Hardin Co.
G.D. ?

STATE OF IOWA
IOWA GEOLOGICAL SURVEY
GEOLOGY ANNEX
IOWA CITY

Office Copy

May 16, 1945

Mr. E. S. Boudinot
Brown Engineering Company
203-8 Valley Bank Building
Des Moines 9, Iowa

Dear Mr. Boudinot:

Your letter to Dr. Hershey requesting a forecast for a town well at Hubbard, Iowa, has been received. As Dr. Hershey will be away from the office for a few days I am replying for him.

The town of Hubbard is located in the southwestern part of Hardin County in Sec. 23, T. 87 N., R. 21 W. The population in 1940 was 780. The elevation of the railroad station is 1099 feet above sea level.

Very little is known about the present town well. Its depth is reported to be between 377 and 385 feet. The quality of the water is good except for the high fluoride content of 2.0 parts per million. The amount of water needed at Hubbard is estimated to be 35,000 gallons per day. A well yielding between 60 and 100 gallons of water per minute should be satisfactory.

Although we do not have good control in the immediate vicinity of Hubbard the following tabular forecast of the geologic section should be reasonably accurate. This forecast is carried do a depth of 850 feet, at which depth the top of the Wapsipinicon formation should be encountered.

Forecast of Geologic Section at Hubbard, Iowa, based on Starting Elevation of 1100 feet (1094')

Formation and Description	Thickness (feet)	From (feet)	To (feet)	
Pleistocene (undifferentiated)				
(Clay with probably some sand and gravel beds)	250	0	250	220
Pennsylvanian (undifferentiated)				
(Shale, gray to black with some sandstone)	50±	250	300±	250
Mississippian				
Hampton (dolomite, cherty near base)	120±	300±	420	480
English River (sandstone and dolomitic siltstone)	10	420	430	not reached at 485
Maple Mill)				
Devonian or) (shale and dolomitic				
Sheffield) siltstone)	15	430	445	
(silty dolomite with shale beds)	35	445	480	
(shale)	55	480	535	

Formation and Description	Thickness (feet)	From (feet)	To (feet)
Lime Creek			
(dolomite)	25	535	560
(limestone and shale beds)	40	560	600
(shale with dolomite beds)	65	600	665
Shellrock (dolomite and limestone)	45	665	710
Cedar Valley (dolomite and limestone)	140	710	850
Wapsipinicon		850	

Sand and gravel beds are to be expected in the drift but their depth and thickness cannot be predicted because of inadequate control. Usually sand and gravel is present at the base of the drift.

Bedrock is likely to be gray to black shale belonging to the Pennsylvanian system of rocks. These shales will cave shortly after being drilled. Some sandstones may be present near the base of this section but these beds will probably be thin.

The top of the Mississippian rocks is expected to occur at a depth of about 300 feet. However, the Pennsylvanian shales may extend to a depth of 350 feet. Most of the Mississippian section at Hubbard is composed of dolomite with cherty dolomite near the base and siltstone and sandstone at the base. The siltstone and shale section immediately below the sandstone may be Mississippian or Devonian in age. The shale should stand for some time after being drilled but will require a liner. The shales in the Sheffield and Lime Creek formations will also require a liner. One string of casing may be used for this shale section, perforating the casing opposite any dolomite beds where water is found. The Wapsipinicon formation is likely to contain much gypsum. Water encountered in the gypsum section is likely to be quite hard.

Water should be found in the drift sands and gravels but probably not enough to develop a satisfactory water supply. The iron content of the water in the drift is likely to be quite high.

Water may be found in the Hampton formation at a depth of between 350 and 385 feet. The present town well apparently derives its water supply from this section. Water was encountered at the equivalent depth of 350 feet in the Eldora Cooperative Creamery Well located about 12 miles northeast of Hubbard. The town well at Radcliffe located about 7 miles west of Hubbard is 377 feet deep and may obtain water from the same general horizon. The quality of water in the Radcliffe and Hubbard town wells is good except that in the Hubbard well the fluoride content is high (see attached analysis comparison sheet). The water level should stand within 100 feet of the surface.

Water was encountered in the dolomite of the Sheffield formation in the Eldora Cooperative Creamery well. This horizon would occur at an equivalent depth of 445 to 480 feet at Hubbard. Water can also be expected in the Lime Creek and Cedar Valley formations. In the well drilled for the White Institute located about 6 miles east of Hubbard, the main water supply was found near the top of the Wapsipinicon formation at an equivalent depth of about 870 feet. An analysis of the water from this well is shown on the attached analysis comparison sheet. This well was pumped at the rate of 56 gallons of water per minute with a drawdown of 35 feet.

It would appear that a water supply of 100 gallons per minute can be developed from a well not over 870 feet deep. There is a good chance that the necessary amount of water can be developed above the Sheffield formation at a depth of 430 feet.

If the well is drilled we will appreciate receiving samples of the cuttings and data on the pumping test. If you have any questions or desire further information in regard to this matter, please let us hear from you.

Very truly yours,

William E. Hale

WEH'm

IOWA GEOLOGICAL SURVEY
Water Analysis Comparison

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

Owner: _____ Contractor: _____ Date Started: _____

Well Number or Location	1	2	3	4	5	6
		Hubbard Town	Radcliffe town	White Institute		
Depth of Sample		377	377	832		
Formation Source		Mississippian	Mississippian	C.V.-Wapsi.		
Water Level Below Curb				152		
How Sampled						
Sampled by						
Date Sampled				4-19-41		
Total Solids		253	369	395		
Dissolved Solids						
Insoluble Matter		10.4	17.0	58.5		
Alkalinity (MeO)		342	362	254		
Nitrite (NO_2)						
Nitrate (NO_3)		0.0	0.0	0.0		
Sodium(Na) & Potassium(K)*		20.6	21.6	25.4		
Calcium (Ca)		42.3	70.0	57.9		
Magnesium (Mg)		21.7	30.0	23.2		
Iron (Fe)						
Iron (Unfiltered)**		0.8	1.0	1.5		
Manganese (Mn)		TR	0.1	0.0		
Aluminum (Al)						
Fluorine (F)		2.0	0.0	1.5		
Chlorine (Cl)		2.0	3.0	6.0		
Sulphates (SO_4)		0.5	5.2	36.7		
Bicarbonates (HCO_3)		295.2	441.6	309.9		
Phosphates (PO_4)						
Borates (BO_3)						
Calculated Hardness***		196	300	243		
Water Lab. Number						

*Na & K not separated, calculated as Sodium(Na): **Includes iron precipitated or flocculated after sample collected: ***Calculated as $CaCO_3$.

Completed Depth _____ ft.; Final Static Water Level _____ ft.; Production _____ GPM; Draw-down _____ ft., at _____ GPM; Gallons per foot draw-down _____. Date Completed _____ 193_.

Remarks: _____

W

File 2

Memorandum November 20, 1945

To: H.G. Hershey
From: W. E. Hale
Subject: Development of New Town Supply at Hubbard, Iowa

Mr. Boudinot, engineer with the Brown Engineering Company of Des Moines, Iowa, wrote to the Survey in May asking for a forecast of the geologic section and ground-water conditions at Hubbard , Iowa. He stated that the town wished to develop an auxillary supply of about 100 gallons of water per minute.

A general forecast was prepared for a well extending to the top of the Wapsipinicon formation. The control was not good but it was mentioned that there would be Pennsylvanian rocks to contend with. The base of the Mississippian section was called a t 430 feet. (a bad error)

Mr. Art Bruinekool of Pella,Iowa was the successful bidder. The contract was let on a footage basis. Drilling was started on October 24 . A 10-inch hole was started and 10-inch casing was driven as the hole was made.

I first visited the well on Sunday, October 28, and learned that drilling had been carried on to a depth of about 220 feet. As the drillers were gone and the water superintendant mentioned that the drillers were expecting someone, I called in to learn what the situation was. You stated that there was no problem so far as you knew.

I visited the well again on Monday, October 29, and Talked with Mr. Bruinekool. The drilling depth at the time was 240 feet. Shale had been encountered at a depth of 220 feet, sandstone at a depth of 235 feet. Mr. Bruinekool stated that there was quite a bit of water coming in from the sandstone. A water sample was collected from this horizon after the well had been bailed for a few minutes. About 250 gallons were removed before water sample G-62 was collected. The near static water level in the well was 40 feet. Mr. Bruinekool said he would call when he was ready to run a pumping test.

Was and been rejected

The first production test was made on the well on the afternoon of Friday, November 2. The depth of the well was 380 feet. The 10-inch casing was resting on sandstone at a depth of about 236 feet. A 2 foot shale bed was left uncased at a depth of 240 feet. Sandstone continued to a depth of 245 feet where limestone was found. A lift pump set at a depth of 112 feet and powered by the rig was used to test the well. The water level was 38 feet below the measuring point,near land surface,before pumping began but the near static level was about 27 feet below land surface. Pumping was started at 3:05 pm. The well was pumped at the rate of 53 gallons per minute for 2½ hours. The pumping level lowered to 98 feet. The water pumped was very dirty but showed some signs of clearing near the end of the production test. Water sample G-56 was collected.

Analyzed?

Mr. Bruinekool and I met with the council Friday evening to discuss the results of the test. I mentioned that there was probably 40 feet more of rock which might yield water but that the thickness of the remaining rock section above the shale was only a guess. The council decided to have Mr. Bruinekool drill an additional 40 feet and see what the well would yield at that depth.

Drilling was continued to adepth of 450 feet without finding shale. At that depth another production test was made by Mr. Bruinekool with the following results:

Memo. November 20, 1945

Results of production test made on Nov. 7

Static water level_____ 31½ feet
Pumping level_____75-85 feet at 100 gpm
Pumping level_____99-101 feet at 130 gpm

The recovery was rapid. Measurements were taken from a point 1½ feet above land surface. Pumping continued for 13 hours but the water never cleared up.

The council decided to have Mr. Bruinekool drive the 10-inch casing through the shale at a depth of 240-242 feet and continue drilling to a depth of 485 feet. This was done, and a final pumping test was made on the well by Mr. Bruinekool. He will give us the data on this test in the near future. (The shale was never encountered)

Bill ✓
Stan ✓
Unk
+
File

Memorandum:

H. G. Hershey

November 16, 1945

On the evening of November 15 Mr. Art Bruinekool called from Pella to report that the Hubbard Town Well was completed at a depth of 480 feet without having reached the top of the shale. He reported that the lower portion was very high in chert and that he would send to us the remaining samples and a water sample.

He reported that the static level was 28 feet and the pumping level at 97 gpm was 68 feet.

Mr. Bruinekool is expected to drill a well south of Hubbard in the near future. It should give us a check on the rather sharp structure in that area.

HGH.

Memorandum
Re: visit to Hubbard (Hardin)
Nov 9, 1945

Notes on Hubbard

The first pumping test was run at a depth of 380 ~~gpm~~ feet and was attended by Hale. I don't have the exact figures on it but about 3/4 gal per minute was obtained. Something like 58 g.p.m. with a pumping level at 114 feet.

Drilling proceeded to 450 feet into the Maynes Creek chert. The dolomite in the additional 70 feet was highly porous. A pumping test was run on Nov 7. Brunehoel still has the notes and will bring them in when the well is finished. In this second test the results were approx as follows:

s.w.l.	31 1/2	
pumping level	75-85	100 gpm
recovery in 6 (?) min	31	
pumping level	79 ±	100 g.p.m.
pumping level	99-101	130 gpm
recovery in _ min	29 1/2'	

All measurements taken from 1½ ft above ground

Pumping continued for 13 hours but the water never cleared up so it was decided

to set the casing down through the Pennsa ss which had been soft and which yielded about 30 g.p.m. during a short bailing test shortly after it had dulled. When I arrived yesterday the casing was down to 243' 9" and they were trying to decide whether to make another test then or to go on down to get more rock & possibly more water.

Boudinot was very determined that the town should have 100 g p m with a pumping level of 100 ft and from the looks of the test minus the 30 g p m from the now shut off sandstone. it looked very close indeed. Therefore he was anxious to go on in hopes of finding more water. Brunehool pointed out that the higher the pumping level the less the cost:- that if they could raise the pumping level 10 feet the extra cost of going on would be paid for in 3 or 4 years. The final decision of the council was to continue drilling to a depth of 485 of the top of shale whichever came first. Brunehool will keep a record

of the pumping test as he did before & bring us the results.

S E Harris Jr.
Nov 10, 1945

Results of Production Test on Hubbard Town Well - November 2, 1945

Time	Depth to Water (feet)	Discharge (gallons per Minute)	Remarks
Nov. 2			
3:00 p.m.	38±		
3:05			Pumping started.
3:08	84.4	100±	Water very dirty.
3:10	97.00		
3:13	107.00	70.0	
3:20	112±		Pumping air.
4:00	112±	56.0	Water dirty. Water temperature 50°F.
5:00	98	53.0	Water very cloudy
5:30	98	53.0	Pumping stopped, water sample collected.
5:32	84.7		Recovery measurements.
5:33	73.35		
5:34	64.85		
5:35	57.25		
5:36	50.80		
5:37	45.60		
5:38	41.07		
5:39	38.00		
5:40	35.50		
5:41	32.70		
5:43	31.00		
5:45	29.67		
5:47	28.77		
5:49	28.43		
5:51	28.28		
7:00	27.64		
Nov. 3			
8:30 a.m.	27.37		

Recd. Nov. 26

REGISTERED
PROFESSIONAL ENGINEERS:
KENNETH R. BROWN*
E. F. BEHRENS
L. B. ECKLES
J. V. GEBUHR*
M. T. MCDONALD*
J. S. VETERSNECK*
G. C. HAVENS
E. S. BOUDINOT
G. P. PRICHETT
LEON KAPLAN

BROWN ENGINEERING COMPANY
CONSULTING ENGINEERS

203-8 VALLEY BANK BUILDING TELEPHONE 4-9109
DES MOINES 9, IOWA

ENGINEERS
L. C. BLACK
E. R. BOWEN
ELDON WILEN
A. J. MINER*

* IN ARMED SERVICE

November 23, 1945

Dr. H. G. Hershey
Iowa Geological Survey
Geology Annex
Iowa City, Iowa

Re: Hubbard Well #2

Dear Dr. Hershey:

Name: Hubbard town well No. 2
Location: SW¼, NW¼, NE¼, Sec. 33, T 78N, R 21W.
610 feet north and 40 feet east of well #1.
Elevation-Land surface and drilling curb, 1094 feet above sea level. Measuring point during pumping test, 1094.5 feet above sea level.
Owner: Town of Hubbard
Contractor: Art Bruinekool
Driller: Art Bruinekool
Date Started: October 24, 1945
Present depth: 480 feet
Casing record: 246'-3" of 10" wet pipe from 0 to 246'-3".
Aquafier: Lime stone and dolomite from 245 to 480 feet.
Shale bed from 240' to 242' cased off.
Static head 27 feet
Water level 65 feet
Draw down 38 feet
Pumped 112 g.p.m.

Yours very truly,

BROWN ENGINEERING COMPANY

E. S. Boudinot

E. S. Boudinot

ESB:vib

GW

November 20, 1945

Results of Production Test
on
Hubbard Town Well No. 2
Hubbard, Iowa
Nov. 2, 1945

Name: Hubbard Town Well No. 2
Location: SW¼ NW¼ NE¼ Sec. 33, T.87N., R.21W.
Elevation: Land surface and drilling curb, 1094 feet above sea level.
Measuring point during pumping test, 1094.5 feet above sea level.
Owner: Town of Hubbard.
Contr: Art Bruinekool.
Driller: Art Bruinekool.
Date started: October 24, 1945.
Present Depth: 380 feet.
Casing record: 236 feet of 10-inch pipe from 0 to 236 feet.
Aquifers: Sandstone from 236' to 240' and from 242 to 245 feet. Limestone and dolomite from 245 feet to 380 feet.
Test Pump: Lift pump set at 112 feet and powered by drilling rig.
Measuring point: Top of wood plank about 0.5 foot above land surface.
Discharge measurements: Discharge rate measured by filling tank.
Remarks: A two foot shale bed from 240' to 242' was left uncased.

Copies sent to Art Bruinekool, E. S. Boudinot, Hubbard City Clerk. 11/23/45

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves Patented. FORM 416905

MOORE'S MODERN METHODS

copied from Art Brunehod Dec 13, 1945

Hubbard Pumping test Nov 7, 1945

Depth 450

Art Brunehood

all measurements taken at top of clamp 19' above platform

	Time	water level		
pm	1:29	31'6"		
		pump started		
	1:30			
	1:31	70	100 gpm	
	1:32	85		
	1:35	90		
	1:40	92	100 gpm	stroke per min
	1:50	90	"	
	2:00	90 [illegible]"	"	35 spm
	2:30	95'9"	"	
	2:50	96'6"		37
	3:00	94'3"		
	3:15	95'		
	3:40	90'		
	4:00	89'6"		
	4:04	shut down		
	4:05	60		
	4:06	45		
	4:07	38		
	4:08	33		
	4:10	31		
	4:15	started pumping		
	4:18	75		36
	4:20	82		37
	4:22	85		"
	4:23	86		"
	4:35	88'2"		"
	4:45	84		"
	5:00	85'6"		"
	5:15	83'6"		"
	5:30	83'6"		"
	5:45	84		"
	5:50	85		
	6:00	84		

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves Patented. FORM 416905

MOORE'S MODERN METHODS

Hubbard Nov 7 cont

6 15	83'6"		spm
6 30	81		37
6 33	79'6"		
6 45	83		37
6 55	82		
7 15	83		37
7 30	83		
7 45	81 6"		
pm 8 20	pump stopped		

Nov 8 test Art Brainerd

am 8:00	29' 4"		spm
8 04	68		33
8 06	73		34
8 14	80' 3"		37
8 31	97		
8 38	101	130 gpm	41
8 48	97		39
9 07	99		39
9 40	102	110 gpm	39
pm 2:00	stopped pumping		

pumped sand

10- inch casing set at 235 ft

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves Patented. FORM 416905

MOORE'S MODERN METHODS

243' 9"

Hubbard pumping test Nov 12, 1945

Depth 480

casing driven down to 243' 9"

all measurements 7" above platform
by Art Brunelkork

am 10:50	started pumping		spm
11:00	84'		37
11:04	85' 6"		37
11:10	86'		37
11:15	86' 2"		37
11:21	84' 5"		
11:36	87'	19½" in tank	36
11:40	87'		
11:45	87'		
11:50	87' 2"		
11:55	87' 2"		
12:00	87		
pm 12:30	87		
1:00	86' 6"		
1:30	86'		
2:00	85	shut down	

Hubbard Nov 13

all measurements top of Platform

am 7:45	28' 6"	
7:47	65	108 gpm 36 spm

Nov 14

9:50 100 gpm 35 spm

started pumping at 11:20 water cloudy

drove casing 2" out it to 246' 3"

started pumping at 2:00

pm 2:10		97 gpm	34
4:30	65'	"	"
5:15	67'	"	"
5:30	67' 2"		"
5:45	68		"

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves Patented. FORM 416905

MOORE'S MODERN METHODS

Hubbard pumping test Nov 14

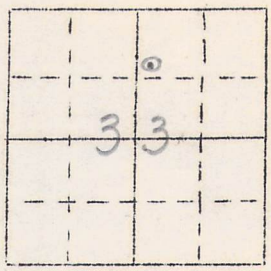
		spm
5:53	67'	34
6:15	67	"
6:30	66'3"	"
7:30	66'6"	"
8:01	67	"
8:30	66'10"	"
9:00	67	"
9:30	67	"
10:00	67'2"	"
10:10	67'2" pm	"
stopped pumping		
10:11	46'	
10:12	36'2"	
10:13	32'8"	
10:14	31'3"	
10:15	30'8"	
10:16	30'6"	
10:17	30'5"	
10:20	30'2"	
Nov 15, 1945		
8:40	28' am	

Copied from A. Brunedeau

W-2162

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

RECORD OF WELL



Location:

Town: Hubbard (N E / S W); County Hardin

SW NW NE sec. 33 T. 87 N., R. 21 E. W. Tipton Twp.

Well name and number Town Well #2

Owner _____ Address _____

Tenant _____ Address _____

Contractor Art Bruinekool Address Pella

Drillers Art Bruinekool

Drilling dates Oct 23, 1945 - Nov. 14, 1945

Well data:

Elevations: Drilling curb 1094 feet; Land surface _____ feet

3 ft below station

Determined by W E Hale

Topographic position upland

Total depth: Reported 488 feet, Measured _____ feet

Drilling method cable

Hole and casing data 246'3" of 10" casing from 0 to 246'3"
(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 27 ft. above/below _____ Date _____

Original elevation of water level 1067 ft.; Source of data _____

Sources of water: Principal Hampton 350-460; Others Penns. 243-45

Production data: Date _____

Static depth to water 27 Measuring point .5' above l.s.

Pumping level 65 at 112 g.p.m.

_____ _____

_____ _____

_____ _____

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

Pump data; Type pump _____ Column Dia. _____ Length _____

Cylinder or bowls: Dia. _____ Length _____ Suction pipe _____

Power _____ Airline _____

Estimated rate of production: _____ g.p.m. for _____ hrs. a day

Use of water _____

WATER ANALYSES (in parts per million)

Date sampled	Nov. 2 1945 Depth 380'	Nov. 1945		
Sampled by	Hale	A. Brunckrool		
Total solids	423	283		
Insoluble matter	22.5	28.5		
Alkalinity (Meo)	312.0	240.0		
Alkalinity (Phn)	0.0	0.0		
pH 11/2/45	2.6	7.7		
Fe_2O_3+ Mn_2O_3+Al_2O_3	6.5	3.0		
Alkali as sodium	21.3	6.9		
Calcium	82.5	42.5		
Magnesium	30.4	32.1		
Iron (unfiltered)	1.4	1.0		
Manganese	0.2	0.0		
Nitrate	0.0	0.0		
Fluoride	0.8	1.0		
Chloride	1.0	1.5		
Sulfate	47.7	2.5		
Bicarbonate	380.6	292.8		
Hardness (ppm)	336	238		
Hardness (gpg)	19.64	13.91		

Remarks _____

Laboratory data: Sample storage location _____

Sample range 0-480 No. spls. 96 No. dupls. & cond. 96 G-P

Spls. prepared by PJH + ES Washed range 235-480 by PJH

Driller's log and cond. Yes good

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

Microscopic study 0-480 E.S strip log Nov. 1945 E.S

Gen. log _____ Correl. by E Schultz

WATER LEVEL DATA

Measuring point _____

Date	Depth to water	Altitude	Remarks
Nov. 2, 1945	38 ±		Well 80' deep 53 gpm 60' dd

REMARKS

2162

Name Hubbard town well No. 2

Loc SW NW NE 33-87N-21W, Hardin Co.

TD. 480'

Drilled Art. Brunekool Oct-Nov. 1945

Log: W-2162 E. Schultz

Casing: 246'3" of 10" csg. from 0-246'3"

239) 2.400 = .0100

239

100

pop. 806 (1960)

100% pop use. 356 meters

$\frac{2.4}{239} = 1.0 \times 10^{-2}$

Prod data:

SWL	27'	27'	
PWL	112'	67'	
Yield	112 gpm	97 gpm	

2.4 gp. cap

40) 97.0

80

170

160

1094

27

piezometric 1067

Analyses: No. K-595 11/45; No. K-596 11/2/45; No. 285(1409) 8/4/59

Remarks: Pennsylvanian ss may be contributing water to well at 235-250' ???

Elevation 1094'

Formations	Depth	Top	Base
St. Louis ???	235'		
Gilmore City	250	844	759
Hampton	335	759	689
Maynes Crk.	405	689	

Jan. 1 to June 30, 1961

7,350,000 pumped by No. 1 = .557 %
5,808,200 " " No. 2 = .443 %
100 %

13,158,200 total =
7,750,200 used
5,408,000 leaked out (represents 41% loss)

Of 7,750,200 used = 43056 gpd ÷ 53.8 gpd/per

43056 gpd
180 | 7,750,200
720
550
540
1020

53.8
800 | 43056
4000
3056
2400
6560
6400

assume:
24000 from well No. 1
19000 " " " 2
43000 gpd

WELL RECORD

Well is located ____ N/S ____ miles E/W and ____ N/S ____ miles E/W from Hubbard (Nearest Town) in Hardin (County),

in the SW NW NE¼ Sec. 33 T. 87 R. 21 W 2nd P.M.

Owner Hubbard Well No. ____

Postoffice address Hubbard

Contractor Art Brunkhorst

Address Pella

Driller Art Brunkhorst

Well begun Oct 23, 1946

completed Nov 14, 1946

Rig used—Cable, Rotary, Jet, or cable

Depth of well 488 (Feet)

Size of hole (note total amount of each size) 10"

243' 9" of casing

Main water supply at 350 to 460' (Feet below surface)

Final water head 27 (Feet above or below surface)

Is well pumped? ____

Yield 97 (Gallons per minute)

Water level when pumping 68'

Position of well valley (Upland, valley, side hill, etc.)

Date and Time	Water Level	SOURCE OF WATER		Production in Gallons per Minute	Pumping Level
		Depth	Type of Rock		
Oct 28	30 ft.	235 ft.	SS	25 g/m	

NOTE: Water levels should be recorded at time of change *and* at regular intervals; for example each morning before drilling starts or at the end of each 100 feet of drilling.

RECORD OF PERMANENT CASING

Size Pipe	Amount of Pipe	Depth to Bottom of Pipe	Depth to Top of Pipe	Type* and Weight of Pipe	DIAGRAM OF WELL
10"	243' 9"	343' 9"	2' + 0	35 #	

*As cast, wrought iron, steel, concrete, etc.

Is screen used?_____ Diameter_____ (Inches)

Length_____ (Feet) Depth to bottom_____

Depth to top_____ Slot size_____

Are packers or seals used?_____

Kind _____

Where used_____

Kind of pump_____ Dia._____ (Inches)

Capacity of pump_____ (g.p.m.)

Power used_____ (Kind and amount)

Depth to bottom of pump line_____ feet,

including _____ feet tailpiece.

Remarks on construction of well_____

_____

Sample No.	DEPTH From	DEPTH To	THICKNESS	DESCRIPTION OF BEDS KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
	0	3-		Yellow clay
	3-	10		" "
	10	15-		Blue clay
	15	20		" "
	20	25-		" "
	25-	30		" "
	30	35-		" "
	35	40		" "
	40	45-		" "
	45-	50		" "
	50	55-		" "
	55	60		" "
	60	65-		" "
	65-	70		" "
	70	75-		" "
	75	80		" "
	80	85-		" "

Sample No.	DEPTH From	DEPTH To	THICKNESS	DESCRIPTION OF BEDS — KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
	85	90		Blue clay
	90	95		" "
	95	100		" "
	100	105		" "
	105	110		" "
	110	115		" "
	115	120		" "
	120	125		" "
	125	130		" "
	130	135		" "
	135	140		" "
	140	145		" "
	145	150		" "
	150	155		" "
	155	160		" "
	160	165		" "
	165	170		" "

Sample No.	DEPTH From	DEPTH To	THICKNESS	DESCRIPTION OF BEDS — KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
	170	175		Blue clay
	175	180		" "
	180	185		" "
	185	190		" "
	190	195		" "
	195	200		" "
	200	205		" "
	205	210		" "
	210	215		" "
	215	220		" "
	220	225		shale
	225	230		"
	230	235		"
	235	240		sand stone
	240	245		shale rock bands
	245	250		Lime Stone
	250	255		" "

Sample No.	DEPTH From	DEPTH To	THICKNESS	DESCRIPTION OF BEDS — KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
	255	260		Lime stone
	260	265		" "
	265	270		" "
	270	275		" "
	275	280		" "
	280	285		" "
	285	290		" "
	290	295		" "
	295	300		" " Miss
	300	305		" "
	305	310		" "
	310	315		" "
	315	320		" "
	320	325		" "
	325	330		" "
	330	335		" "
	335	340		" "

Sample No.	DEPTH From	DEPTH To	THICKNESS	DESCRIPTION OF BEDS KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
	340	345		Lime Stone
	345	350		" "
	350	355		" "
	355	360		" "
	360	365		" "
	365	370		" "
	370	375		" "
	375	380		" "
	380	385		" "
	385	390		" "
	390	395		" "
	395	400		" "
	400	405		" "
	405	410		" "
	410	415		" "
	415	420		" "
	420	425		" " Shale Band of abt 6" after sample

Sample No.	DEPTH From	DEPTH To	THICKNESS	DESCRIPTION OF BEDS KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
	425	430		Lime
	430	435		"
	435	440		"
	440	445		"
	445	450		"
	450	455		"
	455	460		"
	460	465		"
	465	470		"
	470	475		"
	475	480		"