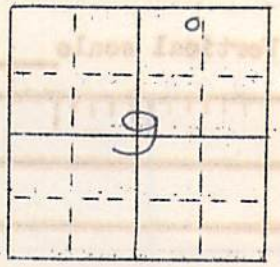
7½' Mt. Pleasant NE Quad
4058ZIN091330S-01
071-06W-09 ABAC
1950 field located by D. Karsten

IOWA GEOLOGICAL SURVEY W-1968
In Cooperation with U. S. Geological Survey

RECORD OF WELL



Location:

Town: Mt. Pleasant (N E / S W): County Henry

NE¼ NW¼ NE¼ sec. 9 T 71 N., R. 6 W. Center Twp.

Well name and number Mt. Pleasant City Well No. 4

Owner City of Mt. Pleasant Address

Tenant Address

Howard R. Green, Engineers, Cedar Rapids

Contractor Thorpe Bros. Well Co. Address Des Moines, Iowa

Drillers Guy Elam, Pat West, Ray McGrew

Drilling dates January 4, 1945 to March 15, 1946

Well data:

Elevations: Drilling curb 731.7 feet; Land surface 730.3 feet

Determined by Spirit Levels by Hale and Schultz

Topographic position Upland

Total depth: Reported 2645 feet, Measured 2648.08 feet

by cable measurement Plugged back to 1860' see remarks

Drilling method Cable tool

Hole and casing data See diagram

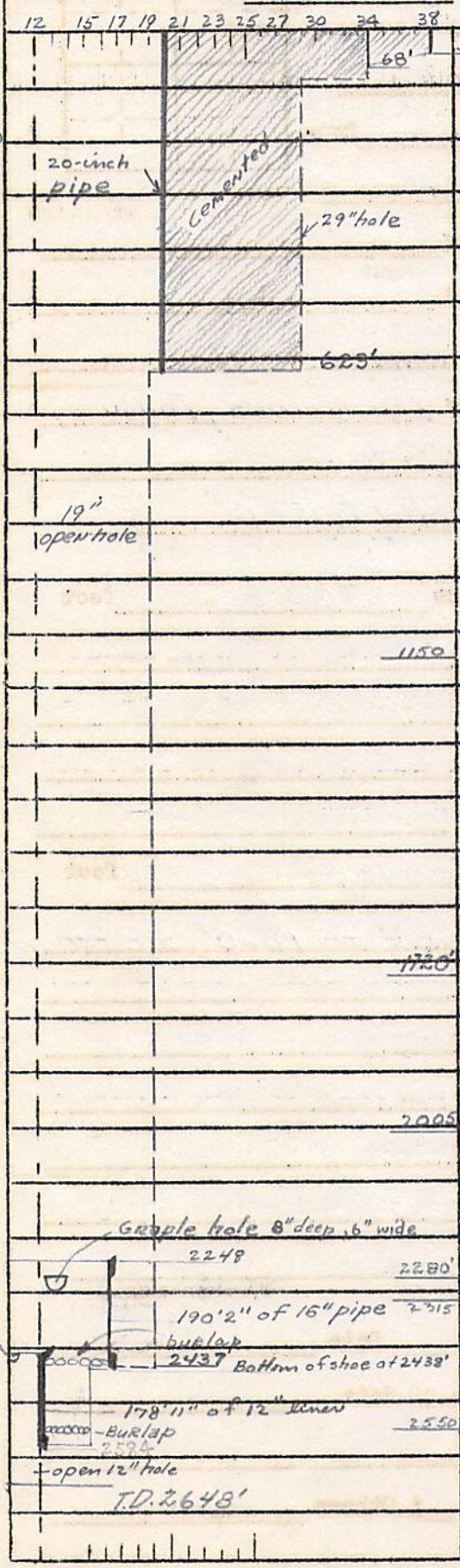
Original depth to water 135.30 ft. above below Date

Original elevation of water level ft.; Source of data

Sources of water: Principal Cambrian dolo + ss ; Others

CASING DIAGRAM

Vertical scale



LOG

1150 Top of St. Peter

1720' Top of Jordon

2005 Top of Franconia

2280' Top of Galesville

2315 Top of Eau Claire

2550 Top of Mt. Simon

Production data: Date April 1946

Static depth to water 135.87 Measuring point 2.25' above top of 20" casing

Pumping level 151.5 at 760 g.p.m.
143.3± 520 } after plugging

Specific capacity _____ g.p.m. per ft. drawdown; Temperature 72½ °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)

	#1	#2	#3	
Date samples	Apr. 8, 1946	Apr 9, 1946	May 6, 1946	
Sampled by	W.E. Hale	W.E. Hale	W.E. Hale	
Total solids	14,910	1414	1259	
Insoluble matter	34	15	13	
Alkalinity (Meo)	214	223	234	
Alkalinity (Phn)	0	0	0	
pH	5/6/46 7.5	4/22/46 7.7	5/4/46 7.7	
Fe_2O_3+ Mn_2O_3+Al_2O_3	24	11	5	
Alkali as sodium	4533	300	256	
Calcium	631	115	109	
Magnesium	136	39	43	
Iron (unfiltered)	3.4	0.2	0.1	
Manganese	0.2	0.0	0.0	
Nitrate	0.0	0.0	0.0	
Fluoride	1.6	1.6	1.6	
Chloride	5910	198	134	
Sulfate	3388	589	550	
Bicarbonate	261	272	285	
Hardness (ppm)	2157	448	449	
Hardness (gpg)	126.1	26.2	26.3	

Remarks #1 Bailer sample 2620' before plugging. #2 discharge before plugging. #3 discharge after plugging

Laboratory data: Sample storage location _____

Sample range 0-2695 No. spls. _____ No. dupls. & cond. _____

Spls. prepared by ENTIRE STAFF Washed range _____ by _____

Driller's log and cond. _____

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

Microscopic study Hale & Burns strip log V. Harris

Gen. log ✓ Correl. by Harris

WATER LEVEL DATA

Measuring point _____

Date	Depth to water	Altitude	Remarks

REMARKS

First water below 623 feet was found at 840' where water came into hole & rose to 240'

Plugging data: The hole is plugged at the bottom up into the 12-inch liner. A bridge was placed in the hole so that the base of a plug consisting of well-cuttings & cement is at 2030'. The plug is 50' thick extending to 1980'. Another plug was constructed on top of this when salty water was found to get past the first. This second plug extends up to 1860' & is composed of cutting packed in gunny sacks & tamped with the bit and also some cement on top. The plug was allowed to set more than 24 hours and the driller reported that it was solid when struck with the bailer

April 12-19

April 22-May 2

Results of Production Test and Chloride Studies
on
City of Mt. Pleasant Well 4
Mt. Pleasant, Iowa
April, 1946

Well Name: City of Mt. Pleasant Well 4.
Location: NE¼ NW¼ NE¼ Sec. 9, T. 71 N., R. 6 W. Center twp. Henry county.
Elevation: Drilling curb, top of 20-inch pipe, about 731.7 feet above sea level.
Owner: City of Mt. Pleasant.
Contractor: Thorpe Bros. Well Company, Des Moines, Iowa.
Engineers: Howard R. Green Engineering Company, Cedar Rapids, Iowa.
Drillers: Guy Hiem, Ray McGrew and Pat West.
Drilling dates: Started, January 4, 1945. Finished drilling, March 15, 1946.
Depth: 2648 feet below top of 20-inch pipe. (By Cable measurement)
Casing and hole size:
About 50 feet of 32-inch curbing from 0 to 50 feet.
About 68 feet of 34-inch curbing from 0 to 68 feet.
623 feet of 20-inch pipe set in 29-inch hole from 0 to 623 feet.
} Cemented in from bottom to top with neat cement.
Open 19-inch hole from 623 to 2248 feet.
190'2" of 16-inch liner set in 19-inch hole from 2248 to 2438 feet. (Shoe at bottom and top of liner.)
178'11" of 12-inch liner set in 15-inch hole and into 16-inch liner from 2405 to 2584 feet. (Shoe at bottom and top of liner. Burlap wrapper near top and bottom of liner.)
64 feet of open 12-inch hole from 2584 to 2648 feet.
Test Pump: Turbine pump setting, 277 feet below top of 20-inch pipe with 22 feet of suction pipe. Pump powered by Diesel engine with belt drive.
Pump base: A special pump base was constructed for this test. The hole for the pump head was offset to one side so that the pump would be near the wall of the 20-inch pipe. Another hole was cut in the pump base to allow a bailer to be lowered into the well at any time.
Bailer: The bailer used to collect water samples was 4-inches in diameter and 29.6 feet long. Ball type valves were in place at the top and near the bottom of the bailer. As the bailer was lowered in the water the balls were raised off the seat which allowed passage of water through the bailer. When coming up the hole the balls would seat and trap the water in the bailer at the point where the bailer was stopped or surged. The bailer was tied to the sand line of the drilling rig. The sample from the bailer was collected through a tapped hole in wall of bailer about 3 feet from bottom of bailer.
Water level measurements: The water level in Well 4 was referred to the rim of the hole in the pump base through which the bailer was inserted at an elevation of 2.25 feet above the top of the 20-inch pipe.
The water level in Well 2 was referred to the plate over the casing, 1.22 feet above the pump house floor and 1.7 feet below the measuring point for Well 4.
Discharge measurements: The discharge from well 4 was measured with a rectangular box type weir with baffle plates.
Temperature measurements: The temperature of the water from Well 4 was measured at the end of 68 feet of 10-inch discharge pipe.

Results of Production Test and Chloride Studies
on
City of Mt. Pleasant Well 4
Mt. Pleasant, Iowa
April, 1946

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 2							
11:45 am			152.74				Well 2 & 4 not pumping. Water level in Well 4 depressed because of muddy water in hole.
11:54			152.72				
12:00 n		134.17					
12:10 pm							Started pumping Well 2 by air lift.
12:11		161.25					
12:12		162.43					
1:23		167.8					Discharge rate at Well 2 estimated at 165 gal. per minute.
1:33			153.11				
1:39		167.99			Discharge 155		Water Sample from Well 2.
1:48		169.14					
1:49							Stopped pumping Well 2. Recovery measurements.
1:50		149.40					
1:51		140.00					
1:52		137.50	152.04				
1:53		136.61					
1:54		136.58					
1:55		136.35					
1:56		136.34					
1:57		136.05					
1:58		135.90					
1:59		135.81					
2:00		135.77					
2:01		135.60					
2:02		135.52	152.95				
2:03		135.56					
2:04		135.38					
2:05		135.31					
2:06		135.24					
2:09			152.89				
2:14			152.85				
2:19			152.83				
2:54			152.64				
3:14		133.87					
4:51		133.68					
4:54			152.42				
1/7:37					1830	227	Water dirty.
1/7:54		133.74			2437	399	Water dirty.
1/8:08					2640	394	Water dirty.

1/ The water sample collected from the bailer to determine chlorides was apparently not representative of the water at the depth to which the bailer was lowered. The bailer was brought up the hole at the rate of 6 feet per sec. or faster. The sample was collected from the bailer after letting the water flow out the tapped hole for less than 30 seconds. Later tests showed that bringing the bailer up this fast caused a fluttering of the lower ball valve or both ball valves which permitted water to enter through the bottom of the bailer as it moved up the hole. Thus in the lower part of the bailer water was present which was picked up from a depth of 1800 feet to the water surface. Later by bringing

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
up the bailer at a rate of 2 feet per second or less the fluttering was stopped and nearly representative samples were obtained.							
6:18 pm			152.33				
9:30							Started pumping Well 4
9:34			159.97				Water dirty.
9:36	370		160.50				Water dirty.
9:40	382		161.61	58°F.			Water cloudy.
9:45		134.61			Discharge 339		
9:48			162.96				
9:50	370			61°F.			Water cloudy.
9:51			163.38	69°F.			Water very dirty.
9:53		134.78					
9:56			158.37				
10:03			153.60				Pumping level raised as muddy water was pumped out.
10:07	420						Water very dirty.
10:08			152.30		Discharge 139.6		
10:11		135.00					
10:16	435		154.02	68°			Water clearing somewhat.
10:20		135.09					
10:23	435		155.20	69°			Water clearing somewhat.
10:30					Discharge 1594		
10:31	435			70°			Water clearing slightly
10:34			155.64				
10:35		135.14					
10:38			154.73				Air temperature 55°F.
10:41	435			72°			Water dirty.
10:44			154.23				
1/11:00					2640	3670	
11:07				73°			
11:15	435		152.44	73.5°			Water dirty.
11:21		135.39					
11:29		135.42					
11:31	435		151.80	74°			Water clearing slightly
11:36							Pumping rate increased.
11:40				74°			
11:50			159.45				
11:55	695			74°			
12:00 m		136.02			Discharge 2765		
April 3							
12:21 am			158.98				
12:23	650			74°			
12:30		136.20					
12:38	650			74°			
1/12:40					2640	2280	

1/ See page 1 & 2

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 3							
1:00 am			156.33				
1:05		136.25					
1:30			154.97				
1:34		136.24					
1:50	677						
1:55					Discharge 1769		
2:09		136.23					
2:14			153.88				
2:29	680			73.5°			Water dirty.
1/2:32					2640	1572	Water dirty.
2:50	665		153.38	73.5°			
3:05					Discharge 1537		
3:07		136.25					
3:20			153.05				
3:21							Pumping rate increased.
3:23			156.63				
3:27	767			73.5°			
3:30			156.67				
3:55	767		156.70	73.5°	Discharge 1400		
4:08			156.65				
4:13		136.55					
1/4:24					2580	1303	
4:41	767		156.20				
4:44							Pumping rate increased.
4:45			159.5				
4:49	870			73°			Water cloudy.
4:55			159.2				
5:00		136.86			Discharge 1240		
5:20		137.02					
5:25	870		158.6				
1/2/5:40					2640	1150	Sample from near bottom of bailer.
					2640	1695	Sample after flow of 3 min. out of bailer.

2/ The flow from the bailer through the tapped hole was negligible after 4 minutes.

5:50					Discharge 1140		
6:00	860		157.60	73°			
6:03							Pumping stopped at Well 4.
							Recovery measurements.
6:04			141.45				
6:05			141.11				
6:06			140.31				
6:07			139.83				
6:25			138.65				
6:30			138.72				
6:35			138.62				
6:45			138.48				
6:48		134.86					
6:50			138.44				
1/7:00					2580	1200	Water sample from near bottom of bailer.
					2580	2950	Water sample after flow of 3 min. from bailer.

1/ See page 1 & 2

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 3							
7:19			138.40				Pumping started.
7:20			150.5				
7:21			151.15				
7:23			152.95				
7:25	845		153.25				Water dirty.
7:29			153.75				
7:33		135.80					
7:34	828		153.42	72°F.			Water dirty.
7:43	828		153.63				
7:50			153.65				
7:52		136.25					
7:53	828		153.40	73°F.			Water dirty.
8:16			153.13				
8:20		136.49					
8:32	828		153.07				Water cloudy (white)
8:49			152.88				
8:51		136.62					
9:08	828		152.80				Water cloudy (white)
9:24			152.91				
9:41	812		152.80				Water cloudy.
9:44		136.78					
10:09	828		152.79				Water cloudy.
10:37	828		152.78				
10:40		136.94					
10:55	828		152.75	73°F.			Water cloudy.
1/11:15					2600	840	Sample from near bottom bailer.
					2600	855	Sample from near top of bailer.
1/11:40					2205	820	Sample from near bottom of bailer.
					2205	840	Sample from near top of bailer.
11:52			152.54				
12:05 pm					Discharge 797		
1:32	875		153.73	73°F.			Water cloudy.
1:37		137.18					
1/ 1:55					2600	731	Sample from near bottom of bailer.
					2600	1400	Sample from near top of bailer.
2:05					Discharge 702		
1/ 2:15					2200	703	Sample from near bottom of bailer.
					2200	930	Sample from near top of bailer.
2:27	875		153.52	73.5°			
3:20			153.59	73°			Water cloudy.
3:22		137.32					

1/ See page 1 & 2

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Depth to Water Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 3							
3:28 pm	875						
1/3:45					2600	687	Sample from near bottom of bailer.
					2600	1112	Sample after flow of 3 min. from bailer.
					Discharge 651		
3:52							Pumping stopped.
4:27							
4:37			138.00				
4:42			137.50				
4:45			137.51				Steel tape reading.
4:52			137.30				
4:55		135.31					
5:02			137.14				
5:09			137.03				
5:18			136.96				
5:20		134.94					
6:48			136.59				
6:56		134.37					
7:05			136.55				
1/7:15					2600	650	Sample from near top of bailer.
7:30		134.20					
7:32							Pumping resumed at Well 4.
7:43			159.5				
7:49			160.29				
7:53		136.55					
7:55	1043		160.60	73°F.			
8:02			160.47				Water very dirty.
8:13		137.01					
8:34	1043		159.80	73°			Water clearing.
9:05		137.59					
9:13	1043		159.52	73°			Water clearing.
9:31			159.56				
1/9:40					2600	574	Sample from near bottom of bailer.
					2600	1068	Sample from near top of bailer.
9:55					Discharge 563		Water sample collected for complete analysis.
10:20		138.00					
10:24	1043		159.58	73°			Water cloudy (white).
11:25	1060		159.28				
11:31		138.25					
April 4							
12:20 am			159.5				
12:25	1043			73°			
12:27		138.35					
1/12:34					2600	485	Sample from near bottom. of bailer.
					2600	1163	Sample from near top of bailer.
12:50					Discharge 469		Water cloudy (white).

1/ See page 1 & 2

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Depth to Water Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 4							
5:45	1060		159.5				
5:47		138.43					
1/5:50					2600	398	Sample after flow of 30 sec. from bailer.
					2600	423	Sample after flow of 1 min. 30 sec. from bailer.
					2600	860	Sample after flow of 2 min. 30 sec. from bailer.
5:50					Discharge 466		
6:07	1860		159.5				
6:08							Pumping stopped.
6:09			140.00				
6:10			139.10				
6:11			138.69				
6:13			138.67				
6:15		136.76					
6:17			138.20				
6:23			137.77				
6:29			137.52				
7:02			136.80				
1/7:10					2600	422	Sample after flow of 1 min. 30 sec. from bailer.
					2600	1260	Sample after flow of 2 min. 30 sec. from bailer.
7:25			136.75				
7:29		135.30					
7:47			136.30				Pumping started.
7:48			156.45				
7:51			157.30				
7:53			159.26				
7:58			161.24				
8:00		137.08					
8:03	1075		161.16	73°			Water dirty.
8:15			160.65				
8:39			158.8				
9:05			159.8				
9:18							Pumping stopped. Motor failed.
9:25							Pumping resumed.
9:30		138.01					
1/9:35					2600	392	Sample after flow of 30 sec. from bailer.
					2600	406	Sample after flow of 1 min. 30 sec. from bailer.
					2600	439	Sample after flow of 2 min. 30 sec. from bailer.
9:51			158.70				
10:10	1075		158.60	73°			Water cloudy.
1/10:30					2600	357	Sample after flow of 30 sec. from bailer.
					2600	731	Sample after flow of 1 min. 30 sec. from bailer.
					2600	2430	Sample after flow of 2 min. 30 sec. from bailer.

1/ See page 1 & 2

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Depth to Water Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 4							
10:30 am					Discharge 340		
1/10:50					2200	382	Sample after flow of 30 sec from bailer.
					2200	798	Sample after flow of 1 min. 30 sec. from bailer.
					2200	3210	Sample after flow of 2 min. 30 sec. from bailer.
1/11:10					2600	375	Sample after flow of 1 min. 30 sec. from bailer.
					2600	702	Sample after flow of 2 min. 30 sec. from bailer.
11:35	1060		159.0	73°F.			Water cloudy (white)
12:40 pm					Discharge 322		
1/12:45					2600	348	Sample after flow of 30 sec from bailer.
					2600	595	Sample after flow of 1 min. 30 sec. from bailer.
					2600	3040	Sample after flow of 2 min. 30 sec. from bailer.
1:05					Discharge 316		Water sample collected for complete mineral analysis.
1/1:15					2100	404	Sample after flow of 1 min. 30 sec. from bailer.
					2160	1621	Sample after flow of 2 min. 15 sec. from bailer.
1:26			159.10				Pumping stopped at Well 4.
1:28			139.80				Recovery measurements.
1:29			139.80				
1:32			138.37				
1:35			136.10				
1:39			137.82				
1:41			137.74				
1:43		136.86					
1:54			137.31				
2:20			136.92				
2:38			136.77				
2:42							Pumping resumed.
2:45	797						
2:50			149.0				
3:00	797		149.33	72°			Water almost clear.
3:12					Discharge 345		
3:15	797		150.3	72°			Water cloudy.
3:23	797		149.4	72.5°			Water clearing.
3:42	797		149.46		Discharge 368		
1/3/3:50					2620	981	Sample after flow of 1 min. 20 sec. from bailer.
					2620	3940	Sample after flow of 2 min. 15 sec. from bailer.

3/ The water from the bailer was more cloudy than that being discharged from the pump.

1/ See page 1 & 2

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 4							
4:03 PM	797		149.70	72½°F.			
4:18					Discharge 317		
4:31	797		150.20	72½°			Water almost clear.
4:45					Discharge 304		
1/4:45					2620	397	Sample after flow of 1 min. 20 sec. from bailer.
					2620	1670	Sample after flow of 2 min. 15 sec. from bailer.
5:00							Pumping rate reduced.
5:07	490		143.63				
5:46	490		142.25		Discharge 334		
6:30	490		142.35	72½°	Discharge 332		Water clear.
1/6:45					2620	1363	Sample after flow of 1 min. 20 sec. from bailer.
					2620	4230	Sample after flow of 2 min. 15 sec. from bailer.
1/7:00					1900	338	Sample after flow of 1 min. 20 sec. from bailer.
					1800	348	Sample after flow of 2 min. 15 sec. from bailer.
7:10					Discharge 336		
7:29	505		142.40	72½°			Water almost clear. Air Temperature 47°F.
7:45					Discharge 325		
1/7:45					2620	488	Sample after flow of 1 min. 20 sec. from bailer.
					2620	2750	Sample after flow of 2 min. 15 sec. from bailer.
1/8:00					2100	1161	Sample after flow of 1 min. 20 sec. from bailer.
					2100	1452	Sample after flow of 2 min. 15 sec. from bailer.
1/4/10:00					2620	365	Sample after flow of 1 min. 20 sec. from bailer.
					2620	867	Sample after flow of 2 min. 15 sec. from bailer.
10:20	1075						Pumping rate increased.
10:25	1075			72½°F			
10:30			160.0				
10:40	1075		158.0				
10:50					Discharge 304		
1/5/11:55					2620	269	Sample after flow of 30 sec from bailer.
					2620	292	Sample after flow of 1 min. 15 sec. from bailer.
					2620	333	Sample after flow of 2 min. from bailer.

4/ Upper ball was tied to top of guide so that upper hole was open as the bailer was brought out of well. This apparently gave less reliable samples than that using both ball valves.

5/ In addition to tying the upper ball to top of guide, the bailer was surged for 15 min. before bringing bailer up the well.

1/ See page 1 & 2

Time	Discharge Well 4 (CFS)	Depth to Water Well 2	Depth to Water Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 4 12:00 M					Discharge 271		
April 5 7:40 am	1090		158.6	72½°			Water cloudy.
1/5/7:50					2620	269	Sample after flow of 30 sec from bailer.
					2620	292	Sample after flow of 1 min. 15 sec. from bailer.
					2620	351	Sample after flow of 2 min. 15 sec. from bailer.
8:15					Discharge 252		
1/6/8:40					2620	257	Sample after flow of 30 sec from bailer.
					2620	286	Sample after flow of 1 min. 15 sec. from bailer.
					2620	1261	Sample after flow of 2 min. 15 sec. from bailer.
6/ Bailer not surged, both ball valves in operation.							
1/7/9:20					2620	259	Sample after flow of 30 sec from bailer.
					2620	285	Sample after flow of 1 min. 15 sec. from bailer.
					2620	695	Sample after flow of 2 min. 15 sec. from bailer.
7/Bailer surged 30 times using 20 foot strokes. Both ball valves in operation.							
1/8/10:35					2620	269	Sample after flow of 30 sec from bailer.
					2620	293	Sample after flow of 1 min. 15 sec. from bailer.
					2620	1039	Sample after flow of 2 min. 15 sec. from bailer.
8/Bailer surged for ½ hour. Both ball valves in operation.							
1/9/11:15					1830	235	Sample after flow of 30 sec from bailer.
					1830	233	Sample after flow of 2 min. 15 sec. from bailer.
9/ Bailer was not surged. Both ball valves in operation.							
11:45					Discharge 232		
1/9/12:30 pm					1900	227	Sample after flow of 30 sec from bailer.
					1900	378	Sample after flow of 2 min. 15 sec. from bailer.
1:03					200	236	Sample after flow of 2 min. 15 sec. from bailer.
3:00					Discharge 217		
1/9/ 3:45					2000	236	Sample after flow of 30 sec from bailer.
					2000	490	Sample after flow of 2 min. 15 sec. from bailer.

1/ See page 1 & 2.

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Depth to Water Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 5							
1/2/4:00 pm					2100	236	Sample after flow of 30 sec from bailer.
					2100	1045	Sample after flow of 2 min. 15 sec. from bailer.
1/2/4:30					2200	236	Sample after flow of 30 sec from bailer.
					2200	243	Sample after flow of 1 min. 15 sec. from bailer.
					2200	413	Sample after flow of 2 min. 15 sec.
1/2/4:45					2300	349	Sample after flow of 30 sec from bailer.
					2300	634	Sample after flow of 2 min. 15 sec. from bailer.
5:00					Discharge 225		
1/2/6:15					2400	211	Sample after flow of 30 sec from bailer.
					2400	213	Sample after flow of 2 min. 15 sec. from bailer.
6:30					Discharge 211		
10/7:00					2500	1927	Sample after flow of 30 sec from bailer.
					2500	5140	Sample after flow of 1 min. 15 sec. from bailer.
					2500	6120	Sample after flow of 2 min. 15 sec. from bailer.

10/ Bailer was brought up the hole at the rate of 2 feet per second. After 7:00 pm April 5, bailer samples were collected by bringing the bailer up the hole at the rate of 2 feet per second or less. The samples collected from near the top of the bailer are probably nearly representative of the water at the depth to which the bailer was lowered.

11/7:40					2620	4115	Sample after flow of 30 sec from bailer.
					2620	5530	Sample after flow of 1 min. 15 sec. from bailer.
					2620	5940	Sample after flow of 2 min. 15 sec. from bailer.

11/ Bailer was not surged.

12/8:20					2620	4900	Sample after flow of 30 sec. from bailer.
					2620	6000	Sample after flow of 1 min. 15 sec. from bailer.
					2620	6275	Sample after flow of 2 min. 15 sec. from bailer.

12/ Bailer was surged. Samples collected after this date were obtained by surging the bailer. The high chloride water appeared to have high iron content.

8:45					Discharge 210		
April 6							
7:15 am	1078		138.05	72.5			Water cloudy.
7:27		139.2					
7:30					Discharge 192		

1/ See page 1 & 2.

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Depth to Water Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 6							
7:40 am					1830	209	Sample after flow of 30 sec. from bailer.
					1830	218	Sample after flow of 1 min. 15 sec. from bailer.
					1830	210	Sample after flow of 2 min. 15 sec. from bailer.
8:10					1900	970	Sample after flow of 30 sec from bailer.
					1900	1280	Sample after flow of 1 min. 15 sec. from bailer.
					1900	1237	Sample after flow of 2 min. 15 sec.
8:35					2000	4218	Sample after flow of 30 sec. from bailer.
					2000	5680	Sample after flow of 1 min. 15 sec. from bailer.
					2000	5975	Sample after flow of 2 min. 15 sec. from bailer.
9:10					2100	4805	Sample after flow of 30 sec. from bailer.
					2100	5740	Sample after flow of 1 min. 15 sec. from bailer.
					2100	6030	Sample after flow of 2 min. 15 sec. from bailer.
10:03					2200	5250	Sample after flow of 30 sec from bailer.
					2200	6175	Sample after flow of 1 min. 15 sec. from bailer.
					2200	6210	Sample after flow of 2 min. 15 sec. fromhailer.
10:15					Discharge 186		Water almost clear.
10:40					2300	4010	Sample after flow of 30 sec. from bailer.
					2300	5855	Sample after flow of 1 min. 15 sec. from bailer.
					2300	6170	Sample after flow of 2 min. 15 sec. from bailer.
11:20					2400	5355	Sample after flow of 30 sec from bailer.
					2400	6265	Sample after flow of 1 min. 15 sec. from bailer.
					2400	6320	Sample after flow of 2 min. 15 sec. from bailer.
1:30 pm					2500	4040	Sample after flow of 30 sec. from bailer.
					2500	5910	Sample after flow of 1 min. 15 sec. from bailer.
					2500	6260	Sample after flow of 2 min. 15 sec. from bailer.

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 6							
2:00					2620	4680	Sample after flow of 30 sec. from bailer.
					2620	5880	Sample after flow 1 min. 15 sec. from bailer.
					2620	6270	Sample after flow of 2 min. 15 sec. from bailer.
12/2:45					2645	6050	Sample after flow of 1 min. 15 sec. from bailer.
					2645	6230	Sample after flow of 2 min. 15 sec. from bailer.
13/	Sample some what cloudy. Some fine sand in bottom of bailer.						
4:00 pm	Attempted to lower bottle filled with fluorescein dye to bottom of well but bottle broke at base of pump.						
5:40	1075		158½	72 9/10°F.	Discharge		Water sample collected for complete mineral analysis.
5:48							Pumping stopped at Well 4
5:53			138.60				Recovery measurements.
5:55			138.41				
5:56			138.30				
5:59			138.11				
6:04			137.91				
6:12			137.98				
6:15	1075						Pumping resumed at Well 4.
7:00	Attempted to lower bottle filled with fluorescein dye to bottom of well. Bottle placed inside 15 foot length of 4-inch pipe., Bottle broke before reaching bottom.						
8:30							Pumping stopped at Well 4.
April 8							
8:27 am			135.51				Well 4 not pumping.
8:45					570	179	Sample after flow of 30 sec. from bailer.
					570	176	Sample after flow of 1 min. 30 sec. from bailer.
9:10					1830	167	Sample after flow of 1 min. from bailer.
					1830	141	Sample after flow of 2 min. from bailer.
9:40					1900	3522	Sample after flow of 45 sec. from bailer.
					1900	4930	Sample after flow of 2 min. from bailer.
10:10					2000	3002	Sample after flow of 30 sec. from bailer.
					2000	4875	Sample after flow of 1 min. 15 sec. from bailer.
					2000	5720	Sample after flow of 2 min. 15 sec. from bailer.
10:55					2100	2435	Sample after flow of 30 sec. from bailer.
					2100	4980	Sample after flow 1 min. 15 sec. from bailer.
					2100	5915	Sample after flow of 2 min. 15 sec. from bailer.

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Well4	Temp.of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 8							
11:40					2300	3160	Sample after flow of 30 sec. from bailer.
					2300	4545	Sample after flow of 1 min. 15 sec. from bailer.
					2300	6050	Sample after flow of 2 min. 15 sec. from bailer.
12:25 pm					2620	3860	Sample after flow of 30 sec. from bailer.
					2620	5490	Sample after flow of 1 min. 15 sec. from bailer.
					2620	5950	Sample after flow of 2 min. 15 sec. from bailer.
1:30					850	195	Sample after flow of 2 min. 15 sec. from bailer.
5:00 pm	A special tube with attachments was prepared for lowering a can filled with fluorescein dye to bottom of well and opening it at the bottom. This was done by inserting the can near bottom of tubing and placing a plunger in a guide at the bottom of bailer. As the tube hit the bottom of the well, the plunger was forced up through the can. The tube was then surged to flush out dye in can. The tube was left near the bottom of the well for a few hours.						
5:03							Pumping started at Well 4.
5:05	1075						
5:08					Discharge 192		
5:15							No trace of dye.
5:45					Discharge 616		Water cloudy, some sand.
6:00					Discharge 495		" " " "
6:25					Discharge 433		Water slightly cloudy. Trace of sand.
7:20					Discharge 334		Water clear.
8:00					Discharge 307		
9:00					Discharge 277		
10:00					Discharge 256		Raised tubing. Dye had been flushed from can.
10:25							No trace of dye in discharg
April 9							
3:15 am							No trace of dye in discharg
3:25							Faint show of dye in discharge. (Green)
3:30					Discharge 212		
3:45							Good show of dye in discharge. (Green)
4:00							Strong show of dye in discharge. (Green)
4:30							Strong show of dye in discharge (Green)
6:15					Discharge 205		Strong show of dye in discharge. (Green)
7:15							Faint show of dye in discharge.
7:30					Discharge 199		
8:20					1900		Water has fair color but not as strong as that in discharge at 4:00 am

Time	Discharge Well 4 (GPM)	Depth to Water Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 9							
14/8:50 am					2300	5600	Sample after flow of 1 min 15 sec. from bailer.
					2900	6090	Sample after flow of 2 min 15 sec. from bailer.
14/ Water has faint green tint but not as strong as water from depth of 1900 feet.							
15/9:30					2620	6220	Sample after flow of 1 min 15 sec. from bailer.
					2620	6220	Sample after flow of 2 min 15 sec. from bailer.
15/ No trace of dye in water sample.							
16/10:30					2648	6390	Sample after flow of 50 sec. from bailer.
16/ No trace of dye in bailer sample. 7 feet of sand and cuttings in bottom of bailer.							
10:40					Discharge 188		
1:05 pm					Discharge 198		
1:35	1075		158±				
1:42			138.22				Pumping stopped at Well 4. Recovery measurements.
1:46			137.93				
2:03			137.33				
2:50			136.80				

April 10

3:30 pm Lowered tubing with can of fluorescein dye to bottom of well and broke can at bottom. After surging the tubing for some time the tubing was removed from the well.

The ball type bailer was then lowered to 2500 feet and a sample was collected at that depth. The color of the sample was pale green and the sample was saved for comparison. A sample was also collected from a depth of 2600 feet. This sample was a vivid green.

No pumping was to be done. Samples were to be collected the following day to determine the direction of movement of the lower water.

April 11

3:20 pm		136.11		
3:25			850	No trace of dye in sample.
3:40			1830	No trace of dye in sample.
4:00			1900	Faint green show. Water salty.
4:30			2000	Faint green show. Water salty.
4:50			2100	Faint green show. Water salty.
5:30			2200	Faing green show. Water salty.
7:00			2300	No trace of dye in sample. Water salty.
7:30			2400	No trace of dye in sample. Water salty.
8:30			2500	No trace of dye in sample. Water salty.

Time	Discharge Well 4 (GPM)	Depth to Water Well2	Depth to Water Well 4	Temp.of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 11							
11:45 pm	Lowered can with potassium permangenate to bottom of well and punctured can. Withdrew tubing after surging for some time. A bailer sample collected from a depth of 2400 feet showed only a faint trace of color. Areaction took place between the potassium permanganate and the iron in the lower water so that in looking for traces of the water effected by the solution, a brown to purple colored water was to be expected.						
April 12							
8:10 am			135.87				Well 4 not pumping.
9:00					1900		Water had very faint green tint.
9:30					2000		Water clear, salty taste.
10:00					2100		Water colored dark brown. Salty taste.
10:30					2200		Water colored pale brown, salty taste.
11:00					2300		Water colored pale brown, salty taste.
11:30					2400		Water colored pale brown, salty taste.
12:45		134.21					
1:00 pm					2500		Water very pale brown, salty taste.
1:40					2600		Water very pale brown, salty taste.

STATE OF IOWA

IOWA GEOLOGICAL SURVEY

GEOLOGY ANNEX

IOWA CITY

Results of Production Test and Chloride Studies on City of Mt. Pleasant Well 4 Mt. Pleasant, Iowa April, 1946

Well Name: City of Mt. Pleasant Well 4.
Location: NE¼ NW¼ NE¼ Sec. 9, T. 71 N., R. 6 W. Center Twp. Henry County.
Elevation: Drilling curb, top of 20-inch pipe, about 731.7 feet above sea level.
Owner: City of Mt. Pleasant.
Contractor: Thorpe Bros. Well Company, Des Moines, Iowa.
Engineers: Howard R. Green Engineering Company, Cedar Rapids, Iowa.
Drillers: Guy Elam, Ray McGrew and Pat West.
Drilling dates: Started January 4, 1945. Finished drilling, March 15, 1946.
Depth: 2648 feet below top of 20-inch pipe. (By Cable measurement)
Casing and hole size:
About 50 feet of 38-inch curbing from 0 to 50 feet.) Cemented in
About 68 feet of 34-inch curbing from 0 to 68 feet.) from bottom to
623 feet of 20-inch pipe set in 29-inch hole from 0 to 623 feet.) top with neat cement.
Open 19-inch hole from 623 to 2248 feet.
190'2" of 16-inch liner set in 19-inch hole from 2248 to 2438 feet.
(Shoe at bottom and top of liner.)
178'11" of 12-inch liner set in 15-inch hole and into 16-inch liner from 2405 to 2584 feet. (Shoe at bottom and top of liner. Burlap wrapper near top and bottom of liner.)
64 feet of open 12-inch hole from 2584 to 2648 feet.

Plugging data: The well was plugged back from 2648 to 2602 feet with cuttings that had been taken from the well. A cement plug was constructed with 23 sacks of cement which extended from 2602 to 2572 feet (into the 12-inch liner).

A bridge was constructed at a depth of 2045 feet and the well was filled with crushed rock and cement up to 2030 feet. A cement plug extending from 2030 to 1980 feet was poured using 106 sacks of cement. The top of the plug appeared to be solid when struck with the bailer.

Test Pump: Turbine pump setting, 177 feet below top of 20-inch pipe with 22 feet of suction pipe. Pump powered by Diesel engine with belt drive.

Pump base: A special pump base was constructed for this test. The hole for the pump head was offset to one side so that the pump would be near the wall of the 20-inch pipe. Another hole was cut in the pump base to allow a bailer to be lowered into the well at any time.

Bailer: The bailer used to collect water samples was 4-inches in diameter and 29.8 feet long. Ball type valves were in place at the top and near the bottom of the bailer. As the bailer was lowered in the water the balls were raised off the seat which allowed passage of water through the bailer. When coming up the hole the balls would seat and trap the water in the bailer at the point where the bailer was stopped or surged. The bailer was tied to the sand line of the drilling rig. The sample from the bailer was collected through a tapped hole in wall of bailer about 3 feet from bottom of bailer.

Water level measurements: The water level in Well 4 was referred to the rim of the hole in the pump base through which the bailer was inserted at an elevation of 2.25 feet above the top of the 20-inch pipe.

The water level in Well 2 was referred to the plate over the casing, 1.22 feet above the pump house floor and 1.7 feet below the measuring point for Well 4.

Discharge measurements: The discharge from Well 4 was measured with a rectangular box type weir with baffle plates.

Temperature measurements: The temperature of the water from Well 4 was measured at the end of 68 feet of 10-inch discharge pipe.

Results of Production Test and Chloride Studies on City of Mt. Pleasant Well 4 Mt. Pleasant, Iowa April, 1946

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 2	Depth to Water (feet) Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 19							
11:00 AM			140.98				
11:20		133.77					
11:25					Discharge	92	From Well No. 3 in City Park.
11:37			141.00				Pumping started at Well 4.
11:40							
11:45			179.4				Water very dirty
11:47	1012						(Dark brown)
11:48			179.8				
11:53	1012		180.4	69°F.			Water very dirty (Dark brown)
11:55			180.97				
12:00					Discharge	178	Water clearing somewhat. Contains mostly cement particles.
12:05 PM			177.9				Water very dirty. Cement particles.
12:15			174.23		Discharge	1349	Water very dirty.
12:30	1043		172.0	73°	Discharge	998	Water very dirty.
12:38	1043		170.7	73°			Water clearing slightly. (Dark gray).
12:40		137.40			Discharge	785	Water gray, very dirty.
12:45	1043		169.9				(Cement particles) Water clearing.
12:54	1043		169.4	73°	Discharge	669	Water light gray, dirty.
1:00					Discharge	539	Water light gray, cloudy.
1:30	1050		168.9	73°	Discharge	421	Water cloudy. Air lift well pumping.
2:10	1050		168.6	73°			
			168.6	73°	Discharge	386	
2:35	1050		168.6	73°	Discharge	353	Water cloudy.
2:55	1050				1980	6400	After flow of 15 seconds from bailer.
1/3:05					1980	6250	After flow of 1 minute from bailer.
					1980	855	After flow of 4 minutes from bailer.

1/ Cuttings in bottom of bailer. Bailer samples very muddy.

3:30			168.4			326	
3:45							Water cloudy.
4:00	1075		168.3				

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 2	Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 19							
4:25 PM	1075		168.40	73°	Discharge	295	Water cloudy.
5:00	1075		168.35	73°	Discharge	274	Water slightly cloudy.
5:25	1075		168.05	73°	Discharge		Water slightly cloudy.
5:30					Discharge	262	
6:00	1075		167.80	73°	Discharge	258	
6:52	1075		166.70	73°	Discharge	272	Water cloudy.
7:20			166.70				
7:45					1800	251	After flow of 30 seconds from bailer.
					1800	250	After flow of 1 min. 15 sec. from bailer.
					1800	254	After flow of 2 min. 15 sec. from bailer.
8:00					Discharge	237	
8:15					1900	1558	After flow of 30 sec. from bailer.
					1900	1275	After flow of 1 min. 15 sec. from bailer.
					1900	1560	After flow of 2 min. 15 sec. from bailer.
8:55					Discharge	227	
11:30	1106		167.0		Discharge	205	
April 20							
12:25 AM			167.3				
2/ 1:00					1982	6250	After flow of 30 sec. from bailer.

2/ Water in bailer samples very dirty.

2:30					Discharge	194	
5:00					Discharge	187	
7:40					Discharge	181	
8:50	1106		167.4	73			Water slightly cloudy.
9:05					1800	186	After flow of 30 sec. from bailer.
					1800	189	After flow of 1 min. 15 sec. from bailer.
					1800	188	After flow of 2 min. 15 sec. from bailer.
						177	Water slightly cloudy.
9:30					1900	742	After flow of 30 sec. from bailer.
3/ 9:40					1900	1170	After flow of 1 min. 15 sec. from bailer.
					1900	1232	After flow of 2 min. 15 sec. from bailer.

3/ Water from bailer was cloudy.

4/10:15					1950	5430	After flow of 30 sec. from bailer.
					1950	6050	After flow of 1 min. 15 sec. from bailer.
					1950	6080	After flow of 2 min. 15 sec. from bailer.

4/ Water from bailer is very dirty.

11:20					Discharge	170	
12:10					Discharge	117	From well No. 2.
12:50					Discharge	167	
1:00							Pumping stopped.

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
April 22					
8:50 am					Pumping started.
8:55	1075±	169±			Pumping rate kept constant.
9:00			Pump discharge	176	
9:15			" "	121	
9:30			" "	464	
9:45			" "	359	
10:00			" "	308	
10:30			" "	273	
11:20			1900	2155	After flow of 1 min. from bailer.
			1900	2240	After flow of 2 min. 15 sec. from bailer.
11:30			Pump discharge	240	
5/ 12:30 pm			1950	5350	After flow of 45 sec. from bailer.
			1950	5920	After flow of 2 min. from bailer.
5/ Water sample from bailer was dirty.					
1:05			Pump discharge	207	
6/ 1:30			1980	6200	After flow of 1 min. from bailer.
			1980	5510	After flow of 2 min. from bailer.
6/ Water sample from bailer was dirty.					
3:15				190	
3:30			1900	1420	After flow of 1 min. from bailer.
			1900	1560	After flow of 2 min. from bailer.
4:40			Pump discharge	184	
6:00			1980	1260	After flow of 1 min. from bailer.
			1980	1352	After flow of 2 min. from bailer.
6:35			Pump discharge	185	
6:40					Pumping stopped.

STATE OF IOWA
IOWA GEOLOGICAL SURVEY
GEOLOGY ANNEX
IOWA CITY

Results of Production Test and Chloride Studies on City of Mt. Pleasant Well 4 Mt. Pleasant, Iowa April, May, 1946

Well Name: City of Mt. Pleasant Well 4.
Location: NE¼ NW¼ NE¼ Sec. 9, T. 71 N., R. 6 W., Center Twp., Henry County.
Elevation: Drilling curb, top of 20-inch pipe about 731.7 ft. above sea level.
Owner: City of Mt. Pleasant.
Contractor: Thorpe Well Company, Des Moines, Iowa.
Engineers: Howard R. Green Engineering Co., Cedar Rapids, Iowa.
Drillers: Guy Elam, Ray McCrew and Pat Wood.
Drilling dates: Started January 4, 1945, Finished drilling March 15, 1946.
Depth: 2643 ft. below top of 20-inch pipe.
Casing and hole size:
About 50 ft. of 38-inch curbing from 0-50 ft.
About 68 ft. of 34-inch curbing from 0-68 ft.
} Cemented from bottom to top with neat cement.
623 ft. of 20-inch pipe set in 28-inch hole from 0-623 ft.
Open 19-inch hole from 623 to 2248 ft.
190'2" of 16-inch liner set in 19-inch hole from 2248 to 2438 ft. (Shoe at bottom and top of liner).
178'11" of 12-inch liner set in 15-inch hole and into 16-inch liner from 2405 to 2584 ft. (Shoe at bottom and top of liner. Burlap wrapper near top and bottom of liner).
64 ft. of open 12-inch hole from 2584 to 2648 ft.

Plugging data: The hole is plugged at the bottom up into the 12-inch liner. A bridge was placed in the hole so that the base of a plug composed of well cuttings and cement is at 2030 feet. The plug is 50 feet thick extending to 1980 feet. Another plug was constructed on top of this when salty water was found to get past the first. This second plug extends up to 1860 feet and is composed of cutting packed in gunny sacks and tamped with the bit and also some cement on top. The plug was allowed to set more than 24 hours and the driller reported that it was solid when struck with the bailer.

Test Pump: Turbine pump setting, 177 feet below top of 20-inch pipe with 22 feet of suction pipe. Pump powered by Diesel engine with belt drive.

Pump base: A special pump base was constructed for this test. The hole for the pump head was offset to one side so that the pump would be near the wall of the 20-inch pipe. Another hole was cut in the pump base to allow a bailer to be lowered into the well at any time.

Bailer: The bailer used to collect water samples was 4-inches in diameter and 29.8 feet long. Ball type valves were in place at the top and near the bottom of the bailer. As the bailer was lowered in the water the balls were raised off the seat which allowed passage of water through the bailer. When coming up the hole the balls would seat and trap the water in the bailer at the point where the bailer was stopped or surged. The bailer was tied to the sand line of the drilling rig. The sample from the bailer was collected through a tapped hole in wall of bailer about 3 feet from bottom of bailer.

Water level measurements: The water level in Well 4 was referred to the rim of the hole in the pump base through which the bailer was inserted at an elevation of 2.25 feet above the top of the 20-inch pipe.

The water level in Well 2 was referred to the plate over the casing, 1.22 feet above the pump house floor and 1.7 feet below the measuring point for Well4.

Discharge measurements: The discharge from Well 4 was measured with a rectangular box type weir with baffle plates.

Temperature measurements: The temperature of the water from Well 4 was measured at the end of 68 feet of 10-inch discharge pipe.

STATE OF IOWA

IOWA GEOLOGICAL SURVEY

GEOLOGY ANNEX

IOWA CITY

Production Results
Mt. Pleasant No. 4
April 29 - 30, 1946

Time	Discharge Well #4 G.P.M.	Depth to Water (feet) Well #4	Temp. of Water Well #4	Depth of Water Sample (feet)	Chlorides P.P.M.	Remarks
April 29, 1946						
10:30 AM	145.2					Not yet pumping.
10:40				(1650 B 0:30)*	190	
				(1650 B 1:15)	196	
				(1650 B 2:15)	191	
11:10				(1800 B 0:30)	163	
				(1800 B 1:15)	166	
				(1800 B 2:15)	166	
11:40				(1855 B 0:30)	210	
				(1855 B 1:15)	218	
				(1855 B 2:15)	220	
12:05				(1830 B 0:30)	156	
				(1830 B 1:15)	191	
				(1830 B 2:15)	217	
12:54 PM		145.56				Not yet pumping.
1:03						Pumping started.
1:05		158.87				Slowed.
1:07		153.66				
1:09		153.55				Speeded.
1:11		160.59				
1:13		155.97 ?				
1:14	750	158.10				Water dirty.
1:15				Pump discharge	125	
1:16		157.43				
1:17		156.63				
1:20		155.72				
1:24	750	155.19				
1:26		155.00				Water dirty.
1:28		154.72				
1:30		154.52	70½	Pump discharge	163	
1:34		151.19				Clearing but cloudy.
1:40		153.90				
1:45		153.79			246	
1:50		153.68	71½			Clearing but cloudy.
1:55		153.54				
2:00		153.55		Pump discharge	202	
2:05		153.50				Nearly clear
2:10		153.43				

*Bailer sample taken at 1650 feet after flow of 30 seconds from bailer.

Time	Discharge Well #4 G.P.M.	Depth to Water (feet) Well #4	Temp. of Water Well #4	Depth of Water Sample (feet)	Chlorides P.P.M.	Remarks
2:15		153.37		Pump discharge	186	
2:20		153.34				
2:30		153.27		Pump discharge	176	
2:41		153.28				
2:52		153.20	72			Cloudy.
3:01		153.08		Pump discharge	175	
3:16		153.09				
3:30				Pump discharge	163	
3:47	750	152.96				
3:48						Speeded pump.
3:49		161.00				
3:49½		161.84				
3:51		162.35				
3:52	1000	162.62				
3:56						Speeded one notch.
3:57		164.00				
3:58	1050					
3:59						Speeded one notch.
4:00		167.84		Pump discharge	157	
4:02	1040					
4:06		167.98				
4:08		167.74				
4:10	1075		72			
4:20		167.31				
4:26		166.80				
4:32	1043	166.54		Pump discharge	159	
4:45		165.80		Pump discharge		
5:01		167.81		Pump discharge	157	
5:30	1075	168.47		Pump discharge	154	
6:00		170.32		Pump discharge	152	
7:00	1100	171.16		Pump discharge	145	
8:00	1100	170.83		Pump discharge	142	
8:57		171.10		Pump discharge	138	Water clear.
10:02		171.17		Pump discharge	134	
11:00	1100	171.25		Pump discharge	131	
12:00 M		171.58		Pump discharge	131	
April 30, 1946						
3:00 AM				Pump discharge	125	
6:00				Pump discharge	126	
7:00	1100	172.00	72	Pump discharge	126	
8:00		171.73		Pump discharge	122	
9:00				Pump discharge	122	
9:30		171.54				
10:00				Pump discharge	119	
10:00				(1830 B 0:30)	154	
				(1830 B 1:15)	135	
				(1830 B 2:15)	143	
11:00				(1855 B 0:30)	1360	
				(1855 B 1:15)	1630	
				(1855 B 2:30)	791	
11:05				Pump discharge	119	

Time	Discharge Well #4 G.P.M.	Depth to Water (feet) Well #4	Temp. of Water Well #4	Depth of Water Sample (feet)	Chlorides P.P.M.	Remarks
11:55				Pump discharge	122	
1:00 PM				Pump discharge	119	Water white, cloudy.
				(1855 B 0:30)	131	
				(1855 B 1:15)	287	
				(1855 B 2:15)	370	
1:32	1090	171.17				Water clear.
1:50				(1855 B 0:30)	920	
				(1855 B 1:15)	615	
				(1855 B 2:15)	570	
2:15				Pump discharge	119	
2:45				(1855 B 0:30)	1010	
				(1855 B 1:15)	1080	
				(1855 B 2:15)	715	
3:10				Pump discharge	112	
				Pump discharge	113	
4:00	1070	170.50	72	Pump discharge	119	
4:30		171.20 Recovery				
4:32		132.14				Stopped pumping.
4:33½		138.62				
4:35		138.19				
4:36		137.94				
4:37		137.90				
4:38		137.81				
4:39		137.70				
4:40		137.64		Weir		Sample for analysis.
4:41		137.54				
4:42		137.48				
4:43		137.44				
4:44		137.38				
4:45		137.31				
4:50		137.14				
4:55		136.97				
5:00		136.85				
5:10		136.68				
5:23		136.53				
5:33		136.42				
5:43		136.37				
5:53		136.27				
6:03		136.21				

Results of Production Test and Chloride Studies
on City of Mt. Pleasant Well 4
Mt. Pleasant, Iowa
April, May, 1946

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
May 2						
5:40 pm				1650	98	After flow of 30 sec. from bailer.
				1650	88	After flow of 1 min. 15 sec. from bailer.
				1650	89	After flow of 2 min. 15 sec. from bailer.
5:56		135.33				
6:02				1800	93	After flow of 30 sec. from bailer
				1800	90	After flow of 1 min. 15 sec. from bailer.
				1800	92	After flow of 2 min. 15 sec. from bailer.
7:00				1830	94	After flow of 30 sec. from bailer.
				1830	94	After flow of 1 min. 15 sec. from bailer.
				1830	96	After flow of 2 min. 15 sec. from bailer.
7:45				1855	510	After flow of 30 sec. from bailer
				1855	275	After flow of 1 min. 15 sec. from bailer.
				1855	392	After flow of 2 min. 15 sec. from bailer.
8:02		135.30				
8:10						Pumping started.
8:12		144.5				
8:20	495					
8:22		142.70				
8:24		142.75				
8:25				Pump discharge 120		
8:26		142.75				
8:28	520		67.5			
8:31		142.77				
8:36		142.83				
8:40	520	142.79	70	Pump discharge 90		
8:45		142.77				
8:55				Pump discharge 88		
9:10		143.15		" "	99	Water clear.
9:18	520	143.15	71.5			
9:25				" "	116	
9:35				1855	2449	After flow of 30 sec. from bailer.
				1855	1140	After flow of 1 min. 15 sec. from bailer.
				1855	771	After flow of 2 min. 15 sec. from bailer.
9:40				Pump discharge 123		
9:55				" "	140	
10:11	520	143.16	72	" "		Water clear.
10:30				" "	173	
11:10		143.23		" "	145	

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 4	Temp of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
May 2						
1/ 11:25 pm				1860	1634	After flow of 5 sec. from bailer.
				1860	2240	After flow of 30 sec. from bailer.
				1860	772	After flow of 1 min. 15 sec. from bailer.
11:40					144	
May 3						
12:10 am	520	143.43	72	Pump discharge	145	
2:00				" "	140	
3:00				" "	140	
4:00				" "	140	
5:00				" "	140	
6:00				" "	138	
7:30	525	143.61	72			
7:35				1860	489	After flow of 5 sec. from bailer.
				1860	1015	After flow of 30 sec. from bailer.
				1860	715	After flow of 1 min 15 sec. from bailer.
7:40				Pump discharge	136	
8:10		143.55				
8:11						Discharge rate increased.
8:14	767					
8:16		150.70				
8:17		150.73				
8:19		150.77				
8:20		150.86				
8:25				Pump discharge	115	
8:28	767	151.11	72			
8:38				Pump discharge	128	
8:40		151.18				
9:25	767	151.35		" "	136	
9:57		151.50				
10:15				1860	1094	After flow of 20 sec. from bailer.
				1860	1362	After flow of 45 sec. from bailer.
				1860	790	After flow of 1 min. 30 sec. from bailer.
10:52	750	151.27				
10:55					107	
11:30	760	151.38		Pump discharge	128	
1:20	767	151.54		" "	127	
2:30				" "	126	
3:10		151.63				
3:30				" "	125	
4:10	760	151.52	72			
4:30				" "	127	
5:10	760	151.52				
5:30		151.51		" "	125	
7:05		151.54		" "	126	
7:30				1860	1208	After flow of 30 sec. from bailer.
				1860	1692	After flow of 1 min. from bailer.
				1860	808	After flow of 1 min. 30 sec. from bailer.
7:46						Pumping stopped.

1/ Water from bailer was cloudy (white).

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
May 3						
7:55				1860	1055	After flow of 30 sec.from bailer.
				1860	1330	After flow of 1 min. from bailer.
				1860	618	After flow of 1 min. 45 sec. from bailer.
May 5						
8:05 pm				1830	94	After flow of 30 sec. from bailer
				1830	93	After flow of 1 min. from bailer.
				1830	92	After flow of 1 min. 45 sec. from bailer.
8:50				1860	397	After flow of 30 sec. from bailer
				1860	415	After flow of 1 min. from bailer.
				1860	576	After flow of 1 min. 45 sec. from bailer.
9:30				1220	94	After flow of 30 sec. from bailer
				1220	93	After flow of 1 min from bailer.
10:45		135.0				
11:30						Pumping started.
11:32	520					
11:35		142.5				
11:40			65.5	Pump discharge	117	
11:50			68.5	" "	119	
12:00 m			70	" "	90	
May 6						
12:05				" "	92	
12:15				" "	123	
12:20				" "	92	
12:25				" "	94	
12:30				" "	95	
12:35				" "	100	
12:40				" "	107	
12:45				" "	120	
12:50				" "	131	
12:55				" "	132	
1:00				" "	137	
1:05				" "	143	
1:10				" "	144	
1:15				" "	147	
1:20				" "	145	
1:25				" "	149	
1:30				" "	147	
1:35				" "	148	
1:40				" "	145	
1:45				" "	147	
1:50				" "	146	
1:55				" "	145	
2:00	520	143.2		" "	146	
2:05				" "	148	
2:10				" "	145	
2:15				" "	142	
2:20				" "	147	
2:25				" "	143	
2:30				" "	145	
2:40				" "	144	
2:50				" "	142	

Time	Discharge Well 4 (GPM)	Depth to Water (feet) Well 4	Temp. of Water Well 4	Depth of Water Sample (feet)	Chlorides (Parts per Million)	Remarks
May 6						
3:00 am				Pump discharge	145	
3:15				" "	143	
3:30				" "	146	
3:45				" "	141	
4:00				" "	143	
4:30				" "	141	
5:00				" "	142	
5:30				" "	140	
6:00				" "	141	
6:30	520	143.55		" "	140	
7:00				" "	140	
7:20				" "	140	
7:30 a				1860	2203	After flow of 30 sec. from bailer
				1860	1395	After flow of 1 min. from bailer.
				1860	1845	After flow of 1 min. 45 sec. from bailer.
8:00				Pump discharge	139	
8:30				" "	108	
9:00				" "	137	
9:12						Pumping rate increased.
9:15	754	150.45				
9:30				Pump discharge	139	
9:45				" "	139	
10:00				" "	141	
10:15				" "	140	
10:30				" "	142	
10:45	744	150.7		" "	138	
11:00				" "	132	
11:15				" "	134	
11:45				" "	132	
12:00 n				" "	131	
12:15 pm	744	150.8		" "	132	
12:20						Pumping stopped.
1:00					116	Discharge from air lift well.

STATE OF IOWA

IOWA GEOLOGICAL SURVEY

GEOLOGY ANNEX

IOWA CITY

Preliminary Generalized Geologic Log of Mt. Pleasant City Well #4 from detailed sample study by Iowa Geological Survey

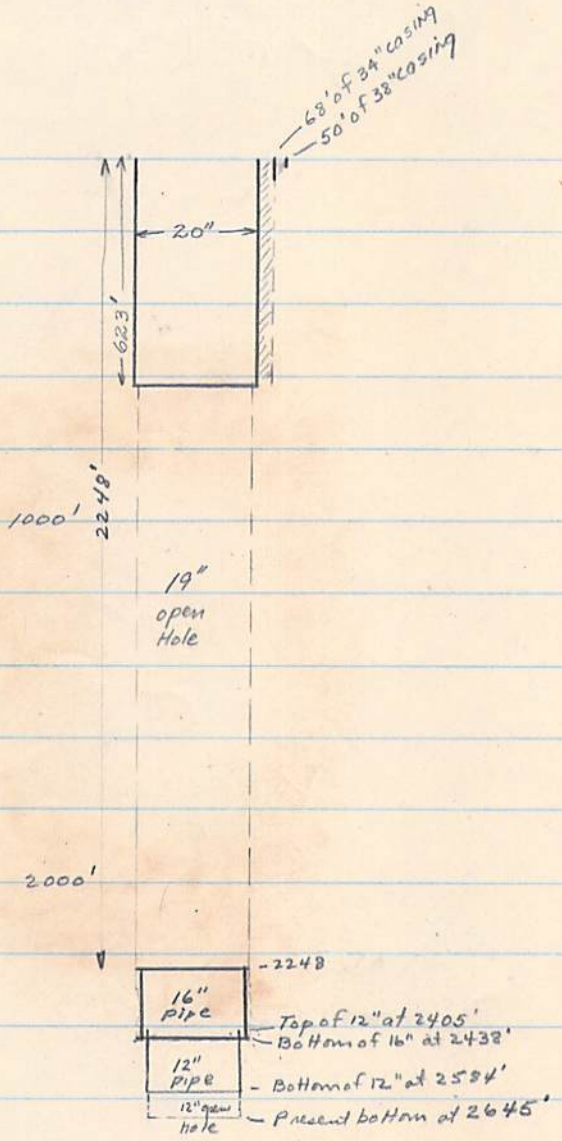
	Thickness	From	To
Pleistocene system - clay, sandy, pebbly (St. Louis type, cherty limestone indicated from 40 to 50 feet, boulder?)	65	0	65
Mississippian system			
St. Louis formation - sandstone and limestone	10	65	75
Warsaw formation - shale, gray with some limestone	40	75	115
Keokuk formation - cherty limestone and dolomite	35	115	150
Burlington formation - cherty limestone and dolomite	50	150	200
Hampton formation			
Wassonville-North Hill members - dolomitic limestone	25	200	225
Prospect Hill-McCraney members			
shale	8	225	233
siltstone and dolomite	17	233	250
English River formation - siltstone	20	250	270
Mississippian-Devonian systems			
Maple Mill formation - shale, green and brown	290	270	560
Devonian system			
Cedar Valley formation - argillaceous limestone	120	560	680
Wapsipinicon formation - limestone and gypsum	122	680	802
Ordovician system			
Maquoketa formation - sandy shale	23	802	825
Galena formation			
Dubuque-Stewartville members - dolomite	90	825	915
Prosser member - cherty dolomite	130	915	1045
Decorah-Platteville formations			
dolomite	59	1045	1104
sandstone	24	1104	1128
shale (Glenwood)	22	1128	1150
St. Peter formation - sandstone	35	1150	1185
Prairie du Chien formation			
cherty, sandy dolomite	365	1185	1550
cherty dolomite	167	1550	1717
Cambrian system			
Trempealeau formation			
Jordan member - sandstone and sandy dolomite	83	1717	1800

	Thickness	From	To
St. Lawrence member			
dolomite, gray, medium-grained, porous	85	1800	1885
dolomite, yellow and pink, fine-grained	120	1885	2005
Franconia formation			
siltstone, dolomitic	45	2005	2050
shale, green, silty	25	2050	2075
dolomitic siltstone and siltstone with some shale beds	123	2075	2198
dolomite	26	2198	2224
siltstone, sandy, dolomitic	56	2224	2280
Dresbach formation			
Galesville member - sandstone, fine-grained	35	2280	2315
Eau Claire member			
sandstone and shale	25	2315	2340
shale with some dolomite and sandstone beds	210	2340	2550
Mt. Simon member			
shale, red, sandy	20	2550	2570
shale, reddish brown	10	2570	2580
sandstone, medium- to coarse-grained	68	2580	2648

(Subject to Revision)

(4)

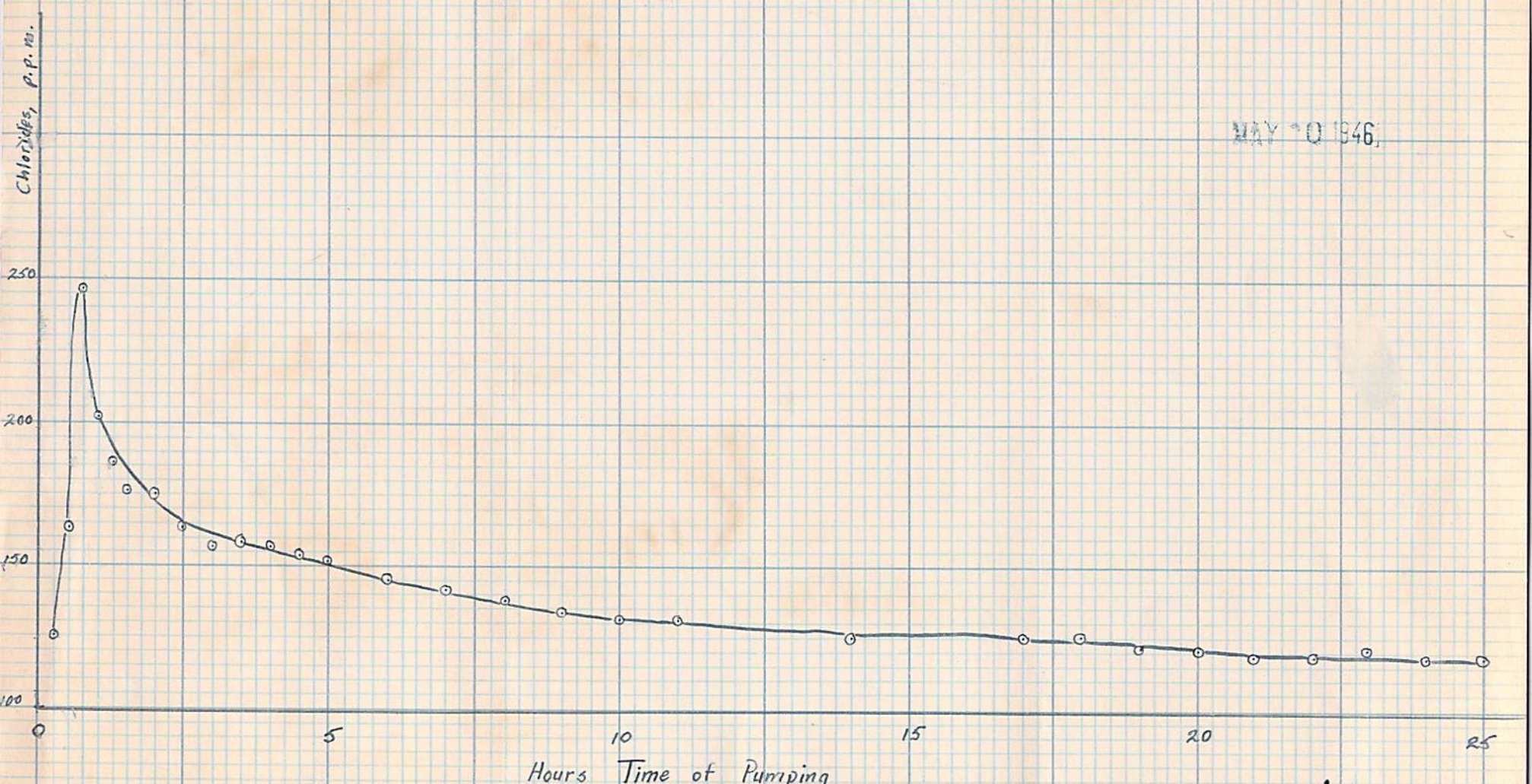
Hole & Casing Data for Mt. Pleasant City Well No. 4

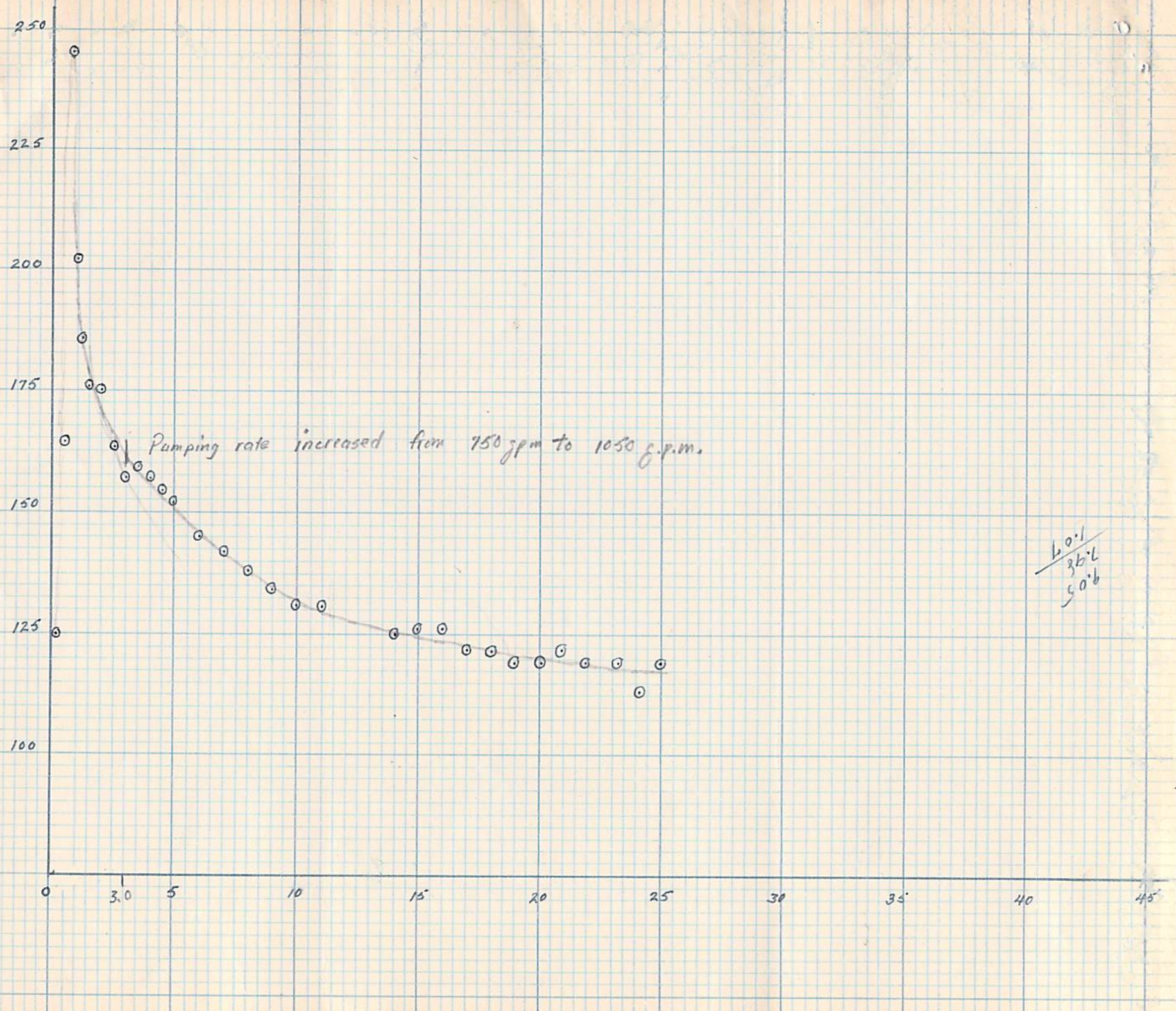


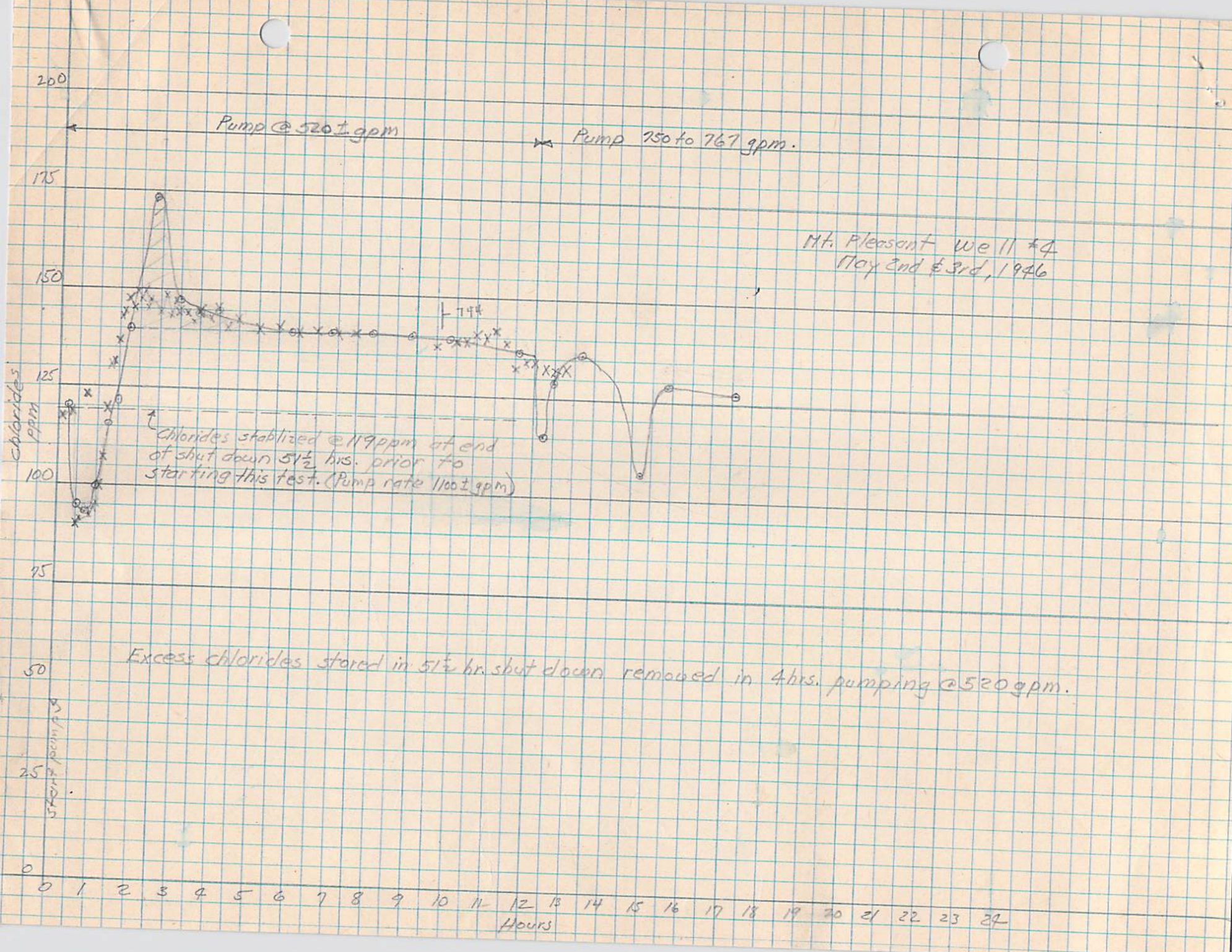
2581
179
2405

GW

Variation of Chloride Content in Pump Discharge
With Number Hours of Pumping.
Mt. Pleasant #4 Well
April 29-30, 1946.




250
225
200
175
150
125
100
0
3.0
5
10
15
20
25
30
35
40
45
Pumping rate increased from 750 gpm to 1050 g.p.m.


Mt. Pleasant well #4
May 2nd & 3rd, 1946
Pump @ 520 ± gpm
Pump 750 to 767 gpm.
74#
Chlorides stablized @ 119 ppm at end of shut down 51½ hrs. prior to starting this test. (Pump rate 1100 ± gpm)
Excess chlorides stored in 51½ hr. shut down removed in 4 hrs. pumping @ 520 gpm.
Chlorides ppm
Static Water Level
Hours
200
175
150
125
100
75
50
25
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

MOORE'S MODERN METHODS

Mar. 18, 1946

Log of Mt. Pleasant City Well No. 4 #1

Started Jan. 4, 1945

0-5	soil	drilling 34" hole Driller Guy Elam
5-10	yellow clay - 6" of cemented at 50'	
10-68	yellow & blue clay	
68-77	Gray lime	drilling 29" hole at 68' - Set 68' of 34" temp casing
77-90	blue shale	next curbing 24' of 45" curbing
90-115	" " & lime shells	50' of 38" curbing set at 50'
115-145	Gray lime with streaks of shale	32" curbing set at 95'
145-220	GRAY lime	Start 29" hole at 95'
220-225	lime & shale	
225-233	green shale	
233-252	gray lime, hard	(hole muddy)
252-255	shale	
255-262	GRAY lime	(Maple Mill at 262')
262-330	Blue shale	
330-400	Brown shale	
400-480	Blue shale	(carrying muddy hole)
480-520	Brown shale	
520-535	Green shale	
535-540	gray lime hard	
540-550	green shale	
550-554	gray lime hard	
554-563	green shale	
563-575	gray lime, hard	
575-580	lime and shale & shale	
580-585	gray lime hard	
585-602	Brown lime hard	
602-605	shale	
	3-18-45 to 7-6-45 (fishing job)	
605-620	gray lime, hard	(Setting 20" casing at 623' center guides at 60-115-242-373-547+620, cleaned hole cemented using 1187 sacks - found in water 2-inch line. Couldn't pull 32+34 inch curbing, pumped in 1290 sacks cmt. +10 sacks between 34+38" casing)

no cement found in 20" ~~hole~~ pipe

Mt. Pleasant #4 Drillers log #2

620-700	gray lime	drilling 19" hole
700-766	brown lime	no water encountered setting pipe at 620'
766-770	gray shale	
770-802	gray lime	
802-832	green shale	
832-845	Brown sandy lime	(Got water at 832' - rose to 242' below top of casing.
845-1104	Brown lime	SWL 220' at 900' depth " 190' at 990' "
1104-1110	Sand	
1110-1115	sand, soft	
1115-1128	sand / foot hole from 1119-1120	SWL rose to 180'
1128-1145	green shale	
1145-1150	Slate & shale - (caving material	
1150-1180	Sand, & Pebs	
1180-1325	Brown lime	hole caving while drilling 1275-1475
1325-1475	Gray lime	
Stopped to cement out caving material		(put in bridge at 1150 to cement out cave. " in 260 sacks of cement through 2" pipe SWL after cementing and drilling out 190'
1475-1515	gray lime	
1515-1550	" " hard	
Shut down to put in cables		SWL rose to 150'
1550-1717	gray lime	
1717-1745	Jordan sand	
1745-1825	Sand with lime	
1825-1832	sand	
1832-1890	gray lime	SWL 145' at 1832' depth Reamed to 15" hole at 1835' No cutting from 1840-1850 water was clear
1890-2010	Brown lime	
		15" hole to 1925' - 12" hole to 1930 and 11" hole started at 1930'
2010-2040	Gray lime	
2040-2130	Sand with lime streaks	
2130-2180	Gray lime	
2180-2215	Brown lime, hard	

MOORE'S MODERN METHODS

#3

Mt Pleasant #4 Drillers log

(3)

2215 - 2285	sandy lime
2285 - 2290	sandy shale red
2290 - 2355	sandy shale, brown & green
2355 - 2375	green shale
2375 - 2415	green & gray shale Hole started to cave at 2380'

Reamed hole to 19" from 1837' to 2437 feet
From 11-6-45 to 12-13-45

2415 - 2430	Blue shale hole caving (drilling 19" hole)
2430 - 2435	red shale

hole caving badly so decided to set 16" liner pipe could not go
Straightening hole 12-28-45 to 2-18-46
set 190'2" of 16" liner at 2438 feet. drilling 15" hole

2435 - 2480	Blue and red shale started hole caving some at depth of 2480
2480 - 2525	Brown shale SWL at 145'
2525 - 2560	gray shale
2560 - 2570	red shale
2570 - 2580	red shale sandy
2580 - 2610	sand (Hole reduced to 12" at 2584'

SWL lowered to 152'
set 178' 11" of 12" liner (shoe on bottom & top of pipe. at 2584

2610 - 2620	red shale sand
2620 - 2645	white sand, soft. on 3-16-46

Guy Elam
Pat West
Ray McGrew
} drillers

7.36 1.63

MOORE'S MODERN METHODS

Mt Pleasant #4

April 2, 1946

	depth to water
1:33	152.98
1:52	152.91
2:02	152.82
2:09	152.76
2:14	152.72
2:19	152.70
2:54	152.64

Measurements to upper pump base by tape

2.13 above casing

2.26 above casing

#4

time	water level	weir	temp	remarks
4:54	152.42			
8:19	152.33			
9:30	~~159.9~~			
9:34	159.97			started pump
9:36	160.5	5"		
9:40	161.61	5 1/8"	58°	water cloudy
9:48	162.96			
9:50		5"	61°	cloudy
9:51	163.38		63°	very dirty
9:56	158.37			
10:03	153.60			
10:07		5 1/2		very dirty
10:08	152.30			
10:16	154.02	5 5/8	68°	clearing somewhat
10:23	155.20	5 1/2	69°	clearing
10:31	~~155.50~~	5 1/2	70° -	clearing slightly
10:34	155.64			
10:38	154.73			
10:41		5 1/2	72°	Air Temp 55°F little muddier
10:44	154.23			
11:07			73°	
11:10				
11:15	152.44	5 1/2	73 1/2°	B-24 trailer dirty
11:30	151.80	5 1/2	74° -	clearing very slightly
11:36				pumping speeded
11:40			74°	
11:50	159:45			
11:55		7 3/8	74°	
Apr. 3				
12:21	158.98			
12:23		7 1/2	74°	

MOORE'S MODERN METHODS

Mt Pleasant #4
April 3, 1946

time	DW	weir	temp	Remarks
12:38		7½	74	
				sp. 2640 U.S. ~~30~~
1:10 p	166.35			
1:30	164.57			
1:50		7 3/4		6788 gpm
2:14	163.88			
2:29		7 3/4	73½°	water dirty
2:32				G-~~123~~ from 2640
2:50	153.38	7 5/8	73½°	
3:20	153.05			
3:21	Pumping rate increased			
3:23	156.63			
3:27		8½	73½°F	
3:30	156.67			
3:55	156.70	8½	73½°F	
4:08	156.65			
4:24		water sample from depths of 2580		
4:41	156.20	8½ -767		water cloudy
4:44	~~159.5~~	Motor speeded up		
4:45	159.5			
4:49		9 3/8 -870	73°F - water cloudy	
4:55	159.2			
5:25	158.6	9 3/8 - 870		
5:40		G-123 top of bailer		
		bottom of bailer		
5:45		Sample at Discharge		

MOORE'S MODERN METHODS

Mt. Pleasant, Iowa
City Well No. 4 — Apr 1946

Time	DW	Weir	Temp	
Apr 3				
6:00a	157.6	9¼	73°F	
6:03		Shut down		
6:04	141.45	Recovery		
6:05	141.11			
6:06	140.31			
6:07	139.83			
6:25	138.65			
6:30	138.72			
6:35	138.62			
6:45	138.48			
6:50a	138.47			
7:00a		Bailer samples from 2580' (bottom bailer) (top bailer)		
~~7:19~~	~~138.40~~	"		
7:19	138.40			start pumping.
7:20	150.5			
7:21	157.15			
7:23	152.95			
7:25	153.25	9⅛		water dirty
7:29	153.75			
7:34	153.42	9.0	72°F	water dirty
7:43	153.63	9.0		
7:50	153.65			
7:53	153.40	9.0 (828)	73°F	Water dirty
8:16	153.13			
8:32	153.07	9.0		water cloudy white
8:49	152.88			
9:08	152.80	9.0		ditto
9:24	152.91			
9:41	152.80	8⅞		water cloudy
10:04	152.79	9.0		"
10:37	152.78	9.0		"
10:55	152.75	9.0 (828)	73°F	"

MOORE'S MODERN METHODS

Mt. Pleasant City Well No. 4

Apr. 3, 1946

Time	No 4 D.W	Weir	Temp.	Remarks
Apr. 3				
11:15a	Bailer sample Depth 2600 feet			G-65 bottom
				G-123 top
	Little leakage			
11:37	Bailer sample. Depth 2205'			G-63 bottom
				G-52 top
11:52	152.54			
1:32	153.73	9 3/8	73°	Water cloudy
2:27	153.52	9 3/8	73°	" "
3:20	153.59		73°	" "
3:28		9 3/8		
3:45	bailer spl 2600'			G 35 bottom
				G 52 top
3:52	discharge spl			G 63
4:27	Pumping stopped			
4:37	138.0			
4:42	137.5			
4:45	137.51 tape			
4:52	137.30 tape			
5:02	137.14 tape			
5:09	137.03			
5:18	136.96			
6:48	136.59			
7:05	136.55			
7:15	Bailer sample collected from 2600'-G-123			
7:32	pumping started			
7:43	159.5			
7:49	160.29			
7:55	160.60	10 3/4 (1043)	73°F	
8:02	160.47			Water very dirty
9:34	159.80	10 3/4 (1043)	73°F	Water clearing
9:13	159.52	10 3/4	73°	water a little cleaner
9:31	159.56			
9:40	Bailer sample from depth of 2600 feet (Sand)			top - G-63 bottom - G-123
9:55	Collect sample from ~~well~~ discharge line - G-52			
10:24	159.58	10 3/4	73° air 50°	water milky

160.55
#3

April 3

11:25	159.28	10 7/8	73°	cloudy white
12:20 Apr 4	159.5			
12:25 Ap		10 3/4	73°	" "
12:34	bailer spl 2600			
5:45		10 7/8		cloudy white
5:50	bailer spl 2600'			
6:07	159.5	10 7/8		
6:08	Shut down			Spl G-20 after 30 sec
6:09	140.0			spl G-11 after 1:30
6:10	139.1			spl No G " 2:30
6:11	138.69			focus 4 min
6:12	138.67			Pump sample G-35
6:17	138.20			
6:23	137.77			
6:29	137.52			
7:02	136.80			
7:10	Bailer sample -		G-3 1:30.	
			G-65 - 2:30	
			4 plank in 2:45	
7:25	136.75			
7:47	136.3			pump on
7:48	156.45			
7:51	157.30			
7:53	159.26			a bit of trouble
7:58	161.24			
8:08	161.16			
8:10		11-	73°	water dirty
8:15	160.65			
8:39	158.8			
9:05	159.8			
9:18				~~motor~~ pump failed
9:23				pump started
9:51	158.7			
10:10	158.6	11±		
10:30	Bailer sample at 2600ft - discharge sample			

Time	DN	Weir	Temp.	
Apr 4				
6:45 p	Bailer sample at 2620'			
7:00 p	" " " 1800'			
7:29 p	142.40	505	72½°F	Water almost clear air 47°F
7:45	Bailer sample at 2620'			
8:00	Bailer sample from 2100'			
10:00	Bailer sample from 2620 (upper ball kept open			
10:20	Pumping rate increased from 500 to			
10:25	11" - 1075		temp 72½°F	Water fairly clear
10:30		160'		
10:40	11" - 1075	158'		
10:50	Water sample collected from discharge			
11:55	bailer sample at 2620 after considerable surging with upper ~~ball~~ valve ball open			
Apr 5				
7:40A	11¼" - 1090	158.60'	temp 72½°F	Water cloudy
7:50	Bailer sample 2620 - upper ball open surged 15 times raising bailer 45'. water clear from bailer no apparent leakage. Bailer not slipped up hole.			
840	Bailer sample - Both balls down - no surging Depth 2620			
9:20	Bailer samples - Both balls down surged 20' strokes for 30 mins - 2620'			
10:35	Bailer sample - Both balls down surged for half hour 2620			
11:15	Bailer at 1800' - Both balls down - no surge			

12:45a- Discharge sample
12:30 Bailer sample 1980' - 2 balls down - No surge
Not much leakage

1:03 p- sample from 200' to check chlorides

1:05 p Bailer at 2000 - 2 balls down - no surge
— out Bad leaks

1:15 Pouring water down between pump column and casing to eliminate possibility of chlorides in this section.

3:00p shut off water. Collect Discharge sample

3:45 Bailer at 2000 - 2 balls down - No surge
water slightly cloudy

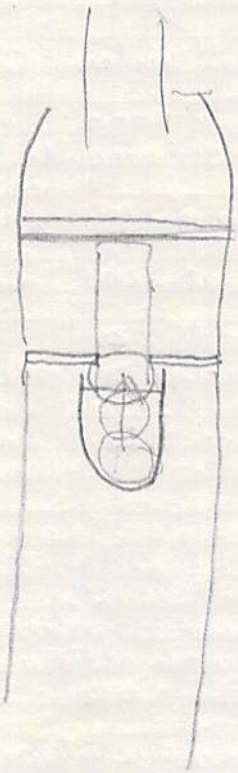
4:00 Bailer at 2100 same

4:30 Bailer at 2200' - same

6:15 Bailer at 2400'
6:30 Discharge sample
7:00 Bailer at 2500' - raised at 2'/sec
7:40 Bailer at 2620 - same
8:20 Bailer at 2620 - auger raised 1.3'/sec

Apr 6
7:15A 158.05 10 7/8 - 1075' Water temp 72½°F Cloudy
7:27 Well No 2 139.2'
7:30 Discharge sample
7:40 Bailer sample at 1830 - 2 balls down surged brought back at 2'/sec 1.7'/sec

8:10 - Bailer sample at 1900' Same - no discharge
8:35 " " " 2000' same " "
9:10 " " " 2100' same " "
10:08 " " 2200' " " "
10:15 Discharge sample
10:40 " " at 2300' some discharge in bailer
11:20 " " at 2400'



apr. 6

11:30- air lift started
1:30 Bailed at 2500'-
2:00p " " 2620'-
2:45 Bailed at bottom

5:48 Shut down G-3 shutdown
5:53 - 138.60
5:55 - 138.41
5:56 138.30
5:59 138.11
6:04 137.91
6:12 137.58
6:15 Pumping started

8:20 p- bottom
8:27 p

MOORE'S MODERN METHODS

Mt Pleasant No. 2 Apr 1946

Time	DW
Apr 2	~~134.61~~
9:45	134.61
9:53	134.78
10:11	135.00
10:20	135.09
10:35	135.14
11:21	135.39
11:29	135.42
12:00	136.02
Apr. 3	
12:30am	136.20
1:05	136.25
1:34	136.24
2:09	136.23
3:07	136.25
4:13	136.55
5:00	136.88
5:20	137.07
6:48	134.86 MP No 2 is 1.7' below M.P No. 4
7:33	135.80
7:52	136.25
8:20	136.49
9:51	136.62
9:44	136.78
10:40	136.94
1:37	137.18
3:22	137.32
4:55	135.31
5:20	134.94
6:56p	134.37
7:30	134.20
7:53	136.55
8:13	137.01 (may be 137.21)
9:05	137.59
10:20	138.00
11:31	138.25
12:27	138.35
5:47	138.43
6:15	136.76

MOORE'S MODERN METHODS

Mt P #2

apr 4

7:29	135.30
9:00	137.08
9:30	138.01
1:43	136.86
2:52	137.00
3:35	137.63
4:41	137.71
6:33	136.60
7:34 p	136.60
8:23 a	139.15 apr 5

6200 x 100 (1-x) 186

$6200 \frac{86}{6100} =$

x = 15 gpm lower water

Mt Pleasant #4

sd part of pump

Northway

Randy – 377 6339

call —

dam silt qtz/feldsp, mica
coal
sd qtz/feldsp
limestone, rdd grains

probably all Pleistocene

April 20, 1996

Brian Wilke, Bill Barker

Comment by Randy Northway (4/20/94)

Recased in 1962 to 650'

B Witzke

B Bunker

March 28, 1944

Mr. Howard R. Green
208-210 Bever Building
Cedar Rapids, Iowa

Dear Mr. Green:

Some of the salient points in the consideration of a well to the Dresbach formation at Mt. Pleasant are discussed in the following paragraphs:

A sharp structure occurs at Mount Pleasant. Therefore location of the well will be important in estimating depths. In this discussion all depth figures apply to the location of the No. 2 city well where the elevation is 671 feet. The rock intervals and other data are based on the information that we have on the New London city well, the Murray Iron Works deep well at Burlington, and other wells penetrating the Dresbach in eastern Iowa. Some additional work should be done on existing wells before a final and complete report is presented.

Beneath the Jordan sandstone in the Burlington-New London area occurs the St. Lawrence dolomite with a thickness of approximately 205 feet. It is underlain by the Franconia formation composed of glauconitic, dolomitic, siltstones and sandstones, silty, sandy dolomites, and some green shale. Underlying it is found the Ironton sandstone which is about 40 feet thick.

The Dresbach sandstones lie beneath the Ironton. The Dresbach is represented by three members: 1) the Galesville at the top, 2) the Eau Claire in the middle, and 3) the Mt. Simon in base.

The Galesville is interpreted as representing the bottom 40 feet in the Murray Iron Works well. In the New London city well it is interpreted as being 23 feet thick. In both wells it is composed of sandstone, the lower portion of which is slightly dolomite cemented in the lower 25 feet at Burlington. The Eau Claire beds were undrilled at Burlington but were penetrated at New London where they were found to be 204 feet thick, and to be made up of sandstones, maroon and green-gray shales, and a very minor amount of sandy dolomite. The Mt. Simon member at New London was found to contain sandstone throughout the 135-feet of the sampled drilling. In order to reach the equivalent total depth of the Murray Iron Works well in a well at Mount Pleasant it will be necessary to drill to a depth of 2360 feet. At the Mount Pleasant site it would be necessary to drill to a depth of 2735 feet in order to reach the equivalent total depth of the New London city well.

From the meager figures available it appears that the static level in a well with all aquifers below the Jordan uncased would be about 70 feet.

The chemical characteristics of Dresbach water at Mount Pleasant are not exactly known. The best approximation available is from analyses of water from the New London and Murray Iron Works wells which are appended with an analysis of water from the No. 2 city well at Mount Pleasant. It is reported that water from the well penetrating the Dresbach at New London is better than water from the well to the Jordan. New samples should be collected from the New London and Mount Pleasant wells before final conclusions are drawn in regard to the possible mineral composition of Dresbach water at Mount Pleasant.

Production of the Murray Iron Works well was 2000 g.p.m. with approximately 10 feet of drawdown and 2250 g.p.m. with a drawdown of 20 feet. The deep New London well is reported to have produced 250-300 g.p.m. for a period of 48 hours with a drawdown of 6 feet from a static level of 185 feet.

Drilling below the Jordan sandstone at Mount Pleasant will be of great interest to us and will afford valuable geologic data. I trust that you will find it possible to have the driller save a complete set of cuttings from any new well drilled.

Very truly yours,

H. G. Hershey

HGH:N

Inc.

To check the observations made on your well we made up one or two trial batches of neat cement and water in the office, placed them in a 48 inch length of glass tube and observed the following results: 1 foot depth of cement in the tube was brought to a total 2.44 feet of depth by the addition of water. This was shaken up until it was well mixed and then permitted to stand quietly and the cement finally set with its upper elevation 1.5 feet above the bottom for a 50% swell. The balance of the water, of course, stood above the level of the concrete grout. This is the result which was secured by simply mixing the entire amount of cement with water and letting it settle into place. However, when the grout is pumped through a pressure pipe and forced to rise in the well 20 or 30 feet there is apparently sufficient agitation to permit another 25% of water to escape to the surface and that is the action which we have found happened at your will. For example:

Sunday, July 15, depth of well 620. Placed 50 sacks (50 cubic feet) of Hi-Early strength. The annular space was theoretically 241 square inches, which would require 2.41 cubic feet of grout per foot of height. Therefore, theoretically this grout should have risen to 20.8 feet above the bottom but on the following day its upper surface was found 30 feet above the bottom for a swell of 9.2, or 146% of the volume of cement in the mix.

On Monday the surface of this grout was flushed with clear water for 10 minutes and thereafter 810 sacks of cement were placed for a theoretical rise of 336 feet. The following day the actual rise was found to be 400 feet for a swell of 64, showing that the grout was equal to 118% of the volume of cement placed.

Tuesday, July 17, after flushing the surface of yesterday's grout clean, at a depth of 190 feet below the surface 327 sacks of cement were placed which, theoretically, should have brought the surface up to within 63 feet of the ground surface by reason of the fact that this operation overlapped from the 29 inch hole up to the 38 inch hole where 5.74 sacks per foot of rise were necessary. Actually, however, the surface of the grout came to within 24 feet of the ground surface for an overrun of 39 feet, which again was 118% of the theoretical distance.

Wednesday, July 18, no grouting.

Thursday, July 19, and the day following, 114 sacks were used to fill the remaining 24 feet whereas it only figures to bring the level up 20 feet, thus the volume of grout equals 120% of cement volume.

Except for the first day's run the swell at 18 to 20 percent is very constant, but on the first day's run only 30 feet of grout was placed and it was of a different brand than they used on the other days. I am at a loss to explain why the cement on that day was greater than the others.

In thinking about this situation, and you really did get us to thinking, we have looked up considerable data. According to the laboratory manuals, if we mix water with Portland cement to just the amount necessary to get a compact plastic mortar the volume of dry cement required is 12% more than the volume of the resulting mortar. In other words, under that condition there is a shrinkage in volume upon mixing. Dry cement has about 51% voids whereas a normal compact grout has 40 to 43% voids after compaction and still is absolutely impervious to the passage of water through it. A 1 to 4 concrete having only 12 to 14% voids will permit water to percolate through it. This is for the reason that even though the neat cement grout has 4 times the amount of voids they are so tiny and uniform that they do not line up in the channel as in the case of a less porous concrete. Another thing to remember is that water to only 8 to 10% of the weight of cement is required to go into combination with the cement to insure setting and any surplus of water using above that amount fills the pores before mentioned or finds its way to the surface as free water before setting takes place. My personal theory is that by pumping the grout down a pressure line to a submerged outlet, from which point it is forced to rise to a distance of 60 to 80 feet, a considerable quantity of the water is held entrained in the mortar and thus accounts for the swell or the overrun in surface rise. I don't think that this fact has any particularly bad effect on the results. I have checked on several tunneling and dam foundation projects where cavities and fissures in rock formations are grouted by this theoretical means and where the waterproofing effect could be observed and all of these operations were reported as successful.

Anyway you brought up a very interesting question.

Yours very truly,

HOWARD R. GREEN CO.

By H R Green

HRG:ab

Mr. Speaker phoned this morning soon after 8 o'clock and I talked with him since Yonah Stan were gone. He wanted the chemist to come right back down to Mt. Pleasant since they had more samples, which he said were "getting better." I said George couldn't come this morning since no car was available. Then he wanted to know if you could come down this P.M., and I said I

consult Ray! He wants you to phone him when you get back —
Mt Pleasant 36 - Lee T. Spradley

George phoned results of following tests:

	Chloride
2170'	~~70~~ 140 ppm
2260'	410 ppm

(Duplicate of info. phoned to Hurd, H.) M.

Oct 26, 1945

Dr. Hershey

Speaker called early this morning to ask that someone come down to run accurate chlorides. He wanted someone to stay for some time. He reported that the chlorides were now running 5 times as high as the Jordan. I said that you were out of town but that George & I would go down today - which we did.

When we arrived we found that Speaker had been called to the Hospital at I.C. & was expected back at 1. At one we set up George's equipment & I got water samples taken at 2260 & 2280 from Elom. These we ran through & found that the chlorides are definitely high enough to why about:

2260 - 410 ppm

2280 - 446 ppm

We waited around, talked to Elom & McGrew etc, until about 4 & Speaker had not yet returned. I left a note giving him the above figures and saying that I would ask you to call when you got back tonight. Of course, you haven't

(over)

been able to make it so I suspect he will call in the morning.

I have asked George to determine the chlorides on the sample from 2175 the first thing in the morning so you will have it when you get back.

Drilling is now between 2280 & 85 but I don't know just when Speaker first noted high chlorides. Last saturday he reported only 16-35 ppm.

I decided to go on with the trip to Davenport & am taking the Ford and my Chevy - expect to be back for supper & will call you.

Stopped to see Van Winkle in NE Jefferson Co. They seem to be in St. Louis at 107 feet. Bedrock at 91'. Still drilling & no water.

Stan

November 7, 1945.

Mr. Lee F. Speaker,
City Manager,
Mount Pleasant, Iowa.

Dear Mr. Speaker:

We enclose herewith a copy of a letter addressed to Thorpe Well Company which I think you will find self-explanatory and which we have discussed by long distance phone today.

I have been over this matter thoroughly with Mr. Thorpe and believe that this is the best solution of the problem which confronts us at the moment. It is my hope that the elimination of the $5,000 worth of casing will cover the cost of this extra work order and I am quite sure from my talk with Mr. Thorpe that it will do so provided that no great quantity of caving shale is encountered below the present 2415 foot depth.

The $7.50 per foot which Mr. Thorpe has bid on the 580 feet of reaming (and this amount is definite) amounts to $4,350.00. The 170 feet of 16 inch pipe at $3.30 per foot amounts to $561.00 and these two total $4,911.00, which is still under the casing provided for at Item 9 in the specifications. If there is any change from the foregoing it will probably be to use a smaller and less costly liner than the 16 inch, but Mr. Thorp's proposal states that he will bill you the market price on the liner that is used. It seems to me that this can not vary greatly from the estimated amount as I just talked with Dr. Hershey by long distance phone and he is willing to make a rather definite forecast that only 50 feet more of shale is to be expected. That might require a few more than the 170 feet of 16 inch casing I have used in this estimate, but not very much. On the other hand, if smaller sizes of casing are used through the shale as may be necessary, the cost will be proportionately reduced. On the basis of our study of the matter and Dr. Hershey's comments and our discussion with Mr. Thorpe, we recommend the acceptance of his proposal.

Yours very truly,

HOWARD R. GREEN CO.

By H R Green

HRG:ab
Enc.

2

November 7, 1945.

Thorpe Well Company,
Lock Box 1376,
Des Moines, Iowa.

Gentlemen: SUBJECT: Mt. Pleasant Well.

Daily reports on the progress of the Mount Pleasant well indicate that from about depth 2235 to the present bottom of the hole at 2415 sandy shale, brown and green shale and green shale have been encountered, and both the daily reports and my telephone conversation with City Manager Speaker, as well as our observation of the material being taken from the well a week ago Monday, indicate that this material is of an unstable nature and has in the past few days been caving badly. As the diameter of the drill hole at this point is 11 inches (the contract calls for 10 inches) there is little chance to case out this caving material without restricting the finished diameter of the hole to an undesirable minimum if we are to pump the finished well at or in the neighborhood of 500 g.p.m. We, therefore, think it advisable that the hole be reamed to 12 inches diameter from the present base of the 10 inch hole, which is at or about depth 1835, and every attempt be made to carry the diameter at that large size down through the caving material so that the 170 feet of such formation which we have already encountered together with whatever amount of caving material may be exposed below the present 2415 depth of well may be cased if possible at 10 inches O.D. or, if absolutely necessary, at some smaller diameter, depending upon the further development of the well.

We would like to have you give us a firm quotation on a unit price basis for reaming the well from 1835 to 2415, a distance of 580 feet, from its present diameter to 12 inches, or as large a hole as can practically be produced.

We also would like to have you give us a quotation on the placing of such casing as may be determined as necessary to be placed opposite an estimated 170 feet of caving material now anticipated, although this quantity may be increased as the hole is carried below the present 2415 bottom.

3

We contemplate the elimination of the 1233 feet of 10 inch I.D. casing called for at Item 9 of the bidding form from elevation 602 to 1835, thus reducing the contract amount by $5,055.30.

The foregoing information and request is submitted under the provisions of Paragraph 3 of the Detailed Specifications and Paragraph 9 (b) of the General Specifications.

When you have received this letter will you please immediately prepare, in written form, the foregoing requested information and present it together with this letter to Mr. Speaker, who is the City's official representative on the work, and he in turn may, if he so desires, place it before the Council for authority to accept your offer under the terms of the aforementioned contract paragraphs.

It is our understanding and your letter to the City should be conditioned upon the fact that this reaming and casing is to be considered as extra work only and does not relieve you from any responsibility in completing the well under the terms of the original agreement and that the City accepts no responsibility on any hazards involved in carrying out the extra work. It is our understanding also that should this recommended change be executed that instead of continuing the drilling below the bottom of the reamed section of the well at 10 inches diameter, as required by the original contract, you will, without additional cost to the City above the bid price on 10 inch hole, maintain as large a diameter in excess of 10 inches as can practically be accomplished.

Yours very truly,

HOWARD R. GREEN CO.

By H R Green

HRG:ab

November 7, 1946

City Of Mount Pleasant,
Mount Pleasant, Iowa.

A t t e n t i o n : Mr. Lee Spencer, City Manager.

Gentlemen;

In keeping with your Engineer's request, I am submitting the following for your consideration:

We will ream the hole from approximately 1835 foot level 12 inches in diameter until caving formation makes it necessary for us to put in a liner, which should be approximately the 2400 foot level. This liner could be 16 inches O.D. pipe, threaded and coupled, or 17 inches O.D. pipe with welded joints. After the liner is placed we would continue with the drilling below the liner full size of the inside of the pipe until it was necessary to case, or to the bottom of the hole. This section of the hole could be cased with the most standard reduction 12 inches, or a larger casing by welding the joints. We would continue below this liner the full size of the pipe to the bottom of the hole and no reductions would be made unless caving formation made it necessary to case.

We agree to do this for the same rate as we set out in the contract for drilling the 12 inches hole, which is Seven Dollars and Fifty Cents ($7.50) per lineal foot for the actual amount reamed.

Below the bottom of the present hole we would continue with the balance of the hole regardless of size the same as the price set out in the contract for the 12 inch hole, Seven Dollars and Fifty Cents ($7.50) per lineal foot.

We will place the liner at its exact cost to us for the material alone, including any driving shoe or entering shoes which may be necessary, the cost of placing the same to be absorbed by the reaming price.

We understand this would not make any other changes in the contract and we would return to the original contract and complete same.

Yours very truly,

TWIN DISC COMPANY

By D W Kropf

DWK:ab

Henry

February 11, 1947

Mr. Lee F. Speaker, City Manager
Mt. Pleasant,
Iowa

Dear Mr. Speaker:

Enclosed are results of the chloride studies I made on your well No. 4 on February 5, 1947.

I have not had an opportunity to talk to Dr. Hershey in regard to preparing a display of the section encountered in your No. 4 well but will let you know regarding this just as soon as possible.

Very truly yours,

William E. Hale

WEH:SH

December 7, 1948

Mr. R. W. Brooks
Layne-Western Company
P. O. Box 662
Ames, Iowa

Dear Mr. Brooks:

I am enclosing a copy of the water analysis from the Mt. Pleasant city well No. 4 which you requested last week.

You will note that although the hole was drilled to a depth of 2,645 feet, it was eventually plugged back to a depth of 1,860 feet to reduce the high content of chlorides found in water from the deeper formations.

Very truly yours,

H. G. Hershey

HGH:KEA:AEH
ENC.

RESULTS OF CHLORIDE STUDIES MADE ON WATER PUMPED FROM MT. PLEASANT

CITY WELL NO. 4
MT. PLEASANT, IOWA

February 5, 1947

WELL NAME: City of Mt. Pleasant Well No. 4.

LOCATION: NE¼ NW¼ NE¼ Sec. 9, T. 71 N., R. 6 W., Center Twp., Henry County.

ELEVATION: Drilling curb, top of 20-inch pipe, about 731.7 feet above sea level.

EFFECTIVE DEPTH: 1860 feet.

CHIEF AQUIFER: St. Lawrence dolomite.

PERMANENT PUMP: Turbine, setting 174 feet to bottom of suction pipe. Powered by 30 hp. electric motor.

WATER LEVEL MEASUREMENTS: Reference point for water level measurements is hole in pump base 1.2 feet above concrete floor of pump house.

NOTE: Well had been idle since May 1946.

Observations made by W. E. Hale, U. S. Geological Survey, Iowa City, Iowa.

RESULTS OF CHLORIDE STUDIES ON WATER PUMPED FROM MT. PLEASANT

CITY WELL NO. 4

TIME	DEPTH TO WATER (FEET)	EST. DISCHARGE RATE (GPM)	CHLORIDES P.P.M.	REMARKS
Feb.5				
10:35am	135.4			Ref. point is hole in pump base, 1.2 feet above concrete floor. Well No. 4 not pumping. Well pump chlorinated with 5# H.T.H.
10:53				Pumping started
10:55	141.7	405±		
10:59			135	Water has slight yellow tint.
11:12	141.7	405±	108	Water clear, trace of fine sand
11:21			90	
11:30	141.55	405±	90	Water clear
11:40			87	
11:50	141.55	85		
12:00 N		85		
12:10pm		92		Air lift pump started on well No. 2
12:20	142.0	100		
12:30		130		
12:42				Pumping stopped, discharge line failed
12:50				Pumping resumed
1:15		130		
1:30		123		
1:45		127		
2:00	141.9	130		
2:15		127		
2:30	141.9	405±	126	
2:45				Well No. 2 - 96 PPM. chloride
2:45			127	
3:00			130	
3:05				Pumping stopped at Well No. 4