WELL AND AQUIFER PERFORMANCE TESTS

CITY OF RIVIERA BEACH
WELLS #851 AND #852

PROJECT NO. 84-1032-3

BARKER, OSHA & ANDERSON, INC.
Professional Engineers
"We Specialize in Futures"

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WELL AND AQUIFER PERFORMANCE TESTS

CITY OF RIVIERA BEACH WELLS #851 AND #852

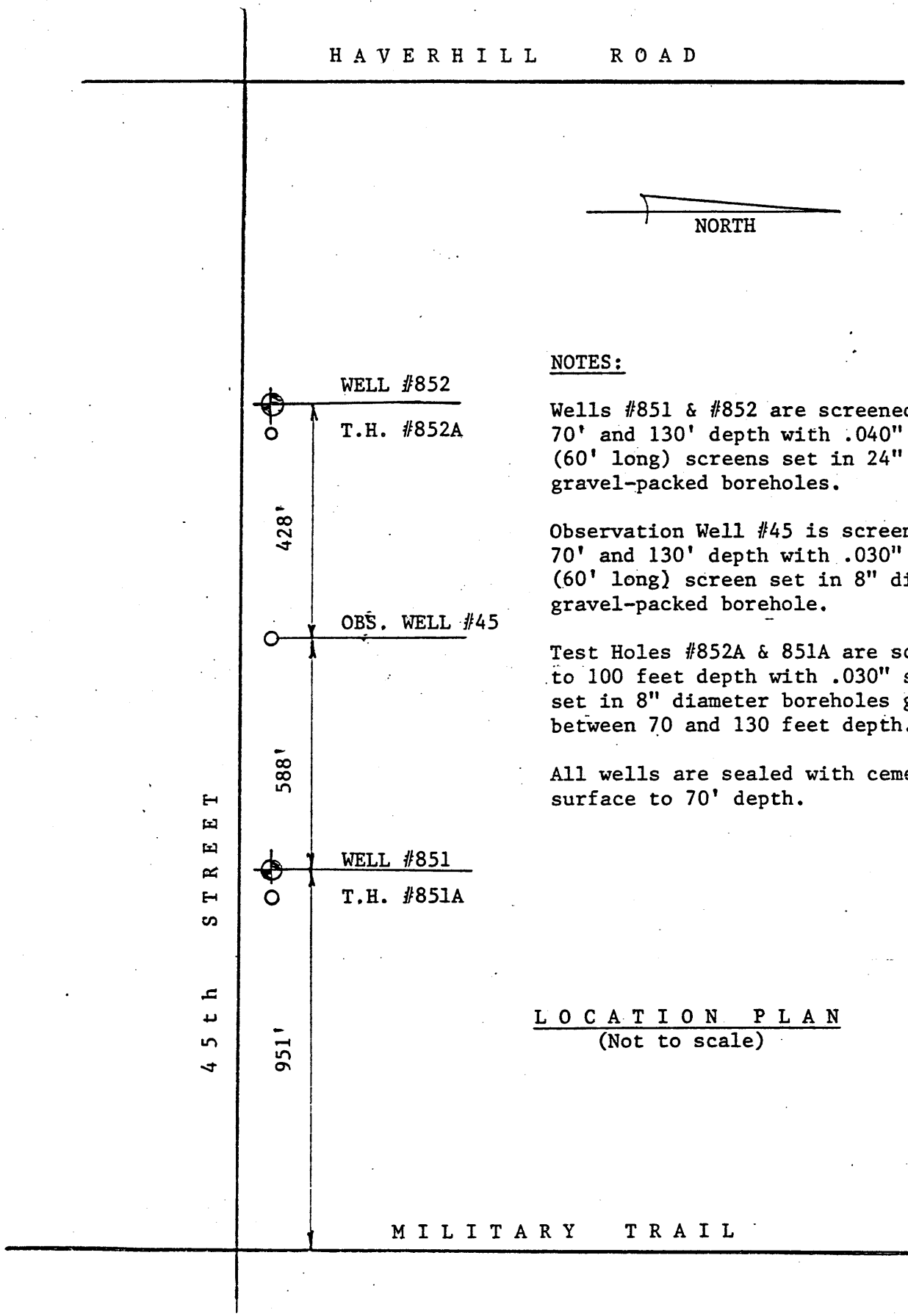
PROJECT NO. 84-1032-3

DECEMBER 23,1985

WELL AND AQUIFER
PERFORMANCE TESTS

CITY OF RIVIERA BEACH
WELLS #851 AND #852

CONTENTS



NOTES:

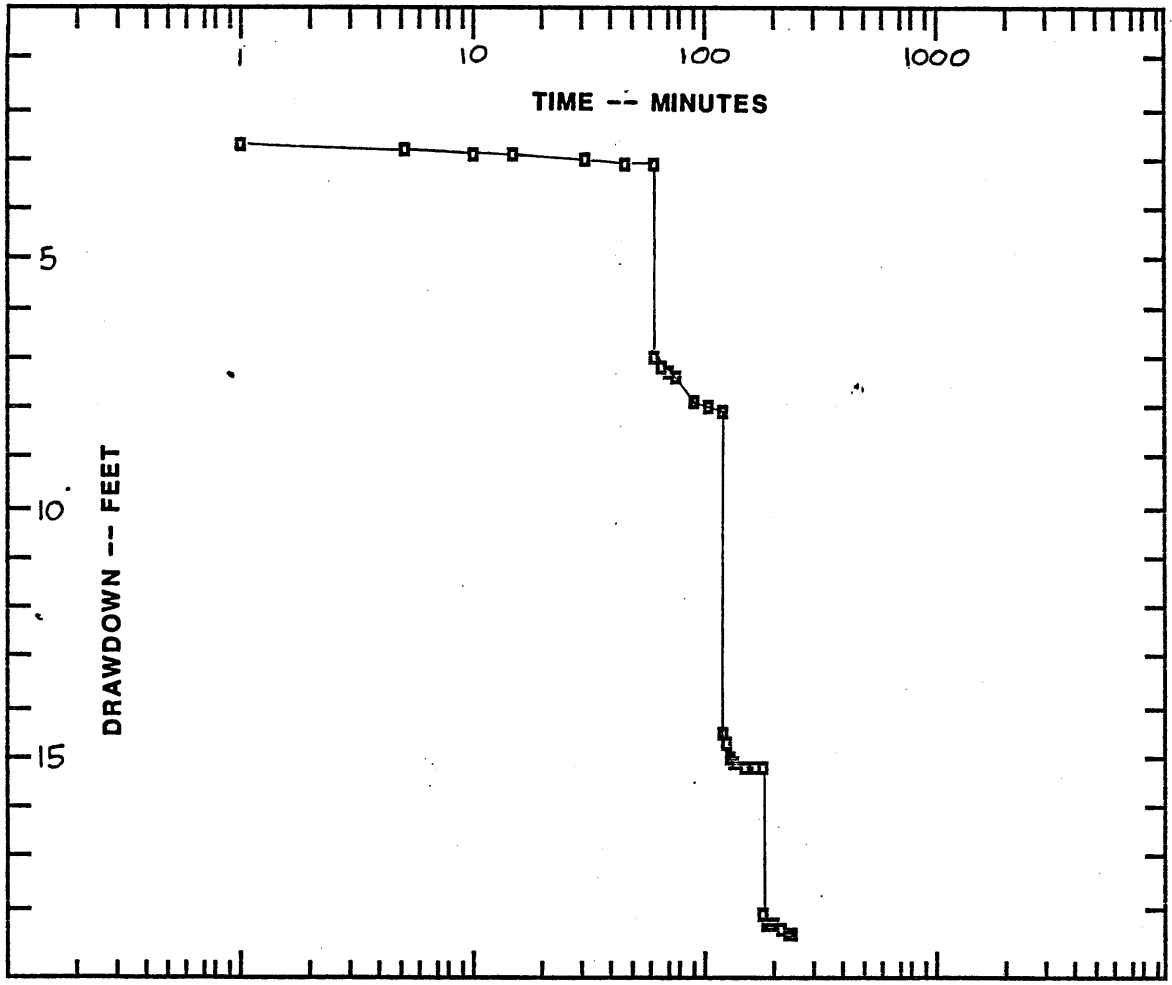
Wells #851 & #852 are screened between 70' and 130' depth with .040" slot/12" dia. (60' long) screens set in 24" diameter gravel-packed boreholes.

Observation Well #45 is screened between 70' and 130' depth with .030" slot/2" dia. (60' long) screen set in 8" diameter gravel-packed borehole.

Test Holes #852A & 851A are screened at 90 to 100 feet depth with .030" slot/2" dia., set in 8" diameter boreholes gravel-packed between 70 and 130 feet depth.

All wells are sealed with cement from surface to 70' depth.

LOCATION PLAN
(Not to scale)



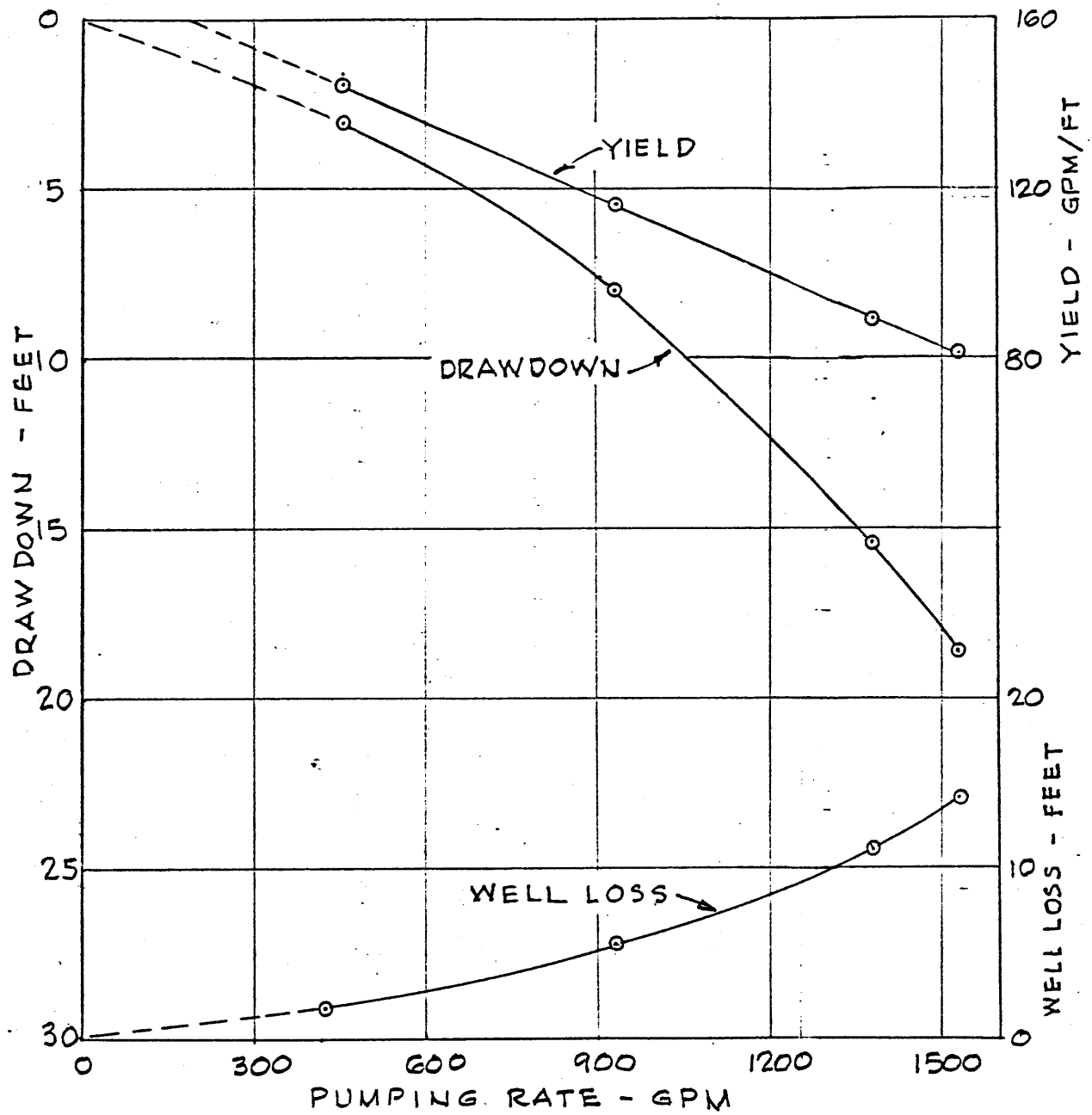
TIME (MINUTES)	DRAWDOWN (FEET)
1.00	2.750
5.00	2.850
10.00	2.900
15.00	2.940
30.00	3.020
45.00	3.100
60.00	3.100
61.00	7.050
65.00	7.200
70.00	7.330
75.00	7.440
90.00	7.900
105.00	8.040
120.00	8.050
121.00	14.500
125.00	14.720
130.00	15.020
135.00	15.140
150.00	15.230
165.00	15.240
180.00	15.240
181.00	18.100
185.00	18.330
190.00	18.340
195.00	18.370
210.00	18.450
225.00	18.490
240.00	18.520

SEMI-LOGARITHMIC PLOT OF

STEP-DRAWDOWN TEST OF WELL #851 -- DECEMBER 11, 1985

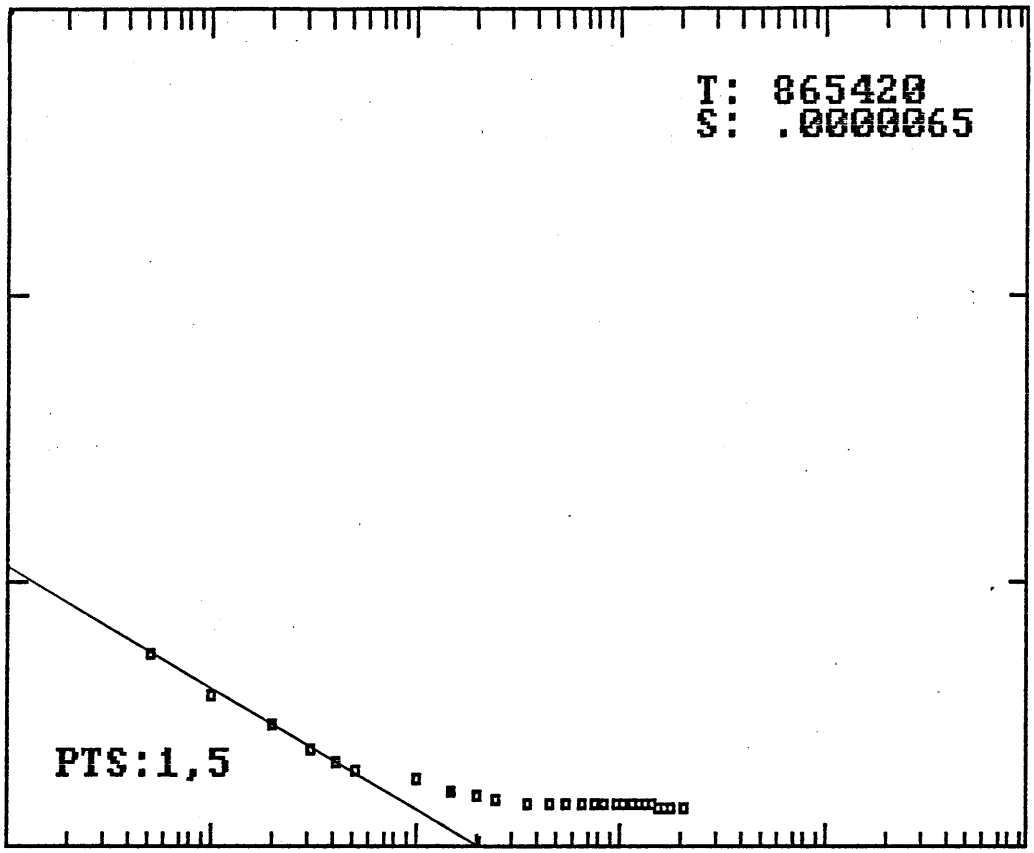
PUMPING RATES

000-060 MINUTES -- 450 GPM
060-120 MINUTES -- 930 GPM
120-180 MINUTES -- 1380 GPM
180-240 MINUTES -- 1525 GPM



WELL #851 PERFORMANCE ANALYSIS

BASED ON STEP-DRAWDOWN TEST 12-11-1985



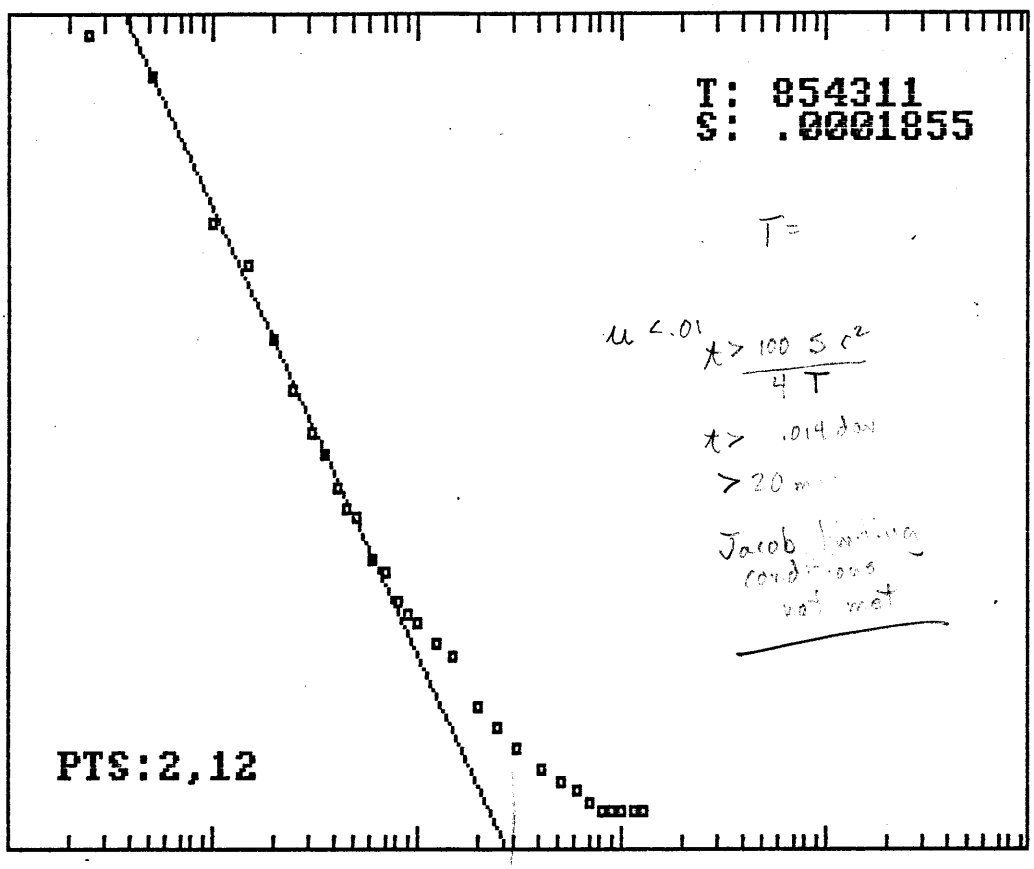
MICROCOMPUTER PROGRAM "THEISAQ"
SEMILOGARITHMIC SOLUTION OF AQUIFER CONSTANTS -- TIME DRAWDOWN METHOD

PUMPING RATE: 1380 GPM -- DISTANCE TO OBSERVATION WELL: 7.92 FEET

MEASUREMENTS:	TIME (MINUTES)	DRAWDOWN (FEET)
1	0.50	2.250
2	1.00	2.390
3	2.00	2.490
4	3.00	2.590
5	4.00	2.630
6	5.00	2.660
7	10.00	2.690
8	15.00	2.730
9	20.00	2.750
10	25.00	2.760
11	35.00	2.770
12	45.00	2.770
13	55.00	2.770
14	65.00	2.770
15	75.00	2.770
16	85.00	2.770
17	95.00	2.770
18	105.00	2.770
19	115.00	2.780
20	125.00	2.780
21	135.00	2.780
22	145.00	2.780
23	155.00	2.790
24	165.00	2.790
25	175.00	2.790
26	205.00	2.790

POINTS USED IN SOLUTION: 1 & 5 -- ZERO TIME: 0.00 MINUTES
SOLUTION: TRANSMISSIVITY = 865420 GAL/FT/DAY -- STORATIVITY = .0000065

TIME-DRAWDOWN SEMILOGARITHMIC PLOT OF OBS. WELL #851A WITH WELL NO. 851 PUMPING AT 1380 GPM FOR 205 MINUTES.



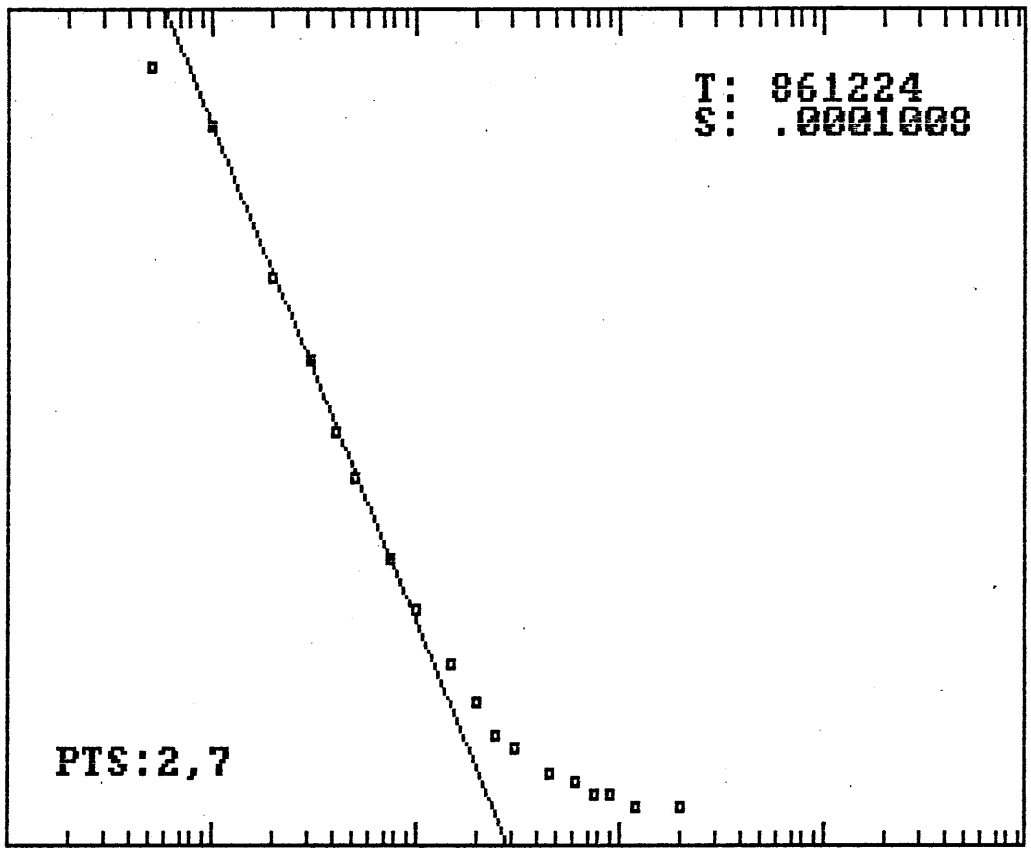
MICROCOMPUTER PROGRAM "THEISAQ"
SEMILOGARITHMIC SOLUTION OF AQUIFER CONSTANTS -- TIME DRAWDOWN METHOD

PUMPING RATE: 1380 GPM -- DISTANCE TO OBSERVATION WELL: 589 FEET

MEASUREMENTS:	TIME (MINUTES)	DRAWDOWN (FEET)
1	0.25	0.020
2	0.50	0.060
3	1.00	0.200
4	1.50	0.240
5	2.00	0.310
6	2.50	0.360
7	3.00	0.400
8	3.50	0.420
9	4.00	0.450
10	4.50	0.470
11	5.00	0.480
12	6.00	0.520
13	7.00	0.530
14	8.00	0.560
15	9.00	0.570
16	10.00	0.580
17	12.50	0.600
18	15.00	0.610
19	20.00	0.660
20	25.00	0.680
21	30.00	0.700
22	40.00	0.720
23	50.00	0.730
24	60.00	0.740
25	70.00	0.750
26	80.00	0.760
27	90.00	0.760
28	100.00	0.760
29	115.00	0.760
30	130.00	0.760

POINTS USED IN SOLUTION: 2 & 12 -- ZERO TIME: 0.36 MINUTES
SOLUTION: TRANSMISSIVITY = 854311 GAL/FT/DAY -- STORATIVITY = .0001855

TIME-DRAWDOWN SEMILOGARITHMIC PLOT OF OBS. WELL #45 WITH WELL NO. 851 PUMPING AT 1380 GPM FOR 130 MINUTES



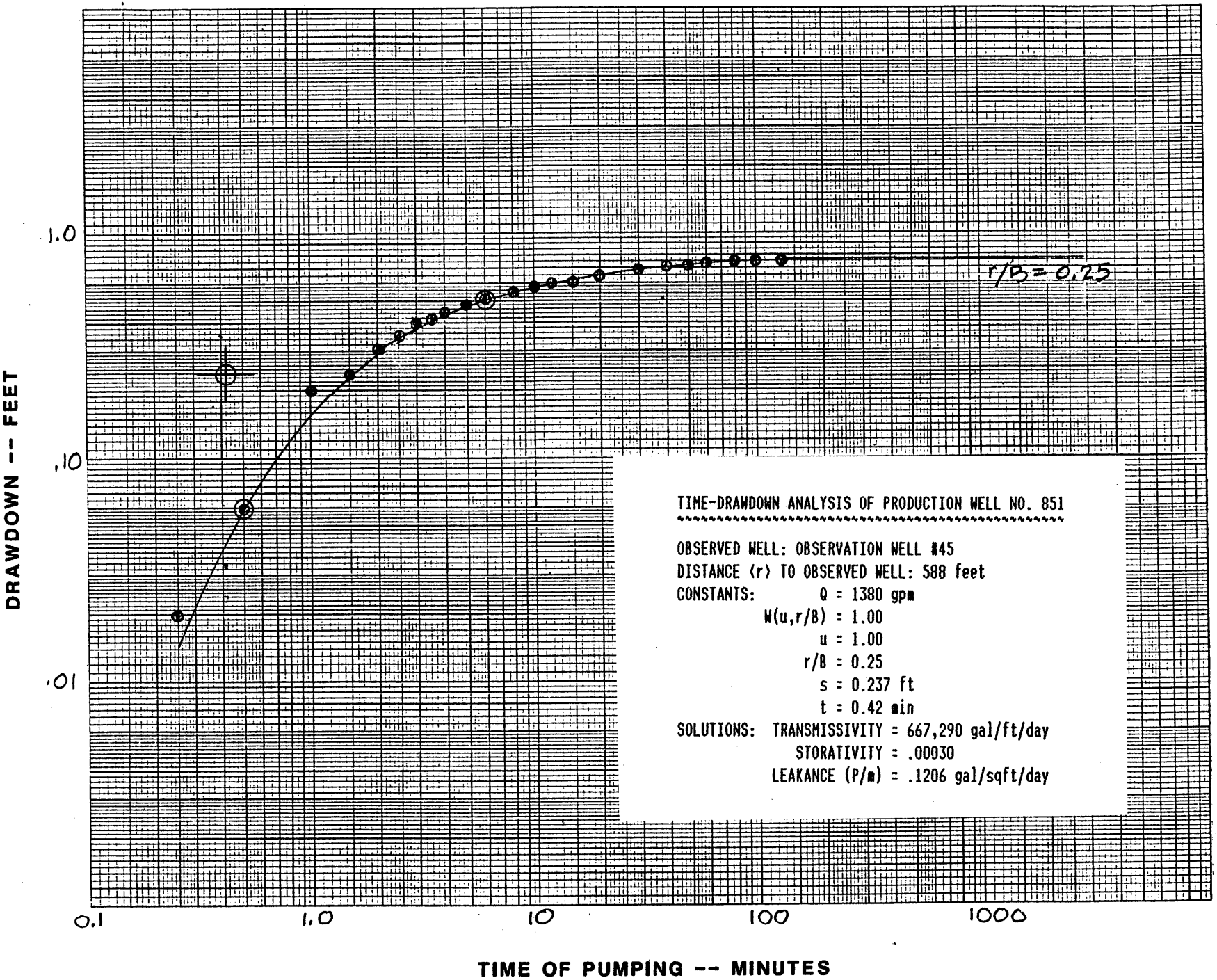
MICROCOMPUTER PROGRAM "THEISAQ"
SEMILOGARITHMIC SOLUTION OF AQUIFER CONSTANTS -- TIME DRAWDOWN METHOD

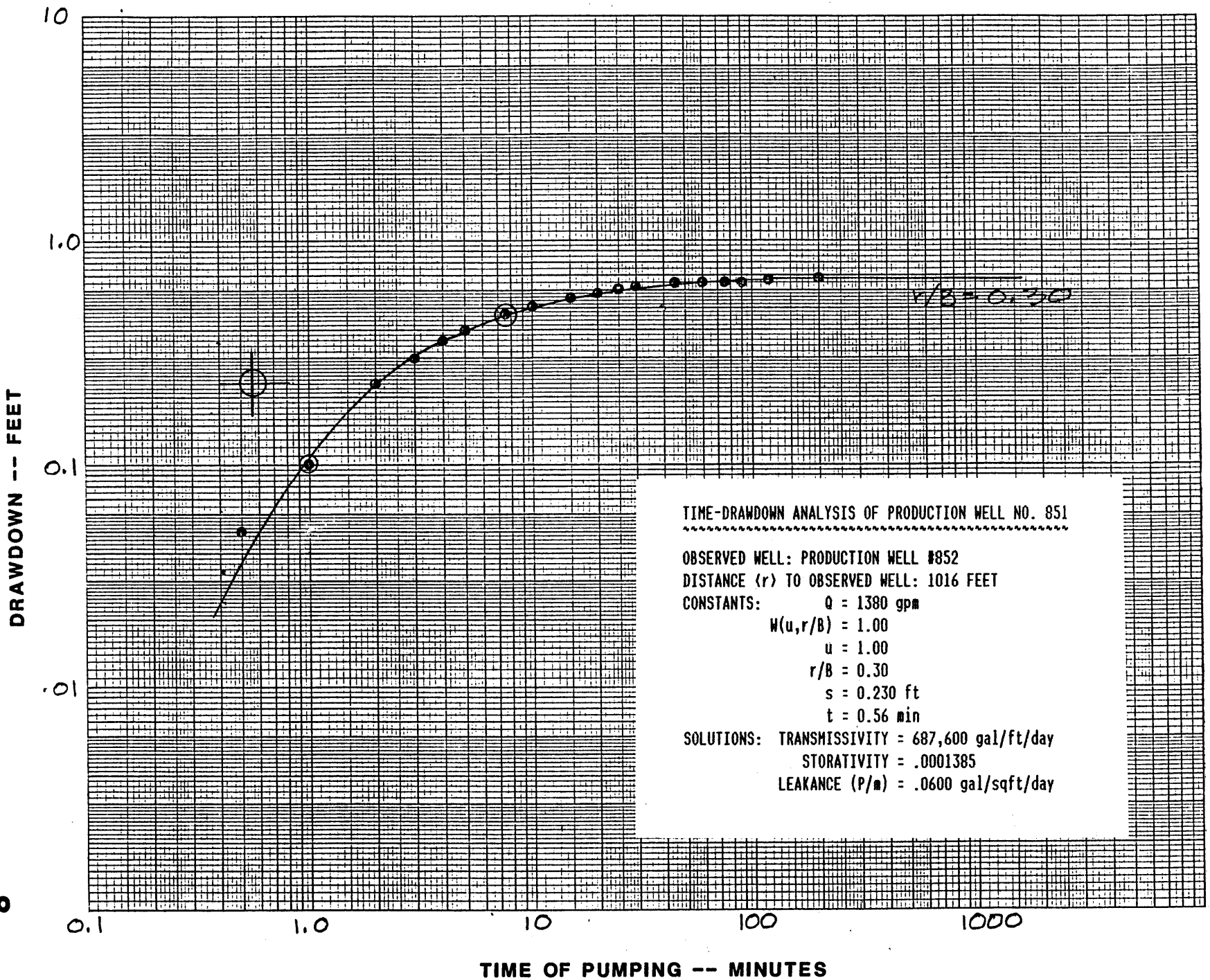
PUMPING RATE: 1380 GPM -- DISTANCE TO OBSERVATION WELL: 1016 FEET

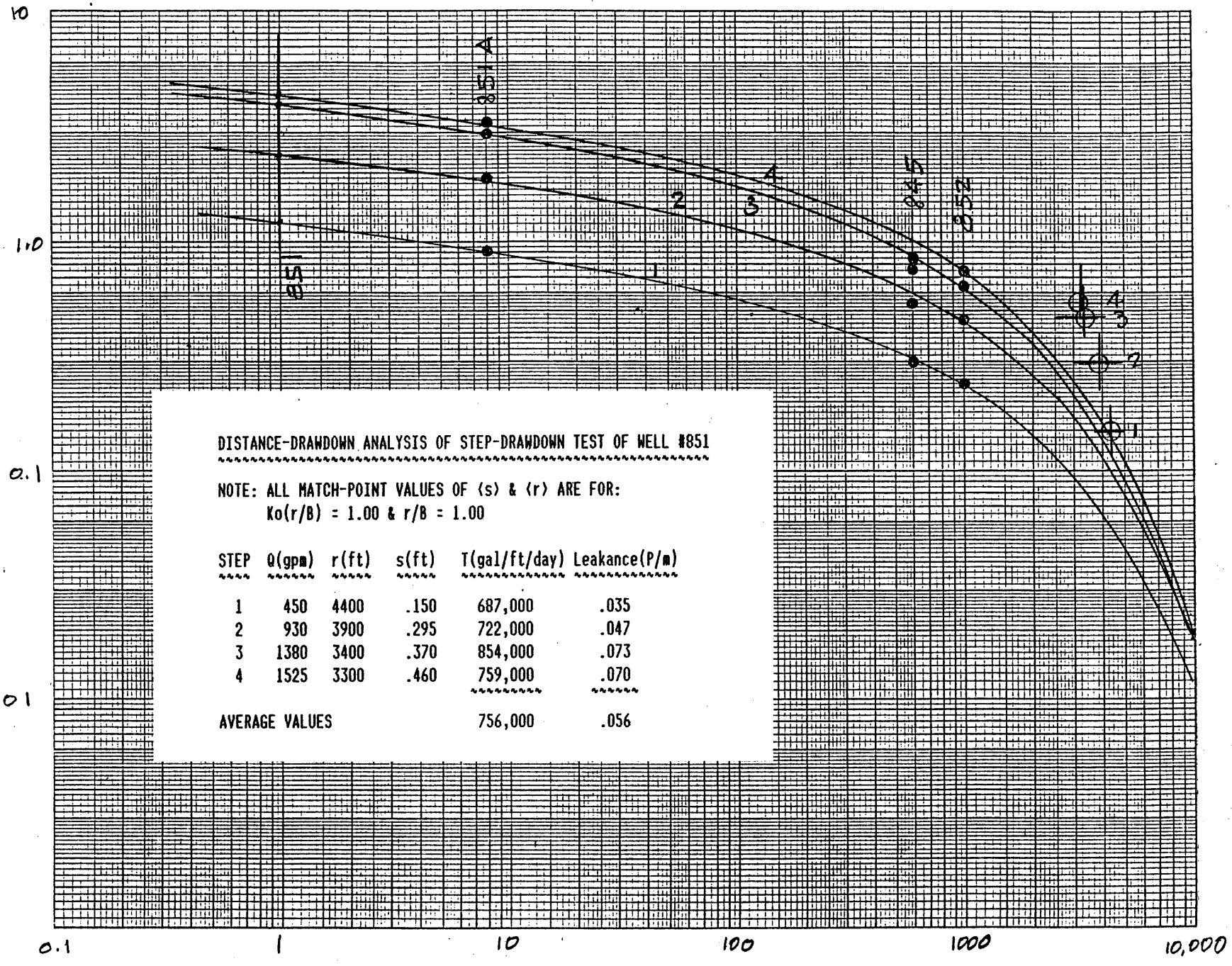
MEASUREMENTS:	TIME (MINUTES)	DRAWDOWN (FEET)
1	0.50	0.050
2	1.00	0.100
3	2.00	0.230
4	3.00	0.300
5	4.00	0.360
6	5.00	0.400
7	7.50	0.470
8	10.00	0.510
9	15.00	0.560
10	20.00	0.590
11	25.00	0.620
12	30.00	0.630
13	45.00	0.650
14	60.00	0.660
15	75.00	0.670
16	90.00	0.670
17	120.00	0.680
18	200.00	0.680

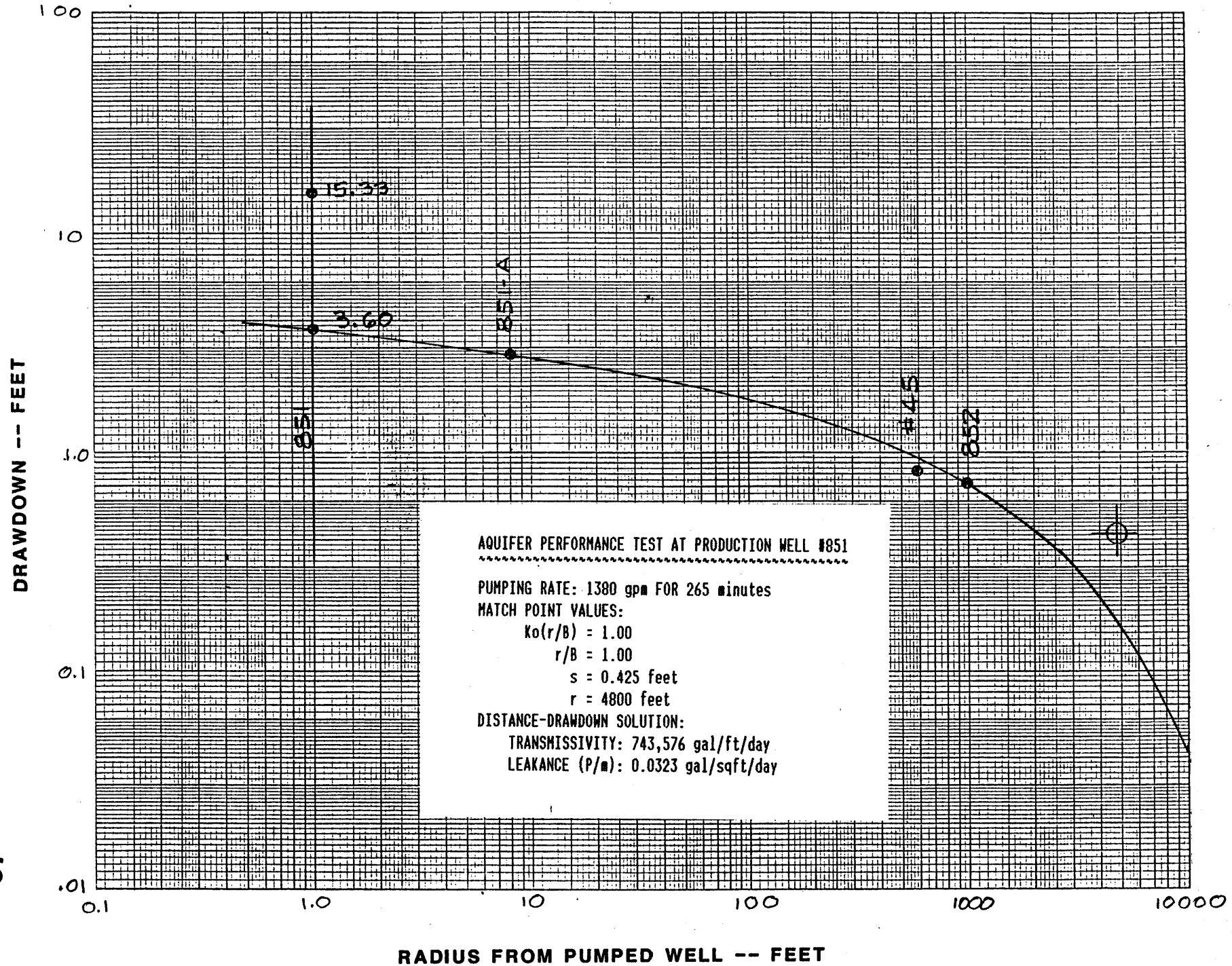
POINTS USED IN SOLUTION: 2 & 7 -- ZERO TIME: 0.58 MINUTES
SOLUTION: TRANSMISSIVITY = 861224 GAL/FT/DAY -- STORATIVITY = .0001008

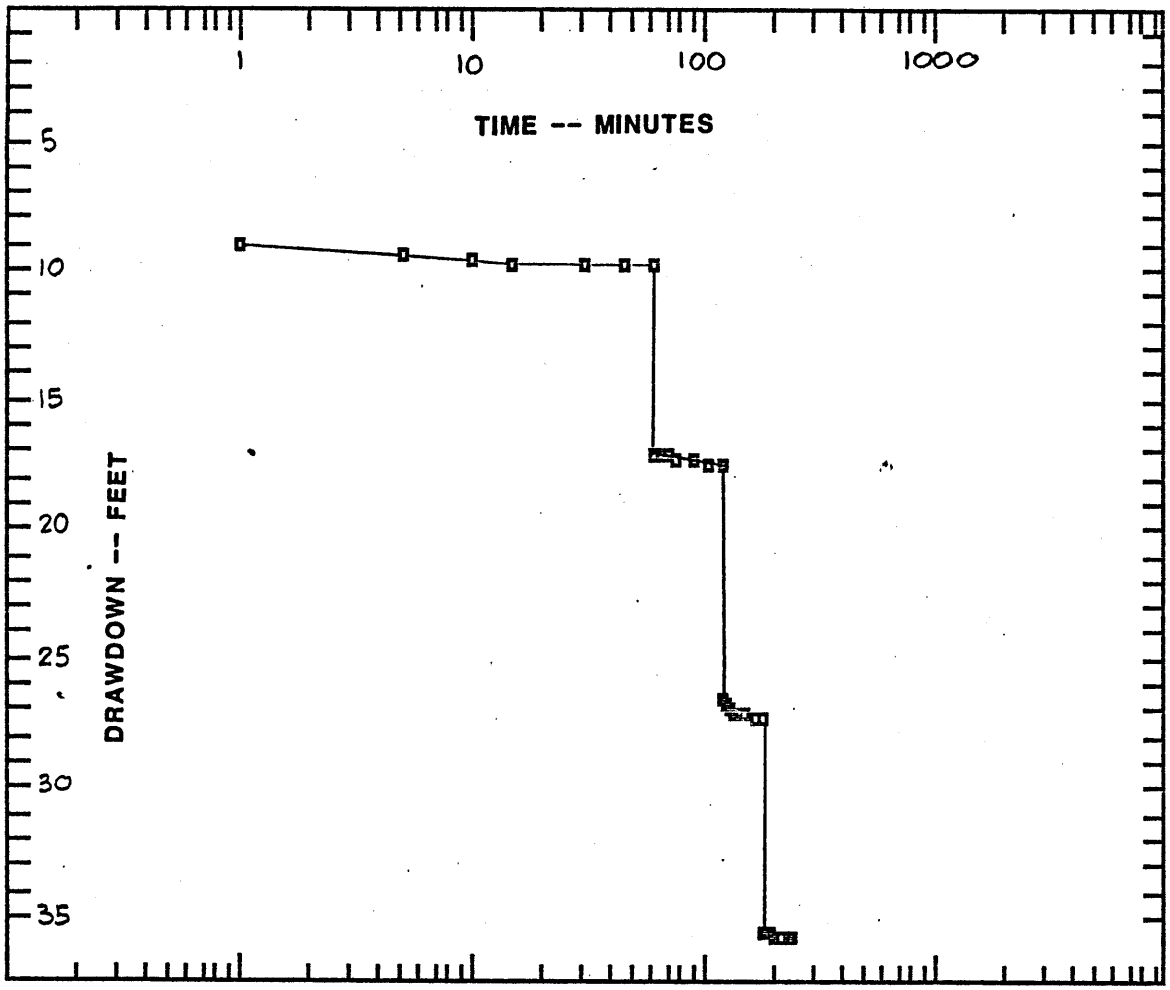
TIME-DRAWDOWN SEMILOGARITHMIC PLOT OF WELL #852 WITH WELL #851 PUMPING AT 1380 GPM FOR 200 MINUTES.


1.0
.10
.01
0.1
1.0
10
100
1000
r/B=0.25
DRAWDOWN -- FEET
TIME OF PUMPING -- MINUTES
TIME-DRAWDOWN ANALYSIS OF PRODUCTION WELL NO. 851
OBSERVED WELL: OBSERVATION WELL #45
DISTANCE (r) TO OBSERVED WELL: 588 feet
CONSTANTS: Q = 1380 gpm
W(u,r/B) = 1.00
u = 1.00
r/B = 0.25
s = 0.237 ft
t = 0.42 min
SOLUTIONS: TRANSMISSIVITY = 667,290 gal/ft/day
STORATIVITY = .00030
LEAKANCE (P/m) = .1206 gal/sqft/day


10
1.0
0.1
.01
0.1
1.0
10
100
1000
DRAWDOWN -- FEET
TIME OF PUMPING -- MINUTES
r/B=0.30
0.30
TIME-DRAWDOWN ANALYSIS OF PRODUCTION WELL NO. 851
OBSERVED WELL: PRODUCTION WELL #852
DISTANCE (r) TO OBSERVED WELL: 1016 FEET
CONSTANTS: Q = 1380 gpm
W(u,r/B) = 1.00
u = 1.00
r/B = 0.30
s = 0.230 ft
t = 0.56 min
SOLUTIONS: TRANSMISSIVITY = 687,600 gal/ft/day
STORATIVITY = .0001385
LEAKANCE (P/m) = .0600 gal/sqft/day


10
1.0
0.1
.01
DRAWDOWN -- FEET
0.1
1
10
100
1000
10,000
RADIUS FROM PUMPED WELL -- FEET
DISTANCE-DRAWDOWN ANALYSIS OF STEP-DRAWDOWN TEST OF WELL #851
NOTE: ALL MATCH-POINT VALUES OF (s) & (r) ARE FOR:
Ko(r/B) = 1.00 & r/B = 1.00
STEP Q(gpm) r(ft) s(ft) T(gal/ft/day) Leakance(P/m)
1 450 4400 .150 687,000 .035
2 930 3900 .295 722,000 .047
3 1380 3400 .370 854,000 .073
4 1525 3300 .460 759,000 .070
AVERAGE VALUES 756,000 .056


100
10
1.0
0.1
.01
0.1
1.0
10
100
1000
10000
DRAWDOWN -- FEET
RADIUS FROM PUMPED WELL -- FEET
15.33
3.60
851-A
851
#45
852
AQUIFER PERFORMANCE TEST AT PRODUCTION WELL #851
PUMPING RATE: 1380 gpm FOR 265 minutes
MATCH POINT VALUES:
Ko(r/B) = 1.00
r/B = 1.00
s = 0.425 feet
r = 4800 feet
DISTANCE-DRAWDOWN SOLUTION:
TRANSMISSIVITY: 743,576 gal/ft/day
LEAKANCE (P/m): 0.0323 gal/sqft/day



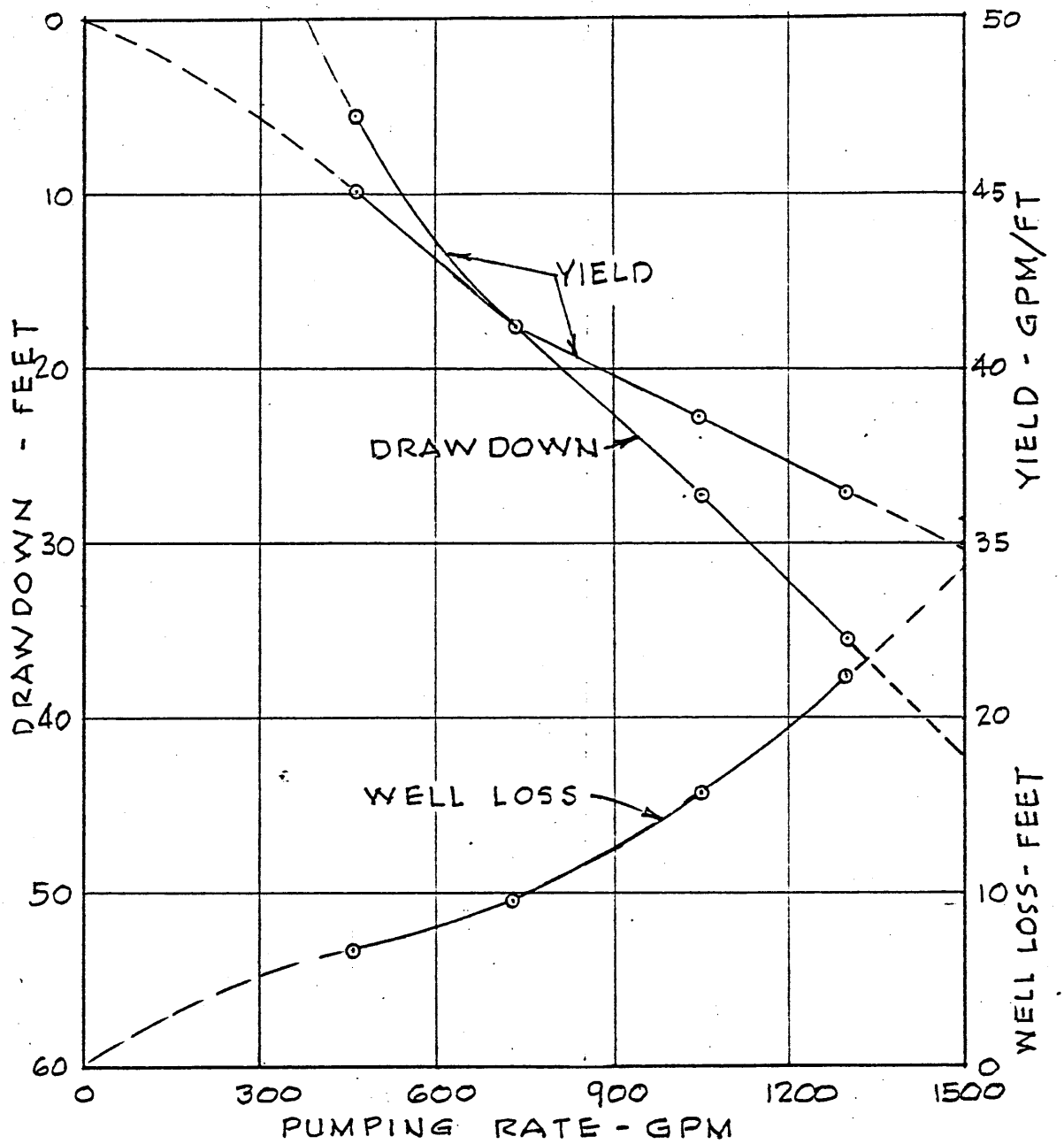
TIME (MINUTES)	DRAWDOWN (FEET)
1.00	9.040
5.00	9.400
10.00	9.650
15.00	9.780
30.00	9.810
45.00	9.810
60.00	9.810
61.00	17.050
65.00	17.100
70.00	17.200
75.00	17.250
90.00	17.350
105.00	17.480
120.00	17.510
121.00	26.600
125.00	26.700
130.00	26.850
135.00	27.040
150.00	27.180
165.00	27.220
180.00	27.220
181.00	35.500
185.00	35.560
190.00	35.660
195.00	35.700
210.00	35.750
225.00	35.780
240.00	35.780

SEMI-LOGARITHMIC PLOT OF

STEP-DRAWDOWN TEST OF WELL #852 -- DECEMBER 16, 1985

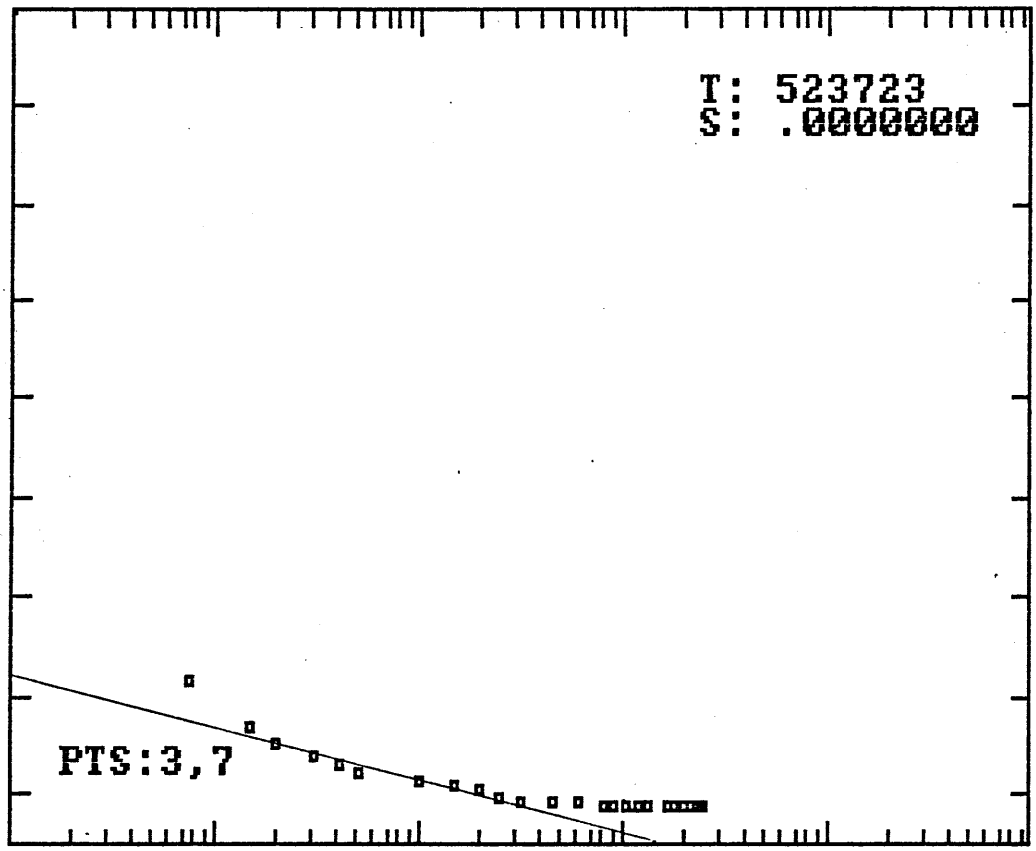
PUMPING RATES

000-060 MINUTES -- 463 GPM
060-120 MINUTES -- 725 GPM
120-180 MINUTES -- 1050 GPM
180-240 MINUTES -- 1300 GPM



WELL #852 PERFORMANCE ANALYSIS

BASED ON STEP-DRAWDOWN TEST 12-16-1985



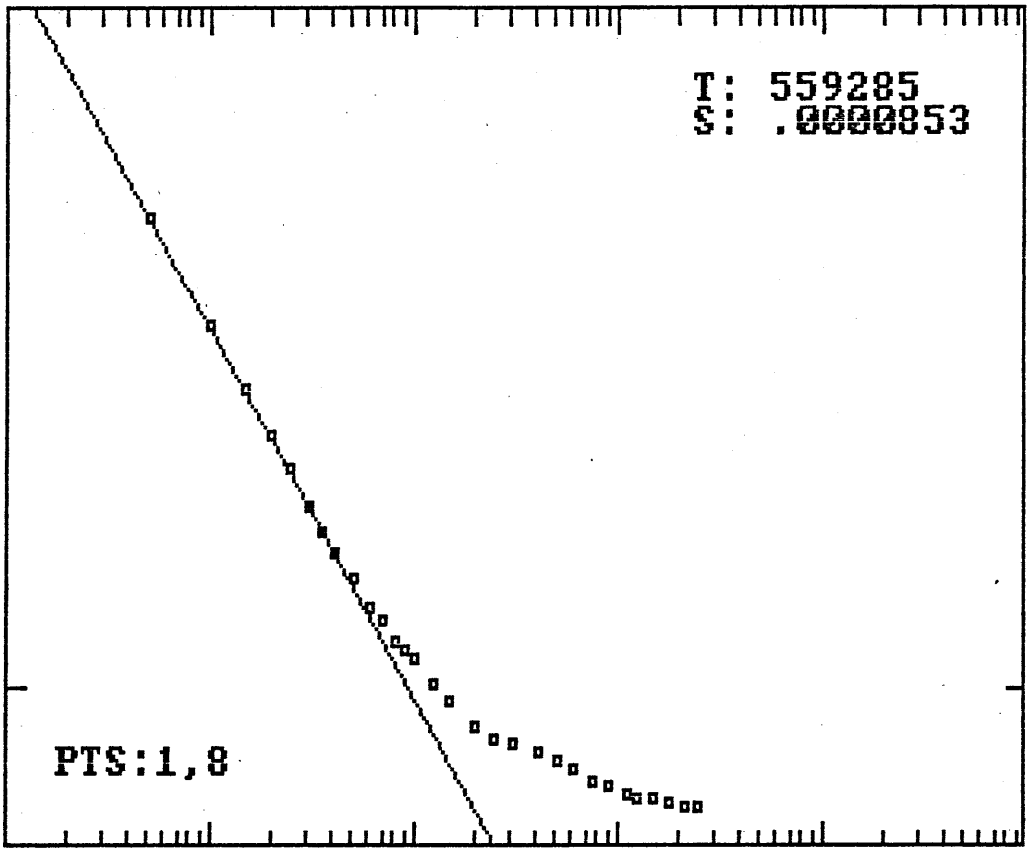
MICROCOMPUTER PROGRAM "THEISAQ"
SEMILOGARITHMIC SOLUTION OF AQUIFER CONSTANTS -- TIME DRAWDOWN METHOD

PUMPING RATE: 1150 GPM -- DISTANCE TO OBSERVATION WELL: 8.05 FEET

MEASUREMENTS:	TIME (MINUTES)	DRAWDOWN (FEET)
1	0.75	6.850
2	1.50	7.310
3	2.00	7.470
4	3.00	7.610
5	4.00	7.700
6	5.00	7.780
7	10.00	7.875
8	15.00	7.935
9	20.00	7.960
10	25.00	8.060
11	32.00	8.070
12	45.00	8.090
13	60.00	8.100
14	80.00	8.110
15	90.00	8.120
16	105.00	8.130
17	120.00	8.120
18	135.00	8.130
19	165.00	8.135
20	180.00	8.130
21	195.00	8.135
22	210.00	8.130
23	225.00	8.125
24	235.00	8.135
25	250.00	8.130
26	250.00	8.130

POINTS USED IN SOLUTION: 3 & 7 -- ZERO TIME: 0.00 MINUTES
SOLUTION: TRANSMISSIVITY = 523723 GAL/FT/DAY -- STORATIVITY = .0000000

TIME-DRAWDOWN SEMILOGARITHMIC PLOT AT OBS. WELL #852A WITH WELL #852 PUMPING AT 1150 GPM FOR 250 MINUTES.



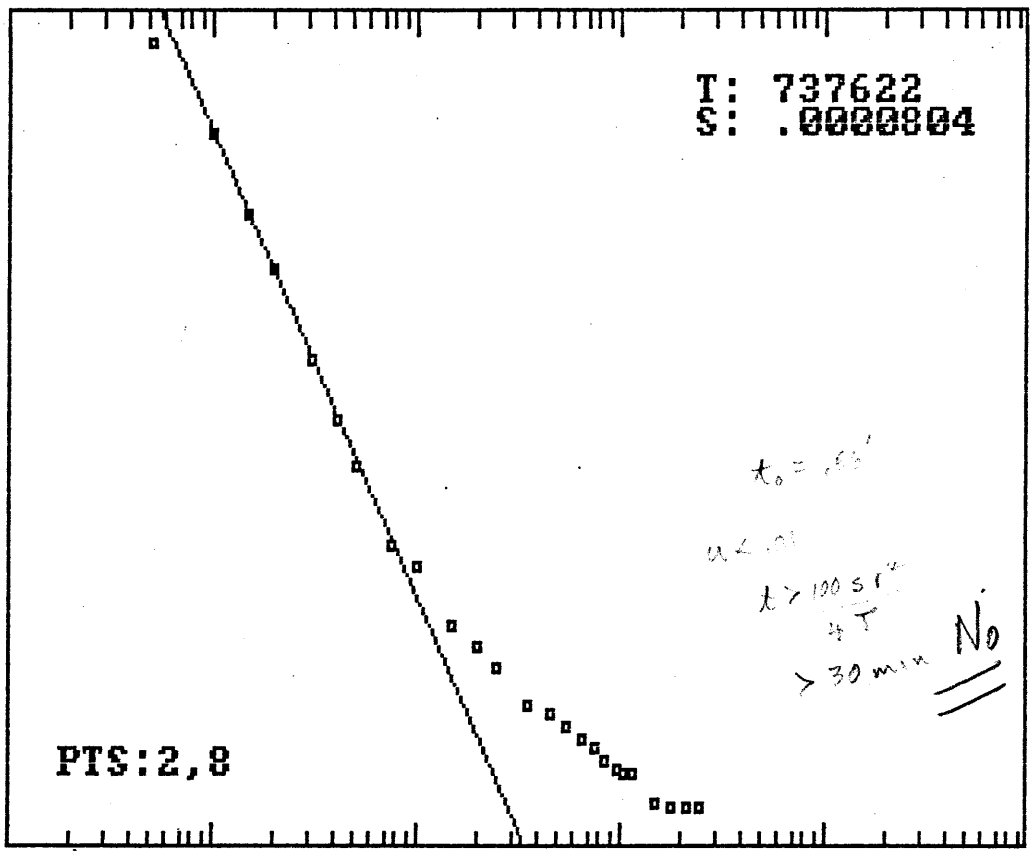
MICROCOMPUTER PROGRAM "THEISAQ"
SEMILOGARITHMIC SOLUTION OF AQUIFER CONSTANTS -- TIME DRAWDOWN METHOD

PUMPING RATE: 1150 GPM -- DISTANCE TO OBSERVATION WELL: 428 FEET

MEASUREMENTS:	TIME (MINUTES)	DRAWDOWN (FEET)
1	0.50	0.310
2	1.00	0.470
3	1.50	0.560
4	2.00	0.630
5	2.50	0.680
6	3.00	0.730
7	3.50	0.770
8	4.00	0.800
9	5.00	0.840
10	6.00	0.880
11	7.00	0.900
12	8.00	0.930
13	9.00	0.940
14	10.00	0.955
15	12.50	0.990
16	15.00	1.015
17	20.00	1.050
18	25.00	1.070
19	30.00	1.075
20	40.00	1.090
21	50.00	1.100
22	60.00	1.115
23	75.00	1.130
24	90.00	1.140
25	110.00	1.150
26	125.00	1.155
27	150.00	1.160
28	180.00	1.165
29	210.00	1.170
30	250.00	1.170

POINTS USED IN SOLUTION: 1 & 8 -- ZERO TIME: 0.13 MINUTES
SOLUTION: TRANSMISSIVITY = 559285 GAL/FT/DAY -- STORATIVITY = .0000853

TIME-DRAWDOWN SEMILOGARITHMIC PLOT AT OBS. WELL #45 WITH WELL #852 PUMPING AT



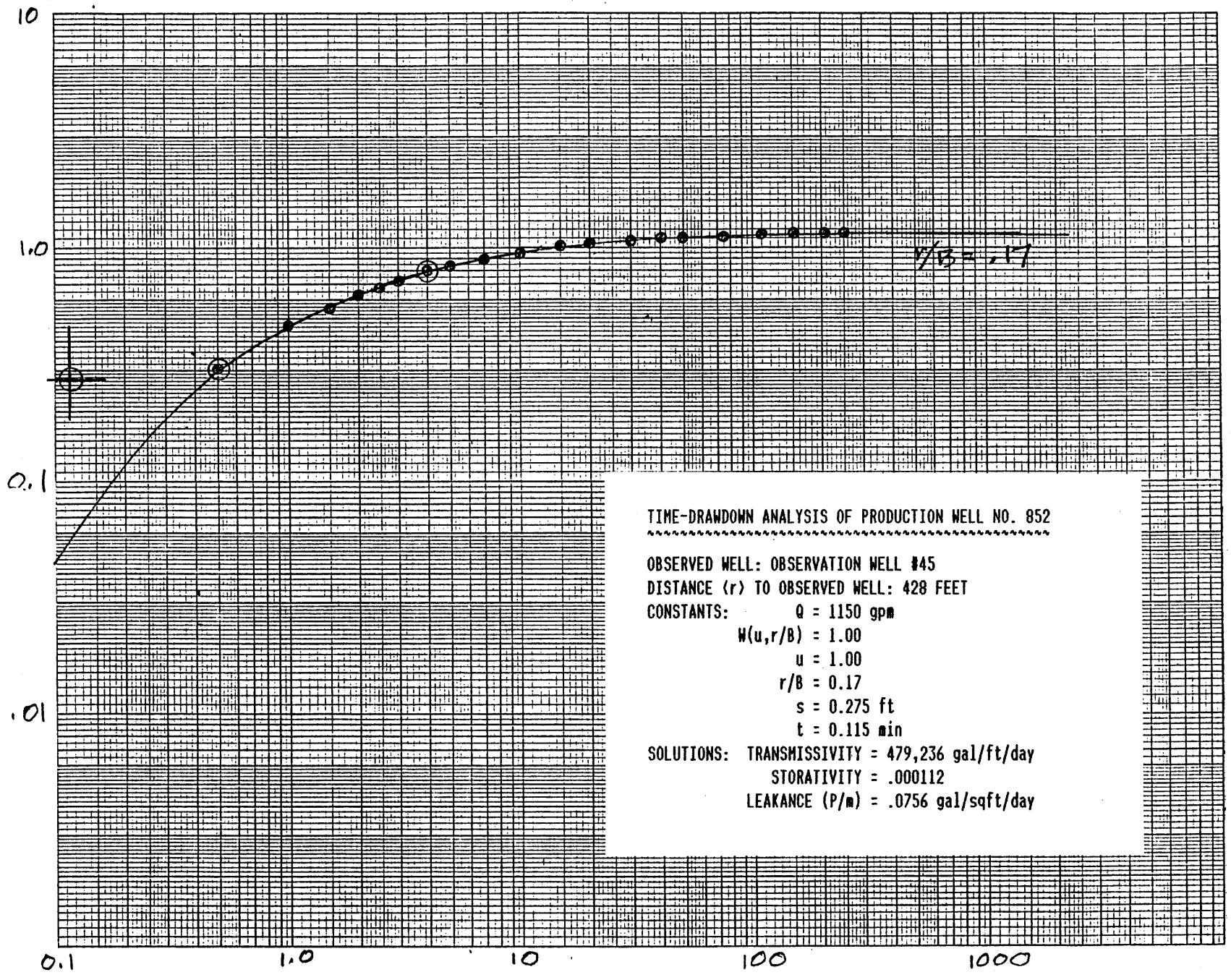
MICROCOMPUTER PROGRAM "THEISAQ"
SEMILOGARITHMIC SOLUTION OF AQUIFER CONSTANTS -- TIME DRAWDOWN METHOD

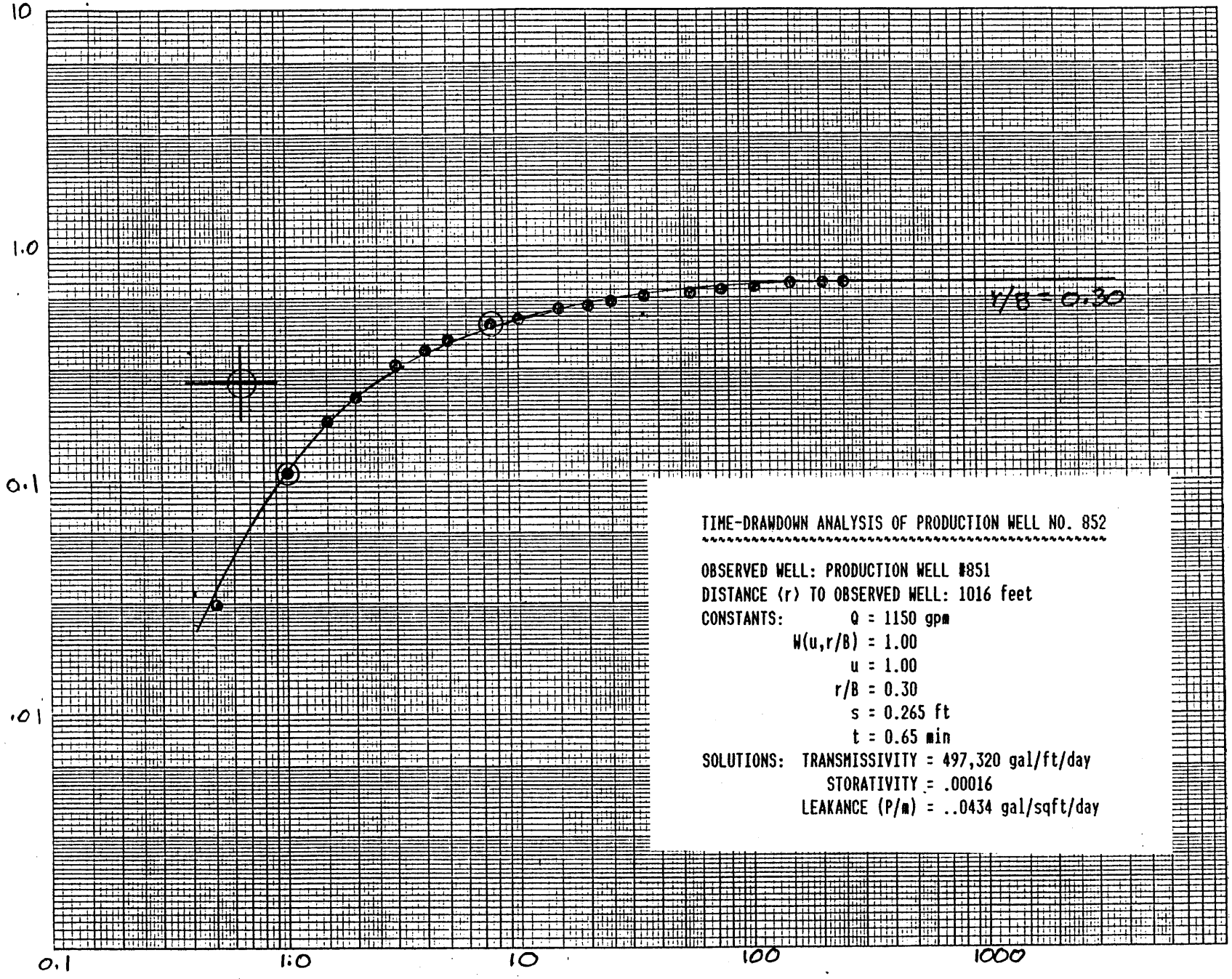
PUMPING RATE: 1150 GPM -c- DISTANCE TO OBSERVATION WELL: 1016 FEET

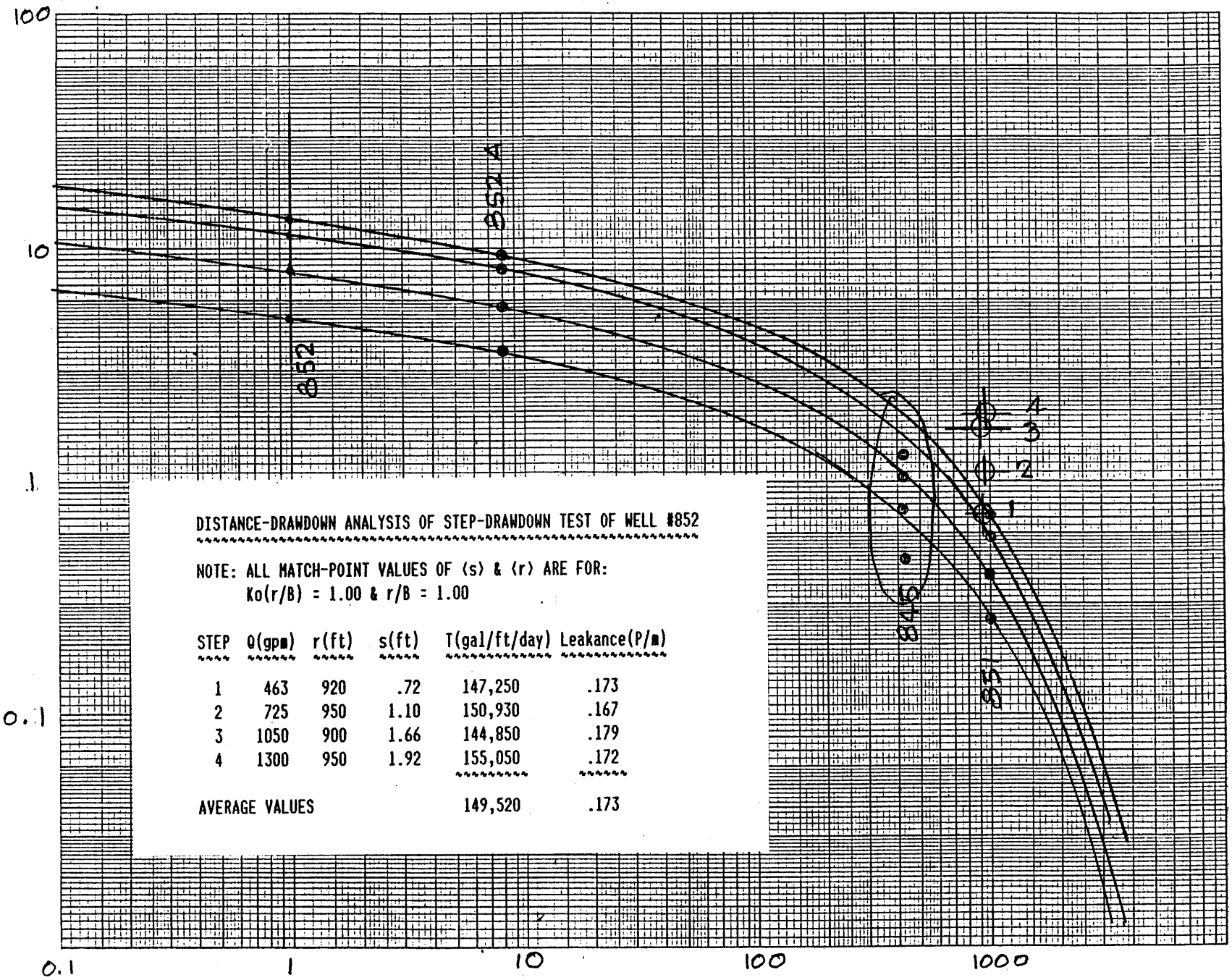
MEASUREMENTS:	TIME (MINUTES)	DRAWDOWN (FEET)
1	0.50	0.030
2	1.00	0.110
3	1.50	0.180
4	2.00	0.230
5	3.00	0.310
6	4.00	0.360
7	5.00	0.400
8	7.50	0.470
9	10.00	0.490
10	15.00	0.540
11	20.00	0.560
12	25.00	0.580
13	35.00	0.610
14	45.00	0.620
15	55.00	0.630
16	65.00	0.640
17	75.00	0.650
18	85.00	0.660
19	95.00	0.665
20	105.00	0.670
21	115.00	0.670
22	150.00	0.695
23	180.00	0.700
24	210.00	0.700
25	250.00	0.700

POINTS USED IN SOLUTION: 2 & 8 -- ZERO TIME: 0.54 MINUTES
SOLUTION: TRANSMISSIVITY = 737622 GAL/FT/DAY -- STORATIVITY = .0000804

TIME-DRAWDOWN SEMILOGARITHMIC PLOT AT WELL #851 WITH WELL #852 PUMPING AT 1150 GPM FOR 250 MINUTES.


10
1.0
0.1
.01
0.1
1.0
10
100
1000
r/B = .17
DRAWDOWN -- FEET
TIME OF PUMPING -- MINUTES
TIME-DRAWDOWN ANALYSIS OF PRODUCTION WELL NO. 852
OBSERVED WELL: OBSERVATION WELL #45
DISTANCE (r) TO OBSERVED WELL: 428 FEET
CONSTANTS: Q = 1150 gpm
W(u,r/B) = 1.00
u = 1.00
r/B = 0.17
s = 0.275 ft
t = 0.115 min
SOLUTIONS: TRANSMISSIVITY = 479,236 gal/ft/day
STORATIVITY = .000112
LEAKANCE (P/m) = .0756 gal/sqft/day


10
1.0
0.1
.01
0.1
1.0
10
100
1000
r/B = 0.30
DRAWDOWN -- FEET
TIME OF PUMPING -- MINUTES
TIME-DRAWDOWN ANALYSIS OF PRODUCTION WELL NO. 852
OBSERVED WELL: PRODUCTION WELL #851
DISTANCE (r) TO OBSERVED WELL: 1016 feet
CONSTANTS: Q = 1150 gpm
W(u,r/B) = 1.00
u = 1.00
r/B = 0.30
s = 0.265 ft
t = 0.65 min
SOLUTIONS: TRANSMISSIVITY = 497,320 gal/ft/day
STORATIVITY = .00016
LEAKANCE (P/m) = ..0434 gal/sqft/day

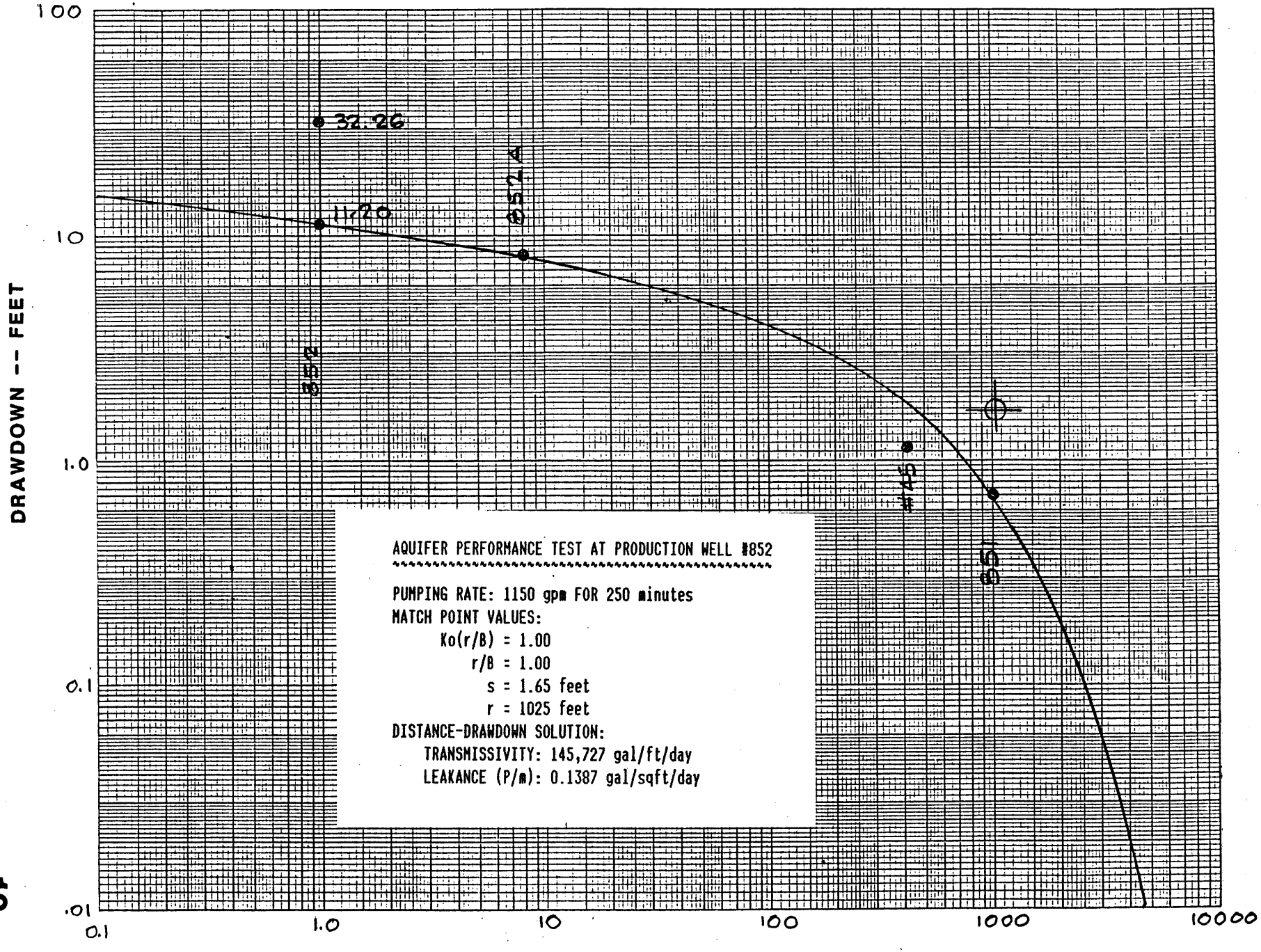


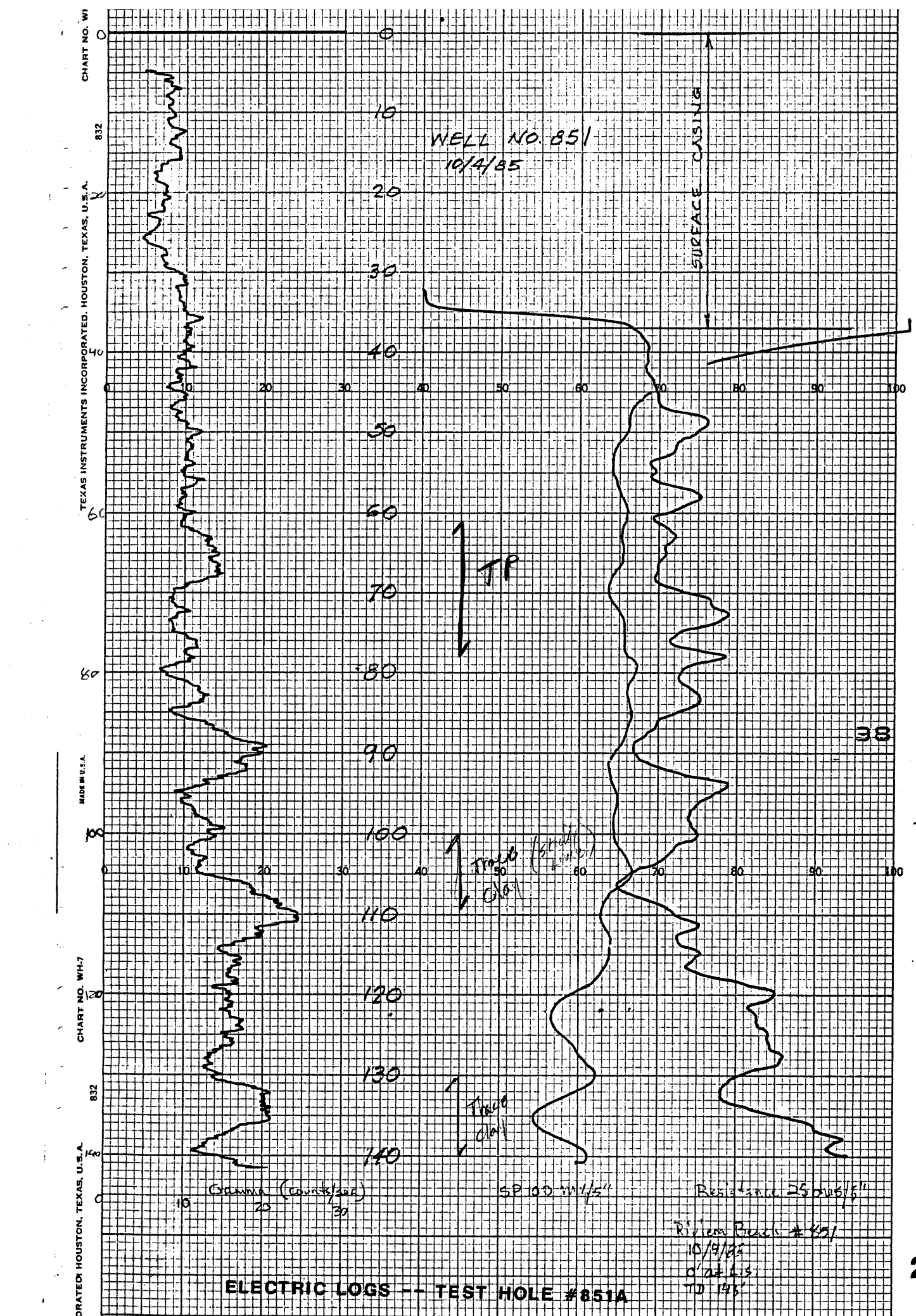
DISTANCE-DRAWDOWN ANALYSIS OF STEP-DRAWDOWN TEST OF WELL #852

NOTE: ALL MATCH-POINT VALUES OF (s) & (r) ARE FOR:
Ko(r/B) = 1.00 & r/B = 1.00

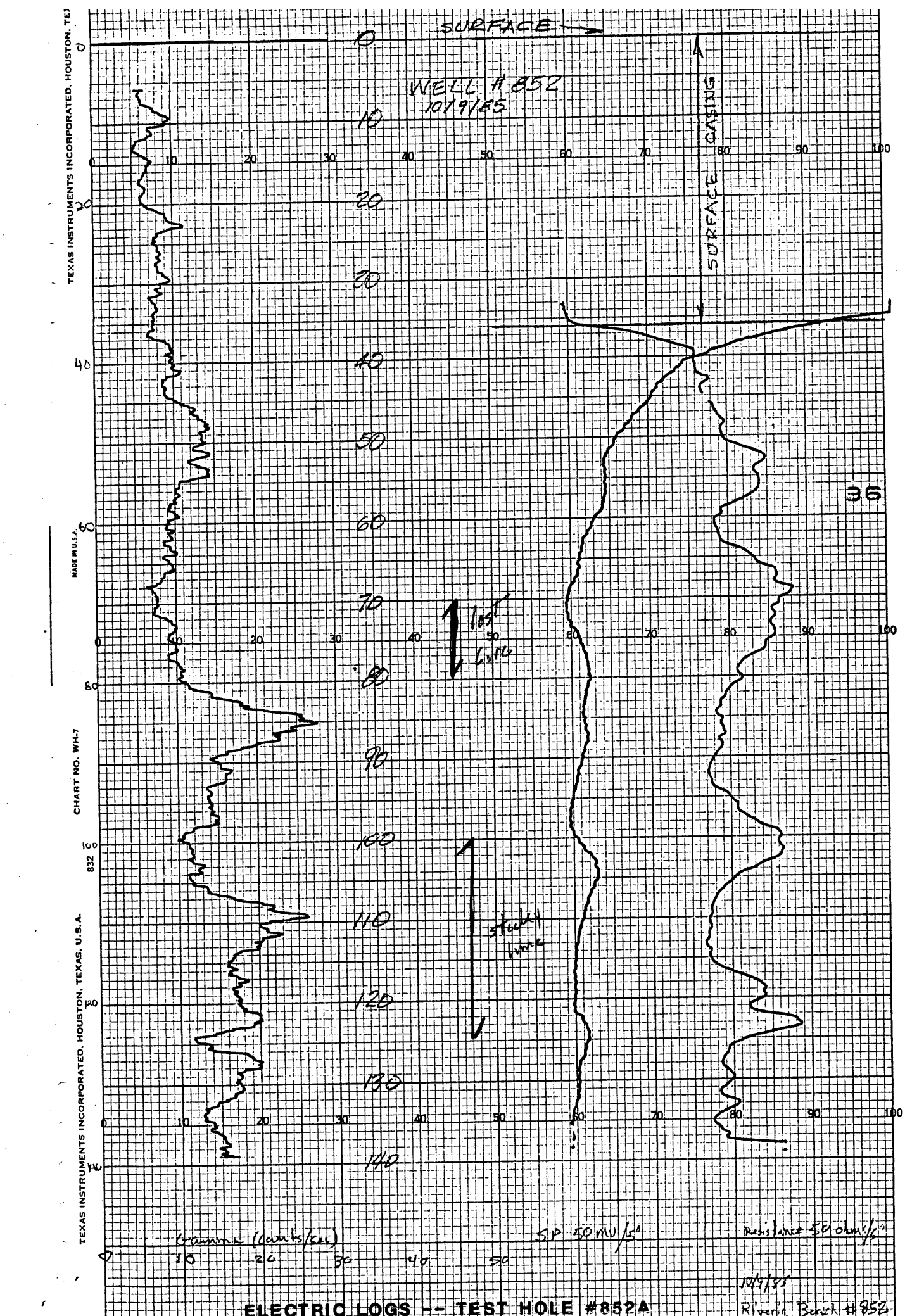
STEP	Q(gpm)	r(ft)	s(ft)	T(gal/ft/day)	Leakance(P/m)
1	463	920	.72	147,250	.173
2	725	950	1.10	150,930	.167
3	1050	900	1.66	144,850	.179
4	1300	950	1.92	155,050	.172
AVERAGE VALUES				149,520	.173

Poor Matches


100
10
1.0
0.1
.01
0.1
1.0
10
100
1000
10000
DRAWDOWN -- FEET
RADIUS FROM PUMPED WELL -- FEET
32.26
11.20
3.89
1.65
0.57
AQUIFER PERFORMANCE TEST AT PRODUCTION WELL #852
PUMPING RATE: 1150 gpm FOR 250 minutes
MATCH POINT VALUES:
Ko(r/B) = 1.00
r/B = 1.00
s = 1.65 feet
r = 1025 feet
DISTANCE-DRAWDOWN SOLUTION:
TRANSMISSIVITY: 145,727 gal/ft/day
LEAKANCE (P/m): 0.1387 gal/sqft/day



ELECTRIC LOGS -- TEST HOLE #851A



ELECTRIC LOGS -- TEST HOLE #852A

10/9/65

Riverside Bench #852

ALSAY – PIPPIN CORPORATION

Date: 10-4-85

WELL # 851

WELL LOG

Owner CITY OF RIVIERA BEACH 2. Location 45TH ST

Type Const. MUD ROTARY 4. Casing

Screen, Gravel, Etc.

Total Depth 147' 7. Jet Head 8. Static Level

From	To	Formation
0	10	TOP SOIL & SAND
10	20	SUGAR SAND
20	30	SAND AND SHELL
30	40	SHELL W/ TRACE SAND
40	48	SHELL AND SANDSTONE
48	58	MED SAND STONE
58	61	HARD SANDSTONE
61	70	SANDSTONE W/ SHELL (STARTED FLUID LOSS)
70	78	MED. HARD SANDSTONE
78	78½	CAVITY (LOST CIRCULATION)
78½	90	MED. GRAINY SANDSTONE
90	100	MED SANDSTONE
100	110	MED SOFT SANDSTONE W/ TRACE CLAY & SHELL
110	120	MED SANDSTONE AND LIMESTONE W/ TRACE SHELL
120	130	MED SANDSTONE AND LIME STONE
130	140	MED SANDSTONE W/ TRACE CLAY & SHELL
140	147	MED SANDSTONE

Total Chlorides (ppm) 10. Iron 11. Ph 12. Hardness

Remarks:

Driller (s):

JERRY R HICKMAN

ALSAY – PIPPIN CORPORATION

852

Date:

WELL LOG

1. Owner CITY OF RIVIERA BEACH 2. Location 45TH ST.

3. Type Const. MUD ROTARY 4. Casing

5. Screen, Gravel, Etc.

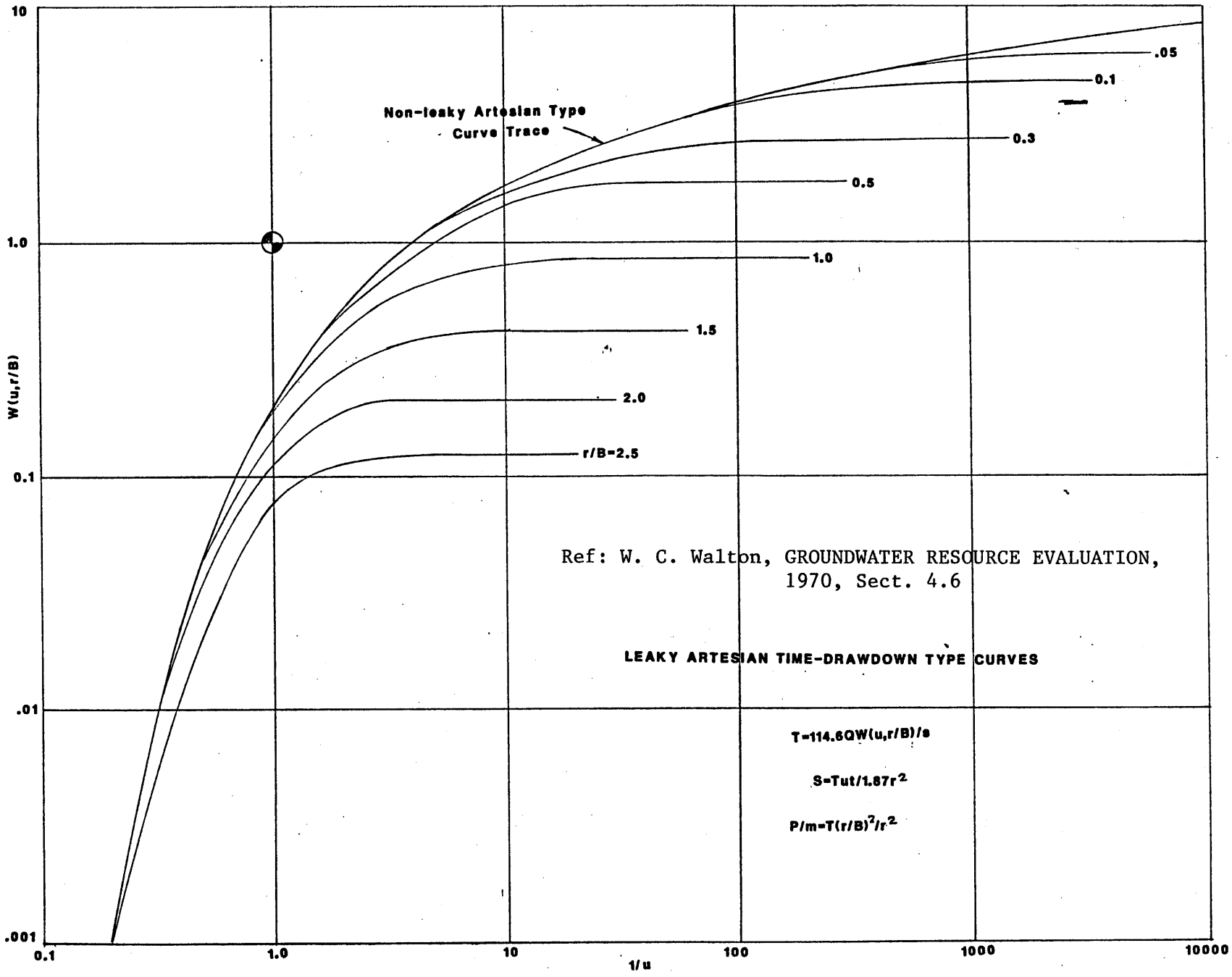
6. Total Depth 7. Jet Head 8. Static Level

From	To	Formation
0	10	TOP SOIL & SAND
10	20	SUGAR SAND
20	30	SAND AND SHELL
30	40	SHELL & SANDSTONE
40	50	SANDSTONE W/ SHELL
50	60	MED SANDSTONE W/ SHELL
66	70	MED. SANDSTONE W/ SHELL
70	80	MED - HARD SANDSTONE
80	90	MED SANDSTONE W/ TRACE OF SHELL
90	100	MED SANDSTONE W/ TRACE COURSE SAND AND SHELL
100	110	SOFT SANDSTONE W/ STICKY LIME & SHELL
110	120	SOFT SANDSTONE W/ COURSE SAND AND STICKY LIME
120	125	SOFT SANDSTONE W/ STICKY LIME & SAND
125	130	HARD SANDSTONE
130	140	SOFT - MED SANDSTONE W/ SAND AND SHELL
140	150	MED SANDSTONE W/ SHELL

9. Total Chlorides (ppm) 10. Iron 11. Ph 12. Hardness

Remarks: LOST FLUID AT 70'-80'

Driller (s): JERRY R HICKMAN



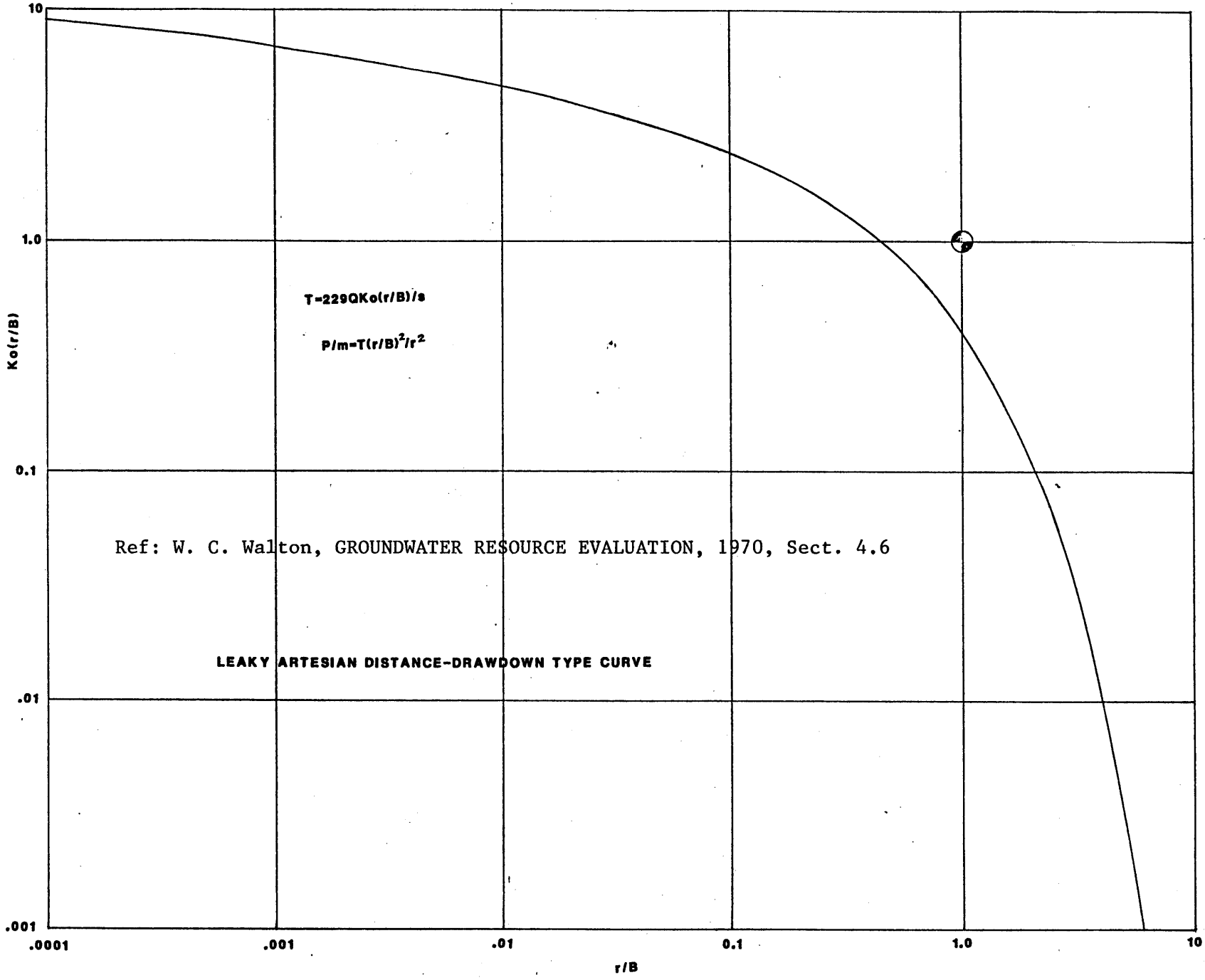
Ref: W. C. Walton, GROUNDWATER RESOURCE EVALUATION, 1970, Sect. 4.6

LEAKY ARTESIAN TIME-DRAWDOWN TYPE CURVES

$T=114.6QW(u,r/B)/s$

$S=Tut/1.87r^2$

$P/m=T(r/B)^2/r^2$



Ref: W. C. Walton, GROUNDWATER RESOURCE EVALUATION, 1970, Sect. 4.6

LEAKY ARTESIAN DISTANCE-DRAWDOWN TYPE CURVE