Geology and Ground Water in the Platte-Republican Rivers Watershed and the Little Blue River Basin Above Angus, Nebraska

By C. R. JOHNSON

With a section on

CHEMICAL QUALITY OF THE GROUND WATER

By ROBERT BRENNAN

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GEOLOGY AND GROUND WATER IN THE PLATTE-REPUBLICAN RIVERS WATERSHED AND THE LITTLE BLUE RIVER BASIN ABOVE ANGUS, NEBRASKA

By C. R. Johnson

ABSTRACT

This report describes an area of about 7,300 square miles in south-central Nebraska. Approximately one-fourth of the area, largely at its east end, consists of an undissected southeastward-sloping upland plain and is almost wholly irrigable; the remainder is in various stages of dissection and only parts of it are suitable for irrigation. Although some of the deeper lying bedrock formations are potential sources of water supply, they are not likely to be tapped in the near future because abundant supplies are available at shallower depth from semiconsolidated and unconsolidated deposits.

The Ogallala formation of Tertiary (Pliocene) age consists of gravel, sand, silt, and volcanic ash, some layers of which are partly cemented. It was deposited by eastward-flowing streams, which formed a constructional plain above a surface into which the streams had previously eroded broad valleys. In turn, valleys were cut into the surface of the Ogallala before the overlying deposits of gravel, sand, silt, and clay of Quaternary (Pleistocene) age were laid down, also forming a constructional plain. During Recent time, streams have dissected the older deposits and have deposited thin alluvium in their valleys; also, several parts of the area have become mantled by wind-deposited sand. Because during Tertiary and Quaternary time the area repeatedly was the site of deposition and erosion, the thickness of all the stratigraphic units differs markedly from place to place. In general, however, the Ogallala formation thins eastward and in the central and eastern parts of the area is overlain by the eastward-thickening deposits of Pleistocene age. The maximum thickness of the Ogallala formation is about 500 feet, and the maximum thickness of the Pleistocene deposits is a little more than 300 feet. Each thins to a featheredge and is completely absent in parts of the area.

The water-bearing part of the combined Tertiary and Pleistocene deposits is considered to be a single zone of saturation because the ground water, as it percolates southeastward beneath the area, moves out of the Tertiary and into the Quaternary deposits without apparent hindrance. The water that enters the area as underflow from the west is augmented within the area by water that infiltrates from the land surface. The principal sources of infiltrating water are precipitation, seepage from canals and reservoirs, and applied irrigation water. Except for the water withdrawn through wells or discharged by natural processes where valleys have been cut into the zone of saturation, ground water leaves the area as underflow into the Platte River valley on the north, the Blue River drainage basin on the east, or the Republican River valley on the south.

Part of the water used for irrigation and watering livestock and all the water used in rural and urban homes, in public buildings, and for industrial purposes is obtained from wells. To date (1952) there is no indication that the supply

of ground water is being depleted faster than it is being replenished; instead, studies indicate that greater quantities can be withdrawn without causing an excessive decline of the water table. An increase of ground-water withdrawals to a sustainable maximum, however, will be possible only if the points of withdrawal are scattered fairly uniformly. It is estimated that annual withdrawals per township should not exceed 2,100 acre-feet where infiltrating precipitation is the only source of recharge, or 3,000 acre-feet where other sources of recharge are significant. Although perennial withdrawals of this amount could be sustained indefinitely, they would cause some lowering of the water table and eventually a decrease in the amount of water discharged from the area by natural means.

The ground water is of the calcium bicarbonate type. In much of the area it is hard or very hard, and in places it contains excessive amounts of iron. In all other respects the water is chemically suitable for domestic use. It is suitable for irrigation also.

INTRODUCTION

LOCATION AND EXTENT OF THE AREA

The area described in this report is in the south-central part of Nebraska. It is bounded on the north by the valley of the eastward-flowing South Platte and Platte Rivers and on the south by the valley of the eastward-flowing Republican River. The western part of the area adjoins the drainage basin of Frenchman Creek, which is a tributary of the Republican River, and the eastern part adjoins the drainage basins of the Big Blue River and of the Little Blue River below Angus. The area includes all or nearly all of Frontier, Gosper, Phelps, and Kearney Counties, and parts of Keith, Perkins, Lincoln, Hayes, Dawson, Hitchcock, Red Willow, Furnas, Harlan, Franklin, Webster, Nuckolls, Clay, Adams, and Hall Counties. (See fig. 1.) The area comprises about 7,300 square miles.

PURPOSE AND SCOPE OF THE INVESTIGATION

In the area described in this report, part of the water used for irrigation and for the watering of livestock and all the water used for public supply, rural domestic supply, and industrial purposes is obtained from wells. Because the rate of ground-water withdrawal has been increasing greatly in recent years and probably will continue to increase in the years to come, an appraisal of the supply of ground water in the area was included in the program of the Department of the Interior for development of the natural resources of the Missouri River basin. The appraisal included determination of the extent, thickness, and water-yielding capacity of the rocks that contain the water, the source of recharge to these rocks, the direction and rate of movement of the water within them, and the present natural and artificial discharge of water from them. The information collected in the investigation and presented in this report provides a basis for guiding ground-water development toward full utilization of the supply.

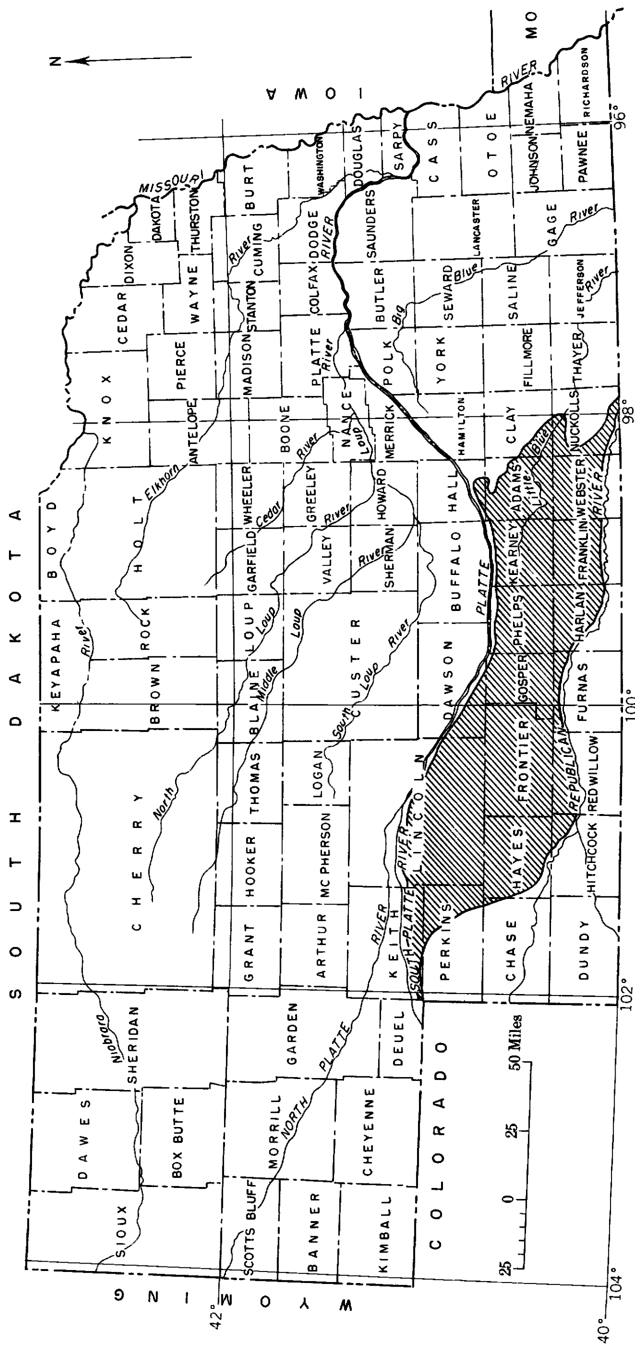


FIGURE 1.—Map of Nebraska showing location of area described in this report.

PREVIOUS INVESTIGATIONS

The earliest known investigation dealing specifically with the ground-water resources of the area was that made by Nettleton (1892), who briefly described the underflow of ground water and noted the existence of artesian water.

Darton (1898) described in considerable detail the geology and occurrence of ground water in that part of the area extending eastward from Frontier County and north of a line that passes about 2 miles south of Holdrege. At the time Darton made his investigation, no irrigation was practiced in that part of the area. His report contains considerable information on the depth to water, depth of wells, and slope of the water table and serves as a basis for comparison of current with the then-existing ground-water conditions.

The area studied by Lugn and Wenzel (1938) included all but the western part of the area described in this report. Their report describes the unconsolidated deposits of the area in much more detail than does Darton's and presents a map showing the contour of the water table. They concluded that pump irrigation on a large scale within the area described by this report would cause a serious lowering of the water table and eventually would cause a decrease in the flow of the Big Blue and Little Blue Rivers and of the tributaries to the Republican River. Their report, however, was prepared before much detailed subsurface information had been gained by test drilling and before extensive tracts within the area were developed for irrigation.

In 1939, the late R. C. Cady of the U.S. Geological Survey made a study of the geology and occurrence of ground water in the southern half of Nuckolls, Webster, and Franklin Counties. He collected much information on wells and compiled a map depicting the contour of the water table, but his findings never were published. Some of his data have been incorporated into this report.

The geology and ground-water conditions in Keith County were reported on by Wenzel and Waite (1941). Some of the data they collected in the part of Keith County south of the South Platte River are reproduced in this report.

A report prepared by Waite, Reed, and Jones (1946) describes the geology and occurrence of ground water in the Republican River valley. It contains some information that pertains to the southernmost part of the area described in this report.

The Conservation and Survey Division of the University of Nebraska, in cooperation with the U.S. Geological Survey, has drilled many test holes through the unconsolidated deposits and a few feet into the bedrock. From the logs of these test holes and from water-level measurements, E. C. Reed of the Conservation and Survey

Division has drawn geologic cross sections and maps showing the depth to water, the contour of the water table, and the thickness of saturated sand and gravel in Adams, Clay, Franklin, Nuckolls, Kearney, and Webster Counties. Several of the illustrations in this report are based in large part on the drawings prepared by Mr. Reed. The test-hole logs have been reproduced by multilithing and copies may be obtained from the Conservation and Survey Division of the University of Nebraska.

PERSONNEL AND ACKNOWLEDGMENTS

Most of the fieldwork for this report was done under the supervision of H. A. Waite, former district geologist in charge of groundwater studies in Nebraska. J. G. Cronin and D. W. Brown collected field data in 1948 and 1949 and prepared a map showing the depth to water and contour of the water table in Phelps, Kearney, and Adams Counties. In 1949 and 1950, R. S. Brown collected field data and prepared a map showing the configuration of the water table in southern Lincoln, southwestern Dawson, and northern Gosper Counties. The additional fieldwork necessary for the preparation of this report was done in 1952 by the author under the supervision of C. F. Keech, district engineer, who succeeeded Mr. Waite.

P. C. Benedict, regional engineer, supervised the collection and chemical analysis of water samples and the writing of the chemical-quality section of this report. The water samples were collected by W. H. Durum, Robert Brennan, and the late F. G. Schnittker.

The author wishes to express his appreciation to the well drillers who furnished data on wells installed by them, to the county agricultural agents and employees of the U.S. Soil Conservation Service for supplying information on the locations of newly installed irrigation wells, to farmers who permitted measurements of water levels to be made in their wells and described in detail their current irrigation practices, and to municipal officials who gave information on the public water-supply systems.

METHODS USED IN THIS INVESTIGATION

All wells in the area that discharge moderately large to large amounts of water were examined; pertinent data obtained by direct measurement or observation or by interviewing the owner or operator of the well were recorded. In those parts of the area where all wells have a small discharge, data were recorded for selected wells only. In all, 696 wells were visited. The information thus collected is included in table 5 and the location of the wells is shown on plate 1.

The altitude of the point from which the depth to water was measured was established by instrumental leveling or with the aid of an altimeter. The altitude of the water level in the wells was then determined, and a map showing the contour of the water table was prepared.

Water samples were collected from 54 wells and were analyzed in the laboratory of the Geological Survey at Lincoln, Nebr.

Published and unpublished geologic and hydrologic information that had been collected previously in the area was reviewed and much of it was incorporated in this report. Much information on water-supply problems was also obtained by conferring with well drillers, farmers, superintendents of municipal-supply systems, county agents, and soil conservationists.

NUMBERING SYSTEM FOR WELLS AND TEST HOLES

Wells and test holes referred to in this report have been assigned numbers that designate their location within the land subdivisions surveyed by the Bureau of Land Management. The first segment of the number indicates the township and the second the range. The third segment consists of two parts—the number of the section of land and lowercase letters that indicate the location of the well within the section. The first lowercase letter indicates the quarter-section and the second the quarter-quarter section; they are assigned in a counterclockwise direction beginning with "a" in the northeast quarter. If more than one well within the indicated subdivision of the section is listed, each is distinguished by a digit which follows the lowercase letters. The numbering system is illustrated in figure 2.

GEOGRAPHY

TOPOGRAPHY AND DRAINAGE

Although the area described in this report falls largely within that physiographic subdivision of the State generally referred to as the Nebraska loess plain, it is divisible into several distinct subareas. (See pl. 1.) Each subarea is characterized by its own soil type and surface slope, both of which influence the agricultural practices within the subarea.

About one-fourth of the area consists of extensive remnants of an undissected upland plain, which slopes gently to the east and southeast. These remnants straddle the barely detectable drainage divide between the Platte and Republican Rivers. The largest remnant extends through the northern part of the area from the eastern boundary into the eastern part of Gosper County. This part of the area is almost imperceptibly rolling and is dotted by marshy depressions as much as several hundred acres in extent. A few of the depressions contain standing water throughout the year, but most become dry during the summer and remain so until early spring.

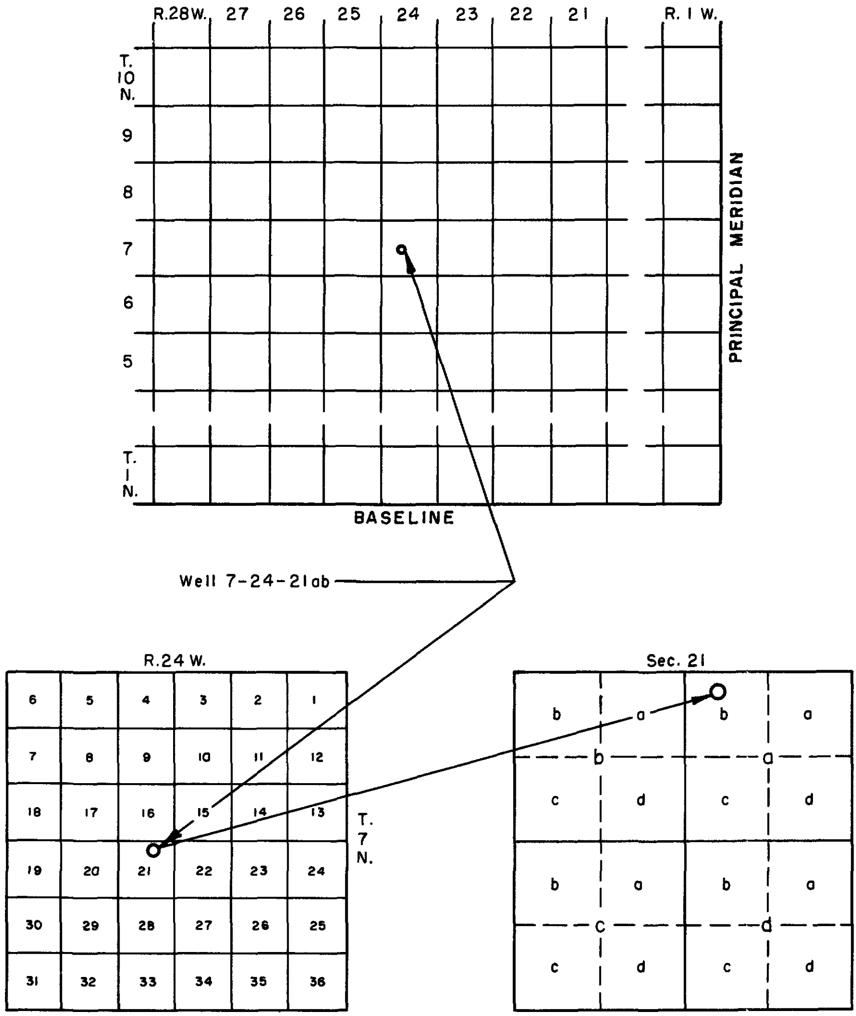


FIGURE 2.—System for numbering wells and test holes.

No drainage courses have developed. The principal smaller remnants are in southwestern Dawson County, southeastern Lincoln County, southern Keith County, and northern Perkins County. The undissected upland plain in northern Perkins County is part of the Perkins tableland, is somewhat more rolling, and has fewer undrained depressions than the other remnants.

A thick loamy soil is present throughout the undissected upland plain. Because the slopes are so gentle, most of the land is suitable for irrigation.

Tributaries of the Platte and Republican Rivers, eroding headward toward the divide between the two drainages, have dissected the originally much more extensive upland plain. Flat-topped divides between the tributaries characterize the large part of the area shown on plate 1 as "moderately dissected upland plain;" but no remnants of the upland plain remain in the small part shown as "highly dissected areas." Nearly all the moderately dissected upland plain is south of the undissected upland plain and therefore within the area drained by tributaries of the Republican River. An area that is maturely dissected almost throughout lies between the undissected upland plain and the Platte River valley. It is broadest in southeastern Lincoln County, where it connects with the maturely dissected area bordering Medicine Creek, a tributary of the Republican River. Maturely dissected areas also border Blackwood, Red Willow, and Deer Creeks, all of which are tributaries of the Republican River.

The flat-topped divides in the moderately dissected upland plain have retained their thick loamy soil, but the steep-sided slopes that border the flat-topped divides generally have a thin clayey to sandy soil, as does all the highly dissected area. Nearly all the irrigable land in the dissected area is on the flat-topped divides.

In the western part of the area, principally in southern Lincoln County, is an extensive rolling plain of wind-deposited sand. Because the dunes are covered with prairie grass, they no longer migrate. The sand appears to have been deposited as a mantle on the undissected upland plain and probably was derived principally from outcrops of the Ogallala formation of Pliocene age.

Another area of wind-deposited sand borders the Platte River valley from northeastern Phelps County to southwestern Hall County. Here the sand mantles a highly dissected surface and therefore is at a lower altitude than that of the surface of the undissected upland plain to the south. The sand probably was picked up by winds from sandbars in the Platte River and was dropped where the winds began their rise to the level of the upland plain. This area of dune sand is about 4 miles wide at its widest point.

Neither of these areas of dune sand has a well-developed drainage pattern, and undrained depressions are common. As the surface is rolling and the soil is thin, practically none of the dune-sand area is considered irrigable.

A third area of dune sand lies across the Adams-Kearney County line in Tps. 6 and 7 N. It also is below the surface of the upland plain. The source of the sand is not obvious but may be the Crete and Todd Valley formations of Quaternary (Pleistocene) age, which have been exposed here by headward erosion of tributaries of the Little Blue River.

About 65 percent of the report area is within the drainage basin of the Republican River, about 20 percent is within the Platte River drainage basin, and about 15 percent is drained by the Little Blue River. Not all the area contributes direct runoff to these rivers, however, because runoff throughout most of the undissected upland plain and in the areas of dune sand is to closed basins. The altitude of the Republican River is about 2,465 feet above sea level at McCook, 2,145 feet at Arapahoe, 1,750 feet at Riverton, and 1,540 feet at Superior. The altitude of the confluence of the South Platte and North Platte Rivers is about 2,755 feet, and the altitude of the Platte is about 2,480 feet at Cozad, 2,060 feet at Gibbon, and 1,835 feet near Grand Island. The Platte, therefore, flows at an elevation about 300 feet higher than does the Republican at points directly south. The gradient of both streams in these reaches is about 6.5 feet per mile. The Republican River is entrenched about 400 feet below the level of the undissected upland plain, whereas the Platte is only about 100 feet below. Throughout this part of its course the Republican has a perennial flow, because it has cut its valley into bedrock and therefore receives not only surface runoff but also most of the ground water that is discharged from the mantle rock (unconsolidated deposits overlying the bedrock). Within the area the tributaries of the Republican River are several times as long as those of the Platte, and many have a perennial flow in their lower reaches because they are entrenched in water-bearing deposits. The Platte receives relatively little direct runoff from the area and receives significant ground-water discharge only as far east as eastern Dawson County; it undoubtedly received even less ground-water discharge prior to construction of the canals and reservoirs of the North Platte Power and Irrigation District and the Central Nebraska Public Power and Irrigation District. Principally because so much of the Platte River water is diverted for irrigation, the bed of the Platte east of Kearney is dry during much of the summer.

About 1,050 square miles of the eastern part of the area is drained by the Little Blue River, which heads near Minden and flows generally east-southeastward. Outside the area, the Little Blue flows into the Big Blue River, which, like the Republican, is a tributary of the Kansas River. Within the area, the Little Blue is entrenched 50 to 100 feet below the general level of the upland plain. Although the Little Blue has not cut this part of its valley into bedrock, it has cut into the saturated part of the mantle rock and therefore receives considerable ground-water discharge.

ELECTRIC-POWER AND IRRIGATION DEVELOPMENTS

Water released from Lake McConaughy (a reservoir created by Kingsley Dam on the North Platte River) is diverted into the Sutherland Canal by a low dam about 2 miles west of Keystone.

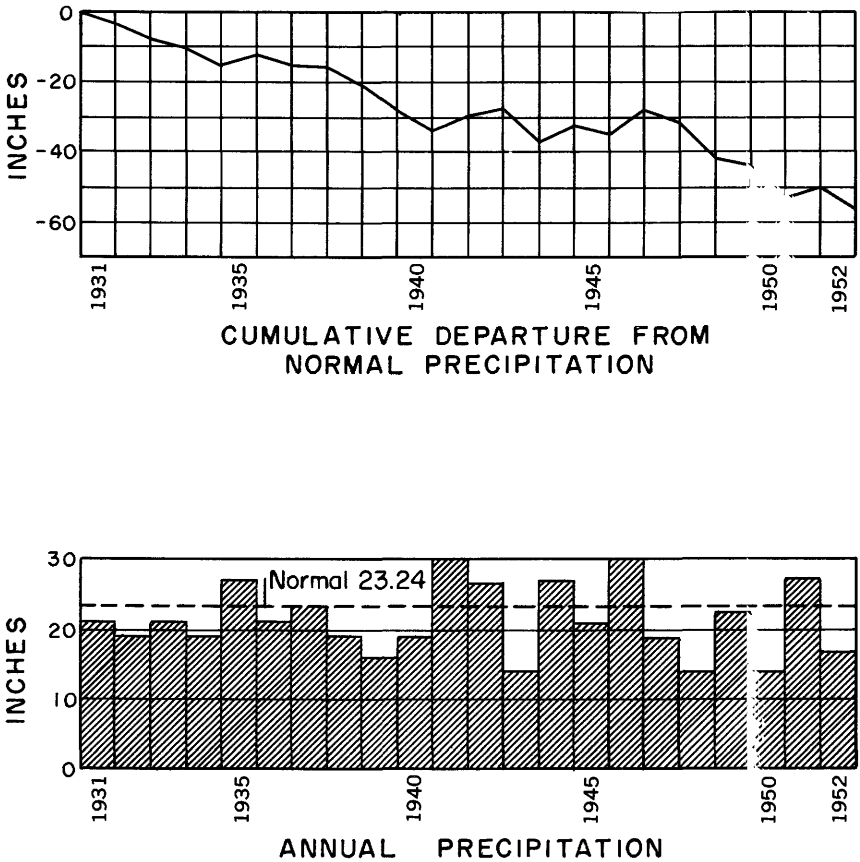
The canal conveys water to a siphon that passes beneath the South Platte River at Paxton, from there to the Sutherland Reservoir, and thence to the North Platte regulating reservoir and powerplant south of the town of North Platte. The discharge from the powerplant empties into the South Platte about 3 miles upstream from the confluence of that stream with the North Platte River. Just below the confluence, river water is diverted into the Tri-County Canal, which conveys the water along the south side of the Platte River to the Jeffrey Reservoir and powerplant south of Brady. Part of the water then is returned to the river and the remainder is conveyed southeastward by a continuation of the Tri-County Canal to sec. 1, T. 8 N., R. 23 W. Here the canal splits, one fork known as the Main Lateral E–65 supplying water for irrigation of land in eastern Gosper County and western Phelps County and the other fork conveying water to the Johnson Reservoir and powerplants (Nos. 1 and 2) near Lexington. The water that passes through the powerplants can be returned to the river or diverted into the Phelps County Canal, which extends across Phelps County into north-central Kearney County and supplies irrigation water to farmland in the northern parts of both counties. The canal and all land irrigated from it are wholly north of the topographic divide between the Platte and Republican Rivers, and the excess water is returned to the Platte River. The Adams County Canal, which connects with the Phelps County Canal in north-central Kearney County and extends into northwestern Adams County, was intended to convey water to irrigable land in western Adams County but is not used because it would deliver Platte River water to lands outside the Platte River drainage basin. Such delivery would constitute an infraction of the ruling of the Nebraska Supreme Court that forbids diversion of water out of the drainage basin in which it originates.

Several irrigation wells have been drilled within the part of the area irrigated by diverted river water, but many more have been drilled outside it. Altogether, at the time the fieldwork for this study was completed (1952) there were 246 wells that supplied water to about 28,000 acres, equivalent to a little more than one-fourth of the number of acres irrigated with surface water.

CLIMATE

The mean annual precipitation in the area ranges from about 19 inches in the extreme west to about 25 inches in the east. In the western part of the area, the least annual precipitation on record is the 9 inches that fell at Paxton in 1934 and the greatest is the 45 inches that fell at Hayes Center in 1915. In the eastern part of the area, the least on record is the 12 inches at Hastings in 1936 and the most is the 49 inches at Minden in 1879. About 65 percent of the precipitation falls in local thunderstorms during the growing season, May through September. Hail during such storms sometimes causes considerable crop damage. Usually the precipitation is fairly well distributed in May and June and less so in July; it is poorly distributed in August and September. Dry spells in late summer often cause extensive damage to crops that are not irrigated. The average annual snowfall is about 30 inches.

The annual precipitation and departure from normal precipitation at Hayes Center and Minden for the period 1931–52 are shown in figures 3 and 4. It is interesting to note that precipitation at Minden during the drought years 1934 through 1938 was less than at Hayes Center, despite the fact that normal precipitation at Minden is greater than at Hayes Center. Because of this, the curve repre-



Data from U. S. Weather Bureau

FIGURE 3.—Graphs showing annual precipitation and cumulative departure from normal precipitation at Hayes Center, Nebr., 1931–52.

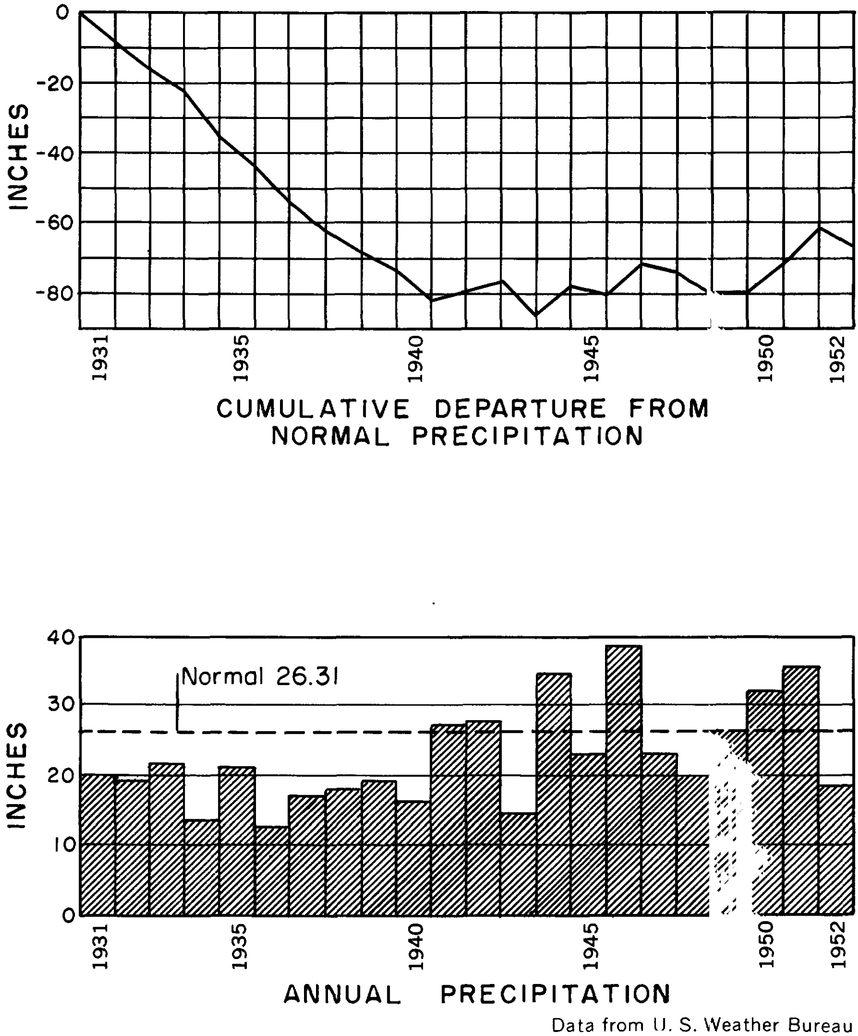


FIGURE 4.—Graphs showing annual precipitation and cumulative departure from normal precipitation at Minden, Nebr., 1931–52.

senting cumulative departure descended faster at Minden than at Hayes Center during the dry thirties. However, the curve for Minden stayed relatively level during the forties and climbed a little during the early fifties, whereas the curve for Hayes Center declined almost consistently during the entire period.

The mean temperature in the area is about 50° F. At Holdrege the mean temperature in July is 76° F, but daily highs of more than 100° F are common. In winter the temperature frequently drops to near zero and occasionally as low as –30° F. The average date of the last killing frost is about May 1, and the average growing season ranges in length from about 130 days in the western part of the area to about 166 days in the eastern part.

The average wind velocity is about 9 miles per hour. During storms, velocities as high as 80 miles per hour have been recorded. The prevailing winds are from the north or northwest in winter and from the south or southeast in summer.

Evaporation from a free water surface totals about 64 inches from April through October and generally exceeds 10 inches per month in July and August. The average monthly evaporation from a class A evaporation pan at Rosemont is shown in figure 5.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

Because ample supplies of ground water can be obtained from either the unconsolidated deposits of Pleistocene age or the Ogallala formation of Pliocene age, few, if any, attempts have been made to explore all the underlying Cretaceous bedrock formations to determine their capacity to yield water. Wells tap the uppermost rocks of Cretaceous age in southern Frontier County only, but these rocks are believed to be potential sources of water supply throughout the area.

CRETACEOUS SYSTEM (UPPER CRETACEOUS SERIES)

Rocks of Late Cretaceous age underlie the entire report area but do not crop out. The oldest, or bottommost, are a series of sandstones and shales, which, where they are exposed outside the area,

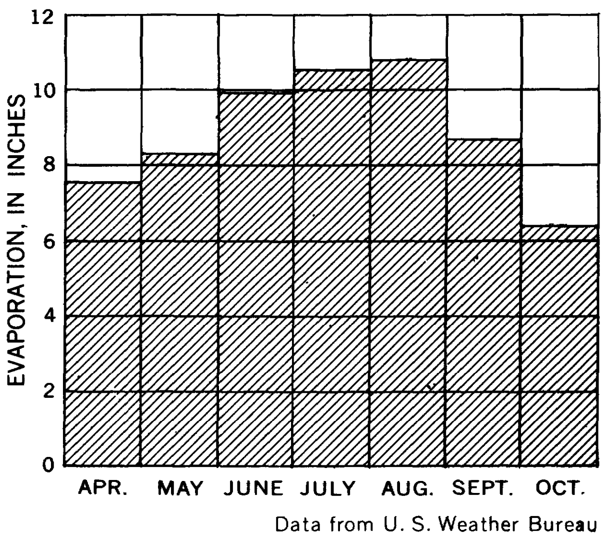


FIGURE 5.—Graph showing average monthly evaporation, April–October, 1945–51, near Rosemont, Nebr.

have been variously named. The Nebraska Geological Survey subdivides these rocks into the Lakota sandstone, Fuson shale, and Omadi sandstone, in ascending order, where they crop out in northeastern Nebraska (Condra and Reed, 1943). Where these rocks cannot be subdivided readily or when they are referred to collectively, the Nebraska Geological Survey refers to them as the Dakota group.

A few of the sandstone layers are massive and crossbedded, but most are thin and interbedded with layers of shale. Hematite concretions are common in the sandstone layers. Some of the shale is sandy and some is clayey; some is also carbonaceous. The thickness of the Dakota in this area probably ranges from 400 to 500 feet. The top is about 450 feet below the surface in the southeastern corner of the area, about 600 feet below the floor of the Little Blue River, and, according to Wenzel and Waite (1941, p. 34), probably 2,000 feet or more below the surface in Keith County.

Within the report area, the water in the permeable beds of the Dakota is under artesian pressure, but the pressure probably is not great enough to raise the water to the land surface. On the basis of the known quality of the water in the Dakota elsewhere, the water in the Dakota in the report area is believed to be moderately saline and of correspondingly limited usefulness.

Conformably overlying the Dakota is a succession of predominantly fine-grained strata known as the Colorado group. The basal formation of the Colorado group is the Graneros shale, which is about 90 feet thick and consists of dark-gray shale interbedded with thin layers of sandy shale and sandstone. Overlying the Graneros is a sequence, 30 feet thick, of alternating beds of gray limestone and gray shale. Next above is the Carlile shale, about 270 feet thick, which consists of bluish-gray shale separated in the lower part by thin chalky layers and in the upper part by beds of fine-grained sandstone.

The Niobrara formation, which is the youngest formation in the Colorado group, is subdivided into two members—the lower Fort Hayes limestone member and the upper Smoky Hill chalk member. The Fort Hayes consists of gray to yellowish-gray massive limestone and the Smoky Hill of gray and yellow shaly chalk.

Planation in Late Cretaceous and early Tertiary time removed the top part of the Niobrara formation in two parts of the area—one in eastern and central Frontier County and eastern Lincoln County (along the axis of a broad bedrock uplift known as the Cambridge arch) and the other east of a sinuous line that trends from west-central Franklin County to southeastern Hall County. In these two places the thickness of the Niobrara obviously is somewhat less than the full thickness of 500 feet. Many of the test holes in the eastern part of the area were drilled a short distance into the Niobrara formation. (See pl. 2.)

Probably all the formations in the Colorado group contain beds that would yield sufficient water for domestic and livestock needs. However, except for a few wells in southeastern Frontier County that possibly tap the Niobrara formation, no wells in the area are deep enough to obtain water from these formations. Numerous springs issue from joints and small faults in the Niobrara where it is exposed in the southeastern part of the area along the valleys of tributaries to the Republican River.

In the parts of the area where planation in Late Cretaceous and early Tertiary time did not expose the Niobrara formation, the Colorado group is overlain by the Pierre shale. In Gosper, Phelps, Kearney, and Harlan Counties only the lower part of the Pierre remains (probably not more than 300 feet), but from a line extending from about Bartley to North Platte—that is, on the west side of the Cambridge arch—the thickness of the Pierre increases progressively westward. Its thickness at the western end of the area is not known but may be as much as 2,000 feet. Although the Pierre consists principally of black, gray, and brown shale, it contains scattered thin layers of bentonite, shaly chalk, shaly limestone, and sandstone, and also some well-defined zones of concretions. Several test holes were drilled deep enough to penetrate the uppermost layers of the Pierre shale. (See pl. 2.) Although some layers in the Pierre probably would yield a little water to wells, the formation is not tapped anywhere within the area.

TERTIARY SYSTEM (OLIGOCENE AND PLIOCENE SERIES)

At the beginning of the Oligocene epoch of Tertiary time the land surface in the area was one of low topographic relief. During the Oligocene and again during the Pliocene broad fans of rock debris derived from the western mountains encroached on the area. No evidence indicates that deposition during the Oligocene epoch extended beyond the middle of the area, but the sediments deposited during the Pliocene buried not only those deposited during the Oligocene in the western part of the area but also the rocks of Cretaceous age in the eastern part of the area.

Two formations of Oligocene age are present in the western part of the area. The older, or lower, is the Chadron formation and the younger is the Brule clay; together they are referred to as the White River group. The Chadron consists of greenish to buff clay and silt. It probably is about 50 feet thick in western Keith County and thins eastward to a featheredge. The Brule clay consists principally of pink sandy clay, which encloses some channel-fill sandstones in its lower part and is interbedded with thin layers of volcanic ash and sandstone in its upper part. It is as much as 200 feet thick at the western end of the area and, like the Chadron, thins eastward to a featheredge. So far as is known, no wells in the area tap either formation of the White River group.

The Ogallala formation of Pliocene age consists, for the most part, of coarser grained rock debris and extends farther east than do the formations of the White River group. It is composed of sandstone and conglomerate cemented with calcium carbonate or opaline silica, unconsolidated sand and gravel, loesslike silt, and volcanic ash. Because individual beds generally are not very extensive, correlations from place to place cannot be made on the basis of lithology. However, fossil grass seeds in the formation have proved to be a reliable means of correlation. The Ogallala is progressively finer grained and less permeable in an eastward direction.

Because the Ogallala was deposited on an irregular surface and, after its deposition, was eroded deeply in places, its thickness differs markedly from place to place. (See pl. 2.) Near the eastern end of the area the Ogallala in places is as much as 150 feet thick but locally is entirely absent; in the western part of the area it is present everywhere and is as much as 500 feet thick. The original thickness of the formation probably was much greater in the west than in the east. Most of the test holes were drilled through the entire thickness of the Ogallala.

In the eastern part of the area the entire thickness of the Ogallala is water bearing, in the central part it is mostly water bearing, and in the western part only the lower part is water bearing. Most of the wells in the western part of the area derive water from only the Ogallala, whereas many wells in the central and southeastern parts derive water not only from the Ogallala but also from the overlying formations. Few wells, if any, in the northeastern part of the area are deep enough to tap the Ogallala.

The coarser grained, less well cemented beds in the Ogallala are moderately permeable and will transmit fairly large quantities of water to wells. The field coefficient of permeability [1] of the Ogallala was not determined, but the average of all beds in it is believed to be on the basis of determinations made in the Ladder Creek drainage basin in Kansas (Bradley and Johnson, 1957), a little more than 300 gallons per day per square foot. Owing to differences in permeability and thickness of the formation, the coefficient of transmissibility [2] varies from place to place.

[1] The field coefficient of permeability is the rate of flow of water, in gallons per day, through a cross section of 1 square foot, under a hydraulic gradient of 100 percent, at the prevailing temperature of the water.

[2] The coefficient of transmissibility is the average field coefficient of permeability multiplied by the thickness of the water-transmitting material, in feet.

Because the Ogallala is only moderately permeable, wells tapping it must be drilled through a relatively great thickness of water-bearing material if large yields are to be obtained. Most of the wells tapping the Ogallala yield water for domestic and stock use only, but the yields of the few irrigation and public-supply wells indicate that a fairly large supply can be obtained if a well is drilled through a sufficient thickness of saturated permeable material, and if the well is constructed properly, developed carefully, and equipped with an adequate pump. Because of these limiting conditions, it is advisable to do exploratory test drilling before attempting to obtain supplies sufficient for irrigation use from the Ogallala.

QUATERNARY SYSTEM (PLEISTOCENE AND RECENT SERIES)

After the Ogallala was deposited, streams flowing over its surface began to deepen their valleys, especially in the eastern half of the area. Before long, geologically speaking, these streams had eroded broad valleys as much as 250 feet deep into what had once been a nearly smooth surface. Then, when the first of the Pleistocene glaciers advanced into eastern Nebraska and the stream valleys were blocked by the ice margin, the streams that formerly were deepening their valleys now filled them with the rock fragments they no longer could transport. When the first glacier melted, new valleys were cut; and when the second glacier advanced and blocked them, these valleys also were filled. After the second glacier melted, valley cutting and refilling on a smaller scale occurred at least twice. Meanwhile, widespread deposition of wind-transported silt and clay occurred at least two times. These later phases of deposition probably were related to advances of glacial ice that did not reach Nebraska. Dune sand and stream alluvium are the most recent deposits in the area.

Nebraska geologists have subdivided the deposits of Pleistocene age into formations (Condra and Reed, 1950). The thickness, extent, and relation of the formations to each other are known in detail principally because the Conservation and Survey Division of the University of Nebraska, in cooperation with the U.S. Geological Survey, has drilled and carefully logged many test holes in the area. (See pl. 2.)

The oldest deposit of Pleistocene age is the Holdrege formation, which consists principally of sand and gravel and generally is coarsest near its base. Because the Holdrege was laid down for the most part in valleys and because much of the upper part of the deposit was removed by later erosion, its thickness differs considerably from place to place. The maximum thickness penetrated in test drilling was about 170 feet. It underlies more than half the eastern part of the area.

In some places the Holdrege is overlain by a deposit of dark calcareous silt and clay known as the Fullerton formation. Formerly coextensive with the Holdrege, the Fullerton was removed in large part by streams that cut their valleys through it and into the Holdrege. The maximum thickness of the Fullerton penetrated in test drilling was about 40 feet. Together, the Holdrege and Fullerton probably represent deposition during the Nebraskan stage of glaciation.

The Grand Island formation, like the Holdrege, consists of sand and gravel that is coarsest at the base. However, it is much more continuous and extends farther west than the Holdrege and Fullerton formations. Because it too was deposited on an irregular surface and its upper part was removed by later erosion, its thickness differs considerably from place to place. The maximum thickness penetrated in test drilling was about 170 feet.

Overlying the Grand Island in most places is the Sappa formation, a deposit of greenish-gray clay and fine sand containing a layer of volcanic ash that is referred to as the Pearlette ash member. The Sappa has a maximum thickness of about 140 feet but generally is much thinner. Together, the Grand Island and Sappa represent deposition west of the ice margin during the Kansan stage of glaciation.

Early in the succeeding Illinoian stage of glaciation, streams cut valleys into, and in places through, the Sappa formation. These streams then partly filled their valleys with the sand and gravel known as the Crete formation. The Crete probably consists largely of reworked Grand Island formation and is known to be present only in places in the eastern part of the area. Its maximum thickness is about 30 feet.

The Loveland formation, a deposit of reddish-brown calcareous silt containing minor amounts of sand and clay, overlies the Crete formation or, where the Crete is absent, the Sappa formation. It was deposited during the latter part of the Illinoian stage of glaciation. Because the Loveland is of eolian origin, it was deposited both in the drainageways and on the intervening low divides. Its original thickness probably was fairly uniform, but its present thickness ranges from 0 to as much as 200 feet.

Parts of the eastern half of the area are underlain by a deposit of greenish-gray fine sand, the Todd Valley sand, which ranges in thickness from 0 to about 60 feet. This formation rests on the surface of the Loveland or, where the Loveland was removed by erosion, on one of the older Pleistocene formations.

After the Todd Valley sand was laid down, another layer of windblown silt, the Peorian loess of Pleistocene age, was deposited as a mantle over the entire area. The Peorian is light brown to nearly white and contains nodular calcareous concretions. It has a vertical columnar structure and slumps to form "cat steps" on moderately steep slopes. Fossil soils within the formation indicate that deposition of the loess was interrupted several times. The loess averages about 40 feet in thickness but in places is as much as 100 feet thick. The Peorian loess, together with the Todd Valley sand, was deposited during the Wisconsin stage of glaciation.

Another layer of loess, the Bignell, overlies the Peorian in some places. It is gray and generally is thin. On the cross sections (pl. 2), it is included with the Peorian loess, from which it probably was derived. The Bignell is considered to be of Pleistocene (late Wisconsin) and Recent age.

Dune sand is the surficial deposit in three separate parts of the area. The most extensive is in Lincoln, Hayes, and Perkins Counties. Of the other two, the larger is in northern Phelps and Kearney Counties and the smaller is in southeastern Kearney and southwestern Adams Counties. The sand is gray and is fine to medium grained. In the largest of these parts, it probably was derived principally from the surface of exposed coarse-grained Pleistocene deposits.

Streams in the area have picked up and redeposited material derived from the Pleistocene formations exposed in their drainage basins. Such alluvium generally is poorly sorted and thin. The alluvium, like the dune sand, is principally of Recent age.

Where sufficiently thick and saturated, the sand and gravel formations of Pleistocene age are capable of yielding large quantities of water to wells drilled into them. The average field coefficient of permeability of the formations that yield water to wells is about 850 gallons per day per square foot, or nearly three times as great as that of the Ogallala formation. Nearly all the irrigation wells in the area tap either the Holdrege or the Grand Island formation, or both, and where the Todd Valley sand is within the principal zone of saturation some wells tap that formation also. In some small parts of the area, wells of low yield tap "perched" ground water—that is, bodies of ground water that are suspended on impermeable beds between the principal zone of saturation and the land surface—within the Crete and Todd Valley formations or possibly within the loess. Where the Fullerton, Sappa, Loveland, and Peorian formations are within the zone of saturation, they yield insignificant quantities of water to wells. Where they are above the zone of saturation they, along with the Bignell loess, dune sand, and alluvium, are important factors in the hydrologic regimen in that they either transmit water readily or impede the transmission of water infiltrating from the land surface to the zone of saturation.

GROUND WATER IN THE OGALLALA FORMATION AND QUATERNARY DEPOSITS

Except for the bodies of perched ground water, which generally are thin and of small extent, the water in the Ogallala formation and overlying Quaternary deposits constitutes a continuous zone of saturation underlying almost the entire area and continuous with the zone of saturation in adjoining areas. The lower surface of this principal zone of saturation coincides with the top of the Cretaceous bedrock, and the upper surface is known as the water table.

Most of the perched bodies of ground water result from the inability of the Sappa formation to transmit downward all the water that infiltrates from the land surface. The perched water generally is contained in the Crete formation or the Todd Valley sand, or both, or in the loess. Possibly, also, some perched bodies of ground water are supported by the Fullerton formation. The presence of perched ground-water bodies can be detected where the water level in a well stands markedly higher than the regional water table, or when, in a well tapping the principal zone of saturation, water can be heard trickling from a point of entry higher than the static water level. The areal extent of perched ground-water bodies can generally be determined only by detailed investigation.

THICKNESS OF THE PRINCIPAL ZONE OF SATURATION

The thickness of the principal zone of saturation in the eastern and central parts of the area is fairly well known; it ranges from less than 1 foot to as much as 450 feet and averages about 175 feet. The thickness in the western part of the area, where almost no test drilling has been done, is less well known but is believed to exceed 50 feet everywhere except in a narrow band bordering the Republican River valley eastward from northeastern Hitchcock County. The thickness of the principal zone of saturation along north-south lines crossing the central and eastern parts of the area is shown on plate 2, and the parts of the entire area underlain by more or by less than 50 feet of water-bearing sand and gravel are shown on plate 3.

CONFIGURATION AND POSITION OF THE WATER TABLE

The water table, or top surface of the principal zone of saturation, is a gently undulating plane that slopes southeastward throughout nearly all the area described in this report. The configuration of this surface throughout the area is shown on plate 3 by contour lines drawn at 100-foot intervals, and in the northern part of the area is shown on plate 4 by contour lines drawn at 20-foot intervals. The average gradient of the water table is about 10 feet per mile but ranges from about 6 to more than 100 feet per mile; the gradients are steepest close to the Republican River valley. The pronounced water-table ridges in western and south-central Lincoln County and in southeastern Dawson and northwestern Gosper Counties are the result of seepage from the canals and reservoirs of the Platte Valley Public Power and Irrigation District and of the Central Nebraska Public Power and Irrigation District. The less prominent but much broader bulge in contour lines in northern Phelps and northern Kearney Counties is due to the infiltration of irrigation water applied to lands within the Tri-County project of the Central Nebraska Public Power and Irrigation District.

In about one-fifth of the area, principally in the northwestern part, the water table stands higher than does the Platte River at points directly north; throughout the entire area it stands higher than does the Republican River at points directly south. In the western part of the area the water table is within the Ogallala formation, but in the central and eastern parts it is within one or another of the Pleistocene formations.

DIRECTION OF MOVEMENT

Ground water percolates in the direction of the greatest downward slope of the water table. As shown by plate 3, the water table slopes northeastward toward the Platte on the north side of the dashed line that represents the ground-water divide between the Platte River and the drainage basins to the south. Within the area bounded on the north by the ground-water divide between the Big Blue and Little Blue Rivers and on the south by the ground-water divide between the Little Blue and Republican Rivers, the water table slopes southeastward, eastward, and northeastward toward the Little Blue River. Throughout the remainder (about three-fourths) of the area, the slope of the water table is southeastward or southward toward the Republican River. Because the topographic and ground-water divides do not coincide, ground water beneath the upland part of northeastern Gosper County, northern Phelps County, and northwestern Kearney County (roughly, the area of the Tri-County irrigation project) moves toward the Republican or the Little Blue River, whereas surface runoff in the same part of the area is toward the Platte.

The average rate of percolation of ground water in the principal zone of saturation is thought to range from about one-half foot to 2 feet per day.

No information on the slope of the perched water tables was obtained. Presumably the perched water tables slope generally eastward, approximately parallel to the surface of the relatively impermeable layers that support them. The perched water infiltrates to the principal zone of saturation by filtering slowly through the layer that supports it or by spilling over the edge of the supporting layer.

DEPTH TO THE WATER TABLE

Measurements of the depth to water in 587 wells in the area ranged from 2 to 365 feet; in about half the wells the depth to water was between 50 and 125 feet. The water table is less than 50 feet below the land surface north of the Sutherland Canal in Lincoln County, in the northern part of Kearney and Phelps Counties, and beneath valley lands throughout the area. At no place in the area east of R. 13 W. is the depth to water more than 150 feet and nowhere east of R. 18 W. is it more than 200 feet. Northwestward from south-central Phelps County the depth to water exceeds 200 feet in many places on the undissected part of the upland plain; in 3 wells in southwestern Dawson County and in 1 well in central Lincoln County the water level is more than 300 feet below the land surface. The depth to water in individual wells is shown on plate 4 and in the record of wells and irrigation practices (table 5).

RECHARGE

Because the zone of saturation within the report area is part of a much more extensive body of ground water that is percolating generally eastward, ground water enters the report area diagonally across both its southwestern border and the northern border eastward from Buffalo County. If it is assumed that the average coefficient of permeability of the zone of saturation along the southwestern border of the area is 300 gpd (gallons per day) per foot, that the water-table gradient is about 10 feet per mile, and that the zone of saturation is about 400 feet thick, then about 70,000 acre-feet of water enters the area each year by subsurface inflow across the southwestern border. Similarly, if it is assumed that the average coefficient of permeability along the northern border east of Buffalo County is 1,000 gpd per foot, that the water-table gradient is 7 feet per mile, and that the zone of saturation is 150 feet thick, about 11,000 acre-feet of water enters the area each year by inflow across this segment of the border. Added to the ground-water inflow, as it percolates eastward and southeastward through the area, is recharge that infiltrates from the land surface. Precipitation, ponded water, influent streams, unlined irrigation canals and reservoirs, and applied irrigation water are land-surface sources of recharge to the zone of saturation. Recharge from all sources, including ground-water inflow, is estimated to be nearly 1,200,000 acre-feet per year.

Of the precipitation that enters the soil, most is evaporated or is extracted by vegetation. A small part, however, infiltrates below the level from which it can be returned to the atmosphere by natural processes and continues to descend, under the influence of gravity, until it reaches either a perched body of ground water or the principal zone of saturation. Both the proportion of precipitation that enters the soil and the proportion of the soil water that infiltrates to the zone of saturation differ widely from time to time and from place to place within the area. For example, a brisk shower is far less effective as a source of recharge than is a prolonged soaking rain, and rapid snowmelt is less effective than slow snowmelt. Furthermore, tilled soil with a cover crop or layer of mulch is more receptive to moisture than hard-packed soil without cover; warm soil is more receptive than frozen soil; moist soil generally is more receptive than dessicated soil; and sandy soil is more receptive than clayey soil. But because soil that is tilled, which includes the soil of most of the area, retains more moisture than a virgin loess soil that has a well-developed columnar structure, it may be that less of the precipitation infiltrates to the zone of saturation now than did before the prairie sod was broken and the columnar structure of the soil disturbed. The fact that water may remain ponded throughout the year in some of the shallow depressions on the undissected upland plain is evidence that the loessial soils, beneath which a hardpan, or layer of caliche, generally is present, transmit only very small amounts of water to depths beyond the reach of plant roots. Throughout much of the dissected part of the area, however, the loessial soil and associated hardpan have been removed, and consequently there is less to hinder the penetration of precipitation. Because dune sand is fairly permeable to infiltrating water and for the most part is not tilled, recharge from precipitation probably is greatest in those parts of the area where the surface deposits are dune sand.

Numerous depressions on the undissected upland plain and in the dune-sand areas collect runoff, thus creating temporary ponds from which some of the water infiltrates to the zone of saturation. Where streams in the dissected part of the area are above the water table, they also lose water to the zone of saturation.

It is estimated, on the basis of values determined for central Box Butte County, Nebr., by Cady and Scherer (1946), and for the southern High Plains by Theis (1937), that recharge from precipitation averages slightly less than 1 inch per year in most of the undissected upland, about 1.5 inches in maturely dissected areas, and as much as 2 inches per year in the areas mantled by dune sand. If it is assumed that recharge from precipitation together with recharge from ponds and influent streams averages 1.5 inches per year in the area as a whole, then recharge from these sources is nearly 600,000 acre-feet per year.

Since the power and irrigation projects have been in operation, the water level has risen significantly in wells close to the supply canals and reservoirs and in wells within the area that is irrigated with diverted river water. The maximum rise detected to date is the rise of 104 feet in well 8–22–8cd, which is close to Johnson Reservoir. During the period October 1948 to October 1951, the water table in Gosper, Phelps, Kearney, and Adams Counties rose as shown in figure 6. If it is assumed that the materials that thus become saturated have a porosity of 20 percent, then the water-table rise during the 3-year period in Kearney and Phelps Counties alone would indicate an increase in ground-water storage of about 175,000 acre-feet, or nearly 60,000 acre-feet per year. Because the water levels in wells outside the area affected by the electric-power and irrigation developments did not change appreciably during the same period, it is assumed that recharge from irrigation accounts for most of the increase in storage. Annual recharge from the system of canals, reservoirs, and applied irrigation water (including irrigation water pumped from wells) in the area as a whole probably is about 8 times as much as that in Kearney and Phelps Counties. Seepage losses from the Sutherland Canal and reservoir have been estimated to be about 150,000 acre-feet per year and from the Tri-County Canal and Jeffrey and Johnson Reservoirs to be about 250,000 acre-feet per year (Johnson, 1950, p. 8).

It is of interest to note that at least half the recharge resulting from water diverted out of the Platte River by the Central Nebraska Public Power and Irrigation District reaches the zone of saturation south of the ground-water divide and consequently moves toward either the Republican or the Little Blue River.

The dam on Medicine Creek in sec. 26, T. 5 N., R. 26 W., was closed for filling of the reservoir on August 10, 1949. The water level in wells close to the reservoir rose about 18 feet between March 2 and December 19, 1950, indicating that seepage from the reservoir was saturating the underlying and adjacent porous materials. The dam, therefore, not only will impound surface water but in time will result also in an increase in stored ground water—possibly as much ground water as surface water.

DISCHARGE

Unconfined ground water percolates laterally toward places where it is discharged at the land surface. Although in the report area some of the ground water is pumped from wells, issues from springs, is absorbed by the roots of growing vegetation, evaporates, or sustains the flow of streams, a far greater part leaves the area by subsurface flow across the northern, eastern, and southern boundaries of the area and is discharged in the valleys of the Platte, Big Blue,

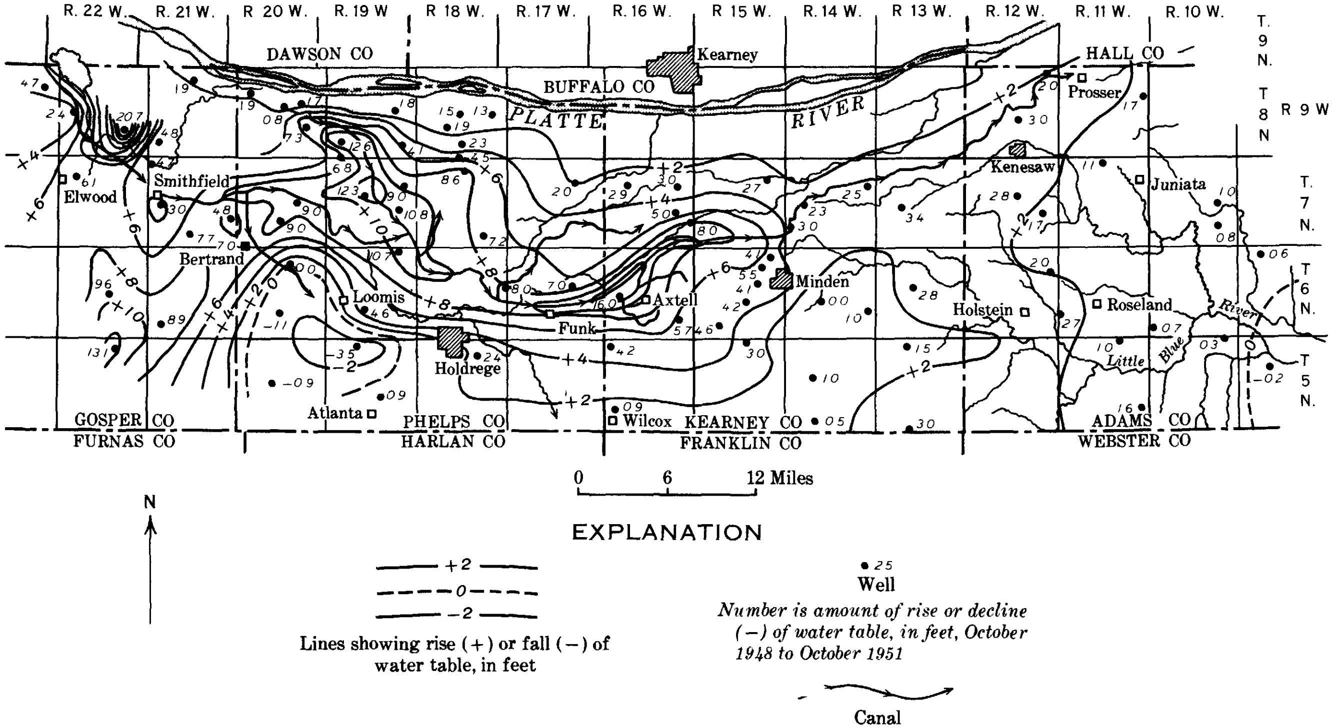


FIGURE 6.—Map of Gosper, Phelps, Kearney, and Adams Counties, showing net change in ground-water levels, October 1948–October 1951.

Little Blue, and Republican Rivers. At the present time, the annual discharge of ground water—natural discharge plus pumpage from wells—probably is slightly less than the current average annual recharge, because the hydraulic gradient still has not adjusted completely to recharge from the electric-power and irrigation developments. Annual discharge of ground water from the report area is estimated to be somewhat more than 680,000 acre-feet (the estimated sum of natural recharge) and less than 1,200,000 acre-feet (the estimated sum of recharge from all sources).

NATURAL DISCHARGE

The only places in the area where ground water is discharged by natural means are the stretches of the stream valleys that are incised below the water table. In such stretches the water table generally is within the reach of plant roots, and in places it may be so close to the land surface that capillarity is sufficient to raise water to a level from which it can be evaporated directly from the soil. Only a relatively small part of the ground water absorbed by vegetation is incorporated into plant tissues, a much larger part being lost to the atmosphere by evaporation from leaves (a process known as transpiration). The ground water that escapes discharge by evaporation or transpiration eventually is discharged into a stream. A stream in such a stretch is described as effluent, and the first point at which ground water enters the stream is referred to as the point of effluency. Effluent stretches are characterized by perennial flow, the flow during periods of no surface runoff being maintained by ground water that enters along the stream banks and through the stream bed. The upstream flexures of the water-table contour lines on plates 3 and 4 indicate the principal places where ground water is being discharged by natural processes.

Of the total discharge of the Little Blue River at Angus during the period 1950–52, about 60,000 acre-feet per year is estimated to have been ground water. It is estimated that an additional 30,000 acre-feet was discharged by evaporation and transpiration in the stretch between the point of effluency and Angus.

Several tributaries of the Republican River become effluent within the boundary of the report area, but no estimate is made of the aggregate amount of ground water discharged by these streams. Residents of southern Lincoln County report that in recent years the point at which Medicine Creek begins to flow has moved upstream. This would indicate an increase in ground-water discharge into the stream, probably as the result of recharge from the power and irrigation developments that utilize diverted river water.

Plum Creek is the only tributary of the Platte that becomes effluent within the report area, and the point of effluency has been moving progressively upstream since the Tri-County irrigation project has been in operation.

DISCHARGE FROM WELLS

About one-fourth of the water used for irrigation, a large part of the water supplied to livestock, and essentially all the water used in homes, in public buildings, and by industries is obtained from wells. The combined annual discharge of all wells in the area at the present time (1952) is estimated to be a little less than one-twentieth of the total annual recharge.

IRRIGATION WELLS

The greatest use of ground water in the area is that for irrigation. The 246 irrigation wells situated on the uplands are distributed, by counties, as shown below:

Distribution of irrigation wells on the uplands

County	Number of irrigation wells	County	Number of irrigation wells
Adams	76	Hall	1
Clay	24	Harlan	3
Dawson	1	Hayes	1
Franklin	9	Kearney	75
Frontier	2	Keith	3
Furnas	4	Phelps	40
Gosper	3	Webster	4

As the average pumpage in 1952 from 75 wells for which data were obtained was 115 acre-feet, the total pumpage from all 246 irrigation wells is estimated to have been about 28,000 acre-feet. Information given by the pump operators indicates that the wells were pumped an average of 754 hours during the year. Most of the pumping was done during the summer, although some alfalfa was irrigated in the spring and some wheat in the fall. As the average size of the area irrigated from a well was 115 acres (out of an average of 143 acres per well that could have been irrigated), approximately 1 acre-foot of water was applied to each acre of irrigated cropland.

The irrigation wells range in depth from 35 to 402 feet, and nearly all were drilled to such a depth as to contain about 50 feet of water when not being pumped. In most wells the casing is metal or concrete pipe and is 18 inches in diameter. Screened gravel generally is packed around the casing when the well is being constructed. The pump and powerplant for nearly all the wells is mounted on a concrete platform that surrounds and is flush with the top of the casing. Almost without exception the pumps are deep-well turbines of 1 to 5 stages and are driven by internal-combustion engines or electric motors. Many of the installations, especially those powered by electric motors, are housed in small wooden or sheet-metal buildings. A few pumps are operated by belts connected to tractors.

The water pumped from irrigation wells is distributed by gravity flow in ditches or through pipes or is forced under pressure through pipes and ejected from sprinklers. Most commonly the water is distributed through unlined ditches. Small canvas damming devices are used to raise the water in the ditch to a level slightly higher than the field so that the water can be siphoned out of the ditch into the rows through curved plastic tubes. Pasture, wheat, and alfalfa generally are flooded by breaching the wall of the supply ditch; in recent years, however, more and more alfalfa has been irrigated by sprinkling.

Corn is the crop most commonly irrigated, and alfalfa is the second most commonly irrigated. Other crops irrigated in 1952 were wheat, barley, oats, clover, brome grass, sugar beets, sweet clover, grain sorghum, and wheat grass.

The rate of installation of irrigation wells from 1933 through 1952 is shown graphically in figure 7. Apparently the demand for irrigation wells developed rapidly between 1940 and 1945, but, because construction materials were then in short supply, the demand could not be satisfied until after World War II. Improved well-drilling methods, increased pump efficiencies, improved methods of

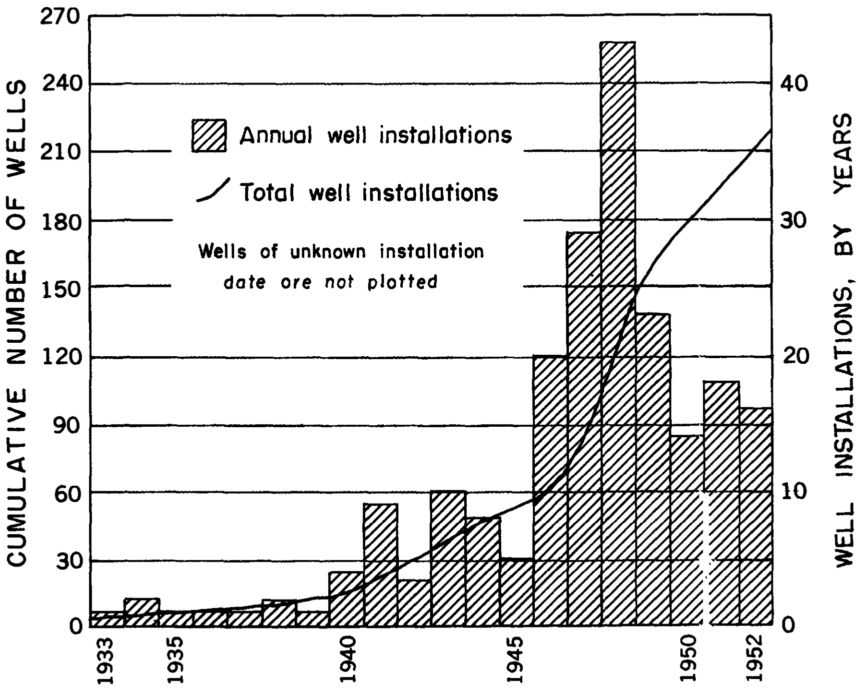


FIGURE 7.—Graph showing rate of installation of upland irrigation wells.

water distribution, and the growing conviction that irrigation insures high crop yields even in drought years have combined to stimulate the drilling of wells. Many farmers indicate that they intend to install an irrigation well in the relatively near future.

DOMESTIC AND LIVESTOCK WELLS

Most of the rural residents in the area obtain water for their livestock and for use in their homes from small-diameter wells that are equipped with force pumps. The majority of the pumps are powered by windmills, but some are driven by small gasoline or electric motors or are hand operated. Most of the wells were drilled to a depth 10 to 20 feet below the water table. In the eastern part of the area the casing of most wells is 2 or 4 inches in diameter and serves also as the pump column, whereas in the western part most wells are cased with 5½- or 6-inch galvanized steel pipe and the pump column is inside the casing. Domestic and livestock wells rarely discharge more than a few gallons per minute, but they are so numerous and are pumped for such long periods that their aggregate discharge probably is as much as 23,000 acre-feet per year.

PUBLIC-SUPPLY WELLS

Twenty-eight towns in the area have one or more public-supply wells. The casing of most of these wells is a steel pipe that is 6 inches or more in diameter, and the water is lifted by turbine pumps powered by electric motors. In some towns the water is pumped directly into the mains or into elevated tanks; in others the water is stored in cisterns or reservoirs from which it is pumped into the mains by centrifugal pumps. The combined annual pumpage of all public-supply wells in the area is between 2,500 and 3,000 acre-feet. The number of wells, storage capacity, and annual consumption of water in all but one of the towns having a public-supply system is given below.

Public-supply systems

Town or city	Number of wells	Storage capacity (thousands of gallons)	Annual consumption (acre-feet)	Town or city	Number of wells	Storage capacity (thousands of gallons)	Annual consumption (acre-feet)
Alma	[a] 4	45	200	Heartwell	----------	----------	----------
Atlanta	1	6	6	Hildreth	2	50	40
Axtell	1	33	6	Holdrege	5	460	560
Bertrand	2	90	45	Juniata	1	----------	----------
Bladen	2	35	27	Kenesaw	2	35	45
Blue Hill	3	160	280	Lawrence	4	50	66
Campbell	2	75	----------	Loomis	1	25	17
Elsie	1	30	22	Minden	4	----------	670
Elwood	1	60	34	Moorefield	1	20	11
Eustis	2	175	84	Norman	1	----------	----------
Fairfield	2	50	34	Smithfield	1	----------	2
Farnam	2	70	101	Upland	1	36	17
Funk	1	13	----------	Wallace	1	40	34
Hayes Center	1	30	73	Wilcox	2	64	143

[a] One of these wells is outside the area.

Because both the population of the towns and the per capita water use are increasing, many towns have had to augment their water supply in recent years and in so doing have modernized much of their equipment. Also, several towns that only a few years ago were supplied from privately owned wells and cisterns now have a municipally owned system.

INDUSTRIAL WELLS

Water for industrial use is supplied from the public-supply systems in Holdrege and Minden but elsewhere is generally obtained from wells owned by the industries. Similarly, railroads obtain water either from public-supply systems or from railroad-owned wells. Industrial use of water probably is about 1,000 acre-feet per year.

SIGNIFICANCE OF WATER-TABLE FLUCTUATIONS

Under a natural hydrologic regimen, the amount of ground water discharged from the zone of saturation is governed by the amount of recharge to the zone of saturation. The adjustment of discharge to different rates of recharge necessitates changes in the hydraulic gradient, which in turn cause fluctuations of the water table. The magnitude of such fluctuations depends on the amount and rate of recharge and on the porosity and permeability of the material through which the water table rises and declines.

In the report area, in places that are remote from the influence of seepage of diverted river water and from large withdrawals through wells, the water table fluctuates between fairly narrow limits, as is indicated in figure 8 by the hydrograph of the water levels in wells 10–32–17cc, 9–29–4cb, and 3–10–34cb. Such a small range in water-table fluctuations in an aquifer that is both highly porous and highly permeable indicates a stabilized ratio of discharge to recharge. A similar stability probably characterized all the upland area before the power and irrigation systems were constructed.

In and near the part of the report area, where seepage from the system of canals, reservoirs, and irrigated land has increased several times the former natural rate of recharge, a steeper hydraulic gradient is being established. The rising trend of the water level in wells 7–21–6bc, 5–18–4abl, and 5–15–3ba, which are in this part of the area, is evidence that discharge still does not balance recharge. Unless ground-water discharge in this vicinity is increased substantially by pumping from wells, the process of adjustment will continue until the water-bearing materials can transmit the added recharge to points of natural discharge. The steep gradient (60 feet per mile) that exists in the vicinity of some of the reservoirs (see pl. 4) indicates that material of fairly low transmissibility is becoming saturated by the seepage.

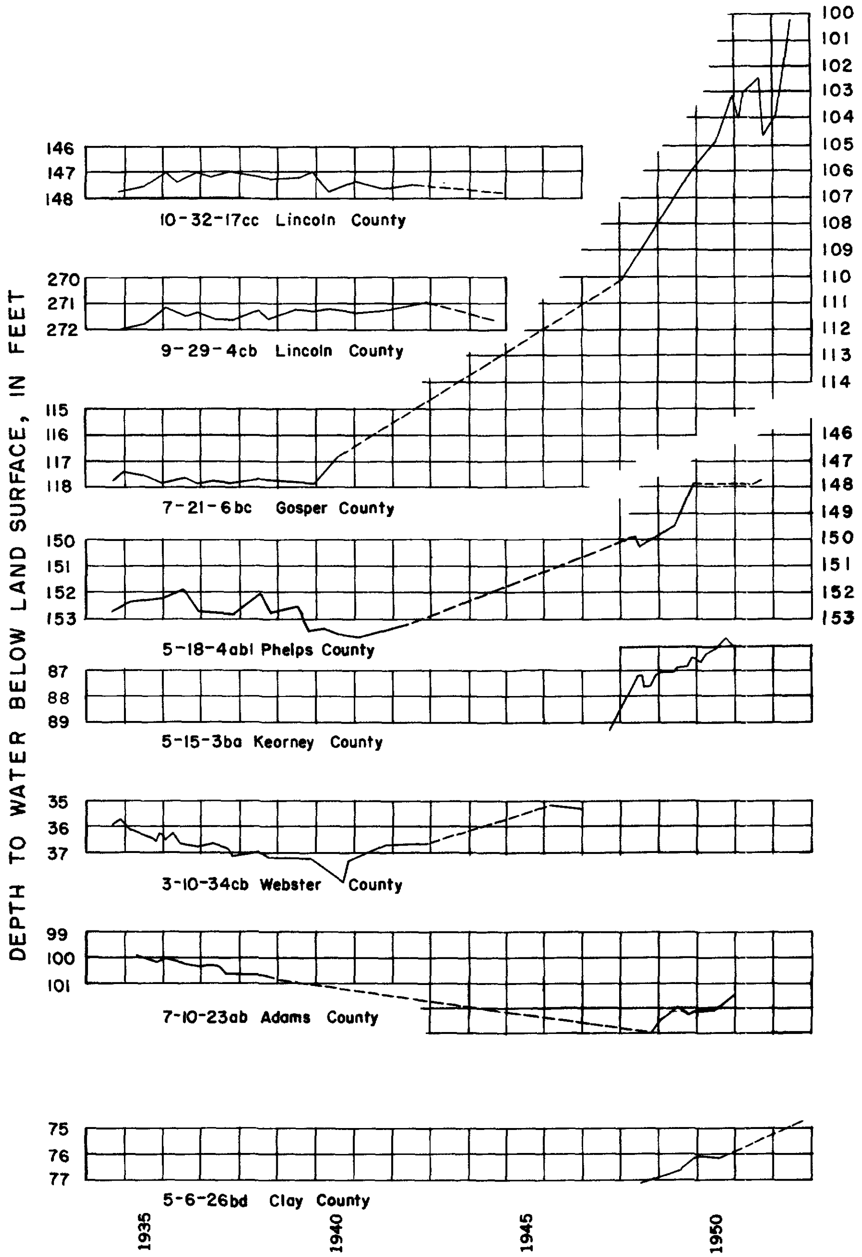


FIGURE 8.—Hydrographs showing water-level fluctuations in eight wells.

Pumping of water for irrigation in Adams, Kearney, and Phelps Counties has caused a slight decline of the water table in some places. This is indicated by the hydrograph of the water level in well 7–10–23ab (fig. 8). A lowering of ground-water levels in an area of artificial discharge does not necessarily indicate overwithdrawal but instead may indicate the water-table adjustment necessary to create hydraulic gradients sufficient to sustain the discharge of the wells. On the other hand, continuing, persistent decline of water levels in an area of artificial withdrawals, especially after withdrawals have been stabilized for a time, should be looked upon as an indication that the maximum capacity of the zone of saturation to yield on a sustained basis may have been exceeded.

POTENTIAL DEVELOPMENT OF GROUND-WATER RESOURCES

Unless artificial withdrawals of ground water are balanced by an increase in natural recharge, which may occur under certain conditions, or by artificial recharge, such withdrawals necessitate an eventual decrease in natural ground-water discharge. Although the decrease may not be detectable for several years or decades, it will be no less real. Insofar as the artificial withdrawals are used beneficially, the reduction of natural discharge that can be considered nonbeneficial is not a matter for concern; but when artificial withdrawals result in a lessening of beneficial natural or artificial discharge, the situation is one of "robbing Peter to pay Paul." In planning for the most beneficial development of the total water resources of a hydrologic unit (for example, the Republican River drainage basin) the effect of consumptive water use in one part of a basin on the availability of water for beneficial use in other parts of the basin should be given due consideration.

In the report area, because seepage from the canals, reservoirs, and irrigation is an important source of artificial recharge to the zone of saturation, a considerable quantity of ground water can be withdrawn each year without reducing natural discharge to less than its present rate. However, if withdrawals are to be effective in intercepting the artificial recharge, they must be made within or downgradient from the area of artificial recharge.

If it is assumed that ground-water outflow from the area could be reduced, without untoward consequences, to a point that it equaled ground-water inflow to the area, a much greater amount of ground water could be withdrawn each year without eventually exhausting the supply. The average annual total recharge (natural in addition to artificial) that occurs by means other than ground-water inflow then would be the factor limiting the amount of ground water that could be withdrawn each year. In the part of the area where precipitation alone accounts for most of the recharge, the annual increment is estimated to average about 1 inch of water, or about 1,900 acre-feet per township per year. If 10 percent of the pumped water were to return to the zone of saturation, then about 2,100 acre-feet per township per year could be pumped. At the average rate of pumping by irrigation wells in 1952, the 2,100 acre-feet would be sufficient for about 18 irrigation wells per township. In and within a few miles of the Tri-County irrigation project, the added recharge from the applied irrigation water probably would increase the possible annual withdrawal to about 3,000 acre-feet per township, or enough for about 26 irrigation wells per township. A similarly large annual withdrawal of ground water probably would be possible in the townships bordering the east side of the large sand-dune area in Hayes and Lincoln Counties, because natural recharge within the sand-dune area is greater than elsewhere and withdrawals in that area itself are not likely to be great.

Altogether, about 1,200,000 acres of land in the report area is classed as irrigable. The estimated potential annual yield of ground water, based on the rate of recharge within the area, would be sufficient for applying about 1 foot of irrigation water per year to all this land. Unfortunately, however, the irrigable land is concentrated within about one-fourth of the area, whereas the water supply sufficient for irrigation wells underlies a much larger part of the area—about four-fifths. It is unlikely, therefore, that much more than about one-tenth of the irrigable land can be irrigated on a sustained basis with water pumped from wells, and then only if the irrigated tracts are distributed rather uniformly throughout the area of irrigable land.

CHEMICAL QUALITY OF THE GROUND WATER

By Robert Brennan

This section of the report defines the chemical characteristics of the ground water and rates the suitability of the water for domestic use and irrigation. It is based principally on the study of the analyses of 44 ground-water samples collected in 1945–49, 10 ground-water samples collected in 1952, and 14 surface-water samples. (See tables 1 and 2 and fig. 9.) The samples represent water used for domestic purposes, livestock, public supply, and irrigation.

PHYSICAL AND CHEMICAL RELATIONSHIPS IN THE WATER

All the ground-water samples were collected from wells that tap either the Ogallala formation or the deposits of Quaternary age. The analytical results show that the water from the Ogallala formation is similar in mineral concentration to the water from the Quaternary deposits and that water from both is of the calcium bicarbonate type.

TABLE 1.—*Chemical analyses of ground water in the Platte-Republican watershed and the Little Blue River basin above Angus, Nebr.*

[To, Ogallala formation; Qd, Quaternary deposits. Results in parts per million except as indicated]

Well	Water-bearing formation	Depth of well below land surface (feet)	Date of collection	Temperature (° F)	Silica (SiO_2)	Total iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue on evaporation at 180° C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25° C)	pH
Adams County																							
6-10-33dd	Qd	------	6-22-49	55	42	1.4	98	15	53	7.2	236	0	38	40	0.4	167	0.13	675	306	112	27	876	8.1
12-27aa	Qd	126	6-11-48	56	32	.06	28	1.7	15	4.0	125	0	4.0	2.7	.5	3.3	.03	166	77	0	28	277	7.7
7-9-8bc	Qd	195	6-17-47	56	29	.04	51	9.6	14	10	171	9	30	9.2	.3	12	.19	245	167	11	15	388	8.3
11-12ac	Qd	------	6-22-49	59	31	.02	42	5.3	13	6.0	176	0	9.0	5.4	.2	8.8	.20	228	127	0	17	331	6.9
12-24cc	Qd	145	8-1-49	55	22	.02	41	4.5	17	6.4	186	0	14	2.0	.2	1.5	.20	208	121	0	22	332	7.2
8-12-34bcl	Qd	130	6-12-48	57	35	.04	44	6.5	22	2.4	207	0	4.0	4.2	.2	5.6	.11	238	136	0	26	345	7.8
Dawson County																							
9-22-29dc	To	------	6-23-49	56	40	0.56	134	21	18	7.6	258	4	218	24	0.3	3.0	0.17	650	421	203	8	881	8.2
23-32da	To	------	6-23-49	57	46	.02	94	20	35	8.4	203	15	182	24	.2	2.2	.20	580	317	126	19	724	8.6
25-31cdl	To	218	5-6-49	58	57	.02	68	15	3.4	10	284	0	10	4.0	.3	9.7	.30	342	231	0	3	478	7.3
Franklin County																							
4-13-24adl	To	150	6-9-48	56	41	0.04	90	12	16	3.2	289	0	66	12	0.1	1.2	0.07	397	274	37	11	571	7.5
14-16aa	To	288	6-10-48	56	29	.10	98	13	18	6.0	280	0	102	11	.2	3.0	.09	458	298	68	11	628	7.6
15-5dc2	To	168	6-11-48	56	32	.06	91	12	20	2.4	302	0	62	10	.2	4.9	.09	389	276	28	13	578	7.4
Frontier County																							
5-27-14bb	To	243	9-24-52	61	50	0.82	53	18	9.9	11	258	0	18	4.0	0.7	7.5	0.05	306	204	0	9	444	7.7
7-30-29bd	To	237	9-23-52	58	11	24	41	13	9.0	10	167	0	22	9.0	.9	25	.05	247	156	19	10	371	7.6
8-24-15db2	To	207	5-6-49	56	46	.05	87	16	2.8		327	0	7.2	1.0	.0	15	.06	369	283	15	2	537	7.4

Gosper County

5-23-11cd	------	86	9-24-52	59	50	1.8	73	15	8.7	9.2	290	0	25	9.0	0.4	6.0	0.05	362	245	7	7	508	7.6
7-21-18dc	------	235	6-23-49	58	49	.12	80	15	18	4.8	302	0	23	9.0	.2	20	.19	385	261	13	13	571	8.0
22-7ac	To	339	6-12-48	58	64	.08	75	15	9.2		303	0	4.0	6.5	.3	7.9	.09	357	249	1	4	488	8.0
8-21-25dd	To	172	6-23-49	56	49	1.5	83	13	23	4.0	322	0	26	6.8	.7	17	.08	389	261	0	16	586	7.3

Hayes County

6-33-1cd	To	290	9-23-52	61	55	0.03	45	15	12	12	223	0	22	4.5	0.8	9.2	0.08	288	175	0	12	399	7.8
9ab	To	300	9-23-52	58	54	.26	45	13	13	11	218	0	19	4.0	.7	6.6	.06	282	168	0	14	392	7.7
9db	To	------	9-23-52	------	------	------	45	17	17		223	0	20	5.0	------	12	------	------	183	0	17	410	7.6

Kearney County

5-13-18cd	Qd	119	9-30-48	55	60	0.60	72	10	8.1	3.6	252	0	18	3.0	0.1	5.8	0.00	306	238	31	7	428	7.4
14-14a	Qd	180	11-26-49	60	------	------	------	------	------	------	288	0	58	8.4	------	------	------	------	268	32	------	563	7.4
16-6ac	Qd	206	6-24-48	55	40	.08	97	11	20	10	334	0	60	2.5	.2	1.7	.03	423	287	13	13	617	7.6
30cd2	Qd	176	6-11-48	56	44	.08	81	9.5	18	6.8	283	0	34	7.8	.1	12	.08	367	241	9	14	519	7.6
6-13-16cd	Qd	130	6-10-48	55	39	.06	60	6.9	13	4.4	206	0	34	7.1	.3	2.3	.08	282	178	9	13	407	7.5
14-7cc2	Qd	170	3-30-45	55	33	.08	86	12	30	9.4	308	0	65	9.0	.4	.1	------	403	264	12	19	607	7.6
15-1cb	Qd	176	5-27-48	55	30	1.4	70	8.9	34	1.2	287	0	38	5.0	.2	.1	.05	323	211	0	26	499	7.3
35cc	Qd	190	8-6-49	56	30	.80	94	13	24	8.6	337	0	66	8.0	.3	1.1	.11	426	288	12	15	649	7.1
16-21ba	Qd	155	6-17-47	54	27	.03	112	17	22	16	272	0	133	11	.4	50	.17	528	349	126	12	772	8.0
			10-14-49	54	30	.02	94	14	24	10	283	0	104	9.0	.4	8.1	.03	462	292	60	15	666	7.1
7-13-16dc2	Qd	112	6-22-49	58	18	8.0	50	6.7	14	7.2	226	0	1.6	2.0	.3	.8	.30	216	153	0	16	356	7.8
20aa	Qd	168	8-1-49	55	27	.05	53	6.7	14	4.4	204	12	7.0	2.6	.2	2.5	.30	242	160	0	16	371	8.5
14-5cb	Qd	37	6-23-49	55	34	.02	40	6.8	4.9	6.8	148	0	3.5	2.0	.3	20	.30	226	128	7	7	300	7.5
16-23da	Qd	100	8-1-49	55	28	.02	56	5.7	10	6.8	218	0	2.5	4.0	.5	1.7	.30	244	163	0	11	353	7.2

Keith County

13-37-29ab	To	276	9-23-52	58	39	0.08	40	8.5	12	7.8	180	0	18	4.0	0.6	4.6	0.05	232	135	0	15	326	7.9

Lincoln County

10-34-14bc	To	127	9-23-52	64	47	0.02	52	13	9.6	12	224	0	21	7.5	0.4	11	0.05	296	185	1	9	415	7.7

TABLE 1.—*Chemical analyses of ground water in the Platte-Republican watershed and the Little Blue River basin above Angus, Nebr.*—Con.

[To, Ogallala formation, Qd, Quaternary deposits. Results in parts per million except as indicated]

Well	Water-bearing formation	Depth of well below land surface (feet)	Date of collection	Temperature (° F)	Silica (SiO_2)	Total iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue on evaporation at 180° C)	Hardness as $CaCO_3$		Percent sodium	Specific conductance (micromhos at 25° C)	pH
																			Calcium, magnesium	Noncarbonate			
Nuckolls County																							
3-7-6dd	To	77	9-25-52	55	33	7.5	83	15	17	3.0	337	0	10	15	0.2	0.7	0.04	370	267	0	12	560	7.2
4-8-30aa	To	200	6-8-48	58	48	.08	84	13	16	3.2	294	0	22	29	.4	2.1	.05	391	263	22	12	552	7.8
Perkins County																							
11-36-1cc	To	212	9-23-52	------	48	1.0	53	15	6.4	13	227	0	10	18	0.3	2.6	0.05	290	194	8	6	423	7.8
Phelps County																							
5-19-28dd	Qd	190	6-12-48	57	55	0.05	78	14	11	1.6	285	0	20	6.0	0.1	16	0.07	346	252	18	9	490	7.4
6-18-33bd2	Qd	182	6-16-47	55	34	.04	82	13	8.4		262	9	28	5.9	.2	10	.09	335	258	28	7	500	8.3
19-20bc2	Qd	254	6-16-47	51	43	.04	76	11	7.6		248	9	16	4.7	.1	12	.07	301	235	17	6	467	8.3
7-17-9ac	Qd	------	6-23-49	55	38	.02	72	11	9.6	10	272	0	24	8.0	.4	8.8	.30	326	225	2	8	479	8.0
18-35ab	Qd	123	8-15-49	55	36	.03	94	13	22	6.0	268	20	84	6.6	.3	5.0	.17	439	288	35	14	643	8.6
19-12bb	Qd	------	9-16-49	56	38	1.8	54	16	19	8.0	219	0	46	13	.3	.5	.20	318	201	21	16	519	7.9
16ba	Qd	133	9-16-49	56	42	3.6	100	15	15	9.2	350	0	50	11	.2	1.5	.20	478	311	24	9	752	7.3
20-31ca1	Qd	256	6-16-47	51	44	.16	82	14	5.4		285	0	23	5.5	.2	10	.15	344	262	28	4	523	7.8
8-19-24dc	Qd	------	8-1-49	55	34	.02	88	14	24	9.6	238	0	119	19	.5	7.6	.15	452	277	82	15	657	7.6
Webster County																							
2-10-4ac	Qd	58	5-5-49	60	30	0.12	52	11	8.2	2.4	188	0	6.4	9.0	0.1	19	0.06	252	175	21	9	387	7.2
3-11-18ba	Qd	212	6-22-49	56	42	.20	87	11	14	4.4	284	0	49	14	.1	3.7	.30	376	263	30	10	529	7.9
4-10-4dc1	To	196	6-9-48	56	53	.06	105	13	14	4.0	319	0	30	30	.0	9.8	.16	435	315	53	9	622	7.8
11-18aa2	Qd	155	6-10-48	55	40	.05	84	11	16	3.6	280	0	40	17	.2	1.8	.06	354	255	25	12	527	7.4

TABLE 2.—*Chemical analyses of water in Johnson Reservoir near Lexington, Nebr.*

[Results in parts per million except as indicated]

Date of collection	Reservoir storage (acre-ft)	Temperature (° F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180° C	Dissolved solids: Tons per acre-foot	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25° C)	pH
1950																						
Jan. 19	......	35	30	0.01	73	22	97		238	0	240	25	0.5	1.1	0.38	620	0.84	273	78	44	894	7.8
May 3	......	......	24	.02	79	26	95		198	0	293	29	.4	1.4	.10	676	.92	304	142	40	923	7.8
June 14	......	74	22	.02	60	18	73		203	0	174	22	.4	2.3	.20	485	.66	224	58	41	717	8.0
Sept. 28	......	63	25	.02	53	16	78		191	8	159	20	.5	1.1	.25	470	.64	196	26	46	690	8.3
Oct. 31	43,435	57	23	.04	58	16	79		212	0	171	22	.4	.8	.20	478	.65	212	38	45	722	8.2
1951																						
Jan. 15	42,060	36	24	.10	73	20	96		228	0	237	25	.6	1.6	.10	614	.84	264	77	44	868	8.1
Apr. 3	39,585	......	......	......	......	......	77	......	217	0	215	24	......	......	......	......	......	254	76	38	832	7.6
June 24	44,935	71	......	......	......	......	64	......	202	0	163	19	......	......	......	......	......	214	48	38	709	7.5
July 6	47,935	65	......	......	......	......	69	......	196	0	177	21	......	......	......	......	......	222	61	40	729	7.5
Sept. 27	43,685	58	......	......	......	......	......	......	214	0	215	......	......	......	......	......	......	247	72	......	831	7.9
Dec. 4	......	38	......	......	......	......	......	......	225	0	221	......	......	......	......	......	......	257	72	......	857	7.7
1952																						
Feb. 29	......	35	......	......	......	......	87	......	240	0	239	......	......	......	......	......	......	284	87	40	913	8.0
June 2	......	74	......	......	......	......	......	......	209	0	280	......	......	......	......	......	......	294	123	......	957	7.9
Sept. 3	......	69	......	......	......	......	......	......	208	0	184	......	......	......	......	......	......	210	39	......	763	8.1

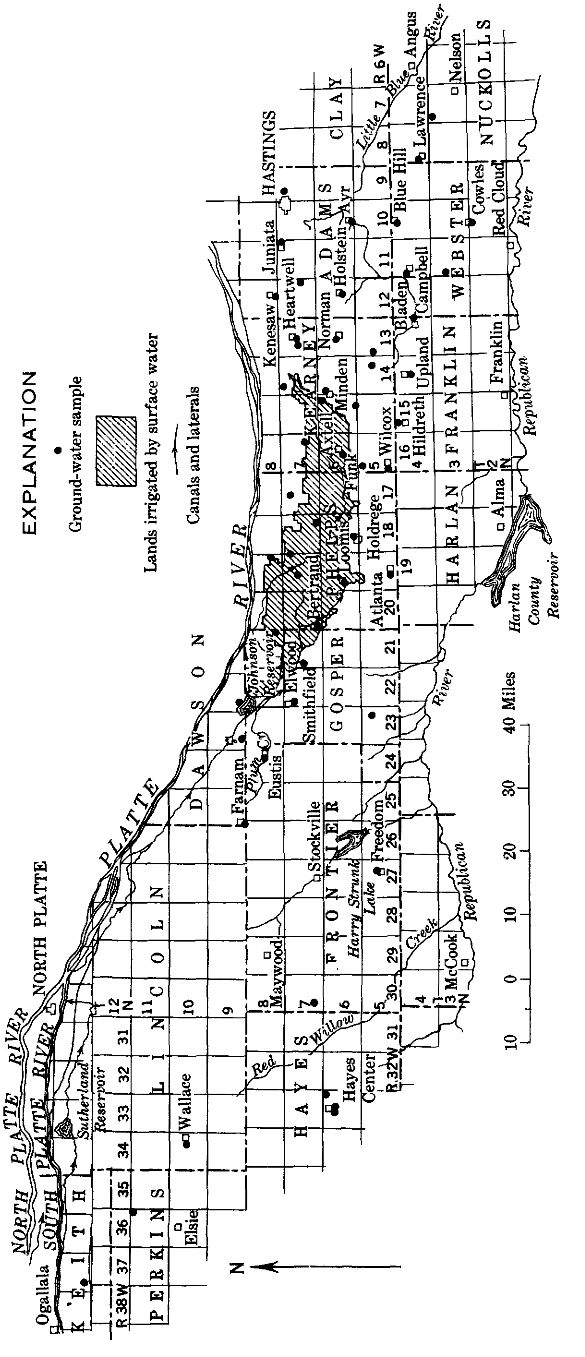


FIGURE 9.—Location of quality-of-water sampling points.

The total concentration of dissolved salts, in equivalents per million (epm), in the ground water is low when compared with that in ground water from most parts of the Great Plains. The total concentrations ranged from about 5 to 19 epm. The relations of the concentrations of the principal ions to the total ionic concentration are shown in figure 10. Also shown are the relations of the con-

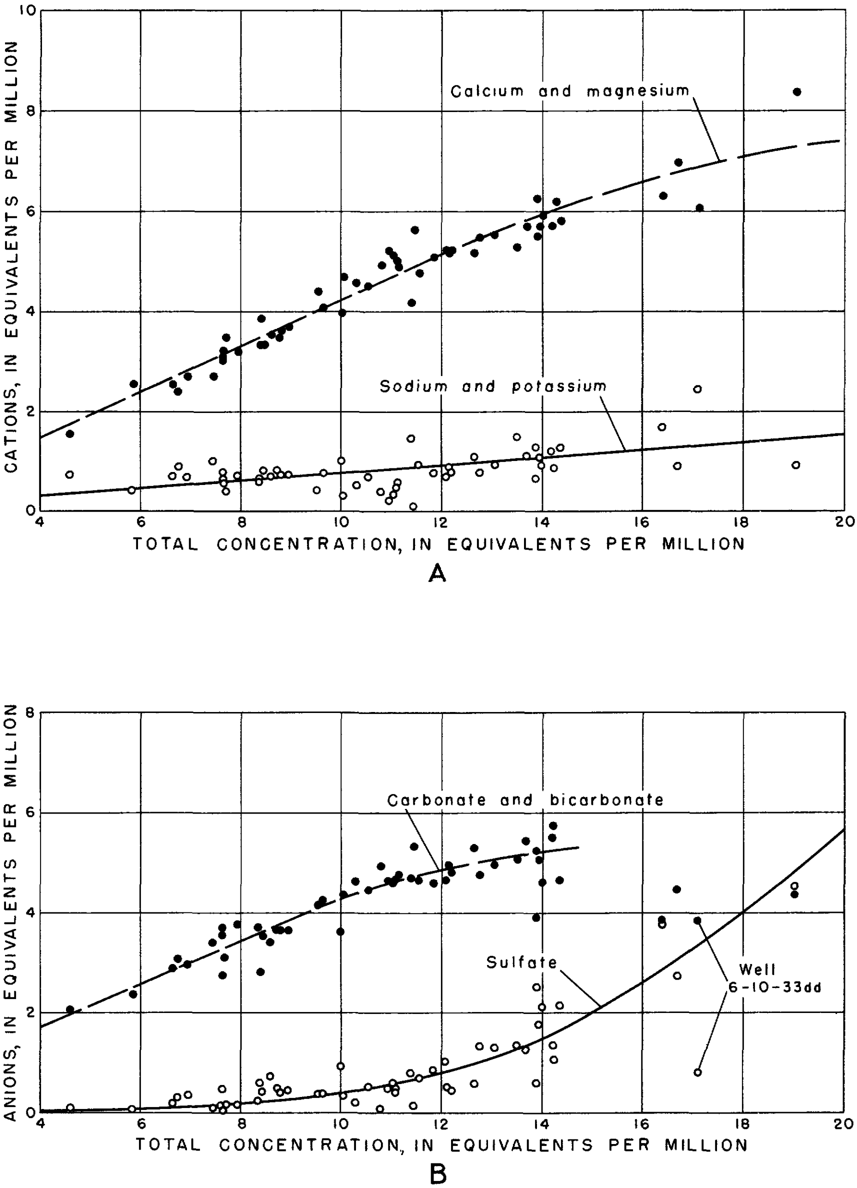


FIGURE 10.—Relations of cations and anions to total ionic concentration.

centrations of principal ions to each other; however, the concentrations of ions that undergo similar reactions in water solutions have been added together.

The curves in figure 10*A* indicate that the concentrations of calcium and magnesium increase substantially, whereas those of sodium and potassium increase only slightly as the total concentration increases. The curves in figure 10*B* indicate that the concentrations of carbonate and bicarbonate and of sulfate increase as the total concentration increases. The concentration of calcium and magnesium predominates over that of sodium and potassium, and the concentration of carbonate and bicarbonate predominates over that of sulfate. The concentration of sulfate is relatively low if the total concentration is less than about 12 epm but increases rapidly if the total concentration is more than about 12 epm. For a total concentration of less than about 12 epm, the similarity in slope and position between the line representing calcium and magnesium and the line representing carbonate and bicarbonate indicates that the constituent pairs are present in nearly equivalent concentrations. The unusually low concentration of sulfate in relation to the total concentration in water from well 6–10–33dd is accompanied by an unusually high concentration of nitrate.

Analyses of ground-water samples that have a total concentration of more than about 14 epm probably reflect the effect of reservoir seepage and the application of surface water during irrigation. Ground water in certain parts of the report area downgradient from storage reservoirs and canals is similar in chemical composition to water in the reservoirs. For example, concentrations of sulfate are relatively high in water from wells 9–22–29dc and 9–23–32da and in water from Johnson Reservoir. (See tables 1 and 2.) The chemical composition of the water in Johnson Reservoir represents reasonably well the chemical composition of the water in all the storage reservoirs and in the distribution canals.

The hardness of the ground water differs from place to place in the area. Water having a hardness of less than 150 ppm underlies northeastern Kearney County and northwestern Adams County. One analysis indicates that the water underlying south-central Keith County also has a hardness of less than 150 ppm. Water having a hardness of 151 to 250 ppm underlies most of the southwestern half of the area. Water having a hardness of more than 250 ppm underlies a relatively narrow strip that extends from southern Dawson County to northeastern Nuckolls County and southwestern Clay County. (See fig. 11.)

Because most of the hardness of the water is caused by calcium and magnesium, the relation of hardness to total concentration of

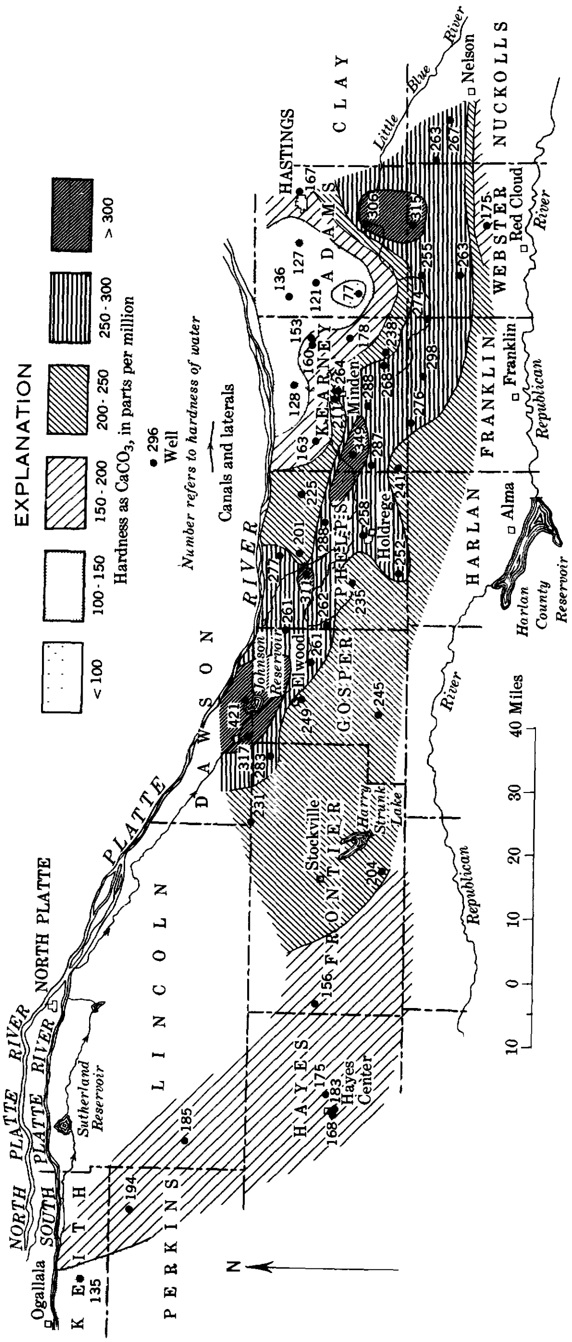


FIGURE 11.—Map of the Platte-Republican Rivers watershed and Little Blue River basin above Angus, Nebr., showing zones of hardness of ground water in the Quaternary and Tertiary deposits.

dissolved salts is similar to the relation of calcium and magnesium to total concentration (fig. 10A). Generally, the hardness of the water in the report area is almost directly proportional to the mineralization of the water. The water that is the most mineralized and hardest underlies much of, or is downgradient from, the undissected upland surface; the higher mineralization may be caused by recharge that becomes more mineralized while infiltrating thick deposits of loess before reaching the water table, or it may be caused by the infiltration of the relatively highly mineralized surface water used for power development and irrigation.

USABILITY OF THE WATER

DOMESTIC PURPOSES

The United States Public Health Service (1946) has suggested or prescribed maximum concentrations of various mineral constituents in drinking water supplied for use on interstate carriers. Some of these limits are given below so that comparisons can be made with the results of analyses of ground water in table 1.

Constituent	*Suggested maximum concentration (ppm)*
Iron and manganese together	0.3
Magnesium	125
Sulfate	250
Chloride	250
Fluoride	[a] 1.5
Total solids	[b] 500

[a] Mandatory.
[b] 1,000 ppm permitted if water of better quality is not available.

The concentrations of iron exceeded the limits in 14 of 52 samples. Iron in high concentrations is objectionable because it imparts an unpleasant taste to the water and stains fabrics, utensils, and fixtures. The concentrations of magnesium, sulfate, chloride, and fluoride in all the ground-water samples were well within the limits. In only 4 of 52 samples did the concentration of dissolved solids exceed 500 ppm, and in none was it more than 700 ppm.

Hardness is caused almost entirely by calcium and magnesium and generally is expressed as calcium carbonate ($CaCO_3$). Hard water is objectionable in washing processes because, in combination with soap, it produces an insoluble curd and because it necessitates the use of large quantities of soap to produce a lather. Hard water is objectionable also because it forms scale in boilers, water heaters, radiators, and pipes; the scale results in a loss in heat transfer, failure of boilers, and loss of flow. Some calcium bicarbonate in water is beneficial, however, because it makes the water less corrosive, and where its concentration is within certain limits or is controlled it can form a protective coating in pipes and other equipment. No specific limits for hardness of water have been established, but the following are generally recognized:

Hardness (ppm)	*Rating*	*Usability*
Less than 60	Soft	Suitable for many uses without further softening.
61–120	Moderately hard	Usable except in some industrial applications. Softening profitable for laundries.
121–200	Hard	Softening required by laundries and some other industries.
More than 200	Very hard	Requires softening for most purposes.

According to the above criteria, the ground water in the report area is hard or very hard.

IRRIGATION

Water used for irrigation should meet the following requirements: The concentration of dissolved salts should be low; the percent sodium (the ratio, expressed as a percentage, of sodium to the principal cations—calcium, magnesium, sodium, and potassium— all concentrations expressed in equivalents per million) should be low; toxic elements, such as boron, should not exceed certain limits; and the concentration of bicarbonate should not be greatly in excess of the concentrations of calcium and magnesium. Evaluation of the analyses in table 1 indicates that the water in the report area is very suitable for irrigation.

High concentrations of dissolved salts in irrigation water can lead to the buildup of high levels of salinity in the soil, especially if drainage is poor. Water having a specific conductance of less than 750 micromhos is considered to have a low or medium salinity hazard (U.S. Salinity Laboratory Staff, 1954). Because most of the water in the report area has a specific conductance of less than 750 micromhos, a buildup of high levels of salinity in the soil is not likely.

Calcium and magnesium ions fixed on soil particles aid in maintaining a good condition of permeability and tilth in the soil. Sodium ions, if present in disproportionately high concentrations in the soil solution, can replace the calcium and magnesium on the soil particles and can cause a dispersion of the fine soil particles; the dispersion can, in turn, cause a deterioration of the soil permeability and tilth. The percent sodium of the water can be used as an index of the sodium (alkali) hazard. According to a diagram by Wilcox (1948), the sodium hazard involved in the use of water is small when the percent sodium is less than about 50. The maximum percent sodium calculated for water in the area was 28.

Boron is toxic to plants when present in excess of certain limits, but, according to Scofield (1936), even boron-sensitive crops can tolerate up to 0.33 ppm of boron in irrigation water. The boron concentrations in the ground water from the report area were less than 0.33 ppm.

Bicarbonate concentrations greatly in excess of calcium and magnesium concentrations in irrigation water may result in residual sodium carbonate in the soil and cause soil to attain a high pH and to become gray or black, owing to the solution of organic matter. Such a soil condition is known as "black alkali." Although the concentrations of bicarbonate exceed the concentrations of calcium and magnesium in about one third of the samples, they do so by only a small amount. The maximum excess in the samples was 0.65 epm. Wilcox, Blair, and Bower (1954) concluded that when the concentration of bicarbonate exceeds the concentration of calcium and magnesium by less than 1.25 epm, the water probably will not cause black-alkali conditions.

CONCLUSION

Nearly all the irrigable land in the area described by this report is underlain by an aquifer that is sufficiently thick and permeable and is close enough to the land surface for irrigation from wells to be feasible. However, because recharge to the aquifer is limited, so too is the amount of water that can be withdrawn without causing a progressive water-table decline. The total natural recharge within the report area is estimated at 600,000 acre-feet per year. To this must be added recharge from irrigation canals and reservoirs and irrigated land about 500,000 acre-feet per year, and inflow of ground water into the area, estimated at 80,000 acre-feet per year. No definite evidence indicates that present pumping exceeds, or is close to exceeding, the capacity of the water-bearing material to yield on a sustained basis.

Within the area of irrigable land as a whole, the number of irrigation wells or other large-discharge wells could be quadrupled before withdrawals would equal recharge. However, unless the wells were distributed fairly uniformly throughout the irrigable area, the water-table decline would be excessive in the local areas of concentrated withdrawals. It is estimated that natural recharge will be exceeded and the water table will decline progressively if annual withdrawals are greater than about 3,000 acre-feet per township within or close to the Tri-County irrigation project or about 2,100 acre-feet per township at a distance from the project.

Outside the area of irrigable land, except where the saturated sand and gravel is too thin to sustain large yields, at least 1,900 acre-feet per township could be withdrawn each year without exceeding natural recharge. However, as the pumping of water from wells is a means of intercepting ground water that eventually would be discharged naturally at some other place, the base flow of streams drawing ground water from the area would be decreased. If withdrawals by pumping were increased so that they equaled all recharge, both natural and artificial, occurring within the area, the natural discharge of ground water from the area would decrease to an amount equal to ground-water flow into the area, or about 80,000 acre-feet per year.

Chemically, the ground water is suitable for irrigation. The water is suitable for domestic use and probably for most industrial uses, except that it is hard or very hard and, in places, has a high iron content.

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BASIC DATA

As part of the State-Federal program of ground-water studies in Nebraska, 223 test holes have been drilled in the area described in this report. The materials brought to the surface were examined closely and descriptive logs were prepared. Because the logs of these test holes have already been published, they are not reproduced in this report. Similarly, the logs of 41 wells and test holes drilled in the area by the U.S. Bureau of Reclamation, the U.S. Corps of Engineers, and commercial drillers have been published elsewhere and so are not included in this report. Table 3 gives the depth, the geologic formation in which drilling ended, the name of the driller, and the publication containing the log for each of the above-mentioned wells and test holes.

The logs of 11 commercially drilled wells and test holes, not previously published, are given in table 4.

Table 5 contains data pertaining to all the wells of large discharge in the area and to selected wells of small discharge. Information on irrigation practices is also included.

The locations of all wells and test holes for which logs are available are shown on plate 3, and the locations of all wells listed in table 5 are shown on plate 1.

Table 3.—*Summary of logs of wells and test holes*

Driller: BR, U. S. Bureau of Reclamation; CE, U. S. Army Corps of Engineers; UN, Conservation and Survey Division of the University of Nebraska in cooperation with the U. S. Geological Survey.

Publication: BB, Bjorklund, L. J., and Brown, R. F. (1957); LW, Lugn, A. L., and Wenzel, L. K. (1938); Ml, Multilithed logs (obtainable from Conservation and Survey Division of the University of Nebraska); N, Nettleton, E. S. (1892); Tr, This report; WRJ, Waite, H. A., Reed, E. C., and Jones, D. S., Jr. (1945); WW, Wenzel, L. K., and Waite, H. A. (1941).

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Adams County		
5-11- 1aa	430	Niobrara	UN	Ml
24aa	320	do	UN	Ml
12- 6bb	270	Pierre	UN	Ml
6- 9- 1dd	350	Niobrara	UN	Ml
10- 6bb	400	do	UN	Ml
11-24ad	300	do	UN	Ml
12- 6bb	330	Pierre	UN	Ml
19bb	360	Niobrara	UN	Ml
7- 9-24dd	300	do	UN	Ml
10-18cc	310	do	UN	Ml
11- 1aa	267	do	UN	Ml
8-10-18cc	270	do	UN	Ml
11- 5d	163	(?)		LW
12-19bb	230	(?)	UN	Ml
27aa	340	Niobrara	UN	Ml
		Clay County		
5- 8- 6bb	330	Niobrara	UN	Ml
19bb	115	do	UN	Ml
6- 8-19bc	430	Carlile	UN	Ml
		Dawson County		
9-24-13dd	589	Niobrara	UN	Ml
25- 4cc	630	Ogallala	UN	Ml
29aa	630	do	UN	Ml
31	220	(?)		LW
10-25- 5dd	200	Ogallala	UN	Ml
27bb	570	Niobrara	UN	Ml
		Franklin County		
1-16- 2ac	97	Niobrara(?)	UN	WRJ
6ad	175	do	UN	WRJ
2-13- 3bd	189	Niobrara	UN	WRJ
18aa	159	do	UN	WRJ
24ad	95	do	UN	WRJ
14- 2bc	282	do	UN	WRJ
7cc	190	do	UN	Ml
16bc	172	do	UN	WRJ
23aa	121	do	UN	WRJ
15- 1aa	310	do	UN	Ml
1bc	261	(?)	John Alfs	Tr

Table 3.—*Summary of logs of wells and test holes*—Continued

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Franklin County—Continued		
2-15-24bb	86	Niobrara	UN	WRJ
28bb	154	do	UN	WRJ
16-16cc	163	do	UN	WRJ
19ba	120	Pierre(?)	UN	Ml
31ba	133	Niobrara	UN	WRJ
35dd	150	do	BR	WRJ
3-13-13dd	250	do	UN	Ml
15-24aa	330	do	UN	Ml
4-13-24a	151	(?)		LW
14- 6bb	350	Pierre(?)	UN	Ml
15-13dd	270	do	UN	Ml
36dd	270	do	UN	Ml
		Frontier County		
5-25- 9bb	110	Niobrara(?)	UN	Ml
29aa	210	Niobrara	UN	Ml
26-24cd	45	do	BR	WRJ
24dc1	87	do	BR	WRJ
24dc2	88	do	BR	WRJ
24dc3	100	do	BR	WRJ
24dc4	100	do	BR	WRJ
25ab	90	do	BR	WRJ
25ba1	70	do	BR	WRJ
25ba2	100	do	BR	WRJ
25bb	115	do	BR	WRJ
6-24-12aa	370	Pierre(?)	UN	Ml
25- 5dd	320	Niobrara	UN	Ml
29aa	250	(?)	UN	Ml
7-24- 1ad	600	Niobrara	UN	Ml
25- 9bb	300	do	UN	Ml
28bb	310	Ogallala	UN	Ml
8-24- 1ba	610	Niobrara	UN	Ml
25- 6dd	210	Ogallala	UN	Ml
7aa	630	Niobrara	UN	Ml
20dc	530	do	UN	Ml
		Furnas County		
4-21- 4ab	260	Pierre	UN	WRJ
21dd	130	do	UN	WRJ
24dd	185	do	UN	WRJ
22-15aa	230	do	UN	WRJ
24aa	80	do	UN	WRJ
23- 2ad	230	do	UN	WRJ
7aa	71	do	UN	WRJ
24- 2bc	220	do	UN	WRJ
4cc1	69	do	UN	WRJ
4cc2	77	do	UN	WRJ
20bc	49	Niobrara	UN	WRJ
25- 4bb	240	do	UN	WRJ
7bb	69	(?)	UN	WRJ
9dc	200	Niobrara	UN	WRJ
18bb	89	(?)	UN	WRJ

Table 3.—*Summary of logs of wells and test holes*—Continued

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Gosper County		
5-21-25aa...........	123	.... (?).........................	S. B. Yoeman	N
22-12ad...........	310	Niobrara..........................	UN	Ml
25dd...........	270	Pierre or Niobrara............	UN	Ml
33ba...........	230	Niobrara..........................	UN	Ml
23- 7bb...........	260	Pierre or Niobrara............	UN	Ml
24-25aa...........	180	..........do.........................	UN	Ml
36dd...........	200	..........do.........................	UN	Ml
6-21- 7bb...........	450	..........do.........................	UN	Ml
19cc...........	340	..........do.........................	UN	Ml
22ad...........	470	..........do.........................	UN	Ml
23-19cc...........	290	..........(?).........................	UN	Ml
7-21- 6bb...........	530	Niobrara..........................	UN	Ml
14bb...........	186	..........(?).........................	John Kelley	N
18cc...........	600	Pierre or Niobrara............	UN	Ml
26bc...........	232	..........(?).........................	Wm. West	N
22- 7..............	335	..........(?).........................	....	LW
23-30bb...........	470	..........(?).........................	UN	Ml
8-21-11cc...........	38	..........(?).........................	E. T. Wallace	N
16dd...........	60	Pleistocene......................	UN	LW
19bb...........	700	..........(?).........................	UN	Ml
21cc...........	85	Ogallala..........................	UN	LW
22aa...........	178	..........(?).........................	A. T. Axelsol	N
34ad...........	208	..........(?).........................	A. J. Tolberd	N
22- 7ac...........	263	..........(?).........................	Cole Carson Well Co.	N
23-18cc...........	485.7	Niobrara..........................	UN	Ml
		Hall County		
9-11-24da...........	300	Pierre or Niobrara............	UN	Ml
36da...........	280	..........do.........................	UN	Ml
		Harlan County		
1-17- 2bb...........	141	Niobrara..........................	CE	WRJ
2-17- 1aa...........	300	Pierre or Niobrara............	UN	Ml
3ad...........	260	..........do.........................	UN	WRJ
21cc...........	160	Pierre............................	UN	WRJ
18- 8aa...........	200	Niobrara..........................	UN	Ml
9dd...........	180	Pierre or Niobrara............	UN	WRJ
16cc...........	200	..........do.........................	UN	Ml
19- 1cb...........	200	..........do.........................	UN	WRJ
24ba...........	39	Pierre(?).........................	UN	WRJ
3-17- 1aa...........	360	Pierre or Niobrara............	UN	Ml
9cc...........	280	..........do.........................	UN	WRJ
24aa...........	250	..........do.........................	UN	Ml
18- 9bb...........	290	..........do.........................	UN	WRJ
29aa...........	260	..........do.........................	UN	Ml
19- 7cc...........	190	..........do.........................	UN	WRJ
4-17- 1aa...........	360	Pierre............................	UN	Ml
18c...........	265	.... (?).........................	....	LW
24aa...........	340	Pierre or Niobrara............	UN	Ml
18- 4ba...........	437	Niobrara..........................	UN	Ml

Table 3.—*Summary of logs of wells and test holes*—Continued

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
Harlan County—Continued				
4-18-17ad	370	Pierre or Niobrara	UN	Ml
33bb	270	do	UN	Ml
20- 1da	320	do	UN	Ml
25aa	319	do	UN	WRJ
Hayes County				
5-32-25cc	139	(?)	UN	WRJ
25cd	140	(?)	Ellithorpe and Putman.	Tr
6-33- 9ab	355	(?)	Arthur W. Haggard.	Tr
Hitchcock County				
3-31- 4ba	85	Pierre or Niobrara	UN	WRJ
4-31- 6cb	139	(?)	UN	WRJ
18ab	135	(?)	UN	WRJ
19ad	99	(?)	UN	WRJ
19dd	169	Pierre or Niobrara	BR	WRJ
29aa	181	do	BR	WRJ
29ab1	120	do	BR	WRJ
29ab2	135	do	BR	WRJ
29ba	121	do	BR	WRJ
29bb	155	do	BR	WRJ
29dd	102	(?)	UN	WRJ
Kearney County				
5-13-24aa	240	Ogallala	UN	Ml
36dd	240	do	UN	Ml
14- 6bb	340	Pierre or Niobrara	UN	Ml
19bb	330	do	UN	Ml
16- 6bb	280	do	UN	Ml
19bb	350	do	UN	Ml
6-14- 7ca	265	do	UN	Ml
15- 1aa	370	do	UN	Ml
13dd	310	do	UN	Ml
16-20cc	190	Ogallala	Kearney foundry.	Tr
31a	280	(?)	....	LW
7-13-13dd	450	Ogallala	UN	Ml
14-18cc	310	do	UN	Ml
8-13-36dd	350	Pierre	UN	Ml
14-31cc	280	Pierre or Niobrara	UN	Ml
Keith County				
12-36- 5bb	450	Brule	UN	BB
18dd	480	Ogallala	UN	BB
39- 2dd	400	do	UN	BB

Table 3.—*Summary of logs of wells and test holes*—Continued

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Keith County—Continued		
12-39- 5da	326	Ogallala	Ellithorpe and Putman.	Tr
40- 6ad	235	Brule(?)	UN	WW
8dd	390	Brule	UN	BB
41- 2bc	151	Ogallala	Arthur W. Haggard.	BB
2bd	149	Brule(?)	...do	BB
3db	166	Ogallala	...do	BB
13-37-29ab	398	Ogallala(?)	Ellithorpe and Putman.	Tr
38-18ab	254	Ogallala	UN	BB
30ba	390	Brule	UN	BB
33ca	426	Brule(?)	Ellithorpe and Putman.	Tr
36aa	113	Ogallala	UN	WW
		Nuckolls County		
1- 5-19bb	100	Carlile	UN	WRJ
8- 1dd	48	Niobrara or Carlile	UN	WRJ
6cc	80	Niobrara	UN	Ml
2- 8-10bb	60	...do	UN	WRJ
13cb	70	...do	UN	WRJ
19bb	90	...do	UN	Ml
29cc	52	Niobrara or Carlile	UN	WRJ
3- 8- 6bb	180	Niobrara	UN	Ml
19bb	120	...do	UN	Ml
4- 7-11aa	110	...do	UN	Ml
30cd	135	Niobrara(?)	John Alfs	Tr
35aa	160	Niobrara	UN	Ml
8-18cc	170	...do	UN	Ml
35dd	150	Niobrara(?)	John Alfs	Tr
		Phelps County		
5-17-17aa	210	Ogallala	...	LW
18- 3bb	340	Pierre(?)	UN	Ml
22bb	400	...do	UN	Ml
19-19bb	440	Pierre	UN	Ml
20- 1bb	475	...do	UN	Ml
6c	159	...(?)	...	N
18cc	125	...(?)	...	N
31cb	94	...(?)	...	N
31cc	260	Pierre (?)	UN	Ml
6-17-13dd	340	...do	UN	Ml
18-15cc	360	...do	UN	Ml
33bd	187	Ogallala	Cole Carson Well Co.	Tr
19-23c	770	Niobrara	...	LW
20- 6ad	560	Pierre(?)	UN	Ml
6c	250	Ogallala(?)	...	N
14dd	520	Ogallala	UN	Ml
18bc	226	...(?)	...	N
7-17-24aa	360	Pierre or Niobrara	UN	Ml

Table 3.—*Summary of logs of wells and test holes*—Continued

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Phelps County—Continued		
7-17-36dd........	340	Pierre or Niobrara............	UN	Ml
18- 3bb........	330	..........do.........................	UN	Ml
9ba........	108	..........(?).........................	UN	Ml
16dd........	260	Pierre or Niobrara............	UN	Ml
33dd........	310	..........do.........................	UN	Ml
19- 6da........	420	Pierre(?).........................	UN	Ml
20-14ad........	490	Ogallala..........................	UN	Ml
27bb........	500	Pierre(?).........................	UN	Ml
35dd........	480	Pierre.............................	UN	Ml
8-18-21dd........	290	Pierre or Niobrara............	UN	Ml
19-28da........	244.3	Ogallala(?)	UN	Ml
20-35aa........	420	Pierre.............................	UN	Ml

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Red Willow County		
3-28- 5da........	69	Ogallala..........................	UN	WRJ
8bb........	69	Pierre or Niobrara............	UN	WRJ
29-28bc........	43	Pierre.............................	UN	WRJ
30-12dd........	200	..........do.........................	UN	WRJ
4-26- 1dd........	55	Pierre or Niobrara............	UN	WRJ
6bc........	225	Niobrara..........................	UN	WRJ
12aa........	65	Pierre or Niobrara............	UN	WRJ
24dd........	160	..........do.........................	UN	WRJ
30ab........	36	..........do.........................	UN	WRJ
36bb........	69	..........do.........................	UN	WRJ
27-26ba........	99	..........do.........................	UN	WRJ
26da........	59	..........do.........................	UN	WRJ
28-23dd........	99	Ogallala(?)	UN	WRJ
31dd........	78	..........do.........................	UN	WRJ
32aa........	280	Niobrara..........................	UN	WRJ
36cd........	74	..........do.........................	UN	WRJ
29- 6bd........	119	Pierre or Niobrara............	UN	WRJ
22ba........	89	..........do.........................	UN	WRJ
25cc........	99	..........do.........................	UN	WRJ
25dc........	59	..........do.........................	UN	WRJ
30-13dc........	320	Pierre.............................	UN	WRJ

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication containing log
		Webster County		
1-10- 1ab1........	40	..........(?).........................	UN	WRJ
1ab2........	60	Niobrara..........................	UN	WRJ
1dc........	26	..........do.........................	UN	WRJ
2- 5-14ca........	68	Carlile............................	UN	WRJ
9- 1aa........	50	Niobrara..........................	UN	Ml
20ca........	123	Carlile(?)	UN	WRJ
21bb........	35	Pleistocene......................	UN	WRJ
24cc........	76	Carlile(?)	UN	WRJ
24db........	70	..........do	UN	WRJ
26cc........	127	Niobrara or Carlile............	UN	WRJ
36dd........	90	Niobrara..........................	UN	Ml
10-15ba........	97	Niobrara or Carlile............	UN	WRJ
16bb........	105	..........do.........................	UN	WRJ
26bb........	195	..........do.........................	UN	WRJ
11- 1ab........	260	Niobrara..........................	UN	Ml

Table 3.—*Summary of logs of wells and test holes*—Continued

Well or test hole	Depth (feet)	Geologic unit in which drilling ended	Driller	Publication Containing log
Webster County—Continued				
2- 11-11aa......	195	Niobrara or Carlile...........	UN	WRJ
13dc......	140	Niobrara......................	UN	Ml
20ba......	30	.........do......................	UN	WRJ
12- 1ad......	210	Niobrara or Carlile...........	UN	WRJ
5ad......	181	Niobrara......................	UN	WRJ
22ba......	135	.........do......................	UN	WRJ
26bc......	16	.........do......................	UN	WRJ
3-10-27ab......	105	Niobrara or Carlile...........	UN	WRJ
28ab......	70	.........do......................	UN	WRJ
29aa......	100	.........do......................	UN	WRJ
11-24aa......	170	Niobrara......................	UN	Ml
4- 9- 1aa......	200	.........do......................	UN	Ml
10- 3c......	196	.........(?).....................	....	LW
4db......	218	Niobrara(?)	Layne-Western Co.	Tr
11- 1aa......	200	.........do......................	UN	Ml
24aa......	150	.........do......................	UN	Ml
36dd......	145	.........do......................	UN	Ml
12-18cc......	180	Pierre..........................	UN	Ml
31cc......	200	.........do......................	UN	Ml

Table 4.—*Logs of wells and test holes*

Type of material	Thickness (feet)	Depth (feet)
2-15-1bc		
[Driller's log of irrigation well in Franklin County; drilled in 1947 by John Alfs of Shickley, Nebr., for John C. Blank. Depth to water, 174 ft]		
Topsoil	2	2
Clay	28	30
Sand	16	46
Clay	19	65
Sand; with clay balls	27	92
Sand	16	108
Clay	18	126
Sand, coarse	12	138
Sand and gravel, coarse	35	173
Sand, fine	9	182
Clay	2	184
Sand and gravel, coarse	36	220
Clay	9	229
Sand and gravel	10	239
Clay	8	247
Sand and gravel	14	261
5-32-25cd		
[Driller's log of test hole in Hayes County; drilled in 1947 by Ellithorpe and Futman, Ogallala, Nebr. Depth to water, 41.8 ft]		
Topsoil and light clay	10	10
Clay, yellow	5	15
Clay, sandy	11	26
Clay, hard	4	30
Clay, soft	26	56
Sand, fine to medium; with wood chips	2	58
Rock in thin layers with medium to coarse sand	5	63
Gravel, coarse	5	68
Sand, coarse, and fine gravel; some clay	7	75
Sand, coarse, with some clay	5	80
Sand, fine to medium	5	85
Sand, medium to coarse	3	88
Gravel, medium	7	95
Sand and gravel	15	110
Clay, sandy	10	120
Clay, with coarse sand	3	123
Sand, fine, with clay and limestone fragments	7	130
Sand, fine, with considerable clay	5	135
Sand, fine to medium, with some clay	5	140
6-33-9ab		
[Driller's log of test hole in Hayes County; drilled in 1951 by Arthur W. Haggard of Ogallala, Nebr., for Tyre Nelson. Depth to water, 228 ft]		
Soil	1	1
Soil	2	3
Clay	95	98
Clay, white, clastic	2	100
Clay, brown, hard	35	135
Limestone, white	20	155
Sandstone	7	162
Gravel, medium to coarse, cemented	23	185
Clay, brown, cemented	10	195

Table 4.—*Logs of wells and test holes*—Continued

Type of material	Thickness (feet)	Depth (feet)
6-33-9ab—Continued		
Gravel, fine to coarse	20	215
Limestone, brown, with thin partings of gravel	10	225
Sandstone, gray	12	237
Gravel, fine to medium	11	248
Sand, gray	5	253
Limestone, hard	4	257
Limestone, brown; thin streaks of gravel	17	274
Limestone, white	1	275
Clay with streaks of gravel	7	282
Gravel, coarse, clean	18	300
Limestone, brown	20	320
Limestone, white and brown, with thin sandy streaks	35	355
6-16-20cc		
[Driller's log of irrigation well in Kearney County; drilled in 1949 by Kearney Foundry of Kearney, Nebr., for Leo F. Fishell. Depth to water, 89 ft]		
Topsoil	1	1
Clay	24	25
Sand	7	32
Clay	3	35
Sand	27	62
Clay	17	79
Clay and sand	35	114
Gravel, clean	76	190
12-39-5da		
[Driller's log of irrigation well in Keith County; drilled in 1950 by Ellithorpe and Putman of Ogallala, Nebr., for Krajewske Bros. Depth to water, 240 ft]		
Topsoil	6	6
Clay, tan	3	9
Clay with layers of magnesia	3	12
Clay, buff	3	15
Sandstone with some free gravel	15	30
Magnesia	3	33
Clay, sandy, with layers of magnesia	10	43
Gravel with some clay	10	53
Gravel	20	73
Clay	10	83
Clay, sandy, with some gravel	20	103
Gravel, cemented	10	113
Clay with cemented gravel	40	153
Gravel	3	156
Clay with cemented gravel	4	160
Gravel	3	163
Clay with gravel. Hard layer at 167 ft	10	173
Gravel, some clay	10	183
Clay, calcareous, with some gravel	10	193
Clay with layers of limestone	10	203
Gravel	7	210
Clay with layers of magnesia	26	236
Gravel	2	238
Clay, sandy	3	241
Gravel	19	260
Clay with streaks of gravel	5	265

Table 4.—*Logs of wells and test holes*—Continued

Type of material	Thickness (feet)	Depth (feet)
12-39-5da—Continued		
Clay	7	272
Clay with streaks of magnesia	15	287
Gravel	4	291
Clay with streaks of magnesia	15	306
Magnesia with layers of clay	10	316
Clay, sandy	10	326

13-37-29ab

[Driller's log of test hole in Keith County; drilled in 1948 by Ellithorpe and Putman of Ogallala, Nebr., for R. Nelson. Depth to water, 217 ft]

Type of material	Thickness (feet)	Depth (feet)
Topsoil	7	7
Sand, coarse, and gravel	10	17
Clay, brown	11	28
Sandstone	11	39
Sandstone, medium hard	4	43
Clay, brown and white	20	63
Gravel, fine to coarse, and brown clay	17	80
Clay, brown	5	85
Sand, coarse in streaks	12	97
Clay, brown	17	114
Sand, coarse, and gravel	14	128
Clay, brown and white, with layers of limestone	9	137
Gravel, coarse, with brown clay and medium hard limestone	7	144
Clay, brown, with medium hard white limestone	12	156
Clay, brown and white, hard	8	164
Gravel, coarse, and white clay	5	169
Gravel, coarse to fine, with trace of clay	9	178
Clay, brown with gravel streaks	6	184
Clay, brown	20	204
Limestone with hard clay layers	15	219
Sand, fine, and some gravel and clay	4	223
Clay, brown, with some gravel	5	228
Sand, coarse, and coarse gravel	41	269
Clay, white, with sandstone, limestone, and streaks of gravel	34	303
Limestone, very hard	2	305
Clay, white, and hard limestone	12	317
Sand, fine, and fine gravel	13	330
Clay, white, some limestone	4	334
Limestone, some white clay	15	349
Limestone, very hard	2	351
Limestone, some white clay, gravel, and sand	4	355
Clay, white, some gravel	2	357
Limestone and white clay, medium hard	10	367
Limestone, hard	31	398

13-39-33ca

[Driller's log of test hole in Keith County; drilled in 1948 by Ellithorpe and Putman of Ogallala, Nebr., for H. S. Shelburne. Depth to water, 209 ft]

Type of material	Thickness (feet)	Depth (feet)
Topsoil	8	8
Gravel	31	39
Clay	4	43
Limestone	15	58
Gravel	20	78
Clay, hard	14	92
Clay, yellow	6	98

Table 4.—*Logs of wells and test holes*—Continued

Type of material	Thickness (feet)	Depth (feet)
13-39-33ca—Continued		
Gyp rock	4	102
Sand, fine	5	107
Rock and clay	10	117
Gravel	3	120
Clay, hard	6	126
Rock	2	128
Clay, soft	1	129
Gravel	3	132
Magnesia	12	144
Rock, hard	3	147
Clay	3	150
Limestone, soft	3	153
Limestone, hard	3	156
Clay	4	160
Gravel	12	172
Clay, brown, and sand	11	183
Limestone	1	184
Clay, brown	9	193
Limestone, hard	2	195
Clay	9	204
Limestone	1	205
Clay	14	219
Sand and gravel	12	231
Clay	3	234
Sand, coarse	2	236
Magnesia	1	237
Sand, cemented	5	242
Sand, medium	2	244
Clay	6	250
Magnesia	1	251
Sand and gravel	5	256
Clay	7	263
Sand, medium	10	273
Clay	12	285
Gravel, medium	5	290
Clay	9	299
Limestone, soft	5	304
Clay, white	2	306
Clay, brown	12	318
Sandstone, soft	12	330
Clay, white	3	333
Sand, fine	1	334
Clay, brown	5	339
Sand, fine	1	340
Clay, sandy, white	8	348
Clay, brown	2	350
Sand, coarse, and medium gravel	2	352
Limestone and clay	1	353
Clay, brown, sandy	6	359
Sand and gravel	5	364
Sand, fine to coarse	5	369
Sand, medium to coarse	2	371
Sand, coarse, and fine gravel	3	374
Gravel, medium	6	380
Clay	11	391
Limestone	.5	391.5
Clay	5.5	397
Sand, coarse	3	400
Clay	1	401

Table 4.—*Logs of wells and test holes*—Continued

Type of material	Thickness (feet)	Depth (feet)
13-39-33ca—Continued		
Limestone	0.5	401.5
Clay	1.5	403
Sand, fine	2	405
Clay	11	416
Clay, magnesia	6	422
Clay, hard, brown (Brule?)	4	426
4-7-30cd		
[Driller's log of test hole in Nuckolls County; drilled by John Alfs of Shickley, Nebr., for Frank Karmazin. Depth to water, 75 ft]		
Clay	100	100
Rock, white	34	134
Rock, hard	1	135
4-8-35dd		
[Driller's log of test hole in Nuckolls County; drilled by John Alfs of Shickley, Nebr., for Eugene F. McCarthy. Depth to water, 60 ft]		
Clay and silt	149	149
Rock, hard	1	150
6-18-33bd		
[Driller's log of public-supply well in Phelps County; drilled in 1947 by Cole-Carlson Well Co. of Loomis, Nebr., for city of Holdrege. Depth to water, 138 ft]		
Topsoil and clay	30	30
Sand with clay layers	124	154
Sand and gravel	33	187
4-10-4db		
[Driller's log of test hole in Webster County; drilled in 1934 by Layne-Western Co. of Omaha, Nebr., for village of Blue Hill. Depth to water, 106.5 ft]		
Topsoil, black	4	4
Clay	42	46
Clay with a little fine silty sand	68	114
Clay and magnesia rock	1	115
Clay and fine silty sand	16	131
Sand, fine, with some clay	4	135
Rock, magnesia	.5	135.5
Sand with clay balls and small boulders	20.5	156
Clay	35	191
Clay with some gravel and rock	2	193
Shale	25	218

Table 5.—*Record of wells and irrigation practices*

Well number: See text for description of well-numbering system.
Depth of well: Measured depths are given in feet and tenths below land surface; reported depths are given in feet only.
Type of casing: C, concrete; M, metal; T, tile; W, wood.
Type of pump: C, centrifugal; Cy, cylinder; J, jet; N, none; T, turbine.
Type of power: D, diesel fuel; E, electricity; G, gasoline; H, hand; N, none; Ng, natural gas; P, propane or butane gas; T, tractor fuel; W, wind.
Geologic source: Qp, Pleistocene deposits; To, Ogallala formation.
Type of material: C, clay; G, gravel; S, sand.
Measuring point: Ep, lower edge of discharge pipe; Hb, hole in pump base; Hc, hole in casing; Ls, land surface; Tc, top of casing; Tp, top of platform.

Depth to water: Measured depths are given in feet and hundredths; reported depths are given in feet only.
Use of water: D, domestic; I, irrigation; N, none; O, observation of water-level fluctuations; P, public supply; R, railroad; S, stock.
Method of distributing water: D, ditch; G, gravity; P, gated pipe; S, sprinkler.
Principal crops irrigated: A, alfalfa; C, corn; G, grass or pasture.
Other crops irrigated: A, alfalfa; B, sugar beets; By, barley; C, corn; Cl, clover; G, grass or pasture; Gs, grain sorghum; M, melons; O, oats; P, potatoes; S, soybeans; W, wheat.

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer	
												Geologic source	Type of material
	Adams County												
5- 9- 9dc	Dan McClary	1946	142	18	M	....	T	.....	.....	T	....	Qp	S, G
20bc	Art. Post	1948	178	18	M	....	T	.....	.....	....	....	Qp	S, G
20cb	Barney Buss	1948	190	18	M	....	T	.....	.....	....	....	Qp	S, G
23bb	Carl Whitcomb	1952	174	18	M	36	T	8	3	G	4.57	Qp	S, G
30d	Pierce Jones	1948	174	18	M	....	T	.....	.....	T	....	Qp	S, G
10- 1bb	J. F. Sims	1943	164.0	24	M	....	T	.....	.....	....	....	Qp	S, G
2aa	Lester Woods	1947	178	18	M	....	T	.....	.....	....	....	Qp	S, G
10cb	Mrs. Nettie Kort	1948	209	18	M	48	T	8	2	G	3.54	Qp	S, G
25db	Alfred Frohm	1948	172	18	M	....	T	.....	.....	....	....	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Adams County																
5- 9- 9dc....	Hb	1.2	1,795.43	38.90	Aug. 20, 1947	....	1,000	I	....	....	....	....	....	....	....	....
20bc....	Hb	.5	....	112.30	June 9, 1948	....	1,000	I	....	....	....	....	....	....	....	....
20cb....	Hb	.5	1,889.68	111.55	Aug. 9, 1948	....	750	I	....	....	....	....	....	....	....	....
23bb....	Hb	.0	....	119.62	Oct. 14, 1952	25	800	I	135	19	D	73	0.3	C	....	73
30d.....	Hb	.5	1,921.95	132.70	June 1, 1948	....	300	I	....	....	....	....	....	....	....	....
10- 1bb....	Hb	.0	1,877.16	94.00	Apr. 2, 1948	....	....	I	....	....	....	....	....	....	....	....
2aa....	Hb	1.0	1,880.55	92.95	Aug. 2, 1948	....	1,000	I	....	....	....	....	....	....	....	....
10cb....	Hb	.0	....	97.34	Oct. 17, 1952	11	1,050	I	240	46	D	60	8	C	S, A	75
25db....	Hb	.5	1,909.54	116.72	Aug. 9, 1948	....	700	I	....	....	....	....	....	....	....	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer	
												Geologic source	Type of material
	Adams County—Continued												
5-10-28bd	A. Buschow	1948	208	18	M	...	T	...	...	...	...	Qp	S, G
30bd	Harold J. Koepke	1947	175	18	C	...	T	...	...	...	...	Qp	S, G
11- 1ac	Mr. Krabel	...	...	18	M	...	T	...	...	...	...	Qp	S, G
2bb	Dr. Neilson	1940	170	18	M	...	T	...	...	...	...	Qp	S, G
20cb	John Shaw	1949	151	18	M	48	T	8	2	P	1.09	Qp	S, G
21ab	Norbert Barwege	1932	160	10	M	...	T	...	...	...	...	Qp	S, G
25ac	C. A. Slater	1946	184	18	M	...	T	...	...	...	...	Qp	S, G
12- 6dc	Fred Kimlé	1951	180	18	M	40	T	6	3	T	4.24	Qp	S, G
9aa	Catherine Chapman	1912(?)	90.0	5½	M	...	N	...	...	N	...	Qp	S, G
25bc	L. Grandstaff	...	197	18	M	...	T	...	...	P	...	Qp	S, G
6- 9- 4cb	J. P. Larson	1943	145	18	M	...	T	...	...	T	...	Qp	S, G
6c	John H. Stein	1940	150	14	M	...	T	...	...	...	...	Qp	S, G
25bb	Fred Ellermeier	1943	165	18	M	...	T	...	...	...	...	Qp	S, G
30bc	Guy Williams	1950	149	18	M	48	T	6	5	T	3.52	Qp	S, G
10- 3dd	Chris Eigenberg	1951	163	18	C	65	T	8	3	P	2.78	Qp	S, G
8ac	Fred Hogeman	1943	193	18	M	...	T	...	...	...	...	Qp	S, G
9db	Mr. Bauer	1952	...	...	...	...	T	...	...	...	...	Qp	S, G
13bb	M. M. Snyder	1948	175	...	...	...	T	8	...	G	...	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Adams County—Continued																
5-10-28bd	Ep	3.0	1,946.24	123.82	June 1, 1948	...	...	I	...	...	...	...	...	...	...	...
30bd	Hb	1.0	1,931.43	94.74	Aug. 9, 1948	30	1,100	I	...	...	...	...	...	...	...	...
11- 1ac	Hb	.0	...	89.86	Oct. 13, 1952	...	...	I	...	...	...	...	...	...	...	...
2bb	Hb	.5	1,944.24	86.72	Nov. 24, 1947	...	...	I	...	...	...	...	...	...	...	...
20cb	Hb	.0	...	40.41	Oct. 13, 1952	25	1,100	I	480	97	P	65	1.5	C	Cl	65
21ab	...	...	1,956.14	80	June 21, 1948	...	700	I	...	...	...	...	...	...	...	...
25ac	Hb	.0	...	90.90	do	17	1,000	I	...	...	...	...	...	...	...	...
12- 6dc	Hb	...	...	...	...	.8	520	I	900	86	S	135	.6	C	A, W	160
9aa	Tc	1.5	...	81.30	Apr. 2, 1948	...	...	N	...	...	...	...	...	...	...	...
25bc	Hb	.0	...	92.25	Oct. 13, 1952	...	...	I	...	...	...	...	...	...	...	...
6- 9- 4cb	Hb	.0	1,891.85	104.00	Aug. 20, 1947	...	...	I	...	...	...	...	...	...	...	...
6c	Hb	.0	1,898.25	100.60	Aug. 17, 1948	...	450	I	...	...	...	...	...	...	...	...
25bb	Hb	.0	1,856.01	104.73	July 30, 1948	...	...	I	...	...	...	...	...	...	...	...
30bc	Hb	.0	...	95.04	Oct. 14, 1952	13	500	I	180	17	S	60	.3	C	Gs, By	166
10- 3dd	Ep	5.0	...	108.89	do	...	3,000	I	600	99	P	65	1.5	C	...	80
8ac	Hb	1.0	1,927.93	91.55	Nov. 24, 1947	...	...	I	...	...	...	...	...	...	...	...
9db	Ep	3.0	...	99.89	Oct. 14, 1952	...	...	I	...	...	...	...	...	...	...	...
13bb	...	...	...	...	...	...	950	I	1,440	252	P	90	2.8	C	...	160

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Adams County—Continued												
6-10-14ca	Oscar Hibberlay	1947	175	18	M	...	T	...	...	...	...	Qp	S, G
23bb	University of Nebraska	1936	17.8	1	M	...	N	...	...	N	...	Qp	S, C
24ad	Clara Whitlake	1944	186	18	C	...	T	...	...	...	...	Qp	S, G
31bd	C. V. Magnuson	...	156.0	18	M	...	T	...	...	...	...	Qp	S, G
33dd	Ayr Lumber Co	...	...	...	...	...	Cy	...	...	E	...	Qp	...
11- 1cc	M. M. Lippincott	1952	...	...	...	...	T	...	...	N	...	Qp	S, G
1dd	....do	1952	...	...	...	...	T	...	...	N	...	Qp	S, G
4da	Leander Koos	1951	190	18	M	...	T	8	2	Ng	0.42	Qp	S, G
6ab	M. M. Lippincott	1948	180	18	C	...	T	...	...	G	...	Qp	S, G
6da	....do	1949	188	18	C	...	T	...	...	G	...	Qp	S, G
9bb	Tony Hoffman	1948	186	18	M	...	T	...	...	...	...	Qp	S, G
14ad	Ed. Kothe	1948	206	18	C	...	T	...	...	...	...	Qp	S, G
16dc	Leonard Brown	1952	181	18	M	...	T	8	2	Ng	.54	Qp	S, G
21cc	Art Hoffman	1952	167	18	M	48	T	8	2	Ng	.81	Qp	S, G
22cc	...	1949	...	18	...	...	T	...	...	...	...	Qp	S, G
26bb	Wilford Trausch	1951	191	...	M	90	T	8	2	Ng	.49	Qp	S, G
30bc	Helen Marble	1948	192	18	M	...	T	...	...	...	...	Qp	S, G
12-12ac	Robert Hohlfield	1946	165	18	M	...	T	...	...	...	...	Qp	S, G
27aa	Chicago, Burlington & Quincy Railroad Co	...	126	5½	M	...	Cy	...	...	W	...	Qp	...

Table 5.—*Record of wells and irrigation practices* —Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Adams County—Continued																
6-10-14ca	Hb	0.5	1,900.65	97.33	Oct. 20, 1948			I								
23bb	Tc	3.0	1,818.27	12.38	Dec. 16, 1936			O								
24ad	Hb	.0	1,886.93	99.50	Oct. 20, 1948		1,000	I								
31bd	Hb	.5	1,919.93	91.78	Apr. 2, 1948			I								
33dd								D								
11- 1cc	Hb	.0		69.10	Oct. 9, 1952			I								
1dd	Hb	.0		83.00	do			I								
4da	Hb	.5		95.16	Oct. 8, 1952		1,180	I	720	156	P	80	2.0	C		135
6ab	Hb	.0		106.77	do			I								
6da	Hb	.0		101.36	do			I								
9bb	Hb	.5	1,979.34	88.90	Aug. 10, 1948		1,200	I								
14ad	Hb	1.5	1,963.45	102.13	do		1,400	I								
16dc	Hb	.0		94.61	Oct. 8, 1952	13	1,100	I	160	28	D	60	.5	C		70
21cc	Hb	.0		82.86	do	13	1,000	I			D	55		C		65
22cc	Hb	1.0		91.30	Mar. 24, 1950			I								
26bb	Hb	.5		95.41	Oct. 8, 1952	10	1,000	I	1,440	265	P	105	2.5	C		105
30bc	Hb	.5	1,987.00	88.00	Aug. 5, 1948			I								
12-12ac	Hb	.5	2,016.31	97.56	Oct. 6, 1948	8	750	I								
27aa			2,009.10	105	June 11, 1948		40	R								

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Adams County—Continued												
7- 9- 8bc	City of Hastings	1944	195	18	M	......	T	8	......	E	....	Qp	S, G
27cc	State Hospital	1943	175	18	M	......	T	......	......	......	....	Qp	S, G
32ba	Lester Lautz	1944	180	18	C	......	T	......	......	......	....	Qp	S, G
10- 9dd1	State Hospital	....	180	18	M	......	T	......	......	E	....	Qp	S, G
9dd2	....do	....	150	....	....	......	T	......	......	E	....	Qp	S, G
9dd3	....do	....	150	....	....	......	T	......	......	E	....	Qp	S, G
10cb	....do	1932	180	18	M	......	T	......	......	E	....	Qp	S, G
15bb	....do	1930	150	....	....	......	T	......	......	E	....	Qp	S, G
16ac	....do	1947	180	18	M	......	T	......	......	E	....	Qp	S, G
16cc	John H. Hueske	1950	172	18	M	......	T	......	......	Ng	....	Qp	S, G
16dc	State Hospital	....	180.0	18	....	......	T	......	......	E	....	Qp	S, G
23ab	Rev. R. C. Walter	1930	155.0	8	M	......	N	......	......	N	....	Qp	S, G
24aa	Dean Dougherty	1944	174	18	M	......	T	......	......	......	....	Qp	S, G
26da	Roy Dougherty	1943	186	18	M	......	T	......	......	......	....	Qp	S, G
29cc	Emma Wright	1947	170	18	M	48	T	6	......	T	3.92	Qp	S, G
33ac	C. R. Anderson	....	......	....	....	......	T	......	......	......	....	Qp	S, G
11- 3aa	M. D. Sargeant	1948	185	18	C	......	T	......	......	......	....	Qp	S, G
3cb	Vic. Katzberg	1946	182	18	M	......	T	......	......	Ng	....	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Adams County—Continued																
7- 9- 8bc				110	Oct. 7, 1944		1,000	P								
27cc	Hb	0.0	1,891.31	107.27	July 30, 1948	9	1,400	I								
32ba	Hb	.0	1,912.71	113.60	June 25, 1948	15	1,000	I								
10- 9dd1				100	Oct. 7, 1952		1,000	P								
9dd2							375	P								
9dd3							375	P								
10cb	Hb	1.0	1,948.95	102.57	Oct. 22, 1948		700	I								
15bb				100	Oct. 7, 1952		300	I								
16ac	Hb	.5		112.70	do		400	I								
16cc	Hb	.0		107.15	do			I								
16dc	Hb	3.0	1,957.55	113.70	Oct. 22, 1948			I								
23ab	Tc	1.0	1,928.00	100.96	Aug. 3, 1934											
24aa	Hb	1.5	1,914.98	103.80	Aug. 10, 1948	12	1,000	I								
26da	Hb	1.0	1,932.79	115.00	Nov. 24, 1947			I								
29cc	Hb	.5		86.06	Oct. 7, 1952		900	I	720	99	P, S	40	2.5	C	A, Gs	65
33ac	Hb	.5	1,927.75	95.99	Aug. 10, 1948			I								
11- 3aa	Hb	.5	2,007.68	105.72	Aug. 13, 1948			I								
3cb	Hb	.0	2,020.04	112.19	Nov. 17, 1947			I								

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Adams County—Continued												
7-11- 4ca	Elmer Young	1948	198	18	M	...	T	...	...	...	...	Qp	S, G
12ac	Village of Juniata	1936	...	2	M	...	Cy	...	...	E	...	Qp	S, G
16ba	A. H. Jones	1944	190	18	M	...	T	...	...	...	...	Qp	S, G
20cb	Wilfred Plambeck	1949	160	18	M	...	T	8	2	P	2.61	Qp	S, G
21ca	Mousel brothers	1952	170	18	C	...	T	...	...	N	...	Qp	S, G
22ad	Verne Anderson	1945	182	18	M	...	T	...	...	...	...	Qp	S, G
22db	Albert Ganguish	1952	172	18	M	48	T	8	3	G	4.02	Qp	S, G
31cb	Nienhueser brothers	1949	160	18	M	60	T	8	2	P	2.61	Qp	S, G
12- 2bc	Dr. Kingsley	1942	183	18	M	...	T	...	...	...	...	Qp	S, G
15ca	Roscoe Karr	1946	180	18	M	...	T	...	...	...	...	Qp	S, G
24cc	John D. Croff	1941	145.0	18	M	...	T	...	...	D	...	Qp	S, G
24dc	Detleff Einspahr	1949	168	18	M	40	T	8	2	T	3.62	Qp	S, G
8-10-19bd	H. W. Witte	1948	178	18	M	...	T	...	...	T	...	Qp	S, G
29ab	John Junker	1946	190	18	M	...	T	...	...	...	...	Qp	S, G
29bc	R. Patterson	1943	177	18	M	...	T	...	...	...	...	Qp	S, G
30dd	H. M. Witte	1944	190	18	M	...	T	...	...	...	...	Qp	S, G
32da	W. J. Kieefe	1948	186	18	M	...	T	...	...	...	...	Qp	S, G
11-13aa	Edwin Kent	1941	165	18	M	...	T	...	...	...	...	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Adams County—Continued																
7-11- 4ca	Hb	0.0	2,058.44	144.30	Aug. 13, 1948	...	...	I	...	...	...	...	...	...	...	...
12ac	...	...	...	...	...	...	...	P	...	...	...	...	...	...	...	...
16ba	Hb	.0	2,043.73	131.88	Oct. 21, 1948	...	1,200	I	...	...	...	...	...	...	...	...
20cb	Hb	.0	...	84.55	Oct. 8, 1952	...	1,000	I	960	177	P	90	2.0	C	A	112
21ca	...	...	...	100	do	11	1,000	I	...	...	...	...	...	...	...	...
22ad	Hb	.5	2,007.20	121.10	Aug. 14, 1947	...	...	I	...	...	...	...	...	...	...	...
22db	Hb	.5	...	101.00	Oct. 7, 1952	11	1,000	I	...	...	D, P	50	...	C	...	75
31cb	Hb	.0	...	95.97	Oct. 8, 1952	10	1,000	I	540	99	D, P	78	1.3	C	A	125
12- 2bc	Hb	.0	2,042.23	84.72	June 4, 1948	...	1,000	I	...	...	...	...	...	...	...	...
15ca	Hb	1.0	2,057.90	99.05	Nov. 17, 1947	...	...	I	...	...	...	...	...	...	...	...
24cc	Hb	.5	2,033.72	99.52	do	...	...	I	...	...	...	...	...	...	...	...
24dc	Hb	.0	...	90.18	Oct. 8, 1952	...	1,000	I	400	66	D	80	.8	C	A	125
8-10-19bd	Hb	.5	2,005.50	109.65	July 29, 1948	16	1,100	I	...	...	...	...	...	...	...	...
29ab	Hb	1.5	1,997.69	120.60	Oct. 4, 1948	...	...	I	...	...	...	...	...	...	...	...
29bc	Hb	.0	1,987.50	109.97	July 23, 1948	20	1,000	I	...	...	...	...	...	...	...	...
30dd	Hb	.5	1,985.00	104.70	July 27, 1948	13	1,000	I	...	...	...	...	...	...	...	...
32da	Hb	1.0	1,972.92	105.05	Oct. 21, 1948	...	1,000	I	...	...	...	...	...	...	...	...
11-13aa	Hb	.0	2,003.52	92.68	Aug. 14, 1947	...	...	I	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of well (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Adams County—Continued												
8-11-24ad	Edwin Kent	1945	176	18	M	......	T	......	......	......	......	Qp	S, G
28cc	Harry Saddler	1948	218	18	M	......	T	......	......	......	......	Qp	S, G
12- 1cd	Vernon W. Brickel	1947	178	18	C	......	T	......	......	......	......	Qp	S, G
22db	H. W. Long	1935	130	24	M	......	T	......	......	......	......	Qp	S, G
34bc1	Village of Kenesaw	1921(?)	130	8	M	......	T	......	......	E	......	Qp	S, G
34bc2	do	1921(?)	130	8	M	......	T	......	......	E	......	Qp	S, G
	Clay County												
5- 6-26bd	B. W. Merrill	1900	86.0	5½	M	......	N	......	......	N	......	Qp	S, G
7- 3cb1	City of Fairfield	......	138	10	M	......	T	......	......	E	......	Qp	S, G
3cb2	do	......	138	10	M	......	T	......	......	E	......	Qp	S, G
4cd	Edward Schliep	1945	180	19	M	......	T	8	2	T	2.94	Qp	S, G
4dc	John Brodrick	......	......	......	......	......	T	......	......	T	......	Qp	S, G
5cb	Edward Schliep	1942	180	18	M	......	T	10	2	P	......	Qp	S, G
8bb	Carl Brodrick	1946	174	18	M	......	T	8	2	P	2.65	Qp	S, G
9ab	C. J. Hubbel	1942	160	18	C	......	T	8	2	T	2.94	Qp	S, G
11cb	Warren Wilson	1945	160	18	M	......	T	8	2	T	2.57	Qp	S, G
20cc	James Lipousky	1949	180	......	......	......	T	......	......	P	......	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Adams County—Continued																
8-11-24ad	Hb	0.0	1,998.94	99.01	July 23, 1948	...	...	I	...	...	...	...	...	...	...	...
28cc	Hb	.0	2,056.96	135.00	July 1, 1948	...	...	I	...	...	...	...	...	...	...	...
12- 1cd	Hb	2.0	2,056.03	86.05	Oct. 22, 1948	...	1,000	I	...	...	...	...	...	...	...	...
22db	Ep	2.5	2,062.33	87.10	Aug. 13, 1947	...	...	I	...	...	...	...	...	...	...	...
34bc1	...	...	...	80	June 12, 1948	...	...	P	...	...	...	...	...	...	...	...
34bc2	...	...	...	80	do	...	...	P	...	...	...	...	...	...	...	...
Clay County																
5- 6-26bd	Tc	1.0	...	78.00	June 1, 1948	...	...	N	...	...	...	...	...	...	...	...
7- 3cb1	...	...	...	87	Oct. 30, 1952	...	300	P	...	...	...	...	...	...	...	...
3cb2	...	...	...	87	do	...	250	P	...	...	...	...	...	...	...	...
4cd	Hb	.0	...	a89.14	do	...	1,000	I	1,440	265	P, S	120	2.2	C	A, W	160
4dc	Ep	4.0	...	b92.71	do	...	...	I	...	...	...	...	...	...	...	...
5cb	Hb	.0	...	89.12	Oct. 21, 1952	...	1,200	I	1,680	371	P	150	2.5	C	A	150
8bb	Hb	.0	...	81.04	Oct. 30, 1952	10	900	I	770	128	D	150	.8	C	...	400
9ab	Hb	1.0	...	88.70	do	...	1,000	I	462	85	D	100	.8	C	A	136
11cb	Hb	1.0	...	75.76	Oct. 31, 1952	...	1,000	I	720	132	P	145	.9	C	...	240
20cc	...	...	...	...	do	...	...	I	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Clay County—Continued							
5- 7-20dc	Anton Skalka	1948	175	18	M	....	T	8	2	P	3.06	Qp	S, G
21ca	Joseph R. Skalka	1949	180	18	M	....	T	8	2	P	4.12	Qp	S, G
22db	George J. Harms	1946	180	18	M	....	T	8	2	P	2.56	Qp	S, G
28bb	Albert J. Skalka	1950	185	18	M	....	T	8	2	E	2.50	Qp	S, G
29ad	Leo Sykora	1948	168	18	M	....	T	8	2	T	....	Qp	S, G
32ac	University of Nebraska	1936	23.0	1	M	....	N	....	....	....	....	....	....
8- 1bb	Ralph Kissinger	1948	165	18	M	....	T	....	....	E	....	Qp	S, G
2aa	H. and W. Fitzke	1951	158	18	M	50	T	8	2	P	4.07	Qp	S, G
3bb	Ida Onken and others	....	....	....	....	....	T	....	....	E	....	Qp	S, G
6db	Albert Davis	1952	178	18	M	....	T	8	1	P	....	Qp	S, G
6- 8- 7bd	Rav J. Kissinger	1949	....	18	M	....	T	8	3	....	4.07	Qp	S, G
7da	Albert Ellermeier	1942	180	18	M	....	T	....	....	P	....	Qp	S, G
8cc	Ray J. Kissinger	....	....	....	....	....	T	....	....	....	....	Qp	S, G
16cb	Henry R. Hinrichs	1951	169	18	M	48	T	8	2	P	2.07	Qp	S, G
17bb	W. W. Kissinger	....	....	....	....	....	T	....	....	P	....	Qp	S, G
29ba	Esther Bienhoff	1948	170	18	M	....	T	8	....	T	3.66	Qp	S, G
30ab	Ira Hunnicutt	1947	170	18	M	....	T	8	....	T	3.66	Qp	S, G
32bb	Irene E. Dahlgren	1949	....	....	....	....	T	....	....	G	....	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Clay County—Continued																
5- 7-20dc	Hb	0.5		95.44	Oct. 21, 1952		1,000	I	250	46	D	80	0.6	C		135
21ca	Hb	.0		80.49	do		1,000	I	520	76	D, S	77	1.0	A	C, G	157
22db	Hb	.5		80.30	do	12	1,100	I	760	140	D	90	1.5	C	A	160
28bb	Hb	.5		87.48	do		1,000	I	576	106	D	100	1.1	C	A	137
29ad	Hb	1.0		92.67	do		1,000	I	336	62	D	37	1.8	C		50
32ac	Tc	3.3		15.89	Dec. 15, 1936			O								
8- 1bb				91	Oct. 30, 1952		1,000	I	720	132	G	120	1.1	C	A	150
2aa	Hb	.0		94.03	do	16	900	I	210	35	D	65	.5	C	A	100
3bb	Tc	.5		96.70	Oct. 21, 1952			I								
6db	Hb	.5		96.25	do		1,000	I	300	55	D	65	.8	C		97
6- 8- 7bd	Hb	.0		110.44	do			I	450	83	D	100	.8	C	A	130
7da	Tc	.0		104.39	do		1,150	I								
8cc	Hb	.5		103.04	do			I								
16cb	Hb	.0		89.98	do	15	1,000	I	450	83	G	90	.9	C	A	115
17bb	Hb	.0		97.74	do			I								
29ba	Hb	.0		96.82	Oct. 20, 1952		1,000	I	300	55	D	90	.6			90
30ab				97	do		1,000	I	360	66	D	60	1.1	A		80
32bb	Tc	.0		92.55	do			I								

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Dawson County							
9-22-20ac	P. L. Bierman	1918(?)	34.0	3	M	......	N	......	......	N	......	......	......
29dc	Mildred Roseberg	1898(?)	......	5½	M	......	Cy	......	......	W	......	To	......
33aa	C. J. Magnuson	1918(?)	88.0	3	M	......	N	......	......	N	......	To	......
23- 9cc	Henry Etherton	1948	161	14	M	......	T	......	......	P	......	To	S, G
14da	D. Rhone	......	140	2½	M	......	Cy	......	......	W	......	To	......
20bc	Ray Kugler	......	155.0	2	M	......	N	......	......	N	......	To	......
20bd	....do	......	216.0	3	M	......	N	......	......	N	......	To	......
21bb	Oscar Weissart	1909	253.0	3	M	......	N	......	......	N	......	To	......
21dc	Mr. Myers	......	......	3½	M	......	Cy	......	......	W	......	To	......
22ac	John Toeber	......	273.0	4	M	......	N	......	......	N	......	To	......
22cc	Henry Gerken	1918	238.0	4	M	......	N	......	......	N	......	To	......
23cd	Mr. Foss	......	200.8	3½	M	......	Cy	......	......	W	......	To	......
28bb	Fred Weissert	......	214.0	3	M	......	N	......	......	N	......	To	......
30ba	G. Gengenbach	......	......	3½	M	......	Cy	......	......	N	......	To	......
32da	Mr. Myers	......	......	3	M	......	Cy	......	......	W	......	To	......
24- 9cd	......	......	187.0	3½	M	......	Cy	......	......	W	......	To	......
13da	John Toeber	1920(?)	200.5	3½	M	......	Cy	......	......	W	......	To	......
14dd	....do	1913	252.0	3	M	......	N	......	......	N	......	To	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Dawson County																
9-22-20ac.....	Tc	1.0	2,476.58	23.58	May 11, 1948	......	......	N	......	......	......	......	......	......	......	......
29dc.....	Tp	1.4	2,657.66	31.27	May 10, 1948	......	......	D	......	......	......	......	......	......	......	......
33aa.....	Tc	.0	2,508.69	34.56	.....do........	......	......	N	......	......	......	......	......	......	......	......
23- 9cc.....	Ep	4.0	2,548.59	58.40	July 1, 1949	......	1,100	I	......	......	......	......	......	......	......	......
14da.....	Tc	1.5	2,536.73	75.14	May 12, 1949	......	......	N	......	......	......	......	......	......	......	......
20bc.....	Hc	3.0	2,587.46	5.67	July 7, 1949	......	......	N	......	......	......	......	......	......	......	......
20bd.....	Tc	1.4	2,652.24	131.67	May 12, 1949	......	......	N	......	......	......	......	......	......	......	......
21bb.....	Tc	1.5	2,685.20	172.24	May 11, 1949	......	......	N	......	......	......	......	......	......	......	......
21dc.....	Tc	.8	2,678.70	153.99	June 24, 1949	......	......	N	......	......	......	......	......	......	......	......
22ac.....	Tc	1.3	2,696.93	193.25	May 13, 1949	......	......	N	......	......	......	......	......	......	......	......
22cc.....	Tc	2.0	2,653.45	130.88	.....do........	......	......	N	......	......	......	......	......	......	......	......
23cd.....	Tc	2.9	2,644.55	141.64	May 17, 1949	......	......	D, S	......	......	......	......	......	......	......	......
28bb.....	Tc	.1	2,649.88	136.69	May 12, 1949	......	......	N	......	......	......	......	......	......	......	......
30ba.....	Tc	.3	2,675.00	155.60	June 30, 1949	......	......	D, S	......	......	......	......	......	......	......	......
32da.....	Tc	1.2	2,656.22	158.16	May 18, 1949	......	......	D, S	......	......	......	......	......	......	......	......
24- 9cd.....	Tc	.5	2,662.95	103.03	July 21, 1949	......	......	N	......	......	......	......	......	......	......	......
13da.....	Tc	.5	2,681.77	154.62	July 7, 1949	......	......	S	......	......	......	......	......	......	......	......
14dd.....	Tc	1.2	......	175.68	July 12, 1949	......	......	N	......	......	......	......	......	......	......	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Dawson County—Continued							
9-24-15ba	Bess Sterner	1942	300	4	M		Cy			W		To	
17ab	R. F. Yentter	1910	347	3½	M		Cy			W		To	
20cc	Clarence Wagner		400				Cy			W		To	
27aa	E. H. Timm	1942	350.0	3½	M		N			N		To	
28bb	R. F. Yentter		401.0	4	M		Cy			W		To	
25- 4cb			306.0	6	M		N			N		To	
6bc			247.0	2½	M		Cy			W		To	
9bd	Geo. Brinkhouse	1900(?)	355.0	3½	M		N			N		To	
14cc	P. Mangus	1894(?)	350	4	M		Cy			W		To	
18aa				4	M		N			N		To	
18ba	Jack Colligan		286.0	6	M		N			N		To	
18dd	Gilbert Hess			3	M		N			N		To	
31cd1	Village of Farnam		218		M		T			E		To	
31cd2	do	1914	221	6	M		Cy			E		To	
31db	Lonnie Tell Estate	1919		6	M		Cy			N		To	
36cd	Fred Gaibler	1888	217.0	4	M		N			N		To	
10-24-31dc	Midway Ranch		182.0	3½	M		Cy			W		To	
25- 5dc	Grace M. Wiggins	1949	146.0	4	M		Cy			N		To	

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Dawson County—Continued																
9-24-15ba	Tc	1.3	2,799.72	253.25	July 19, 1949	...	...	D, S	...	...	...	...	...	...	...	...
17ab	Tc	.8	2,809.80	255.45	July 18, 1949	...	...	S	...	...	...	...	...	...	...	...
20cc	Hc	.7	2,842.31	325.14	Oct. 4, 1949	...	...	...	...	...	...	...	...	...	...	...
27aa	Tc	1.6	2,812.16	292.26	July 6, 1949	...	...	N	...	...	...	...	...	...	...	...
28bb	Hb	1.0	2,840.78	315.79	July 25, 1949	...	...	S	...	...	...	...	...	...	...	...
25- 4cb	Tc	.5	2,820.01	267.61	July 11, 1949	...	...	N	...	...	...	...	...	...	...	...
6bc	Tc	1.3	2,787.80	223.34	Aug. 8, 1949	...	...	D	...	...	...	...	...	...	...	...
9bd	Tc	1.0	2,860.81	313.52	July 11, 1949	...	...	N	...	...	...	...	...	...	...	...
14cc	Tc	.7	2,829.53	298.79	Oct. 4, 1949	...	...	...	...	...	...	...	...	...	...	...
18aa	Tc	1.9	2,778.71	231.26	Aug. 5, 1949	...	...	N	...	...	...	...	...	...	...	...
18ba	Tc	.3	2,773.64	222.48	Aug. 14 1949	...	...	N	...	...	...	...	...	...	...	...
18dd	Tc	1.7	2,790.89	246.62	Aug. 5, 1949	...	...	N	...	...	...	...	...	...	...	...
31cd1	...	...	...	180	May 6, 1949	...	150	P	...	...	...	...	...	...	...	...
31cd2	...	...	...	180	....do....	...	...	P	...	...	...	...	...	...	...	...
31db	Tp	.7	2,729.30	193.98	Dec. 10, 1936	...	...	N	...	...	...	...	...	...	...	...
36cd	Tc	.8	2,711.49	205.99	Aug. 3, 1949	...	...	N	...	...	...	...	...	...	...	...
10-24-31dc	Tc	1.0	2,661.64	79.85	July 22, 1949	...	...	N	...	...	...	...	...	...	...	...
25- 5dc	Tp	1.8	2,665.06	63.34	Aug. 8, 1949	...	...	S	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
Dawson County—Continued													
10-25-10cc	....	1916	....	$3\frac{1}{2}$	M	....	N	....	....	N	....	To	....
23ad	....	....	115.0	3	M	....	Cy	....	....	W	....	To	....
Franklin County													
1-16- 3ba1	Perry Losey	1943	71	18	M	....	T	6	....	Ng	0.71	Qp	S, G
3ba2	.....do	1941	73	18	M	....	T	6	....	Ng	.71	Qp	S, G
2-13- 9ab	Otto Kahrs	1947	70	36	C	....	T	....	....	G	....	Qp	S, G
15- 1bc	John C. Blank	1947	252	18	M	....	T	8	4	P	4.81	Qp	S, G
16- 7cb	Wayne Kelley	1946	87	18	M	....	T	....	....	T	....	....	S, G
17ac	Starr brothers	1947	137	18	M	....	T	....	....	T	....	....	S, G
17bb	Paul Sindt	1941	93	18	M	....	T	....	....	E	....	....	S, G
17ca	Albert Sindt	....	64	13	M	....	T	....	....	E	....	....	S, G
17cb	.....do	....	....	18	M	....	T	....	....	E	....	....	S, G
20bb	Karl Sindt	1946	61	24	M	....	T	....	....	T	....	....	S, G
3-14-28bb	John Evers	1952	190	18	M	....	T	8	....	P	....	Qp	S, G
36dd	University of Nebraska	1934	30.5	$1\frac{1}{4}$	M	....	N	....	....	N	....	....	S, G
15-19cc	George Garret	....	252	18	M	69	T	8	4	P	6.70	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Dawson County—Continued																
10-25-10cc	Tc	-2.5	2,670.49	75.20	July 11, 1949	...	...	N	...	...	...	...	...	...	...	...
23ad	Tc	1.5	2,676.42	103.06	Sept. 7, 1949	...	...	N	...	...	...	...	...	...	...	...
Franklin County																
1-16- 3ba1	Hb	0.5	...	56.90	Sept. 11, 1952	8	230	I	1,200	51	D	30	1.7	C	...	50
3ba2	Hb	.5	...	60.64	...do...	8	230	I	1,200	51	D	30	1.7	C	...	50
2-13- 9ab	Hb	.0	...	14.49	...do...	...	...	I	...	...	...	...	...	...	...	...
15- 1bc	Hb	.0	...	174.14	...do...	8	850	I	1,250	195	G	100	2.0	C	A	160
16- 7cb	Hb	.0	...	18.64	...do...	11	572	I	...	...	...	...	...	...	...	...
17ac	Hb	1.0	...	38.90	...do...	...	650	I	...	...	...	...	...	...	...	...
17bb	...	...	...	19	...do...	12	885	I	...	...	...	...	...	...	...	...
17ca	Hb	1.0	...	15.84	...do...	17	935	I	...	...	...	...	...	...	...	...
17cb	Hb	1.0	...	9.20	...do...	...	330	I	...	...	...	...	...	...	...	...
20bb	Hb	1.0	...	2.24	...do...	...	500	I	...	...	...	...	...	...	...	...
3-14-28bb	Hb	.0	...	147.85	...do...	...	800	I	960	141	D	60	2.4	C	A, Cl	80
36dd	Tc	...	...	21.02	Oct. 29, 1934	...	...	O	...	...	...	...	...	...	...	...
15-19cc	Hb	.0	...	192.78	Sept. 11, 1952	9	785	I	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Franklin County—Continued												
3-16- 6ac	George Meyers	1948	262	18	C	50	T	...	...	D	5.15	To	S, G
16cb	Dean Potter	1950	275	18	M	40	T	10	...	D	4.07	Qp	S, G
4-13-24ad1	Village of Campbell	1903	150	5½	M	...	T	...	...	E	...	To	S, G
24ad2	....do	1930	150	24	M	...	T	...	...	E	...	To	S, G
14-10da	Gilgen brothers	1934	225	12	M	...	T	...	...	D	...	To	S, G
16aa	Village of Upland	1932	288	8	M	...	T	...	...	E	...	To	S, G
15- 5dc1	Village of Hildreth	1913(?)	172	10	M	...	Cy	...	...	E	...	To	S, G
5dc2	....do	1928	168	10	M	...	T	...	...	E	...	To	S, G
16-32bd	Lester Schepler	1950	254	18	M	40	T	8	4	P	6.85	To	S, G
	Frontier County												
5-27-14bb	Rural school	1949	243.0	5½	M	...	Cy	...	...	W	...	To	...
29-11bd	...	...	222.0	5½	M	...	Cy	...	...	W	...	To	...
6-25-33ba	...	...	122.0	5½	M	...	Cy	...	...	W	...	To	...
27-11cd	Oscar Amstuz	1949	210	18	M	...	T	...	...	P	6.65	To	S, G
28-11cb	...	...	197.0	5½	M	...	Cy	...	...	W	...	To	...
30-26ca	...	...	192.0	5½	M	...	Cy	...	...	W	...	To	...
7-24-21ab	...	...	166.0	5½	M	...	Cy	...	...	W	...	To	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hour)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Franklin County—Continued																
3-16- 6ac	Hb	-1.0	...	223.00	Sept. 18, 1952	13	722	I	500	66	D	130	0.5	C	A,O,Cl	130
16cb	Hb	.0	...	216.60	Sept. 15, 1952	27	1,200	I	900	199	D	170	1.2	C	A	225
4-13-24ad1	...	...	...	65	June 9, 1948	...	100	P	...	...	...	...	...	...	...	...
24ad2	Hb	-4.0	...	64.60	....do	...	250	P	...	...	...	...	...	...	...	...
14-10da	Hb	2.3	...	169.04	Mar. 13, 1935	...	...	I	...	...	...	...	...	...	...	...
16aa	...	...	...	190	June 10, 1948	...	500	P	...	...	...	...	...	...	...	...
15- 5dc1	...	...	...	135	June 11, 1948	...	119	P	...	...	...	...	...	...	...	...
5dc2	...	...	...	135	....do	...	190	P	...	...	...	...	...	...	...	...
16-32bd	Hb	.0	...	191.33	Sept. 18, 1952	...	700	I	1,560	152	D	75	2.0	C	A	98
Frontier County																
5-27-14bb	Tc	0.0	...	222.78	July 28, 1952	...	...	P	...	...	...	...	...	...	...	...
29-11bd	Tc	.0	...	215.67	July 27, 1952	...	...	N	...	...	...	...	...	...	...	...
6-25-33ba	Tc	.0	...	93.03	....do	...	...	N	...	...	...	...	...	...	...	...
27-11cd	Hb	.5	...	153.30	July 29, 1952	...	650	I	336	25	D	60	0.4	C	A	200
28-11cb	Tc	.5	...	168.92	July 27, 1952	...	...	S	...	...	...	...	...	...	...	...
30-26ca	Tc	.5	...	189.65	July 26, 1952	...	...	S	...	...	...	...	...	...	...	...
7-24-21ab	Tc	.0	...	150.42	Aug. 6, 1952	...	...	S	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
Frontier County—Continued													
7-25-18bb			225.0	3½	M		Cy			W		To	
27- 4da			165.0	5½	M		Cy			W		To	
34cb	Orville Worley	1930		4	M		Cy			H		To	
28- 3cb	P. G. Taylor	1918(?)	196.3	4	M		N			N		To	
23aa			202.0	5½	M		Cy			W		To	
29- 8dd			187.0	5½	M		Cy			W		To	
30-29bd			237.0	5½	M		Cy			W		To	
8-24-10aa			291.0	4	M		N			N		To	
15db1	City of Eustis	1918	205	8	M					E		To	S, G
15db2	do	1937	207	8	M		T			E		To	S, G
27- 4cc	Village of Moorefield	1931	385	5½	M		T			E		To	S, G
28- 2ca	L. N. Elson	1948	362	30	M		T	12		D	2.61	To	S, G
29- 7cb			192.0	5½	M		Cy			W		To	
11ab			244.0	5½	M		Cy			W		To	
Furnas County													
3-21- 1aa	A. H. Askey	1915(?)		4	M		Cy			H		To	
4-21- 1aa			68.7	4	M		Cy					To	

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Frontier County—Continued																
7-25-18bb	Ep	1.5	...	216.04	July 27, 1952	...	...	N	...	...	...	...	...	...	...	...
27- 4da	Hb	1.5	...	a160.68	....do	...	...	S	...	...	...	...	...	...	...	...
34cb	Hb	.6	...	53.54	Dec. 8, 1934	...	...	N	...	...	...	...	...	...	...	...
28- 3cb	Tc	.0	...	192	Sept. 6, 1934	...	...	N	...	...	...	...	...	...	...	...
23aa	Tc	.5	...	173.62	July 27, 1952	...	...	S	...	...	...	...	...	...	...	...
29- 8dd	Tc	.5	...	165.44	July 26, 1952	...	...	S	...	...	...	...	...	...	...	...
30-29bd	Tc	.5	...	200.85	....do	...	...	S	...	...	...	...	...	...	...	...
8-24-10aa	Tc	1.3	...	230.99	Aug. 5, 1949	...	...	N	...	...	...	...	...	...	...	...
15db1	...	...	...	165	May 6, 1949	...	75	P	...	...	...	...	...	...	...	...
15db2	...	...	...	167	....do	...	185	P	...	...	...	...	...	...	...	...
27- 4cc	...	...	...	280	July 27, 1952	...	170	P	...	...	...	...	...	...	...	...
28- 2ca	...	...	...	145	....do	...	1,960	I	1,440	397	D, G	300	1.3	C	A, G	300
29- 7cb	Tc	.5	...	165.73	July 26, 1952	...	...	N	...	...	...	...	...	...	...	...
11ab	Tc	.5	...	211.98	....do	...	...	N	...	...	...	...	...	...	...	...
Furnas County																
3-21- 1aa	Tc	0.6	...	70.66	Dec. 11, 1936	...	...	N	...	...	...	...	...	...	...	...
4-21- 1aa	Hb	2.0	...	53.95	July 24, 1948	...	...	N	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Furnas County—Continued							
4-21-16da	Mr. Schoen	1940	....	18	M	......	T	......	......	T	....	......	S, G
22ba	....	....	151.5	$5\frac{1}{2}$	M	......	N	......	......	N	....	To	......
22db	Mr. Brunz	1951	190	18	M	......	T	8	......	P	5.72	To	S, G
26aa	Knuth brothers	1948	161	18	M	......	T	......	......	P	3.80	To	S, G
29ab	Percival brothers	1948	126	18	M	......	T	8	......	P	....	To	S, G
36bb	Harold Lueking	1947	158	18	M	......	T	......	......	E	5.16	To	S, G
22-15bb	....	1932	101.5	$5\frac{1}{2}$	M	......	Cy	......	......	W	....	To	......
						Gosper County							
5-21-35bd	Mrs. Roy Pettijohn	....	....	....	......	......	T	......	......	......	....	To	S, G
36dd	....	....	93.8	$5\frac{1}{2}$	M	......	Cy	......	......	N	....	Qp	......
22- 3da	R. E. Phillips	....	158.0	3	M	......	Cy	......	......	H	....	Qp	......
12ab	Melvin Berntson	1896(?)	128.5	4	M	......	Cy	......	......	H	....	Qp	......
12bb	University of Nebraska	1936	15.0	3	M	......	N	......	......	N	....	......	C
24da	C. K. Mousel	1952	200	12	M	......	T	......	......	P	....	To	S, G
23-10da	Ray L. Carter	1947	140	18	M	......	T	......	......	P	2.61	To	S, G
11cd	....do	....	86.0	$5\frac{1}{2}$	M	......	Cy	......	......	W	....	......	......
35cd	Samuel Golter	1948	50	....	......	......	T	......	......	T	....	......	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Furnas County—Continued																
4-21-16da				30	Aug. 14, 1952		700	I								
22ba	Tc	1.0		117.98	Aug. 6, 1952			N								
22db	Hb	.0		a147.87	Aug. 14, 1952		800	I	720	106	D, G	100	1.1	C	A	
26aa	Hb	1.0		100	do		600	I	720	80	D, S	80	1.0	C	A	150
29ab	Hb	.5		84	do		400	I	960	80	D, S	45	1.8	C	A	45
36bb				122	do		400	I	1,440	106	D	70	1.5	C		700
22-15bb	Tc	1.0		95.50	Aug. 6, 1952			S								
Gosper County																
5-21-35bd								I								
36dd	Tc	0.0		79.20	July 24, 1948			N								
22- 3da	Tc	1.0	2,418.62	152.10	Jan. 20, 1948			N								
12ab	Tc		2,359.97	117.68	Sept. 27, 1934			N								
12bb	Tc	3.5	2,258.07	8.85	Dec. 10, 1936			O								
24da	Hb	.5		111.09	Aug. 7, 1952			I								
23-10da	Hb			83	Aug. 6, 1952	15	1,000	I	480	88	D, G	75	1.2	A	C, Gs	75
11cd	Tc	2.0		78.12	Sept. 23, 1952			D, S								
35cd				20	Aug. 6, 1952		500	I								

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
							Gosper County—Continued						
5-24-10cc			185.0	$5\frac{1}{2}$	M		Cy			W			
6-21-7bb			205.0	3	M		Cy			W		To	
8ab	A. Langenberg	1900	137.0	4	M		N			N			
10cb	Mrs. W. Ziebarth		217.0	4	M		Cy			W		To	
16cb			265.0	3	M		Cy			W		To	
29cc	Mr. Forrester		135.8	4	M		N			N			
22-12cc			78.2	$5\frac{1}{2}$	M		N			N			
15cd			152.3	4	M		N			N			
16cc			192.6	4	M		Cy			N			
23-18bb			132.5	$5\frac{1}{2}$	M		Cy			W		To	
7-21-2ad	Clara Ebmier		177.0	3	M		Cy			W		Qp(?)	
4ad	John Meyer		207.0	4	M		Cy			W		Qp(?)	
6bc	A. Larson Estate		132.3	4	M		N			N		Qp(?)	
10dd	Sophia Swartz		184.0	2	M		Cy			W		Qp(?)	
15bb	.....do		221.0	3	M		N			N		Qp(?)	
18da	Flora Robb	1900	232.5	4	M		Cy			N			
18dc	Village of Smithfield	1905(?)	235	$3\frac{1}{2}$	M		Cy			W			
20bb			229.0	$2\frac{1}{2}$	M		N			N			
22bb			208.5	3	M		Cy			W			

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Gosper County—Continued																
5-24-10cc	Tc	1.0	....	154.75	Aug. 6, 1952	....	....	N	....	....	....	....	....	....	....	....
6-21- 7bb	Tc	1.8	2,511.37	91.53	Nov. 13, 1948	....	....	S	....	....	....	....	....	....	....	....
8ab	Tc	.7	2,428.77	117.86	July 27, 1948	....	....	N	....	....	....	....	....	....	....	....
10cb	Tc	2.7	....	209.14	June 28, 1949	....	....	D	....	....	....	....	....	....	....	....
16cb	Tc	3.0	2,550.04	248.66	.....do.....	....	....	S	....	....	....	....	....	....	....	....
29cc	Tc	1.4	2,402.65	125.05	July 27, 1948	....	....	N	....	....	....	....	....	....	....	....
22-12cc	Tc	1.3	2,390.23	71.94	July 28, 1948	....	....	N	....	....	....	....	....	....	....	....
15cd	Tc	2.3	....	129.30	July 27, 1948	....	....	N	....	....	....	....	....	....	....	....
16cc	Tc	2.0	....	181.85	July 28, 1948	....	....	N	....	....	....	....	....	....	....	....
23-18bb	Tc	.5	....	122.04	Aug. 7, 1952	....	....	N	....	....	....	....	....	....	....	....
7-21- 2ad	Tc	3.3	....	151.04	June 21, 1949	....	....	D, S	....	....	....	....	....	....	....	....
4ad	Tc	2.6	....	195.25	July 1, 1949	....	....	S	....	....	....	....	....	....	....	....
6bc	Tc	.4	2,467.35	117.99	Sept. 27, 1934	....	....	N	....	....	....	....	....	....	....	....
10dd	Tc	2.6	2,506.12	169.98	June 17, 1949	....	....	N	....	....	....	....	....	....	....	....
15bb	Tc	1.8	....	202.81	.....do.....	....	....	N	....	....	....	....	....	....	....	....
18da	Tc	1.4	2,546.76	205.30	July 28, 1948	....	....	N	....	....	....	....	....	....	....	....
18dc	....	....	....	235	June 23, 1949	....	....	P	....	....	....	....	....	....	....	....
20bb	Tc	1.5	2,545.71	200.47	Nov. 25, 1947	....	....	N	....	....	....	....	....	....	....	....
22bb	Tc	1.5	2,531.19	198.50	June 17, 1949	....	....	N	....	....	....	....	....	....	....	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer	
												Geologic source	Type of material
Gosper County—Continued													
7-21-24dc			195.4	4	M		N			N			
30da			226.0	4	M		Cy			W			
33aa			192.0	3	M		Cy			W			
22- 7ac	Village of Elwood	1937	339	8	M		T			E		To	
7ca	do	1947	349	8	M		T			E		To	
8bb			284.0	3	M		N			N		To	
10cc			289.0	4	M		Cy			W		To	
13bb	Walter Naumann	1920	255	4	M		N			N		To	
33bc			251.0	4	M		Cy			W		To	
23- 2ad	J. Seaman		162.0	4	M		Cy			W		To	
8-21- 9bb			76.5	18	M		T			E			S,G
18ac			217.0	4	M		N			N		To	
21cd			88.0	$5\frac{1}{2}$	M		Cy			W			
23cb			143.0	3	M		N			N		To	
24aa	D. C. Holtus			4	M		Cy			W		To	
25dd			172.0	4	M		Cy			W		To	
30dd	Robert Hyslop		144.0	3	M		N			N		To	
22- 3da	Rosie Young	1914(?)	222.0	4	M		Cy			W		To	

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Gosper County—Continued																
7-21-24dc	Tc	3.0	2,487.87	175.11	May 28, 1948	...	...	N	...	...	...	...	...	...	...	...
30da	Tc	1.2	2,548.59	219.24	Oct. 14, 1948	...	...	D, S	...	...	...	...	...	...	...	...
33aa	Tc	1.5	2,495.69	183.18	Dec. 17, 1947	...	...	N	...	...	...	...	...	...	...	...
22- 7ac	...	...	...	298	June 12, 1948	...	60	P	...	...	...	...	...	...	...	...
7ca	...	...	...	308	...do...	...	60	P	...	...	...	...	...	...	...	...
8bb	Hc	.5	2,638.94	252.15	Nov. 25, 1947	...	...	N	...	...	...	...	...	...	...	...
10cc	Hb	1.3	...	261.34	June 24, 1949	...	...	S	...	...	...	...	...	...	...	...
13bb	Tc	1.8	2,583.87	229.60	Aug. 12, 1947	...	...	N	...	...	...	...	...	...	...	...
33bc	Tc	2.0	...	234.42	June 24, 1949	...	...	D, S	...	...	...	...	...	...	...	...
23- 2ad	Tc	.3	2,569.23	158.53	July 13, 1949	...	...	S	...	...	...	...	...	...	...	...
8-21- 9bb	Hb	.6	2,395.63	36.40	Mar. 18, 1947	...	...	I	...	...	...	...	...	...	...	...
18ac	Tc	1.5	2,560.32	177.10	Oct. 16, 1948	...	...	N	...	...	...	...	...	...	...	...
21cd	Tc	3.2	...	57.12	June 30, 1948	...	...	S	...	...	...	...	...	...	...	...
23cb	Tc	2.2	2,490.32	144.67	May 18, 1949	...	...	N	...	...	...	...	...	...	...	...
24aa	Hb	3.5	2,445.72	110.30	July 2, 1948	...	...	...	...	...	...	...	...	...	...	...
25dd	Tc	3.5	2,472.93	136.95	July 3, 1948	...	...	...	...	...	...	...	...	...	...	...
30dd	Tc	2.0	2,490.96	134.11	Jan. 21, 1948	...	...	N	...	...	...	...	...	...	...	...
22- 3da	Tc	3.0	...	123.19	July 6, 1949	...	...	D, S	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
Gosper County—Continued													
8-22- 8bc	Central Nebraska Public Power & Irrigation District.	1935	256	12	M		N			N		To	S, G
8cd	do			4	M		N			N		To	
8db	do		225.0	12	M		N			N		To	
17dd			222.0	3	M		N			N		To	
18db			96.0	3	M		N			N			
22aa			187.0	4	M		Cy			W		To	
26ba			201.0	4	M		Cy			N		To	
26cc	Mr. Halker		171.0	3	M		Cy			W		To	
28bc			241.0	4	M		Cy			W		To	
28da			126.0	3	M		Cy			W		To	
34dd							Cy			W		To	
23- 2da	Henry Schilling		227.0	4	M		Cy			W		To	
3bb	do	1908(?)		3½	M		Cy			W		To	
4dd	Mr. Weisert			3½	M		Cy			W		To	
12cb	Cliff Tilson			4	M		Cy			W		To	
13ba	Carl Willets	1900	155.0	2½	M		N			N		To	
13cc			231.0	4	M		Cy			W		To	
17ac	Fred Keller	1894	170	3½	M		Cy			W		To	
19ba	Mrs. Carl Taberer	1903	210	3	M		Cy			W		To	

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Gosper County—Continued																
8-22- 8bc	Tc	1.0	...	130.30	Aug. 12, 1947	...	...	N	...	...	...	...	...	...	...	...
8cd	Tc	.0	2,616.96	135.88	July 3, 1948	...	...	N	...	...	...	...	...	...	...	...
8db	Tc	.0	...	81.19	July 5, 1949	...	...	N	...	...	...	...	...	...	...	...
17dd	Tc	1.0	2,603.79	170.72	Nov. 25, 1947	...	...	N	...	...	...	...	...	...	...	...
18db	Tc	1.9	...	69.98	June 29, 1949	...	...	N	...	...	...	...	...	...	...	...
22aa	Hb	1.9	...	165.24	July 1, 1949	...	...	N	...	...	...	...	...	...	...	...
26ba	Tc	2.1	...	170.08	Oct. 16, 1948	...	...	N	...	...	...	...	...	...	...	...
26cc	Tc	1.3	...	135.20	June 16, 1949	...	...	N	...	...	...	...	...	...	...	...
28bc	Tc	4.0	2,619.34	220.25	Nov. 25, 1947	...	...	S	...	...	...	...	...	...	...	...
28da	Tc	1.8	2,491.07	91.80	June 21, 1949	...	...	S	...	...	...	...	...	...	...	...
34dd	Hb	2.8	2,595.54	216.43	June 24, 1949	...	...	S	...	...	...	...	...	...	...	...
23- 2da	Tc	1.2	...	125.51	June 30, 1949	...	...	D, S	...	...	...	...	...	...	...	...
3bb	Hb	1.2	2,620.50	107.15	May 13, 1949	...	...	D, S	...	...	...	...	...	...	...	...
4dd	Tc	1.3	2,573.44	100.89	Oct. 17, 1948	...	...	N	...	...	...	...	...	...	...	...
12cb	Tc	1.0	...	59.67	....do....	...	...	S	...	...	...	...	...	...	...	...
13ba	Tc	2.8	...	88.74	June 29, 1949	...	...	N	...	...	...	...	...	...	...	...
13cc	Tc	1.7	...	219.37	July 7, 1949	...	...	D, S	...	...	...	...	...	...	...	...
17ac	Tc	1.4	...	116.11	July 13, 1949	...	...	D, S	...	...	...	...	...	...	...	...
19ba	Hb	2.3	...	172.91	July 12, 1949	...	...	D, S	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
Gosper County—Continued													
8-23-25cb	......	......	274.0	3	M	......	Cy	......	......	W	......	To	......
26bb	W. Schweinger	1945	303	3	M	......	Cy	......	......	W	......	To	......
Hall County													
9-10-29db	Roy Rainforth	1941	151	18	M	......	T	......	......	E	......	Qp	S, G
Harlan County													
2-17-30cc	L. L. Cammerer	......	......	......	......	......	T	......	......	P	......	To	......
18-15dd	H. McArthur	1920	......	4	M	......	N	......	......	N	......	......	......
17ad	L. H. Whitehead	1947	160	18	M	......	T	......	......	P	4.01	To	S, G
28bb1	City of Alma	......	118	24	M	......	T	......	......	E	......	To(?)	S, G
28bb2	do	......	129	24	M	......	T	......	......	E	......	To(?)	S, G
28bb3	do	......	114	26	C	......	T	......	......	E	......	To(?)	S, G
33ac	do	1947	52	24	M	......	T	......	......	E	......	......	S, G
3-17-17cc	Virgil Watts	1903	101.5	$5\frac{1}{2}$	M	......	N	......	......	N	......	Qp	......
19ca	F. Scheske	1890	79.0	$5\frac{1}{2}$	M	......	Cy	......	......	H	......	Qp	......
19cb	G. Sims	1900	94.5	$5\frac{1}{2}$	M	......	N	......	......	N	......	Qp	......
21da1	G. H. Remke	1925	57.8	48	C	......	C	......	......	T	......	Qp	S, G
21da2	do	1949	......	......	......	......	T	......	......	......	......	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Gosper County—Continued																
8-23-25cb	Tc	0.0	....	240.24	July 7, 1949	....	....	S	....	....	....	....	....	...	....	....
26bb	Tc	2.3	....	247.98	Sept. 20, 1949	....	....	D, S	....	....	....	....	....	...	....	....
Hall County																
9-10-29db	Hb	1.0	1,982.12	71.03	Nov. 14, 1947	20	800	I	....	....	....	....	....	...	....	....
Harlan County																
2-17-30cc	....	....	....	....	....	....	200	I	....	....	....	....	....	...	....	....
18-15dd	Tc	0.9	....	87.17	Dec. 4, 1935	....	....	N	....	....	....	....	....	...	....	....
17ad	Hb	1.0	....	93.00	Aug. 13, 1952	....	650	I	960	114	D	40	2.8	C	A	80
28bb1	....	....	....	54	May 25, 1947	....	300	P	....	....	....	....	....	...	....	....
28bb2	....	....	....	50	....do....	....	300	P	....	....	....	....	....	...	....	....
28bb3	....	....	....	47	....do....	....	600	P	....	....	....	....	....	...	....	....
33ac	....	....	....	11	....do....	....	150	P	....	....	....	....	....	...	....	....
3-17-17cc	Tc	1.0	....	101.30	Apr. 21, 1948	....	....	N	....	....	....	....	....	...	....	....
19ca	Tc	.2	....	76.40	....do....	....	....	....	....	....	....	....	....	...	....	....
19cb	Tc	.5	....	91.72	....do....	....	....	N	....	....	....	....	....	...	....	....
21da1	Tp	1.1	....	53.01	Jan. 21, 1935	....	....	I	....	....	....	....	....	...	....	....
21da2	Hb	.0	....	45.45	Apr. 27, 1949	....	....	I	....	....	....	....	....	...	....	....

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Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer	
												Geologic source	Type of material
Harlan County—Continued													
3-17-27bb	University of Nebraska	1934	32.0	1	M	...	N	...	...	N	...	...	S, G
20- 2bb	J. Bloom	...	122	24	M	...	T	...	...	T	...	...	S, G
4-17- 6ab	R. Kremlacek	1950	248	18	M	...	T	...	...	P	5.14	To	S, G
18-35dd	Mr. Stark	...	69.5	5½	M	...	Cy	...	...	W	...	Qp	...
20- 2cd	Rural school	...	148.2	5½	M	...	Cy	...	...	H	...	Qp	...
21aa	L. Kuck	1933	76	18	M	...	T	...	...	T	...	To	S, G
26ca	R. Cook	1950	67	...	...	...	T	...	...	T	...	...	S, G
Hayes County													
5-32- 2dc	...	...	...	5½	M	...	Cy	...	...	N	...	To	...
6-33- 1cd	City of Hayes Center	1946	290	...	...	...	T	...	...	E	...	To	S, G
9ab	T. Nelson	1951	300	18	M	100	T	8	...	D	7.00	To	S, G
9db	do	...	...	...	...	...	...	...	...	...	...	To	...
7-32- 8ac	...	...	188.0	36	C	...	Cy	...	...	W	...	To	...
33-27aa	...	...	232.0	3½	M	...	N	...	...	N	...	To	...
34- 4ac	Laird and Ward Estate	...	265.3	4	M	...	N	...	...	N	...	To	...
34dd	...	...	240.0	5½	M	...	Cy	...	...	W	...	To	...
8-33-30db	...	...	288.0	5½	M	...	Cy	...	...	W	...	To	...
34-32cc	...	...	248.0	...	...	...	Cy	...	...	W	...	To	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Harlan County—Continued																
3-17-27bb...	Tc	2.2	...	18.28	Nov. 1, 1934	...	...	O	...	...	...	...	...	...	...	...
20- 2bb...	...	...	...	38	Aug. 13, 1952	...	1,350	I	...	...	...	...	...	...	...	...
4-17- 6ab...	Hb	.5	...	194.13	Aug. 20, 1952	...	1,820	I	480	72	D	65	1.1	C	...	128
18-35dd...	Tc	1.0	...	64.98	June 8, 1948	...	...	S	...	...	...	...	...	...	...	...
20- 2cd...	Hb	1.3	...	132.70	July 22, 1948	...	...	P	...	...	...	...	...	...	...	...
21aa...	Tp	1.0	...	44.95	Aug. 20, 1952	...	522	I	...	...	...	...	...	...	...	...
26ca...	...	...	...	31	Aug. 13, 1952	...	750	I	...	...	...	...	...	...	...	...
Hayes County																
5-32- 2dc...	Tc	0.5	...	193.40	July 25, 1952	...	...	N	...	...	...	...	...	...	...	...
6-33- 1cd...	...	...	...	220	...do...	...	135	P	...	...	...	...	...	...	...	...
9ab...	Hb	.5	...	227.08	Sept. 23, 1952	...	900	I	1,080	139	D	112	1.2	C	A	112
9db...	...	...	...	...	...	...	...	D	...	...	...	...	...	...	...	...
7-32- 8ac...	Tp	.5	...	184.46	July 25, 1952	...	...	S	...	...	...	...	...	...	...	...
33-27aa...	Tc	1.0	...	227.92	...do...	...	...	N	...	...	...	...	...	...	...	...
34- 4ac...	Tc	1.0	...	253.39	Oct. 27, 1941	...	...	S	...	...	...	...	...	...	...	...
				Dry	July 25, 1952											
34dd...	Tc	.0	...	220.90	...do...	...	...	S	...	...	...	...	...	...	...	...
8-33-30db...	Tc	.5	...	269.50	...do...	...	...	S	...	...	...	...	...	...	...	...
34-32cc...	Tp	1.5	...	245.50	...do...	...	...	N	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Hitchcock County							
4-31-10dd	......	......	233.0	5½	M	......	Cy	......	......	W	......	To	......
						Kearney County							
5-13- 4bc	Omar Larson	1948	216	18	......	......	T	......	......	P	......	Qp	S, G
18aa	R. Johnson	......	95	4	M	......	Cy	......	......	W	......	Qp	......
18cd	W. E. Christensen	......	118.8	5½	M	......	Cy	......	......	W	......	Qp	......
21bc	C. L. Raun	1950	190	18	M	......	T	......	......	D	2.81	Qp	S, G
33cc	....do	1946	245	18	M	......	T	......	......	......	......	To	S, G
36cc	C. Schmidt	......	184.0	5½	M	......	Cy	......	......	W	......	Qp	......
14- 4ab	H. F. Paulsen	1949	259	18	C	40	T	8	......	D	2.75	Qp	S, G
9dc	H. Warp	1941	250	10	......	......	T	......	......	......	......	Qp	S, G
10ad	G. Mittman	......	130.0	5½	M	......	Cy	......	......	W	......	Qp	......
14a	E. Busboom	1933	180.0	2	......	......	......	......	......	......	......	Qp	G
16cb	N. Peterson	......	255.0	18	M	......	T	......	......	D	......	Qp	S, G
33bb	Mrs. I. Nielson	1890(?)	172.0	5½	M	......	N	......	......	N	......	Qp	......
15- 1cc	B. Bloomfield	1890(?)	138.0	4	T	......	Cy	......	......	W	......	Qp	......
3ba	E. Downs	......	122.0	5½	M	......	N	......	......	N	......	Qp	......
5da	H. Boisen	1906(?)	105.0	4	M	......	Cy	......	......	W	......	Qp	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Hitchcock County																
4-31-10dd......	Tc	0.0	....	205.74	July 26, 1952	....	....	N	....	....	....	....	....	...	....	....
Kearney County																
5-13- 4bc......	Hb	1.3	2,109.95	122.08	June 29, 1948	32	1,000	I	....	....	....	....	....	...	....	....
18aa......	Tc	-4.6	2,074.27	67.50	July 12, 1948	....	....	D, S	....	....	....	....	....	...	....	....
18cd......	Tc	1.0	2,109.20	107.50	....do....	....	....	D, S	....	....	....	....	....	...	....	....
21bc......	....	....	....	135	Sept. 10, 1952	....	600	I	850	94	D	80	1.2	C	A, G	180
33cc......	Hb	.0	2,114.46	138.92	Nov. 24, 1947	....	....	I	....	....	....	....	....	...	....	....
36cc......	Hb	1.0	2,111.72	152.59	July 12, 1948	....	....	D, S	....	....	....	....	....	...	....	....
14- 4ab......	Hb	.5	....	149.23	Sept. 9, 1952	13½	835	I	900	138	D, G, S	100	1.4	C	A, Cl, G	160
9dc......	Hb	1.0	....	155.97	Aug. 16, 1948	....	....	I	....	....	....	....	....	...	....	....
10ad......	Tc	.7	....	123.06	Aug. 6, 1948	....	....	N	....	....	....	....	....	...	....	....
14a	....	....	....	96	....	....	....	D	....	....	....	....	....	...	....	....
16cb......	Hb	1.0	2,180.70	143.18	Aug. 11, 1948	....	....	I	....	....	....	....	....	...	....	....
33bb......	Tc	.7	2,175.14	159.17	July 23, 1948	....	....	N	....	....	....	....	....	...	....	....
15- 1cc......	Tp	1.3	....	121.50	Aug. 25, 1949	....	....	D, S	....	....	....	....	....	...	....	....
3ba......	Tc	1.0	2,193.73	109.15	Aug. 8, 1947	....	....	O	....	....	....	....	....	...	....	....
5da......	Tc	.5	....	89.19	Aug. 25, 1948	....	....	D	....	....	....	....	....	...	....	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Kearney County—Continued							
5-15- 9cb	E. Olson	......	120.2	4	M	......	N	......	......	N	......	Qp	......
9da	G. E. Wendell	1948	214	18	M	......	T	......	......	T	......	Qp	S, G
15dd	C. J. Reitan	1951	233	18	M	......	T	8	......	P	4.88	To(?)	S, G
35cc	Minnie Bunger	1890(?)	127.0	5½	M	......	Cy	......	......	W	......	Qp	......
16- 6ac	C. Falk	1946	206	18	M	......	T	......	......	......	......	Qp	S, G
6db	R. Wendell	1947	216	20	M	......	T	8	......	D	1.96	Qp	S, G
9ba	W. Wendell	1946	172.0	18	M	......	T	......	......	......	......	Qp	S, G
17bb	L. S. Myers	1947	153.0	18	M	......	T	......	......	P	......	Qp	S, G
19bc	W. O. Wendell	......	......	......	......	......	T	......	......	P	......	To(?)	S, G
25ba	Mrs. J. D. Jelkin	......	132.5	4	M	......	Cy	......	......	W	......	Qp	......
29ad	H. Swanson	1949	169	18	M	......	T	......	......	......	......	Qp	S, G
30cd1	Village of Wilcox	1912(?)	170	7	M	......	T	......	......	E	......	Qp	S, G
30cd2	.....do	1935	176	8	M	......	T	......	......	E	......	Qp	S, G
30da	R. R. Caswell	1947	172.0	18	M	......	T	......	......	......	......	Qp	S, G
32da	J. Gardel	......	......	......	......	......	T	......	......	P	......	Qp	S, G
6-13- 8bc	......	......	85.0	4	......	......	Cy	......	......	W	......	Qp	......
8cd	F. Youngson	1949	130	18	M	......	T	......	......	P	2.44	Qp	S, G
14cc	G. M. Christensen	1900(?)	91.0	5½	M	......	Cy	......	......	W	......	Qp	......
15ca	Mrs. M. Kingsley	1943	180	22	M	......	T	......	......	T	2.29	Qp	S, G
16cc	John Boasen	1950	200	18	......	......	T	......	......	P	3.26	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Kearney County—Continued																
5-15- 9cb	Tc	0.5	2,196.12	112.92	Dec. 29, 1947	...	...	N	...	...	...	...	...	...	...	...
9da	Hb	.1	...	114.38	Oct. 22, 1948	...	750	I	...	...	...	...	...	...	...	...
15dd	...	...	...	...	...	...	640	I	1,440	169	D	80	2.1	C	...	120
35cc	Tc	.5	...	119.69	Aug. 17, 1948	...	...	D	...	...	...	...	...	...	...	...
16- 6ac	Hb	1.0	2,257.18	122.80	Jan. 1, 1948	...	...	I	...	...	...	...	...	...	...	...
6db	Hb	.5	2,256.30	120.76	Aug. 21, 1952	...	1,000	I	720	133	D, G	160	.8	C	A, O, Cl	160
9ba	Hb	1.0	2,230.92	106.50	Dec. 29, 1947	...	1,200	I	...	...	...	...	...	...	...	...
17bb	Hb	1.0	2,207.75	94.30	Aug. 6, 1947	...	...	I	...	...	...	...	...	...	...	...
19bc	Hb	.5	...	132.35	Aug. 21, 1952	...	...	I	...	...	...	...	...	...	...	...
25ba	Tc	2.0	...	118.82	Aug. 12, 1948	...	...	S	...	...	...	...	...	...	...	...
29ad	Hb	.0	...	130.33	Oct. 3, 1949	...	1,000	I	...	...	...	...	...	...	...	...
30cd1	...	...	...	...	...	...	300	P	...	...	...	...	...	...	...	...
30cd2	...	...	...	150	June 11, 1948	...	400	P	...	...	...	...	...	...	...	...
30da	Hb	.8	2,229.01	137.30	Aug. 6, 1947	...	1,000	I	...	...	...	...	...	...	...	...
32da	Hb	1.0	...	147.58	Sept. 10, 1948	...	...	I	...	...	...	...	...	...	...	...
6-13- 8bc	Tc	1.5	...	75.70	Sept. 23, 1948	...	...	S	...	...	...	...	...	...	...	...
8cd	Hb	.5	...	82.43	Sept. 9, 1952	...	1,200	I	360	66	D	40	1.7	C	A	40
14cc	Hb	.3	2,052.86	72.93	Sept. 16, 1948	...	...	D	...	...	...	...	...	...	...	...
15ca	Hc	.5	2,080.63	87.90	Sept. 8, 1952	...	800	I	540	85	D	100	.8	C	A	138
16cc	Hb	1.0	...	84.45	Sept. 9, 1952	...	1,800	I	480	106	D	110	1.0	C	A, S	155

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
					Kearney County—Continued								
6-13-16cd	Anderson Estate	......	130	2	M	......	Cy	......	......	E	......	Qp	......
16db	V. M. Youngson	1946	171	18	M	......	T	......	......	......	......	Qp	S, G
17dd	R. Newell	......	108.0	4	M	......	Cy	......	......	W	......	Qp	......
14- 4dc	J. H. Olson	1946	174	18	M	......	T	......	......	......	......	Qp	S, G
6cb	City of Minden	......	......	......	......	......	T	......	......	E	......	Qp	S, G
7cc1	.....do	1920	160	8	M	......	T	......	......	E	......	Qp	S, G
7cc2	.....do	1942	170	18	M	......	T	......	......	E	......	Qp	S, G
7cc3	.....do	1916	150	8	M	......	T	......	......	E	......	Qp	S, G
7cc4	.....do	......	150	10	M	......	T	......	......	E	......	Qp	S, G
7dc	R. Rogers	......	......	......	......	......	T	......	......	......	......	Qp	S, G
8ad1	Mr. Binderup	......	103.5	19	M	......	N	......	......	N	......	Qp	S, G
8ad2	Jennie Palmblade	1948	......	......		......	T	......	......	G	......	Qp	S, G
9bc	......	1948	......	......		......	T	......	......	......	......	Qp	S, G
13ca	Mrs. Hapeman	1948	186	18	......	......	T	......	......	......	......	Qp	S, G
19da	Christine Jorgensen	......	130	4	M	......	Cy	......	......	W	......	Qp	......
21bb	C. Peterson	1945	160.0	18	M	......	T	......	......	......	......	Qp	S, G
21db	Eva Larson	......	......	18	M	......	T	......	......	......	......	Qp	S, G
23bc	Tom Tomsen	1949	193	18	M	......	T	10	......	P	4.60	Qp	S, G
25ba	......	......	98.0	4	M	......	N	......	......	N	......	Qp	......
26bc	David Larsen	1952	210	18	M	......	T	8	......	T	1.52	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Kearney County—Continued																
6-13-16cd	...	...	...	100	June 10, 1948	...	2	P	...	...	...	...	...	...	...	...
16db	Hb	0.0	2,082.10	89.42	Aug. 13, 1947	...	...	I	...	...	...	...	...	...	...	...
17dd	Tc	.0	...	85.76	Sept. 23, 1948	...	...	D	...	...	...	...	...	...	...	...
14- 4dc	Hb	.5	2,140.37	81.09	Nov. 17, 1947	6	800	I	...	...	...	...	...	...	...	...
6cb	Hb	2.0	...	...	...	...	...	I	...	...	...	...	...	...	...	...
7cc1	...	...	...	90	Mar. 30, 1945	39	500	P	...	...	...	...	...	...	...	...
7cc2	...	...	...	90	...do...	20	600	P	...	...	...	...	...	...	...	...
7cc3	...	...	...	90	...do...	...	300	P	...	...	...	...	...	...	...	...
7cc4	...	...	...	90	...do...	30	650	P	...	...	...	...	...	...	...	...
7dc	Hb	1.5	...	91.85	Nov. 16, 1948	...	...	I	...	...	...	...	...	...	...	...
8ad1	Tc	.0	2,149.22	85.29	May 27, 1948	...	...	I	...	...	...	...	...	...	...	...
8ad2	Hb	.4	...	84.97	Apr. 19, 1949	...	...	I	...	...	...	...	...	...	...	...
9bc	Hb	.3	2,149.74	89.84	Oct. 25, 1948	...	...	I	...	...	...	...	...	...	...	...
13ca	Hb	.3	2,120.87	87.20	Sept. 15, 1948	...	...	I	...	...	...	...	...	...	...	...
19da	Tc	1.7	...	114.48	Sept. 24, 1948	...	...	S	...	...	...	...	...	...	...	...
21bb	Hb	.0	2,161.69	107.22	Aug. 11, 1947	...	...	I	...	...	...	...	...	...	...	...
21db	Hb	.5	2,156.43	104.95	Dec. 31, 1947	...	...	I	...	...	...	...	...	...	...	...
23bc	Hb	.5	...	100	Sept. 9, 1952	...	1,300	I	1,080	239	D	140	1.7	C	A, S	200
25ba	Tc	1.5	2,123.29	95.06	Dec. 31, 1947	...	...	N	...	...	...	...	...	...	...	...
26bc	Hb	.5	...	109.47	Sept. 9, 1952	...	1,000	I	480	88	D	75	1.2	C	A	90

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Kearney County—Continued							
6-14-29cb	E. Nielson	1952	240	18	M	......	T	8	......	T	......	Qp	S, G
6-15- 1cb	R. Youngson	1947	176	18	......	......	T	......	......	......	......	Qp	S, G
2dc	R. H. Rogers	1944	185.0	18	M	......	T	......	......	......	......	Qp	S, G
9ab	D. Keedle	......	100	4	M	......	Cy	......	......	W	......	Qp	......
11ab	W. Bang	1948	......	......	......	......	T	......	......	Ng	......	Qp	S, G
14bb1	C. Stadler	1946	......	24	M	......	T	......	......	......	......	Qp	S, G
14bb2	Stadler brothers	1947	170.0	15	M	......	N	......	......	N	......	Qp	S, G
15bc	......	......	......	24	M	......	T	......	......	......	......	Qp	S, G
22ac	G. Worth	1944	207.0	18	M	......	T	......	......	......	......	Qp	S, G
28dd	Alfred Hansen	1949	......	18	M	40	T	......	......	P	3.39	Qp	S, G
29db	J. Olson	......	......	......	......	......	T	......	......	D	......	Qp	S, G
31aa	H. Lundeen	......	......	......	......	......	T	......	......	......	......	Qp	S, G
32ab	N. M. Stadler	1948	214	18	M	......	T	......	......	P	......	Qp	S, G
34ac	M. Olson	1947	235	18	M	......	T	......	......	D	......	Qp	S, G
35cc	J. W. Stadler	1944	190.0	18	M	......	T	......	......	......	......	Qp	S, G
16- 1da	Mrs. Clara Carlson	......	......	5½	M	......	Cy	......	......	W	......	Qp	......
7ad	B. M. Tilbury	......	100.0	24	M	......	T	......	......	......	......	Qp	S, G
9bb	H. Eckloff	......	101.5	4	M	......	Cy	......	......	W	......	Qp	......
14ad	G. Johnson	1948	210	12	......	......	T	......	......	......	......	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Kearney County—Continued																
6-14-29cb	Hb	0.5	....	120	Sept. 9, 1952	......	800	I	....	......	P	100	......	C	A	140
15- 1cb	Hb	1.0	2,172.80	71.59	Nov. 17, 1948	21	....	I	....	......	....	....	......	...	....	....
2dc	Hb	.5	2,185.81	81.70	Sept. 19, 1947	......	....	I	....	......	....	....	......	...	....	....
9ab	Tc	2.0	....	63.02	Sept. 16, 1948	......	....	D	....	......	....	....	......	...	....	....
11ab	Hb	.0	2,176.96	75.78	Aug. 2, 1948	......	....	I	....	......	....	....	......	...	....	....
14bb1	Hb	1.0	2,187.10	84.55	Dec. 31, 1947	......	....	I	....	......	....	....	......	...	....	....
14bb2	Tc	1.0	2,187.20	82.94	June 29, 1949	......	....	N	....	......	....	....	......	...	....	....
15bc	Hb	.7	2,192.57	79.03	Oct. 3, 1949	......	....	I	....	......	....	....	......	...	....	....
22ac	Hb	.0	2,197.67	97.55	Dec. 31, 1947	......	....	I	....	......	....	....	......	...	....	....
28dd	Hb	.0	....	101.80	Aug. 21, 1952	......	1,000	I	600	110	D	100	1.1	C	A, Cl	110
29db	Hb	.3	....	97.42	Oct. 25, 1948	......	....	I	....	......	....	....	......	...	....	....
31aa	Hb	.2	....	95.75	Sept. 11, 1948	......	....	I	....	......	....	....	......	...	....	....
32ab	Hb	.4	2,200.48	92.32	....do....	......	....	I	....	......	....	....	......	...	....	....
34ac	Hb	.5	....	113	Aug. 26, 1948	9	1,000	I	....	......	....	....	......	...	....	....
35cc	Hb	1.0	2,197.49	114.59	Aug. 8, 1947	......	....	I	....	......	....	....	......	...	....	....
16- 1da	Tp	1.0	....	69.10	Sept. 20, 1948	......	....	D	....	......	....	....	......	...	....	....
7ad	Tc	-1.0	2,223.01	73.02	Jan. 1, 1948	......	....	I	....	......	....	....	......	...	....	....
9bb	Tc	1.0	....	68.34	Aug. 9, 1948	......	....	S	....	......	....	....	......	...	....	....
14ad	Hb	.9	2,218.62	83.37	Oct. 23, 1948	......	....	I	....	......	....	....	......	...	....	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
					Kearney County—Continued								
6-16-16bc	R. A. Gustafson	1900	120	$5\frac{1}{2}$	M	......	Cy	......	......	W	....	Qp	......
20bb1	E. E. Carlson	....	102.0	3	M	......	Cy	......	......	H	....	Qp	......
20bb2	L. E. Tilbury	1946	166.0	18	......	......	T	......	......	Ng	....	Qp	S, G
20cc	L. F. Fishell	1949	189	18	M	60	T	......	......	Ng	0.54	Qp	S, G
21ba	Village of Axtell	1936	155	12	M	......	T	......	......	E	....	Qp	S, G
25cb	H. Lorenzen	1947	180.0	24	M	......	T	......	......	P	3.92	Qp	S, G
28cd	A. W. Saderquist	1907	128.3	2	M	......	N	......	......	N	....	Qp	......
29bb	E. Strolberg	....	....	18	......	......	T	......	......	P	....	Qp	S, G
30ca	O. W. Norblade	1947	185	18	......	......	T	......	......	P	....	Qp	S, G
30da	G. Anderson	1947	152.0	18	M	......	T	......	......	......	....	Qp	S, G
30db	.....do	1951	183	18	M	......	T	......	......	Ng	.49	Qp	S, G
7-13- 4aa	R. Filbin	1951	130	18	M	......	T	......	......	P	2.28	Qp	S, G
12cc	J. R. Hoban	1900(?)	66.0	4	M	......	Cy	......	......	W	....	Qp	......
15dc	F. Pantenberg	1928	100.0	2	M	......	Cy	......	......	H	....	Qp	......
16dc1	....	1937	84.0	8	M	......	N	......	......	N	....	Qp	......
16dc2	Village of Heartwell	1914	112	2	M	......	Cy	......	......	E	....	Qp	......
19dc	E. C. Dornhoff	1946	105.0	18	M	......	T	......	......	......	....	Qp	S, G
20aa	C. Gleason	1946	168.0	18	M	......	T	......	......	......	....	Qp	S, G
23cc	Porterfield Estate	1949	157	18	M	......	T	......	......	Ng	.14	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
					Kearney County—Continued											
6-16-16bc	Hb	0.6	...	72.44	Aug. 9, 1948	...	...	D, S	...	...	...	...	...	...	...	...
20bb1	Hc	1.1	2,236.82	101.26	Dec. 11, 1936	...	...	N	...	...	...	...	...	...	...	...
20bb2	Hb	.0	2,249.29	100.15	Aug. 5, 1947	10	1,200	I	...	...	...	...	...	...	...	...
20cc	...	...	...	89	Aug. 21, 1952	13	1,300	I	720	132	D	100	1.3	C	A, Gs	120
21ba	...	...	...	95	June 17, 1947	...	200	P	...	...	...	...	...	...	...	...
25cb	Hb	.5	2,225.27	100.39	Nov. 17, 1947	11	1,200	I	1,440	265	D, P	240	1.1	C	A, P, S, G	240
28cd	Tc	.3	...	83.86	Aug. 11, 1948	...	...	D, S	...	...	...	...	...	...	...	...
29bb	Ep	.4	...	90.07	Aug. 6, 1948	...	...	I	...	...	...	...	...	...	...	...
30ca	Hb	1.0	...	89.20	Oct. 25, 1948	...	500	I	...	...	...	...	...	...	...	...
30da	Hb	.5	2,233.16	90.02	Aug. 6, 1947	...	...	I	...	...	...	...	...	...	...	...
30db	...	...	...	100	Aug. 21, 1952	...	1,000	I	720	132	D	160	.6	C	A	160
7-13- 4aa	Hb	.5	...	42.90	Sept. 6, 1952	...	1,000	I	360	66	S	80	.8	C	A, O, P, M.	160
12cc	Tc	2.0	...	58.88	Sept. 21, 1948	...	...	D, S	...	...	...	...	...	...	...	...
15dc	Tc	1.8	2,073.84	65.82	Aug. 13, 1947	...	...	D	...	...	...	...	...	...	...	...
16dc1	Tc	10.0	2,106.93	83.19	June 29, 1949	...	...	N	...	...	...	...	...	...	...	...
16dc2	...	...	...	...	...	...	...	P	...	...	...	...	...	...	...	...
19dc	Hb	1.0	2,104.65	66.40	Dec. 29, 1947	...	...	I	...	...	...	...	...	...	...	...
20aa	Hb	.5	2,088.04	57.02	Aug. 11, 1947	5	1,000	I	...	...	...	...	...	...	...	...
23cc	Hb	.0	...	63.37	Sept. 10, 1952	...	1,200	I	300	66	P	50	1.3	C	A, Cl	50

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer	
												Geologic source	Type of material
					Kearney County—Continued								
7-13- 32ca	E. Podewitz	1947	195	18	...	...	T	...	...	...	...	Qp	S, G
33ba	Fred Kingsley	1952	183	18	M	...	T	...	...	Ng	0.49	Qp	S, G
14- 4ab	...	...	88.0	4	M	...	Cy	...	...	W	...	Qp	...
5cb	...	...	37.0	4	M	...	Cy	...	...	W	...	Qp	...
7ba	W. D. Newbold	...	49.5	4	M	...	Cy	...	...	H	...	Qp	...
7cc	E. L. Olson	...	47	4	M	...	Cy	...	...	W	...	Qp	...
12cd	Mrs. A. Shearer	1947	123	18	M	...	T	...	...	T	...	Qp	S, G
18bc	O. A. Newbold	1937	98.0	...	M	...	T	...	...	T	...	Qp	S, G
20ba	G. Burchall	1948	183	18	M	...	T	...	...	T	...	Qp	S, G
28cb	O. Warp	1941	142	18	M	...	T	...	...	...	...	Qp	S, G
30db	Dona Oman	...	105.0	24	M	...	T	...	...	...	...	Qp	S, G
31ad	G. Latter	...	80	4	M	...	Cy	...	...	W	...	Qp	...
34dd	S. M. Babcock	...	70.0	4	M	...	Cy	...	...	W	...	Qp	...
15- 1db	V. Jepson	...	80	...	...	...	T	...	...	T	...	Qp	S, G
5ad	F. Kingsley	...	...	4	M	...	Cy	...	...	W	...	Qp	...
7db	...	1941	103.0	3½	M	...	Cy	...	...	W	...	Qp	...
10ac	W. Talbert	1949	66	18	M	42	T	...	4	T	4.30	Qp	S, G
11ad	H. H. Hokser	1941	71	14	M	...	T	...	...	T	...	Qp	S, G
14dd	...	...	72.0	3	M	...	Cy	...	...	W	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Kearney County—Continued																
7-13-32ca......	Hb	0.8	......	79.30	Sept. 15, 1948	......	......	I	......	......	......	......	......	...	......	...
33ba......	Hb	.5	......	73.84	Sept. 9, 1952	10	1,000	I	......	......	D	80	......	C	A, O, Cl	80
14- 4ab......	Tc	8.8	2,107.02	31.47	June 17, 1948	......	......	S	......	......	......	......	......	...	......	...
5cb......	Tc	3.8	2,104.80	18.42	.....do......	......	......	S	......	......	......	......	......	...	......	...
7ba......	Tc	2.0	2,120.47	29.45	.....do......	......	......	N	......	......	......	......	......	...	......	...
7cc......	Tc	1.4	......	42.12	Sept. 27, 1948	......	......	D	......	......	......	......	......	...	......	...
12cd......	Hb	1.5	2,110.05	54.05	Sept. 16, 1948	......	......	I	......	......	......	......	......	...	......	...
18bc......	Hb	.5	2,129.13	35.22	Sept. 23, 1948	......	......	I	......	......	......	......	......	...	......	...
20ba......	Hb	.3	2,156.26	75.24	Oct. 24, 1948	9	1,400	I	......	......	......	......	......	...	......	...
28cb......	Hb	.5	2,146.17	78.16	Aug. 8, 1947	......	......	I	......	......	......	......	......	...	......	...
30db......	Hb	.0	2,160.23	71.70	Dec. 30, 1947	......	......	I	......	......	......	......	......	...	......	...
31ad......	Tc	1.5	......	64.59	Sept. 22, 1948	......	......	D	......	......	......	......	......	...	......	...
34dd......	Hb	1.6	......	63.45	Sept. 24, 1948	......	......	S	......	......	......	......	......	...	......	...
15- 1db......	Hb	.2	......	23.00	Aug. 31, 1948	......	......	I	......	......	......	......	......	...	......	...
5ad......	Tc	1.7	2,144.30	21.65	June 17, 1948	......	......	S	......	......	......	......	......	...	......	...
7db......	Tc	.0	2,187.10	57.07	.....do......	......	......	S	......	......	......	......	......	...	......	...
10ac......	Hb	.5	......	21.29	Sept. 8, 1952	......	400	I	480	35	S	75	0.5	C	A	75
11ad......	Hb	.0	2,139.16	34.92	Aug. 7, 1947	......	......	I	......	......	......	......	......	...	......	...
14dd......	Tc	1.5	2,145.87	45.12	Dec. 30, 1947	......	......	N	......	......	......	......	......	...	......	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Kearney County—Continued							
7-16- 2db	T. F. Ditwiler	1948	72	......	......	......	T	......	......	T	......	Qp	S, G
3ac	L. R. Wells	1933	54	48	C	......	C	......	......	T	......	Qp	S, G
3dd	....do	1951	73	......	M	50	T	......	......	D	2.98	Qp	S, G
8dc	I. Kring Estate	......	54	14	M	......	T	......	......	T	......	Qp	S, G
10cc	Mrs. Waite	1940	......	......	......	......	T	......	......	T	......	Qp	S, G
11dd	H. Black	1946	66	18	M	......	T	......	......	T	......	Qp	S, G
12ab	G. Nichols	1946	......	18	M	......	C	......	......	T	......	Qp	S, G
12bd	O. G. Williams	1947	75	18	M	......	T	......	......	......	......	Qp	S, G
13db	W. Benfeldt	1950	135	18	M	......	T	......	......	Ng	.50	Qp	S, G
20bb	A. Gustafson	......	60	4	M	......	Cy	......	......	W	......	Qp	......
23da	C. Keene	1947	100.0	18	M	......	T	......	......	......	......	Qp	S, G
25aa	H. Schneider	......	86.0	5½	M	......	N	......	......	N	......	Qp	......
31dc	A. Winholtz	1949	140	18	M	40	T	......	......	P	1.96	Qp	S, G
8-13- 33dd	......	......	88.0	4	M	......	Cy	......	......	W	......	Qp	......
						Keith County							
12-35- 13aa	......	......	179.0	3	M	......	Cy	......	......	W	......	To	......
39- 5da	Krajewske brothers	1950	316	14	M	......	T	......	......	P	......	To	S, G
13-37- 29ab	R. Nelson	1948	276	......	M	......	T	12	......	D	......	To	S, G
39- 33ca	H. S. Snelburne	1948	402	18	M	96	T	......	......	G	9.90	To	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Kearney County—Continued																
7-16- 2db......	Hb	0.0	...	17.59	Oct. 19, 1948	...	1,200	I	...	...	...	...	...	...	...	...
3ac......	Tp	2.0	...	20.79	.....do.....	...	...	N	...	...	...	...	...	...	...	...
3dd......	Hb	.5	...	10.60	Aug. 22, 1952	18	660	I	1,080	131	S	145	0.9	A	...	145
8dc......	Ep	.4	2,179.70	21.80	Aug. 7, 1947	...	...	I	...	...	...	...	...	...	...	...
10cc......	Ep	1.3	...	21.70	Oct. 20, 1948	...	...	N	...	...	...	...	...	...	...	...
11dd......	Hb	.0	2,169.04	27.61	Aug. 7, 1947	...	...	N	...	...	...	...	...	...	...	...
12ab......	Tp	.0	...	16.97	Oct. 23, 1948	...	...	I, S	...	...	...	...	...	...	...	...
12bd......	Tc	1.0	...	18.05	Oct. 19, 1948	...	1,200	I	...	...	...	...	...	...	...	...
13db......	...	...	...	60	Aug. 22, 1952	...	540	I	1,200	119	S	150	.8	A	...	400
20bb......	Hb	3.0	...	41.88	Aug. 9, 1948	...	...	D, S	...	...	...	...	...	...	...	...
23da......	Hb	.5	2,208.80	68.35	Dec. 30, 1947	...	...	I	...	...	...	...	...	...	...	...
25aa......	Tc	.3	2,183.43	49.10	Sept. 20, 1948	...	...	N	...	...	...	...	...	...	...	...
31dc......	...	...	...	60	Aug. 22, 1952	...	1,000	I	360	66	D	80	.8	C	Cl, S	80
8-13- 33dd......	Tc	3.8	2,085.68	57.48	June 18, 1948	...	...	S	...	...	...	...	...	...	...	...
Keith County																
12-35- 13aa......	Tc	1.5	3,219.41	163.73	Oct. 12, 1950	...	...	D, S	...	...	...	...	...	...	...	...
39- 5da......	...	...	...	240	July 22, 1952	20	500	I	2,380	218	S	70	3.1	G	A	...
13-37- 29ab......	...	...	...	217	.....do.....	...	900	I	1,440	238	S	300	.8	A	C,W,O,G	300
39- 33ca......	Hb	1.0	...	209.03	.....do.....	20	500	I	...	...	S	80	...	A	B,C,W	200

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Lincoln County							
9-26- 5da	W. Schroder	1942	400	3	M	......	Cy	......	......	W	......	To	......
28-25aa	......	......	213.0	5½	M	......	Cy	......	......	W	......	To	......
29- 4cb	G. Roethemeyer	......	285.8	6	M	......	Cy	......	......	W	......	To	......
10-26- 1ca	J. Quinn	......	104.0	4	M	......	N	......	......	N	......	To(?)	......
7ad	......	......	218.0	4	M	......	Cy	......	......	W	......	To	......
10bb	E. T. McDermott	......	176.0	4	M	......	Cy	......	......	W	......	To	......
27- 2da	......	......	286.0	4	M	......	Cy	......	......	W	......	To	......
30- 2aa	......	......	237.0	4	M	......	Cy	......	......	W	......	To	......
31-16cc	Rural school	......	69.0	5½	M	......	N	......	......	N	......	To	......
32-17cc	J. M. Fristo	......	209.6	4	M	......	Cy	......	......	W	......	To	......
34- 3dc	R. Cowles	......	55.5	5½	M	......	Cy	......	......	W	......	To	......
10aa	E. Evans	1947	52.0	4	M	......	N	......	......	N	......	To	......
11dd	do	......	36.5	4	M	......	N	......	......	N	......	To	......
14bc	Village of Wallace	1950	127	30	C	......	T	......	......	E	......	To	......
18ad	G. R. Connealy	......	178.2	3	M	......	N	......	......	N	......	To	......
22bb	......	......	123.0	5½	M	......	Cy	......	......	N	......	To	......
11-27- 9ca	Central Nebraska Public Power & Irrigation District.	......	......	3½	M	......	N	......	......	N	......	To	......
14cc	......	......	......	4	M	......	Cy	......	......	W	......	To	......
20ba	S. Johnson	......	......	5½	M	......	Cy	......	......	W	......	To	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
				Lincoln County												
9-26- 5da	Hb	...	...	...	...	...	...	D, S	...	...	...	...	...	...	...	...
28-25aa	Tc	0.5	...	206.66	July 29, 1952	...	...	N	...	...	...	...	...	...	...	...
29- 4cb	Tc	1.7	3,003.31	273.68	Sept. 6, 1934	...	...	N	...	...	...	...	...	...	...	...
10-26- 1ca	Tc	4.0	2,678.42	75.26	Aug. 9, 1949	...	...	N	...	...	...	...	...	...	...	...
7ad	Tc	.1	2,817.32	193.55	Aug. 10, 1949	...	...	S	...	...	...	...	...	...	...	...
10bb	Tc	.0	2,738.09	127.66	Aug. 9, 1949	...	...	S	...	...	...	...	...	...	...	...
27- 2da	Tc	1.2	2,925.28	260.06	Aug. 10, 1949	...	...	D, S	...	...	...	...	...	...	...	...
30- 2aa	Tc	.7	3,014.22	208.62	Sept. 2, 1949	...	...	D, S	...	...	...	...	...	...	...	...
31-16cc	Tc	.3	2,915.95	19.48	Aug. 31, 1949	...	...	N	...	...	...	...	...	...	...	...
32-17cc	Tc	.3	3,123.53	147.51	Dec. 8, 1936	...	...	N	...	...	...	...	...	...	...	...
34- 3dc	Tp	1.0	3,080.58	35.32	Sept. 1, 1949	...	...	N	...	...	...	...	...	...	...	...
10aa	Tc	1.3	3,084.33	40.63	do	...	...	S	...	...	...	...	...	...	...	...
11dd	Tc	1.0	3,059.54	22.78	do	...	...	N	...	...	...	...	...	...	...	...
14bc	...	...	...	75	July 24, 1952	...	700	P	...	...	...	...	...	...	...	...
18ad	Tc	1.0	3,221.44	160.10	Sept. 1, 1949	...	...	N	...	...	...	...	...	...	...	...
22bb	Tc	1.0	...	100.10	July 24, 1952	...	...	N	...	...	...	...	...	...	...	...
11-27- 9ca	Tc	2.0	2,771.87	49.18	Aug. 10, 1949	...	...	N	...	...	...	...	...	...	...	...
14cc	Tc	2.9	2,785.73	121.77	Aug. 12, 1949	...	...	D, S	...	...	...	...	...	...	...	...
20ba	Tc	.2	2,791.28	93.07	Aug. 4, 1949	...	...	D, S	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Lincoln County—Continued							
11-28- 2ac	N. Ingman	1903(?)	172.0	5½	M	...	Cy	...	...	W	...	To	...
14bc	E. Harnan	...	168.0	5½	M	...	N	...	...	N	...	...	...
16ad	R. F. Harnan	...	...	5½	M	...	Cy	...	...	W	...	...	...
30- 2aa	...	...	275.0	4	M	...	Cy	...	...	W	...	...	...
9bc	A. Ynruh	1917	240.0	5½	M	...	Cy	...	...	W,G	...	...	...
13cc	R. Congland	1909	205.0	4	M	...	Cy	...	...	W	...	To	...
20bb	...	...	216.0	5½	M	...	N	...	...	N	...	To	...
31- 4ba	...	...	175.0	5½	M	...	Cy	...	...	W	...	To	...
11bb	G. Nunemacher	1924	220	5½	M	...	Cy	...	...	W	...	To	...
20da	D. Reynolds	...	160.0	5½	M	...	Cy	...	...	W	...	To	...
28ad	do	...	142.5	5½	M	...	N	...	...	N	...	To	...
28cb	Mr. Lue	...	164.0	5½	M	...	Cy	...	...	W	...	To	...
32- 8bb	E. G. Hudson	...	188.0	4	M	...	Cy	...	...	W	...	To	...
14bb	W. Chamberlain	...	181.0	4	M	...	Cy	...	...	W	...	To	...
20bc	H. E. Speckman	...	170.0	5½	M	...	N	...	...	N	...	To	...
24bb	J. L. Chamberlain Estate	1919	162.0	4½	M	...	Cy	...	...	W	...	To	...
26cd	do	1919	170.0	2½	M	...	Cy	...	...	W	...	To	...
32cd	...	...	181.0	4	M	...	Cy	...	...	W	...	To	...
34cc	F. Becker	...	200.0	4	M	...	N	...	...	W	...	To	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Lincoln County—Continued																
11-28- 2ac	Tp	1.2	2,841.42	123.33	Aug. 5, 1949	...	...	N	...	...	...	...	...	...	...	...
14bc	Tc	-.3	2,828.35	144.35	Aug. 11, 1949	...	...	N	...	...	...	...	...	...	...	...
16ad	Tc	1.0	2,886.07	164.60	Aug. 5, 1949	...	...	D, S	...	...	...	...	...	...	...	...
30- 2aa	Tc	.5	3,052.36	231.34	Aug. 25, 1949	...	...	N	...	...	...	...	...	...	...	...
9bc	Hb	1.0	3,052.03	197.32	Aug. 26, 1949	...	...	D, S	...	...	...	...	...	...	...	...
13cc	Tc	.4	2,991.35	176.44	Aug. 25, 1949	...	...	D, S	...	...	...	...	...	...	...	...
20bb	Tc	.5	3,044.54	181.04	Aug. 26, 1949	...	...	N	...	...	...	...	...	...	...	...
31- 4ba	Tp	.7	3,066.79	147.59	Aug. 30, 1949	...	...	S	...	...	...	...	...	...	...	...
11bb	Tc	.0	3,091.00	189.32	Aug. 29, 1949	...	...	D, S	...	...	...	...	...	...	...	...
20da	Tc	.5	3,046.95	123.34	Aug. 30, 1949	...	...	D	...	...	...	...	...	...	...	...
28ad	Tc	.6	3,050.49	139.69	Aug. 31, 1949	...	...	N	...	...	...	...	...	...	...	...
28cb	Tp	.5	3,078.80	119.57	do	...	...	S	...	...	...	...	...	...	...	...
32- 8bb	Tc	1.6	3,145.24	164.74	do	...	...	D, S	...	...	...	...	...	...	...	...
14bb	Tc	.0	3,093.32	139.90	Aug. 29, 1949	...	...	S	...	...	...	...	...	...	...	...
20bc	Tc	1.4	3,117.22	135.80	Aug. 31, 1949	...	...	N	...	...	...	...	...	...	...	...
24bb	Tc	.5	3,070.26	124.34	Aug. 29, 1949	...	...	S	...	...	...	...	...	...	...	...
26cd	Tc	.2	3,084.00	132.65	do	...	...	S	...	...	...	...	...	...	...	...
32cd	Tc	.0	3,139.29	155.80	Aug. 31, 1949	...	...	D, S	...	...	...	...	...	...	...	...
34cc	Tc	.7	3,123.34	162.50	Aug. 29, 1949	...	...	N	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices* —Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Lincoln County—Continued							
11-32-34da	F. Becker	...	198.0	2½	M	...	Cy	...	...	W	...	To	...
33- 3dd	...	...	165.0	...	...	...	Cy	...	...	W	...	To	...
19ac	...	...	161.0	3	M	...	Cy	...	...	W	...	To	...
32dd	...	...	135.0	4	M	...	Cy	...	...	W	...	To	...
34- 2bc	Mrs. D. Raney	...	163.0	5½	M	...	Cy	...	...	W	...	To	...
8dd	E. Evans	...	165.0	3	M	...	N	...	...	N	...	To	...
12ba	A. L. Steck	...	219.0	4	M	...	Cy	...	...	W	...	To	...
18bc	C. Coppersmith	...	174.0	4	M	...	Cy	...	...	W	...	To	...
22ba	J. Fleecs	...	148.0	3	M	...	Cy	...	...	W	...	To	...
30bc	H. Coppersmith	...	109.0	5½	M	...	Cy	...	...	W	...	To	...
33db	A. D. Coppersmith	1947	130	4	M	...	Cy	...	...	W	...	To	...
36cc	W. R. O'Conner	...	131.0	4	M	...	Cy	...	...	W	...	To	...
12-28-25cb	N. Ingman	1901(?)	128.0	5½	M	...	Cy	...	...	W	...	To	...
26da	A. Carver	1895(?)	100	5½	M	...	Cy	...	...	W	...	To	...
28bc	...	...	138.5	4	M	...	Cy	...	...	W	...	To	...
31db	F. C. Christenson	...	145.5	5½	M	...	N	...	...	N	...	To	...
29- 6bd	Mr. Thompson	...	248.0	4	M	...	Cy	...	...	W	...	To	...
10dd	...	...	400	4	M	...	Cy	...	...	W	...	To	...
12cd	W. Wittig	1919	91.0	4	M	...	Cy	...	...	W	...	To	...
26da	H. Vonderfecht	1945	161.0	4	M	...	Cy	...	...	W	...	To	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
					Lincoln County—Continued											
11-32-34da	Tc	1.3	3,121.19	166.20	Aug. 29, 1949	......	......	S	......	......	......	......	......	......	......	...
33- 3dd	Hb	.0	3,158.44	155.25	Sept. 1, 1949	......	......	S	......	......	......	......	......	......	......	...
19ac	Tc	.0	3,177.25	144.45	Oct. 16, 1950	......	......	S	......	......	......	......	......	......	......	...
32dd	Tc	.9	3,149.76	128.38	Sept. 1, 1949	......	......	S	......	......	......	......	......	......	......	...
34- 2bc	Hb	1.0	3,184.99	141.27	Oct. 16, 1950	......	......	N	......	......	......	......	......	......	......	...
8dd	Tc	.0	3,222.25	163.52	Oct. 9, 1950	......	......	S	......	......	......	......	......	......	......	...
12ba	Hb	.0	3,186.16	145.14	Oct. 16, 1950	......	......	S	......	......	......	......	......	......	......	...
18bc	Tc	1.5	3,221.80	155.07	Oct. 6, 1950	......	......	S	......	......	......	......	......	......	......	...
22ba	Tc	1.0	3,183.54	137.33	Oct. 16, 1950	......	......	S	......	......	......	......	......	......	......	...
30bc	Tc	.5	3,165.51	97.88	Oct. 11, 1950	......	......	S	......	......	......	......	......	......	......	...
33db	Tc	.0	3,156.16	101.14	Oct. 10, 1950	......	......	S	......	......	......	......	......	......	......	...
36cc	Tc	.0	3,137.58	98.28	....do....	......	......	S	......	......	......	......	......	......	......	...
12-28-25cb	Tc	1.0	2,794.84	77.40	Aug. 9, 1949	......	......	N	......	......	......	......	......	......	......	...
26da	Hb	.5	2,800.60	66.14	Aug. 10, 1949	......	......	D, S	......	......	......	......	......	......	......	...
28bc	Hb	.7	2,823.76	86.85	Sept. 2, 1949	......	......	S	......	......	......	......	......	......	......	...
31db	Tc	.2	2,878.12	133.58	....do....	......	......	N	......	......	......	......	......	......	......	...
29- 6bd	Tc	1.0	3,001.56	220.47	Aug. 24, 1949	......	......	S	......	......	......	......	......	......	......	...
10dd	Tp	.5	3,116.62	365.02	Sept. 20, 1949	......	......	N	......	......	......	......	......	......	......	...
12cd	Hb	.3	2,799.95	58.33	Aug. 11, 1949	......	......	D	......	......	......	......	......	......	......	...
26da	Tc	.0	2,838.77	75.74	Aug. 24, 1949	......	......	D	......	......	......	......	......	......	......	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Lincoln County—Continued							
12-29-34cd	R. Stinger	...	156.0	5½	M	...	N	...	...	N	...	To	...
30- 2bd	H. Johnston	...	218.0	...	...	...	Cy	...	...	W,G	...	To	...
4bb	Rural school	...	...	5½	M	...	Cy	...	...	W	...	To	...
13bc	...	...	191.0	4	M	...	Cy	...	...	N	...	To	...
15db	C. Smallfoot	1925	250	5½	M	...	Cy	...	...	W	...	To	...
16bc	L. White	1912(?)	223.0	4	M	...	Cy	...	...	W	...	To	...
22cd	R. Branting	...	265	3	M	...	Cy	...	...	W	...	To	...
25ba	...	...	...	4	M	...	Cy	...	...	W	...	To	...
34ab	C. G. Palmer	...	230.0	4	M	...	Cy	...	...	W	...	To	...
31-16cc	Rural school	...	169.0	2½	M	...	Cy	...	...	W	...	To	...
30da	...	...	231.0	5½	M	...	Cy	...	...	W	...	To	...
34aa	F. Watkins	1880	188.5	5½	M	...	N	...	...	N	...	To	...
32- 2aa	L. Broeder	1915	183.0	5½	M	...	Cy	...	...	W	...	To	...
4dd	do	1940	209.0	4	M	...	N	...	...	N	...	To	...
5ca	...	...	153.0	4	M	...	Cy	...	...	W	...	To	...
30aa	...	...	190.0	4	M	...	Cy	...	...	W	...	To	...
33- 3ca	...	...	146.0	5½	M	...	Cy	...	...	W	...	To	...
25ab	...	...	207.0	5½	M	...	Cy	...	...	W	...	To	...
35cd	J. Fears	1949	160	3½	M	...	Cy	...	...	W	...	To	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Lincoln County—Continued																
12-29-34cd	Tc	0.0	2,893.85	67.30	Aug. 11, 1949	......	......	N	......	......	......	......	......	...	......	...
30- 2bd	Hb	1.0	2,997.65	192.93	Aug. 25, 1949	......	......	D, S	......	......	......	......	......	...	......	...
4bb	Tp	.0	3,037.00	156.84	Aug. 22, 1949	......	......	P	......	......	......	......	......	...	......	...
13bc	Tc	.3	2,987.92	176.95	Aug. 24, 1949	......	......	N	......	......	......	......	......	...	......	...
15db	Tp	.0	3,059.80	226.05	Aug. 25, 1949	......	......	......	......	......	......	......	......	...	......	...
16bc	Tc	1.0	3,029.31	154.36	Aug. 24, 1949	......	......	D, S	......	......	......	......	......	...	......	...
22cd	Hb	.2	3,070.98	227.53	Aug. 25, 1949	......	......	......	......	......	......	......	......	...	......	...
25ba	Tc	.0	2,967.50	147.23	Aug. 24, 1949	......	......	D, S	......	......	......	......	......	...	......	...
34ab	Tp	1.0	3,055.04	214.53	....do....	......	......	D, S	......	......	......	......	......	...	......	...
31-16cc	Tc	1.1	3,044.02	126.99	Aug. 29, 1949	......	......	P	......	......	......	......	......	...	......	...
30da	Tc	.5	3,126.57	195.92	Aug. 30, 1949	......	......	D, S	......	......	......	......	......	...	......	...
34aa	Tc	.5	3,047.21	141.18	....do....	......	......	N	......	......	......	......	......	...	......	...
32- 2aa	Tc	.5	3,087.22	163.18	Aug. 31, 1949	......	......	S	......	......	......	......	......	...	......	...
4dd	Tc	.0	3,114.55	182.06	....do....	......	......	N	......	......	......	......	......	...	......	...
5ca	Tc	.4	3,084.84	135.18	Aug. 30, 1949	......	......	S	......	......	......	......	......	...	......	...
30aa	Tc	.0	3,150.91	173.65	Aug. 31, 1949	......	......	S	......	......	......	......	......	...	......	...
33- 3ca	Tc	2.8	3,131.03	140.25	Sept. 1, 1949	......	......	N	......	......	......	......	......	...	......	...
25ab	Tc	1.1	3,161.04	175.02	....do....	......	......	S	......	......	......	......	......	...	......	...
35cd	Tp	.3	3,121.57	123.77	....do....	......	......	S	......	......	......	......	......	...	......	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
			Lincoln County—Continued										
12-34- 2dd	A. Reicks	......	186	4	M	......	Cy	......	......	W	......	To	......
4da	J. H. Ecker	......	217.0	5½	M	......	Cy	......	......	W	......	To	......
10dd	A. W. Elfeldt	......	191.0	3	M	......	N	......	......	N	......	To	......
14ad	A. Reicks	......	151.0	3	M	......	N	......	......	N	......	To	......
17ca	J. B. Steck	......	193.0	5½	M	......	Cy	......	......	W	......	To	......
22ab	F. G. Fear	......	158.0	3	M	......	Cy	......	......	W	......	To	......
25ba	.....do	......	169.0	3	M	......	Cy	......	......	W	......	To	......
32bd	V. Raney	......	191.0	3	M	......	Cy	......	......	W	......	To	......
13-30- 25bb	Lech brothers	......	56.8	4	M	......	Cy	......	......	W	......	To	......
31- 7cd	Platte Valley Public Power & Irrigation District.	1938	54	2	M	......	N	......	......	N	......	To	......
14bb	.....do	1938	32.0	2	M	......	N	......	......	N	......	To	......
16aa	.....do	1938	35.0	2	M	......	N	......	......	N	......	To	......
18dd	.....do	......	66.0	2	M	......	N	......	......	N	......	To	......
26bb	.....do	......	107.0	2	M	......	N	......	......	N	......	To	......
28dd	.....do	......	151.0	2	M	......	N	......	......	N	......	To	......
29bd	......	......	133.0	4	M	......	Cy	......	......	W	......	To	......
35bb	Platte Valley Public Power & Irrigation District.	......	171.0	2	M	......	N	......	......	N	......	To	......
32- 6ab	.....do	1938	29.0	2	M	......	N	......	......	N	......	To	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
					Lincoln County—Continued											
12-34- 2dd	Hb	2.0	3,173.42	130.87	Oct. 13, 1950	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
4da	Tc	.5	3,198.38	162.71	Oct. 19, 1950	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
10dd	Tc	3.0	3,184.09	152.43	Oct. 11, 1950	.....	.....	N	.....	.....	.....	.....	.....	.....	.....	.....
14ad	Tc	1.0	3,173.77	145.28	Oct. 13, 1950	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
17ca	Tc	.0	3,192.49	147.71	Oct. 11, 1950	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
22ab	Tc	.0	3,189.00	151.36	Oct. 12, 1950	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
25ba	Tc	.0	3,185.28	154.44	.....do.....	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
32bd	Tc	2.0	3,229.92	172.48	Oct. 10, 1950	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
13-30- 25bb	Tp	.4	.....	48.21	Nov. 28, 1936	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
31- 7cd	Tc	.0	2,914.29	35.00	July 20, 1950	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
14bb	Tc	.5	2,846.79	7.18	.....do.....	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
16aa	Tc	.5	2,875.01	23.00	.....do.....	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
18dd	Tc	.5	2,933.40	64.45	Oct. 30, 1950	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
26bb	Tc	.3	2,974.35	101.36	Oct. 11, 1950	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
28dd	Tc	.0	3,007.86	63.27	Oct. 31, 1950	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
29bd	Tc	2.2	3,024.82	109.05	.....do.....	.....	.....	S	.....	.....	.....	.....	.....	.....	.....	.....
35bb	Tc	.5	3,016.06	117.27	Oct. 1, 1950	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....
32- 6ab	Tc	.5	2,940.58	25.55	July 20, 1950	.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Lincoln County—Continued												
13-32- 7bb	Platte Valley Public Power & Irrigation District.	1938	36.0	2	M	......	N	......	......	N	......	To	......
9bb	....do	1938	36.0	2	M	......	N	......	......	N	......	To	......
10aa	....do	1938	38.0	2	M	......	N	......	......	N	......	To	......
20bb	R. D. Parker	......	194.0	5½	M	......	Cy	......	......	W	......	To	......
22ab	Mrs. E. Huebner	......	187	4	M	......	Cy	......	......	W	......	To	......
24da	Platte Valley Public Power & Irrigation District.	......	126.0	2	M	......	N	......	......	N	......	To	......
29aa	W. S. Huebner	......	154.0	4	M	......	Cy	......	......	W	......	To	......
34ba	E. Rodgers	......	210	4	M	......	Cy	......	......	W	......	To	......
36bd	F. England	......	151.0	4	M	......	Cy	......	......	W	......	To	......
33- 4dd	Rural school	......	40.0	4	M	......	Cy	......	......	H	......	To	......
11ba	......	1930	140	4	M	......	Cy	......	......	W	......	To	......
24bb	H. T. Frels	......	183	5½	M	......	N	......	......	N	......	To	......
27dc	E. Applegate	......	182.0	5½	M	......	Cy	......	......	W	......	To	......
30ba	H. A. Lawhead	......	152.0	5½	M	......	N	......	......	N	......	To	......
32dd	S. Stuart	......	178.0	5½	M	......	Cy	......	......	W	......	To	......
35ad	M. E. Sandberg	......	217.0	4	M	......	N	......	......	N	......	To	......
34- 8cb	R. J. Weir	......	27.0	5½	M	......	Cy	......	......	W	......	To	......
11aa	T. J. Knotts	......	47.0	5½	M	......	Cy	......	......	W	......	To	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Lincoln County—Continued																
13-32- 7bb......	Tc	1.0	2,955.59	21.65	July 20, 1950	......	....	O	....	......	....	......	....	...	....	...
9bb......	Tc	1.0	2,937.06	23.60	July 19, 1950	......	....	O	....	......	....	......	....	...	....	...
10aa......	Tc	.5	2,914.32	21.35	July 21, 1950	......	....	O	....	......	....	......	....	...	....	...
20bb......	Tc	1.0	3,112.29	164.31	Oct. 27, 1950	......	....	S	....	......	....	......	....	...	....	...
22ab......	Tc	1.5	3,050.58	126.59	Oct. 30, 1950	......	....	S	....	......	....	......	....	...	....	...
24da......	Tc	.0	3,011.34	73.79	Oct. 31, 1950	......	....	O	....	......	....	......	....	...	....	...
29aa......	Tc	2.0	3,090.78	148.34	Oct. 27, 1950	......	....	S	....	......	....	......	....	...	....	...
34ba......	Hb	1.0	3,097.50	158.96	Oct. 30, 1950	......	....	D, S	....	......	....	......	....	...	....	...
36bd......	Tc	.5	3,047.22	125.47	Oct. 31, 1950	......	....	S	....	......	....	......	....	...	....	...
33- 4dd......	Tp	.0	2,948.40	10.00	July 20, 1950	......	....	P	....	......	....	......	....	...	....	...
11ba......	Tc	3.0	3,050.00	91.30	.....do............	......	....	D, S	....	......	....	......	....	...	....	....
24bb......	Tc	.5	3,105.29	127.14	Oct. 26, 1950	......	....	N	....	......	....	......	....	...	....	...
27dc......	Tp	.0	3,120.47	116.70	Oct. 27, 1950	......	....	S	....	......	....	......	....	...	....	...
30ba......	Tc	.0	3,119.91	84.63	Oct. 26, 1950	......	....	N	....	......	....	......	....	...	....	....
32dd......	Tc	1.0	3,151.44	138.43	.....do............	......	....	S	....	......	....	......	....	...	....	...
35ad......	Tc	2.5	3,153.84	178.10	Oct. 27, 1950	......	....	N	....	......	....	......	....	...	....	...
34- 8cb......	Tc	.0	3,029.09	12.30	Oct. 20, 1950	......	....	S	....	......	....	......	....	...	....	...
11aa......	Tc	.5	3,016.78	22.43	Oct. 24, 1950	......	....	S	....	......	....	......	....	...	....	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Lincoln County—Continued							
13-34-15aa	Rural school	....	58.0	5½	M	......	Cy	......	......	H	......	To	......
16cd	C. Peterson	....	65	5½	M	......	Cy	......	......	W	......	To	......
20bb	G. Wylie	....	102.0	5½	M	......	N	......	......	N	......	To	......
22da	C. Cutsor	....	98.0	5½	M	......	Cy	......	......	W	......	To	......
23aa	C. Peterson	....	58.0	5½	M	......	N	......	......	N	......	To	......
25cd	W. R. Maloney	....	269.0	4	M	......	Cy	......	......	W	......	To	......
28cc	C. Gordart	....	136.0	4	M	......	Cy	......	......	W	......	To	......
30ad	.....do	....	103.0	4	M	......	N	......	......	N	......	To	......
						Nuckolls County							
3- 7- 6dd	Rural school	....	77.0	8	M	......	Cy	......	......	W	......	To	......
4- 7-26aa	W. N. Statz	1916	72.0	5½	M	......	Cy	......	......	W	......	To	......
8-30aa1	Village of Lawrence	1928	200	12	M	......	T	......	......	E	......	To	......
30aa2	.....do	1933	100	3	M	......	Cy	......	......	E	......	To	......
30aa3	.....do	1932	100	8	M	......	Cy	......	......	E	......	To	......
30aa4	.....do	1952	200	12	M	......	T	......	......	E	......	To	......
30ac	.....do	1934	112	7	M	......	Cy	......	......	W	......	To	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Lincoln County—Continued																
13-34-15aa	Tp	-0.5	3,040.50	24.20	July 20, 1950	...	...	P	...	...	...	...	...	...	...	...
16cd	Tc	1.0	3,063.48	33.98	Oct. 20, 1950	...	...	D, S	...	...	...	...	...	...	...	...
20bb	Tc	.0	3,080.50	42.20	July 21, 1950	...	...	N	...	...	...	...	...	...	...	...
22da	Tc	1.5	3,083.33	43.67	Oct. 19, 1950	...	...	S	...	...	...	...	...	...	...	...
23aa	Tc	1.5	3,056.65	21.63	Oct. 25, 1950	...	...	N	...	...	...	...	...	...	...	...
25cd	Tc	.0	3,248.04	214.27	Oct. 19, 1950	...	...	S	...	...	...	...	...	...	...	...
28cc	Tc	.2	3,147.92	106.66	.....do	...	...	S	...	...	...	...	...	...	...	...
30ad	Tc	.0	3,115.96	73.14	Oct. 18, 1950	...	...	N	...	...	...	...	...	...	...	...
Nuckolls County																
3- 7- 6dd	Tc	0.0	...	58.43	Sept. 25, 1952	...	...	N	...	...	...	...	...	...	...	...
4- 7-26aa	Tc	.9	...	54.18	Dec. 6, 1935	...	...	N	...	...	...	...	...	...	...	...
8-30aa1	...	...	...	80	Oct. 31, 1952	...	25	P	...	...	...	...	...	...	...	...
30aa2	...	...	...	80	.....do	...	6	P	...	...	...	...	...	...	...	...
30aa3	Tc	1.0	...	74.58	June 8, 1948	...	9	P	...	...	...	...	...	...	...	...
30aa4	...	...	...	80	Oct. 31, 1952	...	20	P	...	...	...	...	...	...	...	...
30ac	...	...	...	...	...	...	9	P	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Perkins County							
9-35-24ab	M. Clemens	1951	250	18	M	...	T	8	...	D	2.24	To	S, G
10-35-22aa	Grainton school	...	256.0	3½	M	...	Cy	...	...	W	...	To	...
36-11ca	Chicago, Burlington & Quincy Railroad Co.	1894	296	8	M	...	Cy	...	...	T	...	To	S, G
11cb	Village of Elsie	1948	318	12	M	...	T	...	...	E	...	To	S, G
11-35-14cd	...	...	137.0	3½	M	...	Cy	...	...	E	...	To	...
36-1cc	...	...	212.0	...	...	...	Cy	...	...	W	...	To	...
						Phelps County							
5-17-17bb	...	...	120	5½	M	...	...	...	...	...	...	Qp	...
18-2cc	C. M. Brown	1946	185.0	18	M	...	T	...	...	...	...	Qp	S, G
2dc	C. Kutz	1949	185	18	C	...	T	...	...	...	...	Qp	S, G
3ac	C. M. Brown	1949	210	36	C	...	T	...	...	Ng	...	Qp	S, G
3bb	...	...	...	...	...	...	T	...	...	Ng	...	Qp	S, G
3db	...	...	...	...	...	...	T	...	...	Ng	...	Qp	S, G
4ab1	Western Public Service	1917	173	8	M	...	N	...	...	N	...	Qp	S, G
4ab2	City of Holdrege	...	192	8	M	...	T	...	...	E	...	Qp	S, G
4ab3	do	...	190	8	M	...	T	...	...	E	...	Qp	S, G
4ab4	do	...	189	10	M	...	T	...	...	E	...	Qp	S, G
4ab5	do	...	186	8	M	...	Cy	...	...	E	...	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Perkins County																
9-35-24ab	Hb	0.0	...	126.80	July 23, 1952	...	1,000	I	...	...	D, S	100	...	A	O, W, By, C	150
10-35-22aa	Tc	.5	...	230.50	do	...	...	P	...	...	...	...	...	...	...	...
36-11ca	...	...	...	180	do	...	60	R	...	...	...	...	...	...	...	...
11cb	...	...	...	170	do	...	300	P	...	...	...	...	...	...	...	...
11-35-14cd	Tc	1.0	...	132.40	do	...	...	S	...	...	...	...	...	...	...	...
36-1cc	Tp	1.5	...	168.95	do	...	...	S	...	...	...	...	...	...	...	...
Phelps County																
5-17-17bb	...	...	...	...	...	...	...	N	...	...	...	...	...	...	...	...
18-2cc	Hb	0.5	2,327.34	159.67	July 25, 1947	...	...	I	...	...	...	...	...	...	...	...
2dc	Hb	1.0	2,303.75	136.18	Oct. 7, 1949	...	...	I	...	...	...	...	...	...	...	...
3ac	Hb	.9	2,324.08	152.51	Sept. 23, 1949	...	...	I	...	...	...	...	...	...	...	...
3bb	Hb	.5	...	126.94	Aug. 12, 1952	...	...	I	...	...	...	...	...	...	...	...
3db	Hb	.5	...	163.66	do	...	...	I	...	...	...	...	...	...	...	...
4ab1	Tc	.0	2,325.68	147.75	Sept. 27, 1950	...	...	N	...	...	...	...	...	...	...	...
4ab2	...	...	...	146	June 16, 1947	...	200	P	...	...	...	...	...	...	...	...
4ab3	...	...	...	146	do	12	200	P	...	...	...	...	...	...	...	...
4ab4	...	...	...	146	do	12	400	P	...	...	...	...	...	...	...	...
4ab5	...	...	...	146	do	12	150	N	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Phelps County—Continued							
5-18- 4ab6	City of Holdrege		186	8	M		Cy			E		Qp	S, G
6ab	Children's Home	1942	258.0	16	M		T			Ng		Qp	S, G
10aa	H. McClymant	1949			M		T					Qp	S, G
15cb	Mr. Rodgers			$2\frac{1}{2}$	M		Cy			W		Qp	
19- 4bc			213.0	3	M		Cy			N		Qp	
22da		1943	246	12	M		N			N		Qp	
28dd	Village of Atlanta		190	4	M		T			E		Qp	S, G
35db	E. Gray	1942	216.0	14	M		T					Qp	S, G
20- 5cc			153.0	4	M		Cy			W		Qp	
16dc			44.7	$5\frac{1}{2}$	M		Cy			W		Qp	
18cc	Mr. Thorndyke		140	4	M		Cy			W		Qp	
19cc	R. M. Sandquist	1900	102.5	$5\frac{1}{2}$	M		Cy			W		Qp	
21cd	F. McKibben		45	4	M		Cy			W		Qp	
26da	Christian Children's Home		116.0	4	M		Cy			W		Qp	
27ca			82.0	2	M		Cy			N		Qp	
29dd	J. J. Lewis		117.5	4	M		Cy			W		Qp	
32bb	W. Peterson	1898	109.4	4	M		Cy			W		Qp	
32cc			111.7	4	M		N			N		Qp	
34cb	N. Drew			4	M		Cy			N		Qp	

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Phelps County—Continued																
5-18- 4ab6	...	...	...	146	June 16, 1947	12	150	N	...	...	...	...	...	...	...	...
6ab	Hb	1.0	2,337.95	160.57	July 24, 1947	...	500	I	...	...	...	...	...	...	...	...
10aa	Hb	1.5	2,316.00	147.84	Oct. 7, 1949	...	...	I	...	...	...	...	...	...	...	...
15cb	Tc	1.7	2,314.07	160.75	June 1, 1948	...	...	D, S	...	...	...	...	...	...	...	...
19- 4bc	Tc	2.0	2,416.00	210.25	Jan. 21, 1948	...	...	N	...	...	...	...	...	...	...	...
22da	Tc	1.5	2,380.31	205.36	July 24, 1947	...	...	O	...	...	...	...	...	...	...	...
28dd	...	...	...	170	June 12, 1948	...	60	P	...	...	...	...	...	...	...	...
35db	Hb	1.0	2,359.67	199.84	July 24, 1947	...	550	I	...	...	...	...	...	...	...	...
20- 5cc	Tc	1.0	2,404.91	146.35	July 22, 1948	...	...	S	...	...	...	...	...	...	...	...
16dc	Tc	1.2	2,271.76	41.15	do	...	...	...	...	...	...	...	...	...	...	...
18cc	Hb	2.6	2,368.87	124.50	July 26, 1948	...	...	...	...	...	...	...	...	...	...	...
19cc	Tp	1.2	2,400.58	169.55	do	...	...	D, S	...	...	...	...	...	...	...	...
21cd	Tc	2.0	2,252.63	38.22	do	...	...	D, S	...	...	...	...	...	...	...	...
26da	Tc	1.7	2,309.97	109.20	June 7, 1948	...	...	S	...	...	...	...	...	...	...	...
27ca	Tc	1.5	2,285.71	77.07	July 22, 1948	...	...	N	...	...	...	...	...	...	...	...
29dd	Tc	.8	2,306.12	98.70	July 24, 1948	...	...	N	...	...	...	...	...	...	...	...
32bb	Hb	2.4	2,315.08	104.10	do	...	...	D, S	...	...	...	...	...	...	...	...
32cc	Tc	1.0	2,303.25	106.57	July 26, 1948	...	...	N	...	...	...	...	...	...	...	...
34cb	Tc	.1	2,215.79	34.66	June 7, 1948	...	...	N	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
Phelps County—Continued													
6-17-15ad	C. Rumste.	1946	170.0	18	M	......	T	......	......	......	......	Qp	S, G
24ad	Weber and Pierce	1950	......	......	......	......	T	......	......	Ng	......	Qp	S, G
28ba	Village of Funk	1938	160	8	M	......	T	......	......	E	......	Qp	S, G
30ccc	M. Jensen	1951	......	......	......	......	T	......	......	Ng	......	Qp	S, G
36aa	......	1948	183.0	18	M	......	T	......	......	......	......	Qp	S, G
36db	A. H. Shelton	1941	165	14	M	......	T	......	......	T	......	Qp	S, G
18-12bc	H. Wells	1939	141.0	18	M	......	T	......	......	......	......	Qp	S, G
13da	Mr. Brown	1944	168	......	......	......	T	......	......	D	......	Qp	S, G
28cc	Carl A. Erickson	1948	200	......	......	......	T	......	......	Ng	0.65	Qp	S, G
28dc	H. Warp	1943	195	18	M	......	T	......	......	Ng	......	Qp	S, G
31ab	Charles Foote	1951	208	......	......	......	T	......	......	P	8.15	Qp	S, G
33aa	C. Burgeson	1947	182.0	18	M	......	T	......	......	......	......	Qp	S, G
33bd1	City of Holdrege	1947	187	12	M	......	T	......	......	E	......	Qp	S, G
33bd2	do	......	182	8	M	......	T	......	......	E	......	Qp	S, G
19-2aa	Central Nebraska Public Power & Irrigation District.	......	151.0	1	M	......	N	......	......	N	......	Qp	......
7cc	E. C. Nelson	1900	......	4	M	......	Cy	......	......	W	......	Qp	......
12ac	May brothers	1951	181	......	......	......	T	......	......	D	1.60	Qp	S, G
18ba	E. C. Nelson	1907	200	5½	M	......	N	......	......	N	......	Qp	......
20bc1	Village of Loomis	......	254	18	M	......	T	......	......	E	......	Qp	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Phelps County—Continued																
6-17-15ad	Hb	0.0	2,253.60	90.08	Aug. 6, 1947	7½	1,000	I	....	....	....	....	....	....	....	....
24ad	....	....	....	....	....	....	....	I	....	....	....	....	....	....	....	....
28ba	....	....	....	90	July 29, 1948	....	100	P	....	....	....	....	....	....	....	....
30ccc	Hc	.5	....	137.26	Aug. 13, 1952	....	....	I	....	....	....	....	....	....	....	....
36aa	Hb	1.0	2,233.42	81.56	July 14, 1948	....	....	I	....	....	....	....	....	....	....	....
36db	Ep	.0	2,242.72	97.62	Jan. 1, 1947	....	1,000	I	....	....	D, S	160	....	C	A	320
18-12bc	Hb	1.5	2,283.28	91.42	July 5, 1947	....	....	I	....	....	....	....	....	....	....	....
13da	Hb	.2	2,304.54	116.95	May 20, 1948	....	900	I	....	....	....	....	....	....	....	....
28cc	Hb	.5	....	158.06	Aug. 12, 1952	....	835	I	1,440	221	P	150	1.5	C	A	200
28dc	Hb	.5	2,320.35	134.34	June 19, 1948	....	750	I	....	....	....	....	....	....	....	....
31ab	Hb	.5	....	147.84	Aug. 12, 1952	....	800	I	480	71	D	50	1.4	C	....	....
33aa	Hb	1.0	2,318.66	138.42	July 27, 1947	....	....	I	....	....	....	....	....	....	....	....
33bd1	....	....	....	137	June 16, 1947	....	500	P	....	....	....	....	....	....	....	....
33bd2	....	....	....	138	....do....	12	350	P	....	....	....	....	....	....	....	....
19-2aa	Tc	1.0	2,361.81	115.15	Nov. 18, 1947	....	....	O	....	....	....	....	....	....	....	....
7cc	Hc	1.5	2,419.31	164.25	May 10, 1948	....	....	S	....	....	....	....	....	....	....	....
12ac	Hb	.5	....	122.56	Aug. 12, 1952	....	1,100	I	480	97	D	160	.6	C	A, G	160
18ba	Tc	2.2	....	158.46	Dec. 30, 1948	....	....	N	....	....	....	....	....	....	....	....
20bc1	Hb	1.4	2,435.60	197.27	May 7, 1948	....	....	P	....	....	....	....	....	....	....	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Phelps County—Continued							
6-19- 20bc2	Village of Loomis	1949	244	......	M	......	T	......	......	E	......	Qp	S
21dc	......	......	165.5	4	M	......	N	......	......	N	......	Qp	......
23da	John Ivey	1952	200	......	......	......	T	......	......	D	2.21	Qp	S, G
27bb	......	......	......	4	M	......	Cy	......	......	W	......	Qp	......
20- 8ab	Swenson brothers	1949	252	18	M	......	T	......	......	P	6.40	Qp(?)	S, G
10aa	......	......	202.3	2	M	......	N	......	......	N	......	Qp	......
28ad	J. W. Johnson Estate	1898	212.0	4	M	......	Cy	......	......	H	......	Qp	......
7-17- 9ac	O. W. Jones	......	......	4	M	......	Cy	......	......	W	......	Qp	......
11cb	W. O. Just	1941	60	18	M	......	T	......	......	T	......	Qp	S, G
30bb	A. Solderholm	1938	100.0	24	M	......	T	......	......	T	......	Qp	S, G
30cc	C. Peterson	......	84.8	2	M	......	J	......	......	E	......	Qp	......
34bb	E. H. Silver Estate	1900	92	2	M	......	Cy	......	......	W	......	Qp	......
36aa	Mr. Elsam	1947	127	4	M	......	Cy	......	......	W	......	Qp	......
18- 3cc	Central Nebraska Public Power & Irrigation District.	1948	84.7	4	M	......	N	......	......	N	......	Qp	......
27ab	R. J. Getty	1946	114.0	24	M	......	T	......	......	......	......	Qp	S, G
35ab	A. L. Anderson	1948	123	......	......	......	......	......	......	......	......	Qp	......
19- 2bd	J. W. Jacobsen	1949	114	......	M	......	T	......	......	P	......	Qp	S, G
6aa	Central Nebraska Public Power & Irrigation District.	......	116.2	4	M	......	N	......	......	N	......	Qp	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Phelps County—Continued																
6-19-20bc2	Hb	2.0	......	197	May 12, 1949	......	80	P	......	......	......	......	......	...	......	...
21dc	Tc	1.8	2,377.79	153.15	May 5, 1948	......	......	N	......	......	......	......	......	...	......	...
23da	......	......	......	140	Aug. 12, 1952	30	800	I	......	......	D	50	......	C	A, S	...
27bb	Hb	1.0	2,363.24	125.5	May 5, 1948	......	......	......	......	......	......	......	......	...	......	...
20- 8ab	......	......	......	216	Aug. 11, 1952	14	850	I	504	79	D	158	0.5	C	A, O, Cl	158
10aa	Tc	3.8	2,464.57	191.81	May 17, 1948	......	......	N	......	......	......	......	......	...	......	...
28ad	Hb	2.4	......	197.18	July 23, 1948	......	......	N	......	......	......	......	......	...	......	...
7-17- 9ac	Hb	4.2	2,227.00	36.44	July 7, 1948	......	......	D, S	......	......	......	......	......	...	......	...
11cb	Hb	.0	2,205.89	28.78	Aug. 7, 1947	......	......	I	......	......	......	......	......	...	......	...
30bb	Hb	.0	2,256.67	57.17	Aug. 5, 1947	......	......	I	......	......	......	......	......	...	......	...
30cc	Tp	.5	2,267.72	68.10	May 12, 1948	......	......	D, S	......	......	......	......	......	...	......	...
34bb	Tc	2.8	2,248.15	65.40	July 8, 1948	......	......	S	......	......	......	......	......	...	......	...
36aa	Tc	-3.3	2,225.90	56.96	July 14, 1948	......	......	D, S	......	......	......	......	......	...	......	...
18- 3cc	Tc	1.4	2,316.19	80.29	June 30, 1948	......	......	O	......	......	......	......	......	...	......	...
27ab	Hb	.0	2,284.10	64.15	Aug. 5, 1947	10	800	I	......	......	......	......	......	...	......	...
35ab	Tc	.5	2,282.03	73.24	May 12, 1948	......	......	......	......	......	......	......	......	...	......	...
19- 2bd	......	......	......	68	Aug. 11, 1952	......	800	I	......	......	D	60	......	C	S	...
6aa	Tc	1.4	2,366.80	64.44	May 25, 1948	......	......	O	......	......	......	......	......	...	......	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
							Phelps County—Continued						
7-19-12bb	Rural school	......	......	2½	M	......	Cy	......	......	W	......	Qp	......
12cc	Central Nebraska Public Power & Irrigation District.	......	91.0	1	M	......	N	......	......	N	......	Qp	......
16ac	F. Cole	1939	138.0	18	M	......	T	......	......	......	......	Qp	S, G
16ba	do	1948	133	2½	M	......	Cy	......	......	W	......	Qp	......
17db	G. Berquist	1948	149	......	......	......	T	......	......	D	......	Qp	S, G
23ad	Central Nebraska Public Power & Irrigation District.	......	82.0	1	M	......	N	......	......	N	......	Qp	......
26dd	do	......	56.0	1	M	......	N	......	......	N	......	Qp	......
28ba	G. Sayre	1951	185	24	M	......	T	8	......	P	3.26	Qp	S, G
20-4bb	C. I. T. Johnson	......	127.5	4	M	......	Cy	......	......	W	......	Qp	......
8da	do	......	......	4	M	......	Cy	......	......	W	......	Qp	......
14cc	......	......	193.3	3½	M	......	N	......	......	N	......	Qp	......
18cd	......	......	......	3½	M	......	Cy	......	......	W	......	Qp	......
24ad	W. F. Malm	1934	202	16	M	......	T	......	......	T	......	Qp	S, G
25ad	E. J. Sand	1903	185	4	M	......	Cy	......	......	W	......	Qp	......
28bb	D. A. Carlson	......	194.0	3	M	......	N	......	......	N	......	Qp	......
28dc	A. Dahlgren	......	173.1	3	M	......	Cy	......	......	H	......	Qp	......
29ba	......	......	178.0	2	M	......	N	......	......	N	......	Qp	......
31ca1	Village of Bertrand	......	256	10	M	......	T	......	......	E	......	Qp(?)	......

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
					Phelps County—Continued											
7-19-12bb	...	...	...	47	Sept. 16, 1949	...	...	P	...	...	...	...	...	...	...	...
12cc	Tc	-1.0	2,318.72	53.07	July 24, 1947	...	...	O	...	...	...	...	...	...	...	...
16ac	Hb	.8	2,366.12	82.20	July 25, 1947	...	...	I	...	...	...	...	...	...	...	...
16ba	...	...	...	74	Sept. 16, 1949	...	...	D	...	...	...	...	...	...	...	...
17db	Hb	1.0	2,378.57	92.33	Oct. 3, 1949	...	...	I	...	...	...	...	...	...	...	...
23ad	Tc	1.0	2,331.84	61.55	Nov. 18, 1947	...	...	O	...	...	...	...	...	...	...	...
26dd	Tc	.0	2,348.21	44.27	Nov. 26, 1947	...	...	O	...	...	...	...	...	...	...	...
28ba	Hb	.5	...	112.16	Aug. 11, 1952	13	600	I	720	79	P	118	0.7	C	A	...
20- 4bb	Tc	1.2	2,436.59	116.32	July 2, 1948	...	...	N	...	...	...	...	...	...	...	...
8da	Tc	1.5	2,501.98	181.91	July 1, 1948	...	...	D, S	...	...	...	...	...	...	...	...
14cc	Tc	1.9	2,473.70	170.53	May 18, 1948	...	...	D, S	...	...	...	...	...	...	...	...
18cd	Tc	.5	2,477.56	153.98	...do...	...	...	D, S	...	...	...	...	...	...	...	...
24ad	Hb	.0	2,431.35	150.18	Jan. 20, 1948	...	200	I	...	...	...	...	...	...	...	...
25ad	Hc	1.8	2,418.53	134.00	June 12, 1948	...	...	D, S	...	...	...	...	...	...	...	...
28bb	Tc	2.0	2,477.15	178.20	Nov. 25, 1947	...	...	N	...	...	...	...	...	...	...	...
28dc	Tc	1.4	2,451.54	171.38	Sept. 28, 1934	...	...	N	...	...	...	...	...	...	...	...
29ba	Tc	1.4	2,466.55	164.13	July 6, 1948	...	...	N	...	...	...	...	...	...	...	...
31ca1	...	...	...	244	June 16, 1947	...	350	P	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Phelps County—Continued							
7-20-31ca2	Village of Bertrand	...	260	10	M	...	T	...	...	E	...	Qp(?)	...
31cc	...	1947	260	18	M	...	T	...	...	...	...	Qp(?)	S, G
31cd	E. Peterson	1928	241.0	5½	M	...	N	...	...	N	...	Qp(?)	...
8-18-21dd	Central Nebraska Public Power & Irrigation District.	1948	35.3	4	M	...	N	...	...	N	...	Qp	...
33dd	...do	1948	79.5	4	M	...	N	...	...	N	...	Qp	...
34bb	...do	1948	35.5	4	M	...	N	...	...	N	...	Qp	...
19-20db	C. Cruise	1941	83.2	18	...	...	T	...	...	E	...	Qp	S, G
21cc	R. Enquist	...	100	...	...	...	T	...	...	T	2.28	Qp	S, G
23cc	R. A. Marshall	...	...	...	...	...	T	...	...	E	...	Qp	S, G
24dc	E. Lindstrom	1941	...	18	M	...	T	...	...	E	...	Qp	S, G
29cc	Central Nebraska Public Power & Irrigation District.	...	100.5	4	M	...	N	...	...	N	...	Qp	...
29dd	...do	...	56.4	5	M	...	N	...	...	N	...	Qp	...
33cc	...do	1948	117.0	4	M	...	N	...	...	N	...	Qp(?)	...
34bc	W. Carlson	1948	112	18	M	...	T	...	...	D	1.77	Qp(?)	S, G
35ac	...	1950	115.0	...	...	...	T	...	...	P	...	Qp(?)	S, G
35bc	Miss Street	1940	98.0	18	M	...	T	...	...	T	...	Qp(?)	S, G
35cb	...	1950	100.0	...	...	...	T	...	...	T	...	Qp(?)	S, G
35da	...	1950	115.0	...	...	...	T	...	...	G	...	Qp(?)	S, G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Phelps County—Continued																
7-20-31ca2	......	......	......	244	June 16, 1947	......	350	P	......	......	......	......	......	...	......	....
31cc	Hb	0.5	2,513.02	219.92	Nov. 19, 1947	......	1,000	I	......	......	......	......	......	...	......	....
31cd	Tc	.8	2,519.70	228.20	Aug. 20, 1947	......	......	N	......	......	......	......	......	...	......	....
8-18-21dd	Tc	.0	2,249.21	11.33	June 15, 1948	......	......	O	......	......	......	......	......	...	......	....
33dd	Tc	.0	2,309.88	74.40	....do....	......	......	O	......	......	......	......	......	...	......	....
34bb	Tc	.0	2,257.35	20.22	....do....	......	......	O	......	......	......	......	......	...	......	....
19-20db	Hb	.6	2,334.25	39.92	May 18, 1948	......	975	I	......	......	......	......	......	...	......	....
21cc	......	......	......	42	Aug. 12, 1952	......	1,000	I	72	132	D	100	1.3	C	......	150
23cc	Hb	.8	2,303.01	25.34	July 6, 1948	......	......	I	......	......	......	......	......	...	......	....
24dc	Hb	1.0	2,288.93	25.82	....do....	......	1,000	I	......	......	......	......	......	...	......	....
29cc	Tc	1.8	2,365.62	66.16	May 18, 1946	......	......	O	......	......	......	......	......	...	......	....
29dd	Ls	.0	2,354.26	53.28	May 18, 1948	......	......	O	......	......	......	......	......	...	......	....
33cc	Tc	1.8	2,352.77	53.38	May 25, 1948	......	......	O	......	......	......	......	......	...	......	....
34bc	Tc	.4	2,343.09	58.17	May 18, 1948	......	1,200	I	......	......	D	150	......	C	......	150
35ac	Hb	.5	......	53.40	Aug. 11, 1952	......	......	I	......	......	......	......	......	...	......	....
35bc	Hb	1.0	2,334.17	58.15	July 25, 1947	......	......	I	......	......	......	......	......	...	......	....
35cb	Hb	.5	......	50.28	Aug. 11, 1952	......	......	I	......	......	......	......	......	...	......	....
35da	Hb	.0	......	50.12	....do....	......	......	I	......	......	......	......	......	...	......	....

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
						Phelps County—Continued							
8-19-36bb	Central Nebraska Public Power & Irrigation District.	......	41.0	1	M	......	N	......	......	N	......	......	......
20-18dd	J. High Estate	......	140	4	M	......	Cy	......	......	W	......	Qp(?)	S, G
23dc	Central Nebraska Public Power & Irrigation District.	......	99.8	4	M	......	N	......	......	N	......	Qp(?)	S, G
26dc	.....do	1948	90.4	4	M	......	N	......	......	N	......	Qp(?)	......
28bc	E. J. Hanson	1906	153	4	M	......	Cy	......	......	W	......	Qp(?)	......
						Webster County							
1- 9- 5cc	G. E. Reed	1947	48	18	M	......	T	......	......	T	......	......	S, G
6ab	H. Reed	1936	......	36	W	......	C	......	......	T	......	......	S, G
6cd	......	......	63.0	5½	M	......	N	......	......	N	......	......	......
6db	W. Giger	1949	92	18	M	......	T	......	......	G	......	......	S, G
2- 9-24bc	R. Langer	......	......	......	......	......	C	......	......	......	......	......	S, G
24dc	.....do	......	......	......	......	......	T	......	......	G	......	......	S, G
31bc	E. Richards	1950	89	18	M	......	T	......	......	T	......	......	S, G
10- 4ac	C. C. Bennett	1906	58	5½	M	......	Cy	......	......	E	......	Qp	......
14bb	......	......	140.0	4	M	......	Cy	......	......	H	......	......	G
25cb	V. Kehl	1936	76	36	W	......	T	......	......	G	......	......	G

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point			Static water level		Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated		Available irrigable acres
	Description	Height above or below (-) land surface (feet)	Altitude above mean sea level (feet)	Depth below measuring point (feet)	Date of measurement									Principal	Other	
Phelps County—Continued																
8-19-36bb......	Tc	0.0	2,304.82	34.37	Nov. 18, 1947	...	...	O	...	...	...	...	...	...	...	...
20-18dd......	Tp	.0	2,436.19	106.92	June 30, 1948	...	...	D, S	...	...	...	...	...	...	...	...
23dc......	Tc	.6	2,390.03	75.79	May 18, 1948	...	...	O	...	...	...	...	...	...	...	...
26dc......	Tc	.6	2,391.22	65.45	May 25, 1948	...	...	O	...	...	...	...	...	...	...	...
28bc......	Hb	3.3	2,442.38	120.07	June 30, 1948	...	...	D	...	...	...	...	...	...	...	...
Webster County																
1- 9- 5cc......	...	...	...	11	Sept. 16, 1952	16	1,000	I	...	...	...	...	...	...	...	...
6ab......	Tp	1.0	...	19.00	Sept. 19, 1952	...	150	N	...	...	...	...	...	...	...	...
6cd......	Tc	1.5	...	49.53	Apr. 14, 1948	...	...	N	...	...	...	...	...	...	...	...
6db......	Hb	.0	...	68.38	Sept. 16, 1952	...	120	I	120	...	P	15	...	C	A	25
2- 9-24bc......	...	...	...	...	...	...	...	N	...	...	...	...	...	...	...	...
24dc......	Hb	.5	...	...	...	...	...	I	...	...	...	...	...	...	...	...
31bc......	Hb	.0	...	35.02	Sept. 16, 1952	17	1,000	I	...	...	...	...	...	...	...	...
10- 4ac......	...	...	...	47	May 5, 1949	...	...	D	...	...	...	...	...	...	...	...
14bb......	Tc	...	...	121.05	July 17, 1939	...	...	...	...	...	...	...	...	...	...	...
25cb......	Tp	.5	...	23.54	Sept. 16, 1952	16	1,000	I	...	...	...	...	...	...	...	...

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Owner or user	Year drilled	Depth of well (feet)	Diameter of casing (inches)	Type of casing	Length of screen (inches)	Type of pump	Column diameter (inches)	Number of stages	Type of power	Cost of fuel per acre-foot of water (dollars)	Aquifer: Geologic source	Aquifer: Type of material
	Webster County—Continued												
2-10-26da	D. C. Oberheide	1950	99	24	C		T			G			S, G
33cc			43.0	8	T		C			N			
36ba	D. C. Oberheide	1947	89	18	M		T			Ng			S, G
36dc	H. J. Somerhalder	1932	35.4	40	M		T						S, G
3-10-34cb	R. E. Adams	1931	39.5	5½	M		Cy			W			
11-18ba	J. Hanson	1934	212	2½	M		Cy			W		Qp(?)	
4-10-4dc1	Village of Blue Hill	1946	196	18	C		T			E		To	S, G
4dc2	do	1947	197	18	C		T			E		To	S, G
9db	do	1903	170	8	M		T			E		To	S, G
11-5bc	K. D. Urbauer	1947	179	18	M	40	T	8	2	P	2.99	Qp	S, G
6dc	A. O. Buschow						T					Qp	S, G
7ad	Eldon Davis	1948	178				T			P	2.60	Qp	S, G
18aa1	Village of Bladen	1912		6	M		Cy			E		Qp(?)	
18aa2	do	1930	155	8	M		T			E		Qp(?)	

Table 5.—*Record of wells and irrigation practices*—Continued

Well	Measuring point: Description	Measuring point: Height above or below (-) land surface (feet)	Measuring point: Altitude above mean sea level (feet)	Static water level: Depth below measuring point (feet)	Static water level: Date of measurement	Drawdown (feet)	Reported yield (gallons per minute)	Use of water	Use per year (hours)	Pumpage per year (acre-feet)	Method of distributing water	Average number of acres irrigated yearly	Consumptive use of water per acre (acre-feet)	Crops irrigated: Principal	Crops irrigated: Other	Available irrigable acres
Webster County—Continued																
2-10-26da	Hb	0.0		27.51	Sept. 16, 1952	12	1,000	I								
33cc	Tc	1.5	1,701.31	33.08	Dec. 13, 1949			N								
36ba	Hb	.5		28.90	Sept. 16, 1952	28	1,000	I								
36dc	Tp	.0		25.08	Oct. 2, 1934	7½	300	I								
3-10-34cb	Tp	.5		35.98	do			N								
11-18ba								D, S								
4-10-4dc1				90	Sept. 17, 1952		75	P								
4dc2				80	do		150	P								
9db				80	do		50	P								
11-5bc	Hb	.0		82.88	Oct. 13, 1952	13	1,000	I	720	132	P	131	1.0	C	A	150
6dc								I								
7ad	Hb	1.0		87.28	Sept. 17, 1952		1,000	I	288	53	D	75	.7	C		75
18aa1								P								
18aa2				85	June 10, 1948		200	P								

[a] Well pumped recently.
[b] Nearby well pumped recently.

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