PINK—WELL DRILLER'S COPY

Log No. 110353
Permit No. 48481
Basin

WELL DRILLERS REPORT

Please complete this form in its entirety

WELL #14

1. OWNER American Borates Co. ADDRESS 3311 South Jones Blvd. Suite 212 Las Vegas Nv. 89102

2. LOCATION SW ¼ NE ¼ Sec. 09 T. 26 N/S 65 E. - DSB Cou
PERMIT NO.

3. TYPE OF WORK
New Well ☒ Recondition ☐
Deepen ☐ Other ☐

4. PROPOSED USE Mining-DSB
Domestic ☐ Irrigation ☐ Test ☐
Municipal ☒ Industrial ☐ Stock ☐

5. TYPE WELL
Cable ☐ Rotary
Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Silt w/ clay		0	3	3
Cliche		3	8	5
Clay & Sand		8	23	15
Sand		23	32	9
Clay & Sand		32	38	6
Clay w/ Gravel		38	42	4
Gravel w/ Sand	1st	42	54	12
Clay w/ Sand and Gravel		54	60	6
Sand & Gravel	2nd	60	75	15
Clay, Sand, & Gravel		75	84	9
Gravel	3rd	84	88	4
Gravel and clay		88	95	7
Clay and Sand		95	100	5

Date started 3-19-81, 19
Date completed 3-31-81, 19

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump
	287	to63'	100

BAILER TEST
G.P.M. Draw down feet hours
G.P.M. Draw down feet hours
G.P.M. Draw down feet hours

8. WELL CONSTRUCTION
Diameter hole 20 inches Total depth 100
Casing record
Weight per foot Thickness 207

Diameter		From	To
12 3/4	inches	0 feet	100
	inches	feet	
	inches	feet	
	inches	feet	
	inches	feet	
	inches	feet	

Surface seal: Yes ☒ No ☐ Type cement
Depth of seal 30'
Gravel packed: Yes ☒ No ☐
Gravel packed from 30 feet to 100

Perforations:
Type perforation machine
Size perforation 3"x1/8"
From 30 feet to 100
From feet to
From feet to
From feet to
From feet to

9. WATER LEVEL
Static water level 19.2 Feet below land surface
Flow G.P.M.
Water temperature cool °F Quality untested

10. DRILLERS CERTIFICATION
This well was drilled under my supervision and the report is tru the best of my knowledge.

Name Dave Rau
Address SR 15 Box 543 Lathrop Wells,
Nevada contractor's license number 5976A
Nevada driller's license number 830
Signed [signature]
Date 3/31/81

USE ADDITIONAL SHEETS IF NECESSARY

5471

Analysis of Pump Test Data from the American Borate Company Water Wells Near Stateline, Nevada

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May 5, 1988

Introduction

A pump test of a shallow aquifer near Stateline, Nevada was performed during the period of February 9-12, 1988. The purpose of the test was to obtain estimates of aquifer transmissivity and storage coefficient by monitoring drawdown and recovery in one pumped and four observation wells.

The wells used in the pump test are shown in figure 1. All the wells, except 6 and 6A, are completed in the same surficial geologic units. Well 6 is cased and is not perforated in the same interval as the monitored wells. Well 6A is uncased and is open to the same interval as the monitored wells. In general, the material in which the wells are completed is fine-grained (clay, silt and fine sand) fluvial sediment with some gravel lenses and limestone (possibly caliche) beds.

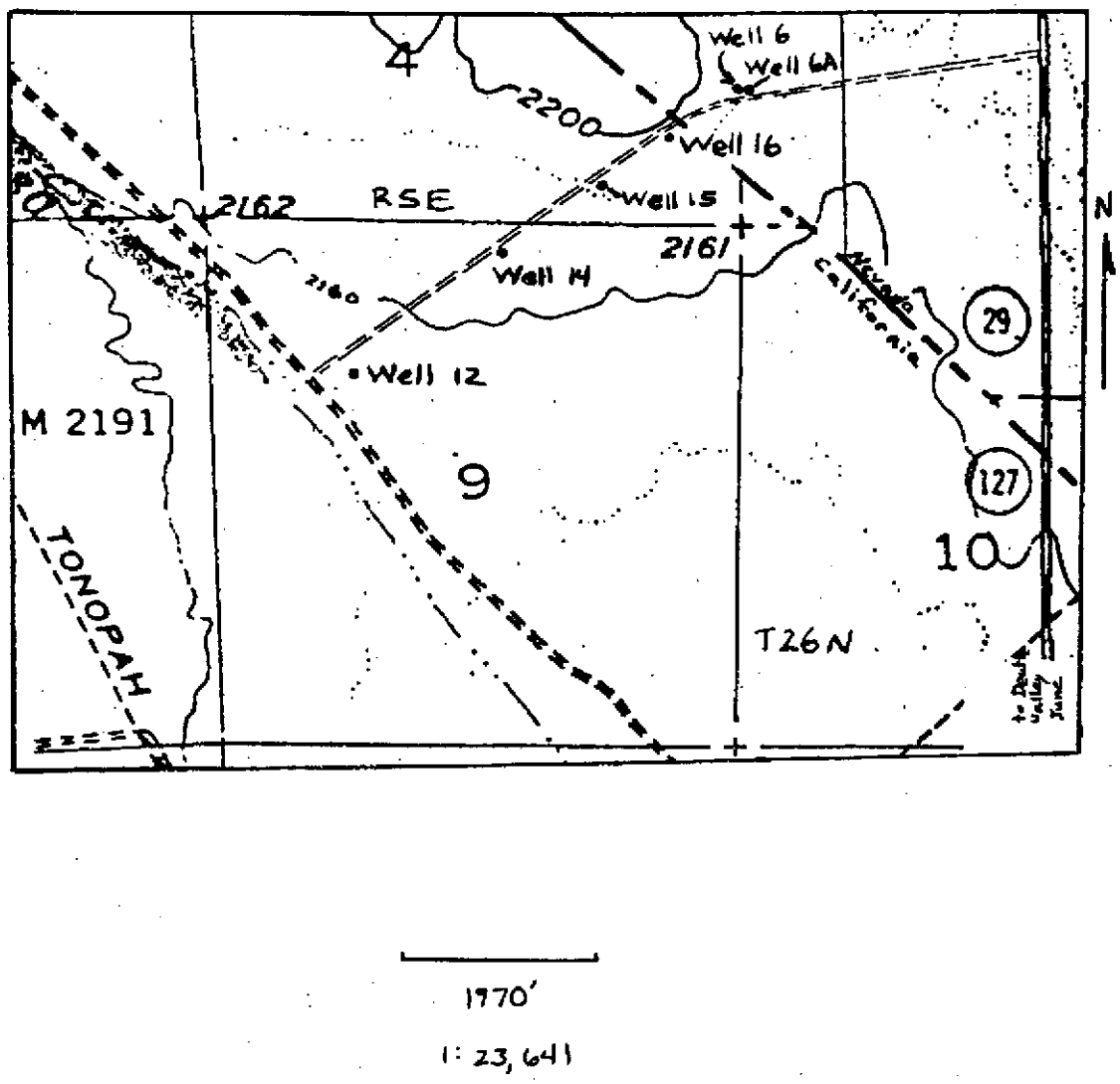

Figure 1.--Location of the study area and well site locations (base from USGS Ash Meadows 15 minute quadrangle).

Pump Test Operations

The pump test was conducted from 12:53 pm, February 9, 1988 to 11:00 am, February 12, 1988. During this time both drawdown and recovery data were recorded, with recovery starting at 1:13 pm, February 11, 1988. Well 15 was pumped, using the pump installed by the driller, at an average rate of 80 gpm (gallons per minute). Attempts to increase the pumping rate by opening the flow valve were unsuccessful even though the pump was rated at 135 gpm. Table 1 gives the flow-rate history during the test; flow rates were monitored using an in-line Rockwell International flow rate meter. Table 2 gives initial depth to water, well radius and distance from the pumped well (well 15). Wells 12, 14, 15 and 16 were monitored for drawdown using zero-to-5 psi (pounds per square inch) transducers from EnviroLabs Inc. Wells 6, 6A, 12, 14 and 16 (observation wells) also were periodically monitored using a steel tape. Transducer data were collected and stored using two Cambell Scientific Inc. 21X data loggers.

Transducer Calibration

Each transducer was calibrated within its particular well using the following method:

1. The static depth to water in the well was determined using the transducer as the measuring device. The point on the transducer cable at this depth was marked

Table 1.--Pump test flow rate data.

time (min)	Volume (gal)	rate(gpm)
0.0	58738	---
1.0	58830	92.00
2.0	58916	86.00
3.0	59002	86.00
4.0	59090	88.00
5.0	59178	88.00
6.0	59264	86.00
7.0	59350	86.00
8.0	59436	86.00
9.0	59525	89.00
10.0	59610	85.00
20.0	60462	85.20
30.0	61336	87.40
70.0	64756	85.50
145.0	71000	86.67
260.0	80480	82.43
262.5	80690	84.00
265.0	80890	80.00
286.0	82610	81.90
291.0	83020	82.00
376.0	103088	82.00
1070.9	146555	81.00
1230.0	159392	80.69
1235.0	159798	81.20
1731.0	199360	79.76
1735.0	199680	80.00
1742.0	200276	79.60
2612.0	269144	79.16
2617.0	269540	79.20
2863.0	288837	78.44
2869.0	289310	78.80

Table 2.--Well number, initial depth to water, well radius and radial distance from well 15.

well	depth to water (ft)	radius (ft)	distance from well 15 (ft)
6	56.63	0.50	---
6A	21.57	0.38	895.9
12	25.17	0.50	1688.1
14	23.18	0.50	463.6
15	23.78	0.50	---
16	23.38	0.50	425.9

with adhesive tape and considered to be the point of zero drawdown for that particular well.

2. The transducer cable was accurately marked in 1 foot increments beyond the zero point using an engineer's tape measurer and adhesive tape.

3. The transducer was lowered initially into the water in the well to a depth of 10 feet.

4. Pressure data measured as transducer millivolt output were recorded at 5 second intervals using the data logger. Data were collected for one minute.

5. The transducer was raised quickly one foot to the next higher calibration mark on the cable; data were collected as in step 4 for one minute.

6. Steps 4 and 5 were repeated until the zero point was reached.

7. The calibration data were then edited to remove data collected during the raising period of the calibration process. The edited data were used to obtain a linear regression equation relating the millivolt reading to the depth below the static water level.

The transducer calibrations were performed with the pump off.

Pump Test Analysis and Results

Well 15

The time-drawdown data for well 15 are shown in figures 2, 3 and 4. The early-time data show the effects of wellbore storage (1:1 slope). The late-time data fit the Theis curve very well. Values of transmissivity (T) and storage coefficient (S) agree well between the Theis curve match and the Jacob-Cooper straight-line solution. The data indicate that the aquifer is unconfined and has low permeability. A correction can be made to the drawdown to account for the changing saturated thickness and/or partial penetration (Jacob, 1963). The correction to the data yields similar values for T and S (figure 2). Recovery data for well 15 (figures 5, 6 and 7) do not give meaningful values for T and S (this curve appears to exhibit a recharge-boundary affect, but attempts to account for this yielded unrealistic values of T and S).

Wells 12, 14 and 16

The data for well 12 (steel tape and transducer) indicated no measurable drawdown during the test. Drawdown and recovery data for wells 14 and 16 are shown in figures 8, 9, 10 and 11.

Well 15 [pumped]: Log–Log Time–Drawdown

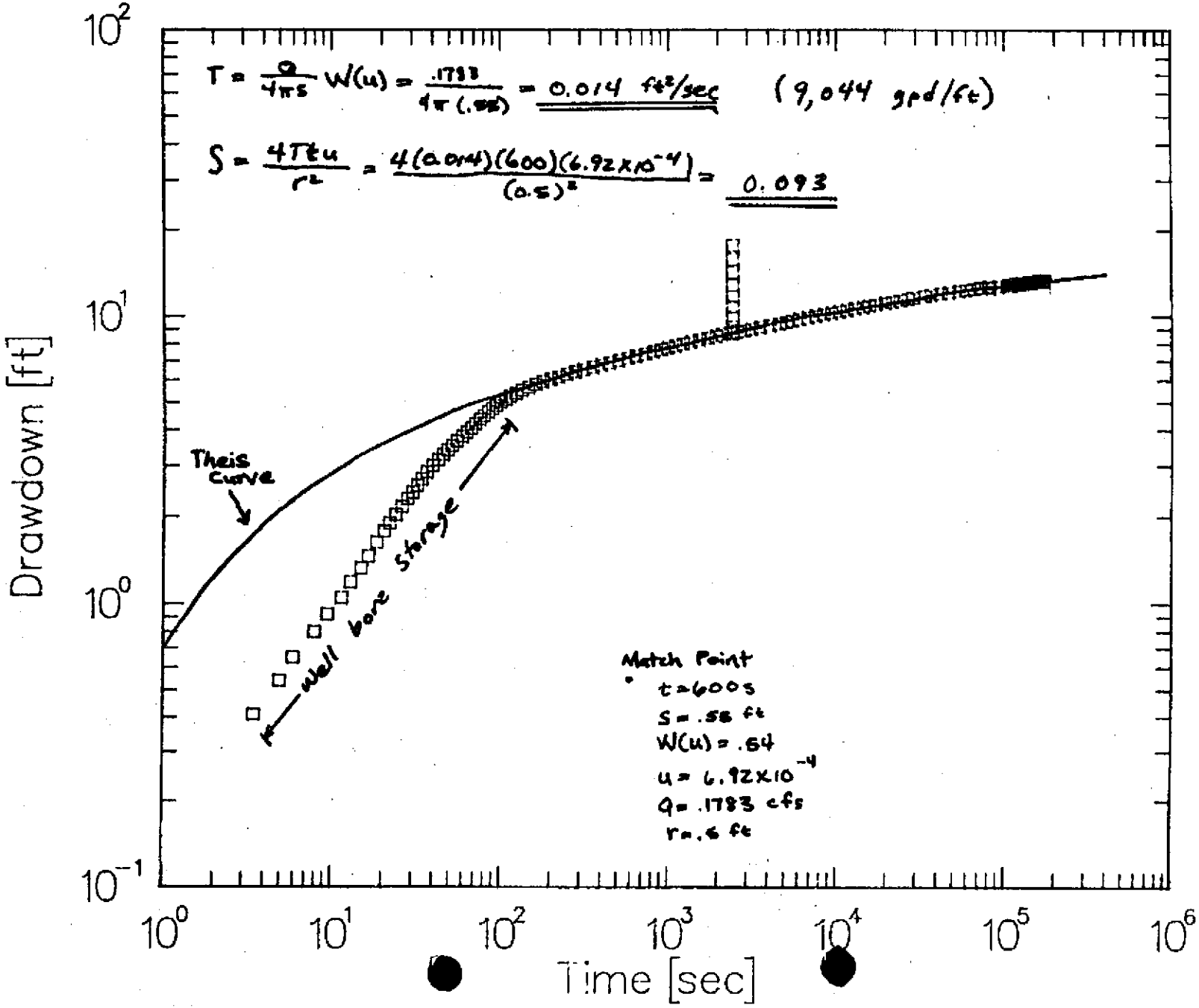

fig 2

Well 15 [pumped]: Log--Linear Time–Drawdown

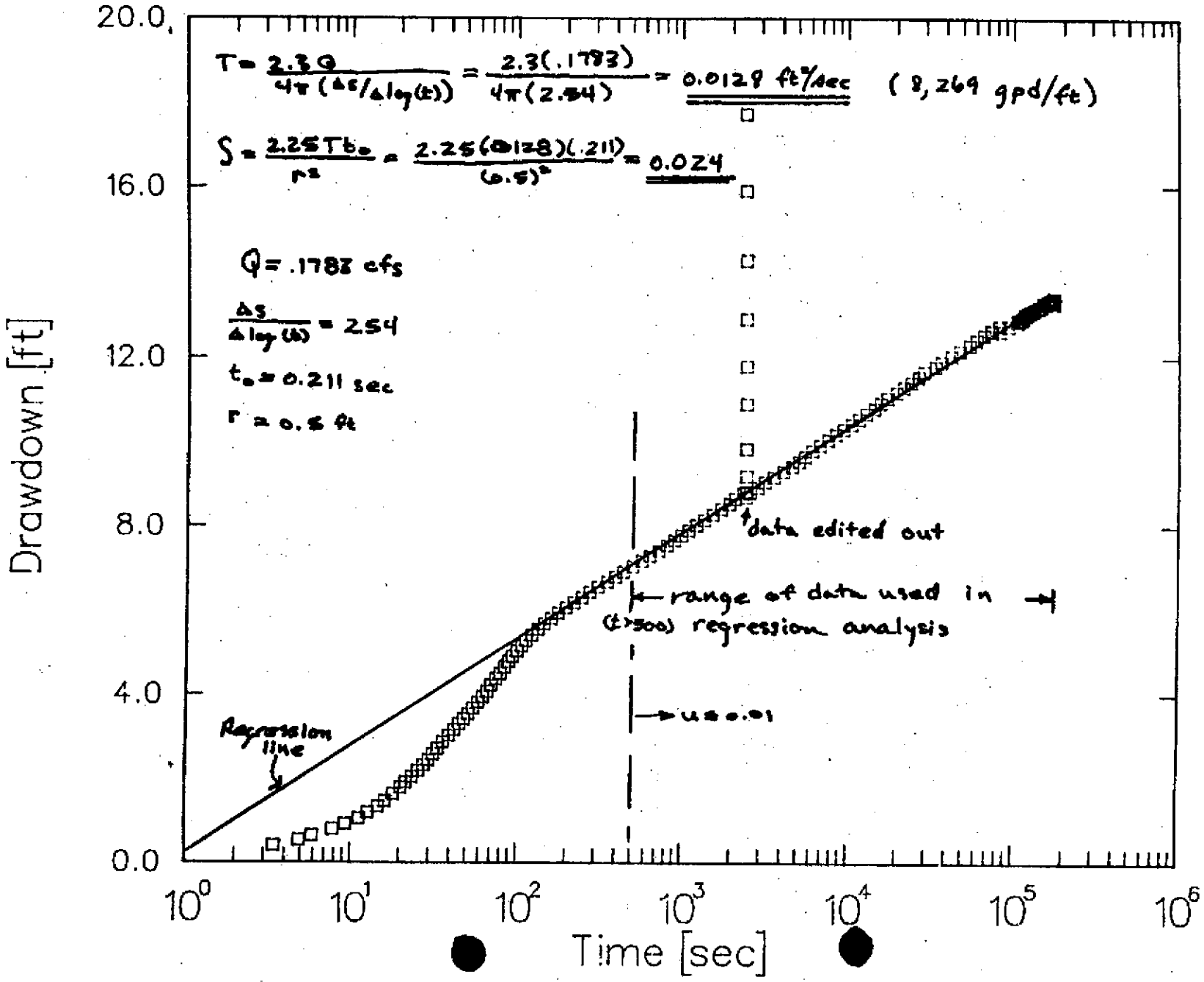

fig 3

Well 15 [pumped]: Log–Log Time--Corrected Drawdown

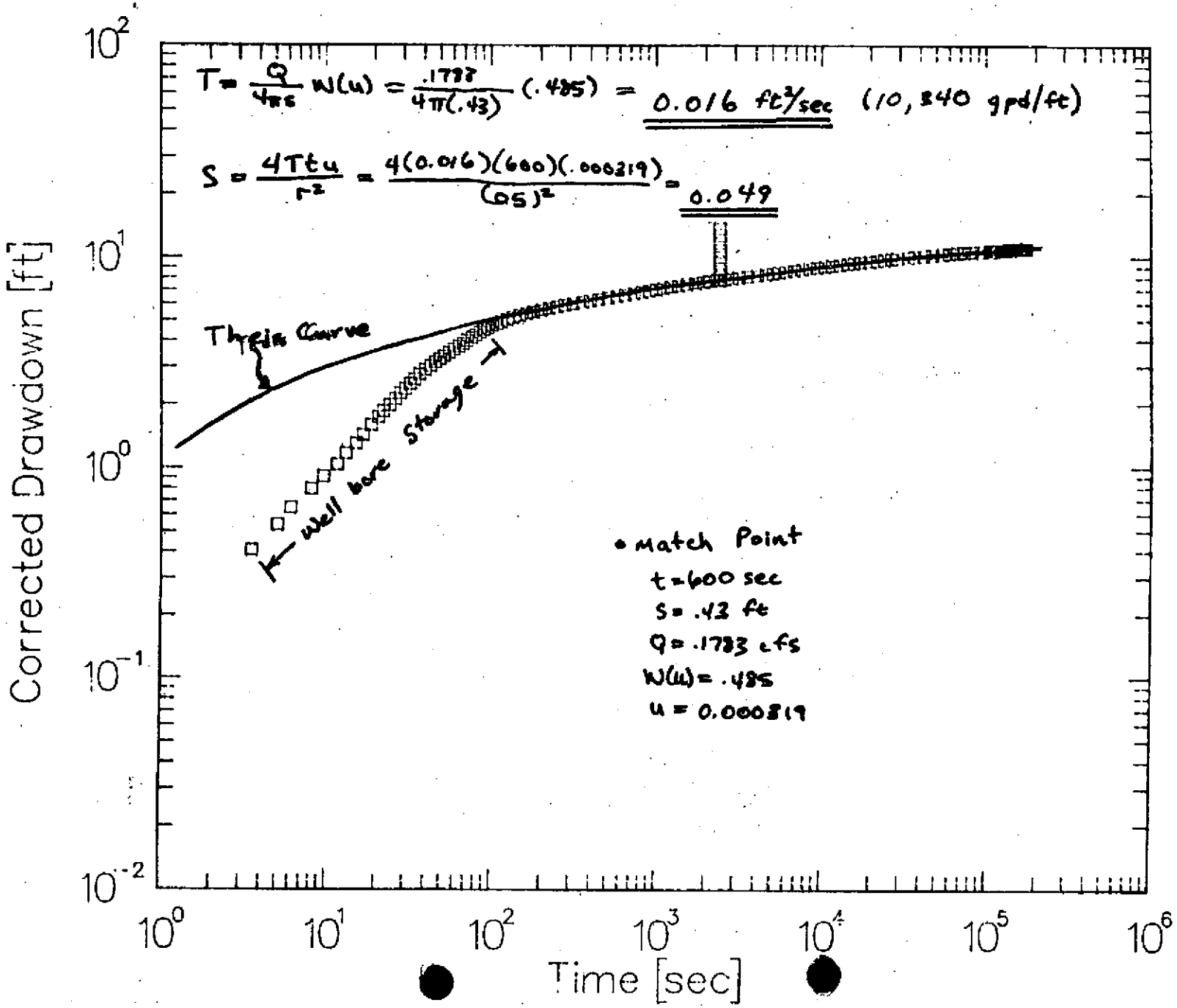

Fig. 4

No attempt has been made to correct for the unconfined condition. Analyses of these data give spurious results, with an average T of about 0.001 ft^2/s (feet squared per second) and S of about .005 (analyses not shown). Factors contributing to the questionable value of these data include: (1) the affects of partial penetration, (2) the low pumping rate (the aquifer was not stressed enough during the test to give definitive results at the observation wells), (3) noisiness of the data (the noisy quality of these data can be attributed to precision of the transducer measurements). In addition, during the pump test, ground water could be heard cascading down the wellbore in the pumped well, indicating unconfined conditions. Therefore, data from the observation wells are not considered representative of aquifer properties.

Weeks (1978) gives a time criterion for the length of a pump test: $t > 25r_c^2 / T$, where t is the length of time a pump test should be run to avoid the affects of wellbore storage, r_c is the pumped well radius and T is transmissivity. For well 15, assuming that $T=0.016$ ft^2/sec, this time is 390 seconds. Thus the pump test was run long enough to ensure reliable results in the pumped well.

Well 15 [pumped]: Log--Log Time--Recovery

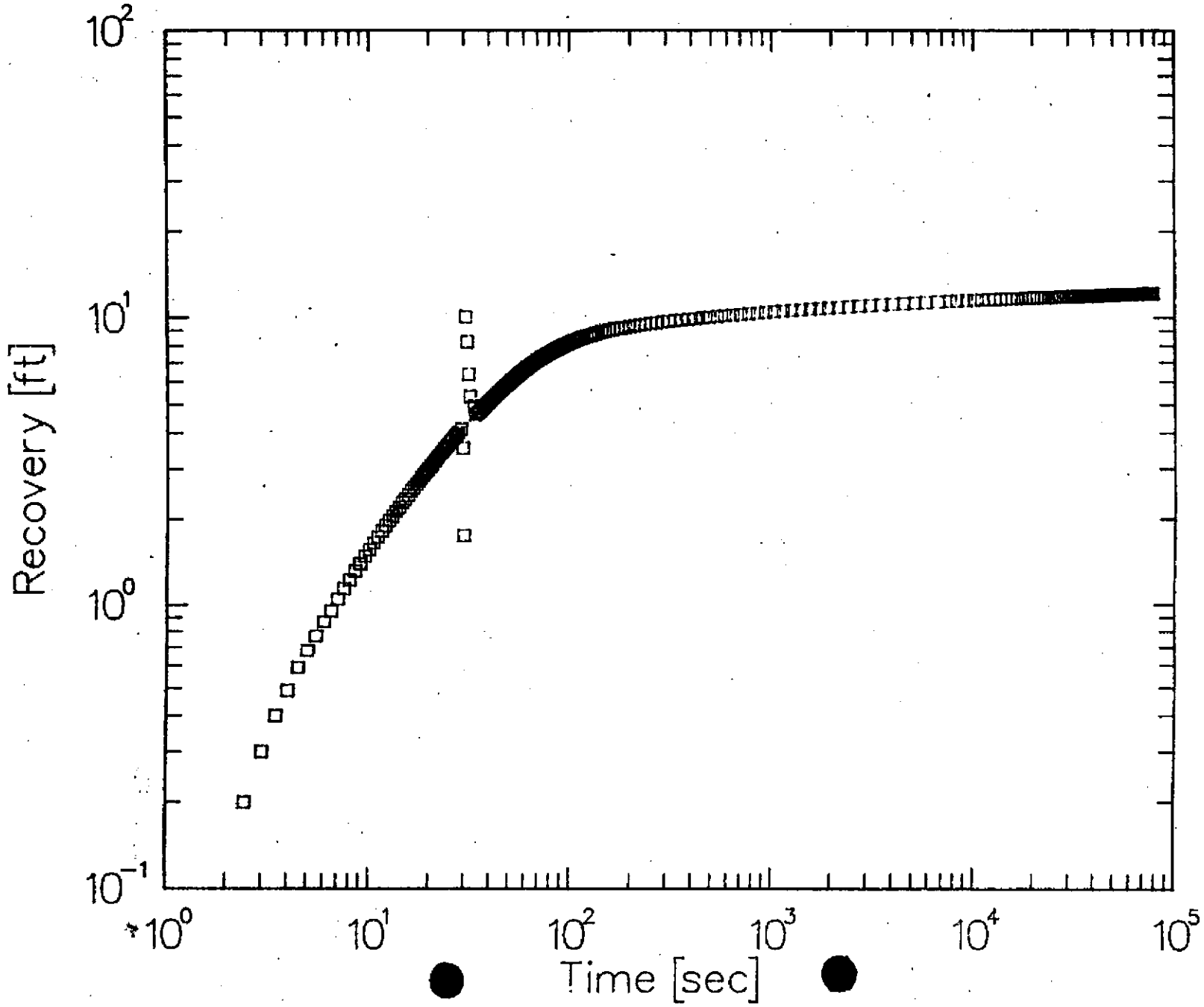

fig 5

Well 15 [pumped]: Log--Linear t/tp--Recovery

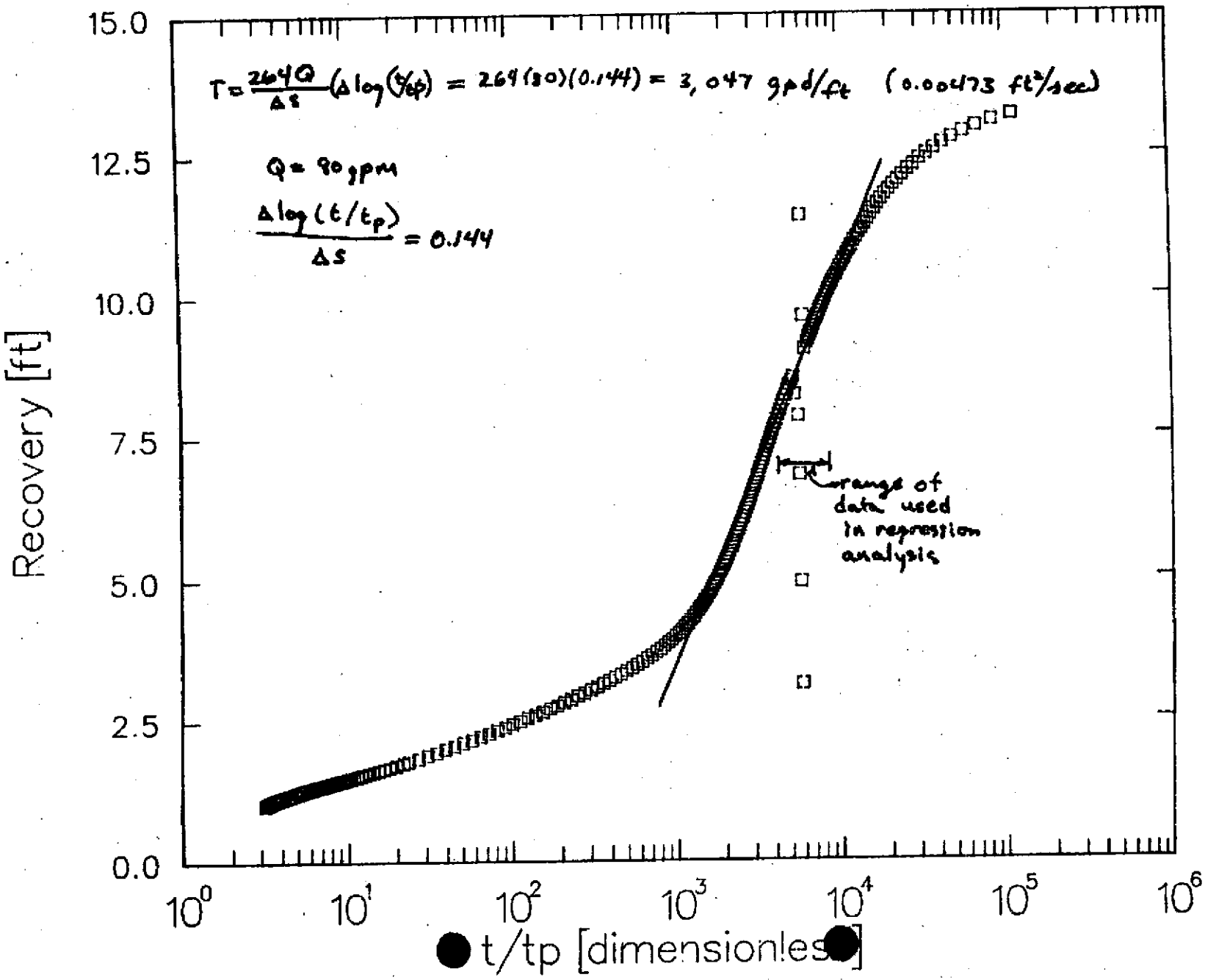

fig 6

Well 15: Log–Linear Time–Recovery [Theoretical]

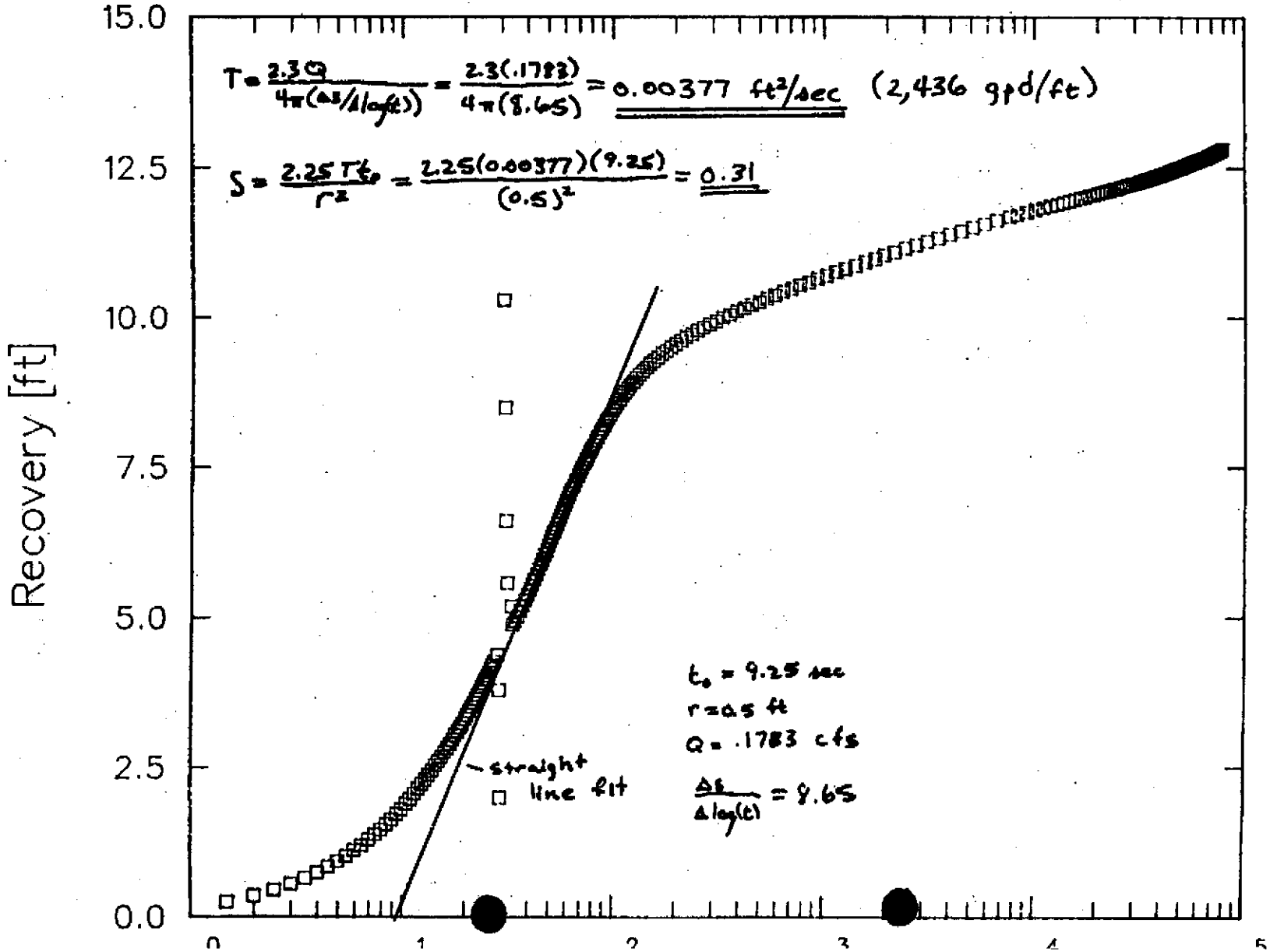

fig 7

Well 14: Log–Log Time–Drawdown

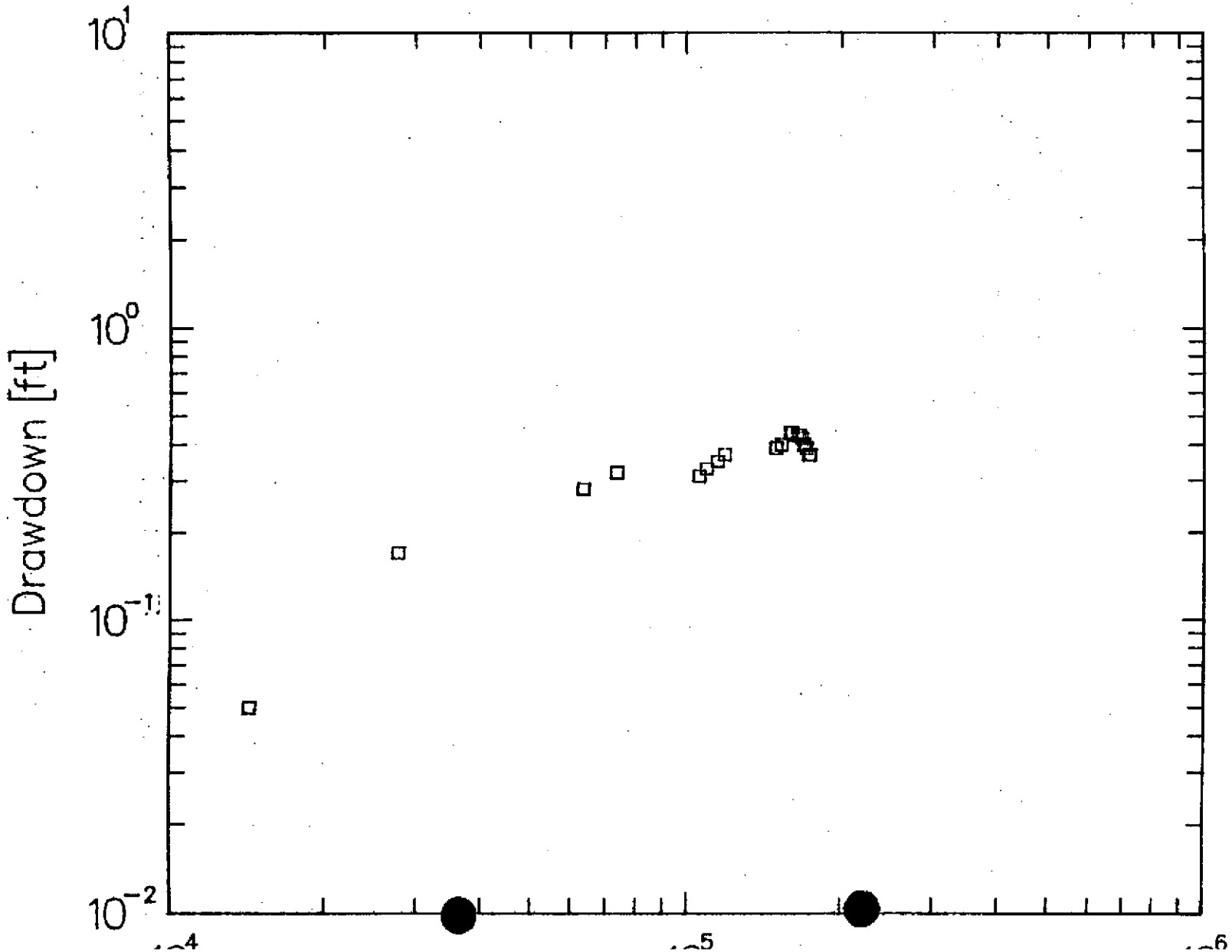

fig 8

Well 14: Log–Log Time–Recovery

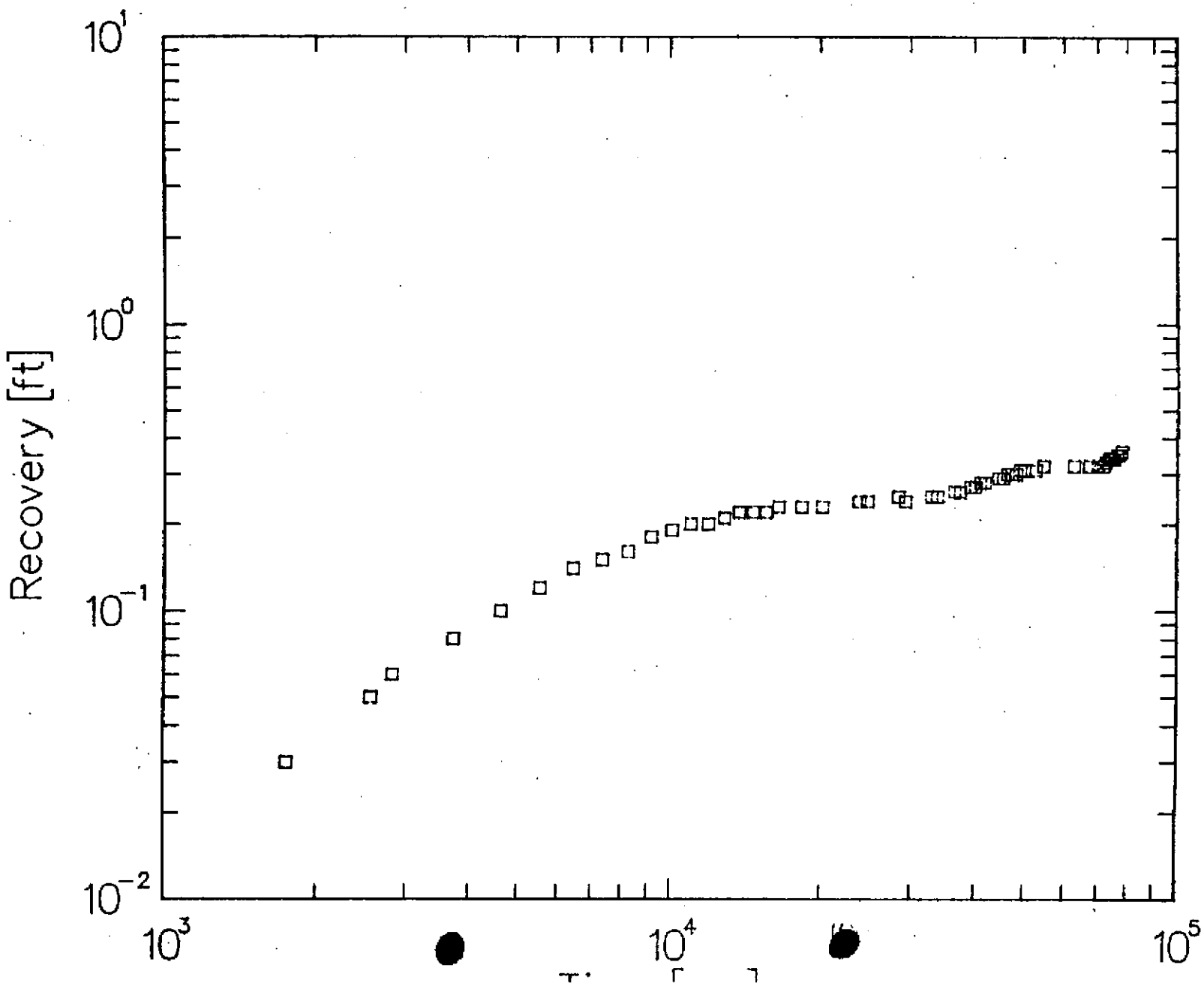

fig 6

Well 16: Log–Log Time--Recovery

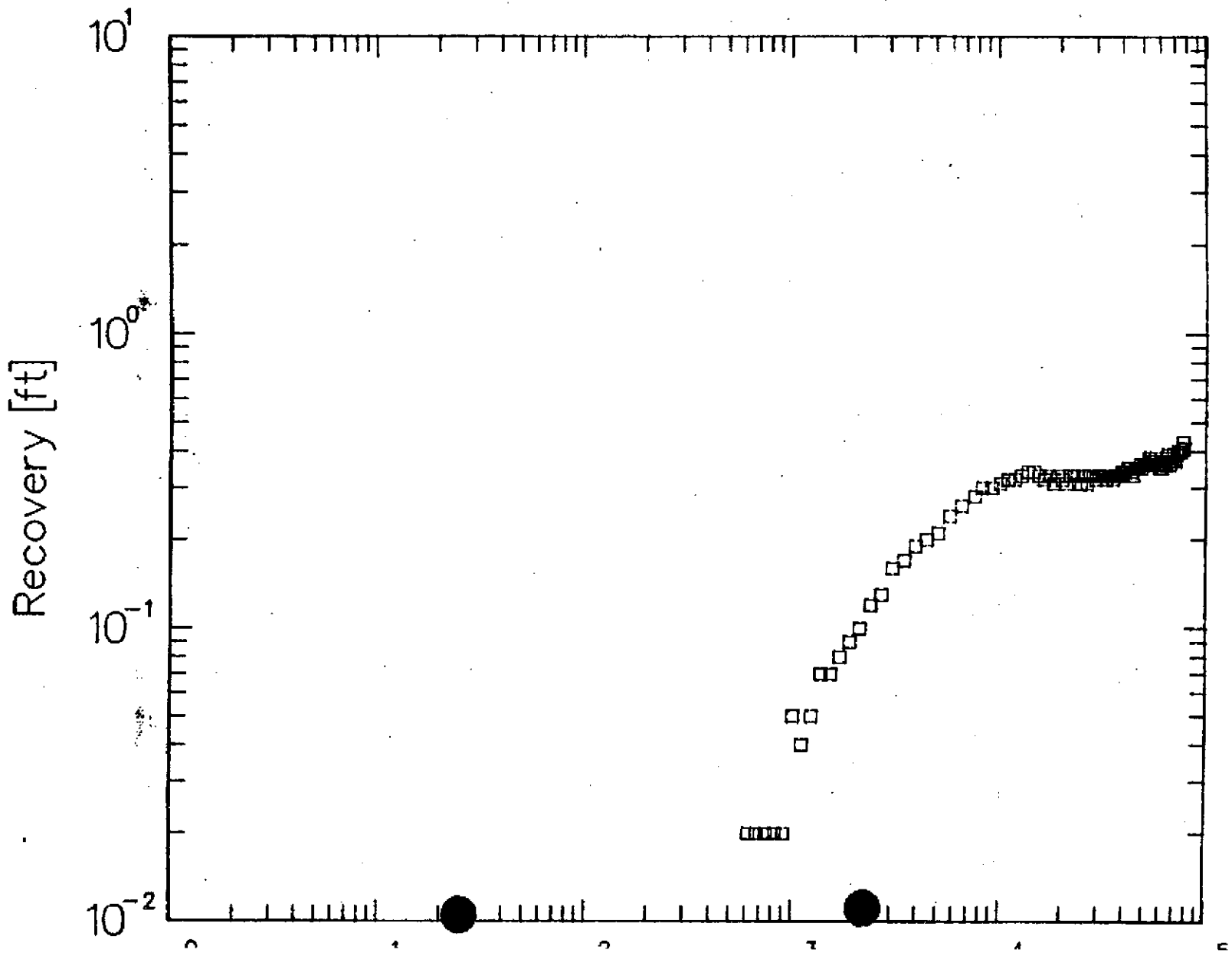

fig 11

Conclusions

A pump test was conducted using the American Borate Company water wells near Stateline, Nevada, for the purpose of quantifying transmissivity and specific yield values for a shallow aquifer. Data were collected and analyzed using standard procedures.

The estimated transmissivity for the alluvial material in which the wells are completed is 0.016 ft^2/sec (10,300 gpd/ft (gallons per day per foot)). The estimated storage coefficient is 0.05. These values are those obtained from the analysis of the well 15 corrected drawdown data. The recovery data and the drawdown data for the observation wells is considered to be non-representative of the aquifer materials.

Selected References

Driscoll, F. G., 1986, Groundwater and wells, 2nd. edition: Johnson Division, St. Paul, Minnesota, 1089 p.

Jacob, C. E., 1963, Correction of drawdowns caused by a pumped well tapping less than the full thickness of an aquifer, in Bentall, R., ed., Methods of determining permeability, transmissibility, and drawdown: U.S. Geological Survey Water-Supply Paper 1536-I, p. 272-292.

Loman, S. W., 1979, Ground-water hydraulics: U.S. Geological Survey Professional Paper 708, 70 p.

Weeks, E. P., 1977, Aquifer tests--the state of the art in hydrology in Invitational Well-Testing Symposium Proceedings: University of California, Berkly, California, p. 14-26.