HYDROLOGY OF THE OGALLALA AQUIFER IN FORD COUNTY, SOUTHWESTERN KANSAS

by Joseph M. Spinazola and Michael T. Dealy

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WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
contact:

District Chief
U.S. Geological Survey
1950 Constant Avenue - Campus West
University of Kansas
Lawrence, Kansas 66044-3897
[Telephone: (913) 864-4321]

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CONVERSION FACTORS

Conversion factors for the International System of Units (SI) and the abbreviations for terms used in this report are listed below for readers who prefer to use metric units rather than inch-pound units.

To convert from inch-pound units	To SI units	Multiply by
Length		
inch	millimeter	25.40
foot	meter	0.3048
mile	kilometer	1.609
foot per mile (ft/mi)	meter per kilometer (m/km)	0.19
Area		
acre	square meter	4,047
square mile	square kilometer	2.590
Flow		
gallon per minute (gal/min)	cubic meter per second (m^3/s)	0.06308
gallon per minute per foot [(gal/min)/ft]	cubic meter per second per meter [(m^3/s)/m]	0.2070
Volume		
acre-foot	cubic meter	1,233
Specific conductance		
micromho per centimeter at 25°Celsius	microsiemens per centimeter at 25°Celsius	1.000
Hydraulic conductivity		
foot per day (ft/d)	meter per day (m/d)	0.3048
Transmissivity		
foot squared per day (ft^2/d)	meter squared per day (m^2/d)	0.09290
Temperature		
degree Fahrenheit(°F)	degree Celsius (°C)	°F = 9/5°C + 32

DEFINITION OF TERMS

Alluvium - Unconsolidated deposits of clay, silt, sand, and gravel deposited by streams during comparatively recent time.

Aquifer - Formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Available soil moisture - The quantity of water in soil that is available to plants.

Base flow - Discharge entering stream channels from ground water and other delayed sources.

Confined aquifer - Aquifer in which an artesian water body exists. The water level in a well completed in the aquifer stands above the top of the artesian water body.

Dip - The angle that a formation or planar surface is inclined from the horizontal.

Discharge - Flow of water expressed as a volume per unit of time.

Ephemeral stream - A stream that flows briefly only in direct response to precipitation in the immediate locality and has a channel that is, at all times, above the water table.

Formation - Basic rock unit in local classification of rocks; consists of an identifiable body of rock generally characterized by some distinctive lithologic features.

Geophysical log - A record obtained by lowering an instrument into a borehole or well and recording continuously on a meter at the surface some physical properties of the rock material being logged.

Hydraulic conductivity - The volume of water at the existing kinematic viscosity that will move through a medium in unit time under a unit hydraulic gradient through a unit area measured at a right angle to the direction of flow. Hydraulic conductivity depends on particle size, sorting, and packing of the materials comprising the aquifer.

Hydraulic connection - Aquifers are hydraulically connected when (1) a hydraulic gradient exists between them, and (2) there is no impermeable barrier, such as a clay or shale layer, obstructing flow.

Lithology - The description of rock or the general physical character of a rock.

Loess - A homogeneous, unstratified, commonly calcareous deposit consisting predominantly of wind-laid silt.

Recharge - Quantity of water added to the saturated zone.

Sandstone - A sedimentary rock composed of abundant rounded or angular fragments, generally of sand-size quartz, more or less firmly cemented by some material such as iron oxide or calcium carbonate.

Saturated thickness - Thickness of water-bearing material filled with water under pressure greater than atmospheric.

Sedimentary rocks - A rock resulting from the consolidation of loose sediment that has accumulated in layers, consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice, or a chemical rock formed by precipitation from solution, or an organic rock consisting of the remains or secretions of plants and animals.

Specific capacity - The rate of discharge of water from a well divided by the drawdown of the water level within the well. Specific capacity of a well usually decreases with time as the water level declines during a pumping test. When changes in specific capacity become slight with additional time of pumping, specific capacity is proportional to transmissivity by the relation:

$$T = 270 \times C,$$

where

T = transmissivity, in feet squared per day, and
C = specific capacity, in gallons per minute per foot of drawdown.

Specific yield - The ratio of (1) the volume of water that the rock or soil, after being saturated, will yield by gravity to (2) the volume of the rock or soil.

Storage coefficient - Describes the property of an aquifer to store or release water. Storage coefficient is the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. In an unconfined aquifer, the storage coefficient is closely approximated by specific yield.

Transmissivity - Describes the property of an aquifer to transmit water. Transmissivity is the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient. Transmissivity can be determined as the product of hydraulic conductivity and saturated thickness of the aquifer.

Unconfined aquifer - Aquifer in which a water-table body exists.

Water table - Surface in an unconfined water body at which the pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water.

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SOUTHWESTERN KANSAS

By

Joseph M. Spinazola* and Michael T. Dealy**

ABSTRACT

The rapid increase of ground-water withdrawal in recent years has caused concern about the effects that this development will have on the future use of the Ogallala aquifer in Ford County, southwestern Kansas. The study area consists of about 700 square miles in northwestern and southern Ford County where the Ogallala aquifer is the principal source of water for irrigation and other uses.

Basins on the bedrock surface have formed on the downthrown side of the Crooked Creek-Fowler fault in areas where the dissolution of salt in underlying Lower Permian rocks has led to the collapse of overlying rocks. The thickness of Tertiary deposits in these basins can be up to 250 feet greater than the general thickness of Tertiary deposits in the remainder of the study area. Saturated thickness of the Ogallala aquifer ranges from 0 to about 350 feet on the downthrown side of the fault. Saturated thickness ranges from 0 to about 120 feet on the upthrown side of the fault.

Water in the Ogallala aquifer in Ford County generally moves from west to east at a gradient of about 7 feet per mile. Depths to water range from about 9 feet for wells completed in the Quaternary alluvium in the Arkansas River valley to about 185 feet for wells completed in the Ogallala aquifer. Concentrations of chemical constituents in water from the Ogallala aquifer generally are less than limits recommended by the Kansas Department of Health and Environment for drinking water and pose no problem when used for irrigating crops. However, excess fluoride was detected in some water samples from the Ogallala aquifer. Recommended limits for drinking water were exceeded for fluoride, nitrate, sulfate, and dissolved solids in water samples from the alluvium along the Arkansas River.

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* U.S. Geological Survey, Lawrence, Kansas.

**Southwest Kansas Groundwater Management District No. 3, Garden City, Kansas.

Ground-water withdrawals for 1980 and 1981 were calculated by two methods. The time-discharge method computed withdrawal of about 81,000 acre-feet during 1980 and about 58,000 acre-feet during 1981. The irrigation-requirement method computed withdrawal of about 121,000 acre-feet during 1980 and about 131,000 acre-feet during 1981. Results from the irrigation-requirement method probably are closer to the actual quantity of ground-water withdrawal because of problems encountered when applying the time-discharge method.

Applications for new irrigation wells increased five-fold between 1968 and 1980. Operational irrigation wells increased from 187 in 1939 to 622 in 1981. Water-level declines between 1939 and 1981 ranged from about 10 to about 50 feet. Water in storage in the Ogallala aquifer was depleted by about 688,000 acre-feet or 8 percent during this same period. If withdrawals continue to the point where the water table drops below the top of the bedrock surface on the upthrown side of the Crooked Creek-Fowler fault, ground-water discharge from the Ogallala to the Arkansas River could cease east of the fault.

INTRODUCTION

The development of ground-water resources in Ford County, principally the Ogallala aquifer,[1] has helped the economy and the people of the county to prosper. Ground-water development, however, is not without problems. The supply of ground water is limited. Studies throughout the High Plains region have proven that in most areas the Ogallala aquifer is being mined of its vast stores of water and the part that underlies Ford County is no exception. Concern about the relationship between the rate of development and the rate of mining has increased among users and developers.

Management policies adopted by the Southwest Kansas Groundwater Management District No. 3 established criteria for the orderly development of the Ogallala aquifer in the 13-county area under its jurisdiction, including Ford County. These management policies have been implemented to stabilize development and provide for the extended use of ground water for beneficial purposes.

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1 High Plains aquifer is the name generally accepted for the principal unconsolidated regional ground-water system in parts of South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas. In Kansas, the aquifer generally synonymous with the High Plains aquifer has been referred to as the Ogallala aquifer. In this report, the name Ogallala aquifer has been retained.

PURPOSE AND SCOPE

The objectives of this cooperative investigation between the U.S. Geological Survey and Southwest Kansas Groundwater Management District No. 3 were (1) to update and interpret geologic and hydrologic information affecting the Ogallala aquifer in Ford County, and (2) to evaluate hydrologic conditions in the Ogallala aquifer in Ford County during 1980 and 1981.

Geophysical and drillers' logs were interpreted to define the geologic setting and to determine the extent of the Crooked Creek-Fowler fault. An onsite inventory of irrigation wells completed in the Ogallala aquifer was conducted. Well discharge, crop types, and irrigated acreages were monitored for a selected number of irrigation wells. Irrigated acreages and crop types were tabulated for the entire study area from records collected and maintained by the Ford County office of the U.S. Agricultural Stabilization and Conservation Service. The time-discharge and irrigation-requirement methods were compared for determining ground-water withdrawals by irrigation wells. Water levels were measured on a quarterly basis in a network of observation wells established for the study. Water-level and storage changes were determined by comparing data from Waite (1942) with results obtained from kriging techniques using data collected during the study. Inventory data, well discharges, and water-level measurements were submitted to the Ground-Water Site Inventory (GWSI) section of WATSTORE, a computer storage and retrieval system for water-resources data maintained by the U.S. Geological Survey. Data submitted to GWSI as part of this study were verified as to correctness.

LOCATION OF STUDY AREA

The report area encompasses about 700 square miles in Ford County, which is located in southwestern Kansas. It comprises that part of Ford County principally underlain by the Ogallala aquifer. This area includes the four northwestern townships and all townships south of the Arkansas River, as shown in figure 1.

ACKNOWLEDGMENTS

Thanks and appreciation are expressed to the people of Ford County, who permitted access to and supplied information about their wells. Also, thanks go to the Layne-Western Drilling Co. for providing samples and logs and to the Kansas Geological Survey, the Ford County Agricultural Stabilization and Conservation Office, and the Stafford and Garden City offices of the Division of Water Resources, Kansas State Board of Agriculture for providing information on either wells, crop acreage, or water permits. Special acknowledgment is made to James (Jim) Dilts, Petroleum Geologist, who provided much-needed geophysical logs, and to Mary Dealy and Jean Spinazola, who contributed much of their own time and effort to the completion of this study.

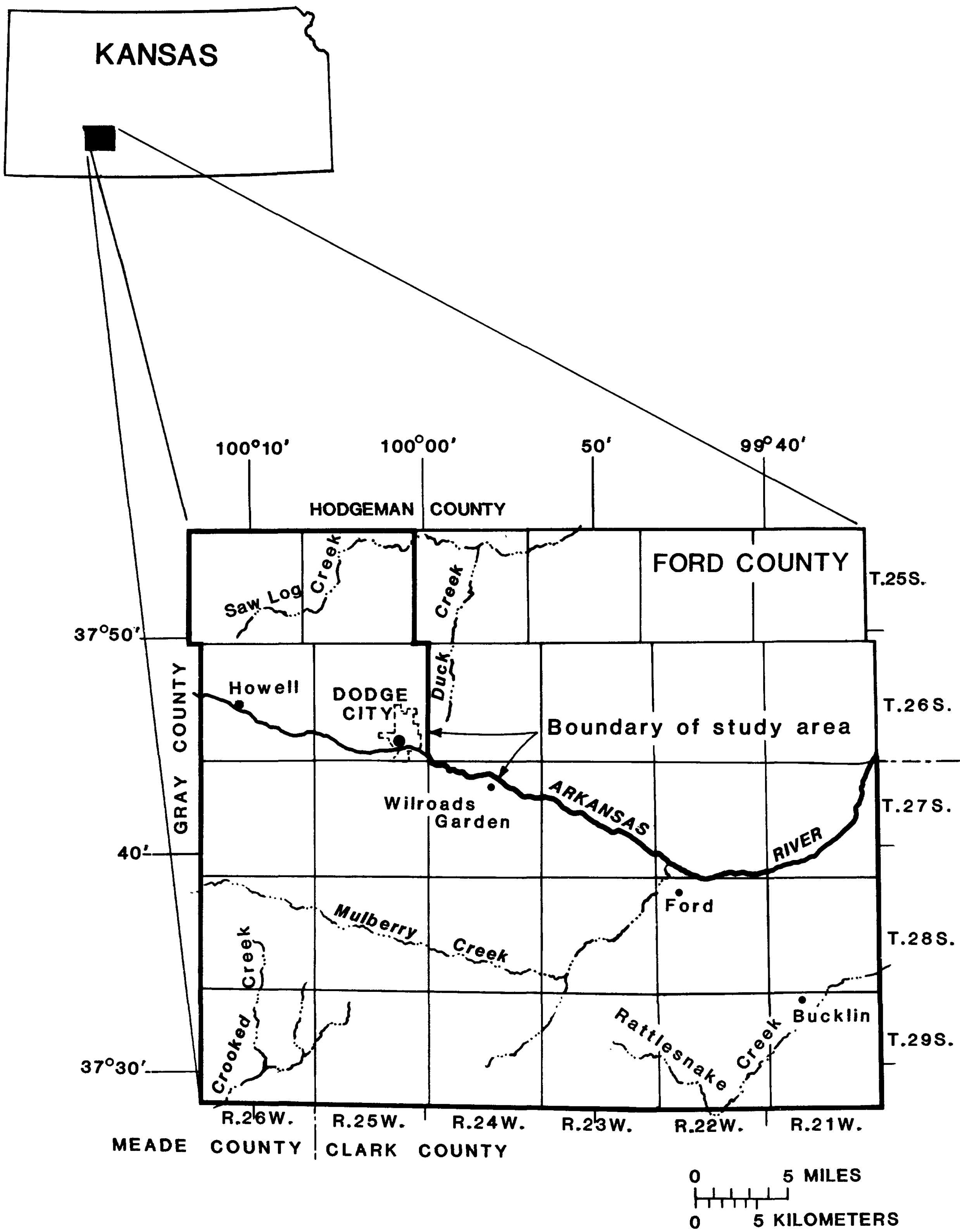

Figure 1.--Location of study area.

WELL-NUMBERING SYSTEM

The wells and test holes described in this report are numbered according to a modification of the U.S. Bureau of Land Management's system of land subdivision (fig. 2). The system denotes the first set of digits of a well number as the township; the second set is the range west of the Sixth Principal Meridian; and the third set of digits denotes the section in which the well is located. The letters following the numbers divide the location of the well into smaller tracts of land. The first letter denotes the quarter section or 160-acre tract; the second letter, the quarter-quarter section or 40-acre tract; and the third letter, the quarter-quarter-quarter section or 10-acre tract. The tracts of land are labeled A,B,C, and D in a counterclockwise direction beginning in the northeast tract with the letter "A". Therefore, a well with a legal description NW1/4 SE1/4 SE1/4 sec. 15, T. 28 S., R. 21 W. would be 28-21W-15DDB under the U.S. Bureau of Land Management's system. If more than one well is located in the same 10-acre tract, the wells are numbered serially in the order in which they are inventoried.

SURFACE FEATURES OF STUDY AREA

The study area lies along the eastern edge of the High Plains region in the Great Plains physiographic province. The area is comprised mostly of rolling uplands except for the valley of the Arkansas River, which traverses the study area from west to east. The southwestern part of the study area drains into the Cimarron River through Crooked Creek. The rest of the study area drains into the Arkansas River through its main tributaries: Mulberry Creek, Saw Log Creek, Rattlesnake Creek, and Duck Creek (fig. 1).

A band of sand dunes is located along the south side of the Arkansas River. The dunes parallel the Arkansas River through the study area. Isolated dune sand is located in the southwestern part of the study area in T. 29 S., Rs. 25 and 26 W.

GENERAL GEOLOGY OF STUDY AREA

STRATIGRAPHIC RELATIONSHIPS

The stratigraphic relationships of geologic units, especially nonwater-yielding units to water-yielding units, are basic to geohydrologic study. The geologic units underlying and overlying the Ogallala aquifer are discussed briefly to provide (1) an understanding of the effects of the geologic environment on the Ogallala aquifer and (2) a description of possible alternative ground-water supplies in the study area. Stratigraphic nomenclature of geologic units described in this study are given in table 1.

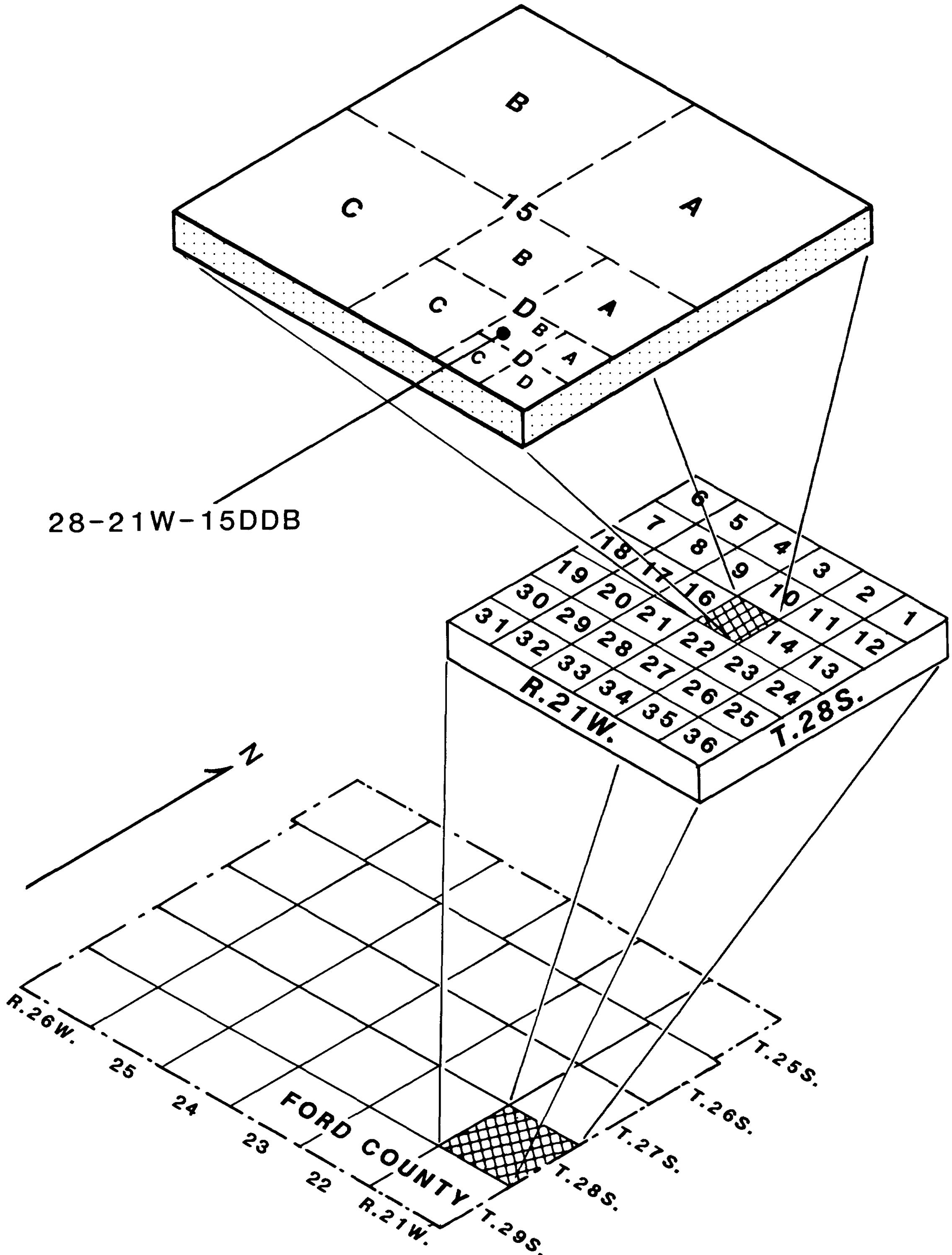

Figure 2.--Well-numbering system.

Table 1.--Generalized section of geologic units and water-yielding characteristics[1/]

System	Series	Stratigraphic unit	Thickness (feet)	Physical character	Water-yielding characteristics
QUATERNARY	Pleistocene	Dune sand and loess	0-70	Fine to medium sand; contains some silt and clay.	Generally lies above the water table and does not yield water to wells.
QUATERNARY	Pleistocene	Alluvium	0-60	Stream-laid deposits ranging from silt and clay to sand and gravel, which occur along principal stream or river valleys.	Yields to wells can range from 100 to more than 1,000 gallons per minute in the Arkansas River valley.
QUATERNARY	Pleistocene	Undifferentiated deposits	0-135	Fine to medium sand and pink, tan, or gray silt and clay, alternating with layers of loose to well-cemented, medium to very coarse-grained sand and gravel. Caliche (mortar) beds are common.	Where both Teritary deposits (Miocene) and undifferentiated Quaternary deposits (Pleistocene) are present and saturated, they comprise one hydrologic unit or aquifer, commonly referred to as the Ogallala aquifer. Water quality generally is suitable for most uses, and well yields can range from 200 to 2,000 gallons per minute.
TERTIARY	Miocene	Ogallala Formation	20-350	Pink to tan sandy clay and silt alternating with poorly sorted, loose to well-cemented sand and gravel. Caliche (mortar) beds are common.	
CRETACEOUS	Upper Cretaceous	Greenhorn Limestone	0-120	Light-gray to gray chalky and crystalline limestone and shale in the upper part. Thick beds of gray to dark-gray calcareous shale and thin beds of bentonite in the lower part, with thin beds of gray crystalline limestone near the base.	Generally does not yield water to wells. May yield a few gallons per minute to domestic or stock wells from the upper weathered or fractured zone.
CRETACEOUS	Upper Cretaceous	Graneros Shale	0-60	Dark-gray to black shale with few very thin beds of sandstone, limestone, and bentonite.	Not known to yield significant water to wells.
CRETACEOUS	Lower Cretaceous	Dakota Formation	100-450	Gray to yellow-brown or black shale, with interbedded sandstone lenses commonly cemented with iron oxide or calcium carbonate. The sandstone commonly is light yellow-brown to white, varying in hardness with the quantity of cement. Also contains thin discontinuous layers of clay, siltstone, ironstone, and lignite. The lignite layers are most common near the top and the bottom of the formation.	Few wells are completed in the Dakota aquifer in the study area. It does constitute an important aquifer in the northeastern part of Ford County. Yields range from 100 to 1,50 gallons per minute, and water quality varies through the aquifer. A hydraulic connection with the Ogallala aquifer exists in subcrop areas.
CRETACEOUS	Lower Cretaceous	Kiowa Formation	100-250	Gray to black clayey shale, with thin discontinuous lenses of sandstone and limestone. Locally contains gypsum. Also contains thin fossil shell beds, some of which may be continuous throughout the area.	Not known to yield significant quantities of water to wells.
CRETACEOUS	Lower Cretaceous	Cheyenne Sandstone	20-300	Light-gray to yellow fine-to coarse-grained sandstone. Commonly cemented with iron sulfide or calcium carbonate. Interbedded shales vary from white to green or dark gray.	Little information is available, but water may be very mineralized and unsuitable for irrigation especially in the lower part of the formation. Not known to yield water to wells in the study area.

Table 1.--Generalized section of geologic units and water-yielding characteristics--Continued

System	Series	Group	Stratigraphic unit	Thickness (feet)	Physical character	Water-yielding characteristics
PERMIAN	Upper Permian		Undifferentiated rocks including the Big Basin Sandstone, Day Creek Dolomite, Whitehorse Sandstone	150-300	Red to maroon fine-grained silty sandstone, siltstone, dolomite, and shale.	Not known to yield water to wells in the study area.
	Lower Permian	Nippewalla Group	Dog Creek Formation	10-60	Maroon silty shale, siltstone, very fine sandstone, and thin layers of dolomite and gypsum.	
			Blaine Formation	10-25	Generally consists of a white to gray gypsum bed. Has a characteristic deflection on geophysical logs and is used as a shallow structural marker bed.	
			Flowerpot Shale	40-330	Red silty mudstone, shale, and salt. The salt or anhydritic and halitic shale occur where thickness exceeds several hundred feet.	
			Cedar Hills Sandstone	60-180	Red sandstone, siltstone, and silty shale. Used as a shallow saltwater disposal zone for oilfield brine in the county.	
			Salt Plains Formation	90-200	Chiefly red silty shale and some siltstone.	
			Harper Sandstone	180-350	Chiefly red siltstone and very fine silty sandstone.	
		Sumner Group	Stone Corral Formation	30-80	Formation composed of dolomite, anhydrite, gypsum, and salt. The anhydrite, gypsum, and salt parts are lost through solution in exposed sections. Chiefly gray with red to pink streaks locally. Used as structural marker beds because it produces well-marked reflections in seismograph survey.	

1 The classification and nomenclature of the stratigraphic units used in this report are those of the U.S. Geological Survey and differ somewhat from those of the Kansas Geological Survey.

CROOKED CREEK-FOWLER FAULT

The Crooked Creek-Fowler fault was penetrated during test drilling in the southwestern corner of the study area near the Ford-Meade County line (Waite, 1942). Geologic sections, contour maps, and a thickness map prepared for this report from geophysical logs, drilling logs, and samples indicate that the fault extends from the southwestern corner to the eastern edge of the study area (fig. 3).

The geologic sections were prepared using geophysical-log correlations and were verified with the Kansas Geological Society's type log for Ford County. The correlations were generally distinct and easily defined, making the sections a good representation of the stratigraphy of the study area. The Blaine Formation and the Stone Corral Formation have distinctive logging curves that were used as correlative or marker beds. Examples of typical geophysical logs with correlations are shown in figure 4. Location of the oil or gas exploration holes from which the geophysical logs were obtained is shown in figure 3.

Salt zones in the Flowerpot Shale (Nippewalla Group) significantly affect the extent of the Crooked Creek-Fowler fault in the study area. Geologic sections (fig. 5 and 6) show the salt zones underlying the south-central and southeastern part of the study area and ranging in thickness from 0 to about 300 feet. The salt zones are remnants of deposits that at one time covered all southwestern Kansas, the Oklahoma Panhandle, and the Texas Panhandle. Salt was deposited when shallow, brackish seas extended inland from the south into the Anadarko Basin and the Hugoton Embayment (Irwin and Morton, 1969; Holdoway, 1978). Ford County is situated along the eastern edge of the Hugoton Embayment.

During late Tertiary or early Quaternary time, subsidence occurred in southwestern Kansas (Irwin and Morton, 1969; McGovern and Long, 1974; Holdoway, 1978; Gutentag and others, 1981). The area of subsidence is bounded on the west by the Bear Creek fault, located about 80 miles west of the study area, and on the east by the Crooked Creek-Fowler fault, located in the study area (Gutentag and others, 1981). Ground water dissolved and removed part of the salt zone in the Flowerpot Shale in Ford County. The salt zone is missing on the downthrown side of the Crooked Creek-Fowler fault (fig. 5 and 6) and ends abruptly along the north and west sides of the fault, whereas the main salt body remains in place to the east and south of the upthrown side of the fault. The voids created by dissolution of the salt were filled by the collapse or subsidence of overlying rocks.

A surface map of the Blaine Formation (Nippewalla Group) is shown in figure 7. The Blaine Formation lies directly above the Flowerpot Shale. The Blaine Formation has been displaced vertically by as much as 275 feet, as shown in figure 7. The vertical displacement on the collapsed side corresponds to the missing salt zone in the Flowerpot Shale.

The interval between the base of the Stone Corral Formation (Sumner Group) and the top of the Blaine Formation ranges in thickness from 420 to 930 feet (fig. 8). The differences in thickness across the fault also correspond to the missing salt zone in the Flowerpot Shale. For a more detailed discussion on the dissolution of salt deposits in Permian rocks, the reader is referred to Irwin and Morton (1969), Gustavson and others (1980), and Johnson (1981).

The Crooked Creek-Fowler fault is reflected in overlying Upper Permian and Cretaceous rocks (figs. 5 and 6), but recent deposits of loess and dune sand have buried the fault, and it cannot be observed from surface features. The faulting created basins on the downthrown side of the fault which trapped Ogallala and younger sediments. As a result, unconsolidated deposits of Tertiary and Quaternary age reach thicknesses of as much as 530 feet in these basins, which is generally 400 to 500 feet thicker than in the rest of the study area.

GEOLOGY IN RELATION TO GROUND WATER

PERMIAN SYSTEM

Information pertaining to rocks of the Permian System was obtained from geophysical logs and published reports (Irwin and Morton, 1969; Gustavson and others, 1980; Johnson, 1981). The thickness of rocks of the Sumner and Nippewalla Groups and undifferentiated Upper Permian rocks ranges from about 600 to 1,150 feet in the study area, and the rocks rest conformably on one another. These rocks consist mainly of sandstone, siltstone, shale, dolomite, gypsum, and salt. Because of their striking red color, they are collectively known as the Permian red beds. An unconformity exists between undifferentiated Upper Permian rocks and the overlying Cheyenne Sandstone (Lower Cretaceous). The thickness, physical character, and water-yielding characteristics of geologic units are described in table 1.

The Sumner and Nippewalla Groups and the undifferentiated Upper Permian rocks are not considered to be a source of freshwater. No well in the study area is known to be completed in the red beds for a supply of water. The salt, anhydrite, and other evaporites would make any water in the rocks very mineralized and unsuitable for most uses. Two saltwater disposal wells in the study area inject brine from oil and gas wells into the Cedar Hills Sandstone of the Nippewalla Group (Don Ubel, Kansas Department of Health and Environment, oral commun., 1981).

CRETACEOUS SYSTEM

Consolidated Lower and Upper Cretaceous rocks comprise the top of the bedrock surface in the study area. The Lower Cretaceous rocks contain sandstone, siltstone, and shale, and the Upper Cretaceous rocks contain limestone and shale (table 1). Rocks of the Dakota Formation (Lower Cretaceous) crop out at several locations north and east of the study area in Ford County and the Greenhorn Limestone and Graneros Shale (Upper Cretaceous) crop out in the northwestern part of the study area.

page 15 follows

The bedrock surface in the western and extreme northeastern parts of the study area is formed of Upper Cretaceous rocks except where channels have been eroded into the underlying Lower Cretaceous rocks. The bedrock surface in the south-central and southeastern parts of the study area is formed on Lower Cretaceous rocks. The bedrock surface (fig. 3) is both an erosional and a structural surface. At the end of Cretaceous time, erosion removed great thicknesses of Cretaceous sediments that were deposited in marine and continental environments.

The bedrock surface slopes to the southeast at a maximum gradient of about 11 ft/mi. Depths below land surface to the bedrock surface range from about 50 to 415 feet. The bedrock surface west of the Crooked Creek-Fowler fault (downthrown side) has a steeper slope than the bedrock surface east of the fault (upthrown side). In comparison, the bedrock surface west of the fault in T. 27 S., R. 24 W. has a maximum gradient of approximately 26 ft/mi, whereas the bedrock surface east of the fault has a maximum gradient of approximately 10 ft/mi. As much as 250 feet of local relief is the result of erosion in the western part of the study area and subsidence along the Crooked Creek-Fowler fault.

Two major channels were eroded into the bedrock surface by rivers or streams. One channel roughly parallels the present position of the Arkansas River. The other channel extends into the study area from Gray County about 2 miles south of the north side of T. 28 S. A ridge, or bedrock high, separates the two channels. The bedrock surface east of the fault appears almost flat. However, locally it contains smaller erosional channels not shown at the contour interval used for figure 3 (Dealy and Jenkins, 1980).

Two Lower Cretaceous formations contain permeable sandstones that could, and in some instances do, yield water to wells. The formations are the Cheyenne Sandstone and the Dakota Formation.

The Cheyenne Sandstone is considered the deepest potential source of freshwater but is not known to yield water to wells in the study area. Below the Cheyenne lie the Permian red beds. The relation of the Cheyenne to strata above and below, its depth below land surface, and its thickness are shown in figures 5 and 6. It is likely that the water from the Cheyenne would be very mineralized and unsuitable for most uses because of its contact with the Permian red beds. In the northern and western parts of the study area, thickness of the Cheyenne ranges from 135 to 300 feet, which is more than in other parts of the study area. The water in the upper part of the Cheyenne, farther from contact with the Permian red beds, may be fresh enough for most uses. In counties to the west (Grant, Morton, and Stanton) many multiple-aquifer wells obtain part of their yield from the Cheyenne (Fader and others, 1964; McLaughlin, 1942).

The Kiowa Formation consists of shale, lenses of sandstone, and limestone. The Kiowa is not considered to be an aquifer in the study area.

The Dakota Formation subcrops in a northeasterly direction and underlies the western and extreme northern parts of the study area. The depth below land surface, the relationship with strata above and below, and the thickness of the Dakota are shown in figures 5 and 6. The Dakota Formation is an important aquifer in northeastern Ford County (Lobmeyer and Weakly, 1979). Few wells in the study area obtain water solely from the Dakota, and the quality and quantity of the water vary locally. Historically, it has not been considered a source of freshwater supply for the study area because the Ogallala aquifer is shallower, is economically cheaper to develop and pump, and is a dependable source of freshwater. Only recently, in the northern part of the study area where the Ogallala aquifer is thinnest, has the Dakota Formation been considered as a source of freshwater. Areas where the Dakota and Ogallala aquifers are separated by the Graneros Shale (Upper Cretaceous), as well as where they are more likely to be hydraulically connected, are shown in figures 5 and 6. The hydraulic connection between the Dakota and Ogallala aquifers has not been clearly defined.

Upper Cretaceous rocks are considered to be relatively impermeable. They yield little if any water to wells in the study area.

TERTIARY AND QUATERNARY SYSTEMS, INCLUDING THE OGALLALA AQUIFER

The Tertiary Ogallala Formation consists of interbedded clay, silt, sand, and gravel with thin caliche (mortar) beds. The physical character of the Ogallala changes laterally within short distances, but sand is considered to be the predominant sediment type (see table 1).

Younger Quaternary deposits consist of loess, dune sand, undifferentiated deposits, and alluvium. Loess deposits cover the southern part of the study area. Dune sand overlies the loess in some places, especially in an area immediately south and parallel to the Arkansas River. Quaternary deposits were derived in part from deposits eroded from the Ogallala Formation. The two deposits are difficult to distinguish where both are present.

The saturated part of the Ogallala Formation and Quaternary loess, dune sand, and undifferentiated deposits comprises the Ogallala aquifer and is the principal water-yielding unit in the study area. The "Hydrology of the Ogallala aquifer" section of this report describes the Ogallala aquifer in detail.

Alluvium is present in the valleys of several streams in Ford County. The alluvium in the Arkansas River valley contains the most important alluvial aquifer in Ford County. In this report, alluvial aquifer refers to the saturated part of the Arkansas River alluvium.

The Arkansas River alluvium is composed of silt, sand, and gravel that partly filled the valley in an aggradation cycle after eroding downward through older deposits in a degradation cycle. Thickness of the alluvium "...ranges from about 15 feet in the eastern part of the county... to about 40 feet in the central and western part of the county." (Waite, 1942). In most parts of the study area, the alluvium was deposited on the Ogallala Formation. In the vicinity of Ford the alluvium unconformably overlies and is probably hydraulically connected with the Dakota Formation.

A detailed investigation of the Arkansas River valley about 50 miles upstream from Ford County demonstrated that there is a hydraulic connection between the alluvial and Ogallala aquifers (Dunlap and others, 1983). Although a similar investigation in Ford County was beyond the scope of this study, conditions in both areas are comparable, and the hydraulic connection between the alluvial and Ogallala aquifers is assumed for Ford County. The importance of the hydraulic connection will be developed in a description of the water budget beginning in the section on conditions in the Ogallala aquifer.

HYDROLOGY OF THE OGALLALA AQUIFER

HYDRAULIC PROPERTIES

Specific capacity for wells in the Ogallala aquifer in the study area as reported by local well drillers ranged from about 3 to 270 (gal/min)/ft of drawdown. Estimates of specific yield and hydraulic conductivity in the Ogallala aquifer were made using 66 drill logs in the study area. Each drill log was divided into zones based on the description of the physical composition of the aquifer material. Values of specific yield and hydraulic conductivity were assigned to each zone. Weighted averages for hydraulic-conductivity and specific-yield estimates were calculated from each drill log. Only zones that could yield water were included in the average. Estimates of specific yield ranged from 0.07 to 0.25 and averaged 0.18. Estimates of hydraulic conductivity ranged from 15 to 160 ft/d and averaged 88 ft/d.

CONDITIONS IN THE OGALLALA AQUIFER

Water Budget

The Ogallala aquifer is a single, continuous hydrologic unit in Ford County. The ultimate source of all water stored in the aquifer is precipitation. Water moves through the aquifer under a regional gradient from areas of recharge to areas of discharge. Local flow patterns were superimposed on the regional gradient as ground water that had discharged naturally to rivers, seeps, and springs was intercepted by pumping wells.

Inflow to the Ogallala aquifer equals outflow plus or minus changes in storage to the aquifer. The most important components of this general relationship were calculated for the water budget shown below. The values used represent conditions for 1980 and are discussed in the following sections.

Inflow	Acre-feet
Precipitation	21,750
Subsurface inflow	16,780
Streamflow losses	0
Subtotal	38,530
Outflow	
Streamflow gains	5,160
Evapotranspiration	3,000
Subsurface outflow	5,950
Withdrawal by wells	120,760
Subtotal	134,870
Total change in storage (1980)- - - - -	-96,340

Inflow to the Ogallala Aquifer

Precipitation

In general terms, recharge to the aquifer from precipitation in western Kansas can be defined as 3 percent of annual precipitation (Lloyd Stullken, U.S. Geological Survey, oral commun., 1981). Using this definition, about 0.6 inch or 21,750 acre-feet of recharge to the Ogallala aquifer can be attributed to precipitation during 1980. Total annual precipitation was 19.8 inches during that year.

Subsurface Inflow

Water moves from the Ogallala aquifer in Gray County into the Ogallala in Ford County along the Gray-Ford County line. Net movement of water in the Ogallala between Hodgeman and Ford Counties to the north and Ford, Meade, and Clark Counties to the south was near zero during January 1981. The geologic section along the Gray-Ford County line was divided into segments of equal saturated thickness of the Ogallala. Flow through each segment was computed by multiplying the hydraulic gradient of the water table by the average hydraulic conductivity of the aquifer and by the saturated area of each segment. Total subsurface inflow, determined by summing the flow through each segment, was 16,780 acre-feet during January 1981.

Streamflow Losses

Another source of recharge to the Ogallala aquifer is the infiltration of water from streams during periods of flow. The potential for infiltration exists whenever the water table in the Ogallala aquifer drops below the water table in the adjacent stream system. Streamflow losses generally contribute little or no inflow to the aquifer in Ford County. The Arkansas River upstream from the town of Ford, and Saw Log, Mulberry, Duck, and Rattlesnake Creeks are ephemeral streams, and periods of flow in them are infrequent.

Outflow from the Ogallala Aquifer

Streamflow Gains

Streams can be a natural drain on aquifers and become gaining streams where they intersect the water table. The Arkansas River is the major gaining stream in the study area. Records during the 1960's show the Arkansas River as a gaining stream during most of the year throughout its course in Kansas. By the mid-1970's, base flow became more intermittent until it ceased entirely for the reach between Lakin (about 60 miles west of Ford County in Kearny County, Kansas) and Dodge City. This trend continued during 1980 and 1981 with base flow observed at Howell in the spring but receding to Wilroads Gardens, about 15 miles downstream, by mid-summer. The decline in base flow in upstream reaches of the Arkansas River has been shown to be the result of a combination of factors, including ground-water withdrawal by wells, reduced incoming streamflow at the State line, and less-than normal precipitation (Barker and others, 1981).

Records indicate a net gain in streamflow of 10,580 acre-feet in the Arkansas River between streamflow-gaging stations at Dodge City and Kinsley (about 12 miles east of Ford County in Edwards County, Kansas) for the water year ending September 1980. This figure does not include the 2,800 acre-feet of water added to the system that year by the Dodge City wastewater treatment facility (John Remigo, Dodge City sewage treatment plant, oral commun., 1981). About 31 miles, or 62 percent, of the 50-mile reach between stations occurs in Ford County. Because surface flow from tributaries to the Arkansas River in the study area was minimal during 1980, the alluvial aquifer contributed about 6,560 acre-feet of ground water to supply streamflow gains in this year. Computed underflow to the alluvial aquifer from Gray County was 1,400 acre-feet during 1980. Because the alluvial aquifer and the Ogallala aquifer are hydraulically connected, the difference between inflow and outflow in the alluvial aquifer, 5,160 acre-feet, can be ascribed to water loss from the Ogallala aquifer, assuming no change in storage in the alluvial aquifer.

Crooked Creek near sec. 33, T. 29 S., R. 26 W. was observed to contain water throughout the duration of this study. Water derived from subsurface springs in the Ogallala aquifer (Waite, 1942) is ponded by several low-hydraulic-head dams across the creek. Although Crooked Creek constitutes a source of outflow from the aquifer locally in Ford County, estimates of this loss were not made.

Evapotranspiration

Evapotranspiration is the combined effect of evaporation and transpiration. Wherever water is in contact with the atmosphere, evaporation can occur. Plant roots penetrating to the water table are capable of transpiring large quantities of water. Because the water table in the Ogallala aquifer is beneath the reach of plant roots, evapotranspiration directly from the Ogallala aquifer is negligible in Ford County.

Evapotranspiration occurs from the alluvial aquifer in the Arkansas River valley where the water table is within reach of plant roots. Because a hydraulic connection exists between the alluvial aquifer and the Ogallala aquifer, loss of water to evapotranspiration in the alluvial aquifer can induce flow from the Ogallala aquifer. The gradient of the water table generally is from the Ogallala aquifer to the alluvial aquifer; therefore, losses from the alluvial aquifer are ascribed to the Ogallala.

Although no estimate of evapotranspiration from the 51-mile-long alluvial aquifer in Ford County is available, estimates have been made for a 48-mile-long reach of the Arkansas River valley located about 100 miles upstream of Ford County (Barker and others, 1981). A general comparison of evapotranspiration is possible as hydrologic conditions between both reaches are similar. For the 10 years between 1970 and 1979, average annual loss of water from the alluvial aquifer to evapotranspiration was about 3,000 acre-feet.

Subsurface Outflow

Ground water flows from Ford County into Kiowa County to the east and Clark County to the southeast. Subsurface outflow was calculated in the same manner as subsurface inflow. A total of 5,950 acre-feet flowed out of Ford County into Kiowa and Clark Counties during 1980.

Withdrawal by Wells

Pumpage for irrigation is the largest component of flow out of the Ogallala aquifer in Ford County. A major effort of this study involved estimating water withdrawal from the Ogallala aquifer for irrigation. Two methods were used to calculate annual withdrawals for 1980 and 1981. The time-discharge method and the irrigation-requirement method:

Year	Annual withdrawals (acre-feet)	
	Time-discharge method	Irrigation-requirement method
1980	81,215	120,760
1981	57,792	130,960

Time-discharge method.--One approach taken to extrapolate ground-water withdrawals was based on determining an average irrigation-application rate for each major crop in the area and applying this rate to the total irrigated acres for each of the major crops. The average irrigation-application rate for each major crop (corn, wheat, sorghum, and alfalfa) was determined for 1980 and 1981 by measuring pump discharge with a Pitot-tube manometer and recording total pumping time with an E-cell Sentry meter (Baker, 1979). Measurements were made at a 20-site sample network during the 2-year study. An average discharge rate was determined for each site. The operator of each installation was contacted at the end of each irrigation season to validate total pumping time. Operators reported total time and crop acreages by categories if an installation was used to irrigate more than a single crop. The average irrigation rate per acre for each major crop was calculated in this manner and then multiplied by total irrigated acres for each major crop from records of the U.S. Agricultural Stabilization and Conservation Service (table 2).

Irrigation-requirement method. --Another approach used to determine ground-water withdrawals was based on crop-irrigation requirements and associated irrigated acreage. Crop-irrigation requirements were calculated for the major crops during 1980 and 1981 using a soil-moisture model (Lappala, 1978). This method has been applied in two ground-water modeling studies in southwestern Kansas (Dunlap and others, 1980; Dunlap and others, 1983) and is described by Lindgren (1982). The model uses crop-growth data; weather data, including temperature, precipitation, solar radiation, and percentage of possible sunshine; and soil characteristics, such as field capacity, wilting point, and soil type, to calculate each crop's water demands during the year. The model monitors crop water demand and soil moisture and applies irrigation water when necessary to maintain the soil-moisture at one-half of available moisture.

Irrigation requirements of the four major crops, which vary according to the soil type, were calculated by the soil-moisture model for each of three general soil types in the study area. Irrigated acres for each crop obtained from records of the U.S. Agricultural Stabilization and Conservation Service were determined for the three soil types. The irrigation requirement calculated by the soil-moisture model was then multiplied by the total irrigated acres of each crop in the soil type. Ground-water withdrawal for each major crop was thereby obtained for all three soil types (table 3).

The values calculated by the irrigation-requirement method are probably closer to the actual value of ground-water withdrawal than are the time-discharge values. Two drawbacks of the time-discharge method were difficulty in choosing a reliable network of sample sites and failure of testing equipment. Many of the wells chosen initially as samples sites were physically incompatible with discharge-measuring equipment used in the study, which required about 6 feet of unobstructed discharge pipe. Under these circumstances, plans to interpret pumpage data statistically were soon abandoned. Mechanical problems with pumps at several sample sites further reduced the quantity of information available. Failure of time-recording devices at several sites also complicated data collection.

Table 2.--Ground-water withdrawal calculated for selected crop types using the time-discharge method

Crop	Alfalfa			Corn			Sorghum			Wheat		
	Acre-age	Pumping time (hours)	Acre-feet	Acre-age	Pumping time (hours)	Acre-feet	Acre-age	Pumping time (hours)	Acre-feet	Acre-age	Pumping time (hours)	Acre-feet
Totals, 1980 sample network----	345	4,392.1	491.6	843	6,742.8	930.2	1,877	16,740.7	2,665.9	982	2,176.7	406.7
Average application rate per acre-----			1.4			1.1			1.4			0.4
Total 1980 acres in study area--------	9,450			24,002			24,899			16,809		
Ground-water withdrawal--------			13,230			26,402			34,859			6,724
Total 1980 withdrawal--------												81,215
Totals, 1981 sample network----------	189	1,714.3	188.9	828	6,991.1	977.3	1,344	7,692.7	960.2	565	2,410.5	305.7
Average application rate per acre-----			1.0			1.2			0.7			0.5
Total 1981 acres study area--------	450			15,203			28,020			20,968		
Ground-water withdrawal--------			9,450			18,244			19,614			10,484
Total 1981 withdrawal--------												57,792

Table 3.--Ground-water withdrawal calculated for selected crop types using a soil-moisture accounting model

[Soil types: (I) fine sand, sandy-loamy, (II) silty loam, (III) silty clay-loam]

Crop	Soil type	1980 crop year			1981 crop year		
		Acreage	Irrigation requirement (inches)	Calculated ground-water withdrawal (acre-feet)	Acreage	Irrigation requirement (inches)	Calculated ground-water withdrawal (acre-feet)
Corn	I	0	27.91	0	0	28.40	0
	II	19,340	24.23	39,035	12,070	24.77	24,904
	III	4,662	23.93	9,293	3,133	24.77	6,464
Wheat	I	47	4.22	17	66	9.97	55
	II	13,479	0.0	0	16,171	9.47	12,753
	III	3,283	0.0	0	4,735	9.39	3,704
Sorghum	I	157	27.91	365	274	28.40	648
	II	16,405	24.23	33,111	18,771	24.77	38,731
	III	8,337	23.93	16,619	8,975	24.77	18,518
Alfalfa	I	0	35.18	0	0	34.72	
	II	7,560	28.41	17,891	7,560	31.99	20,146
	III	1,890	28.11	4,426	1,890	31.99	5,036
Total------		75,160		120,757	73,645		130,959

Water-Table Configuration

Depths to water below land surface ranged from about 9 feet for wells completed in the Arkansas River alluvium to about 185 feet for wells completed in the Ogallala aquifer. Water-level measurements were made at 100 locations in the study area.

The configuration of the water table in the Ogallala aquifer in Ford County is shown in figures 9 and 10. Data for these maps were derived using a mathematical interpolation technique called kriging (Skrivan and Karlinger, 1980). The technique has been applied to produce hydrologic maps using water-level data from west-central Kansas (Dunlap and Spinazola, 1981). The kriging technique was used to determine a value for the water-table altitude at the center of each section in the study area, utilizing the actual water-level measurements for each map. This technique thus supplied eight times the original number of 100 data points for contouring.

Static conditions are shown by the configuration of the water table during January 1981 when the seasonal effects of ground-water pumping are at a minimum (fig. 9). The slope and shape of the water table are the two most evident features on this map. The water table generally slopes from west to east at a gradient of about 7 ft/mi. Given the average gradient and the average hydraulic conductivity for the study area, water travels approximately 150 feet per year through the aquifer.

Changes in the shape of the water table can be attributed to variations in the properties and physical characteristics of the aquifer and to imposed stresses on the aquifer. Closely spaced contours generally indicate areas of lower transmissivity in the aquifer, representing a decrease in the hydraulic conductivity or a thinning of the saturated thickness or both. Conversely, widely spaced contours generally indicate areas of higher transmissivity where hydraulic conductivity or saturated thickness is greater.

The effect of pumping ground water for irrigation is shown by the configuration of the water table during August 1981 (fig. 10). Local changes in the gradient of the water table are visible across the entire study area but are most evident in T. 28 S., Rs. 25 and 26 W. The combination of ground-water pumping and less saturated thickness in this area led to the development of a cone of depression at this time of year. This effect is apparent even though seasonal precipitation was greater and ground-water pumping decreased compared with the previous year.

Saturated Thickness

The saturated thickness of the Ogallala aquifer for January 1981 is shown on plate 1. Data for this map were obtained by determining the bedrock altitude at the center of each section from the bedrock map (fig.3) and subtracting it from a corresponding kriged value of the January 1981

page 27 follows

water-level altitude (fig. 9). Saturated thickness in the Ogallala aquifer ranged from 0 to about 350 feet on the downthrown side of the Crooked Creek-Fowler fault and from 0 to 120 feet on the upthrown side of the fault.

Saturated thickness is greatly affected by the shape of the bedrock surface. Comparing the map showing saturated thickness (plate 1) with the bedrock map (fig. 3), the areas of greatest saturated thickness correspond to the areas of depressions or troughs in the bedrock surface. The effect of the bedrock surface on saturated thickness is most evident on the downthrown side of the Crooked Creek-Fowler Fault in T. 28 S., R. 24 W., where saturated thickness can increase more than 200 feet within a few miles. The thinnest areas of saturated thickness are associated with highs or ridges in the bedrock surface. Examples include areas along the west-central and southern borders and in the east-central part of the county.

Saturated thickness gives a general indication of the quantity of water available at a location. Storage will vary in the study area in relation to changes in saturated thickness and specific yield. The volume of water in storage in the aquifer was found by planimetering equal intervals of saturated thickness from plate 1 and multiplying by the average specific yield of the aquifer. The volume of water in storage during 1981 was calculated at about 7,500,000 acre-feet based on a specific yield of 0.18.

Water Quality

Water samples from wells in the Ogallala aquifer were collected and analyzed for other studies in the area (Hathaway and others, 1978; Dealy and Jenkins, 1980) and as part of a statewide water-quality network (table 4). Results from the chemical analyses indicate that water from the Ogallala aquifer is suitable for most uses.

The Kansas Department of Health and Environment has recommended limits to the concentrations of certain chemical constituents in drinking water. Concentrations in excess of these recommended limits can lead to health problems, such as mottled teeth and bone changes in children caused by excess fluoride, or methemoglobinemia, which results from excess nitrate. Maximum concentrations recommended for the more common chemical constituents are:

Constituent	Recommended limit, in milligrams per liter
Dissolved solids	500
Sulfate (SO_4)	250
Chloride (Cl)	250
Fluoride (F)	1.5
Nitrate (NO_3)	45

Table 4.--Chemical analyses of water from selected wells

[Analyses by U.S. Geological Survey or Kansas Geological Survey, Lawrence, Kansas, or Kansas Department of Health and Environment, Topeka, Kansas. Values are given in milligrams per liter, except as indicated. °C = degrees Celcius. Geologic unit: OT, Ogallala Formation; OA, Arkansas River alluvium]

Local well number	Geologic unit	Date of sample	Specific conductance (micromhos per centimeter at 25°C)	pH	Temperature (°C)	Hardness (as $CaCO_3$)	Hardness noncarbonate (as $CaCO_3$)	Dissolved calcium (as Ca)	Dissolved magnesium (as Mg)	Dissolved sodium (as Na)	Sodium adsorption ratio	Dissolved iron (as Fe)	Dissolved potassium (as K)	Bicarbonate (as HCO_3)	Carbonate (as CO_3)	Dissolved sulfate (as SO_4)	Dissolved chloride (as Cl)	Dissolved fluoride (as F)	Dissolved silica (as SiO_2)	Dissolved solids (residue on evaporation at 180°C)	Dissolved nitrogen, nitrate (as NO_3)
25-26W-25CDD01	OT	7/77	515	7.6	15.0	234	33	52	25	14	0.40	0.023	4.8	245	--	43	18	2.3	57	329	14
25-26W-30ABB01	OT	7/77	540	7.5	15.0	232	40	53	24	18	.51	.006	5.3	235	--	56	18	1.7	51	355	18
26-24W-32DDA01	OA	7/77	2,100	7.2	15.0	852	576	210	79	172	2.56	.065	7.5	337	--	734	110	2.3	29	1,567	39
26-24W-33CDA02	OA	7/77	2,620	7.0	16.0	1,262	899	294	127	148	1.81	.070	9.4	443	--	816	172	1.5	64	1,973	168
26-25W-33BAD01	OA	9/8/80	1,240	7.9	14.5	460	250	130	31	72	1.50	--	5.0	260	0	340	33	.6	24	787	22
26-25W-34BBB01	OA	7/77	2,000	7.5	15.0	736	399	182	68	199	3.19	.020	7.0	412	--	694	60	2.2	23	1,376	55
26-26W-12CDB01	OT	7/77	498	7.7	15.0	244	35	48	25	15	.44	.002	4.4	231	--	48	12	2.1	49	309	14
26-26W-32ADD01	OT	7/77	530	7.5	16.0	223	29	71	11	23	.67	.017	4.6	237	--	43	9.8	.5	26	316	34
26-26W-36DCC01	OT	7/77	520	7.6	16.0	204	1	66	9.4	24	.73	.101	4.4	248	--	35	10	.4	26	326	23
28-21W-08CCA01	OT	6/28/79	550	--	14.5	241	29	72	15	23	.64	--	4.0	260	0	29	22	.5	26	319	4.1
28-21W-14BCA01	OT	7/06/79	540	--	14.5	214	22	66	12	21	.62	--	3.0	230	0	23	20	.4	26	284	5.9
28-21W-17ADB01	OT	6/28/79	550	--	14.5	238	24	74	13	21	.59	--	4.0	260	0	25	19	.4	27	311	5.9
28-21W-24DBA01	OT	7/06/79	440	--	14.5	199	8	62	11	17	.52	--	3.0	230	0	15	15	.4	26	262	3.7
28-21W-27AAB01	OT	6/28/79	445	--	14.5	197	11	61	11	16	.49	--	4.0	230	0	20	14	.4	29	268	3.4
28-25W-06AAB01	OT	7/24/80	410	7.8	17.0	170	0	54	8.1	20	.70	--	4.0	200	0	30	12	.4	21	263	10
29-21W-07ADC01	OT	8/14/80	480	7.8	17.0	230	9	72	13	11	.30	--	4.0	270	0	14	14	.5	32	306	12

The results from chemical analyses indicate concentrations less than the recommended limits of these constituents for water from wells in the Ogallala aquifer except for three wells where the concentration of fluoride was exceeded. For wells in the Arkansas River alluvium, water from three exceeded the recommended fluoride concentration, water from one exceeded the recommended nitrate concentration, and water from four exceeded the recommended concentrations for dissolved solids and sulfate.

Water in the Ogallala aquifer in Ford County is a calcium bicarbonate type (Hathaway and others, 1978). The data in table 1 indicate that water in the alluvial aquifer is a calcium sulfate type. Water type is determined by a predominance of the type cations and anions to total ions in a sample analysis.

The suitability of water for irrigation purposes can be evaluated by plotting values obtained for sodium-adsorption ratio (SAR) and specific conductance on the diagram shown in figure 11 and determining the proper classification. SAR is the relationship of sodium ions to calcium and magnesium ions in a water. Specific conductance is expressed by the electrical conductivity of ions in a water. For the purpose of irrigation classification, specific conductance is a measure of the dissolved solids (salinity) in a given water. An explanation of the classification diagram (fig. 11) according to the U.S. Salinity Laboratory staff (1954) follows:

Salinity Classification

C1 - LOW SALINITY WATER can be used for irrigation with most crops on most soils, with little likelihood that a salinity problem will develop. Some leaching is required, but this occurs under normal irrigation practices except in soils of extremely low permeability.

C2 - MEDIUM SALINITY WATER can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most instances without special practices for salinity control.

C3 - HIGH SALINITY WATER cannot be used on soil with restricted drainage. Even with adequate drainage, special management for salinity control may be required, and plants to be grown will need good salt tolerance.

C4 - VERY HIGH SALINITY WATER is not suitable for irrigation under ordinary conditions but may be used occasionally under very special circumstances. The soil must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and plants to be grown will need to be very salt tolerant.

Sodium Classification

S1 - LOW SODIUM WATER can be used for irrigation on almost all soils, with little danger of the development of a sodium problem. However, sodium-sensitive crops, such as stone-fruit trees, may accumulate injurious amounts of sodium in the leaves.

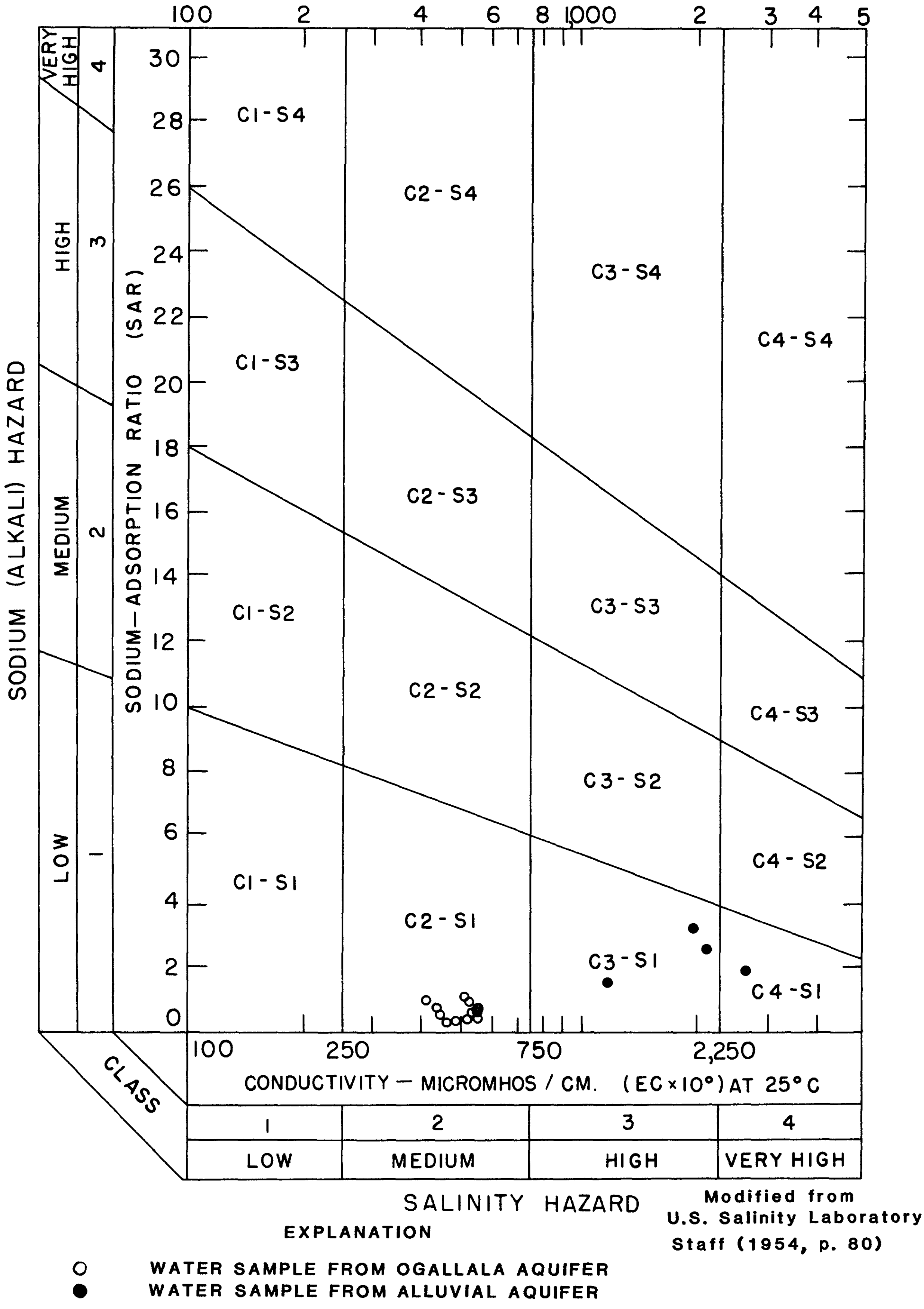

Figure 11.--Suitability of water for irrigation.

S2 - MEDIUM SODIUM WATER may present a moderate sodium problem in fine-textured (clay) soils unless gypsum is in the soil. This water can be used on coarse-textured (sandy) or organic soils that take water well.

S3 - HIGH SODIUM WATER may produce troublesome sodium problems in most soils and will require special management--good drainage, high leaching, and additions of organic matter. If there is plenty of gypsum in the soil, a serious problem may not develop for some time. If gypsum is not present, it or some similar material may have to be added.

S4 - VERY HIGH SODIUM WATER is generally unsatisfactory for irrigation except at low or medium salinity levels where the use of gypsum or some other amendment makes it possible to use such water.

The irrigation classification indicates that water from the Ogallala aquifer has a low sodium and medium salinity hazard. Water from the Ogallala aquifer is suitable for growing most crops on soils where a moderate degree of leaching occurs. Water from the alluvial aquifer has a low sodium hazard and a high to very high salinity hazard. Special management practices may be required when using water from the alluvial aquifer for irrigating crops.

Ground-Water Development

Irrigation Wells

Ground-water use was minimal and limited to domestic and stock use until the development of the pumping plant powered by the gasoline engine around the beginning of the 20th century. By 1939, 187 wells pumped about 4,800 acre-feet of ground water to irrigate 2,814 acres of cropland in Ford County (Waite, 1942). Most of these wells were located in the Arkansas River valley. Records obtained through the Division of Water Resources, Kansas State Board of Agriculture, show a gradual increase in the number of well applications between 1946 and 1972, with significant increases occurring in 1955, 1968, and continuing from 1973 through 1978 (fig. 12). Between 1968 and 1980, well applications increased five-fold.

An onsite inventory was conducted during this study to determine the number and location of irrigation wells completed in the Ogallala aquifer. By 1981, there were 622 irrigation wells pumping water from the Ogallala aquifer. These wells were approved to pump 210,000 acre-feet of ground water annually for irrigating 75,160 acres of crops. Discharge from wells measured at 20 sites during the study ranged from 220 to 992 gal/min. Information collected during the inventory is listed in table 5 at the end of the report.

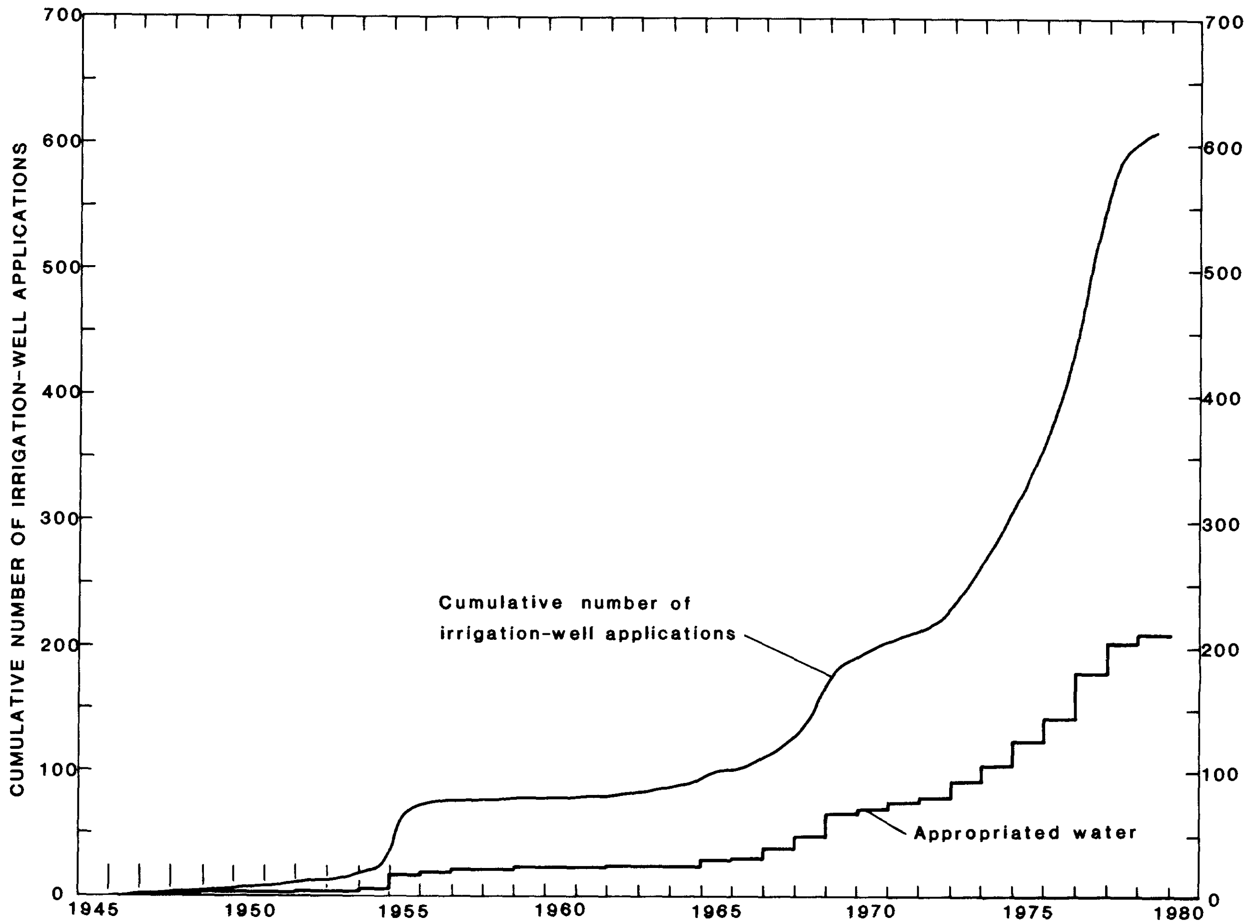

Figure 12.--Cumulative number of irrigation-well applications and corresponding amount of appropriated water (from records of the Kansas State Board of Agriculture, Division of Water Resources).

Irrigated Acres

Irrigated acres of corn, wheat, and sorghum for 1980 and 1981 were tabulated on a township basis from records on file at the Ford County Agricultural Stabilization and Conservation Service. Personnel from that office consider that in any given year 98 percent of the farms in the county report their crop acreages in order to participate in the crop program. Of those farms usually reporting, 3 percent had yet to report their 1980 acreages, and 5 percent had yet to report their 1981 acreages when acreage figures were compiled for this study.

Alfalfa also contributes a representative fraction of total irrigated acreage but was not directly recorded in the files for 1980 and 1981. Therefore, 90 percent of total 1980 alfalfa acreage, as given in Duitsman and Johnson (1981), is taken as an approxmate estimate of alfalfa acreage irrigated with ground water from the Ogallala aquifer for both 1980 and 1981. Because Duitsman and Johnson (1981) report total county acreages and ground water for irrigation is supplied from the Dakota Formation in northeastern Ford County, this percentage of total alfalfa acreage seemed appropriate. The percentage for alfalfa approximately coincides with the percentage of acres irrigated with water from the Ogallala aquifer, as recorded by the Agricultural Stabilization and Conservation Service, and reports of total irrigated acres for corn, wheat, and grain sorghum in Ford County (Duitsman and Johnson, 1981). Total acres irrigated by water from the Ogallala aquifer, adjusted only for alfalfa, were estimated to be 75,160 acres during 1980 and 73,645 acres during 1981.

Effects of Ground-Water Withdrawal

Ground-water withdrawal for irrigation is responsible for declining water levels in the Ogallala aquifer in the study area. Water-level changes were determined by comparing data presented by Waite (1942) to data calculated by the kriging technique from January 1981 measurements. Water-level declines ranged from about 0 to 50 feet and averaged between 15 and 20 feet, or about 0.4 foot per year between 1939 and 1981 (fig. 13). Areas of greatest decline are generally west of the Crooked Creek-Fowler fault and south of the Arkansas River where ground-water withdrawal for irrigation has been practiced the longest.

Areas of no change for 1939-81 are shown in T. 26 S. and T. 28 S., R. 26 W. and in the easternmost townships of the study area. Unlike the remainder of the study area, the 1939 data are sparse in these areas. Although there is insufficient information to verify a water-level decline between 1939 and 1981, many irrigation wells have since been completed in the easternmost townships of the study area. Water levels were observed to decline about 1.5 feet in this area during 1977-80 (Dealy and Jenkins, 1980). Water-level declines can be expected to continue in this area as pumping continues and more long-term information becomes available.

Water-level declines between 1939 and 1981 also indicate a decrease in the volume of ground water in storage. The magnitude of this decrease was calculated by determining, from figure 13, the volume of the aquifer dewatered and multiplying by the average specific yield of 0.18 for the aquifer. The volume of ground water in storage was decreased by 687,670 acre-feet or 8-percent between 1939 and 1981.

Continuing water-level declines and the presence of the Crooked Creek-Fowler fault could combine to have an effect on streamflow in the Arkansas River eastward from the fault. The Arkansas River is a gaining stream in eastern Ford County, as indicated by the inflection of the water-table contours toward the river (fig. 9). Should water-level declines continue to the extent that the water table drops below the bedrock surface on the upthrown side of the fault, flow across the fault could cease. Present information indicates that the water table would have to drop about 80 feet from 1980 levels before this could happen.

SUMMARY AND CONCLUSIONS

The pronounced increase of ground-water development in Ford County during the past 10 years has caused concern about the effect that development could have on the future use of the Ogallala aquifer. Information was collected and analyzed in 1980 and 1981 to update the geohydrologic setting and to evaluate the hydrologic conditions of the Ogallala aquifer in Ford County.

Of significant geohydrologic importance is the extension of the Crooked Creek-Fowler fault from its original location to the eastern edge of the study area. Information compiled for this study indicates that the fault was the result of dissolution and removal of a zone of salt in the Flowerpot Shale, which caused the collapse or subsidence of overlying beds. The fault created localized basins, which trapped Ogallala and younger sediments. Thickness of sediments in these basins can be as much as 530 feet.

Rocks of Permian age consist mainly of sandstone, siltstone, shale, dolomite, gypsum, and salt. Thickness of these rocks ranges from about 600 to 1,150 feet in the study area. No well in the study area is known to be completed in these rocks for a supply of water.

The tops of rocks of Cretaceous age comprise the bedrock surface in the study area. The bedrock surface is formed on Lower Cretaceous rocks in the south-central and southeastern parts and on Upper Cretaceous rocks in the western and extreme northwestern parts of the study area. Lower Cretaceous rocks contain sandstone, siltstone, and shale whereas Upper Cretaceous rocks contain mainly limestone and shale. The bedrock surface is disrupted by the Crooked Creek-Fowler fault. The surface west of the fault (downthrown side) slopes to the southeast at a maximum gradient of about 26 feet per mile, whereas the surface to the east of the fault (upthrown side) slopes at a maximum gradient of about 10 feet per mile. Two erosional channels in the bedrock surface, along with the disruption of the bedrock surface along the fault, affect the variation in the saturated thickness of the Ogallala aquifer in the study area.

The Cheyenne Sandstone and Dakota Formation contain saturated sandstones, which potentially can be developed in the study area. No wells in the study area presently withdraw water from the Cheyenne, but the Dakota Formation is an important aquifer adjacent to the study area in northeastern Ford County and is used for irrigation in the northwestern part of the study area.

Deposits of Tertiary age consist of interbedded clay, silt, sand, and gravel with thin caliche beds. Deposits of Quaternary age consist of loess, dune sand, and alluvium. The combined thickness of Quaternary deposits were derived, in part, from material eroded from the Ogallala Formation, and the two deposits are difficult to distinguish where both are present. For this reason, the saturated parts of both Tertiary and Quaternary deposits--excluding the Arkansas River alluvium--are referred to as the Ogallala aquifer in this report.

The alluvial aquifer in the Arkansas River valley is in hydraulic connection with the Ogallala aquifer, the major source of ground water in the county. The Ogallala aquifer comprises a single, continuous unit that stores and transmits water in Ford County. Inflow to the Ogallala aquifer equals outflow from the aquifer plus or minus changes in storage to the aquifer. Inflow and outflow can be calculated using estimates for

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the quantities of precipitation, subsurface inflow, streamflow losses, evapotranspiration, streamflow gains, subsurface outflow, and withdrawal by wells. Calculations based on data indicate that inflow to the Ogallala aquifer was about 38,500 acre-feet during 1980. Outflow from the aquifer was calculated at about 135,000 acre-feet, for a net loss from storage of about 96,000 acre-feet.

Specific yield and hydraulic conductivity of the Ogallala aquifer were estimated from 66 drill logs in the study area. Estimates of specific yield ranged from 0.07 to 0.25 and averaged 0.18, indicating water-table conditions in the aquifer. Estimates of hydraulic conductivity ranged from 15 to 160 feet per day and averaged 88 feet per day.

Ground water in the study area generally moves from west to east under a gradient of about 7 feet per mile. Water travels approximately 150 feet per year through the aquifer. The effect of ground-water pumping for irrigation is expressed by a general depression in the water table and the formation of cones of depression in areas of intensive pumping. Saturated thickness of the Ogallala aquifer ranged from 0 to about 350 feet for January 1981. The volume of ground water in storage was calculated as about 7,500,000 acre-feet during 1981.

Concentrations of chemical constituents in water from the Ogallala aquifer generally are less than the limits recommended by the Kansas Department of Health and Environment for drinking water and pose no problem when used for irrigating crops. However, excess fluoride was present in some water samples from the Ogallala aquifer, and water samples from wells completed in the Arkansas River alluvium were found to contain nitrate, fluoride, dissolved solids, and sulfate in excess of the recommended limits.

During 1981, 622 irrigation wells pumped water from the Ogallala aquifer. These wells were approved to pump 210,000 acre-feet of ground water annually to irrigate about 75,000 acres of crops. Well yields measured at 20 sites during the study ranged from 220 to 992 gal/min.

Ground-water withdrawal for irrigation was calculated by two methods--the time-discharge method and the irrigation-requirement method. Calculations of ground-water withdrawal using the time-discharge method were about 81,000 acre-feet during 1980 and 58,000 acre-feet during 1981. Calculations of ground-water withdrawal using the irrigation-requirement method were about 121,000 acre-feet during 1980 and 131,000 acre-feet during 1981. The results from the irrigation-requirement method are probably closer to the actual quantity of ground-water withdrawal because of problems encountered when applying the time-discharge method. Problems included (1) an incompatibility of discharge-testing equipment with many wells in the study area, (2) failure of time-recording devices, and (3) mechanical problems with pumps or powerplants.

Prior to large-scale irrigation development, recharge to the Ogallala aquifer equaled discharge. The rapid increase of irrigation development during the mid-1970's has resulted in ground-water-withdrawal rates that were three times greater than recharge during 1980 alone. When withdrawal exceeds recharge, ground water is removed from storage, or mined, to satisfy pumping demands. The effect of mining water in the aquifer is indicated by water-level declines and a reduction in saturated thickness.

Water-level declines ranged from about 0 to 50 feet between 1939 and 1981. Average water-level decline was about 0.4 foot per year. The volume of water in storage in the Ogallala aquifer was reduced by about 688,000 acre-feet from 1939 to 1981. This value corresponds to a reduction of approximately 8 percent of the water that was available in the aquifer prior to irrigation development. The number of irrigation wells in the study area increased five-fold between 1968 and 1980. Therefore, the bulk of the water-level declines and reduction in storage in the study area occurred during this period.

The occurrence of the Crooked Creek-Fowler fault in the study area could have a marked effect on underflow to the east of the fault and recharge to the Arkansas River. Should the mining of ground water reach the extent that the water table drops below the bedrock surface on the upthrown side of the fault, flow across the fault could cease, and the aquifer east of the fault could be separated from underflow from the main body of the aquifer.

Additional investigations could help to better define the bedrock surface in Ford County, especially with respect to the fault. In addition, a model study of the stream-aquifer relationship between the Arkansas River and the Ogallala aquifer would be an important step in understanding the gain and loss regimen of these two vital water resources.

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Table 5. --Records of wells completed in the Ogallala aquifer

(1) Site uses --I, irrigation; O, observation; U, unused.

(2) Lift --T, turbine; C, centrifugal. Power --D, diesel; E, electric; G, gasoline; L, LP gas; N, natural gas; Z, unknown.

(3) Pump discharge --Gallons per minute reported by driller or irrigator; M, measured during study.

(4) Specific capacity --Gallons per minute of discharge per foot of drawdown.

(5) Drill log available --D, drill log describing the lithology of the well bore available from the Kansas Department of Health and Environment

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
25-25W-04BCA 01	235	01-01-1976	70.00	- -	2543	--	--	I	T D	--	- -		DURR, GALEN W
25-25W-29CAD 01	--	01-01-1978	65.30	03-C6-1980	2592	--	--	I O	T N	467M	- -		HAMPTON, MARVI
25-25W-29DBC 01	103	07-25-1979	- -	- -	2599	95	--	I	T N	350	11.67		HAMPTON, MARVI
25-25W-30ACB 01	--	01-01-1977	- -	- -	2558	--	--	I	T D	--	- -		OREBAUGH,RAY
25-25W-30BBC 01	--	01-01-1977	- -	- -	2590	--	--	I	T D	--	- -		OREBAUGH, ROY
25-25W-32ABB 01	--	01-01-1968	- -	- -	2602	--	--	I	T N	--	- -		BROCE,RAY
25-25W-32ACD 01	--	01-01-1967	- -	- -	2611	--	--	I	T N	--	- -		BROCE, RAY
25-25W-32DAD 01	--	01-01-1967	- -	- -	3593	--	--	I	T N	--	- -		BROCE, RAY
25-25W-33BCA 01	--	01-01-1968	- -	- -	2602	--	--	I	T N	--	- -		ADAMS, JESSE
25-25W-33BDC 01	--	01-01-1968	- -	- -	2597	--	--	I	T N	--	- -		ADAMS, JESSE
25-25W-34CDD 01	100	08-16-1978	- -	- -	2580	90	--	I	T L	350	5.83		ADAMS, JESSE
25-25W-34DDD 01	--	01-01-1955	- -	- -	2563	--	--	I	T L	--	- -		ADAMS, JESSE
25-26W-19BDB 01	175	09-22-1979	101.20	07-01-1980	2679	175	73.80	I O	T D	600	25.00	D	YOUNG, HOWARD
25-26W-19CBD 01	193	03-05-1976	105.00	06-05-1976	2683	187	82.00	I	T D	900	16.36	D	YOUNG, HOWARD
25-26W-19DBD 01	185	03-01-1976	103.00	03-01-1976	2679	180	77.00	I	T D	900	15.79	D	YOUNG, HOWARD
25-26W-20ABC 01	--	10-31-1975	104.00	07-C1-1980	2668	178	74.00	I O	T D	900	- -	D	STRAUTH, FRANK
25-26W-22CBD 01	--	12-27-1977	75.00	12-27-1977	2630	155	80.00	I	T D	800	18.60	D	STRAUTH, FRANK
25-26W-22CCD 01	--	01-01-1968	- -	- -	2633	--	--	I	T D	--	- -		STRAUTH, FRANK
25-26W-22DCC 01	--	01-01-1970	69.40	07-01-1980	2625	--	--	I O	T D	--	- -		HAMPTON, MARVI
25-26W-24CDC 01	85	09-01-1976	68.70	07-01-1980	2610	83	14.30	I O	T E	308	15.40	D	OREBAUGH, MARK

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
25-26W-25CDD 01	187	01-01-1968	74.80	12-01-1977	2623	187	112.20	I O	T N	--	- -		O. L. AGUR
25-26W-30ABB 01	222	10-31-1975	109.30	07-01-1980	2682	221	111.70	I	T D	1000	- -	D	YOUNG, HOWARD
25-26W-30BBD 01	--	01-01-1975	- -	- -	--	--	--	I	T D	--	- -		COCY, IRMINA
25-26W-32AAC 01	232	02-23-1978	90.00	02-23-1978	2664	230	140.00	I	T D	700	5.38	D	SCHRAEDER, ARL
25-26W-36DBB 01	224	09-08-1978	87.00	09-08-1978	2620	222	135.00	I	T N	400	3.39	D	AGUR, VERNON L
25-26W-36DCC 01	--	01-01-1968	- -	- -	2624	--	--	I	T N	--	- -		AGUR, VERNON L
26-25W-03DAAB01	--	01-01-1972	- -	- -	2580	--	--	I	T E	--	- -		DURLER, JOHN E
26-25W-06CDA 01	--	01-01-1969	89.50	07-02-1980	2595	--	--	I O	T N	--	- -		RABER, JAY PAU
26-25W-06CDD 01	--	01-01-1969	- -	- -	2591	--	--	I	T N	--	- -		BACON, DON B
26-25W-07BBC 01	--	01-01-1975	102.90	09-11-1980	2613	--	--	I O	T N	--	- -		OWENS, LARRY
26-25W-07CCC 01	225	01-01-1975	- -	- -	2628	--	--	I	T N	--	- -		OWENS, LARRY
26-25W-07CDC 01	220	01-01-1975	122.40	- -	2621	--	--	I	T N	--	- -		OWENS, LARRY
26-25W-11CCA 01	--	01-01-1976	- -	- -	2590	--	--	I	T N	--	- -		REBEIN, HAROLD
26-25W-15CCD 01	--	01-01-1979	- -	- -	2611	--	--	I	T N	--	- -		REBEIN, BILL
26-25W-16CCD 01	--	01-01-1973	137.80	09-11-1980	2619	--	--	I O	T N	--	- -		REBEIN, HAROLD
26-25W-16DCD 01	--	01-01-1973	- -	- -	2621	--	--	I	T N	--	- -		REBEIN, HAROLD
26-25W-19DDB 01	--	01-01-1974	80.40	09-11-1980	2574	--	--	I O	T N	--	- -		WHITE, HERBERT
26-25W-20ABD 01	--	01-01-1972	- -	- -	2607	--	--	I		--	- -		WHITE, HERBERT
26-25W-20BAC 01	--	01-01-1972	- -	- -	2605	--	--	I	T N	--	- -		WHITE, HERBERT
26-25W-20DDB 01	235	05-19-1976	88.00	05-19-1976	2584	235	147.00	I	T D	2200	- -	D	D&D LAND & CAT
26-25W-29CBC 01	--	01-01-1965	- -	- -	2511	--	--	I	C L	--	- -		EICHMAN, DALE
26-25W-29CDB 01	--	01-01-1976	- -	- -	2509	--	--	I	C E	--	- -		EICHMAN, DALE
26-25W-32AAA 01	--	- -	- -	- -	2505	--	--	I	T E	--	- -		
26-25W-32BCD 01	192	08-15-1976	11.00	08-15-1976	2499	191	180.00	I	T E	700	38.89	D	MCCLURE, DONAL
26-25W-32CCA 01	--	01-01-1945	- -	- -	--	--	--	I	T N	--	- -		MCKIBBON, M W
26-25W-32DBD 01	--	01-01-1973	- -	- -	2499	--	--	I	T E	--	- -		DOLL, LOREN A
26-25W-33CCC 01	160	01-01-1945	17.00	10-01-1938	2510	--	--	I	T E	--	- -		JOHN H. CLAR
26-25W-33DCD 01	--	01-01-1945	- -	- -	2500	--	--	I	T E	--	- -		ALGER, JOHN
26-26W-01ACB 01	--	01-01-1977	- -	- -	2612	--	--	I	T N	--	- -		GIESSEL, ALFRE
26-26W-01ACC 01	--	01-01-1977	- -	- -	2613	--	--	I	T N	--	- -		GIESSEL, ALFRE
26-26W-02CBB 01	225	01-01-1954	108.40	07-02-1980	2640	--	--	I	T N	650	5.33	D	REBEIN, HAROLD
26-26W-02CCC 01	--	01-01-1979	115.10	07-02-1980	2644	--	--	I		--	- -		REBEIN, BILL
26-26W-02DBB 01	445	01-01-1976	117.60	07-02-1980	2643	--	--	I	T N	--	- -		REBEIN, HAROLD
26-26W-04BCB 01	285	07-11-1979	111.40	07-02-1980	2657	263	151.60	I O	T N	450	3.49	D	REX STANLEY FE
26-26W-10DCB 01	--	- -	119.20	07-02-1980	2645	--	--	I O	T N	--	- -		GIESSEL, ALFRE

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
26-26W-11ADB 01	--	01-01-1966	--	--	2635	--	--	I	T N	--	--		CASTERLINE GRA
26-26W-12CDB 01	261	--	104.00	09-01-1942	--	--	--	I		--	--		WILLIAM C. KNO
26-26W-12DDB 01	--	01-01-1966	--	--	2625	--	--	I	T E	--	--		KNOY, WILLIAM
26-26W-13ADB 01	--	01-01-1966	--	--	2619	--	--	I	T N	--	--		OWENS, LARRY
26-26W-13BAB 01	--	01-01-1974	--	--	2627	--	--	I	T N	--	--		OWENS, LARRY
26-26W-13BDB 01	--	06-02-1975	100.00	06-02-1979	2625	244	144.00	I	T N	1400	14.00	D	OWENS, LARRY
26-26W-13DBD 01	--	01-01-1972	113.50	09-11-1980	2621	--	--	I O	T N	--	--		OWENS, LARRY
26-26W-16CCC 01	--	01-01-1945	--	--	2549	--	--	I	C E	--	--		BAILES, GERALD
26-26W-16CCD 01	23	01-01-1976	7.40	10-01-1938	2545	--	--	I	C E	--	--		BAILES, GERALD
26-26W-17CCA 01	--	01-01-1954	--	--	2548	--	--	I	T N	--	--		NICHOLS, ALLEN
26-26W-18CCB 01	--	01-01-1976	19.00	09-12-1980	2558	--	--	I	T N	--	--		KIDWELL, DELMI
26-26W-19ACA 01	179	05-24-1976	--	--	2555	179	--	I	T N	--	--	D	NICHOLS, ALLEN
26-26W-19BDB 01	--	01-01-1971	--	--	2562	--	--	I	T N	--	--		NICHOLS, ALLEN
26-26W-19CCA 01	--	01-01-1970	68.50	09-11-1980	2575	--	--	I	T N	--	--		GOETZ, VERN
26-26W-19DCA 01	--	--	--	--	2568	--	--	I	T N	--	--		
26-26W-20ACA 01	218	05-05-1976	10.00	05-05-1976	2544	210	200.00	I	T N	1500	--	D	HESSMAN, THOMA
26-26W-20BCA 01	--	01-01-1967	--	--	2548	--	--	I	T N	--	--		GOETZ, VERN
26-26W-20CAB 01	--	01-01-1966	--	--	2549	--	--	I	T N	--	--		GOETZ, VERN
26-26W-20DCA 01	205	10-10-1977	--	--	2550	202	--	I	T N	2000	--	D	HESSMAN, THOMA
26-26W-21CBC 01	--	01-01-1953	9.30	03-06-1980	2545	--	--	I O	T N	913M	--		STANLEY, JOHN
26-26W-23DCB 01	--	01-01-1970	--	--	2535	--	--	I	T N	--	--		HULL, JAMES JR
26-26W-24ACB 01	--	01-01-1977	--	--	2598	--	--	I	T N	--	--		CURTIS, L S
26-26W-25CDA 01	28	01-01-1938	9.00	05-21-1980	2515	--	--	I	C G	--	--		STRIEF, JESSE
26-26W-27CBD 01	--	01-01-1972	--	--	2550	--	--	I	T N	--	--		STANLEY, JOHN
26-26W-28ABB 01	--	01-01-1965	--	--	2540	--	--	I	T N	--	--		STANLEY, JOHN
26-26W-28ACC 01	--	01-01-1966	--	--	2556	--	--	I	T N	--	--		STANLEY, JOHN
26-26W-29AAC 01	--	01-01-1967	--	--	2565	--	--	I	T N	--	--		FELDT, NORBERT
26-26W-29ADC 01	--	01-01-1967	--	--	2578	240	--	I	T N	--	--	D	FELDT, NORBERT
26-26W-29BBD 01	--	01-01-1971	--	--	2581	--	--	I	T N	--	--		GOETZ, VERN
26-26W-29CDB 01	--	01-01-1973	--	--	2580	212	--	I	T N	1300	13.13	D	DOLL, LOREN A
26-26W-30AAC 01	--	01-01-1970	--	--	2578	--	--	I	T N	--	--		GOETZ, VERN
26-26W-30BBD 01	--	01-01-1970	--	--	2592	--	--	I	T N	--	--		GOETZ, VERN
26-26W-30CCD 01	--	01-01-1966	--	--	2595	--	--	I	T N	--	--		GOETZ, VERN
26-26W-30DCC 01	--	--	54.90	09-11-1980	2600	--	--	I O	T N	--	--		
26-26W-31BCA 01	--	01-01-1976	--	--	2606	--	--	I	T N	--	--		MILLER, DUANE

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
26-26W-31CCA 01	105	01-04-1977	74.00	01-04-1977	2620	182	108.00	I	T N	1451	72.55	D	MILLER, DUANE
26-26W-32ADD 01	128	01-01-1967	48.30	12-01-1977	2585	128	79.70	I O	T N	--	- -		N. + L. FELDT
26-26W-32BBD 01	--	01-01-1967	- -	- -	2590	138	--	I	T N	1900	57.58	D	DOLL, LOREN A
26-26W-32CAC 01	--	01-01-1967	- -	- -	2600	149	--	I	T N	2000	95.24	D	DOLL, LOREN A
26-26W-32DCA 01	--	01-01-1967	- -	- -	2605	--	--	I	T N	--	- -		DOLL, LOREN A
26-26W-33ABD 01	--	01-01-1971	- -	- -	2570	--	--	I	T N	--	- -		PERRIER, JOHN
26-26W-33BAC 01	--	01-01-1971	- -	- -	2590	--	--	I	T N	--	- -		PERRIER, JOHN
26-26W-33CAC 01	183	02-02-1977	69.00	02-02-1977	2601	171	102.00	I	T N	1200	75.00	D	SCHIFFNER, ALB
26-26W-33DCA 01	--	01-01-1971	- -	- -	2600	--	--	I	T N	--	- -		PERRIER, JOHN
26-26W-34BBA 01	--	01-01-1973	- -	- -	2560	--	--	I	T N	--	- -		STANLEY, REX E
26-26W-36ACA 01	175	02-21-1977	14.00	02-21-1977	2518	170	156.00	I	T N	800	9.30	D	SHUMARD, DONAL
26-26W-36BBD 01	--	01-01-1968	- -	- -	2529	--	--	I	T N	--	- -		SHUMARD, DONAL
26-26W-36DCC 01	--	01-01-1969	34.20	02-01-1977	2543	168	133.80	I O	T N	--	- -		DONALD SHUMARD
27-23W-19BCD 01	160	01-14-1977	20.00	01-14-1977	2452	157	137.00	I O	T D	850	170.00	D	JONES,EUGENE
27-23W-20CCC 01	--	01-01-1973	60.98	06-20-1980	2470	--	--	I	T E	--	- -		BARNGROVER,LOR
27-23W-21DAB 01	--	01-01-1968	5.77	05-29-1980	2411	--	--	I	T E	--	- -		DINKELA,L.F.
27-23W-22CCD 01	--	01-01-1955	34.20	06-17-1980	2407	--	--	I	T E	--	- -		STOUT,JOSEPH
27-23W-27BBD 01	--	01-01-1954	27.40	03-07-1980	2415	--	--	I	T E	491M	- -		COAKE FEEDYARD
27-23W-28AAA 01	--	01-01-1974	23.17	05-29-1980	2421	--	--	I O	T E	--	- -		STEELE,ALAN
27-23W-28AAC 01	--	- -	- -	- -	2435	--	--	U		--	- -		STEELE,ALAN
27-23W-29ACC 01	161	10-31-1975	55.82	07-14-1980	2468	149	93.18	I	T E	1400	- -	D	DOWNEY,MICHAEL
27-23W-29CCB 01	--	01-01-1974	51.34	06-17-1980	2469	--	--	I	T N	--	- -		STEELE,ALAN
27-23W-31DAA 01	--	01-01-1972	77.86	06-17-1980	2490	--	--	I	T N	--	- -		STEELE,ALAN
27-23W-31DBD 01	--	01-01-1974	- -	- -	2512	--	--	I O	T N	--	- -		STEELE,ALAN
27-23W-32ADD 01	--	01-01-1976	60.84	07-14-1980	2470	--	--	I	T N	--	- -		STEELE,EARL
27-23W-33ABC 01	155	11-22-1976	48.00	11-22-1976	2455	147	99.00	I	T N	1000	83.33	D	STEELE,ALAN
27-23W-33ACC 01	169	11-22-1976	54.00	11-08-1980	2463	157	103.00	I	T N	800	133.33	D	STEELE,ALAN
27-23W-34DCC 01	148	06-17-1980	60.00	06-17-1980	2460	148	88.00	I	T N	1120	101.82	D	STEELE,ALAN
27-23W-35CCC 01	150	05-16-1980	58.00	06-17-1980	2445	136	78.00	I	T N	1120	50.91	D	STEELE,ALAN
27-23W-35DCA 01	145	01-01-1968	42.91	05-30-1980	2430	--	--	I	T D	--	- -		STOUT,MARVIN
27-23W-36CCC 01	147	01-01-1967	40.70	02-01-1977	2428	147	106.30	I O	T N	--	- -		ANSEL HAGER
27-24W-03CCA 01	159	09-21-1977	38.00	09-21-1977	2445	153	115.00	I	T L	--	- -	D	CAMPBELL SYLVE
27-24W-06ADC 01	--	- -	- -	- -	2467	--	--			--	- -		THENNES,DAVE
27-24W-06ADD 01	--	- -	- -	- -	2469	--	--			--	- -		THENNES,DAVE
27-24W-06BDB 01	--	01-01-1968	- -	- -	2472	--	--	I	T N	--	- -		SCHRADER,CHARL

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
27-24W-06CDB 01	--	01-01-1974	--	--	2492	--	--	I	T	--	--		ORINGDERFF,RAL
27-24W-06DAC 01	--	01-01-1967	--	--	2491	--	--	I	T	--	--		McALLISTER,MON
27-24W-07BAD 01	--	01-01-1974	--	--	2502	--	--	I	T	--	--		DUNSFORD,J.C.
27-24W-07CAD 01	--	01-01-1967	--	--	2511	--	--	I	T N	--	--		DUNSFORD,J. JR
27-24W-07CBB 01	--	01-01-1967	--	--	2518	--	--	I	T E	--	--		DUNSFORD,J. JR
27-24W-07DCB 01	191	07-26-1976	77.00	07-26-1976	2514	182	105.00	I	T	800	18.60	D	GJERSTAD,PHIL
27-24W-08AAB 01	--	01-01-1973	58.14	07-07-1980	2474	--	--	I	T N	--	--		RENICK,DONALD
27-24W-08DAB 01	--	01-01-1972	--	--	2475	--	--	I	T N	--	--		RENICK & DOLL
27-24W-09ADD 01	--	01-01-1972	--	--	2480	--	--	I	T N	--	--		RENICK & DOLL
27-24W-09BDD 01	--	01-01-1972	--	--	2475	--	--	I	T N	--	--		RENICK & DOLL
27-24W-09DBC 01	--	01-01-1972	67.58	07-08-1980	2483	--	--	I O	T N	--	--		RENICK & DOLL
27-24W-09DDA 01	--	01-01-1972	--	--	2493	--	--	I	T N	--	--		RENICK & DOLL
27-24W-10DDA 01	--	--	--	--	2445	--	--	U		--	--		HITTLE,FRANK,B
27-24W-11CBD 01	148	10-31-1975	20.00	10-01-1975	2441	145	125.00	I	T L	1300	46.43	D	LEE,EILEEN
27-24W-12CCC 01	144	02-20-1980	9.00	02-22-1980	2434	140	131.00	I O	T E	1800	19.78	D	RILEY,HARRY
27-24W-13ADD 01	142	11-18-1976	14.00	11-05-1976	2425	142	128.00	I	T D	2000	32.79	D	GOBIN,GARY,D.
27-24W-13BAD 01	140	06-16-1977	3.00	06-11-1977	2428	137	134.00	I	T D	2000	42.55	D	RILEY,HARRY
27-24W-13DBA 01	156	09-11-1975	18.81	07-16-1980	2430	154	135.19	I	T	850	--	D	LANG,WILLIAM
27-24W-14ACD 01	--	01-01-1973	--	--	2464	--	--	I	T	--	--		STEGMAN,AL
27-24W-15AAC 01	--	01-01-1973	--	--	2490	--	--	I	T N	--	--		RENICK,RONALD
27-24W-15BCA 01	--	01-01-1973	--	--	2490	--	--	I	T N	--	--		RENICK,RONALD
27-24W-15DBD 01	170	11-23-1976	48.00	10-16-1976	2488	165	117.00	I	T N	800	11.94	D	SCHNEWEIS,ROBE
27-24W-16ACA 01	--	01-01-1972	--	--	2510	--	--	I	T N	--	--		RENICK & DOLL
27-24W-16CAC 01	--	01-01-1977	--	--	2523	--	--	I	T N	--	--		MARVEL LIVESTO
27-24W-16DAA 01	--	01-01-1972	70.70	07-08-1980	2501	--	--	I	T N	--	--		ANDERSON,WILLI
27-24W-16DCA 01	--	01-01-1976	71.06	07-08-1980	2515	--	--	I	T D	--	--		SCHNEWEIS,ROBE
27-24W-17BCB 01	--	01-01-1973	--	--	2521	--	--	I	T N	--	--		ROESENER,E.G.
27-24W-17DDB 01	--	01-01-1969	--	--	2519	--	--	I	T N	--	--		BARNES,WAYNE
27-24W-18BCD 01	162	10-29-1975	65.00	10-01-1975	2541	160	95.00	I	T N	--	--	D	ROESENER,E.G.
27-24W-18DAD 01	--	01-01-1972	--	--	2543	--	--	I	T N	--	--		ROESENER,E.G.
27-24W-19ABA 01	--	01-01-1974	--	--	2535	--	--	I O	T N	--	--		ROESENER, E.G.
27-24W-19BDD 01	--	01-01-1970	--	--	2552	--	--	I	T N	--	--		ROESENER,E.G.
27-24W-20DAA 01	--	01-01-1973	--	--	2547	--	--	I	T N	--	--		MONGER,RALPH
27-24W-20DCC 01	175	07-02-1976	107.00	06-26-1976	2551	162	55.00	I	T N	--	--	D	MONGER,RALPH
27-24W-22BCC 01	--	01-01-1973	96.55	07-09-1980	2535	--	--	I O	T N	--	--		ANDERSON,WILLI

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
27-24W-22BDB 01	--	01-01-1954	- -	- -	2513	--	--	I	T N	--	- -		ANDERSON,WILLI
27-24W-22CCA 01	--	01-01-1955	- -	- -	2533	--	--	I	T N	--	- -		SCHNEWEIS,R[illegible]
27-24W-22DCA 01	--	01-01-1967	- -	- -	2521	--	--	I	T N	--	- -		ANDERSON,WILLI
27-24W-23ACD 01	--	01-01-1967	- -	- -	2499	--	--	I	T	--	- -		VOGEL,STANLEY
27-24W-24AAC 01	184	01-14-1977	40.00	01-14-1977	2463	178	138.00	I	T	850	170.00	D	DILLON,RUTH,M.
27-24W-24CBD 01	--	01-01-1968	- -	- -	2501	--	--	I	T L	--	- -		VOGEL,STANLEY
27-24W-24DCA 01	--	01-01-1967	73.36	07-14-1980	2495	--	--	I	T L	--	- -		VOGEL,STANLEY
27-24W-26BDB 01	--	01-01-1974	- -	- -	2522	--	--	I	T N	--	- -		BARNGROVER,LOR
27-24W-26CAC 01	204	12-20-1979	114.00	12-20-1979	2520	--	--	I		--	- -	D	BARNGROVER,LOR
27-24W-26DAA 01	191	01-01-1971	84.50	02-01-1977	2512	191	106.50	I O	T N	--	- -		LOREN L. BARNG
27-24W-27ADB 01	--	01-01-1969	- -	- -	2522	--	--	I	T	--	- -		FERGUSON,MITCH
27-24W-27CDD 01	--	01-01-1955	- -	- -	2530	--	--	I	T N	--	- -		ANDERSON,FRANK
27-24W-27DDC 01	--	01-01-1973	- -	- -	2535	--	--	I	T N	--	- -		VOGEL,STANLEY
27-24W-28ACA 01	--	01-01-1974	- -	- -	2537	--	--	I	T N	--	- -		BARNGROVER,LOR
27-24W-28CCD 01	181	06-30-1970	99.12	03-06-1980	2538	175	75.88	I	T N	983M	- -	D	MELIA,JOHN
27-24W-28DAA 01	--	01-01-1967	98.24	06-18-1980	2531	--	--	I	T N	--	- -		HAMILTON,DEAN
27-24W-29ADA 01	180	04-03-1976	93.00	04-03-1976	2540	177	84.00	I	T N	1100	39.29	D	DOWLING;CARL
27-24W-29DCD 01	--	01-01-1957	- -	- -	2543	--	--	I	T	--	- -		MELIA,JOHN
27-24W-30ABA 01	--	01-01-1971	- -	- -	2565	--	--	I	T N	--	- -		MONGER,KENNETH
27-24W-30BAA 01	--	01-01-1970	- -	- -	2573	--	--	I	T N	--	- -		MONGER,KENNETH
27-24W-34ACC 01	--	01-01-1973	- -	- -	2525	--	--	I	T N	--	- -		ANDERSON,FRANK
27-24W-34BAA 01	--	01-01-1968	- -	- -	2521	--	--	I	T N	--	- -		BARNGROVER,LOR
27-24W-34CDD 01	338	11-22-1976	- -	- -	2548	351	--	I O		1000	- -	D	STEELE,ALAN
27-24W-35CDD 01	416	01-22-1977	86.00	01-22-1977	2510	415	329.00	I	T N	1400	41.18	D	BARNGROVER,LOR
27-25W-01DDB 01	176	12-30-1974	60.10	07-16-1980	2497	--	--	I O	T E	--	- -		SHELOR EARL
27-25W-04ACC 01	--	01-01-1970	31.92	03-07-1980	2514	--	--	I		--	- -		ZIMMERMAN, GRA
27-25W-04BC 01	57	- -	20.00	- -	2512	--	--		C Z	--	- -		C. R. ATEN
27-25W-05ACA 01	168	06-01-1976	20.00	06-01-1976	2510	165	145.00	I	T N	1100	84.62	D	FRALICK, KEVIN
27-25W-05CAC 01	160	01-01-1968	- -	- -	2543	150	--	I	T N	1330	133.00		TURLEY, WM.
27-25W-05DCA 01	--	01-01-1976	- -	- -	2548	--	--	I	T N	--	- -		ZIMMER, HAROLD
27-25W-06BCA 01	137	06-01-1976	38.00	06-01-1976	2544	175	137.00	I	T N	1100	137.50	D	MAYRATH, NICHO
27-25W-06CBD 01	--	01-01-1974	- -	- -	2550	--	--	I	T N	--	- -		MAYRATH, NICHO
27-25W-06DCC 01	--	01-01-1955	- -	- -	2565	--	--	I	T N	--	- -		TURLEY, WILLIA
27-25W-07ADB 01	--	01-01-1977	- -	- -	2590	--	--	I	T N	--	- -		MAYRATH, NICHO
27-25W-07BCA 01	198	03-07-1977	87.00	03-07-1977	2598	192	105.00	I	T N	880	48.89	D	MAYRATH, NICHO

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
27-25W-07CDB 01	195	03-07-1977	95.00	03-07-1977	2570	198	103.00	I	T N	800	80.00	D	MAYRATH, NICHO
27-25W-07DDB 01	--	01-01-1956	98.50	05-22-1980	2595	--	--	I O	T N	--	- -		TURLEY, WILLIA
27-25W-08CCA 01	109	06-01-1976	87.60	05-22-1980	2589	185	97.40	I	T N	1100	25.58	D	ZIMMERMAN, GRA
27-25W-09ACA 01	--	01-01-1975	- -	- -	2546	--	--	I	T N	--	- -		BRADY, RICHARD
27-25W-09DBD 01	--	01-01-1975	- -	- -	2570	--	--	I	T N	--	- -		BRADY, RICHARD
27-25W-10ABB 01	--	01-01-1945	- -	- -	--	--	--	I	T N	--	- -		MILLER, DONALD
27-25W-10BBD 01	--	05-31-1978	64.60	09-12-1980	2540	186	121.40	I	T N	850	30.36	D	MILLER, DONALD
27-25W-10CBD 01	--	01-01-1968	- -	- -	2545	--	--	I	T N	--	- -		DIRKS, ERWIN A
27-25W-11ABB 01	209	06-16-1978	43.00	06-16-1978	2510	175	132.00	I	T N	1250	11.16	D	RAY BROCE FARM
27-25W-11CAC 01	--	01-01-1977	- -	- -	2530	--	--	I	T N	--	- -		RAY BROCE FARM
27-25W-11DDB 01	151	06-01-1976	50.00	06-01-1976	2526	148	98.00	I	T E	1400	- -	D	RAY BROCE FARM
27-25W-12AAA 01	174	06-01-1976	34.50	01-01-1976	2497	--	--	I	T N	--	- -	D	BEL FARMS
27-25W-12CAC 01	--	01-01-1959	- -	- -	2522	--	--	I	T N	--	- -		SHELOR JAMES
27-25W-12DCA 01	150	03-06-1976	50.00	03-06-1976	2523	136	86.00	I	T N	1275	25.00	D	SHELOR JAMES
27-25W-13ACA 01	--	01-01-1968	- -	- -	2528	--	--	I	T N	--	- -		MONGER RALPH
27-25W-14CAB 01	176	09-13-1976	84.00	09-13-1976	2557	166	82.00	I	T N	750	46.88	D	WISEMAN, GEORG
27-25W-14DCA 01	159	06-01-1976	92.60	09-12-1980	2560	156	63.40	I O	T N	1100	84.62	D	DIRKS, ELMER
27-25W-16ACB 01	--	01-01-1955	- -	- -	2582	--	--	I		--	- -		SCHNEWEIS,ALBE
27-25W-16BCB 01	--	01-01-1980	91.60	06-28-1980	2579	196	104.40	I	T N	1000	125.00	D	SCHNEWEIS, MIK
27-25W-16CCA 01	191	06-25-1976	110.00	06-25-1975	2585	192	82.00	I	T N	1000	40.00	D	BELL FARMS
27-25W-16DBD 01	169	06-28-1976	110.00	06-28-1976	2595	186	76.00	I	T N	900	36.00	D	BELL FARMS
27-25W-17BCA 01	199	06-18-1979	90.00	06-18-1979	2583	196	106.00	I	T D	800	80.00	D	SCHNEWEIS, MIC
27-25W-18ACA 01	--	01-01-1968	103.57	05-22-1980	2596	--	--	I	T N	--	- -		TURLEY, WILLIA
27-25W-18BDB 01	--	01-01-1968	- -	- -	2605	--	--	I	T N	--	- -		TURLEY, WILLIA
27-25W-18CBB 01	237	10-31-1979	117.00	10-31-1979	2621	237	120.00	I	T N	1200	10.17	D	TURLEY, WILLIA
27-25W-18DAA 01	--	01-01-1977	- -	- -	2605	--	--	I	T N	--	- -		TONGIER, GLENN
27-25W-19DAD 01	--	01-01-1968	131.30	09-12-1980	2633	--	--	I O	T N	--	- -		LEMBRIGHT, WIL
27-25W-20AAA 01	--	01-01-1977	110.80	03-06-1980	2598	--	--	I	T D	--	- -		DAVIS, JODIE
27-25W-20DBB 01	215	04-04-1979	119.10	06-28-1980	2612	205	85.90	I		380	4.75	D	S & R LAND & C
27-25W-21ACD 01	--	01-01-1972	- -	- -	2583	--	--	I	T N	--	- -		ROENFELDT, RIC
27-25W-22ABA 01	--	01-01-1955	- -	- -	2582	--	--	I	T N	--	- -		HAMILTON, DEAN
27-25W-22BDC 01	170	01-01-1955	104.70	06-28-1980	2582	189	84.30	I	T N	860	11.47	D	BRADY, W D
27-25W-22CDC 01	206	06-01-1976	108.00	06-01-1976	2585	198	90.00	I	T L	1100	28.21	D	GERDES, GERHAR
27-25W-23DBA 01	--	01-01-1967	- -	- -	2578	--	--	I	T N	--	- -		WILLIAMS, CLAR
27-25W-24ACC 01	179	07-01-1972	116.50	10-07-1980	2572	--	--	I	T N	--	- -		WISEMAN GEORGE

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
27-25W-24CAD 01	164	01-01-1975	- -	- -	2572	161	--	I	T N	1250	39.94	D	ROFF DAVID
27-25W-25ACA 01	--	01-01-1978	- -	- -	2562	--	--	I	T N	--	- -		JACKSON HAROLD
27-25W-25BBB 01	--	01-01-1972	112.22	07-09-1980	2574	--	--	I O	T N	--	- -		ROFF DAVID
27-25W-27DBD 01	210	11-15-1976	105.00	11-15-1976	2580	209	104.00	I	T N	1000	18.18	D	ROBB, DAVID E
27-25W-29ABA 01	250	06-14-1976	144.20	06-28-1980	2635	250	105.80	I	T N	550	6.18	D	SCHEWEIS, ROBE
27-25W-29ADB 01	242	06-14-1976	141.00	06-14-1976	2637	242	101.00	I	T N	550	5.56	D	SCHEWEIS, ROBE
27-25W-31BBC 01	--	01-01-1973	- -	- -	2665	--	--	I	T E	--	- -		EATON, O L
27-25W-31BDD 01	--	01-01-1976	- -	- -	2654	--	--	I	T N	--	- -		MCCOY, WAYNE
27-25W-31CBB 01	--	01-01-1973	- -	- -	2661	--	--	I	T N	--	- -		EATON, O L
27-25W-31CDA 01	--	01-01-1976	162.50	09-12-1980	2646	--	--	I	T N	--	- -		MCCOY, WAYNE
27-25W-31DAB 01	188	06-29-1976	157.00	06-29-1976	2658	185	28.00	I	T N	600	100.00	D	MCCOY, WAYNE
27-25W-32BCA 01	--	01-01-1976	157.70	06-28-1980	2656	--	--	I	T D	--	- -		MCCOY, WAYNE
27-25W-35BAB 01	--	- -	- -	- -	--	--	--	I	T N	--	- -		
27-26W-01ADB 01	152	11-24-1979	51.20	05-21-1980	2562	149	97.80	I O	T N	2500	125.00	D	MONGER, RALPH
27-26W-01BCA 01	164	11-14-1979	67.00	11-14-1979	2574	161	94.00	I	T N	3500	269.23	D	MONGER, RALPH
27-26W-01CBD 01	167	11-18-1976	90.00	11-18-1976	2597	166	76.00	I	T N	1000	31.25	D	JOHNSON, RUSSE
27-26W-01DBD 01	--	01-01-1955	- -	- -	--	--	--	I	T N	--	- -		MAYRATH, NICHO
27-26W-02ABD 01	164	- -	55.00	11-14-1979	2562	161	106.00		T N	900	100.00	D	MONGER, RALPH
27-26W-02DBC 01	--	01-01-1974	- -	- -	2630	--	--	I	T N	--	- -		JOHNSON, LEO N
27-26W-03AAC 01	--	01-01-1973	76.90	05-21-1980	2605	--	--	I	T N	--	- -		MINTER, ROBERT
27-26W-04ABD 01	--	01-01-1973	97.10	09-11-1980	2623	--	--	I	T N	--	- -		MINTER, ROBERT
27-26W-04BDB 01	151	10-31-1975	68.00	10-31-1975	2619	150	82.00	I	T N	1200	54.55	D	YOUNG, DONALD
27-26W-04DCA 01	176	01-03-1977	107.00	01-03-1977	2635	179	72.00	I	T N	1000	20.83	D	HINSHAW, NEIL
27-26W-05ACA 01	--	01-01-1968	- -	- -	2619	--	--	I	T N	--	- -		YOUNG, DONALD
27-26W-05CAC 01	--	01-01-1971	106.80	09-12-1980	2642	--	--	I	T N	--	- -		YOUNG, DONALD
27-26W-05DCA 01	--	01-01-1968	- -	- -	2645	--	--	I	T N	--	- -		YOUNG, DONALD
27-26W-06ABB 01	--	01-01-1976	- -	- -	2701	--	--	I	T N	--	- -		CLARK, WILLIAM
27-26W-06ACA 01	--	01-01-1966	96.80	05-12-1980	2630	--	--	I	T N	--	- -		BUCHANAN, DAVI
27-26W-06BBB 01	160	06-16-1976	153.00	06-16-1976	2711	204	51.00	I	T N	1177	28.71	D	WILLIAMS, CLAR
27-26W-06DBC 01	--	01-01-1970	- -	- -	2633	--	--	I	T N	--	- -		DOLL, LOREN A
27-26W-07ADC 01	--	01-01-1945	- -	- -	2658	--	--	I	T N	--	- -		WAGNER, DANIEL
27-26W-07DBB 01	--	01-01-1967	- -	- -	2669	--	--	I	T N	--	- -		WAGNER, DANIEL
27-26W-09BBD 01	--	01-01-1976	- -	- -	2630	--	--	I	T N	--	- -		GOETZ LAND & C
27-26W-09CAC 01	145	02-03-1977	67.00	- -	2600	145	78.00	I	T N	550	7.05	D	GOETZ LAND & C
27-26W-10BAA 01	--	01-01-1977	- -	- -	2622	--	--	I	T N	--	- -		GOETZ LAND & C

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
27-26W-10DCC 01	--	01-01-1972	133.60	09-12-1980	2629	--	--	I	T N	--	- -		DROSTE, ARTHUR
27-26W-11BAC 01	--	01-01-1968	- -	- -	2611	--	--	I	T N	--	- -		JOHNSON, LEO N
27-26W-11DAA 01	150	11-18-1976	102.00	11-18-1976	2618	150	48.00	I	T N	950	39.58	C	JOHNSON, RICHA
27-26W-12ABD 01	--	01-01-1977	- -	- -	2612	--	--	I	T N	--	- -		MAYRATH, NICHO
27-26W-12BBD 01	165	01-01-1977	84.00	- -	2625	165	81.00	I	T N	1100	44.00	D	BROSE FARMS
27-26W-14DDD 01	231	12-27-1977	112.00	12-27-1977	2628	227	115.00	I	T N	800	9.09	D	MCCAULEY, ARLI
27-26W-16BCA 01	--	01-01-1973	- -	- -	2651	234	--	I	T N	--	- -	D	DOLL, LOREN
27-26W-17BBB 01	--	01-01-1954	- -	- -	2675	--	--	I	T N	--	- -		BUCHANAN, DAVI
27-26W-17BCC 01	--	01-01-1976	- -	- -	--	--	--	I	T N	--	- -		BUCHANAN, DAVI
27-26W-18ABA 01	--	01-01-1974	125.12	06-30-1980	2678	--	--	I	T N	--	- -		JOHNSON, RICHA
27-26W-18BCC 01	--	01-01-1964	- -	- -	2684	--	--	I	T N	--	- -		JOHNSON, LEO N
27-26W-18CCC 01	--	01-01-1951	140.43	06-30-1980	2697	--	--	I O	T N	--	- -		JOHNSON, LEO
27-26W-19CCD 01	--	01-01-1972	- -	- -	2730	--	--	I	T N	--	- -		PATTON, DAVID
27-26W-19DCC 01	--	01-01-1974	- -	- -	2723	--	--	I	T N	--	- -		PATTON, DAVID
27-26W-21DAA 01	199	01-01-1968	161.00	02-01-1977	2695	199	38.00	I	T N	245	- -		DALE E. STOUTH
27-26W-22BCD 01	225	05-31-1975	- -	- -	2690	234	--	I	T N	--	- -	D	HERRMAN, CLARE
27-26W-22CAC 01	--	01-01-1968	- -	- -	2701	--	--	I	T N	--	- -		NEWELL, ROBERT
27-26W-23BCC 01	214	02-24-1977	173.00	02-24-1977	2699	212	39.00	I	T N	680	13.88	D	CRAGG, MERLE
27-26W-24ACA 01	245	03-05-1977	130.00	03-05-1977	2640	240	110.00	I	T D	600	5.61	D	STAGGS, DARREL
27-26W-24DCA 01	--	01-01-1977	- -	- -	2650	--	--	I	T D	--	- -		STAGGS, DARREL
27-26W-26AAD 01	--	01-01-1973	185.19	06-05-1980	2692	--	--	I O	T E	--	- -		DAVIS, SAM V
27-26W-26DAD 01	--	01-01-1973	- -	- -	2690	--	--	I	T E	--	- -		DAVIS, SAM V
27-26W-28AAC 01	254	05-31-1975	184.40	03-07-1980	2710	254	69.60	I O	T E	920M	- -	C	STAUTH, DALE E
27-26W-28CCA 01	285	05-20-1977	173.00	05-20-1977	2707	275	102.00	I	T N	--	- -	D	BEL FARMS
27-26W-29DBD 01	315	05-20-1977	164.00	05-20-1977	2708	300	136.00	I	T N	--	- -	D	BEL FARMS
27-26W-30CBC 01	233	12-29-1967	166.00	12-29-1967	2726	228	62.00	I	T N	1650	68.75	D	REINERT, JIMMI
27-26W-31ABD 01	--	01-01-1975	173.40	09-12-1980	2700	--	--	I O	T N	--	- -		REINERT FEEDYA
27-26W-31BBD 01	210	03-23-1977	170.00	03-23-1977	2718	297	127.00	I	T N	1451	90.69	D	REINERT FEEDYA
27-26W-32AAAC01	--	01-01-1974	- -	- -	2702	--	--	I	T N	--	- -		FRINK, RONALD
27-26W-33BAD 01	300	04-09-1977	154.00	04-09-1977	2690	292	138.00	I	T N	--	- -	D	BEL FARMS
27-26W-33CBB 01	236	11-24-1976	- -	- -	2692	232	--	I	T N	1100	- -	D	HINK, KENNETH
27-26W-34AAB 01	--	01-01-1967	175.40	05-13-1980	2693	--	--	I	T N	--	- -		FRINK, RONALD
27-26W-36ACC 01	--	01-01-1972	146.70	06-05-1980	2654	--	--	I	T N	--	- -		HEYEN, ORLIN V
27-26W-36CAB 01	--	01-01-1970	- -	- -	2664	--	--	I	T N	--	- -		HEYEN, ORLIN V
27-26W-36DBD 01	190	06-01-1976	134.00	06-01-1976	2654	185	51.00	I	T N	1100	84.62	D	ROBINSON, IRVI

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
28-21W-08CCA 01	75	04-01-1955	47.12	02-16-1977	2378	75	27.88	I O	T L	648	- -		SPEER, F.H.
28-21W-09CCA 01	70	03-01-1975	40.00	01-01-1975	2368	70	30.00	I	T E	--	- -		KONDA, LEO
28-21W-09CCD 01	70	07-01-1975	39.70	03-01-1979	2361	70	30.30	I	T E	--	- -		KONDA, LEO
28-21W-09DCA 01	80	03-01-1975	40.00	03-10-1975	2363	--	--	I	T L	750	- -	D	AUSTIN, G.L. &
28-21W-10CDA 01	76	06-01-1979	41.00	06-18-1979	2359	--	--	I	T N	--	- -		AUSTIN, G.L.
28-21W-10CDB 01	78	01-01-1976	41.40	09-20-1979	2367	78	36.60	I	T N	--	- -		AUSTIN, G.L.
28-21W-10DDD 01	89	06-18-1979	39.70	06-18-1979	2349	89	49.30	I O	T N	840M	- -		GEORGE F. AUST
28-21W-11DDB 01	94	04-01-1973	41.10	07-06-1979	2345	94	52.90	I	T N	--	- -		AUSTIN, G.F.
28-21W-12ACD 01	78	01-01-1953	34.90	07-06-1979	2327	78	43.10	I O	T N	--	- -		BRENSING, E.P.
28-21W-14BBA 01	85	- -	44.40	09-21-1979	2352	85	40.60	U		--	- -		
28-21W-14BCA 01	107	04-01-1971	54.10	09-20-1979	2358	107	52.90	I	T N	764M	- -		AUSTIN, G.L.
28-21W-14CAC 01	126	- -	68.40	08-31-1979	2371	126	57.60	U		--	- -		AUSTIN, GEORGE
28-21W-15A 01	102	08-01-1969	45.50	07-06-1979	2355	102	56.50	I	T N	--	- -		AUSTIN, G.F.
28-21W-15BAC 01	104	08-01-1969	50.90	07-16-1979	2360	104	53.10	I	T N	939M	- -		AUSTIN, G.L.
28-21W-15DDB 01	105 0	04-01-1951	56.40	03-19-1979	2369	105	48.60	I	T N	775	- -		MELIA, GORDON
28-21W-16BDB 01	97	07-01-1975	48.10	06-28-1979	2365	97	48.90	I	T N	--	- -	D	KONDA, LEO
28-21W-17ADB 01	84	01-01-1974	40.40	06-28-1979	2370	84	43.60	I	T N	700	70.00		FORD LAND & CA
28-21W-17BDC 01	115	01-01-1977	- -	- -	2385	115	--	I	T D	--	- -		PRICE, M.W.
28-21W-17CCD 01	149	01-01-1977	91.20	09-24-1979	2410	149	57.80	I	T D	--	- -		PRICE, M.W.
28-21W-21AAA 01	109	01-01-1973	44.40	03-19-1979	2378	101	56.60	I O	T E	--	- -		RINGWALD, J.F.
28-21W-21BCA 01	130	01-01-1950	94.80	06-28-1979	2412	130	35.20	I D	T L	--	- -		KIRKPATRICK, (
28-21W-22A 01	160	01-01-1974	66.70	06-18-1979	2378	160	93.30	I	T E	--	- -		FORD LAND & CA
28-21W-22B 01	122	01-01-1974	65.50	07-06-1979	2380	122	56.50	I	T E	--	- -		FORD LAND & CA
28-21W-22DB 01	162	02-01-1977	77.70	09-20-1979	2382	162	84.30	I	T D	--	- -		PRICE, M.W.
28-21W-24AAC 01	170	01-01-1973	81.80	09-20-1979	2370	170	88.20	I O	T E	1000	- -		HAYSE, P.W.
28-21W-24DBA 01	175	04-01-1975	87.80	07-06-1979	2370	175	87.20	I	T N	720	- -		AUSTIN, G.L.
28-21W-25ABB 01	149	01-01-1977	69.80	07-06-1979	2365	149	79.20	I	T D	--	- -		PRICE, M.W.
28-21W-25BBB 01	143	01-01-1977	82.00	07-06-1979	2381	143	61.00	I	T N	750	- -		PRICE, R.C.
28-21W-26BAB 01	--	12-01-1979	77.80	05-28-1980	2385	--	--	I	T N	--	- -		PRICE, MARVIN
28-21W-27AAB 01	155	08-01-1957	82.30	06-28-1979	2390	155	72.70	I	T N	850	51.52		STAATS, P.B.
28-21W-27BAB 01	175	04-01-1977	92.90	06-28-1979	2405	175	82.10	I D	T N	--	- -		STAATS, P.B.
28-21W-29BDB 01	151	12-10-1979	83.73	05-28-1977	2410	--	--	I		--	- -		SIEMENS, VENNET
28-21W-29CAC 01	160	04-10-1976	100.00	04-10-1974	2417	--	--	I	T L	--	- -		AUSTIN, G.L.
28-21W-30ADB 01	151	01-22-1977	85.79	05-28-1980	2413	140	54.21	I	T D	1400	14.74	D	PRICE, MARVIN
28-21W-33AAC 01	--	01-01-1958	87.53	06-03-1980	2400	--	--	I	T N	--	- -		ESTES, BUD

Table 5. *Records of wells completed in the Ogallala aquifer-- Continued*

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
28-21W-33DCA 01	--	01-01-1954	77.93	06-03-1980	2387	--	--	I O	T N	--	- -		ESTES,E.R.
28-22W-03CCB 01	82	08-25-1977	13.00	08-25-1977	2363	--	--	I	T E	450	7.03	D	FORD LAND & CA
28-22W-03CDC 01	62	08-11-1977	15.00	08-11-1977	2361	60	45.00	I	T E	300	7.14	D	FORD LAND & CA
28-22W-04BCD 01	--	01-01-1976	12.59	06-17-1980	2369	--	--	I	T E	--	- -		STEPHENSON,LAR
28-22W-04CC 01	76	01-01-1945	27.50	10-01-1938	2385	78	50.50	I	T E	--	- -		L. A. LAMP
28-22W-04CDA 01	--	01-01-1976	14.46	06-18-1980	2371	--	--	I	T E	--	- -		STEPHENSON,LAR
28-22W-05ACD 01	51	01-01-1967	- -	- -	2378	--	--	I	T E	--	- -		STEPHENSON BU
28-22W-05ADC 01	--	01-01-1967	- -	- -	2375	--	--	I	T E	--	- -		STEPHENSON,BUR
28-22W-05ADD 01	--	01-01-1975	- -	- -	2370	--	--	I D	T E	--	- -		STEPHENSON,DWA
28-22W-07BBB 01	--	- -	27.15	06-23-1980	2385	--	--	I	T L	--	- -		
28-22W-09BBD 01	--	- -	- -	- -	2410	--	--	I	T L	--	- -		RUSSEL,FRANCIS
28-22W-10ACD 01	69	- -	24.50	11-01-1938	2372	--	--	U		--	- -		J. J. MAAS
28-22W-10DAB 01	115	04-01-1975	45.00	03-14-1975	2389	--	--	I	T E	--	- -	D	BRAUN H.H.
28-22W-10DDC 01	110	03-01-1977	60.14	06-16-1980	2408	--	--	I	T D	--	- -	D	MAAS,RAYMOND
28-22W-11BDB 01	--	01-01-1977	21.61	06-17-1980	2365	--	--	I	T D	--	- -		KELLY,RANDY
28-22W-11BDC 01	--	- -	28.77	06-17-1980	2371	--	--	I	T D	--	- -		MELIA,E.V.
28-22W-11CBD 01	120	10-06-1976	40.90	06-16-1980	2388	--	--	I	T E	1200	120.00	D	ESTES,BUD
28-22W-11DBD 01	120	01-01-1975	- -	- -	2392	120	--	I	T E	--	- -		JENKINS, P.H.
28-22W-12BDA 01	--	01-01-1968	32.80	03-04-1980	2373	--	--	I	T L	--	- -		MELIA,JOHN
28-22W-12BDD 01	--	01-01-1975	42.54	06-18-1980	2383	--	--	I	T D	--	- -		MELIA,JOHN
28-22W-12CAC 01	--	10-25-1976	- -	- -	2405	82	--	I O	T D	1200	52.17	D	J. L. MELIA ET
28-22W-13BDB 01	105	07-01-1979	47.50	08-31-1979	2388	105	57.50	I	T D	750	- -	D	JENKINS, P.H.
28-22W-16BAB 01	164	10-29-1976	63.86	06-12-1980	2421	161	97.14	I O	T D	800	40.00	D	DERSTEIN,BROTH
28-22W-17CAD 01	185	08-05-1976	118.70	06-19-1980	2466	--	--	I	T D	800	- -	D	COPELAND, EARL
28-22W-19BCA 01	--	01-01-1975	120.69	06-19-1980	2481	--	--	I	T N	--	- -		HOOD,BRADY
28-22W-20AAC 01	--	- -	146.18	06-16-1980	2492	--	--	I	T N	--	- -		FLETCHER,FRANK
28-22W-20BDA 01	--	01-01-1976	110.64	06-16-1980	2471	--	--	I		--	- -		CLEVENGER, RO
28-22W-20BDD 01	206	11-10-1976	116.00	08-25-1976	2476	200	84.00	I	T L	750	9.26	D	CLEVENGER,ROGE
28-22W-20CAC 01	--	01-01-1954	- -	- -	2475	--	--	I	T N	--	- -		COPELAND,EVERE
28-22W-20DAC 01	--	01-01-1977	125.67	06-13-1980	2485	--	--	I	T N	--	- -		FLETCHER,EVANG
28-22W-26DAC 01	169	07-01-1979	110.90	08-30-1979	2451	155	44.10	I	T D	--	- -	D	BAILEY, M.E.
28-22W-28AAD 01	--	01-01-1972	28.33	06-17-1980	2430	--	--	I	T E	--	- -		STEELE,ALAN
28-22W-28BBA 01	193	12-27-1977	115.00	11-03-1977	2473	187	72.00	I	T D	800	12.31	D	WHITE,DAVID,G.
28-22W-28CCD 01	175	01-01-1976	- -	- -	2473	--	--	I	T N	--	- -		BERGER,KENNETH
28-22W-28CDD 01	165	01-01-1955	- -	- -	2462	--	--	I	T N	--	- -		BERGER,KENNETH

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
28-22W-29ADB 01	--	01-01-1976	- -	- -	2475	--	--	I	T D	--	- -		FLETCHER,EVANG
28-22W-29BAC 01	--	01-01-1977	116.52	03-04-1980	2480	--	--	I	T N	--	- -		HOOD,BRADLEY
28-22W-29CBB 01	--	01-01-1977	122.65	06-13-1980	2472	--	--	I	T N	--	- -		BERGER,KENNETH
28-22W-29CCA 01	--	01-01-1977	120.83	06-13-1980	2482	--	--	I	T N	--	- -		BERGER,KENNETH
28-22W-32BAB 01	161	01-01-1954	120.00	02-01-1977	2485	161	41.00	I O	T N	--	- -		RONALD L. SMIT
28-22W-33BBB 01	--	01-01-1967	123.98	06-13-1980	2476	--	--	I	T N	--	- -		BERGER,KENNETH
28-22W-35ADB 01	170	04-28-1977	60.00	04-28-1977	2448	165	105.00	I O	T D	--	- -	D	LEWIS,RANDY
28-22W-35BBD 01	--	01-01-1977	115.76	06-12-1980	2446	--	--	I	T D	--	- -		LEWIS,RANDY
28-22W-35DCC 01	--	01-01-1977	118.35	06-12-1980	2451	--	--	I	T D	--	- -		DAVIDSON,LYSLE
28-23W-01BBD 01	--	01-01-1976	39.73	06-19-1980	2421	--	--	I	T L	--	- -		STEELE,EARL
28-23W-01CDC 01	--	01-01-1977	70.34	06-19-1980	2451	--	--	I	T L	--	- -		STEELE,EARL
28-23W-01DAB 01	--	01-01-1969	33.24	06-24-1980	2400	--	--	I	T D	--	- -		STEELE,EARL
28-23W-02ADC 01	177	12-30-1978	40.00	11-11-1978	2440	176	136.00	I	T D	--	- -	D	STWALLEY,KEITH
28-23W-04BDD 01	224	01-01-1977	95.00	05-11-1979	2495	--	--	I	T N	--	- -		STEELE,EARL
28-23W-05ADD 01	--	01-01-1977	86.65	05-29-1980	2493	--	--	I	T L	--	- -		STEELE,EARL
28-23W-09BCC 01	116	01-01-1945	85.20	10-01-1938	2496	--	--	I	T Z	--	- -		IRA PAULIN
28-23W-11DBC 01	--	01-01-1967	96.75	06-19-1980	2465	--	--	I	T D	--	- -		WILCOXEN,CHARL
28-23W-12AAD 01	--	01-01-1945	39.35	06-23-1980	2402	--	--	I	T	--	- -		SNOOK,M.W.
28-23W-15DDB 01	--	01-01-1968	37.67	06-19-1980	2435	--	--	I	T E	--	- -		HAWES,KAY
28-23W-18BAB 01	247	08-28-1979	113.00	08-28-1979	2547	239	126.00	I O	T	900	19.15	D	CONRAD,M.A.
28-23W-19DCA 01	--	01-01-1973	- -	- -	2515	--	--	I	T E	--	- -		JONES,ROGER,A.
28-23W-20BAC 01	--	01-01-1975	105.12	06-26-1980	2512	--	--	I	T N	--	- -		MALONE,ALBERT
28-23W-23BAD 01	--	01-01-1967	- -	- -	2440	--	--	I	T N	--	- -		KELLER,HARRY,A
28-23W-24ABB 01	--	01-01-1969	97.88	06-16-1980	2465	--	--	I O	T L	--	- -		CLEVENGER,BRUC
28-23W-24DCA 01	--	01-01-1967	128.61	06-23-1980	2508	--	--	I	T N	--	- -		COPELAND,EVERE
28-23W-25AAC 01	--	01-01-1954	141.25	06-24-1980	2512	--	--	I	T N	--	- -		COPELAND,EVERE
28-23W-25BDD 01	--	01-01-1971	- -	- -	2515	--	--	I	T N	--	- -		COPELAND,EVERE
28-23W-25DCB 01	--	01-01-1975	147.63	06-23-1980	2525	--	--	I	T N	--	- -		HOOD,BRADY
28-23W-26ABD 01	--	01-01-1973	133.15	06-26-1980	2514	--	--	I	T E	--	- -		KELLER,HARRY
28-23W-28CAC 01	--	01-01-1974	106.70	06-26-1980	2508	--	--	I	T E	--	- -		ARNOLD,ROGER
28-23W-29CBD 01	--	01-01-1978	79.25	06-24-1980	2481	--	--	I	T D	--	- -		ARNOLD,ROGER
28-23W-31DCB 01	--	- -	- -	- -	2485	--	--	I	T N	--	- -		
28-23W-31DDB 01	240	05-24-1976	125.00	05-24-1976	2535	236	111.00	I	T N	1000	13.33		FARMS,BEL
28-23W-32DBD 01	--	01-01-1974	78.60	06-24-1980	2481	--	--	I	T E	--	- -		ARNOLD,ROGER
28-23W-33BAC 01	--	01-01-1975	113.00	06-24-1980	2515	--	--	I O	T D	--	- -		BAILES,JOE

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
28-23W-36DBB 01	--	01-01-1977	153.40	03-04-1980	2530	--	--	I	T D	711M	- -		McCARTY,KENNET
28-24W-01ADB 01	--	01-01-1974	83.65	06-27-1980	2505	--	--	I	T E	--	- -		CONRAD M
28-24W-04ACA 01	270	10-10-1975	120.00	10-10-1975	2555	265	145.00	I	T N	1050	21.00	D	KINDSVATER DEN
28-24W-04DCC 01	--	01-01-1976	129.15	06-27-1980	2561	--	--	I	T N	--	- -		ANDERSON FRANK
28-24W-04DDD 01	220	01-01-1977	93.00	05-11-1979	2483	--	--	I O	T N	--	- -		STEELE,EARL
28-24W-05CAA 01	250 O	06-01-1976	140.00	06-01-1976	2568	--	--	I	T N	--	- -	D	SPOHR HERBERT
28-24W-05CBC 01	--	- -	- -	- -	2595	--	--		T N	--	- -		SPOHR HERBERT
28-24W-06BCC 01	--	01-01-1965	144.20	06-27-1980	2595	--	--	I	T N	--	- -		ROESNENER WERN
28-24W-06DAB 01	256	02-02-1976	146.00	02-02-1976	2598	254	108.00	I O	T N	700	9.46	D	ROESENER WERN
28-24W-07ACA 01	205	01-08-1975	148.00	01-08-1975	2604	207	59.00	I	T N	1212	44.89	D	MACE E
28-24W-07DBD 01	--	01-01-1974	- -	- -	2602	--	--	I	T N	--	- -		MACE E K
28-24W-08ACB 01	275	06-01-1976	136.00	01-01-1976	2588	273	137.00	I	T N	1100	61.11	D	BELL THOR
28-24W-08BCA 01	--	01-01-1978	129.65	06-30-1980	2568	--	--	I	T L	--	- -		BISHOP EVELYN
28-24W-08CAA 01	--	01-01-1974	152.07	06-30-1980	2585	--	--	I	T N	--	- -		BELL T
28-24W-08DCC 01	--	01-01-1974	133.00	05-01-1977	2578	--	--	I	T N	--	- -		T. W. BELL
28-24W-09CBC 01	227	01-01-1969	128.00	02-01-1977	2572	227	99.00	I O	T N	--	- -		DEAN DOWLING
28-24W-10BBD 01	--	01-01-1973	136.41	06-27-1980	2568	--	--	I	T N	--	- -		JONES EUGENE
28-24W-10BDD 01	--	01-01-1955	- -	- -	2572	--	--	I	T N	--	- -		JONES' EUGENE
28-24W-10DBD 01	--	01-01-1967	128.10	06-26-1980	2561	--	--	I	T N	--	- -		DOWLING CARL
28-24W-11BCC 01	160	01-01-1945	127.00	10-01-1938	2554	--	--	I O	T N	--	- -		ROBERT LEHMAN
28-24W-12ABB 01	364	02-25-1978	108.00	10-24-1977	2525	360	252.00	I	T D	--	- -	D	CONRAD M
28-24W-12ADD 01	--	01-01-1968	137.13	05-30-1980	2554	--	--	I	T D	--	- -		CONRAD M
28-24W-13ADA 01	--	01-01-1974	146.70	05-29-1980	2561	--	--	I	T N	--	- -		WILCOXEN JESSE
28-24W-13ADD 01	--	01-01-1974	146.06	05-30-1980	2564	--	--	I	T N	--	- -		WILCOXEN JESSE
28-24W-13CDD 01	--	01-01-1974	- -	- -	2554	--	--	I	T N	--	- -		WILCOXEN JESSE
28-24W-13DDD 01	245	05-01-1977	140.00	05-18-1977	2554	--	--	I	T N	693M	12.50	D	HAGER JERRY
28-24W-16BBC 01	--	01-01-1974	129.98	06-30-1980	2571	--	--	I	T N	--	- -		KLINE DONNA
28-24W-17BBD 01	--	01-01-1966	- -	- -	2582	--	--	I	T N	--	- -		ALLEN HARRY
28-24W-17DBD 01	--	01-01-1975	- -	- -	2555	--	--	I	T N	--	- -		ALLEN LEON
28-24W-18BDB 01	--	01-01-1974	- -	- -	2605	--	--	I	T N	--	- -		GERDES GERHARD
28-24W-18DCA 01	275	09-28-1976	- -	- -	2581	272	--	I O	T N	1400	- -	D	RIMA HOWARD
28-24W-19BBC 01	210	04-08-1976	97.00	04-08-1976	2542	182	85.00	I	T N	1300	35.14	D	FAULDS STANLEY
28-24W-21DCB 01	--	01-01-1973	73.42	06-30-1980	2515	--	--	I	T N	--	- -		ALLEN LEON
28-24W-22CDA 01	295	04-19-1976	100.00	04-19-1976	2500	--	--	I O	T D	1200	60.00	D	DOWLING DEAN
28-24W-25DAC 01	175	03-10-1977	39.00	04-15-1977	2453	151	112.00	I	T N	--	- -	D	BEL FARMS

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
28-24W-29ADB 01	202	12-24-1975	82.02	06-30-1980	2510	196	113.98	I	T N	--	--	D	SCHNEWEIS ROGE
28-24W-29DBD 01	--	01-01-1976	--	--	2565	--	--	I O	T N	--	--		SCOGGINS GEORG
28-24W-31BBB 01	--	01-01-1966	138.09	07-01-1980	2570	--	--	I O	T N	--	--		GOETZ HAROLD
28-24W-35CAB 01	421	08-23-1976	97.00	08-23-1976	2528	450	353.00	I O	T D	1040	13.16	D	ROONEY BERNARD
28-24W-36ACA 01	--	01-01-1974	--	--	2555	--	--	I	T E	--	--		BERRYMAN WADE
28-24W-36DBD 01	244	05-24-1976	125.00	05-24-1976	2545	238	113.00	I	T N	2000	44.44	D	BEL FARMS
28-25W-01ACC 01	205	07-30-1976	110.00	07-30-1976	2605	--	--	I	T N	220M	--	D	FOESENER FRED
28-25W-02BBB 01	--	01-01-1957	162.70	06-28-1980	2636	--	--	I O	T N	--	--		BELL, HOMER
28-25W-02CDA 01	--	01-01-1967	--	--	2617	--	--	I		--	--		BELL,GARY
28-25W-03ACD 01	--	01-01-1954	--	--	2634	--	--	I	T N	--	--		PARKES, JESSIE
28-25W-03DCC 01	--	01-01-1967	--	--	2624	--	--	I	T N	--	--		BELL, MELVIN
28-25W-05ACC 01	--	01-01-1977	134.30	06-28-1980	2625	--	--	I O	T D	--	--		HESSMAN, BOB
28-25W-06ABB 01	189	01-01-1967	138.00	03-01-1972	2643	--	--	I	T N	--	--		CHAS. W. SWITZ
28-25W-06BBA 01	--	01-01-1955	--	--	2647	--	--	I	T N	--	--		ROBINSON, IRWI
28-25W-10ABD 01	181	10-31-1975	141.90	03-07-1980	2612	179	37.10	I	T N	680M	24.00	D	BELL, MELVIN
28-25W-10DBD 01	--	01-01-1974	132.50	06-19-1980	2602	--	--	I	T N	--	--		YOUNG, D P
28-25W-12BDD 01	--	01-01-1967	165.90	07-01-1980	2603	--	--	I O	T N	--	--		ROESNER OSCAR
28-25W-12CDB 01	--	01-01-1967	146.66	07-01-1980	2605	--	--	I	T N	--	--		SCOGGINS GEORG
28-25W-14CBA 01	--	01-01-1970	--	--	2582	--	--	I	T N	--	--		WILLIAMS, CLAR
28-25W-14DBD 01	--	01-01-1977	--	--	2590	--	--	I	T N	--	--		GEFFORD, CHARL
28-25W-15DAC 01	--	01-01-1974	90.20	06-19-1980	2561	--	--	I O	T N	--	--		WINGER, DWIGHT
28-25W-16BBD 01	184	03-26-1976	94.00	03-26-1976	2578	180	86.00	I	T N	800	38.10	D	HESSMAN, BOB
28-25W-17ADB 01	--	01-01-1975	93.00	06-19-1980	2579	--	--	I O	T D	--	--		HESSMAN, BOB
28-25W-18ABC 01	--	01-01-1978	80.40	06-24-1980	2578	--	--	I O	T L	--	--		SWITZER, PAUL
28-25W-18CAC 01	--	01-01-1968	--	--	2624	--	--	I	T N	--	--		POST, DANNY
28-25W-19BBB 01	265	01-01-1957	137.00	02-01-1977	2635	265	128.00	I	T N	--	--		DANNY D. POST
28-25W-21ACA 01	--	01-01-1975	127.20	06-19-1980	2600	--	--	I O	T N	--	--		WINGER, DWIGHT
28-25W-22ACA 01	--	01-01-1974	98.79	06-19-1980	2560	--	--	I	T N	--	--		WINGER, DWIGHT
28-25W-22DCB 01	--	10-31-1975	152.50	06-19-1980	2613	272	119.50	I	T E	1400	--	D	NEWELL, ROBERT
28-25W-23BAD 01	205	10-31-1975	69.60	06-19-1980	2530	200	130.40	I	T N	1400	40.00	D	WINGER, DWIGHT
28-25W-23CDC 01	--	01-01-1955	147.20	09-19-1980	2605	--	--	I	T N	--	--		WINGER, DWIGHT
28-25W-23DAB 01	275	01-17-1977	71.00	01-17-1977	2525	270	199.00	I	T N	1400	25.45	D	WINGER, DWIGHT
28-25W-24BBD 01	--	01-01-1964	109.85	07-01-1980	2558	--	--	I O	T N	--	--		FAULDS JAMES
28-25W-25DBA 01	--	01-01-1974	--	--	2583	--	--	I	T N	--	--		FAULDS CHARLES
28-25W-26DDC 01	235	03-04-1977	136.02	06-18-1980	2587	265	128.98	I O	T N	1000	12.20	D	NICHOLSON, MYR

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
28-25W-27BAA 01	--	01-01-1968	- -	- -	2618	--	--	I	T N	--	- -		BURNETT, VERN[illegible]
28-25W-27CBB 01	--	01-01-1954	164.89	06-19-1980	2632	--	--	I O	T N	--	- -		WINGER, DWIGHT
28-25W-28AAA 01	--	01-01-1975	- -	- -	2594	--	--	I	T N	--	- -		BURNETT, VERN[illegible]
28-25W-34BCB 01	--	01-01-1973	- -	- -	2626	--	--	I	T N	--	- -		WINGER, DWIGHT
28-25W-34CBC 01	--	01-01-1973	- -	- -	2626	--	--	I	T N	--	- -		WINGER, DWIGHT
28-25W-35ACA 01	--	01-01-1973	- -	- -	--	--	--	I	T N	--	- -		NICHOLSON, MY[illegible]
28-25W-35BCC 01	--	01-01-1964	162.00	06-18-1980	2615	--	--	I	T N	--	- -		NICHOLSON, MY
28-25W-35CAC 01	--	01-01-1976	- -	- -	2611	--	--	I	T N	--	- -		WINGER, DWIGHT
28-25W-35CBC 01	--	- -	- -	- -	2625	--	--	I	T N	--	- -		WINGER, DWIGHT
28-26W-01BAA 01	186	09-10-1976	131.00	09-10-1976	2680	180	49.00	I	T N	1100	157.14	D	WESLEY, JAM[illegible]
28-26W-01CBD 01	212	04-18-1977	112.00	04-18-1977	2610	210	98.00	I	T N	900	90.00	D	FOULKS, CHARL[illegible]
28-26W-02ABA 01	--	01-01-1967	- -	- -	2659	--	--	I	T N	--	- -		MONGER, RALPH
28-26W-02BAA 01	--	01-01-1970	- -	- -	2545	--	--	I	T N	--	- -		EATON, O L
28-26W-02CAB 01	257	10-26-1976	125.50	06-05-1980	2637	254	128.50	I	T N	--	- -	D	GREENWOOD, AL[illegible]
28-26W-02DCA 01	216	06-01-1976	117.00	06-01-1976	2631	212	95.00	I	T N	1400	73.68	D	MONGER, RALPH
28-26W-03AAB 01	--	01-01-1970	150.10	06-05-1980	2606	--	--	I O	T N	--	- -		EATON, O L
28-26W-03BBA 01	--	01-01-1970	- -	- -	2669	--	--	I	T N	--	- -		EATON, O L
28-26W-03CAB 01	224	11-18-1976	136.20	06-05-1980	2655	224	87.80	I	T N	1260	- -	D	GREENWOOD AL[illegible]
28-26W-03DBA 01	--	- -	134.80	06-05-1980	2652	--	--	U		--	- -		GREENWOOD, [illegible]
28-26W-04AAB 01	--	01-01-1974	154.60	- -	2679	--	--	I O	T N	--	- -		HINK, KENNETH
28-26W-06AAB 01	--	01-01-1976	141.00	02-01-1977	2685	195	54.00	I	T N	--	- -		CLARK WILLIAMS
28-26W-10BAA 01	199	04-11-1978	93.00	04-11-1978	2608	192	99.00	I	T D	600	5.77	D	S & R LAND & [illegible]
28-26W-11ABC 01	182	05-17-1977	90.90	06-05-1980	2599	178	87.10	I	T D	1800	51.43	D	HOLIDAY CATTLE
28-26W-11DBC 01	--	05-16-1977	109.00	05-16-1977	2629	200	91.00	I	T D	875	9.94	D	HOLIDAY CATTLE
28-26W-11DDA 01	190	05-16-1977	86.00	05-16-1977	2597	182	96.00	I	T D	900	9.89	D	HOLIDAY CATTLE
28-26W-12BCB 01	--	01-01-1976	126.80	06-05-1980	2633	--	--	I O	T N	--	- -		SCAMMEY, JA
28-26W-13AAA 01	221	09-22-1977	120.10	06-24-1980	2618	215	94.90	I	T D	1100	11.11	D	ZINK, CARL W
28-26W-13BDD 01	225	01-01-1970	127.00	06-01-1975	--	--	--	I O	T E	--	- -		CARL ZINK
28-26W-13CAD 01	--	01-01-1976	- -	- -	2639	--	--	I	T N	--	- -		GREENWOOD, AL[illegible]
29-21W-04DAD 01	--	01-01-1954	- -	- -	2360	--	--	I	T L	--	- -		HAGENBUSH, RALP[illegible]
29-21W-05BBB 01	130 O	01-01-1956	79.50	05-01-1956	2418	--	--	I	T N	--	- -		E. AND M. EST[illegible]
29-21W-05CBA 01	140	01-01-1948	- -	- -	2422	--	--	I	T N	--	- -		McCOLM ROBERT
29-21W-06BBB 01	--	01-01-1967	90.60	06-03-1980	2439	--	--	I	T N	--	- -		KOELLING, EVER[illegible]
29-21W-06BBC 01	--	01-01-1967	- -	- -	2439	--	--	I	T N	--	- -		KOELLING, EVER[illegible]
29-21W-07CBD 01	--	05-07-1980	85.18	06-02-1980	2412	--	--	I	T N	--	- -		HOFFMAN, HAROLD

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
29-26W-01CDC 01	--	01-01-1971	90.70	- -	2985	--	--	I	T N	--	- -		LEIS, WILLIAM
29-26W-01CDD 01	--	01-01-1969	89.60	02-01-1977	2583	163	73.40	I O	T N	--	- -		H. C. WHITE
29-26W-06CDB 01	--	01-01-1970	95.20	03-06-1980	2645	--	--	I O	T N	--	- -		DOLL, LOREN A
29-26W-12DAC 01	--	01-01-1967	- -	- -	2564	--	--	I	T N	--	- -		ROST, ELEANOR
29-26W-13AAB 01	--	01-01-1972	75.70	06-04-1980	2564	--	--	I O	T N	--	- -		MCCLAREN, BRUC
29-26W-13DDBC01	--	01-01-1947	51.80	06-04-1980	2542	--	--	I	T N	--	- -		REEVE, DALE
29-26W-14ADB 01	195	11-16-1977	76.00	09-17-1980	2553	189	113.00	I O	T N	1200	15.38	D	BARTLETT, CH.
29-26W-14CBA 01	--	01-01-1952	71.29	03-05-1980	2555	--	--	I	T N	696M	- -		POST, JULIANN
29-26W-14DDA 01	--	01-01-1976	- -	- -	2550	--	--	I	T N	--	- -		BARTLETT, GUS
29-26W-15ADB 01	220	01-01-1973	80.60	03-30-1978	2563	--	--	I O	T N	--	- -		STURGEON
29-26W-15CAD 01	149	01-01-1945	44.20	10-01-1938	2555	--	--	I	T N	--	- -		STURGEON, I
29-26W-20BDD 01	170	05-02-1976	92.04	06-02-1980	2575	164	71.96	I	C N	250	3.16	D	SOBBA, ROBERT
29-26W-20CAC 01	--	01-01-1968	- -	- -	2573	--	--	I	T N	--	- -		BARTLETT, MIKE
29-26W-21CBA 01	--	01-01-1948	- -	- -	2556	--	--	I	T N	--	- -		WAKEMAN, LESLI
29-26W-21DBB 01	180	11-20-1976	60.00	11-20-1976	2545	184	124.00	I	T N	948	7.52	C	WAKEMAN, LESLI
29-26W-22ABB 01	--	01-01-1952	60.10	06-04-1980	2545	--	--	I	T N	--	- -		BARTLETT, MIKE
29-26W-22BCC 01	--	01-01-1955	53.83	03-05-1980	2538	--	--	I O	T N	717M	- -		BARTLETT, D A
29-26W-22DAB 01	275	12-01-1976	53.60	03-05-1980	2532	--	--	I	T N	892M	17.96	D	BARTLETT, D A
29-26W-23BAA 01	--	01-01-1968	- -	- -	2540	--	--	I	T N	--	- -		BARTLETT, GAIL
29-26W-24AAB 01	--	01-01-1977	46.00	09-17-1980	2538	--	--	I O	T N	--	- -		MCMANAMAN, S
29-26W-24BBD 01	--	01-01-1945	- -	- -	2451	--	--	I	T N	--	- -		BARTLETT, GAIL
29-26W-26CAA 01	310	06-01-1971	38.00	06-01-1971	2512	263	225.00	I	T N	925	7.58	D	ZORTMAN, C
29-26W-26CDD 01	--	01-01-1970	- -	- -	2507	--	--	I	T N	--	- -		ZORTMAN, C
29-26W-27BAB 01	--	01-01-1971	43.56	06-04-1980	2525	--	--	I	T N	--	- -		WATERS, TED
29-26W-28CBB 01	--	01-01-1971	- -	- -	2635	--	--	I	T N	--	- -		MILFORD, ADRIA
29-26W-28DCA 01	--	05-01-1975	- -	- -	2511	--	--	I	T N	--	- -		MILFORD, ADRIA
29-26W-29ABB 01	178	01-01-1955	62.30	06-01-1971	2558	--	--	I O	T N	--	- -		O. J. DEAVER
29-26W-29CCB 01	--	01-01-1946	66.30	06-02-1980	2550	--	--	I	T N	--	- -		HAYWOOD, CHARL
29-26W-30CCB 01	--	01-01-1965	- -	- -	2567	--	--	I	T N	--	- -		SOBBA, ROBERT
29-26W-30DDB 01	--	12-20-1974	- -	- -	2552	--	--	I	T N	--	- -		HAYWOOD, LOUIS
29-26W-31BDB 01	--	01-01-1974	77.00	03-05-1980	2562	--	--	I O	T N	595M	- -		STURGEON, LARR
29-26W-31DBB 01	204	11-20-1976	56.00	11-20-1976	2545	207	151.00	I	T N	1400	11.29	D	STURGEON, LARR
29-26W-32BBC 01	--	01-01-1946	- -	- -	2540	--	--	I	T N	--	- -		HAYWOOD, CLARE
29-26W-32CBC 01	--	01-01-1965	39.90	06-02-1980	2533	--	--	I O	T N	--	- -		STURGEON, F F
29-26W-33BAA 01	--	01-01-1971	- -	- -	2519	--	--	I	T N	--	- -		MILFORD, ADRIA

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
29-26W-33BCB 01	--	01-01-1954	- -	- -	2523	--	--	I	T N	--	- -		REESE, DALE
29-26W-34BCB 01	--	01-01-1945	- -	- -	2517	--	--	I	T L	--	- -		WAKEMAN, LESLI
29-26W-34BCC 01	255	03-03-1976	30.40	06-03-1980	2517	250	219.60	I O	T N	--	- -	D	WAKEMAN, LESLI
29-26W-34CCC 01	--	01-01-1964	- -	- -	2512	--	--	I	T N	--	- -		WAKEMAN, LESLI
29-26W-35AAC 01	--	01-01-1973	28.70	06-03-1980	2525	--	--	I	T N	--	- -		BERGKAMP, CON
29-26W-35CBA 01	300	10-26-1978	49.00	10-26-1978	2511	293	244.00	I	T D	1100	7.28		BERGKAMP, CON
29-26W-36BBB 01	--	01-01-1973	22.10	02-01-1977	2532	212	189.90	I O	T N	--	- -		O. J. BLANCETT

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATU-RATED THICK-NESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DIS-CHARGE (3)	SPE-CIFIC CAPA-CITY (4)	DRILL LOG AVAIL-ABLE (5)	OWNER
29-26W-01CDC 01	--	01-01-1971	90.70	- -	2985	--	--	I	T N	--	- -		LEIS, WILLIAM
29-26W-01CDD 01	--	01-01-1969	89.60	02-01-1977	2583	163	73.40	I O	T N	--	- -		H. C. WHITE
29-26W-06CDB 01	--	01-01-1970	95.20	03-06-1980	2645	--	--	I O	T N	--	- -		DOLL, LOREN A
29-26W-12DAC 01	--	01-01-1967	- -	- -	2564	--	--	I	T N	--	- -		ROST, ELEANOR
29-26W-13AAB 01	--	01-01-1972	75.70	06-04-1980	2564	--	--	I O	T N	--	- -		MCCLAREN, BRUC
29-26W-13DDBC01	--	01-01-1947	51.80	06-04-1980	2542	--	--	I	T N	--	- -		REEVE, DALE
29-26W-14ADB 01	195	11-16-1977	76.00	09-17-1980	2553	189	113.00	I O	T N	1200	15.38	D	BARTLETT, GUS
29-26W-14CBA 01	--	01-01-1952	71.29	03-05-1980	2555	--	--	I	T N	696M	- -		POST, JULIANN
29-26W-14DDA 01	--	01-01-1976	- -	- -	2550	--	--	I	T N	--	- -		BARTLETT, GUS
29-26W-15ADB 01	220	01-01-1973	80.60	03-30-1978	2563	--	--	I O	T N	--	- -		STURGEON
29-26W-15CAD 01	149	01-01-1945	44.20	10-01-1938	2555	--	--	I	T N	--	- -		STURGEON, F
29-26W-20BDD 01	170	05-02-1976	92.04	06-02-1980	2575	164	71.96	I	C N	250	3.16	D	SOBBA, ROBERT
29-26W-20CAC 01	--	01-01-1968	- -	- -	2573	--	--	I	T N	--	- -		BARTLETT, MIKE
29-26W-21CBA 01	--	01-01-1948	- -	- -	2558	--	--	I	T N	--	- -		WAKEMAN, LESLI
29-26W-21DBB 01	180	11-20-1976	60.00	11-20-1976	2545	184	124.00	I	T N	948	7.52	D	WAKEMAN, LESLI
29-26W-22ABB 01	--	01-01-1952	60.10	06-04-1980	2545	--	--	I	T N	--	- -		BARTLETT, MIKE
29-26W-22BCC 01	--	01-01-1955	53.83	03-05-1980	2538	--	--	I O	T N	717M	- -		BARTLETT, D A
29-26W-22DAB 01	275	12-01-1976	53.60	03-05-1980	2532	--	--	I	T N	892M	17.96	D	BARTLETT, D A
29-26W-23BAA 01	--	01-01-1968	- -	- -	2540	--	--	I	T N	--	- -		BARTLETT, GAIL
29-26W-24AAB 01	--	01-01-1977	46.00	09-17-1980	2538	--	--	I O	T N	--	- -		MCMANAMAN, S P
29-26W-24BBD 01	--	01-01-1945	- -	- -	2451	--	--	I	T N	--	- -		BARTLETT, GAIL
29-26W-26CAA 01	310	06-01-1971	38.00	06-01-1971	2512	263	225.00	I	T N	925	7.58	D	ZORTMAN, C
29-26W-26CDD 01	--	01-01-1970	- -	- -	2507	--	--	I	T N	--	- -		ZORTMAN, C
29-26W-27BAB 01	--	01-01-1971	43.56	06-04-1980	2525	--	--	I	T N	--	- -		WATERS, TED
29-26W-28CBB 01	--	01-01-1971	- -	- -	2635	--	--	I	T N	--	- -		MILFORD, ADRIA
29-26W-28DCA 01	--	05-01-1975	- -	- -	2511	--	--	I	T N	--	- -		MILFORD, ADRIA
29-26W-29ABB 01	178	01-01-1955	62.30	06-01-1971	2558	--	--	I O	T N	--	- -		O. J. DEAVER
29-26W-29CCB 01	--	01-01-1946	66.30	06-02-1980	2550	--	--	I	T N	--	- -		HAYWOOD, CHARL
29-26W-30CCB 01	--	01-01-1965	- -	- -	2567	--	--	I	T N	--	- -		SOBBA, ROBERT
29-26W-30DDB 01	--	12-20-1974	- -	- -	2552	--	--	I	T N	--	- -		HAYWOOD, LOUIS
29-26W-31BDB 01	--	01-01-1974	77.00	03-05-1980	2562	--	--	I O	T N	595M	- -		STURGEON, LARR
29-26W-31DBB 01	204	11-20-1976	56.00	11-20-1976	2545	207	151.00	I	T N	1400	11.29	D	STURGEON, LARR
29-26W-32BBC 01	--	01-01-1946	- -	- -	2540	--	--	I	T N	--	- -		HAYWOOD, CLAYE
29-26W-32CBC 01	--	01-01-1965	39.90	06-02-1980	2533	--	--	I O	T N	--	- -		STURGEON, F E
29-26W-33BAA 01	--	01-01-1971	- -	- -	2519	--	--	I	T N	--	- -		MILFORD, ADRIA

Table 5. Records of wells completed in the Ogallala aquifer-- Continued

LOCAL NUMBER	DEPTH OF WELL (FEET)	DATE DRILLED	DEPTH TO WATER (FEET)	DATE MEASURED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH TO BEDROCK (FEET)	SATURATED THICKNESS (FEET)	SITE USES (1)	LIFT AND POWER (2)	PUMP DISCHARGE (3)	SPECIFIC CAPACITY (4)	DRILL LOG AVAILABLE (5)	OWNER
29-26W-33BCB 01	--	01-01-1954	- -	- -	2523	--	--	I	T N	--	- -		REESE, DALE
29-26W-34BCB 01	--	01-01-1945	- -	- -	2517	--	--	I	T L	--	- -		WAKEMAN, LESLI
29-26W-34BCC 01	255	03-03-1976	30.40	06-03-1980	2517	250	219.60	I O	T N	--	- -	D	WAKEMAN, LESLI
29-26W-34CCC 01	--	01-01-1964	- -	- -	2512	--	--	I	T N	--	- -		WAKEMAN, LESLI
29-26W-35AAC 01	--	01-01-1973	28.70	06-03-1980	2525	--	--	I	T N	--	- -		BERGKAMP, CON
29-26W-35CBA 01	300	10-26-1978	49.00	10-26-1978	2511	293	244.00	I	T D	1100	7.28		BERGKAMP, CON
29-26W-36BBB 01	--	01-01-1973	22.10	02-01-1977	2532	212	189.90	I O	T N	--	- -		O. J. BLANCETT