Jack Hamman

TEXAS WATER COMMISSION

Joe D. Carter, Chairman
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GROUND-WATER GEOLOGY OF BANDERA COUNTY, TEXAS

Prepared in cooperation with the Geological Survey
United States Department of the Interior
and the City of San Antonio

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By

R. D. Reeves and F. C. Lee, Geologists
United States Geological Survey

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GROUND-WATER GEOLOGY OF BANDERA COUNTY, TEXAS

ABSTRACT

Bandera County, in southwest-central Texas, is underlain by a basement complex of Paleozoic rocks on which a wedge of Lower Cretaceous sedimentary rocks was deposited. After the Cretaceous rocks were deposited, structural deformation and erosion created a high plateau surface in the northwestern part of the county, capped by limestones of the Fredericksburg and Washita groups. Erosion has dissected the plateau in the remainder of the county so that only the interstream areas and high hills are capped by resistant remnants of these limestones. The Glen Rose limestone of the Trinity group forms the rest of the land surface except for minor alluvial deposits along stream valleys. The other Cretaceous formations, the Hosston, Sligo, and Pearsall formations, do not crop out in the county, but occur in the subsurface overlying the truncated surface of Paleozoic rocks.

The regional dip of the rocks is southward or southeastward at a low angle, which steepens near the south edge of the county where small normal faults displace the beds. The general trend of the faulting is northeastward, parallel with the main development of the Balcones fault zone.

The limestones of the Fredericksburg and Washita groups yield small to moderate supplies of water of good chemical quality to wells and provide much of the low flow of the major streams through springs issuing from the base of the unit.

The Glen Rose limestone yields small quantities of water to many wells and springs in the county. Most of the water in the lower member is of good chemical quality; however, the water in the upper member is generally saline, being contaminated by sulfate-bearing water associated with anhydrite beds in the member.

Two members of the Pearsall formation, the Cow Creek limestone member and the Hensell shale member, are aquifers in the county. The Cow Creek limestone member yields small to moderate quantities of water in most parts of the county. The Hensell shale member yields moderate to large supplies of water to wells in the northern part of the county. The water-bearing sandstone and conglomerate of the Hensell become shaly and thin in the southern part of the county. Consequently, the yields are small in the southern part, and the water becomes saline.

Sandstone and conglomerate of the Hosston and Sligo formations yield small to large quantities of water to a few wells in the county.

The principal use of ground water in Bandera County is for domestic and stock purposes in the rural areas. The city of Bandera has the only municipal supply in the county, and a few wells are used for supplementary irrigation in

the stream valleys. No wells are used for industrial purposes. It is estimated that the total use of ground water in the county is about 800,000 gallons per day. This probably is only a small percentage of the potential available for development.

GROUND-WATER GEOLOGY OF BANDERA COUNTY, TEXAS

INTRODUCTION

Purpose and Scope of Investigation

The investigation in Bandera County was made as part of a program of investigations to determine the occurrence of ground water along the south edge of the Edwards Plateau. The work was done by the U.S. Geological Survey in cooperation with the Texas Water Commission [formerly the Texas Board of Water Engineers] and the city of San Antonio. The purpose of the investigation was to obtain data pertaining to the composition, depth, and thickness of the water-bearing formations of the area, their capacities as aquifers, and the chemical quality of the ground water. The fieldwork was done at intervals during the period 1953-59.

The surface geology of Bandera County was mapped on aerial photographs and later transferred to a base map. Outcrops of geologic formations were measured to determine lithologic characteristics and thickness of individual beds for purposes of correlation with subsurface equivalents and with geologic units of surrounding counties. The subsurface study of lithology and correlation of the formations were effected through microscopic examination of well cuttings and the study of electric and radioactivity logs. The fossil identifications were made by the authors.

Measurements were made of the depth to water in wells and pumping data were collected where feasible to determine the hydrologic characteristics of the aquifers. Altitudes of wells were determined by either spirit or barometric leveling.

Records of 337 wells and springs (Table 2) and drillers' logs of 13 wells (Table 3) were collected during the investigation. Water samples were taken from 85 wells and springs (Table 4) and were analyzed in the laboratory of the Geological Survey in Austin, Texas.

Plate 1 shows the location of wells and springs in Bandera County for which records are available. For purposes of numbering the wells, the county has been divided into quadrangles, each embracing 10 minutes of latitude and longitude. The quadrangles are labeled alphabetically, beginning in the northern part of the county, and the wells are numbered consecutively within each quadrangle.

The investigation was made under the administrative direction of A. N. Sayre and P. E. LaMoreaux, successive chiefs of the Ground Water Branch of the U.S. Geological Survey, and under the supervision of R. W. Sundstrom, district engineer in charge of ground-water investigations in Texas.

Location and Areal Extent

Bandera County is in southwest-central Texas at the south edge of the Edwards Plateau between longitudes 98°45' and 99°37' W. and latitudes 29°33' and 29°54' N. (Figure 1). Adjacent bounding counties are Kerr on the north, Kendall on the northeast, Bexar on the southeast, Medina and Uvalde on the south, and Real on the west. The town of Bandera, the county seat, is about 38 miles northwest of San Antonio. The county has an area of approximately 765 square miles.

History and Economic Development

Bandera County was created by legislative action in 1856, 2 years after the colonization of the first settlement near the present town of Bandera. The name Bandera is the Spanish word for "flag." According to popular belief, in 1752 a troop of Spanish cavalry was ambushed by Apache Indians in the narrows near the headwaters of Bandera Creek. After the battle, the victorious Spanish placed flags on the surrounding heights to serve either as a warning to future marauders or to delineate the boundary between Spanish and Indian lands.

Development of the area started in 1854 with the establishment of saw and shingle mills along the watercourses where giant cypress timber flourished. The first community, consisting of Mormon settlers, was located in 1854 in an area now covered by the impounded water of Medina Lake.

In 1856, U.S. Cavalry troops set up camp on Verde Creek to protect the area from recurrent Indian raids. By 1860 flour mills, improved sawmills, and a cotton gin were located at the town of Bandera, the commercial center of widespread ranching activities.

After the timber resources were depleted, most of the activities were directed to stockraising, and today Bandera County is primarily ranching country. The predominately rough and rolling land is used for the raising of livestock, mohair and wool being the principal products. Most of the farming is limited to the cultivation of feed and grain crops on river terraces. Most of the land is dry farmed. Supplementary income is derived from the leasing of hunting acreages and the operation of dude ranches.

Bandera had a population of 1,036 in 1960. Other communities are Medina, population 475; Pipe Creek, population 220; Bandera Falls, population 30; Medina Lake, population 250; Tarpley, population 40; and Vanderpool, population 30. The total population of the county in 1960 was 3,892.

Previous Investigations

Prior to the present study the geology and ground water of Bandera County had received little attention. Two small occurrences of igneous rocks were described by Kirby, Dawson, and Hanna (1927). Broadhurst, Sundstrom, and Rowley (1950, p. 21) collected data on the wells used for the public water supply of Bandera. The present study of the geology of Bandera County was facilitated by similar investigations in neighboring counties. Included in these are the works of Long (1958) in Real County, Welder and Reeves (1960) in Uvalde County, Holt (1956) in Medina County, and Arnow (1959) in Bexar County.

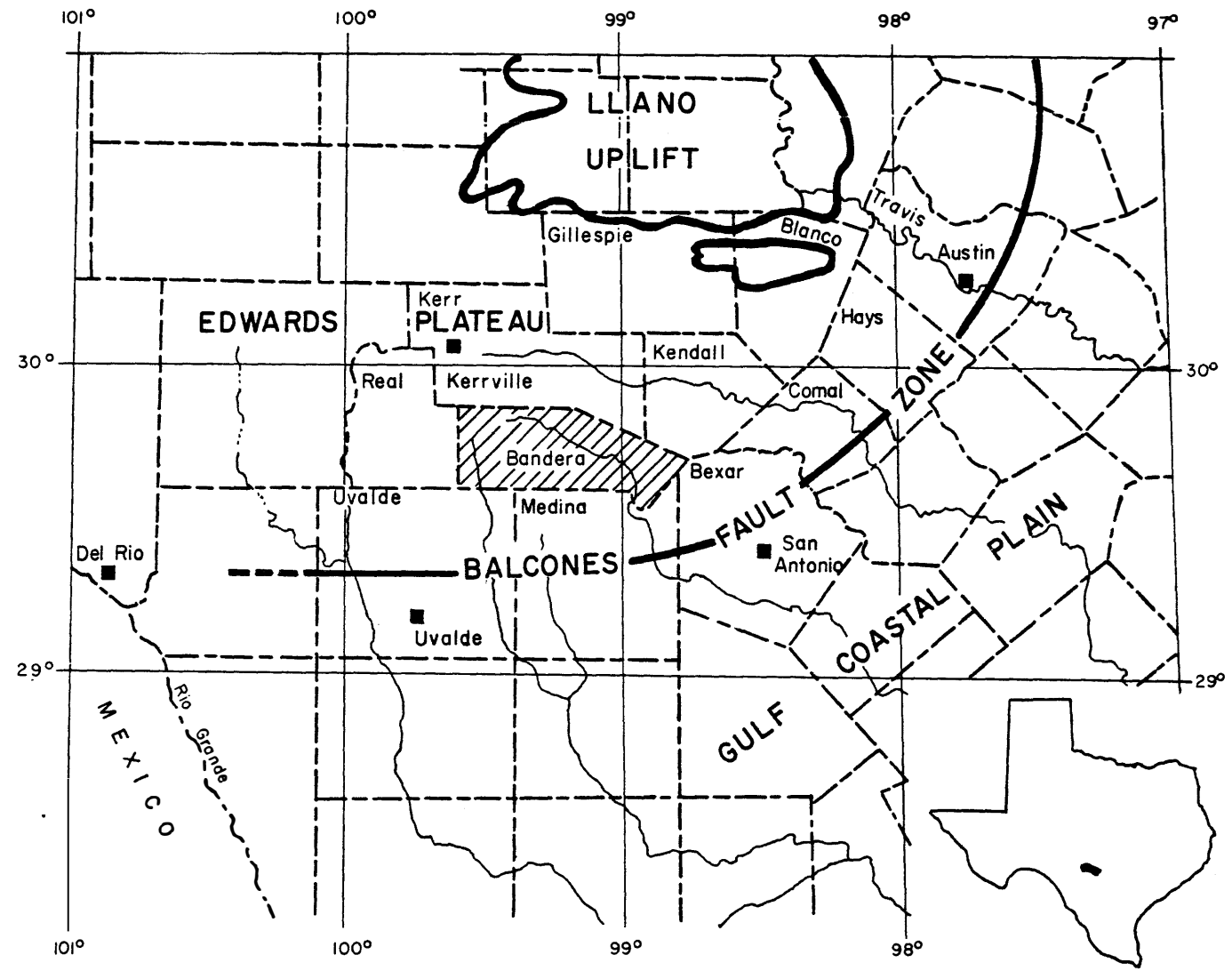

FIGURE 1.- Map of central Texas showing physiographic provinces and location of Bandera County

Acknowledgments

The writers are indebted to the many farmers, ranchers, well drillers and city and county officials who willingly supplied information and aided in the collection of field data. The authors express their appreciation to Messrs. F. L. Stricklin, Jr., and Frank Lozo of the Shell Development Co. for the loan of instruments, electric logs, and well cuttings which were used in the preparation of this report.

GEOGRAPHY

Surface Features

Bandera County is a dissected portion of the Edwards Plateau, lying along the Plateau's south edge, adjacent to the Balcones fault zone (Figure 1). The extensive dissection of the plateau has produced high hills of generally uniform altitude separated by valleys incised into materials less resistant than those forming the caprock. The summits consist of weathered surfaces of limestone, locally covered by rich black or brown soil supporting grass, shin oak, and cedar. In places the soil contains numberous pebbles and cobbles of flint. The valley walls and hillsides, in which bedrock crops out or is covered by detritus, support a sparse cover of grass, live oak, and cedar. Along some of the streams luxuriant growths of elm, sycamore, walnut, live oak, pecan, and cypress are concentrated in narrow belts upon the soils of alluvial terraces and flood plains.

The land surface ranges in altitude from about 1,000 feet above sea level in the bed of the Medina River in the extreme southeastern part of the county to about 2,300 feet in the northwestern part.

Drainage

Most of the northern and eastern parts of Bandera County are drained by the Medina River. The south-central part of the county is drained by Verde and Hondo Creeks and the western part by Turkey Creek, Seco Creek, and the Sabinal River. The Medina and Sabinal Rivers and Hondo Creek are essentially perennial in their lower reaches, although they may cease flowing at times during droughts; the rest of the streams are intermittent.

The upper reaches of the Sabinal and Medina Rivers consist of shallow draws on limestone outcrops which carry water only during times of torrential rainfall. Here most of the drainage is beneath the surface through porous or cavernous zones in the limestone. Most of this water is later released by gravity springs where the contact of the porous limestones and underlying less permeable beds has been exposed by erosion. Stream gradients in the upper reaches are steep, and the watercourses are confined between steep canyon walls.

In the lower reaches of the streams the gradients are gentler, and the streams have an interrupted flow through gravel deposits and over scoured bedrock. Locally the streams have developed broad meander patterns and extensive terraces along wide, flat-bottomed valleys. Courses of the streams are generally concordant with the regional dip of the underlying rocks, and long reaches have been developed at nearly the same gradient as the dip of the beds.

Some of the thin limestone strata contain porous zones which absorb rainfall and transmit the water laterally along interfaces of less pervious beds, releasing

it to wells and gravity springs downdip. However, the small recharge (outcrop) area of these thin zones makes the springs very sensitive to rainfall fluctuation, so that many of them are intermittent. A few perennial springs issuing along faults contribute minor flow to the streams. Rather than serving as sources of new flow, these fissure springs generally serve as conduits returning flow that has been recharged to the limestone through permeable zones updip.

Climate

Bandera County has a semiarid to subhumid climate. The average annual precipitation at the town of Tarpley in the south-central part of the county was 27.76 inches during the period 1939-59. The precipitation generally is sufficient for the production of feed and grain crops except during periods of drought. The months of heaviest rainfall are May, June, September, and October (Figure 2).

The average annual temperature in Bandera County is 67°F. The summers are hot, the daily maximum temperatures being above 90°F most of the time; however, 100°F temperatures are rare. Southerly breezes generally cause a rapid drop in temperature after sunset, and the nights are comfortable. The winters are mild; north winds periodically drive the temperature below freezing, but the freezes do not last long.

STRATIGRAPHY AND WATER-BEARING PROPERTIES OF ROCK UNITS

The rocks exposed in Bandera County range in age from Early Cretaceous to Recent. The sedimentary rocks consist of limestone, dolomite, conglomerate, sand, silt, clay, and caliche. A few small bodies of intrusive basalt crop out in the southern part of the county; however, because of their small extent they are not shown on the geologic map (Plate 1).

Rock units supplying ground water (aquifers) in Bandera County include, from oldest to youngest: the Hosston, Sligo, and Pearsall formations, the Glen Rose limestone, the Comanche Peak, Edwards, and Georgetown limestones (collectively referred to as limestones of the Fredericksburg and Washita groups), and alluvial deposits. The lithologic and water-supply properties of the units are summarized in Table 1.

The areas of outcrop of the geologic formations, exclusive of the igneous rocks and the alluvium, are shown on Plate 1. The Glen Rose limestone, the oldest exposed formation, crops out in approximately three-fifths of the land surface of Bandera County. Exposures of the limestones of the Fredericksburg and Washita groups are limited to the high plateau surface in the northwestern part of the county and to interstream hills and ridges in the rest of the county.

Pre-Cretaceous Rocks

Rocks of pre-Cretaceous age are not exposed in Bandera County. They form a basement complex probably representing different systems of the Paleozoic era in different parts of the county. Little is known concerning the lithology of the pre-Cretaceous rocks in the county; however, logs of oil tests in nearby counties indicate that they consist at least in part of hard black noncalcareous shale, sandstone, and limestone.

No fresh water has been reported in the pre-Cretaceous rocks in Bandera County.

Texas Water Commission in cooperation with the U.S. Geological Survey and the city of San Antonio

Figure 2

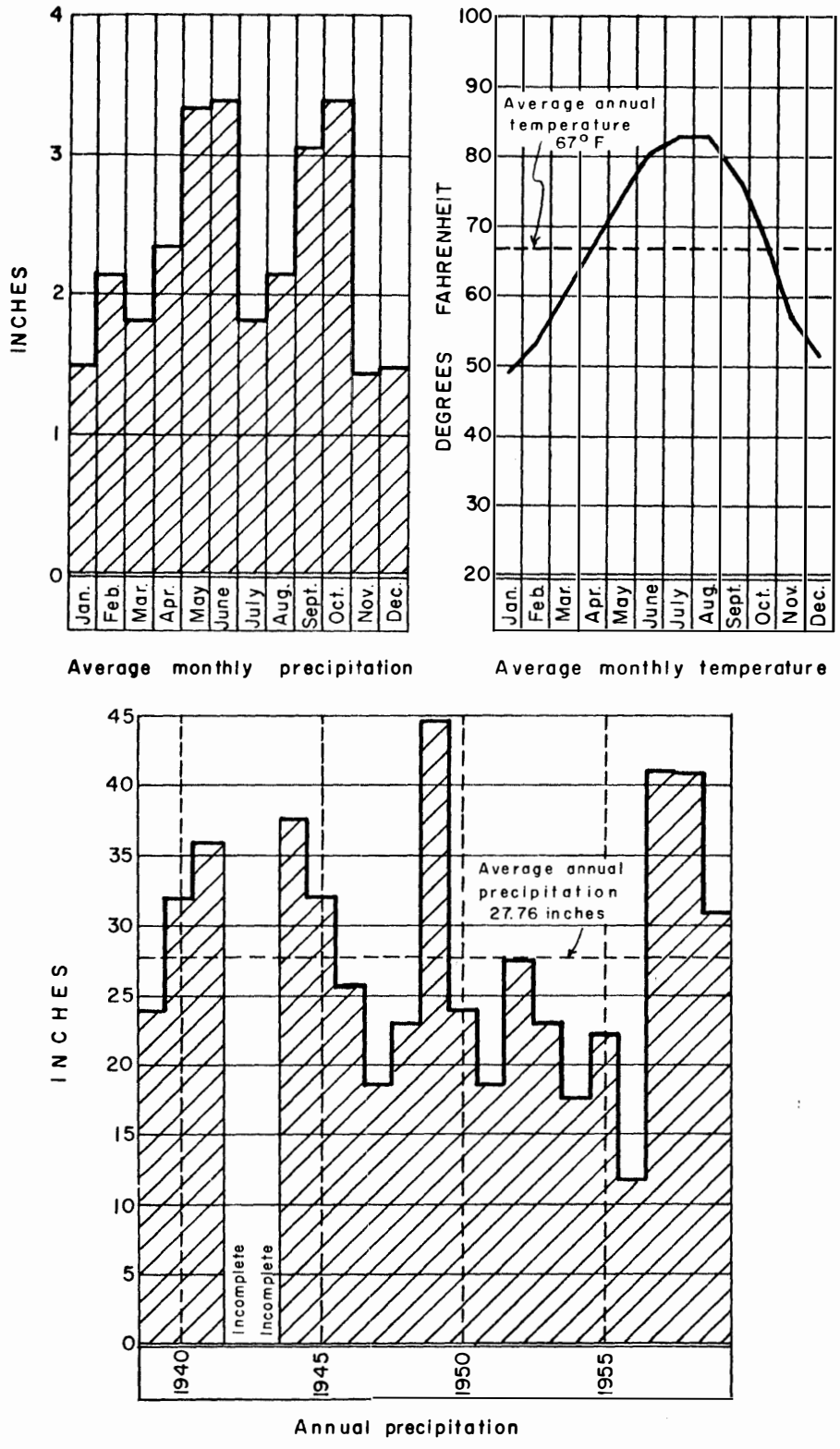

FIGURE 2.- Precipitation and temperature at Tarpley, Bandera County, Texas, 1939-59

(From records of U.S. Weather Bureau)

Table 1.--Geologic formations in Bandera County

System	Series	Group	Stratigraphic unit		Maximum observed thickness (feet)	Character of material	Water-supply properties
Quaternary and Tertiary(?)	Recent, Pleistocene and Pliocene(?)		Alluvium		50	Clay, silt, sand, and gravel.	Yields small supplies of water in valleys.
Cretaceous	Comanche	Washita and Fredericksburg groups	Georgetown and Edwards limestones	Zone C	230	Hard massive cherty limestone, bluff forming.	Yields small to moderate supplies of water.
				Zone B	170	Dark soft cavernous cherty and dolomitic limestone, flaggy to thin bedded.	
				Zone A	125	Hard massive gray limestone containing chert nodules, bluff forming.	
				Comanche Peak limestone	60	Nodular, marly limestone.	
				Walnut clay	5	Marly clay and shell aggregate.	Yields no water to wells in Bandera County.
		Trinity group	Glen Rose limestone	Upper member	440	Marl and shale alternating with thin, resistant beds of limestone and dolomite.	Yields are generally small, and much of the water is saline.
				Lower member	380	Massive limestone and marl.	Yields small supplies of water.
			Pearsall formation	Hensell shale member	150	Conglomerate, sandstone, clay, shale, and sandy dolomite.	Yields moderate to large supplies of water in northern part of county. Yields decrease and water becomes saline in southern part.
				Cow Creek limestone member	60	White to gray or brown sandy limestone and dolomite.	Yields small to moderate supplies of water in most parts of Bandera County.
				Pine Island shale member	70	Sandy dark blue to gray shale; some dolomitic limestone.	Yields no water to wells in Bandera County.
	Pre-Comanche	Nuevo Leon and Durango groups of Mexico	Sligo and Hosston formations		335	Limestone, dolomite, clay, sandstone, and conglomerate.	Yields small to large supplies of water.
Pre-Cretaceous	?	?	?		?	Hard black noncalcareous shale, sandstone and limestone.	Not tapped by wells in Bandera County.

Cretaceous System

Pre-Comanche Rocks

The Cretaceous rocks of south Texas have been divided by Imlay (1945, p. 1427) into the Coahuila series in Mexico, Comanche series, and Gulf series. The oldest rocks of Cretaceous age have been classified as the Hosston and Sligo formations and correlated with rocks of the Durango and Nuevo Leon groups of the Coahuila series in Mexico.

Hosston and Sligo Formations

In Bandera County the Hosston formation consists of conglomerate and sandstone interbedded with red and green clay and dolomite. The Hosston grades upward into dolomitic limestone and sandy dolomite of the Sligo formation. Near the southern border of the county the Hosston consists chiefly of sandy dolomite, dolomitic sandstone, and shale. The Sligo in the southern part of the county is predominately hard spherulitic limestone and dense sandy dolomite.

The formations form a wedge between the underlying Paleozoic rocks and the overlying Pearsall formation, the wedge thinning generally northward from at least 335 feet in well N-3 to about 260 feet in well D-2 (Figure 3). The rate of thinning is not uniform, however, because of a considerable amount of relief on the basement surface of Paleozoic age.

The Hosston and Sligo formations have been penetrated by only a few water wells in Bandera County because shallower aquifers provide adequate water supplies for most purposes. Wells H-43, H-45, and J-62, probably obtaining most of their supply from the Hosston, have reported yields in excess of 1,200 gpm (gallons per minute); however, all these wells have been acidized to increase their production. In contrast, the yields of wells H-57, H-61, M-11, and N-3 range from 16 to 350 gpm. Of these only well N-3, the 350-gpm well, was acidized.

In general, small to large quantities of water can be expected from the Hosston and Sligo formations in most of Bandera County. The meager data available indicate that the water is of good chemical quality and suitable for most purposes. One of the major factors that might limit the development is the comparatively great depth to the formations. This is especially true in the southern part of the county, where it would be necessary to drill more than 1,000 feet in order to penetrate enough of the formations to obtain sufficient water for irrigation, industrial, or municipal use.

Comanche Series

Trinity Group

Pearsall Formation

Imlay (1945, p. 1441) assigned the rocks above the Sligo formation and below the Glen Rose limestone to the Pearsall formation in the subsurface of south Texas, the type section being at a well in Frio County. The Pearsall formation includes the Pine Island shale, Cow Creek limestone, and Hensell shale members, a lithic sequence similar to that of the members of the Travis Peak formation as described by Hill (1901, p. 141). Imlay suggested that the Pearsall and Travis Peak formations occupy the same stratigraphic position, but that the name Travis Peak be

restricted to the formation where it is exposed. The formation does not crop out in Bandera county; therefore the name Pearsall is used in this report.

Pine Island Shale Member

The Pine Island shale member, the lowest member of the Pearsall formation, overlies the Sligo formation. In southern Bandera County the Pine Island consists of sandy fossiliferous dark-blue to gray shale containing thin interbedded layers of dolomitic limestone. Northward the member becomes increasingly sandy. The thickness of the Pine Island ranges from about 70 feet in the southern part of the county to about 45 feet in the northern part (Figure 3).

The Pine Island shale member yields no water to wells in Bandera County.

Cow Creek Limestone Member

The Cow Creek limestone member of the Pearsall formation consists chiefly of white to gray or brown sandy fossiliferous limestone and dolomite. The lower and upper beds are generally dense and coquinoid, consisting of poorly cemented, worn shell fragments. Lignite is present locally. The Cow Creek limestone member maintains a fairly uniform thickness of 50 to 60 feet throughout the county (Figure 3).

The Cow Creek generally yields small to moderate quantities of water to wells in most parts of Bandera County. The yields of practically all the wells tapping the Cow Creek were greater than 5 gpm, and the average yield probably was about 15 gpm. Well N-4, which probably obtains most of its water from the Cow Creek, had a reported yield of 723 gpm with a drawdown of 61 feet after acidization.

Hensell Shale Member

The Hensell shale member of the Pearsall formation does not crop out in Bandera County. The Hensell consists of poorly cemented conglomerate, sandstone, and ferruginous clay in the northern part of the county, changing to sandstone, shale, and sandy dolomite in the southern part. The wedge of clastic materials forming the Hensell in the northern part thins southward and probably intertongues with strata of the overlying Glen Rose limestone. The member thins from 150 feet in well D-2 to 20 feet in well N-4 (Figure 3).

Because of the facies change from coarse-grained material in the northern part to fine-grained material in the southern part, the Hensell member is an important aquifer only in the northern part of Bandera County. Yields as large as 500 gpm have been reported (well C-5), and many wells in the northern part of the county are capable of producing as much as 200 gpm, although few large wells have been developed because of lack of demand. In the southern part of the county, only stray sand lenses and granular dolomite of the Hensell member yield water to wells; consequently, the yields are small. Most wells in this area are drilled to the underlying, more permeable limestone beds of the Cow Creek limestone member. Most of the wells that draw from the Hensell in the northern part of the county yield water that is of good chemical quality except that it is hard. In the southern part of the county the water becomes saline, an increase in the sulfate content being particularly noticeable.

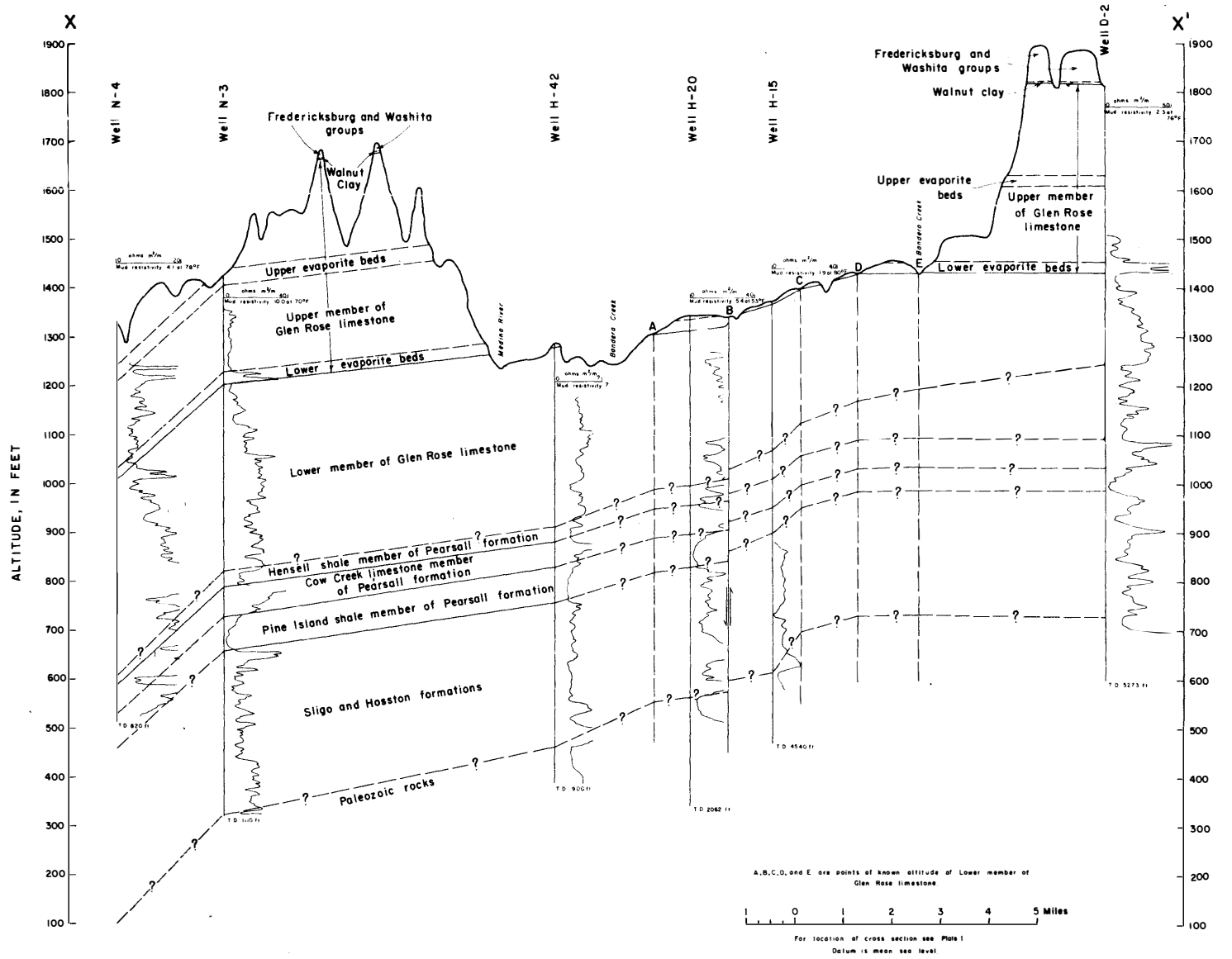

FIGURE 3.-Geologic section X-X', Bandera County, Texas

Glen Rose Limestone

Most of the land surface of Bandera County has been developed upon the alternating limestone and marl beds of the Glen Rose limestone. Differential erosion of the alternating hard and soft beds has created a characteristic terrace or stairstep topography.

The Glen Rose limestone is predominantly calcareous, containing clay and sand as accessory materials. The calcareous strata range from thick reefy, massive beds of limestone in the lower part of the formation to thin granular coquina, calcarenite, and soft granular dolomite in the upper part. Throughout Bandera County and across adjacent counties, the thickness and lithology of individual beds is remarkably uniform; many of the units are identifiable for 60 miles or more.

In Comal County, George (1952, p. 17-18) divided the Glen Rose limestone into lower and upper members. The top of a thin limestone forming the uppermost part of a prominent fossiliferous zone (Salenia texana zone) was arbitrarily selected as the boundary. The limestone, the uppermost part of which is formed by a layer of shells of the fossil Corbula texana Whitney, is overlain by porous evaporite beds of dolomite and anhydrite of the upper member. The limestone and the overlying evaporite beds form an important mapping datum which is traceable on the outcrop from Bandera County at least to Travis County. The evaporite beds, which are recognizable in well cuttings and are indicated by a strong resistivity peak on electric logs, are useful in subsurface correlation. A second evaporite zone of almost identical characteristics lies approximately in the middle of the upper member. In this report the zones are referred to as the lower and upper evaporite beds.

The separation of the Hensell shale member of the Pearsall formation and the Glen Rose limestone in Bandera County is made arbitrarily because of the gradational nature of the contact. As identified in electric logs and well cuttings, the contact is placed at the base of the lowest well-developed limestone beds of the Glen Rose.

Lower Member

The lower member of the Glen Rose limestone in Bandera County consists of massive rudistid limestone and thin beds of marl containing Orbitolina texana (Roemer), grading upward into thin beds of fragmental limestone and marl. Shallow-water features such as ripple marks, filled borings, finely ground shell material, solution channels, mud cracks, lignite, dinosaur tracks, and crossbedding characterize many of the thin beds in the upper 50 feet of the member. The upper 20 feet of the member, the Salenia texana zone, is a nodular limy marl containing many fossils of Orbitolina texana (Roemer), Hemiaster sp., crab claws, Porocystis sp., Trigonia sp., Salenia texana (Credner), and Douvilleiceras sp. As stated above, this limestone containing abundant fossils of Corbula texana Whitney at the top of the marl marks the upper limit of the lower member of the Glen Rose.

Exposures of the lower member are limited to areas along the Medina River and its tributaries southeast of Medina, along Hondo, Williams, Thomas, and Commissioners Creeks near Tarpley, and along the Sabinal River and its tributaries south of Vanderpool. The best exposures form cliffs along the Medina River and Red Bluff Creek southeast of Bandera. Elsewhere the exposures are poor or are mantled by alluvium which forms broad terraced flats along the streams.

Although individual beds of the lower member of the Glen Rose maintain uniform thickness along strike, the member as a whole thickens from north to south. The thickness in the northern part of the county is about 190 feet and in the southern part, about 380 feet (Figure 3).

The lower member of the Glen Rose limestone generally yields small quantities of water, most of which is of fairly good chemical quality. The yields of most of the wells range from 2 or 3 to 15 gpm, the yields varying with the size of the openings penetrated; one well (G-23) has been reported to yield 700 gpm.

Upper Member

The upper member of the Glen Rose limestone consists predominantly of blue to yellowish-brown shale, marl, and thin fossiliferous limestone. Dolomitic beds are common throughout the formation, and an oyster- and rudistid-bearing limestone occurs about 150 feet above the base of the member.

The upper member may be divided into the following sequences as observed in the northern part of the county: (1) lower evaporite beds and overlying marl, 45 to 50 feet thick and only sparsely fossiliferous; (2) marl containing abundant fossils of Orbitolina minuta Douglass and fragmental coquina which grades upward into an oyster- and rudistid-bearing limestone; total thickness 100 to 105 feet; (3) calcareous marl 30 to 40 feet thick; (4) anhydritic marl and dolomite (upper evaporite beds), 12 to 30 feet thick; and (5) upper marl and calcarenite grading upward into sugary-textured argillaceous dolomite, 160 feet thick. The overall thickness of the member ranges from about 385 feet in the northern part of the county to about 440 feet in the southern part.

The two evaporite beds form important marker horizons identifiable in both the outcrop and the subsurface. Where exposed the evaporite beds are weathered and occur as brown ferruginous dolomitic clay, weathering having removed most of the anhydrite. Sinks, collapse structures, seeps and springs, and distorted bedding are characteristic of the outcrop. In the subsurface where they are not weathered, the evaporite beds are readily identified by their caving tendencies during drilling, by the presence of anhydrite and lack of Orbitolina in well cuttings, and by a pronounced resistivity peak on electric logs (Figure 3).

The upper member of the Glen Rose limestone yields small quantities of water to wells, much of the water being saline. The most productive beds of the upper member are the evaporite beds. The anhydrite layers have been highly leached and weathered, especially in and near the outcrop, forming a highly permeable, cavernous, honeycombed mass. Unfortunately the water in these evaporite beds characteristically has a high sulfate content which makes the water unfit for most uses. Particular care should be taken in drilling wells into the Glen Rose to make sure that the evaporite beds are cased off or cemented.

Fredericksburg and Washita Groups

The Fredericksburg group in Bandera County includes the Walnut clay, the Comanche Peak limestone, and the Edwards limestone. The Kiamichi formation, the uppermost formation of the Fredericksburg group, was not recognized in the county. The only formation of the Washita group in Bandera County is the Georgetown limestone. The Fredericksburg and Washita groups have been mapped as a single unit (Plate 1). The three limestones form a single hydrologic unit.

The walnut clay, the oldest formation of the Fredericksburg group in Bandera County, consists of a thin bed of marly clay and shell aggregrate ranging in thickness from 6 inches to 5 feet. Because of its thinness it is not differentiated on the geologic map (Plate 1). The Walnut weathers to a steep slope or undercut beneath the more resistant Comanche Peak limestone. Locally a rounded bench is formed at the base of the Walnut clay on the underlying Glen Rose limestone. Echinoids (Loriolia sp., Holectypus sp.), pelecypods, gastropods, Engonoceras sp., Dictyoconus sp., Porocystis globularis (Giebel), and a profusion of Exogyra texana (Roemer) mark the horizon.

The Walnut clay is not an aquifer in Bandera County.

The Comanche Peak limestone in Bandera County is a marly nodular limestone ranging from 25 to 60 feet in thickness. The lower contact appears to be gradational with the Walnut clay; the upper contact is distinct but conformable. The nodular appearance of the outcrop is believed to have resulted from extensive boring by marine organisms. Fossils found in abundance in the Comanche Peak include Exogyra texana (Roemer), Protocardia sp., Lunatia sp., Engonoceras sp., and small, high-spired gastropods. Masses of secondary calcite are common.

A pronounced break in vegetation marks the top of the Glen Rose limestone. Live-oak trees form a band at the top of the Glen Rose limestone extending upward onto the outcrop of the Comanche Peak. The overlying resistant beds of the Edwards limestone are generally cliff-forming and support a dense growth of cedar on the tops of the cliffs.

The uppermost approximately 500 feet of the Fredericksburg and Washita groups contains the Edwards and Georgetown limestones; however, the two formations have not been recognized as such. The sequence can be divided into three zones; (A) A lower massive cavernous hard limestone, light gray in color, contains chert layers and minor beds of soft dolomitic limestone. The zone ranges in thickness from 100 to 125 feet. (B) The middle zone consists predominantly of dolomitic limestone which is softer and more thinly bedded than the limestone of the lower zone. Chert nodules, calcite masses, siliceous geodes, and solution caverns are characteristic of the zone. In general, these softer beds are contrastingly darker in color, are less resistant to erosion, and support more vegetation than the lower beds. The zone is about 170 feet thick. (C) The upper zone, 230 feet thick, consists of massive hard white bluff-forming highly fossiliferous limestone. Some of the beds are composed almost entirely of fossils containing abundant Caprina, Toucasia, Monopleura, Radiolites, Pecten, and gastropods. Kingena waconensis (Roemer) is common near the top of the zone. Chert beds and nodules are abundant in most of the zone but disappear in the upper part where the limestones become fine grained and thin bedded.

Wells in limestones of the Fredericksburg and Washita groups in Bandera County provide small to moderate supplies of water used only for domestic and stock purposes. Hence, data pertaining to the yield of the unit are limited to a few bailing tests recorded by well drillers. The wells have a great diversity of yield according to the size and degree of interconnection of the joints or solution channels from which the water is derived. One well may enter large water-bearing channels, whereas a well only a short distance away may be practically dry because it penetrates only small water-bearing openings. The largest yield as reported by the driller of well A-6 during a bailing test was about 50 gpm with no appreciable drawdown. The water in the unit is of good chemical quality except that it is hard.

Tertiary(?) and Quaternary Systems

Pliocene(?), Pleistocene, and Recent Alluvial Deposits

Alluvial deposits in Bandera County occur as small remnants on hilltops, as terraces and fills of old meander channels of streams, and as flood-plain deposits along present streams. The deposits range in age from Pliocene(?) to Recent. Maximum thicknesses of these sediments are found in the major stream valleys where the deposits form broad valley flats. The alluvium ranges in thickness from a knife edge to about 50 feet and consists principally of limestone detritus which forms lenticular beds of gravel, sand, silt, and clay. Locally the beds are red where iron-stained materials are concentrated.

A prominent terrace occurs in many places about 25 to 40 feet above the present stream channels, but where stream gradients are low the terrace merges with Recent flood-plain deposits. The most extensive deposits of alluvium in Bandera County lie along the Medina River from Bandera northward to Medina, along Hondo Creek from the Medina County line to Tarpley, and along the Sabinal River from the Uvalde County line to Vanderpool.

The alluvial deposits in Bandera County are, for the most part, highly permeable; however, because of their thinness, small areal extent, and topographic position, they are not important as aquifers. The deposits yield only small quantities of water to a few wells along some of the streams.

Igneous Rocks

Igneous rocks occur in a few places in Bandera County as small, isolated masses. Dikes consisting largely of basalt were described by Dawson, Hanna, and Kirby (1927) at localities west and southwest of Bandera. Several other exposures of basaltic rocks were found in the county during the present investigation, including a small plug and dike about 4 miles northeast of Tarpley, and a dike on the Dean Ranch 3 miles north of Tarpley.

The igneous rocks yield no water to wells in Bandera County. Because of their small areal extent and lack of hydrologic significance, they are not shown on the geologic map (Plate 1).

GEOLOGIC STRUCTURE

The principal geologic structure of Bandera County is a southward- or southeastward-dipping monocline crossed by discontinuous northeastward-trending faults and folds roughly paralleling the Balcones fault zone of the counties to the south. In contrast to the major northeastward-striking structural trend, a minor system of synclines and anticlines strikes generally north-south across the county, their axes gently plunging southward nearly at right angles to the Balcones fault zone.

The regional structure of the county is shown on Figure 4, which shows the altitude of the top of the lower member of the Glen Rose limestone. The figure shows that the dip in much of the central and western parts of the county ranges from 10 to 20 feet per mile toward the southeast or south. In the southeastern part of the county the dip steepens to about 100 feet per mile and is chiefly toward the south.

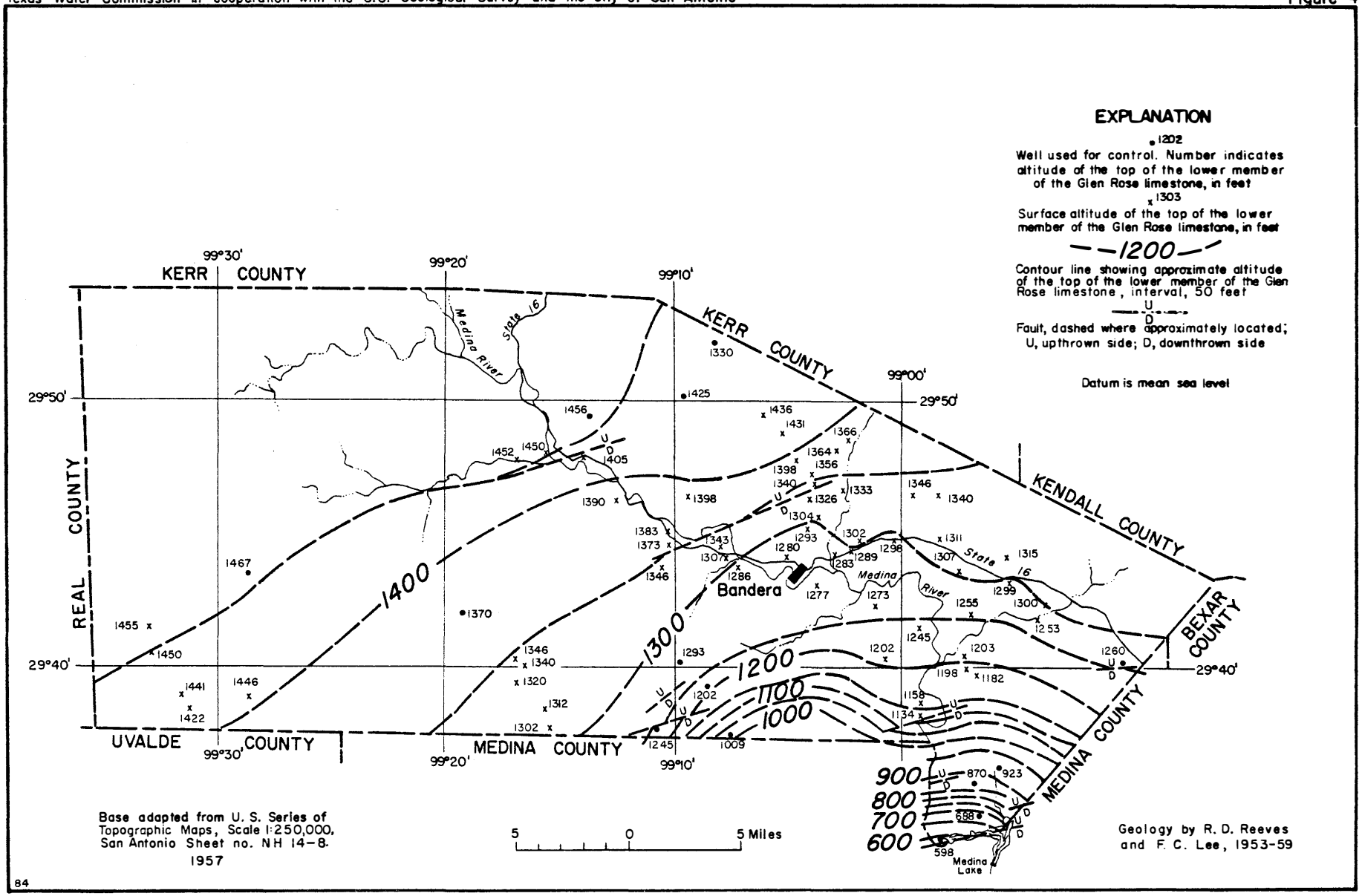

FIGURE 4.–Map showing the altitude of the top of the lower member of the Glen Rose limestone, Bandera County, Texas

Most of the faults in Bandera County strike northeastward and are not continuous for long distances. The faults roughly parallel those of the Balcones fault zone to the south. The faulting is normal and the fault planes dip steeply to the southeast at angles of 65° to 78°. The faults are generally downthrown to the south, the maximum displacement on a single fault being about 100 feet.

Folding in Bandera County occurs in two trends which with associated faulting have influenced the development of the drainage system of the county. The major trend is characterized by gentle flexures which are roughly parallel with and are probably associated with the Balcones fault zone. The strikes are northeastward, creating beltlike flattening and steepening of the beds across the southward dipping regional structure. This flattening and steepening has created temporary base levels to stream erosion, resulting in development of broad valleys having extensive meander patterns along the stream courses. Rejuvenation has caused incisement into the old valley floors, which remain as broad terraces adjacent to the present stream channels. The minor trend of folding is characterized by broad, low northward- to northwestward-striking folds which plunge slightly toward the south where they are truncated by faults of the Balcones zone.

GROUND WATER

Occurrence and Movement

Ground water in Bandera County occurs in two types of aquifers: (1) coarse- to fine-grained detrital rocks, consisting chiefly of sandstone, in which the water occurs in the spaces between the sand grains, and (2) limestone and dolomite, in which the water occurs in joints, other fracture openings, and solution channels. In either type of aquifer, the water may occur under water-table or artesian conditions. Under water-table conditions the water is unconfined and does not rise in wells above the level at which it is encountered in the formation. Under artesian conditions the water is confined under pressure between relatively impermeable layers, and the water will rise above the level at which it is encountered.

With the exception of the alluvial deposits along the streams which are thin and relatively unimportant, the detrital aquifers are found in the Hosston and Sligo formations and the Hensell shale member of the Pearsall formation and are artesian. The aquifers are charged from precipitation and streamflow on the outcrops in areas to the north of Bandera County. Most of the precipitation on the outcrop areas is lost to flood runoff. A part is consumed by evaporation and transpiration by plants; a small part percolates downward to the water table, then moves down the hydraulic gradient of the aquifers toward areas of discharge. Data are not available to map accurately the direction of ground-water movement in the aquifers in Bandera County; however, the general direction of movement in the sandstone aquifers is probably down the dip of the formations toward the south or southeast. Natural discharge from the sandstone aquifers occurs chiefly by slow upward movement into the overlying less permeable formations.

The limestone and dolomite aquifers in Bandera County consist of the Cow Creek limestone member of the Pearsall formation, the Glen Rose limestone, and the limestones of the Fredericksburg and Washita groups. As stated above, the ground water in these aquifers occurs in joints, other fracture openings, and solution channels. Piper (1932, p. 71) states that solution openings in limestone and dolomite are developed under conditions where natural waters may percolate considerable distances before they reach chemical equilibrium with the surrounding rock; and that openings along bedding planes, primary pore spaces, and fractures are converted by these percolating waters from small openings to larger crevices and caverns. The rate

of this conversion is dependent upon factors of composition, texture, and primary permeability of the rocks, rate of circulation and temperature and pressure of the water, amount and seasonal distribution of rainfall, and nature of the soil and vegetal cover. Thus, rainwater containing carbon dioxide dissolved from the air and the soil, which increases the solvent power of the water toward limestone, percolates through limestone beds developing small channels which are controlled by pre-existing joint patterns or bedding planes. As solution continues, larger conduits may develop which may erase all vestiges of this primary control, and the resultant channels may transect earlier patterns.

Recharge to the Cow Creek limestone member of the Pearsall formation probably occurs chiefly from rainfall and streamflow on the outcrop areas to the north of Bandera County. A smaller amount of recharge to the Cow Creek limestone member probably occurs by seepage from overlying or underlying aquifers. Natural discharge from the Cow Creek occurs chiefly by upward seepage into overlying formations.

The Glen Rose limestone is recharged by direct infiltration of precipitation and streamflow upon exposed surfaces through fissures, or through an overlying mantle of alluvium. The streams may serve as both recharge and discharge facilities for the Glen Rose. Water may enter porous or fractured zones upstream and discharge from them downstream where the stream intersects the water table. A small amount of recharge may occur by vertical upward seepage from underlying beds where water in them is confined under higher artesian pressure.

Most of the ground water in the Glen Rose limestone occurs under artesian pressure because of the presence of shale beds which act as confining layers for the beds of limestone. In the thin-bedded limestone the solution channels are tubular and well developed parallel with the bedding planes. In the thick-bedded limestone the vertical continuity of the solution channels is greater. The channels are best developed in the most competent beds or in the dolomitic limestone and anhydrite beds of the evaporite zones.

The Comanche Peak, Edwards, and Georgetown limestones are recharged by precipitation on the outcrops, which are extensively eroded and generally honeycombed or porous. The thick beds of limestone contain fracture systems, which have been enlarged by solution, forming conduits that permit relatively free downward and lateral movement of ground water. In addition to these largely vertical conduits, sheet solution channels have been developed parallel to the bedding planes. Because of the resultant high permeability of the limestone, water entering the unit moves rapidly downward to the lower part, and thence laterally toward discharge areas along the stream valleys. The water discharges through seeps and springs at the exposed contact between the limestones of the Fredericksburg and Washita groups and the underlying Glen Rose limestone. The springs provide most of the perennial flow of the major streams in Bandera County and a part of the recharge to the Glen Rose.

Development

The total use of ground water in Bandera County as of 1958 is estimated to be about 800,000 gpd (gallons per day), or about 900 acre-feet per year. The most widespread use of water is for domestic and stock purposes in the rural areas. There is no recorded use of wells for industrial purposes in the county, and the only municipal use is that at Bandera. A small quantity of water is used for supplementary irrigation, primarily of pasture and small plots of feed crops, mostly along the river valleys.

The domestic and stock wells generally yield only a few gallons per minute and are pumped by windmills or small power pumps equipped with electric or gasoline motors. The wells are designed to produce only sufficient water for domestic or stock use, and larger yields could be obtained in many places if necessary.

Large-capacity municipal wells at Bandera and irrigation wells have yields as great as about 1,300 gpm. These wells are equipped with turbine pumps, some of them powered by electric motors and some by gasoline or diesel engines.

Although data are not available for quantitative evaluation of the ground-water resources of the county, the present development is undoubtedly only a small percentage of the potential. Large quantities of water await development in the Hosston and Sligo formations and in the northern part of the county in the Hensell shale member of the Pearsall formation. The Glen Rose limestone will yield at least small quantities of water practically anywhere in the county, but the quality of much of the water is poor. The limestones of the Fredericksburg and Washita groups will yield small to moderate quantities of water in the northwestern part of the county.

Quality of Water

Water samples from 81 wells and 4 springs in Bandera County were collected during the investigation; most of the samples were analyzed in the laboratory of the U.S. Geological Survey at Austin, Texas. The wells and springs sampled are indicated on Plate 1 by a bar above the location numbers. The results of the analyses are given in Table 4.

Standards set by the U.S. Public Health Service (1946, p. 371-384) for drinking water used on interstate carriers are often used in evaluating water for domestic and public supplies. In most instances a greater concentration of mineral constituents can be tolerated, and the use of water that does not meet the suggested standards is common in Bandera County. The suggested limits for some of the important dissolved minerals are given below:

Iron (Fe) and manganese (Mn) together should not exceed 0.3 ppm (parts per million).

Magnesium (Mg) should not exceed 125 ppm.

Chloride (Cl) should not exceed 250 ppm.

Sulfate (SO_4) should not exceed 250 ppm.

Fluoride (F) must not exceed 1.5 ppm.

Dissolved solids should not exceed 500 ppm for a water of good chemical quality. However, if such water is not available, a dissolved-solids content of 1,000 ppm may be permitted.

The nitrate content of water in limestone commonly varies considerably because surface water, which may have a high organic content, has ready access to the aquifers through solution channels and fractures. Lohr and Love (1952, p. 10) state that "more than several parts per million of nitrate may indicate previous contamination by sewage or other organic matter." However, a high nitrate content is not, of itself, an indication of pollution. Water having a high nitrate

content should be tested for bacterial contamination. Most of the samples collected in Bandera County had low concentrations of nitrate; however, water from wells A-5, G-34, H-63, and J-30 had concentrations of 28, 16, 25, and 54 ppm, respectively, indicating possible contamination.

Hardness of water is caused principally by dissolved calcium and magnesium. Hardness equivalent to the carbonate and bicarbonate is called carbonate hardness; the remainder of the hardness is called noncarbonate hardness. The selection of proper methods for softening is based largely on the type and degree of hardness. Water having a hardness of 120 to 200 ppm is classified as hard; water having a hardness of more than 200 ppm is classified as very hard. The analyses show that all samples, except those from wells H-55, H-73, and M-11, which produce from the Hosston and Sligo formations, may be classified as very hard.

Fluoride in many of the water samples analyzed for that constituent was in excess of the concentration permissible for drinking water according to the U.S. Public Health Service drinking-water standards. Fluoride in excess of 1.5 ppm may cause the mottling of the tooth enamel of children, the degree or severity of mottling varying directly with the increase in concentration and ingestion of fluoride (Dean, Dixon, and Cohen, 1935, p. 424-442).

The amount and type of dissolved minerals in ground waters depend on the solubility and type of rock through which the water moves and on the length of time the water is in contact with the rock, as well as on the temperature and pressure. As a general rule, the dissolved-solids content of the water in Bandera County increases down the dip of the formations.

Most of the wells in Bandera County yield mixed waters from several formations; therefore, it is difficult to draw reliable conclusions regarding the character of the water supplied by different aquifers for the county as a whole.

The analyses from 4 wells that draw from the Hosston and Sligo formations (H-45, H-55, H-73, and M-11) in the southeastern part of the county showed a range in dissolved solids from 464 to 561 ppm and a range in hardness from 166 to 261 ppm. Available data are too meager to permit a general statement regarding the quality of the water in the Hosston and Sligo throughout the county; however, the few samples taken indicate that the water, though hard, is suitable for most purposes.

Most wells that draw from the Pearsall formation in Bandera County are cased only to the top of the massive limestone beds of the lower member of the Glen Rose limestone; consequently, most of the wells produce a mixture of waters from both formations. Analyses of samples from 4 wells (E-18, H-39, K-3, and N-4), which produce from the Pearsall formation only, show dissolved-solids contents ranging from 549 to 1,400 ppm. Sulfate appears to be the most objectionable constituent, ranging from 146 to 810 ppm in the 4 samples.

Water samples were collected from 6 wells that draw from only the lower member of the Glen Rose limestone. The dissolved-solids content of the 6 samples ranged from 310 to 601 ppm and the sulfate content ranged from 16 to 198 ppm. The most objectionable characteristic of the water is its hardness; all the samples would be classed as very hard.

The water from the upper member of the Glen Rose limestone varies widely in quality. Many of the wells yield saline water which is particularly high in sulfate content. The observed range of dissolved-solids content in 14 samples was from 283 to 4,140 ppm, and the sulfate content ranged from 10 to 2,910 ppm. All

the water was very hard. The water of poor quality seems to be associated with the evaporite beds. The anhydrite dissolves fairly readily in the percolating ground water, thus contributing large amounts of sulfate to the water. Where the evaporite beds lie at shallow depth, particularly in the vicinity of streams, they may be highly leached and the contained water may be of relatively good quality.

The water from the limestones of the Fredericksburg and Washita groups in Bandera County is hard but otherwise of excellent quality. The dissolved-solids content of samples from 5 wells and 1 spring ranged from 224 to 322 ppm, and the sulfate content was low.

SUMMARY

Aquifers in Bandera County include the Hosston and Sligo formations, the Cow Creek limestone and Hensell shale members of the Pearsall formation, the Glen Rose limestone, and limestones of the Fredericksburg and Washita groups. The Hosston and Sligo formations make up the oldest and, consequently, the deepest aquifer in the county. The unit consists of limestone, dolomite, shale, sandstone, and conglomerate, the water occurring chiefly in the sandstone and conglomerate. The Hosston and Sligo unit yields small to large quantities of water to a few wells in the county, and it is believed that similar yields could be obtained in most places. The unit occurs at relatively great depth; however, the water is under artesian pressure and will rise nearly to the surface in wells.

Two members of the Pearsall formation--the Cow Creek limestone member and the Hensell shale member--form aquifers in the county. The older of the two, the Cow Creek, consists of limestone and dolomite which yield small to moderate quantities of water in most parts of the county. The overlying Hensell member consists of conglomerate, sandstone, shale, and sandy dolomite. The Hensell yields moderate to large supplies of water, chiefly in the northern part of the county. In the southern part the Hensell becomes increasingly shaly and dolomitic; the yields of wells decrease and the water becomes saline.

The Glen Rose limestone consists of a lower member composed of massive limestone and interbedded thin layers of marl, and an upper member consisting of alternating thin beds of limestone and marl. The lower member rather consistently yields small supplies of water in most parts of the county. The upper member yields only small quantities of water, and much of the water is saline. The high salinity of the water from the upper member is caused by the presence of anhydrite beds at two levels in the member. The anhydrite is rather easily dissolved by the percolating ground waters and contributes a high sulfate content to the water.

The Fredericksburg and Washita groups in Bandera County consist of four geologic formations--the Walnut clay, the Comanche Peak limestone, the Edwards limestone, and the Georgetown limestone, the three limestones forming a single hydrologic unit. The Comanche Peak limestone can be distinguished both on the surface and in logs of wells; however, the Georgetown and Edwards have not been differentiated in the county. The Comanche Peak consists of nodular marly limestone, whereas the upper two units consist predominantly of thick, massive beds of hard limestone and some dolomite. The limestones of the Fredericksburg and Washita groups crop out extensively at the surface in the western and northwestern parts of the county. Elsewhere the limestone unit forms a cap on high hills and interstream areas. The unit yields small to moderate supplies of water in much of the western part of Bandera County. The water is of excellent quality except that it is hard.

The total use of ground water in Bandera County is about 800,000 gallons per day, the principal use being for domestic and stock purposes in the rural areas. The only municipal use is at the city of Bandera, and there is no industrial use in the county. A small quantity of water is used for supplementary irrigation, primarily for pasture and small plots of feed crops along the river valleys. Although data are not available for a quantitative evaluation of the potential of undeveloped ground-water resources of Bandera County, it is believed that the present use is only a small percentage of the total potential.

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*Name of agency changed to Texas Water Commission January 30, 1962.

Table 2.--Records of wells and springs in Bandera County

All wells are drilled unless noted otherwise in Remarks column.
Water level : Reported water levels given in feet; measured water levels given in feet and tenths.
Method of lift and type of power: B, bucket; C, cylinder; Cf, centrifugal; E, electric; G, gasoline, butane, or diesel engine; H, hand; J, jet; N, none; T, turbine; W, windmill. Number indicates horsepower.
Use of water : D, domestic; Irr, irrigation; N, none; P, public supply; S, stock.

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
A-1	A. L. Haby Estate	T. M. Boyce	1904	200	6	Limestones of Fredericksburg and Washita groups	--	189.8 192.3 187.5	Feb. 6, 1953 Feb. 23, 1954 Mar. 16, 1959	C,W	D,S	Cased to 3 feet.
*A-2	A. S. Kelley	E. Boyce	1923	301	6	do	--	257.2 255.9 254.0	Feb. 6, 1953 Feb. 23, 1954 Mar. 17, 1959	C,E, 1	D,S	Cased to 3 feet. Temperature 69°F.
A-3	N. J. Hans Estate	B. Page	1915	277	--	do	--	218.2 214.9	Feb. 6, 1953 Feb. 23, 1954	C,W,G	D,S	
A-4	N. J. Hans Estate and J. C. Short	--	--	300	6	do	--	220.2	Mar. 16, 1959	N	N	Small supply reported. Formerly supplied water for stock. Old well.
*A-5	J. Short	--	--	200	6	do	--	100	Feb. 1954	C,E, 1½	D,S	Deepened from 160 to 200 feet in 1958. Temperature 69°F. Old well.
A-6	N. J. Hans Estate	--	--	Spring	--	do	--	(+)	--	Flows	S	Flow estimated 15 gpm February 23, 1956, 25 gpm March 17, 1959.
B-1	J. F. Camp	King Stokes	1953	456	7	Limestones of Fredericksburg and Washita groups and Glen Rose(?) limestone, upper member	--	100	Feb. 1953	C,W	S	Cased to 10 feet. 1/
B-2	do	C. Norton	1949	405	7	do	--	155.7	Mar. 3, 1959	C,E, 1	D,S	
B-3	do	A. Smith	1955	825	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	1,950	28.0 350.0	Feb. 3, 1955 Feb. 4, 1955	T,E	D	Cased to 600 feet. Water level 28.0 feet before casing of well. 1/ 2/
B-4	do	--	--	Spring	--	Limestones of Fredericksburg and Washita groups	--	(+)	--	Flows	S	Flow estimated 150 gpm February 5, 1954; 200 gpm March 3, 1959.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
*B-5	J. F. Camp	E. Boyce	--	250	6	Limestones of Fredericksburg and Washita groups	2,282	174.5	Feb. 23, 1954	C,E, l	D,S	Cased to 20 feet. Temperature 67°F.
B-6	S. P. Sutton	--	1929	16	60	Glen Rose limestone, upper member	--	14.8	Mar. 3, 1959	J,E, ½	D	Dug.
B-7	O. S. Petty	A. Smith	1955	180	7	do	--	30.3	do	C,E l	D,S	Small supply reported during drought.
B-8	do	--	--	380	6	do	1,818	178.0	Feb. 5, 1954	C,W	D	Cased to 20 feet. Old well.
B-9	C. H. Heimsath	King Stokes	1953	558	7	Glen Rose limestone and Pearsall formation, Hensell member	1,727	166.0	July 20, 1953	T,E, 1½	D	1/ 2/
*B-10	do	do	1954	445	7	do	1,662	84	May 1954	C,W	S	Cased to 36 feet. Deepened from 100 to 445 feet in May 1954. 2/ E-log
*B-11	J. N. Rayzor	--	1937	450	--	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	78	Aug. 1955	T,E	D,S	Cased to 250 feet. Deepened by A. Smith in 1955. Temperature 74°F.
B-12	do	A. Smith	1955	400	7	Glen Rose limestone	--	86.7 42.5	Aug. 6, 1955 Mar. 3, 1959	C,W	S	
B-13	W. Thompson	King Stokes	1954	600	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	205 204.2	1956 Dec. 17, 1958	T,E, 2	N	Cased to 365 feet. Drawdown measured 12 feet after 10 minutes pumping at 50 gpm.
B-14	L. R. Neal	A. Smith	1954	460	7	Glen Rose limestone, and Pearsall formation, Hensell member	--	129.0	Dec. 17, 1958	C,W	S	Cased to 41 feet.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
B-15	L. R. Neal	A. Smith	1955	448	7	Glen Rose limestone, lower member and Pearsall formation, Hensell member	--	54.0	June 24, 1955	T,E, l	D	Cased to 175 feet. 2/
B-16	S. Keese	do	1954	435	7	do	--	60	July 1954	T,E, l	D,S	Cased to 170 feet.
*B-17	Mrs. E. B. Stephens	do	1953	465	8	do	--	55	Jan. 1954	T,E, 2	D,S	Cased to 125 feet. Temperature 74°F.
C-1	V. C. Dabney	do	1954	500	7	do	1,697	32.0 142.0	Aug. 1, 1954 Aug. 31, 1954	T,E	D	Cased to 282 feet. Water level 32.0 feet before casing of well. Drawdown reported 97 feet after bailing 30 gpm. 2/
C-2	J. E. Buckelew	do	1953	435	7	do	--	104.1	Feb. 1954	T,E, 1½	D,S	Cased to 200 feet.
C-3	W. W. McCutchen	--	--	600	7	do	--	195.0	Feb. 1954	T,E	D,S	Cased to 475 feet.
*C-4	Medina Children's Home	--	1940	385	6	Glen Rose limestone	--	76.4 52.0	Feb. 1954 Dec. 12, 1958	C,W	D	Deepened from 260 to 385 feet when visited in February 1954.
*C-5	do	A. Smith	1952	520	10	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	20 75.9	Feb. 1952 Feb. 1954	T,G, 25	Irr	Cased to 140 feet. Drawdown reported 200 feet after pumping 500 gpm.
C-6	Mrs. M. Wright	do	1956	375	7	do	--	51.0	Feb. 6, 1956	N	N	Cased to 160 feet. 2/
C-7	S. Smith	--	1950	40	6	Alluvium and Glen Rose limestone, upper member	--	11.3 17.1	Aug. 1, 1955 Dec. 10, 1958	J,E, ½	D	
*C-8	E. Hund	King Stokes	1953	150	6	Glen Rose limestone	--	44.5	Mar. 29, 1954	T,E	D,S	Cased to 20 feet. Temperature 81°F. 2/
*C-9	E. W. Brown, Jr.	--	--	Spring	--	Limestones of Fredericksburg and Washita groups	--	(+)	--	Flows	--	Temperature 69°F.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
*C-10	E. W. Brown, Jr.	B. Page	1955	680	8	Glen Rose limestone, lower member, and Pearsall formation	--	247.2	Aug. 22, 1955	T,G, 25	D,S Irr	Cased to 300 feet. Drawdown reported 177 feet after 2 hours pumping 90 gpm. Temperature 69°F.
C-11	C. H. Adams	A. Smith	1954	410	7	Glen Rose limestone, and Pearsall formation Hensell member	--	92.5 70.6	July 1, 1954 Mar. 5, 1959	C,W	D,S	Cased to 50 feet. 2/
C-12	B. R. Moore	C. Walker	1944	200	7	Glen Rose limestone	1,680	126.2	June 2, 1954	C,W	D,S	
C-13	Burch Ranch	--	1947	20	36	Glen Rose limestone, upper member	1,564	10.1 4.7	June 2, 1954 Mar. 5, 1959	C,W	D,S	Dug.
C-14	L. O. Bauerlein	T. Rayfield	1918	100	6	do	--	84.1	June 2, 1954	C,W	D,S	Cased to 30 feet.
C-15	D. R. Krisch	A. Smith	1951	100	7	do	--	60.4	Mar. 29, 1954	C,W	D,S	
C-16	do	do	1954	40	6	Alluvium and Glen Rose limestone, upper member	--	19.0 31.8	Mar. 29, 1954 Dec. 9, 1958	N	N	Cased to bottom.
C-17	Miss J. Kirkland	Rayfield Bros.	1930	120	6	Glen Rose limestone, upper member	1,598	43.6	Jan. 20, 1954	C,W	D,S	
C-18	C. O. Bauerlein	do	1900	400	8	Glen Rose limestone	1,572	53.7 42.3	Jan. 20, 1954 Dec. 16, 1958	T,E, ½	D,S	Drawdown measured 0.7 foot after ½ hour pumping 8 gpm.
C-19	E. L. Whitehead	A. Smith	1954	86	7	Alluvium and Glen Rose limestone, upper member	--	34.3	Dec. 17, 1958	T,E, 1½	D,S	Cased to 20 feet. Drawdown measured 1.6 feet after ½ hour pumping 20 gpm.
C-20	do	do	1955	400	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	38.6 14.5	July 20, 1955 Dec. 17, 1958	J,E, 1	S	Cased to 160 feet. 2/
C-21	E. M. Levy	do	1955	405	6	do	--	19.8	Sept.16, 1955	T,E, 1	D	Do.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
C-22	C. G. Seale	Rayfield Bros.	1938	366	6	Glen Rose limestone	1,603	45.6	Dec. 17, 1958	C,W	D,S	Cased to 18 feet.
D-1	E. W. Brown, Jr.	E. W. Brown, Jr.	1952	901	10	--	--	--	--	--	--	2/
D-2	G. L. Rowsey	G. L. Rowsey	1953	5,273	8	--	--	--	--	--	--	Oil test. 2/
D-3	do	do	1952	6,205	8	--	--	--	--	--	--	Do.
D-4	C. S. Archer	A. Smith	1952	486	6	Glen Rose limestone and Pearsall formation, Hensell member	--	146.6	Apr. 12, 1954	C,W,E, 3/4	D,S	Cased to 4 feet.
D-5	L. M. Stevens	B. Page	1917	380	7	do	--	61.7	do	C,G	S	Do.
*D-6	A. Storms	J. P. Heinen	1953	380	7	Glen Rose limestone	--	150	Apr. 1953	T,E, 3/4	D,S	Cased to 98 feet. Drawdown reported 85 feet after bailing 16 gpm.
D-7	F. M. Montague	A. Smith	1954	440	5	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	1,665	189.7	May 18, 1954	C,W	D,S	Cased to 250 feet. 1/
E-1	J. F. Camp	King Stokes	1953	380	7	Limestones of Fredericksburg and Washita groups	--	178.3	Mar. 3, 1959	C,W	S	Cased to 21 feet. 1/
E-2	do	--	--	300	6	do	--	101.4	do	C,W	S	Cased to 20 feet.
E-3	F. Weed	--	--	16	24	Alluvium and Glen Rose limestone, upper member	--	13.0	do	J,E, ½	D,S	Dug. Cased to bottom. Old well.
E-4	P. Harbin	--	--	12	24	Alluvium	--	5.9 4.7	May 16, 1956 Mar. 17, 1959	N	N	Dug.
*E-5	do	--	--	20	36	Alluvium and Glen Rose limestone, upper member	--	11.4	May 16, 1956	J,E	D,S	Dug. Temperature 72°F.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
E-6	S. A. Polvado	--	--	60	6	Glen Rose limestone, upper member	--	35.3 23.7	May 16, 1956 Mar. 17, 1959	N	N	Reported "gyp" water.
E-7	L. N. Coffee	W. Cornelius	1953	80	7	do	--	40.6	May 16, 1956	J,E	D	Do.
*E-8	do	--	--	Spring	--	Alluvium, and Glen Rose limestone, upper member	--	(+)	--	Flows	S	Flow estimated 35 gpm May 16, 1956.
E-9	do	--	--	23	48	do	--	20.5 16.9	May 16, 1956 Mar. 17, 1959	N	N	Dug.
E-10	J. A. Hanson	--	--	35	60	do	--	31.1 24.9	May 16, 1956 Mar. 17, 1959	B,H	D	Dug. Cased to 5 feet. Reported dry for short period just before end of drought. Old well.
*E-11	G. W. Henri	--	1952	60	--	Glen Rose limestone, upper member	--	--	--	N	N	Test hole.
*E-12	do	--	1952	22	8	do	--	16.0	May 16, 1956	N	N	Abandoned. Insufficient supply.
*E-13	do	--	--	Spring	--	do	--	(+)	--	Flows	D	Flow estimated 25 gpm. May 16, 1956.
E-14	S. H. Anderson	--	--	Spring	--	do	--	(+)	--	Flows	D,S	Flow estimated 50 gpm May 16, 1956.
E-15	do	General Crude Oil Co.	1955	1,514	--	--	1,833	--	--	N	N	Oil test. Abandoned. 2/
E-16	A. E. Clayton	Wood-Texas Oil Co.	1921	4,020	--	--	--	--	--	N	N	Oil test. Abandoned.
E-17	W. F. Stelzer	H. Crawford	1946	825	7	Sligo and Hosston formations	--	246.4 187.4	May 16, 1956 Apr. 22, 1959	N	N	Cased to 756 feet. Reported "gyp" water.
*E-18	do	Mikton Oil Co.	1946	872	10	Pearsall formation, Cow Creek limestone member	--	--	--	T,E,3	D,S	Oil test. Originally drilled to 8,515 feet. Plugged back to 872 feet, and perforated from 675 to 690 and 705 to 720 feet.
E-19	L. S. Foster	A. Smith	1955	--	--	Glen Rose limestone	--	67.0	Mar. 14, 1955	N	N	Caved and abandoned. 2/

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
E-20	Mrs. M. Nowel	--	--	Spring	--	Alluvium and Glen rose limestone, upper member	--	(+)	--	Flows	D,S	Flow estimated 16 gpm May 16, 1956; 50 gpm March 18, 1959. Temperature 70°F.
*E-21	R. G. Thompson	J. Smallwood	1950	84	8	Glen Rose limestone, upper member	1,544	21.7 23.7	Feb. 18, 1953 Mar. 18, 1959	J,E, 3/4	D	Cased to 20 feet. Deepened from 49 feet to 84 feet in 1956.
E-22	A. N. Horsman	--	--	Spring	--	Alluvium and Glen Rose limestone, lower member	--	(+)	--	Flows	S	Flow estimated 30 gpm May 16, 1956; 50 gpm March 19, 1959.
E-23	R. B. Miller	--	--	35	36	Alluvium and Glen Rose limestone	--	24.0 21.9	Feb. 18, 1953 Mar. 18, 1959	C,W	D,S	Dug. Cased to 3 feet.
E-24	H. G. Thompson	Humble Oil & Refining Co.	1924	3,670	--	--	--	--	--	N	N	Oil test. Abandoned.
E-25	J. Thompson	W. Barton	1917	250	6	Glen Rose limestone	--	121.9 110.0	Feb. 18, 1953 Mar. 18, 1959	C,W	S	Cased to 8 feet. Reported "gyp" water.
F-1	G. W. Allsup	--	--	Spring	--	Limestones of Fredericksburg and Washita groups	--	(+)	--	Flows	D,S	Flow estimated 20 gpm March 3, 1959.
F-2	Don Loyd	--	--	150	--	do	--	125.3	Feb. 5, 1954	C,W	S	
*F-3	A. C. Allsup	A. Smith	--	232	6	do	--	214.3	Jan. 25, 1954	C,E, 1	S	Cased to 5 feet. Discharge estimated 8 gpm. Temperature 67°F.
F-4	Ben Parker	do	1951	230	7	do	--	212.4	do	C,W	D,S	Cased to 7 feet.
*F-5	B. H. LeStourgeon	do	1953	160	6	do	2,093	63.0	do	T,E	D,S	Cased to 5 feet. Discharge reported 5 gpm. Temperature 65°F.
F-6	A. C. Allsup	--	--	Spring	--	do	--	(+)	--	Flows	D,S	Flow estimated 10 gpm January 25, 1954; 15 gpm February 5, 1959.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
F-7	Adams Estate	A. Smith	1953	580	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell shale member	--	350	July 1953	T,E, 2	D,S	Cased to 360 feet.
F-8	D. Volentine	do	1946	730	7	Glen Rose limestone, and Pearsall formation	--	261.0	Jan. 25, 1956	N	N	Cased to 30 feet. Reported "gyp" water.
F-9	H. Lofton	--	--	Spring	--	Alluvium and Glen Rose limestone, upper member	--	(+)	--	Flows	S	Flow estimated 10 gpm January 25, 1956.
F-10	T. A. Bauerlein	--	--	100	7	do	--	37.7 39.1	Feb. 1, 1954 Mar. 3, 1959	C,W	S	Old well.
*F-11	A. A. Keese	H. Murphy	1955	69	6	Glen Rose limestone, upper member	--	43	Feb. 1955	N	N	Cased to bottom.
F-12	Ben Johnson	--	--	Spring	--	do	--	(+)	--	Flows	D,S	Flow estimated 5 gpm January 25, 1956.
F-13	R. R. Ross	A. Smith	1953	300	7	do	--	175.0	Feb. 1, 1954	C,W	S	
F-14	do	--	--	190	6	do	--	85.5	do	C,E	D,S	Reported "gyp" water.
*F-15	P. L. Garrison	--Brenlee	1955	487	7	Glen Rose limestone, lower member and Pearsall formation, Hensell member	--	193	July 1955	T,E	D,S	Cased to 280 feet. Temperature 76°F. 2/
F-16	A. J. Flowers	--	--	30	--	Alluvium	--	13.3	Jan. 27, 1955	B,H	D	Dug. Old well.
F-17	P. L. Garrison	A. Smith	1953	615	7	Glen Rose limestone, and Pearsall formation, Hensell member	--	200	July 1955	N	N	Cased to 20 feet. 2/
F-18	R. D. Garrison	Plateau Oil Co.	1935	5,365	--	--	--	--	--	--	--	Oil test. Abandoned. 1/

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
F-19	L. R. Duke	A. Smith	1955	400	7	Glen Rose limestone	--	37	Oct. 1955	N	N	Cased to 20 feet. Reported "gyp" water. 2/
F-20	do	L. R. Duke	1951	15	36	Alluvium and Glen Rose limestone, upper member	--	3.7	Mar. 19, 1959	Cf,E, ½	D,S	Dug. Cased to 12 feet. Reported dry in summers during drought.
*F-21	do	A. Smith	1957	73	5	Glen Rose limestone, upper member	--	55.1	do	N	N	Cased to 6 feet. Discharge reported 3 gpm. Temperature 75°F.
*F-22	I. K. Reavis	--Barton	--	190	7	Glen Rose limestone	--	93	May 1956	T,E	D,S	Temperature 70°F. Old well.
F-23	Martha Tompkins	--	--	88	5	do	--	55.8 27.3	May 15, 1956 Mar. 19, 1959	N	N	Old well.
F-24	W. C. Meider	--	1952	50	5	Glen Rose limestone, upper member	--	35 11.0	Sept. 1956 Apr. 4, 1959	T,E	D,S	
F-25	Paul Kayser	King Stokes	1947	800	6	Pearsall formation	--	116.1 119.3	Feb. 18, 1953 Apr. 22, 1959	N	N	Cased to 500 feet. Reported "gyp" water.
G-1	H. H. Mull	A. Smith	1955	500	7	Glen Rose limestone and Pearsall formation, Hensell member	--	180	June 1955	N	N	Drawdown reported 40 feet after pumping at 50 gpm. 1/
G-2	J. Bagwell	do	1955	500	7	do	--	136.7	July 20, 1955	C,E	D	2/
G-3	A. Gallant	do	1951	385	8	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	18	Aug. 1957	T,E	D,S	Cased to 85 feet.
G-4	Val Click	King Stokes	1948	350	--	do	--	7 (+)	Apr. 1955 Dec. 11, 1958	T,E	D,S	Cased to 30 feet. Flow estimated 2 gpm December 11, 1958.
*G-5	G. D. Sears	A. Smith	1951	317	8	do	--	17.5	Aug. 8, 1955	C,E	D	Cased to 20 feet. Discharge reported 10 gpm. Temperature 72°F.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
G-6	E. K. Burt	--	--	400	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	14.6	June 2, 1955	Cf,E	D	
*G-7	L. O. Reatherford	A. Smith	1954	340	7	do	--	52.4	do	T,E	D,S	Cased to 15 feet. Temperature 74°F.
G-8	Mrs. E. Autrey	do	1953	200	6	Glen Rose limestone	1,546	55.2	June 4, 1954	C,E	D	Cased to 80 feet. Reported "gyp" water.
G-9	R. B. Watson	Palm Wynn Oil Co.	1934	876	--	--	--	--	--	--	--	Oil test. Abandoned.
G-10	W. H. Lewis	A. Smith	1952	512	--	Glen Rose limestone and Pearsall formation	1,560	72	Apr. 1954	N	N	2/
G-11	do	Rayfield Bros.	--	215	6	Glen Rose limestone	1,535	46 58.9	Apr. 1954 Dec. 16, 1958	C,W	D	Old well.
G-12	Pauline Crawford	King Stokes	1953	348	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	1,515	64	July 1953	C,E	D	Cased to 80 feet. 1/
G-13	Jack Graham	A. Smith	1953	500	10	Glen Rose limestone, lower member, and Pearsall formation	1,522	40.4	Mar. 30, 1954	T,G, 75	D,Irr	Cased to 60 feet. Drawdown reported 160 feet after 8 hours pumping 337 gpm.
G-14	B. R. Moore	do	1955	250	7	Glen Rose limestone	1,521	75	Apr. 1955	T,E, 3/4	D,S	Cased to 12 feet. Reported "gyp" water.
G-15	P. A. Pue	--	--	300	7	do	1,529	50.6	Mar. 23, 1954	C,W,E	D,S	Old well.
G-16	Mrs. Pauline Pue	Cox-Langford	1917	292	--	do	1,503	34.2 43.1	May 18, 1954 Dec. 15, 1958	C,W,G, 1½	D,S	Reported formerly flowing.
*G-17	D. O. Tallman	Cox-Rayfield	1900	200	6	do	1,488	16.4	May 18, 1954	C,E, 3/4	D	

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
*G-18	S. W. Stevens	Rob Cox	--	61	6	Glen Rose limestone, upper member	1,488	16.0	May 18, 1954	C,W	D,S	Old well.
G-19	J. S. Hammond	Jim Cox	--	90	7	Glen Rose limestone	1,478	58.5	Dec. 16, 1958	C,E, ½	D,S	Cased to 8 feet. Old well.
*G-20	T-4 Ranch	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	S	Flow estimated 20 gpm March 23, 1954; 100 gpm December 16, 1958.
G-21	L. Heder	Cox-Bush	--	50	24	Glen Rose limestone	1,405	39.2 26.2	May 18, 1954 Dec. 16, 1958	N	N	Dug. Old well.
G-22	W. Morrow	H. Murphy	1957	420	5	Pearsall formation	1,447	48.1	Dec. 16, 1958	T,E, 3/4	D	Cased to 240 feet.
G-23	do	A. Smith	1954	200	12	Glen Rose limestone, lower member	1,406	12.8	Mar. 30, 1954	T,G, 30	Irr	Cased to 30 feet. Discharge reported 700 gpm.
G-24	G. Whitehead	do	1953	155	6	Glen Rose limestone	--	19.9	Mar. 30, 1955	J,E	D	Cased to 38 feet.
*G-25	Tex Anderson	do	1954	455	7	Glen Rose limestone and Pearsall formation	1,451	31	Apr. 1954	N	N	Cased to 20 feet. Reported large drawdown pumping 33 gpm. 2/
G-26	do	do	1954	400	10	Glen Rose limestone, lower member and Pearsall formation	--	99 67.2	Apr. 1954 Mar. 4, 1959	T,E, 3	D	Cased to 150 feet. Reported pump broke suction at 200 feet after several minutes pumping 75 gpm. Drilled to 700 feet, caved at 400 feet.
*G-27	C. R. Frederick	G. Heinen	1954 1955	520	7	Glen Rose limestone, and Pearsall formation	--	30.0	Mar. 15, 1954	T,E	D	Cased to 54 feet. After acidizing drawdown reported 350 feet after pumping at 400 gpm. Temperature 76°F. 2/
G-28	Morris Miller	A. Smith	1953	525	9	Glen Rose limestone, lower member and Pearsall formation	--	126 73.2	May 1953 Mar. 5, 1959	T,E, 1½	D,S	Cased to 180 feet.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
*G-29	B. L. Light	G. Heinen	1955	580	7	Glen Rose limestone and Pearsall formation	--	203 78.5	July 1955 Mar. 7, 1959	T,E	S	Cased to 27 feet. Drawdown reported 97 feet after pumping 17 gpm.
G-30	~~A. Smith~~ Bill Rau	A. Smith	1951	515	7	Glen Rose limestone and Pearsall formation, Hensell member	--	235	Jan. 1954	N	N	Cased to 20 feet. 2/
G-31	B. E. Kyle and W. W. Kyle, Jr.	do	1955	435	6	do	--	223 211.7	Sept. 1955 Mar. 9, 1959	C,W	S	
G-32	do	do	1953	495	8	Glen Rose limestone, lower member, and Pearsall formation	--	24.2	Mar. 3, 1954	N	N	Cased to 32 feet. 2/
*G-33	Gilbert Wendt	G. Heinen	1951	330	7	do	--	15	June 1951	T,E, 3/4	D,S	Cased to 29 feet.
*G-34	R. M. Kendrick	J. P. Heinen	1948	100	7	Glen Rose limestone, upper member	--	66.7 63.1	Sept. 1, 1955 Mar. 3, 1959	C,E	D	Temperature 70°F.
*G-35	do	do	1948	143	7	Glen Rose limestone, lower member	--	102	Sept. 1948	C,W	D	Cased to 75 feet. Temperature 68°F.
G-36	P. Wedgworth	do	1948	95	6	Glen Rose limestone, upper member	--	70	Sept. 1948	C,W	D,S	Cased to 30 feet.
G-37	B. E. Kyle and W. W. Kyle, Jr.	A. Smith	1955	400	7	Glen Rose limestone, and Pearsall formation, Hensell member	--	108.8	Mar. 9, 1959	C,W	S	
*G-38	J. W. Halley	do	1955	570	7	Glen Rose limestone and Pearsall formation	--	115	Mar. 1955	C,E	D,S	Cased to 20 feet. Temperature 70°F. 2/
G-39	M. B. Padgett	do	1954	96	6	Glen Rose limestone	--	20	Sept. 1954	J,E	D,S	Cased to 16 feet.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
G-40	D. D. Dossmann	--	--	154	7	Glen Rose limestone	--	90.5	Sept.22, 1955	T,E, 3/4	D,S	
G-41	P. Wedgworth	J. P. Heinen	1948	464	6	do	--	191	Oct. 1948	C,W	S	Cased to 30 feet. Drawdown reported 79 feet after bailing 6 gpm.
*G-42	G. A. Cooper	G. Heinen	1953	650	7	Glen Rose limestone, lower member, and Pearsall formation	--	217	Oct. 1953	T,E	D,S	Cased to 379 feet. Drawdown reported 98 feet after bailing 15 gpm. Temperature 72°F.
H-1	F. M. Montague	King Stokes	1947	461	6	Glen Rose limestone, lower member	1,702	227.1	Mar. 10, 1954	C,W	S	Cased to 263 feet. Reported "gyp" water. Drilled 775 feet, caved at 461 feet.
H-2	E. D. Mayfield	A. Smith	1950	150	7	Glen Rose limestone	1,558	120.6 121.8	Mar. 11, 1954 May 18, 1954	C,G, 1	D,S	Cased to 8 feet.
H-3	J. H. Mayfield	Rayfield Bros.	1920?	400	7	Glen Rose limestone and Pearsall formation, Hensell member	1,528	70.0	Mar. 11, 1954	C,W	D,S	
H-4	Mrs. Walter Meadows	King Stokes	1947	500	6	do	1,545	122.2 115.8	Mar. 18, 1954 Dec. 15, 1958	C,W	S	
H-5	J. Garrett	A. Smith	1953	415	6	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	79.7	Apr. 12, 1954	C,W	S	Cased to 120 feet.
H-6	F. Stevens	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	D,S	Flow estimated 10 gpm January 26, 1959.
H-7	W. S. Kight	--	--	Spring	--	do	--	(+)	--	Flows	S	Flow estimated 20 gpm April 12, 1954; 30 gpm February 24, 1959.
H-8	do	--	--	Spring	--	do	--	(+)	--	Flows	S	Flow estimated 10 gpm April 12, 1954; 15 gpm February 24, 1959.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
*H-9	J. Garrett	--	1940	309	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	41.6 42.7	Apr. 12, 1954 Feb. 24, 1959	C,W	D,S	Cased to 20 feet.
H-10	W. S. Kight	J. P. Heinen	1950	103	7	Glen Rose limestone	--	52.6 49.0	Apr. 12, 1954 Feb. 25, 1959	C,E	D,S	Cased to 6 feet. Drawdown measured 2.2 feet after 5 minutes pumping at 7 gpm.
*H-11	J. A. Barnett	--	--	400	6	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	95.5	Apr. 9, 1954	C,W	D,S	Old well.
*H-12	L. R. Vaughn	J. P. Heinen	1948	403	7	Glen Rose limestone and Pearsall formation, Hensell shale and Cow Creek(?) limestone members	--	147.8	Aug. 25, 1955	C,E, 3/4	D	Cased to 40 feet. Drawdown reported 60 feet after bailing 20 gpm. Temperature 74°F.
*H-13	J. D. Fly	C. Walker	1956	390	7	Glen Rose limestone and Pearsall formation, Hensell shale and Cow Creek(?) members	--	160	Mar. 1956	T,E	D	Cased to 40 feet.
H-14	W. B. Joiner	J. P. Heinen	1952	400	7	Glen Rose limestone, lower member, and Pearsall formation	--	89.7 15.8	Aug. 25, 1955 Apr. 20, 1959	C,E, 3/4	D,S	Cased to 45 feet.
H-15	W. A. Evans	G. L. Rowsey	1956	4,540	--	--	1,375	--	--	--	--	Oil test. Abandoned. 2/
H-16	J. W. Sharman	J. P. Heinen	1951	368	9	Glen Rose limestone, lower member and Pearsall formation	--	140	Aug. 1954	T,E, 3	D,S	Cased to 160 feet. Drawdown reported 70 feet after bailing 50 gpm.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
*H-17	W. C. Ramsey	--	--	135	6	Glen Rose limestone	--	39.3 7.7	Nov. 3, 1955 Feb. 25, 1959	C,E, 3/4	D,S	Temperature 66°F.
H-18	J. W. Sharman	J. P. Heinen	1950	442	7	do	--	152.1	Aug. 21, 1955	C,W	S	Cased to 65 feet. Drawdown reported 65 feet after bailing 14 gpm.
H-19	J. H. Hardcastle	do	1952	445	7	Glen Rose limestone, lower member	--	253.3	Sept.21, 1955	T,E, 1½	D	Cased to 245 feet. Drawdown reported 80 feet after bailing 10 gpm.
H-20	--Goodenough	Stan Ross Production Corp.	1953	2,062	--	--	1,343	--	--	--	--	Oil test. Abandoned. 2/
H-21	J. M. Goodenough	Glen Heinen	1955	410	7	Glen Rose limestone, lower member, and Pearsall formation	--	95.8	July 18, 1955	T,E, 1	D	Cased to 38 feet. Drawdown reported 5 feet after bailing 35 gpm.
H-22	Hugo Bausch	J. P. Heinen	1954	420	7	do	--	109.3 83.4	May 11, 1954 Feb. 24, 1959	C,G, 2	S	Cased to 20 feet.
*H-23	do	do	1953	425	7	do	--	106.0 85.3	May 11, 1954 Feb. 24, 1959	C,E, 1	D,S	Cased to 47 feet. Drawdown reported 25 feet after bailing 18 gpm.
H-24	do	do	--	225	7	Glen Rose limestone, lower member	--	79.0 16.6	May 11, 1954 Feb. 24, 1959	C,W	D,S	Cased to 32 feet.
H-25	F. M. Montague	--	--	450	7	Glen Rose limestone and Pearsall formation	--	73.5 72.1	June 2, 1954 Feb. 23, 1959	C,W	D,S	Deepened from 240 to 450 feet by A. Smith in 1954.
H-26	H. G. Hay	A. Smith	1954	370	7	Glen Rose limestone and Pearsall formation, Hensell member	--	103	June 1954	C,W	S	Cased to 30 feet.
H-27	do	--	--	30	36	Glen Rose limestone	--	11.3 8.3	Mar. 1, 1954 Feb. 23, 1959	N	N	Dug.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
*H-28	H. G. Hay	A. Smith	1953	400	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	1,441	128	Feb. 1954	T,E, 3/4	D,S	Cased to 37 feet. Temperature 62°F.
H-29	F. M. Montague	White Bros.	1910	405	6	Glen Rose limestone, lower member and Pearsall formation	1,396	90 86.9	Feb. 1954 Feb. 23, 1959	C,E, 2	D,S	Cased to 30 feet.
*H-30	do	A. Smith	1954	425	5	do	1,467	96.1 92.5	Mar. 11, 1954 Jan. 26, 1959	C,E, 3	S	2/
H-31	Mrs. Ira Garrison	Rayfield Bros.	1920	400	7	Glen Rose limestone and Pearsall formation	1,427	57.9	May 25, 1954	C,E	D,S	Reported "gyp" water.
H-32	J. L. Hensley	J. P. Heinen	1950	423	7	Glen Rose limestone, lower member and Pearsall formation	1,417	60.3	do	C,G	S	Cased to 42 feet. Drawdown reported 75 feet after bailing 20 gpm. 2/
H-33	Mrs. J. B. Mac Naughton	Rayfield Bros.	1920	380	7	do	1,379	61.4	May 27, 1954	J,E, 3/4	D	Cased to 42 feet. Reported "gyp" water.
H-34	J. L. Hensley	--	--	399	7	do	1,371	79.5	Dec. 15, 1958	T,E, 2	D	Cased to 6 feet.
*H-35	B. Tilghman	A. Smith	1953	520	7	do	--	166	1954	T,E	D	Cased to 40 feet. Temperature 65°F.
H-36	Felix Kindla	do	1955	450	7	Glen Rose limestone and Pearsall formation	--	106	Sept. 1955	T,E	S	Cased to 40 feet.
*H-37	Mrs. L. Rainey	--	--	130	8	Glen Rose limestone, lower member	--	124.3	Aug. 23, 1955	T,E	D	Temperature 67°F.
H-38	Bandera Electric Coop.	J. P. Heinen	1952	445	7	Pearsall formation	--	65	Nov. 1952	T,E	D	Cased to 203 feet. Drawdown reported small after bailing 50 gpm.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
*H-39	Raymond Hicks	J. P. Heinen	1954	460	7	Pearsall formation	--	92	Oct. 1954	T,E, 2	D	Cased to 280 feet.
H-40	do	--	1900	700	4	Glen Rose limestone and Pearsall formation	--	69.6	Apr. 24, 1959	N	N	2/
H-41	Gilbert Moore	M. Kalka	1954	450	7	Glen Rose limestone, lower member, and Pearsall formation	--	138.5 74.6	Aug. 23, 1955 Jan. 26, 1959	T,E	D	Cased to 40 feet. Drawdown reported 12 feet after 1½ hours pumping 9 gpm.
H-42	Bandera Water Control and Improvement District No. 1	J. R. Johnson	1953	900	--	--	1,287	--	--	N	N	Caved and abandoned. 1/ 2/
H-43	do	do	1953	842	15, 12	Hosston formation	--	55 74.2	Apr. 1953 Feb. 23, 1959	T,E, 20	P	Cased to 742 feet. Drawdown reported 215 feet after 2 hours pumping at 1,327 gpm.
*H-44	do	Rayfield Bros.	1945	435	6	Glen Rose limestone(?), lower member, and Pearsall formation	--	63 73.8	July 1954 Feb. 23, 1959	N	N	Reported large drawdown after pumping 40 gpm.
*H-45	do	J. R. Johnson	1946	896	11, 9	Sligo and Hosston formations	--	97	July 1954	T,E, 15	P	Cased to 680 feet. Flow reported 30 gpm when drilled.
*H-46	do	--Cravens	1940	467	10	Glen Rose limestone(?), lower member, and Pearsall formation	--	--	--	C,E	P	Reported breaks suction pumping in excess of 26 gpm.
H-47	Mayan Ranch	G. Heinen	1953	440	7	Glen Rose limestone and Pearsall formation	--	95 78.8	July 1953 Apr. 29, 1959	C,E, 2	D	Cased to 40 feet. Drawdown reported 115 feet after bailing 18 gpm.
H-48	H. J. Risinger	A. Smith	1955	435	7	Glen Rose limestone, lower member, and Pearsall formation	--	126	Mar. 1955	T,E	D	

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
H-49	Frank Kalka	Rayfield Bros.	1900	462	6	Glen Rose limestone, lower member, and Pearsall formation	--	145.5	May 31, 1954	C,E, 2½	D	Cased to 40 feet.
H-50	Flying L Ranch	King Stokes	1945	960	10	Pearsall, Sligo and Hosston formations	--	120	Aug. 1958	T,E, 3	D	Reported to flow when drilled. Reported broke suction at 48 gpm with pump set at 180 feet.
H-51	do	A. Smith	1945	413	8	Glen Rose limestone, lower member and Pearsall formation	--	165	Aug. 1953	T,E, 7½	D	Drawdown reported 27 feet after 2½ hours pumping 250 gpm.
H-52	Mrs. P. H. Gardner	--	--	450	7	do	--	84.5	Oct. 21, 1955	C,E	D	
H-53	A. Dean	G. Heinen	1954	172	7	Glen Rose limestone, lower member	--	29.3	May 13, 1954	T,E	D	Cased to 22 feet. Drawdown reported 60 feet after bailing 20 gpm.
*H-54	Purple Sage Ranch	Cravens Bros.	1948	400	8	Glen Rose (?) limestone, lower member, and Pearsall formation	--	173.5	Sept.21, 1954	T,E	D	
*H-55	do	King Stokes	1954	780	10, 8	Pearsall, Sligo and Hosston formations	--	100	Sept. 1954	T,E, 10	D	Cased to 780 feet. Drawdown reported 300 feet after 3 hours pumping 50 gpm.
H-56	do	Cravens Bros.	1949	427	12	Glen Rose (?) limestone, lower member and Pearsall formation	--	174.5	Sept.21, 1954	N	N	Drawdown reported 112 feet after 8 hours pumping 35 gpm.
H-57	do	Cravens & Heinen	1954	850	10, 6	Sligo and Hosston formations	--	68.8	do	N	N	Cased to 650 feet. Drawdown reported 250 feet after pumping 28 gpm.
H-58	E. F. Heinen	J. P. Heinen	1949	340	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	117.4	Feb. 12, 1959	C,W	S	Cased to 14 feet.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
H-59	J. P. Heinen	B. Price	1916	470	6	Glen Rose limestone, lower member, and Pearsall formation	--	188.3 181.0	Sept.21, 1954 Feb. 12, 1959	C,W	S	Cased to 70 feet. Deepened to 470 feet in September 1954. Drawdown reported 145 feet after bailing 10 gpm.
*H-60	do	J. P. Heinen	1918	463	7	do	--	195 189.4	Apr. 1953 Feb. 12, 1959	T,E, 1½	D,S	Cased to 84 feet. Deepened from 432 to 463 feet in 1953. Drawdown reported 40 feet after bailing 15 gpm.
H-61	B. Parker	J. R. Johnson	--	925	11	Hosston formation	--	116.4	Jan. 8, 1959	T,E, 40	S,Irr	Cased to 820 feet. Drawdown measured 84 feet after 10 minutes pumping 210 gpm.
H-62	do	J. P. Heinen	1952	432	7	Glen Rose limestone and Pearsall formation, Hensell member	--	170 163.2 146.0	July 1952 Aug. 23, 1955 Dec. 8, 1958	C,W	S	Cased to 22 feet. Drawdown reported 95 feet after bailing 15 gpm. Reported "gyp" water.
*H-63	do	do	1952	454	9	Glen Rose limestone, lower member, and Pearsall formation	--	130	May 1952	T,E	D	Cased to 83 feet. Drawdown reported 45 feet after bailing 25 gpm.
H-64	C. G. Armstrong	do	--	428	16	do	--	121.2 106.9	Aug. 23, 1955 Jan. 8, 1959	T,E, 1½	D	Cased to 7 feet. Drawdown reported 40 feet after bailing 17 gpm. Old well.
*H-65	L. D. Fisher	A. Smith	1954	420	7	do	--	83	June 1954	T,E, 1	D	Cased to 150 feet. Temperature 77°F. 2/
H-66	G. F. Bradley	J. P. Heinen	1953	435	7	Pearsall formation	--	150	Mar. 1953	T,E	D	Cased to 207 feet. Drawdown reported 100 feet after bailing 20 gpm.
H-67	W. M. Ratcliffe	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	S	Flow estimated 10 gpm August 24, 1955.
*H-68	do	A. Smith	1930	165	7	Glen Rose limestone, lower member	--	73	June 1954	T,E	D	Cased to 27 feet. Temperature 71°F.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
H-69	John Mazurek	G. Heinen	1954	463	7	Glen Rose limestone, lower member, and Pearsall formation	--	161.0	Aug. 24, 1955	C,W	S	Cased to 43 feet. 2/
*H-70	M. L. Stoner	--	1951	528	7	Glen Rose limestone and Pearsall formation	--	163.2	Aug. 23, 1955	T,E, 1	D,S	Temperature 76°F.
H-71	A. M. Lundquist	--	--	300	6	Glen Rose limestone	--	200	Aug. 1954	C,E	D	Reported "gyp" water.
H-72	B. Poster	A. Smith	1954	650	--	Pearsall formation, Cow Creek limestone member	--	250	Apr. 1954	C,W	S	
*H-73	D. H. Crowell	Muckelory Drilling Co.	1953	1,085	6	Sligo and Hosston formations	1,545	270	Sept. 1954	T,E, 2	D	Cased to 812 feet. Temperature 79°F. 2/
J-1	P. W. Shiner	G. Brauchle	1921	220	6	Glen Rose limestone, lower member	--	113.3 109.9	Mar. 16, 1954 Nov. 3, 1955	C,W	D	Temperature 67°F.
J-2	J. H. McBride	--	1948	460	10	Glen Rose limestone, lower member, and Pearsall formation	--	34.3 35.0	Mar. 16, 1954 Nov. 3, 1955	N	N	2/
*J-3	Emory Brown	--Brennan	1945	413	7	Glen Rose limestone and Pearsall formation	--	90	1952	C,E, 3/4	D	Cased to 125 feet. Temperature 63°F.
J-4	Mrs. C. H. Blakeney	--	1900	300	7	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	75.3 60.3	Nov. 3, 1955 Jan. 28, 1959	C,W	D,S	
J-5	Mrs. J. Allen	J. P. Heinen	1947	200	6	Glen Rose limestone, lower member	--	139.5 140.5	Nov. 3, 1955 Jan. 29, 1959	C,E, 1/2	D,S	

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
J-6	Bob Marcum	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	D,S	Flow estimated 20 gpm January 29, 1959.
J-7	H. H. Wagner	J. P. Heinen	1947	678	7	Glen Rose limestone and Pearsall formation	--	146.0	Feb. 5, 1959	C,W	S	Cased to 106 feet. Drawdown reported 25 feet after bailing 12 gpm.
J-8	do	do	1947	160	7	Glen Rose limestone, upper member	--	126.0 131.7	Mar. 14, 1954 Feb. 5, 1959	C,W	N	Reported "gyp" water.
*J-9	Mrs. P. G. Northrup	G. Heinen	1948	740	6	Glen Rose limestone and Pearsall formation	--	400 171.7	June 1948 Feb. 5, 1959	C,E, 2	D	Cased to 40 feet. Drawdown reported 70 feet after bailing 6 gpm. Temperature 74°F.
J-10	J. O. Clarke	do	1948	360	5	Glen Rose limestone	--	152.5 183.2 166.3	Mar. 16, 1954 Nov. 8, 1955 Feb. 6, 1959	N	N	
J-11	Adolph Schott	--	--	48	6	Glen Rose limestone, upper member	--	41 40.2	Mar. 1954 Feb. 6, 1959	C,W	S	Reported "gyp" water. Old well.
J-12	J. O. Clarke	J. P. Heinen	1950	497	8	Glen Rose limestone, lower member and Pearsall formation	--	160	Nov. 1950	T,E, 1½	D	Cased to 80 feet. Drawdown reported 70 feet after bailing 9 gpm.
J-13	Adolph Schott	J. P. Heinen	1951	307	7	Glen Rose limestone	--	196.2	Mar. 16, 1954	C,W	S	Cased to 23 feet. Reported "gyp" water.
J-14	A. Kroukosky	--	--	200	6	do	--	86.3 82.2	Oct. 22, 1955 Feb. 14, 1959	N	N	
*J-15	do	Gus Brinnel	1945	651	7	Glen Rose limestone, lower member, and Pearsall formation	--	360 196.1	Mar. 1954 Feb. 14, 1959	C,E, 3	D	Cased to 150 feet. Temperature 72°F.
J-16	H. Jersig	J. R. Johnson	1948	999	--	Pearsall, Sligo, and Hosston formations	--	175	Mar. 1954	T,E, 5	D	Cased to bottom.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
J-17	W. K. Morrow	Max Gerfers	1935	481	6	Glen Rose limestone, lower member	1,582	370	Jan. 1952	C,G	D	Cased to 311 feet. Drawdown reported 5 feet after bailing 14 gpm in 1952.
J-18	do	do	1935	466	6	do	1,562	343	Aug. 1951	C,G	D	Cased to 253 feet. Drawdown reported 23 feet after bailing 14 gpm in 1951.
J-19	do	W. Bergmann	1942	368	7	do	1,534	318	Oct. 1942	C,W	S	Cased to 266 feet. Drawdown reported 5 feet after bailing 17 gpm.
J-20	S. X. Callahan	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	N	Dry when visited in 1955; flow estimated 10 gpm February 9, 1959.
*J-21	W. F. Bush	--	--	60	--	Glen Rose limestone	--	18	Oct. 1955	C,W	D	Temperature 64°F. Old well.
*J-22	E. H. Frerich	J. P. Heinen	1948	475	6	Glen Rose limestone, lower member, and Pearsall formation	--	--	--	T,E, 1½	D,S	Cased to 30 feet.
J-23	do	--	--	300	6	Glen Rose limestone	--	236.1 174.7	Mar. 16, 1955 Feb. 6, 1959	C,W	S	Reported pipes set near bottom breaks suction in 1 hour. Old well.
J-24	do	J. P. Heinen	1949	515	7	Pearsall formation	--	290	Mar. 1954	C,W,G	S	
J-25	Mrs. C. H. Krause	A. Kalka	1907	300	7	Glen Rose limestone, lower member	--	129.9 126.6	Mar. 10, 1954 Feb. 6, 1959	C,E, 1	D,S	Small supply reported.
J-26	do	G. Heinen	1950	500	7	Glen Rose limestone, lower member, and Pearsall formation	--	169.5	Mar. 14, 1954	N	N	2/
J-27	L. J. Edwards	J. P. Heinen	1926	335	6	Glen Rose limestone	--	149.8	Feb. 5, 1959	C,W	S	Cased to 5 feet. Reported "gyp" water.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
J-28	Pipe Creek School	J. P. Heinen	1948	512	7	Glen Rose limestone, lower member, and Pearsall formation	--	218.3	Nov. 3, 1955	C,E	N	Cased to 70 feet.
J-29	Mrs. J. T. Brammer	do	1917	487	6	do	--	210	Feb. 1953	C,E, 1	D	Cased to 63 feet. Deepened to 487 feet in 1953. Drawdown reported 90 feet after pumping 15 gpm.
*J-30	Jim Edwards	G. Heinen	1949	120	7	Glen Rose limestone, lower member	--	90.3 92.3	Mar. 8, 1954 Oct. 31, 1955	T,E, 1	D	Cased to 20 feet. Discharge reported 18 gpm.
J-31	Roland Thallman	--	--	503	7	Glen Rose limestone, lower member, and Pearsall formation	--	270	Oct. 1955	T,E	D,S	Cased to 10 feet. Deepened from 333 feet to 503 feet by J. P. Heinen in 1955.
J-32	do	J. P. Heinen	1955	270	7	Glen Rose limestone	--	225 216.0	Oct. 1955 Feb. 5, 1959	C,W	S	Cased to 68 feet.
*J-33	Milton and J. W. Lewis	do	1941	480	7	Glen Rose limestone, lower member, and Pearsall formation	--	220 219.0	Aug. 1948 Feb. 2, 1959	C,E, 1	D	Cased to 40 feet. Deepened from 100 feet to 480 feet by J. P. Heinen in 1948. Temperature 70°F.
J-34	L. J. Edwards	do	1923	500	7	Glen Rose limestone and Pearsall formation	--	220 213.6	1954 Feb. 2, 1959	T,E, 1½	D,S	Cased to 5 feet.
J-35	S. R. Odum	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	S	Flow estimated 3 gpm October 23, 1955, and February 16, 1959.
J-36	do	G. Heinen	1949	392	7	Glen Rose limestone, lower member, and Pearsall formation	--	141.6 126.4	Oct. 23, 1955 Feb. 16, 1959	C,G, 2	S	Cased to 15 feet.
J-37	D. R. Rippey	do	1952	365	7	do	--	125.4 118.2	Oct. 23, 1955 Feb. 16, 1959	T,E, 3/4	D,S	Do.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
J-38	E. H. Purdy	G. Heinen	1952	495	7	Glen Rose limestone, lower member, and Pearsall formation	--	200	July 1952	T,E, 1½	D,S	Cased to 58 feet. Drawdown reported 165 feet after pumping 10 gpm.
J-39	D. White	do	1951	600	6	Pearsall formation, Cow Creek limestone member	--	280	Oct. 1955	T,E, 3	D,S	Cased to bottom. Casing perforated from 540 feet to bottom.
J-40	L. C. Mathis	do	1954	405	7	Glen Rose limestone, lower member, and Pearsall formation	--	165	Aug. 1954	T,E, 1½	D,S	Cased to 30 feet. Drawdown reported 85 feet after pumping 9 gpm.
*J-41	E. D. DuFrechoru	G. Heinen	1952	387	7	do	--	120	July 1952	T,E, 1½	D	Cased to 56 feet. Drawdown reported 110 feet after bailing 15 gpm. Temperature 74°F.
J-42	R. E. Pickens	Elias Peters	1905	310	6	Glen Rose limestone, lower member, and Pearsall formation, Hensell member	--	159.3 107.3	Oct. 23, 1955 Jan. 29, 1959	C,W,E, 3/4	D,S	Cased to 20 feet.
J-43	Lessie Schuchardt	G. Brinnel	1900	140	6	Glen Rose limestone, lower member	--	83.4 70.7	Nov. 3, 1955 Jan. 28, 1959	C,E, ½	D	Cased to 13 feet.
J-44	L. C. Mathis	G. Heinen	1954	340	7	Glen Rose limestone, lower member, and Pearsall formation	--	130.1 120.0	Oct. 23, 1955 Feb. 2, 1959	C,W	S	Cased to 32 feet. Drawdown reported 62 feet after bailing 18 gpm.
J-45	R. R. Lowe	do	1953	400	7	Pearsall formation, Cow Creek limestone member	--	88.7 83.5	Oct. 23, 1955 Feb. 18, 1959	C,E, 1½	D,S	Cased to 350 feet.
J-46	Medina Lake Association	--	1921?	--	6	--	--	(+)	--	Flows	--	Flow estimated 10 gpm October 23, 1955 and February 17, 1959. Reported "gyp" water.
J-47	do	--	1921?	--	4	--	--	(+)	--	Flows	--	Do.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
J-48	Beam Ranch	--	--	Spring	--	Glen Rose limestone, lower member	--	(+)	--	Flows	S	Flow estimated 60 gpm May 11, 1954.
J-49	Tom Crist	--	--	Spring	--	do	--	(+)	--	Flows	N	Flow estimated 60 gpm in November 1955.
*J-50	C. D. Lovelace	G. Heinen	1954	420	7	Glen Rose limestone, lower member and Pearsall formation	--	80.0	June 4, 1954	T,E, 1½	D	Cased to 20 feet. Temperature 84°F.
J-51	D. R. Rippey	J. P. Heinen	1953	445	7	do	--	134.5	Feb. 22, 1954	C,W	S	Cased to 40 feet. Drawdown reported 145 feet after bailing 12 gpm.
J-52	Raymond Buck	do	1952	410	8	do	--	105.9	Nov. 14, 1955	C,G	S	Cased to 40 feet.
J-53	W. M. Bennack	do	1952	417	7	do	--	118	Apr. 1952	T,E	D	Cased to 60 feet.
J-54	A. R. Heisler	--	--	202	6	Glen Rose limestone, lower member	--	90.0 116.3	Feb. 22, 1954 Feb. 17, 1959	N	N	Abandoned. Insufficient supply. Old well.
*J-55	do	Wallace & Erfurt	1954	420	6	Glen Rose limestone, lower member, and Pearsall formation	--	113	June 1954	T,E	D,S	Drawdown reported 20 feet after pumping 35 gpm.
J-56	C. Burton	--	1900	300	6	Glen Rose limestone, lower member and Pearsall formation, Hensell member	--	84.3 111.8	Feb. 22, 1954 Feb. 17, 1959	C,E, 1	D,S	
J-57	do	A. Smith	1954	440	6	Glen Rose limestone, lower member and Pearsall formation	--	215.7	Feb. 17, 1959	C,W	S	Cased to 10 feet.
J-58	C. A. Duke	G. Heinen	1948	515	7	do	--	320	July 1948	C,E, 1½	D,S	Cased to 20 feet. Drawdown reported 55 feet after pumping 3 gpm.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
J-59	Mrs. J. Villemain	Cox Bros.	1900	190	7	Glen Rose limestone, lower member	--	97.6 88.4	Oct. 23, 1955 Feb. 17, 1959	C,W	D,S	Cased to 10 feet.
J-60	J. V. Ledford	Wallace & Erfurt	1955	365	7	Glen Rose limestone and Pearsall formation, Hensell member	--	153.3	Feb. 17, 1959	C,W	D,S	
J-61	J. Newcomer	--	--	Spring	--	Glen Rose limestone, upper member	--	(+)	--	Flows	D,S	Dry in July 1955. Flow estimated 10 gpm February 16, 1959.
*J-62	W. W. Walton	--Rossmann	1956	1,120	10	Glen Rose limestone, lower member and Pearsall, Sligo and Hosston formations	--	295	Apr. 1956	T,E, 75	D,Irr	Cased to 924 feet. Casing perforated from 300 to 880 feet. Discharge reported increased from 205 gpm to 1,200 gpm after acidizing with 5,000 gallons. Temperature 73°F. 1/
*J-63	do	Wallace & Erfurt	1956	500	7	Glen Rose limestone and Pearsall formation, Hensell member	--	--	--	T,E	D	Cased to 20 feet. Temperature 68°F.
J-64	V. A. Brill	--Rossmann	1956	1,030	10	Pearsall(?), Sligo and Hosston formations	--	--	--	T,E, 3	D,S	
K-1	F. W. Jones, Sr.	--	--	431	6	Glen Rose limestone	--	38.9	Feb. 16, 1953	C,E, 1	D,S	
K-2	Curtis Young	A. Smith	1953	495	7	Glen Rose limestone and Pearsall formation	--	160	July 1953	T,E, 1½	D	Cased to 29 feet.
*K-3	T. J. Haby	C. Walker	1955	490	7	Pearsall formation	--	165 154.1	Oct. 1955 Mar. 18, 1959	C,W	D	Cased to 380 feet. Temperature 69°F. 1/
K-4	Clinton Kearney	A. Smith	1953	640	7	Glen Rose limestone and Pearsall formation	--	170	May 1953	C,W	D,S	
K-5	Sterling Fisher	do	1953	460	7	do	--	95	July 1953	T,E, 2	D,S	

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
K-6	J. F. Jenkins	A. Smith	1953	500	7	Glen Rose limestone, lower member and Pearsall formation	--	110	Aug. 1953	T,E	D	Cased to 43 feet.
K-7	Bandera Electric Coop.	do	--	455	7	Glen Rose limestone, lower member and Pearsall formation, Hensell member	--	168	1956	T,E, 1½	D	Cased to 40 feet. Reported "gyp" water.
L-1	E. Boultinghouse	W. Cornelius	1957	500	7	Glen Rose limestone and Pearsall formation	--	16.5	Mar. 19, 1959	C,E, 3/4	D,S	Cased to 20 feet.
L-2	M. L. Boultinghouse	--	1900	300	6	Glen Rose limestone	--	200 168.0	May 1956 Mar. 19, 1959	C,W	D,S	
L-3	S. Mazurek	J. Roberts	1915	250	7	do	--	26.0	May 15, 1956	C,W	D	Cased to 10 feet.
M-1	Paul Kayser	H. Murphy	1955	600	7	Pearsall formation, Cow Creek limestone member	--	165	Nov. 1955	N	N	Reported small supply.
M-2	do	Layne-Texas Co.	1956	1,000	8	Hosston formation	--	200	1956	T,E, 15	S	Cased to bottom. Perforated from 980 feet to bottom. Drawdown reported 300 feet after pumping 65 gpm. Reported "gyp" water.
M-3	Tarpley Baptist Church	A. Smith	1953	200	7	Glen Rose limestone, lower member	--	20 13.9	Oct. 1953 Apr. 23, 1959	T,E, 3/4	D	
M-4	Mrs. --Jeffers	do	1954	100	7	do	--	33.6	Feb. 18, 1955	J,E	D	Cased to 30 feet.
*M-5	R. R. Pue	C. C. White	1924	405	7	Glen Rose limestone, lower member and Pearsall formation	--	80	Aug. 1953	J,E	D,S	Cased to 100 feet.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
M-6	George Mathis	J. P. Heinen	1953	280	7	Glen Rose limestone, lower member	--	140	June 1953	C,W	S	Cased to 40 feet. Drawdown reported 125 feet after bailing 8 gpm.
M-7	A. W. Nichols	C. Downing	1949	--	--	--	--	--	--	--	--	Oil test well. Abandoned.
*M-8	W. J. Schmidt	A. Smith	1945	260	6	Glen Rose limestone, lower member	--	36.3 15.4	Feb. 18, 1955 Apr. 23, 1959	T,E, ½	D,S	Cased to 30 feet.
*M-9	A. W. Nichols	--	--	14	36	do	--	12.5 3.8	Feb. 18, 1955 Apr. 23, 1959	C,W	D,S	Dug. Temperature 68°F. Old well.
M-10	W. V. James	A. Smith	--	525	7	Glen Rose limestone	--	271.5	Jan. 27, 1955	C,W	D,S	Cased to 104 feet.
*M-11	J. F. Merrick	J. R. Johnson	1953	1,137	7	Sligo and Hosston formations	--	275	May 1953	T,E, 10	D,S	Cased to 900 feet. Drawdown reported 75 feet after pumping 16 gpm. Temperature 82°F. 1/2/
*N-1	Roland Britsch	--	--	30	24	Glen Rose limestone, upper member	--	10.3	Feb. 18, 1955	J,E	S	Dug. Temperature 66°F. Old well.
N-2	J. S. Morris	--	--	Spring	--	do	--	(+)	--	Flows	S	Flow estimated 30 gpm April 20, 1954.
N-3	do	J. R. Johnson	1953	1,110	--	Pearsall(?), Sligo, and Hosston formations	1,426	135	July 1953	T,E, 5	S,Irr	Reported increased from 150 to 350 gpm after acidizing. 2/
*N-4	do	do	1952	820	8	Pearsall formation	1,330	168.6	Apr. 27, 1952	T,E, 50	Irr	Cased to 691 feet. Drawdown reported 61 feet after 3 hours pumping 723 gpm. 2/
N-5	do	A. Smith	1954	470	5	Glen Rose limestone	--	150	July 1954	C,W	S	Cased to 128 feet. Reported well deepened from 235 to 470 feet. Reported "gyp" water.
N-6	C. Hutcheson	do	1954	135	--	Glen Rose limestone, upper member	--	31.5	Apr. 20, 1954	J,E	D,S	
N-7	J. M. Martinez	--	--	Spring	--	do	--	(+)	--	Flows	S	Flow estimated 5 gpm April 20, 1954.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
N-8	G. D. Harrison	J. P. Heinen	--	125	6	Glen Rose limestone, upper member	--	48.2	Apr. 20, 1954	C,W,E, 3/4	D,S	Discharge reported small.
*N-9	Gene Dunlap	--	1936	84	6	do	--	50	Apr. 1954	J,E	D	
N-10	B. C. Fleenor	--	1905	160	5	do	--	77.0 76.4 57.4	Apr. 20, 1954 July 23, 1954 Dec. 4, 1958	N	N	Reported "gyp" water.
P-1	E. E. Hoskinson	--	--	600	7	Pearsall formations	--	258.0 259.3	Mar. 19, 1954 Sept.21, 1955	N	N	2/
P-2	do	--	--	150	7	Glen Rose limestone, upper member	--	43.7 44.0	Mar. 19, 1954 Jan. 15, 1959	C,W	S	
P-3	Dewitt Leibold	--	--	670	7	Glen Rose limestone and Pearsall formation	--	25.6	Apr. 11, 1959	C,G	D,S	Cased to 40 feet. Deepened from 190 feet to 670 feet in 1955. Temperature 64°F.
P-4	Rudolph Schott	G. Heinen	1952	350	7	Glen Rose limestone	--	170	Feb. 1954	C,W	S	Cased to 22 feet. Drawdown reported 130 feet after bailing 3 gpm.
*P-5	do	--Brauchle	1928	400	6	Glen Rose limestone, lower member	--	330	1928	C,W,G	D,S	Cased to 150 feet. Temperature 70°F.
P-6	A. G. Boehme	A. Mackel	1920	275	6	do	--	149.5	Feb. 22, 1954	C,W	D,S	Cased to 4 feet. Deepened from 220 to 275 feet in 1945.
P-7	Robert & J. M. Cline	--	--	50	60	Glen Rose limestone, upper member	--	38.7 38.2	Sept.22, 1954 Apr. 18, 1959	N	N	Dug. Reported "gyp" water. Old well.
P-8	Adolph Mazurek	G. Heinen	1954	651	7	Glen Rose limestone, lower member and Pearsall formation	--	99.4	Sept.22, 1954	T,E, 3	D	Cased to 315 feet. 2/
P-9	S. A. Tschirhart	--	1951	90	36, 6	Glen Rose limestone, upper member	--	15.9	Jan. 15, 1959	C,W	S	Cased to 3 feet. Dug to 30 feet, drilled to bottom.
P-10	E. H. Leibold	--	--	250	6	Glen Rose limestone	--	55.3	Sept.21, 1955	C,W	S	Cased to 15 feet.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level: Below land-surface datum (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
P-11	E. H. Leibold	J. P. Heinen	1930	335	6	Glen Rose limestone	--	200	Feb. 1954	C,W	S	Cased to 15 feet.
P-12	A. Leibold	do	--	287	6	do	--	153.9	Feb. 22, 1954	C,W	D,S	
*P-13	R. D. Faurie	--	1900	300	5	do	--	97.5 18.1	Mar. 16, 1955 Jan. 16, 1959	C,E, 1	D	
P-14	E. Johnson	G. Heinen	1951	396	7	do	--	97 20.9	Aug. 1951 Jan. 16, 1959	N	N	Cased to 21 feet. Drawdown reported 73 feet after pumping 15 gpm.
P-15	do	do	1955	218	7	do	--	85 63.9	Mar. 1955 Jan. 16, 1956	C,G, 2½	S	Cased to 32 feet.
*P-16	A. K. Smith	C. Walker	1956	480	7	Glen Rose limestone, lower member	--	156.3	Jan. 15, 1959	T,E, 1	D	Cased to 260 feet. Temperature 70°F.
P-17	Binford Baptist Church	G. Heinen	1954	412	7	Glen Rose limestone	--	132.7 92.4	Feb. 22, 1954 Jan. 15, 1959	C,E, 1	D	Cased to 102 feet.
P-18	C. Mazurek	G. Brauchle	1940	370	7	do	--	115.0	Apr. 18, 1959	C,E, 1	D,S	Cased to 70 feet.
P-19	Hulda Mazurek	do	1950	376	7	do	--	168 100.1	July 1955 Apr. 18, 1959	T,E, 1	D	Cased to 60 feet. Deepened from 270 feet to 370 feet in 1955.
P-20	W. R. Walls	--	--	275	7	Glen Rose limestone, upper member	--	152.0 49.6	Mar. 27, 1954 Apr. 18, 1959	C,E, 1½	D	Reported "gyp" water. Old well.
*P-21	do	G. Brauchle	1950	356	6	do	--	130	Sept. 1950	T,E, 1	D	Temperature 71°F.
*P-22	J. E. McDonald	G. Heinen	1953	525	7	Glen Rose limestone	--	65.0	Mar. 27, 1954	C,E	D	Drilled to 725 feet, plugged back to 525 feet. Temperature 68°F.
*P-23	Buck Morse	G. Brauchle	1952	320	--	do	--	65.4	Apr. 18, 1959	C,E, 1½	D	
*P-24	George Ruede	G. Heinen	1956	275	--	Glen Rose limestone, upper member	--	100	Dec. 1955	J,E, 3/4	N	Temperature 70°F.

See footnotes at end of table.

Table 2.--Records of wells and springs in Bandera County--Continued

Well	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Water-bearing unit	Altitude of land surface (ft.)	Water level		Method of lift	Use of water	Remarks
								Below land-surface datum (ft.)	Date of measurement			
P-25	R. Morgan	G. Heinen	1955	625	7	Glen Rose limestone, lower member	--	115.0	Mar. 27, 1955	T,E	D	Cased to 566 feet. Drawdown reported 80 feet after bailing 20 gpm. 1/

1/ See Table 3 for drillers' logs of wells in Bandera County.
2/ Electric logs and radio-activity logs in files of U.S. Geological Survey.
* See Table 4 for analyses of water from wells and springs in Bandera County.

Table 3.--Drillers' logs of wells in Bandera County

(Formation and fossil names added by authors)

Well B-1

Owner: J. F. Camp. Driller: King Stokes.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil	2	2	Lime (Edwards)	80	220
Lime, hard, and flint	33	35	Lime, blue	103	323
Lime	7	42	Shale and limestone (Glen Rose)	42	365
Lime crevice (lost water)	13	55	Lime, blue	68	433
Lime (Edwards); struck water at 115 to 120 and at 140 feet	85	140	Shale, green, and lime	23	456

Well B-3

Owner: J. F. Camp. Driller: A. Smith.

Limestone, white, hard	107	107	Gypsum	20	520
Clay and limestone	38	145	Clay, blue, shelly	35	555
Limestone and clay, blue	100	245	Limestone, white	20	575
			Shale, blue	10	585
Clay and limestone, shelly	60	305	Limestone, white and blue	115	700
Gypsum	30	335	Shale, red, and sand	40	740
Limestone and clay, blue	45	380	Sand, yellow	20	760
Limestone and shells, white	10	390	Shale and red sand	30	790
			Sand and gravel	25	815
Clay, blue, and limestone; contains Orbitolina texana (Roemer)	110	500	limestone, yellow, and sand	10	825

Table 3.--Drillers' logs of wells in Bandera County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well B-9

Owner: C. H. Heimsath. Driller: King Stokes.

Clay and limestone-----	70	70	Limestone, gray, shaly	90	380
Dolomite, gray, hard, and gypsum----------	10	80	Limestone, white, shaly, sugary texture; abundant Orbitolina texana (Roemer)----------	45	425
Shale, gray, dolomitic, fossiliferous--------	50	130	Dolomite, brown; abundant lignite and sand----------	15	440
Limestone, white, dolomitic, and some sand; abundant shells------	5	135	Shale, sandy, lignitic	10	450
Shale, gray, limy; Orbitolina texana (Roemer) abundant----	110	245	Sandstone, shaly, glauconitic, and dolomite----------	30	480
Gypsum and brown, sandy dolomite; contains Corbula texana Whitney in lower part--------	20	265	Sand, medium to coarse; some glauconite and sandy dolomite------	78	558
Shale, gray, sandy; contains Orbitolina texana (Roemer)------	25	290			

Well D-7

Owner: F. M. Montague. Driller: A. Smith.

Shale, yellow----------	45	45	Shale, blue----------	35	280
Lime, blue----------	65	110	Shale, gray----------	50	330
Shale, gray----------	110	220	Lime, blue and gray---	70	400
Gypsum----------	20	240	Lime, brown----------	40	440
Lime, blue----------	5	245			

Well E-1

Owner: J. F. Camp. Driller: King Stokes.

Topsoil----------	4	4	Flint boulders--------	4	8

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well E-1--Continued					
Lime and flint-------	25	33	Lime, soft----------	13	253
Lime-----------------	137	170	Lime----------------	13	266
Lime and flint crevices; water at 170 to 175 feet--------	40	210	Lime and soft lime--	59	325
			Lime, honeycombed---	25	350
Lime and flint-------	30	240	Lime----------------	30	380
Well F-18, partial log					
Owner: R. D. Garrison. Driller: Plateau Oil Co.					
Lime, broken---------	20	20	Shale---------------	20	400
Shale, gray----------	30	50	Lime----------------	50	450
Lime-----------------	10	60	Shale, gray---------	5	455
Shale, blue----------	55	115	Lime----------------	15	470
Lime-----------------	5	120	Shale, white, soft--	5	475
Shale----------------	5	125	Lime, broken--------	21	496
Shale, blue----------	5	130	Lime----------------	157	653
Lime-----------------	25	155	Lime, hard in spots-	57	710
Shale, light---------	27	182	Lime----------------	40	750
Sand (little water)--	3	185	Shale---------------	5	755
Lime, broken---------	80	265	Sand (hole full of water)------------	10	765
Shale, gray----------	15	280	Lime----------------	10	775
Lime, broken---------	20	300	Sand (hole full of water)------------	5	780
Shale, sticky--------	50	350	Lime----------------	15	795
Lime, hard-----------	10	360	Shale, blue---------	5	800
Lime, broken---------	10	370	Shale---------------	40	840
Lime-----------------	10	380			

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

Well F-18, partial log--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Lime	10	850	Rock, red	60	1,035
Mud, blue, sticky	10	860	Rock, red, and lime (hole full of water)	23	1,058
Shale, blue	20	880	Sand, soft	7	1,065
Lime, sandy	5	885	Lime, sandy	30	1,095
Shale, blue	5	890	Lime and shale	35	1,130
Shale	5	895	Lime, broken	5	1,135
Lime	5	900	Lime, hard	5	1,140
Shale	14	914	Lime and red rock	25	1,165
Lime, sandy	6	920	Sand, red; hard streaks	30	1,195
Shale, blue	5	925	Shale, red, sandy	15	1,210
Lime	20	945	Rock	3	1,213
Rock, red	5	950	Slate and black shale	8	1,221
Lime	4	954	Shale and lime streaks	6	1,227
Rock, red	6	960	Total depth		5,365
Lime, sandy	10	970			
Sand	5	975			

Well G-1

Owner: H. H. Null. Driller: A. Smith.

Clay, yellow	35	35	Lime, blue	15	195
Lime, blue	5	40	Shale, gray	5	200
Lime and shale, blue	40	80	Gypsum	25	225
Lime, white	70	150	Lime, gray	55	280
Shale, gray	30	180	Shale, blue	10	290

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well G-1--Continued					
Lime, gray----------	50	340	Sand and lime--------	20	460
Lime, blue----------	25	365	Sand----------	15	475
Shale, red----------	10	375	Lime, gray----------	25	500
Lime and shale, gray---	65	440			

Well G-12

Owner: Pauline Crawford. Driller: King Stokes.

No record----------	70	70	Limestone, white, hard, dense; abundant calcite crystals; fossils and dolomite in lower part---------	40	245
Shale, light-gray; contains dark-gray pellets and fossils; Orbitolina texana (Roemer)----------	10	80	Dolomite, gray to brown, finely crystalline; contains sparkling dolomitic crystals; grades into dolomitic limestone in lower part; fine sand increases toward base--------	20	265
Limestone, light-gray, shaly, soft, contains dark fossils and pellets----------	60	140	Limestone, white, sugary; abundant dark sand grains---	20	285
Limestone, white, sugary, fossiliferous, abundant foraminifera at top; gastropods, ostracods. Orbitolina texana (Roemer) and calcite veins in lower part----------	20	160	Sand, fine to medium, in places cemented by sugary limestone and dolomite; scattered gray, sandy shale----------	63	348
Limestone, light-gray, shaly; contains small dark fossils; overlies light-gray, sugary dolomite------	30	190			
Shale, gray and brown, calcareous, indurated, blocky----------	15	205			

Table 3.--Drillers' logs of wells in Bandera County--Continued

Well H-42

Owner: Bandera County Water Control and Improvement Dist. No. 1.
Driller: J. R. Johnson.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
No record	50	50	Limestone, cream to gray, dense, very porous; grades into crystalline drusy dolomite and dolomitic limestone in lower part	45	450
Limestone, light- to medium-gray, finely crystalline; in places speckled with dark fossil fillings; in places shell fragments abundant	115	165	Limestone, greenish-white to cream, dense to finely crystalline	10	460
Limestone, cream to gray, oölitic, sugary; abundant dolomitic crystals; fossiliferous	110	275	Shale, green to gray, calcareous, soft; red to gray crystalline dolomite in lower part	75	535
No record	15	290	Limestone, cream to gray, dense, fine to medium quartz crystals abundant	10	545
Dolomite, green to gray, sugary, indurated	20	310	Dolomite, dense; contains some green slightly indurated shale	55	600
Limestone, gray, dolomitic, speckled with dark fossils; dolomitic crystals abundant	25	335	Sandstone, cream to white, dolomitic, and some soft pink shale at top	50	650
Limestone, medium-gray, dense; contains well-sorted quartz grains; lowermost occurrence of abundant Orbitolina texana (Roemer) at 345 feet	40	375	Shale, calcareous, soft, variegated; scattered cream, dense, sandy dolomite	90	740
Dolomite, green to gray, finely crystalline; very sandy in lower part	30	405			

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

Thickness (feet)	Depth (feet)	Thickness (feet)	Depth (feet)

Well H-42--Continued

Dolomite, hard, crystalline and sandy; dense in places------	30	770	
Dolomite, white, sugary, soft, and some gray and maroon soft shale	10	780	
Dolomite, cream to buff, varies from soft to hard, grades into crystalline dolomite in lower part; abundant chert fragments and rounded quartz grains at base-------	50	830	
Shale, buff, noncalcareous, moderately indurated----	45	875	
Shale, gray to white, hard, noncalcareous	25	900	

Well J-62

Owner: W. W. Walton. Driller: --Rossman.

Limestone, broken, and brown shale----------	35	35	
Limestone, tan to white, hard, and earthy dolomite	80	115	
Clay, yellow, and coquinal limestone---	60	175	
Limestone, chalky, and tan clay----------	20	195	
Dolomite and gypsum, gray, and blue clay--	17	212	
Clay and shell, blue; contains Orbitolina texana (Roemer)------	18	230	
Limestone, coquinal, and earthy dolomite--	45	275	
Limestone, gray, hard, fossiliferous, and some porous, white, crystalline dolomite	85	360	
Clay, blue; contains Orbitolina texana (Roemer)----------	15	375	
Limestone, white and light-blue, coquinal	85	460	
Limestone, white to pink, coquinal, sandy, hard streaks contain crystalline dolomite----------	115	575	

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Well J-62--Continued

	Thickness (feet)	Depth (feet)
Dolomite, gray, crystalline, porous, and glauconitic shale	25	600
Limestone, sandy, hard; some dolomite at base	25	625
Limestone and dolomite, white; dolomite increases toward base	75	700
Shale, gray, sticky; dark nodules; some white limestone and dolomite; shell fragments	60	760
Limestone, light-gray, nodular, porous	40	800
Dolomite, light-gray, earthy	60	860
Dolomite, sandy, white and some pink, sandstone, and green shale	70	930
Sandstone and shale, pink and white, some dolomitic limestone, and green shale	110	1,040
Limestone, tan, and green and red shale; chert and limestone fragments	71	1,111
No record	9	1,120

Well K-3

Owner: T. J. Haby. Driller: C. Walker.

	Thickness (feet)	Depth (feet)
Gravel, silty	35	35
Shale and limestone, blue	40	75
Limestone, blue	35	110
Shale, blue	15	125
Limestone, brown	30	155
Limestone, gray and blue	75	230
Shale, gray	50	280
Limestone, gray, soft	30	310
Shale and limestone, brown	25	335
Limestone, white, sandy	40	375
Limestone, black	5	380
Limestone, brown, gritty	35	415
Sand and shale, brown	25	440
Shell and sand, black	10	450
Shale, gray and black, sticky	10	460
Shale and brown sand	10	470

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well K-3--Continued					
Sand and coal-------	10	480	Sand and white limestone---------	10	490

Well M-11

Owner: J. F. Merrick. Driller: J. R. Johnson.

No record----------	130	130	Dolomite, light-gray, shaly, lignitic, and brown and grayish-white, sandy limestone; dark pellets and small shells----------	35	535
Limestone, creamy white and light-gray, sugary, fossiliferous; some soft, gray shale; shell fragments; Orbitolina texana (Roemer)-----	50	180	Limestone, cream to brown, fossiliferous, shaly, sandy; dolomite in middle; ostracods and miliolids abundant-----	30	565
Shale, gray and light-gray, calcareous, indurated; fossiliferous, shaly sugary limestone----------	40	220	Limestone, cream to gray, shaly in upper part, sandy, dolomitic, and slightly glauconitic in lower part; fossiliferous----------	30	595
No record----------	80	300			
Limestone and dolomite, light-gray to brown, crystalline, sugary, fossiliferous; abundant small fossils----------	50	350	Dolomite, light-gray, crystalline, sandy, glauconitic; fossiliferous limestone in middle; small fossils in upper part-----	25	620
Limestone, white, sugary, fossiliferous; dolomite in middle----------	60	410	Limestone, light-gray to brown; speckled with dark and cream-colored fossils; shaly in lower part; large shell fragments abundant in places----------	35	655
Limestone, creamy gray and brown, fossiliferous; dolomite in middle and at base; some lignite, gypsum, and fine crystals in sugary matrix-------	90	500			

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well M-11--Continued					
Dolomite, light-brown, shaly; abundant quartz sand; some lignite; calcareous, gray shale in lower part	20	675	Dolomite, light-brown and white, fossiliferous; sandy in upper part; shaly glauconitic, and lignitic in middle; poorly sorted sand in lower part; large shells at base	70	935
Limestone, light-brown, fossiliferous, sandy, glauconitic; sandy dolomite in middle part; large shell fragments in lower part	40	715	Shale, gray and brown, calcareous, indurated; and sandy, glauconitic limestone	50	985
Dolomite, white to light-gray and brown; glauconitic and sandy in upper part; shaly in lower part; abundant oyster shells	45	760	Dolomite, pink and white, soft, sugary, sandy, glauconitic; and grayish-green shale	65	1,050
Shale, gray; limy in upper part; soft in lower part; abundant oyster shells	50	810	No record	87	1,137
Limestone, sugary to dense, fossiliferous; interbedded shale and sandy dolomite in lower part	55	865			
Well P-25					
Owner: R. Morgan. Driller: G. Heinen					
Limestone, light-gray, shelly, hard	40	40	Shale and limestone, light-gray	85	275
Limestone, hard, and blue shale	60	100	Dolomite and gypsum, tan, sugary; some gray shale	35	310
Limestone, light-gray, earthy	90	190	Shale, blue	25	335

(Continued on next page)

Table 3.--Drillers' logs of wells in Bandera County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well P-25--Continued					
Limestone, gray, shelly, hard	40	375	Shale, blue, sticky; some Orbitolina texana (Roemer)	20	550
Shale and gray limestone; abundant Orbitolina texana (Roemer)	132	507	Limestone, gray to white, shelly, hard	30	580
Dolomite and gypsum, dark, and some gray shale; Corbula texana Whitney in lower part	23	530	Limestone, white, shelly, sugary, porous	45	625

Table 4.--Analyses of water from wells and springs in Bandera County
(Analyses by U. S. Geological Survey, Austin, Texas. Chemical constituents in parts per million)

Water-bearing unit: A, alluvium; E, limestones of the Fredericksburg and Washita groups; Gu, Glen Rose limestone, upper member; Gl, Glen Rose limestone, lower member; G, Glen Rose limestone, undifferentiated; Ph, Pearsall formation, Hensell shale member; Pc, Pearsall formation, Cow Creek limestone member; P, Pearsall formation, undifferentiated; S, Sligo formation; H, Hosston formation.

Well	Owner	Depth of well (ft.)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
A-2	A. S. Kelley	301	Feb. 12, 1957	E	13	-	72	22	10	326	3.4	12	-	5.6	-	298	270	3	8	0.3	513	7.3
A-5	J. Short	200	do	E	13	-	87	16	6.6 1.3	304	4.6	16	-	28	-	322	283	0	5	.2	569	7.3
B-5	J. F. Camp	250	Feb. 10, 1957	E	9.8	-	89	13	12	345	2.6	10	-	2.0	-	308	276	0	8	.3	529	7.4
B-10	C. H. Heimsath	445	May 6, 1954	Gu	9.2	-	516	421	124	274	2,910	25	-	.0	-	4,140	3,020	2,790	8	1.0	4,220	7.7
B-11	J. N. Rayzor	450	Aug. 6, 1955	Gl & Ph	12	a0.00	101	70	57	325	327	40	-	1.5	-	818	540	274	17	1.0	1,170	7.4
B-17	Mrs. E. B. Stephens	465	do	Gl & Ph	12	.01	96	64	49	340	267	37	-	.5	-	735	502	324	17	1.0	1,080	7.4
C-4	Medina Childrens Home	285	Feb. --, 1952	G	13	-	98	71	27	351	242	34	2.8	.5	-	712	536	249	10	.5	1,050	7.3
C-5	do	520	Feb. --, 1952	Gl & Ph	13	.00	86	64	34 9.2	351	190	34	2.8	1.0	0.53	635	478	190	13	.7	982	7.8
C-8	E. Hund	150	Aug. 24, 1955	G	12	b .01	554	263	48	267	2,210	34	-	.5	-	3,250	2,460	2,240	4	.4	3,430	7.2
C-9	E. W. Brown, Jr.	Spring	Feb. 13, 1957	E	9.8	-	68	21	5.0 .6	296	4.2	12	-	3.0	-	270	256	14	4	.1	474	7.3
C-10	do	630	do	Gl & Ph	5.4	-	54	49	49	338	129	22	-	.0	-	485	336	59	24	1.2	772	7.8
D-6	Albee Storms	380	Aug. 20, 1953	G	12	.00	-	-	49	358	902	31	-	.2	.59	-	1,170	876	8	.6	1,960	7.8
E-5	Paul Harbin	20	Feb. 12, 1957	Gu & A	8.4	-	46	20	13	226	19	14	-	.0	-	231	197	12	12	.4	406	7.5
E-8	N. L. Coffee	Spring	Aug. 11, 1947	Gu & A	-	-	-	-	-	288	10	14	-	-	-	-	c 264	28	-	-	510	-
E-11	G. W. Henri	60	June 1, 1952	Gu	-	-	-	-	-	511	-	18	-	-	-	-	283	0	-	-	1,340	7.6
E-12	do	22	Aug. 10, 1947	Gu	-	-	-	-	-	260	10	12	-	-	-	-	c 216	3	-	-	464	-

See footnotes at end of table.

Table 4.--Analyses of water from wells and springs in Bandera County--Continued

Well	Owner	Depth of well (ft.)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
E-13	G. W. Henri	Spring	Aug. 10, 1947	Gu	-	-	-	-	-	256	10	16	-	-	-	-	c 246	36	-	-	543	-
E-18	W. F. Stelzer	872	Feb. 12, 1957	Pc	11	-	121	83	91	331	482	41	3.6	0.2	-	996	644	372	23	1.6	1,400	7.6
E-21	R. G. Thompson	84	do	Gu	15	-	124	33	20	349	160	24	.2	1.4	-	561	445	159	9	.4	840	7.4
F-3	A. C. Allsup	232	Feb. 8, 1957	E	12	-	71	21	6.0 -	311	4.0	12	-	5.5	-	284	264	8	5	.2	497	7.3
F-5	B. H. LeStourgeon	160	Feb. 7, 1957	E	8.2	-	58	16	3.8 -	246	3.4	9.5	-	4.6	-	224	210	9	4	.1	397	7.5
F-11	A. A. Keese	69	Feb. --, 1957	Gu	8.4	-	70	19	10	288	15	13	-	5.3	-	283	252	16	8	.3	493	7.2
F-15	P. L. Garrison	487	Aug. 25, 1955	Gl & Ph	13	d0.01	83	55	57	337	215	39	-	1.0	-	651	433	157	22	1.2	1,010	7.4
F-21	L. R. Dukes	73	Feb. 12, 1957	Gu	13	-	546	216	37	266	2,000	15	3.6	.2	-	2,960	2,250	2,030	3	.3	3,050	7.3
F-22	I. K. Reavis	190	do	G	11	-	163	87	27	303	525	17	1.8	.0	-	981	764	516	7	.4	1,310	7.5
G-5	G. D. Sears	317	Aug. 6, 1955	Gl & Ph	12	.01	88	62	46	351	221	40	-	.5	-	678	474	187	17	.9	1,030	7.4
G-7	L. O. Reatherford	340	Aug. 29, 1955	Gl & Ph	12	e .02	97	52	43	354	196	38	-	.0	-	643	455	165	17	.9	988	7.4
G-18	S. W. Stevens	61	May 18, 1954	Gu	15	-	628	64	15	293	1,540	14	-	.0	-	2,420	1,830	1,590	2	.2	2,600	7.2
G-20	T-4 Ranch	Spring	May 15, 1954	Gu	12	-	607	71	12	291	1,510	16	-	.0	-	2,370	1,810	1,570	1	.1	2,570	7.5
G-25	Tex Anderson	455	May 16, 1954	G & P	11	--	476	209	28	292	1,770	18	-	.0	-	2,660	2,050	1,810	3	.3	2,850	7.4
G-27	C. R. Frederick	520	Aug. 29, 1955	G & P	12	f .00	580	76	31	220	1,560	16	-	.5	-	2,380	1,760	1,580	4	.3	2,560	7.3
G-29	B. L. Light	580	Aug. 6, 1955	G & P	12	.01	396	163	70	324	1,440	31	-	4.0	-	2,280	1,660	1,390	8	.7	2,610	7.1
G-33	Gilbert Wendt	330	June 17, 1954	Gl & P	12	-	71	50	54	363	147	35	-	1.0	-	550	382	85	24	1.2	920	7.7
G-34	R. M. Kendrick	100	Feb. 7, 1957	Gu	12	-	142	31	7.0 2.3	348	175	15	.6	16	-	572	482	197	3	.1	866	7.2

See footnotes at end of table.

Table 4.--Analyses of water from wells and springs in Bandera County--Continued

Well	Owner	Depth of well (ft.)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
G-35	R. M. Kendrick	143	Feb. 7, 1957	Gl	12	-	98	38	25	363	131	13	-	2.5	-	504	401	104	12	0.5	749	8.0
G-38	J. W. Halley	570	Jan. 17, 1957	G & P	11	-	522	330	61	346	2,360	27	5.2	.8	-	3,490	2,660	2,380	5	.5	3,570	7.3
G-42	G. A. Cooper	650	Feb. 12, 1957	Gl & P	11	-	54	42	8.2	285	67	12	-	.2	-	334	307	74	6	.2	596	7.2
H-9	J. Garrett	309	May 13, 1954	Gl & Ph	14	-	105	37	15	368	87	28	-	18	-	500	414	112	7	.3	809	7.9
H-11	J. A. Barnett	400	June 14, 1954	Gl & Ph	12	-	122	92	38	351	410	36	-	1.5	-	957	683	396	11	.6	1,320	7.8
H-12	L. R. Vaughn	403	Aug. 9, 1955	P & G	12	0.01	106	83	39	361	333	33	-	1.0	-	853	606	310	12	.7	1,190	7.4
H-13	J. D. Fly	390	Jan. 16, 1957	P & G	12	-	133	110	44	363	500	35	4.4	.5	-	1,020	784	487	11	.7	1,410	7.4
H-17	W. C. Ramsey	135	do	Gu	11	-	149	121	46	375	577	36	4.4	.0	-	1,130	870	562	10	.7	1,520	7.4
H-23	Hugo Bausch	425	May 30, 1954	Gl & P	17	-	104	71	51	428	187	82	-	1.0	-	757	552	201	17	.9	1,200	7.3
H-28	Howard G. Hay	400	Jan. 17, 1957	Gl	12	-	74	55	51	372	156	33	2.6	.2	-	569	410	106	21	1.1	898	7.5
H-30	F. M. Montague	425	May 16, 1954	Ph, Pc & Gl	11	-	80	53	41	390	142	28	-	.0	-	558	418	98	18	.9	915	7.6
H-35	B. Tilghman	520	Jan. 16, 1957	Ph, Pc & Gl	12	-	84	66	63	367	248	36	3.4	.2	-	701	482	181	22	1.3	1,060	7.6
H-37	Mrs. L. Rainey	130	do	Gl	13	-	82	15	11	283	36	13	.4	.8	-	310	265	33	8	.3	516	7.4
H-39	Raymond Hicks	460	Aug. 16, 1955	P	13	.00	72	52	46	362	146	32	-	1.0	-	549	394	97	20	1.0	899	7.6
H-44	Bandera County Water Control & Improvement District No. 1	435	Nov. 2, 1945	Gl & P	14	g .20	73	51	38 21	362	139	37	2.8	0	-	560	392	85	16	.8	933	7.2
*H-45	do	896	Mar. 22, 1950	S & H	11	1.6	50	33	-	372	68	57	2.2	.4	-	492	261	0	-	-	-	-
H-46	do	467	Nov. 2, 1945	Gl & P	13	.06	86	62	39 20	358	220	36	2.4	0	-	682	464	176	15	.8	1,070	6.9

See footnotes at end of table.

Table 4.--Analyses of water from wells and springs in Bandera County--Continued

Well	Owner	Depth of well (ft.)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
H-54	Purple Sage Ranch	400	May 20, 1954	Gl & P	8.8	-	76	87	47	377	279	35	-	0.0	-	751	547	238	16	0.9	1,130	7.7
H-55	do	780	do	S & H	13	-	38	25	106	378	46	50	-	.0	-	464	198	0	54	3.3	824	7.7
H-60	J. P. Heinen	463	July 2, 1954	Gl & P	14	-	76	45	30	378	89	27	-	.0	-	476	374	265	15	.7	797	7.8
H-63	B. Parker	454	Aug. 18, 1955	Gl & P	18	0.00	80	28	24	377	14	16	-	25	-	390	314	6	14	.6	670	8.0
H-65	L. D. Fisher	420	June 14, 1954	Gl & P	13	-	73	55	49	355	167	35	-	1.5	-	573	408	117	21	1.1	954	8.0
H-68	W. M. Ratcliffe	165	Aug. 24, 1955	Gl	15	.01	97	69	12	397	198	14	-	1.0	-	601	526	200	5	.2	947	7.4
H-70	M. L. Stoner	528	Aug. 16, 1955	G & P	14	.01	332	195	30	336	1,330	24	-	2.0	-	2,090	1,630	1,360	4	.3	2,420	7.3
H-73	D. H. Crowell	1,085	Jan. --, 1957	S & H	13	-	32	21	134	360	51	73	2.8	.0	-	504	166	0	64	4.5	858	7.6
J-3	Emory Brown	413	Jan. 10, 1957	G & P	12	-	132	147	47	381	628	40	5.6	.8	-	1,200	934	622	10	.7	1,630	7.4
J-9	Mrs. P. G. Northrup	740	Jan. 5, 1957	G & P	10	-	242	166	79	320	1,080	43	4.0	.0	-	1,780	1,290	1,020	12	1.0	2,180	7.5
J-15	A. Kronkosky	651	do	Gl & P	12	-	86	60	29	301	234	18	2.6	.4	-	605	461	214	12	.6	883	7.7
J-21	W. F. Bush	60	Jan. --, 1957	G	13	-	137	101	21	296	507	20	1.6	.0	-	947	758	515	6	.3	1,290	7.4
J-22	E. H. Frerich	475	Jan. 5, 1957	Gl & P	12	-	65	62	22	336	140	24	3.6	.2	-	499	417	142	10	.5	807	7.5
J-30	Jim Edwards	120	Jan. 9, 1957	Gl	20	-	133	10	13	380	16	21	.4	54	-	454	374	62	7	.3	728	7.4
J-33	J. W. & Milton Lewis	480	Jan. 14, 1957	Gl & P	13	-	158	117	59	361	621	36	3.4	1.5	-	1,190	875	579	13	.9	1,590	7.3
J-41	E. D. Du Frechoru	387	do	Gl & P	16	-	104	32	29	398	79	24	1.4	9.7	-	491	391	65	14	.6	816	7.2
J-50	C. D. Lovelace	420	Aug. 19, 1955	Gl & P	20	.01	92	17	22	339	15	37	-	1.0	-	393	300	22	14	.6	662	7.4
J-55	A. R. Heisler	420	July 2, 1954	Gl & P	13	-	64	57	66	356	189	35	-	.0	-	611	394	102	27	1.4	977	7.9

See footnotes at end of table.

Table 4.--Analyses of water from wells and springs in Bandera County--Continued

Well	Owner	Depth of well (ft.)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
J-62	W. W. Walton	1,120	Dec. 21, 1956	Gl, P, S, & H	13	-	304	180	46	316	1,260	20	-	1.4	-	1,980	1,500	1,240	6	.5	2,270	7.4
J-63	do	500	do	G & Ph	12	-	302	194	77	356	1,340	21	-	2.0	-	2,120	1,550	1,260	10	.8	2,430	7.1
K-3	T. J. Haby	490	Feb. 12, 1957	P	12	-	194	142	45	336	810	26	3.6	1.3	-	1,400	1,070	792	8	.6	1,780	7.3
M-5	R. R. Pue	405	Aug. 1, 1953	Gl & P	15	-	166	145	21	355	692	23	2.6	4.7	-	1,240	1,010	719	4	.3	1,660	7.6
M-9	A. W. Nichols	14	Jan. 17, 1957	Gl	13	-	130	24	13	356	127	16	.6	3.8	-	512	422	130	6	.3	787	7.4
M-11	John F. Merrick	1,137	do	H	13	-	39	20	137 15	364	70	85	3.0	.0	0.8	561	180	0	60	4.4	949	7.7
N-1	Roland Britsch	30	do	Gu	14	-	264	33	11	330	500	14	.6	6.1	-	1,000	794	524	3	.2	1,300	7.2
N-4	J. S. Morris	820	Mar. 27, 1952	Pc	1.6	0.9	-	-	13	143	622	65	-	24	-	-	840	723	3	-	1,730	7.9
N-9	Gene Dunlap	84	Jan. 16, 1957	Gu	14	-	550	142	27	288	1,680	18	1.8	.0	-	2,570	1,960	1,720	3	.3	2,730	7.1
P-5	Rudolph Schott	400	Jan. 7, 1957	G	13	-	62	32	20	299	56	15	-	6.7	-	352	286	41	13	.5	585	7.3
P-13	R. D. Faurie	300	Feb. --, 1957	G	15	-	138	54	15	367	251	16	1.0	15	-	685	566	266	6	.3	1,010	7.3
P-16	A. K. Smith	480	Feb. 13, 1957	G	12	-	205	157	63	486	819	22	4.8	.7	-	1,520	1,160	758	11	.8	1,880	7.4
P-21	W. R. Walls	356	June 16, 1954	Gu	15	-	352	305	207	312	2,210	16	-	3.5	-	3,260	2,130	1,880	17	1.9	3,380	7.0
P-22	J. E. McDonald	525	June 20, 1954	G	15	-	538	125	54	256	1,590	77	-	.0	-	2,520	1,860	1,650	6	.5	2,570	7.6
P-23	Buck Morse	320	June 17, 1953	G	7.2	h .00	472	255	10 12	283	1,930	20	2.6	.5	.38	2,850	2,230	1,990	1	.1	3,070	7.8
P-24	George Ruede	275	Feb. 7, 1957	Gu	13	-	492	92	20	243	1,370	15	1.8	.1	-	2,120	1,610	1,410	3	.2	2,330	7.2

a Total iron (Fe), 1.5 ppm.
b Total iron (Fe), 2.5 ppm.
c Hardness by soap method.
d Total iron (Fe), 1.2 ppm.
e Total iron (Fe), 3.5 ppm.
f Total iron (Fe), 4.8 ppm.
g Total iron (Fe), 1.1 ppm.
h Total iron (Fe), 2.4 ppm.
* Analysis by Texas State Department of Health