reported	---	Domestic and stock	End of casing open
71	D. J. Smith	do	Flat surface	Єcsl	6	97	77	16	do	---	Domestic	
72	Paul Lusk	do	Hillside	OЄk	6	135	100	20	do	---	do	Flows in wet weather
73	T. E. Reeve	do	do	Єcm	6	20	---	8	do	40	Domestic and stock	
74	J. B. Postell	do	do	Mfs	6	76	76	29	do	---	Domestic	End of casing open
75	D. O. Casey	do	do	Єcsl	6	220	120	27	do	---	Domestic and stock	
76	Hoyt Hightower	do	do	Єcsl	6	83	30	20	do	---	Domestic	
77	Alex Harris	do	do	Єcsl	6	330	30	20	do	20	Domestic and stock	
78	Harvey Combs	do	do	Єcsl	6	54	10	12	do	10	do	
79	City of Calhoun	do	Local depression	OЄk-Єcm(?)	8	183	111	6	do	200	None	Destroyed
80	Calhoun Ice Co.	do	Valley	Єcl	6	168	---	7	do	57	do	do
7LL1	W. P. Hunt	do	Hilltop	Єcsl	6	280	---	78.75	8-18-43	---	Domestic	
2	Mrs. J. L. Wyatt	do	Flat surface	Єcsl	6	25	---	3.90	8-18-43	---	do	
3	Z. V. Reddick	do	Hillside	Єcsl	6	48.5	---	15.76	8-19-43	---	do	
4	Frank Kelly	do	Hilltop	Єcsl	6	48.6	20	24.78	8-18-43	---	do	
5	J. C. Baxter	do	Flat surface	Єcsl	6	85	85	25	Reported	10+	Stock	Perforated casing
6	Estate of Mrs. Sam Owens	do	do	Єcsl	6	112	---	25.14	8-17-43	---	Domestic	
7	Jean Owen	do	Hilltop	Єcsl	6	183	52	60	Reported	---	None	Destroyed
8	Estate of Mrs. Sam Owens	do	do	Єcsl	6	85.5	52	18.25	8-17-43	---	Domestic	
9	Ford Roberts	do	do	Єcm	6	167.5	60	---	---	---	Domestic and stock	
10	McClain Causby	do	do	Єcm	4	89.8	50	35.08	8-18-43	---	Domestic	
11	Gordon County Bd. of Ed.	do	do	Єcm	6	98	---	50	Reported	---	do	
12	H. B. Allen	do	Local depression	Єcsl	6	100	15	20	do	---	Domestic and stock	
13	C. L. Moss	do	Hilltop	Єcm-Єcsl(?)	6	160	---	---	---	---	do	
14	O. W. Pankey	do	Hillside	Єcs	6	102	14.5	---	---	10	Domestic	
15	Frank Taylor	do	Hilltop	Єcs	6	42.3	---	24	9-09-43	---	do	
16	Mrs. Henry Padgett	do	do	Єcs	6	32.6	22	12.30	9-07-43	---	do	
17	D. Z. Whittmore	do	Hillside	Єcs	6	63.3	---	13.66	9-10-43	---	do	
18	Warren McDaniel	do	do	Єcs	6	39.4	---	12.95	8-14-43	---	do	
19	Jordon Taylor	do	do	Єcs	6	51.2	---	12.89	9-10-43	---	do	
20	R. G. Thompson	do	do	Єcs	6	100	21	---	---	---	Stock	
21	Troy Knight	do	do	Єcs	6	115	28	15	Reported	---	Domestic	
22	C. J. Welch	do	do	Єcs	6	98	17	5.40	7-06-66	10+	do	
23	J. C. Fite	do	do	Єcs	6	59.5	---	22.01	9-10-43	---	do	
24	Heywood Porter	do	do	Єcs	6	61.6	---	16.40	9-14-43	---	do	
25	Curtis Welch	do	do	Єcsl	6	100	20	18	Reported	--	Domestic and stock	
26	Max Tolbert	do	Hilltop	Єcsl	6	79	65	37.40	8-19-43	---	Domestic	
27	Jess Borders	do	Hillsidw	Єcsl	6	100	6	20	Reported	---	Domestic and stock	
28	do	do	do	Єcsl	6	50	---	---	---	---	Domestic	
29	do	do	do	Єcsl	6	40.9	---	17.22	8-18-43	---	do	
30	Gordon County Bd. of Ed.	do	do	Єcm	6	100	---	---	---	---	None	Destroyed
31	C. W. Henry	do	do	Єcm	6	84	50	30	Reported	---	Domestic	
32	Marvin White	do	do	OЄk	6	137.5	43	12	do	---	do	
33	J. O. Wheaver	do	do	OЄk	6	130	130	---	---	10+	do	Perforated casing
34	W. Larkin Weaver	do	Flat surface	OЄk	6	81	76	---	---	---	Domestic and stock	
35	Grady King	do	do	Єcsl	6	75	24	---	---	---	do	
36	Mrs. Sudie Floyd	do	Hillside	OЄk	6	80	80	30	Reported	---	do	End of casing open

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
7LL37	L. P. Owen, Sr.	Dug	Hilltop	Ꞓcm	30	64	64	48.00	6-16-65	---	Domestic and stock	
38	Lloyd Patterson	Drilled	Hillside	Ꞓcsl	6	100	---	7	Reported	20	do	
39	Henry Fortenberry	do	do	Ꞓcsl	6	75	12	14.95	6-16-65	---	do	
40	G. C. Quinn	do	do	Ꞓcsl	6	75	20	---	---	---	Domestic	
41	Creswell Black	do	do	Ꞓcsl	6	100	27	20	Reported	---	do	
42	Sallie Weaver	do	do	Ꞓcsl	6	100	18	18	do	---	do	
43	Roland Jeffords	do	do	Ꞓcsl	6	46	46	18	do	---	do	Perforated casing
44	C. T. Quinn	do	do	OꞒk	6	90	90	20	do	---	Domestic and stock	End of casing open
45	M. M. Crump	do	Valley	Ꞓcsl	6	105	57	---	---	---	do	
46	R. J. Royers	do	do	Ꞓcsl	6	101	10	7	Reported	---	Stock	
47	C. L. Weaver	do	Hillside	OꞒk	6	95	95	---	---	10	Domestic and stock	End of casing open
48	L. D. Reese	do	Valley	Ꞓcs	6	35	---	8	Reported	---	Domestic	
8LL1	J. L. Owens	do	Hilltop	Ꞓcls	6	82	20	35	Reported	---	do	QW analyses
2	Mart Baxter	do	Valley	Ꞓcs	6	26	---	4.46	9-10-43	---	do	
3	Loy Puckett	do	Hillside	Ꞓcls	6	48	---	---	---	---	do	
4	Mrs. H. L. Wilson	do	do	Ꞓcls	6	48.2	---	31.15	9-14-43	---	do	
5	Jess Brown	do	do	Ꞓcls	6	52	---	17	Reported	---	do	
6	G. B. Owen	do	Valley	Ꞓcls	6	22	---	16	do	---	do	
7	J. W. Ratcliff	do	do	Ꞓcls	4	60.1	---	24.91	9-14-43	---	do	
8	Gordon County Bd. of Ed.	do	Hilltop	Ꞓcls-Ꞓcs(?)	6	63	---	---	---	---	do	
9	Mrs. John Davenport	do	do	Ꞓcls-Ꞓcs(?)	6	42.8	---	12.66	9-10-43	---	do	
10	V. G. Silvers	do	do	Ꞓcs	6	54.5		35.38	9-15-43	---	do	
11	Mrs. J. M. Black	do	Valley	Ꞓcls	6	59.8		12.67	9-15-43	---	do	
12	J. W. Evans	do	do	Ꞓcls	6	178.7		11.88	9-15-43	---	do	
13	V. G. Silvers	do	do	Ꞓcs(?)(Ꞓcl	6	119.8		---	---	---	do	
14	Fair View Church	do	do	Ꞓcs	6	29.6		10.95	9-15-43	---	do	
15	V. G. Silvers	do	do	Ꞓcs	6	57.1	4	13.3	8-14-43	---	do	
16	do	do	Hillside	Ꞓcs	6	55.2	---	24.76	8-14-43	---	do	
17	Rome Kraft	do	Valley	Ꞓcs	6	107.7	---	---	---	---	do	
18	C. B. Black	do	Hillside	Ꞓcs	6	64.7	---	27.87	8-14-43	---	do	
19	Felton Johnson	do	do	Ꞓcs	6	24.2	---	8.13	8-14-43	---	do	
20	J. W. Harris	do	Flat valley	Ꞓcs	6	100	23	---	---	---	Domestic and stock	
21	Ralph Tatum	do	Hillside	Ꞓcs	8	60	42	10	do		do	
22	Martha Scott	do	Valley	Ꞓcs	6	34.9	---	8.73	9-10-43	---	Domestic	
23	Ralph Tatum	do	do	Ꞓcs	6	29.1	---	16.98	9-10-43	---	do	
24	Lawrence Mulkey	do	Hilltop	Ꞓcls	6	58.3	---	25.50	9-18-43	---	do	
25	A. L. Earnest	do	Valley	Ꞓcls	6	34	---	---	---	---	do	
26	G. W. Parks	do	do	Ꞓcls	6	67	---	8	Reported	5+	do	
27	Mrs. H. M. Ashworth	do	do	Ꞓcls	6	35	35	---	---	---	do	Perforated casing
28	G. W. Parks	do	Hilltop	Ꞓcls	6	107	---	---	---	---	do	
29	Mrs. R. V. Putman	do	Hillside	Ꞓcls	6	64	---	18.95	9-18-43	---	do	
30	Mrs. Vanetah Bowen	do	Valley	Ꞓcls	6	52	14	8	Reported	---	do	
31	Mrs. A. A. Lambert	do	do	Ꞓcls	6	43.8	---	5.18	9-18-43	---	do	
32	J. W. Evans	do	do	Ꞓcls	6	26.1	---	15.42	9-18-43	---	do	
33	Shell Oil Company	do	Hillside	Ꞓcls	6	45	45	---	---	---	do	Perforated casing
34	J. K. Hill	do	Valley	Ꞓcls	6	41.7	8	7.67	9-18-43	---	do	
35	Wes Evans	do	Hilltop	Ꞓcls	6	111	---	15.33	7-20-66	---	None	Low yield - would pump dry - water has bad smell
36	Virgil Brown	do	Hillside	Ꞓcls	6	77	14	19.35	7-20-66	---	Domestic	

Table 5.--Record of wells in Gordon County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield	Use	Remarks
8LL37	Virgil Brown	Drilled	Hilltop	Ꞓcls	6	88	---	20	Reported	10+	Domestic and stock	
38	S. H. Leatherwood	do	Hillside	Ꞓcls	6	67	20	30	do	---	Domestic	
39	Mrs. R. L. Moreland	do	Valley	Ꞓcls	6	100	26	---	---	---	Domestic and stock	
40	Edward Rogers	do	Hillside	Ꞓcls	6	41.6	---	15.57	9-09-43	---	Domestic	
41	L. E. Silvers	do	Valley	Ꞓcs	6	53	---	30.61	7-20-66	10+	Domestic and stock	

Table 6.--Record of wells in Whitfield County, Georgia

Geologic symbol: Mfs, Floyd Shale; MDc, chert of Mississippian and Devonian age; Mls, Lavender Shale Member of Fort Payne Chert; Srm, Red Mountain Formation; Om, Moccasin Formation; Ob, Bays Formation; Oh, Holston Limestone; OꞒk, Knox Group; Ꞓcm, Maynardville Limestone Member of the Conasauga Formation; Ꞓcsl, shale and limestone of the Conasauga; Ꞓcls, limestone and shale of the Conasauga; Ꞓcs, shale and siltstone of the Conasauga; Ꞓcl, limestone unit of the Conasauga; Ꞓr, Rome Formation.

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
5MM1	Dan Tullock	Drilled	Flat valley	Ob	6	60	14	6	Reported	20	Domestic and stock	QW analyses
2	J. F. Owens	do	Hillside	OꞒk	6	227	200	87	do	3	do	High iron
3	Gaston Davis	do	do	OꞒk	6	150	150	---	---	---	do	Perforated casing
4	David Owens	do	do	MDc	6	180	180	40	Reported	---	do	Do
5	Loy Collins	do	Undulating	Ob	6	100	22	---	---	10	do	
6	J. W. Collins	do	Hillside	Ꞓr	6	110	44	---	---	---	do	
7	Floyd Sheram	do	do	Ꞓcsl	6	100	17	---	---	---	do	
8	John Hammontree	do	Flat surface	Ꞓcsl	6	100	40	---	---	---	do	
9	Claude Holcomb	do	Hillside	Ꞓr	6	144	144	21	Reported	10	do	Perforated casing
10	O. E. Quades	do	Hilltop	OꞒk	6	270	175	---	---	12	do	Iron
11	C. W. Master	do	Undulating	Ob	6	102	20	16.60	11-02-67	---	Domestic	
12	Bradley Estate	do	Hillside	Ob	6	131	---	---	---	6	do	
13	Lee Montgomery	do	Valley	Ob	5	55	15	15.94	10-14-43	2	Domestic and stock	
14	T. J. Gazaway	do	Flat valley	MDc	6	55	55	25	Reported	5	do	Perforated casing QW analyses
15	Ed. King	do	Hillside	Ꞓcsl	6	135	25	---	---	16	Stock	
16	Mrs. Gussie Garrett	Dug	do	Ꞓcsl-MDc(?)	36	23	None	6.49	11-16-67	---	Domestic	
17	Joe B. Cochran, Sr.	Drilled	Flat valley	MDc	6	86	84	50	Reported	---	do	High iron
6MM1	Elbert Wells	do	Undulating	Ꞓcsl	6	100	12	8	do	8	Domestic and stock	
2	John D. Groves	do	do	Ꞓcsl	6	82	7	2.63	10-25-67	---	Domestic	
3	James B. Brown	do	Hillside	Ꞓcs	6	100	40	---	---	10	Domestic and stock	
4	Charles Russell	do	do	Ꞓcsl	6	143	53	---	---	---	do	
5	M. Vester Stanley	do	do	Ꞓcs	6	159	42	50	Reported	10	do	
6	Jessie Penion	Dug	Undulating	Ꞓcs	48	23.6	None	15.88	10-30-67	---	None	
7	Jim Underwood	Drilled	Hillside	Ꞓcs	6	85	21	21	Reported	---	Domestic	
8	Tilton Baptist Church	Dug	do	Ꞓcs	60	19.4	None	11.11	10-23-67	---	None	
9	Viola Bright	do	do	Ꞓcs	48	27.5	None	16.80	10-30-67	---	None	
10	Charlie Ray	Drilled	do	Ꞓcs	6	58	24	15	Reported	---	Domestic	
11	John F. Burns	Dug	do	Ꞓcs	48	25.2	None	14.15	10-23-67	---	None	
12	Marian Maples	Drilled	do	Ꞓcsl	6	115	30	---	---	---	Domestic	
13	Harem Voyles	do	Foot of hill	MDc	6	55	51	49.44	11-18-64	---	do	QW analyses
14	E. Guy Jones	Dug	Flat valley	Ꞓcsl	36	19	None	---	---	---	do	
15	C. J. Holland	do	Ridge	Ꞓcsl	48	21.9	None	13.91	11-16-67	---	do	
16	J. R. Ratcliff	Drilled	Hilltop	Ꞓcs	6	105	30	40	Reported	---	do	
17	George Bell	Dug	Undulating	Ꞓcs	48	34.5	None	25.67	11-14-67	---	do	
18	Mrs. Charles Evans	do	Hillside	Ꞓcs	48	24.8	None	14.00	11-14-67	---	None	
19	Marvin Seay	Drilled	Hilltop	Ꞓcs	6	105	25	25	Reported	---	Domestic	
20	Jess Brock	do	Undulating	Ꞓcsl-Ꞓcs(?)	6	72	60	22	do	---	None	
21	Robert H. Gillespie	do	Hilltop	Ꞓcs	6	105	60	40	do	---	Domestic	
22	T. G. Strickland	do	Undulating	Ꞓcsl	6	42.7	---	3.76	11-15-67	---	None	
23	Homer L. Cook	Dug	Hillside	Ꞓcsl	48	30	---	21.49	11-15-67	---	Domestic	
24	Sam Duncan	Drilled	do	Ꞓcs	6	115	40	30	Reported	---	do	
25	Hubert Johns	do	Hilltop	OꞒk	6	117	117	62	do	7	do	
26	F. W. Keen	do	Flat valley	OꞒk	5	60	60	22	do	12	do	
27	do	do	Hilltop	OꞒk	5	77	---	63.45	8-30-44	---	None	Abandoned - insufficient water
28	Irwin Block	do	Hillside	OꞒk	6	132.6	---	75.05	8-30-44	---	Domestic	

Table 6.--Record of wells in Whitfield County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6MM29	Marvin Grant	Drilled	Flat valley	O€k	6	70	70	20	Reported	10	Domestic	High iron
30	Trammell Johns	do	Undulating	O€k	6	82	80	60	do	---	None	Perforated casing
31	Ed King	do	Hillside	€csl	6	135	25	---	---	---	Stock	
7MM53	Paul Mitchell	do	Local depression	€csl	6	100	86	---	---	---	Domestic and stock	
54	E. C. Caylor	do	Hilltop	€csl	6	77	21	17	Reported	10	Domestic	
55	Melvin Bryson	Dug and drilled	Undulating	€csl	6	75	26	23	do	10	do	
4NN1	Jack Duvall	Drilled	Hillside	Mls	6	100	48	---	---	---	Domestic and stock	
2	A. G. Tate	do	do	MDc	6	100	17	---	---	---	Domestic	
5NN1	Frank Powell	do	do	O€k	6	160	158	---	---	---	do	
2	Jerry Cook	do	Undulating	O€k-€cm(?)	6	170	125	---	---	---	Domestic and stock	
3	J. D. Lowry	do	Hilltop	O€k	6	105	55	45	Reported	---	do	
4	Robbie Griffin	do	Hillside	O€k	6	100	100	---	---	---	Domestic	Perforated casing
5	Eston Manley	do	do	O€k	6	100	100	---	---	---	Domestic and stock	Do
6	Kendall Hall	do	do	€csl	6	100	36	---	---	10	Domestic	
7	Oscar Nance	do	Flat surface	Ob	6	129	83	25	Reported	---	Domestic and stock	
8	Willie Boyd	do	Hillside	O€k	6	239	34.5	---	---	---	do	
9	Mrs. Johnnie Gilstrap	do	Depression	O€k	6	115	68.5	35	Reported	6	do	
10	Ruth F. Reed	do	Hillside	€csl	6	100	22	20	do	---	do	High iron
11	Clifford Davis	do	Flat surface	€csl	6	100	31	---	---	---	do	
12	Arthur Belk	do	Undulating	Ob	6	100	100	---	---	---	do	Perforated casing
13	Dual Broodrick	do	Hillside	€r	6	250	38	15	Reported	3	do	
14	Joel Hayes	do	Flat surface	Om	6	100	96	13	do	---	do	
15	Mrs. Marlin Clark	do	Hillside	€cm	6	150	29	11	do	---	do	
16	James Poarch	do	Local depression	Om	6	111	104	25	do	---	do	
17	Arnold Duckworth	do	Flat valley	€r	6	75	62	30	do	---	do	
18	B. C. Epps	do	Hillside	€r	6	100	12	20	do	---	do	
19	Farley E. Cook	do	do	Ob	6	80	80	35	do	10	do	21 feet of casing perforated
20	Aud J. Franks	do	Flat surface	€csl	6	165	45.5	17	do	9	do	
21	John C. Cash	do	Hillside	Ob	6	101	41	---	---	---	do	
22	J. Ernest Thompson	do	Flat surface	Ob	6	102	45	---	---	---	do	
23	Henry Epps	do	Hillside	€cls	6	185	---	8.65	10-24-67	---	None	
24	do	do	do	€cls	6	115	21	11.12	10-24-67	8	do	
25	G. W. Beaver	do	do	Ob	6	82.5	82.5	40	Reported	---	Domestic	21 feet of casing perforated
26	Claude Haynes	do	do	Ob	6	57	42	18	do	10	do	
27	Issac Adams	do	Flat valley	Ob	5	87	---	17	do	---	Domestic and stock	
28	Tom Gilbert	do	Hillside	O€k	5	92.5	---	39.44	10-15-43	---	Domestic	
29	Mrs. Willie Woods	do	do	Ob	5	49.5	40	25	Reported	10	Domestic and stock	Pumps dry
30	John Rogers	do	Hilltop	€r	6	148.6	---	15.68	10-15-43	4	do	
31	A. L. Middleton	do	Undulating	€r	6	80	30	10	Reported	10	Domestic	QW analyses
32	Clyde Hayes	do	Hillside	€r+Om(?)	6	144	75	10	do	10	do	Do
6NN1	John L. Miller, Jr.	do	Rolling	€csl	6	100	22	50	do	---	do	
2	Johnnie Combes	Dug	Hillside	Ob	36	60	None	42.00	3-23-65	---	None	QW analyses
3	Ethel Coggins	Drilled	Rolling	€csl	6	100	30	28	Reported	---	Domestic and stock	
4	Charles T. Gay	do	do	€cs	6	100	56	24	do	---	do	
5	Floyd M. Henry	do	Hillside	€cs	6	125	23	20	do	9	Domestic	
6	Amos Cochran	do	do	€csl	6	190	---	---	---	---	do	Pumps dry
7	John H. Patterson	do	do	€csl	6	100	35	20	Reported	---	do	
8	Henry Warmack	do	Valley	€csl	6	64	12	40	do	5	---	
9	Paul Maries	do	Hillside	O€k	6	185	72	30	do	---	Domestic	

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6NN10	James C. Carter	Drilled	Hillside	Єcsl	6	80	50	---	---	10+	Domestic and stock	
11	Mrs. W. L. Williams	do	Flat valley	Ob	6	105	74	15	Reported	20	do	
12	John F. Rollins	do	Rolling	Ob	6	117	117	20	do	5	do	Perforated casing
13	C. E. Morrison	do	Hillside	OЄk-Єcsl(?)	6	128	85	40	do	---	do	
14	J. V. Harris	do	Flat surface	Єcsl	6	135	60	27	do	---	do	
15	Leonard Morris	do	Hillside	OЄk	6	100	100	30	do	---	Domestic	Perforated casing
16	T. E. Masters	do	do	Єcm	6	55	?	38.00	9-12-67	---	do	
17	Earnest Ellis	do	do	Єcsl	6	68	42	5	---	20	do	
18	J. E. Poteet	Dug	Hilltop	Єcs	60	39.5	None	30.92	9-14-67	---	None	
19	Walter McClure	do	Rolling	Єcsl	36	18	18	10	Reported	---	do	
20	G. T. Whaley	Drilled	Hilltop	OЄk	6	137	133	28	do	--	Domestic	
21	[illegible]. L. Long	do	do	OЄk	6	64	24	24	do	---	do	
22	H. M. Poteet	Dug	Hillside	Єcsl	36	28	28	20	do	---	Domestic and stock	
23	I. E. Cady	Drilled	Flat	Єcsl	6	58.75	6	1.5	do	---	do	
24	A. E. Rollins	Dug	Hillside	Єcsl	48	28.6	None	16.79	9-14-67	---	Domestic	
25	Mack Rollins	Drilled	Flat	Єcsl	6	60	20	---	---	---	Stock	
26	John Poteet	do	Rolling	Єcsl	6	100	10	65	Reported	---	None	
27	Dalton Rock Products Company	do	Flat	Єcsl	6	300	20	---	---	---	Domestic	
28	do	do	do	Єcsl	6	218	---	---	---	---	do	
29	do	do	do	Єcsl	6	200	---	---	---	---	do	
30	John Hollis	do	Hillside	Єcsl	6	50	20	20	Reported	---	do	
31	James C. Carter	do	do	Єcsl	6	65	15	15	do	10+	Domestic and stock	
32	D. L. Crumly	do	Flat valley	Єcsl	6	70	70	30	do	---	do	
33	John White	do	Hillside	Єcsl	6	18.4	---	17.14	do	---	None	
34	Mrs. Alton Massey	Dug	do	Єcsl	48	25.5	---	15.40	do	---	do	
35	W. C. Cox, Jr.	Drilled	do	Єcs	6	110	25	24	do	17	Minnow pond	
36	Arthur D. Jennings	do	Rise	Єcsl	6	80	25	25	do	16	Domestic	High iron
37	W. W. Cantrell	do	Hillside	Єcsl	6	110	110	35	do	---	do	
38	Tom Satterfield	Dug	Hilltop	Єcs	4x4	40.35	---	27.95	9-26-67	---	None	
39	J. S. Barton	Drilled	Flat	Єcsl	6	93	---	30	Reported	---	Domestic	
40	Dovie Jackson	do	Hillside	Єcsl	6	79	32	27	do	10	do	QW analyses 30 feet dug 49 feet drilled
41	F. L. Williams	Dug	Flat valley	OЄk	---	18.4	---	2.20	do	---	None	
42	Smith Ellis, Sr.	Drilled	Hillside	OЄk-Єcm(?)	6	100	48	10.55	7-20-67	---	Domestic and stock	
43	J. L. Shuttes	Dug	Valley	Єcsl	---	23	---	12.2	8-31-44	---	Domestic	
44	J. B. Cook	Drilled	do	Єcsl	---	64	45	10	Reported	---	do	
45	Bobby Craig	do	Flat surface	Єcsl	6	115	20	8.65	9-13-67	---	Stock	
46	Lane Hamilton	do	Hillside	Єcs	6	100	37	36	Reported	---	Domestic	
47	Isaac Painter	do	do	Єcs	6	170	66	7	do	---	Domestic and stock	
48	Boyles Estate	do	do	Єcs	6	87	20	30	do	---	Domestic	Pumps dry
49	Mrs. I. E. Carson	do	Hilltop	Єcsl	6	100	---	40	do	---	None	
50	L. A. Bond	do	do	Єcs	6	60	20	40	do	20	Domestic	
51	R. E. Presley	do	Hillside	Єcsl	6	74	30	6	do	---	do	
52	do	do	do	Єcsl	6	50	20	3.95	7-20-67	---	None	
53	Mark Brown	do	do	Єcsl	6	100	35	35	Reported	---	Domestic and stock	
54	Billy Teasley	do	do	Єcsl	6	85	11	12.80	9-26-68	---	None	
55	Quinn Jackson	do	Hilltop	Єcs	6	83	50	20.17	9-26-68	---	do	
6PP1	Beachel Elrod	do	do	Єcsl	6	125	25	35	Reported	20+	Domestic and stock	QW analyses
2	Vida W. Fetzer	do	Hillside	Єcs	6	75	20	30	do	---	Domestic?	
3	James B. Kennedy	do	do	Єcsl	6	100	23	?	---	---	do	

Table 6.--Record of wells in Whitfield County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6PP4	William J. Ledford	Drilled	Valley	Ꞓcsl	6	200	22	120	Reported	5	Domestic	
5	Purdle D. Forester	do	Hillside	OꞒk	6	129	61	69	do	---	do	
6	C. L. Pritchett	do	do	Oh	6	116	40	52	do	8	do	QW analyses
7	Bob Souther	do	Flat surface	Ob	6	100	100	Land Surface	do	---	do	
8	Crawford Brownfield	do	Hillside	OꞒk	6	175	63	50	do	---	Domestic and stock	
9	Sherrod D. Williams	do	Hilltop	Ꞓcsl	6	200	18	---	---	---	None	Pumps dry
10	Roy Coker	do	do	OꞒk	6	84	84	---	---	---	Domestic and stock	Perforated casing
11	Mrs. Virgie O. Ward	do	Hillside	Ꞓcsl	6	100	21	12	Reported	3	do	
12	Lock L. Boyd	do	do	OꞒk	6	115	115	60	do	10+	Domestic	21 feet of perforated casing
13	Jim E. [illegible]ey	do	Flat surface	Ꞓcsl	6	80	17	50	do	10	Domestic and stock	
14	C. L. Holcomb	do	Hillside	Ꞓcm	6	138	16	40	do	5	Stock	
15	Voyd Osborn	do	Rolling	Ꞓcsl	6	105	18	20	do	---	Domestic and stock	
16	Willard Scott	do	Hillside	OꞒk	6	65	65	---	---	---	do	
17	U. S. Dept. of Agri.	do	do	Ꞓcm	6	104	---	6	Reported	15	Domestic	
18	Sherrod Williams	do	Depression	Ꞓcsl	6	60	18	---	---	---	do	
19	J. J. Gresson	do	Flat valley	Ꞓcsl	6	150	22	20	Reported	40	Domestic and stock	
20	Willard Scott	do	do	OꞒk	6	70	68	---	---	---	do	
21	Charles Nelson	do	Hillside	OꞒk	6	115	115	45	Reported	---	do	Perforated casing
22	W. A. Thompson	do	Rolling	Ꞓcsl	6	85	85	30	1965	---	do	
23	J. J. Greeson	do	Flat valley	Ꞓcsl	6	100	20	20	Reported	30?	do	
24	Ed Bryant	do	Hillside	Ꞓcsl	6	130	---	30	do	---	Domestic	
25	do	Dug	do	Ꞓcsl	84	26	---	15	do	---	do	
26	Joe Williams	Drilled	Hilltop	Ꞓcs	6	300	50	100	do	---	do	
27	Clyde L. Smith	do	Rolling	Ꞓcsl	6	120	120	---	---	---	Domestic and stock	End of casing open
28	O. T. Fetzer	do	Hillside	Ꞓcsl	6	55	40	20	Reported	7	do	
29	H. B. Hammontree	do	Hilltop	Ꞓcs	6	75	15	25	do	---	Domestic	
30	Lloyd Ogle	do	do	Ꞓcs	6	208	18	---	---	---	do	Pumps dry
31	Earnest Barnard	do	Hillside	Ꞓcsl	6	220	18	5.50	7-19-67	---	None	Small yield, will pump dry
32	do	do	Hilltop	Ꞓcsl	6	70	20	---	---	---	Stock	
33	Dalton Asphalt Co. Jim & Kenneth Boring	do	Flat valley	Ꞓcsl	6	105.9	---	10.60	Reported	---	None	
34	Arthur Wilson	do	Hilltop	Ꞓcsl	6	278	23	23	do	---	Domestic	
35	James A. Elrod	do	Hillside	Ꞓcsl	6	75	24	8	do	---	Domestic and stock	
36	George Moses	do	do	OꞒk	6	83	80	45	do	---	do	
37	do	do	do	OꞒk	6	113	113	43	do	---	Domestic	
38	Robert Mason	do	do	OꞒk	6	315	60	85	do	---	do	
39	W. D. Cline	do	Hilltop	OꞒk	6	145	---	100	do	10	Domestic and stock	
40	Frank Boyd	do	do	OꞒk	6	100	60	---	---	---	Domestic	
41	Ernest O. Nicholson	do	do	OꞒk	6	67	18	55	Reported	---	do	
42	Bob Bryant	do	Hillside	OꞒk	6	77	30	57	do	---	do	
43	Joe Starks	do	do	Ꞓcs	6	382	19	11.69	7-18-67	---	do	
44	Dannie Cline	do	do	OꞒk	6	80	75	20	Reported	---	do	
45	Ida Mae Bryant	do	Flat surface	OꞒk	6	45	45	8	do	10+	Domestic and stock	
46	Herman Cantrell	do	Hillside	OꞒk	6	100	40	40	do	10	None	
47	M. L. Nicholson	do	do	OꞒk	6	274	110	120	do	---	Domestic	
48	W. L. Clayton	Dug	Valley	Ꞓcsl	48	24	---	18	do	---	do	
49	Thomas D. Henderson	Drilled	do	OꞒk	6	61	61	22	do	---	None	
50	D. E. Bagby	do	Hillside	Ꞓcm	6	106	37	60	do	---	Domestic	
51	W. H. Coker	Dug	Hilltop	Ꞓcls	36	60	60	48	do	---	do	End of casing open

Table 6.--Record of wells in Whitfield County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6PP52	C. W. Parrott	Dug	Depression	€cls	48	37	---	16	Reported	---	Domestic	
53	C. E. Bagby	Drilled	Hillside	O€k	6	96	96	36	do	---	do	End of casing open
54	Thomas C. Little	do	do	O€k	6	197	197	107	do	---	do	do
55	Sam Compton	do	Top of ridge	O€k-Oh(?)	6	83	32	22	do	10	do	
56	Glenn Cooper	do	Hilltop	Oh	6	65	65	30	do	---	Domestic and stock	End of casing open
57	Wallace Brown	do	Flat	Oh	6	72	72	16.37	do	---	None	6 feet of perforated casing on bottom
58	James R. Stafford	Dug	Flat valley	Oh	36	15	15	10.21	do	---	do	
59	John McCarty	Drilled	Hillside	O€k	6	120	100	80	do	---	Domestic and stock	Well has to be cleaned often because of mud
60	Jeff Stacey	do	do	O€k	6	113.5	?	86.58	10-30-67	---	Domestic	
61	Claude Postom	Dug	Flat valley	O€k	36	19.4	None	5.93	10-30-67	---	do	
62	Fred Hayes	Drilled	Stream channel	Oh	6	24	24	---	---	---	do	End of casing open
63	Clifton C. Howell	do	Hillside	Oh	6	120	19	80	Reported	---	do	
64	Varnell Consolidated School	do	Valley bottom	€csl	---	21.2	---	15.11	8-31-44	---	Public supply	
65	J. C. Wheat	do	Hilltop	O€k	---	41	---	39	Reported	---	do	
66	J. F. Weaver	do	Valley	O€k	5	82	74	38.2	9-02-44	---	Domestic	
67	Clarence Archer	do	do	€cs	5	37.8	---	20.36	9-02-44	---	do	
68	Gordon Kettles	do	Hillside	€cs	---	52.5	---	---	---	---	Domestic and stock	
69	Porter Cooper	Dug	Valley	O€k	---	61.57	---	50.57	8-31-44	---	Domestic	
70	Mrs. Fate Hammertree	do	Hilltop	O€k	---	56.5	---	49.23	8-31-44	---	do	
71	P. C. Henderson	Drilled	Hillside	€csl	6.6	74	56	33.62	8-31-44	12	Domestic and stock	
72	C. W. Cooper	do	Hilltop	O€k	6	80	80	---	---	---	Domestic	
73	Cohutta Consd. School	do	Flat valley	€csl	---	196	---	60	Reported	---	None	
7PP51	Richard Long	do	Hilltop	€cs	6	180	18	40	do	---	Domestic	
52	Mrs. H. E. Warmock	do	Hillside	€cs	6	120	22	20	do	6	Stock	
53	L. B. Quinton	do	do	O€k	6	40	20	18	do	---	Domestic	
54	Ernest Mathis	do	Undulating	O€k	6	110	29	15	do	9	Domestic and stock	
55	L. W. Deverell	do	Hillside	€csl	6	420	49	15.65	5-25-67	2	None	Recovery of well too slow for use
56	George Lewis	do	Hilltop	O€k	6	240	87	87	Reported	20	Domestic and stock	
57	Ethel F. Whaley	do	Hillside	€csl	6	100	26	75	do	---	do	
58	E. G. Baldridge	do	Flat	€csl	6	36	---	---	---	---	Domestic	
59	Clinton William	do	Flat	€csl	6	80	28	7.80	5-25-67	---	Domestic and stock	
60	Leroy Hefner	do	Flat	€csl	6	100	30	15	Reported	---	Domestic	
61	Herbert Whaley	do	Hilltop	€csl	6	55	23	15	do	---	do	20 feet dug, 35 feet drilled
62	W. C. Ledford	do	do	€cl	6	160	26	25	do	---	do	
63	L. W. Deverell	do	Flat	€csl	6	50	7	7.50	1952	---	do	
64	Mrs. R. E. Ogle	do	do	€csl	6	65	20	20	Reported	10	do	
65	Ray Crider	do	Hillside	€csl	6	60	30	5	do	---	do	
66	Lake Lackey	do	Flat	€csl	6	100	27	12	do	10	Domestic and stock	
67	Clifford Lewis	do	Hillside	O€k	6	92	---	45	do	10+	do	
68	George Lewis	do	do	O€k	6	133	70	75	do	10+	do	
69	Billy Holcomb	do	do	O€k	6	190	48	32.60	7-20-67	10+	do	
70	Coy Douglas	do	do	€cs	6	103	45	18	Reported	10	do	
71	Mrs. Gladis Whaley	do	do	€csl	6	50	21	15	do	---	Domestic	
72	U. S. Dept. Agri.	do	do	O€k	6	256	---	130	do	12	do	
73	Wilbur Brown	do	do	€csl	6	150	16	---	---	14	Domestic and stock	

Table 7.--Record of wells in Murray County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
7NN26	Mrs. Hughes Calhoun	Drilled	Foot of hill	Ɛcs	6	98	---	20	Reported	10+	Domestic	
27	Mrs. E. A. Wells	do	Hilltop	Ɛcs	6	102	66	20	do	---	do	
28	Mrs. Tom Martin	do	do	Ɛcs	6	95	67	0.00	do	---	do	
29	John Aiken	do	Hillside	OƐk	6	370	40	12	do	---	do	
30	Hartsel Bond	do	Hilltop	OƐk	6	97.5	---	---	---	---	do	
31	Robert Bartley	do	do	OƐk	6	98	---	---	---	---	do	
32	Ballew and Trammell Ogletree	do	Hillside	OƐk	6	63	35	30	Reported	10+	Domestic and stock	
33	L. D. Pritchard	do	do	OƐk	5	62	30	30	do	---	Domestic	
34	F. P. Bond	do	do	OƐk	6	45	20	10	do	---	do	
35	Ruth Ann Pritchett	do	Hilltop	OƐk	5	84	45	29	do	---	do	Analyses? Collected by Herrick
36	H. S. Wilson	do	Hillside	Ɛcs	6	87	60	40	do	8	Domestic and stock	
37	Odis Sugartown	do	Valley	OƐk	6	185	---	50	do	---	Domestic	
38	C. H. Smith	do	Slope	Ɛcsl	6	70	---	25±	do	---	do	
39	Earl Hogan	do	do	Ɛcsl	6	70	---	---	---	---	do	
40	Roy Gallman	do	Hillside	OƐk	6	280	20	20	Reported	---	do	
41	Ida Treadwell	do	Top of flat top hill	OƐk	6	64.5	---	48.44	9-29-43	---	do	
42	Mrs. Sophie Springfield	do	Hilltop	Ɛcs	6	81	---	---	---	---	do	
43	Estate of Mrs. B. E. Messer	do	do	Ɛcs	6	63.3	---	28.48	11-11-43	---	do	
44	City of Chatsworth	do	Valley	Ɛcs	8	350	50	15	Reported	---	None	Well abandoned because of hard water well now destroyed
45	Chatsworth Lmbr. Co.	do	do	Ɛcsl	6	125	---	18	do	---	None	Water hard
8NN1	S. L. Dickey	do	Hillside	Ɛcs	6	97	12	22.88	11-16-64	8	Domestic	QW analyses
2	Charlie Kendrick	do	do	Ɛcs	6	100	20	11.08	10-13-66	---	do	
3	Fred Young	do	Flat surface	Ɛcs	6	71.5	---	4.36	10-13-66	---	do	
4	U. S. Dept. of Agriculture	do	Hillside	Ɛcs	6	106	80	78.45	10-13-66	---	do	
5	State Park Dept.	do	Hilltop	miu	6	404	71.5	18	Reported	45	do	
7PP1	Mrs. Julie Parker	do	Hillside	OƐk	6	73	73	51.1	8-02-66	10+	Domestic and stock	
2	R. F. Hill	do	Hilltop	Ɛcsl	6	153	55	60	Reported	10+	do	
3	J. L. Langford	do	Hillside	Ɛcm	6	150	---	---	---	8	Domestic	
4	Mrs. Calvin Brown	do	Flat valley	Ɛcsl	6	67	27	40	Reported	---	do	
5	Mrs. Beulah Bryant	do	Hillside	Ɛcsl	6	100	40	20	do	---	do	
6	Jimmie Sloughter	do	Flat valley	Ɛcsl	6	80	20	15.13	8-02-66	---	Domestic and stock	
7	W. H. McClure	do	do	Ɛcsl	6	60	17	10	Reported	---	Domestic	
8	Ben Foster	do	do	Ɛcsl	6	100	---	20	do	10+	Domestic and stock	
9	S. A. Stafford	do	Hillside	Ɛr	6	135	18	10	do	5	do	
10	Lee Caylor	do	Hilltop	OƐk	6	110	25	25	do	---	Domestic	
11	John Caylor	do	Hillside	Ɛcm	6	22	---	8	do	---	do	
12	Ed Dalton	do	do	OƐk	6	90	90	---	---	8	do	
13	Olin Dycus	do	Hilltop	OƐk	4	75.5	50	45	Reported	---	do	
14	do	do	Hillside	OƐk	6	300	54	58.09	8-02-66	---	Stock	
15	Julius Dunn	do	do	On	6	60	20	40	Reported	---	Domestic	
16	do	do	do	On	8	100	7	52	do	---	do	
17	Miss Rossie McNeely	do	Flat surface	OƐk	5	70	---	32.64	8-04-66	---	do	
18	Paul Timms	do	Hillside	OƐk	6	68	68	43.90	10-10-66	---	do	
19	O. T. Roberts	do	Flat surface	OƐk	6	85	85	40	Reported	---	do	Perforated casing
20	Tom Harris	do	Rolling	OƐk	6	56	---	46	do	---	Domestic and stock	
21	A. C. Harris	do	Hillside	OƐk	6	65	65	25	do	10	do	Perforated casing
22	Mrs. Melvin Pullen	do	Hilltop	On	4	112	---	55.33	11-08-43	---	Domestic	

Table 7.--Record of wells in Murray County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
7MM30	John Brindle	Drilled	Hilltop	Єcs	6	105	40	17.85	10-26-66	---	Domestic and stock	
31	J. B. Hensley	do	Flat surface	Єcs	6	51	16	5	Reported	16	Domestic	
32	R. E. Stanley	Dug and drilled	Hillside	Єcsl	36-6	70	22	14.43	10-27-66	10+	Domestic and stock	Originally dug 20 feet, then drilled to 70 after water gave out
33	Leon Brindle	Drilled	do	Єcs	6	50	30	23.23	10-27-66	10+	Domestic	
34	Ruben Ingle	do	do	Єcs	6	83	17	12	Reported	---	do	
35	C. B. Tucker	do	Flat surface	Єcs	6	34	8	4.13	10-27-66	---	do	
36	J. J. Walraven	do	Hilltop	Єcsl	6	109	79	40	Reported	10+	do	
37	J. T. Walraven	do	do	Єcsl	6	78	40	---	---	10+	Domestic and stock	
38	R. T. Springfield	do	Hillside	Єcs	6	55	10	22	Reported	8	do	QW analyses
8MM1	John Hemphill	do	Flat valley	Єcls	6	55	9	8	do	10	Domestic	
2	Bud Ramsey	do	Hillside	Єcs	6	100	---	20	do	---	do	Water has bad odor and iron
3	Murray County Bd. of Ed.	do	Hilltop	Єcs	6	75	---	30	do	---	do	
4	Mrs. Pauline M. Davis	do	Valley	Єcs	6	58	---	15	do	---	do	
5	W. W. Nelson	do	Hilltop	Єcs	4	63	---	40	do	---	do	Well goes dry
6	Kenneth Defore	do	do	Єcs	6	75	20	16.40	11-11-43	---	do	
7	Willard Jackson	do	do	Єcs	6	102	102	27	Reported	---	do	
8	Paul Summey	do	Hillside	Єcs	6	73	15	15	do	---	do	
9	Roy Gordon	do	Hilltop	Єcs	5	50.4	---	18.2	11-11-43	---	do	
10	Grady Kendrick	do	Hillside	Єcs	6	60	18	---	---	---	Domestic and stock	
11	Miss Mittie Adams	do	do	Єcs	4	59.2	---	10.13	11-11-43	---	Domestic	
12	J. B. Horne, Sr.	do	Valley	Єcls	6	246	30	25	Reported	---	do	QW analyses
7NN1	Ringold Burnett	do	Hilltop	OЄk	6	75	17	30	do	20	do	Do
2	John Reaves	do	Flat hilltop	OЄk	6	78	---	45.92	9-29-43	---	do	
3	C. B. Davis	do	do	OЄk	6	87	---	57.50	9-29-43	---	do	
4	Mark Swanson	do	Hillside	OЄk	6	125	---	46.14	9-30-43	---	do	
5	Charlie Richards	do	Hilltop	OЄk	6	112.7	---	75.93	9-30-43	---	do	
6	Mr. Slatterfield	do	do	OЄk	6	235±	80±	91.93	9-30-43	---	do	
7	Luke Jones	do	do	OЄk-Єcl	8	76	50±	50	Reported	---	Domestic and stock	
8	W. A. Johnson	do	Hillside	Єcs	6	75	30	16	do	---	do	
9	Mrs. Bessie Adams	do	Valley	OЄk	6	51	---	25	do	24	Domestic	
10	J. H. Pulliam	do	Hilltop	OЄk	6	100	---	70	do	---	do	
11	Odell Ingle	do	Slope	OЄk	6	128	70	---	---	---	Domestic and stock	
12	Ella Gregory	do	do	OЄk	6	97.7	---	55.10	9-30-43	---	Domestic	
13	Aaron Leonard	do	Flat surface	OЄk	6	90	40	50	Reported	9	Domestic and stock	
14	do	do	do	OЄk	6	90	90	60	do	---	do	21 feet of casing perforated
15	Fred Smith	do	Hilltop	Єcsl	6	77	22	30.36	10-13-66	---	Domestic	
16	Harold Springfield	do	Hillside	Єcsl	6	110	22	---	---	---	do	
17	Willie Gallman	do	Slope	OЄk	6	117.5	---	---	---	---	do	
18	Carl Johnson	do	Hillside	OЄk	6	80	45	37	---	5	do	
19	Austin Parrott, Jr.	do	do	OЄk	6	107	50	50	Reported	---	do	
20	John Webb	do	do	Єcs	6	205	18	49.50	10-13-66	20	Domestic and stock	Original depth 125 ft. shortage of water then deepened to 205 ft.
21	J. L. Roberts	do	Hilltop	OЄk	6	100	100	75.80	10-12-66	---	Domestic	21 feet of casing perforated
22	Hubert Stevenson	do	Flat surface	OЄk	6	90	80	60	Reported	8	do	
23	George Mitchell	do	Hillside	OЄk	6	140	38.5	38.47	10-12-66	---	Stock	
24	Roy Gladden	do	Flat surface	On	6	125	20	20	10-12-66	15	do	
25	J. Charles	do	Hillside	Єcs	6	70	60	20	Reported	---	Domestic	

Table 7.--Record of wells in Murray County, Georgia

Geologic symbol: Oc, Chota Formation; Oa, Athens Shale; On, Newala Limestone; OꞒk, Knox Group; Ꞓcm, Maynardville Limestone Member of the Conasauga Formation; Ꞓcsl, shale and limestone of the Conasauga; Ꞓcls, limestone and shale of the Conasauga; Ꞓcs, shale and siltstone of the Conasauga; Ꞓcl, limestone unit of the Conasauga; Ꞓr, Rome Formation; miu, metasedimentary and igneous rocks, undivided.

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
6LL81	Kenneth Defoor	Drilled	Hillside	Ꞓcsl	6	100	23	20.60	10-27-66	10+	Domestic	
7LL49	Ford Stancill	do	Hilltop	Ꞓcsl	6	95	27	27	Reported	10+	do	
50	W. H. Stancill	Dug and Drilled	do	Ꞓcsl	36-6	67	33	19.72	10-2[illegible]-66	---	do	Well originally dug 27 feet, water level lowered during 1956. Drilled 40 feet in center of dug well and installed 6 ft. of 6-inch casing
51	A. R. Edwards	Drilled	do	Ꞓcm	6	75	25	12	Reported	10	Domestic and stock	
52	Jeff Mashburn	do	Hillside	Ꞓcsl	6	93	21	10	do	10+	do	
53	Mrs. Walt McBrayer	do	do	Ꞓcm	6	72	72	42	do	10+	Domestic	End of casing open
8LL42	Hiwassee Land Co.	do	do	Ꞓcs	6	200	22	32.70	10-25-66	---	do	
43	Mrs. Ralph Messer	do	do	Ꞓcls	6	100	---	50	Reported	---	do	
44	Emmett Cochran	do	do	Ꞓcs	6	100	12	22.16	10-25-66	---	None	
45	J. C. Maben	do	Valley	Ꞓcls	6	360	---	56.10	9-15-43	---	Domestic	
46	J. B. Horn	do	do	Ꞓcl	6	168	---	16.04	10-25-66	---	do	
6MM32	Mrs. Maggie Davis	do	Hillside	Ꞓcs-Ꞓcls	6	85	26	20.35	10-27-66	10	do	
7MM1	Tarver Robinson	do	Hilltop	Ꞓcm	6	110	55	40	Reported	15	do	QW analyses
2	Lee Timms	do	do	Ꞓcsl	6	87	16	20	do	8	Domestic and stock	
3	O. C. Boling	do	Flat surface	Ꞓcsl	6	75	26.4	17.42	10-13-66	---	Domestic	
4	Lee Green	do	Hillside	Ꞓcsl	6	108	20	---	---	---	Domestic and stock	
5	Tom Green	do	do	Ꞓcsl	6	105	40	26.51	10-13-66	---	Domestic	
6	Doyl Cochran	do	do	Ꞓcs	6	70	19	9	Reported	---	do	
7	Barney Gray	do	do	Ꞓcsl	6	140	28	30	do	10	do	
8	do	do	Hilltop	Ꞓcsl	6	84	17	25	do	20	Domestic and stock	
9	Tom Turner	do	do	OꞒk	6	87.5	60	58.00	11-10-43	---	do	
10	John Boyles	do	Flat surface	Ꞓcsl	6	95	27	3	Reported	20+	Domestic	
11	Emory Scott	do	Hillside	Ꞓcsl	6	100	22	12.00	10-27-66	--	Domestic and stock	
12	L. H. Kilgore	do	Hilltop	Ꞓcsl	6	79	16	16	Reported	---	Domestic	
13	Trammell Bramblett	do	Flat surface	OꞒk	6	100	35	9.19	10-27-66	---	do	
14	S. R. Long	do	Hillside	OꞒk	6	144	60	30	Reported	10+	Domestic and stock	
15	Lawrence Hawkins	do	do	OꞒk	6	80	30	19.51	10-27-66	10+	do	
16	J. E. Baggett	do	Flat surface	Ꞓcsl	6	55	8	13	Reported	10+	do	
17	Paul Baggett	do	Hilltop	Ꞓcs	6	80	22	17.80	10-26-66	---	Domestic	
18	Frank Springfield	do	do	Ꞓcs	6	101	None	12	Reported	---	do	
19	Frank Banks	do	do	Ꞓcs	6	61.8	---	11.74	11-11-43	---	do	
20	Lloyd Jones	do	do	Ꞓcs	6	61.4	20	26.28	11-11-43	---	do	
21	Mort Peeples	do	Hillside	Ꞓcs	6	110	14	21.13	10-26-66	---	do	
22	do	do	do	Ꞓcs	6	75	10	8.00	10-26-66	---	Stock	
23	Raymond Davis	do	Flat surface	Ꞓcs	6	80	25	13.14	10-27-66	10+	do	
24	J. R. Klingersmith	Dug and Drilled	Hillside	Ꞓcs	36-6	64	20	15	Reported	10+	Domestic and stock	Well originally dug to 20 ft. later drilled to 64 ft. after water gave out
25	Malcom Holloway	Drilled	Flat surface	Ꞓcsl	6	62	21	20.14	10-27-66	10+	Domestic	
26	J. H. Young	do	Hillside	Ꞓcsl	6	100	14	20	Reported	10+	Domestic and stock	
27	Charlie Young	do	do	Ꞓcsl	6	50	14	14.76	10-27-66	---	None	
28	do	do	do	Ꞓcsl	6	82	14	14	Reported	20+	Domestic and stock	
29	Jeff Ingle	do	do	Ꞓcs	6	77	70	28.99	10-26-66	---	Domestic	

Table 7.--Record of wells in Murray County, Georgia--Continued

Well no.	Owner	Type of Well	Topography	Geologic symbol of aquifer	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface	Date measured	Yield (gpm)	Use	Remarks
7PP23	Roy Hawkins	Dug	Hillside	On	24	40	40	20	Reported	---	Domestic	
24	Walter Crowley	Drilled	Hilltop	OЄk	4	85	83	51.70	11-09-43	---	do	
25	Fred Dalton	do	Flat surface	Єcsl	6	90	30	20	Reported	10	do	
26	Ben Wilson	do	do	Єcs	6	120	22	20	do	8	Domestic and stock	
27	Mrs. J. M. Petty	do	do	OЄk	6	81	81	---	---	---	Domestic	Perforated and gravel packed
28	C. H. Bryant	do	Hillside	Єcsl	6	107	37	85	Reported	8	do	
29	B. C. Stafford	do	Flat surface	Єcsl	6	80	30	55	do	8	Domestic and stock	
30	Thomas Hedrick	do	Hilltop	OЄk	6	83	43	43	do	8	do	
31	John Gladden	do	Hillside	OЄk	6	65	45	11.34	10-11-66	---	do	
32	O. O. Deal	do	do	OЄk	6	83	53	68	Reported	14	do	
33	Leon Ensley	do	do	OЄk	6	80	49	31.91	10-11-66	---	do	
34	C. H. and Mildred Bartley	do	do	OЄk	6	68	---	5.59	10-24-66	---	do	
35	Jessie Dunn	do	Flat valley	OЄk	6	50	30	20	Reported	---	do	
36	Mrs. Johnnie Eisenhower	do	Hillside	OЄk	6	82	---	---	---	---	do	
37	Howard Hill	do	do	OЄk	6	120	30	---	---	---	do	
38	Oscar Hill	do	do	OЄk	6	85	50	50	Reported	5	Domestic	
39	Garvin Kirby	do	Hilltop	OЄk	6	126	---	---	---	---	Domestic and stock	
40	J. C. Smith	do	do	OЄk	6	67.2	---	52.83	10-11-66	---	do	
41	Mrs. J. B. McEntire	do	do	OЄk	6	135	48	56.25	10-11-66	---	do	
42	Bentley Dill	do	do	OЄk	4	43.9	---	38.70	11-10-43	---	do	
43	Jack Profitt	do	do	Oa-On(?)	4	70	---	22.50	10-11-66	---	Domestic	
44	Murray County	do	do	OЄk	4	81.5	---	62.75	11-09-43	---	do	
45	Glenn Frazier	do	Hillside	OЄk	6	86	---	---	----	---	do	
46	William Hill	do	do	Єcsl	6	100	37	---	---	---	do	
47	H. S. Wilson	do	Flat surface	On	6	74	65	59	Reported	---	Domestic and stock	
48	Onnie Deal	do	Rolling	OЄk	4	68	---	19.09	11-09-43	---	Domestic	
49	Winfrey Colvard	do	Hilltop	OЄk	4	80	---	50	---	---	None	
50	Luke Caylor Estate	do	do	OЄk	5	70	64	57	Reported	---	Domestic	
8PP1	Jack Clayton	do	Hillside	Oa	6	80	13	12	do	10	do	QW analyses
2	John Franklin	do	do	miu	6	100	30	21	do	---	do	
3	Clara Cockburn	Dug	do	Oc	48	26	None	17.03	11-17-64	---	do	QW analyses
4	V. A. Bearden	Drilled	do	On	6	104	74	40	Reported	6	do	Do
5	C. L. Wilson	do	do	On	6	197	26	26	do	8	do	
6	do	do	Hilltop	On	6	117	40	---	---	---	do	
7	Will Ross	do	do	On	6	90	40	20	Reported	68	do	
8	Ernest Easley	do	do	On	4	93	46	40.70	10-01-43	---	do	
9	J. B. Hawkins	Dug	Valley	OЄk	48	36.2	None	25.83	10-01-43	---	do	
10	Carlton Petty	Drilled	Flat valley	OЄk	6	53	---	9.55	7-28-66	5	Domestic and stock	
11	George Coffey	do	Hillside	Oa	6	100	32	20	Reported	8	Stock	
12	Richard Patterson	do	Hilltop	Єcsl(?)	4	108	---	100	do	---	Domestic	Goes dry
13	do	do	do	Єcsl(?)	6	300	125	120	do	10	Domestic and stock	
14	Murray County	do	do	Oc	4	60	---	20	do	---	None	

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FIGURE 3

Geology and location of wells and springs in Gordon County, Georgia.

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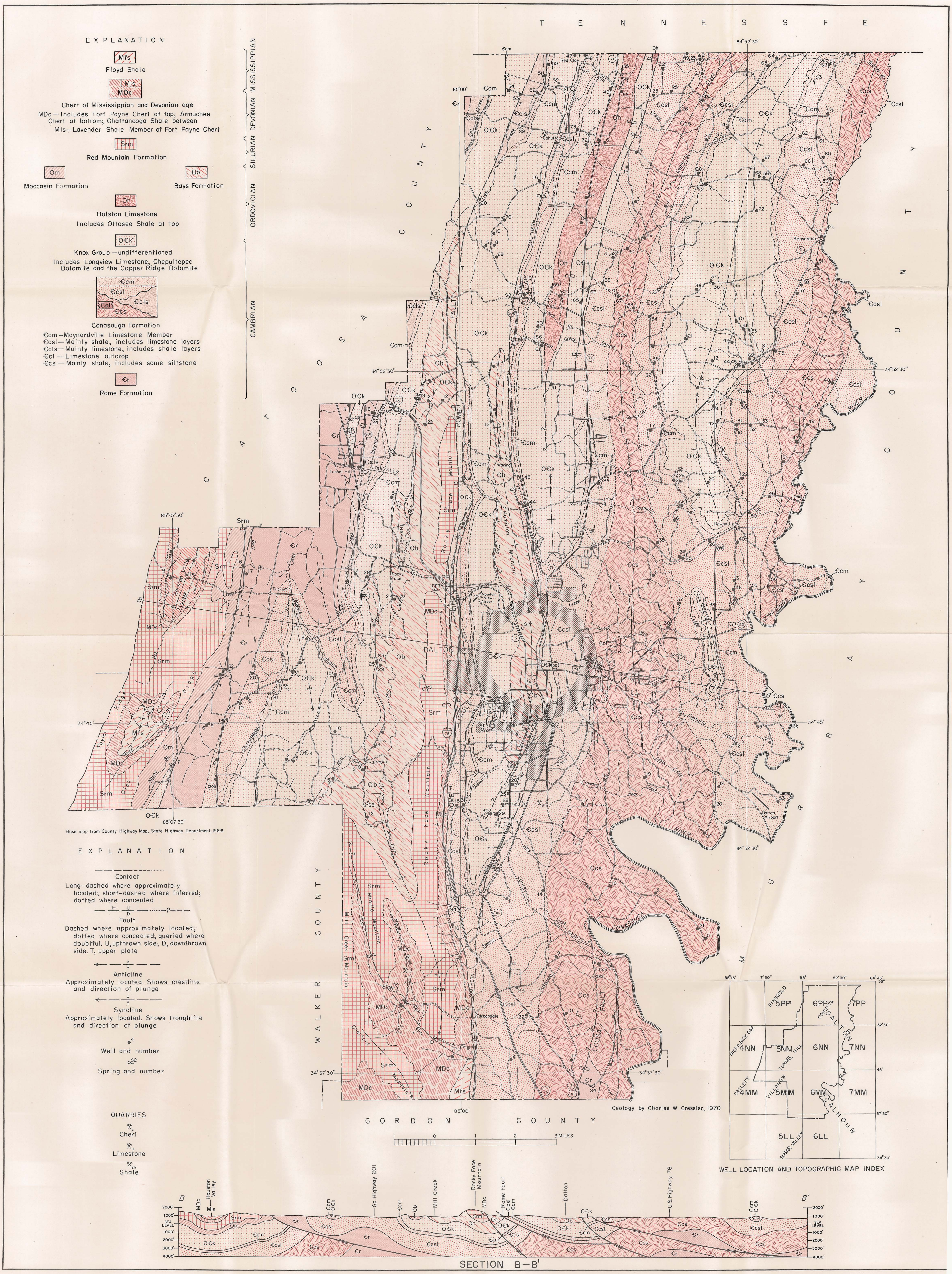
FIGURE 4



Geology and location of wells and springs in Whitfield County, Georgia.

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Geology and location of wells and springs in Murray County, Georgia.