DST REPORT

PATRICIA - 1

(W963)

ATTACHMENT TO WCR

W963. PATRICIA-1. DST RESULTS.

PATRICIA NO. 1 DST RESULTS

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January 1988

Report No. RN109
Copy No.: 4

PATRICIA NO. 1 DST RESULTS

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1. INTRODUCTION

Patricia No. 1 was drilled to total depth on 4 July 1987, and flow tested with the following objectives:

1) To determine the nature of gas and fluids in three potential reservoir zones.

2) To determine well deliverability and reservoir properties of the three zones.

3) To obtain representative gas samples for compositional and PVT analysis.

Four drill stem tests were run on this well. The first test was run in the small gas bearing sand in the Barracouta Formation to determine the deliverability of the sand. The second test was conducted on an interval of the Gurnard Formation, which logs indicated to be of poor quality, to determine whether the gas contained within this interval could be regarded as recoverable reserves. The third test was run to determine the deliverability of the entire gas bearing interval of the Gurnard Formation. However, during the test it became evident that flow restrictions were occurring in the test string, thereby masking the true productivity of the interval. The fourth and final test was conducted over the same interval as the third test, using a modified test string to overcome the flow restriction problems experienced in the previous test. A summary of the data gathered during the four tests is presented in Table 1.

This report presents the results of the analyses of the four drill stem tests, in particular the deliverabilities and reservoir properties of the three tested zones are presented.

2. CONCLUSIONS

2.1 DST No. 1 tested the gas bearing sand within the Barracouta Formation over the interval 744-747m RT and flowed dry gas with up to 75 ppm hydrogen sulphide at a maximum rate of 2.593 MMSCFPD with a surface flowing pressure of 75 psia.

2.2 A malfunction of the downhole gauges during DST No. 1 resulted in insufficient pressure data being collected to be able to determine the reservoir properties of the gas bearing sand in the Barracouta Formation. However, based on the information available, it would appear that the average permeability of the interval is less than 10 md.

2.3 DST No. 2 was conducted over the interval 719 - 728m RT in the Gurnard Formation to determine whether this poor quality section of the reservoir is productive. However the results of the test analysis indicate that the test interval was not isolated from the sands above and below. This is further substantiated by the cement bond log which indicates a poor cement bond across the test interval.

2.4 DST No. 3 was conducted over the interval 703 - 738m RT to determine the productivity and reservoir properties of the total gas bearing Gurnard Formation. The interval flowed dry gas at a maximum rate of 13.24 MMSCFPD with a surface flowing pressure of 230 psia.

2.5 The results of the analysis of DST No. 3 indicate a total flow capacity of 2689 md.ft with an absolute open flow potential of 31.9 MMSCFPD. The average permeability of the test interval is about 25 md.

2.6 While conducting DST No. 3, it was noted that flow restrictions were occurring in the 3-1/2" tubing test string, thereby masking the true productivity of the interval.

2.7 In order to overcome the flow restriction problems experienced in DST No. 3, a second test, DST No. 3A, was conducted over the same interval with a modified test string comprising 5" drillpipe. With this test string configuration, a maximum rate of 24.11 MMSCFPD was achieved with a surface flowing pressure of 419 psia.

2.8 Results of the analysis of DST No. 3A indicate a total flow capacity of 2278 md.ft, with an absolute open flow potential of 32.8 MMSCFPD. The average permeability of the test interval is calculated to be 21 md.

2.9 There is no evidence from the pressure transient analyses of any reservoir heterogeneities within the radius of investigation of the tests.

2.10 After considering the RFT pressure data and the extrapolated reservoir pressures from the test, which show an excellent comparison, the original reservoir pressure has been defined as 1087 psia at 745.5m RT in the Barracouta Formation and in the Gurnard Formation, it is defined as 1090 psia at 720.5m RT.

3. RESULTS OF PATRICIA NO. 1 DRILL STEM TESTS

3.1 DST No. 1 Results

DST No. 1 was conducted over the interval 744 - 747m RT in the Barracouta Formation. The objective of the test was to determine the deliverability of the gas bearing sand in the Barracouta Formation. The interval flowed dry gas containing hydrogen sulphide (up to a maximum concentration of 75 ppm) at a maximum rate of 2.593 MMSCFPD. A Pressure vs Time plot of the test is presented in Figure 1 and shows that rapid pressure build-ups and drawdowns were obtained during the test. A malfunction in the rapid sampling downhole gauge resulted in insufficient pressure data being collected to be able to determine reservoir properties. Since no core was recovered from this interval, an estimate of reservoir properties from core analysis is not possible. Several unsuccessful attempts were made to quantify the reservoir properties using the DST pressure data, the pressure drawdown data collected during RFT sampling, and the log analyses.

Details of the reservoir and fluid properties of the Barracouta Formation are presented in Table 2.

A Horner plot of the final build-up (the test period with the most data points) was produced with pseudo-pressure being plotted against log $(t+\Delta t)/\Delta t$ (refer Figure No. 2). Several possible straight lines were identified in the build-up plot with the results of their respective analyses summarized below.

Line No.	Slope (psi^2/cp.log cycle)	Permeability (md)	Skin Factor
1	42.5×10^6	5	-0.8
2	30.4×10^6	7	+0.1
3	21.3×10^6	10	+1.4
4	4.8×10^6	44	+48.8
5	2.6×10^6	83	+39.3

Previous experience with underbalanced perforation (as used on Patricia No. 1) has shown that skin factors resulting from formation damage created during perforating are close to zero. Given that the analysis of DST data from the Gurnard Formation indicated only minor near-wellbore formation damage (demonstrating the success of the use of underbalanced perforation in minimizing formation damage in Patricia No. 1), it would appear reasonable to assume that skin factors of a similar magnitude would be seen in the Barracouta Formation. Based upon this, the average permeability of the formation is less than 10 md.

3.2 DST No. 2 Results

DST No. 2 was conducted over the interval 719 - 728m RT in the Gurnard Formation. The objective of DST No. 2 was to determine whether this section of the reservoir, which the logs indicated to be of poor quality, is productive which, in turn, would allow the gas volumes contained in this zone to be included in the overall recoverable reserves. A Pressure vs Time plot of the test is presented in Figure 3.

Both pressure squared and pseudo-pressure approaches were adopted to analyse the data using the superposition time function. Since the reservoir pressure is less than 2000 psia, the use of the pressure squared approach is a valid approximation of the more complex pseudo-pressure analysis. Results of the analyses of respective test periods show an excellent comparison between the pseudo-pressure and pressure squared approaches, and as such only the pressure squared analyses will be presented in detail.

Details of the reservoir and fluid properties of the Gurnard Formation are presented in Table 3. Results of the test analyses performed on all flow periods and build-ups are presented in Figures 4 to 8, and are summarized in Tables 4 and 5. The results of the analyses indicate that the interval has the following properties:

Flow Capacity kh = 2308 md.ft
Skin S = +13.5
Absolute Open Flow Capacity AOF = 9.3 MMSCFPD

Assuming that the test interval was isolated from the gas bearing sands both above and below, the formation has an average permeability of about 82 md. The calculated total flow capacity (kh) of the interval however, is similar to that derived from the results of DST No. 3 and DST No. 3A. This indicates that the test interval was not isolated from the other higher quality Gurnard sands situated both above and below the test interval. This is further substantiated by the cement bond logs which show a poor cement bond around the test interval. The apparently high values of skin factors calculated for this test may be explained by partial completion effects in the total reservoir section, or by channeling behind the casing. Calculations have shown that the apparent skin factor caused by such a partial completion is in the region of +12.0, which is similar to the calculated skin factor of +13.5. This reduces the skin factor due to formation damage to approximately +1.5, which appears reasonable given that underbalanced perforation was used.

The extrapolated shut-in pressures from the analyses are detailed in Table 5 and indicate an average extrapolated pressure of 1095.8 psia at the middle perforation depth (723.5m RT). This agrees favourably with the pressure results from the RFT survey (refer Figure 13).

Based on the results of the test, it was evident that both inertial and turbulent effects were significant. A Flow-After-Flow analysis (refer Figures 9 and 10) was used to produce a Rate vs Skin plot (refer Figure 11) which yielded a rate-dependent skin coefficient (D) of 3.06×10^{-3} $MSCFPD^{-1}$ and a non-Darcy flow coefficient (F) of 1.06 $psia^2/cP/MSCFPD^2$. These inertial and turbulent effects were used to derive a deliverability relationship (refer Figure 12) which indicates an absolute open flow capacity of 9.3 MMSCFPD.

There was no evidence from the pressure transient analysis of any reservoir heterogeneities within the radius of investigation of the test (i.e. to a calculated maximum radius of 399 ft).

3.3 DST No. 3 Results

DST No. 3 was conducted over the interval 703 - 738m RT in the Gurnard Formation. The objective of DST No. 3 was to determine the productivity and reservoir properties of the total gas bearing Gurnard Formation. A Pressure vs Time plot of the test is presented in Figure 14.

Both pressure-squared and pseudo-pressure approaches were adopted to analyse the data using the superposition time function. Since the reservoir pressure is less than 2000 psia, the use of a pressure-squared approach is a valid approximation of the more complex pseudo-pressure analysis. Results of the analyses of respective test periods show an excellent comparison between the pseudo-pressure and pressure squared approaches and as such only the pressure squared analyses will be presented in detail.

Details of the reservoir and fluid properties of the Gurnard Formation are presented in Table 3. The results of the test analyses performed on all flow periods and build-ups are presented in Figures 15 to 21, and are summarized in Tables 6 and 7. The results of the analyses indicate that the test interval has the following properties:

Flow Capacity kh = 2689 md.ft
Skin S = +1.4
Absolute Open Flow Capacity AOF = 31.9 MMSCFPD

Assuming a net thickness of 109 ft, the average permeability of the test interval is about 25 md. During the test, it was noted that flow restrictions were occurring in the 3-1/2" tubing test string, thereby masking the true productivity of the interval. The flow restrictions occurred downstream of the pressure gauges and as such, a full modified isochronal analysis could still be undertaken.

The extrapolated shut-in pressures from the analyses are detailed in Table 7, and indicate an average extrapolated pressure of 1092.0 psia at the middle perforation depth (720.5m RT). This agrees favourably with the pressure results from the RFT survey (refer Figure 13).

Based on the results of the test, it was evident that both inertial and turbulent effects were significant. A modified isochronal test analysis (refer Figures 22 and 23) was used to produce a Rate vs Skin plot (refer Figure 24) which yielded a rate-dependent skin coefficient (D) of 1.00 x 10^{-4} $MSCFPD^{-1}$ and a non-Darcy flow coefficient (F) of 0.028 $psia^2/cP/MSCFPD^2$. These inertial and turbulent effects were used to derive a deliverability relationship (refer Figure 25) which indicated an absolute open flow capacity of 31.9 MMSCFPD.

There was no evidence from the pressure transient analysis of any reservoir heterogeneities within the radius of investigation of the test (i.e. to a calculated maximum radius of 142 ft).

3.4 DST No. 3A Results

DST No. 3A was conducted over the same interval of 703 - 738m RT in the Gurnard Formation as DST No. 3, with a modified test string using 5" drillpipe. The objective of DST No. 3A was to overcome the flow restriction problems experienced while testing the same interval in DST No. 3, by using the large diameter test string, and hence ascertain the true productivity of the total gas bearing Gurnard Formation. A Pressure vs Time plot of the test is presented in Figure 26.

Both pressure squared and pseudo-pressure approaches were adopted to analyse the data using the superposition time function. Since the reservoir pressure is less than 2000 psia, the use of a pressure squared approach is a valid approximation of the more complex pseudo-pressure analysis. Results of the analyses of respective test periods show an excellent comparison between the pseudo-pressure and pressure squared approaches, and as such only the pressure squared analyses will be presented in detail.

Details of the reservoir and fluid properties of the Gurnard Formation are presented in Table 3. The results of the test analyses performed on all flow periods and build-ups are presented in Figures 27 to 30, and are summarized in Tables 8 and 9. The results of the analyses indicate that the test interval has the following properties:

Flow Capacity kh = 2278 md.ft
Skin S = +1.2
Absolute Open Flow Capacity AOF = 32.8 MMSCFPD

Assuming a net thickness of 190 ft, the average permeability of the interval is about 21 md. This compares favourably with the average permeability of 25 md calculated from the results of DST No. 3. With the modified test string, a maximum gas rate of 24.11 MMSCFPD was achieved, with a surface flowing pressure of 419 psia. The measured productivity was significantly improved over the maximum rate of 13.24 MMSCFPD with a surface pressure of 230 psia achieved in DST No. 3, which indicates that the problem of flow restrictions in the test string had been overcome by the use of the larger diameter test string.

The extrapolated shut-in pressures from the analyses are detailed in Table 9, and indicate an average extrapolated pressure of 1090.3 psia at the middle perforation depth (720.5m RT). This agrees favourably with the pressure results from the RFT pressures survey (refer Figure 13).

Based on the results of DST No. 3, it appeared that both inertial and turbulent effects would also be significant in DST No. 3A. Since the same interval was tested in both DST No. 3 and DST No. 3A, the same coefficients of rate dependent skin and non-Darcy flow were used to derive a deliverability relationship (refer Figure 30), which indicated an absolute open flow capacity of 32.8 MMSCFPD. This agrees favourably with the estimate of 31.9 MMSCFPD derived from the results of DST No. 3.

There was no evidence from the pressure transient analysis of any reservoir heterogeneities within the radius of investigation of the test (i.e. to a calculated maximum radius of 108 ft).

3.5 Sampling

Gas samples were taken at the separator gas outlet during tests conducted on both the Barracouta and Gurnard Formations. The samples were sent to two independent laboratories for analysis. A summary of the results of the gas analyses is presented in Table 10.

Upon completion of the testing operations, it was discovered that significant sand production had occurred during the flow testing of the Gurnard Formation. The very fine nature of the produced sand resulted in the sand production occurring undetected by the sand detection probe (SANDEC) installed in the surface test equipment. Sand samples taken from the core have been sent to various service companies for a sieve analysis and for their sand control recommendations.

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TABLES

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TABLE 1

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PATRICIA NO. 1

SUMMARY OF DST RESULTS

Phase II

DST NO.	OPERATION	CHOKE SIZE (inches)	DURATION (Min)	FINAL FLOWING PRESSURE BOTTOMHOLE (psia)	FINAL FLOWING PRESSURE WELLHEAD (psia)	GAS FLOWRATE (MMSCFPD)
1	Clean-Up Flow	1	233	169	75	2.593
	Clean-Up Build-Up	-	230	-	-	-
	First Iso Flow	3/8	237	635	570	1.810
	First Iso Build-up	-	236	-	-	-
	Second Iso Flow	1/2	242	423	365	2.023
	Second Iso Build-up	-	238	-	-	-
	Third Iso Flow	5/8	251	251	191	2.050
	Final Build-Up	-	30	-	-	-
2	Clean-Up Flow	1	235	671	435	8.300
	Clean-Up Build-Up	-	223	-	-	-
	First Iso Flow	5/8	241	895	575	5.150
	First Iso Build-Up	-	242	-	-	-
	Second Iso Flow	1	169	833	282	6.123
	Final Build-Up	-	8	-	-	-
3	Clean-Up Flow #1	1 1/4+ 1 1/4	153	906	217	12.310
	Clean-Up Build-Up #1	-	3	-	-	-
	Clean-Up Flow #2	1 1/4+ 1 1/4	83	890	230	13.240
	Clean-Up Build-Up #2	-	235	-	-	-
	First Iso Flow	3/8	180	1049	971	3.200
	First Iso Build-Up	-	180	-	-	-
	Second Iso Flow	1/2	181	1013	906	5.890
	Second Iso Build-Up	-	178	-	-	-
	Third Iso Flow	5/8	188	980	826	8.354
	Final Build-Up	-	107	-	-	-
3A	Clean-Up Flow	1 1/4+ 1 1/4	126	765	374	22.830
	Clean-Up Build-Up	-	108	-	-	-
	Main Flow Period	1 1/4+ 1 1/4	240	774	419	24.110
	Final Build-Up	-	254	-	-	-

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TABLE 2

PATRICIA NO. 1
BARRACOUTA FORMATION
RESERVOIR AND FLUID PROPERTIES

Gas Composition

Bottom ~~Mid~~ table

N2	1.27%
CO2	1.00%
C1	97.53%
C2	0.16%
C3	0.01%
iC4	0.01%
nC4	0.01%
iC5	0.01%
nC5	0.01%
C6+	0.03%

Gas Properties

Gas Gravity (Air = 1.0) = 0.571

Critical Pressure = 669.8 psia

Critical Temperature = -115.5°F

Initial Gas Compressibility Factor = 0.910

Initial Gas Viscosity = 0.013 cp

Reservoir Properties

Date

At Top

Interval = 744 - 747m RT

Reservoir Pressure = 1087 psia

Reservoir Temperature = 106°F

Average Porosity = 25%

Average Water Saturation = 0.35%

Net to Gross Ratio = 0.90

TABLE 3

PATRICIA NO. 1
GURNARD FORMATION
RESERVOIR AND FLUID PROPERTIES

Gas Composition

N_2	0.66%
CO_2	1.32%
C_1	97.70%
C_2	0.28%
C_3	0.005%
iC_4	0.003%
nC_4	0.000%
iC_5	0.000%
nC_5	0.003%
C_{6+}	0.005%

Gas Properties

Gas Gravity (Air = 1.0) = 0.573
Critical Pressure = 672.5 psia
Critical Temperature = -112.7^{o}F
Initial Gas Compressibility Factor = 0.907
Initial Gas Viscosity = 0.013 cp

Reservoir Properties

Interval = 700 - 739m RT
Reservoir Pressure = 1090 psia
Reservoir Temperature = 106^{o}F
Average Porosity = 34%
Average Water Saturation = 35%
Net to Gross Ratio = 0.95

TABLE 4

DST NO. 2 RESULTS

FLOW PERIOD/ TEST	PRESSURE SQUARED ANALYSIS RESULTS kh (md-ft)	k* (md)	S	ΔPSKIN (psi)	RINV (ft)	AOF (MMSCFPD)	PSEUDO-PRESSURE ANALYSIS RESULTS kh (md-ft)	k* (md)	S	ΔPSKIN (psi)	RINV (ft)	AOF (MMSCFPD)
Drawdowns Flow After Flow	2323.1	82.7	-	-	-	9.4	2374.4	84.5	-	-	-	9.5
Clean-Up Build-Up Variable Rate B/U	2299.0	81.8	+15.8	329.2	309.5	-	2320.6	82.6	+16.7	331.4	310.9	-
Flow # 1 Variable Rate D/D	2333.0	83.0	-	-	-	9.2	2315.0	82.4	-	-	-	9.3
Build-Up # 1 Variable Rate B/U	2372.8	84.4	+12.7	137.3	399.1	-	2370.7	84.4	+13.1	138.6	399.0	-
Flow # 2 Variable Rate D/D	2274.7	81.0	-	-	-	9.3	2117.6	75.4	-	-	-	9.3
Build-Up # 2 Variable Rate B/U	2261.8	80.8	+13.1	183.8	271.8	-	2281.5	81.5	+13.8	186.3	273.0	-
Average Results	2308.3	82.2	-	-	-	9.3	2281.1	81.3	-	-	-	9.4

* Calculated Assuming h = 28.10 ft.

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TABLE 5

DST NO. 2 - EXTRAPOLATED PRESSURES

FLOW PERIOD/ TEST	PRESSURE SQUARED ANALYSIS RESULTS		PSEUDO-PRESSURE ANALYSIS RESULTS	
	PEXTRAP AT GAUGE DEPTH* (psia)	PEXTRAP AT MID POINT PERFORATION** (psia)	PEXTRAP AT GAUGE DEPTH (psia)	PEXTRAP AT MID POINT PERFORATION (psia)
CLEAN UP BUILD-UP VARIABLE RATE B/U	1095.6	1096.8	1094.9	1096.1
BUILD-UP # 1 VARIABLE RATE B/U	1094.6	1095.8	1094.7	1095.9
BUILD-UP # 2 VARIABLE RATE B/U	1093.6	1094.8	1093.9	1095.1
AVERAGE RESULTS	1094.6	1095.8	1094.5	1095.7

* GAUGE DEPTH = 707.64 m. RT
** MID POINT PERFORATION DEPTH = 723.5m. RT

TABLE 6

DST NO. 3 RESULTS

FLOW PERIOD/ TEST	PRESSURE SQUARED ANALYSIS RESULTS						PSEUDO-PRESSURE ANALYSIS RESULTS					
	kh (md-ft)	k* (md)	S	ΔPSKIN (psi)	RINV (ft)	AOF (MMSCFPD)	kh (md-ft)	k* (md)	S	ΔPSKIN (psi)	RINV (ft)	AOF (MMSCFPD)
Isochronal Build-Up	2229.7	20.5	-	-	-	-	2102.8	19.3	-	-	-	-
Isochronal Drawdown	2844.1	26.1	-	-	-	30.8	3364.1	30.9	-	-	-	31.6
Clean-Up Build-Up Variable Rate B/U	2684.0	24.6	+19.3	749.4	130.3	-	2622.7	24.1	+19.8	750.3	128.8	-
Iso Flow # 1 Variable Rate D/D	2295.8	21.1	-	-	-	32.9	2161.7	19.8	-	-	-	32.2
Iso Build-Up # 1 Variable Rate B/U	2535.4	23.3	+11.6	68.7	142.4	-	2460.5	22.6	+11.4	68.5	140.3	-
Iso Flow # 2 Variable Rate D/D	3048.8	28.0	-	-	-	31.4	3233.9	29.7	-	-	-	31.2
Iso Build-Up # 2 Variable Rate B/U	2331.7	21.4	+3.7	44.9	136.4	-	2341.6	21.5	+3.9	46.3	136.7	-
Iso Flow # 3 Variable Rate D/D	3751.1	34.4	-	-	-	32.5	3722.2	34.1	-	-	-	31.9
Iso Build-Up # 3 Variable Rate B/U	2479.4	22.7	+1.3	22.0	108.6	-	2474.6	22.7	+1.5	23.6	106.9	-
Average Results	2688.9	24.7	-	-	129.4	31.9	2720.5	25.0	-	-	128.2	31.7

* Calculated Assuming h = 109 ft.

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TABLE 7

DST NO. 3 - EXTRAPOLATED PRESSURES

FLOW PERIOD/ TEST	PRESSURE SQUARED ANALYSIS RESULTS		PSEUDO-PRESSURE ANALYSIS RESULTS	
	PEXTRAP AT GAUGE DEPTH* (psia)	PEXTRAP AT MID POINT PERFORATION** (psia)	PEXTRAP AT GAUGE DEPTH (psia)	PEXTRAP AT MID POINT PERFORATION (psia)
BUILD-UPS ISOCHRONAL	1086.8	1089.0	1087.1	1089.3
CLEAN-UP BUILD-UP VARAIBLE RATE B/U	1090.2	1092.4	1090.1	1092.3
BUILD-UP #1	1090.7	1092.9	1090.8	1093.0
BUILD-UP # 2	1091.8	1093.0	1091.5	1093.7
BUILD-UP # 3	1091.7	1092.9	1091.3	1093.5
AVERAGE RESULTS	1090.2	1092.0	1090.2	1092.4

* GAUGE DEPTH = 691.80m. RT
** MID POINT PERFORATION DEPTH = 720.5m. RT.

TABLE 8

DST NO. 3A RESULTS

FLOW PERIOD/ TEST	PRESSURE SQUARED ANALYSIS RESULTS kh (md-ft)	k* (md)	S	Δ PSKIN (psi)	RINV (ft)	AOF (MMSCFPD)	PSEUDO-PRESSURE ANALYSIS RESULTS kh (md-ft)	k* (md)	S	Δ PSKIN (psi)	RINV (ft)	AOF (MMSCFPD)
Flow # 1 Variable Rate D/D	2183.7	20.0	-	-	-	26.3	2264.1	20.8	-	-	-	26.9
Build-Up #1 Variable Rate B/U	2276.8	20.9	+1.1	68.0	107.7	-	2313.0	21.2	+1.3	74.5	108.5	-
Flow # 2 Variable Rate D/D	2308.8	21.2	-	-	-	32.8	2319.9	21.3	-	-	-	33.0
Build-Up # 2 Variable Rate B/U	2341.1	21.5	+1.2	69.4	108.4	-	2307.7	21.2	+1.3	74.0	107.7	-
Average Results	2277.6	20.9	-	-	108.1	29.6	2301.2	21.1	-	-	108.1	30.0

* Calculated Assuming h = 109 ft.

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TABLE 9

DST NO. 3A - EXTRAPOLATED PRESSURES

FLOW PERIOD/ TEST	PRESSURE SQUARED ANALYSIS RESULTS		PSEUDO-PRESSURE ANALYSIS RESULTS	
	PEXTRAP AT GAUGE DEPTH* (psia)	PEXTRAP AT MID POINT PERFORATION** (psia)	PEXTRAP AT GAUGE DEPTH (psia)	PEXTRAP AT MID POINT PERFORATION (psia)
BUILD-UP # 1	1089.5	1090.8	1089.0	1090.3
BUILD-UP # 2	1088.4	1089.7	1088.8	1090.1
AVERAGE RESULTS	1089.0	1090.3	1088.9	1090.2

* GAUGE DEPTH = 703.50m. RT.
** MID POINT PERFORATION DEPTH - 720.50m. RT.

TABLE 10

PATRICIA NO. 1

SUMMARY OF GAS ANALYSIS RESULTS

	FLOPETROL ANALYSIS				GAS AND FUEL ANALYSIS				AVERAGE	
DST NO	1	1	3	3	1	1	3	3	1	3
BOTTLE NO	54263	54284	54303	54275	54255	54237	54257	54281	-	-
N2	1.27	2.10	0.65	0.61	1.17	1.44	0.68	0.66	1.50	0.65
CO2	1.00	1.05	1.24	1.25	0.92	0.96	1.32	1.32	0.98	1.28
C1	97.53	96.56	97.69	97.59	97.8	97.4	97.7	97.7	97.3	97.67
C2	0.16	0.19	0.32	0.30	0.12	0.12	0.28	0.28	0.15	0.30
C3	0.01	0.03	0.01	0.03	0.004	0.004	0.005	0.005	0.012	0.01
iC4	0.01	0.01	0.01	0.01	0.00	0.00	0.003	0.003	0.00	0.004
nC4	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.000	0.00	0.00
iC5	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.000	0.00	0.00
nC5	0.01	0.01	0.01	0.02	0.004	0.006	0.003	0.003	0.003	0.007
C6+	0.03	0.05	0.08	0.06	0.006	0.015	0.005	0.005	0.025	0.04
HEATING VALUE mJ/m^3	36.97	36.69	37.25	37.44	36.95	36.84	37.04	36.86	36.86	37.15
GRAVITY	0.571	0.576	0.573	0.576	0.568	0.570	0.571	0.573	0.571	0.573

NOTE: THE ABOVE ANALYSES HAVE BEEN CORRECTED TO AN AIR FREE BASIS.

FIGURES

LIST OF FIGURES

PANGAS (C) EPDS 1985, 86, 87.

PRESSURE v TIME PLOT FOR DST NO. 1

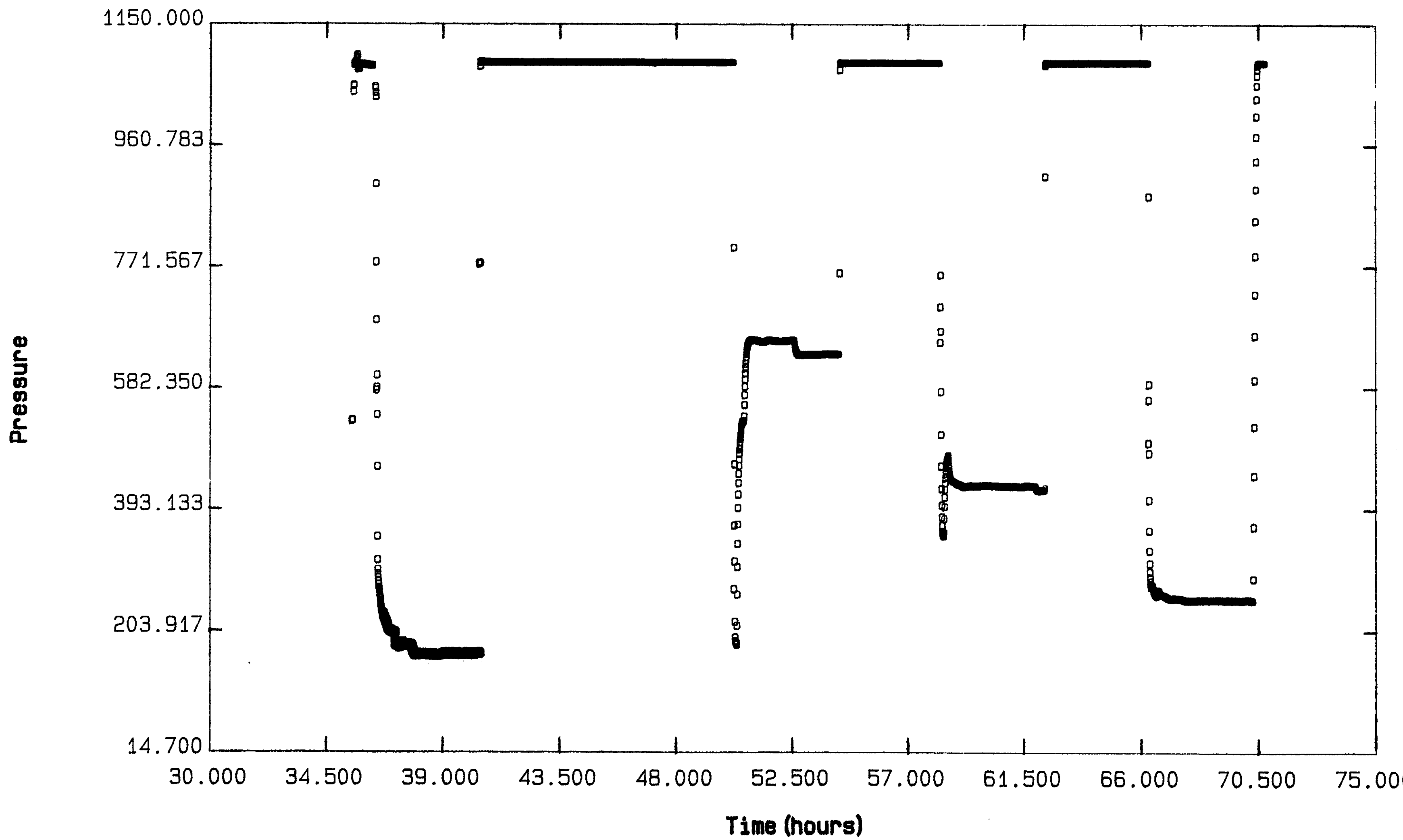
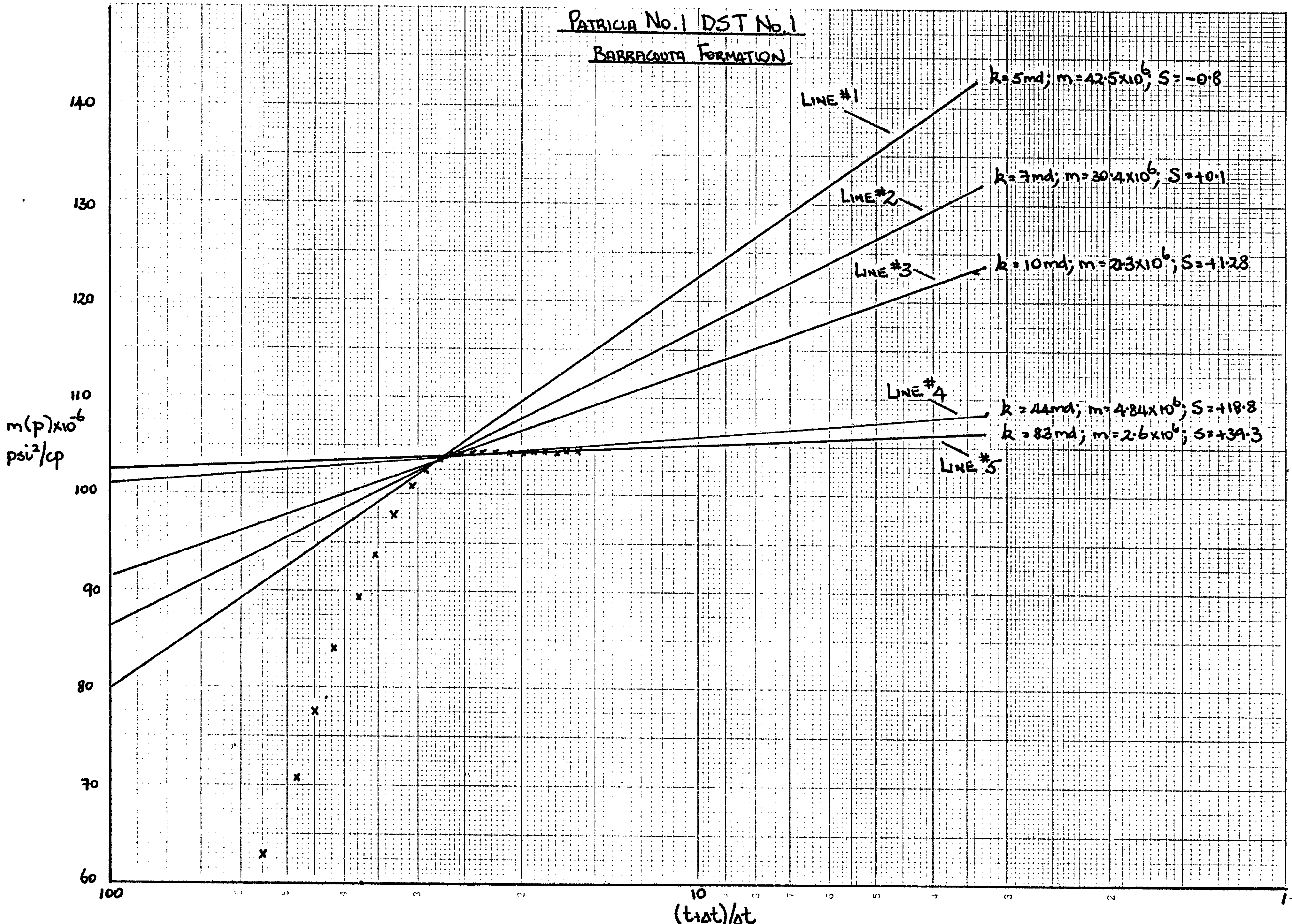


Figure 1



PATRICIA No. 1 DST No. 1
BARRACOUTA FORMATION
LINE #1
k = 5md; m = 42.5x10^6; S = -0.8
LINE #2
k = 7md; m = 30.4x10^6; S = +0.1
LINE #3
k = 10md; m = 20.3x10^6; S = +1.28
LINE #4
k = 44md; m = 4.84x10^6; S = +18.8
k = 83md; m = 2.6x10^6; S = +39.3
LINE #5
m(p)x10^-6 psi²/cp
140
130
120
110
100
90
80
70
60
100
10
1
(t+Δt)/Δt

Figure 2

PANGAS (C) EPDS 1985, 86, 87.

PRESSURE v TIME PLOT FOR DST NO. 2

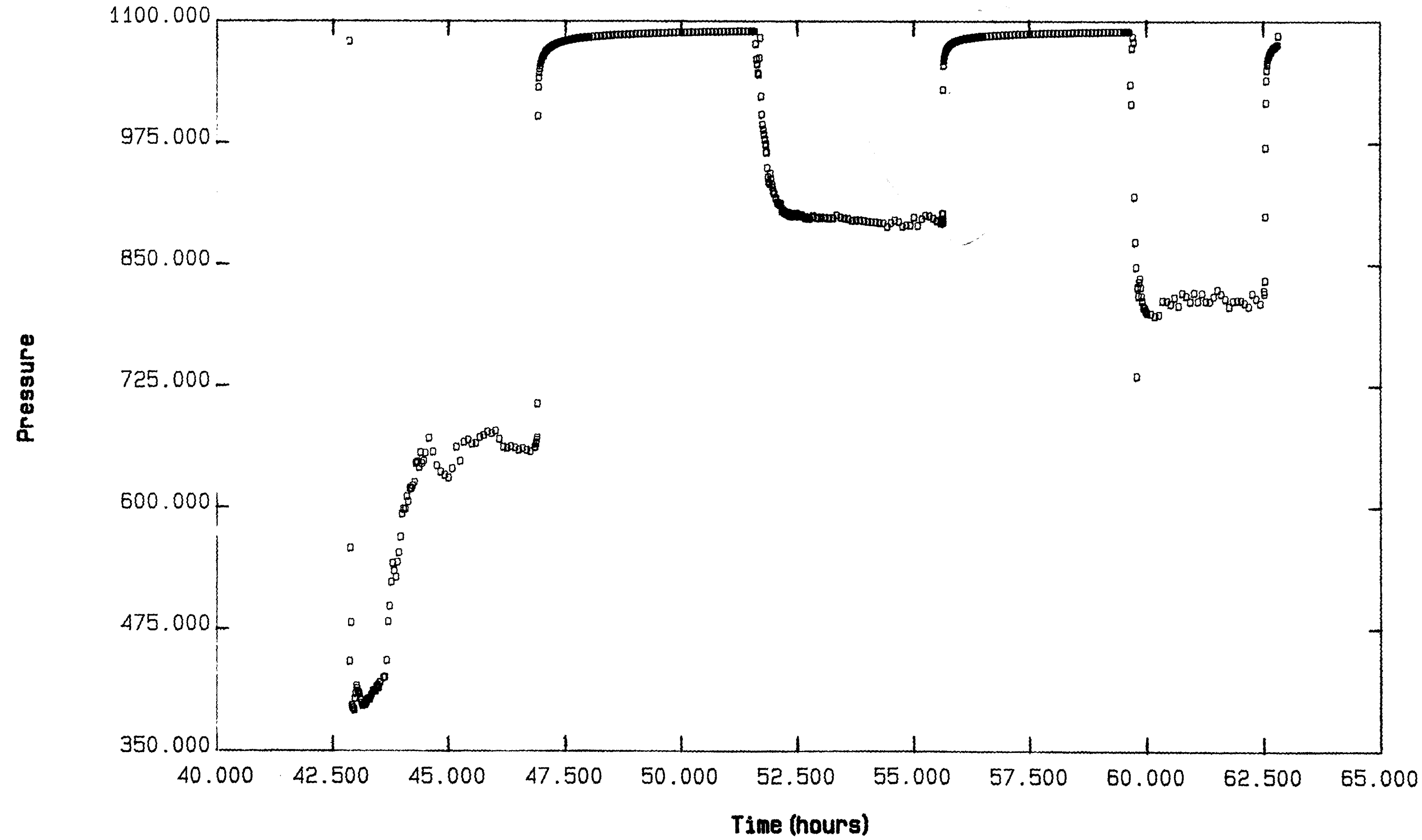


Figure 3

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 2

File	DST2CUB	Dst No.	2	Slope	-0.040
Analyst name	GARY HING	Date	SEPTEMBER 1987	Intercept	1.200
Company	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE BUILD-UP (SUPERPOSITION	Permeability	81.813
Well	PATRICIA NO. 1	Test	DST NO. 2 CLEAN UP BUILD PERIOD.	Skin	15.833

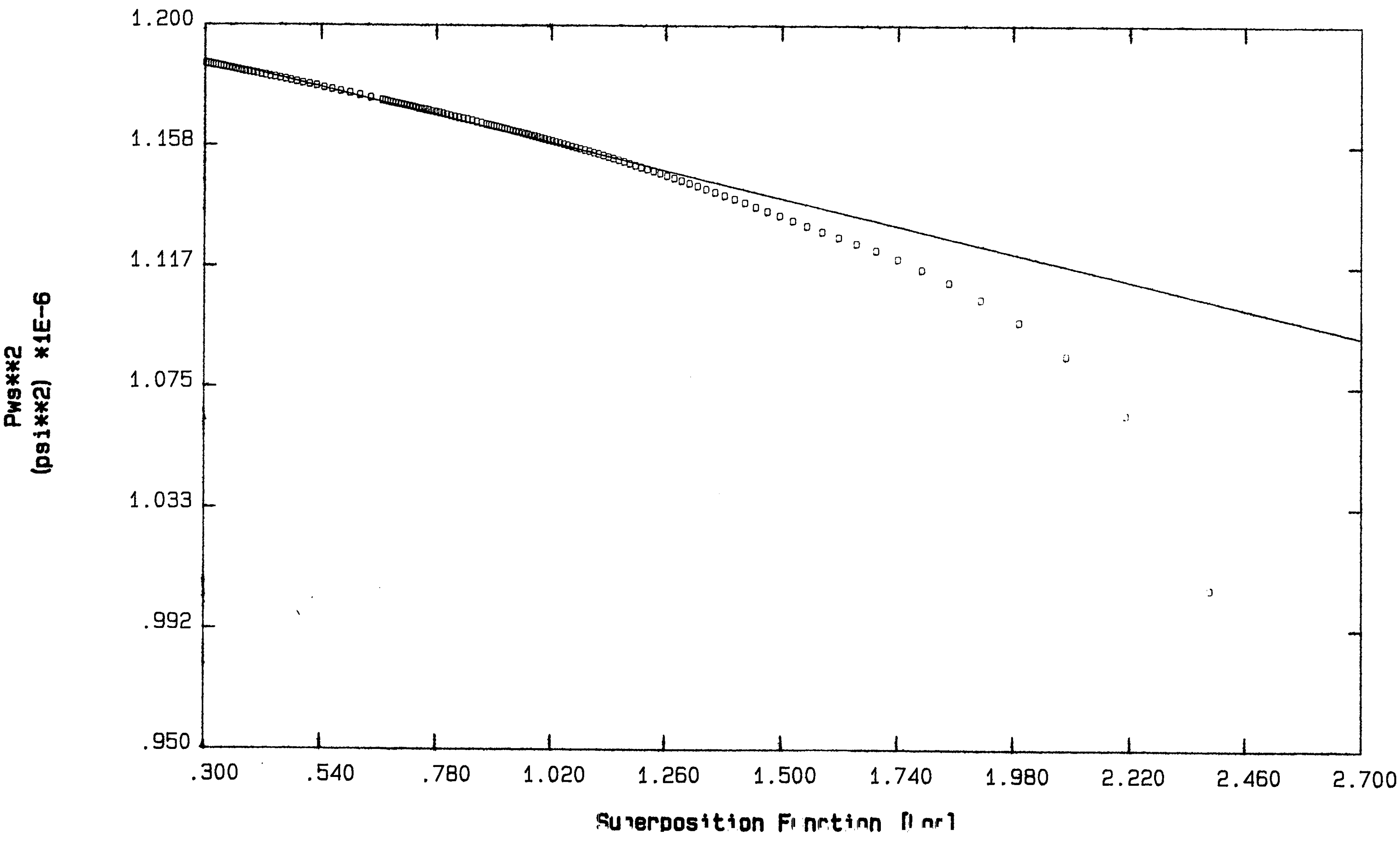


Figure 4

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 2

File..........	DST2IF1	Dst No..............	2	Intercept.....:	0.006
Analyst name..........	GARY HING	Date....................	SEPTEMBER 1987	Permeability.:	83.023
Company................	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin.........:	-4.052
Well..............	PATRICIA NO. 1	Test................	DST NO. 2 FLOW PERIOD NO. 1	F............:	1.060

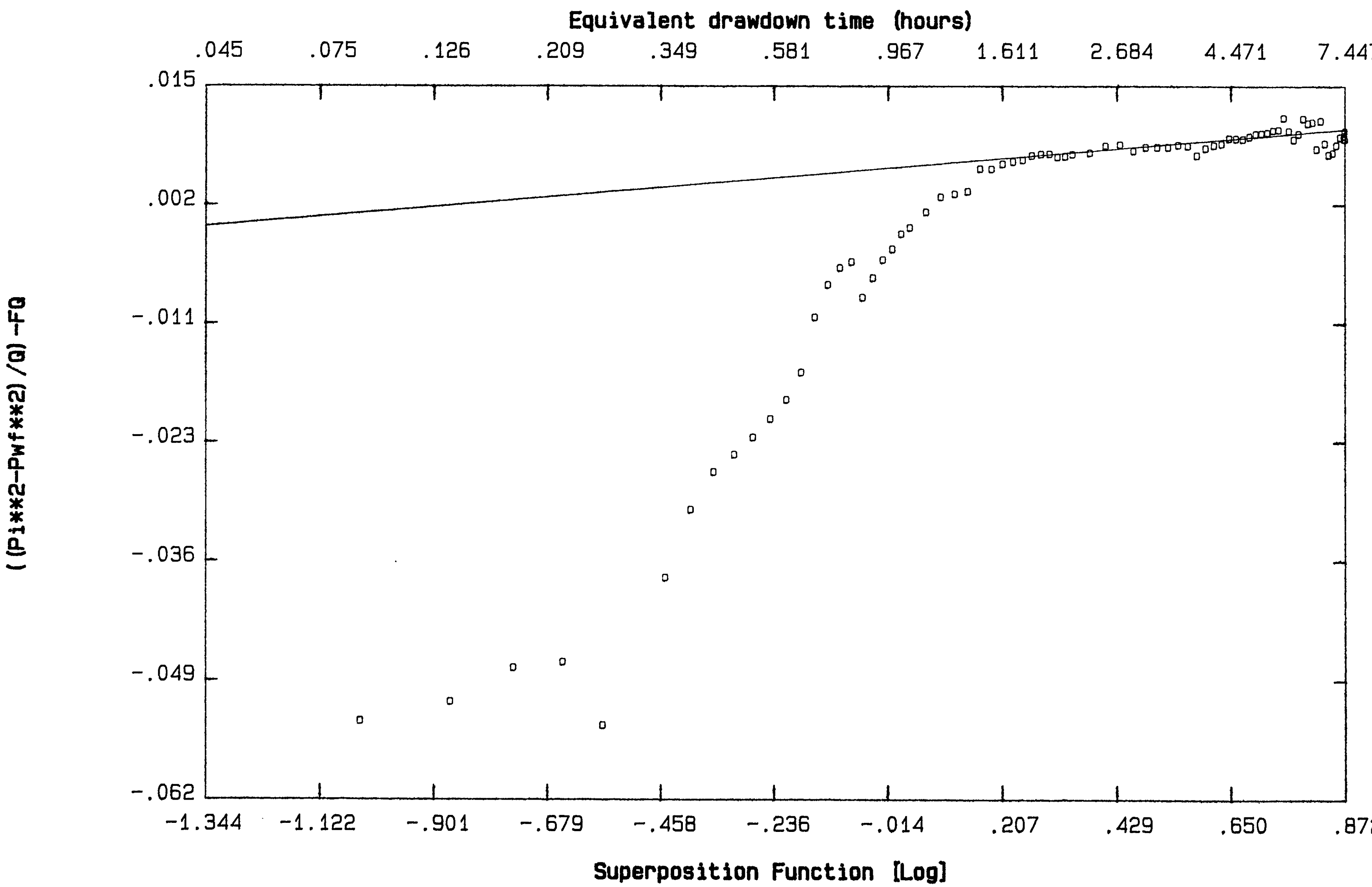


Figure 5

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 2

File..................	DST2IS1	Dst No..................	2	Slope........	-0.024
Analyst name..........	GARY HING	Date....................	SEPTEMBER 1987	Intercept....	1.198
Company...............	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE BUILD UP (SUPERPOSITION	Permeability.	84.441
Well....	PATRICIA NO. 1	Test..	DST NO. 2 BUILD PERIOD #1	Skin......	12.671

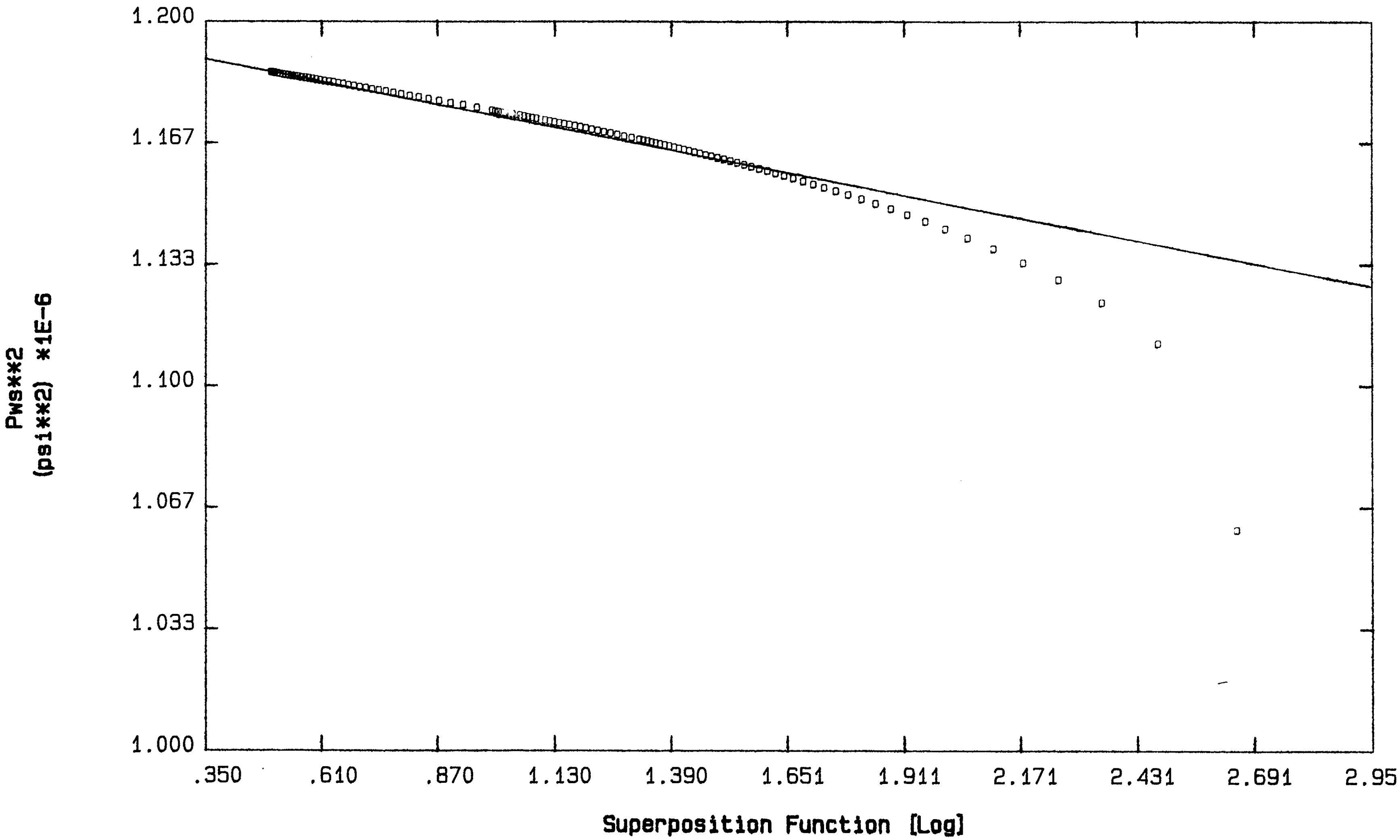


Figure 6

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 2

File......................:	DST2IF2	Dst No...................:	2	Intercept.....:	0.006
Analyst name............:	GARY HING	Date.......................:	SEPTEMBER 1987	Permeability.:	80.949
Company....... ....:	LASMO ENERGY AUSTRALIA	Analysis ....:	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin.........:	-4.034
Well....... .....:	PATRICIA NO. 1	Test.......... ....:	DST NO. 2 FLOW PERIOD NO. 2	F...... ...:	1.060

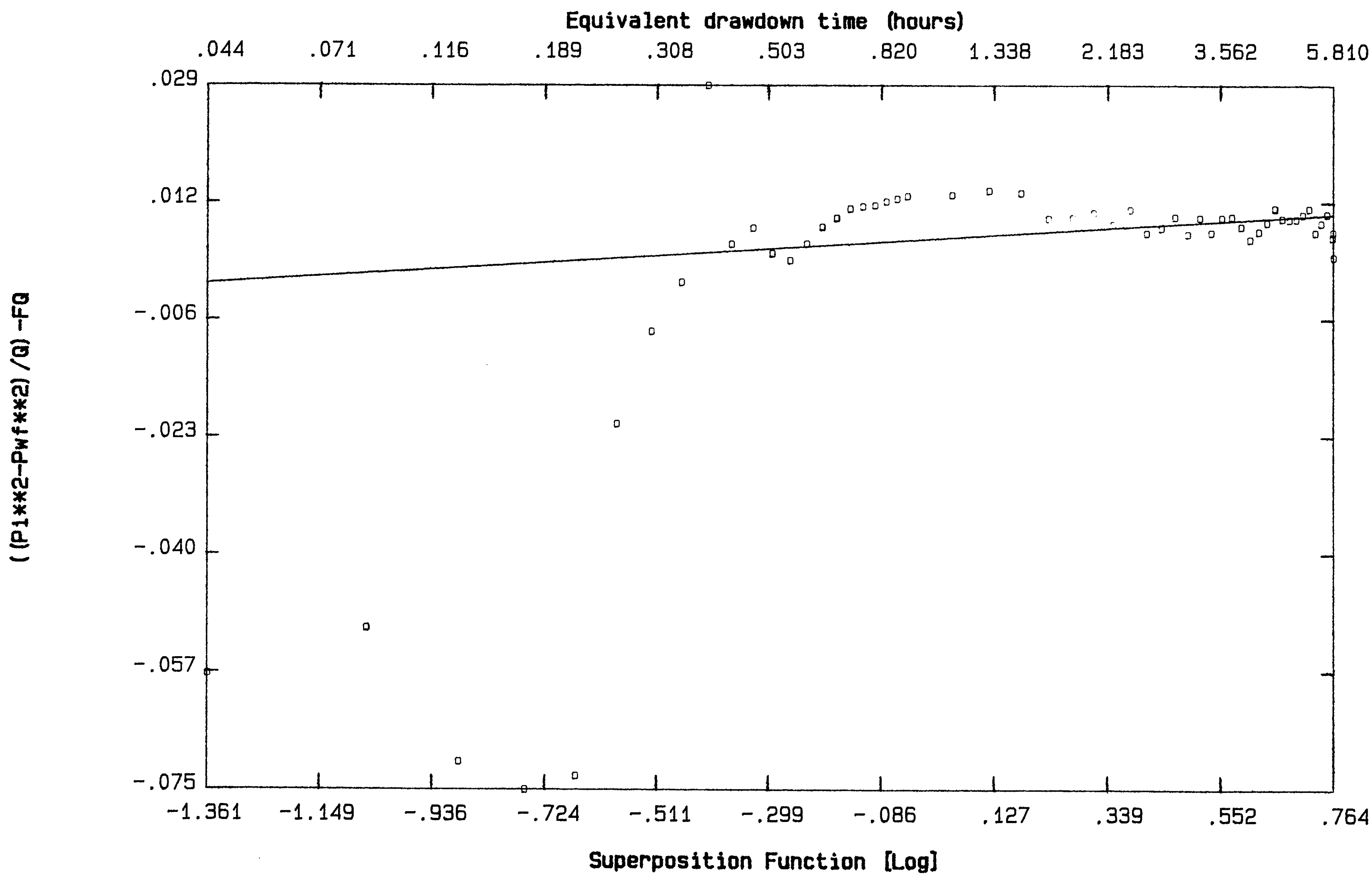


Figure 7

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 2

File..........	DST2IS2	Dst No..........	2	Slope........	-0.030
Analyst name....	GARY HING	Date..........	SEPTEMBER 1987	Intercept.....	1.195
Company......	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE BUILD UP (SUPERPOSITION	Permeability..	80.776
Well	PATRICIA NO. 1	Test.	DST NO. 2 BUILD PERIOD #2	Skin..	13.048

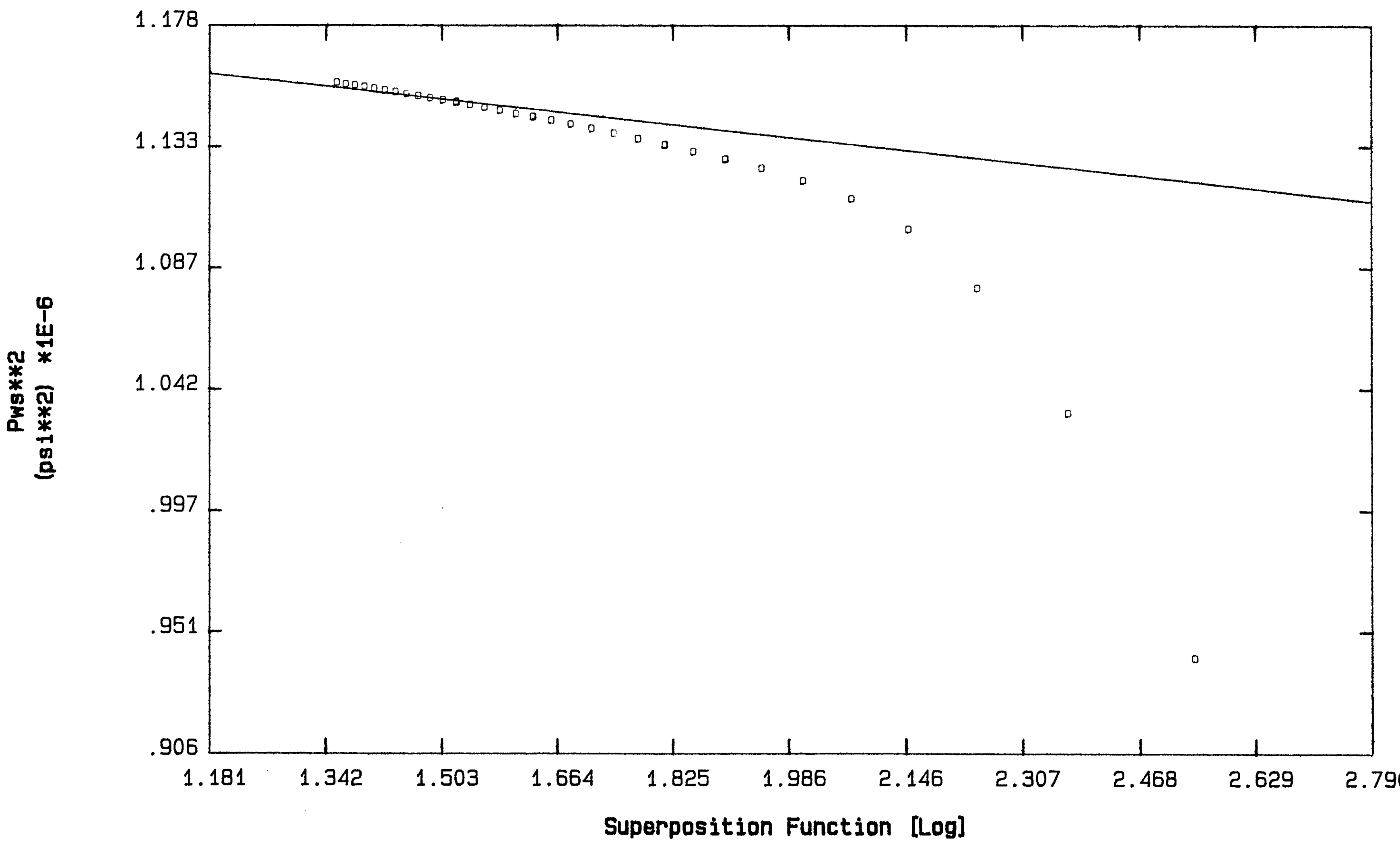


Figure 8

PANGAS (C) EPDS 1985, 86, 87.

FAF PLOT FOR DST NO. 2

File..................	DST2	Dst No..................	2			Line 1	Line 2
Analyst name...	GARY HING	Date....................	SEPTEMBER 1987	Slope.........		0.004	0.004
Company...	LASMO ENERGY AUSTRALIA	Analysis	FLOW AFTER FLOW	Intercept.....		0.066	0.078
Well..........	PATRICIA NO. 1	Test....................	DST NO. 2	Flowrate......		5.150	6.120
				Skin..........		10.465	13.434

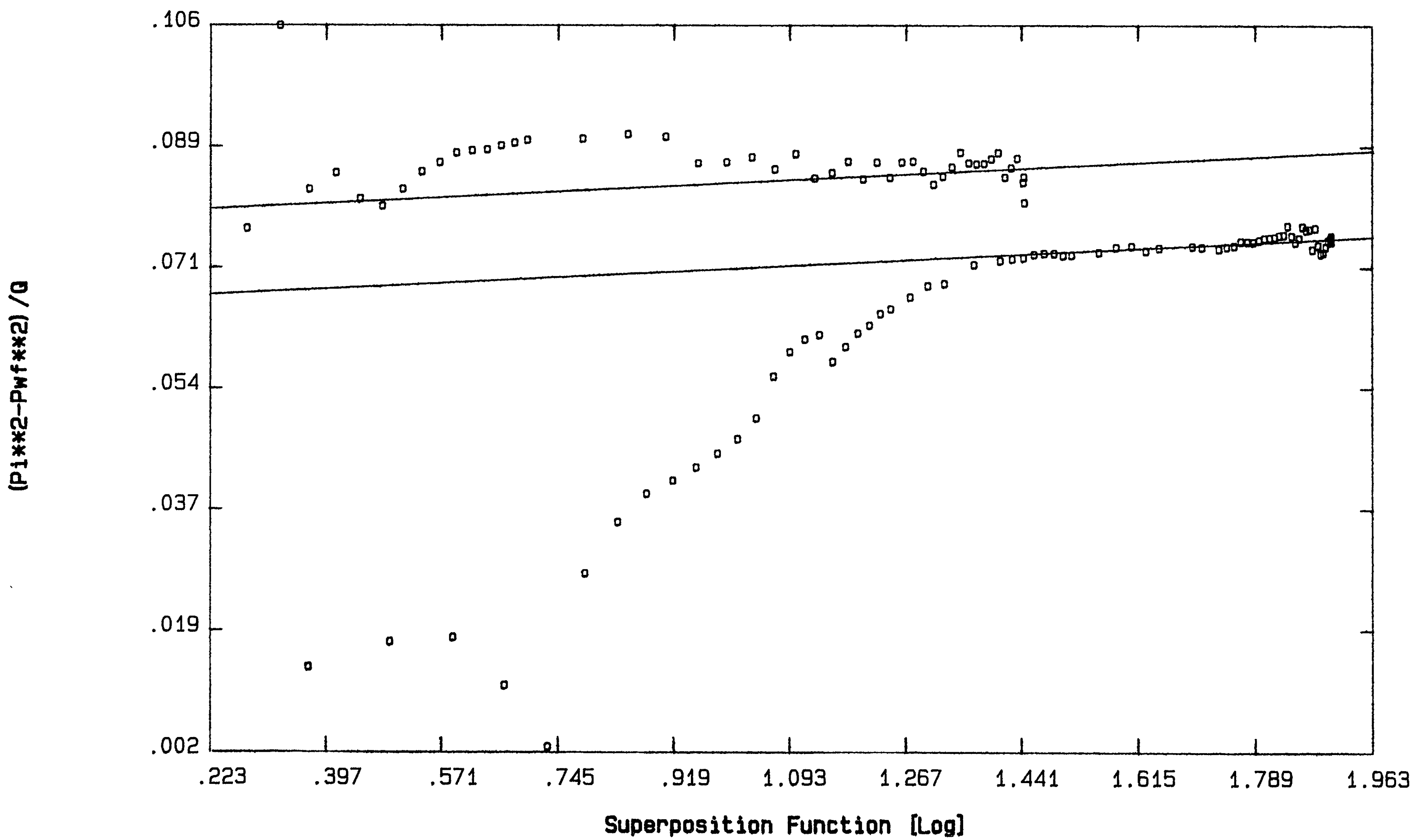


Figure 9

PANGAS (C) EPDS 1985, 86, 87.

FAF PLOT FOR DST NO. 2

File..........	DST2	Dst No..........	2	Intercept.....	0.000
Analyst name......	GARY HING	Date..........	SEPTEMBER 1987	Permeability..	82.674
Company......	LASMO ENERGY AUSTRALIA	Analysis	FLOW AFTER FLOW	Skin..........	-5.438
Well....	PATRICIA NO. 1	Test..........	DST NO. 2	F..........	1.059

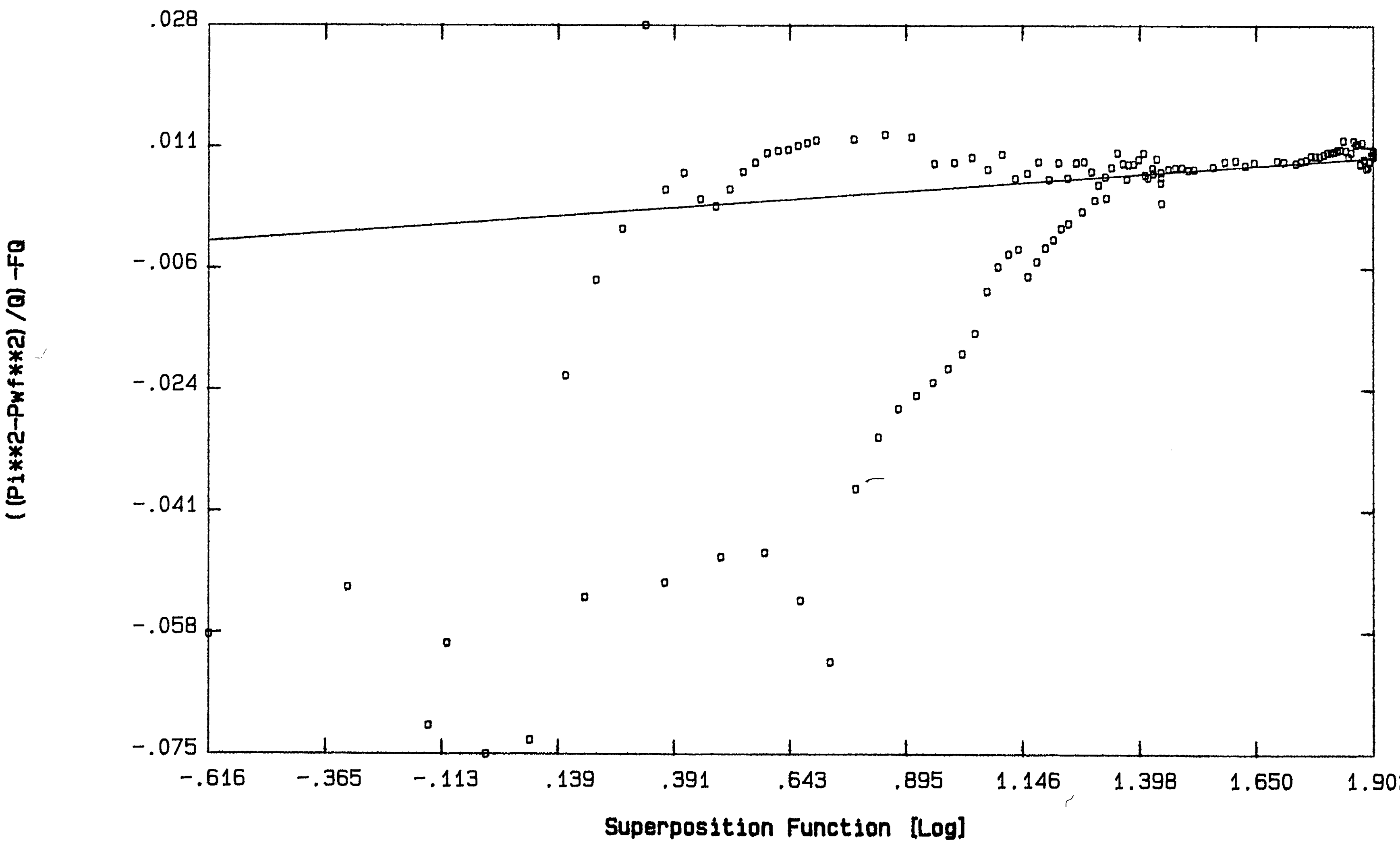


Figure 10

PANGAS (C) EPDS 1985, 86, 87.

SKIN V FLOWRATE PLOT FOR DST NO. 2

File..........	DST2	Dst No..................	2	Darcy skin....	-5.296
Analyst name.........	GARY HING	Date..................	SEPTEMBER 1987	F............	1.059
Company......	LASMO ENERGY AUSTRALIA	Analysis	FLOW AFTER FLOW		
Well....	PATRICIA NO. 1	Test....................	DST NO. 2		

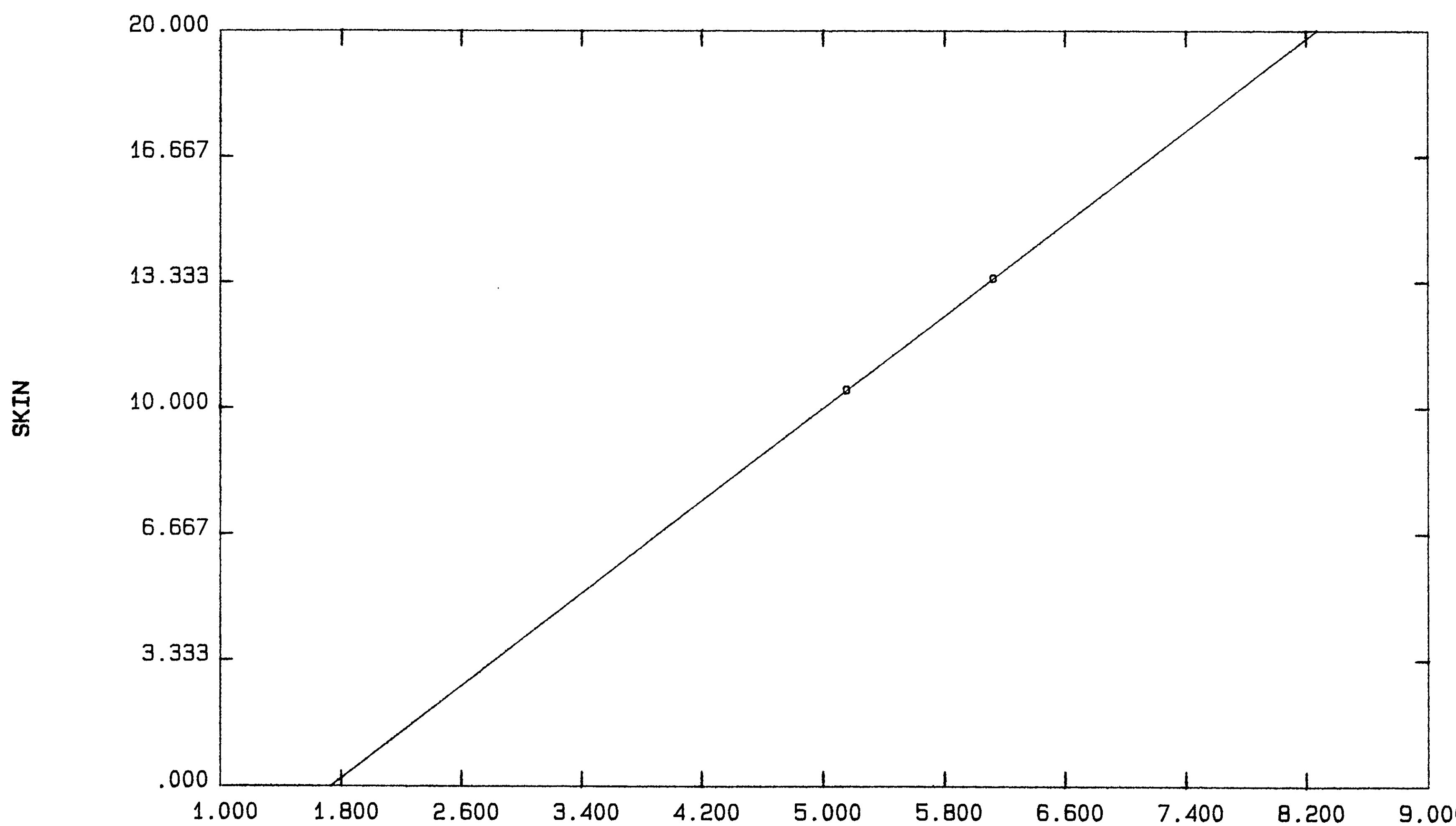


Figure 11

PANGAS (C) EPDS 1985, 86, 87.

DELIVERABILITY PLOT FOR DST NO. 2

File....	DST2IF2	Dst No....	2	DST2IF2	TRAN
Analyst name..	GARY HING	Date....	SEPTEMBER 1987	Darcy Flow (B):	1053.192
Company...	LASMO ENERGY AUSTRALIA	Analysis	DELIVERABILTY - TRANSIENT ANALYSIS	Non Darcy (F)..	1.060
Well..	PATRICIA NO. 1	Test....	DST NO. 2	AOF....	9.265

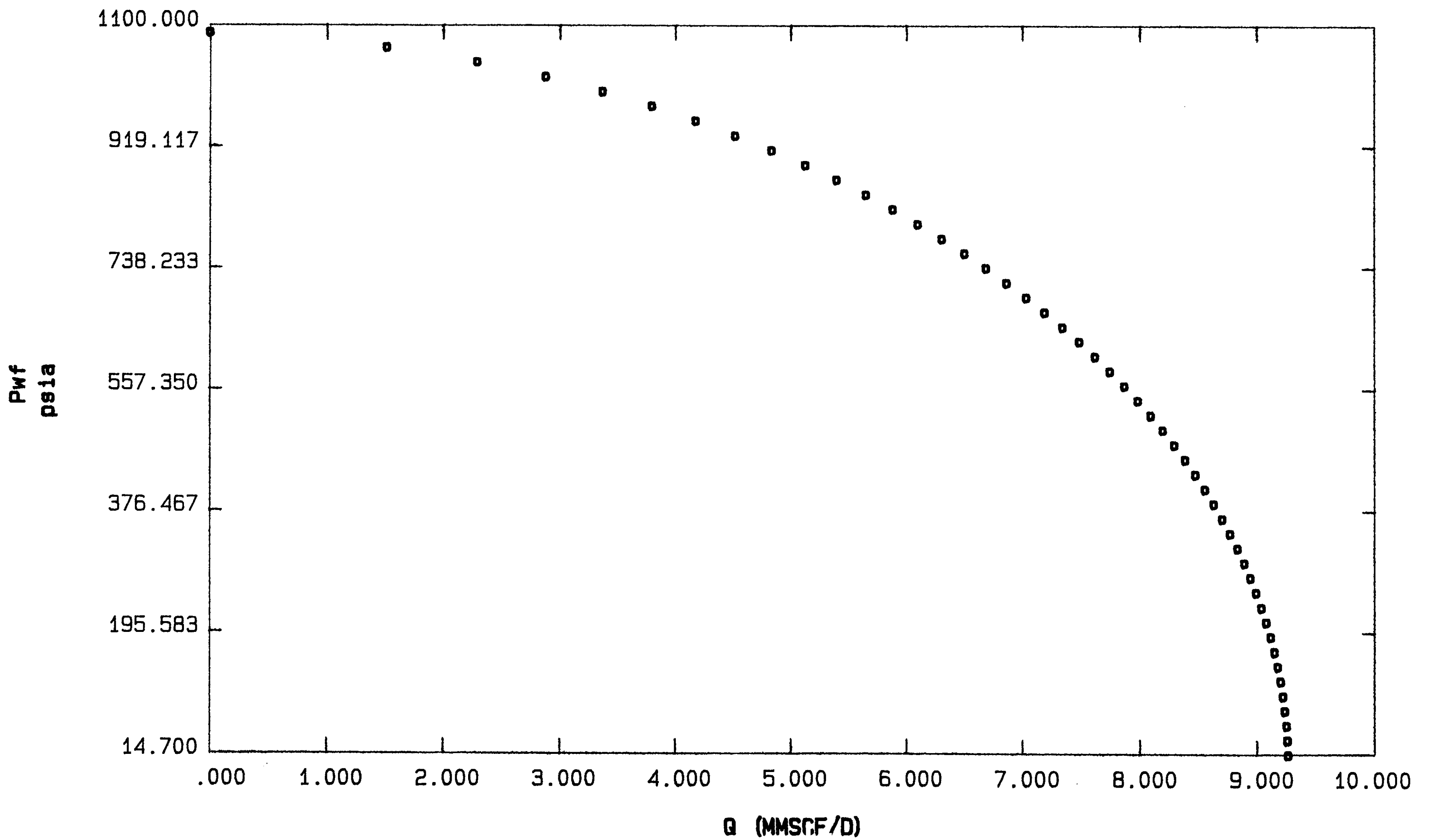
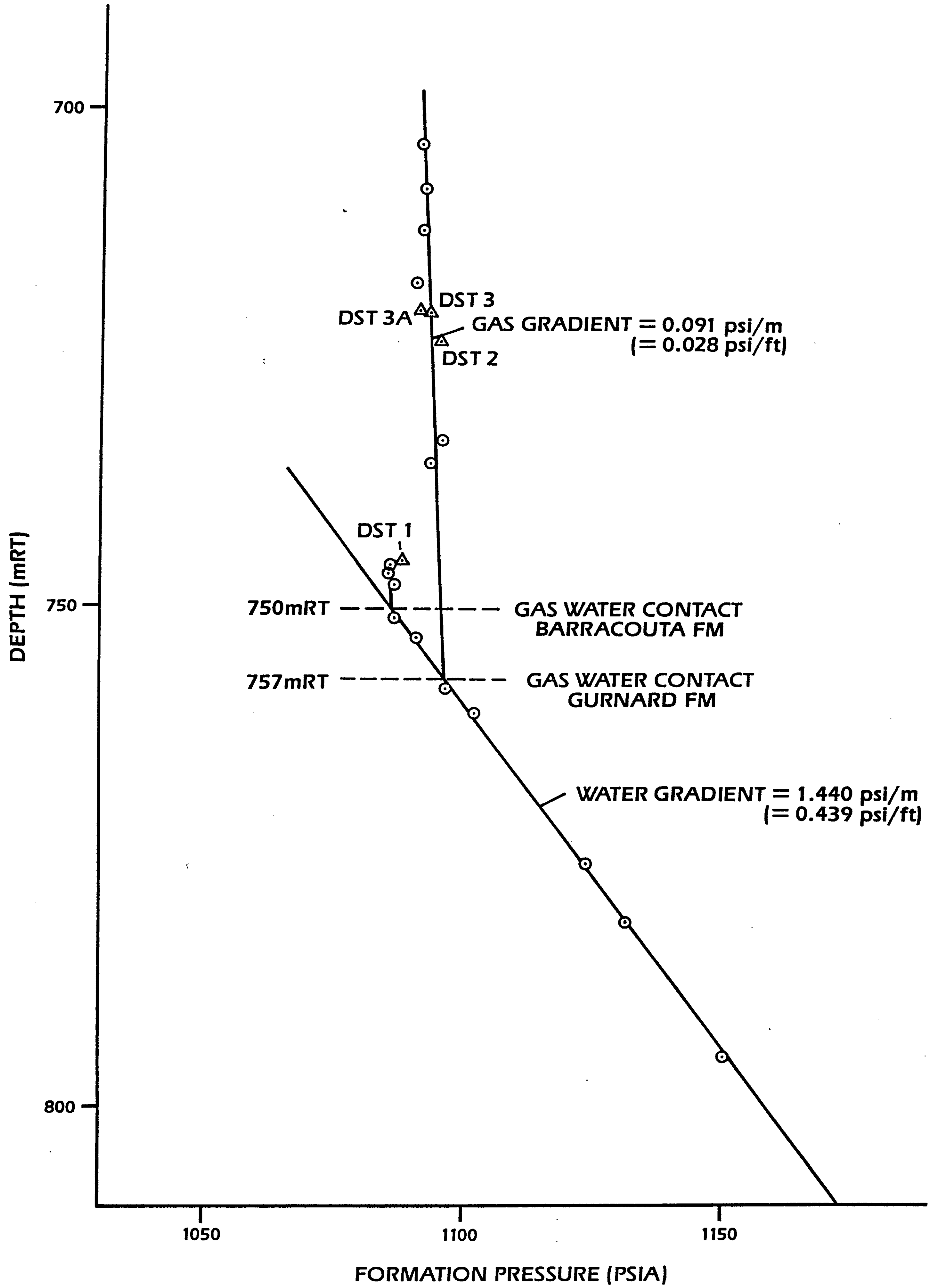


Figure 12

Figure 13

VIC/P11
PATRICIA - 1
PRESSURE V DEPTH PLOT



PANGAS (C) EPDS 1985, 86, 87.

PRESSURE v TIME PLOT FOR DST NO. 3

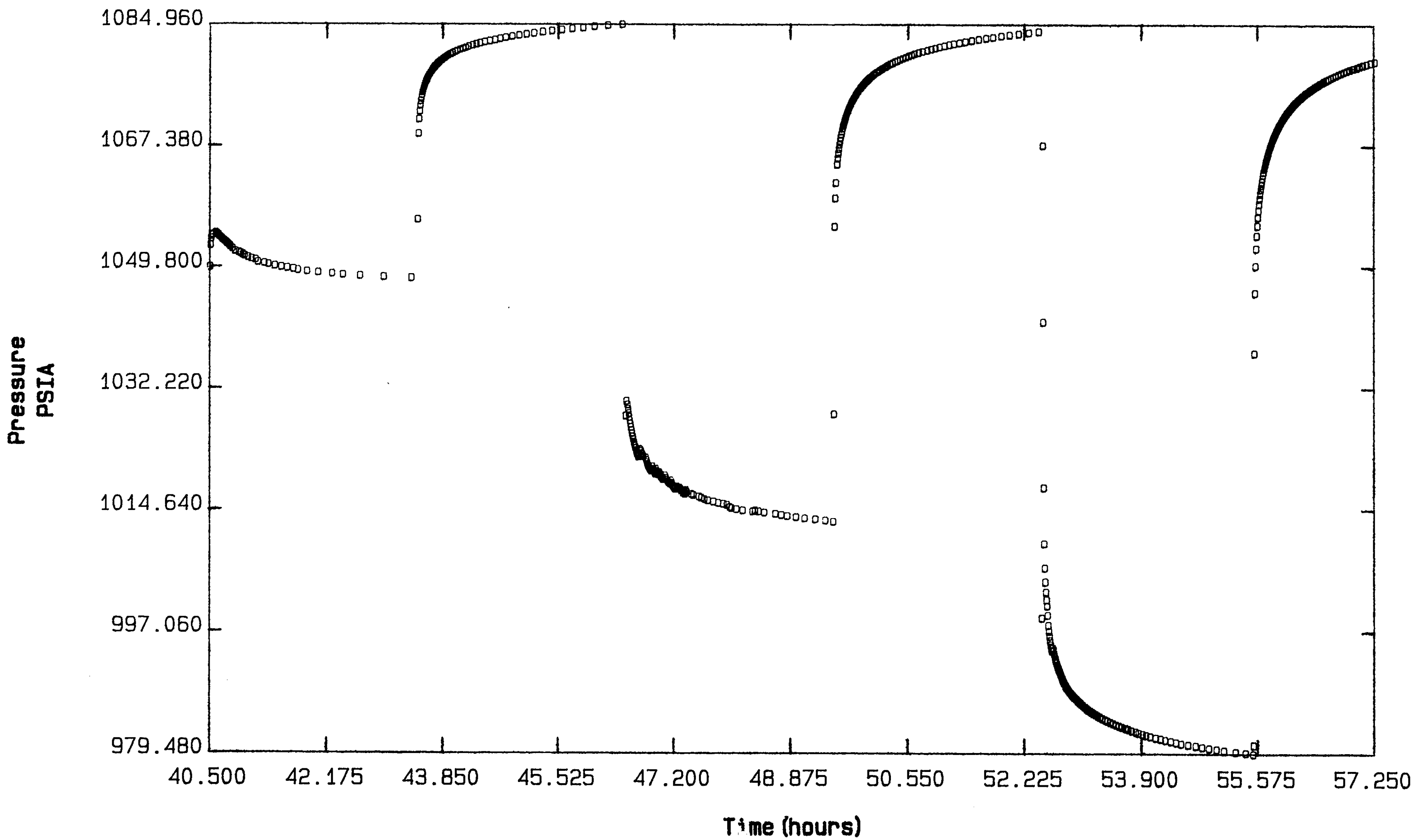


Figure 14

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 3

File	dst31cs2	Dst No.	VIC P/11	Slope	-0.054
Analyst name	GARY HING	Date	AUGUST 1987	Intercept	1.188
Company	LASMO ENERGY AUSTRALIA	Analysis	DIAMOND 'M' EPOCH	Permeability	24.624
Well	PATRICIA NO. 1.	Test	DST NO.3 CLEAN UP BUILD PERIOD	Skin	19.249

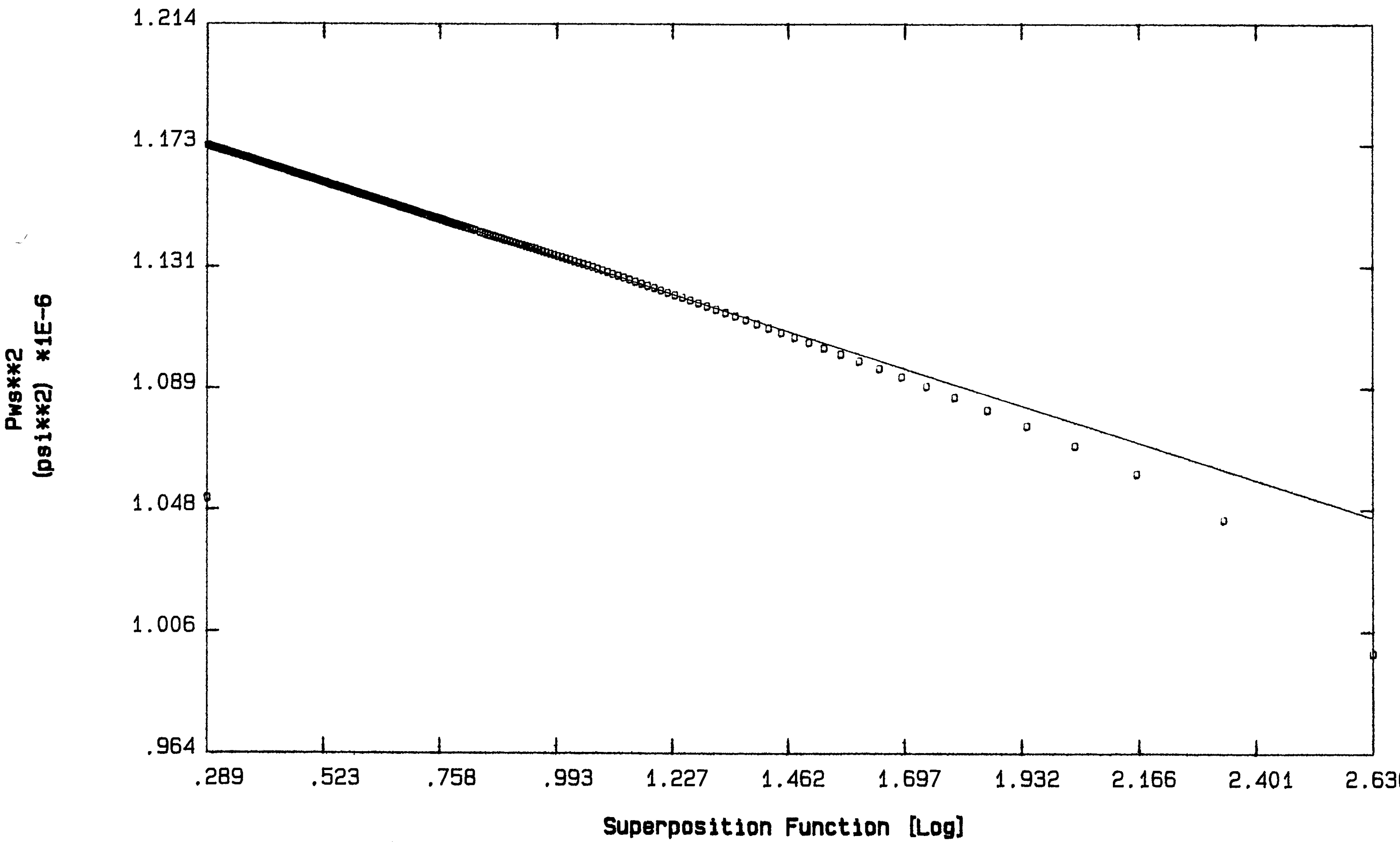


Figure 15

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 3

File.....................:	DST31IF1	Dst No...................:	3	Intercept.....:	0.016
Analyst name...............:	GARY HING	Date.....................:	AUGUST 1987	Permeability.:	21.062
Company..................:	LASMO ENERGY AUSTRALIA	Analysis...........:	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin..........:	-1.033
Well.......................:	PATRICIA NO. 1	Test.....................:	DST NO. 3 FLOW PERIOD #1	F.............:	0.028

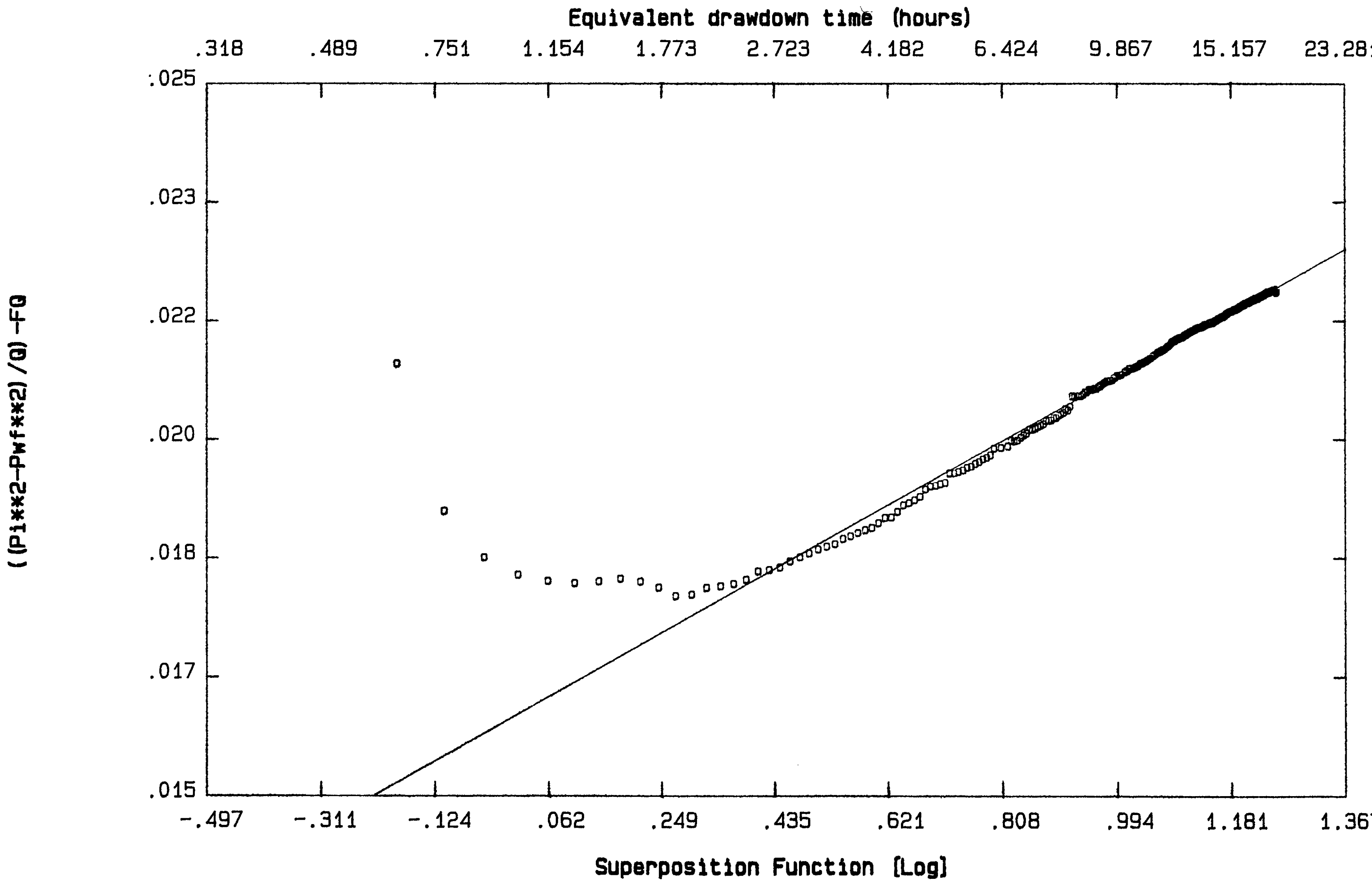


Figure 16

PANGAS (C) EPDS 1985, 86, 87.

VAB PLOT FOR DST NO. 3

File....................	DST31IS1	Dst No..................	3	Slope........	-0.014
Analyst name............	GARY HING	Date....................	AUGUST 1987	Intercept....	1.189
Company..	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE BUILD-UP (SUPERPOSITION	Permeability.	23.260
Well..	PATRICIA NO. 1.	Test....................	DST NO. 3 BUILD-UP PERIOD #1	Skin.........	11.559

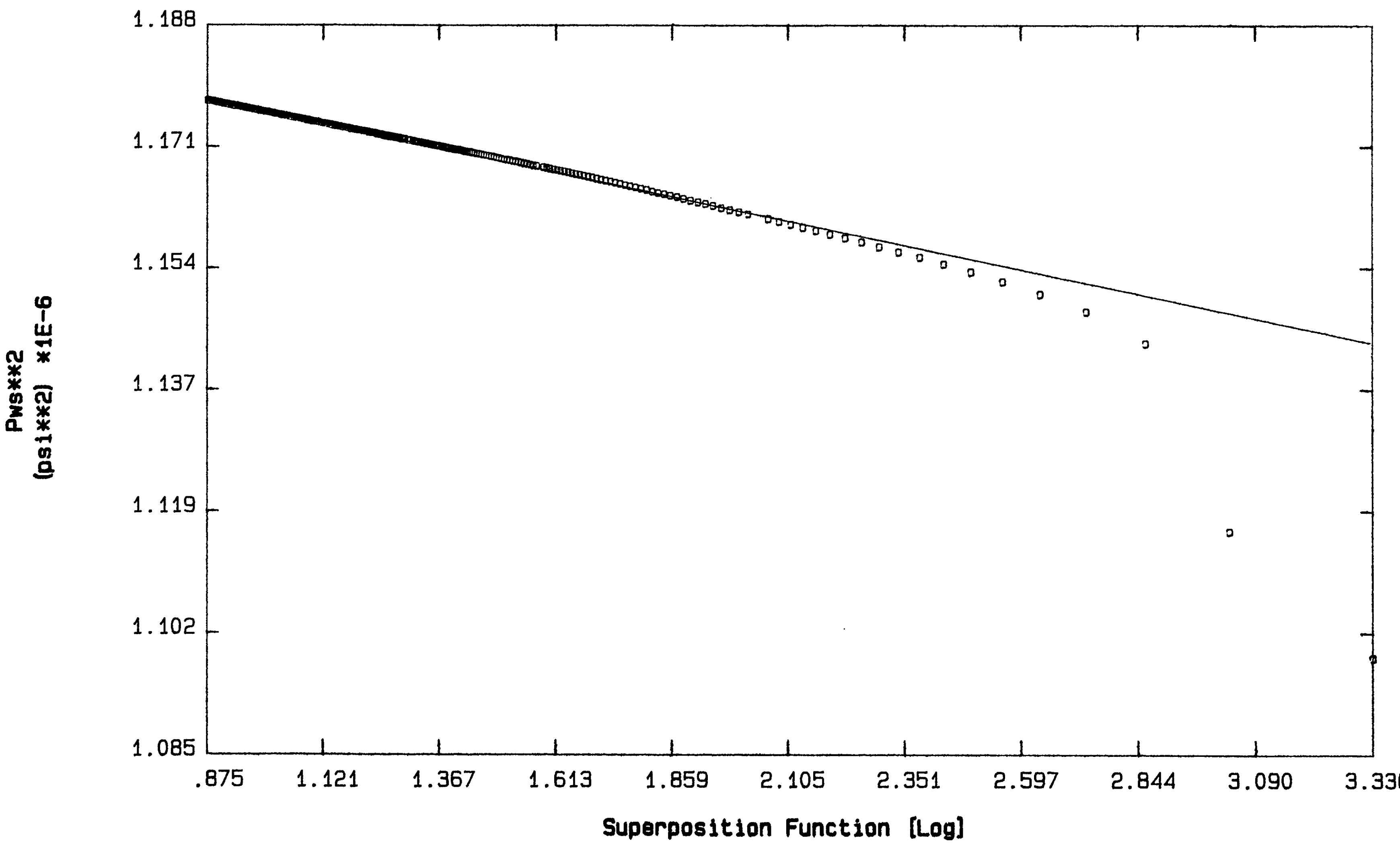


Figure 17

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 3

File....................	DST31IF2	Dst No..................	3	Intercept.....	0.021
Analyst name........	GARY HING	Date....................	AUGUST 1987	Permeability..	27.970
Company...............	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin..........	1.671
Well.........	PATRICIA NO. 1.	Test............	DST NO. 3 FLOW PERIOD #2	F.......	0.028

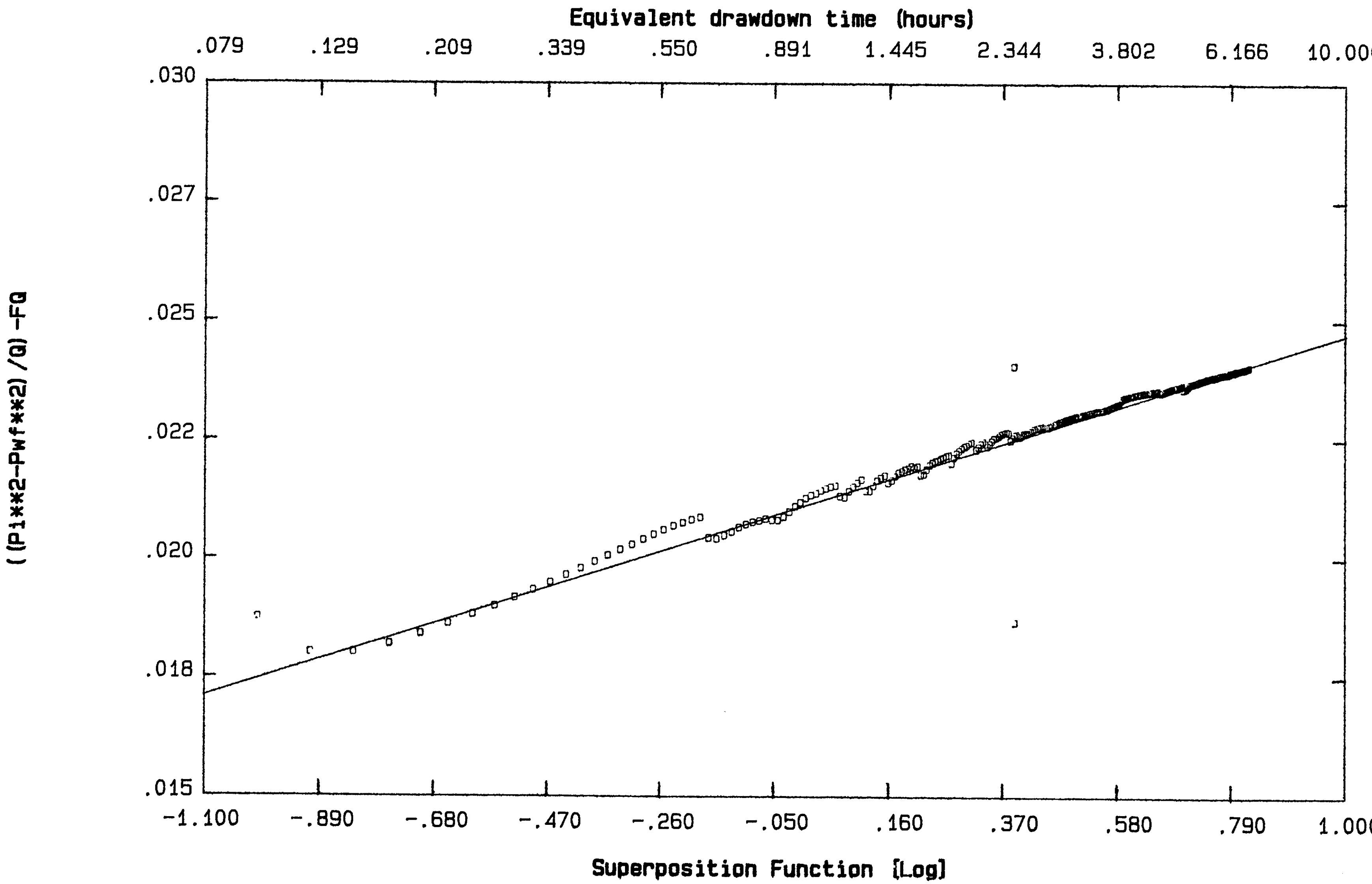


Figure 18

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 3

File..................	DST31IS2	Dst No..................	3	Slope.........	-0.028
Analyst name..........	GARY HING	Date..................	AUGUST 1987	Intercept....	1.191
Company...	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE BUILD-UP (SUPERPOSITION	Permeability.:	21.392
Well..	PATRICIA NO. 1.	Test.	DST NO. 3. BUILD-UP PERIOD #2	Skin..	3.707

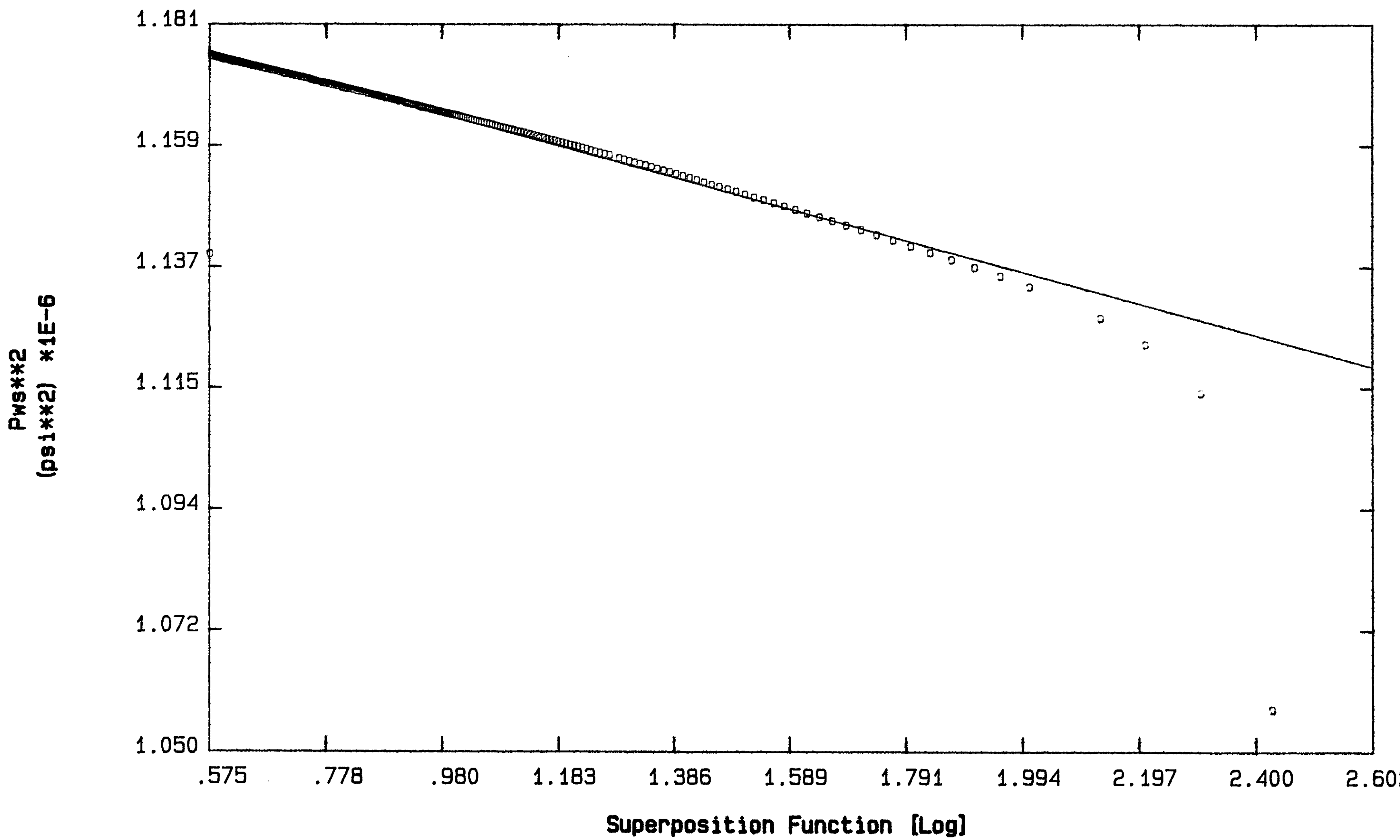


Figure 19

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 3

File....	DST31IF3	Dst No....	3	Intercept..	0.021
Analyst name....	GARY HING	Date..	AUGUST 1987	Permeability..	34.413
Company...	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin........	3.259
Well..	PATRICIA NO.1	Test..	DST NO. 3 FLOW PERIOD #2	F........	0.028

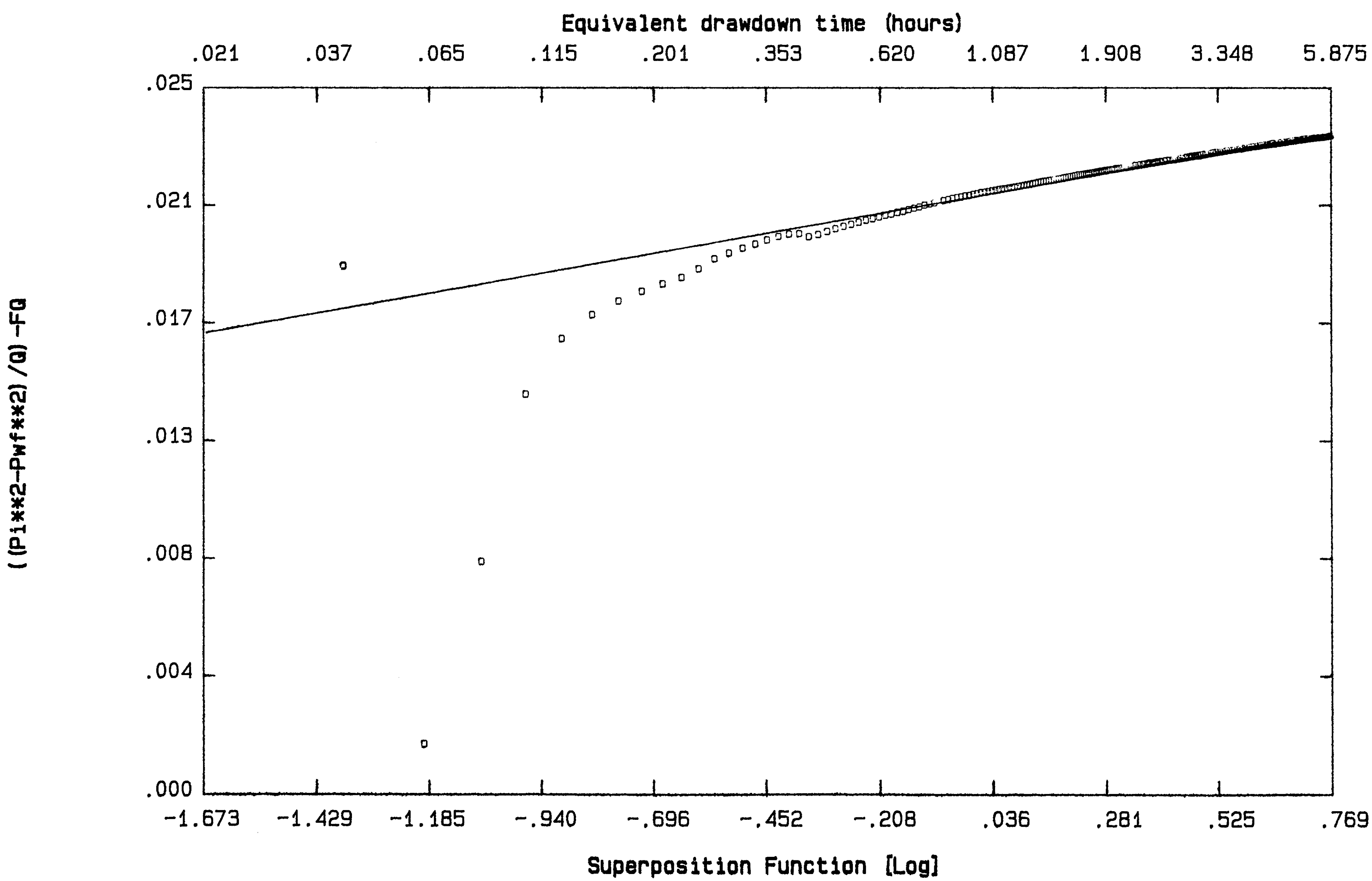


Figure 20

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 3

File...	DST31IS3	Dst No.	3	Slope...	-0.037
Analyst name..	GARY HING	Date...	AUGUST 1987	Intercept...	1.191
Company...	LASMO ENERGY AUSTRALIA	Analysis	VARIABLE RATE BUILD-UP (SUPERPOSITION	Permeability..	22.746
Well...	PATRICIA NO. 1.	Test....	DST NO. 3.BUILD-UP PERIOD #3.	Skin...	1.343

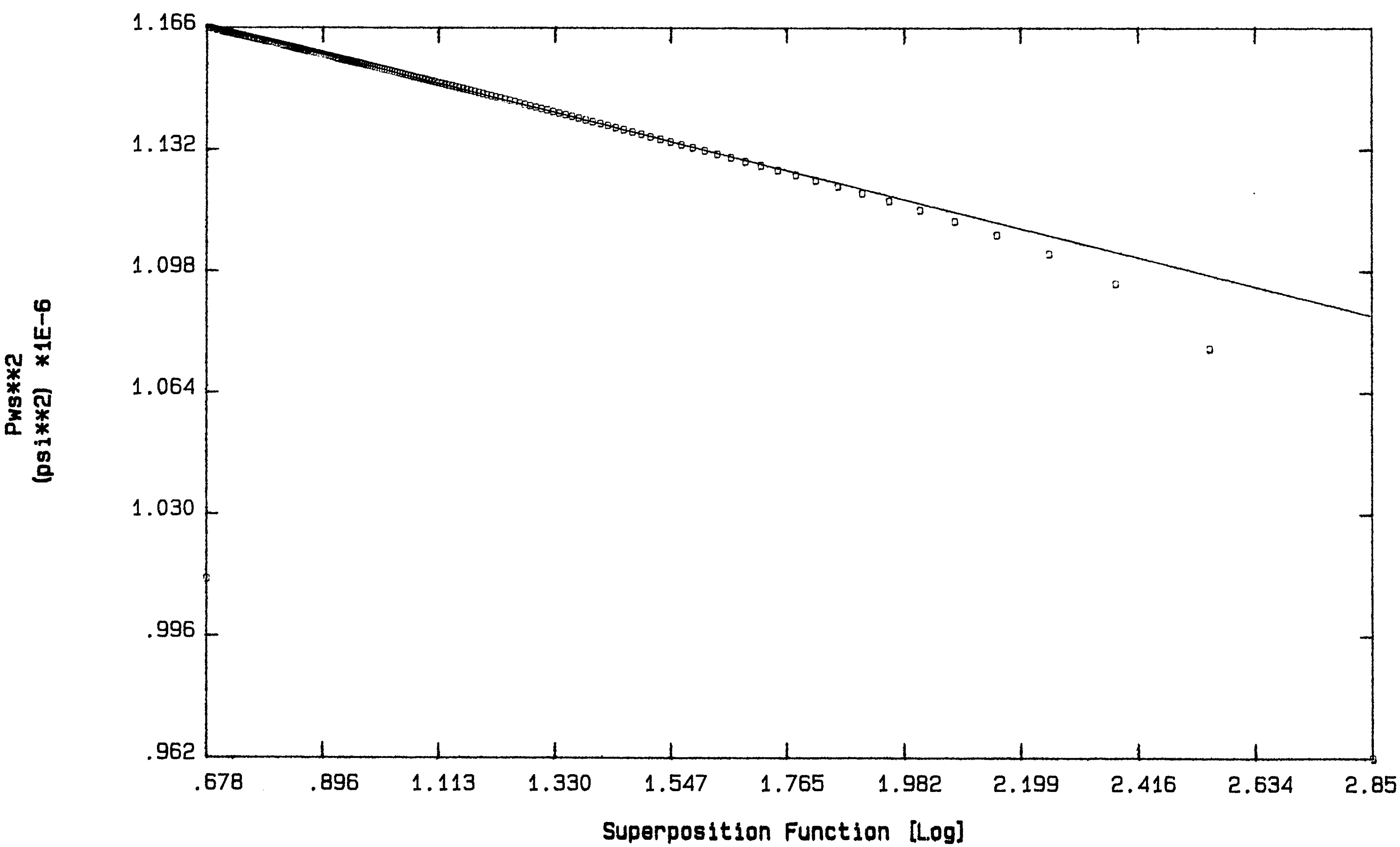


Figure 21

PANGAS (C) EPDS 1985, 86, 87.

ISO-DD PLOT FOR DST NO. 3

File....................	DST31	Dst No..............	3	Slope..	0.003	0.003
Analyst name.	GARY HING	Date..................	AUGUST 1987	Intercept....	0.022	0.023
Company...	LASMO ENERGY AUSTRALIA	Analysis	ISOCHRONAL (SUPERPOSITION)	Flowrate....	3.200	5.890
Well..	PATRICIA NO. 1	Test.	DST NO. 3. MODIFIED ISOCHRONAL	Skin...	1.543	1.843

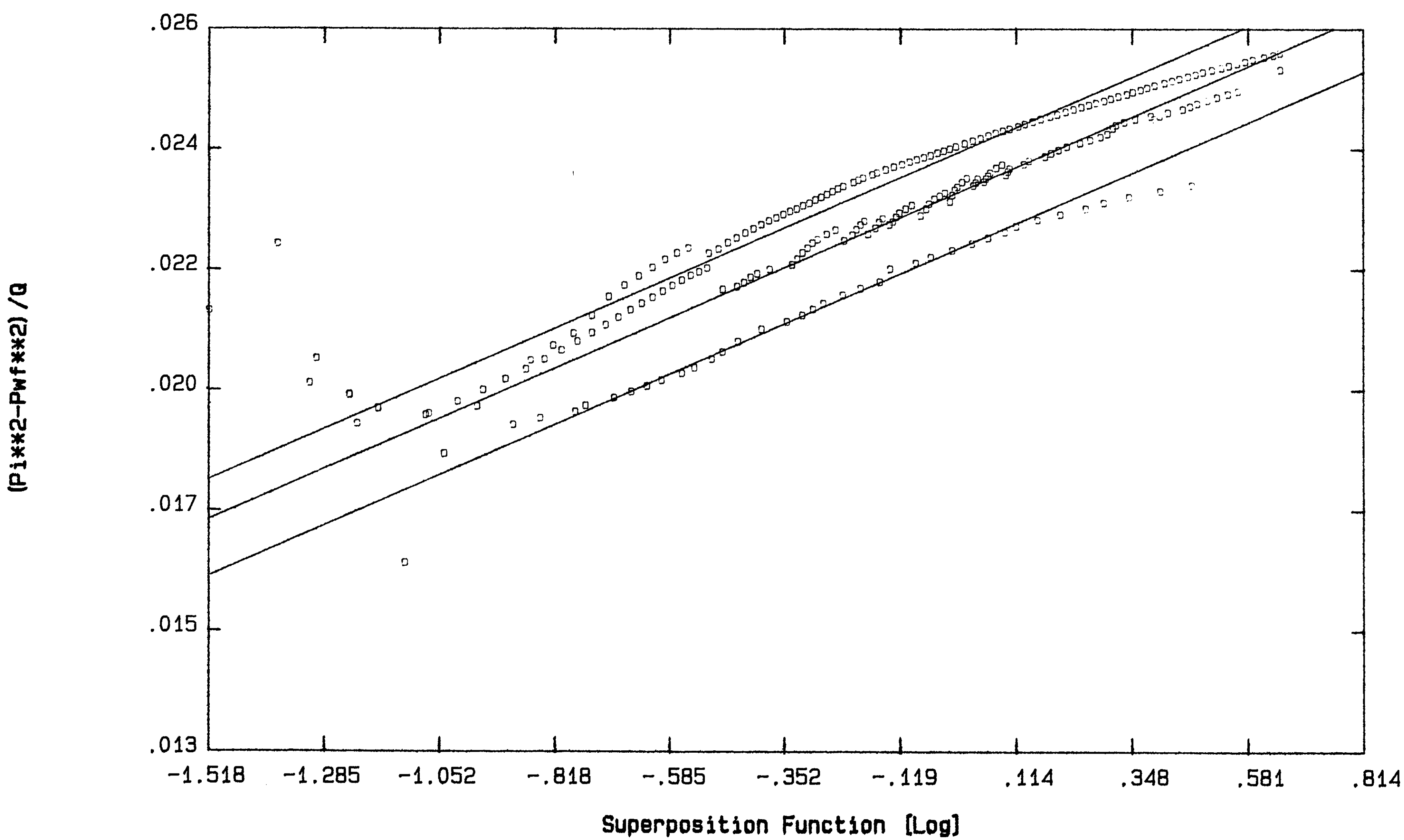


Figure 22

PANGAS (C) EPDS 1985, 86, 87.

ISO-DD PLOT FOR DST NO. 3

File....................	DST31	Dst No.................	3	Intercept.....	0.021
Analyst name............	GARY HING	Date...................	AUGUST 1987	Permeability..	26.092
Company.................	LASMO ENERGY AUSTRALIA	Analysis...............	ISOCHRONAL (SUPERPOSITION)	Skin..........	1.222
Well....................	PATRICIA NO. 1	Test...................	DST NO. 3. MODIFIED ISOCHRONAL	F.............	0.028

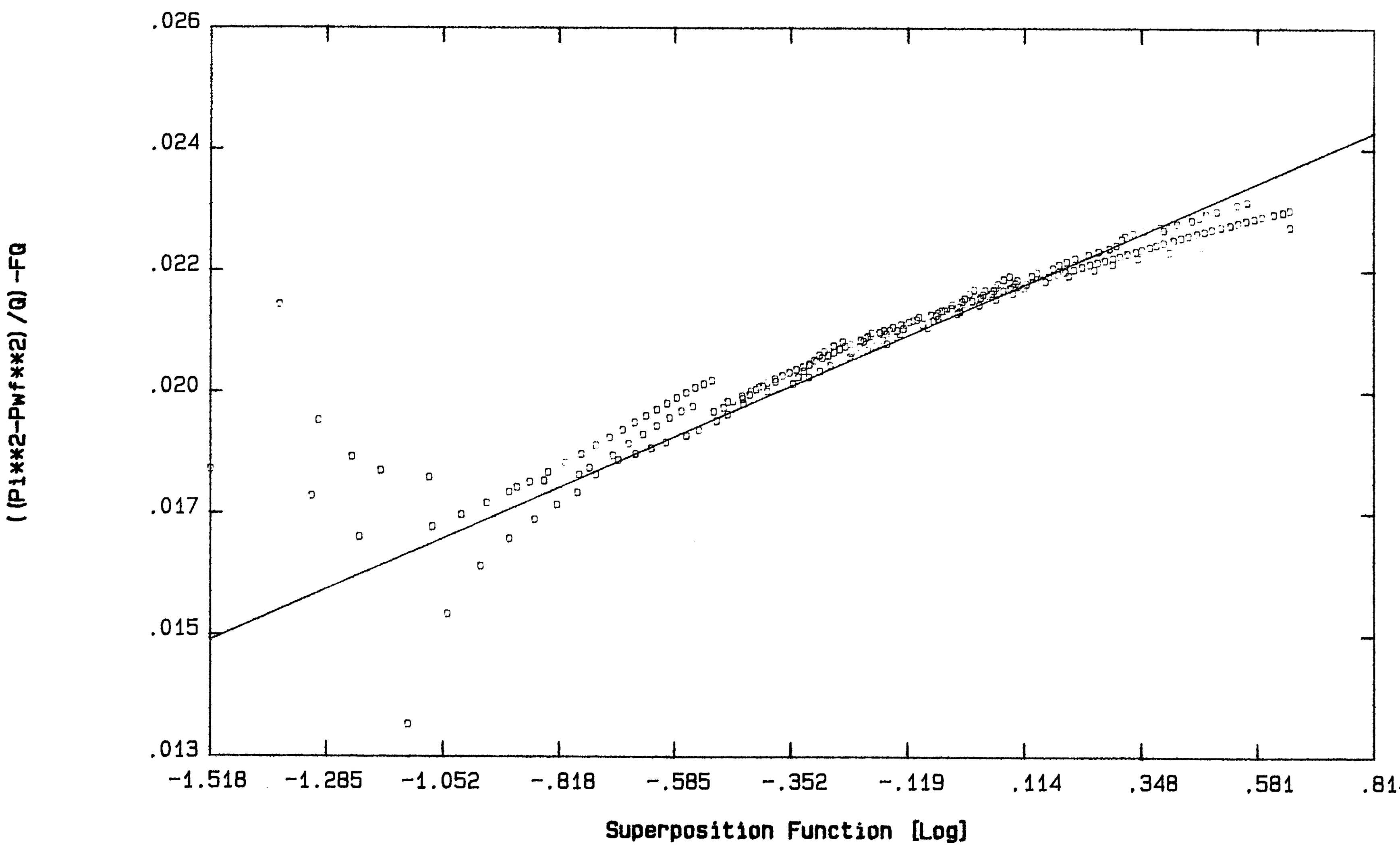


Figure 23

PANGAS (C) EPDS 1985, 86, 87.

SKIN V FLOWRATE PLOT FOR DST NO. 3

File	DST31	Dst No.	3	Darcy skin	1.234
Analyst name	GARY HING	Date	AUGUST 1987	F	0.028
Company	LASMO ENERGY AUSTRALIA	Analysis	ISOCHRONAL (SUPERPOSITION)		
Well	PATRICIA NO. 1	Test	DST NO. 3. MODIFIED ISOCHRONAL		

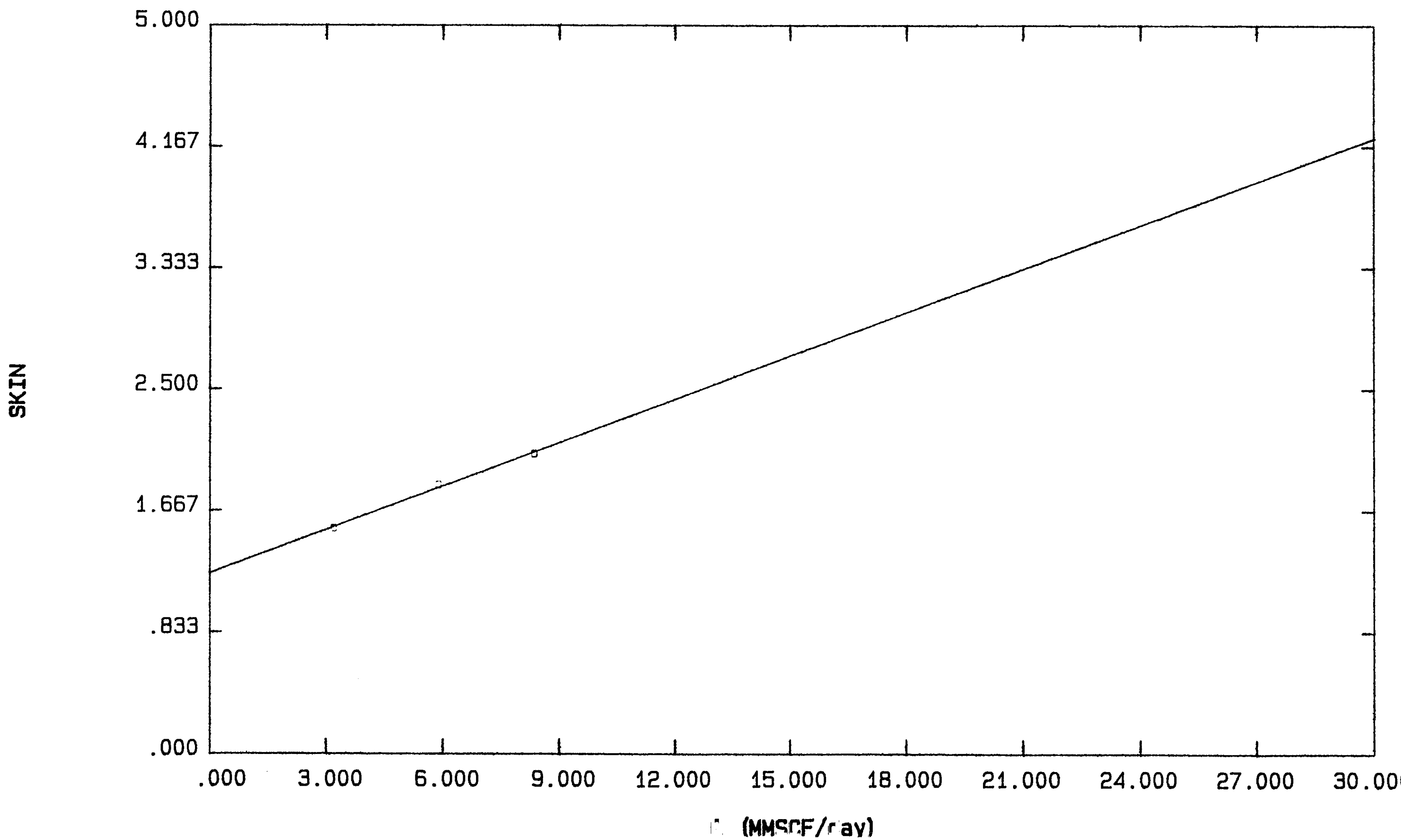


Figure 24

PANGAS (C) EPDS 1985, 86, 87.

DELIVERABILITY PLOT - LINEAR FOR DST NO. 3

o o o Transient

File..................	DST31IF2	Dst No.	3		TRAN
Analyst name..........	GARY HING	Date................	AUGUST 1987	Darcy Flow (P):	2290.752
Company...............	LASMO ENERGY AUSTRALIA	Analysis............	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Non Darcy (F)..	0.028
Well..................	PATRICIA NO. 1.	Test................	DST NO. 3 ISOCHRONAL FLOW PERIOD #2	AOF.	31.362

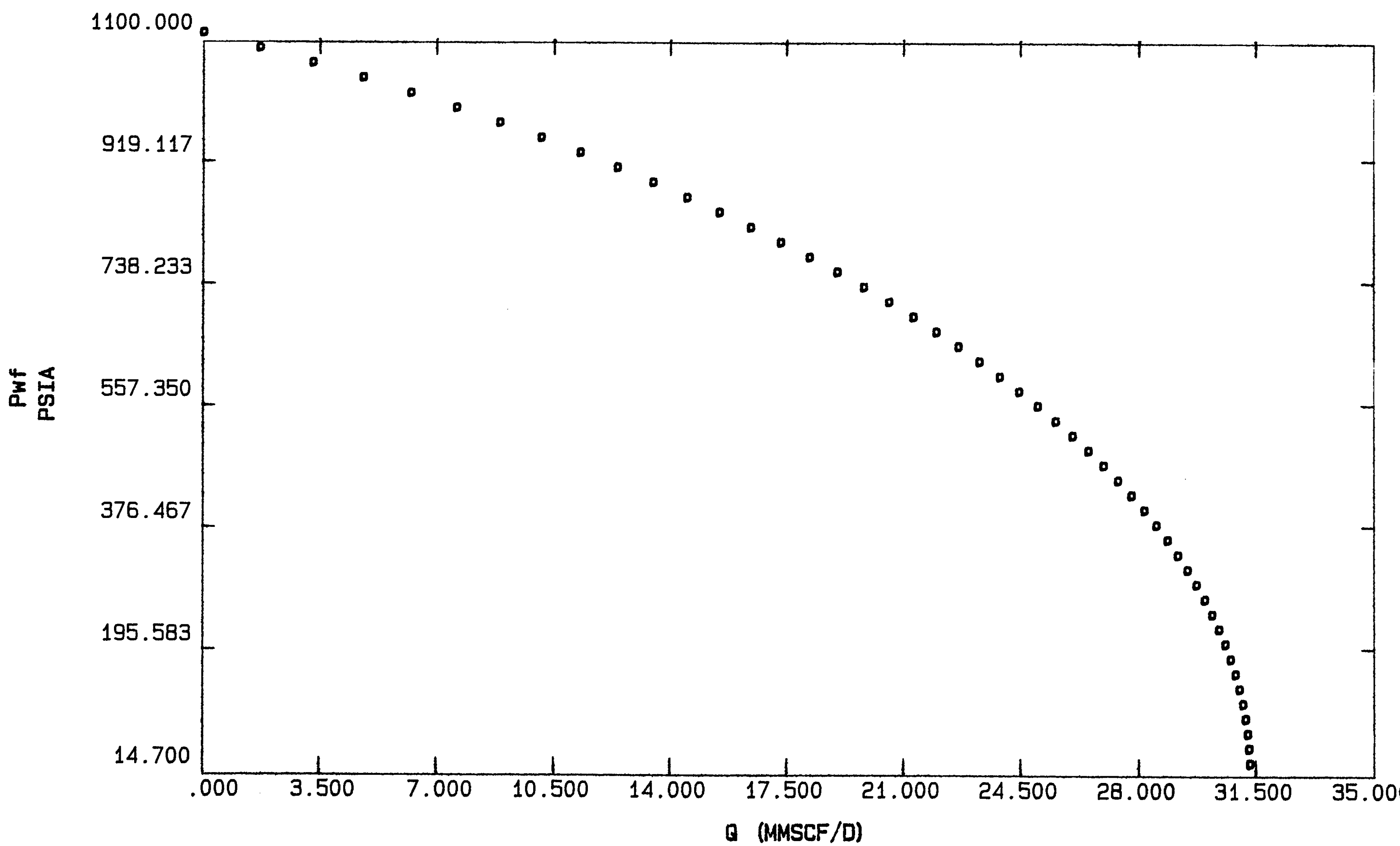


Figure 25

PANGAS (C) EPDS 1985, 86, 87.

PRESSURE v TIME PLOT FOR DST 3A

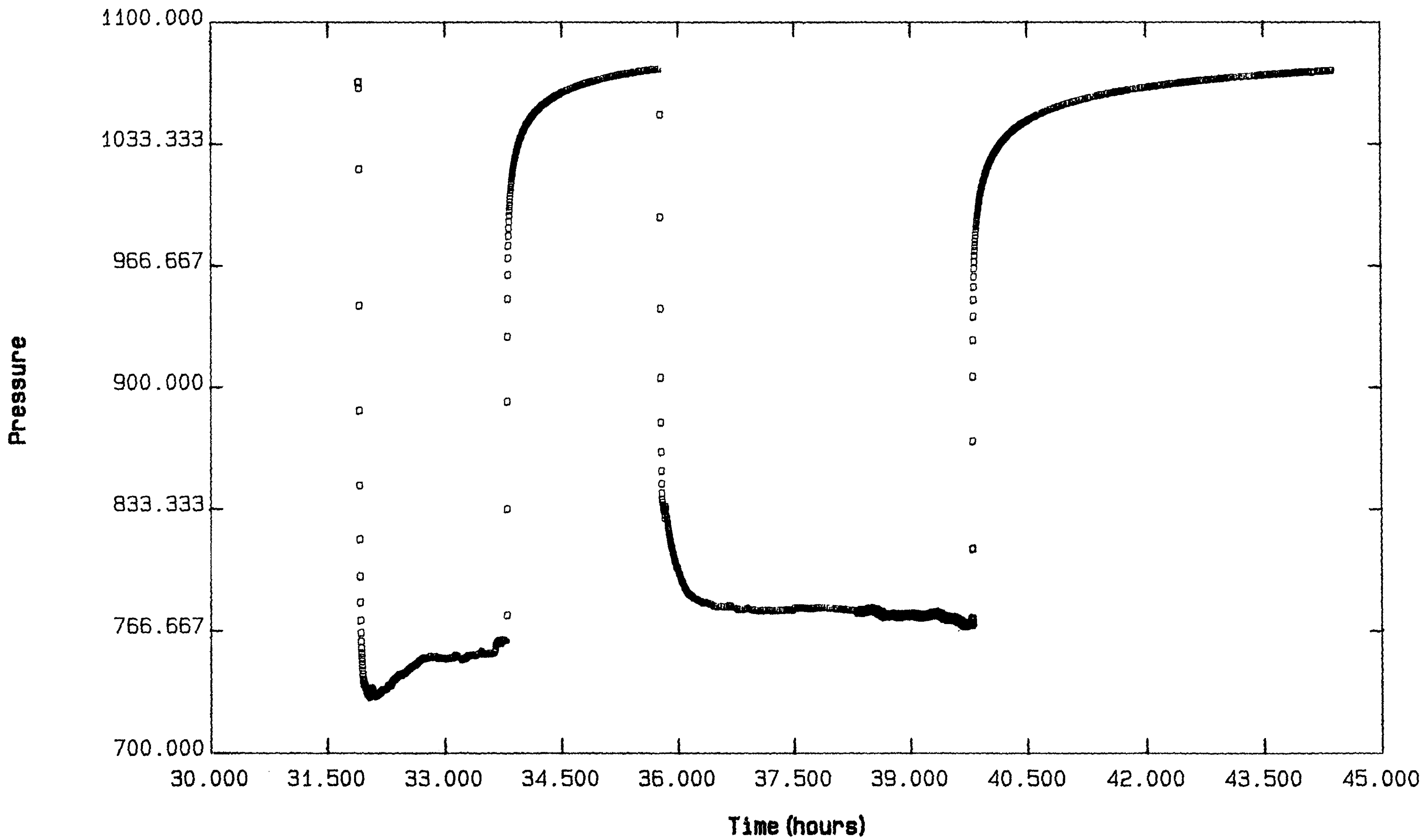


Figure 26

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 3A

File.................:	DST3AF1	Dst No.................:	3A	Intercept....:	0.027
Analyst name...........:	GARY HING	Date...................:	AUGUST 1987	Permeability.:	20.033
Company................:	LASMO ENERGY AUSTRALIA	Analysis ....:	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin.........:	1.375
Well...................:	PATRICIA NO. 1	Test...................:	DST 3A FLOW PERIOD #1	F............:	0.028

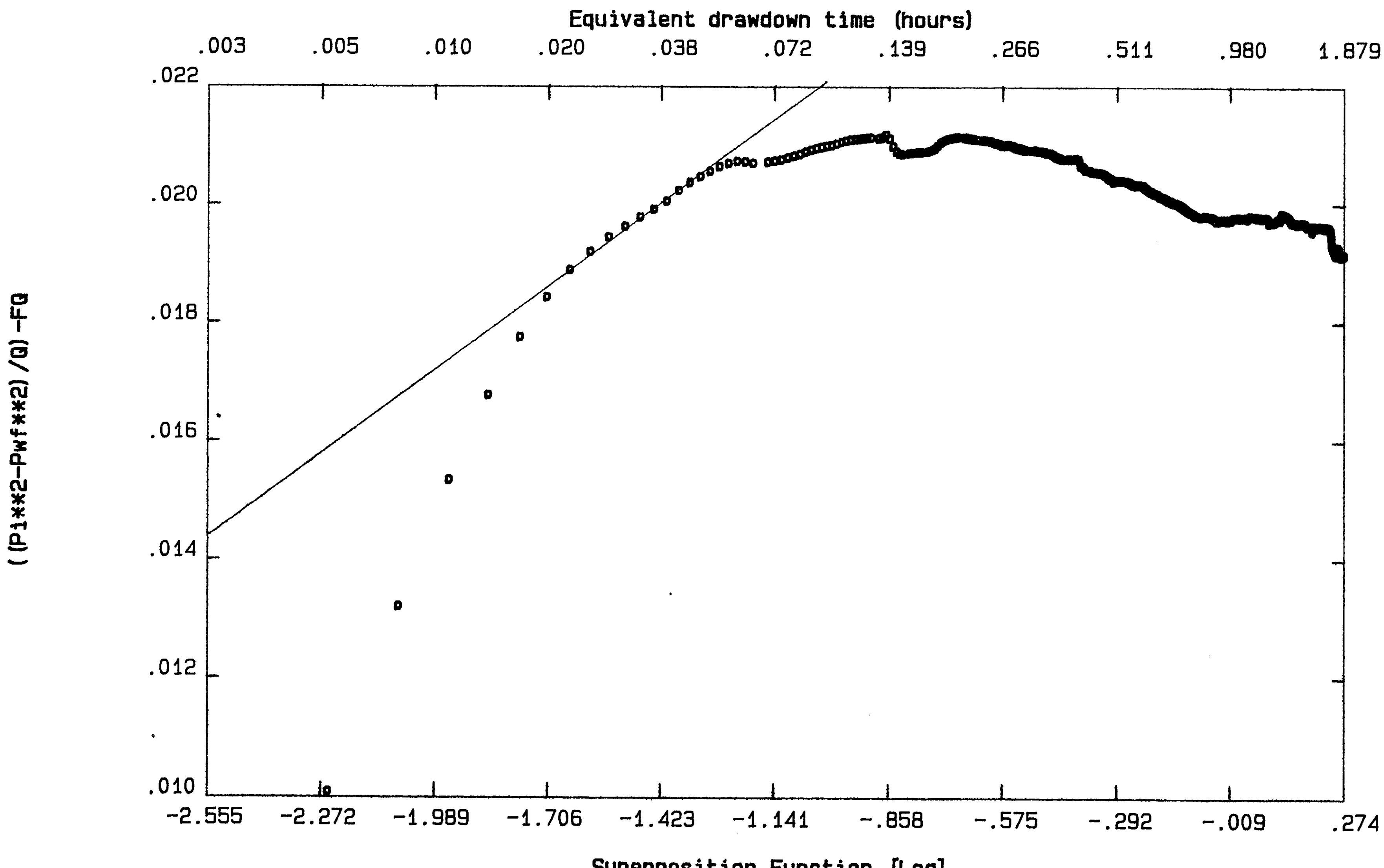


Figure 27

PANGAS (C) EPDS 1985, 86, 87.

VRB PLOT FOR DST NO. 3A

File....................:	DST3AS1	Dst No..................:	3A	Slope........:	-0.109
Analyst name...........:	GARY HING	Date....................:	AUGUST 1987	Intercept....:	1.186
Company.................:	LASMO ENERGY AUSTRALIA	Analysis ....:	VARIABLE RATE BUILD-UP (SUPERPOSITION	Permeability.:	20.888
Well....................:	PATRICIA NO. 1	Test....................:	DST3A BUILD PERIOD #2	Skin.........:	1.145

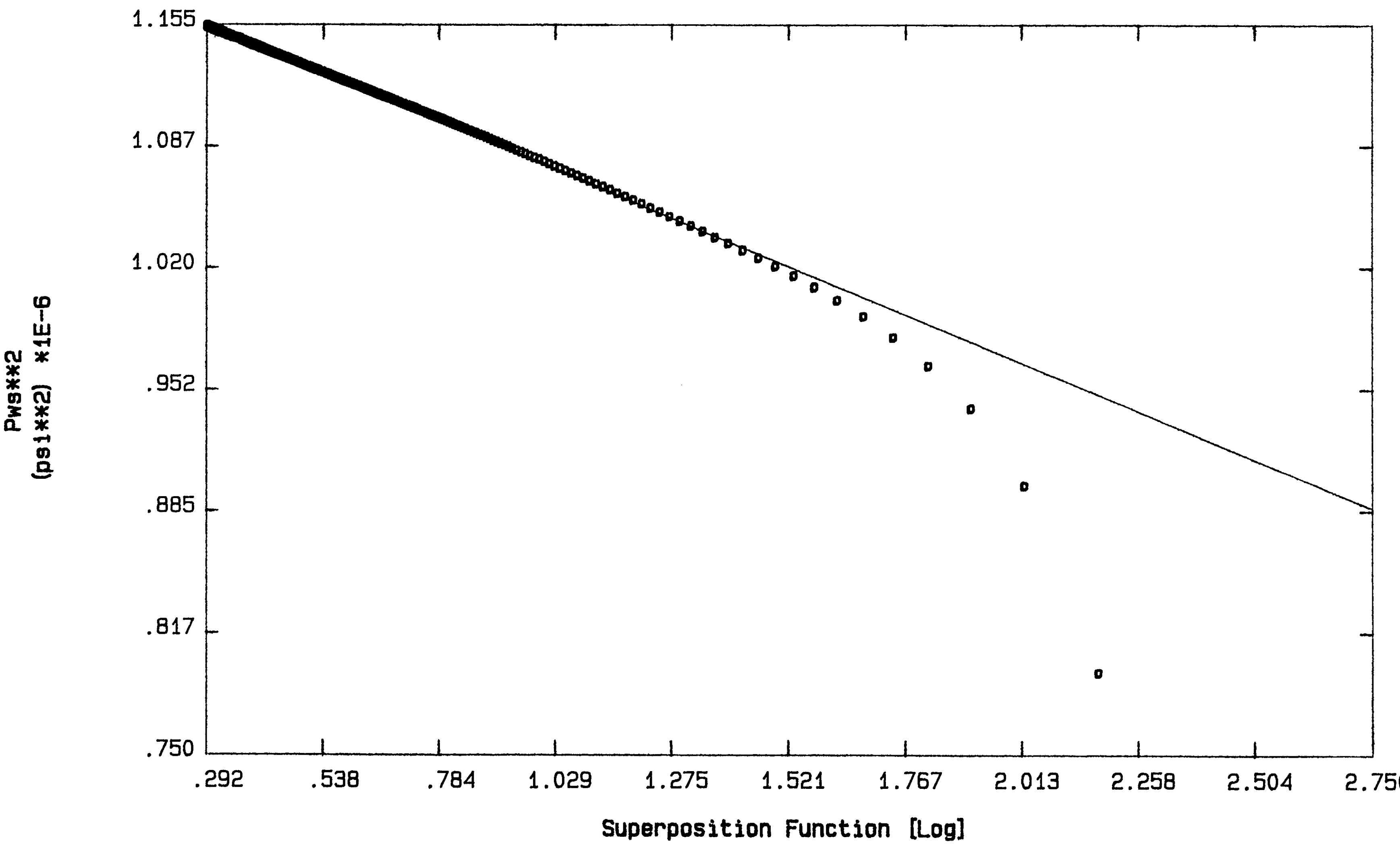


Figure 28

PANGAS (C) EPDS 1985, 86, 87.

VRD PLOT FOR DST NO. 3A

File...................:	DST3AF2	Dst No..................:	3A	Intercept....:	0.016
Analyst name...........:	GARY HING	Date....................:	AUGUST 1987	Permeability.:	21.051
Company................:	LASMO ENERGY AUSTRALIA	Analysis ....:	VARIABLE RATE DRAWDOWN (SUPERPOSITION	Skin.........:	-0.969
Well...................:	PATRICIA NO. 1.	Test....................:	DST 3A FLOW PERIOD #2	F............:	0.028

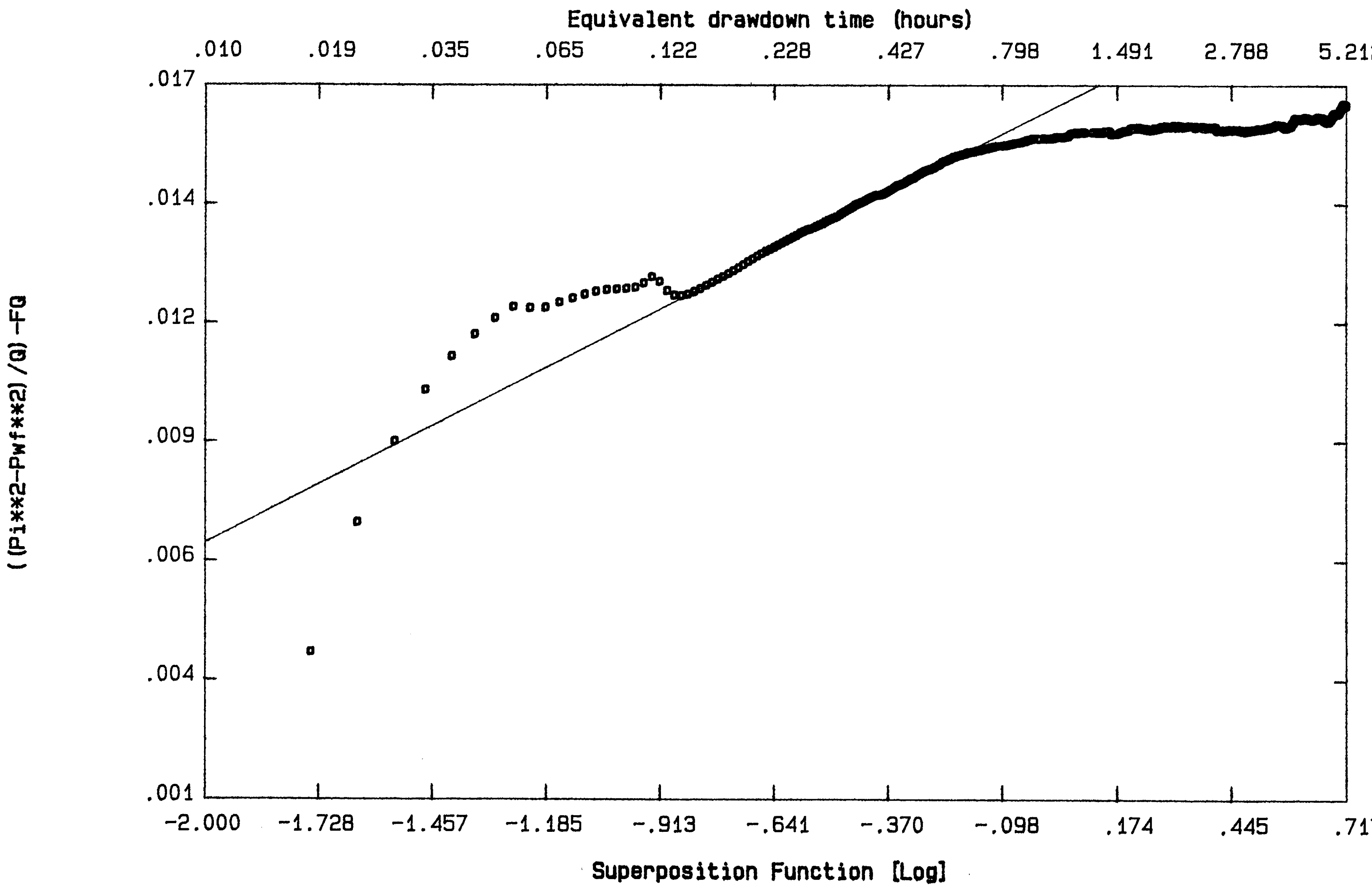


Figure 29

PANGAS (C) EPDS 1985, 86, 87..

VRB PLOT FOR DST NO. 3A

File.......................:	DST3AS2	Dst No....................:	3A	Slope.........:	-0.108
Analyst name............:	GARY HING	Date.......................:	AUGUST 1987	Intercept.....:	1.184
Company..................:	LASMO ENERGY AUSTRALIA	Analysis ....:	VARIABLE RATE BUILD-UP (SUPERPOSITION	Permeability.:	21.478
Well.......................:	PATRICIA NO. 1	Test.......................:	DST 3A BUILD-UP PERIOD #2	Skin.........:	1.183

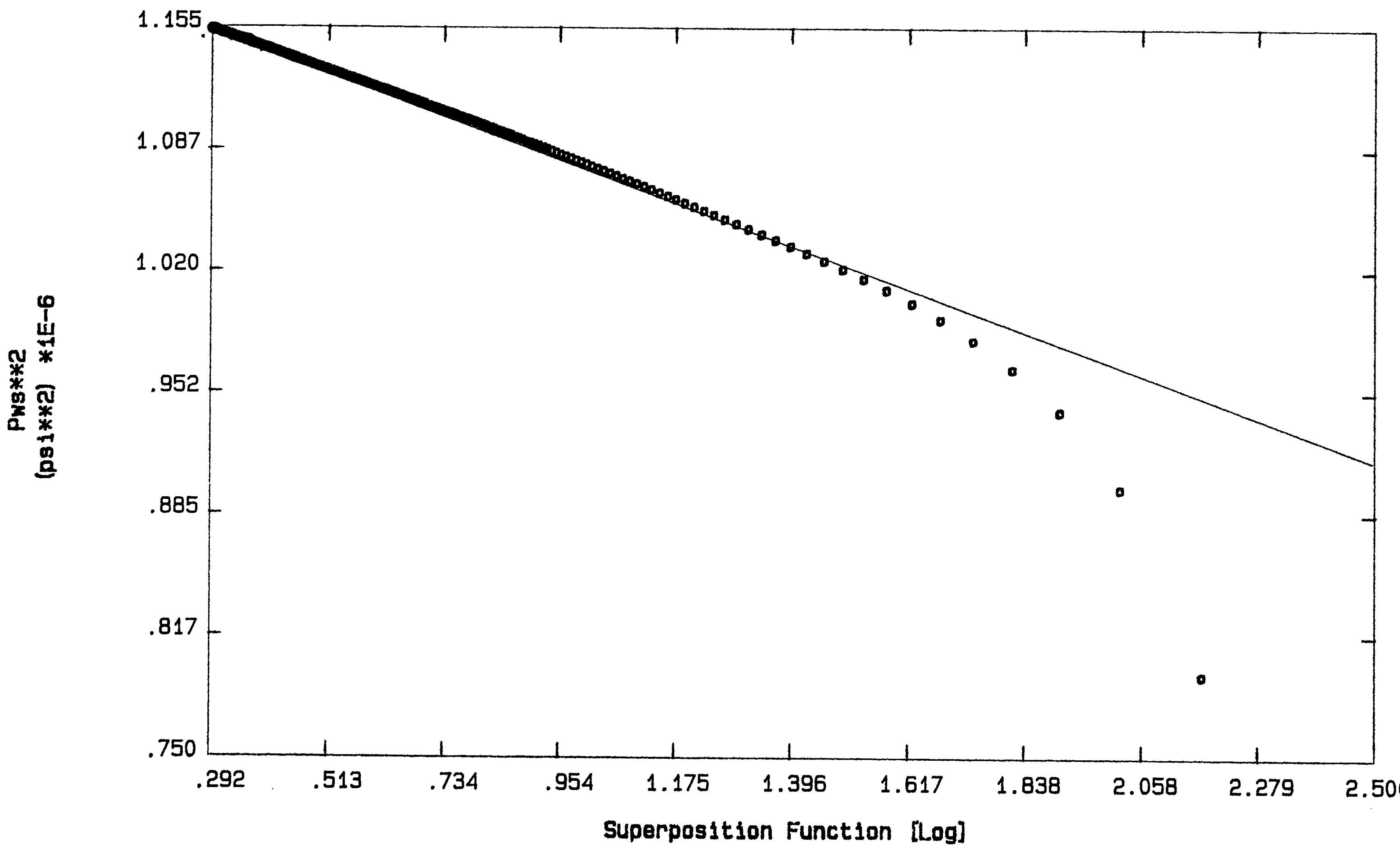


Figure 30

PANGAS (C) EPDS 1985, 86, 87.

DELIVERABILITY PLOT - LINEAR FOR DST NO. 3A

File...................:	DST3AF2	**Test No**...................:	3A	TRAN	Transient
Analyst name...........:	GARY HING	**Date**...................:	AUGUST 1987	**Darcy Flow (B)**:	2113.176
Company...................:	LASMO ENERGY AUSTRALIA	**Analysis** ....:	VARIABLE RATE DRAWDOWN (SUPERPOSITION	**Non Darcy (F)**:	0.028
Well...................:	PATRICIA NO. 1.	**Test**...................:	DST 3A FLOW PERIOD #2	**AOF**..........:	32.753

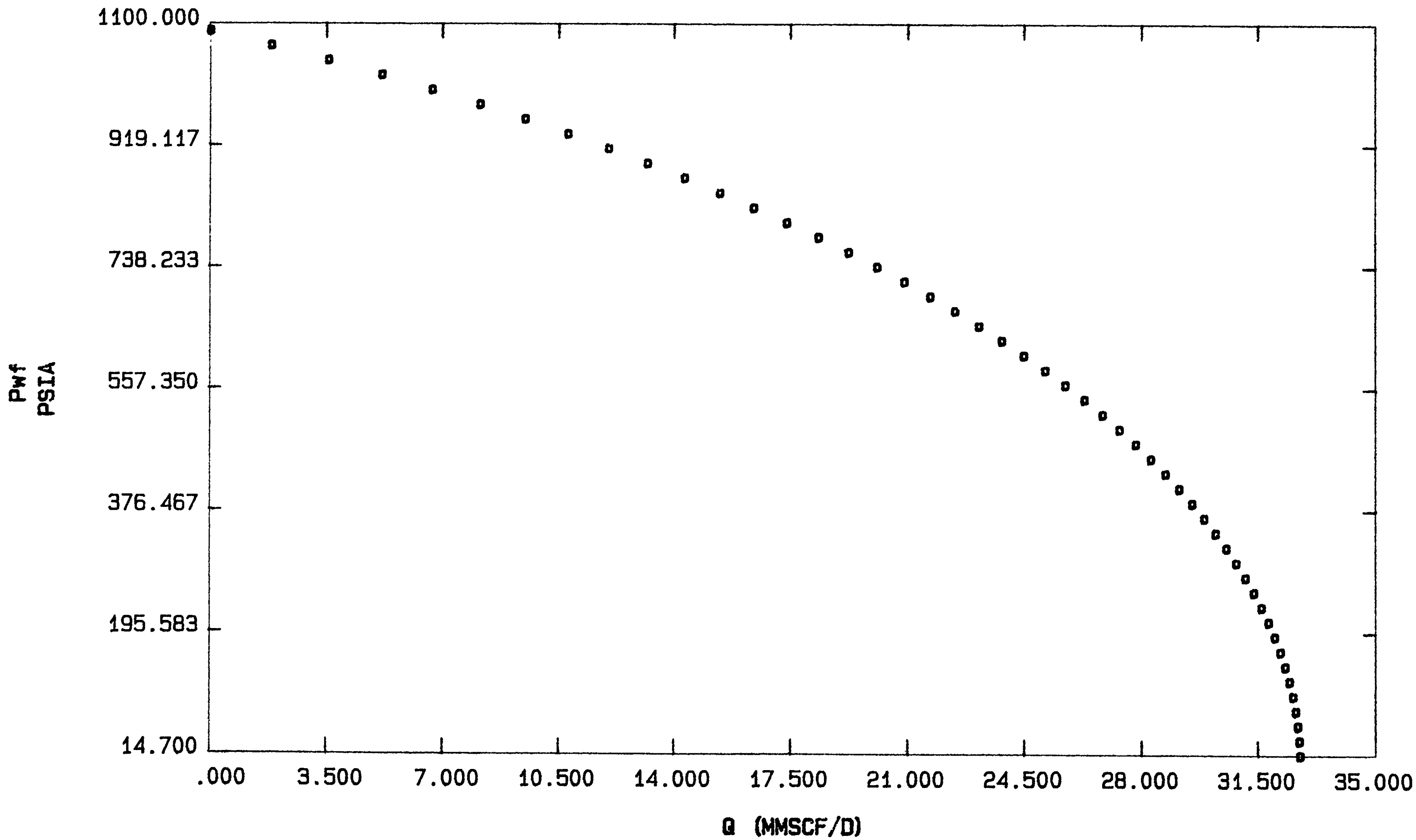


Figure 31