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**MISSIMER AND ASSOCIATES, INC.**

Consulting Hydrologists - Geologists - Environmental Scientists

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July 28, 1987

Mr. Robert Miller  
Vice President, Engineering  
U. S. Sugar Corporation  
P. O. Drawer 1207  
211 Ponce DeLeon Avenue  
Clewiston, Florida 33440

Re: Rogers Ranch Citrus Project

Dear Mr. Miller:

Enclosed herewith please find location maps of subject project showing sites of geologic and hydrologic testing. Accompanying these are geologist logs, well data, and results of aquifer testing.

We have, after careful analysis, determined that ample water is available in the Lower Tamiami Aquifer to meet your citrus irrigation requirements. The build-out pumpage impacts beneath adjacent properties will be minimal as depicted on the drawdown map, which is also enclosed.

Sincerely yours,

MISSIMER AND ASSOCIATES, INC.

*Thomas O'Donnell*

Thomas H. O'Donnell  
Senior Hydrologist

THO:sm

Enclosures

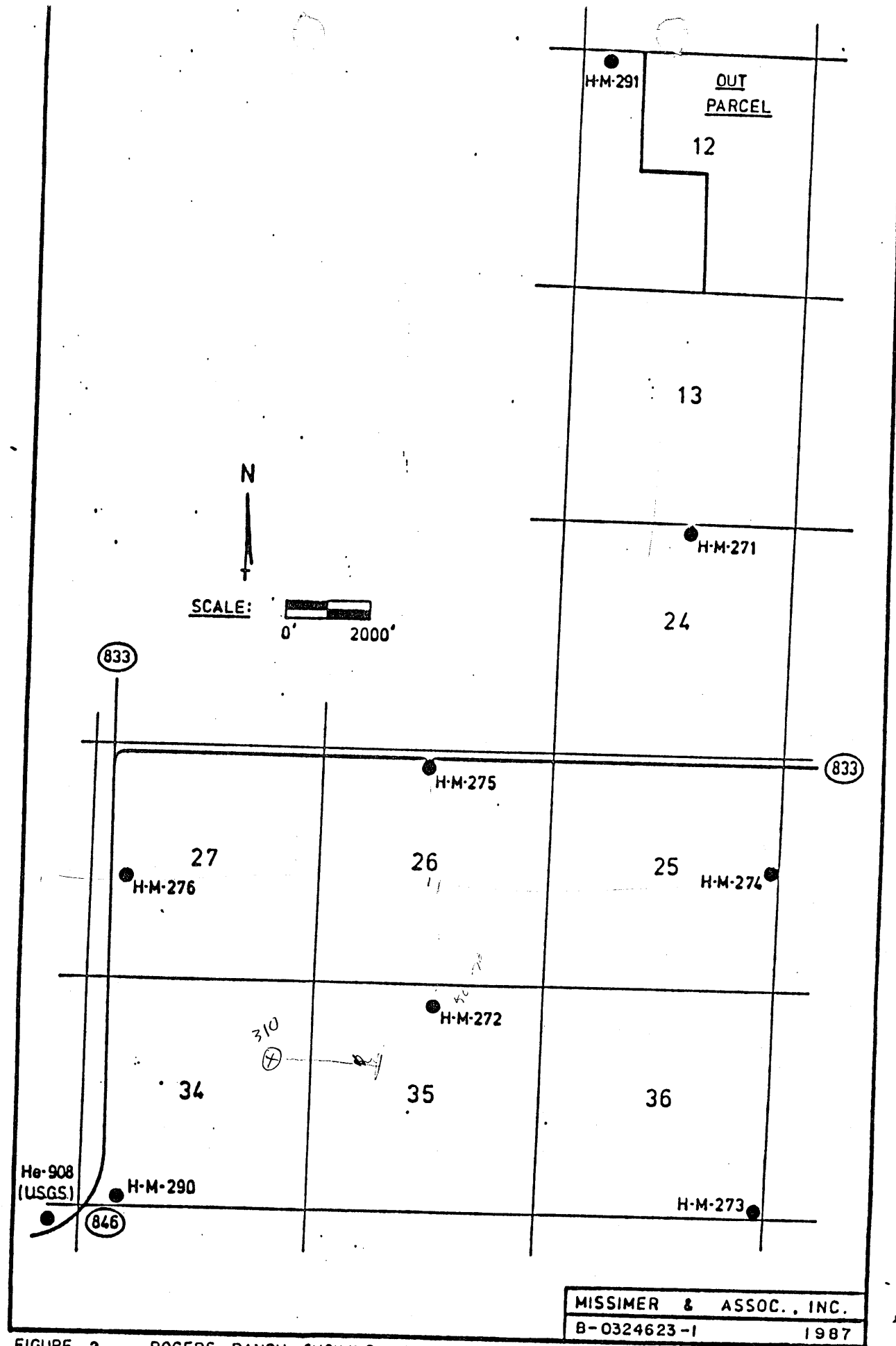


FIGURE 2. ROGERS RANCH SHOWING LOCATION OF GEOLOGIC TEST HOLES.

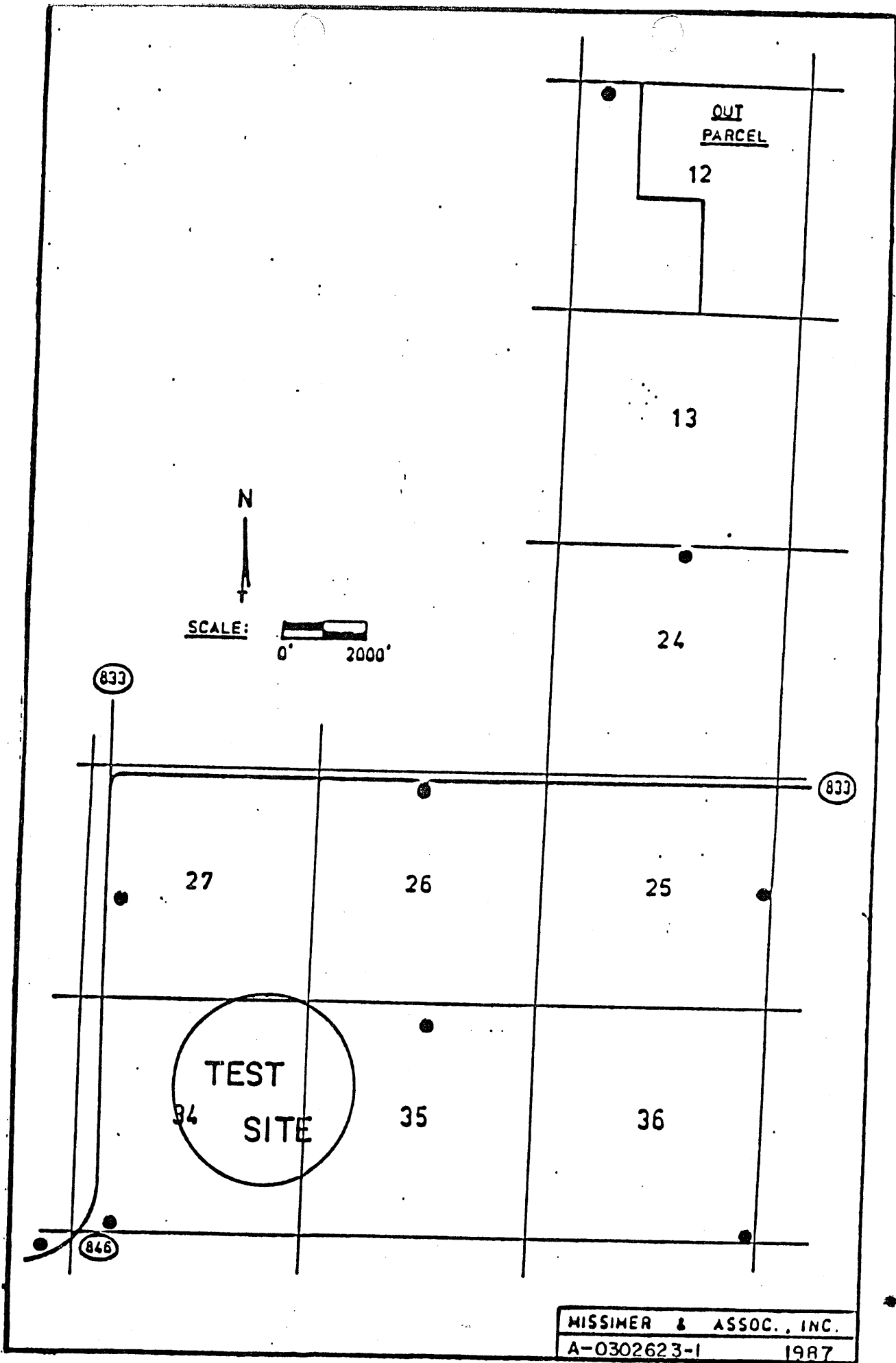


FIGURE 3. ROGERS RANCH SHOWING LOCATION OF AQUIFER TEST SITE.

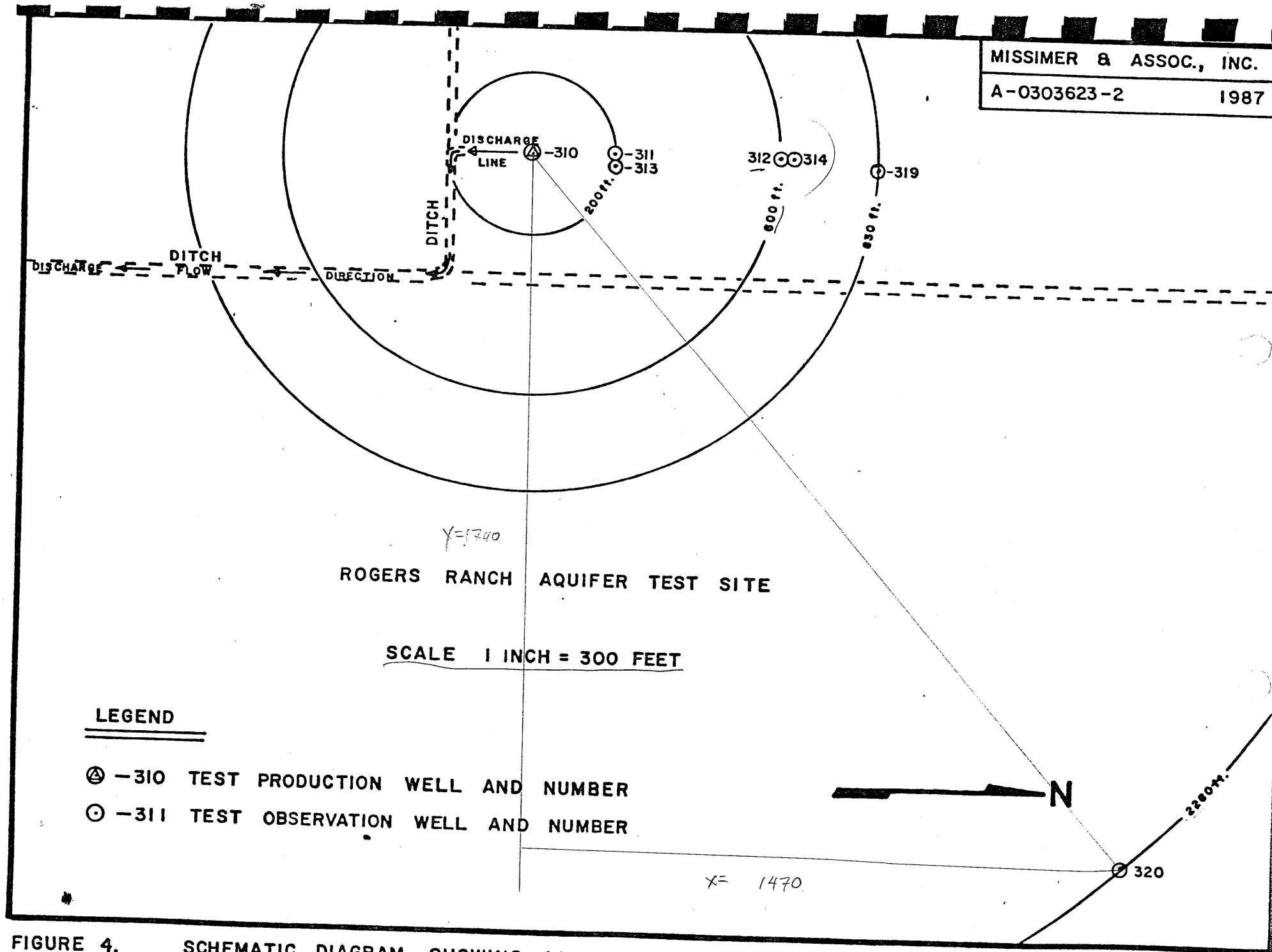
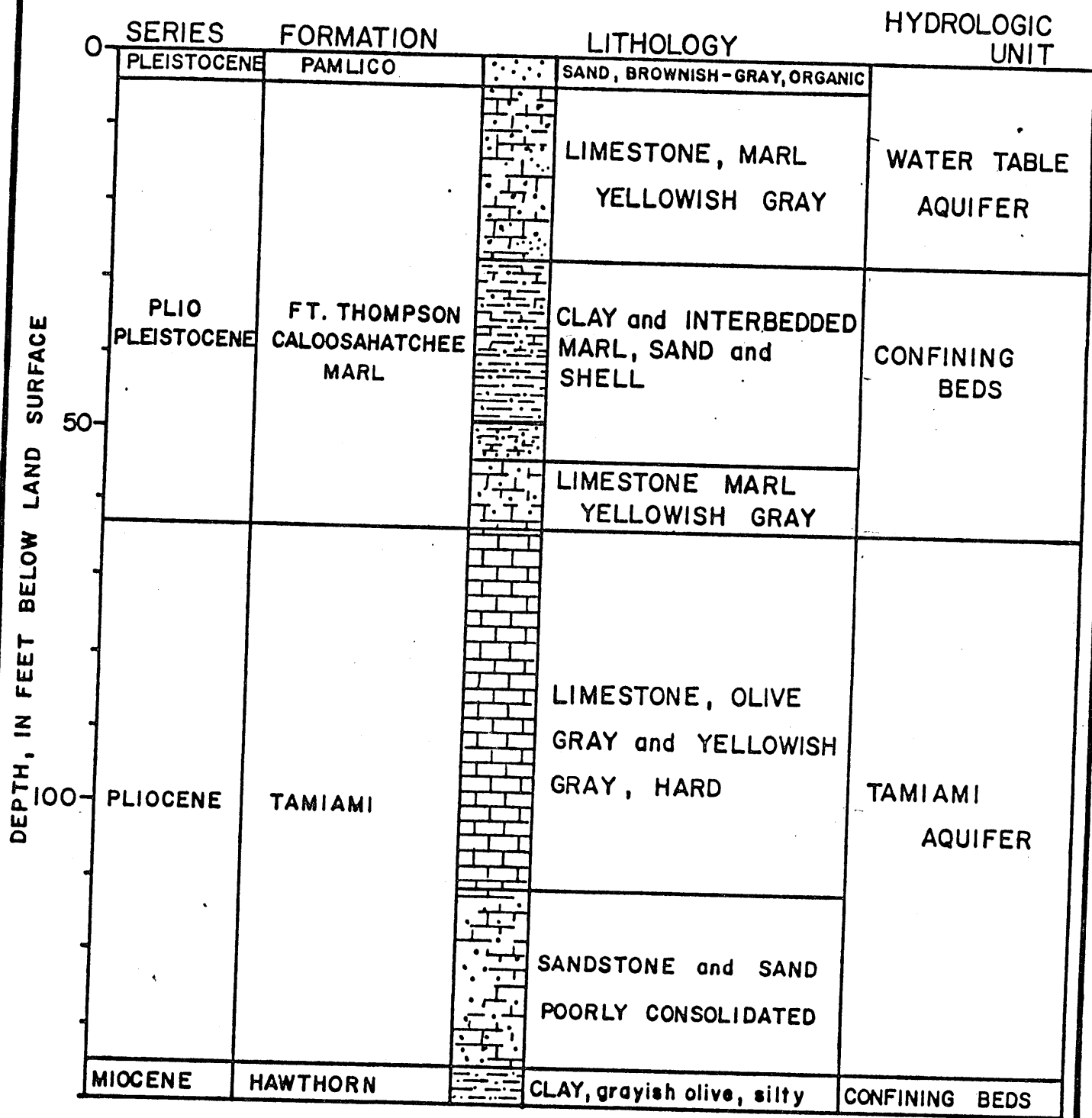


FIGURE 4. SCHEMATIC DIAGRAM SHOWING AQUIFER TEST SET-UP.

TABLE 1. CONSTRUCTION DETAILS OF MONITOR, TEST PRODUCTION AND EXISTING WELLS

Well Number	Total Depth(ft)	Casing Depth(ft)	Casing Diameter(in)	Casing Type	Finish	Lithologic Co
H-M-271	145	69	2	PVC	Open Hole	✓
H-M-272	137	60	4	PVC	Open Hole	✓
H-M-273	138	47	4	PVC	Open Hole	✓
H-M-274	138	60	4	PVC	Open Hole	✓
H-M-275	138	70	4	PVC	Open Hole	✓
H-M-276	138	75	4	PVC	Open Hole	✓
H-M-290	125	35	4	PVC	Open Hole	✓
H-M-291	120	55	4	PVC	Open Hole	✓
<i>PW</i> * H-M-310	105	65	4	PVC	Open Hole	✓
<i>200'</i> H-M-311	110	65	10	PVC	Open Hole	✓
<i>600'</i> H-M-312	110	65	4	PVC	Open Hole	✓
<i>200'</i> H-M-313	15	5	4	PVC	Open Hole	✓
<i>600'</i> H-M-314	10	3	4	PVC	.020 Screen	✓
<i>830'</i> H-M-319	79	50	4	PVC	.020 Screen	✓
(USSC #6)			8	Steel	Open Hole	
H-M-320	66	41	8	Steel	Open Hole	
(USSC #26)						



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FIGURE 5. HYDROGEOLOGIC SECTION OF WELL H-M-310 TEST HOLE.

TABLE 2. SUMMARY OF COMPUTED AQUIFER HYDRAULIC COEFFICIENTS

		$T = 630,000 \text{ gpd/ft}$ $1.2 \times 10^{-4}$ $\sim$ $1 \times 10^{-4}$		
<u>ID</u>	<u>Well Number</u>	<u>Method</u>	<u>Transmissivity (gpd/ft)</u>	<u>Storage Coefficient</u>
65-110	H-M-311	Straight Line Curve Matching	$650,000$ $610,000$	$1.4 \times 10^{-4}$ $0.6 \times 10^{-4}$
65-110	H-M-312	Straight Line Curve Matching	$675,000$ $580,000$	$1.2 \times 10^{-4}$ $1.5 \times 10^{-4}$
50-79	H-M-319	Straight Line Curve Matching	$710,000$ $485,000$	$1.5 \times 10^{-4}$ $1.6 \times 10^{-4}$
41-66	H-M-320	Straight Line Curve Matching	$1,330,000$ $780,000$	$2.0 \times 10^{-4}$ $2.5 \times 10^{-4}$
Distance Drawdown			440,000	---
Computer Match			400,000	---
				1.0 x 10 <sup>-1</sup>

PW-HM-310  
65-105

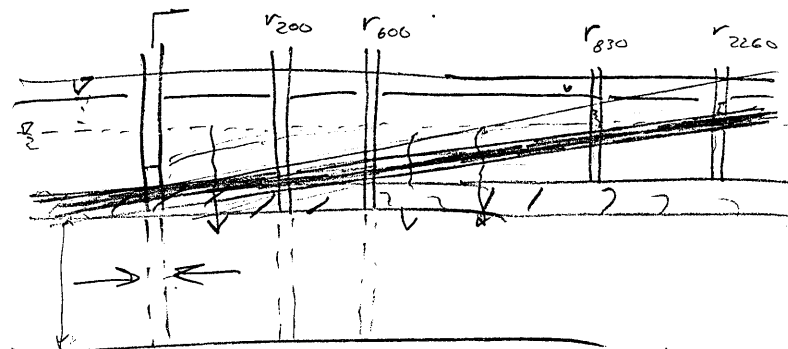


TABLE 3. WATER QUALITY FROM TEST PRODUCTION WELL  
H-M-310 DURING AQUIFER TEST

<u>Volume of Water Discharge (gpm) <i>gallons</i></u>	<u>Chloride (mg/l)</u>	<u>Conductivity (umhos/cm)</u>
8,536	70	800
69,355	70	800
458,810	68	800
1,339,085	70	800
2,312,189	68	800
3,342,911	68	800
4,353,360	70	800



drawn at equilibrium

BLANKY  
E=10 days  
t=

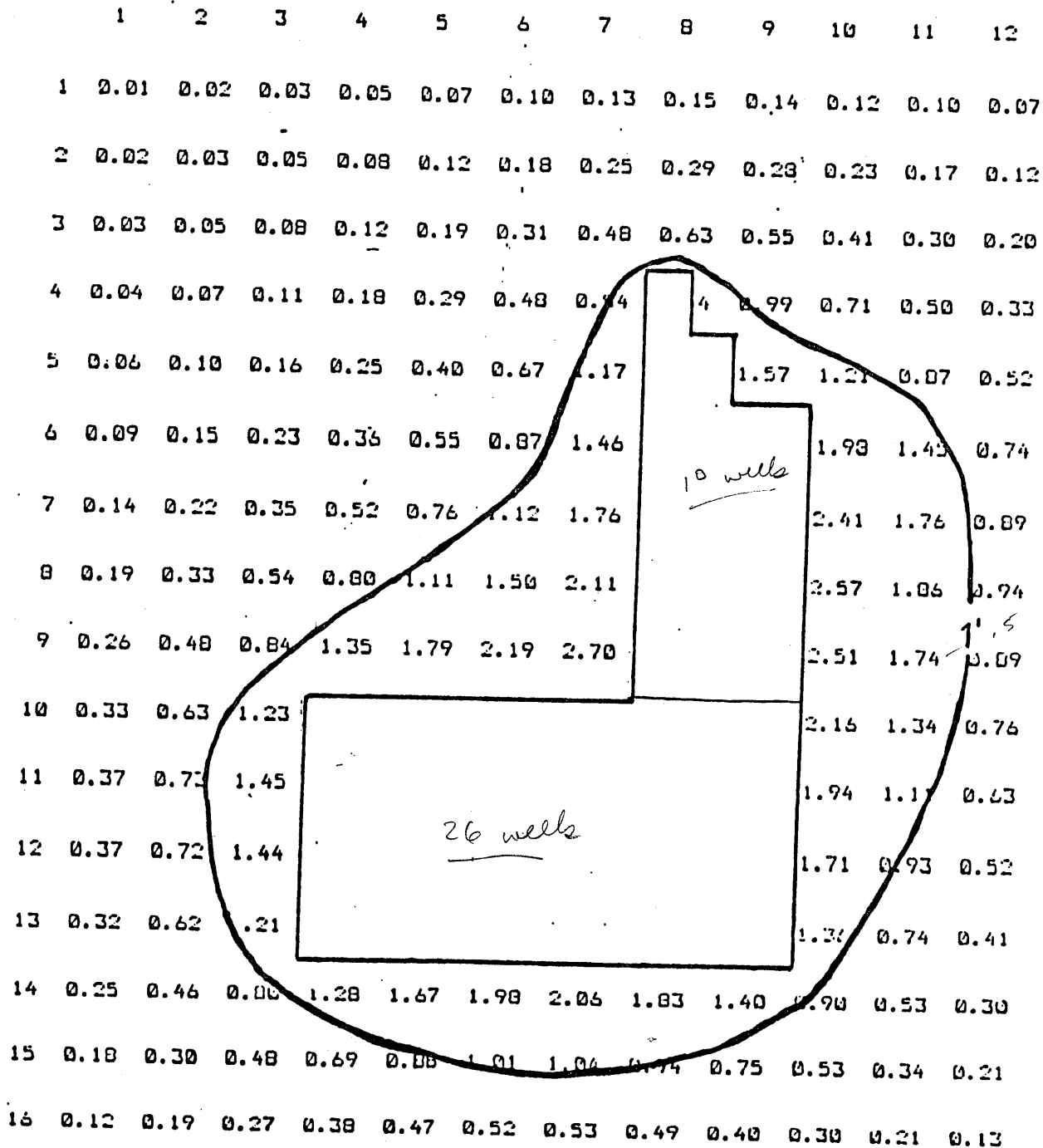
t = 610000 gpd/ft

LEGEND

l = 0.030000000000

grid spacing = 2640 ft

1' — DRAWDOWN CONTOUR



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FIGURE II OFFSITE DRAWDOWN IMPACTS INDUCED BY PUMPING ALL WELLS AT 900 GPM/well

APPENDIX A: GEOLOGIST LOGS OF  
TEST HOLES

# GEOLOGIST LOG OF WELL H-M-271

<u>Depth(feet)</u>	<u>Lithology</u>
0-6	Sand, pale yellowish brown (10 YR 7/2), minor iron stained, poorly sorted, ranging from fine, subrounded to very coarse rounded quartz.
6-17	Interbedded, white bleached bivalves averaging 3 to 5 mm; white (N 9) to light olive gray (5 Y 6/1) lime mud; and fine to very coarse rounded quartz with traces of fine to coarse phosphorite.
17-24	Sand, clayey; interbedded, as above, clay percentage increasing.
24-26	Sand, coarse to very coarse, clear to whitish, rounded quartz; minor white shell fragments and traces of coarse phosphorite.
26-35	Clay, pale green (5 G 7/2), greasy with abundant white shell fragments, and coarse, subrounded sand; minor phosphorite.
35-41	Dolosilt, dusky yellow (5 Y 6/4), with abundant yellowish gray (5 Y 7/2) bivalve shells and fine subangular to subrounded quartz sand; trace phosphorite.
41-54	Marl, light gray (N 7) to yellowish gray (5 Y 8/1) lime mud with fine subrounded quartz sand; abundant bivalve; bryozoan shells; minor lithification.
54-67	Sandy limestone, medium gray (N 5) to yellowish gray (5 Y 8/1), soft to medium calcirudite; 40-50% fine to pebble sand, subrounded quartz sand; 30-45% bivalve shells and fossils; trace amounts of fine to coarse phosphorite; very good vugular and moldic porosities.
67-82	Sandstone, yellowish gray (5 Y 8/1) to light gray (N 7), poorly to well lithified; fine to coarse, subrounded quartz; 20-40% bivalve fossils and shells; calcareous cement; 1-3% phosphorite; good moldic and vugular porosities.
82-91	Sandstone, as above, soft and friable, 1-5% fine phosphorite.

GEOLOGIST LOG OF WELL H-M-271 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
91-136	Sandstone, as above, very poorly lithified to unlithified and clayey; 1-5% fine phosphorite.
136-146	Clay, dark greenish gray (5 GY 4/1), silty, dolomitic, finely sandy lime mud, 10-15% fine phosphorite sand.

# GEOLOGIST LOG OF WELL H-M-272

<u>Depth(feet)</u>	<u>Lithology</u>
0-2	Sand, brownish gray (5 YR 4/1), fine to coarse, subrounded quartz; 20-30% organics rich clay.
2-10	Limestone, white to light olive gray (5 Y 6/1), soft, marly, poorly lithified; shell; fine to coarse quartz in a lime mud matrix; fair moldic and vugular porosity.
10-18	Shell marl, yellowish gray (5 Y 8/1), and white (N9) shells in a finely to coarsely sandy lime mud; naturally colored barnacles, bivalves, common; minor lithification.
18-27	Sandy clay, olive gray (5 Y 5/1), dense; 50% fine to medium-sized quartz sand; 1-3% fine to medium-sized phosphorite.
27-31	Sandy clay, yellowish gray (5 Y 6/2), medium soft; 40-50% fine to medium-sized quartz sand; trace amounts of fine to medium-sized phosphorite; minor shell fragments.
31-54	Marl, yellowish gray (5 Y 6/2); 20-40% fine to medium-sized quartz; 20-30% shells (oysters, barnacles, bryozoans) in a lime mud matrix; unlithified to fairly lithified.
54-60	Limestone, light gray (N7), medium soft to medium; 20% sand; 25% bivalves; 25% fossiliferous, biomicrudite; fair moldic and vugular porosities; trace phosphorite; minor marly.
60-68	Limestone, light gray (N7), medium hard, calcirudite; 20% sand; 25% bivalves; 25% fossils; very good moldic and vugular porosities; fine to pebble-sized quartz; 1-2% fine to pebble-sized phosphorite; common spar-infilled cavities.
68-101	Calcareous sandstone, very pale orange (10 YR 8/2), medium soft to medium hard; 50% fine to coarse quartz sand; 30-40% bivalve shells and fossils; 5-20% micrite and spar cement; 1-5% phosphorite sand; good moldic and vugular porosities; (soft, marly, sandy from 68-74).

GEOLOGIST LOG OF WELL H-M-272 (continued)

Depth(feet)

Lithology

101-117

Sand, very light gray (N8), very fine to fine subangular quartz; 1-5% fine phosphorite; minor shell fragments.

117-137

Clay, light olive gray (5 Y 6/1), silty, finely sandy, shells common; 1-3% phosphorite; minor lithification.

# GEOLOGIST LOG OF WELL H-M-273

<u>Depth(feet)</u>	<u>Lithology</u>
0-1	Sand, brownish black (5 YR 2/1), fine to medium, rounded quartz; 20-30% organics and clay.
1-4	Sand, dark yellowish brown (10 YR 3/2), fine to very coarse, rounded quartz; 30-40% clay.
4-7	Limestone, yellowish gray (5 Y 7/2), minor iron staining; 70-80% shells and fossils (barnacles common); poorly to fairly lithified biomicrudite; common quartz sand.
7-15	Shell marl, yellowish gray (5 Y 8/1); 70-80% naturally colored shells (echinoids, bivalves); white (N 9) lime mud; common quartz sand, minor lithification.
15-19	Shell marl, as above; increased lithification (medium soft to medium).
19-23	Clay, light olive gray (5 Y 6/1), sandy; 40-50% fine to coarse quartz; barnacles common; trace phosphorite.
23-35	Interbedded, yellowish gray (5 Y 8/1), sandy lime mud; (30-40% fine to medium quartz); poorly to fairly lithified limestone; shells and shell marl (bivalves, barnacles abundant).
35-45	Limestone, yellowish gray (5 Y 7/2), medium to medium soft, some friable to clay, shelly, fossiliferous, moldic, calcarenite; 10-20% medium quartz sand; excellent vugular porosity; trace phosphorite; becomes harder with depth.
45-48	Limestone, as above, yellowish gray (5 Y 7/2), grading to medium light gray (N 5), medium soft to medium.
48-72	Limestone, light gray (N 7) to medium dark gray (N 4), medium soft to medium hard; very shelly, very fossiliferous, biomicrudite; very good moldic and vugular porosities; 10-20% fine to very coarse quartz sand; 40-60% shells and molds of bivalves, bryzoans, worm tubes.
72-80	Limestone, as above, yellowish gray (5 Y 8/1), and light gray (N 7); 15-30% fine to very coarse quartz sand.

GEOLOGIST LOG OF WELL H-M-273 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
80-100	Sandstone, yellowish gray (5 Y 8/1) and light olive gray (5 Y 6/1), medium soft to medium hard, moldic, vugular; 40-90% fine to very coarse, rounded quartz, calcareously cemented; shells common; trace phosphorite.
100-104	Sandstone, as above, medium soft, poorly lithified to unlithified.
104-109	Dolosilt, greenish gray (5 GY 6/1), soft; 10-20% quartz silt and fine to medium sand; 1-5% phosphorite sand; yellowish gray (5 Y 8/1), shells common.
109-113	Sand, very light gray (N 8) to yellowish gray (5 Y 8/1); bivalves and fine quartz sand; minor clay; 1-5% fine phosphorite.
113-115	Shell bed, yellowish gray (5 Y 8/1), bivalves; minor dolosilt as 104-109.
115-130	Sand, shell, as in 109-113 feet.
130-138	Dolosilt, greenish gray (5 GY 6/1) to olive gray (5 Y 6/1); 30-50% quartz silt and fine to medium sand; 20-30% fine phosphorite and 3-5 mm pebbles; shells common.



# GEOLOGIST LOG OF WELL H-M-274

<u>Depth(feet)</u>	<u>Lithology</u>
0-4	Sand, dark yellowish brown (10 YR 4/2), fine to coarse, rounded quartz, minor iron staining; minor clay.
4-13	Interbedded; marl, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1); 10-25% fine to coarse sand; bivalve and gastropod shells common; minor lithification; minor iron staining, traces of phosphorite; minor light gray (N 7), medium soft, sandy micrite; yellowish gray (5 Y 8/1), medium soft to medium hard, sandy, shelly biomicrite.
13-15	Clay, light olive gray (5 Y 6/2), sandy, silty lime mud; 30-40% very fine to coarse quartz; trace phosphorite; minor shell (barnacles, bivalves).
15-25	Clay, as above, 40-50% very fine to very coarse quartz, 1% phosphorite pebbles.
25-30	Clay, as above, 5-15% fine to pebble sized phosphorite.
30-40	Clay, as above, yellowish gray (5 Y 8/1); shell increased to 30-40%.
40-46	Clay, olive gray (5 Y 3/2), greasy, dense calcareous clay; 5-10% quartz silt to fine sand; trace phosphorite.
46-57	Interbedded, yellowish gray (5 Y 7/2), sandy, silty lime mud with trace to 1% fine phosphorite and minor shells; yellowish gray (5 Y 7/2) medium soft to medium, shelly, sandy biomicrite with trace phosphorite; good moldic and vugular porosities in places.
57-65	Limestone, very light gray (N 7) to medium gray (N 5), sandy, shelly, medium to medium soft, biomicrudite; 20-40% fine to coarse quartz; natural and fossilized bivalves; good moldic porosity, fair to poor vugular porosity; trace phosphorite as fine sand.
65-75	Limestone, as above, calcarenite with rudaceous shells and molds; good vugular porosity; medium to medium hard.

GEOLOGIST LOG OF WELL H-M-274 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
75-84	Limestone, yellowish gray (5 Y 8/1), medium to medium hard, sandy, shelly, biomicrudite; 10-40% fine to coarse quartz; 40-50% bivalve shells; fossils; very good moldic and very good vugular porosity.
84-90	Sandstone, calcareous, yellowish gray (5 Y 8/1), medium soft and friable; fine to coarse rounded quartz with 10-20% shell; good moldic porosity.
90-100	Sandstone, as above; 1-3% phosphorite as fine to pebble sized sand; increased vugular and moldic porosity, especially from bivalves, barnacles, bryozoans, worm tubes.
100-105	Sandstone, as above; 3-5% phosphorite as fine to medium sized sand.
105-108	Sand, yellowish gray (5 Y 8/1), very fine to fine quartz with 25-35% lime mud; 10-20% shell, 3-5% phosphorite fine sand; minor poorly lithified.
108-116	Silty clay, light olive gray (5 Y 5/2),; 20-30% quartz fine sand and silt; 3-5% fine phosphorite; 10-20% shell and traces of dolosilt in a calcareous clay matrix.
116-125	Silty clay, as above; minor fairly lithified.
125-138	Clayey silt, light olive gray (5 Y 5/2), soft to medium soft; fairly to unlithified; quartz silt to fine sand, 10-20% shell; 5-10% fine to pebble phosphorite; 10-15% clay matrix.

# GEOLOGIST LOG OF WELL H-M-275

<u>Depth(feet)</u>	<u>Lithology</u>
0-3	Sand, dark yellowish brown (10 YR 4/2), very fine to very coarse, rounded quartz; 5-10% organics and clay.
3-5	Sand, clayey, dusky yellowish brown (10 YR 2/2), very fine to very coarse, rounded quartz; 10-20% organics and clay.
5-19	Limestone, marly, yellowish gray (5 Y 7/2), soft to medium hard, very sandy (fine to coarse quartz), shelly (echinoids, bivalves), biomicrudite; similar unlithified sand, shell and lime mud.
19-27	Clay, light olive gray (5 Y 6/2), silty, sandy, slightly dolomitic lime mud; bivalve, echinoid shells common; trace phosphorite sand and fossils.
27-33	Shell marl, light olive gray (5 Y 6/2); 40-50% bivalve, echinoid shells and fossils; 10-20% fine to coarse quartz, in a calcareous mud matrix; minor lithification; trace phosphorite sand.
33-36	Limestone, yellowish gray (5 Y 8/1), shelly, biomicrite; 10-15% fine quartz; 10-20% naturally colored bivalves.
36-42	Shell marl, as 27-33 feet.
42-44	Clay, light olive gray (5 Y 5/2); 30-40% fine to medium quartz sand; 1-3% fine to coarse phosphorite sand; bivalve (barnacle) shells common.
44-67	Interbedded, yellowish gray (5 Y 6/2), sandy, silty, shelly (bivalves) lime mud; poorly lithified similar biomicrudite; traces of fine to medium sized phosphorite.
67-73	Sandy limestone, light gray (N 7) to medium light gray (N 6), biomicrudite, medium to medium hard, minor friable; 40-50% fine to very coarse subrounded quartz; 30-40% bivalve shells (oyster, barnacles mostly); very good moldic and vugular porosities; trace of phosphorite.

GEOLOGIST LOG OF WELL H-M-275 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
73-78	Sandy limestone, as above, with secondary spar as cement and lining of cavities.
78-90	Sandy limestone, yellowish gray (5 Y 8/1), medium soft to medium hard, biomicrudite, minor friable 81-83 feet; 30-50% medium, subrounded quartz; 30-40% shells, fossils (bryozoan, bivalve), good moldic, good vugular porosity; trace of phosphorite.
90-105	Sandstone, light gray (N 7) to yellowish gray (5 Y 8/1), medium soft, friable to medium; calcareously cemented fine to medium sized rounded quartz; 15-30% shells, fossils (bivalves, echinoids, bryozoans), good moldic and vugular porosities; trace fine phosphorite sand; softer 97-100 feet.
105-108	Sandstone, as above; 1-3% phosphorite sand and nodules; minor unlithified/
108-135	Silty, sandstone, light olive gray (5 Y 4/1), poorly lithified; subrounded fine quartz sand and silt; calcareous clay matrix; 1-5% fine phosphorite sand; 10-20% shells (bivalve, echinoid).
135-138	Clay, light olive gray (5 Y 4/1), silty, finely sandy; 3-8% fine to pebble sized phosphorite; 20-30% yellowish gray (5 Y 8/1), bivalve shells.

# GEOLOGIST LOG OF WELL H-M-276

<u>Depth(feet)</u>	<u>Lithology</u>
0-2	Sand, grayish black (N2), very fine to very coarse subrounded quartz; minor clay.
2-6	Interbedded, limestone, grayish yellow (5 Y 8/4), medium soft micrite, friable; 20-30% quartz; dark yellowish brown (10 YR 4/2), iron stained, hard, finely crystalline micrite with minor fine quartz sand; light olive gray lime mud with fine to coarse sand, shell fragments.
6-12	Limestone, marly, white (N9) to yellowish gray (5 Y 8/1), fairly to unlithified, shelly, sandy, biomicrudite; 40% yellowish gray, bivalve shells; 20-30% fine to coarse quartz sand.
12-17	Marl, white (N9) to yellowish gray (5 Y 8/1); 20-40% yellowish gray bivalve shells; 20-30% fine to medium quartz sand; trace fine to medium phosphorite sand.
17-29	Limestone, as 6-12; medium soft to medium.
29-40	Clay, sandy, dolomite, yellowish gray (5 Y 5/1), sticky calcareous; 40-50% medium to coarse quartz; minor naturally-colored shells; trace phosphorite.
40-47	Marl, dusky yellow green (5 GY 5/2) clay; 50-70% fine to coarse, subrounded quartz; 1-3% fine to very coarse phosphorite; 10-15% naturally colored bivalve shells
47-52	Marl, as above, color slightly lighter (5 GY 6/2); shells increased to 20-30%; phosphorite increased to 3-5%.
52-60	Marl, as above, shells increased to 40-60%
60-65	Marl, dusky yellow green (5 GY 5/2); 50-70% fine to coarse, subrounded quartz; 1-3% fine to coarse phosphorite; 20-30% naturally colored bivalve shells; minor similar, light olive gray (5 Y 6/1) lime mud.
65-71	Marl, yellowish gray (5 Y 8/1), sandy, shelly lime mud; 40-60% fine to coarse, subrounded quartz; 20-30% bivalve, echinoid shells; 1-3% fine to medium phosphorite sand.

GEOLOGIST LOG OF WELL H-M-276 - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
71-72	Limestone, marly, yellowish gray (5 Y 7/1) to light gray (N7), poorly lithified to unlithified, sandy, shelly biomicrudite; 30-40% white (N9) to medium dark gray (N5), bivalve shells; (oysters), 10-30% fine to coarse, subrounded quartz; trace fine phosphorite sand.
72-73	Limestone, as above, fairly lithified bio-micrudite, medium soft, good moldic and vugular porosities, fossiliferous, minor unlithified.
73-78	Limestone, yellowish gray (5 Y 8/1) to medium light gray (N6), medium to medium hard, sandy, fossiliferous, shelly biomicrudite; 20-40% fine to coarse subrounded quartz; 40-50% natural and fossilized bivalve shells; very good moldic and vugular porosities; trace to 1% fine phosphorite sand.
78-96	Limestone, yellowish gray (5 Y 8/1) with minor light gray (N7), medium to medium hard, arenite, calcirudite to biomicrudite; 10-30% fine to coarse subrounded quartz; 30-60% shell fragments and fossils; very good moldic and vugular porosities; trace to 1% fine phosphorite sand.
96-114	Sandstone, yellowish gray (5 Y 8/1), medium soft to medium hard, calcareously cemented; fine to very coarse, rounded quartz; 20-40% shells and fossils; good moldic, interstitial and vugular porosities; trace to 1% fine phosphorite sand from 96 to 110 and 1-3% from 110 to 114.
114-116	Sandstone, as above, poorly lithified; 3-5% phosphorite.
116-118	Clay, light olive gray (5 Y 5/2); 20% silty, 20% sandy, 20% shelly, soft lime mud; 1-3% fine phosphorite.
118-135	Sandstone, light olive gray, poorly lithified, clayey; fine to coarse, rounded quartz; shells (bivalves, bryozoan, echinoids); 3-5% fine phosphorite sand; minor unlithified.
135-138	Clay, as 116-118; 3-5% fine phosphorite.

LOGIST'S LOG OF WELL HM-0  
ROGERS RANCH USSC

<u>Depth(feet)</u>	<u>Lithology</u>
0-4	Sand; brownish gray (5 YR 4/1), unlithified, common ironstaining; fine to course sized quartz grains, subrounded.
4-9	Marl; 60-70% sandy clay, light olive gray (5 Y 5/2), unlithified and minor lithified of the same medium hardness, abundant fine quartz sand and silt, common large bivalve pecten fragments.
9-18	Shell marl, as above; better lithified with 40-50% hard sandstone, same; barnicle fragments abundant, minor phosphate sand.
18-27	Limestone, yellowish gray, (5 Y 6/2); medium hardness; 20-30% unlithified sandy lime mud same; minor phosphate, common fine gray shell fragments.
27-32	Limestone marl, as above, predominantly unlithified.
32-52	Limestone, light olive gray (5 Y 6/1), hard, micrite cement, 20-30% quartz sand, fossil molds and casts common, good moldic porosity.
52-60	Limestone, as above, and gray (N6), somewhat finer moldic porosity.
60-65	Limestone light olive gray to light gray, medium soft and hard; sandy, common loose shell fragments, gray, good moldic porosity.
65-73	Limestone, gray (N6) and yellowish gray (5 Y 8/1), micrite and sparite cement respectively, hard; 20-50% sandy fine to course quartz grains, large fossil molds and casts abundant, excellent moldic porosity.
73-100	Limestone/sandy limestone, yellowish gray (5 Y 8/1); medium hardness, microcrystalline sparry calcite cement, 40-50% quartz sand, incomplete solutioning of fossil barnicles common, good moldic porosity.
100-105	Sandstone, yellowish gray (5 Y 7/2), medium and softer with depth, abundant quartz sand, fair moldic to intergranular porosity.

GEOLOGIST'S LOG OF WELL HM-290  
ROGERS RANCH USSC - Continued:

<u>Depth(feet)</u>	<u>Lithology</u>
105-120	Sandstone and sand, as above, soft to unlithified, minor interbedded hard moldic limestone.
120-125	Clay, greenish gray (5 GY 6/1), unlithified, fine sand and silt size quartz abundant, common shell fragments.



GEOLOGIST'S LOG OF WELL 1 291  
ROGERS RANCH USSC

<u>Depth(feet)</u>	<u>Lithology</u>
0-9	Sand, brownish gray (5 YR 4/1), unlithified, common ironstaining, fine to coarse sized quartz grains, subrounded, upper 1 foot black, organic rich.
7-14	Clay, greenish gray (5 GY 6/1), unlithified, stiff texture, silty, occasional barnicle fragments.
14-28	Limestone marl, light olive gray (5 Y 6/1), soft to medium sandy limestone with large cemented bivalve section fragments and 30-40% unlithified lime mud of the same, common fine white shell fragments, minor phosphate.
28-41	Marl, as above, but 50-60% unlithified common interbedded land sandstone, similar composition, light olive gray and olive brown (5 YR 5/6), fairly well developed moldic porosity.
41-53	Limestone, yellowish gray (5 Y 7/2) medium hard and unlithified marly to 50', 40-50% quartz sand, fossil molds and casts common minor phosphate.
53-60	Limestone, yellowish gray (5 Y 6/2), medium hard, micrite cement common fine quartz and phosphate sand, good moldic porosity.
60-79	Limestone as above, and light gray (N6), well developed secondary moldic porosity.
79-100	Limestone, sandy, yellowish gray (5 Y 8/1) medium to hard, microcrystalline sparry calcite cement and minor light gray (N6) micritic cement matrix, excellent moldic porosity, becoming calcarious sandstone same composition, and softer with depth.
100-110	Sandstone, light olive gray (5 Y 6/1), soft to very poorly lithified, quartz fine to course sand size grains.
110-120	Sandstone, as above, and clayey sand light olive gray same; occasional hard moldic sandy limestone lenses; basal greenish gray (5 GY 6/2) sandy clay minor shell from 119 feet.

## TABLE

GEOLOGISTS LOG OF WELL H-M-310  
(ROGERS RANCH USSC FIELD #24)

<u>Depth(feet)</u>	<u>Lithology</u>
0-4	Sand, brownish gray (5 YR 4/1), unlithified, organic rich, fine to coarse sized quartz grains, clayey with depth.
4-27	Limestone Marl, yellowish gray (5 Y 7/2), medium hardness to unlithified, sandy, abundant light olive gray (5 Y 5/2) shell and barnacle fragments from 10 feet.
27-39	Clay, light olive gray (5 Y 6/1), unlithified, and marly limestone, as above, abundant fine quartz sand and silt.
39-49	Clay, as above, abundant shell, gray (N6), fine quartz abundant.
49-54	Sand, fine quartz, and shell, clayey matrix as above.
54-63	Limestone marl, yellowish gray (5 Y 8/1), and gray shell (N5), soft, 20-30% unlithified, quartz sand common.
63-85	Limestone, light olive gray (5 Y 6/1), medium hardness, well developed secondary solutioning of fossil remains, minor fine gray shell fragments, excellent moldic porosity.
85-95	Limestone, as above, and yellowish gray (5 Y 8/1), quartz sand abundant, good moldic porosity.
95-111	Limestone/sandy limestone, yellowish gray (5 Y 8/1), medium hardness, finer moldic porosity than above, barnacle fragments common.
111-125	Sandstone and sand, yellowish gray (5 Y 8/1), loosely consolidated, quartz sand fine in size, minor shell fragments.
125-135	Sandstone light olive gray (5 Y 6/1), poorly consolidated, similar to above.
135-140	Clay, grayish olive (10 Y 4/2), unlithified, abundant fine sand and silt size quartz and phosphate.

GEOLOGIST'S LOG OF WELL H-M-311

<u>Depth(feet)</u>	<u>Lithology</u>
0-7	Sand, brownish-gray, unconsolidated, organic rich upper 1 foot, fine to coarse sized quartz grains, basal clayey.
7-14	Shell marl, yellowish-gray, 10-20% lime mud; light yellowish gray, sandy, common soft limestone interbedded same.
14-25	Lime mud, light yellowish-gray and shell, as above, becoming gray stiffer clay with depth, sandy.
25-40	Clay, light olive gray, stiff, sandy, and shell, light gray, common interbedded soft marly limestone, yellowish-gray, from 30 feet.
40-55	Marl, as above, and tan sandy clay interbedded.
55-80	Limestone, light olive gray, medium to hard, good moldic porosity, marly to 58 feet, sandy.
80-110	Limestone, light yellowish-gray, hard, good moldic porosity, quartz sand abundant. Lost circulation zone from 80-83 feet, very soft from 109 feet.

GEOLOGIST'S LOG OF WELL H-M-312

<u>Depth(feet)</u>	<u>Lithology</u>
0-5	Sand, brownish-gray, unconsolidated, organic rich to 2 feet, fine to coarse sized quartz grains.
5-20	Shell marl, light yellowish-gray lime mud and shell, tan, sandy.
20-36	Clay, light olive gray, and marl, as above, abundant shell, light gray, sandy.
36-52	Limestone marl, light olive gray, predominantly clayey from 40 feet, abundant shell fragments, gray and tan, sandy.
52-76	Limestone, yellowish-gray and gray, hard, marly to 55 feet, good moldic porosity.
76-90	Limestone, light yellowish-gray, hard, good moldic porosity, quartz sand abundant, losing drilling fluid circulation from 76 feet.
90-110	Limestone, as above, lost circulation.

APPENDIX B: TABLES OF TIME VERSUS DRAWDOWN  
DURING THE AQUIFER PERFORMANCE  
TEST

TIME VS. DRAWDOWN IN TEST PRODUCTION WELL  
H-M-310 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
2	4.39
3	4.52
5	4.60
7	4.69
11	4.70
35	4.80
45	4.81
65	4.87
75	4.89
90	4.87
105	4.88
125	4.88
150	4.83
288	4.96
300	5.00
430	4.99
480	5.05
705	5.03
965	5.05
1255	4.95
1320	4.92
1440	4.90
1620	4.84
1800	4.84
1984	4.92
2167	4.92
2482	4.92
2601	4.95
2890	4.87
3133	4.89
3360	4.86
3600	4.85
3840	4.83

TIME VS. DRAWDOWN IN TAMIAMI OBSERVATION WELL  
H-M-311 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
.083	.272
.16	.435
.33	.594
.42	.666
.5	.675
.75	.751
1	.785
1.5	.877
2	.935
2.5	.989
3	1.023
3.5	1.052
4	1.089
5	1.113
6	1.172
7	1.201
8	1.220
9	1.238
10	1.254
12	1.281
14	1.301
17	1.323
25	1.316
35	1.379
50	1.402
60	1.402
75	1.413
90	1.414
108	1.421
151	1.421
180	1.420
211	1.450
285	1.539
314	1.550
365	1.553
437	1.562
480	1.562
572	1.576
680	1.579
720	1.579
840	1.577
968	1.572
1080	1.584
1200	1.530
1320	1.460
1440	1.424
1620	1.402
1800	1.402

TIME VS. DRAWDOWN IN TAMIAMI OBSERVATION WELL  
H-M-311 DURING AQUIFER PERFORMANCE TEST (cont)

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
1991	1.433
2174	1.431
2487	1.423
2615	1.432
2885	1.427
3133	1.442
3360	1.390
3600	1.375
3840	1.372
4150	1.439



TIME VS. DRAWDOWN IN TAMIAMI OBSERVATION WELL  
H-M-312 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
.16	.03
.25	.049
.33	.079
.42	.10
.5	.122
.66	.164
.82	.193
1	.223
1.25	.260
1.5	.290
2	.340
2.5	.379
3	.410
4	.469
5	.510
6	.543
7	.570
8	.595
9	.617
10	.629
12	.655
14	.674
17	.70
20	.702
25	.728
30	.753
35	.767
40	.773
50	.788
60	.796
75	.805
90	.805
105	.810
120	.811
150	.811
181	.811
216	.860
281	.949
317	.962
367	.971
440	.981
483	.993
577	.994
600	.993
675	.993
722	.992
840	.990
972	.990

TIME VS. DRAWDOWN IN TAMIAMI OBSERVATION WELL  
H-M-312 DURING AQUIFER PERFORMANCE TEST (cont)

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
1080	.996
1208	.922
1320	.850
1440	.819
1620	.792
1800	.793
2022	.818
2180	.815
2494	.809
2608	.811
2881	.820
3125	.795
3357	.734
3601	.719
3846	.710
4135	.763

TIME VS. DRAWDOWN IN WATER-TABLE OBSERVATION  
WELL H-M-313 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
1.5	0
2.5	.009
4	.024
5.5	.039
6.5	.047
7.5	.052
8.5	.059
9.5	.065
10.5	.068
13	.077
16	.084
26	.099
33.5	.103
35.5	.105
41	.109
51	.116
60	.116
75	.120
91	.125
109	.129
120	.129
150	.133
180	.137
210	.142
240	.149
285	.162
314	.169
365	.175
437	.182
480	.188
572	.199
689	.207
720	.209
840	.216
968	.227
1080	.237
1204	.245
1320	.245
1440	.245
1620	.246
1800	.247
1991	.256
2175	.267
2489	.266
2606	.276
2885	.282
3130	.287
3362	.332
	.342

TIME VS. DRAWDOWN IN WATER-TABLE OBSERVATION  
WELL H-M-313 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
1.5	0
2.5	.009
4	.024
5.5	.039
6.5	.047
7.5	.052
8.5	.059
9.5	.065
10.5	.068
13	.077
16	.084
26	.099
33.5	.103
35.5	.105
41	.109
51	.116
60	.116
75	.120
91	.125
109	.129
120	.129
150	.133
180	.137
210	.142
240	.149
285	.162
314	.169
365	.175
437	.182
480	.188
572	.199
689	.207
720	.209
840	.216
968	.227
1080	.237
1204	.245
1320	.245
1440	.245
1620	.246
1800	.247
1991	.256
2175	.267
2489	.266
2606	.276
2885	.282
3130	.287
3362	.332
	.342

TIME VS. DRAWDOWN IN WATER-TABLE OBSERVATION  
WELL H-M-313 DURING AQUIFER PERFORMANCE TEST  
Continued:

Time (minutes)

Drawdown (feet)

3604

.345

3847

.349

4150

.371

TIME VS. DRAWDOWN IN WATER-TABLE OBSERVATION WELL  
H-M-314 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
7.5	.06
15	.12
21	.15
30	.18
36	.19
45	.20
51	.21
60	.21
75	.22
90	.225
180	.24
210	.255
283	.30
318	.31
442	.32
485	.33
580	.34
678	.34
724	.33
975	.35
1210	.35
1440	.31
1620	.32
1800	.32
2023	.33
2183	.33
2497	.34
2611	.34
2990	.35
3135	.36
3360	.34
3600	.39
3842	.33
4140	.35

TIME VS. DRAWDOWN IN TAMIAMI OBSERVATION WELL  
H-M-319 DURING AQUIFER PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
.42	.005
.67	.040
.83	.060
1	.080
1.25	.123
1.50	.152
2	.190
2.5	.228
3	.258
3.5	.280
4	.307
5	.345
6	.376
7	.402
8	.423
9	.446
10	.462
12	.485
14	.505
17	.540
20	.546
25	.569
30	.580
35	.595
40	.607
50	.620
60	.630
75	.639
90	.640
107	.642
120	.643
153	.645
181	.645
220	.691
277	.758
321	.771
368	.784
444	.788
487	.790
582	.790
672	.792
726	.791
967	.791
1212	.719
1320	.690
1440	.672
1620	.675
1800	.675

TIME VS. DRAWDOWN IN TAMIAMI OBSERVATION WELL  
H-M-319 DURING AQUIFER PERFORMANCE TEST (cont)

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
2027	.652
2185	.642
2498	.637
2613	.642
2880	.620
3123	.620
3360	.568
3600	.539
3850	.510
4130	.570



TIME VS. DRAWDOWN IN EXISTING TAMiami  
OBSERVATION WELL H-M-320 DURING AQUIFER  
PERFORMANCE TEST

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
5	.038
5.5	.045
6	.051
6.5	.056
7	.060
7.5	.065
8	.071
8.5	.073
9.5	.085
10.5	.092
11.5	.101
12.5	.110
13.5	.117
14.5	.123
16.5	.136
18.5	.146
21.5	.159
24.5	.172
29.5	.188
34.5	.197
39.5	.205
44.5	.213
54.5	.223
60	.229
75	.241
90	.247
105	.251
120	.251
150	.257
180	.259
224	.275
273	.323
325	.348
374	.360
425	.367
492	.374
587	.378
665	.379
730	.379
958	.372
1080	.374
1216	.361
1320	.308
1440	.280
1620	.252
1800	.253
2030	.258

TIME VS. DRAWDOWN IN EXISTING TAMIAMI  
OBSERVATION WELL H-M-320 DURING AQUIFER  
PERFORMANCE TEST (Cont)

<u>Time (minutes)</u>	<u>Drawdown (feet)</u>
2190	
2504	.259
2595	.265
2870	.260
3117	.265
3355	.250
3600	.222
3840	.203
4115	.190
	.189

TIME VERSUS RECOVERY IN TAMIAMI OBSERVATION WELL  
H-M-311

Time (minutes)

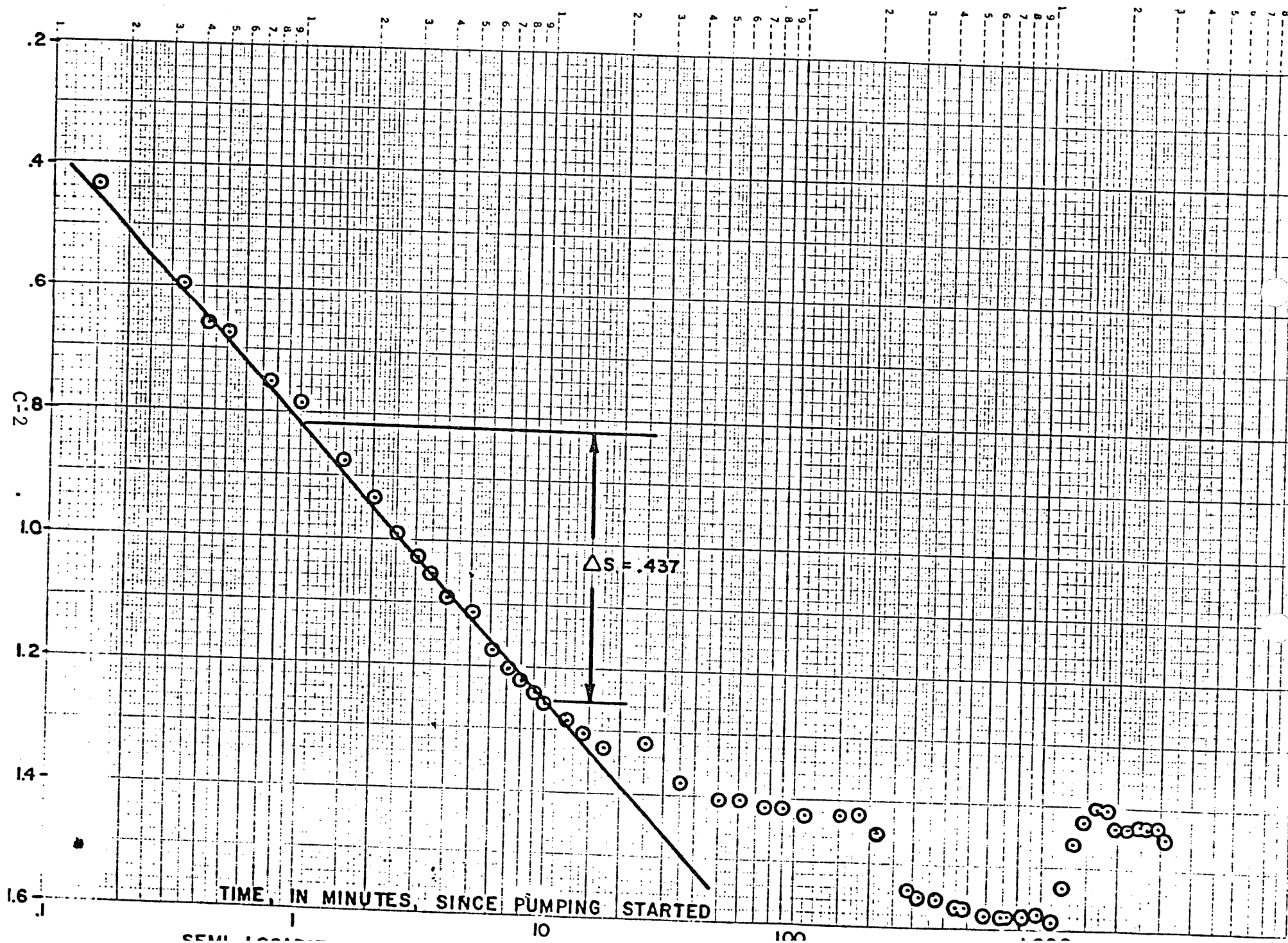
Recovery (feet)

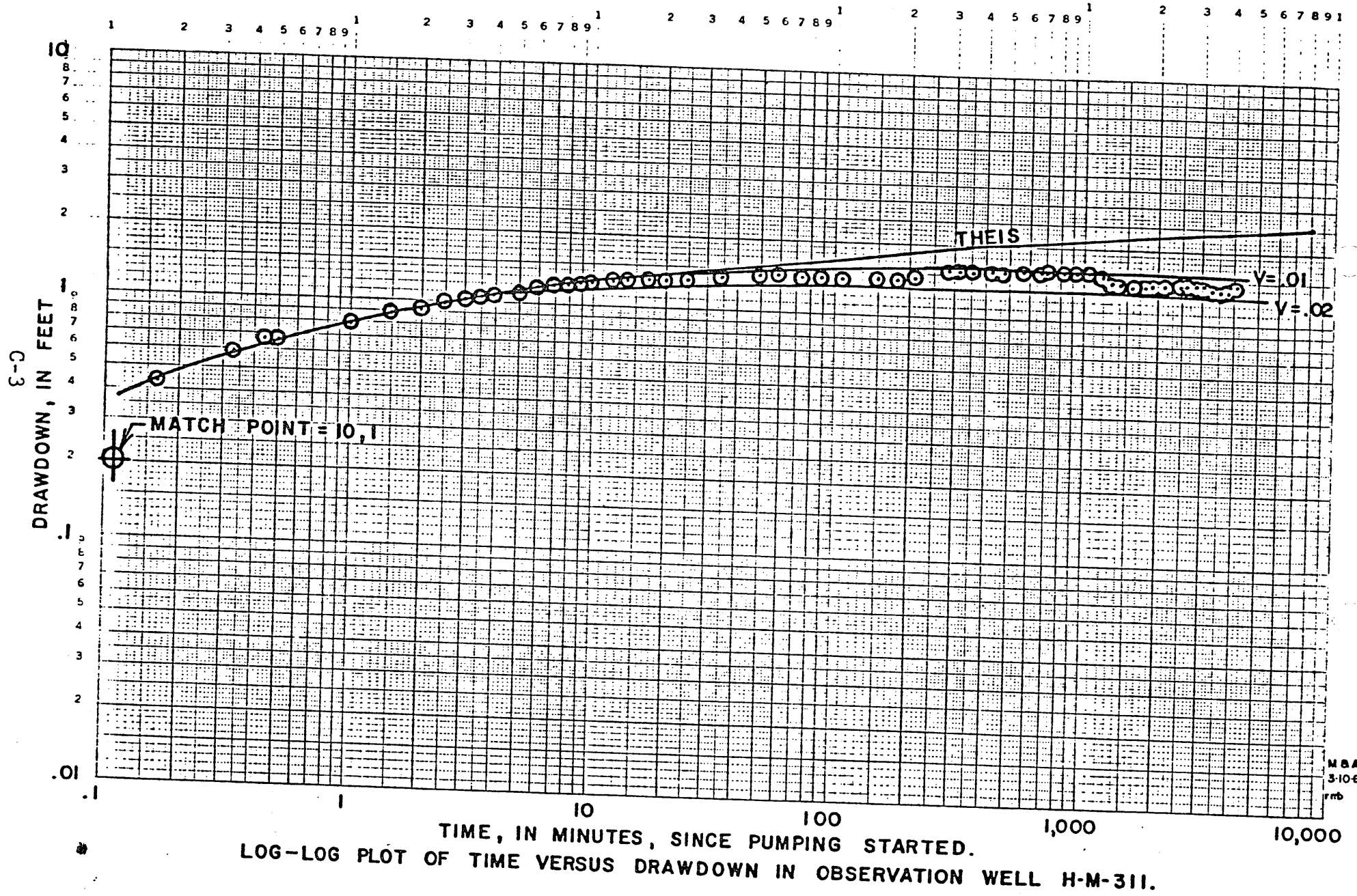
2	1.068
3	1.130
4	1.160
5	1.187
6	1.218
7	1.233
8	1.243
9	1.257
10	1.270
12	1.288
14	1.302
17	1.32
20	1.325
25	1.338
30	1.360
35	1.367
40	1.373
50	1.373
60	1.378
90	1.379
130	1.380
180	1.377

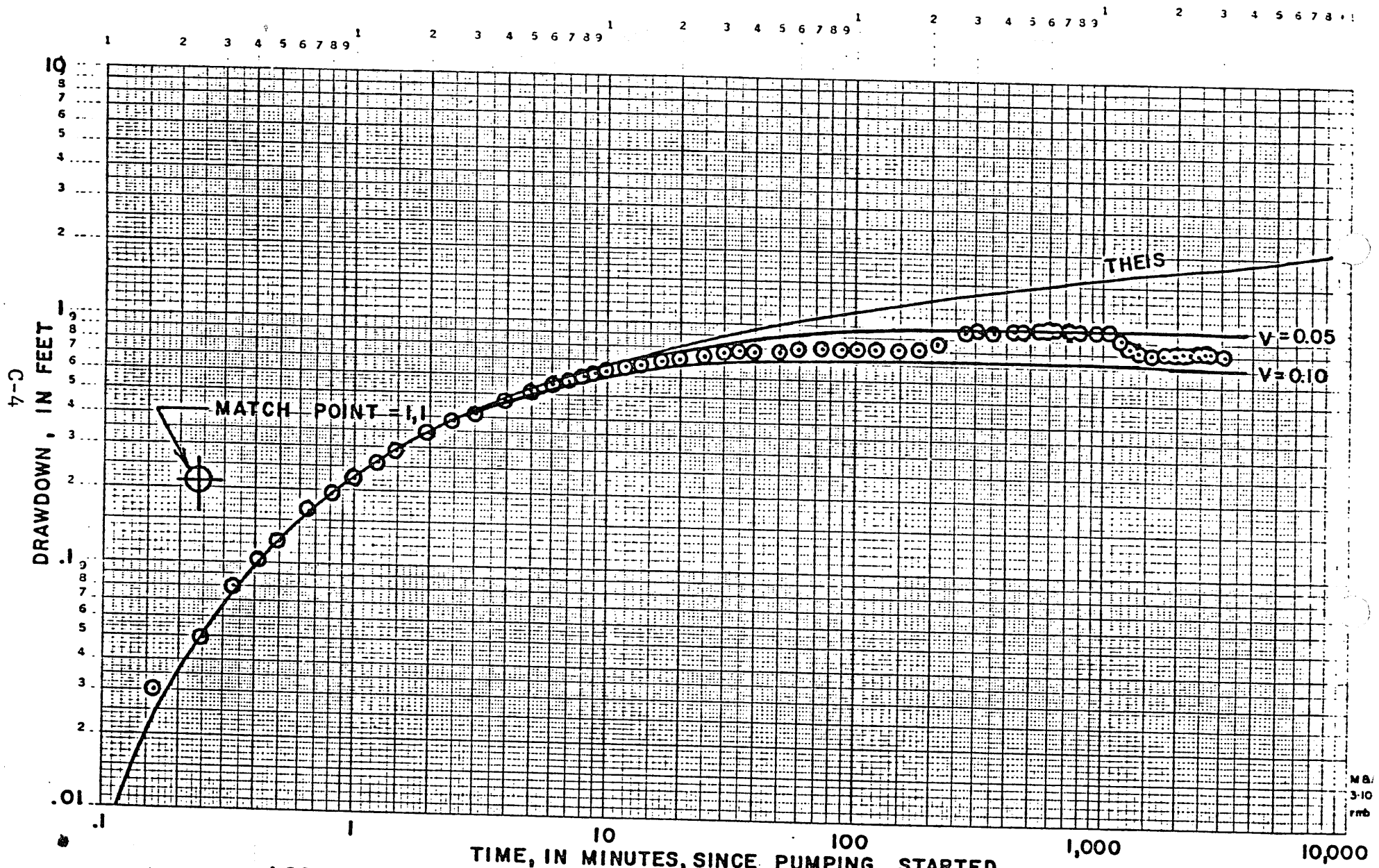
TIME VERSUS RECOVERY IN WATER TABLE OBSERVATION  
WELL H-M-313

<u>Time (minutes)</u>	<u>Recovery (feet)</u>
2	.018
5	.037
7	.044
8	.052
9	.056
10	.056
12	.063
14	.069
17	.073
20	.078
25	.082
30	.086
35	.088
40	.090
50	.094
60	.098
91	.105
130	.112
180	.114

APPENDIX C: TIME VERSUS DRAWDOWN  
GRAPHS



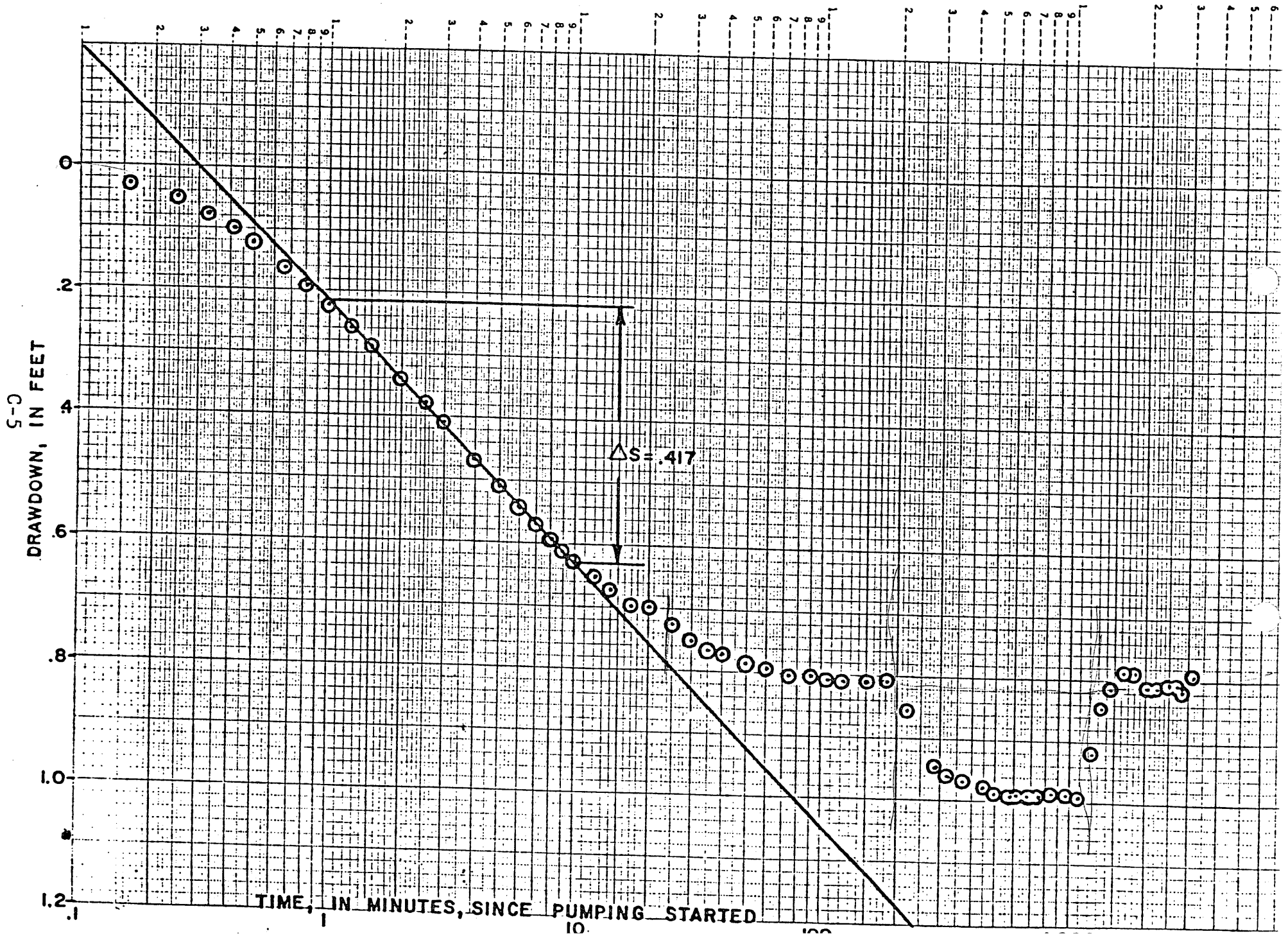


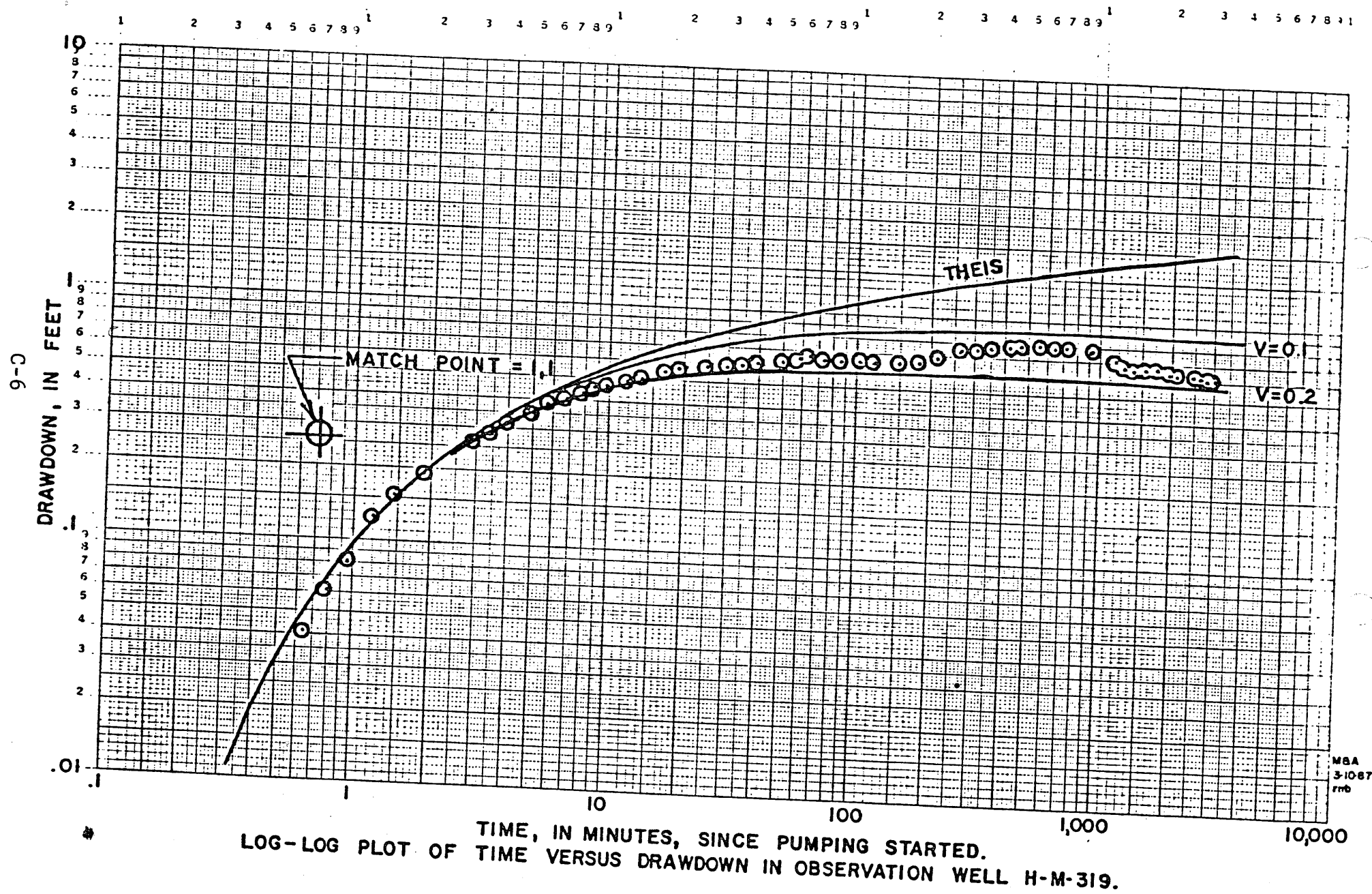


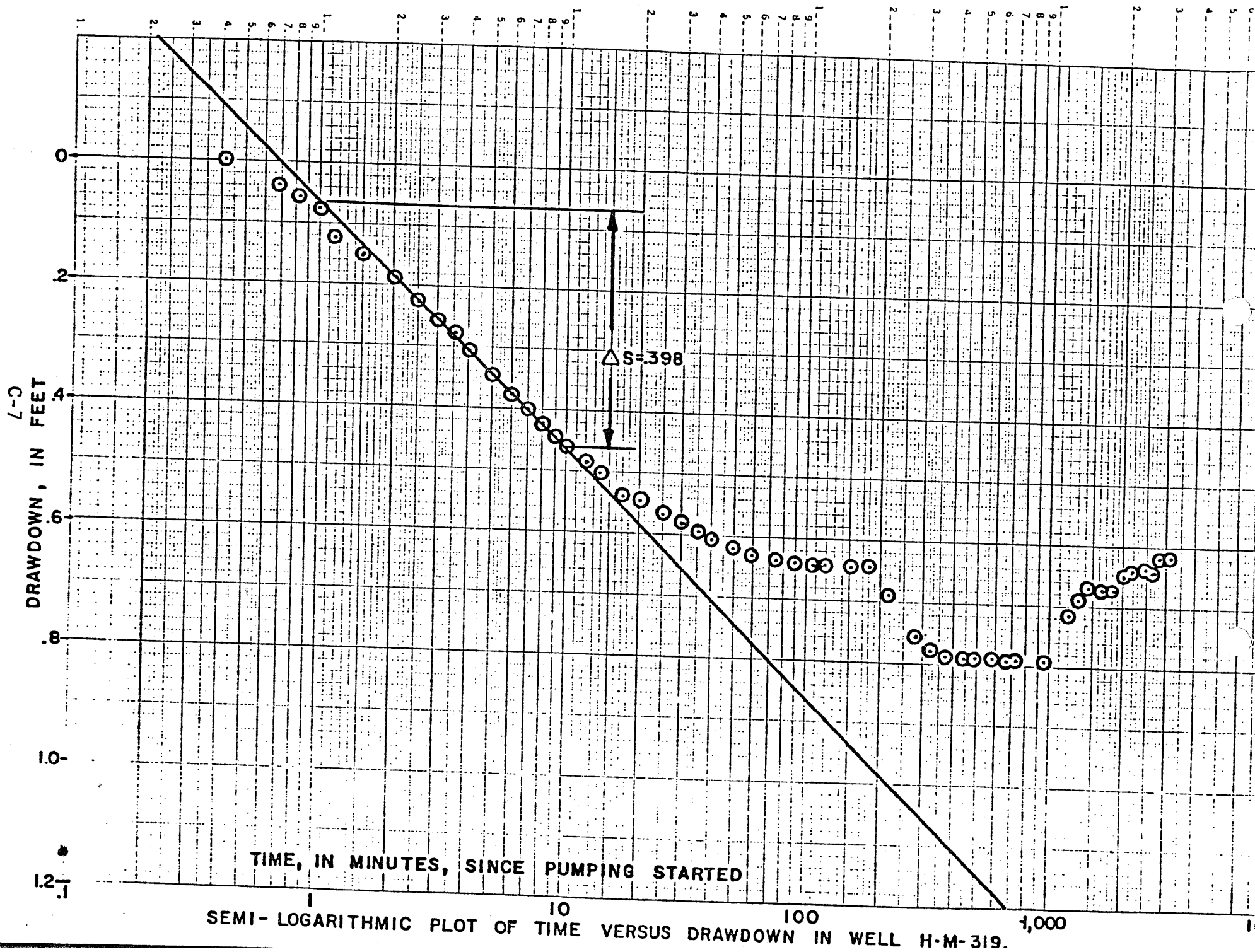
LOG-LOG PLOT OF TIME VERSUS DRAWDOWN IN OBSERVATION WELL H-M-312.

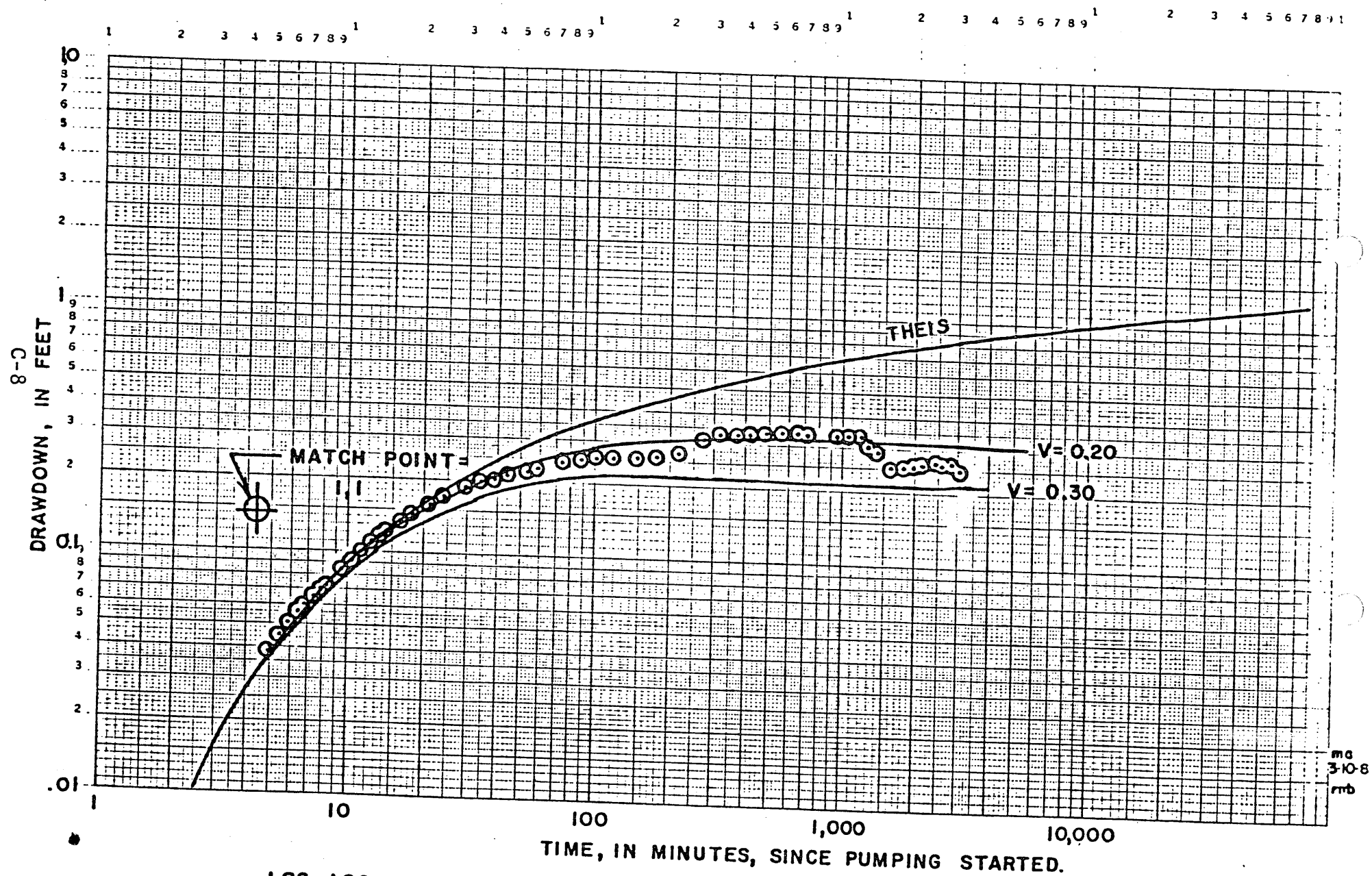
M.B.  
3-10  
rmb











LOG-LOG PLOT OF TIME VERSUS DRAWDOWN IN OBSERVATION WELL H-M-320.

