STATE OF SOUTH DAKOTA
Richard F. Kneip, Governor

DEPARTMENT OF NATURAL RESOURCE DEVELOPMENT
Vern W. Butler, Secretary

GEOLOGICAL SURVEY
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Special Report 61

GROUND-WATER INVESTIGATION FOR THE CITY OF ORIENT, SOUTH DAKOTA

by

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INTRODUCTION

Present Investigation

This report contains the results of a special ground-water investigation conducted by the South Dakota Geological Survey during parts of June and July, 1973, one day in August, 1973, and two days in August, 1974, in and around the city of Orient, Faulk County, South Dakota (fig. 1). This report is the 61st in a continuing series of investigations assisting cities in locating their future water supplies.

Orient now obtains its water from a well which is 1,365 feet deep within the city limits. The Dakota Formation probably yields water to the well. The water contains high amounts of dissolved chemicals and the casing and pumping system in the well have deteriorated with age. This study was initiated to find out if there is a better quality shallow water supply.

Included in the survey of the Orient area were: (1) mapping the geology of the area; (2) drilling 32 auger test holes (within approximately 1.5 mile radius around Orient); (3) making a well inventory; and (4) collecting and analyzing 21 water samples.

As a result of this study, a buried sand and gravel deposit was found southwest of the city. The water from this sand and gravel is very high in dissolved chemicals.

The cooperation of the residents of the area, and of Orient, especially the city officials, Lloyd Boyd and Ethan Ortle, was appreciated.

The project was financed by the South Dakota Geological Survey, the Oahe Conservancy Sub-District, and the city of Orient.

Location and Extent of Area

The city of Orient is located in the north central part of eastern South Dakota on the southern border of Faulk County which is in the James Basin, a part of the Central Lowlands physiographic province (fig. 1).

Topography and Drainage

The topography of the Orient area is a generally flat surface developed on glacial till. It slopes west to east away from a high hilly area 3 miles west of Orient. The gently sloping surface is dissected by many small west to east-flowing intermittent drainages.

GENERAL GEOLOGY

Surficial Deposits

Surficial deposits of the Orient area are chiefly the results of glaciation late in the Pleistocene Epoch of geologic time. Glacial deposits are collectively termed drift, which is divisible into two broad lithologic groups: till and outwash.

Till, commonly called "boulder clay," "blue clay," or "gumbo" consists of a heterogeneous mixture of boulders, pebbles, and sand in a matrix of clay deposited directly by the ice. Figure 2 is a geologic map of the Orient area showing the distribution of surficial deposits in the area.

Outwash material is a more homogeneous deposit, consisting primarily of sand and gravel with minor amounts of silt and clay which were deposited by melt water streams issuing from a glacier. Some outwash material is exposed in a gravel pit 3 miles west and 2 miles north of Orient. Some surface outwash is shown in figure 2 and some surface alluvium is mapped. This alluvium consists of a thin layer of sand and some gravel deposited by a present stream within the confines of the stream valley. Buried outwash is present with its most extensive distribution found west and south of Orient.

Exposed and Subsurface Bedrock

There is no exposed bedrock in the study area and the glacial drift covering the surface is approximately 60 feet thick. Data obtained from deep test holes in Hughes, Faulk, and Hyde Counties, coupled with deep city and farm water wells in Hand and Faulk County reveal the following units in the subsurface (thicknesses in parentheses are approximate).

The units are listed in descending order:

Pierre Shale — (275 feet--underlies the glacial drift in the study area)
Niobrara Marl — (140 feet)
Carlile Shale — (250 feet)
Greenhorn Limestone — (10 feet)
Graneros Shale — (300 feet)
Dakota Formation — (300 feet--alternating beds of sand and shale)
Skull Creek Shale — (100 feet)
Fall River Sandstone — (150 feet)
(Remainder of Mesozoic and Paleozoic section — 315 feet)
Pre-Cambrian — (? - surface is approximately 1,900 feet below land surface and the rock type is a granite).

OCCURRENCE OF GROUND WATER

Principles of Occurrence

Ground water is defined as water contained in the voids or openings within rocks or sediments below the water table. Practically all open spaces in the rocks that lie below the water table are filled with water; this is called the zone of saturation. The water

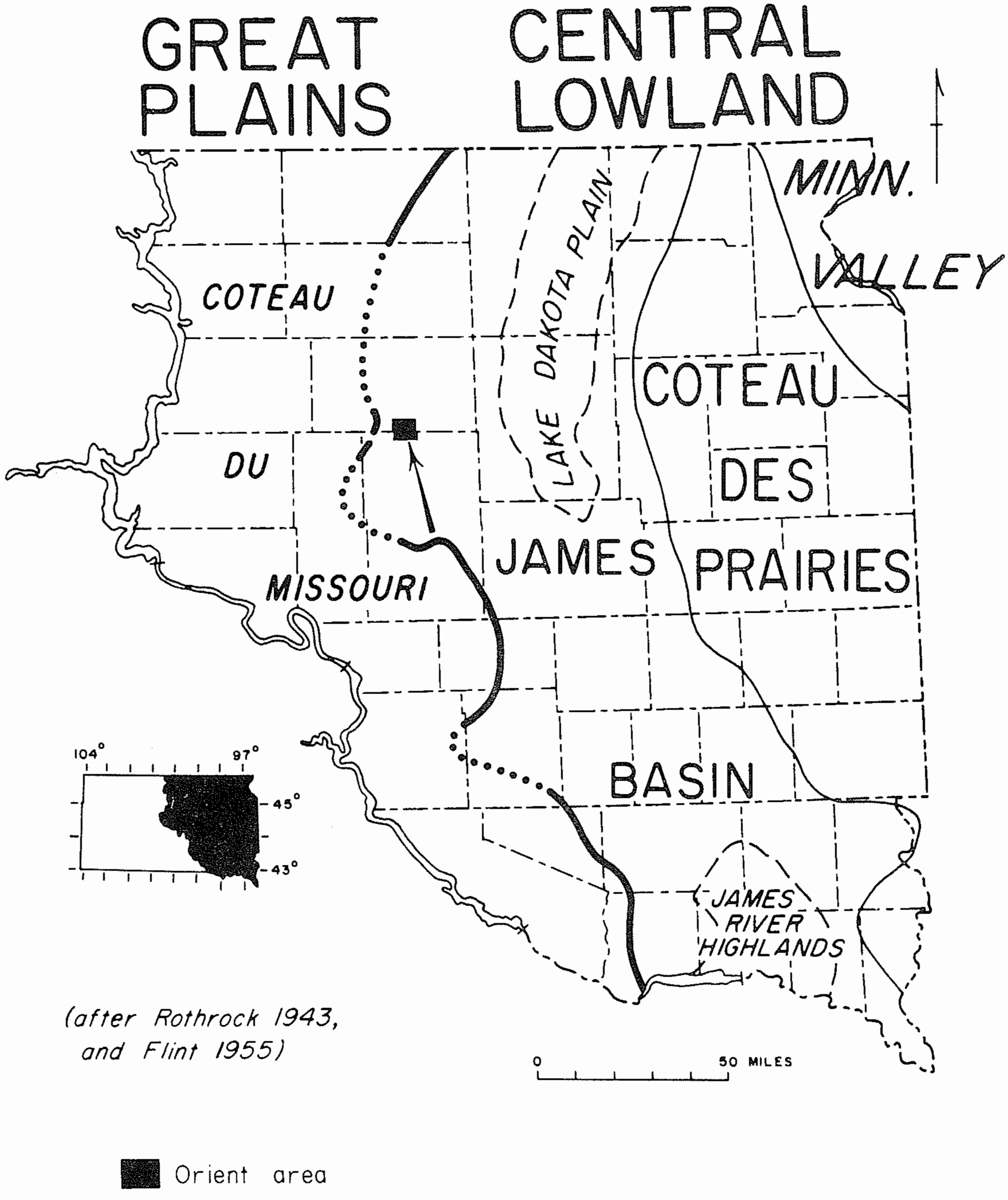
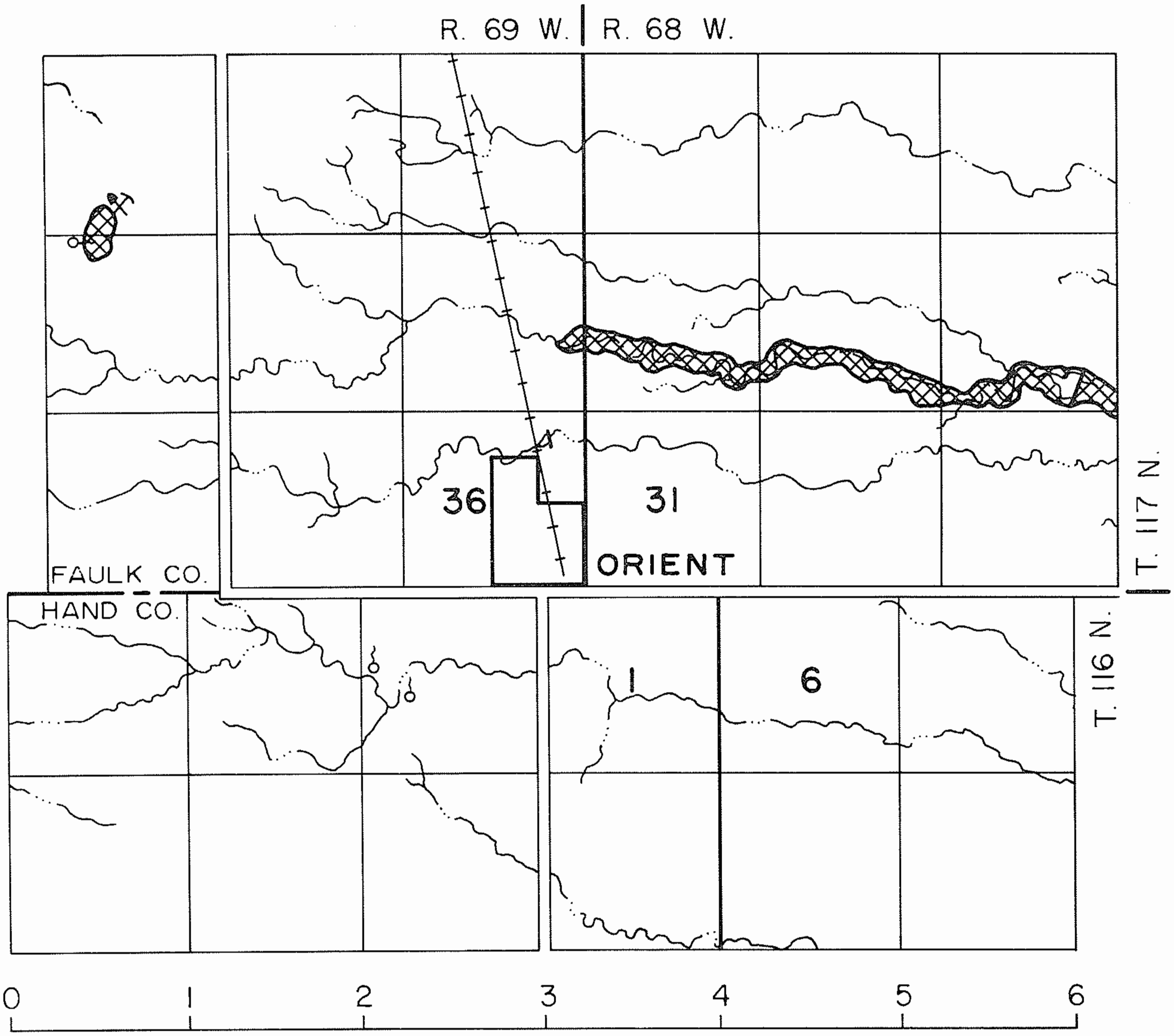


Figure 1. Map of eastern South Dakota showing the major physiographic divisions and location of the Orient area.



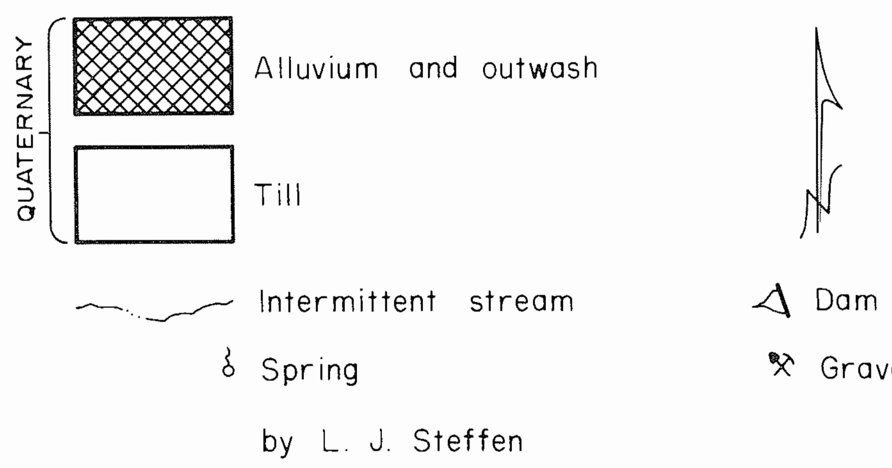


Figure 2. Generalized geologic map of the Orient area.

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table is the upper surface of the zone of saturation and is under atmospheric pressure. Rocks (including the soil) that lie above the water table are in the zone of aeration because only some of the open spaces in this zone are filled with water; the remaining portion contains air. This water is either held by molecular attraction, or is moving downward toward the zone of saturation. Water within the ground above the saturated zone moves downward under the influence of gravity, whereas in the saturated zone, it moves in a direction determined by the hydraulic gradient.

Contrary to popular belief, ground water does not occur in "veins" that crisscross the 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, 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 (a deposit having structures that permit appreciable water to move through it under ordinary field conditions). Recharge to an aquifer is accomplished in four general ways: (1) by downward percolation of precipitation from the ground surface, (2) by downward percolation from surface bodies of water, (3) by lateral movement of ground water into the area, 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 ways: (1) by evaporation and transpiration by plants, (2) by seepage upward or laterally into surface bodies of water, (3) by lateral movement of ground water out of the area, 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 is expressed as the percentage of void spaces to the total volume of the rock. Porosity of a sedimentary deposit depends chiefly on (1) the shape and arrangement of its constituent particles, (2) the degree of sorting of its particles, (3) the cementation and compaction to which it has been subjected since its deposition, (4) the removal of mineral matter through solution by percolating waters, and (5) the fracturing of the rocks, resulting in joints and other openings. Thus, the size of the material has little or no 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 terms.

Ground Water in Glacial Deposits

It was stated earlier that glacial deposits are divided into till and outwash. Till does not yield water readily because of its highly unsorted nature and the predominance of silt and clay. Locally there may occur some lenses of sand and/or gravel within the till which provide an adequate supply of water for a farm well, but considering the till as a unit, it cannot function as a source of water for municipalities.

Outwash, a highly permeable deposit, may make an aquifer if it is extensive and located below the water table. Results of test hole drilling and a well inventory from the area (apps. A and B; figs. 3, 4, and 5) indicate that the most extensive and thickest buried outwash is located on the west and southwest edge of Orient (test holes 12, 16, 17, 18, 19, 20, and 27, app. A; and fig. 4).

Ground Water in Bedrock

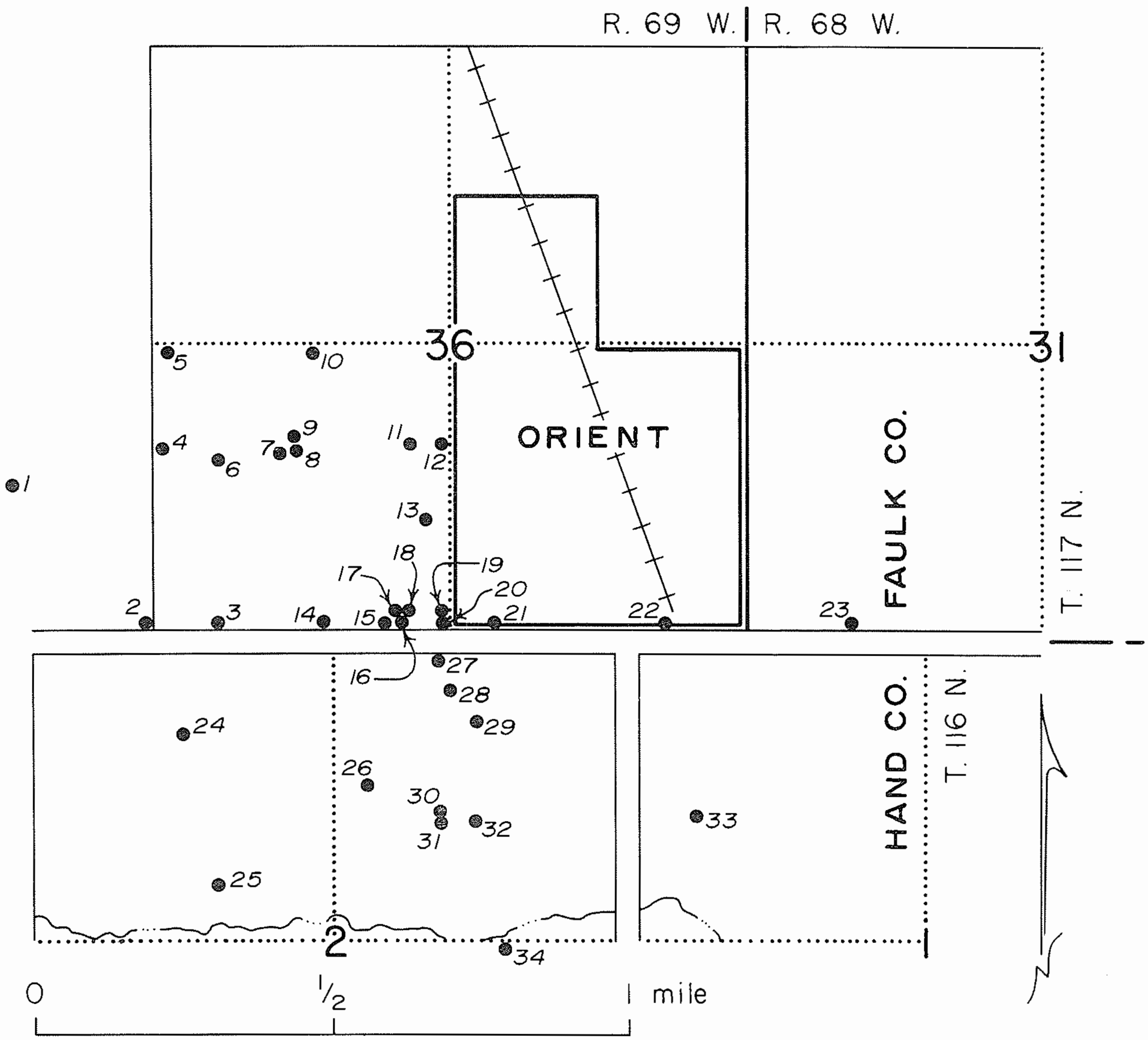
The Dakota Formation is the major bedrock aquifer in the Orient area. The top of the Dakota sand and shale beds is at a depth of approximately 1,000 feet below land surface and the unit is approximately 150 feet thick. Some small volume flowing wells are developed in this formation, and the water is high in dissolved chemicals.

Another aquifer in the Orient area is the Fall River Sandstone. From deep holes in other counties, the thickness of the sandstone is about 150 feet. The water quality from this unit shows high amounts of dissolved chemicals.

Quality of Ground Water

Ground water always contains dissolved chemicals. These dissolved chemicals are derived from (1) the atmosphere as water vapor condenses and falls, (2) the soil and underlying deposits as the water moves downward to the water table, and (3) the rocks below the water table. In general, the more chemical substances the water contains, the poorer its quality will be.

Table 1 lists the amounts of dissolved chemicals in water samples collected in the Orient area (for map location, see fig. 5). Table 2 lists the recommended limits of amounts of dissolved chemicals in drinking water in South Dakota. This table also discusses the effects or significance of the dissolved chemicals. Except for samples W4, W5, W10, and W14, which



Test hole. (number refers to test hole locations listed in Appendix A.)

Intermittent stream

by L. J. Steffen

Figure 3. Map showing location of test holes in the Orient area.

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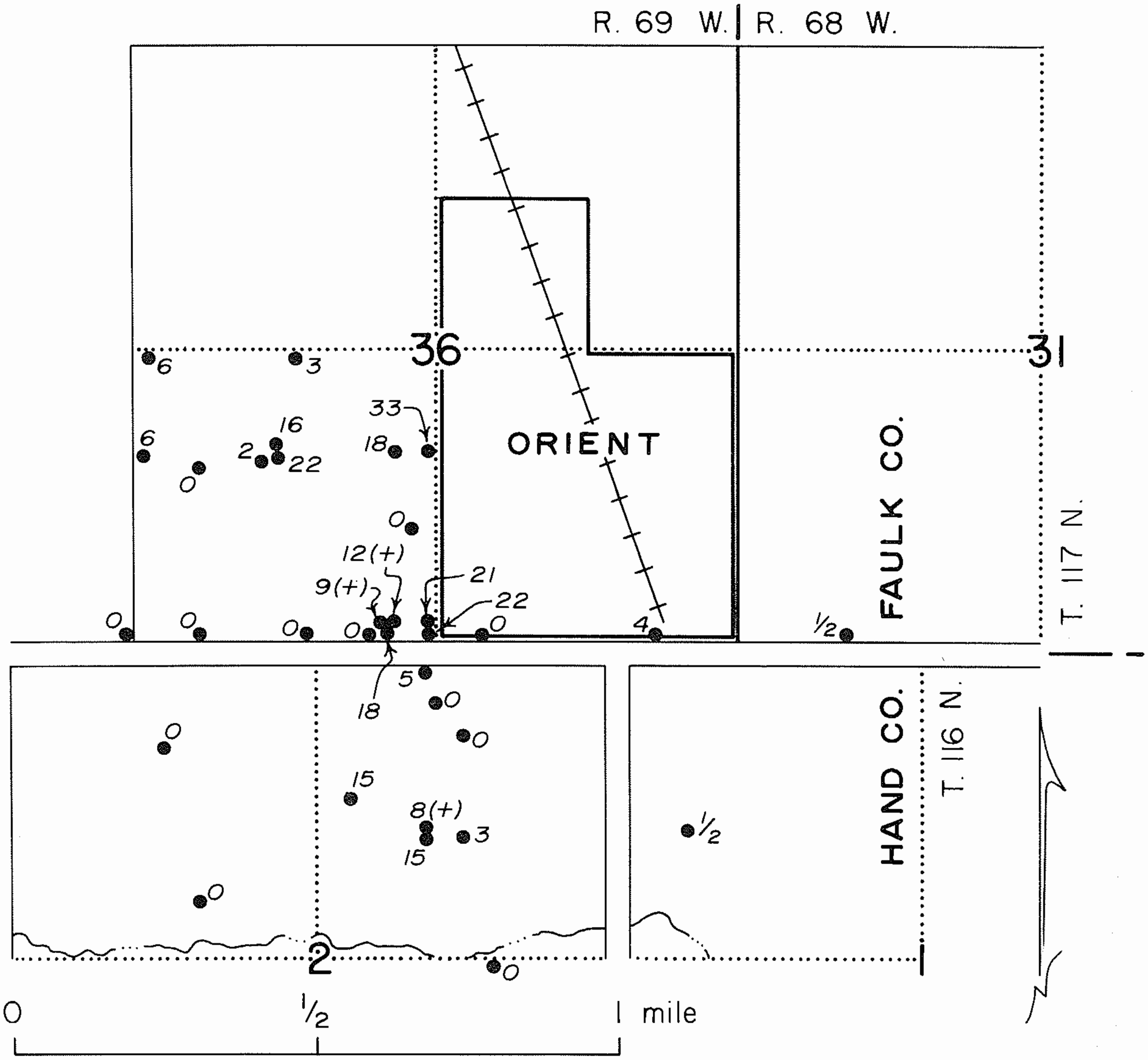

● 15 Test holes located in the Orient area – numbers refer to total thickness of sand and/or gravel. A plus (+) indicates the total thickness of sand and/or gravel was not penetrated. (for test hole number and depth to sand see Figure 3 and Appendix A.)

Intermittent stream

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Figure 4. Map showing total thickness of buried sand and/or gravel deposits in the Orient area.

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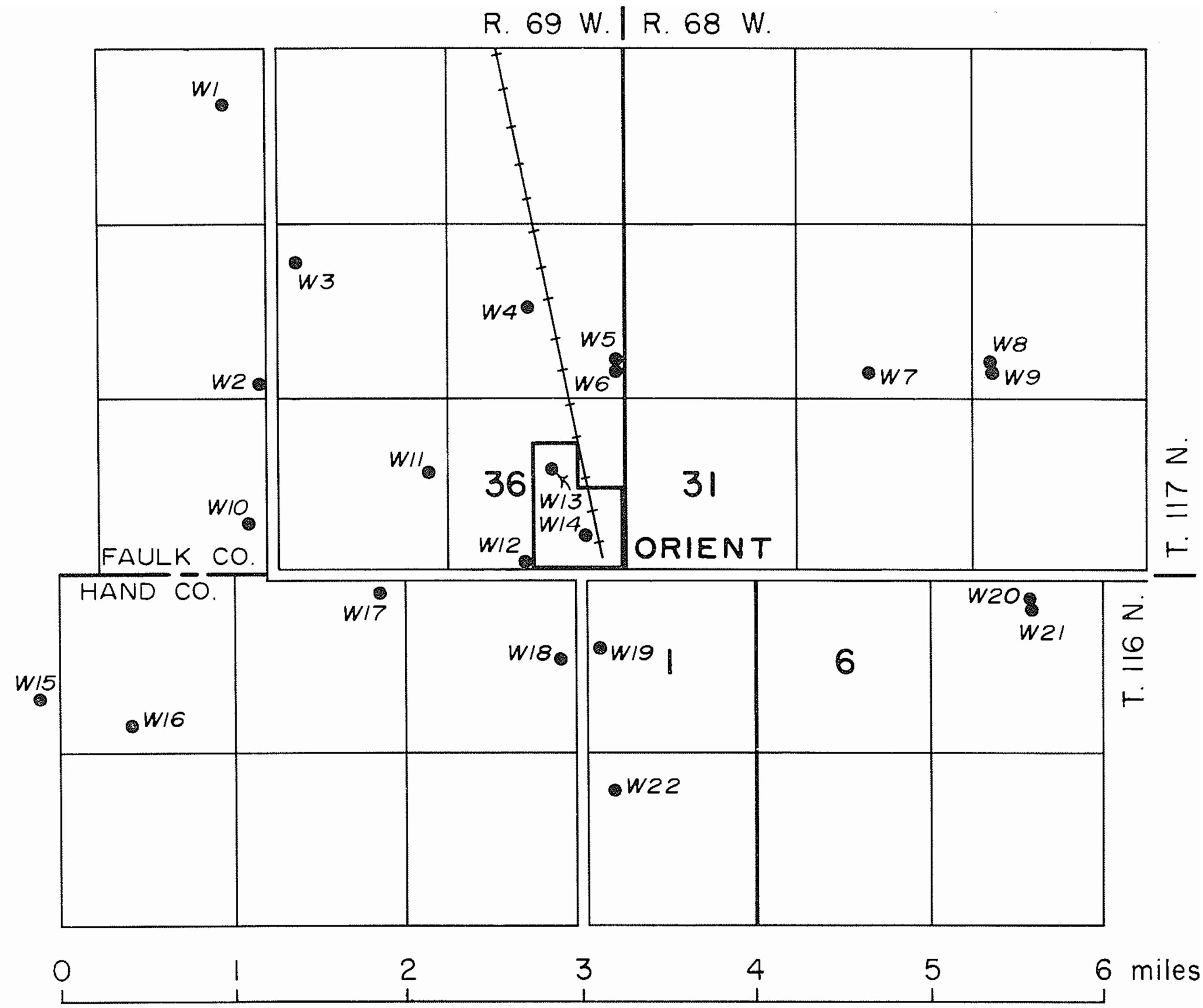

W17 ● Location of water samples. (numbers refer to water samples listed in Table I. Well owners listed on following page.)

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Figure 5. Map showing location of water samples collected in the Orient area.

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TABLE 1. Chemical analyses of water samples from the Orient area

Sample	Source	Parts Per Million											
		Calcium	Sodium	Magnesium	Chloride	Sulfate	Iron	Manganese	Nitrate Nitrogen	Fluoride	pH	Hardness $CaCO_3$	Total Solids
A		....	......	....	250	500[1]	0.3	0.05	10.0	0.9-1.7[2]	....	....	1000[1]
W 1	O	90		30	75	375	0.0	2.0	0.5		7.05	350	1320
W 2	O	190		90	260	1250	0.0	2.25	7.0		7.10	840	3120
W 3	O	195		67	215	1250	0.0	2.7	1.0		6.95	760	2640
W 4	K	8		14	405	525	0.0	0.0	0.0		7.85	80	1960
W 5	K(?)	375		88	75	1300	0.05	0.05	0.0		7.20	1295	2240
W 6	O	31		8	80	760	0.0	0.0	0.0		7.70	110	2040
W 7	O	360		148	245	1560	0.0	0.95	6.0		7.30	1505	3560
W 8	O	270		118	170	1380	0.0	0.3	11.0		7.35	1155	3160
W 9	O	160		42	515	1400	0.03	0.25	1.5		7.30	570	3400
W10	K	12.5		12.5	345	475	0.0	0.0	0.0		7.85	82	1800
W11	O	100		48	35	350	0.0	0.90	0.0		7.35	450	960
W12	O	190	600	0	265	1360	1.0	0.05	5.0		7.45	200	2200
W13	O	83		30	2330	25	0.0	0.15	0.0		7.85	330	4160
W14	K	24		9	340	538	0.7	0.0	2.0		8.00	97	1801
W15	O	175		155	66	1250	0.0	1.8	5.0		7.20	1075	2200
W16	O	140		61	4.5	325	0.06	2.1	0.0		7.20	600	760
W17	O	455		140	110	1130	0.0	3.0	12.0		6.85	1700	2440
W18	O	115		31	90	480	0.0	0.38	8.0		8.05	415	1360
W19	O	60		30	415	560	0.0	0.10	0.5		7.80	275	2320
W20	O(?)	185		67	85	1090	0.16	1.0	8.5		7.25	735	2400
W21	O(?)	120		365	160	1880	0.0	4.0	1.7		6.85	1795	4440
W22	O	20		10	960	50	0.0	0.0	0.0		8.10	85	2280

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

Source: O, buried outwash and sand lenses; K, Dakota Formation

Sample W14 was analyzed by the South Dakota Department of Health (from South Dakota Public Water Supply Data, January, 1971).

All other samples were analyzed by the South Dakota Geological Survey.

[1] Modified for South Dakota by the Department of Health (written communication, Water Sanitation Section, September 24, 1968).

[2] 1.2 is optimum for South Dakota.

Location of water samples from the Orient area
(For map location, see fig. 5)

W 1. NE¼NE¼SW¼NE¼ sec. 22, T. 117 N., R. 69 W., D. Hammond, 81 feet deep, water level 40 feet.

W 2. NE¼SE¼SE¼SE¼ sec. 27, T. 117 N., R. 69 W., E. Hargens, 105 feet deep, water level 78 feet.

W 3. SE¼SW¼NW¼NW¼ sec. 26, T. 117 N., R. 69 W., H. Bauer, 100 feet deep, water level 25 feet.

W 4. SE¼SE¼SE¼NW¼ sec. 25, T. 117 N., R. 69 W., R. Meyer, 1200 feet deep.

W 5. NE¼NE¼SE¼SE¼ sec. 25, T. 117 N., R. 69 W., R. Schulte, 1800 feet deep, flows.

W 6. NE¼NE¼SE¼SE¼ sec. 25, T. 117 N., R. 69 W., R. Schulte, 62 feet deep, water level 22 feet.

W 7. SE¼NE¼SE¼SW¼ sec. 29, T. 117 N., R. 68 W., J. O'Donnell, 70 feet deep, water level 60 feet.

W 8. SE¼NW¼SW¼SW¼ sec. 28, T. 117 N., R. 68 W., L. Pottebaum, 85 feet deep.

W 9. SE¼NW¼SW¼SW¼ sec. 28, T. 117 N., R. 68 W., L. Pottebaum, 96 feet deep, water level 47 feet.

W10. SW¼SE¼NE¼SE¼ sec. 34, T. 117 N., R. 69 W., E. Schmidt, 1300 feet deep, water level 160 feet.

W11. NW¼SE¼SE¼NE¼ sec. 35, T. 117 N., R. 69 W., D. Dieter, 30 feet deep, water level 16 feet.

W12. SE¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W., Test well, 66 feet deep.

W13. NE¼SW¼SW¼NE¼ sec. 36, T. 117 N., R. 69 W., T. Anderson, 140 feet deep, water level 30 feet.

W14. NW¼NW¼SE¼SE¼ sec. 36, T. 117 N., R. 69 W., Orient City, 1365 feet deep, water level 84 feet.

W15. SW¼SE¼NE¼SE¼ sec. 5, T. 116 N., R. 69 W., W. Matter, 56 feet deep, water level 39 feet.

W16. SW¼NE¼SE¼SW¼ sec. 4, T. 116 N., R. 69 W., D. Riechers, 20 feet deep.

W17. SE¼NW¼NE¼NE¼ sec. 3, T. 116 N., R. 69 W., R. Conway, 37 feet deep, water level 33 feet.

W18. SW¼SE¼SE¼NE¼ sec. 2, T. 116 N., R. 69 W., J. Pottebaum, 49 feet deep.

W19. NE¼SW¼SW¼NW¼ sec. 1, T. 116 N., R. 69 W., E. Schirber, 28 feet deep, water level 12 feet.

W20. SE¼NW¼NW¼NE¼ sec. 5, T. 116 N., R. 68 W., L. Larson, house.

W21. SE¼NW¼NW¼NE¼ sec. 5, T. 116 N., R. 68 W., L. Larson, windmill.

W22. SW¼SE¼NW¼NW¼ sec. 12, T. 116 N., R. 69 W., O. Hagen, 86 feet deep, water level 24 feet.

Table 2.--Significance of some chemical and physical properties of drinking water.

Chemical Constituents	Significance	Recommended Limits (ppm)[1]
Calcium (Ca) and Magnesium (Mg)	Cause most of the carbonate hardness and scale-forming properties of water by combining with carbonate and bicarbonate present in the water. Seldom can be tasted except in extreme concentrations.	Ca—None Mg—None
Sodium (Na)	Large amounts in combination with chloride will give water a salty taste. Large amounts will limit water for irrigation and industrial use.	None
Chloride (Cl)	Large amounts in combination with sodium give water a salty taste. Large quantities will also increase corrosiveness of water.	250
Sulfate (SO_4)	Large amounts of sulfate in combination with other ions give a bitter taste to water and may act as a laxative to those not used to drinking it. Sulfates of calcium and magnesium will form hard scale. U. S. Public Health Service recommends 250 ppm maximum concentration.	500[2]
Iron (Fe) and Manganese (Mn)	In excess will stain fabrics, utensils, and fixtures and produce objectionable coloration in the water. Both constituents in excess are particularly objectionable.	Fe—0.3 Mn—0.05
Nitrate Nitrogen (N)	In excess may be injurious when used in infant feeding. The U. S. Public Health Service regards 45 ppm as the safe limit of nitrate (NO_3) or 10 ppm nitrate nitrogen (N).	10
Fluoride (F)	Reduces incidence of tooth decay when optimum fluoride content is present in water consumed by children during period of tooth calcification. Excessive fluoride in water may cause mottling of enamel.	0.9-1.7[3]
pH	A measure of the hydrogen ion concentration; pH of 7.0 indicates a neutral solution, pH values lower than 7.0 indicate acidity, pH values higher than 7.0 indicate alkalinity. Alkalinity tends to aid encrustation and acidity tends to aid corrosion.	None
Hardness	Hardness equivalent to carbonate and bicarbonate is called carbonate hardness. Hardness in excess of this amount is noncarbonate hardness. Hardness in water consumes soap and forms soap curd. Will also cause scale in boilers, water heaters, and pipes. Water containing 0-60 ppm hardness considered soft; 61-120 ppm moderately hard; 121-180 ppm hard, and more than 180 ppm very hard. Good drinking water can be very hard.	None
Total Solids	Total of all dissolved constituents. U. S. Public Health Department recommends 500 ppm maximum concentration. Water containing more than 1000 ppm dissolved solids may have a noticeable taste; it may also be unsuitable for irrigation and certain industrial uses.	1000[2]

Modified from Jorgensen (1966).
[1] (ppm) parts per million.
[2] Modified for South Dakota by the South Dakota Department of Health (written communication, Water Sanitation Section, September 24, 1968).
[3] 1.2 is optimum for South Dakota.

are from deep aquifers, all the other samples are from shallow glacial deposits.

The wells in glacial deposits are developed in shallow buried glacial outwash or possibly from sand lenses in till. Some of these analyses represent the best and worst quality water in the area. Sample W7 is representative of some of the worst quality water in the area. All the amounts of dissolved chemicals in sample W7 are more than the recommended limits except chlorides, nitrate, and iron. Sample W16 is the best quality water analyzed in the area. Only manganese in this sample is more than the recommended limits set by the South Dakota Department of Health. All other dissolved chemicals in sample W16 are within those limits and the water is fairly good in quality. The remaining samples from the shallow glacial aquifer fall between the two samples discussed above, which means their water is generally high in dissolved chemicals.

Sample W12 was collected from a test well next to the city after it was pumped for two hours. The well was finished in a sand and gravel deposit to a depth of 66 feet. This sample was very comparable to the average water quality found in all the other shallow buried outwash deposits in the Orient area. Nitrate and manganese were the only dissolved chemicals that were within the recommended limits set by the South Dakota Department of Health. The water contains more total solids, iron, and sulfate than the present city well (sample W14). This water is also harder than the water from the city well.

Samples from deep aquifers W4, W5, W10, and W14 also have some chemicals higher than the recommended limits. Sample W10, from the Ernest Schmidt farm well (formerly the Chalquist well--see test hole 1, app. A), shows water very similar in quality to the city water supply (W14). A driller's log and electric log (South Dakota Geological Survey) of the Chalquist well (now the Schmidt well) show that the well is finished in the Dakota Formation. Since the Orient city well is approximately the same depth, it too is probably finished in the Dakota Formation. The total solids and chlorides in the water from both wells are more than the recommended limits set by the South Dakota Department of Health. The iron, sulfates, and fluoride values from the city well are also more than the recommended limits allow. All other dissolved chemicals in both samples are within those limits.

Samples W4 and W5 are from two more wells in deep aquifers in the Orient area. Sample W4, from the Robert Meyer farm, is from a well 1,200 feet deep (Dakota Formation) and sample W5, from the Richard Schulte farm, is from a well 1,800(?) feet deep (Fall River Sandstone?). Both wells show water with high amounts of dissolved chemicals. Sample W4 is similar in quality to the Orient city well and the Schmidt well. It is also high in total solids, chlorides, and sulfates but is within the recommended limits for all other dissolved chemicals. Total solids and sulfates in sample W5 are more than sample W4. Also W5 is harder water than W4. All other dissolved chemicals, including chlorides, are within the recommended limits.

CONCLUSIONS AND RECOMMENDATIONS

A glacial aquifer was located just south and west of the Orient city limits. The thickness of the sand and gravel in each test hole is shown in figure 4. Because of rapid changes in the thickness of this deposit, contours are not shown on this figure. The sand and gravel deposit was at an average depth of 38 feet below land surface and the area having the thickest and widest extent of known sand was in SW¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W. A test well (test hole 20, app. A) in this area was pumped and the water was shown to contain high amounts of dissolved chemicals (sample W12, table 1). The total solids, iron, and sulfate content of this water are higher than the city water (W14). This water is also harder than the city water.

The Dakota Formation is a major bedrock aquifer in the Orient area and it is the source of the present city water supply. It lies approximately 1,000 feet below land surface and is about 300 feet thick. The water is high in dissolved chemicals, but it is better quality water than most water samples from the glacial aquifer in the area.

The Fall River Sandstone lies below the Dakota Formation. From wells in other counties in South Dakota, water quality from the unit shows it contains higher amounts of dissolved chemicals than found in water from the Dakota in the Orient area.

Based on the data above, two recommendations can be made to the city of Orient. One recommendation would be for the city to construct a new well in the Dakota Formation. Drilling could be done near the present city well site. The city should also consider treating their water supply if they do construct a new well in the Dakota Formation. Recent advances in water-treatment technology have resulted in more economical water-treatment plants for cities.

The second recommendation would be for the city to participate in a rural water system. Such a system could provide good quality water to the city from a distance source, or treated water from the city could furnish good quality water for both the city and nearby farms.

Before another permanent well is drilled, the city officials should consult the Division of Water Rights, Department of Natural Resource Development, Pierre, South Dakota, to obtain water rights and a permit to drill a municipal well. The city should also consult the Environmental Protection Agency to determine the biological and chemical suitability of the new water supply.

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APPENDIX A

Logs of wells and test holes in the Orient area
(For map location, see fig. 3)

All test holes were drilled by the South Dakota Geological Survey unless otherwise indicated.

Test Hole 1 (Chalquist farm well drilled by Larson Bros.)
Location: SW¼SW¼NE¼SE¼ sec. 34, T. 117 N., R. 69 W.
Depth to water: 161 feet
Elevation: 1682 ± 5 feet

0- 130	Glacial drift
130- 530	Pierre Shale
530- 655	Niobrara Marl
655- 890	Carlile Shale
890- 930	Greenhorn Limestone
930-1175	Graneros Shale
1175-1265	Dakota Sandstone

* * * *

Test Hole 2 (U.S.G.S. test hole)
Location: SE¼SE¼SE¼SE¼ sec. 35, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1626 ± 5 feet

0- 34	Clay, yellow-brown to dark brown, pebbly
34- 54	Clay, gray, pebbly, sandy
54- 55	Shale

* * * *

Test Hole 3
Location: SE¼SW¼SW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1626 ± 5 feet

0 - 1½	Soil, dark brown
1½- 14	Clay, brown, pebbly
14 - 53	Clay, gray, pebbly
53 - 58	Shale

* * * *

Test Hole 4
Location: NW¼SW¼NW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1630 ± 5 feet

0- 2	Soil, dark brown
2- 15	Clay, brown, pebbly
15- 43	Clay, gray, pebbly
43- 46	Sand, very fine, clayey
46- 53	Clay, gray, gravelly, pebbly
53- 56	Gravel
56- 60	Clay, gray, sandy, gravelly, pebbly
60- 68	Shale

* * * *

Test Hole 5
Location: NW¼NW¼NW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1631 ± 5 feet

Test Hole 5 -- continued.

0- 2	Soil, brown
2- 19	Clay, brown, pebbly
19- 32	Clay, gray, pebbly
32- 38	Gravel
38- 61	Clay, gray, gravelly, pebbly
61- 63	Shale

* * * *

Test Hole 6
Location: SE¼SW¼NW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1625 ± 5 feet

0- 2	Soil, brown
2- 24	Clay, brown, sandy, pebbly
24- 56	Clay, gray, pebbly
56- 58	Shale

* * * *

Test Hole 7
Location: NE¼SE¼NW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1623 ± 5 feet

1 - 1½	Soil, brown
1½- 16	Clay, brown, pebbly
16 - 48	Clay, gray, pebbly
48 - 50	Sand fine to medium
50 - 53	Clay, gray, sandy, pebbly

* * * *

Test Hole 8
Location: NE¼SE¼NW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: (rose to top of hole)
Elevation: 1623 ± 5 feet

0 - 1½	Soil, dark brown
1½- 19	Clay, brown, pebbly
19 - 38	Clay, gray, pebbly
38 - 48	Sand, fine to very fine
48 - 60	Sand, coarse to very coarse, some gravel
60 - 63	Shale

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Test Hole 9
Location: NE¼SE¼NW¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: 41.5 feet
Elevation: 1623 ± 5 feet

0- 2	Soil, dark brown
2- 21	Clay, brown, pebbly
21- 24	Clay, gray, sandy, pebbly
24- 32	Sand, fine to medium, clayey
32- 35	Clay, gray, pebbly
35- 43	Sand, medium
43- 53	Gravel

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Test Hole 10
Location: NW¼NW¼NE¼SW¼ sec. 36, T. 117 N., R. 69 W.

Test Hole 10 -- continued.

Depth to water: Not measured
Elevation: 1622 ± 5 feet

0- 2	Soil, dark brown
2- 12	Clay, brown, pebbly
12- 40	Clay, gray, pebbly
40- 43	Sand
43- 65	Clay, gray, sandy, gravelly, pebbly
65- 68	Shale

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Test Hole 11
Location: NW¼SE¼NE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1615 ± 5 feet

0- 1	Soil
1- 19	Clay, light tan, pebbly
19- 29	Clay, gray, pebbly
29- 32	Clay, gray, pebbly, sandy
32- 36	Sand, fine, clayey
36- 40	Sand, fine, some gravel, clayey
40- 50	Sand, fine, very clayey
50- 53	Shale

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Test Hole 12
Location: NE¼SE¼NE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1615 ± 5 feet

0- 4	Soil, black
4- 23	Clay, brown, pebbly
23- 32	Clay, gray, sandy, pebbly
32- 38	Sand, fine
38- 40	Clay, gray, sandy, pebbly
40- 62	Sand, fine to medium
62- 67	Clay, gray, pebbly
67- 72	Sand, fine to medium
72- 82	Shale

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Test Hole 13
Location: NE¼NE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1612 ± 5 feet

0- 2	Soil, black
2- 14	Clay, brown, pebbly
14- 48	Clay, gray, pebbly
48- 53	Shale

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Test Hole 14
Location: SE¼SW¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1614 ± 5 feet

0- 1	Soil
1- 12	Clay, light brown, pebbly

Test Hole 14 -- continued.

12- 54	Clay, gray, pebbly
54- 56	Shale

* * * *

Test Hole 15
Location: SW¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1608 ± 5 feet

0- 2	Soil
2- 15	Clay, tan, pebbly
15- 47	Clay, gray, pebbly
47- 59	Clay, gray, gravelly
59- 61	Shale

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Test Hole 16
Location: SW¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1608 ± 5 feet

0 - ½	Soil, black
½- 8	Clay, brown, pebbly
8 - 12	Clay, gray, pebbly
12 - 13	Sand, brown, very fine, some clay
13 - 28	Clay, gray, sandy, pebbly
28 - 35	Sand
35 - 50	Gravel, coarse
50 - 52	Clay, gray, sandy, gravelly
52 - 55	Gravel, coarse
55 - 63	Clay, gray-black, sandy, pebbly, shaley

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Test Hole 17
Location: SW¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: 10.5 feet
Elevation: 1612 ± 5 feet

0 - 2½	Soil, brown
2½- 16	Clay, brown, pebbly
16 - 39	Clay, gray, pebbly
39 - 48	Gravel

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Test Hole 18
Location: SW¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: 23.3 feet
Elevation: 1612 ± 5 feet

0- 2	Soil, dark brown
2- 18	Clay, yellow-brown, pebbly
18- 38	Clay, gray, pebbly
38- 50	Gravel, coarse

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Test Hole 19
Location: SE¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1616 ± 5 feet

Test Hole 19 -- continued.

0- 1	Soil
1- 18	Clay, tan, pebbly
18- 40	Clay, gray, pebbly
40- 56	Gravel, medium
56- 61	Sand, coarse, some clay
61- 64	Shale

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Test Hole 20
Location: SE¼SE¼SE¼SW¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1612 ± 5 feet

0- 1	Soil
1- 17	Clay, brown, pebbly
17- 26	Clay, gray, pebbly
26- 28	Clay, gray, some fine sand
28- 42	Clay, gray, pebbly
42- 54	Gravel
54- 64	Sand, very coarse
64- 66	Shale

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Test Hole 21
Location: SW¼SW¼SW¼SE¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1610 ± 5 feet

0- 1	Soil
1- 19	Clay, tan, pebbly
19- 36	Clay, gray, some sand
36- 42	Clay, gray, with sand and gravel
42- 46	Silt, gray, clayey
46- 50	Clay, gray, pebbly
50- 55	Shale

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Test Hole 22
Location: SE¼SW¼SE¼SE¼ sec. 36, T. 117 N., R. 69 W.
Depth to water: Not measured
Elevation: 1600 ± 5 feet

0 - ½	Soil, black
½- 30	Clay, brown, sandy, pebbly
30 - 40	Clay, gray, sandy, pebbly
40 - 44	Sand, coarse
44 - 45	Clay, gray-black, pebbly, shaley

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Test Hole 23
Location: SW¼SE¼SW¼SW¼ sec. 31, T. 117 N., R. 68 W.
Depth to water: Not measured
Elevation: 1588 ± 5 feet

0 - ½	Soil, black
½- 11	Clay, brown, silty, pebbly
11 - 47	Clay, gray, sandy, pebbly
47 - 47½	Sand, very fine
47½- 61	Clay, gray, pebbly
61 - 62	Shale

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Test Hole 24
Location: NE¼SE¼NW¼NW¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: None
Elevation: 1620 ± 5 feet

0 - 2½	Soil, brown
2½- 14	Clay, brown, pebbly
14 - 65	Clay, gray, pebbly
65 - 73	Shale

* * * *

Test Hole 25
Location: SE¼NW¼SE¼NW¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: None
Elevation: 1620 ± 5 feet

0- 18	Clay, brown, pebbly
18- 72	Clay, gray, pebbly, sandy
72- 73	Shale

* * * *

Test Hole 26
Location: SW¼SW¼NW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: Not measured
Elevation: 1610 ± 5 feet

0- 24	Clay, brown, pebbly
24- 42	Clay, gray, pebbly
42- 57	Sand, fine to medium, clayey
57- 60	Clay, black, pebbly
60- 76	Shale

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Test Hole 27
Location: NE¼NE¼NW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: Not measured
Elevation: 1612 ± 5 feet

0- 2	Soil
2- 21	Clay, brown, pebbly
21- 47	Clay, gray, pebbly
47- 52	Gravel and coarse sand
52- 54	Shale

* * * *

Test Hole 28
Location: NW¼NE¼NW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: Not measured
Elevation: 1612 ± 5 feet

0- 1	Soil
1- 20	Clay, brown, pebbly
20- 42	Clay, gray, pebbly
42- 44	Clay, gray, gravelly
44- 54	Clay, gray, pebbly
54- 56	Shale

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Test Hole 29
Location: SE¼NE¼NW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: Not measured
Elevation: 1600 ± 5 feet

Test Hole 29 -- continued.

0- 2	Soil, brown
2- 18	Clay, brown, pebbly
18- 48	Clay, gray, pebbly

* * * *

Test Hole 30
Location: NW¼NE¼SW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: 24.4 feet
Elevation: 1610 ± 5 feet

0 - 2½	Soil, black
2½- 18	Clay, brown, pebbly
18 - 40	Clay, gray, pebbly
40 - 48	Sand and gravel

* * * *

Test Hole 31
Location: NW¼NE¼SW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: 16.4 feet
Elevation: 1610 ± 5 feet

0 - 2½	Soil, black
2½- 14	Clay, brown, pebbly
14 - 42	Clay, gray, gravelly, pebbly
42 - 57	Sand, very coarse, some gravel
57 - 60	Clay, gray, gravelly, pebbly
60 - 67½	Shale

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Test Hole 32
Location: NE¼NE¼SW¼NE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: 9.7 feet
Elevation: 1610 ± 5 feet

Test Hole 32 -- continued.

0- 3	Soil, dark brown
3- 18	Clay, yellow-brown, pebbly
18- 23	Clay, gray, sandy, pebbly
23- 26	Sand, medium
26- 58	Clay, gray, pebbly

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Test Hole 33
Location: NW¼NE¼SW¼NW¼ sec. 1, T. 116 N., R. 69 W.
Depth to water: Not measured
Elevation: 1590 ± 5 feet

0 - 5	Soil, dark brown
5 - 28	Clay, brown, sandy, pebbly
28 - 50	Clay, gray, sandy, pebbly
50 - 50½	Sand, very fine
50½- 63	Shale

* * * *

Test Hole 34
Location: NW¼NW¼NE¼SE¼ sec. 2, T. 116 N., R. 69 W.
Depth to water: None
Elevation: 1600 ± 5 feet

0 - 1½	Soil, dark brown
1½- 20	Clay, brown, pebbly
20 - 47	Clay, gray, pebbly
47 - 58	Clay, black, pebbly, shaley
58 - 68	Shale

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APPENDIX B

Well records in the Orient area

Source: O, outwash and sand lenses; K, Dakota sands
Use: D, domestic; S, stock; OB, observation well

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Gebhart, R.	SE¼SE¼SW¼SE¼ sec. 1, T. 117 N., R. 69 W.			K	
SDGS	SE¼SE¼SE¼SE¼ sec. 1, T. 117 N., R. 69 W.	99	50		OB
Bowar, L.	NW¼ sec. 2, T. 117 N., R. 69 W.	1252			D,S
Bowar, L.	NW¼NW¼NW¼NW¼ sec. 2, T. 117 N., R. 69 W.	1239	101	K	D,S
Bowar, L.	NW¼NW¼NW¼NW¼ sec. 2, T. 117 N., R. 69 W.	1252	23	K	
Benet, A.	NE¼NE¼NW¼NE¼ sec. 2, T. 117 N., R. 69 W.				D,S
Bowar, E.	NE¼SE¼NE¼NE¼ sec. 3, T. 117 N., R. 69 W.	1325	106	K	D,S
Bowar, H.	NE¼ sec. 3, T. 117 N., R. 69 W.	1230		K	D,S
Schraeder, E.	SE¼SE¼SE¼SW¼ sec. 4, T. 117 N., R. 69 W.	80	22	K	
Unknown	SW¼ sec. 4, T. 117 N., R. 69 W.	1200			S
Schraeder, E.	SE¼SE¼SE¼SW¼ sec. 4, T. 117 N., R. 69 W.	57	19	O	
Schraeder, E.	SE¼SE¼SE¼SW¼ sec. 4, T. 117 N., R. 69 W.	60		O	D,S
Martschinske, E.	NW¼NW¼NW¼SW¼ sec. 5, T. 117 N., R. 69 W.	120		K	D,S
Martschinske, E.	NW¼NW¼NW¼SW¼ sec. 5, T. 117 N., R. 69 W.	1600		K	
Martschinske, E.	NW¼NW¼NW¼SW¼ sec. 5, T. 117 N., R. 69 W.	107			
Martschinske, E.	NW¼ sec. 5, T. 117 N., R. 69 W.	1200		K	D,S
Wild, E.	SE¼SE¼SE¼SE¼ sec. 6, T. 117 N., R. 69 W.	70		O	S
Unknown	SE¼ sec. 6, T. 117 N., R. 69 W.	1200		K	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Potter, R.	SW¼NE¼NE¼NE¼ sec. 7, T. 117 N., R. 69 W.	50		O	
Potter, R.	NE¼NE¼NE¼NE¼ sec. 7, T. 117 N., R. 69 W.	67			
Potter, R.	NE¼ sec. 7, T. 117 N., R. 69 W.	1200		K	D,S
Unknown	NW¼NW¼NW¼SE¼ sec. 8, T. 117 N., R. 69 W.	123	79		
Unknown	SW¼SW¼SW¼SW¼ sec. 8, T. 117 N., R. 69 W.	77	38		
Waterman, G. E.	NE¼ sec. 9, T. 117 N., R. 69 W.	1320		K	
Bowar, H.	SE¼NE¼NE¼NE¼ sec. 10, T. 117 N., R. 69 W.	1309	120	K	D,S
Bowar, H.	NE¼ sec. 10, T. 117 N., R. 69 W.	1240		K	D,S
Huss, R.	SE¼NE¼NE¼SE¼ sec. 12, T. 117 N., R. 69 W.	1272	40	K	
Larson, R.	SE¼SE¼SE¼NE¼ sec. 13, T. 117 N., R. 69 W.			K	D,S
USGS	SW¼SW¼SW¼SW¼ sec. 14, T. 117 N., R. 69 W.	114	24	O	OB
Mauer, F.	SW¼NW¼NW¼SW¼ sec. 14, T. 117 N., R. 69 W.	80			D,S
Hansen, L.	NW¼ sec. 22, T. 117 N., R. 69 W.			K	
Hammen, R.	NE¼NE¼SW¼NE¼ sec. 22, T. 117 N., R. 69 W.	80			D
Hammond, D.	NE¼NE¼SW¼NE¼ sec. 22, T. 117 N., R. 69 W.	81	40	O	D,S
SDGS	SW¼SW¼SW¼SW¼ sec. 23, T. 117 N., R. 69 W.	110			OB
Hanson	NE¼ sec. 23, T. 117 N., R. 69 W.	150		O	S
Schulte, R.	NE¼NE¼SE¼SE¼ sec. 25, T. 117 N., R. 69 W.	62	22	O	
Meyer, R.	SE¼SE¼SE¼NW¼ sec. 25, T. 117 N., R. 69 W.	1200		K	D,S
Schulte, R.	NW¼NW¼SE¼SE¼ sec. 25, T. 117 N., R. 69 W.	1800	flows		S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Bauer, H.	SW¼SW¼NW¼NW¼ sec. 26, T. 117 N., R. 69 W.	100	25	O	S
Unknown	NE¼SE¼ sec. 26, T. 117 N., R. 69 W.			K	
Schraeder, F.	SW¼NW¼NW¼NW¼ sec. 26, T. 117 N., R. 69 W.	85	16		
Unknown	SE¼NW¼SW¼ sec. 26, T. 117 N., R. 69 W.			O	
Hargens, E.	NW¼SE¼SE¼SE¼ sec. 27, T. 117 N., R. 69 W.	105	27	O	
McKay, G.	SW¼SW¼NW¼ sec. 28, T. 117 N., R. 69 W.	28	12	O	
McKay, G.	SW¼ sec. 29, T. 117 N., R. 69 W.	80	30		
McKay, G.	SW¼ sec. 29, T. 117 N., R. 69 W.	40	20		S
USGS	SE¼SE¼SE¼SW¼ sec. 31, T. 117 N., R. 69 W.	39	14		
USGS	SW¼SW¼SW¼SW¼ sec. 32, T. 117 N., R. 69 W.	79	46	K	
Chalquist, E.	SW¼NE¼SE¼ sec. 34, T. 117 N., R. 69 W.	1300	161	K	D,S
Chalquist, E.	SW¼NE¼SE¼ sec. 34, T. 117 N., R. 69 W.	160	45	K	
Schmidt, E.	SW¼SE¼NE¼SE¼ sec. 34, T. 117 N., R. 69 W.	1300	160	K	D,S
USGS	SE¼SE¼SE¼SE¼ sec. 35, T. 117 N., R. 69 W.	55	14	K	
Dieter, D.	NW¼SE¼SE¼NE¼ sec. 35, T. 117 N., R. 69 W.	30	16	O	D,S
Matter, E. H.	SE¼SE¼SE¼NE¼ sec. 35, T. 117 N., R. 69 W.	30	17		
City of Orient	NW¼NW¼SE¼SE¼ sec. 36, T. 117 N., R. 69 W.	1365	84	K	D,S
Anderson, T.	NE¼SW¼SW¼NE¼ sec. 36, T. 117 N., R. 69 W.	140	30		S
Becker, W.	NW¼NW¼ sec. 1, T. 117 N., R. 68 W.	70		O	
NWRR	NW¼SE¼SW¼SE¼ sec. 1, T. 117 N., R. 68 W.	1050	111	K	

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Miranda	NE¼SE¼SE¼SE¼ sec. 1, T. 117 N., R. 68 W.		111	K	
Becker, W.	SE¼SE¼SE¼NW¼ sec. 1, T. 117 N., R. 68 W.	100		O	D
Becker, W.	SE¼SE¼SE¼NW¼ sec. 1, T. 117 N., R. 68 W.	1500	111		
Becker, W.	SE¼NW¼ sec. 2, T. 117 N., R. 68 W.	70		O	
Unknown	SW¼SW¼NW¼SW¼ sec. 3, T. 117 N., R. 68 W.	39	18	O	
Mertchinske, D.	SW¼NW¼NW¼SW¼ sec. 4, T. 117 N., R. 68 W.	80	40	O	
Mertchinske, D.	SW¼NW¼NW¼SW¼ sec. 4, T. 117 N., R. 68 W.	1187	5	K	
USBR	SW¼SW¼SW¼SW¼ sec. 5, T. 117 N., R. 68 W.	16			OB
Muehl, J.	SW¼NW¼NW¼SW¼ sec. 6, T. 117 N., R. 68 W.	1173		K	D,S
Lordeman, W.	NE¼ sec. 6, T. 117 N., R. 68 W.	1186		K	
Huss, K.	SE¼NE¼NE¼NE¼ sec. 7, T. 117 N., R. 68 W.	50	48		
Huss, K.	SE¼NE¼NE¼NE¼ sec. 7, T. 117 N., R. 68 W.	1199		K	D
Kalkman, W.	NE¼NW¼NW¼NW¼ sec. 9, T. 117 N., R. 68 W.	100	50		D,S
SDGS	NW¼NW¼NW¼NW¼ sec. 10, T. 117 N., R. 68 W.	155		K (?)	
Harmon, F.	NE¼NE¼NE¼NE¼ sec. 10, T. 117 N., R. 68 W.		111	K	
Meyer, B.	NW¼NW¼NE¼NW¼ sec. 11, T. 117 N., R. 68 W.	1177	12	K	D,S
Wada, L.	SE¼SE¼SE¼NW¼ sec. 12, T. 117 N., R. 68 W.	1050		K	
Melius, D.	NE¼NE¼NE¼SE¼ sec. 12, T. 117 N., R. 68 W.	1100	111	K	
Unknown	NW¼NE¼NE¼NE¼ sec. 12, T. 117 N., R. 68 W.	38	22		
Fendies, E.	NW¼NW¼NE¼NE¼ sec. 12, T. 117 N., R. 68 W.		111	K	D

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
SDGS	SW¼SE¼SE¼SE¼ sec. 13, T. 117 N., R. 68 W.	200			
Dixem, R.	SW¼SW¼SW¼ sec. 14, T. 117 N., R. 68 W.	72	50	O	D
Dixem, R.	SW¼NW¼NW¼NW¼ sec. 14, T. 117 N., R. 68 W.	32	29	O	
Johnson, R.	NE¼NE¼SE¼NE¼ sec. 16, T. 117 N., R. 68 W.	64	37	O	
Johnson, R.	NE¼NE¼SE¼NE¼ sec. 16, T. 117 N., R. 68 W.	1210	111	K	
Unknown	NE¼ sec. 18, T. 117 N., R. 68 W.	1215		K	
Huss, K.	SE¼SE¼SE¼NE¼ sec. 19, T. 117 N., R. 68 W.		27		
Huss, K.	NW¼NW¼SW¼SE¼ sec. 19, T. 117 N., R. 68 W.	41	24		
USBR	NW¼NW¼NW¼NW¼ sec. 21, T. 117 N., R. 68 W.	15			
Stammer, G.	NE¼NW¼ sec. 23, T. 117 N., R. 68 W.	96		K	
Stammer, G.	SW¼SE¼SW¼ sec. 23, T. 117 N., R. 68 W.	84	18		
Balau Bros.	NE¼SE¼SE¼SE¼ sec. 24, T. 117 N., R. 68 W.	1200	111		D,S
Balau Bros.	NE¼SE¼SE¼SE¼ sec. 24, T. 117 N., R. 68 W.	28		O	
USGS	SE¼SE¼NE¼NE¼ sec. 25, T. 117 N., R. 68 W.	121			
Spraque, A.	NE¼NE¼NE¼NW¼ sec. 25, T. 117 N., R. 68 W.	1050	111		D
Spraque, A.	NE¼NE¼NE¼SE¼ sec. 26, T. 117 N., R. 68 W.	58	20		D,S
Spraque, A.	NE¼NE¼NE¼SE¼ sec. 26, T. 117 N., R. 68 W.	1050		K	
Stammer, G.	SW¼NW¼SW¼SW¼ sec. 26, T. 117 N., R. 68 W.	64		O	
Unknown	SE¼NW¼NW¼NW¼ sec. 27, T. 117 N., R. 68 W.	46	16		
Unknown	SE¼NW¼NW¼NW¼ sec. 27 T. 117 N., R. 68 W.		111	K	

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Pottebaum, L.	SE¼NW¼SW¼SW¼ sec. 28, T. 117 N., R. 68 W.	85			S
Pottebaum, L.	SE¼NW¼SW¼SW¼ sec. 28, T. 117 N., R. 68 W.	96	47	O	D
O'Donnell, L.	SE¼NE¼SE¼SW¼ sec. 29, T. 117 N., R. 68 W.	41			
O'Donnell, L.	SE¼NE¼SE¼SW¼ sec. 29, T. 117 N., R. 68 W.	50	38		D,S
O'Donnell, J.	SE¼NE¼SE¼SW¼ sec. 29, T. 117 N., R. 68 W.	70	60	O	D
Unknown	NE¼SE¼NE¼NW¼ sec. 31, T. 117 N., R. 68 W.	11	8		
USBR	SE¼SE¼SE¼SE¼ sec. 31, T. 117 N., R. 68 W.	52		O	
USGS	SW¼SW¼SW¼SW¼ sec. 33, T. 117 N., R. 68 W.	47	9		
McKay, G.	NE¼SE¼SE¼SE¼ sec. 33, T. 117 N., R. 68 W.	70	20		
Stoner, W.	NW¼NW¼NE¼ sec. 33, T. 117 N., R. 68 W.	48	26		
USGS	SE¼SE¼SE¼SE¼ sec. 34, T. 117 N., R. 68 W.	74	35	K	
Weis, C.	SE¼SE¼SE¼SW¼ sec. 35, T. 117 N., R. 68 W.	1300		K	
USBR	SW¼SW¼SW¼SW¼ sec. 35, T. 117 N., R. 68 W.	130	46	O	
Unknown	SW¼NE¼SW¼SW¼ sec. 36, T. 117 N., R. 68 W.	40	17		
Stevens, J.	NE¼NE¼NE¼ sec. 36, T. 117 N., R. 68 W.	18	9		S
USGS	SW¼SE¼SW¼SE¼ sec. 36, T. 117 N., R. 68 W.	72	1		
Schirber, E.	NE¼SW¼SW¼NW¼ sec. 1, T. 116 N., R. 69 W.	28	12		S
Schirber, E.	NE¼ sec. 1, T. 116 N., R. 69 W.	90	34		S
Pottebaum, J.	SE¼SW¼SE¼NE¼ sec. 2, T. 116 N., R. 69 W.	49		O	S
Conway, R.	SE¼SW¼NE¼NE¼ sec. 3, T. 116 N., R. 69 W.	37	33		S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Abandoned	SW¼NE¼SE¼SE¼ sec. 3, T. 116 N., R. 69 W.		22		
Riechers, D.	SW¼NE¼SE¼SW¼ sec. 4, T. 116 N., R. 69 W.	20		O	S
Matter, W.	NE¼NW¼SE¼SE¼ sec. 5, T. 116 N., R. 69 W.	56	39	O	D,S
Hagen, O.	NE¼SE¼NW¼NW¼ sec. 12, T. 116 N., R. 69 W.	106	60		S
Hagen, O.	SW¼SE¼NW¼NW¼ sec. 12, T. 116 N., R. 69 W.	86	24		D,S