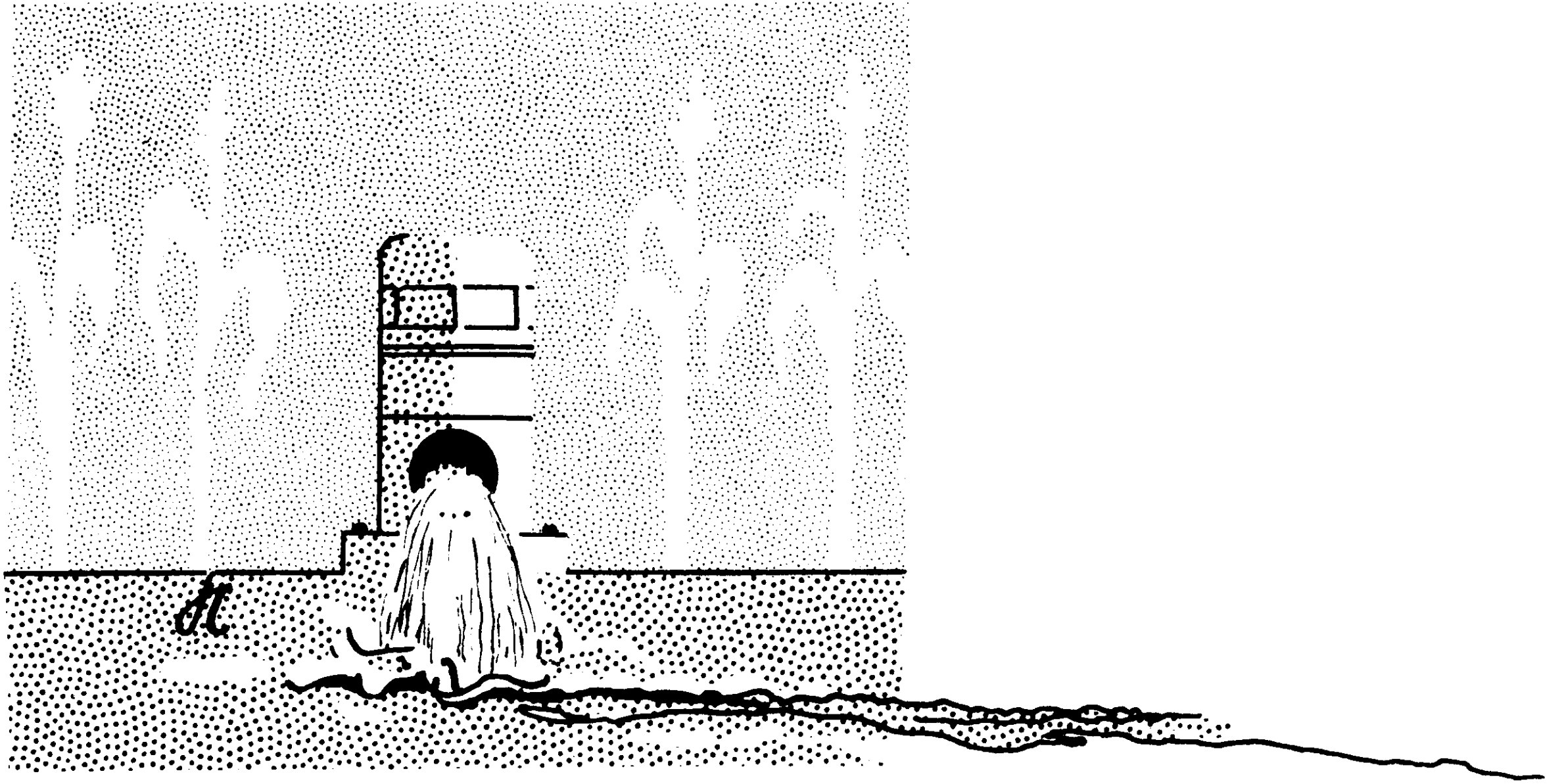
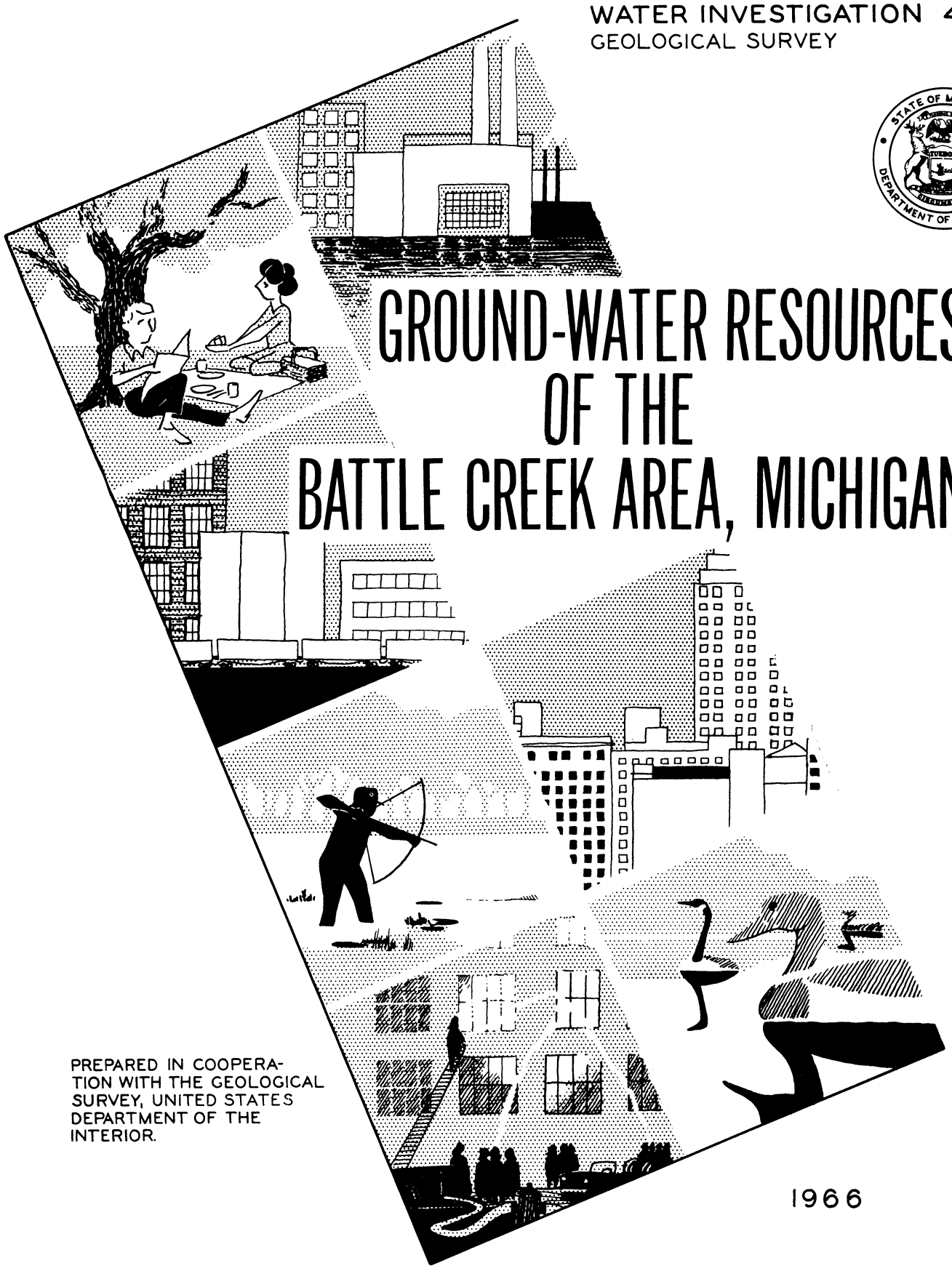


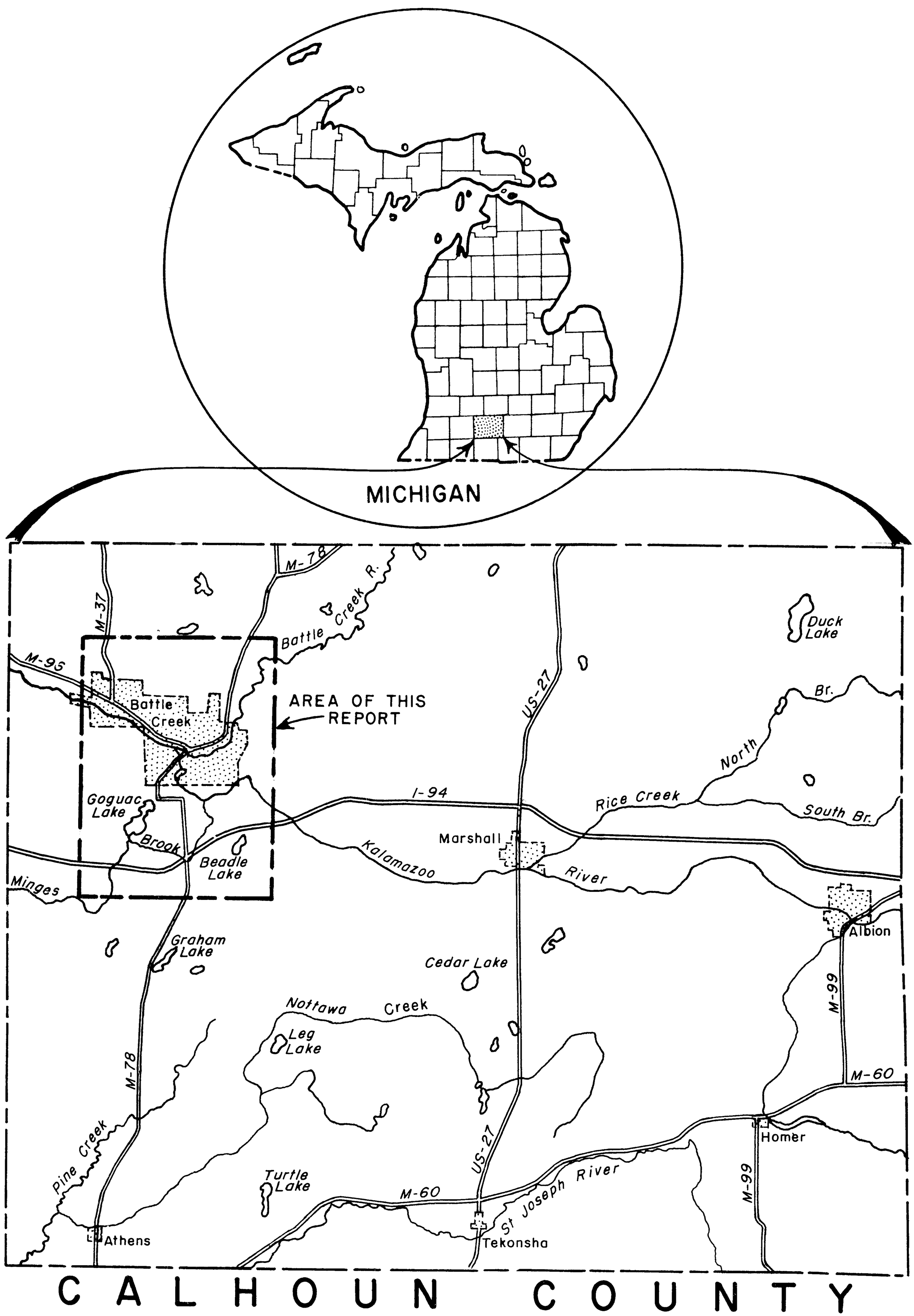
WATER INVESTIGATION 4
GEOLOGICAL SURVEY



GROUND-WATER RESOURCES OF THE BATTLE CREEK AREA, MICHIGAN

PREPARED IN COOPERATION WITH THE GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR.

1966


MICHIGAN
M-37
M-78
Creek R.
Battle
M-96
Battle Creek
AREA OF THIS REPORT
US-27
Duck Lake
Br.
North
Rice Creek
South Br.
I-94
Goguac Lake
Brook
Beadle Lake
Marshall
Kalamazoo
River
Minges
Albion
Graham Lake
Cedar Lake
Nottawa Creek
Leg Lake
M-99
M-60
M-78
Pine Creek
Turtle Lake
US-27
St Joseph River
Homer
M-99
M-60
Athens
Tekonsha
CALHOUN COUNTY

R. 8 W.

R. 7 W.

T. 1 S.

T. 2 S.

BEDFORD

PENNFIELD

SPRINGFIELD

BATTLE CREEK

BATTLE CREEK

EMMETT

Wabascong Creek

M-37

Hamlin Lake

North Ave.

M-78

Wanadoga Cr.

Morgan Rd.

Capital Ave.

M-96

Michigan Ave.

KALAMAZOO RIVER

Spring Lakes

Verona Station

GRAND TRUNK

CREEK

Emmett St.

NEW YORK CENTRAL

GRAND TRUNK

Dickman Rd.

Battle Creek Township

Central

Industrial

Area

Raymond Ave.

BATTLE

Hall Lake

Dexter Lake

Michigan Ave.

RIVER

NEW YORK CENTRAL

KELLOGG AIRPORT

Lower Mill Pond

KALAMAZOO

Willow Cr.

Columbia Ave.

Goguac Lake

Golden Rd.

LAKE

GOGUAC

Mud Lake

Brook

Mingos

BEADLE LAKE

Helmer Rd.

Capital Ave.

Main St.

Beadle Lake Rd.

I-94

N.

B

Dr.

21-1 22-1 22-2 22-3 23-1 23-2 25-1 25-2 25-3 25-4 26-1 27-1 28-1 28-2 29-1 30-1 31-1 31-3 32-1 32-2 32-3 33-1 33-2 34-1 35-1 36-1

1-1 1-2 1-4 1-7 1-12 1-13 1-15 1-17 1-19 2-1 2-3 3-1 3-2 3-3 3-4 3-5 3-6 4-1 4-5 5-1 5-2 5-3 5-4 6-1 7-1 7-2 7-12 8-1 8-2 8-8 9-1 9-2 9-3 9-4 9-5 11-1 11-2 11-3 11-4 12-5 12-9 12-11 13-1 14-1 14-2 16-1 16-2 16-2,3 16-3 16-4 17-1 18-1 18-2 19-1 19-2

EXPLANATION

N — — — — S

Trace of cross section of figure 5

28-1

Well, with number

Observation well

Log in table 4

Quality-of-water data in table 1 or 2

Area of major well fields

N

0 .5 1 Mile

R.8 W.

R.7 W.

T. 1 S.

T. 2 S.

EXPLANATION

Inferred trace and direction of drainage

824

Elevation of bedrock surface at control well

800

Contour on the bedrock surface (feet above mean sea level)

Contour interval 20 feet

Contours and drainage pattern are tentative and subject to change as additional data become available.

N

R. 8 W.

R. 7 W.

T. 1 S.

T. 2 S.

BEDFORD

PENNFIELD

SPRINGFIELD

BATTLE CREEK

BATTLE CREEK

EMMETT

Wabascong Creek

M-37

Hamlin Lake

North Ave

M-78

Wanadoga Cr

Morgan Rd

M-96

Michigan Ave

KALAMAZOO RIVER

NEW YORK CENTRAL

GRAND TRUNK

Dickman Rd

KELLOGG AIRPORT

Capital Ave

Spring Lakes

Emmett St

BATTLE CREEK

Raymond Ave

Hall Lake

Dexter Lake

Michigan Ave

RIVER

KALAMAZOO

Willow Cr

Columbia Ave

Golden Ave

GOGUAC LAKE

Minges Brook

Mud Lake

I-94

BEADLE LAKE

Helmer Rd

Minges B Dr

Main St

Beadle Lake Rd N.

EXPLANATION

Marshall Formation

Coldwater Shale

0 0.5 1

MILES

N

Goguac Lake

Well in sand and gravel

Well in sandstone
(Good well)

Minges Brook

Well in shaly sandstone
(Poor well)

Well in sand and gravel

Well in shale
(No water)

Well in sand and gravel

Well in shale
(No water)

I-94 (Capitol Ave. Interchange)

Well in sandstone
(Good well)

N

S

900

800

700

600

ALTITUDE
(feet above msl)

glacial drift

Marshall Formation

Marshall Formation

Coldwater Shale

R. 8 W.

R. 7 W.

T. 1 S.

T. 2 S.

EXPLANATION

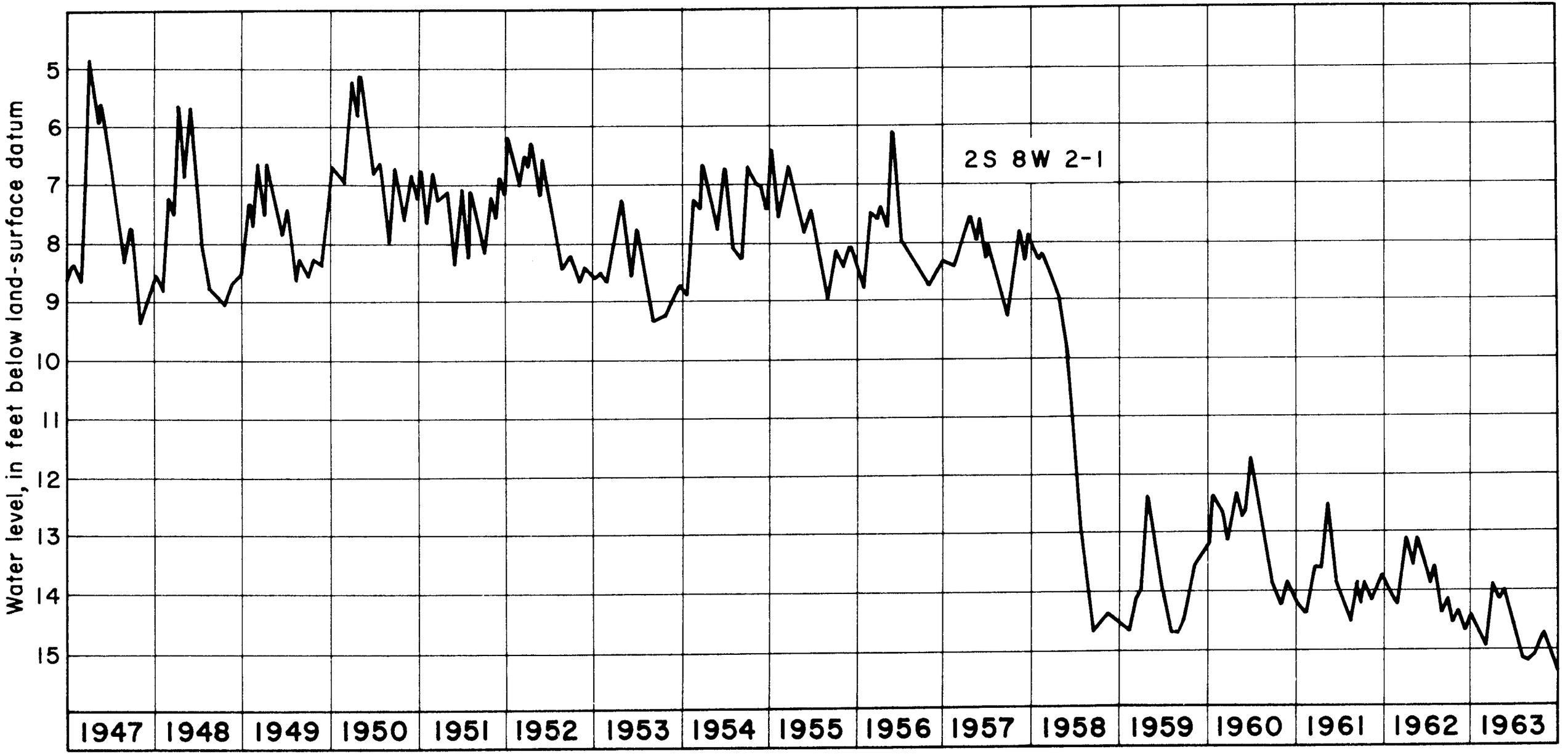
825
Elevation of water level at control well

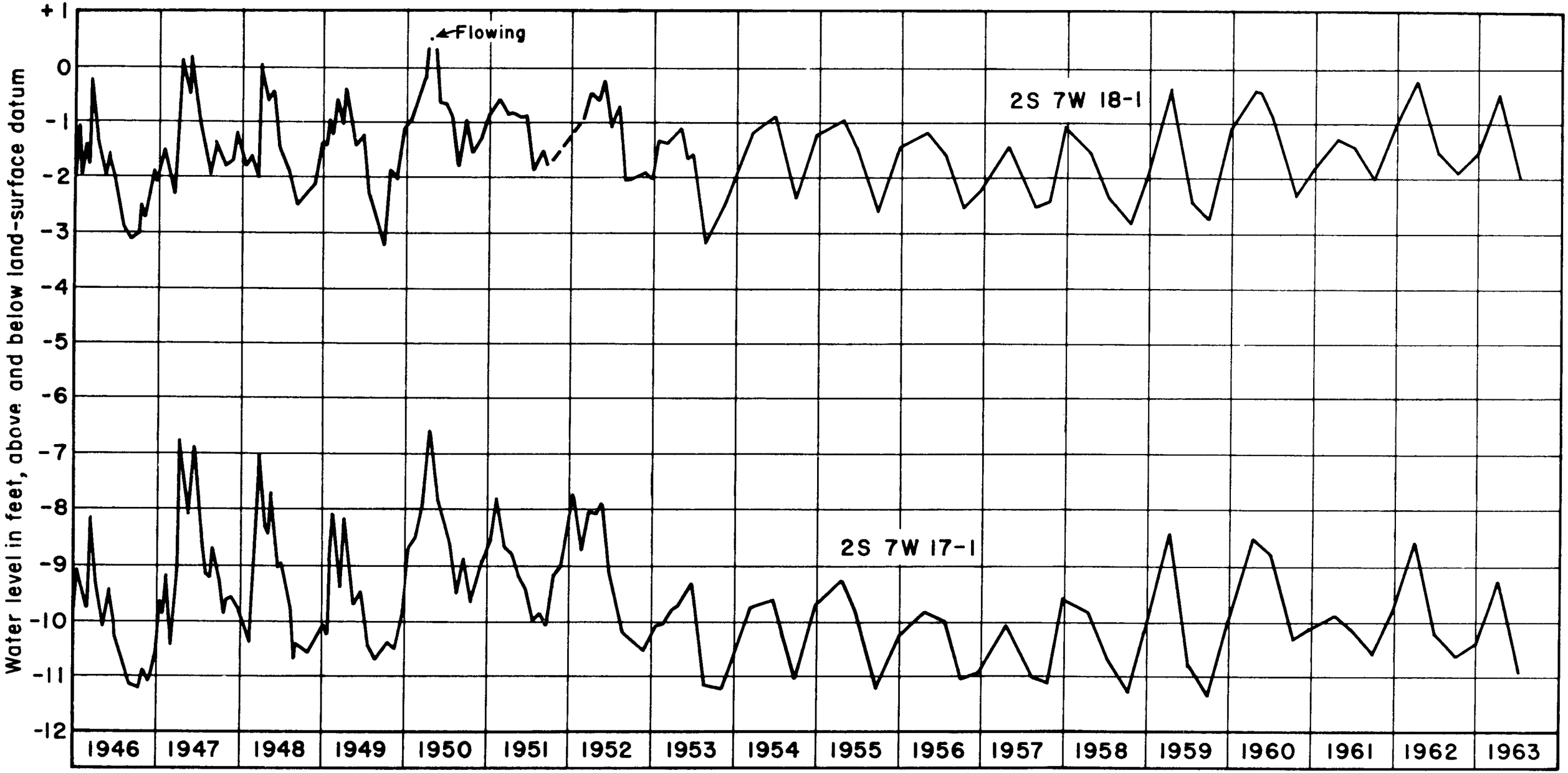
Direction of ground-water flow

—900—
Contour on the water table (water-surface)

N

0 0.5 1
Miles


Water level, in feet below land-surface datum
5
6
7
8
9
10
11
12
13
14
15
2S 8W 2-1
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963


Water level in feet, above and below land-surface datum
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
Flowing
2S 7W 18-1
2S 7W 17-1
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963

N

0 500 1000

FEET

AVE. N.E. (M78)

CAPITAL

BATTLE CREEK

BATTLE CR.

GRAND TRUNK WESTERN

14 15 16 17 30 37 13 36 38 41 40 39 29 28 27 26 24 25 31 20 21 19 18 22 23 7 5 3 33 32 34 35

EXPLANATION

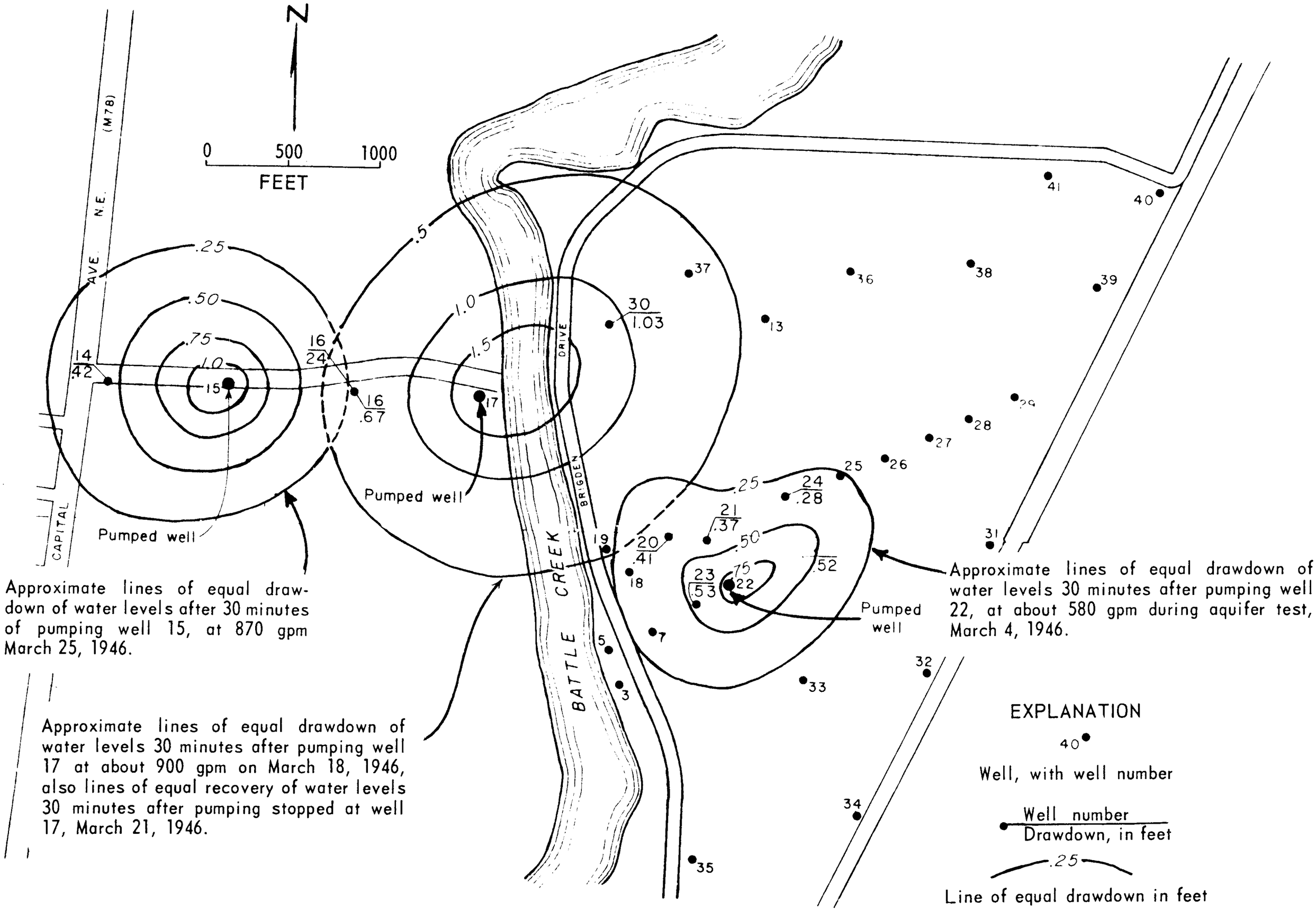
Depth to bedrock

Less than 15 ft.

15 to 25 ft.

25 to 40 ft.

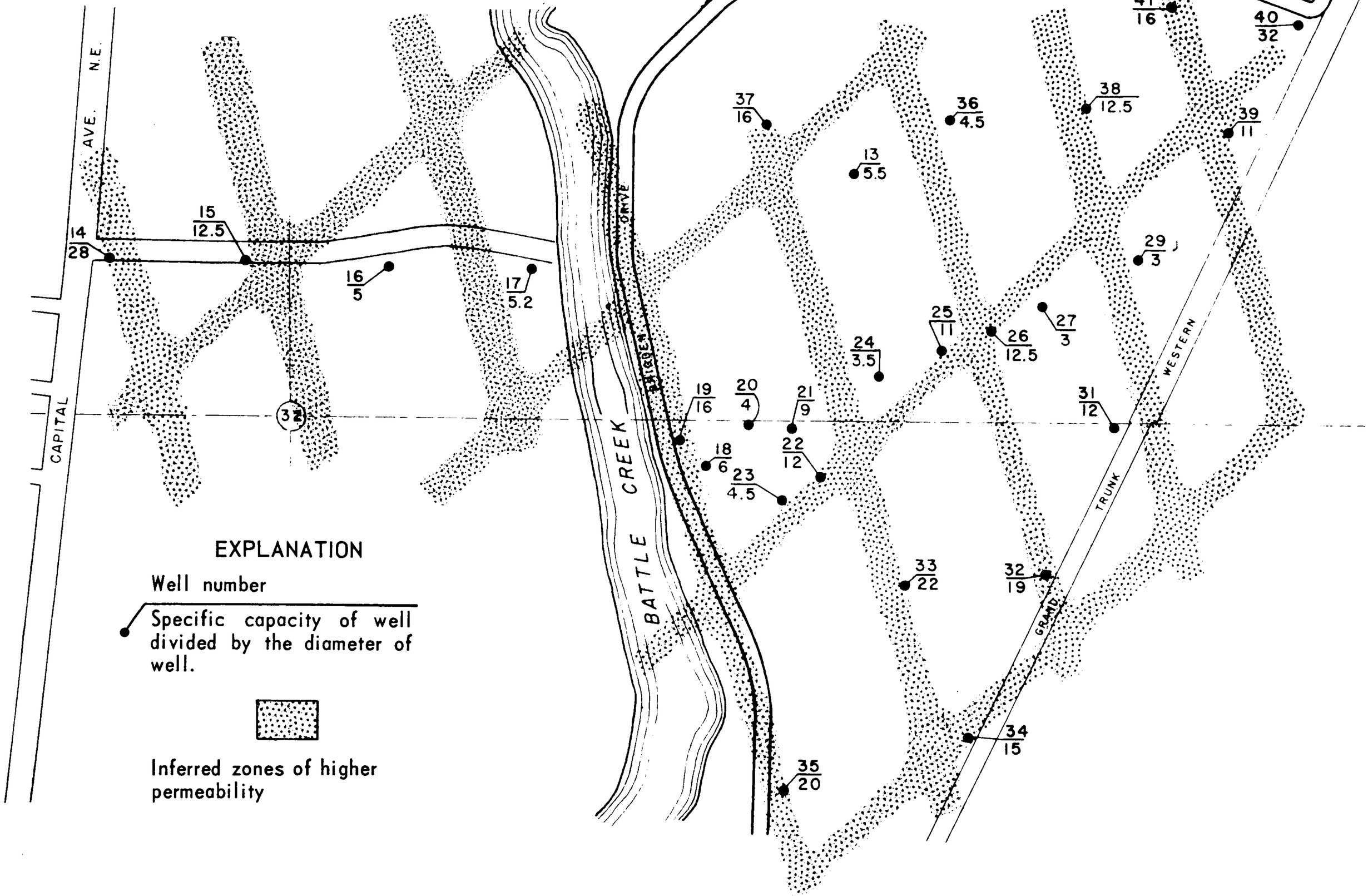
More than 40 ft

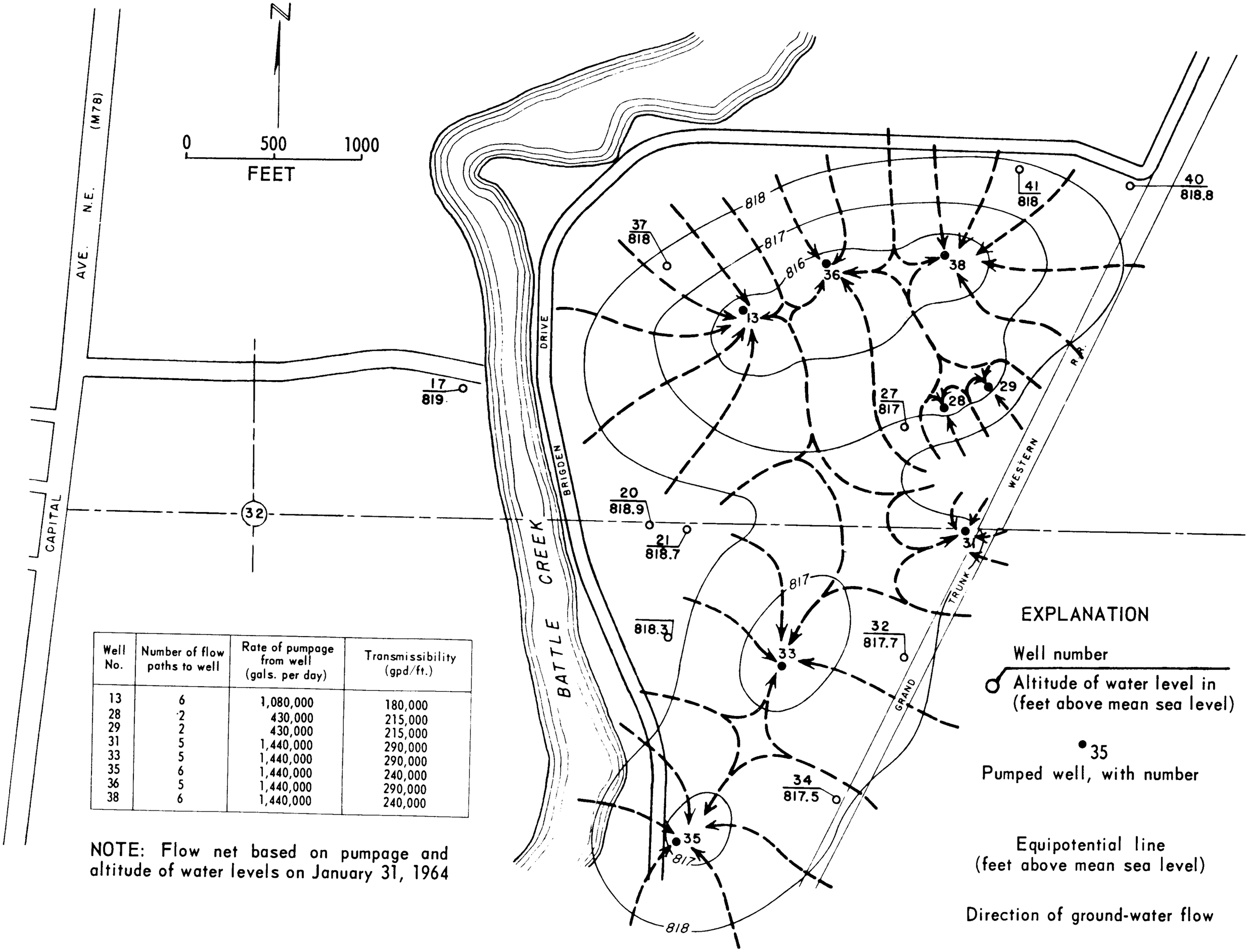


Approximate lines of equal drawdown of water levels after 30 minutes of pumping well 15, at 870 gpm March 25, 1946.

Approximate lines of equal drawdown of water levels 30 minutes after pumping well 17 at about 900 gpm on March 18, 1946, also lines of equal recovery of water levels 30 minutes after pumping stopped at well 17, March 21, 1946.

Approximate lines of equal drawdown of water levels 30 minutes after pumping well 22, at about 580 gpm during aquifer test, March 4, 1946.


AVE. N.E.
CAPITAL
BRADEN DRIVE
BATTLE CREEK
WESTERN
GRAND TRUNK
14
28
15
12.5
16
5
17
5.2
32
19
16
18
6
20
4
21
9
22
12
23
4.5
24
3.5
25
11
26
12.5
27
3
29
3
31
12
33
22
34
15
35
20
36
4.5
37
16
38
12.5
39
11
40
32
41
16
13
5.5
EXPLANATION
Well number
Specific capacity of well divided by the diameter of well.
Inferred zones of higher permeability



Well No.	Number of flow paths to well	Rate of pumpage from well (gals. per day)	Transmissibility (gpd/ft.)
13	6	1,080,000	180,000
28	2	430,000	215,000
29	2	430,000	215,000
31	5	1,440,000	290,000
33	5	1,440,000	290,000
35	6	1,440,000	240,000
36	5	1,440,000	290,000
38	6	1,440,000	240,000

NOTE: Flow net based on pumpage and altitude of water levels on January 31, 1964

EXPLANATION

Well number

Altitude of water level in (feet above mean sea level)

35
Pumped well, with number

Equipotential line (feet above mean sea level)

Direction of ground-water flow

Pumpage (billion gals.)

0
1
2
3
4
5

Annual municipal pumpage at Battle Creek

Water level, in feet below land-surface datum

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

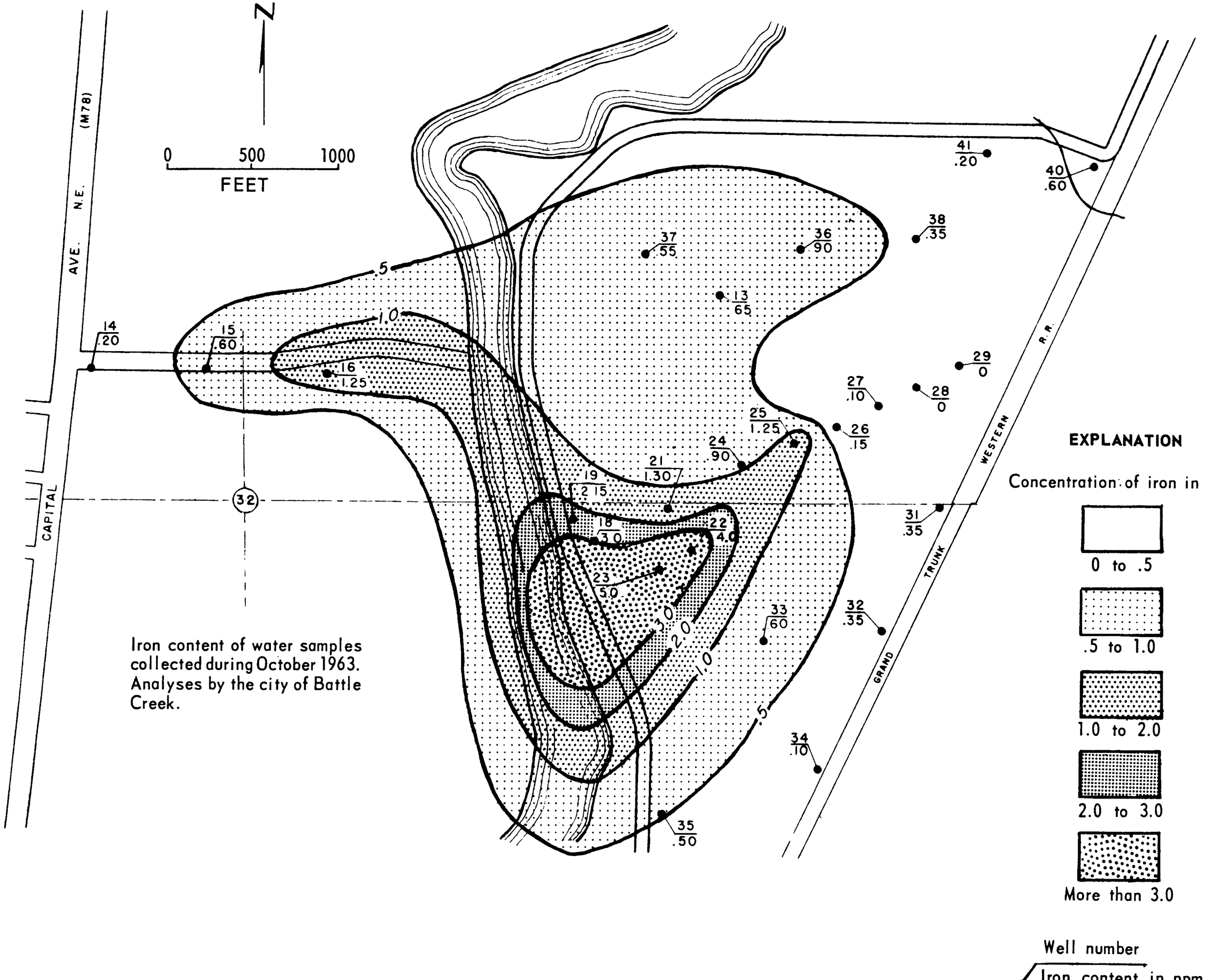
Well: 1S 7W 32-1
Depth: 127 feet
Aquifer: Marshall Formation

Departure (inches)

+20
+10
0
-10
-20

Cumulative departure of precipitation at Battle Creek

1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963



Iron content of water samples collected during October 1963. Analyses by the city of Battle Creek.

Pumpage, in hundred million gals

4

3

2

Iron, in parts per million

3.0

2.5

2.0

1.5

1.0

0.5

0

Well 25

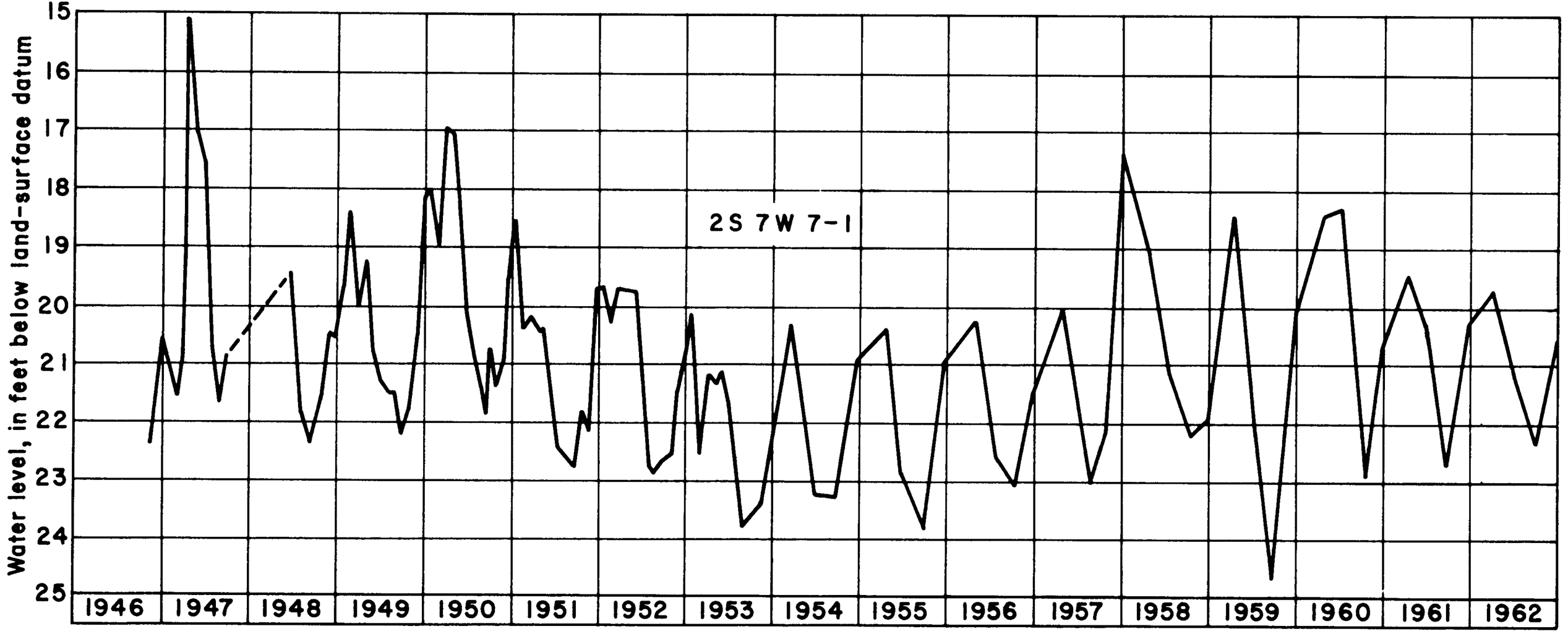
Well 24

Well 26

1961

1962

1963


Water level, in feet below land-surface datum
15
16
17
18
19
20
21
22
23
24
25
2S 7W 7-1
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962

R.8 W.

R.7 W.

T. 1 S.

T. 2 S.

KALAMAZOO MORAINE

Km

BEDFORD

PENNFIELD

KALAMAZOO OUTWASH

Ko

BATTLE CREEK DRAINAGE

GLACIAL BATTLE CREEK CHANNEL

SPRINGFIELD

BCo

BATTLE CREEK

BCm

EMMETT

TEKONSHA MORAINE

Tm

TEKONSHA OUTWASH

To

Waboscong Creek

Hamlin Lake

North Ave

Morgan Rd

Capital Ave

Wanadoga

M-96

Michigan Ave

KALAMAZOO RIVER

NEW YORK CENTRAL

GRAND TRUNK

Spring Lakes

Emmett St

Dickman Rd

KELLOGG AIRPORT

Lower Mill Pond

Raymond Ave

Hall Lake

Dexter Lake

Columbia Ave

Golden

GOGUAC LAKE

Mingos Brook

Mud Lake

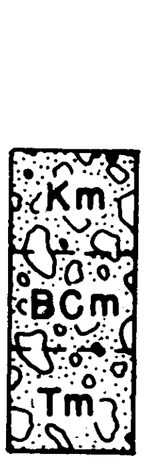
Willow Cr.

Beadle Lake

I-94

Main Dr

Helmer Rd



Kalamazoo moraine

Battle Creek moraine

Tekonsha moraine

Kalamazoo outwash

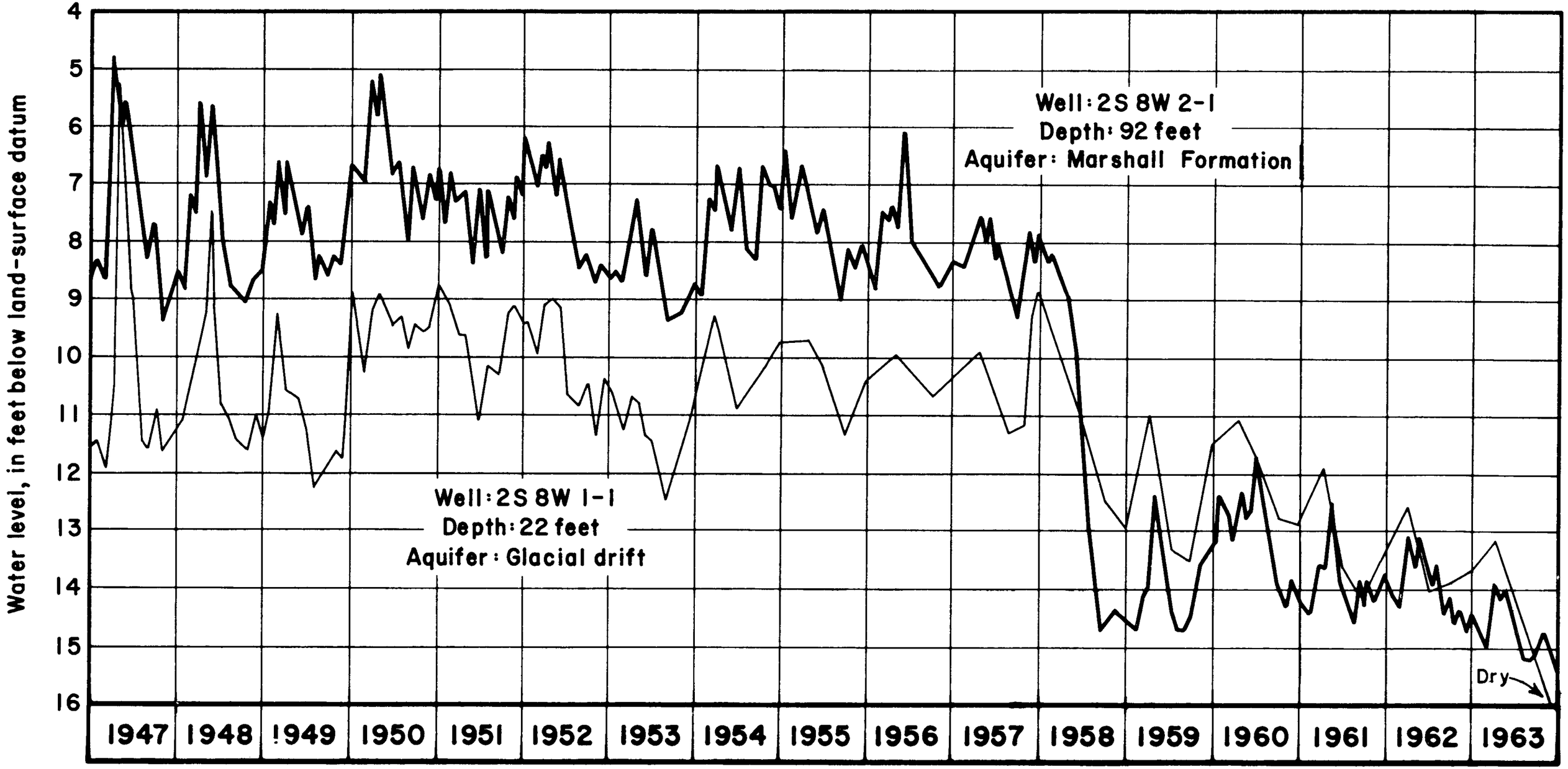
Battle Creek outwash

Tekonsha outwash

0 0.5 1

Miles

N


Water level, in feet below land-surface datum
4
5
6
7
8
9
10
11
12
13
14
15
16
Well: 2S 8W 2-1
Depth: 92 feet
Aquifer: Marshall Formation
Well: 2S 8W 1-1
Depth: 22 feet
Aquifer: Glacial drift
Dry
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963

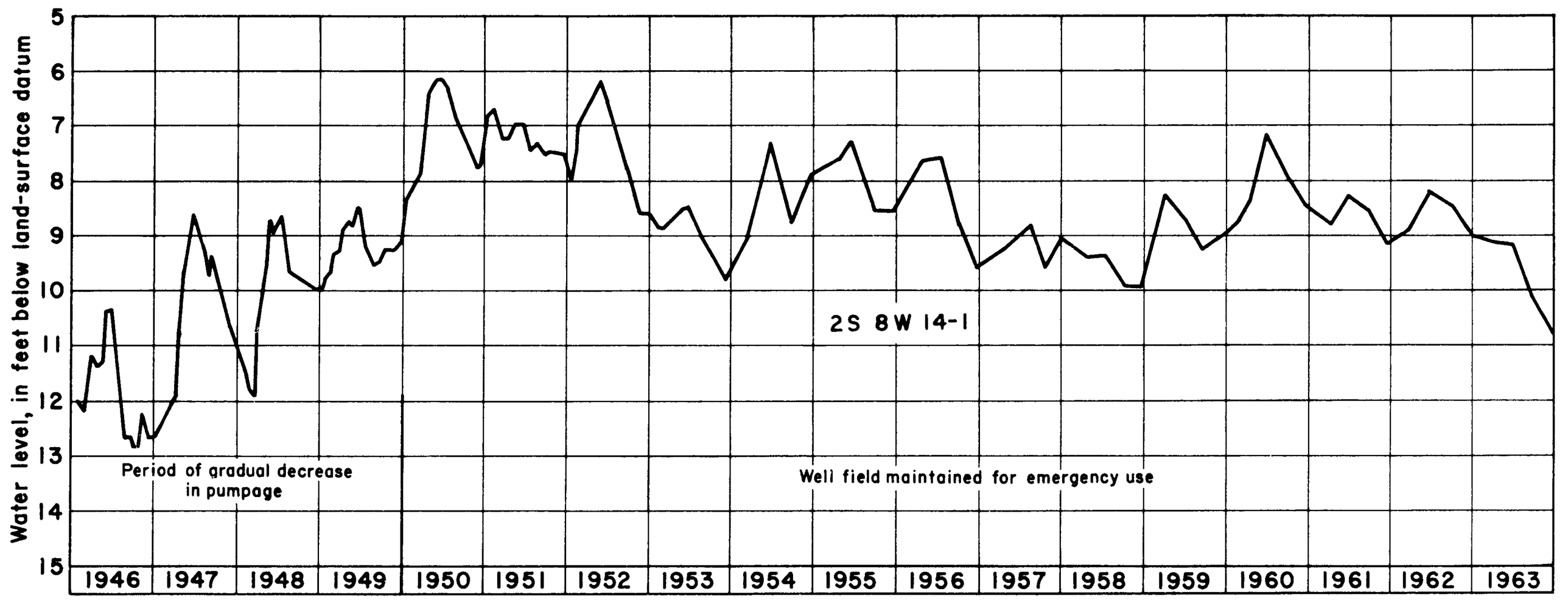

Water level, in feet below land-surface datum
5
6
7
8
9
10
11
12
13
14
15
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
2S 8W 14-1
Period of gradual decrease in pumpage
Well field maintained for emergency use

Table 1.--Chemical Analyses of Water from the Marshall Formation

Analyses by: M - Michigan Department of Health; U - U. S. Geological Survey

Use : P - public; T - test well; D - domestic; In - industrial

Well No.	Owner	Analyses by	Use	Date sampled	Chemical constituents (parts per million)												pH	Specific conductance (Micromhos at 25°C)	Temperature (F°)	Remarks
					Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved solids	Hardness as $CaCO_3$				
1S 8W																				
25-1	Bedford Township	M	P	5-12-58		0.25							4	0.0		220	8.0			
1S 7W																				
31-1	City of Battle Creek	M	T	6-20-52	9.1	.7	66	23	3		274	39	2	.2	310	260	7.7	415	51	
32-16	City of Battle Creek (Verona No. 16)	U	P	9-28-54	13	.84	72	20	2.9	0.8	256	52	5	.0	290	262	7.6	487	51	
32-19	City of Battle Creek (Verona No. 19)	M	P	4- 2-54							254	43	6			240		550		
32-21	City of Battle Creek (Verona No. 21)	M	P	4- 2-54							276	67	5			290		650		
32-23	City of Battle Creek (Verona No. 23)	M	P	6-20-52	8.8	.1	74	25	7.3		280	59	10		332	285	7.6	550	51	
		M	P	1-21-53							268	57	9			285		550	51	
		M	P	3-17-54							258	55	9			265		570	51	
32-24	City of Battle Creek (Verona No. 24)	M	P	8-21-53	10	.1	68	25	5		285	40	5	0	254	270	7.4	520		
		M	P	4- 2-54							293	39	3			270		590		
33-1	W. McPherson	M	D	8-12-60		16										260				H_2S
33-27	City of Battle Creek (Verona No. 27)	M	P	4- 2-54							288	44	3			270		590		
33-29	City of Battle Creek (Verona No. 29)	M	P	1-21-53	9		64	21	3		257	39	2	.1	300	245	7.6	530	50	
2S 8W																				
1-4	Battle Creek Federal Center	M	P	6-20-52	10	1.2	92	26	14		339	64	22	.1	430	335	7.4	700		
3-3	P. E. Slayton	U	D	4-10-59	2.1	.12	30	23	8.5	1.4	172	26	16	.1	185	170	7.8	362		
11-1	Battle Creek Township (No. 1)	M	D	11- 7-57	15	1.0	87	23	7.4	.8	326	40	10	.0	356	312	7.4	600		
11-2	Battle Creek Township (No. 2)	M	P	6-20-52	11.3	.6	74	23	7.9		325	33	6	.1	318	280	7.6	580	51	
		M	P	11- 7-57	15	1.0	91	21	6.0		326	40	8	.0	352	315	7.4	600		
11-3	Battle Creek Township (No. 3)	M	P	6-11-58	13	.5	95	27	10	.9	340	55	17	0	424	350	7.4	660		
11-4	Battle Creek Township (No. 4)	M	P	12-17-59	15	1.2	92	25	6.5	.8	348	35	13	.0	380	335	7.6	640		
12-11	Ralston Purina Co.	U	In	4-19-55	12	.4	130	29	20	3.5	383	122	37	.4	560	444	7.1	892	55	
16-3	Battle Creek Twp.	M	P	1-31-64	13	5.8	74	21	3.5	.7	322	6	2	.1	344	270	7.4	500		
2S 7W																				
5-1	Grand Trunk Western Railroad	M	In	1-23-53	11	.4	68	21	3		266	39	3		280	255	7.5	500	51	
8-8	Kellogg Company	M	In	6-20-52	7.5	.3	82	25	14		300	75	17	.2	400	310	7.7	625	52	
		M		1-21-53							312	73	20			330		700	51	

Table 2.--Chemical Analyses of Water from Glacial Drift

Analyses by: M - Michigan Department of Health; U - U. S. Geological Survey

Use: P - public; T - test well; D - domestic; In - industrial

Well No.	Owner	Analyses by	Date sampled	Chemical constituents (parts per million)													pH	Specific conductance (Micromhos at 25°C)	Temperature (F°)
				Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved solids	Hardness as $CaCO_3$				
2S 8W																			
3-1	Dominic Conto	M	6-20-52	6.7	15.3	104	27	9.4		366	70	16	0.2	504	370	7.4	690	52	
14-2	City of Battle Creek	U	4-10-59	11	1.9	74	17	4.6	0.5	316	0.2	5	.1	478	255	7.5	478		
14-4	City of Battle Creek	M	1-21-53	10	1.1	50	16	4		232	10	2		210	190	7.7	410	53	
22-1	Westlake School	M	12-15-59		.8							2			220	7.4			
23-1	Battle Creek Country Club	M	6-20-52	11	3.5	60	16	4		278		4	.2	262	215	7.4	410	51	

Table 3.--Records of wells in Battle Creek area, Michigan

Location: Most wells are located to the nearest 10-acre tract in the section, some to the nearest 40-acre tract. Others are located by well station (see fig. 2), street number, or corner of nearest street intersection.

Aquifer: G, glacial drift; M, Marshall Formation.

Use: AC, air conditioning; D, domestic; F, fire fighting; In, industrial; O, observation well; P, public supply; T, test well.

Water level: In feet below land-surface datum; M, measured; R, reported.

Altitude: Land-surface datum, in feet above mean sea level, estimated from U.S. Geological Survey topographic maps; reported to 0.1 foot where established by instrumental leveling.

Remarks: L, Log in table 4; Q, Quality of water analysis in table 1 or 2.

Well No.	Location in section ¼ ¼ ¼	Owner	Year drilled	Diameter (in.)	Depth (ft)	Aquifer	Use	Specific capacity	Water level	M or R	Date Measured	Altitude	Depth to bedrock	Remarks
1S 8W														
25-1	NE¼ NE¼ SE¼ sec 25	Bedford Twp. No. 1	1958	10	226	M	P	170	43	R	3- ?-58	890	89	L, Q
25-3	NE¼ NE¼ SE¼ sec 25	Bedford Twp. TW 1	1958	6	220	M	T	170	42	R	3- ?-58	890	84	
27-1	SE¼ SE¼ SW¼ sec 27	Urbandale School	----	--	140	M	P	---	-----	-	--------	830	120	
36-1	SE¼ SE¼ sec 36	City of Battle Creek TW 2	1926	2	53	M	T	---	-----	-	--------	838	49	L
1S 7W														
28-1	NW¼ SE¼ NE¼ sec 28	Pennfield Twp.	1950	6	110	M	F	---	11	M	1-30-64	838	50	
28-2	SW¼ SW¼ NE¼ sec 28	C. Milburn	1963	--	55	M	D	---	-----	-	--------	845	37	L
29-1	CE¼ NW¼ section 29	Doo Drop Inn	----	6	57	M	P	---	16	R	1960	848	21	L, nearby well produced water containing H_2S
30-1	NW¼ NE¼ SE¼ sec 31	Dr. J. Sleight	----	4	166	M	D	---	-----	-	--------	900	126?	
31-1	NW¼ NE¼ SW¼ sec 31	City of Battle Creek TW 1	1926	2	140	M	D	---	2.82	M	11-21-45	838.9	83	L, Q
31-3	SE¼ NW¼ NW¼ sec 31	Pennfield Twp.	1958	6	203	M	D	---	34	R	2- ?-58	875	120	L
32-1	Verona Well Station	City of Battle Creek	1919	8	127	M	O	---	-----	-	--------	830.7	42	Q
32-2	120' E of Capitol Ave, 1500' N of Bridge St.	Mrs. Harriet Rice	1940	2	43	M	O	---	13.96	M	1- 3-46	842.9	---	
32-3	SW corner of Capitol Ave. and Hopkins St.	Pennfield Twp.	1950	6	96	M	F	---	17	R	1950	845	40	
32-13	Verona Well Station	City of Battle Creek (13)	1936	12	127	M	P	66-105	7	R	11- ?-36	834	12	
32-14	Verona Well Station	City of Battle Creek (14)	1939	12	127	M	P	330	9	R	2- ?-39	834	38	
32-15	Verona Well Station	City of Battle Creek (15)	1939	12	138	M	P	85-170	8.61	M	12-29-49	835	34	
32-16	Verona Well Station	City of Battle Creek (16)	1939	12	133	M	P	60	7.87	M	12-29-49	828	22	Q
32-17	Verona Well Station	City of Battle Creek (17)	1939	12	133	M	P	63	6.16	M	12-29-49	828	24	
32-18	Verona Well Station	City of Battle Creek (18)	1915	10	126	M	P	50	5.5	R	8- ?-15	833	14	L
32-19	Verona Well Station	City of Battle Creek (19)	1915	8	125	M	P	120	2	R	4- ?-15	830	15	Q
32-20	Verona Well Station	City of Battle Creek (20)	1904	8	140	M	P	32	+1	R	8- ?-04	832	12	
32-21	Verona Well Station	City of Battle Creek (21)	1915	10	131	M	P	76	14	R	2- ?-61	832	12	Q
32-22	Verona Well Station	City of Battle Creek (22)	1918	10	113	M	P	94	18	R	3- ?-61	832	40	
32-23	Verona Well Station	City of Battle Creek (23)	1913	8	110	M	P	35	17	R	3- ?-61	834	39	L, Q
32-24	Verona Well Station	City of Battle Creek (24)	1926	8	117	M	P	28	24	R	3- ?-61	834	12	Q
32-25	Verona Well Station	City of Battle Creek (25)	1926	8	114	M	P	88	24	R	3- ?-61	834	12	
32-30	Verona Well Station	City of Battle Creek (30)	1904	8	151	M	P	---	4	R	12- ?-04	830	35	
32-33	Verona Well Station	City of Battle Creek (33)	1948	16	150	M	P	125-330	8	R	5- ?-48	836	31	
32-34	Verona Well Station	City of Battle Creek (34)	1948	16	140	M	P	30-300	9.5	R	6- ?-48	839	48	
32-35	Verona Well Station	City of Battle Creek (35)	1948	16	132	M	P	360	15	R	6- ?-48	839	36	L

Table 3.--Records of wells.--Continued

Well No.	Location in section ¼ ¼ ¼	Owner	Year drilled	Diameter (in.)	Depth (ft)	Aquifer	Use	Specific capacity	Water level	M or R	Date Measured	Altitude	Depth to bedrock	Remarks
1S 7W														
32-36	Verona Well Station	City of Battle Creek (36)	1957	16	147	M	P	72	15	R	3- ?-57	837	15	
32-37	Verona Well Station	City of Battle Creek (37)	1957	16	145	M	P	260	9.5	R	3- ?-57	831	15	L
33-1	Clifton and Poulson	W. McPherson	----	2	132	M	D	---	-----	-	--------	925	100	Q
33-2	Gorseline and Bellevue	Pennfield School	----	4	154	M	P	---	-----	-	--------	850	105	
33-26	Verona Well Station	City of Battle Creek (26)	1926	8	115	M	P	100	23	R	3- ?-61	835	12	
33-27	Verona Well Station	City of Battle Creek (27)	1926	8	116	M	P	25	12	R	3- ?-61	835	22	L, Q
33-28	Verona Well Station	City of Battle Creek (28)	1926	8	115	M	P	25	14.5	R	3- ?-61	834	26	
33-29	Verona Well Station	City of Battle Creek (29)	1926	8	121	M	P	25	10	R	3- ?-61	834	35	Q
33-31	Verona Well Station	City of Battle Creek (31)	1948	16	125	M	P	81-185	9	R	6- ?-48	836	53	
33-32	Verona Well Station	City of Battle Creek (32)	1948	16	120	M	P	155-310	9	R	5- ?-48	837	50	
33-38	Verona Well Station	City of Battle Creek (38)	1959	16	152	M	P	200-470	20	R	10- ?-59	837	15	
33-39	Verona Well Station	City of Battle Creek (39)	1960	16	145	M	P	175-375	15	R	8- ?-60	837	12	
33-40	Verona Well Station	City of Battle Creek (40)	1962	16	148	M	P	600	21	R	10- ?-62	840	15	L
33-41	Verona Well Station	City of Battle Creek (41)	1962	16	147	M	P	380	21	R	11- ?-62	839	11	
2S 8W														
1-1	22 Barney Street	H.B. Sherman Mfg. Co.	----	2	22	G	O	---	19.71	M	8-22-46	825.2	---	
1-2	64 S. McCamly St.	Honir Brewing Co.	----	2	61	M	O	---	7.50	M	12- 5-45	819.1	---	
1-4	Washington and Champion Streets	Battle Creek Federal Center	1913	8	120	M	P	---	16	R	1913	836	60	Q
1-7	Washington and Champion Streets	Battle Creek Federal Center	----	12	125	M	P	9.3	21	R	1945	836	94	L
1-12	22 Barney Street	H.B. Sherman Mfg. Co.	1959	8	103	M	In	---	17	R	1959	830	35	
1-13	Washington and Van Buren Streets	Hart Hotel	1934	12	117	M	AC	---	30	R	1934	845	20	
1-15	McCamly and Jackson Streets	Bijou Theater	----	8	100	M	AC	---	12	R	1946	828	6	L
1-17	35 W. Michigan Ave.	Kresge Co.	1940	8	110	M	AC	---	12	R	1940	826	28	L
1-19	W. Michigan Avenue	Michigan Theatre		8	100	M	AC	---	12	R	1941	825	75	
2-1	400 NW, Angell St., 240 SW, Lafayette St.	Oliver Electric Mfg. Company	1930	10	95	M	O	---	8.10	M	1-11-46	820.0	---	
2-3	Parish and Hayes St.	Michigan Carton Co.	----	6	190	M	In	---	-----	-	--------	810	---	
3-1	630 Upton Ave.	Dominick Conto	1930	2	18	G	O	---	9.66	M	8-29-46	862	---	Q
3-2	Ave. C and 20th St.	Eaton Mfg. Co.	----	10	80	M	O	---	20.51	M	8-22-46	834.4	---	
3-3	Ave. A and 20th St.	P. E. Slayton	----	4	90	M	O	---	13.14	M	12- 4-45	849.5	---	Q
3-4	Ave. C and 20th St.	Eaton Mfg. Co.	----	8	100	M	In	---	23	R	1946	834	---	Produces "sulfur" water
3-5	Ave. C and 20th St.	Eaton Mfg. Co.	----	8	127	M	In	75	24	R	1945	834		
3-6	Ave. C and 20th St.	Rich Steel Products Company	1924	8	50	M	In	60	13.8	R	1924	838	10	L
4-1	NE of NE¼ section 4	City of Springfield (TW 1)	1959	6	135	M	T	---	-----	-	--------	818	130	L
11-1	NW¼ NW¼ section 11	Battle Creek Twp (1)	1947	12	180	M	P	22	12	R	3- ?-47	895	120	L, Q
11-2	NE¼ NW¼ section 11	Battle Creek Twp (2)	1947	12	172	M	P	9	26	R	3- ?-47	895	106	Q
11-3	NW¼ NW¼ section 11	Battle Creek Twp (3)	1952	12	135	M	P	---	3	R	1952	885	90	Q
11-4	NE¼ NW¼ section 11	Battle Creek Twp (4)	1958	12	146	M	P	---	-----	-	--------	885	118	Q
12-2	Fountain and Monroe Streets	Battle Creek Gas Co. (1)	1910	4	110	M	In	---	10	R	1910	828	88	
12-5	Fountain and Monroe Streets	Battle Creek Gas Co. (TW 2)	1927	--	92	M	T	---	9	R	3- ?-27	828	90	L
12-9	150 S. McComly St.	Ralston Purina Co. (1)	1938	10	120	M	In	---	12	R	1938	820	30	L
12-11	150 S. McComly St.	Ralston Purina Co. (4)	1952	12	110	M	In	---	10	R	1955	825	---	Q
14-1	Goguac Well Station	City of Battle Creek	1928	2	70	G	D	---	21.5	R	11- ?-28	916.0	---	
14-2	Goguac Well Station	City of Battle Creek	----	26	89	G	O	---	12.51	M	12- 7-45	915.0	---	Q
14-3	Goguac Well Station	City of Battle Creek (3)	1930	26	85	G	P	---	20	R	4- ?-30	915	---	
14-4	Goguac Well Station	City of Battle Creek (4)	1931	26	112	G	P	---	15	R	10- ?-31	915	---	L, Q
14-5	Goguac Well Station	City of Battle Creek (1)	1925	18	82	G	P	---	27.5	R	4- ?-27	915	---	
14-6	Goguac Well Station	City of Battle Creek (2)	1930	26	163	G	P	---	16	R	4- ?-30	915	---	
14-7	NE¼ SE¼ section 14	City of Battle Creek (TW 3)	1929	--	90	G	P	---	-----	-	--------	915	---	One of 7 test wells drilled in 1929.
14-13	NE¼ SE¼ section 14	City of Battle Creek	1931	4	105	G	P	---	21	R	4- ?-30	915	---	One of 6 test wells drilled in 1931.

Table 3.--Records of wells.--Continued

Well No.	Location in section ¼ ¼ ¼	Owner	Year drilled	Diameter (in.)	Depth in feet	Aquifer	Use	Specific capacity	Water level	M or R	Date Measured	Altitude	Depth to bedrock	Remarks
2S 8W														
14-19	SE¼ SE¼ section 14	City of Battle Creek (TW 2)	----	4	87	G	P	---	-----	-	--------	915	---	One of 8 test wells drilled in 1928.
14-35	NE¼ SE¼ section 14	City of Battle Creek	1903	6	430	G	P	---	-----	-	--------	920	198	L, One of 4 test wells drilled about 1900.
16-1	SW¼ NE¼ section 16	Battle Creek Twp (TW 1)	1963	8	155	M	T	4	4.5	R	7- ?-63	917	84	
16-2	SW¼ NE¼ section 16	Battle Creek Twp (TW 2)	1963	8	150	M	T	70	6.5	R	8- ?-63	917	62	L
16-3	SW¼ NE¼ section 16	Battle Creek Twp (1)	1964	14	150	M	P	---	-----	-	--------	917		Q, at site of TW 2.
22-1	NE¼ NW¼ section 22	Westlake School	1959	6	75	G	P	19	38	R	1959	945	---	L, Q
22-2	SW¼ NE¼ section 22	Battle Creek Twp (TW 1)	1961	8	110	G	T	---	0	R	1961	917	---	
22-3	SW¼ NE¼ section 22	Battle Creek Twp (TW 2)	1961	8	200	M	T	6	+1	R	1961	917	93	L
23-1	NW¼ SE¼ section 23	Battle Creek Country Club	----	2	53	G	P	---	-----	-	--------	930	---	Q
23-2	19 Wealthy Street	Nelson Alleshouse	1963	--	80	M	D	---	15	R	1963	917	40	
25-1	SE¼ SE¼ section 25	Michigan State Highway Department	1959	6	148	G	P	6	43	R	12- ?-59	935	140?	L
25-2	NE¼ NE¼ section 25	Battle Creek Twp (TW 1)	1962	8	130	G	T	---	1.5	R	1962	860	117	L
25-3	NE¼ NE¼ section 25	Battle Creek Twp (TW 2)	1962	8	76	G	T	6	1.5	R	1962	860	---	
25-4	NE¼ NE¼ section 25	Battle Creek Twp (TW 3)	1962	8	120	-	T	---	2	R	1962	860	118	
26-1	Capitol Ave at I94	Standard Oil Co.	1961	4	70	G	P	---	38	R	1961	935	---	
35-1	Capitol Ave at I94	Bill Knapps Restaurant	1961	4	130	M	P	---	38	R	1961	945	100	
36-1	Capitol Ave at I94	Holiday Inn	1961	4	150	M	P	---	38	R	1961	945	100	
2S 7W														
4-5	1010 Raymond Rd.	Modern Transit Mix	1961	4	123	M	In	---	21	R	1961	860	70	
5-1	SE¼ NE¼ section 5	Grand Trunk Western RR	1939	16	116	M	In	---	-----	-	--------	840	39	L, Q
5-2	SE¼ NE¼ section 5	Grand Trunk Western RR	1939	16	121	M	In	---	9.5	R	1939	840	30	
5-3	SE¼ NE¼ section 5	Grand Trunk Western RR	1939	16	90	G	T	---	12	R	1939	840	30	L
5-4	1021 Raymond Rd.	Nichols Wire and Steel	----	4	135	M	In	---	-----	-	--------	855	75	
6-1	Wabash and Capitol Sts	J. Kilosky	----	8	125	M	-	---	39	R	--------	855	---	
7-1	150 NE Michigan, 470 SE Huron St.	Oliver Farm Equipment	1910	6	71	M	O	---	19.52	R	11- ?-46	831.5	---	
7-2	NE¼ SE¼ Section 7	General Foods Corp (1)	1918	8	87	M	In	---	22.20	R	1945	850	---	One of 13 production wells, 95 to 119 feet deep.
7-12	NE¼ SE¼ section 7	General Foods Corp (2)	1951	--	117	M	In	---	-----	-	--------	875	35	L
8-1	SE¼ NW¼ section 8	Kellogg Co.	----	8	100	M	O	---	-----	-	--------	847.4	---	
8-2	NE¼ NW¼ section 8	Kellogg Co.	1933	16	119	M	O	---	-----	-	--------	845±	51	L
8-8	NE¼ NW¼ section 8	Kellogg Co. No. 8	1933	16	119	M	In	22	35	R	1933	845	51	Q, One of 11 production wells at plant.
8-13	SE¼ SE¼ section 8	City of Battle Creek (TW 7)	1903	2	73	G	T	---	-----	-	--------	837	---	L
9-1	NW¼ SW¼ section 9	City of Battle Creek (TW1)	1903	2	70	G	T	---	-----	-	--------	838	---	L
9-2	NW¼ SW¼ section 9	City of Battle Creek (TW 2)	1903	2	115	G-M	T	---	-----	-	--------	840	85	
9-3	SW¼ SW¼ section 9	City of Battle Creek (TW 3)	1903	2	131	G	T	---	-----	-	--------	838	---	
9-4	SW¼ SW¼ section 9	City of Battle Creek (TW 5)	1903	2	113	G	T	---	8	R	1903	838	---	L, Water level is 5 feet below level of river.
9-5	SW¼ SW¼ section 9	City of Battle Creek (TW 6)	1903	2	100	G	T	---	-----	-	--------	838	---	
16-1	SW¼ NW¼ section 16	City of Battle Creek (TW 8)	1903	2	81	G	T	---	-----	-	--------	842	---	L
16-2	NE¼ NW¼ section 16	City of Battle Creek (TW 9)	1903	2	62	G	T	---	-----	-	--------	839	---	
16-3	NW¼ NW¼ section 16	City of Battle Creek (TW 10)	1903	2	100	G	T	---	-----	-	--------	836	---	
16-4	NW¼ NW¼ section 16	City of Battle Creek (TW 4)	1903	2	93	M	T	---	-----	-	--------	840	70	L
17-1	NW¼ SW¼ section 17	City of Battle Creek	1926	2	91	M	T	---	10.02	M	11-14-45	841.8	15	L
18-1	SW¼ SE¼ section 18	City of Battle Creek	1926	2	90	M	T	---	1.89	M	11-14-45	832.5	52	L
18-2	NE¼ SE¼ section 18	City of Battle Creek	1926	2	75	M	T	---	-----	-	--------	833	15	L
19-1	NW¼ NE¼ section 19	City of Battle Creek	1926	2	73	M	T	---	-----	-	--------	851	31	L
19-2	SE¼ NE¼ section 19	City of Battle Creek	1926	2	74	M	T	---	-----	-	--------	845	54	L
28-1	SW¼ NW¼ section 28	Michigan Woodworks	----	6	117	M	In	---	38	R	1963	935	60	

Table 4.--Logs of wells and test wells

Logs as recorded by well drillers, except those from samples of drill cuttings. Altitudes estimated from U. S. Geological Survey Topographic Maps are reported to the nearest foot. Those determined by instrumental leveling are reported to the nearest tenth of a foot.

	Thickness (feet)	Depth (feet)
Well 1S 8W 25-1; NE¼ SE¼ section 25, Bedford Twp. No. 1 Altitude 890 feet		
Topsoil and sand	5	5
Sand, brown	15	20
Clay, gray	10	30
Clay, brown	40	70
Sand and gravel	19	89
Sandstone, brown	91	180
Sandstone, white	44	224
Shale	2	226
Well 1S 8W 36-1; SE¼ SE¼ section 36, City of Battle Creek No. 2 Altitude 838 feet		
Muck	1	1
Fine sand	48	49
Sandstone	4	53
Well 1S 7W 28-2; SW¼ NE¼ section 28, Clarence Milburn Altitude 845 feet		
Clay and sand	6	6
Sand and gravel	31	37
Soft sandstone	18	55
Well 1S 7W 29-1; SE¼ NW¼ section 29, Doo Drop Inn Altitude 848 feet		
Clay and sand	21	21
Sand rock	36	57
Note: Nearby well 86 ft. deep produced "sulfur" water (water containing H_2S.		
Well 1S 7W 31-1; NE¼ SW¼ section 31, City of Battle Creek Altitude 838.9 feet		
Loam	1	1
Sand, fine	82	83
Sandstone, blue, cavernous	56	139
Shale	1	140
Well 1S 7W 31-3; NW¼ NW¼ section 31, Penfield Twp. Altitude 875 feet		
Sand and gravel, fine to coarse and clay	80	80
Clay, sandy, gravelly	4	84
Sand and gravel, fine to coarse	6	90
Sand, fine to medium	5	95
Sand and gravel, cemented	10	105
Clay, gravelly	11	116
Gravel (water bearing)	2	118
Gravel and sandstone (water bearing)	2	120
Sandstone, white (water bearing)	30	150
Sandstone, shaly	48	198
Shale, blue gray	5	203
Well 1S 7W 32-18; NE¼ SE¼ section 32, City of Battle Creek (Verona No. 18) Altitude 833 feet		
Fine sand	14	14
Soft sandstone	5	19
Very hard sandstone	61	80
Softer sandstone, many openings	30	110
Fine-grained sandstone, fewer openings	16	126
Well 1S 7W 32-23; NE¼ SE¼ section 23, City of Battle Creek (Verona No. 23) Altitude 834 feet		
Quick sand	30	30
Hardpan	9	39
Soft sandstone	4	43
Hard sandstone	67	110
Well 1S 7W 32-35; SE¼ SE¼ section 32, City of Battle Creek (Verona No. 35) Altitude 839 feet		
Sand	15	15
Sand and gravel	21	36
Broken, muddy sandrock	20	56
Clean sandrock	54	110
Shale	2	112
Muddy sandrock	18	130
Shale	2	132
Well 1S 7W 32-37; SE¼ NE¼ section 32, City of Battle Creek (Verona No. 37) Altitude 831 feet		
Yellow sand	15	15
Yellow sandstone	5	20
Gray sandstone	5	25
Brownish gray sandstone	8	33
Gray sandstone, hard	26	59
Light gray sandstone	20	79
Gray sandstone	31	110
Gray sandstone and shale	7	117
Gray sandstone, dirty	7	124
Gray sandstone, crevices	4	128
Gray sandstone	11	139
Gray sandstone and shale	4	143
Shale	2	145
Well 1S 7W 33-27; SW¼ NW¼ section 33, City of Battle Creek (Verona 27) Altitude 835 feet		
Yellow sand, some stone	5	5
Sand, gravel, and stone	17	22
Sandstone, yellow and gray	5	27
Medium soft sandstone	13	40
Hard sandstone, few caverns	5	45
Hard sandstone	5	50
Hard sandstone, four 2-inch caverns	18	68
Hard cavernous sandstone	44	112
Scaly flint rock	4	116

Table 4.--Logs of wells and test wells.--Continued

	Thickness (feet)	Depth (feet)
Well 1S 7W 33-40;		
NW¼ NW¼ section 33		
City of Battle Creek (Verona 40)		
Altitude 840 feet		
Sand	11	11
Gravel and broken rock	4	15
Soft broken sandstone	10	25
Gray sandstone	35	60
Hard sandstone	4	64
Gray sandstone, no cuttings	1	65
Gray sandstone	25	90
Gray sandstone, no cuttings	25	115
Gray sandstone	19	134
Gray sandstone, no cuttings	8	142
Gray sandstone	5	147
Shale	1	148
Well 2S 8W 1-7;		
SW¼ NE¼ section 1		
Battle Creek Federal Center (5)		
Altitude 836 feet		
Fill, clay	4	4
Gravel, sand, muddy	50	54
Mud, clay	6	60
Gravel and clay layers	30	90
Soft clay	4	94
Sandstone	11	105
Shale, hard	2	107
Sandstone, shale	4	111
Shale	14	125
Well 2S 8W 1-15;		
SE¼ SE¼ section 1		
Bijou Theater		
Altitude 828 feet		
-------	6	6
Sandstone, brown	44	50
Sandstone, gray	50	100
Well 2S 8W 1-17;		
SE¼ SE¼ section 17		
Kresge Co.		
Altitude 826 feet		
Fill	8	8
Sand and clay	20	28
Sandstone and shale	22	50
Sandstone	28	78
Shale, hard, sandy	4	82
Sandstone (water)	20	102
Shale	8	110
Well 2S 8W 3-6;		
SE¼ NE¼ section 3		
Rich Steel Products Co.		
Altitude 838 feet		
Sand and boulders	10	10
Soft sandstone	19	29
Blue sandstone	7	36
Fissure at 36 ft.		
Blue sandstone	14	50
Well 2S 8W 4-1;		
NE¼ NE¼ section 4		
City of Springfield TW No. 1		
Altitude 818 feet		
Log from samples of drill cuttings by the Michigan Geological Survey		
Pleistocene:		
Drift		
Clay, yellow, coarse sand, and fine to medium gravel	20	20
2S 8W 4-1 (Continued)		
Gravel, fine to coarse, medium to coarse sand, very clayey	5	25
Sand, light brown, medium to coarse, few pebbles	5	30
Gravel, medium to coarse, some fine	5	35
Gravel, fine to coarse and medium to coarse sand	5	40
Sand, fine to coarse	5	45
Sand, light yellow, very fine to medium, pebbly		
Some coarse sand and clay	10	55
Sand, very fine to medium, silty, little coarse sand and fine gravel	5	60
Sand, light gray, fine to medium	5	65
Sand and gravel, fine to medium	10	75
Sand, light brown, medium to coarse, some fine gravel and pebbles	5	80
Gravel, fine to coarse and sand medium to coarse	5	85
Gravel, fine and sand, coarse, some medium sand and gravel	5	90
Gravel, fine to coarse, sand, medium to coarse, large pebbles	5	95
Sand, medium to coarse, gravel, fine to medium, few pebbles	5	100
Gravel, fine to coarse and sand, medium to coarse	5	105
Sand, light brown, medium, some coarse sand	10	115
Gravel, fine to medium, some coarse; sand, medium to coarse	5	120
Clay, light gray; coarse sand and fine to medium gravel	5	125
Clay, light gray, some fine to medium gravel	5	130
Mississippian:		
Coldwater Shale:		
Shale, gray soft	5	135
Well 2S 8W 11-1;		
NW¼ NW¼ section 11		
Battle Creek Twp. (1)		
Altitude 895 feet		
Top soil and clay	8	8
Clay, gravel, soft	22	30
Clay, blue	35	65
Sand	5	70
Clay	40	110
Rock, broken; clay, sand and gravel	10	120
Sandrock	30	150
Shale	30	180
Well 2S 8W 12-5;		
SE¼ NE¼ section 12		
Battle Creek Gas Co. (TW No. 2)		
Altitude 828 feet		
Filled earth	4	4
Clay, sandy	12	16
Gravel	49	65
Sand	25	90
Sandrock (?)	2	92
Well 2S 8W 12-9;		
NW¼ NE¼ section 12		
Ralston Purina Co. No. 1		
Altitude 820 feet		
Sand and gravel	30	30
Sandstone (Marshall)	78	108
Shale (Coldwater)	--	120

Table 4.--Logs of wells and test wells.--Continued

	Thickness (feet)	Depth (feet)
Well 2S 8W 14-4;		
NE¼ SE¼ section 14		
City of Battle Creek (Goguac No. 4)		
Altitude 915 feet		
Fill dirt and gravel	10	10
Clay	18	28
Hardpan	2	30
Clay, gravel	2	32
Medium gravel	10	42
Coarse sand	12	54
Fine sand	16	70
Medium sand	18	88
Gravel	2	90
Sand	3	93
Gravel and coarse sand	19	112
Well 2S 8W 14-35'		
NE¼ SE¼ section 14		
City of Battle Creek		
Altitude 920 feet		
Lake sand and gravel	15	15
Lake sand	55	70
Dark gravel (sulfur odor)	10	80
Quicksand and some lake sand	118	198
Soft blue clay	10	208
Blue shale rock	199	407
Hard dark sandrock (dry)	3	410
Soft blue shale	20	430
Well 2S 8W 16-2;		
SW¼ NE¼ section 16		
Battle Creek Twp. (TW No. 2-1963)		
Altitude 917 feet		
Sandy clay, strips of gravel	18	18
Gravel	14	32
Sandy clay, red streaks	28	60
Gravel, clean	2	62
Green sandstone	28	90
Gray and white sandstone	55	145
Shale, gray	5	150
Well 2S 8W 22-1;		
NE¼ NW¼ section 22		
Westlake School		
Altitude 945 feet		
Clay, yellow	30	30
Clay, blue, heavy	30	60
Sand, fine	2	62
Sand, gravel, water	13	75
Well 2S 8W 22-3;		
SW¼ NE¼ section 22		
Battle Creek Twp. (TW No. 2-1961)		
Altitude 917 feet		
Muck	7	7
Marl	8	15
Fine sand, dirty	15	30
Sand and gravel, dirty	4	34
Gravel and clay	59	93
Green shale	5	98
Gray shale and sandstone	7	105
Sandstone and gray shale	27	132
Gray shale, some limestone	68	200
Well 2S 8W 25-1;		
SE¼ SE¼ section 25		
Michigan State Highway Dept.		
Altitude 935 feet		
Fill	2	2
Sand, clay and stones	5	7
Sand and clay	15	22
Sand, clay and boulders	16	38
Sand and clay, brown	30	68
2S 8W 25-1 (Continued)		
Sand and clay, blue	4	72
Sand gravel and clay	10	82
Sand and gravel	6	88
Sand, gravel and clay	9	97
Clay sand and stones	15	112
Sand and gravel	2	114
Sand and gravel, dirty	3	117
Sand, dirty	8	125
Sand, clean	4	129
Sand and gravel, dirty	7	136
Sand and gravel	4	140
Clay, blue	8	148
Well 2S 8W 25-2;		
NE¼ NE¼ section 25		
Battle Creek Twp. (TW No. 1, 1962)		
Altitude 860 feet		
Sand fill	2	2
Muck	14	16
Sand, fine	39	55
Gravel	19	74
Soft clay and sand	6	80
Sand and clay	13	93
Gravel and clay	13	106
Fine sand	4	110
Sand and clay	7	117
Shale, black	13	130
Well 2S 7W 5-1;		
SE¼ NE¼ section 5		
Grand Trunk Western RR (2)		
Altitude 840 feet		
Fill	4	4
Sand, dirty	14	18
Sand	12	30
Sand, dirty	9	39
Shale	2	41
Sand rock	9	50
Sand rock, shale mixed	7	57
Sand rock	6	63
Sand rock, some shale	4	67
Sand rock	41	108
Shale	4	112
Sand rock	4	116
Shale at	--	116
Well 2S 7W 5-3;		
SE¼ NE¼ section 5		
Grand Trunk Western RR (Tw 1)		
Altitude 840 feet		
Fill	1	1
Sand and boulders	15	16
Gravel and sand	14	30
Shale, blue	1	31
Shale sandy	11	42
Sand, fine	1	43
Shale, sandy	10	53
Sand	6	59
Shale and mud	31	90
Well 2S 7W 7-12;		
NE¼ SE¼ section 7		
General Foods Corp.		
Altitude 875 feet		
Log from samples of drill cuttings by the Michigan Geological Survey		
Sand, very fine to coarse	10	10
Sand, very fine with yellow clay	30	40
Mississippian:		
Marshall Formation:		
Sandstone, gray very fine grained	30	70
No sample	5	75
Sandstone, gray, very fine grained	35	110
Shale, gray, soft, very sandy	7	117

Table 4.--Logs of wells and test wells.--Continued

	Thickness (feet)	Depth (feet)
Well 2S 7W 8-2;		
NE¼ NW¼ section 8		
Kellogg Co.		
Altitude 845 feet		
Fill and cinders	24	24
Sand	24	48
Clay	3	51
Shale and sandstone	9	60
Sandstone, gray	51	111
Shale	8	119
Well 2S 7W 8-13;		
SE¼ SE¼ section 8		
City of Battle Creek (TW 7, 1903)		
Altitude 837 feet		
Coarse sand and gravel	26	26
Fine sand	47	73
Well 2S 7W 9-1;		
NW¼ SW¼ section 9		
City of Battle Creek (TW 1, 1903)		
Altitude 838 feet		
Very fine sand	50	50
Coarse sand and fine gravel	18	68
Coarse gravel	2	70
Large boulder at		70
Well 2S 7W 9-4;		
SW¼ SW¼ section 9		
City of Battle Creek (TW 5, 1903)		
Altitude 838 feet		
Sand and medium gravel	30	30
Fine sand	10	40
Coarse sand	10	50
Fine sand	10	60
Sand, medium	6	66
Coarse sand and gravel	29	95
Sand, medium	5	100
Coarse sand and gravel	13	113
Well 2S 7W 16-1;		
SW¼ NW¼ section 16		
City of Battle Creek (TW 8-1903)		
Altitude 842 feet		
Fine sand	50	50
Coarse sand and fine gravel	15	65
Fine sand	16	81
Well 2S 7W 16-4;		
NW¼ NW¼ section 16		
City of Battle Creek (TW 4, 1903)		
Altitude 840 feet		
Fine gray to yellow sand	70	70
Marshall sandstone	20	90
Shale	3	93

	Thickness (feet)	Depth (feet)
Well 2S 7W 17-1;		
NW¼ SW¼ section 17		
City of Battle Creek		
Altitude 841.8 feet		
Loam	1	1
Sand, fine	14	15
Sand, yellow and sandstone	10	25
Sand and sandstone, gray	10	35
Sandstone, blue and sandstone	12	47
Sandstone, blue, cavernous	42	89
Clay	2	91
Well 2S 7W 18-1;		
SW¼ SE¼ section 18		
City of Battle Creek		
Altitude 832.5 feet		
Muck	2	2
Sand, coarse and fine	8	10
Sand, fine	21	31
Sand, very fine, with some clay	10	41
Sand, some fine gravel	5	46
Quicksand	6	52
Sandstone, fine blue	35	87
Clay, blue	3	90
Well 2S 7W 18-2;		
NE¼ SE¼ section 18		
City of Battle Creek		
Altitude 833 feet		
Loam	1	1
Clay and sand	4	5
Sand and fine gravel	10	15
Soft yellow sandstone	5	20
Soft yellow and gray sandstone	7	27
Blue sandstone	46	73
Silty clay	2	75
Well 2S 7W 19-1;		
NW¼ NE¼ section 19		
City of Battle Creek		
Altitude 851 feet		
Muck	2	2
Fine sand	8	10
Gravel and sand	21	31
Blue sandstone	41	72
Blue clay	1	73
Well 2S 7W 19-2;		
SE¼ NE¼ section 19		
City of Battle Creek		
Altitude 845 feet		
Muck	2	2
Sand and fine gravel	8	10
Clay and sand	44	54
Slightly cavernous sandstone	18	72
Clay	2	74