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Scotts Bluff County Test Hole Logs

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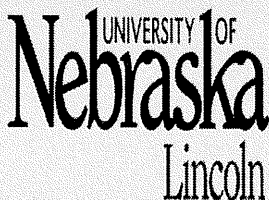
SCOTTS BLUFF COUNTY Test-Hole Logs

**Written in part and revised and compiled in part
from previous works of others**

**by
Vincent H. Dreeszen,
Steven S. Sibray
and
Frank A. Smith**

**Nebraska Water Survey
Test-Hole Report No. 79**

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



May 2002



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UNIVERSITY OF NEBRASKA-LINCOLN CREDITS

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Publication and price lists are furnished upon request.

May 2002

ACKNOWLEDGMENTS

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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 the logs of all test holes drilled in the county under the program as well as those drilled by the North Platte Natural Resources District (NPNRD). The map in this report (Fig. 1) shows the location and test hole field number.

Nearly all of the test holes drilled by the NPNRD and those drilled by CSD in 1994 were completed as observation wells. The drilling was done by the NPNRD in cooperation with CSD. Steve Sibray, CSD geologist, assisted in the project and did the geophysical logging of most test holes using CSD logging equipment. The NPNRD program of drilling was under contract with Nelson Wells, a local well drilling firm. James Cannia, NPNRD geologist, supervised the drilling, logged the holes, and collected most of the samples. The original field logs are on file in the NPNRD office and copies are on file in the Lincoln and Scottsbluff offices of CSD.

Funding to compile this test-hole log book was provided by the Platte River Basin and Cooperative Hydrology Study (COHYST). Format changes for log headings including the addition of latitude and longitude, were suggested by COHYST.

Present techniques of test-hole logging and sampling include use of drilling mud suitable to drilling conditions, timing of the drilling at each 5-foot increment of depth, and removal of cuttings from the test hole at intervals of 5 feet or less. This technique was adapted in the early 1940s and was used in the NPNRD program but was not used in drilling the 1937 and 1940 test holes. Samples, particularly from the 1937 test holes, often represent several tens of feet. The NPNRD technique differed slightly in that most of the samples represent 5-foot intervals with notations in the field log of changes in lithology.

Samples were examined in the field by geologists, described lithologically and the colors evaluated with reference to standard color charts. All samples are processed and kept on open file in the CSD sample and core repository.

The samples from all test holes (some samples are missing as noted in the logs in this report) were reexamined microscopically by the author of this report. Logs of test holes published in earlier reports were revised based on reexamination of samples and in light of new information gained from more recent investigation. James B. Swinehart, CSD geologist, also examined

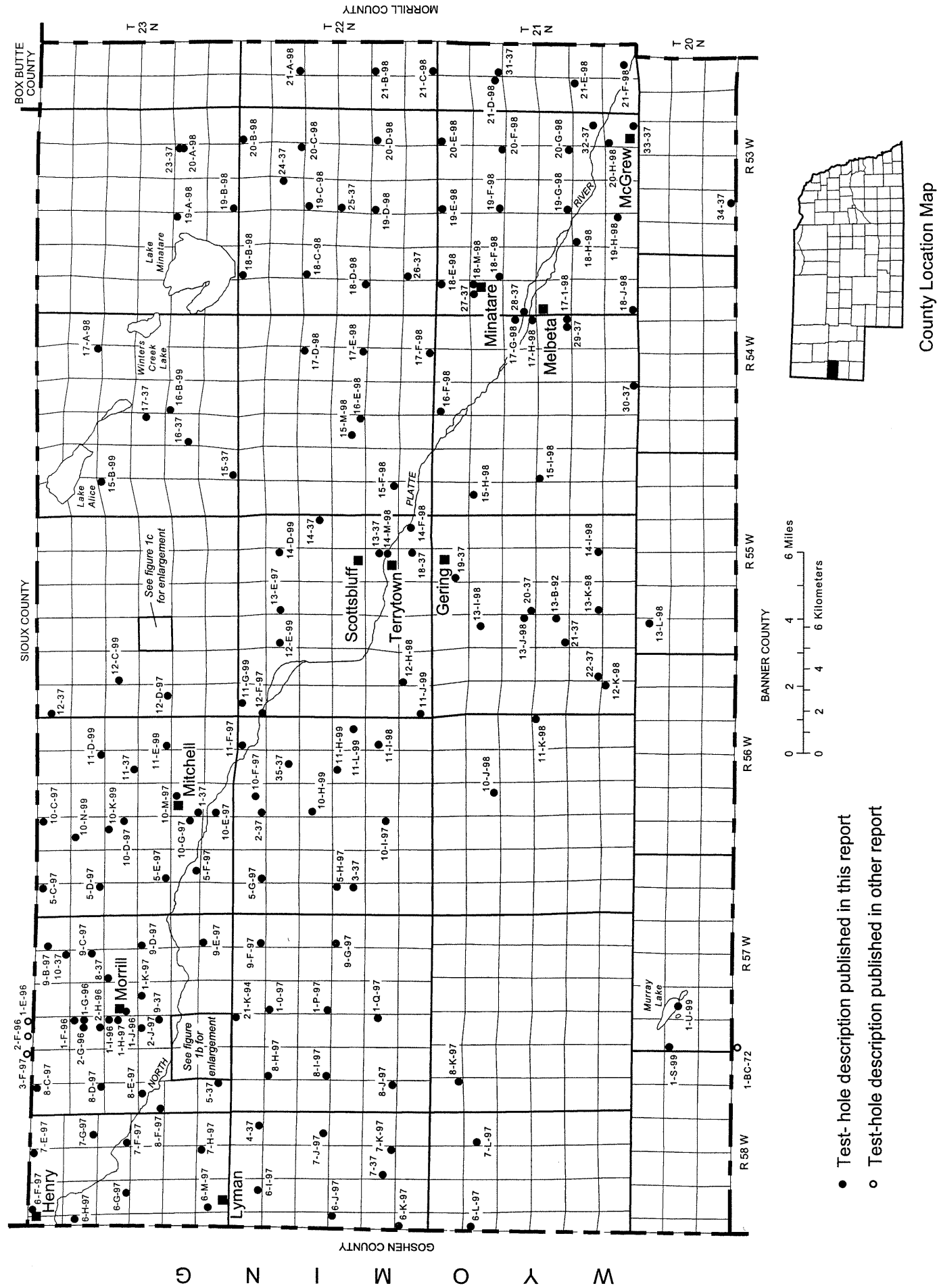


Figure 1a. Test-hole location map of Scotts Bluff County

- Test-hole description published in this report
- Test-hole description published in other report

County Location Map

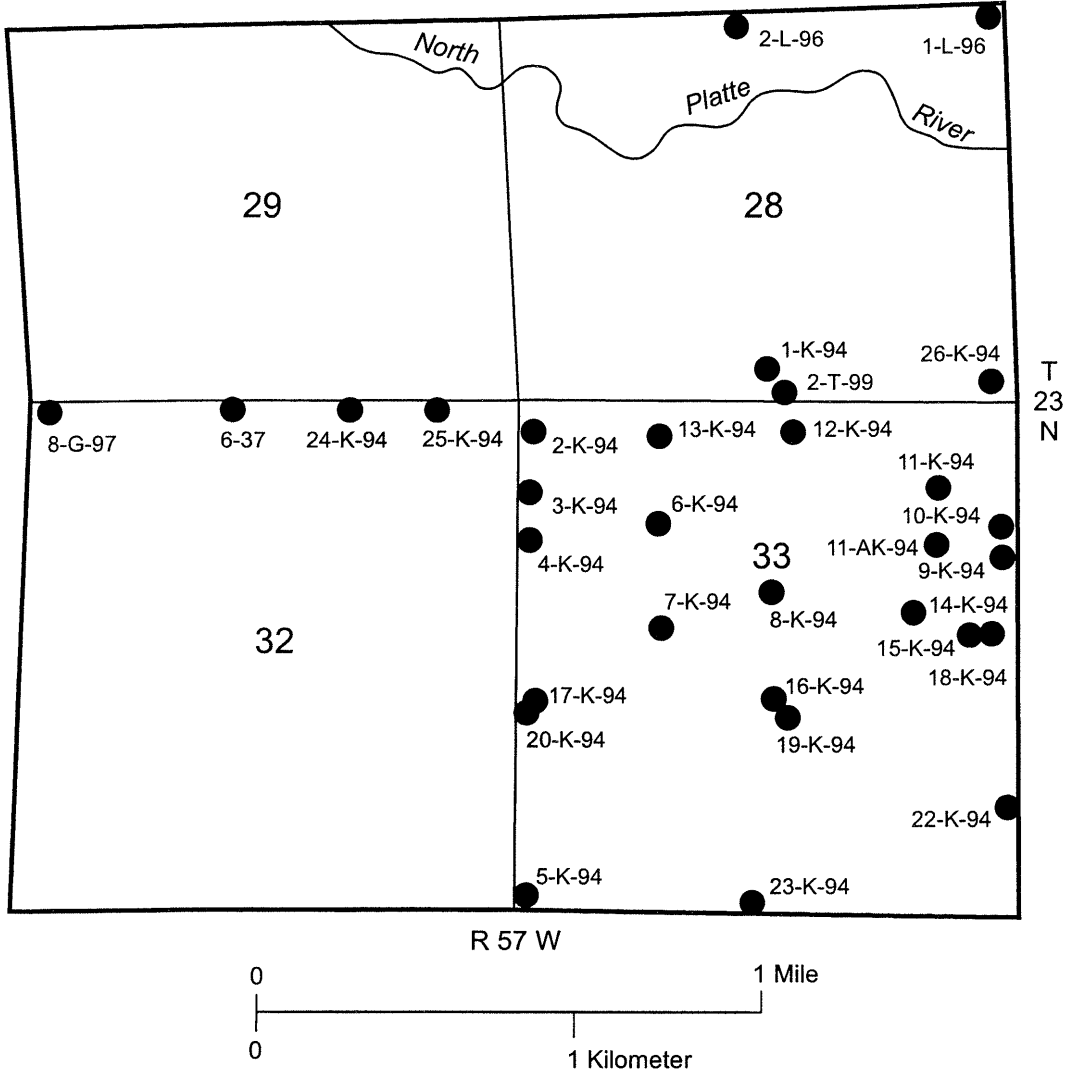


Figure 1b. Test-hole location map of Scotts Bluff County

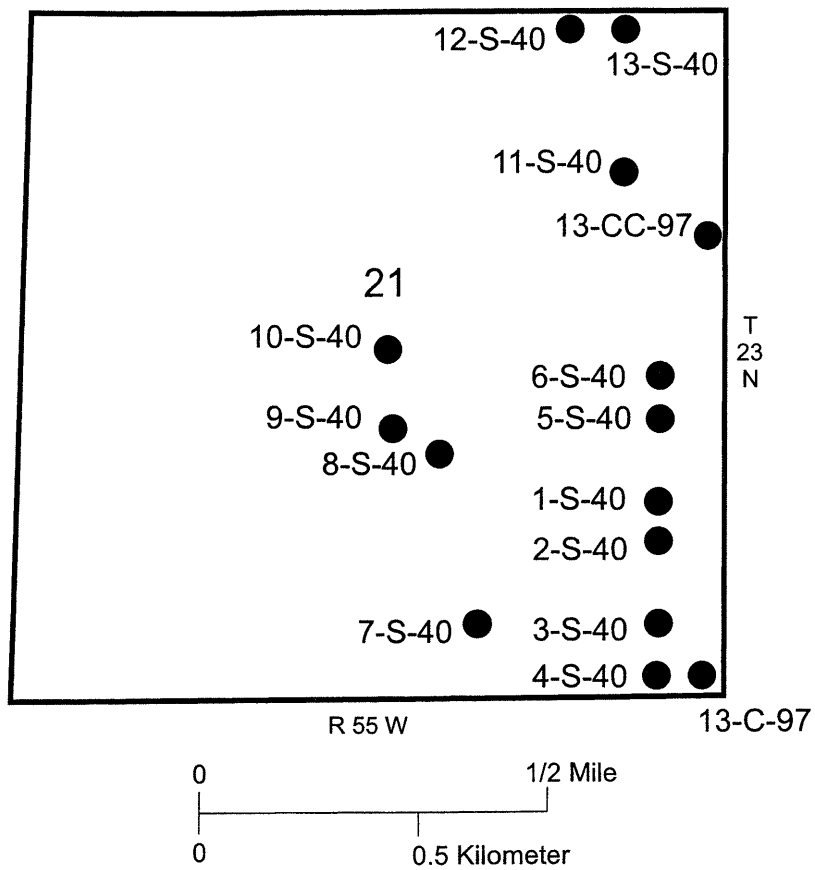


Figure 1c. Test-hole location map of Scotts Bluff County

samples in some test holes where lithology or correlation of units were in question. The correlation of some units are tentative due to condition of samples, shallow penetration of test hole, or limited regional and local understanding of structure and spatial distribution of strata. Additional studies, including petrographic examination of samples, mapping of units and construction of geologic cross sections, remain to be accomplished.

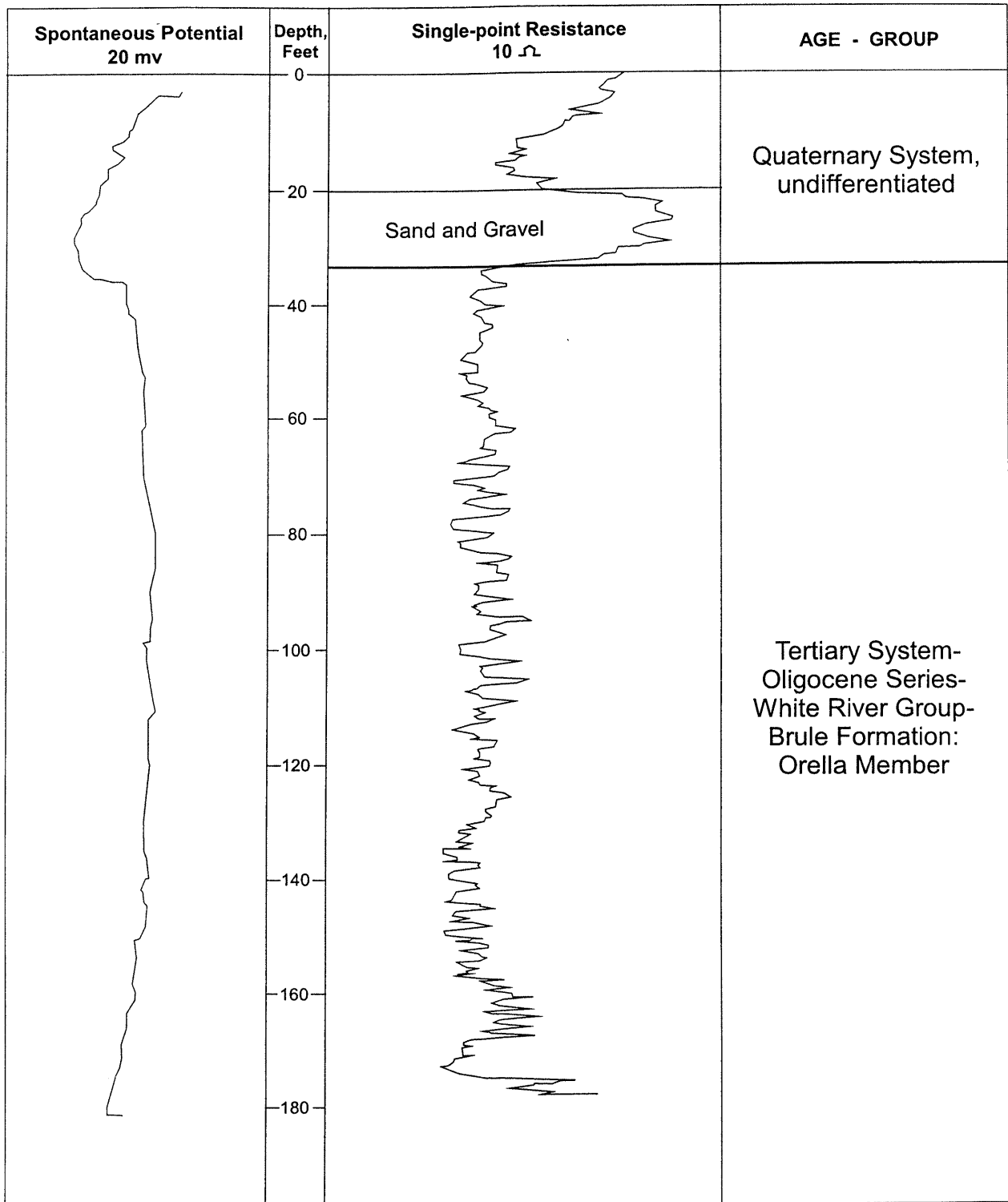
Beginning in September 1951, most of the CSD test holes have been logged electrically. Geophysical logs can be used to determine formation types and boundaries more precisely than by field sampling alone. However, only one of the CSD test holes in the county was electric logged. Figure 2 is an electric log of that test hole (13-B-92) showing electrical characteristics and formation boundaries. Geophysical logs were run in most of the test holes drilled by the NPNRD. A notation on the test hole log indicates whether geophysical logs are a part of the original test hole data on file in the CSD offices in Lincoln and Scottsbluff. A notation on the published log indicates the type of geophysical log available. The letter (R) indicates resistivity, (S) indicates spontaneous potential, (Gamma) indicates natural gamma and (Caliper) indicates a caliper log was run. The spontaneous potential logs were erratic and are not useful. Also, due to the type of equipment and length of probe the upper 20 to 25 feet and lower few feet of the resistivity log are not useful. In most test holes several different resistivity were recorded simultaneously. The lowermost 8 to 10 feet of the gamma logs were not recorded due to probe placement.

Water levels were not recorded for the 1937 test holes nor were they measured in most of the original NPNRD and 1-K through 26-K-94 CSD test holes. The NPNRD staff provided water levels measured shortly after wells were constructed at these test hole sites.

This publication is one of a series being issued to make more readily available the record of test holes drilled in Nebraska since 1930. The series of publications is published on a county basis and included, with some exceptions, logs of all test holes in each of the counties. The logs have not been reviewed for conformance with editorial standards and nomenclature.

The altitude of the ground surface at each test hole site was determined by a number of methods as indicated in the heading of each log. Ground altitudes for all but one of the NPNRD test holes were determined by the Nebraska Department of Natural Resources using Global Positioning System (GPS) equipment. The source is indicated by GPS (geodetic). Other sources are indicated as follows: a = altimeter, i = spirit leveling, t = estimated from 7.5 minute quadrangle map.

Figure 2. Scotts Bluff County sample geophysical log (13-B-92)



The latitude and longitude for all of NPNRD test holes (with one exception determined by NPNRD staff), determined by the Nebraska Department of Natural Resources, is indicated in the heading by GPS (geodetic). The latitude and longitude for the 1-K through 26-K-94 test holes were determined by NPNRD staff using GPS equipment. The latitude and longitude for the CSD test holes were approximated by scaling from test holes plotted on 7.5 minute quadrangle maps.

The normal practice of CSD to determine test hole locations from section lines is to measure distances with a tape accurately to within a few feet. Locations of the 1937 test holes were approximated by car odometer (most test holes were drilled on the edge of a road). The 1940 test holes were located from a given point in the section and then referenced to each other. The distance from section lines for most of the NPNRD test holes were not measured in the field but were estimated. In order to obtain footage locations for these test holes, they were plotted by latitude and longitude on 7.5 minute quadrangle maps and the distances were then scaled off the map with the source indicated in the log heading as (Map).

Each test hole is identified by a number assigned in the field (for example #13-B-92), and most are also identified by a number indicating its location within the land divisions of the U.S. Bureau of Land Management's survey of Nebraska (see USGS test hole identification in figure 3). Location numbers of test holes east of the 6th principal meridian, which passes north-south through Columbus, 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 so on to the quarter-quarter-quarter-quarter section. The letters A, B, C, and D are applied in a counterclockwise direction beginning with A in the northeast quadrant. 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 (NE) indicating the quarter section, the second letter (NW) the quarter-quarter section, the third letter (SW) the quarter-quarter-quarter section, and the fourth letter (SE) the quarter-quarter-quarter-quarter section. 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. Because a number of sections are significantly less or more than a full square mile, odd-size sections are divided into quarter-quarter-quarter sections in order to assign quadrants.

A = NE 1/4
 B = NW 1/4
 C = SW 1/4
 D = SE 1/4
 1 Section =
 1 Mile² =
 640 Acres

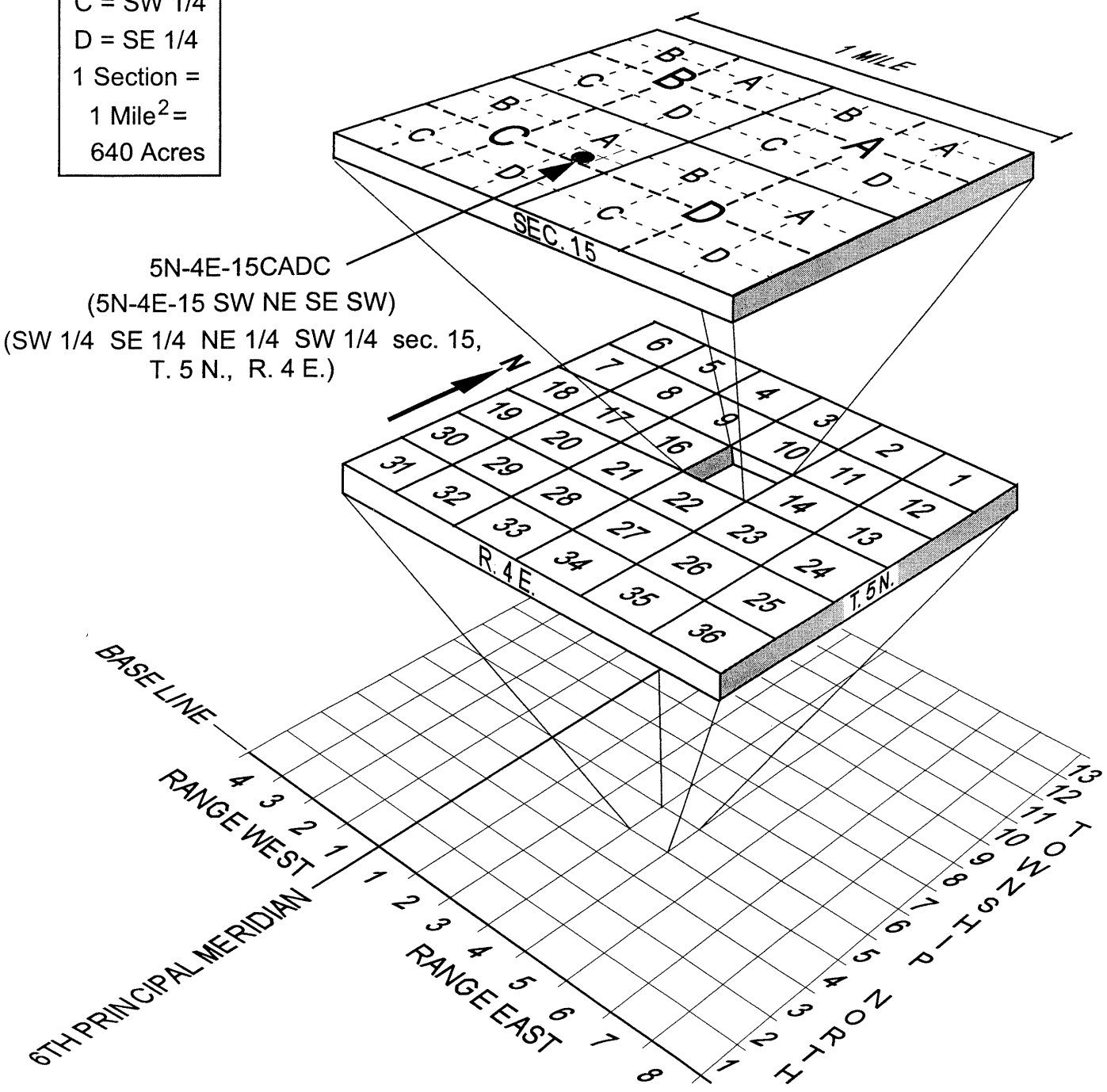


Fig. 3. System for identifying test-hole according to its location.

SELECTED REFERENCES

Some Publications that are Guides to Earth Resources in Scotts Bluff County

Some of the published references pertinent to an understanding of the geologic and hydrologic resources of Scotts Bluff County are included below. The interested reader will find citations of other studies in these reports.

- Bleed, A. and Flowerday, C. F., *An Atlas of the Sand Hills*, Resource Atlas No. 5, Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, 1989, 1990, 1998.
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- U. S. Department of Agriculture, Soil Conservation Service, in cooperation with the Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, *Soil Survey of Scotts Bluff County, Nebraska*, December, 1968.
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- Verstraeten, I. M., Steele, G. V., Cannia, J. C., Hitch, D. E., Scripser, K. G., Bohlke, J. K., Kraemer, T. F. and Stanton, J. S. *Interaction of Surface Water and Ground Water in the Dutch Flats Area, Western, Nebraska, 1995-99*. U. S. Geological Survey Water-Resources Investigations Report 01-4070. Prepared in cooperation with the North Platte Natural Resources District, 2001.

Wenzel, L. K., Cady, R. C., and Waite, H. A., *Geology and Ground-Water Resources of Scotts Bluff County, Nebraska*. U. S. Geological Survey, Water-Supply Paper 943, prepared in cooperation with the Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, 1946.

**Scotts Bluff County
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20N 55W 06ADBD	13-L-98	2
20N 57W 07BBBB	1-S-99	4
20N 57W 08ACBB	1-U-99	6
21N 52W 07DDDA	21-D-98	7
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21N 52W 30AADA	21-E-98	10
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21N 53W 18CBBB	28-37	24
21N 53W 22CCCC	19-G-98	25
21N 53W 23DDDD	20-G-98	26
21N 53W 25DBCB	32-37	28
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21N 53W 31CCCC	18-J-98	30
21N 53W 33ADAA	19-H-98	32
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23N 57W 09ADDA	1-G-96	208
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23N 57W 19CCCB	8-F-97	224
23N 57W 21DADD	09-37	226
23N 57W 21ABAB	2-J-97	227
23N 57W 22ABAB	1-K-97	228
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23N 57W 28DCBC	1-K-94	232
23N 57W 28AAAA	1-L-96	233
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23N 57W 32ABAB	24-K-94	241
23N 57W 32AABA	25-K-94	242
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23N 57W 33BBCB	3-K-94	244
23N 57W 33BCBB	4-K-94	245
23N 57W 33CCCC	5-K-94	246
23N 57W 33BACC	6-K-94	247

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23N 57W 33ACCB 8-K-94	249
23N 57W 33ADAA 9-K-94	250
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23N 57W 33ADCB 14-K-94	256
23N 57W 33ADDC 15-K-94	257
23N 57W 33DBBC 16-K-94	258
23N 57W 33CBBC 17-K-94	259
23N 57W 33ADDD 18-K-94	260
23N 57W 33DBBC 19-K-94	261
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Test-holes are arranged in this publication by township, range and section.

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Test-Hole Logs Table of Contents**

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23N 57W 31DADD	05-37	238
23N 57W 32BAAB	06-37	239
22N 58W 26CBCC	07-37	141
23N 57W 14BBBC	08-37	215
23N 57W 21DADD	09-37	. . . . .	226
23N 57W 02DDAD	10-37	. . . . .	203
23N 56W 14CDDD	11-37	. . . . .	186
23N 55W 06BCBB	12-37	. . . . .	157
22N 55W 26ADDD	13-37	. . . . .	96
22N 55W 13DADD	14-37	. . . . .	95
23N 54W 32CCBC	15-37	. . . . .	156
23N 54W 28CBBC	16-37	. . . . .	155
23N 54W 21ADDD	17-37	. . . . .	153
22N 55W 35AD	18-37	. . . . .	102
21N 55W 02CBBA	19-37	. . . . .	46
21N 55W 15CCCB	20-37	. . . . .	48
21N 55W 21CCBB	21-37	. . . . .	53
21N 55W 29CCCB	22-37	. . . . .	57
23N 53W 26AAAB	23-37	. . . . .	146
22N 53W 10ADDD	24-37	. . . . .	70
22N 53W 22BBBB	25-37	. . . . .	76
22N 53W 32BBBB	26-37	. . . . .	79
21N 53W 07ABBA	27-37	. . . . .	19
21N 53W 18CBBB	28-37	. . . . .	24
21N 54W 24DCCC	29-37	. . . . .	44
21N 54W 34DDCD	30-37	. . . . .	45
21N 52W 08CCCC	31-37	. . . . .	9
21N 53W 25DBCB	32-37	. . . . .	28
21N 53W 36DCCC	33-37	. . . . .	35
20N 53W 17DCCC	34-37	. . . . .	1
22N 56W 11DBC	35-37	. . . . .	110

1940

23N 55W 21DADC	01-S-40	. . . . .	161
23N 55W 21DDAB	02-S-40	. . . . .	162
23N 55W 21DDDB	03-S-40	. . . . .	163
23N 55W 21DDDC	04-S-40	. . . . .	164
23N 55W 21DAAC	05-S-40	. . . . .	165
23N 55W 21DAAB	06-S-40	. . . . .	166
23N 55W 21DCDB	07-S-40	. . . . .	167
23N 55W 21DBCA	08-S-40	. . . . .	168
23N 55W 21DBBC	09-S-40	. . . . .	169
23N 55W 21ACCC	10-S-40	. . . . .	170
23N 55W 21AACD	11-S-40	. . . . .	171
23N 55W 21AABB	12-S-40	172
23N 55W 21AABA	13-S-40	173

1992

21N 55W 21DADA	13-B-92	51
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1994

23N 57W 28DCBC	1-K-94	232
23N 57W 33BBBC	2-K-94	243
23N 57W 33BBCB	3-K-94	244
23N 57W 33BCBB	4-K-94	. . . . .	245
23N 57W 33CCCC	5-K-94	. . . . .	246
23N 57W 33BACC	6-K-94	. . . . .	247
23N 57W 33BDCC	7-K-94	. . . . .	248
23N 57W 33ACCB	8-K-94	. . . . .	249
23N 57W 33ADAA	9-K-94	. . . . .	250
23N 57W 33AADD	10-K-94	. . . . .	251
23N 57W 33ADAA	11AK-94	. . . . .	252
23N 57W 33AACA	11-K-94	. . . . .	253
23N 57W 33ABBB	12-K-94	. . . . .	254
23N 57W 33BABB	13-K-94	. . . . .	255
23N 57W 33ADCB	14-K-94	. . . . .	256
23N 57W 33ADDC	15-K-94	. . . . .	257
23N 57W 33DBBC	16-K-94	. . . . .	258
23N 57W 33CBBC	17-K-94	. . . . .	259
23N 57W 33ADDD	18-K-94	. . . . .	260
23N 57W 33DBBC	19-K-94	. . . . .	261
23N 57W 33CBCC	20-K-94	. . . . .	262
22N 57W 04AAAA	21-K-94	. . . . .	124
23N 57W 33DDAA	22-K-94	. . . . .	263
23N 57W 33CDDD	23-K-94	. . . . .	264
23N 57W 32ABAB	24-K-94	. . . . .	241
23N 57W 32AABA	25-K-94	. . . . .	242
23N 57W 28DDDD	26-K-94	. . . . .	237

21N 57W 06DDDD	8-K-97	. . . . .	62
23N 57W 01BCBB	9-B-97	. . . . .	201
23N 57W 11DAAA	9-C-97	. . . . .	214
23N 57W 24BBBB	9-D-97	. . . . .	230
23N 57W 36BBBB	9-E-97	. . . . .	265
22N 57W 01CCBC	9-F-97	. . . . .	122
22N 57W 24BBBB	9-G-97	. . . . .	130
23N 56W 04AABA	10-C-97	. . . . .	177
23N 56W 16DADD	10-D-97	. . . . .	187
23N 56W 34BCCC	10-E-97	. . . . .	199
22N 56W 03DECC	10-F-97	. . . . .	107
23N 56W 28DAAA	10-G-97	. . . . .	196
22N 56W 28DADB	10-I-97	. . . . .	121
23N 56W 27ABDB	10-M-97	. . . . .	194
22N 56W 01BBBB	11-F-97	. . . . .	104
23N 55W 19DCDD	12-D-97	. . . . .	159
22N 55W 06CCCC	12-F-97	. . . . .	91
23N 55W 21DDDD	13-C-97	. . . . .	174
23N 55W 21ADAA	13-CC-97	. . . . .	176
22N 55W 10BCCB	13-E-97	. . . . .	93

1998

21N 56W 10DCAA	10-J-98	. . . . .	59
22N 56W 25BCDD	11-I-98	. . . . .	120
21N 56W 24AAAD	11-K-98	. . . . .	61
22N 55W 32BBAA	12-H-98	. . . . .	100
21N 55W 31AAAB	12-K-98	. . . . .	58
21N 55W 09ACAB	13-I-98	. . . . .	47
21N 55W 16DADD	13-J-98	. . . . .	49
21N 55W 27CCCC	13-K-98	. . . . .	56
20N 55W 06ADED	13-L-98	. . . . .	2
22N 55W 36ACBB	14-F-98	. . . . .	103
21N 55W 26DDDC	14-I-98	. . . . .	54
22N 55W 26DACA	14-M-98	. . . . .	97
22N 54W 30DDDA	15-F-98	. . . . .	86
21N 54W 07ABBC	15-H-98	. . . . .	38
21N 54W 20BCCB	15-I-98	. . . . .	41
22N 54W 21CAAC	15-M-98	. . . . .	82
22N 54W 21DDDD	16-E-98	. . . . .	83
21N 54W 03BBCC	16-F-98	. . . . .	36
23N 54W 11DDAA	17-A-98	. . . . .	150
22N 54W 14AAAA	17-D-98	. . . . .	80
22N 54W 23DDDD	17-E-98	. . . . .	84
22N 54W 35DDDD	17-F-98	. . . . .	88
21N 54W 13ADDD	17-G-98	. . . . .	39
21N 54W 13DDDA	17-H-98	. . . . .	40
21N 54W 24DDDD	17-I-98	. . . . .	42

22N 53W 05BBBB	18-B-98	. . . . .	69
22N 53W 17BBBB	18-C-98	. . . . .	74
22N 53W 19DDDD	18-D-98	. . . . .	75
21N 53W 06AAAA	18-E-98	. . . . .	16
21N 53W 08CCCD	18-F-98	. . . . .	20
21N 53W 28BBDA	18-H-98	. . . . .	29
21N 53W 31CCCC	18-J-98	. . . . .	30
21N 53W 07AAAD	18-M-98	. . . . .	17
23N 53W 28AAAA	19-A-98	. . . . .	147
23N 53W 34CCCC	19-B-98	. . . . .	149
22N 53W 15BBBB	19-C-98	. . . . .	72
22N 53W 27BBBA	19-D-98	. . . . .	78
21N 53W 03BBBB	19-E-98	. . . . .	15
21N 53W 10CCDC	19-F-98	. . . . .	22
21N 53W 22CCCC	19-G-98	. . . . .	25
21N 53W 33ADAA	19-H-98	. . . . .	32
23N 53W 26AADD	20-A-98	. . . . .	145
22N 53W 01BBBB	20-B-98	. . . . .	68
22N 53W 11DDDD	20-C-98	. . . . .	71
21N 53W 11DDDD	20-D-98	. . . . .	23
21N 53W 01BBBA	20-E-98	. . . . .	13
22N 53W 25BBBA	20-F-98	. . . . .	77
21N 53W 23DDDD	20-G-98	. . . . .	26
21N 53W 36BBDD	20-H-98	. . . . .	34
22N 52W 08CCCC	21-A-98	. . . . .	65
22N 52W 29BBBB	21-B-98	. . . . .	66
22N 52W 32CCCC	21-C-98	. . . . .	67
21N 52W 07DDDA	21-D-98	. . . . .	7
21N 52W 30AADA	21-E-98	. . . . .	10
21N 52W 32CADD	21-F-98	. . . . .	11

1999

20N 57W 07BBBB	1-S-99	. . . . .	4
20N 57W 08ACBB	1-U-99	. . . . .	6
23N 57W 28CDDD	2-T-99	. . . . .	235
22N 56W 15BCDD	10-H-99	. . . . .	111
23N 56W 16ABBB	10-K-99	. . . . .	189
23N 56W 09BABA	10-N-99	. . . . .	182
23N 56W 11DDDD	11-D-99	. . . . .	184
23N 56W 24CCCC	11-E-99	. . . . .	192
22N 55W 06BABD	11-G-99	. . . . .	90
22N 56W 23BABC	11-H-99	. . . . .	117
22N 55W 31CBBB	11-J-99	. . . . .	98
22N 56W 24DBAC	11-L-99	. . . . .	118
23N 55W 17BCBB	12-C-99	. . . . .	158
22N 55W 09BCDC	12-E-99	. . . . .	92
22N 55W 11ADDD	14-D-99	. . . . .	94
23N 54W 18AAAA	15-B-99	. . . . .	152
23N 54W 27BBBC	16-B-99	. . . . .	154

**Test Hole #34-37
(20-53-17dccc)
Scotts Bluff County**

Location: SW SW SW SE sec. 17, T. 20 N., R. 53 W., approximately
0.45 mile west of southeast corner on north edge of road
Source Footage: Map
Latitude: 41 42 01N
Longitude: 103 27 18W
Source Lat/Long: Map
7.5-minute Quad Map Name: McGrew
Ground elevation: 3910 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Logged as fine sand with a dark soil layer at 19 ft; the single sample consists mostly of silt and sandy silt, light yellow-brown with a little dark brown-gray sandy silt.....	0.0	41.0
Lithic gravel, composed primarily of light brown siltstone; common well indurated fine-grained sandstone grains 45 to 50 ft, sandstone is dark speckled and calcareous.....	41.0	50.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, clayey to in part silty, very pale brown, very slightly calcareous.....	50.0	64.0

**Test Hole #13-L-98
(20-55-6adb)
Scotts Bluff County**

Location: SE NW SE NE sec. 6, T. 20 N., R. 55 W., approximately 1850 ft south and 750 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 44 11.25N

Longitude: 103 41 54.20W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Wildcat Mountain

Ground elevation: 4168.95 ft

Source elev: GPS (geodetic)

Depth to water: Dry

Date measured:

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, moderately silty, slightly clayey in part, sand is mostly very fine to fine, rare medium, light brown, contains rare lithic calcareous fine-grained sandstone grains.....	0.0	5.0
Silt, slightly to in part moderately sandy, silt is mostly very fine to fine, light brown-gray, slightly calcareous.....	5.0	12.0
Sand, silty and lithic gravel, sand is mostly fine, contains common brown siltstone and a few limy grains.....	12.0	15.0
Lithic sand and gravel composed mostly of rounded grains of brown clayey siltstone and very fine sandy siltstone, contains rare quartz sand grains.	15.0	21.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation

Orella Member:

Siltstone, moderately clayey, some coarse siltstone, light medium brown, mostly very slightly calcareous; contains a little very fine to fine sand, rare coarser grains below 30 ft.....	21.0	34.0
Siltstone-sandstone, sand is mostly very fine, some fine, poorly indurated, light brown, in part calcareous; contains rare coarse sand grains; some gravel grains noted in field log from 40 to 45 ft.	34.0	50.0
Siltstone, slightly clayey, light brown.....	50.0	55.0

Siltstone, slightly to in part moderately sandy, sand is mostly very fine to fine, rare medium and coarse sand, matrix is clayey, light brown; mod- erately to very sandy 65 to 70 ft.....	55.0	70.0
Siltstone, moderately clayey, light brown, contains a few fine sand grains.....	70.0	100.0

**Test Hole #1-S-99
(20N-57W-7bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 7, T. 20 N., R. 57 W., approximately 150 ft south and 100 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 43 37.125N
Longitude: 103 56 49.447W
Source Lat/Long: GPS (geodetic)
7.5- minute Quad Map Name: Murray Lake

Ground elevation: 4431.20 ft
Source elev: GPS (geodetic)

Depth to water: 12.92 ft
Date measured: 7/22/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, moderately sandy, sand is very fine to fine, medium dark brown, moderately calcareous..... 0.0 4.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, mostly coarse silt, slightly sandy, sand is very fine, light brown, moderately calcareous, contains a trace of limy areas..... 4.0 10.0

Siltstone, slightly to in part moderately clayey, silt is fine to coarse, slightly sandy, sand is very fine, light brown, slightly calcareous; intermittently soft and hard layers noted in field log. 10.0 20.0

Siltstone, moderately clayey, silt is mostly fine, very slightly sandy, sand is very fine, light brown, moderately calcareous; slightly less calcareous 50 to 60 ft; slightly clayey 60 to 76 ft.. 20.0 76.0

Siltstone, slightly to in part moderately clayey, silt is fine to very coarse, contains some very fine sand and volcanic ash, light brown, moderately calcareous..... 76.0 95.0

Siltstone, moderately clayey, silt is fine to coarse, light brown, slightly calcareous, contains a trace of small limy areas, color noted as light brown and light greenish gray in field log; no limy areas noted 95 to 100 ft, color is very light brown..... 95.0 110.0

Siltstone, moderately clayey, silt is fine to coarse, slightly calcareous, very light olive-gray, some greenish granular siltstone and green clay noted in log from 95 to 125 ft..... 110.0 125.0

**Test Hole #1-U-99
(20N-57W-8acbb)
Scotts Bluff County**

Location: NW NW SW NE sec. 8, T. 20 N., R. 57 W., approximately
1650 ft south and 2500 ft west of northeast corner of
section

Source Footage: Map

Latitude: 41 43 21.347N

Longitude: 103 55 08.253W

Source Lat/Long: GPS (geodetic)

7.5- minute Quad Map Name: Murray Lake

Ground elevation: 4417.07 ft

Source elev: GPS (geodetic)

Depth to water: 5.67 ft

Date measured: 7/22/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, slightly to in part moderately sandy, sand is very fine to medium, dark brown-gray in upper part, light brown-gray in lower, all moderately calcareous; contains rare coarse sand and gravel grains below 10 ft.....

0.0 15.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, silt is fine to coarse, very slightly sandy, sand is very fine, light brown, moderately calcareous; slightly calcareous 30 to 110 ft; some softer layers noted in field log 35 to 50 and 80 to 95 ft.....

15.0 110.0

**Test Hole #21-D-98
(21-52-7ddda)
Scotts Bluff County**

Location: NE SE SE SE sec. 7, T. 21 N., R. 52 W., approximately 550 ft north and 60 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 48 12.65N

Longitude: 103 22 55.71W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3874.4 ft

Source elev: GPS (geodetic)

Depth to water: 20.09 ft

Date measured: 5/9/01

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Mixed sample, silt and fine-grained clayey to sandy silt, light yellow-gray, in part dark mineral stained; contains a few coarse sand grains, slightly calcareous.....	0.0	5.0
Sand, some gravel, clayey matrix, some fine grained sandy silt, slightly calcareous.....	5.0	10.0
Sand and gravel, silt, clay and limy coating on grains, may have silty sand layers or lithic siltstone grains.....	10.0	15.0
Sand and gravel, approximately 40 percent fine to medium gravel, mostly quartz and light colored silicates, rare dark grains.....	15.0	20.0
Sand, some gravel, gravel mostly fine, sand is fine to very coarse, mostly quartz.....	20.0	35.0
Sand and gravel, gravel is fine with some medium and a little coarse, quartz with light colored silicates and metamorphic grains, contains a few brown lithic siltstone grains.....	35.0	40.0
Sand, some gravel, gravel is mostly fine, mostly quartz, light brown lithic siltstone grains rare..	40.0	65.0
Sand and gravel, gravel is mostly fine to medium, mostly quartz, contains a few metamorphic grains, approximately 50 percent very coarse sand and fine gravel.....	65.0	80.0
Sand, fine to very coarse, field log indicates poor sample; approximately 20 percent fine gravel 85 to 95 ft.....	80.0	90.0

Sand and gravel, gravel is fine to coarse, contains common light brown lithic siltstone gravel and pebble clasts.....	90.0	100.0
Sand, fine to very coarse; approximately 10 percent fine gravel 105 to 110 ft.....	100.0	110.0
Sand and gravel, gravel is fine to coarse, approximately 30 percent gravel, common lithic grains of siltstone, claystone and sandstone.....	110.0	120.0
Sand, fine to very coarse; a little fine gravel 120 to 130 and 135 to 140 ft; white clay coating on some grains 125 to 130 ft.....	120.0	140.0
Sand and gravel, gravel is mostly fine to medium, mostly quartz, rare metamorphic and light brown lithic grains, approximately 50 percent gravel....	140.0	159.5

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone and claystone, siltstone contains volcanic ash, claystone is massive, both light brown and moderately calcareous, field log indicates firm and soft sticky sediments, mixed.....	159.5	165.0
Siltstone, moderately clayey, slightly sandy, sand is mostly very fine, light brown; contains some fine sand 170 to 180 ft.....	165.0	180.0

**Test Hole #31-37
(21-52-8cccc)
Scotts Bluff County**

Location: SW SW SW SW sec 8, T. 21 N., R. 52 W., approximately 50 feet north of bridge on east side of road at road intersection

Source Footage: Map

Latitude 41 48 07N

Longitude: 103 22 51W

Source Lat/Long: Map

7.5-minute Quad Map Name: Bayard SW

Ground elevation: 3870 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	4.0
Sand, clayey, brown-gray; contains some gravel.....	4.0	9.0
Sand and gravel, gravel is mostly fine, considerable very coarse sand; one sample from this interval...	9.0	82.0
Sand, some gravel, gravel is mostly fine, much coarse to very coarse sand; one sample.....	82.0	117.0
Sand and gravel, logged as coarse with many boulders, tough drilling; one sample.....	117.0	156.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, moderately clayey, light reddish brown, moderately calcareous.....	156.0	168.0

**Test Hole #21-E-98
(21-52-30aada)
Scotts Bluff County**

Location: NE SE NE NE sec. 30, T. 21 N., R. 52 W., approximately 800 ft south and 60 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 46 14.43N

Longitude: 103 22 59.03W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3776.8 ft

Source elev: GPS (geodetic)

Depth to water: 4.17 ft

Date measured: 2/24/99

Geophysical Log(s): Electric (R), Gamma, Caliper

<u>Depth, in feet</u>	
From	To

Quaternary System, undifferentiated:

Sand, moderately clayey, moderately to in part very sandy with scattered coarse sand and gravel, medium brown-gray, slightly calcareous, contains a few white limy areas; sample contains some very light olive-gray very clayey sand.....	0.0	5.0
Gravel, sandy, approximately 75 percent fine to coarse gravel, quartz with some metamorphic and and dark gray mafic grains.....	5.0	10.0
Sand and gravel, gravel is fine to medium with some coarse, mostly quartz, approximately 50 percent gravel.....	10.0	20.0
Sand, some gravel, gravel is mostly fine, much coarse to very coarse sand.....	20.0	35.0
Sand, a little gravel, much coarse to very coarse sand, approximately 15 percent gravel.....	35.0	45.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, moderately sandy, sand is mostly very fine to fine, light brown, moderately calcareous; logged in field as drilling soft.....	45.0	60.0
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**Test Hole #21-F-98
(21-52-32cadd)
Scotts Bluff County**

Location: SE SE NE SW sec. 32, T. 21 N., R. 52 W., approximately 4000 ft south of north section line and 2750 ft west of east section line (west and south section lines indefinite)

Source Footage: Map

Latitude: 41 44 50.45N

Longitude: 103 22 23.31W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: South Bayard

Ground elevation: 3767.47 ft

Source elev: GPS (geodetic)

Depth to water: 4.27 ft

Date measured: 10/28/99

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, mostly fine to medium sand, a little very coarse sand and fine gravel.....	0.0	5.0
Sand, slightly gravelly, sand is fine to very coarse, gravel is fine, quartz and light colored silicates, very little pink, some gray, approximately 25 percent very coarse sand and fine gravel.....	5.0	10.0
Sand, fine to very coarse, approximately 5 percent fine gravel, mostly quartz.....	10.0	15.0
Sand and gravel, gravel is fine to medium, quartz and light colored silicates, some gray granitic grains, a few metamorphics.....	15.0	25.0
Sand, fine to very coarse, approximately 5 percent fine gravel, much quartz; slightly gravelly 35 to 45 ft, approximately 20 percent fine gravel, contains rare lithic light brown siltstone grains....	25.0	45.0
Sand and gravel, gravel is fine to medium, approximately 40 percent very coarse sand to medium gravel.....	45.0	55.0
Sand, slightly gravelly, gravel is fine to medium, approximately 10 percent gravel, much quartz, a few lithic light brown siltstone grains; approximately 25 percent gravel 80 to 90 ft, common siltstone grains of gravel 85 to 90 ft.....	55.0	90.0
Sand, fine to very coarse.....	90.0	95.0

Sand, slightly gravelly, gravel is fine, contains scattered light brown siltstone grains, approximately 10 to 15 percent fine gravel; approximately 30 percent gravel 110 to 115 ft, common lithic grains of siltstone-claystone, very light gray.....	95.0	115.0
Sand, fine to coarse, a little very coarse sand and gravel, rare light brown lithic siltstone grains of gravel; Brule pebbles logged 115 to 120 ft.....	115.0	125.0
Sand, some gravel, gravel is mostly fine, approximately 30 percent very coarse sand and fine gravel, contains rare lithic light brown siltstone grains.....	125.0	140.0
Sand and gravel, gravel is fine to coarse, approximately 40 percent gravel, common light brown lithic siltstone grains and rare fine grained siltstone-sandstone grains; approximately 25 percent gravel 150 to 160 ft.....	140.0	160.0
Sand, fine to very coarse, contains a trace of gravel; common lithic grains and pebbles of siltstone and claystone, very light brown and very light gray 165 to 170 ft.....	160.0	180.0
Sand, a little gravel, gravel is mostly fine, approximately 25 percent very coarse sand and fine gravel, contains a few lithic siltstone grains.....	180.0	190.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, clayey, very light olive-gray, slightly calcareous; slight brown tint 190 to 200 ft; logged as being sticky.....	190.0	220.0

**Test Hole #20-E-98
(21-53-1bbba)
Scotts Bluff County**

Location: NE NW NW NW sec. 1, T. 21 N., R. 53 W., approximately 120 ft south and 650 ft east of northwest corner of section
 Source Footage: Map
 Latitude: 41 49 47.20N
 Longitude: 103 25 07.20W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Bayard Southwest
Ground elevation: 3927.45 ft
 Source elev: GPS (geodetic)
Depth to water: 57.73 ft
 Date measured: 5/9/01
Geophysical Log(s): Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Logged as fill, sand, silt, and gravel.....	0.0	5.0
Sample appears to be land or road fill of silty clay derived from Brule Formation, some sand and gravel in sample including lithic siltstone and claystone grains.....	5.0	10.0
Sand and gravel, approximately 20 percent gravel....	10.0	15.0
Sand, silty, slightly clayey, sand is mostly fine to medium, some coarse sand, light yellow-brown.....	15.0	20.0
Sand, fine to very coarse, silty and in part clayey.	20.0	25.0
Sand, fine to very coarse, a little fine gravel, approximately 15 percent very coarse sand and fine gravel.....	25.0	30.0
Sand and gravel, gravel is fine to coarse, approximately 30 percent gravel, much quartz, some metamorphics, very few dark silicates.....	30.0	40.0
Sand, fine to very coarse, much coarse to very coarse, scattered fine gravel; contains layer of fine sand 90 to 95 ft.....	40.0	95.0
Sand, fine to very coarse, some fine gravel, much fine to coarse sand.....	95.0	100.0
Sand, fine to coarse, some very coarse, contains a few white clayey lithic grains; mostly very fine to medium sand 115 to 120 ft.....	100.0	120.0
Sand, fine to very coarse, much coarse to very coarse sand, contains some fine gravel and a few lithic siltstone and claystone grains; contains slightly more fine gravel 135 to 140 ft.....	120.0	140.0
Sand, very fine to very coarse, rare fine gravel, contains a few lithic light brown siltstone grains.....	140.0	155.0

Sand, some gravel, gravel is mostly fine, approximately 20 percent gravel, common light brown lithic grains.....	155.0	160.0
Sand, fine to very coarse; contains a little fine gravel 160 to 190 ft; mostly fine to coarse sand 175 to 180 ft.....	160.0	190.0
Sand, slightly gravelly, gravel is mostly fine, approximately 10 to 15 percent gravel, contains light brown lithic siltstone grains; contains many grains and cutting of lithic siltstone and fine sandstone 215 to 225 ft.....	190.0	225.0
Sand, fine to very coarse, rare fine gravel.....	225.0	230.0
Sand, fine to very coarse, some fine gravel, approximately 15 percent fine gravel, contains a few lithic grains; approximately 30 percent fine gravel 240 to 245 ft, 250 to 255 ft, and 260 to 272 ft; approximately 40 to 50 percent gravel 260 to 272 ft, gravel is fine to coarse.....	230.0	272.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light brown-gray slightly to moderately calcareous, logged as being sticky.....	272.0	295.0
Clay or mudstone, very light olive-gray, moderately calcareous; logged as being mixed with greenish gray.....	295.0	300.0

**Test Hole #19-E-98
(21-53-3bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 3, T. 21 N., R. 53 W., approximately 40 ft south and 100 ft west of northwest corner of section
 Source Footage: Map
 Latitude: 41 49 46.22N
 Longitude: 103 27 35.40W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Bayard Southwest
Ground elevation: 3841.45 ft
 Source elev: GPS (geodetic)
Depth to water: 12.60 ft
 Date measured: 8/15/00
Geophysical Log(s): Electric (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, moderately sandy, medium gray-brown, slightly calcareous, sand is mostly very fine to fine, some coarser grains including rare lithic gravel.....	0.0	5.0
Silt, slightly clayey, slightly sandy, sand is mostly fine, light yellow- to brown-gray, contains some yellow-brown stain, moderately calcareous....	5.0	9.0
Gravel, sandy, gravel is fine to coarse, approximately 60 percent gravel, quartz with rare mafic grains; contains abundant whitish gray fine-grained calcareous sandstone and a few light brown siltstone grains; fewer lithic grains 20 to 25 ft.	9.0	25.0
Sand, some gravel, gravel is fine to coarse, approximately 25 percent gravel, lithic siltstone and sandstone gravel grains common; less gravel 45 to 50 ft.....	25.0	58.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Sandstone, moderately clayey, in part slightly sandy, contains very fine sand, very light reddish brown, moderately calcareous; contains a few yellow-brown iron-stained spots in upper few feet; slightly sandy 65 to 75 ft, sand is mostly very fine to fine, rare medium sand grains.....	58.0	80.0

**Test Hole #18-E-98
(21-53-6aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 6, T. 21 N., R. 53 W., approximately 250 ft south and 15 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 49 44.04N
Longitude: 103 29 56.59W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Bayard SW

Ground elevation: 3893.62 ft
Source elev: GPS (geodetic)

Depth to water: 62.0 ft
Date measured: 7/24/98

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand and gravel, fine to coarse gravel, a few pebbles, approximately 60 percent gravel, quartz with a few pink and dark silicates; approximately 30 percent gravel 5 to 15 ft.....	0.0	15.0
Sand, a little gravel, gravel is mostly fine, much coarse to very coarse sand, much quartz, approximately 10 to 20 percent gravel; common light brown siltstone grains 45 to 85 ft; approximately 10 percent gravel 40 to 65 ft; approximately 5 to 10 percent gravel 80 to 85 ft.....	15.0	85.0
Sand, fine to very coarse, much coarse sand.....	85.0	100.0
Sand, some gravel, gravel is mostly fine, approximately 15 to 25 percent gravel, quartz with light and a few dark silicates and lithic siltstone pebbles; cobbles logged from 137 to 140 ft.....	100.0	140.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to very clayey, very light brown, slightly to moderately calcareous; logged as being sticky and firm; sample missing 150 to 155 ft.....	140.0	180.0
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**Test Hole #18-M-98
(21-53-7aaad)
Scotts Bluff County**

Location: SE NE NE NE sec. 7, 21 N., R. 53 W., approximately 450 ft south and 50 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 48 51.05N
Longitude: 103 29 57.39W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3822.62 ft
Source elev: GPS (geodetic)

Depth to water: 5.31 ft
Date measured: 6/8/00

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately to very clayey, slightly to moderately sandy, sand is fine to coarse, very light brown-gray, moderately calcareous, contains limy areas.....	0.0	2.5
Sand, slightly gravelly, gravel is mostly fine, approximately 40 percent very coarse sand and fine gravel, quartz with a few dark mafic grains.....	2.5	15.0
Sand, fine to very coarse, scattered gravel grains, mostly quartz, a few mafic and lithic siltstone and claystone grains; approximately 15 percent gravel 45 to 50 ft; contains a few light green claystone grains 55 to 60 ft.....	15.0	95.0
Sand, fine to very coarse, approximately 5 to 10 percent fine gravel, lithic siltstone grains common; siltstone and claystone lithic grains abundant 105 to 135 ft, approximately 15 percent fine gravel, contains a few medium gravel-size siltstone grains and pebbles.....	95.0	135.0
Sand, some gravel, gravel is mostly fine, much quartz, lithic siltstone grains abundant, approximately 25 percent gravel, some siltstone pebbles; interval 155 to 170 ft logged as including clay and silt, light gray, samples suggest that silt and clay may be lithic pebbles and cobbles.....	135.0	180.0
Sand, fine to very coarse, a little fine gravel, much very coarse sand, much quartz, some mafic grains; sand is mostly fine to coarse, some very coarse 185 to 191 ft.....	180.0	191.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light brown,
slightly to moderately calcareous..... 191.0 200.0

**Test Hole #27-37
(21-53-7abba)
Scotts Bluff County**

Location: NE NW NW NE sec. 7, T. 21 N., R. 53 W., approximately
2200 feet west and 220 feet south of northeast corner
Source Footage: Map

Latitude: 41 48 57N
Longitude: 103 30 33W
Source Lat/Long: Map
7.5-minute Quad Map Name: Minatare

Ground elevation: 3824 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, slightly silty, very slightly sandy, sand is scattered, medium dark brown-gray, slightly calcareous.....	0.0	3.5
Sample missing 3.5 to 85 ft; logged as gravel, some lithic grains at 35 ft.....	3.5	85.0
Sand and gravel (one sample) logged as containing many lithic grains 85 to 92 ft and a blue silty sand at 135 ft.....	85.0	195.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, clayey, pale brown, slightly calcareous...	195.0	212.0
Mudstone, clayey, very light yellowish to brownish gray, noncalcareous.....	212.0	224.0

**Test Hole #18-F-98
(21-53-8cccd)
Scotts Bluff County**

Location: SE SW SW SW sec. 8, 21 N., R. 53 W., approximately 20 ft north and 400 ft east of southwest corner of section
Source Footage: Map

Latitude: 41 48 03.15N
Longitude: 103 29 52.05W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3819.44 ft
Source elev: GPS (geodetic)

Depth to water: 7.16 ft
Date measured: 2/24/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, silty, slightly sandy, mostly fine sand, medium brown-gray and light gray, slightly calcareous; sample logged as road fill and soil; sample contains a few light brown siltstone grains.....	0.0	4.0
Sand and gravel, gravel is fine to medium, approximately 30 percent gravel, much quartz, rare pink, some dark gray silicates; approximately 40 percent very coarse sand and gravel 10 to 15 ft, contains a few light brown siltstone grains.....	4.0	30.0
Sand, slightly gravelly, gravel is fine to medium, approximately 20 percent gravel, much quartz, some pink and rare dark colored grains, contains a trace of siltstone grains.....	30.0	35.0
Sand, fine to very coarse, contains a little fine gravel, mostly quartz, a few pink and dark colored grains.....	35.0	85.0
Sand, fine to coarse, some very coarse, much quartz; less coarse sand, very little very coarse sand 90 to 95 ft.....	85.0	95.0
Sand, fine to very coarse, contains a trace of fine gravel, much quartz, 5 to 10 percent fine gravel 105 to 110 ft.....	95.0	135.0
Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel, much quartz, a few pink and dark gray grains, contains a few siltstone grains.....	135.0	141.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light brown,
slightly calcareous, contains rare very fine to
fine sand grains..... 141.0 160.0

**Test Hole #19-F-98
(21-53-10ccdc)
Scotts Bluff County**

Location: SW SE SW SW sec. 10, T. 21 N., R. 53 W., approximately 200 ft north and 900 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 48 03.21N

Longitude: 103 27 23.13W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3808.23 ft

Source elev: GPS (geodetic)

Depth to water: 5.16 ft

Date measured: 2/24/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, slightly to in part moderately sandy, sand is very fine to fine, light brown-gray, yellow tint, moderately calcareous....	0.0	5.0
Silt, moderately to very clayey, light medium gray, slightly calcareous, contains some embedded sand..	5.0	9.5
Sand and gravel, gravel is fine to medium, approximately 50 percent gravel, much quartz, a few mafic grains and rare red and dark silicates; approximately 30 percent gravel 20 to 25 ft.....	9.5	25.0
Sand, some gravel, much fine to very coarse sand, approximately 10 to 15 percent fine, some medium gravel, quartz with some mafic grains, lithic siltstone grains rare to common; mostly fine to coarse sand with some very coarse sand and rare gravel 60 to 67 ft, much quartz.....	25.0	67.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light reddish brown, very slightly calcareous, may be interbedded with less indurated clayey silt.....	67.0	80.0
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**Test Hole #20-F-98
(21-53-11dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 11, T. 21 N., R. 53 W., approximately 50 ft north and 10 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 48 01.25N
Longitude: 103 25 16.98W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3885.72 ft
Source elev: GPS (geodetic)

Depth to water: 23.62 ft
Date measured: 2/24/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is very fine to fine, dark brown-gray, noncalcareous..... 0.0 4.0

Silt, slightly to in part moderately sandy, sand is mostly very fine, light yellow-brown, moderately calcareous; contains some sand and gravel 9 to 10 ft..... 4.0 10.0

Sand, some gravel, gravel is mostly fine; silty 10 to 15 ft..... 10.0 20.0

Sand and gravel, gravel is fine to medium, approximately 30 percent gravel, quartz and light colored silicates, a few dark colored metamorphics; approximately 15 percent gravel 25 to 34 ft..... 20.0 34.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, silty, moderately clayey, silt is fine grained, light reddish brown, moderately calcareous; light brown 45 to 60 ft; interval from 34 to 60 ft logged as sticky..... 34.0 60.0

**Test Hole #28-37
(21-53-18cbbb)
Scotts Bluff County**

Location: NW NW NW SW sec. 18, T. 21 N., R. 53 W., approximately 75 feet north of bridge and just east of road

Source Footage: Map

Latitude: 41 47 35N

Longitude: 103 31 06W

Source Lat/Long: Map

7.5-minute Quad Map Name: Minatare

Ground elevation: 3823 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	Depth, in feet	
	From	To

Quaternary System, undifferentiated:

Sand, very fine to coarse, some coarse sand and fine gravel.....	0.0	16.0
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Sand and gravel, gravel is mostly fine to medium, quartz with pink and a few metamorphic and dark grains.....	16.0	54.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, pale brown, noncalcareous.....	54.0	77.0
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**Test Hole #19-G-98
(21-53-22cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 22, T. 21 N., R. 53 W., approximately 50 ft north and 50 ft east of southwest corner of section
Source Footage: Map

Latitude: 41 46 17.58N

Longitude: 103 27 37.17W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3798.41 ft

Source elev: GPS (geodetic)

Depth to water: 4.99 ft

Date measured: 9/29/99

Geophysical Log(s): Electric (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, very clayey, slightly to in part very sandy, medium brown-gray and light gray, slightly calcareous.....	0.0	3.0
Sand, fine to very coarse, some gravel, gravel is mostly fine, approximately 30 percent very coarse sand and fine gravel, quartz with a few mafic grains and scattered light brown lithic siltstone grains.....	3.0	60.0
Sand, some gravel, gravel mostly fine, some medium gravel, much quartz, a few dark colored and pink grains, some lithic siltstone and fine-grained calcareous sandstone clasts; contains a trace of coal 60 to 65 ft.....	60.0	70.0
Gravel, sandy, abundant lithic calcareous sandstone grains, approximately 70 percent gravel.....	70.0	90.0
Sand and some gravel, gravel is mostly fine, approximately 15 to 20 percent gravel, lithic grains common; mostly sand 100 to 105 ft; occasional light brown siltstone pebbles 110 to 124 ft.....	90.0	124.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light reddish brown, noncalcareous; very light brown 130 to 140 ft, in part slightly calcareous; moderately calcareous 135 to 140 ft.....	124.0	140.0

**Test Hole #20-G-98
(21-53-23dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 23, T. 21 N., R. 53 W., approximately 100 ft north and 50 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 46 16.45N

Longitude: 103 25 18.84W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3789.85 ft

Source elev: GPS (geodetic)

Depth to water: 6.20 ft

Date measured: 9/29/99

Geophysical Log(s): Electric (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil and road fill, silt, moderately to very sandy, moderately clayey, medium dark brown and very light gray, moderately calcareous; some gravel in sample.....	0.0	5.0
Gravel, sandy, gravel is fine to coarse, quartz with light colored and gray silicates, a few metamorphic grains, approximately 50 percent gravel...	5.0	15.0
Sand and gravel, much quartz, rare pink grains, approximately 30 percent gravel.....	15.0	30.0
Sand, slightly gravelly, much quartz, a few dark grains, approximately 15 percent fine, a little medium gravel, rare lithic siltstone and sandstone grains.....	30.0	35.0
Sand, fine to very coarse, quartz, contains approximately 5 percent gravel.....	35.0	75.0
Sand, fine to very coarse.....	75.0	85.0
Sand, fine to very coarse, a little fine gravel, approximately 5 to 10 percent fine gravel, contains rare lithic grains of light brown siltstone.	85.0	100.0
Sand, slightly gravelly, sand is fine to very coarse, gravel is mostly fine, much quartz, a few light and dark silicates and lithic siltstone and sandstone grains.....	100.0	115.0
Sand, fine to very coarse, mostly quartz, a few lithic grains of siltstone, rare grains of sandy ironstone.....	115.0	140.0

Sand and gravel, gravel is mostly fine, much very coarse sand, quartz with light and dark silicates, a few siltstone grains, approximately 30 percent gravel; approximately 15 percent gravel 160 to 165 ft.....	140.0	170.0
Sand, some gravel, gravel is mostly fine, approximately 15 percent gravel, common dark gray silicates, much quartz.....	170.0	191.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, slightly silty, moderately to very clayey, very light brown-gray, slightly calcareous; very light olive-gray 195 to 200 ft, slightly calcareous; light-olive 205 to 210 ft, contains rare very fine sand grains.....	191.0	210.0

**Test Hole #32-37
(21-53-25dbcb)
Scotts Bluff County**

Location: NW SW NW SE sec. 25, T. 21 N., R. 53 W., approximately
0.3 mile east of river bridge on north side of road

Source Footage: Map

Latitude: 41 45 42N

Longitude: 103 24 42W

Source Lat/Long: Map

7.5-minute Quad Map Name: Bayard SW

Ground elevation: 3780 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, very sandy, sand is mostly very fine to fine, contains some scattered coarser sand and a few gravel grains, dark brown-gray, slightly calcareous.....	0.0	3.0
Sand and gravel, sand is mostly fine to medium, pink with some dark silicates.....	3.0	45.0
Sand, much fine to coarse sand, approximately 20 percent very coarse sand and a trace of fine gravel.....	45.0	78.0
Sand and gravel, logged as coarse with boulders, hard drilling, contains a few lithic and metamorphic grains (one sample).....	78.0	196.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone and mudstone, very light brown and very light brownish gray, slightly to moderately calcareous.....	196.0	208.0
Mudstone, very light olive-gray, some very light brownish gray, noncalcareous; logged as green clay.....	208.0	224.0

**Test Hole #18-H-98
(21-53-28bbda)
Scotts Bluff County**

Location: NE SE NW NW sec. 28, T. 21 N., R. 53 W., approximately 950 ft south and 950 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 46 06.96N

Longitude: 103 28 32.85W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3809.78 ft

Source elev: GPS (geodetic)

Depth to water: 13.70 ft

Date measured: 9/29/99

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, mostly very fine to fine sand, medium brown-gray, a little light gray, noncalcareous.....	0.0	5.0
Sand and gravel, gravel is fine to coarse, quartz with some pink and dark gray silicates; contains a few light brown siltstone grains 10 to 15 ft.....	5.0	15.0
Sand, fine to very coarse, approximately 5 to 10 percent gravel.....	15.0	27.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, light reddish brown, slightly to noncalcareous; essentially noncalcareous 30 to 45 ft.....	27.0	45.0
Siltstone, moderately clayey, silt is in part coarse, contains rare volcanic glass shards, very light reddish brown, moderately calcareous.....	45.0	50.0
Siltstone, moderately clayey, very light reddish brown, slightly to noncalcareous.....	50.0	55.0
Siltstone, moderately clayey, silt is fine to in part coarse, very light reddish brown, slightly calcareous, contains rare volcanic glass shards...	55.0	60.0

**Test Hole #18-J-98
(21-53-31cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 31, T. 21 N., R. 53 W., approximately 50 ft north and 50 ft east of southwest corner of section
Source Footage: Map

Latitude: 41 44 31.17N
Longitude: 103 31 07.05W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Wright Gap

Ground elevation: 3910.45 ft
Source elev: GPS (geodetic)

Depth to water: 41.05 ft
Date measured: 9/29/99

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, sand is mostly very fine to fine, some medium, rare coarse grains, light medium brown-gray, noncalcareous.....	0.0	5.0
Silt, moderately sandy, sand is mostly very fine, light yellow-brown, slightly calcareous, contains trace of limy nodules and rootlets.....	5.0	13.5
Silt, slightly sandy, slightly clayey, sand is mostly very fine, light yellow-brown, moderately calcareous; in part contains fine to medium sand 20 to 25 ft and in part, light brown-gray and slightly to noncalcareous.....	13.5	25.0
Silt, moderately to very clayey, light yellow-brown, slightly calcareous.....	25.0	30.0
Silt, slightly clayey, slightly sandy, sand is very fine to fine with a trace of coarser grains, light yellow-brown, moderately calcareous; moderately sandy 35 to 40 ft, contains rare snail shell fragments.....	30.0	40.0
Silt, moderately clayey, in part slightly to moderately sandy, sand is mostly very fine to fine, light yellow-brown, moderately calcareous, contains a trace of lithic siltstone gravel grains; from 48 to 53 ft contains common lithic gravel grains of calcareous fine grained sandstone, very light gray and a few light brown siltstone grains.	40.0	53.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light brown, slightly calcareous, may be slightly sandy in upper few feet, sand is very fine to fine; light brown 70 to 75 ft, contains a few very fine to medium sand grains.....	53.0	75.0
Siltstone, moderately clayey, light brown, moderately calcareous.....	75.0	80.0

**Test Hole #19-H-98
(21-53-33adaa)
Scotts Bluff County**

Location: NE NE SE NE sec. 33, T. 21 N., R. 53 W., approximately 1450 ft south and 50 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 45 09.07N

Longitude: 103 27 38.27W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3827.2 ft

Source elev: GPS (geodetic)

Depth to water: 34.92 ft

Date measured: 9/29/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, sand is very fine to fine, light yellow-brown, very slightly calcareous.....	0.0	5.0
Silt, moderately to very sandy, slightly clayey, in part sand is very fine to fine, light yellow-brown, slightly calcareous, contains a trace of lithic siltstone grains.....	5.0	10.0
Silt, moderately sandy, sand is mostly very fine, rare fine and a trace of medium sand, light yellow-brown, slightly calcareous.....	10.0	18.0
Silt, very slightly clayey, light yellow-brown, slightly calcareous; a few siltstone grains noted in field log.....	18.0	25.0
Silt, slightly clayey, very slightly sandy, mostly embedded sand, light yellow-brown to very light brown-gray, very slightly calcareous.....	25.0	30.0
Silt, moderately to very clayey, light and medium gray, contains some small limy areas, slightly calcareous, contains a trace of snail shells 30 to 35 ft; mostly light gray, some medium gray 35 to 43 ft; contains scattered sand grains 35 to 43 ft.	30.0	43.0
Sand, fine to very coarse, a little fine gravel, much quartz, a few lithic siltstone grains; poor sample recovery noted in field log.....	43.0	63.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to very clayey, very light brown, very slightly calcareous, moderately well indurated, blocky structure, slightly calcareous

70 to 80 ft..... 63.0 80.0

**Test Hole #20-H-98
(21-53-36bdd)
Scotts Bluff County**

Location: SE SE NW NW sec. 36, T. 21 N., R. 53 W., approximately 1100 to 1200 ft south of indefinite north section line and 1150 ft east of northeast corner of section (approximately 4100 ft north of south section line)

Source Footage: Map

Latitude: 41 45 12.23N

Longitude: 103 25 04.32W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3781.6 ft

Source elev: GPS (geodetic)

Depth to water: 3.25 ft

Date measured: 9/29/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly to in part moderately clayey, moderately sandy, sand is mostly very fine to fine; noncalcareous.....	0.0	2.0
Silty sand and gravel.....	2.0	5.0
Sand, slightly gravelly, sand is fine to very coarse, gravel is fine to medium, approximately 10 percent gravel, much quartz, a few dark mafic grains.....	5.0	20.0
Sand, fine to very coarse, much coarse to very coarse, contains scattered fine gravel.....	20.0	40.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, slightly sandy, sand is very fine to fine, light brown, slightly calcareous; moderately sandy 45 to 55 ft, contains a trace of medium sand and volcanic ash.....	40.0	60.0
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**Test Hole #33-37
(21-53-36dccc)
Scotts Bluff County**

Location: SW SW SW SE sec. 36, T. 21 N., R. 53 W., approximately
0.5 mile west of southeast corner
Source Footage: Map
Latitude: 41 44 33N
Longitude: 103 24 43W
Source Lat/Long: Map
7.5-minute Quad Map Name: McGrew
Ground elevation: 3777 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly to moderately clayey, moderately sandy, sand is very fine with some fine, dark brown-gray; some very sandy silt in sample, sand is mostly very fine, light brown-gray, non- to in part slightly calcareous.....	0.0	7.0
Clay, slightly silty, very slightly sandy, light gray with some mottled dark gray, moderately calcareous, compact, contains shell fragments.....	7.0	12.0
Sand and gravel, gravel is fine to medium, approximately 30 to 40 percent gravel, many pink and few dark grains.....	12.0	32.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
One sample 32 to 84 ft: siltstone, sandy siltstone and some claystone, sand is mostly very fine, very light brown with some light reddish brown claystone, most cuttings slightly to moderately calcareous.....	32.0	84.0

**Test Hole #16-F-98
(21-54-3bbcc)
Scotts Bluff County**

Location: SW SW NW NW sec. 3, T. 21 N., R. 54 W., approximately 1450 ft south and 30 ft east of northwest corner of elongated section (north to south)

Source Footage: Map

Latitude: 41 49 35.32N

Longitude: 103 34 38.98W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3847.09 ft

Source elev: GPS (geodetic)

Depth to water: 6.59 ft

Date measured: 8/14/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand and gravel, silty clay matrix in upper part, gravel is fine to coarse.....	0.0	5.0
Sand and gravel, gravel is fine to coarse, occasional pebbles, common dark mafic grains, a few metamorphic grains, approximately 60 to 70 percent gravel.....	5.0	20.0
Sand and gravel, gravel is fine to coarse, much quartz, common pink silicates, a few dark mafic grains, rare lithic grains, approximately 50 percent gravel.....	20.0	35.0
Sand, some gravel, gravel is mostly fine to medium, considerable coarse to very coarse sand, approximately 20 percent gravel, much quartz, a few pink silicates and dark mafic grains, rare lithic grains.....	35.0	45.0
Sandy gravel, considerable lithic gravel and pebbles, approximately 75 percent gravel; considerably more sand 50 to 55 ft, approximately 30 percent gravel.....	45.0	60.0
Sand, fine to very coarse, scattered fine to coarse gravel and pebbles, field log notes poor sample recovery 60 to 80 ft; considerable lithic grains 75 to 80 ft.....	60.0	80.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Silt, moderately clayey, very light brown-gray, moderately calcareous, poorly indurated, logged as soft and sticky; very light brown- to olive-gray 85 to 90 ft.....	80.0	90.0
Siltstone, moderately clayey, very light olive-gray, slight brown tint, slightly to moderately calcareous.....	90.0	95.0

**Test Hole #15-H-98
(21-54-7abbc)
Scotts Bluff County**

Location: SW NW NW NE sec. 7, T. 21 N., R. 54 W., approximately 550 ft south and 2500 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 48 47.50N
 Longitude: 103 37 34.32W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3875 ft
 Source elev: GPS (geodetic)

Depth to water: 11.92 ft
 Date measured: 5/7/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
 From To

Quaternary System, undifferentiated:

Silt, slightly clayey, slightly to in part moderately sandy, sand is mostly fine, contains a few medium to coarse sand grains, light medium brown-gray, slightly calcareous, contains slightly more coarse sand and a trace of gravel 5 to 10 ft, contains rare lithic siltstone grains.....	0.0	10.0
Sand, some gravel, composed primarily of lithic siltstone, claystone and fine grained sandstone grains.....	10.0	14.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to very clayey, very light yellow-brown to very light brown-gray, noncalcareous, massive; slightly calcareous 25 to 30 ft, moderately calcareous 30 to 60 ft, contains a few limy areas 40 to 45 ft; slightly less clayey 45 to 60 ft.....	14.0	60.0
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**Test Hole #17-G-98
(21-54-13addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 13, T. 21 N., R. 54 W., approximately 2400 ft south and 100 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 47 38.03N

Longitude: 103 31 10.05W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3821.41 ft

Source elev: GPS (geodetic)

Depth to water: 3.79 ft

Date measured: 5/12/99

Geophysical Log(s): Electric (R), Gamma, Caliper

	Depth, in feet	
	From	To

Quaternary System, undifferentiated:

Sand, clayey, very light gray, sand is fine to coarse.....	0.0	2.0
Sand and gravel, gravel is fine to coarse, much quartz, a few dark mafic and trace of metamorphic grains, approximately 60 percent gravel.....	2.0	25.0
Sand, some gravel, gravel is mostly fine to medium, approximately 25 percent gravel, contains a few lithic siltstone grains; common lithic grains 35 to 40 ft and 50 to 86 ft.....	25.0	86.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, very light yellow-brown, slightly calcareous, slightly granular structure, logged as sticky 95 to 100.....	86.0	100.0
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**Test Hole #17-H-98
(21-54-13ddda)
Scotts Bluff County**

Location: NE SE SE SE sec. 13, T. 21 N., R. 54 W., approximately 500 ft north and 200 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 47 15.34N

Longitude: 103 31 11.98W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3821.68 ft

Source elev: GPS (geodetic)

Depth to water: 7.30 ft

Date measured: 9/29/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, slightly clayey, sand is mostly very fine, contains some coarser grains, light brown-gray, very slightly calcareous.....	0.0	2.0
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Sand and gravel, interbedded coarse and fine grained, logged as containing about 20 percent pebbles, mostly quartz; sandy silt layer or ball 19 to 20 ft, very light olive-gray, slightly iron stained.....	2.0	20.0
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Sand and gravel, gravel is mostly fine to medium, some pebbles of siltstone and calcareous siltstone-sandstone, approximately 30 percent gravel; mostly fine to very coarse sand 50 to 55 ft; common lithic grains of very light brown siltstone and claystone 55 to 62 ft.....	20.0	62.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, fine grained, very light yellow-brown, slightly to moderately calcareous, massive, logged as sticky.....	62.0	80.0
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**Test Hole #15-I-98
(21-54-20bbcb)
Scotts Bluff County**

Location: NW SW NW NW sec. 20, T. 21 N., R. 54 W., approximately 700 ft south and 75 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 47 00.48N

Longitude: 103 36 58.98W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3945.33 ft

Source elev: GPS (geodetic)

Depth to water: 26.4 ft

Date measured: 3/9/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, very slightly clayey, sand is mostly very fine to fine, dark brown-gray, noncalcareous, contains some sandy to clayey silt in lower part.....	0.0	5.0
Silt, slightly to moderately clayey, slightly to in part moderately sandy, sand is very fine to fine, light brownish gray, moderately calcareous.....	5.0	10.0
Silt, moderately to very clayey, light brown, moderately calcareous, slightly indurated.....	10.0	15.0
Silt, slightly to in part moderately clayey, silt is fine to coarse, light brown, moderately calcareous; slightly calcareous 25 to 34 ft, mostly moderately clayey 20 to 34 ft, common rounded claystone and siltstone grains 25 to 34 ft; logged as lithic coarse sand 25 to 34 ft.....	15.0	34.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to very clayey, light brown, slightly calcareous, sample contains a few rounded siltstone-claystone grains, logged as <i>sticky</i> ; contains a little coarse silt to very fine sandy silt 40 to 45 ft; contains rare small lithic claystone grains 50 to 60 ft; moderately calcareous 50 to 60 ft.....	34.0	60.0
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Note: An alternative correlation is that the top of the Orella is at 10 ft

**Test Hole #17-I-98
(21-54-24dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 24, T. 21 N., R. 54 W., approximately 30 ft north and 50 ft west of southeast corner of section
 Source Footage: Map
 Latitude: 41 46 16.91N
 Longitude: 103 31 09.45W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Minatare
Ground elevation: 3844.97 ft
 Source elev: GPS (geodetic)
Depth to water: 17.81 ft
 Date measured: 9/29/99
Geophysical Log(s): Caliper

	<u>Depth, in feet</u>	
	From	To
Silt, slightly clayey, slightly to very sandy, mostly very fine to fine sand, contains some coarser sand and a few gravel grains, light brown-gray, slightly calcareous.....	0.0	5.0
Silt, very slightly clayey, very sandy, sand is mostly very fine to fine, light yellow-brown, slightly calcareous; contains a trace of gravel and rare lithic grains.....	5.0	13.0
Silt, moderately clayey, slightly to in part very sandy, sand is mostly very fine to fine, some coarser grains, light brown-gray, slightly to moderately calcareous; contains a few shell fragments 20 to 25 ft.....	13.0	25.0
Silt, moderately clayey, slightly sandy, sand is mostly very fine, light medium brown-gray, moderately calcareous.....	25.0	30.0
Silt, slightly to moderately clayey, moderately to in part very sandy, sand is mostly very fine to medium, dark brown-gray, thin sand and gravel logged at 32 ft.....	30.0	35.0
Sand, some gravel, gravel is mostly fine; mostly sand 40 to 45 ft.....	35.0	45.0
Silt, slightly clayey, very sandy, sand is mostly very fine, light gray to light brown-gray, moderately calcareous, contains limy areas; interval drilled very fast, logged as sand.....	45.0	50.0
Sand, some gravel, possibly silty and clayey, may contain lithic pebbles and boulders; may have interbedded clayey to sandy silt layers 55 to 60 ft; abundant lithic grains of light brown siltstone 60 to 70 ft.....	50.0	±70.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone to sandstone, sand is mostly very fine, may contain some coarser sand grains, light yellow-brown, slightly calcareous.....	±70.0	79.0
Siltstone-mudstone, moderately clayey, very light brown-gray, slightly calcareous; drilled slower below 70 ft; some very light yellow-brown 85 to 90 ft.....	79.0	90.0
Siltstone, moderately clayey, some sandy siltstone and mudstone (interbedded?), firm drilling logged as somewhat sticky 95 to 110 ft, very light yellow-brown to very light yellow-gray, slightly to moderately calcareous.....	90.0	110.0

**Test Hole #29-37
(21-54-24dccc)
Scotts Bluff County**

Location: SW SW SW SE sec. 24, T. 21 N., R. 54 W., approximately
0.45 mile west of southeast corner, north side of road
Source Footage: Map

Latitude: 41 46 17N
Longitude: 103 31 40W
Source Lat/Long: Map
7.5-minute Quad Map Name: Minatare

Ground elevation: 3856 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, in part slightly clayey, mostly moderately to very sandy, sand is very fine with some fine, medium brown-gray with some light brown-gray, slightly calcareous.....	0.0	16.0
Silt, moderately to in part very clayey, slightly sandy, sand is mostly very fine to medium, light yellow-brown, slightly calcareous; some medium dark brown-gray silt in sample.....	16.0	21.0
Lithic sand, some gravel, consists mostly of silt-stone with some sandstone and crystalline grains..	21.0	26.0
Lithic sand and gravel, gravel is fine to medium....	26.0	35.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, in part moderately clayey and fine grained and in part coarse grained and very slightly sandy, sand is very fine, light reddish brown and light yellow-brown, slightly to in part noncalcareous.....	35.0	63.0
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**Test Hole #30-37
(21-54-34ddcd)
Scotts Bluff County**

Location: SE SW SE SE sec. 34, T. 21. N., R. 54 W., approximately
900 feet west of southeast corner on north edge of road
Source Footage: Map
Latitude: 41 40 30N
Longitude: 103 33 37W
Source Lat/Long: Map
7.5-minute Quad Map Name: Wright Gap
Ground elevation: 3948 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately to very sandy, sand is mostly very fine to fine, medium dark brown-gray; scattered gravel grains in sample.....	0.0	5.0
Silt, in part slightly clayey, silt is fine to coarse, light yellow-brown, slightly calcareous; sample contains a little dark brown-gray silt; contains some rounded siltstone, a few limy grains and a trace of crystalline gravel 15 to 29 ft.....	5.0	29.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, in part moderately clayey, in part fine grained and in part moderately sandy, sand is very fine to fine, moderately well indurated, mostly pinkish brown, noncalcareous, appears to have some thin layers.....	29.0	42.0

**Test Hole #19-37
(21-55-2cbba)
Scotts Bluff County**

Location: NE NW NW SW sec. 2, T. 21 N., R. 55 W., approximately
0.5 mile north and 0.13 mile east of southwest corner,
south side of road
Source Footage: Map

Latitude: 41 49 17N

Longitude: 103 40 22W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3963 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very slightly clayey, moderately sandy, silt is fine to very coarse, sand is very fine, light medium reddish brown, slightly to moderately calcareous.....	0.0	20.0
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Silt, slightly to in part moderately clayey, slightly sandy, sand is very fine, light medium reddish brown, slightly calcareous.....	20.0	33.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately sandy, sand is very fine, very light brownish gray.....	33.0	36.0
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Siltstone, in part moderately clayey, mottled or interbedded very light olive-gray, slightly calcareous; moderately well indurated; field log indicates interval 36 to 40 ft was greenish.....	36.0	50.0
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Siltstone, some mudstone-siltstone, mottled or interbedded very light olive-gray and very light brown-gray, noncalcareous, moderately well indurated.....	50.0	75.0
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Siltstone, some mudstone, mostly very light yellowish and brownish gray, noncalcareous, moderately well indurated.....	75.0	83.0
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**Test Hole #13-I-98
(21-55-9acab)
Scotts Bluff County**

Location: NW NE SW NE sec. 9, T. 21 N., R. 55 W., approximately 1550 ft south and 1700 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 48 35.40N

Longitude: 103 42 00.71W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 4168.03 ft

Source elev: GPS (geodetic)

Depth to water: 39.66 ft

Date measured: 5/7/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silty sand and sandy silt, in part slightly clayey, sand is mostly very fine to fine with rare coarser quartz grains and scattered lithic gravel, light brown-gray, in part calcareous.....	0.0	5.0
Silt, very sandy, sand is very fine to fine, light yellow-brown, slightly calcareous, contains lithic pebbles.....	5.0	10.0
Sand, gravel and pebbles consisting mainly of rounded clasts of siltstone and mudstone.....	10.0	22.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, light brown, slightly calcareous, silt is fine to medium, moderately well indurated; thin whitish-gray volcanic ash lens logged in field in 45 to 50 ft interval; a few cuttings of white clay noted in sample from approximately 47 to 48 ft (electric log).....	22.0	80.0
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**Test Hole #20-37
(21-55-15cccb)
Scotts Bluff County**

Location: NW SW SW SW sec. 15, T. 21 N., R. 55 W., approximately
0.12 mile north of southwest corner, east side of road
Source Footage: Map

Latitude: 41 47 12N

Longitude: 103 41 35W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3989 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	Depth, in feet	
	From	To

Quaternary System, undifferentiated:

Silt, slightly clayey, moderately sandy, sand is mostly very fine, some fine, light yellowish to brownish gray with some light brown, slightly calcareous.....	0.0	7.0
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Silt, slightly clayey, moderately sandy, sand is mostly very fine, light reddish brown, slightly calcareous.....	7.0	22.0
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No sample, logged as less clayey than interval above.....	22.0	37.0
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Lithic sand and gravel, gravel is fine to medium consisting of siltstone, claystone, sandstone and a trace of limy grains.....	37.0	40.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, mostly moderately clayey, pale reddish brown; slightly calcareous, moderately well indurated.....	40.0	83.0
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**Test Hole #13-J-98
(21-55-16dadd)
Scotts Bluff County**

Location: SE SE NE SE sec. 16, T. 21 N., R. 55 W., approximately 1350 ft north and 50 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 47 19.97N

Longitude: 103 41 38.09W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 4012.5 ft

Source elev: GPS (geodetic)

Depth to water: 49.33 ft

Date measured: 3/3/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is very fine to fine, light brown-gray, in part slightly calcareous; contains rare lithic grains.....	0.0	5.0
Sand, very silty and silt, slightly clayey and moderately sandy, sand is mostly very fine, light brown, slightly calcareous.....	5.0	10.0
Silt, moderately sandy, silt is coarse, sand is very fine, light yellow-brown, slightly calcareous.....	10.0	22.0
Silt, slightly sandy, silt is coarse, sand is very fine, light yellow-brown to brownish gray, slightly calcareous; contains a trace of light medium gray clay and pyrite 22 to 25 ft; light yellow-brown 25 to 40 ft; slightly finer grained, very slight induration 30 to 40 ft.....	22.0	40.0
Silt, slightly sandy, very slightly clayey, silt is coarse, sand is very fine, light yellow-brown, slightly calcareous; contains rare pyrite crystals; contains a limy concretion or pebbles of calcareous siltstone 42 to 42.5 ft.....	40.0	45.0
Lithic gravel, consists mainly of siltstone, claystone and limy siltstone-sandstone.....	45.0	49.5

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, light brown, slightly to moderately calcareous, moderately well indurated, silt is mostly fine to medium; contains a trace of pyrite; contains a hard limy layer or concretion about 60.5 ft.....

49.5

80.0

**Test Hole #13-B-92
(21-55-21dada)
Scotts Bluff County**

Location: NE SE NE SE sec. 21, T. 21 N., R. 55 W., 1348 feet north of south section line and 94 feet west of east section line

Source Footage: Field

Latitude: 41 46 26N

Longitude: 103 41 37W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3987 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): Electric (R and S), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, sand is mostly very fine to fine, dark brown-gray, slightly calcareous, contains some organic material and scattered lithic siltstone grains; common lithic grains 10 to 12.8 ft.....	0.0	12.8
Lithic sand and gravel, composed primarily of brown to pinkish brown siltstone with some fine grained sandstone clasts.....	12.8	20.5
Sand, some lithic gravel, arkosic sand is mostly fine to coarse, much coarse sand.....	20.5	32.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, silt is fine to very coarse, rare very fine sand, very light brown with some mottled very light olive-gray to very light greenish gray, very very slightly calcareous; common mottled very light olive-gray to very light greenish gray 43.8 to 50 ft and 60.5 to 61.7 ft; root holes 61 to 61.7 ft.....	32.0	61.7
Siltstone, very light brown with some light greenish gray mottled; moderately calcareous 62.8 to 69.6 ft.....	61.7	69.6
Mudstone, very light greenish gray, moderately to very calcareous; some mottled very light brown 73.2 to 76.1 ft; contains small burrows 70.5 to 72.2 and 74.5 to 73.3 ft, slightly calcareous; contains some volcanic ash and biotite mica 74.5 to 75.3 ft and 75.3 to 76.1 ft.....	69.6	76.1
Mudstone, very light brown-gray, very calcareous....	76.1	77.2

Mudstone, mottled very light brown-gray and very light greenish gray, slightly calcareous; very calcareous 78.6 to 82.8 ft; mostly very light brown 82 to 82.8 ft.....	77.2	85.3
Mudstone-siltstone, very light brown-gray, some very light greenish gray mottles, mostly noncalcareous.	85.3	87.7
Mudstone, very light brown-gray, very calcareous; very light greenish gray 90 to 90.3 ft; slightly calcareous 90.3 to 98.1 ft, contains abundant green mottles along root holes or burrows 90.3 to 98.1 ft.....	87.7	98.1
Mudstone, very light brown, moderately calcareous, contains calcareous rhizoliths and scattered teeth.....	98.1	100.4
Mudstone, very light greenish gray with mottled very light brown; mostly very light brown-gray 101.8 to 103.8 ft, very slightly calcareous.....	100.4	103.8
Mudstone, very light brown, very calcareous; contains calcareous rhizoliths 110 to 111 ft; mottled very light brown and very light greenish gray, very slightly calcareous 111 to 122.5 ft.....	103.8	122.5
Mudstone, mottled very light brown and very light brownish gray, very slightly calcareous; contains mottled very light green-gray 125.3 to 129.4 ft; contains calcite and claystone clasts 129.4 to 130 ft.....	122.5	130.0
Mudstone, mottled with brownish gray and very light greenish gray, very slightly to noncalcareous; contains scattered very fine sand 140.2 to 148.1 ft; mostly very light brown-gray 142.4 to 145.9 ft; contains scattered biotite mica 145.9 to 148.1 ft.....	130.0	148.1
Mudstone, very light gray, noncalcareous, contains scattered biotite mica; very slightly calcareous 152 to 158.8 ft; contains some greenish mottles 152 to 171 ft; moderately calcareous 159 to 159.5 ft; contains coarser silt to very fine sand 159 to 171 ft; slightly calcareous 159.5 to 171 ft....	148.1	171.0
Mudstone, very light greenish gray, contains scattered calcareous rhizoliths and clayey mudstone clasts; moderately calcareous 179 to 181.3 ft and 186.8 to 190.5 ft; noncalcareous 181.3 to 186.8 ft; slightly calcareous 190.5 to 201.5 ft, contains abundant clayey mud clasts.....	171.0	201.5
Note: Test hole cored 0 to 60 ft; log compiled from field log description of sample cuttings and core		

**Test Hole #21-37
(21-55-21ccbb)
Scottsbluff County**

Location: NW NW SW SW sec. 21, T. 21 N., R. 55 W., approximately
0.2 mile north of southwest corner, east side of road
Source Footage: Map
Latitude: 41 46 27N
Longitude: 103 42 44W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff South
Ground elevation: 4022 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly clayey, moderately sandy, silt is fine to very coarse, sand is mostly very fine, light yellow-brown and light to medium brown-gray, slightly to moderately calcareous.....	0.0	20.0
Lithic sand, some gravel, gravel is mostly fine, considerable very coarse sand-sized light reddish brown siltstone.....	20.0	36.0
Sand, slightly to moderately silty, in part slightly clayey, sand is mostly very fine to medium with some coarse and a trace of very coarse, much quartz, common dark gray grains, very light brown-gray, slightly calcareous.....	36.0	44.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey and siltstone, slightly sandy, sand is very fine, very pale brown, slightly calcareous, poorly indurated.....	44.0	51.0
Siltstone, silt is fine to coarse, contains a trace of very fine sand, very light brownish gray, slightly calcareous, moderately well indurated; logged as having green streaks.....	51.0	63.0

**Test Hole #14-I-98
(21-55-26dddc)
Scotts Bluff County**

Location: SW SE SE SE sec. 26, T. 21 N., R. 55 W., approximately 80 ft north and 650 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 45 23.54N
Longitude: 103 39 25.18W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 4055.95 ft
Source elev: GPS (geodetic)

Depth to water: 16.18 ft
Date measured: 5/7/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is mostly very fine to fine, light and medium dark brown-gray, noncalcareous...	0.0	5.0
Sand, slightly to in part moderately silty, sand is mostly very fine, considerable very coarse silt, light yellow-brown to brownish gray, slightly calcareous.....	5.0	10.0
Silt, very sandy, sand is very fine, silt is coarse, light yellow-brown, slightly calcareous.....	10.0	15.0
Silt, slightly to in part moderately clayey, moderately sandy, sand is very fine, medium dark brown-gray, slightly calcareous, contains a few limy nodules, dense.....	15.0	±20.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, sandy, some sandstone, sand is mostly very fine to fine, some coarser grains, some moderately clayey, slightly calcareous siltstone, light brownish gray, contains a few pink clay grains.....	±20.0	25.0
Siltstone, moderately sandy, sand is very fine to fine, some medium to coarse sand, rare fine gravel grains, slightly calcareous, contains a few lithic siltstone and claystone grains; lithic grains common 30 to 35 ft; some sand and fine gravel 35 to 40 ft, logged as loose to lightly cemented.....	25.0	40.0

Siltstone to sandstone, clayey, sand is fine to medium with some coarse to very coarse sand, a few lithic grains.....	40.0	47.0
Siltstone to mudstone, moderately clayey, very light brown, slightly to moderately calcareous.....	47.0	70.0

**Test Hole #13-K-98
(21-55-27cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 27, T. 21 N., R. 55 W., approximately 50 ft north and 80 ft east of southwest corner of section
Source Footage: Map

Latitude: 41 45 22.54N
Longitude: 103 41 35.37W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 4040.21 ft
Source elev: GPS (geodetic)

Depth to water: 12.53 ft
Date measured: 3/3/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, sand is mostly very fine to fine, light brown-gray, contains a few lithic gravel siltstone and limy grains; gravelly 4.5 to 5 ft...	0.0	5.0
Silt, very sandy, silt is coarse, sand is very fine, light yellow-brown, a little light brown-gray, slightly calcareous; field log notes some siltstone clasts.....	5.0	10.0
Sand, silty, sand is mostly very fine, light-brown, slightly calcareous, contains rare lithic gravel grains.....	10.0	15.0
Sand, probably mostly fine, contains considerable coarse to very coarse lithic grains of siltstone..	15.0	20.0
Sand, silty, sand is very fine to fine, a few lithic sand grains; common lithic grains 30 to 35 ft; mostly very fine to fine sand 35 to 40 ft.....	20.0	50.0
Sand, mostly very fine to fine, slightly gravelly, contains many coarse sand to medium gravel lithic grains of siltstone and mudstone, light brown, contains rare quartz sand and limy grains; contains hard sandstone lens or pebble 56 to 56.5 ft.	50.0	60.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, clayey, light olive-gray, noncalcareous, massive; logged as blue-gray 86 to 90 ft and variegated olive and blue-gray 90 to 100 ft; in part slightly sandy, fine grained 95 to 100 ft, logged as containing sandstone layers 95 to 100 ft.....	60.0	100.0
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**Test Hole #22-37
(21-55-29cccb)
Scotts Bluff County**

Location: NW SW SW SW sec. 29, T. 21 N., R. 55 W., approximately
0.1 mile north of southwest corner, east side of road
Source Footage: Map
Latitude: 41 45 21N
Longitude: 103 43 53W
Source Lat/Long: Map
Ground elevation: 4108 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately to very sandy, some very silty sand, sand is very fine to fine, light yellow-brown and light brown-gray, slightly calcareous...	0.0	27.0
Silt, very sandy, sand is mostly very fine, dark gray, contains some organic matter.....	27.0	28.0
Logged as fine sand, sample mainly lithic siltstone grains, some very sandy silt.....	28.0	36.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, light olive-gray, slightly to moderately calcareous, poorly indurated.....	36.0	45.0
Siltstone, very light brownish to yellowish gray, slightly to moderately calcareous, well indurated.	45.0	47.0
Siltstone, mostly very fine to fine silt, very light olive-gray, moderately well indurated, noncalcareous.....	47.0	58.0
Siltstone, silt is fine to coarse, light olive-gray, slightly calcareous; logged as blue clay cutting in chips.....	58.0	63.0

**Test Hole #12-K-98
(21-55-31aaab)
Scotts Bluff County**

Location: NW NE NE NE sec. 31, T. 21 N., R. 55 W., approximately 30 ft south and 400 ft west of northeast corner section
Source Footage: Map

Latitude: 41 45 21.13N
Longitude: 103 44 00.90W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 4127.41 ft
Source elev. GPS (geodetic)

Depth to water: 27.74 ft
Date measured: 3/3/99

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, moderately silty, sand is mostly very fine, some fine, rare granitic sand grains, light medium brown, slightly calcareous.....	0.0	5.0
Silt, slightly sandy, sand is mostly very fine, silt is coarse, light gray-brown, slightly calcareous, light yellow-brown 10 to 22 ft; some sticky silty clay logged 10 to 22 ft.....	5.0	22.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light olive-gray, moderately calcareous.....	22.0	25.0
Siltstone, moderately to very clayey, moderately calcareous, very light olive-gray, massive, moderately well indurated; light olive-gray below 35 ft; moderately clayey 50 to 60 ft.....	25.0	60.0

Note: Brule Formation may be as shallow as 10 ft

**Test Hole #10-J-98
(21-56-10dcaa)
Scotts Bluff County**

Location: NE NE SW SE sec. 10, T. 21 N., R. 56 W., approximately 1300 ft north and 1450 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 48 10.93N

Longitude: 103 47 49.50W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Roubadeau Pass

Ground elevation: 4167.6 ft

Source elev: GPS (geodetic)

Depth to water: 22.58 ft

Date measured: 3/3/99

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, silt is coarse, medium brown-gray, very slightly calcareous, common small black concretions..... 0.0 5.0

Silt, slightly clayey, slightly sandy, sand is very fine, light yellowish to brownish gray, slightly calcareous, a few black concretions; common concretions 15 to 25 ft, very slightly clayey, moderately sandy, much coarse silt and very fine sand, slightly to moderately calcareous, poor sample recovery 15 to 30 ft..... 5.0 30.0

Silt, slightly clayey, in part slightly sandy, sand is very fine, light yellow-brown, moderately calcareous, contains a few dark concretions and a few snail shells 30 to 35 ft; some moderately sandy silt 40 to 45 ft, contains rare small lithic grains; moderately sandy, mostly very fine sand 45 to 61 ft, contains shell fragments; contains a few rounded lithic siltstone, sandstone and limy grains 55 to 61 ft; dark gray angular sandstone grains noted in log at 53 ft..... 30.0 61.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, very slightly clayey, moderately to very sandy, sand is mostly very fine, light greenish gray, slightly calcareous..... 61.0 65.0

Siltstone, moderately clayey, mostly light olive-gray, a little very light brown, noncalcareous; mostly light greenish gray 70 to 80 ft..... 65.0 80.0

Siltstone, moderately clayey, very slightly sandy,
sand is very fine, light greenish gray, slightly
calcareous; very little sand 85 to 95 ft, noncal-
careous; slightly more clay 80 to 95 ft; logged
as blue-green 65 to 95 ft..... 80.0 95.0

**Test Hole #11-K-98
(21-56-24aaad)
Scotts Bluff County**

Location: SE NE NE NE sec. 24, T. 21 N., R. 56 W., approximately 400 ft south and 200 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 41 47 06.03N
 Longitude: 103 45 08.48W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Roubadeau Pass
Ground elevation: 4083.32 ft
 Source elev: GPS (geodetic)
Depth to water: 20.71 ft
 Date measured: 5/5/99
Geophysical Log(s): Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly clayey, slightly to in part moderately sandy, sand is very fine to fine, light medium gray, some light gray non to slightly calcareous.....	0.0	5.0
Silt, very sandy, sand is very fine, some fine, light brown, moderately calcareous; contains rounded siltstone gravel grains 15 to 20 ft.....	5.0	20.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, light olive-gray, slightly to moderately calcareous, moderately well indurated, logged as <i>sticky</i> , structure massive to slightly granular.....	20.0	60.0

**Test Hole #8-K-97
(21N-57W-6dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 6, T. 21 N., R. 57 W., approximately 300 ft north and 30 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 48 53.33N

Longitude: 103 57 49.73W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Stegall

Ground elevation: 4228.61 ft

Source elev: GPS (geodetic)

Depth to water: 19.14 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is mostly very fine, some fine, some moderately clayey to moderately sandy silt, medium dark brown-gray and light brown-gray, sandy silt is slightly calcareous.....	0.0	5.0
Silt, in part slightly clayey, very sandy, sand is very fine with some fine, light yellow- to brown-gray, slightly calcareous; contains a trace of very coarse sand and fine gravel.....	5.0	12.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone-mudstone, clayey, very light brown, essentially noncalcareous; very pale brown to brownish gray 30 to 35 ft, very slightly calcareous; very light yellow to olive-gray 35 to 40 ft, very slightly calcareous.....	12.0	40.0
Mudstone, very light yellowish to very light greenish gray, noncalcareous.....	40.0	55.0
Mudstone-siltstone, very light yellowish to brownish gray, very slightly calcareous, colors appear to be mottled, mostly very light yellow- to olive-gray 65 to 70 ft; green-blue sandstone chips logged in interval 65 to 70 ft.....	55.0	70.0
Mudstone-siltstone, very light olive-gray, slightly calcareous.....	70.0	80.0

**Test Hole #6-L-97
(21N-58W-9bbcc)
Scotts Bluff County**

Location: SW SW NW NW sec. 9, T. 21 N., R. 58 W., approximately 1300 ft south and 50 ft east of northwest corner of narrow half-mile wide section

Source Footage: Map

Latitude: 41 48 34.87N

Longitude: 104 03 09.90W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Robb Draw

Ground elevation: 4225.91 ft

Source elev: GPS (geodetic)

Depth to water: 6.89 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, in part slightly clayey, sand is very fine to fine with some medium to coarse, contains a few lithic grains, dark brown-gray, logged as clay, drilled fast.....	0.0	5.0
Sand, silty, sand is mostly very fine to fine with a little medium to coarse, medium dark brown-gray, logged in field as above.....	5.0	10.0
Silt, moderately sandy, sand is very fine, silt is coarse, light medium yellow-brown to brownish gray, noncalcareous; logged as drilling fast, poor recovery.....	10.0	15.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, clayey, silty, very light brown to brownish gray, noncalcareous; very light yellowish to brownish gray 20 to 30 ft.....	15.0	30.0
Mudstone and claystone, silty in part, very light olive-gray, some very light brown, noncalcareous; logged as sandy siltstone interbedded with light greenish gray siltstone.....	30.0	35.0
Clay to claystone, very light brown and light yellowish to greenish gray, may have rare fine to coarse embedded sand grains.....	35.0	40.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, light reddish to pinkish brown, brittle, dense, bentonitic.....	40.0	52.0

**Test Hole #7-L-97
(21N-58W-12bcbc)
Scotts Bluff County**

Location: SW NW SW NW sec. 12, T. 21 N., R. 58 W., approximately 1850 ft south and 150 ft west of northwest corner of section

Source Footage: Map

Latitude: 41 48 28.47N

Longitude: 104 00 09.40W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Robb Draw

Ground elevation: 4224.56 ft

Source elev: GPS (geodetic)

Depth to water: 21.31 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Road fill.....	0.0	2.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, silt is mostly fine, very light brown, non- to very slightly calcareous; very light brownish gray, very slightly calcareous 10 to 20 ft.....	2.0	20.0
Siltstone-mudstone, silt is mostly fine, light brown, slightly calcareous; very light brown 25 to 45 ft, mostly very slightly calcareous.....	20.0	45.0
Mudstone-siltstone, clayey, very light yellowish to brownish gray, noncalcareous.....	45.0	55.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, very light olive to greenish gray, a little mottled very pale brown, bentonitic.....	55.0	60.0
Clay, very pale reddish brown and very light yellow-gray, bentonitic, noncalcareous; mostly very pale brown and very light olive to yellowish gray 65 to 70 ft, contains trace of yellow-brown iron-stained spots 70 to 75 ft; contains a little secondary lime 75 to 80 ft.....	60.0	80.0

**Test Hole #21-A-98
(22-52-8cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 8, T. 22 N., R. 52 W., approximately 50 ft north and 200 ft east of southwest corner of section
Source Footage: Map

Latitude: 41 53 18.89N
Longitude: 103 22 50.85W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4074.8 ft
Source elev: GPS (geodetic)

Depth to water: Dry

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very slightly clayey, very sandy, sand is very fine to fine, rare coarse sand grains, dark brown-gray, noncalcareous.....	0.0	5.0
Silt, very sandy, sand is very fine to fine, medium yellow-brown, slightly calcareous; slightly clayey in part 10 to 18 ft, contains rare coarse sand and gravel grains.....	5.0	18.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, slightly to moderately clayey, silt is fine to very coarse, very light brown, noncalcareous; granular structure (siltstone aggregates 18 to 40 ft); light reddish brown 30 to 60 ft; very slightly calcareous 40 to 50 ft; slightly to moderately calcareous 50 to 60 ft; sticky clay logged as 47 ft.....	18.0	60.0
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**Test Hole #21-B-98
(22-52-29bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 29, T. 22 N., R. 52 W., approximately 150 ft south and 30 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 51 31.01N
Longitude: 103 22 53.00W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3991.56 ft
Source elev: GPS (geodetic)
Depth to water: Dry
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, clayey to silty, medium dark gray and gravelly sand, common lithic grains.....	0.0	5.0
Sand, moderately to very coarse, trace of fine gravel, mostly quartz, rare lithic grains; approximately 15 percent gravel 15 to 24 ft.....	5.0	24.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, slightly to moderately clayey, silt is fine to coarse, light brown, slightly calcareous, some aggregates; logged as being soft and sticky..	24.0	40.0
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**Test Hole #21-C-98
(22-52-32cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 32, T. 22 N., R. 52 W., approximately 250 ft north and 50 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 49 50.85N

Longitude: 103 22 51.41W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3917.43 ft

Source elev: GPS (geodetic)

Depth to water: 24.76 ft

Date measured: 8/15/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy, sand is very fine to medium, medium dark brown-gray, some light gray, slightly to noncalcareous..... 0.0 5.0

Silt, slightly clayey, moderately sandy, sand is very fine to medium with a trace of coarser grains, light yellow-brown, slightly to moderately calcareous..... 5.0 10.0

Sand, very silty, in part slightly clayey, sand is mostly very fine to medium, some coarse to very coarse sand, light brownish to yellowish gray, slightly to moderately calcareous; poor sample, poor recovery 15 to 20 ft..... 10.0 20.0

Sand, fine to very coarse, much quartz, a few mafic grains; contains a little fine gravel 25 to 35 ft, approximately 10 percent gravel..... 20.0 41.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:?

Siltstone, slightly clayey, silt is fine to coarse, light pinkish brown, slightly calcareous..... 41.0 50.0

**Test Hole #20-B-98
(22-53-1bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 1, 22 N., R. 53 W., approximately 25 ft south and 100 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 55 00.21N
Longitude: 103 25 14.58W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4047.2 ft
Source elev: GPS (geodetic)

Depth to water: 11.39 ft
Date measured: 8/15/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, moderately to very silty, sand is very fine to fine, medium brown-gray, noncalcareous.....	0.0	5.0
Silt, very sandy, sand is very fine to fine, medium gray, very slightly calcareous, described in field as loose fine silty sand.....	5.0	10.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, slightly clayey, slightly sandy, silt is coarse, sand is very fine, light brown, very slightly calcareous.....	10.0	15.0
Siltstone, slightly clayey, very slightly sandy, light brown, very slightly calcareous, contains a trace of limy siltstone concretions.....	15.0	20.0
Siltstone, slightly clayey, light brown, slightly to moderately calcareous, massive; contains a trace of very fine sand 65 to 70 ft.....	20.0	80.0

**Test Hole #18-B-98
(22-53-5bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 5, T. 22 N., R. 53 W., approximately 75 ft south and 120 ft east of northwest corner of section

Source Footage: Map
 Latitude: 41 54 59.57N
 Longitude: 103 29 57.38W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4133.83 ft
 Source elev: GPS (geodetic)

Depth to water: 60.69 ft
 Date measured: 8/16/00

Geophysical Log(s): Caliper

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, in part slightly clayey, sand is mostly very fine to fine, contains a trace of medium to coarse sand, light medium brown-gray, in part slightly calcareous.....	0.0	6.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Whitney Member:		
Siltstone, slightly clayey, fine to very coarse silt, light brown, slightly calcareous; logged as containing thin silty sand lenses 10 to 15 ft; in part moderately sandy 15 to 30 ft, sand is mostly very fine to fine; rare medium sand grains 25 to 30 ft; very slightly sandy 30 to 35 ft.....	6.5	35.0
Siltstone, slightly clayey, light brown, slightly to moderately calcareous, fine grained, massive, logged as being sticky.....	35.0	100.0

**Test Hole #24-37
(22-53-10addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 10. T. 22 N., R. 53 W., approximately
2500 feet south of northeast corner on west edge of road
Source Footage: Map

Latitude: 41 53 46N

Longitude: 103 26 23W

Source Lat/Long: Map

7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4001 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To

Quaternary System, undifferentiated:

Sand, fine.....	0.0	9.0
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Sand, coarse; contains some fine gravel in lower part; contains some siltstone.....	9.0	20.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, brown.....	20.0	40.0
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**Test Hole #20-C-98
(22-53-11dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 11, T. 22 N., R. 53 W., approximately 60 ft north and 30 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 53 16.53N
Longitude: 103 25 12.52W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 3985.45 ft
Source elev: GPS (geodetic)

Depth to water: 9.51 ft
Date measured: 8/15/00

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Poor sample recovery, logged in field as silty sand, loose, fine..... 0.0 12.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:?

Siltstone, slightly clayey, very slightly sandy, sand is very fine, light brown, very slightly calcareous, granular structure in part; contains a trace of embedded fine sand 35 to 45 ft; less granular structure, massive in part 40 to 60 ft, slightly to moderately calcareous; interval 40 to 60 ft logged as soft and sticky..... 12.0 60.0

**Test Hole #19-C-98
(22-53-15bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 15, T. 22 N., R. 53 W., approximately 70 ft south and 75 ft east of northwest corner of section
 Source Footage: Map
 Latitude: 41 53 16.92N
 Longitude: 103 27 31.76W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Lake Minatare
Ground elevation: 4041.63 ft
 Source elev: GPS (geodetic)
Depth to water: 41.88 ft
 Date measured: 8/15/00
Geophysical Log(s): Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, mostly fine sand, light brown-gray.....	0.0	0.5
Sand and gravel, gravel is fine to medium, much quartz, a few dark mafic grains.....	0.5	10.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Whitney Member:		
Siltstone, very slightly clayey, silt is coarse, light brown, slightly calcareous.....	10.0	35.0
Siltstone, very slightly clayey, silt is coarse, very light brownish gray, slightly to moderately calcareous.....	35.0	40.0
Siltstone, slightly clayey, light brown, noncalcareous, silt is coarse, in part slightly calcareous 45 to 55 ft; slightly calcareous 55 to 75 ft.....	40.0	75.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone and mudstone, light brown, slightly to moderately calcareous, a little light reddish brown to whitish gray clay, noncalcareous; field log notes some thin hard cherty siltstone to claystone 75 to 80 ft.....	75.0	85.0
Siltstone, moderately clayey, light brown, moderately calcareous; contains a trace of very fine grained siltstone-sandstone 85 to 90 ft; some mudstone, clayey 90 to 95 ft.....	85.0	95.0

Mudstone, silty, a little claystone, light reddish brown; slightly to moderately calcareous; some clayey siltstone 100 to 120 ft (field log notes interbedded brown and red-brown siltstone)..... 95.0 120.0

**Test Hole #18-C-98
(22-53-17bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 17, T. 22 N., R. 53 W., approximately 30 ft south and 120 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 53 18.62N
Longitude: 103 29 52.81W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4051.54 ft
Source elev: GPS (geodetic)

Depth to water: 44.04 ft
Date measured: 8/14/00

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, in part very clayey, sand is fine to coarse, contains rare gravel grains, dark brown gray.....	0.0	7.0
Sand and gravel, silty, in part clayey, gravel is fine to medium.....	7.0	9.0
Silt, very sandy, silt is coarse, sand is principally very fine, some fine sand and rare coarser grains, light brown-yellow, noncalcareous.....	9.0	18.0
Sand and gravel, gravel is fine to medium, some coarse, approximately 50 percent gravel, much quartz, a few dark mafic grains.....	18.0	45.0
Gravel, sandy, gravel is fine to coarse, a few pebbles, approximately 75 percent gravel, common lithic siltstone and sandstone grains.....	45.0	60.0
Sand and gravel, gravel is fine to medium, some coarse, a few pebbles, approximately 40 percent gravel, much quartz, rare pink and dark silicates, contains a few lithic siltstone and calcareous fine grained sandstone grains; 50 to 60 percent gravel 70 to 80 ft; approximately 40 to 50 percent gravel 80 to 100 ft; 60 percent gravel 110 to 120 ft.....	60.0	121.0

Tertiary System - Oligocene Series - White River Group:

Brule Foundation:

Orella Member:

Siltstone, slightly to moderately clayey, light brown, slightly calcareous.....	121.0	140.0
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**Test Hole #18-D-98
(22-53-19ddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 19, T. 22 N., R. 53 W., approximately 20 ft north and 50 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 51 36.13N
Longitude: 103 29 57.58W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Bayard SW

Ground elevation: 3952.55 ft
Source elev: GPS (geodetic)

Depth to water: 41.82 ft
Date measured: 8/15/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, moderately to very silty, sand is very fine to medium with a few coarser grains, some dark brown-gray, mostly light yellow-brown, moderately calcareous.....	0.0	5.0
Sand, moderately silty, sand is very fine to medium, much fine sand, light yellow-brown, noncalcareous; contains a little moderately clayey to very silty sand and rare gravel grains.....	5.0	14.0
Sand and gravel, gravel mostly fine to medium, contains a few pebbles, mostly quartz, a few dark mafic grains, approximately 30 to 40 percent gravel; approximately 25 to 30 percent gravel 40 to 50 ft.....	14.0	50.0
Sand, some gravel, much quartz, gravel is mostly fine, approximately 20 percent gravel.....	50.0	65.0
Sand, fine to coarse, some very coarse, some scattered gravel, log notes some pebbles; clay logged 114 to 115 ft and sticky Brule mixed 120 to 125 ft; approximately 20 percent gravel 115 to 120 ft and 130 to 134 ft.....	65.0	134.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, light brown, slightly to moderately calcareous.....	134.0	155.0
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**Test Hole #25-37
(22-53-22bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 22, T. 22 N., R. 53 W, south side of
road in ditch
Source Footage: Map

Latitude: 41 52 24N

Longitude: 103 27 32W

Source Lat/Long: Map

7.5-minute Quad Map Name: Bayard SW

Ground elevation: 3982 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, fine..... 0.0 11.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, brown..... 11.0 14.0

**Test Hole #20-F-98
(22-53-25bbba)
Scotts Bluff County**

Location: NE NW NW NW sec. 25, T. 22 N., R. 53 W., on or near north section line and 700 ft east of northwest corner of East-West elongate section

Source Footage: Map

Location: 41 51 29.80N

Longitude: 103 25 06.06W

Source Lat/Long GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3990.98 ft

Source elev: GPS (geodetic)

Depth to water: 53.96 ft

Date measured: 8/15/00

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, sand is very fine to fine, light brown-gray, slightly calcareous; contains rare medium sand grains; very slightly clayey, slightly less sandy 5 to 10 ft.....	0.0	10.0
Sand, very silty, sand is principally very fine to fine, much fine sand, light yellowish to brownish gray, slightly calcareous.....	10.0	15.0
Silt, very sandy, sand is very fine to fine, light yellow-brown, noncalcareous; moderately to very sandy 20 to 25 ft.....	15.0	25.0
Silt, moderately sandy, sand is mostly very fine, light yellow-brown, noncalcareous; moderately to very sandy, contains some fine and a trace of coarser sand and gravel grains 34 to 35 ft and 38 to 39 ft.....	25.0	40.0
Silty sand and gravel, lithic siltstone, sandstone and limy grains common, gravel grains coated with silt in upper part; contains common lithic siltstone pebbles.....	40.0	72.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, light brown, slightly to moderately calcareous.....	72.0	80.0
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**Test Hole #19-D-98
(22-53-27bbba)
Scotts Bluff County**

Location: NE NW NW NW sec. 27, T. 22 N., R. 53 W., approximately 100 ft south and 400 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 51 30.00N

Longitude: 103 27 33.30W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Bayard Southwest

Ground elevation: 3907.3 ft

Source elev: GPS (geodetic)

Depth to water: 18.75 ft

Date measured: 5/12/99

Geophysical Log(s): Electric (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, sandy, mostly very fine sand, some yellow-brown silty clay, common wood or root fragments, slightly to moderately calcareous; light medium gray 5 to 10 ft, contains a few gravel grains.....	0.0	10.0
Mixed sample, as above with some sand and trace of gravel, common lithic fine-grained sandstone grains, logged as silty sand and gravel; Brule chips logged at 17 ft.....	10.0	20.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone and claystone, in part silty, light brown, slightly calcareous.....	20.0	25.0
Siltstone, moderately to very clayey, light brown, slightly calcareous; contains some coarse silt to very fine sand seams 35 to 40 ft, contains rare fine sand grains.....	25.0	60.0

Note: Lost considerable drilling fluid 20 to 25 ft; logged as soft and sticky 53 to 60 ft

**Test Hole #26-37
(22-53-32bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 32, T. 22 N., R. 53 W, south edge of road
 Source Footage: Map
 Latitude: 41 50 38N
 Longitude: 103 29 55W
 Source Lat/Long: Map
 7.5-minute Quad Map Name: Bayard SW
Ground elevation: 3916 ft
 Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Top soil.....	0.0	4.0
Sand, clayey, yellow.....	4.0	12.0
Sand and gravel, gravel is mostly fine to medium; contains less gravel 78 to 112 ft.....	12.0	112.0
Sand and gravel, gravel is fine to coarse.....	112.0	128.0
Sand and gravel, gravel is fine to coarse with many boulders.....	128.0	210.0

**Test Hole #17-D-98
(22-54-14aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 14, T. 22 N., R. 54 W., approximately 50 ft south and 250 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 53 20.47N
Longitude: 103 32 19.88W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lake Alice

Ground elevation: 4069.21 ft
Source elev: GPS (geodetic)

Depth to water: 106.29 ft

Date measured: 8/14/00

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, very slightly clayey, sand is very fine to medium with some coarse sand and a trace of gravel, dark brown-gray.....	0.0	2.0
Sand and gravel, gravel is fine to coarse, a few pebbles, approximately 60 percent gravel, much quartz, a few dark mafic grains and a trace of chert; a few light brown siltstone grains 10 to 15 ft.....	2.0	15.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 to 40 percent very coarse sand to fine gravel, much quartz, a few pink and rare dark mafic grains, contains rare brown siltstone grains.....	15.0	27.0
Sand, some gravel, gravel is mostly fine; contains interbedded silt layers logged from 27 to 28 ft and 42 to 43 ft, silt is very sandy and slightly clayey, sand is mostly very fine to fine, very light olive-gray, slightly calcareous.....	27.0	43.0
Sand, some gravel, gravel is mostly fine, approximately 30 to 40 percent very coarse sand and fine gravel, mostly quartz, rare dark grains, rare fine-grained lithic sandstone grains.....	43.0	60.0
Silt, moderately sandy and silt, very clayey, very light olive-gray, moderately calcareous, logged as being interbedded with sand.....	60.0	70.0
Clay, very light gray and very light olive-gray, moderately calcareous, contains limy areas, logged as interbedded with sand and gravel.....	70.0	75.0
Sand, fine to very coarse, contains a trace of fine gravel, much fine to coarse sand.....	75.0	80.0

Sand and gravel, gravel is fine to coarse, a few pebbles, much quartz, a few pink and dark gray silicates, approximately 75 percent gravel.....	80.0	90.0
Sand, some gravel, gravel is mostly fine, much quartz; approximately 5 to 15 percent gravel, mostly sand 120 to 125 ft.....	90.0	161.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, slightly clayey, light brown, slightly to moderately calcareous, contains small white limy areas, granular structure.....	161.0	180.0

**Test Hole #15-M-98
(22-54-21caac)
Scotts Bluff County**

Location: SW NE NE SW sec. 21, T. 22 N., R. 54 W., approximately 2150 ft north and 2150 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 51 57.47N

Longitude: 103 35 22.24W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3943.84 ft

Source elev: GPS (geodetic)

Depth to water: 25.44 ft

Date measured: 5/15/01

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, in part slightly clayey, sand is mostly very fine to coarse, light brown-gray and light yellow-brown, in part slightly calcareous...	0.0	4.0
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Sand and gravel, gravel is mostly fine to medium, clay coating on some grains.....	4.0	10.0
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Sand, some gravel, gravel is fine to coarse, a few pebbles, mostly quartz, some dark mafic grains, rare lithic siltstone grains; lithic grains common 55 to 60 ft and abundant 60 to 79 ft, approximately 40 to 50 percent gravel.....	10.0	79.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, very light brown, slightly calcareous; moderately clayey 85 to 95 ft.....	79.0	95.0
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**Test Hole #16-E-98
(22-54-21dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 21, T. 22 N., R. 54 W., approximately 50 ft north and 300 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 51 38.11N
Longitude: 103 34 45.02W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Minatare

Ground elevation: 3931.76 ft
Source elev: GPS (geodetic)

Depth to water: 14.71 ft
Date measured: 8/14/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, sand is mostly very fine to fine, a little moderately clayey to very sandy silt, medium brown-gray, slightly calcareous.....	0.0	6.0
Sand and gravel, gravel is mostly fine to medium, considerable very coarse sand to fine gravel, much quartz, a few dark mafic grains, rare metamorphic grains.....	6.0	34.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, silt is fine to very coarse, very light brown-gray, slightly calcareous, very light brown 40 to 50 ft; in part slightly sandy 45 to 50 ft.....	34.0	50.0
Siltstone, slightly clayey, slightly sandy, sand is very fine, light brown, slightly calcareous; slight iron stain 60 to 65 ft.....	50.0	75.0
Siltstone, slightly to moderately clayey, very light brown, slightly to moderately calcareous.....	75.0	85.0
Siltstone, moderately to very clayey, very light brown to very light brown-gray, moderately calcareous, logged as being soft and sticky.....	85.0	100.0

**Test Hole #17-E-98
(22-54-23dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 23, T. 22 N., R. 54 W., approximately 30 ft north and 200 ft west of southeast corner of section
 Source Footage: Map
 Latitude: 41 51 34.36N
 Longitude: 103 32 20.73W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Minatare
Ground elevation: 3934.32 ft
 Source elev: GPS (geodetic)
Depth to water: 13.85 ft
 Date measured: 8/14/00
Geophysical Log(s): None

Depth, in feet
 From To

Quaternary System, undifferentiated:

Silt, slightly clayey, slightly to in part moderately sandy, sand is mostly very fine, a little fine and rare medium sand, medium and dark brown-gray, noncalcareous.....	0.0	5.0
Silt, moderately clayey, slightly to moderately sandy, sand is mostly very fine, rare embedded coarse grains, light yellow-gray, in part slightly calcareous; coarse sand logged in lower part of interval.....	5.0	10.0
Silt, slightly to moderately clayey, moderately to in part very sandy, sand is fine to very coarse, contains a trace of gravel, light yellow-gray, slightly calcareous.....	10.0	15.0
Sand and gravel, gravel is mostly fine, may have a silty matrix in upper few feet, mostly quartz, approximately 30 to 40 percent very coarse sand and fine gravel.....	15.0	40.0
Sand, fine to very coarse, a little gravel, rare lithic grains.....	40.0	50.0
Sand and gravel, gravel is mostly fine, mostly quartz, approximately 30 to 40 percent very coarse sand and gravel.....	50.0	70.0
Sand, fine to very coarse, contains a little gravel, much fine to coarse sand, contains rare lithic light brown siltstone grains; slightly gravelly 125 to 135 ft, approximately 10 to 15 percent gravel.....	70.0	165.0

Sand and gravel, gravel is fine to coarse, much quartz, common lithic siltstone and calcareous siltstone-sandstone grains, approximately 60 percent gravel 165 to 170 ft and 30 to 40 percent gravel 170 to 198 ft; contains siltstone pebbles 195 to 198 ft.....	165.0	198.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light brown, slightly to moderately calcareous, moderately well indurated; contains a few volcanic ash shards 200 to 210 ft, drilled fast.....	198.0	220.0

**Test Hole #15-F-98
(22-54-30ddda)
Scotts Bluff County**

Location: NE SE SE SE sec. 30, T. 22 N., R. 54 W., approximately 550 ft north and 250 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 50 48.42N

Longitude: 103 37 04.09W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3868.78 ft

Source elev: GPS (geodetic)

Depth to water: 9.58 ft

Date measured: 8/15/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately to in part very sandy, sand is mostly very fine to medium, some coarse sand and gravel in lower part, light and dark brown-gray, slightly calcareous.....	0.0	5.0
Sand and gravel, gravel is fine to coarse, some clay coatings on grains, mostly quartz, rare lithic siltstone grains, some dark mafic grains, approximately 60 percent gravel; approximately 40 percent gravel 10 to 15 ft.....	5.0	15.0
Sand and gravel, gravel is mostly fine to medium, mostly quartz, rare lithic siltstone grains, approximately 30 percent gravel.....	15.0	30.0
Sand, some gravel, gravel is mostly fine, much quartz, a few pink silicates.....	30.0	55.0
Sand and gravel, gravel is fine to coarse, much quartz, a few pink and dark gray silicates, common light brown and very light gray lithic siltstone grains.....	55.0	80.0
Sand, fine to very coarse, much coarse to very coarse sand, much quartz; approximately 10 percent gravel 95 to 100 ft.....	80.0	100.0
Sand and gravel, gravel is fine to coarse, common lithic grains of light brown and very light brown-gray siltstone and claystone, approximately 40 to 60 percent gravel.....	100.0	140.0
Sand with some sand and gravel layers, gravel is mostly fine, much very coarse sand, contains common lithic grains, approximately 20 percent gravel.....	140.0	155.0

Sand, fine to very coarse, a little gravel, gravel is mostly fine, contains a few lithic siltstone grains.....	155.0	185.0
Sand and gravel, gravel is fine to coarse, common lithic grains of claystone and very fine grained sandstone, approximately 50 to 70 percent gravel..	185.0	195.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light olive-gray, slightly calcareous.....	195.5	200.0
Mudstone, moderately to very clayey, very light olive-gray, moderately calcareous, logged as intermittently light green-gray and tan, appears to have some crystalline quartz; contains some biotite mica and volcanic ash.....	200.0	205.0
Clay-claystone, light brown, noncalcareous, dense...	205.0	210.0
Clay, mottled very light olive-gray and light brown, noncalcareous, contains a trace of embedded fine sand.....	210.0	215.0
Mudstone-siltstone, silt is fine to coarse, clayey, very slightly sandy, sand is very fine, very light brownish gray, slightly calcareous, contains some biotite mica and volcanic ash shards.....	215.0	220.0

**Test Hole #17-F-98
(22-54-35dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 35, T. 22 N., R. 54 W., approximately 120 ft north and 75 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 49 49.25N

Longitude: 103 32 20.49W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Minatare

Ground elevation: 3836.89 ft

Source elev: GPS (geodetic)

Depth to water: 1.78 ft

Date measured: 8/14/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, light gray, moderately calcareous, contains rare limy nodules.....	0.0	6.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few dark mafic and rare lithic siltstone grains, approximately 50 percent gravel; contains a medium dark gray clayey to sandy silt layer 13 to 14 ft.....	6.0	35.0
Sand, fine to very coarse, much coarse to very coarse sand, contains a trace of fine gravel.....	35.0	50.0
Sand, some gravel, gravel is mostly fine, contains a few lithic siltstone and sandstone grains, approximately 20 to 30 percent gravel.....	50.0	60.0
Sand, fine to very coarse, contains 10 to 15 percent fine to medium gravel, lithic siltstone grains common; contains silty clay layer or ball about 72 to 73 ft, clay is very light yellow-gray, moderately calcareous.....	60.0	75.0
Sand and gravel, gravel is mostly fine, common pebbles of light brown siltstone and very light gray calcareous siltstone-sandstone.....	75.0	80.0
Sand, fine to very coarse, some gravel, gravel is mostly fine, contains some lithic siltstone grains.....	80.0	90.0
Sand and gravel, gravel is fine to coarse, common lithic siltstone and claystone pebbles; contains some silty clay grains or layers 95 to 103 ft.....	90.0	103.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone-mudstone, very light olive- to yellow-gray, moderately well indurated, noncalcareous....	103.0	110.0
Siltstone, moderately to very clayey very light yellowish gray, slightly to moderately calcareous, may have rare embedded medium sand grains; slight iron stain in upper part.....	110.0	120.0

**Test Hole #11-G-99
(22-55-6babd)
Scotts Bluff County**

Location: SE NW NE NW sec. 6, T. 22 N., R. 55 W., approximately 500 ft south and 1750 ft east of northwest corner of small section

Source Footage: Map

Latitude: 41 54 46.83N

Longitude: 103 44 53.61W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 3923.68 ft

Source elev: GPS (geodetic)

Depth to water: 7.52 ft

Date measured: 3/15/00

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To

Quaternary System, undifferentiated:

Silty sand.....	0.0	2.0
Sand and gravel, gravel is fine to coarse, quartz with some light colored and dark silicates, approximately 40 percent gravel 5 to 15 ft; approximately 60 to 70 percent gravel 15 to 35 ft, contains a few lithic siltstone grains.....	2.0	35.0
Sand, fine to very coarse; approximately 15 to 20 percent gravel 45 to 55 ft.....	35.0	55.0
Sand and gravel, gravel is fine to coarse with pebbles and cobbles, approximately 60 to 70 percent gravel.....	55.0	62.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light yellow- to olive-gray, moderately calcareous, logged as soft and sticky.....	62.0	80.0
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**Test Hole #12-F-97
(22-55-6cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 6, T. 22 N., R. 55 W., approximately 50 ft north and 50 ft east of southwest corner of section
 Source Footage: Map
 Latitude: 41 54 07.08N
 Longitude: 103 45 17.66W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Mitchell
Ground elevation: 3916.9 ft
 Source elev: GPS (geodetic)
Depth to water: 5.91 ft
 Date measured: 8/1/00
Geophysical Log(s): Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, moderately to very sandy, sand is fine to very coarse, dark brown-gray, slightly to moderately calcareous.....	0.0	4.0
Sand and gravel, gravel is mostly fine to medium, much quartz, some pink silicates, rare dark mafic and metamorphic grains.....	4.0	15.0
Sand, fine to very coarse, approximately 5 to 10 percent fine gravel, mostly quartz, a few metamorphic and dark mafic grains, rare pebbles.....	15.0	30.0
Sand, fine to coarse, some very coarse, mostly quartz.....	30.0	35.0
Sand, fine to very coarse, a little fine gravel, much quartz, a few dark mafic grains, approximately 15 percent fine gravel; approximately 30 percent gravel 40 to 45 ft; contains a few pebbles throughout.....	35.0	55.0
Sand, fine to very coarse, approximately 5 to 10 percent gravel, occasional pebbles, a few lithic siltstone grains; slightly more gravel 145 to 183 ft, approximately 20 percent gravel.....	55.0	183.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, clayey, in part silty, very light greenish gray to very light gray, noncalcareous; in part whitish gray 190 to 200 ft; whole interval logged as <i>soft and sticky</i>	183.0	200.0

**Test Hole #12-E-99
(22-55-9bcd)**
Scotts Bluff County

Location: SW SE SW NW sec. 9, 22 N., R. 55 W., approximately 2500 ft north and 700 ft east of southwest corner of section
 Source Footage: Map
 Latitude: 41 53 43.48N
 Longitude: 103 42 42.68W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 3912.20 ft
 Source elev: GPS (geodetic)
Depth to water: 6.14 ft
 Date measured: 8/9/00
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, slightly sandy, medium brown-gray, slightly calcareous in upper part, silty to slightly clayey sand in lower part, sand is fine to coarse.....	0.0	5.0
Sand, fine to very coarse, some fine gravel, much quartz, a few metamorphic pink and gray silicates.	5.0	15.0
Sand and gravel, gravel is mostly fine to medium, a few pebbles, much quartz, a few pink and dark colored silicates, rare lithic siltstone grains, approximately 30 to 40 percent gravel.....	15.0	30.0
Gravel, sandy, gravel is fine to coarse, much quartz, common dark silicates, rare metamorphic grains, approximately 60 to 70 percent gravel.....	30.0	36.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, light olive-gray, slight brown tint, noncalcareous, moderately well indurated; logged as <i>sticky and soft</i> ; slightly calcareous 45 to 50 ft.....	36.0	50.0
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**Test Hole #13-E-97
(22-55-10-bccb)
Scotts Bluff County**

Location: NW SW SW NW sec. 10, T. 22 N., R. 55 W., approximately 2000 ft south and 60 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 53 49.90N

Longitude: 103 41 41.04W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 3942.4 ft

Source elev: GPS (geodetic)

Depth to water: 34.19 ft

Date measured: 8/9/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, very fine to fine, a little medium and rare coarse sand, dark brown-gray, noncalcareous.....	0.0	5.0
Silt, very sandy, sand is mostly very fine to fine, a little very silty sand, medium dark brown-gray..	5.0	12.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 percent gravel, cobbles logged at 23 ft.....	12.0	23.0
Sand, some gravel, gravel is mostly fine, much very coarse sand, much quartz.....	23.0	40.0
Sand, fine to very coarse, much quartz.....	40.0	45.0
Sand, some gravel, gravel is mostly fine to medium, much quartz, a few dark mafic grains, lithic grains of siltstone and claystone common; large cobbles logged 56 to 59 ft and a silty clay layer in interval 50 to 53 ft.....	45.0	67.0

Tertiary System - Oligocene Series - White River Group:

Brule Fdormation:

Orella Member:

Siltstone, slightly to moderately clayey, light yellowish to olive-gray, noncalcareous, logged as <i>soft and sticky</i>	67.0	90.0
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**Test Hole #14-D-99
(22-55-11addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 11, T. 22 N., R. 55 W., approximately 2630 ft south and 30 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 53 45.07N

Longitude: 103 39 22.69W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 3966.4 ft

Source elev: GPS (geodetic)

Depth to water: 26.07 ft

Date measured: 7/28/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, slightly to in part very sandy, sand is mostly very fine to fine, scattered coarser sand and rare gravel grains, contains a trace of lithic grains, dark brown-gray, noncalcareous.....	0.0	5.0
Sand, in part silty to slightly clayey, sand is fine to coarse, mostly quartz, contains a little very coarse sand and a trace of gravel.....	5.0	15.0
Sand, fine to very coarse, contains a trace of fine gravel, much quartz, some pink and rare dark silicates.....	15.0	20.0
Sand and gravel, gravel is mostly fine to medium, much quartz, some pink and a few dark silicates...	20.0	50.0
Sand, some gravel, gravel is mostly fine with scattered medium to coarse gravel and pebbles, approximately 25 percent gravel; pebbles common 65 to 70 ft.....	50.0	90.0
Sand, fine to coarse, a little very coarse, mostly quartz, much medium to coarse sand; siltstone pebbles logged in lower 2 to 3 ft.....	90.0	102.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, slightly sandy, sand is very fine, slightly calcareous, very light brown..	102.0	115.0
Siltstone, moderately clayey, very light brown, noncalcareous; logged as soft and sticky.....	115.0	120.0

**Test Hole #14-37
(22-55-13dadd)
Scotts Bluff County**

Location: SE SE NE SE sec. 13, T. 22 N., R. 55 W., approximately
0.3 mile north of southeast corner, west side of road
Source Footage: Map

Latitude: 41 52 40N

Longitude: 103 38 10W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 3910 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand and gravel.....	0.0	17.0
Sand and gravel.....	17.0	21.0
Clay, sandy, white.....	21.0	25.0
Sand and gravel.....	25.0	40.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Clay, gray, with some green.....	40.0	60.0
Note: Samples missing for this test hole		

**Test Hole #13-37
(22-55-26addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 26, T. 22 N., R. 55 W., approximately southeast corner NE1/4 on west side of road
Source Footage: Map

Latitude: 41 51 09N

Longitude: 103 39 20W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3872 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To

Quaternary System, undifferentiated:

Road fill, sandy to clayey silt, brown-gray.....	0.0	2.0
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Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel; contains common lithic grains at 40 ft.....	2.0	90.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, very light olive-gray to greenish gray....	90.0	100.0
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Mudstone, clayey, very light brownish gray, slightly calcareous.....	100.0	125.0
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Mudstone, mostly very light olive-gray, noncalcareous.....	125.0	135.0
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Mudstone-claystone, very light olive-gray, noncalcareous, moderately well indurated, contains some crystalline quartz grains.....	135.0	145.0
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**Test Hole #14-M-98
(22-55-26daca)
Scotts Bluff County**

Location: NE SW NE SE sec. 26, T. 22 N., R. 55 W., approximately 1650 ft north and 800 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 50 58.41N

Longitude: 103 39 31.62W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3875.80 ft

Source elev: GPS (geodetic)

Depth to water: 14.81 ft

Date measured: 6/8/00

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Fill, clayey silty, moderately sandy to gravelly, medium brown-gray.....	0.0	2.5
Sand and gravel, gravel is mostly fine to medium, logged as mostly gravel, some pebbles, some dark mineral stain.....	2.5	15.0
Sand, some gravel, gravel is mostly fine, much very coarse sand, much quartz, charcoal noted in field log 25 to 30 ft and organic dark clayey silt 32 to 33 ft.....	15.0	40.0
Sand and gravel, gravel is fine to coarse, much quartz, a few dark mafic grains, contains a trace of siliceous siltstone grains, approximately 60 percent gravel; approximately 40 percent gravel 45 to 55 ft.....	40.0	55.0
Sand, some gravel, mostly quartz, contains a few lithic siltstone and sandstone grains, approximately 25 percent gravel; approximately 30 to 40 percent gravel 65 to 81 ft.....	55.0	81.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light olive-gray, noncalcareous, logged as white to tan silty clay..	81.0	91.0

**Test Hole #11-J-99
(22-55-31cbbb)
Scotts Bluff County**

Location: NW NW NW SW sec. 31, T. 22 N., R. 55 W., approximately
2300 ft north and 50 ft east of southwest corner of
section

Source Footage: Map

Latitude: 41 50 08.03N

Longitude: 103 45 14.86W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Roubadeau Pass

Ground elevation: 4102.37 ft

Source elev: GPS (geodetic)

Depth to water: 29.72 ft

Date measured: 7/27/99

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, silt is coarse, sand is mostly very fine, some fine, little reddish brown to brownish gray, slightly calcareous, light brown and light brownish gray 5 to 10 ft, contains some very slightly clayey to sandy silt, sand is very fine.....	0.0	10.0
Silt, very slightly clayey, very slightly sandy, sand is very fine, very light brownish gray, slightly calcareous, slightly sandy, sand is very fine with some fine sand, light brown 15 to 20 ft, logged as containing some small firm Brule pieces..	10.0	20.0
Silt, very slightly clayey, slightly sandy to gravelly, sand is mostly very fine, gravel consists of light brown rounded siltstone grains, light brown, slightly calcareous.....	20.0	25.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Sandstone-siltstone, sand is very fine, very calcareous, dark speckled, drilled with hydraulic pressure.....	25.0	26.0
Mudstone-siltstone, silt is fine to very coarse, light brownish gray; light brown, slightly calcareous, silt is mostly fine to medium 35 to 40 ft...	26.0	40.0
Mudstone, light reddish brown, slightly to moderately calcareous.....	40.0	45.0

Siltstone and mudstone, siltstone is slightly to moderately sandy, sand is mostly very fine, a little fine, mostly slightly calcareous; moderately sandy 53 to 57 ft and 63 to 67 ft, sand is very fine with some fine and trace of medium sand, logged as containing a dark gray very fine sandstone at 64 ft.....	45.0	67.0
Mudstone, siltstone, a little claystone, very light brownish-gray, slightly calcareous, contains some sandy siltstone, sand is very fine; contains a little light reddish brown claystone 70 to 75 ft..	67.0	75.0
Mudstone-claystone, very light olive gray with some light brown, slightly calcareous; mostly very light greenish gray 80 to 85 ft; some mottled very light brown 85 to 90 ft; mostly very light olive- to green-gray 90 to 95 ft, slightly to non-calcareous.....	75.0	95.0
Mudstone, some clayey siltstone, very light brown and very light brownish gray, slightly to moderately calcareous; contains a little very light olive- to green-gray 100 to 125 ft; mostly very light brownish gray and very light brown 125 to 140 ft.....	95.0	140.0

**Test Hole #12-H-98
(22-55-32bbaa)
Scotts Bluff County**

Location: NE NE NW NW sec. 32, T. 22 N., R. 55 W., approximately on section line and 1100 ft east of northwest corner section
 Source Footage: Map
 Latitude: 41 50 38.14N
 Longitude: 103 43 54.50W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Scottsbluff South
Ground elevation: 4035.92 ft
 Source elev: GPS (geodetic)
Depth to water: 100.32 ft
 Date measured: 5/18/99
Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately sandy, silt is coarse, sand is very fine, dark brown-gray, noncalcareous.....	0.0	4.0
Silt, moderately sandy, sand is mostly very fine to fine, scattered medium sand, rare gravel grains, probably some lithic siltstone grains, light yellow-brown, slightly calcareous.....	4.0	12.0
Silt and siltstone, slightly sandy, silt is coarse, sand is very fine, light brown, slightly calcareous.....	12.0	15.0
Silt and siltstone, moderately sandy, silt is coarse, sand is very fine, a little fine, light brown, noncalcareous, granular structure, poor recovery of sample; interval 20 to 25 ft includes common lithic clay grains, reddish brown, rare shell fragments; mostly silt; slightly sandy 27 to 30 ft, sand is very fine with scattered fine to coarse sand, logged as possibly reworked, light reddish brown, noncalcareous.....	15.0	30.0
Silt, slightly sandy, sand is mostly very fine to fine, rare medium to coarse sand grains, rare rounded lithic clay grains, light brown, slightly calcareous.....	30.0	35.0
Silt, moderately sandy, sand is mostly very fine, little reddish brown, slightly calcareous.....	35.0	62.0
Sand, silty, sand is very fine to coarse, mostly rounded siltstone and claystone grains, lithic clay grains are reddish brown, contains a few rusty yellow-brown grains; rare shell fragments 65 to 70 ft; common lithic gravel grains of fine-grained calcareous sandstone 75 to 80 ft.....	62.0	80.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, slightly sandy, sand is mostly very fine, very light brown, slightly calcareous.....	80.0	90.0
Siltstone, slightly moderately clayey, silt is fine to coarse, very light brown to very light brownish gray, slightly calcareous, moderately well indurated, in part with granular structure.....	90.0	120.0

Note: an alternative correlation of interval 12 to 80 ft is an Orella sandy zone.

**Test Hole #18-37
(22-55-35ad)
Scotts Bluff County**

Location: SE NE sec. 35, T. 22 N., R. 55 W. Field log indicates test hole approximately 100 yards south of irrigation canal, road to west just south of canal-this is first road to east south of bridge between Gering and Scottsbluff.

Source Footage: Map

Latitude: 41 50 28N

Longitude: 103 39 20W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3881 ft

Source elev: (a)

Depth to water: Unknown

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, sand is mostly very fine to fine, dark brown-gray and sand, mostly very fine to medium.....	0.0	6.0
Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel.....	6.0	48.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, very light brown, some very light brownish gray, noncalcareous, moderately well indurated.....	48.0	65.0
Mudstone, very light brownish gray, noncalcareous, moderately well indurated; contains fine grain of crystalline quartz.....	65.0	78.0
Mudstone, mostly very light olive-gray, some very light brownish gray, noncalcareous, contains a trace of volcanic ash and very fine quartz grains.	78.0	85.0

**Test Hole #14-F-98
(22-55-36acbb)
Scotts Bluff County**

Location: NW NW SW NE sec. 36, T. 22 N., R. 55 W., approximately 1450 ft south and 2550 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 50 27.43N

Longitude: 103 38 44.51W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff South

Ground elevation: 3867.41

Source elev: GPS (geodetic)

Depth to water: 5.44 ft

Date measured: 10/23/98

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand and gravel, road fill, some soil.....	0.0	5.0
Sand and gravel, gravel is fine to coarse, much quartz, some mafic grains, some dark mineral stain, approximately 50 percent gravel.....	5.0	10.0
Sand, some gravel, gravel is mostly fine, much quartz, dark mineral stain 10 to 15 ft.....	10.0	25.0
Sand, some gravel, gravel is mostly fine to medium, quartz with pink and some dark mafic silicates, approximately 25 to 30 percent gravel.....	25.0	35.0
Sand, fine to very coarse, scattered gravel grains, contains rare lithic siltstone grains.....	35.0	45.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 percent gravel; common lithic grains 50 to 54 ft.....	45.0	54.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone-mudstone, moderately clayey, silt is fine, very light yellowish to brownish gray, non-calcareous, logged as being brittle 55 to 60 ft; mostly very light olive-gray silt 65 to 90 ft, in part with a brown tint; field log indicates colors variegated tan and green-blue 80 to 94 ft and green-blue 94 to 100 ft.....	54.0	100.0
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**Test Hole #11-F-97
(22-56-1bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 1, T. 22 N., R. 56 W., approximately 250 ft south and 60 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 54 47.98N
Longitude: 103 46 26.49W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Mitchell

Ground elevation: 3926.31 ft
Source elev: GPS (geodetic)

Depth to water: 6.99 ft
Date measured: 8/9/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey and moderately sandy, some silty sand, sand is mostly fine to coarse, dark brown-gray, slightly calcareous.....	0.0	5.0
Sand and gravel, gravel is fine to coarse, a few pebbles, approximately 40 percent gravel, a few lithic siltstone grains; some dark mineral stain 5 to 25 ft.....	5.0	35.0
Sand, fine to very coarse, scattered gravel grains, much quartz, a few lithic siltstone and fine-grained sandstone grains, some charcoal logged from 50 to 60 ft (probably coal).....	35.0	65.0
Sand and gravel, gravel is mostly fine to medium, some pebbles, common lithic grains of siltstone and fine-grained sandstone, common charcoal pieces logged from 75 to 80 ft (probably coal).....	65.0	102.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Formation:

Siltstone, moderately clayey, very light yellow-brown, noncalcareous, logged as sticky.....	102.0	110.0
Siltstone-mudstone, moderately to very clayey, light olive-gray, noncalcareous.....	110.0	115.0
Siltstone, moderately clayey, very slightly sandy, sand is very fine, very light olive-gray.....	115.0	120.0

**Test Hole #2-37
(22-56-3ccdd)
Scotts Bluff County**

Location: SE SE SW SW sec. 3, T. 22 N., R. 56 W., approximately 0.23 miles east of southwest corner section on private land just north of section line

Source Footage: Map

Latitude: 41 54 06N

Longitude: 103 48 32W

Source Lat/Long: Map

7.5-minute Quad Map Name: Mitchell

Ground elevation: 3958 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, moderately sandy, sand is mostly very fine, medium dark brown-gray.....	0.0	10.0
Lithic gravel, gravel is mostly fine to medium, mostly light brown with some very light gray siltstone; some very light greenish gray mudstone and a few yellow-brown iron-stained grains 20 to 32 ft, contains a limonitic rootlet.....	10.0	32.0
Sand, fine to very coarse, much quartz, contains approximately 10 to 15 percent gravel including lithic siltstone grains.....	32.0	43.0
Logged in field as above; sample is mostly a little fine to medium gravel.....	43.0	55.0
Sample is also mostly lithic medium gravel grains; logged as sand with water-worn Brule.....	55.0	63.5
Sample is as above; logged as medium gravel with gray sandstone seams at 63.5 and 67 ft.....	63.5	75.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, very light brownish gray, a little very light olive-gray, noncalcareous.....	75.0	94.0
Mudstone, mostly very light brownish gray, some very light olive-gray, noncalcareous.....	94.0	100.0
Mudstone, some siltstone, very light olive-gray, noncalcareous, appears to be thinly layered; logged as sandy, tough and green.....	100.0	120.0

Mudstone-siltstone, in part very slightly sandy, sand is very fine, very light olive-gray, very slightly calcareous; logged as green, contains mica; sample 135 to 145 ft contains some moderately sandy siltstone-mudstone, sand is very fine, dark speckled, very light olive-gray to greenish gray; logged as sandstone with mica flakes.....	120.0	145.0
Mudstone, moderately sandy, sand is very fine to fine, light greenish gray, dark speckled, contains a little volcanic ash; logged as green sandstone containing coarser sand than above interval.....	145.0	152.0
Mudstone-claystone, very light brown, very slightly calcareous; logged as clay with intermixed sand...	152.0	163.0
Mudstone-siltstone, very light olive- to green-gray, noncalcareous; logged as hard, green, sandy.....	163.0	170.0
Sample appears to have been destroyed by washing; logged as green sandstone.....	170.0	175.0
Claystone-mudstone, in part very slightly sandy, sand is mostly embedded very fine to fine with rare medium to coarse sand grains, mostly very light brownish gray, a little greenish gray.....	175.0	185.0
Claystone, contains rare embedded sand grains, very light olive-gray and very light gray, in part brittle structure, noncalcareous.....	185.0	±195.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay-claystone, may have rare embedded sand grains, very light brown (pink tint) with a little very light yellow-brown clay.....	±195.0	200.0
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Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Sample destroyed by washing; logged as rubbery light green to gray shale, sticky, plugged bit.

Note: sample in next test hole #3-37 from 0 to 6 ft has medium dark gray shale, presumably from shale clinging to bit from this test hole.

Note: top of Chadron Formation may be in interval 185 to 195 ft

**Test Hole #10-F-97
(22-56-3dbcc)
Scotts Bluff County**

Location: SW SW NW SE sec. 3, T. 22 N., R. 56 W., approximately 1450 ft north and 2350 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 54 19.27N
 Longitude: 103 48 10.25W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Mitchell

Ground elevation: 3966.57 ft
 Source elev: GPS (geodetic)

Depth to water: 6.19 ft

Date measured: 8/1/00

Geophysical Log(s): Electric log (R), Gamma

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, slightly sandy, medium brown-gray.....	0.0	3.0
Silt, moderately clayey, slightly to in part moderately sandy, light brown-gray, slightly calcareous; some very light brown-gray, moderately calcareous in sample.....	3.0	5.0
Silt, moderately clayey, very light brown-gray to very light yellow-brown, slightly to moderately calcareous; some light reddish brown, slightly clayey to moderately sandy silt 10 to 15 ft, sand is very fine, silt is coarse, slightly calcareous.	5.0	15.0
Silt, slightly clayey, in part slightly sandy, sand is very fine, light yellow-brown and light-brown, slightly calcareous.....	15.0	20.0
Silty sand to moderately clayey, light brown and light brown-gray; some light medium gray silty clay.....	20.0	25.0
Silt, moderately to in part very clayey, slightly sandy, sand is very fine, light medium brown-gray, essentially noncalcareous; some medium dark brown 30 to 35 ft and a little light brown moderately clay to moderately sandy silt.....	25.0	35.0
Silt, slightly to moderately clayey, moderately sandy, sand is very fine to medium, light brown; very sandy 38 to 39 ft, sand is fine to coarse....	35.0	68.0

Note: Samples from 35 to 68 ft appear to be mostly lithic gravels composed of siltstone, rare limy and crystalline grains, lithic grains mostly light brown siltstone, some very light gray; contains rare limestone grains; some fine grained sandstone grains 60 to 68 ft; interval 60 to 68 logged as having some large gravel.

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light brown about 68 to 69 ft, light yellowish gray 69 to 75 ft, slightly calcareous, logged as sticky clay.....	68.0	75.0
Siltstone, moderately clayey, very slightly sandy, sand is very fine, light greenish gray, noncalcareous, contains rare volcanic ash shards, slightly calcareous 80 to 100 ft; contains a little mottled very pale brown 90 to 95 ft; very light yellowish to greenish gray 95 to 100 ft; rare crystalline quartz grains in some of the samples.....	75.0	100.0
Siltstone, moderately clayey, very slightly sandy, light medium greenish gray, slightly calcareous, logged as stiff to soft and sticky.....	100.0	120.0

**Test Hole #5-G-97
(22N-56W-5cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 5, T. 22 N., R. 56 W., on or near south section line and approximately 100 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 54 03.41N

Longitude: 103 51 07.36W

Source Lat/Long: GPS (geodetic)

7.5 minute Quad Map Name: Mitchell

Ground elevation: 4019.95 ft

Source elev: GPS (geodetic)

Depth to water: 33.54 ft

Date measured: 7/31/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very slightly clayey, light yellow-brown, slightly calcareous; a trace of medium brown-gray very sandy silt, silt is very fine.....	0.0	5.0
Silt, slightly clayey, in part slightly sandy, sand is very fine, light brown-gray, slightly calcareous.....	5.0	10.0
Silt, slightly clayey, silt is fine to very coarse, light yellow-brown, slightly calcareous.....	10.0	15.0
Silt, slightly to moderately clayey, silt is fine to very coarse, light yellowish to brownish gray, slightly calcareous.....	15.0	25.0
Silt, moderately clayey, mostly light medium brown-gray, noncalcareous.....	25.0	30.0
Silt, moderately clayey, light yellow-brown, slightly calcareous.....	30.0	35.0
Silt, slightly to moderately clayey, in part slightly sandy, sand is very fine to fine, slightly to moderately calcareous; contains rounded very coarse sand to fine gravel-size lithic siltstone grains 40 to 45 ft.....	35.0	45.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, very light yellowish gray, slightly to moderately calcareous; moderately calcareous 55 to 100 ft; very light yellow- to olive-gray 70 to 100 ft.....	45.0	100.0
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**Test Hole #35-37
(22-56-11dbc)
Scotts Bluff County**

Location: SW NW SE sec. 11, T. 22 N., R. 56 W., on private land 25 feet east of irrigation well (observation well No. 195)
 Source Footage: Map
 Latitude: 41 53 28N
 Longitude: 103 47 0W
 Source Lat/Long: Map
 7.5-minute Quad Map Name: Mitchell
Ground elevation: 3937 ft
 Source elev: (a)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, very clayey, light medium brown, reddish tint, slightly calcareous.....	0.0	3.5
Silt, moderately clayey, slightly sandy, sand is mostly very fine, medium dark brown-gray, slightly calcareous; sample contains a little brown-gray silt.....	3.5	4.5
Silt, slightly clayey, silt is fine to very coarse, light reddish brown, slightly calcareous.....	4.5	14.0
Logged as fine sand, contains a poor sample, probably a silty very fine to medium sand, shell fragment.....	14.0	21.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 percent gravel, contains a few dark grains; approximately 40 percent gravel 50 to 78 ft; boulders noted on field log from 58 to 68 ft.....	21.0	78.0
Sand and gravel, gravel is fine to coarse, common lithic siltstone and claystone grains, contains a trace of coal.....	78.0	115.0
Lithic sand and gravel, composed primarily of siltstone and claystone with some sandstone and a trace of coal.....	115.0	135.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, light olive-gray, slightly calcareous, poor sample, much lag.....	135.0	140.0
Mudstone, very light olive-gray with slightly light brown mottling, slightly calcareous.....	140.0	150.0

**Test Hole #10-H-99
(22-56-15bcdd)
Scotts Bluff County**

Location: SE SE SW NW sec. 15, T. 22 N., R. 56 W., approximately 2640 ft south and 1250 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 52 46.028N

Longitude: 103 48 30.504W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 4043.50 ft

Source elev: GPS (geodetic)

Depth to water: 67.67 ft

Date measured: 7/27/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, sand is mostly very fine to fine, light medium brown-gray, noncalcareous, contains a few fine gravel-size lithic siltstone grains....	0.0	5.0
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Silt, very slightly clayey, slightly sandy, sand is mostly very fine, light yellow-brown to light brownish gray, slightly calcareous.....	5.0	10.0
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Sand, some gravel, silty, sample largely very rounded siltstone grains, light brown, matrix is probably fine, very sandy silt.....	10.0	30.0
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Lithic gravel, composed of fine to coarse, rounded to subangular light brown siltstone grains.....	30.0	41.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, mostly very clayey, very light brown, noncalcareous, structure is slightly brittle, occasional crystalline quartz.....	41.0	65.0
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Siltstone-sandstone; moderately clayey, sand is very fine, very light brown and light brown-gray, slight dark speckling, noncalcareous.....	65.0	75.0
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Siltstone, moderately clayey, in part very clayey, very light brown, in part very clayey, noncalcareous, may have some interbeds of sandy siltstone, sand is very fine.....	75.0	85.0
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Siltstone, moderately clayey, very light brown-gray, moderately calcareous; contains rare limy nodular fragments 85 to 90 ft, non to very slightly calcareous 90 to 95 ft.....	85.0	95.0
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Siltstone, moderately clayey, very light brown, non-calcareous, slightly to in part moderately indurated; slightly calcareous 100 to 120 ft; moderately well indurated 105 to 115 ft; very slightly sandy 115 to 120 ft.....	95.0	120.0
Siltstone, moderately clayey, very light yellow-gray, a little very light brown, slightly calcareous; very light olive-gray 125 to 135 ft.....	120.0	135.0
Siltstone, moderately clayey, very light yellowish gray, moderately calcareous, contains some volcanic ash ; much volcanic ash 140 to 145 ft, in part well indurated, mostly noncalcareous.....	135.0	145.0
Clay, silty and claystone, very light olive-gray, well indurated, claystone is brittle, mostly noncalcareous.....	145.0	150.0
Siltstone, moderately to very clayey, very light olive to greenish gray, slightly calcareous.....	150.0	160.0

**Test Hole #3-37
(22-56-19daaa)
Scotts Bluff County**

Location: NE NE NE SE sec. 19, T. 22. N., R. 56 W., on west side of road
 Source Footage: Map
 Latitude: 41 51 52N
 Longitude: 103 51 05W
 Source Lat/Long: Map
 7.5-minute Quad Map Name: Roubadeau Pass
Ground elevation: 4173 ft
 Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly to moderately clayey, very slightly sandy, sand is very fine, medium brown-gray Note: sample contains medium dark gray shale, probably retained on bit from previous test hole 2-37.....	0.0	6.0
Silt, very slightly clayey, silt is coarse to very coarse, medium reddish brown.....	6.0	19.0
Lithic silty sand and gravel, sample consists of rounded grains of siltstone and mudstone, small snail shell noted in field; interval logged as pinkish brown with some light green clay.....	19.0	37.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone with some mudstone, siltstone is slightly sandy, sand is very fine, mostly very light olive-gray with some very light brown-gray, noncalcareous.....	37.0	53.0
Siltstone, slightly to moderately sandy, sand is mostly very fine, very light brownish gray, non-calcareous, well indurated.....	53.0	58.0
Mudstone-siltstone, very light olive-gray, a little very light brown-gray, in part slightly calcareous, well indurated.....	58.0	60.0
Siltstone, in part fine grained, very light brown-gray and very light greenish gray.....	60.0	65.0
Sandstone, mostly fine grained, mostly very light greenish gray, in part very slightly calcareous; one sample 65 to 158 ft, logged as tough gray clay 65 to 66 ft, then blue, softer at 148 ft.....	65.0	158.0

Mudstone and fine grained siltstone, mostly very light brown and very light brownish gray.....	158.0	170.0
Mudstone, some siltstone, mostly very light olive-gray with some brownish gray (one sample).....	170.0	265.0
Sample missing 265.5 to 300 ft, logged as gray and pinkish brown pieces with most of sample, blue....	265.0	300.0
Clay and claystone, very light olive-gray, hard drilling.....	300.0	318.0
Clay and claystone, very light olive-gray with some yellow-brown, slight iron staining, sample contains a trace of medium to coarse quartz sand grains and chalcedony, logged as containing some soft white and brown material.....	318.0	330.0

**Test Hole #5-H-97
(22N-56W-19aaab)
Scotts Bluff County**

Location: NW NE NE NE sec. 19, T. 22 N., R. 56 W., approximately 150 ft south and 350 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 52 17.35N

Longitude: 103 51 11.12W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Roubadeau Pass

Ground elevation: 4132.69 ft

Source elev: GPS (geodetic)

Depth to water: 44.74 ft

Date measured: 5/17/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly to moderately clayey, silt is fine to very coarse, medium dark brown-gray and light brown-gray, noncalcareous.....	0.0	5.0
Silt, slightly clayey, slightly sandy, sand is mostly very fine to medium, light yellowish to brownish gray, contains many lithic siltstone grains.....	5.0	10.0
Lithic sand, a little gravel, composed of light yellowish to brownish gray siltstone (may have a silty matrix).....	10.0	15.0
Silt, very sandy, sand is mostly very fine to fine, very light yellow-brown, contains interbeds or incorporated lithic siltstone grains; samples 20 to 40 ft and 45 to 51 ft composed mostly of coarse to very coarse sand-sized lithic siltstone grains; some gravel-sized grains 40 to 45 ft; poor sample recovery 25 to 35 ft.....	15.0	51.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, slightly to moderately clayey, silt is fine to very coarse, very light yellow-to brown-gray, slightly calcareous, contains a few volcanic ash shards.....	51.0	60.0

Siltstone, moderately clayey, mostly fine to coarse silt, light greenish gray, noncalcareous, in part moderately well indurated; contains rare volcanic ash shards; well indurated, very slightly calcareous 75 to 100 ft, in part very clayey; slightly granular structure 85 to 100 ft; contains a little very fine sand 90 to 95 ft; contains rare quartz crystals 95 to 100 ft..... 60.0 100.0

**Test Hole #11-H-99
(22-56-23babc)
Scotts Bluff County**

Location: SW NW NE NW sec. 23, T. 22 N., R. 56 W., approximately
600 ft south and 1500 ft east of northwest corner of
section

Source Footage: Map

Latitude: 41 52 14.91N

Longitude: 103 47 16.64W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Roubadeau Pass

Ground elevation: 4001.78 ft

Source elev: GPS (geodetic)

Depth to water: 44.25 ft

Date measured: 7/27/99

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, light brown-gray and silt, very sandy, sandy is very fine, light brown, contains many clasts of siltstone, very light brown, slightly calcareous.....	0.0	5.0
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Sand, some gravel, composed of rounded siltstone grains, mostly coarse to very coarse grain-size; considerable large clasts of siltstone 20 to 30 ft; poor recovery 20 to 25 ft; mostly siltstone and silt 30 to 40 ft, a few rounded grains; snail shells and shell fragments 40 to 45 ft and 50 to 65 ft; bone fragments 70 to 75 ft, a few quartz sand grains and subangular calcareous sandstone grains. Note: section drilled very fast 0 to 83 ft, matrix may be very fine to fine sand.....	5.0	83.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, light greenish gray, a little very light brown, moderately calcareous, moderately well indurated; very light brown-gray 90 to 110 ft; very slightly calcareous 95 to 110 ft.....	83.0	110.0
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**Test Hole #11-L-99
(22-56-24dbac)
Scotts Bluff County**

Location: SW NE NW SE sec. 24, T. 22 N., R. 56 W., approximately 2200 ft north and 2300 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 51 51.13N

Longitude: 103 45 40.83W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Roubadeau Pass

Ground elevation: 3954.22 ft

Source elev: GPS (geodetic)

Depth to water: 34.71 ft

Date measured: 7/27/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, in part very slightly sandy, light brown-gray, very slightly calcareous, scattered fine to coarse sand grains.....	0.0	5.0
Silt, slightly to in part moderately clayey, slightly sandy, light yellow-brown, sand is mostly fine to medium, slightly calcareous, contains some siltstone fragments; in part very clayey 10 to 15 ft, light gray, siltstone fragments common.....	5.0	20.0
Silt, slightly to moderately clayey, in part slightly sandy, sand is mostly very fine to medium, light medium yellow-brown, slightly calcareous; contains many siltstone fragments, subangular to slightly rounded; some light gray, moderately to very clayey silt 25 to 30 ft, logged as <i>sticky</i> 25 to 30 ft; occasional subangular pieces of light gray slightly sandy clayey silt 30 to 48 ft.....	20.0	48.0
Sand, some gravel, clayey matrix, many siltstone and clay grains.....	48.0	55.0
Sand, slightly silty to clayey, sand is mostly fine to coarse, scattered gravel grains, some lithic siltstone and limy grains.....	55.0	65.0
Sand, slightly gravelly, gravel is mostly fine, much quartz, a few dark mafic grains and pink silicates; large pieces of charcoal (probably coal) logged in this interval.....	65.0	75.0
Sand and gravel, most of sample consists of rounded grains of well indurated siltstone and fine grained calcareous sandstone.....	75.0	85.0

Lithic gravel, fine to coarse, grains of siltstone and fine grained sandstone are mostly subrounded to subangular.....	85.0	98.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, slightly to moderately clayey, very light olive-gray, slightly calcareous, very light brownish to olive-gray 105 to 110 ft.....	98.0	110.0
Siltstone, moderately clayey, light olive-gray, moderately calcareous.....	110.0	120.0

**Test Hole #11-I-98
(22-56-25bcdd)
Scotts Bluff County**

Location: CSL SE SW NW sec. 25, T. 22 N., R. 56 W., approximately 2600 ft south and 1000 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 51 03.18N

Longitude: 103 46 11.90W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map: Roubadeau Pass

Ground elevation: 4029.55 ft

Source elev: GPS (geodetic)

Depth to water: 31.1 ft

Date measured: 7/27/99

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, silt is fine to very coarse, little medium brown-gray, very slightly calcareous.....	0.0	14.0
Siltstone, slightly clayey, sand is fine to very coarse, light reddish to yellowish brown, very slightly calcareous, structure uniformly massive to slightly granular; slightly calcareous 65 to 105 ft; contains nodular calcareous siltstone, slightly sandy 87 to 95 ft, may contain rare crystalline sand grains 100 to 105 ft, contains angular nodular calcareous siltstone-sandstone grains 100 to 105 ft.....	14.0	105.0
Siltstone, moderately clayey, very light brown, slightly calcareous; very light olive-brown 110 to 115 ft, light olive-gray 115 to 120 ft, essentially noncalcareous; logged as soft and sticky 105 to 120 ft.....	105.0	120.0

Note: drilling time 10 to 14 ft and 20 to 90 ft was unusually fast, less than 1 minute per 5 ft; sandstone and brown siltstone grains 90 to 95 ft and 100 to 105 ft were considered to be lithic coarse sand grains; upper few feet of interval may be Quaternary in age.

**Test Hole #10-I-97
(22-56-28dadb)
Scotts Bluff County**

Location: NW SE NE SE sec. 28, T. 22 N., R. 56 W., approximately 1750 ft north and 600 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 50 53.31N

Longitude: 103 48 52.75W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Roubadeau Pass

Ground elevation: 4190.1 ft

Source elev: GPS (geodetic)

Depth to water: Dry

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand and gravel, sample mostly siltstone lithic grains, much coarse sand to fine gravel-size grains, some pebbles, light brown, a few lithic sandstone grains, bone fragments and crystalline grains 20 to 25 ft.....

0.0 25.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, light greenish gray, some siltstone-sandstone, fine grained, greenish gray, both non to slightly calcareous, logged in part as soft and sticky.....

25.0 30.0

Siltstone, moderately clayey, very slightly sandy, sand is very fine, very light brown, moderately calcareous; may have thin siltstone-sandstone layers interbedded 35 to 40 ft.....

30.0 45.0

Siltstone, slightly to moderately clayey, light olive-gray with a little very light brown mottles, slightly calcareous; mostly very light greenish gray 50 to 55 ft.....

45.0 55.0

Siltstone, moderately clayey, very light greenish gray, moderately calcareous, logged as interbedded soft and firm, sticky.....

55.0 75.0

Siltstone, slightly clayey, very slightly to in part slightly sandy, sand is very fine, light greenish gray, moderately calcareous.....

75.0 80.0

Siltstone, slightly to moderately clayey, in part very slightly sandy, light greenish gray, moderately calcareous.....

80.0 100.0

**Test Hole #9-F-97
(22N-57W-1ccbc)
Scotts Bluff County**

Location: SW NW SW SW sec. 1, T. 22 N., R. 57 W., approximately 850 ft north and 50 ft east of southwest corner of section
Source Footage: Map

Latitude: 41 54 10.15N
Longitude: 103 53 22.78W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 4182.28 ft
Source elev: GPS (geodetic)
Depth to water: 32.68 ft 23 ft

Date measured: 7/31/00 9/17/97

Geophysical Log(s): Electric log (R), Gamma

<u>Depth, in feet</u>	
From	To

Quaternary System, undifferentiated:

Silt, slightly to in part moderately clayey, slightly to in part moderately sandy, sand is mostly very fine, dark brown-gray, some light brown-gray, slightly calcareous.....	0.0	5.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, silt is fine to very coarse, contains a trace of very fine sand, light brown, noncalcareous; slightly calcareous 10 to 15 ft, contains some thin moderately to very clayey layers.....	5.0	15.0
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Siltstone, slightly to moderately clayey, silt is fine to very coarse, contains a trace of very fine sand, light brown, slightly calcareous, granular structure, contains rare volcanic ash shards; some interbedded moderately to very clayey siltstone 20 to 25 ft; red silica chips noted in field log 20 to 30 ft, not noted in samples, small thin laminar red-brown clay cuttings noted; field log notes thin <i>grayish clay</i> , <i>?ash layers</i> 45 to 50 ft, some fine grained sandstone-siltstone in sample.....	15.0	50.0
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Siltstone, slightly to moderately clayey, light brown, contains some volcanic ash, interbedded with some very clayey silt to siltstone, logged as hard and crunchy, slightly more reddish 55 to 60 ft.....	50.0	65.0
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Siltstone, slightly clayey and siltstone, moderately to very clayey, interbedded, slightly clayey siltstone is fine to very coarse grained with a trace of very fine sand and some volcanic ash, clayey siltstone is light reddish brown, all slightly to noncalcareous.....	65.0	70.0
Siltstone, mostly moderately clayey, a little slightly clayey to coarse grained siltstone, very light yelloww-brown to light brownish gray, very slightly to noncalcareous. Note: thin high resistivity layers 74 to 82 ft on electric log.....	70.0	80.0
Siltstone, moderately to in part very clayey, silt is fine to coarse, very light yellowish to olive-gray with some very light brown, moderately calcareous; mostly very light olive-gray 90 to 100 ft, in part with brownish tint.....	80.0	100.0

**Test Hole #21-K-94
(22-57-4aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 4, T. 22 N., R. 57 W., approximately
190 ft south and 70 ft west of northeast corner
Source Footage: Map
Latitude: 41 54 51.96N
Longitude: 103 55 44.65W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4040.97 ft
Source elev: (i)
Depth to water: 4.13 ft
Date measured: 5/95
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, slightly silty, sand is very fine to medium with some coarse and rare very coarse sand, contains a few lithic light brown and very light olive-gray siltstone grains.....	0.0	7.5
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, very slightly sandy, silt is fine to very coarse, sand is very fine, very light brownish gray, very slightly calcareous; very light yellowish to olive-gray 15 to 25 ft, slightly calcareous.....	7.5	25.0
Siltstone, silt is fine to very coarse, light greenish gray, slightly calcareous, logged as slightly sticky.....	25.0	27.0
Mudstone, light greenish gray, slightly to moderately calcareous, logged as slightly sticky, hard drilling 30.5 to 35 ft.....	27.0	35.0

**Test Hole #8-H-97
(22N-57W-8bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 8, T. 22 N., R. 57 W., approximately 100 ft south and 50 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 54 00.30N
Longitude: 103 58 02.17W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 4091.9 ft
Source elev: GPS (geodetic)

Depth to water: 17.97 ft
Date measured: 7/25/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, in part slightly clayey, moderately to in part very sandy, sand is mostly very fine to fine, some coarse grains, mostly dark brown-gray, some light gray.....	0.0	5.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, silt is mostly fine, very light yellow-brown to very pale brown, slightly calcareous.....	5.0	10.0
Siltstone, moderately clayey and clay, very light yellow-gray and very pale brown, slightly calcareous.....	10.0	15.0
Siltstone-mudstone, clayey, silt is mostly fine, mostly very pale brown, slightly to moderately calcareous; very light gray and light olive-brown 20 to 40 ft, may be interbeds or mottled colors; mostly very light yellow- to olive-gray 40 to 60 ft; very light olive-gray 60 to 70 ft; very light olive- to green-gray 70 to 80 ft; interval 5 to 80 ft tends to be massive; silt is coarser and contains a trace of very fine sand in part, moderately well indurated, color changes are very slight.....	15.0	80.0

**Test Hole #1-O-97
(22N-57W-10bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 10, T. 22 N., R. 57 W., on or near north section line and approximately 250 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 54 01.26N

Longitude: 103 55 38.91W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Morrill

Ground elevation: 4113.55 ft

Source elev: GPS (geodetic)

Depth to water: 19.3 ft

Date measured: 7/25/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, silt is fine to very coarse, light brown, noncalcareous, moderately well indurated, massive, slightly micaceous.....	0.0	20.0
Siltstone, slightly to moderately clayey, very slightly sandy, silt is fine to very coarse, sand is very fine, light brown to light reddish brown..	20.0	25.0
Siltstone, moderately to very clayey, silt is fine, slightly calcareous, light brown.....	25.0	45.0
Siltstone, slightly to moderately clayey, some silty very fine grained sandstone, very light brown-gray, in part slightly calcareous, mostly very light yellowish gray 50 to 54 ft, sample has some reddish brown and very light gray rounded clay clasts.....	45.0	54.0
Siltstone, very clayey, silt is mostly fine, very light yellow-gray with a little very light brown, logged as <i>greenish and blue-green silty clay</i>	54.0	65.0
Clay to claystone, very light olive-gray, thin bedded in part, slightly calcareous; may have some mottled or bedded very light brown 75 to 80 ft, very little brown 80 to 85 ft; light medium olive-gray 85 to 90 ft; some very light brown-gray 90 to 100 ft.....	65.0	100.0

**Test Hole #1-P-97
(22N-57W-15cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 15, T. 22 N., R. 57 W., approximately 100 ft north and 75 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 52 17.93N

Longitude: 103 55 40.39W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Stegall

Ground elevation: 4163.45 ft

Source elev: GPS (geodetic)

Depth to water: 11.29 ft

Date measured: 7/25/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly to moderately clayey, dark brown-gray, noncalcareous and silt, slightly to moderately clayey, slightly calcareous, some very fine sandy silt in sample, poor sample recovery noted in field log.....	0.0	5.0
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Silt, slightly clayey, moderately sandy, sand is very fine, light medium yellow-brown to reddish brown, slightly calcareous; contains scattered grains of sand and small lithic grains of siltstone.....	5.0	12.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, slightly sandy, silt is coarse, sand is very fine, light reddish brown, poor sample recovery noted, drilled fast 15 to 20 ft, small cuttings.....	12.0	20.0
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Mudstone, clayey, pale reddish brown, slightly calcareous.....	20.0	25.0
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Mudstone and clayey siltstone, very light yellow-gray, slightly calcareous.....	25.0	30.0
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Siltstone-mudstone, moderately to very clayey, silt is mostly fine, very light yellow-gray, moderately calcareous; mottled very light yellowish and brownish gray 35 to 45 ft; slightly more clayey 45 to 50 ft, yellow- to olive-gray.....	30.0	50.0
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Siltstone, moderately to very clayey, silt is fine,
very light olive-gray; slight iron staining 60 to
65 ft, some pale brown mottling 60 to 75 ft,
mostly light brown- to olive-gray 75 to 80 ft..... 50.0 80.0

Test Hole #8-I-97
(22N-57W-17cccb)
Scotts Bluff County

Location: NW SW SW SW sec. 17, T. 22 N., R. 57 W., approximately
800 ft north and 50 ft east of southwest corner of
section

Source Footage: Map

Latitude: 41 52 24.50N

Longitude: 103 58 00.22W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Stegall

Ground elevation: 4130.91 ft

Source elev: GPS (geodetic)

Depth to water: 8.90 ft

Date measured: 7/25/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy to
slightly gravelly, mostly dark brown-gray..... 0.0 3.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to in part very clayey, very
light yellowish gray, slight brown tint, very
slightly calcareous..... 3.0 10.0

Siltstone-mudstone, clayey, very light yellow-
gray, very slightly to noncalcareous, moderately
well indurated, thin bedded in part; thin clay
layers logged in field 20 to 25 ft..... 10.0 45.0

Siltstone-mudstone, moderately clayey, very pale
brown-gray, noncalcareous..... 45.0 50.0

Siltstone, moderately clayey, very pale brown-gray,
contains a little volcanic ash, noncalcareous 50
to 55 ft; siltstone, some mudstone 55 to 60 ft,
very slightly calcareous, very pale brownish to
yellowish gray..... 50.0 60.0

Siltstone-mudstone, very pale brownish gray,
slightly calcareous; mostly very light yellow-gray
70 to 81 ft..... 60.0 81.0

Siltstone, moderately clayey, very pale yellow-gray,
slightly calcareous, logged as soft and clayey;
very pale brownish gray 90 to 100 ft; slightly to
moderately calcareous..... 81.0 100.0

**Test Hole #9-G-97
(22N-57W-24bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 24, T. 22 N., R. 57 W., approximately 100 ft south and 50 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 52 17N

Longitude: 103 53 19W

Source Lat/Long: Map

7.5-minute Quad Map Name: Stegall

Ground elevation: 4161 ft

Source elev: (t)

Depth to water: Not recorded

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, silt is fine to very coarse, mostly light yellowish to brownish gray, some medium dark brown-gray, slightly calcareous.....	0.0	5.0
Silt, very slightly clayey, very slightly sandy, sand is very fine, silt is fine to very coarse, light yellow-brown, slightly to moderately calcareous, poor sample recovery; a little medium dark brown noncalcareous silt in sample; contains rare snail shell fragments; contains rare sand-size grains of siltstone 10 to 15 ft.....	5.0	15.0
Silt and sandy silt, sand is composed of coarse to very coarse grain-size rounded clasts of siltstone, poor sample recovery.....	15.0	20.0
Sand and gravel, composed of rounded lithic siltstone grains; contains a trace of charcoal.....	20.0	25.0
Silt and lithic siltstone, light yellow-brown, siltstone grains range up to medium gravel; contains a few limy grains 30 to 35 ft.....	25.0	35.0
Lithic sand and gravel, mostly very coarse sand to fine gravel-size grains; much fine to medium gravel 40 to 45 ft, rare limy grains; grain size mostly coarse to very coarse sand 50 to 55 ft.....	35.0	59.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Siltstone, moderately clayey, silt is fine to very coarse, very light yellow- to olive-gray; contains a few volcanic shards 60 to 65 ft, non- to slightly calcareous; contains a trace of mottled light brown 65 to 70 ft; slightly to moderately calcareous 70 to 75 ft, light yellow-gray.....	59.0	75.0
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Siltstone, moderately to very clayey, very light greenish gray, a little mottled very light brown, moderately calcareous.....	75.0	80.0
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**Test Hole #1-Q-97
(22N-57W-28addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 28, 22 N., R. 57 W., approximately 2640 ft south and 100 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 50 58.06N
Longitude: 103 55 41.21W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Stegall

Ground elevation: 4210.56 ft
Source elev: GPS (geodetic)

Depth to water: 44.41 ft
Date measured: 7/25/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light brown-gray, slightly calcareous.....	0.0	5.0
Mudstone-siltstone, very light brownish gray; moderately calcareous; very light brownish gray, moderately calcareous; very light olive to brownish gray 10 to 25 ft.....	5.0	25.0
Siltstone-mudstone, mostly very light olive gray, slightly to moderately calcareous, very pale brownish to yellowish gray 35 to 45 ft; mostly very light yellowish to brownish gray 45 to 55 ft, some very light brownish gray 50 to 55 ft; some <i>red siliceous chips</i> noted in field log 45 to 50 ft; soft gray clay noted 52 to 54 ft and very light <i>blue clay</i> at 54 ft.....	25.0	60.0
Siltstone-mudstone, colors range from very light brown-gray to very light olive-gray, very slightly calcareous, some <i>green siltstone</i> noted in field log 65 to 80 ft.....	60.0	80.0

**Test Hole #8-J-97
(22N-57W-30dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 30, T. 22 N., R. 57 W., approximately 50 ft north and 150 west of southeast corner of section
Source Footage: Map

Latitude: 41 50 32.80N
Longitude: 103 58 00.66W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Stegall

Ground elevation: 4151.18 ft
Source elev: GPS (geodetic)

Depth to water: 6.32 ft
Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, in part moderately clayey, in part moderately sandy, sand is mostly very fine to fine, light medium brown, appears to have some large pieces of lithic siltstone and mudstone incorporated.....	0.0	5.0
Sand, silty, sand is mostly very fine to fine with some medium sand and coarse to very coarse grain-size lithic siltstone, sandstone and claystone grains, contains a trace of bone and shell fragments; drillers log indicated poor sample recovery.....	5.0	13.0
Lithic gravel and pebble layer, iron-stained grains of siltstone and fine-grained sandstone common....	13.0	16.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, clayey, silt is fine grained, very pale brownish gray, noncalcareous; very pale brown 25 to 35 ft; very pale yellowish gray with some very pale brownish gray 35 to 40 ft; mostly very pale yellow- to olive-gray 40 to 43.5 ft.....	16.0	43.5
Clay, silty, very light greenish gray, noncalcareous, contains some volcanic ash; green sandstone chips logged 45 to 50 ft; logged as blue-green 43.5 to 50 ft.....	43.5	50.0
Clay, light brown with a little mottled very light gray; mottled light brown and light yellowish gray with a little light reddish brown 55 to 60 ft; bentonitic 50 to 60 ft.....	50.0	60.0

**Test Hole #4-37
(22-58-1dcd)
Scotts Bluff County**

Location: SE SW SE sec. 1, T. 22 N., R. 58 W., approximately one-quarter mile west of southeast corner of section on north side of road

Source Footage: Map

Latitude: 41 54 03N

Longitude: 103 59 08w

Source Lat/Long: Map

7.5-minute Quad Map Name: Morrill

Ground elevation: 4065 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sample missing, logged as probably being reworked

Brule..... 0.0 23.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, mostly fine grained, very light brownish gray, noncalcareous, slight dark stain on joint faces..... 23.0 46.0

Siltstone, mostly fine grained, very light brownish gray with a little very light olive-gray, noncalcareous; field log indicates a light green layer at 51 ft..... 46.0 61.0

Mudstone, some siltstone, very light greenish gray with some very light brown, noncalcareous..... 61.0 82.0

**Test Hole #6-I-97
(22N-58W-3dccc)
Scotts Bluff County**

Location: SE SW SW SE sec. 3, T. 22 N., R. 58 W., approximately 50 ft north and 2150 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 54 01.75N

Longitude: 104 01 57.89W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lyman

Ground elevation: 4054.17 ft

Source elev: GPS (geodetic)

Depth to water: 9.44 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma

	<u>Depth, in feet</u>	
	From	To
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Clay, slightly sandy with some very sandy to clayey silt, sand is mostly scattered in clay, sand is very fine to fine, light yellow-brown, non-calcareous.....	0.0	5.0
Silt, moderately clayey, mostly moderately sandy, sand is very fine, some fine, light yellow-brown, slightly calcareous.....	5.0	10.0
Siltstone, moderately clayey, slightly to moderately sandy, sand is very fine, silt is coarse, very light yellowish to brownish gray, very slightly calcareous, sample contains a trace of clayey sandstone, sand is very fine to medium, rare coarse sand grains; field log records some sand and small gravel in interval.....	10.0	15.0
Clay, silty to very slightly sandy and gravelly, contains a trace of lithic clay, sandstone, limy and ironstone grains.....	15.0	18.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Claystone-siltstone, in part very slightly sandy, sand is very fine, very light olive to greenish gray, noncalcareous; very light olive-gray 20 to 25 ft, very slightly calcareous; some interbedded claystone, clayey siltstone and very fine-grained sandstone to siltstone 30 to 40 ft; contains some volcanic ash 30 to 40 and 45 to 50 ft, mostly noncalcareous, appears to be thin bedded, logged in field as alternating layers; well indurated; slightly calcareous 40 to 55 ft.....	18.0	55.0
Claystone, light gray to very light greenish gray, moderately calcareous, well indurated, brittle....	55.0	60.0

Note: alternative correlation interval 0 to 18 ft may be Quaternary in age

**Test Hole #7-J-97
(22N-58W-13cddb)
Scotts Bluff County**

Location: SE NW SE SW sec. 13, T. 22 N., R. 58 W., approximately 750 ft north and 1700 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 52 24.39N

Longitude: 103 59 55.01W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Stegall

Ground elevation: 4089.99 ft

Source elev: GPS (geodetic)

Depth to water: 8.49 ft

Date measured: 7/25/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly clayey, slightly to in part very sandy, sand is mostly very fine to fine, medium dark brown-gray, contains rare coarse sand grains.	0.0	5.0
Logged as <i>Brule pebbles</i> 5 to 9 ft, sample consists primarily of mudstone-siltstone fragments, very light brown and very light gray, logged as firm at 9 ft.....	5.0	9.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, clayey, light brown, noncalcareous, logged as <i>firm to crunchy</i>	9.0	15.0
Siltstone-mudstone, clayey, very light yellow- to brown-gray, noncalcareous, logged as interbedded soft and hard.....	15.0	20.0
Siltstone to mudstone, clayey, very light olive- to green-gray, slightly yellow stain, noncalcareous.....	20.0	30.0
Mudstone-claystone, very light green-gray, noncalcareous.....	30.0	±37.0
Tertiary system - Eocene Series - White River Group:		
Chadron Formation:		
Clay-claystone, mottled light brown, light reddish brown with some very light gray, bentonitic; much very light yellowish gray 45 to 50 ft.....	±37.0	50.0
Clay to claystone, very light olive to greenish gray, bentonitic.....	50.0	79.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Shale, clayey and silty, in part moderately sandy, sand is very fine, micaceous, medium to bright brown-yellow with some light yellow-gray and a little reddish brown; contains some fine-grained siltstone-sandstone, platy, sand is very fine, logged as hard 88 to 90 ft.....	79.0	90.0
Shale, clayey and shale, silty and slightly sandy, sand is very fine, some well indurated very fine-grained sandstone, appears to be interbeds, very light olive to greenish gray with some yellow-brown and a little reddish brown.....	90.0	100.0

Note: sand in interval 79 to 100 ft is mostly quartz, contains some muscovite mica.

**Test Hole #6-J-97
(22N-58W-21aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 21, T. 22 N., R. 58 W., approximately 50 ft south and 100 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 52 16.08N

Longitude: 104 02 37.80W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Robb Draw

Ground elevation: 4115.36 ft

Source elev: GPS (geodetic)

Depth to water: 20.63 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly sandy, silt is fine to very coarse, sand is very fine, light medium yellow-brown, slightly to moderately calcareous; 2 ft of top soil recorded in field log..... 0.0 5.0

Silt, very sandy, silt is coarse, sand is very fine with a little fine sand, in part very slightly clayey, little medium yellow-brown, slightly calcareous; contains a few small limy concretions.... 5.0 13.0

Sand, very silty, some slightly clayey to very sandy silt, sand is mostly very fine to fine, scattered coarser grains, light medium yellow-brown, common small irregularly shaped limy concretions; log indicates poor sample recovery; considerable moderately to sandy clay about 20 to 23 ft; some clay logged at 18 ft..... 13.0 23.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay, very pale brown to pinkish brown, considerable very calcareous white limestone to calcareous clay in upper part, clay is bentonitic; light brown to pink 28 to 30 ft..... 23.0 30.0

Clay to claystone, mottled very light brown with some light brown- to olive-gray, bentonitic, contains rare embedded very fine to fine sand grains, noncalcareous..... 30.0 40.0

Clay, moderately sandy and clayey sandstone, sand is mostly very fine to fine, light olive- to greenish gray..... 40.0 47.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Fox Hills Formation:

Clay, slightly to moderately sandy, sand is mostly very fine to fine, bright brown-yellow, light yellow-gray, a little reddish brown, bentonitic; mostly bright brown-yellow clay with a little clayey fine-grained sandstone 50 to 55 ft.....	47.0	55.0
Clayey siltstone and siltstone-sandstone, sand is mostly very fine to fine, rare medium sand, may contain some less sandy clay layers, light yellow-gray with some light brown-yellow.....	55.0	60.0
Sandstone, silty, sand is very fine to fine, light yellow to brownish-gray with some light brown-yellow; contains some layers of sandy clay, thin bedded limestone and calcareous sandstone 65 to 70 ft.....	60.0	70.0
Interbedded clay, clayey silt and sandstone, sandstone is mostly very fine to fine, rare medium sand, bright medium brown-yellow; contains one or more thin beds of calcareous sandstone and limestone.....	70.0	80.0

**Test Hole #7-37
(22-58-26cbcc)
Scotts Bluff County**

Location: SW SW NW SW sec. 26, T. 22 N., R. 58 W., on east side of road just north of bridge over irrigation ditch, approximately 1800 feet north of southwest corner
Source Footage: Map

Latitude: 41 50 48N

Longitude: 104 01 22W

Source Lat/Long: Map

7.5-minute Quad Map Name: Robb Draw

Ground elevation: 4180 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, sandy.....	0.0	11.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
No sample, logged as finely arenaceous Brule.....	11.0	36.0
Siltstone and mudstone, very light brown and very light olive-gray, noncalcareous.....	36.0	47.0
Mudstone, some claystone, layered or mottled very light brown and very light olive-gray to greenish gray, noncalcareous.....	47.0	58.0
Clay and claystone, in part very slightly sandy, sand is mostly fine with rare medium to coarse sand grains, mostly light brown, some very light olive-gray, noncalcareous, in part slightly bentonitic; contains rare lithic grains of yellow-brown sandstone.....	58.0	87.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Fox Hills Formation:		
Sample missing, logged as yellow sand with concretions and hard ironstone layers at 87, 89.5 and 98 ft.....	87.0	106.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
undifferentiated:		
Sample missing, logged as clay, sandy, sticky, in part pink, contains hard layers at 123 and 163 ft, has some blue sandy layers more numerous at bottom of test hole.....	106.0	168.0

**Test Hole #7-K-97
(22N-58W-26ddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 26, T. 22 N., R. 58 W., approximately 50 ft north and 50 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 50 32.71N
Longitude: 104 00 15.13W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Robb Draw

Ground elevation: 4208.18 ft
Source elev: GPS (geodetic)

Depth to water: 24.56 ft
Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, clayey, sandy, sand is mostly very fine, medium dark gray; field log records soft sticky clay.....	0.0	4.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, silt is mostly fine grained, very light brownish gray, noncalcareous; very slightly calcareous 10 to 15 ft.....	4.0	15.0
Siltstone-mudstone, very light brownish to yellowish gray, very slightly calcareous; mostly very pale brownish gray 20 to 45 ft; mostly very light yellowish gray 45 to 60 ft.....	15.0	60.0
Siltstone and mudstone interbedded, siltstone is clayey and silt is fine to coarse, very light yellowish to brownish gray, very slightly calcareous, granular structure in part.....	60.0	70.0
Siltstone-mudstone, very light yellowish and brownish gray, very slightly calcareous, logged as soft and sticky 70 to 80 ft, drilled without hydraulic pull down 70 to 100 ft.....	70.0	100.0

**Test Hole #6-K-97
(22N-58W-33bbb)
Scotts Bluff County**

Location: NW NW NW sec. 33, T. 22 N., R. 58 W., approximately 50 ft south and 250 ft east of northwest corner of narrow half-mile wide section

Source Footage: Map

Latitude: 41 50 32.12N

Longitude: 104 03 06.18W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Robb Draw

Ground elevation: 4160.31 ft

Source elev: GPS (geodetic)

Depth to water: 15.72 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, clayey, moderately sandy, sand is very fine to medium, medium dark brown-gray.....	0.0	3.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, very pale brown and very light gray, contains a trace of yellow-brown and reddish brown, non-calcareous, bentonitic, swells in diluted acid; mostly pale brown 10 to 15 ft, contains a little embedded very fine to medium and rare coarse sand; contains rare lithic grains of iron-cemented sandstone.....	3.0	16.0
Cretaceous system - Upper Cretaceous Series - Montana Group:		
Fox Hills Formation:		
Siltstone, clayey, slightly sandy, silt is coarse and sand is very fine light to medium brown-yellow with a little reddish brown, noncalcareous; contains a little calcareous thin-bedded sandstone.....	16.0	25.0
Clay, silty and siltstone clayey, and sandstone, sandstone is very fine to fine grained, all bright yellow; sandstone about 28 to 30 ft (electric log).....	25.0	30.0
Siltstone, clayey and claystone silty, silt is mostly fine to coarse, little brown-yellow, light yellow-gray and some pink, noncalcareous; considerable claystone 35 to 38 ft; siltstone to sandstone 38 to 40 ft.....	30.0	40.0

Siltstone, in part clayey, in part sandy, some fine-grained siltstone-sandstone, all bright brown-yellow; mostly poorly indurated 40 to 45 ft.....	40.0	50.0
Siltstone and siltstone-sandstone, sand is mostly very fine, bright brown-yellow; contains a few ironstone-sandstone concretions 55 to 60 ft, contains some very fine- to fine-grained sandstone and some thin clay beds; sandstone logged in field 68 to 69 ft, hard at 69 ft; in part light yellowish to brownish gray 70 to 75 ft; contains some dense calcareous sandstone 75 to 80 ft; logged as hard sandstone 75 to 79 ft, rough drilling.....	50.0	80.0

**Test Hole #20-A-98
(23-53-26aadd)
Scotts Bluff County**

Location: SE SE NE NE sec. 26, T. 23 N., R. 53 W., approximately 1150 ft south and 30 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 56 29.96N

Longitude: 103 25 15.15W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4127.35 ft

Source elev: GPS (geodetic)

Depth to water: 47.35 ft

Date measured: 8/15/00

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Lithic sand and gravel, lithic grains of fine grained siltstone-sandstone, well indurated, mostly very calcareous, light gray.....	0.0	5.0
Lithic gravel and pebbles composed of fine grained calcareous siltstone-sandstone, very light gray, grains well-rounded.....	5.0	15.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone to sandstone, sand is mostly very fine, rare to medium sand, light brown, noncalcareous, some slightly clayey siltstone 25 to 30 ft, no sample 30 to 35 ft.....	15.0	35.0
Siltstone, slightly clayey, light brown, noncalcareous; slightly to moderately calcareous 45 to 80 ft.....	35.0	80.0

**Test Hole #23-37
(23-53-26aaab)
Scotts Bluff County**

Location: NW NE NE NE sec. 26, T. 23 N., R. 53 W., approximately
0.13 mile west of northeast corner on south side of road
and north of farm house

Source Footage: Map

Latitude: 41 56 41N

Longitude: 103 25 21W

Source Lat/Long: Map

7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4153 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, fine..... 0.0 13.0

Siltstone, reworked, contains some gray sandstone
fragments..... 13.0 19.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone..... 19.0 37.0

**Test Hole #19-A-98
(23-53-28aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 28, T. 23 N., R. 53 W., approximately 100 ft south and 50 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 56 41.72N

Longitude: 103 27 38.91W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lake Minatare

Ground elevation: 4147.4 ft

Source elev: GPS (geodetic)

Depth to water: 39.57 ft

Date measured: 8/16/00

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, moderately silty, sand is very fine to fine, rare medium grain, dark brown-gray, noncalcareous. 0.0 5.0

Silt, very slightly clayey, very sandy, sand is mostly very fine to medium, brown-gray, very slightly calcareous to noncalcareous; mostly slightly clayey to moderately sandy 10 to 21 ft, very light yellow-brown, slightly calcareous..... 5.0 21.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, clay and some sandy siltstone, sand is very fine, light brown slightly to moderately calcareous..... 21.0 25.0

Siltstone, clayey, light brown to light reddish brown, some clay, very slightly calcareous; mostly light brown clay 30 to 35 ft..... 25.0 35.0

Siltstone, slightly clayey, light brown, slightly calcareous, silt is fine to coarse, slightly to moderately calcareous 40 to 45 ft, contains a few small limy areas and/or soft limy nodules; very slightly calcareous 45 to 55 ft, very light brownish gray..... 35.0 55.0

Siltstone, slightly clayey, slightly sandy, sand is very fine, light reddish brown, slightly calcareous; some white clay logged 45 to 50 ft..... 55.0 60.0

Siltstone, slightly to moderately clayey, light
brown to light reddish brown, slightly to in part
moderately calcareous; essentially noncalcareous
95 to 100 ft..... 60.0 100.0

**Test Hole #19-B-98
(23-53-34cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 34, T. 23 N., R. 53 W., approximately
50 ft north and 30 ft east of southwest corner of section
Source Footage: Map
Latitude: 41 55 0.82N
Longitude: 103 27 36.95W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lake Minatare
Ground elevation: 4097.22 ft
Source elev: GPS (geodetic)
Depth to water: 35.48 ft
Date measured: 8/16/00
Geophysical Log(s): Caliper

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very silty, slightly clayey in part, sand is very fine to fine with rare coarser grains, medium brown-gray, noncalcareous; contains rare gravel grains 5 to 13 ft.....	0.0	13.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Whitney Member:		
Siltstone, slightly clayey, very slightly sandy, sand is very fine, light yellow-gray, noncalcareous, in part well indurated; contains a trace of fine sand 20 to 25 ft.....	13.0	25.0
Sandstone, silty, sand is very fine to fine, very light gray to very light yellow-gray, dark speckled, noncalcareous, in part moderately indurated, in part unconsolidated.....	25.0	36.0
Interbedded siltstone, sandstone and clay, sand is mostly very fine to fine; contains a few coarse sand grains below 40 ft, may contains some lithic grains.....	36.0	44.0
Siltstone, slightly to moderately clayey, light reddish brown, noncalcareous; slightly calcareous to in part moderately calcareous 50 to 80 ft, massive, logged as having some silty clay 45 to 50 ft and as soft sticky clay 50 to 80 ft with some hard layers 55 to 60 ft.....	44.0	80.0

**Test Hole #17-A-98
(23-54-11ddaa)
Scotts Bluff County**

Location: NE NE SE SE sec. 11, T. 23 N., R. 54W., approximately 1100 ft north and 30 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 58 43.34N

Longitude: 103 32 17.51W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lake Alice

Ground elevation: 4179.21 ft

Source elev: GPS (geodetic)

Depth to water: 35.87 ft

Date measured: 8/16/00

Geophysical Log(s): Electric (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly to moderately clayey, moderately sandy, sand is mostly very fine to fine, contains scattered coarse sand and gravel grains, light yellow-brown, a little medium brown-gray.....	0.0	5.0
Lithic pebble-boulder gravel, composed of brown siltstone, siltstone-sandstone and fine grained light gray sandstone.....	5.0	10.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, moderately sandy, sand is very fine, silt is coarse, light medium brown, moderately calcareous; slightly finer grained, slightly clayey 20 to 30 ft.....	10.0	30.0
Siltstone, slightly clayey, silt is coarse, light medium brown, noncalcareous, slightly more clayey; slightly to moderately calcareous 35 to 45 ft.....	30.0	45.0
Siltstone, slightly sandy, slightly clayey, sand is very fine, light medium brown, slightly to moderately calcareous.....	45.0	75.0
Siltstone, slightly clayey, silt is coarse, light medium brown, very slightly calcareous, contains trace of very fine sand.....	75.0	80.0
Siltstone, slightly clayey, in part moderately sandy, sand is very fine, light medium brown, contains a few volcanic ash shards, slightly to moderately calcareous.....	80.0	90.0

Siltstone, slightly clayey, in part slightly sandy,
sand is very fine light brown, slightly to mod-
erately calcareous; contains very little sand 90
to 100 ft; logged as being interbedded hard and
soft 90 to 100 ft; light medium brown 95 to 100
ft..... 90.0 100.0

**Test Hole #15-B-99
(23-54-18aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 18, T. 23 N., R. 54 W., approximately 30 ft south and 100 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 41 58 38.09N
 Longitude: 103 36 59.11W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Lake Alice
Ground elevation: 4266.71 ft
 Source elev: GPS (geodetic)
Depth to water: 44.76 ft
 Date measured: 7/28/99
Geophysical Log(s): None

Depth, in feet
From To

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, slightly to moderately clayey, silt is coarse to very coarse, very light brown, very slightly calcareous, moderately well indurated; very light brown-gray 5 to 10 ft.....	0.0	10.0
Siltstone, slightly clayey, silt is coarse to very coarse, very light brown, non to very slightly calcareous, granular structure, contains a trace of very fine sand, contains volcanic ash shards; in part slightly calcareous, contains small discrete limy areas 40 to 50 ft; non to slightly calcareous 55 to 65 ft.....	10.0	65.0
Siltstone, slightly to moderately clayey, silt is fine to very coarse, very light brown, very slightly calcareous, granular structure; very slightly calcareous, slightly less clayey 70 to 100 ft, contains a trace of very fine sand; slightly calcareous 75 to 90 ft; moderately calcareous 90 to 100 ft.....	65.0	100.0
Siltstone, slightly clayey, silt is fine to very coarse, light brown, slightly calcareous, contains volcanic ash shards, granular structure.....	100.0	105.0
Siltstone, slightly clayey, silt is fine to very coarse, very light brown, slightly to moderately calcareous, slight granularity; light brown 120 to 130 ft, less indurated.....	105.0	130.0

**Test Hole #17-37
(23-54-21addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 21, T. 23 N., R 54 W., approximately
0.5 mile south of northeast corner on west edge of road
Source Footage: Map
Latitude: 41 57 20N
Longitude: 103 34 41W
Source Lat/Long: Map
7.5-minute Quad Map Name: Lake Alice
Ground elevation: 4149 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, fine.....	0.0	9.0
Tertiary System - Oligocene Series - White River Group		
Brule Formation, undifferentiated:		
Siltstone.....	9.0	21.0

**Test Hole #16-B-99
(23-54-27bbbc)
Scotts Bluff County**

Location: SW NW NW NW sec. 27, T. 23 N., R. 54 W., approximately 450 ft south and 50 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 56 47.92N

Longitude: 103 34 39.72W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lake Alice

Ground elevation: 4131.60 ft

Source elev: GPS (geodetic)

Depth to water: 72.09 ft

Date measured: 7/28/99

Geophysical Log(s): None

	Depth, in feet	
	From	To

Quaternary System, undifferentiated:

Silty sand.....	0.0	1.5
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Whitney Member:

Siltstone, slightly clayey, very slightly sandy, sand is very fine, silt is coarse, very light brown, noncalcareous; rare limy areas 5 to 10 ft, very slightly calcareous; slightly more clayey 15 to 20 ft.....	1.5	20.0
Siltstone, slightly clayey, slightly sandy, sand is very fine, silt is coarse, light reddish brown, slightly to moderately calcareous, rare volcanic ash shards, slight dark speckling; slightly calcareous, light brown 25 to 35 ft.....	20.0	35.0
Siltstone, slightly clayey, very slightly sandy, sand is very fine, silt is coarse, light brown, noncalcareous; significant water loss 43 to 44 ft.	35.0	50.0
Siltstone, slightly clayey, very slightly sandy, silt is coarse, light reddish brown, granular structure, in part slightly calcareous; contains a trace of red-brown clay 50 to 55 ft, very light brown 55 to 70 ft, very slightly calcareous, in part finer grained; sticky clay logged 68 to 70 ft.....	50.0	70.0
Siltstone, slightly clayey, silt is coarse, very light brown, very slightly calcareous; very slightly sandy 75 to 80 ft, sand is very fine, moderately calcareous.....	70.0	80.0

**Test Hole #16-37
(23-54-28cbbc)
Scotts Bluff County**

Location: SW NW NW SW sec. 28, T. 23 N., R. 54 W., approximately
0.4 mile north of southwest corner on east side of road
Source Footage: Map
Latitude: 41 56 20N
Longitude: 103 35 46W
Source Lat/Long: Map
7.5-minute Quad Map Name: Lake Alice
Ground elevation: 4080 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, fine.....	0.0	7.0
Tertiary System - Oligocene Series - White River Group		
Brule Formation, undifferentiated:		
Siltstone, logged as lots of loose, broken Brule....	7.0	20.0

**Test Hole #15-37
(23-54-32ccbc)
Scotts Bluff County**

Location: SW NW SW SW sec. 32, T. 23 N., R. 54 W., approximately
0.15 mile north of southwest corner on east side of road
Source Footage: Map
Latitude: 41 55 04N
Longitude: 103 36 58W
Source Lat/Long: Map
7.5-minute Quad Map Name: Lake Alice
Ground elevation: 4040 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, sand is very fine to fine with a few coarser grains.....	0.0	18.0
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Tertiary System - Oligocene Series - White River Group

Brule Formation, undifferentiated:

Siltstone, light reddish brown, in part slightly calcareous, sample contains a little reddish brown clay (one sample).....	18.0	113.0
Siltstone, slightly sandy, sand is very fine, light reddish brown, most of sample has granular struc- ture (one sample).....	113.0	140.0
Siltstone, mostly fine grained, very light brown and very light brownish gray, sample contains a little fine grained very light olive-gray siltstone; field log indicates sample mostly gray below 160 ft (one sample).....	140.0	204.0

**Test Hole #12-37
(23-55-6bcbb)
Scotts Bluff County**

Location: NW NW SW NW sec. 6, T. 23 N., R. 55 W., approximately
0.25 mile south of northwest corner on east side of road
Source Footage: Map
Latitude: 41 59 53N
Longitude: 103 45 49W
Source Lat/Long: Map
7.5-minute Quad Map Name: Mitchell
Ground elevation: 4181 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Logged as fine sand with reworked Brule (sample missing).....	0.0	6.0
Sand, some gravel, slightly to in part very silty, gravel is mostly fine, considerable fine to coarse sand.....	6.0	28.0
Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel.....	28.0	33.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Whitney Member:		
Siltstone, silt is fine to coarse, in part moderately sandy, sand is very fine, light reddish brown, in part slightly calcareous.....	33.0	60.0

**Test Hole #12-C-99
(23-55-17bcbb)
Scotts Bluff County**

Location: NW NW SW NW sec. 17, T. 23 N., R. 55 W., approximately 1,650 ft south and 50 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 58 03.15N

Longitude: 103 44 11.66W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4065.97 ft

Source elev: GPS (geodetic)

Depth to water: 47.88 ft

Date measured: 7/28/99

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, in part slightly clayey, sand is very fine to medium, much very fine to fine sand, rare coarse sand grains, medium brown-gray, slightly calcareous; light brown-gray, contains a few coarse sand and rare gravel grains 5 to 12 ft.	0.0	12.0
Sand and gravel, gravel is fine to coarse, mostly quartz with light colored silicates, contains a few lithic siltstone and sandstone grains, approximately 40 to 50 percent gravel.....	12.0	25.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few pink and dark colored silicates, rare lithic grains, approximately 30 percent gravel; approximately 20 percent gravel 55 to 70 ft.....	25.0	80.0
Sand, some gravel, gravel is mostly fine, some medium, much quartz, approximately 15 percent gravel.....	80.0	104.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light olive-gray, slightly to moderately calcareous.....	104.0	120.0
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**Test Hole #12-D-97
(23-55-19dcdd)
Scotts Bluff County**

Location: SE SE SW SE sec. 19, T. 23 N., R. 55 W., approximately 200 ft north and 1650 ft west of southeast corner of section
Source Footage: Map

Latitude: 41 56 36.77N
Longitude: 103 44 32.88W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4004.31 ft
Source elev: GPS (geodetic)

Depth to water: 9.88 ft

Date measured: 8/9/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is mostly very fine to fine in upper part and fine to coarse in lower part, dark brown-gray, noncalcareous, sample contains a little noncalcareous white silty clay.....	0.0	5.0
Sand and gravel, gravel is mostly fine, some coarse sand and pebbles, much quartz, a few dark mafic grains, some lithic fine-grained sandstone clasts, approximately 50 percent gravel.....	5.0	25.0
Sand, some gravel, gravel is mostly fine, much quartz, a few pebbles including lithic sandstone grains, approximately 25 percent gravel.....	25.0	50.0
Sand, some gravel, gravel is mostly fine, mostly quartz, a few light colored silicates, rare lithic grains, approximately 15 to 20 percent gravel.....	50.0	68.0
Silt, very sandy, sand is very fine to fine, light yellow-brown, slightly calcareous; silt, slightly clayey, in part slightly sandy, sand is very fine to fine, light yellow-brown, very slightly calcareous 75 to 80 ft.....	68.0	80.0
Logged as silty sand, much of sample is a light yellow-brown silty and clay silt, considerable fine to coarse sand in sample, may be a silty sand with a large percentage of lithic silt and siltstone grains; resistivity log suggests sediments are fine grained.....	80.0	95.0

Silt, slightly clayey, in part sandy, principally very fine sand, some clayey silt, very light yellow-brown, slightly calcareous; considerable moderately clayey silt 100 to 105 ft, some fine to coarse sand in sample; resistivity log suggests sand 100 to 103 ft.....	95.0	108.0
Sand, fine to very coarse, a little fine gravel, mostly quartz, a few dark mafic grains, approximately 5 to 10 percent gravel; some grains appear to have clay coating.....	108.0	125.0
Sand and gravel, gravel is mostly fine to medium, mostly quartz, a few lithic siltstone grains, approximately 25 percent gravel; some grains appear to have clay coating.....	125.0	145.0
Sand and gravel, gravel is fine to medium, approximately 40 percent gravel.....	145.0	150.0
Sand, fine to very coarse, approximately 5 to 15 percent fine gravel, mostly quartz, a few lithic grains, most grains have clay coating.....	150.0	190.0
Sand, fine to coarse, some very coarse, rare scattered gravel, a few pebbles.....	190.0	200.0
Sand, fine to very coarse, some gravel, mostly quartz, rare dark mafic grains, a few lithic grains, approximately 15 percent gravel; pebbles and boulders logged from 200 to 207 ft.....	200.0	207.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light brown to very light brownish gray, moderately well indurated; contains a trace of volcanic ash 200 to 225 ft; contains rare limy nodules 225 to 230 ft..	207.0	230.0

Test Hole #1-S-40
(23-55-21dadc)
Scotts Bluff County

Location: SW SE NE SE sec. 21, T. 23 N., R. 55 W., approximately
 1650 feet north and 650 feet west of southeast corner
 Source Footage: Field
 Latitude: 41 56 54N
 Longitude: 103 41 57W
 Source Long/Lat: Field
 7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4085 ft
 Source elev: Map
Depth to water: Unknown; test hole caved at 45 ft
 Date measured: 11/1/40
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy.....	0.0	8.0
Sand and gravel, gravel is mostly fine.....	8.0	20.0
Sand and gravel, gravel is mostly fine, compact.....	20.0	35.0
Sand and gravel, gravel is fine to coarse.....	35.0	40.0
Sand, fine texture, compact.....	40.0	57.0
Clay, sandy, buff.....	57.0	61.5
Sand and gravel, gravel is fine to coarse, some boulders.....	61.5	64.0
Clay, sandy, buff.....	64.0	67.0
Sand and gravel, gravel is fine to coarse.....	67.0	68.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink.....	68.0	88.0

**Test Hole #2-S-40
(23-55-21ddab)
Scotts Bluff County**

Location: NW NE SE SE sec. 21, T. 23 N., R. 55 W., approximately
1125 feet north and 650 feet west of southeast corner
Source Footage: Field
Latitude: 41 56 48N
Longitude: 103 41 57W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4079 ft
Source elev: (t)
Depth to water: 55.2 ft
Date measured: 11/8/40
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, buff.....	0.0	4.0
Sand, clayey, buff.....	4.0	6.0
Sand and gravel, red, gravel is fine to medium.....	6.0	15.0
Sand and gravel, red, gravel is fine to coarse.....	15.0	18.0
Sand and clay, buff to brown.....	18.0	35.0
Sand and gravel, red, texture grades from fine to coarse.....	35.0	40.0
Sand, cemented, texture grades from sand to very coarse.....	40.0	46.0
Clay, sandy, pink to buff.....	46.0	47.0
Clay, sandy, gray.....	47.0	49.0
Sand and gravel, red, gravel is fine to coarse, boulders common.....	49.0	67.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink.....	67.5	89.0

Test Hole #3-S-40
(23-55-21dddb)
Scotts Bluff County

Location: NW SE SE SE sec. 21, T. 23 N., R. 55 W., approximately
650 feet north and 650 feet west of southeast corner
Source Footage: Field

Latitude: 41 56 44N

Longitude: 103 41 57W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4077 ft

Source elev: (t)

Depth to water: 56.5 ft

Date measured: 11/8/40

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy.....	0.0	3.0
Sand, clayey, buff.....	3.0	5.0
Sand, red.....	5.0	10.0
Sand and gravel, red, texture grades from sand to medium gravel.....	10.0	23.5
Sand, clayey, red.....	23.5	25.0
Sand and gravel, red, gravel is mostly fine.....	25.0	29.0
Sand, clayey.....	29.0	34.0
Sand, clayey, to clay, sandy, buff.....	34.0	41.0
Sand and gravel, red, gravel is fine to coarse.....	41.0	46.0
Clay, sandy, green-gray.....	46.0	47.0
Sand and gravel, gravel is fine to coarse.....	47.0	54.0
Sand and gravel, red and black, gravel is fine to coarse.....	54.0	70.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink.....	70.0	79.0

**Test Hole #4-S-40
(23-55-21dddc)
Scotts Bluff County**

Location: SW SE SE SE sec. 21, T. 23 N., R. 55 W., approximately
90 feet north and about 650 feet west of southeast corner
Source Footage: Field
Latitude: 41 56 38N
Longitude: 103 41 57W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4078 ft
Source elev: (t)
Depth to water: 55.8 ft
Date measured: 11/8/40
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, sandy.....	0.0	5.0
Sand, some gravel, gravel is fine.....	5.0	10.0
Sand, some clay.....	10.0	15.0
Sand and gravel, red, fine texture.....	15.0	25.0
Sand and gravel, texture grades from sand to fine gravel.....	25.0	32.0
Sand and gravel, red, coarse texture.....	32.0	35.0
Sand, clayey, buff.....	35.0	36.0
Sand and gravel, red, texture grades from sand to fine gravel.....	36.0	38.0
Sand and gravel, red, gravel is fine to coarse.....	38.0	50.0
Sand and gravel, red and black, gravel is medium to coarse below 60 ft, some boulders 60 to 84 ft.....	50.0	84.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, buff to pink.....	84.0	88.0
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**Test Hole #5-S-40
(23-55-21daac)
Scotts Bluff County**

Location: SW NE NE SE sec. 21, T. 23 N., R 55 W., approximately
2150 feet north and 650 feet east of southeast corner
Source Footage: Field
Latitude: 41 56 58N
Longitude: 103 41 57W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4063 ft
Source elev: (t)
Depth to water: 52.7 ft
Date measured: 11/8/40
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy.....	0.0	4.0
Sand, red, sand is fine to very coarse.....	4.0	21.0
Sand and gravel, red, gravel is fine to medium.....	21.0	35.0
Sand, red, sand is fine to very coarse.....	35.0	38.0
Sand and gravel, red, gravel is fine to coarse.....	38.0	45.0
Sand, clayey, buff to gray.....	45.0	48.0
Sand and gravel, red, gravel is fine to medium.....	48.0	49.0
Sand and gravel, red and black, gravel is fine to coarse.....	49.0	55.0
Sand and gravel, red and some black, texture grades from fine to medium, some coarse.....	55.0	61.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink to buff.....	61.0	69.0

**Test Hole #6-S-40
(23-55-21daab)
Scotts Bluff County**

Location: NW NE NE SE sec. 21, T. 23 N., R. 55 W., approximately
2475 feet north and 650 feet west of southeast corner
Source Footage: Field

Latitude: 41 57 03N

Longitude: 103 41 57W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4063 ft

Source elev: (t)

Depth to water: 31.8 ft

Date measured: 11/8/40

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy.....	0.0	3.5
Sand, sand is fine to very coarse.....	3.5	7.0
Sand, clayey; contains some gravel.....	7.0	8.5
Sand and gravel, red, gravel is fine to coarse; finer below 20 ft.....	8.5	35.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink to buff, jointed.....	35.0	38.0
Siltstone, sandy, pink to buff, jointed, well indu- rated.....	38.0	51.0
Siltstone, sandy, pink to buff.....	51.0	69.0

**Test Hole #7-S-40
(23-55-21dcd)**
Scotts Bluff County

Location: NW SE SW SE sec. 21, T. 23 N., R. 55 W., approximately
1900 feet west and 525 feet north of southeast corner
Source Footage: Field

Latitude: 41 56 43N

Longitude: 103 42 14W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4067 ft

Source elev: (t)

Depth to water: 31.8 ft

Date measured: 11/8/40

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy.....	0.0	4.0
Sand, clayey, buff.....	4.0	6.0
Sand and gravel, red, texture grades from sand to fine gravel.....	6.0	20.0
Sand, clayey, buff.....	20.0	22.0
Sand and gravel, red, gravel is fine to medium.....	22.0	31.0
Sand, clayey, green-gray.....	31.0	33.0
Sand and gravel, red and some black grains, gravel is fine to medium.....	33.0	37.0
Sand and gravel, red and black, gravel is fine to coarse.....	37.0	78.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink.....	78.5	86.0

Test Hole #8-S-40
(23-55-21dbca)
Scotts Bluff County

Location: NE SW NW SE sec. 21, T. 23 N., R. 55 W., approximately
 525 feet east and 800 feet south of center of section
 Source Footage: Field
 Latitude: 41 56 54N
 Longitude: 103 42 17W
 Source Lat/Long: Map
 7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4069 ft
 Source elev: (t)
Depth to water: 52.7 ft
 Date measured: 11/8/40
Geophysical Log(s): None

Depth, in feet
 From To

Quaternary System, undifferentiated:

Silt, sandy, and sand, clayey, light-brown, contains scattered gravel.....	0.0	9.0
Sand and gravel, red, texture grades from sand to coarse gravel.....	9.0	20.0
Sand, clayey, buff to pink.....	20.0	35.0
Sand and gravel, red, gravel is fine to coarse.....	35.0	42.0
Sand and gravel, red, gravel is fine to coarse, contains some pebbles and boulder below 50 ft.....	42.0	71.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, pink.....	71.0	75.0
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Test Hole #9-S-40
(23-55-21dbbc)
Scotts Bluff County

Location: SW NW NW SE sec. 21, T. 23 N., R. 55 W., approximately
500 feet south and 25 feet east of center of section
Source Footage: Field
Latitude: 41 56 58N
Longitude: 103 42 24W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4071 ft
Source elev: (t)
Depth to water: 49 ft
Date measured: 11/8/40
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, brown.....	0.0	5.0
Sand, clayey, buff.....	5.0	8.0
Sand and gravel, red, texture grades from sand to fine gravel.....	8.0	11.0
Sand and gravel, red, gravel is fine to coarse.....	11.0	16.0
Sand, buff, clayey in upper part.....	16.0	23.0
Sand and gravel, red, gravel is fine to coarse.....	23.0	31.0
Sand, red, sand is fine to very coarse.....	31.0	33.0
Clay, sandy, buff.....	33.0	36.5
Sand and gravel, red, gravel is mostly fine.....	36.5	40.0
Sand and gravel, red, gravel is fine to medium.....	40.0	45.0
Sand and gravel, red and black, gravel is fine to coarse, contains boulders.....	45.0	74.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink.....	74.0	79.0

**Test Hole #10-S-40
(23-55-21accc)
Scottsbluff County**

Location: SW SW SW NE sec. 21, T. 23 N., R 55 W., approximately
115 feet north and 25 feet east of center of section
Source Footage: Field
Latitude: 41 57 05N
Longitude: 103 42 23W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4078 ft
Source elev: (t)
Depth to water: 41.2 ft
Date measured: 11/8/40
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, and sand, fine, brown.....	0.0	5.0
Sand, clayey, buff.....	5.0	8.0
Sand, fine to very coarse.....	8.0	24.0
Sand, red, sand is fine to very coarse, some fine gravel.....	24.0	39.0
Sand, red.....	39.0	44.0
Sand and gravel, red, gravel is mostly fine.....	44.0	50.0
Sand and gravel, red and black, gravel is fine to coarse, contains some pebbles.....	50.0	58.5
Clay, sandy, gray to buff.....	58.5	61.0
Sand and gravel, gravel is fine to coarse, contains large pebbles.....	61.0	66.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, sandy, pink to buff.....	66.0	75.0

**Test Hole #11-S-40
(23-55-21aacd)
Scotts Bluff County**

Location: SE SW NE NE sec. 21, T. 23 N., R. 55 W., approximately
1300 feet south and 660 feet west of northeast corner
Source Footage: Field

Latitude: 41 57 18N

Longitude: 103 41 58W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4130 ft

Source elev: (t)

Depth to water: 49.3 ft

Date measured: 11/8/40

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, brown.....	0.0	5.0
Sand, clayey, light-brown, cuts in slabs.....	5.0	7.0
Sand.....	7.0	10.0
Sand and gravel, red, gravel is mostly fine.....	10.0	14.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, buff to pink, jointed; lost circulation at 71 ft.....	14.0	71.0

**Test Hole #12-S-40
(23-55-21aabb)
Scotts Bluff County**

Location: NW NW NE NE sec. 21, T. 23 N., R. 55 W., approximately
1300 feet west and 105 feet south of northeast corner
Source Footage: Field

Latitude: 41 57 59N

Longitude: 103 42 06W

Source Lat/Long: Map

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4138 ft

Source elev: (t)

Depth to water: 37 ft

Date measured: 11/8/40

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, in part clayey, brown.....	0.0	6.0
Sand and gravel, red, gravel is fine to coarse, contains some siltstone fragments.....	6.0	14.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink, appeared to be jointed 95 to 118 ft, drilling mud became progressively thicker as noted in field log.....	14.0	118.0

**Test Hole #13-S-40
(23-55-21aaba)
Scotts Bluff County**

Location: NE NW NE NE sec. 21, T. 23 N., R. 55 W., approximately
825 feet west and 50 feet south of northeast corner
Source Footage: Field
Latitude: 41 57 59N
Longitude: 103 42 0W
Source Lat/Long: Map
7.5-minute Quad Map Name: Scottsbluff North
Ground elevation: 4151 ft
Source elev: (t)
Depth to water: 29 ft
Date measured: 11/8/40
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, and sand, fine.....	0.0	4.0
Sand and gravel, red, gravel is fine to medium.....	4.0	20.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, pink, compact 20 to 50 ft, appeared to be jointed as noted in field log; less well indurated 50 to 99 ft.....	20.0	99.0

**Test Hole #13-C-97
(23-55-21dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 21, T. 23 N., R. 53 W., approximately 50 ft north and 50 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 56 37.92N

Longitude: 103 41 49.82W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4087.69 ft

Source elev: GPS (geodetic)

Depth to water : 77.82 ft

Date measured: 8/9/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy, sand is very fine to fine, dark brown-gray, noncalcareous.	0.0	5.0
Silty sand, in part slightly clayey, mostly very fine to fine sand, a little gravelly sand in sample including lithic grains of siltstone and sandstone, poor sample recovery; sample 15 to 20 ft composed mostly of reddish brown slightly indurated clay; contains a trace of shell fragments.....	5.0	20.0
Clay, may be in part sandy to gravelly, very light gray and whitish gray, some yellow-brown, logged as <i>sticky</i> , common lithic grains in sample.....	20.0	25.0
Sand and gravel, gravel is mostly fine to medium, mostly quartz, a few metamorphic grains, approximately 30 percent gravel 25 to 30 ft and 15 to 25 percent gravel 30 to 50 ft; some clay and sandy silt in interval 50 to 55 ft; resistivity log suggests whole interval 20 to 55 ft has considerable silt and clay.....	25.0	55.0
Sand, fine to very coarse, contains very little gravel.....	55.0	60.0
Sand and gravel, gravel is fine to medium, some coarse, quartz with a few dark mafic and a few metamorphic grains, a few cobbles logged from 60 to 80 ft.....	60.0	80.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, in part slightly sandy, sand is very fine, light reddish brown, slightly calcareous; slightly more clayey

85 to 90 ft, logged as *sticky*..... 80.0 100.0

**Test Hole 13-CC-97
(23-55-21adaa)
Scotts Bluff County**

Location: NE NE SE NE sec. 21, T. 23 N., R. 55 W., approximately 1500 ft south and 50 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 57 14.17N

Longitude: 103 41 50.78W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Scottsbluff North

Ground elevation: 4130.95 ft

Source elev: GPS (geodetic)

Depth to water: 34.5 ft

Date measured: 8/9/00

Geophysical Log(s): Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly sandy, sand is mostly very fine to fine, scattered medium to coarse sand grains, light brown, moderately calcareous.....	0.0	3.0
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Silt, slightly sandy, sand is mostly very fine, very light reddish brown, moderately calcareous, logged as including some chunks of siltstone.....	3.0	±10.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, light brown, noncalcareous, moderately well indurated; slightly less indurated slightly more clayey 15 to 20 ft, logged in part as <i>soft and sticky</i> ; massive, moderately calcareous 15 to 40 ft.....	±10.0	40.0
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Siltstone, moderately clayey, fine to coarse silt, light brown, slightly calcareous, contains some volcanic ash.....	40.0	65.0
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Siltstone, moderately clayey, light brown, slightly calcareous; some well indurated layers 72 to 80 ft.....	65.0	80.0
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Siltstone, moderately clayey, light brown, slightly to moderately calcareous, contains a few volcanic ash shards, logged as being <i>soft and sticky</i> in part; some reddish brown claystone logged 100 to 105 ft.....	80.0	105.0
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Siltstone, moderately to very clayey, light brown, slightly to moderately calcareous.....	105.0	120.0
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**Test Hole #10-C-97
(23-56-4aaba)
Scotts Bluff County**

Location: NE NW NE NE sec. 4, 23 N., R. 56 W., approximately 50 ft south and 900 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 42 00 02.35N
 Longitude: 103 49 03.97W
 Source Lat/Long: GPS (geodetic)
 7.5 minute Quad Map Name: Erdman Ranch
Ground elevation: 4135.12 ft
 Source elev: GPS (geodetic)
Depth to water: 100.18 ft
 Date measured: 10/4/99
Geophysical Log(s): Electric log (R), Gamma

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand and gravel, silty and clayey, mostly light yellow-gray, some medium dark brown-gray.....	0.0	5.0
Sand, some gravel, silty, some clay coating, much coarse sand, some fine to coarse gravel, silty sand lens logged 10 to 15 ft.....	5.0	18.0
Silt, moderately to very sandy, some very silty sand, sand is mostly very fine to medium, some coarser grains, light medium yellow-brown, non-calcareous.....	18.0	25.0
Sand, a little gravel, slightly silty, much coarse to very coarse sand, gravel is mostly fine, mostly quartz.....	25.0	30.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few metamorphic and dark mafic grains, approximately 30 to 40 percent gravel.....	30.0	35.0
Sand and gravel, gravel is fine to coarse, much quartz, a few metamorphic and dark mafic grains, approximately 40 to 50 percent gravel; approximately 30 to 40 percent gravel 45 to 53 ft.....	35.0	53.0
Sandy silt and silty sand, sand is mostly very fine to fine with some interbedded fine to coarse silty sand, light yellow-brown.....	53.0	63.0
Sand, fine to very coarse, some fine gravel, mostly quartz, a few dark gray mafic grains, approximately 30 percent very coarse sand and fine gravel.....	63.0	75.0
Sand and gravel, gravel is fine to coarse, much quartz, a few metamorphic and gray mafic grains, approximately 60 percent gravel, some interbedded yellow-brown sandy silt or silty sand.....	75.0	80.0

Sandy silt and silty sand and gravel, light brown, some lithic siltstone grains.....	80.0	90.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few lithic siltstone grains, may be slightly silty, approximately 40 percent gravel...	90.0	102.5
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey with siltstone-sand- stone, sand is very fine, light brown, noncalcar- eous; considerable very sandy silt to siltstone 115 to 120 ft, sand is very fine.....	102.5	120.0
Siltstone, slightly clayey, slightly sandy, sand is very fine, light brown, noncalcareous; in part very slightly sandy and in part moderately sandy 125 to 130 ft, sand is very fine to fine.....	120.0	130.0
Siltstone, moderately clayey, very light brown, non- calcareous; slightly calcareous 140 to 150 ft.....	130.0	150.0

**Test Hole #5-C-97
(23N-56W-6aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 6, T. 23 N., R. 56 W., approximately 100 ft south and 50 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 42 00 00.69N
 Longitude: 103 51 12.35W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Erdman Ranch
Ground elevation: 4097.81 ft
 Source elev: GPS (geodetic)
Depth to water: 53.4 ft
 Date measured: 5/26/99
Geophysical Log(s): Electric (R), Gamma

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, moderately to very sandy, sand is mostly fine to medium, dark brown-gray and silt slightly clayey, moderately to very sandy, very light gray, slightly calcareous.....	0.0	4.0
Silty sand to gravel (as logged in field).....	4.0	5.0
Sand, very silty, sand is mostly very fine to medium, light yellow-brown, contains a few gravel grains including lithic grains of siltstone; slightly to very silty 10 to 15 ft, contains a trace of limy areas.....	5.0	15.0
Sand, very silty, in part slightly clayey, sand is very fine to medium, a few coarser grains, very light brown-gray, moderately calcareous, very slight induration.....	15.0	20.0
Sand, slightly silty, sand is very fine to medium, much fine sand, rare coarser grains including a few lithic grains, light yellow-brown, a few small limy areas.....	20.0	25.0
Sand, slightly to moderately silty, sand is very fine to medium with a little coarse sand and rare gravel grains, light yellow-brown and light brownish gray, moderately calcareous; may have some interbedded very sandy silt.....	25.0	30.0
Sand, slightly silty, sand is fine to coarse, rare coarser grains, contains a trace of limy areas and root casts.....	30.0	36.0
Sand, some gravel, gravel is mostly fine, much quartz (thin gravel layers logged), approximately 15 to 20 percent gravel.....	36.0	50.0
Sand, fine to very coarse, mostly quartz.....	50.0	60.0

Sand, a little gravel, mostly fine gravel, mostly quartz, approximately 15 to 20 percent gravel.....	60.0	80.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few metamorphic, gray mafic, and lithic siltstone grains, approximately 50 percent gravel.....	80.0	105.0
Sand, a little gravel, gravel is mostly fine, approximately 10 to 20 percent gravel; slightly coarser 120 to 128 ft.....	105.0	128.0
Clay, silty, possibly in part sandy to gravelly, very light greenish gray, moderately calcareous, logged as <i>sticky</i>	128.0	137.0
Sand, some gravel, gravel is mostly fine, much quartz, a few lithic siltstone and clay grains, logged as having clay layers 137 to 142 ft.....	137.0	162.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, silt is coarse, very light brown-gray, slightly to moderately calcareous, moderately well indurated, may contain a trace of volcanic ash; slightly calcareous 170 to 180 ft.....	162.0	180.0
Siltstone, moderately clayey, light reddish brown, slightly calcareous, logged as <i>brittle</i> , granular structure.....	180.0	190.0
Note: Field log describes interval from 163 to 183 as being <i>reworked Brule</i> .		

Test Hole #5-D-97
(23N-56W-7dddd)
Scotts Bluff County

Location: SE SE SE SE sec. 7, 23 N., R. 56 W., approximately 150 ft north and 50 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 58 18.85N

Longitude: 103 51 11.09W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 4052.62 ft

Source elev: GPS (geodetic)

Depth to water: 46.84 ft

Date measured: 5/26/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, very sandy, sand is mostly

very fine to fine, dark brown 0 to 2 ft; mod-

erately clayey, light brown-gray 2 to 7 ft,

slightly to moderately calcareous..... 0.0 7.0

Sand, some gravel, gravel is mostly fine to medium;

some coarse gravel 15 to 20 ft; a few lithic

siltstone grains 15 to 35 ft, approximately 10 to

25 percentage..... 7.0 35.0

Sand to gravel, gravel is fine to coarse, much

quartz, a few dark gray silicates; a few pebbles

35 to 40 ft..... 35.0 40.0

Sand, some gravel, gravel is mostly fine to medium,

much quartz, approximately 25 percent gravel..... 40.0 49.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, silt is fine to

coarse, very light olive-gray, very slightly cal-

careous, logged as *sticky* below 53 ft..... 49.0 55.0

Siltstone, moderately clayey, very light olive-gray

and light yellow-gray, very slightly calcareous,

contains a trace of iron stain..... 55.0 65.0

Siltstone, moderately to very clayey, very light

olive-gray, moderately calcareous; logged as

intermittently soft and hard layers 70 to 90 ft;

moderately well indurated 80 to 100 ft..... 65.0 100.0

**Test Hole #10-N-99
(23-56-9baba)
Scotts Bluff County**

Location: NE NW NE NW sec. 9, T. 23 N., R. 56 W., approximately 20 ft south and 1850 ft east of northwest corner of section
Source Footage:

Latitude: 41 59 10.39N
Longitude: 103 49 37.31W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Mitchell

Ground elevation: 4060.60 ft
Source elev: GPS (geodetic)

Depth to water: 54.49 ft
Date measured: 7/27/99

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is very fine to fine with some medium, a few coarser sand grains and trace of gravel, medium dark brown-gray, noncalcareous..	0.0	5.0
Sand, very silty, in part slightly clayey, sand is very fine to medium with some coarse sand and some sand and gravel, light brownish gray, noncalcareous.....	5.0	10.0
Sand and gravel, gravel is fine to coarse, much quartz, some dark mafic grains, approximately 50 percent gravel.....	10.0	30.0
Sand, some gravel, much very coarse sand, approximately 10 to 20 percent gravel; some silty clay logged 40 to 45 ft.....	30.0	50.0
Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel; some silty clay logged..	50.0	60.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 to 40 percent gravel; some silty clay logged from 80 to 95 ft.....	60.0	95.0
Clay silty and some silty, moderately clayey, very light olive to greenish gray, moderately calcareous, mostly clay 105 to 110 ft, in part waxy and dense.....	95.0	110.0
Silt, very sandy, sand is mostly very fine to fine, very light olive-gray, some clay as above, mostly noncalcareous; considerable sand 115 to 120 ft....	110.0	120.0
Sand, fine to very coarse, much quartz.....	120.0	125.0
Sand, fine to very coarse, a little fine to medium gravel, much fine to medium sand.....	125.0	130.0
Sand, fine to very coarse, some fine gravel, much very coarse sand and fine gravel, much quartz.....	130.0	145.0

Sand, silty, sand is mostly very fine to medium, light yellow-gray, logged as sand and gravel with <i>light tan silty clay</i> , possibly lithic pebbles.....	145.0	150.0
Sand and gravel, gravel is fine to coarse, many lithic grains, possibly large pebbles, logged as containing <i>tan silty clay</i> , very rough drilling 160 to 165 ft.....	150.0	165.0
Sand and gravel, gravel is fine to coarse, common siltstone and fine grained lithic clay grains, 50 to 60 percent gravel; 30 to 40 percent gravel 175 to 200 ft.....	165.0	200.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, moderately clayey, very light yellowish gray, brown tint, noncalcareous; very light olive-gray 210 to 215 ft.....	200.0	215.0
Siltstone, moderately clayey, in part slightly sandy, sand is very fine, very light olive-gray, in part very slightly calcareous; very little sand 220 to 225 ft, silt is fairly coarse, slightly calcareous.....	215.0	230.0
Siltstone-mudstone, moderately clayey, very light olive- to brown-gray, noncalcareous; in part very clayey 230 to 245 ft, slightly calcareous; mostly very light olive-gray 240 to 245 ft.....	230.0	245.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, very light green, noncalcareous; mottled with some very light brown 250 to 255 ft.....	245.0	255.0
Clay to claystone, very light pinkish brown, very light brown-gray, bentonitic, noncalcareous, logged as soft clay.....	255.0	260.0

**Test Hole #11-D-99
(23-56-11dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 11, T. 23 N., R. 56 W., approximately 50 ft north and 300 ft west of southeast corner of section
 Source Footage: Map
 Latitude: 41 58 19.99N
 Longitude: 103 46 35.06W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Mitchell
Ground elevation: 4071.8 ft
 Source elev: GPS (geodetic)
Depth to water: 61.38 ft
Geophysical Log(s): Electric log to 265 ft (R), Gamma

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly to in part moderately clayey, moderately sandy, sand is very fine to fine with some medium, very light yellowish to brownish gray, moderately calcareous.....	0.0	5.0
Silt, slightly clayey, moderately to very sandy, sand is very fine to medium with some coarser sand grains, very light yellowish to brownish gray, moderately calcareous; a small amount of silty clay, very light yellow-gray in sample.....	5.0	10.0
Sand, slightly clayey, sand is mostly fine to very coarse, contains a trace of gravel.....	10.0	15.0
Sand and gravel, gravel is mostly fine to medium, quartz with some pink and a few dark colored mafic grains, approximately 35 percent gravel.....	15.0	20.0
Sand, some gravel, much very coarse sand, gravel is mostly fine, a few coarser grains, much quartz, approximately 10 to 20 percent gravel.....	20.0	70.0
Sand and gravel, gravel is fine to medium, much quartz, a few pink silicates, dark mafic grains and metamorphic grains, approximately 40 percent gravel; approximately 25 to 30 percent gravel 75 to 80 ft.....	70.0	80.0
Sand, some gravel, gravel is mostly fine, much very coarse sand.....	80.0	94.0
Silt, slightly clayey, slightly to in part moderately sandy, sand is mostly very fine to medium, light brownish gray, moderately calcareous.....	94.0	100.0
Silt, very slightly clayey, moderately sandy, sand is mostly very fine, some fine, light yellowish to brownish gray, moderately calcareous; very slightly calcareous 105 to 108 ft.....	100.0	108.0

Sand, fine to very coarse, mostly quartz, a few lithic siltstone grains, some very sandy silt in sample.....	108.0	115.0
Poor recovery of samples 115 to 130 ft, samples consist mostly of fine to coarse sand, possibly silty and slightly clayey.....	115.0	130.0
Sand, very silty, sand is mostly very fine to medium, a little coarser sand, light yellowish gray, moderately calcareous, poor sample recovery; in part clayey 145 to 150 ft.....	130.0	150.0
Sand, fine to very coarse, mostly quartz.....	150.0	170.0
Sand and gravel, gravel is mostly fine to medium, approximately 50 percent very coarse sand and fine gravel, mostly quartz, a few dark mafic grains, a few lithic siltstone grains.....	170.0	195.0
Sand, some gravel, gravel is fine to coarse, some pebbles logged; common lithic siltstone grains 230 to 258 ft; approximately 50 percent gravel 235 to 258 ft.....	195.0	258.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, very light gray, non-calcareous.....	258.0	265.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, light gray, noncalcareous, waxy, dense.....	265.0	270.0
Clay, very light brown, noncalcareous, waxy, dense.	270.0	280.0

**Test Hole #11-37
(23-56-14cddd)
Scotts Bluff County**

Location: SE SE SE SW sec. 14, T. 23 N., R. 56 W., approximately
0.5 mile east of southwest corner on north edge of road
Source Footage: None
Latitude: 41 57 28N
Longitude: 103 47 04W
Source Lat/Long: Map
7.5-minute Quad Map Name: Mitchell
Ground elevation: 4032 ft
Source elev: (a)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, moderately silty, sand is mostly very fine to medium, medium dark brown-gray, noncalcareous.....	0.0	13.0
Sand and gravel, gravel is mostly fine with some medium to coarse, logged as containing many large boulders (one sample).....	13.0	78.0
Sample mostly clayey to sandy silt, some siltstone in sample; possibly sand and gravel with clay balls (poor sample).....	78.0	88.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, very light yellowish to brownish gray, noncalcareous, moderate induration.....	88.0	100.0

**Test Hole #10-D-97
(23-56-16dadd)
Scotts Bluff County**

Location: SE SE NE SE sec. 16, T. 23 N., R. 56 W., approximately 2050 ft north and 50 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 57 46.41N
 Longitude: 103 48 50.86W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Mitchell

Ground elevation: 3979.71 ft
 Source elev: GPS (geodetic)

Depth to water: 4.09 ft
 Date measured: 7/16/99

Geophysical Log(s): Electric log (R), Gamma

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, very fine to fine, some medium sand, light yellow-brown, a little medium dark brown-gray, very sandy silt.....	0.0	5.0
Silt, slightly sandy, moderately clayey, sand is mostly scattered, contains rare very coarse sand and lithic siltstone grains; some very light brown-gray, slightly calcareous; very clayey silt in sample, very light gray.....	5.0	10.0
Clay, silty, light gray, mostly noncalcareous, contains a trace of shell fragments, some sand in sample; logged as gravel, sand and soft sticky clay.....	10.0	20.0
Sand, silty to clayey, sand is fine to very coarse, contains a few lithic siltstone and fine-grained sandstone grains, logged as soft silty sand.....	20.0	24.0
Sand, some gravel, gravel is mostly fine, a little medium to coarse gravel and pebbles, contains a few lithic siltstone and fine-grained sandstone grains, approximately 20 percent gravel; much very coarse sand, 30 percent gravel 45 to 50 ft.....	24.0	50.0
Sand and gravel, gravel is fine to coarse, contains common siltstone and sandstone gravel and pebble clasts.....	50.0	64.0
Silt, clayey and slightly to very sandy and gravelly, light gray, logged as soft and sticky 64 to 65.5 ft.....	64.0	70.0
Sand, some gravel, gravel is fine to coarse, some pebbles, approximately 25 to 30 percent gravel....	70.0	78.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, very light brown-gray, very slightly calcareous; moderately clayey 85 to 100 ft, slightly calcareous.....	78.0	100.0
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Test Hole #10-K-99
(23-56-16abbb)
Scotts Bluff

Location: NW NW NW NE sec. 16, T. 23 N., R. 56 W., approximately 2600 ft west and a few ft south of northeast corner of section

Source Footage: Map

Latitude: 41 58 17.78N

Longitude: 103 49 26.35W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 4043.76 ft

Source elev: GPS (geodetic)

Depth to water: 47.36 ft

Date measured: 8/9/99

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, moderately silty, sand is very fine to fine with some medium, contains scattered coarser grains, light to medium brown-gray; contains much coarse to very coarse sand 5 to 10 ft.....

0.0 10.0

Sand, some gravel, sand is fine to coarse with some very coarse sand and fine to medium gravel, approximately 5 to 10 percent gravel; very little gravel 15 to 20 ft.....

10.0 20.0

Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel, quartz with a few pink silicates and dark mafic grains; contains a few lithic siltstone grains and wood fragments.....

20.0 25.0

Sand, fine to very coarse, much coarse to very coarse sand, some scattered gravel grains with rare lithic siltstone and sandstone grains; approximately 25 percent gravel 40 to 45 ft.....

25.0 69.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light brownish gray, noncalcareous; moderately well indurated, logged as sticky; very slightly calcareous 75 to 85 ft; very light brownish gray to very light olive-brown 85 to 100 ft, slightly calcareous.....

69.0 100.0

**Test Hole #5-E-97
(23N-56W-20ccda)
Scotts Bluff County**

Location: NE SE SW SW sec. 20, T. 23 N., R. 56 W., approximately 1600 ft north and 500 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 56 49.10N

Longitude: 103 51 02.52W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 3962.55 ft

Source elev: GPS (geodetic)

Depth to water: 9.04 ft

Date measured: 5/26/99

Geophysical Log(s): Electric log (R), and Gamma to 197 ft

Depth, in feet
From To

Quaternary System, undifferentiated:

Sandy gravel, gravel is fine to coarse, some pebbles, clay coating on some grains, some metamorphic, common dark mafic grains, approximately 60 to 70 percent gravel; approximately 40 to 50 percent gravel 10 to 20 ft.....	0.0	20.0
Sand, some gravel, gravel is fine to medium, some coarse, much quartz, a few lithic siltstone grains, approximately 30 percent gravel 20 to 35 ft and 40 percent 35 to 45 ft.....	20.0	45.0
Sand, a little gravel, gravel is mostly fine, much very coarse sand, mostly quartz, a few lithic siltstone and very fine-grained sandstone grains common, approximately 10 to 15 percent gravel; charcoal logged at 65 ft.....	45.0	70.0
Sand and gravel, gravel is fine to coarse, much quartz, dark mafic, lithic siltstone and fine-grained sandstone grains common, contains a few metamorphic grains, approximately 35 to 40 percent gravel 70 to 90 ft; approximately 25 to 30 percent gravel 90 to 125 ft.....	70.0	125.0
Gravel, sandy, gravel is fine to coarse, approximately 60 to 70 percent gravel.....	125.0	130.0
Sand, some gravel, gravel is mostly fine to medium, approximately 25 to 30 percent gravel; approximately 35 to 40 percent gravel 145 to 150 ft.....	130.0	150.0
Gravel, sandy, gravel is fine to coarse, quartz with some metamorphic, gray mafic, lithic siltstone and fine-grained calcareous sandstone grains.....	150.0	160.0

Sand and gravel, gravel is fine to coarse, some pebbles and cobbles, much quartz, common light to dark gray silicates and a few lithic grains, approximately 50 to 70 percent gravel; only 15 to 20 percent gravel 185 to 190 ft; common lithic grains 190 to 199 ft; contains a trace of yellow-brown clay in interval 195 to 200 ft.....	160.0	198.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay shale, light yellow-brown, a little light gray, noncalcareous; some bright yellow-brown 205 to 210 ft.....	198.0	210.0
Clay shale, light yellow-brown and light olive-brown, a little very light brownish gray; considerable light yellow-gray 215 to 220 ft, a very little reddish brown, all noncalcareous.....	210.0	220.0

**Test Hole #11-E-99
(23-56-24cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 24, T. 23 N., R. 56 W., approximately 250 ft north and 30 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 56 37.79N

Longitude: 103 46 28.60W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 4024.78 ft

Source elev: (geodetic)

Depth to water: 47.98 ft

Date measured: 7/28/99

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, slightly to very silty, sand is mostly very fine to fine, some medium a little coarse sand, medium brown-gray, a little very light gray clay to sandy silt, noncalcareous.....	0.0	5.0
Sand, slightly silty, in part slightly clayey, sand is fine to very coarse, very light gray, noncalcareous, contains rare siltstone lithic grains....	5.0	10.0
Sand, fine to coarse, rare very coarse.....	10.0	15.0
Sand, some gravel, gravel is mostly fine, much very coarse sand, much quartz.....	15.0	50.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few lithic siltstone grains, approximately 20 percent gravel; approximately 50 percent gravel 75 to 80 ft; sticky clay intermixed logged 75 to 80 ft.....	50.0	80.0
Sand, fine to very coarse, logged as containing many lithic grains of siltstone and clay.....	80.0	101.0

Tertiary System - Oigocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light olive- to brownish gray, noncalcareous, moderately well indurated, logged as sticky, light olive-gray 105 to 120 ft; moderately to very clayey 110 to 120 ft, slightly calcareous.....	101.0	120.0
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**Test Hole #1-37
(23-56-27cccc)
Scotts Bluff County**

Location: SW SW SW SW sec. 27, T. 23 N., R. 56 W., approximately
600 feet north of river bridge on east side of road
Source Footage: Field
Latitude: 41 55 45N
Longitude: 103 48 16W
Source Lat/Long: Map
7.5-minute Quad Map Name: Mitchell
Ground elevation: 3935 ft
Source elev: (a)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt and sand.....	0.0	2.5
Sand and gravel, texture grades from medium to coarse; contains water-worn siltstone, very rough drilling 113 to 178 ft, boulders common.....	2.5	178.0

**Test Hole #10-M-97
(23-56-27abdb)
Scotts Bluff County**

Location: CWL SE NW NE sec. 27, T. 23 N., R. 56 W., approximately 950 ft south and 1900 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 56 24.97N

Longitude: 103 48 04.33W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 3946.4 ft

Source elev: GPS (geodetic)

Depth to water: 4.52 ft

Date measured: 6/13/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Road gravel.....	0.0	2.0
Silt, moderately to in part very clayey, moderately sandy, sand is mostly very fine to fine, medium brown-gray, noncalcareous and some light gray, moderately calcareous with cuttings.....	2.0	4.0
Sand and gravel, gravel is fine to medium, some coarse; approximately 30 to 40 percent gravel, much quartz, rare dark mafic grains and metamorphic grains.....	4.0	20.0
Sand, some gravel, gravel is mostly fine to medium, 40 percent very coarse sand and fine gravel, mostly quartz, a few dark mafic grains, contains a trace of ironstone grains, yellow-brown; 30 percent very coarse sand and fine gravel 30 to 45 ft.....	20.0	45.0
Sand, fine to very coarse, much coarse to very coarse sand.....	45.0	65.0
Sand and gravel, gravel is mostly fine to medium, a few pebbles, approximately 40 percent gravel....	65.0	70.0
Sand, fine to very coarse, some gravel, much quartz, rare iron-stained sandstone grains, approximately 15 percent gravel.....	70.0	80.0
Sand and gravel, gravel is fine to coarse, a few pebbles, some lithic grains of siltstone, sandstone and limy grains.....	80.0	85.0
Sand, fine to very coarse, much very coarse sand, mostly quartz, common cuttings of light gray clay 85 to 90 ft.....	85.0	90.0

Sand and gravel, gravel is fine to coarse, abundant lithic grains of siltstone, clay and fine-grained sandstone, approximately 40 to 50 percent gravel..	90.0	108.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to very clayey, very light olive-gray upper part, then siltstone, moderately to very clayey, very light brown, non to very slightly calcareous; very light yellowish brown 115 to 130 ft; slightly calcareous 120 to 125 ft..	108.0	130.0
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**Test Hole #10-G-97
(23-56-28daaa)
Scotts Bluff County**

Location: NE NE NE SE sec. 28, T. 23 N., R. 56 W., approximately 2750 ft south and 75 ft west of northeast corner of section (south section line not clearly defined on Mitchell Quadrangle)
 Source Footage: Map
 Latitude: 41 56 06.57N
 Longitude: 103 48 49.23W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Mitchell
Ground elevation: 3943.73 ft
 Source elev: GPS (geodetic)
Depth to water: 5.46 ft
 Date measured: 8/1/00
Geophysical Log(s): Electric log (R&S), Gamma

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, sandy clay, cinders, some limestone, light gray; some dark brown-gray sandy clay 5 to 9 ft, a few gravel grains.....	0.0	9.0
Gravel and pebbles, some sand, common dark gray mafic grains, some metamorphic grains, a few very calcareous siltstone-sandstone grains.....	9.0	20.0
Sand and gravel, much quartz, some pink, some dark gray mafic grains, rare lithic siltstone and fine grained sandstone grains, approximately 50 percent gravel; approximately 70 percent gravel 25 to 30 ft.....	20.0	30.0
Sand, fine to very coarse, some fine gravel, approximately 50 percent very coarse sand and fine gravel.....	30.0	35.0
Sand and gravel, much quartz, a few dark gray mafic grains, rare lithic grains, approximately 50 percent gravel; approximately 35 to 40 percent gravel 40 to 60 ft.....	35.0	60.0
Sand, fine to very coarse, much quartz, much very coarse sand.....	60.0	65.0
Sand and gravel, gravel is mostly fine to medium, common lithic grains, some are calcareous.....	65.0	70.0
Sand, fine to very coarse, a little gravel; much medium to coarse sand 80 to 105 ft.....	70.0	110.0

Note: poor sample recovery and some circulation circulation losses 55 to 95 ft.

Sand and gravel, gravel is mostly fine to medium, much quartz, rare dark mafic grains, a few metamorphic grains, common light brown and very light gray lithic siltstone grains.....	110.0	115.0
Sand, a little gravel, gravel is mostly fine, much quartz, a few lithic grains; some fine gravel 160 to 165 ft, approximately 35 percent very coarse sand and fine gravel; some pebbles logged from 140 to 165 ft.....	115.0	165.0
Sand and gravel, gravel is fine to coarse, some pebbles and cobbles, much quartz, a few metamorphic and gray mafic grains, approximately 60 to 70 percent gravel, <i>rough drilling</i> 165 to 200 ft.....	165.0	200.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Silty clay, slightly to moderately sandy, very light light olive-gray, sand is mostly fine to medium, noncalcareous, slightly cemented as sandstone; mostly very light greenish gray 205 to 210 ft.....	200.0	210.0
Silty to sandy clay, in part a siliceous clayey sandstone, sand is fine to coarse, a little very coarse, mostly very light gray.....	210.0	±213.0
Clay, in part very fine sandy, reddish brown.....	±213.0	±216.0
Sandy clay, slightly cemented as sandstone, sand is mostly very fine to fine but with some drill cuttings medium to coarse sandy, light greenish gray.....	±216.0	220.0

**Test Hole #5-F-97
(23N-56W-29cdbd)
Scotts Bluff County**

Location: SE NW SE SW sec. 29, T. 23 N., R. 56 W., approximately 450 ft north and 1700 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 55 51.70N

Longitude: 103 50 46.24W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Mitchell

Ground elevation: 3951.89 ft

Source elev: GPS (geodetic)

Depth to water: 6.94 ft

Date measured: 7/31/00

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Silty sand logged..... 0.0 3.0

Sand, some gravel, gravel is mostly fine, some dark stain, approximately 15 to 20 percent gravel; approximately 30 to 40 percent gravel 10 to 15 ft. 3.0 20.0

Sand and gravel, gravel is fine to coarse, some pebbles, quartz, common dark mafic grains, approximately 35 to 45 percent gravel..... 20.0 35.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, very light yellow-gray, slightly calcareous; in part very clayey 40 to 60 ft, slightly calcareous, moderately well indurated..... 35.0 60.0

**Test Hole #10-E-97
(23N-56W-34bccc)
Scotts Bluff County**

Location: SW SW SW NW sec. 34, T. 23 N., R. 56 W., approximately 2200 ft south and 100 ft east of northwest corner of section (short section N-S)

Source Footage: Map

Latitude: 41 55 22.11N
 Longitude: 103 48 47.69W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Mitchell

Ground elevation: 3940.05 ft
 Source elev: GPS (geodetic)

Depth to water: 7.21 ft
 Date measured: 7/31/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
 From To

Quaternary System, undifferentiated:

Sandy silt, light brown-gray and sand and gravel, gravel is fine to coarse, approximately 30 percent gravel.....	0.0	5.0
Gravel, sandy, gravel is fine to coarse with pebbles, much quartz, a few metamorphic grains, approximately 60 to 70 percent gravel.....	5.0	10.0
Sand and gravel, gravel is mostly fine with a little coarse gravel and a few pebbles, much quartz, a few dark mafic grains and rare metamorphic grains, approximately 40 percent very coarse sand and fine gravel; approximately 40 percent fine to medium gravel 20 to 25 ft and 35 to 45 ft.....	10.0	45.0
Sand, some gravel, gravel is mostly fine, much very coarse sand, contains a few lithic siltstone grains; approximately 15 to 20 percent gravel; contains more coarse sand 70 to 90 ft.....	45.0	90.0
Sand and gravel, gravel is mostly fine to medium, a little coarse, scattered pebbles, mostly quartz. a few dark mafic grains and a few lithic siltstone grains, approximately 20 to 30 percent gravel; logged as fine grained, poor recovery 125 to 130 ft; contains many lithic pebbles 130 to 135 ft....	90.0	140.0
Sand and gravel, gravel is fine to coarse, with a few pebbles, much quartz, dark mafic grains common, approximately 40 to 60 percent gravel; 20 to 30 percent gravel 160 to 165 ft and 180 to 185 ft; much coarse gravel 185 to 200 ft.....	140.0	207.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay, whitish gray and light greenish gray, mostly noncalcareous, may contain rare embedded sand grains; some mottled very light pinkish gray 210 to 214 ft; contains a thin very fine-grained sandstone layer at 214 ft.....	207.0	215.0
Clay, very light greenish gray with a very light pinkish gray, bentonitic, noncalcareous; some very fine sand logged 215 to 220 ft; some light gray bentonitic clay 220 to 230 ft, poor samples 220 to 230 ft; some cuttings appear to have embedded sand, sample 225 to 230 ft contains a little fine-grained clayey sandstone.....	215.0	230.0

**Test Hole #9-B-97
(23N-57W-1bcbb)
Scotts Bluff County**

Location: NW NW SW NW sec. 1, T. 23 N., R. 57 W., approximately 1550 ft south and 50 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 59 45.64N

Longitude: 103 53 31.99W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Morrill

Ground elevation: 4080.15 ft

Source elev: GPS (geodetic)

Depth to water: 28.81 ft

Date measured: 7/7/99

Geophysical Log(s): Electric log (R), Gamma

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, sand is very fine to medium with some coarse dark brown-gray.....	0.0	7.0
Sand, some gravel, gravel is fine to medium, mostly quartz, approximately 15 to 20 percent gravel; approximately 25 percent gravel 20 to 30 ft.....	7.0	30.0
Sand and gravel, gravel is fine to coarse, much quartz, a few dark mafic grains, rare lithic calcareous fine-grained siltstone-sandstone grains, approximately 50 percent gravel, pebbles logged from 30 to 45 ft.....	30.0	45.0
Sand, a little gravel, gravel is mostly fine, much quartz, approximately 20 percent gravel; approximately 40 percent gravel 50 to 58 ft; siltstone pebbles logged from 45 to 58 ft.....	45.0	58.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, slightly to moderately clayey, silt is very fine to medium, very light yellow-brown to pale brown, slightly to moderately calcareous; sandy silt and silty sand logged in interval 58 to 65 ft, none noted in sample; light brown 60 to 65 ft, some moderately to very clayey siltstone 60 to 65 ft, light brown; some well indurated moderately calcareous siltstone-mudstone layers 65 to 75 ft, silt is very fine to medium.....	58.0	75.0

<p>Siltstone, slightly to moderately clayey, light brown, slightly calcareous, granular structure; some well indurated layers, moderately calcareous; very light brownish gray 80 to 90 ft; very light yellowish to brownish gray 90 to 95 ft, silt is slightly coarser; interval 93 to 94 ft logged as drill cuttings hard and having conchoidal fracture; slightly calcareous 95 to 100 ft, very light brown.....</p>	75.0	100.0
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**Test Hole #10-37
(23-57-2ddad)
Scotts Bluff County**

Location: SE NE SE SE sec. 2, T. 23 N., R. 57 W., approximately
0.13 mile north of southeast corner on west side of road
Source Footage: Field

Latitude: 41 56 16N
Longitude: 103 53 32W
Source Lat/Long: Map
7.5-minute Quad Map Name: Morrill

Ground elevation: 4082 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, very silty, sand is very fine to fine with with some coarser grains, light yellow-brown.....	0.0	10.0
Sand and gravel, gravel is fine to medium with some coarse, common dark grains (one sample).....	10.0	98.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, very slightly sandy, sand is fine to very coarse, sand is mostly very fine, very pale brown- ish gray to very light olive-gray, noncalcareous, contains some volcanic ash.....	98.0	110.0

**Test Hole #8-C-97
(23N-57W-6aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 6, T. 23 N., R. 57 W., approximately 150 ft south and 50 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 42 00 03.93N
 Longitude: 103 58 14.72W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Dry Sheep Creek
Ground elevation: 4088.52 ft
 Source elev: GPS (geodetic)
Depth to water: 47.63 ft
 Date measured: 6/29/99
Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, slightly clayey, sand is very fine to medium with some coarse sand and rare gravel grains, a few lithic siltstone grains, medium dark gray with some light brown-gray, slightly to moderately calcareous.....

0.0 7.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, very slightly sandy, sand is very fine, in part slightly calcareous, very light brown-gray; very light brown 10 to 25 ft, essentially noncalcareous 10 to 80 ft, very light brownish gray 25 to 30 ft; very light yellowish brown 30 to 35 ft; mostly very light brownish gray, some very pale brown 35 to 75 ft; very pale brownish to yellowish gray 75 to 80 ft; interval 7 to 80 ft is massive, moderately well indurated; hard sandstone chips logged between 70 and 75 ft.....

7.0 80.0

**Test Hole #8-D-97
(23N-57W-7dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 7, T. 23 N., R. 57 W., approximately 50 ft north and 150 ft west of southeast corner section
 Source Footage: Map
 Latitude: 41 58 13.44N
 Longitude: 103 58 14.53W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill
Ground elevation: 4015.86 ft
 Source elev: GPS (geodetic)
Depth to water: 5.67 ft
 Date measured: 7/18/99
Geophysical Log(s): Electric log (R), Gamma

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, in part slightly clayey, very sandy, sand is very fine to fine with a trace of medium, medium brown-gray and light medium yellowish brown, slightly calcareous.....	0.0	5.0
Sand, silty, sand is very fine to fine, some slightly clayey silt, slightly calcareous, slight iron stain, light yellow-brown, interval drilled fast, poor recovery; probably a very sandy silt with some interbedded silty sand, contains a trace of snail shell fragments 10 to 15 ft.....	5.0	15.0
Sand, fine to very coarse, a little fine gravel, contains rare lithic siltstone grains.....	15.0	25.0
Sand and gravel, gravel is mostly fine to medium, a few dark grains, approximately 30 percent gravel; common lithic fine-grained sandstone grains 35 to 40 ft, approximately 30 to 40 percent gravel.....	25.0	40.0
Sand, a trace of gravel, much very coarse sand, approximately 10 to 20 percent gravel 55 to 70 ft; large angular siltstone chunks logged 55 to 60 ft; common coarse gravel pebbles 70 to 75 ft, cobbles at 72 ft.....	40.0	75.0
Sand, some gravel, gravel is mostly fine to medium, a little coarse gravel and pebbles, rare dark gray silicates, approximately 20 to 25 percent gravel 75 to 90 ft; some coarse gravel 95 to 100 ft and 105 to 110 ft.....	75.0	110.0

Sand, a little gravel, gravel is mostly fine with a little medium, common lithic fine-grained sandstone grains; approximately 20 to 25 percent gravel; a silty clay layer or clay ball logged 114 to 116 ft; some coarse gravel logged 120 to 125 ft; many lithic siltstone and sandstone grains 140 to 149 ft..... 110.0 149.0

Note: Interval 108 to 149 ft drilled fast, electric log indicates low resistivity and low permeability, possibly interval contains silt and clay in pore spaces.

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Sandstone, clayey and clayey sand, sand is mostly very fine to fine, a little medium, yellow-brown and light yellow-gray; mostly light medium gray 155 to 160 ft, sand is mostly very fine to fine 160 to 165 ft; light medium gray to light medium olive-gray 165 to 170 ft..... 149.0 160.0

Cretaceous System - Upper Cretaceous System - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Shale, clay, very silty, slightly to moderately sandy, micaceous, sand is very fine; a little very fine grained silty to clayey sandstone, micaceous (muscovite) light yellow-brown and light medium gray; light medium gray to light olive-gray 165 to 175 ft..... 160.0 175.0

Test Hole #1-F-96
(23N-57W-9aaaa)
Scotts Bluff County

Location: NE NE NE NE sec. 9, T. 23 N., R. 57 W., within a few feet
of northeast corner
Source Footage: Map
Latitude: 41 59 07.43N
Longitude: 103 55 52.53W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4080.01 ft
Source elev: GPS (geodetic)
Depth to water: 21.34 ft
Date measured: 5/30/96
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Top soil, from field log.....	0.0	2.0
Sand and gravel, gravel is mostly fine to medium, approximately 40 to 50 percent gravel, much quartz.....	2.0	5.0
Sand and gravel, gravel is fine to coarse, approx- imately 60 to 70 percent gravel, much quartz, common dark mafic grains, large pebbles noted in field log.....	5.0	24.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, moderately clayey, light yellow-brown to very light brownish gray, slightly to moderately calcareous; moderately calcareous 40 to 50 ft, light yellow-gray 45 to 50 ft.....	24.0	50.0

**Test Hole #1-G-96
(23N-57W-9adda)
Scotts Bluff County**

Location: NE SE SE NE sec. 9, T. 23 N., R. 57 W., approximately 2250 ft south and a few feet west of northeast corner of section

Source Footage: Map

Latitude: 41 58 45.01N
 Longitude: 103 55 52.06W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 4017.98 ft

Source elev: GPS (geodetic)

Depth to water: 8.1 ft

Date measured: 5/21/96

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, very sandy, sand is very fine to fine with some medium, dark brown-gray, contains scattered fine gravel grains.....	0.0	5.0
Sand, some gray, silty, in part slightly clayey, brown-gray and light-gray, gravel is mostly fine.....	5.0	10.0
Silt, moderately to very sandy, sand is mostly very fine to fine, probably interbedded with sand and gravel; clay logged at 14 ft.....	10.0	15.0
Silt, slightly to in part moderately clayey, light yellow-brown, moderately calcareous, some sand and gravel in sample.....	15.0	20.0
Sand and gravel, silty, gravel is fine to medium, one sample, 20 to 40 ft, logged as <i>poor sample</i> ; interval 35 to 50 ft logged as drilling fast.....	20.0	50.0
Silt, very slightly clayey, very sandy, sand is very fine to fine, contains some embedded medium to coarse sand and gravel, light medium yellow-brown, noncalcareous; some interbedded moderately clayey to moderately sandy silt, sand is mostly very fine, contains rare lithic gravel grains.....	50.0	60.0
Silt, slightly clayey, very sandy, sand is mostly very fine, silt is coarse, light brown-yellow, slightly calcareous; chert noted in field log, not seen in sample examination.....	60.0	65.0
Sand and gravel, gravel is fine to coarse, much quartz, a few dark mafic grains, grains moderately well rounded, coarse gravel logged from 68 to 72 ft.....	65.0	72.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay, very slightly silty, bentonitic, very light olive-gray with a trace of very pale brown, noncalcareous.....	72.0	75.0
Clay, very slightly silty, rare embedded fine sand, very pale brown, bentonitic, noncalcareous, contains a trace of light greenish gray clay 75 to 80 ft, contains a little secondary calcium carbonate 80 to 85 ft.....	75.0	85.0

**Test Hole #2-G-96
(23N-57W-9acaa)
Scotts Bluff County**

Location: NE NE SW NE sec. 9, 23 N., R. 57 W., approximately 1350 ft south and 1400 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 58 53.78N
Longitude: 103 56 10.93W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 4072.92 ft
Source elev: GPS (geodetic)

Depth to water: 1885 ft
Date measured: 6/13/96

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very sandy, sand is mostly very fine to medium, some coarse sand to fine gravel, dark brown-gray, a little light gray to brownish gray.....	0.0	4.0
Sand, very silty, very slightly clayey, sand is mostly fine to coarse, 5 to 10 percent fine to medium gravel, very light gray, very slightly calcareous.....	4.0	10.0
Sand and gravel, slightly silty, mostly quartz, approximately 30 percent gravel, may have some very silty layers.....	10.0	15.0
Sand and gravel, slightly silty, gravel is fine to coarse, mostly quartz with a few dark mafic grains.....	15.0	18.0
Silt, moderately clayey, silt is fine to very coarse, very light yellow-brown, contains rare rounded siltstone grains; most of sample consists of rounded lithic grains of siltstone 25 to about 53 ft, siltstone grains are moderately well consolidated; probably interval 18 to 53 ft is a lithic gravel and pebbles bed; logged as drilling fast.....	18.0	53.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, silt is fine to coarse, light yellow-brown, noncalcareous; very pale yellow-brown 60 to 65 ft.....	53.0	65.0
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Siltstone, moderately to very clayey, and siltstone, moderately clayey to moderately sandy, sand is mostly very fine, in part micaceous, very light yellow- to olive-gray, noncalcareous.....	65.0	70.0
Siltstone to sandstone, slightly clayey, sand is very fine, very light yellow-gray, in part with slightly brownish tint.....	70.0	75.0
Siltstone, moderately clayey, in part slightly sandy, sand is very fine, very light yellow to olive-brown, slightly calcareous.....	75.0	80.0
Clay, very pale yellow- to olive-gray, very slightly calcareous.....	80.0	85.0
Clay to claystone, very light olive to greenish gray, brittle structure in part, noncalcareous....	85.0	90.0
Clay, very light olive to greenish gray, very slightly calcareous; slightly to moderately calcareous 95 to 100 ft, contains a little mottled very pale brown.....	90.0	100.0

Note: clays 50 to 100 ft are non-swelling

**Test Hole #2-H-96
(23N-57W-9dcab)
Scotts Bluff County**

Location: NW NE SW SE sec. 9, T. 23 N., R. 57 W., approximately 1250 ft north and 1700 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 58 26.50N
 Longitude: 103 56 14.07W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 4017.21 ft

Source elev: GPS (geodetic)

Depth to water: 5.04 ft

Date measured: 7/9/96

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very slightly clayey, very sandy, sand is very fine to medium with a few coarse grains, dark brown-gray with some light brown-gray, noncalcareous.....	0.0	5.0
Silt, very sandy, sand is mostly very fine, silt is fine to very coarse, light medium yellow-brown to brownish gray, slightly calcareous, sand is very fine.....	5.0	10.0
Silt, slightly clayey, in part sandy, sand is very fine, light yellow-brown with a little medium brown-gray, slightly calcareous; fragments of lithic siltstone logged from 12 to 15 ft.....	10.0	15.0
Silt, slightly clayey, mostly moderately to very sandy, sand is very fine to fine with a little medium to coarse, light yellow-brown, contains common coarse to very coarse grain-size siltstone grains; poor recovery 20 to 30 ft, sample contains some fine to very coarse quartz sand; sample 25 to 30 ft includes much silt (possibly lithic pebbles).....	15.0	30.0
Sand, silty, some gravel, may have some slightly clayey to very sandy silt layers, common siltstone fragments.....	30.0	37.0
Lithic gravel, sample consists of rounded and broken gravel and pebble grains of siltstone.....	37.0	46.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately to very clayey, silt is mostly fine, very light brown with some very light brownish to greenish gray, noncalcareous; mostly very light yellowish gray, some very pale brownish gray.....

46.0 55.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay, very pale pinkish brown, noncalcareous, bentonitic, clay swells; pale pinkish to brownish gray 65 to 70 ft, brittle structure in part.....

55.0 70.0

**Test Hole #9-C-97
(23N-57W-11daaa)
Scotts Bluff County**

Location: NE NE NE SE sec. 11, T. 23 N., R. 57 W., approximately 2550 ft north and 50 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 58 41.74N
 Longitude: 103 53 31.69W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 4039.68 ft
 Source elev: GPS (geodetic)

Depth to water: 21.79 ft
 Date measured: 7/7/99

Geophysical Log(s): Electric (R), Gamma

Depth, in feet
 From To

Quaternary System, undifferentiated:

Silt, slightly to in part moderately clayey, sandy, sand is mostly very fine to fine, contains some embedded coarse sand and gravel grains, light medium brown-gray and light yellow-gray; contains large siltstone gravel to pebble grains.....	0.0	5.0
Silt, slightly clayey, mostly very sandy, sand is very fine to medium, some coarse sand and gravel grains, light yellowish to brownish-gray, non- to slightly calcareous.....	5.0	9.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 to 40 percent gravel, quartz, a few dark mafic grains; approximately 20 percent gravel 20 to 37 ft.....	9.0	37.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly to moderately clayey, silt is fine to very coarse, very light brown to very light brown-gray, slightly calcareous, noncalcareous 45 to 50 ft; slightly calcareous 50 to 65 ft; moderately calcareous 75 to 80 ft; most of interval logged as soft and sticky.....	37.0	80.0
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Test Hole #8-37
(23-57-14bbbc)
Scotts Bluff County

Location: SW NW NW NW sec. 14, T. 23 N., R. 57 W., approximately
0.1 mile south of the northwest corner on east edge of
road

Source Footage: Field

Latitude: 41 58 10N

Longitude: 103 54 37W

Source Lat/Long: Map

7.5-minute Quad Map Name: Morrill

Ground elevation: 3983 ft

Source elev: (t)

Depth to water: Unknown

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand.....	0.0	27.0
Sand and gravel, texture grades from coarse sand to fine gravel.....	27.0	110.0
Sand, fine.....	110.0	176.0
Sand and gravel, texture grades from sand to fine gravel.....	176.0	187.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation, undifferentiated:		
Very hard material; unable to get sample.....	187.0	200.0
Note: Interval 187 to 200 ft is assumed to be Cretaceous age based on depth and drilling action		

**Test Hole #1-J-96
(23N-57W-15cbcb)
Scotts Bluff County**

Location: NW SW NW SW sec. 15, T. 23 N., R. 57 W., approximately
1700 ft north and 50 ft east of SW corner of section
Source Footage: Map
Latitude: 41 57 38.03
Longitude: 103 55 49.37
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3993.71 ft
Source elev: GPS (geodetic)
Depth to water: 15.41 ft
Date measured: 5/30/96
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly clayey, slightly sandy, sand is very fine to medium, yellowish-brownish gray, noncalcareous; a little dark brown, very sandy silt in sample.....	0.0	4.0
Silt, moderately clayey, moderately sandy, sand is very fine to coarse, light yellow-brown to brownish gray, slightly calcareous.....	4.0	6.0
Sand and gravel, much quartz, common siltstone and claystone grains, a few dark grains, approximately 50 to 60 percent gravel; probably slightly clayey in upper 10 ft.....	6.0	30.0
Sand, some gravel, much quartz, some dark mafic grains, a few lithic siltstone and yellow-brown fine-grained sandstone grains, approximately 25 percent fine to medium gravel.....	30.0	35.0
Sand, a little gravel, much quartz, rare dark grains, a trace of lithic grains, approximately 15 to 20 percent gravel.....	35.0	50.0
Sand and gravel, gravel is fine to coarse, much quartz, lithic siltstone and siltstone-sandstone grains common, approximately 60 percent gravel....	50.0	55.0
Sand, a little gravel, much coarse to very coarse sand.....	55.0	60.0
Sand and gravel, gravel is fine to coarse, lithic siltstone, sandstone and claystone grains common, approximately 50 percent gravel.....	60.0	65.0

Sand and gravel, gravel is mostly fine to medium, much coarse to very coarse sand, approximately 30 percent gravel; approximately 15 percent gravel 90 to 95 ft; approximately 30 to 40 percent gravel 95 to 140 ft; common large lithic grains scattered throughout.....	65.0	140.0
Sand, some gravel, gravel is mostly fine, much coarse to very coarse sand; approximately 25 to 30 percent gravel.....	140.0	150.0
Sand, a little gravel, much coarse to very coarse sand; approximately 30 percent very coarse sand and fine gravel, a few lithic siltstone and sandstone grains, rare yellow-brown sandstone grains.....	150.0	165.0
Sand and gravel, gravel is fine to medium, some coarse, a few dark mafic grains, rough drilling 170 to 175 ft.....	165.0	175.0
Sand and gravel, gravel is fine to very coarse, quartz, a few gray silicates and metamorphic grains, a few fine-grained lithic sandstone grains, white and yellow-brown; cobbles noted in field log 180 to 196 ft; logged as rough drilling 175 to 196 f, approximately 60 to 70 percent gravel.....	175.0	196.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Transition zone - Pierre Formation:		
Clay shale, silty, slightly sandy, sand is very fine, slightly micaceous, dark-gray, noncalcareous, in part medium dark gray 200 to 205 ft.....	196.0	210.0

**Test Hole #1-I-96
(23N-57W-16aaab)
Scotts Bluff County**

Location: NW NE NE NE sec. 16, 23 N., R. 57 W., approximately 300 ft south and 600 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 41 58 11.17N
 Longitude: 103 55 58.82W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill
Ground elevation: 3993.85 ft
 Source elev: GPS (geodetic)
Depth to water: 10.29 ft
 Date measured: 5/30/96
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly to moderately clayey, moderately sandy, sand is very fine to medium with some coarser grains, medium brown-gray, in part slightly calcareous.....	0.0	4.0
Sand, some gravel.....	4.0	6.0
Silt, slightly to in part moderately clayey, slightly sandy to in part very sandy, very light yellow- to olive-gray, slight iron stain, slightly calcareous; may have some interbedded slightly sandy to gravelly layers 10 to 15 ft, poor sample recovery noted in field log.....	6.0	15.0
Sand, probably very silty to slightly clayey, sand is fine to very coarse, a few small lithic siltstone grains, poor sample recovery noted in field log from 15 to 20 ft, interval 20 to 25 ft drilled fast, sample similar to interval 15 to 20 ft, possibly interbeds of silty sand, some gravel and sandy to clayey silt.....	15.0	25.0
Sand and gravel, gravel is fine to coarse, much of sample consists of lithic siltstone and fine grained sandstone grains, possibly some thin clayey layers or clay balls, approximately 60 percent gravel; many lithic pebbles 40 to 77 ft.....	25.0	77.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Siltstone, slightly to in part very sandy, silt is coarse, sand is very fine, light medium yellow-brown to light medium yellowish gray, very slightly calcareous; slightly calcareous 80 to 90 ft, mostly moderately to very sandy; slight olive tint 85 to 90 ft; poorly indurated 77 to 90 ft.... 77.0 90.0

**Test Hole #1-H-97
(23N-57W-16adbd)
Scotts Bluff County**

Location: SE NW SE NE sec. 16, T. 23 N., R. 57 W., approximately 1850 ft south and 900 ft west of northeast corner of section

Latitude: 41 57 55.86N
 Longitude: 103 56 02.44W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 3994.62 ft
 Source elev: GPS (geodetic)

Depth to water: 16.16 ft
 Date measured: 6/10/97

Geophysical Log(s): None

Depth, in feet
 From To

Quaternary System, undifferentiated:

Sand, moderately silty, sand is very fine to medium, a few coarser grains, medium dark brown-gray, noncalcareous.....	0.0	5.0
Sand, slightly silty, sand is very fine to medium with a little coarse sand and a few coarser grains, light brown to yellow-gray.....	5.0	10.0
Sand and gravel, gravel is fine to coarse, much quartz, a few dark gray mafic grains and rare lithic siltstone and sandstone grains, approximately 60 to 70 percent gravel; a few pebbles notes in field log.....	10.0	35.0
Sand and gravel, gravel is mostly fine to medium, much quartz, a few dark gray mafic grains and a trace of lithic grains, approximately 40 percent gravel; approximately 50 to 60 percent gravel 45 to 65 ft.....	35.0	65.0
Sand and gravel, gravel is fine to coarse, approximately 50 percent of sample consists of lithic grains, approximately 50 percent gravel.....	65.0	75.0
Sand and gravel, gravel is fine to coarse, common lithic siltstone grains, approximately 50 percent gravel; approximately 25 to 30 percent gravel 85 to 100 ft; approximately 30 to 40 percent gravel 100 to 105 ft; approximately 20 to 25 percent gravel 105 to 150 ft. Note: interval 65 to 105 ft logged as having much sand; sample 150 to 155 ft has a few lithic ironstone and iron cemented sandstone grains, approximately 30 to 40 percent gravel.....	75.0	155.0

Sand, some gravel, gravel is mostly fine to medium, samples have considerable fine sandy and clayey silt, yellow-brown (possibly pebbles or layers), contains a few yellow-brown fine grained sandstone grains.....	155.0	185.0
Sand, some gravel, gravel is fine to coarse, some pebbles noted in field log, approximately 50 percent gravel; a few cuttings of yellow-brown clay from 190 to 195 ft.....	185.0	198.0
Cretaceous System - Upper Cretaceous Series - Montana Group - Pierre Shale:		
Transition zone - Pierre Formation:		
Shale, silty to clayey, in part sandy, sand is very fine, a little fine-grained sandstone, mostly dark gray, a little yellow-brown, very slightly calcareous; noncalcareous 205 to 210 ft, shale is mostly silty.....	198.0	210.0

**Test Hole #8-E-97
(23N-57W-19abab)
Scotts Bluff County**

Location: NW NE NW NE sec. 19, T. 23 N., R. 57 W., approximately 30 ft south and 1850 ft west of northeast corner section

Source Footage: Map

Latitude: 41 57 18.93N
 Longitude: 103 58 35.91W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 4009.20 ft

Source elev: GPS (geodetic)

Depth to water : 12.67 ft

Date measured: 6/30/99

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is mostly very fine to fine, dark brown-gray, contains scattered coarser sand grains.....	0.0	4.0
Sand, gravel, pebbles, common dark grains, approximately 60 to 70 percent gravel.....	4.0	15.0
Sand, fine to very coarse with scattered gravel and pebbles.....	15.0	20.0
Sand, some gravel, gravel is mostly fine to medium with scattered coarse gravel and pebbles, quartz with very few dark grains, approximately 30 percent gravel.....	20.0	30.0
Sand, a little gravel, sand is coarse to very coarse, approximately 20 percent gravel, rare lithic grains, cobbles logged 44 to 45 ft.....	30.0	46.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Sandstone, clayey, sand is very fine to fine, light gray, some yellow-brown.....	46.0	50.0
Sandstone, clayey, sand is mostly very fine to fine, a little medium, light gray, some dark speckling, contains some very sandy clay and rare clay grains; contains a little coarse sand 55 to 60 ft; contains some moderately sandy clay layers 60 to 65 ft.....	50.0	65.0
Sandstone, slightly to very clayey, sand is mostly very fine to fine, light gray, some thin indurated layers; contains rare medium to coarse sand grains; mostly massive uniform sandstone 75 to 95 ft.....	65.0	95.0

Sandstone-siltstone, clayey, sand is mostly very fine with some fine, light gray, uniform, massive; some fine sand and a few coarser grains 105 to 110 ft; contains a trace of indurated sandstone 110 to 115 ft; logged as hard sandstone 110 to 111 ft, slight yellow-brown iron staining 110 to 115 ft; mostly very fine sand 115 to 120 ft; some water loss noted at 97 ft..... 95.0 120.0

Note: interval 46 to 120 ft was logged in the field as being a light bluish-green.

**Test Hole #8-F-97
(23N-57W-19cccb)
Scotts Bluff County**

Location: NW SW SW SW sec. 19, T. 23 N., R. 57 W., approximately 350 ft north and 70 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 56 41.00N

Longitude: 103 59 13.90W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Morrill

Ground elevation: 4002.55 ft

Source elev: GPS (geodetic)

Depth to water: 5.47 ft

Date measured: 6/13/00

Geophysical Log(s): Electric log (R), Gamma, Caliper to 195 ft

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, slightly sandy, sand is mostly very fine to fine and silt, very slightly clayey and very sandy, sand is very fine to fine with a few coarser grains, in part dark brown-gray and in part light brown-gray and slightly calcareous.....	0.0	4.0
Sand and gravel, a few pebbles, quartz, metamorphic, dark mafic and rare lithic iron-cemented sandstone grains, approximately 60 to 70 percent gravel.....	4.0	10.0
Sand and gravel, gravel is mostly fine to medium, quartz with a few dark mafic grains, contains a few lithic grains of siltstone, fine-grained sandstone and ironstone grains, approximately 25 to 30 percent quartz 10 to 15 ft, approximately 10 to 15 percent gravel; lithic pebbles logged from 25 to 35 ft.....	10.0	35.0
Sand, a little gravel, gravel is mostly fine, quartz with a few dark grains, approximately 15 to 20 percent gravel; contains some coarse gravel and a few pebbles from 55 to 65 ft, contains lithic grains of siltstone, fine-grained very light gray sandstone and a trace of yellow-brown sandstone...	35.0	65.0
Sand, a little gravel, sand is fine to very coarse, gravel is mostly fine, approximately 25 percent gravel.....	65.0	75.0
Sand, fine to very coarse, a few fine gravel grains, approximately 10 to 15 percent gravel 90 to 100 ft, approximately 25 percent gravel 110 to 115 ft; approximately 15 percent gravel 115 to 125 ft.....	75.0	125.0

Sand and gravel, gravel is fine to coarse, a few pebbles, common lithic fine-grained sandstone and claystone grains, approximately 30 to 40 percent gravel.....	125.0	135.0
Sand, a little gravel, gravel is mostly fine, much very coarse sand, approximately 40 to 50 percent very coarse sand, contains a few lithic clasts including coarse sandstone grains.....	135.0	160.0
Sand and gravel, pebbles and cobbles, sample contains many broken grains.....	160.0	186.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Shale, very silty, micaceous, contains much coarse to very coarse silt, very slightly sandy, sand is very fine, light medium and medium dark gray; some clay shale 190 to 195 ft, contains a trace of siltstone-sandstone 195 to 210 ft, sandstone is very fine; interval 186 to 210 ft appears to be thin bedded to platy in part.....	186.0	210.0
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**Test Hole #9-37
(23-57-21dadd)
Scotts Bluff County**

Location: SE SE NE SE sec. 21, T. 23 N., R. 57 W., approximately
0.3 mile north of southeast corner on west side of road
Source Footage: Field
Latitude: 41 56 44N
Longitude: 103 55 49W
Source Lat/Long: Map
7.5-minute Quad Map Name: Morrill
Ground elevation: 3987 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand.....	0.0	6.0
Sand and gravel, texture grades from sand to fine gravel, contains some coarse gravel below 95 ft (one sample).....	6.0	147.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Siltstone-sandstone, slightly to moderately clayey, sand is mostly very fine, light gray to medium greenish gray, slight to moderate induration.....	147.0	153.0

Test Hole #2-J-97
(23N-57W-21abab)
Scotts Bluff County

Location: NW NE NW NE sec. 21, T. 23 N., R. 57 W., on or near north section line and approximately 1900 ft west of northeast corner section

Source Footage: Map

Latitude: 41 57 20.99N

Longitude: 103 56 15.04W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Morrill

Ground elevation: 3993.63 ft

Source elev: GPS (geodetic)

Depth to water: 13.92 ft

Date measured: 4/14/97

Geophysical Log(s): None

Note: samples not available, compiled and interpreted from field log.

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silty sand, dark brown and top soil.....	0.0	9.0
Silty sand, fine sand and small gravel.....	9.0	15.0
Sand and small gravel, some Brule pebbles.....	15.0	38.0
Sand and medium course gravel, common Brule pebbles; slightly coarser 50 to 75 ft, abundant Brule pebbles (15 percent) 60 to 65 ft.....	38.0	75.0
Sand and fine to medium gravel; some pebbles 90 to 95 ft including small Brule pebbles; 20 percent feldspar and common mafic pebbles 95 to 95 ft; some Brule pebbles 100 to 115 ft; no Brule pebbles 115 to 125 ft; some sandstone pebbles 125 to 135 ft; large Brule pebbles 135 to 145 ft; no Brule pebbles 145 to 175 ft.....	75.0	175.0
Sand and gravel, large cobbles common, drilled very rough 175 to 192 ft.....	175.0	192.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Shale Formation:		
Transition zone, Pierre Formation:		
Clay, dark gray/blue, very sticky.....	192.0	200.0

**Test Hole #1-K-97
(23N-57W-22abab)
Scotts Bluff County**

Location: NW NE NW NE sec. 22, T. 23 N., R. 57 W., a few ft south
and 1850 ft west of northeast corner of section
Source Footage: Map

Latitude: 41 57 21.92N
Longitude: 103 55 03.59
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 3985.99 ft

Source elev: GPS (geodetic)

Depth to water: 10.91 ft

Date measured: 5/8/97

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy and sand, moderately silty, sand is very fine to fine, some medium dark gray, mostly medium yellowish brown, slightly calcareous.....	0.0	5.0
Sand, moderately silty, sand is very fine to fine, light medium yellowish brown, noncalcareous, rare coarse to very coarse sand grains in lower part...	5.0	9.0
Sand and gravel, gravel is mostly fine to medium, a little coarse gravel and pebbles, mostly quartz, rare dark gray mafic and lithic siltstone grains, approximately 60 percent gravel.....	9.0	25.0
Sand and gravel, gravel is mostly fine to medium, much very coarse sand and fine gravel, much quartz, a few siltstone grains, approximately 20 to 30 percent gravel; approximately 30 to 40 percent gravel 35 to 45 ft; some coal fragments in samples 40 to 70 ft; approximately 35 to 40 percent gravel 62 to 80 ft.....	25.0	80.0
Sand, some gravel, gravel is mostly fine, some medium, mostly quartz, rare dark gray mafic grains, a few lithic and metamorphic grains, approximately 25 percent very coarse sand and gravel, charcoal noted in field log 80 to 110 ft, probably coal, approximately 30 percent gravel 95 to 105 ft; approximately 40 percent gravel 105 to 110 ft, common lithic grains.....	80.0	110.0
Sand, a little gravel, gravel is mostly fine, much very coarse sand, slightly more gravel 130 to 135 ft.....	110.0	135.0

Sand and gravel, gravel is mostly fine to medium, approximately 50 percent gravel.....	135.0	140.0
Gravel, sandy, gravel is fine to very coarse, quartz and dark mafic grains, a few lithic grains, approximately 70 percent gravel.....	140.0	155.0
Sand and gravel, gravel is fine to medium with some coarse, 30 to 40 percent gravel 155 to 170 ft, approximately 50 to 60 percent gravel 170 to 180 ft, approximately 70 percent gravel 180 to 200 ft, common pebbles, rare lithic sandstone grains, some iron cemented.....	155.0	200.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Transition zone - Pierre Formation:		
Clay shale, very dark gray, in part slightly micaceous, noncalcareous.....	200.0	204.0

**Test Hole #9-D-97
(23N-57W-24bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 24, T. 23 N., R. 57 W., approximately 60 ft south and 200 ft east of northwest corner section
Source Footage: Map

Latitude: 41 57 23.30N
Longitude: 103 53 27.35W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 3970.37 ft
Source elev: GPS (geodetic)

Depth to water: 2.75 ft
Date measured: 7/7/99

Geophysical Log(s): Electric (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, sand is very fine to medium with some coarse and a trace of very coarse, medium dark brown-gray; very clayey 6 to 7 ft, dark brown-gray.....	0.0	7.0
Sand and gravel, gravel is fine to medium, a little coarse, much quartz, a few metamorphic and dark gray mafic grains, approximately 50 to 60 percent gravel; approximately 40 to 50 percent gravel 25 to 30 ft.....	7.0	30.0
Sand, a little gravel, gravel is mostly fine, much quartz, a few dark mafic grains, rare iron-cemented sandstone grains 30 to 35 ft, much very coarse sand, approximately 10 percent fine gravel; a little medium gravel 35 to 60 ft, a few limestone grains, approximately 25 percent gravel; some large gravel noted in log 45 to 50 ft; charcoal logged at 39 ft (probably coal).....	30.0	60.0
Sand, fine to very coarse, a trace of gravel, some rounded lithic grains of coal noted in each 5-foot sample (logged in field as charcoal).....	60.0	145.0
Sand, some gravel, gravel is mostly fine to medium, much quartz, a few coal fragments, approximately 25 to 30 percent gravel.....	145.0	175.0
Gravel, sandy, gravel is fine to coarse, some pebbles, many broken pieces in sample, logged as rough drilling.....	175.0	189.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Clay shale, dark gray, interbedded silty clay shale
and silty shale, micaceous, silt is coarse, non-
calcareous..... 189.0 210.0

**Test Hole #1-K-94
(23-57-28dcbc)
Scotts Bluff County**

Location: SW NW SW SE sec. 28, T. 23 N., R. 57 W., approximately 315 ft north and 2610 ft west of southeast corner of short (North-South) section

Source Footage: Map

Latitude: 41 55 49.80N
 Longitude: 103 56 19.79W
 Source Lat/Long: GPS (hand held)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 3984.87 ft

Source elev: (i)

Depth to water: 7.78 ft

Date measured: 5/95

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Gravel, sandy, gravel is fine to coarse, clay coating and dark organic stain, approximately 60 percent gravel.....	0.0	5.0
Sand and gravel, gravel is fine to medium, dark organic stain, approximately 20 percent gravel....	5.0	10.0
Sand, fine to coarse, some very coarse sand and a trace of gravel, much coarse, slight organic stain in upper part.....	10.0	18.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, light greenish gray, noncalcareous, well indurated.....	18.0	25.0
Mudstone, clayey, light greenish gray, noncalcareous, slightly bentonitic in part.....	25.0	29.0

**Test Hole #1-L-96
(23N-57W-28aaaa)
Scotts Bluff County**

Location: NE NE NE NE sec. 28, T. 23 N., R. 57 W., on or near north section line and approximately 50 ft west of northeast corner of section

Source Footage: Map

Latitude: 41 56 28.43N

Longitude: 103 55 48.88W

Source Lat/Long: GPS (geodetic)

7.5 minute Quad Map Name: Morrill

Ground elevation: 3977.9 ft

Source elev: GPS (geodetic)

Depth to water: 3.87 ft

Date measured: 5/30/96

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy, sand is mostly very fine to fine, medium dark brown.....	0.0	2.0
Sand, silty, very fine to fine, light brown.....	2.0	3.0
Sand, some gravel, gravel is mostly fine, much quartz, approximately 10 percent dark mafic grains, approximately 15 to 20 percent very coarse sand and gravel; approximately 20 to 25 percent very coarse sand and gravel 10 to 15 ft and 20 to 25 ft; contains a few lithic siltstone grains 10 to 15 ft; some medium gravel 20 to 25 ft.....	3.0	25.0
Sand, medium to very coarse, contains a little gravel, mostly quartz, a few lithic siltstone grains (more abundant 40 to 50 ft), approximately 20 percent very coarse sand and fine gravel 55 to 60 ft.....	25.0	60.0
Sand and gravel, gravel is fine to coarse, much quartz, a few dark mafic grains and lithic sandstone grains, yellow-brown, approximately 50 percent gravel.....	60.0	70.0
Sand, a little gravel, much coarse to very coarse sand, gravel is mostly fine, a few pebbles noted in field log, much quartz, rare lithic siltstone, sandstone and ironstone grains; lithic siltstone grains more common 90 to 106 ft.....	70.0	106.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay and siltstone-sandstone, interbedded, sandstone is very fine grained, platy, pale green, noncalcareous, clays tend to swell, bentonitic....	106.0	120.0
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Test Hole #2-L-96
(23N-57W-28baaa)
Scotts Bluff County

Location: NE NE NE NW sec. 28, T. 23 N., R. 57 W., on or near north section line and approximately 2600 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 56 27.89N
Longitude: 103 56 24.01W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 3985.44 ft
Source elev: GPS (geodetic)

Depth to water: 4.75 ft
Date measured: 5/30/96

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, silty, sand is very fine to fine with a few embedded coarser grains, light medium brown-gray..... 0.0 4.0

Sand and gravel, gravel is fine to coarse, quartz, feldspar and common dark mafic grains, rare metamorphic grains, a few pebbles noted on field log, approximately 40 to 60 percent gravel; slightly fewer dark mafic grains below 30 ft; coarse gravel logged at 48 ft; rare iron-cemented sandstone grains throughout..... 4.0 60.0

Sand and gravel, gravel is mostly fine to medium, much very coarse sand to fine gravel, much quartz, a few dark grains, rare yellow to red iron-cemented sandstone grains, approximately 30 to 40 percent very coarse sand and gravel; much coarse to very coarse sand 75 to 86 ft, approximately 25 percent gravel, some coarse gravel noted in field log..... 60.0 86.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Sandstone, slightly to moderately clayey, sand is mostly very fine, some fine, medium greenish gray, noncalcareous..... 86.0 100.0

**Test Hole #2-T-99
(23N-57W-28cddd)
Scotts Bluff County**

Location: SE SE SE SW sec. 28, T. 23 N., R. 57 W., approximately 150 ft north and 2550 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 55 49.68N

Longitude: 103 56 19.51W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Morrill

Ground elevation: 3986.85 ft

Source elev: GPS (geodetic)

Depth to water: 5.17 ft

Date measured: 7/28/99

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand and gravel, fine sand with fine to coarse gravel, some lithic siltstone and claystone grains, one sample 0 to 20 ft.....

0.0 19.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, moderately to very clayey, very slightly silty, light greenish gray, noncalcareous; very light greenish gray 20 to 25 ft, mostly very clayey.....

19.0 25.0

Mudstone, moderately to very clayey, very light brownish gray, noncalcareous.....

25.0 31.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Clay, very light brown, dense, somewhat waxy.....

31.0 35.0

Clay, mudstone, a little slightly sandy clay, sand is very fine to fine, mottled colors of light and very light gray, very light brown and a trace of yellow-brown, clays tend to swell, bentonitic, in part slightly calcareous;; some clayey very fine to fine-grained sandstone 40 to 45 ft, contains rare dense limestone nodules.....

35.0 45.0

Mudstone-claystone, mostly very light gray, a little very light brown and a trace of yellow-brown noncalcareous, clays tend to swell.....

45.0 50.0

Siltstone-sandstone, moderately clayey, silt is fine to very coarse, sand is very fine with some fine, medium dark brown-yellow, in part very slightly calcareous; mostly very light yellow-gray, a little yellow-brown 55 to 60 ft.....	50.0	60.0
Siltstone, moderately clayey, silt is fine to very coarse, slightly sandy, sand is very fine, light medium greenish gray, noncalcareous, logged as soft; contains a trace of yellow-brown and red-brown 75 to 90 ft.....	60.0	90.0
Siltstone, some siltstone to sandstone, slightly to moderately clayey, sand is very fine to fine, light greenish gray with a trace of yellow-brown, fine silty sand logged 92 to 95 ft.....	90.0	95.0
Siltstone-sandstone, slightly to moderately clayey, sand is very fine to fine, light greenish gray; sand is mostly very fine, silt is very coarse 100 to 115 ft, slightly more clayey or has interbeds of more clayey layers, noncalcareous.....	95.0	115.0
Siltstone-sandstone, slightly clayey; silt is coarse, sand is very fine, light greenish gray, noncalcareous, sand is very fine to fine 120 to 125 ft.....	115.0	125.0
Sandstone, clayey, sand is very fine to fine with some medium and rare lithic sand grains of clay shale, mostly medium brown- to olive-yellow, some light gray.....	125.0	130.0
Clay, slightly to very sandy, sand is very fine to fine with some medium and rare coarse sand grains, coarse sand grains are quartz, light greenish gray.....	130.0	135.0
Silt, moderately clayey, slightly to in part very sandy, sand is mostly very fine to fine, with rare medium to coarse quartz sand grains; slightly more medium to coarse sand 140 to 150 ft, rare very coarse sand grains.....	135.0	150.0
Siltstone, slightly clayey, moderately sandy, sand is mostly very fine to fine, light greenish gray, (may contain thin sandstone layers); contains a trace of thin-bedded calcareous sandstone 155 to approximately 160 ft.....	150.0	160.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Shale, silty, clayey, very slightly sandy, micaceous, silt is coarse, light gray to greenish gray, a little yellow-brown; sticky gray clay logged at 160 ft; some platy clay layers 165 to 180 ft; contains a little light medium gray 170 to 175 ft; medium gray 175 to 180 ft, may contain very thin fine-grained sandstone layers.....	160.0	180.0
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**Test Hole #26-K-94
(23-57-28dddd)
Scotts Bluff County**

Location: SE SE SE SE sec. 28, T. 23 N., R. 57 W., approximately
200 ft north and 260 ft west of southeast corner
Source Footage: Map
Latitude: 41 55 48.71N
Longitude: 103 55 48.50W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3979.09 ft
Source elev: (i)
Depth to water: 4.99 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, slightly to very sandy, sand is mostly fine, light yellow-brown and brown-gray, slightly calcareous.....	0.0	3.0
Sand, some gravel, gravel is mostly fine.....	3.0	10.0
Sand, fine to very coarse; sand is fine to coarse 15 to 20 ft.....	10.0	20.0
Sand, very fine to medium.....	20.0	25.0
Sand, fine to very coarse.....	25.0	30.0

**Test Hole #5-37
(23-57-31dadd)
Scotts Bluff County**

Location: SE SE NE SE sec. 31, T. 23 N., R. 57 W., approximately
0.3 mile north of southeast corner
Source Footage: Field
Latitude: 41 55 08N
Longitude: 103 58 01W
Source Lat/Long: Map
7.5-minute Quad Map Name: Morrill
Ground elevation: 4033 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to medium, some coarser and rare lithic grains.....	0.0	11.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Claystone, whitish gray and light olive-gray, slightly calcareous, dense, brittle, thin bedded, well indurated.....	11.0	12.0
Mudstone, very light olive-gray, noncalcareous, mod- erately well indurated, logged as greenish.....	12.0	31.0

Test Hole #6-37
(23-57-32baab)
Scotts Bluff County

Location: NW NE NE NW sec. 32, T. 23 N., R. 57 W., approximately
0.4 mile east of northwest corner of south side of road
Source Footage: Field
Latitude: 41 55 45N
Longitude: 103 57 31N
Source Lat/Long: Map
7.5-minute Quad Map Name: Morrill
Ground elevation: 3993 ft
Source elev: (t)
Depth to water: Unknown
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and road fill: sand, silty.....	0.0	2.0
Sand, fine.....	2.0	10.0
Clay, blue.....	10.0	12.5
Sand and gravel; texture grades from coarse sand to fine gravel; contains green clay below 28 ft.....	12.5	42.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, sandy, greenish gray and gray, very hard 153.5 to 154.5 ft (one sample).....	42.0	±164.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Transition Zone, Pierre Formation:		
Shale, silty, micaceous, medium dark and dark gray, some very fine grained sandstone (one sample).....	±164.0	190.0

**Test Hole #8-G-97
(23N-57W-32bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 32, T. 23 N., R. 57 W., approximately 50 ft south and 100 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 55 45.56N
Longitude: 103 58 00.45W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 4002.49 ft
Source elev: GPS (geodetic)

Depth to water: 8.83 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, slightly to in part very sandy, sand is mostly very fine, medium dark brown-gray, some light brown-gray, noncalcareous; mostly light brown-gray 5 to 9 ft, probably some medium dark brown-gray in upper part, both intervals slightly calcareous, contains a trace of shell fragments.....	0.0	9.0
Sand, some gravel, gravel is mostly fine to medium, quartz with some dark silicates, a few lithic sandstone and claystone grains and rare limonitic-stained clay grains, approximately 20 to 25 percent gravel; common coarse gravel and a few pebbles 35 to 42 ft.....	9.0	42.0

Tertiary System - Eocene Series - White River Group:

Chadron Formation:

Sand, very clayey and silty, clayey sandstone, sand is mostly very fine, yellow-brown, yellow-gray and light gray; mostly yellow-brown with a little reddish brown 50 to 55 ft; some clay in sample....	42.0	55.0
Sandstone, clayey, sand is very fine with some fine, light gray with some yellow-brown stain and a little mottled reddish brown; logged as blue-green silty clay 60 to 68 ft.....	55.0	72.0
Clay, silty, slightly sandy, sand is very fine, mostly yellow-brown, some light gray; tan silty clay logged 77 to 80 ft.....	72.0	80.0

**Test Hole #24-K-94
(23-57-32abab)
Scotts Bluff County**

Location: NW NE NW NE sec. 32, T. 23 N., R. 57 W., approximately
30 ft south and 1750 ft west of northeast corner
Source Footage: Map

Latitude: 41 55 46.05N
Longitude: 103 57 18.34W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill

Ground elevation: 3989.46 ft

Source elev: (i)

Depth to water: 6.89 ft

Date measured: 5/95 Note: measured in 9 ft observation well #23-S

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, slightly to in part moderately sandy, sand is mostly very fine to fine, medium dark brown-gray, some light brown-gray, slightly to moderately calcareous, contains a trace of snail shells.....	0.0	5.0
Silt, moderately clayey, moderately sandy, sand is mostly very fine to fine, light medium brown-gray and grayish brown, slightly calcareous.....	5.0	8.0
Sand, fine to very coarse, contains a trace of fine gravel.....	8.0	15.0
Sand, fine to coarse, a little very coarse.....	15.0	25.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Clay and claystone, very slightly sandy, sand is mostly fine to medium, light brown and light yellowish to olive-gray with a trace of yellow-brown mottling; very light gray slightly sandy clay in lower part of interval is slightly bentonitic.....	25.0	30.0
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**Test Hole #25-K-94
(23-57-32aaba)
Scotts Bluff County**

Location: NE NW NE NE sec. 32, T. 23 N., R. 57 W., approximately 50 ft south and 750 ft west of northeast corner

Source Footage: Map

Latitude: 41 55 45.92N

Longitude: 103 57 05.61W

Source Lat/Long: GPS (hand held)

7.5-minute Quad Map Name: Morrill

Ground elevation: 3988.09 ft

Source elev: (i)

Depth to water: 5.97 ft

Date measured: 5/95

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very clayey, slightly sandy, sand is very fine to fine, medium dark brown-gray, light brown-gray and medium gray-brown, very slightly calcareous; mostly medium to dark brown-gray 5 to 7 ft, contains rare medium to very coarse sand grains.....	0.0	7.0
Sand, medium to very coarse, some fine and a trace of medium gravel.....	7.0	20.5

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, mottled very light brown and very light olive-gray noncalcareous, well indurated.....	20.5	30.0
Mudstone, slightly sandy, sand is mostly fine to medium, a trace of coarse, light yellow-brown, slightly to moderately calcareous, contains rare yellow-brown lithic grains; interval may have very sandy layers containing rare gravel grains.....	30.0	35.0

**Test Hole #2-K-94
(23-57-33bbbc)
Scotts Bluff County**

Location: SW NW NW NW sec. 33, T. 23 N., R. 57 W., approximately
380 ft south and 110 ft east of northwest corner
Source Footage: Map
Latitude: 41 55 42.88N
Longitude: 103 56 53.42W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3986.69 ft
Source elev: (i)
Depth to water: 4.71 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, very slightly sandy and silt slightly clayey and moderately to very sandy, sand is mostly very fine with some fine to medium sand in the sandy silt, light brown gray and very light gray, moderately calcareous, contains rare small limy areas.....	0.0	6.0
Sand, fine to coarse, rare very coarse sand, mostly quartz; slightly coarser grained 9.7 to 15 ft.....	6.0	15.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone with some sandy siltstone to sandstone, sand is very fine to fine, micaceous, very light olive-gray, noncalcareous.....	15.0	20.0
Siltstone, silt is fine to medium, very light olive-gray; very slightly calcareous, moderately well indurated; sample contains a little moderately clayey silt.....	20.0	25.0
Siltstone to claystone, light olive-gray to light greenish gray, noncalcareous, moderately well indurated.....	25.0	30.0

**Test Hole #3-K-94
(23-57-33bbcb)
Scotts Bluff County**

Location: NW SW NW NW sec. 33, T. 23 N., R. 57 W., approximately
980 ft south and 70 ft east of northwest corner

Source Footage: Map

Latitude: 41 55 36.98N
 Longitude: 103 56 53.55W
 Source Lat/Long: GPS (hand held)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 3987.24 ft

Source elev: (i)

Depth to water: 3.54 ft

Date measured: 5/95

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly clayey, moderately sandy, sand is mostly very fine to fine, medium dark brown-gray, moderately calcareous.....	0.0	4.0
Silt, moderately clayey, in part slightly sandy, sand is fine to coarse, medium dark brown-gray, slightly to in part moderately calcareous; contains rare small lithic grains of yellow-brown clay.....	4.0	10.0
Sand, clayey, sand is fine to very coarse, medium brown-gray and light gray.....	10.0	15.0
Sand, fine to very coarse, much quartz, rare light olive-gray lithic siltstone grains.....	15.0	20.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone with some siltstone-claystone, light yellowish gray noncalcareous, moderately well indurated.....	20.0	25.0
Mudstone, very light olive-gray, noncalcareous, moderately well indurated.....	25.0	30.0

**Test Hole #4-K-94
(23-57-33bcbb)
Scotts Bluff County**

Location: NW NW SW NW sec. 33, T. 23 N., R. 57 W., approximately
1495 ft south and 60 ft east of northwest corner
Source Footage: Map
Latitude: 41 55 31.85N
Longitude: 103 56 53.79W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3986.89 ft
Source elev: (i)
Depth to water: 2.15 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, slightly clayey, slightly sandy, silt is coarse, sand is very fine, very light brownish gray, very slightly calcareous.....	0.0	5.0
Mixed sample, some dark gray silty clay, some moderately clayey to slightly sandy silt, light gray and some sandy to clayey silt, light gray, sand is fine to coarse.....	5.0	10.0
Sand, clayey, sand is fine to medium, some coarse, light gray, slightly calcareous.....	10.0	12.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, very slightly sandy, sand is very fine, very light light brownish gray, noncalcareous, moderately well indurated.....	12.0	20.0
Mudstone, light olive-gray, slightly calcareous; very light olive-gray 25 to 30 ft, contains some volcanic ash, very slightly calcareous.....	20.0	30.0
Claystone, very light olive- to green-gray, noncalcareous.....	30.0	35.0

Test Hole #5-K-94
(23-57-33cccc)
Scotts Bluff County

Location: SW SW SW SW sec. 33, T. 23 N., R. 57 W., approximately 90 ft north and 50 ft east of southwest corner

Source Footage: Map

Latitude: 41 54 54.55N

Longitude: 103 56 52.99W

Source Lat/Long: GPS (hand held)

7.5-minute Quad Map Name: Morrill

Ground elevation: 4030.47 ft

Source elev: (i)

Depth to water: 9.30 ft

Date measured: 5/95

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very silty, in part slightly clayey, sand is mostly very fine to fine, a little medium sand, light brown, slightly calcareous..... 0.0 5.0

Silt, slightly clayey, silt is fine to very coarse, very slightly sandy, light yellow-brown, slightly to moderately calcareous..... 5.0 10.0

Sand, very fine to medium with some coarse to very coarse sand and a trace of fine gravel, contains many small well rounded lithic grains of light brown and very light gray siltstone..... 10.0 13.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Claystone, very light brown, massive noncalcareous.. 13.0 15.0

Siltstone and claystone interbedded?, very light brown and very light to light gray, very slightly calcareous, moderately well indurated; sample contains a little very fine sandy, light gray siltstone-sandstone..... 15.0 20.0

Claystone, light olive-gray and siltstone, light brown interbedded?, very slightly calcareous, moderately well indurated..... 20.0 25.0

Mudstone, contains a trace of very fine sand, very light olive- to green-gray, moderately well indurated; logged as slightly sticky..... 25.0 30.0

**Test Hole #6-K-94
(23-57-33bacc)
Scotts Bluff County**

Location: SW SW NE NW sec. 33, T. 23 N., R. 57 W., approximately
1310 ft south and 1450 ft east of northwest corner
Source Footage: Map
Latitude: 41 55 33.63N
Longitude: 103 56 35.16W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3986.92 ft
Source elev: (i)
Depth to water: 4.14 ft
Date measured: 5/95
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, in part slightly clayey, sand is fine to medium with some coarse, light brown-gray.....	0.0	5.0
Sand, fine to coarse, some very coarse, mostly quartz.....	5.0	13.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, light olive-gray with a greenish tint, fine grained, noncalcareous, moderately well indurated.....	13.0	25.0
Mudstone to siltstone, light olive-gray to greenish gray, contains a trace of light brown and red-brown mottling, noncalcareous, moderately well indurated; less well indurated 33 to 35 ft, drilled without drill chatter; turquoise silty clay logged in interval 30 to 35 ft.....	25.0	35.0

**Test Hole #7-K-94
(23-57-33bdcc)
Scotts Bluff County**

Location: SW SW SE NW sec. 33, T. 23 N., R. 57 W., approximately
2410 south and 1500 ft east of northwest corner
Source Footage: Map
Latitude: 41 55 22.98N
Longitude: 103 56 33.96W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3992.68 ft
Source elev: (i)
Depth to water: 5.16 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, silty, medium to dark brown-gray, very slightly calcareous; sandy at base of interval, contains a trace of gravel composed of lithic siltstone grains.....	0.0	5.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, slightly sandy, silt is coarse, sand is very fine, very light brown-gray, noncalcareous, moderately well indurated.....	5.0	10.0
Siltstone, very slightly sandy, silt is coarse, very light yellow-gray, noncalcareous; contains mudstone layer.....	10.0	15.0
Siltstone, silt is coarse, light olive-gray, noncalcareous, moderately well indurated; very slightly calcareous 20 to 30 ft, very light olive-gray.....	15.0	30.0
Siltstone-mudstone, silt is very fine to coarse, very light olive-gray, noncalcareous, moderate induration; drill chatter zone at 3 ft; logged as being brownish.....	30.0	35.0

Test Hole #8-K-94
(23-57-33accb)
Scotts Bluff County

Location: NW SW SW NE sec. 33, T. 23 N., R. 57 W., approximately
 2030 ft south and 2580 ft west of northeast corner
 Source Footage: Map
 Latitude: 41 55 26.53N
 Longitude: 103 56 19.05W
 Source Lat/Long: GPS (hand held)
 7.5-minute Quad Map Name: Morrill
Ground elevation: 3993.49 ft
 Source elev: (i)
Depth to water : 4.09 ft
 Date measured: 5/95
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to medium, a little coarse sand and rare very coarse sand and fine gravel; silty to clayey in upper part of interval.....	0.0	5.0
Sand, fine to medium, a little coarse.....	5.0	10.0
Sand, fine to very coarse, a little gravel, common rounded lithic siltstone grains.....	10.0	12.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone-mudstone, silt is very fine to coarse, very light olive-gray, very slightly calcareous to noncalcareous, moderate induration.....	12.0	25.0
Mudstone, silty, very light olive-gray, noncalcareous, massive.....	25.0	31.0
Mudstone, silty, very light greenish gray, noncalcareous, moderate induration.....	31.0	35.0

**Test Hole #9-K-94
(23-57-33adaa)
Scotts Bluff County**

Location: NE NE SE NE sec. 33, T. 23 N., R. 57 W., approximately
1650 ft south and 200 ft west of northeast corner
Source Footage: Map
Latitude: 41 55 30.83N
Longitude: 103 55 47.24W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4004.84 ft
Source elev: (i)
Depth to water: 5.60 ft
Date measured: 5/95
Geophysical Log(s): None

Depth, in feet
From To

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, silty, silt is mostly fine to medium, very light olive-gray, in part very slightly calcareous, moderate induration, thin organic soil logged at surface; contains a little very pale brown-gray 5 to 15 ft, noncalcareous.....	0.0	15.0
Mudstone, slightly silty, very light olive-gray, noncalcareous, moderately well indurated, in part very slightly calcareous; slightly finer grained 30 to 35 ft.....	15.0	35.0

**Test Hole #10-K-94
(23-57-33aadd)
Scotts Bluff County**

Location: SE SE NE NE sec. 33, T. 23 N., R. 57 W., spproximately
1310 ft south and 190 ft west of northeast corner

Source Footage: Map

Latitude: 41 55 33.93N

Longitude: 103 55 46.97W

Source Lat/Long: GPS (hand held)

7.5-minute Quad Map Name: Morrill

Ground elevation: 3989.64 ft

Source elev: (i)

Depth to water: 9.95 ft

Date measured: 5/95

Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To

Quaternary System, undifferentiated:

Sand, silty, sand is fine to very coarse.....	0.0	8.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, silty, silt is mostly fine to medium, very light olive-gray to very light brown-gray, essentially noncalcareous; very light olive-gray 15 to 30 ft; slight brown stain along joints 15 to 20 ft.....	8.0	30.0
Mudstone, clayey, very light olive- to green-gray, very slightly bentonitic, noncalcareous, massive..	30.0	35.0

**Test Hole #11AK-94
(23-57-33adaa)
Scotts Bluff County**

Location: NE NE SW NE sec. 33, T. 23 N., R. 57 W., approximately
1400 ft south and 820 ft west of northeast corner
Source Footage: Map
Latitude: 41 55 38.32N
Longitude: 103 55 55.61W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3993.19 ft
Source elev: (i)
Depth to water: 4.72 ft
Date measured: 5/95
Geophysical Log(s): None

<u>Depth, in feet</u>	
From	To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy, sand is very fine to fine, medium dark brown-gray, non-calcareous.....

	0.0	2.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, silty, moderately clayey, light olive-gray, very slightly calcareous 2 to 5 ft, moderately well indurated; very light olive-gray 10 to 20 ft; very slightly calcareous 15 to 25 ft; sample 25 to 30 ft contains a trace of very fine to fine sand and brown clay, possibly lithic grains; contains trace of yellow stain 30 to 35 ft; field log notes drill-rig chatter 32 to 35 ft.

	2.0	35.0
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**Test Hole #11-K-94
(23-57-33aaca)
Scotts Bluff County**

Location: NE SW NE NE sec. 33, T. 23 N., R. 57 W., approximately
850 ft south and 810 ft west of northeast corner
Source Footage: Map
Latitude: 41 55 32.94N
Longitude: 103 55 55.62W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3992.8 ft
Source elev: (t)
Depth to water: Dry, hole collapsed at 12 ft
Date Measured: 5/10/94
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, slightly silty, slightly clayey at surface, sand is fine to coarse with a trace of very coarse sand and fine gravel, light brown-gray with some dark brown-gray.....	0.0	5.0
Sand, fine to medium, a little coarse, much medium sand.....	5.0	10.0
Sand, fine to coarse, a little very coarse sand, much medium to coarse.....	10.0	15.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, silty, very light olive-gray, noncalcar- eous, moderate induration; moderately well indu- rated 20 to 27 ft, slightly more clayey, slightly bentonitic.....	15.0	27.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Clay, mottled, light brown and very light greenish gray, bentonitic, noncalcareous; logged as sticky clay and siltstone 27 to 35 ft, blue-gray.....	27.0	35.0

**Test Hole #12-K-94
(23-57-33abbb)
Scotts Bluff County**

Location: NW NW NW NE sec. 33, T. 23 N., R. 57 W., approximately
230 ft south and 2360 ft west of northeast corner
Source Footage: Map

Latitude: 41 55 44.22N
Longitude: 103 56 16.37W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill

Ground elevation: 3986.24 ft

Source elev: (i)

Depth to water: 7.28 ft

Date measured: 5/95

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, fine to very coarse..... 0.0 14.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, very light olive-gray, noncalcareous,
moderate induration..... 14.0 30.0

Mudstone-claystone, light olive-gray, moderately
well indurated, contains some volcanic ash..... 30.0 35.0

**Test Hole #13-K-94
(23-57-33babb)
Scotts Bluff County**

Location: NW NW NE NW sec. 33, T. 23 N., R. 57 W., approximately
310 ft south and 1500 ft east of northwest corner
Source Footage: Map
Latitude: 41 55 43.43N
Longitude: 103 56 34.74W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 3985.85 ft
Source elev: (i)
Depth to water: 4.70 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey, sandy, and silt, slightly clayey, moderately to very sandy, sand is mostly very fine to fine, medium brown-gray and light medium brown; may have some interbedded clayey sand.....	0.0	8.0
Sand, fine to very coarse, contains a trace of gravel.....	8.0	12.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone, moderately clayey, very light olive-gray, noncalcareous, contains a trace of volcanic ash, moderately well indurated.....	12.0	25.0
Mudstone-claystone, very light olive-gray, non-calcareous, moderately well indurated.....	25.0	35.0

**Test Hole #14-K-94
(23-57-33adcb)
Scotts Bluff County**

Location: NW SW SE NE sec. 33, T. 23 N., R. 57 W., approximately
2100 south and 1120 ft west of northeast corner

Source Footage: Map

Latitude: 41 55 24.76N

Longitude: 103 55 59.14W

Source Lat/Long: GPS (hand held)

7.5-minute Quad Map Name: Morrill

Ground elevation: 4002.92 ft

Source elev: (i)

Depth to water: 8.42 ft

Date measured: 5/95

Geophysical Log(s): None

<u>Depth, in feet</u>	
From	To

Quaternary System, undifferentiated:

Sand, moderately silty, sand is very fine to medium.	0.0	5.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone-mudstone, silt mostly fine to coarse, very light olive-gray with some very light brown mottling or very light brown interbeds, moderate induration, logged as slightly sticky.....	5.0	15.0
Siltstone and mudstone, very light yellowish gray, in part calcareous, moderate induration, logged as slightly sticky.....	15.0	25.0
Mudstone, very light yellowish to olive-gray, very slightly calcareous; very light olive- to green-gray 30 to 35 ft.....	25.0	35.0

**Test Hole #15-K-94
(23-57-33addc)
Scotts Bluff County**

Location: SW SE SE NE sec. 33, T. 23 N., R. 57 W., approximately
2420 ft south and 525 ft west of northeast corner
Source Footage: Map
Latitude: 41 55 23.44N
Longitude: 103 55 51.16W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4008.98 ft
Source elev: (i)
Depth to water: 13.19 ft
Date measured: 5/95
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, slightly sandy, sand is mostly very fine, a little fine sand, medium reddish brown, slightly calcareous, poorly indurated; in part moderately sandy 5 to 10 ft, sand is very fine to medium with rare coarse sand; contains common rounded lithic grains of very light olive-gray and light brown siltstone 10 to 12 ft; interval logged as siltstone in field.....	0.0	12.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone-mudstone, very light yellowish to olive-gray, noncalcareous, moderate induration; very light olive-gray 15 to 20 ft, in part very slightly calcareous.....	12.0	20.0
Mudstone, very light olive-gray, very slightly calcareous, moderately well indurated; slightly calcareous 25 to 30 ft.....	20.0	35.0

**Test Hole #16-K-94
(23-57-33dbbc)
Scotts Bluff County**

Location: SW NW NW SE sec. 33, T. 23 N., R. 57 W., approximately
2220 ft north and 2530 ft west of southeast corner

Source Footage: Map

Latitude: 41 55 15.53N
 Longitude: 103 56 17.89W
 Source Lat/Long: GPS (hand held)
 7.5-minute Quad Map Name: Morrill

Ground elevation: 4009.12 ft

Source elev: (i)

Depth to water: 17.95 ft

Date measured: 5/95

Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, slightly silty, sand is very fine to medium, rare coarse sand, medium brown-gray; mostly very fine to fine sand 5 to 10 ft, moderately silty, light brown-gray; sand is very fine to medium with some coarse sand 10 to 15 ft, contains some very sandy silt interbeds.....	0.0	15.0
Sand, slightly silty, sand is very fine to medium with some coarse to very coarse sand.....	15.0	20.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone-mudstone, fine grained, very light yel- lowish brown, slightly calcareous, moderate indu- ration.....	20.0	35.0
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**Test Hole #17-K-94
(23-57-33cbbc)
Scotts Bluff County**

Location: SW NW NW SW sec. 33, T. 23 N., R. 57 W., approximately
2210 ft north and 125 ft east of southwest corner
Source Footage: Map
Latitude: 41 55 15.38N
Longitude: 103 56 52.31W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4010.6 ft
Source elev: (i)
Depth to water: 8.15 ft
Date measured: 5/95
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, silty, sand is very fine to coarse with some very coarse sand to gravel grains of lithic siltstone.....	0.0	4.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, in part clayey, very pale brown and very light brownish gray, contains volcanic ash, moderately indurated.....	4.0	10.0
Mudstone, claystone, some siltstone, very light brownish gray, light gray and very light olive-gray, in part slightly calcareous, moderately well indurated; contains a little volcanic ash.....	10.0	15.0
Interbedded mudstone, claystone, and some very slightly sandy siltstone, mostly very light gray, some very light brown, slight dark stain on joints, moderately to well indurated.....	15.0	20.0
Claystone, very light gray, brittle, noncalcareous, well indurated; in part very pale brown 20 to 25 ft, sample 20 to 25 ft contains a little siltstone and very fine grained silty sandstone, micaceous..	20.0	30.0
Mudstone and claystone, very light olive-gray with some very light brown, brittle, well indurated, noncalcareous.....	30.0	35.0

**Test Hole #18-K-94
(23-57-33addd)
Scotts Bluff County**

Location: SE SE SE NE sec. 33, T. 27 N., R. 57 W., approximately
2400 ft south and 260 ft west of northeast corner
Source Footage: Map
Latitude: 41 55 22.99N
Longitude: 103 55 47.55W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4011.45 ft
Source elev: (i)
Depth to water: 14.55 ft
Date measured: 5/95
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, very slightly clayey, sand is mostly very fine to fine, rare medium to coarse sand, medium dark brown-gray, noncalcareous.....	0.0	2.0
Silt, slightly to moderately clayey, moderately sandy, sand is mostly very fine to fine, a little medium to coarse sand, light yellow-brown; siltstone logged in field at 5 ft.....	2.0	±13.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Mudstone, very light olive-gray, noncalcareous, a few cuttings appear to be slightly sandy, sand is very fine to medium.....	±13.0	20.0
Mudstone-siltstone, very light olive-gray, in part slightly calcareous; slight to moderate induration 30 to 35 ft, slightly lighter in color.....	20.0	35.0

**Test Hole #19-K-94
(23-57-33dbbc)
Scotts Bluff County**

Location: SW NW NW SE sec. 33, T. 23 N., R. 57 W., approximately
2100 ft north and 2400 ft west of southeast corner
Source Footage: Map
Latitude: 41 55 14.38N
Longitude: 103 56 16.07W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4011.62 ft
Source elev: (i)
Depth to water: 18.47 ft
Date measured: 5/95
Geophysical Log(s): None

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, moderately silty, slightly clayey, sand is very fine to medium, a little coarse, medium dark brown-gray, noncalcareous.....	0.0	5.0
Sand, moderately silty, sand is very fine to fine, light yellow- to brown-gray; slightly silty 10 to 15 ft, contains a little medium sand.....	5.0	15.0
Sand, slightly silty, sand is very fine to fine with a little medium sand, much fine sand, light yellow-brown.....	15.0	19.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Mudstone and siltstone interbedded, siltstone contains rare very fine to medium sand grains, all very light olive-gray, in part very slightly calcareous; mostly a mudstone 20 to 27 ft, not sandy, slightly calcareous.....	19.0	27.0
Siltstone, very light brownish gray, some very light olive-gray, moderate induration.....	27.0	35.0

**Test Hole #20-K-94
(23-57-33cbcc)
Scotts Bluff County**

Location: SW SW NW SW sec. 33, T. 23 N., R. 57 W., approximately
2030 ft north and 45 ft east of southwest corner
Source Footage: Map
Latitude: 41 55 13.82N
Longitude: 103 56 53.41W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4014.05 ft
Source elev: (i)
Depth to water: 8.51 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, fine, field log.....	0.0	2.5
Silt, very slightly clayey, very sandy, sand is very fine to fine with a little medium to coarse, dark brown-gray; some moderately sandy and slightly clayey silt 5 to 12 ft, may have thin sand layer or layers, mostly medium dark brown-gray.....	2.5	12.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, claystone, some very fine sandy siltstone, mostly very light olive-gray, a little very light brown clay, slightly calcareous.....	12.0	20.0
Mudstone, in part slightly sandy, contains very fine to medium sand grains and rare small lithic clay grains, slightly to moderately calcareous.....	20.0	26.0
Claystone and siltstone, very light gray and light gray, in part moderately calcareous, moderately to well indurated; cherty layer logged 26 to 30 ft; drilled slowly.....	26.0	30.0
Claystone, very pale brownish gray, noncalcareous, moderately well indurated, somewhat brittle.....	30.0	35.0

**Test Hole #22-K-94
(23-57-33ddaa)
Scotts Bluff County**

Location: NE NE SE SE sec. 33, T. 23 N., R. 57 W., approximately
1180 ft north and 120 ft west of southeast corner
Source Footage: Map
Latitude: 41 55 05.16N
Longitude: 103 55 45.45W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4030.40 ft
Source elev: (i)
Depth to water: 22.41 ft
Date measured: 5/95
Geophysical Log(s): None

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, some medium; contains some coarser grains about 14 to 15 ft (including lithic light brown siltstone).....	0.0	15.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Orella Member:		
Siltstone, mudstone and some claystone, very light olive- to green-gray with a little light brown, slightly calcareous.....	15.0	20.0
Siltstone and mudstone, very light greenish gray, slightly to moderately calcareous, contains a trace of calcite.....	20.0	25.0
Mudstone, in part very clayey, very light greenish gray, slightly calcareous, slight very light brown mottling or very light brown layers, appears thin bedded, contains a trace of brown stain on joints; logged as slow drilling 15 to 35 ft.....	25.0	35.0

**Test Hole #23-K-94
(23-57-33cddd)
Scotts Bluff County**

Location: SE SE SE SW sec. 33, T. 23 N., R. 57 W., approximately
2460 ft east and 80 ft north of southwest corner
Source Footage: Map
Latitude: 41 54 54.49N
Longitude: 103 56 20.95W
Source Lat/Long: GPS (hand held)
7.5-minute Quad Map Name: Morrill
Ground elevation: 4033.69 ft
Source elev: (i)
Depth to water: 9.61 ft
Date measured: 5/95
Geophysical Log(s): None

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, very fine to fine, some medium; sand is very fine to medium 6 to 10 ft and is fine to coarse with a little very coarse sand 10 to 12 ft.....	0.0	12.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Claystone with a little mudstone and trace of sandy clay, interlayered light brown and very light brownish to olive-gray with some light bluish to greenish gray, the trace of sandy clay has very fine to medium sand, all slightly to moderately calcareous.....	12.0	20.0
Mudstone, very light yellowish to brownish gray, some thin beds of calcareous mudstone, very light gray and a trace of very fine sandy clayey mudstone, all slightly to moderately calcareous.....	20.0	27.0
Mudstone and claystone, very light olive-gray, some thin very calcareous beds and some very light brown noncalcareous layers, all well indurated, logged as hard chert, brittle.....	27.0	30.9
Mudstone and claystone, mostly light olive-gray, very slightly calcareous, brittle, well indurated.	30.9	35.0

**Test Hole #9-E-97
(23N-57W-36bbbb)
Scotts Bluff County**

Location: NW NW NW NW sec. 36, T. 23 N., R. 57 W., approximately 20 ft south and 40 ft east of northwest corner of section
Source Footage: Map

Latitude: 41 55 46.15N
Longitude: 103 53 23.22W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Morrill

Ground elevation: 3979.83 ft
Source elev: GPS (geodetic)

Depth to water: 7.07 ft

Date measured: 7/31/00

Geophysical Log(s): Electric (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, very slightly sandy, sand is mostly embedded fine to medium, rare coarse grains, mostly light yellowish to greenish gray, a little very light brown-gray; slightly calcareous, moderately sandy 10 to 13 ft, sand is fine to coarse, rare gravel grains, light greenish gray.....	0.0	13.0
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Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, in part very slightly sandy, sand is very fine, very light greenish gray, noncalcareous.....	13.0	20.0
Siltstone, moderately to in part very clayey, silt is fine to coarse, very light greenish gray, noncalcareous, contains rare volcanic ash shards, contains rare small quartz crystals.....	20.0	30.0
Siltstone, moderately clayey, silt is mostly fine, very light greenish gray, noncalcareous; contains some interbeds of slightly sandy siltstone 35 to 40 ft, sand is fine, granular structure.....	30.0	40.0
Siltstone, moderately clayey, silt is fine, very light greenish gray, slightly calcareous, massive to slightly granular structure; contains rare volcanic ash shards 40 to 45 ft; more granularity 45 to 70 ft, very slightly to noncalcareous; slightly calcareous, slightly lighter in color 65 to 70 ft; slightly more clay, massive 80 to 100 ft, very slightly to noncalcareous.....	40.0	100.0

**Test Hole #7-E-97
(23N-58W-2aabb)
Scotts Bluff County**

Location: NW NW NE NE sec. 2, T. 23 N., R. 58 W., approximately 50 ft south and 1300 ft west of northeast corner of section
 Source Footage: Map
 Latitude: 42 00 05.64N
 Longitude: 104 00 47.16W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Torrington SE
Ground elevation: 4126.70 ft
 Source elev: GPS (geodetic)
Depth to water: 31.15 ft
 Date measured: 6/29/99
Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, slightly to in part moderately sandy, sand is very fine to fine, a little medium, dark brown-gray, contains small limy nodules or lithic limy grains, silt essentially noncalcareous, contains a trace of charcoal.....	0.0	5.0
Silt, in part moderately clayey, in part slightly clayey and very sandy, sand is mostly very fine to fine with scattered medium to very coarse sand, medium yellow-brown, noncalcareous.....	5.0	9.0
Sand, fine to medium, some coarse to very coarse....	9.0	10.0
Sand and gravel, clayey, calcareous, somewhat consolidated.....	10.0	11.0
Sand and small gravel logged 11 to 15 ft.....	11.0	15.0
Mixed sample, some sand and gravel, considerable silty clay, some slightly gravelly, some with embedded sand and gravel, light yellow-brown, noncalcareous, contains a trace of secondary lime.	15.0	20.0
Sand, a little gravel, gravel is mostly fine, quartz and feldspar with a few metamorphic and dark gray mafic grains, approximately 10 to 15 percent gravel.....	20.0	30.0
Sand and gravel, gravel is fine to coarse, approximately 50 percent gravel, some clasts of brown clay logged 35 to 38 ft.....	30.0	38.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, very light yellowish gray, slightly calcareous.....	38.0	45.0
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Siltstone, slightly clayey, very slightly sandy, sand is very fine, very light yellowish to brownish gray, very slightly calcareous, contains a little volcanic ash, logged as soft 40 to 45 ft.....	45.0	50.0
Siltstone and mudstone interbedded, very light brown, very slightly calcareous.....	50.0	55.0
Siltstone, very slightly clayey, very light brown, very slightly calcareous, granular structure; very light yellowish to brownish gray 60 to 70 ft; less granularity 65 to 80 ft; slightly finer grained siltstone 75 to 80 ft.....	55.0	80.0
Mudstone-siltstone, very light brown, essentially noncalcareous.....	80.0	85.0
Siltstone, slightly clayey, fine grained, very light yellowish to brownish gray, noncalcareous, slight granular structure; fine to coarse grained 90 to 100 ft.....	85.0	100.0

**Test Hole #6-F-97
(23N-58W-3bbaa)
Scotts Bluff County**

Location: NE NE NW NW sec. 3, T. 23 N., R. 48 W., approximately 150 ft south and 1050 ft east of northwest corner of section
Source Footage: Map

Latitude: 42 00 04.07N
Longitude: 104 02 36.98W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Torrington SE

Ground elevation: 4083.0 ft
Source elev: GPS (geodetic)

Depth to water: 24.69 ft
Date measured: 6/30/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, fine to very coarse, contains scattered gravel and pebbles; poor recovery 5 to 15 ft.....	0.0	15.0
Sand, some gravel, gravel is mostly fine to medium, contains common lithic siltstone and sandstone grains, approximately 20 to 25 percent gravel; some pebbles logged 25 to 27 ft; poor recovery 20 to 25 ft.....	15.0	27.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, moderately clayey, silt is mostly fine, very pale brown, slightly calcareous; contains a little volcanic ash; silt is fine to very coarse with a little very fine sand 35 to 40 ft; logged as intermittent firm and soft siltstone with some clay.....	27.0	40.0
Mudstone-siltstone; light yellow-gray with some mottled very light brown, slightly calcareous, contains a little volcanic ash.....	40.0	50.0
Mudstone, clayey, slightly silty, very light brown, slightly to moderately calcareous.....	50.0	60.0
Mudstone-claystone, pale brown; slightly to moderately calcareous; moderately calcareous 65 to 80 ft, contains some very light yellowish to greenish gray layers or mottling 70 to 80 ft.....	60.0	80.0

Test Hole #6-H-97
(23N-58W-9addd)
Scotts Bluff County

Location: SE SE SE NE sec. 9, T. 23 N., R. 58 W., approximately
 2600 ft south and 50 ft west of northeast corner of
 section

Source Footage: Map

Latitude: 41 58 48.24N

Longitude: 104 02 48.32W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lyman

Ground elevation: 4030.49 ft

Source elev: GPS (geodetic)

Depth to water: 9.98 ft

Date measured: 6/13/00

Geophysical Log(s): Electric log (R), Gamma, Caliper (to 190 ft)

Depth, in feet
 From To

Quaternary System, undifferentiated:

Silt, slightly to in part moderately clayey, very sandy, sand is very fine to fine, medium dark brown-gray, slight iron stain, in part slightly calcareous, grades to silty sand, very light gray, sand is very fine to fine.....	0.0	7.0
Sand and gravel, gravel is fine to coarse, a few pebbles, contains a few lithic grains of fine-grained sandstone and iron-cemented grains.....	7.0	14.0
Sand, a little gravel, gravel is mostly fine with a trace of medium to coarse gravel and pebbles, much quartz and feldspar, rare dark gray mafic grains, much very coarse sand, approximately 10 to 15 percent gravel, contains a few lithic siltstone, claystone and ironstone-sandstone grains.....	14.0	65.0
Sand, some gravel, gravel is mostly fine to medium, much very coarse sand, approximately 20 to 25 percent gravel; approximately 15 to 20 percent gravel 90 to 110 ft; siltstone lenses or cobble logged in interval 85 to 90 ft; some pebbles logged 100 to 110 ft.....	65.0	110.0
Sand, a little gravel, much very coarse sand with scattered coarse gravel and pebbles; approximately 10 to 20 percent gravel; silt and clay lenses or balls logged from 125 to 155 ft; 20 to 25 percent gravel 145 to 186 ft; some coarse gravel and pebbles 175 to 186 ft; very rough drilling 185 to 186 ft, many broken grains.....	110.0	186.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Sandstone, silt with sandy micaceous silt, sand is very fine to fine, contains some thin sandy and silty clay layers, mostly dark gray with a little yellow-brown, some light medium gray, noncalcareous; sand is mostly very fine 200 to 205 ft; logged as silty clay 186 to 205 ft..... 186.0 205.0

**Test Hole #7-G-97
(23N-58W-12cdbc)
Scotts Bluff County**

Location: SW NW SE SW Sec. 12, T. 23 N., R. 58 W., approximately 900 ft north and 1350 ft east of southwest corner of section

Source Footage: Map

Latitude: 41 58 30.49N

Longitude: 104 00 10.13W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lyman

Ground elevation: 4099.15 ft

Source elev: GPS (geodetic)

Depth to water: 17.76 ft

Date measured: 6/30/99

Geophysical Log(s): Electric log (R), Gamma, Caliper

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, slightly clayey, very silty, sand is mostly very fine to fine, dark gray and silty sand, medium dark brown-gray, sand is mostly very fine to fine with some coarser grains.....	0.0	5.0
Sand, slightly to moderately clayey, silty, sand is very fine to fine, some medium, scattered coarser grains, very light brown-gray to very light gray, moderately calcareous.....	5.0	11.0
Sand, some gravel, gravel is mostly fine, much very coarse sand, silt and clay coating on some grains, some dark mineral or organic stain, approximately 30 percent very coarse sand to fine gravel.....	11.0	22.0

Tertiary System - Oligocene Series - White River Group:

Brule Formation:

Orella Member:

Siltstone, slightly clayey, silt is mostly fine, very light brown, contains a little volcanic ash, noncalcareous, logged as sticky and firm.....	22.0	35.0
Siltstone-mudstone, slightly sandy, sand is mostly embedded very fine to medium, sample contains a little sandy claystone, very light brown, noncalcareous, may contain scattered coarse sand grains.....	35.0	47.0
Sand, clayey to clay, sandy, sand is mostly fine, a little medium to coarse sand, dark speckled, sample contains some reddish-brown silty clay, possibly lithic grains; dense hard sandstone 52 to 53 ft, dark speckled, noncalcareous.....	47.0	55.0

Sample mostly lag, logged as soft sand, sample contains a little silty very fine to fine sand and poorly indurated very fine to fine speckled sandstone, probably representative of interval, common amphibole and biotite mica.....	55.0	60.0
Sandstone, silty, clayey, sand is mostly very fine to fine, very light yellow-gray and siltstone-claystone, slightly micaceous, very light yellow-gray.....	60.0	65.0
Siltstone, in part clayey, slightly to in part moderately sandy, sand is mostly very fine, micaceous, very light yellowish to brownish gray, logged as firm and soft sticky siltstone; slightly finer grained 70 to 75 ft; a little thin bedded claystone 75 to 80 ft and a coarse siltstone to fine grained sandstone layer 78 to 80 ft, dark speckled, logged as clayey, soft and sticky 81 to 83 ft.....	65.0	83.0
Sand to sandstone, probably slightly silty or clayey, grain size questionable, probably very fine to medium with some coarse to very coarse sand, logged as small to medium gravel, very little fine to medium sand in sample, sample contains some coarse to very coarse sand and a trace of fine gravel, considerable quartz, some dark mafic grains and a few pink grains, mostly sub-angular to subrounded, contains a few lithic grains, electric log confirms sand 83 to 94.5 ft..	83.0	94.5
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Claystone, very light brown, noncalcareous.....	94.5	100.0
Claystone-siltstone, in part very slightly sandy, sand is mostly embedded very fine to medium, very light brown and very light yellow-gray, noncalcareous, logged as <i>soft sticky clay</i>	100.0	105.0
Mudstone-claystone, mottled very light brown and very light yellow-gray, noncalcareous, bentonitic.	105.0	110.0
Claystone, mottled very light yellow-gray and very light brown, noncalcareous, bentonitic.....	110.0	120.0

**Test Hole #7-F-97
(23N-58W-13CCCC)
Scotts Bluff County**

Location: SW SW SW SW sec. 13, T. 23 N., R. 58 W., approximately 10 ft north and 20 ft east of southwest corner of section
 Source Footage: Map
 Latitude: 41 57 29.45N
 Longitude: 104 00 25.50W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Lyman
Ground elevation: 4011.92 ft
 Source elev: GPS (geodetic)
Depth to water: 7.81 ft
 Date measured: 6/13/00
Geophysical Log(s): Electric log (R), Gamma

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Brown silty sand, top soil.....	0.0	1.0
Sand, fine to coarse, a little very coarse.....	1.0	10.0
Sand and gravel, gravel is fine to medium, some coarse, approximately 60 percent gravel, common dark silicates.....	10.0	20.0
Sand, a little gravel, sand is fine to very coarse, gravel is fine, much coarse to very coarse sand, approximately 10 to 15 percent gravel, much quartz.....	20.0	50.0
Sand and gravel, gravel is mostly fine to medium, approximately 30 to 40 percent gravel, quartz, a few dark silicates and metamorphic grains.....	50.0	60.0
Sand, a little gravel, gravel is mostly fine to medium, approximately 25 percent gravel, much quartz; approximately 15 percent gravel 75 to 95 ft; approximately 25 percent gravel 95 to 100 ft; approximately 15 percent gravel 100 to 140 ft; approximately 20 to 25 percent gravel 140 to 168 ft.....	60.0	168.0
Sand and gravel, gravel is fine to coarse, some pebbles, quartz, metamorphic and lithic grains, a few dark silicates, some broken grains.....	168.0	191.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Transition zone, Pierre Formation:		
Sandstone, silty, sand is mostly very fine to fine, dark gray, little well indurated sandstone, poor samples.....	191.0	200.0

Sandstone, silty, sand is very fine to fine, rare medium sand and silt, sandy, sand is mostly very fine, micaceous, sandstone is in part well indurated, dark gray, a little limonitic yellow-brown stain 205 to 215 ft; field log notes drilling fluid turned gray 200 to 215 ft, possibly indicating silts and clays not seen in samples. Poor sample recovery noted 200 to 215 ft, interval drilled with pull down at 191 ft and 195 to 215 ft.....

200.0 215.0

Test Hole #6-G-97
(23N-58W-15dcbc)
Scotts Bluff County

Location: CWL NW SW SE sec. 15, T. 23 N., R. 58 W., approximately 1000 ft north and 2550 ft west of southeast corner of section

Source Footage: Map

Latitude: 41 57 39.60N

Longitude: 104 02 10.07W

Source Lat/Long: GPS (geodetic)

7.5-minute Quad Map Name: Lyman

Ground elevation: 4018.40 ft

Source elev: GPS (geodetic)

Depth to water: 5.21 ft

Date measured: 6/13/00

Geophysical Log(s): Electric log (R), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand and gravel, gravel is fine to coarse, quartz, feldspar and dark mafic grains, approximately 50 to 60 percent gravel.....	0.0	15.0
Sand and gravel, gravel is mostly fine to medium, quartz, feldspars, a few dark mafic grains and rare lithic limy claystone, approximately 40 to 50 percent gravel.....	15.0	30.0
Sand, some gravel, gravel is mostly fine, contains some lithic claystone and fine grained sandstone grains, approximately 25 to 30 percent gravel; contains pebbles 35 to 40 ft.....	30.0	40.0
Sand, a little gravel, gravel is mostly fine, a little medium to coarse gravel and rare pebbles, approximately 20 percent gravel, much very coarse sand; approximately 25 to 30 percent gravel 85 to 90 ft.....	40.0	90.0
Sand, a little gravel, much fine to very coarse sand, gravel is mostly fine, much quartz, approximately 10 to 15 percent gravel; contains rare siltstone, sandstone and ironstone grains.....	90.0	125.0
Sand, some gravel, gravel is mostly fine, consists of quartz, feldspar, metamorphic and dark mafic grains, contains rare lithic siltstone, limestone, and ironstone grains, approximately 20 to 30 percent gravel.....	125.0	140.0
Sand, a little gravel, rare pebbles, approximately 15 percent gravel.....	140.0	165.0
Sand and gravel, gravel is fine to coarse, some pebbles, approximately 60 percent gravel; rough drilling, many broken grains in lower part.....	165.0	182.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Siltstone-sandstone, slightly clayey, micaceous, sand is very fine to fine with a trace of medium sand interbedded with clay, dark gray.....	182.0	195.0
Siltstone to sandstone, sand is mostly very fine, a little clay, dark gray.....	195.0	210.0

Note: interval 182 to 210 ft logged as clay,
Drilled slow, used pull down.

**Test Hole #6-M-97
(23N-58W-34bcbc)
Scotts Bluff County**

Location: SW NW SW NW sec. 34, T. 23 N., R. 58 W., approximately 1850 ft south and 100 ft east of northwest corner of section

Source Footage: Map

Latitude: 41 55 27.17N
 Longitude: 104 02 40.26W
 Source Lat/Long: GPS (geodetic)
 7.5-minute Quad Map Name: Lyman

Ground elevation: 4052.07 ft

Source elev: GPS (geodetic)

Depth to water: 14.52 ft

Date measured: 6/14/00

Geophysical Log(s): Electric log (Rand SP), Gamma

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, moderately clayey, moderately sandy, sand is mostly very fine to fine, some coarser grains, rare gravel grains, dark brown-gray, slightly calcareous, a little very light gray clayey to sandy silt.....	0.0	3.0
Silt, slightly clayey, moderately sandy, silt is coarse, sand is very fine, light yellowish to brownish gray, slightly to moderately calcareous; in part very sandy 10 to 14 ft, sand is very fine with some coarser grains.....	3.0	14.0
Sand, some gravel, slightly silty and clayey, mostly quartz and feldspar grains, contains a trace of lithic grains including ironstone, approximately 30 percent gravel; contains less silt and clay 20 to 25 ft.....	14.0	25.0
Sand and gravel, gravel is fine to coarse, mostly quartz and feldspar grains, contains a few lithic grains of very light gray to yellow-gray sandstone, approximately 50 to 60 percent gravel.....	25.0	70.0
Sand, some gravel, gravel is mostly fine, common clasts of siltstone, fine grained sandstone, claystone and limy grains, approximately 30 percent gravel; 10 to 20 percent of grains are lithic clasts 70 to 85 ft; pebble or boulder of siltstone 78 to 80 ft.....	70.0	85.0
Sand and gravel, gravel is fine to coarse, considerable sand, common lithic grains, approximately 30 to 40 percent gravel and pebbles.....	85.0	112.0

Cretaceous System - Upper Cretaceous Series - Montana Group:

Pierre Formation:

Transition zone, Pierre Formation:

Siltstone-sandstone, sand is mostly very fine, light yellow-gray and light brownish gray, sample is poor; contains a trace of medium dark-gray micaceous siltstone in sample 115 to 120 ft, fresh gray siltstone logged 117 to 120 ft.....	112.0	120.0
Siltstone-sandstone, some clay, micaceous, sand is mostly very fine, dark gray, appears thin bedded, contains a little indurated calcareous siltstone (possible nodules), logged as black, soft shale 122 to 125 ft; considerable thin-bedded silty clay 125 to 135 ft, may contain some silty-fine grained sandstone layers, logged as soft, sticky shale 125 to 140 ft, drilled slow....	120.0	140.0

**Test Hole #7-H-97
(23N-58W-35aabb)
Scotts Bluff County**

Location: NW NW NE NE sec. 35, T. 23 N., R. 58 W., approximately
250 ft south and 1330 ft west of northeast corner section
Source Footage: Map
Latitude: 41 55 43.23N
Longitude: 104 00 39.94W
Source Lat/Long: GPS (geodetic)
7.5-minute Quad Map Name: Lyman
Ground elevation: 4031.58 ft
Source elev: GPS (geodetic)
Depth to water: 15.57 ft 32.5 ft E-log
Date measured: 6/14/00 9/17/97
Geophysical Log(s): Electric log (R), Gamma, Caliper

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately clayey and slightly sandy and silt, slightly clayey and moderately sandy, sand is mostly very fine to fine; light brown-gray with a little medium dark brown-gray, noncalcareous.....	0.0	8.0
Sand and gravel, gravel is mostly fine to medium, quartz with pink and some dark silicates, approximately 90 percent gravel.....	8.0	15.0
Sand, fine to very coarse, a little fine gravel, much coarse to very coarse sand, approximately 10 percent gravel, quartz with pink and dark colored silicates, rare lithic siltstone and claystone grains.....	15.0	30.0
Sand and gravel, gravel is fine to coarse, heterogeneous, a few lithic grains of siltstone, sandstone and claystone, approximately 50 to 60 percent gravel; approximately 40 percent gravel 40 to 48 ft.....	30.0	48.0
Tertiary System - Eocene Series - White River Group:		
Chadron Formation:		
Claystone, mottled very light brown and very light olive- to yellow-gray, noncalcareous, bentonitic, brittle; much very light olive-gray 55 to 60 ft, some secondary lime, contains rare very fine to fine sand grains and a trace of quartz crystals.....	48.0	60.0
Clay, light brown and clayey siltstone-sandstone, reddish brown, sand is mostly very fine, some of the clay is slightly sandy, sand is very fine to medium.....	60.0	65.0

Interbedded clayey sandstone, very light olive-gray (sand is very fine to medium), clayey sandstone-siltstone, light reddish brown and clay, pink and yellow-brown.....	65.0	70.0
Interbedded clayey sandstone and sandy clay, sand is mostly very fine to fine, a little medium, colors range from very light olive- to green-gray and light reddish brown to bright yellow-brown, all noncalcareous.....	70.0	78.0
Sandstone, clayey, sand is mostly very fine to fine, a little medium, light greenish gray; some very sandy clay, sand is mostly very fine.....	78.0	85.0
Sandstone-siltstone, very slightly clayey, sand is mostly very fine to fine, light greenish gray, contains rare coarse sand grains; contains a little yellow-brown clay 90 to 95 ft; contains a trace of lithic yellow-brown clay grains 95 to 100 ft.....	85.0	100.0