IC 33

GEORGIA

STATE DIVISION OF CONSERVATION

DEPARTMENT OF MINES, MINING AND GEOLOGY

A. S. FURCRON, Director

THE GEOLOGICAL SURVEY

Information Circular 33

GROUND-WATER RESOURCES AND GEOLOGY OF ROCKDALE COUNTY, GEORGIA

By

M. J. McCollum

U.S. Geological Survey

Prepared in cooperation with the U.S. Geological Survey

ATLANTA

1966

CONTENTS

ILLUSTRATIONS

TABLES

GROUND-WATER RESOURCES AND GEOLOGY OF ROCKDALE COUNTY, GEORGIA

M. J. McCollum

ABSTRACT

Rockdale County is located in the Piedmont area of Georgia about 20 miles east of Atlanta. Six major geologic units — Lithonia Gneiss of Watson (1902), garnet mica schist, muscovite quartzite, amphibolite gneiss, porphyroblastic biotite gneiss, and Panola Granite of Herrmann (1954) have been mapped. Diabase dikes striking N. 30° W. to N. 45° W. occur in the northern part of the county. All rock units are intruded by non-mappable pegmatite dikes and quartz veins. Only one pegmatite of mappable size was found. It occurs in the southern part of the county. A mantle of saprolite overlies all rock types.

Ground water occurs in the pore spaces of the saprolite and in the cracks and crevices of the unweathered bedrock. Water for rural use is supplied from dug, drilled, and bored wells. The yield of wells is usually greater on hillsides and in valleys than on hilltops.

Treated surface water from Yellow River is supplied to residents of Conyers and Milstead and to industries in the vicinity of Conyers from the Conyers Water Treatment Plant.

The chemical quality of ground water throughout Rockdale County is generally good. However, a high iron content is reported in water from isolated areas underlain by almost all rock types, but most predominantly in the southern part of the county in areas underlain by porphyroblastic biotite gneiss.

Total water consumption in Rockdale County during 1964 has been estimated at 776,000 gallons per day. This includes 225,000 gallons of ground water and 551,000 gallons of surface water.

INTRODUCTION

Rockdale County, located about 20 miles east of Atlanta, is undergoing rapid change from a rural to an urban economy. Although the county is small in size, 128 square miles in area, its situation is such that it will develop both industrially and residentially as the Atlanta Metropolitan area expands. (See fig. 1.) Before such development can take place, however, one prerequisite must be met; an adequate water supply.

The purpose of this report is to summarize the present water supply in Rockdale County and to relate the occurrence of ground water to the geology of the area, thereby indicating the potential water resources for future needs.

The total population of Rockdale County in the 1960 census was 10,600 and since then it has grown to almost 14,000. Conyers and Milstead are the only towns in the county. The population of Conyers, the county seat, was 2,900 in 1960.

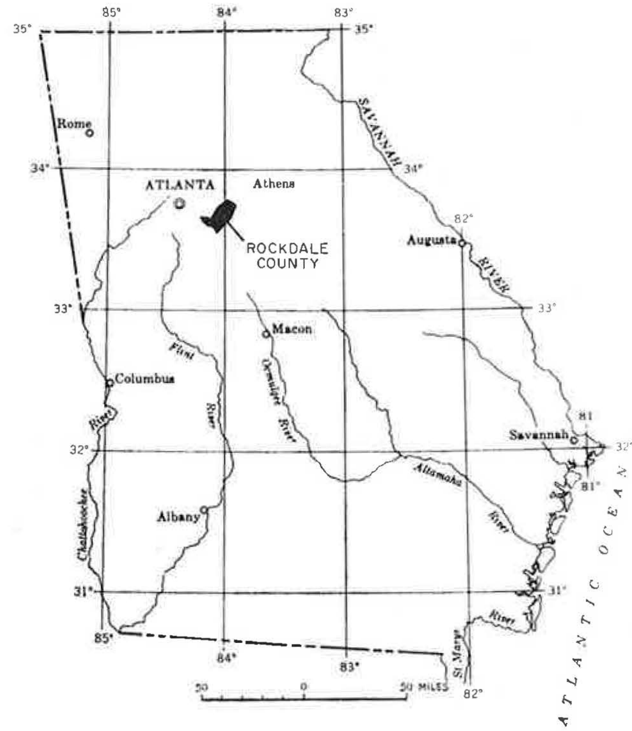


Figure 1.—Index map of Georgia showing location of Rockdale County.

Previous Work

Watson (1902, p. 153-161) included a description of his Lithonia contorted granite-gneiss (termed Lithonia Gneiss in this paper) in Rockdale County in his report on the granites and gneisses of Georgia. The report was concerned primarily with the economic aspects of the Lithonia. Later work by Lester (1938) was done on the geology around Stone Mountain in nearby DeKalb County, Georgia. Crickmay (1952) reported on the general geology of the crystalline rocks of Georgia.

A report by Herrick and LeGrand (1949) on the geology and ground-water resources of the Atlanta area included a brief discussion of the geology of Rockdale County and reported on the occurrence of ground-water and municipal-water supplies in the county.

Herrmann (1954) mapped a portion of Rockdale County in his work on the "Stone Mountain-Lithonia district" of Georgia. His report included a geologic map, rock descriptions, structure interpretations, and a discussion of the stone industry in the area. Much of Herrmann's work has been used in this report.

Acknowledgments

The writer is indebted to Mr. W. T. Green and the staff of the Rockdale County Public Health Department for furnishing valuable assistance. Thanks are also due the many people of Rockdale County who graciously offered information which helped to make this report possible. Suggestions and helpful criticism by Mr. R. T. Bentley, formerly of the Georgia Department of Mines, Mining and Geology, are appreciated.

The writer wishes also to acknowledge the help of Mr. W. A. Martin of Virginia Supply and Well Co. and Mr. Weisner of Weisner Well Drilling Co., who furnished well data.

Well-Numbering System

The well-numbering system used in this report is based on the 7½-minute quadrangle series of the U. S. Geological Survey. Each 7½-minute quadrangle in the State has been given a number and letter designation dependent on its location within the State. The numbers begin in the southwest corner of the State and increase numerically eastward, and the letters begin in the same southwest corner and increase alphabetically northward, using the principle "read right up."

Parts of eight quadrangles compose Rockdale County. These quadrangles range in letter and number designation from 12CC to 14EE. In each quadrangle wells are numbered consecutively as they are scheduled. For example, the 13th well scheduled in quadrangle 14DD is numbered 14DD13. A spring is numbered the same way except that an "S" is inserted before the final number, such as in 14DDS1.

GEOLOGY

The State of Georgia is divided into four major physiographic provinces on the basis of topography—Coastal Plain, Blue Ridge, Piedmont, and Valley and Ridge. Rockdale County lies in the Piedmont Province which is underlain by the oldest rocks in the State. The rocks, for the most part, are sediments that were deeply buried in the past and subjected to high temperatures and pressures, which subsequently altered the mineral assemblages and folded the rocks into complex structures. Later intrusions by igneous masses further deformed and altered the rocks.

The geology of Rockdale County is shown as two major rock types on the "Geologic Map of Georgia" (Crickmay, 1939). The unit shown in the northern part of the county is called granite gneiss, Lithonia type, of igneous origin, and the unit shown in the southern part of the county is referred to as biotite gneiss and schist, Carolina Series, of metamorphic origin. Both units are thought to be of Precambrian age.

The geologic map of Rockdale County (plate 1) shows the six major rock units and several minor rock units. The most predominant rock unit is the Lithonia Gneiss of Watson (1902), which covers most of the northern part of the county. Other major rock units in decreasing order of areal extent are garnet mica schist, muscovite quartzite, amphibolite gneiss, porphyroblastic biotite gneiss, and the Panola Granite of Herrmann (1954). Minor rock units include diabase dikes, a pegmatite, amphibolite, and alluvium.

A mantle of decomposed residual rock called saprolite covers most of Rockdale County. Composition of the saprolite depends on the nature of the original rock and much of the geologic mapping was done on the basis of saprolite character. Exposures of fresh rock were found mostly in road cuts and small stream valleys. Where the Lithonia Gneiss of Watson and the Panola Granite of Herrmann occur, however, flat or gently sloping areas devoid of saprolite are exposed. Herrmann (1954, p. 3) calls this type of exposure "pavement." Locations of major "pavement" areas are shown on the geologic map (plate 1).

Lithonia Gneiss of Watson (1902)
Rock Description

The dominant rock type in the northern part of Rockdale County is a highly contorted gneiss. Herrmann (1954) classified this gneiss as a migmatite and called it "Lithonia Gneiss." Earlier workers called it "granite gneiss, Lithonia type" (Crickmay, 1952) and "Lithonia contorted granite gneiss" (Watson, 1902). This report will follow Herrmann's revision and the term Lithonia Gneiss of Watson will be used.

The Lithonia Gneiss is typically contorted in appearance. Layers of biotite alternating with layers of quartz and feldspar accentuate the contorted appearance and impart a light-gray color to the rock. The major portion of the rock is composed of quartz and oligoclase with minor amounts of biotite. The biotite is lineated, giving a gneissic appearance. Herrmann (1954) reported garnetiferous layers in the Lithonia Gneiss and a heavy mineral residue of zircon, magnetite, and ilmenite obtained from panning saprolite in a streambed.

Many dikes composed of aplite and pegmatite cut the Lithonia Gneiss of Watson, and a few are concordant with lineation. The pegmatites are composed chiefly of quartz and oligoclase with accessory biotite and tourmaline. Injection of the aplite and pegmatite into the Lithonia is the basis for its classification as a migmatite (Herrmann, 1954).

Weathering of Watson's Lithonia Gneiss produces a saprolite that ranges in color from light gray to light brown and is composed of sandy clay to clayey sand. In areas of higher biotite concentrations the saprolite is reddish brown.

Exposures of Lithonia Gneiss frequently occur as areas of "pavement" from a fraction of an acre to several acres in extent. The pavement or bare rock generally follows the usual land-surface contours with spalling occurring parallel to the surface contours rather than along lineation planes. Because this rock is exposed so frequently and because it has properties suitable for dimension stone, it has been utilized extensively as building stone and crushed rock. Evidence of numerous small abandoned quarries was found in Rockdale County, though at present there are few operating companies that quarry Lithonia Gneiss. Large quarries are operating just east of the area in DeKalb County.

Water-Bearing Characteristics

Because the Lithonia Gneiss of Watson (1902) underlies so much of Rockdale County it is very important as an aquifer. Records of wells in the gneiss indicate that dug wells are the most abundant sources of water supply, drilled wells are second in number, and bored wells are the least utilized. The average depth of dug wells is about 35 feet on hilltops and hillsides and about 16 feet in valleys. Drilled wells on hilltops have an average depth of 295 feet and about 37 feet of casing; those on hillsides average 249 feet and have 40 feet of casing, and drilled wells in the valley average 300 feet in depth and have 46 feet of casing. Bored wells average about 45 feet on hillsides and hilltops. No records of bored wells in valleys were reported.

The yield of dug and bored wells was not reported. Records of drilled wells show an average yield of 26 gpm (gallons per minute) for hilltop wells, 73 gpm for hillside wells, and 47 gpm for valley wells. Two drilled wells, a dug well, and a bored well on hilltops were reported to be inadequate and one well drilled in a small valley was reported to have been dry.

The reported quality of water from wells penetrating Lithonia Gneiss is good. No water of poor quality is recorded from drilled or bored wells. Water from a few dug wells, however, was reported to have a limy taste or as being milky. The limy taste and milky color probably are derived from suspended kaolin in uncased dug wells, a weathering product of feldspar minerals in the gneiss. Objectionable amounts of iron were reported in a few dug wells. Large amounts of biotite could cause objectionable iron. Corrosion of pipes in the water system by acidic water could also cause objectionable iron.

Garnet Mica Schist
Rock Description

Structurally overlying the Lithonia Gneiss of Watson (1902) is a group of rocks which include muscovite-biotite garnet schist, biotite gneiss, and amphibolite gneiss. Interlayered with these rocks is a highly resistant, ridge-forming muscovite quartzite, which will be discussed separately. These rocks were mapped as "Brevard Schist" on the geologic map of Georgia. This report, however, will follow Herrmann (1954), who gave them a purely lithologic group name of garnet mica schist because, he reported, they do not fit the original description of the Brevard Schist as given by Keith (1907).

The garnet mica schist crops out in isolated areas surrounded by Watson's Lithonia Gneiss in the northwestern part of the area and in the west-central part of Rockdale County it occurs adjacent to the Lithonia Gneiss.

Very few exposures of fresh muscovite-biotite garnet schist were found. It is dark gray in color, where fresh, and composed of garnetiferous muscovite-biotite layers with associated quartz-feldspar bands. The weathered rock is brownish red to red and the completely weathered saprolite is a micaceous red clay. Similarly, the biotite gneiss and amphibolite gneiss were found mostly as saprolitic material. The biotite gneiss is medium to fine grained with a banding of biotite in a matrix of quartz and feldspar. It weathers to a brownish-red, slightly sandy clay. Discontinuous amphibolite gneiss layers weather to dark-reddish-brown clay. Numerous pegmatites cut the garnet mica schist. Many of the pegmatites contain well-developed tourmaline crystals.

Water-Bearing Characteristics

Records of wells in garnet mica schist are few. Of the drilled wells reported, the average depth on hilltops is 137 feet and length of casing 24 feet; on hillsides the average depth is 175 feet and the casing 23 feet. No drilled wells in valleys were reported. Dug wells average 39 feet on hilltops and 28 feet on hillsides and in valleys. There are no records of bored wells.

The average yield of wells drilled on hilltops is reported to be 60 gpm and the yield of hillside wells, 12 gpm. The quality of water from the drilled wells, except from well 13DD7, is reported to be good. (See table 2.) Dug wells yield water reported to be only fair to good. Excess iron is the most objectionable constituent of water from garnet mica schist.

Muscovite Quartzite
Rock Description

A distinctive layer of ridge-forming muscovite quartzite crops out in the northwestern part of Rockdale County along the Rockdale-DeKalb County line. The rock unit can be traced eastward into DeKalb County and then southward until it reenters Rockdale County in the west-central part. Although the muscovite quartzite is a thin unit (50 to 100 feet) compared with the other major rock units, it is mapped separately because of its persistent ridge-forming character. The muscovite quartzite is interlayered with garnet mica schist, and Herrmann (1954) groups them together as a formation.

The quartzite, when fresh, is light gray to brownish gray and very hard. It is composed mostly of quartz with disseminated flakes of muscovite. Saprolite formed from weathering of the quartzite is a brownish-gray clayey sand.

Water-Bearing Characteristics

Only one well in muscovite quartzite has been reported. Because of its ridge-forming occurrence, few homes are located where it crops out. It is a highly fractured rock and therefore a potentially excellent aquifer. Bored and dug wells would be difficult to construct because there is little saprolite cover on the quartzite.

Porphyroblastic Biotite Gneiss
Rock Description

The southeastern part of Rockdale County is underlain by a group of rocks designated as porphyroblastic biotite gneiss. Included in this group of rocks is porphyroblastic biotite gneiss interlayered with thin nonmappable units of fine-grained biotite gneiss, sillimanite-quartz schist, muscovite-biotite schist (sometimes garnetiferous), phlogopite quartzite, and amphibolite gneiss.

The medium- to coarse-grained porphyroblastic biotite gneiss is coarsely layered. Biotite layers alternate with quartz-plagioclase layers. The latter contain andesine porphyroblasts. Fine-grained biotite gneiss is interlayered with the porphyroblastic biotite gneiss. It is composed of quartz and plagioclase with accessory lineated biotite. The partially weathered biotite gneisses are well-banded soft sandy clays, and the completely weathered saprolite is brownish-red clay.

Quartz veins and pegmatite dikes are numerous in the porphyroblastic biotite gneiss. They are usually less than a foot thick, but some pegmatites may cover large areas.

Water-Bearing Characteristics

In the area underlain by porphyroblastic biotite gneiss wells drilled on hilltops average about 325 feet in depth with 63 feet of casing, wells drilled on hillsides average about 282 feet with 62 feet of casing, and drilled wells in valleys average about 193 feet with 47 feet of casing. Bored wells average about 30, 37, and 20 feet on hilltops, hillsides, and in valleys. The average depths of dug wells are approximately 42 feet on hilltops, 32 feet on hillsides, and 21 feet in valleys.

Yields of drilled wells are about the same for hilltop and hillside locations (17-18 gpm), and wells in valleys average only about 9 gpm. Inadequate supplies were reported from two wells drilled on hillsides and one well drilled in a valley.

The reported quality of water from dug, bored, and drilled wells was mostly good. About 78 per cent of the well owners who were interviewed reported good water, 12 per cent reported fair water, and 10 per cent reported poor water. The most objectionable constituent reported was excessive iron. The variance in quality is probably because of the large number of different, nonmappable, rock units. The poor-quality water is probably associated with the amphibolite gneisses, which contain many iron-bearing minerals.

Amphibolite Gneiss
Rock Description

In addition to the amphibolite gneisses that are commonly interlayered with porphyroblastic biotite gneiss and garnet mica schist, three large masses of amphibolite gneiss occur in Rockdale County. One mass crops out in the southwestern part of the county adjacent to the Panola Granite of Herrmann (1954), another unit crops out in the east-central part of the county, and a third occurs in the northeastern part of the area.

The amphibolite gneisses are composed mostly of hornblende with some epidote and biotite alternating with plagioclase-rich layers. Biotite gneiss and biotite schist are interlayered with the amphibolite gneisses and pegmatite dikes are common. Layering of the amphibolites is irregular.

The amphibolite weathers to an ocherous yellowish-brown to reddish-brown soft rock and finally to a dark-red clay. The saprolite is distinctive because of the dark-red color.

Water-Bearing Characteristics

Information on wells penetrating amphibolite gneiss is sparse. Well construction should be similar to that of porphyroblastic biotite gneiss. Quality of water from wells on record is fair. It is expected that excessive iron would occur in water from amphibolite gneiss because of the high iron content of the mineral constituents.

Panola Granite of Herrmann (1954)
Rock Description

The Panola Granite of Herrmann (1954) crops out in the southwestern part of Rockdale County forming a dome-shaped mass intruded into porphyroblastic biotite gneiss which projects about 200 feet above the surrounding countryside. This mass of granite is called Pig Mountain on the U. S. Geological Survey topographic quadrangle map of the area.

The texture of the granite is porphyritic. Large phenocrysts of microcline occur in a groundmass of quartz, oligoclase, and biotite. Inclusions of biotite gneiss from several inches to several feet across are found in the Panola Granite in a road cut adjacent to Georgia Highway 155 southwest of Pig Mountain. Thin pegmatite dikes composed of quartz and feldspar with radial clusters of tourmaline also were found at this location.

The Panola Granite weathers to light-gray to brownish-red sandy saprolite. It is the only rock unit other than the Lithonia Gneiss that forms pavement.

Water-Bearing Characteristics

Little is known about the water-yielding characteristics of Herrmann's Panola Granite. The average depth of the three drilled wells on record is 410 feet, and the average casing depth is only 10 feet. The quality of the water is reported to be fair.

Pegmatite
Rock Description

All rock units in the area are intruded by numerous pegmatitic dikes, but only one pegmatite was found to be of mappable size. This pegmatite is in the southern part of the county and intruded into porphyroblastic biotite gneiss. Although no actual outcrop was found, float in the form of large feldspar crystals, quartz, and muscovite books covered an area about 150 yards in diameter. Location of this pegmatite is shown on the geologic map (plate 1).

Water-Bearing Characteristics

No known wells have been drilled in pegmatites in Rockdale County. The only pegmatite of mappable size would probably yield water of good quality, because the physical characteristics of pegmatites make them susceptible to fracturing, thus facilitating the circulation of meteoric waters.

Diabase Dikes

Rock Description

Numerous diabase dikes occur in the northern part of Rockdale County. They range in thickness from less than a foot to more than 30 feet. Several dikes appear to be continuous across the entire county, striking N. 30° W. to N. 45° W., and smaller dikes are evidently discontinuous. Herrmann (1954) reported dikes in the Stone Mountain-Lithonia area striking in the same general direction. The dikes in Rockdale County are probably a continuation of the dikes reported by him.

The dikes are composed of black diabase. According to Lester and Allen (1950) the component minerals in the diabase are plagioclase and pyroxene and smaller amounts of olivine, hornblende, magnetite, and pyrite. The dikes are highly fractured and weathering takes place in a circular pattern from the fractures inward. Weathering of the dikes forms a soft yellowish-brown ocherous clay. A small nodular mass of the rock is often completely weathered on the outside and fresh on the inside.

Water-Bearing Characteristics

Although diabase dikes are very thin, they are potentially excellent aquifers. Their highly fractured nature makes them good water conduits and when intersected below land surface they should yield large quantities of water. Well 14DD2 is drilled adjacent to a dike which dips toward the well. A yield of more than 100 gpm was reported by the driller. The quality of the water from this well is shown on table 2.

Alluvium

Rock Description

Alluvium, as shown on the geologic map, consists of stream-deposited sand and gravel and is restricted to the flood plains of the major rivers and larger creeks. Although some of the smaller creeks may have alluvial deposits in small flood plains, they are not mappable at the scale of the geologic map (plate 1).

Water-Bearing Characteristics

Alluvium in Rockdale County is rarely utilized as an aquifer because of its location in low areas subject to periodic flooding. It is potentially productive by means of dug wells where its thickness is great enough.

GROUND WATER

In those areas of Rockdale County where treated surface water is not available, ground water is

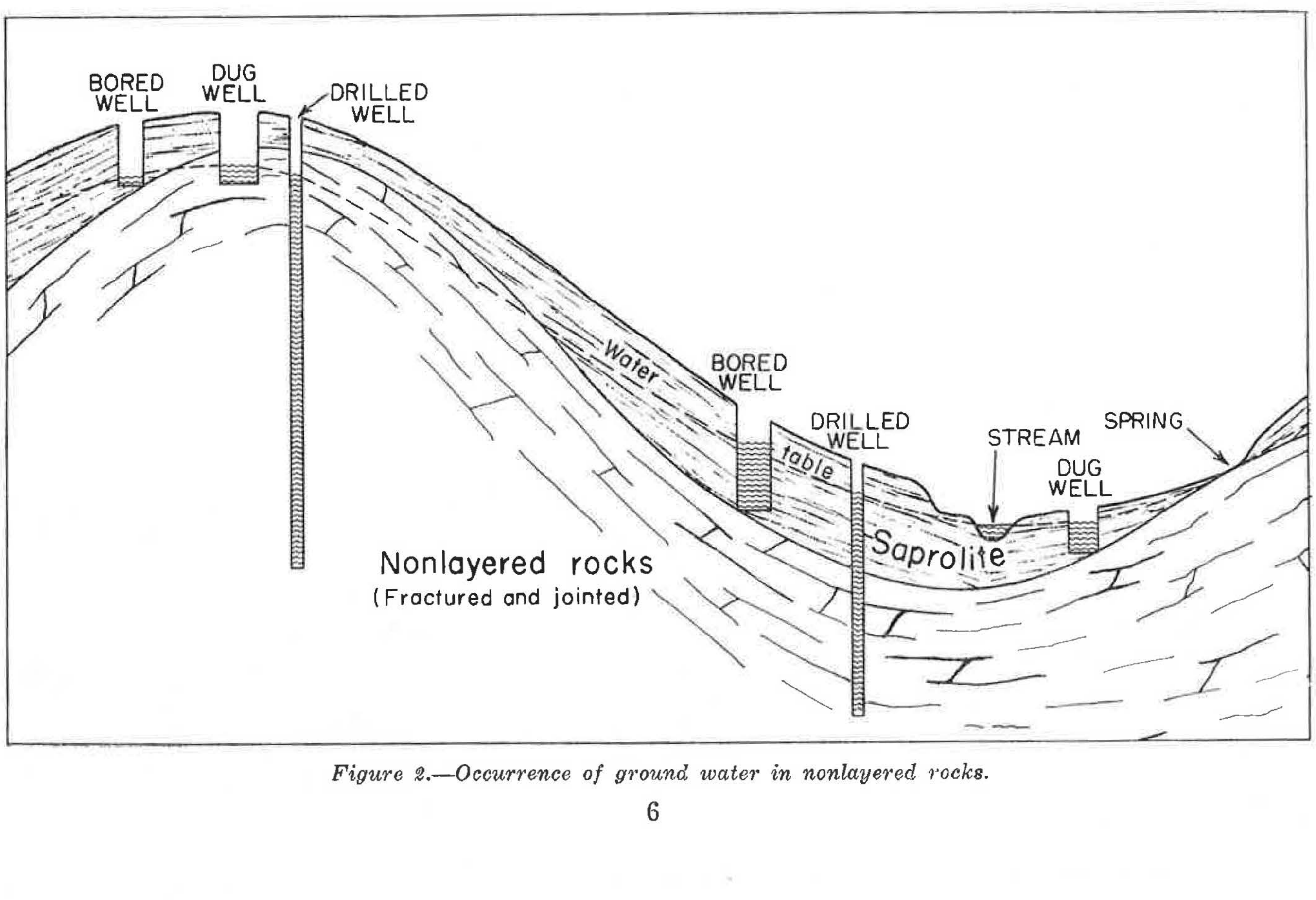


Figure 2.—Occurrence of ground water in nonlayered rocks.

utilized for human consumption, for watering of stock, and for some irrigation. Ground water is water beneath the land surface in the zone of saturation, or water that occupies pore spaces in the saprolite, and in cracks, crevices, and openings in the underlying rock.

Occurrence

Rainfall, percolating downward, becomes ground water when it reaches the zone of saturation. Not all rainfall, however, becomes ground water; evaporation, transpiration, and runoff claim a large portion. Once the water reaches the zone of saturation, it is stored in the pore spaces of the saprolite and in the cracks and crevices of the rock beneath the saprolite.

The top of the zone of saturation is called the water table. In a well that penetrates the zone of saturation the level of water in the well coincides with the water table. Generally, the water table reflects the topography, but on hilltops it is farther below the land surface than in the valleys. Where lakes and streams occur the water table intersects the land surface at their surface level.

Fluctuation of the water table is related to precipitation. Usually there is a lag from the time precipitation occurs until the water reaches the water table and the water level in a well rises. Similarly, a low water table lags dry spells. In late fall and early winter the water table is usually at its lowest point. It begins to rise in late winter and reaches its peak by late spring.

Ground-water occurrence in nonlayered rocks is illustrated on figure 2. In Rockdale County nonlayered rocks include the Lithonia Gneiss of Watson (1902) and the Panola Granite of Herrmann (1954). Because interstitial openings are small, ground-water storage and movement is limited to fractures. Fractures in the rock are the result of exfoliation, structural disturbances, and weathering. Exfoliation in homogeneous rock masses occurs roughly parallel to the surface of the rock mass, and the exfoliation fractures are usually more pronounced on the slopes and in the valleys surrounding the rock masses. Joints are caused by structural deformation and are important water conduits. Weathering enlarges exfoliation fractures and joints.

Figure 3 illustrates the occurrence of ground water in layered rocks. Porphyroblastic biotite gneiss, garnet mica schist, amphibolite gneiss, and muscovite quartzite are the important waterbearing units that consist of layered rocks in Rockdale County. In these rocks ground-water movement is controlled largely by fracturing parallel to the layering. Highly fractured layers often alternate with more competent layers and ground-water movement may be restricted.

Discharge and Recharge

Discharge of ground water takes place by either natural or artificial processes. Natural discharge of ground water is the process whereby water is removed from storage and returned to the atmosphere by natural means. It occurs when ground water discharges into springs, streams, and lakes and when it is transpired by vegetation. Discharge of ground water by artificial processes takes place when water is removed from the zone of saturation by means of wells.

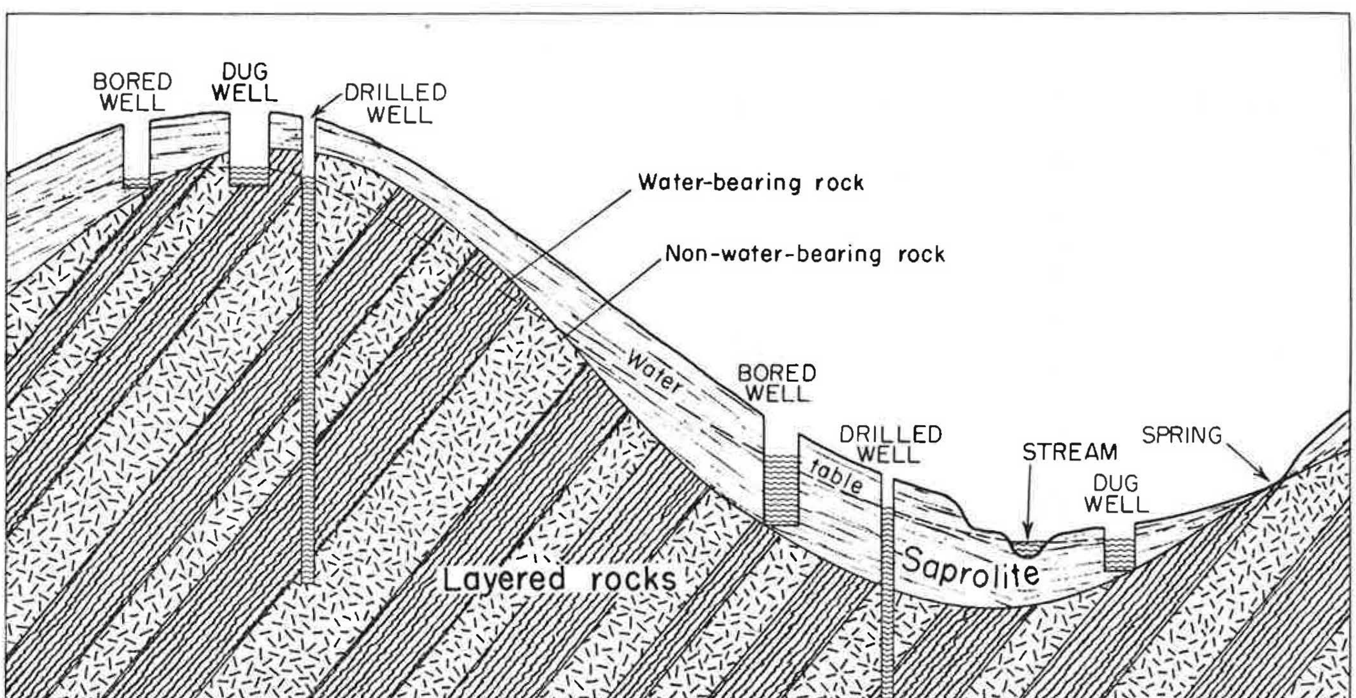


Figure 3.—Occurrence of ground water in layered rocks.

Recharge of water to the zone of saturation is mainly by downward percolation of rainfall. Recharge may take place also when the water table in the vicinity of lakes and streams is low. Water from the lakes and streams then tends to flow toward the areas of water-table depression. The rate of recharge depends on the permeability of the unsaturated material.

Well Construction

Three types of wells are utilized in Rockdale County—dug, bored, and drilled. Dug and bored wells obtain water mostly from the saprolitic material in the subsurface. Drilled wells penetrate the underlying rock and obtain water from openings, cracks, and crevices in the rock. Figure 4 illustrates the three types of wells.

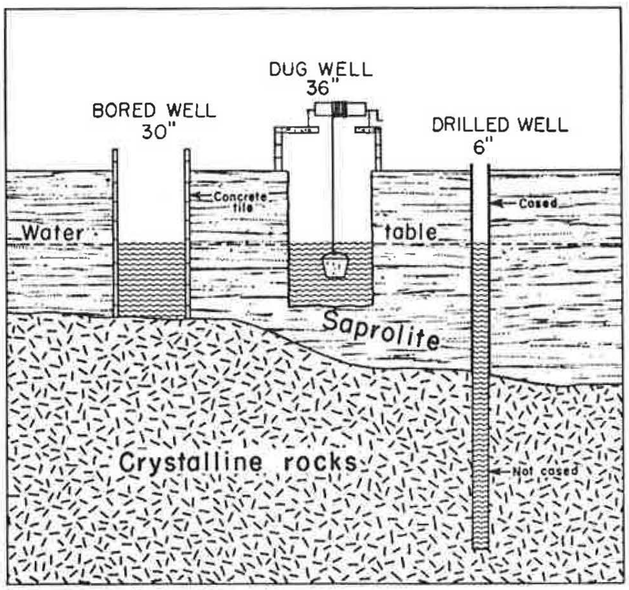


Figure 4.—Construction of bored, dug, and drilled wells.

Dug wells are usually prepared with a pick and shovel. Consequently, they are the shallowest type of well and are generally confined to the saprolite. When cased, concrete pipe is most often used, but a dug well may be shored with wood or may be bricked. Often only the bottom portion of the well is cased; usually that portion of the well below the water table. The water in a dug well is generally drawn by hand, but many wells are equipped with shallow-well pumps.

Bored wells are confined entirely to the saprolite, because a well-boring machine is not capable of penetrating hard rock. In areas where the water table is near the base of the saprolite bored wells cannot be used. Concrete pipe, 24 to 36 inches in diameter, is used to case bored wells from the land surface to the bottom of the well. Water enters the well through loose-fitting joints in the pipe and through the bottom of the well. Pumps are almost always installed in bored wells.

Drilled-well construction differs greatly from that of bored and dug wells. The saprolite is cased out with steel pipe and an open hole is drilled into the rock beneath the saprolite. The diameter of drilled wells averages 6 inches. Pumps are used to remove water from them.

Yields of Wells

Drilled wells are usually the most reliable of the three types of wells because they obtain water from greater depths than dug or bored wells and, therefore, are not so susceptible to water-table fluctuations. Crystalline rocks have been compacted and recrystallized by deep burial and the interstitial openings are minute and afford little room for water storage. Therefore, to be productive a drilled well must intersect fractures in the rocks that are interconnected with either the surface or the saprolite. Records show that wells drilled through a thick saprolite cover are usually more productive than wells drilled through a thin saprolite cover, or wells that have no saprolite cover. The saprolite acts as a sponge, retaining the water until it is needed and then permitting it to move through the rock fractures into the well bore.

Two major factors affecting the yield of dug and bored wells are saprolite permeability and depth of penetration into the saturated zone. Permeability of the saprolite determines the rate of ground-water movement through it, and thickness of the saturated zone penetrated determines the amount of water stored in the well bore. Because saprolite permeability is usually low, withdrawals in excess of the amount the saprolite will yield to the well bore must come from the water stored in the well. If the well has penetrated only a few feet of the saturated zone and the withdrawal is greater than the amount of water flowing into the well, the well will be pumped dry in a short time. It is important, therefore, to construct the well so that there is ample storage of water in the well bore to meet the peak demands.

SURFACE WATER

Surface water is furnished to the cities of Conyers and Milstead by the Conyers Water Treatment Plant. In addition to furnishing water to residents of these towns, treated surface water is supplied also to several industries in the immediate vicinity of Conyers.

The Conyers Water Treatment Plant is located about three-fourths of a mile northeast of the Conyers city limits on Georgia Highway 20. Yellow River water is supplied to the plant by a pumping station about half a mile north of the plant, where Highway 20 crosses the river. A flocculating agent is added, after which it is sand filtered. The pH of the water is adjusted with lime, chlorine and fluoride are added, and the water is distributed. Analyses 13 and 14 in table 2 show the chemical quality of raw water and treated water from the Conyers Water Treatment Plant. The capacity of the treatment plant is $1\frac{1}{2}$ mgd (million gallons per day).

WATER QUALITY

The chemical quality of ground water in Rockdale County is governed by the type of rock in which the water occurs. Rain, relatively free of chemical impurities when falling, dissolves chemicals out of the saprolite and rock as it percolates downward. Some chemical constituents are harmful when taken internally and others are not desirable because of a displeasing taste or smell. Most industrial users require water low in dissolved chemical constituents and spend a great deal of money treating water to make it suitable for use.

The U. S. Public Health Service (1962) has recommended limits of chemical concentrations for drinking water used by carriers subject to Federal Quarantine Regulations. These minimum standards should be adhered to by all persons consuming water. A few of the more important concentration limits for chemical constituents are listed in table 1.

Table 1.—*Recommended minimum standards of water quality (based on U. S. Public Health Service drinking water standards, 1962).*

Chemical constituent	*Recommended limit (parts per million)*
Iron (Fe)	0.3
Magnesium (Mg)	125
Sulfate (SO_4)	250
Chloride (C1)	250
*Fluoride (F)	1.2
Nitrate (NO_3)	45
Dissolved solids	500

Table 2 lists chemical analyses of water from wells, a spring, and treated and untreated surface water from the Conyers Water Treatment Plant. Analyses of water from the six major rock groups in Rockdale County show that only one chemical constituent found in the water exceeds the U. S. Public Health Service standards. That constituent is iron and in only two samples is the amount of iron excessive. An analysis of water from garnet mica schist exceeds the recommended limit of 0.3 ppm (parts per million) by about 13 times. The other analysis of water from porphyroblastic biotite gneiss shows just slightly more than the recommended limit.

Iron in excess of 0.3 ppm tends to stain clothes and imparts a bitter taste to the water. Magnesium, in combination with the sulfate ion, has a laxative effect and causes scaling in boilers. Concentrations of sulfate and chloride in excess of 250 ppm are objectionable primarily because of bad taste. The same is true for total dissolved solids in excess of 500 ppm.

Excess nitrate in the water can cause death in infants (methemoglobinemia) during their first few months of life, and both humans and animals can be poisoned by nitrate if the concentration is great enough. Few nitrate minerals occur in Rockdale County and nitrate concentrations shown in table 2 are well below the recommended limit of 45 ppm set by the U. S. Public Health Service. However, the major cause of pollution by nitrate

*Recommended limit for the average maximum temperature in Rockdale County.

Table 2—*Chemical analyses of ground water and of Conyers surface-water supply, Rockdale County, Georgia.*

Well No.	Owner	Rock type (symbol refers to geologic map, pl. 1)	Depth of well (feet)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (sum)	Dissolved solids (residue at 180° C)	Hardness as ($CaCO_3$): Calcium Magnesium	Hardness as ($CaCO_3$): Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Remarks
[1]12CC1	H. B. Toney	pgr	353	5-18-64	46	0.0	15	0.9	12	1.5	76	0	3.2	1.0	0.1	.0	117	106	41	0	128	7.0	
[2]13CC1	Joe Katz - Double "T" Ranch	pbg	608	8-10-63	30	.1	10	3	5		46	0	3	5	.1	5		68	37			6.1	
[3]13CC17	Monastery of the Holy Ghost	pbg	307	8-28-62	13	.34	7.4	.9	3.6	1.6	28	0	16	.8	.2	.0	58	52	22	0	93	6.9	
[1]13CC2	M. W. Hill	pbg	150	4-28-64	34	.0	6.8	1.7	5.6	2.2	42	0	2.8	.0	.1	1.5	76	68	24	0	80	6.9	
[1]13DD2	Abbot Estates	lgn	250	5-20-64	17	.1	.7	.1	2.1	1.2	8	0	.0	.0	.0	1.9	27	22	2	0	20	6.4	
[2]13DD7	Martin Hurst	gms		2-11-65	24	4	18	4	13		98	0	4	4	.2			125	62			6.7	
[1]13DD18	Camp Westminster	lgn	209	5-20-64	29	.0	2.4	.5	6.1	.7	22	0	.3	2.2	.2	3.4	55	46	8	0	49	6.4	
[3]13DD54	City of Conyers	lgn	550	10-8-58	18	.06	13	.4	3.9	1.2	31	0	10	5.5	.4	.5	68	75	26	8	91.0	7.2	
[2]14DD2	Hi Roc Development Corp.	lgn	130	5-7-64	20	.7	5	1.5	4		32	0	.6	3	.1	3.8		61	19			6.3	
[1]14DD7	Billy Farmer	lgn	137	5-18-64	28	.1	3.6	.2	6.4	1.6	15	0	.4	3.5	.0	12	63	54	10	0	61	6.0	
[1]14CC1	Highland Golf Club, Inc.	pbg		5-20-64	28	.2	13	1.1	5	1.9	46	0	11	1.5	.2	.0	85	110	37	0	101	6.8	
[2]13CCS3	Monastery of the Holy Ghost	pbg		2-10-65	12	.0	3	2	5		24	0	1	5	.2	3		44	16			6.0	Spring
[2]	Conyers Water Treatment Plant			2-11-65	14	1.5	2.4	2	5		22	0	2	3	—	.7		43	14			6.8	Untreated surface water from Yellow River
[2]	do			2-11-65	14	.0	6.5	2	5		23	0	5	4	1.0	0.7		50	24			7.1	Treated surface water from Yellow River

[1] Analysis by U. S. Geological Survey except for iron, which was analyzed by Georgia Department of Mines, Mining and Geology

[2] Analysis by Georgia Department of Mines, Mining and Geology

[3] Analysis by U. S. Geological Survey

is from use of nitrate fertilizers and from human and animal wastes. Any well located near a fertilized field, septic tank, or barnyard is susceptible to nitrate contamination, especially if improper construction permits surface water to flow into the well.

In "Drinking Water Standards" published by the U. S. Public Health Service (1962) it is stated that "Fluoride in drinking water will prevent dental caries" and that ". . . no ill effects will result when the concentration is optimum." The fluoride concentration in water for human consumption is based on the annual average of maximum daily air temperatures. The recommended concentrations are lower for those areas having higher annual average maximum daily air temperatures. The recommended range of concentration is from 0.7 to 1.2 ppm, and the optimum concentration is 0.9 ppm for an annual average maximum daily air temperature that ranges from 63.9° to 70.6° F. Rockdale County's average maximum daily air temperature is within this range. As can be seen from table 2, ground water in Rockdale County contains little fluoride, the highest concentration shown being only 0.4 ppm. Surface water users, however, have the benefit of fluoridated water.

Most ground water in Rockdale County is acidic. Such water is corrosive and when in contact with rocks containing iron it tends to dissolve iron from them. Raising the pH of the water decreases its corrosiveness and precipitates the iron. A simple way of raising the pH is to run the water through marble chips. Reaction of the basic chemicals in the marble with the acidic chemicals in the water has a neutralizing effect. Because the iron in solution is not stable in neutral or basic water, it will precipitate and form a coating on the marble chips. Periodic cleaning of the marble chips renews their effectiveness.

Marble chips can be placed directly in bored and dug wells because of their large diameter. Because drilled wells have such a small diameter and the pump is often placed near the bottom of the well, it is necessary to run the water through a tank or reservoir containing the marble chips. Dr. S. M. Herrick of the U. S. Geological Survey suggested (oral communication, Feb. 23, 1965) that wooden baskets be made to hold the marble chips and that the basket be lowered in the dug or bored well. Periodically the basket could be raised and the marble chips cleaned.

WATER CONSUMPTION

An estimate of the total water consumption per day in Rockdale County can be made by figuring the per capita ground-water consumption and adding it to the total surface-water consumption. The national average per capita consumption is approximately 50 gpd (gallons per day). This figure is probably high for the average rural resident of Rockdale County because of the large number of dug wells without pumps in use. Assuming that the per capita consumption of ground water is only 25 gpd and that the rural population is approximately 9,000 (based on 14,000 total population), the total ground-water consumption in Rockdale County is about 225,000 gpd.

Surface-water use in Conyers and Milstead, including industrial use, averaged about 551,000 gpd during 1964 (Warren Griffin, personal communication, Feb. 11, 1965). This added to the 225,000 gpd of ground water consumed by rural residents gives a total of approximately 776,000 gallons of water used daily during 1964 in Rockdale County.

CONCLUSIONS

Ground water is not present everywhere in Rockdale County in the amounts needed for modern day living. It is important, therefore, when drilling a well to pick the best location available. Well records show that geology and topography play an important part in whether or not a well is successful. The location of a well with respect to fracture patterns in homogeneous rock or with respect to recharge of water-bearing layers in layered rock determines the well yield. When rock exposures are not available topographic features and saprolite thickness criteria must be used to determine the best well location.

Chemical quality of ground water in Rockdale County is generally good. Most water is soft and has a low dissolved-solids content. In isolated areas throughout the county excessive iron has been reported.

RECORD OF SPRINGS AND WELLS

The locations of the springs and wells in the following tables are shown on plate 1.

SELECTED REFERENCES

Crickmay, W. S., 1952, Geology of the crystalline rocks of Georgia: Georgia Geol. Survey Bull. 58, 52 p.

Crickmay, W. S., and others, 1939, Geologic map of Georgia: Georgia Geol. Survey Map.

Herrick, S. M., and LeGrand, H. E., 1949, Geology and ground-water resources of the Atlanta area, Georgia: Georgia Geol. Survey Bull. 55, 121 p.

Herrmann, L. A., 1954, Geology of the Stone Mountain-Lithonia district, Georgia: Georgia Geol. Survey Bull. 61, 193 p.

Keith, Arthur, 1907, Description of the Pisgah quadrangle: U. S. Geol. Survey Geol. Atlas, Folio 147.

Lester, J. G., 1938, The geology of the region around Stone Mountain, Georgia: Colorado Univ., Ph.D. Thesis.

Lester, J. G., and Allen, A. T., 1950, Diabase of the Georgia Piedmont: Geol. Soc. America Bull., v. 6, p. 1217-1224.

Sever, C. W., 1964, Geology and ground-water resources of crystalline rocks, Dawson County, Georgia: Georgia Geol. Survey Inf. Circ. 30, 32 p.

Watson, J. L., 1902, A preliminary report on the granites and gneisses of Georgia: Georgia Geol. Survey Bull. 9-A, 367 p.

U. S. Public Health Service, 1962, Drinking water standards: Public Health Service Pub. 956.

Table 3.—*Record of springs in Rockdale County.*

Spring No.	Owner	Location	Type of rock	Yield (gpm)	Use	Dependability	Remarks
13CCS1	Evan Farmer	Draw	Garnet mica schist & gneiss	4-5	None	Good	
S2	Lowland Mitchell	do	Garnet mica schist	—	Domestic	do	
S3	Monastery of the Holy Ghost	Hillside	—	12	do	do	
S4	J. R. Young	Foot of hill	—	2	do	do	
13DDS1	Morris Jackson	Small valley	Lithonia Gneiss	4	do	do	
S2	G. Van Greene, Jr.	Sloping hilltop	do	—	Domestic & stock	do	
S3	J. F. Camp	Small draw	—	2	None	do	
S4	B. Frank Nash	do	—	4	do	do	
S5	T. A. Wajcik	Foot of hill	—	—	Domestic & stock	do	No overflow.
S6	Ernest Bradford	do	—	3	None	do	
14CCS1	Charles Hunter	Low depression	—	30	Domestic & stock	do	
14DDS1	Parks Printing Co.	Small valley	Lithonia Gneiss	10	None	do	
S2	W. D. Merritt	Sloping hillside	—	20	Domestic	do	
S3	C. R. Hayes	Edge of small valley	Saprolite	10	do	do	
S4	H. T. Humphries	Sloping hillside	—	10	do	do	High iron content.
S5	W. E. Singleton	Depression in hillside	Garnet mica schist	—	Stock	do	
S6	do	Depression near hilltop	do	—	do	Fair	Dry in extremely dry weather.
S7	G. P. Owen	Foot of hill	—	1	Domestic	Good	
S8	E. A. Braswell	Draw	—	5	do	do	
S9	Mrs. Grace McGettie	Draw at foot of hill	—	2	do	do	
S10	John H. Morris	do	—	2	do	do	

Table 4.—*Record of wells in Rockdale County, Georgia.*

Well No.	Owner	Type of well	Topography	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface (feet)	Date measured	Yield (gpm)	Use	Remarks
12CC1	H. B. Toney	Drilled	Hillside	6	353	10	45	Reported	22+	Domestic	
2	Mr. Mitchell	do	do	6	340	10±	—	—	—	do	
3	W. T. Ward	do	Hilltop	6	143	5	—	—	10	do	
4	W. F. Hammonds	Bored	Flat	24	—	—	—	—	—	do	
5	Jerry Taylor	Dug	Hilltop	36	32	—	28	Reported	—	do	
6	James F. Berry	do	do	30	30	30	25	do	—	do	
12DD1	F. E. Alexander	Drilled	do	6	145	50	50±	do	45	Domestic & stock	High iron content.
2	do	Dug	Hillside	36	50	None	—	—	—	Domestic	
13CC1	Joe Katz	Drilled	do	6	608	55	40	Reported	10.3	Domestic & stock	
2	M. W. Hill	do	Flat	6	134	82	35	do	6	Domestic	
3	C. H. Phelps	Dug	Hillside	36	19	None	8.6	May - 1964	—	do	
4	H. G. Conner	do	do	30	38	None	11.5	May - 1964	—	do	Can be pumped dry.
5	John C. McGehee	do	do	30	25	25	19.5	Sept - 1964	—	do	
6	W. A. Staples	do	Ridge	36	37	None	—	—	—	do	
7	W. G. Gleaton	do	Hillside	36	20	None	15.0	Reported	—	do	
8	Evan Farmer	do	do	36	33	None	—	—	—	do	High iron content.
9	Paul Staple	do	Hilltop	36	50	None	38	Reported	—	do	
10	Jack Parris	do	Hillside	36	29.5	None	26.5	Oct - 1964	—	do	
11	H. M. Duke	do	do	36	28	None	22.0	Reported	—	do	
12	Charles Patrick	do	Flat	36	30	None	21.8	Oct - 1964	—	Domestic & stock	Do.
13	Walker Smith	Drilled	Hillside	6	100	63	30	Reported	20	Domestic	Do.
14	G. J. Hammonds	Bored	Hilltop	30	51	51	49	do	—	Domestic & stock	
15	W. L. Susong	Dug	do	36	20±	None	—	—	—	do	Do.
16	Monastery of the Holy Ghost	Drilled	Hillside	6	246	—	18.0	Nov - 1964	22	None at present	
17	do	do	do	8	307	26	15.0	Reported	9.9	Domestic & stock	
18	do	do	do	8	621	57.5	77.5	do	4	None	
19	J. R. McElhattan	do	do	6	250±	—	—	—	—	Domestic & stock	
20	J. L. Moon	do	Hilltop	6	380±	—	—	—	—	Domestic	Do.
21	A. B. Paul	do	do	6	214	—	36.4	Jan - 1965	40	do	

Table 4.—*Record of wells in Rockdale County, Georgia (continued).*

Well No.	Owner	Type of well	Topography	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface (feet)	Date measured	Yield (gpm)	Use	Remarks
13CC22	A. B. Paul	Dug	Hilltop	36	38	None	26.1	Jan - 1965	—	Domestic	
23	do	Drilled	Hillside	6	250 ?	—	—	—	—	do	
24	do	Dug	do	36	24	—	14.5	Jan - 1965	—	do	Water quality poor.
25	do	do	Hilltop	36	61	None	39.5	Jan - 1965	—	do	
26	do	do	do	36	43.4	None	37.1	Jan - 1965	—	do	
27	J. F. Thomson	Drilled	Hillside	6	187	64	45	Reported	18	Domestic & stock	
28	Kirkus Contr. Co.	Bored	do	30	30	30	10	do	—	Domestic	Water tastes of lime.
29	John H. Anderson, Sr.	Drilled	do	6	227	61	—	—	—	do	
30	Robert Kirkus	Dug	do	36	42	42	24	Reported	—	Domestic & stock	
31	Irvin Smith	do	Draw	30	10.4	10.4	9.3	Feb - 1965	—	do	
32	R. W. Hammons	do	Hillside	40	42	None	38	Reported	—	do	
33	Sam Walden	do	do	40	35	None	23	do	—	do	
34	I. W. Smith, Sr.	do	Ridge	30	41.0	None	36	Feb - 1965	—	do	
35	Essie Davis	do	Hillside	36	29	None	10	Feb - 1965	—	Domestic	Some iron content.
36	Joseph Davis	do	Creek bottom	30	19.5	19.5	15.7	Feb - 1965	—	do	
37	Marion Hill	do	Hilltop	30	44.5	None	33.9	Feb - 1965	—	do	
38	Junior Kind	do	Ridge	30	30	None	24.1	Feb - 1965	—	do	
39	Clark Harrison	do	Hillside	36	40	None	32.3	Feb - 1965	—	do	
40	Walter Green	do	do	36	40	None	25	Feb - 1965	—	Domestic & stock	
41	B. A. Hasty	Drilled	Hilltop	6	165	—	—	—	—	do	
42	do	do	do	6	202	42	40	Reported	23	do	
43	do	Dug	Hillside	30	55	25	45	do	—	do	
44	Mr. C. L. Blackmon	do	do	36	25.5	None	17.3	Feb - 1965	—	Domestic	
45	H. K. Wood	do	Hilltop	36	40	None	28	Reported	—	do	
46	J. R. Young	Bored	Hillside	30	20	20	17	do	—	do	Inadequate supply.
47	Plantation Manor	Drilled	Slope	6	235	—	25	do	50	do	
48	Presbyterian Home Mission	do	do	6	340	—	—	—	20	do	
13DD 1	Joe Underwood	do	Hilltop	6	396	34	—	—	1-2	do	

Table 4.—*Record of wells in Rockdale County, Georgia (continued).*

Well No.	Owner	Type of well	Topography	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface (feet)	Date measured	Yield (gpm)	Use	Remarks
13DD 2	Abbot Estates	Drilled	Hillside	6	250	18	10.0	Reported	50	Public supply	
13DD 3	do	do	do	6	135	21.5	38	do	20	do	
4	J. E. Abbot	do	Hilltop	6	137	8	11.0	do	34	Domestic	
5	Ed Turner	Dug	Hillside	36	30±	—	—	—	—	do	
6	Martin Hurst	Bored	do	30	—	—	—	—	—	do	
7	do	Drilled	do	6	—	—	—	—	—	do	High iron content.
8	Mercer Rowan	Dug	do	36	27	27	—	—	—	do	Do
9	J. J. Mitchell, Jr.	Drilled	do	8	372	28	15	Reported	200±	do	Water seems hard.
10	Charlie Wilson	Dug	do	35	—	—	—	—	—	do	
11	Phillips 66 Station	Drilled	Hilltop	6	239	73	—	—	16	Industrial	
12	W. W. Parker	do	Hillside	6	538	—	—	—	—	Domestic & stock	Causes iron stain.
13	Mrs. E. H. Plunkett	Dug	Flat land	—	—	—	—	—	—	Domestic	
14	William A. Hinton	do	Hillside	54	25	—	—	—	—	do	Supply inadequate in dry weather; high iron content.
15	G. Van Green, Jr.	do	do	—	25	—	—	—	—	do	
16	do	do	Hilltop	—	30	—	12.5	May - 1964	—	do	
17	Joe H. Bennett	do	Valley	—	23.6	—	10.2	May - 1964	—	do	High iron content.
18	Camp Westminster	Drilled	Hilltop	6	209	46.5	31.3	May - 1964	35	Public supply	
19	do	do	Hillside	6	221	43	0	Reported	13	do	
20	do	do	do	6	267	30	45	do	3	do	
21	H. M. Pace	do	do	6	46	34.5	—	—	25	Domestic	
22	W. L. Gainer	do	Hilltop	6	196	—	—	—	½	do	Supply inadequate.
23	Green Meadows Memorial Garden	do	do	6	470	61	30	Reported	1	Industrial	Do
24	R. H. Johnson	Dug	Flat	30	17.3	18	11.9	Sept - 1964	—	Domestic	
25	Frank Fagan	Bored	Hilltop	30	36	None	31.8	Sept - 1964	—	None	Do
26	B. R. Miller	Dug	do	—	20±	—	—	—		Domestic	
27	Frank Johnson	do	do	36	28.7	6	215	Feb - 1965	—	do	
28	J. F. Camp	do	do	36	23	23	10.7	Feb - 1965	—	do	
29	Jerald Ledford	Dug	Hillside	36	55	55	50	Reported	—	Domestic & stock	Some sulfur content.

Table 4.—*Record of wells in Rockdale County, Georgia (continued).*

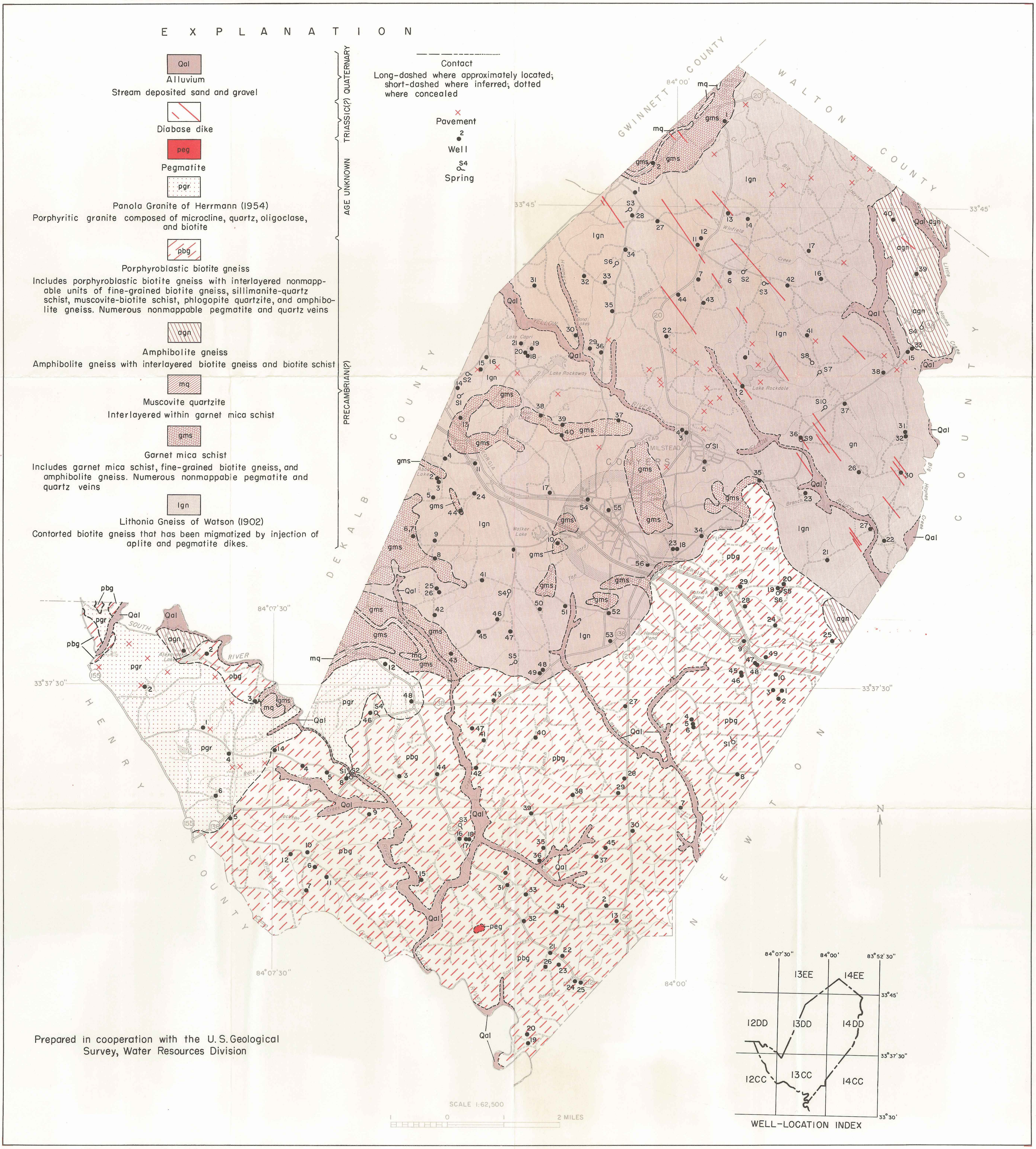
Well No	Owner	Type of well	Topography	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface (feet)	Date measured	Yield (gpm)	Use	Remarks
13DD30	Roy M. Bond, Sr.	Dug	Hillside	36	44	None	48	Reported	—	Domestic & stock	
31	Coy Elliott	do	do	30	37.4	37.4	31.3	Feb - 1965	—	do	
32	Lee Owens	do	Hilltop	36	21	None	13	Feb - 1965	—	do	
33	J. H. Oglesby	do	Hillside	36	22.5	None	16.7	Feb - 1965	—	do	
34	Mrs. Eula Bradford	do	Hilltop	36	32.5	None	27.0	Feb - 1965	—	Domestic	
35	James E. Williams	do	Valley	36	15	None	9	Reported	—	Domestic & stock	
36	Luther Blake	do	Hilltop	48	None	None	18.7	Feb - 1965	—	Domestic	
37	Mrs. E. B. Burnham	Drilled	Hillside	6	151	11	33	Reported	17	do	
38	Hiram Dunn	Dug	Hilltop	36	28	None	26.2	Feb - 1965	—	Domestic & stock	
39	Vaden White	do	do	48	26	None	21.2	Feb - 1965	—	do	
40	do	do	Hillside	36	20	None	17	Feb - 1965	—	Domestic	
41	Tom Granade	do	Hilltop	30	25	9	18	Reported	—	do	
42	Charles Codney	do	Hillside	48	33	None	24.2	Feb - 1965	—	Domestic & stock	
43	R. P. Hull	do	do	36	30.4	None	23.7	Feb - 1965	—	Domestic	
44	Lewis Hull	Drilled	Flat	6	200	34.5	20	Reported	7	do	
45	J. C. Kilgore	do	Hillside	6	155	33.5	30	do	30	do	
46	Terrell Underwood	Dug	Hilltop	30	28	28	22	do	—	do	
47	Robert Cornwell	do	Hillside	48	25.3	None	20.6	Feb - 1965	—	do	
48	Joseph Smith	do	do	60	16	None	10.8	Feb - 1965	—	None	
49	do	do	do	36	32.9	None	20.1	Feb - 1965	—	Domestic	
50	Willis J. Johnson	do	Flat	60	14.5	None	8.9	Feb - 1965	—	do	Goes dry every summer.
51	J. W. Bruce	do	Hillside	48	23	None	13.2	Feb - 1965	—	Domestic & stock	High iron content.
52	Tom Parker	do	do	36	14	None	7.5	Feb - 1965	—	Domestic	
53	J. A. Stanton	Drilled	do	6	202	58	30	Reported	35	Domestic & stock	
54	City of Conyers	do	do	8	350±	—	160	do	90	None	
55	do	do	Hilltop	8	550	34	113	do	120	Public supply	Standby well.
56	do	do	do	10	410	103.5	60	do	348	None	
13EE 1	C. S. Farmer	Dug	Flat	48	16.3	None	7.4	Feb - 1965	—	Domestic & stock	
2	O. R. Ellington	do	Hilltop	48	48.7	None	39.2	Feb - 1965	8	do	Some iron.

Table 4.—*Record of wells in Rockdale County, Georgia (continued).*

Well No.	Owner	Type of well	Topography	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface (feet)	Date measured	Yield (gpm)	Use	Remarks
14CC 1	Highland Golf Club Inc.	Drilled	Hillside	6	385	60	20	Reported	28	Golf course	
2	do	do	do	6	307	9	—	—	—		Supply inadequate.
3	do	do	do	6	—	—	—	—	—		Do.
4	B. K. Hammond	do	Draw	6	80	29	25	Reported	9	Domestic	
5	H. W. Lytle	do	Hillside	6	145	42.5	40	do	6	do	
6	Miss Nidia Gardner	do	do	6	195	42	—	—	—	None	Do.
7	Gordon Dean	do	Hilltop	6	342	38	30	Reported	6.5	Stock	
8	E. O. Brock	Dug	Hillside	36	40	None	32	do	—	Domestic	
14DD 1	Hi Roc Development Corp.	Drilled	Valley	6	405	1	—	—	—	None	Do.
2	do	do	do	6	130	106	—	—	100	Public supply	
3	Parks Printing Co.	do	do	10	550	—	25	Oct - 1947	60	None	
4	do	do	do	10	237	30	6	Dec - 1950	75	Industrial	
5	do	do	Hilltop	10	600	—	55	Oct - 1947	20	None	
6	Roy Staples	Bored	do	30	55	55	—	—	—	Domestic	
7	Billy Farmer	Drilled	Hillside	6	137	51	18	May - 1964	4	Domestic & stock	
8	James Pickard	Dug	Hilltop	36	37.6	None	26.8	May - 1964	—	do	High iron content.
9	J. A. Cowan	Bored	Hillside	30	42	—	25	Reported 1962	—	Domestic	
10	Highland Golf Club	Drilled	Depression	6	247	65	—	—	—	None	Supply inadequate.
11	H. L. Maynor	Dug	Hillside	36	41	None	35	Reported 1963	—	Domestic	
12	T. D. Watson	Bored	Hilltop	24	48	48	18	July - 1964	—	do	
13	L. F. Robinson, Jr.	Dug	Flat land	30	19.7	None	9	July - 1964	—	do	
14	R. L. Mims	Bored	do	30	10.9	10.9	6.7	July - 1964	—	do	
15	Jesse Costley	Dug	Hilltop	36	58	None	46.2	July - 1964	—	do	
16	J. W. Kincaid	do	Ridgetop	36	63	None	43.8	July - 1964	—	do	
17	T. L. Brooks	Bored	Hillside	30	40	40	25	Reported	—	do	
18	Green Meadows Memorial Garden	Drilled	do	6	146	19	21	do	12	Cemetery	
19	W. E. Singleton	Dug	Hillside	36	34	None	30	Reported	—	Domestic	

Table 4.—*Record of wells in Rockdale County, Georgia (continued).*

Well No.	Owner	Type of well	Topography	Diameter of well (inches)	Depth (feet)	Cased to (feet)	Water-level below land surface (feet)	Date measured	Yield (gpm)	Use	Remarks
14DD 20	S. C. Herring	Drilled	Hilltop	6	206	55	12	Reported	—	Domestic	
21	H. R. Payne	do	do	6	—	8	—	—	—	Domestic & stock	
22	Charles I. Goodwin	Dug	Hillside	36	46	None	33.5	Sept - 1964	—	do	
23	Mrs. Manley	do	do	36	20.6	None	16.8	Jan - 1965	—	Domestic	
24	Larry D. Bradley	Drilled	Flat	6	347	40	46	Reported	1.5	do	
25	J. L. Miller, Jr.	Bored	Hillside	36	40	40	11	do	—	do	High iron content.
26	John Steincher	Drilled	Hilltop	6	108	70	20	do	60	do	
27	W. E. Brown	do	do	6	300	41	60	do	8	Domestic & stock	
28	Alfred Marshall	do	do	6	165	20	25	do	4	Domestic	
29	A. R. Barksdale	Dug	Hillside	36	41	None	36	Feb - 1965	—	Domestic & stock	
30	Roy Hightower	do	do	30	40	40	25	Reported	—	Domestic	
31	H. K. Costley	do	do	48	32	9	7	Feb - 1965	10	Domestic & stock	
32	do	do	do	36	32	None	4.5	Feb - 1965	—	None	Water milky.
33	Miss Eva Costley	do	do	36	62	None	54	Reported	—	Domestic	
34	Calvin Thomas	do	Hilltop	36	39.5	9	30.5	Feb - 1965	—	do	Do.
35	E. J. Parker	do	Draw	36	27.5	None	4.5	Feb - 1965	—	do	
36	Grace McGettie	do	Hillside	48	13	None	9.5	Feb - 1965	—	do	
37	J. C. Haynes	do	Hilltop	36	55	None	42.7	Feb - 1965	—	do	
38	Estate of Gene Smith	do	do	30	25.5	25.5	23.9	Feb - 1965	—	do	High iron content.
39	J. M. Mitcham	Drilled	Hillside	36	50	None	42	Feb - 1965	—	Domestic & stock	
40	Grover Thomas	do	do	6	338	30	35	Reported	—	Domestic	Water milky.
41	W. K. Farmer	Dug	do	36	15.9	None	14.6	Feb - 1965	—	Domestic & stock	
42	John Black	do	do	36	19.5	9	14.5	Feb - 1965	—	Domestic	
43	Milton Sheppard	do	Hilltop	36	46	None	42.1	Feb - 1965	—	Domestic & stock	
44	Leon Shaw	do	Hillside	36	38.1	None	24.7	Feb - 1965	—	do	
45	American Tel. & Tel. Co.	Drilled	Flat	8	700	106	45	Reported	32	Industrial	
46	do	do	do	8	700	105	34	do	28	do	
47	Moonlit Drive-in Theater	do	Hilltop	6	400	80	30	do	30	Drinking	
48	do	do	do	6	300	85	30	do	10	do	
49	Mrs. Violet M. Edwards	do	Slope	6	240	92.5	—	—	12	Trailer park	
14EE 1	Gwinnett Cox	do	Hilltop	6	125	8	31	Reported	60±	Domestic	Some iron.



Base map compiled from U.S. Geological Survey and Corps of Engineers, U.S. Army $7\frac{1}{2}$-minute quadrangle maps

Geology by M. J. McCollum, 1964

Map of Rockdale County, Georgia showing geology and location of wells and springs.