TEXAS WATER DEVELOPMENT BOARD

REPORT 19

GROUND-WATER RESOURCES OF GUADALUPE COUNTY, TEXAS

By

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FOREWORD

On September 1, 1965 the Texas Water Commission (formerly, before February 1962, the State Board of Water Engineers) experienced a far-reaching realignment of functions and personnel, directed toward the increased emphasis needed for planning and developing Texas' water resources and for administering water rights.

Realigned and concentrated in the Texas Water Development Board were the investigative, planning, development, research, financing, and supporting functions, including the reports review and publication functions. The name Texas Water Commission was changed to Texas Water Rights Commission, and responsibility for functions relating to water-rights administration was vested therein.

For the reader's convenience, references in this report have been altered, where necessary, to reflect the current (post September 1, 1965) assignment of responsibility for the function mentioned. In other words credit for a function performed by the Texas Water Commission before the September 1, 1965 realignment generally will be given in this report either to the Water Development Board or to the Water Rights Commission, depending on which agency now has responsibility for that function.

Texas Water Development Board

John J. Vandertulip

John J. Vandertulip
Chief Engineer

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GROUND-WATER RESOURCES OF GUADALUPE COUNTY, TEXAS

ABSTRACT

Guadalupe County, in the West Gulf Coastal Plain of south-central Texas, has an area of 715 square miles, and it had a population of 29,017 in 1960. The economy of the county depends largely on agriculture and the production of oil.

The principal water-bearing units underlying the county are the Wilcox Group, Carrizo Sand, Edwards and associated limestones, Austin Chalk, and the alluvium and Leona Formation. Of these the Wilcox Group and the Carrizo Sand together constitute the most favorable aquifer for large-scale ground-water development.

The yields of water wells range from a few gallons per minute to as much as 2,000 gpm (gallons per minute), the largest yields being from wells in the Wilcox Group. Potentially larger yields generally can be expected from properly constructed wells tapping both the Carrizo Sand and the Wilcox Group.

In 1963, only 2,200 acre-feet or 2.0 mgd (million gallons per day) of ground water was pumped in the county. Of this amount nearly 80,000 gpd (gallons per day) was for public supply, about 800,000 gpd was for irrigation, and the rest (1.1 mgd) was for domestic and livestock needs. Where ground-water supplies are meager or difficult to obtain, as in that part of the county where the Taylor Marl and Navarro Group crop out, the domestic and municipal needs are supplied by wells outside of the county or by cisterns.

The chemical quality of the water from the several aquifers differs widely. The Wilcox Group contains fresh to slightly saline water throughout a large part of its extent in the county; in general the water is hard to very hard and has a high iron content. The water from the Carrizo Sand is soft to very hard, generally low in sulfate and chloride, high in iron, and is acidic. The alluvium and Leona Formation furnish water for most purposes, but the hardness and high concentration of nitrate render the water less desirable for public supply or domestic use. The Edwards and associated limestones yields water that commonly contains objectionable quantities of hydrogen sulfide. In only a small area in the western part of the county, the water from the Edwards is fresh, containing less than 1,000 ppm (parts per million) dissolved solids, but very hard.

The Carrizo Sand and Wilcox Group, as an aquifer, is capable of supporting a ground-water development of at least 40 mgd with pumping levels not exceeding 400 feet along an assumed line of discharge. In addition to the 40 mgd which can be pumped indefinitely, during the process of lowering the water levels to

400 feet, about 7,000,000 acre-feet of water would be released from storage and made available to wells. In fact, the aquifer probably transmits annually on the order of 19 mgd at the present hydraulic gradient, or nearly 10 times the quantity of ground water discharged by wells from all aquifers and for all purposes in Guadalupe County. The alluvium and Leona Formation contained an estimated 156,000 acre-feet of ground water in storage in 1964.

GROUND-WATER RESOURCES OF GUADALUPE COUNTY, TEXAS

INTRODUCTION

Location and Extent of Area

Guadalupe County (Figure 1) occupies an area of 715 square miles in south-central Texas. The county is near the boundary between the Edwards Plateau and and the West Gulf Coastal Plain, and is bordered by the following counties: on the north, by Comal and Hays; on the east, by Caldwell and Gonzales; on the south, by Wilson; and on the west, by Bexar. Seguin, the county seat, is about 34 miles northeast of San Antonio.

Purpose and Scope of Investigation

The investigation was a cooperative project of the Texas Water Development Board, the Guadalupe-Blanco River Authority, Guadalupe County, and the U.S. Geological Survey. The purpose was to determine and describe the ground-water resources of the county and to present information as a guide to their development. The results of the investigation are described in this report, which includes a discussion of the occurrence and availability of ground water, the problems that may result from surface or subsurface disposal of brine from oil fields in the area, and the tabulations of basic data obtained during the investigation. Moreover, determinations were made of the location and extent of the water-bearing formations, the chemical quality of the water contained, the quantity of ground water being withdrawn and the effects of these withdrawals on the water levels, the hydraulic characteristics of the important water-bearing formations, and the estimated quantities of ground water available for development.

The report is based on records of 426 water wells and springs (Table 3), 88 electric logs of wells, 15 drillers' logs (Table 5), chemical analyses of water collected during this investigation and previous ones (Table 6), climatological data (Figures 2 and 3), streamflow data, and water-level data.

The investigation consisted of an inventory of all public supply, irrigation, and industrial wells, and a representative number of the domestic wells, livestock wells, and oil tests to provide basic ground-water data throughout the county (Table 3). The electric and drillers' logs of wells, in conjunction with other data, were used to study the subsurface geology and to determine the thickness of sand containing fresh to slightly saline water and the altitude of the base of this water. An inventory was made of the 1963 municipal, industrial, and irrigation pumpage; and estimates were made of the past pumpage.

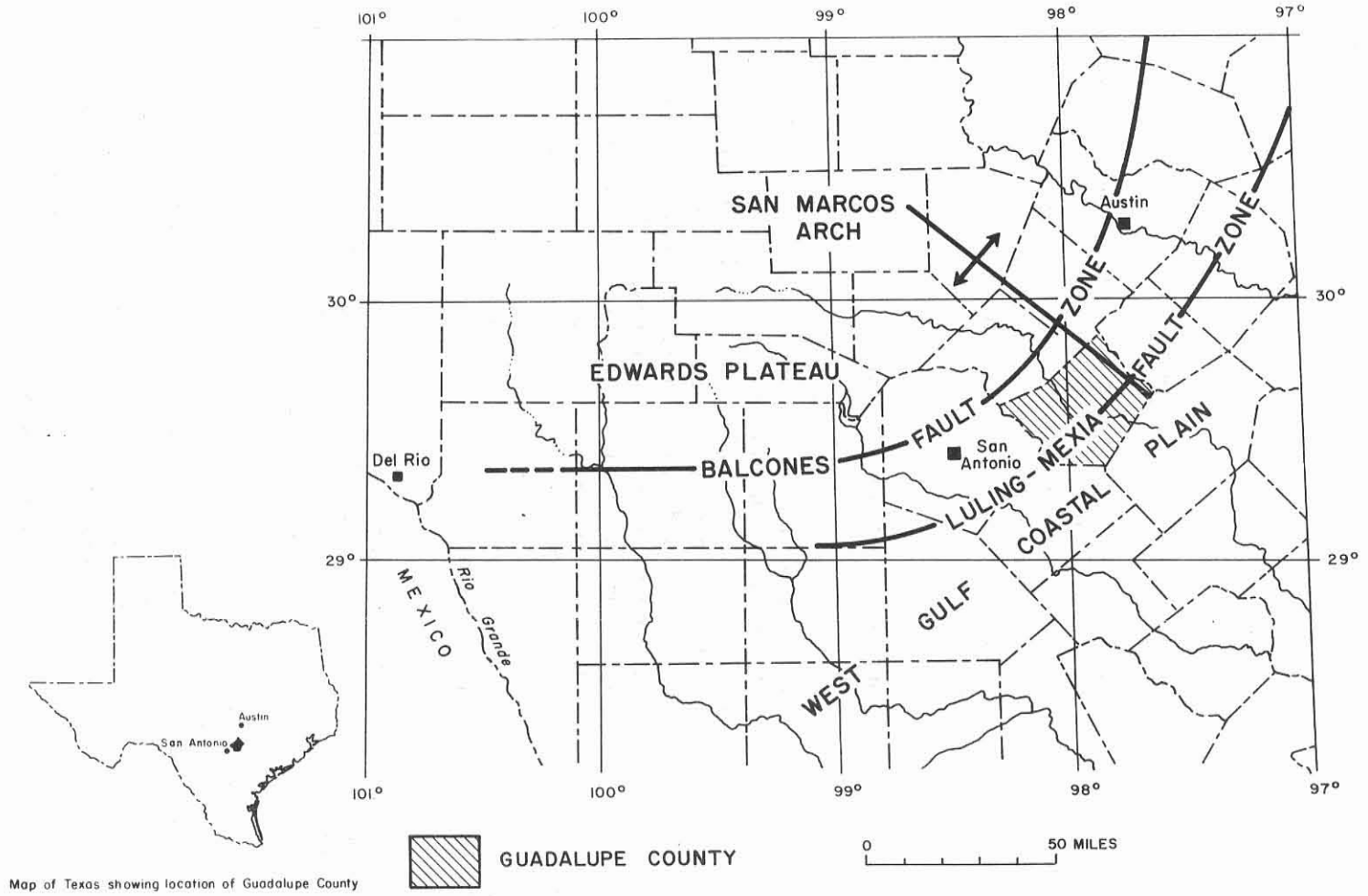

Figure 1

Index Map Showing Location of Guadalupe County and Regional Physiographic and Structural Features

U. S. Geological Survey in cooperation with the Texas Water Development Board and Others

Acknowledgments

The author wishes to express his thanks to the property owners in Guadalupe County for granting access to their properties and for supplying information about their water wells; to the well drillers for logs and other information on water wells; to oil companies for their generous cooperation; and to county and city officials for their assistance. Considerable help was also received from Gary Bowman, geologist with Roland K. Blumberg Interests of Seguin. Many records used in this report had been collected previously by personnel of the U.S. Geological Survey and the Texas Water Development Board.

Previous Investigations

Basic data from prior investigations on ground water in the county are incorporated in this report. The earliest report on the subject by Altgelt and Michal (1937) contained an inventory of wells and springs, records of wells, chemical analyses of water samples, drillers' logs, and a map showing the locations of wells and springs. The public water supplies of Marion and Seguin were described by Broadhurst, Sundstrom, and Rowley (1950, p. 58-59). A reconnaissance report on the ground-water resources of the Guadalupe, San Antonio, and Nueces River Basins by Alexander, Myers, and Dale (1963) contained data on the ground water in Guadalupe County. A description of the regional geology, including the geologic formations in the report area, is in reports by Deussen (1924) and Sellards and others (1932).

Reports on ground-water resources of counties adjacent to Guadalupe County include the following: Bexar (Arnow, 1963), Caldwell (Rasmussen, 1947 and Follett, 1965), Comal (George, 1952), Gonzales (Shafer, 1964), Hays (De Cook, 1963), and Wilson (Anders, 1957).

Economic Development

The income in Guadalupe County is derived principally from farming and the raising of livestock. According to the U.S. Bureau of the Census (1961, p. 161), 134,783 acres, or 29 percent of the land area in the county, was cultivated in 1959. Of the acreage cultivated in 1963, only 735 acres was irrigated with surface water, whereas 990 acres was irrigated with ground water. The principal crops included corn, grain sorghum, cotton, grasses, watermelons, peanuts, pecans, and a variety of vegetables.

The production of oil is also an important source of revenue in the county. Oil was discovered in 1929 about 13 miles east of Seguin, in an area now part of the Darst Creek field. According to records of the Railroad Commission of Texas (1963), the cumulative production in Guadalupe County through 1962 was about 120 million barrels, of which 5 million barrels was produced in 1962. These figures are conservative because they do not include some production from fields that extend across the county line.

In 1960, the county had a population of 29,017, of which 14,299 lived in Seguin. Other towns in the county include Schertz, population 2,281; Marion, 557; Cibolo, McQueeney, and Kingsbury, each about 300; and Staples, 150.

From these small communities come products that contribute to the county economy, such as poultry, flour, fiberglass, cloth, steel, Mexican food, and

furniture. Supplementary income is contributed by tourists who are attracted to the lakes along the Guadalupe River.

Physiography and Drainage

Guadalupe County is in the West Gulf Coastal Plain of Texas (Fenneman, 1938, p. 100). The county is divided into two northeastward-trending belts which are clearly marked by soil, plant, and topographic characteristics.

The blackland prairie belt is in the northwestern third of the county in the area underlain by rocks of the Taylor, Navarro, and Midway Groups. The surface is hilly, and the soil produced from the weathering of the rocks is rich, heavy, and black. Locally, faulting has resulted in a hill-and-dale topography.

The post-oak belt occupies most of the rest of the county. In this belt, the surface slopes gently southeastward, and the soil is sandy and heavily timbered.

The most prominent physiographic features in the county are the broad, flat, alluvial plains; for example, the one (on which the city of Seguin is situated) that extends generally northward a few miles from Seguin--or the one that, extending along Cibolo Creek, reaches its maximum width 3 or 4 miles south of Marion. Both of these alluvial plains are covered by black topsoil, generally cultivated, and very productive.

The altitude of the land surface in the county ranges from about 900 feet a few miles north of Schertz to about 300 feet in the Guadalupe River channel where the river leaves the county.

Most of the county is in the drainage basin of the Guadalupe River; the western fourth of the county is in the San Antonio River Basin. Cibolo Creek, a tributary of the San Antonio River, drains an area adjacent to Bexar and Wilson Counties. The Guadalupe River enters the county northwest of Seguin, flows southeastward through Seguin, and thence eastward into Gonzales County. The northeastern part of the county is drained by the San Marcos River, a tributary of the Guadalupe River.

Climate

The subhumid climate of Guadalupe County is characterized by moderate rainfall, mild winters, and hot summers. The normal annual precipitation at Seguin during the period 1931-60 was 30.85 inches. The precipitation ranged from 15.89 inches in 1956 to 49.47 inches in 1949 (Figure 2). The precipitation is fairly well evenly distributed throughout the year, the monthly average ranging from 1.71 inches in November to 3.60 inches in September (Figure 3).

The normal annual temperature at Seguin was 69.2°F for the period 1931-60; the normal monthly temperature ranged from 52.5°F in January to 84.3°F in August. The average annual gross lake surface evaporation in Guadalupe County, for the period 1940-57 was about 63 inches (Figure 3); this is more than twice the normal annual precipitation at Seguin.

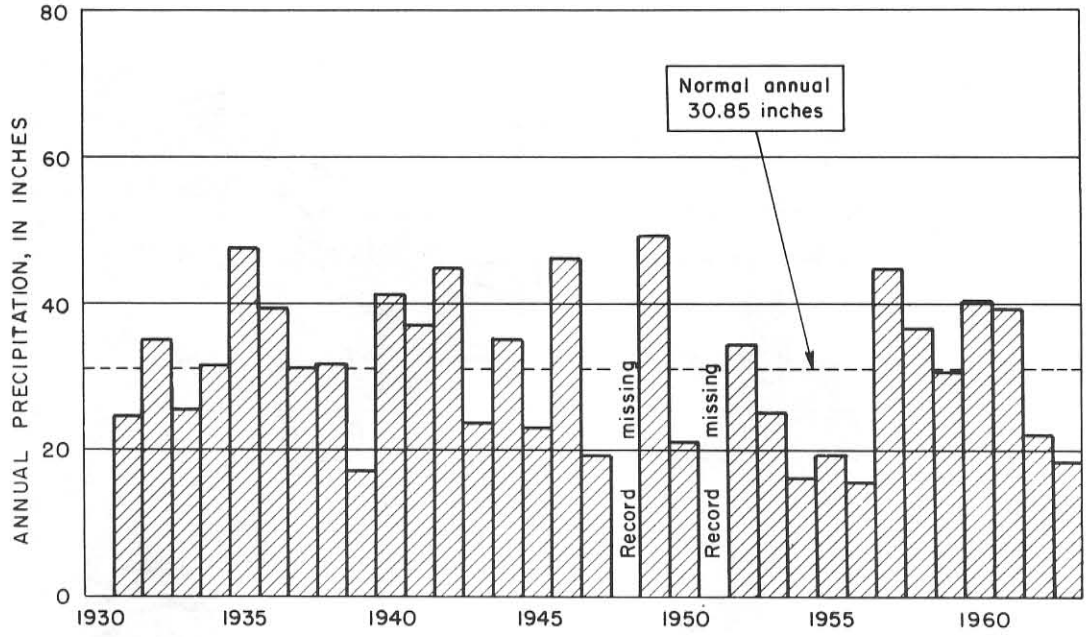

Figure 2

Annual Precipitation at Seguin, 1931-63

(From records of U.S. Weather Bureau)

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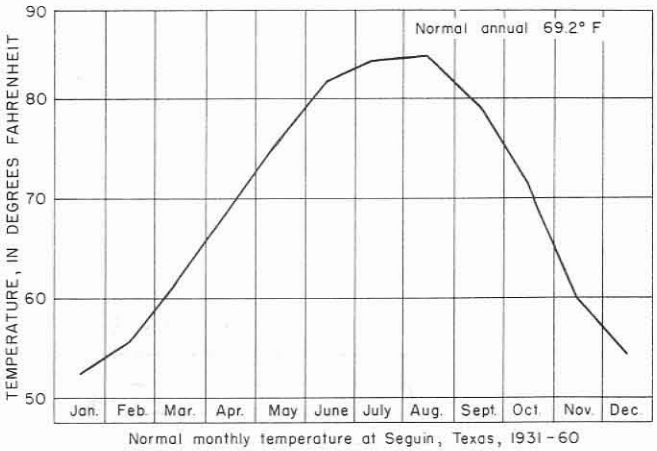
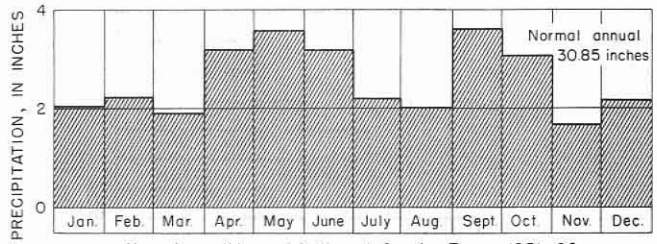
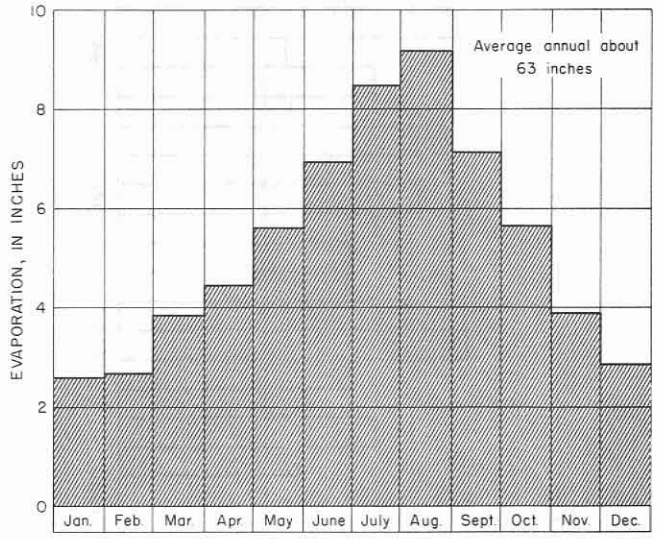


Normal monthly temperature at Seguin, Texas, 1931-60



Normal monthly precipitation at Seguin, Texas, 1931-60



Average monthly gross lake surface evaporation in Guadalupe County, Texas, 1940-57

Figure 3

Normal Monthly Temperature and Precipitation at Seguin, and Average Monthly Gross Lake Surface Evaporation in Guadalupe County

(From U.S. Weather Bureau and Texas Board of Water Engineers, 1960)

U.S. Geological Survey in cooperation with the Texas Water Development Board and Others

Well-Numbering System

The numbers assigned to wells in this report conform to the Statewide system which is used by the Texas Water Development Board and which is based on the division of Texas into 1-degree quadrangles bounded by lines of latitude and longitude. Figure 4 illustrates the well-numbering system. Under this system, each 1-degree quadrangle in the state is given a number consisting of two digits. These are the first two digits appearing in the well number. Each 1-degree quadrangle is divided into $7\frac{1}{2}$-minute quadrangles which are also given 2-digit numbers from 01 to 64. These are the third and fourth digits of the well number. Each of the $7\frac{1}{2}$-minute quadrangles is subdivided into $2\frac{1}{2}$-minute quadrangles and are similarly designated by 1-digit numbers from 1 to 9. This is the fifth digit of the well number. Finally, each well within a $2\frac{1}{2}$-minute quadrangle is given a 2-digit number in the order in which the well is inventoried, starting with 01. These are the last two digits of the well number. In addition to the 7-digit well number, a 2-letter prefix is used to identify the county. The prefix for Guadalupe County is KX. Thus, Well KX-68-31-401 (Plate 1) is in Guadalupe County (KX), in the 1-degree quadrangle 68 (the numbers of the wells in Guadalupe County begin with 67 and 68), in the $7\frac{1}{2}$-minute quadrangle 31, in the $2\frac{1}{2}$-minute quadrangle 4, and was the first well (01) inventoried in the $2\frac{1}{2}$-minute quadrangle.

On the geologic and well-location map in this report (Plate 1), the $7\frac{1}{2}$-minute quadrangles are shown and numbered in the northwest corner of each quadrangle. The 3-digit number shown with the well symbol contains the number of the $2\frac{1}{2}$-minute quadrangle in which the well is located and the number of the well within that quadrangle.

Definition of Terms

In the following sections of the report, certain technical terms or terms subject to different interpretations are used. For convenience and classification, these terms are defined.

Aquifer.--A geologic formation, group of formations, or part of a formation that is water bearing.

Artesian water.--Ground water under sufficient pressure to rise above the level at which it is found in a well, although the water does not necessarily rise to or above the surface of the ground.

Coefficient of permeability.--The rate of flow of water in gallons per day through a cross-sectional area of 1 square foot under a unit hydraulic gradient.

Coefficient of storage.--The volume of water an aquifer releases from or takes into storage per unit of surface area of the aquifer per unit change in the component of head normal to that surface. Under water-table conditions the coefficient of storage is practically equal to the specific yield, which is defined as the volume of water released from or taken into storage in response to a change in head attributed partly to gravity drainage or refilling of the zone through which the water table moves, and partly to compressibility of the water and aquifer material in the saturated zone.

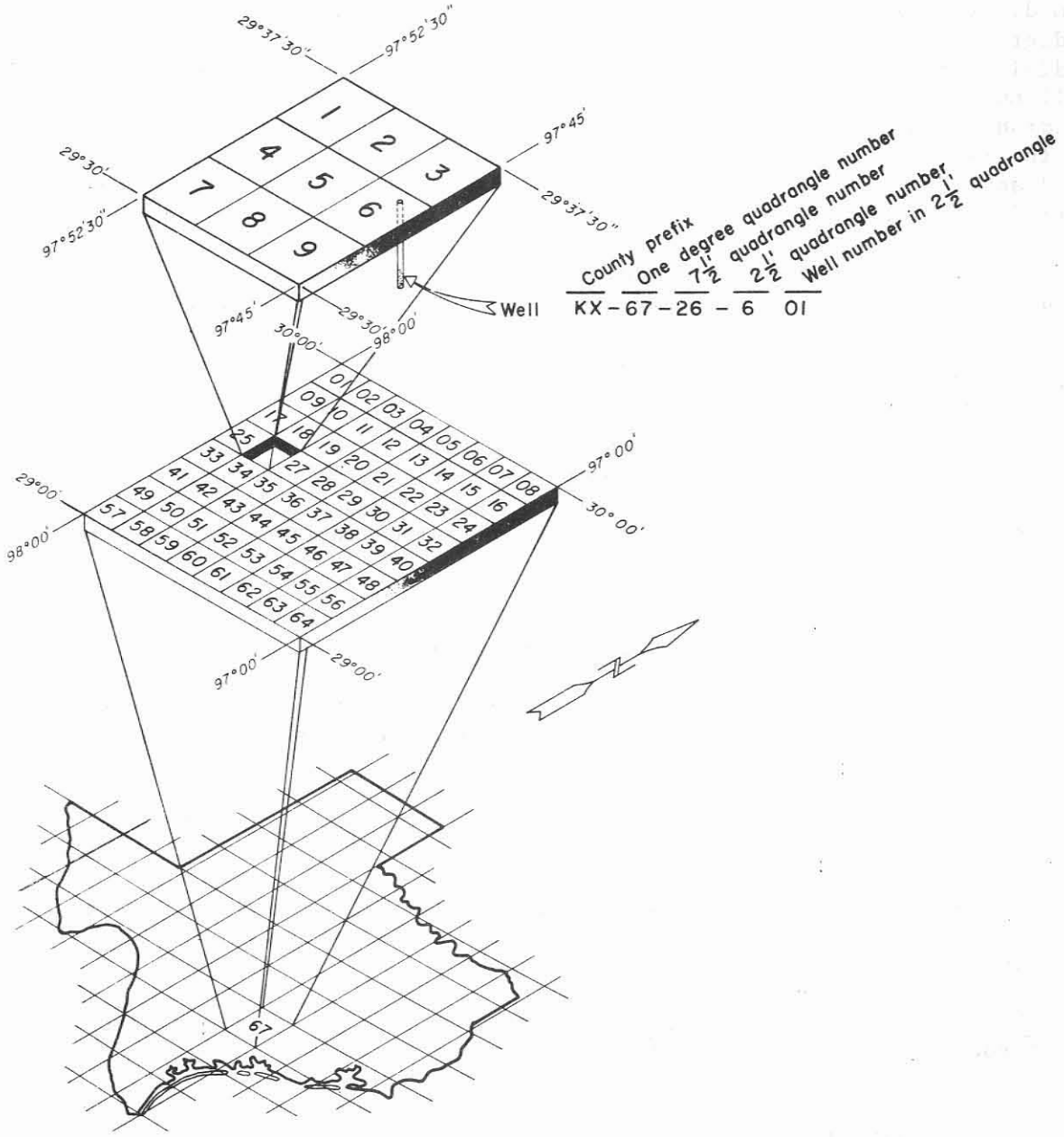


Figure 4

Well - Numbering System

U.S. Geological Survey in cooperation with the Texas Water Development Board and Others

Coefficient of transmissibility.--The number of gallons of water that will move in 1 day through a vertical strip of the aquifer 1 foot wide and having the height of the aquifer when the hydraulic gradient is unity. It is the product of the field coefficient of permeability and the saturated thickness of the aquifer.

Piezometric surface.--The imaginary surface to which water will rise in artesian wells, and also the surface formed by the water table in the outcrop areas. The terms are synonymous in the outcrop area, but only piezometric surface is applicable to artesian areas.

Resistivity.--That property of a material which characterizes its opposition to the flow of electricity. The resistivity of a water-saturated material is a function of both the texture of the material and the contained fluid and is recorded in ohms per square meter per meter (ohms m^2/m) in electric logs of wells.

Specific capacity.--The discharge of a well expressed as the rate of yield per unit of drawdown, generally in gallons per minute per foot of drawdown.

Specific conductance (conductivity).--As expressed in micromhos per centimeter at 25°C, a measure of the ability of a solution to conduct electricity. The conductivity is approximately proportional to the content of dissolved solids. Herein the term is used in connection with the description of the quality of water.

Spontaneous potential.--The spontaneous potential curve on electric logs indicates the difference in electrical potential across boundaries of different types of material. Spontaneous potential is recorded in millivolts.

Transmission capacity.--The quantity of water that can be transmitted through a given width of an aquifer at a given hydraulic gradient.

Water level (static level or hydrostatic level).--In an unconfined (water table) aquifer, it is the distance from the land surface to the water table; in a confined (artesian) aquifer, the term applies to the level to which the water will rise either above or below the land surface.

Water table.--The upper surface of a zone of saturation except where that surface is formed by impermeable material.

Yield.--The following ratings apply for general discussions of yields of wells in Guadalupe County.

Description	Yield in gallons per minute (gpm)
Small	Less than 50
Moderate	50 to 500
Large	More than 500

In this report, water containing less than 1,000 ppm (parts per million) dissolved solids is considered fresh; 1,000 to 3,000 ppm, slightly saline;

3,000 to 10,000, moderately saline; 10,000 to 35,000, very saline; and more than 35,000, brine (Winslow and Kister, 1956, p. 5).

GEOLOGY AS RELATED TO THE OCCURRENCE OF GROUND WATER

The geologic formations that are penetrated by water wells or test wells in Guadalupe County range in age from Cretaceous to Quaternary and are composed chiefly of sand, sandstone, gravel, clay, shale, marl, and limestone. The thickness, lithology, and water-bearing properties of the rocks are summarized in Table 1, although only those rock units important to the ground-water resources are discussed in detail in this report. The rock units that contain fresh to slightly saline water in the county are, from oldest to youngest: the Edwards and associated limestones and the Austin Chalk of Cretaceous age; the Wilcox Group, Carrizo Sand, and Reklaw Formation of Tertiary age; and the alluvium and Leona Formation of Quaternary age.

Little is known of the water-bearing properties of the Sligo and Hosston Formations of Early Cretaceous age in Guadalupe County. However, water reportedly from the Sligo (depth 1,998 feet) in Well KX-68-31-212 contained 3,000 ppm sulfate and 4,920 ppm dissolved solids (Table 6). Well KX-68-30-602, originally drilled to the Edwards and associated limestones, was deepened in 1947 to the basal sands of the Trinity Group. Water from a loose, coarse sand from 2,225 to 2,350 feet--probably the Hosston Formation--reportedly contained 1,530 ppm sulfate. The Sligo and Hosston Formations probably contain moderately saline water or worse throughout Guadalupe County; therefore, they will not be discussed further in this report.

The general geologic structure in the county is fairly simple. The formations crop out in belts that trend generally northeastward (Plate 1), the oldest unit--the Austin Chalk--cropping out in the western part of the county. The formations dip southeastward toward the Gulf of Mexico at a rate slightly greater than the dip of the land surface; the rate of dip increases rather rapidly in the southeastern part of the county. The general structure and the relationship between the formations are shown on the geologic section (Plate 2). The contacts between the formations are based on the interpretation of electric logs of oil tests, and consequently may be somewhat at variance with those based on paleontological data.

The formations in the county are cut by two major systems of northeasterly-trending faults. In the northwestern part of the county, the faults (which belong to the Balcones fault system) generally are of the normal or tension type in which the downthrown side is toward the southeast. Conversely, although in the eastern and southern parts of the county, the faults (which belong to the the Luling-Mexia fault system) are normal faults also, the downthrown sides are toward the northwest. Only a few of the faults are shown on the geologic map (Plate 1), and, for purposes of simplification, none are shown on the geologic section (Plate 2).

The axis of the San Marcos Arch, a subsurface structural arch (Sellards and others, 1932, p. 266), approximately follows the course of the San Marcos River. The arch probably has little effect on the occurrence of ground water in the county, but has resulted in a thinning of some of the sediments that normally occur above the Edwards and associated limestones.

Table 1.--Stratigraphic units and their water-bearing properties, Guadalupe County

System	Series	Group	Geologic unit	Approximate maximum thickness (feet)	Lithologic character	Water-bearing properties
Quaternary	Recent and Pleistocene		Alluvium	25	Clay, silt, sand, and gravel.	No wells are known that obtain water from the alluvium. Locally, the alluvium and Leona Formation are contiguous and probably act as a single hydrologic unit.
	Pleistocene		Leona Formation	60	Silt, sand, gravel, and caliche.	Yields small to large quantities of water.
Tertiary(?)	Pliocene(?)		Uvalde Gravel	10	Predominantly flint gravel.	Not known to yield water to wells in Guadalupe County.
Tertiary	Eocene	Claiborne	Queen City Sand	?	Medium to fine sand, clay and shale.	Do.
			Reklaw Formation	200±	Glauconitic sand and silty clay in lower part of formation, and clay and silt in the upper part.	Yields small quantities of fresh to slightly saline water to wells in the outcrop.
			Carrizo Sand	550	Coarse to fine sand, sandstone, silt, clay, and shale.	Yields small quantities of fresh water to wells and springs in outcrop. Probably, larger yields of fresh to slightly saline water could be obtained from properly constructed wells in the extreme southern and southeastern parts of county.
		Wilcox		1,420	Silt, clay, fine to medium sand and sandstone, sandy shale, and thin beds of lignite.	Yields small to large quantities of fresh to moderately saline water to wells.
	Paleocene	Midway		500±	Predominantly clay and silt, a few lenses of sand and limestone.	Not known to yield water to wells in Guadalupe County.
Cretaceous	Gulf	Navarro		600	Clay and clayey marl.	Do.
			Taylor Marl and Anacacho Limestone	800	Nodular marl, locally chalky and calcareous clay.	Do.
			Austin Chalk	220	White to buff chalk, marl, limestone, and some pyrite.	Yields small to moderate quantities of fresh to slightly saline water to wells in and near outcrop.
			Eagle Ford Shale	30	Black shale, gray sandy limestone and calcareous shale.	Not known to yield water to wells in Guadalupe County.
	Comanche	Washita	Buda Limestone	70	Fine-textured limestone, hard nodular limestone.	Do.
			Grayson Formation (Del Rio clay of former usage)	50	Blue clay, thin beds of fossiliferous limestone, selenite.	Do.
			Edwards and associated limestones	550	Hard massive limestone and dolomitic limestone; contains flint, and some thin beds of marl. Cavernous in places.	Yields small to moderate quantities of fresh water to a few wells in the northwestern part of Guadalupe County.

Edwards and Associated Limestones

The Edwards and associated limestones in Guadalupe County comprises the Comanche Peak, Edwards, and Georgetown Limestones. As stated by Petitt and George (1956, p. 21), "...in some places it is impossible to distinguish the Edwards from the overlying Georgetown Limestone and the underlying Comanche Peak Limestone, both of which are water bearing, the three formations are referred to as the Edwards and associated limestones."

The Edwards and associated limestones is present in Guadalupe County only in the subsurface. For purposes of this report, it was mapped only in approximately the northwestern half of the county where it occurs at depths ranging from 490 feet above sea level (880 feet below land surface) in Well KX-68-30-306 (Figure 5) to 2,055 feet below sea level (2,455 feet below land surface) in Well KX-67-18-602. The unit consists of about 550 feet of hard, massive limestone and dolomitic limestone in which some marl and flint is present. The limestone is cavernous in places. The unit is the principal aquifer in an area along the Balcones fault zone extending from Kinney County on the west to at least Hays County on the north. Within this area, the unit yields moderate to large supplies of fresh to slightly saline water to many springs and a large number of wells. The Edwards and associated limestones is not so prolific an aquifer in Guadalupe County; however, the unit yields small to moderate supplies of fresh water to a few wells only in an area north of Schertz. South and southeast of the line trending northeast through the western corner of the county (Figure 5), the water in the unit contains hydrogen sulfide and more than 1,000 ppm dissolved solids, and farther downdip the water becomes too highly mineralized for most purposes. In some of the southern and southeastern parts of the county, the unit yields commercial quantities of oil.

Austin Chalk

The Austin Chalk, exposed on the upthrown sides of faults in the western part of the county, is in fault contact with the Taylor Marl and Anacacho Limestone, undifferentiated (Plate 1). The Austin ranges from about 60 to 220 feet in thickness, according to electric logs of oil tests, and consists principally of beds of chalky limestone interbedded with shale. On the outcrop the Austin characteristically is white to buff fossiliferous chalky limestone and marl with some crystals of pyrite.

Small to moderate quantities of fresh to slightly saline water are obtained from a few wells in and near the outcrop of the Austin Chalk. Aside from supplying the town of Marion, the water from the Austin is used chiefly for domestic and livestock needs.

Wilcox Group

The Wilcox Group crops out in a northeastward-trending belt that ranges in width from about 8 to 12 miles (Plate 1). The Wilcox consists of clay, silt, fine to medium sand and sandstone, sandy shale, and thin beds of lignite, and has a maximum thickness of about 1,420 feet. The individual sand beds generally are not continuous over long distances and correlation of the beds is difficult even in short distances (Plate 2).

The Wilcox supplies small to large quantities of fresh to slightly saline water used principally for domestic and livestock needs, although some is used for irrigation. A few shallow wells (less than 100 feet deep) yield moderately saline water. The electric logs of oil tests reveal that the Wilcox contains fresh to slightly saline water throughout a large part of its extent in the county, although in the lower 100 to 300 feet of the formation the water probably is too highly mineralized for most purposes. In the southwestern part of the county, where the Wilcox is overlain by the Carrizo Sand, the two can be considered as a single hydrologic unit, although no known wells are screened opposite both aquifers.

Carrizo Sand

The Carrizo, unconformably overlying the Wilcox Group, crops out in the southern and southeastern parts of the county in a belt that averages about 4 miles in width. Most of the outcrop is heavily timbered with blackjack oak, or with hickory and brush. The Carrizo consists chiefly of fine to coarse, loose, cross-bedded sand and some thin beds of sandstone, silt, clay, and shale. Generally, the sand is white to salmon pink and consists of rounded to subangular coarse quartz grains. According to electric logs of several oil tests, the Carrizo has a maximum thickness of about 550 feet. The contact between the Carrizo and the Wilcox Group (Plate 2) was placed arbitrarily at or near the base of the massive sand overlying the alternating beds of shale and sand of the Wilcox.

The area underlain by the Carrizo Sand in Guadalupe County is sparsely populated, and development of water supplies from the formation has been principally from a few wells designed to supply only small quantities of fresh to slightly saline water for domestic and livestock purposes. Larger yields undoubtedly could be obtained if screens were set through the entire thickness of the formation. At some places in the outcrop, water-table springs in the Carrizo Sand supply water for livestock use. In the extreme southern part of the county, yields of probably more than 2,000 gpm could be expected from properly constructed wells that screen both the Carrizo Sand and Wilcox Group.

Reklaw Formation

The Reklaw Formation, conformably overlying the Carrizo Sand, crops out in a hilly belt that ranges from about 1 to 2 miles in width in the southeast corner of the county (Plate 1). The lower part of the formation consists principally of glauconitic sand and silty clay; the upper part is chiefly silt and clay. The basal sand, which is finer grained than the underlying Carrizo, probably is equivalent to the Newby Glauconitic Sand Member of Stenzel (1938, p. 71-78). The thickness of the Reklaw was not determined but probably does not exceed 200 feet. Few wells obtain water from the Reklaw, principally because of the small area the formation occupies. In general, the basal sand yields small quantities of fresh to slightly saline water to a few wells chiefly for livestock use.

Leona Formation

In Guadalupe County the Leona Formation forms a broad flat terrace which generally occupies a position between the Recent floodplain deposits and the

Uvalde Gravel that caps the uplands. Although the alluvium and Leona have not been mapped separately, by far the larger part of the Quaternary sediments shown on the geologic map (Plate 1) belongs to the Leona Formation. Small outcrops of the formation are found also as erosional remnants in other parts of the county, but because of their small extent and hydrologic insignificance, these outcrops are not shown on the geologic map. In general, the surface of the Leona is a nearly level plain having a characteristically black, fertile soil.

Where exposed in gravel pits, the Leona consists of stratified gravel and sand, partly cross bedded, and of lenses of caliche, silt, and water-worn fossils. The gravel is composed chiefly of limestone, but also contains some chert. The photographs in Figure 6 show the stratification and the variation in size of the material. The light-colored bed in the upper part of the lower photograph is a sand lens which pinches out beyond the area shown in the photograph. Overlying this sand are several feet of caliche. The maximum thickness of the Leona is about 60 feet.

Although most of the small to large quantities of water which the formation yields to wells and springs in the county are used for domestic and livestock purposes, some of the water serves for irrigation and public supply. The saturated thickness of the Leona ranges from less than 1 foot to as much as 15 feet, but these thicknesses are rather variable depending on the rainfall. Locally, where the saturated section of the formation is thick (generally in the river valleys), the Leona yields enough water to irrigate small farms. Where rather impermeable formations (such as the Taylor Marl, Navarro, or Midway Groups) lie beneath the Leona, it is the only source of small water supplies; and where the Wilcox or Austin Chalk underlie the Leona, it may facilitate recharge to these rocks by retarding the rate of surface runoff.

Alluvium

Pleistocene and Recent stream alluvium containing clay, silt, sand, and gravel is exposed along some of the major stream channels in the county. At some places these materials have a thickness of as much as 25 feet; however, no wells are known to obtain water from the alluvium. At many places in the stream valleys, however, the alluvium and the Leona Formation are contiguous and act as a single hydrologic unit; they are, therefore, not differentiated along the streams shown on the geologic map (Plate 1).

GROUND-WATER HYDROLOGY

Source and Occurrence of Ground Water

The principal source of ground water in Guadalupe County is precipitation on the outcrop areas of the water-bearing rocks or on the hydrologically connected rock units. A large part of the precipitation either runs off, or is consumed by evapotranspiration, or is stored in the soil until evaporated or transpired. A small part of the water migrates downward by gravity to the water table to become a part of the ground water in storage.

The ground water occurs under water-table (unconfined) or artesian (confined) conditions. Water-table conditions occur in the outcrop areas of the Wilcox Group, Carrizo Sand, Reklaw Formation, and the alluvium and Leona

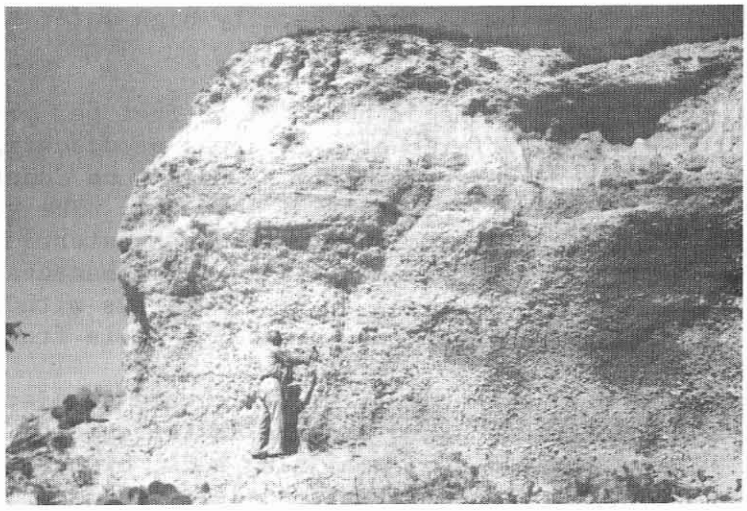


Figure 6

Views of Leona Formation in Gravel Pit One-Half Mile Northwest of Well KX-68-24-901

U.S. Geological Survey in cooperation with the Texas Water Development Board and Others

Formation near the present stream channels. Artesian conditions exist downdip from the outcrop or recharge areas where the aquifer is overlain by less permeable material and the water becomes confined. Water under artesian pressure will rise in wells above the top of the aquifer. Where the elevation of the land surface at a well is considerably below the general level of the area of outcrop, the pressure may be sufficient to cause the water to rise above the land surface, and the well will then flow. Only one flowing well, KX-67-18-504, was observed in the county. The flow of this well, however, is the result of pressure created by natural gas that entered the aquifer probably through a nearby fault.

Recharge, Movement, and Discharge of Ground Water

Recharge to the aquifers in Guadalupe County occurs by direct infiltration of precipitation on the outcrops and, to a lesser extent, by seepage from streams that cross the outcrops. The sandy outcrops of the Carrizo Sand and Wilcox Group, as well as the sand and gravel in the Leona Formation, are highly receptive to infiltration of rainfall. Even with the excellent recharge facility, however, a large part of the precipitation is consumed by evapotranspiration; appreciable quantities of water are recharged to the ground-water reservoir only during extended periods of precipitation. Recharge from streams that cross the outcrop areas of the aquifers in the county probably is small by comparison with that from other sources. Probably, some recharge occurs where the streams cross the permeable rocks of the Wilcox Group and Carrizo Sand; the quantity, however, is small owing to the generally high water table in the outcrop of these formations.

Ground water moves slowly (tens or hundreds of feet per year) under the influence of gravity from areas of recharge to areas of discharge. Fresh to slightly saline water in the aquifers underlying Guadalupe County is in transient storage and hence in a constant state of movement. The general direction of movement of the ground water in the county is southeastward toward the Gulf of Mexico. Locally, however, some exceptions may exist because of fault barriers or withdrawals of water by pumping. Where water is withdrawn by pumping, the direction of ground-water movement is toward the wells from all directions.

Ground water in the aquifers underlying the county is discharged naturally in three major ways: through seeps and springs in the outcrop; by evapotranspiration; and by seepage through semi-confining beds, or along fault lines, into other aquifers having lower hydrostatic heads.

A large but undetermined portion of the spring flow is from the Leona Formation. The flow of several springs in the Leona contributes substantially to the flow of Geronimo Creek. In fact, measurements made at three stream-gaging sites on Geronimo Creek (Plate 1) during the period June 22 - July 2, 1964, reveal a gain of 2.16 cfs (cubic-feet per second) or 970 gpm between sites 1 and 2; in other words, a gain of about 0.5 cfs per mile of stream channel. Between sites 2 and 3, however, no net gain occurs, indicating that the Leona along this part of the stream contributes little or no spring flow. This is indicated also by the near absence of wells that tap the Leona along this part of the creek (Plate 1).

Springs and seeps issue also from small localized areas in the outcrop of the Carrizo Sand in the southern part of the county. Many such springs and seeps are developed, usually by bulldozing a shallow pond or pit, to provide

water for livestock use. The quantity of water discharged by seeps and springs or by evapotranspiration is not known, but the amount is probably several times that of the present (1963) rate of withdrawal by all wells. The discharge by wells is described more fully in a following section on the development of the ground-water supplies.

Development of Ground Water

Only small quantities of ground water are pumped from the aquifers underlying Guadalupe County. In 1963, about 2.0 mgd (million gallons per day) of water (or about 2,200 acre-feet) was pumped, of which 80,000 gpd (or 4 percent) was for public supply and 800,000 gpd (or 40 percent) was for irrigation. The rest of the water, about 1.1 mgd, was pumped for domestic and livestock use. The quantity of water pumped from the different aquifers was not determined because of the small amounts involved; however, a large part of the total pumpage in 1963 was undoubtedly from the Wilcox Group, followed in order by the Leona Formation, the Edwards and associated limestones, the Austin Chalk, and the Carrizo Sand.

The town of Marion pumped approximately 50,000 gpd in 1963 from two dug wells that tap the Austin Chalk. The wells, 50 feet deep, yielded about 60 gpm.

The town of McQueeny pumped about 10,000 gpd from a dug well tapping the Leona Formation. The well, 25 feet deep, yielded 500 gpm.

Cibolo, in the northwestern part of the county, obtained its water supply (20,000 gpd) from one well (KX-68-31-401) in the Edwards and associated limestones. The well, 602 feet deep, yielded about 160 gpm of water that contained 2,300 ppm dissolved solids and 704 ppm sulfate; the water also was highly charged with hydrogen sulfide. Because of these undesirable constituents, the well was abandoned in July 1964, and since that time the water needs of Cibolo have been met by wells in Bexar County which also supply the town of Schertz.

The water needs of Schertz formerly were supplied from Well KX-68-30-602. The well, which was drilled in 1942, was 1,146 feet in depth (Edwards and associated limestones). The water from the well was too highly mineralized for public supply; consequently, in 1947, the well was deepened to the basal sandstones of the Trinity Group which lie at depths of 2,225 to 2,350 feet. Unfortunately, the water from these sandstones was also too highly mineralized (1,530 ppm of sulfate) and the well was abandoned. Since then, Schertz has obtained water from wells in Bexar County.

The water supply of Staples, in the northeastern part of the county, is furnished by a well across the San Marcos River in Caldwell County. Seguin, the largest city in the county, obtains its water supply from the Guadalupe River.

Irrigation by ground water is practiced only on a small scale in Guadalupe County. In general, both the time and the amount of precipitation are adequate for growing crops; but when precipitation is below normal during the growing season, ground water is used for supplementary irrigation. Of the 36 irrigation wells in the county in 1964, more than half had been drilled since 1952. According to the records of the Texas Board of Water Engineers (1960a, p. 107), in 1958 about 1,847 acres was irrigated with 1,392 acre-feet of ground water.

In 1963, only 990 acres was irrigated with 900 acre-feet. Much of the ground water used for irrigation was from the Wilcox Group and from the Leona Formation. The irrigation wells in use in 1963 ranged in depth from about 20 to 800 feet and the reported yields ranged from about 100 to 2,000 gpm.

Domestic and livestock use of ground water in 1963 amounted to 1.1 mgd or 55 percent of the total withdrawals. Throughout most of the county the water for domestic and livestock use is obtained from wells. In some areas, however, particularly in the northern half of the county, adequate supplies of good-quality ground water are not available because the underlying formations (the Navarro and Midway Groups) consist of several hundred feet of nearly impermeable clay, shale, and marl. At other places, although ground water is available in sufficient quantities, poor quality limits its use and also discourages further ground-water development. In some areas where suitable ground-water supplies are not obtainable, water-distribution systems have been installed to deliver water from wells outside the county. For example, the water supply for the rural population in the vicinity of Marion and McQueeney is soon to be furnished from a well tapping the Edwards and associated limestones in Comal County, a few miles north of the Comal-Guadalupe county line. In the near future similar water-distribution systems probably will be installed in other parts of Guadalupe County where suitable water supplies are not available.

Changes in Water Levels

Water levels in wells fluctuate not only in response to changes in the rates of recharge to and discharge from the aquifers, but also to a lesser extent, in response to changes in atmospheric pressure, tides, earthquakes, and numerous other disturbances.

Water levels in a few selected wells in the Edwards and associated limestones have been measured periodically as part of the Statewide observation-well program of the U.S. Geological Survey and the Texas Water Development Board (Table 4). Of these wells, only KX-68-30-302 and KX-68-30-601 were measured during the present investigation. The records show that the water levels trended generally upward during the period 1957-60, reflecting the above normal rainfall in 1957 and 1958. In fact, following the heavy rains of 1957 and 1958, the water levels in the Edwards reservoir in the San Antonio area rose nearly to the levels existing when the drought began in 1947 (Garza, 1962a, p. 1). The water levels in 1964 were lower than in 1960 due mainly to the below-normal rainfall since 1962.

Long-term records of water-level measurements of wells in the Wilcox Group and Carrizo Sand in Guadalupe County are not available; however, the water levels in 11 wells in the Wilcox Group were measured in 1936 and again in 1963 or 1964. The water levels declined 3.2 to 11.1 feet in 3 of the wells, and rose from 0.9 foot to 15.1 feet in 8 of them. These records are insufficient to determine a definite trend in the water levels, but the changes in reservoir storage are, for all practical purposes, negligible. In fact, the aquifers probably are nearly as full of water now as they have been in the past.

In 1957 and again in 1964, the water levels were measured in 17 wells tapping the Leona Formation. In 7 of these wells the water levels declined 0.6 to 7.2 feet, and in 10 they rose from 0.5 to 7.4 feet. Little significance can be attached to these changes as no water-level trend can be inferred.

Aquifer Tests

Little is known about the hydraulic characteristics of the aquifers underlying Guadalupe County, principally because of the lack of suitable wells in which to observe these characteristics. Aquifer tests made in one well in Guadalupe County and four in Caldwell County by Follett (1965, Table 6) indicated that the coefficients of transmissibility of the Wilcox Group ranged between 5,000 gpd per foot in Well KX-68-40-902 in Guadalupe and 105,000 gpd per foot in wells in the Luling well field in Caldwell County. Although the average of the transmissibilities determined from the tests was 62,000 gpd per foot, a value of 50,000 gpd per foot probably more nearly represents the transmissibility of the Wilcox Group in Guadalupe County. The coefficients of storage determined from the tests in Caldwell County ranged from 0.00047 to 0.0012 and averaged 0.0008, and these might be considered applicable to Guadalupe County also.

No pumping tests were made in wells tapping the Carrizo Sand in Guadalupe County, but Shafer (1964, p. 45) has reported that in neighboring Gonzales County the average transmissibility of the producing intervals in the Carrizo was 50,000 gpd per foot. On the basis of well logs and the results of pumping tests, the composite section of the Carrizo Sand and Wilcox Group in Guadalupe County has an estimated coefficient of transmissibility of 100,000 gpd per foot.

The coefficients of transmissibility and storage may be used to predict future drawdown of water levels caused by pumping. Figure 7 shows the theoretical relation between drawdown of water levels, distance from the centers of pumping, and different coefficients of transmissibility in homogeneous aquifers of infinite areal extent. The calculations of drawdown were based on a well or a group of wells pumping 500 gpm continuously for one year from the Wilcox Group having the given coefficients of transmissibility and storage. For example, if the coefficients of transmissibility and storage were 50,000 gpd per foot and 0.0008, respectively, the drawdown in the water level would be 6 feet at a distance of 5,000 feet from the pumped well. If the coefficients of transmissibility and storage were 10,000 gpd per foot and 0.0008, respectively, the drawdown would be 23 feet at the same distance.

The relation between drawdown, distance, and time in a well pumping from an artesian aquifer of infinite areal extent is shown in Figure 8. The fact that the rate of drawdown decreases with time is shown in this graph. For example, if the drawdown 5,000 feet from a well is 2.3 feet after 100 gpm has been pumped for 1 year, the drawdown would be about 4 feet after 100 gpm had been pumped for 50 years. The total drawdown at any one place within the area of influence of pumping from several wells would be the sum of the influence of the individual wells.

Wells drilled close together may create cones of depression that intersect, thereby causing additional lowering of the water table or piezometric surface. The overlapping of cones of depression between wells may cause a significant decrease in yield of the wells, or an increase in pumping costs, or both.

Construction of Wells

Most of the water wells in Guadalupe County are drilled wells, the exceptions being those wells about 30 feet deep which have been dug in the alluvium and Leona Formation along the major streams. In many of the dug wells the casings consist of concrete rings, brick, or native rock, and have a diameter of

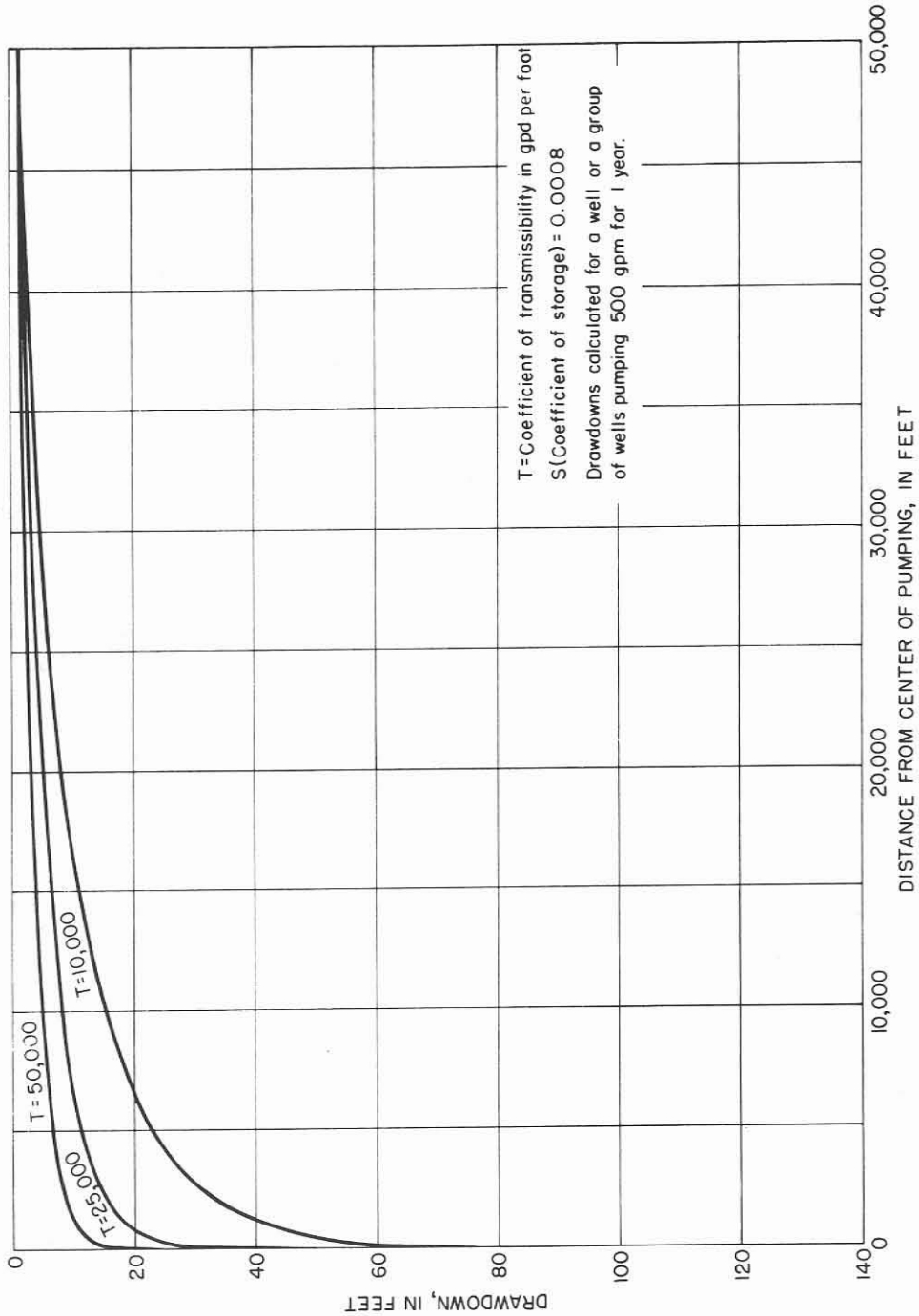


Figure 7

Relation of Distance to Drawdown and Transmissibility

U. S. Geological Survey in cooperation with the Texas Water Development Board and Others

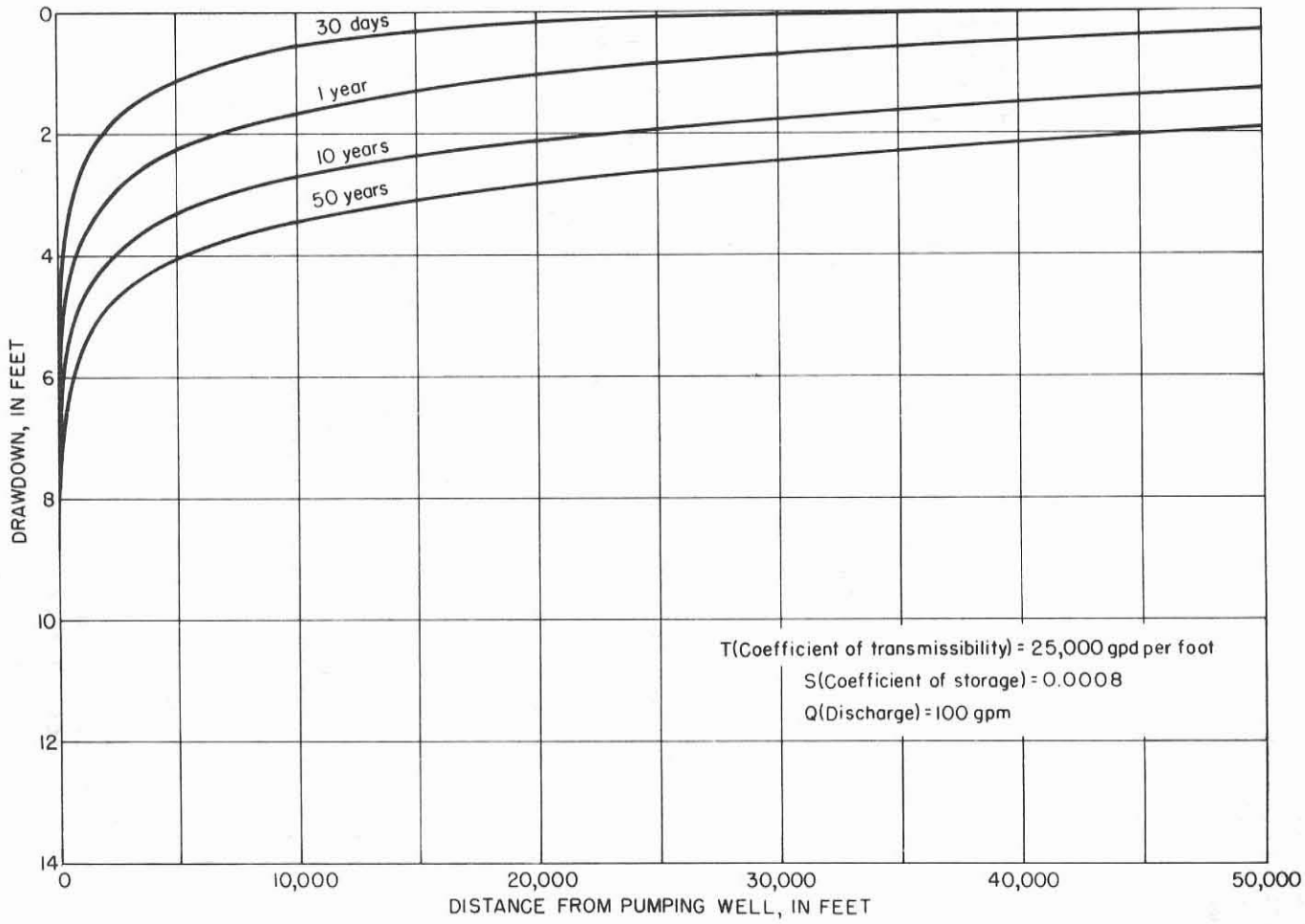


Figure 8

Relation of Distance to Drawdown and Time

U. S. Geological Survey in cooperation with the Texas Water Development Board and Others

30 to 70 inches; but no casing is present in some of the wells, especially in those that penetrate indurated sand or sandstone.

The casings for drilled wells are made of plastic, wrought iron, or galvanized iron, and range from 2½ to 16 inches in diameter. Casings from 4 to 6 inches in diameter commonly are used in wells drilled for domestic and livestock use, whereas casings of larger diameter are used in wells drilled for public supply or irrigation. Numerous wells have large-diameter casings in the upper part of the well, and smaller (4- or 6-inch) casings in the lower part. In most of the wells, slotted casings or well screens are placed opposite the water-bearing materials. Some of the larger-diameter wells are gravel walled and have sections of casings that are cemented.

USE OF SURFACE WATER

Surface water, principally from the Guadalupe River, is used in the county for public supply, irrigation, domestic and livestock purposes, and for generating electricity. The Texas Water Rights Commission has been granted the authority to issue permits for the diversion of water from streams and at specified locations. The Commission specifies the rate of withdrawal, the amounts of land to be irrigated, and in some cases, the time of year that these withdrawals may be made.

According to the records of the Texas Water Rights Commission, about 735 acres was irrigated with 805 acre-feet of surface water in 1963, and less than 30 acre-feet was used for domestic, livestock, and industrial purposes. In 1963, the city of Seguin pumped about 2.3 mgd (2,600 acre-feet per year) of water from the river. Electricity is generated in Guadalupe County at six hydroelectric plants on the Guadalupe River. The water diverted (about 1,000 mgd, or 1,120,000 acre-feet, in 1963) by these plants is not consumed, but is returned to the river for use downstream.

QUALITY OF GROUND WATER

The amount of dissolved mineral matter contained in ground water is related in part to the composition of the rocks through which the water moves, and in part to the length of time the water has been in contact with the rocks. Generally, the chemical content of ground water increases with depth. The temperature of ground water near the land surface is generally about the same as the mean air temperature of the region and likewise increases with depth. Analyses of water from 193 wells and springs in the report area are given in Table 6, and the temperatures of the water samples are given in Table 3.

The major factors determining the suitability of a water supply are the limitations imposed by the contemplated use of the water. Various criteria of water-quality requirements include: bacterial content; physical characteristics, such as temperature, odor, color, and turbidity; and chemical constituents. Although the bacterial content and the undesirable physical properties can usually be alleviated economically, the removal of chemical constituents may be difficult and expensive.

The U.S. Public Health Service has established and periodically revises standards of drinking water to be used on common carriers engaged in interstate commerce. These standards, designed to protect the traveling public, may be

used also to evaluate domestic and public water supplies. According to these standards, chemical constituents in a public water supply should not exceed the concentrations listed in the following table, except where other more suitable supplies are not available (U.S. Public Health Service, 1962, p. 7-8):

Substance	Concentration (ppm)
Chloride (Cl)	250
Fluoride (F)	.8*
Iron (Fe)	.3
Manganese (Mn)	.05
Nitrate (NO_3)	45
Sulfate (SO_4)	250
Total dissolved solids	500

*The appropriate upper limit based on the annual average of maximum daily air temperature of 79.8°F at San Antonio, 35 miles southwest of Seguin. The U.S. Public Health Service states also that fluoride in average concentrations greater than twice the optimum value, or 1.4 ppm, may constitute grounds for rejection of the supply.

Excessive concentrations of fluoride in water may cause teeth to become mottled. On the other hand, optimum fluoride concentrations may reduce the incidence of tooth decay in children with no ill effects, and caries rates may be 60 to 65 percent below the rates in communities using water supplies with little or no fluoride (Dean, Arnold, and Elvove, 1942, p. 1155-1179; Dean and others, 1941, p. 761-792). Of the 74 samples analyzed for fluoride, 9 contained amounts more than 0.8 ppm.

Concentrations of nitrate in excess of 45 ppm in water used for infant feeding have been related to the incidence of infant cyanosis (methemoglobinemia or "blue baby" disease), a reduction of the oxygen content in the blood constituting a form of asphyxia (Maxcy, 1950, p. 271). High concentrations of nitrate may be an indication of pollution from organic matter. Of the 102 samples analyzed for nitrate, 23 contained amounts of more than 45 ppm. More than half of the water samples containing a concentration of nitrate in excess of 45 ppm were from shallow wells drawing from the alluvial deposits and Leona Formation.

Excessive concentrations of iron and manganese in water cause reddish-brown or dark-gray precipitates that discolor clothes and stain plumbing fixtures. Of 56 iron determinations, 45 were in excess of 0.3 ppm. Generally water from the Wilcox Group and the Carrizo Sand contained excessive concentrations of iron.

Water having a chloride content exceeding 250 ppm may have a salty taste. Of 155 water samples tested for chloride, 46 contained amounts of more than 250

ppm. Excessive chloride concentrations are rather common in the water from wells in the Edwards and associated limestones and Wilcox Group in Guadalupe County.

Sulfate in water in excess of 250 ppm may produce a laxative effect. High concentrations of sulfate are common in much of the slightly or moderately saline water in the county.

Calcium and magnesium are the principal constituents in water that cause hardness. Excessive hardness causes increased consumption of soap and induces the formation of scale in hot-water heaters and water pipes. Below is a commonly accepted classification of water hardness.

Hardness range (ppm)	Classification
60 or less	Soft
61 - 120	Moderately hard
121 - 180	Hard
More than 180	Very hard

Of 179 determinations of hardness, 161 were in the hardness range of more than 180 ppm (or very hard classification).

Water used for industry may be placed in three catagories, namely, process water, cooling water, and boiler water. Process water is the term used for the water incorporated into or in contact with the manufactured products. The quality requirements for this use may include physical and biological as well as chemical factors. Water for cooling and boiler uses should be non-corrosive and relatively free of scale-forming constituents. The presence of silica in boiler water is undesirable because it forms a hard scale of encrustation, and the scale-forming tendency increases with the pressure in the boiler. In the following table is shown the maximum suggested concentrations of silica for water used in boilers (Moore, 1940, p. 263):

Concentration of silica (ppm)	Boiler pressure (pounds per square inch)
40	Less than 150
20	150 - 250
5	251 - 400
1	More than 400

The silica content in water samples from 101 wells in the county ranged from 2.7 to 20 ppm in 45 samples, 21 to 41 ppm in 41 samples, and 41 to 72 ppm in 15 samples.

In addition to its chemical quality, the suitability of water for irrigation depends on the quantity of water used, type of crops grown, type of soil,

adequacy of drainage, and climatic conditions. All are important factors in the continued productivity of irrigated crops.

A classification commonly used for judging the quality of a water for irrigation was proposed in 1954 by the U.S. Salinity Laboratory Staff (1954, p. 69-82). In brief, the classification (Figure 9) is based on the salinity hazard as measured by the electrical conductivity of the water and on the sodium hazard as measured by the SAR (sodium-adsorption ratio). However, Wilcox (1955, p. 15) stated that this system of classification of irrigation water "...is not directly applicable to supplemental waters used in areas of relatively high rainfall." The normal annual rainfall in the report area is about 30.85 inches, and most irrigation would be on a supplemental basis. Wilcox (1955, p. 16) also reported that water generally may be used safely for supplemental irrigation if its conductivity is less than 2,250 micromhos per centimeter at 25°C and its SAR is less than 14. The SAR value and the conductivity of samples from wells tapping the Wilcox Group, the Edwards and associated limestones, the alluvium and Leona Formation, and the Carrizo Sand are shown in Figure 9.

The RSC (residual sodium carbonate) also is used to assess the quality of water for irrigation. Excessive RSC will cause the water to be alkaline, and the organic content of the soil will tend to dissolve. The soil may then become grayish black, and the land areas thus affected are termed "black alkali." Wilcox (1955, p. 11) states that laboratory and field studies have led to the conclusion that water containing more than 2.5 epm (equivalents per million) RSC is not suitable for irrigation. Water containing from 1.25 to 2.5 epm RSC probably is safe. Good irrigation practices and proper use of soil amendments might, however, make possible the successful use of marginal water for irrigation. Furthermore, the degree of leaching will modify the permissible limit to some extent (Wilcox, Blair, and Bower, 1954, p. 265). The RSC exceeded 2.5 epm in only 4 of 172 samples collected in Guadalupe County, the maximum being 4.37 epm.

An excessive boron content will likewise make water unsuitable for irrigation. Wilcox (1955, p. 11) indicated that a maximum permissible boron concentration for irrigating sensitive crops would be 1.0 ppm; for semitolerant crops, 2.0 ppm; and for tolerant crops, 3.0 ppm. Boron does not seem to be a significant problem in Guadalupe County. Of 15 boron determinations, only two were greater than 1 ppm.

Edwards and Associated Limestones

The Edwards and associated limestones yields fresh to moderately saline water to a few wells in the western part of the report area. In general, north and northwest of a northeasterly-trending line (Figure 5) near Cibolo, the water from the Edwards reservoir is fresh (less than 1,000 ppm dissolved solids) but very hard, being of the calcium bicarbonate type; a few wells close to the line furnish water charged with hydrogen sulfide. South and southeast of the line, the water from most of the wells is slightly to moderately saline and high in sulfate and chloride; and in all of the wells the water was charged with hydrogen sulfide. In fact, the well (KX-68-31-401) that formerly supplied the water needs of Cibolo was abandoned in July 1964 owing to the relatively high salt content (2,300 ppm dissolved solids) and the high concentration of hydrogen sulfide.

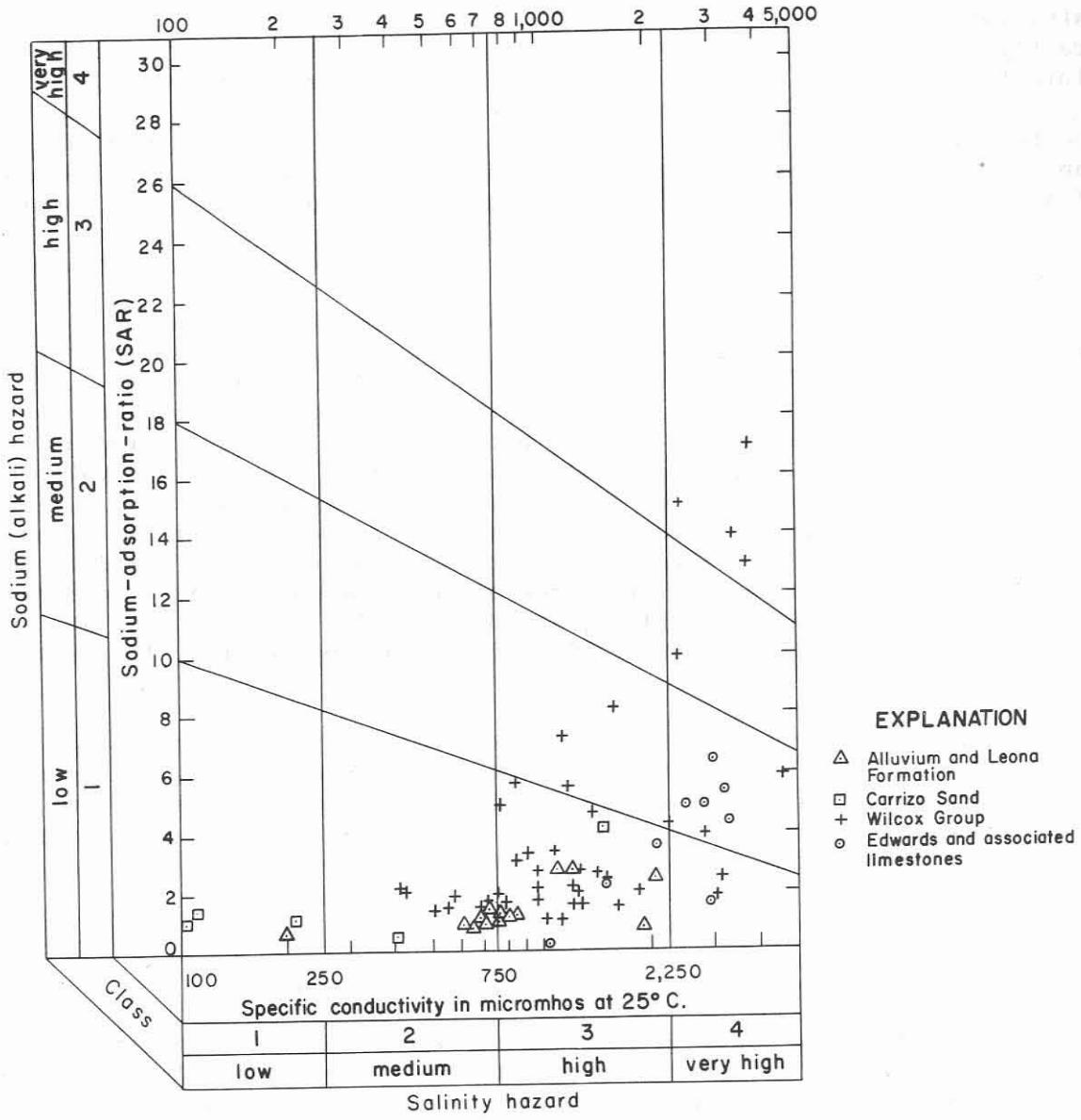


Figure 9

Classification of Irrigation Waters

(After United States Salinity Laboratory Staff, 1954, p. 80)

U. S. Geological Survey in cooperation with the Texas Water Development Board and Others

The suitability of water from the Edwards reservoir for irrigation may be questionable because of the high to very high salinity hazard (Figure 9), particularly in that part of the reservoir where the water is slightly to moderately saline. Only one well (KX-68-30-610) was used for irrigation in 1964. If the use of water from the Edwards reservoir for irrigation is contemplated, however, such items as the type of soil and local conditions of drainage should be considered. Where the soil is derived from rocks of the Taylor Marl and Navarro Group, adequate subdrainage may be a problem.

Austin Chalk

Water from wells tapping the Austin Chalk is used for the public supply at Marion and for domestic and livestock needs. The water from four of eight wells (Table 6) conforms in most respects to the drinking water standards of the Public Health Service. In three wells the dissolved-solids content exceeds 500 ppm but is less than 1,000 ppm. The water of all the wells is very hard. Locally, the Austin Chalk yields water charged with hydrogen sulfide. The small yields that can be expected from the Austin virtually preclude it as a source for irrigation.

Wilcox Group

Wells tapping the Wilcox Group yield fresh to moderately saline water. Of the 72 wells sampled, water from 49 was fresh; from 20 wells, slightly saline; and from 3 wells, moderately saline. Analysis of the data (Table 6) suggests that water below a depth of 200 feet generally is fresh, whereas water above that level ranges from fresh to moderately saline. The depth to which fresh water extends in the Wilcox could not be determined exactly. Well KX-67-33-501 (900 feet deep) yielded water having 612 ppm dissolved solids from a depth of 806 feet. Hardness and the high iron content probably are the major quality problems in the use of water from the Wilcox. Of the wells sampled, only one (KX-67-18-903, 165 feet deep) yielded moderately hard water, and the rest yielded hard to very hard water. The iron content in 38 samples ranged from 0.01 to 38 ppm; in all but five samples, the iron exceeded 0.3 ppm. Many water systems in the rural areas of the county are, therefore, designed to remove iron from the domestic water supplies.

The system of classification (Figure 9) shows that of the 42 samples for which SAR and specific-conductance data are available, 33 had SAR values less than 14 and specific conductance less than 2,250 micromhos. Thus, in the report area, where the moderately high annual rainfall results in a considerable amount of leaching, most of the ground water is suitable for supplemental irrigation. Of course, those waters that are medium in salinity hazard and low in sodium hazard probably can be used for continuous irrigation, particularly if a moderate amount of leaching occurs. On the other hand, water having a very high salinity hazard may not be suitable even for supplemental irrigation unless such factors as soil type, drainage, and the method of application are considered. The RSC in water from 68 wells ranged from 0 to 4.37 epm; in 59, the RSC was less than 1.25 epm.

Carrizo Sand

Only a few wells tap the Carrizo Sand in the report area at the present time (1964). Most of the outcrop of the Carrizo is a forested ranch-type land where the raising of livestock is the chief economy; consequently, the demand for water supplies has been almost entirely for domestic and livestock use.

The water sampled from six wells and two springs in the county was fresh, soft to very hard, generally low in sulfate and chloride, and high in iron. In addition, several wells yielded water having a low pH, or acid water. In fact, one well (KX-67-34-704, depth 123 feet) yielded water having a pH of 3.3 and 1.9 ppm total acidity as H^{+1} (Table 6).

Water from the Carrizo Sand is suitable for irrigation when judged according to the classification diagram (Figure 9). In five of the six samples collected, the water was low in sodium hazard and low to medium in salinity hazard; in one sample, the salinity hazard was very high. The soil developed on the Carrizo generally has good drainage which, coupled with the moderately high annual rainfall, will permit the use of water of high salinity at least for supplemental irrigation and probably for continuous irrigation.

Alluvium and Leona Formation

Water from wells in the alluvium and Leona Formation is used for public supply at McQueeney, for domestic and livestock purposes, for irrigation, and for industrial uses. The water probably is least desirable for public supply or domestic use owing to its hardness and high concentration of nitrate. In 33 samples the hardness ranged from 136 to 1,040 ppm, exceeding 180 ppm in 32 of the samples. In 19 samples the nitrate ranged from 1.8 to 752 ppm; 13 samples contained more than 45 ppm. Most of the wells in the alluvium and Leona are dug to depths of 16 to 60 feet; they are, therefore, highly vulnerable to pollution by seepage from organic matter.

The alluvium and Leona supplies water to a few wells for irrigation in the report area. According to the classification diagram (Figure 9), the water is low in sodium hazard and medium to high in salinity hazard, the only exception being one well in which the water was low in salinity hazard. Thus, the water is suitable at least for supplemental irrigation and probably for continuous irrigation, particularly with those waters containing low to medium salinity hazard.

DISPOSAL OF OIL-FIELD BRINES

In some of the oil fields in the county, salt water has been produced with the oil from many wells since they were first drilled. In 1959 the ratio of salt water to oil produced in the Darst Creek field was 96 to 4 (Lozo and others, 1959, p. 140). The disposal of such large quantities of salt water has always been a serious problem. Formerly the salt water was stored in a large surface reservoir, but as the quantities grew larger, this method became impracticable. At present (1964) the brine is either injected through wells into formations below the oil zones, or is stored in open surface pits of various sizes. In Table 2 is shown the quantity of oil-field brine reportedly produced in 1961 in each oil field in the county and the means of brine disposal.

Table 2.--Oil-field brine production and disposal, 1961. (From Texas Water Commission and Texas Water Pollution Control Board, 1963)

Field name	Brine production (barrels)	Brine disposal			
		Injection well		Open surface pit	
		(barrels)	(percent)	(barrels)	(percent)
Darst Creek (Buda Limestone)	17,468,790	17,102,447	97.9	366,343	2.1
Darst Creek (Edwards Limestone)	67,995,309	67,990,509	100	4,800	.0
Dunlap	5,341	--	--	5,341	100
Jayeddie	3,000	--	--	3,000	100
La Vernia	11,443	--	--	11,443	100
La Vernia (190 foot sand)	50	--	--	50	100
Luling - Branyon	27,845,360	27,703,200	99.5	142,160	.5
Spiller	51,293	--	--	51,293	100
Staples	19,000	--	--	19,000	100
Zoboroski	24,335	--	--	14,335	100
County totals	113,413,921	112,796,156	99.5	617,765	.5

The disposal of oil-field brines into surface pits is a possible source of contamination of the ground water in Guadalupe County. Shallow aquifers particularly are endangered, especially if the surface pits are on a sandy outcrop such as the Wilcox Group or the Carrizo Sand. The brine in the pit seeps into the ground and, over a period of time, may contaminate the water in the shallow aquifer. The time required for the brine to affect the quality of water in nearby wells may vary considerably, depending upon the permeability of the soil and the rate of movement of the brine. The process may take several years or only a few months. Generally, contamination of the water is indicated by an abnormal increase in the salinity of the water, principally in the chloride content without an accompanying increase in the sulfate content. Once the source of the contamination is eliminated, another problem is presented--that of water purification which, because of the slow process of leaching and dilution, may require a considerably longer time than the period of original pollution. In many oil fields throughout the State, surface pits for storing oil-field brines are lined with impervious materials to prevent any seepage of brine into the fresh water-bearing sands.

The aquifers underlying the report area may be contaminated also by the invasion of salt water through improperly cased oil wells or oil tests. In recent years, the Texas Water Commission has made recommendations to the oil operators concerning the depths to which water-bearing formations are to be protected; by cemented casing, however, the Oil and Gas Division of the Railroad Commission of Texas is responsible for the protection of the water-bearing formations. The amount of cemented casing specified in the field rules of the Railroad Commission through April 1965 is adequate to protect the fresh to slightly saline water in all fields covered by the rules except the La Vernia fields. In the western part of this field in Guadalupe County about 350 feet of fresh to slightly saline water may be unprotected.

No instances of contamination from inadequate casing or from brine pits were reported or observed in the county during the investigation; however, the pits are still in use in many of the oil fields in the county. At some places the sites of formerly used pits are conspicuous as barren areas from which most of the vegetation has been destroyed by the salt water. Such places, however, are gradually becoming less and less evident in view of modern practices and concern with regard to salt-water disposal.

AVAILABILITY OF GROUND WATER FOR FUTURE DEVELOPMENT

The availability of water for future development from the aquifers in Guadalupe County is directly related to the amount of water in storage, the transmission capacity of the aquifers, and the rate of recharge to the aquifers.

The geologic formations containing significant quantities of fresh to slightly saline water in the county include the Wilcox Group, Carrizo Sand, alluvium and Leona Formation, and the Edwards and associated limestones.

The Carrizo Sand and Wilcox Group are considered as a unit in this discussion, because they are hydrologically connected. Together they form the principal source for the development of ground water in the county. The geologic section (Plate 2) shows that the Carrizo Sand and Wilcox Group contain fresh to slightly saline water throughout their entire thickness only in a small area near the updip limit of the Wilcox. Elsewhere the interface between the

slightly saline and moderately saline water occurs within the Wilcox, in places as much as 300 feet above the base. The altitude of the base of the fresh to slightly saline water in the aquifer ranges from more than 400 feet above sea level in the updip part of the aquifer to at least 1,456 feet below sea level in the extreme southern part of the county (Figure 10). The approximate thickness of the sands in the Carrizo Sand and Wilcox Group that contain fresh to slightly saline water is shown in Figure 11; and the areas most favorable for ground-water development are the areas where the sands are thickest. The map shows that the thickness increases toward the south and southeast, a maximum thickness of slightly more than 1,200 feet being attained in a well in Gonzales County near the Guadalupe-Gonzales county line. Where the sands are thickest, the largest yields, perhaps more than 2,000 gpm, might be expected from properly constructed wells screened throughout the entire thickness of sand containing fresh to slightly saline water.

A principal factor affecting the availability of water from the Wilcox Group and Carrizo Sand is the ability of the aquifer to transmit water to wells. Estimates of availability are predicated on several assumptions, some of which are not precisely applicable to Guadalupe County. Moreover, the estimates should be considered as correct only in their order of magnitude, because the effect of future large-scale development of ground water from the aquifer in adjoining areas was not considered.

For the purposes of this report, the estimate of the amount of ground water perennially available was based on pumping lifts of not more than 400 feet along an assumed line of discharge located approximately along the line of surface contact between the Carrizo Sand and the Reklaw Formation. The line of discharge is assumed to be the same length as and parallel to the line of recharge, which is assumed to be the center line of the outcrop of the Wilcox Group. Furthermore, the recharge is assumed to be adequate to keep the altitude of the water levels everywhere the same along the line of recharge.

On the basis of the present hydraulic gradient of 9.6 feet per mile and a composite transmissibility of 100,000 gpd per foot, the aquifer would transmit annually on the order of 21,000 acre-feet, or 19 mgd. Actually, the 19 mgd is a somewhat conservative estimate because it does not include an unknown quantity of potential recharge that is presently either rejected to streams as spring flow and seepage on the outcrop or is lost by evapotranspiration. The 19 mgd is equivalent to about 1.0 inch of water covering and effectively recharging the outcrop of the aquifer. The 1.0 inch of recharge is roughly equivalent to only 3 percent of the normal annual precipitation (30.85 inches).

If the water level could be lowered to 400 feet along the assumed line of discharge and if the specific yield of the dewatered sediments was 15 percent, approximately 7 million acre-feet of water would be released from storage in that part of the aquifer between the outcrop and the line of discharge. Actually, that part of the aquifer downdip from the line of discharge also would release from storage an approximately equal volume.

After the water levels had been lowered to 400 feet along the line of discharge and a hydraulic gradient of about 37 feet per mile had been established, the aquifer would transmit about 45,000 acre-feet per year (or about 40 mgd) assuming a transmissibility of 50,000 gpd per foot. The lower coefficient of transmissibility is used in making this estimate, because, by lowering the water level to 400 feet along the line of discharge, that part of the aquifer consisting of the Carrizo Sand would be nearly completely dewatered; and the

water would, therefore, be transmitted downdip only through the Wilcox which has an estimated average transmissibility of 50,000 gpd per foot.

The Leona Formation, the principal aquifer in the north-central part of Guadalupe County, supplies water primarily for domestic and livestock use; but at some places, mostly near the major streams, this aquifer yields enough water to irrigate some small farms. In general, the yields of wells in the Leona range widely within short distances, the largest yields being obtained from wells near the major streams and in the areas where the saturated thickness is greatest. Although yields of some of the larger wells range from about 300 to 700 gpm, one well is reported to yield about 2,000 gpm. It is doubtful, however, that the well could sustain this yield for more than a short period of time; for the wells are generally not capable of maintaining a yield of even 500 gpm for more than a few hours.

The nature of the bedrock probably affects the yields of wells in the Leona. At places where the Leona overlies the sandy Wilcox Group, water from the Leona infiltrates the underlying Wilcox, and the Leona might not be expected to yield even moderate amounts of water. In fact, few wells tap the Leona where it is underlain by the Wilcox (Figure 2). However, where the bedrock consists of impermeable clay, as occurs in many places in the northern part of the county, the water in the Leona is retained in the formation and larger yields can be expected.

During the summer of 1964, an estimated 156,000 acre-feet of fresh to slightly saline water was stored in the Leona Formation, the average thickness of saturation being 6 feet. Of course, the quantity of water in storage will vary widely with time, depending on the availability of recharge. During or following periods of above normal rainfall, the amount of water in storage could be considerably more than 156,000 acre-feet; on the other hand, during extended droughts the quantity could be substantially less. For example, in 1956, the last year of an extended drought, many wells in the Leona were reported to have gone dry. In the following year when rainfall was above normal, the aquifer was again replenished.

Although the Edwards and associated limestones yields fresh to slightly saline water to a few wells in a small area in the western part of the county, the quantity available for development probably is small relative to that from the other formations.

In summary, the aquifers underlying Guadalupe County are virtually untapped. The Carrizo Sand and Wilcox Group, as an aquifer, probably transmits annually on the order of 19 mgd at the present (1963) hydraulic gradient, or nearly 10 times the quantity of ground water discharged by wells from all aquifers and for all purposes in 1963. At present, the water moves southeastward into the adjoining counties. Even larger quantities of ground water would be available if wells were installed and pumped so as to maintain pumping levels at 400 feet along an assumed line of discharge. During periods of normal rainfall, large quantities of water (as much as 156,000 acre-feet) are available from the alluvium and Leona Formation.

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Table 3.--Records of wells and springs in Guadalupe County

All wells are drilled unless otherwise noted in remarks column.
Water level — Reported water levels given in feet; measured water levels given in feet and tenths; plus (+), water level at or above land-surface datum.
Method of lift and type of power: A, airlift; B, bucket and rope; 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; Ind, industrial; Irr, irrigation; N, none; P, public supply; S, livestock.
Water-bearing unit : Qle, Alluvium and Leona Formation; Ka, Austin Chalk; Kea, Edwards and associated limestones; Tr, Reklaw Formation; Tc, Carrizo Sand; Twi, Wilcox Group; Kh, Hosston Formation.

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
KX-67-09-501	Hermann Sons	--	--	9	36	--	--	5.7	May 21, 1957	Cf,E	D	Dug well. Reported water in gravel.
* 502	Fritz Moeller	--	1933	15	48	--	--	4.1	do	Cf,E	D	Dug well. Reported water used for laundering and sprinkling; not used for drinking. Temp. 72°F.
503	Elsie Hosch	--	1954	18	36	--	--	--	--	Cf,E	S	Dug well. Reported weakened in 1956.
* 601	Jessie Dietz	--	--	--	36	--	--	--	--	Cf,E	D,S	Dug well. Old well. Temp. 72°F.
602	Macolm Fleming	--	--	15	36	--	--	8.2	May 21, 1957	C,W	D,S	Dug well. Old well. Reported dry in 1956, but recovered in 1957.
603	Seb Lopez	--	--	21	36	--	--	18.4	do	B,H	D,S	Dug well. Old well. Reported dry in 1950-56 drought.
801	Rudy Voss	Parsons & Norman	--	3,075	--	--	567	--	--	--	--	Oil test. 1/
802	W. C. Dreibrodt	Magnolia Petroleum Corp.	1956	700	--	--	--	--	--	--	--	Oil test.
803	Rudy Voss	--	--	50?	42	--	--	.0	May 21, 1957	N	N	Dug well. Old well. Abandoned.
804	Fritz Galle	M. Merritt	1894	983	6	Kea?	--	--	--	N	N	Abandoned. Formerly flowed sulphur water. Well 4 in Guadalupe County report, 1937.
901	Mrs. Mabel Petty well 1	G. D. Galle	1951	1,728	--	--	613	--	--	--	--	Oil test. 1/
902	Arvin Huber	--	--	16	30	--	--	7.2	May 30, 1957	N	D,S	Dug well. Not in use when visited.
903	Albert P. Henk	Magnolia Petroleum Corp.	1956	780	--	--	--	--	--	--	--	Oil test.
904	Adolph Henk	--	--	35	36	--	--	10.9	May 21, 1957	B,H	D,S	Dug well. Old well. Reported water in gravel.
10-401	Roland Tieken	--	1948	21	36	Qle	--	18	May 1957	J,E	D,S	Dug well. Reported strong supply.
402	C. C. Roger, Jr.	--	--	15	36	Qle	--	11.0	May 28, 1957	C,H	D,S	Dug well. Old well. Reported water in sand.
403	C. C. Howard, Jr.	--	--	15	--	Qle	--	5.9	May 29, 1957	B,H	D	Dug well. Old well.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
*KX-67-10-404	C. C. Howard, Jr.	--	--	25	36	Qle	--	--	--	C,E	D,S	Dug well. Old well. Reported water in sand. Temp. 72°F.
405	R. P. Lowman	Lincoln Petroleum Co.	1940?	3,200	10, 6	--	--	--	--	--	--	Oil test.
701	Oscar Vineyard well 1	Luling Oil & Development Co.	1949	1,143	--	--	533	--	--	--	--	Oil test. 2/
703	Karl Lehmann	H. H. Weinert	1951	3,372	--	--	--	--	--	--	--	Oil test. 1/
704	-- Waldrip	Sherman Nelson	1952	1,205	--	--	535	--	--	--	--	Do.
705	Victor Vineyard	do	1952	1,168	--	--	544	--	--	--	--	Do.
805	George Elam	L. B. Haberle & Son	--	1,480	--	--	487	--	--	--	--	Do.
902	Carl Waller	--	--	36	36	--	--	33.2	Aug. 2, 1957	B,H	N	Dug well. Old well. Not used when visited; reported not used in 10 years.
909	-- Fleming	--	--	30	36	--	--	--	--	C,W	D,S	Dug well. Old well.
17-101	R. L. Moffett well 1	Wise & Killam	1956	923	--	--	579	--	--	--	--	Oil test. 1/
102	Paul Dietert	--	--	30	48	--	--	--	--	N	D,S	Dug well. Old well. Not used when visited.
201	Ernest Hohenberg well 1	Pryor Dillard	1950	1,504	--	--	488	--	--	--	--	Oil test. 1/
202	A. J. Harborth	J. E. Clark, et al.	1934	1,024	--	--	589	--	--	--	--	Do.
203	William Ziegenhals	--	1956	20	--	--	--	--	--	J,E	S	Reported dug with dragline. Water from gravel in creek bed.
* 301	Edwin Jechow	--	1945	11	36	--	--	--	--	C,G	D,S	Dug well. Reported water in gravel. Temp. 66°F.
302	Walter Exleban	J. N. Modesett	1956	1,207	--	--	463	--	--	--	--	Oil test. 2/
* 401	Albert L. Hensley	--	--	35	36	Qle	--	--	--	C,E	D	Dug well. Not used for drinking. Temp. 70°F.
402	V. Bormann	--	--	28	36	Qle	--	--	--	C,W	D,S	Dug well. Reported weakened in 1956.
403	Emil Hermann	--	--	30	36	Qle	--	--	--	Cf,E	D,S	Dug well.
404	Herbert Eberhard	--	1932	23	36	Qle	--	19.5	May 11, 1957	C,W	D,S	Dug well. Reported never failed.
405	Gus Dedke	--	--	42	36	Qle	--	39.5	July 30, 1957	C,W	D,S	Dug well.
406	Hilmar Boenig	--	--	48	--	Qle	--	--	--	C,W	S	Dug well. Old well. Reported water unsuitable for drinking.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-17-407	August Hoffman	--	1937	36	36	Qle	--	34.5	July 30, 1957	C,W	D,S	Dug well. Reported deepened after going dry in 1956.
408	Walter Werner	--	--	32	36	Qle	--	29.8 22.4	July 30, 1957 May 5, 1964	C,W	D,S	Dug well. Old well.
* 409	R. Forrester	--	1925	35	36	Qle	--	--	--	J,E	D,S	Dug well. Reported dry during 1950-56 drought. Temp. 66°F.
410	Erwin Schuenemann	--	--	30	36	Qle	--	24.0 19.4	July 30, 1957 May 5, 1964	B,H	D,S	Dug well. Old well. Cased to 5 ft. Reported strong supply.
411	Navarro Public School	--	--	33	36	Qle	--	30.4	July 25, 1957	J,E	D	Dug well.
412	John J. Nitsch	--	1927?	28	36	Qle	--	25.3	do	C,W	D,S	Dug well. Cased to 10 ft. Reported weak supply in 1956.
* 413	R. E. Neumann	--	1925	18	96	Qle	--	9.7	May 5, 1964	N	N	Dug well. Reported strong supply. Supplies water for irrigation of garden. Not used when visited.
501	Mrs. Meta Mathis	-- Nelson	1950	1,353	--	--	654	--	--	--	--	Oil test. 2/
502	W. A. Heinemeyer	--	1905	36	32	Qle	595	24.7 19.3	May 30, 1957 May 5, 1964	C,W	D,S	Dug well. Not in use when visited in 1964.
503	do	--	1954	22	36	Qle	--	--	--	B,H	D,S	Dug well. Cased to bottom. Not in use when visited in 1964.
504	Harry Bormann	-- Patterson	--	32	36	Qle	--	--	--	C,W	D,S	Dug well. Reported strong supply.
601	Walter Meyer	--	--	25?	--	--	--	--	--	--	D,S	Formerly a spring. Dug out and completed as a well. Reported weak supply.
602	Jack Burner	--	1953	32	10	--	--	--	--	C,W	S	Originally drilled as oil test. Caved-in and later opened up as water well. Reported weak supply.
603	J. C. Weinert	H. H. Weiner, et al.	1927	1,910	--	--	692	--	--	--	--	Oil test. 2/
701	Nolan Harborth	--	1894	25	36	Qle	--	--	--	T,E	D,S, Irr	Dug well. Cased to 5 ft. Reported discharge 700 gpm. Reported irrigated 25 acres in 1955.
* 702	Benno Heinemeyer	--	1905	27	48	Qle	--	19.3 22.4	June 1, 1936 Aug. 1, 1957	T,E, 5	P,Ind	Dug well. Cased to 15 ft. Supplies water for Geronimo cotton gin. Well 20 in Guadalupe County report, 1937. Temp. 71°F.
703	Floyd Schlichting	--	--	35	36	Qle	--	30.9	July 30, 1957	C,W,E	D,S	Dug well. Old well. Cased to 5 ft.
704	Herman Schubert	J. R. Johnson	--	1,110	--	--	610	--	--	--	--	Oil test. 2/

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
	KX-67-17-705	Herbert Schriewer	--	1886	38	48	Qle	--	23.5	May 4, 1964	C,W	D,S	Dug well. Cased to 12 ft. Reported did not go dry in 1956.
	706	Pleasant Prairie Farm	B. H. Puls	1904	1,370	--	--	--	--	--	--	--	Oil test.
	707	do	do	--	33	36	Qle	--	--	--	C,W	D,S	Cased to 8 ft. Dug well. Old well.
*	708	Navarro Public School	--	1953	28	36	Qle	--	25.5	May 29, 1964	T,E, 3	P	Dug well. Supplies water for school. Temp. 72°F.
	709	Wilfred Bartoskewitz	--	--	30	36	Qle	--	26.9	July 29, 1957	C,W	D,S	Dug well. Old well. Temp. 69°F.
	710	Obin Mayfield	--	1917	35	36	Qle	--	30.4	do	T,E	D,S	Dug well. Cased to 25 ft. Reported strong supply.
	711	M. W. Barth	--	1914?	35	40	Qle	--	--	--	T,E	D,S	Dug well. Cased to 8 ft. Reported discharge 5 gpm.
*	712	T. D. Jackson	--	--	42	36	Qle	--	28.0	Aug. 7, 1957	C,W	S	Dug well. Old well. Not used for human consumption.
	713	do	--	1942?	30	36	Qle	--	27.4	July 29, 1957	B,H	D,S	Dug well.
	714	Walter Lange	--	--	23	36	Qle	--	21.5	Aug. 1, 1957	T,E	D,S	Dug well. Old well. Cased to bottom.
*	715	Mrs. Alice Ractzesch	--	--	34	40	Qle	--	29.6	May 4, 1964	T,E	D	Dug well. Old well.
	801	Eric Skolaut	Henry Norwood	1956	32	6	Qle	--	--	--	T,E	D,S	Cased to 30 ft. Perforated 10 ft at bottom. Reported discharge 18 gpm.
	802	Martin Glenewinkle	--	1910	300	--	--	--	--	--	C,W	N	Dug well to 100 ft; drilled from 100 to 200 ft. Caved in. Abandoned.
	803	Raymond Downs	--	--	16	36	Qle	--	9.5	May 29, 1957	N	N	Not in use when visited.
*	804	Henry Engelke	--	--	33	48	Qle	--	--	--	T,E	D,S	Dug well. Old well. Reported dry in 1956, but recovered in 1957.
*	805	Martin & Norman Glenewinkle	--	--	40	36	Qle	--	--	--	Cf,E	D,S	Dug well. Old well. Temp. 67°F.
	806	Raymond Downs	--	1933	20	36	Qle	--	17.5	May 29, 1957	T,E	D,S	Dug well. Reported almost dry in 1956.
*	807	William Timmerman Estate	--	--	Spring	--	Qle	--	+	May 5, 1964	Flows	D,S	Measured flow 220 gpm on June 23, 1964. Discharges into Geronimo Creek. Temp. 69°F.
	808	do	--	--	Spring	--	Qle	--	+	--	Flows	D,S	Estimated flow 35 to 40 gpm. Known as Ewing Spring.
	901	H. Calvert well 1	Cecil Hagen	1947	4,391	--	--	555	--	--	--	--	Oil test. 1/
	902	Alves Estate well 1	do	1946	1,916	--	--	560	--	--	--	--	Do.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-18-101	Freeman & Seeligman	Jennings Oil Co.	1950	1,350	--	--	446	--	--	--	--	Oil test. 2/
* 102	William Stautzenberger	--	--	50	36	--	--	41.4 33.7	Aug. 7, 1957 Nov. 20, 1957	T,E	S	Old well. Temp. 69°F. Cased to 36 ft.
103	do	--	--	50	36	--	--	39.8	Aug. 2, 1957	C,W	S	Reported water salty.
201	Monroe Schubert	--	--	30	36	--	--	--	--	T,E	D	Dug well. Old well. Reported weak supply of water from gravel.
202	Mrs. Georgia Roberts	H. A. Pakenkoff	1948	1,911	--	--	470	--	--	--	--	Oil test. 2/
302	W. Z. Miller	--	--	60	60	Qle	--	--	--	C,W	D	Dug well. Old well. Reported weak supply. Not used when visited.
303	Mrs. -- Roberts	--	--	--	36	--	--	--	--	Cf,E	D,S	Dug well.
304	A. Miller	-- Hoxsey	--	1,254	--	--	465	--	--	--	--	Oil test. 2/
305	Lem Allen	E. B. Kutscher	1961	172	12, 10	Twi	410	26.6	Feb. 20, 1964	T,E	Irr	Casing: 12-in. to 110 ft; 10-in. perforated from 110 ft to bottom. Reported discharge 700 to 800 gpm. Pump set at 150 ft. 3/
401	H. Bormann well 1	Mills & Blackman, et al.	1953	1,938	--	--	656	--	--	--	--	Oil test. 1/
402	Willie Muse	Alfred Brown	1958	109	4	Twi	--	--	--	C,E	N	Cased to 104 ft. Perforated at bottom. Not used in 1964. Pump set at 100 ft. Reported weak supply.
* 403	Arthur Stautzenberger	D. Perryman	1955	174	6	Twi	--	105.1	Aug. 2, 1957	C,E, 1/2	S	Cased to 130 ft. Reported weak supply.
404	J. H. Henry	do	1912	154	6	Twi	--	79.6	Dec. 10, 1963	C,W	N	Reported water of poor quality. Seep at 80 ft. Not in use.
405	E. Hartwick, et al.	R. P. Holland	1959	1,920	--	--	563	--	--	--	--	Oil test. 1/
501	Otto Rabe	--	--	50	30	Twi	--	40	Dec. 1963	B,H, J,E	D,S	Dug well. Old well. Reported weak supply.
502	Sam Merriweather	Will Sutton	1939	172	4	Twi	620?	124.7	Dec. 10, 1963	C,W	D,S	
* 503	J. M. Lunsford	--	--	140	5	Twi	--	4.4	Dec. 16, 1963	J,E, 1/4	D,S	Reported water has gas taste.
504	do	--	--	--	--	Twi	--	+	do	Flows	S	Flows intermittently. Drilled as oil test, but has caved in to unknown depth. Water is accompanied by gas, and has mineral taste.
505	Monroe Schubert	D. Perryman	--	316	4	Twi	--	.0	Dec. 17, 1963	T,G	S,Irr	Reported discharge 400 gpm. Reported flows intermittently.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
* 506	Bob Hemmick	H. W. Schubert	1963	180	4	Twi	--	--	--	C,W	S	Cased to bottom. Reported sand and clay from 120 to 160 ft.
507	Elizabeth Wilke well 2	Ohio Oil Co.	1956	2,166	--	--	569	--	--	--	--	Oil test. 1/
* 601	J. D. Cowley	--	--	80	6	Twi	--	60.2 59.2	Sept. 21, 1936 Dec. 10, 1963	C,W	S	
602	-- Baker well 2 (SWD)	Mobile Oil Co.	1961	2,530	--	--	400?	--	--	--	--	Oil test. 2/
* 603	Lem Allen	John Perryman	--	180	6	Twi	--	--	--	T,E	S,Irr	Reported discharge 400 gpm. 3-in. discharge pipe. Temp. 73°F.
605	B. A. Harris	--	--	50?	5	Twi	--	25.4	Dec. 17, 1963	N	N	Dug well. Reported water has mineral taste.
606	Otto Engelke well 2	Parker Petroleum Co.	--	2,192	--	--	440?	--	--	--	--	Oil test. 2/
607	Alvin Engelke	D. Perryman	1963	150	5	Twi	--	28	Dec. 1963	C,W	D,S	Cased to bottom. Pump set at 80 ft.
608	do	Parker Drilling Co.	1949	2,100?	--	--	--	--	--	--	--	Oil test. Abandoned and filled.
609	M. Merriweather	--	1951	2,181	--	--	464	--	--	--	--	Oil test. 1/
701	Herman Schmidt well 2	W. F. Pegg	1955	2,046	--	--	543	--	--	--	--	Oil test. 4/
702	Herman Schmidt well 1	Baker-Grace Oil Co.	--	2,098	--	--	558	--	--	--	--	Do.
703	F. Schmidt well 1	Pat Baker	1959	2,157	--	--	592	--	--	--	--	Do.
704	H. W. Wurzbach	-- Suttle, et al.	1930	2,139	--	--	530	--	--	--	--	Oil test. 2/
* 801	W. F. Pegg	John Perryman	1954	156	4	Twi	--	53	Apr. 1962	T,E, 3/4	D,S, Irr	Supplies water for irrigation of small garden. Cased to bottom. Temp. 74°F.
802	F. Schmidt well 1	Henry Henderson	--	2,237	--	--	608	--	--	--	--	Oil test. 2/
803	-- Noack well 1	J. L. Ashen, et al.	1955	2,424	--	--	600	--	--	--	--	Do.
* 804	W. W. Hickman	D. Perryman	1940	240	4	Twi	--	140	Jan. 1964	C,W,E	D,S	Cased to 205 ft. Reported strong supply. Pump set at 200 ft.
* 805	Leslie Baker	Billy Perryman	--	310	4	Twi	--	--	--	T,E	D,S	Cased to 200 ft. Casing perforated 2 ft at bottom. Pump set at 160 ft.
901	J. T. Cash well 1	L. O. Tarrant, et al.	--	2,458	--	--	582	--	--	--	--	Oil test. 2/
902	August Engelke	John Perryman	1945?	65	6	Twi	--	40	Dec. 1963	C,W	D,S	Cased to bottom. Casing perforated at bottom. Reported strong supply.
* 903	August Glenewinkle	Will Smith	--	165	5	Twi	592	82.9	Sept. 21, 1936	T,E	D,S	Old well. Reported water in blue sand. Well 83 in Guadalupe County report, 1937.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-18-904	-- Miller	--	--	--	4	--	--	--	--	C,W	D,S	Old well. Reported strong supply.
905	Clara Lawson well 1	Hoxsey Oil Co.	--	2,397	--	--	450	--	--	--	--	Oil test. See geologic section A-A'. 1/
19-114	A. J. Baker well 1	Magnolia Petroleum Co.	--	2,507	--	--	400	--	--	--	--	Do.
* 404	J. D. Wright	--	1918	180	6	Twi	--	--	--	T,E	S	Reported weak supply.
405	Mrs. Pierce Wright	John Perryman	1953	100	5	Twi	--	--	--	T,E	D,S	Reported water has sulphur odor at times.
406	Vernon Engelke	--	--	50?	--	Twi	--	30	Dec. 1963	C,W	D,S	Pump set at 40 ft.
407	*do*	*Davenport Irrigation* Equipment Co.	1963	480	--	Twi	--	25	Dec. 1963	N	N	Drilled for irrigation, but insufficient quantity of water. Reported discharge 15 gpm. Not in use when visited. 3/
701	Tom H. Baker	Plymouth Oil	1950?	140	4	Twi	390	31.4	Dec. 18, 1963	C,E, 3/4	D,S	Cased to bottom. Drilled as core test to 1,050 ft; plugged back to 140 ft, and completed as water well.
* 702	-- Gambre	--	1892	103	6	Twi	--	50.5	Sept. 16, 1936	N	N	Hole filled and abandoned in 1963. Well 61 in Guadalupe County report, 1937.
* 703	Doyle R. Tilley	--	--	43	6	Twi	--	27	Jan. 1964	C,E	D,S	Cased to bottom. Pump set at 40 ft.
* 704	*Rufus Penry*	*John Perryman*	1951	450	4	Twi	--	70	Jan. 1964	T,E, 2-1/2	D,S	Reported water bad at 200 ft; deepened to present depth. Pump set at 147 ft.
705	J. R. Tiller Estate well 1	Lewis Hart	1955	2,358	--	--	400	--	--	--	--	Oil test. 2/
801	Mack Smith	D. Perryman	1947	180	4	Twi	--	90	Jan. 1964	T,E	S	Cased to 160 ft. Reported mineral water.
802	T. M. Jeffers well 1	G. C. Shoenmaker	--	2,950	--	--	447	--	--	--	--	Oil test. 4/
903	M. L. Webb well 1	Bay City Drilling Co.	1951	2,935	--	--	375	--	--	--	--	Do.
25-101	E. A. Tschoepe	--	1912	35	36	Qle	--	--	--	J,E	D,S	Reported weakened in 1956, but recovered after rains.
102	Hilmar Kuhn	--	--	25	36	Qle	--	17.6	July 30, 1957	C,W	D,S	Cased to 12 ft. Reported has never failed. Old well.
103	do	--	--	22	36	Qle	--	19.5	do	B,H	D,S	Dug well. Cased to bottom. Reported water in hard gravel.
104	Mrs. Clara Breustedt	--	--	32	36	Qle	--	29	July 1957	C,W	D,S	Dug well. Old well. Reported supplies water for two families and a garden. Not used in July 1964.
105	Mrs. -- Blumberg	--	--	35	36	Qle	--	31.5	July 24, 1957	C,E	D,S	Dug well. Old well. Reported water in gravel. Cased to bottom.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-25-106	Marcalo Urias	--	--	90	--	-	--	30.6	July 24, 1957	C,E, 1/4	D,S	Old well. Reported weak supply in 1956.
107	K. W. Doerr	--	1915	34	36	Qle	--	30	July 1957	T,E	D,S	Dug well. Reported strong supply. Water-level measured while well was pumping.
108	O. D. Rudolph	--	1940?	36	36	Qle	--	33.5	Aug. 15, 1957	C,W	D,S	Dug well. Reported never dry. Not in use when visited Aug. 4, 1964.
109	Milton Bormann	--	--	37	36	Qle	--	--	--	J,E, 1/4	D,S	Dug well. Old well. Cased to 8 ft. Temp. 69°F.
110	H. F. Baese	--	--	32	48	Qle	--	--	--	Cf,E, 1/4	D,S, Irr	Dug well. Old well. Supplies water for irrigation of pecan trees.
202	F. H. Westphal	Hudgens Bros.	1957	1,442	--	--	555	--	--	--	--	Oil test. 2/
203	do	--	1936	35	36	Qle	--	33.5	Aug. 1, 1957	C,W	D,S	Dug well. Reported dry 2 years, but recovered.
* 204	R. Grein	--	--	16	36	Qle	--	12.2	Nov. 20, 1957	T,E, 1	D,S	Dug well. Old well. Reported strong supply.
205	George Lehman	--	1938	33	30	Qle	--	27.7	Aug. 1, 1957	B,H	D	Dug well. Reported weak supply. Cased to 30 ft.
206	J. Bauchman well 1	R. P. Holland	1957	1,747	--	--	519	--	--	--	--	Oil test. 1/
301	T. T. Green	H. W. Schubert	1958	100	5	Twi	--	--	--	C,E, 1/2	D	Reported weak supply.
302	Clem Schuler well 1	Sherman Nelson	1958	1,979	--	--	563	--	--	--	--	Oil test. 1/
401	Mrs. Weldon Lawson	--	1953	32	60	Qle	--	27.5	Mar. 26, 1962	Cf,G	Irr	Dug well. Cased to bottom. Reported discharge 300 gpm. Irrigated 3 acres of orchard in 1961.
402	City of Seguin	Ready-Mix Concrete Co.	1959	23	96	Qle	--	12	1959	T,E, 40	Irr	Dug well. Cased to bottom. Reported discharge 500 gpm. Irrigates 25-acre golf course.
* 403	Reno Grimm	H. W. Schubert	1962	60	4	Twi	--	40	1962	J,E, 1/2	D	Cased to bottom. Reported discharge 7 gpm. Sand from 45 to 55 ft. Temp. 75°F.
404	Mrs. Otto Roecker	Roland Herbold	1961	80	--	Twi	--	60.4	Dec. 4, 1963	N	N	Not in use when visited Dec. 4, 1963. Reported water unfit for drinking purposes.
405	-- Kenny well 1	Moser & Fisher	--	1,909	--	--	507	--	--	--	--	Oil test. See geologic section A-A'. 2/
501	H. S. Mansfield	John Perryman	1956	227	--	--	--	--	--	N	N	Dry hole. Abandoned.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
*KX-67-25-502	Anthony Mays	John Perryman	1954	200	4	Twi	--	45	1962	J,E, 1	D	Cased to bottom. Perforated from 190 to 198 ft. Temp. 74°F.
503	David Wright	H. W. Schubert	1962	140	6, 4	Twi	--	60	1962	T,E, 1/2	N	Cased to bottom. Not in use when visited in 1962.
504	-- Smith	do	1956?	130	4	Twi	--	60	1962	T,E, 1/2	N	Cased to bottom. Perforated from 110 to 120 ft. Not in use in April 1962.
505	Burl Mackey	do	1961	120	4	Twi	--	60	1961	T,E, 1/2	D,S	Cased to bottom. Perforated from 105 ft to bottom.
506	Nolte Estate well 1	Pryor Dillard	1949	1,991	--	--	520	--	--	--	--	Oil test. 2/
* 507	Jack Mondin	Roland Herbold	1959	140	4	Twi	--	--	--	T,E	D,S	3/
508	E. McLeod	Charles Behrens	1963	215	4	Twi	--	--	--	T,E	D	
509	F. R. Siegbiel	do	1963	200	5	Twi	--	--	--	--	D	Casing perforated from 166 ft to 184 ft.
601	R. J. Govett well 1	C. R. England	1953	2,334	--	--	515	--	--	--	--	Oil test. 1/
602	F. Schmidt well 1	R. L. Turner	1954	2,348	--	--	--	--	--	--	--	Oil test. 4/
* 603	Norman Roecker	Charles Behrens	1962	178	4	Twi	--	65	1964	J,E, 1	D	Cased to bottom. Perforated from 158 ft to bottom. Pump set at 100 ft. Reported water unfit for drinking purposes.
* 701	Troy Lakey	-- Weeks	1958	290	5	Twi	--	27	1962	J,E, 1	D,S	Cased to bottom. Perforated from 265 ft to bottom. Temp. 73°F.
702	Faust Rest Home	Charles Behrens	1963	160	5	Twi	--	--	--	T,E	D	3/
703	Charles Grein	Roland Herbold	1961	93	8, 4	Twi	--	49.0	Dec. 4, 1963	T,E	D,S	3/
* 704	H. A. Gombert Estate	Charles Best	1900	75	6	Twi	--	48.8	Oct. 9, 1936	T,E	D	Well 375 in Guadalupe County report, 1937.
705	Charles Spahn well 1	E. C. Johnson	1955	2,098	--	--	552	--	--	--	--	Oil test. 4/
706	Troy Lakey	John Perryman	1954	59	4	Twi	--	20	1954	N	N	Abandoned and filled in 1958. Replaced by well KX-67-25-701.
801	Old Bossy Dairy	Ready-Mix Concrete Co.	1958	40	48	Qle	--	10	1962	T,G	Irr	Dug well. Reported discharge 700 gpm in 1962. Supplies water to irrigate 200 acres.
802	do	do	1958	30	48	Qle	--	15	1962	T,G	Irr	Dug well. Cased to bottom. Reported discharge 500 gpm. Partially supplies water to irrigate 200 acres.
803	do	do	1958	40	48	Qle	--	10	1962	T,B	Irr	Cased to bottom. Dug well. Reported discharge 700 gpm. Partially supplies water to irrigate 200 acres.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
*KX-67-25-804	Chris and Ralph Tarnava	Roland Herbold	1960	185	4	Twi	--	102.1	Jan. 28, 1964	T,E	D,S	Reported strong supply. Observation well. 2/
805	-- Alexander	Roland K. Blumberg	--	--	--	--	--	--	--	N	D,S	No pump installed May 4, 1962.
* 806	Frank Lambrecht	--	--	100	6	Twi	--	96.3 81.2	Oct. 9, 1936 Dec. 4, 1963	C,W	D,S	Not in use in December 1963. Well 394 in Guadalupe County report, 1937.
* 807	Cleburne Soefje	Charles Behrens	1963	253	4	Twi	--	51	1964	T,E, 1-1/2	S	Cased to bottom. Estimated discharge 20 gpm. Pump set at 140 ft. Perforated from 210 ft to 233 ft. 3/
* 901	Leon Engler	L. W. Bishop	1958	229	7, 5	Twi	--	30	1961	C,E, 1	D,S	Casing perforated at 65 ft, and from 194 ft to bottom. Equipped with filter for removal of iron from water. Temp. 74°F.
* 902	Bernard Nitsch	Fritz Meyer	1916	120	5	Twi	--	60	1962	C,E, 1	S	Estimated discharge 5 gpm. Unfit for drinking purposes. Temp. 74°F.
* 903	do	H. W. Schubert	1961	265	5	Twi	--	40	1961	T,E, 1/2	D,S	Reported discharge 10 gpm. Cased to bottom; perforated from 225 ft to bottom. Temp. 79°F.
904	L. A. Beiker	--	--	90	--	Twi	--	--	--	C,W	D,S	Reported strong supply.
* 905	D & D Ranch	Charles Behrens	1963	395	7	Twi	--	61	1963	T,E, 20	Irr	Reported drawdown 3 ft after pumping 3 hours at 300 gpm. Casing perforated from 328 to 337 ft, from 340 to 348 ft, and from 358 to 384 ft. Cased to 384 ft. Pump set at 300 ft. Not used for irrigation in 1963.
906	Virgil Halm well 1	Hughes & Hebert	1952	2,983	--	--	490	--	--	--	--	Oil test. 1/
907	Sam B. Butler	Roland K. Blumberg	1961	350	2	Twi	--	39.3	Jan. 27, 1964	N	N	Test well. Will be completed as water well in future. Not used when visited.
* 908	do	Henry Herbold	1949	105	6	Twi	--	--	--	J,E, 3/4	D,S	
26-101	N. A. Wundt well 1	Jas. N. Eddy	--	2,493	--	--	512	--	--	--	--	Oil test. 1/ 2/
* 103	F. A. Pfullmann	--	--	50	40	Twi	--	21.2	Feb. 5, 1964	C,W	S	Old well. Reported water not used for drinking purposes.
* 104	Gene Tausch	--	--	110?	8	Twi	--	44	1964	C,W	D,S	Old well. Pump set at 80 ft. Reported strong supply.
201	Paul Knohloch	D. Perryman	1951	413	--	Twi	--	90	1964	C,E, 1	D,S	Pump set at 190 ft. Reported water in sand from 320 to 350 ft.
202	Jessie A. Turner well 1	Texas Southern Oil Production Co.	1957	5,455	--	--	498	--	--	--	--	Oil test. 2/

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-26-203	Paul & Emma Bauert well 1	Weigand Bros.	1944	2,530	--	--	546	--	--	--	--	Oil test. See geologic section A-A'. 1/
301	-- Bibbs well 1	Diamond Half Oil Co.	1937	5,509	--	--	509	--	--	--	--	Oil test. 1/
* 302	Mrs. Pat Baker	--	--	130	6	Twi	--	100	1936	N	N	Abandoned about 10 years ago.
303	D. J. Perryman	John Perryman	1954	419	6	Twi	--	227	1954	C,E, 2	D,Irr	Open hole from 319 ft to bottom. Reported discharge 12 gpm.
304	do	do	1946	270	4	Twi	--	225	1946	C,E, 3	S	Reported discharge 12 gpm. Pump set at 270 ft.
305	Corinne Vaughn well 2	Weigand & Silbert	1956	2,776	--	--	601	--	--	--	--	Oil test. 4/
306	C. Knobloch well 16	Sun Oil Co.	1952	2,697	--	--	486	--	--	--	--	Oil test. 2/
* 307	H. H. Weinert	R. W. Brite	1944	360?	6	Twi	--	--	--	C,G, 3	D	Casing perforated from 340 to 360 ft. Pump set at 200 ft.
401	Le Roy Dolle	John Perryman	1954	162	4	Twi	--	38	1964	J,E, 1/2	D,S	Reported strong supply. Equipped with filter for iron removal.
* 402	Mrs. M. Behring	--	--	90	30	Twi	--	79.1 84	Sept. 23, 1936 1963	C,W	D,S	Dug well. Old well. Reported weak supply.
* 403	Eugene Pfullmann	--	--	100	6	Twi	--	45	1964	J,E, 1	D,S	Old well. Cased to bottom. Pump set about 100 ft.
404	A. G. Rode well 1	Sam Maceo Oil Co.	1949	2,086	--	--	485	--	--	--	--	Oil test. 2/
405	Mrs. -- Schwarzkopf	Roland Herbold	1960	100	4	Twi	--	--	--	T,E	D	3/
406	F. A. Pfullman well 1	M. C. Hughes	1953	2,088	--	--	445	--	--	--	--	Oil test. 4/
501	Adolph Hoffman well 1	E. H. Stickney	1956	2,479	--	--	428	--	--	--	--	Oil test. 2/
502	Dan Denman well 6	Humble Oil & Refining Co.	1961	2,655	--	--	453	--	--	--	--	Do.
504	Kat Lay well 1	Honor Oil Co.	1954	2,788	--	--	456	--	--	--	--	Do.
* 505	R. D. Hoover	H. W. Schubert	1962	370	4	Twi	500	95.0	Feb. 6, 1964	T,E, 1	D,S	Cased to bottom. Pump set at 180 ft. 3/
* 506	Homer Denmar	John Perryman	1956	254	4	Twi	--	80	July 1964	T,E	D,S	Well is equipped with filter for removal of iron from water.
* 507	Denman Estate	--	--	100?	4	Twi	--	--	--	C,W	S	Old well.
601	L. Anderson well 17	The Texas Co.	1957	2,703	--	--	491	--	--	--	--	Oil test. 2/
602	Sue Denman well 1 SWD	Humble Oil & Refining Co.	1948	2,706	--	--	450	--	--	--	--	Do.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-26-603	Donald Spring	John Perryman	1954	175	5	Twi	--	30	1959	J,E, 1/2	D,S	Cased to bottom. Perforated from 75 ft to bottom. Reported discharge 6 gpm, May 29, 1959. Temp. 76°F.
604	Dusker Harris	--	--	52	48	Twi	--	48	1964	J,E	D	Dug well. Old well. Reported strong supply.
701	A. Zoboraski well 1	Bradco Oil & Gas Co.	1955	2,468	--	--	505	--	--	--	--	Oil test. 2/
702	Joe Fleming	Roland K. Blumberg	--	360	6	Twi	--	--	--	T,E	D,S	Cased to bottom.
801	Vivroux Hardware Co. well 1	Travis Drillers Inc.	1957	3,555	--	--	548	--	--	--	--	Oil test. 4/
* 802	W. M. Weiss	D. Perryman	1949	120	4	Twi	--	40	1964	T,E	D,S	
* 803	Eugene Soefje	--	1958	111	5	Twi	--	35	1958	J,E, 1	D,S	Cased to bottom. Perforated from 45 to 56 ft, and from 75 to 95 ft. Reported discharge 55 gpm.
804	do	--Muckleroy	1963	650	8	Twi	440	35	1963	N	D	Drilled as oil test; plugged back to 650 ft. Cased to 63 ft. Reported discharge 300 to 400 gpm. Gravel-packed. Reported good water sands. Will be used in future.
* 805	Ed Grimm	H. W. Schubert	1963	119	--	Twi	--	57	1964	T,E	D,S	Reported strong supply.
* 901	Edgar Jahns	--	1902	120	6	Twi	--	92	1936	C,W	S	Reported strong supply. Well 139 in Guadalupe County report, 1937.
902	Vivroux Hardware Co. well 1	R. L. Lawrence	1955	3,252	--	--	453	--	--	--	--	Oil test. 2/
* 903	Gustav Beiker, Sr.	--	1896	52	60	Twi	450	34.9 35.4	Apr. 1, 1936 Jan. 27, 1964	J,E, 1/3	D,S	Well 123 in Guadalupe County report, 1937.
904	Gustav Beiker well 1	J. H. Eddy	1957	3,015	--	--	455	--	--	--	--	Oil test. 4/
905	Theo Buerger	-- McPeters	1956	650	16, 12	Twi, Qle	395	17.3	Apr. 28, 1964	N	N	Cased to bottom. Reported discharge 1,000 gpm. Used as standby well. Known as Capote water well 1. 1/
906	do	H. W. Schubert	1962	45	5	Twi, Qle	--	14	1964	J,E, 1	D,S	Cased to bottom. Perforated from 30 to 35 ft. Reported strong supply.
* 27-101	H. H. Weinert, Inc. Rand Miller lease	--	--	210	6	Twi	--	--	--	--	--	
102	Erwin Forsage well 2	Magnolia Petroleum Co.	--	2,643	--	--	466	--	--	--	--	Oil test. 2/
103	A. B. Corley	D. Perryman	1953?	225	5	Twi	--	60	1964	C,E, 3/4	D,S	Cased to 150 ft. Pump set at 70 ft. Reported strong supply.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
	KX-67-27-104	Zeb Nixon well 1	John B. Coffee	1957	3,084	--	--	481	--	--	--	--	Oil test. 4/
	105	Thomas Dix well 1	Gulf Oil Corp.	1953	2,750	--	--	497	--	--	--	--	Oil test. 2/
*	201	Mrs. E. F. Wood	--	1916	171	6	Twi	--	80 91.1	1936 Jan. 6, 1964	C,E	D,S	
	202	-- Manford well 2	-- Hall, et al.	1958	2,355	--	--	464	--	--	--	--	Oil test. 2/
	203	C. D. McEver well 1	Allen & Shumate, Inc.	1962	5,013	--	--	384	--	--	--	--	Do.
	301	Handy Chase	--	1958	80?	6	Twi	--	65	1964	J,E	S	
*	401	New Birth Baptist Church	--	1961?	27	30	Tc	--	--	--	B,H	D	Dug well.
	702	Dusker Harris	John Perryman	1954	462	4	Tc	--	80	1954	C,E	S	Pump set at about 100 ft. 3/
	33-101	Walter Schneider	Roland Herbold	1959	222	4	Tc	--	90	1963	J,E	D,S	Cased to bottom. Reported strong supply.
	102	Edmund Langa	Rudy Lange	1945?	54	6	Tc	--	25	1963	C,E	S	Cased to bottom. Reported weak supply.
	103	G. W. Dickey	--	1916	80	6	Tc	--	65	1963	T,E, 1/2	D	Cased to bottom. Pump set at 74 ft. Reported weak supply.
	104	do	Roland K. Blumberg	1962	450	3	Tc	--	38	1963	C,E, 1/3	S	Cased to 100 ft.
	106	Ella H. Greenwood well 1	A. T. Jergins	1955	1,031	--	--	550	--	--	--	--	Oil test. 2/
*	201	P. F. Cornelius, Jr.	Roland K. Blumberg	1962	278	--	Twi	--	--	--	T,E	D,S	Cased to 240 ft. Equipped with filter for removal of iron from water. Reported water sand from 220 to 240 ft.
	202	Ernest Hartman	Roland Herbold	1960	308	5	Twi	--	94	1960	T,E	D,S	Pump set about 160 ft. Reported strong supply.
*	203	do	--	1934	75	6	Twi	--	65.0 54.1	Oct. 1, 1936 Nov. 21, 1963	N	N	Not in use Nov. 21, 1963. Well 371 in Guadalupe County report, 1937.
	204	Herbert Hartman	Roland Herbold	1960	262	6	Twi	--	--	--	T,E	S	Cased to bottom. Pump set about 135 ft. Perforated 100 ft at bottom.
*	205	Emma Dibrell	Elmo Dibrell	--	165	5	--	--	--	--	C,W	S	Old well. Well 329 in Guadalupe County report, 1937.
*	206	Ed Eckols, Sr.	Ed Eckols, Jr.	1932	33	6	Twi	--	27.5 30.7	Oct. 1, 1936 Dec. 5, 1963	N	N	Dug well. Not in use, Dec. 5, 1963.
	207	do	--	--	70	5	Twi	--	35	1963	T,E	D,S	Old well. Reported strong supply.
	208	A. Brodt well 1	Cain Drilling Co.	1947	2,620	--	--	531	--	--	--	--	Oil test. 4/

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
*KX-67-33-209	Ed Eckols, Jr.	H. W. Schubert	1959	401	4, 3	Twi	572	147.7	Feb. 19, 1964	T,E	D,S	Casing: 4-in. to 310 ft; 3-in. from 310 ft to bottom. Supplies water for about 27,000 turkeys.
301	W. W. Hohertz	Charles Behrens	1963	305	--	Twi	--	--	--	--	D,S	3/
302	Walter Grimm	Roland K. Blumberg	1963	--	4	Twi	--	--	--	T,E	D,S	Drilled as test well, completed as water well.
303	Raymond Statzen	Charles Behrens	1963	203	4	Twi	545	120.2	Dec. 6, 1963	T,E	S	Cased to bottom. Perforated 20 ft at bottom.
304	Booker Hysaw well 1	Roland K. Blumberg	1962	2,867	--	--	546	--	--	--	--	Oil test. 4/
305	W. J. Blanks Estate well 1	Allen Burr, et al.	1957	3,225	--	--	645	--	--	--	--	Oil test. See geologic section A-A'. 2/
306	-- Schmidt	Roland Herbold	1960	196	4	Twi	--	--	--	T,E	D,S	
* 307	Walter Koepp	John Perryman	1955	438	4	Twi	625	157.3	Mar. 5, 1964	C,E	S	Cased to 366 ft. No casing from 366 ft to bottom.
* 401	Hiram Jackson	--	--	81	48	Twi	561	69.0 67.0	Feb. 17, 1936 Nov. 12, 1963	C,W	S	Dug well. Reported strong supply. Well 380 in Guadalupe County report, 1937.
402	-- McIntyre well 1	Olson Drilling Co.	1955	1,400	--	--	587	--	--	--	--	Oil test. 4/
403	R. K. Blumberg well 1	Allen Springs	1958	1,240	--	--	560	--	--	--	--	Do.
404	A. J. Ball well 1	Amoy Minerals Co.	1955	1,060	--	--	582	--	--	--	--	Do.
406	J. W. Massie well 1	Herbert C. Wenske	1955	1,142	--	--	593	--	--	--	--	Oil test. 2/
407	Elwood Mays	Roland K. Blumberg	1962	460	7	Twi	575	74.8	Feb. 5, 1964	N	D	Drilled as test well; converted to water well. Owner plans to use in future.
* 501	H. H. Weinert Estate	do	1957	900	2	Twi	740	93.6	May 26, 1959	A,G	S	Cased to 826 ft. Perforated from 701 to 806 ft. Reported discharge 5 gpm.
502	do	--	1944	450	5	Tc?	--	200	May 1959	--	D	Cased to bottom. Temp. 74°F.
* 503	Elwood Mays	Roland Herbold	1960	247	5	Twi	--	145	1963	T,E, 1	D,S	Cased to bottom. Perforated 60 ft at bottom. Pump set at 160 ft.
504	H. H. Weinert Estate well 2	Vernport Oil Co.	1963	3,488	--	--	710	--	--	--	--	Oil test. 4/
* 505	H. H. Weinert Estate	--	--	Spring	--	Tc	--	+	June 4, 1964	Flows	S	Reported numerous openings in quicksand aggregate a total flow of about 5 or 10 gpm into pond.
506	do	--	--	--	4	Tc	660	173.4	do	C,W	S	Reported used intermittently.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-33-601	E. R. Cowen well 1	W. M. Parks	1956	2,375	--	--	535	--	--	--	--	Oil test. 4/
701	Roland K. Blumberg	Pegg Bros.	1956	800	8	Twi	650	216.2	May 26, 1959	T,G	Irr	Cased to bottom. Perforated from 300 ft to bottom. Reported base of Carrizo Sand at 95 ft. Used to irrigate a pasture and Bermuda grass.
801	H. H. Weinert Estate	-- Perryman	1957	757	3, 2	Tc, Twi	594	126.5	do	N	N	Casing: 3-in. from 0 to 302 ft; 2-in. from 302 to 352 ft. Base of massive Carrizo Sand reported at 366 ft. Not in use when visited in 1959.
802	do	--	--	Spring	--	Tc	--	+	June 4, 1964	Flows	S	Reported numerous seeps flow into livestock pond.
* 803	J. O. Starcke	A. White	--	140	4	Tc	--	125	Aug. 1964	C,E	D	Cased to bottom. Reported strong supply.
901	H. H. Weinert Estate	-- Perryman	1957	1,030	7	Tc	--	190.8	May 22, 1959	A,G	S	Cased to 600 ft. Perforated from 580 to 600 ft. Reported discharge 1,000 gpm.
* 902	do	--	--	40	40	Tr	--	23.3	June 4, 1964	C,W	S	Dug well. Old well. Sandstone curb.
903	do	--	--	--	4	Tc	--	192.0	do	A,G	S	Reported used intermittently as needed.
* 904	do	--	--	--	4	Tr	--	125.7	do	C,W	S	
* 905	do	--	--	Spring	--	Tc	--	+	do	Flows	S	Reported numerous openings in quicksand. Flows about 10 gpm into pond. Reported never dry. Known as King Hill Spring.
34-102	W. J. Blanks well 1	J. H. Eddy	1954	3,390	--	--	658	--	--	--	--	Oil test. 4/
201	Gus Mauerman well 1	Wellington Oil Co.	1940	3,640	--	--	656	--	--	--	--	Do.
* 301	Wells Ranch	A. R. Thierry	1957	250	4	Tc	410	73.7	May 21, 1959	C,W	S	Cased to bottom. Perforated from 200 ft to bottom.
* 302	do	do	1957	250	4	Tc	495	57.1	do	C,W	S	Do.
401	-- Webb well 1	Sutton Drilling Co.	--	1,670	--	--	572	--	--	--	--	Oil test. 4/
* 402	A. W. Batey	Tommy Moye	1956	330	4	Tc	620	104.0	Aug. 20, 1964	C,E	S	Cased to bottom. Reported quicksand at 140 ft.
* 701	H. H. Weinert Estate	--	--	100	4	Tr?	--	85.1	June 4, 1964	C,W	S	
702	H. H. Weinert Estate well 1	Tidelands Oil Co.	1954	4,413	--	--	509	--	--	--	--	Oil test. See geologic section A-A'. 2/
703	H. H. Weinert Estate	--	--	--	3	Tr?	--	78.2	June 4, 1964	N	S	Standby well equipped to be jetted by air.
* 704	A. G. Lakey	A. R. Thierry	1945	123	4	Tc	--	35	Aug. 1964	J,E	D,S	Cased to bottom. Reported watered 60 head of cattle in 1963. Located in Gonzales Co

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-67-34-802	W. E. Davenport well 1	Renick & Sutton	1955	2,153	--	--	455	--	--	--	--	Oil test. 4/
35-104	Albert Soefie well 1	United North & South Development Co.	1950	4,050	--	--	379	--	--	--	--	Do.
68-23-801	Reinhold Wenzel	--	1921?	500?	6	Kea	--	114.3 115.7	Oct. 12, 1956 Apr. 27, 1964	C,W	S	Former San Antonio Project Observation well. 5/
802	E. R. Shockey	--	--	43	4	--	--	28.6	Aug. 22, 1957	C,W	S,Irr	Supplies water for lawn. Well out of order and not in use when visited.
803	V. A. Sanders	--	--	400?	4	Kea	--	117.9	do	T,E	N	Old well. Not in use, Apr. 27, 1964.
804	Eugene Froboese	--	--	20	36	--	--	9 15	Aug. 1957 Apr. 1964	C,W	S	Dug well. Old well. Reported water in gravel.
805	Robert Falkenberg	--	1920	610	8	Kea	--	142.2 116.0	Oct. 12, 1956 Apr. 27, 1964	C,E,I	D	Old well. Reported water slightly sulphurous.
806	Sanders Ranch	--	1951	600	6	Kea	--	--	--	C,E	S	Reported water slightly sulphurous.
* 901	City of Marion	--	1933	50	8	Ka	--	23	1964	T,E, 7-1/2	P	City of Marion well 1. Reported discharge 60 gpm in 1964. Temp. 71°F.
* 902	do	--	1933	50	10	Ka	--	3.5 23	Jan. 2, 1936 1964	T,E, 7-1/2	P	City of Marion well 2. Reported discharge 66 gpm in 1964.
903	Clifford Hoegenauer	--	--	33	6	Ka	--	4.6	Dec. 12, 1957	C,W	D	Formerly supplied water for Live Oak School.
904	Alvin A. Schaefer	--	--	63	72	Ka	--	20	1957	C,W	D,S	Dug well. Reported rock from 0 to bottom.
905	Herbert Schaefer	--	--	500	6	Kea	--	170.0	Oct. 11, 1956	C,W	D	Old well. Reported salty water.
906	Hilmar Schlatcher	--	--	--	72	--	--	41.2	Aug. 26, 1957	J,E	D,S	Dug well.
907	E. Peter	--	--	20	36	--	--	10.4	do	C,H	S	Dug well. Reported water in gravel.
* 24-201	Alvin Westmeyer	--	1897	54	36	Qle	--	48.1	Dec. 5, 1957	C,W	D,S	Dug well. Supplies water for 3 families. Temp. 70°F.
301	Dan Timmerman	--	1915?	650	--	Kea	--	--	--	N	N	Filled and abandoned. Reported water had sulphur taste.
302	G. J. Timmerman	Magnolia Petroleum Co.	--	600?	--	--	--	--	--	--	--	Drilled as oil test. Reported an abundance of water.
303	-- Jenkins	--	--	--	36	Qle	--	--	--	C,W	D,S	Reported weak supply, but never dry.
304	G. J. Timmerman	--	1924	38	40	Qle	--	35.2 31.3	June 13, 1957 Apr. 29, 1964	C,W	D,S	Dug well. Formerly supplied water for garden. Formerly equipped with 6 h.p. gas engine.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-68-24-305	Willie Borman	--	1925	32	36	Qle	--	--	--	J,E	D,S	Reported weak supply.
* 401	Alfred Liebscher	--	1925	35?	60	Qle	--	30	1964	C,E, 2	D,S, Irr	Dug well. Reported discharge 550 gpm. Supplies water for 3 houses. Equipped with 2 pumps.
* 402	Oscar Kline	--	1933	16	48	Ka?	--	1.3	July 25, 1957	B,H	S	Dug well. Temp. 64°F.
403	Edward Heil	--	--	38	--	--	--	13.4	Aug. 26, 1957	C,W	D,S	Dug well. Reported water in gravel.
* 404	Cora D. Koetzer	E. B. Kutscher	1954	40	7	Qle	--	--	--	T,E	D,S	
501	Gilbert Wilke	--	--	44	36	--	--	--	--	J,E	N	Dug well. Old well. Reported dry hole. Owner uses as cistern.
502	Mrs. Etleka Timmerman	E. B. Kutscher	--	59	8	Qle	--	--	--	C,W	S	Reported strong supply.
503	Alvin Westmeyer	--	--	55	36	Qle	--	46.9	June 12, 1957	C,W	D,S	Cased to 20 ft. Dug well. Old well. Reported strong supply.
504	Herman Timmerman	--	1919	45	36	Qle	--	45.8 43.1	June 11, 1957 Apr. 28, 1964	T,E	D,S	Dug well. Reported weakened in 1956, but never failed.
505	Curt O. Saur	--	--	49	48	Qle	--	45.7 43.3	June 11, 1957 Apr. 28, 1964	C,W	D,S	Cased to 10 ft. Dug well.
506	Raymond Porter	--	--	38	36	Qle	--	34.2	June 11, 1957	C,W	D,S	Cased to 12 ft. Dug well. Old well.
507	James Timmerman	--	--	--	36	Qle	--	23.7 27.8	June 11, 1957 Apr. 28, 1964	C,W	D,S	Dug well.
508	-- Scheel	--	--	43	36	Qle	--	36.2 39	June 11, 1957 Apr. 1964	C,W	D	Dug well. Not used when visited.
509	D. B. Dofmeister	--	1955	24	36	Qle	--	--	--	T,E	D	Dug well.
510	A. C. Kreusler	E. B. Kutscher	1948	40	7	Qle	--	27.8 22.0	June 13, 1957 Apr. 28, 1964	J,E, 1	P	Reported pumps about 600,000 gallons per month during summer. Supplied water for 70 customers in 1964.
511	Alfred Liebscher	--	1934	2,857	--	--	620	10.8 5.2	Nov. 21, 1957 Apr. 28, 1964	--	--	Reported flowed sulphur water when drilled. Drilled as oil test. 5/
* 512	H. L. Hood (Camp Willow)	--	--	42	24	Qle	--	--	--	J,E	D	Dug well. Supplies water for 10 cabins. Temp. 67°F.
513	-- Buss (Camper's Cove)	G. J. Voss	1956	37	6	Qle	--	27	1957	T,E	D	Cased to bottom.
514	R. E. Timmerman, Jr.	--	--	42	36	Qle	--	31.5 34.8	July 29, 1957 Apr. 29, 1964	C,W	N	Dug well. Not in use when visited in April 1964.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
*KX-68-24-516	J. J. Gajdos	--	--	35	36	Qle	--	32.5	July 29, 1957	J,E	D,S	Dug well. Old well. Cased to bottom. Reported weak supply. Temp. 65°F.
* 517	Gilbert Becker	--	--	Spring	--	Qle	--	+	Apr. 28, 1964	Flows	S	Reported did not go dry in 1956. Earthen dam. No openings inside. Known locally as 3-mile Creole Spring.
* 518	Shady Acres Resort	--	--	--	--	Qle	--	14.9 15.5	June 26, 1957 Apr. 28, 1964	Cf,E, 1/2	D	Supplies water for cafe. Temp. 64°F.
* 601	Sam Bretzke	--	1924	53	36	Qle	--	46 40.8	Apr. 1957 May 4, 1964	Cf,E, 5	D,S, Irr	Cased to 15 ft. Reported not used except in very dry years. Reported discharge 600 gpm. Temp. 68°F.
* 602	Harvey Dedeke	--	1919	35	36	Qle	--	--	--	Cf,E	D,S	Reported strong supply. Temp. 70°F.
* 603	Clarence Krackau	--	--	34	40, 8	Qle	--	18.9	Nov. 15, 1963	T,C, 35	D,S, Irr	Dug well. Old well. Cased to bottom. Meausred discharge 477 gpm. Pump set at 33 ft. Reported water in coarse gravel.
604	G. J. Timmerman	--	--	32	40	Qle	--	29.1	June 13, 1957	C,W	D,S	Dug well. Cased to 10 ft.
605	do	Parsons & Norman	1957	2,958	--	--	622	--	--	--	--	Oil test. See geologic section A-A'.
606	Sam Bretzke	Rayborn Drilling Co.	1957	876	10, 7, 5	Kea	--	55	1957	N	N	Oil test; converted to water well. Hole filled and abandoned. Driller reported salt water in limestone.
607	do	L. Mollendoph	1958	948	--	--	628	--	--	--	--	Oil test. 2/
608	Raymond Zipp	--	1900	40	36	Qle	--	35.9	July 25, 1957	C,W	D,S	Dug well. Reported strong supply. Cased to 15 ft.
609	R. E. Timmerman	--	--	50	54	Qle	--	45	June 1957	J,E, C,W	D,S	Dug well. Old well. Cased to 15 ft.
610	Marvin Zipp	--	--	36	36	Qle	--	33.5 32.1	July 30, 1957 May 4, 1964	C,W	D,S	Dug well.
611	Rudolph Magin	-- Barborth	1957	48	6	Qle	--	34.2	June 11, 1957	N	N	Cased to 45 ft. Not in use when visited.
612	Juan Rodriquez	--	--	36	36	Qle	--	34.2	June 13, 1957	C,W	D,S	Dug well. Cased to 15 ft. Not used for drinking purposes.
613	Herman Piper	Joe Robledo	--	32	48	Qle	--	29.2	do	C,W	D,S	Dug well. Cased to 12 ft. Reported strong supply.
614	Mary Schliching	Butler Oil Co.	1947	840	--	--	639	--	--	--	--	Oil test. 2/
801	Otto Foster	Jones & Irving	1931	707	--	--	593	--	--	--	--	Do.
802	Albert Schuetz	--	1953	20	42	--	--	--	--	--	D,S	Dug well. Reported strong supply.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
*KX-68-24-803	Lonnie Gray	--	1954	19	42	--	--	--	--	J,E, 1	D,S	Dug well. Reported strong supply. Gravel from 6 to 19 ft. Temp. 71°F.
804	-- Gray	--	1950	20	36	--	--	12.8	June 26, 1957	N	N	Dug well. Reported went dry in 1956, but recovered in 1957. Not in use when visited.
805	Mrs. Max Altgelt	--	--	40	36	Qle	--	--	--	T,E	D,S	Dug well. Cased to bottom. Reported strong supply.
806	Richard Dittmar	--	--	Spring	--	Qle	--	+	June 26, 1957	Flows	--	Discharged into Guadalupe River at rate of about 25 gpm, July 8, 1964.
807	do	--	1930	25	36	Qle	--	20	1957	T,E, 3/4	D,S, Irr	Dug well. Used to irrigate lawn.
808	John Moy	--	--	25	36	Qle	--	21.5	July 29, 1957	T,E	D	Dug well. Reported strong supply. Reported gravel from 19 to 24 ft.
* 810	Gilbert Schlather	--	--	35	36	Qle	--	--	--	C,W	D,S	Dug well. Old well. Reported weakened in 1956. Temp. 67°F.
* 811	Ernest Sommer	--	1930	18	36	--	--	--	--	J,E, 1/4	D,S	Dug well. Reported went dry in 1956. Blue clay from 10 to 18 ft. Temp. 70°F.
* 901	D. E. Cozart	--	--	40	60	Qle	--	29.6 32.8	Dec. 3, 1957 July 8, 1964	C,W, J,E,3	D,S, Irr	Dug well. Supplies water for 3 families, pecan trees, and garden. Old well. Temp. 68°F.
902	Davidson well 1	Johnson Oil Co.	1962	1,169	--	--	597	--	--	--	--	Oil test. See geologic section A-A'. 2/
903	Arno Link, Jr.	--	--	20	48	Qle	--	15.1 18.6	July 30, 1957 July 7, 1964	T,E	D,S, Irr	Dug well. Old well. Supplies water for small garden. Reported weakened in 1956.
904	Mrs. Ida Stautzenberger	--	--	35	36	Qle	--	--	--	C,W	D,S	Dug well. Old well. Cased to 16 ft. Dry when visited July 29, 1957.
905	D. Davidson	--	--	35	35	Qle	--	--	--	C,W	D,S	Dug well. Reported strong supply.
906	H. Borman well 1	Butler Oil Co.	1948	1,162	--	--	603	--	--	--	--	Oil test. 1/
907	E. A. Heinemeyer	--	1927	40	36	Qle	--	35.0 34.5	July 25, 1957 July 8, 1964	C,W	D,S	Cased to 8 ft. Dug well. Reported never dry.
908	Arno Koepp	--	--	38	36	Qle	--	--	--	C,W	D,S	Dug well. Old well.
909	Roy Zipp	--	--	42	36	Qle	--	39.9 40.5	July 24, 1957 July 8, 1964	C,W	D	Dug well. Old well. Not in use when visited in July 1964.
910	Walter Zipp	Roy Turner	1952	1,562	--	--	--	--	--	--	--	Oil test.
911	Albert Schlathen	--	--	30	36	Qle	--	25.8 28.9	July 29, 1957 July 8, 1964	C,W	D,S	Dug well. Old well. Reported weak supply in 1956, but did not fail completely.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
*KX-68-30-201	Alvin Friesenhahn	--	1923	320	6	Kea	770	142.9	Oct. 5, 1956	C,W	D	Well 316 in Texas Board Water Engineers Bull. 5610 (Follett, 1956). 5/
202	C. W. Taylor	Pence-Gerfers	1955	524	10, 8	Kea	775	145	Jan. 1955	T,E, 60	Irr	Casing: 10-in. to 62 ft, and 8-in. from 62 ft to bottom. Reported discharge 850 gpm. Irrigated 67 acres in 1961, 1962, and 1963.
203	Alfred Wiley	-- Verdell	1953	204	8	Ka	--	118.2	Aug. 7, 1958	T,E	D	
204	Emil Heye	--	--	247	6, 4	Kea?	--	--	--	C,E, 1-1/2	D	Pumping level 197 ft in 1956. Reported water has slight sulphur taste.
205	-- Burge	--	--	333	6	Kea	760	--	--	T,E	D	Cased to 230 ft. Reported sulphur water.
* 206	Alvin Friesenhahn	-- Sherman	1913	323	8, 5	Kea	749	--	--	C,E, 3/4	D,Irr	Casing: 8-in. to 84 ft, 5-in. from 84 ft to bottom. Pumping level 180 ft, Oct. 5, 1956. Well 317 in Texas Board Water Engineers Bull. 5610 (Follett, 1956). Temp. 69°F. 5/
* 207	E. M. Griffin	-- Owens	1954	255	7	Kea?	--	--	--	C,E, 3/4	N	Cased to 220 ft. Reported water formerly used after treating.
* 301	Bertha Beynon	-- Cravens	1951	255	6	Kea?	--	173	1957	C,E, 1	D	Reported water has sulphur odor. Temp. 74°F.
* 302	C. L. Worthy, Jr.	-- Verdell	1955	370	7	Kea?	768	124.9	Aug. 7, 1958	T,E	D	Cased to 300 ft. 5/
303	Willie Froboese	--	1905	346	7	Ka, Kea	--	165.5	May 15, 1957	C,W	D,S	Reported good quality water in Austin Chalk; water from Edwards and associated limestones sulphurous.
304	Herman Hoffman	--	--	252	--	Ka	--	147.1	do	C,W	D,S	Cased to 180 ft. Reported weak supply. Has slight sulphur odor.
305	Edwin Beck	A. Way	1945	265	6	Kea	--	110	May 1957	C,W,G	D,S	Cased to 190 ft. Reported blue mud at 190 ft.
306	-- Adams	Sterzing Drilling Co.	1962	480	6	Kea	880	229.0	Nov. 12, 1962	N	D	Cased to 396 ft. Reported drawdown 110 ft after 2-1/2 hours pumping at 25 gpm. Will be used in future for subdivision. Reported mineralized water with sulphur odor.
307	John Fry	Henry Schwab	1908	319	--	Ka, Kea	--	160	1945	C,W	D,S	Reported water has slight sulphur taste. Deepened in 1945 from 297 to 319 ft.
308	H. Riedel	A. Way	1941	300	6	Ka, Kea	--	169.9	May 15, 1957	C,W	D,S	Reported water has slight sulphur taste.
309	Roman Kraft	P. E. Owen	1955	150	--	Ka?	--	101.0	do	C,E, 3/4	D	Reported water of poor quality.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
KX-68-30-310	Herbert Kneupper	--	1897	360	10	Kea?	--	107.2	May 16, 1957	C,W	D,S	Reported water slightly sulphurous.
311	Paul Silber	--	1953	180	7	Ka	--	121.3	Dec. 12, 1957	T,E	S	Do.
* 501	George Gesche	-- Johnson	1950	160	7	Kea	--	134.5	Oct. 4, 1956	T,E, 1-1/2	D	Cased to 94 ft.
502	Allen Beigert	--	--	45	48	Qle	--	40.6	May 15, 1956	C,W	N	Dug well. Old well. Reported went dry during 1950-56 drought. Not in use when visited.
503	Donald Blatchford	Sam Johnson	1956	110	5	Qle, Ka	--	--	--	J,E, 1/2	D	Cased to bottom.
* 504	George Gesche	--	--	140	6	Ka	--	--	--	C,W	D,S	Old well. Not in use July 9, 1964. Temp. 73°F.
505	H. J. Neusse	Moos-Haskins	1958	270	7	Kea	--	90	Feb. 1959	T,E	D	Pump set at 220 ft, July 1964.
* 601	Walter Kramer	Testman & Sauer	1896	565	6	Kea	--	69.3	Aug. 25, 1958	C,W	--	5/
* 602	Schertz Water Works	J. R. Johnson	1947	2,353	8, 5	Kea, Kh?	--	49.8	June 7, 1946	N	N	Drilled as a test well to the Edwards and associated limestones in 1942, then deepened to basal sands of the Trinity Group (probably the Hosston Formation) in 1947. Reported minieralized water in all formations. Abandoned.
603	Aaron Beck	-- Schubert	1956	550	7	Kea	--	84	Sept. 1956	T,E, 3	Irr	Reported discharge 55 gpm, Sept. 12, 1956. Pumping level 255 ft. Used to irrigate pecan trees and small garden. Reported not in use since 1961.
604	-- Guiterrez	-- Markwardt	1947	336	6	Ka, Kea	--	132.0	May 16, 1957	C,W	D,S	
605	Henry Guiterrez	do	1949	116	8	Ka	--	69.0	do	C,W	D,S	Reported slight sulphur odor.
* 606	G. W. Veazey	H. W. Schubert	1956	295	6	Ka	710	22.8 22.8 41.2	May 21, 1958 June 19, 1958 Sept. 15, 1958	T,E, 1-1/2	D	Do.
607	Robert Jonas	--	--	80	6	--	--	47.4 54	May 16, 1957 May 1964	C,W	D,S	Reported water not used for drinking purposes.
608	do	-- Markwardt	1953	200	7	Ka	--	--	--	C,E, 3/4	S	Cased to 12 ft. Reported slight sulphur odor.
609	Kiel Sisters	Cravens Drilling Co.	1951	343	5	Kea	755	79	1951	--	--	Cased to 294 ft. Pump set at 140 ft in 1951. Not in use when visited.
* 610	G. C. Boggess	Haskins Drilling Co.	1963	680	10	Kea	--	90	1963	T,G, 75	Irr	Cased to 100 ft. Reported discharge 300 gpm. 6-in. discharge pipe.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
KX-68-30-611	-- Douglas	Cravens Drilling Co.	1951	362	5	Kea	--	126	1951	T,E	D,Irr	Cased to 287 ft. Supplies water to irrigate small shrubs. 2
* 31-101	Aubrey Brooks	A. Way	--	350	36, 6	Ka	--	--	--	C,E, 1/2	D,S	Dug well to 10 ft; drilled from 10 ft to 350 ft. Old well. Temp. 72°F.
102	-- Dean	--	1902	405	5	Kea	--	172.7	Nov. 12, 1956	C,W	D	Reported sulphur water.
* 103	Harold Jansing	Max Gerfers	--	545	7	Kea	--	--	--	T,E	D,S	Cased to 400 ft. Deepened from 400 ft to 545 ft in 1958. 5/
104	Marvin F. Pahmiyer	E. B. Kutscher	1956	470	8, 6	Kea	--	--	--	N	N	Not in use May 6, 1964.
105	Theo. F. Schmidt well 1	Stanolind Oil & Gas Co.	1954	2,640	9	--	807	--	--	--	--	Oil test. Plugged and abandoned. 1/
106	E. J. Stehle	--	--	400	6	Kea	--	--	--	C,E, 3/4	D	Pumping level, 220 ft, Oct. 6, 1956.
107	Oscar Orth	--	--	122	6	Ka	--	107.3	May 17, 1957	C,W	S	Old well. Reported water of poor quality.
108	Arthur Zieschang	--	1923	600	6, 5	Kea	--	157.6	Oct. 6, 1956	C,E, 2	D,S	Reported slight sulphur odor.
109	Oscar Orth	T. E. Owen	1956	240	6	Ka	--	73.7	May 17, 1957	C,W	S,Irr	Reported to irrigate garden.
110	H. W. Pfeil	H. W. Pfeil	1934	40	42	--	--	5.7	do	C,W	D,S	Reported dry during 1950-56 drought, but recovered after rains of 1957.
111	H. A. Land	T. E. Owen	1956	448	5	Kea	--	190	Sept. 1956	C,E, 1	D,S	Reported water treated before used for drinking. Slight sulphur taste reported.
112	Olen H. Krueger	--	--	45	--	--	--	--	--	C,E, C,W	D	Dug well. Reported water in gravel.
113	-- Dean	J. T. Johnson	--	689	7	Kea	800	--	--	N	N	Reported slight sulphur odor. Cased to 387 ft. Not in use when visited in 1964.
114	Ernest Schlather	-- Patton	1914	400?	6	--	--	50	Oct. 1956	N	D	Formerly supplied water for domestic use. Not used when visited. 3/
* 201	Henry Weil	H. Kneupper	1936	560	6	Kea	--	113.0	May 7, 1964	C,W	D,S	Cased to 490 ft. 5/
* 202	Carl Kosseth	Otto Eberling	1912	165	6	Ka	--	126.5	Oct. 29, 1957	C,W	D,S	Cased to 47 ft. 5/
* 204	W. C. Straub	T. E. Owen	1956	434	7	Kea	785	100 122.9	Jan. 1956 Dec. 3, 1957	C,W	S	Temp. 71°F. 3/
205	Ray Brinks	F. J. Gravis	1946	2,580	--	--	798	--	--	--	--	Oil test. 1
206	Mrs. Minnie Kuedel	R. J. Goode	1935	1,935	10, 8, 6	--	807	--	--	--	--	Oil test. Well 460 in Guadalupe County report, 1937.

See footnotes at end of table.

Table 3. -Records of wells and springs in Guadalupe 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			
KX-68-31-207	Otto Voges	Lewis & Neis	1930	687	--	--	727	--	--	--	--	Oil test. 2/
209	E. H. Menking	--	1956	430	5	Kea	--	137.6 139.5 141.3	May 21, 1958 June 19, 1958 July 18, 1958	C,W	S	
210	George Eberling	T. E. Owen	1956	293	6	--	--	98.7 76.1 80.2	Oct. 22, 1957 May 21, 1958 July 18, 1958	C,G	D,S	
211	Robert Weyel	-- Friesenhahn	1900	442	6	--	--	--	--	C,W	D	Reported sulphur water.
* 212	R. H. Sanders	Roland K. Blumberg	1961	2,499	--	--	770	--	--	--	--	Oil test.
* 301	Walter Stolte	--	1924	18	36	Qle	--	13.4	Dec. 3, 1957	C,W	D,S	Reported weakened during 1950-56 drought. Dug well. Temp. 65°F.
302	Louis Kurre	J. R. Johnson	1938	540	--	--	678	--	--	--	--	Oil test. 2/
303	A. F. Tasto	A. F. Tasto	1956	14	36	--	--	10	Aug. 1957	B,H	D,S	Reported water in gravel, weak supply. Dug well.
304	Randolph Wohlfahrt	--	1925	16	36	--	--	--	--	C,W	S	Dug well. Reported water in gravel.
306	A. V. Cale	H. B. Baker	1954	650	--	--	700	--	--	--	--	Oil test. 2/
307	Harold Tschirhart	Haskins Drilling Co.	1962	655	7	Kea	772	180	June 1962	T,E, 15	Irr	Cased to 605 ft. Owner plans to use for irrigation in future.
* 401	City of Cibolo	J. R. Johnson	1950	602	8	Kea	705	51	Oct. 1950	T,E, 15	--	Reported discharge 160 gpm in 1951. Formerly supplied water for town of Cibolo. 3/
* 402	Herb Schraub	--	1920	35	36	Qle	--	--	--	C,W	S	Dug well. Cased to bottom.
* 501	Henry Tolle	H. W. Schubert	1955	430	5	Kea	710	83.6 76.5	Oct. 22, 1957 Dec. 3, 1957	T,E	D,S	Cased to 385 ft. Reported discharge 15 gpm. Temp. 74°F.
* 502	Edmond Sassman	--	--	623	6	Kea	--	--	--	C,E	D,S	Cased to 618 ft.
* 503	H. H. White	H. W. Schubert	1955	594	7	Kea	670	68	Oct. 1955	C,E, 3/4	D,S	Cased to 572 ft. Reported poor quality of water cased off from 325 to 427 ft. Casing cemented to 572 ft. Reported strong supply. Temp. 73°F.
504	Arthur Pfannstiel	--	1955	33	24	Qle	--	5	Aug. 1957	C,W	S,Irr	Dug well. Used to irrigate small garden. Reported strong supply.
505	W. R. Sweeten	Sam Johnson	1957	525	6	Kea	--	--	--	T,E, 1/4	D,S	Reported salty water.
506	Dan J. Lambrecht	--	--	40	72	Qle	--	25	Aug. 1957	B,H	D,S	Dug well. Reported dry in 1956.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
*KX-68-31-507	Richard Tolle	H. W. Schubert	1956	635	7	Kea	--	75 52.9	1956 May 8, 1964	C,E	S	Cased to 601 ft. 5/
508	Fred Sassman	--	--	20	36	--	--	4.5	Oct. 29, 1957	N	D,S	Dug well. Old well. Reported dry in 1956. Formerly supplied water for 4 families. Owner plans to use well again.
* 509	do	T. E. Owens	1955	126	7	Ka?	--	--	--	C,W	D,S	Reported strong supply. Temp. 72°F
510	Mark Willemin	Haskins Drilling Co.	1962	703	7	Kea	641	240	June 1962	--	N	Cased to 653 ft. Reported mineral water. Not in use when visited.
* 602	Le Roy Schmockl	H. W. Schubert	1955	46	8	Qle	--	34	Aug. 1957	J,E	D	Not in use when visited in 1964.
603	William Zuehl well 1	S. M. Messer	1948	1,545	--	--	--	--	--	--	--	Oil test. 1/
* 701	Theo Reinhard	--	--	35	--	Qle	--	--	--	C,E, 3/4	D,S	Dug well. Old well. Supplies water for lower valley school and 2 houses. Reported strong supply. Temp. 72°F.
* 801	John Kassner	--	1950	100	--	--	--	20	1953	T,E, 1/3	D,S	Dug to 85 ft; drilled from 85 ft to 100 ft. Reported rock from 84 ft to 100 ft. Temp. 72°F.
802	Arno Reiley	--	--	48	--	Qle	--	36	Aug. 1957	T,E, 3/4	D,S	Dug well. Reported water in gravel.
803	Ed Stolte	--	--	48	--	Qle	--	36	Aug. 1957	T,C	D,S	Dug well. Cased to bottom. Reported water in gravel.
804	Robert Real	--	1935	40	10	Qle	--	37.0	Aug. 10, 1957	C,W	D	Cased to bottom. Dug well. Reported water in gravel. Reported dry for several years, but recovered.
805	Udo Grobe	--	1950	31	--	Qle	--	15.5	do	N	D,S	Dug well. Not in use when visited in 1963. Reported weak supply.
* 806	E. A. J. Schievelbein	--	--	50	36	Qle	--	--	--	C,W	S	Dug well. Not in use when visited in 1963. Reported weak supply. Temp. 70°F.
807	Richard Wohlfahrt	--	1946	25	--	Qle	--	13	Aug. 1957	T,E	D	Dug well. Reported water in gravel.
901	Pete Rakowitz	--	1940	30	36	Qle	--	20.2	Aug. 14, 1957	T,E	D	Do.
* 902	Cleburne Meyer	--	--	35	--	Qle	--	19.0	do	T,E	D,S, Irr	Dug well. Old well. Reported used for irrigation a short time in summer of 1957. Reported pumped about 2 months in 1963.
903	Reinhold Altwein	--	--	33	42	Qle	--	32	Aug. 1957	J,E, 1/2	D	Dug well. Reported water in gravel from 25 ft to bottom.
904	Lewis Schmoekl	--	--	32	36	Qle	--	24.5	Aug. 14, 1957	T,E	D,S	Dug well.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
KX-68-31-905	O. H. Pehrens	--	1940?	25	36	Qle	--	23.0	Aug. 14, 1957	C,W	D,S	Dug well.
906	Alfred Marokwardt	--	1940?	21	36	Qle	--	10	Aug. 1957	T,E, 1/2	D,S	Do.
907	Edwin Theilengerdes	--	--	25	--	Qle	--	23.4	Aug. 14, 1957	J,E	D,S	Cased to 21 ft. Dug well. Reported water in gravel from 22 ft to bottom.
* 32-201	Wilburn Keohler	--	1955	45	36	Qle	--	25	July 1957	T,E,1 T,E,5	D,S, Irr	Cased to bottom. Equipped with 2 electric pumps. Reported discharge 100 gpm, July 30, 1957. Supplies water to irrigate 20 acres. Temp. 70°F.
202	Van Grein	--	--	15	36	Qle	--	--	--	C,W	D	Dug well. Old well. Supplies water for lawn only.
203	Robert Jubela	--	--	37	36	Qle	--	30.1	July 25, 1957	C,E	D,S	Reported strong supply. Old well. Dug well.
205	Paul Friesenhahn	--	--	28	36	Qle	--	--	--	T,E	S,Irr	Dug well. Old well. Supplies water for lawn and trees.
206	do	--	--	35	36	Qle	--	29.7	July 25, 1957	C,W	D,S, Irr	Do.
207	Bruno Blumberg	W. D. McBee, et al.	1930	1,005	--	--	555	--	--	--	--	Oil test. 2/
209	Walt's Place	H. W. Schubert	1963	39	5	Qle	--	--	--	J,E	D	Cased to bottom. Reported gravel from 24 to 35 ft.
301	Walter Vaughn	--	1957	33	42	Qle	--	--	--	T,G	Irr	Dug well. Reported discharge 250 gpm in 1964.
302	do	--	1957	26	42	Qle	--	11.2	July 30, 1957	T,G	Irr	Dug well. Reported drawdown 2 ft after pumping 300 hours at 600 gpm. Sprinkler system used.
* 303	do	--	1956	26	42	Qle	--	--	--	T,G	Irr	Dug well. Reported drawdown 2 ft after pumping 300 hours at 600 gpm. Sprinkler system used. Temp. 69°F.
* 304	McQueeney Water Works	--	1953	25	96	Qle	--	16	Aug. 1957	T,E, 7-1/2 T,E,5	P	Dug well. Reported discharge 500 gpm in 1957. Supplies water for about 110 families. Temp. 71°F.
305	Ol' Bossy Dairy	--	--	35	48	Qle	--	29.1	June 25, 1964	T,E, 25	Irr	Dug well. Old well. Reported discharge 350 gpm. Used to irrigate 60 acres in 1961 and 1962. Cased to bottom.
306	Ted Holtz	--	--	40	--	Qle	--	--	--	C,W	D,S	Cased to 15 ft. Dug well. Old well.
307	A. O. Urban	--	--	40	36	Qle	--	35.9 30	July 24, 1957 June 1964	C,W, T,E	D,S	Dug well.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-68-32-308	A. Urias	--	--	44	36	Qle	--	40.8	July 27, 1957	--	N	Dug well. Old well. Well not in use when visited in 1964.
* 309	W. M. Hartmann	--	1949	40	4	Qle	--	34.6	June 25, 1964	J,E	P,D	Cased to bottom. Supplies water for resort and cafe.
* 310	E. Wischkaemper	--	--	32	40	Qle	--	28.0	Dec. 3, 1957	C,W	D,S	Dug well. Old well. Cased to 12 ft. Temp. 67°F.
311	H. H. Friesenhahn	--	--	40	48	Qle	--	--	--	J,E	S	Dug well. Old well. Reported used for watering livestock.
312	--	Russell & Blumberg	1941	1,001	--	--	545	--	--	--	--	Oil test. 2/
313	Ol' Bossy Dairy	--	1955	51	6	Qle	--	41	Aug. 1964	T,E, 5	D,S	Cased to bottom. Reported strong supply.
314	do	--	1962	48	48	Qle	--	--	--	T,E, 25	N	Dug well. Reported dry Aug. 6, 1964.
315	do	--	--	45	48	Qle	--	--	--	N	D,S	Dug well. Old well. Reported dry Aug. 6, 1964. Pump removed. Reported well will be used again if and when it recovers.
316	James C. Lucas	--	1954	24	28	Qle	--	14	Aug. 1964	T,G,E	D,Irr	Dug well. Reported irrigates 5 acres of pecan and fruit trees.
317	Otto Armbreuster	--	1953	32	42	Qle	--	17	Aug. 1964	N	N	Dug well. Formerly used to irrigate 56 acres of alfalfa. Reported not used in 8 years.
401	Walter Rabe	-- Altgelt	1932	1,500?	6	--	--	1.2	Aug. 15, 1957	N	N	Reported sulphur water at 800 ft.
402	R. A. Schumann	F. Eisenhauer	1913	600?	6	Kea	--	11.2	Oct. 29, 1957	N	N	Reported flowed mineralized water when drilled. Formerly supplied water for livestock.
* 501	Harold Alves	--	1956	35	36	--	--	25.0	Aug. 15, 1957	J,E	D,Irr	Dug well. Supplies water for irrigation of lawn.
601	R. Bartrom	--	--	41	--	Qle	--	27.1	do	T,E, 7-1/2	D,S, Irr	Dug well. Reported watered 54 head of cattle and irrigated 6 acres of land in 1961.
602	Herbert Riley	--	1930	40	10	Qle	--	25.8	do	T,G, 75	D,S, Irr	Dug well. Reported discharge 2,000 gpm. Used to irrigate 40 to 50 acres.
603	Edmund Campbell	Ready-Mix Concrete Co.	1954	42	--	Qle	--	30	Mar. 1962	T,E, 10	Irr	Cased to bottom. Dug well. Reported discharge 700 gpm. Irrigated 41 acres in 1961.

See footnotes at end of table.

Table 3. Records of wells and springs in Guadalupe 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			
KX-68-32-604	Edmund Campbell	Ready-Mix Concrete Co.	1953	36	36	Qle	--	33	Mar. 1962	T,E, 10	Irr	Dug well. Reported discharge 175 gpm. Cased to bottom. Irrigated 14 acres in 1961.
605	do	--	1952	36	36	Qle	--	32	Mar. 1962	T,E, 7-1/2	Irr	Dug well. Reported discharge 300 gpm. Irrigated 30 acres in 1961.
606	Oscar Boenig	--	--	38	--	Qle	--	51.8	Aug. 15, 1957	C,W	D,S	Dug well. Supplies water for 30 head of livestock. Never dry.
607	Arthur Skolaut	--	--	36	6	Qle	--	29.3	do	J,E	D,S	Supplies water for 70 head of cattle. Never dry.
608	Bill's Ice Station	--	1940	--	6	Qle	--	27.3	Aug. 16, 1957	J,E	D	Supplies water for ice house and residence.
609	O. L. Peters	--	1947	36	6	Qle	--	28.5	Aug. 15, 1957	J,E	D	Bored well. Reported gravel from 25 ft to bottom.
610	Herman Woerndell	--	--	33	6	Qle	--	29.2	do	J,E	D,S	
* 801	P. Moltz	--	1925	135	6	Twi	--	90.0 88.3	Sept. 6, 1936 Nov. 14, 1963	C,W	S	Reported strong supply. Well 438 in Guadalupe County report, 1937.
802	Otto E. Boecker well 1	John H. Hueners	1954	1,877	--	--	610	--	--	--	--	Oil test. 1/
803	A. Germann	--	--	80	--	Twi	605	77.3	Nov. 20, 1963	C,W	S	Dug well. Reported weak supply. Old well.
804	Mrs. Louis Moltz	--	1924?	130	6	Twi	--	110	Nov. 1963	C,W	S	Cased to bottom. Reported water of poor quality.
901	Eugene Boecker	H. W. Schubert	1947	156	4	Twi	--	30	Nov. 1963	C,W	S	Do.
902	H. P. Harwood	do	1962	230	7, 5	Twi	--	80	Jan. 1964	T,E, 1-1/2	D,S	Casing: 7-in. to 160 ft, 5-in. from 160 ft to bottom. Reported strong supply. 3/
* 903	Arthur Acker	--Gorman	1914	95	6	Twi	--	80	1936	C,W	N	Not in use Jan. 29, 1964. Well 377 in Guadalupe County report, 1937.
39-601	E. J. Zuehl well 1	Utah Oil Corp.	1949	1,699	--	--	510	--	--	--	--	Oil test. 4/
* 40-101	H. S. Muelder	Vicente Duran	1925	24	--	Twi	--	7.5	June 2, 1936	J,E	D	Dug well.
* 102	W. E. Tewes	Robert Stein	1906	70	5	Twi	560	48.3 45.7	Sept. 2, 1936 Nov. 14, 1963	C,W	D,S	Reported strong supply.
103	do	Sinclair Oil & Gas Co.	1929	2,075	--	--	--	--	--	--	--	Oil test. Well 435 in Guadalupe County report, 1937.
104	E. Theiss well 1	Joe Carlson	1955	679	--	--	570	--	--	--	--	Oil test. 2/

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
*KX-68-40-105	W. L. Pence	Fred Sahley	1955	112	6, 4	Twi	--	69	Feb. 1964	C,E, 1/2	D,S	Casing: 6-in. to 90 ft, 4-in. from 90 ft to bottom; perforated 90 ft at bottom. Pump set at 82 ft.
106	Melvin Strey	H. W. Schubert	1962	69	12	Twi	--	--	--	-,E	D	Cased to bottom. 3/
201	R. R. McBride	Roland Herbold	1957	263	4	Twi	--	70	Nov. 1963	J,E, 1	D,S	Cased to bottom. Pump set at 120 ft.
202	Kubela well 1	Gasoline Production Co.	1957	1,886	--	--	554	--	--	--	--	Oil test. 4/
203	-- Kunde well 1	Sutton Production Co.	1960	3,775	--	--	528	--	--	--	--	Oil test. 2/
301	D. Brewer	Roland Herbold	--	254	--	--	--	100	Mar. 1964	T,E	D,S	
302	do	Roland K. Blumberg	1962	407	3	Twi	--	70.5	Mar. 5, 1964	A,E	Irr	Reported irrigated about 12 acres of pasture in 1963. 2-in. discharge pipe. Cased to 360 ft.
* 303	Paul Woelke	Silas Wright	1932	123	6	Twi	--	118.0 104.5	Oct. 8, 1936 Nov. 20, 1963	C,W	D,S	Reported strong supply. Well 378 in Guadalupe County report, 1937.
* 304	Roland Herbold	Roland Herbold	1961	220	4	Twi	--	120	Feb. 1964	T,E, 2	D,S	Reported discharge 5 gpm. Pump set at 140 ft. 3/
305	Edmond Schomekel	do	1960	245	4	Twi	515	37.3	Dec. 4, 1963	T,E, 1/2	D,S	Cased to bottom. Formerly supplied Elm Creek School. Reported strong supply. 3/
306	Ben Stein well 1	Lake Rice Mills	--	1,979	--	--	567	--	--	--	--	Oil test. 2/
307	N. Mierhofer well 1	C. C. Winn	1955	1,005	--	--	550	--	--	--	--	Oil test. 4/
308	E. Gerdes well 1	Lake Rice Mills	1953	2,006	--	--	580	--	--	--	--	Oil test. See geologic section A-A'.
309	O. O. Clark	Roland Herbold	1959	225	4	Twi	--	136	Mar. 1964	C,E, 1/2	D,S	Cased to 200 ft. Reported strong supply.
* 401	Paul Pape	--	--	64	36	Twi	541	54.9 47.6	Sept. 8, 1936 Nov. 14, 1963	C,W	D,S	Dug well. Well 432 in Guadalupe County report, 1937.
* 402	Robert Waltisperger	Silas Wright	1915	115	--	Twi	--	78.0	Sept. 2, 1936	C,W	D,S	Reported water from gravel 90 to 95 ft. Well 431 in Guadalupe County report, 1937.
403	J. Hollingsworth well 1	B. W. Hudgens	1957	1,834	--	--	572	--	--	--	--	Oil test. 4/
404	Willie Warnecke well 1	Brance Oil Co.	1949	1,077	--	--	500	--	--	--	--	Do.
405	Alfred Mattke	Roland Herbold	1960	125	4	Twi	--	--	--	T,E	D,S	
406	E. J. Zuehl	--	--	160	6	Twi	555	77.9	Feb. 18, 1964	--	S	Reported water sand from 124 ft to bottom.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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
KX-68-40-407	W. E. Walker	T. Blount	1963	310	7	Twi	485	16.3	Mar. 19, 1964	T,E, 5	S,Ind	Reported discharge 50 gpm. Supplies water for drilling rigs. Will supply water for irrigation in future.
501	W. M. Gibbons well 1	W. R. Parrish, et al.	--	--	--	--	512	--	--	--	--	Oil test. 4/
502	-- Newman well 4	Rouse Exploration Co.	1940	2,174	--	--	501	--	--	--	--	Do.
601	-- Voight well 1	Lundells Inc.	1955	1,065	--	--	593	--	--	--	--	Do.
602	J. E. Clark well 1	S. F. Springs	1934	--	--	--	540	--	--	--	--	Oil test. 1/
* 603	Reno Voight	Charles Behrens	1963	210	4	Twi	--	--	--	T,E, 1/4	D	Cased to bottom.
* 604	Oscar Walker	--Weidner	1963	190	5	Twi	--	--	--	T,E	D,S	Cased to 20 ft; slotted at bottom. Pump set at 100 ft.
* 605	Ernst Kleinschmidt	Roland Herbold	1961	118	4	Twi	--	--	--	C,E	D,S	
606	Albert Hoefmann	Charles Behrens	1963	95	5	Twi	--	--	--	C,W	S	Cased to bottom. Reported water in blue sand 58 ft to bottom.
* 701	C. J. Cantu	H. W. Schubert	1962	71	5	Twi	--	30	Mar. 1962	J,E, 1/2	D,S	Cased to bottom. Reported discharge 10 gpm. Temp. 75°F.
702	Eddie Doege	-- Markgraf	1944	100?	8	Twi	--	--	--	J,E, 1	D	Pump set at 80 ft.
* 703	Ross Scull	Moye Drilling Co.	1956	508	12, 7	Twi	500	69.7 64.6	Nov. 19, 1963 Feb. 18, 1964	T,E, 60	D,S	Casing slotted at two intervals. Pump set at 250 ft. Reported discharge 1,800 gpm in 1956 when tested.
704	I. A. Echels well 1	Freeman Crenshaw	1950	786	--	--	491	--	--	--	--	Oil test. 2/
705	Alfred Doege well 1	W. O. Fortenberry	1955	964	--	--	494	--	--	--	--	Do.
706	C. E. Scull well 2	do	1955	769	--	--	455	--	--	--	--	Do.
707	Eric Koepp well 2	do	1955	1,040	--	--	463	--	--	--	--	Do.
708	-- Mattke well 1	H. H. Weinert	1949	2,013	--	--	510	--	--	--	--	Oil test. See geologic section A-A'. 2/
* 709	W. C. Poehlmann	H. W. Schubert	1962	140	4	Twi	--	30	Feb. 1964	J,E	D	Reported not used for drinking purposes. Pump set at 115 ft.
* 710	Ed Lee	Moye Drilling Co.	1959	256	7	Twi	--	40	1959	C,E	D,S	Cased to 186 ft. Reported strong supply.
801	D. G. Hale	H. & S. Drilling Co.	1962	565	8	Twi	537	115.0	Feb. 17, 1964	T,E	Irr	Cased to bottom. 3/
* 802	Lovette Wishert	T. Blount	1963	476	8	Twi	505	59.6	Feb. 18, 1964	T,E, 30	Irr	Cased to 246 ft. Estimated discharge 300 to 400 gpm. 4-in. discharge pipe.

See footnotes at end of table.

Table 3.--Records of wells and springs in Guadalupe 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			
KX-68-40-803	E. Doege well 1	Glasscock Oil Co.	1954	1,500	--	--	554	--	--	--	--	Oil test. 4/
* 901	D. G. Hale	H. W. Schubert	1950	175	4	Twi	--	75	Apr. 1962	C,E, 3/4	D,S	Cased to bottom. Reported water in sand from 145 ft to bottom. Temp. 73°F.
* 902	do	H. & S. Drilling Co.	1961	576	12, 8	Twi	--	172.5 171.8	Feb. 17, 1964 Mar. 9, 1964	T,G	S,Irr	Casing: 12-in. to 276 ft, 8-in. from 276 ft to bottom; perforated 80 ft at bottom. Measured discharge 310 gpm, Mar. 25, 1964. Pump set at 350 ft. Temp. 78°F.
* 903	B. Pernitz	James Murphy	1910	145	6	Twi	--	140	1936	C,W	D,S	Pump set at 100 ft in 1963. Well 426 in Guadalupe County report, 1937.
904	-- Feiselman well 1	C. M. S. Oil Co.	1955	1,356	--	--	554	--	--	--	--	Oil test. 2/
905	-- Hoermann well 4	M. Hauset, et al.	1955	2,010	--	--	595	--	--	--	--	Do.

* Chemical analysis of well, or spring, in this report. (See Table 6.)
1/ Electric log in files of U.S. Geological Survey, Austin, Texas.
2/ Electric log in files of Texas Water Development Board, Austin, Texas.
3/ Drillers' log of well, or spring, in this report. (See Table 5.)
4/ Electric log in files of Roland K. Blumberg, Seguin, Texas.
5/ Historical measurements of water levels in well, or spring, in this report. (See Table 4.)

Table 4.--Water levels in wells in Guadalupe County
(in feet below land surface datum)

Date	Water level	Date	Water level	Date	Water level
Well KX-68-23-801					
Owner: Reinhold Wenzel.					
Oct. 12, 1956	113.60	June 8, 1959	96.06	May 9, 1960	96.04
Sept. 15, 1958	104.53	Aug. 3	99.82	May 30	97.96
Oct. 14	100.53	Dec. 2	101.62	July 11	96.78
Dec. 15	97.33	Jan. 7, 1960	100.94	a/Aug. 4	100.02
Jan. 14, 1959	97.82	Mar. 8	98.91		
Apr. 7	99.85	Apr. 7	98.60		
Well KX-68-24-511					
Owner: Alfred Liebscher.					
Nov. 21, 1957	10.86	Oct. 14, 1958	8.17	Apr. 28, 1964	5.30
May 21, 1958	9.13	Nov. 17	8.01		
Sept. 15	8.44	Dec. 15	8.10		
Well KX-68-30-201					
Owner: Alvin Friesenhahn.					
Oct. 2, 1933	107.65	Apr. 22, 1938	104.99	Mar. 1, 1939	108.87
Dec. 12, 1936	100.22	May 19	100.86	Mar. 18	109.70
Jan. 16, 1937	100.79	July 20	105.75	Apr. 23	110.69
Dec. 15	105.76	Aug. 25	106.23	Oct. 5	116.13
Jan. 21, 1938	103.55	Sept. 28	107.99	Dec. 19	112.82
Feb. 2	108.35	Dec. 12	107.50	Jan. 30, 1940	112.96
Mar. 30	102.61	Jan. 24, 1939	107.46	Mar. 22	115.06

a/ Pumped recently.

(Continued on next page)

Table 4.--Water levels in wells in Guadalupe County--Continued

Well KX-68-30-201--Continued

Date	Water level	Date	Water level	Date	Water level
Apr. 30, 1940	114.56	Dec. 21, 1943	110.41	Sept. 15, 1958	143.83
May 23	114.80	Aug. 24, 1944	110.71	Oct. 14	106.58
June 21	113.62	Dec. 19	105.43	Nov. 17	100.29
July 25	115.07	May 23, 1945	103.95	Jan. 19, 1959	102.76
Aug. 28	117.04	Mar. 19, 1946	107.57	Apr. 8	107.06
Sept. 24	117.99	July 5, 1947	110.82	June 8	110.08
Oct. 19	117.25	Nov. 8	113.25	Aug. 5	113.52
Dec. 4	114.22	June 25, 1948	122.46	Oct. 9	108.05
Jan. 23, 1941	111.67	Jan. 10, 1949	121.99	Dec. 2	106.06
Mar. 25	105.23	Dec. 7, 1949	116.01	Jan. 5, 1960	103.90
May 29	100.20	Feb. 1, 1950	115.92	Mar. 11	105.29
Nov. 14	103.89	Apr. 10	118.84	Apr. 12	107.46
Apr. 9, 1942	106.34	Jan. 22, 1951	124.04	a/Oct. 3	113.59
Aug. 6	109.96	May 21, 1958	105.50	a/Nov. 3	109.24
Apr. 20, 1943	105.70	June 19	107.43		
Sept. 3	110.24	July 18	140.51		

a/ Pumped recently.

Well KX-68-30-206

Owner: Alvin Friesenhahn.

Oct. 2, 1933	26.08	Jan. 21, 1938	74.04	May 19, 1938	73.12
Dec. 12, 1936	73.99	Feb. 2	73.72	June 23	74.23
Jan. 16, 1937	75.37	Mar. 30	73.69	July 20	74.83
Dec. 15	71.21	Apr. 22	73.49	Aug. 25	75.22

(Continued on next page)

Table 4.--Water levels in wells in Guadalupe County--Continued

Date	Water level	Date	Water level	Date	Water level
Well KX-68-30-206--Continued					
Sept. 28, 1938	75.43	Dec. 19, 1939	76.70	Sept. 24, 1940	76.54
Dec. 12	75.80	Jan. 30, 1940	76.69	Oct. 29	76.06
Jan. 24, 1939	75.53	Feb. 20	75.66	Dec. 4	75.32
Mar. 1	74.22	Mar. 22	76.46	Jan. 23, 1941	74.92
Mar. 28	75.56	Apr. 30	75.48	Mar. 25	52.12
Apr. 23	75.98	May 23	63.70	May 29	71.99
May 25	75.64	June 21	60.88	Apr. 9, 1942	72.79
July 4	76.37	July 25	75.66		
Oct. 5	76.48	Aug. 28	76.43		
Well KX-68-30-302					
Owner: C. L. Worthy.					
Jan. 14, 1959	104.28	July 11, 1960	117.08	Nov. 30, 1961	106.00
Apr. 7	108.13	Aug. 4	117.02	Jan. 29, 1962	108.04
June 8	110.73	Oct. 3	114.81	Nov. 21	120.49
Aug. 3	114.41	Nov. 3	106.54	Jan. 26, 1963	119.45
Oct. 9	111.42	Dec. 9	104.63	Mar. 21	120.88
Dec. 2	108.29	Jan. 26, 1961	102.31	July 23	82.21
Jan. 5, 1960	106.82	Mar. 24	103.60	Sept. 24	134.55
Mar. 8	106.57	b/ May 24	181.50	Jan. 24, 1964	126.52
Apr. 8	106.45	July 18	108.39	Mar. 26	125.33
May 9	107.64	Sept. 27	109.06	July 20	140.10
May 30	113.06	Oct. 25	107.28		

b/ Pumping.

Table 4.--Water levels in wells in Guadalupe County--Continued

Date	Water level	Date	Water level	Date	Water level
Well KX-68-30-601					
Owner: Walter Kramer.					
Sept. 15, 1958	71.5	May 30, 1960	54.97	Feb. 20, 1962	53.22
Oct. 14	51.54	July 8	60.38	May 25	61.93
Nov. 17	46.10	Aug. 3	60.33	July 26	73.18
Dec. 15	47.63	Oct. 3	58.76	Sept. 28	67.15
Jan. 14, 1959	47.73	Nov. 3	48.52	Nov. 21	64.26
Apr. 7	51.60	Dec. 9	47.66	Jan. 26, 1963	61.75
June 8	54.41	Jan. 26, 1961	45.36	Mar. 21	63.41
Aug. 3	58.38	Mar. 24	47.88	May 21	69.35
Oct. 9	54.10	May 24	57.24	July 23	82.21
Dec. 2	51.60	July 18	51.10	Sept. 24	79.74
Jan. 5, 1960	50.04	Sept. 27	52.70	Nov. 21	73.60
Mar. 8	50.11	Oct. 25	51.38	Jan. 24, 1964	71.98
Apr. 7	51.82	Nov. 30	49.35	Mar. 26	69.86
May 9	51.44	Jan. 29, 1962	51.45	July 20	84.39
Well KX-68-31-103					
Owner: Harold Jansing.					
June 8, 1959	179.88	May 30, 1960	178.24	Jan. 26, 1961	175.32
Aug. 3	185.85	July 8	182.10	Mar. 24	175.64
Dec. 2	181.60	Aug. 3	183.05	May 24	180.81
Mar. 11, 1960	177.92	Oct. 6	182.60	Feb. 20, 1962	184.50
Apr. 7	177.73	Nov. 3	185.50		
May 9	177.90	Dec. 9	177.52		

Table 4.--Water levels in wells in Guadalupe County--Continued

Date	Water level	Date	Water level	Date	Water level

Well KX-68-31-114

Owner: Ernest Schlather.

May 21, 1958	34.32	Sept. 15, 1958	43.38	Dec. 15, 1958	32.63
June 19	33.63	Oct. 14	42.37		
July 18	34.81	Nov. 17	27.70		

Well KX-68-31-201

Owner: Henry Weil.

Sept. 15, 1958	111.66	Aug. 3, 1959	103.40	May 30, 1960	99.80
Oct. 14	107.45	Oct. 9	104.58	July 8	101.82
Nov. 18	101.67	Dec. 2	103.04	Aug. 4	103.20
Dec. 15	101.90	Jan. 5, 1960	101.80	Oct. 3	103.87
Jan. 14, 1959	100.79	Mar. 8	100.26	Dec. 9	97.95
Apr. 7	104.20	Apr. 7	99.92	May 7, 1964	113.04
June 8	99.92	May 9	100.41		

Well KX-68-31-202

Owner: Carl Kosseth.

Oct. 29, 1957	126.52	Dec. 15, 1958	123.53	Apr. 7, 1960	123.05
May 21, 1958	124.07	b/Jan. 14, 1959	130.21	May 9	123.07
June 19	125.34	Apr. 7	123.59	May 30	123.84
July 18	125.02	June 8	123.38	July 8	123.75
Sept. 15	139.50	Aug. 3	126.53	Aug. 3	125.06
Oct. 14	128.63	Oct. 9	123.73	Oct. 3	128.92
Nov. 18	122.47	Mar. 8, 1960	123.18	Nov. 3	119.24

b/ Pumping.

Table 4.--Water levels in wells in Guadalupe County--Continued

Date	Water level	Date	Water level	Date	Water level
Well KX-68-31-507					
Owner: Richard Tolle.					
Sept. 15, 1958	52.00	Oct. 9, 1959	50.99	July 8, 1960	41.30
Oct. 14	44.84	Dec. 2	40.32	Aug. 3	41.95
Nov. 18	37.31	Jan. 5, 1960	38.92	Oct. 3	42.97
Jan. 14, 1959	37.40	Mar. 8	37.55	Nov. 3	37.61
Apr. 7	38.00	Apr. 7	37.68	Dec. 9	34.89
June 8	38.22	May 9	37.84	May 8, 1964	52.90
Aug. 3	42.37	May 30	38.85		

Table 5.--Drillers' logs or wells in Guadalupe County

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

Well KX-67-18-305

Owner: Lem Allen. Driller: E. B. Kutscher.

Sand	3	3	Sand, water	31	105
Dirt, red	15	18	Rock	107	112
Sand	4	22	Sand, water	2	114
Gravel	1	23	Lignite	4	118
Shale	12	35	Sand, water	1	119
Rock	28	63	Shale	41	160
Shale	1	64	Sand, water	9	169
Shale, gray	10	74	Rock	3	172

Well KX-67-19-407

Owner: Vernon Engelke. Driller: Davenport Irrigation Equipment Co.

Clay and sandy clay	50	50	Rock	3	185
Sand, fine and gravel	15	65	Shale, sandy	5	190
Shale, sandy	15	80	Shale, sticky, black	10	200
Rock	2	82	Shale	20	220
Shale	18	100	Sand, fine	5	225
Sand, fine	15	115	Shale	15	240
Rock and sandy shale	20	135	Sand, fine	6	246
Sand, fine with hard streaks	15	150	Shale and sandy shale	19	265
Shale	5	155	Sand, fine	10	275
Rock	3	158	Shale	85	360
Sand, fine	12	170	Rock	2	362
Shale	12	182	Shale	118	480

Table 5.--Drillers' logs of wells in Guadalupe County--Continued

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

Well KX-67-25-507

Owner: Jack Mondin. Driller: Roland Herbold.

Topsoil----------	3	3	Rock, blue----------	1	97
Rock, gravel and clay----	17	20	Shale, blue----------	10	107
Sand and clay, yellow----	20	40	Rock, blue----------	1	108
Shale, blue----------	15	55	Shale, blue----------	12	120
Sand----------	8	63	Sand, blue, and shale streaks----------	10	130
Shale, blue----------	13	76	Shale, blue----------	10	140
Rock----------	2	78			
Shale, blue----------	18	96			

Well KX-67-25-702

Owner: Faust Rest Home. Driller: Charles Behrens.

Clay, brown, sandy-------	45	45	Clay, blue----------	35	125
Clay, blue----------	30	75	Sand, blue and rocks----	32	157
Clay and sand, streaks, blue----------	15	90	Clay, blue----------	3	160

Well KX-67-25-807

Owner: Cleburne Soefje. Driller: Charles Behrens.

Clay, brown----------	51	51	Sand and clay streaks---	13	173
Sand----------	6	57	Clay, blue----------	29	202
Clay, blue----------	15	72	Sand and rock----------	5	207
Sand----------	4	76	Clay, blue----------	3	210
Clay, blue----------	26	102	Sand----------	23	233
Sand----------	15	117	Clay, blue----------	20	253
Clay, blue----------	43	160			

Table 5.--Drillers' logs of wells in Guadalupe County--Continued

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

Well KX-67-26-505

Owner: R. D. Hoover. Driller: H. W. Schubert.

No record	20	20	Sand, water	5	335
Slate and rocks	25	45	Slate and rocks	14	349
Sand, water	220	265	Sand, water	15	364
Slate and rocks	65	330	Slate	6	370

Well KX-67-27-702

Owner: Dusker Harris. Driller: John Perryman.

Gravel	4	4	Sand, bailed dry	23	153
Clay	6	10	Shale and boulders	237	390
Sand	30	40	Rock	6	396
Clay, blue	57	97	Shale, sandy	22	418
Sandrock	4	101	Rock, hard	4	422
Shale	25	126	Sand, water	40	462
Sandrock	4	130			

Well KX-67-33-301

Owner: W. W. Hohertz. Driller: Charles Behrens.

Clay, brown	25	25	Clay, blue	6	115
Clay, blue	15	40	Rock	1	116
Rock	2	42	Sand	22	138
Sand, brown	38	80	Clay, blue	30	168
Clay, blue	26	106	Rock	1	169
Rock	3	109	Clay, blue	11	180

(Continued on next page)

Table 5.--Drillers' logs of wells in Guadalupe County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well KX-67-33-301--Continued					
Sand streaks and rock----	25	205	Shale, blue----------	8	248
Rock and sandy streaks---	10	215	Sand----------	50	298
Sand streaks----------	25	240	Clay, blue----------	7	305
Well KX-68-31-204					
Owner: W. C. Straub. Driller: T. E. Owen.					
Surface soil----------	3	3	Limestone----------	57	292
Clay, yellow----------	50	53	Clay----------	49	341
Chalk----------	157	210	Limestone----------	93	434
Shale----------	25	235			
Well KX-68-31-401					
Owner: City of Cibolo. Driller: J. R. Johnson.					
Soil----------	3	3	Shale----------	19	295
Clay, yellow and gravel--	47	50	Lime----------	47	342
Shale----------	51	101	Clay----------	68	410
Marl----------	73	174	Limestone----------	192	602
Chalk----------	102	276			
Well KX-68-32-902					
Owner: H. P. Harwood. Driller: H. W. Schubert.					
Sand and clay----------	80	80	Rock----------	2	120
Shale----------	20	100	Shale----------	32	152
Rock----------	5	105	Rock and sand----------	2	154
Shale----------	13	118	Shale----------	2	156

(Continued on next page)

Table 5.--Drillers' logs of wells in Guadalupe County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well KX-68-32-902--Continued					
Rock	1	157	Rock	3	195
Shale	23	180	Sand, water	30	225
Rock	1	181	Shale	5	230
Shale, sandy	11	192			
Well KX-68-40-106					
Owner: Melvin Strey. Driller: H. W. Schubert.					
Clay, sandy	23	23	Sand and clay	24	50
Sand, water	3	26	Shale, blue	19	69
Well KX-68-40-304					
Owner: Roland Herbold. Driller: Roland Herbold.					
Clay, yellow and sand	32	32	Shale, blue	155	200
Rock	1	33	Sand, blue	20	220
Clay, yellow	12	45			
Well KX-68-40-305					
Owner: Edmund Schmoekel. Driller: Roland Herbold.					
Surface soil and clay, yellow	25	25	Rock, blue	1	65
Clay, yellow	11	36	Shale, blue	8	73
Rock	1	37	Rock	2	75
Clay, blue	19	56	Sand, blue	5	80
Rock	1	57	Shale, blue	18	98
Sand, blue and shale	7	64	Rock, blue	2	100

(Continued on next page)

Table 5.--Drillers' logs of wells in Guadalupe County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well KX-68-40-305--Continued					
Sand, blue	3	103	Sand, blue	4	158
Rock, blue	2	105	Shale, blue	57	215
Sand, blue	8	113	Rock, blue	1	216
Rock, blue	2	115	Shale, blue	2	218
Sand, blue	5	120	Rocks and shale, blue	18	236
Rock and shale streaks	17	137	Rock, blue, and pyrite	5	241
Shale, blue	17	154	Sand, blue	4	245

Well KX-68-40-801

Owner: D. G. Hale. Driller: H. & S. Drilling Co.

Clay	35	35	Shale	71	445
Shale with hard streaks	200	235	Shale, sandy, hard streaks	60	505
Shale	62	297	Sand, hard streaks	60	565
Shale with hard streaks	18	315			
Shale, sandy	59	374			

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County

[Analyses given are in parts per million except specific conductance, pH, percent sodium, sodium adsorption ratio, and residual sodium carbonate.]

Water-bearing unit: Qle, Alluvium and Leona Formation; Ka, Austin Chalk; Kea, Edwards and associated limestones; Tr, Reklaw Formation; Tc, Carrizo Sand; Twi, Wilcox Group.

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-67-09-502	15	Nov. 20, 1957	--	--	--	--	--	--		313	--	179	--	--	--	--	408	--	--	0.00	1,590	7.6
601	--	do	--	--	--	--	--	--		144	--	440	--	--	--	--	1,160	--	--	.00	3,590	7.6
10-404	25	do	Qle	10	--	120	7.3	*99		218	106	142	--	68	--	685	330	39	2.4	.00	1,110	7.7
17-301	11	do	--	--	--	--	--	--		288	--	1,640	--	--	--	--	2,020	--	--	.00	7,250	7.9
401	35	Dec. 4, 1957	Qle	--	--	--	--	--		495	--	348	--	--	--	--	570	--	--	.00	2,410	7.2
409	35	do	Qle	--	--	--	--	--		296	--	38	--	--	--	--	259	--	--	.00	643	7.3
413	18	May 5, 1964	Qle	19	--	109	5.8	*45		292	24	64	0.4	48	0.17	459	296	25	1.1	.00	768	7.2
702	27	June 1, 1936	Qle	--	--	125	11	*8		366	--	54	--	--	--	378	358	--	--	.00	--	--
702	27	Nov. 20, 1957	Qle	22	--	130	6.1	*38		364	21	52	--	48	--	495	350	19	.9	.00	817	7.9
708	28	do	Qle	--	--	--	--	--		280	--	47	--	--	--	--	279	--	--	.00	716	7.4
712	42	Dec. 3, 1957	Qle	--	--	--	--	--		241	--	830	--	--	--	--	885	--	--	.00	3,400	7.4
715	34	May 4, 1964	Qle	23	--	272	16	*150		272	80	380	.4	280	--	1,340	744	30	2.4	.00	2,160	7.0
804	33	Nov. 20, 1957	Qle	23	--	91	5.5	*58		289	27	51	--	49	--	442	250	34	1.6	.00	731	7.8
805	40	do	Qle	--	--	--	--	--		416	--	720	--	--	--	--	1,040	--	--	.00	3,530	7.7
807	Spring	May 5, 1964	Qle	21	--	102	7.2	*39		308	20	33	.4	60	--	434	284	23	1.0	.00	711	7.7
18-102	50	Nov. 20, 1957	--	--	--	--	--	--		220	--	380	--	--	--	--	1,280	--	--	.00	3,690	7.9
403	174	Aug. 1957	Twi	--	--	--	--	--		404	--	370	--	--	--	--	1,960	--	--	.00	5,020	7.0
403	174	Nov. 20, 1957	Twi	--	--	--	--	--		454	--	390	--	--	--	--	1,900	--	--	.00	5,040	7.7
503	140	Feb. 20, 1964	Twi	36	3.8	87	10	*55		337	27	51	.4	.0	--	432	258	32	1.5	.36	688	7.4
506	180	Mar. 3, 1964	Twi	12	--	78	38	*623		265	355	790	--	6.0	--	2,030	351	79	14	.00	3,450	7.9
601	80	Sept. 21, 1936	Twi	--	--	--	--	--		61	409	1,560	--	--	--	3,070	--	--	--	--	--	--
603	180	Feb. 6, 1964	Twi	34	6.9	80	24	*108		448	84	55	.3	.2	--	606	298	44	2.7	1.38	961	7.7
801	156	Apr. 13, 1962	Twi	36	1.1	87	14	60	4.3	333	48	64	.2	.0	.42	478	274	32	1.6	.00	772	6.9
804	240	Jan. 27, 1964	Twi	18	3.4	32	12	*131		380	23	54	.3	1.5	--	459	130	69	5.0	3.64	766	7.7
805	310	Feb. 20, 1964	Twi	31	--	134	18	*50		300	66	144	.1	.0	--	591	408	21	1.1	.00	1,020	7.5

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-67-18-903	165	Sept. 21, 1936	Twi	--	--	16	12	*61		171	16	44	--	--	--	233	87	--	2.8	1.06	--	--
19-404	180	Sept. 26, 1936	Twi	--	--	--	--	--		311	52	980	--	--	--	1,861	--	--	--	--	--	--
404	180	Mar. 3, 1963	Twi	12	--	48	41	*678		402	62	970	--	0.5	--	2,010	288	84	17	.82	3,680	7.4
702	103	Sept. 16, 1936	Twi	--	--	--	--	--		305	44	90	--	--	--	453	--	--	--	--	--	--
703	43	Feb. 6, 1964	Twi	28	3.5	37	13	*53		58	33	98	0.2	50	--	341	146	44	1.9	.00	573	6.8
704	450	Jan. 27, 1964	Twi	19	--	42	17	*448		480	27	515	.4	.8	--	1,310	175	85	15	4.37	2,340	7.8
25-204	16	Nov. 20, 1957	Qle	--	--	--	--	--		334	--	158	--	--	--	--	460	--	--	.00	1,400	7.5
403	60	Apr. 26, 1962	Twi	46	5.2	186	32	*85		198	552	30	.5	.2	--	1,030	596	24	1.5	.00	1,310	6.3
502	200	do	Twi	17	.59	73	31	*406		392	334	362	.2	17	--	1,430	310	74	10	.23	2,350	7.3
507	140	Jan. 28, 1964	Twi	17	--	230	11	*85		232	51	270	.1	120	--	947	619	23	1.5	.00	1,650	7.4
603	178	Feb. 6, 1964	Twi	17	.01	180	80	*257		372	256	530	--	22	--	1,530	778	42	4.0	.00	2,520	7.6
701	290	Apr. 26, 1962	Twi	18	4.0	51	25	*290		432	276	155	.2	.0	--	1,030	230	73	8.3	2.48	1,620	7.4
704	75	Oct. 9, 1936	Twi	--	--	--	--	--		201	38	72	--	--	--	337	--	--	--	--	--	--
704	75	Jan. 29, 1964	Twi	49	2.0	56	19	*68		188	51	112	.4	.0	--	447	218	41	2.0	.00	752	6.8
804	185	Jan. 28, 1964	Twi	47	3.9	149	24	*80		312	134	175	.5	1.2	--	764	470	27	1.6	.00	1,230	7.3
806	100	Oct. 9, 1936	Twi	--	--	138	53	*223		354	295	320	--	--	--	1,203	562	--	--	.00	--	--
807	253	Jan. 28, 1964	Twi	28	--	83	20	*132		334	138	112	.4	.0	0.17	677	290	50	3.4	.00	1,100	7.6
901	229	May 4, 1962	Twi	24	1.5	99	4.7	*32		281	14	24	.4	70	--	432	266	21	.9	.00	667	6.6
902	120	do	Twi	46	15	475	69	*217		270	912	545	.3	1.0	--	2,400	1,470	24	2.5	.00	3,340	6.3
903	265	do	Twi	24	.28	46	24	*108		352	59	69	.2	1.0	--	502	214	52	3.2	1.50	842	7.0
905	395	July 21, 1964	Twi	21	.13	19	19	148	4.2	370	60	60	.2	.2	.24	514	126	71	5.7	3.55	845	8.2
908	105	Jan. 28, 1964	Twi	27	3.4	160	39	*88		416	216	130	.7	.0	--	866	560	26	1.6	.00	1,370	7.2
26-103	50	Feb. 5, 1964	Twi	45	.09	988	203	*282		248	984	1,320	--	1,020	--	4,960	3,300	16	2.1	.00	6,690	7.8
104	110	Mar. 3, 1964	Twi	52	--	78	14	*60		270	101	38	.5	.2	--	478	252	34	1.6	.00	721	7.9
302	130	Sept. 21, 1936	Twi	--	--	53	25	*74		92	40	198	--	--	--	435	235	--	2.1	.00	--	--
307	360?	Feb. 6, 1964	Twi	15	2.2	29	22	*212		1412	87	138	.4	.2	--	707	163	74	7.2	3.23	1,180	8.3
402	90	Sept. 23, 1936	Twi	--	--	173	17	*128		317	181	234	--	--	--	889	500	--	2.5	.00	--	--

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (*SAR*)	Residual sodium carbonate (*RSC*)	Specific conductance (micromhos at 25°C)	pH
KX-67-26-403	100	Feb. 5, 1964	Twi	51	1.1	210	31	*126		432	42	345	0.7	50	--	1,070	652	30	2.1	0.00	1,840	7.5
505	370	Feb. 6, 1964	Twi	19	5.4	53	47	*199		380	218	155	.3	.0	--	878	326	57	4.8	.00	1,420	8.0
506	254	July 22, 1964	Twi	38	--	132	27	*131		334	137	216	.7	2.8	--	848	440	39	2.7	.00	1,430	7.4
507	100	do	Twi	46	27	149	41	*122		258	223	254	1.2	1.5	--	965	540	33	2.3	.00	1,570	6.6
802	120	Jan. 28, 1964	Twi	25	--	102	33	*132		330	192	145	.3	.0	--	791	390	42	2.9	.00	1,280	7.6
803	111	Jan. 27, 1964	Twi	72	--	460	59	*504		348	444	1,220	--	22	--	2,950	1,390	44	5.9	.00	4,740	7.0
805	119	Jan. 28, 1964	Twi	51	--	56	13	*175		198	114	205	.5	3.1	--	715	193	66	5.5	.00	1,200	6.8
901	120	Mar. 18, 1936	Twi	--	--	198	65	*253		61	317	660	--	--	--	1,520	760	--	4.0	.00	--	--
903	52	Apr. 1, 1936	Twi	--	--	238	17	*219		61	103	700	--	--	--	1,310	666	--	3.7	.00	--	--
903	52	Jan. 27, 1963	Twi	25	--	82	4.7	*118		348	86	47	.6	46	--	580	224	53	3.4	1.22	907	7.5
27-101	210	Mar. 25, 1940	Twi	--	--	48	16	*70		240	40	85	.8	--	--	408	186	--	2.2	.21	--	7.9
201	171	Apr. 17, 1936	Twi	--	--	--	--	--		55	25	26	--	--	--	121	--	--	--	--	--	--
401	27	Aug. 20, 1964	Tc	25	.03	69	6.3	*15		248	14	8.8	.2	1.2	--	262	198	15	.5	.10	424	6.5
33-201	278	Mar. 5, 1964	Twi	40	3.1	148	32	*81		358	149	162	.2	.2	--	788	501	26	1.6	.00	1,280	7.0
203	75	Oct. 1, 1936	Twi	--	--	7	9	*32		104	14	18	--	--	--	131	56	--	1.9	.58	--	--
205	--	Feb. 12, 1936	--	--	--	264	117	*171		110	389	235	--	--	--	1,730	1,140	--	2.2	.00	--	--
206	33	Oct. 1, 1936	Twi	--	--	--	--	--		220	28	45	--	--	--	290	--	--	--	--	--	--
209	401	Feb. 19, 1964	Twi	35	2.3	108	23	*74		286	114	121	.6	.0	--	617	364	31	1.7	.00	984	7.4
307	438	Mar. 5, 1964	Twi	43	33	43	17	*46		132	53	79	.7	.2	--	347	178	36	1.5	.00	566	6.7
401	81	Feb. 17, 1936	Twi	--	--	541	147	*378		159	747	1,330	--	--	--	3,220	1,960	--	3.7	.00	--	--
501	900	May 26, 1959	Twi	24	--	84	26	86	8.0	277	122	109	.4	.2	--	612	316	36	2.1	.00	988	7.9
503	247	Feb. 5, 1964	Twi	33	33	118	26	*92		224	88	230	.5	1.0	--	699	402	33	2.0	.00	1,250	6.8
505	Spring	June 4, 1964	Tc	7.3	1.1	5.5	2.0	3.7	3.9	4	6.8	5.9	.0	20	--	57	22	23	.3	.00	92	5.3
803	140	Aug. 20, 1964	Tc	10	12	5.0	2.3	*15		20	17	14	.0	.8	--	74	22	60	1.4	.00	123	5.8
902	40?	June 4, 1964	Tr	31	1.8	22	7.6	*40		120	29	21	.2	17	--	227	86	50	1.9	.24	382	6.8
904	--	do	Tr	46	13	14	4.6	*36		4	50	54	.3	.0	--	207	54	59	2.1	.00	319	5.5
905	Spring	do	Tc	9.7	6.6	5.0	.9	2.5	6.3	3	5.6	5.7	.1	15	--	52	16	18	.3	.00	75	5.3

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-67-34-301	250	Aug. 19, 1964	Tc	17	9.0	2.8	2.7	*13		20	8.2	14	0.0	0.8	--	71	18	60	1.3	0.00	104	5.6
302	250	do	Tc	20	5.0	2.8	2.4	8.6	3.0	9	12	13	.0	.5	--	67	17	47	.9	.00	94	5.6
402	330	Aug. 20, 1964	Tc	15	11	30	3.9	*13		100	9.2	19	.0	.8	--	141	91	24	.6	.00	236	6.4
701	100?	June 4, 1964	Tr?	29	11	97	26	*106		192	259	107	.2	.5	--	719	349	40	<.5	.00	1,100	7.4
704	123	Aug. 20, 1964	Tc	34	14	55	19	*140		0	34	410	.0	.2	--	694	215	50	4.2	.00	1,520	2/ 3.3
68-23-901	50	July 28, 1944	Ka	18	.1	140	15	67	4.8	353	99	80	.9	67	--	685	411	26	1.4	.00	978	7.3
902	--	June 2, 1936	Ka	--	--	--	--	--		73	99	98	--	--	--	354	--	--	--	--	--	--
24-201	54	Dec. 3, 1959	Qle	--	--	--	--	--		294	--	66	--	--	--	--	288	--	--	.00	778	7.4
401	60	Nov. 21, 1957	Qle	--	--	--	--	--		346	--	30	--	--	--	--	293	--	--	.00	635	8.2
402	16	Dec. 4, 1957	Ka?	--	--	--	--	--		296	--	65	--	--	--	--	251	--	--	.00	800	7.6
404	40	do	Qle	--	--	--	--	--		315	--	52	--	--	--	--	269	--	--	.00	715	7.4
512	42	Dec. 3, 1957	Qle	--	--	--	--	--		401	--	43	--	--	--	--	368	--	--	.00	764	7.4
516	35	do	Qle	--	--	--	--	--		230	--	19	--	--	--	--	239	--	--	.00	559	7.6
517	Spring	Apr. 28, 1964	Qle	9.9	--	49	3.3	*20		178	16	10	.4	1.8	--	198	136	24	.7	.20	352	7.2
518	--	Dec. 4, 1957	Qle	--	--	--	--	--		439	--	29	--	--	--	--	352	--	--	.16	701	7.3
601	53	Aug. 1, 1957	Qle	24	.00	107	6.9	*38		294	9.8	50	.0	70	--	441	296	22	1.0	.00	724	7.4
602	35	Dec. 4, 1958	Qle	27	--	120	10	*120		277	66	168	--	85	--	728	340	43	2.8	.00	1,210	7.4
603	34	May 4, 1964	Qle	22	--	96	6.9	35	1.5	316	14	27	.4	41	0.18	399	268	22	.9	.00	660	7.5
803	19	Nov. 21, 1957	--	--	--	--	--	--		377	--	33	--	--	--	--	278	--	--	.61	797	7.8
810	35	Dec. 3, 1957	Qle	--	--	--	--	--		332	--	28	--	--	--	--	260	--	--	.22	715	7.4
811	18	Nov. 21, 1957	--	--	--	--	--	--		270	--	24	--	--	--	--	243	--	--	.00	639	7.5
901	40	Dec. 3, 1957	Qle	20	--	242	52	50	5.5	214	67	162	.2	550	--	1,300	818	12	.8	.00	1,910	7.6
901	40	Aug. 7, 1958	Qle	--	--	--	--	--		--	--	270	--	752	--	--	--	--	--	--	2,550	--
901	40	July 8, 1964	Qle	18	.00	98	23	21	3.4	288	27	28	.4	107	.16	468	339	12	.5	.00	733	7.3
30-201	320	Apr. 18, 1958	Kea	14	--	130	29	*17		340	52	64	.8	68	--	614	444	8	.3	.00	902	7.8
201	320	Dec. 1, 1959	Kea	--	--	--	--	--		391	48	24	--	4.7	--	--	374	--	--	--	732	7.0
206	323	Dec. 18, 1957	Kea	19	.03	175	11	*15		369	28	66	--	108	--	696	482	6	.3	.00	1,010	7.3

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-68-30-207	255	Dec. 18, 1957	Kea?	--	--	--	--	--		295	--	37	--	--	--	--	254	--	--	0.00	618	7.9
301	255	do	Kea?	16	--	67	32	*48		291	82	56	--	0.0	--	444	298	26	1.2	.00	706	7.3
302	370	Aug. 7, 1958	Kea?	11	--	61	36	31	2.7	243	89	57	1.6	.0	0.32	422	300	18	.8	.00	717	7.4
302	370	Sept. 9, 1959	Kea?	--	--	--	--	--		242	--	60	--	--	--	--	290	--	--	.00	691	7.3
302	370	Dec. 2, 1959	Kea?	--	--	--	--	--		247	90	59	--	--	--	--	298	--	--	.00	717	7.5
302	370	Sept. 27, 1960	Kea?	--	--	--	--	--		--	87	56	--	--	--	--	--	--	--	--	660	--
302	370	Mar. 8, 1961	Kea?	--	--	--	--	--		240	82	55	--	--	--	--	286	--	--	.00	706	7.1
302	370	Sept. 13, 1961	Kea?	--	--	--	--	--		240	86	55	--	--	--	--	294	--	--	.00	704	7.5
302	370	Mar. 6, 1962	Kea?	--	--	--	--	--		242	86	59	--	--	--	--	290	--	--	.00	703	7.0
302	370	Oct. 26, 1962	Kea?	--	--	58	34	--		248	78	58	--	--	--	--	284	--	--	.00	691	7.3
302	370	Mar. 13, 1963	Kea?	--	--	--	--	--		242	87	58	--	--	--	--	304	--	--	.00	724	7.0
302	370	Aug. 8, 1963	Kea?	--	--	--	--	--		240	93	58	--	--	--	--	296	--	--	.00	698	6.9
302	370	Mar. 11, 1964	Kea?	--	--	--	--	--		242	89	57	--	--	--	--	306	--	--	.00	712	7.6
302	370	Aug. 21, 1964	Kea?	--	--	--	--	--		248	88	55	--	--	--	--	286	--	--	.00	706	7.0
501	160	Dec. 17, 1957	Kea	9.6	--	88	52	19	--	540	1.2	22	--	--	--	458	434	9	.4	.18	--	--
504	140	do	Ka	--	--	--	--	--		--	19	35	--	--	--	--	355	--	--	--	703	--
601	565	Apr. 6, 1949	Kea	--	--	--	--	--		274	261	237	--	--	--	--	--	--	--	--	--	--
601	565	Dec. 2, 1959	Kea	--	--	--	--	--		307	354	319	--	--	--	--	602	--	--	.00	1,940	7.2
601	565	Mar. 8, 1961	Kea	--	--	--	--	--		258	372	345	--	--	--	--	645	--	--	.00	2,130	7.6
601	565	Aug. 7, 1961	Kea	12	--	130	71	*204		254	356	335	3.2	1.8	--	1,240	616	42	3.6	.00	2,040	7.2
601	565	Mar. 6, 1962	Kea	--	--	--	--	--		256	390	365	--	--	--	--	660	--	--	.00	2,150	7.3
601	565	Mar. 11, 1963	Kea	--	--	--	--	--		256	418	380	--	--	--	--	705	--	--	.00	2,230	7.0
601	565	Aug. 8, 1963	Kea	--	--	--	--	--		268	608	600	--	--	--	--	950	--	--	.00	3,070	7.1
602	2,353	Apr. 14, 1947	Kea	--	--	--	--	--		196	1,200	1,000	--	--	--	--	--	--	--	--	--	--
602	2,353	Apr. 17, 1947	Kea	--	--	--	--	--		145	2,000	438	--	--	--	--	--	--	--	--	5,480	--
606	295	May 6, 1964	Ka	17	8.1	75	21	*38		308	37	45	1.0	.2	--	385	274	23	1.0	.00	670	7.6
610	680	July 21, 1964	Kea	14	--	212	127	331	18	264	670	610	--	1.5	.73	2,110	1,050	40	4.4	.00	3,280	7.0

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-68-31-101	350	Dec. 18, 1957	Ka	25	--	138	36	*91		401	194	110	--	5.3	--	834	492	29	1.8	0.00	1,290	7.6
103	545	Sept. 9, 1959	Kea	14	--	178	222	751	41	950	220	1,470	4.6	.0	6.2	3,370	1,360	54	8.9	.00	5,600	6.6
103	545	Dec. 2, 1959	Kea	--	--	--	--	--		1,160	46	1,880	--	--	--	--	1,720	--	--	.00	6,620	6.9
103	545	Sept. 27, 1960	Kea	--	--	--	--	--		--	12	1,860	--	--	--	--	--	--	--	--	--	--
103	545	Mar. 8, 1961	Kea	--	--	--	--	--		1,180	69	1,800	--	--	--	--	1,730	--	--	.00	6,700	6.7
104	470	Dec. 18, 1957	Kea	16	--	146	100	*333		322	467	530	--	2.0	--	1,820	512	48	5.2	.00	2,810	7.3
201	560	Sept. 10, 1959	Kea	14	--	155	86	*401		337	512	565	2.7	.0	--	1,990	740	54	6.4	.00	2,940	7.1
202	165	Dec. 18, 1957	Ka	23	--	152	17	*68		323	192	88	--	9.0	--	729	449	25	1.4	.00	1,120	7.6
202	165	Dec. 2, 1959	Ka	--	--	--	--	--		396	170	106	--	--	--	--	490	--	--	.00	1,120	7.0
204	434	Dec. 3, 1957	Kea	16	--	121	62	*124		470	144	206	--	2.5	--	974	557	33	2.3	.00	1,530	7.3
* 3/ 212	†2,499	June 16, 1961	--	--	--	--	--	--		--	3,000	480	--	--	--	4,920	2,550	--	--	--	--	7.3
301	18	Dec. 3, 1957	Qle	--	--	--	--	--		264	--	910	--	--	--	--	1,040	--	--	.00	4,480	7.7
401	602	Dec. 17, 1957	Kea	13	--	218	118	*417		262	704	700	--	1.0	--	2,300	1,030	47	5.6	.00	3,530	7.4
401	602	Sept. 9, 1959	Kea	14	--	208	109	394	24	258	698	670	2.8	.0	.86	2,250	967	46	5.5	.00	3,350	6.8
401	602	Dec. 8, 1959	Kea	--	--	--	--	--		256	722	680	--	--	--	--	980	--	--	.00	3,450	6.8
401	602	Aug. 7, 1960	Kea	--	--	--	--	--		258	672	650	--	--	--	--	940	--	--	.00	3,360	7.3
401	602	Mar. 8, 1961	Kea	--	--	--	--	--		252	384	350	--	--	--	--	625	--	--	.00	2,130	7.1
401	602	Sept. 13, 1961	Kea	--	--	--	--	--		254	676	648	--	--	--	--	965	--	--	.00	3,360	7.0
401	602	Mar. 9, 1962	Kea	--	--	--	--	--		260	698	680	--	--	--	--	980	--	--	.00	3,460	7.2
401	602	Oct. 26, 1962	Kea	--	--	208	106	--		256	670	640	--	--	--	--	955	--	--	.00	3,320	6.9
401	602	Mar. 11, 1963	Kea	--	--	--	--	--		258	692	640	--	--	--	--	1,010	--	--	.00	3,430	6.9
401	602	Aug. 8, 1963	Kea	--	--	--	--	--		260	668	640	--	--	--	--	970	--	--	.00	3,220	7.2
402	35	Dec. 17, 1957	Qle	--	--	--	--	--		4316	--	56	--	--	--	--	250	--	--	.19	895	8.4
501	430	Dec. 3, 1957	Kea	14	--	135	80	292	15	308	329	520	--	30	--	1,550	665	48	4.9	.00	2,450	7.3
502	623	Oct. 29, 1957	Kea	2.7	5.9	150	116	480	27	106	663	830	--	2.6	1.0	--	851	54	7.2	.00	3,770	7.1
503	594	do	Kea	12	6.6	168	90	*320		263	485	540	--	2.5	--	1,930	789	47	4.9	.00	2,870	7.6
507	635	Dec. 2, 1959	Kea	--	--	--	--	--		134	1,140	1,400	--	--	--	--	1,380	--	--	.00	5,850	--

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-68-31-509	126	Oct 29, 1957	Ka?	13	--	158	90	280	25	--	268	428	--	1.5	--	--	764	43	4.4	0.00	2,590	8.0
602	46	Aug. 16, 1957	Qle	--	--	--	--	--	--	318	--	163	--	--	--	--	373	--	--	.00	1,270	7.5
701	40	do	Qle	--	--	--	--	--	--	325	16	--	--	--	--	--	292	--	--	.00	723	7.2
701	40	Dec. 17, 1958	Qle	21	--	96	9.1	*33		350	26	12	--	22	--	398	277	21	.9	.20	629	7.4
801	100	Dec. 17, 1957	--	22	--	117	12	*86		366	39	85	--	84	--	676	342	35	2.0	.00	1,040	7.4
806	*50*	*do*	Qle	--	--	--	--	--		--	74	89	--	--	--	--	305	--	--	--	855	--
902	35	Aug. 16, 1957	Qle	--	--	--	--	--		464	--	178	--	--	--	--	364	--	--	.32	1,550	7.5
32-201	45	Nov. 21, 1957	Qle	20	--	94	23	*54		321	42	65	--	60	--	493	329	26	1.3	.00	830	8.1
303	28	Dec. 4, 1957	Qle	28	--	120	34	*27		407	97	43	--	3.0	--	611	440	12	.6	.00	900	7.4
304	25	Mar. 26, 1962	Qle	17	--	74	39	36	1.7	398	43	24	0.4	29	0.12	460	345	18	.8	.00	771	7.1
309	40	June 25, 1964	Qle	32	0.20	83	28	21	.9	384	7.8	33	.5	1.8	.10	397	322	12	.5	.00	671	7.2
310	32	Dec. 3, 1957	Qle	--	--	--	--	--		264	--	165	--	--	--	--	380	--	--	.00	1,260	7.8
501	35	Aug. 15, 1957	--	--	--	--	--	--		413	--	48	--	--	--	--	348	--	--	.00	889	7.6
801	135	Sept. 8, 1936	Twi	--	--	291	84	*247		464	584	440	--	--	--	1,870	1,070	--	3.3	.00	--	--
903	95	Aug. 9, 1936	Twi	--	--	166	65	*236		305	429	355	--	--	--	1,400	685	--	3.9	.00	--	--
40-101	24	June 2, 1936	Twi	--	--	--	--	--		244	14	40	--	--	--	283	--	--	--	--	--	--
102	70	Sept. 2, 1936	Twi	--	--	76	32	*185		476	131	138	--	--	--	796	320	--	4.5	1.40	--	--
105	112	Feb. 4, 1964	Twi	35	19	130	29	*109		504	60	145	.3	.0	--	756	444	35	2.2	.00	1,270	7.5
303	123	Aug. 8, 1936	Twi	--	--	307	137	*365		12	986	770	--	--	--	2,570	1,330	--	4.3	.00	--	--
304	220	Feb. 17, 1964	Twi	53	5.1	33	7.2	*52		96	93	33	1.2	.0	--	319	112	50	2.1	.00	441	6.5
401	24	Sept. 8, 1936	Twi	--	--	--	--	--		207	40	108	--	--	--	395	--	--	--	--	--	--
402	115	Sept. 2, 1936	Twi	--	--	--	--	--		256	97	305	--	--	--	825	--	--	--	--	--	--
603	210	Jan. 29, 1964	Twi	42	1.0	53	7.8	*44		204	40	35	.6	.0	--	322	164	37	1.5	.06	508	7.5
604	190	Feb. 5, 1964	Twi	41	6.9	107	19	*75		340	73	109	.3	.0	--	591	345	32	1.8	.00	960	7.6
605	118	Feb. 18, 1964	Twi	49	37	145	55	*239		128	132	612	.4	1.2	--	1,300	588	47	4.3	.00	2,250	6.4
701	71	May 4, 1962	Twi	35	1.1	455	114	*243		382	828	635	.8	1.18	--	2,570	1,600	25	2.6	.00	3,710	6.5
703	508	June 3, 1964	Twi	29	1.2	152	22	58	5.0	416	75	125	.2	2.0	.17	673	673	21	1.2	.00	1,140	7.0

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells and springs in Guadalupe County--Continued

Well	Depth of well (ft)	Date of collection	Water-bearing unit	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH
KX-68-40-709	140?	Feb. 4, 1964	Twi	22	21	455	84	*165		264	744	600	--	1.0	--	2,200	1,480	19	1.9	0.00	3,190	7.0
710	256	do	Twi	31	13	111	20	*51		416	69	40	0.3	.0	--	527	844	24	1.2	.00	844	7.5
802	476	Feb. 19, 1964	Twi	17	1.8	90	54	652	8.6	342	400	840	--	.0	2.5	2,230	446	76	13	.00	3,660	7.7
901	175	Apr. 24, 1962	Twi	36	.7	47	15	*94		116	72	136	.2	25	--	527	179	53	3.1	.00	831	6.5
902	576	Mar. 25, 1964	Twi	36	11	140	27	57	8.1	352	114	135	.3	.0	.13	691	460	21	1.2	.00	1,140	7.0
903	145	Sept. 8, 1936	Twi	--	--	87	37	*62		268	111	118	--	--	--	547	368	--	1.4	.00	--	--

* Sodium and potassium calculated as sodium (Na).
† Drill-stem sample from 1,998 feet.
1/ Includes the equivalent of 8 ppm of carbonate (CO_3).
2/ Contains 1.9 ppm total acidity as H^{+1}.
3/ Analysis by Texas State Department of Health, Austin, Texas.
4/ Includes the equivalent of 5 ppm of carbonate (CO_3).