County Buchanan

sec. 24 T. 57 R. 35

Owner Miller, F.C. (Bob)

Elev. 985.5 MGS# 5874

Farm Corrough No. 1 TD 2307 Shows no Spls. ✓

Status _____ Date Completed 1-16-40 Fm@TD Jeff City

Remarks;

0 600 1
00009

MISSOURI GEOLOGICAL SURVEY
ROLLA, MISSOURI
H. A. Buehler, Director

Summary, Oil and Gas Test

F. C. (Bob) Miller, et al, No. 1 Corrough. 640 feet north and 630 feet west of southeast corner, Sec. 24, T. 57 N., R. 35 W., Buchanan County, Missouri, near St. Joseph. Surface elevation 989 feet (P.T.). Commenced 9-24-39, completed 1-16-40. Dry and abandoned. Total depth 2307 feet. Cable tool test. Casing record: 15½ inch at 203 feet; 12½ inch at 830 feet; 10 inch at 1430 feet; 8 inch at 1898 feet; then later reamed and reset, first to 1943, and later to 1984 feet. Hole was reduced from 8 inches to 6 inches at 2137 feet. Contractor, F. C. Miller, Enid, Oklahoma, and St. Joseph, Missouri.

The following formational summary has been prepared from studies of samples submitted by the operator to the Missouri Geological Survey, Rolla, Mo., where they may be examined.

	Thickness feet	Depth feet
Surface and glacial drift	200	200
Pennsylvanian System:		
Lansing formation	116	316
Kansas City formation (482 driller's log)	170	486
Pleasanton formation	139	625
Henrietta formation	81	706
Cherokee formation	495	1201
Mississippian System:		
St. Louis formation	21	1222
Spergen-Upper Warsaw formations	28	1250
Lower Warsaw formation	50	1300
Keokuk-Burlington formations	139	1439
Chouteau formation	73	1512
Kinderhook shale	130	1642
Devonian System ("Hunton"):	298	1940
Ordovician System:		
Maquoketa (Sylvan)	42	1982
Richmond*(?) (Upper Viola) dolomite	24	2006
Kimmswick (Lower Viola) formation	149	2155
Decorah formation (Simpson)	26	2181
St. Peter (Simpson) Sand	64	2245
Ordovician or Canadian System (Arbuckle):	62	2307 TD

* The top of the Ordovician presents a stratigraphic problem in some wells, due to the presence of a crystalline non-cherty dolomite which is closely associated with the Maquoketa shale. This dolomite is believed to be of Richmond (Ordovician) age. This problem will be discussed in a report now in preparation by the Missouri Geological Survey.

27-F-29

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

County: Buchanan

Owner: Rob't. Miller - #1 Carrough

Location: Sec. 24, T. 57, R. 34

Source: Drilling well, 83 ft.

Analysis No.: 2498 in NB 772, P. 143 Total Depth_____ and NO._____

Date Analyzed: 11-16-39

Analyst: R. T. Rolufs

Collector: H. S. McQueen

CONSTITUENTS:	IN PARTS PER MILLION.
Turbidity	Sl. Turbid - Bailer Sample
Color	None
Odor	ND
Total Suspended Solids	ND
Total Dissolved Solids	206.0
Loss on Ignition	
Chloride Radicle (Cl)	3.3
Nitrate Radicle (NO_3)	
Sulphate (SO_4)	8.6
Bi-Carbonate Radicle (HCO_3)	
Carbonate Radicle (CO_3)	
Sodium (Na) Potassium (K) as Na	
Magnesium (Mg)	
Iron (Fe)	
Manganese (Mn)	
Silica (SiO_2)	
Calcium (Ca)	
Total Hardness	
Carbonate Hardness	
Alkalinity	
Precipitated Iron (Pp't. Fe.)	
Temporary Hardness	
Al_2O_3	

Remarks: This sample from 83 ft.

Copies to: F. C. Greene, Rob't. Miller, H.S. McQueen

27-F-29

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

County: Buchanan

Owner: Rob't. Miller - #1 Carrough

Location: Sec. 24, T. 57, R. 34

Source: Drilling well, 178 ft.

Analysis No.: 2498 in NB 772, P. 143 Total Depth_____ and NO._____

Date Analyzed: 11-16-39

Analyst: R. T. Rolufs

Collector: H. S. McQueen

CONSTITUENTS:	IN PARTS PER MILLION.
Turbidity	Turbid - Bailer Sample
Color	None
Odor	ND
Total Suspended Solids	ND
Total Dissolved Solids	274.0
Loss on Ignition	
Chloride Radicle (Cl)	9.1
Nitrate Radicle (NO_3)	
Sulphate (SO_4)	30.7
Bi-Carbonate Radicle (HCO_3)	
Carbonate Radicle (CO_3)	
Sodium (Na) Potassium (K) as Na	
Magnesium (Mg)	
Iron (Fe)	
Manganese (Mn)	
Silica (SiO_2)	
Calcium (Ca)	
Total Hardness	
Carbonate Hardness	
Alkalinity	
Precipitated Iron (Pp't. Fe.)	
Temporary Hardness	
Al_2O_3	

Remarks: This sample from 178 ft.

Copies to: F. C. Greene, Rob't. Miller, H. S. McQueen

November 27, 1939

Mr. Robert Miller
Jerome Hotel
St. Joseph, Missouri

Dear Mr. Miller:

We have now received and examined samples from your No. 1 Carrough well to a depth of 830 feet and I am sending to you under separate cover a copy of our graphic sample log to that point. This log shows the various formations that have been drilled to date.

Information from the driller's log which has now been obtained by Mr. F. C. Greene to 1034 feet suggests that the well is at the top of the sand and shale zone which marks the base of the Pennsylvanian-Cherokee formation. From the available information it now appears that the top of the Mississippi lime will be reached at a depth of about 1240 feet. We will be glad to give you an immediate report regarding what part of the lime is encountered beneath the Cherokee formation in this well.

Very truly yours,

McQ/mh
cc: Frank C. Greene

November 29, 1939

Mr. Robert Miller
Jerome Hotel
St. Joseph, Missouri

Dear Mr. Miller:

Samples have been received to a depth of 1226 feet from your Corrough well in Buchanan county. The well entered the St. Louis formation of Mississippian age at a depth of 1201 feet. At a depth of 1222 feet the well passed from the St. Louis formation to the upper Warsaw-Spergen formation. It is estimated that the base of the Mississippi line will occur somewhere between 1490 and 1510 feet.

As additional samples are received, we will check and revise our estimate if necessary. I will send you the portion of the log covering the interval from 1000 to 1226 feet tomorrow.

Very truly yours,

John Grohskopf
Geologist

JG/mb

December 18, 1939

Mr. F. C. Miller
Jerome Hotel
St. Joseph, Missouri

Dear Bob:

Frank Greene has now submitted samples to us from your Corrough well to a depth of 1784 feet and I have just finished an examination of them.

It appears that the dolomite section from 1710 to 1780 feet in the Bermond well is represented in your well by a section which consists in the main of limestone, although some dolomite is present below 1735 feet. Although this change has taken place I do not believe that it materially affects the situation for the top of the main body of dolomite in the lower part of the Devonian (Hunton) in this area should come between 1800 and 1825 feet. From the available information it appears that the section has not changed materially as to thickness and I believe the Sylvan shale will come about where I originally figured it.

I have asked Green to keep in close contact with your well and weowill give the samples immediate attention. I may be gone for several days this week but in my absence John Grohskopf will report to you.

Sincerely yours,

McQ/mh
cc: Frank C. Greene

December 19, 1939

Mr. F. C. Miller
Jerome Hotel
St. Joseph, Missouri

Dear Bob:

Examination of samples from your Corrough well to 1822 feet shows fine grained to finely crystalline, very compact, and probably hard dolomite from 1782 to 1811 feet. From 1811 to 1822 feet dense limestone was drilled.

The section seems to be running about normal for most of the wells through the Hunton in western Missouri, although as I previously told you the dolomite section in the Bermond well from 1710 to 1780 feet is either not developed as such in the Corrough well or is entirely missing. I note that water was reported at 1790 feet, but the determination of the chloride radicle of several samples from 1580 to 1790 feet indicates little, if any, change in the water and all the samples might reasonably be from the same source. We will have additional determinations on these water samples but in the meantime I am glad to furnish the following:

Depth in feet	Chlorides in parts per million
1580	1208.2
1653	1185.6
1660	1217.2
1790	1217.2

Did you notice any change in the level of the water with the present hole full as against the level prior to the time you dried up the hole at 1430 feet? The rock around 1790 feet appears to be very compact and hard and its general character does not suggest that it would be a producer of water. As near as I can tell at this time dolomite should be found from the present total depth, 1822 feet, to near the bottom of the Hunton where sandy dolomite or sand can be expected. The log I made for you should stand fairly well for the rest of the well.

Very truly yours,

McQ/mh
cc: Frank C. Greene

December 20, 1939

Mr. F. C. Miller
Jerome Hotel
St. Joseph, Missouri

Dear Bob:

We have now completed partial analyses of several water samples collected from 1580 to 1790 feet in your Corrough well and I enclose herewith the results.

The samples collected at 1580, 1653, and 1660 feet are probably from the same water. The sample taken at a depth of 1790 feet shows the same chloride radicle as the other samples but you will notice there is a decrease in the total dissolved solids and a more noticeable decrease in the amount of the sulphate radicle. However, the difference, in my opinion, is not that which should mark a Mississippian water from a Hunton water in this locality. It should be remembered of course that the sample at 1790 might represent new water coming into the hole but diluted somewhat by the water that existed before it was encountered.

Very truly yours,

McQ/mh
encl.
cc: Frank C. Greene

Partial Analyses, Water Samples

F. C. Miller, et al No. 1 Corrough
Sec. 24, T. 57 N., R. 35 W
Buchanan Co. Mo.

Results in Parts Per Million

Depth in feet	Total Dissolved Solids	Chloride Radicle	Sulphate Radicle
1580	4880	1208.2	1565.6
1653	4842	1185.6	1569.5
1660	4828	1217.2	1581.8
1790	4710	1217.2	1375.6

December 22, 1939

Mr. F. C. Miller
Jerome Hotel
St. Joseph, Missouri

Dear Bob:

Samples to a depth of 1898 feet from your Corrough well have been received and I am sending to you under separate cover a copy of our graphic sample log to that depth.

Some crystalline quartz and some sand was noted with the dolomite in the samples from 1868 to the present total depth. This material usually marks the lower part of the Devonian (Hunton) and it is possible that the top of the Sylvan shale might come as high as 1950 feet in this well. The depth at which this shale is found will depend upon the thickness of the basal Devonian sand and sandy dolomite zone. Certainly it will not be lower than 1975 feet which was the depth which I originally predicted for the top of the Sylvan.

A report from Greene covering the present shipment of samples states that the 8" is being set at 1898 feet. Next time you see him I would like to have your ideas regarding whether the water in the hole is new water or whether it is coming from behind the pipe.

Cordially yours,

McQ/mh
cc: Frank C. Greene

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

COUNTY Buchanan OWNER F. C. Miller, Corrough No. 1 Sec. 24, T. 57, R. 35 W.

ANALYST R. T. Rolufs TOTAL DEPTH 2307

Depth sample collected	83	178	463	1170	1385	1393	1580	1653
Analysis Number	2498,NB772	2498,NB772	3233	3234	3235	3241	2498,NB772	2498,NB772
Date Analyzed	11-16-39	11-16-39	12-22-39	12-22-39	12-22-39	12-22-39	12-20-39	12-20-39
Turbidity	Sl. Tur.B.S.	Tur.B.Sp.	Tur.B.Sp.	Tur. B.Sp.	Tur. B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.
Color	None	None	None	None	None	None	None	None
Odor	ND	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids	ND	ND	ND	ND	ND	ND	ND	
Total Dissolved Solids	206.0	274.0	11714.0	6257.0	5013.0	5258.0	4880.0	4842.0
Loss On Ignition			ND	ND	ND	ND		
Chloride Radicle (Cl)	3.3	9.1	6516.0	2864.3	1325.8	1479.7	1208.2	1185.6
Nitrate Radicle (NO_3)			ND	ND	ND	ND		
Sulphate (SO_4)	8.6	30.7	3.1	457.0	1502.8	1520.7	1565.6	1569.5
Bi-Carbonate Radicle (HCO_3)			374.0	680.5	472.4	434.5		
Carbonate Radicle (CO_3)			00	9.7	00	00		
Sodium (Na) Potassium (K) as Na			4238.5	2380.1	1554.7	1761.6		
Magnesium (Mg)			56.9	54.2	64.0	39.6		
Iron (Fe)			ND	ND	ND	ND		
Manganese (Mn)			-----	-----	-----	-----		
Silica (SiO_2)			7.2	6.4	9.2	2.8		
Calcium (Ca)			104.4	25.4	134.9	107.3		
Total Hardness			494.3	285.7	599.7	430.6		
Carbonate Hardness			306.7	285.7	387.4	356.3		
Alkalinity			306.7	566.1	387.4	356.3		
Precipitated Iron (Pp't. Fe.)			ND	ND	ND	ND		
Temporary Hardness			ND	ND	ND	ND		
Al_2O_3 + Fe_2O_3			1.20	1.20	2.00	.80		
Bromine								
Fluorine								
Formational Source	G.DriftPl.Ser.	G.Drift	Ladore Sh.	L. Cher.	Keo.-Bur.	Keo.-Burl.		

Remarks: 1580: This sample from 1580 ft. and from water entering hole after reaming and setting 10" pipe to 1431 ft.

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

COUNTY Buchanan OWNER Miller-Corrough LOCATION 24-57-35

ANALYST R. T. Rolufs TOTAL DEPTH 2307

Depth sample collected	1660	1790	1912-1940	2011-2015	2056	2075	2100	2113-2120
Analysis Number	2498,NB772	3245	3246	3247	3248	3249	2525,NB772	3250
Date Analyzed	12-20-39	2-6-40	2-6-40	2-6-40	2-6-40	2-6-40	1-22-40	2-6-40
Turbidity	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.
Color	None	None	None	None	None	None	None	None
Odor	ND	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids		ND	ND	ND	ND	ND	ND	ND
Total Dissolved Solids	4828.0	4710.0	5018.0	7466.0	8299.0	8434.0	8301.0	8700.0
Loss On Ignition		ND	ND	ND	ND	ND		ND
Chloride Radicle (Cl)	1217.2	1217.2	1565.7	2877.9	3497.8	3606.4	3502.4	3742.2
Nitrate Radicle (NO_3)		ND	ND	ND	ND	ND		ND
Sulphate (SO_4)	1581.8	1375.6	1340.0	1358.2	1258.0	1258.4	1249.1	1276.9
Bi-Carbonate Radicle (HCO_3)		407.7	309.3	392.3	331.8	333.2		334.6
Carbonate Radicle (CO_3)		00	00	00	00	12.4		00
Sodium (Na) Potassium (K) as Na		1298.2	1560.2	2191.2	2483.9	2668.8		2679.1
Magnesium (Mg)		75.2	62.1	167.0	218.2	239.1		179.8
Iron (Fe)		ND	ND	ND	ND	ND		ND
Manganese (Mn)		----	------	-----	--------	-----		------
Silica (SiO_2)		2.0	1.6	15.2	12.8	37.2		10.8
Calcium (Ca)		190.0	128.3	168.2	151.5	139.2		252.3
Total Hardness		783.3	575.4	1105.2	1273.4	1328.3		1367.9
Carbonate Hardness		334.3	253.6	321.7	272.1	283.5		274.4
Alkalinity		334.3	253.6	321.7	272.1	283.5		274.4
Precipitated Iron (Pp't. Fe.)		ND	ND	ND	ND	ND		ND
Temporary Hardness		ND	ND	ND	ND	ND		ND
Al_2O_3 + Fe_2O_3		.40	2.40	2.00	2.40	1.20		1.20
Bromine								
Fluorine								
Formational Source				Top.Kimm.	Tp.Md.Ch.Km.	Tp.Md.Kim.	Kimm.	Bot.L.Km.

Remarks: 1660: This sample from 1660 ft. but driller says this water is coming from uncased pool of Miss. lime below 1430.8'
2011-2015: This sample from 2011-2015 ft. after 8" casing had been lowered to 1984 ft. Water from 1987-1993 ft.

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

COUNTY Buchanan OWNER Miller-Corrough No. 1 24-57-35

ANALYST R. T. Rolufs TOTAL DEPTH 2307

Depth sample collected	2143	2150-2151	2170-2173	2185-2192	2205-2212	2246	2259
Analysis Number	2525,NB.772		3251	3252	3253	3254	3255
Date Analyzed	1-22-40		2-6-40	2-6-40	2-6-40	2-6-40	2-6-40
Turbidity	Tur.B.Sp.	Tur. B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.
Color	None	None	None	None	None	None	None
Odor	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids	ND	ND	ND	ND	ND	ND	ND
Total Dissolved Solids	8418.0	8785.0	9526.0	10555.0	11408.0	11000.0	11225.0
Loss On Ignition			ND	ND	ND	ND	ND
Chloride Radicle (Cl)	3651.7	3760.3	4168.3	4794.5	5159.0	4981.4	5159.0
Nitrate Radicle (NO_3)			ND	ND	ND	ND	ND
Sulphate (SO_4)	1273.0	1290.7	1317.4	1258.4	1333.7	1262.7	1280.4
Bi-Carbonate Radicle (HCO_3)			333.6	246.1	247.5	226.4	258.7
Carbonate Radicle (CO_3)			00	00	00	00	00
Sodium (Na) Potassium (K) as Na			2914.3	3328.2	3488.7	3339.2	3380.1
Magnesium (Mg)			195.9	200.8	199.4	212.9	247.1
Iron (Fe)			ND	ND	ND	ND	ND
Manganese (Mn)			----	ND	ND	----	ND
Silica (SiO_2)			10.0	46.4	44.4	28.8	11.6
Calcium (Ca)			288.6	357.4	408.9	368.1	335.7
Total Hardness			1524.7	1716.8	1839.8	1793.1	1852.4
Carbonate Hardness			373.4	201.8	203.0	185.6	212.1
Alkalinity			373.4	201.8	203.0	185.6	212.1
Precipitated Iron (Pp't. Fe.)			ND	ND	ND	ND	ND
Temporary Hardness			ND	ND	ND	ND	ND
Al_2O_3 + Fe_2O_3			.80	2.00	2.40	2.40	1.60
Bromine							
Fluorine							
Formational Source	Bot. L. Km.	Bot.L. Kim.	Base Dec.	Top St. P.	St. Peter	St.P.-Can.	Arbuckle

Remarks: 2150-2151: SWL 262 2170-2173: Temp. 84 degrees F, SWL 250' 2185-2192: SWL 262
2205-2212: SWL 262 2246: SWL: 257 ft.

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

COUNTY Buchanan OWNER Miller-Corrough No. 1 24-57-35

ANALYST R. T. Rolufs TOTAL DEPTH 2307

Depth sample collected	2286-2293	2307						
Analysis Number	3261	3262						
Date Analyzed	2-6-40	2-6-40						
Turbidity	Tur.B.Sp.	Tur. B.Sp.						
Color	None	None						
Odor	ND	ND						
Total Suspended Solids	ND	ND						
Total Dissolved Solids	8192.0	16493.0						
Loss On Ignition	ND	ND						
Chloride Radicle (Cl)	3687.0	8023.5						
Nitrate Radicle (NO_3)	ND	ND						
Sulphate (SO_4)	1111.1	1423.2						
Bi-Carbonate Radicle (HCO_3)	165.9	237.6						
Carbonate Radicle (CO_3)	00	00						
Sodium (Na) Potassium (K) as Na	2621.6	4733.4						
Magnesium (Mg)	145.1	303.9						
Iron (Fe)	ND	ND						
Manganese (Mn)	ND	---						
Silica (SiO_2)	3.2	3.6						
Calcium (Ca)	291.5	699.6						
Total Hardness	1323.7	2995.0						
Carbonate Hardness	136.0	194.8						
Alkalinity	136.0	194.8						
Precipitated Iron (Pp't. Fe.)	ND	ND						
Temporary Hardness	ND	ND						
Al_2O_3 + Fe_2O_3	.40	.40						
Bromine								
Fluorine								
Formational Source	Arbuckle	Arbuckle TD						

Remarks:

Log of F. C. (Bob) Miller, *et al* No. 1 Corrough. Location: 640 feet north and 630 feet west of southeast corner sec. 24, T. 57 N., R. 35 W., Buchanan County, Missouri, near St. Joseph. Surface elevation, 989 feet (P.T.). Commenced, 9-24-39, and completed, 1-16-40. Total depth, 2307 feet. Dry and abandoned. Cable tool test. Casing record: 15 1/2 inch set at 203 feet; 12 1/2 inch at 830 feet; 10 inch at 1430 feet; and 8 inch at 1898 feet (later reamed and twice reset: first to 1943 feet and later to 1984 feet). Hole was reduced from 8 inches to 6 inches at 2137 feet. Contractor: F. C. Miller, St. Joseph, Missouri.

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FORMATIONAL SUMMARY

	Thickness, feet	*Depth, feet*
Pleistocene and Recent Series:		
Surface and glacial drift	200	200

	Thickness, feet	Depth, feet
Pennsylvanian system:		
Lansing group	116	316
Kansas City group (482 feet on driller's log)	170	486
Pleasanton-Henrietta groups	220	706
Cherokee group	495	1201
Mississippian system:		
St. Louis formation	21	1222
Spergen-Upper Warsaw formations	28	1250
Lower Warsaw formation	50	1300
Keokuk-Burlington formations	139	1439
Chouteau formation	73	1512
Kinderhook shale	130	1642
Devonian system:	298	1940
Ordovician system:		
Maquoketa formation	42	1982
Kimmswick formation	173	2155
Decorah formation	26	2181
St. Peter sandstone	64	2245
Ordovician or Canadian system ("Arbuckle")	62	2307, T.D

SAMPLE LOG

No samples	97	97
Pleistocene series:		
Glacial drift:		
Sand, coarse, angular, polished with pebbles of igneous, metamorphic and sedimentary rocks	13	110
Sand, as above, with much limestone as pebbles and small boulders	15	125

NOTE: The driller's log shows this interval as limestone. The samples, however, show no fresh limestone, but many pebbles showing the smoothed and striated surfaces characteristic of glacial drift.

No samples	40	165
Sand, igneous rock fragments, limestone fragments and gray clay	35	200

NOTE: The clay and limestone fragments increase below 180 feet. The samples below 180 feet may be Pennsylvanian shales, the preponderance of drift obscures the nature of these samples.

Pennsylvanian system:		
Lansing group:		
Limestone (Stanton), white, dense, sparingly fossiliferous. Residue, 10 percent, of silicified brachiopod fragments and gray shale	21	221
Shale, gray and black with limestone, as above	3	224
Limestone, light tan to gray, dense, sparingly fossiliferous. Residue, 15 percent, of green and gray shale and silicified spines and tubes	12	236
Shale and limestone: shale, gray with calcareous fossils; and limestone, tan and gray, highly fossiliferous. Residue, 25 percent, of gray shale with silicified gastropods and bryozoans	19	255

	Thickness, feet	Depth, feet
No samples	37	292
Sandstone and shale: medium fine-grained sand with gray shale and mica. Some calcareous cement	9	301
Shale, gray	15	316
Kansas City group:		
Limestone, tan and gray, fossiliferous. Residue, 10 percent of silicified spines, tubes, bryozoans and kaolin	9	325
No samples	28	353
Shale, green with shaly, fossiliferous limestone fragments. Residue, 40 percent, of green, flaky shale	3	356
Limestone, white, fossiliferous. Residue, 10 percent, of gray shale, spine aggregates and silicified tubes	9	365
Shale and limestone: shale, gray; and limestone, gray, fine-grained, fossiliferous. Residue, 10 percent, of gray shale and silicified spines and tubes	9	374
Shale, black, platy, carbonaceous with some light tan, fossiliferous limestone fragments	13	387
Shale, gray, calcareous with many small brachiopod shells	5	392
Shale and limestone; shale, gray; and limestone, gray, oolitic, argillaceous. Residue, 20 percent, of gray and green shale and silicified tubes	13	405
Limestone (Winterset), light tan, dense, sparingly fossiliferous. Residue, 10 to 20 percent, of tan, dense, fossiliferous chert, green shale, and silicified spines and tubes	28	433
Shale, black, carbonaceous with limestone, as above (1 sample).	12	445
Limestone (Bethany Falls), oolitic, with the oolites leached leaving a honey combed matrix of limestone. Residue, about 10 percent, of chalcedonic chert and balls of kaolin	6	451
Limestone, white and light tan, dense, sparingly fossiliferous. Residue, 10 percent, as above	21	472

NOTE: The sample at 472 feet contained 40 percent of chert, tan, flaky, porous, and tripolitic, and is very unusual for this formation.

No samples	9	481
Limestone and shale; limestone, white and light tan, dense, fossiliferous; and shale, black, platy, carbonaceous	5	486
Pleasanton and Henrietta groups:		

NOTE: The base of the Pleasanton may be at 599 feet.

Shale, greenish-gray, silty with some calcareous nodules	14	500
No samples	22	522
Shale, gray with plant remains and mica. Slightly calcareous at base	38	560
Limestone and shale: limestone, gray, argillaceous, fossiliferous with crinoids and brachiopods; and shale, gray. Residue, 30 percent, of gray shale and silicified fossil fragments	5	565
Shales, red and gray, calcareous	7	572
Shale, gray, sandy, calcareous with medium- to fine-grained sand, mica and calcareous nodules and cement	24	596
Shale, gray with pyritized pelecypods	3	599
Shale, gray and black with some fragments of coal and tan, fossiliferous limestone	6	605

	Thickness, feet	Depth, feet
Shale and limestone, gray, argillaceous, with many calcareous fossils. Small productid shells	11	616
Shale, gray	10	626
Shale and limestone: shale, gray; and limestone, white and tan, dense. Some traces of glauconite occur in the limestone chips	8	634
Limestone, gray, argillaceous, sparingly fossiliferous. Residue, 20 percent, of gray shale, silicified tubes, pyrite and a trace of black shale	14	648
Sandstone, medium grains, angular, micaceous with calcareous cement	7	655
Shale, dark gray to black with tan, fossiliferous limestone	10	665
Coal (Lexington), bituminous with black shale. Coal makes up about 50 percent of the sample	7	672
Limestone, white to light tan, dense, argillaceous. Residue, 20 percent, of kaolin balls, green shale, and silicified crinoids, spines and tubes	11	683
Shale, gray, shelly, calcareous in upper and lower 5 feet	17	700
Limestone, tan, fine-grained, crystalline with black, platy shale	6	706
Cherokee group:		
Shale, gray, slightly sandy and micaceous. Concretions and nodules of siderite occur between 711-723 feet, and 735-740 feet	37	743
Shale, dark gray to black with dark, argillaceous limestone fragments	17	760
Shale, dark gray to black, slaty with concretions and nodules of siderite	14	774
Shale, gray, sandy with plant remains and mica	11	785
Shale, black, slaty, carbonaceous with siderite or "ironstone" concretions	10	795
Shale, gray and black with coal and some black, fossiliferous limestone	7	802
Limestone (Ardmore ?), tan, fine-grained with crinoids and brachiopods, argillaceous. Residue, 15 percent, of gray shale and silicified tubes	16	818
Shale, gray, sandy with spherulites of siderite and many plant remains; leaf and stem prints	12	830
Shale, gray and black with some concretionary siderite	14	844
Sand, medium-grained, angular with mica and gray shale	4	848
Shale, gray to black with limestone nodules	5	853
Shale, red with calcareous nodules	3	856
Shale, gray, sandy, micaceous with spherulites and concretions of siderite	12	868
Shale, gray	12	880
Shale, black with pyrite and siderite concretions	4	884
Shale, gray with pyrite	4	888
Shale, black, carbonaceous with some coal and limestone fragments	9	897
Limestone, tan, fossiliferous with gray shale	13	910
Sandstone, gray, shaly with plant remains and mica. Some siderite occurs below 922 feet	20	930
Shale, gray with spherulites of siderite	10	940
Shale, black and gray with concretions of siderite or "clay ironstone"	53	993
Sandstone, medium-grained, argillaceous, micaceous with much pyrite and some concretionary siderite. Becomes more shaly toward the base	12	1005
Shale, gray with concretions of siderite	6	1011
Shale, black, carbonaceous with plant remains	9	1020

	Thickness, feet	Depth, feet
Sandstone, angular grains, micaceous with shale toward the base. Contains concretions and spherulites of siderite	14	1034
Shale, black, slaty, carbonaceous with concretions of siderite or "ironstone"	56	1090
Shale, dark gray with thin beds and streaks of fine-grained sand. Contains some spherulites of siderite	5	1095
Sand, medium-grained, argillaceous with calcareous cement	10	1105
Shale, gray, heavy bedded, clay-like	5	1110
Sandstones and shales, interbedded: shale, dark gray; and sandstones, medium, angular grained, quartzitic. A bed of quartzitic sandstone occurs between 1122-1130 feet	35	1145
Shale, dark gray to black with plant remains and a thin coal bed between 1165-1170 feet	25	1170
Sand, fine-grained with soft gray shale and siderite concretions	20	1190
Shale, gray with siderite spherulites	5	1195
Shale, gray with coarse sand grains and much pyrite	6	1201
Mississippian system:		
St. Louis formation:		
Limestone, white to light tan, dense to lithographic. Residue, small, about 10 percent, of quartzose chert, quartz covered oolites, and some rounded and frosted sand grains	21	1222
Spergen-Upper Warsaw formations:		
Dolomitic limestone, light tan to white with soft green shale. Residue, 10 to 20 percent, of green shale and red, chalcedonic, spinose chert	28	1250
Warsaw formation:		
Limestone, white, crystalline, highly fossiliferous with some gray shale and dolomitic limestone occurring between 1258-1274 feet. Residue, 20 to 30 percent, of tan, mottled, fossiliferous chert with many bryozoan fragments	50	1300
Keokuk-Burlington formations:		
Limestone, white, crystalline, crinoidal, cherty with some glauconite occurring at 1305 feet. Some dolomitic limestone occurs between 1322-1328 feet. Residue, 10 to 50 percent, of dense white chert, beekites, crinoidal chert, and rough white, porous chert	83	1383
Dolomitic limestone grading into dolomite below 1494 feet. Dolomite, tan to gray, fine-grained, crystalline, vuggy. Residue, 50 to 80 percent, of dense, flaky white chert, and rough white chert, with quartz	34	1417
No samples	6	1423
Limestone, cream colored, finely crystalline, very cherty. Chert, dense and rough white with some quartz druses. Residue, 60 to 80 percent, of chert	16	1439
Chouteau formation:		
Dolomitic limestone, brown and gray, crystalline, cherty. Residue, 70 percent, of rough, gray, porous chert	19	1458
Limestone, gray, dense, sparingly fossiliferous. Residue, 30 to 60 percent, of gray, dense, porous chert	17	1475
Limestone, gray and tan, fossiliferous with crinoids, brachiopods, bryozoans and ostracods. Residue, small, 10 percent or less, of rough, gray to white chert, pyrite and some fossil fragments	37	1512

	Thickness, feet	Depth, feet
Kinderhook group (undifferentiated):		
Shale, gray with some fine-grained siltstone or sandstone	11	1523
Shale, red and green with flat, discoidal oolites of hematite	7	1530
Shale, red and green with some small black and brown spores and plant remains	20	1550
Shale, green, fissile, spore bearing, contains some sand, brown shale, and phosphate nodules from 1630-1635 feet	92	1642
Devonian system:		
Limestone, cream, fine to medium crystalline with some brown crystalline dolomite. Residue, 20 percent, of tan, coralline chert and fine sand	13	1655
Dolomite, cream-gray, finely crystalline. Residue, 10 percent, as above	5	1660
Limestone, tan and light gray, lithographic. A little very fine sand occurs from 1685-1695 feet and a little tan chert from 1720-1735 feet. Residue, less than 10 percent, of green shale	75	1735
Limestone, tan, dense with a little brown, finely crystalline dolomite. Residue, less than 10 percent, of coralline chert and green shale	38	1773
Limestone, gray, lithographic. Residue, less than 10 percent, of pyrite	12	1785
Dolomite, brown, finely crystalline to dense. Residue, less than 5 percent, of tan chert	25	1810
Limestone, gray-tan, dense. Residue, 10 percent, of white, quartzose chert	10	1820
Dolomite, brown, crystalline. Residue, just a trace to 1860 feet and 5 percent between 1860-1870 feet, of tan, quartzose chert	50	1870
Dolomite, cream, medium crystalline. Residue, averages 20 percent, of white, quartzose chert	17	1887
Dolomite, light gray, dense to lithographic. Residue, 10 percent, of gray-white chert and sand grains	14	1901
Dolomite, as above, with some brown and finely crystalline. Residue, 10 percent, of brown, quartzose chert and sand grains	18	1919
Dolomite, brown, very finely crystalline. Residue, as above	10	1929
Dolomite, as above. Residue, 20 to 80 percent, of rounded to subangular sand	11	1940
Ordovician system:		
Maquoketa formation:		
Shale, gray-green, pyritic	31	1971
Shale, green, pyritic	11	1982
Kimmswick formation:		
Dolomite, blue-gray, medium crystalline. Residue, less than 10 percent, of white chert	11	1993
Dolomite, white-cream, crystalline. Residue, as above	14	2007
Dolomite, dark gray, crystalline. Residue, averages 25 percent, of smooth and rough, white chert	13	2020
Dolomite gray-tan, crystalline. Residue, averages 40 percent, of smooth and rough, white, dolocastic chert	30	2050
Dolomite, gray-blue and gray-tan, crystalline. Chert at 2075 feet contains embedded white sponge (?) spicules. Residue, 40 percent, of gray-tan, smooth and rough chert	25	2075

	Thickness, feet	Depth, feet
Dolomite, gray-brown, crystalline. Residue, 40 percent, of gray-white rough chert	30	2105
Dolomite, brown, crystalline. Residue, 20 percent, of tan, smooth and rough chert	10	2115
Dolomite, as above. Some silicified cystid (?) segments occur at 2135 feet. Residue, 10 percent, of smooth and rough, white chert	20	2135
Dolomite, tan, crystalline. Residue, less than 10 percent, of very fine sand and smooth white chert	20	2155
Decorah formation:		
Dolomite, gray, finely crystalline. Residue, 20 percent, of sand and some pyrite	26	2181
St. Peter and Everton formations:		
Sandstone, white, rounded to sub-angular	44	2226
Shale, green	2	2228
Sandstone, white, rounded to sub-angular	17	2245
Canadian system:		
Jefferson City formation:		
Dolomite, sandy, cherty with brown oolites	62	2307, T.D.

WATER ANALYSES

COUNTY, Buchanan. OWNER, F. C. Miller, Corrough No. 1. LOCATION, Sec. 24, T. 57, R. 35 W.

ANALYST, R. T. Rolufs. TOTAL DEPTH, 2307.

Depth sample collected	83	178	463*	1170*	1385	1393**	1580	1653
Analysis Number	2498,NB772	2498,NB772	3233	3234	3235	3241	2498,NB772	2498,NB772
Date Analyzed	11-16-39	11-16-39	12-22-39	12-22-39	12-22-39	12-22-39	12-20-39	12-20-39
Turbidity	Sl. Tur.B.S.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.
Color	None	None	None	None	None	None	None	None
Odor	ND	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids	ND	ND	ND	ND	ND	ND	ND	.....
Total Dissolved Solids	206.0	274.0	11714.0	6257.0	5013.0	5258.0	4880.0	4842.0
Loss on Ignition	.....	.....	ND	ND	ND	ND	.....	.....
Chloride Radicle (Cl)	3.3	9.1	6516.0	2864.3	1325.8	1479.7	1208.2	1185.6
Nitrate Radicle (NO_3)	.....	.....	ND	ND	ND	ND	.....	.....
Sulphate (SO_4)	8.6	30.7	3.1	457.0	1502.8	1520.7	1565.6	1569.5
Bi-Carbonate Radicle (HCO_3)	.....	.....	374.0	680.5	472.4	434.5	.....	.....
Carbonate Radicle (CO_3)	.....	.....	00	9.7	00	00	.....	.....
Sodium (Na) Potassium (K) as Na	.....	.....	4238.5	2380.1	1554.7	1761.6	.....	.....
Magnesium (Mg)	.....	.....	56.9	54.2	64.0	39.6	.....	.....
Iron (Fe)	.....	.....	ND	ND	ND	ND	.....	.....
Manganese (Mn)	.....	.....	.....	.....	.....	.....	.....	.....
Silica (SiO_2)	.....	.....	7.2	6.4	9.2	2.8	.....	.....
Calcium (Ca)	.....	.....	104.4	25.4	134.9	107.3	.....	.....
Total Hardness	.....	.....	494.3	285.7	599.7	430.6	.....	.....
Carbonate Hardness	.....	.....	306.7	285.7	387.4	356.3	.....	.....
Alkalinity	.....	.....	306.7	566.1	387.4	356.3	.....	.....
Precipitated Iron (Pp't Fe.)	.....	.....	ND	ND	ND	ND	.....	.....
Temporary Hardness	.....	.....	ND	ND	ND	ND	.....	.....
$Al_2O_3 + Fe_2O_3$	.....	.....	1.20	1.20	2.00	.80	.....	.....
Bromine	.....	.....	.....	.....	.....	.....	.....	.....
Fluroine	.....	.....	.....	.....	.....	.....	.....	.....
Formational Source	G.Drift Pl.Ser.	G.Drift	Ladore Sh.	L. Cher.	Keo.-Burl.	Keo.-Burl.	.....	.....

Remarks: 1580: This sample from 1580 ft. and from water entering hole after reaming and setting 10″ pipe to 1431 feet.

*Samples at 463 (Kansas City) and at 1170 (Cherokee) are representative samples for the Pennsylvanian. (15½″ casing at 203′ and 12½″ casing set at 830 feet.

**Sample at 1393 (Burlington) representative of Mississippian water (10″ set at 1393 feet).

COUNTY, Buchanan. OWNER, Miller-Corrough. LOCATION, 24-57-35.

ANALYST, R. T. Rolufs. TOTAL DEPTH, 2307.

Depth Sample Collected	1660	1790	1912-1940*	2011-2015**	2056**	2075**	2100	2113-2120**
Analysis Number	2498,NB772	3245	3246	3247	3248	3249	2525,NB772	3250
Date Analyzed	12-20-39	2-6-40	2-6-40	2-6-40	2-6-40	2-6-40	1-22-40	2-6-40
Turbidity	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.
Color	None	None	None	None	None	None	None	None
Odor	ND	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids	.....	ND	ND	ND	ND	ND	ND	ND
Total Dissolved Solids	4828.0	4710.0	5018.0	7466.0	8299.0	8434.0	8301.0	8700.0
Loss on Ignition	.....	ND	ND	ND	ND	ND	.....	ND
Chloride Radicle (Cl)	1217.2	1217.2	1565.7	2877.9	3497.8	3606.4	3502.4	3742.2
Nitrate Radicle (NO_3)	.....	ND	ND	ND	ND	ND	.....	ND
Sulphate (SO_4)	1581.8	1375.6	1340.0	1358.2	1258.0	1258.4	1249.1	1276.9
Bi-Carbonate Radicle (HCO_3)	.....	407.7	309.3	392.3	331.8	333.2	.....	334.6
Carbonate Radicle (CO_3)	.....	00	00	00	00	12.4	.....	00
Sodium (Na) Potassium (K) as Na	.....	1298.2	1560.2	2191.2	2483.9	2668.8	.....	2679.1
Magnesium (Mg)	.....	75.2	62.1	167.0	218.2	239.1	.....	179.8
Iron (Fe)	.....	ND	ND	ND	ND	ND	.....	ND
Manganese (Mn)	.....	.....	.....	.....	.....	.....	.....	.....
Silica (SiO_2)	.....	2.0	1.6	15.2	12.8	37.2	.....	10.8
Calcium (Ca)	.....	190.0	128.3	168.2	151.5	139.2	.....	252.3
Total Hardness	.....	783.3	575.4	1105.2	1273.4	1328.3	.....	1367.9
Carbonate Hardness	.....	334.3	253.6	321.7	272.1	283.5	.....	274.4
Alkalinity	.....	334.3	253.6	321.7	272.1	283.5	.....	274.4
Precipitated Iron (Pp't Fe.)	.....	ND	ND	ND	ND	ND	.....	ND
Temporary Hardness	.....	ND	ND	ND	ND	ND	.....	ND
$Al_2O_3 + Fe_2O_3$	.....	.40	2.40	2.00	2.40	1.20	.....	1.20
Bromine	.....	.....	.....	.....	.....	.....	.....	.....
Fluorine	.....	2.24	3.22	2.79	2.00	1.95	.....	2.60
Formational Source	.....	.....	.....	Top.Kimm.	Tp.Md.Ch.Km.	Tp.Md.Kim.	Kimm.	Bot.L.Km.

Remarks: 1660: This sample from 1660 feet but driller says this water is coming from uncased pool of Mississippian lime below 1430.8′ 2011-2015: This sample from 2011-2015 feet after 8″ casing had been lowered to 1984 feet. Water from 1987-1993 feet.

*Sample at 1912-1940 representative of Devonian (8″ set at 1898′).

**Sample 2011-2015 representative of Kimmswick (8″ reset at 1984 in Kimmswick): samples at 2056,2075 and 2113-2120 all representative of Kimmswick water.

COUNTY, Buchanan. OWNER, Miller-Corrough No. 1. LOCATION, 24-57-35.

ANALYST, R. T. Rolufs. TOTAL DEPTH, 2307.

Depth Sample Collected	2143	2150-2151	2170-2173*	2185-2192**	2205-2212**	2246	2259
Analysis Number	2525,NB.772	.....	3251	3252	3253	3254	3255
Date Analyzed	1-22-40	.....	2-6-40	2-6-40	2-6-40	2-6-40	2-6-40
Turbidity	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.	Tur.B.Sp.
Color	None	None	None	None	None	None	None
Odor	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids	ND	ND	ND	ND	ND	ND	ND
Total Dissolved Solids	8418.0	8785.0	9526.0	10555.0	11408.0	11000.0	11225.0
Loss on Ignition	.....	.....	ND	ND	ND	ND	ND
Chloride Radicle (Cl)	3651.7	3760.3	4168.3	4794.5	5159.0	4981.4	5159.0
Nitrate Radicle (NO_3)	.....	.....	ND	ND	ND	ND	ND
Sulphate (SO_4)	1273.0	1290.7	1317.4	1258.4	1333.7	1262.7	1280.4
Bi-Carbonate Radicle (HCO_3)	.....	.....	333.6	246.1	247.5	226.4	258.7
Carbonate Radicle (CO_3)	.....	.....	00	00	00	00	00
Sodium (Na) Potassium (K) as Na	.....	.....	2914.3	3328.2	3488.7	3339.2	3380.1
Magnesium (Mg)	.....	.....	195.9	200.8	199.4	212.9	247.1
Iron (Fe)	.....	.....	ND	ND	ND	ND	ND
Manganese (Mn)	.....	.....	.....	ND	ND	.....	ND
Silica (SiO_2)	.....	.....	10.0	46.4	44.4	28.8	11.6
Calcium (Ca)	.....	.....	288.6	357.4	408.9	368.1	335.7
Total Hardness	.....	.....	1524.7	1716.8	1839.8	1793.1	1852.4
Carbonate Hardness	.....	.....	373.4	201.8	203.0	185.6	212.1
Alkalinity	.....	.....	373.4	201.8	203.0	185.6	212.1
Precipitated Iron (Pp't Fe.)	.....	.....	ND	ND	ND	ND	ND
Temporary Hardness	.....	.....	ND	ND	ND	ND	ND
$Al_2O_3 + Fe_2O_3$	.....	.....	.80	2.00	2.40	2.40	1.60
Bromine	.....	.....	.....	.....	.....	.....	.....
Fluorine	.....	.....	1.9	2.6	2.7	2.8	2.3
Formational Source	Bot. L. Km.	Bot. L. Kim.	Base Dec.	Top St. P.	St. Peter	St.P.-Can.	Arbuckle

Remarks: 2150-2151: SWL 262. 2170-2173: Temp. 84 degrees F, SWL 250′. 2185-2192: SWL 262. 2205-2212: SWL 262. 2246: SWL: 257 feet.

*Sample at 2175 is probably representative of Decorah water due to change in chemical analysis.

**Samples 2185-2192 and 2205-2212 probably representative of St. Peter water due to change in chemical analysis.

COUNTY, Buchanan. OWNER, Miller-Corrough No. 1. LOCATION, 24-57-35.

ANALYST, R. T. Rolufs. TOTAL DEPTH, 2307.

Depth Sample Collected	2286-2293	2307*
Analysis Number	3261	3262
Date Analyzed	2-6-40	2-6-40
Turbidity	Tur.B.Sp.	Tur.B.Sp.
Color	None	None
Odor	ND	ND
Total Suspended Solids	ND	ND
Total Dissolved Solids	8192.0	16493.0
Loss on Ignition	ND	ND
Chloride Radicle (Cl)	3687.0	8023.5
Nitrate Radicle (NO_3)	ND	ND
Sulphate (SO_4)	1111.1	1423.2
Bi-Carbonate Radicle (HCO_3)	165.9	237.6
Carbonate Radicle (CO_3)	00	00
Sodium (Na) Potassium (K) as Na	2621.6	4733.4
Magnesium (Mg)	145.1	303.9
Iron (Fe)	ND	ND
Manganese (Mn)	ND	.....
Silica (SiO_2)	3.2	3.6
Calcium (Ca)	291.5	699.6
Total Hardness	1323.7	2995.0
Carbonate Hardness	136.0	194.8
Alkalinity	136.0	194.8
Precipitated Iron (Pp't Fe.)	ND	ND
Temporary Hardness	ND	ND
$Al_2O_3 + Fe_2O_3$	.40	.40
Bromine	.....	.....
Fluorine	2.6	3.3
Formational Source	.....	.....

Remarks: *Sample at 2307 no doubt representative of Arbuckle water (H.F.W. 2291-2296 ft.)