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The Stratigraphy of the City Wells and the Problems of Water Distribution at Mankato

Mankato, a southern Minnesota city, has a population at the present time of approximately 24,000 inhabitants. The conurbation, however, including the city of north Mankato and the housing developments lying outside the limits of either city, bring the total population of the nucleus to about 30,000. Most of the area occupied by the city lies within the valley carved about 10,000 years ago by the glacial River Warren. The altitude of the post office building located on the first terrace above the Minnesota River, the river which now occupies the valley, is 793 feet above sea level. The plain into which this valley was cut was glacially deposited. In the Mankato area no conspicuous moraines are present. The many bench marks record altitudes either a few feet under or over 1000 feet. No official precipitation records are available. Maps prepared by the U.S. Government indicate that Mankato lies within an area that can normally expect 28 inches of precipitation. This amount, as is true elsewhere in the state, is not distributed evenly. 21 inches of the total amount is expected during the months of April to September.

Mankato was incorporated as a city in 1852. Since then it has experienced a steady pattern of population growth. Mankato's situation in southern Minnesota on the bend of the Minnesota River places it in the heart of agricultural Minnesota. The industries of the city both past and present reflect the agricultural pattern of the area.

The early use of water in Mankato was tied directly to the Minnesota River. Early steamboat traffic on the river helped to

develop Mankato and South Bend, a village two miles up the river, as ports for the exchange of cargo destined for or originating from cities on the Mississippi River. The site of early Mankato indicated a street pattern parallel or at right angles to the river.

The site of early Mankato was the big bend of the Minnesota River within the valley of the River Warren where much of the valley is two miles wide and 200 feet deep. Early Mankato was located on the many alluvial and rock terraces on the bottom of the valley. As the city expanded homes and schools were located on the bluffs and on the plain outside the valley. Industry continued to develop on the terraces, especially the rock terraces to the north of the city.

Early commercial water needs were met by the use of river water, springs, and shallow wells sunk into the alluvium of the river bed. It appears likely, though no records bear out the supposition, that springs in the vicinity helped to furnish water for domestic uses. Today a number of springs can be found in the area but none are used. It might be said that several have a nuisance value in that they interfere with building and road construction. The largest spring in the area is the one located near the corner of Rock and Broad streets. The cistern is approximately 15 feet deep and 15 feet in diameter. It is estimated that the spring discharges about 90 gallons of water a minute through a wooden culvert under the Mankato streets until it joins a storm sewer at the Hubbard Mill. At one time an attempt was made to stop the flow of this spring. This resulted in the flooding of the basement of the house on the adjoining lot.

The first deep wells explored the possibility of securing water in large quantities from the sedimentary rock formations underlying the city. The most significant drilling was made about 1880 at the southeastern part of the city on a formation known locally as Bunker Hill. The depth of this drilling is 2204 feet. The strata of this well have been described in great detail as 3 sets of rock samples encountered were saved (Winchell 1885: 422-424). The Mankato city council collected 29 samples at varying levels. These samples were

divided. One set can be seen at the Geology Department of the University of Minnesota. No trace can be found of the samples saved by the city council. Mr. W. Hodapp, a Mankato druggist, also saved a set of samples. His collection of 18 specimens can be viewed at the Blue Earth County Historical Society Museum at Mankato. It was hoped that this drilling would result in an artesian well that would supply the city with an abundance of water. The well failed to provide the needed water and was later abandoned. There has been some discussion recently as to the advisability of reopening the Bunker Hill well. This is quite unlikely in that the size of the bore, believed to be about 8 inches, is too small to make the well practical.

The present water supply for the city of Mankato is secured from three shallow wells sunk into the sediments of the Minnesota River valley and at least eleven wells that are drawing water from the sandstone beds underlying the city. Together the wells amply supply the present needs of the city of Mankato except in the periods of prolonged drought when use exceeds the amount the pumps are able to bring to the surface. All the wells on the lower terraces, with one exception, are artesian. However, pumps are used as the normal flow is much too slow to satisfy the present water needs.

The following Mankato industries have wells which supply their water needs: Mankato Cold Storage; Honeymead; Archer-Daniels-Midland; Kato Beer; Model Dairy; 7-Up; and the Hubbard Mill. The latter has three wells. The Good Council Academy has its own well. The Free Press, Mankato's one daily newspaper, and the First National Bank, each have wells used primarily for air conditioning. The well dug to the depth of 100 feet for the bank is not artesian. The well at the Free Press is 380 feet and is artesian.

Mankato water is not quality water. Analysis of the water indicates a degree of hardness that makes water softening a necessity. The water also tends to be corrosive.

The following table shows the analysis as described by Thiel (1944). The third column of figures is the writer's and is based upon information gathered from various pages of this compilation.

TABLE 1—Analysis of water from Mankato city wells:

	Raw Water	After Treatment	To Be Desired
Hardness	395	390	170
Alkalinity	286	288	
Iron	0.9	0.0	0.3
Manganese	4.0	3.0	2.2
Chlorides	5.5	3.5	250
Sulphates	144	132	250
Turbidity	2	0.01	
Color	32	3	
pH value	7.8	8.2	7.5

The distribution of water in Mankato is unique in that two levels are supplied and each has its own distribution system. Water is pumped from the Sibley Park wells which have a static water level of about 30 feet and the one deep well which is 600 feet to the filtration plant and then to a million gallon storage tank from which it is pumped under pressure to two underground storage tanks each holding approximately 2,000,000 gallons located off main street on the plain above the valley. From these tanks the water flows back into the water mains that supply the lower levels, the valley part of the city. A 500,000 gallon underground storage tank is now (May, 1958) under construction between Carney and Woodland Avenues. This will help feed the mains on the western part of the city which is not adequately serviced at this time.

At the same location of the two 2,000,000 gallon storage tanks is a 250,000 gallon overhead storage tank which is serviced from the underground tanks. This overhead tank feeds the mains which service the upper levels of the city.

As noted, the Mankato wells discharge an ample supply of water except in periods of unusual water demand. The six wells now in use are capable of discharging 4,500 gallons per minute. The following table gives some of the physical aspects of these wells:

Well	Depth (feet)	Diameter (inches)	Static Level (feet below sur.)	Pumping (G.P.M.)	Drawdown (feet)
6	600	12	35	500	81
8	69	16	29	350	10
9	66	19¼	29	750	14
10	73	19¼	29	900	19
11	847	20	177	1000	100
12	857	24	180	1000	100

CONCLUSION

There is an abundance of water available for domestic and industrial uses in Mankato. Wells sunk into the alluvium of the river valley and into the sandstone underlying the lower terraces can be artesian. Wells sunk from the plain outside the city are not. The water is odorless, colorless, and has no objectionable taste. It is extremely hard, making water softening necessary and it does tend to be corrosive. Some early wells have been abandoned because of the small size of their bore. A switch from steam power to electric power has caused a number to be capped. The growing popularity of air conditioning has resulted in the digging of several new ones. Waterwise, Mankato is a wealthy city.

LITERATURE CITED

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