Gladbrook Tama GLADBROOK CITY WELL W-1823

7/12/45 mco.

Loc. SE-Nw Sec. 9, T85N R15W El. 954' T.D. 51'

16 cem

0-51 Pleistocene

Well bottomed in gravel

Corporation, Rochester, N. Y. Binder and holes in leaves Patented. FORM 410546

MOORE'S MODERN METHODS

Gladbrook (Tama)

IEA
1-19-44

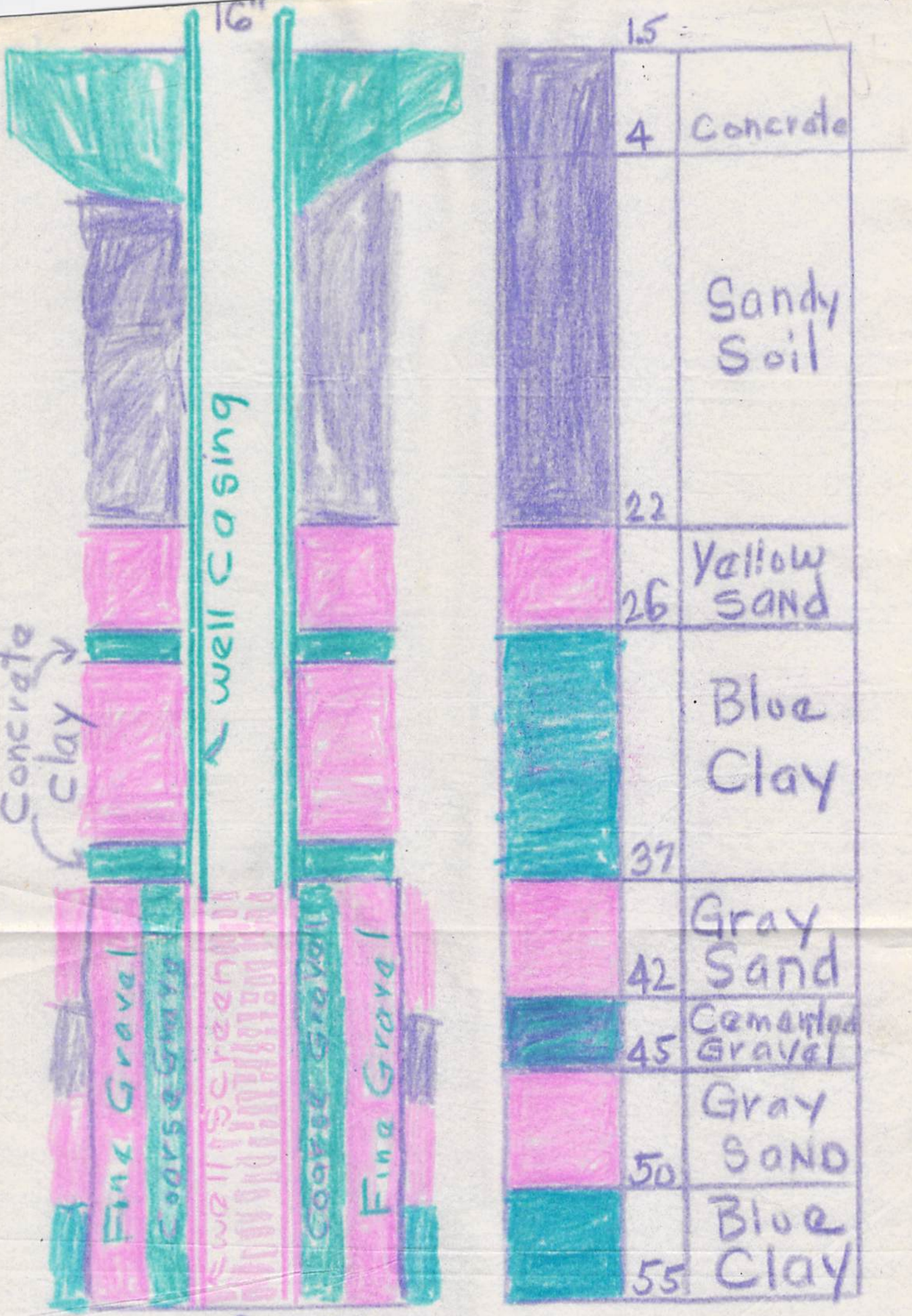
City Well No. 4

Loc: SW/c - NE - 9 - 85N - 16W - Spring Crk. Twp.
Elev: 4' above CGW top rail or = 954'

Elmer E. Walker, driller
Thorpe Well Co, contractor

T.D. 51' (sdy bl. clay)

Sand & gravel 13' thick from 38'-51'



RALPH GEARHART GLADBROOK, IOWA
ENGINEER TOWN WELL
JUNE 1937 THORPE WELL Co

IOWA GEOLOGICAL SURVEY
Iowa City, Iowa

May 1943

GEOLOGY AND GROUND WATER POSSIBILITY

at

GLADBROOK, TAMA COUNTY

Introduction

The town of Gladbrook is located in the northeastern part of Tama County, in sections 9 and 10 of Spring Creek Township, (T. 85 N., R. 16 W.). The population according to 1940 census is 945.

Gladbrook is situated on the gently rolling upland of Iowan drift which slopes northward in town to the valley of Wolf Creek, giving almost as much as 100 feet of relief within the town limits. The area is drained by Wolf Creek which flows eastward at the northern edge of town to join the Cedar River in Black Hawk County.

The town is served by the Chicago Northwestern Railway, Chicago Great Western Railway, State highway 96, and County roads "P" and "Z".

Present Water Supply

A well 828 feet deep was drilled for the town in 1914 by E. A. Ford of Marshalltown at the site of the water tower. The well reportedly would furnish 125 gallons a minute. Ten inch casing extends from the surface to 168 feet, and 8-inch casing from 160 to 412 feet. The log, according to the drillers, is as follows:

Wisconsin and Kansan drift	0 to 168 feet
Mississippian lime, solid	168 to 258 feet
Mississippian lime and shale	258 to 400 feet
Devonian lime	400 to 685 feet
Silurian lime	685 to 828 feet

This well produces from the cherty dolomites of the Silurian, the same horizon which supplies some farm wells in the vicinity.

Another city well is reported in town, 260 feet deep, producing from the limestone of the Lime Creek formation of Devonian age. No other information about this well was obtainable from the files of the Geological Survey.

The present city water supply is obtained from two gravel packed wells, about 50 feet deep, located in the low-lying valley of Wolf Creek at the north edge of town. One of these wells, drilled by Thorpe Well Co. of Des Moines in 1937, is 52 feet deep and is finished with a brass screen 15 inches in diameter and 20 feet long. This well furnished 250 gallons a minute when drilled.

The present supply is treated for iron removal, aerated and filtered.

Geology

The area around Gladbrook is covered with a thick mantle of glacial drift of Iowan and Kansan age. The Iowan drift at the surface, as well as the underlying Kansan drift, is composed mainly of yellow and blue clay, somewhat sandy or gravelly in places but apparently with no good sand or gravel beds which are water-bearing. A thin layer of Peorian loess may cover the Iowan drift in places.

In the valley of Wolf Creek, alluvial sands and gravels extend to a depth of at least 30 feet, and are water-bearing.

Immediately beneath the drift lie the shales of the Maple Hill formation of Mississippian age. The drillers log for the deep city well shows bedrock as being solid Mississippian limestone, but from information obtained from other wells drilled in the vicinity, it seems certain that the first indurated rock encountered will be the Maple Hill shale. This formation consists entirely of grey, green and brown shales, slightly calcareous. The total thickness of the formation at Gladbrook should be about 150 feet, but due to the thickness of the drift, only about 75 feet should occur.

The Lime Creek formation of Devonian age lies beneath the Maple Hill shale. This formation consists of three members, which in descending order are the Owen, Cerro Gordo, and Juniper Hill.

The Owen and Cerro Gordo members are fossiliferous limestones and dolomites with thin shale streaks, and their combined thickness is about 70 feet. The Juniper Hill member is a calcareous green shale, and is about 90 feet thick at Gladbrook.

The Shell Rock and Cedar Valley formations of Devonian age, lie beneath the Lime Creek formation. These two formations are not separated in subsurface geology, both consisting of pale gray to buff limestones with a few thin dolomite beds. The combined thickness of these formations at Gladbrook is about 135 feet.

The Wapsipinicon formation of Devonian age lies below the Cedar Valley and is about 235 feet thick at Gladbrook. This formation consists almost entirely of gray to brown dolomites, slightly sandy or shaly at the base, with beds of gypsum or anhydrite near the top, base, and scattered occasionally in other parts of the section. A heavy chert zone also occurs about 75 feet below the top of the formation.

Dolomites of Silurian age, probably belonging to the Hopkinton formation, lie beneath the Wapsipinicon formation and are about 155 feet thick at Gladbrook. They consist of buff to drab dolomites, porous in part, and very cherty. Chert is especially heavy near the top.

The Maquoketa formation, of Ordovician age, lies beneath the Silurian dolomites. The upper portion of the Maquoketa consists almost entirely of grey and green shales, slightly calcareous. The lower hundred feet or so, however, are dolomites, slightly shaly, with abundant chert. This lower zone probably correlates with the Elgin member of the Maquoketa formation of the

outcrop area. The total thickness of this formation is about 250 feet at Gladbrook.

The Galena formation lies under the Maquoketa, and is about 195 feet thick at Gladbrook. It consists almost entirely of limestone and dolomite, with a few cherty zones near the middle and base. The Galena overlies the Decorah and Platteville formations, which have an aggregate thickness of about 80 feet, and which consist of limestones with several green shales.

The St. Peter formation, a clean, white sandstone, underlies the Platteville formation. The thickness of the St. Peter sandstone at Gladbrook is about 35 to 40 feet.

The St. Peter formation is underlain in sequence downward by the Willow River formation, consisting of about 145 feet of dolomite, somewhat cherty and sandy; the Root Valley (New Richmond) formation, consisting of about 90 feet of dolomitic sandstone; and the Oneota formation, consisting of about 220 feet of cherty dolomite. All of these formations are of Ordovician age, belonging to the Prairie du Chien group.

The Jordan sandstone which underlies the Oneota formation, consists of about 80 feet of sandstone, slightly dolomitic. It is of Cambrian age, and is underlain by the dolomites and sandy dolomites of the St. Lawrence formation.

Possible Ground-Water Sources

The chief possible sources of ground water at Gladbrook are, in descending order, the alluvial deposits along Wolf Creek, the Owen-Cerro Gordo members of the Lime Creek formation, the top of the Silurian dolomites, the Galena limestone and dolomite, the St. Peter sandstone, and the Jordan sandstone. These sources will be treated separately in the following discussion.

The alluvial deposits found along Wolf Creek furnish large amounts of water, as shown by the present city wells to that aquifer. The water is fairly soft (see analysis at end of the report), contains no fluoride and is low in sulphates but has objectionable amounts of both iron and manganese which would necessitate treatment to prevent troubles in the distribution system and prevent staining of clothing and domestic fixtures. The water level is near the surface keeping pumping costs at a minimum. Such a shallow source, however, is occasionally susceptible to bacteriological contamination from unused wells or faulty construction of the well itself and with such an excessively high iron content it may be necessary to clean the screen in the well periodically.

The Owen and Cerro Gordo limestone members of the Devonian Lime Creek formation are another possible source of water at Gladbrook. One city well is reported to have been drilled to this horizon. In the general vicinity of Gladbrook, however, these limestones are not very productive and even with acidizing of the formation would probably not furnish enough water for the town. The quality of water should be satisfactory, of moderate hardness and no excessive amount of any undesireble constituent. The water level should be within 100 to 150 feet of the surface. Temperature of the water should be about 52 degrees F. A well to this horizon would require casing from the surface to solid limestone of an approximate depth of 235 feet to prevent the glacial drift and Maple Hill shale from caving.

The Silurian dolomites, especially the upper part, furnish water to a number of wells in the vicinity of Gladbrook, and the deepest city well produces from this horizon. This city well is reported to have produced 125 gallons a minute. Nearby farm wells are occasionally reported to produce as much as 20 gallons a minute with very little drawdown. The quality of water is fairly good, in spite of the fact that gypsum occurs in the overlying Wapsipinicon

formation. The gypsum probably accounts for the higher than average sulphate content of the water, and the resulting increase in hardness. Total hardness, however, should not exceed 550 parts per million (about 32 grains per gallon). The static water level should be from 150 to 175 feet below the ground surface. Temperature of the water should be about 56 to 58 degrees F. A well to this horizon would require casing to a depth of about 400 feet to prevent caving of overlying glacial drift and shales.

The limestones and dolomites of the Galena formation normally produce small amounts of water. The amounts to be expected, however, are not large, although oxidizing of the zones at which water was encountered would probably increase production somewhat. No information is available on the quality of water from these zones, but it should be satisfactory. The static water level should probably be within 175 feet of ground surface. The temperature of the water would probably be no greater than 58 to 60 degrees F. A well to this or greater depths should be cased from the surface through the Maquoketa shales, to a depth of about 1100 feet, to prevent caving of the shales and also to shut out the gypsum and more mineralized waters of the Wapsipinicon formation.

The St. Peter sandstone, in many parts of Iowa, is a very good aquifer. In the vicinity of Gladbrook, however, the sandstone is fairly thin and other wells drilled in the area have reported encountering little water at this depth. Probably no more than 75 to 100 gallons a minute, at the most, could be expected from this formation. The quality of water from the St. Peter should be satisfactory with the possible exception of appreciable amounts of iron. The water level should be within 150 feet of the ground, and the temperature slightly in excess of 60 degrees F. A well to this formation would require casing to a depth of 1100 feet (through the Maquoketa shales) and possibly a liner through the shales of the Decorah-Platteville formations to prevent their caving.

The Jordan sandstone is almost universally a good water-producing horison. At Gladbrook, ample amounts of water for a town supply could be derived from this formation. The quality of water from it should be very satisfactory, with a total hardness of about 400 parts per million (23 to 24 grains per gallon) and no objectionable constituents in appreciable amounts. The water level should be within 150 feet of the ground and the temperature of the water from 62 to 64 degrees F. A well to the Jordan sandstone would require casing to 1109 feet through the Maquoketa shales and possibly a liner through the Decorah, Platteville and St. Peter formations to prevent shale caving and to shut out any water from the St. Peter if it seemed to be of undesirable quality.

All depths mentioned in the foregoing paragraphs have been based on a starting elevation the same as the old deep city well at the water tower. A summary of formations to be encountered in drilling at this site, with their lithologic character, thickness and depth range is given on a following page. To predict the formations to be found in a well drilled at any other location in Gladbrook the forecast would have to be corrected for the difference in starting elevation.

Chemical analyses of water from city wells into the Wolf Creek alluvial deposits and the upper Silurian dolomites are shown on a seperate sheet.

The Geological Survey will be glad to be of any assistance in the drilling or testing of any well drilled for the town of Gladbrook. Samples should be saved from each five-foot interval of drilling or of each formation if less than 5 feet thick. Sample sacks and log books for this purpose will be gladly furnished by the Survey for this purpose.

Summary of Geologic Formations
Gladbrook, Iowa

(for a well to be drilled at the site of the present water tower in town)

Formation and Character	Thickness	Depth
PLEISTOCENE		
Glacial drift (yellow and blue clay, with some sand and gravel)	170	0 to 170
MISSISSIPPIAN SYSTEM		
Maple Mill formation (shale)	75	170 to 245
DEVONIAN SYSTEM		
Lime Creek formation		
Owen-Cerro Gordo members (limestone, shaly)	70	245 to 315
Juniper Hill member (shale)	85	315 to 400
Shell Rock-Cedar Valley formations (limestone)	135	400 to 535
Wapsipinicon formation (limestone, dolomite, with gypsum and some chert)	235	535 to 770
SILURIAN SYSTEM		
Hopkinton (?) formation (dolomite, cherty)	155	770 to 925
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Maquoketa formation (shale, with cherty dolomite near the base)	250	925 to 1175
Galena formation (limestone and dolomite)	195	1175 to 1370
Decorah-Platteville formations (limestone, with green shales)	80	1370 to 1450
St. Peter formation (sandstone)	35	1450 to 1485
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Oneota formation (dolomite, cherty)	220	1720 to 1940
CAMBRIAN SYSTEM		
Jordan formation (sandstone, slightly dolomitic)	80	1940 to 2020
St. Lawrence formation (dolomite, sandy)	—	2020 to —

Mineral Analyses of Wells at Gladbrook, Iowa

(all figures in parts per million)

Constituent	Gladbrook City Well Depth 828 feet	Gladbrook City Well Depth 52 feet
Total solids	1205.	720.
Insoluble matter	18.0	124.0
Alkalinity (MeO)	264.	154.
Alkalinity (Phn)	0.0	0.0
$Fe_2O_3 + Al_2O_3 + Mn_2O_3$	2.0	46.5
Nitrogen as nitrate	0.00	0.50
Alkali as sodium	175.5	4.4
Calcium	144.5	90.8
Magnesium	40.4	28.9
Iron (unfiltered)	0.3	16.0
Manganese	0.1	0.5
Fluoride	2.0	0.0
Chloride	27.0	26.0
Sulphate	579.6	171.0
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Calculated hardness (as $CaCO_3$)	527.	375.
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Tama

January 24, 1938

Mr. George Koster, Mayor
Gladbrook, Iowa

Dear Sir:

Thank you very much for the information which you furnished us on the Gladbrook city well. As you suggest, I will get the remaining data from the Thorpe Well Company.

Very truly yours,

H. G. Hershey

HGH:A

TOWN OF GLADBROOK

INCORPORATED

GLADBROOK, IOWA 12-30-37.

Iowa Geological Survey
Iowa City Ia.

Gentlemen.

Yours Letter at hand contents noted, will say that the Well driller (Thorpe Bros of Des Moines) never left us a complete report of this Well after it was finished.

The Well is what we call a double Gravel packed Well. It is 52 feet deep. At 25 feet we found water in quick sand which gave us some trouble to get the 72 inch casing down to completely shut of the sand. Then we found 4 or 6 feet blue clay then more quick sand, more trouble to lower our casing to the course gravel which gave us an abundance of fine (quite soft) water.

I can not give you the elevation of the ground. I think there is an abundance of water at this point. No danger for overflow altho it is sort of bottom land. We have pumped this Well at the rate of 250 gallons pr minute, It did pump down some. We now pump it 60 gallons pr minute which is just about right for the kind of pump we use. We have a copper screen 15 inch wide 20 feet long in the Well. I hope this will give you the information desired.

Yours truly Geo. Wooster Mayor.

GEOLOGICAL BOARD
NELSON G. KRASCHEL
GOVERNOR OF IOWA
EUGENE A. GILMORE
PRESIDENT STATE UNIVERSITY OF IOWA
CHARLES E. FRILEY
PRESIDENT IOWA STATE COLLEGE
ARTHUR C. TROWBRIDGE
PRESIDENT IOWA ACADEMY OF SCIENCE
CHARLES W. STORMS
AUDITOR OF STATE

STATE OF IOWA
IOWA GEOLOGICAL SURVEY
103 GEOLOGY BUILDING
IOWA CITY

ARTHUR C. TROWBRIDGE
DIRECTOR AND STATE GEOLOGIST

December 28, 1937

The Mayor
Gladbrook, Iowa

Dear Sir:

Information has reached us that the town of Gladbrook recently completed drilling a new water well. The Iowa Geological Survey has been attempting for the past several years to obtain records of all wells drilled in the state. Our success in doing so depends on the cooperation of city officials, and your assistance in this case will be greatly appreciated.

We would like to know the depth, location, and elevation of the well; the depth at which water was found and where it stands in the well; and the kinds and thicknesses of formations passed through. Regarding the formations, we are particularly anxious to learn if bedrock was encountered. If the first solid formation was a shale or limestone or sandstone, we would like to determine at what depth it was first found. It will also be valuable for us to know the size and length of casing and where it is placed in the well.

Thanking you for your assistance and cooperation in this work, I remain,

Very truly yours,

H. G. Hershey

H. G. Hershey

HGH:A

December 28, 1937

The Mayor
Gladbrook, Iowa

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HGH:A

IOWA GEOLOGICAL SURVEY
Water Well Data Sheet

Survey Number W-1823

Town Gladbrook County Tama T. 85 N., R. 15 W.

Name Gladbrook City Well Location SE ¼ NW ¼, Sec. 9

Contractor Thorpe Well Co., Des Moines Driller E. E. Walker Use City Supply

Construction Gravel Pack Drilling Dates January-March 1944 Drilling Depth —

Topog. Valley of Wolf Creek Curb Elev. 954 Ref. — Total Depth 51

Final Static Level 16 / below curb Pumping Level 27' / 33' Draw down 11' / 17' 250 / 400 gpm Time pumped — Date —

Depth to bot. pump — ft. with — ft. suction pipe. Calc. g/ft. drawdown — Prin. Prod. —

Producing Horizons —

Water levels and pumping tests on various horizons during drilling:

Depth Range	Stat. Level	Pump Level	Draw down	gpm.	Temp.	Producing horizons	Producing formations	Formations cased out

Additional information Casing: 54" curbing set at 49'
34" curbing set at 50'6"
16" pipe from 0-41 with 10' of 16" screen from 41-51 ft.

Boulders in bottom of well.

Laboratory Data

Sample range 8-51 Number samples 3 Number Duplicates 3 Cond. Good

Log Yes (No) Cond. — Boxed Kringel Range 8-51 Date 3/28/44

Remarks —

Microscopic Study Range — Strip Log — Gen. Log — Blue Print — Samples Washed None

Insol. Res. Study Range — Strip Log — Gen. Log — Insol. Res. Prepared — Well Corel. —

IOWA GEOLOGICAL SURVEY
Iowa City, Iowa

May 1943

GEOLOGY AND GROUND WATER POSSIBILITY

at

GLADBROOK, TAMA COUNTY

Introduction

The town of Gladbrook is located in the northeastern part of Tama County, in sections 9 and 10 of Spring Creek Township, (T. 85 N., R. 16 W.). The population according to 1940 census is 945.

Gladbrook is situated on the gently rolling upland of Iowan drift which slopes northward in town to the valley of Wolf Creek, giving almost as much as 100 feet of relief within the town limits. The area is drained by Wolf Creek which flows eastward at the northern edge of town to join the Cedar River in Black Hawk County.

The town is served by the Chicago Northwestern Railway, Chicago Great Western Railway, State highway 96, and County roads "P" and "Z".

Present Water Supply

A well 828 feet deep was drilled for the town in 1914 by E. A. Ford of Marshalltown at the site of the water tower. The well reportedly would furnish 125 gallons a minute. Ten inch casing extends from the surface to 168 feet, and 8-inch casing from 160 to 412 feet. The log, according to the drillers, is as follows:

Wisconsin and Kansan drift	0 to 168 feet
Mississippian lime, solid	168 to 258 feet
Mississippian lime and shale	258 to 400 feet
Devonian lime	400 to 685 feet
Silurian lime	685 to 828 feet

This well produces from the cherty dolomites of the Silurian, the same horizon which supplies some farm wells in the vicinity.

Another city well is reported in town, 260 feet deep, producing from the limestone of the Lime Creek formation of Devonian age. No other information about this well was obtainable from the files of the Geological Survey.

The present city water supply is obtained from two gravel packed wells, about 50 feet deep, located in the low-lying valley of Wolf Creek at the north edge of town. One of these wells, drilled by Thorpe Well Co. of Des Moines in 1937, is 52 feet deep and is finished with a brass screen 15 inches in diameter and 20 feet long. This well furnished 250 gallons a minute when drilled.

The present supply is treated for iron removal, aerated and filtered.

Geology

The area around Gladbrook is covered with a thick mantle of glacial drift of Iowan and Kansan age. The Iowan drift at the surface, as well as the underlying Kansan drift, is composed mainly of yellow and blue clay, somewhat sandy or gravelly in places but apparently with no good sand or gravel beds which are water-bearing. A thin layer of Peorian loess may cover the Iowan drift in places.

In the valley of Wolf Creek, alluvial sands and gravels extend to a depth of at least 50 feet, and are water-bearing.

Immediately beneath the drift lie the shales of the Maple Mill formation of Mississippian age. The drillers log for the deep city well shows bedrock as being solid Mississippian limestone, but from information obtained from other wells drilled in the vicinity, it seems certain that the first indurated rock encountered will be the Maple Mill shale. This formation consists entirely of gray, green and brown shales, slightly calcareous. The total thickness of the formation at Gladbrook should be about 150 feet, but due to the thickness of the drift, only about 75 feet should occur.

The Lime Creek formation of Devonian age lies beneath the Maple Hill shale. This formation consists of three members, which in descending order are the Owen, Cerro Gordo, and Juniper Hill.

The Owen and Cerro Gordo members are fossiliferous limestones and dolomites with thin shale streaks, and their combined thickness is about 70 feet. The Juniper Hill member is a calcareous green shale, and is about 90 feet thick at Gladbrook.

The Shell Rock and Cedar Valley formations of Devonian age, lie beneath the Lime Creek formation. These two formations are not separated in subsurface geology, both consisting of pale gray to buff limestones with a few thin dolomite beds. The combined thickness of these formations at Gladbrook is about 135 feet.

The Wapsipinicon formation of Devonian age lies below the Cedar Valley and is about 235 feet thick at Gladbrook. This formation consists almost entirely of gray to brown dolomites, slightly sandy or shaly at the base, with beds of gypsum or anhydrite near the top, base, and scattered occasionally in other parts of the section. A heavy chert zone also occurs about 75 feet below the top of the formation.

Dolomites of Silurian age, probably belonging to the Hopkinton formation, lie beneath the Wapsipinicon formation and are about 155 feet thick at Gladbrook. They consist of buff to drab dolomites, porous in part, and very cherty. Chert is especially heavy near the top.

The Maquoketa formation, of Ordovician age, lies beneath the Silurian dolomites. The upper portion of the Maquoketa consists almost entirely of gray and green shales, slightly calcareous. The lower hundred feet or so, however, are dolomites, slightly shaly, with abundant chert. This lower zone probably correlates with the Elgin member of the Maquoketa formation of the

outcrop area. The total thickness of this formation is about 250 feet at Gladbrook.

The Galena formation lies under the Maquoketa, and is about 195 feet thick at Gladbrook. It consists almost entirely of limestone and dolomite, with a few cherty zones near the middle and base. The Galena overlies the Decorah and Platteville formations, which have an aggregate thickness of about 80 feet, and which consist of limestones with several green shales.

The St. Peter formation, a clean, white sandstone, underlies the Platteville formation. The thickness of the St. Peter sandstone at Gladbrook is about 35 to 40 feet.

The St. Peter formation is underlain in sequence downward by the Willow River formation, consisting of about 145 feet of dolomite, somewhat cherty and sandy; the Root Valley (New Richmond) formation, consisting of about 90 feet of dolomitic sandstone; and the Oneota formation, consisting of about 220 feet of cherty dolomite. All of these formations are of Ordovician age, belonging to the Prairie du Chien group.

The Jordan sandstone which underlies the Oneota formation, consists of about 80 feet of sandstone, slightly dolomitic. It is of Cambrian age, and is underlain by the dolomites and sandy dolomites of the St. Lawrence formation.

Possible Ground-Water Sources

The chief possible sources of ground water at Gladbrook are, in descending order, the alluvial deposits along Wolf Creek, the Owen-Cerro Gordo members of the Lime Creek formation, the top of the Silurian dolomites, the Galena limestone and dolomite, the St. Peter sandstone, and the Jordan sandstone. These sources will be treated separately in the following discussion.

The alluvial deposits found along Wolf Creek furnish large amounts of water, as shown by the present city wells to that aquifer. The water is fairly soft (see analysis at end of the report), contains no fluoride and is low in sulphates but has objectionable amounts of both iron and manganese which would necessitate treatment to prevent troubles in the distribution system and prevent staining of clothing and domestic fixtures. The water level is near the surface keeping pumping costs at a minimum. Such a shallow source, however, is occasionally susceptible to bacteriological contamination from unused wells or faulty construction of the well itself and with such an excessively high iron content it may be necessary to clean the screen in the well periodically.

The Owen and Cerro Gordo limestone members of the Devonian Lime Creek formation are another possible source of water at Gladbrook. One city well is reported to have been drilled to this horizon. In the general vicinity of Gladbrook, however, these limestones are not very productive and even with acidizing of the formation would probably not furnish enough water for the town. The quality of water should be satisfactory, of moderate hardness and no excessive amount of any undesirable constituent. The water level should be within 100 to 150 feet of the surface. Temperature of the water should be about 52 degrees F. A well to this horizon would require casing from the surface to solid limestone of an approximate depth of 235 feet to prevent the glacial drift and Maple Hill shale from caving.

The Silurian dolomites, especially the upper part, furnish water to a number of wells in the vicinity of Gladbrook, and the deepest city well produces from this horizon. This city well is reported to have produced 125 gallons a minute. Nearby farm wells are occasionally reported to produce as much as 20 gallons a minute with very little drawdown. The quality of water is fairly good, in spite of the fact that gypsum occurs in the overlying Wapsipinicon

formation. The gypsum probably accounts for the higher than average sulphate content of the water, and the resulting increase in hardness. Total hardness, however, should not exceed 550 parts per million (about 32 grains per gallon). The static water level should be from 150 to 175 feet below the ground surface. Temperature of the water should be about 56 to 58 degrees F. A well to this horizon would require casing to a depth of about 400 feet to prevent caving of overlying glacial drift and shales.

The limestones and dolomites of the Galena formation normally produce small amounts of water. The amounts to be expected, however, are not large, although acidizing of the zones at which water was encountered would probably increase production somewhat. No information is available on the quality of water from these zones, but it should be satisfactory. The static water level should probably be within 175 feet of ground surface. The temperature of the water would probably be no greater than 58 to 60 degrees F. A well to this or greater depths should be cased from the surface through the Maquoketa shales, to a depth of about 1100 feet, to prevent caving of the shales and also to shut out the gypsum and more mineralized waters of the Wapsipinicon formation.

The St. Peter sandstone, in many parts of Iowa, is a very good aquifer. In the vicinity of Gladbrook, however, the sandstone is fairly thin and other wells drilled in the area have reported encountering little water at this depth. Probably no more than 75 to 100 gallons a minute, at the most, could be expected from this formation. The quality of water from the St. Peter should be satisfactory with the possible exception of appreciable amounts of iron. The water level should be within 150 feet of the ground, and the temperature slightly in excess of 60 degrees F. A well to this formation would require casing to a depth of 1100 feet (through the Maquoketa shales) and possibly a liner through the shales of the Decorah-Platteville formations to prevent their caving.

The Jordan sandstone is almost universally a good water-producing horizon. At Gladbrook, ample amounts of water for a town supply could be derived from this formation. The quality of water from it should be very satisfactory, with a total hardness of about 400 parts per million (23 to 24 grains per gallon) and no objectionable constituents in appreciable amounts. The water level should be within 150 feet of the ground and the temperature of the water from 62 to 64 degrees F. A well to the Jordan sandstone would require casing to 1100 feet through the Maquoketa shales and possibly a liner through the Decorah, Platteville and St. Peter formations to prevent shale caving and to shut out any water from the St. Peter if it seemed to be of undesirable quality.

All depths mentioned in the foregoing paragraphs have been based on a starting elevation the same as the old deep city well at the water tower. A summary of formations to be encountered in drilling at this site, with their lithologic character, thickness and depth range is given on a following page. To predict the formations to be found in a well drilled at any other location in Gladbrook the forecast would have to be corrected for the difference in starting elevation.

Chemical analyses of water from city wells into the Wolf Creek alluvial deposits and the upper Silurian dolomites are shown on a separate sheet.

The Geological Survey will be glad to be of any assistance in the drilling or testing of any well drilled for the town of Gladbrook. Samples should be saved from each five-foot interval of drilling or of each formation if less than 5 feet thick. Sample sacks and log books for this purpose will be gladly furnished by the Survey for this purpose.

Summary of Geologic Formations
Gladbrook, Iowa

(for a well to be drilled at the site of the present water tower in town)

Formation and Character	Thickness	Depth
PLEISTOCENE		
Glacial drift (yellow and blue clay, with some sand and gravel)	170	0 to 170
MISSISSIPPIAN SYSTEM		
Maple Mill formation (shale)	75	170 to 245
DEVONIAN SYSTEM		
Lime Creek formation		
Owen-Cerro Gordo members (limestone, shaly)	70	245 to 315
Juniper Hill member (shale)	85	315 to 400
Shell Rock-Cedar Valley formations (limestone)	135	400 to 535
Wapsipinicon formation (limestone, dolomite, with gypsum and some chert)	235	535 to 770
SILURIAN SYSTEM		
Hopkinton (?) formation (dolomite, cherty)	155	770 to 925
ORDOVICIAN SYSTEM		
Maquoketa formation (shale, with cherty dolomite near the base)	250	925 to 1175
Galena formation (limestone and dolomite)	195	1175 to 1370
Decorah-Platteville formations (limestone, with green shales)	80	1370 to 1450
St. Peter formation (sandstone)	35	1450 to 1485
Willow River formation (dolomite, cherty and sandy in part)	145	1485 to 1630
Root Valley (New Richmond) formation (sandstone, dolomitic)	90	1630 to 1720
Oneota formation (dolomite, cherty)	220	1720 to 1940
CAMBRIAN SYSTEM		
Jordan formation (sandstone, slightly dolomitic)	80	1940 to 2020
St. Lawrence formation (dolomite, sandy)	—	2020 to —

Mineral Analyses of Wells at Gladbrook, Iowa

(all figures in parts per million)

Constituent	Gladbrook City Well Depth 828 feet	Gladbrook City Well Depth 52 feet
Total solids	1205.	720.
Insoluble matter	18.0	124.0
Alkalinity (MeO)	264.	154.
Alkalinity (Phn)	0.0	0.0
$Fe_2O_3 + Al_2O_3 + Mn_2O_3$	2.0	46.5
Nitrogen as nitrate	0.00	0.50
Alkali as sodium	175.5	4.4
Calcium	144.5	90.8
Magnesium	40.4	28.9
Iron (unfiltered)	0.3	16.0
Manganese	0.1	0.5
Fluoride	2.0	0.0
Chloride	27.0	26.0
Sulphate	579.6	171.0
Bicarbonate	322.1	187.9
Calculated hardness (as $CaCO_3$)	527.	375.
Calculated hardness (grains per gallon as $CaCO_3$)	30.8	21.9

Sheet No. 1 Name of Well. Gladbrook City Well Survey No. W-1923

Location ..... Date Drilled Jan. Mar. 1914 Analyst Parker

00

N.S.

8

10 Gvl - yellow & gray clay & sandy.

Sand - med & f & c.

20

30 Blue-gray clay - v. sandy & silty clay.

N.S.

36

40 gravel

50

51

T.D.

60

70

80

90

00

MASTER CARD-A

9-26-69
RP 11-22-70

STATE	COUNTY	LATITUDE DEG	LATITUDE MIN	LATITUDE SEC	N or S	LONGITUDE DEG	LONGITUDE MIN	LONGITUDE SEC	SEQ. NO
1 2	3 4	5 6	7 8	9 10	11	12 13 14	15 16	17 18	19
19	86	42	11	30	N	092	43	20	1

WELL SCHEDULE

US GEOLOGICAL SURVEY

IOWA DISTRICT WRD

WELL NO. 1823 CO TAMA

OWNER GLADBROOK CITY WELL ADDRESS GLADBROOK

DRILLER THORPE WELL CO. DATE DRLD 3-44

MAP

SOURCE OF DATA FILE

DESCRIPTION M. P LSD FEET (ABOVE) (BELOW) LSD

CONTINUED FROM ABOVE	ACCURACY	LOCAL WELL NUMBER T	R	E/W	SEC.	QUARTERS	LOCAL USE W-NUMBER	OPTIONAL	OWNER OR NAME	OWNERSHIP	WATER USE	WELL USE	WELL DATA	FREQ. W/L	FIELD CHAR	HYD LAB	QW-DATA	QW-FREQ.	PUMPAGE	APERTURE	LOG DATA	CARD DESIG
	20	21 22 23	24 25	26	27 28	29 30 31 32 33 34	35 36 37 38 39	40 41 42 43 44 45 46 47 48 49 50 51	52 53 54 55 56 57 58 59 60 61 62 63 64 65 66	67	68	69	70	71	72	73	74	75	76	77	78 79	80
	3	085	16	W	09	BD	01823	/144CITY	GLADBROOK	M	P	W	1	Ø			M	I			G	A

WELL-DESCRIPTION CARD - B

DUPLICATE CARD A CC 1-19	DEPTH OF WELL	ACCURACY	DEPTH CASED OR FIRST PERF.	DIAM. INCHES	WELL FINISH METH DRILLED	YEAR DRILLED	PUMP SETTING	METH. LIFT	DEEP SHALLOW	POWER	ALTITUDE OF LSD (FEET)	ACCURACY	WATER LEVEL (FEET)	ACCURACY	DATE MONTH	DATE YEAR	YIELD OF WELL (GPM)	METH. DET	DRAW-DOWN (FEET)	ACCURACY	PUMPING PERIOD (HOURS)	QUALITY OF WATER IRON	SULF.	CHLOR	HARD	SP. COND.	TEMP	DATE SAMPLED	CARD DESIG.
	20 21 22 23	24	25 26 27 28	29 30	31	32 33 34 35	36 37 38	39	40	41	42 43 44 45 46	47	48 49 50 51	52	53 54 55		56 57 58 59 60	61	62 63 64	65	66 67 68	69	70	71	72	73	74 75 76	77 78 79	80
		5 1	3		41	16	S	C	94		T		5		954	7		16	D	34	4		25	0	3		1	1	3		B

HYDROGEOLOGIC CARD - C

DUPLICATE CARD A CC 1-19	PHYS-IOG-RAPHY PROV.	PHYS-IOG-RAPHY SEC.	DRAINAGE BASIN	SUBBASIN	TOPO SETTING	MAJOR AQUIFER SYSTEM	SERIES USGS	SERIES ISG	UNIT	LITH-OLOGY	ORIG.	THICK-NESS	LENGTH WELL OPEN TO	DEPTH TO TOP OF	MINOR AQUIFER SYSTEM	SERIES USGS	SERIES ISG	UNIT	LITH-OLOGY	ORIG.	THICK-NESS	LENGTH WELL OPEN TO	DEPTH TO TOP OF	DEPTH TO CONSOL-DATED ROCK	SOURCE	DEPTH TO BASEMENT	SOURCE	SURF MAT LITH-OLOGY	SURF MAT INFIL	COEF TRAN SIG FIG	COEF TRAN XIO	COEF STOR SIG FIG	COEF STOR XIO-	CARD DESIG
	20 21	22	23 24 25	26	27	28	29	30	31	32 33	34	35 36 37	38 39 40	41 42 43	44	45	46	47	48 49	50	51 52 53	54 55 56	57 58 59	60 61 62 63	64	65 66 67 68	69	70 71	72	73 74	75	76 77	78	79	80
	12	E	25	E	T	Q	G	G	X		G	0			10		36											S	2						C

CASING AND SCREEN (SIZE, TYPE, INTERVALS):

54" curbing set at 49'

34" curbing set at 50'6"

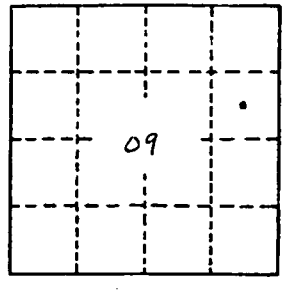
16" casing 0-41' with 10' of 16" sc. 41-51'

CODED BY MACGOWAN DATE 6-26-72

PUNCHED BY HEXUM DATE 6-29-72

VERIFIED BY DATE

SKETCH ON REVERSE: YES NO



WELL NO 1823

W-1823
085 16W 09BD
GLADBROOK TOWN WELL

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Card Q

State: IOWA (19) County: TAMA (86) Town: GLADBROOK

Well No. Latitude 42 11 30 N (5–11) Longitude 092 43 20 (12–18) Seq. No. 1 (19) Date M 03 D 29 Y 46 (20–25)

Sampling Depth 51 (26–29) Type (30) Kx10^6 (31–35) pH 77 (36–38) Temp. °F (39–41)

SiO_2 (42–44) Ca 134 (45–49) Mg 26 (50–53) Na 21 (54–58) K C (59–61)

HCO_3 312 (62–65) CO_3 (66–67) SO_4 178 (68–72) Cl 26 (73–78) Source No. 3 (79) Q (80)

Card R

Duplicate Columns 1-25 from Card Q

F 0.3 (26–28) NO_3 31 (29–32) PO_4 (33–35) B (36–38) Al (39–41) Fe 50 (42–45)

Mn 0.80 (46–49) Cu (50–52) Pb (53–54) Zn (55–57)

Solids Determined 596 (58–63) Calc. (64–69) Ca,Mg 454 (70–73) Hardness Non-Carb. 198 (74–77)

Color (78–79) No. R (80)

Card S

Duplicate Columns 1-25 from Card Q

Br (26–28) I (29–31) Alk. as $CaCO_3$ 256 (32–35) Free CO_2 (36–38) SAR (39–41)

RSC (42–44) ABS (45–47) (48–50)

Alpha (pc/l) (55–57) Beta (pc/l) (58–60) Ra (pc/l) (61–63) U (ug/l) (64–66)

No. S (80)

Recorded by: MACGOWAN

Punched by: MACGOWAN Date: 6-29-72

Published:

W-1823
085 16W 09 BD
GLADBROOK TOWN WELL

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality - PARTIAL
(ppm)

Card Q

State: IOWA [19] (1-2) County: TAMA [86] (3-4) Town: GLADBROOK

Well No. Latitude [42 11 30 N] (5-11) Longitude [092 43 20] (12-18) Seq. No. [1] (19) Date M D Y [10 29 52] (20-25)

Sampling Depth [51] (26-29) Type [1] (30) Kx10^{e} (31-35) pH (36-38) Temp. °F (39-41)

SiO_2 (42-44) Ca (45-49) Mg (50-53) Na (54-58) K (59-61)

HCO_3 (62-65) CO_3 (66-67) SO_4 (68-72) Cl (73-78) Source No. [3] (79) [Q] (80)

Card R

Duplicate Columns 1-25 from Card Q

F (26-28) NO_3 (29-32) PO_4 (33-35) B (36-38) Al (39-41) Fe [4.5] (42-45)

Mn [0.60] (46-49) Cu (50-52) Pb (53-54) Zn (55-57)

Solids Determined (58-63) Calc. (64-69) Ca,Mg [500] (70-73) Hardness Non-Carb. (74-77)

Color (78-79) No. [R] (80)

Card S

Duplicate Columns 1-25 from Card Q

Br (26-28) I (29-31) Alk. as $CaCO_3$ (32-35) Free CO_2 (36-38) SAR (39-41)

RSC (42-44) ABS (45-47) (48-50)

Alpha (pc/l) (55-57) Beta (pc/l) (58-60) Ra (pc/l) (61-63) U (ug/l) (64-66)

No. (80)

Recorded by: MACGOWAN

Punched by: MACGOWAN Date: 6-29-72

Published:

W-1823
085 16W 09 BD
GLADBROOK TOWN WELL

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Card Q

State: IOWA (19) County: TAMA (86) Town: GLADBROOK

Well No. 42 11 30 N (Latitude, 5–11) 092 43 20 (Longitude, 12–18) Seq. No. 1 (19) Date M D Y: 07 22 59 (20–25)

Sampling Depth 51 (26–29) Type 1 (30) Kx10^6 680 (31–35) pH 7.5 (36–38) Temp. °F 52 (39–41)

SiO_2 17 (42–44) Ca 97 (45–49) Mg 24 (50–53) Na 14 (54–58) K 0.8 (59–61)

HCO_3 290 (62–65) CO_3 0 (66–67) SO_4 117 (68–72) Cl 14 (73–78) Source No. 3 (79) Q (80)

Card R

Duplicate Columns 1-25 from Card Q

F 0.2 (26–28) NO_3 1.8 (29–32) PO_4 (33–35) B (36–38) Al (39–41) Fe 1.6 (42–45)

Mn 0.74 (46–49) Cu (50–52) Pb (53–54) Zn (55–57)

Solids Determined 444 (58–63) Calc. (64–69) Ca,Mg 341 (70–73) Hardness Non-Carb. 103 (74–77)

Color (78–79) No. R (80)

Card S

Duplicate Columns 1-25 from Card Q

Br (26–28) I (29–31) Alk. as $CaCO_3$ 238 (32–35) Free CO_2 (36–38) SAR (39–41)

RSC (42–44) ABS (45–47) (48–50)

Alpha (pc/l) (55–57) Beta (pc/l) (58–60) Ra (pc/l) (61–63) U (ug/l) (64–66)

No. S (80)

Recorded by: MACGOWAN

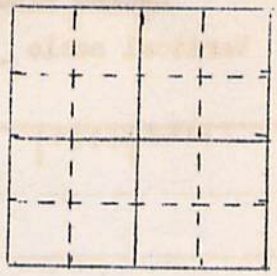
Punched by: MACGOWAN Date: 6-29-72

Published:

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

W-1823

RECORD OF WELL



Location:

Town: Gladbrook (N E S W); County Tama

SE¼ NW¼ sec. 9 T. 85 N., R. 16 W. Crystal Twp.

Well name and number Gladbrook City Well (1944)

Owner _____ Address _____

Tenant _____ Address _____

Contractor Thorpe Well Co. Address Des Moines

Drillers E. B. Walker

Drilling dates Jan - Mar. 1944

Well data:

Elevations: Drilling curb 954 feet; Land surface _____ feet

Determined by _____

Topographic position Valley of Wolf Creek

Total depth: Reported 51 feet; Measured _____ feet

Drilling method _____

Hole and casing data see remarks

(Give amount, size, kind, and depth of all casing; type and position of seals and packers; cementing; how finished--perforated pipe, screen, GRAVEL PACK gravel pack, open hole, etc.)

Original depth to water 16 ft. ~~above~~ below _____ Date _____

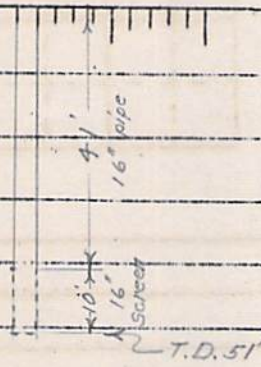
Original elevation of water level _____ ft.; Source of data _____

Sources of water: Principal _____; Others _____

CASING DIAGRAM

Vertical scale _____

LOG



Production data: Date _____

Static depth to water 16'; Measuring point _____

Pumping level below curb 27' Draw 11' at 250 g.p.m.

33' down 17' 400

_____ _____

_____ _____

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 ANALYSES (in parts per million)

Date sampled	March 29, 1946			
Sampled by	A.L. Bennett			
Total solids	596			
Insoluble matter	10.5			
Alkalinity (Meo)	256			
Alkalinity (Phn)	0.0			
pH	4/8/46 7.7			
$Fe_2O_3+Mn_2O_3+Al_2O_3$	8.5			
Alkali as sodium	21.4			
Calcium	134			
Magnesium	26.4			
Iron (unfiltered)	5.0			
Manganese	0.8			
Nitrate	3.1			
Fluoride	0.3			
Chloride	26			
Sulphate	178			
Bicarbonate	312			
Hardness (ppm)	453.6			
Hardness (gpg)	26.5			

Remarks _____

Laboratory data: Sample storage location CD11

Sample range 8-51 No. spls. 3 No. dupls & cond. 3 - Good

Spls. prepared by Kringel Washed range _____ by _____

Driller's log and cond. _____

Insoluble residues: Prepared by _____ Studied by _____ Strip log _____

Microscopic study 8-51 strip log July 12, 1945 M.C.P

Gen. log _____ Correl. by Mary Porter

WATER LEVEL DATA

Measuring point _____

Date	Depth to water	Altitude	Remarks

REMARKS

Casing 54" curbing set at 49'

34" " " " " 50'6"

16" pipe from 0-41 with 10' of 16" screen from 41-51 ft.