

SANTOS – BEACH

COMPILED FOR

SANTOS LIMITED

ABN 80 007 550 923

NAYLOR SOUTH 1

WELL COMPLETION REPORT

**Prepared by:
A.HUDDLESTON
June 2002**

NAYLOR SOUTH 1 WCR

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LOCATION MAP



Santos

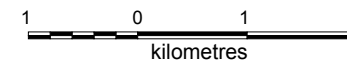
Exploration & Development

VICTORIA

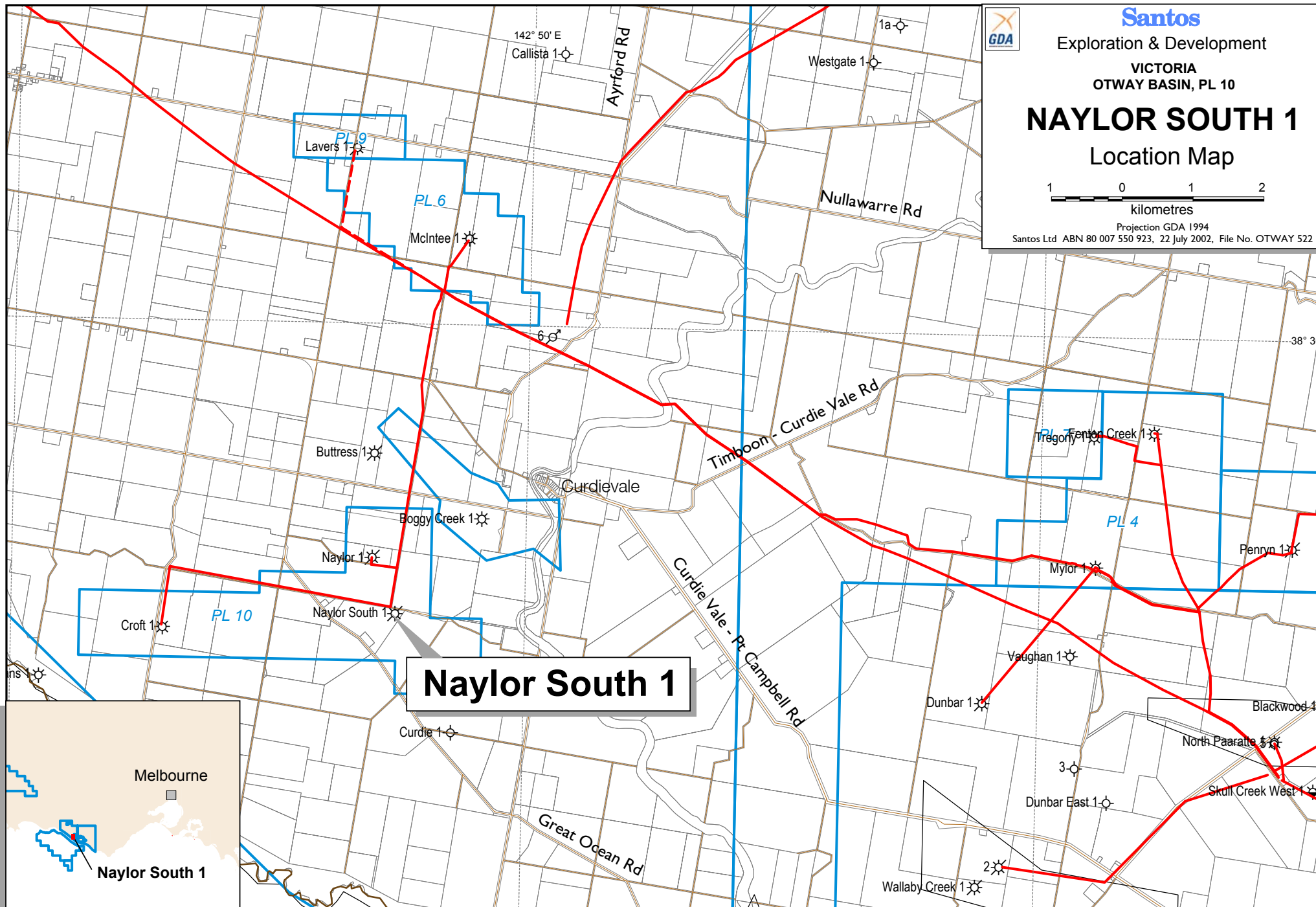
OTWAY BASIN, PL 10

NAYLOR SOUTH 1

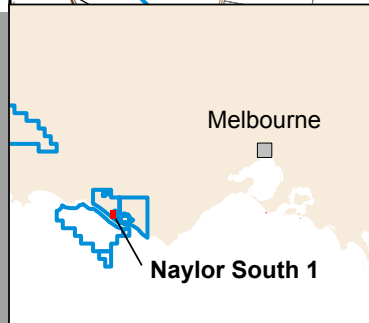
Location Map



Projection GDA 1994
Santos Ltd ABN 80 007 550 923, 22 July 2002, File No. OTWAY 522



Naylor South 1



WELL DATA CARD

WELL: NAYLOR SOUTH 1		WELL CATEGORY: EXPLORATION WELL INTENT: GAS		SPUD: 0730, 15-12-2001 TD REACHED: 0430, 26-12-2001 RIG RELEASED: 0430, 30/12/2001 CMPLT:			
LAT:		LONG: (AGD84)		RIG: OD&E 30			
LAT: 38 32' 12.86" S		LONG: 142 48' 44.39" E (GDA94)		STATUS: PLUGGED & ABANDONED			
SEISMIC STATION: INLINE 2580 CDP 10133				REMARKS: DEVIATED WELL DUE TO SURFACE			
ELEVATION GND: 48.55 m RT: 53.24 m				CONSTRAINTS. FOUR PLUGS SET. PLUG 1:2141m-2049m			
BLOCK/LICENCE: PEP 154				PLUG 2:1297m-1207m, PLUG 3: 464m-374m, PLUG 4:30m-			
TD 2243 m (Logr Ext)		2243 m (Drlr)		Surface.			
PBTD m (Logr)		m (Drlr)					
TYPE STRUCTURE: FAULT BLOCK				HOLE SIZE	CASING SIZE	SHOE DEPTH	TYPE
TYPE COMPLETION: PLUGGED AND ABANDONED				250.825mm	193.675mm	434m (D&L)	26 lb/ft L80, BT&C
ZONE(S): WARRE SANDSTONE (GAS)				171.45mm			

AGE	FORMATION OR ZONE TOPS	DEPTH (m)		THICKNESS TVD (m)	HIGH (H) LOW (L)
		LOGGERS	TVD SS		
EARLY – MIDDLE MIOCENE	GELLIBRAND MARL	124	70.72	348.76	NP
LATE OLIGOCENE – EARLY MIOCENE	CLIFTON FORMATION	460	406.50	12.99	3m' H
LATE EOCENE - EARLY OLIGOCENE	NARRAWATURK MARL	473	419.48	74.29	NP
MIDDLE - LATE EOCENE	MEPUNGA FORMATION	549	493.78	80.88	1m H
EARLY PALEOCENE – MIDDLE EOCENE	DILWYN FORMATION	633	574.66	271.61	5m' H
EARLY PALEOCENE – EARLY EOCENE	PEMBER MUDSTONE	909	846.26	73.74	38m L
EARLY PALEOCENE	PEBBLE POINT FORMATION	984	920.01	84.56	55m L
CAMPANIAN – MASTRICHTIAN	MASSACRE SHALE	1070	1004.57	39.33	NP
CAMPANIAN – MASTRICHTIAN	TIMBOON SANDSTONE	1110	1043.9	139.62	NP
CAMPANIAN – MASTRICHTIAN	PAARATTE FORMATION	1252	1183.52	374.62	142m L
SANTONIAN - CAMPANIAN	SKULL CREEK MUDSTONE	1633	1158.14	128.31	103m H
CENOMANIAN - SANTONIAN	BELFAST MUDSTONE	1763.5	1686.46	307.76	176m H
CENOMANIAN - CONIACIAN	FLAXMANS FORMATION	2076.5	1994.21	20.16	39m L
CENOMANIAN - TURONIAN	WAARRE FORMATION, UNIT C	2097	2014.37	35.89	39m L
CENOMANIAN - TURONIAN	WAARRE FORMATION, UNIT B	2133.5	2050.26	27.04	NP
CENOMANIAN - TURONIAN	WAARRE FORMATION, UNIT A	2161	2077.30	39.33	NP
ALBIAN	EUMERALLA FORMATION	2201	2116.63	41.30+	63m L
	TD	2243	2190		

PRELIMINARY LOG INTERPRETATION (Interval Averages)						PERFORATIONS (4 shots/m)				
INTERVAL (m)	Ø %	SW %	INTERVAL (m)	Ø %	SW %	FORMATION		INTERVAL		
NO PAY										
						CORES				
						FORM	NO.	INTERVAL	CUT	REC

LOG	SUITE/ RUN	INTERVAL	BHT/TIME/ REMARKS	LOG	SUITE/ RUN	INTERVAL	BHT/TIME/ REMARKS
GR	1/1	2234 - SURF	81°C/10 Hrs since circulation	GR	1/2	2229 - SURF	86°C/18 Hrs since circulation
CSS		2224 - 434		PDS		2234 - 434	
CSS		2224 - 1950	Semblance Processing over Waarre	CNS		2231 - 434	
DLL		2233 - 434		CAL		2234 - 434	
SLL		2233 - 434					
MLL		2237 - 434					
CAL		2237 - 434					
SP		2216 - 434					

FORMATION TESTS

NO.	INTERVAL (m)	FORMATION	FLOW (mins)	SHUT IN (mins)	BOTTOM GAUGE IP/FP (psia)	SIP	MAX SURF PRESS (psia)	FLUID TO SURF (mins)	TC/ BC	REMARKS
										No formation tests

SUMMARY:

Naylor South 1 is located in South Western Victoria in the onshore portion of the Otway Basin. It is located in the PEP 154 licence (90% Santos (operator) and 10% Beach Petroleum N.L), and sited at CDP 10133, inline 2580, on the Curdievale 3D Seismic Survey. It lies approximately 10 km NW of the town of Peterborough, 1 km SSE of Naylor 1 gas field and 2 km SW of Boggy Creek gas field. Naylor South 1 is situated within the productive Waarre Sandstone play fairway of the Port Campbell Embayment.

Naylor South 1 was a near field gas exploration well, targeting the Waarre Sandstone. The Naylor South 1 structure is a tilted fault block closure defined by the Curdievale 3D seismic dataset.

One suite of wireline logging was carried out by Reeves Logging after reaching total depth, and consisted of the following: Run 1: GR-DLS-MRS-LCS-CAL; Run 2: GR-PDS-CNS.

Log analysis of Naylor South 1 has identified the following:

- No pay in the Waarre Sandstones
- Sandstone development was not observed in the Waarre "Unit B".

Naylor South 1 reached a total depth of 2243m (Drlr & Logr Ext), and has been plugged and abandoned.

AUTHOR: A. Huddleston

DATE: June 2002

WELL HISTORY

1. GENERAL DATA

Well Name:	Naylor South 1
Well Classification:	Gas Exploration
Interest Holders:	Santos Ltd (90%) Beach Petroleum (10%)
Participating Interests:	Santos Ltd (90%) Beach Petroleum (10%)
Operator	Santos
Block/Licence	PEP 154, Onshore Otway Basin, Victoria
Surface Location	Latitude: 38° 32' 12.86" South Longitude: 142° 48' 44.39" East
Surveyed Elevation	Ground Level: 48.55m Rotary Table: 53.24m
Seismic Survey	CURDIEVALE 3D
Seismic Location	CDP 10133, LINE 2580
Total Depth	Driller: 243.0m Logger Ext: 2243.0m
Completion	6 joints of 88.9mm 9.3 ppf L80 New NK 3SB and 162 joints of 88.9mm 9.3 ppf J55 New NK3SB Tubing, set at 1623m.
Status	Plug & Abandoned.

2. DRILLING DATA

Date Drilling Commenced	0730 hours, 15 th December 2001
Date Drilling Completed	0430 hours, 26 th December 2001
Date Rig Released	0430 hours, 30 th December 2001
Contractor	Oil Drilling & Exploration Pty Ltd (OD&E)
Rig	OD&E 30
Rig Specifications	Refer to Appendix XIV

3. DRILLING SUMMARY

(a) Drilling Summary:

Naylor South 1 was spudded at 0730 hours on the 15th December 2001. A 250.825mm surface hole was drilled to 438m (Drlr). A 193.675mm surface casing was run and cemented from surface to 434m (Drlr). It was drilled as a deviated well, due to surface constraints. A Leak-Off Test was conducted to 17.2 ppg EMW at 360m (Drlr). A 171.45mm main hole was then drilled to a Total Depth of 2243m (Drlr) which was reached at 0430 hours, on the 26th December 2001. Deviation constraints insured that the well had to be steered on to target from 1087m to 1283m using directional assembly. Naylor South 1 was plugged and abandoned post logging with four plugs: Plug #1 at 2141m – 2049m (Drlr), Plug #2 at 1297m-1207m, Plug #3 at 464m-374m and Plug # 4 at 30m-surface. The rig was released at 0430 hours on 30th December 2001. A more comprehensive drilling summary can be found in Appendix XIII, in the Drilling - Final Well Report.

Tables I and II summarise the casing, cementing and mud systems used in this well. A more comprehensive summary is appended to this report Appendix XIII: (Drilling - Final Well Report).

TABLE I: CASING, HOLE, AND CEMENT DETAILS

BIT SIZE	DEPTH	CSG SIZE	CSG DEPTH	JNTS	CSG TYPE	CEMENT
250.825 mm	438m	193.675 mm	434m (D&L)	37	26.4 lb/ft L-80	Lead: 68 bbls of Slurry (113 sacks Class G cement) @ 11.0 ppg + 4% bwoc of D020 + 1.5% bwoc of S001 CaCl ₂ + 0.01 gal (sax of D144). Tail: 19 bbls of slurry (90 sacks Class G) @ 15.6 ppg + 0.5 gal/sx of D145A + 0.01 gal/sax of D144.
171.45 mm	2243 (D) 2243 (L)					

TABLE II: SUMMARY OF MUD SYSTEMS

MUD TYPE	INTERVAL (m)
Spud Mud (Gel/Water)	Surface – 438m
KCL/Polymer	438m – 2243m

(b) Lost Time:

Lost time at Naylor South 1 – Please refer to Appendix XIII (Drilling - Final Well Report: Time Breakdown Data).

(c) Water Supply:

Naylor South flowing bore containing:

Cl: 15,000mg/l,

Hardness(Ca⁺⁺): <320 mg/l

PH:8.5

Pf/Mf: 0.05/0.3

Mains water was also used as make up water containing:

Cl: 600 mg/l

Hardness(Ca⁺⁺): <40 mg/l

PH: 8.5

Pf/Mf: 0.05/0.1

(d) Mudlogging:

Mudlogging services were provided by Geoservices Ltd. Samples were collected, washed, and described at 10m intervals from the surface to 1000m, 3m intervals from 1000m to 2243m (T.D.), except for the following intervals where the samples were collected at 6m intervals:

1002 – 1020m

1023 – 1029m

1056 – 1062m

1080 – 1089m

1110 – 1116m

1122 – 1128m

1140 – 1152m

1161 – 1167m

All samples were checked for oil shows using ultraviolet fluorescence. Gas levels were monitored from the surface casing shoe to TD using a total gas detector and other parameters monitored include rate of penetration, weight on hook and mud pit levels.

(e) Testing:

No DST's were conducted in Naylor South 1.

(f) Coring:

No cores were cut in Naylor South 1.

(g) Electric Logging:

Reeves completed two wireline logging runs. A sonic and resistivity run (GR-DLL-SLL-CSS-MLL-SP-CAL) and a density logging run (GR-PDS-CNS-CAL). Two logging runs (Pressure Survey and Sidewell Cores) were cancelled due to lack of hydrocarbon show in the Primary Objective.

One suite of wireline logs was run in Naylor South 1, as detailed below:

TABLE III: ELECTRIC LOG SUMMARY

LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS	LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS
GR	1/1	2234-surface	81°C/36:00hrs	GR	1/2	2229 - surface	86°C/42:00hrs
CSS (compensated sonic)	1/1	2224 - 434	81°C/36:00hrs	CAL	1/2	2234 - 434	86°C/42:00hrs
CSS (wave-Form sonic)	1/1	2224 - 1950	81°C/36:00hrs	PDS	1/2	2234 - 434	86°C/42:00hrs
DLL	1/1	2233 - 434	81°C/36:00hrs	CNS	1/2	2231 - 434	86°C/42:00hrs
SLL	1/1	2233 - 434	81°C/36:00hrs				
MLL	1/1	2237 - 434	81°C/36:00hrs				
SP	1/1	2216 - 434	81°C/36:00hrs				
CAL	1/1	2237 - 434	81°C/36:00hrs				

*Logger Contractor - REEVES

(h) Geothermal Gradient:

An estimated static bottom hole temperature of 80.3°C at 1694m, and a geothermal gradient of 2.64°C/100m was calculated from down hole temperatures recorded during logging runs 1 and 2.

(i) Hole Deviation

The Naylor South 1 well is a deviated hole. Directional surveys indicate a maximum deviation from vertical of 23.1° inclination 167.52°T at 1783m

(j) Velocity Survey:

No velocity survey was run in Naylor South 1.

(k) Completion Summary:

Naylor South 1 was plugged and abandoned on the 30/12/01.

GEOLOGY

1. PRE-DRILLING SUMMARY (after Well Proposal)

Naylor South 1 was proposed as an Otway Basin near field gas exploration well in the PEP 154 licence. The proposed location lies approximately 10 km north west of the town of Peterborough, 1 km SSE of Naylor-1 gas field and 2 km SW of Boggy Creek gas field. The Naylor South-1 prospect is situated within the productive Waarre Sandstone play fairway of the Port Campbell Embayment.

The PEP 154 Licence is held 90% Santos (Operator) and 10% Beach Petroleum NL. The Naylor South-1 structure is a tilted fault block closure defined by the Curdievale 3D seismic dataset with the proposed location as a crestal test. The stratigraphic column for Otway Basin is shown in Appendix IX. The primary objective in the well was the Waarre Sandstone, with a prognosed mean average net pay of 19.7m across the structure. No significant full stack amplitude or AVO anomaly is identified over the Naylor South-1 structure. The lack of amplitude/AVO at the well location is interpreted either to be a function of the thinner Waarre section at this location, the variation in thickness of the Waarre subunits generating seismic interference or raypath interference from the bounding fault, rather than lack of hydrocarbon charge. **Risks due to the absence of amplitude anomaly are related to seal or charge, with seal being identified as the critical risk.** Reservoir presence was considered to be a minimal risk based on proximity to Naylor-1.

Proximity to the Croft-Naylor pipeline (within 0.5 km) would have allowed early connection and production.

2. DRILLING RATIONALE (after Well Proposal)

GEOLOGICAL RISK ASSESSMENT

2.1 Play Analysis

The Naylor South-1 prospect was mapped as an east west striking tilted fault block closure on the upthrown side of a major fault, with the primary reservoir of the Waarre Sandstone. Vertical and cross fault seal are provided by a Belfast Mudstone section. The prospect is charged from the mature source beds located within the underlying Eumeralla and/or Crayfish Group, with migration either directly into the reservoir or via fault conduits. The play has proven successful in the nearby Naylor and Croft gas fields. The Naylor South-1 prospect does not exhibit an amplitude anomaly at the Waarre Sandstone horizon. The lack of amplitude/AVO at the well location is interpreted either to be a function of the thinner Waarre section at this location, the variation in thickness of the Waarre subunits generating seismic interference or raypath interference from the bounding fault, rather than lack of hydrocarbon charge/seal, however this does remain a possibility.

2.2 Trap and Mapping (Pcl = 75%)

Interpretation and mapping of the Naylor South-1 prospect was based on the Curdievale 3D seismic survey which was recorded in early 2000. The Curdievale 3D data quality is good over the prospect area.

The Naylor South-1 structure is mapped as an east west striking tilted fault block. Three way dip closure is to the north with updip fault closure on the southern flank of the structure Figures 3 and 4 (not shown). One strike line across the structure is shown in Figure 5 (not shown) and two dip lines in Figures 6 and 7 (not shown). The prospect is on the upthrown side of a major fault.

Vertical closure at the Waarre Sandstone is at least 40m. The current interpretation shows that the Naylor/Naylor South areas can be encompassed by a closing contour at about –2060m implying that they could be part of one field. This has significant implications on OGIP if it can be verified.

The prospect is reliant on top seal and cross-fault seal by the Belfast Mudstone and this is demonstrable in nearby accumulations, notable Croft-1. The proposed location for Naylor South-1 is at Inline 2580 CDP 10133, which is crestal on the Naylor South prospect. No full stack amplitude or AVO anomaly is observed at the Waarre Sandstone level at Naylor South. This lack of amplitude could be caused by:

- Thinning of the Waarre “C” sand to below 10-15m
- Variation between the sub-units to generate destructive interference
- Poor imaging due to the significant fault
- Erosion of the Waarre “C” unit, with remaining Waarre “A”
- Lack of a hydrocarbon accumulation, from leak or lack of charge

Figure 5 (not shown) demonstrates the variation in Waarre subunit reflectors and Figure 7 (not shown) possibly shows a flatspot at ~1550 msec.

Reasonable confidence exists on the mapping with closure risk at 75%.

2.3 Reservoir (Prs = 90%)

Naylor South-1 was prognosed to have 53m of Waarre section compared with 83.5m at Naylor-1 (~1 km North) Figure 8 (not shown). An analogous section to Naylor-1 can be predicted where Unit “C” contains 25.5m of net gas pay at average porosity of 17.2% and Unit “A” contains 25.8m of net gas pay with an average porosity of 13.6%. Permeability should be good to excellent. Boggy Creek-1 log is also presented as Figure 9 (not shown). A high degree of confidence is placed in reservoir development with reservoir risk at 90%.

2.4 Seal (Psl = 60%)

Top Seal and cross fault seal for the Naylor South-1 structure are provided by the Belfast Mudstone. The seismic sections demonstrate an optimum relationship between the Waarre and seal sections. However the lack of amplitude response could be indicating seal failure resulting in leak and therefore risk on seal is placed at 60%. Note the final probability of geological success is the critical outcome on the prospect.

2.5 Charge (Pch = 70%)

The concepts on charge are discussed in the Port Campbell Embayment Geological Assessment (not shown in this report). The Naylor South-1 location meets the requirements for charge and the Naylor South-1 location and the Naylor field can be mapped within the one closing structural closure at ~ 1550 msec.

However, based on the lack of amplitude response a risk on charge must be considered and accordingly the risk is placed at 70%.

3. RESULTS OF DRILLING

(a) Stratigraphy

The following table lists the formations intersected in Naylor South 1, together with sub-sea elevations and thicknesses. All depths are Logger's Depths.

TABLE IV: STRATIGRAPHY IN THE NAYLOR SOUTH 1 WELL

AGE	FORMATIONS	DEPTH (m)	THICK. (m)	ELEV. (m)
	<u>HEYTESBURY GRP</u>			
MIDDLE-LATE MIOCENE	PORT CAMPBELL LIMESTONE	Surface	124	53
EARLY-MIDDLE MIOCENE	GELLIBRAND MARL	124	336	-70.72
LATE OLIGOCENE-EARLY MIOCENE	CLIFTON FM <u>NIRRANDA GRP</u>	460	13	-406.50
LATE EOCENE-EARLY OLIGOCENE	NARRAWATURK MARL	473	76	-419.48
MIDDLE-LATE EOCENE	MEPUNGA FORMATION	549	84	-493.78
EARLY PALEOCENE – MIDDLE EOCENE	DILWYN FORMATION	633	276	-574.66
EARLY PALEOCENE-EARLY EOCENE	PEMBER MUDSTONE	909	75	-846.26
EARLY PALEOCENE	PEBBLE PT FM <u>SHERBROOK GRP</u>	984	86	-920.01
CAMPANIAN-MASTRICHTIAN	MASSACRE SHALE	1070	40	-1004.57
CAMPANIAN-MASTRICHTIAN	TIMBOON SANDSTONE	1110	142	-1043.9
CAMPANIAN-MASTRICHTIAN	PAARATTE FORMATION	1252	381	-1183.52
SANTONIAN-CAMPANIAN	SKULL CREEK MUDSTONE	1633	130.5	-1558.14
CENOMANIAN-SANTONIAN	BELFAST MUDSTONE	1763.5	313	-1686.46
CENOMANIAN-CONIACIAN	FLAXMAN FORMATION	2076.5	20.5	-1994.21
CENOMANIAN-TURONIAN	WAARRE FM, UNIT C	2097	36.5	-2014.37
CENOMANIAN-TURONIAN	WAARRE FM, UNIT B	2133.5	27.5	-2050.26
CENOMANIAN-TURONIAN	WAARRE FM, UNIT A	2161	40	-2077.30
ALBIAN	EUMERALLA FORMATION	2201	42+	-2116.63
	TD	2243		-2190

Samples were collected, washed, and described at 10m intervals from the surface to 1000m, 3m intervals from 1000m to total depth at 2243m (Drlr & Logr).

A brief summary of the formations penetrated in Naylor South 1, their ages and interpreted environments of deposition follows:- (For more detailed lithological descriptions refer to Appendix I). For specific relationships between the units, refer to the stratigraphic column in Appendix IX)

Total depth for Naylor South 1 was reached at 2243m (Drlr & Logr), in the Early Cretaceous **Eumeralla Formation**, of the **Otway Group**. The well intersected 42m of the Eumeralla, the top coming in at 2201m (maximum recorded thickness in the Otway Basin is 2743m, in the Fergusons Hill-1 well). The formation consists of interbedded sandstone and siltstone. The sandstones are off-white, commonly light grey to pale green. Quartz grains are dominantly fine to occasionally medium-sized. They are subangular to subrounded, moderately well sorted, contain common weak calcareous cement, and have a common to abundant white argillaceous matrix. Characteristically, the Eumeralla contains a high percentage of volcanic rock fragments (38-53%--Abele *et al*, 1995). In Naylor South 1, there is trace of pyrite, and the sandstone varies from friable to occasionally moderately hard, but only exhibits poor porosity. No oil fluorescence was observed. The siltstone comprises approximately 10-20% of the section drilled and is medium to dark grey. It is moderate to very silty in parts and is locally micro-micaceous. The siltstone is firm to moderately hard and is sub blocky to occasionally sub fissile.

The Eumeralla was deposited in a low-energy fluvial environment, probably in a major braided stream system where there was an abundant supply of sand-sized volcanic detritus. The landscape also included occasional high energy streams, lakes and channel tracts. The source of the volcanic material is unknown, but due to results from age dating, it appears that volcanism was contemporaneous with sedimentation (Foster and Hodgson, 1995). In the eastern portion of the Otway Basin the Eumeralla has been dated to be Aptian to Albian.

The Late Cretaceous **Sherbrook Group** unconformably overlies the Early Cretaceous Eumeralla in the Otway Basin. The **Waarre Formation** makes up the oldest formation of the group and is dated to be Turonian in age (Partridge, 1997). The formation was divided up into 4 units by Buffin (1989), however the youngest, "Unit D", is generally called the Flaxmans Formation, after Flaxmans-1, by Bain (1961). The sandstone is off-white, clear, translucent, very fine to coarse, predominantly medium and is poorly sorted. The grains are subangular to subrounded, with weak siliceous cement. There is trace to common off white argillaceous matrix throughout. The sandstone is loose to occasionally hard, has a poor visible porosity, and no fluorescence. The siltstone is pale to medium grey, medium to dark grey/brown and has common carbonaceous material. It is firm to moderately hard and sub-blocky to sub-fissile.

The sandstone packages are from 3 to 15m thick and are generally blocky in shape, although the Waarre B sand package exhibits a fining upward signature. The basal Waarre is interpreted to be shallow marine to marginal marine. After the transgression in the lower part of the Waarre, the formation became more regressive, depositing the best reservoir sands in the lower coastal and delta areas.

The Waarre Formation was transgressed by another flooding event (conformably overlain) by the **Flaxmans Formation**. In the Naylor South 1 well it was intersected at 2076.5m (-1994.21m SS), and is 20.5m thick. It consists of a coarsening upward package of approximately equal amounts of sandstone and siltstone. The siltstone is pale to medium grey and medium to dark grey/brown, and has common glauconite, with a trace of muscovite flakes. The sandstone is clear, translucent, milky to off white, very fine to medium, predominantly fine. It is poorly sorted, subangular to subrounded, has a hard siliceous cement and trace off white argillaceous matrix. The sand is predominately loose and exhibits poor inferred porosity. The Flaxmans is dated as being Coniacian in age, and is defined as the initial sediments of the major marine transgression to the overlying Belfast Mudstone. Both the Flaxmans and Belfast are considered part of the regional seal and side seal for the Waarre Formation.

The **Belfast Mudstone** conformably overlies the Flaxmans Formation. It was penetrated at 1763.5m (-1686.46m SS), and is 313m thick. The siltstone is pale to medium grey and pale brownish grey, arenaceous with minor argillaceous. The siltstone contains common nodular pyrite with trace carbonaceous specks and feldspar. It is very soft to firm, occasionally moderately hard, sub blocky to sub fissile. The sandstone is off white, clear, translucent, very fine to fine, occasional coarse, moderately well sorted, subangular to subrounded grains, white argillaceous matrix, moderate siliceous cement, with trace pyrite, loose, occasional moderately hard aggregates with very poor visual porosity and no fluorescence. The Belfast has been dated as Turonian to Campanian (Abele *et al.*, 1995), but Partridge (1997) considered it to be only Coniacian to Santonian. It was deposited below storm wave base in low-energy marine conditions, in a pro-delta environment.

The **Skull Creek Mudstone**, (often considered part of the Paaratte Formation), conformably overlies the Belfast Mudstone. The top of the mudstone was encountered at 1633m (-1558.14m SS), and is 130.5m thick. It comprises a pale to medium grey, predominantly light grey siltstone. The siltstone is argillaceous in part, with common calcareous. It is soft to dispersive, and often amorphous. The sandstone is clear to translucent, occasionally milky, very fine to very coarse grains with bimodal sorting. The grains are subangular to subrounded and there is trace off white argillaceous matrix present. Occasional pyrite nodules are seen. The sand grains are loose with poor inferred porosity and no fluorescence. A pro-delta environment of deposition is interpreted for the Skull Creek and an age of Santonian has been attributed to it.

The top of the youngest formation of the Sherbrook Group, the **Paaratte Formation**, was intersected at 1252m, (-1183.52m SS). The formation is 381m thick and is made up sandstone with interbedded siltstone. The sandstone is clear, translucent, milky to off white and pale brown/grey. The quartz grains are very fine to predominantly medium, with occasional coarse and are moderately sorted. The grains are subangular to subrounded, angular in part with trace moderate siliceous cement. Rare to trace pale grey argillaceous matrix occurs in this formation as well as occasion pyrite nodules. The sandstone is dominantly loose and exhibits poor to fair porosity. No fluorescence was noted.

The minor interbedded siltstone is medium to dark grey brown, commonly arenaceous with traces of argillaceous material. Occasional carbonaceous specks and laminations are also seen in this siltstone. The siltstone is very soft to firm in part, and very dispersive and sub-blocky to amorphous.

The Paaratte Formation was deposited in a deltaic environment, in this case, presumably delta plain, and has been dated to be Santonian to Maastrichtian in age in the Otway Basin.

Unconformably overlying the Paaratte Formation is the oldest unit in the **Wangerrip Group**, the **Pebble Point Formation**. At Naylor South 1, the Pebble Point is 86m thick, from 984m (-920.01m SS) to 1070m, and consists of interbedded sandstone, siltstone and claystone. The claystone is dark grey/brown, and is calcareous and argillaceous. Trace fossil fragments were noted in the claystone. The siltstone is medium to dark grey/brown, argillaceous with rare arenaceous, and calcareous in part, soft to firm and moderately hard in part. The siltstone is predominantly blocky. The sandstone seen in the Pebble Point Formation is brown, clear to translucent, fine to coarse, sub angular to subrounded, poorly sorted with weak siliceous cement, occasional to common brown silty matrix. Rare nodular pyrite. The sand is dominantly loose, with poor visible and inferred porosity with no fluorescence.

The environment of deposition for the Pebble Point is interpreted to be shallow water, near-shore, restricted marine with periodic influxes of coarse detrital material. Various megafossils and microfossils have been identified in the formation, that indicate a Palaeocene age (Abele *et al.*, 1995).

Conformably overlying the Pebble Point is the **Pember Mudstone**, between 909m (-846.26m SS) and 984m, thus is 75m thick. This claystone is medium to dark brown/grey, and is calcareous and argillaceous with the CLAYSTONE occasionally grading to SILTSTONE. It has trace carbonaceous flecks and lithics and is soft and amorphous. The sandstone in this section is clear to off white, occasionally light brown, with very fine to fine, occasionally medium grains that are subrounded to subangular. The grains are loose with poor to fair inferred porosity and no fluorescence.

The Pember Mudstone was deposited in a marine environment where there was restricted circulation and low energy conditions, probably below or close to storm wave base. It has been given an age of Late Paleocene to Early Eocene (Abele *et al*, 1995) as a result of enclosed palynomorphs.

The **Dilwyn Formation** conformably overlies the Pember Mudstone at this location, and was encountered between 633m (-574.66m SS) and 909m (-846.26m SS). It is 276m thick. The section consists predominantly of sandstone with minor interbedded siltstone and claystone. The sandstone is a light to medium brown, translucent, fine to medium with occasion coarse grains. It is moderately sorted with grains that are predominately subangular to subrounded. Moderate calcareous cement is present, as is a trace amount of brown argillaceous matrix. Trace quantities of pyrite nodules are also seen. The sand grains are loose with poor to fair inferred porosity with no fluorescence. The claystone is light to medium brown, calcareous with trace fossil fragments. It is soft to firm and amorphous. Siltstone is light to medium greyish brown, argillaceous and calcareous. Trace pyrite is evident. The siltstone is dispersive and soft, and is commonly amorphous.

Both macrofossils and microfossils from the Dilwyn have been dated to be Early Eocene. The environment of deposition is interpreted to be shallow marine, with the cleaner sandy portions representing shore-face deposits of a coastal barrier system and the interbedded section possibly back beach lagoonal sediments, with some breaching occurring. Another interpretation is that the Dilwyn could have formed in a lower delta plain area with the sands, distributary channels and mouth bars, and the clays, the inter-distributary bay fills (Abele *et al.*, 1995).

The Dilwyn Formation is the youngest unit of the **Wangerrip Group**, and is disconformably overlain by the **Mepunga Formation**, the oldest formation of the **Nirranda Group**. In the Naylor South 1 well the Mepunga was intersected at 549m (-493.78m SS) and is 84m thick. The sandstone is off white to light brown, and has fine to medium grains. The grains are subangular to subrounded and moderately sorted. The quartz grains are loose with poor inferred porosity and no fluorescence. The claystone is medium to dark brown/red and calcareous with minor fossil fragments. The siltstone is seen to grade to siltstone in part, and is soft to firm and occasionally amorphous.

According to dating of forams, molluscs and palynomorphs discovered within the Mepunga, an age of Late Eocene has been given. The sandstones have been interpreted as being deposited in beach and near-shore locations as barrier islands, whereas the claystone is regarded as estuarine and some as deep lagoonal in origin (Abele *et al*, 1995).

The **Narrawaturk Marl** overlies the Mepunga Formation with a conformable contact. The marl was encountered at 473m (-419.48m SS), and is 76m thick. The formation comprises of a sandstone that is redish brown, with common iron staining. The grains are very fine to medium, with occasional coarse grains, poorly sorted and are rounded to subrounded. The sandstone has common argillaceous red/brown matrix and calcareous cement. The grains are generally loose, however moderately hard aggregates are present. The sandstone has poor inferred porosity and no fluorescence. The siltstone is orange to red/brown, arenaceous grading to very fine sandstone. It is calcareous, soft and occasionally amorphous.

The Narrawaturk represents the youngest formation of the Nirranda Group, and overlying it with a regional disconformity is the **Clifton Formation**, the oldest unit of the **Heytesbury Group**. The Clifton is a 13m thick formation of calcarenite, found from 460m (-406.5m SS) to 473m in the Naylor South 1 well. The Sandstone is orange to reddish brown, and very iron oxide rich. It is very fine to medium, coarse in part, poorly sorted and subangular to subrounded grains, with weak calcareous cement and common orange to reddish brown argillaceous matrix, grading to LIMESTONE in part. It is friable to loose in part, with poor porosity and no fluorescence.

Fossils found within the calcarenite have been dated to be Late Oligocene, and it is thought to represent a shallow marine unit, a carbonate sand, deposited above fair weather base under fairly energetic conditions (Abele *et al*, 1995).

The Clifton Formation grades vertically, and in places laterally into the **Gellibrand Marl**. Here, the marl is 336m thick, from 124m (-70.72m SS) to 460m. It is a pale to medium grey Marl, which is strongly calcareous, with common fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules. It is very soft to dispersive and amorphous in part.

The Early to Middle Miocene Gellibrand Marl was deposited in low-energy, continental shelf environment, with a minimum water depth of 60m, due to the presence of glauconite (Abele *et al*, 1995).

The Naylor South 1 well was spudded into the **Port Campbell Limestone**, the topmost formation of the Heytesbury Group, (overlying the Gellibrand with a transitional contact), appearing from spud to 124m in depth. The calcarenite is off white to pale grey/brown, clear, crystalline, common shell fragments and is soft to dispersive.

The Port Campbell Limestone is Middle to Late Miocene in age and was deposited in a moderate-energy, continental shelf environment, above fair weather wave base.

For further details concerning the formations encountered in Naylor South 1, refer to **Appendix I** of this report.

(b) Stratigraphic Prognosis (after Well Proposal)

The geological section penetrated varied significant to prognosis. Formation tops ranged from 142m low to 176m high. The primary objective, the Waarre Formation, was 39m low. Actual versus predicted formation tops and thicknesses for Naylor South 1 are tabled below (all depths quoted are Logger's Depths):

TABLE V: ACTUAL VERSUS PREDICTED DEPTHS AND THICKNESSES
NAYLOR SOUTH 1

FORMATION	PROG SS DEPTH	ACTUAL SS DEPTH	DEPTH DIFF	PROG THICK	ACTUAL THICK	THICK DIFF
Port Campbell Lst					124m	
Gellibrand Marl		-70.72m			336m	
Clifton Fm	-410m	-406.50m	3.5m H		13m	
Narrawaturk Marl		-419.48m			76m	
Mepunga Fm	-495m	-493.78m	1.22m H	85m	84m	-1m
Dilwyn Fm	-580m	-574.66m	5.34m H	228m	276m	+48m
Pember Mdst	-808m	-846.26m	38.26m L	177m	75m	-102m
Pebble Point Fm	-865m	-920.01m	55.01m L		86m	
Massacre Shale		-1004.57m			40m	
Timboon Sandstone		-1043.9m			142m	
Paaratte Fm	-1042m	-1183.52m	141.52m L	619m	381m	-238m
Skull Creek Mdst	-1661m	-1558.14m	102.86m H		130.5m	
Belfast Mdst	-1862m	-1686.46m	175.54m H	93m	313m	+220m
Flaxmans Fm	-1955m	-1994.21m	39.21m L	59m	20.5m	-38.5m
Waarre Fm, UNIT C	-1975m	-2014.37m	39.37m L	79m	36.5m	-42.5m
Waarre Fm, UNIT B		-2050.26m			27.5m	
Waarre Fm, UNIT A		-2077.30m			40m	
Eumeralla Fm	-2054m	-2116.63m	62.63m L		42m+	
TD	-2100m	-2190 m	90m L			

(c) Hydrocarbon Summary

Total gas was recorded from the surface to total depth (2243m RT) using a FID total gas detector run by Geoservices Ltd. One unit of gas is equal to 200 ppm methane equivalent. Chromatographic analysis was determined using a FID chromatograph and these values are quoted as percentages (C1-C4). Ditch cuttings were washed, described and checked for fluorescence using ultraviolet light.

Surface to the top of the Skull Creek Mudstone (spud to 1633m)

No gas was recorded through the Port Campbell Limestone, Gellibrand Marl, Clifton Formation, Narrawaturk Marl, Mepunga Formation, Dilwyn Formation, Pember Mudstone, Pebble Point Formation, Massacre Shale, Timboon Sandstone or the Paaratte Formation. No hydrocarbon fluorescence in the drill cuttings was recorded within these formations.

Skull Creek Mudstone (1633m to 1763.5m)

No gas was recorded through the majority of this formation. Traces (nil to less than 1%) of 100% C1 were detected at the very bottom of the formation. No hydrocarbon fluorescence in the drill cuttings was recorded within this formation.

Belfast Mudstone (1763.5m to 2076.5m)

There was less than 1% total gas that was 100% C1 at the top of the Belfast Mudstone. Gas levels increased steadily to 15 units toward the middle of the formation. These gas ratios were C1=98%, C2=2%. Gas levels steadily increased from 15 units to 60 units toward the bottom of the Belfast Mudstone. The gas ratios at the lower part of this formation were C1=94%, C2=5%, C3=1%. The background gas level at the bottom part of the Belfast Mudstone was 40 units. No hydrocarbon fluorescence was recorded within this formation.

Flaxmans Formation (2076.5m to 2097m)

During this formation the background gas level was 39 units. The relevant gas ratio was C1=94%, C2=5%, C3=1%. There were no significant gas peaks above background gas levels throughout the Flaxmans Formation. No hydrocarbon fluorescence was recorded within this formation.

Waarre Formation (2097m to 2133.5m)**Waarre “Unit C” (2097m to 2133.5m)**

The primary objective of the Naylor South 1 well was the Waarre Sandstone. This unit yielded poor gas values in the top sand, with no significant gas shows. There was one gas peak that stood out above background gas level. This gas peak at the top of the Waarre “Unit C” which reached a level of 200 units had a chromatograph gas ratio of C1=93%, C2=5%, C3=2%. The background gas level in this section was 80 units. No oil fluorescence was observed at the well site.

Log analysis data identified no pay in Waarre “Unit C”.

Waarre “Unit B” (2133.5m to 2161m)

As a result of no sandstone development being observed in the Waarre “Unit B” there were no significant gas shows recorded. Total gas varied between 60 and 100 units, and the gas ratios were C1=92%, C2=6%, C3=2%, C4=trace. No oil fluorescence was observed at the well site.

Log analysis data identified no pay in Waarre “Unit B”.

Waarre “Unit A” (2161m to 2201m)

There was one gas peak which stood out against background gas levels in the Waarre “Unit A”. This gas peak reached 300 units and had a gas ratio of C1=93%, C2=6%, C3=1%. The background gas level in “Unit A” was 70 units. No oil fluorescence was observed in this unit.

Log analysis data identified no pay in Waarre “Unit A”.

Eumeralla Formation (2201m to 2243m T.D.)

In the Eumeralla Formation, total gas levels began at 85 units and dropped down to 7 units at total depth. Background gas levels were 20 units. Gas ratios were C1=93%, C2=5%, C3=2, No oil fluorescence was observed in this unit.

The Naylor South 1 well was plugged and abandoned on 30th December, 2001.

4. SUMMARY

Naylor South 1 has been drilled as an Otway Basin gas exploration well located in the PEP 154 licence, approximately 10 km north west of the town of Peterborough, 1km SSE of Naylor 1 gas field and 2 km SW of Boggy Creek gas field. Naylor South 1 is situated within the productive Waarre Sandstone play fairway.

The primary objective of Naylor South 1 was the Late Cretaceous Waarre Sandstone which was mapped as a tilted-fault block closure.

Drilling of Naylor South 1 was terminated 60m into the Eumeralla Formation. The majority of the formation tops came within 40m-70m to prognosis. The Clifton Formation, the Dilwyn Formation, the Skull Creek Mudstone and the Belfast Mudstone all came in high to prognosed (3m, 5m, 103m and 176m respectively). The remaining formation tops all came in low to prognosed, ranging from 38m low for the Pember Mudstone to 142m low for the Paaratte Formation. The top of the primary objective, the Waarre Sandstone, was 39m low (at -2014m SS).

Wireline logging at total depth of 2243m consisted of the following: Run 1: DLL-SLL-MLL-LCS-GR-CAL; Run 2: GR-PDS-CNS. No cores or DST's were carried out on Naylor South 1.

Log analysis data indicate the following:

- No pay in the Waarre Sandstones.
- Sandstone development was not observed in the Waarre "Unit B".

The Naylor South 1 well was plugged and abandoned on 30th December, 2001.

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APPENDIX I: LITHOLOGICAL DESCRIPTIONS

APPENDIX I (a): CUTTINGS

LITHOLOGICAL DESCRIPTIONS

Ditch cuttings were collected, washed, described, and checked for fluorescence at 10m intervals from the surface to 1000m, 3m intervals from 1000m to total depth at 2243m (driller & log ext).

HEYTESBURY GROUP

Port Campbell Limestone (Middle to Late Miocene)

124m thick

SPUD-124m

Spud-124m LIMESTONE: off white to cream, clear in part, moderately crystalline, sucrosic in part, common fossil fragments, common shell fragments, friable to loose.

SANDSTONE: clear to off white, pale grey, fine to medium, moderately sorted, subangular to subrounded in part, common calcareous, loose, poor to fair inferred porosity, no fluorescence.

MARL: light to medium grey, trace pale brownish grey, very calcareous, common fossil fragments, very soft to soft, dispersive, amorphous, sticky.

Gellibrand Marl (Early to Middle Miocene)

336m thick

124-460m

124-460m MARL: light to medium grey, occasional pale grey, trace pale brownish grey, very calcareous, common fossil fragments, abundant shell fragments, very soft to soft, dispersive, sticky in part, amorphous to trace subblocky.

LIMESTONE: off white, cream, pale greyish orange, trace pale brownish orange, abundant fossil fragments, friable, medium crystalline.

MARL: pale to medium grey, rare greyish green, strongly calcareous, common fossil fragments, occasional pyrite nodules, very soft to dispersive, amorphous in part.

Clifton Formation (Late Oligocene - Early Miocene)

13m thick

460-473m

460-473m MARL: pale to medium grey, pale grey/green, strongly calcareous, trace fossil fragments, very soft to firm, amorphous.

Narrawaturk Marl (Late Eocene - Early Oligocene)

76m thick

473-549m

473-549m SILTSTONE: orange - red brown, common iron staining, arenaceous grading to fine SANDSTONE, calcareous, soft, amorphous.

SANDSTONE: orange - red/brown, common iron staining, very fine - medium grained, coarse in part, poor sorted, rounded to subrounded, common argillaceous red/brown matrix, calcareous cement, loose to firm, poor inferred porosity, no fluorescence.

NIRRANDA GROUP

Mepunga Formation (Middle to Late Eocene)

84m thick

549m-633m

549-633m CLAYSTONE: medium - dark brown, medium red/brown, calcareous, minor fossil fragments, grading to SILTSTONE in part, soft - firm, amorphous.

SANDSTONE: pale brown, off white, fine - medium, moderately sorted, subangular - subrounded, loose, poor inferred porosity.

WANGERRIP GROUP

Dilwyn Formation (Early Paleocene to Middle Eocene)

276m thick

633-909m

633-782m: SANDSTONE: light - medium brown, translucent, fine - medium, occasionally coarse, moderately sorted, subangular - subrounded, occasional angular, moderately calcareous cement, trace brown argillaceous matrix, trace pyrite nodules, loose, fair inferred visual porosity, no fluorescence.

CLAYSTONE: light grey, medium brown, medium red/brown, calcareous, trace pyrite, trace fossil fragments, soft - firm, amorphous.

782-909m: SANDSTONE: clear - very pale grey/brown, translucent, iron staining in part, fine - medium, occasional coarse, moderately sorted, subangular - subrounded, loose, poor - fair inferred porosity, no fluorescence.

SILTSTONE: light - medium brown-grey/brown, argillaceous, calcareous, trace pyrite, soft, dispersive, amorphous.

Pember Mudstone (Early Paleocene to Early Eocene)

75m thick

909-984m

909-984m SANDSTONE: off white, translucent, pale brown, very fine - fine, occasional medium grained, rare coarse grains, moderately well sorted, subangular - subrounded, loose, poor - fair inferred porosity, no fluorescence.

CLAYSTONE: medium - dark grey/brown, calcareous, argillaceous, occasional grading to SILTSTONE, trace carbonaceous specks, soft, amorphous.

Pebble Point Formation (Early Palaeocene)

86m thick

984-1070m

984-1070m SANDSTONE: pale brown/orange, off white, fine - coarse, predominantly medium, moderately - poor sorted, subangular - subrounded, occasional brown silty matrix, calcareous, rare pyrite, predominantly loose, occasionally friable, poor visual and inferred porosity, no fluorescence.

CLAYSTONE: dark brown/grey, calcareous, argillaceous, trace fossil fragments, soft, amorphous.

Massacre Shale (Campanian to Mastrichtian)

40m thick

1070-1110m

1070-1110m SANDSTONE: clear, translucent, pale brown, very fine to medium, rare coarse, poor sorted, subrounded - subangular, occasional calcareous matrix, rare pyrite, loose, poor - fair inferred and visual porosity, no fluorescence.

SILTSTONE: medium - dark grey / brown, occasional light brown, argillaceous, arenaceous in part, occasional calcareous, soft - firm, moderately hard in part, predominantly blocky.

Timboon Sandstone (Campanian to Mastrichtian)

142m thick

1110-1252m

1110-1252m SANDSTONE: off white, clear, translucent, occasional pale brown, very fine - coarse, occasional very coarse, poor sorted, subrounded - subangular, loose, poor inferred porosity, no fluorescence.

SILTSTONE: light - medium grey/brown, light brown, trace calcareous, common argillaceous, arenaceous in part, common carbonaceous specks, soft, amorphous.

SHERBROOK GROUP

Paaratte Formation (Campanian to Mastrichtian)

381m thick

1252-1633m

1252-1458m SANDSTONE: clear, off white, translucent, very fine - medium, occasional coarse, moderately poor sorted, subangular - subrounded, loose, poor inferred porosity, no fluorescence.

SILTSTONE: light - medium grey, medium grey/brown, arenaceous, trace argillaceous in part, occasional carbonaceous specks and lams, trace very fine lithics, soft - dispersive in part, amorphous.

1458-1510m SANDSTONE: clear, very pale grey, translucent, very fine - medium, occasional coarse, poor sorted, subangular - subrounded, loose, poor - fair inferred porosity, no fluorescence.

SILTSTONE: pale - medium grey, occasional dark grey, common arenaceous, soft - dispersive, subblocky - amorphous.

1510-1633m SANDSTONE: clear, translucent, milky, off white, pale brown, fine - coarse, predominantly medium, poor sorted, subangular - subrounded, angular in part, moderately siliceous cement, off white argillaceous matrix, occasional pyrite nodules, predominantly loose, poor inferred porosity, no fluorescence.

SILTSTONE: medium - pale brown/grey, medium grey, occasional dark grey, common arenaceous grading to very fine SANDSTONE in part, soft - firm, subblocky - amorphous.

Skull Creek Mudstone (Santonian to Campanian)

130.5m thick

1633-1763.5m

1633-1763.5m SANDSTONE: clear, translucent, occasionally milky, very fine - very coarse, bimodal sorting, subangular - subrounded, trace off white argillaceous matrix, occasional pyrite nodules, loose, poor inferred porosity, no fluorescence.

SILTSTONE: pale - medium grey, predominantly light grey, argillaceous in part, common calcareous, soft – dispersive, amorphous.

Belfast Mudstone (Coniacian to Santonian)

313m thick

1763.5-2076.5m

1763.5-1865m SILTSTONE: light - medium grey, occasional light grey / brown, argillaceous to arenaceous in part, trace carbonaceous specks, common pyrite nodular, soft, amorphous.

SANDSTONE: clear, off white, translucent, pale grey in part, predominantly very fine - fine, occasional coarse, moderately well sorted, subangular - subrounded, white argillaceous matrix, moderately siliceous cement, trace pyrite, loose, occasional moderately hard aggregates, very poor visual porosity, no fluorescence.

1865-1936m SILTSTONE: medium - dark grey, arenaceous - argillaceous in part, occasional carbonaceous specks, trace feldspars, soft - occasional firm, subblocky - subfissile.

LIMESTONE: pale - medium brown, micritic, firm, moderately hard, microcrystalline.

1936-2076.5m SILTSTONE: medium - dark grey, medium - dark grey brown, arenaceous, trace micro micaceous, trace calcareous, common dark green glauconite, firm, dispersive.

Flaxmans Formation (Cenomanian to Coniacian)

20.5m thick

2076.5-2097m

2076.5-2097m SANDSTONE: clear, translucent, milky-off white, very fine - medium, predominantly fine, subangular - subrounded, hard siliceous cement, white argillaceous matrix, predominantly loose, occasional hard, poor inferred porosity, no fluorescence.

SILTSTONE: pale - medium grey, medium - dark grey / brown, very fine arenaceous, common carbonaceous specks, common glauconite, calcareous, trace micro micaceous, trace pyrite, firm - moderately hard, subblocky - dispersive.

Waarre Formation (Cenomanian to Turonian)

104m thick

2097-2201m

2097-2116m WAARRE 'UNIT C'

SANDSTONE: clear, translucent, off white, very fine - very coarse, predominantly medium, poor sorted, angular - subangular, occasional weak siliceous cement, trace off white argillaceous matrix, loose - moderately hard, poor visual porosity, poor - fair inferred porosity, no fluorescence.

- 2116-2144m SILTSTONE: pale - medium grey, very fine arenaceous, common carbonaceous specks and laminations, minor calcareous, firm - moderately hard, subblocky - subfissile.
WAARRE 'UNIT B'
SANDSTONE: clear, translucent, off white, very fine - coarse, poor sorted, subangular - subrounded, weak siliceous cement, common off white argillaceous matrix, loose - moderately hard, poor visual porosity, no fluorescence.
- SILTSTONE: pale - medium grey, very fine arenaceous, common carbonaceous specks and laminations, minor calcareous, firm - moderately hard, subblocky - subfissile.
- 2144-2201m WAARRE 'UNIT A'
SANDSTONE: off white, clear, translucent, occasional pale grey, very fine - fine, occasional coarse, well sorted - bimodal, subangular - subrounded, moderately hard siliceous cement, trace calcareous matrix, common argillaceous matrix, trace glauconite, trace pyrite, moderately hard - hard, very poor visual porosity, poor inferred porosity, no fluorescence.
- SILTSTONE: pale brown, pale - medium brown / grey, medium - dark grey, arenaceous, trace glauconite, trace calcareous, firm - moderately hard, subfissile - subblocky.

Eumeralla Formation (Albian)

42+m

2201-2243m TD

- 2201-2243m SANDSTONE: off white – very light grey, occasionally light green / grey, occasional clear – translucent, fine - medium, predominantly fine, moderately well sorted, subangular - subrounded, common weak calcareous cement, common - abundant white argillaceous matrix, occasional lithics, trace pyrite, friable - occasional loose, poor visual and inferred porosity, no fluorescence.
- SILTSTONE: medium grey - medium grey / brown, common pale blue / grey, argillaceous, trace very fine arenaceous, trace very fine micro micaceous in part, firm - occasional soft, rare moderately hard, subblocky.

APPENDIX I (b): SIDE WALL CORES

No side wall cores were taken at Naylor South 1.

APPENDIX II: HYDROCARBON SHOW REPORTS

There were no hydrocarbon shows on Naylor South 1

APPENDIX III: WIRELINE LOGGING REPORTS

APPENDIX III (a): LOGGING ORDER FORM

LOGGING ORDER FORM

COMPANY: Santos			
WELL: NAYLOR SOUTH 1		FIELD: OTWAY	
RIG: OD&E 30		STATE: VICTORIA	
LOCATION: OTWAY, VICTORIA		BLOCK: PEP 154	
LATITUDE: 38 32' 12.86" S (GDA 94)		LONGITUDE: 142 48' 44.39" E (GDA 94)	
ELEVATION:	GL: 48.30	RT: 53.00	DF: 4.70
9 7/8" HOLE: 438 m		7 5/8" CSG: 434 (D)	WT: 26 lb/ft, L-80, BT&C
6 3/4" HOLE: 2244		3 1/2" CSG:	WT:
TD (Drillr.): 2244		TD (Logr.): 2238.00	
MUD SYSTEM: 2% KCl / Polymer		CIRC. STOPPED: 05:30 AM 26/December/2001	
WT: 9.4	VISC: 40	PV/YP: 12/12	PH: 9
GEOLOGIST: T. PRATER		FLUID LOSS: 5.6	CHL: 10,500

INFORMATION GIVEN ABOVE IS TO BE USED ON LOG HEADING SHEETS.

HOLE CONDITIONS: (TIGHT SPOTS, DEVIATION, COALS, BARITE IN MUD, ETC..)

Maximum Hole Deviation: 22.8deg @ 1828m
Maximum Dog Leg Severity: 7.2deg @ 1677m
Barite: 1.2%
KCl: 17.5ppb, 6%

No expected over-pressure or depletion. Expected fm press: 2800psi
Expected BHT: 95degC
TIGHT HOLE: 1900 - 2000m

DRILL STEM TESTS/CORED INTERVALS:

NO FORMATION TESTS

COMMENTS

LOGS:PROGRAM CONFIRMED WITH OPERATIONS GEOLOGIST AT 4.30pm HOURS ON 26/12/2001PROGRAM VARIES FROM PRE-SPUD NOTES: YES: NO:

LOG	INTERVAL (m)	REMARKS/REPEAT SECTION
RUN # 1		
GR	2244 to Surface	DOWNLOG
DLS	2244 to 434	Semblance Processing TD TO 1950
MRS	2244 to 800	UPLOG
LCS	2244 to 434	DOWNLOG
CAL	2244 to 434	UPLOG
RUN # 2		
GR		
PDS	2244 to 2050	UPLOG
CNS	2244 to 2050	UPLOG
RUN # 3	CANCELLED	
GR	20 PRESET POINTS	TO BE PICKED FROM RUN # 1
RFS		
RUN # 4	CANCELLED	
SCG	ONE GUN 20 SAMPLES	

*Transmitted Ascii data to include: dt24, dth, dtr, dtt, so11, so12, so13, so14 sonic curves.***REMARKS:****(ALL OPERATIONS ARE TO CONFORM TO CURRENT SANTOS OPERATING PROCEDURES)**

- 1 TENSION CURVE - TO BE DISPLAYED ON LOG FROM T.D. TO CASING SHOE.
- 2 ALL CALIBRATIONS IN CASING MUST BE VERSUS DEPTH. (IF HOLE CONDITIONS PERMIT).
- 3 SONIC WAVEFORMS TO BE RECORDED FROM TD TO 30m ABOVE CONIACIAN (WAARRE FORMATION).
- 4 ALL ZONES OF SONIC CYCLE SKIPPING OR POOR QUALITY DATA TO BE REPEATED AND NOTED IN REMARKS SECTION. (EXCEPT ABOVE NARRAWATURK MARL. IF HOLE CONDITION IS POOR).
- 5 REPEAT SECTION NOT TO BE RUN IN 6" HOLES, COMPARE DOWN LOG FOR REPEAT ANALYSIS.
- 6 REPEAT SECTION TO BE LOGGED PRIOR TO MAIN LOG OVER INTERVAL OF INTEREST. (IF HOLE CONDITIONS ALLOW). CONFIRM REPEAT SECTION INTERVAL WITH OPERATIONS GEOLOGIST.
- 7 ALL THERMOMETER READINGS TO BE RECORDED ON LOG
- 8 ALL SCALES AND PRESENTATIONS TO CONFIRM TO STANDARDS UNLESS OTHERWISE ADVISED.
- 9 THE FIELD/EDIT TAPE MUST BE A MERGED COPY OF ALL LOGS RUN. SEPARATE TAPES ARE ONLY ACCEPTABLE AS AN INTERIM MEASURE.
- 10 ANY CHANGE FROM STANDARD PROCEDURES/SCALES TO BE NOTED IN REMARKS SECTION.
- 11 RM, RMF, RMC AND BHT MUST BE ANNOTATED ON FAXED LOGS. FAXED LOGS SHOULD ALSO INDICATE IF ON DEPTH OR NOT.
- 12 LOG DATA IS TO BE TRANSMITTED AS SOON AS POSSIBLE AFTER ACQUISITION. IF ANY DELAYS ARE LIKELY OR IF DATA TRANSMISSION WILL ADVERSELY EFFECT THE OPERATION THEN THE OPERATIONS GEOLOGIST MUST BE IMMEDIATELY INFORMED.
- 13 THE OPERATIONS GEOLOGIST MUST BE INFORMED IMMEDIATELY OF ANY TOOL OR HOLE PROBLEMS, LOST TIME OR ANY OTHER EVENT WHICH MAY AFFECT THE LOGGING OPERATIONS.

APPENDIX III (B): ELECTRIC LOG TIME SUMMARY

ELECTRIC LOGGING TIME SUMMARY

LOGGING UNIT:	1030	LEFT BASE:	AM (19/12)	WELL NAME:	NAYLOR SOUTH 1
START DATE:	27-Dec-01	ARRIVED AT THE WELLSITE:	09:30 (20/12)	TRIP NUMBER:	SUITE 1, RUN 1 & 2
END DATE:	XX/12/2001	INITIAL RIG UP:	10:00 (27/12)	WSG:	T. PRATER
DEPTH DRILLER:	2244 MD	FINAL RIG DOWN:	02:15 (28/12)	LOGGING ENGINEER:	A.DIGIACOMO
DEPTH LOGGER:	2238 MD	RETURN TO BASE:		PAGE / DATE:	PAGE 1 26/12/2001

26-Dec	RIG UP / DOWN	TOOL CHECK	RIH / POOH	LOGGING	DATA TX	LOST TIME LOGGER	I. O.	WIPER TRIP	LOST TIME OTHERS	OTHERS	COMMENTS / REMARKS
12:00	0:15										RIG UP FOR RUN 1
	0:15										
:30			0:15								RUN IN HOLE
			0:15								CSG CHECK, CAL CHECK
13:00			0:15								CALIPER WON'T OPEN, POOH TO CHECK
			0:15			0:15					CHECK AT SURFACE - CLEAN
:30			0:15			0:15					RUN IN HOLE AND CHECK - OK
				0:15							START DOWNLOG
14:00				0:15							
				0:15							
:30				0:15							
				0:15							
15:00				0:15							VERY TIGHT HOLE AT 1800m
				0:15							
:30				0:15							AT TD, BEGIN WAVEFORM MAIN UPLOG
				0:15							
16:00				0:15							
				0:15							
:30				0:15							
				0:15							
17:00				0:15							FINISHED WFT - BACK TO TD
				0:15							UPLOG RUN #1
:30				0:15							
				0:15							
18:00				0:15							
				0:15							
:30				0:15							
				0:15							
19:00				0:15							
				0:15							
:30				0:15							
				0:15							
20:00				0:15							TOOL TO SURFACE
				0:15							RIG DOWN RIG 1
:30	0:15										
	0:15										
21:00	0:15										
	0:15							0:15			LOST TIME WAITING ON DRILLER TO CLEAR FLOOR
:30	0:15										RIG UP FOR RUN 2
	0:15										
22:00			0:15								
			0:15						0:15		LOST TIME: CAN'T GET PAST CSG
:30			0:15						0:15		
				0:15							DOWNLOG
23:00				0:15							
				0:15							BEGIN UPLOG FOR RUN # 2
:30				0:15							
				0:15							

WSG (SIGN)	ENGINEER (SIGN)
------------	-----------------

TOTALS

1:30	0:00	1:15	6:45	0:00	0:30	0:00	0:00	0:15	0:00
0:30	0:00	0:45	1:15	0:00	0:00	0:00	0:00	0:30	0:00
0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00

TOOLS RUN:	GR-DLL-SLL-MLL-LCS-CAL
TOOLS RUN:	GR-PDS-CNS
TOOLS RUN:	

LOGGING UNIT: 1030

WELL NAME: NAYLOR SOUTH 1

PAGE: 2

27-Dec	RIG UP / DOWN	TOOL CHECK	RIH / POOH	LOGGING	DATA TX	LOST TIME LOGGER	I. O.	WIPER TRIP	LOST TIME OTHERS	OTHERS	COMMENTS / REMARKS
0:00				0:15							
				0:15							
:30				0:15							
				0:15							
1:00				0:15							
				0:15							
:30				0:15							ON SURFACE
	0:15										RIG DOWN RUN # 2
2:00	0:15										
	0:15										
:30											
3:00											
:30											
4:00											
:30											
5:00											
:30											
6:00											
:30											
7:00											
:30											
8:00											
:30											
9:00											
:30											
10:00											
:30											
11:00											
:30											

TOTALS

WSG (SIGN) ENGINEER (SIGN)

0:00 0:00 0:00 0:00 0:00 0:00 0:00 0:00 0:00 0:00

TOOLS RUN: GR-DLL-SLL-MLL-LCS-CAL

2:30 0:45 0:00 0:00 1:45 0:00 0:00 0:00 0:00 0:00

TOOLS RUN: GR-PDS-CNS

0:00 0:00 0:00 0:00 0:00 0:00 0:00 0:00 0:00 0:00

TOOLS RUN:

GRAND TOTALS

9:30	1:30	0:00	1:15	6:45	0:00	0:30	0:00	0:00	0:15	0:00
5:00	1:15	0:00	0:45	3:00	0:00	0:00	0:00	0:00	0:30	0:00
0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00

TOOLS RUN: GR-DLL-SLL-MLL-LCS-CAL

TOOLS RUN: GR-PDS-CNS

TOOLS RUN:

OVERALL JOB TOTAL

14:30	2:45	0:00	2:00	9:45	0:00	0:30	0:00	0:00	0:45	0:00
-------	------	------	------	------	------	------	------	------	------	------

SERVICE QUALITY SUMMARY

CLIENT WSG					ENGINEER					
1	2	3	4	5	1	2	3	4	5	
					✓					SAFETY
					✓					PROMPTNESS
					✓					TOOL & SURFACE SYSTEM PERFORMANCE
					✓					ATTITUDE & CO-OPERATION
					✓					WELLSITE PRODUCTS / LOG QUALITY
					✓					COMMUNICATIONS / TX PERFORMANCE
										OTHER (PLEASE SPECIFY)

1 Excellent, 2 - 3 Normal, 4 - 5 Very Poor

APPENDIX III (C): FIELD ELECTRIC LOG REPORT

SANTOS LIMITED

FIELD ELECTRIC LOG REPORT

WELL:	NAYLOR SOUTH 1
LOGGING ENGINEER:	A.DIGIACOMO
RUN No.:	1,2
DRILLERS DEPTH:	2244.00
ARRIVED ON SITE:	09:30 (20/12)
ACTUAL LOGGING TIME:	9:45
TOTAL TIME:	14:30

GEOLOGIST:	T. PRATER
	SUITE 1, RUN 1 & 2
DATE LOGGED:	27-Dec-01
LOGGERS DEPTH:	2238.00
CIRCULATION STOPPED:	05:30 26/Dec/01
LOST TIME LOGGERS:	0:30
LOST TIME OTHERS:	0:45

TYPE OF LOG	GR-DLL-SLL-MLL-LCS-CAL	GR-FMT
TIME CIRC. STOPPED:	05:30 27/Dec/01	05:30 27/Dec/01
TIME TOOL RIG UP:	12:00 27/Dec/01	21:30 27/Dec/01
TIME TOOL RIH:	12:30 27/Dec/01	22:00 26/Dec/01
TIME TOOL RIG DOWN:	21:30 27/Dec/01	02:15 27/Dec/01
TOTAL TIME:	9:30	4:45

TYPE OF LOG	FROM (m)	TO (m)	REPEAT SECTION	TIME SINCE LAST CIRCULATION	BHT
RUN # 1					
GR	2238	SURFACE		10 hrs	81 deg C
DLS	2238	434			
MRS	2238	434			
LCS	2238	434			
CAL	2238	434			
RUN # 2					
GR	2238	434		18 hrs	86 deg C
PDS	2238	434			
CNS	2238	434			

SUITE/RUN	BHT	DEPTH	TIME	SUITE/RUN	BHT	DEPTH	TIME	SUITE/RUN	BHT	DEPTH	TIME	SUITE/RUN	BHT	DEPTH	TIME
1 / 1	81	2231	36	1 / 2	86	2238	42	1 / 3				1 / 4			

MUD SYSTEM:	TYPE	WT.	VISC.	WL	PH	CI	PV/YP	RMF	RM	RMC
	2% KCl / Polymer	9.4	40	5.6	9	10,500	12/12	0.172 ohmm @ 65.8 F	0.1985 ohmm @ 65.34 F	0.338 ohmm @ 64.05 F

HOLE CONDITIONS:

Maximum Hole Deviation: 22.8deg @ 1828m
 Maximum Dog Leg Severity: 7.2 deg @ 1677m
 Barite: 1.2%
 KCl: 17.5ppb, 6%
 Expected BHT: 95 degC
 Tight High: 1900 - 2000m

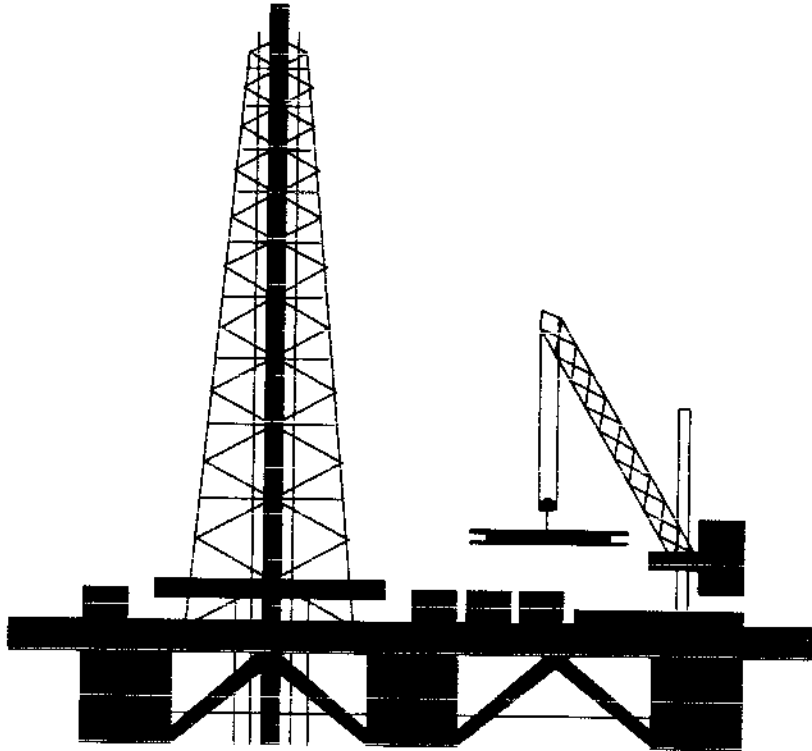
LOG ORDER FORM	✓	MUD SAMPLE RESISTIVITY	✓	TOOL No. / CODE CHECK	✓
OFFSET WELL DATA	✓	CABLE DATA CARD	✓	LOG SEQUENCE CONFIRM	✓

LOG TYPE	GR	DLS	MRS	LCS	CAL	GR	PDS	CNS				REMARKS
CASING CHECK	✓	✓	✓	✓	✓	✓	✓	✓				
SCALE CHECK	✓	✓	✓	✓	✓	✓	✓	✓				
DEPTH Casing Total			✓									
CALIBRATIONS OK	✓	✓	✓	✓	✓	✓	✓	✓				
REPEATABILITY	✓	✓	✓	✓	✓	✓	✓	✓				
LOGGING SPEED	✓	✓	✓	✓	✓	✓	✓	✓				
OFFSET WELL REPEATABILITY	✓	✓	✓	✓	✓	✓	✓	✓				
NOISY MISSING DATA												
CURVES / LOGS DEPTH MATCHED	✓	✓	✓	✓	✓	✓	✓	✓				
Rm MEASUREMENTS	✓	✓	✓	✓	✓	✓	✓	✓				
RS / RD CHECK		✓										
?PERF / ZCOR CHECK												
LOG HEADER / TAIL	✓	✓	✓	✓	✓	✓	✓	✓				
PRINT FILM QUALITY	✓	✓	✓	✓	✓	✓	✓	✓				

Notes:

APPENDIX IV: DIRECTIONAL DRILLING END OF WELL

SANTOS LTD.



DIRECTIONAL DRILLING END OF WELL REPORT

WELL : NAYLOR SOUTH #1

sperry-sun
DRILLING SERVICES

SANTOS LTD.

WELL : NAYLOR SOUTH #1

TABLE OF CONTENTS

SECTION ONE :	WELL SUMMARY
SECTION TWO :	SURVEY PLOT & DEFINITIVE SURVEY REPORTS
SECTION THREE :	SURVEY & DRILLING PARAMETERS
SECTION FOUR :	BHA DATA
SECTION FIVE :	MOTOR PERFORMANCE REPORTS
SECTION SIX :	DAILY DIRECTIONAL DRILLING REPORTS

Customer : Santos Ltd.

Well : Naylor South #1

Job Objectives:

To achieve a small target (25m radius) 90m at 165° azimuth @ 2050m TVD. It was hoped by jetting to 3 degrees in the top hole and holding angle and direction to TD, the objective could be achieved. In the event that this was unsuccessful, a correction run into the target as late as possible is planned.

Summary of Results:

Jetting in the top hole proved unsuccessful, however even if it was its highly unlikely that such a small target over a long distance could have been achieved without a correction run at any event.

A correction run begun at 1650m lined the well to the target without any problems, at which point the target was close enough that the well could be rotated to TD.

Discussion:

BHA #	Bit #	Motor Run #	Hole Size (in)	MD In (m)	MD Out (m)	TVD In (m)	TVD Out (m)	Inc In (deg)	Inc Out (deg)	Azi In (deg)	Azi Out (deg)	Drig hrs	Circ hrs
1	1		9.875	13	438	12	438	0.2	1.3	145	8	29	7
2	2		6.750	438	1650	438	1649	1.3	3.3	6	261	55	2
3	3	1	6.750	1650	1819	1649	1811	3.3	22.1	261	167	27	2
4	?		6.750	1819		1811		0	22.1	167	0	0	0

Table 1 - BHA Summary

Motor Run #	Manufacturer	Type	Lobe	OD (in)	Gauge (in)	Bend (deg)	Adj	DLS (Ori) (°/30m)	ROP (Ori) (m/hr)	ROP (Rot) (m/hr)
1	SSDS	SperryDrill	4/5	4.700	6.500	1.15	Y		4	8

Table 2 - Motor Run Summary

Bit Run Summary:

Bit 1 - A 16" Hughes GT-1 Sn A33/D used in the top hole jetting assembly performed well drilling at 60m/hr in the soft top hole. Came out with little wear and tear.

Bit 2

6-3/4" Hughes PDC

Drilled 1200m of 6 3/4" hole to 1650m where the assembly was pulled for a correction run. The ROP was good 40+ /hr for most of the run however slowed over the last 100m. The bit was quite knocked about with chipped and worn teeth and starting to ring out.

Bit 3

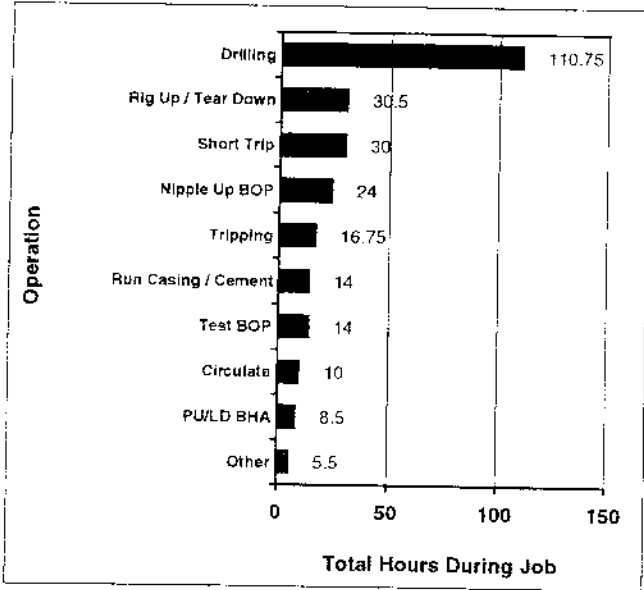
6-3/4" Smith XR32TDGPS

Used with a steerable assembly. A hard formation insert bit, not the first choice but the only tricone bit with suitable nozzles, however it slid well with a steady toolface and achieved good dogleg rates. At the end of the correction run rotary ROP had become very slow and the bit was pulled. It was quite worn and there was a lot of erosion.

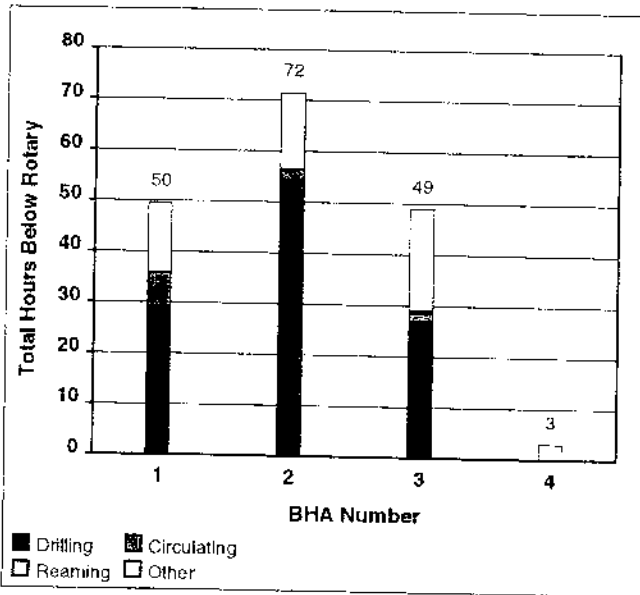
Bit #	Manufacturer	Style	OD (in)	Gge Len (in)	Nozzles (/32's)	TFA (in ²)	Dull Grades I O D L B G O R	Figs (m)	Drig hrs	ROP (m/hr)
1	Hughes	GT-1	9.875	3.000	1x22	0.371	1-2-WI-A-F-I-NO-TD	426	29.25	15
2	Hughes		6.750		2x11, 2x9	0.310	5-2-WT-SH-X-I-RO-BHA	1212	54.50	22
3	Smith	XR32TDGPS	6.750		3x12	0.331	5-5-WT-A-F-I-ER-ROP	169	27.00	6
?	Hughes		6.750		2x11, 2x9	0.310			0.00	

Table 3 - Bit Run Summary

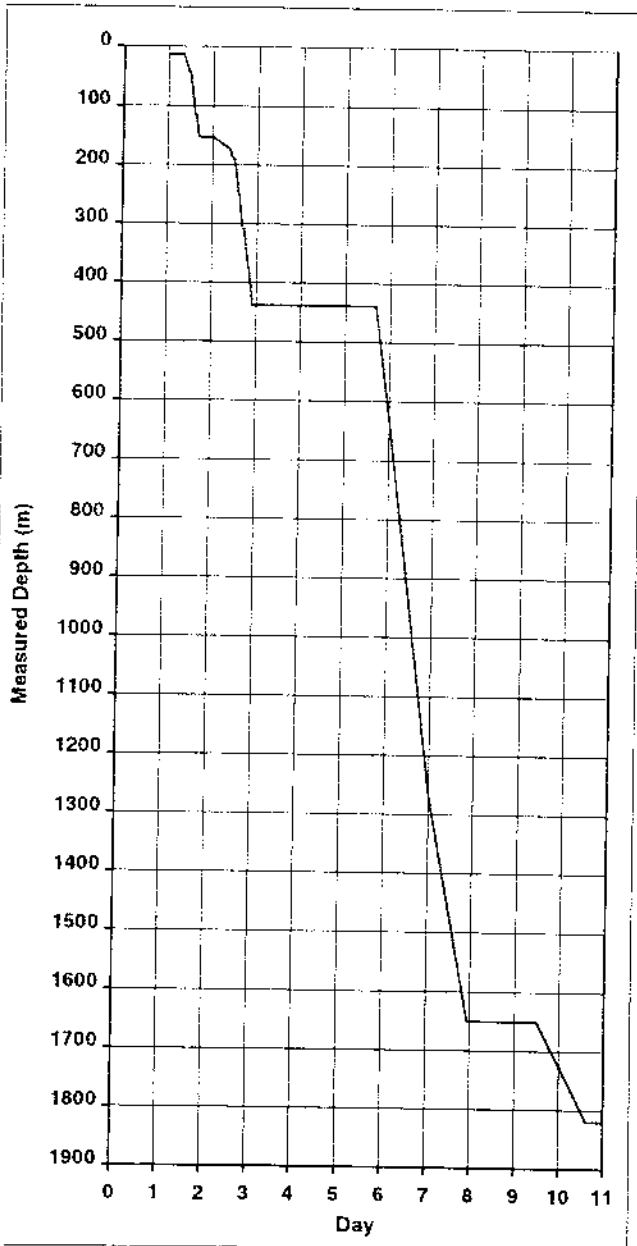
Hours by Operation Summary



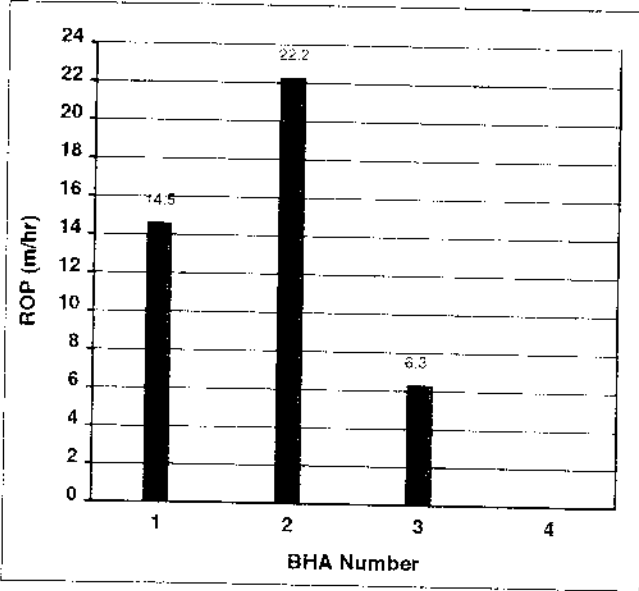
Hours per BHA Breakdown



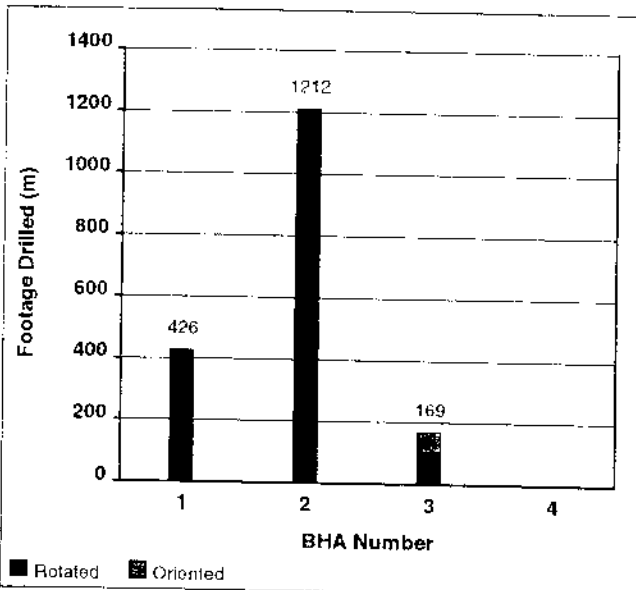
Days vs. Depth



Average Rate of Penetration per BHA



Footage per BHA



MD (m)	Formation Name MD/TVD	Inclination DLS	BIT Data	Drilling Parameters	Motor	BHA Stabilizers	Comments	BHA ID
10		0						
110		0	G-1 1x22/32's 0.24 in/min 29.25 hrs	WOB 11 kips RPM 112 FLO 526 gpm SPP 1876 psi		9.875 in @ 12.98 m		#1 @ 13
210		0						
310		0						
410		0						
510	Clifton 462 / 462	0						
610	Mapunga 547 / 547	0	2x 1 1/2 x 9 1/2's 0.37 in/min 54.65 hrs	WOB 15 kips RPM 120 FLO 300 gpm SPP 1900 psi		6.750 in @ 0.83 m 6.750 in @ 5.99 m 6.750 in @ 15.91 m	Directional Driller was released during the drilling of this section	#2 @ 438
710	Dilwyn 632 / 632	0						
810		0						
910	Pamber 860 / 860	0						
1010	Pebble pt 917 / 917	0						
1110	Paaratle 1094 / 1093	0						
1210		0						
1310		0						
1410		0						
1510		0						
1610		0						
1710	Skull Creek 1713 / 1712	0	XR321D6-PS 3x12.02's 0.10 in/min 27.50 hrs	WOB 18 kips RPM 91 FLO 242 gpm SPP 1935 psi	4-3/4" SperryChill 4/5 L 1.15 ABH	6.500 in @ 0.59 m 6.500 in @ 5.86 m 6.250 in @ 21.71 m		#2 @ 1850
1810		0						
1910	Belfast 1914 / 1900	0						



Santos Ltd.
Naylor South
Naylor South #1 : Survey Data

Sperry-Sun

Survey Report

8 May, 2002

**Surface Coordinates: 5733054.64 N, 657956.77 E (38° 32' 12.3832" S,
142° 48' 44.3590" E)**

**Grid Coordinate System: UTM Zone 54S on Australian Datum 1984,
Meters**

Kelly Bushing: 53.00m above Mean Sea Level

Survey Ref: svy4959

HALLIBURTON

Survey Report for Naylor South #1 : Survey Data

Measured Depth (m)	Incl.	Azim.	Vertical Depth (m)	Northings (m)	Eastings (m)	Vertical Section (m)	Dogleg Rate (°/30m)
0.00	0.000	0.000	0.00	0.00 N	0.00 E	0.00	
25.48	0.500	145.000	25.48	0.09 S	0.06 E	0.07	0.59
99.08	0.250	248.000	99.08	0.41 S	0.10 E	0.37	0.25
135.94	0.750	182.000	135.94	0.69 S	0.02 E	0.66	0.56
155.13	0.850	357.000	155.13	0.67 S	0.00 E	0.65	2.50
174.00	3.000	2.000	173.98	0.04 S	0.01 E	0.03	3.43
231.55	2.500	352.000	231.47	2.71 N	0.11 W	-2.59	0.36
286.85	1.350	12.000	286.74	4.54 N	0.14 W	-4.35	0.71
357.75	1.000	357.000	357.62	5.98 N	0.00 E	-5.78	0.20
425.17	1.250	2.000	425.03	7.30 N	0.00 E	-7.05	0.12
568.00	2.500	38.000	567.78	11.31 N	1.97 E	-11.44	0.35
712.00	2.130	53.000	711.67	15.40 N	6.04 E	-16.43	0.15
857.00	2.000	37.000	856.57	19.04 N	9.71 E	-20.90	0.12
1010.00	1.630	23.000	1009.50	23.18 N	12.17 E	-25.53	0.11
1163.00	2.000	0.000	1162.42	27.85 N	13.02 E	-30.26	0.16
1308.00	2.500	325.000	1307.32	32.97 N	11.21 E	-34.74	0.30
1453.00	2.370	311.000	1452.19	37.53 N	7.13 E	-38.10	0.13
1627.00	3.000	279.000	1626.01	40.60 N	0.08 W	-39.21	0.28
1638.11	3.320	265.670	1637.10	40.62 N	0.69 W	-39.07	2.16
1647.88	3.340	263.300	1646.85	40.57 N	1.25 W	-38.87	0.43
1655.12	3.200	251.730	1654.08	40.48 N	1.66 W	-38.69	2.79
1667.38	3.260	206.910	1666.32	40.06 N	2.14 W	-38.16	6.03
1677.06	4.810	181.810	1675.98	39.41 N	2.28 W	-37.49	7.17
1696.56	8.230	163.360	1695.35	37.25 N	1.90 W	-35.51	6.11
1725.76	14.350	156.170	1723.98	31.94 N	0.16 E	-30.90	6.44
1744.82	18.150	158.300	1742.27	27.02 N	2.21 E	-26.67	6.05
1764.21	21.620	162.650	1760.50	20.80 N	4.40 E	-21.23	5.83
1782.92	23.050	167.520	1777.81	13.93 N	6.21 E	-15.06	3.75
1792.18	22.680	167.370	1786.34	10.42 N	7.00 E	-11.87	1.21
1801.55	22.460	167.200	1795.00	6.91 N	7.79 E	-8.68	0.73

All data is in Metres unless otherwise stated. Directions and coordinates are relative to Grid North. Vertical depths are relative to RT. Northings and Eastings are relative to Well.

The Dogleg Severity is in Degrees per 30 metres. Vertical Section is from Well and calculated along an Azimuth of 194.927° (Grid).

Coordinate System is UTM Zone 54S on Australian Datum 1984, Meters. Grid Convergence at Surface is -1.129°. Magnetic Convergence at Surface is -11.963° (08-Jan-02)

Based upon Minimum Curvature type calculations, at a Measured Depth of 1801.55m., The Bottom Hole Displacement is 10.41m., in the Direction of 48.417° (Grid).

Formation tops are provisional and should be used as a guide.

Survey Report for Naylor South #1 : Survey Data

Formation Tops

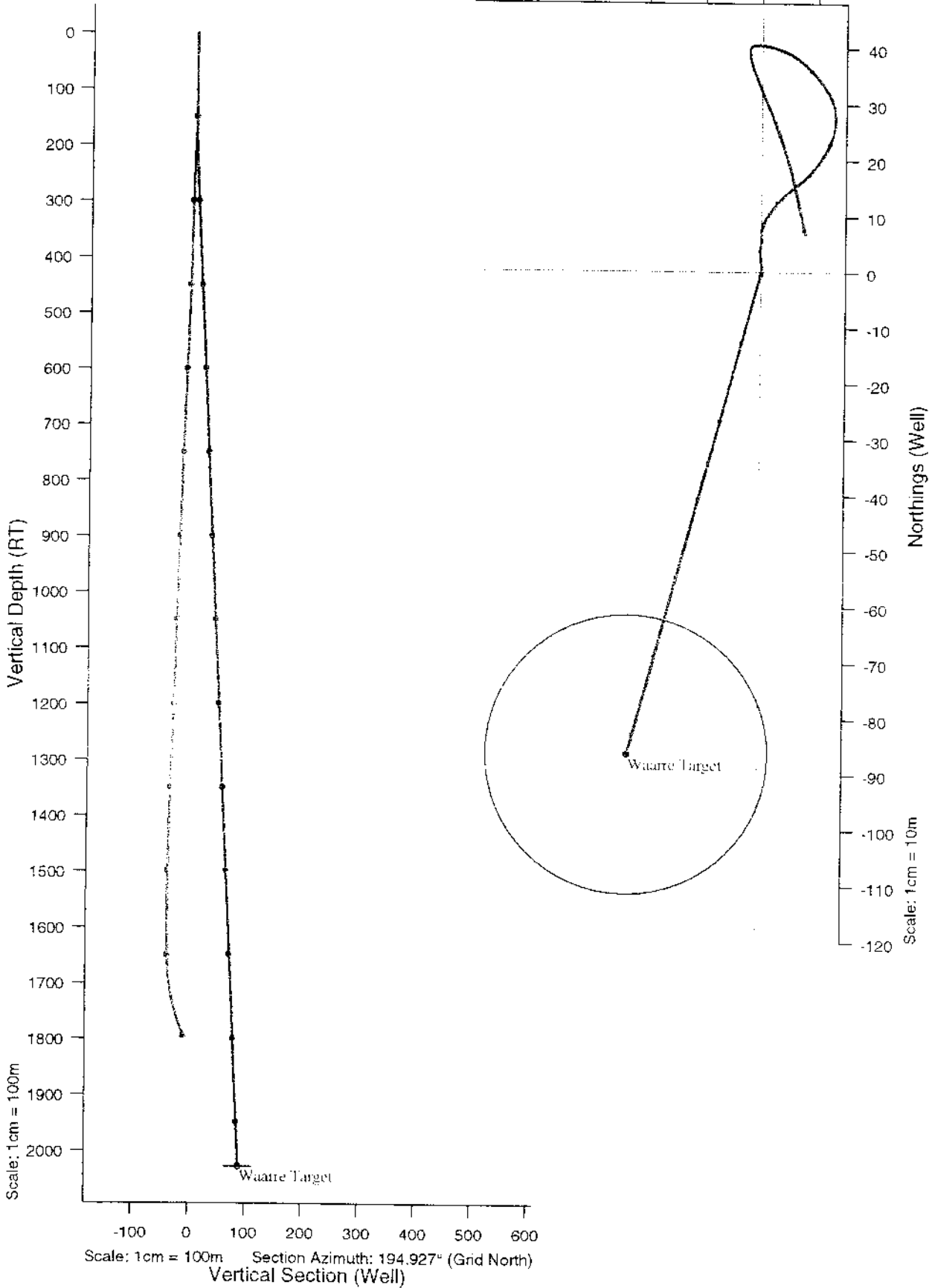
Measured Depth (m)	Vertical Depth (m)	Sub-Sea Depth (m)	Northings (m)	Eastings (m)	Dip Deg.	Dip Dir. Deg.	Formation Name
462.00	461.85	408.85	8.16 N	0.15 E	0.000	0.000	Clifton
547.00	546.80	493.80	10.61 N	1.44 E	0.000	0.000	Mepunga
632.00	631.73	578.73	13.34 N	3.73 E	0.000	0.000	Dilwyn
860.00	859.57	806.57	19.12 N	9.78 E	0.000	0.000	Pamber
917.00	916.54	863.54	20.69 N	10.86 E	0.000	0.000	Pebble Point
1094.00	1093.46	1040.46	25.58 N	12.85 E	0.000	0.000	Paaratte
1713.00	1711.54	1658.54	34.58 N	0.95 W	0.000	0.000	Skull Creek

Well : Naylor South #1

Eastings (Well)

Scale: 1cm = 10m

-50 -40 -30 -20 -10 0 10



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DRILLING SERVICES

Survey and Drilling Parameters

Customer : Santos Ltd.
Well : Naylor South #1
Rig : OD & E Rig 30

Location : Otway Basin
Lease : Pep 154
Job # : AU-DD-01075

North Ref : Grid Declination : ° VS Dir : 194.93° (from Wellhead)

WELLBORE SURVEY

Measured Depth (m)	Incl Angle (deg)	Azi Dir (deg)	Vertical Depth (m)	Vertical Section (m)	Coordinates N/S (m)	E/W (m)	DLS (°/30m)	Build Rate (°/30m)	Turn Rate (°/30m)	WOB (klbs)	RPM	Flow Rate (gpm)	Pipe Stand (psi)	Orientation From (m)	Orientation To (m)	Tool Face (deg)	ROP (m/hr)	BHA Comment	
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	10	100	500	1600				50	1	Teon
25.48	0.50	145.00	25.5	0.1	-0.1	0.1	0.59	0.59	0.00	12	100	500	1650				62	1	
99.08	0.25	248.00	99.1	0.4	-0.4	0.1	0.25	-0.10	0.00	12	100	500	1650				62	1	
135.94	0.75	182.00	135.9	0.7	-0.7	0.0	0.56	0.41	0.00	30	100	600	2200	153	155	165R	1	1	
155.13	0.85	357.00	155.1	0.6	-0.7	0.0	2.50	0.16	0.00	10	120	550	2000	155	157	165R	60	1	
174.00	3.00	2.00	174.0	0.0	0.0	0.0	3.43	3.42	0.00	10	120	550	2000	164	168	165R	60	1	
231.55	2.50	352.00	231.5	-2.6	2.7	-0.1	0.36	-0.26	-5.21	10	120	550	2000				60	1	
286.85	1.35	12.00	286.7	-4.4	4.5	-0.1	0.71	-0.62	-10.85	10	120	550	2000				60	1	
357.75	1.00	357.00	357.6	-5.8	6.0	0.0	0.20	-0.15	0.00	10	120	550	2000				60	1	
425.17	1.25	2.00	425.0	-7.1	7.3	0.0	0.12	0.11	0.00	10	120	550	2000				60	1	
568.00	2.50	38.00	567.8	-11.4	11.3	2.0	0.35	0.26	7.56	15	120	300	1900				40	2	
712.00	2.13	53.00	711.7	-16.4	15.4	6.0	0.15	-0.08	3.13	15	120	300	1900				40	2	
857.00	2.00	37.00	856.6	-20.9	19.0	9.7	0.12	-0.03	-3.31	15	120	300	1900				40	2	
1010.00	1.63	23.00	1009.5	-25.5	23.2	12.2	0.11	-0.07	-2.75	15	120	300	1900				40	2	
1163.00	2.00	0.00	1162.4	-30.3	27.8	13.0	0.16	0.07	-4.51	15	120	300	1900				40	2	
1308.00	2.50	325.00	1307.3	-34.7	33.0	11.2	0.30	0.10	-7.24	15	120	300	1900				40	2	
1453.00	2.37	311.00	1452.2	-38.1	37.5	7.1	0.13	-0.03	-2.90	15	120	300	1900				40	2	
1627.00	3.00	279.00	1626.0	-39.2	40.6	-0.1	0.28	0.11	-5.52	15	120	300	1900				40	2	
1638.11	3.32	265.67	1637.1	-39.1	40.6	-0.7	2.16	0.86	-35.99	15	120	300	1900				40	2	
1648.88	3.34	263.30	1647.9	-38.9	40.6	-1.3	0.39	0.06	-6.60	15	120	300	1900				40	2	
1655.12	3.20	251.73	1654.1	-38.7	40.5	-1.7	3.24	-0.67	-55.62	18	80	240	1850	1655	1655	165m	12	3	
1667.38	3.26	206.91	1666.3	-38.2	40.1	-2.1	6.03	0.15	-109.67	15	80	240	1900	1655	1665	165m	30	3	
1677.00	4.81	181.81	1675.9	-37.5	39.4	-2.3	7.22	4.83	-78.27	15	80	240	1900				30	3	
1696.56	8.23	163.36	1695.4	-35.5	37.3	-1.9	6.09	5.25	-28.30	18	80	240	1850	1684	1697	165m	12	3	
1725.76	14.35	156.17	1724.0	-30.9	31.9	0.2	6.44	6.29	-7.39	20	80	240	2100	1697	1704	165m	10	3	
1744.82	18.15	158.30	1742.3	-26.7	27.0	2.2	6.05	5.98	3.35	20	80	240	2100	1714	1726	20R	10	3	
														1726	1733	20R	10	3	
														1743	1745	25R	10	3	

SPERRY-SUN

DRILLING SERVICES

Survey and Drilling Parameters

Customer : Santos Ltd.

Well : Naylor South #1

Rig : OD & E Rig 30

Location : Otway Basin

Lease : Pep 154

Job # : AU-DD-01075

North Ref : Grid Declination : ° VS Dir : 194.93° (from Wellhead)

WELLBORE SURVEY

Measured Depth (m)	Incl Angle (deg)	Azi Dir (deg)	Vertical Depth (m)	Vertical Section (m)	N/S (m)	Coordinates E/W (m)	DLS (°/30m)	Build Rate (°/30m)	Turn Rate (°/30m)
1764.00	21.62	162.65	1760.3	-21.3	20.9	4.4	5.90	5.43	6.80
1782.92	23.05	167.50	1777.8	-15.1	13.9	6.2	3.70	2.27	7.69
1792.18	22.68	167.37	1786.3	-11.9	10.4	7.0	1.21	-1.20	-0.42
1801.55	22.46	167.20	1795.0	-8.7	6.9	7.8	0.73	-0.70	-0.54

DRILLING PARAMETERS

WOB (klbs)	RPM	Flow Rate (gpm)	Stand Pipe (psi)	Orientation From (m)	Orientation To (m)	Tool Face (deg)	ROP (m/hr)	BHA No.	Comment
20	240	2100	1745	1752	25R	10	3		
20	100	240	1900	1762	1764	80R	3		
20	100	240	1900	1764	1771	80R	10	3	
20	100	240	1900				10	3	
20	100	240	1900				10	3	

sperry-sun DRILLING SERVICES

BHA Report

Customer : Santos Ltd.
Well : Naylor South #1
Location : Otway Basin
Lease : Pep 154
Rig : OD & E Rig 30
Job # : AU-DD-01075

BHA# 1

BHA# 1 : Date In 15/12/200 MD In (m) : 13 TVD In (m) : 12 Date Out 17/12/200 MD Out (m): 438 TVD Out(m): 438

BIT DATA

Bit #	OD (in)	MFR	Style	Serial#	Nozzles (/32's)	TFA (in ²)	Dull Condition
1	9.875	Hughes	GT-1	A33JD	1x22	0.371	1-2-WT-A -E-I-NO-TD

MOTOR DATA

Run #	OD (in)	MFR	Model	Serial#	Bend	Nzl (/32's)	Avg Dif (psi)	Cum Circ Hrs

COMPONENT DATA

Item #	Description	Serial #	OD (in)	ID (in)	Gauge (in)	Weight (lbs/ft)	Top Con	Length (m)	Bit - Center Blade (m)
1	PDC Hughes GT-1	A33JD	9.875	4.000	9.875	218.19	P 6-5/8" Reg	0.26	
2	Bit Sub		8.000	2.813		150.12	B 6-5/8" Reg	0.95	
3	Cross Over Sub		6.500	2.813		91.91	B 4" IF	0.84	
4	Cross Over Sub		6.500	2.813		91.91	B 4-1/2" IF	0.48	
5	Non-Mag 1x Drill collar	91129	6.500	2.813		92.00	B 4-1/2" IF	9.23	
6	Cross Over Sub		6.500	2.813		91.91	B 4" IF	0.47	
7	Carbide Insert Stabiliser	GU163	6.500	2.813	9.875	91.91	B 4" IF	1.80	12.98
8	10x Drill collar		6.500	2.813		92.00	B 4" IF	91.88	
9	Cross Over Sub		4.750	2.250		46.84	B 3-1/2" IF	0.65	
10	4x HWDP		3.500	2.063		25.30	B 3-1/2" IF	36.21	
								142.77	

Parameter	Min	Max	Ave	Activity	Hrs	BHA Weight (lb)	Drill String	OD(in)	Len(m)
WOB (klbs) :	10	30	11	Drilling :	29.25	in Air (Total) : 35361	DP(S)-NC38(IF)-13.30#	3.500	295
RPM (rpm) :	60	120	112	Reaming :	0.00	in Mud (Total) :			
Flow (gpm) :	45	600	526	Circ-Other :	6.50	in Air (Bel Jars) : 0			
SPP (psi) :	1600	2200	1876	Total :	35.75	in Mud (Bel Jars) :			

PERFORMANCE

	In	Out	Distance(m)	ROP (m/hr)	Build (°/30m)	Turn (°/30m)	DLS (°/30m)
Inclination (deg) :	0.25	1.33	Oriented :	8.00	0		
Azimuth (deg) :	145.00	7.71	Rotated :	417.50	15		
			Total :	425.50	15	0.08	0.00
							0.11

COMMENTS

OBJECTIVES:

Begin jetting at approximately 150m, building to 3 degrees at around 165° azimuth as required to achieve the target at 2050mTVD. MSS will be run on slick line to monitor progress. A UBHO sub was not used at company's request; instead a line was scribed from the jetting nozzle and carried 150m up the BHA and drill pipe.

RESULTS:

At about 150m the scribe line was oriented to approximately 165° azimuth and jetting commenced. 3m per single was jetted for 3 singles by which time 3 degrees had been built but in almost the opposite direction to which was required. It is not known why this happened, perhaps despite great care taken the scribe line became misaligned over 150m of scribing, or maybe the formation trended in this direction. At this point it was decided to rotate ahead to section TD and try to drop off as much angle as possible.

RECOMMENDATIONS:

If jetting use a UBHO sub, to ensure that you travel in the desired direction.

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DRILLING SERVICES

BHA Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

BHA# 2

BHA# 2 : Date In 19/12/200 MD In (m) : 438 TVD In (m) : 438 Date Out 22/12/200 MD Out (m) : 1650 TVD Out (m) : 1649

BIT DATA

Bit #	OD (in)	MFR	Style	Serial#	Nozzles (/32's)	TFA (in ²)	Dull Condition
2	6.750	Hughes		1904177	2x11, 2x9	0.310	5-2-WT-SH-X-I-RO-BHA

MOTOR DATA

Run #	OD (in)	MFR	Model	Serial#	Bend	Nzl (/32's)	Avg Dif (psi)	Cum Circ Hrs

COMPONENT DATA

Item #	Description	Serial #	OD (in)	ID (in)	Gauge (in)	Weight (lbs/ft)	Top Con	Length (m)	Bit - Center Blade (m)
1	PDC	1904177	6.750	3.500	6.750	89.17	P 3-1/2" Reg	0.28	
2	Integral Blade Stabiliser		4.750	2.250	6.750	46.84	B 3-1/2" IF	1.10	0.83
3	Pony collar		4.750	2.250		47.00	B 3-1/2" IF	3.90	
4	Integral Blade Stabiliser		4.750	2.250	6.750	46.84	B 3-1/2" IF	1.41	5.99
5	1x Non-Mag Drill collar	1616	4.750	2.250		47.00	B 3-1/2" IF	8.34	
6	Integral Blade Stabiliser		4.750	2.250	6.750	46.84	B 3-1/2" IF	1.75	15.91
7	16x Spiral Drill collar		4.750	2.250		47.00	B 3-1/2" IF	140.80	
8	Drilling Jar	23921	4.750	2.250		46.84	B 3-1/2" IF	9.19	
9	3x Drill collar		4.750	2.250		47.00	B 3-1/2" IF	28.24	
10	4x HWDP		3.500	2.063		25.30	B 3-1/2" IF	36.21	
								231.22	

Parameter	Min	Max	Ave
WOB (klbs) :	15	15	15
RPM (rpm) :	120	120	120
Flow (gpm) :	300	300	300
SPP (psi) :	1900	1900	1900

Activity	Hrs
Drilling :	54.50
Reaming :	0.00
Circ-Other :	2.00
Total :	56.50

BHA Weight	(lb)
in Air (Total) :	33108
in Mud (Total) :	
in Air (Bel Jars) :	24335
in Mud (Bel Jars) :	

Drill String	OD(in)	Len(m)
DP(S)-NC38(IF)-13.30#	3.500	1419

PERFORMANCE

	In	Out
Inclination (deg)	1.33	3.31
Azimuth (deg)	7.71	261.30

	Distance(m)	ROP (m/hr)	Build (°/30m)	Turn (°/30m)	DLS (°/30m)
Oriented :	0.00	0			
Rotated :	1212.00	22			
Total :	1212.00	22	0.05	-2.63	0.10

COMMENTS

Directional Driller was released during the drilling of this section

OBJECTIVES:

To rotate ahead to a point where a correction run to achieve the target requires building to less than 30 degrees, and requires less than 8°/30m doglegs.

RESULTS:

Rotated ahead to 1650m at which point the well was at 3 degrees at 265° azimuth.

Sperry-Sun DRILLING SERVICES

BHA Report

Customer : Santos Ltd.
Well : Naylor South #1
Location : Otway Basin
Lease : Pep 154
Rig : OD & E Rig 30
Job # : AU-DD-01075

BHA# 3

BHA# 3 : Date In 22/12/200 MD In (m) : 1650 TVD In (m) : 1649 Date Out 24/12/200 MD Out (m) : 1819 TVD Out (m) : 1811

BIT DATA

Bit #	OD (in)	MFR	Style	Serial#	Nozzles (/32's)	TFA (in ²)	Dull Condition
3	6.750	Smith	XR32TDGPS	MH4631	3x12	0.331	5-5-WT-A-E-I-ER-ROP

MOTOR DATA

Run #	OD (in)	MFR	Model	Serial#	Bend	Nzl (/32's)	Avg Dif (psi)	Cum Circ Hrs
1	4.750	SSDS	SperryDrill	475355	1.15°		128	29.00

COMPONENT DATA

Item #	Description	Serial #	OD (in)	ID (in)	Gauge (in)	Weight (lbs/ft)	Top Con	Length (m)	Bit - Center Blade (m)
1	Tricone Smith XR32TD	MH4631	6.750	3.000	6.750	97.86	P 3-1/2" Reg	0.19	
2	4-3/4" SperryDrill Lobe 4/5 - 6.3 stg	475355	4.750	2.794	6.500	39.50	B 3-1/2" IF	8.13	0.59
3	Float Sub	A397	4.625	2.125		45.17	B 3-1/2" IF	0.76	
4	Integral Blade Stabilizer	0207000168	4.750	2.250	6.500	46.84	B 3-1/2" IF	1.75	9.96
5	Non-Mag Px P Cross Over Sub	3081	4.500	2.250		40.65	P 3-1/2" IF	0.64	
6	DWD SlimHole - HOC	00045	4.750	2.810		39.26	B 3-1/2" IF	9.54	
7	Integral Blade Stabilizer	5040	4.625	2.125	6.250	45.17	B 3-1/2" IF	1.41	21.71
8	16x Spiral Drill collar		4.750	2.250		47.00	B 3-1/2" IF	150.11	
9	Drilling Jar	23921	4.750	2.250		46.84	B 3-1/2" IF	9.19	
10	3x Drill collar		4.750	2.250		47.00	B 3-1/2" IF	28.24	
11	4x HWDP		3.500	2.063		25.30	B 3-1/2" IF	36.21	
								246.17	

Parameter	Min	Max	Ave	Activity	Hrs	BHA Weight (lb)	Drill String	OD(in)	Len(m)
WOB (klbs) :	15	20	18	Drilling :	27.00	in Air (Total) :	DP(S)-NC38(IF)-13.30#	3.500	1573
RPM (rpm) :	80	120	91	Reaming :	0.50	in Mud (Total) :			
Flow (gpm) :	240	300	242	Circ-Other :	1.50	in Air (Bel Jars) :			
SPP (psi) :	1850	2100	1935	Total :	29.00	in Mud (Bel Jars) :			

PERFORMANCE

	In	Out	Distance(m)	ROP (m/hr)	Build (°/30m)	Turn (°/30m)	DLS (°/30m)
Inclination (deg)	3.31	22.05	Oriented :	67.00	4		
Azimuth (deg)	261.30	166.87	Rotated :	102.00	8		
			Total :	169.00	6	3.33	-16.76
							4.00

COMMENTS

OBJECTIVES:

A correction run to achieve the target. Need to build to 22 degrees at 6°/30m then hold to TD.

RESULTS:

The required angle and direction was achieved by sliding two singles and rotating one. Sliding was generally reasonable, becoming a little tedious towards the end. After rotating ahead 40m the ROP became very slow, and the assembly was pulled for a bit.

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DRILLING SERVICES

BHA Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

BHA# 4

BHA# 4 : Date In 24/12/200 MD In (m) : 1819 TVD In (m) : 1811 Date Cur 13/12/200 MD Cur (m): TVD Cur (m): 0

BIT DATA							
Bit #	OD (in)	MFR	Style	Serial#	Nozzles (/32's)	TFA (in ²)	Dull Condition
6.750		Hughes		1904177	2x11, 2x9	0.310	

MOTOR DATA								
Run #	OD (in)	MFR	Model	Serial#	Bend	Nzi (/32's)	Avg Dif (psi)	Cum Circ Hrs

COMPONENT DATA									
Item #	Description	Serial #	OD (in)	ID (in)	Gauge (in)	Weight (lbs/ft)	Top Con	Length (m)	Bit - Center Blade (m)
1	PDC	1904177	6.750	3.500	6.750	89.17	P 3-1/2" Reg	0.28	
2	Integral Blade Stabiliser		4.750	2.250	6.563	46.84	B 3-1/2" IF	1.10	0.83
3	Float Sub	A536	4.750	2.250		46.84	B 3-1/2" IF	1.10	
4	Float Sub	A397	4.750	2.250		46.84	B 3-1/2" IF	0.76	
5	Integral Blade Stabiliser		4.750	2.250	6.625	46.84	B 3-1/2" IF	1.41	3.95
6	1x Non-Mag Drill collar	1616	4.750	2.250		47.00	B 3-1/2" IF	8.34	
7	Integral Blade Stabiliser		4.750	2.250	6.625	46.84	B 3-1/2" IF	1.75	13.87
8	16x Spiral Drill collar		4.750	2.250		47.00	B 3-1/2" IF	140.80	
9	Drilling Jar	23921	4.750	2.250		46.84	B 3-1/2" IF	9.19	
10	3x Drill collar		4.750	2.250		47.00	B 3-1/2" IF	28.24	
11	4x HWDP		3.500	2.063		25.30	B 3-1/2" IF	36.21	
								229.18	

Parameter	Min	Max	Ave
WOB (klbs) :			
RPM (rpm) :			
Flow (gpm) :			
SPP (psi) :			

Activity	Hrs
Drilling :	0.00
Reaming :	0.00
Circ-Other :	0.00
Total :	0.00

BHA Weight (lb)
in Air (Total) : 32792
in Mud (Total) :
in Air (Bel Jars) : 24020
in Mud (Bel Jars) :

Drill String	OD(in)	Len(m)
DP(S)-NC38(IF)-13.30#	3.500	

PERFORMANCE		
	In	Out
Inclination (deg)	22.05	0.00
Azimuth (deg)	166.87	0.00

Distance(m)	ROP (m/hr)	Build (°/30m)	Turn (°/30m)	DLS (°/30m)
Oriented :				
Rotated :				
Total :				

COMMENTS

OBJECTIVES:

As the well was lined up to the target and there was little chance of missing the target over a relatively short distance, it was decided to use a slightly dropping rotary assembly to TD.

RESULTS:

Rotated to TD intersecting the target 19m from centre.

Motor Serial # : 475355	Job # : AU-DD-01075
Directional Driller(s) : A. Pritchett	Customer : Santos Ltd.
Location : Pep 154	Rig : OD & E Rig 30
Well : Naylor South #1	Bit Run # : 3 BHA # : 3
Depth In/Out : 1650 / 1819 m	Date In/Out : 22/12/2001 / 24/12/2001
Application Details : Correction Run	Motor Run # : 1
	Hole Size : 6.750 in

MOTOR CONFIGURATION

	From Bit (m)	Component	Type	Diam In/Out (in)
1	0.59	Sleeve Stab/Pad	Yes	Stab: 5.0"
2	1.51	Bent Housing	Yes	Adjustable: 1.15° bend
3		Housing Tool Used	No	
4	6.32	Stator Elastomer	HSN	Stator Oversized
5		Bent Sub / 2nd Bent Hsg	No	
6	9.96	Lower String Stab	Yes	Stab: 3.1 180°
7	21.71	Upper String Stab	Yes	Stab: 3.1 180°

Additional Features :				Arr	Ret
Flex Collar	No	Short Brg Pack	Yes	Rtr Noz / Size	1.22's
Brg Cfg (Off/On)		Lobe Cfg	4/5	BHA OD/ID	4.625 / 2.125 in
				Pick Up Sub	Yes Yes
				Bit Box Protr	Yes Yes

MOTOR RUN DATA

Max Dogleg While Rotating	330m	RPM		Motor Stalled	No	Prev Job/Well Hrs	0.00
Max Dogleg Overpulled In	330m	Force	sf	Float Valve	No	Drilling Hrs	27.00
Max Dogleg Pushed Through	330m	Force	sf	DP Filter	No	Circ Hrs	1.50
Hole Azimuth Start / End	261.30° / 166.87°	Inc Start / End	3.31" / 22.05"	Reaming Hrs	0.50	Total Hrs This Run	29.00
Interval Oriented / Rot.	67 / 102 m	Directional Perf Ori / Rot	/ / 130m	New Cumulative Hrs	29.00		
Jarring Occured	No						

	Diff Press (psi)	Str RPM	Rotn Torque (ft-lbs)	Drag Up/Dn (lb)	WOB (kips)	ROP Oriented (m/hr)	ROP Rotated (m/hr)
Avg :	128	91			18	4	8
Max :	200	120			20	12	40

PRE-RUN TESTS

Motor Tested Pre-Run	No	with	
Dump Sub Operating	N/A	Brg Play	mm
Flow 1	gpm	Pressure 1	psi
Flow 2	gpm	Pressure 2	psi
Driveshaft Rotation Observed	No		
Bearing Leakage Observed	No		

POST-RUN TESTS

Motor Tested Post-Run	No	with	
Dump Sub Operating	N/A	Brg Play	mm
Flow 1	gpm	Pressure 1	psi
Flow 2	gpm	Pressure 2	psi
Driveshaft Rotation Observed	No		
Bearing Leakage Observed	No		
Driveshaft Rotated to Drain Mud	No		
Fluid Flushed	No	Fluid Used	

MUD DATA

Base	Additives :	Mud Wt	ppg	SPP Start/End	1850 / 1900	psi
% Oil/Water	% Solids	% Sand	PV	cp	YP	100000
DH Temp Avg/Max		FlowRate Avg/Max	242 / 300	gpm	Chloride Content	gpm
Principle Formation Name(s)	Paaratta, Skull Creek		Lithology			

BIT DATA

Make	Smith	Type	XR32TDGPS	Serial #	MH4631	Dull Grade	1	2	3	4	5	6	7	8
Pre Existing Hours From Other Wells:						In								
Prev Drilling Hrs	0.00	Prev Reaming Hrs	0.00	No of Runs This Bit		Out	5	5	WT	A	E	I	ER	ROP
Jet Sizes	3x12	TFA	0.331	Gage Length										

PERFORMANCE COMMENTS

Problem Perceived	No	Problem Date		Service Interrupt	No	Service Interrupt Hrs	
Performance Motor	Yes	Tandem Motor	No	LIH	No	PPR Ref #	

Customer Representative's Signature (optional) :

Date:

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 1 14/12/2001

Total Depth (m) :	13	Casing Depth (m) :	0.00	Operator Reps :	Duncan New
Drilled last 24 hrs (m) :	0	Casing Diameter (in) :	0.000	SSDS Reps :	A .Pritchett (1)
Hole Size (in) :		Casing ID (in) :			

LAST SURVEY

LAST FORMATION TOP

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
0.00	0.00	0.00	0.00	0.00	N00.00E

Formation Name	MD Top (m)	TVD Top (m)

BHA SUMMARY

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lb/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	00:00	24.00	12.50		Rig Up

COMMENTS

A.Pritchett arrives on site

sperry-sun DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
Well : Naylor South #1
Location : Otway Basin
Lease : Pep 154
Rig : OD & E Rig 30
Job # : AU-DD-01075

CURRENT STATUS Report # 2 15/12/2001

Total Depth (m) :	154	Casing Depth (m) :	0.00	Operator Reps :	Duncan New
Drilled last 24 hrs (m) :	141	Casing Diameter (in) :	0.000	SSDS Reps :	A .Pritchett (2)
Hole Size (in) :	9.875	Casing ID (in) :			

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
135.94	0.75	182.00	135.94	0.69	S01.35E

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)

BHA SUMMARY

BHA 1: 142.77 m; Bit #1 (9.75 hrs), Sub, Sub, Sub, DC, Sub, Stab, 10x DC, Sub, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lb/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	06:30	6.50	12.50		Rig Up
06:30	07:30	1.00	12.50		Make up 9-7/8" BHA
07:30	07:45	0.25	12.50	1	Trip In
07:45	11:00	3.25	43.30	1	Continue to make up BHA while drilling
11:00	11:30	0.50	43.30	1	Circulate and MSS Deviation Survey
11:30	14:30	3.00	116.00	1	Drill 9-7/8" hole from 43.3m to 116m
14:30	15:00	0.50	116.00	1	Circulate and MSS Deviation Survey
15:00	16:30	1.50	153.00	1	Drill 9-7/8" hole from 116m to 153m
16:30	17:00	0.50	153.00	1	Circulate and MSS Deviation Survey
17:00	18:00	1.00	153.60	1	Drilling / Jetting 9-7/8" hole from 153 to 153.6m
18:00	23:00	5.00	153.60	1	Circulate / jet with one pump (300 gpm) while repairing other pump
23:00	00:00	1.00	154.00	1	Drilling / Jetting 9-7/8" hole to 154m

COMMENTS

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 3 16/12/2001

Total Depth (m) : 438	Casing Depth (m) : 0.00	Operator Reps : Duncan New
Drilled last 24 hrs (m) : 284	Casing Diameter (in) : 0.000	SSDS Reps : A Pritchett (3)
Hole Size (in) : 9.875	Casing ID (in) :	

LAST SURVEY

LAST FORMATION TOP

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction	Formation Name	MD Top (m)	TVD Top (m)
425.17	1.25	2.00	425.03	7.30	N00.03W			

BHA SUMMARY

BHA 1: 142.77 m; Bit #1 (29.25 hrs), Sub, Sub, Sub, DC, Sub, Stab, 10x DC, Sub, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	09:00	9.00	173.00	1	Drilling / Jetting 9-7/8" hole from 154m to 173m
09:00	11:00	2.00	191.00	1	Drill 9-7/8" hole from 173m to 191m
11:00	11:30	0.50	191.00	1	Deviation Survey
11:30	14:00	2.50	250.00	1	Drill 9-7/8" hole from 191m to 250m
14:00	14:30	0.50	250.00	1	Deviation Survey
14:30	16:00	1.50	308.00	1	Drill 9-7/8" hole from 250m to 308m
16:00	16:30	0.50	308.00	1	Service Rig
16:30	17:00	0.50	308.00	1	Deviation Survey
17:00	19:30	2.50	376.00	1	Drill 9-7/8" hole from 308m to 376m
19:30	20:00	0.50	376.00	1	Deviation Survey
20:00	22:00	2.00	438.00	1	Drill 9-7/8" hole from 376m to 438m - Section TD
22:00	23:30	1.50	438.00	1	Circulate hole clean
23:30	00:00	0.50	438.00	1	Deviation Survey

COMMENTS

sperry-sun DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
Well : Naylor South #1
Location : Otway Basin
Lease : Pep 154
Rig : OD & E Rig 30
Job # : AU-DD-01075

CURRENT STATUS Report # 4 17/12/2001

Total Depth (m) :	438	Casing Depth (m) :	0.00	Operator Reps :	Duncan New
Drilled last 24 hrs (m) :	0	Casing Diameter (in) :	0.000	SSDS Reps :	A. Pritchett (4)
Hole Size (in) :	9.875	Casing ID (in) :			

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
425.17	1.25	2.00	425.03	7.30	N00.03W

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)

BHA SUMMARY

BHA 1: 142.77 m; Bit #1 (29.25 hrs), Sub, Sub, Sub, DC, Sub, Stab, 10x DC, Sub, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	07:00	7.00	438.00	1	Wiper trip to surface and back to TD
07:00	09:00	2.00	438.00	1	Trip Out (at Surface)
09:00	10:00	1.00	438.00	1	PU/LD BHA
10:00	00:00	14.00	438.00		Run Casing / Cement

COMMENTS

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 5 18/12/2001

Total Depth (m) :	438	Casing Depth (m) :	0.00	Operator Reps :	Duncan New
Drilled last 24 hrs (m) :	0	Casing Diameter (in) :	0.000	SSDS Reps :	A .Pritchett (5)
Hole Size (in) :		Casing ID (in) :			

LAST SURVEY

LAST FORMATION TOP

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
425.17	1.25	2.00	425.03	7.30	N00.03W

Formation Name	MD Top (m)	TVD Top (m)

BHA SUMMARY

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	00:00	24.00	438.00		Nipple Up BOP

COMMENTS

A.Pritchett released from rig

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DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 6 19/12/2001

Total Depth (m) : 628	Casing Depth (m) : 0.00	Operator Reps : Duncan New
Drilled last 24 hrs (m) : 190	Casing Diameter (in) : 0.000	SSDS Reps :
Hole Size (in) : 6.750	Casing ID (in) :	

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
568.00	2.50	38.00	567.78	11.48	N09.87E

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)
Mapunga	547.00	546.80

BHA SUMMARY

BHA 2: 231.22 m: Bit #2 (8. hrs), Stab. Pony. Stab. 1x DC. Stab. 16x DC, Jar, 3x DC. 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	14:00	14.00	438.00		Test BOP
14:00	15:00	1.00	438.00		Pick up 6-3/4" Rotary BHA
15:00	16:00	1.00	438.00	2	Trip In
16:00	00:00	8.00	628.00	2	Drill / Survey 6-3/4" hole from 348m to 628m

COMMENTS

sperry-sun DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
Well : Naylor South #1
Location : Otway Basin
Lease : Pep 154
Rig : OD & E Rig 30
Job # : AU-DD-01075

CURRENT STATUS Report # 7 20/12/2001

Total Depth (m) :	1267	Casing Depth (m) :	0.00	Operator Reqs :	Duncan New
Drilled last 24 hrs (m) :	639	Casing Diameter (in) :	0.000	SSDS Reqs :	
Hole Size (in) :	6.750	Casing ID (in) :			

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
1163.00	2.00	0.00	1162.42	30.74	N25.06E

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)
Paaratte	1094.00	1093.46

BHA SUMMARY

BHA 2: 231.22 m; Bit #2 (32. hrs), Stab, Pony, Stab, 1x DC, Stab, 16x DC, Jar, 3x DC, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	00:00	24.00	1267.00	2	Drill / Survey 6-3/4" hole from 628m to 1267m

COMMENTS

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 8 21/12/2001

Total Depth (m) : 1650	Casing Depth (m) : 0.00	Operator Reps : Duncan New
Drilled last 24 hrs (m) : 383	Casing Diameter (in) : 0.000	SSDS Reps : A .Pritchett (6)
Hole Size (in) : 6.750	Casing ID (in) :	

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
1648.88	3.34	263.30	1647.85	40.58	N01.85W

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)
Paaratte	1094.00	1093.46

BHA SUMMARY

BHA 2. 231.22 m; Bit #2 (54.5 hrs), Stab, Pony, Stab, 1x DC, Stab, 16x DC, Jar, 3x DC, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	22:30	22.50	1650.00	2	Drill / Survey 6-3/4" hole from 1267m to 1650m
22:30	23:00	0.50	1650.00	2	Circulate hole clean
23:00	23:30	0.50	1650.00	2	Deviation Survey
23:30	00:00	0.50	1650.00	2	Circulate - pump Hi - Vis pill

COMMENTS

A.Pritchett and C. Landon arrive at rig

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 9 22/12/2001

Total Depth (m) : 1650	Casing Depth (m) : 0.00	Operator Reps : Duncan New
Drilled last 24 hrs (m) : 0	Casing Diameter (in) : 0.000	SSDS Reps : A .Pritchett (7)
Hole Size (in) : 6.750	Casing ID (in) :	

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
1648.88	3.34	263.30	1647.85	40.58	N01.85W

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)
Paaratte	1094.00	1093.46

BHA SUMMARY

BHA 2: 231.22 m; Bit #2 (54.5 hrs), Stab, Pony, Stab, 1x DC, Stab, 16x DC, Jar, 3x DC, 4x HWDP
 BHA 3: 246.17 m; Bit #3 (0.5 hrs), PDM #1 (0.5 hrs), Sub, Stab, Sub, MWD, Stab, 16x DC, Jar, 3x DC, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	05:30	5.50	1650.00	2	Wiper trip to shoe - Hole tight all the way out.
05:30	09:30	4.00	1650.00	2	Run back to bottom - hole ok
09:30	10:30	1.00	1650.00	2	Circulate hole clean
10:30	14:30	4.00	1650.00	2	Trip Out (at Surface) for a correction run
14:30	16:00	1.50	1650.00	2	Lay out 6-3/4" rotary BHA
16:00	18:00	2.00	1650.00	2	Make up 6-3/4" steerable assembly - Test motor and MWD
18:00	21:30	3.50	1650.00	3	Trip In to 1633m
21:30	22:00	0.50	1650.00	3	Pick up kelly to wash to bottom - No go , pressure trapped in string
22:00	00:00	2.00	1650.00	3	POOH to find blockage

COMMENTS

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 10 23/12/2001

Total Depth (m) :	1725	Casing Depth (m) :	0.00	Operator Reqs :	Duncan New
Drilled last 24 hrs (m) :	75	Casing Diameter (in) :	0.000	SSDS Reqs :	A. Pritchett (8)
Hoie Size (in) :	6.750	Casing ID (in) :			

LAST SURVEY

LAST FORMATION TOP

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
1696.56	8.23	163.36	1695.35	37.31	N02.92W

Formation Name	MD Top (m)	TVD Top (m)
Skull Creek	1713.00	1711.54

BHA SUMMARY

BHA 3: 246.17 m; Bit #3 (12.5 hrs), PDM #1 (13. hrs), Sub, Stab, Sub, MWD, Stab, 16x DC, Jar, 3x DC, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	04:00	4.00	1650.00	3	POOH to BHA fing 6 feet of pipe scale above MWD
04:00	06:00	2.00	1650.00	3	Rack back motor & MWD - RJH drill collars and circulate out scale. - POOH
06:00	07:00	1.00	1650.00	3	Pick up and test motor and MWD
07:00	11:30	4.50	1650.00	3	Trip in drifting drill pipe
11:30	12:00	0.50	1650.00	3	Pick up kelly and wash to bottom.
12:00	00:00	12.00	1725.00	3	Drilling - Slide/Rotate 6-3/4" hole to 1725m

COMMENTS

sperry-sun

DRILLING SERVICES

Daily Drilling Report

Customer : Santos Ltd.
 Well : Naylor South #1
 Location : Otway Basin
 Lease : Pep 154
 Rig : OD & E Rig 30
 Job # : AU-DD-01075

CURRENT STATUS Report # 11 24/12/2001

Total Depth (m) : 1819	Casing Depth (m) : 0.00	Operator Reps : Duncan New
Drilled last 24 hrs (m) : 94	Casing Diameter (in) : 0.000	SSDS Reps : A .Pritchett (9)
Hole Size (in) : 6.750	Casing ID (in) :	

LAST SURVEY

Depth (m)	Inclination	Azimuth	TVD (m)	Displ (m)	Direction
1801.55	22.46	167.20	1794.99	10.41	N48.43E

LAST FORMATION TOP

Formation Name	MD Top (m)	TVD Top (m)
Skull Creek	1713.00	1711.54

BHA SUMMARY

BHA 3: 246.17 m; Bit #3 (27.5 hrs), PDM #1 (29. hrs), Sub, Stab, Sub, MWD, Stab, 16x DC, Jar, 3x DC, 4x HWDP
 BHA 4: 229.18 m; Bit # (54.5 hrs), Stab, Sub, Sub, Stab, 1x DC, Stab, 16x DC, Jar, 3x DC, 4x HWDP

MUD DATA

Type	Weight (ppg)	FV (sec)	PV (cp)	YP (lbf/100ft ²)	Gels	Fluid Loss	pH	Solids (%)	Sand (%)	Oil (%)

TIME BREAKDOWN

From	To	Hours	TMD (m)	BHA #	Activity
00:00	15:00	15.00	1819.00	3	Drilling - Slide/Rotate 6-3/4" hole to 1819m
15:00	16:00	1.00	1819.00	3	Circulate hole clean
16:00	19:00	3.00	1819.00	3	Trip Out (at Surface) for Bit and pick up rotary assembly
19:00	21:00	2.00	1819.00	3	Lay out Motor and MWD - pick up rotary assembly
21:00	00:00	3.00	1819.00	4	Trip In

COMMENTS

Directional driller released from rigsite.

APPENDIX V: LOG ANALYSIS

NAYLOR SOUTH 1 - LOG ANALYSIS

Naylor South 1 wireline logs were analysed over the Waarre Sandstone (2097-2193m) interval. No gas pay was identified. Naylor South 1 was plugged and abandoned.

A 250.825mm surface hole was drilled to 438 metres and 193.675mm casing set at 434 metres. A 171.45mm hole was then drilled with KCl/PHPA mud to 2243 metres (D). Wireline logging was carried out by Reeves (as described below).

Unless otherwise specified, all depths mentioned below are loggers depths referenced to the drill floor.

Logs Acquired

Run 1	GR	2234-Surface
	CSS (Long Spaced Compensated Sonic Sonde)	2224-434m
	(Waveform Sonic)	2224-1950m
	DLS (Dual Laterolog Sonde)	2233-434m
Run 2	MLL (Microlog)	2237-434m
	PDS (Compensated Density Sonde)	2234-434m
	CNS (Compensated Neutron Sonde)	2234-434m

Mud Parameters

Mud Type	KCl/polymer
Mud Density	9.4ppg
KCl	6%
Rm	0.816 ohmm @ 17.8°C
Rmf	0.676ohmm @ 16.4°C
Rmc	2.320ohmm @ 19.5°C
MRT	86°C from Run 2 at 2234m

Remarks

- The laterolog and sonic was run with 1 inch stand-offs.
- 1.2% Barite in mud.

Log Processing

- Regional salinity data was used to derive the R_w used for this analysis.
- A BHT of 91°C was used for the analysis (Gradient of 30°C/km).

Interpretation Procedures and Parameters

An interpretation over the Waarre Sandstone intervals was conducted using a combination of density (DPHI), neutron (NPRL) and sonic porosity (SPHI) from sonic. A gamma-ray derived volume of shale was calculated with water saturations computed using a pseudo-Archie Equation (Parameters used for the interpretation are detailed in Table 1).

- The GR from Run 1 was corrected for environmental effects such as mud-weight, KCl and borehole size using measurements made from the MLL caliper.
- Borehole corrections for the Dual Laterolog SLL and DLL curves using 1" stand-offs were applied (Table 1). These are ratios illustrated in the Reeves charts Lat-1 and Lat-2 respectively.
- The borehole corrected deep resistivity curve (DLL_BC) was further corrected for shoulder effects (DLLc).
- The invasion corrected R_T was derived using the following tornado chart emulation relationship:

$$R_T = (1.59 * DLL_C - 0.59 * SLL_{BC})$$

where:

DLL_C = Deep resistivity response borehole and shoulder bed corrected.

SLL_BC = Shallow resistivity response borehole corrected.

- Density porosity was calculated over the Waarre Sandstones:

$$DPHI = (2.65 - DEN) / (1.65)$$

where:

DEN= Bulk Density in g/cc.

- A Hunt-Raymer sonic porosity curve was calculated:

$$SPHI = (DTC2 - 55.5/DTC2)*0.625$$

where:

DTC2 = 3-4ft Compensated Sonic (µs/ft).

- PHIE was primarily produced from the minimum value of DPHI and NPRL with some editing to SPHI and porosity interpreted from the MLL.

- A shale corrected porosity (PHIE to be used in the pseudo-Archie equation) was calculated as follows:

$$\text{if } Vsh < VshSt \dots \dots \dots \text{ PHIE} = \text{DPHI}$$

$$\text{elseif } VshSt < Vsh < VshCO \dots \text{ PHIE} = \text{a proportional percentile correction}$$

from DPHI to (DPHI - (Vsh * PHIsh))

$$\text{elseif } Vsh > VshCO \dots \dots \dots \text{ PHIE} = \text{DPHI} - (Vsh * \text{PHIsh})$$

where: VshSt = The start of the sliding scale Vsh correction.

VshCO = Shale volume cut-off.

Vsh = Shale volume.

DPHI = Combination of density/neutron and sonic porosity.

PHIsh = Apparent shale porosity.

- Limited SCAL data from Mylor indicate that the cementation exponent “m” for the Waarre sandstones has a range between 1.67 and 1.84 and varies with porosity. Given this range, it was appropriate to use a variable cementation exponent “m” for the use in calculating S_w. The derivation of “m” was porosity based and results in “m” decreasing as porosity increases. The variable “m” relationship is given as;

$$MEXP = (-0.2413 * \text{Log}10 \text{ PHIE}) + 2.4657$$

- Limited SCAL data from Mylor indicate that the saturation exponent “n” for the Waarre sandstones has a range between 1.52 and 1.78 and varies with porosity and shaleness. A pseudo saturation exponent “n” has been used in the Archie equation. This is to take into account the impact of micro-porosity inherent in shaly sandstones. It is postulated that shale intergranular micro-porosity increases the surface area (conductivity) of the rock, and therefore “n” needs to be adjusted to compensate for the extra conductivity in shaly sandstones.

$$\text{Clean sand "n"} = 1.85 \quad \text{Shaly sand "n"} = 1.50$$

Shaly sand is defined where the shale volume is greater than a cut-off of 40%. Saturation exponent is gradational between the two end-points above.

- Water saturations were calculated using a pseudo-Archie equation.

$$SW = \sqrt[n]{\frac{aRw}{\phi^m Rt}}$$

where: R_w = Resistivity of formation water at formation temperature.

RT = True resistivity, i.e. resistivity of the non-invaded reservoir (i.e.

LLD corrected for borehole, invasion and resistive shoulder beds).

PHIT= Input as shale corrected PHIE (derived above).

a = Porosity coefficient (default = 1).

m = Cementation factor or exponent from the variable “m” relationship.

n = Saturation exponent from the “n” relationship derived above.

Conclusions

1. Naylor South 1 log analysis identified no pay in the Waarre Sandstones.
2. Sandstone development was not observed in the Waarre B.
3. Naylor South 1 was plugged and abandoned.

Attached is the well evaluation summary (WES) plot for Naylor South 1 (02.002)

data/wes_ot/naylorsouth1_02.002_waarre.wes

TABLE 1
Log Analysis Parameters

PARAMETERS	WAARRE C SANDSTONE	WAARRE A SANDSTONE
R_w (ohmm) @ 25°C	0.3	0.3
a	1	1
m	Variable	Variable
n	Variable	Variable
Borehole cor RD	0.96	0.96
Borehole cor RS	0.95	0.95
RD Shoulder Corr.	0.8	0.8
GR matrix (API)	23	23
GR shale (API)	100	100
VSHST	0.2	0.2
VSHCO	0.4	0.4
PHISH	0.13	0.15

APPENDIX VI: PRESSURE SURVEY

No pressure surveys were taken for Naylor South 1

APPENDIX VII: DRILL STEM TEST DATA

No drill stem tests were conducted for Naylor South 1

APPENDIX VIII: HYDROCARBON ANALYSIS

No Hydrocarbon Analysis was done for Naylor South 1

APPENDIX IX: WATER ANALYSIS

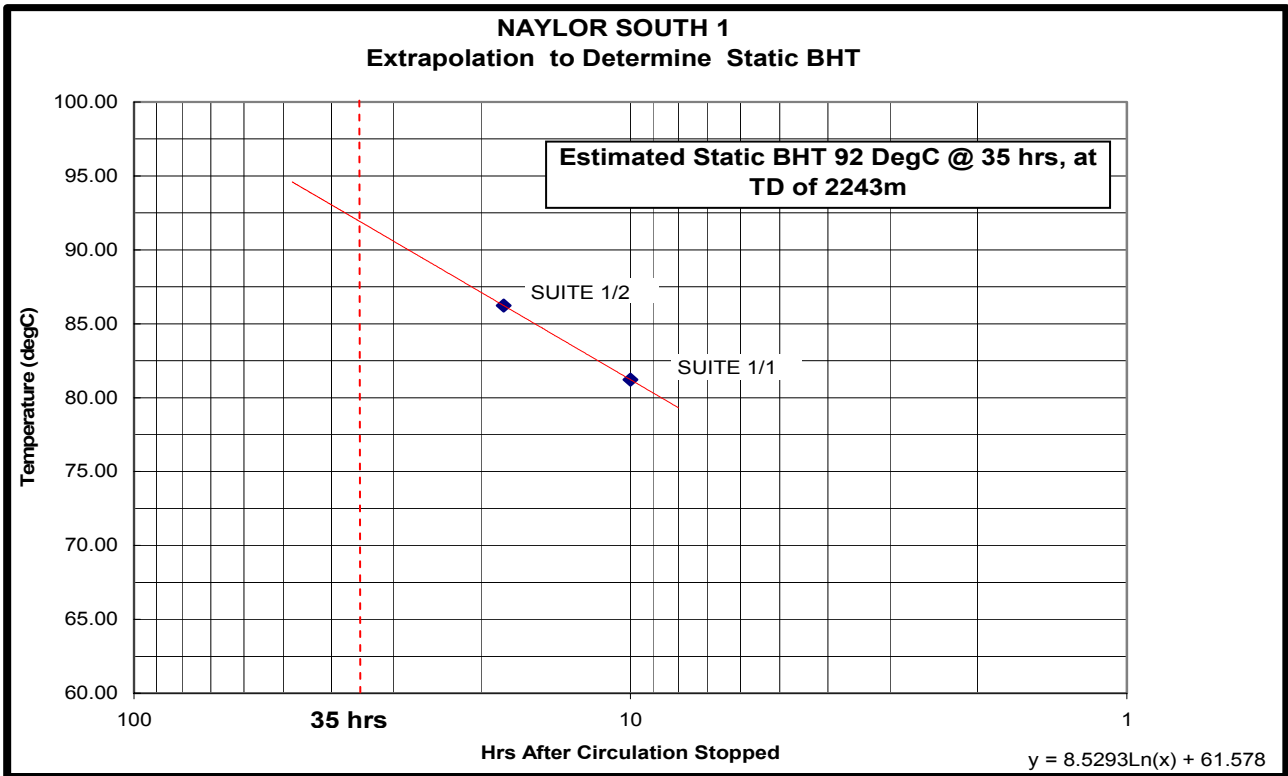
No Water Analysis was conducted on Naylor South 1

APPENDIX X: PALYNOLOGICAL ANALYSIS

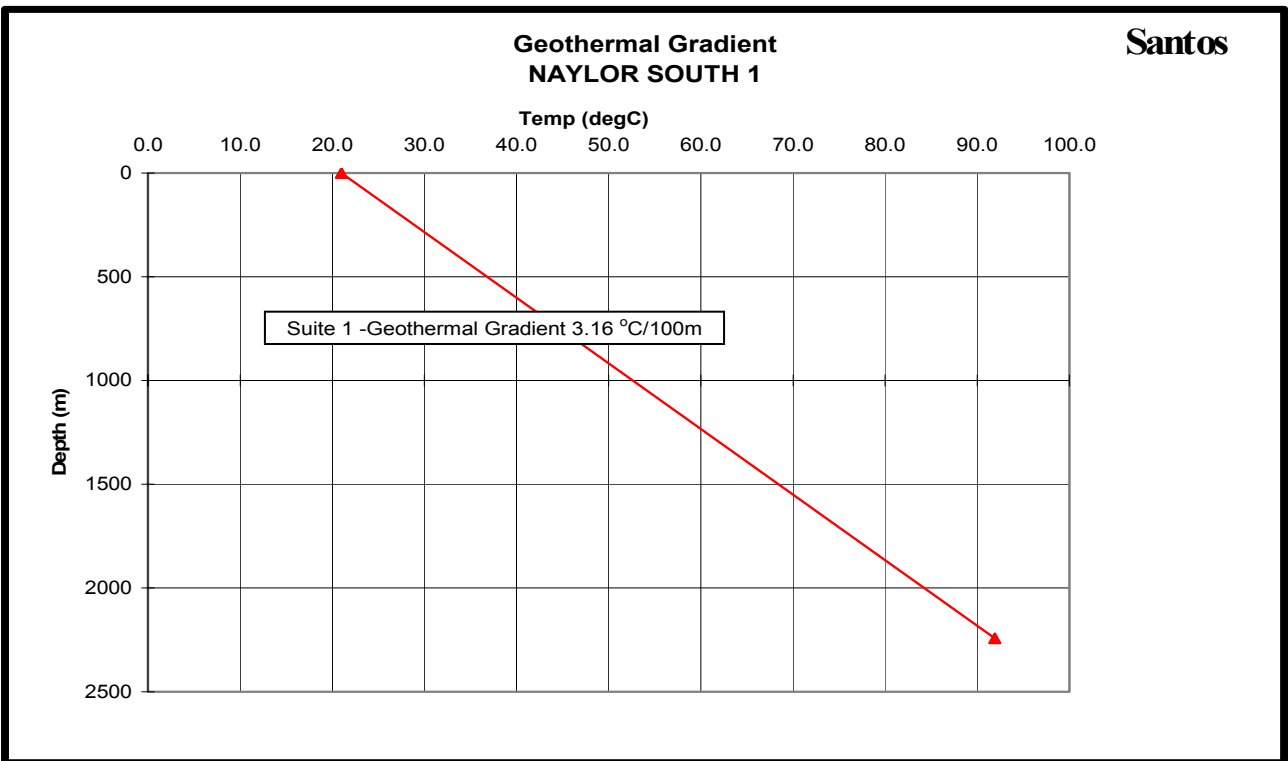
No Palynological Analysis was done for Naylor South 1

APPENDIX XI: GEOTHERMAL GRADIENT

	Max Recorded Temp (degC)	Depth Recorded (m)	Time Since Circulation. (hrs)	Total Depth (m)	Estimated BHT (degC)
Run 1	81	2237	10	2243	81.22
Run 2	86	2237	18	2243	86.23
Run 3					



STATIC BHT @ 35 hrs	91.9	°C	@	2243	m
SURFACE TEMP.	21	°C	@	0	m
Geothermal Gradient for Suite 1			3.16	°C/100 m	



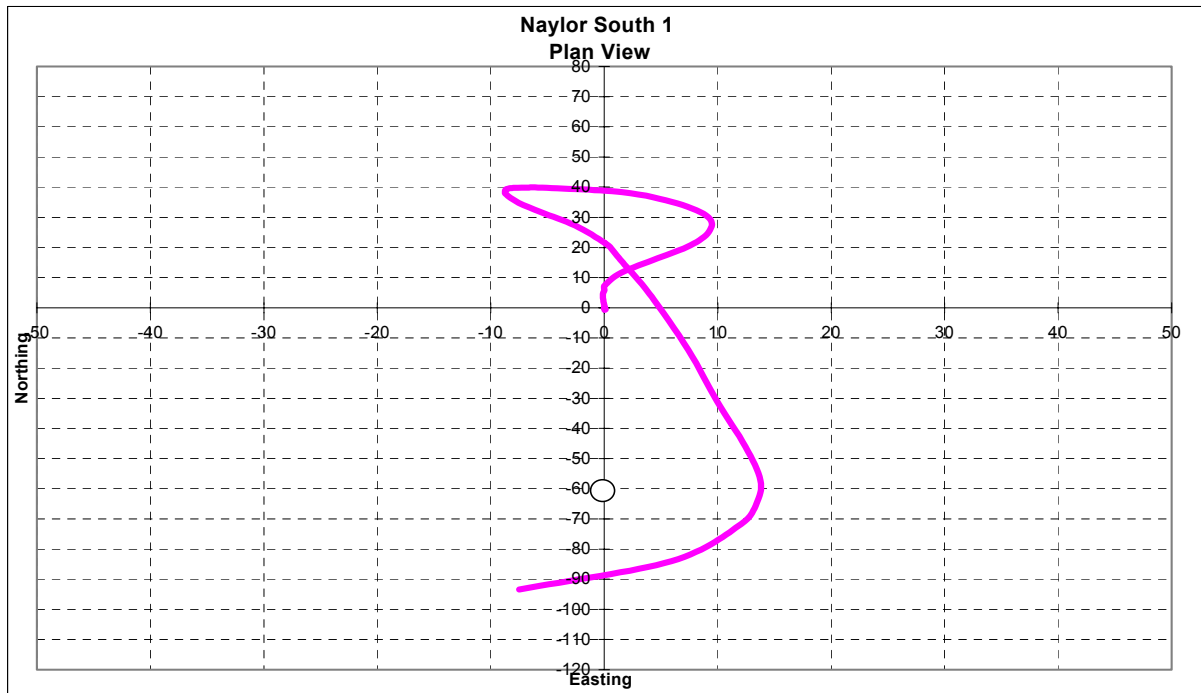
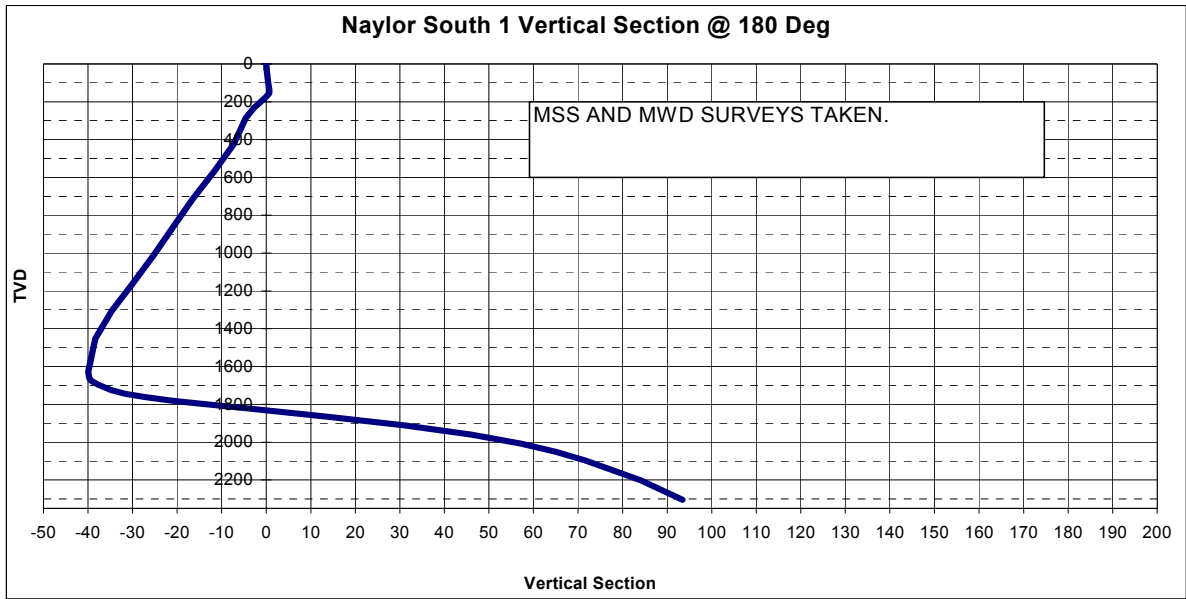
APPENDIX XII: DEVIATION DATA

NAYLOR SOUTH 1

DEVIATION DATA

DEPTH M	INCLIN DEG	Azimuth DEG	TVD M	TVD S/S M	Northing north	Easting east	Q DEG	Vert Sect	Vert Plane	Displ	Direction True
0.00	0.00	0.00	0.00	-53.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.50	142.00	25.00	-28.00	-0.09	0.07	0.01	0.09	-0.09	0.11	0.00
100.00	0.25	245.00	100.00	47.00	-0.41	0.12	0.01	0.41	-0.41	0.43	163.75
136.00	0.75	182.00	136.00	83.00	-0.68	0.04	0.01	0.68	-0.68	0.68	176.56
155.00	0.85	357.00	155.00	102.00	-0.67	0.03	0.03	0.67	0.67	0.67	177.49
174.00	3.00	2.00	173.98	120.98	-0.03	0.04	0.04	0.03	-0.03	0.05	125.04
232.00	2.50	352.00	231.92	178.92	2.74	-0.08	0.01	-2.74	-2.74	2.74	358.25
287.00	1.35	12.00	286.89	233.89	4.56	-0.12	0.02	-4.56	4.56	4.57	358.54
358.00	1.00	357.00	357.87	304.87	6.00	0.03	0.01	-6.00	-6.00	6.00	0.24
425.00	1.25	2.00	424.86	371.86	7.31	0.02	0.00	-7.31	7.31	7.31	0.16
568.00	2.50	27.00	567.78	514.78	11.65	1.49	0.03	-11.65	11.65	11.75	7.29
712.00	2.13	42.00	711.67	658.67	16.44	4.71	0.01	-16.44	16.44	17.10	15.98
857.00	2.00	26.00	856.57	803.57	20.72	7.62	0.01	-20.72	20.72	22.07	20.19
1010.00	1.63	12.00	1009.50	956.50	25.24	9.24	0.01	-25.24	25.24	26.88	20.11
1163.00	2.00	349.00	1162.42	1109.42	29.99	9.19	0.01	-29.99	-29.99	31.37	17.03
1308.00	2.50	314.00	1307.32	1254.32	34.67	6.43	0.03	-34.67	-34.67	35.27	10.50
1453.00	2.37	300.00	1452.19	1399.19	38.37	1.56	0.01	-38.37	-38.37	38.40	2.32
1627.00	3.00	267.00	1626.00	1573.00	39.93	-6.11	0.03	-39.93	-39.93	40.40	351.30
1638.00	3.32	265.67	1636.99	1583.99	39.89	-6.71	0.01	-39.89	-39.89	40.45	350.45
1647.00	3.34	263.30	1656.57	1603.57	39.78	-7.85	0.00	-39.78	-39.78	40.55	348.84
1657.62	3.20	242.00	1665.94	1612.94	39.63	-8.35	0.02	-39.63	39.63	40.50	348.10
1667.00	3.26	196.00	1675.92	1622.92	39.22	-8.67	0.04	-39.22	39.22	40.17	347.53
1677.00	4.81	171.00	1695.88	1642.88	37.85	-8.70	0.04	-37.85	37.85	38.84	347.06
1697.00	8.23	152.00	1724.69	1671.69	34.81	-7.53	0.07	-34.81	34.81	35.62	347.79
1726.00	14.35	145.00	1743.31	1690.31	31.68	-5.54	0.11	-31.68	31.68	32.16	350.08
1745.00	18.15	147.00	1761.55	1708.55	27.27	-2.58	0.07	-27.27	27.27	27.39	354.60
1764.00	21.60	162.65	1779.43	1726.43	21.44	0.08	0.11	-21.44	21.44	21.44	0.21
1783.00	23.10	167.52	1787.75	1734.75	18.14	0.95	0.04	-18.14	18.14	18.16	3.01
1792.00	22.70	167.37	1796.96	1743.96	14.34	1.80	0.01	-14.34	14.34	14.45	7.15
1802.00	22.50	167.20	1820.97	1767.97	4.59	4.00	0.00	-4.59	4.59	6.09	41.04
1828.00	22.80	172.00	1866.19	1813.19	-13.95	7.40	0.03	13.95	-13.95	15.79	152.07
1877.00	19.20	171.00	1911.00	1858.00	-30.96	9.93	0.06	30.96	-30.96	32.52	162.23
1925.00	15.00	170.00	1960.69	1907.69	-46.04	12.43	0.07	46.04	-46.04	47.69	164.89
1977.00	12.00	177.00	2007.36	1954.36	-57.15	13.77	0.06	57.15	-57.15	58.78	166.45
2025.00	9.00	190.00	2049.64	1996.64	-64.93	13.42	0.07	64.93	-64.93	66.30	168.32
2068.00	7.50	193.00	2097.14	2044.14	-71.68	12.07	0.03	71.68	-71.68	72.69	170.44
2116.00	8.00	219.00	2201.21	2148.21	-84.04	5.93	0.06	84.04	-84.04	84.24	175.97
2221.00	10.50	247.00	2304.89	2251.89	-93.46	-7.49	0.09	93.46	-93.46	93.76	184.58

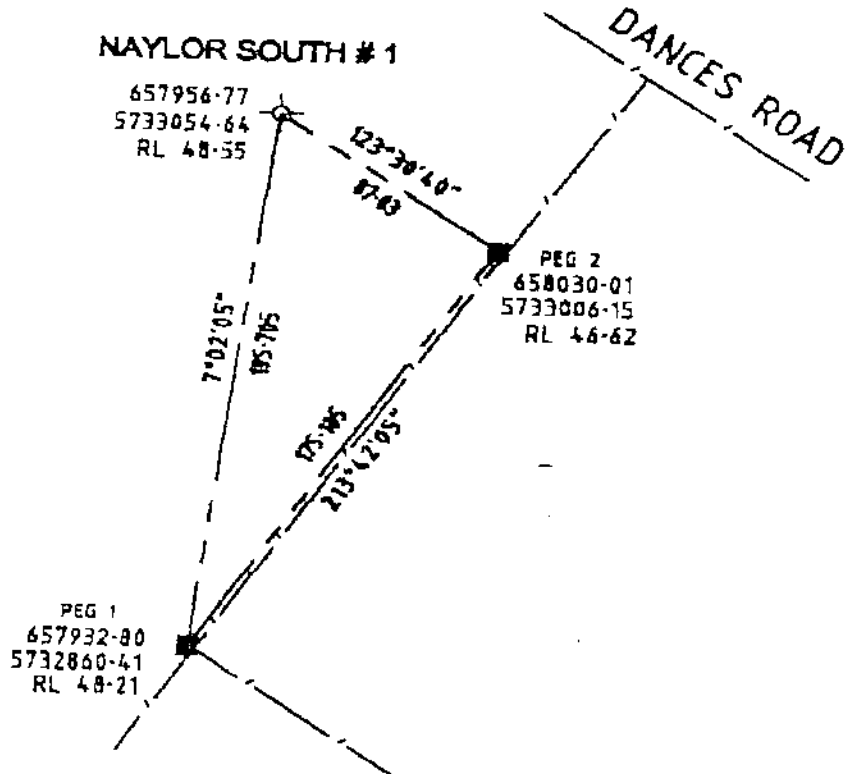
Naylor South 1 Deviation plots



APPENDIX XIII: WELL LOCATION SURVEY

VICTORIA
GAS WELL LOCATION
 REFERENCE MARKS SKETCH PLAN
 EXPLORATION LICENCE PEP 154

Well Name	NAYLOR SOUTH # 1		
Map			
Spheroid	GDA94	MGA,94	ZONE 54
Latitude	S 38°32'12.86"	Measurement units (metres)	
Longitude	E 142°48'44.39"	Easting	657 956.77
Convergence	1°07'46"	Northing	5 733 054.64
Scale Factor	0.99990726	Elevation	48.55 (AHD)



NOTES : This sketch plan is not to scale.
 Distances shown are computed grid distances.
 Bearings shown are computed grid bearings.
 DATUM : GDA94 vide Peg 1 and Peg 2.
 Datum coordinates determined by Fyfe
 Surveyors 22 / 10 / 2001.
 Height datum is to AHD vide Peg 1 and Peg 2.
 Estimated Horizontal error is less than +/- 0.05 metre.
 Estimated Vertical error is less than +/- 0.05 metre.
 Date of Survey : 5 / 12 / 2001

Paul Crowe Surveyor ABN 59521601183 "Ambleside" 192 Korok Street Warrnambool 3280 Ph. (09) 5581 1500	REF 1050
--	--------------------

Date 6 / 12 / 2001
Trevor McDowell
 TREVOR McDOWELL
 LICENSED SURVEYOR

APPENDIX XIV: DRILLING - FINAL WELL REPORT

A high-contrast, black and white photograph of an oil drilling rig. The rig's derrick is the central focus, extending vertically from the bottom to the top of the frame. The background shows a hazy, industrial landscape with other structures and equipment. The overall image has a grainy, high-contrast appearance.

SANTOS

FINAL WELL REPORT

NAYLOR SOUTH #1

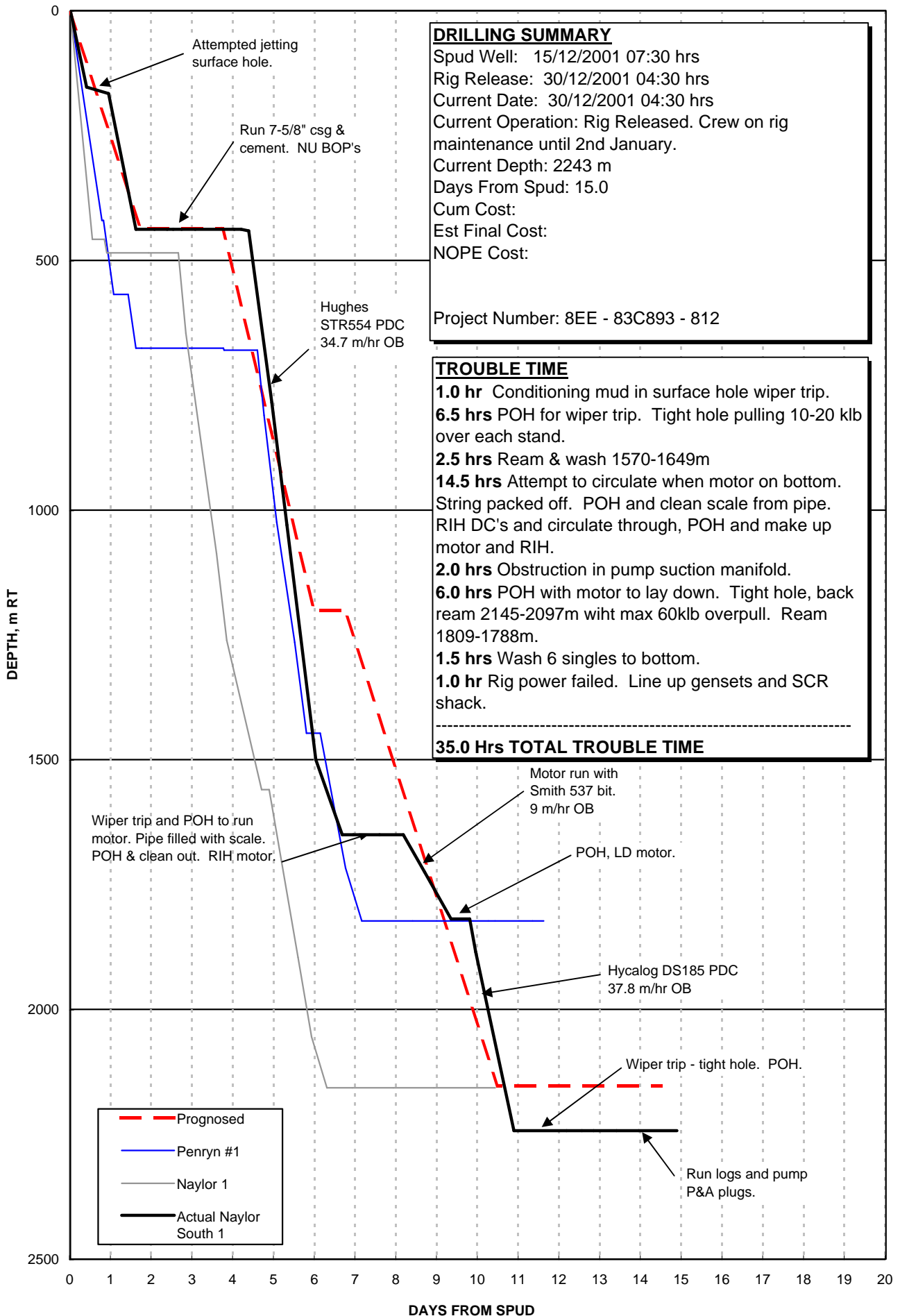
Drilling Supervisor(s) : D. New
Drilling Engineer(s) : J. Bevern
Report Author : T. Robertson
Report Supervisor : J. Bevern
Date of Issue : 17th January 2002

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Section 1 – Well Summary
Time vs Depth Curve

NAYLOR SOUTH 1 TIME v DEPTH CURVE



Section 2 – Well History
Well History Report

RT above GL: 4 m Lat : 38 deg 32 min 12.86 sec Spud Date: 15/12/2001 Release Date: 30/12/2001
 GL above MSL : 48 m Long : 142 deg 48 min 44.39 sec Spud Time: 7:30:00 Release Time: 4:30:00

Well History

#	DATE	DEPTH	WELL HISTORY (24 Hr Summary)
1	10/12/2001	0	Wait on daylight. Move rig equipment from Warrnambool to Nylor South #1. Wait on daylight.
2	11/12/2001	0	Continue moving equipment and rigging up.
3	12/12/2001	0	Continue rigging up. Hold pre spud safety meeting. Continue rigging up.
4	13/12/2001	0	Continue rigging up.
5	14/12/2001	0	Finish rigging up. Prepare to drill rat hole and mouse hole.
6	15/12/2001	154	Drill rat hole and mouse hole. Fish bit breaker from conductor. Spud well and drill to 153m. Jet from 153m to 154m.
7	16/12/2001	438	Jet to 173m. Drill with surveys to 438m. POOH for wiper trip.
8	17/12/2001	438	Finish wiper trip. POOH and lay down DC's. Run and cement 7 5/8" casing. WOC.
9	18/12/2001	438	WOC. Install bradenhead. Nipple up and test BOP's.
10	19/12/2001	628	Finish pressure testing BOP's. Make up new BHA and RIH. Drill shoe track and 3m new hole. LOT. Drill ahead with surveys to 628m.
11	20/12/2001	1,263	Drill with surveys from 628m to 1262m.
12	21/12/2001	1,650	Drill with surveys to 1649.9m. POOH for wiper trip.
13	22/12/2001	1,650	POOH through tight hole. RIH and rea/wash to bottom. CBU and POOH. Make up motor and MWD and RIH. Attempt to circulate - no go string packed off. POOH.
14	23/12/2001	1,725	POOH and clear pipe scale from MWD tools. RIH with BHA and circulate clean. Make up motor and MWD and RIH. Drill ahead building angle to 18.1° and change direction to 158.3°.
15	24/12/2001	1,819	Directionally drill to 1819m. POOH and lay out motor and MWD. Make up new BHA and RIH.
16	25/12/2001	2,186	RIH with new bit. Break in bit and drill ahead to 2186m taking surveys every 50m.
17	26/12/2001	2,243	Drill to 2243m - TD. CBU and POOH. Lay out stabilisers and NMDC. RIH.
18	27/12/2001	2,243	RIH to 2160m. Wash to bottom. Circulate hole clean. POOH. Run wireline logs.
19	28/12/2001	2,243	Finish running wireline logs. Make up cement stinger and RIH. Set abandonment plugs 1, 2 and 3.
20	29/12/2001	2,243	Set plug #3. Lay out excess pipe. RIH and tag shoe plug. POOH lay down pipe and collars. Nipple down BOP's.
21	30/12/2001	2,243	Nipple down BOP. Cut off bradenhead. Set plug #4 from 0-30m. Release rig at 04:30 hrs.

Section 3 – Drilling Data
Bit Record
FIT/LOT Report

BIT RECAP

NAYLOR SOUTH #1

From : 15/12/2001
To : 27/12/2001

DATE	BIT#	SIZE	SER#	MF	IADC	TYPE	JETS	OUT	FTGE	HRS IADC	SPP psi	FLW gpm	WOB lbs	RPM	VEL fps	HHP	ROP f/hr	I	O1	D	L	B	G	O2	R
15/12/2001	1	9.88	A33JB	HU	116	GT-1	1x22		154	15.0	2250	550	5.0	90	144.5	7.517	49.7								
16/12/2001	1	9.88	A33JB	HU	116	GT-1	1x22	438	284	19.0	2100	502	10.0	120	131.9	0.000	21.5								
17/12/2001	1	9.88	A33JB	HU	116	GT-1	1x22	438	0	0.0	2100	502	10.0	120	131.9	0.000		1	2	WT	A	2	I	NO	TD
19/12/2001	2	6.75	1904177	HU		STR554A3X	2x11, 2x9		190	9.0	1000	311	5.0	130	97.9	0.000	39.6								
20/12/2001	2	6.75	1904177	HU		STR554A3X	2x11, 2x9		634	21.5	1500	311	5.0	110	97.9	4.175	45.9								
21/12/2001	2	6.75	1904177	HU		STR554A3X	2x11, 2x9		388	21.0	2000	311	11.0	80	97.9	0.000	23.8								
22/12/2001	2	6.75	1904177	HU		STR554A3X	2x11, 2x9	1,650	0	0.0	2000	311	11.0	80	97.9	0.000		6	2	WT	S	X	I	RO	BHA
23/12/2001	3	6.75	MH4631	SM	537	X32DGPS	3x12		75	12.0	2000	239	12.0	80	70.4	0.000	9.6								
24/12/2001	3	6.75	MH4631	SM	537	X32DGPS	3x12	1,819	94	15.0	2000	239	15.0	80	70.4	0.000	9.0	5	5	WT	A	E	I	ER	PR
25/12/2001	4	6.75	24429	HY		DS185	4x12		367	13.5	2100	287	15.0	80	63.4	0.000	49.6								
26/12/2001	4	6.75	24429	HY		DS185	4x12	2,243	57	4.5	2100	287	15.0	80	63.4	0.000	15.0	2	5	WT	S	X	I	LN	TD
26/12/2001	2RR	6.75	1904177	HU		STR554A3X	2x32, 2x9	2,243	0	0.0					0.0	0.000		6	2	WT	S	X	I	RO	BHA
27/12/2001	2RR	6.75	1904177	HU		STR554A3X	2x32, 2x9	2,243	0	0.0	1500	287			16.5	0.116		6	2	WT	S	X	I	RO	BHA

Section 4 – Casing and Cementing

Casing and Cementing Report/s

Wellhead Installation Report/Plug and Abandonment Report

Santos

Santos Ltd
A.C.N. 007 550 923

CASING AND CEMENTING REPORT

Well Name: Naylor South #1

FORM

DQMS F-220

Casing type: Surface casing Intermediate Casing Production Casing Completion tubing

Originated by: D. New **Date:** 17-Dec-01 **Checked by:** JNB **Date:** 18/12/2001

Hole Size: 9 7/8" **T.D.:** 438m **Rig:** ODE Rig 30 **Date:** **Cemented by:** Howco

PRE-FLUSH 0 bbls. @ **SPACER** 40 bbls@ 8.4 ppg
Additives: Mains water

CEMENT

LEAD SLURRY: 113 sacks class "G"
Slurry Yield: 3.38 cu.ft./sack
Mixwater Req't: 21.43 gal./sack
Actual Slurry Pumped: 68.0 bbls @ 11.0 ppg
381 cu ft

(Job was planned for top of lead slurry to surface using 50% excess)

TAIL SLURRY: 90 sacks class "G"
Slurry Yield: 1.19 cu.ft./sack
Mixwater Req't: 5.24 gal./sack
Actual Slurry Pumped: 19.0 bbls @ 15.6 ppg
107 cu ft

(Job was planned for top of tail slurry at 340m using 30% excess).

ADDITIVES

	%	Amount
D020 Bentonite	4	424 lbs
S001 Accelerator	1.5	239 lbs
D144 Antifoam	0.01 ga/sx	1 gal

D145A Dispersant	0.05 gal/sx	4 gal
D144 Antifoam	0.01 gal/sx	1 gal

DISPLACEMENT

Fluid: Mud 9 ppg
Theoretical Displ.: 63.5 bbl. Bumped plug with 900 psi
Actual Displ. 63.1 bbl @ 5 BPM Pressure Tested to: 2500 psi
Displaced via RIG / CEMENTING UNIT Bleed back: 0.5 bbl

ACTIVITY	Time	Returns to Surface:	120 bbls mud	10 bbls Cement
Start Running csg. 17/12	12:00	Reciprocated/Rotated Casing:	No - casing chained down.	
Casing on Bottom	16:30	Top Up Job run:	Yes / No	47 sx class G
Start Circulation	16:40	Plug Set make/type:	Weatherford non rotating.	
Pump Preflush (Rig)	17:48	Centraliser type/depth:	Weatherford Bow Spring at 428m, 416m, 398m, 386m, 363m and 17m.	
Start Pressure Test	17:52	Remarks:	Very good cement job. Densities even for both lead and tail.	
Start Mixing	18:04		Good returns throughout job.	
Finish Mixing	18:25		Bradenhead set 0.23m BELOW current groundlevel but will be 0.07m ABOVE final ground level after lease is cleaned up.	
Start Displacing	18:30			
Stop Displ./Bump	18:50			
Press. test	19:05			

No. JOINTS	SIZE OD	WT lb/ft	GRADE	THREAD	M	FROM	TO
Stick up					-0.89	-0.89	0.00
Rotary table to top of bradenhead					4.93	0.00	4.93
Bradenhead. Woods 5k 11" x 9 5/8" with 7 5/8" X/O					0.58	4.93	5.51
35	7 5/8"	26.4	L80	BTC	404.62	5.51	410.13
Float collar	7 5/8"	26.4	L80	BTC	0.41	410.13	410.54
2	7 5/8"	26.4	L80	BTC	23.21	410.54	433.75
Float shoe	7 5/8"	26.4	L80	BTC	0.45	433.75	434.20

Theoretical Bouyed wt of casing(klb):	36 klb	Bradenhead Height above GL	0.07m above final GL.
Actual wt of casing (last joint run-block wt, klb)	37 klb	Marker jts Left	0.00
Hanging wt (after cementing and pressure bleed off)	40 klb	Total Jts on Loc	40
Casing wt just prior to setting slips	N/A	Total No. Run	37
(Indicator wt - Blocks = Csg wt)		No. Left	3

WELL: Naylor South 1

29/12/2001

Supervisor: D. New

Well Details

Hole Section	Hole	Depth	Casing	Depth
	Size		Size	
Surface	9 7/8"	438	7 5/8"	434
Intermediate				
Production				

Formation Tops (ft RT)

Formation	Depth	Formation	Depth	Formation	Depth
Clifton	464	Pebble Point	980	Flaxmans	2084
Mepunga	551	Paarate	1259	Waare	2102
Dilwyn	609	Skull Creek	1781	Eumeralla	2193
Pember	909	Belfast	1936	TD	2243

Plug Details

Plug No.	Reason	Top Depth	Top Depth	Length m	Cement Type	Sacks	Weight	Additives	Tagged Depth	Tagged Weight
1	Waaree Isolation	2141	2049	90	G	68	15.6	D081, D145A	-	
2	Parrate	1297	1207	90	G	68	15.6	D081, D145A	-	
3	Shoe isolation	464	374	90	G	100	15.6	D145A, S001	388	10 klb
4	Surface	30	0	30	G	24	15.6	D145A, S001	-	
5										
6										

Identification Plate Installed (Yes/No)? Yes

Braden Head Removed (Yes/No)? Yes

Additional Comments:

Tagged shoe plug at 388m with 10 klb and pressure tested to 1100 psi for 10 min.

APPENDIX XV: RIG SPECIFICATIONS

RIG INVENTORY FOR RIG # 30

DRAWWORKS	:	Ideco Hydrair H-725-D double drum with V-80 Parmac hydromatic brake, Martin Decker satellite automatic drilling control. Max. single line pull - 50,000 lbs. Main drum grooved for 1-1/8" drilling line.
SUBSTRUCTURE	:	One piece substructure 14' high x 13'6" wide x 50' long with 12' BOP clearance. Setback area loading: 250,000 lbs Casing area loading: 275,000 lbs
ENGINES	:	Four (4) Caterpillar Model 3412 PCTA diesel engines.
BRAKE	:	V-80 Parmac hydromatic brake,
MAST	:	Dreco Model #: M12713-510 Floor Mounted Cantilever Mast designed in accordance with API Specification 4E Drilling & Well Servicing Structures. Hook load Gross Nominal Capacity - 510,000 lbs with:- 10 lines strung - 365,000 lbs 8 lines strung - 340,000 lbs Clear working height of 127'. Base width of 13'6". Adjustable racking board with capacity for i) 108 stands of 4.½" drill pipe, ii) 10 stands of 6.½" drill collars, iii) 3 stands of 8" drill collars Designed to withstand an API windload of 84 mph with pipe racked and 100 mph with no pipe racked.
CATHEADS	:	One (1) Foster Model 37 make-up spinning cathead mounted on drillers side. One (1) Foster Model 24 break-out cathead mounted off drillers side.
TRAVELLING BLOCK/HOOK	:	One (1) 667 Crosby McKissick 250 ton combination block hook Web Wilson. 250 ton Hydra hook Unit 5 - 36" sheaves.
WINCHES	:	One (1) Ingersol Rand HU-40 with 5/8" wireline. Capacity 2,000 lb. One (1) ANSI B30.7 with 3/8" wire capacity 4000lbs @ 70 fpm
SWIVEL	:	One (1) Oilwell PC-300 ton swivel
RIG LIGHTING	:	Explosive proof fluorescent. As per approved State Specifications.
KELLY DRIVE	:	One (1) 27 HDP Varco kelly drive bushing.
MUD PUMPS	:	Two (2) Gardner Denver mud pumps Model PZH-8 each driven by 750 HP EMD D-79 motors. 8" stroke with liner size 6" through to 5". 6" liner maximum pressure 2387 psi 5.1/2" liner maximum pressure 2841 psi 5" liner maximum pressure 3437 psi 6" liner maximum volume 412 gpm 5.1/2" liner maximum volume 345 gpm 5" liner maximum volume 280 gpm
MIXING PUMP	:	Two (2) Mission Magnum 5" x 6" x 14" centrifugal pump complete with 50 HP, 600 Volt, 60 Hz, 3 phase explosion proof electric motors.

MUD AGITATORS	:	Five (5) Geolograph/Pioneer 40TD - 15" 'Pitbull' mud agitators with 15 HP, 60 Volt, 60 HZ, 3 phase electric motors.
LINEAR MOTION SHALE SHAKERS	:	Two (2) DFE SCR-01 Linear motion shale shakers.
DEGASSER	:	48" Dia Poor Boy Degasser
DESILTER	:	One (1)DFE - Harrisburg style 12 cone desilter 12 x 5" cones. Approximate output of 960 gpm. Driven by Mission Magnum 5" x 6" x 11" centrifugal pump complete with 50 hp 600 volt 60 Hz 3 phase explosion proof motor.
GENERATORS	:	Four (4) Brown Boveri 600 volt, 600 Kw, 750 kva , 3 phase, 60 HZ AC generators. Powered by four (4) Cat 3412 PCTA diesel engines.
BOP's & ACCUMULATOR	:	One (1) Wagner Model 20-160 3 BND 160 gallon accumulator consisting of: Sixteen (16) 11 gallon bladder type bottles One (1) 20 HP electric driven triplex pump 600 volts, 60 HZ, 3 phase motor and controls. One (1) Wagner Model A 60 auxiliary air pump 4.5 gals/minute.
BOP's & ACCUMULATOR (Cont'd)	:	One (1) Wagner Model UM2SCB5S mounted hydraulic control panel with five (5) 1" stainless steel fitted selector valves and two (2) stripping controls and pressure reducing valves. Three (3) 4" hydraulic readout gauges:- one for annular pressure- one for accumulator pressure one for manifold pressure. One (1) Stewart & Stevenson 5 station remote drillers control with air cable umbilical with three pressure gauges, increase and decrease control for annular pressure. One (1) Shaffer 13.5/8" x 3,000 psi spherical annular BOP, One (1) Shaffer 13.5/8" x 5,000 psi LWS studded, double gate autolock B.O.P.
KELLY COCK (UPPER)	:	Two (2) Upper Kelly Cock 7.3/4"OD with 6.5/8" API connections (1 x M&M, 1 x Hydril).
KELLY COCK (LOWER)	:	Three (3) M&M Lower Kelly Cocks 6.½" OD with 4" IF connections
DRILL PIPE SAFETY VALVE	:	One (1) Hydril 6.½" stabbing valve (4" IF). One (1) Gray inside BOP with 4.3/4" OD and 2.1/4" ID with 3.1/2" IF connections c/w releasing tool and thread protectors.
AIR COMPRESSORS AND RECEIVERS	:	Two (2) LeRoi Dresser Model 660A air compressor packages c/w 10 HP motors rated at 600 Volts, 60 HZ, 3 phase. Receivers each 120 gallon capacity and fitted with relief valves.
POWER TONGS	:	One (1) Farr 13.5/8" - 5.½" hydraulic casing tongs c/w hydraulic power pack and hoses and torque gauge assembly. One (1) Foster hydraulic kelly spinner with 6.5/8" LH connection.
TORQUE WRENCH	:	Yutani c/w drive sockets 1 1/8" through to 2 3/8"

SPOOLS	:	One (1) set double studded adaptor flanges to mate 13.5/8" 5,000 psi. API BOP flange to following wellhead flange 13.5/8" x 3,000 series, 11" x 3,000 series, 11" x 5,000 series 7.1/16" x 3,000 series, 7.1/16" x 5,000 series 4 1/16" 5000 x 3 1/16" 5000 3 1/16" 5000 x 2 1/16" 5000
SPOOLS (Cont'd)	:	1 double studded adaptor flange 4 1/16" 5K x 3 1/16" 5K 1 double studded adaptor flange 3 1/16" 5K x 2 1/16" 5K 1 only 14" - BOP mud cross (drilling spool) 13.5/8" 5,000 x 13.5/8" 5,000 BX160. with 2 x 3 1/16" 5K outlets. 1 only BOP spacer spool 13 5/8" 3,000 x 13 5/8" 3,000 1 only BOP spacer .spool 11" 3,000 x 13.5/8" 5,000 .
ROTARY TABLE	:	One (1) Oilwell A 20.½" rotary table torque tube driven from drawworks complete with Varco MASTER bushings and Insert Bowls.
MUD TANKS	:	SHAKER Active No 1. 277 BBL Desilter 73 BBL Sand Trap 50 BBL Trip Tank 29 BBL Total <u>429 BBL</u> SUCTION Active No 2 174 BBL Pre-Mix 146 BBL Pill Tank 63 BBL Total <u>383 BBL</u>
TRIP TANK	:	Trip Tank <u>29 BBL</u> One (1) Mission Magnum 2" x 3" centrifugal pump complete with 20 HP, 600 Volts, 60 HZ, 3 phase explosion proof motors
KILL LINE VALVE	:	2 x 3 1/8" Cameron FL 5K gate valves
CHOKE LINE VALVES	:	1 x 4 1/16 Cameron FC 5K hydraulic operated gate valve 1 x 4 1/16 5K manual gate valve
CHOKE MANIFOLD	:	One (1) McEvoy choke and kill manifold 3" 5,000 psi with hydraulic Swaco "super" choke.
DRILL PIPE	:	240 joints (2270 m) - 3.½" 13.30lb/ft drill pipe Grade 'G' 105 with 3 1/2" IF conn
PUP JOINTS	:	One (1) - 10'(3.65 m)3.½" OD Grade 'G' with 3.½" IF conn
HEVI-WATE DRILL PIPE	:	6 joints of 3.½" H.W.D.P. with 3.½" IF conn
DRILL COLLARS	:	12 x 6.½" OD drill collars (113 m) with 4" IF conn 24 x 4 ¾" O.D. drill collars (227 m) with 3.½"IF conn 1 x 4.3/4" OD Pony Drill Collar
KELLIES	:	Two (2) Square Kelly drive 4.¼" x 40' complete with Scabbard and 55 ft x 3 ½" kelly hose

FISHING TOOLS	:	<p>One (1) only 8.1/8" Bowen series 150 FS overshot One (1) 5.3/4" SH Bowen 150 Overshot c/w grapples and packoffs to fish contractors downhole equipment. One (1) only Reverse circulating junk basket 4" IF box One (1) only 6.½" OD Griffith Fishing Jars One (1) only 4 ¾" O.D. Bowen Type "Z" Fishing Jar One (1) only Bumper Sub 6.½" OD 4" IF pin & box. One (1) 5" R.C.J.B. One (1) 5" Junk Sub with 4.3/4" OD x 1.1/2" ID.</p>
WIRELINE SURVEY UNIT	:	<p>Gearmatic hydraulic drive Model 5 c/w .092" line</p>
SUBSTITUTES	:	<p>Two (2) Bit Sub - 7.5/8" reg x 6.5/8" reg double box. Two (2) Bit Subs - 6.5/8" reg double box. Two (2) Bit Sub - 6.5/8" reg box. x 4½" IF box Two (2) Bit Subs - 4.½" reg x 4" IF double box. Two (2) 4.3/4" bit subs (36" long) with 3.1/2" IF box x 3.1/2" reg box bored for float. One (1) Float Sub 6.5/8" reg box (FC) x 6.5/8" reg pin Two (2) XO Sub - 4" IF box x 4.½" IF pin. Two (2) XO Sub - 4½" IF box x 4." IF pin. One (1) XO Sub - 4.½" reg x 4" IF double pin. Two (2) XO Sub - 6.5/8" reg pin x 4" IF box. One (1) Junk Sub - 6.5/8" reg pin x 6.5/8" reg box One (1) Junk Sub - 4.½" reg box x 4.½" reg pin. One (1) XO Sub - 4.½" IF box x 4" IF box. Two (2) Kelly Saver Subs c/w rubber 4" IF pin & box. Two (2) Kelly Saver Subs 4" IF pin & box One (1) Kelly Saver Subs 4½" IF pin & box. Two (2) 4 IF box x 3.1/2" IF pin Saver Subs. One (1) Circulating Subs - 4" IF x 2" 1502 hammer union. One (1) Circulating Subs - 4" IF x 2" 602 hammer union. Eleven (11) Lifting Subs - 18" Taper 4.½" pick up neck and 4" IF pin. Eight (8) Lift Subs with 3.1/2" OD D.P. neck and 3.1/2" IF pin connections.</p>
HANDLING TOOLS	:	<p>2 only 4.½" BJ 250 ton 18 degree taper D/P elevators. 1 only 3.½" BJ 200 ton 18 degree taper D/P elevators. 1 only 3.1/2" BJ type MGG 18° centre latch Elevators. 1 only 4.½" Varco SDXL D/P slips. 1 only 4.½" Varco SDML D/P slips 2 only 8" - 6.½" DCS-R drill collar slips. 1 only 3.1/2" Varco SDML Slips 1 only 4.3/4" Varco DCS-S Drill Collar Slips</p>
CASING RUNNING TOOLS	:	<p>1 only 13.3/8" Webb Wilson 150 ton side door elevator. 1 only 13.3/8" single joint P.U. elevators. 1 only 9.5/8" Webb Wilson 150 ton side door elevators. 1 only 9.5/8 single joint P.U. elevator. 1 only 7" BJ 150 ton side door elevators. 1 only 7" single joint P.U. elevators. 1 only 5.½" BJ 200 ton S11 1 only 2.7/8" BJ 100 ton tubing elevator. 1 only 2.3/8" BJ 100 ton tubing elevator. (all P.U. elevators c/w slings & swivel) 1 only 13.3/8" Varco CMS-XL casing slips 1 only 9.5/8" Varco CMS-XL casing slips. 1 only 7" Varco CMS-XL casing slips. 1 only 3.1/2" Varco SDML tubing slips.</p>
CASING / TUBING DRIFTS	:	<p>9 5/8, 7", 5 ½", 3 ½"</p>
THREAD PROTECTORS	:	<p>9 5/8, 7".</p>

KELLY SPINNER	:	One (1) Foster hydraulic kelly spinner with 6.5/8" LH connection.
PIPE SPINNER	:	One (1) International 850H hydraulic pipe spinner
WELDING EQUIPMENT	:	1 - Miller 400 amp welding machine. 1 - oxy acetylene set.
DOGHOUSE	:	1 Doghouse 5m x 2.4m x 2.3m
GENERATOR HOUSE	:	Ross Hill SCR
UTILITY HOUSE	:	1 Utility and Mechanics House
CATWALKS	:	2 catwalks total 18.6m long x 1.6m wide x 1.08m high
PIPE RACKS	:	8 - 9m tumble racks.
DAY FUEL TANK	:	1 only 19,000 ltrs
WATER/FUEL TANK	:	WATER 1 only 320 bbls. 1 only brake cooling tank 80 bbl FUEL 1 only 27,500 litres
OIL STORAGE	:	drums
DRILLING RATE RECORDER	:	1 only 6 pen Pioneer Geograph drill sentry recorder to record: weight (D) penetration (feet) pump pressure (0-6,000 psi) electric rotary torque rotary speed (rpm) pump spm (with selector switch)
DEVIATION RECORDER	:	1 set Totco 'Double Shot' deviation instrument 0□-8□.
INSTRUMENTS & INDICATORS	:	1 only Martin Decker Sealtite. 1 only Martin Decker Deadline type. 1 only drillers console including the following equipment. Martin Decker Weight Indicator type'D' Electric rotary torque gauge. MD Totco Mud Watch Instrumentation c/w display and alarms. Rotary rpm gauge
MUD TESTING	:	1 set Baroid mud testing laboratory (standard kit
RATHOLE DRILLER	:	One (1) fabricated rotary table chain driven.
MUD SAVER	:	Okeh unit
CELLAR PUMP	:	Cellar jet from No 1 pump
WATER PUMP	:	Three (3) Mission Magnum 2" x 3" centrifugal pumps c/w 20 HP, 600 Volts, 60 HZ, 3 phase explosion proof motors
FIRE EXTINGUISHERS	:	Dry Chemical Rig 22 Camp 20 CO2 Rig 3 Camp 0 Foam Rig 1 Camp 1
PIPE BINS	:	5 units
CUP TESTER	:	Two (2) Grey Cup Tester c/w test cups for 9.5/8" & 13.3/8" .
DRILLING LINE	:	5,000' 1.1/8" - E.I.P.S

TRANSPORT EQUIPMENT AND MOTOR VEHICLES

One (1) International 530 Forklift
One (1) Tray Top Utility
One (1) Crew Bus

CAMP EQUIPMENT

Four (4) x 8-Man Bunkhouses (12 man emergency)
One (1) x Recreation/Canteen unit
One (1) x Ablution/Laundry/Freezer unit
One (1) x Kitchen/Cooler/Diner unit
One (1) x Toolpushers unit
One (1) x Meeting / Smoko unit
One (1) x Combined Water/Fuel Tank unit
Two (2) x CAT 3304PC generator sets each 106 kVa, 86 KW, 50 HZ.

NOTE: At Contractor's discretion any of the foregoing items may be replaced by equipment of equivalent or greater capacity.

ENCLOSURE I 1:200m COMPOSITE LOG



ENCLOSURE II 1:500m MUDLOG



ENCLOSURE III STRUCTURE MAPS (Pre-Drilling)



ENCLOSURE IV WELL EVALUATION SUMMARY PLOT

