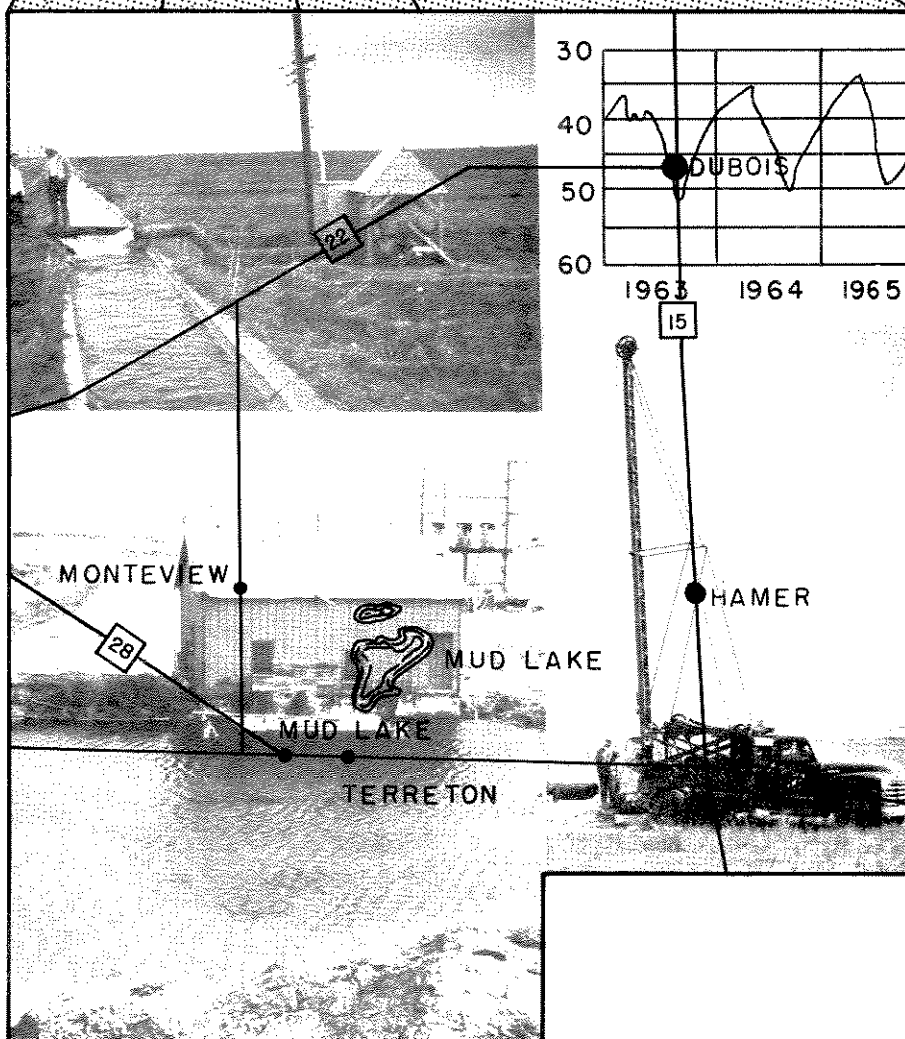


WATER LEVEL CHANGES IN THE MUD LAKE AREA, IDAHO, 1958 - 68

Water Information Bulletin No. 7
Idaho Department of Reclamation

January 1969



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Water-Level Changes
in the
Mud Lake Area, Idaho, 1958-68

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INTRODUCTION

Purpose and Objectives

The Mud Lake area in northeastern Idaho (figure 1) has long been a center of ground-water development. Hundreds of wells have been developed in the area to irrigate many thousands of acres of land. It is important to know the effect of the present well development on the ground-water resource. This information is necessary to allow for maximum development while protecting established water rights. Knowledge of the ground-water resource in the Mud Lake area is also important in understanding the ground-water system underlying the Snake Plain.

Measurements of depth-to-water were obtained in 229 wells in the Mud Lake area in the spring of 1968, ten years after similar measurements were obtained in the spring of 1958. Comparison of the two series of measurements provides information on changes in the ground-water resource as a result of well development. Analysis of the 1968 data provides additional information about the characteristics of the ground-water system and aids in the study of the aquifer underlying the Snake Plain.

Acknowledgements

The Department of Reclamation and the authors wish to acknowledge the assistance of the Water Resource Division of the U. S. Geological Survey in the preparation of this report. H. G. Sisco, of the Survey, provided valuable aid in analyzing the records and selecting wells to be measured. The U. S. Geological Survey also assisted in conducting the spring 1968 measurements of depth-to-water.

Previous Investigations

Stearns and others prepared reports on the ground-water resource of the Mud Lake area in 1922, 1930, and 1939 (Bryan and Stearns, 1922, Stearns,

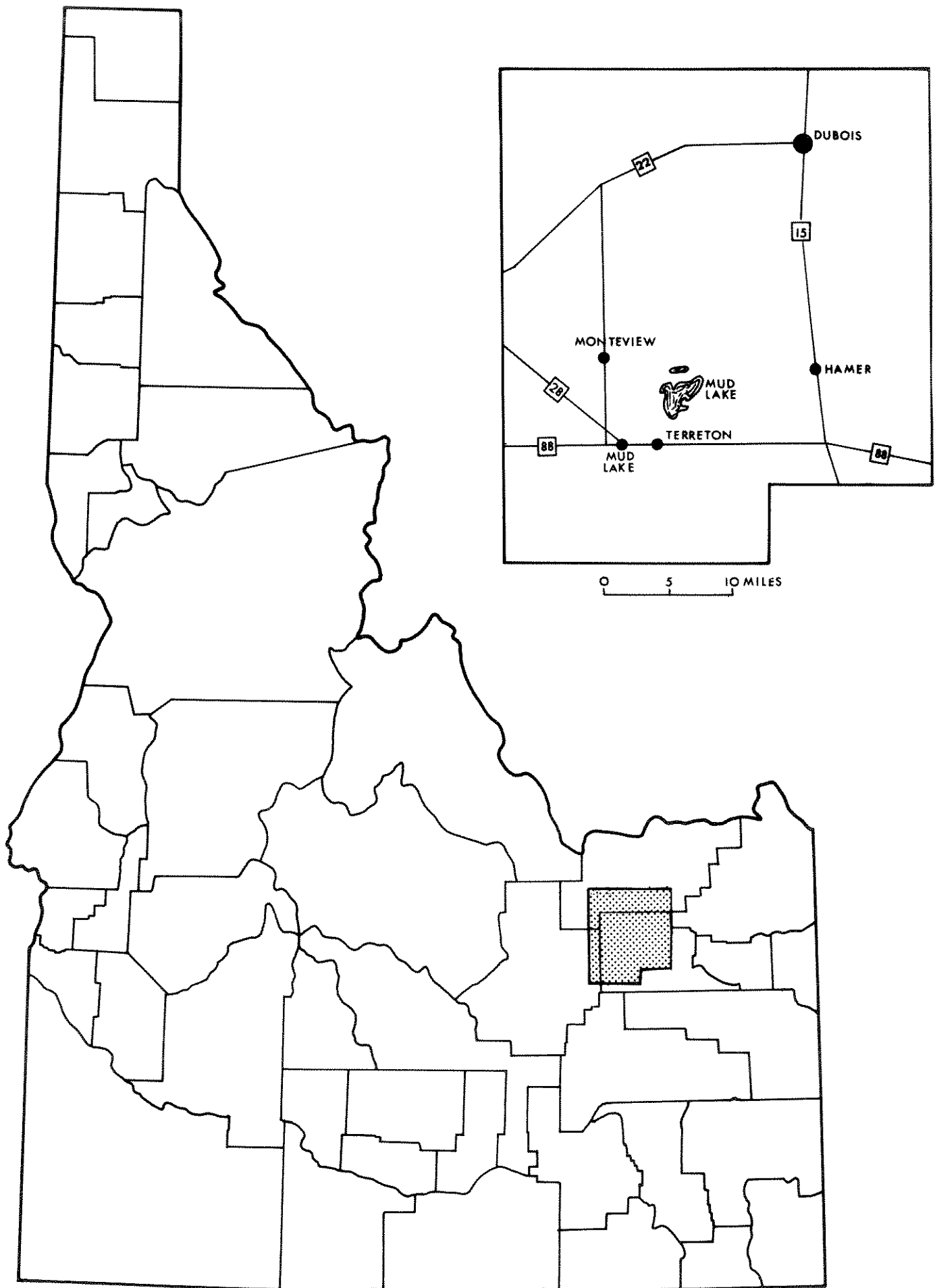


Figure 1.--Index map showing the area covered by this report

1930, and Stearns, Bryan and Crandell, 1939). Additional data was collected by Stevens (U. S. Geological Survey) during the period 1957-61. The 1957, 1958 and 1959 water level measurements that are presented later in the report were obtained as a part of the Stevens study. The discussion of ground-water geology included in this report was abstracted from the 1939 study of the Mud Lake area (Stearns et al., 1939).

History and Extent of Ground-Water Development

Well development in the Mud Lake area was initiated about the turn of the century when irrigation of farm lands began. Many flowing and non-flowing wells were drilled during the 1920's. A well inventory conducted in 1929 indicated over 300 wells were being used in the area (Stearns et al., 1939, p. 5). The well development has continued to the present. This development is graphically depicted in figure 2 by increasing power demand by pumps for the period 1946-67. The estimated present ground-water discharge in the Mud Lake area is in excess of 200,000 acre-feet per year (Ralston, 1968, p. 4).

GROUND-WATER GEOLOGY

The Mud Lake plain is bounded on the north by the Beaverhead and Centennial Mountains, on the east by the Big Bend Ridge, on the west by the Lemhi and Lost River Ranges, and merges with the Snake Plain on the south. The area consists of an undulating lava plain and a broad, flat expanse of lake sediments. Cinder cones and lava buttes rise above the plain and are the prominent topographic features.

Pre-Tertiary Rocks

Rocks of Mesozoic and Paleozoic age crop out in the mountains adjacent to the Mud Lake plain. Limestone, shale, sandstone, and conglomerate of Carboniferous and Cretaceous age are present in the Beaverhead and

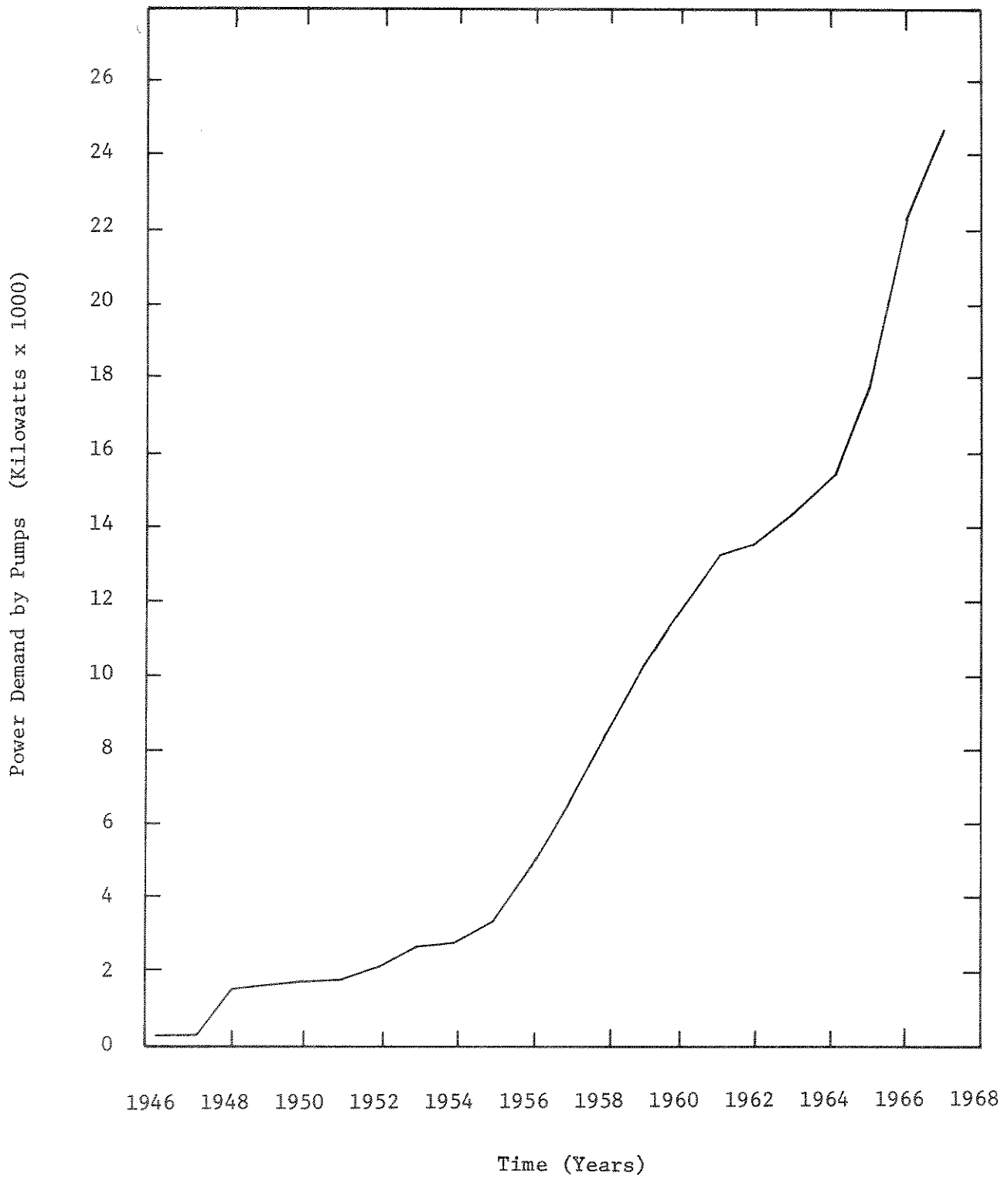


Figure 2.--Well development shown by increasing power demand by pumps, 1946-67

Centennial Mountains. These ancient rocks are so highly cemented and deformed that they are nearly impermeable. Any ground water present would probably be limited in both quantity and areal extent.

Tertiary Rocks

Rhyolite and associated volcanic rocks of late Tertiary age outcrop along the mountain front to the north and east of the Mud Lake plain. These rocks are generally light colored, fragmental rhyolite and welded ash flows. Basalt overlies the rhyolite at several locations. The total thickness of the Tertiary volcanic rocks is unknown but probably exceeds 2000 feet. Most of the wells that have been drilled into the rhyolite in the Mud Lake area have low yields.

Sedimentary rocks of Pliocene (?) age overlie the older Tertiary volcanic rocks along the mountain front. These deposits have an exposed thickness of approximately 500 feet and are remnants of ancient alluvial fans.

Quaternary Rocks

The Mud Lake plain is underlain by large volumes of volcanic rocks. These rocks are predominantly basalt with a few flows of andesite. The sources of these rocks were innumerable volcanic cones and fissures. Remnants of some of these vents now form small hills on the plain. Differences in erosion of various craters and numerous sedimentary interbeds indicate the eruption of lava took place intermittently over a long period of time. The basalts, extruded as thin, low viscosity flows, are highly jointed and have cavernous, slaggy contacts. These features, in combination with lava tubes and blisters, provide openings for ground-water flow beneath the Mud Lake plain. Ground water moves almost unimpeded through these rocks and yields to wells of 4500 gpm (gallons per minute) with little drawdown are common.

Lake beds consisting of sand, clay, and silt are present near Mud Lake. These sediments were deposited in a shallow lake formed when ancient creeks to the north discharged into a structural depression. The lake covered approximately 140 square miles at its highest stage. Numerous angular lava boulders, present in the lake sediments, were presumably rafted from shore by ice during the winter months. The lake sediments, which interfinger with the younger basalt flows, act more as confining beds than aquifers. A high water table, present near Mud Lake, is a result of the low permeability of these sediments. Extensive deltas were formed where the creeks flowed into the ancient lake. These deposits, consisting primarily of sand and gravel, are located along the northern edge of the lake beds. Some of these delta sediments have been penetrated by wells in the Montevue and Camas areas and yield small quantities of water.

Alluvium of both Pleistocene and Holocene age is present along the major stream valleys and along the hill front as broad coalescing fans. These fans generally consist of detritus from the older sedimentary rocks exposed in the mountains.

Structure

The Mud Lake plain is bounded to the east, north, and northwest by highly deformed Paleozoic and Mesozoic rocks. These rocks may be considered as ground-water barriers because of their low permeability. The Mud Lake plain is open to the south and west, which indicates that any ground-water flow out of the basin would probably be in this direction. The Tertiary rhyolites have been flexed into a large structural depression while the basalts of Quaternary age have undergone only local, minor deformation. The movement of ground water in the Mud Lake area is not believed to be controlled by structural features.

ANALYSIS OF DATA

The data used in evaluating water level changes in the Mud Lake area are presented in table 1. The depth-to-water was measured in 229 wells in the spring of 1968. One hundred and thirty-five of these wells were measured in 1958, 28 either in 1957 or 1959, and 66 were not previously measured. The locations of the wells measured are shown in figure 3.

Depth-to-Water

Ground-water levels are within 100 feet of land surface beneath most of the Mud Lake area. The depth-to-water is greater than 200 feet in the extreme northern, western and southern portions of the study area. The deepest water levels are present in the extreme northern portion of the area where depths-to-water exceed 400 feet.

The state engineer has been charged by statute with the responsibility of determining the reasonable pumping level in each ground-water area in the state. Although several studies have been initiated, a reasonable pumping level for the Mud Lake area has not yet been determined. The partial results that have been obtained, however, indicate that the 100-foot depth-to-water common to the Mud Lake area is above the reasonable pumping level.

Ground-Water Flow

Contours of water level elevation using the spring 1968 data are presented in figure 3. The contours indicate that the general movement of ground water is from the northeast to the southwest. The gradient or slope of the ground-water surface is very flat (1 to 2 feet per mile) from the vicinity of Dubois to the vicinity of Montevieu and Mud Lake. The water levels in this area are believed to represent either a perched ground-water system or a dammed or constricted ground-water system. The contours of water level elevation from 4520 to 4600 feet (mean sea level datum) in the

southern and western portions of the study area are believed to represent the deeper, more general ground-water system underlying the Snake Plain. The gradient in this area is approximately 10 feet per mile. The water levels in a number of wells do not conform to either the upper level or the more general lower system. These water levels range from 4700 to 4760 feet in elevation, above the highest level in the lower system and 20 feet below the lowest level in the perched zone. This intermediate zone might be either a single or series of lower perched zones, or simply the downward flow of water over the edges of the interbedded sediments.

Water-Level Changes

The 1958-68 water-level changes for 135 wells in the Mud Lake area are presented in figure 4. Water-level changes for the periods 1957-68 and 1959-68 are presented for 28 additional wells. The data do not indicate any general change in water levels in the 10-year period. Eighty-six percent of the wells had changes between plus or minus 5 feet. Only 6 percent of the wells indicated a water-level change of 10 feet or greater during the 10-year period.

The water-level changes that have occurred may be related to the contour map of water-level elevation presented in figure 3. Only minor water-level changes occurred in the upper zone north and east of Mud Lake and Montevieu. Small rises and declines were noted in the general ground-water system in the southern and western portions of the study area. Most of the larger changes occurred in wells that have 1968 water-level elevation ranging from 4700 to 4760 feet, the intermediate zone shown on figure 4. In order to evaluate the water-level fluctuations in this zone, the location, depth, and water-surface elevation of the wells with changes greater than 5 feet are presented in figure 5. The largest areas of water-level change

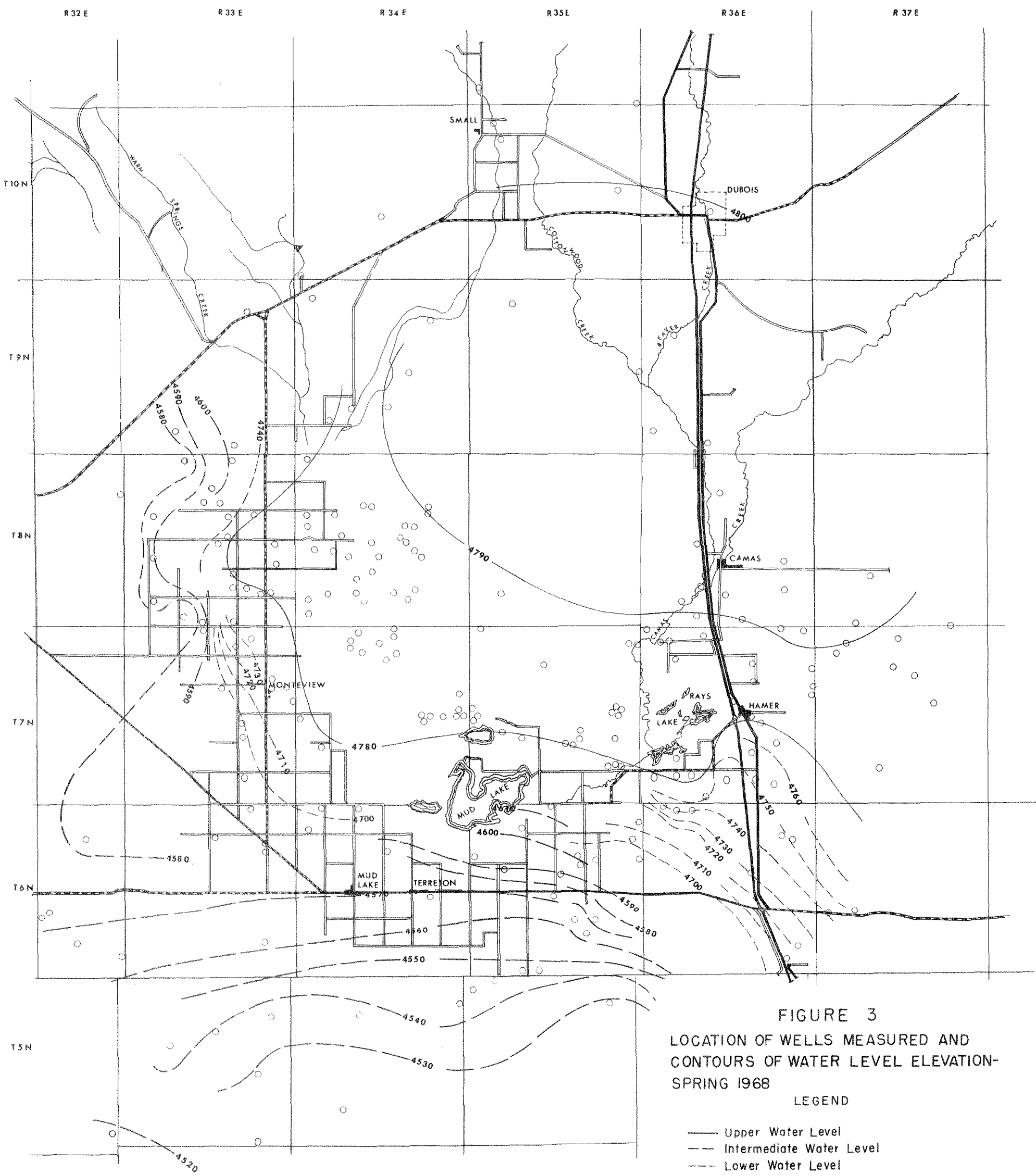


FIGURE 3
 LOCATION OF WELLS MEASURED AND
 CONTOURS OF WATER LEVEL ELEVATION-
 SPRING 1968

LEGEND

- Upper Water Level
- - - Intermediate Water Level
- · · Lower Water Level

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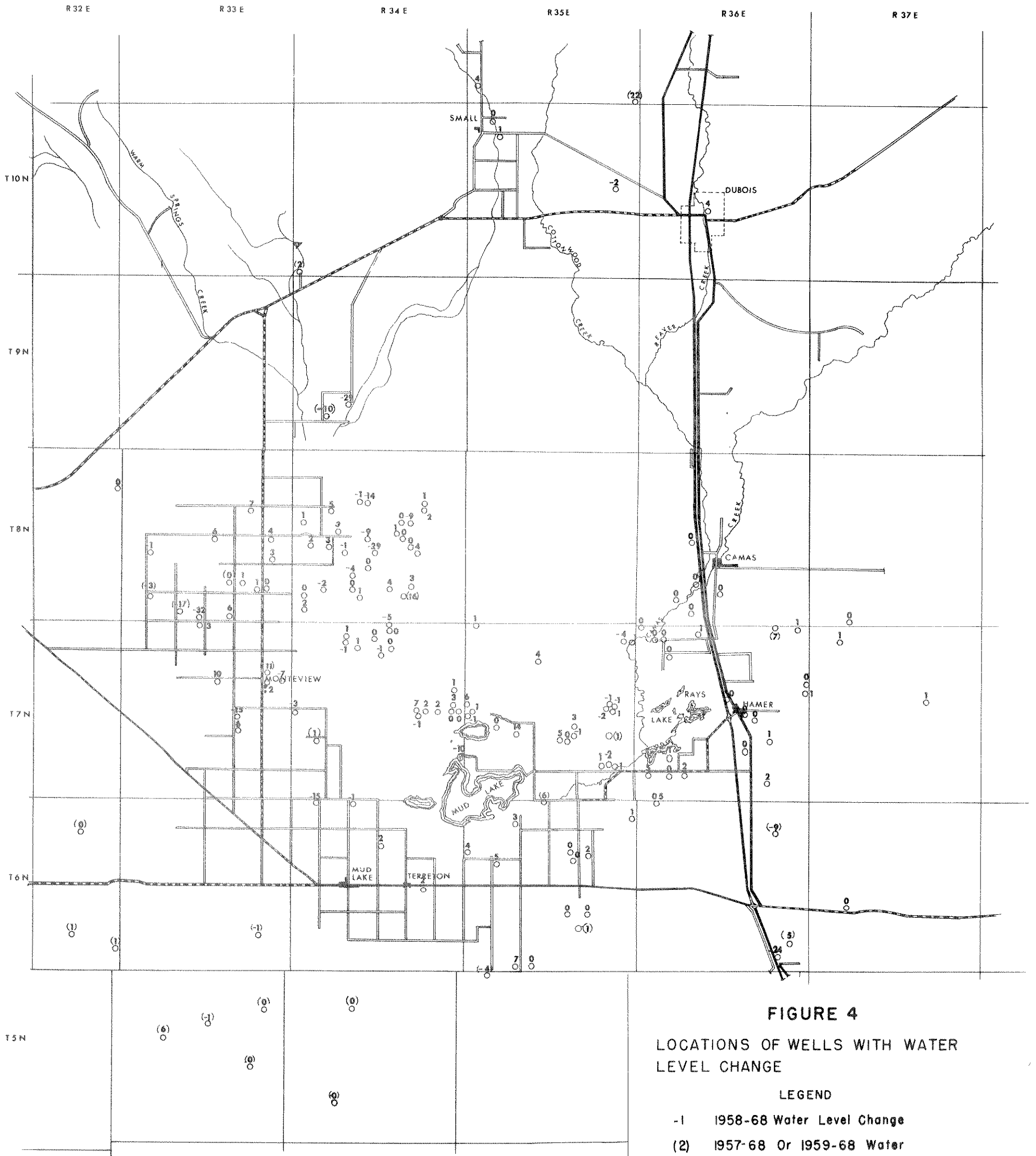


FIGURE 4
LOCATIONS OF WELLS WITH WATER LEVEL CHANGE
LEGEND
 -1 1958-68 Water Level Change
 (2) 1957-68 Or 1959-68 Water Level Change

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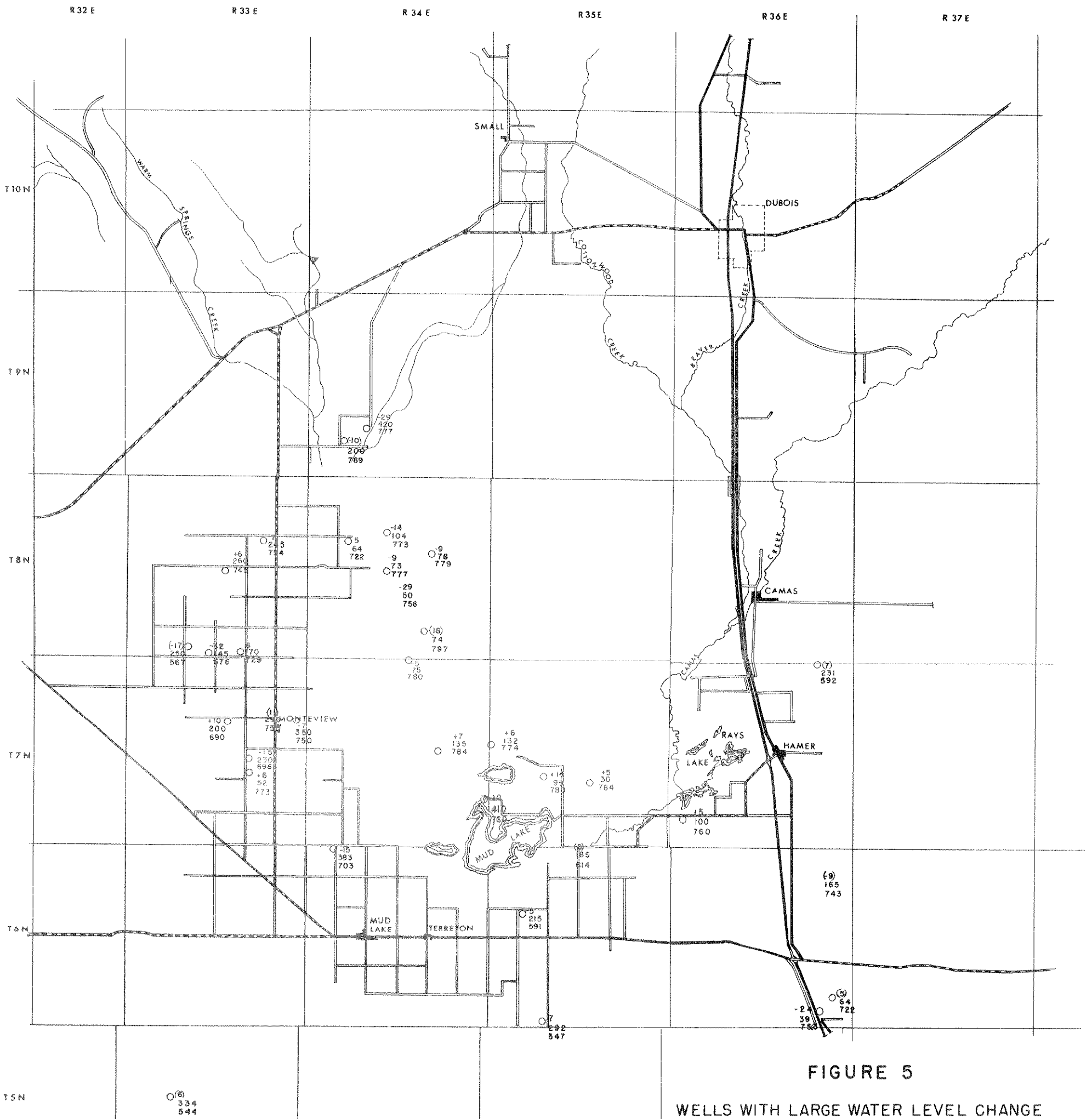


FIGURE 5

WELLS WITH LARGE WATER LEVEL CHANGE

LEGEND

- 15 Water Level Change
- 230 Depth of Well
- 696 Elevation of Water Surface in Well (+ 4000')

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are along the western and southern edges of the upper zone. Declines from 5 to 29 feet have occurred in T. 7-8 N., R. 34 E. at water level elevations from 4756 to 4780 feet. Rises of 5 to 15 feet are shown in T. 7 N., R. 34-36 E. at approximately the same elevation. Other water-level changes are shown on figure 5 to the west and south of the areas described above. These declines vary with the depth and location of the well, and the depth-to-water.

The large changes in water-level elevation are believed to occur in aquifers limited in vertical extent by sedimentary strata. These strata impede the downward flow of water from the upper zone and form small perched zones at lower elevations. The water levels in these small perched zones are subject to large fluctuations as a result of changes in recharge. The sedimentary strata become more discontinuous to the south and west allowing water to move downward to the general aquifer system.

SUMMARY AND CONCLUSIONS

Water levels beneath most of the Mud Lake area are within 100 feet of land surface. The depth-to-water is greater than 200 feet in the extreme northern, western, and southern portions of the study area. The depth-to-water of 100 feet or less, common to most of the Mud Lake area, is above the preliminary estimate of the reasonable pumping level.

Contours of water-level elevation in the Mud Lake area based on the spring 1968 measurements indicate flow from the northeast to the southwest. Upper, intermediate, and lower zones are delineated by the contours. The upper and lower zones have gradients of approximately 2 and 10 feet per mile respectively, while the intermediate zone has a steeper gradient of 20 feet per mile.

The water-level change data indicate that the ground-water levels in the Mud Lake area have not changed significantly during the period 1958-68. Eighty-six percent of the wells measured did not experience water-level changes of plus or minus 5 feet in the 10-year period. Most of the wells with changes of 5 feet or more draw water from an intermediate zone between the upper zone at Mud Lake and the deeper more general aquifer system. The changes do not represent a significant portion of the ground-water resource of the Mud Lake area.

The present well development has not significantly altered the ground-water resource in the Mud Lake area. Additional well development can occur without causing widespread declines in water levels. Specific areas near Mud Lake may, however, show local declines and rises as the recharge varies in magnitude and location.

TABLE 1
HYDROLOGIC DATA

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
5N 32E 36 ad 1	1952	405	6	4839.4	4511.0	
5N 33E 10 cd 1	1953	428	8	4786.2	4533.3	-1(a)
13 bd 1	1953	405	8	4794.6	4529.9	0(a)
17 ad 1	1953	334	6	4771.6	4543.7	6(a)
23 dd 1	1953		6	4812.4	4527.6	0(a)
5N 34E 1 dd 1	1967	410	20	4788	4541	
9 bd 1	1950	553	6	4791.3	4535.1	0(a)
29 da 1	1953	425	6	4877.5	4528.1	0(a)
5N 35E 1 cc 1	1959	300	24	4759	4524	
5 bb 1	1959	300	6	4790	4543	-4(b)
6 bd 1	1956	301	16	4790	4542	
6N 32E 11 ab 1	1952	266	6	4789.8	4582.0	0(a)
26 cd 1	1956	322	8	4787.9	4567.7	1(a)
36 ad 1	1949	292	8	4785.6	4563.7	1(a)
6N 33E 10 db 1	1965	630	20	4784(e)	4681(e)	
11 ad 1	1967	351	16	4785(e)	4669(e)	
11 da 1	1960	332	12	4785	4660	
26 dd 1	1952	312	6	4784.3	4561.4	-1(a)
6N 34E 4 bb 1		27	36	4782.9	4765	-1
6 aa 1	1957	400	18	4783.3	4703.1	-15
6 cd 1	1962	192	12	4785	4632	
10 cb 1		12	15	4781.3	4774.1	2

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
6N 34E 22 ba 1	1944	262	6	4786	4683	
22 ab 2	1938	267	6	4786.6	4648.8	
23 ab 1		270	6	4785.6	4567.8	2
6N 35E 1 da 1	1954	375	18	4793.7	4711.1	1
4 aa 1	1929	185	6	4785	4614	6(b)
5 dd 1	1950	204	6	4783	4602	3
7 cc 1	1929	253	6	4782.5	4586.9	4
10 ca 1	1951	130	6	4782.9	4694.8	0
11 cd 1		120	6	4787.5	4694.8	2
12 ab 1	1966	152	16	4785	4696	
12 dd 1	1967	196	8	4784	4639	
12 bc 1	1965	150	18	4786	4694	
15 aa 1	1947	132	6	4787.5	4695.4	0
15 bc 1	1966	137	6	4786	4696	
17 bb 1	1954	215	6	4783.8	4591.4	-5
26 ba 1	1957	307	21	4790.6	4574.7	0
27 ab 1	1957	350	20	4796	4559	0
27 dda 1		260	20	4798.7	4564.9	1(a)
32 dd 1	1955	292	6	4789.2	4546.7	7
33 cd 1	1956	400	16	4792.3	4547.9	0
6N 36E 5 adb 1	1959	190	16	4857.4	4724.4	
5 bdb 1		188	20	4841	4743	

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
6N 36E 6 ab 1	1956	130	16	4792.5	4720.5	0.5
11 aa 2	1957	165	18	4820	4743	-9(b)
12 bb 1		62	6	4810	4754	
15 aca 1	1959	170	12	4875.3	4723.8	
27 baa 1	1960	227	8	4884.5	4700.6	
35 da 1		39.2	48	4795	4753	-24
36 ba 2		64	6	4760	4722	5(a)
6N 37E 19 cdc 1				4769	4741	
20 cbd 1		45	6	4810.3	4777.3	0
7N 33E 2 db 1	1957	335	21	4786.4	4730	
3 da 2	1949	26	6	4789.3	4763.1	
4 aa 1	1952	236	18	4790(e)	4710	3
11 dd 2	1950	36	6	4786.2	4752	
12 cc 1	1953	290	16	4790	4749	11(b)
13 ab 1	1951	350	16	4789(e)	4750	-7
13 bb 1	1934	23.5	36	4789(e)	4781	2
13 bb 3				4789(e)	4781	
13 dac 1	1965	285	20	4787(e)	4750	
14 dd 1	1959	50	1.25	4787(e)	4711	
15 ba 1	1959	200	6	4786(e)	4690	10
16 ba 1	1955	335	16	4786	4647	79
23 bc 1	1953	230	6	4784(e)	4696	-15

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
7N 33E 23 cc 2		52.5	14	4783.9	4772.6	6
7N 34E 3 ba 1	1953	75	30	4797.7	4780.3	-5
3 ba 2	1953	75	30	4799.1	4784.3	0
3 cd 1	1953	67	30	4797	4785	
4 bc 1				4795	4786	
4 cdc 1	1953	57.3	6	4791.8	4784.6	1
4 da 1	1949	67	36	4792.4	4785.1	0
5 da 1		25.1	30	4789.9	4785.9	1
5 da 2		21.6	24	4789	4787	-1
5 da 3	1955	46	6	4791	4784	
10 bb 2	1930	65	36	4791.2	4783.9	-1
10 bc 4		501		4791.2	4783.9	
13 ac 1	1951	51	24	4799.6	4783.7	1
13 dc 1	1951	126	24	4791.8	4784.8	3
19 bb 1		72	6	4783.8	4779.6	-3
23 aa 1		77		4793.1	4783.5	2
23 ba 2		24.7	6	4791.8	4782.9	-1
23 ba 3	1958	135	28	4791.8	4783.5	7
24 aa 1		100	30	4791.6	4783.6	0
24 ab 1	1951	91	26	4791.6	4783.7	0
24 bb 1		74		4793.4	4783.3	2
25 da 1	1943	410	4	4793.1	4759.5	-10

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
7N 34E 30 aa 1		141	40	4781.8	4779.4	1(b)
7N 35E 1 da 1	1956	174	18	4793.9	4784.2	-4
1 db 1	1957	203	24	4799.7	4790.0	1
6 ba 1			6	4849	4777	1
9 ad 1			5	4867	4786	4
13 cc 1	1934	30	24	4792.3	4782.1	-2
13 cc 2	1934	112	30	4790.6	4782.0	-1
13 cc 4	1957	19		4793.7	4785.2	1
13 cc 5	1959	36	24	4794.3	4784.1	-1(b)
18 cc 1	1957	132	28	4796.9	4773.7	6
19 ba 1	1957	105	24	4803.3	4783.5	1
19 bc 3	1957	160	26	4790.2	4784	-1
20 cbd 1	1953	58	20	4818.2	4782.8	0
20 dd 1	1954	99	24	4798.8	4780.3	14(b)
22 da 2	1954	36		4791.4	4785.6	3
22 dd 1	1952	45	30	4792.5	4782.2	-1
25 bb 1	1954	83	26	4788.3	4781.7	1
25 cc 1	1945	65	18	4792	4779	-2
25 cc 2	1939	65	24	4794.4	4776.0	1
26 dd 2	1945	65	24	4792	4783	1
27 ab 1	1934	30	24	4788.5	4781.7	0
27 ba 1	1930	30	20	4789.7	4783.5	5(b)

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
7N 36E 1 ad 1			8	4933.3	4789.3	1
2 aa 1	1956	231	20	4831	4592	7(b)
4 bc 1	1945	80	12	4805.8	4789.6	1
6 bb 1	1954	40	14	4798.2	4789.3	0
6 da 1	1933	151	10	4797.2	4788.2	0
6 db 2	1957	165	24	4795.1	4789.4	0
8 bb 1		200		4800.3	4788.3	0
10 aab 1	1961	168	20	4885	4787	
10 dd 1	1954	65	6	4812	4782	
12 adc 1	1966	225	20	4903	4793	
13 aa 1	1956	153	16	4851.9	4787.4	1
13 ad 1	1947	101	10	4829.4	4787.5	1
15 cb 1	1947	120	10	4794.4	4787.0	0
22 abd 4		35	6	4791.7	4785.3	0
23 bc 1	1935	130	12	4807.3	4786.4	0
26 ab 2	1952	58	6	4797.5	4767.1	1
27 ad 1		50	6	4800	4759	0
29 dbb 1	1952	375	24	4790.4	4782.8	1
31 bab 1	1946	100	12	4785.4	4759.7	5
32 ab 1	1948	275	12	4791.6	4783.8	2
32 bb 1	1953	438	14	4790.8	4781.4	0
33 aaa 1	1967	100	6	4805	4748	

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
7N 36E 33 cb 1	1951	367	13	4808.0	4782.7	
34 aa 1	1966	150	16	4820	4746	
35 acc 1		100	20	4816	4754	2
7N 37E 4 adc 1	1964	135	20	4858	4787	
5 cbc 1		135	6	4908.4	4789.1	1
6 dcc 1	1963	205	20	4919	4791	
9 acb 1	1964	115	20	4855	4791	
10 cad 1	1967	242	20	4848	4789	
14 cbc 1	1922	93.3	6	4863.8	4787.7	1
28 ccd 1	1960	135	8	4848.5	4784.6	
8N 32E 12 ad 1	1957	335	20.75	4980(e)	4717	0
8N 33E 1 ba 1	1964	214	20	4810(e)	4748	
3 aa 1	1962	385	20	4809(e)	4607	
4 bb 1	1964	400	20	4812(e)	4549	
9 da 2			8	4809(e)	4715	
10 bb 1	1963	338	20	4810(e)	4689	
10 ca 1	1966	200	16	4809(e)	4737	
14 ab 1	1953	245	18	4806.6	4754.4	7
15 ab 1	1959	220	20	4807	4733	
15 dc 1	1960	200	20	4805	4745	
17 bb 1	1963	400	20	4815(e)	4587	
20 cb 1	1958	350	20	4875	4644	-1

TABLE 1
HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
8N 33E 22 ba	1 1956	260	20	4811	4745	6
24 ba	1 1955	54	18	4797	4786	4
24 cd	2		18	4795.4	4783.9	3
25 cc	1 1914	16		4792	4780	0
26 ca	2 1955	68	20	4800	4785	1
26 dd	3 1947	28	6	4803	4791	1
27 aa	1 1957	350	20	4812	4789	
27 da	1 1952	35	30	4812	4792	0(b)
32 bb	1 1959	300	20	4803	4581	-3(b)
33 cb	1 1958	250	18	4750	4567	-17(b)
33 dd	1 1954	145	6	4793	4676	-32
34 cd	1 1951	170	6	4794	4729	6
8N 34E 9 dc	1 1954	104	18	4824	4773	-14
9 dc	2 1956	114	30	4821.7	4787.5	-1
11 dc	1 1955	116	24	4870.5	4788.0	-1
11 dd	1 1955	129	24	4875.7	4790.1	2
14 ab	2 1957	118	30	4865.6	4789.1	0
14 cb	1 1955	78	34	4826.8	4778.6	-9
15 da	1	68	24	4826.1	4788.3	0
15 dca	1 1954	83	24	4822.4	4787.8	1
17 dc	2 1927	97	10	4802.1	4788.4	3
18 ba	4 1954	65	18	4803.7	4789.9	5

TABLE 1
HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
8N 34E 18 ca 1	1947	40	16	4811	4786	1
19 ac 1	1953	55	16	4817.1	4785.6	2
20 bd 2	1950	310	20	4813	4785	3
20 da 1	1946	46	22	4812.4	4785.4	-1
21 ab 1	1956	73	26	4825.1	4776.6	-9
21 da 1		50	24	4804.2	4756.4	-29
22 aa 1	1953	81	30	4824.7	4786.9	0
23 bc 2	1953	87	24	4826.2	4787.4	0
23 ca 1		95		4830	4788	4
26 cc 1	1955	75	24	4813.9	4789.0	3
27 cd 1	1955	76	24	4815	4790	4
27 dd 1	1954	73	24	4809.4	4785.6	0
28 ab 1	1953	50	31	4803.9	4784.2	0
28 bc 1	1946	34.6	20	4800.1	4781.4	-4
28 cc 1	1954	50	12	4803.7	4786.2	0
29 cc 1	1938	30.3	24	4796.8	4782.0	-2
31 ba 3	1947	30	18	4795	4784	0
31 ca 1	1943	30.8	24	4793.9	4785.1	2
33 ba 1	1954	48	30	4793.7	4675.8	1
34 aa 1	1959	74	24	4820	4797	16(b)
8N 35E 29 cc 1	1955	365	6	4979	4787	
8N 36E 9 acc 1	1914	67	6	4842	4794	

TABLE 1
HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
8N 36E 21 bb	1	45	6	4819.3	4789.7	0
23 ad	1967	176	20	4820	4795	
26 da	1967	145	20	4808	4747	
28 cb	1954	209	18	4812.9	4794.1	0
28 dd	1950	148	14	4812.2	4790.4	0
32 ba	1957	255	24	4800.4	4789	0
32 da		101	12	4803	4789	0
34 ca		158	20	4821	4785	
8N 37E 29 aad	1960	215	18	4922	4792	
32 cd		123	6	4895.5	5789.5	0
8N 37E 35 dc		160	4	4940	4792	
9N 33E 11 ba	1959	280	8	5000(e)	4920	
32 aa		435	20	4910(e)	4586	
34 ad				4885(e)	4677	
9N 34E 22 aa		118	24	4875	4792	
27 bd	1962	450	24	4860	4795	
29 ad	1952	420	20	4839	4777	-29
29 cc		200	6	4829	4769	-10(b)
9N 35E 5 cd	1964			4977	4789	
24 aa	1946	207	6	4924	4793	
9N 36E 8 cc		290	6	4971	4792	
31 bad				4920	4796	

TABLE 1

HYDROLOGIC DATA (Cont'd.)

Well Location Number	Year Drilled	Depth of Well (feet)	Diameter of Casing (inches)	Elev. L.S.D. (feet)	1968 Elev. W.S. (feet)	58-68 10-year W.L. Change (feet)
33 cbb 1	1962	155	12	4865	4787	
10N 34E 22 cc 1		525		5021	4756	
31 cc 1	1954	189	6	4916	4741	2(b)
10N 35E 6 da 1	1944	229	6	5292	5128	0
8 bb 1	1949	360	8	5253.9	4998.7	1
13 cc 1		370	6	5151	4794	-2
10N 36E 21 ca 1	1903	615	10	5148.6	4791.5	4
11N 35E 15 cc 1	1960	254	6	5440	5223	
31 bd 1	1956	330	20	5362	5125	4
36 dd 1		416	4	5307.6	4896.9	22(a)

(a) 1957 Measurement

(b) 1959 Measurement

(e) Land Surface Elevation Estimated

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