W-3239

IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey

RECORD OF WELL

Location:

Town: Garrison (NE) (SW): County Benton

NW NE SE sec. 29 T 85 N., R. 11 W. Twp.

Well name and number Town well No. 2 (1948)

Owner Town of Garrison Address

Tenant Address

Contractor Hoeg and Ames Address Lincoln, Iowa

Drillers Ervol Fink

Drilling dates

Well data:

Elevations: Drilling curb 868 feet; Land surface 867.5 feet

Well curb is 5' above rail at station CRI&P - Sta El. 863±

Determined by hand level by W.E. Hale

Topographic position Valley of Hinkle Creek

Total depth: Reported feet, Measured 528 - Deepened to 1622 in 1958 feet

Drilling method Cable tool

Hole and casing date 70' of 10" casing 0-70

300' 4" of 8" casing 474' 8" to 775'

102' of 7" casing 893 - 1045'

Original depth to water 60' ft. above below Date

Original elevation of water level ft.; Source of data

Sources of water: Principal ; Others

Production data: Date

Static depth to water 60 Measuring point
Pumping level 107' at 300 g.p.m.

Specific capacity g.p.m. per ft. drawdown; Temperature °F.

Pump data; Type pump Column Dia. Length
Cylinder or bowls: Dia. Length Suction pipe
Power Airline
Estimated rate of production: g.p.m. for hrs. a day
Use of water

WATER AIALYSES (in parts per million)

Date samples				
Sampled by				
Total solids				
Insoluble matter				
Alkalinity (Meo)				
Alkalinity (Phn)				
pH				
Fe_2O_3-Mn_2O_3-Al_2O_3				
Alkali as sodium				
Calcium				
Magnesium				
Iron (unfiltered)				
Manganese				
Nitrate				
Fluoride				
Chlordie				
Sulfate				
Bicarbonate				
Hardness (ppm)				
Hardness (gpg)				

Remarks

Laboratory data: Sample storage location CD9-3 DA3-18,19,20.
Sample range 0-528 No. spls. 102 +209 No. dupls. & cond. 102-Good +203-Good
Spls. prepared by CWL & RKS Washed range 53-528-1622 by RKS & CWL; GWD; V.E.D.
Driller's log and cond. None
Insoluble residues: Prepared by Studied by Strip log
Microscopic study [illegible] strip log Sept 12, 1949
Gen. log Correl. by Hale
Nortrup 528'-1622' Oct., 1958

Ground-Water Conditions at Garrison, Iowa

The following commentary represents an interpretation of the available hydrogeologic data in the files of the Iowa and U. S. Geological Surveys.

The town of Garrison(1960 population 421) is located about 5-6 miles southwest of Vinton along the C.R.I.& P. Railway and Highway 198 in parts of sections 28 and 29, T. 85N., R. 11W. (Jackson township), Benton County. This places it in an area of moderately rolling terrain representing the Iowan glaciation. A generalized log of the formations encountered in the Garrison town well No. 2, drilled in 1948, is outlined in tabular form as follows (all depths are referred to a starting elevation of 868 feet above sea level):

Formation	Thickness(ft.)	Depth Range(ft.)
Quaternary System		
Pleistocene Series(thin loess at top underlain by glacial drift)	25	0 - 25
Devonian System		
Lime Creek Formation(shale)	10	25 - 35
Cedar Valley Formation(limestone and dolomite, minor chert and shale)	180	35 - 215
Wapsipinicon Formation(limestone, very dense, and dolomite, some shale in middle with trace of chert)	90	215 - 305
LaPorte City Formation(limestone 65±% and chert 35±%)	142	305 - 447
Silurian System		
Niagaran Series(dolomite, silty, minor chert)	63	447 - 510
Edgewood(?) Formation(dolomite, silty, trace of sand)	11	510 - 521
Ordovician System		
Maquoketa Shale, dolomitic, some thin dolomite beds in upper and lower parts	169	521 - 690
Galena Formation(limestone and dolomite, some chert in lower half)	250	690 - 940
Decorah-Platteville Formations (mostly limestone, very dense in lower half, some dolomite, thin shale near middle and at base)	102	940 - 1042
St. Peter Sandstone	30	1042 - 1072
Prairie du Chien Formation (dolomite, very sandy in upper half, very cherty in lower half;		

Formation	Thickness(ft.)	Depth Range(ft.)
Root Valley Sandstone in middle at 1,235-1,285 feet; Madison Sandstone and dolomite transition zone at base, 40 feet thick)	438	1072 - 1510
Cambrian System		
Jordan Sandstone	100	1510 - 1610
St. Lawrence Dolomite	12	1610 - 1622

A new well in this vicinity may show slightly different formation depths owing to local variations in the structure and thickness of the beds. A higher or lower starting site will also modify these depth figures somewhat.

In 1944 Garrison had a public supply well 150 feet deep which apparently was their only source of water. This well probably was completed in the Cedar Valley Formation. No data are available on the construction and production. A mineral analysis obtained in May 1941 showed the water to be acceptable for drinking, although containing 18 parts per million nitrate. Another town well was drilled for Garrison in 1948 which penetrated to the top of the Maquoketa Shale to a depth of 528 feet. Construction consisted of 70 feet of 10-inch casing cemented in a 15-inch hole and 10-inch open hole to bottom. A pumping test of about 7 hours duration delivered 70+ gpm with 179 feet of drawdown from a static head of 20.5 feet below the curb. About a year later this well began to pump a gas to such an extent that many consumers were having trouble with hammering in their water pipes and foaming and milky water. The Geological Surveys made some geophysical studies in this well with an electrical logging unit. This investigation indicated the gas may have been entering the well at a depth of 286 feet opposite the lower part of the Wapsipinicon Formation. In January 1950 the gas problem reportedly was eliminated, but the pump man working on the well could not explain why.

In the summer of 1958 the town well was deepened from 528 to 1,622 feet through the Jordan Sandstone and into the top of the St. Lawrence Dolomite. Additional casing was installed through the Maquoketa Shale section and lower Galena, Decorah-Platteville, and St. Peter Formations. The driller reported the well was capable of delivering 300 gpm with a drawdown of 134 feet from a static head of 60 feet. The water is acceptable for drinking and other general uses, but contains troublesome amounts of iron in solution. The water is treated for iron removal and disinfection before distribution into the mains. At this writing(July,1967) the deep town well is reported to be in poor condition with low output. The town reportedly has purchased the old Iowa Canning Company well drilled at Garrison in 1926 to a depth of 1,435 feet. This well seems to pump sand when the pumping rate climbs to about 100 gpm. The sand would seem to be derived from the St. Peter Sandstone and possibly the Root Valley Sandstone.

It is possible the existing deep well drilled in 1948-58 could be re-conditioned satisfactorily although this might not be simple and might also be rather expensive. Since there are already one string of surface casing and two strings of liner casing in this well, adding more casing would be rather difficult. However, acidizing and developing the Jordan Sandstone aquifer might restore much of the original production. This step might be worth the expense and time involved when the cost of drilling another deep Jordan well and the uncertain yields and water quality of the upper bedrock formations in this area are considered.

If the re-conditioning attempt is unsuccessful or for various reasons the town decides not to try this, a new well can be drilled through the Devonian-Silurian strata as far as the top of the Maquoketa Shale. Because of the uncertain results in these upper formations, it would seem advisable to start with a hole diameter large enough to extend the well through the Jordan Sandstone if necessary. The new well should be located as far as possible from the existing wells to reduce the interference effects. A favorable drilling location would seem to be the northwest part of the community on high ground. The results of the town well drilled in 1948 were rather disappointing since the specific capacity was less than .40 gpm/foot of drawdown. The yield from limestone rocks depends on the drill intersecting a good creviced zone. For example, the La Porte City Well No. 2 obtained a yield of 800 gpm with only 71.5 feet of drawdown. Unfortunately, the crevices occur so irregularly in the limestones there is no way to predict where they will occur. Acidizing the water-yielding zones may appreciably increase the original production from limestone aquifers. Since contamination can travel long distances through creviced limestones casing probably should be set and grouted in place from the surface to a considerable depth, perhaps as deep as 300 feet into the top of the La Porte City Formation. This will cut down on the chances of contamination reaching the well from the nearby quarries and from other wells in town that are open to the overlying Devonian rocks. A pumping test should be run and a water sample obtained when the well reaches the top of the Maquoketa Shale to ascertain the yield and quality of water available from the Devonian-Silurian section.

A well through the Jordan Sandstone is practically certain to yield at least several hundred gallons a minute and may yield much more if developed properly. The water is expected to be of good quality. In a well of this type casing should be set all the way down from the surface into the top of the Prairie du Chien

Dolomite and cemented in the hole to provide a good seal and prevent any mixing of the water from the upper and intermediate formations with the Jordan water.

To summarize, this report outlines three possibilities for solving the water supply problem at Garrison as follows: 1) an attempt may be made to re-condition the deep town well drilled in 1948-58 by acidizing and developing the Jordan aquifer, 2) a new well can be finished in the lower Devonian and Silurian rocks between about 300 and 525 feet, and 3) a new well can be drilled through the Jordan Sandstone to about 1,625 feet with all strata from the upper part of the Prairie du Chien Dolomite on up cased out.

PJH 8/67

THORPE WELL COMPANY

2340 SIXTH AVENUE
DES MOINES, IOWA

Drilled for City of Garrison at Garrison, Iowa

Well is located ___ miles N-E-S-W and ___ miles N-E-S-W from ___

in the ___ ¼ ___ ¼ Section ___ Township ___ Range ___

Drilling started 6-16-58 19__ Completed 7-30-58 19__

Well No. 2 Kind of Well Drilled Depth 1614 Size hole started 10" in.

Finish 6 1/4" G. P. M. 300 Static Head 60 &107 after pumping Drawdown - 134

PWL 194'

134
60
194

Water was first encountered at ___ in. ___ Approx. Amt. ___ Temp. 54°

Remarks Static head was 107' after pumping

(GIVE DETAILS OF PERFORATED PIPE AND SEALS)

RECORD OF PERMANENT PIPE					TEMPORARY PIPE	
SIZE PIPE	AMOUNT OF PIPE	DEPTH TO BOTTOM OF PIPE	DEPTH TO TOP OF PIPE	MAKE OF PIPE	SIZE PIPE	AMOUNT
8"	300'-4"	775	474'-8"	steel welded pipe		
7"	102'-0" 202'	1095	893'-0"	steel welded pipe		

Driller Guy Elam From Surface to 528' to 1618 feet

Driller True Ashlock From 550' feet to 1618 feet

Driller Wallace Hansen From 550' feet to 1200 feet

AMOUNT IN FEET	KIND OF SOIL OR FORMATION (BE SPECIFIC)	TOTAL DEPTH FEET
Hole was 528' when started to deepen		528
47	Green shale	575
105	Green & gray shale	680
10	Brown shale	690
35	Brown lime	725
15	Brown shale	740
10	Brown lime & shale	750
220	Gray lime	970
2	Green shale	972
56	Gray lime	1028
17	Green shale	1045
50	St. Peters sand	1095
169	Gray lime	1264
23	Sand	1287

--over--

W.E.A.
KHA

Benton

MEMORANDUM

Date: Monday, December 19, 1949
From: H. G. Hershey
Re: Visit by Louis Whitney regarding problem at Garrison, Iowa

Trouble developed in the 528-foot well at Garrison Iowa in the form of entrapped "air" during the heavy pumping period of last summer. Since then, "air" has been pumped to such an extent that many consumers are having touble with air hammer as well as foaming and milky water.

Last summer the well was pumped at the level of the bowls when the large demand from canning company forced heavy pumping of town wells. The depth of bowls in the deep well was about 190 feet. Much of the water is thought to enter the well above this level. The well is cased to a depth of 70 feet. Nonpumping water level 20'$\pm$

Mr. Whitney states that he added 20 feet to pump column and 20 feet of suction pipe but air continued to be pumped. With pumping rates of between 20 and 40 g.p.m. and with approximately 130 feet of water above the pump intake (Depth to water roughly 100 feet), "air" was still being pumped with the water.

We suggested that Whitney try a number of tests to determine at least, the probable source of the gas.

1st. - see if "air" is pumped when pumping rate is such that pumping level is in cased part of well.

2nd. - At higher uniform rates see if gas or air enters or leaves the well through the breather pipe.

3rd. - Collect sample of gas which is pumped.

Mr. Whitney will inform us of developments. He plans to go to Garrison on Tuesday or Wednesday, December 20 or 21, and may call us if he thinks we may help him.

Results of Geophysical Survey Made on the 521-foot Garrison Town Well
January 6, 1950

During the intensive pumping period in the summer of 1949, trouble developed in the 521-foot town well in the form of a "gas" reportedly being pumped with the water. This trouble persisted in spite of lowering the pump setting to 230 feet and pumping the well at such a rate as to maintain a reported 130 feet of water above the pump intake. The pump was again removed in the early part of January, 1950, preparatory to trying other innovations in an attempt to rid the water supply of "gas." The removal of the pump presented the opportunity of exploring the well using the geophysical equipment of the Iowa Geological Survey. Permission was granted and the survey was made on January 6, 1950. The principal purpose of the survey was to obtain additional geologic and ground water data in wells with the use of geophysical equipment and, incidentally, to obtain data which might aid in the solution of the "gas" problem.

Data obtained included hole size from bottom to top, distribution of flow of water in the well under idle conditions and induced recharge conditions, and information on the geologic section penetrated by the well together with other features of the rocks, such as water-bearing properties, etc.

A caliper survey of the well indicated the present depth of the well to be about 521 feet below the top of the pump base. The hole size seems to be fairly uniform, varying between 9 and 10 inches in diameter. There were no indications of any crevices of appreciable size having been penetrated in the uncased part of the well.

No flow of water was observed to occur in the well after the well had stood idle for a few days. Water was then allowed to flow into the well through a line connected to the main; the water level was maintained within a foot or two of the top of the casing. With this head of water the downward movement of water in the cased part of the well was calculated to be about 35 gallons a minute. About half of this amount of water left the well between the bottom of the casing at 70 feet and a depth of 120 feet. About 15 gallons a minute appeared to be moving down the hole to a depth of at least 510 feet.

On the whole, the resistance of the rocks penetrated by the well, as shown by different electrical logging arrangements, correlated very closely with what was expected by inspection of the log of the drill cuttings. At a depth of 286 feet, the resistance was particularly high. This points to a possible location of the occurrence of the "gas" being pumped with the water. Another point with somewhat less resistance was recorded at a depth of approximately 427 feet.

5

CLAPSADDLE - GARBER ASSOCIATES

CONSULTING ENGINEERS

AREA 515 - 366 - 2620 / CONRAD, IOWA 50621

July 17, 1967

Dr. H. Garland Hershey
Director
Iowa Geological Survey
Geology Annex
Iowa City, Iowa 52240

Dear Dr. Hershey:

We are investigating means of augmenting the public water supply for the Town of Garrison.

The Town presently has a Jordan well in poor condition and with low production which is their current source of supply. They have recently purchased property which included a deep well, 1435 ft., drilled in 1926. The latter well pumps sand above a pumping rate of about 100 GPM.

It appears that rejuvenation of either of these wells would be costly as well as of questionable good judgment.

We would greatly appreciate your forecast of any likely water sources at a shallower depth. Any related comments or advice will be much appreciated.

Yours very truly,

CLAPSADDLE-GARBER ASSOCIATES

Jack L. Clapsaddle

Jack L. Clapsaddle, P. E.

JLC/dab

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