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Keith County Test-Hole Logs: Nebraska Water Survey Test-Hole Report No. 51

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KEITH COUNTY
Test-Hole Logs

Written in Part and Revised and Compiled in Part
from Previous Works

by
R.F. Diffendal, Jr.
and
James W. Goeke

Nebraska Water Survey
Test-Hole Report No. 51

Conservation and Survey Division
School of Natural Resources
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

April 2004

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UNIVERSITY OF NEBRASKA-LINCOLN CREDITS

UNIVERSITY OF NEBRASKA-LINCOLN

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INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES

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Publication and price lists are furnished upon request.

April 2004

ACKNOWLEDGMENTS

The following persons performed important field and office tasks in connection with the test drilling: H. P. Burleigh, R. C. Cady, C. Conklin, J. L. Deffenbaugh, R. Diffendal, V. H. Dreeszen, E. A. Duncan, C. Fricke, J. Goeke, E. D. Gordon, O. C. Hansen, H. A. Haworth, D. L. Hill, M. Johnson, C. F. Keech, L. Larson, R. C. Lawrence, A. L. Lugn, J. W. Nelson, H. W. Pinneker, O. J. Scherer, R. L. Schreurs, F. Smith, G. R. Svoboda, H. S. Unger, H. A. Waite, H. Williamson, and L. K. Wenzel. Many other persons contributed during short periods of time to the test-hole drilling, both in the field and in the office. The review, arrangement, and final assembly of all the data were performed principally by R. F. Diffendal, Jr., and J. W. Goeke. Typing was done by Melba Stemm. Ann Mack and Jerry Leach drafted the figures. Duane Mohlman aided in revision and production.

Logs of test holes published by the Conservation and Survey Division from the Logs of Test Holes, Keith and Arthur Counties, Nebraska (1953), Logs of Test Holes, Platte and Republican Groundwater Study (1979, Open-File Report) and Hydrologic Data for the Southern Sand Hills Area (1986, U.S.G.S. Open-File Report #86-41) are included in this report with minor modifications.

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INTRODUCTION

In 1930, the Conservation and Survey Division (CSD) of the University of Nebraska and the U.S. Geological Survey began a program of cooperative groundwater studies in Nebraska. Since then test drilling by use of rotary drilling equipment has been an integral part of that program. This report contains logs of all the test holes drilled in the county under the program as well as those drilled by the Conservation and Survey Division with financial assistance from other government agencies.

The maps in this report show the locations of all test holes drilled in the county since 1934 (Figure 1a-d).

Present techniques of test-hole logging and sampling include use of drilling mud suitable to drilling conditions, timing by stopwatch of the drilling of each 5-foot increment of depth, and removal of all cuttings from the test hole at intervals of 5 feet or less. During the drilling of the hole, cuttings from each interval are examined immediately; samples representing each 5-foot interval and each recognizable change in material are retained. After samples are washed, they are described lithologically and the color is evaluated by comparison with standard color charts. The samples then are dried, cataloged, and stored. All samples are processed and kept on open file in the offices of the Conservation and Survey Division, 113 Nebraska Hall, University of Nebraska-Lincoln, 68588-0517.

Beginning in September 1951, some of the test holes have been logged electrically. Geophysical logs (e-logs) often can be used to determine formation boundaries more precisely than by field sampling, especially where differences in rock types from one formation to another occur at the boundary. Figure 2 is an example of geophysical logs of a test hole from Keith county (14-S-82) with formation boundaries shown. Departures of the curves from the center lines generally indicate that the geologic unit is becoming coarser grained. A notation on each test-hole log indicates if geophysical logs are part of the original test-hole data in the CSD office in Lincoln.

This publication is one of a series being issued to make more readily available the record of test holes drilled since 1930. The series of publications is made on a county basis and includes, with some exceptions, logs of all test holes drilled in each of the counties. The logs have not been reviewed for conformance with editorial standards and nomenclature. In the case of Keith County, descriptions of strata done in earlier test-hole reports are included with some revised formation information in this report.

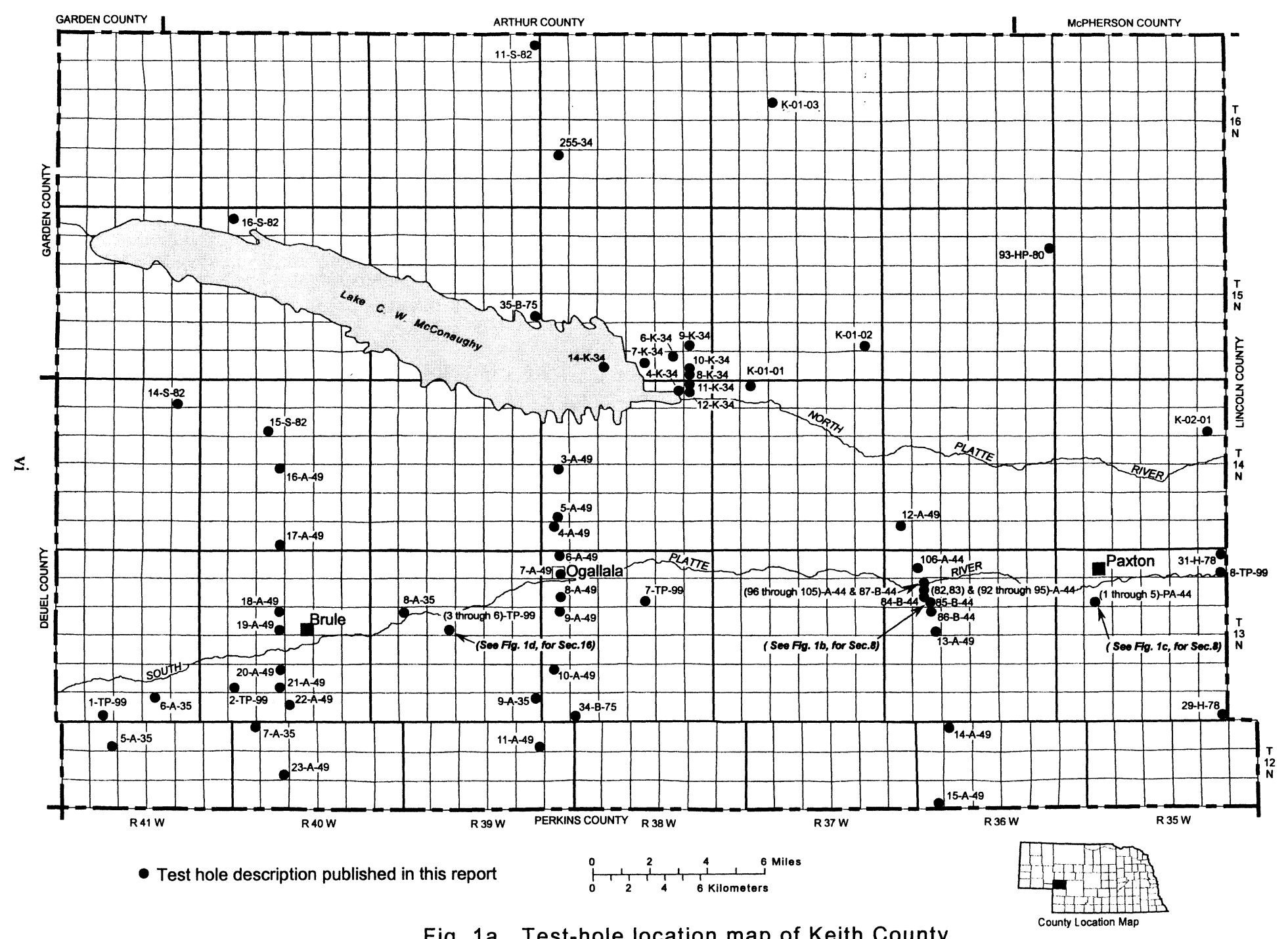


Fig. 1a. Test-hole location map of Keith County.

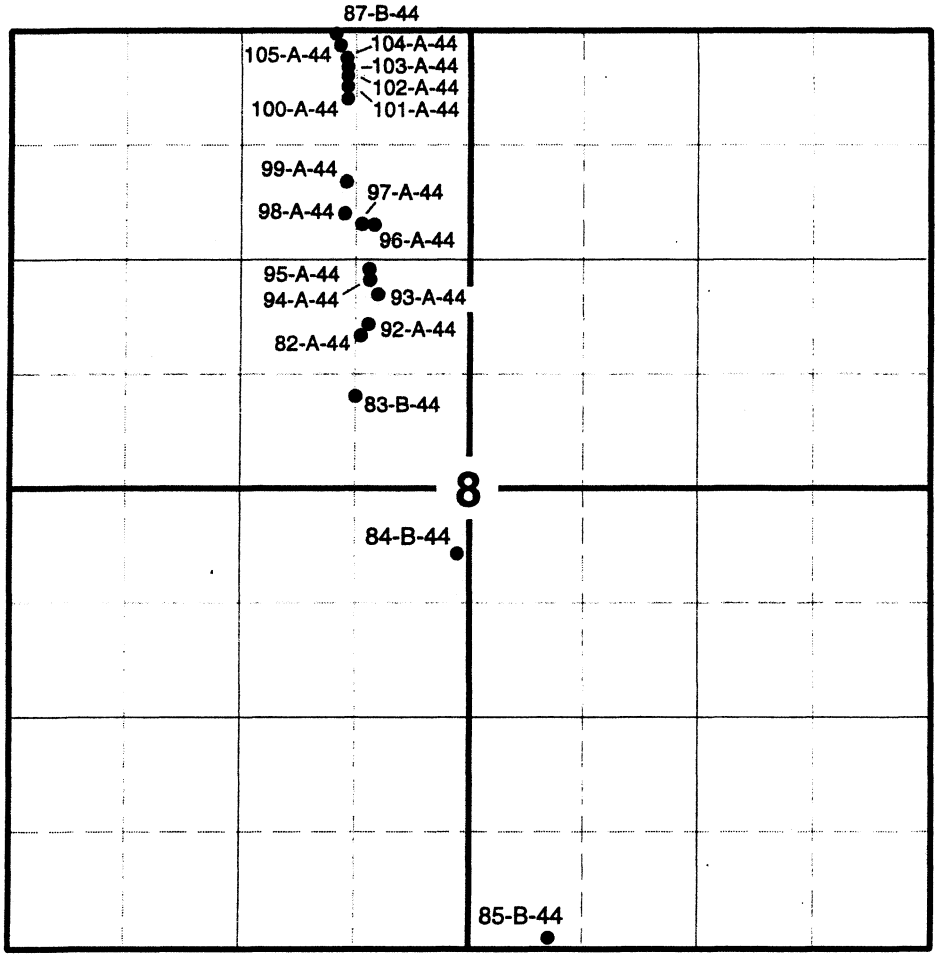


Fig. 1b. Test-hole locations in Township 13 North, Range 36 West, Section 8, Keith County.

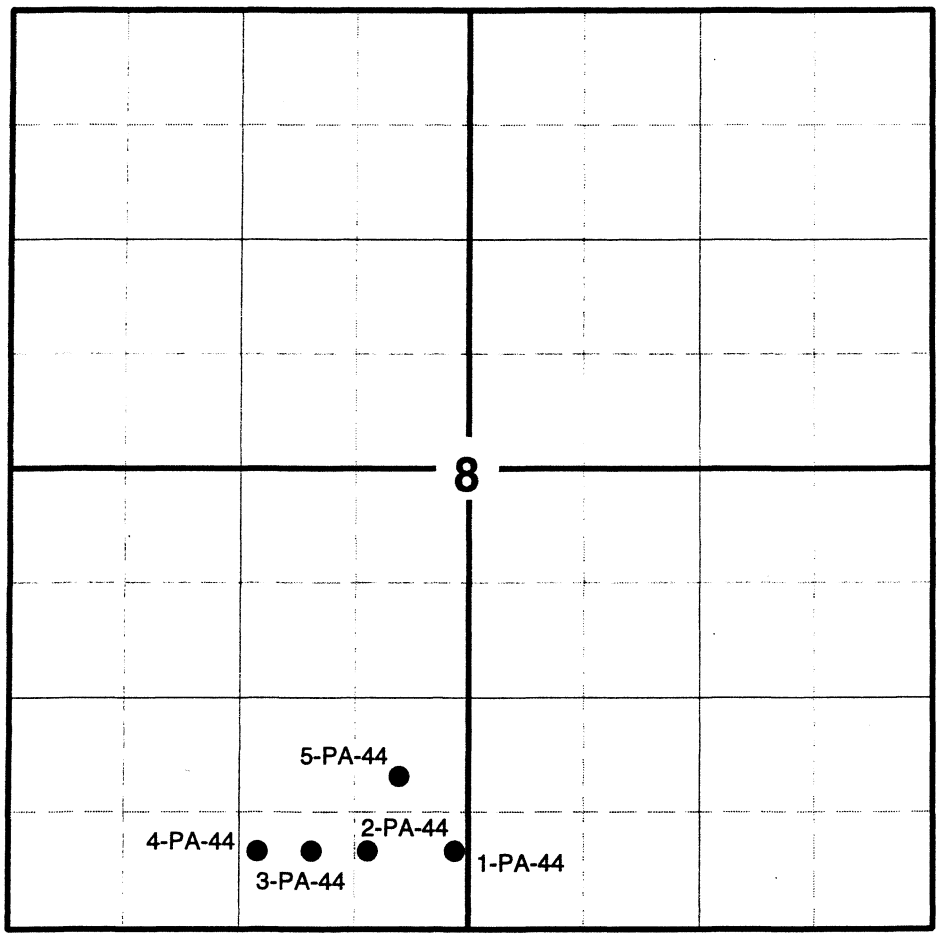


Fig. 1c. Test-hole locations in Township 13 North, Range 35 West, Section 8, Keith County.

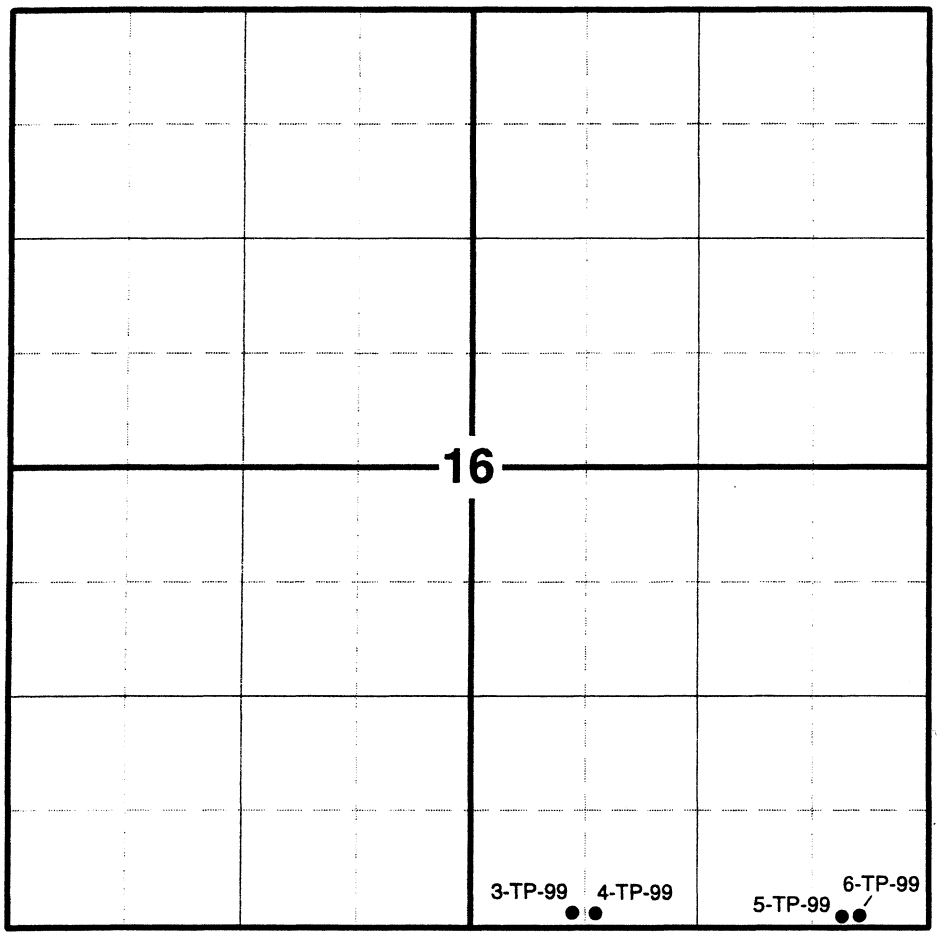


Fig. 1d. Test-hole locations in Township 13 North, Range 39 West, Section 16, Keith County.

Fig. 2. Keith County sample geophysical logs. (#14-S-82)

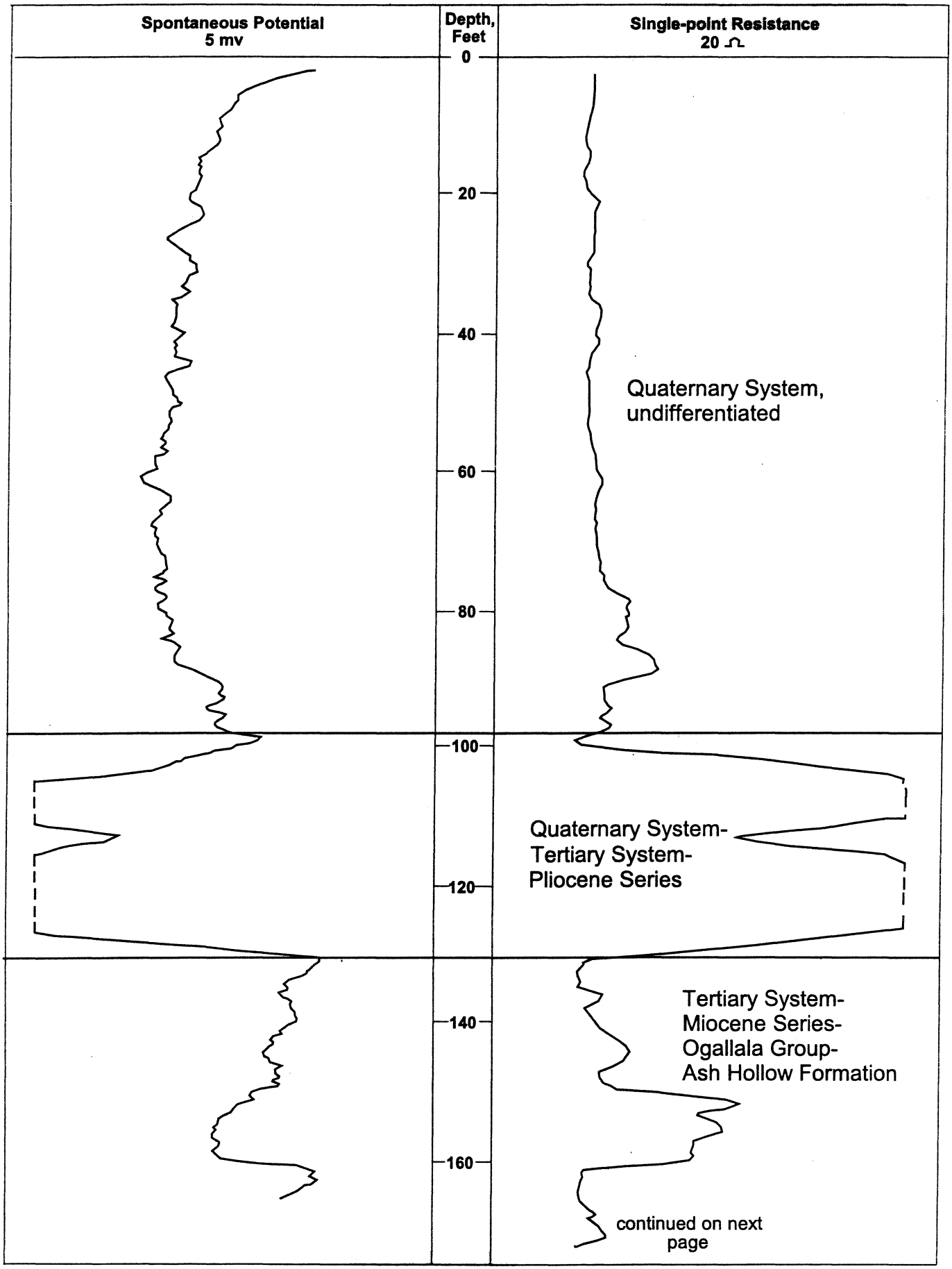


Fig. 2 continued. Keith County sample geophysical logs.

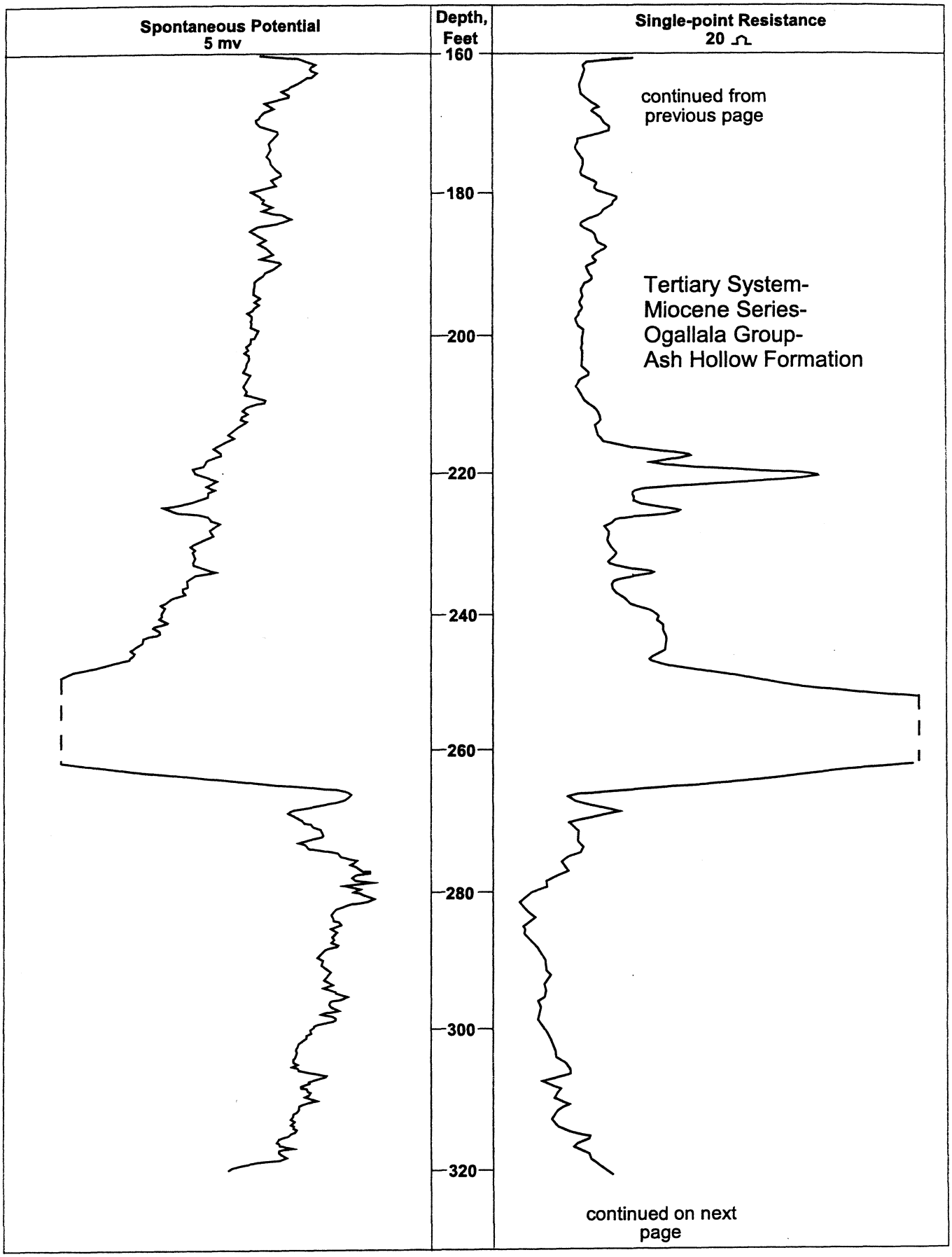
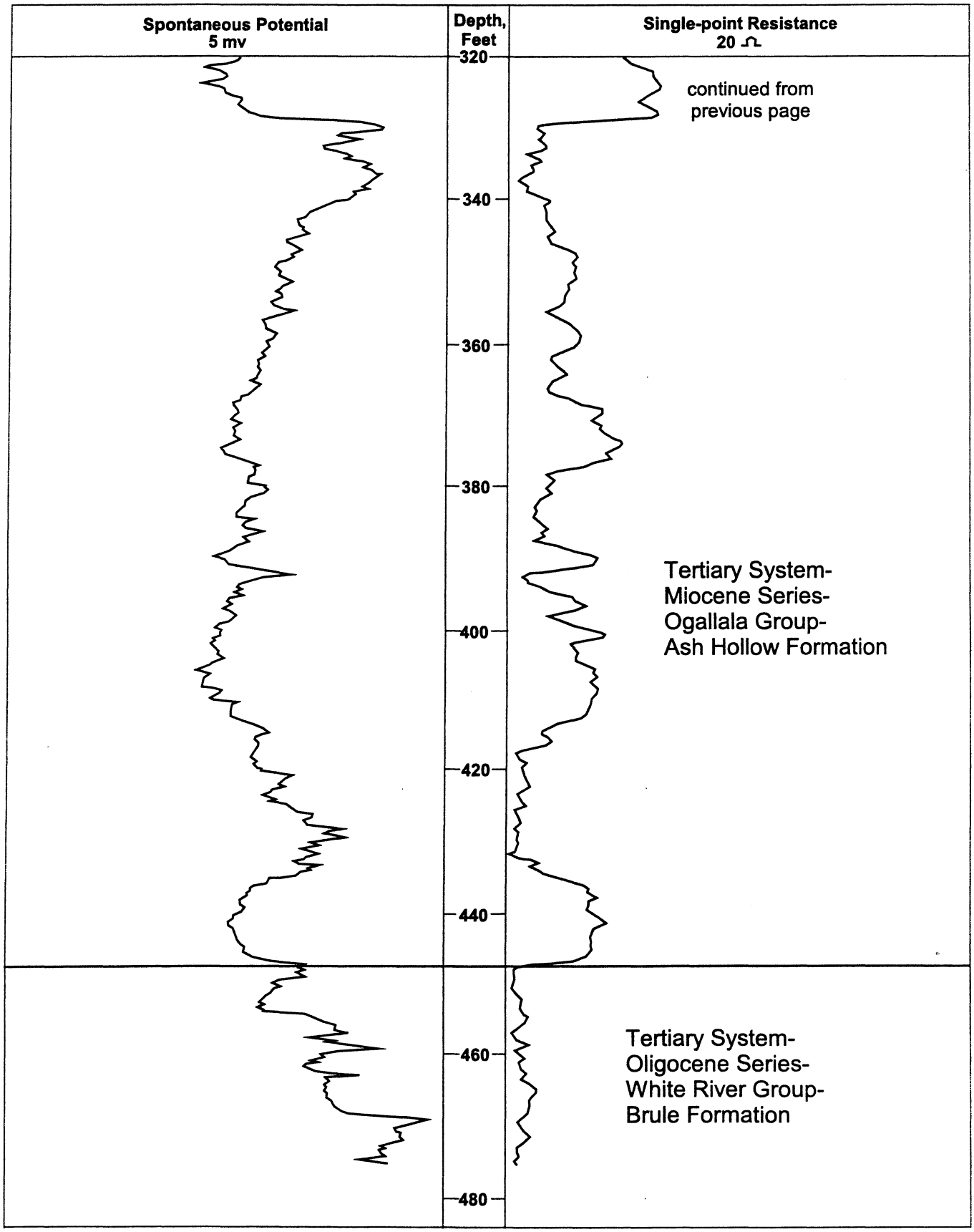


Fig. 2 continued. Keith County sample geophysical logs.



The method whereby the elevation of the land surface at test hole sites was determined is indicated in the heading of each log, as follows: a = altimeter, h = hand leveling, i = spirit leveling, t = estimated from topographic map.

The test-hole records accurately reflect subsurface conditions only at the locations where the test holes were drilled. Interpretive data reflecting probable subsurface conditions between test holes are being compiled for publication in county reports and are available for inspection in the offices of the Conservation and Survey Division.

Each test hole is identified by a number assigned in the field (for example #3-B-67, #41-79), and also is identified by a number indicating its location within the land divisions of the U.S. Bureau of Land Management's survey of Nebraska. Location numbers of test holes east of the 6th principal meridian, which passes through Columbus in a north-south direction, are preceded by the capital letter A; those west of the principal meridian have no preceding letter. The first numeral indicates the township, the second the range, and the third the section. As shown in figure 3, the letters that follow the section number indicate the location of the test hole within the section, the first letter indicating the quarter section and the second letter indicating the quarter-quarter section and so on to the quarter-quarter-quarter-quarter section. The letters A, B, C, and D are applied in counterclockwise direction beginning with A in the northeast quadrant. The last numeral is the serial number of the test hole within the quarter-quarter-quarter-quarter section if more than one well is present in that area. Figure 3 also shows the equivalent relationship between this system and the one used more commonly in Nebraska by citizens and many governmental units.

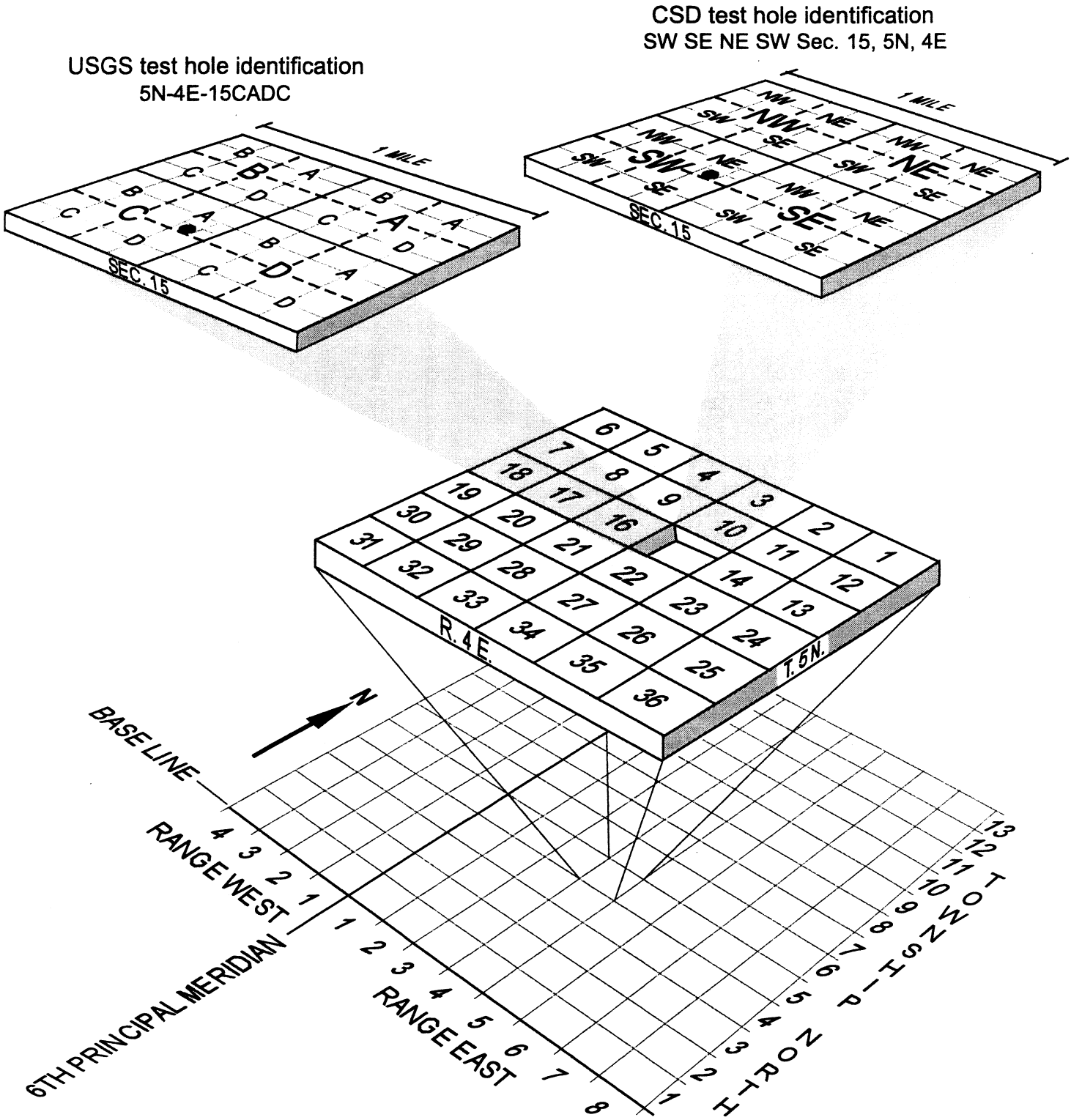


Fig. 3. System for identifying test-hole according to its location.

SELECTED REFERENCES

A few of the most recently published references to geology, soil, and groundwater resources of Keith County are included below. The interested reader may find citations in these references to earlier published studies.

Bleed, A.S. and C.A. Flowerday (eds.), 1998, An atlas of the Sand Hills: University of Nebraska, University of Nebraska, Conservation and Survey Division, Resource Atlas 5b, 260 p.

Diffendal, R.F., Jr., 1991, Geologic map showing configuration of the bedrock surface, North Platte 1°x2° quadrangle, Nebraska: U.S. Geological Survey, Miscellaneous Investigations Map I-2277, 1 sheet, scale 1:250,000.

Goeke, J.W., J.M. Peckenpaugh, R.E. Cady, and J.T. Dugan, 1992, Hydrogeology of parts of the Twin Platte and Middle Republican Natural Resources Districts, southwestern Nebraska: University of Nebraska, Conservation and Survey Division, Nebraska Water Survey Paper No. 70, 89 p.

Scheinost, S.A., 1995, Soil survey of Keith County, Nebraska: U.S. Department of Agriculture, Natural Resources Conservation Service, 205 p. + maps.

Swinehart, J.B. and others (Compilers) and G.M. Richmond (Editor), 1994, Quaternary geologic map of the Platte River 4°x6° quadrangle, United States: U.S. Geological Survey Miscellaneous Investigations Map I-1420, 1 sheet, scale 1:1,000,000.

Keith County
Test-Hole Logs Table of Contents

Legal Descrip Twp Rge Sec	Test-Hole Number	Page
12N 36W 05BBBB	14-A-49	1
12N 36W 18DDDD	15-A-49	4
12N 39W 02DDDD	11-A-49	7
12N 40W 06AAAD	07-A-35	10
12N 40W 08DDDD	23-A-49	11
12N 41W 05DDAD	05-A-35	14
13N 35W 01AADD	31-H-78	15
13N 35W 01DDBB	08-TP-99	17
13N 35W 08CDAC	05-PA-44	18
13N 35W 08CDCA	03-PA-44	19
13N 35W 08CDCB	04-PA-44	20
13N 35W 08CDDA	01-PA-44	21
13N 35W 08CDDB	02-PA-44	22
13N 35W 36DDDD	29-H-78	23
13N 36W 05CBAD	106-A-44	25
13N 36W 08BABA1	87-B-44	26
13N 36W 08BABA2	105-A-44	28
13N 36W 08BABA3	104-A-44	29
13N 36W 08BABD1	103-A-44	30
13N 36W 08BABD2	102-A-44	31
13N 36W 08BABD3	101-A-44	32
13N 36W 08BABD4	100-A-44	33
13N 36W 08BACA1	99-A-44	34
13N 36W 08BACD	98-A-44	35
13N 36W 08BADC1	97-A-44	36
13N 36W 08BADC2	96-A-44	37
13N 36W 08BDAB1	95-A-44	38
13N 36W 08BDAB2	94-A-44	39
13N 36W 08BDAB3	93-A-44	40
13N 36W 08BDAC1	92-A-44	41
13N 36W 08BDAC2	82-B-44	42
13N 36W 08BDDB	83-B-44	44
13N 36W 08CAAD	84-B-44	45
13N 36W 08DCCD	85-B-44	47
13N 36W 17ABDC	86-B-44	50
13N 36W 17DDDC	13-A-49	51
13N 38W 06ABCD	06-A-49	53
13N 38W 06DCBB	07-A-49	54
13N 38W 07DBBA	08-A-49	56
13N 38W 10DCBA	07-TP-99	58
13N 38W 18ABBA	09-A-49	59
13N 38W 30BAAA	10-A-49	61

13N 38W 32CCDC 34-B-75 64
13N 39W 16DDCD1 03-TP-99 66
13N 39W 16DDCD2 04-TP-99 67
13N 39W 16DDDD1 05-TP-99 68
13N 39W 16DDDD2 06-TP-99 69
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13N 40W 28AAAA 20-A-49 74
13N 40W 28DDAA 21-A-49 75
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13N 40W 34BCCC 22-A-49 77
13N 41W 32DCCC 01-TP-99 79
13N 41W 35BABB 06-A-35 80
14N 35W 12CCDD K-02-01 81
14N 36W 31ABBB 12-A-49 82
14N 37W 05BBAA K-01-01 85
14N 38W 01BBAB 11-K-34 86
14N 38W 01BCAC 12-K-34 87
14N 38W 02ADDD 04-K-34 88
14N 38W 19ABBB 03-A-49 89
14N 38W 30DCCC 05-A-49 92
14N 38W 31BAAA 04-A-49 96
14N 40W 09CDCD 15-S-82 97
14N 40W 21AAAA 16-A-49 98
14N 40W 33DDDD 17-A-49 100
14N 41W 01CCCD 14-S-82 102
15N 36W 12ADBB 93-HP-80 104
15N 37W 25DCCC K-01-02 106
15N 38W 25CCAC 09-K-34 107
15N 38W 33CACA 14-K-34 108
15N 38W 34ACDD 07-K-34 109
15N 38W 35ABDD 06-K-34 110
15N 38W 36CDBD 10-K-34 111
15N 38W 36CCAC 08-K-34 112
15N 39W 24DDAD 35-B-75 113
15N 40W 05BCCD 16-S-82 115
16N 37W 16CBCA K-01-03 117
16N 38W 30ABBC 255-34 119
16N 39W 01ADAD 11-S-82 120

Test-holes are arranged in this publication by township, range and section.

Keith County
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13N 36W 08BABD1	103-A-44	30
13N 36W 08BABD2	102-A-44	31
13N 36W 08BABD3	101-A-44	32
13N 36W 08BABD4	100-A-44	33
13N 36W 08BACA1	99-A-44	34
13N 36W 08BACD	98-A-44	35
13N 36W 08BADC1	97-A-44	36
13N 36W 08BADC2	96-A-44	37
13N 36W 08BDAB1	95-A-44	38
13N 36W 08BDAB2	94-A-44	39
13N 36W 08BDAB3	93-A-44	40
13N 36W 08BDAC1	92-A-44	41
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13N 36W 08CAAD	84-B-44	45
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13N 36W 17ABDC	86-B-44	50
13N 36W 17DDDC	13-A-49	51
13N 38W 06ABCD	06-A-49	53
13N 38W 06DCBB	07-A-49	54
13N 38W 07DBBA	08-A-49	56
13N 38W 10DCBA	07-TP-99	58
13N 38W 18ABBA	09-A-49	59
13N 38W 30BAAA	10-A-49	61

13N 36W 08BABD3 101-A-44 32
13N 36W 08BABD2 102-A-44 31
13N 36W 08BABD1 103-A-44 30
13N 36W 08BABA3 104-A-44 29
13N 36W 08BABA2 105-A-44 28
13N 36W 05CBAD 106-A-44 25

1949

14N 38W 19ABBB 03-A-49 89
14N 38W 31BAAA 04-A-49 96
14N 38W 30DCCC 05-A-49 92
13N 38W 06ABCD 06-A-49 53
13N 38W 06DCBB 07-A-49 54
13N 38W 07DBBA 08-A-49 56
13N 38W 18ABBA 09-A-49 59
13N 38W 30BAAA 10-A-49 61
12N 39W 02DDDD 11-A-49 7
14N 36W 31ABBB 12-A-49 82
13N 36W 17DDDC 13-A-49 51
12N 36W 05BBBB 14-A-49 1
12N 36W 18DDDD 15-A-49 4
14N 40W 21AAAA 16-A-49 98
14N 40W 33DDDD 17-A-49 100
13N 40W 16AAAD 18-A-49 72
13N 40W 16DDDD 19-A-49 73
13N 40W 28AAAA 20-A-49 74
13N 40W 28DDAA 21-A-49 75
13N 40W 34BCCC 22-A-49 77
12N 40W 08DDDD 23-A-49 11

1975

13N 38W 32CCDC 34-B-75 64
15N 39W 24DDAD 35-B-75 113

1978

13N 35W 36DDDD 29-H-78 23
13N 35W 01AADD 31-H-78 15

1980

15N 36W 12ADBB 93-HP-80 104

1982

16N 39W 01ADAD 11-S-82 120
14N 41W 01CCCD 14-S-82 102
14N 40W 09CDCD 15-S-82 97
15N 40W 05BCCD 16-S-82 115

1999

13N 41W 32DCCC 01-TP-99 79
13N 40W 29CCDD 02-TP-99 76
13N 39W 16DDCD1 03-TP-99 66
13N 39W 16DDCD2 04-TP-99 67
13N 39W 16DDDD1 05-TP-99 68
13N 39W 16DDDD2 06-TP-99 69
13N 38W 10DCBA 07-TP-99 58
13N 35W 01DDBB 08-TP-99 17

2001

14N 37W 05BBAA K-01-01 85
14N 35W 12CCDD K-02-01 81

2002

15N 37W 25DCCC K-01-02 106

2003

16N 37W 16CBCA K-01-03 117

Test Hole #14-A-49 (No e-logs)
(12N-36W-5bbbb)
Keith County

Location: NW NW NW NW sec. 05, T. 12 N., R. 36 W., approximately 50 ft south and 27 ft east of northwest corner.
Ground elevation: 3,322 ft. (i). (Paxton SW 7.5 min. quadrangle).
Depth to water: 209.9 ft. (06-30-49)

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, silt, slightly sandy, grayish brown.....	0.0	0.5
Silt, slightly clayey, light-gray.....	0.5	3.5
Silt, slightly calcareous, light gray-white; contains some limy nodules.....	3.5	8.5
Silt, sandy, slightly calcareous, light-brown; texture of sand grades from very fine to fine; contains some limy nodules.....	8.5	10.0
Sand, silty, slightly calcareous, light-brown; texture of sand grades from very fine to fine; contains some limy nodules.....	10.0	21.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, very calcareous, white.....	21.0	26.0
Sandstone, slightly clayey to silty, moderately calcareous, reddish brown; contains hard limy layers.....	26.0	37.0
Silt, very sandy, to sand, very silty, very calcareous, white; texture of sand grades from very fine to fine; reddish brown tint below 40 ft.....	37.0	46.0
Sand, silty, moderately calcareous; texture of sand grades from very fine to coarse; contains some limy nodules; coarser from 55 ft.....	46.0	60.0
Sand to sandstone, silty, moderately calcareous, red-brown; texture of sand grades from very fine to coarse.....	60.0	63.5
Sand, pinkish tan; texture of sand grades from very fine to carse.....	63.5	66.0
Silt, sandy, slightly calcareous, grayish tan.....	66.0	76.5
Sand, pinkish tan; texture of sand grades from fine to coarse.....	76.5	86.0
Silt, sandy, moderately calcareous, white; contains hard limy layers.....	86.0	95.0
Sand, silty, slightly calcareous, reddish brown; texture of sand grades from very fine to medium...	95.0	105.5
Sand, pinkish tan; texture of sand grades from very fine to very coarse.....	105.5	125.0
Sand, pinkish tan; texture of sand grades from very fine to very coarse; contains some very coarse gravel and some black grains.....	125.0	130.0

Sand, silty, reddish brown; texture of sand grades from very fine to medium; some medium to very coarse gravel; contains more silt below 135 ft....	130.0	140.0
Silt, slightly sandy, slightly calcareous, reddish brown; contains hard layers.....	140.0	154.0
Sand, pinkish tan; texture of sand grades from very fine to coarse.....	154.0	170.0
Sand. light-brown; texture of sand grades from very fine to coarse; silt layer from 175 to 175.4 ft...	170.0	185.0
Silt, sandy, very calcareous, mottled grayish brown and white; contains hard limy layers.....	185.0	189.5
Silt, sandy, moderately calcareous, dark-brown.....	189.5	194.0
Silt, sandy, very calcareous, white.....	194.0	196.0
Sand,texture of sand grades from fine to very coarse, in parts cemented.....	196.0	200.0
Sandstone to sand, slightly calcareous, light-tan; texture of sand grades from very fine to medium; in parts cemented.....	200.0	205.0
Sandstone, silty, very calcareous, white.....	205.0	207.5
Clay, reddish brown; contains some limy layers.....	207.5	210.0
Sandstone, reddish brown; texture of sand grades from very fine to fine; contains some clay fragments.....	210.0	215.0
Sandstone, reddish brown; texture of sand grades from very fine to fine; contains some limy layers.....	215.0	220.0
Sand, silty, to sandstone, greenish gray; texture of sand grades from very fine to fine; contains some clay fragments; moderately silty with some limy layers below 226 ft; reddish brown below 230 ft.....	220.0	236.0
Silt, sandy, to sandstone, reddish brown; contains some limy layers and reworked clay fragments; moderately sandy at 250 ft.....	236.0	255.0
Sand, reddish brown; texture of sand grades from very fine to medium with a trace of coarse contains some limy layers; texture of sand grades from very fine to very coarse below 270 ft.....	255.0	280.0
Sand, pinkish tan; contains some fine gravel; contains some silt layers.....	280.0	290.0
Sand, pinkish brown; texture of sand grades from very fine to coarse.....	290.0	300.0
Sand to sandstone, light-brown; texture of sand grades from very fine to medium; contains some limy layers.....	300.0	310.0
Sand; texture of sand grades from very fine to coarse; contains hard layer from 315.5 to 316 ft.....	310.0	320.0
Sand, brown; texture of sand grades from very fine to medium; contains some limy layers.....	320.0	340.0
Sand, brown; texture of sand grades from very fine to medium.....	340.0	380.0

Sand, reddish brown; texture of sand grades from very fine to medium.....	380.0	395.0
Sand, reddish brown; texture of sand grades from very fine to medium; coarse sand and some consolidation	395.0	400.0
Silt and sandstone, reddish brown; very fine texture sand.....	400.0	403.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Clay, slightly silty, reddish brown.....	403.0	410.0
Sandstone, slightly clayey to slightly silty, reddish brown; texture of sand is very fine; contains some limy layers below 420 ft.....	410.0	430.0
Clay, slightly silty, reddish brown, in part blocky structure; contains some limy layers.....	430.0	450.0

Test Hole #15-A-49 (No e-logs)
(12N-36W-18dddd)
Keith County

Location: SE SE SE SE sec. 18, T. 12 N., R. 36W., approximately 1 ft north and 61 ft west of southeast corner.
Ground elevation: 3,313 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 182.5 ft. (7-7-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, slightly sandy, black	0.0	3.0
Silt, clayey to slightly sandy, brown-gray; dark-gray from 5 to 7.5 ft; light-brown below 7.5 ft	3.0	10.0
Clay, slightly silty, olive-gray	10.0	15.0
Silt, slightly clayey to sandy, red; contains some limy nodules	15.0	20.0
Silt, very sandy, very calcareous, white; contains very fine sand	20.0	21.0
Silt, coarse texture, very sandy, brown-gray with a red tint; contains very fine sand; very calcareous, white from 25 to 26 ft; moderately calcareous, reddish brown and green below 26 ft; contains limy layers	21.0	30.0
Silt, slightly clayey to sandy, moderately calcareous brown-gray with a red tint	30.0	36.0
Silt, slightly clayey to slightly sandy, moderately calcareous, green and brown-gray	36.0	40.0
Sand, very silty, very calcareous, white; texture of sand grades from very fine to medium	40.0	45.0
Sand, very silty, moderately calcareous, reddish tan; texture of sand grades from very fine to fine	45.0	50.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand to sandstone, very silty; texture of sand grades from very fine to medium; contains some hard limy layers	50.0	57.5
Sand, brown-tan; texture grades from very fine to coarse; texture grades from very fine to very coarse from 60 to 65 ft	57.5	70.0
Sand and gravel; texture grades from sand to fine gravel (contains about 40 percent gravel to 90 ft and about 50 percent gravel below 90 ft); some medium gravel below 90 ft	70.0	103.5
Silt, slightly sandy, brown-gray with a red tint	103.5	107.0
Silt, sandy, slightly calcareous, reddish brown; green-gray below 113 ft	107.0	116.0

Sand, silty, tan and green-gray; texture of sand grades from very fine to coarse; slightly calcareous from 116 to 120 ft; contains limy layer below 120 ft	116.0	125.0
Silt, slightly sandy, light reddish tan; very slightly sandy below 130 ft, slightly calcareous; contains white limy layers	125.0	146.0
Silt, sandy, light-brown with red tint; contains limy rootlets	146.0	150.0
Sand, brown with pink tint; texture of sand grades from very fine to very coarse	150.0	170.0
Sand and gravel; texture grades from sand to fine gravel (about 30 percent fine gravel)	170.0	182.0
Sand, silty, brown with reddish tint; texture of sand grades from very fine to medium	182.0	193.0
Sand, silty, grayish tan; texture of sand grades from very fine to coarse; contains some limy layers	193.0	200.0
Silt, sandy, reddish tan; contains some limy layers	200.0	208.5
Silt to sandstone, light-brown, very fine texture; contains some limy layers	208.5	210.0
Silt, sandy, slightly calcareous, light-tan; contains some limy layers	210.0	215.0
Sand to sandstone, slightly calcareous, gray-green; texture of sand is very fine; contains some limy layers	215.0	223.0
Sand, pinkish tan; texture of sand grades from very fine to very coarse	223.0	235.0
Sand to sandstone, silty, reddish brown; texture of sand grades from very fine to fine; contains some limy layers	235.0	250.0
Sand, silty; texture of sand grades from very fine to medium; contains red clay fragments	250.0	258.0
Sand, light-brown; texture of sand grades from very fine to medium; texture of sand grades from very fine to coarse below 260 ft	258.0	270.0
Sand, slightly silty; texture of sand grades from fine to very coarse; contains some reworked clay fragments	270.0	280.0
Silt. sandy, greenish tan	280.0	289.0
Sand, pinkish tan; texture of sand grades from very fine to very coarse	289.0	290.0
Silt, sandy, white; contains some limy layers	290.0	295.0
Sand, light-brown; texture of sand grades from very fine to medium; texture of sand grades from very fine to coarse below 300 ft with some consolidation; white below 305 ft	295.0	310.0
Silt, sandy, to sand, light-brown; texture of sand grades from very fine to coarse; contains some limy rootlets	310.0	360.5

Silt, slightly sandy, moderately calcareous, white..	360.5	363.0
Sand, light-brown; texture of sand grades from very fine to medium with some consolidation; white below 376 ft.....	363.0	380.0
Silt, sandy, very calcareous, white; slightly darker and more sand below 385 ft.....	380.0	390.0
Silt, slightly sandy, very calcareous, white.....	390.0	395.0
Sand, silty, to slightly clayey, moderately calcareous, white and gray.....	395.0	400.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, very slightly sandy, moderately calcareous, brownish olive-green; contains some limy layers.....	400.0	410.0
Clay, silty, reddish brown with some grayish green sandy silt.....	410.0	430.0
Siltstone, slightly clayey, grayish green; contains some sand; reddish brown silt and clay fragments below 445 ft.....	430.0	450.0
Clay, silty, green; contains red silty clay fragments.....	450.0	455.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, light-green.....	455.0	485.0

Test Hole #11-A-49 (No e-logs)
(12N-39W-2dddd)
Keith County

Location: SE SE SE SE sec. 2, T. 12 N., R. 39 W., approximately 21 ft. north and 58 ft. west of southeast corner.
Ground elevation: 3,418 ft. (i). (Ogallala SW 7.5 min. quadrangle)
Depth to water: 78.8 ft. (7-6-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, slightly clayey, dark brown-gray; more brownish and slightly calcareous below 3 ft.....	0.0	3.5
Silt, sandy, moderately calcareous buff-gray with a yellow tint.....	3.5	4.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Marl, silty to very slightly sandy, very calcareous, white with slight tan tint; medium-tan below 7.5 ft.....	4.5	9.5
Sandstone, silty to siltstone, sandy, very calcareous white to tan-gray; contains very fine to fine with a trace of medium to coarse sand; contains a few rootlets; light-tan to tan-gray below 15 ft.....	9.5	20.0
Sandstone, silty, very calcareous, very light buff-gray; texture of sand grades from very fine to fine with a trace of coarser grains: contains a few rootlets; very fine-grained below 23.5 ft, brown-tan.....	20.0	27.5
Clay, silty, slightly sandy, red-tan; contains limy layers from 30 to 35 ft; light-brown below 35 ft..	27.5	37.5
Sand, light brown-tan; texture of sand grades from very fine to coarse.....	37.5	40.0
Sand, light brown-pink; texture grades from medium to very coarse with a trace of fine gravel.....	40.0	50.0
Sand, silty, reddish brown; texture of sand grades from very fine to very coarse.....	50.0	60.0
Sand and some gravel, brown-gray; texture of sand grades from very fine to very coarse (contains about 35 percent fine to medium gravel).....	60.0	70.0
Sand and gravel; texture grades from medium sand to medium gravel (contains 50 percent sand and 50 per cent gravel).....	70.0	79.0
Clay, silty to very slightly sandy, slightly calcareous, light-gray.....	79.0	80.5
Clay, silty to slightly sandy, moderately calcareous, red-tan; contains some limy layers.....	80.5	85.0
Silt, slightly clayey to sandy, slightly calcareous, red-tan; texture of sand grades from very fine to fine; light tan-gray below 87 ft.....	85.0	90.0

Silt, slightly clayey to slightly sandy, slightly calcareous, pink-tan; texture of sand grades from very fine to fine; contains some limy nodules.....	90.0	97.0
Silt, slightly clayey to slightly sandy, light olive-gray; pinkish tan below 100 ft.....	97.0	106.0
Silt. slightly sandy, slightly calcareous; contains some coarse sand.....	106.0	110.0
Marl, silty to very sandy, to siltstone, very calcareous, white.....	110.0	112.5
Silt, very sandy, slightly calcareous, brown-tan; texture of sand grades from fine to coarse.....	112.5	114.5
Sand, green, brown and gray; texture of sand grades from fine to very coarse; contains some fine gravel.....	114.5	118.0
Silt, slightly clayey to sandy, slightly calcareous, tan; texture of sand grades from fine to coarse; moderately sandy below 125 ft.....	118.0	128.0
Sand, pinkish brown; texture of sand grades from fine to very coarse.....	128.0	130.0
Silt, slightly clayey to sandy, olive-gray; tannish gray below 136 ft.....	130.0	139.5
Silt, slightly clayey to slightly sandy, moderately calcareous, tannish gray; contains some limy layers below 140 ft.....	139.5	150.0
Marl, silty to very fine sandy, very calcareous.....	150.0	154.5
Silt, slightly clayey to sandy, slightly calcareous, light-gray and olive-green; light brown-tan and some limy layers below 158 ft; reddish tan below 160 ft.....	154.5	173.0
Sand, brown-tan; texture of sand grades from very fine to medium; contains a trace of coarse.....	173.0	175.0
Sandstone, slightly calcareous, brown-tan; texture grades from very fine to fine with a little medium sand; contains a few rootlets; slightly lighter in color from 177 to 190 ft; gray to olive-gray below 190 ft; moderately calcareous from 177 to 180 ft; contains some hard limy layers from 180 to 195 ft.....	175.0	200.0
Sand to sandstone, light-gray; texture grades from very fine to fine with some medium; contains some limy layers.....	200.0	210.0
Silt, slightly sandy, moderately calcareous, light gray-green; texture of sand grades from very fine to fine.....	210.0	220.0
Sand, silty, slightly calcareous, grayish tan; texture of sand grades from very fine to very coarse.....	220.0	225.0
Sand, light-brown to pinkish tan; texture of sand grades from fine to very coarse with a trace of fine gravel; contains a few light-gray silty sand stone fragments from 230 to 240 ft; contains cemented layers below 240 ft.....	225.0	267.5

Silt, sandy, very calcareous, white; light grayish tan below 270 ft; contains some hard limy layers; in part moderately calcareous below 275 ft.....	267.5	280.0
Sand, silty, very calcareous, white; texture of sand grades from fine to medium.....	280.0	285.0
Sand, silty, to sandstone, moderately calcareous, light tannish gray; texture of sand grades from fine to coarse.....	285.0	305.0
Silt, sandy, to sandstone, slightly calcareous, light grayish tan; contains very fine to medium sand.....	305.0	310.0
Sand, silty, to sandstone, slightly calcareous, gray.....	310.0	315.0
Marl, slightly silty to sandy, very calcareous, white.....	315.0	322.0
Silt, slightly clayey to sandy, slightly calcareous, olive-gray.....	322.0	326.0
Marl, slightly silty to slightly sandy, very calcareous, white.....	326.0	330.0
Sand, pinkish tan; texture of sand grades from very fine to coarse; slightly coarser with clay fragments below 378 ft.....	330.0	380.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Sand, silty, brown-gray; texture of sand grades from very fine to fine.....	380.0	385.0
Silt, sandy, slightly calcareous, tannish brown with a gray tint; very fine texture sand.....	385.0	400.0

Test Hole #7-A-35 (No e-logs)
(12N-40W-6aaad)
Keith County

Location: SE NE NE NE sec. 6, T. 12 N., R. 40 W.; just south of irrigation canal.
Ground elevation: 3,381 ft. (t). (Brule 7.5 min. quadrangle)
Depth to water: Approximately 55 ft. (7-23-35).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil:	0.0	3.0
Silt, yellow	3.0	5.0
Clay, sandy	5.0	10.0
Gravel	10.0	22.0
Clay, sandy	22.0	33.0
Gravel	33.0	36.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, limy; contains some gravel	36.0	39.0
Gravel, consolidated; contains sandy clay layer at 47.5 ft	39.0	53.0
Clay, sandy; contains some fine gravel	53.0	69.0
Clay, sandy, brown; contains some sandstone layers	69.0	81.0
Clay, sandy; contains some sandstone layers and rootlets	81.0	149.0
Gravel; texture grades from fine to medium	149.0	160.0
Clay, sandy	160.0	163.0
Gravel; contains some cementation	163.0	207.0
Clay, sandy, buff	207.0	227.0
Gravel	227.0	228.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, clayey, brown	228.0	235.0

Test Hole #23-A-49 (No e-logs)
(12N-40W-8dddd)
Keith County

Location: SE SE SE SE sec. 8, T. 12 N., R. 40 W., approximately 59 ft. north and 8 ft. west of southeast corner.
Ground elevation: 3,533 ft. (t). (Brule 7.5 min. quadrangle)
Depth to water: Unknown; test hole caved at 172 ft. (7-21-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill: silt, clayey, dark-brown	0.0	0.5
Silt, sandy, brown	0.5	3.0
Sand; texture grades from fine to very coarse; silty and very calcareous from 3 to 4.5 ft	3.0	10.0
Sand and gravel, brown, some dark grains; texture grades from very fine sand to medium gravel (about 60 percent gravel)	10.0	18.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, slightly silty, fine-grained, buff to gray	18.0	20.0
Silt, slightly clayey to slightly sandy, light reddish brown	20.0	26.0
Sand and gravel, pink and brown with some dark grains; texture grades from fine sand to coarse gravel	26.0	30.0
Sand and some gravel, pink and brown with some dark grains; texture grades from fine sand to medium gravel; contains sandy silt layers below 40 ft	30.0	51.5
Silt, sandy, light reddish brown; more sandy below 55 ft	51.5	60.0
Sand and some gravel, pink-brown; texture grades from fine sand to fine gravel	60.0	68.0
Sand, silty, light reddish brown	68.0	70.0
Silt, sandy, light reddish brown	70.0	72.5
Sand and gravel, tan-brown with some dark grains; texture grades from fine sand to medium gravel; contains sandy silt layer, light reddish brown from 75 to 76 ft	72.5	80.0
Silt, sandy, grayish brown with red tint	80.0	82.5
Sand, pink-brown; texture grades from very fine to medium	82.5	85.0
Silt. sandy, reddish brown with some green-gray	85.0	90.0
Silt, slightly sandy. moderately calcareous, very light-brown with some white	90.0	104.0
Sand and gravel, tan and pink; texture grades from fine sand to coarse gravel, about 50 percent gravel; sandy silt layer from 110.8 to 112.5 ft; contains some dark grains below 112.5 ft	104.0	122.5
Silt, slightly sandy, light-brown	122.5	130.0

Silt, sandy, slightly calcareous, very light green-gray; contains some reddish brown clay fragments..	130.0	140.0
Silt, slightly sandy. light reddish brown; contains reddish brown clay fragments.....	140.0	145.0
Sand, pinkish brown; texture grades from very fine to very coarse.....	145.0	160.0
Sand and gravel, yellow, pink and brown; texture grades from very fine sand to medium gravel (about 30 percent gravel).....	160.0	170.0
Sand, pink and brown; texture grades from very fine to very coarse.....	170.0	176.0
Silt. slightly clayey, slightly calcareous, light-brown.....	176.0	180.0
Silt, slightly clayey to sandy, moderately calcareous, brown; contains some white limy areas; light-brown below 185 ft; contains reddish brown clay fragments; noncalcareous from 190 to 195 ft; slightly calcareous below 195 ft.....	180.0	200.0
Sand, pink-brown; texture grades from very fine to very coarse.....	200.0	216.5
Silt, light-tan.....	216.5	221.0
Sand, brown-tan; texture grades from very fine to very coarse.....	221.0	233.5
Silt, sandy, moderately calcareous; contains some limy nodules; contains reddish brown clay fragments below 235 ft.....	233.5	240.0
Sand, slightly silty, pinkish brown; texture grades from very fine to very coarse.....	240.0	250.0
Sand and some fine gravel, brown-tan; texture of sand grades from very fine to very coarse.....	250.0	270.0
Sand and gravel, silty, light brown-pink; contains some limy layers.....	270.0	280.0
Sand, silty, to silt, sandy, brown, yellow and pink; texture grades from very fine to very coarse.....	280.0	290.0
Silt, very calcareous; contains some limy layers with reddish brown clay fragments.....	290.0	300.0
Silt, sandy, moderately calcareous, white; contains some reddish brown clay fragments.....	300.0	310.0
Silt, sandy, to sand, moderately calcareous, light-brown; contains some limy layers.....	310.0	315.0
Sand, yellow-pink; texture grades from fine to coarse with brownish red clay fragments.....	315.0	320.0
Sand, slightly silty; contains some limy layers with brown clay fragments.....	320.0	330.0
Silt, sandy, very calcareous, white; contains brown clay fragments from 330 to 335 ft.....	330.0	340.0
Silt, sandy, light-brown.....	340.0	345.0
Sand, pinkish brown; texture grades from very fine to coarse.....	345.0	361.5
Silt, slightly sandy, reddish brown.....	361.5	370.0
Clay, silty, reddish brown.....	370.0	375.0

Sand, pinkish brown; texture grades from fine to coarse	375.0	385.0
Silt, slightly sandy, white	385.0	390.0

Test Hole #5-A-35 (No e-logs)
(12N-41W-5ddad)
Keith County

Location: SE NE SE SE sec. 5, T. 12 N., R. 41 W., along west side of road, just south of irrigation canal.
Ground elevation: 3,398 ft. (t). (Big Springs 7.5 min. quadrangle)
Depth to water: Unknown. (7-13-35).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	5.5
Gravel, with sandy clay	5.5	8.0
Silt, yellow	8.0	12.5
Sand and fine gravel	12.5	22.0
Gravel; texture grades from medium to coarse gravel; contains some sandy clay	22.0	35.0
Gravel; contains limy concretions	35.0	38.0
Clay, sandy, white; contains some gravel below 58 ft	38.0	82.0
Gravel; texture grades from fine to medium gravel	82.0	94.0
Clay, sandy, brown	94.0	105.0
Gravel; contains some sandy clay	105.0	110.0
Gravel	110.0	127.0
Clay, sandy	127.0	138.0
Tertiary System - Oligocene Series - White River Group: Brule Formation:		
Silt, clayey, brown	138.0	215.5

Test Hole #31-H-78 (E-log)
(13N-35W-1AADD)
Keith County

Location: SE SE NE NE sec. 1, T. 13 N., R. 35 W., 1,100 ft. south and 60 ft. west of northeast corner.
Ground elevation: 3,023 ft. (t) (Paxton North 7.5 min. quadrangle)
Depth to water: Approximately 15 ft. (10-5-78)

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, sandy, slightly-moderately clayey, black-brown, very sandy below 7 ft., slightly to moderately calcareous.....	0.0	10.0
Sand and gravel, very fine sand to coarse gravel, much fine gravel.....	10.0	45.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly to moderately clayey, slightly to very limy, moderately to very sandy, very fine to fine siliceous rootlets, brown to pale brown, limy fragments, moderately calcareous.....	45.0	67.0
Sand to sandstone, very fine to very coarse, trace fine gravel to medium gravel 80 to 88 ft., lime cemented.....	67.0	91.0
Sand, very fine to very coarse, much coarse to very coarse, trace fine to medium gravel and sandstone.	91.0	100.0
Silt, very sandy with interbedded sandstone, very fine to fine, slightly to moderately limy, brown..	100.0	112.0
Sandstone, very fine to very coarse, much fine to medium, trace fine gravel, in part moderately to very silty and in part limy and lime cemented, brown to pale brown.....	112.0	133.0
Silt, very sandy, very fine to medium sand, very limy, limy streaks, lime cement, rootlets, brown to pale brown.....	133.0	141.0
Sand to sandstone, very fine to medium, trace fine to medium gravel, slightly to very silty, moderately limy with limy silts, pale brown to brown...	141.0	172.0
Silt, very sandy, very fine to medium, trace coarse to very coarse, rare fine gravel, slightly limy, pale brown to brown.....	172.0	190.0
Sandstone, very fine to medium, trace rootlets, brown to pale brown.....	190.0	197.0
Silt to siltstone, moderately clayey, slightly sandy, very fine sand, very limy, very pale brown to white, some ash 200 to 204 ft.....	197.0	204.0
Siltstone to sandstone, very fine to fine, very silty, moderately limy, trace siliceous cement, pale brown, ashy in parts.....	204.0	216.0

Siltstone, sandy, very fine to very coarse, trace fine gravel, very limy, pale yellow.....	216.0	237.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt to siltstone, moderately clayey, trace iron and manganese stains, trace pink bentonite?, pale brown to reddish brown to yellow brown with olive brown between 272 to 296 ft.....	237.0	367.0
Silt, moderately clayey, non limy, most white with black fragments, possible volcanic ash.....	367.0	380.0
Silt to siltstone with claystone, brown to dark brown, olive to pale olive below 390 ft.....	380.0	430.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Siltstone, pale olive to greenish gray.....	430.0	468.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Shale Formation:		
Clay, shaley, yellow with gray streaks, possibly re-worked 460 to 480 ft., slightly calcareous.....	468.0	497.0
Clay, shaley, dark gray, slightly calcareous.....	497.0	520.0

Test Hole #8-TP-99 (E-log)
(13N-35W-1DDBB)
Keith County

Location: NW NW SE SE sec. 1, T. 13 N., R. 35 W., 1100 ft. north and 1100 ft. west of southeast corner.
Ground elevation: 3022 ft. (t) (Paxton South 7.5 minute quadrangle)
Depth to water: 12.03 ft. (7-30)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Topsoil, silt, slightly clayey, dark gray to black..	0.0	5.0
Sand and gravel, fine sand to medium gravel.....	0.0	25.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, moderately clayey, reddish brown.....	25.0	42.0
Silt, very sandy, very fine to coarse sand slightly to moderately clayey, in part cemented, pale brown to pale reddish gray brown.....	42.0	60.0
Clay, pale reddish brown.....	60.0	74.0
Sandstone, very fine to medium sand slightly to moderately cemented, very pale reddish brown.....	74.0	80.0
Sand and gravel, very fine sand to fine gravel, slightly silty, rootlets.....	80.0	96.0
Sandstone, very fine to fine, well consolidated, rootlets, reddish brown.....	96.0	110.0

Test Hole #5-PA-44 (No e-logs)
(13N-35W-8cdac)
Keith County

Location: SW NE SW SE sec. 8, T. 13 N., R. 35 W., 2,220 ft. east and 950 ft. north of southwest corner, southwest corner of Paxton Cemetery.
Ground elevation: 3,080 ft. (t). (Paxton South 7.5 min. quadrangle)
Depth to water: Unknown; not reached. (12-8-44)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Topsoil, silty sand, brown.....	0.0	2.2
Sand, silty, brown to light brown.....	2.2	6.2
Sand, silty, light brown, calcareous cement.....	6.2	8.7
Silt, sandy, light yellowish brown.....	8.7	15.4
Sand and gravel, granitic, much quartz.....	15.4	17.2

Test Hole #3-PA-44 (No e-logs)
(13N-35W-8cdca)
Keith County

Location: NE SW SE SW sec. 8, T. 13 N., R. 35 W., 1,800 ft. east and 438 ft. north of southwest corner.
Ground elevation: 3,097 ft. (i). (Paxton South 7.5 min. quadrangle)
Depth to water: Unknown; not reached. (12-8-44).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Topsoil, silty sand, brown.....	0.0	2.4
Sand, silty, brown to light brown.....	2.4	6.0
Silt, sandy, light yellowish brown.....	6.0	18.0

Test Hole #4-PA-44 (No e-logs)
(13N-35W-8cdcb)
Keith County

Location: NW SW SE SW sec. 8, T. 13 N., R. 35 W., 1,400 ft. east and 440 ft. north of southwest corner.
Ground elevation: 3,099 ft. (i). (Paxton South 7.5 min. quadrangle)
Depth to water: Unknown; not reached. (12-8-44)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Topsoil, silty sand, brown.....	0.0	1.2
Sand, silty, brown to light brown.....	1.2	10.0
Silt, sandy, brown to light yellowish brown.....	10.0	17.0

Test Hole #1-PA-44 (No e-logs)
(13N-35W-8cdda)
Keith County

Location: NE SE SE SW sec. 8, T. 13 N., R. 35 W., 2,600 ft. east and 432 ft. north of southwest corner.
Ground elevation: 3,098 ft. (i). (Paxton South 7.5 min. quadrangle)
Depth to water: Unknown; not reached. (12-8-44).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, brown.....	0.0	2.8
Sand, silty, light brown.....	2.8	7.0
Silt, sandy, light yellowish brown.....	7.0	22.0

Test Hole #2-PA-44 (No e-logs)
(13N-35W-8cddb)
Keith County

Location: NW SE SE SW sec. 8, T. 13 N., R. 35 W., 2,200 ft. east and 435 ft. north of southwest corner.
Ground elevation: 3,100 ft. (i). (Paxton South 7.5 min. quadrangle)
Depth to water: Unknown; not reached. (12-8-44)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, brown, and topsoil.....	0.0	2.0
Sand, silty, light brown to brown.....	2.0	7.8
Silt, sandy, light yellowish brown.....	7.8	20.0

Test Hole #29-H-78 (E-logs)
(13N-35W-36dddd)
Keith County

Location: SE SE SE SE sec. 36, T. 13 N., R. 35 W., 25 ft. north and 53 ft. west of SE corner.
Ground elevation: 3,188 ft. (t). (Paxton South 7.5 min. quadrangle)
Depth to water: Unknown. (9-30-79).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, very sandy, dark-gray; sand is very fine to medium; below 5 ft pale brown.....	0.0	20.0
Sand, very fine to very coarse, moderately silty, some limy grains.....	20.0	22.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone; very fine to coarse grained, trace of very coarse.....	22.0	38.0
Silt, very sandy, slightly clayey, pinkish white; very calcareous.....	38.0	56.0
Sand, gravelly; very fine sand to coarse gravel, little medium gravel.....	56.0	66.0
Silt, very sandy, slightly clayey, light brown; sand is very fine to medium; some coarse; 75 to 80 ft light reddish brown, trace of rootlet fragments...	66.0	84.0
Sand, slightly gravelly; very fine sand to fine gavel, trace of medium gravel.....	84.0	90.0
Silt, very sandy, slightly clayey, brown, in places reddish brown; sand is very fine to fine, in places very fine to very coarse with rare gravel; below 112.5 ft very calcareous; below 116.5 ft in places interbedded sandstone lenses.....	90.0	140.0
Sand, gravelly; very fine sand to medium gravel.....	140.0	147.0
Sand, very fine to medium; below 148 ft very fine to very coarse, with trace of fine gravel.....	147.0	149.0
Silt, very sandy, slightly clayey, pinkish gray, very calcareous; in places interbedded sandstone lenses.....	149.0	155.0
Sand, very fine to very coarse, little fine to medium gravel.....	155.0	160.0
Sand, gravelly; very fine sand to fine gravel, trace of medium gravel.....	160.0	180.0
Caliche, silty, white, calcareous.....	180.0	185.0
Siltstone, clayey, brown.....	185.0	187.5
Sandstone; very fine to medium grained.....	187.5	190.0
Silt, very sandy, light brown; sand is very fine to medium.....	190.0	200.0
Sandstone; very fine to medium grained; in places traces of rootlets; below 220 ft silty; below 232 ft much coarse sand to fine gravel.....	200.0	235.0

Sand, gravelly; very fine sand to fine gravel, trace of medium gravel; below 240 ft gravel is lime cemented	235.0	256.0
Sand, very fine to very coarse, little fine gravel, silty	256.0	275.0
Sandstone, very fine to medium grained, with some coarse to very coarse sand, trace of fine gravel; in places lime cemented	275.0	288.0
Sand, gravelly; very fine sand to fine gravel; some medium gravel	288.0	295.0
Sandstone; very fine to fine grained, lime cemented.	295.0	297.0
Sand, gravelly; very fine sand to fine gravel; some medium gravel	297.0	300.0
Sandstone; very fine to fine grained, some rootlet fragments	300.0	315.0
Siltstone, clayey, sandy light gray; sand is very fine to fie	315.0	320.0
Sand, very fine to medium, below 326 ft some sandstone and siltstone fragments	320.0	337.0
Siltstone, clayey, sandy, pinkish gray, moderately calcareous	337.0	340.0
Sand, very fine to coarse, little very coarse	340.0	348.0
Silt, very sandy, slightly clayey, light brown to light reddish brown; sand is very fine to medium; in places limy areas	348.0	375.0
Silt, very sandy, slightly clayey, pinkish white, very calcareous; sand is very fine to medium; below 405 marly	375.0	416.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Siltstone, clayey, light olive gray	416.0	480.0
Clay, silty, light greenish gray, bentonite; below 490 ft some reddish brown	480.0	500.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Shale Formation:		
Clay, shale, light yellowish brown; below 510 ft yellowish brown	500.0	515.0
Clay, shale, black	515.0	540.0

Test Hole #106-A-44 (No e-logs)
(13N-36W-5cbad)
Keith County

Location: SE NE NW SW sec. 5, T. 13 N., R. 36 W., approximately 2,000 ft. north and 1,000 ft. east of southwest corner.
Ground elevation: 3,109 ft. (i). (Nevens 7.5 min. quadrangle)
Depth to water: 6.2 ft. (12-7-44).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil: sandy, black	0.0	2.0
Sand, silty, tan; fine texture	2.0	4.0
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel	4.0	25.0
Sand, silty, tan	25.0	47.5
Sand and gravel; cemented	47.5	59.0

Test Hole #87-B-44 (No e-logs)
(13N-36W-8baba1)
Keith County

Location: NE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately on section line, 1,740 ft. east of northwest corner.
Ground elevation: 3,107 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 7.7 ft. (11-20-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, brown-gray; texture grades from fine to medium; contains some coarse.....	0.0	2.0
Silt, sandy, to sand, silty, calcareous, brown-gray.	2.0	10.0
Sand and gravel, reddish brown; texture grades from medium sand to coarse gravel; texture grades from coarse sand to medium gravel below 20.5 ft.....	10.0	23.0
Sand and gravel, calcareous, reddish brown; texture grades from coarse sand to medium gravel.....	23.0	30.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, calcareous, pinkish gray; contains some limy layers...,.....	30.0	60.0
Siltstone, sandy, to sandstone, silty, calcareous, light-gray to pinkish.....	60.0	65.0
Sand and gravel; texture grades from medium sand to fine gravel.....	65.0	85.0
Sand, silty, pinkish tan; calcareous and contains some marly limestone below 95 ft.....	85.0	110.0
Sand, silty, pinkish gray.....	110.0	113.0
Marl, sandy, to sandstone, light-gray.....	113.0	117.0
Marl, sandy to silty, white,.....	117.0	125.0
Sand, silty, pinkish gray.....	125.0	130.0
Marl, sandy to silty, pinkish gray.....	130.0	135.0
Sand and gravel, silty, light gray-brown; texture grades from sand to medium gravel; marly below 150 ft.....	135.0	156.0
Sand, silty, light-gray; fine texture sand; contains marl fragments from 156 to 160 ft; pinkish gray be low 160 ft; contains marl fragments from 165 to 170 ft.....	156.0	174.0
Sand, silty, to silt, sandy, pinkish gray.....	174.0	180.0
Sand, silty, grayish brown; texture grades from fine to medium sand; texture grades from fine to coarse sand below 183.5 ft.....	180.0	190.0
Sand and gravel; texture grades from fine sand to gravel.....	190.0	196.0
Silt, slightly sandy, gray with a pinkish tint.....	196.0	202.0
Clay, silty, pink-gray.....	202.0	210.0
Sand, light-gray; texture grades from fine to medium; contains some coarse sand.....	210.0	214.0

Clay, silty, to silt, clayey, pink and green.....	214.0	217.0
Sand, silty, light-gray with a pink tint.....	217.0	225.0
Sand, slightly silty, brown-green; texture of sand is medium coarse.....	225.0	230.0
Marl and caliche, calcareous, white.....	230.0	240.0
Marl, silty, white.....	240.0	250.0
Clay, silty, light green-gray.....	250.0	271.0
Clay, silty, brown with a pink tint; light green-gray below 277 ft.....	271.0	301.5
Marl and caliche, calcareous, white; grading to caliche; contains green-gray clay below 306.5 ft; pink clay below 320 ft.....	301.5	325.0
Caliche, white.....	325.0	330.0

Test Hole #105-A-44 (No e-logs)
(13N-36W-8baba2)
Keith County

Location: NE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately 100 ft. south and 1,775 ft. east of northwest corner.
Ground elevation: 3,105 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 2.9 ft. (12-7-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	20.0
Silt, sandy, tan.....	20.0	24.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, brown; contains some cemented layers..	24.5	46.0
Sand; contains some limy cemented mortar layers....	46.0	49.5
Sand and gravel, light reddish brown; coarser texture below 54 ft.....	49.5	59.0

Test Hole #104-A-44 (No e-logs)
(13N-36W-8baba3)
Keith County

Location: NE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately 250 ft. south and 1,825 ft. east of northwest corner.
Ground elevation: 3,106 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 3.6 ft. (12-7-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel; somewhat coarser below 9 ft.....	0.0	21.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, calcareous, light grayish tan.....	21.0	26.0
Sand, silty; contains some limy cementation.....	26.0	27.5
Sand, calcareous, brownish tan; contains slightly cemented layers.....	27.5	39.0
Sand, silty, calcareous; slightly cemented and contains some hard layers.....	39.0	49.0
Sand, buff-gray; contains some limy cemented layers.	49.0	56.0

Test Hole #103-A-44 (No e-logs)
(13N-36W-8babd1)
Keith County

Location: SE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately 375 ft. south and 1,850 ft. east of northwest corner.
Ground elevation: 3,104 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 2.4 ft. (12-7-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	19.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, tan-brown; slightly cemented.....	19.0	24.0
Sand, brown; cemented; contains some limy layers....	24.0	49.0
Sand, silty, brownish tan-buff; cemented.....	49.0	59.0
Sand and gravel; contains some limy cemented layers; reddish brown below 64 ft.....	59.0	79.0
Sand, silty, brown; contains some limy cemented layers.....	79.0	84.0
Sand and gravel; lime cemented.....,.....	84.0	94.0
Sand, silty, light-tan; contains some lime cementation, white below 104 ft.....	94.0	115.0
Sand, silty, calcareous, greenish gray.....	115.0	139.0

Test Hole #102-A-44 (No e-logs)
(13-36-8babd2)
Keith County

Location: SE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately 500 ft. south and 1,875 ft. east of northwest corner.
Ground elevation: 3,106 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 4.0 ft. (12-6-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, tan to buff; contains some limy cemented layers.....	24.0	29.0
Sand, brown; slightly cemented; contains limy layers.....	29.0	39.0
Sand, brown to buff; lime cemented; contains hard mortar beds.....	39.0	43.5
Sand; contains some limy cemented layers.....	43.5	51.5

Test Hole #101-A-44 (No e-logs)
(13N-36W-8babd3)
Keith County

Location: SE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately 625 ft. south and 1,900 ft. east of northwest corner.
Ground elevation: 3,106 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 3.7 ft. (12-6-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, tan to reddish brown; texture grades from fine sand to coarse gravel.....	0.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, brown; contains limy cemented layers...	24.0	29.0
Sand, brown; contains some cemented layers.....	29.0	39.0
Sand, silty, tan; contains some hard Layers.....	39.0	44.0
Sand, light tan-brown; contains some limy cemented layers.....	44.0	52.5

Test Hole #100-A-44 (No e-logs)
(13N-36W-8babd4)
Keith County

Location: SE NW NE NW sec. 8, T. 13 N., R. 36 W., approximately 750 ft. south and 1,925 ft. east of northwest corner.
Ground elevation: 3,107 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 3.8 ft. (12-6-44).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, pinkish tan; contains some limy layers.	24.0	29.0
Caliche, tan; contains some brownish tan sand and limy layers.....	29.0	34.0
Sand, brownish tan; slightly cemented.....	34.0	44.0
Sand and gravel; contains some hard limy layers.....	44.0	49.0

Test Hole #99-A-44 (No e-logs)
(13N-36W-8baca1)
Keith County

Location: NE SW NE NW sec. 8, T. 13 N., R. 36 W., approximately 900 ft. south and 1,950 ft. east of northwest corner.
Ground elevation: 3,104 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 1.0 ft. (12-5-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, brownish tan; slightly cemented.....	24.0	29.0
Sand, silty, light-tan; contains some limy cemented layers.....	29.0	44.0
Sand and gravel, cemented.....	44.0	46.5

Test Hole #98-A-44 (No e-logs)
(13N-36W-8bacd)
Keith County

Location: SW SW NE NW sec. 8, T. 13 N., R. 36 W., approximately 1,025 ft. south and 1,975 ft. east of northwest corner.
Ground elevation: 3,104 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 1.2 ft. (11-28-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, brownish red; texture grades from fine sand to coarse gravel.....	0.0	19.0
Sand, silty, brown.....	19.0	24.0
Silt, light-tan; contains some limy layers.....	24.0	29.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, tan to brown; slightly cemented.....	29.0	44.0
Sand; contains limy cemented layers.....	44.0	54.0
Sand and gravel, reddish brown.....	54.0	59.0

Test Hole #97-A-44 (No e-logs)
(13N-36W-8badc1)
Keith County

Location: SW SE NE NW sec. 8, T. 13 N., R. 36 W., approximately 1,125 ft. south and 2,000 ft. east of northwest corner.
Ground elevation: 3,105 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 1.9 ft. (11-28-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand to gravel, brown; texture grades from coarse sand to fine gravel.....	0.0	4.0
Sand and gravel, light to dark-red; texture grades from fine sand to coarse gravel.....	4.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, light buff-brown; cemented.....	24.0	39.0
Sandstone, light brown-gray; contains cemented limy layers.....	39.0	44.0
Gravel, light tan-buff; texture grades from medium to coarse gravel; contains some limy cemented sandstone.....	44.0	59.0

Test Hole #96-A-44 (No e-logs)
(13N-36W-8badc2)
Keith County

Location: SW SE NE NW sec. 8, T. 13 N., R. 36 W., approximately 1,250 ft. south and 2,050 ft. east of northwest corner.
Ground elevation: 3,106 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 3.4 ft. (11-27-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, tan-brown; texture grades from coarse sand to fine gravel.....	0.0	4.0
Gravel, reddish brown; texture grades from medium to coarse gravel.....	4.0	24.0
Clay, silty, light-brown; contains some gravel.....	24.0	29.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, cemented, brown.....	29.0	34.0
Sandstone, brown, and white to buff; contains some limy layers, brown-tan below 39 ft; brown-buff below 44 ft.....	34.0	48.0
Sand and gravel, reddish brown; contains some cemented limy layers.....	48.0	54.0
Caliche, white.....	54.0	59.0

13N 36W 08BDAB1 95-A-44

Test Hole #95-A-44 (No e-logs)
(13N-36W-8bdab1)
Keith County

Location: NW NE SE NW sec. 8, T. 13 N., R. 36 W., approximately 1,350 ft. south and 2,075 ft. east of northwest corner.
Ground elevation: 3,100 ft. (t). (Paxton SW 7.5 min. quadrangle)
Depth to water: 2.4 ft. (11-27-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, light brown-gray; texture grades from fine sand to medium gravel.....	0.0	4.0
Gravel, reddish brown-gray; texture grades from medium to coarse gravel with some sand.....	4.0	14.0
Sand and gravel; light-gray, red, brown, and tan; texture grades from medium sand to coarse gravel..	14.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, brown to pinkish buff; contains cemented limy silt layers.....	24.0	34.0
Caliche, light pinkish tan; contains some hard layers.....	34.0	39.5
Sand, brown; contains some cemented layers.....	39.5	43.5
Sand, tannish pink; contains some limy cemented layers.....	43.5	44.0
Silt, sandy, brown; contains some hard layers.....	44.0	47.0
Sand and gravel, reddish brown; texture grades from coarse sand to medium gravel.....	47.0	49.0
Caliche, tan-white.....	49.0	52.0

Test Hole #94-A-44 (No e-logs)
(13N-36W-8bdab2)
Keith County

Location: NW NE SE NW sec. 8, T. 13 N., R. 36 W., approximately 1,450 ft. south and 2,100 ft. east of northwest corner.
Ground elevation: 3,106 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 2.4 ft. (11-27-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, tan to reddish brown; coarse texture sand; finer texture and tannish brown below 5 ft.....	0.0	10.0
Sand and gravel, dark reddish brown; texture grades from fine sand to coarse gravel.....	10.0	25.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, brown; contains some cemented limy layers.....	25.0	35.0
Sandstone, limy, light tannish gray; contains some hard layers below 40 ft.....	35.0	45.0
Sand and gravel; texture grades from coarse sand to coarse gravel.....	45.0	50.0
Sand, limy cemented.....	50.0	60.0
Sand and gravel; contains some cemented hard layers.	60.0	80.0
Sand, cemented, light-brown.....	80.0	85.0
Sand, reddish brown; texture grades from medium to coarse sand; contains fine to coarse sand with some hard layers below 90 ft; contains some limy layers below 95 ft; contains coarse to very coarse sand below 105 ft.....	85.0	115.0
Sand; contains hard limy layers.....	115.0	120.0

Test Hole #93-A-44 (No e-logs)
(13N-36W-8bdab3)
Keith County

Location: NW NE SE NW sec. 8, T. 13 N., R. 36 W., approximately 1,575 ft. south and 2,125 ft. east of northwest corner.
Ground elevation: 3,104 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 1.4 ft. (11-26-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	4.0
Gravel, light reddish brown; texture grades from medium to coarse gravel; contains some fine sand from 4 to 9 ft.....	4.0	23.0
Gravel and sand; texture grades from fine sand to medium gravel; contains some clay.....	23.0	24.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Clay, light-brown; contains some sand.....	24.0	29.0
Sand, light-brown; fine texture sand with fragments of coarse gravel, slightly cemented.....	29.0	44.0
Gravel, pinkish red; texture grades from medium to coarse gravel; contains some cementation.....	44.0	54.0
Sand and gravel; contains some cementation.....	54.0	59.0

Test Hole #92-A-44 (No e-logs)
(13N-36W-8bdac1)
Keith County

Location: SW NE SE NW sec. 8, T. 13 N., R. 36 W., approximately 1,700 ft. south and 2,150 ft. east of northwest corner.
Ground elevation: 3,105 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 1.7 ft. (11-24-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and gravel, reddish brown; texture grades from fine sand to coarse gravel.....	0.0	19.0
Gravel, pinkish gray; texture grades from fine to coarse gravel with some medium sand; contains some reworked sandstone.....	19.0	27.0
Tertiary System, Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, silty, light-gray with a greenish tint; cemented.....	27.0	49.0
Sandstone; contains some lime cementation.....	49.0	59.0

Test Hole #82-B-44 (No e-logs)
(13N-36W-8bdac2)
Keith County

Location: SW NE SE NW sec. 8, T. 13 N., R. 36 W., approximately 1,811 ft. south and 2,130 ft. east of northwest corner.
Ground elevation: 3,109 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 7.1 ft. (7-15-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: clay, silty to sandy, brown-gray.....	0.0	2.0
Clay, silty, brown to light-gray.....	2.0	4.0
Sand and gravel; texture grades from coarse sand to coarse gravel.....	4.0	10.0
Sand and gravel; texture grades from fine sand to coarse gravel.....	10.0	20.0
Sand and gravel; texture grades from medium sand to coarse gravel; contains some silty clay.....	20.0	25.0
Sand and gravel; texture grades from coarse sand to coarse gravel.....	25 .0	29.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, chalky, white; in part sandy.....	29.5	32.5
Sandstone, silty, light brownish gray.....	32.5	40.0
Sandstone, silty, to siltstone, sandy, calcareous, light brown-buff; less calcareous below 50 ft.....	40.0	50.0
Sand and gravel; texture grades from coarse sand to medium gravel.....	50.0	56.0
Marl, slightly silty to sandy, moderately calcareous, light-gray.....	56.0	61.0
Sand and gravel; texture grades from coarse sand to medium gravel.....	61.0	80.0
Sandstone, slightly calcareous, light-brown.....	80.0	84.0
Sand and gravel, reddish brown to pink.....	84.0	90.0
Sandstone to marl, moderately calcareous, light-gray; principally marl below 97 ft.....	90.0	101.0
Marl, silty. light-gray with pink tint.....	101.0	103.0
Marl to sandstone, silty, light brown-gray; light-gray with pinkish tint below 110 ft.....	103.0	120.0
Sand, reddish brown; texture grades from medium to very coarse sand.....	120.0	130.0
Sand and gravel; texture grades from coarse sand to fine gravel; contains some marl and sandstone fragments; contains some silty sandstone below 140 ft.....	130.0	145.0
Silt to sandstone, light-gray; contains some marl..	145.0	150.0
Sand and gravel; texture grades from fine sand to fine gravel; slightly coarser below 165 ft.....	150.0	170.5
Clay, silty, brown with pinkish tint.....	170.5	177.0

Sand and gravel; texture grades from medium sand to fine gravel; contains medium sand to medium gravel with some silt below 185 ft.....	177.0	190.0
Sand and gravel; texture grades from fine sand to fine gravel; contains some marl fragments.....	190.0	200.0
Silt, clayey, to sandstone, silty, medium-gray.....	200.0	210.0
Marl, silty, moderately calcareous, light-gray with pinkish tint.....	210.0	220.5
Marl, silty to sandy, very calcareous, white.....	220.5	226.0
Silt, clayey, slightly marly, light pinkish gray....	226.0	230.0
Sand; texture grades from medium to coarse sand.....	230.0	235.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, moderately calcareous, light-gray; pinkish tint below 240 ft.....	235.0	246.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Silt, sandy to slightly clayey, light-gray with greenish tint; light pinkish gray below 252.5 ft..	246.0	256.0
Silt, clayey, gray, brown and pink.....	256.0	268.0
Clay, silty, pink-gray; green-gray below 275 ft.....	268.0	280.0

Test Hole #83-B-44 (No e-logs)
(13N-36W-8bddb)
Keith County

Location: NW SE SE NW sec. 8, T. 13 N., R. 36 W., approximately 2,130 ft. south and 1,980 ft. east of northwest corner.
Ground elevation: 3,110 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 7.2 ft. (11-16-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, sandy, brown	0.0	4.0
Clay, gray-brown	4.0	5.5
Sand and gravel, brownish yellow; texture grades from medium sand to coarse gravel	5.5	10.0
Gravel, brownish yellow; medium texture gravel	10.0	20.0
Sand and gravel, brownish yellow; texture grades from medium sand to medium gravel	20.0	24.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, light brown-gray; fine texture sand with some cementation	24.5	26.0
Sand and gravel, brownish red; texture grades from sand to coarse gravel	26.0	28.0
Sand, brownish gray to tan; fine texture sand with some cementation; pinkish tan below 30 ft; contains some limy layers below 39.5 ft	28.0	40.5
Silt, sandy, pinkish tan	40.5	45.0
Sand, tan-gray; contains some cementation with limy layers	45.0	50.0
Sand and gravel; texture grades from fine sand to gravel	50.0	60.0

Test Hole #84-B-44 (No e-logs)
(13N-36W-8caad)
Keith County

Location: SE NE NE SW sec. 8, T. 13 N., R. 36 W., approximately 2,300 ft. north and 2,630 ft. east of southwest corner.
Ground elevation: 3,107 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 4.2 ft. (11-16-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, slightly sandy, moderately calcareous, brown-gray	0.0	2.0
Silt, slightly sandy, very calcareous, light-gray; contains very fine sand	2.0	5.0
Silt, slightly sandy, slightly calcareous, light buff-gray	5.0	7.0
Sand, slightly silty, light brown-gray with pinkish tint; texture grades from very fine to medium sand	7.0	12.0
Sand and gravel, reddish brown; texture grades from fine sand to fine gravel; contains about 30 per cent gravel; contains about 10 percent gravel from 15 to 20 ft; contains a trace of coarse to very coarse gravel from 20 to 25 ft, about 20 percent gravel; about 75 percent gravel with some coarse gravel with pinkish tint between 25 to 30 ft	12.0	36.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, calcareous, tan; texture grades from very fine to coarse sand, some cementation	36.5	40.0
Sandstone, very calcareous, white; texture grades from very fine to fine sand with some medium sand; contains some limy fragments; marly with tan tint below 44.5 ft	40.0	50.0
Sand, very silty, moderately calcareous, tan-gray; texture grades from very fine to fine sand	50.0	53.5
Marl to sandstone, white with olive tint; texture grades from very fine to fine sand	53.5	59.5
Sand and gravel, brown-gray to pink; texture grades from medium sand to medium gravel, contains about 30 percent gravel	59.5	70.0
Sand, slightly silty; contains some lime-coated gravel grains	70.0	70.5
Sand and gravel, brown-gray to pink; texture grades from medium sand to coarse gravel, contains about 40 percent gravel; slightly calcareous, contains some limy cementation below 75 ft; more cementation below 79.5 ft	70.5	85.0

Sandstone, silty, very calcareous, buff-tan; texture grades from fine to medium sand.....	85.0	90.0
Sandstone, fine-grained, limy and siliceous cementation, possibly in part gravelly from 90 to 93.5 ft.....	90.0	95.0
Sand, very silty, very calcareous, white with tan tint; texture grades from very fine sand to coarse sand.....	95.0	100.0

Test Hole #85-B-44 (No e-logs)
(13N-36W-8dccd)
Keith County

Location: SE SW SW SE sec. 8, T. 13 N., R. 36 W., approximately on section line, 2,100 ft. west of southeast corner.
Ground elevation: 3,108 ft. (i). (Paxton 7.5 min. quadrangle)
Depth to water: 4.8 ft. (11-17-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: sandy, slightly calcareous, light brown-gray; contains very fine to fine sand.....	0.0	2.0
Silt, sandy, moderately calcareous, light buff-gray; contains very fine to very coarse sand.....	2.0	5.0
Sand and gravel, silty, brown-gray with pink tint; texture grades from fine sand to medium gravel; contains some limonitic stain.....	5.0	7.0
Sand and gravel, light brown-gray; texture grades from medium sand to medium gravel, contains 40 percent gravel from 7 to 10 ft; contains 50 percent gravel from 10 to 15 ft; contains 40 percent gravel from 15 to 22 ft.....	7.0	22.0
Silt, sandy, slightly calcareous, light buff-gray; very fine texture sand.....	22.0	27.0
Silt, sandy, light olive-gray; contains very fine to fine sand.....	27.0	30.0
Sand, light brown-gray with pinkish tint; texture grades from very fine to coarse sand (contains about 7 percent gravel).....	30.0	37.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, silty, pink-tan; texture grades from very fine to medium sand; slightly calcareous below 50 ft; contains a few rootlets and very calcareous below 57.5 ft.....	37.5	60.0
Sand and gravel, brown-tan with pink and yellow; texture grades from medium sand to medium gravel, contains 20 percent gravel; some cementation below 65 ft; contains 35 percent gravel from 70 to 75 ft; contains 30 percent gravel from 75 to 80 ft; contains 10 percent gravel below 80 ft.....	60.0	84.5
Sand, silty, to sandstone, slightly calcareous, pinkish tan; texture grades from very fine to medium sand.....	84.5	95.0
Sand, silty, to sandstone, very calcareous, light tan-gray; texture grades from very fine sand to gravel.....	95.0	98.0
Sand and gravel, light brown-gray with pinkish tint; texture grades from fine sand to medium gravel, (contains about 10 percent gravel).....	98.0	103.0

Sand and gravel, light brown-gray; texture grades from fine sand to coarse gravel; contains about 50 percent gravel and in part cemented.....	103.0	110.0
Sand and gravel, light brown-gray with yellow tint; texture grades from fine sand to medium gravel; contains about 20 percent gravel from 110 to 120 ft, 15 percent from 120 to 125 ft, 20 percent from 125 to 130 ft, 30 percent from 130 to 135 ft, 25 percent from 135 to 140 ft, 40 percent from 140 to 145 ft, and 25 percent from 145 to 150 ft..	110.0	150.0
Sand, light brown-gray; texture grades from very fine to coarse sand; texture slightly coarser below 155 ft.....	150.0	165.0
Sand, slightly silty, moderately calcareous, brown-gray; very fine texture sand; contains some limy and clay fragments.....	165.0	167.0
Sand, brown-gray; texture grades from very fine to very coarse sand.....	167.0	180.0
Sand, light brown-gray with yellow tint; texture grades from fine to very coarse sand; contains about 30 percent gravel and texture grades to medium gravel below 190 ft.....	180.0	193.0
Sandstone, slightly calcareous. light brown, tan and gray; texture grades from very fine to medium medium sand.....	193.0	196.5
Sandstone and marl, white; texture grades from very fine to medium sand; contains some limy nodules...	196.5	200
Sand, clayey and silty, very calcareous, buff-gray with tan tint; contains some limy nodules.....	200.0	205.0
Silt, sandy, very calcareous, light brown-gray; texture of sand is very fine; contains some root-lets and limy nodules.....	205.0	210.0
Sandstone, silty, slightly calcareous, light brown-gray; texture grades from very fine to medium sand, contains some rootlets.....	210.0	220.0
Sand and gravel, light brown-gray; texture grades from fine sand to medium gravel; some cementation below 225 ft.....	220.0	230.0
Silt, sandy, very calcareous, white with tan tint; contains fine to medium sand.....	230.0	235.0
Sandstone, slightly calcareous, light-tan with gray tint; texture grades from very fine to medium sand; contains some rootlets and clay fragments...	235.0	240.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, sandy, moderately calcareous, light tan-gray; very fine texture sand.....	240.0	249.5
Clay, slightly calcareous, pinkish tan; contains some white limy nodules below 255 ft.....	249.5	258.0
Silt, slightly sandy, moderately calcareous, brown-tan; contains very fine to fine sand.....	258.0	260.0

Clay, silty, slightly calcareous, light brown-tan with gray tint; in part very fine sand.....	260.0	270.0
Silt, clayey, and clay, slightly calcareous, brown-tan; light-gray with green tint below 275 ft.....	270.0	279.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, slightly calcareous, dark-gray.....	279.0	290.0
Clay, slightly calcareous, light-gray with greenish tint.....	290.0	295.0
Clay, silty, slightly calcareous, light green-gray..	295.0	300.0

Test Hole #86-B-44 (No e-logs)
(13N-36W-17abdc)
Keith County

Location: SW SE NW NE sec. 17, T. 13 N., R. 36 W., approximately 1,000 ft. south and 1,740 ft. west of northeast corner.
Ground elevation: 3,145 ft. (t). (Paxton SW 7.5 min. quadrangle)
Depth to water: 50.5 ft. (11-18-44).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, sandy, brown-gray; contains very fine to coarse sand.....	0.0	4.0
Silt, very sandy, slightly calcareous, buff-gray; texture of sand is very fine; contains very fine to medium sand and buff-tan from 10 to 25 ft; contains very fine to fine sand below 25 ft.....	4.0	36.5
Sand and gravel, light brown-gray with a pink tint; texture grades from fine sand to coarse gravel, contains about 35 percent gravel; contains about 70 percent gravel below 40 ft.....	36.5	47.0
Silt, slightly sandy, brown-gray.....	47.0	48.0
Sand and gravel, light brown-gray; contains about 40 percent gravel and about 60 percent below 55 ft.....	48.0	60.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, light-gray with a green tint; very fine texture sand.....	60.0	61.0
Sand and gravel, brown-gray with a pink tint; texture grades from medium sand to coarse gravel; contains about 40 percent gravel from 65 to 80 ft, 50 percent from 80 to 90 ft, 30 percent from 90 to 95 ft, 40 percent from 95 to 100 ft, 25 percent from 100 to 105 ft, 30 percent from 105 to 110 ft, 40 percent from 110 to 115 ft, and 35 percent below 115 ft.....	61.0	120.0

Test Hole #13-A-49 (No e-logs)
(13N-36W-17dddc)
Keith County

Location: SW SE SE SE sec. 17, T. 13 N., R. 36 W., approximately 8 ft. north and 341 ft. west of southeast corner.
Ground elevation: 3,150 ft. (i). (Paxton SW 7.5 min. quadrangle)
Depth to water: 47.3 ft. (6-27-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	0.5
Soil: silty, dark-gray	0.5	5.0
Silt, slightly clayey, tan-brown	5.0	8.0
Sand, silty, light tan-brown; texture grades from very fine to medium sand	8.0	18.0
Sand, tan to brown; texture grades from fine to very coarse sand	18.0	25.0
Sand, silty, pinkish tan; texture grades from fine to medium sand; contains some limy nodules	25.0	30.0
Sand, pinkish brown; texture grades from fine to very coarse	30.0	45.0
Clay, light olive-gray	45.0	50.0
Sand, pinkish gray; texture grades from medium to very coarse sand	50.0	55.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Clay, silty to sandy, brownish red; contains some limy nodules	55.0	60.0
Sandstone, silty, brownish red; texture grades from very fine to fine sand; contains limy layers below 65 ft; moderately calcareous and grayish tan below 75 ft; reworked clay fragments below 90 ft	60.0	110.0
Sand to sandstone, silty, moderately calcareous, brownish tan; texture grades from very fine to medium sand; contains some limy layers	110.0	120.0
Sand, pinkish brown; texture grades from very fine to very coarse sand; contains silt layer from 144.5 to 145 ft; contains limy layers from 150 to 160 ft; contains silt layer from 162.5 to 163 ft.	120.0	170.0
Sand, silty, brownish gray; texture grades from very fine to medium sand, contains some hard layers; contains some brown-red clay fragments below 175 ft	170.0	190.0
Sand to sandstone, silty, moderately calcareous from 190 to 195 ft, very light brown-gray with some mottled white; greenish brown below 195 ft.	190.0	202.0
Silt, clayey to slightly sandy, reddish brown	202.0	208.0
Silt, clayey, slightly calcareous, brownish red	208.0	220.0

Sand, pinkish tan; texture grades from fine to very coarse sand with some fine gravel, in part lime cemented.....	220.0	230.0
Sand, silty, gray-brown; texture grades from very fine to medium sand; contains some clay fragments.	230.0	250.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, clayey, brownish red, blocky structure; more silty and lighter color below 265 ft.....	250.0	273.0
Sand to sandstone, silty, brownish tan; contains some limy nodules; slightly silty to clayey below 290 ft.....	273.0	295.0
Clay, slightly silty, brown-red; in part blocky.....	295.0	310.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation?:		
Clay, silty, greenish gray.....	310.0	330.0

Test Hole #6-A-49 (No e-logs)
(13N-38W-6abcd)
Keith County

Location: SE SW NW NE sec. 6, T. 13 N., R. 38 W., approximately 1,319 ft. south and 2,074 ft. east of northeast corner.
Ground elevation: 3,231 ft. (i). (Ogallala 7.5 min. quadrangle)
Depth to water: 26.7 ft. (6-15-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill: silt, sandy	0.0	1.0
Silt, sandy to gravelly, brown-gray; contains fine sand to medium gravel; brown-buff below 3 ft	1.0	9.5
Silt, sandy; contains fine to medium sand with some fine gravel	9.5	11.0
Silt, sandy to gravelly, brown-buff; grading more sandy	11.0	16.5
Silt, slightly clayey to very fine sandy, dark brown-gray	16.5	18.0
Silt, sandy, brown-buff; contains very fine to fine sand	18.0	20.0
Silt, slightly clayey to very fine sandy, brown-buff	20.0	24.5
Silt, slightly clayey, grayish brown; light-gray below 28 ft	24.5	30.0
Silt, sandy, buff-gray with yellow tint; very fine texture sand	30.0	32.0
Sand, light brown-gray; texture grades from fine to coarse sand; light-brown with pinkish tint and some fine gravel below 37.5 ft	32.0	41.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, silty, moderately calcareous, light to dark-gray; texture of sand grades from fine to medium and light-tan below 50 ft; some coarse sand below 57.5 ft	41.5	60.0
Sand; texture grades from fine to coarse sand with some fine to medium gravel; contains more gravel below 65 ft; texture grades finer below 80 ft; contains some coarse gravel below 90 ft	60.0	100.0
Sand to sandstone, light brown-gray; texture grades from fine to coarse sand	100.0	110.0
Sand, light-brown; texture grades from very fine to medium sand	110.0	116.0
Silt, slightly clayey, white with a light green tint	116.0	120.0

Test Hole #7-A-49 (No e-logs)
(13N-38W-6dcbb)
Keith County

Location: NW NW SW SE sec. 6, T. 13 N., R. 38 W., approximately 1,075 ft. north and 2,515 ft. west of southeast corner.
Ground elevation: 3,213 ft. (i). (Ogallala SW 7.5 min. quadrangle)
Depth to water: 4.3 ft. (6-15-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, sandy, light-gray; contains coarse sand and fine gravel below 2 ft...	0.0	2.5
Silt, dark-gray; very fine to fine sandy and light-gray below 3.5 ft.....	2.5	4.5
Sand and gravel, light-brown and pink; texture grades from medium sand to medium gravel; about 60 percent gravel below 10 ft.....	4.5	23.0
Sand and some gravel, light-tan with a yellow tint; texture grades from fine sand to medium gravel with a silt layer from 23 to 23.5 ft.....	23.0	27.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, slightly calcareous, light grayish tan; texture grades from very fine to fine sand; contains some interbedded sandy silt with a few limy layers; moderately calcareous below 35 ft; noncalcareous below 46.5 ft.....	27.0	49.5
Sand, silty, to sandstone, brownish tan; contains some rootlets below 58.5 ft.....	49.5	62.0
Sandstone, moderately calcareous, white; texture grades from fine to medium sand.....	62.0	64.5
Sand, silty, to silt, sandy, light-gray with a greenish tint.....	64.5	67.0
Sandstone, slightly calcareous, light-brown; texture of sand grades from very fine to medium.....	67.0	70.0
Sand to sandstone, brown; texture grades from very fine to fine sand; contains some rootlets.....	70.0	77.0
Sand, light-brown; texture grades from very fine to coarse sand; contains some rootlets.....	77.0	80.0
Sandstone, greenish gray; texture grades from very fine to fine sand; contains some limy layers.....	80.0	87.0
Sandstone, light-gray; texture grades from very fine to medium sand.....	87.0	89.0
Silt, clayey to sandy, greenish brown; contains interbedded sandstone.....	89.0	96.0
Sandstone, light-brown; texture grades from very fine to fine sand; contains limy layer below 100 ft.....	96.0	105.0

Sandstone, slightly calcareous, white; texture grades from very fine to fine sand; contains a few rootlets	105.0	110.0
Sandstone, light grayish tan; texture grades from fine to medium sand; contains some silty and marly layers	110.0	120.5
Sandstone, silty, moderately calcareous, white; contains some hard layers	120.5	125.5
Sand to sandstone, light-brown	125.5	130.0
Sand, silty, grayish brown; texture grades from very fine to medium sand; contains some limy fragments from 130 to 140 ft; contains some limy layers below 146 ft	130.0	150.0
Sand, pinkish tan; texture grades from very fine to coarse sand with some fine gravel; contains some limy layers	150.0	158.0
Silt, clayey, light-tan; contains some medium to coarse sand	158.0	166.0
Sand, silty, light-brown; texture grades from very fine to medium sand	166.0	170.0
Sand, pinkish tan; texture grades from fine to very coarse sand	170.0	186.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, clayey, brown-tan; contains some limy layers below 190 ft	186.0	196.0
Sand, pinkish tan; texture grades from fine to very coarse sand; contains some fine gravel below 200 ft	196.0	206.0
Clay, silty, pinkish brown	206.0	212.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, light-green; contains some medium to coarse sand; slightly calcareous below 220 ft	212.0	221.5
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Shale Formation:		
Clay, medium-gray	221.5	230.8
Siltstone, light-gray; contains silt layer at 231.5 ft	230.8	231.5

13N 38W 07DBBA 08-A-49

Test Hole #8-A-49 (No e-logs)
(13N-38W-7dbba)
Keith County

Location: NE NW NW SE sec. 7, T. 13 N., R. 38 W., approximately 2,631 ft. north and 2,120 ft. west of southeast corner.
Ground elevation: 3,211 ft. (i). (Ogallala SW 7.5 min. quadrangle)
Depth to water: 4.9 ft. (7-6-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, clayey, brown-gray.....	0.0	1.5
Clay, dark brown-gray.....	1.5	2.0
Silt, very calcareous, buff-gray; contains limy nodules.....	2.0	3.5
Sand, silty, yellow-brown; texture grades from fine sand to some medium gravel.....	3.5	6.5
Sand and gravel, brown, gray and pink; texture grades from medium sand to medium gravel, contains about 30 percent gravel, about 40 percent below 10 ft.....	6.5	22.0
Silt, slightly clayey, light-brown.....	22.0	23.5
Sand and gravel, brown, gray and pink; texture grades from fine sand to medium gravel, contains about 25 percent gravel.....	23.5	27.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly clayey to sandy, pinkish tan.....	27.0	30.0
Sand, very silty, light-gray; texture grades from very fine to coarse sand.....	30.0	35.0
Sandstone, brown; texture grades from very fine to fine sand; trace of volcanic ash.....	35.0	38.5
Silt, slightly sandy, very calcareous, white.....	38.5	40.5
Sandstone, moderately calcareous, light brown-gray; texture grades from very fine to fine sand; contains cementation and rootlets; white below 44 ft.....	40.5	56.0
Sandstone, greenish brown; texture grades from fine to medium sand; contains some rootlets and limy layers.....	56.0	70.0
Sand, tan and greenish gray; texture grades from very fine to medium sand.....	70.0	77.0
Sandstone, greenish brown; texture grades from fine to medium sand; contains some rootlets and hard layers.....	77.0	80.0
Sand to sandstone, greenish brown; texture grades from very fine to fine sand; contains intermittent hard layers.....	80.0	90.0
Sand, light-tan; texture grades from very fine to medium sand.....	90.0	93.0

Sand to sandstone, tan and greenish brown; texture grades from very fine to medium sand; contains some green clay fragments.....	93.0	98.5
Sandstone, moderately calcareous, white; texture grades from very fine to fine sand.....	98.5	99.5
Sand, light-brown; texture grades from very fine to fine sand.....	99.5	101.5
Sandstone, silty, moderately calcareous, grayish brown; texture grades from fine to coarse sand....	101.5	110.0
Sand, slightly calcareous; texture grades from very fine to very coarse sand with some fine gravel; contains some cementation.....	110.0	121.5
Sandstone, silty, slightly calcareous, white; texture grades from fine to medium sand; contains intermittent hard layers.....	121.5	130.0

Test Hole #7-TP-99 (E-log)
(13N-38W-10DCBA)
Keith County

Location: NE NW SW SE sec. 10, T. 13 N., R. 38 W., 1000 ft. north and 2635 ft. east of southeast corner.
Ground elevation: 3185 ft. (t) (Ogallala SW 7.5 minute quadrangle)
Depth to water: 11.47 ft. (7-30)

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Topsoil, silt, moderately to very clayey, black to gray	0.0	7.0
Sand and gravel, fine sand to medium gravel, much fine gravel	7.0	24.0
Sand, very fine to very coarse, moderately silty, gray brown	24.0	30.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, very fine to very coarse, moderately to very silty, in part cemented, pale brown-white	30.0	41.0
Sand to sand and gravel, very fine sand to fine gravel	41.0	53.0
Silt, moderately sandy, very fine to medium sand, volcanic ash, limey and cemented, pale yellow to white	53.0	65.0
Sand to sandstone, very fine to medium, in part cemented, gray brown to olive gray	65.0	80.0
Sandstone, very fine to fine sand, slightly silty, cemented, very pale brown to white	80.0	84.0
Sand, very fine to medium, much fine gray brown	84.0	97.0
Sandstone, very fine to medium, sand moderately silty, olive	97.0	101.0
Sand to sand and gravel, fine sand to fine gravel	101.0	113.0
Sandstone, very fine to medium sand, moderately silty, in part cemented, olive gray brown	113.0	120.0

Test Hole #9-A-49 (No e-logs)
(13N-38W-18abba)
Keith County

Location: NE NW NW NE sec. 18, T. 13 N., R. 38 W., approximately 8 ft. south and 2,110 ft. west of northeast corner.
Ground elevation: 3,241 ft. (i). (Ogallala SW 7.5 min. quadrangle)
Depth to water: 32.0 ft. (6-21-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: sand, light-brown; contains fine to medium sand.....	0.0	0.5
Silt, sandy, light-brown; contains very fine to very coarse sand with some medium gravel.....	0.5	7.0
Sand, brown-gray with pinkish tint; texture grades from medium to very coarse sand; contains some clayey silt; contains about 20 percent gravel below 15 ft.....	7.0	20.0
Sand and gravel, brown, gray and pink; texture grades from medium sand to coarse gravel; contains about 40 percent gravel.....	20.0	29.0
Silt, sandy, brown-gray; contains a little yellow-gray silt from 30.5 to 31 ft.....	29.0	31.0
Sand and gravel, light brown-gray; texture grades from coarse sand to coarse gravel; contains about 75 percent gravel.....	31.0	40.0
Silt, sandy, slightly calcareous, pink and tan.....	40.0	42.0
Sand and gravel; texture grades from coarse sand to coarse gravel, contains about 75 percent gravel and about 30 percent below 50 ft.....	42.0	55.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, to sand, silty, slightly calcareous, light pinkish gray; contains medium to coarse sand; moderately calcareous below 66 ft.....	55.0	70.0
Sandstone, slightly calcareous, light tan-gray; contains some rootlets.....	70.0	74.5
Silt, sandy, very calcareous, light-tan and gray; contains very fine to fine sand.....	74.5	80.0
Sandstone, very calcareous, white; texture grades from fine to medium sand.....	80.0	85.0
Sand, slightly calcareous, brown-gray to pink and yellow; texture grades from coarse to very coarse sand; some medium gravel below 90 ft.....	85.0	95.0
Sandstone, moderately calcareous, light brown-gray; texture grades from very fine to fine sand, trace of silty sand from 95 to 105 ft.....	95.0	110.0
Sand, slightly calcareous, light brown-gray; texture grades from fine to coarse sand; contains some cementation.....	110.0	115.0

Sand, silty, slightly calcareous, light tan-gray; texture grades from very fine to medium sand.....	115.0	120.0
Sandstone, moderately calcareous, light tan-gray; texture grades from very fine to coarse sand; contains some cementation and rootlets.....	120.0	138.5
Silt, sandy, to sand, silty, very calcareous, white, in part olive tint; contains fine to coarse sand.....	138.5	140.0
Silt, sandy, moderately calcareous, light olive-gray; contains fine to medium sand; contains some limy layers below 143.5 ft.....	140.0	157.0
Sand with some fine gravel, pinkish tan; texture grades from medium to very coarse sand; contains some sandy silt layers.....	157.0	165.0
Silt, slightly clayey to slightly sandy, moderately calcareous, pinkish tan and gray; contains pink and tan limy fragments below 170 ft; green-gray below 179 ft.....	165.0	183.0
Sand, light brown-gray; texture grades from fine to very coarse sand with some fine gravel; probably silty.....	183.0	190.0
Silt, very sandy, to siltstone, brown-tan.....	190.0	194.0
Sand, brown-gray with pink and green; texture grades from medium to coarse sand with some fine gravel.....	194.0	210.0
Silt, clayey to sandy, light green-gray.....	210.0	216.0
Marl, white.....	216.0	217.5
Sand, brownish gray with pink and green; texture grades from fine to very coarse sand.....	217.5	220.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, clayey, to clay, silty, light green-gray.....	220.0	224.0
Sand, brownish gray with pink and green; texture grades from fine to very coarse sand; contains some green clay below 231 ft.....	224.0	236.0
Sand, brown-gray; texture grades from fine to with some coarse sand.....	236.0	238.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, light-green.....	238.0	243.0
Sand, brown-gray; texture grades from fine to medium.....	243.0	246.5
Clay, light-green; in part siltstone below 250 ft...	246.5	253.7
Siltstone, siliceous.....	253.7	254.0

Test Hole #10-A-49 (No e-logs)
(13N-38W-30baaa)
Keith County

Location: NE NE NE NW sec. 30, T. 13 N., R. 38 W., approximately 129 ft. south and 2,511 ft. east of northwest corner.
Ground elevation: 3,398 ft. (i). (Ogallala SW 7.5 min. quadrangle)
Depth to water: 54.5 ft. (6-21-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill, sandy, light-brown; contains fine to medium sand.....	0.0	1.5
Silt, sandy, white; contains very fine to medium sand.....	1.5	2.5
Quaternary System and Tertiary System - Pliocene Series:		
Sand, brownish gray; texture grades from fine to coarse sand; pinkish tan below 6.5 ft.....	2.5	10.0
Sand, light brown-gray with some pink; texture grades from fine to coarse sand with some very coarse sand to fine gravel.....	10.0	15.0
Sand; texture grades from fine to coarse sand with some fine gravel; contains 15 percent gravel from 15 to 20 ft, 30 percent from 20 to 25 ft and 40 percent below 25 ft.....	15.0	29.0
Silt, sandy, pinkish tan; contains fine to very coarse sand.....	29.0	31.0
Sand and gravel, brown-gray with pinkish tint; texture grades from medium sand to coarse gravel; contains about 30 percent gravel.....	31.0	39.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Clay. silty, light-gray; contains some limy nodules; moderately calcareous below 43.5 ft; slightly calcareous and pinkish tan below 46 ft, grading slightly sandy below 50 ft.....	39.5	53.0
Sand, brown to tannish gray; texture grades from fine to very coarse sand.....	53.0	60.0
Silt, clayey to slightly sandy, moderately calcareous, light tannish gray; contains some limy layers below 70 ft.....	60.0	89.5
Sand and gravel, brown-gray to pink; texture grades from medium sand to fine gravel.....	89.5	99.5
Silt, clayey to slightly sandy, slightly calcareous, light-gray; contains very fine to fine sand.....	99.5	103.0
Silt, slightly sandy to clayey, slightly calcareous, light brown-tan; contains fine to medium sand.....	103.0	116.5
Sand, brown, gray and pink; texture grades from fine to very coarse sand.....	116.5	120.5
Sandstone, silty, very calcareous, white; texture grades from fine to coarse sand.....	120.5	122.0

Silt, sandy, moderately calcareous, light buff-gray; contains medium to coarse sand; contains some limy nodules below 125 ft.....	122.0	130.0
Sandstone, moderately calcareous, brown-gray; contains some lime cementation.....	130.0	134.0
Sand, slightly calcareous, brown-gray; texture grades from fine to coarse sand.....	134.0	137.5
Silt, slightly clayey to sandy, slightly calcareous, brown-tan.....	137.5	140.5
Silt, moderately clayey to slightly sandy, slightly calcareous, light green-gray; contains more limy layers below 145.5 ft; slightly more sandy below 150 ft.....	140.5	160.0
Silt, sandy, slightly calcareous, light brown-tan; contains very fine to fine sand.....	160.0	170.5
Sand, brown, gray and pink; texture grades from fine to very coarse sand.....	170.5	174.5
Silt, slightly clayey to sandy, moderately calcareous, tan-gray; reddish tan below 177.5 ft.....	174.5	180.0
Sand, slightly silty, brown-tan; texture grades from fine to coarse sand.....	180.0	195.0
Sand, brown, gray and pink; texture grades from fine to coarse sand; contains some hard layers with some very coarse sand below 210 ft.....	195.0	221.5
Silt, slightly sandy, pinkish tan; contains very fine sand.....	221.5	224.0
Caliche, marly, with some medium-gray volcanic ash, very calcareous.....	224.0	226.0
Sand to sandstone, slightly calcareous, brown-gray; texture grades from fine to medium sand.....	226.0	233.0
Sandstone, silty, moderately calcareous, light tannish gray; contains some marly layers.....	233.0	240.0
Sand, pinkish tan; texture grades from very fine to coarse sand; contains some rootlets.....	240.0	251.5
Sand to sandstone, slightly calcareous, pinkish tan; texture grades from very fine to coarse sand; contains some rootlets and greenish clay fragments.....	251.5	260.0
Sand, silty, to sandstone, slightly calcareous; texture grades from very fine to medium sand.....	260.0	270.5
Sandstone, moderately calcareous, white with greenish tint; texture grades from very fine to medium sand.....	270.5	290.0
Sandstone, silty, moderately calcareous, white; texture grades from very fine to medium sand.....	290.0	300.0
Sand, silty, to sandstone, moderately calcareous, white to light-tan.....	300.0	310.0
Sandstone, silty, moderately calcareous, light-brown; texture grades from very fine to medium sand; contains limy layer below 315 ft; slightly coarse texture below 325 ft.....	310.0	330.0

Sand, light-brown; texture grades from very fine to medium sand; some cementation.....	330.0	333.0
Sandstone, slightly silty, light brownish green; texture grades from very fine to medium sand.....	333.0	335.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, slightly sandy, very calcareous, white...	335.0	340.0
Silt. clayey with some siltstone, slightly calcareous, light-green.....	340.0	345.0
Clay, silty, to siltstone, clayey, slightly calcareous, light-gray and light-brown.....	345.0	348.0
Silt to siltstone, clayey, moderately calcareous, light brown-tan; in part granular; slightly lighter in color below 365 ft.....	348.0	390.0

Test Hole #34-B-75 (E-logs for upper part)
(13N-38W-32ccdc)
Keith County

Location: SW SE SW SW sec. 32, T. 13 N., R. 38 W., 9 ft. north and 784 ft. east of southwest corner.
Ground elevation: 3,419 ft. (t). (Ogallala SW 7.5 min. quadrangle)
Depth to water: 189 ft. (9-24-75).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	1.5
Sand, brown, with traces of gravel, rhizoliths, discontinuous calcareous cement toward base	1.5	23.5
Quaternary System and Tertiary System - Pliocene Series:		
Sand and gravel, granitic, with manganese oxide stain on grain surfaces	23.5	35.0
Silt, sandy, gravelly, light yellowish brown	35.0	36.9
Sand and gravel, granitic	36.9	39.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy and clayey, yellowish red to light pinkish brown, rhizoliths, calcareous below 47 ft.	39.5	59.0
Sand, light brown	59.0	62.0
Sand and gravel, granitic	62.0	75.0
Silt, sandy to clayey, yellowish brown to pale brown, discontinuous calcareous cement	75.0	96.0
Sand, brown, calcareous cement	96.0	97.7
Silt, sandy to clayey, light brown to reddish brown, discontinuous calcareous cement, rhizoliths in some horizons	97.7	137.3
Silt, sandy, and interbedded sand and gravel, pale grayish brown, weak calcareous cement	137.3	142.7
Silt, sandy to clayey, pale brown to reddish brown, weak calcareous cement	142.7	150.0
Sand and sandstone, silty, calcareous cement, pale brown	150.0	155.0
Silt, sandy to clayey, pale brown to reddish brown	155.0	159.7
Sandstone, pale brown to white, calcareous cement	159.7	160.5
Silt, sandy, pale gray	160.5	170.0
Sandstone, gray brown to brown, calcareous cement at top	170.0	177.0
Silt, sandy to clayey, reddish brown	177.0	195.0
Sandstone, reddish brown to brown, many rhizoliths	195.0	198.8
Silt, sandy to clayey, yellowish brown to brown, slight calcareous cement	198.8	207.4
Sandstone, gravelly, grayish brown, calcareous cement	207.4	220.0
Sandstone, silty to clayey, discontinuous calcareous cement	220.0	245.0
Sand and gravel, granitic	245.0	249.8

Silt, sandy, and silty sand, yellowish brown to brown, calcareous cement	249.8	255.0
Silt, sandy to clayey, pinkish brown to brown	255.0	275.0
Sand and gravel, granitic	275.0	296.5
Clay and silt, pinkish gray to olive	296.5	298.0
Sand and gravel, granitic, with few thin interbeds of brown silty sand	298.0	350.0
Silt, sandy to clayey, light yellowish brown	350.0	360.0
Sand and sand and gravel, discontinous calcareous cement	360.0	372.0
Sand and sandstone, brown to pale olive	372.0	391.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, sandy, pale olive brown to light yellowish brown, clay cement, discontinuous calcareous cement, a few sandy intervals	391.0	520.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, silty to sandy, gray, pink, yellow, red	520.0	540.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Shale Formation:		
Claystone, olive yellow to gray, marcasite crystals.	540.0	560.0

Test Hole #3-TP-99 (E-logs)
(13N-39W-16ddcd1)
Keith County

Location: SE SW SE SE sec. 16, T. 13 N., R. 39 W., 40 ft. north of south section line and 997 ft. west of east section line.
Ground elevation: 3,273 ft. (t). 3,271 ft. (GPS); (Brule SE 7.5 min. quadrangle)
Depth to water: 27.20 ft. (3-25-99).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, silt, slightly to moderately clayey, black to brown.....	0.0	10.0
Silt, slightly to moderately clayey with sand and gravel interbeds, texture grades from very coarse sand to medium gravel.....	10.0	20.0
Sand and gravel, texture grades from very coarse sand to coarse gravel.....	20.0	41.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly to very clayey, much volcanic ash, in part cemented with sandy interbeds, brown to white and light gray.....	41.0	62.0
Sand, texture grades from very fine to very coarse, trace of rootlets, brown.....	62.0	67.0
Silt, very sandy, texture grades from very fine to coarse sand, light brown.....	67.0	70.0
Sand and gravel, texture grades from fine sand to medium gravel with trace of coarse gravel.....	70.0	85.0
Sand, texture grades from very fine to very coarse, moderately to very silty.....	85.0	100.0
Silt, very sandy, in part lime cemented, very pale brown to grayish white with dendritic manganese, oxide stain.....	100.0	110.0

Test Hole #4-TP-99 (No e-log, see 3-TP-99)
(13N-39W-16ddcd2)
Keith County

Location: SE SW SE SE sec. 16, T. 13 N., R. 39 W., 40 ft. north of south section line and 986 ft. west of east section line.
Ground elevation: 3,273 ft. (t). 3,270.8 ft. (GPS); (Brule SE 7.5 min. quadrangle).
Depth to water: 28.35 ft. (3-25-99).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, silt, slightly to moderately clayey, brown....	0.0	11.0
Silt, with gravel interbeds.....	11.0	15.0
Sand and gravel, texture grades from fine sand to fine gravel with much coarse to very coarse sand..	15.0	25.0
Gravel, texture grades from fine to medium gravel with some coarse gravel to cobbles, silty from 40 to 42 ft.....	25.0	42.0

Test Hole #5-TP-99 (E-logs)
(13N-39W-16dddd1)
Keith County

Location: SE SE SE SE sec. 16, T. 13 N., R. 39 W., 36 ft. north of south section line and 263 ft. west of east section line.
Ground elevation: 3,271 ft. (t). 3,270 ft. (GPS); (Brule SE 7.5 min. quadrangle)
Depth to water: 26.54 ft (3-25-99).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, silty, slightly clayey, moderately to very sandy, dark brown.....	0.0	5.0
Silt, slightly to moderately clayey, moderately to very sandy, brown.....	5.0	12.0
Sand and gravel, texture grades from fine sand to coarse gravel with cobbles, light olive clay seam 22 to 24 ft.....	12.0	40.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly to very clayey, slightly to very sandy, contains very fine to very coarse sand, much volcanic ash 50 to 58 ft., brown to white to olive gray brown.....	40.0	60.0
Sand, texture grades from very fine to coarse sand, slightly to very silty.....	60.0	67.0
Sand and gravel, texture grades from fine sand to fine gravel, trace of rootlets.....	67.0	87.0
Silt, moderately sandy, in part cemented, very pale brown.....	87.0	93.0
Clay, pale olive.....	93.0	95.0
Sand, texture grades from very fine to coarse, moderately silty, brown.....	95.0	101.0
Silt, very sandy, cemented with manganese oxide stain, pale olive gray.....	101.0	110.0

Test Hole #6-TP-99 (No e-log, see 5-TP-99)
(13N-39W-16dddd2)
Keith County

Location: SE SE SE SE sec. 16, T. 13 N., R. 39 W., 36 ft. north of south section line and 256 ft. west of east section line.
Ground elevation: 3,272 ft. (t). 3,270 ft. (GPS) (Brule SE 7.5 min. quadrangle)
Depth to water: 28.18 ft. (3-25-99).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, silt, slightly clayey, moderately sandy, brown.....	0.0	5.0
Silt, slightly to moderately clayey.....	5.0	11.0
Sand, texture grades from very fine to very coarse..	11.0	16.0
Sand and gravel, texture grades from fine sand to coarse gravel with cobbles.....	16.0	43.0

Test Hole #8-A-35 (No e-logs)
(13N-39W-17bbcc)
Keith County

Location: SW SW NW NW sec. 17, T. 13 N., R. 39 W., north of U.S. Highway 30 and east of intersection with county road.
Ground elevation: 3,262 ft. (t). (Brule 7.5 min. quadrangle)
Depth to water: 7.0 ft. (7-26-35).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, yellow	0.0	6.0
Clay, sandy, gray	6.0	8.0
Clay, black	8.0	10.5
Gravel	10.5	26.0
Gravel; contains some sandy clay and sandstone fragments	26.0	30.0
Sand; texture grades from coarse sand to some fine gravel	30.0	41.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone	41.5	43.0
Sand; contains some fine gravel	43.0	45.0
Gravel	45.0	68.0
Sand	68.0	73.0
Clay, sandy, brown	73.0	85.0
Clay, sandy, buff to white	85.0	93.0
Caliche	93.0	94.0
Clay, sandy, brown	94.0	109.0
Gravel	109.0	110.0
Caliche	110.0	111.0

Test Hole #9-A-35 (No e-logs)
(13N-39W-36aaaa)
Keith County

Location: NE NE NE NE sec. 36, T. 13 N., R. 39 W., just south of road and about 264 ft. west of northeast corner.
Ground elevation: 3,405 ft. (t). (Ogallala SW 7.5 min. quadrangle)
Depth to water: Unknown. (7-28-35).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	3.0
Silt	3.0	8.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Gravel	8.0	44.0
Clay, sandy, brown	44.0	73.0
Gravel	73.0	78.0
Clay, sandy; contains some gravel	78.0	86.0
Gravel; texture grades from medium to coarse	86.0	93.0
Clay, sandy, brown	93.0	95.0
Gravel	95.0	98.0
Clay, sandy, brown; contains some coarse sand and gravel	98.0	110.0
Gravel; texture grades from fine to medium gravel	110.0	113.0

Test Hole #18-A-49 (No e-logs)
(13N-40W-16aaad)
Keith County

Location: SE NE NE NE sec. 16, T. 13 N., R. 40 W., approximately 630 ft. south and 14 ft. west of northeast corner.
Ground elevation: 3,335 ft. (i). (Brule 7.5 min. quadrangle)
Depth to water: 47.2 ft. (7-17-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, slightly sandy, light-brown.....	0.0	0.5
Silt, slightly clayey, grayish black; brownish gray below 3 ft.....	0.5	6.0
Sand, slightly silty, pinkish tan; texture grades from very fine to coarse sand.....	6.0	10.0
Gravel, brown, pink and tan; texture grades from fine to medium gravel.....	10.0	13.0
Silt, brownish black; lighter in color below 20 ft; buff to light-brown and slightly calcareous below 30 ft.....	13.0	37.0
Sand, brown and pinkish tan; texture grades from fine to very fine sand; contains about 50 percent gravel from 40 to 50 ft; contains some coarse gravel with limy layers below 50 ft.....	37.0	56.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly sandy, slightly calcareous, white....	56.5	64.5
Sand, brown, pink and tan; texture grades from very fine to medium sand; contains some limy layers....	64.5	70.0
Sand, yellow, pink and tan; texture grades from fine to very coarse sand; contains some limy layers; texture grades from medium to very coarse sand below 80 ft.....	70.0	90.0
Sand, brown, pink and tan; texture grades from very fine to coarse sand.....	90.0	102.5
Silt, sandy, very calcareous, white.....	102.5	120.0

Test Hole #19-A-49 (No e-logs)
(13N-40W-16dddd)
Keith County

Location: SE SE SE SE sec. 16, T. 13 N., R. 40 W., approximately 150 ft. north and 7 ft. west of southeast corner.
Ground elevation: 3,299 ft. (i). (Brule 7.5 min. quadrangle)
Depth to water: Unknown; test hole caved at 12.9 ft. (7-17-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, slightly sandy, moderately calcareous, tan	0.0	1.5
Silt, sandy, moderately calcareous, grayish brown; contains very fine to medium sand	1.5	4.0
Soil: silt, moderately calcareous, dark-gray	4.0	5.0
Silt, moderately calcareous, buff-tan	5.0	10.0
Sand, brown, pink, and tan with green tint; texture grades from very fine to coarse sand	10.0	36.5
Silt, sandy, moderately calcareous, buff to tan	36.5	40.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, brown, pink and tan; texture grades from very fine to very coarse sand; contains limy nodules below 50 ft; texture grades from very fine to medium sand below 80 ft	40.0	90.0
Sand, brown, pink, and tan; texture grades from very fine to medium sand	90.0	120.0

Test Hole #20-A-49 (No e-logs)
(13N-40W-28aaaa)
Keith County

Location: NE NE NE NE sec. 28, T. 13 N., R. 40 W., approximately 13 ft. south and 84 ft. west of northeast corner.
Ground elevation: 3,297 ft. (i). (Brule 7.5 min. quadrangle)
Depth to water: 7.2 ft. (7-17-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, sandy, brown.....	0.0	1.0
Sand, brown, pink and tan; texture grades from fine to very coarse sand; contains about 30 percent gravel below 20 ft.....	1.0	30.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Clay, moderately calcareous, reddish tan; contains some limy fragments.....	30.0	33.5
Marl, slightly sandy, very calcareous, white.....	33.5	36.0
Silt, slightly sandy, moderately calcareous, brownish buff; contains limy fragments below 40 ft.....	36.0	45.0
Sand, brown, pink and tan; texture grades from very fine to very coarse sand; contains some limy nodules below 55.5 ft.....	45.0	58.5
Caliche, white; nodular layer, very calcareous.....	58.5	60.0
Silt, slightly sandy, moderately calcareous, light-brown; contains some limy layers; noncalcareous below 67 ft.....	60.0	80.0
Sand to silt, slightly calcareous, brown-gray; texture grades from very fine to coarse sand; contains some limy layers.....	80.0	90.0
Sand and gravel, brown, pink and tan; contains about 40 percent gravel.....	90.0	100.0

Test Hole #21-A-49 (No e-logs)
(13N-40W-28ddaa)
Keith County

Location: NE NE SE SE sec. 28, T. 13 N., R. 40 W., approximately 1,056 ft. north and 6 ft. west of southeast corner.
Ground elevation: 3,305 ft. (t). (Brule 7.5 min. quadrangle)
Depth to water: 9.3 ft. (7-17-49).

	Depth, in feet	
	From	To
Quaternary Sytem, undifferentiated:		
Road fill, slightly calcareous	0.0	2.5
Silt, dark-brown	2.5	7.0
Sand, brown, pink and tan; texture grades from fine to very coarse sand; contains some gravel below 10 ft; contains about 40 percent gravel below 20 ft	7.0	31.5
Silt, tan to gray	31.5	43.0
Sand, brownish pink to tan; texture grades from very fine to medium sand	43.0	60.0
Sand and gravel, brown, pink and tan; contains about 40 percent gravel; contains about 50 percent gravel below 90 ft; contains about 60 percent gravel below 100 ft	60.0	120.0
Sand with some gravel, brown, pink and tan; texture grades from very fine to very coarse sand; contains about 40 percent gravel below 130 ft	120.0	140.0
Sand with a trace of gravel; texture grades from very fine to very coarse sand; contains about 50 percent gravel with a few limy nodules below 150 ft	140.0	160.0
Sand, grayish brown; texture grades from very fine to very coarse sand	160.0	170.0

Test Hole #2-TP-99 (E-logs)
(13N-40W-29ccdd)
Keith County

Location: SE SE SW SW sec. 29, T. 13 N., R. 40 W., 103 ft. north and 1,348 ft. east of southwest section corner.
Ground elevation: 3,321 ft.(t). 3,322.4 ft (GPS) (Brule 7.5 min. quadrangle)
Depth to water: 18 ft. (3-25-99).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, silt, clayey, dark brownish black.....	0.0	9.0
Sand and gravel, texture grades from coarse sand to medium gravel.....	9.0	18.0
Sand and gravel, texture grades from fine sand to fine gravel.....	18.0	42.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly to very clayey, slightly to very sandy, contains very fine to very coarse sand, slightly limy with lime cemented interbeds, pale brown to white.....	42.0	80.0
Sand and gravel, texture grades from coarse sand to fine gravel, trace medium gravel.....	80.0	102.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, moderately to very clayey, pale brown to reddish brown.....	102.0	110.0

Test Hole #22-A-49 (No e-logs)
(13N-40W-34bccc)
Keith County

Location: SW SW SW NW sec. 34, T. 13 N., R. 40 W., approximately 2,640 ft. south and 9 ft. east of northwest corner.
Ground elevation: 3,342 ft. (t). (Brule 7.5 min. quadrangle)
Depth to water: 40.7 ft. (7-17-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill: silt, sandy, brown to dark-brown.....	0.0	1.0
Silt, sandy, dark-brown.....	1.0	5.0
Silt and some sand, light-brown; contains very fine to medium sand.....	5.0	10.0
Sand with interbedded silt, light-brown; texture grades from very fine to very coarse sand.....	10.0	20.0
Sand and some gravel with interbedded silt; texture grades from very fine to medium sand.....	20.0	36.0
Sand, brown, pink and tan; texture grades from fine to very coarse sand with some limy nodules.....	36.0	40.0
Sand and gravel, brown, pink and tan; contains about 40 percent gravel with some limy rootlets; contains about 50 percent gravel below 50 ft; contains about 30 percent gravel below 60 ft.....	40.0	70.0
Sand, brown, pink and tan; texture grades from fine to very coarse sand; contains some gravel with limy fragments; contains about 40 percent gravel below 80 ft.....	70.0	90.0
Sand, brown, pink and tan; texture grades from very fine to very coarse sand; contains a trace of gravel.....	90.0	94.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly sandy, moderately calcareous, tan and light-pink.....	94.0	99.0
Silt, slightly sandy, very calcareous, white.....	99.0	101.0
Sand, silty, moderately calcareous, light brown-grey; texture grades from very fine to medium sand; contains some limy nodules; slightly darker below 105 ft.....	101.0	110.0
Sandstone, very fine grained, moderately calcareous, light brown-gray; contains some limy nodules.....	110.0	117.5
Silt, slightly sandy, very calcareous, white; contains some limy layers.....	117.5	125.0
Sand, brown, pink and tan; texture grades from fine to coarse sand; contains limy nodules from 125 to 130 ft.....	125.0	134.5
Silt, slightly sandy, very calcareous, white.....	134.5	137.5
Sand, brown, pink, and tan; texture grades from fine to coarse sand.....	137.5	139.0

Silt, slightly sandy, very calcareous, white.....	139.0	140.0
Sand, brown, pink and tan; texture grades from fine to very coarse sand with some gravel; some coarser below 150 ft.....	140.0	160.0
Sand, brown, pink and tan; texture grades from fine to very coarse sand; contains some intermittent hard layers below 170 ft.....	160.0	194.0
Silt. sandy, moderately calcareous, light-brown to buff.....	194.0	195.0
Sand, brown, pink and tan; texture grades from fine to medium sand.....	195.0	200.0
Silt, clayey, slightly calcareous, brown; contains some reworked reddish brown fragments.....	200.0	208.0
Silt, sandy, slightly calcareous, light-brown to tan.....	208.0	210.0
Silt, slightly sandy, very calcareous, white.....	210.0	211.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, clayey, slightly calcareous, light-brown; contains some reworked reddish brown clay fragments.....	211.0	215.0
Clay, silty, slightly calcareous, reddish brown; blocky in part.....	215.0	222.0
Sand, brownish tan; texture grades from fine to medium.....	222.0	226.0
Silt, slightly sandy, very calcareous, white.....	226.0	227.0
Silt, sandy, slightly calcareous, light grayish tan.	227.0	230.0
Silt to sand, olive-green; contains some volcanic ash.....	230.0	235.0
Silt, olive-green; slightly clayey below 240 ft; greenish tan below 245 ft.....	235.0	250.0

Test Hole #1-TP-99 (E-logs)
(13N-41W-32dccc)
Keith County

Location: SW SW SW SE sec. 32, T. 13 N., R. 41 W., 47 ft. north and 328 ft. east of west end of east-west half section line.
Ground elevation: 3,366 ft. (t). 3,366.6 ft. (GPS) (Big Springs 7.5 min. quadrangle)
Depth to water: 11.02 ft (3-25-99).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, silt, sandy, gray-black.....	0.0	5.0
Silt, sandy, black.....	5.0	10.0
Sand and gravel; texture grades from fine sand to medium gravel.....	10.0	71.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, cemented, light brown to white.....	71.0	80.0

Test Hole #6-A-35 (No e-logs)
(13N-41W-35babb)
Keith County

Location: NW NW NE NW sec. 35, T. 13 N., R. 41 W., about 0.75 mile west of northeast corner.
Ground elevation: 3,337 ft. (t). (Brule 7.5 min. quadrangle)
Depth to water: 6.5 ft. (7-17-35).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil	0.0	3.0
Clay, sandy, brown-yellow	3.0	5.5
Sand, gray	5.5	11.0
Clay, black	11.0	14.5
Gravel; coarse texture	14.5	24.0
Clay, sandy, pinkish white; contains some gravel layers	24.0	53.0
Gravel, fine texture; contains some cementation	53.0	73.0
Gravel; contains some clay	73.0	76.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Clay, sandy; consolidated	76.0	96.0
Clay, sandy, cemented	96.0	104.0
Silt, clayey	104.0	115.0

Test Hole #K-02-01
(14N-35W-12ccdd)
Keith County

Location: SE SE SW SW sec. 12, T. 14 N., R. 35 W., approximately 10 ft north of south section line and 1340 ft east of west section line.
Source Footage: Field and GPS
Latitude: 41 11 32.18N
Longitude: 101 17 00.44W
Source Lat/Long: GPS
7.5-minute Quad Map Name: Paxton North
Ground elevation: 2996.97 ft
Source elev: GPS
Depth to water: Unknown
Date measured: Unknown
Geophysical logs: Yes

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, very fine to medium, some coarse; some Ogallala Group sandstone fragments, Ogallala fragments effervesce in dilute HCl.....	0.0	5.0
Sand silty, greenish gray to dark gray, probable paleosol, contains calcium carbonate.....	5.0	8.0
Sand and gravel, granitic, some Ogallala sandstone fragments.....	8.0	22.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone, very fine to medium grained, some coarse; gray to light gray, calcium carbonate cement, siliceous rhizoliths present discontinuously throughout, gravel from 18 ft to 22 ft is lag; calcium carbonate cement increases from 65 to 74 ft.....	22.0	74.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, brown, some fragments effervesce in dilute HCl, and are probably from secondary concretions.....	74.0	100.0

Test Hole #12-A-49 (No e-logs)
(14N-36W-31abbb)
Keith County

Location: NW NW NW NE sec. 31, T. 14 N., R. 36 W., approximately 1 ft. south and 2,490 ft. west of northeast corner.
Ground elevation: 3,302 ft. (i). (Nevens 7.5 min. quadrangle)
Depth to water: 202.4 ft. (6-26-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, silty, slightly sandy, grayish black; contains fine sand.....	0.0	3.0
Silt, clayey, tan-brown; lighter below 5 ft.....	3.0	7.5
Sand, silty, pink and tan; texture grades from very fine to medium; more sandy below 8.5 ft; contains some calcareous nodules below 10 ft; light-tan and white below 15 ft.....	7.5	20.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand, pink and tan; texture grades from very fine to coarse sand; contains some cementation.....	20.0	25.0
Sand and some gravel, pink and tan; texture grades from very fine sand to medium gravel; contains about 70 percent gravel below 30 ft.....	25.0	35.5
Silt, clayey, slightly sandy, light brownish tan....	35.5	42.0
Sand; texture grades from very fine to very coarse sand with some fine gravel.....	42.0	50.0
Sand and gravel, pink and gray; texture grades from medium sand to coarse gravel; contains about 70 percent gravel below 60 ft; finer texture below 73 ft.....	50.0	80.0
Sand, pinkish gray; texture grades from fine to very coarse sand with some medium gravel; finer texture below 100 ft.....	80.0	108.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, pink and tan; contains fine to medium sand.....	108.5	110.0
Clay, silty to slightly sandy, slightly calcareous, pinkish brown; pink and grayish tan below 115 ft..	110.0	118.0
Marl, silty, slightly clayey to sandy, moderately calcareous, white; contains some hard layers.....	118.0	120.0
Sandstone, silty, moderately calcareous, white; texture grades from very fine to medium sand; contains some limy layers; grayish tan below 125 ft.....	120.0	130.0
Sand, silty. to sandstone, slightly calcareous, grayish tan; contains some limy layers; sand grades from very fine to medium below 135 ft.....	130.0	140.0

Sand, slightly silty, slightly calcareous, grayish tan; texture grades from very fine to medium sand; contains some limy layers.....	140.0	154.5
Silt, sandy, pinkish brown; contains very fine to medium sand.....	154.5	155.0
Marl, silty, slightly sandy, very calcareous, white.	155.0	156.0
Sand; texture grades from fine to very coarse sand with some fine gravel; contains some cementation; very calcareous below 163 ft.....	156.0	166.0
Sandstone, very fine-grained, silty, very calcareous; contains some hard layers.....	166.0	170.0
Sandstone, very fine-grained, silty, grayish tan....	170.0	172.5
Sandstone, very calcareous, grayish tan; texture grades from very fine to fine sand; contains some some hard layers.....	172.5	175.0
Sand, silty, moderately calcareous, white; texture grades from very fine to fine sand.....	175.0	180.0
Sand, pink and tan; texture grades from fine to coarse sand; slightly coarser below 185 ft.....	180.0	191.0
Sand, silty, to sandstone, slightly calcareous, brownish tan and gray; texture grades from very fine to medium sand.....	191.0	199.5
Sand, silty, slightly calcareous, pink and brown; texture grades from very fine to medium sand; contains some brownish tan clay fragments.....	199.5	208.0
Sand, pinkish brown; texture grades from fine to medium sand.....	208.0	210.0
Sand, silty, brown; texture grades from very fine to medium sand.....	210.0	212.0
Sand, slightly calcareous; texture grades from fine to medium sand with some coarse sand; contains some lime cementation.....	212.0	221.5
Sand, very silty. slightly calcareous, grayish brown; texture grades from very fine to medium sand; contains some reworked fragments.....	221.5	225.0
Sand, silty, to sandstone, slightly calcareous, texture grades from very fine to medium sand; contains some limy layers.....	225.0	230.0
Sandstone, silty, moderately calcareous, white; texture grades from very fine to fine sand.....	230.0	232.0
Sand, slightly calcareous, pink and tan; texture grades from fine to very coarse sand; contains some lime cementation; slightly coarser below 235 ft.....	232.0	240.0
Sand, pinkish tan; texture grades from fine to very coarse sand; coarser with many black grains below 245 ft.....	240.0	250.0
Sand, silty, moderately calcareous, white; texture grades from very fine to medium sand; grading more sandy and less calcareous below 255 ft.....	250.0	260.0

Sand to sandstone, slightly silty, slightly calcareous, brown-gray; texture grades from fine to medium sand; contains some rootlets; non-silty below 265 ft.....	260.0	270.0
Sand, silty. very calcareous, white; texture grades from very fine to medium sand.....	270.0	280.0
Sand to sandstone, brown, gray and white; texture grades from very fine to medium sand; contains some rootlets and limy zones.....	280.0	284.0
Sand, silty, to sandstone, moderately calcareous, brown, gray and white; texture grades from very fine to medium sand.....	284.0	300.0
Sand, slightly silty, slightly calcareous, grayish brown; texture grades from very fine to medium sand.....	300.0	310.0
Sand, pinkish brown; texture grades from very fine to fine sand; contains some clay fragments.....	310.0	320.0
Sand, light brown-gray; texture grades from very fine to medium sand.....	320.0	323.5
Marl, silty to sandy, very calcareous, white.....	323.5	324.5
Sand, light brown-gray; texture grades from very five to medium sand; pinkish brown with some reworked clay fragments from 330 to 340 ft; in part silty and light brown-tan below 340 ft.....	324.5	345.0
Sand, silty, grayish brown with olive tint; texture grades from very fine to medium sand.....	345.0	360.0
Sandstone, silty, very calcareous, white; texture grades from very fine to fine sand; contains marl layers below 365 ft.....	360.0	377.0
Silt, sandy, very calcareous, white.....	377.0	378.5
Sand, light brown-tan; texture grades from very fine to medium sand; contains some limy layers....	378.5	386.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, clayey, brown-tan; granular structure, slightly calcareous below 390 ft; slightly lighter and less granular below 400 ft.....	386.0	420.0
Silt, clayey, brown-tan; in part granular structure.	420.0	430.0

Test Hole #K-01-01
(14N-37W-5bbaa)
Keith County

Location: NE NE NW NW sec. 5, T. 14 N., R. 37 w., approximately 41 ft south and 1,230 ft east of northwest corner of section.
Latitude: 41 13 16.97N
Longitude: 101 35 30.81W
Source Lat/Long: GPS
7.5-minute Quad Map Name: Keystone
Ground elevation: 3104.04 ft
Source elev: GPS
Depth to water: Unknown
Date measured: Unknown
Geophysical logs: Yes

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Top soil, gray, sandy, some gastropod shell fragments	0.0	1.0
Sand, very fine to medium, dark gray, effervesces in dilute HCl	1.0	5.0
Sand and gravel, granitic, some Ogallala sandstone clasts present	5.0	20.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, brown; calcium carbonate cement concentrated toward top, decreases downward but some effervescense through to bottom of test hole, probable calcareous concretions in siltstone	20.0	60.0

Test Hole #11-K-34 (No e-logs)
(14N-38W-1bbab)
Keith County

Location: NW NE NW NW sec. 1, T. 14 N., R. 38 W., about 2.5 miles west of Keystone and about 0.25 miles south of 8-K-34.
Ground elevation: 3,122 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: 7.5 ft. (7-5-34).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, sandy	0.0	0.5
Sand	0.5	5.5
Clay, black and blue	5.5	14.0
Clay, blue	14.0	15.0
Gravel; texture grades from medium to coarse gravel; contains some brown clay fragments	15.0	23.5
Sand	23.5	32.0
Sand; coarser texture below 32 ft	32.0	34.5
Gravel	34.5	35.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Clay, sandy, brownish red	35.0	[1]

Note: Exact location unknown.

[1] No total depth figure in field logs or original published test-hole log book.

Test Hole #12-K-34 (No e-logs)
(14N-38W-1bcac)
Keith County

Location: SW NE SW NW sec. 1, T. 14 N., R. 38 W., about 2.5 miles west of Keystone and about 0.5 mile south of 8-K-34.
Ground elevation: 3,112 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: 7.0 ft. (7-6-34).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy	0.0	0.5
Sand	0.5	3.5
Clay, bluish black	3.5	10.0
Sand and gravel; texture grades from sand to fine gravel	10.0	21.0
Sand	21.0	25.0
Sand and gravel; contains some rounded fragments of sandstone and brown silt and clay	25.0	54.0

Note: Exact location unknown.

14N 38W 02ADDD 04-K-34

Test Hole #4-K-34 (No e-logs)
(14N-38W-2addd?)
Keith County

Location: SW SW SW NE sec. 2, T. 14 N., R. 38 W.
Ground elevation: 3,110 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: 3.9 ft. (6-13-34).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil: sandy	0.0	0.5
Sand	0.5	2.5
Gravel, coarser texture below 5 ft	2.5	10.0
Gravel	10.0	20.0
Sand	20.0	35.0

Note: Exact location unknown.

Test Hole #3-A-49 (No e-logs)
(14N-38W-19abbb)
Keith County

Location: NW NW NW NE sec. 19, T. 14 N., R. 38 W., approximately 17 ft. south and 2,564 ft. west of northeast corner.
Ground elevation: 3,458 ft. (i). (Ogallala 7.5 min. quadrangle)
Depth to water: 248.8 ft. (6-11-49).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill: sand, very silty, medium brown-gray; texture grades from very fine to fine sand.....	0.0	7.0
Sand, silty, light buff-gray; texture of sand is very fine.....	7.0	10.0
Silt, very sandy, to sand, very silty, slightly calcareous, light buff-gray; texture of sand is very fine; contains interbedded very coarse sand to fine gravel from 13 to 15 ft; slightly finer texture be- low 15 ft, contains some limy root- lets below 20 ft; slightly finer texture and some interbedded sand below 53.5 ft.....	10.0	62.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand and gravel, brown-gray with a pink tint; tex- ture grades from fine sand to fine gravel.....	62.0	64.0
Sand, silty, tan; texture of sand is very fine.....	64.0	70.0
Sand, brown, gray and tan; texture grades from very fine to coarse sand.....	70.0	76.5
Sand and gravel, light brown-gray with a pink tint; texture grades from coarse sand to fine gravel; texture grades from coarse sand to medium gravel below 95.5 ft.....	76.5	100.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly clayey to moderately sandy, pink and tan; contains very fine to fine sand; moderately calcareous and contains some limy layers below 105 ft; principally sandy silt below 120 ft; more grayish below 126 ft.....	100.0	128.5
Clay, silty, very calcareous, light-tan; contains some limy layers.....	128.5	130.0
Silt, sandy, moderately calcareous, light-pink and tan; contains very fine to fine sand; contains some limy nodules.....	130.0	131.5
Silt, clayey, grading to slightly sandy, very cal- careous, white to light green-gray.....	131.5	136.0
Silt, sandy, brown and gray; contains very fine to medium sand.....	136.0	138.5
Sand, brown. gray, pink and green; texture grades from fine to very coarse sand; contains some limy cementation.....	138.5	140.0

Sand and gravel, brown, gray, pink and green; texture grades from medium sand to fine gravel....	140.0	143.5
Marl, sandy, very calcareous. white.....	143.5	145.0
Silt, sandy, in part marl, moderately calcareous, light gray-green.....	145.0	150.0
Silt, very sandy, slightly calcareous, pinkish tan; contains fine to very coarse sand; contains some interbedded rootlets from 155 to 157 ft.....	150.0	160.0
Silt, clayey, slightly sandy, slightly calcareous, pinkish tan; contains some limy nodules; very calcareous below 173 ft.....	160.0	177.0
Silt, slightly clayey to sandy, slightly calcareous, pinkish tan; contains very fine sand.....	177.0	180.0
Silt, sandy, moderately calcareous, pink, tan and gray; contains very fine to coarse sand; contains some limy layers; more sandy below 185 ft.....	180.0	190.0
Clay, in part silty, slightly sandy, slightly calcareous, brown-tan; contains some limy nodules....	190.0	194.5
Sand, brown-tan; texture grades from fine to coarse sand.....	194.5	197.0
Silt, sandy, very calcareous, light brown-gray.....	197.0	198.5
Sand and gravel, moderately calcareous, brown-gray, pink and yellow; texture grades from medium sand to medium gravel; contains some hard layers.....	198.5	212.0
Sand and gravel; texture grades from medium sand to medium gravel.....	212.0	219.0
Silt, very sandy, slightly calcareous, brown-gray; contains very fine to fine sand.....	219.0	224.5
Sand, brown-gray; texture grades from fine to very coarse sand with some gravel.....	224.5	227.0
Silt, very sandy, slightly calcareous, brown-gray; contains fine to coarse sand.....	227.0	230.0
Sand, slightly silty, light brown-gray; texture grades from fine to very coarse sand.....	230.0	233.0
Marl, sandy, very calcareous, white; texture grades from fine to coarse sand.....	233.0	236.0
Silt, clayey to sandy, moderately calcareous, white; in part marl.....	236.0	240.0
Sand, slightly silty, grading to marl, slightly calcareous, light brown-gray; texture grades from fine to medium sand.....	240.0	246.0
Silt, very sandy, moderately calcareous, light brown-gray; in part marl; contains some rootlets.....	246.0	253.5
Sand, brown-gray with a pink tint; texture grades from fine to very coarse sand; texture grades from medium to very coarse sand below 255 ft; contains some fine gravel below 260 ft.....	253.5	271.5
Silt, sandy, very calcareous, white with tan tint; in part marl below 275 ft.....	271.5	278.5
Silt, sandy, slightly calcareous, light-tan; contains some limy fragments.....	278.5	280.0

Sand, slightly silty, to sandstone, slightly calcareous, light brown-gray; texture grades from fine to medium sand.....	280.0	288.0
Sandstone and marl, very calcareous, light brown-gray; texture grades from fine to medium sand.....	288.0	290.5
Sand to sandstone, slightly calcareous, light brown-gray; texture grades from fine to medium sand.....	290.5	296.0
Sand, silty, slightly calcareous, light brown-gray with olive tint; texture grades from fine to medium sand; contains some limy fragments; contains some coarse sand below 308.5 ft.....	296.0	320.0
Sand, slightly calcareous, light-brown, gray, pink and green; texture grades from fine to medium sand with some coarse.....	320.0	325.0
Sand to sandstone, slightly calcareous, light brown-gray with olive tint; texture grades from fine to medium sand.....	325.0	335.0
Sand, silty, slightly calcareous, light brown-gray with olive tint; contains some limy layers.....	335.0	340.0
Sand, very silty, moderately calcareous, light tan-gray; texture grades from fine to medium sand; very calcareous below 345.ft; lighter below 355 ft.....	340.0	364.5
Sand, light brown-gray; texture grades from fine to medium sand.....	364.5	366.0
Sand, silty. very calcareous, light-gray; texture grades from fine to medium sand; in part marl; very sandy below 375 ft.....	366.0	383.5
Sand, silty, to silt, sandy, very calcareous, light brown-gray to tan-gray.....	383.5	384.5
Silt, clayey, slightly calcareous, brown-tan.....	384.5	386.0
Sand. brown-gray; texture grades from fine to medium sand; in part silty; slightly calcareous, olive tint and moderately silty below 393.5 ft....	386.0	400.0
Marl, silty, slightly sandy, very calcareous, white.	400.0	410.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, clayey, slightly calcareous, brownish to pinkish tan; granular structure; more clayey below 410 ft; lighter in color below 420 ft; tan-gray below 425 ft; reddish tint below 440 ft.....	410.5	450.0

Test Hole #5-A-49 (No e-logs)
(14N-38W-30dccc)
Keith County

Location: SW SW SW SE sec. 30, T. 14 N., R. 38 W., approximately 88 ft. north and 2,438 ft. west of southeast corner.
Ground elevation: 3,379 ft. (i). (Ogallala 7.5 min. quadrangle)
Depth to water: 173.4 ft. (6-15-49).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Ditch fill	0.0	1.5
Silt, slightly sandy, slightly calcareous, buff-gray; contains fine to very fine sand; more sandy below 3 ft	1.5	5.0
Silt, slightly calcareous, buff-gray; contains some fine gravel	5.0	8.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand and gravel, light-brown, pink and tan; texture grades from fine sand to fine gravel	8.0	11.0
Silt, slightly calcareous, light buff-gray; contains some very fine to fine sand	11.0	22.0
Sand, light-brown, pink and tan; texture grades from very fine to coarse sand with some fine gravel	22.0	24.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly clayey, to sand, light-buff; contains very fine to coarse sand	24.5	30.5
Silt, sandy, very calcareous, light buff-gray; contains very fine to fine sand	30.5	35.0
Sandstone, silty, very calcareous, light buff-gray	35.0	40.0
Silt, sandy, slightly calcareous, light-buff; contains fine to coarse sand	40.0	43.0
Sandstone, moderately calcareous, light-buff to gray; very fine texture sand	43.0	44.5
Sand, silty, to silt, sandy, slightly calcareous, light-buff to light-gray; texture of sand is very fine	44.5	50.0
Sand, silty, to silt, sandy, light green-gray	50.0	53.0
Sandstone, moderately calcareous, light brown-gray; texture grades from very fine to fine sand	53.0	57.5
Sandstone, very calcareous, white; contains some limy nodules	57.5	60.0
Sandstone, silty, very calcareous, light buff-gray; texture of sand is very fine; contains some limy nodules	60.0	62.0
Silt, very sandy, very calcareous, light green-gray; contains very fine to fine sand; contains some lime layers below 65 ft; slightly calcareous below 65 ft; slightly calcareous below 69.5 ft	62.0	71.0

Sand, silty, to silt, sandy, very calcareous, light-buff to light-gray; slightly calcareous below 75 ft	71.0	78.0
Sandstone, silty, slightly calcareous, light-buff; texture grades from very fine to coarse sand	78.0	80.0
Silt, very sandy, slightly calcareous, light buff-gray; contains very fine to fine sand; moderately calcareous and contains some fine gravel below 85 ft	80.0	87.0
Silt, sandy, very calcareous, light-gray; contains very fine to fine sand	87.0	89.0
Sand, silty, slightly calcareous, brown-tan; texture grades from fine to coarse sand	89.0	92.0
Sand, light-brown; texture grades from fine to very coarse sand; contains some fine gravel; light-brown and pink below 100 ft	92.0	103.5
Sand, silty, slightly calcareous; texture grades from very fine to fine sand with some limy layers.	103.5	105.0
Sandstone, slightly calcareous; contains some hard layers	105.0	107.5
Sand, silty, slightly calcareous; texture grades from very fine to fine sand; contains some limy layers; contains some clay fragments below 110 ft.	107.5	115.0
Sand, slightly calcareous, tannish pink; texture grades from medium to coarse sand with some fine gravel	115.0	117.0
Sandstone, silty, very calcareous, light-brown and light-buff; texture of sand is very fine; white below 120 ft	117.0	122.0
Silt, clayey, very calcareous, white with green tint	122.0	125.0
Silt, clayey, to silt, very fine sandy, brown-tan	125.0	129.0
Sandstone, brownish tan; texture grades from very fine to medium sand	129.0	132.5
Sand, silty; texture grades from very fine to fine sand with some medium sand	132.5	135.0
Sand; texture grades from medium to coarse sand with some fine gravel	135.0	140.0
Sandstone, moderately calcareous, light tan-gray; texture grades from very fine to medium sand; contains reddish clayey silt	140.0	145.5
Sand, silty, slightly calcareous, brown-tan; texture grades from fine to coarse sand; contains some cementation	145.5	153.0
Sandstone, very calcareous, light-tan; texture grades from fine to coarse sand	153.0	154.5
Sand, silty, reddish brown; texture grades from very fine to coarse sand	154.5	157.5
Sandstone, very calcareous, light-tan; texture grades from fine to coarse sand	157.5	163.5
Sand, silty, very calcareous, light-tan; texture grades from fine to coarse sand	163.5	166.0

Sand, silty, to sandstone, slightly calcareous; texture grades from fine to coarse sand; some cementation and contains some rootlets.....	166.0	170.0
Sand to sandstone, light-brown; texture grades from fine to coarse sand; some cementation.....	170.0	176.0
Sandstone, slightly calcareous, light tannish brown; texture grades from fine to very coarse sand; contains some rootlets.....	176.0	183.5
Sand, buff, pink, and tan; texture grades from fine to very coarse sand; contains some fine gravel; finer texture below 190 ft.....	183.5	210.5
Sand to sandstone, slightly calcareous, light-gray; some cementation.....	210.5	215.0
Sandstone, very calcareous; texture grades from very fine to fine sand; contains some limy layers.	215.0	224.5
Sand, very silty, light greenish gray.....	224.5	230.0
Sand, brownish tan; texture grades from very fine to medium sand with some coarse; contains some green clay fragments.....	230.0	235.0
Siltstone, sandy, slightly calcareous, dark-green; contains very fine sand.....	235.0	242.5
Sand, light brown-gray; texture grades from very fine to medium sand; contains some clay fragments below 250 ft.....	242.5	255.0
Sandstone, slightly calcareous, dark-brown; contains some whitish marl layers.....	255.0	260.0
Sandstone, slightly silty, light brown-gray.....	260.0	263.5
Sand, light-brown; texture grades from very fine to fine sand.....	263.5	266.0
Siltstone, light-green.....	266.0	270.0
Sandstone, light-green and light-brown; texture grades from very fine to medium sand.....	270.0	276.0
Volcanic ash, very light-gray.....	276.0	280.5
Siltstone, sandy, light brown-gray; texture of sand is very fine; some clay below 285 ft.....	280.5	287.5
Sandstone, silty, moderately calcareous, light-brown and white; texture of sand is very fine.....	287.5	290.5
Sand, slightly calcareous, light-brown; contains some brown clay fragments.....	290.5	295.0
Sand, light-tan; texture grades from very fine to medium sand.....	295.0	298.5
Sand, moderately calcareous; texture grades from very fine to medium sand; contains some limy layers.....	298.5	300.0
Sand, light-tan; texture grades from very fine to medium sand; some coarser below 305 ft.....	300.0	312.0
Sand, slightly silty, slightly calcareous, white; texture grades from very fine to medium sand; some cementation.....	312.0	314.0
Sandstone, slightly calcareous, light tan-gray; texture grades from very fine to coarse sand; contains some rootlets.....	314.0	317.0

Sand, light-tan and brown; texture grades from very fine to coarse sand	317.0	322.0
Clay, silty, light-tan	322.0	325.0
Sand, slightly silty, light grayish tan; texture grades from very fine to coarse sand	325.0	327.5
Sandstone, slightly calcareous, white; texture grades from very fine to coarse sand	327.5	328.5
Sand, slightly calcareous, light grayish tan; texture grades from very fine to coarse sand with some coarse gravel; some cementation	328.5	330.0
Sand, slightly silty, light-tan, gray, pink, and yellow; texture grades from fine to very coarse sand; nonsilty below 335 ft	330.0	340.0
Sand, light pinkish tan; texture grades from very fine to coarse sand; contains some reworked brown clay fragments	340.0	345.5
Sand, light pinkish tan; texture grades from fine to coarse sand with some fine gravel	345.5	350.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, sandy, to sandstone, slightly calcareous, light pinkish brown; texture of sand is very fine; contains some limy layers	350.0	357.5
Sand, slightly silty; texture grades from fine to medium sand with reworked brown clay fragments	357.5	359.5
Clay, silty, pinkish tan grading to gray; light tan-gray below 365 ft; interbedded and pinkish tan below 378 ft	359.5	390.0

Test Hole #4-A-49 (No e-logs)
(14N-38W-31baaa)
Keith County

Location: NE NE NE NW sec. 31, T. 14 N., R. 38 W., approximately 31 ft. south and 2,421 ft. east of northwest corner.
Ground elevation: 3,375 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: Test hole not drilled to water table.

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, sandy, brown-gray; contains very fine to medium sand.....	0.0	1.5
Silt, slightly sandy, slightly calcareous, buff-gray; contains very fine to medium sand.....	1.5	3.0
Silt, sandy, moderately calcareous, light buff-gray; contains very fine to fine sand; contains fine to coarse sand below 6.5 ft.....	3.0	9.5
Quaternary System and Tertiary System - Pliocene Series:		
Sand, light-brown and tan with pink tint; texture grades from fine to very coarse sand; contains some fine gravel below 10 ft.....	9.5	12.0
Sand, silty, buff-tan; texture of sand is very fine; some consolidation.....	12.0	20.0
Sandstone, buff-tan; texture grades from very fine to fine sand.....	20.0	24.5
Sand, light brown-gray with pink tint; texture grades from fine to very coarse sand with a trace of fine to medium gravel.....	24.5	29.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy to clayey, light buff-tan with pink tint; contains very fine to very coarse sand.....	29.5	31.0
Silt, sandy, brown-tan; contains very fine to medium sand; contains some marl layers.....	31.0	36.0
Marl, sandy, to sandstone, very calcareous, white...	36.0	45.0
Sandstone, very calcareous, light brown-gray; texture grades from very fine to fine sand; light olive gray below 50 ft; less calcareous and contains some rootlets below 55 ft.....	45.0	60.0

Test Hole #15-S-82 (E-logs)
(14N-40W-9cdcd)
Keith County

Location: SE SW SE SW sec. 9, T. 14 N., R. 40 W., 1,888 ft. east and 56 ft. north of southwest corner.
Ground elevation: 3,680 ft. (t). (Brule NW 7.5 min. quadrangle)
Depth to water: Unknown. (6-29-82).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, slightly limy, brown to yellow brown.....	0.0	135.0
Silt, moderately clayey, slightly sandy, pale yellow brown, sand to fine gravel, lime cemented.....	135.0	145.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand and gravel, fine sand to medium gravel, much very coarse sand, trace coarse gravel.....	145.0	174.0
Silt, slightly to moderately clayey, moderately to very sandy, trace lime cement, brown.....	174.0	186.0
Sand and gravel, fine sand to fine gravel.....	186.0	193.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, moderately clayey with lime cemented streaks, pale reddish brown.....	193.0	220.0

Test Hole #16-A-49 (No e-logs)
(14N-40W-21aaaa)
Keith County

Location: NE NE NE NE sec. 21, T. 14 N., R. 40 W., approximately 78 ft. south and 7 ft. west of northeast corner.
Ground elevation: 3,665 ft. (i). (Brule NW 7.5 min. quadrangle)
Depth to water: Unknown; test hole caved at 329.5 ft. (7-17-49)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Road fill	0.0	3.0
Silt, grayish black to brown	3.0	7.2
Silt, slightly clayey, light gray-brown; contains some sand	7.2	10.0
Silt, slightly calcareous, buff-brown; slightly sandy below 25 ft	10.0	30.0
Sand, silty, slightly calcareous, buff-brown; texture of sand is very fine; slightly silty below 60 ft; buff-brown to dark-brown below 70 ft	30.0	87.5
Sand, silty, moderately calcareous, white; some of the sand is fine-grained	87.5	90.0
Sand, silty, slightly calcareous, buff-brown; some very fine-grained sand; slightly silty below 110 ft; contains some coarse to very coarse sand below 128 ft	90.0	130.0
Sand, silty, slightly calcareous; texture grades from very fine to coarse sand with limy layers; slightly more coarse sand below 140 ft	130.0	145.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand, brown, pink and tan; texture grades from very fine to very coarse sand	145.0	151.8
Sand, silty, slightly calcareous, light-brown; contains some limy layers	151.8	155.0
Silt, slightly sandy, slightly calcareous, buff-brown; contains some coarse sand	155.0	157.5
Sand, brown, pink, and tan; texture grades from very coarse sand with some silt	157.5	160.0
Sand, pink and tan; texture grades from very coarse sand with some fine gravel; slightly calcareous and contains some limy layers below 170 ft	160.0	180.0
Sand, grayish brown; texture grades from very fine to very coarse sand	180.0	191.5
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, clayey, slightly sandy, reddish brown	191.5	196.0
Silt, slightly sandy, slightly calcareous, light-brown; contains some limy layers; contains more sand below 200 ft	196.0	210.0
Sand, pink and brownish tan; texture grades from medium to very coarse sand	210.0	230.0

Silt, slightly calcareous, grayish brown; contains some limy layers	230.0	245.0
Silt, slightly clayey to sandy, slightly calcareous; contains some limy layers	245.0	260.0
Silt, sandy, to clay, slightly calcareous, brown to light-pink	260.0	275.0
Silt, sandy, brown to dark-buff	275.0	280.0
Silt, sandy, slightly calcareous, brown to light-pink; contains some limy layers; olive-green below 285 ft	280.0	295.0
Sand, silty, to sandstone, slightly calcareous, olive-green; contains some limy layers	295.0	305.0
Silt, sandy, slightly calcareous, brownish red; contains some white limy layers	305.0	310.0
Sand, silty, tan to brown; texture grades from very fine to coarse sand; contains some limy layers	310.0	323.0
Sand, brownish pink and tan; texture grades from very fine to very coarse sand	323.0	330.0
Sand; texture grades from very fine to very coarse sand with a trace of fine gravel; contains some limy layers	330.0	340.0
Silt, sandy, very calcareous, white	340.0	355.0
Sandstone, silty, very calcareous, white	355.0	363.0
Siltstone, slightly sandy, very calcareous, pinkish brown; contains some limy nodules; more sandy below 370 ft; contains reddish brown clay fragments below 375 ft	363.0	380.0
Sand, moderately calcareous, gray-brown; contains medium sand; contains some limy layers with some clay fragments	380.0	420.0
Sand, slightly calcareous, yellowish tan-brown; texture grades from fine to coarse sand; contains some limy nodules	420.0	438.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Clay, silty, reddish brown; blocky in part	438.5	460.0

Test Hole #17-A-49 (No e-logs)
(14N-40W-33dddd)
Keith County

Location: SE SE SE SE sec. 33, T. 14 N., R. 40 W., approximately 5 ft. north and 47 ft. west of southeast corner.
Ground elevation: 3,617 ft. (t). (Brule NW 7.5 min. quadrangle)
Depth to water: Unknown; test hole caved at 286.9 ft. (7-17-49)

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill: slightly calcareous	0.0	1.5
Soil: silt, grayish black	1.5	3.0
Silt, slightly clayey, slightly calcareous, light-brown	3.0	7.0
Sand, silty, slightly calcareous, light tan-brown; texture of sand is very fine	7.0	10.0
Silt, slightly calcareous, light tan-brown; non-calcareous below 30 ft; dark-buff and brownish tan from 90 to 95 ft; light reddish brown below 95 ft	10.0	117.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand, slightly calcareous, grayish brown and pink; texture grades from very fine to medium sand	117.0	120.0
Sand, silty, moderately calcareous, white and brown; slightly more calcareous below 125 ft	120.0	135.0
Sand, moderately calcareous, grayish brown; texture grades from very fine to very coarse sand; contains some limy nodules	135.0	140.0
Sand and gravel, brown, pink and tan; texture grades from fine sand to fine gravel; contains about 40 percent gravel with a few silt layers	140.0	150.0
Sand, grayish brown; texture grades from very fine to coarse sand	150.0	152.0
Silt, reddish brown	152.0	155.0
Silt, sandy, brown-buff	155.0	160.0
Sand and gravel, yellow, pink and tan; contains about 40 percent gravel; contains about 20 percent gravel below 170 ft, and about 50 percent gravel below 190 ft; finer texture below 200 ft	160.0	203.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, sandy, brownish buff	203.0	212.5
Silt, slightly sandy, very calcareous, white	212.5	214.0
Silt, sandy, moderately calcareous; contains some limy nodules	214.0	217.5
Sand, greenish tan; texture grades from very fine to coarse sand	217.5	227.5
Silt, slightly clayey, reddish brown	227.5	230.0
Silt, reddish brown; slightly sandy below 235 ft	230.0	240.0
Silt, sandy, light-brown to brown	240.0	247.5

Sand, grayish brown-tan; texture grades from very fine to medium sand; contains some coarse sand and limy nodules below 250 ft.....	247.5	251.5
Silt, slightly sandy, dark-gray; slightly calcareous, light-brown and contains limy layers below 252 ft.....	251.5	260.0
Silt to siltstone, moderately calcareous, white; contains some clay fragments.....	260.0	263.0
Silt, sandy, moderately calcareous, reddish brown; contains some brown clay fragments.....	263.0	270.0
Silt, slightly sandy, slightly calcareous, grayish brown and tan; contains some brown clay fragments.	270.0	280.0
Silt, very sandy, to sand, very silty, moderately calcareous, white; contains very fine to medium sand.....	280.0	290.0
Sand, yellow, pink, and tan; texture grades from very fine to very coarse sand with some fine gravel; contains some limy nodules below 300 ft...	290.0	305.0
Sand, silty, slightly calcareous, light brown-tan; texture grades from very fine to coarse sand; grayish light-brown below 320 ft.....	305.0	330.0
Sand, slightly silty, slightly calcareous, reddish brown-gray; texture grades from very fine to medium sand; contains some limy nodules; coarser below 335 ft.....	330.0	340.0
Sand, brownish gray; texture grades from very fine to medium sand; contains limy silt layers; greenish below 345 ft.....	340.0	353.8
Sand, very calcareous, white; texture grades from very fine to coarse sand; contains some limy layers.....	353.8	369.5
Silt, slightly clayey to sandy, moderately calcareous, olive-green.....	369.5	370.0
Silt to sandstone, slightly calcareous, brownish green; texture grades from very fine to fine sand; contains some hard layers below 375 ft.....	370.0	380.0
Silt, sandy, very calcareous, white.....	380.0	390.0
Silt, slightly sandy, very calcareous, white; interbedded hard layers with a trace of light-green sandstone; more sandy below 400 ft.....	390.0	410.0
Silt, sandy, very calcareous, white; contains some marl layers.....	410.0	420.0
Silt, clayey, slightly calcareous, light olive-green; contains some limy layers; brownish green below 423 ft.....	420.0	428.0
Tertiary System - Oligocene Series - White River Group: Brule Formation:		
Silt, slightly sandy, slightly calcareous, reddish brown; contains some clay fragments.....	428.0	430.0
Clay, slightly silty, slightly calcareous, reddish pink and brown.....	430.0	440.0
Clay, slightly silty, reddish brown; blocky in part.	440.0	450.0

Test Hole #14-S-82 (E-logs)
(14N-41W-1cccd)
Keith County

Location: SE SW SW SW sec. 1, T. 14 N., R. 41 W., 512 ft. east and 35 ft. north of southwest corner.
Ground elevation: 3,638 ft. (t). (Brule NW 7.5 min. quadrangle)
Depth to water: Unknown. (6-28-82).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, slightly to moderately clayey, occasional limy zones, yellow to brown	0.0	84.0
Sand, very fine to very coarse, moderately silty, brown	84.0	91.0
Silt, moderately clayey, slightly limy, slightly sandy, yellow brown	91.0	98.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand and gravel, fine sand to medium gravel, trace coarse gravel, silt seam at 112 ft	98.0	130.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, moderately clayey, moderately to very limy, moderately sandy, very fine to medium, pale yellow brown to yellow brown	130.0	149.0
Sand and gravel, fine sand to fine gravel, trace medium to coarse gravel, much very coarse sand	149.0	160.0
Silt, slightly clayey, moderately sandy, very fine to fine, limy with lime cemented sand, pale reddish brown to reddish brown	160.0	215.0
Sand and gravel, fine sand to fine gravel, much very coarse sand, thin silt seams	215.0	225.0
Silt, sandy, very fine to coarse, trace very coarse sand to fine gravel, lime cemented, pale brown	225.0	246.0
Sand and gravel, fine sand to fine gravel, much coarse to very coarse sand, moderately silty, in part lime cemented	246.0	265.0
Sand and gravel, fine sand to fine gravel, moderately to very silty, lime cemented	265.0	275.0
Silt, moderately to very sandy, very fine to very coarse sand, lime cemented, pale olive to very pale brown	275.0	320.0
Sand and gravel, fine sand to fine gravel, much coarse to very coarse sand, in part lime cemented.	320.0	330.0
Silt, slightly clayey, moderately to very sandy, very fine to medium, pale reddish brown	330.0	355.0
Sand, very fine to very coarse, lime cemented, slightly silty, pale reddish brown	355.0	381.0
Silt, moderately to very sandy, very fine to very coarse, moderately limy, reddish brown	381.0	387.0

Sand, very fine to very coarse, much medium, reddish brown.....	387.0	391.0
Silt, moderately to very sandy, very fine to very coarse, moderately limy, pale reddish brown.....	391.0	394.0
Sand, very fine to very coarse, trace fine gravel, slightly silty.....	394.0	416.0
Silt to siltstone, slightly sandy, brown to pale brown.....	416.0	434.0
Sand, very fine to coarse, trace very coarse sand to fine gravel, moderately silty, reddish brown.....	434.0	446.0
Tertiary System - Oligocene Series - White River Group: Brule Formation:		
Silt, slightly to moderately clayey, reddish brown..	446.0	480.0

Test Hole #93-HP-80 (E-logs)
(15N-36W-12adbb)
Keith County

Location: NW NW SE NE sec. 12, T. 15 N., R. 36 W., west of Rudd Ranch buildings and 580 ft. north of half section line.
Ground elevation: 3,341 ft. (t). (Big Bald Hill 7.5 min. quadrangle)
Depth to water: Unknown. (9-22-80).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt and fine sand, dark yellowish brown, organic rich.....	0.0	5.0
Silt and fine sand, light yellowish brown.....	5.0	10.0
Silt and fine sand, very pale orange, plant debris..	10.0	15.0
Silt and fine sand, very pale or with light yellowish brown paleosol interbed.....	15.0	20.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand, fine to coarse, granitic, medium well rounded grains, initially coarser - then with alternating finer and coarser beds, some silty horizons (silts at 50 to 70 ft, 85 to 100 ft, 123 to 145 ft).....	20.0	145.0
Sand and gravel, granitic (upper 5 ft mostly medium to coarse sand), considerable anorthosite, pink and white granite, quartz, schist, chert, black volcanic, rhyolite, light and dark anorthosite, some induration.....	145.0	165.0
Sand, silty, pebbly, anorthosite present.....	165.0	170.0
Silty sand with some gravel.....	170.0	185.0
Sand and gravel, granitic with anorthosite, light and dark maroon volcanic, gneiss sandstone, quartzite, brown chert approaching jasper, dark volcanics, (finer grained and less anorthosite than 145 to 165 ft), more of a yellowish cast to sample than 145 to 165 ft.....	185.0	211.0
Pebbly silt and very fine sand, pink possibly colluvial or mudflow, with dark volcanic and anorthosite gravel.....	211.0	227.0
Sand and gravel, granitic, pink, feldspar rich, maroon volcanic schist, wood(?); finer grained silty and possibly ashy interbeds; possible reworked siltstone clasts, much pink color due to silt matrix coating grains. Becomes mostly medium to coarse sand in next to last 5 ft, then pebbly sand.....	227.0	270.0

Tertiary System - Miocene Series - Ogallala Group:
Ash Hollow Formation:

Sand, silty, dusky yellow to light olive gray with siliceous rhizoliths.....	270.0	305.0
Sand, silty, brown to light brown, calcareous, with rhizoliths, possibly diatomaceous.....	305.0	398.0

Test Hole #K-01-02
(15N-37W-25dccc)
Keith County

Location: SW SW SW SE sec. 25, T. 15 N., R. 37 W., approximately 10 ft north of south section line and 2375 ft west of east section line.
Source Footage: Field Log and map
Latitude: 41 14 10.59N
Longitude: 101 30 34.40W
Source Lat/Long: GPS
7.5-minute Quad Map Name: Keystone
Ground elevation: 3284.62 ft
Source elev: GPS
Depth to water: Unknown
Date measured: Unknown
Geophysical logs: Yes

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, silty, pale yellow.....	0.0	10.0
Sand, very fine to fine, clayey to silty matrix, light yellowish brown.....	10.0	15.0
Sand, very fine to fine, with some organic-rich horizons.....	15.0	30.0
Sand, very fine to fine, and silt; becomes siltier downward; pale yellow.....	30.0	61.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, granitic, with anorthosite and quartzite.....	61.0	76.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone and sand, very fine to fine, light gray to pale yellow, some rhizoliths.....	76.0	92.0
Sand and gravel, granitic, sand fine to coarse, granule to pebble gravel, sandier interval from 101 to 107 ft.....	92.0	119.0
Silt, sandy, with some coarser sand, light gray.....	119.0	126.0
Sandstone, silty, with some pebbles, very pale brown to light gray, rhizoliths, calcareous cement.....	126.0	147.0
Sand and sandstone, weakly cemented, a few rhizoliths.....	147.0	158.0
Sandstone, silty, white to light gray, calcareous cement; rhizoliths; more cement at 185 to 189 ft..	158.0	211.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, brown, calcareous in upper 5 ft.....	211.0	240.0

Test Hole #9-K-34 (No e-logs)
(15N-38W-25ccac)
Keith County

Location: SW NE SW SW sec. 25, T. 15 N., R. 38 W., about 2.5 miles west and one mile north of Keystone.
Ground elevation: 3,135 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: Undetermined.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand	0.0	32.5
Silt, clayey, black	32.5	34.0
Clay, carbonaceous	34.0	38.0
Clay, bluish green	38.0	42.0
Sand and gravel; texture grades from sand to fine gravel	42.0	46.0
Gravel	46.0	53.0
Clay, light-green	53.0	55.0
Gravel	55.0	59.0
Clay, light-brown	59.0	61.0
Sand and gravel, green; contains some clay fragments	61.0	70.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Clay, light-green	70.0	72.0
Clay, light-green and brown	72.0	87.0
Clay, sandy, light-brown	87.0	108.0

Note: Exact location unknown.

Test Hole #14-K-34 (No e-logs)
(15N-38W-33caca)
Keith County

Location: NE SW NE SW sec. 33, T. 15 N., R. 38 W., approximately 1.5 miles west of 7-K-34 on road.
Ground elevation: 3,200 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: Undetermined.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand	0.0	3.0
Sand, clayey, dark-gray	3.0	5.0
Sand and gravel	5.0	38.0
Sand	38.0	41.0
Sand, clayey, yellow	41.0	41.5
Silt, clayey	41.5	44.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, red, sandy	44.5	51.0

Note: Exact location unknown.

15N 38W 34ACDD 07-K-34

Test Hole #7-K-34 (No e-logs)
(15N-38W-34acdd)
Keith County

Location: SE SE SW NE sec. 34, T. 15 N., R. 38 W., about 4 miles west of Keystone, on the road.
Ground elevation: 3,133 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: Undetermined.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy	0.0	4.0
Sand, silty	4.0	5.0
Sand, clayey	5.0	9.0
Clay, light-green	9.0	11.0
Sand and gravel; texture grades from sand to fine gravel	11.0	14.0
Clay, sandy, brown	14.0	15.0
Sand and gravel	15.0	29.0
Sand; texture grades from fine to coarse sand; coarser texture below 34 ft	29.0	39.0
Sand and gravel; texture grades from sand to fine gravel, coarser texture below 57.5 ft	39.0	112.0

Note: Exact location unknown.

Test Hole #6-K-34 (No e-logs)
(15N-38W-35abdd)
Keith County

Location: SE SE NW NE sec. 35, T. 15 N., R. 38 W., 3 miles west of Keystone.
Ground elevation: 3,135 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: Undetermined.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy black	0.0	0.5
Sand	0.5	3.0
Sand with some clay fragments	3.0	10.0
Gravel	10.0	18.0
Sand and gravel; texture grades from coarse sand to fine gravel; contains some clay fragments	18.0	39.0
Sand and gravel	39.0	57.0
Clay, brownish green	57.0	65.0
Sand, clayey, light-green	65.0	66.0
Sand and gravel	66.0	68.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, clayey, brown	68.0	118.0

Note: Exact location unknown.

Test Hole #10-K-34 (No e-logs)
(15N-38W-36cbdb)
Keith County

Location: NW SE NW SW sec. 36, T. 15 N., R. 38 W., about 2.5 miles northwest of Keystone and 825 ft. north of 8-K-34.
Ground elevation: 3,125 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: Undetermined.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy	0.0	0.5
Sand	0.5	4.0
Silt, sandy	4.0	9.0
Clay, blue	9.0	10.5
Clay, black	10.5	12.0
Sand, green	12.0	13.5
Clay, black	13.5	17.0
Sand, green; texture grades from fine to coarse sand	17.0	28.0
Clay, greenish yellow	28.0	28.5
Gravel	28.5	62.0
Clay, greenish yellow	62.0	63.5
Sand, texture grades from fine to coarse sand	63.5	113.0

Note: Exact location unknown.

Test Hole #8-K-34 (No e-logs)
(15N-38W-36ccac)
Keith County

Location: SW NE SW SW sec. 36, T. 15 N., R. 38 W., 2.5 miles west of Keystone, south side of road.
Ground elevation: 3,126 ft. (t). (Ogallala 7.5 min. quadrangle)
Depth to water: 7.0 ft. (6-23-34).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy.....	0.0	4.0
Silt, black.....	4.0	6.0
Sand; contains some clay.....	6.0	11.0
Sand and gravel; contains some clay fragments; coarser texture of sand and gravel below 45 ft.....	11.0	74.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt, clayey, brown.....	74.5	81.0

Note: Exact location unknown.

Test Hole #35-B-75 (E-logs)
(15N-39W-24ddad)
Keith County

Location: SE NE SE SE sec. 24, T. 15 N., R. 39 W., 140 ft. west and 900 ft. north of southeast corner.
Ground elevation: 3,285 ft. (t). (Martin 7.5 min. quadrangle)
Depth to water: 30 ft. (10-8-75).

	Depth, in feet From	To
Quaternary Section, undifferentiated:		
Sand, very fine to medium, gray to brown.....	0.0	6.0
Sand, very fine to fine, slightly silty, yellow brown.....	6.0	9.0
Sand, very fine to medium, trace coarse, brown.....	9.0	24.0
Sand, very fine to medium, trace coarse, slightly silty, brown.....	24.0	44.0
Sand, very fine to coarse, trace very coarse, slightly to moderately silty, brown.....	44.0	68.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand and gravel, fine sand to medium gravel, much fine gravel, granitic.....	68.0	85.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly to moderately clayey, moderately sandy, very fine to very coarse, trace rootlets, pale olive to olive yellow.....	85.0	103.0
Sandstone, very fine to very coarse, moderately to very silty, slightly to moderately limy to lime cemented, olive gray to pale olive to white.....	103.0	122.0
Sand to sandstone, very fine to coarse, limy seams, moderately silty with silt seams, pale olive yellow to pale olive to white with reddish brown silts.....	122.0	216.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt to siltstone, slightly to very clayey, limy zones, pale brown to brown.....	216.0	460.0
Silt to siltstone, moderately to very clayey, iron stains, pale olive to pale olive yellow.....	460.0	486.0
Siltstone to claystone, hard, variegated, raspberry, yellow, orange, pink to brown, purple, green, light gray.....	486.0	493.0
Siltstone, light brown to light green.....	493.0	496.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, light gray to light greenish gray.....	496.0	507.0
Silt, moderately to very clayey, iron stains, pale yellow to pale yellow brown.....	507.0	518.0

Cretaceous System - Upper Cretaceous Series - Montana Group:
Pierre Shale Formation:

Chert, variegated, yellow, banded reds, white, very hard.....	518.0	519.0
Clay, variegated, grays, yellows, reds.....	519.0	535.0
Clay, light gray to black.....	535.0	550.0

Test Hole #16-S-82 (E-logs)
(15N-40W-5bccd)
Keith County

Location: SE SW SW NW sec. 5, T. 15 N., R. 40 W., 56 ft. north and 450 ft. east of west end of east-west half section line.
Ground elevation: 3,336 ft. (t). (Belmar 7.5 min. quadrangle)
Depth to water: Unknown. (6-19-82).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, very fine to very coarse, much fine to medium, slightly silty, brown	0.0	25.0
Silt, very sandy, very fine to fine, very pale brown	25.0	34.0
Quaternary System and Tertiary System - Pliocene Series:		
Sand very fine to very coarse, trace fine gravel, slightly silty	34.0	44.0
Silt, slightly to very sandy, very fine to very coarse, most fine to medium, light yellow to light reddish brown	44.0	49.0
Silt, slightly sandy, trace siltstone, light yellow to light reddish brown	49.0	52.0
Sand, very fine to very coarse, moderately silty, pale yellow to light reddish brown	52.0	59.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, slightly sandy, lime cemented, pale olive	59.0	63.0
Sand to sandstone, very fine to fine, slightly silty, lime cemented, pale yellow to white	63.0	82.0
Sandstone, very fine to fine, moderately silty, lime cemented, pale yellow to brown	82.0	137.0
Sandstone and gravel, rounded sandstone fragments, with gravel and siltstone, light reddish brown to brown to white	137.0	146.0
Sandstone, very fine to fine, moderately silty and limy, olive	146.0	154.0
Sand to sandstone, very fine to fine, slightly silty, olive	154.0	159.0
Sandstone, very fine to fine, moderately silty, olive	159.0	163.0
Sand, very fine to very coarse, olive	163.0	169.0
Siltstone, moderately sandy, very fine to fine, limy concretions, olive to pale olive	169.0	184.0
Sand to sandstone, very fine to fine, moderately silty and limy, reddish brown to pale olive	184.0	201.0
Sand, very fine to very coarse, much fine to medium, slightly to moderately silty, lime cemented sandstone lenses	201.0	225.0
Quartzite, very fine to very coarse sand with trace fine gravel, olive to yellow	225.0	229.0

Silt, slightly clayey, slightly sandy, pale olive to pale brown.....	229.0	238.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, slightly clayey, limy zones, light brown to reddish brown.....	238.0	260.0

Test Hole #K-01-03
(16N-37W-16cbca)
Keith County

Location: NE SW NW SW sec. 16, T. 16 N., R. 37 W., approximately 400 ft east of west section line and 1850 ft north of south section line.
Source Footage: Field log
Latitude: 41 21 26.48N
Longitude: 101 34 27.48W
Source Lat/Long: GPS
7.5-minute Quad Map Name: Glinn Ranch
Ground elevation: 3491.85 ft
Source elev: GPS
Depth to water: Unknown
Date measured: Unknown
Geophysical Log(s): Yes

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine	0.0	17.0
Sand, silty with some medium sand, grayish brown	17.0	34.0
Sand, mostly fine to very fine, some medium grained; one cemented sandstone pebble in sample 80-85 ft.	34.0	92.0
Silt, sandy, light gray	92.0	101.0
Sand, very fine to fine	101.0	141.0
Silt, sandy, light greenish gray	141.0	157.0
Sand, very fine to fine	157.0	162.0
Silt, sandy, light greenish gray	162.0	168.0
Sand, very fine to fine	168.0	174.0
Silt, sandy, light greenish gray	174.0	177.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, granitic with quartzite and anorthosite	177.0	206.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sand, fine to medium, silty, light brown, trace rhizoliths	206.0	223.0
Silt, sandy, calcareous, pinkish white	223.0	252.0
Sandy, silty with finer interbeds, some medium to coarse sand, calcareous	252.0	272.0
Silt, sandy, pale olive	272.0	278.0
Sand, very fine to coarse	278.0	312.0
Silt, sandy, and sandstone silty; interbedded, with some gravel; light brown, with some rhizoliths	312.0	352.0
Sand and gravel, granitic	352.0	391.0
Sandstone, calcareous, pale olive to pale yellow; With rhizoliths	391.0	416.0
Caliche and sandstone, silty, pale olive gray	416.0	500.0

Tertiary System - Oligocene Series - White River Group:
Brule Formation:

Siltstone, strongly calcareous from 500 to 505 ft; slight to 540 ft, brown to very pale brown.....	500.0	540.0

Test Hole #255-34 (No e-logs)
(16N-38W-30abbc?)
Keith County

Location: SE NW NW NE sec. 30, T. 16 N., R. 38 W.
Ground elevation: 3,500 ft. (t). (Martin 7.5 min. quadrangle)
Depth to water: Undetermined.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand; texture grades from fine to medium grained....	0.0	43.0

Note: Exact location unknown.

Test Hole #11-S-82 (E-logs)
(16N-39W-1adad)
Keith County

Location: SE NE SE NE sec. 1, T. 16 N., R. 39 W., 53 ft. west of NE Hwy 61, 92 and 47 ft. south of trail.
Ground elevation: 3,530 ft. (t). (Packard Ranch 7.5 min. quadrangle)
Depth to water: Unknown. (6-22-82).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, very fine to medium, trace iron oxide staining at 70 ft, brown.....	0.0	75.0
Quaternary System and Tertiary System - Pliocene Series:		
Silt, very sandy, very fine to fine, pale olive.....	75.0	80.0
Sand, very fine to medium, slightly silty, olive....	80.0	90.0
Silt, very sandy, very fine to fine, gray.....	90.0	94.0
Sand, very fine to medium.....	94.0	102.0
Silt, moderately to very sandy, very fine to fine, slightly clayey, pale brown to pale olive.....	102.0	116.0
Sand, very fine to very coarse, trace fine gravel, slightly to moderately silty 116 to 125 ft, much coarser 125 to 136 ft.....	116.0	136.0
Silt, moderately to very clayey, gray black.....	136.0	140.0
Sand and gravel, fine sand to fine gravel, trace medium gravel, gray to green.....	140.0	161.0
Sand and gravel, fine sand to fine gravel, trace medium gravel, gray to green.....	161.0	175.0
Sand and gravel, fine sand to medium gravel, much fine gravel, trace coarse gravel, gray to green to granitic, rare silt seams.....	175.0	270.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Sandstone to sand, very fine to fine, trace medium, moderately silty, slightly to very limy with lime cement, brown to pale brown to olive.....	270.0	335.0
Sandstone, moderately to very silty, lime cemented, very pale brown to pale olive.....	335.0	342.0
Sandstone, slightly to moderately silty, moderately limy, pale olive.....	342.0	366.0
Sandstone, slightly to moderately silty, pale olive.	366.0	370.0
Sand to sandstone, very fine to medium, trace coarse, slightly silty, slightly limy, brown to pale brown.....	370.0	375.0
Sandstone, moderately silty, moderately limy, pale brown.....	375.0	381.0
Sand and sandstone, very fine to medium, slightly to moderately silty, moderately limy, pale olive.....	381.0	415.0
Sandstone, very fine to fine, lime cemented, interbedded with siltstone, pale olive to pale brown...	415.0	432.0

Tertiary System - Oligocene Series - White River Group:
Brule Formation:

Siltstone, limy zones, pale brown to brown.....	432.0	460.0