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**Open-File Report 65-UR**

**GROUND-WATER STUDY FOR THE TM RURAL WATER DISTRICT  
IN THE VICINITIES OF DOLTON AND PARKER, SOUTH DAKOTA**

**by**

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# CONTENTS

	Page
<b>INTRODUCTION</b> .....	1
<b>ACKNOWLEDGEMENTS</b> .....	1
<b>INVESTIGATION OF THE PARKER AREA</b> .....	3
<b>INVESTIGATION OF THE DOLTON AREA</b> .....	3
Geology .....	4
Glacial drift .....	4
Bedrock .....	4
Glacial aquifers .....	4
Surface outwash .....	5
Intermediate outwash .....	6
Basal outwash .....	8
Bedrock aquifers .....	8
Niobrara Formation .....	8
Dakota Formation .....	9
Sioux Quartzite wash .....	9
Sioux Quartzite .....	9
<b>SUMMARY AND CONCLUSIONS</b> .....	9
Parker area .....	9
Dolton area .....	10
<b>REFERENCES</b> .....	10

## FIGURES

1. Locations of study areas .....	2
-----------------------------------	---

Figures -- continued

Page

2. Map showing locations of test holes and observations wells drilled for this investigation (Parker area) and the saturated thickness of the Parker-Centerville outwash .....	Following	4
3. Map showing locations of test holes and wells drilled for this investigation (Dolton area), aquifer-test sites, lines of cross section and their data points, and surface geology .....	Following	4
4. Cross section A-A' .....	Following	4
5. Cross section B-B' .....	Following	4
6. Geology and configuration of the bedrock surface .....	Following	4
7. Areal extent and thickness of the Dolton aquifer .....	Following	6
8. Dissolved-solids concentrations in the Dolton aquifer, 1983-1984 .....	Following	6
9. Sulfate concentrations in the Dolton aquifer, 1983-1984 .....	Following	6
10. Hardness concentrations in the Dolton aquifer, 1983-1984 .....	Following	6
11. Potentiometric surface of the Dolton aquifer, October 12-November 4, 1983 .....	Following	6
12. Potentiometric surface of the Dolton aquifer, October 11, 1985 .....	Following	6
13. Water-level declines in the Dolton aquifer and locations of rural water production wells .....	Following	6
14. Areal extent and thickness of the basal-outwash aquifer .....	Following	8

**TABLES**

1. Bedrock geologic units .....	5
2. Summary of transmissivity and storativity for the Dolton aquifer .....	7
3. Summary of specific capacity for the Dolton aquifer .....	7

## APPENDICES

A. Logs of test holes and wells .....	12
B. Water-chemistry data ..... Following	56
C. Drawdown and recovery data for aquifer test 1 .....	57
D. Drawdown and recovery data for aquifer test 2 .....	93
E. Drawdown and recovery data for aquifer test 3 .....	103

## INTRODUCTION

The purpose of this study was to locate a suitable ground water supply, in terms of quantity and quality of ground water, for the TM Rural Water District (TMRWD), Parker, South Dakota. The TMRWD was organized in 1982 and serves portions of McCook and Turner Counties in South Dakota. The scope of work included conducting a well inventory, compiling existing data, drilling test holes, installing observation wells, sampling and chemical analysis of ground water, conducting aquifer tests, and surveying elevations of the observation wells.

The majority of the field work for this investigation occurred in 1983 and 1984 when the drilling, aquifer testing, and water sampling were completed. Available water level information for the period from 1979-1986 was also used in this report. The interpretations presented herein reflect the data available during those times. Additional hydrogeologic data have been collected since 1986 and are kept on file at the South Dakota Geological Survey (SDGS), Department of Environment and Natural Resources, Vermillion, South Dakota.

A surface outwash (Parker-Centerville aquifer) associated with the Vermillion River valley in the Parker area was initially considered by the TMRWD as the prime candidate for the source of ground water to supply the system (Holman, 1982). The Dolton area, however, was found by the TMRWD to be more attractive from a geographic viewpoint for two reasons. First, it represented the approximate center of the proposed service area and secondly, the area is topographically higher than the Parker-Centerville aquifer area, effectively reducing the pumping-head requirement for the system. Several members of the TMRWD Board of Directors were aware of domestic wells in the Dolton area that were reported to produce good quality water. Also, the well field for the Hanson Rural Water System was located northwest of Dolton but the areal extent of the aquifer was not known. Therefore, the TMRWD Board of Directors requested that the SDGS conduct a hydrogeologic investigation in the Dolton and Parker areas (fig. 1) with an emphasis placed on investigative efforts in the Dolton area. The study was financed by the TMRWD and SDGS.

A summary of results derived from initial drilling, well installation, water sampling, and aquifer testing was presented orally to the TMRWD Board of Directors on February 7, 1984, and was presented in writing to the board chairman in a letter dated February 16, 1984. Subsequent to this, additional drilling and well installation were performed from April through August of 1984 by the TMRWD. Two additional aquifer tests were conducted jointly by the SDGS and TMRWD in July and August of 1984. Additional sampling and analysis of water samples and measurement of water levels were also performed by SDGS.

## ACKNOWLEDGEMENTS

Many individuals provided valuable assistance during the course of the investigation. Thanks are expressed to the TMRWD Board of Directors, particularly Tom Kramer and Virgil Christensen for their knowledge of the area and logistic support. Dave Holman and Dave Kunath of DeWild Grant Reckert and Associates, Rock Rapids, Iowa, provided valuable assistance during the completion of the study. Thanks are also expressed to the people of the study area who afforded their kindness and cooperation throughout the investigation.

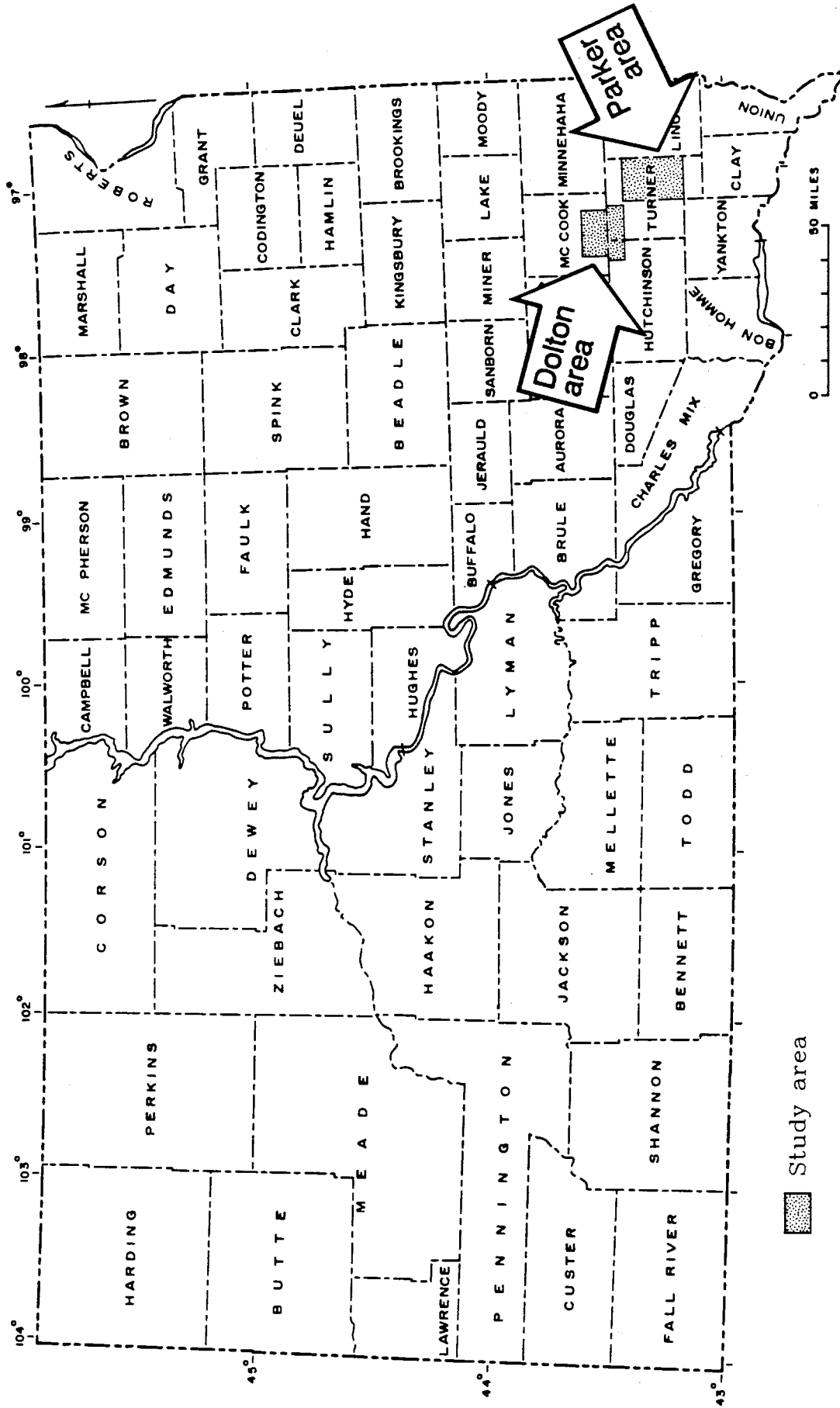


Figure 1. Locations of study areas.

## INVESTIGATION OF THE PARKER AREA

The geologic unit of interest in the Parker area was a sand and gravel unit (outwash) which occurs at or very near the land surface in the Vermillion River valley. Where saturated, this outwash unit is named the Parker-Centerville aquifer (Hedges and others, 1982). For more information on the geology and occurrence of ground water in the Parker-Centerville aquifer, the reader is referred to Tipton (1957) and Lindgren and Hansen (1990).

The SDGS drilled 19 test holes and completed 17 of them as observation wells as part of the investigation of the Parker area (fig. 2 and app. A). The SDGS collected and analyzed 12 water samples from wells in this area. The results of analyses of these water samples are presented in the portion of appendix B labeled the "Parker-Centerville (outwash) aquifer."

Data gathered during this portion of the study showed the saturated sand and gravel to range in thickness from 7 to 42 feet (fig. 2) with an average of 24 feet. The aquifer is primarily unconfined and the average depth to water from land surface was about 8 feet.

According to analyses presented in appendix B, ground water in this aquifer has an average dissolved solids concentration of 766 milligrams per liter (mg/L), an average sulfate concentration of 334 mg/L and an average hardness of 502 mg/L. Iron was found to range from <0.05 to 1.42 mg/L and manganese was found to range from <0.05 to 0.63 mg/L. Of the parameters analyzed for, only nitrate was found to exceed the limit (10 mg/L) set forth in the National Interim Primary Drinking Water Regulations (U.S. Environmental Protection Agency, 1985a). However, nitrate was found to be above the limit of 10 mg/L in only 2 of the 12 samples analyzed.

## INVESTIGATION OF THE DOLTON AREA

Prior to commencement of a drilling program in the Dolton area, a total of 82 wells were inventoried within the general area of study. Fifty-one of these wells were inventoried by DeWild Grant Reckert and Associates, an engineering firm employed by the TMRWD, and the remainder were inventoried by the SDGS. Existing test hole and well data were compiled from McMeen (1964), Cripe and Barari (1977), Barari (1979), Holly and others (in preparation) and from other logs on file at the SDGS.

The SDGS drilled 29 test holes in the Dolton area and completed 18 of them as observation wells as part of this investigation. The TMRWD drilled 15 test holes in which they installed 7 observation wells and 3 production wells. Drilling conducted by the SDGS was performed during 1983. Additional drilling was conducted in 1983 by Layne Western Company and in 1984 by Huron Drilling, Inc. under contract with the TMRWD. Logs of these test holes and wells are presented in appendix A. The SDGS collected and analyzed 27 water samples from wells in the Dolton area. The results of analyses of these water samples are presented appendix B.

Three aquifer tests (pumping and recovery) were conducted to evaluate hydrogeologic properties: one in 1983 and two in 1984. Data from these tests are presented in appendices C, D, and E.

## Geology

The major geologic units underlying the Dolton area are glacial drift and bedrock. Glacial drift occurs at land surface and bedrock underlies the glacial drift. A minor alluvial deposit associated with the West Fork of the Vermillion River overlies the glacial drift. The surface geology of the Dolton area is shown on figure 3. The lateral and vertical distribution of the geologic units are shown on cross sections A-A' and B-B' (figs. 4 and 5).

### Glacial Drift

The glacial drift in the study area consists of till and outwash. Till in the study area consists predominantly of an unweathered gray clay containing varying amounts of other clasts ranging in size from silt to boulders. The upper portion of the till was found to have weathered to a yellow-brown color to an average depth of 22 feet (ranges from 9 to 47 feet).

Outwash in the study area consists mainly of sand and gravel with minor amounts of silt and clay. As shown on figure 4, outwash is present on, within, and under the till. For illustrative purposes on figure 3 a surface-outwash unit, which will be discussed below, has been grouped together with the alluvium because no detailed geologic map of the area was available to allow an accurate portrayal of the positions of the separate units.

### Bedrock

Bedrock underlies the glacial drift. The geology and configuration of the bedrock surface are shown on figure 6. The bedrock formations present in the Dolton area, listed in descending order, from youngest to oldest, are shown in table 1. All of the bedrock units are Cretaceous in age with the exceptions of the Sioux Quartzite wash which is thought to be pre-Cretaceous and Sioux Quartzite which is Precambrian.

A bedrock valley is shown to extend from the northwest to the south through the study area (fig. 6). A large portion of the bedrock surface consists of the Niobrara Formation, although the formation is absent in the central part of the study area which roughly coincides with the bedrock valley just mentioned. The remaining portion of the bedrock surface probably consists predominantly of Sioux Quartzite although other bedrock units (Carlisle Shale, Greenhorn Limestone, Graneros Shale, Dakota Formation, and the Sioux Quartzite wash) are interpreted to subcrop along at least part of the east side of the bedrock valley as indicated on figure 4. However, because little is known about the positions of these other bedrock units along the valley, they could not be included as separate units on figure 6.

### Glacial Aquifers

The glacial aquifers in the Dolton area are comprised of outwash bodies. One outwash body occurring generally on the till (surface outwash), one outwash body occurring primarily within the till (intermediate outwash), and one outwash body occurring at or near the base of the till (basal outwash) will be addressed in this report.



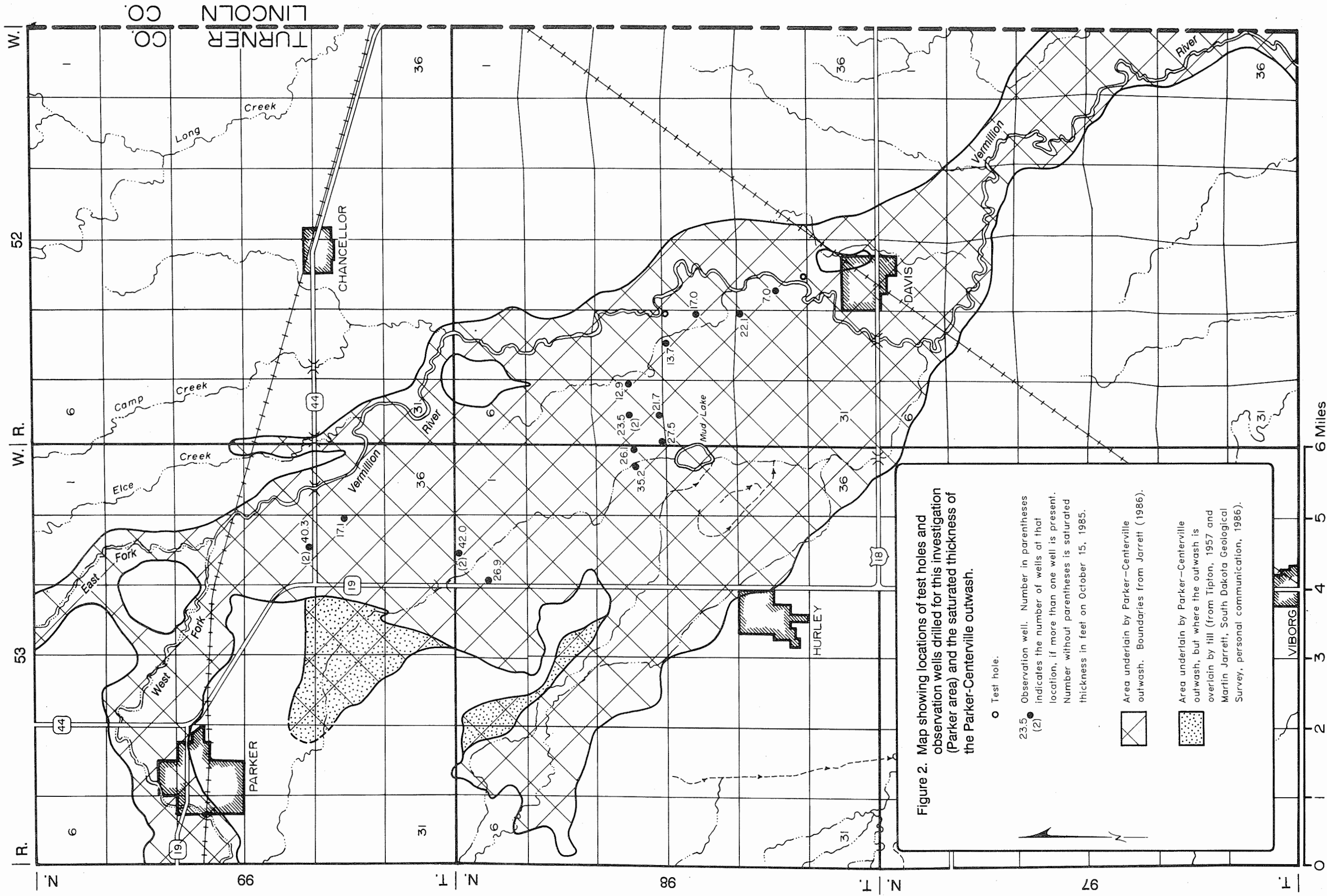




Figure 2. Map showing locations of test holes and observation wells drilled for this investigation (Parker area) and the saturated thickness of the Parker-Centerville outwash.

- Test hole.
- 23.5(2) Observation well. Number in parentheses indicates the number of wells at that location, if more than one well is present. Number without parentheses is saturated thickness in feet on October 15, 1985.
-  Area underlain by Parker-Centerville outwash. Boundaries from Jarrett (1986).
-  Area underlain by Parker-Centerville outwash, but where the outwash is overlain by till (from Tipton, 1957 and Martin Jarrett, South Dakota Geological Survey, personal communication, 1986).

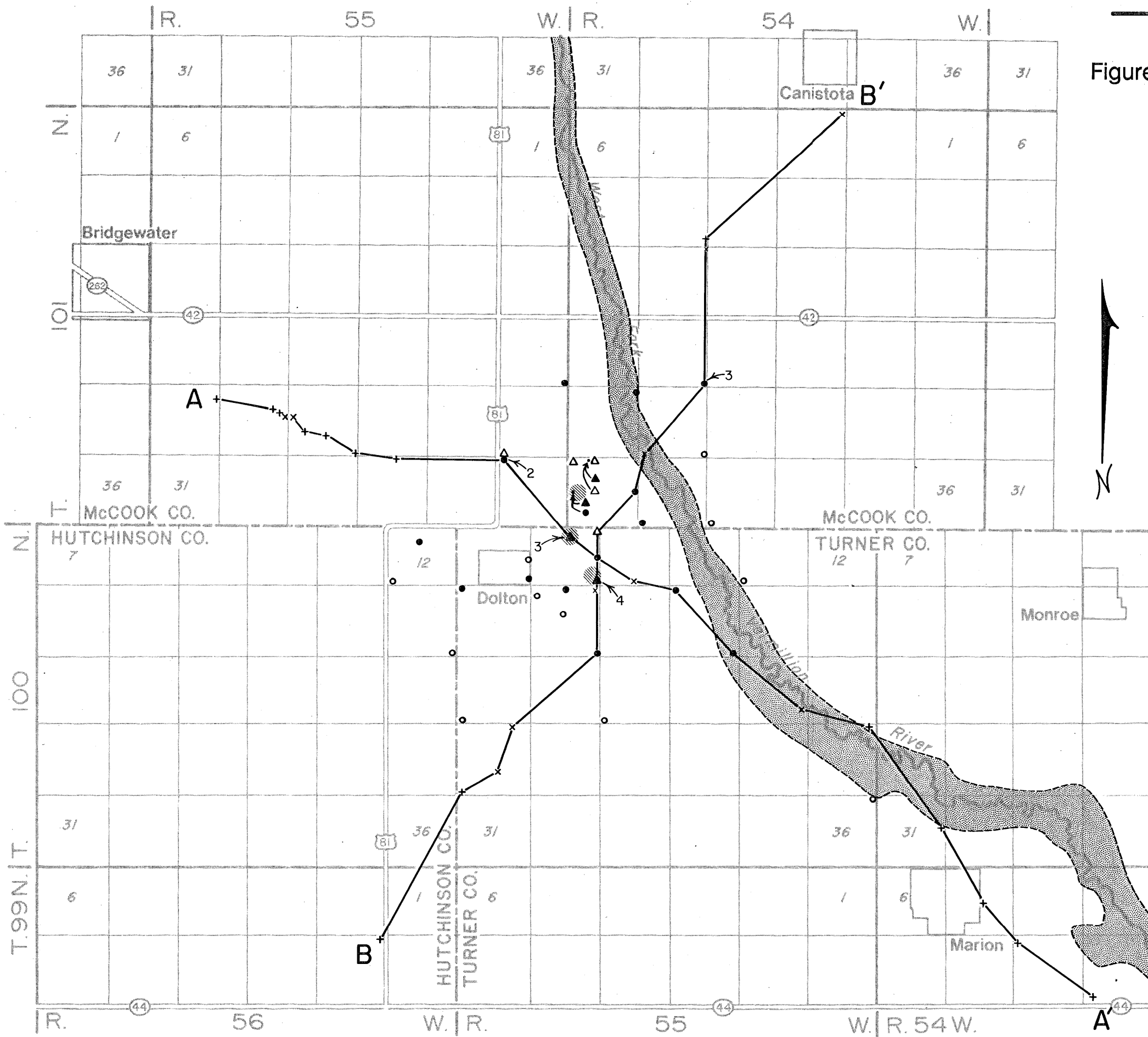


Figure 3. Map showing locations of test holes and wells drilled for this investigation (Dolton area), aquifer-test sites, lines of cross section and their data points, and surface geology.

Drilled by the SD Geological Survey:

- Test hole.
- Observation well. Number indicates more than one well at a location.

Drilled by a private company:

- △ Test hole.
- ▲ Well. Number indicates more than one well at a location.

■ Alluvium and outwash (Vermillion West Fork aquifer).

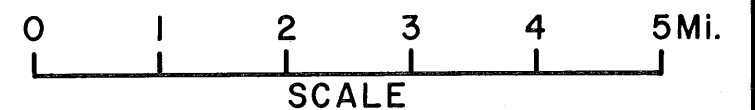
□ Till.

- - - Approximate geologic boundary.

● Aquifer-test site.

B'-B Line of cross section with data points. Symbols "+" (test hole) and "x" (well) are data not from this investigation.

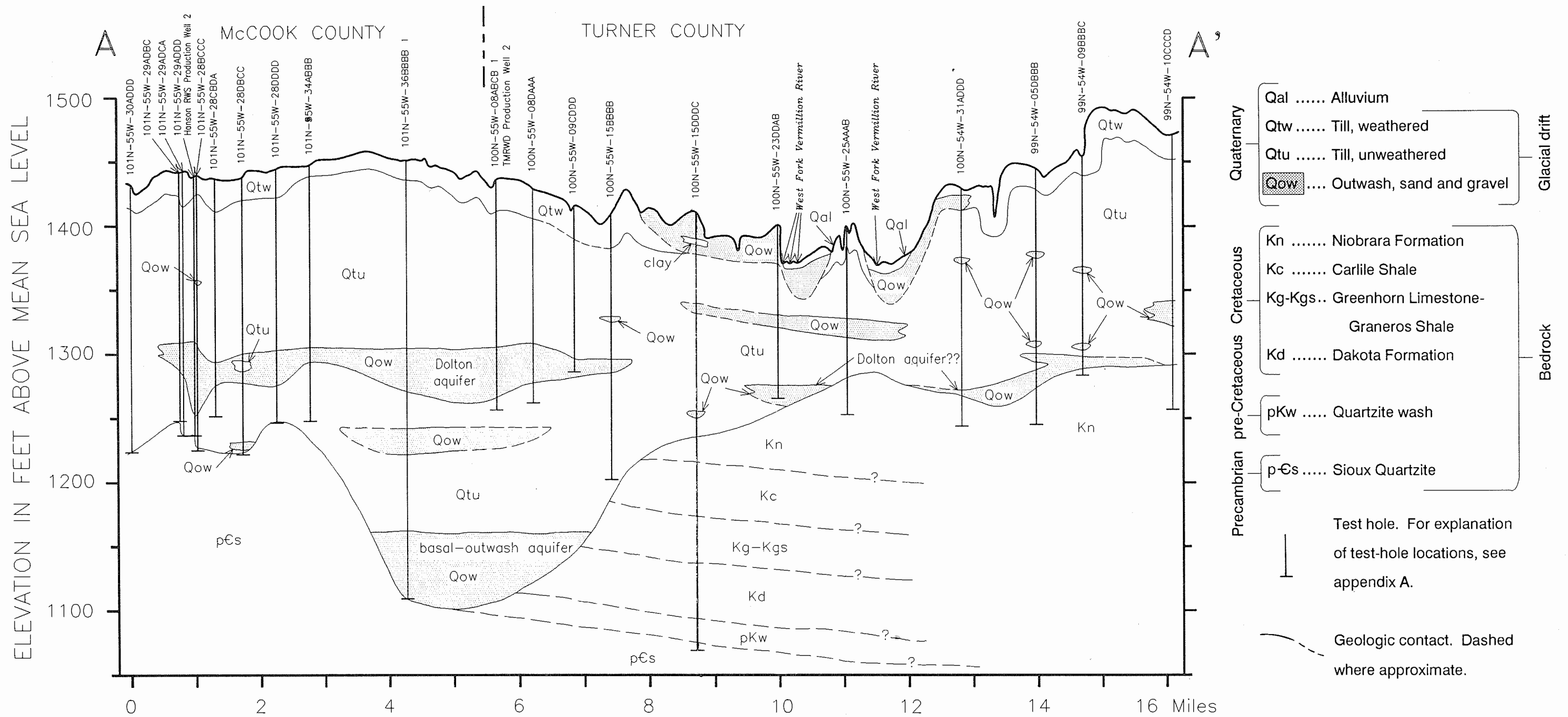
Surface geology modified from Flint (1955) and McMeen (1964).



# Figure 4. Cross section A - A'.

For location of cross section, see figure 3.

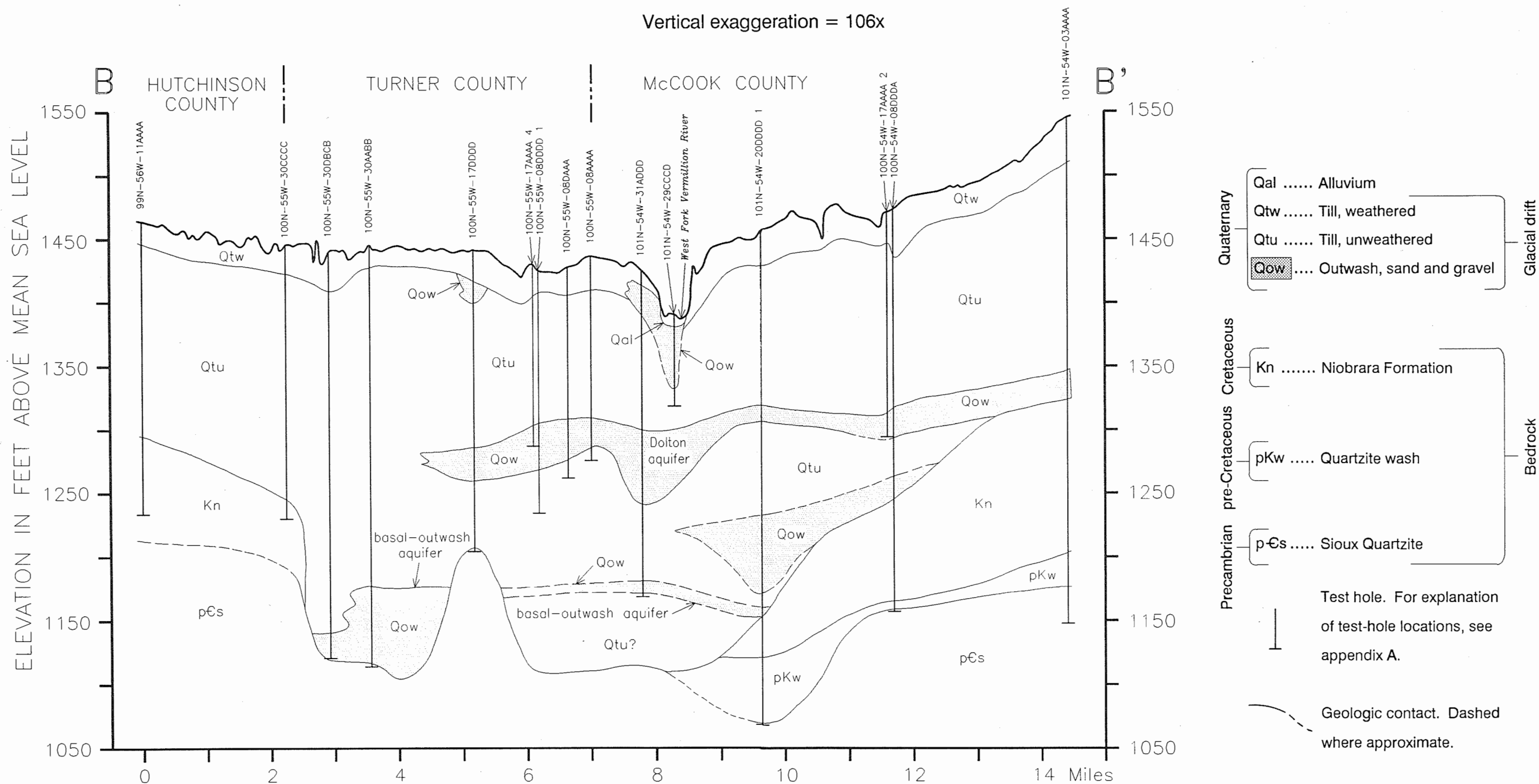
Vertical exaggeration = 106x

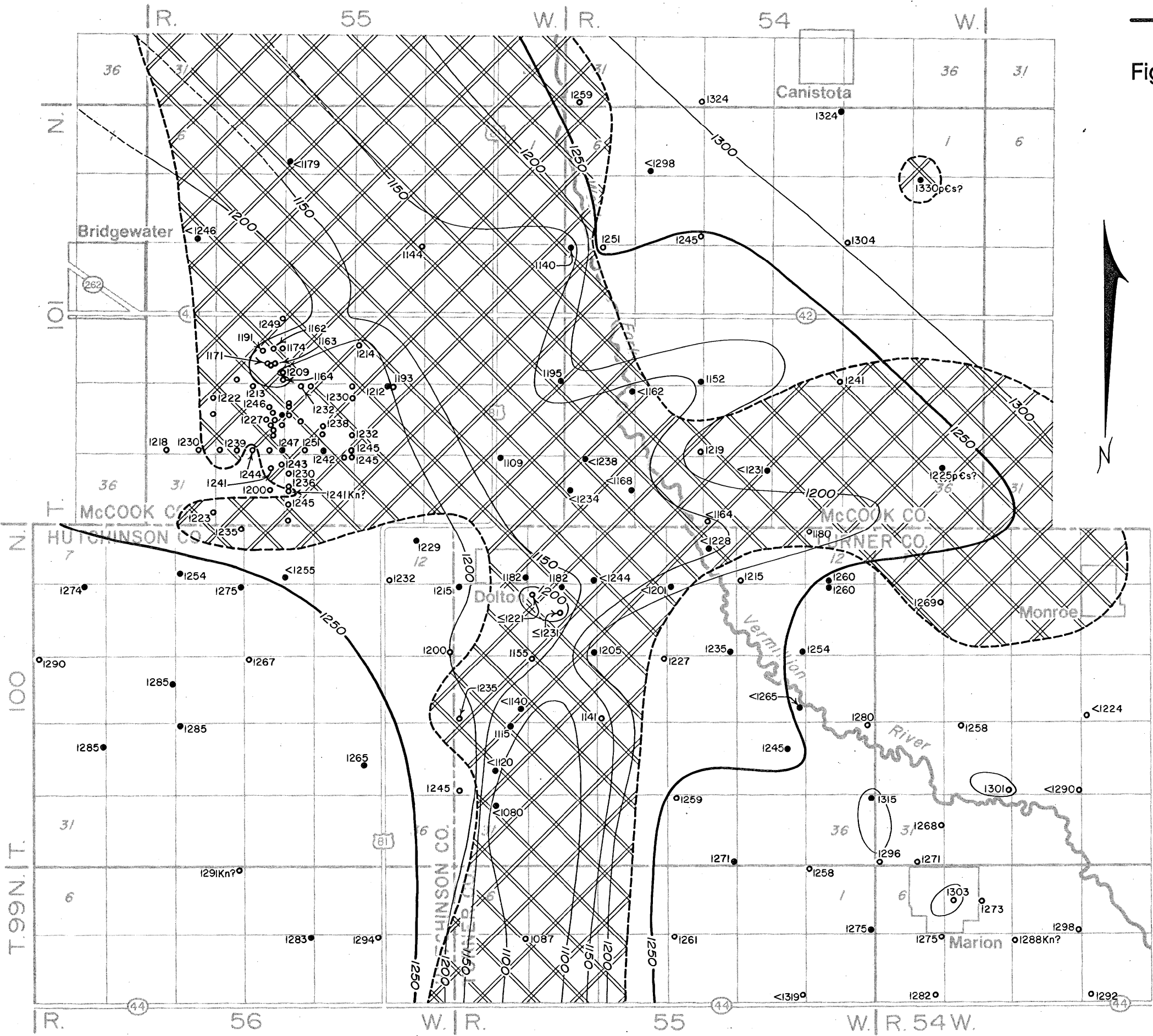


# Figure 5. Cross section B - B'.

For location of cross section, see figure 3.

Vertical exaggaration = 106x





**Figure 6. Geology and configuration of the bedrock surface.**

Number is elevation of bedrock surface in feet above mean sea level. Due to the high density of data points in sections 20, 28 and 29, T. 101 N., R. 55 W., all elevations are not shown. A "less than" symbol (<) indicates bedrock elevation is less than number shown. A "less than or equal to" symbol (≤) indicates bedrock elevation is less than or equal to the number shown.

- Test hole.
- Well.

□ Area where the Niobrara Formation (Kn) was the first bedrock encountered unless otherwise noted.

▨ Area where the Sioux Quartzite (pCs) was the first bedrock encountered unless otherwise noted.

— Contour line connecting points of equal elevation on the bedrock surface. Contour interval = 50 feet.

--- Approximate boundary between the Niobrara Formation and the Sioux Quartzite. The first bedrock in some of the area indicated to be Sioux Quartzite may be Carlile Shale, Greenhorn Limestone, Graneros Shale, Dakota Formation, or quartzite wash. Because little is known about the positions of these other bedrock units along what is shown to be the approximate Kn-pCs boundary they could not be included as separate units on this figure (see text and cross section A-A' for further explanation).



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**Table 1. Bedrock geologic units**

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<b>GEOLOGIC UNIT</b>	<b>AGE</b>	<b>DESCRIPTION</b>
Niobrara Formation	Cretaceous	Chalk, white to black
Carlile Shale	Cretaceous	shale, dark gray, noncalcareous
Greenhorn Limestone	Cretaceous	limestone and calcareous shale, dark gray
Graneros Shale	Cretaceous	shale, medium gray, noncalcareous
Dakota Formation	Cretaceous	sand and sandstone, light gray, fine to medium quartz sand; commonly contains shale layers
Sioux Quartzite wash	pre-Cretaceous	sand and sandstone, pink, fine to coarse quartz sand
Sioux Quartzite	Precambrian	quartzite, pink to red

---

Only the intermediate and basal outwash units discussed herein have been defined as a result of this investigation. Delineation of the surface outwash and alluvium was completed by McMeen (1964), Hedges and others (1982), and Jarrett (1986). Although many of the test holes drilled in the area encountered sand and gravel, some of which was similar in elevation to the intermediate and basal outwash units, not all test holes were interpreted to have sand and gravel belonging to these intermediate and basal outwash units. The extents of only the intermediate and basal outwash units, other than the surface unit, could be confidently delineated with the available data.

#### Surface Outwash

The outwash body occurring on the till is associated with the West Fork of the Vermillion River (figs. 3, 4, and 5). Where saturated, this surface-outwash body is called the Vermillion West Fork aquifer (Hedges and others, 1982). Alluvium along the Vermillion River valley is included as part of this aquifer because (1) the two units are in direct contact with one another, (2) of the nearly same geographic location of surface outwash and the alluvium, and (3) they act, generally speaking, as one hydrologic unit. According to McMeen (1964), the aquifer consists mostly of very fine sand with silt and interbedded clays and averages over 60 feet in thickness. However, McMeen concluded that, in this area, this aquifer was too fine grained to be considered as a source of ground water for the city of Marion (i.e., the aquifer was not suitable for high-capacity wells).

Only one observation well in the Dolton area is completed in this aquifer. A water sample from this well shows a dissolved-solids concentration of 2,578 mg/L (app. B). It is not known whether this water quality is representative of the aquifer in this area since much better water

quality would be anticipated from such a shallow, surficial aquifer. Little effort was put forth in investigating this aquifer because of McMeen's findings and because of the desire of the TMRWD to concentrate on a buried glacial aquifer in the Dolton area.

### Intermediate Outwash

An outwash body which is contained primarily within the till has been defined in the Dolton area and is herein given the informal name of the Dolton aquifer (figs. 4, 5 and 7). It is under confined conditions and is the most widely used aquifer in the area. The thickness of the Dolton aquifer is highly variable and was found to be as much as 59 feet (fig. 7).

There are a number of data points in the vicinity of Marion and Monroe which show sand and gravel (outwash) at elevations similar to those near the town of Dolton. Some of this outwash near Marion and Monroe has been tentatively included as part of the Dolton aquifer (fig. 7). This tentative correlation has been made without water-level and water-chemistry data to substantiate such an interpretation. Also, this sand and gravel in the vicinity of Marion and Monroe is in a basal position, between the till and underlying bedrock, rather than in an intermediate position (fig. 4).

Water quality varies markedly within the Dolton aquifer, ranging from 562 to 3,198 mg/L in dissolved solids (fig. 8) and averages 1,111 mg/L. A portion of the aquifer near the town of Dolton contains the lowest concentrations of dissolved solids. The parameters of sulfate and hardness show patterns similar to that of dissolved solids (figs. 9 and 10).

Water levels (potentiometric surface) in the Dolton aquifer for October-November 1983 and October 1985 are shown in figures 11 and 12, respectively. Figure 11 indicates that the potential for ground-water movement in the aquifer was generally to the southwest or south during a portion of October and November, 1983. The closed 1,370-foot contour in T. 101 N., R. 55 W. indicates at least part of the impact of ground-water withdrawal by the Hanson Rural Water System which began distributing water in July of 1982. Figure 12 shows the effect on water levels on October 11, 1985, due to continued water withdrawal by the Hanson Rural Water System with the addition of withdrawals by the TMRWD to the east and northeast of the town of Dolton. The TMRWD began distributing water in July of 1985.

A comparison of figures 11 and 12 shows that water levels throughout the aquifer had declined between the two times represented on the figures. Figure 13 shows recorded water level declines in the Dolton aquifer through May 1986. This map indicates that the decline of water level is not restricted to the Hanson Rural Water System and TMRWD well-field areas. The water-level decline is occurring in the entire known extent of the aquifer. This indicates that the water withdrawal exceeds the recharge rate for the aquifer.

A total of three aquifer tests were conducted on the Dolton aquifer during the siting of the production wells for the TMRWD. See figure 3 for locations of the three aquifer-test sites. Both pumping and recovery tests were performed and a summary of the calculated aquifer parameters is shown on tables 2 and 3. Drawdown and recovery data for the individual tests are presented in appendices C, D, and E. The average transmissivity (Theis analytical method), storativity (Theis analytical method), and specific-capacity values from the three tests were about 46,000 gallons per

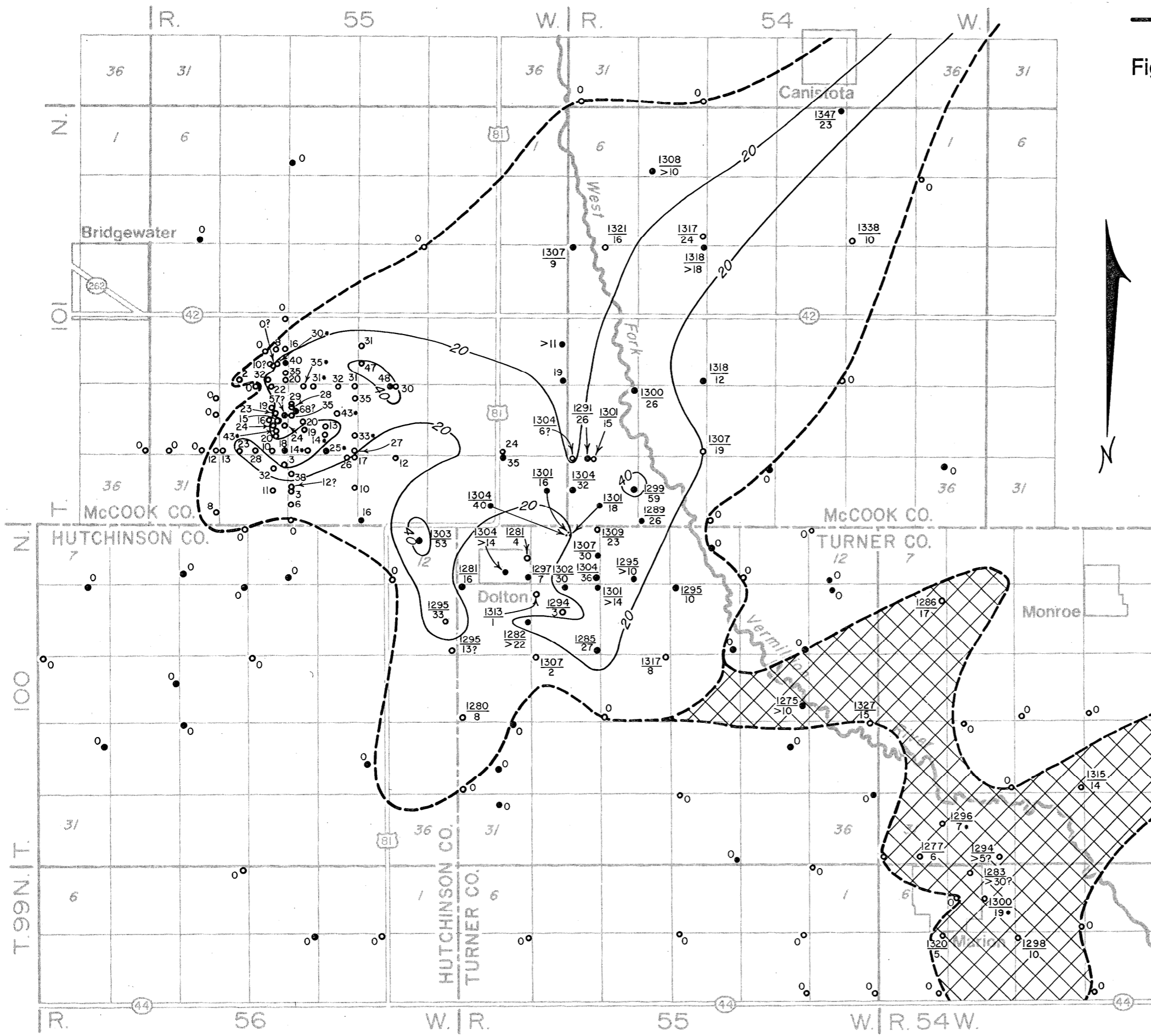
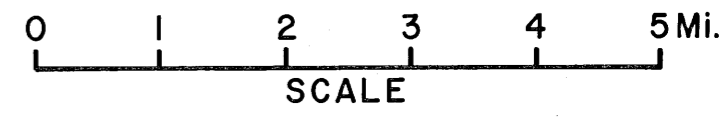


Figure 7. Areal extent and thickness of the Dolton aquifer.

- Test hole.
- Well.

Upper number is elevation of aquifer top, in feet above mean sea level. Lower number is thickness, in feet. A "greater than" symbol (>) indicates entire aquifer thickness was not penetrated. An asterisk (\*) indicates a composite aquifer thickness. Due to the high density of data points in the southwest portion of T. 101 N., R. 55 W., some elevations are not shown. Data points labeled with a number "0" indicate areas where the Dolton aquifer was not found.

- Contour line connecting points of equal saturated thickness. Contour interval = 20 feet.
- - - Approximate aquifer boundary.
- ▣ Area which is tentatively considered part of the Dolton aquifer.





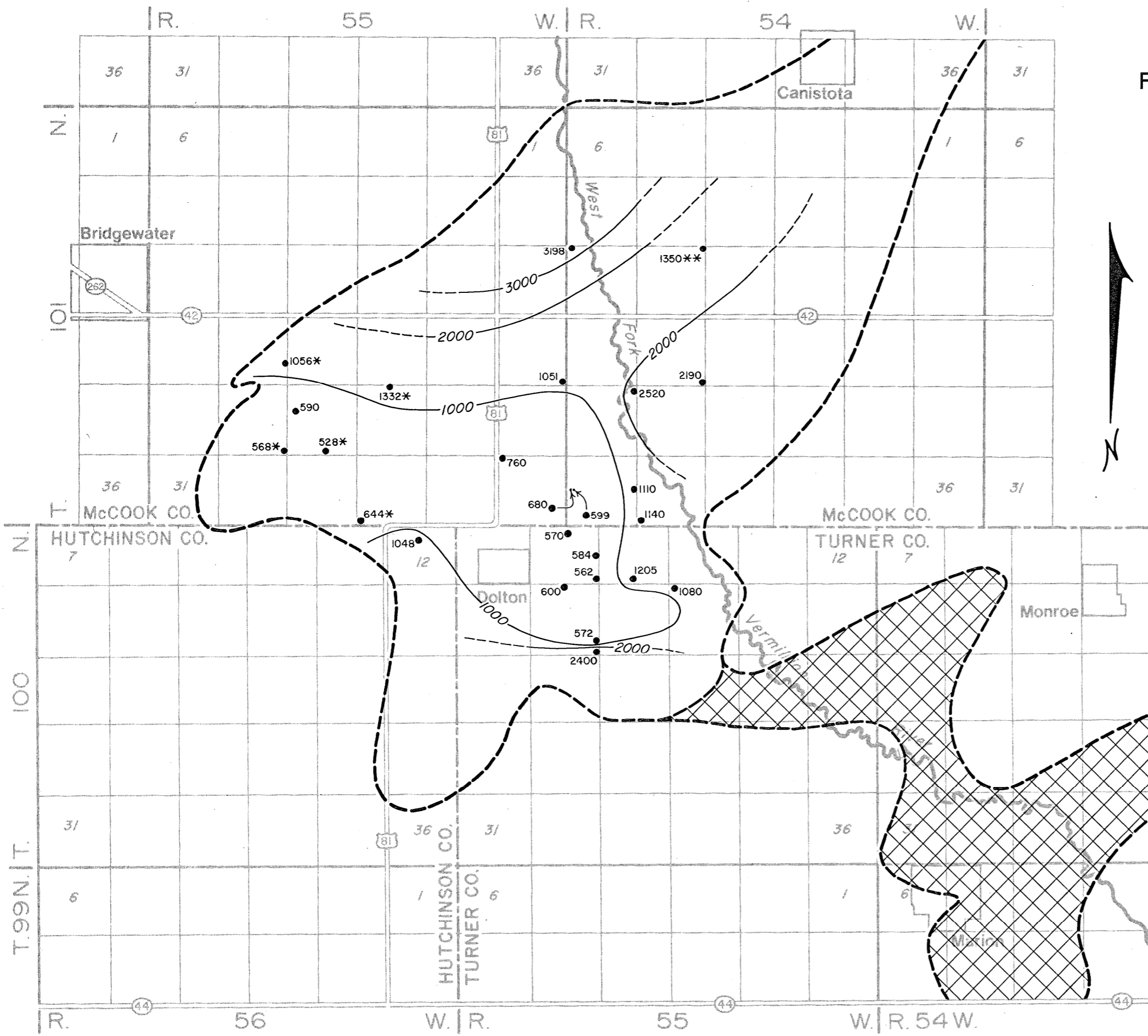


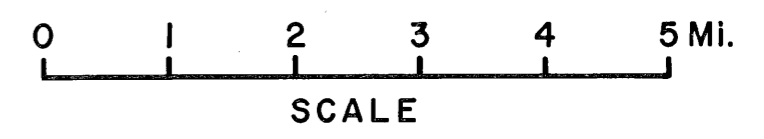
Figure 8. Dissolved-solids concentrations in the Dolton aquifer, 1983-1984.

1350\*\* • Well. Number is dissolved solids concentration in parts per million (milligrams per liter). See appendix B for complete analysis. An asterisk (\*) indicates analytical results from 1979-1980. A double asterisk (\*\*) indicates number was estimated from electrical conductivity.

Line connecting points of equal dissolved solids concentration. Contour interval = 1,000.

Approximate aquifer boundary.

Area which is tentatively considered part of the Dolton aquifer.



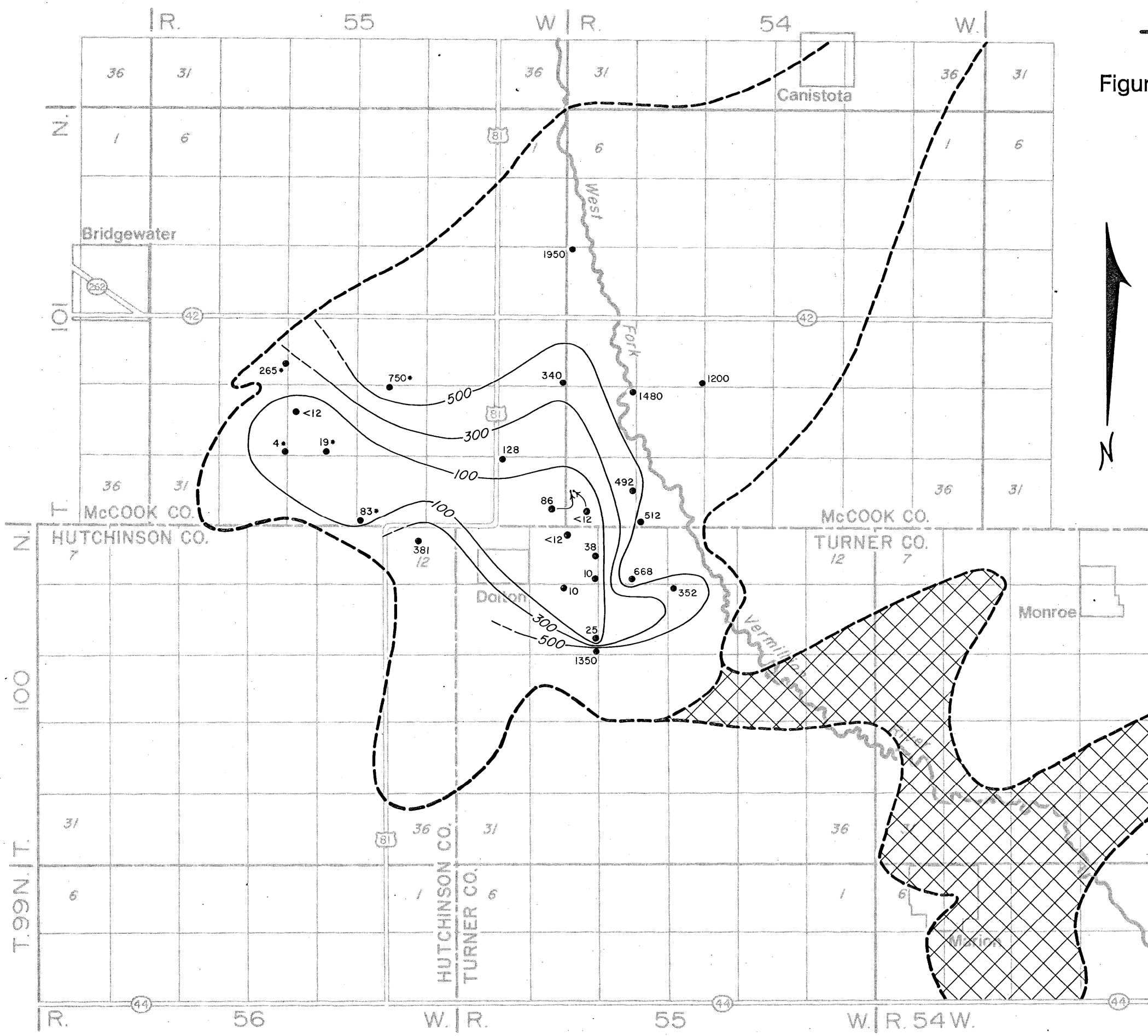


Figure 9. Sulfate concentrations in the Dolton aquifer, 1983-1984.

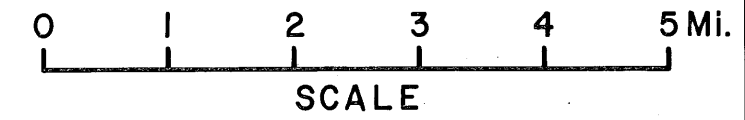
● Well. Number is sulfate concentration in parts per million (milligrams per liter). See appendix B for complete analysis. An asterisk (\*) indicates analytical results from 1979-1980.

— Line connecting points of equal sulfate concentration. Dashed where approximate. Ranges delineated:

- <100
- 100-300
- 300-500
- >500

- - - Approximate aquifer boundary.

▨ Area which is tentatively considered part of the Dolton aquifer.



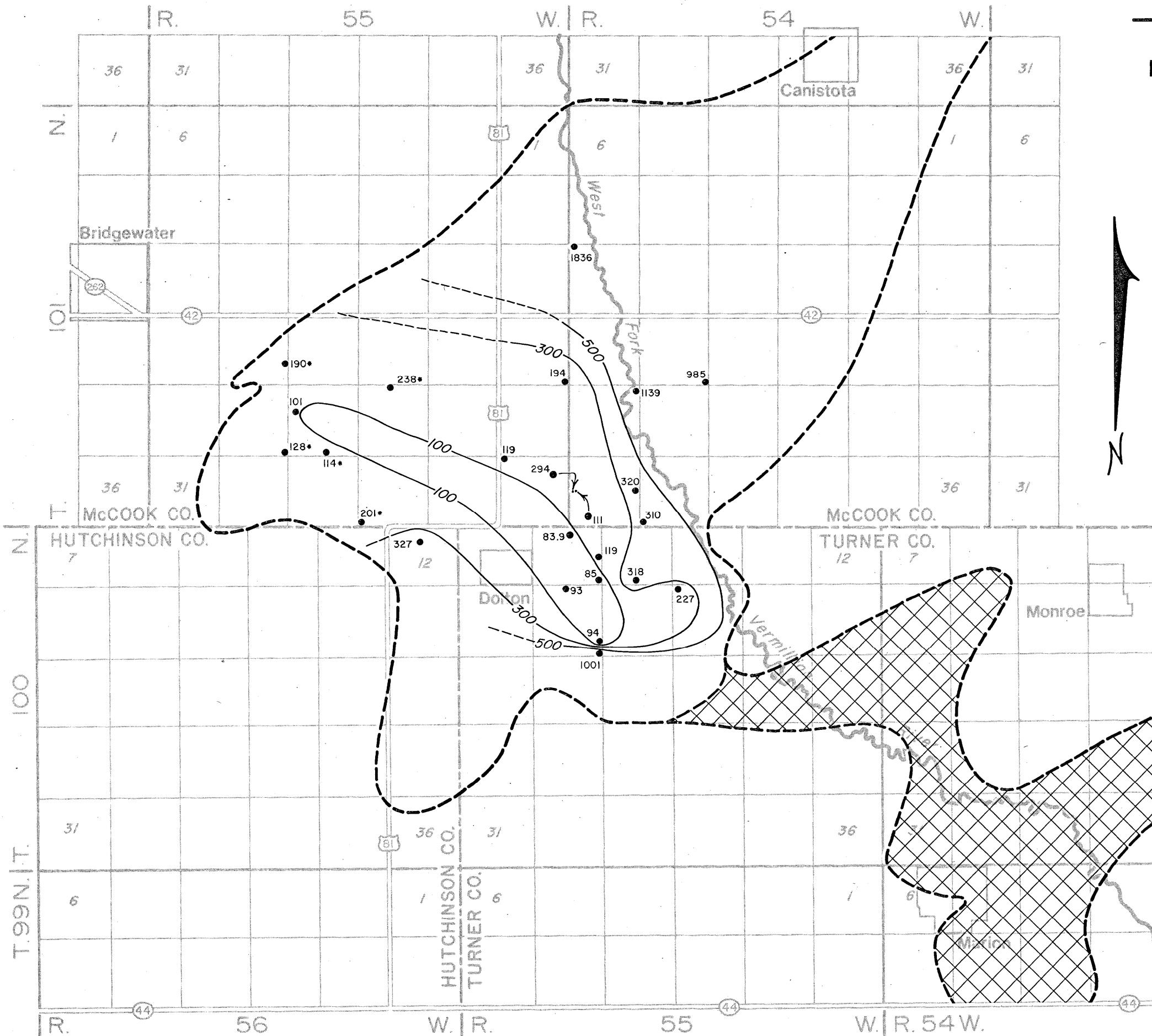


Figure 10. Hardness concentrations in the Dolton aquifer, 1983-1984.

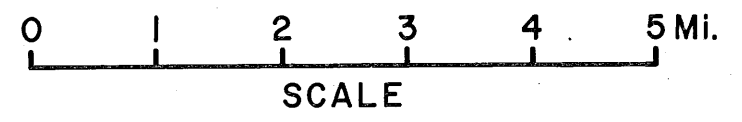
● Well. Number is hardness concentration (as CaCO<sub>3</sub>) in parts per million (milligrams per liter). See appendix B for complete analysis. An asterisk (\*) indicates analytical results from 1979-1980.

Line connecting points of equal hardness concentration. Dashed where approximate. Ranges delineated:

- <100
- 100-300
- 300-500
- >500

--- Approximate aquifer boundary.

▣ Area which is tentatively considered part of the Dolton aquifer.



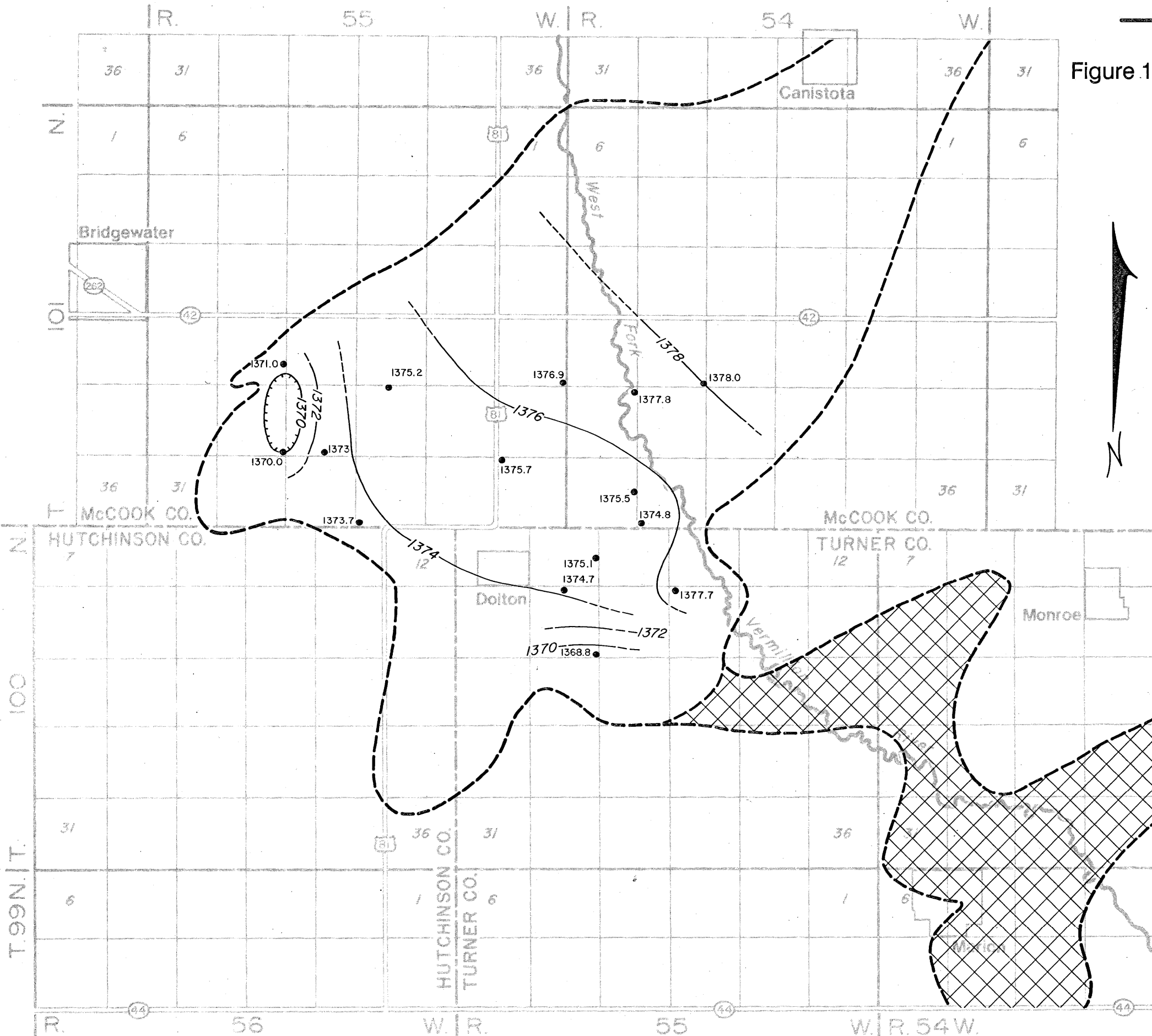


Figure 11. Potentiometric surface of the Dolton aquifer, October 12-November 4, 1983.

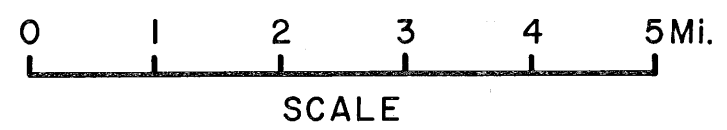
1376.9 • Observation well. Number is elevation of potentiometric surface in feet above mean sea level. Values that include a decimal point were measured from surveyed casing tops; otherwise, ground elevations were estimated from USGS 7.5 minute topographic maps.

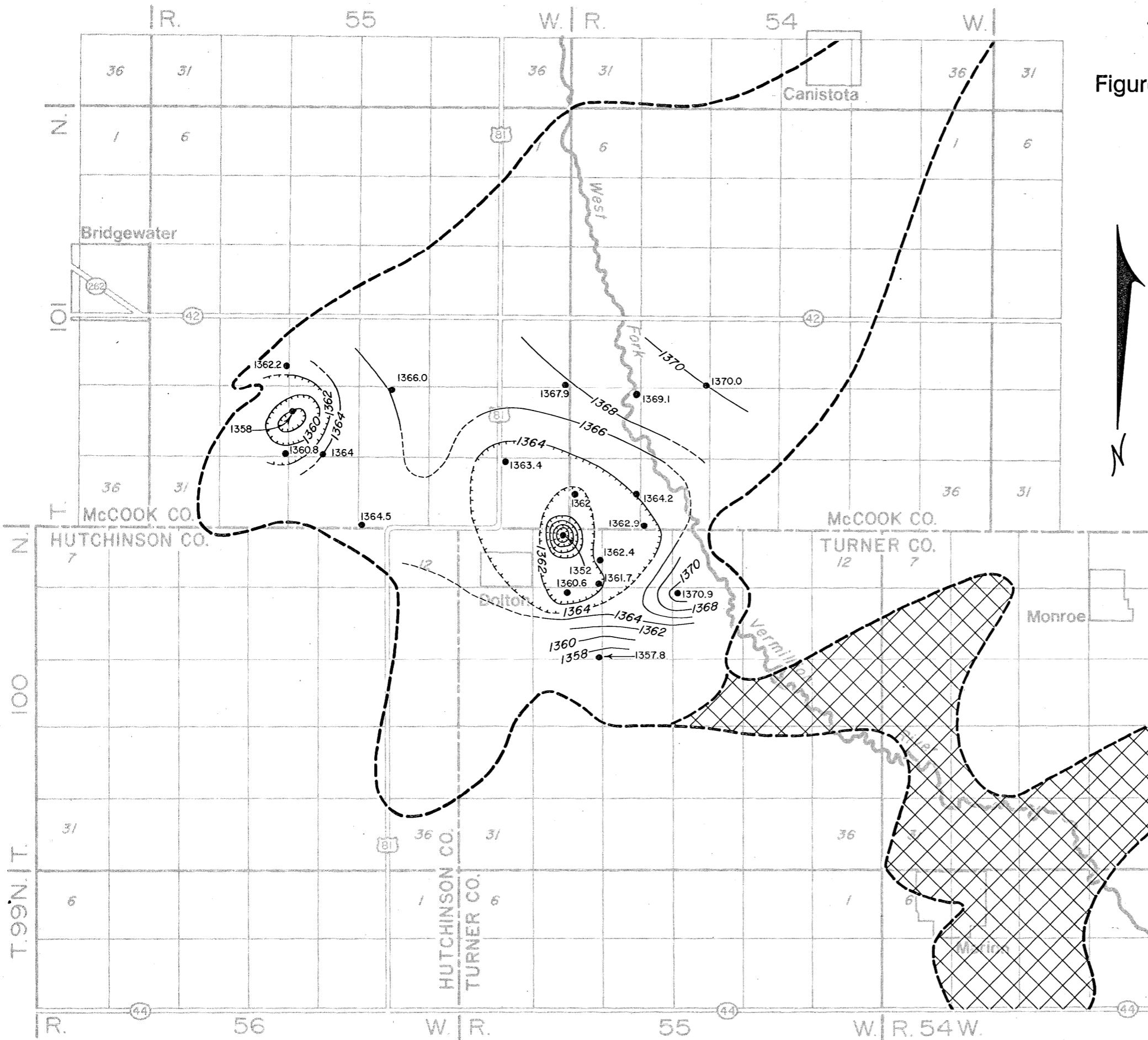
Line connecting points of equal elevation on the potentiometric surface. Dashed where approximate. Hachures indicate a closed depression. Contour interval = 2 feet.

— Approximate aquifer boundary.

Dates of water-level measurements used for this map were October 12, 17, and 31, 1983 and November 2, 3, and 4, 1983.

▨ Area which is tentatively considered part of the Dolton aquifer.





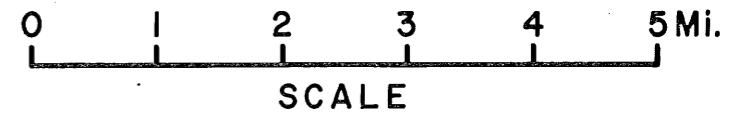
**Figure 12. Potentiometric surface of the Dolton aquifer, October 11, 1985.**

● Observation well. Number is elevation of potentiometric surface in feet above mean sea level. Values that include a decimal point were measured from surveyed casing tops; otherwise, ground elevations were estimated from USGS 7.5 minute topographic maps.

— Line connecting points of equal elevation on the potentiometric surface. Dashed where approximate. Hachures indicate a closed depression. Contour interval = 2 feet.

- - - Approximate aquifer boundary.

▣ Area which is tentatively considered part of the Dolton aquifer.



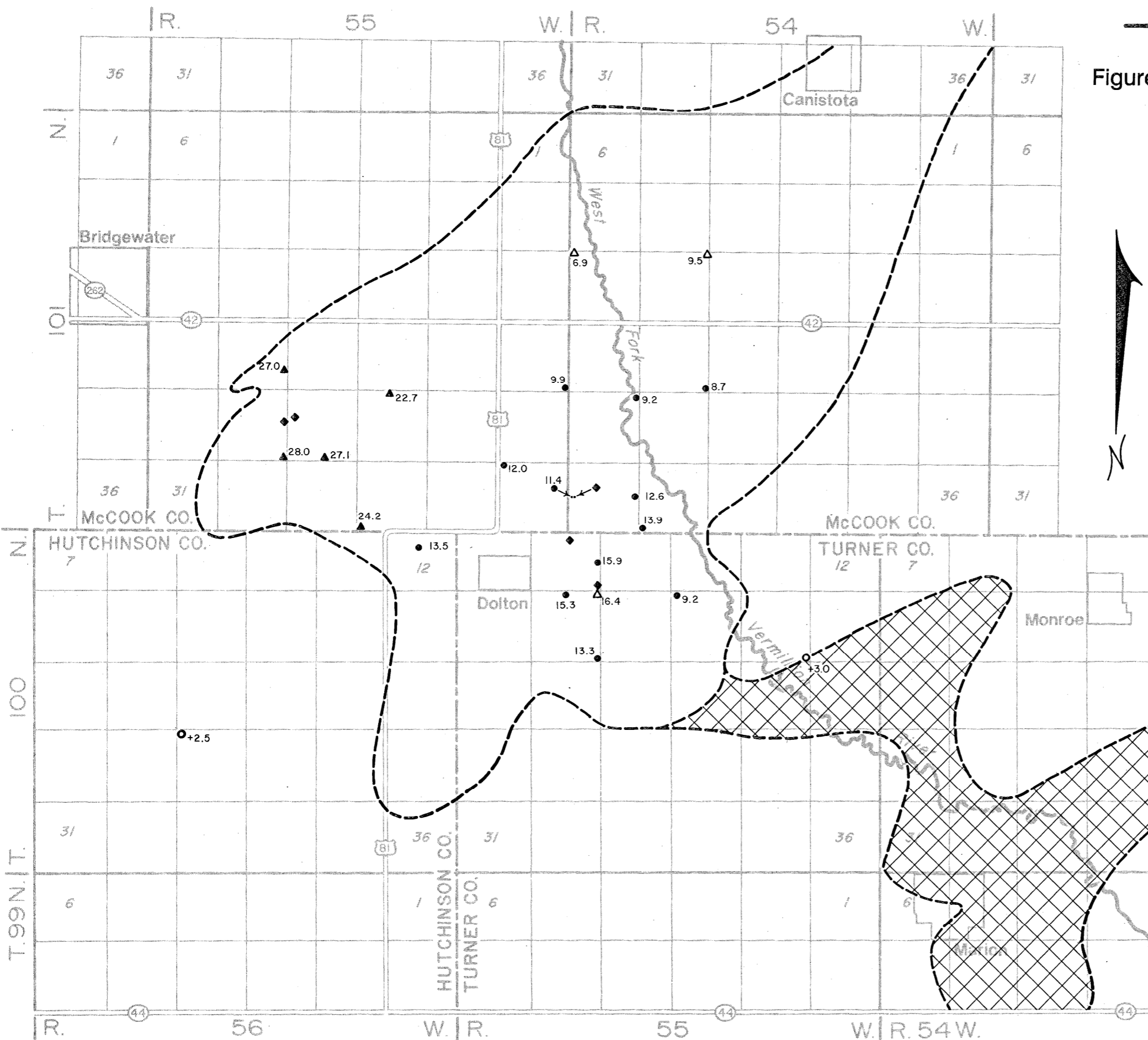


Figure 13. Water-level declines in the Dolton aquifer and locations of rural water production wells.

133● Observation well. Number is water-level decline, in feet, from October 31 or November 2, 3, or 4, 1983, through May 5, 15, or 28, 1986.

95△ Observation well. Number is water-level decline, in feet, from July 3, 12, or 18, 1984, through May 5 or 6, 1986.

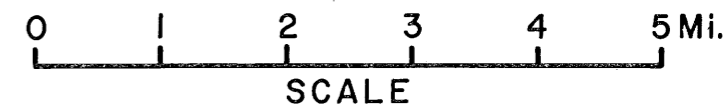
270▲ Observation well. Number is water-level decline, in feet, from August 28, 1979, through May 28, 1986.

◆ Rural water production well.

+3.0○ Observation well constructed in the the Niobrara Formation. Number is RISE in water level from July 17, 26, or 31, 1984, through May 5 or 21, 1986, as indicated by a plus sign (+).

--- Approximate aquifer boundary.

▣ Area which is tentatively considered part of the Dolton aquifer.



**Table 2. Summary of transmissivity and storativity for the Dolton aquifer**

Aquifer test no. <sup>1</sup>	Length of test (hours)	Well location <sup>2</sup>	Distance in feet and direction from pumping well	Transmissivity (gpd/ft) <sup>3</sup>		Storativity	
				This method	Jacob method	This method	Jacob method
1	72.5	100N-55W-08DDDD 2	48 SE	68,588	53,281	$2.88 \times 10^{-4}$	$8.67 \times 10^{-4}$
1	72.5	100N-55W-08DDDD 3	104 NE	59,879	54,439	$2.94 \times 10^{-4}$	$3.98 \times 10^{-4}$
1	72.5	100N-55W-08DDDD 4	198 W	46,659	50,084	$4.07 \times 10^{-4}$	$1.12 \times 10^{-4}$
2	72.2	100N-55W-08ABCB 2	83 N	28,754	29,817	$3.80 \times 10^{-4}$	$3.60 \times 10^{-4}$
2	72.2	100N-55W-08ABCB 3	175 E	31,630	29,336	$2.00 \times 10^{-4}$	$2.00 \times 10^{-4}$
3	23.5	100N-55W-31BCCC 3	82 E	33,580	50,324	$2.60 \times 10^{-3}$	$1.60 \times 10^{-3}$
3	23.5	100N-55W-31BCCC 1	92 W	<u>55,537</u>	<u>61,507</u>	<u><math>5.70 \times 10^{-4}</math></u>	<u><math>4.50 \times 10^{-4}</math></u>
<b>AVERAGES</b> .....				46,375	46,970	$6.77 \times 10^{-4}$	$5.70 \times 10^{-4}$
<b>STANDARD DEVIATIONS</b> .....				14,400	11,545	$7.92 \times 10^{-4}$	$4.76 \times 10^{-4}$

<sup>1</sup> See appendices C, D, and E for aquifer-test data.

<sup>2</sup> See appendix A for explanation of location format.

<sup>3</sup> gpd/ft = gallons per day per foot.

**Table 3. Summary of specific capacity for the Dolton aquifer**

Aquifer test no. <sup>1</sup>	Length of test (hours)	Pumping rate (gpm) <sup>2</sup>	Maximum drawdown (feet)	Specific capacity (gpm/ft) <sup>3</sup>
1	72.5	950	40.72	23
2	72.2	690	46.25	15
3	23.5	630	32.25	<u>20</u>
<b>AVERAGE</b> .....				19

<sup>1</sup> See appendices C, D, and E for aquifer-test data.

<sup>2</sup> gpm = gallons per minute.

<sup>3</sup> gpm/ft = gallons per minute per foot of drawdown.

day per foot (gpd/ft), 0.00068, and 19 gallons per minute per foot of drawdown (gpm/ft), respectively (tables 2 and 3).

Results of the aquifer tests indicate that the Dolton aquifer is capable of yielding sufficient water for high-capacity wells. However, barrier-boundary conditions were indicated from the graphical analysis after approximately 100 minutes of pumping for tests 1 and 3. Also, as it was summarized in a letter dated February 16, 1984, from the SDGS to the chairman of the TMRWD, the continuous water level decline in the Dolton aquifer prior to the utilization of water by the TMRWD suggested that the cone of depression created by the Hanson Rural Water System wells had not reached an area capable of providing adequate recharge to balance the withdrawal rate. As a result, significant drawdowns may occur over time due to pumping of high-capacity wells completed in the aquifer.

Possible recharge to the Dolton aquifer via ground-water flow through the till overlying the aquifer was investigated by Holly and others (in preparation). They concluded that vertical flow through the overlying, unweathered till was insignificant (less than 0.1 inch per year) because of the very low hydraulic conductivity of the till. Data also indicate that the physical connection between the Dolton aquifer and underlying bedrock aquifers is minimal in the area studied. Therefore, it is likely that any significant recharge component to the Dolton aquifer would have to come from undefined portions of the aquifer occurring outside the study area.

#### Basal Outwash

The extent and thickness of an outwash body (herein referred to as the basal-outwash aquifer) which occurs at or near the base of the till are shown on figure 14. This aquifer is under confined conditions. The spatial relationships of this aquifer are further illustrated in figures 4 and 5. Based on two water samples (app. B), ground water in this aquifer contains an average dissolved solids concentration of 993 mg/L. Additional data are necessary to adequately characterize this aquifer but the presence of an outwash body generally associated with the bedrock valley shown on figure 6 is supported by the data.

#### Bedrock Aquifers

Of the bedrock formations in the study area, only the Niobrara Formation, Dakota Formation, Sioux Quartzite wash, and Sioux Quartzite could be classified as aquifers. In most cases, only one or two observation wells have been completed in the various bedrock aquifers within the study area. Therefore, the following summary of hydrogeologic characteristics is based on very limited data.

#### Niobrara Formation

The Niobrara Formation, where present, typically supplies only small quantities of water to domestic wells in the area. Although in areas where the formation is significantly fractured, large quantities of water are sometimes obtained. There are three observation wells completed in the



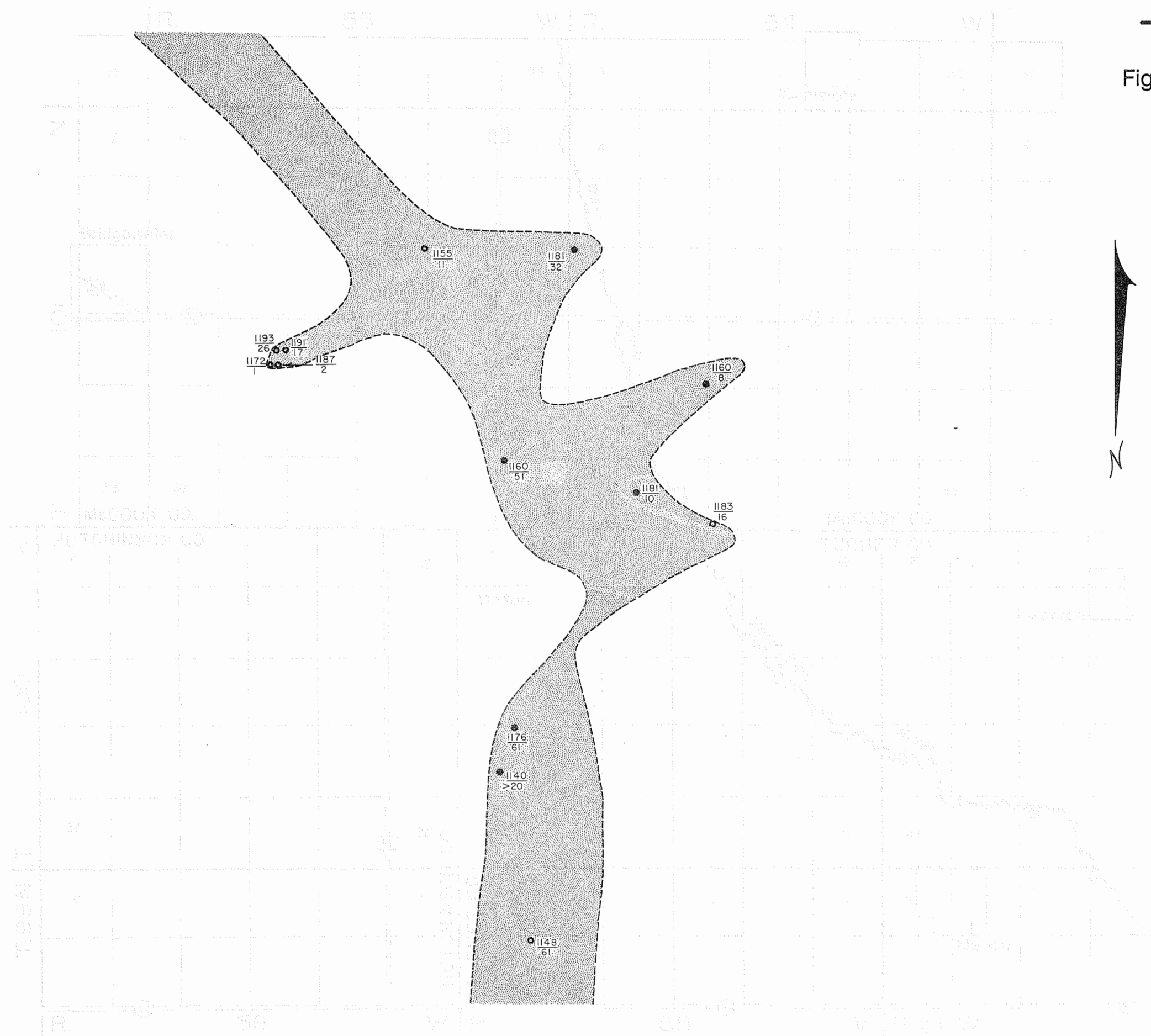


Figure 14. Areal extent and thickness of the basal-outwash aquifer.

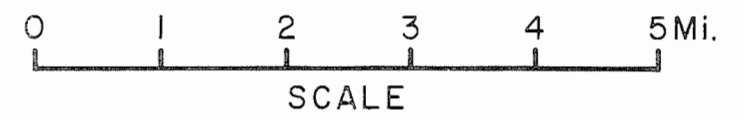
$\frac{1193}{26}$  Test hole.

$\frac{1181}{32}$  Well.

Upper number is elevation of aquifer top, in feet above mean sea level. Lower number is aquifer thickness, in feet. A greater than symbol (>) indicates that the full thickness of the outwash was not penetrated.

--- Approximate aquifer boundary.

■ Basal-outwash aquifer.



Niobrara Formation in the study area which show the formation to be under confined conditions. All show a rise in water level during the period of record (fig. 13) in contrast to the declining water levels in the Dolton aquifer. Based on an analysis of a water sample from one of these observation wells, ground water in the Niobrara Formation contains a dissolved-solids concentration of 2,208 mg/L (app. B).

#### Dakota Formation

The Dakota Formation is considered to be an important regional aquifer although it is not used widely in the area studied. It is absent in at least a portion of the bedrock valley depicted in figures 4 and 6. The aquifer is under confined conditions and, based on one water sample (app. B), the ground water contains a dissolved-solids concentration of 985 mg/L.

#### Sioux Quartzite Wash

Locally, the Sioux Quartzite wash directly overlies the Sioux Quartzite and its thickness is variable (figs. 4 and 5). It consists of sand or sandstone (weathered Sioux Quartzite) and is under confined conditions. Based on two water samples (app. B), the ground water in the quartzite wash contains an average dissolved solids concentration of 1,153 mg/L.

#### Sioux Quartzite

The Sioux Quartzite, where fractured, may yield small to moderate quantities of water to wells. However, in the study area, no wells are known to be completed in the Sioux Quartzite.

### SUMMARY AND CONCLUSIONS

#### Parker Area

Based on the findings of this investigation, the following observations can be made as to the suitability of the Parker-Centerville aquifer for use by the TMRWD.

1. The overall quality of water in the Parker-Centerville aquifer, based on water-quality analyses presented in this report, does not exceed any primary drinking water standards except for nitrate nitrogen in two samples.
2. Areas in the Parker-Centerville outwash where saturated thicknesses are 20 feet or greater have the potential to yield from 100 to 300 gallons per minute (gpm) depending actual saturated thicknesses. It is emphasized, however, that the saturated thickness of the outwash varies greatly within short distances, therefore, predicted yields will also vary. Thus, if the TMRWD should decide to develop the Parker-Centerville aquifer, it is recommended that at least one aquifer test be conducted to verify the estimates of water quantity and quality.

## Dolton Area

Investigative efforts in the Dolton area were concentrated on defining what has been herein referred to as the Dolton aquifer. Two other glacial aquifers, a surface-outwash unit (Vermillion West Fork aquifer) and a basal-outwash unit, and four bedrock aquifers have been briefly discussed in this report. The selection by the TMRWD of the Dolton aquifer as a water source was made based on an evaluation of all these aquifers. Among the factors considered in making this selection were (1) conclusions by an earlier investigator (McMeen, 1964) concerning the suitability of the surface outwash for use by the city of Marion, (2) apparent poor quality water in the surface outwash, (3) limited information on the extent and thickness of the basal outwash, (4) water quality in the basal outwash which is apparently poorer than the quality in a portion of the Dolton aquifer, and (5) very limited information regarding extent, water-yielding potential and water quality in the various bedrock aquifers.

Based on the findings of this investigation, the following observations can be made as to the suitability of the Dolton aquifer for use by the TMRWD.

1. Based on the aquifer tests conducted, the Dolton aquifer has the capability to yield the quantities of water requested by the TMRWD.
2. Evaluation of aquifer tests indicates the presence of barrier-boundary conditions, thus, significant water level declines may be expected over time by pumping of high-capacity wells completed in the aquifer. Water-level data from observation wells completed in the aquifer show a continuing decline in water level throughout the Dolton aquifer. This indicates that the cones of depression created by pumping have not yet intercepted a source of recharge equal to discharge from the aquifer. Water-level declines are expected to continue considering the current and projected water use from the aquifer.
3. The overall quality of ground water in the portion of the aquifer utilized by the TMRWD is significantly better than most other areas of the aquifer. According to preliminary calculations, the quality of water in the TMRWD production wells, pumping at a rate of 500 gpm (average-day use), may show some gradual degradation within a 5-year period after development due to the presence of the poorer quality water in adjacent portions of the aquifer.

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## Appendix A. Logs of test holes and wells

Logs in this appendix are for (1) holes drilled by the South Dakota Geological Survey or a private drilling company in conjunction with this investigation or (2) holes which were used to construct cross sections in this report.

### LEGAL LOCATION and LOCATION

The logs are listed by smallest township number, then the smallest range number, the smallest section number and then by quarter section: NE = A; NW = B; SW = C; SE = D. A comparison of LEGAL LOCATION and LOCATION is as follows. A LEGAL LOCATION of NW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 8, T. 106 N., R. 52 W. is the same as a LOCATION of 106N-52W-08CADB. In several LOCATIONS, the smallest quarter section is followed by the number 1 or 2 which indicates that more than one log may exist for that particular location.

### LATITUDE and LONGITUDE

The format is DD.MMSS where D is degrees, M is minutes, and S is seconds.

### DRILLING COMPANY

SDGS is an abbreviation for South Dakota Geological Survey.

### TOTAL DRILL HOLE DEPTH, SCREEN LENGTH, TOTAL CASING AND SCREEN and CASING STICK-UP

The numbers are presented in feet.

### SCREEN TYPE and CASING TYPE

PVC is an abbreviation for polyvinyl chloride. MFG. is an abbreviation for manufactured and indicates a product that is commercially available. SCH. is an abbreviation for schedule and refers to casing thickness. HM. is an abbreviation for homemade and indicates a hacksaw-slotted casing.

### CASING TOP ELEVATION and GROUND SURFACE ELEVATION

The numbers are presented in feet above mean sea level. I - the elevation was determined using a surveying instrument. T - the elevation was estimated from a 7.5 minute series topographic map.

### CASING DIAMETER

The numbers are presented in inches.

County: TURNER  
Legal Location: NE NE NE SW sec. 18, T. 098 N., R. 52 W.  
Latitude: 43.1823  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-16-1983  
Ground Surface Elevation: 1268.00 T  
Total Drill Hole Depth: 46  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1271.00 T  
Casing Stick-up: 2.70  
Well Maintenance Date: 09-14-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 098N-52W-18CAAA 1  
Longitude: 97.0200

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-156  
SDGS Well Name: CO-83-156

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 32.0

Single Point Resistivity:  
Extra:

Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint. Depth to water was 11.20 feet on 09-14-1983. West well of two.

0	-	2	Silt, black, sandy (topsoil)
2	-	33	Sand and gravel, coarse sand to medium pebble gravel; contains assorted carbonate and black crystalline rock fragments
33	-	46	Clay, medium-dark-gray, silty, sandy (till)

\* \* \* \* \*

County: TURNER  
Legal Location: NE NE NE SW sec. 18, T. 098 N., R. 52 W.  
Latitude: 43.1823  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-17-1983  
Ground Surface Elevation: 1268.00 T  
Total Drill Hole Depth: 16  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1271.00 T

Location: 098N-52W-18CAAA 2  
Longitude: 97.0157

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-157  
SDGS Well Name: CO-83-157

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Casing Stick-up: 2.90  
Well Maintenance Date: 09-14-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Total Casing and Screen: 14.0

Single Point Resistivity:  
Extra:

Depth to water was 11.0 feet on 09-14-1983. East well of two.

0 - 2 Silt, rusty, sandy (topsoil)  
2 - 16 Gravel, yellow-brown, fine to medium pebble; mostly carbonate and black crystalline rock fragments

\* \* \* \* \*

County: TURNER  
Legal Location: SW SW SW SW sec. 18, T. 098 N., R. 52 W.  
Latitude: 43.1823  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-17-1983  
Ground Surface Elevation: 1263.00 T  
Total Drill Hole Depth: 56  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1265.00 T  
Casing Stick-up: 2.30  
Well Maintenance Date: 09-15-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 098N-52W-18CCCC

Longitude: 97.0200

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-159  
SDGS Well Name: CO-83-159

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 40.0

Single Point Resistivity:  
Extra:

Depth to water was 13.65 feet on 09-15-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

0 - 1 Silt, brown, sandy, pebbly (topsoil)  
1 - 38 Sand and gravel, medium sand to fine pebble gravel; mostly carbonate and black crystalline rock fragments, some quartz, silty from 1 to 4 feet  
38 - 56 Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \* \*

County: TURNER

Location: 098N-52W-18CDDD

Legal Location: SE SE SE SW sec. 18, T. 098 N., R. 52 W.  
Latitude: 43.1806  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-17-1983  
Ground Surface Elevation: 1263.00 T  
Total Drill Hole Depth: 46  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1265.00 T  
Casing Stick-up: 1.92  
Well Maintenance Date: 09-15-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Longitude: 97.0201

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-158  
SDGS Well Name: CO-83-158

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 32.0

Single Point Resistivity:  
Extra:

Depth to water was 8.99 feet on 09-15-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

0 - 2	Sand, yellow-brown, silty, pebbly
2 - 29	Sand and gravel, yellow-brown, medium sand to medium pebble gravel; mostly carbonate and black crystalline rock fragments
29 - 46	Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \*

County: TURNER  
Legal Location: NE NE NE SE sec. 18, T. 098 N., R. 52 W.  
Latitude: 43.1806  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-16-1983  
Ground Surface Elevation: 1262.00 T  
Total Drill Hole Depth: 36  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1265.00 T  
Casing Stick-up: 2.50

Location: 098N-52W-18DAAA

Longitude: 97.0126

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-155  
SDGS Well Name: CO-83-155

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 21.0



Well Maintenance Date: 09-15-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Single Point Resistivity:  
Extra:

Depth to water was 8.48 feet on 09-15-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

0	-	2	Silt, yellow-brown, sandy
2	-	19	Sand and gravel, yellow-brown, coarse sand to medium pebble gravel; mostly carbonate rock fragments and some quartz
19	-	36	Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \* \*

County: TURNER  
Legal Location: NE NE NE NE sec. 20, T. 098 N., R. 52 W.  
Latitude: 43.1804  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-15-1983  
Ground Surface Elevation: 1262.00 T  
Total Drill Hole Depth: 76  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 098N-52W-20AAAA  
Longitude: 97.0014

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-150

Single Point Resistivity:  
Extra:

0	-	10	Silt, black, sandy (topsoil)
10	-	76	Clay, medium-dark-gray, silty, sandy, pebbly; gravel lenses from 32 to 34 feet

\* \* \* \* \*

County: TURNER  
Legal Location: NW NW NW NE sec. 20, T. 098 N., R. 52 W.  
Latitude: 43.1805  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-15-1983  
Ground Surface Elevation: 1261.00 T  
Total Drill Hole Depth: 20  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION

Location: 098N-52W-20ABBB  
Longitude: 97.0047

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-151  
SDGS Well Name: CO-83-151

Aquifer: PARKER-CENTERVILLE

Management Unit:

Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1263.00 T  
Casing Stick-up: 2.00  
Well Maintenance Date: 08-16-1983  
USGS Hydrological Unit Code: 10170102

Screen Length: 10.0  
Casing Diameter: 2.0  
Total Casing and Screen: 17.0

Electric Log Information:

Spontaneous Potential:  
Natural Gamma:  
Samples:

Single Point Resistivity:  
Extra:

Depth to water was 5.7 feet on 08-16-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

- 0 - 3 Silt, black, sandy (topsoil)
- 3 - 17 Sand and gravel, medium sand to fine pebble gravel, silty; mostly carbonate and black crystalline rock fragments
- 17 - 26 Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \*

County: TURNER

Legal Location: SE SE SE NE sec. 20, T. 098 N., R. 52 W.

Latitude: 43.1740

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: S. MITCHELL

Geologist: M. PALM

Date Drilled: 08-16-1983

Ground Surface Elevation: 1256.00 T

Total Drill Hole Depth: 56

Water Rights Well:

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG./PVC, HM.

Casing Type: PVC, SCH. 40

Casing Top Elevation: 1259.00 T

Casing Stick-up: 3.00

Well Maintenance Date: 09-15-1983

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential:

Natural Gamma:

Samples:

Location: 098N-52W-20ADDD

Longitude: 97.0013

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number: CO-83-152

SDGS Well Name: CO-83-152

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0

Casing Diameter: 2.0

Total Casing and Screen: 35.0

Single Point Resistivity:

Extra:

Depth to water was 6.22 feet on 09-15-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

- 0 - 2 Silt, black, pebbly (topsoil)
- 2 - 18 Clay, yellow-brown, silty, sandy, pebbly (till)
- 18 - 35 Gravel, very fine to medium pebble, silty; mostly carbonate and black crystalline

35 - 56 rock fragments with some quartz  
Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \* \*

County: TURNER  
Legal Location: NW NW NE SW sec. 28, T. 098 N., R. 52 W.  
Latitude: 43.1620  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-16-1983  
Ground Surface Elevation: 1254.00 T  
Total Drill Hole Depth: 46  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1257.00 T  
Casing Stick-up: 3.00  
Well Maintenance Date: 09-15-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma: Extra:  
Samples:

Location: 098N-52W-28CABB  
Longitude: 96.5937  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: CO-83-154  
SDGS Well Name: CO-83-154  
Aquifer: PARKER-CENTERVILLE  
Screen Length: 10.0  
Casing Diameter: 2.0  
Total Casing and Screen: 22.0  
Single Point Resistivity:

Depth to water was 8.4 feet on 08-16-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

0 - 5	Silt, black, sandy (topsoil)
5 - 12	Clay, yellow-brown, silty, sandy, pebbly (till)
12 - 19	Sand and gravel, very coarse sand to fine pebble gravel; mostly carbonate and black crystalline rock fragments and quartz
19 - 46	Clay, medium-light-gray, sandy, pebbly; contains many chalk fragments

\* \* \* \* \*

County: TURNER  
Legal Location: SE SE SE SW sec. 28, T. 098 N., R. 52 W.  
Latitude: 43.1620  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: M. PALM  
Date Drilled: 08-16-1983  
Ground Surface Elevation: 1254.00 T  
Total Drill Hole Depth: 66

Location: 098N-52W-28CDDD  
Longitude: 96.5937  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: CO-83-153

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential:  
Natural Gamma:  
Samples:

Single Point Resistivity:  
Extra:

0 - 2 Silt, yellow-brown, sandy (topsoil)  
2 - 12 Clay, yellow-brown, sandy, pebbly (till)  
12 - 66 Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \* \*

County: TURNER

Legal Location: NE NE NE NE sec. 29, T. 098 N., R. 52 W.

Latitude: 43.1711

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: S. MITCHELL

Geologist: M. PALM

Date Drilled: 08-15-1983

Ground Surface Elevation: 1256.00 T

Total Drill Hole Depth: 46

Water Rights Well:

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG./PVC, HM.

Casing Type: PVC, SCH. 40

Casing Top Elevation: 1257.00 T

Casing Stick-up: 0.90

Well Maintenance Date: 09-15-1983

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 098N-52W-29AAAA

Longitude: 97.0012

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-149  
SDGS Well Name: CO-83-149

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 25.0

Single Point Resistivity:  
Extra:

Depth to water was 5.33 feet on 09-15-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

0 - 2 Silt, black, sandy, pebbly (topsoil)  
2 - 26 Gravel, fine to medium pebble, silty, sandy; mostly carbonate and black crystalline rock fragments, oxidized  
26 - 46 Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \* \*

County: TURNER

Legal Location: NE NE NE NW sec. 02, T. 098 N., R. 53 W.

Latitude: 43.2037

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Location: 098N-53W-02BAAA 1

Longitude: 97.0420

Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-23-1983  
Ground Surface Elevation: 1285.00 T  
Total Drill Hole Depth: 50  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1287.00 T  
Casing Stick-up: 2.00  
Well Maintenance Date: 08-24-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-110  
SDGS Well Name: R1-83-110

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 43.0

Single Point Resistivity:  
Extra:

Depth to water was 8.5 feet on 08-24-1983. Screen length includes 5-foot sand point and 5 feet of hacksaw slots above sandpoint. East well of two.

0 - 2	Silt, black, sandy (topsoil)
2 - 30	Gravel, very fine to medium pebble, sandy; mostly subrounded carbonate and black mudrock fragments, oxidized from 2 to 20 feet
30 - 50	Sand and gravel, coarse sand to fine pebble gravel; mostly subrounded carbonate and black mudrock fragments and quartz
50 - 51	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \* \*

County: TURNER  
Legal Location: NE NE NE NW sec. 02, T. 098 N., R. 53 W.  
Latitude: 43.2037  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-23-1983  
Ground Surface Elevation: 1285.00 T  
Total Drill Hole Depth: 22  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1287.00 T  
Casing Stick-up: 2.20  
Well Maintenance Date: 08-24-1983  
USGS Hydrological Unit Code: 10170102

Location: 098N-53W-02BAAA 2

Longitude: 97.0421

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-111  
SDGS Well Name: R1-83-111

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 22.0

Electric Log Information:

Spontaneous Potential:  
Natural Gamma:  
Samples:

Single Point Resistivity:  
Extra:

Depth to water was 8.8 feet on 08-24-1983. Screen length includes 10 feet of hacksaw slots. West well of two.

- 0 - 2 Silt, black, sandy (topsoil)
- 2 - 22 Gravel, very fine to medium pebble, sandy; mostly subrounded carbonate and black mudrock fragments, oxidized from 2 to 20 feet

\* \* \* \* \*

County: TURNER  
 Legal Location: SW SW SW NW sec. 02, T. 098 N., R. 53 W.  
 Latitude: 43.2013  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: SDGS  
 Driller: S. MITCHELL  
 Geologist: M. PALM  
 Date Drilled: 08-17-1983  
 Ground Surface Elevation: 1285.00 T  
 Total Drill Hole Depth: 66  
 Water Rights Well:  
 Other Well Name:  
 Basin: VERMILLION  
 Management Unit:  
 Screen Type: PVC, MFG./PVC, HM.  
 Casing Type: PVC, SCH. 40  
 Casing Top Elevation: 1287.00 T  
 Casing Stick-up: 2.00  
 Well Maintenance Date: 08-17-1983  
 USGS Hydrological Unit Code: 10170102  
 Electric Log Information:  
 Spontaneous Potential:  
 Natural Gamma:  
 Samples:

Location: 098N-53W-02BCCC  
Longitude: 97.0520

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-160  
SDGS Well Name: CO-83-160

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 41.0

Single Point Resistivity:  
Extra:

Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint. Depth to water was 15.22 on 09-26-1983.

- 0 - 5 Silt, rusty, sandy, pebbly (topsoil)
- 5 - 40 Gravel, fine pebble, sandy; mostly carbonate and black crystalline rock fragments, some quartz
- 40 - 66 Clay, medium-dark-gray, silty, sandy, pebbly (till)

\* \* \* \* \*

County: TURNER  
 Legal Location: NE NE NE SE sec. 13, T. 098 N., R. 53 W.  
 Latitude: 43.1833  
 Land Owner:

Location: 098N-53W-13DAAA  
Longitude: 97.0230

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: S. MITCHELL

Geologist: D. HOLLY

Date Drilled: 06-15-1983

Ground Surface Elevation: 1270.00 T

Total Drill Hole Depth: 56

Water Rights Well:

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG.

Casing Type: PVC, SCH. 40

Casing Top Elevation: 1272.00 T

Casing Stick-up: 2.20

Well Maintenance Date: 09-27-1983

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential:

Natural Gamma:

Samples:

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number: CO-83-61

SDGS Well Name: CO-83-61

Aquifer: PARKER-CENTERVILLE

Screen Length: 15.0

Casing Diameter: 2.0

Total Casing and Screen: 33.0

Single Point Resistivity:

Extra:

Depth to water was 14.45 feet on 09-27-1983. Screen length includes 15 feet of hacksaw slots.

- 0 - 2 Silt, black, sandy (topsoil)
- 2 - 38 Sand and gravel, fine sand to coarse pebble gravel; mostly subrounded carbonate and crystalline rock fragments
- 38 - 56 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \* \*

County: TURNER

Legal Location: NE NE NW SE sec. 13, T. 098 N., R. 53 W.

Latitude: 43.1832

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: S. MITCHELL

Geologist: D. HOLLY

Date Drilled: 06-15-1983

Ground Surface Elevation: 1267.00 T

Total Drill Hole Depth: 66

Water Rights Well:

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG./PVC, HM.

Casing Type: PVC, SCH. 40

Casing Top Elevation: 1269.00 T

Casing Stick-up: 2.20

Well Maintenance Date: 08-24-1983

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential:

Location: 098N-53W-13DBAA

Longitude: 97.0235

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number: CO-83-62

SDGS Well Name: CO-83-62

Aquifer: PARKER-CENTERVILLE

Screen Length: 15.0

Casing Diameter: 2.0

Total Casing and Screen: 38.0

Single Point Resistivity:

Natural Gamma:  
Samples:

Extra:

Depth to water was 15 feet on 08-23-1984. Screen length includes 5-foot sandpoint and 10 feet of hacksaw slots above sandpoint.

0	-	3	Silt, black, sandy (topsoil)
3	-	25	Sand and gravel, yellow-brown, coarse sand to fine pebble gravel; mostly subrounded carbonate and crystalline rock fragments and quartz
25	-	48	Sand and gravel, gray, coarse sand to medium pebble gravel; mostly carbonate, mudrock and assorted crystalline rock fragments and quartz
48	-	66	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \*

County: TURNER  
Legal Location: SW SW SW SE sec. 23, T. 099 N., R. 53 W.  
Latitude: 43.2224  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-24-1983  
Ground Surface Elevation: 1290.00 T  
Total Drill Hole Depth: 45  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC. HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1292.00 T  
Casing Stick-up: 2.20  
Well Maintenance Date: 08-24-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 099N-53W-23DCCC 1

Longitude: 97.0447

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-112  
SDGS Well Name: R1-83-112

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 38.0

Single Point Resistivity:  
Extra:

Depth to water was 6.1 feet on 08-24-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint. West well of two.

0	-	20	Gravel, yellow-brown, very fine to medium pebble, sandy; mostly subrounded carbonate and black mudrock fragments and quartz, highly oxidized
20	-	44	Gravel, gray, very fine to medium pebble, sandy; mostly subrounded carbonate and black mudrock fragments and quartz
44	-	45	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \*

County: TURNER

Location: 099N-53W-23DCCC 2



Legal Location: SW SW SW SE sec. 23, T. 099 N., R. 53 W.  
Latitude: 43.2224  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-24-1983  
Ground Surface Elevation: 1290.00 T  
Total Drill Hole Depth: 25  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1292.00 T  
Casing Stick-up: 2.00  
Well Maintenance Date: 09-14-1983  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Longitude: 97.0446

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-113  
SDGS Well Name: R1-83-113

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 24.0

Single Point Resistivity:  
Extra:

Depth to water was 5.92 feet on 09-14-1983. Screen length includes 10 feet of hacksaw slots. East well of two.

0 - 25 Gravel, yellow-brown, very fine to medium pebble, sandy; mostly subrounded carbonate and black mudrock fragments and quartz, unoxidized from 20 to 25 feet

\* \* \* \* \*

County: TURNER  
Legal Location: NE SE SE NE sec. 26, T. 099 N., R. 53 W.  
Latitude: 43.2203  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-24-1983  
Ground Surface Elevation: 1295.00 T  
Total Drill Hole Depth: 30  
Water Rights Well:  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG./PVC, HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1297.00 T  
Casing Stick-up: 2.20  
Well Maintenance Date: 09-14-1983  
USGS Hydrological Unit Code: 10170102

Location: 099N-53W-26ADDA

Longitude: 97.0344

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-114  
SDGS Well Name: R1-83-114

Aquifer: PARKER-CENTERVILLE

Screen Length: 10.0  
Casing Diameter: 2.0

Total Casing and Screen: 24.0

Electric Log Information:

Spontaneous Potential:  
Natural Gamma:  
Samples:

Single Point Resistivity:  
Extra:

Depth to water was 11.35 feet on 09-14-1983. Screen length includes 5-foot sandpoint and 5 feet of hacksaw slots above sandpoint.

- 0 - 25 Gravel, yellow-brown, very fine to medium pebble, sandy; mostly subrounded carbonate and black mudrock fragments, highly oxidized
- 25 - 30 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \* \*

County: TURNER  
Legal Location: SE NE NE SE sec. 07, T. 100 N., R. 55 W.  
Latitude: 43.2940  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: D. HOLLY  
Date Drilled: 08-09-1983  
Ground Surface Elevation: 1440.00 T  
Total Drill Hole Depth: 247  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 100N-55W-07DAAD  
Longitude: 97.2244  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: CO-83-140

Single Point Resistivity: X  
Extra:

Depth to water in open hole was 4.5 feet on 10-18-1983. Hole was backfilled with cuttings on 11-18-1984.

- 0 - 2 Silt, grayish-black, sandy (topsoil)
- 2 - 22 Clay, yellow-brown, silty, very sandy, pebbly; oxidized, calcareous, sand lens from 7 to 9 feet (till)
- 22 - 151 Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous, contains several sand lenses from 1 to 3 feet thick (till)
- 151 - 165 Silt, medium-dark-gray, clayey to very sandy; contains sand lenses from 159 to 163 feet
- 165 - 226 Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous (till)
- 226 - 230 Sand and gravel, gray, medium sand to very fine pebble gravel, silty, clayey; mostly subrounded carbonate, mudrock, black crystalline rock fragments, and quartz
- 230 - 236 Clay, medium-dark-gray, very silty, very sandy, pebbly; unoxidized, calcareous (till)
- 236 - 247 Sand, clayey; drilled like clay but E-log shows probable sand, no sample obtained

\* \* \* \* \*

County: TURNER  
Legal Location: SE SE SE SE sec. 07, T. 100 N., R. 55 W.  
Latitude: 43.2916  
Land Owner:

Location: 100N-55W-07DDDD  
Longitude: 97.2247

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: M. JARRETT

Geologist: D. HOLLY

Date Drilled: 06-23-1983

Ground Surface Elevation: 1443.10 I

Total Drill Hole Depth: 262

Water Rights Well: TU-83A

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG. AND HM.

Casing Type: PVC

Casing Top Elevation: 1445.80 I

Casing Stick-up: 2.70

Well Maintenance Date: 08-28-1984

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential: X

Natural Gamma: X

Samples:

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number: R2-83-56

SDGS Well Name: R2-83-56

Aquifer: PLEISTOCENE SERIES

Screen Length: 15.0

Casing Diameter: 2.0

Total Casing and Screen: 244.0

Single Point Resistivity: X

Extra:

Screen length includes 5-foot sandpoint and 10 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 89.4 feet on 11-02-1983; measured from top of casing.

0 - 2	Silt, grayish-black, clayey (topsoil)
2 - 17	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
17 - 146	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very silty from 66 to 75 feet, gravel lenses from 104 to 106, 128 to 130 feet (till)
146 - 153	Sand and gravel, gray, medium sand to very fine pebble gravel; very silty to clayey, mostly subangular to subrounded carbonate and mudrock fragments
153 - 172	Silt, gray, sandy to clayey
172 - 179	Sand and gravel, gray, medium sand to very fine pebble gravel, silty
179 - 230	Clay, medium-dark-gray, silty, sandy, gravelly; unoxidized, calcareous, gravel lenses from 206 to 207, 212 to 215 feet (till)
230 - 244	Sand and gravel, gray, medium sand to medium pebble gravel; mostly subangular to subrounded carbonate and mudrock fragments and quartz
244 - 261	Clay, medium-dark-gray, silty, sandy, very pebbly; unoxidized, calcareous, many sand and gravel lenses (till)
261 - 262	Quartzite, pink; very hard, actually penetrated only a few inches

\* \* \* \* \*

County: TURNER

Legal Location: NE NE NE NE sec. 08, T. 100 N., R. 55 W.

Latitude: 43.2958

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: LAYNE-WESTERN

Driller: J. RENTSCHLER

Geologist: D. HOLLY

Date Drilled: 10-18-1983

Ground Surface Elevation: 1435.00 T

Total Drill Hole Depth: 160

Location: 100N-55W-08AAAA

Longitude: 97.2135

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number:

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential: X

Natural Gamma:

Samples:

Single Point Resistivity: X

Extra:

Hole was not cased. Driller reported sand only from 140 to 144 feet. Hole was E-logged by Layne-Western.

0	-	2	Silt, black (topsoil)
2	-	26	Clay, yellow-brown, silty, very sandy; oxidized, calcareous (till)
26	-	126	Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
126	-	149	Sand and gravel, gray, medium sand to fine pebble gravel, silty; contains clay lenses from 138 to 141 and 143 to 146 feet
149	-	160	Clay, dark-gray, silty, sandy, gravelly; unoxidized, calcareous (till)

\* \* \* \* \*

County: TURNER

Legal Location: NW SW NW NE sec. 08, T. 100 N., R. 55 W.

Latitude: 43.2958

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: HURON DRILLING

Driller: R. KUEHL

Geologist: D. HOLLY

Date Drilled: 07-09-1984

Ground Surface Elevation: 1435.00 T

Total Drill Hole Depth: 180

Water Rights Well:

Other Well Name: 2-2

Basin: VERMILLION

Management Unit:

Screen Type: STAINLESS STEEL, MFG.

Casing Type: STEEL

Casing Top Elevation: 1435.00 T

Casing Stick-up: 0.40

Well Maintenance Date:

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential:

Natural Gamma: X

Samples:

Location: 100N-55W-08ABCB 1

Longitude: 97.2206

Driller's Log:

Geologist's Log: X

Drilling Method: REVERSE

Test Hole Number:

SDGS Well Name:

Aquifer: DOLTON

Screen Length: 30.0

Casing Diameter: 12.0

Total Casing and Screen: 172.0

Single Point Resistivity: X

Extra:

Production well 2-2 used for aquifer test. Drill hole diameter 22 inches. Well was gravel packed with 8 tons of Luther Maddox gravel, Double AA, and grouted with 180 bags of cement, 6 to 1 mix. Depth to water was 64.54 feet on 07-31-1984. Stainless steel screen 80 slot.

0	-	2	Silt, black (topsoil)
2	-	25	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
25	-	131	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
131	-	171	Sand and gravel, gray, medium sand to fine pebble gravel; mostly subrounded carbonate and mudrock fragments and quartz
171	-	180	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \*

County: TURNER  
Legal Location: NW SW NW NE sec. 08, T. 100 N., R. 55 W.  
Latitude: 43.2958  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 04-26-1984  
Ground Surface Elevation: 1435.00 T  
Total Drill Hole Depth: 180  
Water Rights Well:  
Other Well Name: 2-1  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, HM.  
Casing Type: PVC  
Casing Top Elevation: 1436.00 T  
Casing Stick-up: 2.20  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Location: 100N-55W-08ABCB 2  
Longitude: 97.2207  
  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
  
Test Hole Number:  
SDGS Well Name:  
  
Aquifer: DOLTON  
  
Screen Length: 40.0  
Casing Diameter: 2.0  
  
Total Casing and Screen: 180.0  
  
Single Point Resistivity: X  
Extra:

Depth to water was 63 feet on 05-23-1984.

0	-	2	Silt, black (topsoil)
2	-	15	Clay, yellow-brown, silty, sandy, pebbly; unoxidized, calcareous (till)
15	-	134	Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
134	-	150	Sand and gravel, gray, medium sand to medium pebble gravel; subrounded to subangular, mostly carbonate, mudrock, and crystalline rock fragments and quartz with some coal
150	-	180	Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

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County: TURNER  
Legal Location: NW SW NW NE sec. 08, T. 100 N., R. 55 W.  
Latitude: 43.2958  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 07-10-1984  
Ground Surface Elevation: 1435.00 T  
Total Drill Hole Depth: 180  
Water Rights Well:

Location: 100N-55W-08ABCB 3  
Longitude: 97.2206  
  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
  
Test Hole Number:  
SDGS Well Name:

Other Well Name: 2-3  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG.  
Casing Type: PVC  
Casing Top Elevation: 1437.00 T  
Casing Stick-up: 2.00  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma: X  
Samples:

Aquifer: DOLTON  
Screen Length: 20.0  
Casing Diameter: 5.0  
Total Casing and Screen: 170.0  
Single Point Resistivity: X  
Extra:

Depth to water was 61.20 feet on 07-10-1984. Screen length is 20 feet of slotted plastic. Well was gravel packed and sealed with bentonite. Well 2-3.

0 - 2	Silt, black (topsoil)
2 - 15	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
15 - 134	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very silty from 100 to 134 feet (till)
134 - 152	Sand and gravel, gray, medium sand to fine pebble gravel; mostly subrounded carbonate and mudrock fragments and quartz
152 - 180	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

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County: TURNER  
Legal Location: NE NE NE SE sec. 08, T. 100 N., R. 55 W.  
Latitude: 43.2941  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: D. HOLLY  
Date Drilled: 08-08-1983  
Ground Surface Elevation: 1427.00 I  
Total Drill Hole Depth: 166  
Water Rights Well: TU-83C  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1430.10 I  
Casing Stick-up: 3.10  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 100N-55W-08DAAA  
Longitude: 97.2133  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: CO-83-139  
SDGS Well Name: CO-83-139  
Aquifer: DOLTON  
Screen Length: 20.0  
Casing Diameter: 2.0  
Total Casing and Screen: 147.0  
Single Point Resistivity:  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 55.0 feet on 11-02-1983; measured from top of casing.

0	-	2	Silt, grayish-black, clayey (topsoil)
2	-	22	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
22	-	120	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
120	-	150	Sand and gravel, gray, medium sand to very fine pebble gravel, some fine to medium pebble gravel; mostly subangular to subrounded carbonate, mudrock, black crystalline rock fragments, and quartz, contains some thin clay layers 1 to 3 feet thick
150	-	166	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

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County: TURNER  
 Legal Location: SE SE SE SE sec. 08, T. 100 N., R. 55 W.  
 Latitude: 43.2916  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: LAYNE-WESTERN  
 Driller: H. STATZ  
 Geologist:  
 Date Drilled: 10-19-1983  
 Ground Surface Elevation: 1424.30 I  
 Total Drill Hole Depth: 160  
 Water Rights Well:  
 Other Well Name: 83-1  
 Basin: VERMILLION  
 Management Unit:  
 Screen Type: STAINLESS STEEL (COOK)  
 Casing Type: STEEL  
 Casing Top Elevation: 1427.30 I  
 Casing Stick-up: 3.00  
 Well Maintenance Date:  
 USGS Hydrological Unit Code: 10170102  
 Electric Log Information:  
 Spontaneous Potential: X  
 Natural Gamma:  
 Samples:

Location: 100N-55W-08DDDD 1  
 Longitude: 97.2136

Driller's Log: X  
 Geologist's Log:  
 Drilling Method: REVERSE

Test Hole Number:  
 SDGS Well Name:

Aquifer: DOLTON

Screen Length: 30.0  
 Casing Diameter: 12.0

Total Casing and Screen: 158.0

Single Point Resistivity: X  
 Extra:

Aquifer test well. Drill hole diameter: 24 inches. Gravel pack consisted of 15 tons of Lyman Ritchey road gravel. Cement grout placed from 7 to 105 feet. Static water level: 54.68 feet pumping water level: 95.4 feet after 3 days (Q = 950 GPM).

0	-	2	Topsoil
2	-	17	Clay, brown
17	-	95	Clay, blue; with trace of gravel and small rocks
95	-	117	Clay, blue; with trace of gravel, rocks, and boulders
117	-	120	Clay, sandy
120	-	156	Sand, fine and coarse; and small gravel with lignite
156	-	180	Clay, blue

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County: TURNER

Location: 100N-55W-08DDDD 2

Legal Location: SE SE SE SE sec. 08, T. 100 N., R. 55 W.  
 Latitude: 43.2916  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: LAYNE-WESTERN  
 Driller: J. RENTSCHLER  
 Geologist:  
 Date Drilled: 10-19-1983  
 Ground Surface Elevation: 1424.50 I  
 Total Drill Hole Depth: 160  
 Water Rights Well:  
 Other Well Name: 83-5  
 Basin: VERMILLION  
 Management Unit:  
 Screen Type: PVC, HM.  
 Casing Type: PVC  
 Casing Top Elevation: 1426.10 I  
 Casing Stick-up: 1.60  
 Well Maintenance Date:  
 USGS Hydrological Unit Code: 10170102  
 Electric Log Information:  
 Spontaneous Potential:  
 Natural Gamma:  
 Samples:

Longitude: 97.2135

Driller's Log: X  
 Geologist's Log:  
 Drilling Method: ROTARY

Test Hole Number:  
 SDGS Well Name:

Aquifer: DOLTON

Screen Length: 25.0  
 Casing Diameter: 1.5

Total Casing and Screen: 154.0

Single Point Resistivity:  
 Extra:

Aquifer test observation well, r = 48 feet. Log for this hole not available so the lithology shown here was taken from the production well log; production well located 48 feet to the west.  
 100N-55W-08DDDD 1. Static water level: 52.6 feet on 12-02-1983.

0	-	2	Topsoil
2	-	17	Clay, brown
17	-	95	Clay, blue; with trace of gravel, rocks, and boulders
95	-	120	Clay, sandy
120	-	156	Sand, fine and coarse; and small gravel with lignite
156	-	160	Clay, blue

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County: TURNER  
 Legal Location: SE SE SE SE sec. 08, T. 100 N., R. 55 W.  
 Latitude: 43.2917  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: LAYNE-WESTERN  
 Driller: J. RENTSCHLER  
 Geologist:  
 Date Drilled: 10-20-1983  
 Ground Surface Elevation: 1425.00 I  
 Total Drill Hole Depth: 160  
 Water Rights Well:  
 Other Well Name: 83-3#1  
 Basin: VERMILLION  
 Management Unit:  
 Screen Type: PVC, HM.

Location: 100N-55W-08DDDD 3

Longitude: 97.2135

Driller's Log: X  
 Geologist's Log:  
 Drilling Method: ROTARY

Test Hole Number:  
 SDGS Well Name:

Aquifer: DOLTON

Screen Length: 25.0



Casing Type: PVC  
Casing Top Elevation: 1426.70 I  
Casing Stick-up: 1.70  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Casing Diameter: 1.5  
Total Casing and Screen: 153.0  
Single Point Resistivity: X  
Extra:

Aquifer test observation well located 104 feet northwest of production well (r = 104 feet). Static water level: 52.15 feet on 12-02-1983.

0	-	1	Topsoil
1	-	17	Clay, brown
17	-	80	Clay, blue; with some gravel and small rocks
80	-	120	Clay, blue; with trace gravel and boulders
120	-	157	Sand, coarse and fine; small gravel and boulders
157	-	160	Clay, blue

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County: TURNER  
Legal Location: SE SE SE SE sec. 08, T. 100 N., R. 55 W.  
Latitude: 43.2915  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: LAYNE-WESTERN  
Driller: J. RENTSCHLER  
Geologist:  
Date Drilled: 10-21-1983  
Ground Surface Elevation: 1424.70 I  
Total Drill Hole Depth: 160  
Water Rights Well:  
Other Well Name: 83-4#2  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, HM.  
Casing Type: PVC  
Casing Top Elevation: 1426.60 I  
Casing Stick-up: 1.90  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 100N-55W-08DDDD 4  
Longitude: 97.2138

Driller's Log: X  
Geologist's Log:  
Drilling Method: ROTARY

Test Hole Number:  
SDGS Well Name:

Aquifer: DOLTON

Screen Length: 25.0  
Casing Diameter: 1.5

Total Casing and Screen: 155.0

Single Point Resistivity: X  
Extra:

Aquifer test observation well, located 198 feet southwest of production well (r = 198 feet). Static water level: 53.28 feet on 12-02-1983.

0	-	2	Topsoil
2	-	20	Clay, brown
20	-	120	Clay, blue; some gravel, small rocks and boulders

120 - 159 Sand, salt and pepper, fine and coarse; small gravel  
159 - 160 Clay, blue

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County: TURNER  
Legal Location: SW SW SW SW sec. 11, T. 100 N., R. 55 W.  
Latitude: 43.2916  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-17-1983  
Ground Surface Elevation: 1420.00 T  
Total Drill Hole Depth: 245  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 100N-55W-11CCCC  
Longitude: 97.1912  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: R1-83-104  
Single Point Resistivity: X  
Extra:

0 - 1	Silt, grayish-black, clayey (topsoil)
1 - 28	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
28 - 173	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very silty to sandy from 110 to 128 feet, contains numerous sand and gravel lenses from 1 to 3 feet thick (till)
173 - 179	Sand and gravel, gray, medium sand to very fine pebble gravel, silty; mostly subrounded carbonate and mudrock fragments and quartz
179 - 205	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
205 - 245	Clay to claystone, olive-black, silty; highly calcareous, very friable, lost a lot of water at 205 feet (Niobrara Formation)

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County: TURNER  
Legal Location: NW NW NW NW sec. 15, T. 100 N., R. 55 W.  
Latitude: 43.2915  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: D. HOLLY  
Date Drilled: 08-12-1983  
Ground Surface Elevation: 1407.00 I  
Total Drill Hole Depth: 206  
Water Rights Well: TU-83E  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1409.80 I

Location: 100N-55W-15BBBB  
Longitude: 97.2023  
Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: CO-83-147  
SDGS Well Name: CO-83-147  
Aquifer: DOLTON  
Screen Length: 20.0  
Casing Diameter: 2.0

Casing Stick-up: 2.80  
Well Maintenance Date: 08-29-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Total Casing and Screen: 124.0

Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 32.1 feet on 11-02-1983; measured from top of casing.

0	-	2	Silt, grayish-black, clayey (topsoil)
2	-	26	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
26	-	79	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains several thin sand layers less than 1-foot thick (till)
79	-	83	Gravel, very fine to fine pebble, sandy; mostly subangular to subrounded carbonate and black crystalline rock fragments
83	-	112	Clay, medium-dark-gray, silty, very sandy, very pebbly; unoxidized, calcareous, contains several thin gravel lenses (till)
112	-	122	Sand and gravel, gray, medium sand to very fine pebble gravel, silty to clayey; mostly subangular to subrounded carbonate, black mudrock, and black crystalline rock fragments, contains a few clay layers
122	-	206	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains several gravel lenses from 1 to 2 feet thick (till)

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County: TURNER  
Legal Location: SW SE SE SE sec. 15, T. 100 N., R. 55 W.  
Latitude: 43.2823  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: L. HELSETH  
Geologist: D. HOLLY  
Date Drilled: 08-17-1983  
Ground Surface Elevation: 1410.00 T  
Total Drill Hole Depth: 341  
Water Rights Well: TU-83F  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation:  
Casing Stick-up: 2.40  
Well Maintenance Date: 08-29-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 100N-55W-15DDDC

Longitude: 97.1922

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-103  
SDGS Well Name: R1-83-103

Aquifer: DAKOTA

Screen Length: 20.0  
Casing Diameter: 2.0

Total Casing and Screen: 300.0

Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was

gravel packed. Static water level: 71.0 feet on 11-02-1983; measured from top of casing. This log was re-interpreted on 06-30-1986 based on the E-log and additional drilling in area.

0	-	2	Silt, grayish-black, sandy (topsoil)
2	-	21	Sand and gravel, yellow-brown, medium sand to medium pebble gravel; mostly subrounded to subangular and assorted igneous and metamorphic rock fragments and quartz, oxidized
21	-	26	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
26	-	33	Sand, medium to very coarse, gravelly; mostly subrounded carbonate and mudrock fragments and quartz
33	-	175	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains silty sand and gravel lenses from 71 to 79 feet and 155 to 161 feet (till)
175	-	195	Clay to claystone, olive-black; very friable, highly calcareous (Niobrara Formation)
195	-	247	Clay or shale; based on E-log interpretation only, no notation on drillers log (Carlile Shale)
247	-	273	Limestone and shale; based on E-log interpretation only, no notation on drillers log (Greenhorn Limestone and Graneros Shale)
273	-	305	Sandstone, light-gray, fine to medium sand, grains mostly well-rounded quartz (Dakota Formation)
305	-	317	Clay or shale; from E-log interpretation only, no notation or drillers log
317	-	336	Sandstone, pink, medium to coarse, grains mostly well-rounded quartz (quartzite wash)
336	-	341	Rock; very hard, probably quartzite but no samples obtained

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County: TURNER

Legal Location: NE NE NE NW sec. 17, T. 100 N., R. 55 W.

Latitude: 43.2915

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: M. THOMPSON

Geologist: D. HOLLY

Date Drilled: 06-23-1983

Ground Surface Elevation: 1432.30 I

Total Drill Hole Depth: 251

Water Rights Well: TU-83B

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG. AND HM.

Casing Type: PVC, SCH. 80

Casing Top Elevation: 1434.50 I

Casing Stick-up: 2.20

Well Maintenance Date: 08-28-1984

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential: X

Natural Gamma: X

Samples:

Location: 100N-55W-17BAAA

Longitude: 97.2211

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number: R2-83-57

SDGS Well Name: R2-83-57

Aquifer: DOLTON

Screen Length: 20.0

Casing Diameter: 2.0

Total Casing and Screen: 157.0

Single Point Resistivity: X

Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 59.8 feet on 10-12-1983; measured from top of casing.

0 - 3 Silt, grayish-black, clayey (topsoil)  
3 - 18 Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)  
18 - 85 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, gravel lenses from 22 to 23 and 27 to 28 feet (till)  
85 - 92 Sand and gravel, gray, coarse sand to very fine pebble gravel, mostly subangular to subrounded carbonate and mudrock fragments  
92 - 130 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)  
130 - 160 Sand and gravel, gray, coarse sand to fine pebble gravel, clayey, silty; mostly subangular to subrounded carbonate and mudrock fragments  
160 - 230 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)  
230 - 242 Sand and gravel, gray, coarse sand to medium pebble gravel, clayey, silty; mostly subangular to subrounded carbonate and mudrock fragments  
242 - 250 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)  
250 - 251 Quartzite, pink; took a lot of water, may have been a thin layer of chalk above quartzite

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County: TURNER Location: 100N-55W-17BBCB  
Legal Location: NW SW NW NW sec. 17, T. 100 N., R. 55 W.  
Latitude: 43.2907 Longitude: 97.2250  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL Driller's Log:  
Geologist: D. HOLLY Geologist's Log: X  
Date Drilled: 06-16-1983 Drilling Method: ROTARY  
Ground Surface Elevation: 1442.00 T  
Total Drill Hole Depth: 222 Test Hole Number: CO-83-64  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: Single Point Resistivity:  
Natural Gamma: Extra:

Samples:  
0 - 2 Silt, black, clayey (topsoil)  
2 - 22 Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous, sand lenses from 19 to 21 feet (till)  
22 - 221 Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous, sand lenses from 98 to 100 feet and 129 to 130 feet (till)  
221 - 222 Rock; very hard, could not penetrate with drag bit

Hole plugged with bentonite mud; marsh funnel viscosity 55 seconds per quart or greater.

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County: TURNER Location: 100N-55W-17BDDA  
Legal Location: NE SE SE NW sec. 17, T. 100 N., R. 55 W.  
Latitude: 43.2854 Longitude: 97.2212  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL Driller's Log:

Geologist: D. HOLLY  
Date Drilled: 08-09-1983  
Ground Surface Elevation: 1432.00 T  
Total Drill Hole Depth: 202  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Geologist's Log: X  
Drilling Method: ROTARY  
Test Hole Number: CO-83-141

Single Point Resistivity:  
Extra:

0	-	2	Silt, grayish-black, clayey (topsoil)
2	-	27	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
27	-	138	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous; contains several sand lenses from 1 to 2 feet thick
138	-	141	Sand and gravel, medium sand to very fine pebble gravel
141	-	148	Silt, gray, sandy to clayey
148	-	152	Sand and gravel, medium sand to very fine pebble gravel
152	-	201	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
201	-	202	Rock; very hard, could not penetrate, no sample; quartzite or boulder

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County: TURNER  
Legal Location: SE SE SE SE sec. 17, T. 100 N., R. 55 W.  
Latitude: 43.2849  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-16-1983  
Ground Surface Elevation: 1439.50 I  
Total Drill Hole Depth: 236  
Water Rights Well: TU-83D  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1442.50 I  
Casing Stick-up: 3.00  
Well Maintenance Date: 08-29-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 100N-55W-17DDDD  
Longitude: 97.2132

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-102  
SDGS Well Name: R1-83-102

Aquifer: DOLTON

Screen Length: 20.0  
Casing Diameter: 2.0

Total Casing and Screen: 176.0

Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Static water level: 73.7 feet (11-02-1983); measured from top of casing. Well was gravel packed.

0	-	1	Topsoil, grayish-black, silty with clay
1	-	25	Clay, yellow-brown, silty, sandy, gravelly; oxidized, calcareous (till)
25	-	42	Sand, medium to very coarse, gravelly; mostly subrounded carbonate, black mudrock

42	-	155	fragments and quartz, silty to clayey Clay, medium-dark-gray, silty, sandy, gravelly; unoxidized, calcareous, contains many sand lenses from 1 to 4 feet thick
155	-	182	Sand, medium to very coarse, gravelly; mostly subrounded carbonate and mudrock fragments and quartz, contains many clay lenses from 1 to 2 feet thick
182	-	198	Clay, medium-dark-gray, very silty, very sandy, very gravelly; unoxidized, calcareous, contains several sand lenses
198	-	235	Clay, medium-dark-gray, silty, sandy, gravelly; unoxidized, calcareous, sand and gravel lenses from 226 to 227 feet and 235 to 236 feet, lost all water at 234 feet but regained circulation
235	-	236	Rock; hard, drilled like quartzite but no cuttings received

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County: TURNER	Location: 100N-55W-18BBBB
Legal Location: NW NW NW NW sec. 18, T. 100 N., R. 55 W.	Longitude: 97.2402
Latitude: 43.2915	
Land Owner:	
Project: TURNER-MCCOOK RURAL WATER	
Drilling Company: SDGS	
Driller: M. THOMPSON	Driller's Log:
Geologist: D. HOLLY	Geologist's Log: X
Date Drilled: 06-24-1983	Drilling Method: ROTARY
Ground Surface Elevation: 1445.00 T	
Total Drill Hole Depth: 271	Test Hole Number: R2-83-60
USGS Hydrological Unit Code: 10170102	
Electric Log Information:	
Spontaneous Potential:	Single Point Resistivity:
Natural Gamma:	Extra:
Samples:	

0	-	1	Silt, grayish-black, clayey (topsoil)
1	-	19	Clay, yellow-brown, silty, sandy pebbly; oxidized, calcareous (till)
19	-	146	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, gravel lenses from 62 to 64 feet, boulder at 87 feet
146	-	164	Silt, gray, sandy
164	-	180	Sand and gravel, medium sand to fine pebble gravel; very silty to clayey; mostly subangular to subrounded carbonate and mudrock fragments and quartz; contains several clay layers
180	-	230	Clay, medium-dark-gray, very silty, very sandy, pebbly; unoxidized, calcareous boulders at 208 feet (till)
230	-	264	Claystone, grayish-black to black, silty, very calcareous; white layer from 260 to 263 feet (Niobrara Formation)
264	-	270	Silt, pink to light-red, clayey; noncalcareous
270	-	271	Quartzite, pink; very hard, no cuttings received, penetrated only a few inches

\* \* \* \* \*

County: TURNER	Location: 100N-55W-19CCCC
Legal Location: SW SW SW SW sec. 19, T. 100 N., R. 55 W.	Longitude: 97.2401
Latitude: 43.2702	
Land Owner:	
Project: TURNER-MCCOOK RURAL WATER	

Drilling Company: SDGS  
Driller: M. JARRETT  
Geologist: D. HOLLY  
Date Drilled: 06-24-1983  
Ground Surface Elevation: 1440.00 T  
Total Drill Hole Depth: 207  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

0 - 2	Silt, grayish-black, clayey (topsoil)
2 - 18	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
18 - 160	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very silty from 84 to 99 feet, very sandy from 146 to 148 and 152 to 153 feet (till)
160 - 168	Sand and gravel, medium sand to medium pebble gravel, silty, clayey; mostly subrounded carbonate and mudrock fragments
168 - 205	Clay, medium-dark-gray, very silty, very sandy, gravelly; unoxidized, calcareous (till)
205 - 207	Quartzite, pink; very hard

\* \* \* \* \*

County: TURNER  
Legal Location: SW SW SW SW sec. 21, T. 100 N., R. 55 W.  
Latitude: 43.2731  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: M. JARRETT  
Geologist: D. HOLLY  
Date Drilled: 10-26-1983  
Ground Surface Elevation: 1435.00 T  
Total Drill Hole Depth: 295  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

0 - 17	Clay, yellow-brown to brown, silty, sandy, pebbly (till)
17 - 110	Clay, gray, silty, sandy; few pebbles, gravel stringers from 106 to 107 feet and 108 to 109 feet (till)
110 - 263	Clay, gray, silty, sandy, pebbly; sand lens from 166 to 167 feet (till)
263 - 284	Clay, gray, very silty, very sandy
284 - 294	Clay, gray, silty, sandy, pebbly (till)
294 - 295	Quartzite

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County: TURNER  
Legal Location: NE NE NE NE sec. 36, T. 100 N., R. 55 W.  
Latitude: 43.2642

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R2-83-59

Single Point Resistivity: X  
Extra:

Location: 100N-55W-21CCCC

Longitude: 97.2133

Driller's Log: X  
Geologist's Log:  
Drilling Method: ROTARY

Test Hole Number: R2-83-171

Single Point Resistivity: X  
Extra:

Location: 100N-55W-36AAAA

Longitude: 97.1647



Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: SDGS  
 Driller: S. MITCHELL  
 Geologist: D. HOLLY  
 Date Drilled: 06-16-1983  
 Ground Surface Elevation: 1415.00 T  
 Total Drill Hole Depth: 186  
 Water Rights Well:  
 Other Well Name:  
 Basin: VERMILLION  
 Management Unit:  
 Screen Type: PVC, MFG. AND HM.  
 Casing Type: PVC  
 Casing Top Elevation: 1417.00 T  
 Casing Stick-up: 1.50  
 Well Maintenance Date:  
 USGS Hydrological Unit Code: 10170102  
 Electric Log Information:  
 Spontaneous Potential:  
 Natural Gamma:  
 Samples:

Driller's Log:  
 Geologist's Log: X  
 Drilling Method: ROTARY  
  
 Test Hole Number: CO-83-63  
 SDGS Well Name: CO-83-63  
  
 Aquifer: PLEISTOCENE SERIES  
  
 Screen Length: 15.0  
 Casing Diameter: 2.0  
  
 Total Casing and Screen: 77.0  
  
 Single Point Resistivity:  
 Extra:

Well screen consists of 5-foot sandpoint and 10 feet of hacksaw slots. Depth to water was 12.5 feet on 10-18-1983.

0	-	4	Silt, black, clayey, sandy (topsoil)
4	-	17	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
17	-	21	Sand, rusty-brown, coarse to very coarse, pebbly
21	-	43	Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
43	-	75	Sand, gray, medium to very coarse, gravelly; mostly subangular to subrounded carbonate and black mudrock fragments and quartz; may contain a few clay layers
75	-	100	Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains a few sand lenses less than 2 feet thick (till)
100	-	152	Clay, dark-gray; drills very hard (Niobrara Formation)
152	-	186	Mudstone, whitish-gray; calcareous, hard drilling (Niobrara Formation)

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County: HUTCHINSON  
 Legal Location: NE NE SE NW sec. 12, T. 100 N., R. 56 W.  
 Latitude: 43.2952  
 Land Owner: F. DE BELTS  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: SDGS  
 Driller: M. THOMPSON  
 Geologist: D. HOLLY  
 Date Drilled: 10-27-1983  
 Ground Surface Elevation: 1450.00 T  
 Total Drill Hole Depth: 266  
 Water Rights Well:  
 Other Well Name:  
 Basin: VERMILLION  
 Management Unit:

Location: 100N-56W-12BDAA  
 Longitude: 97.2443  
  
 Driller's Log:  
 Geologist's Log: X  
 Drilling Method: ROTARY  
  
 Test Hole Number: R2-83-172  
 SDGS Well Name: R2-83-172  
  
 Aquifer: DOLTON

Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation: 1452.00 T  
Casing Stick-up: 1.70  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Screen Length: 25.0  
Casing Diameter: 2.0  
Total Casing and Screen: 195.0  
Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 20 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 74.3 on 10-31-1983; measured from top of casing.

0	-	2	Topsoil, black
2	-	18	Clay, yellow-brown, silty, sandy (till)
18	-	147	Clay, gray, silty, sandy, pebbly; gravel lens from 128 to 129 feet and from 138 to 140 feet (till)
147	-	200	Sand and gravel, gray, medium sand to medium pebble gravel; mostly subangular to rounded carbonate, mudrock, black crystalline rock fragments and quartz, several clay layers from 1 to 4 feet thick
200	-	209	Clay, gray, silty, sandy, pebbly (till)
209	-	221	Sand and gravel, gray, medium sand to medium pebble gravel; same as interval from 147 to 200 feet
221	-	233	Mudstone; driller reports gray till but Niobrara Formation is likely according to E-log
233	-	237	Mudstone, white; gritty, calcareous (Niobrara Formation?)
237	-	244	Clay, dark-gray; (Niobrara Formation)
244	-	256	Mudstone, dark, black; gritty, E-log shows good shale kick (Niobrara Formation or Carlile Shale)
256	-	262	Quartzite wash(?); E-log shows good sand kick but none reported by driller
262	-	266	Rock; hard (Sioux Quartzite)

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County: HUTCHINSON  
Legal Location: SW SW SW SW sec. 12, T. 100 N., R. 56 W.  
Latitude: 43.2916  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: M. THOMPSON  
Geologist: D. HOLLY  
Date Drilled: 11-03-1983  
Ground Surface Elevation: 1440.00 T  
Total Drill Hole Depth: 224  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma: X  
Samples:

Location: 100N-56W-12CCCC  
Longitude: 97.2514  
Driller's Log: X  
Geologist's Log:  
Drilling Method: ROTARY  
Test Hole Number: R2-83-177  
Single Point Resistivity: X  
Extra:

0	-	1	Topsoil, black
1	-	24	Clay, yellow-brown, silty, pebbly (till)

24 - 91 Clay, gray, silty, pebbly  
 91 - 96 Gravel, fine  
 96 - 140 Clay, gray, silty, pebbly (till)  
 140 - 160 Clay, gray, silty, pebbly; contains gravel stringers (till)  
 160 - 208 Clay, gray, silty, pebbly (till)  
 208 - 223 Clay, light-gray; greasy, hard (Niobrara Formation)  
 223 - 224 Rock; hard, probably quartzite but no samples received

\* \* \* \*

County: HUTCHINSON  
 Legal Location: SE SE SE SE sec. 13, T. 100 N., R. 56 W.  
 Latitude: 43.2823  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: SDGS  
 Driller: M. THOMPSON/M. JARRETT  
 Geologist: D. HOLLY  
 Date Drilled: 06-23-1983  
 Ground Surface Elevation: 1440.00 T  
 Total Drill Hole Depth: 248  
 USGS Hydrological Unit Code: 10170102  
 Electric Log Information:  
 Spontaneous Potential:  
 Natural Gamma:  
 Samples:

Location: 100N-56W-13DDDD  
 Longitude: 97.2407  
 Driller's Log:  
 Geologist's Log: X  
 Drilling Method: ROTARY  
 Test Hole Number: R2-83-58

Single Point Resistivity:  
 Extra:

0 - 2 Topsoil, grayish-black; silt, clayey  
 2 - 26 Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)  
 26 - 145 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)  
 145 - 158 Silt, gray; as logged by driller, could be some carbonate sand and gravel, drill cuttings not definitive but some sand and gravel present  
 158 - 240 Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, gravel lenses at 203 feet and 208 feet (till)  
 240 - 247 Claystone, grayish-black to black, highly calcareous (Niobrara Formation)  
 247 - 248 Quartzite, pink; only a few inches were penetrated

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County: MCCOOK  
 Legal Location: SE SE SE SE sec. 20, T. 101 N., R. 54 W.  
 Latitude: 43.3149  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: SDGS  
 Driller: D. IVERSON  
 Geologist: D. HOLLY  
 Date Drilled: 08-18-1983  
 Ground Surface Elevation: 1456.30 I  
 Total Drill Hole Depth: 387  
 Water Rights Well: MC-83H  
 Other Well Name:  
 Basin: VERMILLION  
 Management Unit:

Location: 101N-54W-20DDDD 1  
 Longitude: 97.1940

Driller's Log:  
 Geologist's Log: X  
 Drilling Method: ROTARY

Test Hole Number: R1-83-106  
 SDGS Well Name: R1-83-106

Aquifer: SIOUX QUARTZITE WASH

Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation: 1459.00 I  
Casing Stick-up: 2.70  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Screen Length: 20.0  
Casing Diameter: 2.0  
Total Casing and Screen: 374.0  
Single Point Resistivity: X  
Extra:

Screen length includes 10-foot sandpoint and 10 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 100.3 feet on 11-03-1983; measured from top of casing. South well of three.

0	-	1	Silt, grayish-black, clayey (topsoil)
1	-	28	Clay, yellow-brown, silty, sandy, gravelly; oxidized, calcareous (till)
28	-	138	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
138	-	150	Sand, gray, medium to very coarse, pebbly; mostly subrounded carbonate, mudrock, and black crystalline rock fragments and quartz; contains a few thin clay layers
150	-	224	Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous, contains several sand lenses from 1 to 3 feet thick, very sandy from 180 to 224 feet (till)
224	-	285	Sand, gray, medium to very coarse; mostly subrounded carbonate, mudrock and black crystalline rock fragments and quartz; contains several thin clay layers
285	-	296	Clay, medium-dark-gray, very silty, very sandy, pebbly; unoxidized, calcareous (till)
296	-	304	Sand, gray, medium to coarse; mostly subrounded carbonate, mudrock and black crystalline rock fragments and quartz
304	-	335	Clay to claystone, olive-black to light-gray, silty; highly calcareous, may contain a thin coal seam at 310 feet, mud changed to a black color (Niobrara Formation)
335	-	353	Mudstone to sandstone; very fine sand, clayey, very poor sample return, drilled like sandstone
353	-	386	Sandstone; fine to coarse sand, pinkish tint, moderate hardness, very hard layer at 356 feet, may contain several claystone layers, may be a thin coal seam at 354 feet, mud changed to black (Quartzite wash?)
386	-	387	Rock; very hard, could not penetrate with drag bit, most likely Sioux Quartzite but no samples received

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County: MCCOOK  
Legal Location: SE SE SE SE sec. 20, T. 101 N., R. 54 W.  
Latitude: 43.3150  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: L. HELSETH  
Geologist: D. HOLLY  
Date Drilled: 08-25-1983  
Ground Surface Elevation: 1456.80 I  
Total Drill Hole Depth: 285  
Water Rights Well: MC-83G  
Other Well Name:  
Basin: VERMILLION  
Management Unit:

Location: 101N-54W-20DDDD 2  
Longitude: 97.1939

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-107  
SDGS Well Name: R1-83-107

Aquifer: PLEISTOCENE SERIES

Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation: 1459.50 I  
Casing Stick-up: 2.70  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Screen Length: 25.0  
Casing Diameter: 2.0  
Total Casing and Screen: 277.0

Single Point Resistivity:  
Extra:

Screen length includes 5-foot sandpoint and 20 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 100.6 feet on 11-03-1983; measured from top of casing. Center well of three.

0 - 1	Silt, grayish-black, clayey (topsoil)
1 - 28	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
28 - 138	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
138 - 150	Sand, gray, medium to very coarse, pebbly; mostly subrounded carbonate, mudrock and black crystalline rock fragments and quartz; contains a few thin clay layers
150 - 224	Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous, contains several sand lenses from 180 to 224 feet (till)
224 - 285	Sand, gray, medium to very coarse; mostly subrounded carbonate, mudrock and black crystalline rock fragments and quartz; contains several thin clay layers

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County: MCCOOK  
Legal Location: SE SE SE SE sec. 20, T. 101 N., R. 54 W.  
Latitude: 43.3151  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: D. IVERSON  
Geologist: D. HOLLY  
Date Drilled: 08-22-1983  
Ground Surface Elevation: 1456.80 I  
Total Drill Hole Depth: 165  
Water Rights Well: MC-83F  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation: 1459.70 I  
Casing Stick-up: 2.90  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Location: 101N-54W-20DDDD 3  
Longitude: 97.1939

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-108  
SDGS Well Name: R1-83-108

Aquifer: DOLTON

Screen Length: 20.0  
Casing Diameter: 2.0

Total Casing and Screen: 154.0

Single Point Resistivity:  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was

gravel packed. Static water level: 81.7 feet on 11-03-1983; measured from top of casing. North well of three.

0	-	1	Silt, grayish-black, clayey (topsoil)
1	-	28	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
28	-	138	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
138	-	150	Sand, gray, medium to very coarse, pebbly; mostly subrounded carbonate, mudrock and black crystalline rock fragments and quartz; contains a few thin clay layers
150	-	165	Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous, contains several sand lenses from 1 to 3 feet thick

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County: MCCOOK  
Legal Location: SE SE SE SE sec. 29, T. 101 N., R. 54 W.  
Latitude: 43.3121  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: L. HELSETH  
Geologist: D. HOLLY  
Date Drilled: 08-18-1983  
Ground Surface Elevation: 1450.00 T  
Total Drill Hole Depth: 232  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 101N-54W-29DDDD

Longitude: 97.1941

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-105

Single Point Resistivity: X  
Extra:

0	-	1	Silt, grayish-black, clayey (topsoil)
1	-	42	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
42	-	46	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
46	-	67	Sand and gravel, gray, medium sand to fine pebble gravel; silty, clayey; mostly subangular to subrounded carbonate, mudrock, and assorted crystalline rock fragments, contains several thin clay layers
67	-	143	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains many thin gravel lenses very sandy from 113 to 126 feet (till)
143	-	62	Sand and gravel, gray, medium sand to fine pebble gravel, silty to clayey; mostly subangular to subrounded carbonate and assorted crystalline rock fragments and quartz; contains several clay layers
162	-	208	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
208	-	231	Sand and gravel, gray, medium sand to very fine pebble gravel, silty to clayey; mostly subrounded carbonate and assorted crystalline rock fragments and quartz
231	-	232	Rock; very hard, probably quartzite but no cuttings obtained, could not penetrate

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County: MCCOOK  
Legal Location: SE NE NE NE sec. 30, T. 101 N., R. 54 W.  
Latitude: 43.3140  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER

Location: 101N-54W-30AAAD

Longitude: 97.2051

Drilling Company: SDGS  
 Driller: S. MITCHELL  
 Geologist: D. HOLLY  
 Date Drilled: 09-10-1983  
 Ground Surface Elevation: 1393.50 I  
 Total Drill Hole Depth: 232  
 Water Rights Well: MC-83E  
 Other Well Name:  
 Basin: VERMILLION  
 Management Unit:  
 Screen Type: PVC, MFG. AND HM.  
 Casing Type: PVC  
 Casing Top Elevation: 1396.00 I  
 Casing Stick-up: 2.50  
 Well Maintenance Date: 08-28-1984  
 USGS Hydrological Unit Code: 10170102  
 Electric Log Information:  
 Spontaneous Potential: X  
 Natural Gamma:  
 Samples:

Driller's Log:  
 Geologist's Log: X  
 Drilling Method: ROTARY  
  
 Test Hole Number: CO-83-144  
 SDGS Well Name: CO-83-144  
  
 Aquifer: DOLTON  
  
 Screen Length: 20.0  
 Casing Diameter: 2.0  
  
 Total Casing and Screen: 124.0  
  
 Single Point Resistivity: X  
 Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 18.2 feet (11-03-1983); measured from top of casing.

0	-	2	Silt, grayish-black, sandy (topsoil)
2	-	15	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous, highly oxidized gravel from 3 to 4 feet (till)
15	-	94	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
94	-	120	Sand and gravel, gray, medium sand to very fine pebble gravel; silty, clayey; mostly subrounded carbonate, black mudrock, and black crystalline rock fragments and quartz; contains several clay layers
120	-	191	Silt, medium-dark-gray, very sandy to pebbly; unoxidized, calcareous, very poor cuttings received
191	-	220	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains many carbonate pebbles (till)
220	-	232	Gravel, fine, very sandy, pebbly; mostly subrounded carbonate, black mudrock and black crystalline rock fragments and quartz; may contain large cobbles, very difficult drilling, caved in alot, could not penetrate past 232 feet

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County: MCCOOK  
 Legal Location: SE SE SE NE sec. 31, T. 101 N., R. 54 W.  
 Latitude: 43.3026  
 Land Owner:  
 Project: TURNER-MCCOOK RURAL WATER  
 Drilling Company: SDGS  
 Driller: S. MITCHELL  
 Geologist: D. HOLLY  
 Date Drilled: 08-10-1983  
 Ground Surface Elevation: 1424.10 I  
 Total Drill Hole Depth: 256  
 Water Rights Well: MC-83B  
 Other Well Name:

Location: 101N-54W-31ADDD  
 Longitude: 97.2053  
  
 Driller's Log:  
 Geologist's Log: X  
 Drilling Method: ROTARY  
  
 Test Hole Number: CO-83-143  
 SDGS Well Name: CO-83-143

Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation: 1427.10 I  
Casing Stick-up: 3.00  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Aquifer: DOLTON  
Screen Length: 20.0  
Casing Diameter: 2.0  
Total Casing and Screen: 182.0  
Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 51.6 feet (11-03-1983); measured from top of casing.

0	-	2	Silt, grayish-black, sandy (topsoil)
2	-	12	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
12	-	34	Gravel, very fine to coarse pebble, sandy; mostly subangular to subrounded carbonate, mudrock, black crystalline and assorted lighter-colored silicate rock fragments; highly oxidized from 12 to 30 feet
34	-	125	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains several sand lenses (till)
125	-	184	Sand, gray, fine to very coarse, pebbly; mostly subrounded carbonate, mudrock, black crystalline rock fragments and quartz, contains several clay layers from 1 to 2 feet thick
184	-	243	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very sandy from 209 to 215 feet (till)
243	-	253	Sand and gravel, gray, medium sand to very fine pebble gravel; mostly subrounded carbonate, mudrock, and black crystalline rock fragments and quartz
253	-	256	Clay; no cuttings obtained, drilled very chattery (till?)

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County: MCCOOK  
Legal Location: NE NW NE NW sec. 31, T. 101 N., R. 54 W.  
Latitude: 43.3050  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 06-29-1984  
Ground Surface Elevation: 1442.00 T  
Total Drill Hole Depth: 180  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Location: 101N-54W-31BABA  
Longitude: 97.2140  
Driller's Log: X  
Geologist's Log:  
Drilling Method: ROTARY  
Test Hole Number:  
Single Point Resistivity: X  
Extra:

Test Hole Number 3-4.

0	-	17	Clay, yellow
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17 - 136 Clay, blue  
 136 - 150 Sand; fair, with clay  
 150 - 160 Sand, clay mixed  
 160 - 170 Sand and clay  
 170 - 180 Clay, blue

E-log shows good "sand kick" from 141 to 156 feet.

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County: MCCOOK	Location: 101N-54W-31BABB 1
Legal Location: NW NW NE NW sec. 31, T. 101 N., R. 54 W.	
Latitude: 43.3047	Longitude: 97.2145
Land Owner:	
Project: TURNER-MCCOOK RURAL WATER	
Drilling Company: HURON DRILLING	
Driller: R. KUEHL	Driller's Log:
Geologist: D. HOLLY	Geologist's Log: X
Date Drilled: 04-27-1984	Drilling Method: ROTARY
Ground Surface Elevation: 1438.00 T	
Total Drill Hole Depth: 200	Test Hole Number:
Water Rights Well:	SDGS Well Name:
Other Well Name: PRIVATE	
Basin: VERMILLION	Aquifer: DOLTON
Management Unit:	
Screen Type: PVC, HM.	Screen Length: 40.0
Casing Type: PVC	Casing Diameter: 2.0
Casing Top Elevation: 1440.00 T	
Casing Stick-up: 2.20	Total Casing and Screen: 180.0
Well Maintenance Date:	
USGS Hydrological Unit Code: 10170102	
Electric Log Information:	
Spontaneous Potential: X	Single Point Resistivity: X
Natural Gamma: X	Extra:
Samples:	

Depth to water was 63.3 feet on 05-23-1984.

0 - 2 Silt, black (topsoil)  
 2 - 30 Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)  
 30 - 147 Clay, dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very sandy from 100 to 147 feet (till)  
 147 - 173 Sand and gravel, gray, medium sand to medium pebble gravel; mostly subrounded to subangular carbonate, mudrock and crystalline rock fragments and quartz  
 173 - 200 Clay, dark-gray, silty, very sandy, very pebbly; unoxidized, calcareous (till)

\* \* \* \* \*

County: MCCOOK	Location: 101N-54W-31BABB 2
Legal Location: NW NW NE NW sec. 31, T. 101 N., R. 54 W.	
Latitude: 43.3050	Longitude: 97.2145
Land Owner:	
Project: TURNER-MCCOOK RURAL WATER	

Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 06-28-1984  
Ground Surface Elevation: 1442.00 T  
Total Drill Hole Depth: 180  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Driller's Log: X  
Geologist's Log:  
Drilling Method: ROTARY

Test Hole Number:

Single Point Resistivity: X  
Extra:

Test Hole Number 3-3.

0 - 20	Clay, yellow
20 - 80	Clay, blue
80 - 120	Clay, blue; with gravel streaks
120 - 138	Clay, blue
138 - 151	Sand, medium
151 - 155	Sand and clay
155 - 180	Clay, blue

E-log shows good "sand kick" from 139 to 153 feet.

\* \* \* \* \*

County: MCCOOK  
Legal Location: NW NW NW NW sec. 31, T. 101 N., R. 54 W.  
Latitude: 43.3051  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 04-25-1984  
Ground Surface Elevation: 1445.00 T  
Total Drill Hole Depth: 180  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Location: 101N-54W-31BBBB  
Longitude: 97.2203

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number:

Single Point Resistivity: X  
Extra:

Test Hole Number 3-1.

0 - 2	Silt, black (topsoil)
2 - 40	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
40 - 120	Clay, gray, silty, sandy, pebbly; unoxidized, calcareous (till)
120 - 180	Clay, gray, very silty, very sandy, pebbly; unoxidized, calcareous, several sand lenses from 1 to 4 feet thick are present, E-log indicates possible sand from 141 to 147 feet (till)

\* \* \* \* \*

County: MCCOOK  
Legal Location: SW SW SW NW sec. 31, T. 101 N., R. 54 W.  
Latitude: 43.3025  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: D. HOLLY  
Date Drilled: 08-11-1983  
Ground Surface Elevation: 1440.00 T  
Total Drill Hole Depth: 206  
Water Rights Well: MC-83C  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1443.00 T  
Casing Stick-up: 2.60  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 101N-54W-31BCCC 1  
Longitude: 97.2203

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-145  
SDGS Well Name: CO-83-145

Aquifer: DOLTON

Screen Length: 20.0  
Casing Diameter: 2.0

Total Casing and Screen: 154.0

Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 69.7 feet on 11-03-1983; measured from top of casing.

- |           |  |
|-----------|--|
| 0 - 2     | Silt, grayish-black, clayey (topsoil)  |
| 2 - 24    | Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)  |
| 24 - 136  | Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains several sand layers approximately 1-foot thick                                  |
| 136 - 168 | Sand, gray, medium to very coarse, pebbly; mostly subrounded quartz, carbonate, mudrock and black crystalline rock fragments, clay lenses from 156 to 160 feet |
| 168 - 206 | Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very sandy from 175 to 180 feet  |

\* \* \* \* \*

County: MCCOOK  
Legal Location: SW SW SW NW sec. 31, T. 101 N., R. 54 W.  
Latitude: 43.3025  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 07-09-1984  
Ground Surface Elevation: 1442.00 T  
Total Drill Hole Depth: 170  
Water Rights Well:  
Other Well Name: 3-5

Location: 101N-54W-31BCCC 2  
Longitude: 97.2203

Driller's Log: X  
Geologist's Log:  
Drilling Method: REVERSE

Test Hole Number:  
SDGS Well Name:

Basin: VERMILLION  
Management Unit:  
Screen Type: STAINLESS STEEL, MFG.  
Casing Type: STEEL  
Casing Top Elevation: 1442.00 T  
Casing Stick-up: 0.40  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Aquifer: DOLTON  
Screen Length: 28.0  
Casing Diameter: 12.0  
Total Casing and Screen: 170.0  
Single Point Resistivity: X  
Extra:

Production well 3-5. Hole diameter 22 inches. Well gravel packed with 8 tons of Luther Maddox gravel, Double AA, and grouted with 180 bags of cement, 6 to 1 mix. Aquifer test well. Depth to water was 72.25 feet on 08-07-1984. Stainless steel screen slot size 80.

0	-	2	Clay (topsoil)
2	-	20	Clay, yellow
20	-	50	Clay, blue
50	-	60	Gravel
60	-	80	Clay, blue; some sand streaks
80	-	140	Clay, blue, sandy
140	-	145	Sand
145	-	150	Clay, blue
150	-	170	Sand, medium

\* \* \* \* \*

County: MCCOOK  
Legal Location: SW SW SW NW sec. 31, T. 101 N., R. 54 W.  
Latitude: 43.3025  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 07-03-1984  
Ground Surface Elevation: 1442.00 T  
Total Drill Hole Depth: 170  
Water Rights Well:  
Other Well Name: 3-6  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG.  
Casing Type: PVC  
Casing Top Elevation: 1444.00 T  
Casing Stick-up: 1.80  
Well Maintenance Date:  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Location: 101N-54W-31BCCC 3  
Longitude: 97.2203  
Driller's Log: X  
Geologist's Log:  
Drilling Method: ROTARY  
Test Hole Number:  
SDGS Well Name:  
Aquifer: DOLTON  
Screen Length: 30.0  
Casing Diameter: 5.0  
Total Casing and Screen: 170.0  
Single Point Resistivity: X  
Extra:

Depth to water was 69.30 feet on 07-03-1984. Screen length is 30 feet of 5-inch slotted plastic.

0	-	2	Topsoil
2	-	14	Clay, yellow
14	-	60	Clay, blue
60	-	136	Clay, blue; with gravel streaks
136	-	140	Sand
140	-	155	Sand; good
155	-	160	Sand; with some clay
160	-	170	Sand; good

\* \* \* \* \*

County: MCCOOK  
Legal Location: SW SW SW SW sec. 32, T. 101 N., R. 54 W.  
Latitude: 43.3000  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: D. HOLLY  
Date Drilled: 08-09-1983  
Ground Surface Elevation: 1421.40 I  
Total Drill Hole Depth: 186  
Water Rights Well: MC-83A  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1424.30 I  
Casing Stick-up: 2.90  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

Location: 101N-54W-32CCCC

Longitude: 97.2052

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-142  
SDGS Well Name: CO-83-142

Aquifer: DOLTON

Screen Length: 20.0  
Casing Diameter: 2.0

Total Casing and Screen: 158.0

Single Point Resistivity: X  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 49.4 feet on 11-02-1983; measured from top of casing.

0	-	2	Silt, grayish-black, sandy (topsoil)
2	-	12	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
12	-	132	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
132	-	158	Sand and gravel, gray, medium sand to very fine pebble gravel; mostly subangular to subrounded carbonate, mudrock, black crystalline rock fragments and quartz, contains several 1 to 2 feet thick clay and silt lenses
158	-	186	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \* \*

County: MCCOOK  
Legal Location: SW SW SW SW sec. 33, T. 101 N., R. 54 W.  
Latitude: 43.3000  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: S. MITCHELL  
Geologist: D. HOLLY  
Date Drilled: 08-11-1983  
Ground Surface Elevation: 1420.00 T  
Total Drill Hole Depth: 256  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma:  
Samples:

0	-	2	Silt, grayish-black, clayey (topsoil)
2	-	34	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
34	-	42	Sand, yellow-brown, medium to very coarse, silty, pebbly; oxidized, mostly subrounded quartz, carbonate, and black crystalline rock fragments
42	-	237	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, very sandy from 162 to 214 feet
237	-	253	Sand and gravel, gray, medium sand to fine pebble gravel, very silty, clayey; mostly subrounded quartz, black and green crystalline rock fragments and some carbonate rock fragments
253	-	256	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, stopped at 256 feet due to lack of drill pipe (till)

\* \* \* \* \*

County: MCCOOK  
Legal Location: SE SE SE SE sec. 24, T. 101 N., R. 55 W.  
Latitude: 43.3144  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: SDGS  
Driller: L. HELSETH  
Geologist: D. HOLLY  
Date Drilled: 08-23-1983  
Ground Surface Elevation: 1442.30 I  
Total Drill Hole Depth: 273  
Water Rights Well: MC-83D  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC, SCH. 40  
Casing Top Elevation: 1445.00 I  
Casing Stick-up: 2.70  
Well Maintenance Date: 08-28-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X

Location: 101N-54W-33CCCC  
Longitude: 97.1940

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: CO-83-146

Single Point Resistivity: X  
Extra:

Location: 101N-55W-24DDDD  
Longitude: 97.2203

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number: R1-83-109  
SDGS Well Name: R1-83-109

Aquifer: DOLTON

Screen Length: 20.0  
Casing Diameter: 2.0

Total Casing and Screen: 166.0

Single Point Resistivity: X

Natural Gamma:  
Samples:

Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 68.1 feet (11-03-1983); measured from top of casing.

0	-	4	Silt, grayish-black, clayey (topsoil)
4	-	22	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
22	-	141	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous, contains several sand lenses
141	-	160	Sand and gravel, gray, medium sand to very fine pebble gravel; mostly subangular to subrounded carbonate, mudrock, and black crystalline rock fragments, some quartz and coal
160	-	213	Clay, medium-dark-gray, very silty, very sandy, pebbly; unoxidized, calcareous, contains several sand lenses sample at 200 feet contained wood fragments (till)
213	-	247	Sand and gravel, silty to clayey; mostly subangular to subrounded carbonated, mudrock, black crystalline rock fragments and quartz, contains several clay layers
247	-	273	Quartzite; hard drilling, weathered quartzite

\* \* \* \*

County: MCCOOK  
Legal Location: SW SW SW SW sec. 25, T. 101 N., R. 55 W.  
Latitude: 43.3052  
Land Owner:  
Project: TURNER-MCCOOK RURAL WATER  
Drilling Company: HURON DRILLING  
Driller: R. KUEHL  
Geologist: D. HOLLY  
Date Drilled: 08-27-1984  
Ground Surface Elevation: 1450.00 T  
Total Drill Hole Depth: 183  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential: X  
Natural Gamma: X  
Samples:

Location: 101N-55W-25CCCC  
Longitude: 97.2314

Driller's Log:  
Geologist's Log: X  
Drilling Method: ROTARY

Test Hole Number:

Single Point Resistivity: X  
Extra:

Test Hole Number 4-1.

0	-	2	Silt, black, clayey (topsoil)
2	-	17	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
17	-	105	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
105	-	115	Sand and gravel, gray, medium sand to very fine pebble gravel; mostly subrounded carbonate mudrock and assorted crystalline rock fragments and quartz
115	-	155	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
155	-	179	Sand and gravel, gray, medium sand to fine pebble gravel; mostly subrounded carbonate, mudrock, assorted crystalline rock fragments and quartz
179	-	183	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \*

County: MCCOOK

Location: 101N-55W-36BBBB 1

Legal Location: NW NW NW NW sec. 36, T. 101 N., R. 55 W.

Latitude: 43.3043

Longitude: 97.2315

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: D. IVERSON

Geologist: D. HOLLY

Date Drilled: 08-25-1983

Ground Surface Elevation: 1449.20 I

Total Drill Hole Depth: 341

Water Rights Well: MC-83J

Other Well Name:

Basin: VERMILLION

Management Unit:

Screen Type: PVC, MFG. AND HM.

Casing Type: PVC

Casing Top Elevation: 1451.60 I

Casing Stick-up: 2.40

Well Maintenance Date: 08-29-1984

USGS Hydrological Unit Code: 10170102

Electric Log Information:

Spontaneous Potential: X

Natural Gamma:

Samples:

Driller's Log:

Geologist's Log: X

Drilling Method: ROTARY

Test Hole Number: R1-83-116

SDGS Well Name: R1-83-116

Aquifer: PLEISTOCENE SERIES

Screen Length: 25.0

Casing Diameter: 2.0

Total Casing and Screen: 338.0

Single Point Resistivity:

Extra:

Screen length includes 5-foot sandpoint and 20 feet of hacksaw slotted casing. Static water level: 93.8 feet on 11-04-1983; measured from casing top. Well was gravel packed. South well of two.

0	-	2	Silt, grayish-black, clayey (topsoil)
2	-	15	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
15	-	146	Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous, not as silty from 15 to 33 feet, sand lense from 138 to 142 feet with some coal (till)
146	-	179	Sand, gray, medium to very coarse, pebbly; mostly subrounded carbonate, mudrock, and black crystalline rock fragments and quartz
179	-	208	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
208	-	227	Sand, gray, fine to very coarse, pebbly; mostly subrounded carbonate and black crystalline rock fragments and quartz
227	-	289	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)
289	-	320	Sand and gravel, gray, medium to very fine pebble gravel; mostly subangular to subrounded carbonate and black crystalline rock fragments and quartz
320	-	340	Sand, fine to very coarse; mostly subrounded carbonate and black crystalline rock fragments and quartz
340	-	341	Rock; very hard, no penetration or cuttings received (Sioux Quartzite?)

\* \* \* \*

County: MCCOOK

Legal Location: NW NW NW NW sec. 36, T. 101 N., R. 55 W.

Latitude: 43.3043

Land Owner:

Project: TURNER-MCCOOK RURAL WATER

Drilling Company: SDGS

Driller: M. THOMPSON

Geologist: D. HOLLY

Location: 101N-55W-36BBBB 2

Longitude: 97.2315

Driller's Log:

Geologist's Log: X



Date Drilled: 11-03-1983  
Ground Surface Elevation: 1449.20 I  
Total Drill Hole Depth: 185  
Water Rights Well: MC-83I  
Other Well Name:  
Basin: VERMILLION  
Management Unit:  
Screen Type: PVC, MFG. AND HM.  
Casing Type: PVC  
Casing Top Elevation: 1451.30 I  
Casing Stick-up: 2.10  
Well Maintenance Date: 08-29-1984  
USGS Hydrological Unit Code: 10170102  
Electric Log Information:  
Spontaneous Potential:  
Natural Gamma:  
Samples:

Drilling Method: ROTARY  
Test Hole Number: R2-83-176  
SDGS Well Name: R2-83-176  
Aquifer: DOLTON  
Screen Length: 20.0  
Casing Diameter: 2.0  
Total Casing and Screen: 182.0  
Single Point Resistivity:  
Extra:

Screen length includes 5-foot sandpoint and 15 feet of hacksaw slots above sandpoint. Well was gravel packed. Static water level: 75.6 feet on 11-04-1983; measured from top of casing. North well of two.

0	-	2	Silt, grayish-black, clayey (topsoil)
2	-	13	Clay, yellow-brown, silty, sandy, pebbly; oxidized, calcareous (till)
13	-	154	Clay, medium-dark-gray, very silty, sandy, pebbly; unoxidized, calcareous (till)
154	-	179	Sand, gray, medium to very coarse, pebbly; mostly subrounded carbonate, mudrock, and black crystalline rock fragments and quartz
179	-	185	Clay, medium-dark-gray, silty, sandy, pebbly; unoxidized, calcareous (till)

\* \* \* \*

Appendix B. Water-chemistry data

Milligrams per liter <sup>1</sup>

Location <sup>2</sup>	Lab <sup>3</sup>	Lab No. <sup>4</sup>	Date Sampled	Well Depth (ft) <sup>5</sup>	Depth to Water (ft) <sup>6</sup>	Conductivity (mmhos) <sup>7</sup>	Milligrams per liter <sup>1</sup>															pH	Temp. <sup>8</sup>
							DS	Hardness as CaCO <sub>3</sub>	Fe	Mn	SO <sub>4</sub>	NO <sub>3</sub> -N	Na	Ca	Mg	K	Cl	F	HCO <sub>3</sub>	CO <sub>3</sub>			
-----	--	---	---	--	-----	---	500 <sup>9</sup>	---	0.3 <sup>9</sup>	0.05 <sup>9</sup>	250 <sup>9</sup>	10 <sup>10</sup>	---	---	---	---	250 <sup>9</sup>	2.4 <sup>10</sup>	---	--	----	----	
PARKER AREA																							
Parker-Centerville (outwash) aquifer																							
098N-52W-18CAAA 1	L1	TMR-83-021	09/14/83	32	11.20	998	760	524	0.07	0.57	308	<0.20	35	124	52	4.8	33	0.33	299	--	----	----	
098N-52W-18CCCC	L1	TMR-83-022	09/15/83	40	13.65	930	714	514	0.07	0.54	254	<0.20	20	120	52	3.6	16	0.28	378	--	----	----	
098N-52W-18DAAA	L1	TMR-83-023	09/15/83	21	8.48	1065	742	563	<0.05	<0.05	270	10.60	17	125	61	2.9	27	0.47	327	--	----	----	
098N-52W-20ADDD	L1	TMR-83-024	09/15/83	35	6.22	843	570	347	0.05	0.28	216	0.04	54	93	28	6.8	5	0.30	317	--	----	----	
098N-52W-29AAAA	L1	TMR-83-027	09/26/83	25	5.82	870	640	458	0.05	0.38	204	0.05	27	116	41	4.8	12	0.24	344	--	----	----	
098N-53W-02BAAA 1	L1	TMR-83-013	08/24/83	43	8.5	1370	998	660	<0.05	0.36	560	<0.05	60	157	65	7.1	13	0.29	244	--	----	----	
098N-53W-02BAAA 2	L1	TMR-83-020	09/14/83	22	9.39	955	720	428	0.08	<0.05	280	14.80	52	99	44	3.5	10	0.34	244	--	----	----	
098N-53W-02BCCC	L1	TMR-83-026	09/26/83	41	15.22	1398	1010	571	<0.05	0.47	470	<0.05	93	133	58	7.8	11	0.28	293	--	----	----	
098N-53W-13DBAA	L1	TMR-83-014	08/24/83	38	15.0	1130	790	620	0.81	0.63	407	<0.05	14	143	64	3.9	18	0.13	268	--	----	----	
099N-53W-23DCCC 1	L1	TMR-83-012	08/24/83	38	6.1	1100	804	537	<0.05	0.21	415	<0.05	42	126	54	5.7	12	0.20	244	--	----	----	
099N-53W-23DCCC 2	L1	TMR-83-019	09/14/83	24	5.92	979	720	444	0.08	0.57	310	0.20	66	102	46	5.3	8	0.36	299	--	----	----	
099N-53W-26ADDA	L1	TMR-83-018	09/13/83	24	5.92	977	728	356	1.42	0.25	310	0.30	101	93	30	6.6	13	0.38	293	--	----	----	
DOLTON AREA																							
Surface outwash (Vermillion West Fork aquifer)																							
101N-54W-29CCCD 1	L4	Q-5191	12/05/67	52	---	2800	2578	1440	0.89	2.70	1480	0	206	358	133	23	5.5	0.3	377	0	7.90	----	
Intermediate outwash (Dolton aquifer)																							
100N-55W-08ABCB 1	L3	843841	08/03/84	172	---	845	570	83.9	1.0	0.06	<12	<0.1	176	22.7	6.6	7.2	25.9	0.51	536	--	7.67	----	
100N-55W-08DAAA	L1	TMR-83-004	08/11/83	147	49.8	944	584	119	<0.05	0.07	38	<0.05	178	33	9	8.1	26	0.58	506	--	----	----	
100N-55W-08DDDD 1	L1	TMR-83-033	12/02/83	158	79.12	698	556	85	0.59	0.07	4	<0.20	176	24	6	7.6	25	0.58	511	--	7.6	42.8	
100N-55W-08DDDD 1	L1	TMR-83-035	12/05/83	158	95.15	701	562	85	0.92	0.05	10	<0.20	179	24	6	7.6	25	0.61	523	--	7.5	44.6	
100N-55W-08DDDD 1	L3	836	12/05/83	158	---	816	537	73	0.90	0.04	<12	<0.1	177	19.1	6.0	7.6	23.5	0.5	506	0	7.98	----	
100N-55W-09CDDD	L1	TMR-83-031	12/02/83	130	42.1	1503	1213	324	<0.05	0.95	585	0.58	272	90	24	12.0	18	0.47	376	--	----	----	
100N-55W-09CDDD	L1	TMR-83-036	12/08/83	130	42.1	1428	1069	268	<0.05	0.67	410	0.48	268	76	19	11.5	18	0.48	497	--	----	----	
100N-55W-09CDDD	L1	TMR-83-037	01/24/84	130	42.1	1914	1205	318	<0.05	0.75	668	----	280	86	25	12.6	18	0.22	366	--	----	----	
100N-55W-15BBBB	L1	TMR-83-009	08/19/83	124	45.3	1600	1080	227	<0.05	0.14	352	<0.05	290	58	20	17.1	34	0.64	415	--	----	----	
100N-55W-17BAAA	L1	TMR-83-002	06/24/83	157	54.2	1030	600	93	0.39	0.26	10	0.28	220	24	8	----	20	0.55	---	--	----	----	
100N-55W-17DDAA	L1	TMR-83-032	12/02/83	165	65	728	576	94	0.65	0.06	31	<0.20	183	26	7	7.6	22	0.58	527	--	7.4	44.6	
100N-55W-17DDAA	L1	TMR-83-034	12/05/83	165	65	723	572	119	0.64	<0.05	25	<0.20	185	36	7	7.6	23	0.71	529	--	7.5	44.6	
100N-55W-17DDDD	L1	TMR-83-008	08/19/83	176	65.7	2880	2400	1001	1.52	0.61	1350	<0.05	339	246	94	18.5	27	0.36	403	--	----	----	
100N-55W-34DDDD 4	L1	GTR-84-050	08/01/84	165	---	1186	745	111	0.16	<0.05	13	<0.2	223	28	10	9.2	25	0.57	696	--	----	----	
100N-56W-12BDAA	L1	TMR-83-028	10/31/83	195	74.34	1060	1048	327	0.06	0.47	381	0.05	260	75	34	12.2	28	0.51	577	--	----	----	
101N-54W-18BBBB	L1	TMR-84-002	07/12/84	153	62.78	3004	3198	1836	0.26	1.75	1950	0.70	153	475	158	16.3	7	0.36	343	--	----	50	
101N-54W-20DDDD 3	L1	TMR-83-011	08/23/83	154	78.7	2610	2190	985	0.83	1.20	1200	<0.05	270	253	86	19.4	11	0.32	390	--	----	----	
101N-54W-30AAAD	L1	TMR-83-005	08/11/83	124	19.0	2880	2520	1139	0.22	2.42	1480	<0.05	293	301	94	21.6	17	0.28	342	--	----	----	
101N-54W-31ADDD	L1	TMR-83-006	08/11/83	182	33.7	1590	1110	320	<0.05	0.42	492	<0.05	247	87	25	14.2	20	0.50	390	--	----	----	
101N-54W-31BCCC 1	L1	TMR-83-007	08/12/83	154	15.4	1020	680	294	<0.05	0.08	86	<0.05	178	44	18	8.8	22	0.55	537	--	----	----	
101N-54W-31BCCC 2	L3	843886	08/08/84	170	---	928	599	111	0.67	0.05	<12	<0.1	176	29.0	9.3	8.1	25.9	0.35	570	--	7.99	----	
101N-54W-32CCCC	L1	TMR-83-003	08/11/83	158	45.0	1600	1140	310	0.07	0.56	512	<0.05	261	88	22	13.9	17	0.44	354	--	----	----	
101N-55W-20DADD	L2	79-564	08/22/79	172	---	1408	1056	190	0.35	----	265	2.60	253	53	14	17	6	----	503	--	7.82	----	
101N-55W-24DDDD	L1	TMR-83-016	09/07/83	166	65.5	1556	1051	194	<0.05	0.08	340	<0.05	299	48	18	12.2	15	0.36	464	--	----	----	
101N-55W-27BAAA	L2	80-0596	08/05/80	203	---	1900	1332	238	6.65	----	750	2.90	325	51	27	18	20	----	185	5	8.39	----	
101N-55W-28BCCA	L5	----	09/01/83	200	---	978	590	101	0.98	<0.02	<12	0.2	196	26	8.8	8.0	24.7	0.43	609	--	7.76	----	
101N-55W-28DCCC	L2	79-566	08/22/79	175	---	857	528	114	0.44	----	19	1.20	171	39	4	10	4	----	556	--	8.20	----	
101N-55W-29DDDD	L2	79-565	08/22/79	160	---	886	568	128	1.32	----	4	3.60	182	38	8	10	6	----	529	34	8.45	----	
101N-55W-34CCCC	L2	79-567	08/22/79	165	---	967	644	201	0.43	----	83	4.10	184	59	13	11	4	----	566	--	7.79	----	
101N-55W-36BBBB 2	L1	TMR-83-029	11/08/83	182	76.9	1213	760	119	<0.05	0.05	128	<0.20	237	31	10	8.8	20	0.39	582	--	----	----	

Appendix B. Water-chemistry data -- continued.

Location <sup>2</sup>	Lab <sup>3</sup>	Lab No. <sup>4</sup>	Date Sampled	Well Depth (ft) <sup>5</sup>	Depth to Water (ft) <sup>6</sup>	Condu-tivity (mmhos) <sup>7</sup>	Milligrams per liter <sup>1</sup>															
							DS	Hardness as CaCO <sub>3</sub>	Fe	Mn	SO <sub>4</sub>	NO <sub>3</sub> -N	Na	Ca	Mg	K	Cl	F	HCO <sub>3</sub>	CO <sub>3</sub>	pH	Temp. <sup>8</sup>
-----	--	---	---	--	-----	---	500 <sup>9</sup>	---	0.3 <sup>9</sup>	0.05 <sup>9</sup>	250 <sup>9</sup>	10 <sup>10</sup>	---	---	---	---	250 <sup>9</sup>	2.4 <sup>10</sup>	---	--	----	----
Basal outwash																						
100N-55W-30AABB	L2	84-0813	08/31/84	321	---	1150	892	257	----	----	469	0.86	136	80	35	14	12	----	185	--	----	----
101N-55W-36BBBB 1	L1	TMR-83-017	09/08/83	338	93.50	1408	1094	604	0.42	1.24	457	<0.05	119	161	49	12.3	11	0.46	437	--	----	----
Niobrara Formation																						
099N-56W-10AAAA	L2	84-0743	09/24/84	214	---	2250	2208	885	----	----	380	0.32	270	206	90	20	16	----	13.9	--	----	----
Dakota Formation																						
099N-55W-01DDDD	L1	TMR-84-003	07/13/84	644	124.15	1430	985	532	<0.05	0.15	455	0.30	115	142	43	12.2	14	0.62	383	--	----	50.0
Sioux Quartzite wash																						
101N-54W-03AAAA	L1	TMR-84-001	07/11/84	387	171.50	1420	1095	587	<0.05	0.47	560	0.60	78	178	57	8.7	10	0.54	293	--	----	51.8
101N-54W-20DDDD 1	L1	TMR-83-010	08/23/83	374	100.5	1590	1210	638	<0.05	0.55	608	<0.05	130	160	58	11.3	20	0.32	305	--	----	----
Pleistocene Series (outwash, miscellaneous category)																						
101N-54W-20DDDD 2	L1	TMR-83-015	08/25/83	277	101.1	1760	1289	636	0.87	1.08	700	<0.05	171	169	52	9.8	10	0.30	329	--	----	----
101N-55W-07DDDD	L1	TMR-83-001	06/24/83	244	88.0	1190	736	190	<0.05	0.30	252	0.91	199	53	14	----	22	0.75	----	--	----	----

<sup>1</sup> DS - dissolved solids; Fe - iron; Mn - manganese; SO<sub>4</sub> - sulfate; NO<sub>3</sub>-N - nitrate nitrogen; Na - sodium; Ca - calcium; Mg - magnesium; K - potassium; Cl - chloride; F - fluoride; HCO<sub>3</sub> - bicarbonate; CO<sub>3</sub> - carbonate.

<sup>2</sup> See appendix A for explanation of location format.

<sup>3</sup> Analytical laboratory: L1 - South Dakota Geological Survey; L2 - Water Resource Research Institute, Brookings; L3 - State Health Laboratory; L4 - unknown; L5 - laboratory is unknown but data are from South Dakota Department of Water and Natural Resources (1983).

<sup>4</sup> An identifier assigned by the analytical laboratory.

<sup>5</sup> Well depth is presented in feet below land surface.

<sup>6</sup> Depth to water is measured from top of casing.

<sup>7</sup> mmhos - micromhos.

<sup>8</sup> Temperature is presented in degrees fahrenheit.

<sup>9</sup> U.S. Environmental Protection Agency (1985b).

<sup>10</sup> U.S. Environmental Protection Agency (1985a).

## Appendix C. Drawdown and recovery data for aquifer test 1

### Pumping Well

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 1)  
Discharge Rate (Q) = 950 gallons per minute

### Observation Wells

1. Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 2)  
Distance from pumping well: 48 feet southeast
2. Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 3)  
Distance from pumping well: 104 feet northeast
3. Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 4)  
Distance from pumping well: 198 feet west
4. Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DAAA)  
Distance from pumping well: 2500 feet north
5. Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 100 N., R. 55 W. (100N-55W-09CDDD)  
a domestic well (Branson)  
Distance from pumping well: 2500 feet east
6. Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 17, T. 100 N., R. 55 W. (100N-55W-17BAAA)  
Distance from pumping well: 2600 feet west
7. Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 32, T. 100 N., R. 54 W. (100N-54W-32CCCC)  
Distance from pumping well: 5500 feet northeast
8. Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 100 N., R. 55 W. (100N-55W-17DDDD)  
Distance from pumping well: 5300 feet south
9. Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 15, T. 100 N., R. 55 W. (100N-55W-15BBBB)  
Distance from pumping well: 5500 feet east

### Drawdown Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 1)  
 Discharge Rate (Q) = 950 gallons per minute

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	----	54.35	----	----
12-02-83	----	54.72	----	----
12-02-83	1330	54.68	0	0
	1331	69.91	1	15.23
	1332	70.82	2	16.14
	1333	71.16	3	16.48
	1334	72.26	4	17.58
	1335	72.58	5	17.90
	1336	73.05	6	18.37
	1337	73.45	7	18.77
	1338	73.69	8	19.01
	1339	73.88	9	19.20
	1340	74.02	10	19.34
	1345	74.79	15	20.11
	1350	75.35	20	20.67
	1356.5	75.65	26.5	20.97
	1400	76.32	30	21.64
	1405	76.84	35	22.16
	1410	77.08	40	22.40
	1415	77.22	45	22.54
	1420	77.43	50	22.75
	1430	78.05	60	23.37
	1440	78.42	70	23.74
	1450	78.70	80	24.02
	1500	79.12	90	24.44
	1510	79.33	100	24.65
	1535	80.00	125	25.32
	1600	80.49	150	25.81
	1630	81.20	180	26.52
	1720	82.11	230	27.43
	1837	83.10	307	28.42
	1932	83.82	362	29.14
	2036	84.35	426	29.67
	2133	85.05	483	30.37
	2229	85.50	539	30.82
	2329	85.95	599	31.27

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-03-83	0029	86.27	659	31.59
	0130	86.65	720	31.97
	0245	87.17	795	32.49
	0332	87.30	842	33.12
	0425	87.73	895	33.05
	0535	88.12	965	33.44
	0629	88.70	1019	34.02
	0726	87.20	1076	32.52
	0829	88.68	1139	34.00
	0928	89.04	1198	34.36
	1021	89.19	1251	34.51
	1125	89.24	1315	34.56
	1228	89.52	1378	34.88
	1330	89.63	1440	34.95
	1427	89.75	1497	35.07
	1527	90.00	1557	35.32
	1625	90.20	1615	35.52
	1727	90.30	1677	35.62
	1825	90.60	1735	35.92
	1927	90.70	1797	36.02
2028	90.90	1858	36.22	
2131	91.00	1921	36.32	
2231	91.18	1981	36.50	
2330	91.27	2040	36.59	
12-04-83	0106	91.50	2136	36.82
	0230	91.70	2220	37.02
	0331	91.72	2281	37.04
	0429	91.91	2339	37.23
	0531	91.96	2401	37.28
	0630	92.10	2460	37.42
	0728	92.30	2518	37.62
	0829	92.45	2579	37.77
	0931	92.47	2641	37.74
	1031	92.61	2701	37.93
	1130	92.68	2760	38.00
	1331	92.61	2881	38.23
	1430	92.98	2940	38.30
	1530	93.05	3000	38.37
	1631	93.20	3061	38.52
	1729	93.28	3119	38.60
	1825	93.55	3175	38.87
	1925	93.47	3235	38.79
	2025	93.57	3295	38.89
	2127	93.80	3357	39.12

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	2228	93.80	3418	39.12
12-05-83	0041	93.82	3551	39.14
	0142	93.95	3612	39.27
	0231	94.04	3661	39.36
	0335	94.10	3725	39.42
	0430	93.90	3780	39.22
	0528	93.80	3838	39.12
	0640	93.65	3910	38.97
	0728	93.50	3958	38.82
	0830	93.22	4020	38.54
	0921	93.18	4071	38.50
	1030	95.00	4140	40.32
	1130	95.00	4200	40.32
	1232	95.15	4262	40.47
	1338	95.32	4328	40.64
	1400	95.40	4350	40.72

### Recovery Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 1)

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1400	95.40	0	40.72
	1402	80.30	2	24.62
	1403	78.42	3	23.72
	1404	78.8(?)	4	24.10
	1405	78.00	5	23.32
	1406	77.85	6	23.17
	1407	77.10	7	22.42
	1408	76.22	8	22.04
	1409	76.46	9	21.78
	1410	76.40	10	21.72
	1415	75.93	15	21.25
	1420	75.30	20	20.62
	1425	74.56	25	19.88
	1430	74.50	30	19.82
	1435	74.15	35	19.47
	1440	73.82	40	18.14
	1445	73.52	45	18.84
	1450	73.28	50	18.60
	1500	72.98	60	18.30
	1510	72.50	70	17.82
	1520	72.15	80	17.47
	1530	71.65	90	16.97
	1540	71.30	100	16.62
	1605	71.00	125	16.32
	1630	70.58	150	15.91
	1700	70.00	180	15.32
	1750	69.15	230	14.47
	1900	68.51	300	13.83
2002	67.80	362	13.12	
2059	67.40	419	12.72	
2159	66.85	479	12.17	
2303	66.65	543	11.97	
12-06-83	0004	65.82	604	11.14
	0120	66.55	680	11.87
	0200	65.37	720	10.69
	0323	64.90	803	10.22
	0358	64.75	838	10.07
	0456	64.70	896	10.02
	0555	64.37	955	9.69



Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
	0655	64.20	1015	9.52
	0809	63.70	1089	9.02
	0900	63.65	1140	8.97
	1000	63.35	1200	8.67
	1100	63.13	1260	8.45
	1154	63.02	1314	8.34
	1303	63.00	1383	8.32
	1405	62.70	1445	8.02
12-08-83	1350	58.50	4310	3.82
01-25-84	1120	55.63	73280	0.95

### Drawdown Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 2)  
 Distance from pumping well: 48 feet southeast

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1334	52.35	-----	-----
12-02-83	1215	52.35	-----	-----
12-02-83	1330	52.60	0	0
	1331	57.65	1	5.05
	1332	58.43	2	5.83
	1333	58.95	3	6.35
	1334	59.46	4	6.86
	1335	59.87	5	7.27
	1336	60.17	6	7.57
	1337	60.57	7	7.97
	1338	60.73	8	8.13
	1339	60.98	9	8.36
	1340	61.15	10	8.55
	1345	62.00	15	9.40
	1350	62.60	20	9.60
	1355	63.12	25	10.52
	1400	63.52	30	10.92
	1405	63.88	35	11.28
	1410	64.15	40	11.55
	1420	64.70	50	12.10
	1430	65.17	60	12.57
	1440	65.58	70	12.98
	1452	66.03	82	13.43
	1500	66.27	90	13.67
	1511	66.60	101	14.00
1535	67.17	125	14.57	
1600	67.72	150	15.12	
1630	68.33	180	15.73	
1721	69.28	231	16.68	
1835	70.31	305	17.71	
1930	71.00	360	18.40	
2034	71.65	424	19.05	
2133	72.20	483	19.60	
2226	72.64	536	20.04	
2328	73.10	588	20.50	
12-03-83	0027	73.50	667	20.90
	0130	73.90	720	21.30

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	0235	74.40	785	21.80
	0331	74.60	841	22.00
	0425	74.90	895	22.30
	0534	75.25	964	22.65
	0628	75.75	1018	23.15
	0722	75.75	1072	23.15
	0831	76.02	1121	23.42
	0929	76.24	1199	23.64
	1022	76.46	1252	23.86
	1123	76.65	1313	24.05
	1228	76.83	1378	24.23
	1330	77.05	1440	24.45
	1429	77.22	1499	24.62
	1530	77.40	1560	24.80
	1626	77.54	1616	24.94
	1729	77.70	1679	25.10
	1827	77.90	1737	25.30
	1928	78.06	1798	25.46
	2030	78.30	1860	25.70
	2130	78.42	1920	25.82
	2231	78.60	1980	26.00
	2328	78.67	2038	26.07
12-04-83	0105	78.95	2135	26.35
	0230	79.11	2220	26.51
	0327	79.22	2280	26.62
	0430	79.35	2340	26.75
	0530	79.48	2400	26.88
	0630	79.77	2460	27.17
	0727	79.65	2517	27.05
	0829	79.83	2579	27.23
	0932	79.91	2640	27.31
	1030	80.00	2700	27.40
	1133	80.10	2763	27.50
	1335	80.34	2885	27.74
	1433	80.45	2943	27.85
	1530	80.55	3000	27.95
	1631	80.65	3061	28.05
	1730	80.77	3120	28.17
	1825	80.81	3175	28.21
	1924	80.90	3234	28.30
	2025	80.56	3295	27.96
	2125	81.17	3355	28.57
	2229	81.30	3419	28.70

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-05-83	0044	81.48	3554	28.88
	0145	81.62	3615	29.02
	0230	81.68	3660	29.08
	0335	81.82	3725	29.22
	0430	81.89	3780	29.29
	0528	81.89	3838	29.38
	0659	82.10	3909	29.50
	0728	82.17	3958	29.57
	0830	82.27	4020	29.67
	1030	82.48	4140	29.88
	1124	82.58	4194	29.98
	1230	82.65	4260	30.05
	1359	82.74	4349	30.14
	1400	82.74	4350	30.14

### Recovery Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 2)  
 Distance from pumping well: 48 feet southeast

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1400	82.74	0	30.14
	1402	82.74	2	30.14
	1403	78.05	3	25.45
	1404	77.24	4	24.64
	1405	76.58	5	23.98
	1406	76.30	6	23.70
	1407	76.05	7	23.45
	1408	75.64	8	23.04
	1409	75.33	9	22.73
	1410	75.05	10	22.45
	1415	74.80	15	22.20
	1420	74.60	20	22.0
	1425	73.68	25	21.08
	1430	73.06	30	20.46
	1435	72.60	35	20.0
	1440	72.22	40	19.62
	1445	71.88	45	19.28
	1450	71.57	50	18.97
	1460	71.32	60	18.72
	1510	71.07	70	18.47
	1520	70.64	80	18.04
	1530	70.26	90	17.66
	1540	69.93	100	17.33
	1605	69.62	125	17.02
	1625	69.35	150	16.75
	1700	68.82	180	16.22
	1750	68.40	230	15.80
1900	66.15	300	13.55	
2001	65.47	361	12.87	
2058	65.02	418	12.42	
2157	64.54	477	11.94	
2302	64.10	542	11.50	
12-06-83	0003	63.71	603	11.11
	0122	63.25	682	10.65
	0158	63.07	718	10.47
	0322	62.55	802	9.95
	0356	62.53	836	9.93
	0455	62.30	895	9.70

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
	0554	62.02	954	9.42
	0654	61.82	1014	9.22
	0808	61.35	1088	8.75
	0901	61.31	1141	8.71
	0959	61.20	1199	8.60
	1059	61.03	1259	8.43
	1152	60.90	1312	8.30
	1302	60.72	1382	8.12
	1404	60.55	1444	7.95
12-08-83	1351	56.90	4311	4.30
01-25-84	1106	53.53	44475	0.93

### Drawdown Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 3)  
 Distance from pumping well: 104 feet northeast

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1416	52.10	-----	-----
12-02-83	1219	52.10	-----	-----
12-02-83	1330	51.25	0	0
	1331	54.76	1	2.61
	----	55.47	1.5	3.32
	1332	56.04	2.0	3.89
	----	56.28	2.5	4.13
	1333	56.49	3.0	4.34
	----	56.81	3.5	4.66
	1334	57.50	4.0	5.35
	----	57.30	4.5	5.15
	1335	57.44	5.0	5.29
	1336	57.73	6	5.58
	1337	58.04	7	5.89
	1338	58.30	8	6.15
	1339	58.50	9	6.35
	1340	58.70	10	6.55
	----	59.17	12.5	7.02
	1345	59.58	15	7.43
	1350	60.18	20	8.03
	1355	60.66	25	8.51
	1400	61.08	30	8.93
	1405	61.46	35	9.31
1410	61.80	40	9.65	
1420	62.30	50	10.15	
1430	62.71	60	10.56	
1440	63.21	70	11.06	
1454	63.61	84	11.46	
1501	63.82	91	11.67	
1511	64.15	101	12.00	
1535	64.69	125	12.54	
1600	65.22	150	13.07	
1630	65.83	180	13.68	
1722	66.80	232	14.65	
1840	67.91	310	15.76	
1933	68.50	363	16.35	
2030	69.10	420	16.95	

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	2150	69.73	500	17.58
	2250	70.15	560	18.00
	2326	70.65	596	18.50
12-03-83	0025	71.05	655	18.90
	0128	71.40	718	19.25
	0230	72.00	780	19.85
	0330	72.08	840	19.93
	0424	72.40	894	20.25
	0530	72.75	960	20.60
	0630	73.00	1020	20.85
	0724	73.25	1074	21.10
	0833	73.50	1143	21.35
	0932	73.78	1202	21.63
	1024	73.97	1254	21.82
	1126	74.17	1316	22.02
	1230	74.38	1380	22.23
	1330	74.59	1440	22.44
	1430	74.74	1500	22.59
	1530	74.92	1560	22.77
	1630	75.10	1620	22.95
	1730	75.25	1680	23.10
	1830	75.42	1740	23.27
	1930	75.61	1800	23.46
	2036	75.83	1866	23.68
	2127	76.05	1917	23.90
	2229	76.08	1978	23.93
	2326	76.23	2036	24.08
12-04-83	0103	76.40	2160	24.25
	0227	76.60	2217	24.45
	0325	76.75	2275	24.60
	0425	76.86	2335	24.71
	0528	77.02	2398	24.87
	0627	77.17	2457	25.02
	0727	77.25	2517	25.10
	0831	77.35	2581	25.20
	0933	77.45	2643	25.30
	1028	77.54	2698	25.39
	1130	77.61	2760	25.46
	1332	77.90	2882	25.75
	1434	77.98	2944	25.83
	1531	78.08	3001	25.93
	1630	78.20	3060	26.05
	1732	78.30	3187	26.15



Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	1827	78.38	3177	26.23
	1922	78.48	3232	26.33
	2022	78.60	3292	26.45
	2124	78.74	3354	26.59
	2226	78.83	3416	26.68
12-05-83	0040	79.05	3550	26.90
	0142	79.18	3612	27.03
	0228	79.25	3658	27.10
	0334	79.38	3724	27.23
	0427	79.47	3777	27.32
	0525	79.85	3835	27.70
	0636	79.68	3906	27.53
	0730	79.73	3960	27.58
	0831	79.85	4021	27.70
	0926	79.95	4076	27.80
	1033	80.05	4143	27.90
	1130	80.13	4200	27.98
	1231	80.20	4261	28.05
	1335	80.30	4325	28.15
	1400	79.40	4350	27.25

### Recovery Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 3)  
 Distance from pumping well: 104 feet northeast

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1400	79.40	0	27.25
	1401	77.60	1	25.45
	1402	76.72	2	24.57
	1403	76.09	3	23.94
	1404	75.65	4	23.50
	1405	75.25	5	23.10
	1406	75.00	6	22.85
	1407	74.71	7	22.56
	1408	74.49	8	22.34
	1409	74.31	9	22.16
	1410	74.10	10	21.95
	1415	73.31	15	21.16
	1420	72.78	20	20.63
	1425	72.31	25	20.16
	1430	71.91	30	19.76
	1435	71.55	35	19.40
	1440	71.29	40	19.14
	1445	71.00	45	18.85
	1450	70.79	50	18.64
	1500	70.35	60	18.20
	1510	69.95	70	17.80
	1520	69.62	80	17.47
	1530	69.36	90	17.21
1540	69.05	100	16.90	
1602	68.54	122	16.39	
1630	68.10	150	15.95	
1700	67.50	180	15.35	
1750	66.75	230	14.60	
1900	65.85	300	13.70	
1958	65.29	358	13.14	
2055	64.74	415	12.59	
2155	64.30	475	12.15	
2259	63.80	539	11.65	
12-06-83	0001	63.37	601	11.22
	0121	63.02	681	10.87
	0157	62.73	717	10.58
	0320	62.40	800	10.25
	0354	62.26	834	10.11

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
	0458	62.00	898	9.85
	0552	61.80	952	9.65
	0652	61.58	1012	9.43
	0806	61.35	1086	9.20
	0902	61.12	1142	8.97
	0958	61.00	1198	8.85
	1058	60.82	1258	8.67
	1152	60.65	1312	8.50
	1301	60.45	1381	8.30
	1401	60.32	1441	8.17
12-08-83	1352	56.70	4312	4.55
01-25-84	1105	53.14	73265	0.99

### Drawdown Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 4)  
 Distance from pumping well: 198 feet west

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1355	52.97	----	----
12-02-83	1222	53.01	----	----
12-02-83	1330	53.20	0	0
	1331	54.78	1	1.58
	1332	55.60	2	2.40
	1333	56.10	3	2.90
	1334	56.65	4	3.45
	1335	57.05	5	3.85
	1336	57.40	6	4.20
	1337	57.65	7	4.45
	1338	57.95	8	4.75
	1339	58.19	9	4.99
	1340	58.42	10	5.22
	1345	59.26	15	6.06
	1350	59.96	20	6.76
	1355	60.45	25	7.25
	1400	60.90	30	7.70
	1405	61.26	35	8.06
	1410	61.59	40	8.39
	1420	62.10	50	8.90
	1430	62.62	60	9.42
	1440	63.00	70	9.80
	1450	63.42	80	10.22
	1500	63.74	90	10.54
	1510	64.05	100	10.85
	1535	64.67	125	11.47
	1600	65.29	150	12.09
	1630	65.90	180	12.70
1730	66.83	240	13.63	
1842	67.89	312	14.69	
1935	68.48	365	15.28	
2032	69.10	422	15.90	
2132	69.65	482	16.45	
2235	70.10	545	16.90	
2323	70.54	593	17.34	
12-03-83	0023	71.10	653	17.90
	0125	71.45	715	18.25

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	0241	72.10	791	18.90
	0330	72.20	840	19.00
	0423	72.40	893	19.20
	0530	72.70	960	19.50
	0626	73.00	1016	19.80
	0725	73.50	1075	20.30
	0835	73.54	1145	20.34
	0934	73.78	1204	20.58
	1025	73.96	1255	20.76
	1127	74.17	1317	20.97
	1232	74.38	1382	21.18
	1333	74.53	1443	21.33
	1434	74.76	1504	21.56
	1531	74.94	1561	21.74
	1631	75.09	1621	21.89
	1732	75.28	1682	22.08
	1830	75.45	1740	22.25
	1934	75.63	1804	22.43
	2030	75.83	1860	22.63
	2127	76.00	1917	22.80
	2227	76.15	1977	22.95
	2328	76.25	2038	23.05
12-04-83	0104	76.50	2134	23.30
	0227	76.70	2217	23.50
	0327	76.82	2277	23.67
	0427	76.95	2337	23.75
	0527	77.06	2397	23.86
	0628	77.19	2458	23.99
	0730	77.31	2520	24.11
	0834	77.39	2584	24.19
	0936	77.51	2646	24.31
	1027	77.59	2697	24.39
	1130	77.70	2760	24.50
	1330	77.85	2880	24.65
	1435	78.04	2945	24.84
	1534	78.14	3004	24.94
	1625	78.24	3055	25.04
	1735	78.35	3125	25.15
	1830	78.45	3180	25.25
	1920	78.57	3230	25.37
	2022	78.70	3292	25.50
	2121	78.79	3351	25.59
	2224	78.93	3414	25.73

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-05-83	0038	79.13	3548	25.93
	0139	79.23	3609	26.03
	0226	79.30	3656	26.10
	0332	79.42	3722	26.22
	0425	79.53	3775	26.33
	0523	79.62	3833	26.42
	0634	79.75	3904	26.55
	0725	79.80	3955	26.60
	0830	79.90	4020	26.70
	0926	79.98	4076	26.78
	1030	80.10	4140	26.90
	1124	80.17	4194	26.97
	1230	80.25	4260	26.97
	1336	80.34	4326	27.14
	1400	80.42	4350	27.22

### Recovery Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DDDD 4)  
 Distance from pumping well: 198 feet west

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1400	80.42	0	27.22
	1401	79.35	1	26.15
	1402	77.80	2	24.60
	1403	77.50	3	24.30
	1404	76.95	4	23.75
	1405	76.65	5	23.45
	1406	76.31	6	23.11
	1407	76.00	7	22.80
	1408	75.75	8	22.55
	1409	75.53	9	22.33
	1410	75.25	10	22.05
	1415	75.45	15	22.25
	1420	73.31	20	20.11
	1425	72.94	25	19.74
	1430	72.64	30	19.44
	1435	72.30	35	19.10
	1440	71.95	40	18.75
	1445	71.75	45	18.55
	1450	71.36	50	18.16
	1500	71.36	60	18.16
	1510	71.00	70	17.80
	1520	70.67	80	17.47
	1530	70.33	90	17.13
	1540	70.07	100	16.87
	1605	69.53	125	15.33
	1628	69.00	150	15.80
	1700	68.42	180	15.22
1730	67.60	230	14.40	
1900	66.80	300	13.60	
1955	66.20	355	13.00	
2053	65.68	413	12.48	
2153	65.22	473	12.02	
2257	64.75	537	11.55	
2359	64.38	599	11.18	
12-06-83	0117	63.94	677	10.74
	0154	63.76	714	10.56
	0317	63.32	797	10.12
	0352	63.15	832	9.95

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
	0457	62.92	897	9.72
	0550	62.69	950	9.49
	0649	62.47	1009	9.27
	0805	62.18	1085	8.98
	0901	62.05	1141	8.85
	0956	61.83	1196	8.63
	0956	61.67	1256	8.47
	1151	61.51	1311	8.31
	1300	61.33	1380	8.13
	1407	61.16	1447	7.96
12-08-83	1353	57.60	4313	4.40
01-25-84	1110	54.07	73253	0.87



### Drawdown Data

Well Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DAAA)  
 Distance from pumping well: 2500 feet north

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1432	55.43	----	----
12-02-83	1017	55.65	----	----
	1230	55.81	----	----
	1330	55.81	0	0
	1331	55.82	1	0.01
	1332	55.82	2	0.01
	1333	55.83	3	0.02
	1334	55.83	4	0.02
	1335	55.83	5	0.02
	1336	55.83	6	0.02
	1356	55.98	26	0.17
	1405	56.12	35	0.31
	1415	56.35	45	0.54
	1435	56.71	65	0.90
	1445	56.93	75	1.12
	1455	57.09	85	1.28
	1508	57.38	98	1.57
	1518	57.55	108	1.74
	1528	57.70	128	1.89
	1551	58.06	151	2.25
	1710	59.10	170	3.29
	2151	61.22	451	5.41
12-03-83	0002	62.10	582	6.29
	0343	62.25	803	7.44
	0638	64.00	978	8.19
	0850	64.49	1110	8.68
	1035	64.81	1205	9.00
	1246	65.02	1336	9.21
	1440	65.50	1450	9.69
	1658	65.88	1588	10.07
	1850	66.17	1700	10.36
	2138	66.58	1868	10.77
12-04-83	0238	67.25	2168	11.44
	0535	67.57	2285	11.76
	0848	67.96	2478	12.15
	1049	68.20	2599	12.39

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	1255	68.44	2725	12.63
	1440	68.55	2830	12.74
	1652	68.80	2962	12.99
	1848	68.90	3078	13.09
	2139	69.27	3249	13.46
12-05-83	0805	70.31	3875	14.50
	1040	70.40	4030	14.59

### Recovery Data

Well Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08DAAA)  
 Distance from pumping well: 2500 feet north

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1408	70.81	8	15.00
	1409	70.83	9	15.02
	1411	70.83	11	15.02
	1415	70.83	15	15.02
	1418	70.79	18	14.98
	1423	70.75	23	14.94
	1425	70.73	25	14.92
	1430	70.67	30	14.86
	1446	70.40	46	14.59
	1450	70.33	50	14.52
	1502	70.10	62	14.29
	1507	70.05	67	14.24
	1531	69.62	91	13.81
	1558	69.23	118	13.42
	1704	68.42	184	12.61
	1915	67.25	315	11.44
	2103	66.47	423	10.66
2307	65.83	547	10.02	
12-06-83	0127	65.17	687	9.36
	0327	64.75	807	8.94
	0501	64.47	901	8.66
	0659	64.12	1019	8.31
	0907	63.80	1147	7.99
	1104	63.50	1264	7.69
	1409	63.17	1449	7.36
	1445	63.08	1485	7.27
12-08-83	1340	60.00	4300	4.19
01-25-84	1050	56.66	73250	0.85

### Drawdown Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 100 N., R. 55 W. (100N-55W-09CDDD)  
a domestic well (Branson)

Distance from pumping well: 2500 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1130	41.88	----	----
12-02-83	1250	41.81	----	----
	1255	41.90	----	----
	1300	42.00	----	----
	1330	42.10	0	0
	1331	42.13	1	0.03
	1332	42.12	2	0.02
	1333	42.10	3	0
	1334	42.09	4	0.01
	1335	42.10	5	0
	1336	42.10	6	0
	1337	42.10	7	0
	1338	42.14	8	0.04
	1339	42.10	9	0
	1340	42.08	10	0.02
	1341	42.17	11	0.07
	1342	42.15	12	0.05
	1343	42.08	13	0.02
	1344	42.11	14	0.01
	1345	42.28	15	0.18
	1350	42.10	20	0
	1355	42.22	25	0.12
	1400	42.35	30	0.25
	1405	42.40	35	0.30
	1410	42.52	40	0.42
	1415	42.55	45	0.45
	1420	42.66	50	0.56
	1425	42.80	55	0.70
	1430	42.75	60	0.65
	1445	43.08	75	0.98
	1500	43.44	90	1.34
	1515	43.77	105	1.67
	1530	44.07	120	1.97
	1545	44.40	135	2.30
	1740	46.00	250	3.90
	2200	48.35	510	6.25

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-03-83	0017	49.05	647	6.95
	0401	51.20	871	9.10
	0644	51.63	1034	9.53
	0824	52.70	1134	10.60
	1110	53.18	1300	11.08
	1239	53.52	1389	11.42
	1457	53.90	1527	11.80
	1652	54.35	1642	12.25
	1843	54.67	1753	12.57
	2145	55.00	1935	12.90
12-04-83	0244	55.77	2234	13.67
	0554	55.90	2424	13.80
	0854	56.57	2604	14.47
	1105	56.85	2735	14.75
	1259	57.05	2849	14.95
	1445	57.50	2955	15.20
	1720	57.60	3110	15.50
	1842	57.58	3192	15.48
	2147	58.15	3377	16.05
12-05-83	0553	58.90	3863	16.80
	0820	59.02	4010	16.92
	1108	59.40	4178	17.30
	1354	59.49	4344	17.39

### Recovery Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 100 N., R. 55 W. (100N-55W-09CDDD)  
a domestic well (Branson)

Distance from pumping well: 2500 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1401	59.49	1	17.39
	1402	59.49	2	17.39
	1427	59.40	27	17.30
	1430	59.35	30	17.25
	1435	59.37	35	17.27
	1440	59.19	40	17.09
	1450	59.00	50	16.90
	1455	58.90	55	16.80
	1500	58.80	60	16.70
	1505	58.70	65	16.60
	1510	58.60	70	16.50
	1539	58.06	99	15.96
	1604	57.61	124	15.51
	1737	56.40	217	14.30
	1920	55.35	320	13.25
	2109	54.16	429	12.06
2320	53.33	560	11.23	
12-06-83	0134	52.45	694	10.35
	0334	51.95	814	9.85
	0507	51.55	907	9.45
	0712	51.07	1032	8.97
	0915	50.80	1155	8.70
	1117	50.37	1277	8.27
	1416	49.90	1456	7.80

### Drawdown Data

Well Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 17, T. 100 N., R. 55 W. (100N-55W-17BAAA)  
 Distance from pumping well: 2600 feet west

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1510	61.48	-----	-----
12-02-83	0956	61.64	-----	-----
	1242	61.64	-----	-----
	1350	61.70	20	0.06
	1400	61.70	30	0.06
	1410	61.73	40	0.09
	1430	61.89	60	0.25
	1440	61.96	70	0.32
	1450	62.07	80	0.43
	1504	62.25	94	0.61
	1513	62.35	103	0.71
	1523	62.47	113	0.83
	1532	62.59	122	0.95
	1557	62.89	147	1.25
	1830	64.56	300	2.92
2008	66.20	518	4.62	
12-03-83	0009	67.00	639	5.36
	0408	68.15	878	6.52
	0650	68.73	1040	7.09
	0841	69.25	1151	7.61
	1031	69.60	1261	7.96
	1236	70.00	1386	8.36
	1445	70.34	1515	8.70
	1635	70.63	1625	8.99
	1837	70.90	1747	9.26
	2150	71.50	1940	9.86
12-04-83	0251	72.15	2241	10.51
	0612	72.55	2442	10.91
	0840	72.90	2590	11.26
	1041	73.24	2711	11.60
	1308	73.50	2858	11.86
	1450	73.66	2960	12.02
	1647	73.84	3077	12.20
	1830	74.05	3180	12.41
	2157	74.35	3387	12.71

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-05-83	0629	75.27	3899	13.63
	0827	75.06	4017	13.42
	1400	75.90	4350	14.26



### Recovery Data

Well Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 17, T. 100 N., R. 55 W. (100N-55W-17BAAA)  
 Distance from pumping well: 2600 feet west

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1400	75.90	0	14.26
	1402	75.90	2	14.26
	1404	75.92	4	14.28
	1405	75.90	5	14.26
	1410	75.98	10	14.34
	1415	76.05	15	14.41
	1420	76.05	20	14.41
	1427	76.04	27	14.40
	1430	76.06	30	14.42
	1445	76.01	45	14.37
	1508	75.88	68	14.24
	1618	75.17	138	13.53
	1731	74.47	211	12.83
	1909	73.67	309	12.03
	2114	72.85	434	11.21
2335	72.16	575	10.52	
12-06-83	0138	71.62	698	9.98
	0338	71.20	818	9.56
	0517	70.90	917	9.26
	0759	70.38	1079	10.74
	0919	70.22	1219	8.58
	1120	69.92	1340	8.28
	1420	69.54	1520	7.90
12-08-83	1240	66.40	4300	4.76
01-24-84	1300	62.80	73440	1.16

### Drawdown Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 32, T. 100 N., R. 54 W. (100N-54W-32CCCC)  
 Distance from pumping well: 5500 feet northeast

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1440	49.74	-----	-----
12-02-83	1010	49.92	-----	-----
12-02-83	1821	50.71	291	0.79
	2300	51.95	570	2.03
12-03-83	0349	53.10	859	3.18
	1045	54.16	1275	4.24
	1702	54.99	1652	5.07
	2257	55.68	2007	5.76
12-04-83	0544	56.33	2414	6.41
	1055	56.87	2725	6.95
	1701	57.39	2971	7.47
12-05-83	0618	58.52	3768	8.60
	1045	58.85	4035	8.93

### Recovery Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 32, T. 100 N., R. 54 W. (100N-54W-32CCCC)  
Distance from pumping well: 5500 feet northeast

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1700	59.00	180	9.08
	2313	58.32	553	8.40
12-06-83	0704	56.92	1024	7.00
	1108	56.42	1268	6.50
	1450	56.17	1490	6.25
12-08-83	1220	53.90	4220	3.98
01-24-84	1045	50.95	-----	1.03

### Drawdown Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 100 N., R. 55 W. (100N-55W-17DDDD)  
 Distance from pumping well: 5300 feet south

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-02-83	0946	74.42	----	----
12-02-83	1756	74.89	266	0.47
	2043	76.16	553	1.74
12-03-83	0417	77.50	88	3.08
	1057	78.95	1287	4.53
	1644	79.84	1634	5.42
	2042	80.56	1992	6.14
12-04-83	0502	81.25	2432	6.83
	1036	81.90	2706	7.48
	1639	82.50	3069	8.08
12-05-83	0605	83.80	3155	9.38
	1055	84.00	3445	9.58

### Recovery Data

Well Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 100 N., R. 55 W. (100N-55W-17DDDD)  
distance from pumping well: 5300 feet south

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-05-83	1720	84.15	200	9.73
	2328	83.00	568	8.58
12-06-83	0723	82.08	1045	7.66
	1128	81.04	1268	6.62
	1505	80.60	1505	6.18
12-08-83	1230	77.80	4230	3.38
01-25-84	1130	75.27	-----	0.85

**Drawdown Data**

Well Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 15, T. 100 N., R. 55 W. (100N-55W-15BBBB)  
 distance from pumping well: 5500 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
12-01-83	1448	32.99	----	----
12-02-83	1003	33.15	----	----
12-02-83	1756	33.13	266	+0.02
	2053	33.10	563	+0.05
12-03-83	0355	33.25	865	0.10
	1050	33.06	1280	+0.09
	1708	33.02	1538	+0.13
	2251	33.10	1881	+0.05
12-04-83	0550	33.17	2300	0.02
	1100	33.15	2610	0.00
	1706	33.13	2976	+0.02
12-05-83	0558	33.22	3748	0.07
	1030	33.28	4020	0.13

### Recovery Data

Well Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 15, T. 100 N., R. 55 W. (100N-55W-15BBBB)  
Distance from pumping well: 5500 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
12-06-83	1714	33.22	1634	0.07
	2313	33.21	1993	0.01
12-08-83	1225	32.90	4225	+0.32
01-25-84	1010	33.13	73210	+0.09

## Appendix D. Drawdown and recovery data for aquifer test 2

### Pumping Well

Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 1)  
Discharge rate (Q): 690 gallons per minute

### Observation Wells

1. Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 2)  
Distance from pumping well: 83 feet north
2. Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 3)  
Distance from pumping well: 175 feet east



### Drawdown Data

Well Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 1)  
 Discharge Rate (Q): 690 gallons per minute

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
07-31-84	1400	64.54	0	0.00
	1401	70.58	1	6.04
	1402	75.04	2	10.50
	1403	80.87	3	16.33
	1404	81.52	4	16.98
	1405	81.81	5	17.27
	1410	88.31	10	23.77
	1415	89.67	15	25.13
	1420	90.37	20	25.83
	1425	90.83	25	26.29
	1430	90.04	30	26.40
	1435	91.58	35	27.04
	1440	92.17	40	27.63
	1445	92.21	45	27.67
	1450	92.25	50	27.71
	1500	92.87	60	28.33
	1520	94.46	80	29.92
	1540	95.10	100	30.56
	1600	95.62	120	31.08
	1630	96.02	150	31.48
	1700	96.37	180	31.83
	1734	97.92	214	33.38
	1800	97.40	240	32.86
	1900	97.81	300	33.27
2000	98.27	360	33.73	
2101	98.58	421	34.04	
2200	98.94	480	34.40	
2300	99.33	540	34.79	
2359	99.50	599	34.96	
08-01-84	0110	100.04	670	35.50
	0200	100.08	720	35.54
	0300	100.12	780	35.58
	0404	100.15	844	35.61
	0502	100.21	902	35.67
	1035	104.50	1235	39.96
	1109	104.62	1269	40.08
	1322	103.83	1402	39.29
	1402	104.25	1442	39.71

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	1455	104.50	1495	39.96
	1606	104.88	1566	40.34
	1701	104.91	1621	40.37
	1800	105.00	1680	40.46
	1900	105.25	1740	40.71
	2001	105.54	1801	41.00
	2100	105.75	1860	41.21
	2201	106.00	1921	41.46
	2302	106.12	1982	41.58
	2400	106.87	2040	42.33
08-02-84	0105	107.17	2105	42.63
	0200	107.25	2160	42.71
	0400	107.37	2280	42.83
	0600	106.25	2400	41.71
	0914	108.17	2594	43.63
	1107	108.44	2707	43.90
	1400	109.12	2880	44.58
	1605	109.67	3005	45.13
	1802	109.58	3122	45.02
	2100	110.29	3300	45.75
	2304	110.50	3424	45.96
08-03-84	0104	110.75	3544	46.21
	0301	110.75	3661	46.21
	0500	110.89	3780	46.35
	0700	110.83	3900	46.29
	0906	110.83	4026	46.29
	1046	110.87	4126	46.33
	1155	110.71	4195	46.17
	1405	110.79	4325	46.25
	1410	110.79	4330	46.25

### Recovery Data

Well Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 1)

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
08-03-84	1410	110.79	0	46.25
	1411	84.21	1	19.67
	1412	86.75	2	22.21
	1413	86.29	3	21.75
	1414	85.62	4	21.08
	1415	85.14	5	20.60
	1420	84.89	10	20.35
	1425	81.98	15	17.44
	1430	81.10	20	16.56
	1435	80.31	25	15.77
	1440	79.92	30	15.38
	1445	79.50	35	14.96
	1450	79.21	40	14.67
	1455	78.94	45	14.40
	1500	78.67	50	14.13
	1510	78.21	60	13.67
	1530	77.54	80	13.00
	1550	76.92	100	12.38
	1610	76.52	120	11.98
	1640	76.06	150	11.52
	1710	75.58	180	11.04
1740	75.25	210	10.71	
1810	75.02	240	10.48	
1938	74.33	328	9.79	
2103	73.75	413	9.21	
2145	73.17	455	8.63	
08-04-84	0825	71.79	1095	7.25
	1055	71.50	1245	6.96
	1325	71.29	1395	6.75

### Drawdown Data

Well Location: NW¼SW¼NW¼NE¼ sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 2)  
 Distance from pumping well: 83 feet north

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
07-31-84	1400	62.86	0	0
	1401	66.15	1	3.29
	1402	67.40	2	4.54
	1403	68.45	3	5.59
	1404	69.15	4	6.29
	1405	69.70	5	6.84
	1410	71.54	10	8.68
	1415	72.67	15	9.81
	1420	73.51	20	10.65
	1425	74.12	25	11.26
	1430	74.61	30	11.75
	1440	75.36	40	12.50
	1445	75.64	45	12.78
	1450	75.88	50	13.02
	1500	76.37	60	13.51
	1520	77.40	80	14.54
	1540	78.04	100	15.18
	1600	78.55	120	15.69
	1635	79.12	155	16.26
	1703	79.52	183	16.66
1736	79.87	216	17.01	
1805	80.31	245	17.45	
1906	80.78	306	17.92	
2005	81.24	365	18.38	
2104	81.52	424	18.66	
2205	81.91	485	19.05	
2304	82.22	544	19.36	
08-01-84	0002	82.47	602	19.61
	0114	82.81	674	19.95
	0203	82.90	723	20.04
	0304	83.50	784	20.64
	0409	83.45	849	20.59
	0503	83.70	903	20.84
	0603	83.95	963	21.09
	0802	84.30	1082	21.44
	1004	84.71	1204	21.85
	1200	84.89	1320	22.03
	1411	85.01	1451	22.15
	1610	85.44	1570	22.58

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	1802	85.70	1682	22.84
	2003	86.10	1803	23.24
	2204	86.29	1924	23.43
08-02-84	0003	86.67	2043	23.81
	0206	86.85	2166	23.99
	0409	87.09	2289	24.18
	0605	87.08	2405	24.22
	0916	87.27	2596	24.41
	1108	87.30	2708	24.44
	1402	87.60	2882	24.74
	1607	87.84	3007	24.98
	1805	87.92	3125	25.06
	2102	88.08	3302	25.22
	2307	88.24	3427	25.38
08-03-84	0107	88.40	3547	25.54
	0307	88.53	3667	25.67
	0506	88.66	3786	25.80
	0701	88.63	3901	25.77
	0855	88.91	4015	26.05
	1058	89.09	4138	26.23
	1304	89.24	4264	26.38
	1410	89.29	4330	26.43

### Recovery Data

Well Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 2)  
 Distance from pumping well: 83 feet north

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
08-03-84	1410	89.29	0	26.43
	1411	85.09	1	22.23
	1412	84.83	2	21.97
	1413	84.21	3	21.35
	1414	83.50	4	20.64
	1420	80.73	10	17.87
	1425	79.67	15	16.81
	1430	78.91	20	16.05
	1435	78.25	25	15.39
	1440	77.82	30	14.96
	1445	77.45	35	14.59
	1450	77.04	40	14.18
	1455	76.79	45	13.93
	1500	76.60	50	13.74
	1510	76.04	60	13.18
	1530	75.40	80	12.54
	1550	74.82	100	11.96
	1610	74.49	120	11.63
	1640	73.95	150	11.09
	1710	73.60	180	10.74
1740	73.15	210	10.29	
1800	73.00	230	10.14	
1940	72.33	330	9.47	
2110	71.82	420	8.96	
2147	71.54	457	8.68	
08-04-84	0824	69.90	1094	7.04
	1058	69.61	1248	6.75
	1330	69.41	1400	6.55
	1453	66.53	5803	3.67

### Drawdown Data

Well Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 3)  
 Distance from pumping well: 175 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
07-31-84	1400	62.45	0	0
	1401	64.05	1	1.60
	1402	64.90	2	2.45
	1403	65.63	3	3.18
	1404	66.36	4	3.91
	1405	66.82	5	4.37
	1410	68.48	10	6.03
	1415	69.53	15	7.08
	1420	70.31	20	7.86
	1425	70.94	25	8.49
	1430	71.40	30	8.95
	1435	71.77	35	9.32
	1440	72.14	40	9.69
	1445	72.40	45	9.95
	1450	72.63	50	10.18
	1500	73.11	60	10.66
	1520	74.02	80	11.57
	1540	74.71	100	12.26
	1600	74.18	120	12.73
	1637	75.82	157	13.37
	1706	76.19	186	13.74
1738	76.58	218	14.13	
1808	76.95	248	14.50	
1910	77.45	310	15.00	
2000	77.87	360	15.42	
2107	78.18	427	15.73	
2211	78.56	491	16.11	
2312	78.87	552	16.42	
08-01-84	0005	79.11	605	16.66
	0103	79.39	663	16.94
	0204	79.52	724	17.07
	0307	79.67	787	17.22
	0416	80.07	856	17.62
	0505	80.30	905	17.85
	0604	80.50	964	18.05
	0805	80.90	1085	18.45
	0905	81.12	1145	18.67
	1100	81.45	1260	19.00
	1311	81.51	1391	19.06

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	1502	81.86	1502	19.41
	1704	82.06	1624	19.61
	1904	82.41	1744	19.96
	2108	82.90	1868	20.45
	2307	83.15	1987	20.70
08-02-84	0107	83.12	2107	20.67
	0315	83.42	2235	20.97
	0512	83.63	2352	21.18
	0707	83.64	2467	21.19
	1006	83.97	2646	21.52
	1204	84.09	2764	21.64
	1404	84.23	2884	21.78
	1610	84.48	3010	22.03
	1807	84.54	3127	22.09
	2312	84.92	3432	22.47
08-03-84	0110	85.07	3550	22.62
	0310	85.23	3670	22.78
	0510	85.32	3790	22.87
	0703	85.37	3903	22.92
	0903	85.57	4023	23.12
	1100	85.80	4140	23.35
	1305	85.89	4265	23.44
	1410	85.96	4330	23.51



### Recovery Data

Well Location: NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 100 N., R. 55 W. (100N-55W-08ABCB 3)  
 Distance from pumping well: 175 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
08-03-84	1410	85.96	0	23.51
	1411	---	1	---
	1412	---	2	---
	1414	81.83	4	19.38
	1415	81.59	5	19.14
	1416	81.15	6	18.70
	1420	80.00	10	17.55
	1425	79.03	15	16.58
	1430	78.27	20	15.82
	1435	77.65	25	15.20
	1441	77.14	31	14.69
	1446	76.78	36	14.33
	1450	76.53	40	14.08
	1455	76.22	45	13.77
	1500	75.98	50	13.53
	1510	75.57	60	13.52
	1528	74.92	78	12.47
	1552	74.30	102	11.85
	1610	73.95	120	11.50
	1640	73.43	150	10.98
1703	73.16	173	10.71	
1740	72.71	210	10.26	
1803	72.52	233	10.07	
1943	71.82	333	9.37	
2107	71.30	417	8.85	
2150	70.82	460	8.82	
08-04-84	0830	69.43	1100	6.98
	1101	69.24	1251	6.79
	1335	68.94	1405	6.49

## Appendix E. Drawdown and recovery data for aquifer test 3

### Pumping Well

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 2)  
Discharge rate (Q): 630 gallons per minute

### Observation Wells

1. Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 1)  
Distance from pumping well: 92 feet west
2. Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 3)  
Distance from pumping well: 82 feet east

### Drawdown Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 2)  
 Discharge rate (Q): 630 gallons per minute

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
08-07-84	1400	72.25	0	0
	1402	98.00	2	25.75
	1404	97.70	4	25.45
	1405	97.65	5	25.40
	1406	97.65	6	25.40
	1410	98.62	10	26.37
	1413	98.35	13	26.10
	1416	98.35	16	26.10
	1421	99.00	21	26.75
	1425	99.45	25	27.20
	1431	99.95	31	27.70
	1435	100.04	35	27.79
	1440	100.80	40	28.55
	1450	100.77	50	28.52
	1500	101.21	60	28.96
	1520	102.08	80	29.83
	1539	102.37	99	30.12
	1600	102.46	120	30.21
	1630	102.77	150	30.52
	1702	102.70	182	30.45
	1730	102.68	210	30.43
	1802	102.84	242	30.59
	1901	102.81	301	30.56
	2000	102.92	360	30.67
2100	103.33	420	31.08	
2201	103.54	481	31.29	
2301	103.72	541	31.47	
2400	103.83	600	31.58	
08-08-84	0100	103.78	660	31.53
	0158	103.81	718	31.56
	0302	103.96	782	31.71
	0424	104.25	864	32.00
	0514	104.38	914	32.13
	0605	104.50	965	32.25
	0655	104.56	1015	32.31
	0900	104.38	1140	32.13
	1001	104.38	1201	32.13
	1059	104.38	1259	32.13
	1201	104.42	1321	32.17

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	1300	104.54	1380	32.29
	1327	104.50	1407	32.25
	1330	104.50	1410	32.25

### Recovery Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 2)

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
08-08-84	1330	104.50	0	32.25
	1333	84.70	3	12.45
	1335	84.21	5	11.96
	1336	84.02	6	11.77
	1337	83.86	7	11.61
	1338	83.73	8	11.48
	1340	83.42	10	11.17
	1343	83.12	13	10.87
	1346	82.84	16	10.59
	1350	82.52	20	10.27
	1355	82.21	25	9.96
	1400	82.00	30	9.75
	1405	81.75	35	9.50
	1416	81.25	46	9.00
	1420	81.12	50	8.87
	1429	80.85	59	8.60
	1510	80.50	100	8.25
	1520	80.28	110	8.03
	1530	79.85	120	7.60
	1550	79.45	140	7.20
	1600	78.92	150	6.67
	1630	78.48	180	6.23
	1730	77.87	240	5.62
1830	77.42	300	5.17	
1900	76.96	330	4.71	
08-09-84	0800	74.62	1110	2.37
	1017	74.46	1247	2.21

### Drawdown Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 1)  
 Distance from pumping well: 92 feet west

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
08-07-84	1400	71.53	0	0
	1401	72.82	1	1.29
	1402	73.91	2	2.38
	1403	74.51	3	2.98
	1404	74.83	4	3.30
	1405	75.03	5	3.50
	1406	75.18	6	3.65
	1407	75.31	7	3.78
	1408	75.41	8	3.88
	1409	75.49	9	3.96
	1410	75.63	10	4.10
	1412	75.84	12.5	4.31
	1415	76.02	15	4.49
	1417	76.16	17	4.63
	1420	76.31	20	4.78
	1425	76.56	25	5.03
	1430	76.84	30	5.31
	1435	77.07	35	5.54
	1440	77.27	40	5.74
	1453	77.76	53	6.23
	1502	78.03	62	6.50
	1518	78.46	78	6.93
	1538	78.95	98	7.42
	1600	79.39	120	7.86
	1635	79.91	155	8.38
	1709	80.33	189	8.80
	1735	80.60	215	9.07
	1803	80.80	243	9.27
	1904	81.38	304	9.85
2002	81.80	362	10.27	
2102	82.20	422	10.67	
2202	82.60	482	11.07	
2303	83.00	543	11.47	
08-08-84	0105	83.44	665	11.91
	0203	83.64	723	12.11
	0306	83.74	786	12.21
	0417	84.03	857	12.50
	0523	84.25	923	12.72
	0606	84.41	966	12.88

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	0700	84.52	1020	12.99
	0901	84.75	1141	13.22
	1002	84.83	1202	13.30
	1101	84.93	1261	13.40
	1204	84.05	1324	12.52
	1243	85.14	1363	13.61
	1330	85.15	1410	13.62

### Recovery Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 1)  
 Distance from pumping well: 92 feet west

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
08-08-84	1330	85.15	0	13.62
	1331	84.18	1	12.65
	1332	83.15	2	11.62
	1333	83.00	3	11.47
	1334	82.85	4	11.32
	1335	82.71	5	11.18
	1336	82.58	6	11.05
	1337	82.47	7	10.94
	1338	82.31	8	10.78
	1339	82.23	9	10.70
	1340	82.15	10	10.62
	1342	81.93	12.5	10.40
	1345	81.75	15	10.22
	1350	81.43	20	9.90
	1355	81.19	25	9.66
	1400	80.92	30	9.39
	1405	80.74	35	9.21
	1416	80.36	46	8.83
	1420	80.22	50	8.69
	1430	79.91	60	8.38
	1440	79.66	70	8.13
	1450	79.40	80	7.87
	1502	79.14	92	7.61
1521	78.73	111	7.20	
1531	78.57	121	7.04	
1600	78.13	150	6.60	
1631	77.70	181	6.17	
1728	77.12	238	5.59	
1830	77.60	300	6.07	
08-09-84	0815	73.90	1125	2.37
	1005	73.86	1235	2.33



### Drawdown Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 3)  
 Distance from pumping well: 82 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
08-07-84	1400	73.40	0	0
	1401	73.66	1	.26
	1402	74.22	2	.82
	1403	74.78	3	1.38
	1404	75.35	4	1.95
	1405	75.60	5	2.20
	1406	76.20	6	2.80
	1407	76.16	7	2.76
	1408	76.32	8	2.92
	1409	76.45	9	3.05
	1410	76.60	10	3.20
	1412.5	77.00	12.5	3.60
	1415	77.26	15	3.86
	1417.5	77.49	17.5	4.09
	1420	77.68	20	4.28
	1425	77.98	25	4.58
	1430	78.17	30	4.77
	1435	78.31	35	4.91
	1440	78.47	40	5.07
	1454	78.89	54	5.49
	1459	79.02	59	5.62
	1522	80.00	82	6.60
	1535	80.65	95	7.25
	1558	81.41	118	8.01
	1630	82.11	150	8.71
	1707	82.43	187	9.03
	1732	81.70	212	8.30
1805	81.93	245	8.53	
1905	80.68	305	7.28	
2004	79.62	364	6.22	
2106	80.20	426	6.80	
2205	80.60	485	7.20	
2306	80.95	546	7.55	
08-08-84	0111	81.40	671	8.00
	0205	81.62	725	8.22
	0310	81.83	790	8.43
	0415	82.01	855	8.61
	0509	82.21	909	8.81
	0612	82.38	972	8.98

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Drawdown (ft)
	0704	82.44	1024	9.04
	0903	82.56	1143	9.16
	1006	82.89	1206	9.49
	1104	83.00	1264	9.60
	1207	83.10	1327	9.70
	1330	83.23	1410	9.83

### Recovery Data

Well Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 101 N., R. 54 W. (101N-54W-31BCCC 3)  
 Distance from pumping well: 82 feet east

Date	Time	Depth to Water (ft)	Elapsed Time (min)	Residual Drawdown (ft)
08-08-84	1330	83.23	0	9.83
	1331	83.11	1	9.71
	1332	83.03	2	9.63
	1333	82.96	3	9.56
	1334	82.88	4	9.48
	1335	82.74	5	9.34
	1336	82.65	6	9.25
	1337	82.60	7	9.20
	1338	82.43	8	9.03
	1339	82.32	9	8.92
	1340	82.24	10	8.84
	1342.5	82.55	12.5	9.15
	1345	81.53	15	8.13
	1350	81.20	20	7.80
	1355	80.80	25	7.40
	1400	80.35	30	6.95
	1405	80.06	35	6.66
	1410	79.69	40	6.29
	1415	79.37	45	5.97
	1420	79.16	50	5.76
	1425	78.82	55	5.42
	1430	78.66	60	5.26
	1435	78.40	65	5.00
	1440	78.27	70	4.87
	1445	78.10	75	4.70
	1520	77.15	110	3.75
1558	76.42	148	3.02	
1633	75.94	183	2.54	
1729	75.27	239	1.87	
1831	74.90	301	1.50	
08-09-84	0810	73.32	1120	+0.08
	1015	73.14	1245	+0.26