Information Pamphlet IP-43

SAND AND GRAVEL RESOURCES IN LINCOLN COUNTY, SOUTH DAKOTA

by

Layne D. Schulz
and
Martin J. Jarrett

Prepared in cooperation with the United States Geological Survey, South Dakota Department of Transportation, and Lincoln County

Science Center
University of South Dakota
Vermillion, South Dakota

1991
CONTENTS

INTRODUCTION ............................................. 1
GEOLOGIC OVERVIEW ..................................... 1
  Till .................................................. 1
  Glacial outwash .................................... 1
  Alluvium .......................................... 2
  Terrace deposits .................................. 2
  Bedrock .......................................... 2
EXPLANATION OF APPENDICES ............................ 2
EXPLANATION OF THE ILLUSTRATION .................. 3
  Sand and gravel ................................... 3
ECONOMIC CONSIDERATIONS ............................. 6
REFERENCES CITED ...................................... 6

APPENDICES
A. List of test holes in Lincoln County, South Dakota, which encountered sand or gravel within 25 feet of the land surface ............................................. 7
B. List of land tracts in Lincoln County, South Dakota, which are on file with either the South Dakota Department of Transportation, or the Office of Minerals and Mining, Department of Environment and Natural Resources, located in Pierre, South Dakota ............................................. 39

ILLUSTRATION
Plate (Plate is in pocket)

I. Location of test holes, sand and gravel pits, numbered land tracts, and sand and gravel deposits in Lincoln County, SD
INTRODUCTION

This pamphlet is the first in a series of reports on the geology and hydrology of Lincoln County, South Dakota. It is designed to aid in the exploration for sources of sand and gravel. The quality of the material was not analyzed. This would require prior knowledge of the material specifications for each intended use, and more extensive sampling.

Other reports in this series include:


Report (a) describes the yield, quality, and location of major aquifers (water-bearing deposits) in a short pamphlet. Report (b) is a more technical and more exhaustive investigation of the water resources of the counties. Report (c) is a scientific investigation of the geology of Lincoln and Union Counties.

GEOLOGIC OVERVIEW

Most of the sand and gravel deposits found in Lincoln County were deposited by glacial ice or meltwater thousands of years ago. Other deposits have resulted from stream deposition since the retreat of the glaciers, and some smaller deposits in the southeastern and south-central part of the county are believed to be of preglacial origin. A short description of geologic terms used in this text follows.

Till

The glaciers were large masses of ice that carried with them debris that was picked up earlier in their routes. Some of this debris, a mixture of clay, silt, sand, gravel, and boulders was deposited directly from the ice and not subjected to the action of running water. Till, the term used to describe this mixture, is locally called "blue clay" or "boulder clay." The majority of Lincoln County is covered by till which is made up primarily of clay and is not considered a source of sand and gravel. However, small isolated sand and gravel hills or lenses may occur within till deposits.

Glacial Outwash

Glacial outwash is the term used to describe any deposit of glacial debris that has been washed
and sorted by flowing glacial meltwater. The material type and grain size of these deposits depends on the velocity of the water that sorted them. Deposits left by slow-flowing streams are made up primarily of silts and clays. Very fast flowing streams may have left stream beds composed entirely of boulders. Most glacial outwash is made up of an assortment of sand and gravel, with minor amounts of silts, clays, and boulders.

Alluvium

Alluvium consists of a mixture of clay, silt, sand, and gravel that has been deposited by present-day streams since the retreat of the glaciers. The grain size of the material deposited is dependent on the same factors that govern the grain size in glacial-outwash deposits and may vary from place to place within the stream valley. Where these deposits consist primarily of sand and gravel, they may be mined as a coarse-aggregate source.

Terrace Deposits

Terrace deposits are flat-topped alluvial or outwash deposits that are remnants of former flood plains. The streams which originally deposited the material have since cut their channels deeper and developed new flood plains at lower levels. Much of the sand and gravel in Lincoln County occurs in this type of deposit.

Bedrock

Bedrock is the older, consolidated rock underlying the glacial deposits. In Lincoln County the bedrock deposits that crop out are sedimentary in origin and consist of the Carlile Shale and the Niobrara Formation. Both are unsuitable as a source of coarse aggregate. Generally, when bedrock units are found at or near the ground surface, no sand or gravel exists below that point.

EXPLANATION OF APPENDICES

Appendix A is a compilation of test holes which encountered sand or gravel in the upper 25 feet. This appendix lists: (a) location of the test hole, (b) depth, and (c) description of sand and gravel intervals. The complete set of drill logs is on file at the office of the South Dakota Geological Survey in Vermillion. The South Dakota Geological Survey, U.S. Geological Survey, South Dakota Division of Water Rights, U.S. Bureau of Reclamation, and private drillers contributed to this list.

Appendix B is a compilation of land tracts that have been tested for sand and gravel by the Department of Transportation or have been bonded with the intent to mine sand and gravel at the Office of Minerals and Mining, Department of Environment and Natural Resources. Both of these departments are located in Pierre, South Dakota. The owner, material type, and where possible, thickness of overburden and aggregate being mined, have been included. The actual thickness of a
deposit may be greater than that mined, because of the depth to the water table, changing material characteristics, or availability of mining equipment that may limit excavation.

EXPLANATION OF THE ILLUSTRATION

Plate 1 at the end of this report shows the location of test holes and sand and gravel pits plus numbered land tracts, as listed in appendix B. It also shows towns, major highways, major lakes, rivers, and creeks.

Test holes are represented by three different symbols. A closed circle (●) represents a location in which sand or gravel was encountered in the upper 25 feet with overburden of 5 feet or less. A square (□) indicates a location at which sand or gravel was encountered in the upper 25 feet, but the overburden exceeds 5 feet. Numbers accompanying these two symbols refer to appendix A, which contains the pertinent information from the test-hole logs. An unfilled circle (○) indicates a location where no sand or gravel was encountered in the upper 25 feet. These are not numbered as they are not listed in the appendices.

Gravel pits are designated by a crossed pick and shovel ( ✔). Land tracts listed in appendix B are designated by (xxxx) and are numbered. Additional information is on file at the Department of Transportation and the Office of Surface Mining, Department of Environment and Natural Resources, both located at Pierre, South Dakota. No attempt has been made to differentiate the active pits from inactive pits.

To further illustrate the areas of highest probability for locating sand and gravel, the map has been divided into three area types indicating a "good," "fair," or "poor" probability of locating sand and gravel. These areas have been delineated by the use of test drilling, sand and gravel pit locations, soil-survey information, topographic maps, aerial-photo interpretation, and field observations. Areas with "good" and "fair" probability of finding sand and gravel have been assigned a letter on the map and are described in the following section.

Sand and gravel deposits in areas labeled as "good" are generally thick, with thin overburden, and cover a broad area. Areas designated as "fair" are comparatively thin, have more overburden, or are laterally discontinuous. Some sand and gravel occurs in the area labeled as "poor" as indicated by the test-hole data and numbered land tracts on the map. Although some of these deposits may be productive, they are generally limited and difficult to locate.

Sand and Gravel

Area A consists of large deposits of sand and gravel located in the flood plain and terraces along the Big Sioux River that forms the boundary between South Dakota and Iowa. Although the terraces are found on both sides of the border, only the deposits in South Dakota are discussed here.

The terrace deposits flank the river's flood plain from just south of the Minnehaha County line into Union County. The total surface area of sand and gravel mapped in area A covers approximately
21 square miles. The area along the Big Sioux River has been subdivided into five different units, (A1 through A5) and are described below.

A1 (designated good): Deposits in this area are a mixture of sand, gravel, and boulders of glacial origin, with a cover of silty alluvium. The average overburden thickness is 5 feet in the test-hole data, but variable throughout. Thicknesses of sand and gravel in excess of 30 feet are common. Shallow water table conditions may limit excavation depth, but do not appear to inhibit pit development which extends south into Union County as described by Jarrett (1988).

A2 (designated good): Deposits in this area are similar to those in A1 and contain outwash deposits of sand, gravel, and boulders with a veneer of alluvium covering them. Underlying these glacial deposits a gravel composed of mainly green quartz and plagioclase feldspar was encountered suggesting a nonglacial source for the material (Green, 1983). An average overburden thickness of 7 feet was calculated from test-hole data and was variable. Thickness of sand and gravel exceeding 30 feet are common in this area. In the area just south of Fairview, A2 may be split into an upper terrace and lower terrace. Water-table levels are generally lower in the upper terrace compared to those in the lower terrace due to the difference in elevation (Green, 1983). Pit development occurs mainly in the lower terrace area.

A3 (designated good): Here the deposits of sand and gravel are again from a glacial source giving a diversity in material type and grain sizes. This area encompasses approximately 10 square miles, making it the largest of the five subdivisions in letter A. The average overburden of silty alluvium is 6 feet over the entire area, but varies locally. Calculated thicknesses of sand and gravel reached in excess of 40 feet, but here again the shallow water table conditions may limit excavation depth. There are 14 numbered land tracts located in A3, and many are being actively mined.

A4 (designated good): Although small in area, only about 1 square mile, this area has high probability for locating sand and gravel. In the test-hole data the average overburden is 2 feet of alluvium and thicknesses of the deposits may exceed 20 feet. This glacial-outwash material has a water table below 20 feet, but may fluctuate with wet and dry year cycles.

A5 (designated fair): In this area deposits of sand and gravel cannot be described accurately. In the single test hole drilled, 1 foot of overburden followed by 23 feet of brown sand was encountered. Numbered land tracts are shown which could indicate economic sand and gravel deposits, but the lack of test-hole data makes an accurate description difficult.

Area B (designated fair): This area contains discontinuous sand deposits with minor amounts of gravel found as isolated terrace and valley-floor deposits along Pattee Creek. The sand is a fine- to medium-grained mixture of reworked nonglacial sand and glacial outwash with an average overburden of 11 feet. Thicknesses are generally thin and are quite variable.

Area C (designated fair): Here, valley-floor deposits of fine to coarse sand are located in the valleys of two unnamed creeks. The sand is discontinuous and has a thick average overburden of 12 feet. The entire thickness of the deposit is saturated and is as much as 48 feet thick in test hole 16.

Area D (designated fair): The sand and fine gravel found in this area appear to be valley-floor
remnants of a preglacial sand along East Brule Creek. The deposit extends south into Union County toward the Alester area. The deposits are covered by more than 15 feet of overburden and are saturated through the entire thickness.

Area E (designated fair): Deposits here are widespread and contain a mixture of glacial outwash and reworked preglacial sands. The average overburden thickness is 11 feet, but varies locally. Extending south into Union County the glacial outwash overlying the preglacial sands has been developed and reaches thicknesses of up to 20 feet (Jarrett, 1989).

Area F (designated fair): This deposit represents a small portion of a valley-train deposit along the valley of the Vermillion River. The majority of the test-hole data shows overburden thickness greater than 5 feet with an average of 9 feet. The bulk of the deposit in area F contains fine to medium grained glacial sand with some deposits of gravel. High water-table conditions may inhibit economic development of this area.

Area G (designated good): Sand and gravel deposits in area G come in the form of glacial-outwash terraces and valley-floor outwash along Long Creek. The combined surface area mapped in area G is approximately 6 square miles, making it the second largest area of deposition for sand and gravel in Lincoln County. Overburden thicknesses are generally low and average just over 4 feet. Calculated thicknesses of sand and gravel average 20 feet with local thicknesses of over 40 feet common in the test-hole data. Deposits contain a mixture of sand, gravel, and boulders with a diversity of material type and grain sizes. Although the area has already been heavily developed, the potential for economic sand and gravel resources still exists in this area.

Area H (designated fair): This area contains a fine to medium, preglacial sand that crops out near Newton Hills State Park. No test-hole data exist within the boundary lines, but the sand may in part be a result ofolian deposition (Hammond, R.H., South Dakota Geological Survey, personal communication, 1988).

Area I (designated fair): Sand and gravel deposits of terrace outwash and valley-floor outwash occur in this area along South Fork Beaver Creek. Average overburden thickness is 10 feet, but again varies locally. The terrace deposits are discontinuous bodies of glacial sand and gravel, while the valley-floor deposits may be preglacial fine to medium sands. Pits have been developed throughout the entire area and numbered land tracts are clustered in the most eastern part of area I.

Area J (designated fair): This area is similar to area I and contains widespread terrace-outwash and valley-floor deposits along Beaver Creek. The terrace deposits have a general overburden of less than 5 feet, while the valley-floor deposits have an overburden in excess of 5 feet with an overall average of 14 feet. Thicknesses of the sands and gravels are quite variable and range to over 40 feet.

The remainder of Lincoln County has been mapped as "poor," although isolated areas of sand and gravel deposits occur. One such example is located in an area 5 miles north of the city of Lennox where test-hole data show small hills and knobs of sand and gravel. Due to the random occurrence of such features, exploratory efforts that will yield high probabilities of finding sand and gravel should be concentrated in areas designated as "good" and "fair."

5
ECONOMIC CONSIDERATIONS

It should be emphasized that this study is quite general and should be used only as a guide to further exploration and development of the sand and gravel resources in Lincoln County. The development of a specific site will depend upon material specifications for the desired use, development costs, transportation costs, and future markets.

REFERENCES CITED


APPENDIX A. List of test holes in Lincoln County, South Dakota, which encountered sand or gravel within 25 feet of the land surface.

Lithologic descriptions, as listed, have been condensed from data contained in logs on file at the South Dakota Geological Survey, Vermillion, South Dakota, and contain only information which has been deemed most useful for this study. Numerical values indicate depth in feet below land surface.

TEST HOLE NUMBER: 1
LEGAL LOCATION: SW SW SW SW sec. 19, T. 096 N., R. 47 W.
0 - 7 Gravel, very coarse; boulders

TEST HOLE NUMBER: 2
LEGAL LOCATION: SW SW SW SW sec. 03, T. 096 N., R. 48 W.
22 - 25 Sand, fine to medium
27 - 38 Sand, fine to coarse

TEST HOLE NUMBER: 3
LEGAL LOCATION: NE NW NW NE sec. 04, T. 096 N., R. 48 W.
3 - 10 Sand, medium

TEST HOLE NUMBER: 4
LEGAL LOCATION: NW NE NW NW sec. 15, T. 096 N., R. 48 W.
6 - 27 Sand, gray to black, gravelly

TEST HOLE NUMBER: 5
LEGAL LOCATION: SW SW SW SE sec. 15, T. 096 N., R. 48 W.
12 - 31 Sand, light-brown, fine to medium, silty; moist to saturated, oxidized

TEST HOLE NUMBER: 6
LEGAL LOCATION: SE SE SE SE sec. 15, T. 096 N., R. 48 W.
10 - 14 Sand, dark-brown, fine to medium, clayey, oxidized, moist

TEST HOLE NUMBER: 7
LEGAL LOCATION: NW NW NW NW sec. 16, T. 096 N., R. 48 W.
17 - 19 Sand, medium; with clay layers

TEST HOLE NUMBER: 8
LEGAL LOCATION: SW SW SW sec. 22, T. 096 N., R. 48 W.
LEGAL LOCATION: NW NW NW NW sec. 22, T. 096 N., R. 48 W.

22 - 25 Gravel, coarse, sandy, angular
31 - 42 Gravel, coarse, sandy, angular

TEST HOLE NUMBER: 9
LOCATION: 096N-48W-23AAAA
LEGAL LOCATION: NE NE NE NE sec. 23, T. 096 N., R. 48 W.

2 - 38 Sand and gravel, medium to coarse, very coarse from 16 feet down

TEST HOLE NUMBER: 10
LOCATION: 096N-48W-23CDDD
LEGAL LOCATION: SE SE SE SW sec. 23, T. 096 N., R. 48 W.

15 - 20 Sand, with clay
20 - 38 Sand and gravel, medium to coarse

TEST HOLE NUMBER: 11
LOCATION: 096N-48W-24BAAA
LEGAL LOCATION: NE NE NE NW sec. 24, T. 096 N., R. 48 W.

2 - 36 Sand and gravel, medium to coarse, very coarse from 20 feet down

TEST HOLE NUMBER: 12
LOCATION: 096N-48W-24CADA
LEGAL LOCATION: NE SE NE SW sec. 24, T. 096 N., R. 48 W.

0 - 2 Gravel, reddish-brown, clayey, sandy; oxidized, dry
2 - 8 Sand, reddish-brown, clayey; oxidized, dry
8 - 13 Gravel, reddish-brown, cobble size; sandy; oxidized, moist; clean
13 - 26 Sand, reddish-brown, gravelly; oxidized, moist; clean
26 - 45 Sand and gravel, reddish-brown; oxidized, saturated; clean

TEST HOLE NUMBER: 13
LOCATION: 096N-48W-25BAAA
LEGAL LOCATION: NE NE NW NW sec. 25, T. 096 N., R. 48 W.

7 - 54 Gravel, coarse; this interval sampled

TEST HOLE NUMBER: 14
LOCATION: 096N-48W-26CDDD
LEGAL LOCATION: SE SE SE SW sec. 26, T. 096 N., R. 48 W.

3 - 31 Sand and gravel, medium to coarse

TEST HOLE NUMBER: 15
LOCATION: 096N-48W-31DAAA
LEGAL LOCATION: SE NE NE SE sec. 31, T. 096 N., R. 48 W.

20 - 30 Sand, brown, coarse, slightly clayey, pebbly; oxidized, saturated
| TEST HOE NUMBER | 16 |
| LOCATION: 096N-48W-32BAAA |
| LEGAL LOCATION: NE NE NE NW sec. 32, T. 096 N., R. 48 W. |
| 10 | 28 | Sand, brown, fine to medium, clayey; saturated |
| 26 | 58 | Sand, brown, coarse; saturated; very clean |

| TEST HOE NUMBER | 17 |
| LOCATION: 096N-48W-34AAAA |
| LEGAL LOCATION: NE NE NE NE sec. 34, T. 096 N., R. 48 W. |
| 10 | 12 | Sand, coarse, silty |
| 16 | 37 | Sand and gravel, medium to coarse |

| TEST HOE NUMBER | 18 |
| LOCATION: 096N-48W-35CDDD |
| LEGAL LOCATION: SE SE SE SW sec. 35, T. 096 N., R. 48 W. |
| 4 | 5 | Sand, medium |

| TEST HOE NUMBER | 19 |
| LOCATION: 096N-48W-35CDDD2 |
| LEGAL LOCATION: SE SE SE SW sec. 35, T. 096 N., R. 48 W. |
| 7 | 35 | Sand, medium to coarse |

| TEST HOE NUMBER | 20 |
| LOCATION: 096N-48W-36CCCC |
| LEGAL LOCATION: SW SW SW SW sec. 36, T. 096 N., R. 48 W. |
| 4 | 8 | Gravel, coarse to cobble, silty; dry, oxidized |
| 8 | 23 | Sand, rusty-brown, fine to medium, silty; moist, oxidized |
| 23 | 52 | Gravel, rusty-brown, silty, sandy; moist, saturated, oxidized |

| TEST HOE NUMBER | 21 |
| LOCATION: 096N-48W-36CCCD |
| LEGAL LOCATION: SE SW SW SE sec. 36, T. 096 N., R. 48 W. |
| 8 | 18 | Sand and gravel, medium to coarse |
| 18 | 37 | Sand and gravel, medium |

| TEST HOE NUMBER | 22 |
| LOCATION: 096N-49W-12BABB |
| LEGAL LOCATION: NW NW NE NW sec. 12, T. 096 N., R. 49 W. |
| 13 | 17 | Gravel |
| 20 | 23 | Sand |

| TEST HOE NUMBER | 23 |
| LOCATION: 096N-49W-23AADD |
| LEGAL LOCATION: SE SE NE NE sec. 23, T. 096 N., R. 49 W. |
| 15 | 28 | Sand, pale-light-brown, slightly clayey; saturated; oxidized |
TEST HOLE NUMBER: 24
LOCATION: 096N-49W-33SSEC
LEGAL LOCATION: SW SE SW SE sec. 33, T. 096 N., R. 49 W.

9 - 58 Sand, brown, very coarse; with minor very fine to fine gravel, some pink and greenish-colored grains

TEST HOLE NUMBER: 25
LOCATION: 096N-49W-34AADD
LEGAL LOCATION: SE SE SE NE sec. 34, T. 096 N., R. 49 W.

26 - 50 Sand, brown, medium, very clayey; oxidized, saturated

TEST HOLE NUMBER: 26
LOCATION: 096N-49W-35ABB
LEGAL LOCATION: NE NW NW NE sec. 35, T. 096 N., R. 49 W.

13 - 23 Sand

TEST HOLE NUMBER: 27
LOCATION: 096N-50W-13ICBB 1
LEGAL LOCATION: NW NW SW NW sec. 13, T. 096 N., R. 50 W.

25 - 28 Sand

TEST HOLE NUMBER: 28
LOCATION: 096N-50W-14BICB
LEGAL LOCATION: NW NW NW NW sec. 14, T. 096 N., R. 50 W.

2 - 31 Sand and gravel, brown, medium to coarse sand, medium gravel, clayey; oxidized, saturated at 10 ft

31 - 35 Sand and gravel, gray, medium to coarse sand, medium gravel, clayey; unoxidized, saturated

TEST HOLE NUMBER: 29
LOCATION: 096N-50W-22AADDAA
LEGAL LOCATION: NE NE SE NE sec. 22, T. 096 N., R. 50 W.

15 - 35 Gravel, reddish-brown, fine, clayey, sandy; oxidized, saturated

TEST HOLE NUMBER: 30
LOCATION: 096N-50W-23CDDCC
LEGAL LOCATION: SW SW SE SW sec. 23, T. 096 N., R. 50 W.

16 - 36 Sand, light-brown, medium, clayey; oxidized, saturated

36 - 42 Sand, light-brown, coarse, very clayey; oxidized

TEST HOLE NUMBER: 31
LOCATION: 096N-50W-26BABA
LEGAL LOCATION: NE NW NE NW sec. 26, T. 096 N., R. 50 W.

10 - 13 Gravel

20 - 22 Sand
25 - 40  Sand (best?)

TEST HOLE NUMBER: 32
LOCATION: 096N-59W-36CDDC
LEGAL LOCATION: SW SE SE SW sec. 36, T. 996 N., R. 50 W.
9 - 16  Gravel, brown; with coarse and very coarse sand, and with quarter-inch cream-colored limestone fragments
16 - 33  Sand, medium to very coarse; with little or no gravel

TEST HOLE NUMBER: 33
LOCATION: 096N-51W-01AABB
LEGAL LOCATION: NW NW NE NE sec. 01, T. 996 N., R. 51 W.
5 - 7    Sand, yellow, medium
21 - 23  Gravel, sandy
29 - 65  Gravel, reddish-brown, medium, sandy, subangular to subrounded; poorly sorted; some "western sand" at 60 to 65 feet

TEST HOLE NUMBER: 34
LOCATION: 096N-51W-06BABA
LEGAL LOCATION: NE NW NE NW sec. 06, T. 996 N., R. 51 W.
8 - 26   Sand, brown, coarse, clayey, poorly sorted; saturated, oxidized
26 - 60  Sand and gravel, light-gray, fine sand, medium gravel, poorly sorted, clayey; saturated, unoxidized

TEST HOLE NUMBER: 35
LOCATION: 096N-51W-06CBBC
LEGAL LOCATION: SW NW SW NW sec. 06, T. 996 N., R. 51 W.
0 - 1    Sand and gravel (roadfill)
5 - 40   Sand, reddish-brown, fine to medium, clayey; oxidized, moist
40 - 45  Sand and gravel, reddish-brown, coarse sand, fine gravel; oxidized, saturated; bit large rocks at 45 feet, abandoned hole

TEST HOLE NUMBER: 36
LOCATION: 096N-51W-24BCBB
LEGAL LOCATION: NW NW SW NW sec. 24, T. 996 N., R. 51 W.
25 - 51  Sand, light-brown, fine to very fine, silty; oxidized, saturated

TEST HOLE NUMBER: 37
LOCATION: 097N-48W-06ABBB
LEGAL LOCATION: NW NW NW NE sec. 06, T. 097 N., R. 48 W.
9 - 17   Sand and gravel, coarse sand to fine pebble gravel; mostly igneous and sedimentary rock fragments, few quartz grains, few pebbles, bit rock, abandoned hole

TEST HOLE NUMBER: 38
LOCATION: 097N-48W-20BAAA
LEGAL LOCATION: NE NE NE NW sec. 06, T. 097 N., R. 48 W.

12 - 15 Gravel, rusty-brown, silty, oxidized, dry

TEST HOLE NUMBER: 39
LOCATION: 097N-46W-06BAAA 2
LEGAL LOCATION: NE NE NE NW sec. 06, T. 097 N., R. 48 W.

12 - 15 Gravel, rusty-brown, silty; oxidized, dry

TEST HOLE NUMBER: 40
LOCATION: 097N-46W-14BDIBC 1
LEGAL LOCATION: SW NW SE NW sec. 14, T. 097 N., R. 48 W.

19 - 22 Gravel, reddish-brown, coarse
24 - 26 Gravel, reddish-brown, coarse
34 - 36 Gravel, reddish-brown, coarse

TEST HOLE NUMBER: 41
LOCATION: 097N-46W-14BDIBC 2
LEGAL LOCATION: SW NW SE NW sec. 14, T. 097 N., R. 48 W.

19 - 22 Gravel, reddish-brown, coarse
24 - 26 Gravel, reddish-brown, coarse

TEST HOLE NUMBER: 42
LOCATION: 097N-46W-14BDLCA 1
LEGAL LOCATION: NE SW SE NW sec. 14, T. 097 N., R. 48 W.

6 - 30 Sand and gravel
30 - 40 Silt, green-gray, very coarse
40 - 41 Sand, gray, very fine

TEST HOLE NUMBER: 43
LOCATION: 097N-46W-14BDLCA 2
LEGAL LOCATION: NE SW SE NW sec. 14, T. 097 N., R. 48 W.

6 - 26 Sand and gravel

TEST HOLE NUMBER: 44
LOCATION: 097N-46W-14BDLCA 3
LEGAL LOCATION: NE SW SE NW sec. 14, T. 097 N., R. 48 W.

6 - 30 Sand and gravel
30 - 36 Sand, green, very coarse

TEST HOLE NUMBER: 45
LOCATION: 097N-46W-14BDDB 1
LEGAL LOCATION: NW SE SE NW sec. 14, T. 097 N., R. 48 W.

20 - 25 Gravel, reddish-brown, coarse to fine; some sand
31 - 34 Gravel, reddish-brown, coarse to fine
36 - 38 Gravel, reddish-brown, coarse to fine
TEST HOLE NUMBER: 46
LOCATION: 097N-46W-14DDBB 2
LEGAL LOCATION: NW SE SE NW sec. 14, T. 097 N., R. 48 W.
20 - 25 Gravel, reddish-brown, coarse to fine; some sand
31 - 34 Gravel, reddish-brown, coarse to fine
36 - 38 Gravel, reddish-brown, coarse to fine

TEST HOLE NUMBER: 47
LOCATION: 097N-46W-14CACA
LEGAL LOCATION: NE SW NE SW sec. 14, T. 097 N., R. 48 W.
7 - 11 Gravel, reddish-brown, coarse
18 - 32 Sand, gray; silt; some clay stringers

TEST HOLE NUMBER: 48
LOCATION: 097N-46W-14CADC 1
LEGAL LOCATION: SW SE NE SW sec. 14, T. 097 N., R. 48 W.
0 - 6 Gravel, red-brown, coarse, grading to sand
9 - 13 Gravel, red-brown, coarse, grading to sand

TEST HOLE NUMBER: 49
LOCATION: 097N-46W-14CADC 2
LEGAL LOCATION: SW SE NE SW sec. 14, T. 097 N., R. 48 W.
0 - 6 Sand, light-brown, very fine
6 - 12 Sand and gravel, medium to coarse
12 - 14 Sand, blue-gray, very fine, well sorted

TEST HOLE NUMBER: 50
LOCATION: 097N-46W-14CABAB
LEGAL LOCATION: NW NE NW SW sec. 14, T. 097 N., R. 48 W.
7 - 39 Gravel, reddish-brown, medium to coarse; some cobbles

TEST HOLE NUMBER: 51
LOCATION: 097N-46W-14CIBC
LEGAL LOCATION: SW NW NW SW sec. 14, T. 097 N., R. 48 W.
5 - 25 Gravel, reddish-brown, coarse to fine; some sand
33 - 36 Gravel, reddish-brown, coarse to fine

TEST HOLE NUMBER: 52
LOCATION: 097N-46W-14CIBC
LEGAL LOCATION: NW SW NW SW sec. 14, T. 097 N., R. 48 W.
4 - 40 Gravel, reddish-brown, coarse

TEST HOLE NUMBER: 53
LOCATION: 097N-46W-14CDAA

13
<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Legal Location</th>
<th>Test Hole Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>997N-A8W-14CDAD</td>
<td>SE SE SW sec. 14, T. 907 N., R. 48 W.</td>
<td>5 - 10 Sand, brown, medium; saturated 10 - 50 Gravel, reddish-brown, fine to coarse, sandy</td>
</tr>
<tr>
<td>56</td>
<td>997N-A8W-14DCCB</td>
<td>NW SW SW sec. 14, T. 907 N., R. 48 W.</td>
<td>4 - 37 Gravel, reddish-brown, coarse; grading to silt</td>
</tr>
<tr>
<td>57</td>
<td>997N-A8W-15ACEB</td>
<td>NW SE SW NE sec. 15, T. 907 N., R. 48 W.</td>
<td>5 - 10 Gravel, reddish-brown, coarse; some sand 10 - 16 Sand, greenish-brown, medium; dry 16 - 34 Sand, greenish-brown, medium grading to coarse; saturated 34 - 48 Gravel, brown, fine, sandy; saturated</td>
</tr>
<tr>
<td>58</td>
<td>997N-A8W-15ACDD 1</td>
<td>SE SE SW sec. 15, T. 907 N., R. 48 W.</td>
<td>5 - 7 Gravel, reddish-brown, coarse to fine 14 - 16 Gravel, reddish-brown, coarse to fine</td>
</tr>
<tr>
<td>59</td>
<td>997N-A8W-15ACDD 2</td>
<td>SE SE SW NE sec. 15, T. 907 N., R. 48 W.</td>
<td>1 - 18 Sand, medium to fine, silty 18 - 23 Gravel, reddish-brown, coarse to fine 24 - 36 Gravel, reddish-brown, very coarse, grading to sand</td>
</tr>
<tr>
<td>60</td>
<td>997N-A8W-23ABAD</td>
<td>LOCALTION: SE SE SW NE sec. 15, T. 907 N., R. 48 W.</td>
<td>1 - 18 Sand, medium to fine, silty 18 - 23 Gravel, reddish-brown, coarse to fine 24 - 36 Gravel, reddish-brown, very coarse, grading to sand</td>
</tr>
</tbody>
</table>
LEGAL LOCATION: SE NE NW NE sec. 23, T. 097 N., R. 48 W.

15 - 17 Gravel, reddish-brown, medium

TEST HOLE NUMBER: 61
LOCATION: 097N-48W-23ABBB
LEGAL LOCATION: NW NW NW NE sec. 23, T. 097 N., R. 48 W.

1 - 3 Gravel, reddish-brown, coarse, grading to sand; dry
10 - 16 Sand, light-brown, fine, grading to medium; moist
18 - 50 Sand, light-brown, fine, grading to fine gravel, clayey; saturated

TEST HOLE NUMBER: 62
LOCATION: 097N-48W-23ABBC
LEGAL LOCATION: SW NW NW NE sec. 23, T. 097 N., R. 48 W.

0 - 8 Gravel, reddish-brown, coarse, grading to sand
35 - 55 Sand, gray, fine, grading to coarse, silty; some clay; wetsized

TEST HOLE NUMBER: 63
LOCATION: 097N-48W-23ABCA
LEGAL LOCATION: NE SW NW NE sec. 23, T. 097 N., R. 48 W.

19 - 20 Sand, white, medium; clean, noncalcareous
34 - 35 Sand, white, soft, noncalcareous

TEST HOLE NUMBER: 64
LOCATION: 097N-48W-23ACDB
LEGAL LOCATION: NW SE SW NE sec. 23, T. 097 N., R. 48 W.

2 - 13 Sand and gravel

TEST HOLE NUMBER: 65
LOCATION: 097N-48W-23BCCB
LEGAL LOCATION: NW SW NW NW sec. 23, T. 097 N., R. 48 W.

24 - 45 Sand and gravel, reddish-brown, coarse sand, fine to medium gravel, clayey at 36 to 45 feet; oxidized, dry; clean

TEST HOLE NUMBER: 66
LOCATION: 097N-48W-24CCDD
LEGAL LOCATION: SE SE SW SW sec. 23, T. 097 N., R. 48 W.

7 - 10 Sand, medium
10 - 43 Sand and gravel, medium to coarse

TEST HOLE NUMBER: 67
LOCATION: 097N-48W-26AABB 1
LEGAL LOCATION: NW NW NE NE sec. 26, T. 097 N., R. 48 W.

2 - 16 Sand and gravel, reddish-brown
16 - 20 Sand and gravel, yellow-brown

15
<table>
<thead>
<tr>
<th>TEST HOLE NUMBER</th>
<th>LOCATION</th>
<th>LEGAL LOCATION</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>16 - 20 Sand and gravel, yellow-brown</td>
</tr>
<tr>
<td>69</td>
<td>097N-46W-36CCAB</td>
<td>NW NE SW SW sec. 36, T. 097 N., R. 48 W.</td>
<td>17 - 23 Gravel, brown, coarse, very sandy</td>
</tr>
<tr>
<td>70</td>
<td>097N-46W-36CCAC</td>
<td>SW NW SW SW sec. 36, T. 097 N., R. 48 W.</td>
<td>18 - 20 Gravel, coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 - 40 Sand, coarse</td>
</tr>
<tr>
<td>71</td>
<td>097N-49W-04A-AB</td>
<td>NW NE SW NE sec. 04, T. 097 N., R. 49 W.</td>
<td>20 - 30 Sand, white, medium, medium to well-rounded; clean, mostly quartz and feldspar, some black specks (western sand)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30 - 92 Gravel, orange-white, fine, very sandy, subrounded; few soft rock clasts (western sand)</td>
</tr>
<tr>
<td>72</td>
<td>097N-49W-23A-DDA</td>
<td>NE SE SE NE sec. 23, T. 097 N., R. 49 W.</td>
<td>13 - 18 Gravel, medium to coarse</td>
</tr>
<tr>
<td>73</td>
<td>097N-46W-27A-BB</td>
<td>NW NW NE NE sec. 27, T. 097 N., R. 49 W.</td>
<td>6 - 10 Sand and gravel, brown, coarse sand, medium to coarse gravel, clayey; oxidized</td>
</tr>
<tr>
<td>75</td>
<td>097N-50W-05A-AAD</td>
<td>SE NE NE NE sec. 05, T. 097 N., R. 51 W.</td>
<td>1 - 4 Gravel, medium to coarse</td>
</tr>
</tbody>
</table>
TEST HOLE NUMBER:  76
LOCATION:  097N-51W-17CDDC
LEGAL LOCATION:  SW SE SE SW sec. 17, T. 097 N., R. 51 W.
0 - 1  Sand, reddish-brown, medium; oxidized, dry
1 - 15  Sand, reddish-brown, medium; oxidized, saturated
15 - 29  Sand, gray, medium; unoxidized, saturated

TEST HOLE NUMBER:  77
LOCATION:  097N-51W-18CCCC
LEGAL LOCATION:  SW SW SW SW sec. 18, T. 097 N., R. 51 W.
10 - 37  Gravel, fine; gravel is 1/8 to 1/4 inch in diameter, also coarse to very coarse sand

TEST HOLE NUMBER:  78
LOCATION:  097N-51W-19BAAA
LEGAL LOCATION:  NE NE NE NW sec. 19, T. 097 N., R. 51 W.
0 - 8  Sand, yellow-brown, fine; limestone fragments appear and probably are road aggregate
8 - 25  Sand, yellow-brown, very coarse; some fine gravel
25 - 30  Sand, gray, very coarse; some small gravel

TEST HOLE NUMBER:  79
LOCATION:  097N-51W-19BBBB 1
LEGAL LOCATION:  NW NW NW NW sec. 19, T. 097 N., R. 51 W.
9 - 37  Gravel, fine; with very coarse sand

TEST HOLE NUMBER:  80
LOCATION:  097N-51W-19BBBB 2
LEGAL LOCATION:  NW NW NW NW sec. 19, T. 097 N., R. 51 W.
10 - 41  Sand, gray, very coarse; with some fine gravel

TEST HOLE NUMBER:  81
LOCATION:  097N-51W-19CBBB
LEGAL LOCATION:  NW NW NW NW SW sec. 19, T. 097 N., R. 51 W.
14 - 43  Sand, very coarse; some 1/4 inch gravel

TEST HOLE NUMBER:  82
LOCATION:  097N-51W-19CCCC
LEGAL LOCATION:  SW SW SW SW sec. 19, T. 097 N., R. 51 W.
2 - 9  Sand, brown, fine to coarse
18 - 49  Sand, very coarse; some fine gravel

TEST HOLE NUMBER:  83
LOCATION:  097N-51W-29CBBB
LEGAL LOCATION:  NW NW NW SW sec. 29, T. 097 N., R. 51 W.
1 - 14  Sand, brown, fine to medium, slightly clayey; oxidized
14 - 22  Sand, brown, fine to medium, slightly clayey; oxidized, moist
TEST HOLE NUMBER: 84
LOCATION: 097N-51W-90AAAA
LEGAL LOCATION: NE NE NE sec. 30, T. 097 N., R. 51 W.
  8 - 26 Sand, dark-brown, fine, very silty, poorly sorted; saturated
  26 - 35 Gravel, dark-brown, fine to medium, very silty, poorly sorted; saturated

TEST HOLE NUMBER: 85
LOCATION: 097N-51W-90BAAA
LEGAL LOCATION: NE NE NW sec. 30, T. 097 N., R. 51 W.
  15 - 37 Gravel, medium, clayey, poorly sorted; saturated, oxidized

TEST HOLE NUMBER: 86
LOCATION: 097N-51W-50CCCC
LEGAL LOCATION: SW SW SW NW sec. 30, T. 097 N., R. 51 W.
  14 - 16 Sand, medium to fine
  16 - 43 Gravel, fine; with very coarse sand

TEST HOLE NUMBER: 87
LOCATION: 097N-51W-30DDDD
LEGAL LOCATION: SE SE SE SW sec. 30, T. 097 N., R. 51 W.
  15 - 52 Gravel; with medium to very coarse sand

TEST HOLE NUMBER: 88
LOCATION: 097N-51W-31BAAA
LEGAL LOCATION: NE NE NE NW sec. 31, T. 097 N., R. 51 W.
  7 - 12 Sand, brown, fine, very clayey, poorly sorted; saturated, oxidized
  12 - 46 Gravel, brown, medium to coarse, clayey; saturated, unoxidized, with coarse sand

TEST HOLE NUMBER: 89
LOCATION: 098N-48W-45CCBB
LEGAL LOCATION: NW NW NW SW sec. 05, T. 098 N., R. 48 W.
  6 - 23 Sand, brown, medium to fine; oxidized, saturated; fairly clean
  23 - 43 Sand, gray, medium to fine; fairly clean

TEST HOLE NUMBER: 90
LOCATION: 098N-48W-06ABAA
LEGAL LOCATION: NE NE NW NE sec. 06, T. 098 N., R. 48 W.
  8 - 26 Sand

TEST HOLE NUMBER: 91
LOCATION: 098N-48W-08CDDD
LEGAL LOCATION: SE SE SE SW sec. 08, T. 098 N., R. 48 W.

24 - 28 Gravel; could not penetrate

TEST HOLE NUMBER: 92
LOCATION: 098N-48W-08IDACA
LEGAL LOCATION: NE SW NE SE sec. 08, T. 098 N., R. 48 W.

3 - 20 Gravel, rusty-brown, coarse to fine, silty, sandy; oxidized, dry

TEST HOLE NUMBER: 93
LOCATION: 098N-48W-17DDCA
LEGAL LOCATION: SW NW SE SE sec. 17, T. 098 N., R. 48 W.

10 - 20 Sand, medium

TEST HOLE NUMBER: 94
LOCATION: 098N-48W-07DDCB
LEGAL LOCATION: NW SW SE SE sec. 17, T. 098 N., R. 48 W.

10 - 22 Sand and gravel, fine sand to medium gravel

TEST HOLE NUMBER: 95
LOCATION: 098N-48W-17DDCB 2
LEGAL LOCATION: NW SW SE SE sec. 17, T. 098 N., R. 48 W.

12 - 18 Sand and gravel, medium sand to coarse gravel

TEST HOLE NUMBER: 96
LOCATION: 098N-48W-18CCCC
LEGAL LOCATION: SW SW SW SW sec. 18, T. 098 N., R. 48 W.

1 - 11 Gravel and sand
11 - 45 Sand, fine to medium, gravelly

TEST HOLE NUMBER: 97
LOCATION: 098N-48W-19AAAD
LEGAL LOCATION: SE NE NE NE sec. 19, T. 098 N., R. 48 W.

3 - 6 Gravel, brown, silty; oxidized, dry

TEST HOLE NUMBER: 98
LOCATION: 098N-48W-19AABB
LEGAL LOCATION: NW NW NW NE sec. 19, T. 098 N., R. 48 W.

4 - 18 Sand, medium

TEST HOLE NUMBER: 99
LOCATION: 098N-48W-19AABB 2
LEGAL LOCATION: NW NW NW NE sec. 19, T. 098 N., R. 48 W.

4 - 18 Gravel, medium to coarse, sandy, subangular, some sedimentary fragments
TEST HOLE NUMBER: 100
LOCATION: 098N-48W-19ADD
LEGAL LOCATION: NE SE SE sec. 19, T. 098 N., R. 48 W.
0 - 4 Sand, blackish-brown to dark-brown, fine (alluvium)
4 - 9 Sand, blackish-yellow-brown, fine; some gravel
9 - 14 Sand, blackish-yellow-brown, fine; some gravel, saturated
14 - 19 Sand and gravel, fine to coarse sand
19 - 29 Sand and gravel, yellowish-brown, coarse sand; saturated
29 - 34 Sand, yellowish-brown, fine to coarse; saturated
34 - 39 Sand, fine to coarse; some gravel; saturated

TEST HOLE NUMBER: 101
LOCATION: 099N-48W-19ADD
LEGAL LOCATION: SE SE SE sec. 19, T. 098 N., R. 48 W.
3 - 9 Sand, brown, fine, slightly clayey; oxidized, moist
9 - 19 Sand, dark-brown, fine, slightly clayey; oxidized, saturated

TEST HOLE NUMBER: 102
LOCATION: 099N-48W-20AABA 1
LEGAL LOCATION: NE NW NE NW sec. 20, T. 098 N., R. 48 W.
0 - 3 Sand, brown, fine, clayey; oxidized, dry
3 - 6 Sand, reddish-brown, fine, clayey; oxidized, dry
6 - 15 Gravel, brown, silt, clayey; oxidized, dry; bit rock at 15 feet, abandoned hole

TEST HOLE NUMBER: 103
LOCATION: 099N-48W-20AABA 2
LEGAL LOCATION: NE NW NE NW sec. 20, T. 098 N., R. 48 W.
0 - 6 Sand, reddish-brown, fine, clayey; oxidized, dry
6 - 14 Gravel, brown, cobble size, clayey, sandy; oxidized, dry; could not penetrate below 14 feet, abandoned hole

TEST HOLE NUMBER: 104
LOCATION: 099N-48W-31DCDC
LEGAL LOCATION: SW SE SW SE sec. 31, T. 098 N., R. 48 W.
2 - 7 Sand, yellow, fine (loess)

TEST HOLE NUMBER: 105
LOCATION: 099N-49W-05AAAA
LEGAL LOCATION: NE NE NE NE sec. 05, T. 098 N., R. 49 W.
20 - 24 Sand
27 - 32 Sand

TEST HOLE NUMBER: 106
LOCATION: 098N-49W-05ADAD
LEGAL LOCATION: SE NE SE NE sec. 0, MT. 098 N., R. 49 W.
15 - 17 Sand, reddish-brown, coarse, slightly clayey, gravelly; oxidized, moist
17 - 26 Gravel, reddish-brown, medium; oxidized, saturated; clean
TEST HOLE NUMBER: 107
LOCATION: 09SN-49W-01BABA
LEGAL LOCATION: NE NW NE NW sec. 05, T. 098 N., R. 49 W.
11 - 17 Sand and gravel, dark-brown, coarse sand, fine to medium gravel, slightly clayey; oxidized, dry

TEST HOLE NUMBER: 108
LOCATION: 09SN-49W-01DAAD
LEGAL LOCATION: SE NE NE SE sec. 05, T. 098 N., R. 49 W.
22 - 29 Sand, brown, fine to medium, very clayey; oxidized, saturated

TEST HOLE NUMBER: 109
LOCATION: 09SN-49W-01DDBA
LEGAL LOCATION: NE NE SE SE sec. 05, T. 098 N., R. 49 W.
13 - 30 Sand, gray, fine

TEST HOLE NUMBER: 110
LOCATION: 09SN-49W-06CBBB
LEGAL LOCATION: NW NW NW SW sec. 06, T. 098 N., R. 49 W.
10 - 58 Sand, brown, medium to coarse, clayey; oxidized, saturated

TEST HOLE NUMBER: 111
LOCATION: 09SN-49W-01BBAA
LEGAL LOCATION: NE NE NW NW sec. 10, T. 098 N., R. 49 W.
20 - 30 Sand, brown, medium to fine; 25 percent clay
30 - 45 Sand, brown, fine to coarse; 25 percent clay; saturated

TEST HOLE NUMBER: 112
LOCATION: 09SN-49W-10DDCC
LEGAL LOCATION: SW SW SE SE sec. 10, T. 098 N., R. 49 W.
0 - 8 Gravel, reddish-brown, clayey; oxidized, dry

TEST HOLE NUMBER: 113
LOCATION: 09SN-49W-15D1DA
LEGAL LOCATION: NE SE SE SE sec. 15, T. 098 N., R. 49 W.
17 - 34 Sand, brown, medium; 25 percent clay
34 - 40 Sand, gray; 50 percent clay

TEST HOLE NUMBER: 114
LOCATION: 09SN-49W-16ABAB
LEGAL LOCATION: NW NE NW NE sec. 16, T. 098 N., R. 49 W.
17 - 27 Sand, brown, fine to very fine; 25 percent clay
27 - 31 Sand, brown, fine to medium; 20 percent clay
33 - 50 Sand, brown, fine to medium; 25 percent clay
TEST HOLE NUMBER: 115
LOCATION: 06SN-49W-19DD
LEGAL LOCATION: SW SW SW SW sec. 18, T. 098 N., R. 49 W.

0 - 4 Sand, fine, silty; to kaem
4 - 14 Sand, brownish-yellow; very dry
14 - 19 Gravel, yellowish-brown; with sand intermixed
19 - 24 Sand, brownish-gray to yellow-gray, gravelly; hit water at 22 feet
24 - 39 Gravel and sand, brownish-gray to yellow-gray

TEST HOLE NUMBER: 116
LOCATION: 06SN-49W-19ADD
LEGAL LOCATION: SE SE NE sec. 19, T. 098 N., R. 49 W.

2 - 30 Gravel, medium-grained, subrounded; large rocks near base

TEST HOLE NUMBER: 117
LOCATION: 06SN-49W-19BBB
LEGAL LOCATION: NW NW NW NW sec. 19, T. 098 N., R. 49 W.

24 - 40 Sand

TEST HOLE NUMBER: 118
LOCATION: 06SN-49W-22DD
LEGAL LOCATION: SE SE SE SW sec. 22, T. 098 N., R. 49 W.

3 - 22 Gravel

TEST HOLE NUMBER: 119
LOCATION: 06SN-49W-22DDD
LEGAL LOCATION: SW SW SW SE sec. 22, T. 098 N., R. 49 W.

25 - 30 Sand, black, fine to medium; 25 percent clay; saturated
30 - 42 Sand, gray, fine to coarse, clayey; saturated

TEST HOLE NUMBER: 120
LOCATION: 06SN-49W-22DDDD
LEGAL LOCATION: SE SE SE SE sec. 22, T. 098 N., R. 49 W.

8 - 19 Sand; with gravel
19 - 30 Gravel; medium to fine, poorly sorted

TEST HOLE NUMBER: 121
LOCATION: 06SN-49W-23AACC
LEGAL LOCATION: SW SW NE NE sec. 23, T. 098 N., R. 49 W.

0 - 19 Sand, dark-brown, fine; to colluvium
19 - 34 Sand, yellowish-brown, fine; with gravel intermixed, saturated; 70 percent sand
34 - 39 Gravel; with fine to coarse sand; 60 percent gravel
39 - 54 Sand, grayish, fine; with clay like material; 70 percent sand

TEST HOLE NUMBER: 122
LOCATION: 06SN-49W-23AD

22
Sand, medium to fine

Sand, fine

Sand, fine to medium

Sand and clay, sandy clay

Sand, fine, silty

Sand, brown, coarse to fine, silty; wet, some clay

Sand and gravel, fine gravel; wet

Gravel, fine to medium, subangular to subrounded; saturated

Sand and gravel, fine to coarse gravel, clayey

Sand and gravel, dirty-black, medium to coarse sand, fine to medium gravel; completely saturated

Gravel, dirty-black, fine to medium, angular; some coarse gravel, saturated

Sand, pebbly, dirty, oxidized, dry

Sand, pebbly, pebbly, oxidized, moist

Gravel, brown-gray, pebble-size, sandy; moist

Gravel, pebble-size, clayey, sandy; unoxidized, moist

Sand, fine to coarse, silty

Sand, fine to coarse, slightly silty
<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sand, brown, dirty</td>
</tr>
<tr>
<td>22</td>
<td>Sand, blue, fine</td>
</tr>
<tr>
<td>1</td>
<td>Sand, fine to coarse</td>
</tr>
<tr>
<td>8</td>
<td>Sand, fine to coarse at the top grading to fine to medium at the bottom</td>
</tr>
<tr>
<td>0</td>
<td>Sand, black, fine, silty</td>
</tr>
<tr>
<td>5</td>
<td>Sand, black, fine, grading to medium</td>
</tr>
<tr>
<td>25</td>
<td>Sand, medium; with some gray clay</td>
</tr>
<tr>
<td>11</td>
<td>Sand and gravel, medium to coarse sand, fine gravel</td>
</tr>
<tr>
<td>25</td>
<td>Sand, medium to coarse with a little gray clay</td>
</tr>
<tr>
<td>27</td>
<td>Sand and gravel, medium to coarse sand, fine gravel; with much gray clay</td>
</tr>
<tr>
<td>11</td>
<td>Sand and gravel, medium to coarse sand, fine gravel; change from oxidized to unoxidized at about 25 feet</td>
</tr>
<tr>
<td>0</td>
<td>Sand, fine to coarse, silty</td>
</tr>
<tr>
<td>26</td>
<td>Sand and gravel, brown, fine to coarse sand, fine to coarse gravel, till Siouxi River terrace</td>
</tr>
</tbody>
</table>
TEST HOLE NUMBER: 136
LOCATION: 098N-49W-23IDCCC
LEGAL LOCATION: SW SW SE sec. 23, T. 098 N., R. 49 W.

7 - 9 Sand, medium

TEST HOLE NUMBER: 137
LOCATION: 098N-49W-23IDDA
LEGAL LOCATION: NE NE SE SE sec. 23, T. 098 N., R. 49 W.

0 - 4 Sand, yellowish-brown, clayey; oxidized, moist
4 - 9 Sand, coarse, pebby; tough at 8 feet
9 - 19 Gravel, dirty, dry; few rocks
19 - 24 Sand, brown-gray, clayey; oxidized, wet
24 - 34 Sand, brownish-gray, clayey, pebby; wet

TEST HOLE NUMBER: 138
LOCATION: 098N-49W-24AAAA
LEGAL LOCATION: NE NE NE SE sec. 24, T. 098 N., R. 49 W.

3 - 21 Sand, medium to coarse

TEST HOLE NUMBER: 139
LOCATION: 098N-49W-24HIDB
LEGAL LOCATION: NW SE NW SW sec. 24, T. 098 N., R. 49 W.

4 - 22 Sand, brown

TEST HOLE NUMBER: 140
LOCATION: 098N-49W-24CB
LEGAL LOCATION: NW SW sec. 24, T. 098 N., R. 49 W.

* THIS LOG CONTAINS UNVERIFIED INFORMATION *

0 - 22 Sand and gravel
22 - 30 Sand, fine to medium

TEST HOLE NUMBER: 141
LOCATION: 098N-49W-24CIBC
LEGAL LOCATION: SW NW NW SW sec. 24, T. 098 N., R. 49 W.

0 - 2 Sand, brown, sily
2 - 7 Sand, medium to coarse, clayey
7 - 27 Sand, medium to coarse, gravelly; pea-size gravel
27 - 40 Sand, coarse; 15 percent clay
40 - 45 Sand, gray, fine to medium; 25 percent clay

TEST HOLE NUMBER: 142
LOCATION: 098N-49W-24CIBC 1
LEGAL LOCATION: SW NW NW SW sec. 24, T. 098 N., R. 49 W.

2 - 7 Sand, fine to coarse

25
TEST HOLE NUMBER: 143
LOCATION: 098N-49W-25DBA
LEGAL LOCATION: NE NW sec. 25, T. 098 N., R. 49 W.
4 - 6 Sand, brown, fine to medium
9 - 14 Sand, fine to medium
14 - 25 Sand, fine to coarse, clayey

TEST HOLE NUMBER: 144
LOCATION: 098N-49W-25DDB
LEGAL LOCATION: SW NE SE NW sec. 25, T. 098 N., R. 49 W.
18 - 22 Sand, medium, silty

TEST HOLE NUMBER: 145
LOCATION: 098N-49W-26CCB
LEGAL LOCATION: SW NW SW SW sec. 25, T. 098 N., R. 49 W.
10 - 22 Gravel, coarse, pea-size and bigger

TEST HOLE NUMBER: 146
LOCATION: 098N-49W-26DADD
LEGAL LOCATION: SE SE SE NW sec. 26, T. 098 N., R. 49 W.
2 - 12 Sand, tan-brown, medium to coarse, slightly clayey; oxidized, saturated
12 - 22 Gravel, tan-brown, medium, clayey, sandy; oxidized, saturated
22 - 35 Gravel, gray, medium, sandy; unoxidized, saturated
35 - 52 Gravel, gray, medium, very clayey, sandy; unoxidized, saturated; bit rock at 52 feet; abandoned hole

TEST HOLE NUMBER: 147
LOCATION: 098N-49W-26DDDD
LEGAL LOCATION: SE SE SE SW sec. 26, T. 098 N., R. 49 W.
7 - 20 Gravel, fine to medium, sandy (outwash)

TEST HOLE NUMBER: 148
LOCATION: 098N-49W-26DDDD 2
LEGAL LOCATION: SE SE SW sec. 26, T. 098 N., R. 49 W.
12 - 22 Sand and gravel, fine sand to fine pebble gravel, clayey; mostly igneous and sedimentary rock fragments with a moderate amount of subangular quartz

TEST HOLE NUMBER: 149
LOCATION: 098N-49W-26DDDD
LEGAL LOCATION: SE NE SE SE sec. 26, T. 098 N., R. 49 W.
18 - 26 Sand and gravel, brown, coarse sand, fine gravel, clayey
26 - 31 Sand and clay, gray, medium to very fine sand
31 - 47 Sand and clay, gray, fine to very fine sand

TEST HOLE NUMBER: 150
LOCATION: 098N-49W-28ADDD

26
LEGAL LOCATION: SE SE SE NE sec. 28, T. 098 N., R. 49 W.

12 - 23 Sand, gray, fine to medium; unoxidized, saturated

TEST HOLE NUMBER: 151
LOCATION: 098N-49W-28C3B
LEGAL LOCATION: SW NW NW SW sec. 28, T. 098 N., R. 49 W.

0 - 20 Sand, rusty-brown, very fine; clean, dry, oxidized

TEST HOLE NUMBER: 152
LOCATION: 098N-49W-29ADD
LEGAL LOCATION: SE SE SE NE sec. 29, T. 098 N., R. 49 W.

0 - 3 Sand
3 - 14 Sand and gravel

TEST HOLE NUMBER: 153
LOCATION: 098N-49W-29HIC
LEGAL LOCATION: NW SW NW NW sec. 29, T. 098 N., R. 49 W.

24 - 33 Gravel, dark-gray, clayey; unoxidized, saturated; driller reports clay at 33 feet; no return

TEST HOLE NUMBER: 154
LOCATION: 098N-49W-29ICB
LEGAL LOCATION: NW NW SW NW sec. 29, T. 098 N., R. 49 W.

1 - 6 Gravel
6 - 30 Sand, medium to fine; gravelly; medium gravel, 20 percent clay

TEST HOLE NUMBER: 155
LOCATION: 098N-49W-30ADD
LEGAL LOCATION: SE SE SE NE sec. 30, T. 098 N., R. 49 W.

0 - 20 Sand and gravel; brown, medium to coarse sand, fine to medium gravel, slightly clayey; oxidized, moist at 14 feet

TEST HOLE NUMBER: 156
LOCATION: 098N-49W-30C3C
LEGAL LOCATION: NW SW SW SW sec. 30, T. 098 N., R. 49 W.

12 - 35 Gravel

TEST HOLE NUMBER: 157
LOCATION: 098N-49W-34ADA
LEGAL LOCATION: SE NE SE NE sec. 34, T. 098 N., R. 49 W.

18 - 30 Sand, dark-gray, fine to medium, very clayey; moist; driller reports clay at 30 feet, drilled hard, no return

TEST HOLE NUMBER: 158
LOCATION: 098N-49W-35ADA
LEGAL LOCATION: SE NE SE NE sec. 35, T. 098 N., R. 49 W.
5 - 10 Sand, medium to coarse; with clay
38 - 40 Sand, medium to coarse

TEST HOLE NUMBER: 159
LOCATION: 099N-49W-36CCC 1
LEGAL LOCATION: SW SW SW SW sec. 36, T. 098 N., R. 49 W.
8 - 10 Sand, fine
10 - 80 Gravel, fine to medium; interbedded with till

TEST HOLE NUMBER: 160
LOCATION: 099N-49W-36CCC 2
LEGAL LOCATION: SW SW SW SW sec. 36, T. 098 N., R. 49 W.
8 - 10 Sand, fine
10 - 80 Gravel, fine to medium; interbedded with till

TEST HOLE NUMBER: 161
LOCATION: 099N-49W-36CCC 4
LEGAL LOCATION: SW SW SW SW sec. 36, T. 098 N., R. 49 W.
0 - 3 Sand and gravel

TEST HOLE NUMBER: 162
LOCATION: 099N-50W-01BBB
LEGAL LOCATION: NW NW NW NW sec. 01, T. 098 N., R. 50 W.
21 - 41 Sand and gravel; fine sand to coarse gravel; with clay layers

TEST HOLE NUMBER: 163
LOCATION: 099N-50W-02ADAA
LEGAL LOCATION: NE NE SE NE sec. 02, T. 098 N., R. 50 W.
7 - 25 Sand, reddish-brown, fine to medium; oxidized, water saturated

TEST HOLE NUMBER: 164
LOCATION: 099N-50W-34AAA
LEGAL LOCATION: NE NE NE NE sec. 24, T. 098 N., R. 50 W.
20 - 32 Sand, fine

TEST HOLE NUMBER: 165
LOCATION: 099N-50W-25CCD
LEGAL LOCATION: SE SW SE SW sec. 25, T. 098 N., R. 50 W.
22 - 38 Sand, brown, very fine; very sandy, oxidized, water saturated
38 - 58 Sand, gray-brown, fine, slightly clayey; water saturated

TEST HOLE NUMBER: 166
LOCATION: 099N-50W-34ADAA

28
LEGAL LOCATION: NE NE SE sec. 34, T. 098 N., R. 50 W.

9 - 20 Gravel, dark-brown, medium, sandy, oxidized, saturated

TEST HOLE NUMBER: 167
LOCATION: 098N-51W-05BDCC
LEGAL LOCATION: SW SW SE NW sec. 05, T. 098 N., R. 51 W.

20 - 32 Sand

TEST HOLE NUMBER: 168
LOCATION: 098N-51W-05CBBB
LEGAL LOCATION: NW NW NW SW sec. 05, T. 098 N., R. 51 W.

0 - 4 Gravel, reddish-brown, clayey, sandy, oxidized, dry
4 - 10 Gravel, reddish-brown, clayey, sandy, oxidized, moist
10 - 24 Gravel, dark-reddish-brown, clayey, sandy, oxidized, saturated
24 - 28 Sand, gray, coarse, very clayey, silty, oxidized, saturated
28 - 55 Sand, gray, fine to medium, unoxidized, saturated, clean

TEST HOLE NUMBER: 169
LOCATION: 098N-51W-05CCCC
LEGAL LOCATION: SW SW SW SW sec. 05, T. 098 N., R. 51 W.

4 - 12 Gravel, brown, medium-grained

TEST HOLE NUMBER: 170
LOCATION: 098N-51W-05H1AA
LEGAL LOCATION: NE NE NW NW sec. 06, T. 098 N., R. 51 W.

0 - 13 Sand and gravel

TEST HOLE NUMBER: 171
LOCATION: 098N-51W-05H2AA
LEGAL LOCATION: NE NE NW NE sec. 08, T. 098 N., R. 51 W.

6 - 9 Sand, reddish-brown, medium to coarse, clayey, oxidized, saturated

TEST HOLE NUMBER: 172
LOCATION: 098N-51W-08ACC
LEGAL LOCATION: SW SW SW NE sec. 08, T. 098 N., R. 51 W.

20 - 31 Sand, coarse, clayey

TEST HOLE NUMBER: 173
LOCATION: 098N-51W-08B1AA
LEGAL LOCATION: NE NE NE NW sec. 08, T. 098 N., R. 51 W.

6 - 50 Sand, medium to coarse; with some fine gravel

TEST HOLE NUMBER: 174
LOCATION: 098N-51W-08BCDC

29
LEGAL LOCATION: SW NW SE SW sec. 08, T. 098 N., R. 51 W.

9 - 14 Sand, fine to coarse, silty
14 - 18 Sand and gravel, fine to coarse sand; clean
18 - 29 Sand and gravel, fine to coarse sand; very silty; with a thin layer of fine gravel at 24 feet, stiff drilling

TEST HOLE NUMBER: 175
LOCATION: 098N-51W-6BCDC
LEGAL LOCATION: NE SW SE SW sec. 08, T. 098 N., R. 51 W.

7 - 10 Gravel and sand, fine gravel, fine to coarse sand; slightly silty

TEST HOLE NUMBER: 176
LOCATION: 098N-51W-0BCDC
LEGAL LOCATION: SE SW SE SW sec. 08, T. 098 N., R. 51 W.

3 - 7 Gravel and sand, fine gravel, medium to coarse sand; clean

TEST HOLE NUMBER: 177
LOCATION: 098N-51W-0BCDC
LEGAL LOCATION: SE SW SE SW sec. 08, T. 098 N., R. 51 W.

0 - 18 Gravel and sand, fine gravel, medium to coarse sand, slightly silty
18 - 29 Sand, medium to coarse; clean

TEST HOLE NUMBER: 178
LOCATION: 098N-51W-0BCDD
LEGAL LOCATION: SE SE SW SW sec. 08, T. 098 N., R. 51 W.

0 - 6 Sand, rust-colored, clayey
6 - 60 Sand, coarse, well-sorted; some fine gravel

TEST HOLE NUMBER: 179
LOCATION: 098N-51W-12CC
LEGAL LOCATION: SW SW SW SW sec. 12, T. 098 N., R. 51 W.

8 - 14 Sand, red; ochreose; weathered granite boulder(?)

TEST HOLE NUMBER: 180
LOCATION: 098N-51W-14DD
LEGAL LOCATION: SE SE SE SE sec. 14, T. 098 N., R. 51 W.

16 - 20 Sand, fine to medium

TEST HOLE NUMBER: 181
LOCATION: 098N-51W-17A
LEGAL LOCATION: NE NE NE NE sec. 17, T. 098 N., R. 51 W.

0 - 6 Gravel
TEST HOLE NUMBER: 182
LOCATION: 098N-51W-17DCCD
LEGAL LOCATION: SE SW SW SE sec. 17, T. 098 N., R. 51 W.
9 - 14 Sand and gravel, brown, medium sand, medium gravel, very clayey; oxidized (outwash)

TEST HOLE NUMBER: 183
LOCATION: 098N-51W-17DDDA
LEGAL LOCATION: NE SE SE SE sec. 17, T. 098 N., R. 51 W.
10 - 17 Sand, fine to coarse
22 - 47 Sand, fine to coarse

TEST HOLE NUMBER: 184
LOCATION: 098N-51W-18BBBB
LEGAL LOCATION: NW NW NW NW sec. 19, T. 098 N., R. 51 W.
2 - 7 Gravel

TEST HOLE NUMBER: 185
LOCATION: 098N-51W-19BBBB 1
LEGAL LOCATION: NW NW NW NW sec. 19, T. 098 N., R. 51 W.
3 - 35 Sand

TEST HOLE NUMBER: 186
LOCATION: 098N-51W-19BBBBC
LEGAL LOCATION: SW NW NW NW sec. 19, T. 098 N., R. 51 W.
0 - 8 Sand and gravel, yellowish-brown, medium sand to medium pebble gravel; wide variety of rock types

TEST HOLE NUMBER: 187
LOCATION: 098N-51W-20A1DD
LEGAL LOCATION: SE SE SE NE sec. 20, T. 098 N., R. 51 W.
4 - 18 Sand, fine

TEST HOLE NUMBER: 188
LOCATION: 098N-51W-28BCBC
LEGAL LOCATION: NW NW NW NW sec. 28, T. 098 N., R. 51 W.
0 - 9 Sand and gravel, reddish-brown, coarse sand, fine to coarse gravel; oxidized, dry; clean
9 - 24 Sand, reddish-brown, coarse, clayey; oxidized, moist; water level at 9 feet
24 - 32 Gravel, gray, medium, clayey, sandy; unoxidized, moist
32 - 52 Sand, gray, medium to coarse; unoxidized, saturated; clean

TEST HOLE NUMBER: 189
LOCATION: 098N-51W-32DCCD
LEGAL LOCATION: SE SW SW SE sec. 32, T. 098 N., R. 51 W.
0 - 7 Sand, reddish-brown, medium to fine; oxidized, dry
7 - 12 Sand, reddish-brown, medium to fine; oxidized, saturated
<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>098N-51W-33BCC</td>
<td>Sand, light-reddish-brown, fine to coarse, slightly clayey; oxidized, saturated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 - 7 Sand and gravel, rusty-brown, fine sand, fine gravel; dry, oxidized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 - 33 Sand, brown, fine to medium; saturated, oxidized, quartzose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33 - 53 Sand, brown, very fine; saturated, oxidized, quartzose</td>
</tr>
<tr>
<td>191</td>
<td>098N-51W-35CCCC</td>
<td>Sand, brown, fine to medium, slightly clayey; oxidized, moist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 - 18 Sand, reddish-brown, fine to medium, slightly clayey; oxidized, saturated</td>
</tr>
<tr>
<td>192</td>
<td>099N-48W-16CCCC</td>
<td>Sand and gravel, fine sand to coarse gravel</td>
</tr>
<tr>
<td>193</td>
<td>099N-48W-20DCCC</td>
<td>Sand, medium</td>
</tr>
<tr>
<td>194</td>
<td>099N-48W-20DDDD</td>
<td>Sand, medium</td>
</tr>
<tr>
<td>195</td>
<td>099N-48W-21BAAA</td>
<td>Sand, coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 - 35 Gravel, coarse</td>
</tr>
<tr>
<td>196</td>
<td>099N-48W-21BCCCC</td>
<td>Sand, reddish-brown, medium to coarse, gravelly; oxidized, dry, clean; hit rock, could not penetrate, abandoned hole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 11</td>
</tr>
<tr>
<td>197</td>
<td>099N-48W-21BCCCC</td>
<td>Sand, light-reddish-brown, fine to coarse, slightly clayey; oxidized, saturated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>
**LEGAL LOCATION:** SW SW SW NW sec. 21, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 12</td>
<td>Sand, reddish-brown, medium to coarse, gravelly; oxidized, dry; clean; bit rock, abandoned hole</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 198**
**LOCATION: 099N-48W-21H2CC 3**
**LEGAL LOCATION:** SW SW SW NW sec. 21, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 12</td>
<td>Sand, reddish-brown, medium to coarse, gravelly; oxidized, dry; clean; bit rock, abandoned hole</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 199**
**LOCATION: 099N-48W-31VDED**
**LEGAL LOCATION:** SE SE SE SE sec. 31, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 19</td>
<td>Sand, medium</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 200**
**LOCATION: 099N-48W-32ABA**
**LEGAL LOCATION:** NW NW NW NE sec. 32, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 23</td>
<td>Sand, medium</td>
<td></td>
</tr>
<tr>
<td>23 - 25</td>
<td>Sand, medium, rocky</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 201**
**LOCATION: 099N-48W-32NAAA**
**LEGAL LOCATION:** NE NE NE NE sec. 32, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td>Sand, brown, silt</td>
<td></td>
</tr>
<tr>
<td>2 - 7</td>
<td>Sand, brown, fine to medium</td>
<td></td>
</tr>
<tr>
<td>7 - 25</td>
<td>Sand and gravel, brown, fine to coarse sand; saturated</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 202**
**LOCATION: 099N-48W-32CBBIC 1**
**LEGAL LOCATION:** SW NW NW SW sec. 32, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 16</td>
<td>Sand, reddish-brown, medium, slightly clayey; oxidized, dry; bit boulder, abandoned hole</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 203**
**LOCATION: 099N-48W-32CBBIC 2**
**LEGAL LOCATION:** SW NW NW SW sec. 32, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 20</td>
<td>Sand, reddish-brown, medium, slightly gravelly; oxidized, dry</td>
<td></td>
</tr>
<tr>
<td>20 - 26</td>
<td>Sand, gray, medium, clayey; unoxidized, moist</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 204**
**LOCATION: 099N-48W-32DCDD**
**LEGAL LOCATION:** SE SE SW SE sec. 32, T. 099 N., R. 48 W.

<table>
<thead>
<tr>
<th>Test Hole Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 - 23</td>
<td>Sand, medium</td>
<td></td>
</tr>
</tbody>
</table>

**TEST HOLE NUMBER: 205**
**LOCATION: 099N-48W-32DCDD 1**
LEGAL LOCATION: SE SE SW SE sec. 32, T. 099 N., R. 48 W.
4 - 22 Sand and gravel, fine sand to coarse gravel
34 - 44 Sand, fine

TEST HOLE NUMBER: 206
LOCATION: 099N-48W-32DD2 2
LEGAL LOCATION: SE SE SW SE sec. 32, T. 099 N., R. 48 W.
4 - 22 Sand and gravel, coarse sand to coarse gravel
34 - 65 Sand, medium to coarse; contains a lot of quartz and some green mineral

TEST HOLE NUMBER: 207
LOCATION: 099N-48W-05AAAA
LEGAL LOCATION: NE NE NE NE sec. 05, T. 099 N., R. 49 W.
13 - 25 Sand, gray, fine

TEST HOLE NUMBER: 208
LOCATION: 099N-48W-12AAAB
LEGAL LOCATION: NW NE NE NE sec. 12, T. 099 N., R. 49 W.
1 - 8 Sand and gravel, medium to coarse

TEST HOLE NUMBER: 209
LOCATION: 099N-48W-12AAAB
LEGAL LOCATION: NE NW NE NE sec. 12, T. 099 N., R. 49 W.
1 - 14 Gravel, very coarse

TEST HOLE NUMBER: 210
LOCATION: 099N-48W-12AAAD
LEGAL LOCATION: SE 55 NE NE sec. 12, T. 099 N., R. 49 W.
0 - 18 Gravel, rusty-brown, medium to coarse, sandy; oxidized, dry
18 - 23 Gravel, coarse; cobbles, dry

TEST HOLE NUMBER: 211
LOCATION: 099N-48W-12ABBA
LEGAL LOCATION: NE NW NW NE sec. 12, T. 099 N., R. 49 W.
6 - 21 Gravel, brown, very coarse, slightly clayey, slightly sandy; oxidized; hit boulder at 21 feet; abandoned hole

TEST HOLE NUMBER: 212
LOCATION: 099N-48W-17CCCB
LEGAL LOCATION: NW SW NW SW sec. 17, T. 099 N., R. 49 W.
24 - 37 Gravel

TEST HOLE NUMBER: 213
LOCATION: 099N-48W-31BCCB 1
<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 214</th>
<th>8</th>
<th>20 - 30</th>
<th>Sand, very fine</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEGAL LOCATION: NW SW NW sec. 31, T. 099 N., R. 49 W.</td>
<td>35</td>
<td>Sand, brown, fine, slightly clayey; oxidized, moist at 15 feet, saturated at 35 feet</td>
<td></td>
</tr>
<tr>
<td>LOCATION: 099N-49W-311DADA</td>
<td>40</td>
<td>Sand, gray, fine, slightly clayey; unoxidized, saturated</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 215</th>
<th>11</th>
<th>11 - 12</th>
<th>Sand, fine; small lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: 099N-49W-322DADC</td>
<td>22</td>
<td>Sand, fine to medium</td>
<td></td>
</tr>
<tr>
<td>LEGAL LOCATION: SW SE SW SE sec. 32, T. 099 N., R. 49 W.</td>
<td>57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 216</th>
<th>0</th>
<th>0 - 19</th>
<th>Sand, buff, very clayey</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: 099N-50W-103DDDD</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEGAL LOCATION: SE SE SE NW sec. 10, T. 099 N., R. 50 W.</td>
<td>19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 217</th>
<th>1</th>
<th>1 - 10</th>
<th>Sand, reddish-brown, coarse, clayey; oxidized, moist</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: 099N-50W-20CCCB</td>
<td>10</td>
<td>Sand and gravel, grayish-brown, coarse sand, fine to medium gravel, clayey; oxidized, moist; water level at 10 feet</td>
<td></td>
</tr>
<tr>
<td>LEGAL LOCATION: NW SW SW SW sec. 29, T. 099 N., R. 50 W.</td>
<td>56</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 218</th>
<th>10</th>
<th>10 - 21</th>
<th>Sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: 099N-50W-30BDBB</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEGAL LOCATION: NW NW NW NW sec. 30, T. 099 N., R. 50 W.</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 219</th>
<th>6</th>
<th>6 - 12</th>
<th>Sand, reddish-brown, coarse, clayey; oxidized, moist</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: 099N-50W-342DADD</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEGAL LOCATION: SE NE SE SE sec. 34, T. 099 N., R. 50 W.</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST HOLE NUMBER: 220</th>
<th>17</th>
<th>17 - 27</th>
<th>Sand, brown, fine-grained; with some clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: 099N-51W-10CCCC</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEGAL LOCATION: SW SW SW SW sec. 10, T. 099 N., R. 51 W.</td>
<td>27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| TEST HOLE NUMBER: 221 | 35 | LOCATION: 099N-51W-28DDDDD | 1 |
LEGAL LOCATION: SE SE SE sec. 28, T. 099 N., R. 51 W.

  25 - 25 Gravel, coarse
  25 - 43 Gravel; interbedded with clay

TEST HOLE NUMBER: 222
LOCATION: 099N-51W-31CCC
LEGAL LOCATION: SW SW SW SW sec. 30, T. 099 N., R. 51 W.

  7 - 14 Gravel

TEST HOLE NUMBER: 223
LOCATION: 099N-51W-31BCCC
LEGAL LOCATION: SW SW NW sec. 31, T. 099 N., R. 51 W.

  2 - 5 Sand and gravel; reddish-brown, coarse sand, fine gravel; oxidized, dry

TEST HOLE NUMBER: 224
LOCATION: 099N-51W-31DCCD
LEGAL LOCATION: SE SW SE SE sec. 31, T. 099 N., R. 51 W.

  8 - 17 Sand, brown, fine

TEST HOLE NUMBER: 225
LOCATION: NE SW SE SE sec. 31, T. 099 N., R. 51 W.

  8 - 39 Sand; water bearing

TEST HOLE NUMBER: 226
LOCATION: 099N-51W-34CCBC
LEGAL LOCATION: SW NW SW SW sec. 34, T. 099 N., R. 51 W.

  17 - 19 Sand, fine to medium

TEST HOLE NUMBER: 227
LOCATION: 100N-49W-14BBBC
LEGAL LOCATION: NW NW NW NW sec. 13, T. 100 N., R. 49 W.

  1 - 24 Sand, brown, peaty

TEST HOLE NUMBER: 228
LOCATION: 100N-49W-22AAAA
LEGAL LOCATION: NW NE NE sec. 22, T. 100 N., R. 49 W.

  7 - 9 Sand and gravel; medium to coarse
  39 - 40 Gravel

TEST HOLE NUMBER: 229
LOCATION: 100N-49W-22CCBB
LEGAL LOCATION: NW NW SW SW sec. 23, T. 100 N., R. 49 W.
2 - 9 Sand, gray, fine, very clayey; moist
9 - 16 Sand, gray, fine to coarse, very clayey; saturated
16 - 22 Gravel, gray, very clayey; saturated

TEST HOLE NUMBER: 230
LOCATION: 100N-49W-26CCAC
LEGAL LOCATION: SW NE SW SW sec. 26, T. 100 N., R. 49 W.
18 - 28 Sand, yellow-brown, medium to coarse, pebbly, angular; contains abundant limestone and shale class

TEST HOLE NUMBER: 231
LOCATION: 100N-49W-31BBAA
LEGAL LOCATION: NE NE NW NW sec. 31, T. 100 N., R. 49 W.
1 - 3 Sand, fine to medium (colun?)
19 - 44 Gravel, medium, sandy (outwash)

TEST HOLE NUMBER: 232
LOCATION: 100N-49W-32DDDD 2
LEGAL LOCATION: SE SE SE SE sec. 32, T. 100 N., R. 49 W.
1 - 8 Sand, rust-red, medium

TEST HOLE NUMBER: 233
LOCATION: 100N-49W-33BBBB 2
LEGAL LOCATION: NW NW NW NW sec. 33, T. 100 N., R. 49 W.
4 - 8 Sand, yellow, medium-grained

TEST HOLE NUMBER: 234
LOCATION: 100N-49W-33DDDC
LEGAL LOCATION: SW SE SE SE sec. 33, T. 100 N., R. 49 W.
3 - 7 Gravel, sandy
7 - 20 Sand and gravel

TEST HOLE NUMBER: 235
LOCATION: 100N-49W-34DDDC
LEGAL LOCATION: SW SW SE NW sec. 34, T. 100 N., R. 49 W.
* THIS LOG CONTAINS UNVERIFIED INFORMATION *

12 - 7 Sand

TEST HOLE NUMBER: 236
LOCATION: 100N-50W-10DDDD
LEGAL LOCATION: SE SE SE SE sec. 10, T. 100 N., R. 50 W.
12 - 25 Sand, brown, medium; some pebbles
| TEST HOLE NUMBER: | 237 |
| LOCATION: | 100N-50W-25BBBB |
| LEGAL LOCATION: | NE NW NW NW sec. 25, T. 100 N., R. 50 W. |
| 0 - 2 | Sand, brown, medium-grained |

| TEST HOLE NUMBER: | 238 |
| LOCATION: | 100N-50W-29AAAA |
| LEGAL LOCATION: | NE NE NE NE sec. 29, T. 100 N., R. 50 W. |
| 0 - 4 | Sand, medium, clayey |

| TEST HOLE NUMBER: | 239 |
| LOCATION: | 100N-51W-11CCDC |
| LEGAL LOCATION: | SW SE SW SW sec. 11, T. 100 N., R. 51 W. |
| 0 - 2 | Sand, fine to medium |

| TEST HOLE NUMBER: | 240 |
| LOCATION: | 100N-51W-28BBAA |
| LEGAL LOCATION: | NE NE NW NW sec. 28, T. 100 N., R. 51 W. |
| 1 - 8 | Sand, red-brown, fine to medium, slightly clayey, oxidized |
| 8 - 22 | Sand, brown, fine to medium, slightly clayey, oxidized, saturated at 16 feet |

| TEST HOLE NUMBER: | 241 |
| LOCATION: | 100N-51W-28CBBB |
| LEGAL LOCATION: | NW NW NW SW sec. 28, T. 100 N., R. 51 W. |
| 1 - 8 | Sand, brown, fine to medium; oxidized, dry, clean |
| 8 - 32 | Sand, brown, fine to medium, clayey; oxidized, moist; saturated at 15 feet |

| TEST HOLE NUMBER: | 242 |
| LOCATION: | 100N-51W-29CCBC |
| LEGAL LOCATION: | SW NW SW SW sec. 29, T. 100 N., R. 51 W. |
| 0 - 6 | Sand and gravel, brown, medium to coarse sand, very coarse gravel, clayey; oxidized, dry |

| TEST HOLE NUMBER: | 243 |
| LOCATION: | 100N-51W-32CCDC |
| LEGAL LOCATION: | SW SE SE SW sec. 32, T. 100 N., R. 51 W. |
| 6 - 11 | Sand, reddish-brown, coarse, clayey; saturated, oxidized |

| TEST HOLE NUMBER: | 244 |
| LOCATION: | 100N-51W-33BCCB |
| LEGAL LOCATION: | NW SW SW NW sec. 33, T. 100 N., R. 51 W. |

* THIS LOG CONTAINS UNVERIFIED INFORMATION *

| 16 - 38 | Gravel |

38
APFENDIX B: List of land tracts in Lincoln County, South Dakota, which are on file with either the South Dakota Department of Transportation, or the Office of Minerals and Mining, Department of Environment and Natural Resources, located in Pierre, South Dakota.

EXPLANATION:

<table>
<thead>
<tr>
<th>Column Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Landowner and address</td>
</tr>
<tr>
<td>b. Location - given in half and quarter sections, section number, township, and range</td>
</tr>
<tr>
<td>c. Aggregate type</td>
</tr>
<tr>
<td>d. Average thickness of deposits in feet</td>
</tr>
<tr>
<td>e. Average thickness of overburden in feet</td>
</tr>
</tbody>
</table>

**Land Tract 1**

| Landowner: E. L. HENDRICK - HUDSON |
| Location: NE¼ sec. 13, T. 96 N., R. 46 W. |
| Aggregate type: GRAVEL |
| Deposit thickness (ft): 12 - 20 |
| Overburden thickness (ft): 0.5 - 3 |

**Land Tract 2**

| Landowner: MERLE SOLBERG - HUDSON |
| Location: NE¼ sec. 24, T. 96 N., R. 48 W. |
| Aggregate type: GRAVEL |
| Deposit thickness: --- |
| Overburden thickness (ft): --- |

**Land Tract 3**

| Landowner: J. COLE AND R. COLE - HUDSON |
| Location: E½ SE¼ NE¼ sec. 25, T. 96 N., R. 48 W. |
| Aggregate type: GRAVEL |
| Deposit thickness (ft): 10 |
| Overburden thickness (ft): 2.9 |

**Land Tract 4**

| Landowner: JOHN GILLMAN - HUDSON |
| Location: NW¼ sec. 36, T. 96 N., R. 48 W. |
| Aggregate type: GRAVEL |
| Deposit thickness (ft): 70 |
| Overburden thickness (ft): 3 |

**Land Tract 5**

| Landowner: --- |
| Location: SW¼ SE¼ sec. 10, T. 96 N., R. 49 W. |
| Aggregate type: GRAVEL |
| Deposit thickness (ft): --- |
| Overburden thickness (ft): --- |
Land Tract 6

a. Landowner: ALDER ODELL
b. Location: E1/2 SW1/4 sec. 14, T. 97 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 7

a. Landowner: LINCOLN COUNTY HIGHWAY DEPT. - CANTON
b. Location: E1/2 SW1/4 sec. 14, T. 97 N., R. 48 W.
c. Aggregate type: ---
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 8

a. Landowner: CHICAGO-MILWAUKEE-ST. PAUL R.R.
b. Location: NW1/4 sec. 23, T. 97 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 9

a. Landowner: SAM POPPENGA - LENNOX
b. Location: NE1/4 sec. 5, T. 97 N., R. 51 W.
c. Aggregate type: SAND AND FINE GRAVEL
d. Deposit thickness (ft): 10
e. Overburden thickness (ft): 2

Land Tract 10

a. Landowner: CARL POPPENGA - LENNOX
b. Location: SE1/4 sec. 5, T. 97 N., R. 51 W.
c. Aggregate type: SAND AND GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 11

a. Landowner: RUSSEL MYERS - CENTERVILLE
b. Location: NW1/4 sec. 17, T. 97 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 12
e. Overburden thickness (ft): 2

Land Tract 12

a. Landowner: ROY SHOGREN - CENTERVILLE
b. Location: E1/2 SW1/4 sec. 17, T. 97 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 6
e. Overburden thickness (ft): 1.5
Land Tract 13
a. Landowner: RALPH LANDSMAN - CENTERVILLE
   b. Location: NE¼ sec. 25, T. 97 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ---
   e. Overburden thickness (ft): ---

Land Tract 14
a. Landowner: PETER J. NELSON - CANTON
   b. Location: NE¼ sec. 5, T. 98 N., R. 48 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ---
   e. Overburden thickness (ft): ---

Land Tract 15
a. Landowner: DRAPER HELDER - CANTON
   b. Location: NW¼ NE¼ sec. 5, T. 98 N., R. 48 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ---
   e. Overburden thickness (ft): ---

Land Tract 16
a. Landowner: DRAPER HELDER - CANTON
   b. Location: SE¼ SW¼ sec. 5, T. 98 N., R. 48 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ---
   e. Overburden thickness (ft): ---

Land Tract 17
a. Landowner: DRAPER HELDER - CANTON
   b. Location: NE¼ sec. 8, T. 98 N., R. 48 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): 6
   e. Overburden thickness (ft): 2.1

Land Tract 18
a. Landowner: DRAPER HELDER - CANTON
   b. Location: SE¼ SW¼ sec. 8, T. 98 N., R. 48 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ---
   e. Overburden thickness (ft): ---

Land Tract 19
a. Landowner: DRAPER HELDER - CANTON
   b. Location: SW¼ SE¼ sec. 8, T. 98 N., R. 48 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ---
   e. Overburden thickness (ft): ---
Land Tract 20
  a. Landowner: JACK CARPENTER - CANTON
  b. Location: NE1/4 sec. 17, T. 98 N., R. 48 W.
  c. Aggregate type: GRAVEL
  d. Deposit thickness (ft): ---
  e. Overburden thickness (ft): ---

Land Tract 21
  a. Landowner: ROSCOE G. MCVAY - CANTON
  b. Location: SE1/4 SW1/4 sec. 17, T. 98 N., R. 48 W.
  c. Aggregate type: GRAVEL
  d. Deposit thickness (ft): 8.7
  e. Overburden thickness (ft): 3.3

Land Tract 22
  a. Landowner: MYRL AND ROY'S PAVING, INC. - SIOUX FALLS
  b. Location: SE1/4 sec. 17, T. 98 N., R. 48 W.
  c. Aggregate type: ---
  d. Deposit thickness (ft): ---
  e. Overburden thickness (ft): ---

Land Tract 23
  a. Landowner: ROSCOE G. MCVAY - CANTON
  b. Location: SE1/4 sec. 17, T. 98 N., R. 48 W.
  c. Aggregate type: GRAVEL
  d. Deposit thickness (ft): 6.8
  e. Overburden thickness (ft): 3.5

Land Tract 24
  a. Landowner: LEO JOHNSON - CANTON
  b. Location: W1/2 NW1/4 sec. 14, T. 98 N., R. 49 W.
  c. Aggregate type: GRAVEL
  d. Deposit thickness (ft): ---
  e. Overburden thickness (ft): ---

Land Tract 25
  a. Landowner: ---
  b. Location: SE1/4 sec. 15, T. 98 N., R. 49 W.
  c. Aggregate type: GRAVEL
  d. Deposit thickness (ft): ---
  e. Overburden thickness (ft): ---

Land Tract 26
  a. Landowner: W.W. FOWLER - CANTON
  b. Location: W1/2 SE1/4 sec. 22, T. 98 N., R. 49 W.
  c. Aggregate type: GRAVEL
  d. Deposit thickness (ft): 12
  e. Overburden thickness (ft): 1.5

42
Land Tract 27
a. Landowner: OBEI ULRICKSON - CANTON
b. Location: SE¼ SE¼ sec. 22, T. 98 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 4.3
e. Overburden thickness (ft): 3.1

Land Tract 28
a. Landowner: HENRY CORNELIUS - CANTON
b. Location: SW¼ sec. 24, T. 98 N., R. 49 W.
c. Aggregate type: SAND
d. Deposit thickness (ft): 10
e. Overburden thickness (ft): 2.5

Land Tract 29
a. Landowner: CLARENCE M. PETERSON - SIOUX FALLS
b. Location: NE¼ sec. 27, T. 98 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 4
e. Overburden thickness (ft): 3

Land Tract 30
a. Landowner: FOWLER ESTATE - CANTON
b. Location: NW¼ sec. 27, T. 98 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 31
a. Landowner: HENRY LIEB - CANTON
b. Location: NW¼ sec. 28, T. 98 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 5
e. Overburden thickness (ft): 3

Land Tract 32
a. Landowner: MARY DEVITT - PALM SPRINGS, CALIFORNIA
b. Location: NW¼ sec. 28, T. 98 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 11
e. Overburden thickness (ft): 3.4

Land Tract 33
a. Landowner: JOHN URGEN - CANTON
b. Location: W¼ SW¼ sec. 28, T. 98 N., R. 49 W.
c. Aggregate type: SAND
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---
Land Tract 34
a. Landowner: PHIL RENNTER - CANTON
   b. Location: SW¼ SE¼ sec. 30, T. 98 N., R. 49 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): 6
   e. Overburden thickness (ft): 2

Land Tract 35
a. Landowner: ...
   b. Location: NW¼ sec. 2, T. 98 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ...
   e. Overburden thickness (ft): ...

Land Tract 36
a. Landowner: NELLIE BOSSMAN - SHELDON, IOWA
   b. Location: E½ SW¼ sec. 5, T. 98 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ...
   e. Overburden thickness (ft): ...

Land Tract 37
a. Landowner: ELROY BOSSMAN - LENNOX
   b. Location: W½ SW¼ sec. 5, T. 98 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ...
   e. Overburden thickness (ft): ...

Land Tract 38
a. Landowner: NELLIE BOSSMAN - SHELDON, IOWA
   b. Location: SE¼ SW¼ sec. 5, T. 98 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ...
   e. Overburden thickness (ft): ...

Land Tract 39
a. Landowner: HENRY E. SMIT - LENNOX
   b. Location: NE¼ sec. 6, T. 98 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ...
   e. Overburden thickness (ft): ...

Land Tract 40
a. Landowner: ...
   b. Location: NE¼ sec. 8, T. 98 N., R. 51 W.
   c. Aggregate type: GRAVEL
   d. Deposit thickness (ft): ...
   e. Overburden thickness (ft): ...

44
Land Tract 41
a. Landowner: SAM BUSE - LENNOX
b. Location: E11/2 NW¼ sec. 6, T. 98 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 5
e. Overburden thickness (ft): 2.5

Land Tract 42
a. Landowner: BEN BURMA - LENNOX
b. Location: NW¼ sec. 8, T. 98 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 8.5
e. Overburden thickness (ft): 4.5

Land Tract 43
a. Landowner: DICK KNOCK - LENNOX
b. Location: SE1/4 SW¼ sec. 8, T. 98 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 6.3
e. Overburden thickness (ft): 2.5

Land Tract 44
a. Landowner: CLARENCE OURE - BELOIT, IOWA
b. Location: NE¼ sec. 20, T. 98 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 10
e. Overburden thickness (ft): 1

Land Tract 45
a. Landowner: RUSSEL SCHNEIDERMAN - LENNOX
b. Location: SE¼ sec. 20, T. 98 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 8.3
e. Overburden thickness (ft): 3

Land Tract 46
a. Landowner: ---
b. Location: SW¼ sec. 28, T. 98 N., R. 51 W.
c. Aggregate type: SAND AND GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 47
a. Landowner: HENRY SMIT - LENNOX
b. Location: NE¼ sec. 32, T. 98 N., R. 51 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---
Land Tract 48

a. Landowner: ---
b. Location: SE¼ sec. 32, T. 98 N., R. 51 W.
c. Aggregate type: SAND AND GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 49

a. Landowner: LAWRENCE SWANSON - CANTON
b. Location: NW¼ sec. 7, T. 99 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 50

a. Landowner: V. SWANSON AND L. SWANSON - SIOUX FALLS
b. Location: NW¼ SW¼ sec. 7, T. 99 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 10 - 12
e. Overburden thickness (ft): 1.5 - 3.0

Land Tract 51

a. Landowner: FRANK N. JONES - CANTON
b. Location: NE¼ sec. 29, T. 99 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 52

a. Landowner: FRANK N. JONES - CANTON
b. Location: SW¼ sec. 29, T. 99 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 53

a. Landowner: FRANK N. JONES - CANTON
b. Location: SE¼ sec. 29, T. 99 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 54

a. Landowner: RICHARD LOMMEN - HARRISBURG
b. Location: NE¼ sec. 32, T. 99 N., R. 48 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

46
Land Tract 55
a. Landowner: LINCOLN COUNTY HIGHWAY DEPT. - CANTON
b. Location: N½ NE¼ sec. 32, T. 99 N., R. 48 W.
c. Aggregate type: ---
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 56
a. Landowner: RICHARD LOMMEN - HARRISBURG
b. Location: N½ NE¼ sec. 32, T. 99 N., R. 48 W.
c. Aggregate type: ---
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 57
a. Landowner: TED PICK - CANTON
b. Location: SW¼ NE¼ sec. 1, T. 99 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 58
a. Landowner: TED PICK - CANTON
b. Location: W½ sec. 1, T. 99 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): 7.8
e. Overburden thickness (ft): 3.2

Land Tract 59
a. Landowner: LIZZIE EVENSON
b. Location: NE¼ sec. 8, T. 99 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 60
a. Landowner: LAWRENCE SWANSON - CANTON
b. Location: NE¼ sec. 12, T. 99 N., R. 49 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

Land Tract 61
a. Landowner: E.E. SOLEM - WORTHING
b. Location: SW¼ sec. 33, T. 99 N., R. 50 W.
c. Aggregate type: GRAVEL
d. Deposit thickness (ft): ---
e. Overburden thickness (ft): ---

47
Land Tract 62
a. Landowner: H.A. ROETZEL  
b. Location: SE1/4 sec. 33, T. 99 N., R. 50 W.  
c. Aggregate type: GRAVEL  
d. Deposit thickness (ft): —  
e. Overburden thickness (ft): —

Land Tract 63
a. Landowner: EVERETT H. SCHNEIDERMAN - LENNOX  
b. Location: NW1/4 sec. 5, T. 99 N., R. 51 W.  
c. Aggregate type: GRAVEL  
d. Deposit thickness (ft): 6  
e. Overburden thickness (ft): 3

Land Tract 64
a. Landowner: H. SMIT AND CHRISTINE SMIT - LENNOX  
b. Location: SE1/4 sec. 31, T. 99 N., R. 51 W.  
c. Aggregate type: GRAVEL  
d. Deposit thickness (ft): 9  
e. Overburden thickness (ft): —

Land Tract 65
a. Landowner: CARL PICTERS - LARCHWOOD, IOWA  
b. Location: NW1/4 sec. 24, T. 100 N., R. 49 W.  
c. Aggregate type: GRAVEL  
d. Deposit thickness (ft): —  
e. Overburden thickness (ft): —

Land Tract 66
a. Landowner: M. JOHNSON - LARCHWOOD, IOWA  
b. Location: SW1/4 sec. 24, T. 100 N., R. 49 W.  
c. Aggregate type: GRAVEL  
d. Deposit thickness (ft): —  
e. Overburden thickness (ft): —

Land Tract 67
a. Landowner: ART EVENSON - VALLEY SPRINGS  
b. Location: NE1/4 sec. 34, T. 100 N., R. 49 W.  
c. Aggregate type: GRAVEL  
d. Deposit thickness (ft): 10  
e. Overburden thickness (ft): 2.5

48