

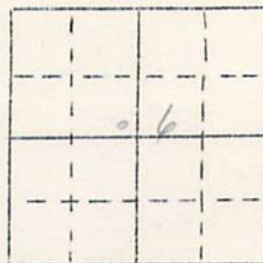
IOWA GEOLOGICAL SURVEY  
In Cooperation with U. S. Geological Survey

W-0814

RECORD OF WELL

Location:

Town: Charles City ( N E )  
( S W ); County Floyd  
SE-SE-NW sec. 6 T. 95 N., R. 15 W. St. Charles Twp.



Well name and number City Well #4

Owner \_\_\_\_\_ Address \_\_\_\_\_

Tenant \_\_\_\_\_ Address \_\_\_\_\_

Contractor Layne Western Address Omaha

Drillers Clarence D. Holland, in charge

Drilling dates June 21, 1938 - February 14, 1939

Well data:

Elevations: Drilling curb 1024' feet; Land surface 1018.5 feet

Determined by \_\_\_\_\_

Topographic position Upland

Total depth: Reported 1305 feet, Measured \_\_\_\_\_ feet

Drilling method cable

Hole and casing data 70' of 30" pipe, 127' of 26" pipe, 295' of 16" C.I.T.  
(Give amount, size, kind, and depth of all casing; type and  
CASING from curb to 295; 118' 2" of 12" liner from 166' 10" to  
position of seals and packers; cementing; how finished--perforated pipe, screen,  
780' shoe top; bottom; 290' of 10" from 731 to 1011  
gravel pack, open hole, etc.)

Original depth to water \_\_\_\_\_ ft. <sup>above</sup> below \_\_\_\_\_ Date \_\_\_\_\_

Original elevation of water level \_\_\_\_\_ ft.; Source of data \_\_\_\_\_

Sources of water: Principal shaly-sandstone; Others \_\_\_\_\_

Production data: \_\_\_\_\_ Date \_\_\_\_\_  
 Static depth to water 63'1" Measuring point \_\_\_\_\_  
 Pumping level 72'11" at 625 g.p.m.  
 \_\_\_\_\_  
 \_\_\_\_\_

Specific capacity 63 g.p.m. per ft. drawdown; Temperature 50 1/4 °F.

Pump data; Type pump Turbine Column Dia. \_\_\_\_\_ Length 109  
 Cylinder or bowls: Dia. 15" Length \_\_\_\_\_ Suction pipe 12 (3 stages)  
 Power \_\_\_\_\_ Airline \_\_\_\_\_  
 Estimated rate of production: \_\_\_\_\_ g.p.m. for \_\_\_\_\_ hrs. a day  
 Use of water City Supply

WATER ANALYSES (in parts per million)

Date sampled	<u>Feb. 14, 1939</u>	_____	_____	_____
Sampled by	<u>H. G. H.</u>	_____	_____	_____
Total solids	<u>310</u>	_____	_____	_____
Insoluble matter	<u>22.8</u>	_____	_____	_____
Alkalinity (Meq)	<u>230.0</u>	_____	_____	_____
Alkalinity (Phn)	<u>0.0</u>	_____	_____	_____
pH	<u>7.0</u>	_____	_____	_____
Fe <sub>2</sub> O <sub>3</sub> + Mn <sub>2</sub> O <sub>3</sub> + Al <sub>2</sub> O <sub>3</sub>	<u>12.4</u>	_____	_____	_____
Alkali as sodium	<u>11.5</u>	_____	_____	_____
Calcium	<u>56.9</u>	_____	_____	_____
Magnesium	<u>25.2</u>	_____	_____	_____
Iron (unfiltered)	<u>0.6</u>	_____	_____	_____
Manganese	<u>0.08</u>	_____	_____	_____
Nitrate	<u>1.00 7.4</u>	_____	_____	_____
Fluoride	<u>1.0</u>	_____	_____	_____
Chloride	<u>4.0</u>	_____	_____	_____
Sulfate	<u>13.6</u>	_____	_____	_____
Bicarbonate	<u>200.6</u>	_____	_____	_____
Hardness (ppm)	<u>247</u>	_____	_____	_____
Hardness (gpg)	<u>14.7</u>	_____	_____	_____
Remarks	_____			

Laboratory data: \_\_\_\_\_ Sample storage location \_\_\_\_\_  
 Sample range 0-1300 No. spls. 259 No. dupls. & cond. 253 cond  
 Spls. prepared by \_\_\_\_\_ Washed range \_\_\_\_\_ by \_\_\_\_\_  
 Driller's log and cond. \_\_\_\_\_  
 Insoluble residues: Prepared by 100-1300 Studied by \_\_\_\_\_ Strip log \_\_\_\_\_  
 Microscopic study Schmidt, Glass, Carmody strip log   
 Gen. log  Correl. by \_\_\_\_\_



Charles City, Floyd Co.  
Well No 4.

Drillers Log - From

	Thick.	From	To	
Black loam & sandy clay	5	0	5	
Sand	50	5	55	
Sand, coarse	10	55	65	
Gravel	13	65	78	50 gpm Flow
Clay gray	19	78	97	
Gravel	13	97	110	Flows 3' above gravel 200 gpm 9' dd
Coarse sand & little clay	16	110	126	
Broken lime	4	126	130	
" " & shale streaks	25	130	155	
Brown lime	25	155	180	
Lime grayish brown	5	180	185	
" " " little harder	5	185	190	
Lime, hard gray	5	190	195	
Lime - hard, gray	10	195	205	
" " " with brown streak	10	205	215	
" " "	20	215	235	
" " " with brown streaks	5	235	240	
Gray shale	5	240	245	
" " lime	25	245	270	
Gray lime, shale streaks	15	270	285	
Dark gray lime	45	285	330	
Gray lime with shale streaks	5	330	335	
Gray shale	25	335	360	
" " & lime rock	5	360	365	
Gray lime & shale	40	365	405	
Hard gray lime	58	405	463	
Lime with shale streaks	27	463	490	
Gray lime (Water)	10	490	500	
Brown lime	5	500	505	
Gray lime	10	505	615	
Hard gray	35	615	650	
Brown lime	34	650	684	
Shale green	2	684	686	
Hard brown & gray lime	4	686	690	

Continued



Charles City, Floyd.  
City Well No. 4.

Oct. 22, 1938

	Green shale	1	690	691	
	Hard dark gray lime	9	691	700	Water
	Green & brown shale	10	700	710	
	Green shale sticky	20	710	730	
	Hard brown lime	18	730	748	
	Green shale	2	748	750	
	Brown lime shale	15	750	765	
	Sandy shale lime	10	765	775	
	Sand (Verbal "Dirty")	65	775	840	
samples to here	White gray lime, hard		840	892	855 Oct. 22

## Generalized Log

Charles City Well # 4.

W-0814

Drilled by Layne Western Co.  
Curb ~~see~~ elevation 1024'

Date: 6/21/38 -

Description of formation

<u>No.</u>	<u>Rock Unit</u>	<u>Thick</u>	<u>From</u>	<u>To</u>
Recent and Pleistocene Alluvium				
1.	Sand, coarse to very coarse to granules with occasional small pebbles, light brown, (Major Grade 1- $\frac{1}{2}$ mm, Principal subsidiary Grade 2-1 mm.). Quartz 80%, Limestone and other igneous materials 20%.	40'	0'	40'
2.	Clay, smoke gray, actually very fine sand to silt, momentarily effervescent.	10'	40'	50'
3.	Sand, light gray buff, medium grained (Major Grade 1/2 - 1/4 mm. Principal Subsidiary Grade $\frac{1}{4}$ -1/8 mm). Coarse sand common	5'	50'	55'
4.	Gravel, light buff, 60% granules and small pebbles, 40% sand, very coarse (Major Grade 2-1 mm., Principal Subsidiary 1- $\frac{1}{2}$ mm.), Sample averages 45% light buff limestone, 40% quartz, and 15% miscellaneous igneous material. Sand <i>very</i> dominantly quartz.	25'	55'	80'
5.	Clay, glacial, medium to dark gray, sandy, pebbly, silty textured, momentarily effervescent, slightly micaceous.	15'	80'	95'
6.	Gravel, (coarse to very coarse sand 35%, granules 30%, <sup>small</sup> pebbles 35%. Sand dominantly quartz; granules and pebbles dominantly limestone and igneous material.	35'	95'	130'
7.	No sample well flowing Possible base of drift.	5'	130'	135'
<i>Dev-Sil. System</i>				
8.	No sample "shale and lime shell".	5'	135'	140'
9.	Shale, light gray, homogeneous, slightly calcareous, entirely as well mud.	5'	140'	145'
10.	<i>light drab to light buff</i> Limestone, grading from <del>lime</del> dolomite in the upper 5' to only slightly dolomitic in lower 15'.	25'	145'	170'
11.	Limestone, light gray, very fine crystalline, hard, highly fossiliferous in upper 10'. Slightly dark speckled between 175' and 180', and with bands of light buff limestone between 185' and 190'.	25'	170'	195'
12.	Limestone, light gray to light buff, fine to coarse crystalline, with numerous small drusy cavities lined with calcite crystals, highly fossiliferous (bryozoans and brachiopod(?) shells)	5'	195'	200'
13.	Limestone, light gray, fine textured, firm, fossiliferous, for the most part dark speckled; 1-3% <del>see</del> coarse clear quartz sand grains; trace of pyrite.	20'	200'	220'

		Thick	From	To 6
14.	Limestone, drab to brownish, translucent, very fine crystalline, much clear calcite, trace of pyrite.	8'	220'	228'
15.	Limestone, blue gray, subtranslucent, with much clear calcite. <u>Medium crystalline.</u>	4'	228'	232'
16.	<i>Dolomite, calcareous</i> Limestone, dolomitic, to dolomite, calcareous, light buff; chert and chalcedony?, buff to drab and brown banded, 20-50%. Limestone is medium crystalline, very numerous small cavities. Much flour from drilling.	13'	232'	245'
	<i>Maquoketa sh</i> or limestone			
17.	Shale, very pale gray, calcareous, wholly-as-well-mud, probably interbanded soft dolomitic limes and limy shales.	5'	245'	250'
18.	Almost entirely as well mud.	15' 25'	245'	260' 270'
18.	Dolomite, light drab, calcareous, fine crystalline, some free calcite, trace pyrite. Much well flour in upper 1/2, and at the base.	50'		
19.	<i>Dol. lt. buff, fine lime, hrd, with occasional small cavities. No Well mud.</i>	50'	260'	315'
20.		7'	270'	320'
19.	Limestone, or shale (?), very light gray, slow effervescence, in parts almost wholly well mud. Possibly similar to unit 18 above. <i>20% med. gr. Qz sd. in lower 5'</i>	13' 15'	315'	322'
20.	Shale, medium gray, <i>Dolomitic</i> , limy, entirely as well mud,	30' 20'	322'	325'
21.	Shale, medium to light gray, and dolomite, light brown interbanded. Dolomite medium crystalline, moderately hard.	20'	335'	355'
	<i>Galena Platteville</i>			
22.	Dolomite, light gray, calcareous, medium crystalline, moderately hard. Considerable well mud. 0-5% chert.	65' 35'	355'	410'
23.	Limestone, very light drab gray, very fine textured, rather soft, much well mud. 2-10% white, porcelain textured, fresh to weathered chert.	20'	440'	460'
24.	Dolomite, drab to buff, fine crystalline, weak, drills down to flour and fine crystalline sand (70-90%)	30'	460'	490'
25.	Dolomite, light drab, medium crystalline, hard, compact, no well-mud well mud. Less than 2% pyrite. Less than 1% calcite.	40'	490'	530'
26.	Dolomite, light drab, medium crystalline, weak - drills to well mud and crystalline sand. Rare medium sized quartz sand grains. 50-85% well mud.	50'	530'	590'
27.	Dolomite, light drab, fine crystalline, weak - drills to well mud and fine crystalline sand. Traces of chert and pyrite throughout.	29'	590'	619'
28.	Limestone, very light buff, fine textured, fossiliferous, thin slabby appearance and with trace of pyrite.	6'	619'	625'
29.	Dolomite, calcareous, very light brown to drab, fine to medium crystalline. Drills to flour and fine crystalline sand.	25'	625'	650'
30.	Limestone, light brown to light gray, slightly dolomitic, fine to medium crystalline, translucent, slightly slabby appearance.	5'	650'	655'

		<u>Thick</u>	<u>From</u>	<u>To</u>
31.	Dolomite, light brown, medium crystalline, rather porous, hard, translucent. 1-2% light brown chert. 1% pyrite.	20'	655'	<del>680'</del> 675'
32.	Limestone, light brown, fine to medium crystalline, sub-translucent, hard, fossiliferous. 1% pyrite.	6'	<del>680'</del> 675'	<del>685'</del> 681'
33.	Dolomite, drab to light brown, medium to fine crystalline, hard, translucent.	4'	<del>680'</del> 681'	<del>690'</del> 685'
34.	Shale, very pale green gray, silty textured, very calcareous.	15'	685'	700'
35.	Shale, dark green gray, with occasional bands of dark brown, non-calcareous, waxy feel. Brown bands contain many small flattened, highly polished discs - possibly concretionary.	30'	700'	730'
36.	Limestone, very dolomitic, light drab, fine textured, sub-translucent.	5'	730'	735'
37.	Shale, light gray, very calcareous, as silty textured well mud.	5'	735'	740'
38.	Limestone, light brown, fine textured, translucent, hard.	8'	740'	748'
39.	Shale, green, dense, as chips and splinters - non-calcareous (Glenwood type)	9'	748'	757'
40.	Limestone, light drab, fine to medium crystalline, flaky texture, fossiliferous	3'	757'	760'
<i>St. Peter SS</i>				
41.	Sandstone, pale green, coarse (Major Grade 1- $\frac{1}{2}$ mm, Principal Subsidiary Grade 1/2-1/4 mm), with much powdered lime or calcareous shale in interstices.	10'	760'	770'
<del>grading-to-medium-grained</del>				
42.	Sandstone, pale green, medium grained (major grade 1/2-1/4 mm, principal subsidiary grade 1/4-1/8 mm). With much powdered lime or calcareous shale in the interstices	5'	770'	775'
43.	Sandstone, white, medium grained (major grade $\frac{1}{2}$ - $\frac{1}{4}$ mm, principal subsidiary grade $\frac{1}{4}$ -1/8 mm), no well mud.	50'	775'	825'
44.	Sandstone, very light gray, medium grained (major grade $\frac{1}{2}$ - $\frac{1}{4}$ mm, Principal Subsidiary grade $\frac{1}{4}$ -1/8 mm), with much moderately effervescing well flour	15'	825'	840'
<i>Prairie Du Chien</i>				
45.	Dolomite, drab, very fine crystalline, hard, porous, with much well flour.	5'	840'	845'
46.	Shale or dolomite flour, white, moderately effervescent; 90% as well mud. Washed sample shows dolomite similar to that of unit 45	5'	845'	850'



Dec 21, 1935

H.J.R.

Charles City City Well No. 4  
Present depth 858

Casing: (In addition to that in H.G.H.'s notes)  
295' of 16" cast iron casing from curb to 295'  
Cemented between 16" casing & hole.  
118'2" of 12" liner from 661'10" to 780' shoe top & bottom.  
Information from driller.

Pumping equipment:

Layne Turbine Pump

15" bowls

12' of 8" suction with bottom at 101'10"

Powered by belt from Auburn-Taylor tractor

Pumping test started with 5" orifice on 6" pipe 15' long.  
Later changed to 4" orifice.  
Orifices calibrated at Purdue University  
Information from J.S. Dawson

Before cementing casing the well was pumped 1600 gpm  
with a drawdown of 17" (inches). At 2400 gpm the  
draw down was 53" (inches) Information from driller

Well treated with 5# chlorinated lime (24% available  
chlorine) on Dec. 20. Chlorinated lime was put in in  
small amounts. Information from J.S. Dawson



PUMPING TEST  
Charles City, Floyd Co., Ia.  
City Well No. 4

Date	Time A.M.	Water Level	Corr. Water Level	Interval Draw down	Time Elapsed	Draw down	Time Elapsed	Prod. G.P.M.	Remarks.
Dec 21 '88	10:20	11.26'	✓	Recovery					Air 26°
	10:31	10.92	✓	"					
	10:35	10.86	✓	"					
	10:35:30								
	10:40	< 90'						75 ± (est.)	Pump started, test run, sample taken, pump stopped
	11:00	13.70	✓	Recovery					
	11:04								Pump started, valve open only slightly.
	11:05	20.02	✓						
	11:05:50	20.34	✓						Valve opened wide
	11:07	37.72	✓						Pump slowed down
	11:08	37.65	✓						Very little water being pumped.
	11:09	36.55	✓						" " " "
	11:10	51.67	✓					150 ± (est.)	Pump speeded up.
	11:10:30								Pump stopped.
	11:11	46.35		Recovery					
	11:12:30	42.45							
	11:15								Pump on
	11:15:30	50.82							
	11:17:30	86.40							
	11:19:30	< 90'							
	11:20								Pump off, change to 4" orifice.
	11:21	65.60							Pump on
	11:20	67.98						100 ±	
	11:24	< 90'							
	11:25								Air 32°, Water 50½
	11:32								Pump off
	11:34	65.90		Recovery					
	11:35	61.38							
	11:35:30	59.89							
	11:36	57.15							
	11:37	56.71							
	11:38	54.98							
	11:40:15	50.00							
	11:42	48.15							
	11:45	45.74							
	11:50	42.75							
	11:55	40.90							
	12:01	40.05							



Charles City, Floyd Co  
City Well No 4

Feb. 14, 1939

6-4	2:50	63' 1"	
	3:00	63' 1"	
	3:05	65' 6"	
	3:10		
	3:14	69' 2"	
	3:20	69' 5"	
	3:25	64' 4"	
	3:26	64' 4"	
	3:30	70' 4"	
	3:35	75' 10"	
	3:40	74' 1"	
	3:45	73' 0"	
	3:50	73' 4 1/2"	
	3:55	73' 17 1/2"	
	4:00	72' 7"	
	4:10	73' 1"	
	4:20	73' 0"	
	4:30	72' 8"	
	4:45	72' 8"	
	4:46	66' 4"	
	4:47	65' 6"	
	4:50	65' 2"	
	4:55	64' 10"	
	5:00	64' 7"	
	5:05	64' 4 1/2"	
	5:10	64' 3 1/2"	
	5:20	64' 2"	
Feb. 14	5:30 P	63' 11 1/2"	
Feb. 15	9:20	63' 4"	

Pump start.  
 300 gpm  
 Stopped to fix  
 governor  
 305-3:10  
 490 gpm  
 " "  
 Shut down 3:20  
 Start  
 560 gpm.  
 740 " at 3:33  
 720 334  
 695 gpm  
 622 gpm  
 622 "  
 640 "  
 610  
 610-635-610  
 640 T <sup>36</sup>/<sub>36</sub>  
 600-620  
 600+  
 Stopped

Production varied from 600-650 during last hour of 1 1/4 hr test, caused P.W.L. to vary also - Ave about 625 at 910' hdd.  
 W.E. Wheeler - F. Heinz - Ed. La Barge

Ref pt. 1' 4" above drill floor 10" above curb  
 Discharge 16' from pump 6" discharge 5" orifice **FLOYD**