

909185 001

PAGE 1 OF 53

Geological + Drilling Rpt.'s

Naringal-1

(W1344)

Naringal-1 / Geological + Drilling Reports

Narrigal-1 PEP/154

909185 002

Latitude 38 27 18.32 S

Corrig  $9\frac{5}{8}$  ~~10~~ ~~(10)~~

1541 +  
53.7  
-----  
1594.7

Longitude 142 44 22.33 E

~~10~~ ~~10~~

1520 +  
53.7  
-----  
1573.7

Ground level 49m

Rotary Table 53.7

TD. 1704 MRT (-1650m)

Rig type ODE 30

Formation	Top on RT	SS
Clifton	630	-576
Mapunga	687	-633
Dilwyn	763	-709
Pemher	938	-884
Pebble Point	973	-919
Paarvatt	993	-939
Skull Creek	1305	-1251
Belfast Mudstone	1380	-1326
Fladman	<del>(1574)</del> (1574)?	-1520
Woorra Fin	1575	-1541
Eumeralla	1639	-1585
T.D.	1704	-1650

SWC : 20 Sample

MDT 20 Point pressure survey

No. Formation logs

No. Continuous coring

909185 003

23/1/02

**NARRINGAL - 1  
POST WELL AUDIT**

1. Q. What play was addressed by the well?

A. Tilted fault block closure.

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2. Q. What were the primary objectives of the well?

A. Waarre Sandstone - Gas

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3. Q. What were the result(s) of the well?  
Specify as a minimum Net Pay and significant test results.

A. The well failed to encounter a hydrocarbon accumulation with the Waarre Sandstone being water wet. Naringal-1 was plugged and abandoned. The Waarre was encountered 17m high which is within expectations and the structural form of the trap is considered to be unchanged. A thinner than predicted gross Waarre section with less sand was encountered. The top seal Belfast Mudstone is relatively thin (38m) at the location but this is due to the well intersecting the Belfast on the low side of the fault (as prognosed) rather than depositional thinning. No tests were run. A mean net pay of 18m was prognosed at the well ahead of drilling

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4. Q. For technical and commercial success cases: were the reservoir/pool parameters within the range (P90 - P10) predicted?

A. A gross Waarre section of 33m was encountered which was within the P90 (29m) to P50 (36.5m) range. Net to gross sand is 20% which is significantly lower than the P99 prognosed at 35%. Average porosities in the well were in the range of 15-20% which is consistent with the prognosed range of P99 at 15% and mean of 19.5%. Pool areas are considered to have been adequately captured in the prognosis in that the structural form is unchanged as a result of drilling.

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5. Q. **For failure cases: what was the reason for failure (in the primary targets)?  
Was the critical risk correctly identified?**

A. Ahead of drilling; seal, specifically updip cross fault seal, was identified as the critical risk on the prospect and was risked at 60%. Furthermore, although a relatively thick Belfast Mudstone section (to provide top/side seal) was predicted it was recognised that the updip fault plane may not be sealing thereby allowing the trap to leak. It was also noted that the Nullawarre Greensand may be juxtaposed in part against the Waarre along the updip cross fault. The Naringal structure did not exhibit a strong amplitude anomaly ahead of drilling as do other gas discoveries. Apart from a possible thinner Waarre section to account for the lack of amplitude anomaly it was recognised that the structure may have leaked due to seal failure.

A review of the outcome of the well indicates that the probable cause for the dry hole is side/top seal failure ie. critical risk was correctly identified.

Reasons for this are:

1. fault plane leak is possible
2. the Belfast section is relatively thin (due to faulting) in the order of 40m
3. a Nullawarre section (37m thick) is present along the updip fault plane within 40m of the Waarre
4. given the thin Belfast and the presence of Nullawarre, leakage at some point along the strike of the updip fault is possible.

There is a possibility that the failure of Naringal 1 is due to lack of charge but this does not seem likely given the widespread presence of the Eumeralla source unit and the presence of conduit faults.

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6. Q. **What was learnt concerning the understanding of the play in this area?**

A. This well had very limited amplitude response and to date successes in the Otway Basin have invariably had good amplitude response. This indicates that the development of amplitude anomalies are a significant factor in recognising potential accumulations.

The failure of the well is ascribed to lack of top/side seal. It will therefore be necessary in future drilling to develop models for top/side seal. These should include a focus on structures where maximum thicknesses of Belfast are present and where there is a low risk of Nullawarre juxtaposed to Waarre, where there is minimal risk of leakage at any point along the sealing fault and where there is some confidence in no fault plane leakage.

The Naringal location had a relatively low net to gross sand ratio in the Waarre sandstone and in future drilling depositional models should be developed and applied to ensure that potential locations have maximum sand development.

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**7. Q. What are the implications for nearby or related drilling opportunities?**

**A. Geological** - Reservoir modelling is needed to ensure locations have maximum sand development. A good understanding of the factors controlling the top/side seal efficiency as discussed above needs to be incorporated into prospects in the area.

**Geophysical** - The 3D data-set provided good structural definition at this location. A velocity survey was run at this well and this will assist in developing regional velocity models for depth conversion. The tie between the calibrated synthetic seismogram and seismic data was poor, however, and acquiring velocity surveys purely for well ties appears unnecessary. A review of the geophysical response versus the well results for the wells within the 3D area has commenced.

Amplitude anomalies appear to be a critical factor in identifying gas charged reservoirs in the area.

**Engineering** - The well was successfully drilled about 1.5 days faster than predicted. The final well cost was 3.6% over budget as detailed in Item 12.

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**8. Q. Were there any unexpected results or surprises in the well which impact on the hydrocarbon prospectivity of the area?**

**A. No.**

The dry hole outcome was within the predicted risk profile of the well and does not detract from the prospectivity of the area. Risks can be clearly identified and applied so that future drilling has a higher chance of success.

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**9. Q. Was there anything about the way this well was drilled which could be improved?**

A. Drilling programme, engineering etc. No issues in this area. The sub-surfaces tolerances were defined ahead of drilling as the well had to drill through a fault a encounter the Waarre crestally on the structure but not too close to the controlling up-dip fault. This was achieved. The well was actually drilled faster than prognosed by about 1.5 days.

Logging, coring, testing etc. No issues in this area. No DST's. A velocity survey was run. SWC's Shot 24 Rec 19

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**10. Q. What is the exploration, appraisal or development programme resulting from this well?**

A. There are no immediate drilling plans in the area as a result of this well. The results will be incorporated into the risk profile of prospects in the immediate area within 3D seismic control. In particular the risking on Glenbrae which is the same type of play as Naringal about 1km to the north will be reviewed.

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**11. Q. Were relevant health, safety and environmental standards maintained? Are there any outstanding issues?**

A. All issues have been addressed according to requirements.

---



Anna.Pignetti@santos.com on 02/04/2002 09:38:07 AM

To: neil.gibbins@beachpetroleum.com.au, hector.gordon@beachpetroleum.com.au,  
kouros.mehin@nre.vic.gov.au, bruce.armour@nre.vic.gov.au,  
malcolm.altmann@beachpetroleum.com.au  
cc: danny.burns@beachpetroleum.com.au (bcc: Kouros Mehin/NRE)  
Subject: Naringal 1 Reports

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(See attached file: NA1\_0202.pdf)

Anna Pignetti  
Geology Operations Department  
Santos Limited  
Ph: 08 8224 7967

Santos Ltd A.B.N. 80 007 550 923

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- NA1\_0202.pdf



# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 02/02/02 (0600 Hours E.S.T.)

DEPTH: 1710m

PROGRESS: 0m

DAYS FROM SPUD: 10

CURRENT OPERATION: WELL PLUGGED AND ABANDONED, RIG RELEASED

NOPE COST (P&A) \$1,177,237  
(C&S) \$1,322,707FINAL FORECAST  
COST

COST TO DATE: \$ 1,184,420

CASING DEPTH: 378m

RIG: ODE 30

PROGRAMMED TD: 1704m

ROTARY TABLE: 53.7m

GROUND LEVEL: 49m

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2130 Hours)									

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST							

SURVEYS:	MD (m)	TVDRT (m)	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)	AZIMUTH (m)

#### PREVIOUS 24 HOURS OPERATIONS:

PULL OUT OF HOLE TO 404M, SET PLUG 3 FROM 404M TO 320M WITH 16.6 BBLs CEMENT AT 15.6 PPG, PULL OUT OF HOLE 4 STANDS AND CIRCULATE STRING AND ANNULAR VOLUMES, PULL OUT OF HOLE LAYING DOWN DRILL PIPE AND CEMENT STINGER, LAY OUT PIPE FROM MAST, MAKE UP BIT AND RUN IN HOLE ON DRILL COLLARS, TAG CEMENT 320M (2M LOW) WITH 15 KLB AND PRESSURE TEST TO 1100 PSI FOR 5 MINUTES, BREAK OUT KELLY AND PLUG TESTER, LAY OUT DRILL COLLARS AND REMAINING DRILL PIPE, FLUSH STACK, CHOKE AND SURFACE LINES, LAY OUT MOUSE HOLE AND REMOVE V-DOOR AND CATWALK, NIPPLE DOWN BLOW OUT PREVENTORS, REMOVE CLAMP ON SPOOL FROM MUD CROSS, CUT OFF AND REMOVE WELL-HEAD, RUN IN HOLE TO 30M WITH CEMENT STINGER, RIG UP CEMENTING LINES, SET PLUG 4 FROM 30 TO 0M WITH 8 BBL CEMENT AT 15.6 PPG, RIG DOWN SURFACE LINES, FLUSH AND LAY DOWN CEMENT STINGER, CLEAN TANKS, LAY OUT KELLY SPINNER, KELLY AND SWIVEL, RELEASE RIG AT 0700 HOURS ON THE 02/02/02.

#### ANTICIPATED OPERATIONS:

RIGGING DOWN, DEMOBILISE RIG.

909185 010



Department of  
Natural Resources and Environment

1 February 2002  
Our Ref: No; PEP/154

**FAXED**

240 Victoria Parade  
PO Box 500 East Melbourne  
Victoria 3002 Australia  
Telephone: (03) 9412 4011  
Facsimile: (03) 9412 4803  
ABN 90 719 052 204  
DX 210099

Justine N. Bevern  
Drilling Engineer  
Santos Ltd  
GPO Box 2319  
Adelaide 5001  
SOUTH AUSTRALIA

Dear Ms Bevern

**Consent To Abandon Naringal -1 Exploration Well in PEP 154**

I refer to your facsimile of 31 January 2002 regarding the above subject.

Under the provisions of the *Petroleum Act 1998*, and Part 4 of the *Petroleum Regulations 2000* I, as the Ministers delegate under the Act, hereby consent to the abandonment of the Naringal-1 well according to your proposed programme.

Please forward the full log evaluation reports as soon as they are available.

Yours sincerely

**HORACIO HAAG**

**Manager Petroleum Operations Safety and Environment**

Santos Ltd  
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Telephone: 08 8224 7618

909185 011  
**Santos**

## Facsimile

**To:** Bruce Armour  
Kourosh Mehin  
**Fax:** 03 9412 5152  
03 9412 5156

**From:** Justine N. Bevern  
**Return Fax:** 08 8224 7864

**Date:** 31 January 2002  
**Ref:** JNB005

**Subject:** Naringal 1 - P & A Approval  
**No of pages:** 1  
(incl. this one)

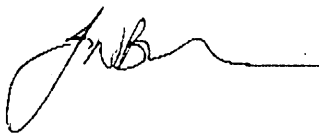
**( IF INCOMPLETE TRANSMISSION RECEIVED PLEASE PHONE 08 8224 7618 )**

Bruce,

Attached is the Plug and Abandon program for Naringal 1. As per our Drilling Operational Procedures we will set the bottom three plugs, wait on cement setting time and then go in and tag the plug over the surface casing shoe. This plug will be pressure tested to 1000 psi, which will ensure integrity of the cement plugs. A surface plug will be set and the well left with a name plate.

Santos are currently seeking your approval to plug and abandon Naringal 1. If you have any questions don't hesitate to give me a call on 08 8224 7618.

Regards,



Justine N. Bevern  
**Drilling Engineer**



909185 013

**Naringal 1 - Cement Plugs**

Plug Density	15.6 ppg	Open Hole	0.0443 bbl/ft	2-7/8 Tubing	0.005794 bbl/ft	580 ft
Plug Yield	1.19 cuft/sax	Tbg - OH	0.0379 bbl/ft	Drill Pipe	0.00742 bbl/ft	
Mix Water 1	5.236 gal/sax	Tbg - Surf Csg	0.0391 bbl/ft			
2	5.246	Surf Csg	0.0472 bbl/ft			
3	5.239					
4	5.298					

PLUG	Formation Top m	Top m MD	Bottom m MD	Depth m	Capacity bbl	Excess / Caliper	Spacer Before Plug bbls	Plug Volume bbls	Plug Volume Cuft	Sacks Cement	Mix Water bbls	Spacer After Plug bbls	Displacement Volume bbls
1	1578	1533	1623	90	13.08	20%	10.0	15.70	88.06	74	9.2	1.5	35.3
2	1093	1048	1138	90	13.08	20%	10.0	15.70	88.06	74	9.2	1.5	23.5
3	380	320	410	90	13.51	20%	10.0	16.21	90.95	76	9.5	1.5	5.8
4	Surface	0	90	90	13.94	0%	5.0	13.94	78.19	66	8.3	0.8	0.0

**Pumping plugs**

- A Spot stinger 35 metres below bottom of plug.
- B Pump high viscosity pill of 5 bbls.
- C Pull stinger up 35 metres (to bottom of plug).
- D Pump 10 bbls of water.
- E Pump plug, volume as above.
- F Pump 1.5 bbls water.
- G Pump displacement volume.
- H Pull out of plug slowly to leave a balanced plug.
- I Reverse circulate tubing clean.



Anna.Pignetti@santos.com on 02/01/2002 08:41:35 AM

To: neil.gibbins@beachpetroleum.com.au, hector.gordon@beachpetroleum.com.au,  
kouros.mehin@nre.vic.gov.au, bruce.armour@nre.vic.gov.au,  
malcolm.altmann@beachpetroleum.com.au  
cc: danny.burns@beachpetroleum.com.au (bcc: Kouros Mehin/NRE)  
Subject: Naringal 1 Reports

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(See attached file: NA1\_0102.pdf)

Anna Pignetti  
Geology Operations Department  
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Ph: 08 8224 7967

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A.C.N. 007 550 923

**WELL PROGRESS REPORT****NARINGAL 1**

DATE: 01/02/02 (0600 Hours E.S.T.)

DEPTH: 1710m

PROGRESS: 0m

DAYS FROM SPUD: 9

CURRENT OPERATION: RUNNING ABANDONMENT PROGRAM, SETTING PLUG 3 OVER THE PAARATE FM

NOPE COST (P&A) \$1,177,237  
(C&S) \$1,322,707FINAL FORECAST  
COST

COST TO DATE: \$ 986,141

CASING DEPTH: 378m

RIG: ODE 30

PROGRAMMED TD: 1704m

ROTARY TABLE: 53.7m

GROUND LEVEL: 49m

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2130 Hours)	4%KCL/POLY	9.50	40	7.0	8.5	22200	26500	14/12	-

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	2/2/WT/A/0/1/RR/TD

SURVEYS:	MD (m)	TVDRT (m)	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)	AZIMUTH (m)
11	1290	1290	0.25	356	2.84	020.45
12	1440	1443	0.25	030	3.46	019.66
13	1598	1590	0.75	150	3.24	035.50
14	1694	1694	1.75	059	4.48	050.46

**PREVIOUS 24 HOURS OPERATIONS:**

WASH AND REAM FROM 1688m TO 1710m, CIRCULATE HOLE CLEAN, FLOW CHECK, PUMP PILL, PULL OUT OF HOLE, RIG UP REEVES FOR RUN 3 (VELOCITY), HOLD SAFETY MEETING, SHUT DOWN RIG POWER, RUN IN HOLE WITH TOOLS, CONDUCT VELOCITY SURVEY, PULL OUT OF HOLE, RIG DOWN EXPERTEST AND REEVES, RIG DOWN SHEAVES, PREPARE TO CEMENT PLUGS FOR P&A, RUN IN HOLE WITH CEMENT STINGER TO 1658m, SET PLUG 1 FROM 1618m TO 1528m WITH 15.5 BBLs OF CEMENT AT 15.6 PPG, CHECK FOR BACK FLOW AND PULL OUT OF HOLE 4 STANDS, PULL OUT OF HOLE TO 1135.4m, MIX AND PUMP PLUG 2 FROM 1135m TO 1035m WITH 15.5 BBLs OF CEMENT AT 15.6 PPG, PULL OUT OF HOLE LAYING DOWN SINGLES TO 443m, MAKE UP CONECTING HEAD AND SPOT 5 BBL HI VIS PILL

**ANTICIPATED OPERATIONS:**

COMPLETE PLUG AND ABANDON PROGRAM, NIPPLE DOWN BLOW OUT PREVENTER'S, REMOVE BRADEN HEAD AND RIG RELEASE

909185 016

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 01/2/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog
CLIFTON FORMATION	658.0	-604	29 L
NARRAWATURK MARL	698.0	-644	NOT PROGNOSED
MEPUNGA FORMATION	729.0	-675	42 L
DILWYN FORMATION	780.0	-726	17 L
PEMBER MUDSTONE	1019.0	-965	81 L
PEBBLE POINT FORMATION	1067.0	-1015	94 L
PAARATTE FORMATION	1090.5	-1037	98 L
SKULL CREEK MUDSTONE	1367.5	-1314	63 L
NULLAWARRE GREENDSAND	1493.0	-1439	N/P
BELFAST MUDSTONE	1520.0	-1466	140 L
FLAXMANS FORMATION	1552.5	-1499	21 H
WAARRE FORMATION	1565.5	-1512	29 H
EUMERALLA FORMATION	1605.0	-1551	34 H
TOTAL DEPTH	1710.0	-1656	6 L

HYDROCARBON SHOW SUMMARY		
INTERVAL	LITHOLOGY	GAS
NONE		

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS



Tina.Mannella@santos.com on 01/30/2002 09:09:24 AM



To: OTWAY.BASIN@santos.com  
cc: (bcc: Kourosch Mehin/NRE)  
Subject: MORNING REPORTS 30/1/02 - NARINGAL 1

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(See attached file: NA1\_3001.pdf) (See attached file: Na1\_1550.pdf)

\* \* Note: Bruce Armour - please advise if you didn't receive weekend reports (26-29/1). - Thank You.

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- Na1\_1550.pdf

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A.C.N. 007 550 923

**WELL PROGRESS REPORT****NARINGAL 1****DATE: 30/01/02 (0600 Hours E.S.T.)****DEPTH:** 1710m**PROGRESS:** 255m**DAYS FROM SPUD:** 7**CURRENT OPERATION:** CONDUCTING WIPER TRIP AT TD PRIOR TO PULLING OUT FOR WIRELINE LOGS**NOPE COST** (P&A)\$1,177,237  
(C&S)\$1,322,707**FINAL FORECAST COST** (P&A)\$  
(C&S)\$**COST TO DATE:** \$824,543**CASING DEPTH:** 378m**RIG:** ODE 30**PROGRAMMED TD:** 1704m**ROTARY TABLE:** 53.7m**GROUND LEVEL:** 49m

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2400 Hours)	4%KCL/POLY	9.35	39	6.4	9.5	22700	25500	9/14	0.18 @ 69° F

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	2/2/WT/A/0/I/RR/TD

SURVEYS:	MD (m)	TVDRT (m)	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)	AZIMUTH (m)
6	520	520	0.38	004	0.49	206.26
7	674	674	0.25	020	0.39	350.10
8	828	828	0.38	091	0.89	038.95
9	983	983	0.50	335	1.52	031.27
10	1136	1136	0.25	050	2.25	019.77
11	1290	1290	0.25	356	2.84	020.45
12	1440	1443	0.25	030	3.46	019.66
13	1598	1590	0.75	150	3.24	035.50
14	1694	1694	1.75	0.59	4.48	050.46

**PREVIOUS 24 HOURS OPERATIONS:**

DRILL AHEAD WITH SURVEYS FROM 1455m TO 1533m, RIG SERVICE, DRILL AHEAD FROM 1533m TO 1619m, RUN SURVEY, FLOW CHECK, PUMP SLUG, PULL OUT OF HOLE TO 828m FOR WIPER TRIP, RUN IN HOLE TO 1598m, HOLE IN GOOD CONDITION, PICK UP KELLY AND WASH TO BOTTOM WITH 1m OF FILL, DRILL AHEAD FROM 1619m TO 1629m, WELL APPEARED TO BE FLOWING, SHUT IN WELL AND MONITOR PRESSURES, CIRCULATE THROUGH CHOKE AND DEGASSER, OPEN ANNULAR AND OBSERVE WELL, NO FLOW, CIRCULATE AND FLOW CHECK, NO FLOW, DRILL AHEAD FROM 1629m TO 1710m, CIRCULATE HOLE CLEAN, SURVEY AND PULL OUT OF HOLE FOR 5 STAND WIPER TRIP

**ANTICIPATED OPERATIONS:**

COMPLETE WIPER TRIP, PULL OUT OF HOLE FOR WIRELINE LOGGING.

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 30/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog
CLIFTON FORMATION	658.0	-604	29 L
NARRAWATURK MARL	698.0	-644	NOT PROGNOSED
MEPUNGA FORMATION	729.0	-675	42 L
DILWYN FORMATION	780.0	-726	17 L
PEMBER MUDSTONE	1019.0	-965	81 L
PEBBLE POINT FORMATION	1067.0	-1015	94 L
PAARATTE FORMATION	1090.5	-1037	98 L
SKULL CREEK MUDSTONE	1367.5	-1314	63 L
NULLAWARRE GREENDSAND	1493.0	-1439	N/P
BELFAST MUDSTONE	1520.0	-1466	140 L
FLAXMANS FORMATION	1552.5	-1499	21 H
WAARRE FORMATION	1565.5	-1512	29 H
EUMERALLA FORMATION	1605.0	-1551	34 H
TOTAL DEPTH	1710.0	-1656	6 L

#### HYDROCARBON SHOW SUMMARY

INTERVAL	LITHOLOGY	GAS
NONE		

#### GEOLOGICAL SUMMARY

INTERVAL	LITHOLOGY	GAS
1367.5m -1493.0m ROP:1.5-8.6 min/m Ave: 3.5 min/m	<p><b>SKULL CREEK MUDSTONE</b>  <b>SILTSTONE AND MINOR SANDSTONE</b>            SILTSTONE: pale grey, light brown grey, medium grey, rare off white, argillaceous, rare arenaceous, trace micromicaceous, trace glauconite, trace disseminated pyrite, soft to dispersive, amorphous, occasionally subblocky.            SANDSTONE: clear to translucent, occasionally pale grey, occasionally off white, very fine to medium, occasionally coarse, poorly to moderately well sorted, subangular to subrounded, weak siliceous cement, trace glauconite, trace lithics, trace pyrite, trace carbonaceous specks, predominantly loose, occasionally friable to firm aggregates, poor inferred porosity, no fluorescence</p>	Trace C1
1493.0m -1520m ROP:0.7-7.2 min/m Ave: 1.5 min/m	<p><b>NULLAWAARRE GREENSAND</b>  <b>GLAUCONITIC SANDSTONE, MINOR SILTSTONE</b>            SANDSTONE: pale green, pale grey green, clear to translucent, fine to medium grained, occasionally coarse, poorly sorted, subangular to subrounded, weak siliceous cement, common quartz overgrowths, trace argillaceous matrix, abundant glauconite, trace lithics, trace pyrite, predominantly loose, occasionally firm aggregates, poor inferred and visual porosity, no fluorescence.</p>	Trace C1

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 30/01/02 (0600 Hours E.S.T.)

GEOLOGICAL SUMMARY		
<p><b>INTERVAL</b> 1520.0m –1552.5m ROP:1.7-7.3 min/m Ave: 3.2 min/m</p>	<p><b>LITHOLOGY</b> <b>BELFAST MUDSTONE</b> <b>INTERBEDDED SILTSTONE AND SANDSTONE</b> SILTSTONE: dark green grey, medium grey, arenaceous, abundant glauconite, trace micromicaceous, trace lithics, firm, subblocky. SANDSTONE: pale green, clear to translucent, green grey, occasionally pale yellow, fine to coarse grained, predominantly medium, poorly sorted, subangular to subrounded, occasionally angular, weak siliceous cement, trace argillaceous matrix, abundant glauconite, trace lithics, trace carbonaceous inclusions, predominantly loose, poor inferred and visual porosity, no fluorescence.</p>	<p><b>GAS</b> Peak: 5 Units BG: 0 Units 100% C1</p>
<p>1552.5m –1565.5m ROP:1.1-3.4 min/m Ave: 1.8 min/m</p>	<p><b>FLAXMANS FORMATION</b> <b>INTERBEDDED SANDSTONE AND SILTSTONE</b> SANDSTONE: predominantly pale brown, common pale green, trace translucent to off white, very fine to fine, medium in part, angular to subangular, weak to moderate siliceous cement, minor argillaceous matrix, abundant glauconite, rare micromicaceous, trace lithics, friable to firm aggregates, trace to rare loose, poor inferred and visual porosity, no fluorescence SILTSTONE: dark brown grey, medium grey, brown, arenaceous, common glauconite, trace micromicaceous, trace lithics, firm, subblocky.</p>	<p>Peak: 12 Units BG: 5 Units 98 / 2</p>
<p>1565.5m –1605.0m ROP:1.2-4.8 min/m Ave: 3.0 min/m</p>	<p><b>WAARRE FORMATION</b> <b>INTERBEDDED SANDSTONE AND SILTSTONE</b> SANDSTONE: pale brown, off white, clear to translucent, yellow, grey, fine to coarse, poorly sorted, subangular to subrounded, occasional subrounded, moderate siliceous cement, occasional quartz overgrowths, common argillaceous matrix, trace glauconite, trace pyrite, predominantly loose grains, occasional hard aggregates, poor to fair visual and inferred porosity, no fluorescence. SILTSTONE: light grey, grey brown, dark grey, arenaceous, rare argillaceous, common glauconite, soft to hard, subblocky to blocky, occasionally fissile.</p>	<p>Peak: 26 Units BG: 5 Units 97 / 3</p>
<p>1605.0m –1710.0m ROP:1.7-32.0 min/m Ave: 4.0 min/m</p>	<p><b>EUMERALLA FORMATION</b> <b>INTERBEDDED SANDSTONE AND SILTSTONE</b> SANDSTONE: white, clear, pale grey, yellow brown in part, fine to medium, rare coarse, moderately well sorted, subangular to subrounded, abundant argillaceous matrix, weak to moderate siliceous cement, rare glauconite (possible contamination), trace pyrite, trace quartz overgrowths, predominantly loose, minor firm aggregates, poor visual and inferred porosity, no fluorescence. SILTSTONE: light grey, off white, argillaceous, soft to firm, subblocky to blocky.</p>	<p>Peak: 28 Units BG: 2-8 Units 99 / 1</p>

909185 021

SANDSTONE:clr-trmsl,pl gy,occ pl  
brn,vf-med,occ crs,pr srt,sbang-  
sbrnudd,wk sil cmt,tr glauc,tr  
liths,tr pry,pred,lse,prn fr  
aggs,pr inf & vis por,no fluor.

SILTSTONE:med gy/gn,lt gy,aren  
g/t SST i/p,abd glauc,tr micmic,  
tr liths,frm,occ sft,sbbkly.

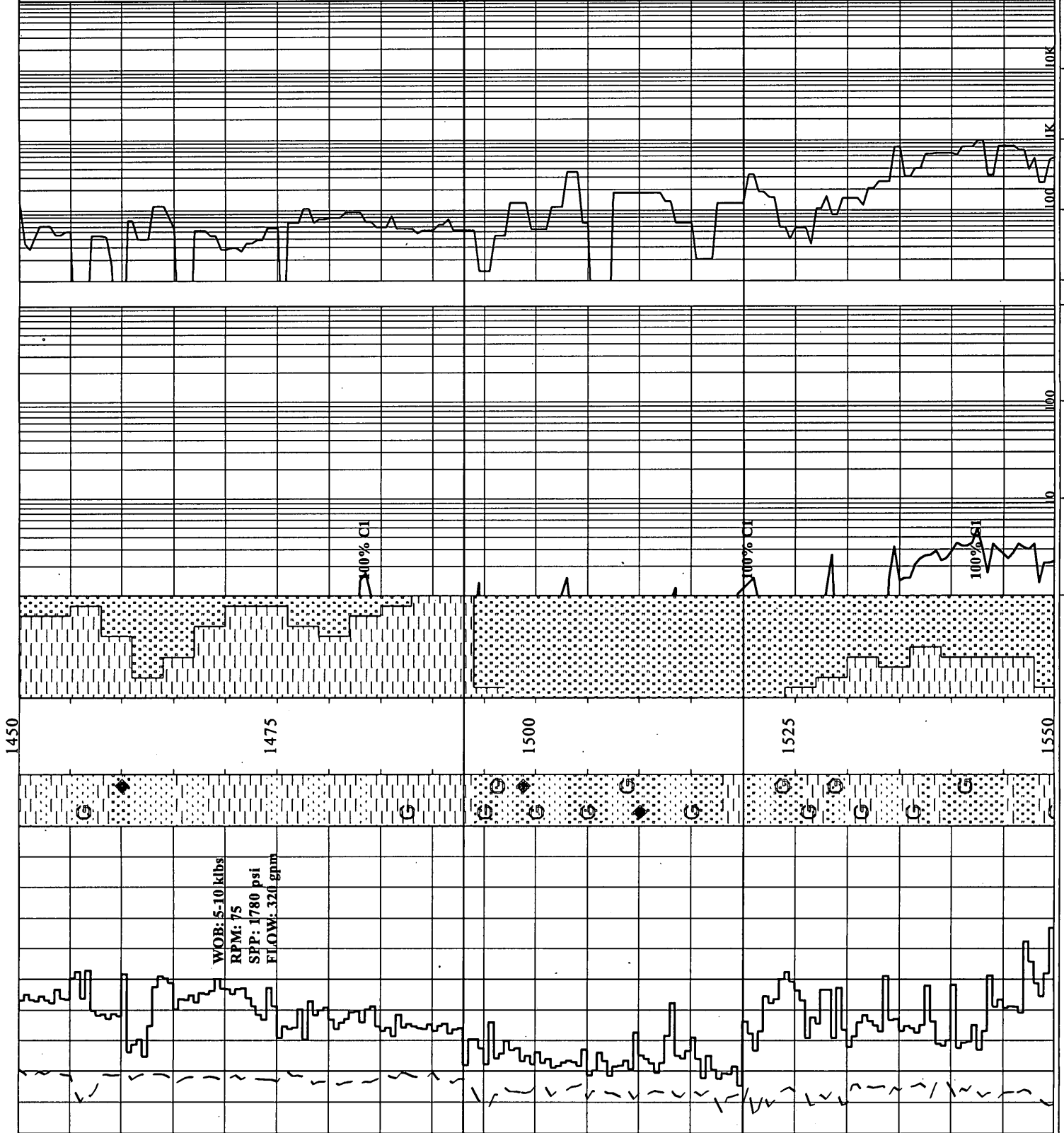
**NULLAWARRE GREENSAND**  
1493mRT (-1439mSS)

SANDSTONE:pl gnp/gy/gn,clr-  
trmsl,f-med,occ crs,pr srt,sbang  
-sbrnudd,wk sil cmt mainly as qtz  
ovgths,tr sity mtr,abd glauc,tr  
liths,tr pyr,pred lse,occ frm  
aggs,pr inf & vis por,no fluor.

**BELFAST MUDSTONE**  
1520mRT (-1466mSS)

SANDSTONE:pl gn,clr-trmsl,gn/gy,  
occ pl yel,f-crs,pred med,pr srt  
sbang-sbrnudd,occ ang,wk sil cmt,  
tr arg mtr,abd glauc,tr liths,tr  
carb inclc,pred lse,pr inf & vis  
por,no fluor.

SILTSTONE:dk gm/gy,med gy,aren,  
abd glauc,tr micmic,tr liths,frm



Well Name: NARINGAL #1

eeservices



Anna.Pignetti@santos.com on 01/29/2002 12:23:11 PM

To: neil.gibbins@beachpetroleum.com.au, hector.gordon@beachpetroleum.com.au,  
kourosh.mehin@nre.vic.gov.au, bruce.armour@nre.vic.gov.au,  
malcolm.altmann@beachpetroleum.com.au  
cc: danny.burns@beachpetroleum.com.au (bcc: Kourosh Mehin/NRE)  
Subject: Naringal 1 Reports

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(See attached file: Na1\_head.pdf)(See attached file: Na1\_1150.pdf)(See attached file: Na1\_1250.pdf)(See attached file: Na1\_1350.pdf)(See attached file: Na1\_1450.pdf)(See attached file: NA1\_2601.pdf)(See attached file: Na1\_450.pdf)(See attached file: Na1\_550.pdf)(See attached file: Na1\_650.pdf)(See attached file: Na1\_750.pdf)(See attached file: Na1\_850.pdf)(See attached file: Na1\_950.pdf)(See attached file: Na1\_1050.pdf)

Anna Pignetti  
Geology Operations Department  
Santos Limited  
Ph: 08 8224 7967

Santos Ltd A.B.N. 80 007 550 923

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- Na1\_head.pdf



- Na1\_1150.pdf



- Na1\_1250.pdf



- Na1\_1350.pdf



- Na1\_1450.pdf



- NA1\_2601.pdf







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-  - Na1\_950.pdf
-  - Na1\_1050.pdf

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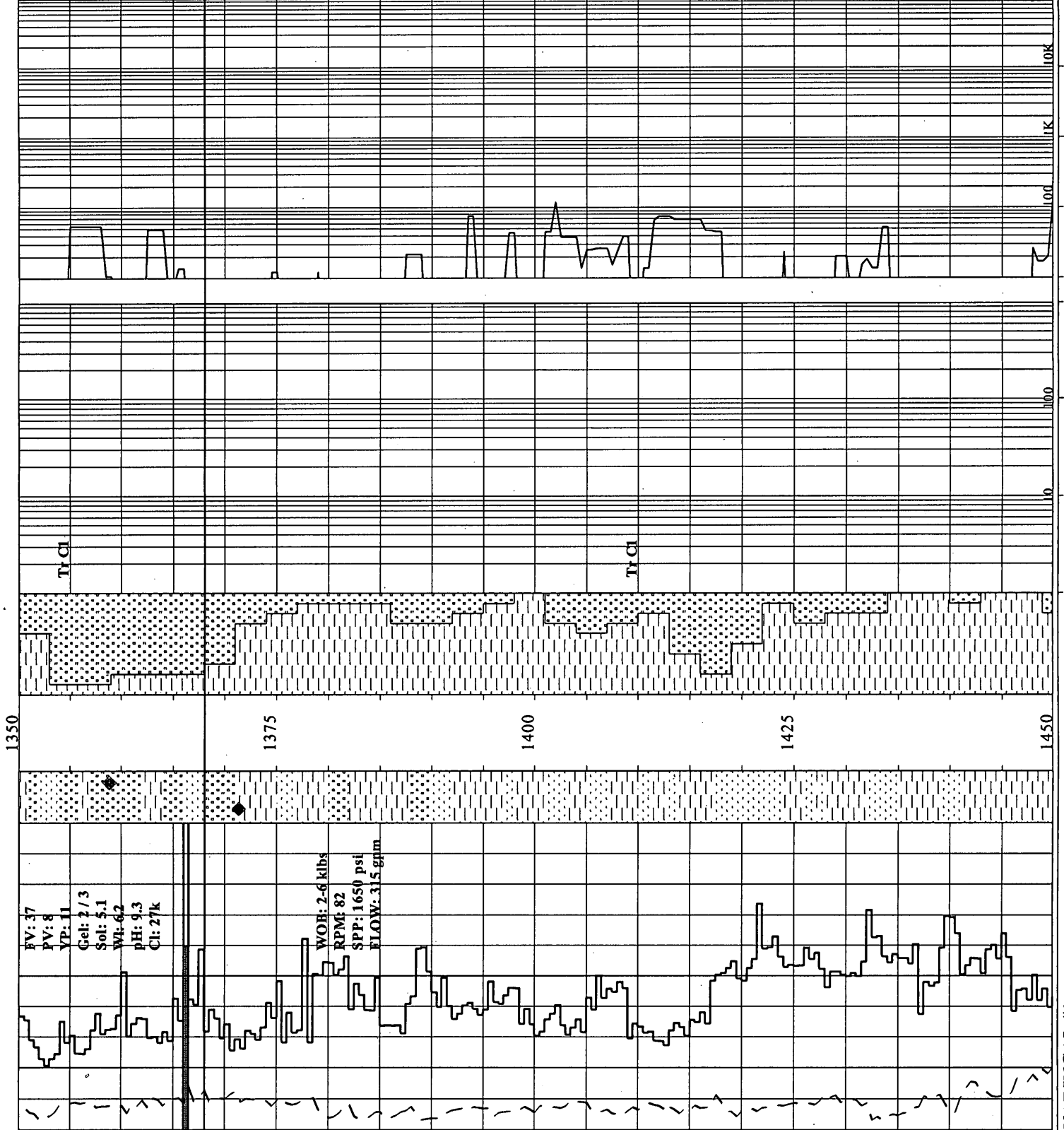
SKULL CREEK MUDSTONE  
1368mRT (-1314mSS)

SILTSTONE: pl gy, lt brn/gy, arg, rr  
aren, tr micmic, tr dissem pyr, sft  
-disp, amorph, occ sbbiky.

SILTSTONE: lt brn/gy, pl gy, occ  
off wh, arg, i/p aren g/t vf SST,  
tr micmic, tr glauc, sft-disp, occ  
frm, amorph-sbbiky.

SANDSTONE: clr-trnsl, occ pl gy,  
occ off wh, vf-f, wl srt, sbrmdd,  
nur wk sil cmt, tr liths, tr carb  
spks, lse, occ fri-frm aggs, pr inf  
& vis por, no fluor.

SILTSTONE: med gy, med gy/brn, arg,  
tr glauc, tr pyr, frm-sft, occ disp  
sbbiky, occ amorph.



Well Name: NARINGAL #1

ecoservices



909185 025

SILTSTONE:med-dk gry, tr-r carb  
flks, tr dis pyr & pyr nod, tr fos  
sft-vsft, sbblky-con amorph.

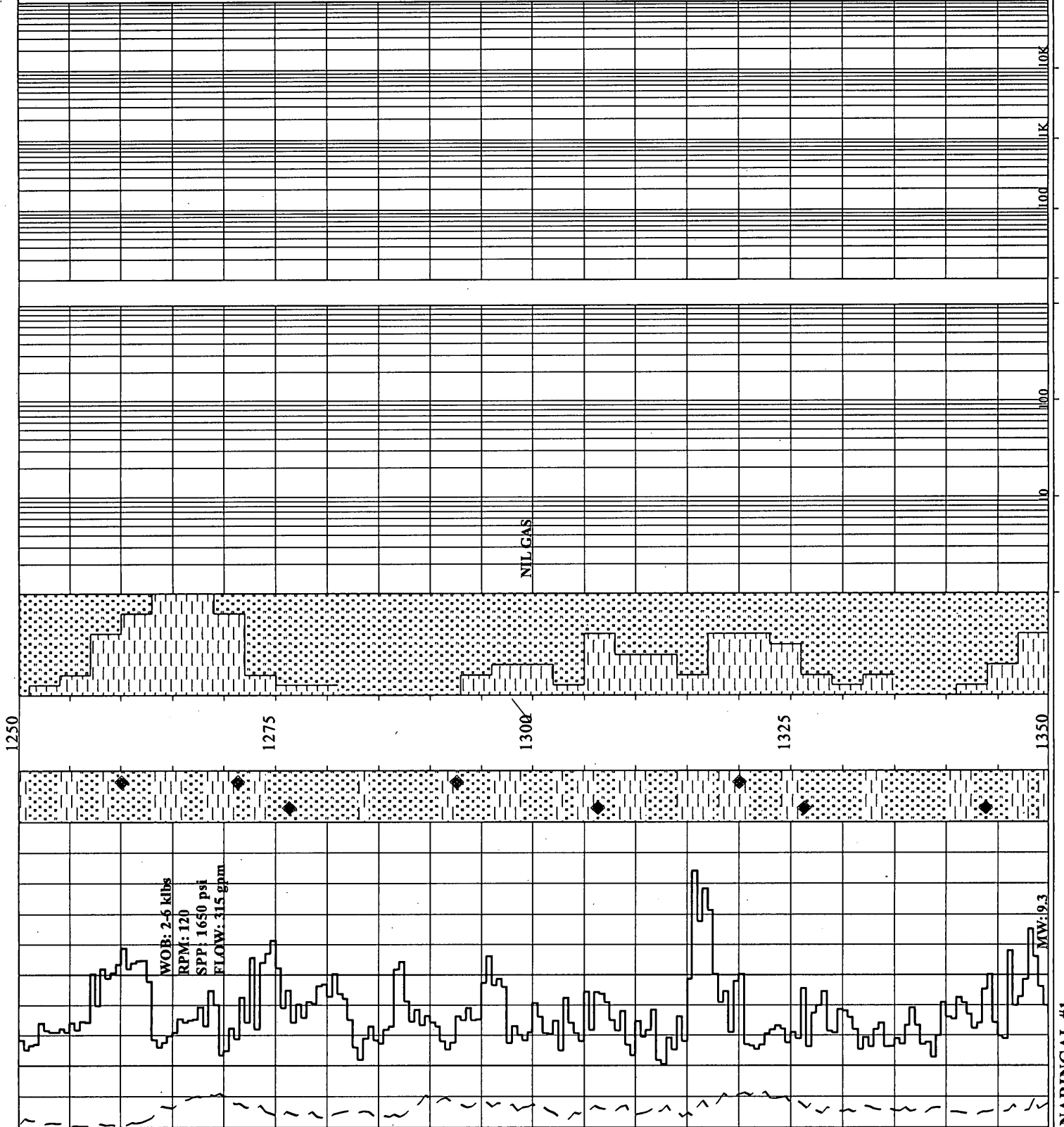
SANDSTONE:clr-trnsl, off wh-opq  
i/p, med-crs, tr vers & r f, pr-mo  
d srt, sbang, wk sil cmt, tr aren  
mtr, rr pyr nod, pred lse, fri i/p  
fr inf & vis por, no fluor.

SURVEY @ 1300m: 0.25° 352°T

SILTSTONE:dk gry, rr pl gry-pl bn  
areb, frm-sft, micmic, tr disp pyr,  
rr pyr nod, sbblky-amorph i/p.

SANDSTONE:clr-trnsl, med-crs, vf &  
& vers ip/pr srt, wk sil cmt, tr  
aren mtr, rr pyr nod, tr qtz  
ovgrths, fr-gd inf & vis por, no  
fluor.

Rmf @ 1350m: 0.15 @ 69°F



Well Name: NARINGAL #1

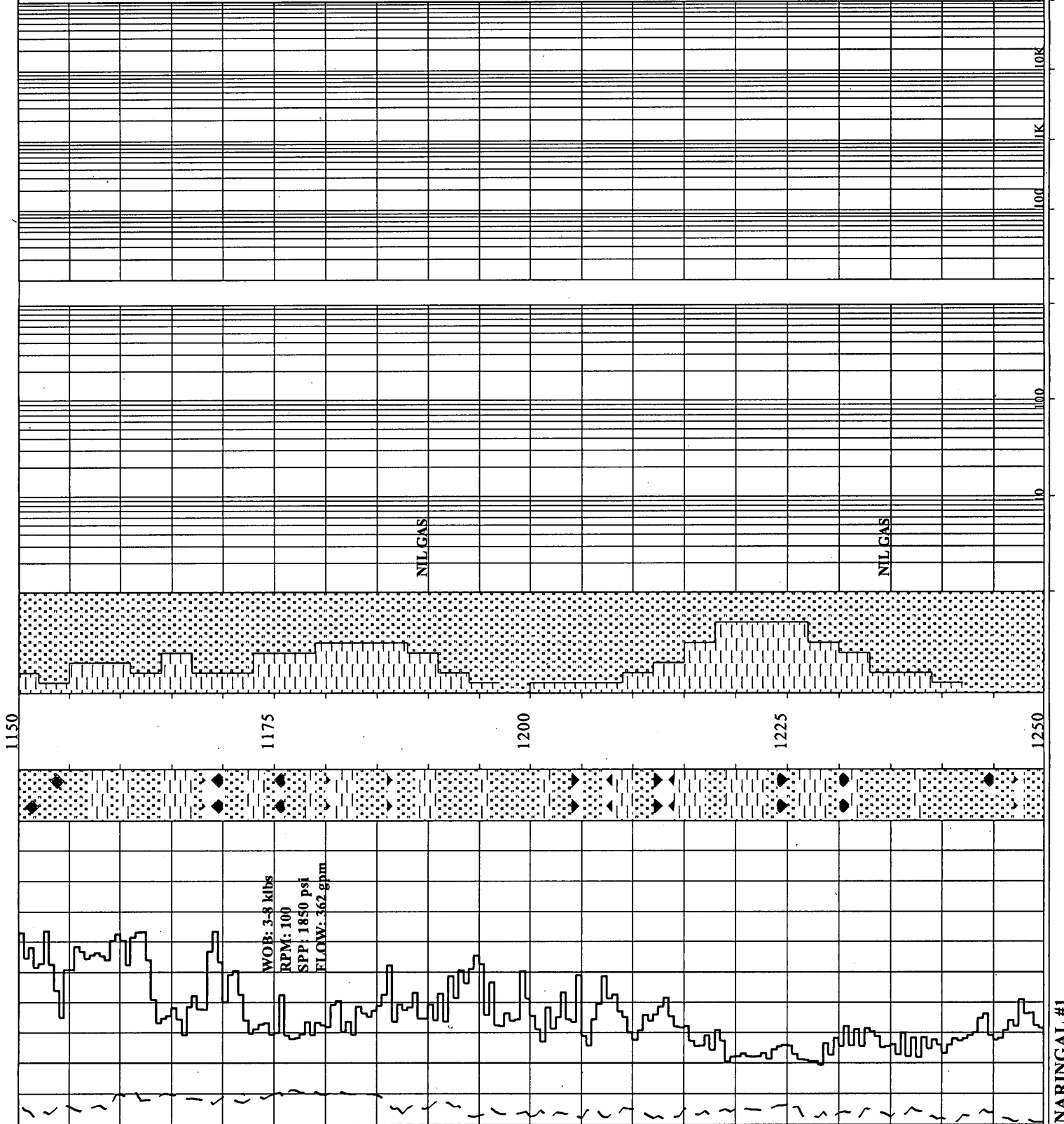
909185 026

SILTSTONE:pl,gy,brn,med,gy/  
brn,aren,arg i/p g/t CLYST, tr  
micmic, tr liths, sft, sbbilky.

SANDSTONE:clr-tmsl,mnr opq-fros  
tr pl,gy,v,crs-crs,pr,srt,sbrnrd  
-sbang,wk calc cmt,com aren mtr  
tr qtz ovgrths,com pyr nod,com  
dis pyr w/- tr foss replc,pr-fr  
inf & vis por,no fluor.

SILTSTONE:gy-lt,gy,aren,tr,dis  
pyr,rr pyr nod, tr glauc, tr foss,  
pred sft, disp i/p, sbbilky.

SANDSTONE:clr-tmsl,pl-opq i/p,  
med-crs,rr f,mod-pr,srt,sbang,wk  
calc cmt i/p,rr wk sil cmt,arg m  
mtrx i/p, tr pyr nod, tr foss,fr  
dom lsc,gd-fr inf & vis por,no  
fluor.



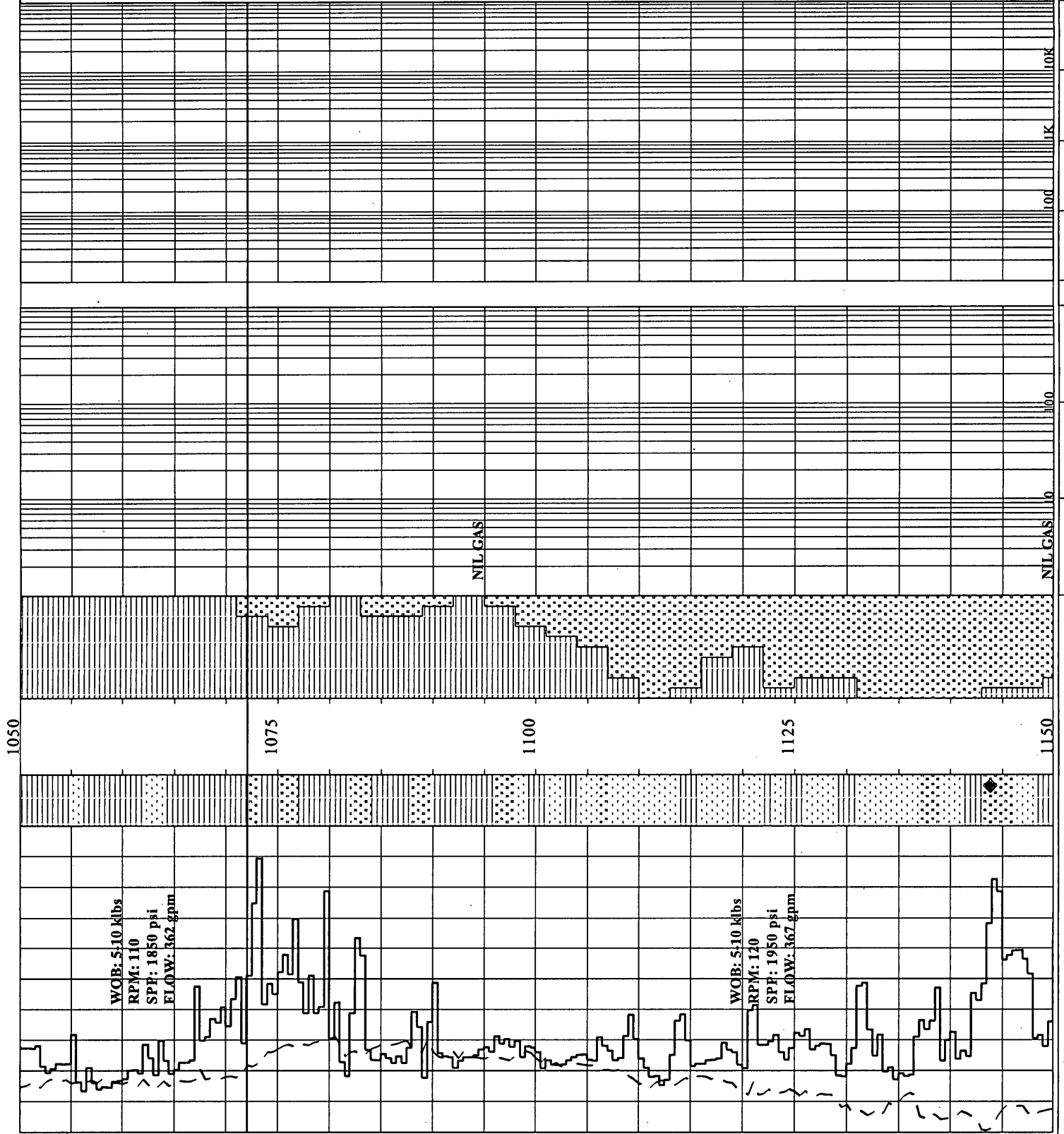
**PEBBLE POINT FORMATION**  
1072mRT (-1018mSS)

SANDSTONE:clr-tmsl,pl brnsh gy,  
f-med,occ crs,pr srt,sbrddd,occ  
sbang,lse,pr inf por,no fluor.

SANDSTONE:clr-tmsl,occ pl gy/  
brn,vf-f,occ med,rr crs,pr srt,  
sbrddd-rnd,mnrsbang,prsd lse,  
occ qtz ovghts,pr inf por,no  
fluor.

CLAYSTONE:lt-med gy,pl brn/gy,  
aren,i/p arg,lr micmic,lr liths,  
v sft-sft,occ disp,amorph,occ  
sbbiky.

SANDSTONE:clr-tmsl,occ pl brn/  
gy,med-crs,pr srt,sbang-sbrddd,  
wk sil cnt,mainly as qtz ovghts,  
tr liths,lse,pr inf por,no fluor



# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 29/01/02 (0600 Hours E.S.T.)

DEPTH: 1455m

PROGRESS: 375m

DAYS FROM SPUD: 6

CURRENT OPERATION: DRILLING AHEAD 6 3/4" HOLE IN THE SKULL CREEK MUDSTONE.

NOPE COST (P&A)\$1,177,237  
(C&S)\$1,322,707

FINAL FORECAST COST (P&A)\$  
(C&S)\$

COST TO DATE: \$788,965

CASING DEPTH: 378m

RIG: ODE 30

PROGRAMMED TD: 1704m

ROTARY TABLE: 53.7m

GROUND LEVEL: 49m

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2210 Hours)	4%KCL/POLY	9.30	37	6.2	9.3	24300	27000	8/11	0.15 @ 69° F

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	2/2/WT/A/0/1/RR/TD

SURVEYS:	MD (m)	TVDRT (m)	INCLINATION(°)	AZIMUTH (°)T	OFFSET (m)	AZIMUTH (m)
6	520	520	0.38	004	0.49	206.26
7	674	674	0.25	020	0.39	350.10
8	828	828	0.38	091	0.89	038.95
9	983	983	0.50	335	1.52	031.27
10	1136	1136	0.25	050	2.25	019.77
11	1290	1290	0.25	356	2.84	020.45
12						

#### PREVIOUS 24 HOURS OPERATIONS:

DRILL 6 3/4" HOLE WITH SURVEYS FROM 1080m TO 1455m, HIGH TORQUE SEEN WHILE DRILLING, UNABLE TO PUT MORE THAN SKLB ON BIT WITHOUT STALLING THE ROTARY TABLE.

#### ANTICIPATED OPERATIONS:

DRILL AHEAD 6 3/4" HOLE WITH SURVEYS IN THE SKULL CREEK MUDSTONE.

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 29/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog
CLIFTON FORMATION	658.0	-604	29 L
NARRAWATURK MARL	698.0	-644	NOT PROGNOSED
MEPUNGA FORMATION	729.0	-675	42 L
DILWYN FORMATION	780.0	-726	17 L
PEMBER MUDSTONE	1019.0	-965	81 L
PEBBLE POINT FORMATION	1067.0	-1015	94 L
PAARATTE FORMATION	1090.5	-1037	98 L
SKULL CREEK MUDSTONE	1367.5	-1314	67 L
NULLAWARRE GREENDSAND			
BELFAST MUDSTONE			
FLAXMANS FORMATION			

HYDROCARBON SHOW SUMMARY		
INTERVAL	LITHOLOGY	GAS
NONE		

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS (Peak/Background)
1019m -1067m ROP:0.7-5.9min/m Ave: 2.2 min/m	<b>PEMBER MUDSTONE</b> <b>CLAYSTONE</b> CLAYSTONE: light to medium brown, medium grey, trace micromicaceous, common carbonaceous specks, trace lithics, soft to dispersive, amorphous, occasionally calcareous.	Nil Gas
1067m -1090.5m ROP:0.8-12min/m Ave: 4.0 min/m	<b>PEBBLE POINT FORMATION</b> <b>CLAYSTONE AND MINOR SANDSTONE</b> CLAYSTONE: light to medium brown, medium grey, trace micromicaceous, common carbonaceous specks, trace lithics, soft to dispersive, amorphous, occasionally calcareous. SANDSTONE: clear to translucent, pale brownish grey, fine to medium, occasionally coarse, poorly sorted, subrounded occasionally subangular, loose, poor inferred porosity, no fluorescence.	Nil Gas
1090.5m -1142m ROP:0.7-4.0min/m Ave: 2.0 min/m	<b>PAARATTE FORMATION</b> <b>SANDSTONE AND CLAYSTONE</b> SANDSTONE: clear to translucent, occasionally pale grey brown, very fine to fine, occasionally medium, rare coarse, poorly sorted, subrounded to rounded, minor subangular, predominantly loose, occasional quartz overgrowths, poor inferred porosity, no fluorescence. CLAYSTONE: light to medium grey, pale brown grey, arenaceous in part, trace micromicaceous, trace lithics, very soft to soft, occasionally dispersive, amorphous, occasionally subblocky.	Nil Gas

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 29/01/02 (0600 Hours E.S.T.)

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS (Peak/Background)
1142m–1172m ROP:1.8-10.5min/m Ave: 4.0 min/m	<p><b>SANDSTONE AND SILTSTONE</b>  <b>SANDSTONE:</b> clear to translucent, occasionally pale brown grey, medium to coarse, poorly sorted, subangular to subrounded, weak siliceous cement, common quartz overgrowths, trace lithics, loose, poor inferred porosity, no fluorescence.  <b>SILTSTONE:</b> pale grey, pale brown, medium grey brown, arenaceous, argillaceous in part grading to claystone, trace micromicaceous, trace lithics, soft, subblocky.</p>	Nil Gas
1172m–1257m ROP:1.0-5.0min/m Ave: 2.5 min/m	<p><b>SANDSTONE AND SILTSTONE</b>  <b>SANDSTONE:</b> clear to translucent, minor opaque to frosted, trace pale grey, coarse to very coarse, poorly sorted, subangular to subrounded, weak calcareous cement, common arenaceous matrix, trace quartz overgrowths, common pyrite nodules, common disseminated pyrite with trace fossil replacement, poor to fair visual and inferred porosity, no fluorescence.  <b>SILTSTONE:</b> grey to light grey, arenaceous, trace disseminated pyrite, rare pyrite nodules, trace glauconite, trace fossils fragments, predominantly soft, dispersive in part, subblocky.</p>	Nil Gas
1257m–1315m ROP:1.0-11.0min/m Ave: 3.0 min/m	<p><b>SANDSTONE AND SILTSTONE</b>  <b>SANDSTONE:</b> clear to translucent, off white to opaque in part, medium to coarse, rare very coarse, rare fine, poorly to moderately sorted, subangular, weak siliceous cement, trace arenaceous matrix, rare pyrite nodules, predominantly loose grains, friable in part, fair visual and inferred porosity, no fluorescence  <b>SILTSTONE:</b> medium dark grey, trace to rare carbonaceous specks, trace disseminated pyrite, rare pyrite nodules, trace fossil fragments, soft to very soft, subblocky to commonly amorphous.</p>	Nil Gas
1315m–1367.5m ROP:1.0-26.0min/m Ave: 2.5 min/m	<p><b>SANDSTONE AND SILTSTONE</b>  <b>SANDSTONE:</b> clear to translucent, medium to coarse, fine and very coarse in part, poorly sorted, weak siliceous cement, trace arenaceous matrix, rare pyrite nodules, trace quartz overgrowths, predominantly loose grains, fair to good visual and inferred porosity, no fluorescence  <b>SILTSTONE:</b> dark grey, rare pale grey to pale brown, arenaceous, micromicaceous, disseminated pyrite, rare pyrite nodules, firm to soft, sub blocky to amorphous in part.</p>	Trace C1
1367.5m–1455m ROP:1.0-26.0min/m Ave: 2.5 min/m	<p><b>SKULL CREEK MUDSTONE</b>  <b>SILTSTONE AND MINOR SANDSTONE</b>  <b>SILTSTONE:</b> pale grey, light brown grey, rare off white, argillaceous, rare arenaceous, trace micromicaceous, trace glauconite, trace disseminated pyrite, soft to dispersive, amorphous, occasionally subblocky.</p>	Trace C1

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 28/01/02 (0600 Hours E.S.T.)

DEPTH: 1080m

PROGRESS: 420m

DAYS FROM SPUD: 5

CURRENT OPERATION: DRILLING AHEAD 6 3/4" HOLE IN THE PEBBLE POINT FORMATION.

NOPE COST (P&A)\$1,177,237  
(C&S)\$1,322,707

FINAL FORECAST COST (P&A)\$  
(C&S)\$

COST TO DATE: \$

CASING DEPTH: 378m

RIG: ODE 30

PROGRAMMED TD: 1704m

ROTARY TABLE: 53.7m

GROUND LEVEL: 49m

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2045 Hours)	4%KCL/PHPA	8.90	37	-	9.5	24300	26000	7/10	0.19 @ 73° F

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	2/2/WT/A/0/I/RR/TD

SURVEYS:	MD (m)	TVDRT (m)	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)	AZIMUTH (m)
6	520	520	0.38	004	0.49	206.26
7	674	674	0.25	020	0.39	350.10
8	828	828	0.38	091	0.89	038.95
9	983	983	0.5	335	1.52	031.27
10						

#### PREVIOUS 24 HOURS OPERATIONS:

DRILL AHEAD WITH SURVEYS FROM 660m TO 1004m, RIG SERVICE, FLOW CHECK, PUMP PILL, INSTALL ELEVATORS, PULL OUT OF HOLE FOR WIPER TRIP TO 231m, HOLE IN GOOD CONDITION, RUN IN HOLE TO 994m, WASH TO BOTTOM, DRILL AHEAD FROM 1004m TO 1080m.

#### ANTICIPATED OPERATIONS:

DRILL AHEAD WITH SURVEYS IN THE PEBBLE POINT – PAARATTE FORMATIONS

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 28/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog
CLIFTON	658	-604	29 L
NARRAWATURK MARL	698	-644	NOT PROGNOSED
MEPUNGA	729	-675	42 L
DILWYN	780	-726	17 L
PEMBER	1019	-965	81 L
PEBBLE POINT	1072	-1018	99 L

#### HYDROCARBON SHOW SUMMARY

INTERVAL	LITHOLOGY	GAS
NONE		

#### GEOLOGICAL SUMMARY

INTERVAL	LITHOLOGY	GAS Peak / Background
382m - 658m ROP:0.4- 3.0 min/m Ave: 0.75 min/m	<b>MASSIVE MARL.</b> MARL: medium grey to light grey, moderately calcareous, common shell fragments, trace fossil fragments, soft to dispersive in part, amorphous to trace subblocky.	Nil Gas
658m - 680m ROP:0.8- 2.8 min/m Ave: 1.5 min/m	<b>CLIFTON FORMATION LIMESTONE AND MARL.</b> LIMESTONE: light orange to light brown, orange red in part; lutitic, arenaceous in part, soft to firm in part, crystalline to micro-crystalline. MARL: medium grey to light grey, light red, moderately calcareous, common shell fragments, trace fossil fragments, common iron staining, soft to dispersive in part, amorphous to trace subblocky	Nil Gas
680m - 698m ROP:0.8- 1.5 min/m Ave: 1.2 min/m	<b>MARL AND SANDSTONE.</b> MARL: grey to dark grey, common calcareous, argillaceous, common micritic, trace glauconite, trace fossil fragments, soft to dispersive, amorphous to subblocky. SANDSTONE: light brown to brown orange, trace clear, predominantly fine to medium grained, trace granules, poor to moderately sorted, subrounded, weak calcareous cement, common red brown argillaceous matrix, iron oxide fossil replacement, trace fossil fragments, friable to moderately hard, trace loose, poor inferred and visual porosity, no fluorescence	Nil Gas
698m - 729m ROP:0.7- 3.2 min/m Ave: 1.2 min/m	<b>NARRAWATURK MARL</b> MARL: medium grey to light grey, light red, moderately calcareous, common shell fragments, trace fossil fragments, common iron staining, soft to dispersive in part, amorphous to trace subblocky	Nil Gas



# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 28/01/02 (0600 Hours E.S.T.)

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS(Peak/Background)
729m – 780m ROP:0.5- 3.5 min/m Ave: 1.0 min/m	<p><b>MEPUNGA FORMATION</b></p> <p>SANDSTONE: opaque to translucent, trace clear, medium to fine, trace coarse, moderately sorted, subangular to subrounded, weak calcareous cement, minor argillaceous matrix, trace glauconite nodules, loose, friable in part, good inferred porosity, no fluorescence.</p>	Nil Gas
780m – 830m ROP:1.0- 6.5 min/m Ave: 2.0 min/m	<p><b>DILWYN FORMATION</b></p> <p><b>INTERBEDDED SANDSTONE AND CLAYSTONE</b></p> <p>SANDSTONE: pale brown, orange brown, minor clear to translucent, medium to coarse grained, occasionally fine, poorly sorted, subrounded to rounded, occasionally well rounded, weak calcareous cement, trace argillaceous matrix, trace pyrite, predominantly loose, good inferred and visual porosity, no fluorescence.</p> <p>CLAYSTONE: grey to dark grey, arenaceous, very soft to soft, silty, trace sandstone.</p>	Nil Gas
830m – 915m ROP:0.6- 5.0 min/m Ave: 1.0 min/m	<p><b>SANDSTONE, MINOR CLAYSTONE</b></p> <p>SANDSTONE: pale brown, orange brown, minor clear to translucent, medium to coarse grained, occasionally fine, poorly sorted, subrounded to rounded, occasionally well rounded, weak calcareous cement, trace argillaceous matrix, trace pyrite, predominantly loose, good inferred and visual porosity, no fluorescence.</p> <p>CLAYSTONE: medium to light brown, occasionally grey brown, arenaceous, very soft to soft, minor firm, silty, trace very fine sandstone.</p>	Nil Gas
915m – 1019m ROP:0.7-28.6min/m Ave: 2.0 min/m	<p><b>INTERBEDDED SANDSTONE AND CLAYSTONE</b></p> <p>SANDSTONE: pale brown, orange brown, minor clear to translucent, medium to coarse grained, occasionally fine, poorly sorted, subrounded to rounded, occasionally well rounded, weak calcareous cement, trace argillaceous matrix, trace pyrite, predominantly loose, good inferred and visual porosity, no fluorescence.</p> <p>CLAYSTONE: medium brown, light to medium grey brown, light brown, occasionally medium light grey, arenaceous, trace micromicaceous, trace pyrite, soft to dispersive, trace firm, amorphous to subblocky.</p>	Nil Gas
1019m – 1072m ROP:0.7-5.9min/m Ave: 2.2 min/m	<p><b>PEMBER FORMATION</b></p> <p>CLAYSTONE</p> <p>CLAYSTONE: light to medium brown, medium grey, trace micromicaceous, common carbonaceous specks, trace lithics, soft to dispersive, amorphous, occasionally calcareous.</p>	Nil Gas

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 27/01/02 (0600 Hours E.S.T.)

DEPTH: 660m                      PROGRESS: 278m                      DAYS FROM SPUD: 4

CURRENT OPERATION: DRILLING AHEAD 6 3/4" MAIN HOLE

NOPE COST (P&A)\$1,177,237      FINAL FORECAST COST (P&A)\$                      COST TO DATE: \$  
(C&S)\$1,322,707                      (C&S)\$

CASING DEPTH: 378m                      RIG: ODE 30

PROGRAMMED TD: 1704m                      ROTARY TABLE: 53.7m                      GROUND LEVEL: 49m

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2400 Hours)	4%KCL/PHPA	8.55	34	32	9.5	22700	24500	3/5	

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	2/2/WT/A/0/1/RR/TD
		2	SEC	FS2463	6 3/4"	4.5	278	IN HOLE

SURVEYS:	MD	TVDRT	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)
	31	31	0.38	85	
	95	95	0.25	18	
	181	181	0.25	196	
	268	268	0.63	212	
	374	374	0.00	11	
	520	520	0.38	4	

#### PREVIOUS 24 HOURS OPERATIONS:

REPLACE GATE SEAT ON TWO CHOKE VALVES, CONTINUE PRESSURE TESTING BLOW OUT PREVENTER, TESTE FOR 5 MIN LOW AND 10 MIN HIGH, TEST PRESSURES 200PSI LOW AND 20000 PSI HIGH, LAY OUT PLUG TESTER AND PRESSURE TEST BLIND RAMS AGAINST CASING TO 2000 PSI, INSTALL WEAR BUSHING, MAKE UP NEW BHA AND RUN IN HOLE, CIRCULATE THROUGH BHA OK, WASH DOWN AND TAG CEMENT AT 351.4m, DRILL PLUGS, FLOAT, CEMENT, SHOE AND RAT HOLE, DRILL 3m OF NEW FORMATION TO 385m, CIRCULATE AND RUN LEAK OFF TEST, LEAK OFF AT 500 PSI WITH 8.5 PPG MUD, LOT = 16.3 PPG EMW, RAN ACCUMULATOR TEST, CHANGE OUT 4" STANDPIPE VALVE AND UPPER WELL CONTROL VALVE, RIG DOWN PRESSURE TESTING GEAR, DRILL 6 3/4" HOLE WITH SURVEYS FROM 385m TO 660m

#### ANTICIPATED OPERATIONS:

DRILL AHEAD 6 3/4" HOLE WITH SURVEYS

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 27/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog	H/L to
CLIFTON FORMATION				
MEPUNGA FORMATION				
DILWYN FORMATION				
PEMBER MUDSTONE				
PEBBLE POINT FORMATION				
MASSACRE SHALE				
TIMBOON SANDSTONE				
PAARATTE FORMATION				
SKULL CREEK MUDSTONE				
BELFAST MUDSTONE				
FLAXMANS FORMATION				
WAARRE FORMATION: UNIT C				
WAARRE FORMATION: UNIT B				
WAARRE FORMATION: UNIT A				
EUMERALLA FORMATION				
TD				

HYDROCARBON SHOW SUMMARY		
INTERVAL	LITHOLOGY	GAS
NONE		

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS
		Peak / Background
SPUD - 215m ROP:0.5- 4.8 mn/m Ave: 1.0 mn/m	<b>MASSIVE LIMESTONE.</b> LIMESTONE: white, off white to buff, microcrystalline, predominantly loose, occasional friable to firm, common shell fragments, common fossil fragments.	Nil Gas
215m - 382m ROP:1.0- 7.0 mn/m Ave: 3.0 mn/m	<b>MASSIVE MARL.</b> MARL: pale to medium grey, medium greyish brown, very calcareous, trace fossil fragments, soft, amorphous to subblocky.	Nil Gas
382m - 660m ROP:0.4- 3.0 mn/m Ave: 0.75 mn/m	<b>MASSIVE MARL.</b> MARL: medium grey to light grey, moderately calcareous, common shell fragments, trace fossil fragments, soft to dispersive in part, amorphous to trace subblocky.	Nil Gas

**Santos**

A.C.N. 007 550 923

**WELL PROGRESS REPORT****NARINGAL 1****DATE: 26/01/02 (0600 Hours E.S.T.)****DEPTH: 382m****PROGRESS: 0m****DAYS FROM SPUD: 3****CURRENT OPERATION: PRESSURE TESTING BLOW OUT PRESENTERS & CHOKE****NOPE COST (P&A)\$1,177,237  
(C&S)\$1,322,707****FINAL FORECAST COST (P&A)\$  
(C&S)\$****COST TO DATE: \$****CASING DEPTH: 378m****RIG: ODE 30****PROGRAMMED TD: 1704m****ROTARY TABLE: 53.7m****GROUND LEVEL: 49m**

MUD DATA	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
(2400 Hours)	4%KCL/PHPA	8.5	34	>30	9.5	22700	24000	3/4	

BIT DATA	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
(2400 Hours)	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	2/2/WT/A/0/I/RR/TD

SURVEYS:	MD	TVDRT	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)
	31	31	0.38	85	
	95	95	0.25	18	
	181	181	0.25	196	
	268	268	0.63	212	
	374	374	0.00	11	

**PREVIOUS 24 HOURS OPERATIONS:**

NIPPLE UP BLOW OUT PRESENTERS AND PRESSURE TEST. PIPE RAMS NOT TESTING. OPEN BONNETS AND INSPECT RAMS. CHANGE OUT RAMS. PRESSURE TEST OK.

**ANTICIPATED OPERATIONS:**

NIPPLE UP AND PRESSURE TEST CHOKE. MAKE UP BOTTOM HOLE ASSEMBLY. RUN IN TO DRILL. DRILL OUT CEMENT AND FORMATION. LEAK OFF TEST. DRILL AHEAD 6-3/4" HOLE WITH MSS SURVEYS EVERY 150M.

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT





### NARINGAL 1

DATE: 26/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog	H/L to
CLIFTON FORMATION				
MEPUNGA FORMATION				
DILWYN FORMATION				
PEMBER MUDSTONE				
PEBBLE POINT FORMATION				
MASSACRE SHALE				
TIMBOON SANDSTONE				
PAARATTE FORMATION				
SKULL CREEK MUDSTONE				
BELFAST MUDSTONE				
FLAXMANS FORMATION				
WAARRE FORMATION: UNIT C				
WAARRE FORMATION: UNIT B				
WAARRE FORMATION: UNIT A				
EUMERALLA FORMATION				
TD				

HYDROCARBON SHOW SUMMARY		
INTERVAL	LITHOLOGY	GAS
NONE		

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS (Peak/Background)
SPUD - 215m ROP:0.5- 4.8 mn/m Ave: 1.0 mn / m	<b>MASSIVE LIMESTONE</b> LIMESTONE: white, off white to buff, microcrystalline, predominantly loose, occasional friable to firm, common shell fragments, common fossil fragments.	Nil Gas
215m - 382m ROP:1.0- 7.0 mn/m Ave: 3.0 mn / m	<b>MASSIVE MARL</b> MARL: pale to medium grey, medium greyish brown, very calcareous, trace fossil fragments, soft, amorphous to subblocky.	Nil Gas

-  - Na1\_750.pdf
-  - Na1\_850.pdf
-  - Na1\_950.pdf
-  - Na1\_1050.pdf

P  
Y

909185 039

SANDSTONE:cl-pl brn,transl,Fe  
std,med-f,occ vf-crs,mod srt,  
sbang-sbrndd,tr ang,tr pyr nods,  
lsc,pr inf por,no fluor.

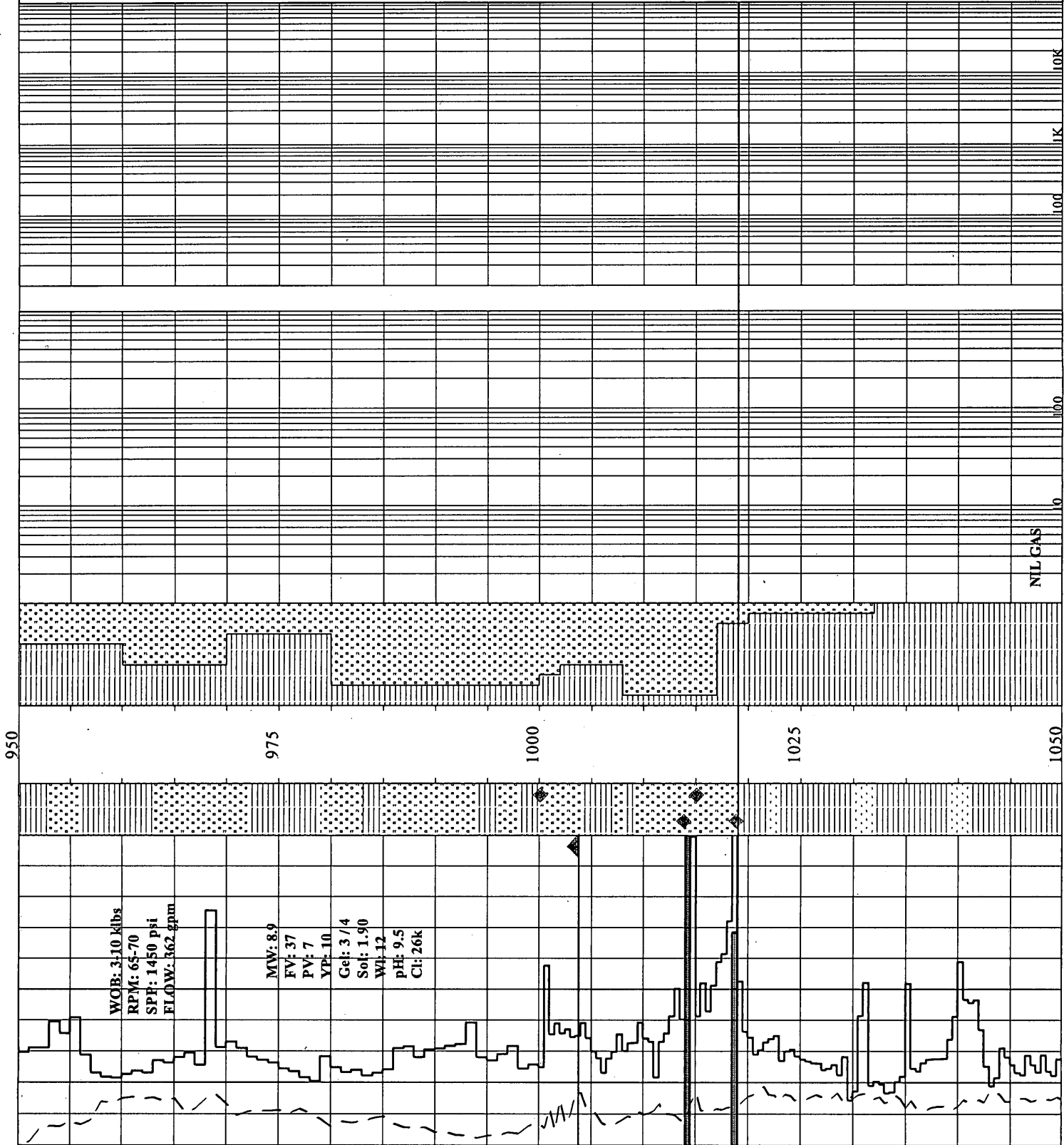
WIPER TRIP TO SHOE @ 1004m

Rmf = 0.19 @ 73° F

PEMBER FORMATION  
1019mRT (-965mSS)

CLAYSTONE:med brn,tr vf micmic,  
com carb spks,tr liths,v sft-  
disp,amorph.

CLAYSTONE:lt-med bn,med gy,tr  
micmic,tr carb spks,tr liths,sft  
-disp,amorph,occ calc.



Well Name: NARINGAL #1

eeservices

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CLAYSTONE: med-lt brn, occ gy/brn,  
rr drn, aren, v sft-sft, mnr frm,  
sly, tr vf SST grns.

SANDSTONE: pl brn-org/brn, rr clr,  
trns, med-crs, occ f, pr srt, sbrnd  
-rnd, wk calc cmt, tr arg mtr, tr  
glau, tr dissem pyr, rr pyr nod, p  
pred lse, tr frm-fri aggs, gd inf  
& vis por, no fluor.

CLAYSTONE: med bn, lt-med gy/bn,  
lt bn, occ med-lt gy, aren, tr  
micic, tr pyr, sft-disp, tr frm,  
amorph-sbbky.

850

875

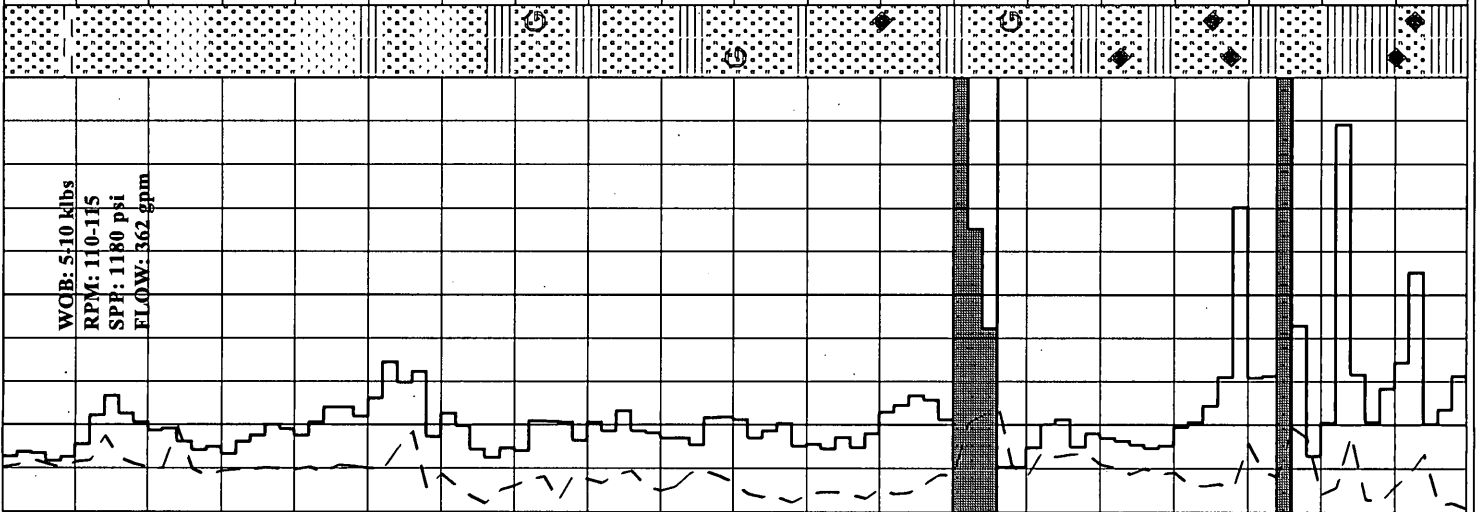
900

925

950

NIL GAS

WOB: 5.10 klbs  
RPM: 110-115  
SPR: 1180 psi  
FLOW: 362 gpm



Well Name: NARINGAL #1



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p.g

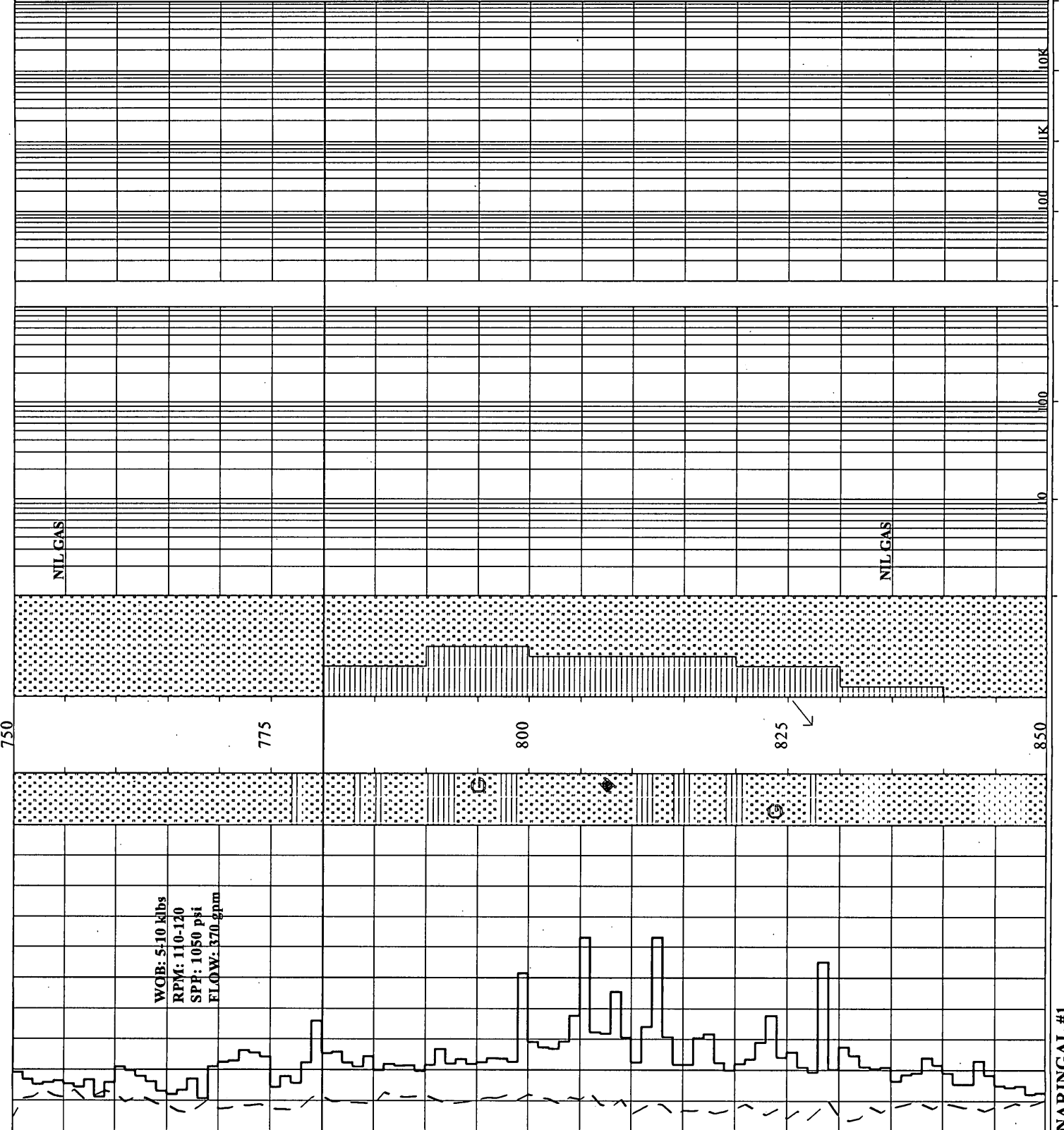
vis por, no fluor.

DILWYN FORMATION  
780mRT (-726mSS)

CLAYSTONE: gry-dk gry, aren, vsft-  
sft, micr, ln, slty, tr SST grns.

SANDSTONE: pl bn, org/bn, mntr cilt  
trmsl, med-ers, occ f, pr srt,  
sbrmdd-rnd, occ w/ rnd, wk calc  
cmt, tr arg matx, tr glauc, tr pyr,  
pred lsc, tr fri-firm aggs, gd inf  
& vis por, no fluor.

SURVEY @ 828m: 0.25° 20°T



WOB: 5-10 klbs  
RPM: 110-120  
SPF: 1050 psi  
FLOW: 170 gpm

**CLIFTON FORMATION:**  
658mRT (-604mSS)

LIMESTONE:it org-it brn,org/rd  
i/p,lut,aren i/p,sft-fm i/p,xln  
-micxln.

**SURVEY @ 674m: 0.38° 91°T**

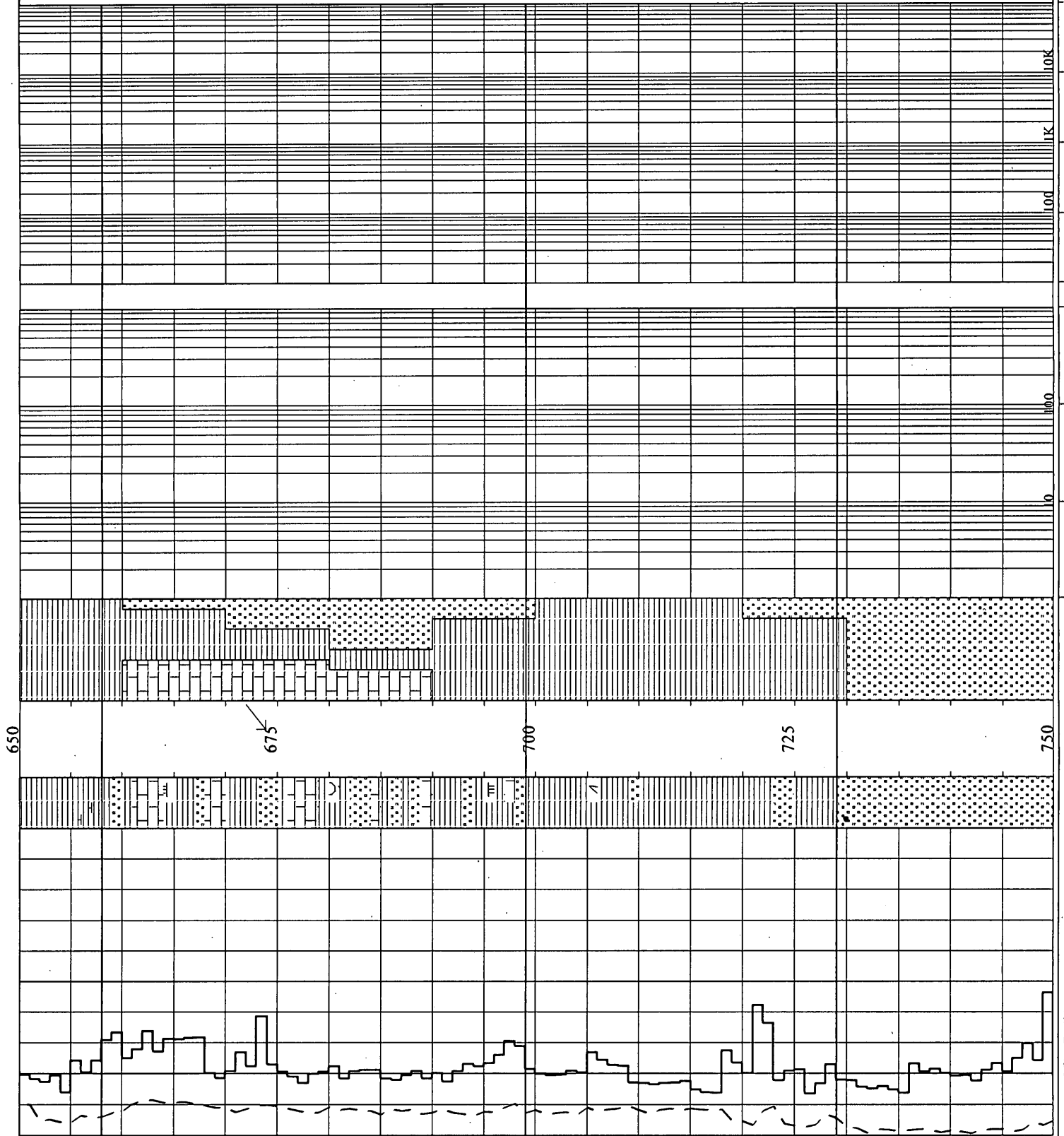
SANDSTONE:it brn-bm/rg,tr clr,  
pred f-med,tr gran,pr-mod srt  
sbrnrd,wk clac cmt,com rd brn/  
org arg mtrx,Fe oxide foss repl  
tr foss frag,dm fri-mod hd,tr  
lse,pr inf & vis por,no fluor.

**NARRAWATURK FORMATION**  
698mRT (-644mSS)

MARL:gy-dk gry,com calc,arg,com  
micmic,tr glauc,tr foss frag,sft  
-disp,sbbiky-amorph.

**MEPUNDA FORMATION**  
729mRT (-675mSS)

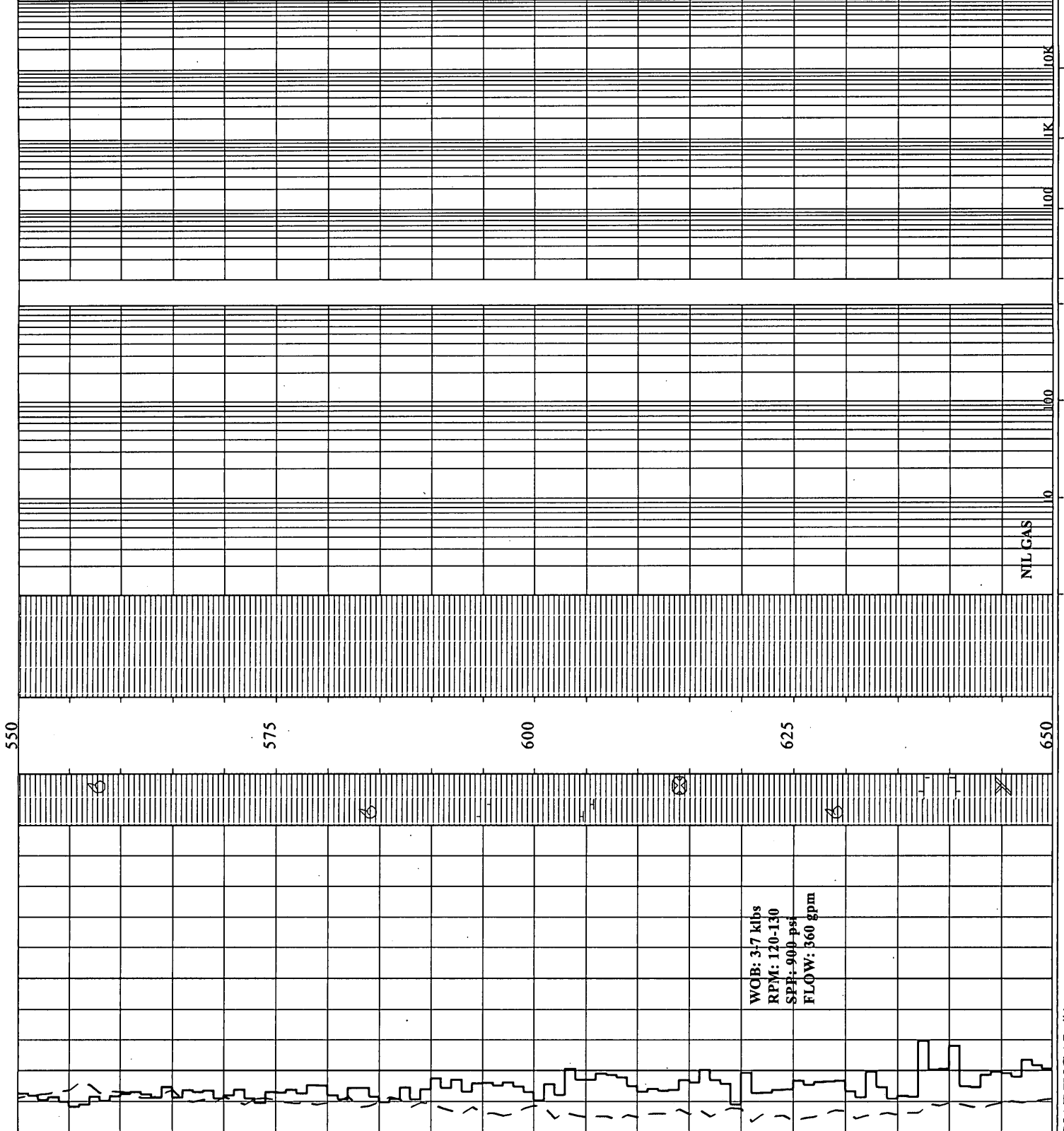
SANDSTONE:op-trans,tr clr,med-fn  
tr crs,mod srt,sbang-sbrnrd,wk  
calc cmt,tr arg mtrx,tr glauc  
nod,pred,lse,fr,i/p,gd,inf &



MARL.med-lt gry.com calc.com  
com foss frags.occ shell frags,  
disp-sft.tr frm,sbblky-amorph.

MARL.med gry.com calc.occ shell  
frags.occ foss frags.sft-disp.tr  
frm,sbblky-amorph.

909185 043



Well Name: NARINGAL #1

eoservices

g.y.

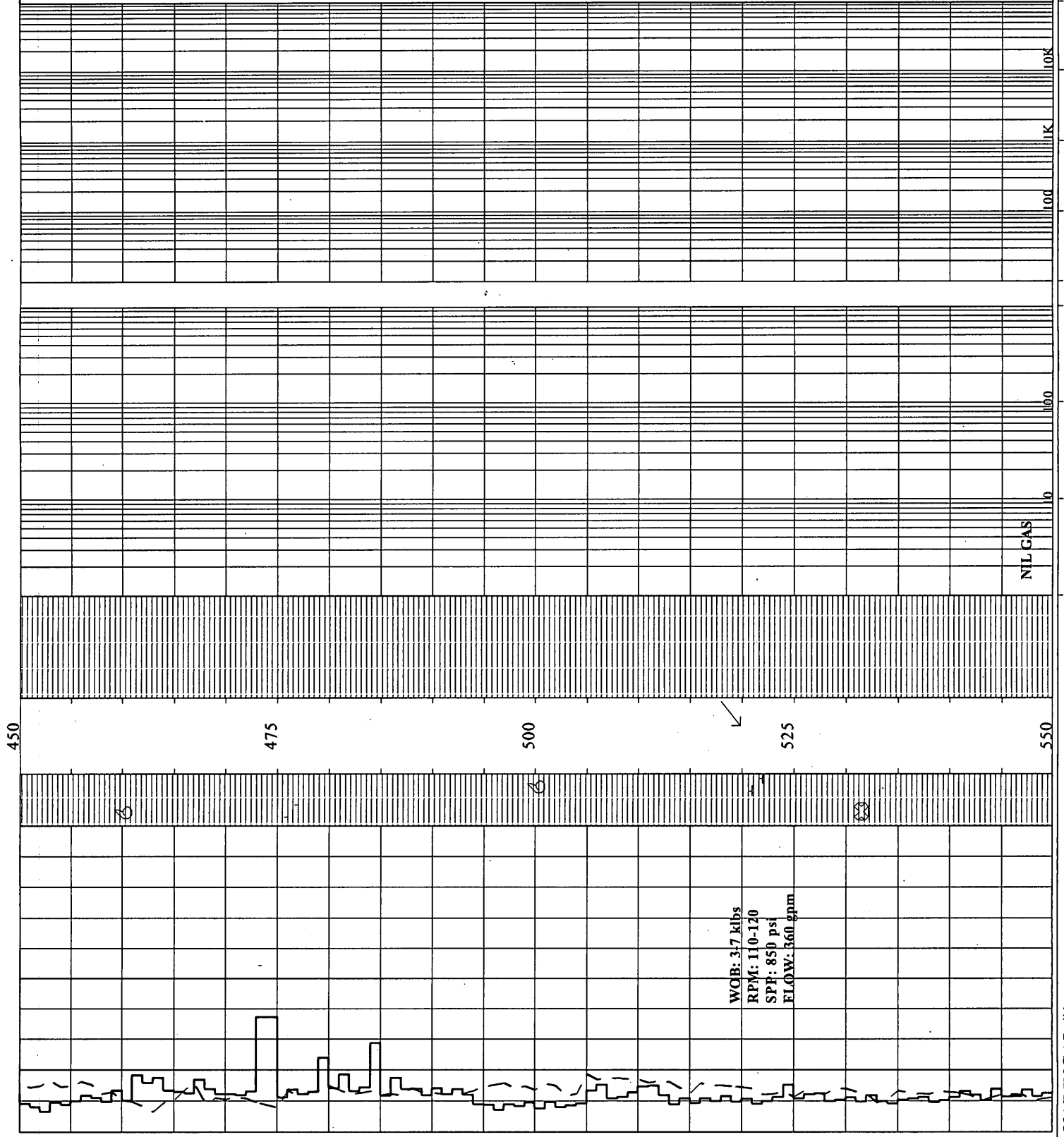
shell frags, tr foss frags, sft-  
disp i/p, tr frm, amorph-tr sbbiky

K

MARL.: med-occ lt gry, com calc, com  
shell frags, occ foss frags, sft-  
disp i/p, tr frm, amorph-sbbiky.

909185 044

SURVEY @ 520m: 0.38° 4°T



Well Name: NARINGAL #1

909185 045

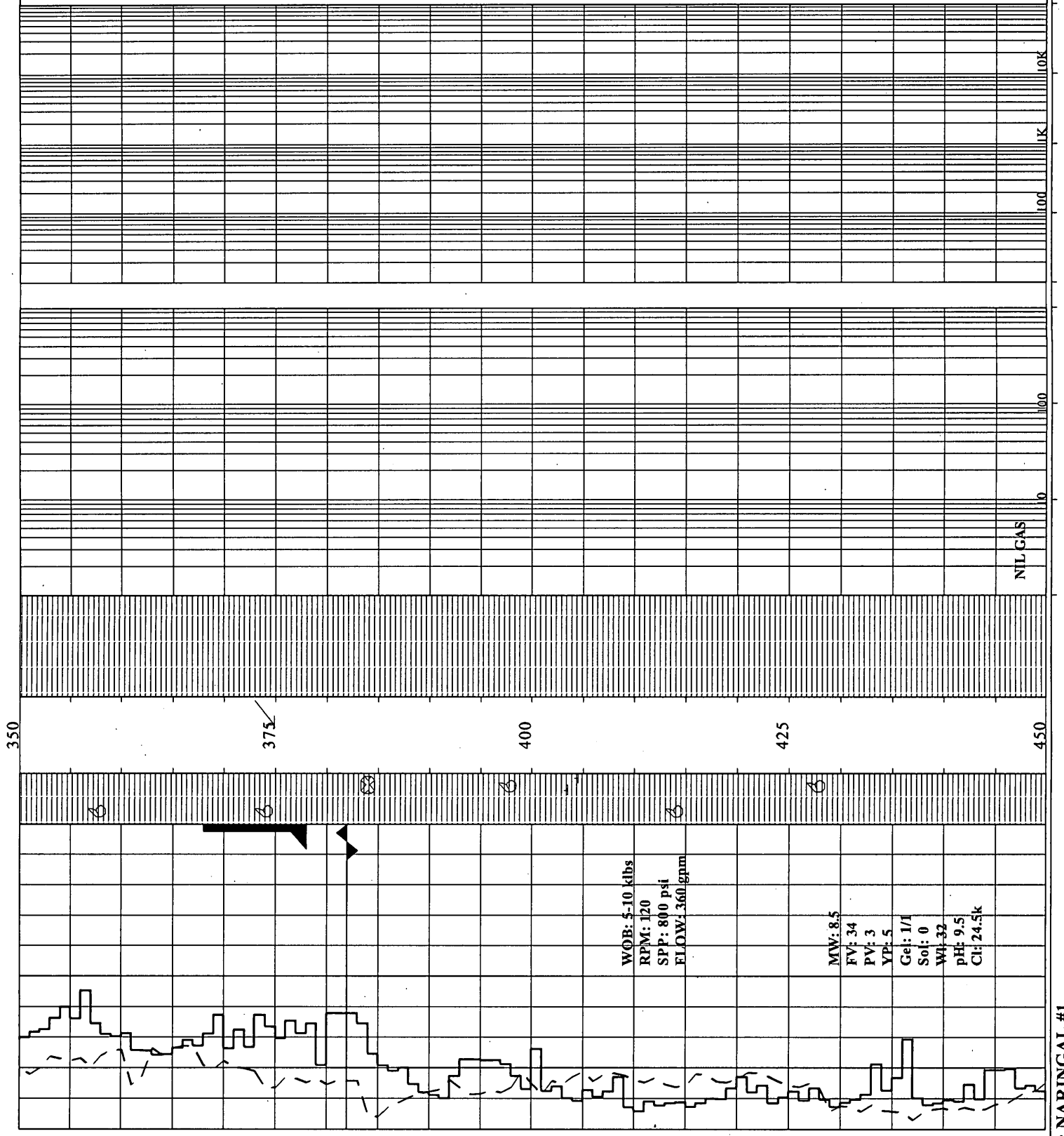
SURVEY @ 374m:0.00° 11°T

7 5/8" CASING SHOE SET @ 378m

BIT #2: SEC FS2463  
SIZE: 6.75" JETS:4x12  
IN: 382m OUT:  
RUN: HRS:  
COND:

MARL:med-lt gy,mod calc,tr foss,  
tr shell frags,sft-disp i/p,occ  
frm,amorph,occ sbbiky.

MARL:med-occ lt.gry.mod calc.com



Well Name: NARINGAL #1

# Santos

# NARINGAL #1



Field : Otway Basin  
 Block: PEP 154  
 State : Victoria  
 Country : AUSTRALIA  
 Scale : 1/ 500

Rig : OD&E 30  
 Rotary table : 53.7m  
 Ground level : 49m  
 Lat. : 38°27'18.32"S  
 Long. : 142°44'22.33"E

Spud date : 23-01-2002  
 TD date :  
 Total depth : m  
 Final status :

Open Hole: 382m  
 9.875" 382m  
 6.75" m

Loggers : P. SKLADZIEN  
 S. SENNIS  
 A. WALSH

### LITHOLOGY

- Conglomerate
- Coarse Sandstone
- Med Sandstone
- Fine Sandstone
- VF Sandstone
- Siltstone
- Carb. Siltstone
- Calc. Siltstone
- Clay
- Limestone
- Dolomite
- Coal
- Anhydrite
- Gypsum
- Igneous
- Volcanic
- Metamorphic
- Cement

### ACCESSORIES

- Pyrite
- Siderite
- Glauconite
- Feldspar
- Mica
- Ferrous
- Chert
- Calcareous
- Dolomitic
- Carbonaceous
- Lithoclast
- Breccia
- Foraminifera
- Corals
- Inoceramus
- Bryozoa
- Plant remains
- Fossils

### DRILLING DATA

- Casing Shoe
  - Bit trip
  - Wiper Trip
  - Core
  - DST
  - Deviation survey
- MUD DATA**
- MW - Mud Weight (lb/gal)
  - FV - Funnel Viscosity (s/qt)
  - PV - Plastic Viscosity (cps)
  - YP - Yield Point (lb/100ft<sup>2</sup>)
  - Gel - Gel Strength (10sec)
  - WL - Water Loss (cc/30min)
  - pH - Acidity / Alkalinity
  - Ck - Cake (32nd/inch)
  - Sol - Solids (% vol)
  - Cl - Chlorides (mg/l)

### ABBREVIATIONS

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| BOPD - Barrels of Oil Per Day     | OG - Over Gauge                    |
| BWPD - Barrels of Water Per Day   | OH - Open Hole                     |
| CG - Connection Gas               | OTS - Oil To Surface               |
| CO - Circulate Out                | Q - Flow Rate                      |
| COND - Condensate                 | REC - Recovery                     |
| c/c - Crush Cut                   | Rmf - Resistivity mud filtrate     |
| DST - Drill Stem Test             | ROP - Rate Of Penetration          |
| FLOW - Flow Rate (gal/min)        | RPM - Revolutions Per Minute       |
| GCM - Gas Cut Mud                 | RTSTM - Rate Too Small To Measure  |
| GCW - Gas Cut Water               | Rw - Resistivity water             |
| GTS - Gas To Surface              | r/r - ring residue                 |
| INJ - Injection of Mist (bbls/hr) | SCFM - Standard Cubic Ft/Min (air) |
| LCM - Lost Circulation Material   | SGCM - Slightly Gas Cut Mud        |
| MMCFD - Million Cubic Feet / Day  | SPM - Strokes Per Minute           |
| NGTS - No Gas To Surface          | SPP - Stand Pipe Pressure          |
| NOTS - No Oil To Surface          | SWC - Side-Wall Core               |
| NR - No Returns                   | TG - Trip Gas                      |
| OCM - Oil Cut Mud                 | WOB - Weight On Bit                |

### ROP (min/m)

WOB (kibs)

### LITHO

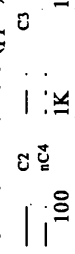
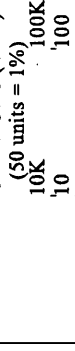
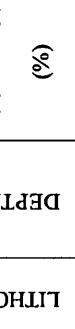
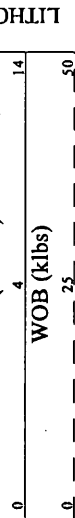
### CUTTINGS (%)

### TOTAL GAS (units)

### DIRTY

### CHROMATOLOG (ppm)

### GEOLOGICAL DESCRIPTION



NARINGAL #1 SPUDDED ON  
 23/01/02 @ XX:XX HRS

BIT #1  
 SIZE: 9.875" JETS:  
 IN: SPUD OUT:  
 RUN: HRS:  
 COND:

LIMESTONE: off wh, pl, yel, rr pl gy  
 micr, lut, i/p, fm, microx, ln.  
**DRILL WITH SPUD MUD**

LIMESTONE: wh, nl, ex, off, wh, bf



Tina.Mannella@santos.com on 01/25/2002 10:21:22 AM

To: OTWAY.BASIN@santos.com  
cc: (bcc: Kourosh Mehin/NRE)  
Subject: MORNING REPORTS 25/01/02 - NARINGAL 1

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(See attached file: NA1\_2501.pdf)

Santos Ltd A.B.N. 80 007 550 923

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# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 25/01/02 (0600 Hours E.S.T.)

DEPTH: 382m

PROGRESS: 42m

DAYS FROM SPUD: 2

CURRENT OPERATION: NIPPLE UP BLOW OUT PREVENTORS.

NOPE COST (P&A) \$1,177,237  
(C&S) \$1,322,707

FINAL FORECAST  
COST

COST TO DATE: \$602,758

CASING DEPTH: 378m

RIG: ODE 30

PROGRAMMED TD: 1704m

ROTARY TABLE: 53.7m

GROUND LEVEL: 49m

MUD DATA (2400 Hours)	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
	gel spud	9.0	37	32	8.3		800	6/15	

BIT DATA (2400 Hours)	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
	LAST	1RR	HTC	GT-1	9 7/8"	7.9	382m	

SURVEYS:	MD	TVDRT	INCLINATION(°)	AZIMUTH(°)T	OFFSET (m)
	31	31	0.38	85	
	95	95	0.25	18	
	181	181	0.25	196	
	268	268	0.63	212	

#### PREVIOUS 24 HOURS OPERATIONS:

DRILL TO 382m. CIRCULATE, WIPER TRIP TO BIT. CIRCULATE. PULL OUT OF HOLE AND LAY OUT BOTTOM HOLE ASSEMBLY. RUN AND CEMENT 7 5/8" CASING. WAIT ON CEMENT. NIPPLE UP BLOW OUT PREVENTORS.

#### ANTICIPATED OPERATIONS:

CONTINUE NIPPLE UP BLOW OUT PREVENTORS. MAKE UP BOTTOM HOLE ASSEMBLY AND RUN IN HOLE. DRILL OUT CEMENT AND PERFORM LEAK OFF TEST. DRILL AHEAD 6 3/4" PRODUCTION HOLE.



# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 25/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog	H/L to
CLIFTON FORMATION				
MEPUNGA FORMATION				
DILWYN FORMATION				
PEMBER MUDSTONE				
PEBBLE POINT FORMATION				
MASSACRE SHALE				
TIMBOON SANDSTONE				
PAARATTE FORMATION				
SKULL CREEK MUDSTONE				
BELFAST MUDSTONE				
FLAXMANS FORMATION				
WAARRE FORMATION: UNIT C				
WAARRE FORMATION: UNIT B				
WAARRE FORMATION: UNIT A				
EUMERALLA FORMATION				
TD				

#### HYDROCARBON SHOW SUMMARY

INTERVAL	LITHOLOGY	GAS
NONE		

#### GEOLOGICAL SUMMARY

INTERVAL	LITHOLOGY	GAS
SPUD - 215m ROP:0.5- 4.8 mn/m Ave: 1.0 mn / m	<b>MASSIVE LIMESTONE.</b> LIMESTONE: white, off white to buff, microcrystalline, predominantly loose, occasional friable to firm, common shell fragments, common fossil fragments.	Nil Gas
215m - 382m ROP:1.0- 7.0 mn/m Ave: 3.0 mn / m	<b>MASSIVE MARL.</b> MARL: pale to medium grey, medium greyish brown, very calcareous, trace fossil fragments, soft, amorphous to subblocky.	Nil Gas

Anna.Pignetti@santos.com on 01/24/2002 09:21:20 AM



To: neil.gibbins@beachpetroleum.com.au, hector.gordon@beachpetroleum.com.au,  
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malcolm.altmann@beachpetroleum.com.au  
cc: danny.burns@beachpetroleum.com.au (bcc: Kouros Mehini/NRE)  
Subject: Naringal 1 Reports

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(See attached file: NA1\_2401.pdf)

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- NA1\_2401.pdf

**Santos**

A.C.N. 007 550 923

**WELL PROGRESS REPORT****NARINGAL 1**

DATE: 24/01/02 (0600 Hours E.S.T.)

DEPTH: 340m

PROGRESS: 340m

DAYS FROM SPUD: 1

CURRENT OPERATION: DRILLING AHEAD 9 7/8" SURFACE HOLE TO CASING POINT @ APPROX. 380m

NOPE COST (P&A) \$1,177,237  
(C&S) \$1,322,707FINAL FORECAST  
COST

COST TO DATE: \$487,736

CASING DEPTH:

RIG: ODE 30

PROGRAMMED TD: 1704m

ROTARY TABLE: 53.7m

GROUND LEVEL: 49m

MUD DATA (2400 Hours)	Type:	Wt:	Visc:	WL:	pH:	K <sup>+</sup> :	Cl <sup>-</sup> :	PV/YP:	Rmf:
	gel spud	8.7	42	21	9.5		900	8/19	

BIT DATA (2400 Hours)	PRESENT	No.	Make	Type	Size	Hours	Meterage	Condition
	LAST	1RR	HTC	GT-1	9 7/8"	6.7	340m	IN HOLE

SURVEYS:	MD	TVDRT	INCLINATION(°)	AZIMUTH (°)T	OFFSET (m)
	31	31	0.38	85	
	95	95	0.25	18	
	181	181	0.25	196	
	268	268	0.63	212	

**PREVIOUS 24 HOURS OPERATIONS:**

CONTINUE RIG UP NARINGAL - 1. SPUD WELL @ 16:00 HRS ON 23/01/02 AND DRILL 9 7/8" HOLE TAKING WIRE LINE SURVEYS.

**ANTICIPATED OPERATIONS:**

DRILL TO 380M. CIRCULATE, WIPER TRIP TO BIT. CIRCULATE. PULL OUT OF HOLE AND LAY OUT BOTTOM HOLE ASSEMBLY. RUN AND CEMENT 7 5/8" CASING.

# Santos

A.C.N. 007 550 923

## WELL PROGRESS REPORT

### NARINGAL 1

DATE: 24/01/02 (0600 Hours E.S.T.)

FORMATION TOPS:	RT(m)	-TVDSS(m)	H/L to Prog	H/L to
CLIFTON FORMATION				
MEPUNGA FORMATION				
DILWYN FORMATION				
PEMBER MUDSTONE				
PEBBLE POINT FORMATION				
MASSACRE SHALE				
TIMBOON SANDSTONE				
PAARATTE FORMATION				
SKULL CREEK MUDSTONE				
BELFAST MUDSTONE				
FLAXMANS FORMATION				
WAARRE FORMATION: UNIT C				
WAARRE FORMATION: UNIT B				
WAARRE FORMATION: UNIT A				
EUMERALLA FORMATION				
TD				

HYDROCARBON SHOW SUMMARY		
INTERVAL	LITHOLOGY	GAS
NONE		

GEOLOGICAL SUMMARY		
INTERVAL	LITHOLOGY	GAS
SPUD - 215m ROP:1.5- 4.8 mn/m Ave: 2.0 mn / m	<b>MASSIVE LIMESTONE.</b> LIMESTONE: white, off white to buff, microcrystalline, predominantly loose, occasional friable to firm, common shell fragments, common fossil fragments.	Nil Gas
215m - 340m ROP:1.0- 7.0 mn/m Ave: 3.0 mn / m	<b>MASSIVE MARL.</b> MARL: pale to medium grey, medium greyish brown, very calcareous, trace fossil fragments, soft, amorphous to subblocky.	Nil Gas

1. WELL DATA SUMMARY

<b>WELL NAME: NIRRANDA 1</b> <i>Narrungal - 1</i>			<b>WELL TYPE: GAS EXPLORATION</b>		
<b>LICENCE:</b> PEP 154 <b>EQUITY:</b> Voting (%) Beach Petroleum NL 90% Santos Ltd 10% <b>TOTAL:</b> 100%			Latitude: 38° 27' 18.32"S Longitude: 142° 44' 22.33"E Seismic Reference: Inline 2202 CDP 10532 Ground Level: 49m (preliminary) Rotary Table: 53.7m (preliminary) Proposed Total Depth: 1704m (-1650m) Rig: OD&E30 Nearest Facilities: Heytesbury (24 km)		
<b>Resource Estimate (Recoverable)</b>					
Mean Success Volume: 7.64 BCF (15 BCF OGIP) Mean Expected Volume: 1.89 BCF					
<b>Objectives/Fluid Contacts</b>			<b>Stratigraphic Prognosis</b>		
<b>Primary</b>	<b>Secondary</b>		<b>Formation</b>	<b>Depth (m-RT)</b>	<b>Depth (m-SS)</b>
Waarre Sandstone (gas)			Clifton	630	-576 ✓
			Mepunga	687	-633* ✓
			Dilwyn	763	-709 ✓
			Pember	938	-884* ✓
			Pebble Pt	973	-919* ✓
			Paaratte	993	-939 ✓
			Skull Creek	1305	-1251 ✓
			Belfast	1380	-1326 ✓
			Flaxmans	1574	-1520* ✓
			Waarre	<del>1495</del> 1595	-1541 ✓
			Eumeralla	1639	-1585 ✓
			TD	1704	-1650 ✓
			*Geological pick		
<b>Formation Evaluation</b>			<b>Hole Design/Drilling Issues</b>		
<b>Wireline Logging:</b> GR-SDT TD to surface casing (GR to surface) Semblance processing over Waarre MSFL-DLL-CAL TD to surface casing (MSFL to 100 m above top Pember approx. 840m RT) LDL-CNL TD to approx. 20m above top Flaxmans (approx. 1550m RT)			Well Class: Down size monobore/exploration  Hole Type: Down size monobore Hole Size: Casing Depth: 9 7/8" 7 5/8" Surface to 475m 6 3/4" 3 1/2" Surface to TD		
<b>SWC's:</b> One gun 20 samples.			<b>Drill Fluid:</b> KCl/PHPA/Polymer		
<b>MDT's:</b> 20-point pressure survey.			<b>Deviation</b> <b>Sub-Surface Targets:</b> Nirranda 1 is a vertical well. An accuracy of 50m radius from seismic reference at TD has been requested. The critical structural direction is north of the wellsite.		
<b>Velocity Survey:</b> No survey.			<b>Other Information/Hazards:</b> No hazardous zone in offset wells. No shallow gas expected. Waarre Sandstones has excellent reservoir properties (porosity 20%).		
<b>Mudlogging:</b> 10m samples from surface casing to approx. 1000m. 3m samples thereafter to TD. Samples as per well programme.			<b>Nearby Wells and Duration:</b>  Lavers 1 10 days (TD 1608m) Rowan 1 18 days (TD 1799m)		
<b>Formation Testing:</b> None programmed.					
<b>Coring:</b> None programmed.					
<b>REMARKS/RECOMMENDATIONS:</b>					
<b>Approved by::</b>	<b>Project Leader:</b>	<b>Team Leader:</b>	<b>Operations Geology</b>		<b>Drilling Engineer:</b>