

**STATE OF SOUTH DAKOTA**  
Frank Farrar, Governor

**SOUTH DAKOTA GEOLOGICAL SURVEY**  
Duncan J. McGregor, State Geologist

**Special Report 49**

**GROUND-WATER INVESTIGATION FOR THE CITY OF  
GREGORY, SOUTH DAKOTA**

by  
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Science Center  
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## CONTENTS

	Page
Introduction . . . . .	1
Present investigation . . . . .	1
Location and extent of area . . . . .	1
General geology . . . . .	1
Surficial deposits . . . . .	1
Exposed bedrock . . . . .	1
Subsurface bedrock . . . . .	6
Ground water . . . . .	6
Concepts . . . . .	6
Ground water in surficial deposits . . . . .	8
Ground water in exposed bedrock . . . . .	8
Ground water in subsurface bedrock . . . . .	9
Quality of ground water . . . . .	9
Conclusions and recommendations . . . . .	9
References cited . . . . .	13

## ILLUSTRATIONS

	Page
Figure	
1. Map showing the major physiographic divisions of east-central South Dakota and location of the Gregory area . . . . .	2
2. Map showing location of recommended areas for additional water supplies at Gregory . . . . .	3
3. Generalized geologic map of the Gregory area . . . . .	4
4. Data map of the Gregory area . . . . .	5
5. Map showing thickness of saturated sand in the Gregory area . . . . .	7
Table	
1. Chemical analyses of water from the Gregory area . . . . .	10
Appendix A. Logs of test holes and wells in the Gregory area . . . . .	14
Appendix B. Well records in the Gregory area . . . . .	44

## INTRODUCTION

### Present Investigation

This report contains the results of a special investigation by the South Dakota Geological Survey from June 10 to July 24, 1968, in and around the city of Gregory, Gregory County, South Dakota (fig. 1), for the purpose of assisting the city in locating a future water supply.

Gregory now obtains its water from 17 wells within the city limits. The combined production of the wells is 300 gallons per minute.

A survey of the ground-water possibilities was conducted in the Gregory area. Included in this survey were: (1) a review of the geology as mapped by the South Dakota Geological Survey (Baker, 1951, and Stevenson, 1958), (2) the drilling of 125 auger test holes and 3 rotary test holes, and (3) the collection of 18 water samples for analysis. As a result of the ground-water survey, two areas are recommended for further testing (fig. 2).

The cooperation of the residents of Gregory, especially Mayor Lloyd Harrison, and the city councilmen, was greatly appreciated. Special thanks are due to Oliver Drilling Company for making their well records available and to the State Chemical Laboratory for analyzing the water samples.

### Location and Extent of Area

The city of Gregory is located in south-central South Dakota in Gregory County. The area is in the Great Plains physiographic province (fig. 1). The Gregory area as used in this report includes a region that measures 8 miles north-south and 8 miles east-west (fig. 2).

## GENERAL GEOLOGY

### Surficial Deposits

The surficial deposits of the Gregory area include Recent alluvium, Pleistocene deposits of the Herrick Formation and terrace deposits along Ponca Creek.

Alluvial material has been deposited along Ponca Creek. Alluvium consists of sand and some clay in this area. Maximum thickness of the deposit is 22 feet (Test Hole No. 100, App. A).

The Herrick Formation is a coarse, light-colored arkosic sand (Stevenson, 1958). This sand is found exposed on the upland surface in the east-central and southeast portions of the study area (fig. 3).

Terrace deposits of Pleistocene age are present along Ponca Creek. These deposits consist of silty sand and interbedded gravel. Maximum thickness of the terrace deposits in the study area is 47 feet (Test hole 115, App. A, fig. 4).

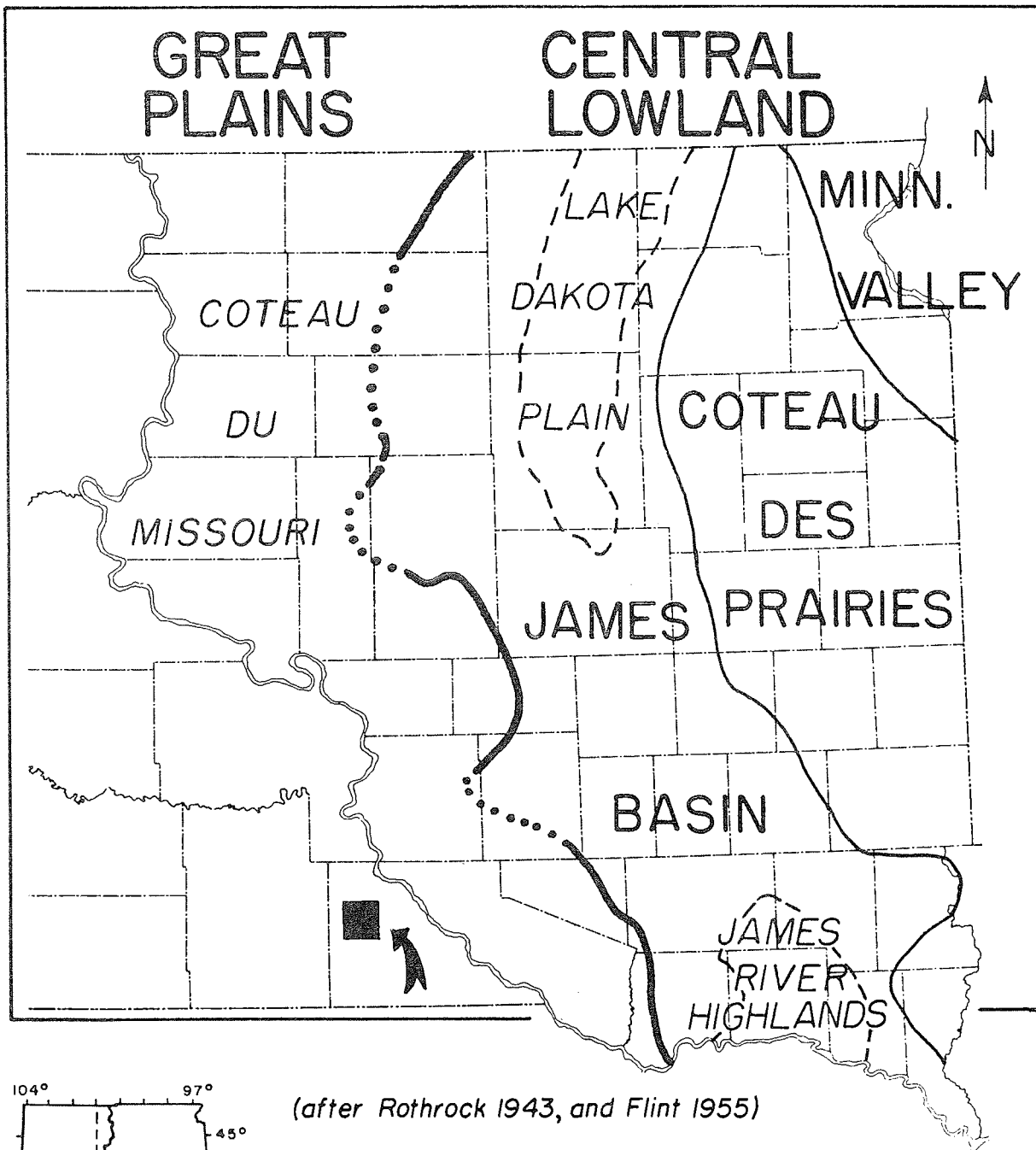
### Exposed Bedrock

The Cretaceous Pierre Shale, a thick marine sediment, underlies the entire area and crops out at lower altitudes. The Pierre locally is overlain by Continental Tertiary deposits. The Tertiary deposits are represented by a basal varicolored clay and by deposits of the Pliocene Ogallala Group which is represented by the Ash Hollow Formation and Valentine Formation.

Exposures of the Ash Hollow Formation are restricted to the upland areas where erosion has not removed this deposit (fig. 3). The Ash Hollow Formation is a greenish-tan, fine-grained, arkosic sand which is partially cemented, and contains beds of greenish-tan clay.

The Valentine Formation underlies the Ash Hollow Formation and is present at the surface over much of the Gregory area (fig. 3). The Valentine consists mostly of greenish-tan to tan, fine- to medium-grained sand.

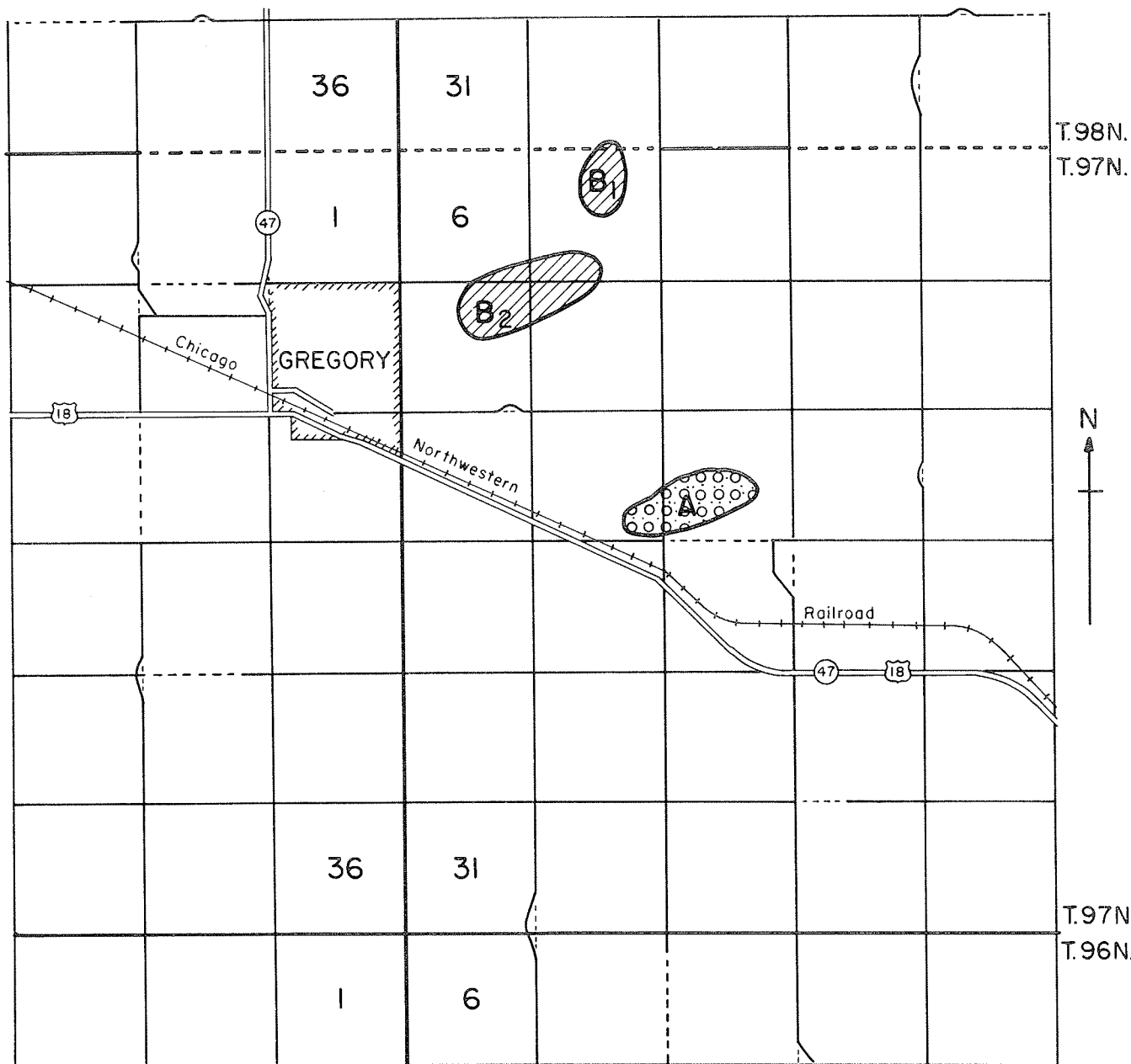
The maximum thickness of the Ogallala Group penetrated by a test hole in the Gregory



(after Rothrock 1943, and Flint 1955)

■ Gregory area

Figure 1. Map showing the major physiographic divisions of east-central South Dakota and location of the Gregory area.



by A. Barari, 1969

R.73W. R.72W.

**EXPLANATION**

- A** Area A
- B<sub>1</sub>** Area B<sub>1</sub>
- B<sub>2</sub>** Area B<sub>2</sub>

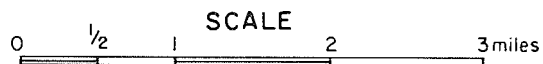
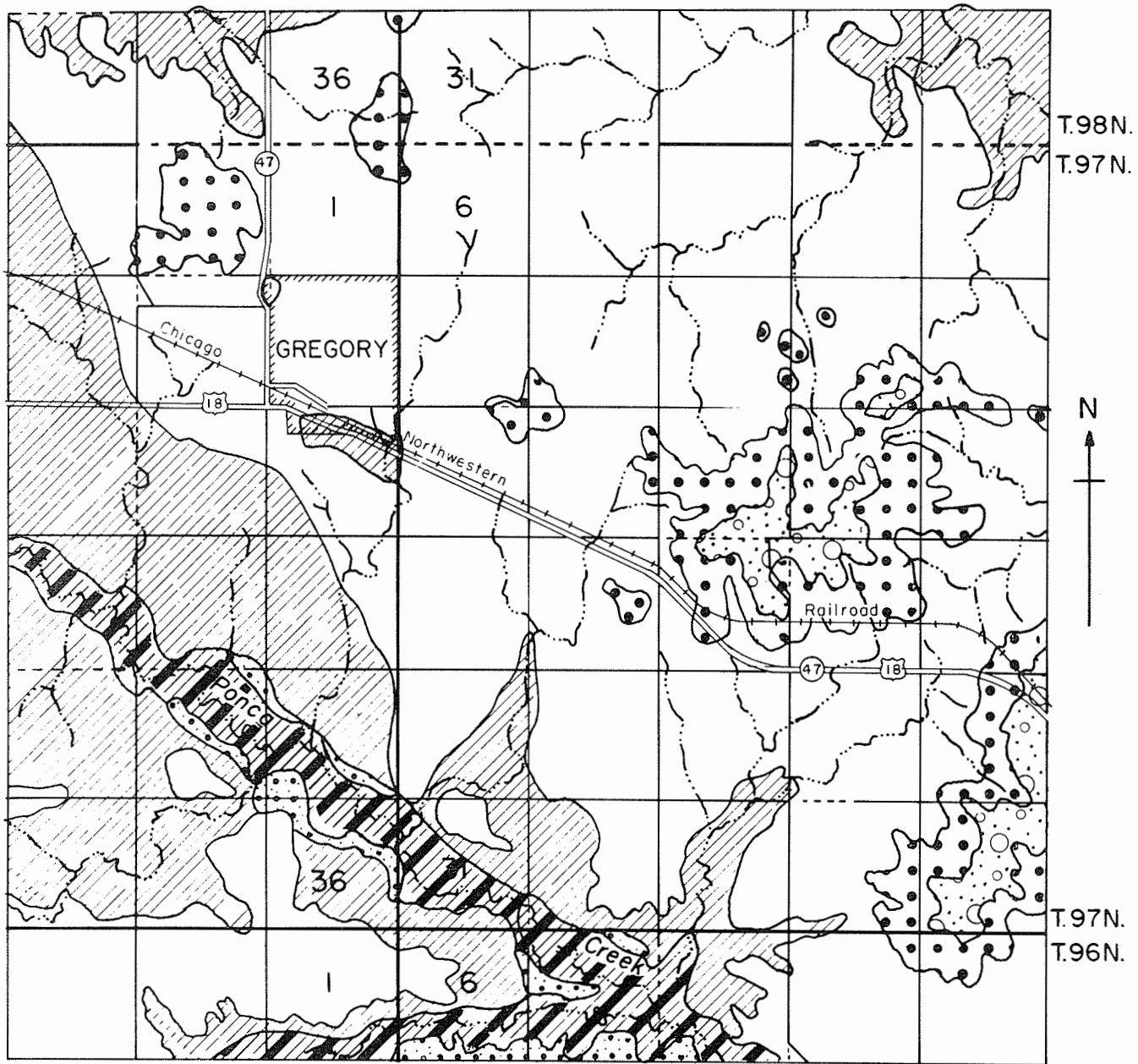


Figure 2. Map showing location of recommended areas for additional water supplies at Gregory.



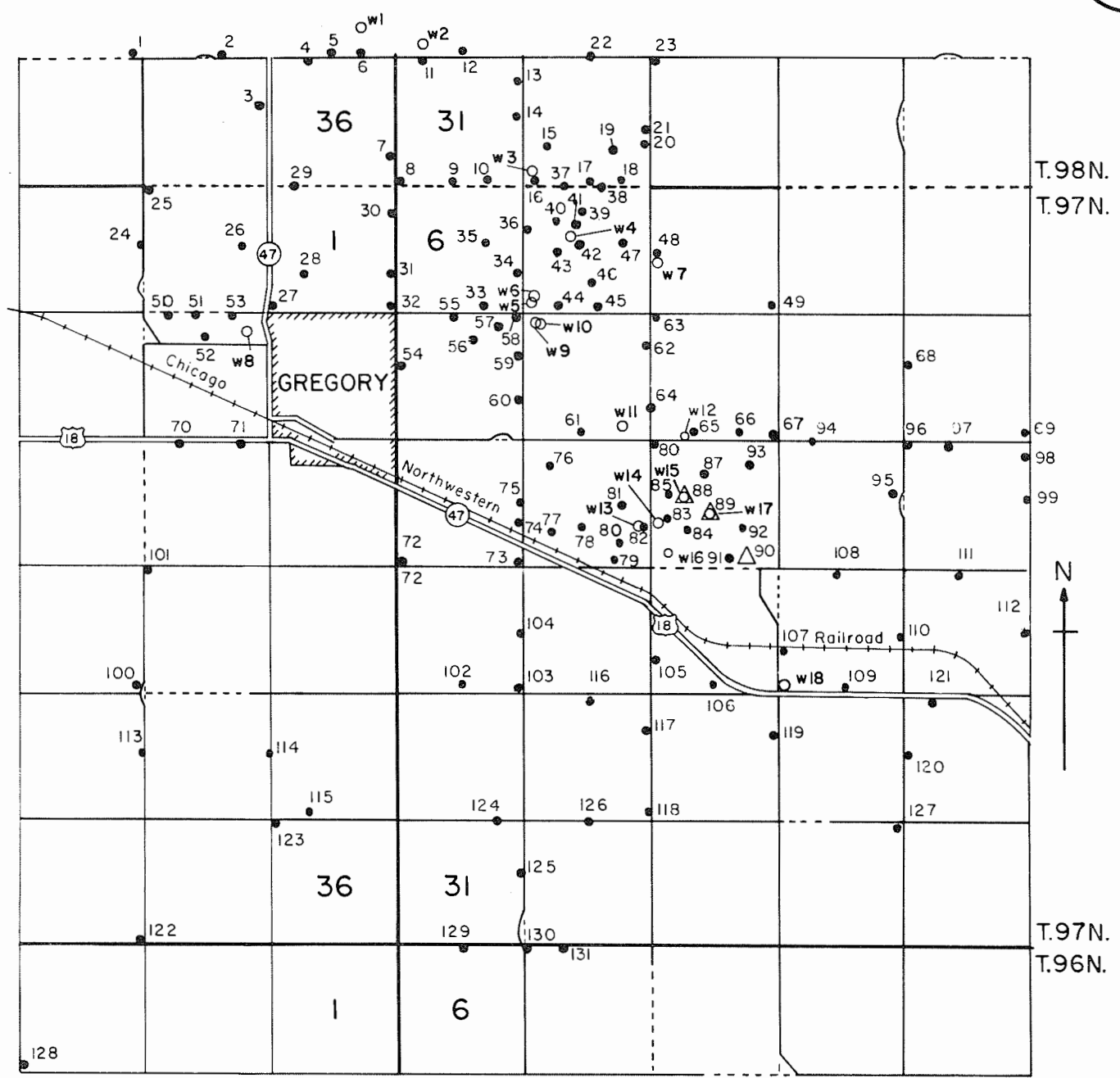
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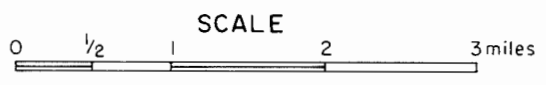


- EXPLANATION**
- Alluvium
  - Terrace Deposits
  - Herrick Formation
  - Ash Hollow Formation
  - Valentine Formation
  - Pierre Formation

Figure 3. Generalized geologic map of the Gregory area. (Modified from C.L. Baker, 1951, and R.E. Stevenson, 1958)



by A. Barari, 1969 R.73W. R.72W.



- EXPLANATION**
- w4o Water Sample
  - 4• South Dakota Geological Survey test hole
  - △ Test wells drilled by Oliver Drilling Co.

Figure 4. Data map of the Gregory area.



area is 130 feet (test hole 92, App. A). It is difficult to differentiate between the Ash Hollow Formation and the Valentine Formation by the data obtained from test holes. The data on Figure 5 show the saturated sand thickness of these two formations, although in general the saturation is mostly in the Valentine Formation.

A varicolored clay underlies the Valentine Formation at some locations. The clay sometimes contains sand and pebbles. The presence of this clay deposit has been determined from test hole data. To the east of the study area but in the Gregory geologic quadrangle (Stevenson, 1958), a clay in a similar stratigraphic position is mapped as Brule Formation. More information is required to determine whether the varicolored clay in the study area is the Brule Formation.

The Cretaceous Pierre Shale is a dark, platy marine clay shale. It is gray to dark-gray, calcareous to noncalcareous shale. The total thickness of this formation is approximately 800 feet in the Gregory area.

### Subsurface Bedrock

The subsurface information is extrapolated to the Gregory area from oil test wells in Tripp and Gregory Counties.

Stratified rocks of Cretaceous age lie beneath the Pierre Shale and in descending order are: Niobrara Marl, Carlile Shale, Greenhorn Limestone, Belle Fourche Formation, Dakota Formation, Skull Creek Shale, and the Inyan Kara Group.

The Niobrara Marl consists mostly of light- to medium-gray, white speckled, calcareous shale or marl and is approximately 180 feet thick.

The Carlile Shale is a light- to medium-gray, plastic shale and is about 220 feet thick.

The Greenhorn Limestone ranges between a nearly white fragmental limestone and a medium-gray, very calcareous shale and is about 80 feet thick.

The Belle Fourche Shale is about 100 feet thick and consists of medium-gray shale.

The Dakota Formation, which consists of alternating shale and sandstone, is nearly 420 feet thick and is mostly sandstone near the base.

The Skull Creek Shale is a medium-gray shale and is approximately 40 feet thick.

The Inyan Kara Group consists of alternating beds of shale and sandstone and is at least 300 feet thick in the study area.

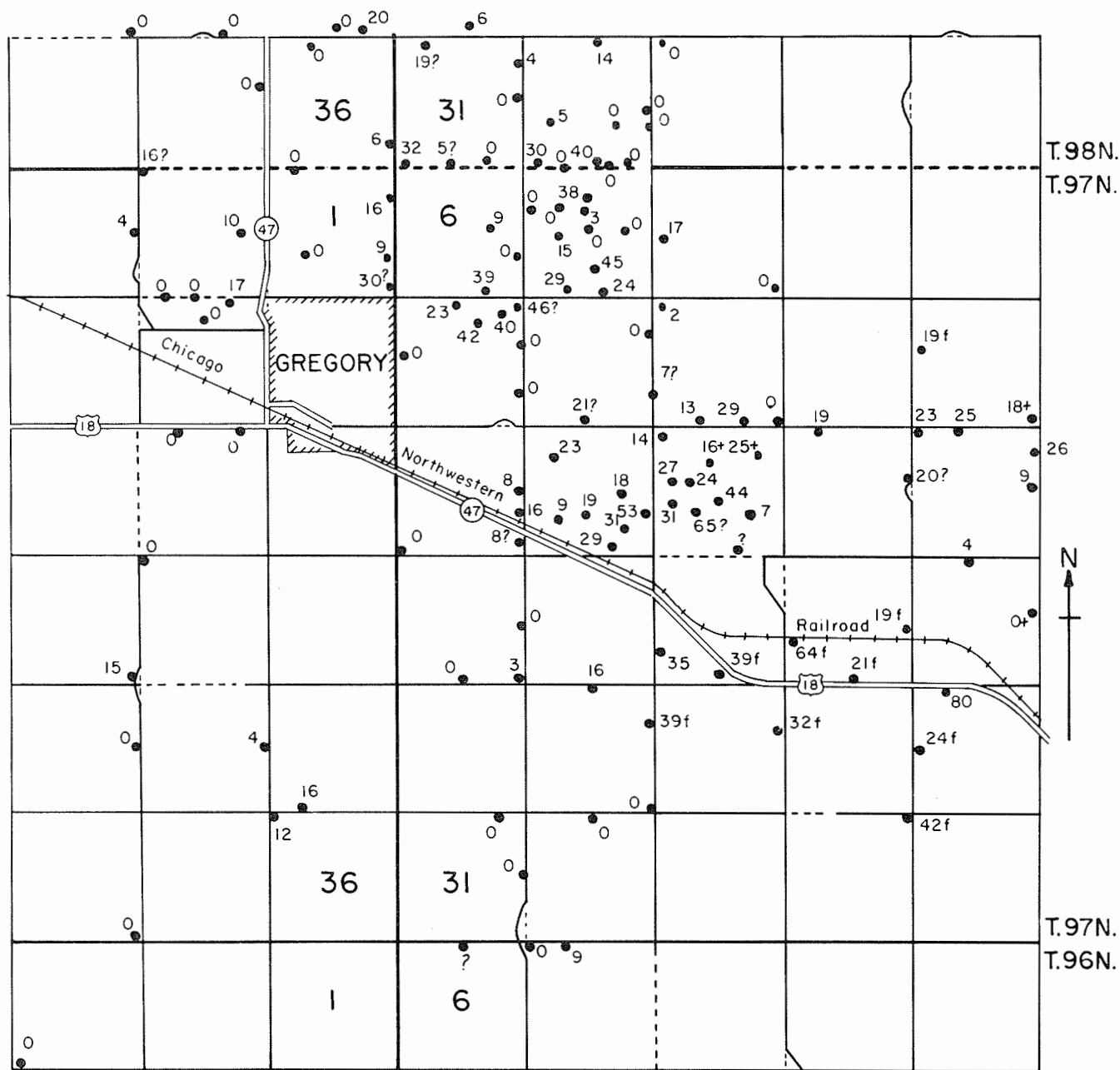
Below the Inyan Kara Group are Paleozoic sediments ranging in age from Permian to Cambrian. Based on the data gathered from the adjacent counties, the following sediments probably are present in this area. More information is necessary to identify the thickness of each formation. The Pennsylvanian system is represented by the Roundtop Formation which is a varicolored shale, and the Fairbank Formation which is a sandstone. The Mississippian system is represented by carbonates in the Lodgepole Formation. The Devonian-Silurian system consists of sandstone. The Ordovician system is represented by sandy and porous Red River carbonates. The Precambrian basement rock is a red medium- to coarse-grained granite.

## GROUND WATER

### Concepts

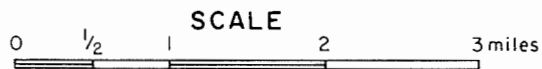
Ground water is defined as water contained in the open spaces within rocks or sediments that is found below the water table. The water table is the upper surface of the zone of saturation. Practically all open spaces in the rocks that lie beneath the water table are filled with water. Rocks (including the soil) that lie above the water table are in the zone of aeration. Some of the interstices in this zone are also filled with water, but the water is either held in them by molecular attraction or is moving downward toward the zone of saturation. Water within the ground moves downward through the unsaturated zone under the action of gravity, whereas in the saturated zone it moves in a direction determined by the surrounding hydraulic head.

Contrary to popular belief, ground water does not occur in "veins" that crisscross the



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R.73W. R.72W.



**EXPLANATION**

- 31 ● Test hole showing thickness of saturated sand.
- 24f ● Saturated thickness of fine sand.

Figure 5. Map showing thickness of saturated sand in the Gregory area.

land at random. Instead it can be shown that water is found nearly everywhere beneath the surface, but at varying depths.

Nearly all ground water is derived from precipitation in the form of rain, melting snow, or ice. This water either evaporates, percolates directly downward to the water table and becomes ground water, or drains off as surface water. Surface water either evaporates, escapes to the ocean by streams, or percolates downward into the rocks.

Recharge is the addition of water to an aquifer (formation having structures that permit appreciable water to move through it under ordinary field conditions), and is accomplished in four main ways: (1) by downward percolation of precipitation from the ground surface, (2) by downward percolation from surface bodies of water, (3) by lateral underflow of water in transient storage, and (4) by artificial recharge, which takes place from excess irrigation, seepage from canals, and water purposely applied to augment ground-water supplies.

Discharge of ground water from an aquifer is accomplished in four main ways: (1) by evaporation and transpiration of plants, (2) by seepage upward or laterally into surface bodies of water, (3) by lateral movement of water in transient storage, and (4) by pumping from wells, which constitutes the major artificial discharge of ground water.

The porosity of a rock or soil is a measure of the contained open pore spaces, and it is expressed as the percentage of void spaces to the total volume of the rock. The porosity of a sedimentary deposit depends chiefly on (1) the shape and arrangement of its particles, (2) the degree of assortment of its particles, (3) the cementation and compaction to which it has been subjected since its deposition, (4) removal of mineral matter through solution by percolating waters, and (5) fracturing of the rock, resulting in joints and other openings. Thus, the size of the material has no or little effect on porosity if all other factors are equal.

The permeability of a rock is its capacity for transmitting a fluid. Water will pass through a material with interconnected pores, but will not pass through material with unconnected pores, even if the latter material has a higher porosity. Therefore, permeability and porosity are not synonymous.

### **Ground Water in the Surficial Deposits**

Alluvium in the Gregory area consists of sand mixed with some clay. The maximum saturated thickness of this deposit upstream from the junction of runoff from the sewage disposal plant is 15 feet. It could provide enough water for farm wells but should not be considered as a high-yield water source.

The terrace deposits and the Herrick Formation are mostly above the water table and therefore are not considered to be potential high-yield water producers. Locally, these formations could supply adequate water for domestic or farm wells.

### **Ground Water in Exposed Bedrock**

The Ash Hollow Formation, Valentine Formation, and the varicolored clay contain large amounts of water where they are below the water table. Because of high clay content the Ash Hollow and the varicolored clay cannot be considered as high water-yielding formations.

The grain size and the amount of clay in the Valentine Formation vary locally. The Valentine sand is a good water source where the sand contains less clay and is of medium to coarse grain size. Figure 5 shows the thickness of saturated sand in the Gregory area. Because of very rapid change of thickness of saturated sand, grain-size, and amount of clay in the formation, it is not practical to contour this map, and in using this map Appendix A should be consulted. An (f) is written on the map after the saturated thickness of sand where the sand is predominantly fine-grained. This fine-grained sand does not easily yield water to a high capacity well, but in the areas where there is a medium to coarse sand adjacent to or surrounding the fine sand, the fine sand acts as a recharge reservoir for the medium-grained sand. This situation is present in area A and to some extent in area B<sub>1</sub> and B<sub>2</sub> (See figs. 2 and 5).

## Ground Water in Subsurface Bedrock

The sandstones of the Dakota Formation and the Inyan Kara Group are the only Cretaceous sediments that can supply an adequate quantity of water for the city of Gregory. The top of the Dakota Formation is at a depth of about 1390 feet and the top of the Inyan Kara is at a depth of approximately 1850 feet at Gregory.

The Paleozoic sediments below the Inyan Kara Group can be considered as a potential source of water although present data does not allow accurate estimates of the potential.

More than one well in any of the subsurface bedrock formations would probably be required to provide an adequate quantity of water for the city of Gregory.

## Quality of Ground Water

Ground water always contains dissolved chemical substances in various amounts. Contained chemicals are derived (1) from the atmosphere as water vapor condenses and falls, (2) from soil and underlying deposits as water moves downward to the water table, and (3) from deposits below the water table where the water is circulating. In general the more chemical substances that a water contains, the poorer its quality.

Table 1 is a comparison of the quality of water from the Valentine Formation in the Gregory area with the Public Health Standards for drinking water.

Samples 13, 14, 15, 16, and 17 are from area A. Except for high manganese in sample 16, high iron in samples 14 and 16, low fluoride content in all the samples, and slightly high nitrate in sample 13, they are within the Public Health standards. Water from area A is generally lower in chemical substances than the water from present city well number 12 (sample no. 8).

Sample 4 is taken from area B<sub>1</sub>. This sample is within the Public Health Standards except for low fluoride content.

Samples 5, 6, 9, and 10 are from area B<sub>2</sub>. Comparison of these samples and their relative locations show a large difference in the chemical quality of the water samples. Therefore, if area B<sub>2</sub> is considered as a supplement to area B<sub>1</sub> for a city water supply the rapid change in quality of water should be considered.

No quality of water data is listed for subsurface bedrock formations at Gregory; however, data from surrounding areas indicate the water is highly mineralized and would require treatment for use as a municipal water supply.

## CONCLUSIONS AND RECOMMENDATIONS

It is recommended that the city of Gregory test for future water supplies in areas A and B<sub>1</sub> (fig. 2). This recommendation is based on the grain size, clay content, areal extent, and the thickness of saturated sand. Area B<sub>1</sub> has coarser and cleaner sand (less clay) than area A but the areal extent is less than that of area A. In the event that area B<sub>1</sub> is considered as a potential supply, area B<sub>2</sub> could also be tested for a supplementary supply. It is doubtful that area B<sub>2</sub> alone would provide an adequate water supply for the city.

Before additional testing is undertaken, the city should hire a consulting engineer licensed in South Dakota. The engineer would plan and coordinate any additional testing. On the basis of the engineer's recommendation a commercial well drilling company should be engaged to drill additional test holes. This would allow location of the best site within area A for installation of a test well. The test well would be used to determine quality of the water, yield, drawdown, and recovery data. Based on the results of the pump test a safe distance between the future wells can be determined. The pump test should be conducted by a qualified hydrologist or engineer and run for a minimum of 72 hours.

The main ground water problem in the Gregory area is the fine nature of the water-bearing material. For this reason, the well(s) should be constructed properly to prevent pumping sand, and to yield the maximum capacity of the aquifer.

If the city should decide to develop a ground-water supply from the subsurface bedrock formations, it is recommended that a test well be drilled through the cretaceous sediments

Table 1.—Chemical analyses of water from the Gregory area.

Sample	Area	Parts Per Million											
		Calcium	Sodium	Magnesium	Chlorides	Sulfate	Iron	Manganese	Nitrate Nitrogen	Fluoride	pH	Hardness as CaCO <sub>3</sub>	Total Solids
A		---	---	50	250	500 <sup>1</sup>	0.3	0.005 <sup>1</sup>	10.0	0.9-1.7 <sup>2</sup>	---	---	1000 <sup>1</sup>
W1		88		14	31	80	0.02	0	7.6	0.33	7.7	276	517
W2		76		6.1	25	39	0.13		28.3		7.4	215	418
W3		89	39	20	37	52	0	0	15	0.2	7.6	305	614
W4	B1	72		8	9	16	0.03	0	3.6	0.29	7.8	212	334
W5	B2	114		13	40	20	0				8.2	340	588
W6	B2	224		22	195	60	0.20		83		7.6	650	1290
W7		76		7	10	50	0		11.7		8.0	220	398
W8		91	7	10	8	28	0.3	0	15	0	7.6	269	394
W9	B2	98	10	21	38	88	0	0	21	0.2	7.0	331	584
W10	B2	194	50	50	117	132	0	0	90	0.4	7.5	691	1254
W11		256		32	115	91	0.03	0		0.58	7.4	770	1355
W12		85		7	30	42	0.05	0		0.28	7.7	240	396
W13	A	68	20	5	9	42	0	0	11	0.4	7.6	190	324
W14	A	37	20	10	7	38	1	0	2	0.2	7.7	145	258
W15	A	53		5	8	12	0.07	0	.012	0.34	7.8	150	289
W16	A	45	20	7	2	18	1	0.34	3	0.6	7.9	141	266
W17	A	45	8	6	2	22	0.11	0	3	0.4	8.0	136	240
W18		72		5	3	14	0	0	0	0.19	7.6	200	347

Except for pH, samples 3, 8, 9, 10, 13, 14, 16, and 17 were analyzed by the South Dakota Chemical Laboratory. The rest of the samples were analyzed by the South Dakota Geological Survey.

<sup>1</sup>Modified for South Dakota by the Department of Health (written communication, Water Sanitation Section, March 20, 1968).

<sup>2</sup>1.2 is optimum for South Dakota.

Location of Water Samples  
(for map location see figure 4)

A. Drinking water standards, U. S. Public Health Service (1962)

- W1. NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 25, T. 98 N., R. 73 W., S. Boxa, 39 feet deep, water table 10 feet.
- W2. SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 30, T. 98 N., R. 72 W., C. Frerichs, 40 feet deep, table 15 feet.
- W3. SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W., R. Becker, 25 feet deep, water table 15 feet.
- W4. NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W., A. Henrecy, 35 feet deep.
- W5. SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W., A. Henrecy, 20 feet deep, water table 10 feet (from the house well).
- W6. NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W., A. Henrecy, 35 feet deep, water table 10 feet (200 feet from the house well).
- W7. SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 4, T. 97 N., R. 72 W., D. Petersen, 30 feet deep, water table 8 feet.
- W8. NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 11, T. 97 N., R. 73 W., City of Gregory (city well no. 12).
- W9. NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 8, T. 97 N., R. 72 W., J. Hlavke, 20 feet deep, water table 11 feet (next to the house).
- W10. NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 8, T. 97 N., R. 72 W., J. Hlavke, 39 feet deep, water table 11 feet (250 feet from the house well).
- W11. SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 8, T. 97 N., R. 72 W., F. Wempe, 40 feet deep, water table 30 feet?
- W12. SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 97 N., R. 72 W., A. Wempe, 40 feet deep.
- W13. SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W., F. Malchow, 35 feet deep.
- W14. SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W., F. Malchow, 35 feet deep.
- W15. SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W., Fred Wempe (city test well).
- W16. NE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W., W. Ronald.
- W17. SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W., F. Malchow (city test well).
- W18. SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 22, T. 97 N., R. 72 W., H. Hutchison, 36 feet deep.

and tests be made to determine the quality and quantity of water from the Dakota Formation and the Inyan Kara Group. The results of the preliminary tests will afford a basis for developing the best water horizon and for proper well design.

Before a permanent well is drilled the city officials should consult with the South Dakota Water Resources Commission to obtain water rights and a permit to drill a city well, and with the South Dakota Department of Health to determine biological and chemical suitability of the water.

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## APPENDIX A

Logs of test holes and wells in the Gregory area  
(for location see figure 4)

## Test Hole No. 1

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 27, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: dry

0- 2	Roadbed
2- 13	Clay, dark-brown
13- 19	Clay, dark-gray, some pebbles

\* \* \* \*

## Test Hole No. 2

Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 26, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: dry

0- 2	Roadbed
2- 17	Clay, brown, some sand
17- 29	Clay, dark-brown, to gray, pebbly

\* \* \* \*

## Test Hole No. 3

Location: NE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 35, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: dry

0- 1	Topsoil
1- 9	Clay, dark-brown, some pebbles
9- 19	Clay, dark-brown
19- 24	Clay, dark-brown to grayish-black

\* \* \* \*

## Test Hole No. 4

Location: NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 36, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: 7 feet

0- 3	Roadbed
3- 7	Clay, dark-brown
7- 11	Clay, black, some sand
11- 24	Shale, yellow-green

\* \* \* \*

## Test Hole No. 5

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 25, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: dry

## Test Hole No. 5 -- continued.

0- 17 Sandy clay, gray-white  
 17- 52 Sand, greenish-gray, with clay  
 52- 72 Sand, whitish-brown, fine to medium  
 72- 73 Rock, could not penetrate

\* \* \* \*

## Test Hole No. 6

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 25, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: 28? feet

0- 5 Roadbed  
 5- 12 Clay, dark-brown, compact  
 12- 19 Clay, light-brown, some pebbles  
 19- 27 Sand, light-brown, fine, some clay  
 27- 47 Sand, light-brown, to yellow, fine to medium  
 47- 59 Shale, yellow-gray

\* \* \* \*

## Test Hole No. 7

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 36, T. 98 N., R. 73 W.

Surface elevation: not measured

Depth to water: 17 feet

0- 1 Topsoil  
 1- 17 Clay, brown-black, pebbly, compact  
 17- 23 Sand, cream, fine to medium  
 23- 34 Shale, yellow-brown

\* \* \* \*

## Test Hole No. 8

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 31, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 20 feet

0- 1 Topsoil  
 1- 5 Clay, brown, compact  
 5- 20 Sand, tan, fine to medium  
 20- 52 Sand, light-brown grading to dark-brown, fine to medium  
 52- 69 Shale, black

\* \* \* \*

## Test Hole No. 9

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 31, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 27? feet

0- 1 Topsoil  
 1- 7 Clay, black to brown  
 7- 17 Clay, light-brown to light-gray  
 17- 32 Sand, light-brown, medium  
 32- 49 Clay, yellow-brown, compact

\* \* \* \*

## Test Hole No. 10

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 31, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 1	Topsoil
1- 5	Clay, black
5- 9	Clay, brown, compact
9- 18	Clay, brown to black, some sand
18- 34	Sand, dark-brown, fine
34- 54	Shale, brown-gray

\* \* \* \*

## Test Hole No. 11

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 31, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 10 feet

0- 1	Topsoil
1- 7	Clay, dark-brown
7- 29	Sand, light-brown to light-gray, medium
29- 49	Clay, yellow-brown

\* \* \* \*

## Test Hole No. 12

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 30, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 20 feet

0- 4	Roadbed
4- 7	Clay, dark-brown, few pebbles
7- 14	Clay, greenish-brown, large pebbles
14- 25	Sand, greenish-tan, fine to medium
25- 26	Rock
26- 44	Clay, gray-brown, compact some pebbles

\* \* \* \*

## Test Hole No. 13

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 31, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 18 feet

0- 5	Roadbed
5- 18	Clay, brown, compact
18- 22	Sand, brown, fine to medium, with clay
22- 29	Shale, grayish-brown

\* \* \* \*

## Test Hole No. 14

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 31, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 7 feet

## Test Hole No. 14 -- continued.

0- 1	Topsoil
1- 4	Clay, black, compact
4- 12	Clay, tan, sandy
12- 25	Shale, grayish-yellow

\* \* \* \*

## Test Hole No. 15

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 31 feet

0- 1	Topsoil
1- 7	Clay, brown, sandy
7- 12	Sand, light-brown, some pebbles
12- 20	Clay, light-brown, sandy
20- 31	Clay, gray-brown, some sand
31- 36	Sand, brown, medium to coarse, with clay
36- 44	Clay, yellow-brown, compact

\* \* \* \*

## Test Hole No. 16

Location: SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 6 feet

0- 1	Topsoil
1- 6	Clay, black, compact
6- 36	Sand, light-brown, fine to medium
36- 54	Clay, brownish-black, grades into shale

\* \* \* \*

## Test Hole No. 17

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 19 feet

0- 4	Topsoil black, clayey
4- 19	Sand, light-brown, fine to medium
19- 59	Sand, light-brown, medium to coarse
59- 69	Clay, light-brown, compact

\* \* \* \*

## Test Hole No. 18

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 4	Topsoil
4- 7	Clay, brown
7- 24	Clay, gray, green, compact, grades into shale

\* \* \* \*

## Test Hole No. 19

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 1	Topsoil
1- 4	Clay, black, compact
4- 6	Clay, brown, compact
6- 8	Sand, brown, fine to medium
8- 19	Clay, yellow, brown, grading to dark-gray shale

\* \* \* \*

## Test Hole No. 20

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 6	Roadbed
6- 10	Clay, light-brown, pebbly, compact
10- 24	Shale, brownish-gray

\* \* \* \*

## Test Hole No. 21

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 10 feet

0- 6	Roadbed
6- 8	Clay, black, some sand
8- 10	Clay, brownish-gray, sandy
10- 13	Clay, dark-brown, sandy
13- 24	Shale, grayish-black

\* \* \* \*

## Test Hole No. 22

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 32, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: 15? feet

0- 6	Roadbed
6- 13	Clay, brown, some sand
13- 29	Sand, greenish-gray, fine to medium, some clay
29- 39	Shale, brownish-gray, with rocks

\* \* \* \*

## Test Hole No. 23

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 33, T. 98 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 1	Topsoil
1- 7	Clay, brown, pebbly, very compact

## Test Hole No. 23 – continued.

7- 24 Shale, brownish-gray

\* \* \* \*

## Test Hole No. 24

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 3, T. 97 N., R. 73 W.

Surface elevation: not measured

Depth to water: 6 feet

0- 1	Topsoil
1- 6	Clay, black, fine sand
6- 10	Sand, brown, fine to medium
10- 30	Shale, red-brown, pebbly, compact

\* \* \* \*

## Test Hole No. 25

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 2, T. 97 N., R. 73 W.

Surface elevation: not measured

Depth to water: 30 feet

0- 3	Roadbed
3- 14	Clay, brown, sandy
14- 18	Sand, brown, medium, some clay
18- 30	Sand, cream, some clay, compact
30-46?	Sand, cream, coarse to medium, much clay
46?- 79	Shale, yellow grading to black

\* \* \* \*

## Test Hole No. 26

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 2, T. 97 N., R. 73 W.

Surface elevation: not measured

Depth to water: 52 feet

0- 2	Topsoil
2- 7	Sand, brown, coarse, some clay
7- 11	Sand, greenish-tan, fine to medium
11- 15	Sand, fine to coarse
15- 32	Sand with clay, light tan
32- 33	Rock (cemented sand?)
33- 52	Sand, whitish-tan, fine to coarse
52- 62	Sand, whitish-tan, fine to coarse, some clay
62- 63	Rock
63- 74	Clay, gray, streaks of brown, very pebbly

\* \* \* \*

## Test Hole No. 27

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 1, T. 97 N., R. 73 W.

Surface elevation: 2211 feet

Depth to water: not measured

0- 4	Sand, light-brown, fine to medium
4- 17	Sand, light-brown, medium to coarse, clean

## Test Hole No. 27 – continued.

17- 36	Sand, dark-brown, fine, some clay
36- 49	Sand, light-brown, fine to medium, some clay
49- 61	Sand, light-brown, fine to medium
61-	Hard rock, could not penetrate

\* \* \* \*

## Test Hole No. 28

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 1, T. 97 N., R. 73 W.

Surface elevation: 2180 feet

Depth to water: dry

0- 1	Topsoil
1- 6	Clay, blackish-brown, compact
6- 11	Clay, greenish-tan, compact
11- 18	Clay, greenish-gray, fine to coarse
18- 33	Clay, dark-brown, to dark-gray

\* \* \* \*

## Test Hole No. 29

Location: NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 1, T. 97 N., R. 73 W.

Surface elevation: not measured

Depth to water: dry

0- 2	Topsoil
2- 9	Clay, black, some fine sand
9- 12	Clay, gray, much fine sand
12- 19	Shale, dark-brown
19- 24	Shale, dark to light gray with brown streaks

\* \* \* \*

## Test Hole No. 30

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 1, T. 97 N., R. 73 W.

Surface elevation: not measured

Depth to water: 19 feet

0- 1	Topsoil
1- 6	Clay, black, with sand
6- 8	Clay, brown, more sand
8- 25	Sand, light-gray to light-brown, fine
25- 44	Clay, yellow-brown to black shale

\* \* \* \*

## Test Hole No. 31

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 1, T. 97 N., R. 73 W.

Surface elevation: 2180 feet

Depth to water: 8 feet

0- 1	Topsoil
1- 6	Clay, cream color
6- 19	Sand, cream, fine, with clay
19- 56	Clay, brownish-gray, sandy
56- 69	Clay, dark-gray, some pebbles

\* \* \* \*

## Test Hole No. 32

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 1, T. 97 N., R. 73 W.

Surface elevation: 2160 feet

Depth to water: 7 feet

0 - 2	Topsoil
2 - 7	Clay, sandy, some pebbles
7 - 37?	Sand, very fine to fine, some clay
37?-107?	Clay, light-brown
107?-124	Shale, brownish-gray

\* \* \* \*

## Test Hole No. 33

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 6, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 6 feet

0- 1	Topsoil
1- 6	Clay, brown, sandy, compact
6- 45	Sand, light-brown, fine to medium
45- 59	Clay, olive-green

\* \* \* \*

## Test Hole No. 34

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 6, T. 97 N., R. 72 W.

Surface elevation: 2175 feet

Depth to water: dry

0- 1	Topsoil
1- 24	Clay, brown, compact

\* \* \* \*

## Test Hole No. 35

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 6, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: 29 feet

0- 1	Topsoil
1- 19	Sand, light-brown, fine to medium
19- 38	Sand, light-brown, fine to medium, with clay
38- 54	Clay, yellow-brown, compact

\* \* \* \*

## Test Hole No. 36

Location: SW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 1	Topsoil
1- 19	Clay, brownish-black, some sand, compact

\* \* \* \*



## Test Hole No. 37

Location: NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 4	Topsoil, black
4- 6	Clay, brown, compact
6- 24	Clay, whitish-gray, compact, grades into shale

\* \* \* \*

## Test Hole No. 38

Location: NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 1	Sand, brown
1- 10	Sand, brown to cream, medium to coarse
10- 21	Clay and sand, brown
21- 29	Shale, yellow with gray streaks

\* \* \* \*

## Test Hole No. 39

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: 13 feet

0- 1	Topsoil
1- 9	Clay, brownish-black
9- 13	Sand, dark-brown, medium
13- 51	Sand, brown, medium, grading to coarse
51- 64	Clay, brownish-green, compact

\* \* \* \*

## Test Hole No. 40

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: dry

0- 7	Sand, brown, fine
7- 24	Sand, cream, fine to medium
24- 28	Clay and sand, brown, compact, pebbly
28- 44	Shale, black, compact

\* \* \* \*

## Test Hole No. 41

Location: SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: not measured

Depth to water: 5 feet

0- 1	Topsoil
1- 5	Clay, dark-brown, fairly compact
5- 8	Sand, light-brown, fine, much clay
8- 14	Shale, yellowish-brown

\* \* \* \*

## Test Hole No. 42

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 16 feet

0-	1	Topsoil
1-	5	Clay, yellowish-gray, pebbly
5-	16	Clay, light-brown, pebbly, fairly compact
16-	18	Clay, light-brown, sandy
18-	29	Shale, brownish-gray, compact

\* \* \* \*

## Test Hole No. 43

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: 2170 feet

Depth to water: 13 feet

0-	1	Topsoil
1-	8	Clay, black, compact, pebbly
8-	13	Sand, light-brown, medium to coarse
13-	28	Sand, light-brown, coarse
28-	44	Shale, black, compact

\* \* \* \*

## Test Hole No. 44

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: 2165 feet

Depth to water: 11 feet

0-	1	Topsoil
1-	6	Clay, black, compact
6-	11	Clay, dark-brown, sandy
11-	40	Sand, gray-brown, with clay
40-	60	Clay, olive-green, fairly compact

\* \* \* \*

## Test Hole No. 45

Location: SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 7 feet

0-	1	Topsoil
1-	7	Clay, light-brown, sandy
7-	31	Sand, light-brown, fine to medium
31-	44	Clay, grayish-green, compact

\* \* \* \*

## Test Hole No. 46

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 11? feet

## Test Hole No. 46 – continued.

0- 1	Topsoil
1- 5	Clay, brownish-black, sandy
5- 8	Clay, black, pebbly, compact
8- 56	Sand, light-brown, fine to medium
56- 74	Clay, dark-brown, compact

\* \* \* \*

## Test Hole No. 47

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 5, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 21 feet

0- 1	Topsoil
1- 11	Clay, light-brown, compact
11- 21	Clay, white-tan, sandy
21- 26	Clay, cream, sandy
26- 39	Shale, yellowish-gray

\* \* \* \*

## Test Hole No. 48

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 4, T. 97 N., R. 72 W.

Surface elevation: 2155 feet

Depth to water: 7? feet

0- 4	Clay, black
4- 7	Clay, brown
7- 10	Clay, grayish-green
10- 18	Sand, and gravel, poorly sorted
18- 27	Sand, light-brown, fine to medium
27- 49	Clay, olive-green, compact

\* \* \* \*

## Test Hole No. 49

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 4, T. 97 N., R. 72 W.

Surface elevation: 2175 feet

Depth to water: dry

0- 2	Topsoil
2- 11	Clay, brown, compact
11- 16	Sand, brown, fine to medium
16- 24	Shale, olive brown

\* \* \* \*

## Test Hole No. 50

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 11, T. 97 N., R. 73 W.

Surface elevation: 2190 feet

Depth to water: dry

0- 1	Topsoil
1- 12	Clay, dark-brown, some sand
12- 19	Clay, gray to dark-gray, compact

\* \* \* \*

## Test Hole No. 51

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 11, T. 97 N., R. 73 W.

Surface elevation: 2210 feet

Depth to water: dry

0- 1	Topsoil
1- 5	Clay, olive-brown
5- 8	Clay, dark-brown, pebbly
8- 10	Clay, whitish-gray, large pebbles
10- 15	Clay, greenish-gray, compact
15- 21	Clay, grayish-brown, with pebbles
21- 28	Clay, light-gray, some pebbles
28- 34	Shale, brownish-gray

\* \* \* \*

## Test Hole No. 52

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 11, T. 97 N., R. 73 W.

Surface elevation: 2183 feet

Depth to water: dry

0- 4	Roadbed
4- 7	Clay, brown, some pebbles
7- 12	Clay, white-brown, some pebbles
12- 17	Sand and clay, light-brown
17- 23	Clay, greenish-tan, some sand
23- 28	Clay, brownish-gray to yellow
28- 32	Clay, dark-gray

\* \* \* \*

## Test Hole No. 53

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 11, T. 97 N., R. 73 W.

Surface elevation: 2190 feet

Depth to water: 10 feet

0- 1	Topsoil
1- 6	Sand, brown, with clay
6- 10	Sand, light-brown, with clay
10- 14	Sand, cream color, much clay
14- 27	Sand, cream, medium to coarse
27-	Rock, could not penetrate; drilled another hole 40 feet to the west; could not penetrate below 28 feet

\* \* \* \*

## Test Hole No. 54

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2176 feet

Depth to water: dry

0- 1	Topsoil
1- 19	Clay, brown, grades to brownish gray shale

\* \* \* \*

## Test Hole No. 55

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 6 feet

0- 1	Topsoil
1- 6	Sand, brown, fine to medium
6- 29	Sand, light-brown, fine to medium
29- 49	Clay, olive-gray, some pebbles, compact

\* \* \* \*

## Test Hole No. 56

Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 10 feet

0- 2	Topsoil, dark-brown, sandy
2- 8	Sandy clay, dark-brown
8- 10	Sand, light-brown, clean
10- 23	Sand, brownish-gray, coarse to medium
23- 33	Sand, light-brown, medium
33- 52	Sand, light-gray, fine, some clay
52- 66	Clay, tan, sandy
66- 79	Clay, greenish-tan, some clay

\* \* \* \*

## Test Hole No. 57

Location: SE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2170 feet

Depth to water: 12 feet

0- 3	Topsoil
3- 7	Clay, greenish-brown, sandy
7- 12	Sand, light-brown, medium
12- 16	Sand, cream, medium to coarse
16- 29	Sand, light-brown, fine to medium, some clay
29- 52	Sand, tan, clean
52- 53	Clay? (hard layer, drilled like clay)
53- 59	Sand, greenish-gray, small amount of clay
59- 87	Clay, grayish-green, sandy
87- 94	Clay, light green

\* \* \* \*

## Test Hole No. 58

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2150 feet

Depth to water: 6 feet

0- 2	Topsoil
2- 6	Sand, tannish-brown, medium
6-50?	Sand, tan, fine to medium
50?- 74	Clay?
74- 78	Rocks
78-113	Clay?

\* \* \* \*

## Test Hole No. 59

Location: SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2180 feet

Depth to water: dry

0- 6	Clay, blackish-brown
6- 9	Sand, light-brown, fine to medium, some clay
9- 12	Clay, light-brown, with sand
12- 24	Clay, light-brown, compact

\* \* \* \*

## Test Hole No. 60

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 7, T. 97 N., R. 72 W.

Surface elevation: 2175 feet

Depth to water: dry

0- 1	Topsoil
1- 9	Clay, brown, sandy
9- 24	Clay, olive-green, compact

\* \* \* \*

## Test Hole No. 61

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 8, T. 97 N., R. 72 W.

Surface elevation: 2190 feet

Depth to water: 17 feet

0- 1	Topsoil
1- 5	Clay, brown, compact
5- 38	Sand, cream, fine to medium
38- 54	Clay, green, pebbly, compact

\* \* \* \*

## Test Hole No. 62

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 8, T. 97 N., R. 72 W.

Surface elevation: 2175 feet

Depth to water: dry

0- 1	Topsoil
1- 6	Clay, black, compact
6- 24	Clay, brown, grading to shale

\* \* \* \*

## Test Hole No. 63

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 9, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 14 feet

0- 1	Topsoil
1- 11	Clay, brown, compact
11- 18	Sand, brown, fine to medium
18- 24	Clay, light-brown

\* \* \* \*

## Test Hole No. 64

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 97 N., R. 72 W.

Surface elevation: 2190 feet

Depth to water: 29? feet

0-	1	Topsoil
1-	8	Clay, light to dark-brown, sandy
8-	12	Sand, dark-brown, fine
12-	29	Sand, light-brown, fine to medium
29-	36	Sand with clay
36-	54	Clay, yellow-brown, compact

\* \* \* \*

## Test Hole No. 65

Location: SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 97 N., R. 72 W.

Surface elevation: 2190 feet

Depth to water: 16 feet

0-	4	Clay, black
4-	6	Clay, light-brown, sandy
6-	29	Sand, light-brown, with clay
29-	40	Clay, light-brown, with sand
40-	54	Clay, yellow-brown

\* \* \* \*

## Test Hole No. 66

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 9, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 24 feet

0-	1	Topsoil
1-	4	Clay, black, sandy
4-	6	Clay, brown
6-	24	Sand, light-brown, fine, with clay
24-	53	Sand, light-brown, medium with clay
53-	64	Clay, brown, pebbly

\* \* \* \*

## Test Hole No. 67

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 9, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: dry

0-	6	Sand, light-brown
6-	16	Clay, brown, sandy
16-	24	Clay, light-brown

\* \* \* \*

## Test Hole No. 68

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 11, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 48 feet

## Test Hole No. 68 -- continued.

0- 6	Clay, brown, fine, sandy
6- 48	Sand, tan, clayey
48- 67	Sand, brown, fine to medium
67- 79	Clay, yellowish-brown

\* \* \* \*

## Test Hole No. 69

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 11, T. 97 N., R. 72 W.

Surface elevation: 2170 feet

Depth to water: 46 feet

0- 4	Topsoil
4- 46	Sand, brown, fine to medium
46- 64	Sand, light-brown, fine to medium

\* \* \* \*

## Test Hole No. 70

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 14, T. 97 N., R. 73 W.

Surface elevation: 2150 feet

Depth to water: dry

0- 1	Topsoil
1- 7	Clay, orange-brown, very pebbly
7- 12	Clay, brown, some pebbles
12- 19	Clay, dark-gray to black

\* \* \* \*

## Test Hole No. 71

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 14, T. 97 N., R. 73 W.

Surface elevation: 2170 feet

Depth to water: dry

0- 1	Topsoil
1- 13	Clay, light-brown, sandy
13- 19	Clay, dark- to light-gray, compact

\* \* \* \*

## Test Hole No. 72

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 18, T. 97 N., R. 72 W.

Surface elevation: 2140 feet

Depth to water: dry

0- 1	Topsoil
1- 17	Clay, dark-brown, some sand
17- 24	Shale, gray, with brown streaks

\* \* \* \*

## Test Hole No. 73

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 18, T. 97 N., R. 72 W.

Surface elevation: 2145 feet

Depth to water: 4? feet



## Test Hole No. 73 – continued.

0- 1	Topsoil
1- 4	Clay, dark-brown, some sand
4- 12	Sand, tan, fine to medium, some clay
12- 21	Clay, tannish-white, some sand
21- 34	Clay, brownish-tan, with gray streaks, many pebbles

\* \* \* \*

## Test Hole No. 74

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 18, T. 97 N., R. 72 W.

Surface elevation: 2155 feet

Depth to water: 7 feet

0- 4	Clay, dark-brown, sandy
4- 7	Sand, light-brown, medium to fine
7- 23	Sand, light-brown, fine to medium, some clay
23- 34	Clay, olive-brown

\* \* \* \*

## Test Hole No. 75

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 18, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 9 feet

0- 9	Sand, light-brown, fine to medium
9- 17	Sand, grayish-white, fine to medium
17- 29	Shale, brownish-gray, hard

\* \* \* \*

## Test Hole No. 76

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2180 feet

Depth to water: 7 feet

0- 4	Clay, dark-brown, sandy
4- 7	Clay, light-gray
7- 20	Sand, light-brown, fine
20- 30	Sand, light-brown, fine to medium
30- 39	Clay, light-brown grading to reddish-tan, few pebbles

\* \* \* \*

## Test Hole No. 77

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2180 feet

Depth to water: 10 feet

0- 2	Topsoil
2- 10	Clay, dark-brown, sandy
10- 19	Sand, tan, fine, some clay
19- 32	Clay, light-brown, sandy
32- 39	Clay, yellow-brown, few pebbles

\* \* \* \*

## Test Hole No. 78

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 19 feet

0- 2	Topsoil
2- 7	Clay, dark-brown, sandy
7- 14	Sand, brown, fine
14- 19	Sand, light-brown, some clay
19- 38	Sand, light-brown, fine, clayey
38- 54	Clay, light-brown, grading to reddish-brown

\* \* \* \*

## Test Hole No. 79

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2160 feet

Depth to water: 7 feet

0- 4	Roadbed
4- 7	Clay, brown, sandy
7- 36	Sand, brown, fine to medium
36- 49	Clay, brown, pebbly, compact

\* \* \* \*

## Test Hole No. 80

Location: SW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2180 feet

Depth to water: 12 feet

0- 2	Sand, dark-brown, fine
2- 7	Sand, light-brown, fine to medium
7- 12	Sand, brown, fine, some clay
12- 18	Sand, light-brown, fine to medium
18- 43	Sand, greenish-tan, medium
43- 54	Clay, light-brown, very compact

\* \* \* \*

## Test Hole No. 81

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2170 feet

Depth to water: 60 feet

0- 7	Sand, light-brown, fine
7- 15	Sand, tan, some clay
15- 29	Sand, light-brown
29- 78	Sand, light-brown, fine to medium
78- 90	Clay, brown

\* \* \* \*

## Test Hole No. 82

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 17, T. 97 N., R. 72 W.

Surface elevation: 2170 feet

Depth to water: 10 feet

## Test Hole No. 82 – continued.

0- 1	Topsoil
1- 5	Sand, brown, medium
5- 10	Sand, light-brown, very fine, some gravel
10- 48	Sand, light-brown, fine
48- 51	Clay?
51- 63	Sand, light-brown, fine to medium
63- 74	Clay, olive-brown, pebbly

\* \* \* \*

## Test Hole No. 83

Location: NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 21 feet

0- 3	Topsoil
3- 11	Sandy, dark-brown, fine to medium, with clay
11- 14	Sand, grayish-tan, fine to medium
14- 21	Sand, light-brown, fine to medium
21- 30	Sand, cream, fine to medium, some clay
30- 52	Sand and clay, dark-brown
52- 56	Clay, grayish-tan, sandy
56- 62	Clay, brown, pebbly
62- 64	Sand?
64- 79	Clay, yellowish-brown, pebbly

\* \* \* \*

## Test Hole No. 84

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 5 feet

0- 5	Sand, dark-brown, fine to medium
5- 6	Sand, coarse, with large pebbles, some clay
6- 10	Sand, tan, fine to medium
10- 14	Sand and clay, light-brown
14- 40	Sand, greenish-tan
40- 54	Sand, tan, medium
54- 70	Sand?, light-brown, medium, some coarse sand
70- 85	Clay, greenish-gray, some sand
85- 87	Sand?
87- 95	Clay, greenish-gray

\* \* \* \*

## Test Hole No. 85

Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 25 feet

0- 2	Topsoil, black, sandy
2- 6	Clay, brown, sandy
6- 25	Sand, cream, fine

## Test Hole No. 85 -- continued.

25- 52 Sand, light-brown, medium  
52- 69 Clay, yellow-gray, pebbly

\* \* \* \*

## Test Hole No. 86

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2190 feet

Depth to water: 15 feet

0- 5 Clay, black  
5- 29 Sand, light-brown, medium  
29- 49 Clay, brown, with pebbles

\* \* \* \*

## Test Hole No. 87

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 43 feet

0- 1 Topsoil  
1- 11 Sand, brown to cream, fine  
11- 24 Sand, light-brown, medium to coarse  
24- 30 Sand, cream, fine  
30- 49 Sand, light-brown, fine to medium  
49- 59 Sand, cream, fine to medium

\* \* \* \*

## Test Hole No. 88 (Test well drilled and logged by Oliver Well Drilling Company)

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2205 feet

Depth to water: 40 feet

0- 4 Topsoil  
4- 29 Sand and Magnesia  
29- 35 Sand  
35- 45 Sand and Magnesia  
45- 55 Magnesia  
55- 62 Sand and Magnesia  
Rock and clay bottom

\* \* \* \*

## Test Hole No. 89 (Test well drilled and logged by Oliver Well Drilling Company)

Location: SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.

Surface elevation: 2215 feet

Depth to water: 49 feet

0- 3 Topsoil  
3- 38 Magnesia  
38- 48 Sand  
48- 49 Magnesia  
49- 77 Sand

Test Hole No. 89 -- continued.  
 77- 94 Sand and Magnesia  
 Clay bottom

\* \* \* \*

Test Hole No. 90 (Test well drilled and logged by Oliver Well Drilling Company)  
 Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.  
 Surface elevation: 2275 feet  
 Depth to water: 75 feet

0- 4 Topsoil  
 4- 31 Coarse sand  
 31-174 Sand and Magnesia  
 Clay bottom

\* \* \* \*

Test Hole No. 91  
 Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.  
 Surface elevation: 2250 feet  
 Depth to water: dry

0- 1 Topsoil  
 1- 4 Clay, black-brown, with sand  
 4- 22 Sand, fine to medium, with clay  
 22- 52 Clay, light-brown, sandy  
 52- 64 Sand, light-brown, fine to medium

\* \* \* \*

Test Hole No. 92 (Rotary test hole)  
 Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.  
 Surface elevation: 2250 feet  
 Depth to water: not measured

0- 1 Topsoil  
 1- 10 Sand, medium  
 10- 20 Siltstone, tan  
 20- 65 Sand, tan, very fine  
 65- 80 Clay, white, sandy  
 80- 95 Sand and clay layers  
 95-110 Sand, fine  
 110-130 Sand, very fine  
 130-140 Clay, white  
 140-155 Same with sand stringers  
 155-165 Clay, white  
 165-180 Clay, tan  
 180-185 Clay, gray (shale?)

\* \* \* \*

Test Hole No. 93  
 Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 16, T. 97 N., R. 72 W.  
 Surface elevation: 2210 feet  
 Depth to water: 50 feet

## Test Hole No. 93 -- continued.

0- 1	Topsoil
1- 6	Clay, dark- to light-brown, sandy
6- 75	Sand, light-brown, fine to coarse

\* \* \* \*

## Test Hole No. 94

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 15, T. 97 N., R. 72 W.

Surface elevation: 2190 feet

Depth to water: 13? feet

0- 1	Topsoil
1- 7	Sand, light-brown, medium
7- 13	Clay, black, some sand
13- 25	Sand, cream, fine
25- 32	Sand, cream, medium, fairly clean
32- 44	Clay, yellowish-brown, pebbly

\* \* \* \*

## Test Hole No. 95 (Rotary test hole)

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 15, T. 97 N., R. 72 W.

Surface elevation: 2218 feet

Depth to water: not measured

0- 10	Sand, tan, fine
10- 30	Clay, tan, sandy
30- 35	Sandstone, very fine grains
35- 60	Clay, white, sandy
60- 65	Sand, very fine
65-105	Clay, interbedded with sand
105-115	Clay?, with concretions
115-125	Clay, tan to red
125-140	Shale, gray

\* \* \* \*

## Test Hole No. 96

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 14, T. 97 N., R. 72 W.

Surface elevation: 2197 feet

Depth to water: 40 feet

0- 5	Sand, dark-brown
5- 17	Sand, white, fine
17- 34	Sand, tan, fine, clayey
34- 40	Sand, light-brown, less clay
40- 63	Sand, tan to light-gray, some clay
63- 79	Clay, light-brown, with yellow patches

\* \* \* \*

## Test Hole No. 97

Location: NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 14, T. 97 N., R. 72 W.

Surface elevation: 2200 feet

Depth to water: 28 feet

## Test Hole No. 97 – continued.

0- 1	Topsoil
1- 6	Sand, dark-brown, fine to medium
6-28?	Sand, light-brown, fine to medium, some clay
28?- 53	Sand, tan, fine to medium
53- 58	Clay, reddish-brown
58- 64	Clay, yellowish-brown, some small white pebbles

\* \* \* \*

## Test Hole No. 98

Location: NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 14, T. 97 N., R. 72 W.

Surface elevation: 2170 feet

Depth to water: 17 feet

0- 2	Topsoil, sandy
2- 6	Sand, dark-brown, fine to medium
6- 14	Clay, dark-brown, sandy
14- 17	Sand, tan, fine to medium
17- 43	Sand, light-brown, fine to medium, some clay
43- 64	Clay, tan, grading to reddish-brown

\* \* \* \*

## Test Hole No. 99

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 14, T. 97 N., R. 72 W.

Surface elevation: 2176 feet

Depth to water: 11 feet

0- 4	Roadbed
4- 11	Clay, black, sandy
11- 20	Sand, black, fine to coarse
20- 29	Clay, yellow-green, compact

\* \* \* \*

## Test Hole No. 100

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 22, T. 97 N., R. 73 W.

Surface elevation: 2164 feet

Depth to water: 7 feet

0- 1	Topsoil
1- 7	Clay, dark- to light-brown, sandy
7- 22	Sand, brown to gray, coarse to very coarse, some clay
22- 34	Shale, blue-gray, some pebbles

\* \* \* \*

## Test Hole No. 101

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 23, T. 97 N., R. 73 W.

Surface elevation: 2130 feet

Depth to water: 12 feet

0- 4	Roadbed
4- 16	Clay, dark-brown, sandy
16- 24	Shale, black

\* \* \* \*

## Test Hole No. 102

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 19, T. 97 N., R. 72 W.

Surface elevation: 2132 feet

Depth to water: 10 feet

0- 1	Topsoil
1- 5	Clay, black, fairly compact
5- 10	Clay, dark- to light-brown
10- 16	Clay, gray-brown, with sand
16- 22	Clay, red-brown
22- 34	Shale, brown, with gray streaks, pebbly compact

\* \* \* \*

## Test Hole No. 103

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 19, T. 97 N., R. 72 W.

Surface elevation: 2115 feet

Depth to water: 6 feet

0- 1	Topsoil
1- 6	Sand, dark-brown, with clay
6- 9	Clay, light-brown, with gravel
9- 18	Clay, brown, with sand
18- 34	Shale, brownish-gray, with gray streaks, pebbly

\* \* \* \*

## Test Hole No. 104

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 19, T. 97 N., R. 72 W.

Surface elevation: 2133 feet

Depth to water: dry

0- 4	Roadbed
4- 11	Clay, brownish-black, some sand
11- 23	Clay, greenish-brown
23- 30	Clay, green, pebbly, compact
30- 39	Clay (shale?), compact

\* \* \* \*

## Test Hole No. 105

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 21, T. 97 N., R. 72 W.

Surface elevation: 2145 feet

Depth to water: 9 feet

0- 44	Sand, light-brown, fine to medium
44- 51	Clay, pink-brown, pebbly
51- 64	Clay, grading to gray shale

\* \* \* \*

## Test Hole No. 106

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 21, T. 97 N., R. 72 W.

Surface elevation: 2150 feet

Depth to water: 15 feet



## Test Hole No. 106 – continued.

0- 2	Roadbed
2- 15	Sand, brown, to light-brown, fine
15- 42	Sand, cream, fine
42- 44	Rocks
44- 54	Sand, light-brown, fine
54- 62	Clay, brown, sandy, compact
62- 74	Shale

\* \* \* \*

## Test Hole No. 107

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 22, T. 97 N., R. 72 W.

Surface elevation: 2130 feet

Depth to water: 22 feet

0- 6	Clay, light-brown, sandy
6- 86	Sand, cream to light-brown, fine
86-104	Clay, dark-brown, very compact

\* \* \* \*

## Test Hole No. 108 (Rotary test hole)

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 22, T. 97 N., R. 72 W.

Surface elevation: 2244 feet

Depth to water: not measured

0- 2	Topsoil
2- 10	Sand, medium
10- 15	Clay, white, interbedded with sand
15- 20	Clay, white
20- 35	Sandstone, very fine grained
35- 80	Clay, very sandy
80-110	Sand, very fine
110-125	Sandstone, very fine grained
125-130	Sand, very fine
130-160	Clay, tan
160-165	Shale with concretions
165-200	Shale, gray

\* \* \* \*

## Test Hole No. 109

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 22, T. 97 N., R. 72 W.

Surface elevation: 2153 feet

Depth to water: 11 feet

0- 32	Sand, cream to light-brown, fine
32- 44	Clay, brown, much fine sand

\* \* \* \*

## Test Hole No. 110

Location: SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 22, T. 97 N., R. 72 W.

Surface elevation: 2194 feet

Depth to water: 40 feet

## Test Hole No. 110 – continued.

0- 1	Topsoil
1- 4	Clay, dark-brown, sandy
4- 40	Sand, brown, fine
40- 59	Sand, brown, grading to green, medium
59- 74	Clay, green, some sand

\* \* \* \*

## Test Hole No. 111

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 23, T. 97 N., R. 72 W.

Surface elevation: 2175 feet

Depth to water: 35 feet

0- 5	Roadbed
5- 35	Sand, cream, fine
35- 44	Sand, greenish-yellow, medium

\* \* \* \*

## Test Hole No. 112

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 23, T. 97 N., R. 72 W.

Surface elevation: 2208 feet

Depth to water: dry

0- 4	Sand, dark-brown, with clay
4- 15	Sand, dark-brown, fine
15- 37	Sand, green to brown, very compact

\* \* \* \*

## Test Hole No. 113

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 27, T. 97 N., R. 73 W.

Surface elevation: 2150 feet

Depth to water: dry

0- 1	Topsoil
1- 13	Clay, brown, sandy
13- 29	Shale, yellow-brown, compact

\* \* \* \*

## Test Hole No. 114

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 26, T. 97 N., R. 73 W.

Surface elevation: 2091 feet

Depth to water: 13 feet

0- 1	Topsoil
1- 13	Clay, brown to black
13- 17	Sand, gray, fine, with clay
17- 29	Shale, blue-gray

\* \* \* \*

## Test Hole No. 115

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 25, T. 97 N., R. 73 W.

Surface elevation: 2087 feet

Depth to water: 31 feet

## Test Hole No. 115 – continued.

0- 1	Topsoil
1- 6	Clay, black to brown, fairly compact
6- 31	Sand, pink-brown, medium
31- 45	Sand, gray, coarse
45- 47	Gravel
47- 54	Shale, blue-gray, compact

\* \* \* \*

## Test Hole No. 116

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 29, T. 97 N., R. 72 W.

Surface elevation: 2132 feet

Depth to water: 10 feet

0- 4	Topsoil
4- 9	Clay, light-gray, fairly compact
9- 17	Sand, fine, with gravel
17- 26	Sand, light-gray, fine
26- 35	Clay, brown, compact
35- 44	Shale, brown, with gray streaks

\* \* \* \*

## Test Hole No. 117

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 29, T. 97 N., R. 72 W.

Surface elevation: 2140 feet

Depth to water: 13 feet

0- 1	Topsoil
1- 4	Sand, dark-brown, fine
4- 32	Sand, light-brown, fine to very fine
32- 52	Sand, cream, with clay
52- 62	Shale, green-brown, with gray streaks
62- 80	Clay, brown, pebbly
80- 94	Clay, green with gray streaks

\* \* \* \*

## Test Hole No. 118

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 29, T. 97 N., R. 72 W.

Surface elevation: 2129 feet

Depth to water: dry

0- 1	Topsoil
1- 7	Clay, gray-green, compact
7- 18	Clay, pink-brown, some sand, compact
18- 29	Clay, yellowish-brown, pebbly

\* \* \* \*

## Test Hole No. 119

Location: SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 28, T. 97 N., R. 72 W.

Surface elevation: 2120 feet

Depth to water: 6 feet

## Test Hole No. 119 -- continued.

0- 6	Sand, brown, fine
6- 38	Sand, gray-brown, fine
38- 72	Clay, brown, sandy
72- 79	Clay, brown-green

\* \* \* \*

## Test Hole No. 120

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 26, T. 97 N., R. 72 W.

Surface elevation: 2180 feet

Depth to water: 6 feet

0- 3	Sand, brown, fine, with clay
3- 6	Sand, brown-gray, fine
6- 30	Sand, brown, fine
30- 44	Clay, some sand

\* \* \* \*

## Test Hole No. 121

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 26, T. 97 N., R. 72 W.

Surface elevation: 2155 feet

Depth to water: 6 feet

0- 6	Sand, brown, fine
6- 86	Sand, light-green to light-brown, fine to medium
86- 99	Clay, brown, compact

\* \* \* \*

## Test Hole No. 122

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 34, T. 97 N., R. 73 W.

Surface elevation: 2172 feet

Depth to water: 25 feet

0- 1	Topsoil
1- 25	Clay, dark-brown to cream, sandy
25- 46	Clay, gray, sandy, compact
46- 64	Clay, yellow-brown, some pebbles

\* \* \* \*

## Test Hole No. 123

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 36, T. 97 N., R. 73 W.

Surface elevation: 2116 feet

Depth to water: 34 feet

0- 1	Topsoil
1- 6	Clay, dark-brown, compact
6- 16	Sand, light-brown, medium to coarse
16- 30	Clay, gray-brown, sandy
30- 34	Sand, gray, fine, with clay
34- 46	Sand, gray, medium to coarse
46- 54	Shale, black

\* \* \* \*

## Test Hole No. 124

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 31, T. 97 N., R. 72 W.

Surface elevation: 2100 feet

Depth to water: dry

0- 1	Topsoil
1- 5	Clay, brown, sandy
5- 16	Clay, cream, sandy
16- 34	Shale, yellow-brown to gray

\* \* \* \*

## Test Hole No. 125

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 31, T. 97 N., R. 72 W.

Surface elevation: 2120 feet

Depth to water: dry

0- 1	Topsoil
1- 19	Clay, brown, compact
19- 44	Clay, brown, grades to gray-brown shale

\* \* \* \*

## Test Hole No. 126

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 32, T. 97 N., R. 72 W.

Surface elevation: 2120 feet

Depth to water: dry

0- 1	Topsoil
1- 5	Clay, dark-brown, fairly compact
5- 32	Clay, light-brown, fairly compact
32- 54	Clay, brown, pebbly, grades to shale

\* \* \* \*

## Test Hole No. 127

Location: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 34, T. 97 N., R. 72 W.

Surface elevation: 2163 feet

Depth to water: 21 feet

0- 21	Sand, brown-yellow, fine
21- 63	Sand, light-brown, fine to medium
63- 74	Clay, green, compact

\* \* \* \*

## Test Hole No. 128

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 3, T. 96 N., R. 73 W.

Surface elevation: 2195 feet

Depth to water: dry

0- 11	Clay, brown, sandy, compact
11- 29	Shale, yellow-brown, pebbly

\* \* \* \*

## Test Hole No. 129

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 6, T. 96 N., R. 72 W.

Surface elevation: 2102 feet

Depth to water: not measured

0- 13	Clay, brown, sandy
13- 51	Sand, brown, medium to coarse
51- 60	Shale, dark-gray

\* \* \* \*

## Test Hole No. 130

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 96 N., R. 72 W.

Surface elevation: 2070 feet

Depth to water: 12 feet

0- 1	Topsoil
1- 9	Clay, dark-brown, fairly compact
9- 12	Clay, gray
12- 22	Clay, gray, sandy
22- 44	Shale, dark-gray, pebbly

\* \* \* \*

## Test Hole No. 131

Location: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 5, T. 96 N., R. 72 W.

Surface elevation: 2080 feet

Depth to water: 13 feet

0- 4	Roadbed
4- 13	Clay, brown, sandy
13- 22	Sand, brown, much clay
22- 49	Shale, black

\* \* \* \*

## APPENDIX B

## Well records in the Gregory area

Source: A, Alluvium; O, Ogallala Group (Valentine, Ash Hollow);  
C, Varicolored clay; P, Pierre Shale

Use: D, Domestic; S, Stock

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Vosika, M.	SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, T. 96 N., R. 72 W.	65	18	P	D,S
Kayl, F.	NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, T. 96 N., R. 72 W.	60		P	S
Kobold, T.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 96 N., R. 72 W.	55	39	A,P?	D,S
Warnkuist, H.	NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, T. 96 N., R. 72 W.	35	2	P	D,S
Cook, R.	SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 96 N., R. 73 W.	55	22	A,P?	D,S
Grin, R.	NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, T. 96 N., R. 73 W.	30	15	A	D,S
Petersen, D.	SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, T. 97 N., R. 72 W.	30	8	O	D,S
Pederson, E.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 4, T. 97 N., R. 72 W.	20	3	O	D,S
Henrecy, A.	NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, T. 97 N., R. 72 W.	35	10	O	S
McFayden, R.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, T. 97 N., R. 72 W.	60	33	O	D,S
Henrecy, A.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T. 97 N., R. 72 W.	20	10	O	D
Henrecy, A.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T. 97 N., R. 72 W.	35	10	O	S
Christensen, M.	SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 97 N., R. 72 W.	18	14	O	S
Hlavke, J.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, T. 97 N., R. 72 W.	20	11	O	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Hlavke, J.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, T. 97 N., R. 72 W.	39	11	O	D,S
Wempe, F.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, T. 97 N., R. 72 W.	40	30	O	D,S
Grenoble, L.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, T. 97 N., R. 72 W.	76		C,P	D,S
Wempe, A.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 9, T. 97 N., R. 72 W.	40		O	D,S
Grin, H.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, T. 97 N., R. 72 W.	40	10	O	D,S
Lubbers, B.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, T. 97 N., R. 72 W.	50		O	D,S
Hlavka, M.	NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, T. 97 N., R. 72 W.	45	10	O	D,S
Lund, C.	SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, T. 97 N., R. 72 W.	55	45	O	D,S
Lund, C.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, T. 97 N., R. 72 W.	40	12	O	D,S
Matucha, F.	NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, T. 97 N., R. 72 W.	40	12	O	D,S
Malchow, F.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, T. 97 N., R. 72 W.	35		O	S
Malchow, F.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, T. 97 N., R. 72 W.	35		O	S
Iden, R.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 17, T. 97 N., R. 72 W.	80		C?P	D,S
Rundall, K.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, T. 97 N., R. 72 W.	35	15	O	D,S
Sattler, H.	SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, T. 97 N., R. 72 W.	35	20	O	D,S
Hutchison, H.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, T. 97 N., R. 72 W.	36		O	D
Horn, H.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 97 N., R. 72 W.	70	52	O	D,S



Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Miller, D.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, T. 97 N., R. 72 W.	40	25	O	D,S
Horn, E.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 26, T. 97 N., R. 72 W.	28	10	O	D,S
Horn, E.	NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, T. 97 N., R. 72 W.	38	11	O	D,S
Horn, E.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, T. 97 N., R. 72 W.	28	10	O	D,S
Vosika, I.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, T. 97 N., R. 72 W.	45	25	O	D,S
Kucera, W.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, T. 97 N., R. 72 W.	30	18	C,P	D,S
Richey, B.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, T. 97 N., R. 72 W.	40	10	O,C	D,S
Klein, A.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, T. 97 N., R. 72 W.	40	20	A,P?	D,S
Kucera, W.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, T. 97 N., R. 72 W.	32	10	A,P?	D,S
Henrich, W.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 97 N., R. 73 W.	30	14	O	D,S
Eisenbraun, J.	SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T. 97 N., R. 73 W.	50	12	O,P	D,S
Gustafson, P.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, T. 97 N., R. 73 W.	40	25	P	D,S
Malchow, F.	SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, T. 97 N., R. 73 W.	70	4	P	D,S
Berens, C.	NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, T. 97 N., R. 73 W.	56		P	S
Krysl, R.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, T. 97 N., R. 73 W.	30	15	A,P	D,S
Rundall, D.	NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, T. 97 N., R. 73 W.	30	15	A,P	D,S
McIntyre, H.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, T. 97 N., R. 73 W.	27	9	P	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Smith, A.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, T. 97 N., R. 72 W.	29	7	O	D
Smith, A.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, T. 98 N., R. 72 W.	49	7	O,C,P	S
Frerichs, C.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, T. 98 N., R. 72 W.	40	15	O,C?	D,S
Boxa, S.	NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, T. 98 N., R. 72 W.	60	40		D,S
Gray, D.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, T. 98 N., R. 72 W.	28	15	C?P	D,S
Becker, R.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, T. 98 N., R. 72 W.	25	15	O	D,S
Krchnavy, F.	NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 98 N., R. 72 W.	20	15	O	D,S
Pederson, E.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, T. 98 N., R. 72 W.	35	10	O,C?,P?	D,S
Boxa, S.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, T. 98 N., R. 73 W.	39	10	O	S
Smith, C.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, T. 98 N., R. 73 W.	20			D,S
Vielmette, W.	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, T. 98 N., R. 73 W.	50	6	P	D,S
Shedeed, R.	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, T. 98 N., R. 73 W.	50		P	S
Smith, C.	NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, T. 98 N., R. 73 W.	70	C?,P	S	