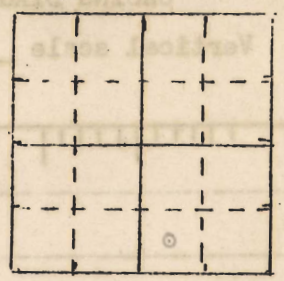
IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey

N-0033

RECORD OF WELL



Location:

Town: Greenfield (N E S W); County Adair E.

C SW¼ SE¼ sec. 7 T. 75 N., R. 31 W. Twp.

Well name and number Greenfield city well No. 1 deep

Owner City of Greenfield Address

Tenant Address

Contractor Layne-Bowler Chicago Co. Address

Drillers

Drilling dates Started: 1928 Completed: July 6, 1929

Well data:

Elevations: Drilling curb 1372.8 feet; Land surface feet

Determined by Hand level

Topographic position Upland

Total depth: Reported 3435 feet; Measured feet

Drilling method Cable tools

Hole and casing data 207' of 20" casing from 0' to 207'; 285 ft of 16" casing from 0' to 285'
(Give amount, size, kind, and depth of all casing; type and 980' of 12" casing from 0 to 980'; 780' of 10" casing from 480' to 1260'; 246' of 8" casing
position of seals and packers; cementing; how finished--perforated pipe, screen, from 1534 to 1780'; 1886' of 6¼" casing from 628' to 2514 feet perforated
gravel pack, open hole, etc.)
from 1138 to 1168'? (10" CASING PERF. AT 1138-1168 ACSO)

Original depth to water 592 ft. above below Date

Original elevation of water level 781 ft.; Source of data

Sources of water: Principal Not known; Others

Water encountered in St. Peter and Oneota and others, see back.

W-0033

Production data: Date _____

Static depth to water _____; Measuring point _____

Pumping level _____ at _____ g.p.m.

600 60 with #0, at 2505

_____ _____

6 60 with #0 3435

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	Sept. 1, 1938			
Sampled by	H.G. Russell			
Total solids	2198.			
Insoluble matter	14.0			
Alkalinity (Meo)	236.0			
Alkalinity (Phn)	0.0			
pH	7.1			
$Fe_2O_3+Mn_2O_3+Al_2O_3$	8.0			
Alkali as sodium	449.3			
Calcium	198.7			
Magnesium	53.9			
Iron (unfiltered)	0.8			
Manganese	1.08			
Nitrate	0.00			
Fluoride	3.0			
Chloride	202.0			
Sulphate	1089.7			
Bicarbonate	287.9			
Hardness (ppm)	720.			
Hardness (gpg)	42.1			

Remarks _____

Laboratory data: Sample storage location _____

Sample range 0-3435' No. spls. _____ No. dupls & cond. _____

Spls. prepared by _____ Washed range _____ by _____

Driller's log and cond. yes good

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

Microscopic study 0-3435' Carmody strip log Carmody & copy from I.G.S. Vol. 33

Gen. log _____ Correl. by Carmody & K.E. Andersen

WATER LEVEL DATA

Measuring point _____

Date	Depth to water	Altitude	Remarks

REMARKS

Water encountered at Depth to water

55 at base of Penn

1600 505 water on slate

2130 505 water sandstone

2983 St. Peter

3185 New Richmond

3290-3345' Oneota 592 cuttings washed away

? 3390-3425 Jordan

Check casing record with

R-1-B

THORPE BROTHERS WELL COMPANY

2340 Sixth Avenue

DES MOINES, IOWA

DL

Drilled for City of Greenfield, Ia *at* _____

Drilling started _____ 19____ *Completed* _____ 19____

Well No. _____ *Kind of Well* _____ *Depth* 3437' *Size hole started* _____ *in.*

Finish 6" *G. P. M.* _____ *Static head* _____ *Drawdown* _____

Water was first encountered at _____ *in* _____ *Approximate Amount* _____

Remarks _____

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
20"	207'	207'	Surface	W.S.		
16"	285'	285'	"	W.I.		
12"	980'	980' ?	"	W.I.		
10"	780'	1260'	980' (480 CHK)	W.I. with (10X6 swaged lead packer on top of 6¼"		
6¼"	1886'	2514'	628'	W.I. Casing 26# (Perforated from (1138 to 1168'		
8"	246'	1780'	1534'	W.I. Pipe liner		

Driller _____ *From Surface to* _____ *feet*

Driller _____ *From* _____ *feet to* _____ *feet*

Driller _____ *From* _____ *feet to* _____ *feet*

AMOUNT IN FEET	KIND OF SOIL OR FORMATION	TOTAL DEPTH FEET
120	Yellow clay	120
20	Black mud	140
40	Blue shale	180
20	Yellow clay	200
20	White limestone, soft	220
10	Black shale	230
20	Mottled clay	250
20	Red shale	270 > 20'
20	Blue shale	290
20	" " lime shells	310
20	Red shale	330
10	White limestone	340
40	Blue shale	380
45	Gray shale	425
35	Gray limestone	460
5	Green shale	465
10	White limestone	475
25	Blue shale	500
15	White limestone	515
10	Black shale	525
17	White limestone	542
3	Black shale	545
35	Red shale	580
20	Blue shale	600
20	Red shale	620
20	Blue shale	640
5	Limestone	645
55	Blue shale	700
50	Mottled shale	750
5	Gray limestone	755
25	Mottled clay	780
40	Blue clay shale	820

(over)

Amount in feet	Formation	Total depth feet
55	Gray shale	875
20	Mottled shale	895
10	Limestone	905
15	Gray shale	920
100	Mottled shale	1020
60	Gray shale	1080
20	Pink shale	1100
38	Black shale	1138
27	Sandstone	1163
72	Black shale	1235
30	Sandstone, soft	1265
15	Black shale	1280
15	Sandstone, soft	1295
15	Black shale	1310
20	Shale & sand	1330
20	Limestone	1350
40	Gray shale	1390
5	Limestone	1395
70	Sandy shale	1465
35	Limestone	1500
10	Shale	1510
60	Limestone	1570
70	Gray shale	1640
80	Limestone	1720
65	S hale	1785
5	Brown limestone	1790
10	S hale	1800
80	Limestone, hard	1880
10	Limestone	1890
10	" sandy	1900
30	" brown	1930
150	" hard	2080
28	" brown	2108
312	" & sandy alternating	2420
2	Shale	2422
5	Limestone, sandy	2427
2	" cherty	2429
46	Shale & limeshells	2475
22	Limestone, hard	2497
22	Shale, red & blue	2519
3	Sandstone	2522
15	Limestone, gray	2537
3	Sandstone	2540
14	Limestone, gray	2554
6	" sandy	2560
15	Sandstone, reddish	2575
5	" gray	2580
100	Shale, sandy, hard	2680
40	Limestone, gray, shale	2720
20	" white	2740
20	S hale, gray, sandy	2760
40	Limestone, reddish	2800
90	S hale, sandy, lime sheels	2890
10	Limestone, white	2900
10	Shale, hard	2910
20	Limestone, white	2930
10	Gray shale	2940
10	Sandstone	2950
33	Shale, blue	2983
27	Sandstone	3010
10	Limestone, white	3020
30	Sandstone, brown	3050
20	" light brown	3070
40	" white	3100
30	Limestone, sandy	3130
15	" white	3145
40	Sandstone, water	3185
15	" brown	3200
20	" white	3220
30	Limestone, white	3250
10	Sandstone	3260
30	" water	3290
55	Water washed cuttings away	3345
15	Sandstone	3360
20	Limestone, white	3380

(Cont.)

(Continued)

Amount in feet	Formation	Total depth feet
30	Limestone, gray, soft	3410
10	Sandstone, hard. light brown	3420
5	" hard, brown	3425
5	" hard. light brown	3430
7	" gray	

Final depth 3,437 feet

02

DRILLER'S LOG OF CITY WELL
TOWN OF GREENFIELD, IOWA

DRILLED BY LAYNE-BOWLER CHICAGO COMPANY, CHICAGO, ILLINOIS, 1929.

DRILLING COMPLETED JULY 6, 1929. PUMPING TEST DECEMBER 6, 1929

LOG OF FORMATIONS

FROM	TO	FORMATION
0	120	Yellow Clay
120	140	Black Mud
140	180	Blue Shale
180	200	Yellow Clay
200	220	White Limestone, soft
220	230	Black Shale
230	250	Mottled Clay
250	270	Red Shale
270	290	Blue Shale
290	310	Blue Shale, lime shells
310	330	Red Shale
330	340	White Limestone
340	380	Blue Shale
380	425	Gray Shale
425	460	Gray Limestone
460	465	Green Shale
465	475	White Limestone
475	500	Blue Shale
500	515	White Limestone
515	525	Black Shale
525	542	White Limestone
542	545	Black Shale
545	580	Red Shale
580	600	Blue Shale
600	620	Red Shale
620	640	Blue Shale
640	645	Limestone
645	700	Blue Shale
700	750	Mottled Shale
750	755	Gray Limestone
755	780	Mottled Shale
780	820	Blue Shale
820	875	Gray Shale
875	895	Mottled Shale
895	905	Limestone
905	920	Gray Shale
920	1020	Mottled Shale
1020	1080	Gray Shale
1080	1100	Pink Shale
1100	1138	Black Shale
1785	1790	Brown Limestone
1790	1800	Shale
1800	1880	Limestone, hard
1880	1890	Limestone
1890	1900	Limestone, sandy
1900	1930	Limestone, brown
1930	2080	Limestone, hard
2080	2108	Limestone, brown
2108	2420	Limestone, sandy and brown alternating
2420	2422	Shale
2422	2427	Limestone, sandy
2427	2429	Limestone, cherty
2429	2475	Shale and Lime shells
2475	2497	Limestone, hard
2497	2519	Shale, red and blue
2519	2522	Sandstone
2522	2537	Limestone, gray
2537	2540	Sandstone
2540	2554	Limestone, gray
2554	2560	Limestone, sandy
2560	2575	Sandstone, reddish
2575	2580	Sandstone, gray
2580	2680	Shale, sandy, hard
2680	2720	Limestone, gray, shale
2720	2740	Limestone, white
2740	2760	Shale, gray, sandy
2760	2800	Limestone, reddish
2800	2890	Shale, sandy, lime shells
2890	2900	Limestone, white
2900	2910	Shale, hard
2910	2930	Limestone, white
2930	2940	Gray shale
2940	2950	Sandstone
2950	2983	Shale, blue
2983	3010	Sandstone
3010	3020	Limestone, white
3020	3050	Sandstone, brown
3050	3070	Sandstone, light brown
3070	3100	Sandstone, white

LOG OF FORMATIONS
(Continued)

FROM	TO	FORMATION
1138	1163	Sandstone
1163	1235	Black Shale
1235	1265	Sandstone, soft
1265	1280	Black Shale
1280	1295	Sandstone, soft
1295	1310	Black Shale
1310	1330	Shale and Sand
1330	1350	Limestone
1350	1390	Gray Shale
1390	1395	Limestone
1395	1465	Sandy Shale
1465	1500	Limestone
1500	1510	Shale
1510	1570	Limestone
1570	1640	Gray Shale
1640	1720	Limestone
1720	1785	Shale
3100	3130	Limestone, sandy
3130	3145	Limestone, white'
3145	3185	Sandstone, water
3185	3200	Sandstone, brown
3200	3220	Sandstone, white
3220	3250	Limestone, white
3250	3260	Sandstone
3260	3290	Sandstone, water
3290	3345	Water washed cuttings away
3345	3360	Sandstone
3360	3380	Limestone, white
3380	3410	Limestone, gray, soft
3410	3420	Sandstone, hard, lt. brown
3420	3425	Sandstone, hard, brown
3425	3430	Sandstone, hard, lt. brown
3430	3437	Sandstone, gray

FINAL DEPTH ------ 3437 feet

Adair
Greenfield City Well

G R E E N F I E L D

I O W A

Depth		Description
From	To	
1960	1975	Hard lime
1975	1985	" "
1985	1995	" "
1995	2010	" "
2010	2020	" "
2020	2040	" "
2040	2060	" "
2060	2080	" "
2080	2090	Brown lime
2090	2100	" "
2100	2108	" "
2108	2130	Water
2130	2420	Lime

Casing Record

20" O. D.	From surface to	207'
16" O. D.	" "	" 285'
12" I. D.	" "	" 980'
10" I. D.	" "	"1260'
8" liner	"	1534 to 1780 feet
6-1/4"	"	surface to 2462' under reamed same to 2514'

There is a lost 8" bit at 2447', failing to fish same out the hole was drilled by it and was cased off with the caving material above and below this point with the 6-1/4" casing.

LITHO U.S.A.

LAYNE-BOWLER CHICAGO COMPANY

WELL WATER SUPPLY CONTRACTORS

PUMP & WELL EQUIPMENT FOR MUNICIPALITIES INDUSTRIES RAILROADS MINES AND IRRIGATION

AFFILIATED WITH

LAYNE & BOWLER, INCORPORATED

"WORLD'S LARGEST WATER DEVELOPERS"

FACTORIES: MEMPHIS, TENN. HOUSTON, TEXAS. LOS ANGELES, CAL.

37 WEST VAN BUREN STREET

CHICAGO, ILLINOIS

May 11, 1929

Mr. W. H. Norton
Mt. Vernon
Iowa

Dear Sir:

I am mailing you by parcel post samples from the well at Greenfield, commencing from the samples recently sent you. Up to last Thursday our present depth ~~was~~ 2650 feet. Am also sending the missing sample of red and blue shale mix at about 2510 feet. Enclosed in this sample is a small fossil also found in same.

We have recently under reamed our 6-1/4" 26 lb. casing to 2514 feet which shuts off all caving material and water from above. The water just below this point is a very weak vein as we can lower it 100 feet with a bailer and we took a soap test in our office here and found it to be only 13 grains hardness compared to 30 above.

Yours very truly,

T. H. Little

T. H. Little
Field Superintendent
LAYNE-BOWLER CHICAGO COMPANY

THL L

2

June 23. 29.

Greenfield Iowa

Mr N. H. Norton.

Mt Vernon Iowa.

3013
506
3519

Dear Sir.

I expressed to you yesterday one box containing one gallon of water, and samples of drilling from the well we are now drilling at Greenfield. The samples are complete from the last I sent you up to our present depths of 3280 ft. That is providing you received the last samples I sent you which was up to I think about 2900 ft, also I wrote you a letter at the same time to advise if you think the men were washing and keeping the samples right, but I never received your answer or if you received the samples, So please let me know if you did, as I had package insured. and if you did not I may have them traced.

The bottle of water, I wish you would analyze as a mineral analysis only, as I belive you said you would do same for $10.00. Please mail bill to our office Layne Bowler Chicago Co. 37 W. VanBuren st Chicago with copy of analysis. also mail me copy to Greenfield.

This water was taken (the best I could) from about 3160 ft. it but of course is not a very good sample, as the well has not been pumped, and the only water taken from well was with bailer while the drilling progresses.

There is two samples of water bearing sand in the samples sent you yesterday. one from what I suppose is the St Peters which we found from about 2983 to 3013 ft. and the othe is a strata we had from 3145 to 3183 ft. We expect another strata about 3400 and according to stewart well would be the last they had this

July 2, 1929.

Analysis of water taken from well at Greenfield, Iowa.

Drilled by the Layne-Bowler Company.

Silica	13 parts per million.
Iron and aluminum oxides (more trace of iron)	2 " " "
Calcium	142 " " "
Magnesium	69 " " "
Sodium	316 " " "
Potassium	27 " " "
Sulfate	769 " " "
Chloride	309 " " "
Bicarbonate	506 " " "
Total solids (independent determination)	1924 " " "

Analyzed by

J. B. Culbertson

Professor of Chemistry.

Nov. 16

Mr. C. C. Dudley, Greenfield

The analysis shows that the water is of the sodic sulphated class with a particularly large amount of sodium sulphate. The pot. sulp. in the figues given is not discriminated fro the sod. sulp. but is probably v very small. On the whle considering other possible sources of supply I th think the water will prove satisfactory on the ground of quality. To be sure tohr waters, such as the deep wells of norteeastern Iowa are much better, but can you get a better water at Greenfield?

The hardness of the water is chiefly due to calcium carbonate, a temp orary hardness which does no possible harm in drinking water. The sulpha of lime present is not I think in amount such as to cause digesteive tru troubles. The amount is about at the exact figure above which sulphate of lime may cause distu bances of the digestive tract especially in those not used to them, according to some English authorities. Deep wells at Washington, Ia. Keokuk, Colfax and Grinnell show as much or more. I do not regard this as a serious objection under the circumstances. Such waters are to be expected fro deep wells in this area. The sodium chloride is not enough to injure the water in any way. The sodiu suphate, Glauber salt, will have a mildly laxativ e effect especially on those not accust omed to the water and when drunk in large quantity. Your well water belongs to the same class as the Colfax springs water and is very similar to it i its ingredients. It appears to come from the same horizon of Mississpia rocks. Probably You will note that your water is superior to the Colfax wat er for a supply in that it has far less magnesium in the form of sulph. or carbonate and less sulpahete of lime As a mineral water it is not so good, but as a rule the less "mineral" a water is the better it is for a supply.

I am very sorry to learn that the well does not yield more water and has so low a static level with so costly pumpage. * * *

Perhaps I should add, although the matter is not of much importance except in manufacturing towns that as boiler water yours would be class -ified as " bad" with the badness mitigated with the facts that the hardness is largely temporary ~~and not permanent~~ and that the water has so much sodium for a softener. In fact it may cause " foaming".

<< the cuttings so far as they went showed no sign of the St Peter set. which evidently was not reached when they stopped using Dewatfer.

5

GREENFIELD City Well CASING RECORD

ELEV. = 1372.8

207' OF 20" CSG. 0-207

285' OF 16" CSG. 0-285

980' OF 12" CSG. 0-980'

780' OF 10" CSG. 480'-1260'

246' OF 8" CSG. 1534'-1780'

1886' OF 6¼" CSG. 628'-2514' (PERFORATED 1138'-1168'

SWL. 592

PL 600' @ 606PM.

137'
59
7°

Pott
Cass
Harr
Guthrie
Harp
Warren
Decatur
Lucas
1518
709
171
(old) 2198
1086
282
449
(combined)
450
(new) 2360
1200
120
1760
750
210
300
1870
820
260
340
760
310
370
671
220
40
140
903
348
64
200
873
303
102
196
Diss soils
Sod
Cl
Na

075-31W-07 DCDB

C S J

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

W-0033

Water Quality
(ppm)

Card Q

State: IOWA (16) County: ADAIR (11) Town: GREENFIELD

Well No. Latitude 411830N (5–11) Longitude 0942733 (12–18) Seq. No. 1 (19) Date M 09 D 0 Y 38 (20–25)

Sampling Depth 3435 (26–29) Type 1 (30) $Kx10^6$ (31–35) pH 7.1 (36–38) Temp. °F (39–41)

SiO_2 (42–44) Ca 199 (45–49) Mg 54 (50–53) Na 499 (54–58) K .C (59–61)

Source No. 3 Q (79–80)

HCO_3 288 (62–65) CO_3 0 (66–67) SO_4 190 (68–72) Cl 202 (73–78)

Card R

Duplicate Columns 1-25 from Card Q

F .30 (26–28) NO_3 .0 (29–32) PO_4 .0 (33–35) B (36–38) Al (39–41) Fe .80 (42–45)

Mn .08 (46–49) Cu (50–52) Pb (53–54) Zn (55–57)

Solids Determined 2200 (58–63) Calc. (64–69)

Hardness Ca,Mg 720 (70–73) Non-Carb. 484 (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 $CaCO_3$ 236 (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)

Verified PMJ No. 5 (80)

Recorded by: D AARONSON

Punched by: Punched FCH Date:

Published:

Wt 00033

STATE HYGIENIC LABORATORY, DES MOINES BRANCH
WATER LABORATORY DIVISION
MINERAL ANALYSIS

LAB. NO. 5962
MINERAL NO. 8652
26 May 1971 bj

TOWN Greenfield COUNTY Adair
OWNER OF SUPPLY Municipal
COLLECTOR'S NAME Dennis Alt
DATE COLLECTED 30 Apr 71 DATE RECEIVED 3 May 71
REPORT TO: NAME EES
ADDRESS SDH

FIELD DATA

SOURCE: WELL NAME, NUMBER, POINT OF COLLECTION, DEPTH, CONSTRUCTION DATE, ETC.,
Jordan well Sample tap in water plant 3467'
Raw sample

WELL PUMPED 24 HRS. AT 260 GPM. DATE OF PREVIOUS SAMPLE
WAS SAMPLE FREE OF TURBIDITY WHEN COLLECTED Yes
TEMPERATURE °C 30 ALKALINITY (ppm $CaCO_3$) P T pH 7.2
IS A POLYPHOSPHATE BEING USED?

LABORATORY ANALYSIS
(PARTS PER MILLION)

SPECIFIC CONDUCTANCE K AT 25°C 310 x 10^{-5}. TURBIDITY
DISSOLVED SOLIDS 2170 SOLUBLE IRON (Fe) 1.6
TOTAL SOLIDS 2170 SILICA (SiO_2) 14 TOTAL IRON (Fe) 1.6
ALKALINITY (ppm $CaCO_3$) P None T 198 pH 7.2 DATE 3 May 71

POSITIVE IONS		NEGATIVE IONS	
K^+	35	NO_3 – asN	0.2
Na^+	450	F^-	3.1
Ca^{++}	172	Cl^-	390
Mg^{++}	48.6	SO_4^{--}	900
Mn^{++}	< 0.05	HCO_3^-	242
Al^{+++}		CO_3^{--}	None

Trace Metals	
Arsenic	< 0.01
Barium	< 0.1
Cadmium	< 0.01
Chromium	< 0.01
Copper	< 0.01
Lead	< 0.01
Zinc	0.01

L Farmer

HARDNESS AS $CaCO_3$ 630 ppm 36.8 gpg

Cloudy with pale yellow color on receipt in lab.

ANALYST Morlan, Ryan, Calkins, Ebert

R. L. MORRIS
JHG PRINCIPAL CHEMIST

WH 33

STATE HYGIENIC LABORATORY, DES MOINES BRANCH
WATER LABORATORY DIVISION
MINERAL ANALYSIS

LAB. NO.
MINERAL NO. 8843
21 Sept 19 71

TOWN Greenfield COUNTY Adair
OWNER OF SUPPLY Municipal
COLLECTOR'S NAME Kenneth Hoadley
DATE COLLECTED 2 August 1971 DATE RECEIVED 3 August 1971
REPORT TO: NAME Environmental Engineering Service
ADDRESS Des Moines, Iowa

FIELD DATA

SOURCE: WELL NAME, NUMBER, POINT OF COLLECTION, DEPTH, CONSTRUCTION DATE, ETC.,
Well 3467', raw water from well before Permeator

WELL PUMPED ____ HRS. AT ____ GPM. DATE OF PREVIOUS SAMPLE ____
WAS SAMPLE FREE OF TURBIDITY WHEN COLLECTED Not Stated
TEMPERATURE °C 30 ALKALINITY (ppm $CaCO_3$) P ____ T ____ pH ____
IS A POLYPHOSPHATE BEING USED?

LABORATORY ANALYSIS
(PARTS PER MILLION)

SPECIFIC CONDUCTANCE K AT 25°C 310 x 10^{-5} TURBIDITY ____
DISSOLVED SOLIDS 2190 SOLUBLE IRON (Fe) 3.0
TOTAL SOLIDS 2190 SILICA (SiO_2) 15 TOTAL IRON (Fe) 3.0
ALKALINITY (ppm $CaCO_3$) P None T 204 pH 7.2 DATE 8-3-71

POSITIVE IONS		NEGATIVE IONS		TRACE METALS	
K^+	27	NO_3-N	0.5	Arsenic	< 0.01
Na^+	480	F^-	3.2	Barium	< 0.1
Ca^{++}	176	Cl^-	340	Cadmium	< 0.01
Mg^{++}	43.7	SO_4^{--}	910	Chromium	< 0.01
Mn^{++}	< 0.05	HCO_3^-	249	Copper	0.03
Al^{+++}		CO_3^{--}	None	Lead	0.05
				Zinc	< 0.01

HARDNESS AS $CaCO_3$ 620 ppm 36.2 gpg
No turbidity observation by collector. Slightly turbid and yellow in color on receipt in lab.

ANALYST Ryan, Calkins

R. L. MORRIS
PRINCIPAL CHEMIST

OW Greenfield Gen Data
Adair Co

April 17, 1967

Mr. D. W. Ebert
State Hygienic Laboratory
405 State Office Building
East 7th and Court
Des Moines, Iowa

Dear Mr. Ebert:

The Thorpe Drilling Company of Des Moines has recently undertaken the task of rehabilitating the deep well drilled for the town of Greenfield in 1929.

The program consists of completely recasing and cement grouting the casing to a point below the St. Peter Sandstone. As some of the upper formations were originally left open in the well, it is felt that there probably has been intermingling of the waters. Therefore it is planned to pump the well for a prolonged period to be certain that eventually a sample will be obtained that is truly representative of the Jordan aquifer in that area.

In this connection the Thorpe Company is planning to collect water samples periodically for mineral analysis in an effort to detect any improvement in quality. It is very probable that they will request spot determination on a few of the constituents.

As the Iowa Geological Survey is vitally interested in this project is is our desire to sponsor the analyses. It is now thought that not more than 6 samples will be collected. We have directed the Company to deliver the samples directly to your laboratory directly upon collection.

Your continued cooperation is greatly appreciated.

Very truly yours,

H. G. Hershey

HGH-OVE

1

April 14, 1967

MEMORANDUM

TO: Dr. H. G. Hershey

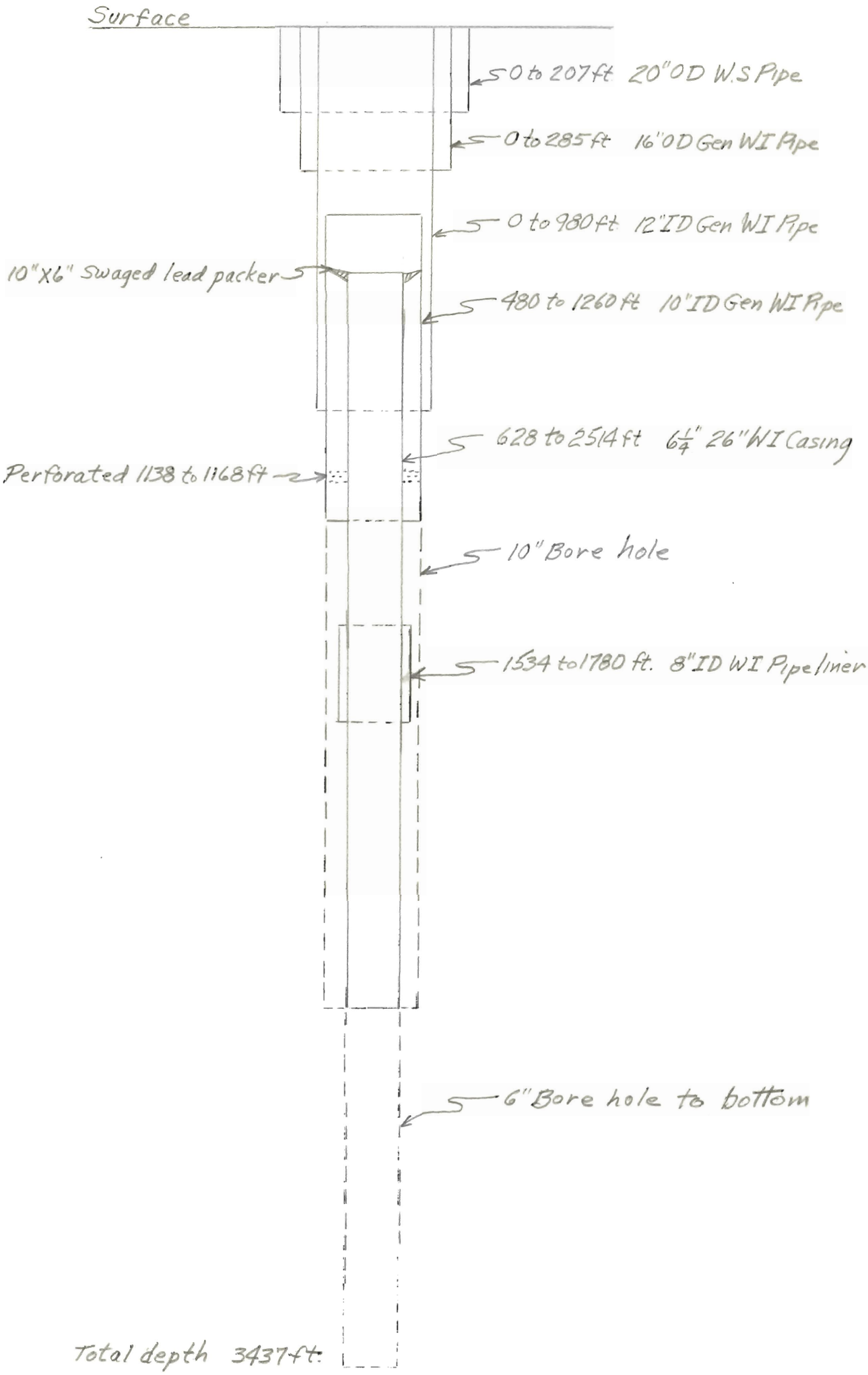
FROM: Richard Northup

RE: Greenfield City Well

As I mentioned in my earlier memorandum, we have received an additional twenty-five feet of samples from the well at Greenfield. They are definitely in the St. Lawrence, which now puts them thirty-five feet into this formation. They will pump the well soon, with pump setting to be at 1000 feet. They may pump for several weeks, if necessary, and plan on taking a sample each day for a week, and less regularly from then on. I talked this over with Orv, who is of the opinion that arrangements be made for Thorpe to deliver the samples directly to the water lab in Des Moines, and he is writing to Mr. Ebert at the lab to advise him accordingly.

CASING LOG OF CITY WELL, GREENFIELD, IA.

LAYNE-BOWLER CHICAGO CO,
CHICAGO, ILLINOIS



GW Greenfield Gen Data
Adair Co.

April 11, 1967

MEMORANDUM

TO: Dr. H. G. Hershey

FROM: Richard Northup

RE: Progress on reconditioning Jordan Well at Greenfield

Wes Thorpe phoned late Monday afternoon to advise that they have made satisfactory progress in repairing the old Jordan well at Greenfield which we discussed with him a few weeks ago. He says that the old casing was removed satisfactorily, a bridge set at 3100' above the Root Valley and a string of new 5" casing set and cemented from there to the surface. Hence any water now should be coming from the Prairie du Chien-Jordan -Upper St. Lawrence aquifer. They now intend to drill about 50 feet into the St. Lawrence hoping that crevices will yield additional water and then test. They want us to check the samples and Wes will see that they reach us as soon as drilling is completed. Apparently there is now a lot of "Junk" at the bottom of the hole and they will want to drill and bail this out first. They plan a lengthy pumping test which they may want to carry over several weeks, if necessary, to check on any change in quality of the water. As Bud was heading in that direction today on his sample pickup run now, I asked him to leave several water bottles at the rig. Probably the testing for the main things such as iron, total hardness and sulphate can be done quickly at the lab here in Iowa City. They undoubtedly have an engineer on the job, too, who will do more field checks as at Winterset and Earlham.

3

GW Greenfield Gen Data
Adair Co

G

April 2, 1968

Mr. D. H. Moore, Supt.
Greenfield Municipal Utilities
Greenfield, Iowa

Dear Mr. Moore:

It was somewhat of a disappointment to learn that the continued pumping of the recased deep well at Greenfield has not resulted in any noticeable lowering of the sulfate content in the water. However, I do believe it would be advisable to submit another sample to the Des Moines Laboratory for a complete mineral analysis. This may indicate that at least some change in quality has occurred.

Continued pumping of the well probably is not necessary at this time. After the new analysis is received we will contact you to discuss any further recommendations.

Very truly yours,

H. G. Hershey

HGH/OVE:njc

Greenfield Municipal Utilities

Greenfield, Iowa

IOWA GEOLOGICAL SURVEY
APR 2 1968

TRUSTEES
W. A. Foster, Chairman
R. C. Gross
Eldon A. Erbes

SYSTEM SUPERINTENDENT
D. H. Moore

TRUSTEES CLERK
E. E. Stowell

April,1,1968.

Mr.H.G.Hershey,Director,

Iowa Geological Survey,

Iowa City,Iowa.

Subject;City well re-cased March,1967.
Thorpe Well Co.

Dear Mr.Hershey;

This well has been pumped continuosly for approximately nine months at a rate of three hundred gallons per minute.Local sulfate determinations indicate no appreciable decrease in sulfate content.However we still have one sample bottle left by your field engineer.If you wish we can submit a sample to the Des Moines lab for their analysis. Please advise if you think this is desirable also if further pumping should be done.

Yours truly,
D.H.Moore
D.H.Moore,Supt.

approx 118,000,000 gals. pumped in 9 mos

If assume 50 ppm moved down well into Jordan in 30 yrs approx 788,100,000 gallons would have flooded into the Jordan from overlying mineralized zones. They have a long way to go to improve the quality although some of this water might have escaped from the radius of influence of pumpage in the aquifer?

BH

GW Greenfield Comp Data
Adair Co.

October 2, 1967

Mr. D. H. Moore
Greenfield Municipal Utilities
Greenfield, Iowa

Dear Mr. Moore:

We have completely reviewed all available data on the Greenfield deep well in an effort to determine the advisability of continuing pumping.

The records indicate that during the drilling of the well the static water level stood at 500 feet below ground level until the St. Peter Sandstone was reached. The static water level then dropped to 592 feet below ground level and remained at that level. This represents a considerable difference in artesian head. Also, the casing schedule was quite complex with some zones perforated and apparently none of the casing cement grouted, as is the standard procedure now. Thus, over a period of almost 30 years the waters from the upper aquifers, which are known to be highly mineralized have been free to run down the well bore and to enter the Jordan aquifer.

Shortly after the well was completed, and before the upper casing was perforated an analysis of the water showed a total dissolved solids content of 1750 ppm and a sulfate content of 769 ppm. This represents water of a much better quality than is now being pumped from the well.

With these thoughts in mind, it seems advisable to continue pumping for some time in an effort to remove the highly mineralized water that has entered the Jordan aquifer from above. Periodic sampling would be advisable. Hopefully, the water will eventually approach a quality comparable to that noted above. There is no way of estimating the time that will be required to accomplish this. The pumping rate is not great, so an extended pumping period will probably be necessary.

In summary, a review of all data indicates that the quality of the water from the newly cased Jordan well possibly can be improved appreciably by continuous pumping.but we cannot be certain of that. In the interest of future development of the Jordan aquifer in southwestern Iowa, a truly representative

analysis of the Jordan water is highly important.

The Geological Survey is tremendously interested in this problem and will aid in any way possible. If you feel that it is desirable to have water samples analyzed periodically by the State Hygienic Laboratory we will be glad to make arrangements to have this done free of charge for you.

Very truly yours,

H. G. Hershey

EGH-OVE/l

Greenfield Municipal Utilities

Greenfield, Iowa

IOWA GEOLOGICAL SURVEY

SEP 15 1967

TRUSTEES
W. A. Foster, Chairman
R. C. Gross
Eldon A. Erbes

SYSTEM SUPERINTENDENT
D. H. Moore

TRUSTEES CLERK
E. E. Stowell

September, 14, 1967

Iowa Geological Survey,

Geological Survey Building,

Iowa City, Iowa.

Gentlemen;

The Greenfield deep well, re-cased by Thorpe Well Company earlier this year has now been pumped at 300 gpm. for three months. Pumping was continuos during this period being discharged to waste. We were hoping the sulphate content would improve since first tests indicated over 1,660 ppm. However very little change has occurred. Temperature has remained at 84 degrees. Daily tests for clorides, iron, sulphates and fluoride have not changed, however total hardness has decreased five grains over the period. In your opinion, should we continue pumping or is there no possibilty of a change?

Yours truly,

D. H. Moore.

D. H. Moore

3

Punched FDH

WRD Exp. (GW)
Aug. 1964

Verified DMJ

U. S. DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

Water Resources Division Well Schedule Form

MASTER CARD

GREENFIELD IA

Record by D.AARONSON Source of data FILE Date 7/22/65 Map 1:62,500

State IOWA 16 County (or town) ADAIR 1

Latitude: 41 18 13 N (deg min sec) Longitude: 094 27 33 (degrees min sec) Sequential number: 1

Lat-long accuracy: 2 T. 75 N S, R 31 E W Sec 7, NWSE¼, SW¼, SE¼ 5

Local well number: 075 3 W 07 d c d b B & M Other number: W-0033

Local use: 0003 CITY Owner or name: GREENFIELD CITY 1, DEEP

Owner or name: GREENFIELD Address: GREENFIELD, IA

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist M

Use of water: (A) Air cond, (C) Comm, (D) Dewatering, (F) Fire, (Dom, (H) Irr, (I) Ind, (N) P S, (P) Stock, (S) Instit, (T) Unused, (U) U

Use of well: (A) Anode, (D) Drain, (G) Seismic, (O) Obs, (P) Oil-gas, (R) Recharge, (S) Spring, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed U

DATA AVAILABLE: Well data 1 Freq. W/L meas.: INVENTORY Ø Field aquifer char.

Hyd. lab. data:

Qual. water data; type: COMPLETE C

Freq. sampling: INTERMITTENT I Pumpage inventory: yes / no, period:

Aperture cards: yes

Log data: GEOLOGIST LOG G

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 3435 ft 3435 Meas. rept 6

Depth cased; (first perf.) 1138 ft 1138 Casing type: STEEL ; Diam. 12 accuracy in 12

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., screen, sd. pt., (S) shored, (T) open hole, (W) other, (X) (Z) X

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other C

Date Drilled: JULY 1929 7 29 Pump intake setting: ft

Driller: LAYNE BOWLER (name), CHICAGO (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple, (cent.), (M) multiple, (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other Deep Shallow D

Power (type): diesel, elec, gas, gasoline, hand, nat gas, wind; LPG H.P. Trans. or meter no.

Descrip. MP LSD ft above below lsd, Alt. MP 1372.8

Alt. LSD: 1373 1372 Accuracy: (source) HAND LEVEL 1

Water Level 592 ft above (below) MP; Ft above (below) lsd 592 Accuracy: REPORTED 6

Date meas: JULY 1929 7 29 Yield: 60 gpm 60 Method determined

Drawdown: 8 ft Accuracy: RCPT 6 Pumping period hrs

QUALITY OF WATER DATA: Iron 0.8 ppm 4 Sulfate 1089.4 ppm 9 Chloride 202.0 ppm 3 Hard. 720 ppm 8

Sp. Conduct K x 10^6 Temp. °F Date sampled SEPT 1938 9 13 8

Taste, color, etc.

Greenfield (Adair)

AUG 30 1956

Greenfield's Well Deepest In Iowa

A job that was supposed to take three months took two and a half years instead. But it brought much-needed water to Greenfield.

The job was digging a new city well, and that well brought the water a long ways—3,435 feet straight up. The well, located in the waterworks building just east of the library, is the deepest one in Iowa.

Work on it started in mid-April 1927. The contractor, Layne-Bowler Co., expected completion in about three months. Sook after work began the drilling was stepped up with shifts around the clock —when they weren't fishing for broken drill bits several hundred feet down in a hole or mending cave-ins on the well's wall.

Once work was delayed fifteen weeks while workmen tried to get hold of a drill bit that had broken off 2,500 feet below the surface.

Three men operated the digging machine and they first encountered difficulty at 150 feet when a strata of black muck led to walls caving in. That was only the beginning. Then work was halted because of failure in the existing city water supply, used in the drilling operation.

Next came a delay for machinery repairs. Then a wait for casing pipes. Still later they had to wait two weeks for wrought iron pipes to put down in the hole.

The hole started out with a twenty-inch diameter and got smaller as the well went deeper, with 16-, 12-, 10- and 6-inch widths.

After five months of drilling, the water shortage in Greenfield was so severe that a shallow well was drilled by Charles Needles of Greenfield southwest of the old city pond. The pond, where the sewage disposal plant is now, was at that time Greenfield's only source of water.

The best vein of water in the new deep well was found in New Richmond sand at a depth of 3,290 to 3,330 feet. But the city of Greenfield demanded that the drillers go deeper because the well wasn't yet producing the 70 gallons per-minute required by the contract.

Drilling actually stopped July 11, 1929 and the well was okayed by the city council November 29, 1929 after a trial period—thus ending a two and a half-year struggle for water in Greenfield.

Until Greenfield's well was finished the deepest one in the state was at Stuart. It is a little over 3,000 feet deep. One other in the state was 3,310 feet deep, but was not operative and so was plugged.

075-31W-7dcdb

Well Number 41.18.13 ⑧09427.33
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD | Physiographic Province: CENTRAL LOWLAND | Section: DISSECTED TILL PLAIN (E) | Drainage Basin: THOMPSON | Subbasin:

Topo of well site: (D) local depression, (F) flat surface, (H) hilltop, hillside, (S) terrace, (T) valley flat, (V) UPLAND

MAJOR AQUIFER: ORDOVICIAN system, MIDDLE series, 02, ST. PETER - PRAIRIE du CHIEN aquifer, formation, group, MP

Lithology: MEDIUM SANDST | Origin: MARINE | Aquifer Thickness: 60 ft

Length of well open to: 60 ft | Depth to top of: 2970 ft | B97

MINOR AQUIFER: CAMBRIAN system, UPPER series, 03, JORDAN SANDSTONE aquifer, formation, group, JT

Lithology: MEDIUM SANDST | Origin: MARINE | Aquifer Thickness: 35 ft

Length of well open to: 35 ft | Depth to top of: 3390 ft | C39

Intervals Screened:

Depth to Consolidated rock: 400 ft | Source of data: WELL CUTTINGS

Depth to Basement: ft | Source of data:

Surficial material: | Infiltration characteristics: POOR

Coefficient Trans: gpd/ft | Coefficient Storage:

Coefficient Perm: gpd/ft² | Spec cap: 7.5 gpm/ft; Number of geologic cards:

CASING

0-207' 20" O.D. W.S. PIPE
0-285' 16" O.D. GEN W.I PIPE
0-980' 12" I.D. GEN. W.I PIPE
480-1260' 10" I.D GEN WI PIPE (PERF 1138-1168')
628'-2514' 6 1/4" 24" W.I CASING (PERF 1138'-1168')
1534'-1780' 8" I.D. W.I PIPELINER
2514'- BOTTOM 6" BORE HOLE

WELL ABANDONED APPROX. 1938 DECA HARDNESS. NOW USE LAKE WATER

GPO 844-225

Free Press
Greenfield, Iowa
APR 27 1967

Pumping Test Of Deep Well Very Successful

Water Flowing At Rate Of 465,000 Gallons Per Day

Water began flowing from Greenfield's deep well again last Friday for the first time in about 30 years, and city officials were highly pleased with the results of the first pumping test.

With a submersible pump 988 feet down in the 3,467-foot well, water was pumped out at the rate of 323 gallons per minute. After a "draw-down" of about 50 feet when the pump was started at about 11:30 Friday morning, the water level stabilized and held constant as the pumping continued through the rest of Friday, and all day Saturday and Sunday.

The water is flowing from the Jordan sandstone layer which is at the bottom of the well, the deepest in the state. A cement caulking seals off the extremely hard water at higher levels which caused the well to be abandoned years ago.

The water seems to be of good quality, Det Moore, light and water plant superintendent, said. It has cleared up as the old water was pumped out. Pumping tests are continuing through this week. Samples are being taken every other day and sent to the state laboratory for testing. No reports have come back from these tests as yet. The water will not be used until approval is received from the state health department.

The 323 gallon per minute rate amounts to about 465,000 gallons in 24 hours. This is more than double the peak water load of last summer, which was about 200,000 gallons per day, except when the city swimming pool was being filled.

The water is warm when it comes out of the deep well, having a temperature of 80 degrees.

The degree of hardness of the water, which will be determined by the tests, will govern somewhat the way it is used. It can be mixed with lake water from the reservoir, or used directly into the treatment plant.

The successful pumping test of the well climaxes an effort which began last January, when Greenfield's reservoir was dropping dangerously low. Now, with recent rains and pumping from the Nodaway River, the reservoir is nearly full.

The well was reopened by the Thorpe Well Co., with Slim Poteet of Independence, Kans., and [illegible] Jackson of Eureka, Kans.



Pumping Test Begins On Greenfield Deep Well

A member of the Thorpe Well Co. crew checks the water flow as Mayor Paul Queck and Earl Brown of the water plant crew look on during the start of the test run of the Greenfield deep well last Friday. The well was pumped continuously from shortly before noon Friday until Monday morning without lowering the water level, with a flow of water measured at 323 gallons per minute. After a shutdown Monday, pumping tests were resumed and will continue through the week. City water board members and officials were very pleased with the results.

Free Press
Greenfield, Iowa
APR 19 1967

Greenfield Well At 3,467 Feet Is Deepest In State

Greenfield has the deepest well in Iowa, according to drillers. Now down 3,467 feet, water has raised up to the 650 static level in the well.

A 24-hour test of the capacity of the well will begin with the arrival of 5 inch pipe from St. Louis, Mo. It was expected to arrive here today (Wednesday). A test of the hardness of the water will be made at the end of the 24 hour pumping test.

Slim Poteet of Independence, Kan., an oil well driller for 40 years and Albert Jackson of Eureka, Kan. also a professional oil well driller, have been in charge of the drilling operations here for the Thorpe Well Co.

A submersible pump attached to 900 feet of 5 inch pipe will elevate the water.

The drillers in charge of the operations here have spent most of their lives drilling in oil fields. Poteet now has an oil well down 2,000 feet in Missouri and is awaiting finance to finish the well on a likely oil location.

IOWA ~~PRESS~~
CLIPPING BUREAU
Des Moines, Iowa

Free Press
Greenfield, Iowa

OCT 18 1967

State Geologist Says Deep Well Should Improve

Water from Greenfield's reopened deep well eventually should approach a good quality, but an extended pumping period probably will be necessary, according to the State Geologist, H. G. Hershey.

Mr. Hershey advised D. H. Moore, light and water plant superintendent, that the city should continue pumping for some time to try and remove the highly mineralized water that has entered the Jordan sandstone layer from above. He advised periodic sampling.

The state geologist wrote that all available data on the Greenfield deep well had been reviewed. He noted that when the old well was first completed and before the upper casing was perforated at various levels, a water analysis showed water with total dissolved solids of 1750 ppm and a sulfate content of 769 ppm. This is water of much better quality than is now being pumped from the well.

Mr. Hershey feels that since highly mineralized water from upper layers has been free to run down into the Jordan layer for 30 years, there is no way of estimating the time needed to pump it out. He said the Iowa Geological Survey is "tremendously interested" in this problem and will aid in any way possible.