

STATE OF SOUTH DAKOTA
Richard Kneip, Governor

DEPARTMENT OF NATURAL RESOURCE DEVELOPMENT
Vern W. Butler, Secretary

GEOLOGICAL SURVEY
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Open-File Report No. 11-UR

GROUND-WATER STUDY FOR THE
CITY OF FREDERICK

by

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Vermillion, South Dakota
1976

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GROUND-WATER STUDY FOR THE CITY OF FREDERICK

This report contains the results of a ground-water study conducted by the South Dakota Geological Survey for the City of Frederick, Brown County, South Dakota. The field work was conducted between June 18 and July 2, 1976. The purpose of the study was to locate a water source to augment the present water supply. The city presently receives its water from a well located within the town. This well is 21 feet deep and yields water from gravel outwash. Included in the study were: (1) interpretation of the geology, (2) drilling of 20 rotary holes and 10 auger holes, (3) chemical analysis of a water sample from the city well. Locations of the test holes are plotted on the map in figure 1 along with the location of the water sample.

Test drilling was conducted near the present well to determine whether the well penetrated the total thickness of gravel in that particular area, and to locate other sources of gravel in the vicinity of the town. Figure 2 shows the thickness of saturated sand and gravel at each hole.

The attached table shows the results of a water sample collected from the city well, and also the recommended limits set by the Department of Health. The water sample was analyzed by the South Dakota Geological Survey, and the results are presented in parts per million. Only iron and manganese exceed the recommended limits in this water.

Within the city limits the saturated thickness of sand varies from 1 foot to a maximum of 17 feet, with the most con-

sistent thickness in the vicinity of the present well. Of the holes drilled outside of town, three holes (8, 9, 10) had from 22 to 29 feet of saturated sand and gravel. These three holes are located from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles east of town (see figs. 1, 2, and app. A).

The water level at the city well is approximately 17 feet below the land surface. Although there are 14 feet of saturated gravel at this location, the city well penetrates only 4 feet into it. This well was pumped approximately 90 gallons per minute with a drawdown of one foot, and the water level stabilized at this level. Therefore, the conclusion of the survey is that deepening the well at this location or drilling a well north of the city well, and penetrating the total thickness of the aquifer, will increase the pumping capacity enough for the foreseeable future.

Another potential area for a well field is in the vicinity of test holes 8 and 9 (see fig. 1 and app. A) approximately $1\frac{1}{2}$ miles east of town. The saturated sand and gravel is more than 20 feet thick in this location. If the city should decide to test this area, it is recommended that a few test holes be drilled in this area and if the results are satisfactory a well should be drilled and a pump test should be conducted for at least 72 hours. Water samples should be collected and analyzed. The results of the pump test and water sample analyses will help to decide if the quantity and quality of water is satisfactory.

Before a new well is drilled, the city should contact the Division of Water Rights, Department of Natural Resource Develop-

ment, to obtain water rights and a permit to drill a municipal well, and the South Dakota Environmental Protection Agency to determine the biological and chemical suitability of the water.

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

This report was prepared by:

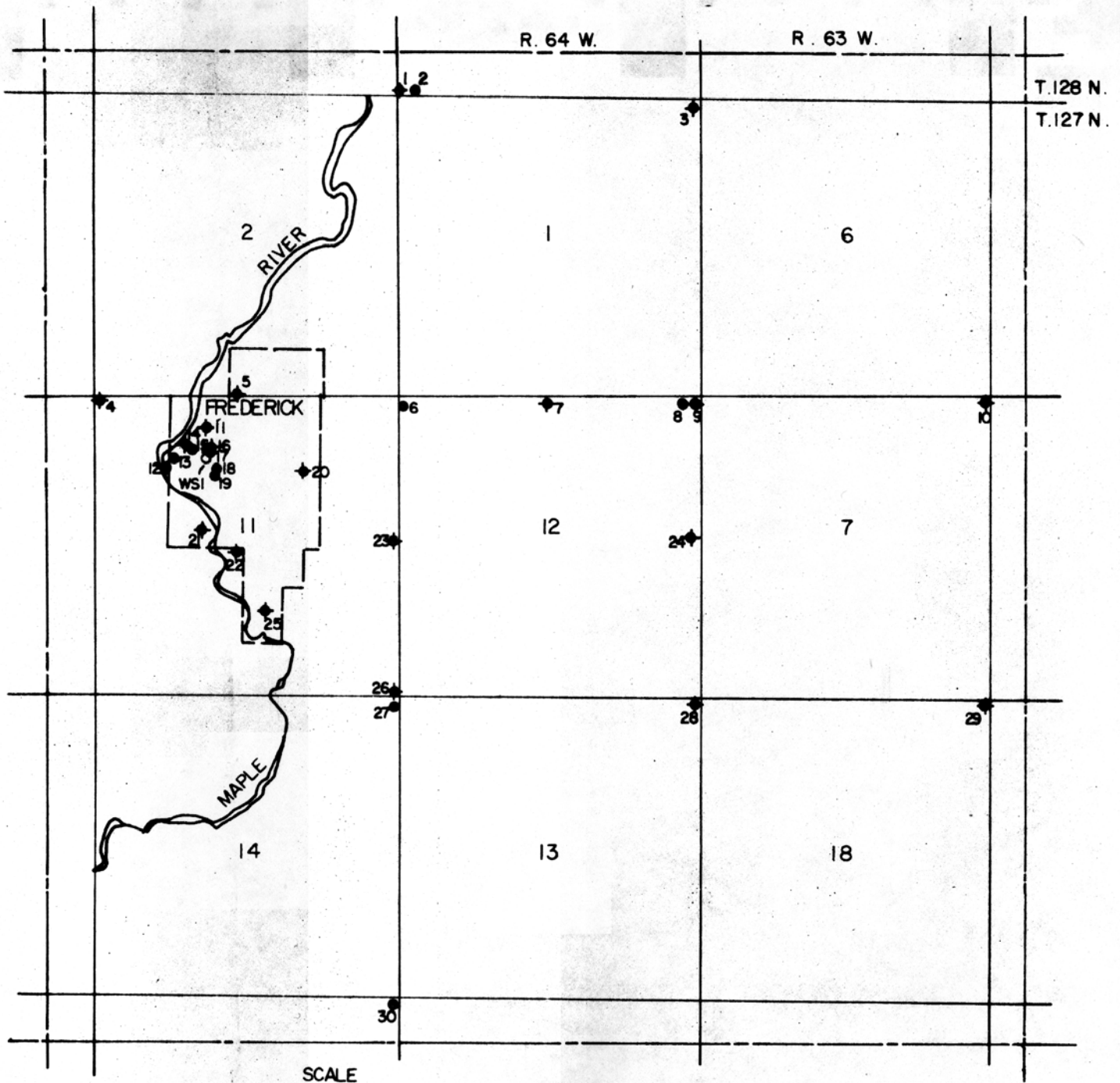
Betsy Slugg
Assad Barari
September, 1976.

CHEMICAL ANALYSES OF WATER SAMPLE COLLECTED FROM FREDERICK CITY WELL

	City well Frederick, S.D.	Drinking Water Standards U.S. Public Health Service
	Parts Per Million ¹	
Calcium	55	----
Sodium	180	----
Magnesium	50	----
Chlorides	110	250
Sulfate	210	500 ²
Iron	0.60	0.3
Manganese	0.40	0.05
Nitrate Nitrogen	4.6	10.0
Hardness CaCO ₃	342 ¹	----
Total Solids	940	1000 ²

¹To convert to grains, divide ppm by 17

²Modified for South Dakota by the Department of Health
(written communication, Water Sanitation Section,
September 24, 1968)



EXPLANATION;

- 2 Auger test hole, number refers to test hole in appendix A.
- ◆ 4 Rotary test hole, number refers to test hole in appendix A.
- _{WS1} Water sample.

FIGURE 1 -- Map showing locations of test hole and water sample in Frederick area.

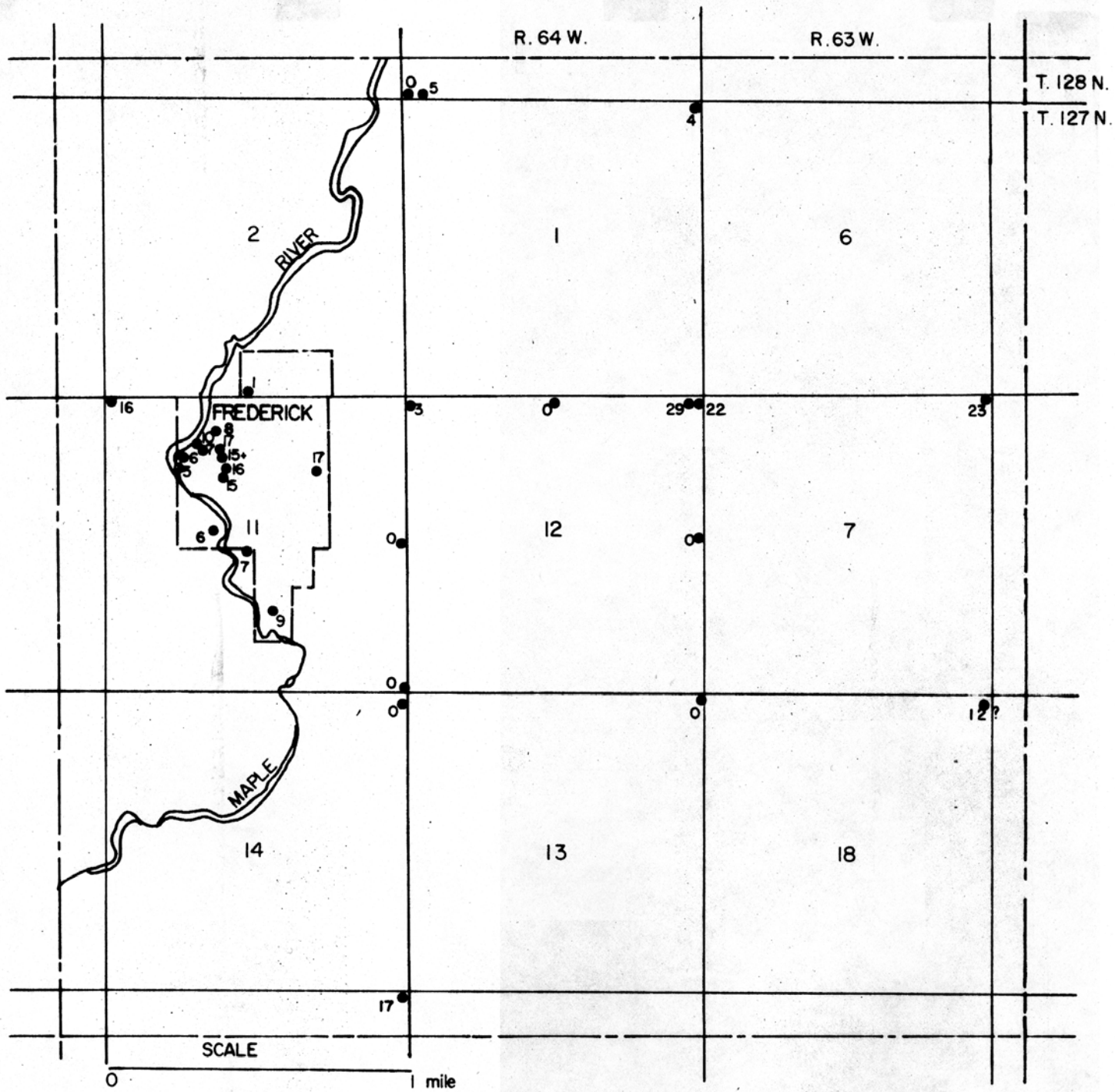


Figure 2 -- Map showing saturated thickness in feet of sand and gravel in the Frederick area.

APPENDIX A

LOGS OF TEST HOLES DRILLED IN THE

FREDERICK AREA

SOUTH DAKOTA GEOLOGICAL SURVEY EDERICK

Location: NE~~NE~~~~NE~~~~NE~~ Section: 23 T. 127 N. ~~XX~~, R. 64 W. ~~XX~~
Well: Auger Test Hole: 30 Land Owner: for the City
County: Brown Date: 6-22-76 Elevation: 1400 (A, I, T)
E-log: _____ Samples: _____ Drilling Company: SDGS
Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	4	Soil, light brown, silty, sandy, clayey	0-4
	14	Till, brown	4-18
	16	Clay, sandy	18-34
	11	Sand, medium to fine, silty	34-45
	6	Sand, medium to coarse, silty	45-51
	6	Till	51-57
		T.D. 57'	
		W.T. 20'	

0.30