WRD Exp. (GW)
Aug. 1964

U. S. DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

Water Resources Division Well Schedule Form

MASTER CARD

COUNTY HWY

Record by D.AARONSON Source of data FILE Date 6/22/65 Map 1:63,360

State IOWA [10] County (or town) CHEROKEE [18]

Latitude: 42 51 35 N Longitude: 095 32 43 Sequential number: 1

Lat-long accuracy: 2 T. 93 N, R. 40 W Sec 23, NW ¼, SW ¼, NW ¼ 5

Local well number: 093N40W23bcb Other number: W-0687 B & M

Local use: 00687 38 CITY 1 Owner or name: LARRABEE CITY WELL #1

Owner or name: LARRABEE IOWA Address: LARRABEE, IOWA

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

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

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 W

DATA AVAILABLE: Well data 1 Freq. W/L meas.: INTERMITTENT I 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: 378 ft 378 Meas. rept accuracy

Depth cased (first perf.) 340 ft 340 Casing type: STEEL ; Diam. 6 in 6

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) P

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 J

Date Drilled: MARCH 17, 1938 3 8 Pump intake setting: 257 ft 257

Driller: H A PIXLER name, LARRABEE, IOWA address

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

Power (type): diesel, elec, gas, (gasoline), hand, gas, wind; nat LPG H.P. 3 Trans. or meter no.

Descrip. MP 3 ft above below lsd, Alt. MP 1379

Alt. LSD: 1376 1376 Accuracy (source)

Water Level 190'3½" ft above below MP; Ft above below lsd 187 Accuracy: REPT G

Date meas: 3/18/38 3 8 Yield: 50.5 gpm 50 Method determined

Drawdown: 3'1½" ft 3 Accuracy: REPT 6 Pumping period 5 hr 5

QUALITY OF WATER DATA: Iron 7.46 ppm 7 Sulfate 825 ppm 8 Chloride 3 ppm 0 Hardness 1064 ppm 3

Sp. Conduct 1940 K x 10⁶ 5 Temp. 48 °F 18 Date sampled 1/29/60 1 6 0

Taste, color, etc. VERY TURBID - YELLOW COLOR ON RECEIPT IN LAB

93-40-23 bcb

Well Number 42 51 35 N 095 32 43
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: CENTRAL LOWLAND [12] (20–21) Section: WEST. [ ]

LAKE [B] (22) Drainage Basin: LITTLE SIOUX [36C] (23–25) Subbasin: [ ] (26)

Topo of well site: local depression, flat surface, hilltop, hillside, terrace, valley flat, UPLAND [H] (27)

MAJOR AQUIFER: CRETACEOUS system, LOWER series [K1] (28–29) DAKOTA SANDSTONE aquifer, formation, group [D1] (30–31)

Lithology: MEDIUM SANDSTONE [3V] (32–33) Origin: MARINE [6] (34) Aquifer Thickness: [ ] ft

[ ] (35–37) Length of well open to: 35 ft [35] (38–40) Depth to top of: 304 ft [S C] (41–42)

MINOR AQUIFER: [ ] system, [ ] series [ ] (44–45) [ ] aquifer, formation, group [ ] (47–48)

Lithology: [ ] (48–49) Origin: [ ] (50) Aquifer Thickness: [ ] ft

[ ] (51–53) Length of well open to: [ ] ft [ ] (54–56) Depth to top of: [ ] ft [ ] (57–59)

Intervals Screened: 38' SCREENED FROM 340' TO 378'

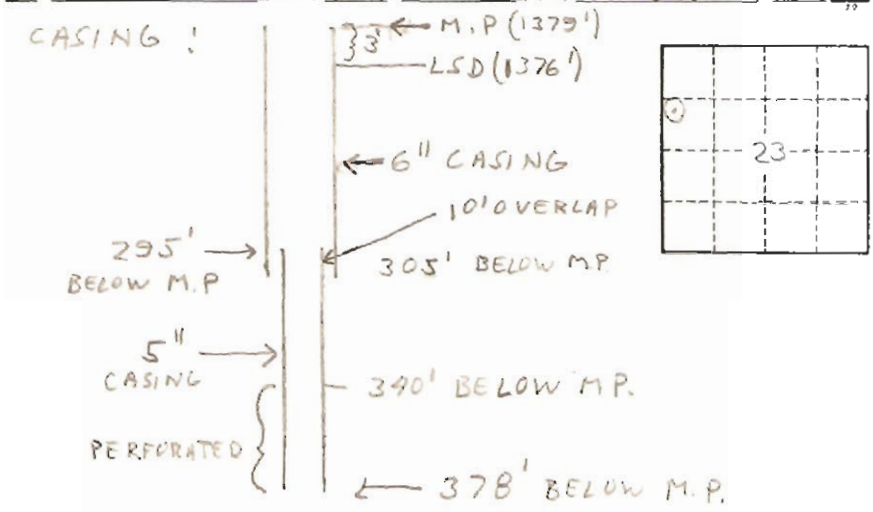
Depth to consolidated rock: 300 ft [300] (60–63) Source of data: WELL CUTTINGS [E] (64)

Depth to basement: [ ] ft [ ] (65–68) Source of data: [ ] (69)

Surficial material: NO SAMPLE [ ] (70–71) Infiltration characteristics: POOR [4] (72)

Coefficient Trans: [ ] gpd/ft [ ] (72–75) Coefficient Storage: [ ] (76–78)

Coefficient Perm: [ ] gpd/ft²; Spec cap: 16.6 gpm/ft; Number of geologic cards: [ ] (79)



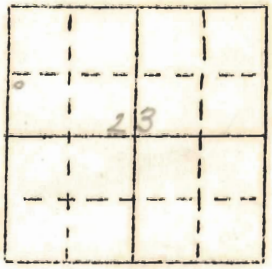
GPO 844-225

5/19 field located by L. Fischer
on 7½' Cherokee North Quad
42.5140N-095.3232W
093-40W-23-BCBD
Topo EL. 1374'

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

N-0687

RECORD OF WELL



Location:

Town: Larabee (N E / S W); County Cherokee

NW-SW-NW sec. 23 T. 93 N., R. 40 E. W. Cedar Twp.

Well name and number City Well #1

Owner _____ Address _____

Tenant _____ Address _____

Contractor H A Pixley Address Larabee

Drillers _____

Drilling dates Dec 27, 1937 - March 12, 1938

Well data:

Elevations: Drilling curb 1379' feet; Land surface 1376' feet

Determined by _____

Topographic position _____

Total depth: Reported 378' feet, Measured _____ feet

Drilling method Jetted

Hole and casing data Entire well cased, 6" casing from +3' to 302'
83' of 5" casing lower 30' perforated. 295'-378'
(Give amount, size, kind, and depth of all casing; type and position of seals and packers; cementing; how finished--perforated pipe, screen, gravel pack, open hole, etc.)

Original depth to water 190 ft. below (above) curb Date _____

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

Sources of water: Principal 304-375 Dakota; Others Pleist.

Production data: Date _____

Static depth to water 190' 3½" Measuring point _____

Pumping level 193.5' at 50 g.p.m.

_____ _____

_____ _____

_____ _____

Specific capacity _____ g.p.m. per ft. drawdown; Temperature 51½ °F.

Pump data; Type pump cylinder 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 18, 1938			
Sampled by	H.G. Hershey			
Total solids	1677.0			
Insoluble matter	27.0			
Alkalinity (Meo)	372.0			
Alkalinity (Phn)	0.0			
pH	6.9			
$Fe_2O_3 + Mn_2O_3 + Al_2O_3$	16.0			
Alkali as sodium	99.9			
Calcium	275.8			
Magnesium	78.4			
Iron (unfiltered)	0.1			
Manganese	1.00			
Nitrate	0.00			
Fluoride	1.0			
Chloride	9.0			
Sulfate	820.7			
Bicarbonate	453.8			
Hardness (ppm)	1013.0			
Hardness (gpg)	59.2			

Remarks _____

Laboratory data: Sample storage location _____

Sample range _____ No. spls. _____ No. dupls. & cond. _____

Spls. prepared by _____ Washed range _____ by _____

Driller's log and cond. Yes

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

Microscopic study 11/5/38 Schubert strip log 11/24/41 A. Milton

Gen. log ✓ ✓ Correl. by _____

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Local Well No. 093-40W-23BCB
Aquifer Code(s) KIDI
Owner's Name LARRABEE CITY #1 (1938)
W Number 00687

Card Q

State: IOWA (19) (1 2) County: CHEROKEE (18) (3 4) Town: LARRABEE, IOWA

Well No. Latitude 42 51 35 N (5–11) Longitude 095 32 43 (12–18) Seq. No. 1 (19) Date M 03 D 18 Y 38 (20–25)

Sampling Depth 378 (26–29) Type 1 (30) Kx10⁶ (31–35) pH 6.9 (36–38) Temp. °F 51 (39–41)

SiO_2 (42–44) Ca 276 (45–49) Mg 78 (50–53) Na+K 1100 (54–58) K .C (59–61)

Source No. 3 Q (79–80)

HCO_3 454 (62–65) CO_3 (66–67) SO_4 821 (68–72) Cl 90 (73–78)

Card R

Duplicate Columns 1-25 from Card Q

F .10 (26–28) NO_3 0. (29–32) PO_4 0. (33–35) B . (36–38) Al . (39–41) Fe .1 (42–45)

Mn .10 (46–49) Cu . (50–52) Pb . (53–54) Zn . (55–57)

Solids: Determined 1680 (58–63) Calc. (64–69)

Hardness: Ca,Mg 1010 (70–73) Non-Carb. 641 (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 $CaCO_3$ 372 (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: D. AARONSON

Punched by: T Date: 10

Published:

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Local Well No. 093-40W-23BCB
Aquifer Code(s) KIDI
Owner's Name LARRABEE CITY #1 (1938)
W Number 00687

Water Quality
(ppm)

Card Q

State: IOWA (1 2: 19) County: CHEROKEE (3 4: 18) Town: LARRABEE, IOWA

Well No. (5–11) Latitude 42 51 35 N; Longitude (12–18) 095 32 43; Seq. No. (19): 1; Date (20–25) M D Y: 05 22 53

Sampling Depth (26–29): 378; Type (30): 1; Kx10⁶ (31–35): 1630; pH (36–38): 7.3; Temp. °F (39–41):

SiO_2 (42–44): ; Ca (45–49): 281; Mg (50–53): 88.; Na (54–58): 85.; K (59–61): 5.5

HCO_3 (62–65): 422; CO_3 (66–67): 0; SO_4 (68–72): 860.; Cl (73–78): 40.; Source No. (79–80): 3 Q

Card R

Duplicate Columns 1-25 from Card Q

F (26–28): .5; NO_3 (29–32): 30.; PO_4 (33–35): ; B (36–38): ; Al (39–41): ; Fe (42–45): .2

Mn (46–49): .10; Cu (50–52): ; Pb (53–54): ; Zn (55–57):

Solids Determined (58–63): 1650; Calc. (64–69): ; Ca,Mg Hardness (70–73): 1060; Non-Carb. (74–77): 718

Color (78–79): ; No. (80): R

Card S

Duplicate Columns 1-25 from Card Q

Br (26–28): ; I (29–31): ; Alk. as $CaCO_3$ (32–35): 346; 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): S

Recorded by: D. AARONSON

Punched by: J Date: 1W

Published:

093-40W-23 BCB

KDD

W-0687

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

1665

Card Q

State: IOWA (16) County: CHEROKEE (18) Town: LARRABEE

Well No. Latitude 42 51 35 N (5–11) Longitude 095 32 43 (12–18) Seq. No. 1 (19) Date M 01 D 29 Y 60 (20–25)

Sampling Depth 378 (26–29) Type 1 (30) Kx10^6 1940 (31–35) pH 7.5 (36–38) Temp. °F 48 (39–41)

SiO_2 32. (42–44) Ca 287. (45–49) Mg 84. (50–53) Na 80. (54–58) K 7.4 (59–61)

HCO_3 468 (62–65) CO_3 0 (66–67) SO_4 825. (68–72) Cl 30. (73–78) Source No. 3 (79) Q (80)

Card R

Duplicate Columns 1-25 from Card Q

F .5 (26–28) NO_3 .9 (29–32) PO_4 . (33–35) B . (36–38) Al . (39–41) Fe 7.5 6 (42–45)

Mn 1.4 (46–49) Cu . (50–52) Pb . (53–54) Zn . (55–57)

Solids Determined 1730 (58–63) Calc. (64–69) Hardness Ca,Mg 1060 (70–73) Non-Carb. 680 (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 $CaCO_3$ 384 (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. 5 (80)

Verified PMJ

Recorded by: D AARONSON

Punched by: Punched FCH Date:

Published:

IOWA GEOLOGICAL SURVEY
Generalized Log Based on Detailed
Description of Drill Cuttings

Name of Well: Larabee City Well Survey No. W-0687

Location NW¼,SW¼,NW¼, Sec. 23, T.93N., R.40W.

~~Drilled by:~~ Dates Dec.27,1937-Mar.17,1938

Total Depth: 378 ft; Curb Elevation: 1377 (1379) ft; Static Level: ____ ft.

Casing Data: ____

Contractor: H. A. Pixler, Larabee, Iowa

Pump and Screen Data: ____

Pumping Test: ____ Hours ____ Min; Gal. Per Min. ____; Drawdown ____ ft. in ____ min.

Description of Formations

No.	Rock Unit	Thick.	From (Feet)	To
	Pleistocene System			
1.	No samples.	42'	0'	42'
2.	Clay, yellowish gray to gray, containing numerous granules to small pebbles, clay highly calcareous and gives off strong odor hydrogen sulphide when treated with HCl. Numerous limestone, shale, and igneous fragments present.	107'	42'	149'
3.	Sand, gray, medium grained, major grade ½ - ¼ mm. principal subsidiary grade 1/4 - 1/8 mm. (reversed in the zone from 160'-165'), angular to subangular, rather poorly sorted and containing numerous granules and small pebbles. Considerable igneous material and limestone and shale fragments	53'	149'	202'
4.	Silt (Loess or clay) pinkish buff, very well sorted, noncalcareous, unconsolidated, contains small percentage of Quartz and rock granules--possibly cave	40'	202'	242'
5.	Sand, light gray, medium grained, major grade ½ - ¼ mm., principal subsidiary grade 1/4 - 1/8 mm., angular to subangular, considerable igneous material	21'	242'	263'
6.	Clay (?) brown, no sample	5'	263'	268'
7.	Clay, hard, blue, mixed with gravel. No sample.	32'	268'	300'
8.	Sand, light gray, medium to fine grained, major grade ½ - ¼ mm., principal subsidiary grade 1/4 - 1/8 mm., angular to subangular, poorly sorted, occasional granules and small pebbles	16'	300'	316'

Notes:

Larabee City Well - W-0687

	Thick.	From	To
9. Sand, gray buff, coarse to fine grained, poorly sorted, (major grade ½ - ¼ mm., principal subsidiary grade 1/4 - 1/8 mm.), considerable igneous material	4'	316'	320'
10. Sand, gray buff, medium to fine grained, (major grade ½ - ¼ mm., principal subsidiary grade 1/4 - 1/8 mm.), well sorted. 5 per cent of granules between 355' and 365' considerable igneous material.	58'	320'	378'

IOWA GEOLOGICAL SURVEY
Well Log Record No. _____

County: Cherokee

Name of Well: Larrabee No 1 Town: Larrabee

Location: _____ Sec. ____ T. ____ N., R. ____ E. W. _____ Twp.

Curb Elevation: _____ Ft. Present Depth _____ Ft. Final Depth _____ Ft.

Static Level: (Depth to Water (Above) (Below) Curb) _____ Ft. Pumping Level _____ Ft.

Contractor: H. A. Pixler, Larrabee Date Drilled: March 17, 1938 Dec. 27, 1937

Description*	FEET Thick	From	To	Description*	FEET Thick	From	To
Surface & Yellow clay	40	0	40				
Very hard blue clay	2	40	42				
Blue clay	107	42	149				
Sand, very hard Stands up	53	149	202				
Shale	3	202	205				
Soft blue clay	33	205	238				
Very hard shale	4	238	242				
Very fine soft sand	21	242	263				
soft brown shale mixed with chalk rock	5	263	268				
Hard blue clay with gravel	17	268	285				
Sand & SS	5'	285	290				
Sandstone	85'	290	375	Softer drilling below		342	
Main Supply 304 - 375							

*Abbreviate descriptions; use one line for each formation.

Remarks on water zones and casing: _____

Temperature: Air ____ °F.; Water ____ °F., at ____ (A.M.) (P.M.) 193

Record obtained from H. A. Pixler Recorded by H. G. Hershey

LARRABEE CITY WELL NO. 1.

Results of Pumping Test

March 18, 1938

3

Time	Water Level	Production in G.P.M.	Temperature Air	Temperature Water	Remarks
1:45	190'-3-1/2"				Pump started at 1:45 P.M. Static Level = 190'-3-1/2"
1:46	192'-9"				
1:47	193'-2"				Water dirty
1:48	193'-7"				
1:49	194'-0"				
1:50	194'-5"	59			Water has strong odor
1:55	194'-5"				
2:00	193'-8"	50.5			
2:05	193'-11"	55.3			Water clearing
2:15	193'-10"		48°	51-1/2°	
2:25	193'-11"				
2:35	193'-8"	50.5			
2:45	193'-7-1/2"				
3:00	193'-8"				
3:15	193'-8"	52.8	45°	51-1/2°	
3:30	193'-7-1/2"				
3:45	193'-6-1/2"	50.5			
4:15	193'-7"				
4:45	193'-4"	47.3	43°	51-1/2°	Pump stopped for repair at 5:02 P.M.
5:03	190'-11				
5:04	190'-9-1/2"				
5:05	190'-8-1/2"				
5:06	190'-8"				
5:07	190'-7-1/2"				
5:12	190'-7"				Pump started at 5:12 P.M.
5:13	192'-8"				Pump slow, estimated 50 G.P.M.
5:14	192'-8"				
5:17	192'-10"				
5:22	193'-11"	51			Pump speeded up slightly
5:27	193'-4"	47.3			
6:12	193'-1"	44.8	42°	51-1/4°	Pump speeded up.
7:20	194'-0"	59			
7:30	194'-1-1/2"	64.2	42°	51-1/4°	Pump pounding. Sample taken for mineral analysis. Water not completely clear and has slight odor. pumping continued for unknow period.
7:40	193'-5"	50			

All measurements on this sheet made directly by:

H. G. Hershey,
Iowa Geological Survey.

Dr Hershey -
This is a very fine report.
W. E. Bucle

Larabee City Well No 1

Results of Pumping Test

March 18, 1938

Time	Water Level	Production G.P.M	Temperature Air	Temperature Water	Remarks
1:45	190' 3½"				Pump started at 1:43 pm. Static level = 190' 3½'
1:46	192' 9"				
1:47	193' 2"				Water dirty
1:48	193' 7"				
1:49	194' 0"				
1:50	194' 5"	59			
1:55	194' 5"				Water has strong odor
2:00	193' 8"	50.5			
2:05	193' 11"	55.3			
2:15	193' 10'		48°	51½°	Water clearing
2:25	193' 11'				
2:35	193' 8"	50.5			
2:45	193' 7½'				
3:00	193' 8"				
3:15	193' 8"	52.8	45°	51½°	
3:30	193' 7½'				
3:45	193' 6½'	50.5			
4:15	193' 7"				
4:45	193' 4"	47.3	43°	51½°	Pump stopped for repair at 5:02 pm
5:03	190' 11"				
5:04	190' 9½"				
5:05	190' 8½"				
5:06	190' 8"				
5:07	190' 7½"				
5:12	190' 7"				
5:13	192' 8"				Pump started at 5:12 pm
5:14	192' 8"				Pump slow, estimated 50 gpm ±
5:17	192' 10"				
5:22	193' 11"	51			
5:27	193' 4"	47.3			Pump speeded up slightly
6:12	193' 1"	44.8	42°	51¼°	Pump speeded up
7:20	194' 0"	59			Pump pounding
7:30	194' 1½"	64.2	42°	51¼°	Sample taken for mineral analysis.
7:40	193' 5"	50			Water not completely clear and has slight odor
					Pumping continued for unknown period

Copy of above given to City of Larrabee

H.J.H

Elevation 1380'

This copy by E.E.H

BUELL & WINTER ENGINEERING CO.
INSURANCE EXCHANGE BUILDING
SIOUX CITY, - - IOWA

Larrabee
Cherokee

March 22, 1938

Public Works Administration
Omaha, Nebraska

RE: Docket No. Ia-1356-D.S.
Larrabee, Iowa waterworks

Gentlemen:

We are attachine hereto one copy of the result of the pumping test made by Dr. H. G. Hershey of the Iowa Geological Survey for the new well at Larrabee and also a copy of the letter written by Mr. Jack J. Hinman, Assistant Director of the State Hygienic Laboratory of the Iowa State Department of Health. We would call particular attention to the paragraph in his letter, as follows:

"It is noted that this specimen which is proposed to be sent, will come from a new source. Probably the well has not been completed as yet or has been finished less than four or five weeks. Unless the well has been sterilized by the use of some such material as chloride of lime or calcium hypochlorite, it is likely that the recentness of drilling will render the examination of little value. It is usual to find that it takes about four or five weeks after the completion of the well to remove bacteria normally carried into the well during the insertion of the casing, and with the tools used in the course of the work. It is important therefore that an unfavorable report issued soon after the completion of the well and on the basis of the examination of a sample taken at that time shall not be considered as definitely condemning the supply."

Without doubt the mineral analysis of this water will be furnished by Dr. Hershey within a very few days. Mr. Mark of the Iowa State Board of Health is taking a sample of the water today for the bacteriological analysis. We anticipate that the bacteriological analysis will not show that the water is pure in accordance with the statement made by Mr. Hinman.

There can be no question as regards the purity of this water in the future. The well is 375' deep and is tightly cased from a point 2' above the ground down to and extending into the sandstone. The casing is of the same size, and thus no lapping of two sizes of casing was required or a seal required. Consequently there is no possibility of any water finding its way into this well except from the sandstone 375' below the surface. The well sets high and all drainage is away from the well.

C. W. Roland, the contractor on the pipe line is very anxious to order out his material not later than Friday of this week because of the fact that next Monday there will be an increase in the Freight Rate.

BUELL & WINTER ENGINEERING CO.
INSURANCE EXCHANGE BUILDING
SIOUX CITY, - - IOWA

2

Mr. Roland took this work at a very reasonable price and we would like very much to have the necessary right to instruct Mr. Roland to start shipping his pipe by Friday of this week in order to save any increase in the freight rate. In looking over the specifications the first thought is that this responsibility is entirely Mr. Roland's and that the city would not be liable in any way by reason of any increase in freight rates. We would further call attention to the fact that the well was supposed to be completed on the first day of February but was not completed until this week. That the contractor on the well, Mr. Pixler, was given an extension of time by the town council and such extension was approved by the P.W.A. Had the well been completed on February 1st Mr. Roland would not have been putoto this extra expense of the extra freight in the event that we are not permitted to order his material to be shipped this week. There is a question then as to whether or not Mr. Roland will not be entitled to claim an extra for this freight.

There is no question in our minds about this being a satisfactory well from a bacteriological standpoint. The quality of the water, we believe will be satisfactory. Perhaps there are better water supplies but certainly there are a great many waters which municipalities are using which are a good deal worse than this ever possibly could be at Larrabee. Anyone familiar with the municipal supplies in North and South Dakota and many of the southern Minnesota cities will know that this water at Larrabee, simply by inspection, is of better quality than in any of the above named states. We would have no hesitancy whatever in approving this supply as being entirely satisfactory and in notifying Mr. Roland to start shipping his material this week.

We are sending a copy of this letter to Mr. Weiters of the Iowa State Board of Health at DesMoines, Mr. Wm. Mark of the Iowa State Board of Health at LeMars, Dr. H. G. Hershey of the Iowa Geological Survey, to the town of Larrabee and to Mr. John A. Murphy, District Engineer, PWA, Cherokee, Iowa, hoping that it will be possible for Mr. Weiters and Mr. Hershey to approve this as a satisfactory water supply prior to Friday of this week and to notify the PWA at Omaha that they deem the same satisfactory.

Yours very truly,

BUELL & WINTER ENGINEERING CO.

WEB:ER

By_____

Copies to: Mr. A.H.Weiters - DesMoines
Mr. Wm. Mark -LeMars
Dr. H.G.Hershey - Iowa City
Town of Larrabee
Mr. John A.Murphy - Cherokee,

March 26, 1938

Mr. R. A. Radford
Regional Director
Public Works Administration
Farm Credit Building
Omaha, Nebraska

Dear Sir:

Mr. C. W. Roland, the contractor who is to put in the water mains at Larrabee, Cherokee County, Iowa, under P. W. A., has requested that I write to you regarding the quantity of waterswailable in the formations penetrated by the new Larrabee town well.

From samples of well cuttings submitted by the driller during the construction of the well we interpret the producing formations as basal Nebraskan sand and Dakota sandstone. The Dakota sandstone immediately underlies the glacial drift at Larrabee. The basal Nebraskan sand and the Dakota sandstone are the two principal water producing formations in Cherokee County and northwestern Iowa. In most cases only one of the formations is utilized. Other towns in Cherokee County which use one or both of these aquifers for municipal water supplies are Cleghorn, Aurelia, and Cherokee. In the surrounding counties numerous other towns obtain water from the same source.

During the pumping test of the Larrabee well on March 18, I was present for about six hours of the reported eight-hour run. A sheet is attached for your convenience which shows the measurements which I made at that time on water levels, productions, and temperatures. These measurements indicate a strong well. The drawdown is less at various productions than average for town wells over the state, and the fact that the water level remains approximately constant over long periods of time with approximately constant productions signifies that the supply is a suitable one.

The type of work shown on the data sheet is detailed and such work has been carried on for a relatively short time by the Geological Survey. Unfortunately, we do not have such detailed measurements on other wells in the immediate vicinity of Larrabee, but the following general data may be useful to you. At Cherokee in well No. 2, which has a larger diameter than the Larrabee well and which obtains water from the Dakota sandstone alone, the drawdown is 18 feet after the well has been pumping 2 hours at 673 g.p.m. At Cleghorn where the Nebraskan sand and Dakota sandstone are both used the drawdown according to Dr. A. C. Tester is 285 feet after the well has pumped 30 minutes at 75 g.p.m. At Primghar in a well drawing from the Dakota sandstone the drawdown is reported as 15 feet when the well is pumping 80 g.p.m., and in a well producing from the basal Nebraskan sand the drawdown is 90 feet after the well has pumped 30 minutes at 125 g.p.m. At Sutherland a well producing from the basal Nebraskan sand is reported to have a drawdown of 3 feet when pumping 80 g.p.m. You will see that the Larrabee well compares favorably with wells in surrounding towns.

In conclusion and based on my measurements during the pumping test, I am confident that the formations penetrated and utilized by the Larrabee well are capable of producing more water than the town will use over a period of years.

Mr. Roland indicated to me that he is extremely anxious to begin work on the pipe line at the first possible moment. May I suggest, therefore, that you wire me if you have any questions on the above statements or if you desire additional information.

Very truly yours,

H. G. Hershey

HGH:A
CC: Mr. C. W. Roland
Buell & Winter Engineering Co.
A. H. Wieters