

T45 R28 Sec 6

INTRODUCTION

As part of the consumptive water use permitting requirements of the SFWMD, CPI has recently installed and tested Sandstone Aquifer observation and production wells in Section 6 of their Hendry County citrus grove. This document has been prepared to transmit the geologic and hydrologic information generated by these efforts.

DATA SUBMITTALS

Figure 1 is a sketch map showing the location of wells used in the testing program. Figures 2 through 4 show aquifer test, drawdown data on log-log plots.

Table 1 lists the construction features of pertinent wells. Geologist's field logs for each of the recently completed Sandstone Aquifer wells are provided in Tables 2 through 4. Geophysical logs (gamma-ray and single-point electric) are also enclosed for two of the wells.

Table 5 lists drawdown data collected during a 24-hour aquifer test. Available recovery measurements are presented in Table 6.

DISCUSSION

Geology: Sandstone Aquifer

The Sandstone Aquifer corresponds to permeable units that occur below a persistent, readily identifiable green clay sequence and above an equally persistent tan limestone unit. At the test site, this interval occurs between depths of 45 and 155 feet.

Lithologically the primary components of the aquifer are quartz sand and gravel. There are also substantial quantities of silt and clay that occur as discrete beds or admixed components of the sand and gravel. The mode of occurrence of the fine grained particles exerts a primary control on local aquifer permeability. In general, four secondary units can be identified within the sandstone sequence. The uppermost has the greatest permeability at each site and is composed of about 5-15 feet of poorly sorted quartz sand and gravel with associated phosphorite, shell and limestone fragments. This sequence grades with depth to a deposit of generally silty or clayey sand with a low permeability. The third sequence is commonly very fine to medium quartz sand, which may yield some water. The lowest unit, separating the Sandstone Aquifer from the permeable tan limestone sequence, is another silty to clayey, fine sand. The lithologic distinction between beds, which is related to grain size distributions, is

apparent on the electric logs (see enclosed). Among the three Sandstone wells that were drilled both H-M-178 and H-M-179 contained considerable amounts of silt and clay throughout the production zones. Neither site would be suitable for installation of a well. The much coarser grained character of strata between 60-75 feet in H-M-177 permitted a very satisfactory production well to be constructed that was later used for aquifer testing.

Hydraulic Characteristics: Sandstone Aquifer

On March 20, 1985, a 24-hour aquifer test was conducted at the project site. H-M-177 was pumped continuously at a rate of 250 gpm. Discharge was controlled with a gate valve and monitored with an orifice: manometer assembly. Water levels were measured periodically with an electric tape. Wells H-M-153, 178 and 179 were used for water level monitoring. The first is open to the tan limestone production zone and provided some information on impacts of pumping the overlying sandstone. H-M-178 and 179 were fitted with a Stevens Type-F continuous recorder. The recovery data immediately following pump shut-down was read from the recorder charts.

The response of the Sandstone Aquifer monitor wells was very unusual. At the distant well, drawdown commenced about 10 minutes after pumping; whereas, the closer well

showed no response for about 50 minutes. The most plausible interpretation of the data from the distant well yields a transmissivity of 35,000 gpd/ft and a maximum leakance of 1.8×10^{-4} gpd/ft³. The transmissivity computed from the closer well was 24,000 gpd/ft. The leakance was determined to be unrealistically high at 0.1 gpd/ft³. It was concluded that the aquifer in the vicinity of H-M-178 was sufficiently clayey that it responded as if only partially connected to the main production zone. This extreme anisotropy is likely to be characteristic of the aquifer below CPI.

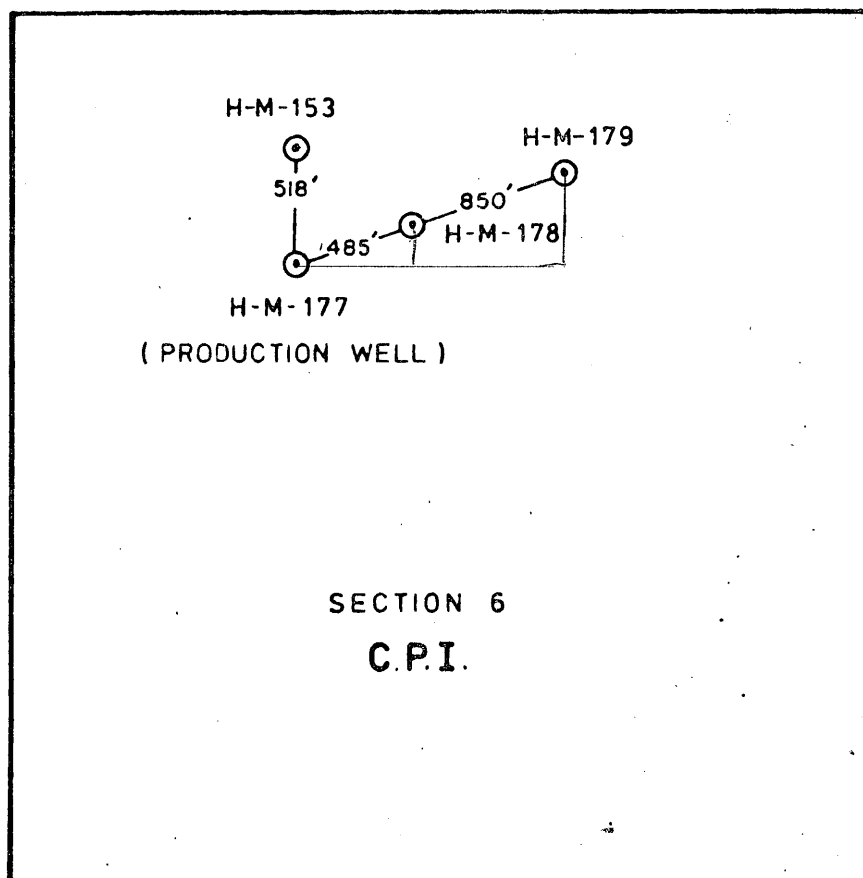
The drawdown in H-M-153, which is 518 feet from the pumping well, reached .74 feet. The contribution of off-site pumpage, natural water level declines and barometric pressure changes to H-M-153 water levels was not fully resolved. The ratio of drawdowns in the deeper tan limestone to the overlying sandstone is expected to be less than 1:6.

Water Quality: Sandstone Aquifer

Water samples collected during the aquifer test yielded consistent values of chloride at 420 mg/l, and a specific conductivity of 1,810 umhos/cm.

N

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scale



MISSIMER & ASSOC., INC., 1985

FIGURE:1 RELATIVE LOCATION OF WELLS USED IN SECTION 6,
SANDSTONE AQUIFER TEST

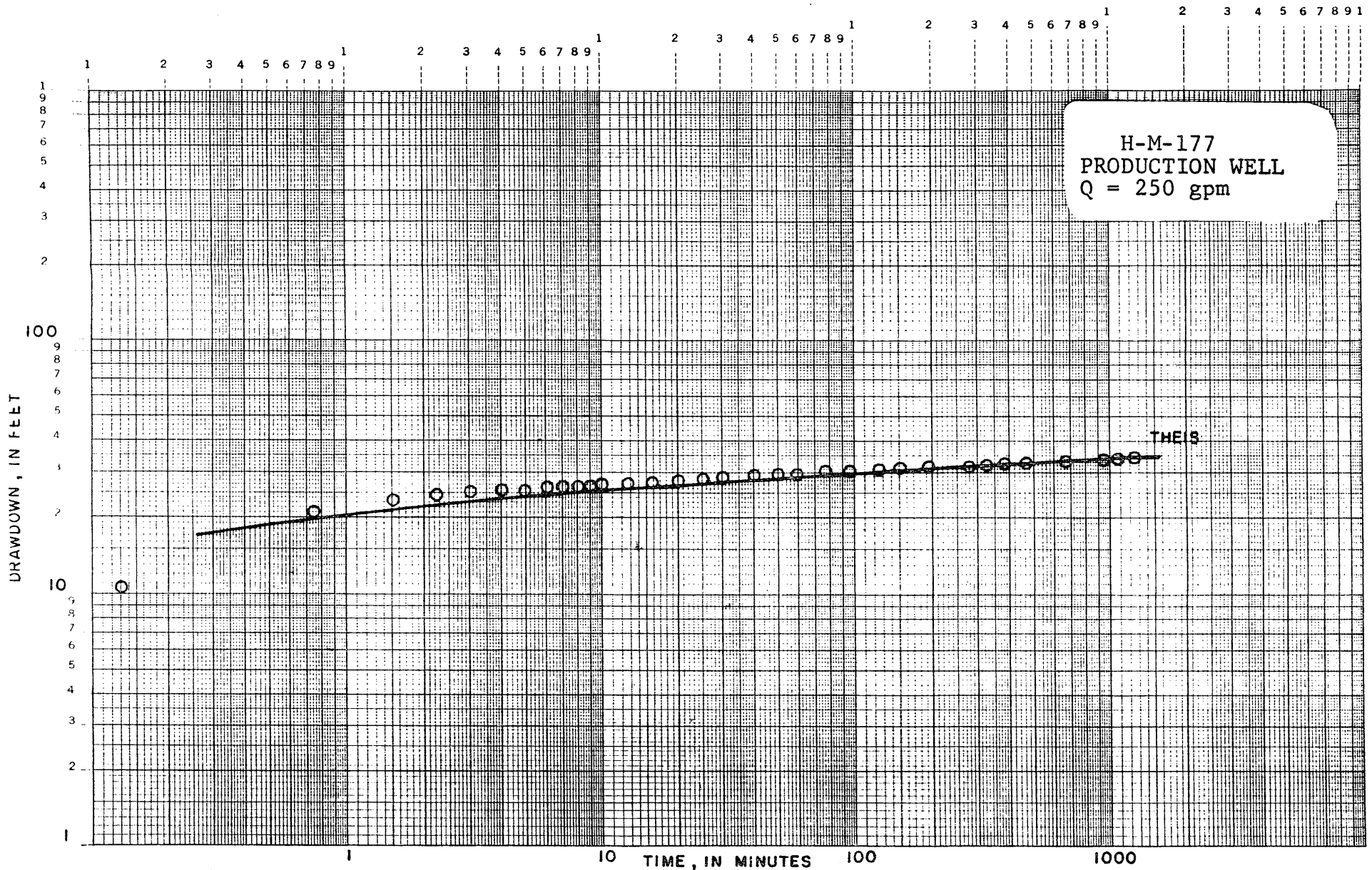


FIGURE: 2 LOG-LOG PLOT OF TIME VERSUS DRAWDOWN DATA FROM H-M-177 DURING THE SECTION 6, SANDSTONE AQUIFER TEST.

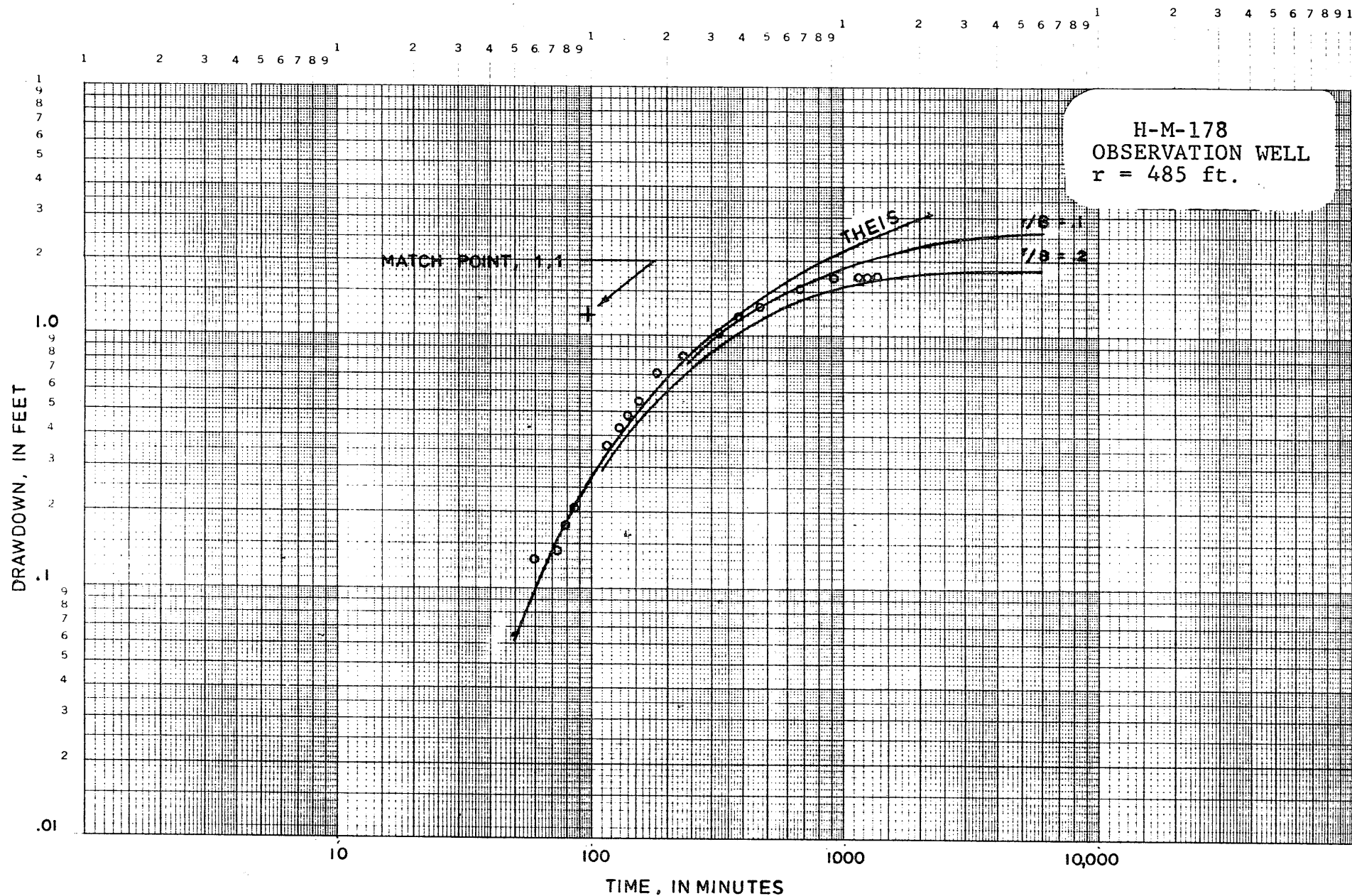


FIGURE: 3 LOG-LOG PLOT OF TIME VERSUS DRAWDOWN DATA FROM H-M-178 DURING THE SECTION 6, SANDSTONE AQUIFER TEST.

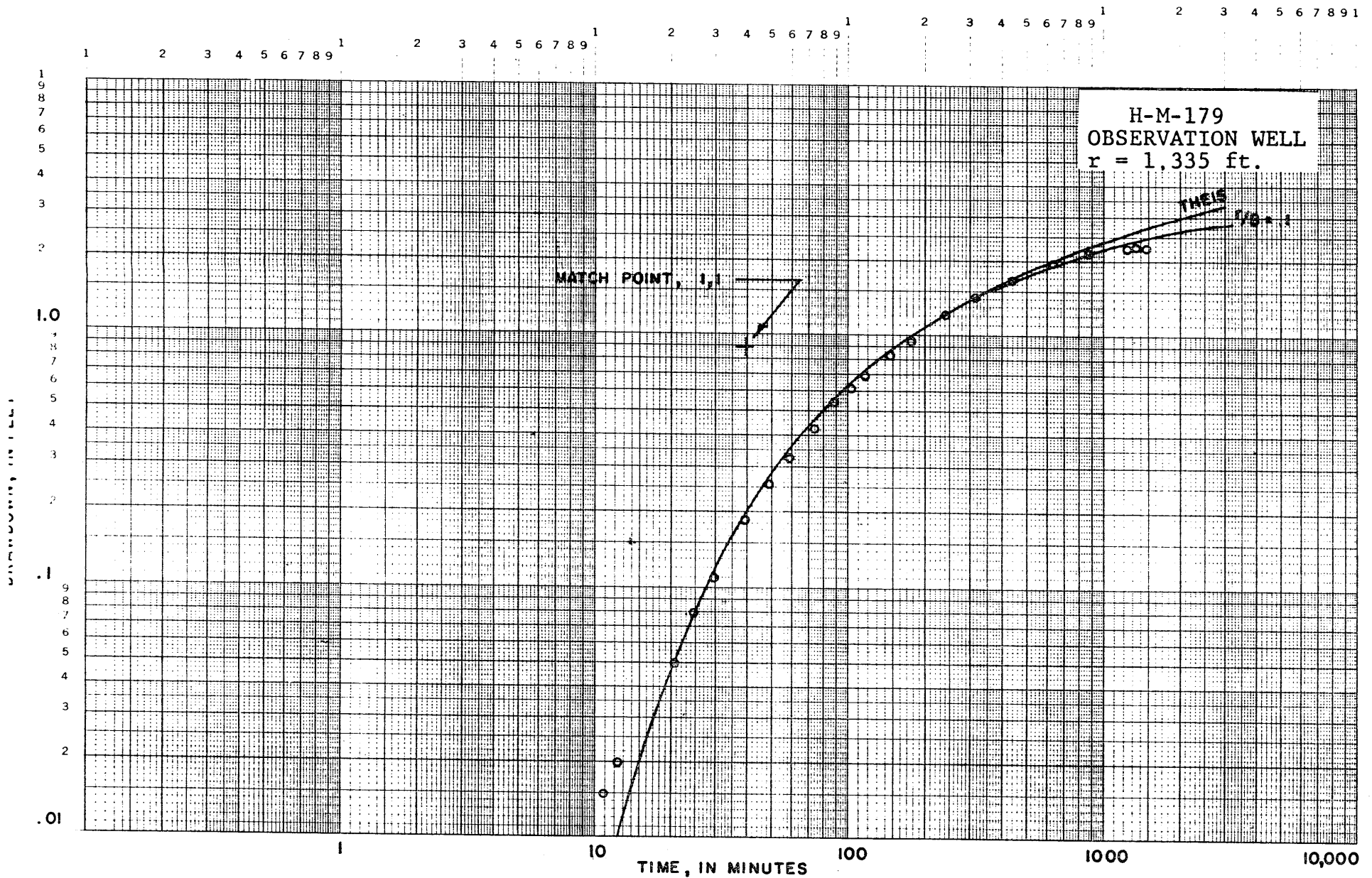


FIGURE: 4 LOG-LOG PLOT OF TIME VERSUS DRAWDOWN DATA FROM H-M-179 DURING THE SECTION 6, SANDSTONE AQUIFER TEST.

TABLE 1. CONSTRUCTION DETAILS OF WELLS USED IN SECTION 6,
SANDSTONE AQUIFER TEST

<u>Well Number</u>	<u>Total Depth (feet)</u>	<u>Casing Diameter (inches)</u>	<u>Casing Depth (feet)</u>	<u>Screened Interval (feet)</u>	<u>Open-Hole Interval (feet)</u>
H-M-177	130	8	65	65-85, 105-125	None
H-M-178	120	4	70	70-75, 105-120	None
H-M-179	128	4	73	73-78, 108-128	None
H-M-153	250	12	163	None	163-250

TABLE 2.

GEOLOGIST FIELD LOG OF WELL H-M-177

<u>Depth(feet)</u>	<u>Lithology</u>
0-5	Sand, quartz, rusty brown, very fine-fine; clayey; organics.
5-10	Sand, quartz, brown, very fine-fine, clayey; limestone fragments; trace phosphorite.
10-12	Sand, quartz, brown, very fine, clayey.
12-20	Limestone, off-white, medium soft, marly; trace shell fragments.
20-29	Clay, light gray; phosphorite.
29-33	Clay, light green-dark green; minor phosphorite.
33-36	Shell; clayey; limestone fragments.
36-45	Clay, dark green; limestone fragments, light gray; some shell; minor phosphorite; sandy toward bottom.
45-53	Sand, quartz, gray, very fine-fine; shell and limestone fragments; phosphorite.
53-58	Clay, medium-dark gray; sand, medium fine; shell and limestone fragments.
58-60	Sand, quartz, gray, very fine-slightly coarse and pebbly (rounded); slightly clayey; minor shell and phosphorite.
60-75.5	Sand, quartz, gray, coarse to pebbly (rounded); shell, whole and fragments; limestone fragments, marly; phosphorite.
75.5-77.5	Limestone, tan, slightly mold and casts, clayey.
77.5-87	Sand, quartz, gray, very fine-coarse and pebbly (rounded), clayey; shell and limestone fragments; phosphorite.
87-91	Sand, very clayey, gray, very fine; shell and limestone fragments; trace phosphorite.
91-103	Sand, very clayey, dark green, fine-medium; shell and limestone fragments; phosphorite.

TABLE 2.
GEOLOGIST FIELD LOG OF WELL H-M-177 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
103-129	Sand, quartz, very fine-coarse, trace rounded pebbles; minor shell and limestone fragments; phosphorite.
129-141	Sand, quartz, very fine-pebbly (rounded); clay; shell and limestone fragments; phosphorite.
141-142	Limestone, light gray, mold and casts.

TABLE 3.

GEOLOGIST FIELD LOG OF WELL H-M-178

<u>Depth(feet)</u>	<u>Lithology</u>
0-3	Sand, quartz, gray, very fine-fine.
3-10	Sand, iron stained, very fine-fine, clayey.
10-15	Limestone, off-white, slight mold and cast; limestone, iron stained, clayey.
15-20	Marl, off-white; limestone and shell fragments.
20-22	Marl and clay; phosphorite.
22-38	Clay, gray; limestone fragments and green clay.
38-40	Clay, green; shell bed @ 38-39 feet.
40-45	Clay, green; phosphorite.
45-55	Clay, green; shell bed @ 52-53 feet.
55-60	Clay, dark gray; shell fragments.
60-70	Clay, dark green; shell at bottom.
70-77	Pebbles, clay, gray; shell fragments.
77-101	Clay, dark gray; shell fragments; sand with pebbles at 82-90 feet.
101-105	Sand, quartz, light gray, very fine; fine size phosphorite.
105-120	Sand, quartz, medium-coarse and pebbly, clayey; limestone fragments.

TABLE 4.

GEOLOGIST FIELD LOG OF WELL H-M-179

<u>Depth(feet)</u>	<u>Lithology</u>
0-5	Sand, quartz, tan-yellow, fine.
5-10	Sand, quartz, gray, very fine-fine; minor clay.
10-15	Sand, quartz, light gray; minor shell.
15-20	Sand, white.
20-22	Marl, white; limestone fragments.
22-37	Clay, light gray.
37-47	Clay, light-dark gray; shell fragments; trace phosphorite.
47-55	Clay, light green.
55-65	Clay, dark green-gray; minor shell and phosphorite; fine sand toward bottom.
65-68	Sand, medium-coarse; clay(?); phosphorite, trace shell.
68-70	Sand, light gray, fine-coarse; minor shell and phosphorite.
70-75	Clay, dark green; shell and phosphorite.
75-80	Clay, dark green; pebbles (rounded).
80-85	Gravel, quartz and phosphorite; abundant clay, shell and tan limestone fragments; sandy throughout.
85-90	Clay, marly; shell and limestone fragments; pebbly.
90-95	Clay, light gray; very sandy (very fine-fine); shell and limestone fragments.
95-100	Clay, gray, sandy (very fine-fine).
100-105	Same as above with fine sand.
105-120	Sand, very fine-medium; phosphorite.
120-125	Sand, fine-medium; clayey in places; phosphorite; trace shell.

TABLE 4.
GEOLOGIST FIELD LOG OF WELL H-M-179 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
125-130	Pebbles, light green clay matrix.
130-135	Same as above with limestone fragments.
135-154	Clay, green; sandy (very fine).
154-160	Limestone, tan, cast and molds.

TABLE 5. TIME AND DRAWDOWN DATA FROM WELLS H-M-153,
177, 178 and 179 USED IN THE SECTION 6,
SANDSTONE AQUIFER TEST

TIME AND DRAWDOWN DATA FOR WELL H-M-153
3-20, 3-21-85

Q = 250 gpm

<u>Time</u> <u>(minutes)</u>	<u>Drawdown</u> <u>(feet)</u>
0-240	0
329	.24
380	.29
454	.36
666	.53
900	.6
1149	.62
1211	.66
1273	.87
1321	.69
1383	.74

Obs 2

(10)

TIME AND DRAWDOWN DATA FOR WELL H-M-177
(PRODUCTION WELL)
3-20, 3-21-85

Q = 250 gpm

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
.08	11.74
.75	21.98
1.5	23.68
2.23	24.37
3	25.02
4	25.45
5	25.92
6	26.20
7	26.39
8	26.62
9	26.81
10	27.02
12.5	27.32
15.75	27.66
20	28.23
25	28.56
30	28.81
40	29.28
50	29.64
60	29.91
77	30.18
97	30.65
125	30.75
150	31.37
193	31.67
280	31.99
324	32.29
389	32.51
467	32.72
676	33.02
912	33.27
1170	33.34
1233	33.41
1294	33.34
1356	33.34

TIME AND DRAWDOWN DATA FOR WELL H-M-178
3-20, 3-21-85

Q = 250 gpm

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
0-45	0
60	0.13
75	.14
77.5	.16
80	.18
85	.21
115	.37
130	.44
140	.49
154	.55
185	.71
235	.85
320	1.07
396	1.20
461	1.30
684	1.55
906	1.71
1184	1.73
1258	1.75
1316	1.77
1419	1.75

Obsl

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TIME AND DRAWDOWN DATA FOR WELL H-M-179
3-20, 3-21-85

Q = 250 gpm

<u>Time</u> <u>(minutes)</u>	<u>Drawdown</u> <u>(feet)</u>
0-10	0
11	.015
12.5	.02
21	.05
25	.08
30	.11
40	.18(5)
50	.25(5)
60	.33
75	.43
90	.54(5)
105	.62
120	.69
150	.84
180	.96
244	1.23
315	1.43
420	1.56
445	1.69
654	1.97
896	2.15
1196	2.23
1264	2.25
1325	2.23

063

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TABLE 6. TIME AND RECOVERY DATA FROM WELLS H-M-178
AND H-M-179 USED IN THE SECTION 6, SAND-
STONE AQUIFER TEST (From water-level
recorders)

TIME AND RECOVERY DATA FOR WELL H-M-178,
3-21, 3-22-85

<u>Time</u> <u>(minutes)</u>	<u>Recovery</u> <u>(feet)</u>
60	.42
120	.92
180	1.16
240	1.31
300	1.40
360	1.45
420	1.54
480	1.57
540	1.63
600	1.68
660	1.74
720	1.78
780	1.82
840	1.85
900	1.88
960	1.90
1020	1.92
1080	1.93
1140	1.96
1200	1.98
1260	2.01
1320	2.03
1380	2.04

TIME AND RECOVERY DATA FOR WELL H-M-179,
3-21, 3-22-85

<u>Time</u> <u>(minutes)</u>	<u>Recovery</u> <u>(feet)</u>
15	.12
30	.25
45	.32
180	1.20
240	1.41
300	1.57
360	1.68
420	1.81
480	1.88
540	1.94
600	1.99
660	2.04
720	2.08
780	2.12
840	2.16
900	2.20
960	2.25
1020	2.28
1080	2.30
1140	2.33
1200	2.36
1260	2.38
1320	2.39