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NUMBER 7029/2

PEL 5 AND PEL 6, MERRIMELIA-INNAMINCKA BLOCK

COOPER AND EROMANGA BASINS

SWAN LAKE 1

TEST REPORTS

Submitted by

Santos Ltd
1988

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MINES AND ENERGY
SOUTH AUSTRALIA



ENVELOPE 7029/2

TENEMENT: PEL 5 and PEL 6, Merrimelia-Innamincka Block; Cooper and Eromanga Basins

TENEMENT HOLDER: Santos Ltd (operator), Alliance Oil Development NL, Delhi Petroleum Pty Ltd, Vamgas Ltd, South Australian Oil and Gas Corporation Pty Ltd

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	MESA NO.
REPORT: Smith, A., 1988. Results of static pressure gradient survey of Tirrawarra Sandstone gas reservoir, conducted on 6/2/88 (Expertest Pty Ltd).	7029/2 R 1 Pgs 3-7

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WIRELINE REPORT

WELL: SWAN LAKE #1

DATE: 6-2-88

PROGRAM: STATIC GRADIENT

PURPOSE OF WORK:

REPORT OF WORK PERFORMED:

6TH FEBRUARY 1988

0900 ARRIVE ON LOCATION & RIG UP WIRELINE EQUIPMENT (DUMMY RUN NOT REQUIRED)

0937 PRESSURE TEST EQUIPMENT (PRESSURE LUBRICATOR.)

0947 R.I.H WITH 2 PRESSURE ELEMENTS & 1 TEMPERATURE ELEMENT.

1102 P.O.O.H

1128 ARRIVE IN LUBRICATOR

1138 BLEED LUBRICATOR, RECOVER CHARTS (OK) & RIG DOWN WIRELINE EQUIPMENT.

OPERATOR'S SIGNATURE

WORK PERFORMED BY: A. SMITH OF EX PERTEST

WELL DATA:

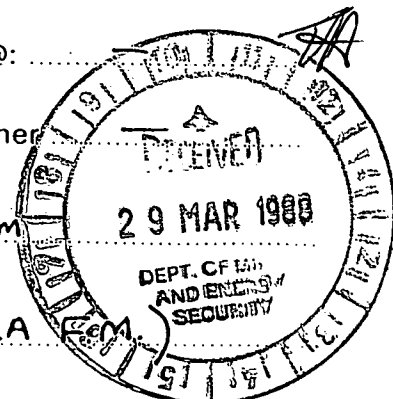
Tubing Size: 3.5' (88.9mm) FWHP: — SIWHP: 19272 KPA

Sub Surface S.V./Landing Nipple @ 2948 m S.S.D. @:

"X" Nipple @ 2938 m "N"/"XN" Nipple @ — other

Min I.D. 56mm " @ 2948 m Packer @ 2931 m

Perforated Interval: 2976 m - 3026 m (TIRRAWARRA FORM)

Forward to: Petroleum Engineering — Adelaide
Production Department — Moomba



WIRELINE REPORT

00004

WELL: SWAN LAKE #1

DATE: 27-1-88

PROGRAM: SWAB WELL

PURPOSE OF WORK:

REPORT OF WORK PERFORMED:

08:00 ARRIVED LOCATION THP 1511 PSI

08:15 OPENED WELL UP ON 48/64 CHOKE & BLED TUBING TO 0

	FLUID LEVEL	SWAB DEPTH	FLUID RECOVERED
08:40 R.H.	3000'	4000'	520'
09:10 "	2200'	4000'	1600'

09:40 WELL FLOWING TO FLARE PIT ON 64/64 CHOKE & UNLOADING FLUID.

10:20 WELL DIED

10:20 R.H.	3900'	5500'	0
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11:00 "	4020'	6000'	100'
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11:35 TOOLSTRING BLED OUT OF LUBRICATOR.

RIGGED DOWN & SECURE WELL

Rail Down
OPERATOR'S SIGNATURE

WORK PERFORMED BY: K. DOWE & R. MOORE OF EXPERTEST

WELL DATA:

Tubing Size: 3 1/2" E.H.E. FWHP: - SIWHP: -

Sub Surface S.V./Landing Nipple @ S.S.D. @:

"X" Nipple @ "N"/"XN" Nipple @ other

Min I.D. " @ Packer @

Perforated Interval:

Forward to: Petroleum Engineering — Adelaide
Production Department — Moomba



**** SWAN LAKE#1 ****

STATIC PRESSURE GRADIENT

TEST DATE: 6-2-88

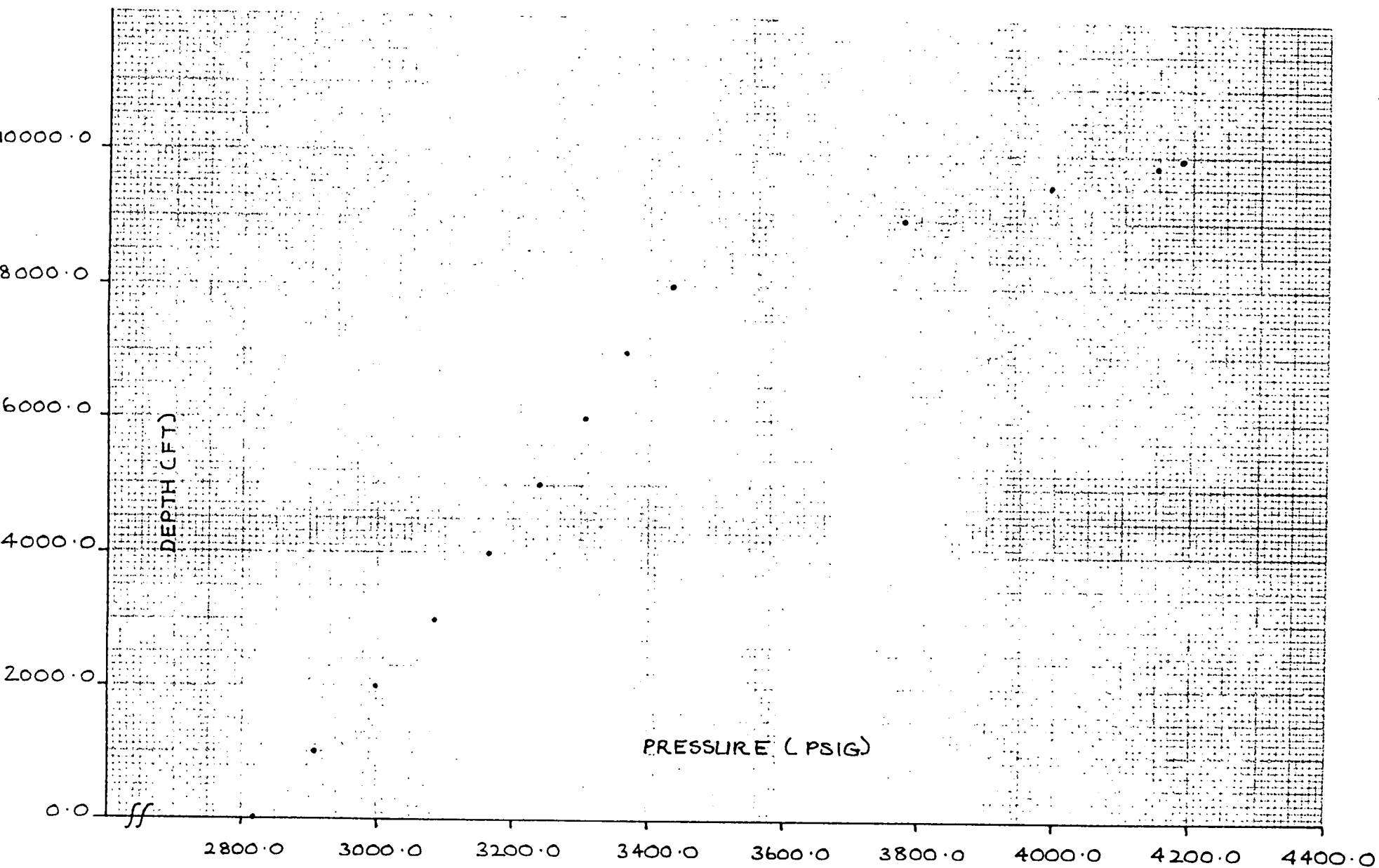
DEPTH (FT.)	TOP PRESSURE ELEMENT 850364/5150			BOTTOM PRESSURE ELEMENT 46103/4800		
	DEFLECTION (INCHES)	PRESSURE (PSIG)	GRADIENT (PSI/FT)	DEFLECTION (INCHES)	PRESSURE (PSIG)	GRADIENT (PSI/FT)
LUB	1.0830	2817.8	----	1.1280	2817.8	----
1000	1.1180	2908.6	0.0908	1.1640	2908.4	0.0906
2000	1.1520	2996.8	0.0882	1.2000	2999.0	0.0906
3000	1.1850	3082.3	0.0856	1.2330	3082.2	0.0831
4000	1.2150	3160.1	0.0778	1.2650	3162.8	0.0806
5000	1.2430	3232.7	0.0726	1.2950	3238.4	0.0756
6000	1.2700	3302.7	0.0700	1.3210	3303.9	0.0655
7000	1.2960	3370.1	0.0674	1.3460	3367.0	0.0630
8000	1.3210	3434.9	0.0648	1.3720	3432.6	0.0656
9000	1.4490	3766.5	0.3316	1.5070	3773.3	0.3407
9500	1.5310	3978.6	0.4243	1.5930	3990.4	0.4342
9846	1.5910	4133.7	0.4483	1.6550	4146.9	0.4524
9928	1.6050	4169.9	0.4411	1.6690	4182.2	0.4310
LUB	1.0890	2833.4	----	1.1330	2830.4	----

GENERAL REMARKS:

DWT IN: 2795
DWT OUT: 2796
MAX BHT: RAN TEMP ELEMENT

ELEMENT 850364/5150 CALIBRATED 25 JAN 88
ELEMENT 46103/4800 CALIBRATED 25 JAN 88

SWAN LAKE # 1 - STATIC PRESSURE GRADIENT - 6/2/88
ELEMENT # 46103/4800 (BOT)



90000



CLIENT SANTOS
WELL SWAN LAKE #1

STATIC GRADIENT SURVEY

OPERATOR A SMITH

DATE 6-2-88

BOMB No. 1 DATA						BOMB No 2 DATA				DWT IN 19272 KPA	
ELEMENT No. 850364		ELEMENT RANGE 5150 PSI				ELEMENT No. 46103		ELEMENT RANGE 4800 PSI		DWT OUT 19278 KPA	
RECORDER No 70544		CLOCK DATA 15014 x 3 HR				RECORDER No 14633		CLOCK DATA 2533 x 3 HR			
ENGAGE STYLUS 0926		DISENGAGE 1147				ENGAGE STYLUS 0926		DISENGAGE 1147			
PRESSURE LUBRICATOR 0937						BLEED LUBRICATOR 1138					
DATE	TIME	DEPTH METERS	DEFLEC- TION	PRESSURE KPA	GRADIENT psi/ft	DEPTH METERS	DEFLEC- TION	PRESSURE KPA	GRADIENT psi/ft	REMARKS	
6TH	FEBURARY	1988									
	0937	LUB	1.083	19429		LUB	1.128	19429		PRESSURE LUBRICATOR	
	0947	R.I.H								RUN IN HOLE	
	0951	304.8	1.118	20055		304.8	1.164	20053			
	0957	609.6	1.152	20663		609.6	1.200	20678			
	1003	914.4	1.185	21252		914.4	1.233	21252			
	1009	1219.2	1.215	21789		1219.2	1.265	21808			
	1015	1524	1.243	22289		1524	1.295	22329			
	1021	1828.8	1.270	22772		1828.8	1.321	22780			
	1027	2133.6	1.296	23237		2133.6	1.346	23215			
	1033	2438.4	1.321	23684		2438.4	1.372	23668			
	1039	2743.2	1.449	25970		2743.2	1.507	26017			
	1043	2895.6	1.531	27432		2895.6	1.593	27514			
	1048	3001	1.591	28502		3001	1.655	28593		MPP	
	1059	3026	1.605	28751		3026	1.669	28836			
	1102	P.O.O.H								PULL OUT OFF HOLE	
	1128	LUB	1.089	19536		LUB	1.133	19516		ARRIVE IN LUBRICATOR	

GENERAL REMARKS: ALSO RAN TEMPERATURE ELEMENT 63256 x 150° - 400° & CASING = Ø KPA
RECORDER 61275 x 15TLS
CLOCK 2530 x 3HR.

South Australia Business Unit
Santos Ltd
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Adelaide South Australia 5001
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Facsimile: 08 8224 7636

Ref: PD: 444/97

18 June 1997

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Managing Director
Crusader Limited
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12 Creek Street
BRISBANE QLD 4000



Mr T Aust
Mines and Energy SA
PO Box 151
EASTWOOD SA 5063

Gentlemen

Re: Swan Lake Well Test PEDSA: 023/97

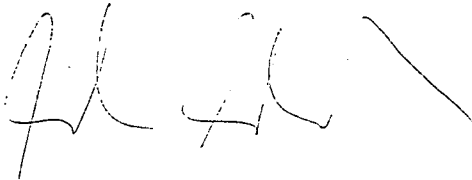
Please find attached a report which documents the well test interpretation for the Swan Lake #1 - Sidetrack #1 well which was performed in April 1997.

The results are summarised in the table below.

Well No.	Date	Test Type	Flow Capacity 'kh' (md.ft)	Skin	Reservoir Pressure @ 8600 ft.SS (psia)	Comment
1	15/04/97	LET/PLT/BHP/SGS	158	9.4	3416	Use results with caution

If you have any queries regarding this report, please contact Richard Leslie on (08) 8224 7898 or Susannah Craddock on (08) 8224 7375.

Yours faithfully

A handwritten signature in black ink, appearing to be 'C Cruickshank', written in a cursive style.

C Cruickshank
Manager - Petroleum Development SA

cc R D Leslie / S M Craddock
K L Chen
J S Evanochko w/o attachments
P O'Rourke w/o attachments
Well file

Swan Lake #1 BHP Survey April 1997

Well Test Analysis Report

Analyst name	M. Pitkin / E. Leung
Company	Santos Limited
Field	Swan Lake
Well	1 - Sidetrack 1
Date	15 / 04 / 97
Formation	Toolachee / Epsilon
Test	LET / PLT / BHP / SGS
Depth Reference	138 ft.ASL
Gauge Type	McAllister
Gauge Number	552
Gauge Depth - Measured	8564 ft.KB
Gauge Depth - Vertical	-8426 ft.SS
Perforated Interval Top	8392 ft.KB
Perforated Interval Bottom	8588 ft.KB

Remarks: A 33 hour liquids evaluation test (LET) was conducted prior to a 92 hour shut-in. An average flow rate of 4.42 MMscf/d was obtained from the LET measurements which was used for the well test analysis. This also the first production test performed in this well.

The Test Overview indicates 'humping' early in the build-up which is usually associated with phase redistribution. However, this phenomenon is not possible in this reservoir as PVT data indicated a dry gas with a negligible condensate gas ratio. The humping does not appear to be due to mechanical problems and therefore the source of the problem is unidentifiable.

The radial derivative (Log-Log Plot) illustrates some peculiar behaviour. It indicates that flow capacity decreases and then increases as a function of time. This indicates that there may be a thin zone of low permeability separating two higher permeability zones, either vertically (draining adjacent reservoir layers) or radially (compartmentalisation).

Using the Log-Log Plot, the onset of radial flow was identified in the late-time region (LTR). A gradient was obtained by a least-squares regression using the corresponding radial flow period on the Horner Plot (Radial Flow Plot) which indicated a flow capacity of 158 md.ft (3.1 md) with an apparent skin of 9.4.

A reservoir pressure of 3404 psia at a gauge depth of 8564 ft.KB was found by extrapolating the late-time data on the Horner Plot. A corrected reservoir pressure of 3416 psia was determined at a datum depth of 8600 ft.SS. The pressure at the datum depth was calculated from the gauge depth using a fluid gradient of 0.067 psi/ft, as measured in the static gradient survey (SGS) which followed the build-up survey.

It appears that there may be a considerable decrease in reservoir pressure during the 113 MMscf of production to date, since the 14th of March, 1997. This is not supported by the flow rate which appears to be cleaning up with time and does not indicate depletion of a thin high permeability layer which would seem an adequate reservoir model given the PLT and pressure information. The relevant plots are attached at the end of this report.

Swan Lake #1 BHP Survey April 1997

Well Test Analysis Report

Reservoir Description

Fluid type : Gas

Well orientation : Vertical

Number of wells : 1

Number of layers : 1

Layer Parameters Data

	Layer 1
Formation thickness	51.50 ft
Average formation porosity	0.0955
Water saturation	0.4019
Gas saturation	0.5981
Formation compressibility	4.9561e-6 psi-1
Total system compressibility	1.4971e-4 psi-1
Layer pressure	3615.0000 psia
Temperature	270.0000 deg F

Well Parameters Data

	Well 1
Well radius	0.25 ft
Distance from observation to active well	0.0000 ft
Wellbore storage coefficient	0.0389 bbl/psi
Well offset - x direction	0.00 ft
Well offset - y direction	0.00 ft

Fluid Parameters Data

	Layer 1
Gas gravity	0.7666 sp grav
Water-Gas ratio	3.5000 STB/MMscf
Water salinity	3.0000e4 ppm
Check Pressure	3615.0000 psia
Check Temperature	270.0000 deg F
Gas density	10.5933 lb/ft3
Initial gas viscosity	0.0211848 cp
Gas formation volume factor	5.5257e-3 ft3/scf
Water density	59.8386 lb/ft3
Water viscosity	0.1988 cp
Water formation volume factor	1.06397 RB/STB
Initial Z-factor	0.96813
Initial Gas compressibility	2.3979e-4 psi-1
Water compressibility	3.3120e-6 psi-1

Swan Lake #1 BHP Survey April 1997

Well Test Analysis Report

Layer Gas Composition Table

	Layer 1
Nitrogen	0.1500
CO2	14.6400
H2S	0.0000
Methane	76.6800
Ethane	5.7500
Propane	1.4900
Iso-Butane	0.2100
n-Butane	0.3700
Iso-Pentane	0.1100
n-Pentane	0.1200
Hexanes	0.1300
C7+	0.3500
C7+ Molecular Weight	120.0000

Layer 1 Correlations

Not Used

Layer Boundaries Data

Layer 1 Boundary Type : Infinitely acting

	Layer 1
L1	0.0000 ft
L2	0.0000 ft
L3	0.0000 ft
L4	0.0000 ft
Drainage area	0.0000 acres
Dietz shape factor	0.0000

Layer 1 Model Data

Layer 1 Model Type : Radial homogeneous

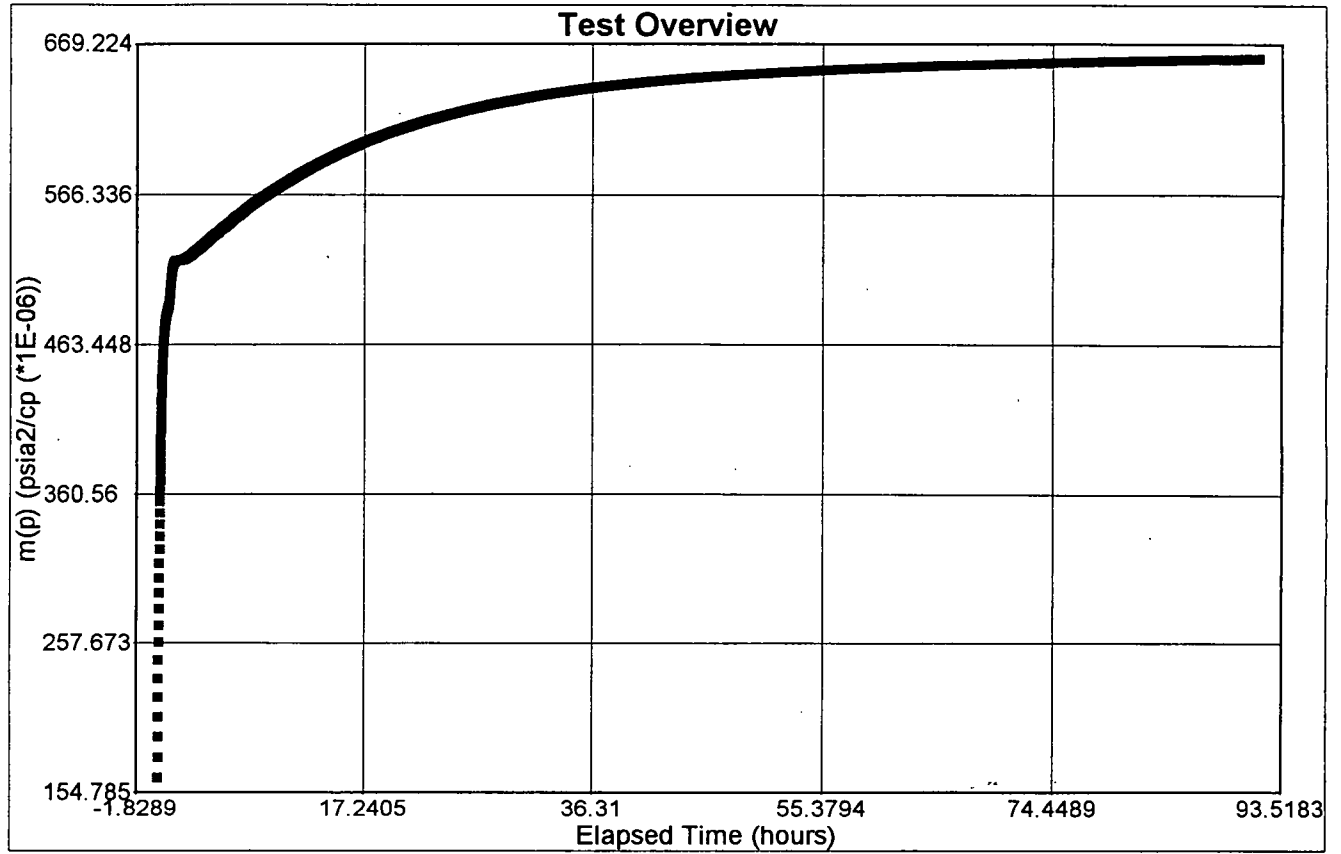
	Layer 1
Permeability	2.085 md
Skin factor (Well 1)	8.3545
Rate dependent skin coefficient (D)	0.0000 1/(Mscf/day)

Rate Change Data

Time	Pressure	Rate
Hours	psia	MMscf/day
0.00000	1524.5031	0.0000
609.35999	1521.8621	4.4190
701.04468	3318.3010	0.0000

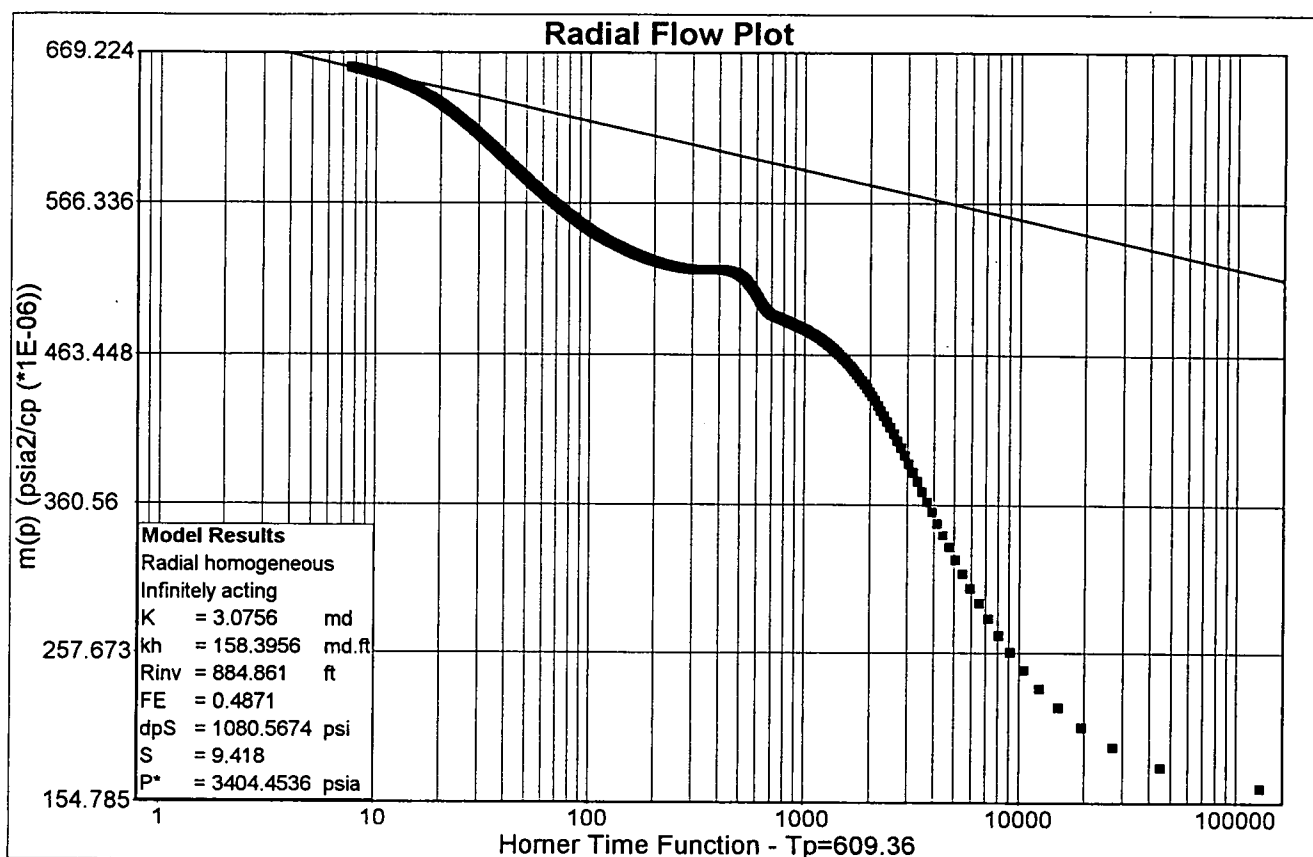
Swan Lake #1 BHP Survey April 1997

Well Test Analysis Report



Swan Lake #1 BHP Survey April 1997

Well Test Analysis Report

**Radial Flow Plot Model Results**

Radial homogeneous

Infinitely acting

	Value
Permeability	3.0756 md
Permeability-thickness	158.3956 md.ft
Radius of investigation	884.8610 ft
Flow efficiency	0.4871
dP skin (constant rate)	1080.5674 psi
Skin factor	9.418
Extrapolated pressure	3404.4536 psia

Radial Flow Plot Line Details

Line type : Radial flow

Slope : -33.315

Intercept : 688.749

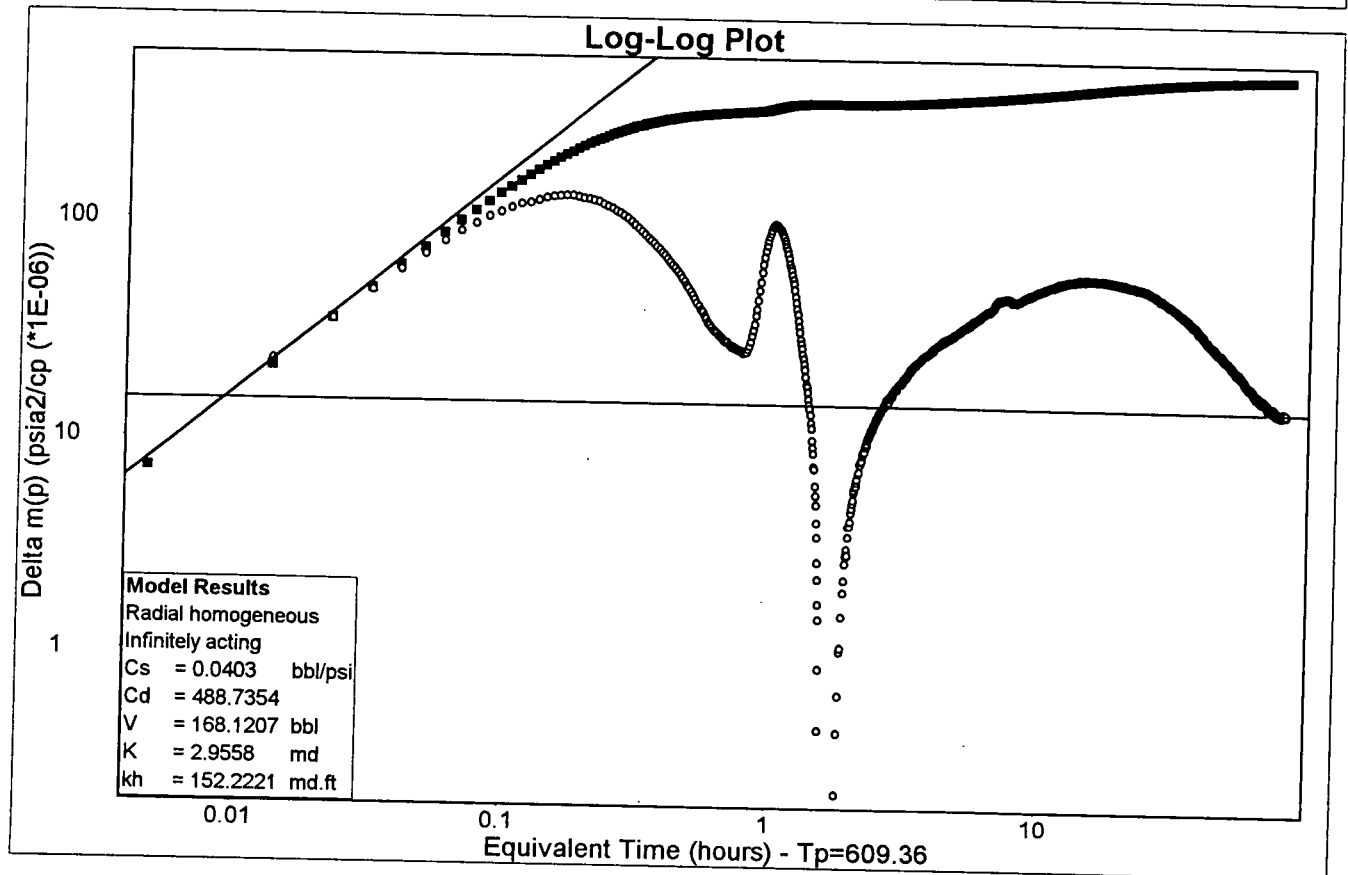
Coefficient of Determination : 0.997462

	Radial flow
Extrapolated m(p)	688.7490 psia2/cp (*1E-06)
Extrapolated pressure	3404.4536 psia
m(p) at dt = 1 hr	595.9471 psia2/cp (*1E-06)
Pressure at dt = 1 hour	3129.1506 psia

Number of Intersections = 0

Swan Lake #1 BHP Survey April 1997

Well Test Analysis Report

**Log-Log Plot Model Results**

Radial homogeneous

Infinitely acting

	Value
Wellbore storage coefficient	0.0403 bbl/psi
Dimensionless wellbore storage	488.7354
Apparent wellbore volume	168.1207 bbl
Permeability	2.9558 md
Permeability-thickness	152.2221 md.ft

Log-Log Plot Line Details

Line type : Wellbore storage

Slope : 1

Intercept : 1686.69

Coefficient of Determination : Not Used

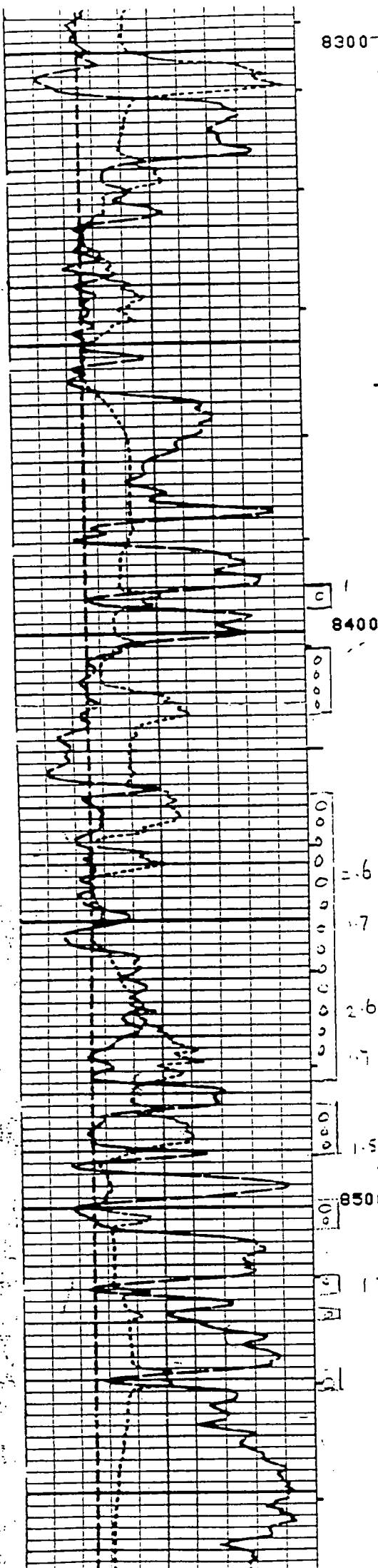
Line type : Radial flow

Slope : 0

Intercept : 15.0553

Coefficient of Determination : Not Used

Number of Intersections = 0



8300

Swan Lake 1
original well logs
Toolacee Formation
Perforation Intervals
(intended)
may be 8 ft off depth

8400

0.6

0.7

2.6

1.5

8500

17

Swan Lake 1

original well
logs

Epsilon Formation
perforation
interval

8500

0 2.5
0 1.7
0
0
0
0

7 March 97

2.8" Gauge Ring
tagged FETD 8582'

8600

8700

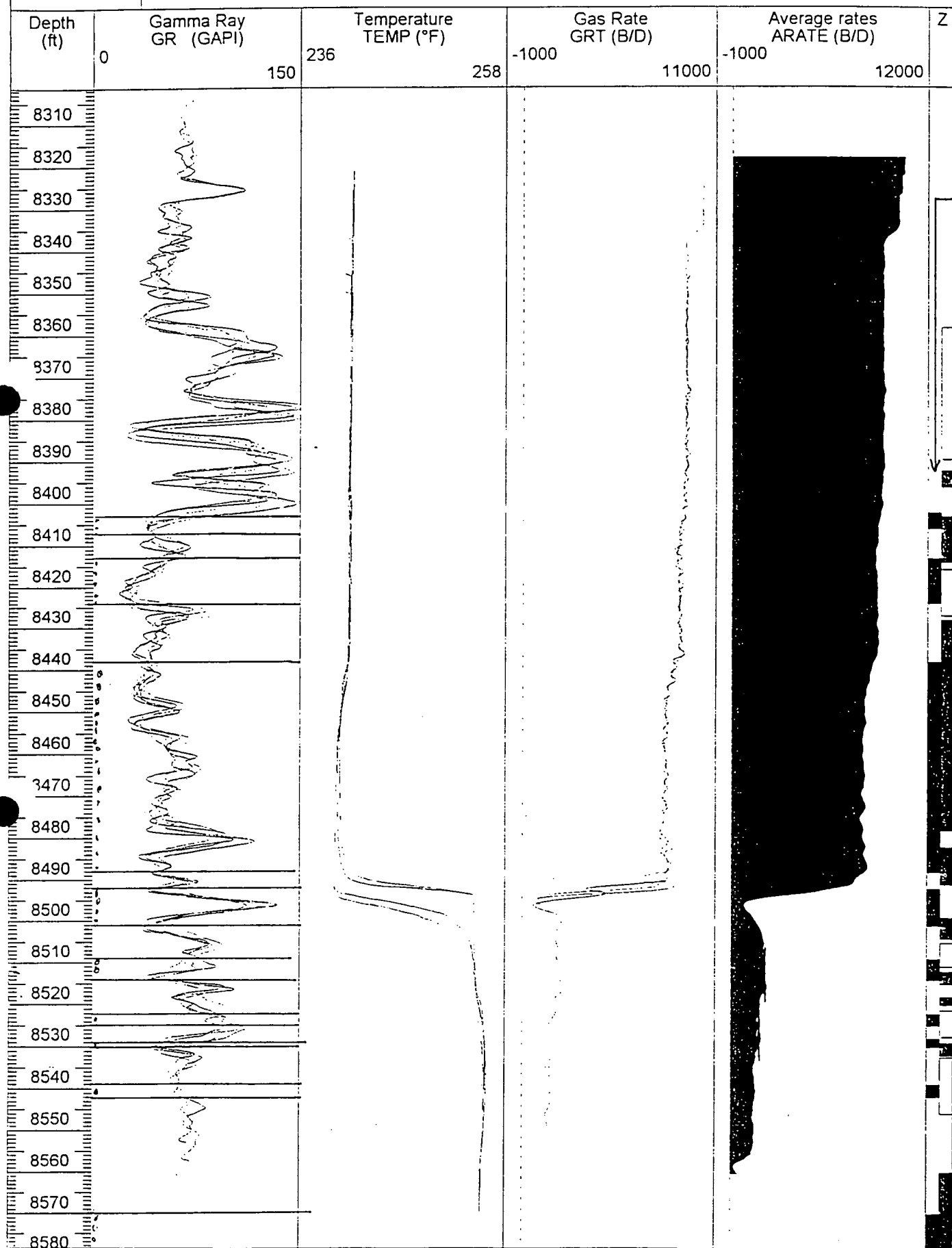


Log

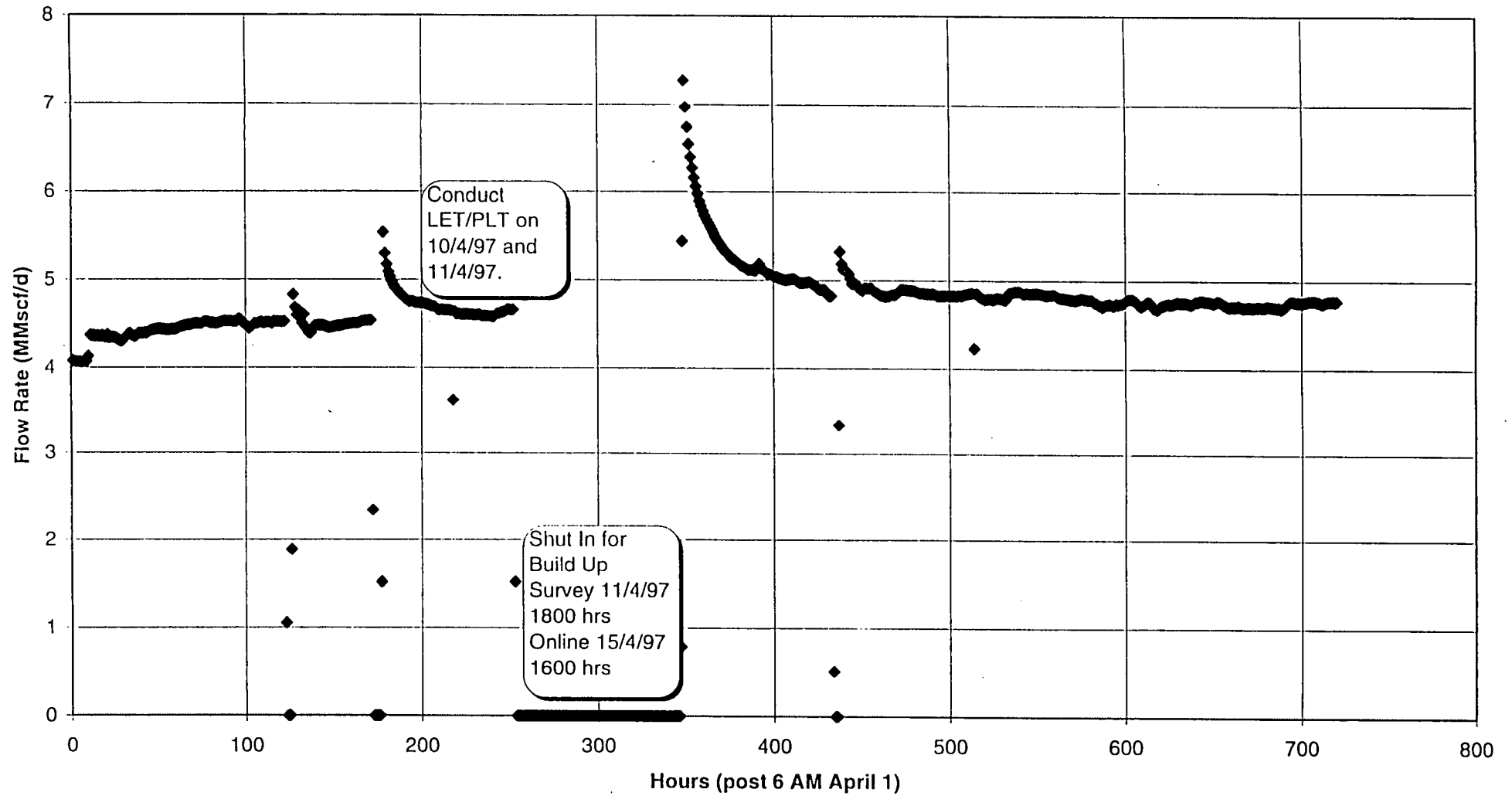
SwanLake1

Company: Santos Ltd
Field: Swan Lake
Well: Swan Lake #1

Test: MPL
Date: 11/4/97



Swan Lake 1 Side Track 1 - April 97 Production



Swan Lake 1 Side Track - March 1997 Production

