# SANTOS – BEACH PETROLEUM

## COMPILED FOR

## SANTOS LIMITED

(A.B.N. 80 007 550 923)

# MELBA 1

# WELL COMPLETION REPORT

Prepared By:
J.PITMAN
(Consultant)
JULY, 2003

# MELBA 1
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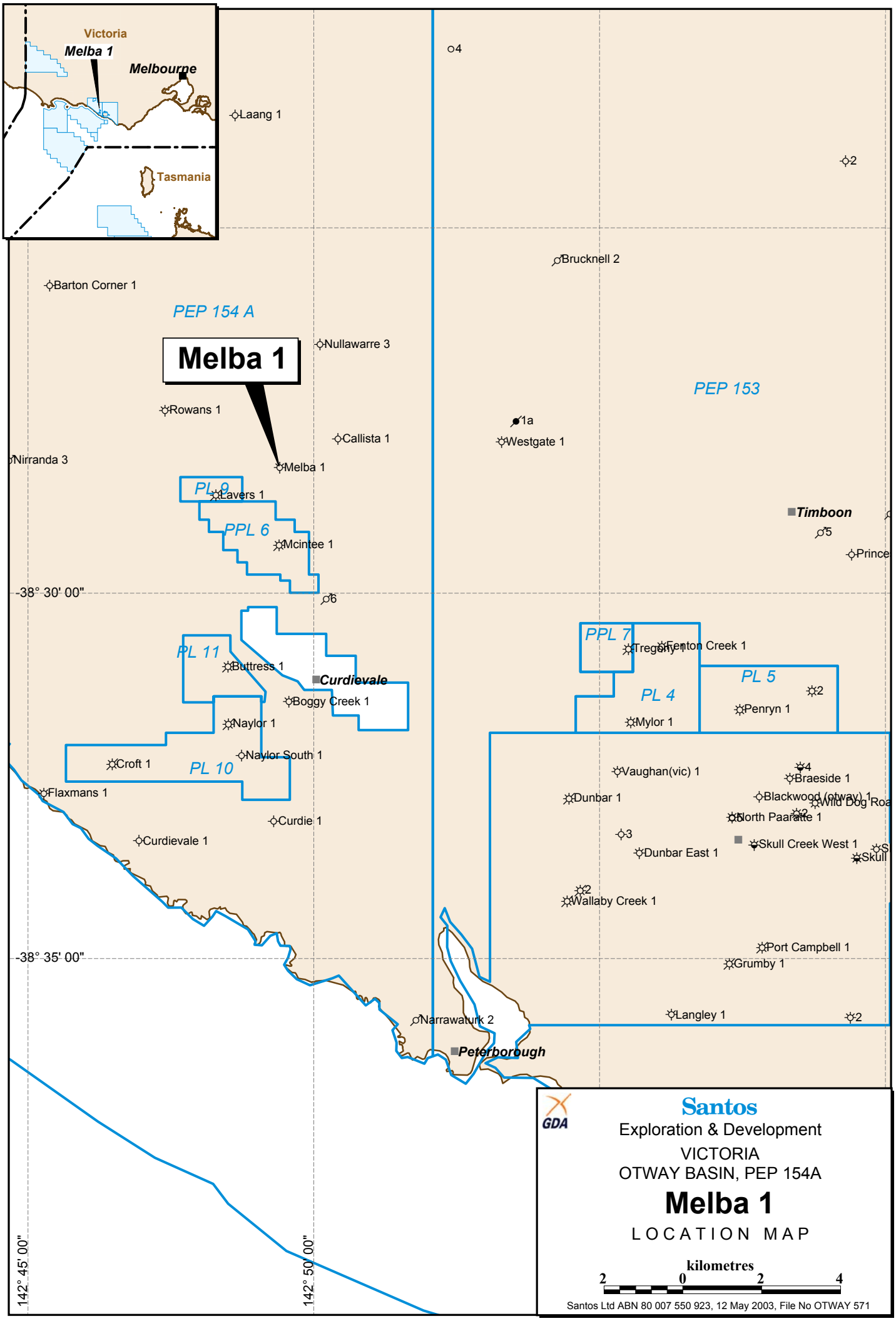
# LOCATION MAP


Victoria
Melba 1
Melbourne
Tasmania
Laang 1
4
2
Brucknell 2
Barton Corner 1
PEP 154 A
Melba 1
Nullawarre 3
PEP 153
Rowans 1
1a
Westgate 1
Callista 1
Nirranda 3
Melba 1
PL 9
Lavers 1
Timboon
PPL 6
Mcintee 1
5
Prince
-38° 30' 00"
6
PPL 7
Tregony 1
Fenton Creek 1
PL 11
Buttress 1
Curdievale
PL 5
PL 4
2
Boggy Creek 1
Penryn 1
Naylor 1
Mylor 1
Naylor South 1
Croft 1
PL 10
Vaughan(vic) 1
4
Braeside 1
Flaxmans 1
Dunbar 1
Blackwood (otway) 1
Wild Dog Roa
North Paaratte 1
Curdie 1
3
Curdievale 1
Skull Creek West 1
Dunbar East 1
Skull
2
Wallaby Creek 1
Port Campbell 1
-38° 35' 00"
Grumby 1
Langley 1
2
Narrawaturk 2
Peterborough
142° 45' 00"
142° 50' 00"
GDA
Santos
Exploration & Development
VICTORIA
OTWAY BASIN, PEP 154A
Melba 1
LOCATION MAP
kilometres
2 0 2 4
Santos Ltd ABN 80 007 550 923, 12 May 2003, File No OTWAY 571

# WELL DATA CARD

| | | | |
|---|---|---|---|
| **WELL:** MELBA 1 | **WELL CATEGORY:** EXP.<br>**WELL INTENT:** GAS | **SPUD:** 22/03/03 | **TD REACHED:** 28/03/2003 |
| | | **RIG RELEASED**: 31/03/2003 | **CMPLT**: |
| **LAT**: 38º 28' 16.58" S | **LONG**: 142º 49' 24.36" E **(GDA94)** | **RIG**: CENTURY 11 | |
| **SEISMIC STATION:** 2m SW of line OCV00-2537 SP: 10238 | | **STATUS**: PLUGGED AND ABANDONED | |
| **ELEVATION GND**: 71.2 M | **RT:** 76.2 M | **REMARKS**: LOG ANALYSIS INDICATES NO GAS PAY. | |
| **BLOCK/LICENCE**: PEP 154 VIC | | | |
| **TD** 1668 M (Logr) | 1668 M (Drlr) | | |
| **PBTD** M (Logr) | M (Drlr) | | |
| **TYPE STRUCTURE**: TILTED FAULT BLOCK | | | |
| **TYPE COMPLETION**: | | | |
| **ZONE(S):** | | | |

| HOLE SIZE | CASING SIZE | SHOE DEPTH | TYPE |
|---|---|---|---|
| 9-7/8" | 7-5/8" | 456m | 26.4# L80 |
| | | | |

| AGE | FORMATION OR ZONE TOPS | DEPTH (m) | | THICKNESS TVD (m) | HIGH (H) LOW (L) |
|---|---|---|---|---|---|
| | | LOGGERS MDRT | TVD SS | | |
| RECENT TO MID – LATE | SURFICIAL SEDIMENTS AND | | | | |
| MIOCENE | PORT CAMPBELL LIMESTONE | 5 | 71.2 | 178 | as prog |
| EARLY MIOCENE | GELLIBRAND MARL | 183 | -106.8 | 325.5 | not prog |
| EARLY-LATE OLIGOCENE – EARLY AQUITANIAN | CLIFTON FORMATION | 509 | -432.3 | 15 | 9.3 L |
| LATE EOCENE | NARRAWATURK MARL | 524 | -447.3 | 44.5 | 4.3 L |
| MID EOCENE | MEPUNGA FORMATION | 568 | -491.8 | 80 | 11.8 L |
| EARLY – MID EOCENE | DILWYN FORMATION | 648 | -571.8 | 209.4 | 5.8 L |
| LATE PALEOCENE – EARLY EOCENE | PEMBER MUDSTONE | 859 | -781.2 | 44.7 | 3.2 L |
| EARLY – LATE PALEOCENE | PEBBLE POINT FORMATION | 904 | -825.9 | 29.7 | 14.9 L |
| LATE SENONIAN | PAARATTE FORMATION | 934.5 | -855.6 | 276.8 | 5.6 L |
| LATE SENONIAN | SKULL CREEK MUDSTONE | 1222 | -1132.4 | 93.8 | 22.4 L |
| LATE SENONIAN | NULLAWARRA SANDSTONE | 1320 | -1226.2 | 159.6 | 24.2 L |
| LATE SENONIAN | BELFAST MUDSTONE | 1484.5 | -1385.8 | 23.2 | 40.8 L |
| LATE SENONIAN | FLAXMAN FORMATION | 1508.5 | -1409 | 28.8 | 1 H |
| LATE SENONIAN | WAARRE SANDSTONE | 1538.5 | -1437.8 | 53.4 | 2.8 L |
| EARLY NEOCOMIAN | EUMERALLA FORMATION | 1594 | -1491.2 | 73 | 1.2 L |
| | TOTAL DEPTH | 1668 | -1564.2 | | 24.2 L |

| LOG INTERPRETATION (Interval Averages) | | | | | |
|---|---|---|---|---|---|
| INTERVAL (m) | Ø % | SW % | INTERVAL (m) | Ø % | SW % |
| No Conventional Pay was identified in this well. | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| PERFORATIONS (4 shots/ft) | |
|---|---|
| FORMATION | INTERVAL |
| | |
| | |
| | |
| | |
| | |

| CORES | | | | |
|---|---|---|---|---|
| FORM | NO. | INTERVAL | CUT | REC |
| | | | | |
| | | | | |

| LOG | SUITE/ RUN | INTERVAL | BHT/TIME/ REMARKS | LOG | SUITE/ RUN | INTERVAL | BHT/TIME/ REMARKS |
|---|---|---|---|---|---|---|---|
| **PEX** | 1 / 1 | | 60ºC / 9.5 HOURS | MDT | 1 / 2 | | Cancelled |
| HGNS | | | | | | | |
| GR | | 1641-surface | | CST | 1 / 3 | 1592 - 1495 | 18 bullets shot, 15 |
| NGT | | 1641 - 1360 | | | | | recovered, 1 lost bullet, |
| TNPH | | 1647 - 456 | | | | | 2 empty |
| HRMS | | | | | | | |
| RXOZ | | 1646 - 456 | | | | | |
| RHOZ | | 1647 - 456 | | | | | |
| HCAL | | 1646 - 456 | | | | | |
| HALS | | | | | | | |
| HLLD | | 1666 - 456 | | | | | |
| HLLS | | 1666 - 456 | | | | | |
| DSI | | 1660 - 456 | | | | | |
| SP | | 1628 - 456 | | | | | |

| FORMATION TESTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **NO.** | **INTERVAL (ft)** | **FORMATION** | **FLOW (mins)** | **SHUT IN (mins)** | **BOTTOM GAUGE IP/FP (psia)** | **SIP** | **MAX SURF PRESS (psig)** | **FLUID TO SURF (mins)** | **TC/ BC** | **REMARKS** |

No drill stem tests were conducted at the Melba 1 location.


**SUMMARY**:

Melba 1 was drilled as an Otway Basin near field exploration wildcat well in the PEP 154 licence. The Melba structure is situated within the Port Campbell Embayment and the productive Waare Sandstone play fairway, immediately north of PPL 6. Melba 1 is 1.8 km NE of the Lavers 1 discovery and 2.0 km N of the McIntee gas field. Melba 1 was drilled as a directional well due to surface constraints on the well location.

Melba 1 was spudded on the 22nd March 2003 utilising the drilling rig Century 11. A 9-7/8" hole was drilled to 457m and 37 joints of 7 5/8" 26.4 lb/ft casing run with the shoe set at 456m. The Blow Out Preventer was installed and pressure tested prior to drilling ahead. The 6¾" drilling assembly was made up with a mud motor and run into the hole drilling the shoe track and 3m of new formation to 460m. The hole was displaced to KCl/PHPA/Polymer mud and a Leak Off Test conducted yielding an equivalent mud weight of 16.1 ppg. Drilling 6¾" hole continued to kick-off point at 816m. The well was kicked-off utilising a combination of slide and rotary drilling with MWD directional surveys taken as required building the angle to 15 degrees. Drilling continued to 1184m where the bit was pulled from the hole due to rotational hours. The 6¾" hole section was completed in two bit runs with total depth reached at 1668m on 28th March 2003 at 21:30 hours. After reaching total depth Suite 1 wireline logs were conducted. Wireline results indicated no pay for the well. Abandonment plugs were set and the rig released at 02:00 hrs on 31st March 2003.

Formation tops were intersected from 1m high for the Flaxman Formation to 41m low for the Belfast Mudstone. The Waarre Sandstone, the primary target for the well was intersected 2.8m low to prognosis.

Good gas shows were observed while drilling. Suite 1 wireline logs conducted at total depth consisted of Run 1 Pex-DSI-NGT and Run 3 CST (18 sidewalls attempted, 15 recovered, 2 empty and 1 lost bullet). Run 2 MDT was cancelled based on the results of Run 1 which indicated no gas pay. No drill stem tests were conducted at the Melba 1 location.

Due to surface constraints Melba 1 was drilled as a directional well. The well was drilled vertically to kick-off point at 816m. The well was kicked – off at 16º to the north-east with LWD surveys taken as instructed by the directional driller. At total depth the well was located at 212m to 45.13º.

After conducting wireline logs at total depth abandonment plugs were set and the rig was released on 31st March 2003 at 02:00 hours.


| | |
|---|---|
| **AUTHOR**: J.PITMAN | **DATE**: JULY 2003 |

# WELL HISTORY

# 1. GENERAL DATA

| | | |
|---|---|---|
| Well Name: | MELBA 1 | |
| Well Classification: | Gas Exploration | |
| Block Voting Factor: | SANTOS Group.<br>Beach Petroleum. | 90.0%<br>10.0% |
| Investment Factor: | SANTOS Group.<br>Beach Petroleum. | 90.0%<br>10.0% |
| Block: | Former PSW Block South Australia | |
| License: | PEP 154 Victoria | |
| Operator: | SANTOS Limited | |
| Surveyed Location: (GDA94) | Latitude: 38° 28' 16.58" South<br>Longitude: 142° 49' 24.36" East | |
| Surveyed Elevation: (AHD) | Ground Level: 71.2m<br>Rotary Table: 76.2m | |
| Seismic Location: | 2m SW of line OCV00-2537 SP: 10238 | |
| Seismic Survey: | Curdievale 3D seismic | |
| Total Depth | Driller: 1668m<br>Logger (Extrapolated): 1668m | |
| Status: | Plugged and Abandoned Dry Hole | |

# 2. DRILLING DATA

| | |
|---|---|
| Date Drilling Commenced: | 14:30 Hours, 22nd March 2003. |
| Date Drilling Completed: | 21:30 Hours, 28th March 2003. |
| Date Rig Released: | 02:00 Hours, 31st March 2003. |
| Contractor: | Century Resources |
| Rig: | CDL 11 |
| Rig Specifications: | Refer to Appendix XII |

# 3. DRILLING SUMMARY

## (a) Drilling Summary (All Depths Driller's KB)

Melba 1 was drilled as an Otway Basin near field exploration wildcat well in the PEP 154 licence. Melba 1 was drilled as a directional well due to surface constraints on the well location.

Melba 1 was spudded on the 22nd March 2003 utilising the drilling rig Century 11. The 9-7/8" hole section was drilled in one bit run to 457m utilising a Hughes GT-C1. 37 joints of 7 5/8" 26.4 lb/ft casing were run with the shoe set at 456m. The Blow Out Preventer was installed and pressure tested prior to drilling ahead.

The 6¾" drilling assembly was made up with a mud motor and a Hughes STR09 bit. The shoe track and 3m of new formation were drilled to 460m. The hole was displaced to KCl/PHPA/Polymer mud and a Leak Off Test conducted yielding an equivalent mud weight of 16.1 ppg.

Drilling 6¾" hole continued to kick-off point at 816m. The well was kicked-off utilising a combination of slide and rotary drilling with MWD directional surveys taken as required building the kick-off angle to 15 degrees.

Drilling continued to 1184m where the bit was pulled from the hole due to increased rotational hours. The 6¾" hole section was completed in two bit runs with total depth reached at 1668m on 28th March 2003 at 21:30 hours.

After reaching total depth Suite 1 wireline logs were conducted and consisted of Run 1 Pex-DSI-NGT and Run 3 CST (18 sidewalls attempted, 15 recovered, 2 empty and 1 lost bullet). Run 2 MDT was cancelled based on the results of Run 1 which indicated no gas pay for the well.

Abandonment plugs were set and the rig released at 02:00 hrs on 31st March 2003.

Tables 1 and 2 below, summarise the major drilling operations in this hole. More comprehensive summaries are appended to this report (Appendix VIII: Drilling and Casing Report).

**TABLE 1: CASING, HOLE AND CEMENT DETAILS**

| *BIT SIZE* | *DEPTH* | *CASING SIZE* | *CASING DEPTH* | *JOINTS* | *CASING TYPE/* | *CEMENT* |
|---|---|---|---|---|---|---|
| 9-7/8" | 457m | 7-5/8" | 456m | 37 | 26.4 lb/ft L80 | Lead: 297 sacks class "G" cement with 1.5% bentonite and 63 bbls of mix water , mixed to a slurry weight of 13.5 ppg. |
| 7-5/8" | 1668m | | | | | Plugged and abandoned. |

**TABLE 2: SUMMARY OF MUD SYSTEMS**

| *MUD TYPE* | *INTERVAL* |
|---|---|
| Spud Mud | Surface to 457m (7-5/8" casing point) |
| KCl / PHPA | 457m to 1668m (Total Depth) |

**(b) Lost Time**

A time breakdown is included in Appendix VIII.

**(c) Water Supply**

The water supply was from the rig bore with a resistivity of 7.5 ohm.m @ 75°F.

(d) **Mudlogging Services**

Mudlogging services were provided by Geoservices (Unit 71). Samples were collected, washed and described at 10m intervals from spud to 987m and 3 and 6m intervals from 987m to TD at 1668m. All samples were checked for oil shows using ultraviolet fluorescence. Gas levels and compositions were monitored from surface to TD using F.I.D. total gas and chromatograph detectors. Other parameters monitored included rate of penetration, mud pit levels and pump strokes.

**(e) Testing**

No drill stem tests were conducted at the MELBA 1 location.

**(f) Coring**

No cores were cut on MELBA 1.

## (g) Electric Logging

One suite of electric logs were run as detailed below:

| *LOG* | *RUN* | *INTERVAL* | *BHT/TIME* | *OTHER* |
|---|---|---|---|---|
| **PEX** | 1 / 1 | | 60ºC / 9.5 HOURS | |
| HGNS | | | | |
| GR | | 1641-surface | | |
| NGT | | 1641 - 1360 | | |
| TNPH | | 1647 - 456 | | |
| HRMS | | | | |
| RXOZ | | 1646 - 456 | | |
| RHOZ | | 1647 - 456 | | |
| HCAL | | 1646 - 456 | | |
| HALS | | | | |
| HLLD | | 1666 - 456 | | |
| HLLS | | 1666 - 456 | | |
| DSI | | 1660 - 456 | | |
| SP | | 1628 - 456 | | |
| MDT | 1 / 2 | | | Cancelled |
| CST | 1 / 3 | 1592 - 1495 | | 18 bullets shot, 15 recovered, 1 lost bullet, 2 empty |

## (h) Geothermal Gradient

A bottom hole temperature of 166°Fht was extrapolated from the logging run temperature data which enabled a geothermal gradient of 1.72°F / 100' to be calculated. A surface temperature of 70°F was assumed. Temperature data used is listed in Appendix IV. The results are displayed graphically in Appendix IV.

## (i) Hole Deviation

MELBA 1 was drilled as a deviated well due to surface constraints. Deviation was monitored during the 9-7/8" section utilising single shot directional surveys. Through the 6¾" hole section the well was drilled vertically to kick-off point at 816m. The well was kicked – off at 16º to the north-east with LWD surveys taken as instructed by the directional driller. At total depth the well was located at 212m to 45.13º. Deviation results are summarised in Appendix V and the Composite Log (Enclosure I).

## (j) Velocity Survey

No velocity survey was conducted at MELBA 1.

## (k) Casing and Completion Summary

A surface string of 7-5/8" casing was run to 456m. The well was drilled to a total depth of 1668m(D) and after logging the well was plugged and abandoned. Further details are appended to this report (Appendix VIII:- Drilling and Casing Report).

# GEOLOGY

## 1. PRE-DRILLING SUMMARY ( after Well Proposal – MELBA 1)

Melba 1 is proposed as an Otway Basin near field exploration wildcat well in the PEP 154 licence. The Melba structure is situated within the Port Campbell Embayment and the productive Waarre Sandstone play fairway, immediately north of PPL 6. The proposed well is 1.8 km NE of the Lavers 1 discovery, and 2.0 km N of the McIntee gas field (Figure 1).

The Melba Prospect is a tilted fault block closure defined by 3-D seismic with a Waarre Sandstone primary target, a proven play type in the area (Figure 2). The prospect is potentially a common pool with the Lavers 1 gas discovery, hence the risk of a high CO2 content is considered minimal.

The Melba Prospect is one of the largest remaining prospects currently mapped within PEP 154, with the highest mean prognosed (untruncated) success case raw gas (5.5 Bcf), and the highest risked mean expected reserves (2.2 Bcf raw gas). Melba has a probability of commercial success (Pc) of 40% (Attachment 1).

Melba 1 is also an attractive project as it is close to the gathering system at McIntee, enabling rapid tie-in in the success case with a flow-line of approximately 2.5 km (Figure 1).

Melba 1 is a critical test of a series of seismic attributes which are believed to be characteristic of Waarre gas accumulations in the Port Campbell Embayment, and if successful will provide new criteria to re-evaluate the remaining prospects within PEP 154.

## 2. DRILLING RATIONALE (after Well Proposal – MELBA 1)

### 2.1 Geological/Geophysical Summary

The Melba Prospect is up-dip of, and potentially a common pool with, the 10 metres of gas pay discovered in the Waarre Sandstone by the Lavers 1 well (Figure 3). The prospect is strongly supported by seismic amplitude anomalies. The up-thrown structural closure at Melba has a time consistent down-dip amplitude termination at 1228 milliseconds on the north and west side of the structure, which is coincident with the gas-water contact observed in the Lavers 1 well. The prospect is also consistent with the following five amplitude characteristics which are generally seen on 3-D seismic associated with other Port Campbell Embayment gas fields (Figures 2, 4, & 5):

Stronger peak amplitude at the top of the Waarre Sandstone,
Strong trough amplitude from the gas-water contact,
AVO (amplitude stronger on far offset ranges),
Frequency/amplitude shadow beneath the gas reservoir, and
Gas chimney effects above the anomaly causing amplitude deterioration in the crest of the structure and time sag relative to wells outside the gas chimney area.

Amplitudes in the south-eastern portion of the Melba structure are diminished by an apparent gas sand-type amplitude occurring in the lower part of the overlying Belfast Formation.

### 2.2 Closure (Pcl = 0.90)

The trap for Melba 1 is well-defined by 3-D seismic, and there are a number of nearby wells to provide good velocity control for depth conversion of the structure. Gas charging of the section overlying the Waarre Sandstone may cause velocity "sags" on the crests of structures, with many of the discoveries in the area coming in significantly high to prognosis at top reservoir.

### 2.3 Reservoir (Prs = 0.90)

Reservoir is present in all surrounding wells (Rowans 1, Lavers 1, Callista 1, and McIntee 1), and is not expected to be a major risk for Melba 1. However, the Waarre C primary target sand does thin somewhat and become poorer quality at Callista 1 (Figure 6), hence there is a slight risk on reservoir.

### 2.4 Seal (Psl = 0.60)

Cross-fault seal is the primary risk of the project. The Waarre Sandstone target in the footwall is potentially juxtaposed against Nullawarre Sandstone in the hangingwall of the main fault to the northeast. However, the fault appears on inspection of a 3-D seismic coherency volume to consist of multiple fault planes with smaller heaves, with the Belfast Shale/Flaxmans Formation within the fault sliver providing a seal for the pool. Alternatively, the fault zone may have sufficient fault smear to provide a seal to the pool.

The adjacent McIntee Field, as well as the recently drilled Seamer Field, are two Waarre Sandstone gas fields within the Port Campbell Embayment where similar cross-fault sand juxtapositions exist, and require a similar mechanism to Melba to provide a seal.

### 2.5 Charge (Pch = 0.85)

Charge is not considered a major risk at Melba, as Lavers and Melba appear to be a common pool. In addition, the Melba structure displays the majority of seismic attributes which are characteristic of adjacent hydrocarbon accumulations. The reservoir section has a high trough amplitude related to an inferred gas-water contact, the reflection displays a strong AVO effect, there is an amplitude/frequency shadow beneath the prospect, and there is a gas chimney effect above the prospect. The seismic peak occurring at the top of the reservoir does not have the characteristic high amplitude in the crest of the structure, but does have high amplitudes on the flanks of the structure down to the inferred gas-water contact. The absence of the peak amplitude over the crest of the field is believed to be due to the gas chimney effect decreasing the density/velocity contrast at the top of the reservoir.

If the saddle and/or fault between Lavers and Melba are not as mapped and do partition the pool, there is a slight risk that the seismic characteristics observed at Melba could be due to residual gas saturations.

High concentration of CO2 is not expected to be a major issue, as the gas is expected to have a similar composition to Lavers (0.47% CO2).

# 3. RESULTS OF DRILLING

## (a) Stratigraphy

**TABLE 2:- COMPARISON OF THE ACTUAL AND PROGNOSED STRATIGRAPHY OF MELBA 1**

(RT = 76.2m)

| AGE | FORMATION OR ZONE | ACTUAL DEPTH | PROG DEPTH | DIFF HI/LO | ACTUAL THICK | PROG THICK | DIFF +/- |
|---|---|---|---|---|---|---|---|
| RECENT TO MID – LATE MIOCENE | SURFICIAL SEDIMENTS AND PORT CAMPBELL LIMESTONE | 71.2 | 71.2 | as prog | 178 | | |
| EARLY MIOCENE | GELLIBRAND MARL | -106.8 | NP | not prog | 325.5 | NP | - |
| EARLY-LATE OLIGOCENE – EARLY AQUITANIAN | CLIFTON FORMATION | -432.3 | -423 | 9.3 L | 15 | 20 | -5 |
| LATE EOCENE | NARRAWATURK MARL | -447.3 | -443 | 4.3 L | 44.5 | 37 | +7.5 |
| MID EOCENE | MEPUNGA FORMATION | -491.8 | -480 | 11.8 L | 80 | 86 | -6 |
| EARLY – MID EOCENE | DILWYN FORMATION | -571.8 | -566 | 5.8 L | 209.4 | 212 | -2.6 |
| LATE PALEOCENE – EARLY EOCENE | PEMBER MUDSTONE | -781.2 | -778 | 3.2 L | 44.7 | 33 | +11.7 |
| EARLY – LATE PALEOCENE | PEBBLE POINT FORMATION | -825.9 | -811 | 14.9 L | 29.7 | 39 | -9.3 |
| LATE SENONIAN | PAARATTE FORMATION | -855.6 | -850 | 5.6 L | 276.8 | 260 | +16.8 |
| LATE SENONIAN | SKULL CREEK MUDSTONE | -1132.4 | -1110 | 22.4 L | 93.8 | 92 | +1.8 |
| LATE SENONIAN | NULLAWARRA SANDSTONE | -1226.2 | -1202 | 24.2 L | 159.6 | 143 | +16.6 |
| LATE SENONIAN | BELFAST MUDSTONE | -1385.8 | -1345 | 40.8 L | 23.2 | 65 | -41.8 |
| LATE SENONIAN | FLAXMAN FORMATION | -1409 | -1410 | 1 H | 28.8 | 25 | +3.8 |
| LATE SENONIAN | WAARRE SANDSTONE | -1437.8 | -1435 | 2.8 L | 53.4 | 55 | -1.6 |
| EARLY NEOCOMIAN | EUMERALLA FORMATION | -1491.2 | -1490 | 1.2 L | 73 | 50 | +13 |
| | TOTAL DEPTH | -1564.2 | -1540 | 24.2 L | | | |

Drilling was terminated after penetrating 73m of the Eumeralla Formation (Early Cretaceous) which was intersected 1.2m low to prognosis. The formation consists of sandstone with thinly interbedded siltstone. Sandstones are clear, translucent and white, fine to medium grained, subangular to subrounded, moderately well sorted, with weak calcareous cement, abundant white argillaceous matrix and trace pyrite, mica and common to abundant volcanics. Porosity was poor to fair with no hydrocarbon fluorescence observed. Siltstones are grey brown, argillaceous and soft to firm. The Eumeralla was deposited in a low-energy fluviatile environment with occasional high energy channels.

The Sherbrook Group (Late Cretaceous) unconformably overlies the Eumeralla Formation. The Waarre Formation is the oldest formation of the group and consists of sandstone with interbedded claystone. Sandstones are clear, translucent, fine to coarse grained with weak siliceous cement and fair inferred porosity. Claystones are light grey, silty and dispersive. The Waarre Sandstone was deposited in a shallow marine environment.

The Waarre Sandstone is conformably overlain by the Flaxman Formation. At the Melba 1 location the Flaxman Formation is 28.8m thick and was intersected 1m high to prognosis. It consists of interbedded sandstone and claystone. Sandstones are translucent, clear, very fine to medium grained with moderately strong siliceous cement, common white argillaceous matrix and have trace glauconite and pyrite. Aggregates are hard and exhibit poor to fair porosity. Claystones are light to medium greenish grey, silty, with trace shell fragments, trace glauconite and pyrite and are soft to firm. The Flaxman Formation was deposited in a marine transgressive environment.

The Belfast Mudstone conformably overlies the Flaxman Formation. At Melba 1 the Belfast Mudstone is 23.2m thick and was intersected 41m low to prognosis. The Belfast Mudstone consists of claystone which is medium to dark grey, occasionally silty, with common glauconite and is soft to dispersive. The Belfast Mudstone was deposited in low-energy marine conditions, in a pro-delta environment.

The Nullawarre Formation conformably overlies the Belfast Mudstone and was penetrated 24.2m low to prognosis. The Nullawarre Formation at Melba 1 consists of sandstone with thin interbedded siltstones. Sandstones are clear, translucent, fine to medium grained with weak siliceous cement, trace pyrite and common glauconite, fair visual porosity and no fluorescence. Siltstones are brownish grey, argillaceous, with trace glauconite and are soft to dispersive. The Nullawarre Formation was deposited in a shallow water marine environment.

The Skull Creek Mudstone conformably overlies the Nullawarre Sandstone and was intersected 22.4m low to prognosis at 1222m. The formation at Melba 1 consists of pale to medium brownish grey siltstone. Accessories include pyrite, glauconite, carbonaceous specks and micro mica. The siltstone is soft to dispersive. The Skull Creek Mudstone was formed in a pro-delta environment of deposition.

The Paaratte Formation conformably overlies the Skull Creek Mudstone and was intersected 5.6m low to prognosis. The formation is 277m thick at Melba 1 and consists of interbedded sandstone and claystone. Sandstones are off white, clear, translucent, medium to very coarse grained with weak siliceous cement and exhibit good visual porosity. Pyrite nodules are common. The claystone is medium brownish grey, micro micaceous, soft and dispersive. The Paaratte Formation was deposited in a deltaic environment.

The Pebble Point Formation unconformably overlies the Paaratte Formation and is 29.7m thick at the Melba 1 location. The Pebble Point Formation consists of claystone with thin sandstone interbeds, The claystone is medium brown, micro micaceous with occasional carbonaceous specks, pyrite and id dispersive. The sandstone seen in the Pebble Point Formation is brown, clear to translucent, off white, medium to occasionally coarse, poorly sorted, subrounded to occasionally subangular. The Pebble Point Formation was deposited in a shallow water, near-shore, restricted marine environment with periodic influxes of coarse detrital material.

The Pember Mudstone conformably overlies the Pebble Point Formation. It consists of medium brown claystone which is micro micaceous, soft to dispersive. The Pember Mudstone is 44.7m thick at the Melba 1 location. 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.

The Dilwyn Formation conformably overlies the Pember Mudstone and consists of interbedded sandstone and claystone. The sandstone is a light to medium brown, yellow brown, translucent, fine to medium with occasional coarse grains, calcareous cement and common grey brown argillaceous matrix. The claystone is light to medium brown, calcareous with trace fossil

fragments. It is soft to firm and amorphous. The Dilwyn Formation was deposited in a shallow marine environment with shore-face deposits of a coastal barrier system.

The Dilwyn Formation is disconformably overlain by the Mepunga Formation. The Mepunga Formation is 80m thick at the Melba 1 location and consists of sandstone with interbedded claystone. The sandstone is clear, translucent, fine to medium grained, predominantly unconsolidated with trace argillaceous matrix. Porosity is good and no hydrocarbon fluorescence was observed. The claystone is light grey brown, olive grey and is soft to dispersive.

The Narrawaturk Marl conformably overlies the Mepunga Formation. The formation is 44.5m thick at Melba 1 and consists of light to medium grey claystone with trace fossil fragments and is soft to dispersive. The Narrawaturk Marl was deposited in a shallow marine environment.

The Clifton Formation overlies the Narrawaturk Formation and consists of limestone deposited in a shallow marine environment. The limestone is pale to medium orange brown with common iron staining. Fossil fragments are common in the limestone.

The Gellibrand Marl conformably overlies the Clifton Formation and consists of pale to dark grey, brownish grey marl deposited in low-energy, continental shelf environment. Fossil fragments are common.

At Melba 1 the Port Campbell Limestone overlies the Gellibrand. The limestone is the upper formation in the Heytesbury Group and consists of limestone with thin sandstone interbeds. The limestone is off white to pale yellow, arenaceous with abundant fossil fragments. Sandstones are translucent, clear, loose with good inferred porosity. The Port Campbell Limestone is Middle to Late Miocene in age and was deposited in a moderate-energy, continental shelf environment.

**(b) <u>Geophysical prognosis</u> (reproduced from the well program)**

The Melba Prospect is up-dip of, and potentially a common pool with, the 10 metres of gas pay discovered in the Waarre Sandstone by the Lavers 1 well (Figure 3). The prospect is strongly supported by seismic amplitude anomalies. The up-thrown structural closure at Melba has a time consistent down-dip amplitude termination at 1228 milliseconds on the north and west side of the structure, which is coincident with the gas-water contact observed in the Lavers 1 well. The prospect is also consistent with the following five amplitude characteristics which are generally seen on 3-D seismic associated with other Port Campbell Embayment gas fields (Figures 2, 4, & 5):

Stronger peak amplitude at the top of the Waarre Sandstone,
Strong trough amplitude from the gas-water contact,
AVO (amplitude stronger on far offset ranges),
Frequency/amplitude shadow beneath the gas reservoir, and
Gas chimney effects above the anomaly causing amplitude deterioration in the crest of the structure and time sag relative to wells outside the gas chimney area.

Amplitudes in the south-eastern portion of the Melba structure are diminished by an apparent gas sand-type amplitude occurring in the lower part of the overlying Belfast Formation.

**TABLE 3: COMPARISONS BETWEEN ACTUAL AND PROGNOSED DEPTHS FOR MELBA 1 AND McINTEE 1**

| *HORIZON* | *PROG DEPTH* | *ACTUAL DEPTH* | *HI/ LO* | *McINTEE 1* | *HI/LO* |
|---|---|---|---|---|---|
| Port Campbell Lst | 71.2 | 71.2 | as prog | | |
| Gellibrand Marl | | -106.8 | not prog | | |
| Clifton Fm | -423 | -432.3 | 9.3 L | -415 | 17.3 L |
| Narrawaturk Marl | -443 | -447.3 | 4.3 L | -431 | 16.3 L |
| Mepunga Fm | -480 | -491.8 | 11.8 L | -466 | 25.8 L |
| Dilwyn Fm | -566 | -571.8 | 5.8 L | -558 | 13.8 L |
| Pember Mdst | -778 | -781.2 | 3.2 L | -797 | 15.8 H |
| Pebble Point Fm | -811 | -825.9 | 14.9 L | -840 | 14.1 H |
| Paaratte Fm | -850 | -855.6 | 5.6 L | -860 | 4.4 H |
| Skull Creek Mdst | -1110 | -1132.4 | 22.4 L | -1174 | 41.6 H |
| Nullawaarre Grnsnd | -1202 | -1226.2 | 24.2 L | -1287 | 60.8 H |
| Belfast Mdst | -1345 | -1385.8 | 40.8 L | -1383 | 2.8 L |
| Flaxmans Fm | -1410 | -1409 | 1 H | -1457 | 48 H |
| Waarre Fm, | -1435 | -1437.8 | 2.8 L | -1474 | 36.2 H |
| Eumeralla Fm | -1490 | -1491.2 | 1.2 L | -1536 | 44.8 H |
| TD | -1540 | -1564.2 | 24.2 L | | |

## (c) Hydrocarbon Summary

Ditch gas values were monitored and recorded in units (U) by F.I.D (flame ionisation detector) Total Gas detector, where one unit is equivalent to 200 ppm (parts per million) of methane gas in air. The ditch gas was also monitored for hydrocarbon gas composition by a F.I.D. chromatograph. Gas composition refers to percent components of the hydrocarbon alkane series: (methane, ethane, propane and butane). Ditch cuttings were tested for hydrocarbon fluorescence by using an ultra-violet fluoroscope. All depths quoted have been adjusted to correlate with electric log depths.

### Surface to base Paaratte Formation

Hydrocarbon gas consisting of 100% C1 was first observed in the Paaratte Formation from 1100m and ranged from trace to 2 U. from 1150m background gas increased to 2 – 4 U (95/5) and remained within this range to the top of the Skull Creek Mudstone at 1222m. No other hydrocarbon indications were observed.

### Skull Creek Mudstone

Background gas increased through the Skull Creek Mudstone reaching a maximum of 15 U (68/11/16/10). The primary lithology was argillaceous siltstone with a reduced average penetration rate of 10m/hr. C3 and C4 were first observed at 1280m. No other hydrocarbon indications were observed.

### Nullawarre Formation to base Belfast Mudstone

Upon penetrating the sandstones of the top Nullawarre Formation gas peaked at 180 U (58/16/15/9/2). The sandstone was translucent, clear, fine to medium grained with weak siliceous cement and fair visual porosity. No hydrocarbon fluorescence was observed. Background gas quickly decreased after the initial peak at the top of the Nullawarre Formation and ranged from trace to 10 U (96/4/trace) through the remainder of the formation. Penetration rate averaged 25m/hr. No other hydrocarbon indications were observed.

Background gas remained low through the claystones of the Belfast Mudstone reaching a maximum of 8 U (85/7/5/3).

**Flaxman Formation**

The Flaxman Formation was 28.8m thick at Melba 1. Background gas ranged from 10 – 25 U (90/5/3/2). A thin sandstone stringer at 1512m MDRT liberated a gas peak of 140 U (73/8/7/8/4). No other indications of hydrocarbons were observed.

**Waarre Sandstone**

The Waarre Sandstone was the primary target for the well. The formation was 53.4m thick at Melba 1 and was intersected 2.8m low to prognosis at 1538.5m MDRT (-1437.8m TVDSS).

Gas peaked at 400 U (89/7/3/1) upon penetrating the Waarre Sandstone. Sandstones were clear, translucent, fine to coarse grained with weak siliceous cement and predominantly loose. Porosity was fair. Background gas ranged from 20 – 30 U (90/8/2) with peaks observed at 1565m (200 U 90/8/2), 1575m (600 U 90/6/3/1) and 1580m MDRT (300 U 90/7/2/1). No Carbon Dioxide was indicated.

No hydrocarbon fluorescence was observed. Log analysis indicated no pay for the Waarre Sandstone. The well was subsequently plugged and abandoned.

**Eumeralla Formation**

Upon penetrating the upper sandstones of the Eumeralla Formation gas peaked at 600 U (88/8/3/1). Sandstones were translucent, clear, white, fine to coarse grained with weak calcareous cement, abundant white argillaceous matrix and poor to fair inferred porosity. The formation was 73m thick at Melba 1. Through the remainder of the section background gas ranged from 20 to 40 U (88/8/3/1). No hydrocarbon fluorescence was observed. Log analysis indicates no pay for the Eumeralla Formation.

## 4. SUMMARY

Melba 1 was drilled as an Otway Basin near field exploration wildcat well in the PEP 154 licence. The Melba structure is situated within the Port Campbell Embayment and the productive Waare Sandstone play fairway, immediately north of PPL 6. Melba 1 is 1.8 km NE of the Lavers 1 discovery and 2.0 km N of the McIntee gas field. Melba 1 was drilled as a directional well due to surface constraints on the well location.

Melba 1 was spudded on the 22nd March 2003 utilising the drilling rig Century 11. A 9-7/8" hole was drilled to 457m and 37 joints of 7 5/8" 26.4 lb/ft casing run with the shoe set at 456m. The Blow Out Preventer was installed and pressure tested prior to drilling ahead. The 6¾" drilling assembly was made up with a mud motor and run into the hole drilling the shoe track and 3m of new formation to 460m. The hole was displaced to KCl/PHPA/Polymer mud and a Leak Off Test conducted yielding an equivalent mud weight of 16.1 ppg. Drilling 6¾" hole continued to kick-off point at 816m. The well was kicked-off utilising a combination of slide and rotary drilling with MWD directional surveys taken as required building the angle to 15 degrees. Drilling continued to 1184m where the bit was pulled from the hole due to rotational hours. The 6¾" hole section was completed in two bit runs with total depth reached at 1668m on 28th March 2003 at 21:30 hours. After reaching total depth Suite 1 wireline logs were conducted. Wireline results indicated no pay for the well. Abandonment plugs were set and the rig released at 02:00 hrs on 31st March 2003.

Formation tops were intersected from 1m high for the Flaxman Formation to 41m low for the Belfast Mudstone. The Waarre Sandstone, the primary target for the well was intersected 2.8m low to prognosis.

Good gas shows were observed while drilling. Suite 1 wireline logs conducted at total depth consisted of Run 1 Pex-DSI-NGT and Run 3 CST (18 sidewalls attempted, 15 recovered, 2 empty and 1 lost bullet). Run 2 MDT was cancelled based on the results of Run 1 which indicated no gas pay. No drill stem tests were conducted at the Melba 1 location.

Due to surface constraints Melba 1 was drilled as a directional well. The well was drilled vertically to kick-off point at 816m. The well was kicked – off at 16º to the north-east with LWD surveys taken as instructed by the directional driller. At total depth the well was located at 212m to 45.13º.

After conducting wireline logs at total depth abandonment plugs were set and the rig was released on 31st March 2003 at 02:00 hours.

## 5. REFERENCES


| | |
|---|---|
| SANTOS, 2003 | MELBA 1 Well Proposal, prepared for SANTOS Ltd, (unpublished). |
| PITMAN,J., 2003 | MELBA 1 Raw Data Report, prepared for SANTOS Limited, (unpublished). |
| SANTOS, 2003 | MELBA 1 Post Well Audit, prepared for SANTOS Limited, (unpublished) |

# APPENDIX I(a): LITHOLOGICAL DESCRIPTIONS

# MELBA 1 - LITHOLOGICAL DESCRIPTIONS

**SURFICIAL DEPOSITS AND PORT CAMPBELL LIMESTONE** (Recent to Mid-Late Miocene)
From Spud to 183m
Thickness: 178m

Spud to 183m LIMESTONE: off white, pale yellow, light grey brown, arenaceous, abundant fossil fragments, occasionally quartz fragments, hard aggregates, occasionally friable, good to tight inferred porosity, no fluorescence. SANDSTONE: clear, translucent, medium to coarse grained, well sorted, weak calcareous cement, loose quartz grains, trace lithic fragments, trace glauconite, good inferred porosity, no fluorescence.

**GELLIBRAND MARL.** (Early Miocene)
From 183 to 509m
Thickness: 325.5m

183 to 457m MARL: pale to medium grey, grey brown in part, occasionally locally silty, trace carbonaceous specks, abundant fossil fragments, forams, echinoid spines, bryozoa, corals, shell fragments, dispersive, firm to very soft in part, amorphous, sub blocky.

457 to 509m MARL: pale to medium grey, grey brown in part, common fossil fragments, firm to dispersive, sub blocky, amorphous.

**CLIFTON FORMATION.** (Early – Late Oligocene – Early Aquitanian)
From 509 to 524m
Thickness: 15m

509 to 524m Interbedded LIMESTONE MARL and SANDSTONE. MARL: as above, medium grey, common fossil fragments, dispersive in part, sub blocky. LIMESTONE: orange, orange brown, Fe stain, common fossil fragments, forams, shell fragments, friable, blocky. SANDSTONE: clear, translucent, medium to predominantly coarse grained, sub rounded, predominantly loose quartz grains, good inferred porosity, no show.

**NARRAWATURK MARL.** (Late Eocene)
From 524 to 568m
Thickness: 44.5m

524 to 568m MARL with minor interbedded SANDSTONE. MARL: medium to dark brownish grey, olive brown, rare very fine carbonaceous specks, minor fossil fragments, trace fine grained glauconite, soft – dispersive, blocky to sub blocky. SANDSTONE: clear, medium grained, predominantly loose as above.

**MEPUNGA FORMATION.** (Mid Eocene)
From 568 to 648m
Thickness: 80m

569 to 648m SANDSTONE with minor interbedded CLAYSTONE. CLAYSTONE: medium brownish grey, moderately calcareous, trace lithics, trace fine carbonaceous specks, trace micro micaceous, soft to dispersive. SANDSTONE: translucent, light orange – brown Fe stain, clear, medium to very coarse predominantly coarse grained, angular to predominantly sub rounded, moderately sorted, trace weak siliceous cement, trace pale grey argillaceous / silty matrix, predominantly loose quartz grains, good inferred porosity, no show.

**DILWYN FORMATION** (Early – Mid Eocene)

From 648 to 859m
Thickness: 209.4m

648 to 720m SANDSTONE with interbedded CLAYSTONE. SANDSTONE: translucent, clear, yellow brown, light brown, fine to medium occasionally coarse grained, angular to predominantly sub rounded, weak calcareous cement, common brownish grey argillaceous matrix, trace black lithics, common yellow orange Fe stain, good inferred porosity, no show. CLAYSTONE: dark brownish grey, rare micro micaceous, trace fine carbonaceous specks, trace lithics, slightly calcareous, soft to firm.

720 to 859m CLAYSTONE with interbedded SANDSTONE. SANDSTONE: clear, translucent, pale brown, very fine to medium grained, moderately sorted, angular to sub rounded, weak siliceous cement, rare grey brown argillaceous matrix, predominantly loose, fair inferred porosity, no fluorescence, generally as above. CLAYSTONE: medium to dark greyish brown, medium to dark brown, non calcareous trace lithics, trace nodular pyrite, soft to firm.

**PEMBER MUDSTONE.** (Late Paleocene – Early Eocene)
From 859 to 904m
Thickness: 44.7m

859 to 904m CLAYSTONE: medium to dark brown, grey brown in part, trace carbonaceous specks, trace micro micaceous, trace nodular pyrite, trace orange lithics, very soft – dispersive, amorphous.

**PEBBLE POINT FORMATION.** (Early – Late Paleocene)
From 904 to 934.5m
Thickness: 29.7m

904 to 934.5m CLAYSTONE with minor interbedded SANDSTONE. SANDSTONE: translucent, clear, orange – brown in part, medium to occasionally very coarse grained, moderately sorted, sub angular to sub rounded, weak siliceous cement, trace light brown argillaceous / silty matrix, trace nodular pyrite, predominantly loose quartz grains, fair inferred porosity, no show. CLAYSTONE: medium to dark brown, trace fine carbonaceous specks, very soft - dispersive.

**PAARATTE FORMATION.** (Late Senonian)
From 934.5 to 1222m
Thickness: 276.8m

934.5 to 970m Interbedded SANDSTONE and CLAYSTONE. SANDSTONE: translucent, clear, white, medium to very coarse grained, poor sorting, (pebbles of quartz to 1cm at shakers), sub rounded, predominantly loose quartz grains, rare nodular pyrite, good inferred porosity, no show. CLAYSTONE: medium to dark brown, medium to dark brownish grey, trace micro carbonaceous specks, trace lithics, soft – dispersive.

970 to 1011m SANDSTONE with interbedded CLAYSTONE. SANDSTONE: translucent, clear, white, medium to very coarse grained, poor sorting, sub rounded, predominantly loose quartz grains, minor pale grey silty matrix, rare nodular pyrite, fair to good inferred porosity, no show. CLAYSTONE: medium to dark grey brown, trace micro carbonaceous specks, trace lithics, soft – dispersive.

1011 to 1155m Interbedded CLAYSTONE and SANDSTONE. SANDSTONE: white, translucent, clear, fine to very coarse, poor sorting, sub angular to predominantly sub rounded,

minor pale grey silty matrix, trace pyrite, trace carbonaceous flecks, predominantly loose, fair inferred porosity, no show. CLAYSTONE: medium to dark brownish grey, silty grading to argillaceous siltstone, minor carbonaceous flecks, trace very fine lithics, trace nodular pyrite, trace micro mica, soft, dispersive in part.

1155 to 1200m Interbedded SANDSTONE, CLAYSTONE and SILTSTONE. SANDSTONE: clear, translucent, white, very fine to occasionally coarse, predominantly medium grained, poor sorting, angular to predominantly sub rounded, rare grey silty matrix, trace pyritic cement, rare nodular pyrite, trace carbonaceous flecks, predominantly loose, good inferred porosity, no fluorescence. SILTSTONE: medium brownish grey, argillaceous grading to silty claystone, trace very fine lithics, soft, dispersive in part, blocky. CLAYSTONE: generally as above, grading to argillaceous siltstone.

1200 to 1215m Interbedded SANDSTONE, CLAYSTONE and SILTSTONE. SANDSTONE: clear, translucent, white, very fine to occasionally coarse, predominantly medium grained, poor sorting, angular to predominantly sub rounded, rare grey silty matrix, trace pyritic cement, rare nodular pyrite, trace carbonaceous flecks, predominantly loose, good inferred porosity, no fluorescence. SILTSTONE: medium brownish grey, argillaceous grading to silty claystone, trace very fine lithics, soft, dispersive in part, blocky. CLAYSTONE: generally as above, grading to argillaceous siltstone.

1215 to 1222m Interbedded SANDSTONE and SILTSTONE. SANDSTONE: clear, translucent, occasionally yellow Fe stain, white in part, very fine to fine grained, moderately well sorted, sub angular to sub rounded, trace well siliceous cement, rare light grey argillaceous matrix, minor nodular pyrite, trace carbonaceous flecks, predominantly loose, fair to good inferred porosity, no fluorescence. SILTSTONE: light to medium grey, brownish grey in part, trace lithics, trace carbonaceous flecks, soft to firm, blocky.

**SKULL CREEK MUDSTONE.** (Late Senonian)
From 1222 to 1320m
Thickness: 93.8m

1222 to 1250m SILTSTONE with trace interbedded SANDSTONE. SILTSTONE: light to medium brownish grey, medium to dark grey, argillaceous, common carbonaceous specks, rare nodular pyrite, trace fine grained glauconite, soft, dispersive in part, amorphous. SANDSTONE: clear, translucent, white, very fine to fine occasionally medium grained, sub angular to sub rounded, minor pale grey argillaceous matrix, trace pyritic cement, trace fine grained glauconite, predominantly loose, poor inferred porosity, no show.

1250 to 1320m SILTSTONE: pale to medium grey, medium brownish grey, dark grey in part, argillaceous grading to silty claystone, occasionally finely arenaceous, minor fine carbonaceous specks, trace nodular pyrite, trace glauconite in part, soft to dispersive, amorphous.

**NULLAWARRE SANDSTONE.** (Late Senonian)
From 1320 to 1484.5m
Thickness: 159.6m

1321 to 1356m SANDSTONE: clear, translucent, yellow Fe stain in part, light green, fine – medium occasionally coarse grained, sub angular to sub rounded, weak siliceous cement, common green silty / argillaceous matrix, trace white argillaceous matrix, minor fine grained glauconite, trace nodular pyrite, trace lithics, friable aggregates in part, predominantly loose, fair inferred porosity, no fluorescence.

1356 to 1434m SANDSTONE with interbedded SILTSTONE. SANDSTONE: greenish yellow, translucent, clear, fine to coarse grained, poor sorting, sub angular to sub rounded, weak siliceous cement, trace pyritic cement, minor light grey argillaceous / silty matrix, trace white argillaceous matrix, rare nodular pyrite, rare glauconite, trace carbonaceous specks, friable aggregates, predominantly loose, fair inferred porosity, no fluorescence. SILTSTONE: light to medium greenish grey, argillaceous grading to glauconitic claystone in part, minor fine grained glauconite, trace pyrite, soft, dispersive in part, blocky – amorphous.

1434 to 1484.5m SANDSTONE with interbedded SILTSTONE. SANDSTONE: yellow, clear, translucent, fine – coarse generally as above. SILTSTONE: medium greenish brown, argillaceous grading to claystone in part, rare fine grained glauconite, soft – dispersive.

**BELFAST MUDSTONE.** (Late Senonian)
From 1484.5 to 1508.5m
Thickness: 23.2m

1484.5 to 1508.5m
CLAYSTONE: medium to predominantly dark brownish grey, medium to dark grey, silty in part, trace fine grained glauconite, trace micro carbonaceous specks, soft – dispersive.

**FLAXMAN FORMATION.** (Late Senonian)
From 1508.5 to 1538.5m
Thickness: 28.8m

1508.5 to 1538.5m
CLAYSTONE: orange – brown, yellow-brown, rust yellow, slightly silty in part, trace fine glauconite, very soft – dispersive.

**WAARRE SANDSTONE.** (Late Senonian)
From 1538.5 to 1594m
Thickness: 53.4m

1538.5 to 1558m SANDSTONE with interbedded CLAYSTONE. SANDSTONE: translucent, clear, white, yellow – brown in part, very fine to medium predominantly fine grained, trace coarse quartz shards, angular to predominantly sub rounded, trace moderately strong siliceous cement, minor white argillaceous matrix, trace nodular pyrite, trace very fine glauconite, locally with minor carbonaceous flecks / fragments, moderately hard aggregates, predominantly loose, poor to fair inferred porosity, no fluorescence. CLAYSTONE: light to predominantly medium grey, greenish grey, silty in part grading to argillaceous siltstone, very finely arenaceous, trace fossil fragments (shell fragments), trace nodular pyrite and fine grained glauconite, soft to firm, dispersive to blocky.

1558 to 1570m SANDSTONE with rare interbedded CLAYSTONE. SANDSTONE: clear, translucent, fine to very coarse grained, predominantly medium - coarse, poor sorted, angular to sub rounded, minor shardy coarse quartz grains, trace pale grey argillaceous matrix, trace nodular pyrite, rare carbonaceous flecks, predominantly loose clean quartz, good inferred porosity, no fluorescence. CLAYSTONE: light to predominantly medium grey, silty in part, trace nodular pyrite, soft to firm.

1570 to 1583m SANDSTONE with minor interbedded CLAYSTONE. SANDSTONE: clear, translucent, fine to coarse grained, poor sorting, sub angular to sub rounded, weak siliceous cement in part, minor pale grey argillaceous matrix, trace nodular pyrite, trace carbonaceous specks, fair inferred porosity, no fluorescence. CLAYSTONE: pale to medium grey as above.

1583 to 1594m SANDSTONE with interbedded CLAYSTONE and SILTSTONE. SANDSTONE: translucent, clear, white in part, fine to coarse predominantly medium grained, fair sorting, sub angular to sub rounded, weak siliceous cement, minor white argillaceous matrix, trace pale grey argillaceous / silty matrix, trace nodular pyrite, trace carbonaceous flecks, poor inferred porosity, no fluorescence. CLAYSTONE: medium grey as above. SILTSTONE: argillaceous grading to silty claystone in part, medium brownish grey, medium grey, very fine arenaceous in part, firm.

**EUMERALLA FORMATION.** (Early Neocomian)
From 1594 to 1668m
Thickness: 73m

1594 to 1668m SANDSTONE: multicoloured, white, translucent, clear, occasionally blue grey, light to dark green, orange, yellow, fine to coarse predominantly medium grained, angular to sub rounded, weak calcareous cement, abundant white argillaceous matrix, rare nodular pyrite, minor black volcanics, loose, friable in part, poor to fair inferred porosity, no fluorescence.

**TOTAL DEPTH DRILLER 1668 m**
**TOTAL DEPTH LOGGER (EXT.) 1668 m**

# APPENDIX I(b): HYDROCARBON SHOW REPORTS

No hydrocarbon fluorescence was observed at the Melba 1 location.

# APPENDIX II: PALYNOLOGY REPORT

**SANTOS STRATIGRAPHIC SERVICES**
**EXPLORATION SERVICES DEPARTMENT**

Palynology Report No. 2003/15

Authors: R. HELBY
G.R. WOOD
Date: 03/09/2003

# PALYNOLOGICAL REPORT NO. 2003/15
# PALYNOSTRATIGRAPHICAL ANALYSIS
# MELBA NO. 1

**Santos Ltd**
A.C.N. 007 550 923

## Introduction

Fourteen sidewall core samples from Melba No. 1, Port Campbell Embayment, Victoria were examined palynologically to assess their palynostratigraphic position and palaeoenvironment.

A summary of the results of this study are presented on Table 1. Individual sample results and assemblage description are presented on Table 2. The palaeoenvironmental and quantitative palynological data is presented on Table 3. Range charts of the palynomorphs identified in this study are presented in Appendix 1.

## Biostratigraphic Framework

During the 1980's most of the palynology undertaken in the Otway Basin was expressed either in terms of the eastern Australian Mesozoic zonation developed by the Minad/APG group (Peter Price and co-workers) or the pan-Australian HMP scheme (Helby, Morgan & Partridge, 1987). Both of these schemes relied on classical interval zone concepts and lacked resolution in the predominantly non-marine to marginal marine Waarre Sandstone and to a certain extent the underlying Eumeralla Formation. By the mid 1990's the Morgan group had begun to develop an event stratigraphy (Morgan& Hooker *in* LaBella WCR) and Partridge (2001 Fig.2)

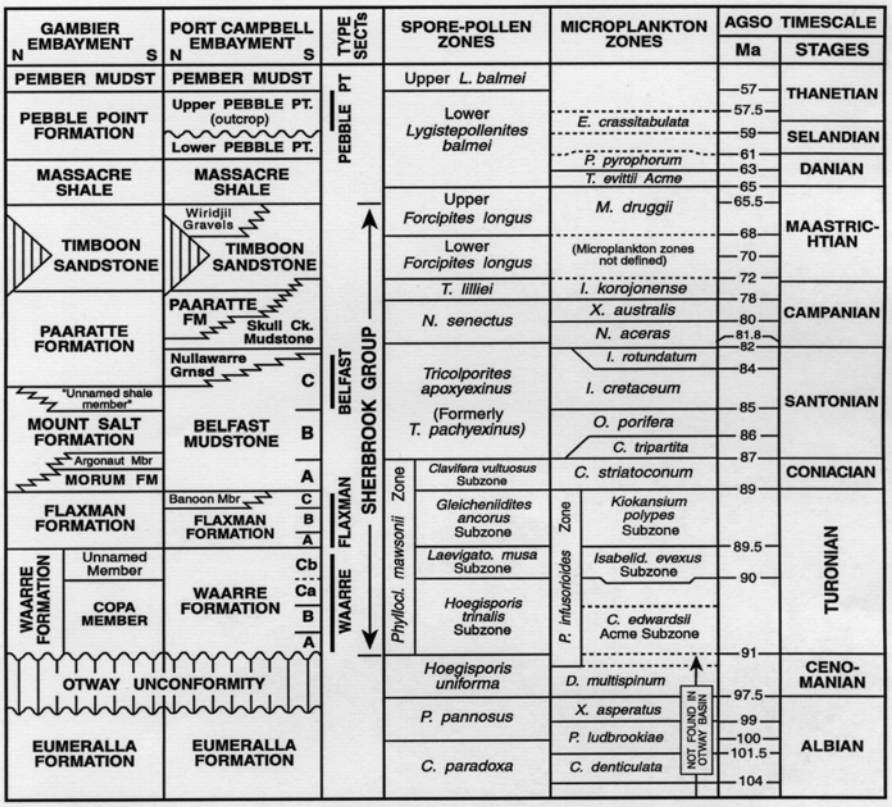



FIG 2 - Revised Sherbrook Group stratigraphy, palynological biostratigraphy and proposed correlation to international stages and AGSO chronometric timescale of Young & Laurie (1996).

Figure 1 Otway Basin Palynostratigraphy (from Partridge 2001, p. 456.

published a review and substantial up-date of the Late Cretaceous part of the HMP scheme, introducing a number of subzones based on both interval zone criteria and event features (acmes). The Partridge (2001) Waarre subdivision was based primarily on Port Campbell Embayment on-shore sequences. The palynostratigraphic results in this report are referred to the general scheme outlined by Partridge (2001), however the definition of the C. striatoconum microplankton zone has been modified and now equates with the upper Flaxmans Formation to Belfast A units.

Reference:, Helby, R Morgan, R. & Partridge, A.D. (1987) A palynological zonation of the Australian Mesozoic. In: Studies in Australian Mesozoic Palynology (P.J. Jell, editor) Association of Australasian Palaeontologists Memoir 4, pp1 - 94

Partridge (2001) Revised Stratigraphy of the Sherbrook Group, Otway Basin. In: PESA Eastern Australian Basins Symposium pp455 - 465

**Well Name : Melba No.1**

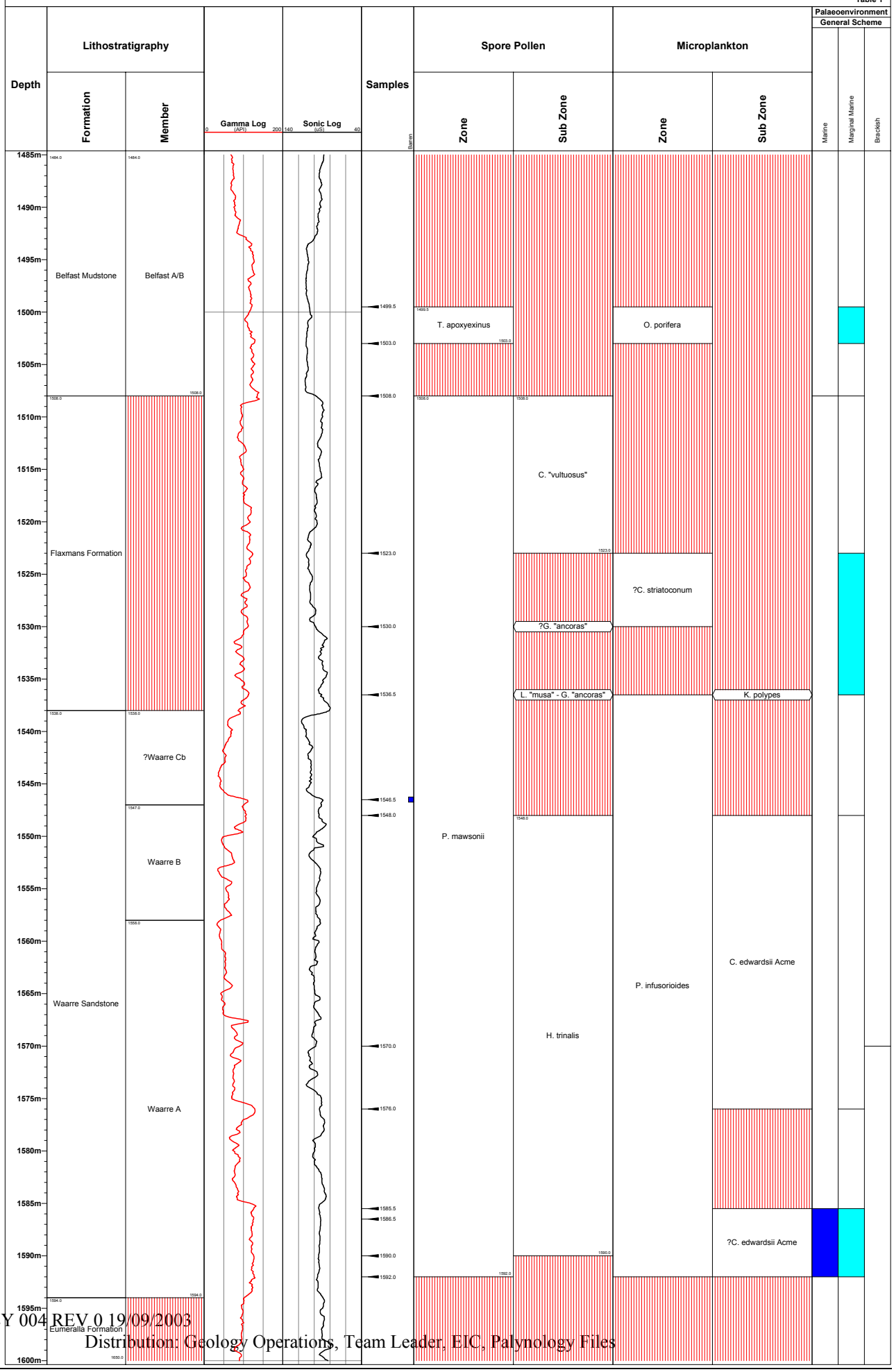
Interval : 1485m - 1600m  Palynostratigraphic Summary

Scale : 1:250

Chart date: 04 September 2003  Analysts: Wood/Helby

**Santos Ltd**
**Adelaide**

Table 1



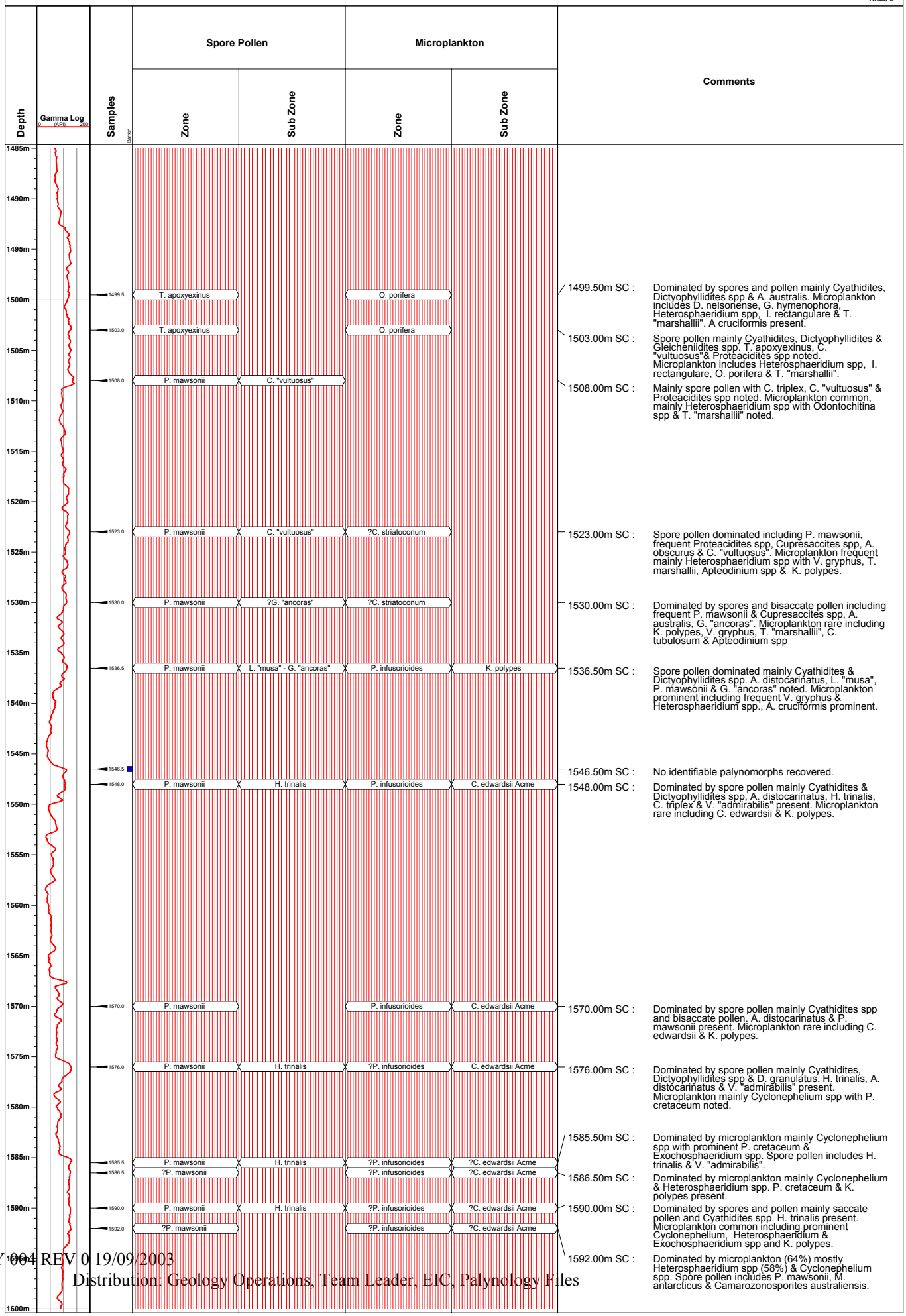
**Well Name : Melba No.1**

Interval : 1485m - 1600m
Scale : 1:250
Chart date : 04 September 2003

Palynostratigraphic Summary
Analysts: Wood/Helby

**Santos Ltd**
**Adelaide**

Table 2

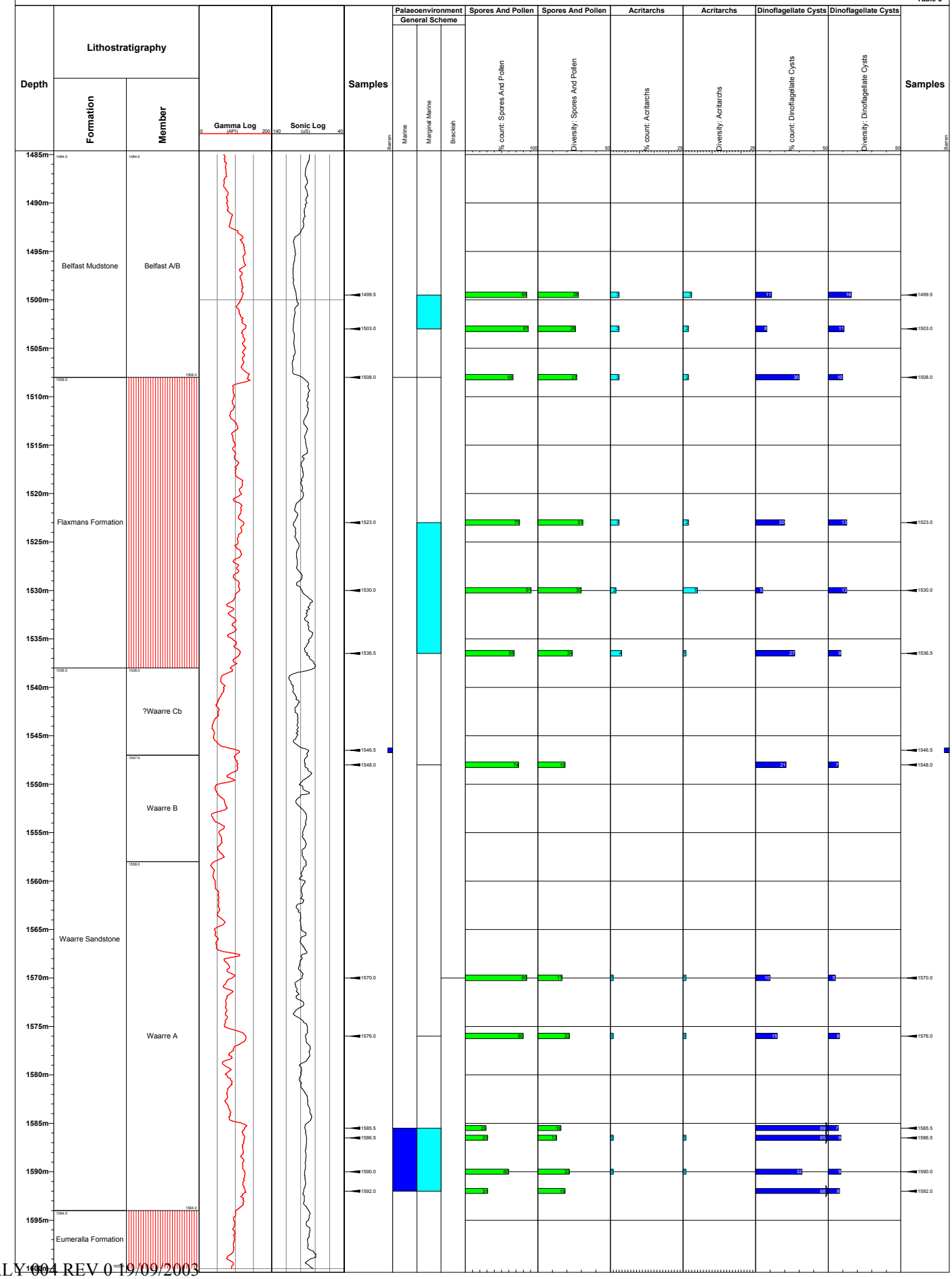


**Well Name : Melba No.1**

Interval : 1485m - 1600m  Palaeoenvironmental Data
Scale : 1:250
Chart date: 04 September 2003  Analysts: Wood/Helby

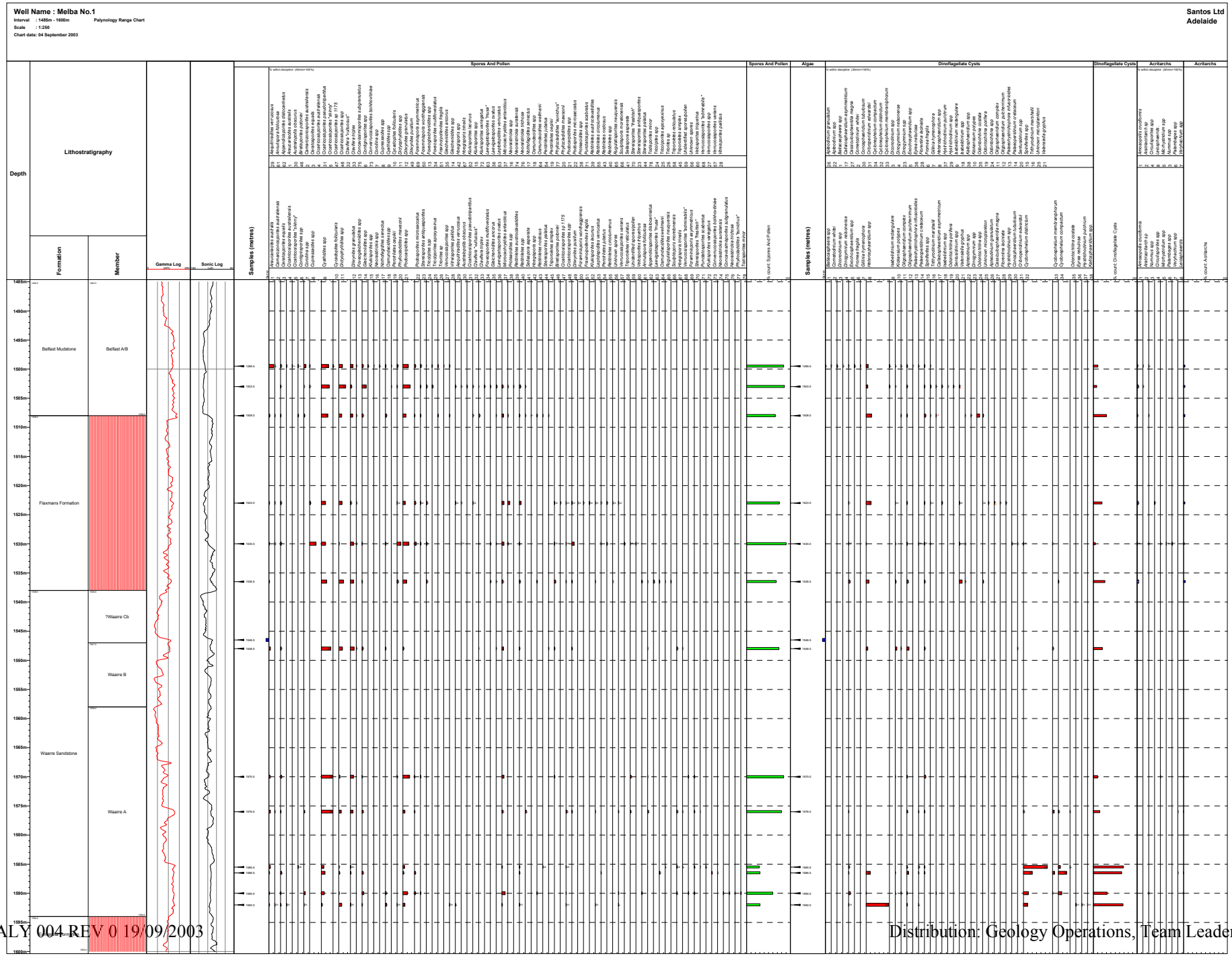
**Santos Ltd**
**Adelaide**

Table 3






Distribution: Geology Operations, Team Leader, EIC, Palynology Files


Well Name : Melba No.1
Interval : 1485m - 1600m
Scale : 1:250
Chart date: 04 September 2003
Palynology Range Chart
Santos Ltd
Adelaide
Lithostratigraphy
Depth
Formation
Member
Belfast Mudstone
Belfast A/B
Flaxmans Formation
?Waarre Cb
Waarre B
Waarre Sandstone
Waarre A
Gamma Log
Sonic Log
Samples (metres)
Spores And Pollen
Algae
Dinoflagellate Cysts
Acritarchs
% count Spores And Pollen
% count Dinoflagellate Cysts
% count Acritarchs

# APPENDIX III: LOG INTERPRETATION

# APPENDIX III(a): LOG ANALYSIS

# MELBA 1

# LOG ANALYSIS

# MELBA 1 - LOG ANALYSIS

Melba 1 wireline logs were analysed over the Nullawaarre Greensand to Waarre Sandstone (1320m-1642m) interval. No conventional gas pay was identified in the Nullawaarre and Waarre Formations. Melba 1 was plugged and abandoned.

A 9 7/8" surface hole was drilled to 457 metres and 7 5/8" casing set at 455.75 metres. A 6 3/4" hole was then drilled with KCl/PHPA mud to 1668 metres (D). Wireline logging was carried out by Schlumberger (as described below).

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

## Logs Acquired

| | | |
|---|---|---|
| Run 1 | NGT | 1642m-Surface |
| | TNPH | 1647m-Surface |
| | RXOZ | 1647m-Surface |
| | RHOZ | 1647m-Surface |
| | HCAL | 1645m-Surface |
| | HALS | 1666m-Surface |
| | DSI | 1655m-Surface |
| | SP | 1628m-Surface |
| Run 2 | GR-MDT (cancelled by Ops Geology) | |
| Run 3 | GR-CST (Recovered 14 of 18 cut) | |

## Mud Parameters

| | |
|---|---|
| Mud Type | KCl/PHPA |
| Mud Density | 9.05LB/G |
| KCl | 3.9% |
| Rm | 0.1931 ohmm @ 18.9$^{o}$C |
| Rmf | 0.1665 ohmm @ 18.9$^{o}$C |
| Rmc | 0.2330 ohmm @ 18.9$^{o}$C |
| MRT | 60$^{o}$C from Run 1 at 1668.4m |

## Remarks

- Dt shear gained from dipole as monopole data intermittent.
- DSI run in Upper Diploe, Lower Dipole and P&S modes.
- 0.0% Barite in mud.

## Log Processing

- A Pickett plot was used to derive the $R_w$ used for this analysis.
- A BHT of 64.9°C was used for the analysis (Gradient of 24.5°C/km).

## Interpretation Procedures and Parameters

An interpretation over the Nullawaarre and Waarre Sandstone intervals was conducted using Multimin. Water saturations were computed using the Dual-water Equation (Parameters used for the interpretation are detailed in Table 1). The parameters used in the Multimin model for this evaluation can be found in the report at the end of this document.

- The NGT from Run 1 was corrected for environmental effects such as mud-weight, KCl and borehole size using measurements made from the MCFL caliper.

- Borehole corrections for the HALS, HLLS and HLLD curves were applied. These are ratios used to emulate the algorithms illustrated in the Schlumberger chartbook.

- The invasion corrected $R_T$ was derived using the Schlumberger laterolog invasion correction supplied with in Geolog.

## Conclusions

1. No gas pay was identified in the Nullawaarre Greensand.
2. No gas pay was identified in the Waarre Formation.
3. The 76% water saturation found in the upper Waarre Formation sands is interpreted as residual gas.
4. Melba 1 was plugged and abandoned.

Attached is the well evaluation summary (WES) plot for Melba 1 (03.051)
*data/wes_ot/melba1_03051.wes*

**TABLE 1**
**Log Analysis Parameters**

| PARAMETERS | NULLAWAARRE GREENSAND | WAARRE C SANDSTONE | WAARRE A SANDSTONE |
|---|---|---|---|
| $R_w$ (ohmm) @ 64°C | 1.6 | 0.25 | 0.25 |
| a | 1 | 1 | 1 |
| m | 2 | 2 | 2 |
| n | 2 | 2 | 2 |

**TABLE 2**
**Conventional Pay Summary**

**No Conventional Pay was identified in this well**

**Cutoffs: Gross Sand > 2% PHIE, Net Sand > 10% PHIE, Net Pay > 10% PHIE & <70% Sw**

```
************************************
*                                  *
*          MULTIMIN REPORT         *
*                                  *
*    Project : PETRO_TXDM          *
*    User id : exptxd              *
*    Date    : 17-Apr-2003 10:46:23 *
*                                  *
************************************
```

MULTIMIN REPORT for well MELBA_1 interval NULLAWARRE GREENSAND (1320.01 - 1484.48 metres) Project PETRO_TXDM

Reported by exptxd on 17-Apr-2003 at 10:46

Analysed by exptxd on at

MODELS:

| Type | Name | Cond# | Cutoff | Expression |
|---|---|---|---|---|
| Primary | MELBA_NULLA | 4.098 | 10.0 | |

FORMATION FLUID PARAMETERS:

Fluid properties option = DEPTH

Oil Gravity Degrees API = 30.00 dapi  Gas specific gravity = 0.650

Rws = 1.6000 @ 64.00  Cwbs = - @ -  Rmfs = 0.2330 @ 18.90

BOREHOLE PARAMETERS:

Mud base = WATER  Mud density = 9.050  KCl concentration of mud = 0.00 %

SHT = -  BHT = 59.00

Rms = 0.1930 @ 18.90  Rmcs = 0.167 @ 18.90  Total depth = 1668.40 metres

Average temperature of 64.00 by method.

Average pressure of 17000.00 by method.

MULTIMIN REPORT for well MELBA_1 interval NULLAWARRE GREENSAND (1320.01 - 1484.48 metres)  Project PETRO_TXDM

PRIMARY MODEL MELBA_NULLA:
Cementation factor m = 1.650  Saturation exponent n = 2.000  Linear dual-water w = 1.80
Expansion of clay bound water is enabled.

| Component | QUARTZ | PYRITE | GLAUCON | ILLITE | KAOLIN | SPCMIN2 | XGAS | XFREWAT | UGAS | UFREWAT |
|---|---|---|---|---|---|---|---|---|---|---|
| Error of prediction | 0.0314 | 0.0110 | 0.0399 | 0.0340 | 0.0318 | 0.0016 | 0.0207 | 0.0288 | 0.0419 | 0.0393 |

EQUATION RESPONSES:

| Log | Method | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Formation density [G/C3] | | 0.0400 | 2.645 | 4.987 | 2.942 | 2.776 | 2.620 | 4.510 | -0.003 | 1.019 | 0.000 | 0.000 |
| RHO_COR | Linear | | | | | | | | | | | |
| Neutron [V/V] | | 0.0100 | -0.050 | -0.019 | 0.500 | 0.300 | 0.451 | -0.010 | 0.309 | 0.972 | 0.000 | 0.000 |
| TNPH_COR | Non-linear | | | | | | | | | | | |
| Sonic transit time [US/F] | | 1.0000 | 50.4 | 37.6 | 49.4 | 85.3 | 85.3 | 95.8 | 250.0 | 189.0 | 0.0 | 0.0 |
| DT | Linear | | | | | | | | | | | |
| Photoelectric absorption [B/C3] | | 0.4000 | 4.78 | 82.22 | 17.42 | 11.73 | 5.38 | 490.94 | 0.02 | 0.59 | 0.00 | 0.00 |
| U | Linear | | | | | | | | | | | |
| Total gamma [GAPI] | | 3.0000 | 12.0 | 5.0 | 150.0 | 265.0 | 104.0 | 2800.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GR_COR | Linear | | | | | | | | | | | |
| Spectral thorium [PPM] | | 0.2500 | 1.0 | 0.0 | 4.0 | 22.0 | 19.3 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| THOR_COR | Linear | | | | | | | | | | | |
| Spectral potassium [%] | | 0.1000 | 0.1500 | 0.0000 | 6.0000 | 7.5000 | 0.0800 | 20.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| POTA_COR | Linear | | | | | | | | | | | |
| Unflushed conductivity [MH/M] | | 0.0300 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.58 |
| CT | Archie linear | | | | | | | | | | | |
| Flushed conductivity [MH/M] | | 0.1000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.87 | 0.00 | 0.00 |
| CXO | Archie linear | | | | | | | | | | | |

CONSTRAINTS:

| | Value | Type | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <PROG UNITY> | 1.000 | Tool | 0.0100 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| <PROG POROSITY> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 | -1.000 | -1.000 |
| <PROG WATER MUD> | 0.000 | <= | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | -1.000 |
| <USER CONSTR1> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

PROPERTIES AND BOUNDS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mineral grain density | 2.650 | 5.000 | 2.960 | 2.780 | 2.620 | 4.510 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mineral cation exchange capacity | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lower Bound | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Upper Bound | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 0.500 | 0.500 | 0.500 |

MULTIMIN REPORT for well MELBA_1 interval BELFAST MUDSTONE (1484.50 - 1508.48 metres) Project PETRO_TXDM

Reported by exptxd on 17-Apr-2003 at 10:46
Analysed by exptxd on at

MODELS:

| Type | Name | Cond# | Cutoff | Expression |
|---|---|---|---|---|
| Primary | MELBA_BELFAST | 2.969 | 10.0 | |

FORMATION FLUID PARAMETERS:

Fluid properties option = DEPTH
Oil Gravity Degrees API = 30.00 dapi Gas specific gravity = 0.650
Rws = 1.6000 @ 64.00 Cwbs = - @ - Rmfs = 0.2330 @ 18.90

BOREHOLE PARAMETERS:

Mud base = WATER Mud density = 9.050 KCl concentration of mud = 0.00 %
SHT = - BHT = 59.00
Rms = 0.1930 @ 18.90 Rmcs = 0.167 @ 18.90 Total depth = 1668.40 metres

Average temperature of 64.00 by method.
Average pressure of 17000.00 by method.

MULTIMIN REPORT for well MELBA_1 interval BELFAST MUDSTONE (1484.50 - 1508.48 metres)  Project PETRO_TXDM

PRIMARY MODEL MELBA_BELFAST:
Cementation factor m = 1.650  Saturation exponent n = 2.000  Linear dual-water w = 2.00
Expansion of clay bound water is enabled.

| Component | | | QUARTZ | GLAUCON | ILLITE | KAOLIN | XFREWAT | UFREWAT |
|---|---|---|---|---|---|---|---|---|
| Error of prediction | | | 0.0594 | 0.0638 | 0.0517 | 0.0496 | 0.0124 | 0.0154 |
| EQUATION RESPONSES: | | | | | | | | |
| Log | Method | Uncertainty | | | | | | |
| Neutron [V/V] | | 0.0400 | -0.050 | 0.500 | 0.300 | 0.451 | 0.971 | 0.000 |
| TNPH_COR | Non-linear | | | | | | | |
| Sonic transit time [US/F] | | 2.0000 | 50.4 | 49.4 | 85.3 | 85.3 | 189.0 | 0.0 |
| DT | Linear | | | | | | | |
| Total gamma [GAPI] | | 3.0000 | 12.0 | 150.0 | 265.0 | 104.0 | 0.0 | 0.0 |
| GR_COR | Linear | | | | | | | |
| Spectral thorium [PPM] | | 0.2500 | 1.0 | 4.0 | 22.0 | 19.3 | 0.0 | 0.0 |
| THOR_COR | Linear | | | | | | | |
| Spectral potassium [%] | | 0.1000 | 0.1500 | 6.0000 | 7.5000 | 0.0800 | 0.0000 | 0.0000 |
| POTA_COR | Linear | | | | | | | |
| Unflushed conductivity [MH/M] | | 0.0200 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.60 |
| CT | Archie linear | | | | | | | |
| Flushed conductivity [MH/M] | | 0.2000 | 0.00 | 0.00 | 0.00 | 0.00 | 12.21 | 0.00 |
| CXO | Archie linear | | | | | | | |
| CONSTRAINTS: | Value | Type Uncertainty | | | | | | |
| <PROG UNITY> | 1.000 | Tool 0.0100 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| <PROG POROSITY> | 0.000 | Tool 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | -1.000 |
| <USER CONSTR1> | 0.000 | Tool 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PROPERTIES AND BOUNDS: | | | | | | | | |
| Mineral grain density | | | 3 | 3 | 3 | 3 | 0 | 0 |
| Mineral cation exchange capacity | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lower Bound | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Upper Bound | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 0.500 |

MULTIMIN REPORT for well MELBA_1 interval FLAXMANS FORMATION (1508.51 - 1538.48 metres) Project PETRO_TXDM

Reported by exptxd on 17-Apr-2003 at 10:46
Analysed by exptxd on at `

MODELS:

| Type | Name | Cond# | Cutoff | Expression |
|---|---|---|---|---|
| Primary | MELBA_WAARRE | 4.738 | 10.0 | |

FORMATION FLUID PARAMETERS:

Fluid properties option = DEPTH
Oil Gravity Degrees API = 30.00 dapi Gas specific gravity = 0.650
Rws = 1.6000 @ 64.00 Cwbs = - @ - Rmfs = 0.2330 @ 18.90

BOREHOLE PARAMETERS:

Mud base = WATER Mud density = 9.050 KCl concentration of mud = 0.00 %
SHT = - BHT = 59.00
Rms = 0.1930 @ 18.90 Rmcs = 0.167 @ 18.90 Total depth = 1668.40 metres

Average temperature of 64.00 by method.
Average pressure of 17000.00 by method.

MULTIMIN REPORT for well MELBA_1 interval FLAXMANS FORMATION (1508.51 - 1538.48 metres) Project PETRO_TXDM

PRIMARY MODEL MELBA_WAARRE:
Cementation factor m = 1.650 Saturation exponent n = 2.000 Linear dual-water w = 1.80
Expansion of clay bound water is enabled.

| Component | QUARTZ | PYRITE | GLAUCON | ILLITE | KAOLIN | SPCMIN2 | XGAS | XFREWAT | UGAS | UFREWAT |
|---|---|---|---|---|---|---|---|---|---|---|
| Error of prediction | 0.0740 | 0.0128 | 0.0886 | 0.0705 | 0.0656 | 0.0016 | 0.0214 | 0.0283 | 0.0416 | 0.0386 |

EQUATION RESPONSES:

| Log | Method | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Formation density [G/C3] | | 0.0400 | 2.645 | 4.987 | 2.942 | 2.776 | 2.620 | 4.510 | -0.006 | 1.017 | 0.000 | 0.000 |
| RHO_COR | Linear | | | | | | | | | | | |
| Neutron [V/V] | | 0.0400 | -0.050 | -0.019 | 0.380 | 0.300 | 0.451 | -0.010 | 0.304 | 0.971 | 0.000 | 0.000 |
| TNPH_COR | Non-linear | | | | | | | | | | | |
| Sonic transit time [US/F] | | 2.0000 | 50.4 | 37.6 | 49.4 | 85.3 | 85.3 | 95.8 | 250.0 | 189.0 | 0.0 | 0.0 |
| DT | Linear | | | | | | | | | | | |
| Photoelectric absorption [B/C3] | | 0.4000 | 4.78 | 82.22 | 17.42 | 11.73 | 5.38 | 490.94 | 0.02 | 0.59 | 0.00 | 0.00 |
| U | Linear | | | | | | | | | | | |
| Total gamma [GAPI] | | 3.0000 | 12.0 | 5.0 | 150.0 | 265.0 | 104.0 | 2800.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GR_COR | Linear | | | | | | | | | | | |
| Spectral thorium [PPM] | | 0.2500 | 1.0 | 0.0 | 4.0 | 22.0 | 19.3 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| THOR_COR | Linear | | | | | | | | | | | |
| Spectral potassium [%] | | 0.1000 | 0.1500 | 0.0000 | 6.0000 | 7.5000 | 0.0800 | 20.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| POTA_COR | Linear | | | | | | | | | | | |
| Unflushed conductivity [MH/M] | | 0.0300 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.61 |
| CT | Archie linear | | | | | | | | | | | |
| Flushed conductivity [MH/M] | | 0.1000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.31 | 0.00 | 0.00 |
| CXO | Archie linear | | | | | | | | | | | |

CONSTRAINTS:

| | Value | Type | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <PROG UNITY> | 1.000 | Tool | 0.0100 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| <PROG POROSITY> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 | -1.000 | -1.000 |
| <PROG WATER MUD> | 0.000 | <= | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | -1.000 |
| <USER CONSTR1> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

PROPERTIES AND BOUNDS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mineral grain density | 2.650 | 5.000 | 2.960 | 2.780 | 2.620 | 4.510 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mineral cation exchange capacity | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lower Bound | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Upper Bound | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 0.500 | 0.500 | 0.500 |

MULTIMIN REPORT for well MELBA_1 interval WAARRE FORMATION (1538.50 - 1593.98 metres) Project PETRO_TXDM

Reported by exptxd on 17-Apr-2003 at 10:46
Analysed by exptxd on at

MODELS:

| Type | Name | Cond# | Cutoff | Expression |
|---|---|---|---|---|
| Primary | MELBA_WAARRE | 4.737 | 10.0 | |

FORMATION FLUID PARAMETERS:

Fluid properties option = DEPTH
Oil Gravity Degrees API = 30.00 dapi  Gas specific gravity = 0.650
Rws = 0.2500 @ 64.00  Cwbs = - @ -  Rmfs = 0.2330 @ 18.90

BOREHOLE PARAMETERS:

Mud base = WATER  Mud density = 9.050  KCl concentration of mud = 0.00 %
SHT = -  BHT = 59.00
Rms = 0.1930 @ 18.90  Rmcs = 0.167 @ 18.90  Total depth = 1668.40 metres

Average temperature of 64.00 by method.
Average pressure of 17000.00 by method.

MULTIMIN REPORT for well MELBA_1 interval WAARRE FORMATION (1538.50 - 1593.98 metres)  Project PETRO_TXDM

PRIMARY MODEL MELBA_WAARRE:
Cementation factor m = 1.650  Saturation exponent n = 2.000  Linear dual-water w = 1.80
Expansion of clay bound water is enabled.

| Component | QUARTZ | PYRITE | GLAUCON | ILLITE | KAOLIN | SPCMIN2 | XGAS | XFREWAT | UGAS | UFREWAT |
|---|---|---|---|---|---|---|---|---|---|---|
| Error of prediction | 0.0740 | 0.0128 | 0.0885 | 0.0704 | 0.0655 | 0.0016 | 0.0212 | 0.0281 | 0.0218 | 0.0151 |

EQUATION RESPONSES:

| Log | Method | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Formation density [G/C3] | | 0.0400 | 2.645 | 4.987 | 2.942 | 2.776 | 2.620 | 4.510 | -0.007 | 1.017 | 0.000 | 0.000 |
| RHO_COR | Linear | | | | | | | | | | | |
| Neutron [V/V] | | 0.0400 | -0.050 | -0.019 | 0.380 | 0.300 | 0.451 | -0.010 | 0.302 | 0.970 | 0.000 | 0.000 |
| TNPH_COR | Non-linear | | | | | | | | | | | |
| Sonic transit time [US/F] | | 2.0000 | 50.4 | 37.6 | 49.4 | 85.3 | 85.3 | 95.8 | 250.0 | 189.0 | 0.0 | 0.0 |
| DT | Linear | | | | | | | | | | | |
| Photoelectric absorption [B/C3] | | 0.4000 | 4.78 | 82.22 | 17.42 | 11.73 | 5.38 | 490.94 | 0.02 | 0.59 | 0.00 | 0.00 |
| U | Linear | | | | | | | | | | | |
| Total gamma [GAPI] | | 3.0000 | 12.0 | 5.0 | 150.0 | 265.0 | 104.0 | 2800.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GR_COR | Linear | | | | | | | | | | | |
| Spectral thorium [PPM] | | 0.2500 | 1.0 | 0.0 | 4.0 | 22.0 | 19.3 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| THOR_COR | Linear | | | | | | | | | | | |
| Spectral potassium [%] | | 0.1000 | 0.1500 | 0.0000 | 6.0000 | 7.5000 | 0.0800 | 20.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| POTA_COR | Linear | | | | | | | | | | | |
| Unflushed conductivity [MH/M] | | 0.0300 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.92 |
| CT | Archie linear | | | | | | | | | | | |
| Flushed conductivity [MH/M] | | 0.1000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.46 | 0.00 | 0.00 |
| CXO | Archie linear | | | | | | | | | | | |

CONSTRAINTS:

| | Value | Type | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <PROG UNITY> | 1.000 | Tool | 0.0100 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| <PROG POROSITY> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 | -1.000 | -1.000 |
| <PROG WATER MUD> | 0.000 | <= | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | -1.000 |
| <USER CONSTR1> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

PROPERTIES AND BOUNDS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mineral grain density | 2.650 | 5.000 | 2.960 | 2.780 | 2.620 | 4.510 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mineral cation exchange capacity | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lower Bound | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Upper Bound | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 0.500 | 0.500 | 0.500 |

MULTIMIN REPORT for well MELBA_1 interval OTWAY GROUP (1594.00 - 1667.99 metres) Project PETRO_TXDM

Reported by exptxd on 17-Apr-2003 at 10:46
Analysed by exptxd on at 0 0

MODELS:

| Type | Name | Cond# | Cutoff | Expression |
|---|---|---|---|---|
| Primary | MELBA_WAARRE | 4.735 | 10.0 | |

FORMATION FLUID PARAMETERS:

Fluid properties option = DEPTH
Oil Gravity Degrees API = 30.00 dapi Gas specific gravity = 0.650
Rws = 0.2500 @ 64.00 Cwbs = - @ - Rmfs = 0.2330 @ 18.90

BOREHOLE PARAMETERS:

Mud base = WATER Mud density = 9.050 KCl concentration of mud = 0.00 %
SHT = - BHT = 59.00
Rms = 0.1930 @ 18.90 Rmcs = 0.167 @ 18.90 Total depth = 1668.40 metres

Average temperature of 64.00 by method.
Average pressure of 17000.00 by method.

MULTIMIN REPORT for well MELBA_1 interval OTWAY GROUP (1594.00 - 1667.99 metres)  Project PETRO_TXDM

PRIMARY MODEL MELBA_WAARRE:
Cementation factor m = 1.650  Saturation exponent n = 2.000  Linear dual-water w = 1.80
Expansion of clay bound water is enabled.

| Component | QUARTZ | PYRITE | GLAUCON | ILLITE | KAOLIN | SPCMIN2 | XGAS | XFREWAT | UGAS | UFREWAT |
|---|---|---|---|---|---|---|---|---|---|---|
| Error of prediction | 0.0739 | 0.0128 | 0.0883 | 0.0703 | 0.0654 | 0.0016 | 0.0211 | 0.0279 | 0.0216 | 0.0150 |

EQUATION RESPONSES:

| Log | Method | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Formation density [G/C3] | | 0.0400 | 2.645 | 4.987 | 2.942 | 2.776 | 2.620 | 4.510 | -0.009 | 1.016 | 0.000 | 0.000 |
| RHO_COR | Linear | | | | | | | | | | | |
| Neutron [V/V] | | 0.0400 | -0.050 | -0.019 | 0.380 | 0.300 | 0.451 | -0.010 | 0.300 | 0.969 | 0.000 | 0.000 |
| TNPH_COR | Non-linear | | | | | | | | | | | |
| Sonic transit time [US/F] | | 2.0000 | 50.4 | 37.6 | 49.4 | 85.3 | 85.3 | 95.8 | 250.0 | 189.0 | 0.0 | 0.0 |
| DT | Linear | | | | | | | | | | | |
| Photoelectric absorption [B/C3] | | 0.4000 | 4.78 | 82.22 | 17.42 | 11.73 | 5.38 | 490.94 | 0.02 | 0.58 | 0.00 | 0.00 |
| U | Linear | | | | | | | | | | | |
| Total gamma [GAPI] | | 3.0000 | 12.0 | 5.0 | 150.0 | 265.0 | 104.0 | 2800.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GR_COR | Linear | | | | | | | | | | | |
| Spectral thorium [PPM] | | 0.2500 | 1.0 | 0.0 | 4.0 | 22.0 | 19.3 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| THOR_COR | Linear | | | | | | | | | | | |
| Spectral potassium [%] | | 0.1000 | 0.1500 | 0.0000 | 6.0000 | 7.5000 | 0.0800 | 20.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| POTA_COR | Linear | | | | | | | | | | | |
| Unflushed conductivity [MH/M] | | 0.0300 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 |
| CT | Archie linear | | | | | | | | | | | |
| Flushed conductivity [MH/M] | | 0.1000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.70 | 0.00 | 0.00 |
| CXO | Archie linear | | | | | | | | | | | |

CONSTRAINTS:

| | Value | Type | Uncertainty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <PROG UNITY> | 1.000 | Tool | 0.0100 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| <PROG POROSITY> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 | -1.000 | -1.000 |
| <PROG WATER MUD> | 0.000 | <= | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | -1.000 |
| <USER CONSTR1> | 0.000 | Tool | 0.0100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

PROPERTIES AND BOUNDS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mineral grain density | 2.650 | 5.000 | 2.960 | 2.780 | 2.620 | 4.510 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mineral cation exchange capacity | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lower Bound | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Upper Bound | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 0.500 | 0.500 | 0.500 |

```
************************************
*                                  *
*          MULTIMIN REPORT         *
*                                  *
*       *** End of Report ***      *
*                                  *
*    Project : PETRO_TXDM          *
*    User id : exptxd              *
*    Date    : 17-Apr-2003 10:46:24 *
*    Pages   :  10                 *
*                                  *
************************************
```

# APPENDIX III(b): MDT DATA

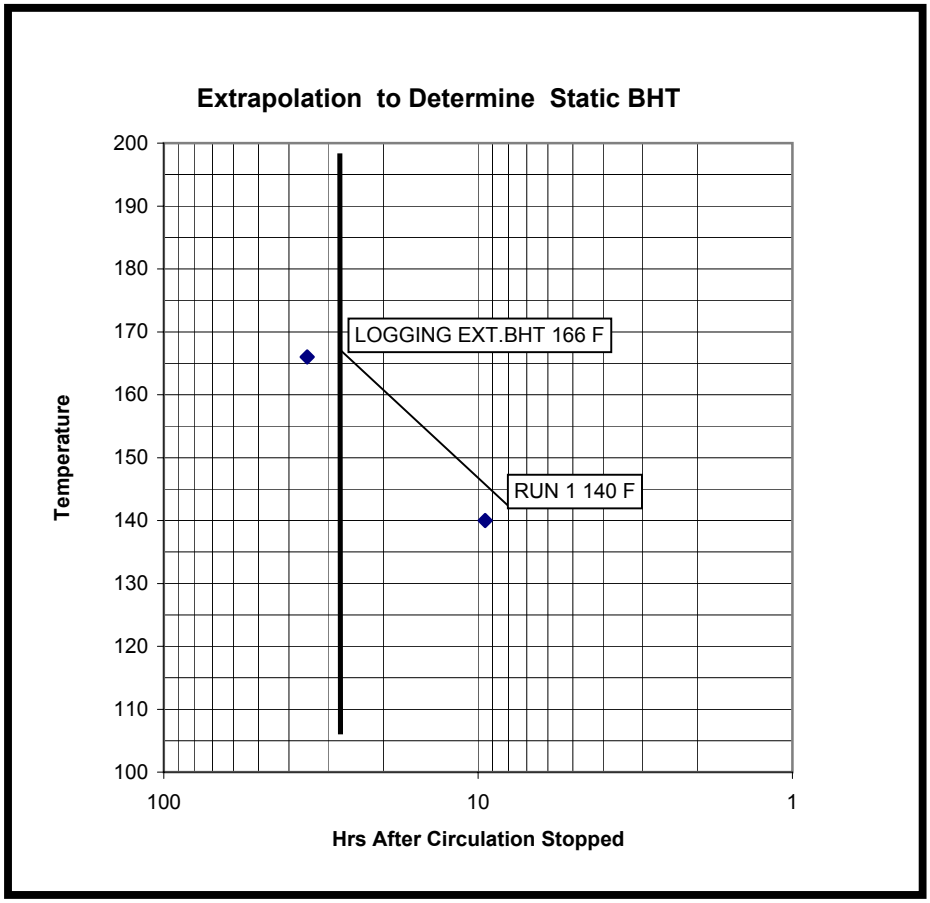
No MDT survey was conducted at the Melba 1 location..

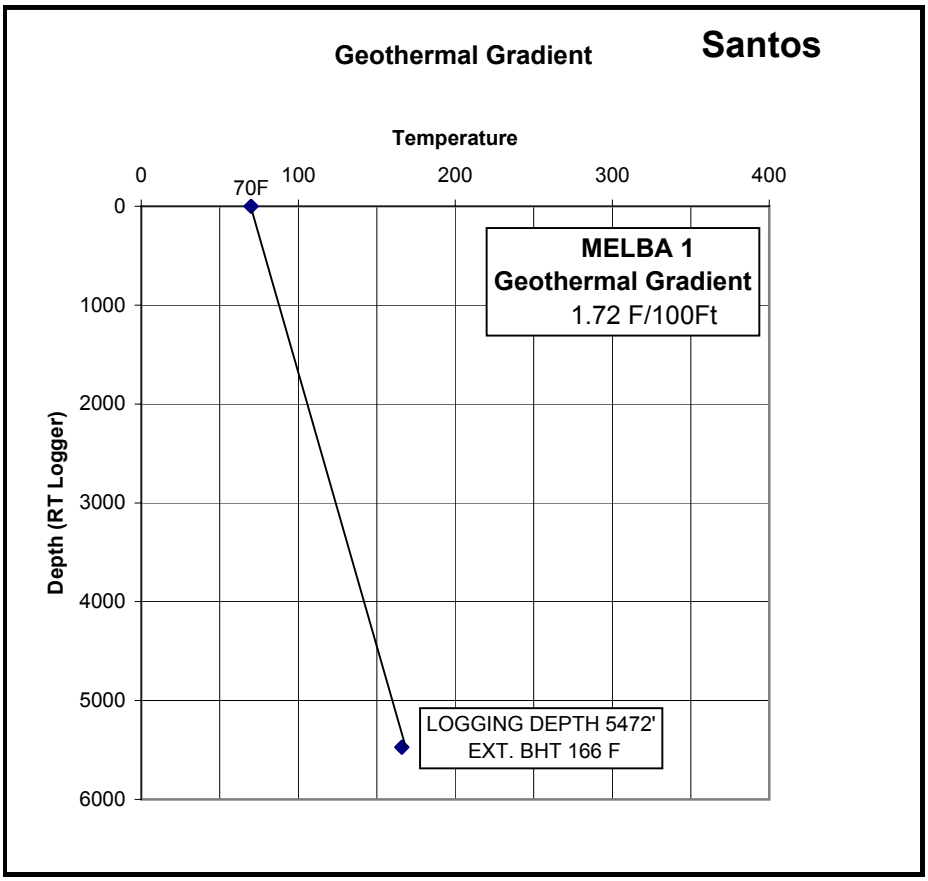
# APPENDIX IV: GEOTHERMAL GRADIENT

# GEOTHERMAL GRADIENT

A bottom hole temperature of 166°Fht was prognosed for the well based on off-set well information. Temperature readings from wireline logging results were only obtained for Run 1 Pex-DSI where a temperature of 60ºC (140ºFht). Extrapolating this information enabled a geothermal gradient of 1.72°Fht/100' to be calculated. A surface temperature of 70°F was assumed. Temperature data used is listed below. The results are displayed graphically overleaf.

| Logging Run | Temperature | Time since Circulation | Depth |
|---|---|---|---|
| Suite 1 Run 1 | 60ºC | 9 hours 30 minutes | 1668m |
| Suite 1 Run 2 | | Cancelled | |
| Suite 1 Run 3 | | No thermometers run. | |


Extrapolation to Determine Static BHT
200
190
180
170
160
150
140
130
120
110
100
Temperature
LOGGING EXT.BHT 166 F
RUN 1 140 F
100
10
1
Hrs After Circulation Stopped


Geothermal Gradient
Santos
Temperature
0
70F
100
200
300
400
0
1000
2000
3000
4000
5000
6000
Depth (RT Logger)
MELBA 1
Geothermal Gradient
1.72 F/100Ft
LOGGING DEPTH 5472'
EXT. BHT 166 F

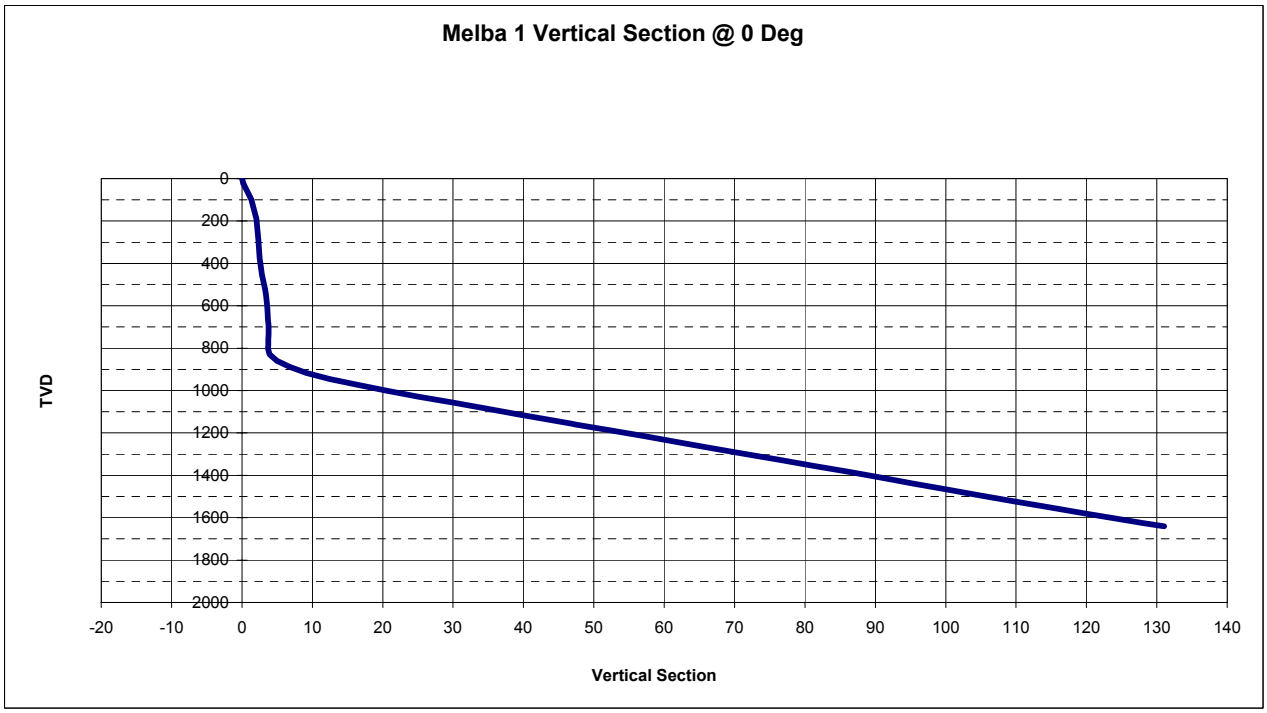
# APPENDIX V: DEVIATION REPORT

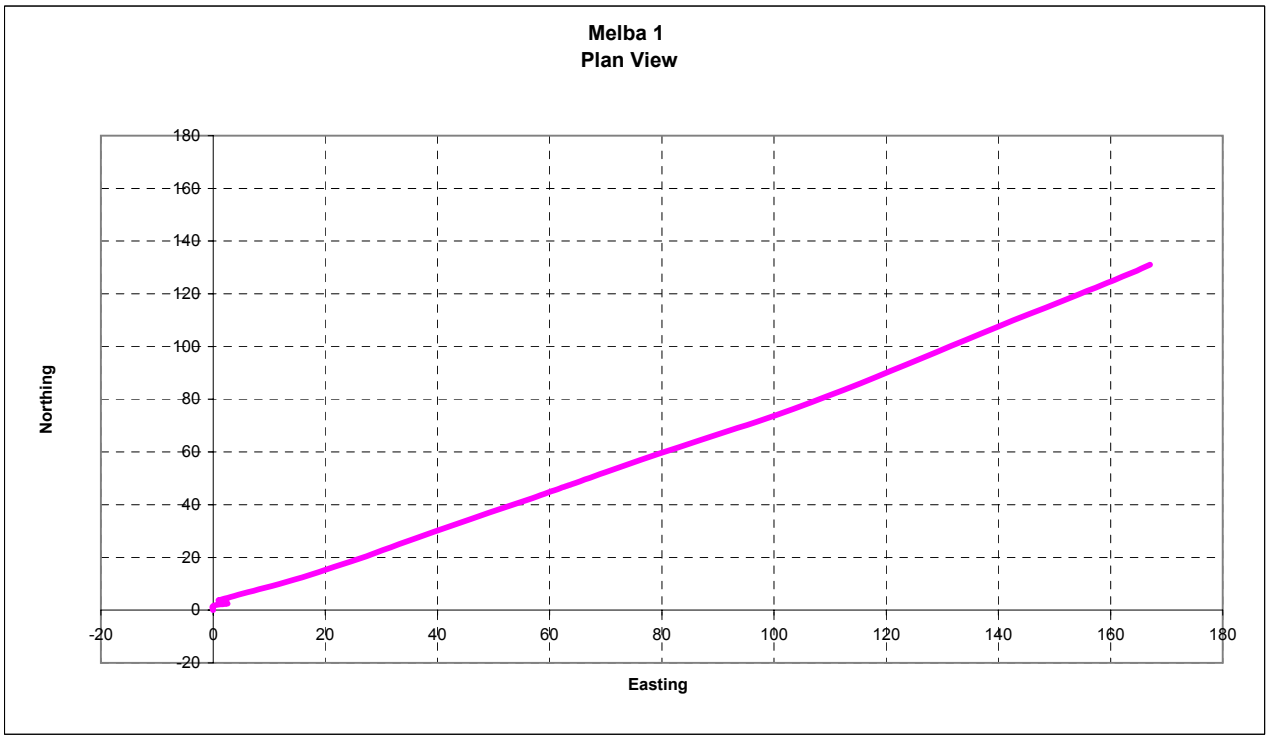
Due to surface constraints Melba 1 was drilled as a directional well. Deviation was monitored during the 9-7/8" section utilising single shot directional surveys. Through the 6¾" hole section the well was drilled vertically to kick-off point at 816m. The well was kicked – off at 16º to the north-east with LWD surveys taken as instructed by the directional driller. At total depth the well was located at 212m to 45.13º.

| DEPTH | INCLIN | Azimuth | TVD | TVD | Northing | Easting | Q | Vert | Vert | Displ | Direction |
|---|---|---|---|---|---|---|---|---|---|---|---|
| m | DEG | DEG | m | S/S m | north | east | DEG | Sect | Plane | | True |
| 0 | 0.00 | 0.00 | 0.00 | -76.20 | 0.00 | 0.00 | 0.00000 | 0.00 | 0 | 0.00 | 0.00 |
| 23 | 1 | 352.80 | 23.00 | -53.20 | 0.20 | -0.03 | 0.01744 | 0.20 | 0.1991 | 0.20 | 352.80 |
| 98 | 0.75 | 5.80 | 97.99 | 21.79 | 1.34 | -0.06 | 0.00556 | 1.34 | -1.337 | 1.34 | 357.53 |
| 191 | 0.75 | 80.80 | 190.98 | 114.78 | 2.04 | 0.60 | 0.01593 | 2.04 | -2.04 | 2.13 | 16.52 |
| 288 | 1 | 77.80 | 287.97 | 211.77 | 2.32 | 2.06 | 0.00442 | 2.32 | -2.32 | 3.10 | 41.59 |
| 375 | 0.25 | 280.80 | 374.97 | 298.77 | 2.52 | 2.61 | 0.02152 | 2.52 | 2.516 | 3.63 | 46.10 |
| 452 | 0.5 | 326.80 | 451.97 | 375.77 | 2.83 | 2.27 | 0.00649 | 2.83 | 2.8286 | 3.62 | 38.69 |
| 521.03 | 0.38 | 20.47 | 521.00 | 444.80 | 3.30 | 2.18 | 0.00718 | 3.30 | -3.295 | 3.95 | 33.49 |
| 549.78 | 0.25 | 59.80 | 549.75 | 473.55 | 3.42 | 2.27 | 0.00428 | 3.42 | -3.416 | 4.10 | 33.58 |
| 578.81 | 0.37 | 32.26 | 578.77 | 502.57 | 3.53 | 2.37 | 0.00327 | 3.53 | -3.527 | 4.25 | 33.93 |
| 608.17 | 0.37 | 277.41 | 608.13 | 531.93 | 3.62 | 2.33 | 0.01087 | 3.62 | 3.6195 | 4.30 | 32.76 |
| 637.53 | 0.24 | 285.50 | 637.49 | 561.29 | 3.65 | 2.18 | 0.00240 | 3.65 | 3.6482 | 4.25 | 30.82 |
| 665.84 | 0.52 | 285.05 | 665.80 | 589.60 | 3.70 | 2.00 | 0.00487 | 3.70 | 3.6974 | 4.20 | 28.35 |
| 693.05 | 0.46 | 292.35 | 693.01 | 616.81 | 3.77 | 1.77 | 0.00152 | 3.77 | 3.771 | 4.17 | 25.20 |
| 732.88 | 0.43 | 250.57 | 732.84 | 656.64 | 3.78 | 1.49 | 0.00556 | 3.78 | -3.782 | 4.06 | 21.45 |
| 762.07 | 0.59 | 271.42 | 762.03 | 685.83 | 3.75 | 1.23 | 0.00422 | 3.75 | 3.7493 | 3.95 | 18.20 |
| 788.21 | 0.37 | 261.8 | 788.17 | 711.97 | 3.74 | 1.01 | 0.00409 | 3.74 | 3.7406 | 3.88 | 15.17 |
| 800.92 | 0.52 | 239.6 | 800.88 | 724.68 | 3.71 | 0.92 | 0.00393 | 3.71 | -3.706 | 3.82 | 14.00 |
| 829.8 | 2.45 | 61.26 | 829.75 | 753.55 | 3.94 | 1.35 | 0.05182 | 3.94 | -3.936 | 4.16 | 18.96 |
| 858.93 | 5.79 | 60.09 | 858.80 | 782.60 | 4.97 | 3.17 | 0.05829 | 4.97 | -4.968 | 5.89 | 32.56 |
| 888.24 | 8.19 | 58.43 | 887.89 | 811.69 | 6.80 | 6.23 | 0.04201 | 6.80 | -6.799 | 9.22 | 42.51 |
| 917.41 | 11.01 | 62.7 | 916.65 | 840.45 | 9.16 | 10.48 | 0.05071 | 9.16 | -9.165 | 13.92 | 48.83 |
| 947.12 | 13.58 | 55.19 | 945.68 | 869.48 | 12.46 | 15.87 | 0.05273 | 12.46 | -12.46 | 20.17 | 51.86 |
| 975.75 | 14.7 | 55.64 | 973.44 | 897.24 | 16.43 | 21.62 | 0.01962 | 16.43 | -16.43 | 27.16 | 52.78 |
| 1003.94 | 14.02 | 53.87 | 1000.75 | 924.55 | 20.46 | 27.33 | 0.01414 | 20.46 | -20.46 | 34.14 | 53.19 |
| 1032.77 | 15.86 | 50.80 | 1028.61 | 952.41 | 25.01 | 33.21 | 0.03493 | 25.01 | -25.01 | 41.57 | 53.02 |
| 1061.66 | 15.95 | 54.11 | 1056.39 | 980.19 | 29.83 | 39.48 | 0.01591 | 29.83 | -29.83 | 49.49 | 52.93 |
| 1091.41 | 15.87 | 53.18 | 1085.00 | 1008.80 | 34.66 | 46.05 | 0.00467 | 34.66 | -34.66 | 57.64 | 53.03 |
| 1120.70 | 16.15 | 54.69 | 1113.15 | 1036.95 | 39.42 | 52.58 | 0.00875 | 39.42 | -39.42 | 65.72 | 53.14 |

| DEPTH | INCLIN | Azimuth | TVD | TVD | Northing | Easting | Q | Vert | Vert | Displ | Direction |
|---|---|---|---|---|---|---|---|---|---|---|---|
| m | DEG | DEG | m | S/S m | north | east | DEG | Sect | Plane | | True |
| 1149.56 | 16.21 | 53.69 | 1140.87 | 1064.67 | 44.12 | 59.10 | 0.00497 | 44.12 | -44.12 | 73.76 | 53.26 |
| 1166.59 | 16.22 | 52.45 | 1157.22 | 1081.02 | 46.98 | 62.90 | 0.00605 | 46.98 | -46.98 | 78.51 | 53.24 |
| 1168.86 | 16.27 | 52.80 | 1159.40 | 1083.20 | 47.37 | 63.41 | 0.00191 | 47.37 | -47.37 | 79.15 | 53.24 |
| 1197.98 | 16.13 | 53.04 | 1187.37 | 1111.17 | 52.27 | 69.89 | 0.00272 | 52.27 | -52.27 | 87.27 | 53.21 |
| 1226.99 | 16.23 | 53.85 | 1215.23 | 1139.03 | 57.08 | 76.38 | 0.00430 | 57.08 | -57.08 | 95.36 | 53.23 |
| 1256.12 | 16.68 | 54.90 | 1243.16 | 1166.96 | 61.89 | 83.09 | 0.00940 | 61.89 | -61.89 | 103.60 | 53.32 |
| 1285.43 | 16.74 | 55.16 | 1271.24 | 1195.04 | 66.72 | 90.00 | 0.00166 | 66.72 | -66.72 | 112.03 | 53.45 |
| 1314.41 | 17.01 | 55.95 | 1298.97 | 1222.77 | 71.47 | 96.93 | 0.00617 | 71.47 | -71.47 | 120.44 | 53.60 |
| 1343.41 | 15.29 | 50.9 | 1326.83 | 1250.63 | 76.26 | 103.42 | 0.03875 | 76.26 | -76.26 | 128.49 | 53.59 |
| 1372.49 | 15.7 | 51.41 | 1354.85 | 1278.65 | 81.13 | 109.47 | 0.00752 | 81.13 | -81.13 | 136.26 | 53.46 |
| 1401.12 | 15.47 | 49.44 | 1382.43 | 1306.23 | 86.03 | 115.40 | 0.01008 | 86.03 | -86.03 | 143.94 | 53.29 |
| 1430.12 | 13.85 | 48.76 | 1410.48 | 1334.28 | 90.83 | 120.95 | 0.02845 | 90.83 | -90.83 | 151.26 | 53.09 |
| 1459.33 | 14.07 | 48.58 | 1438.83 | 1362.63 | 95.49 | 126.24 | 0.00390 | 95.49 | -95.49 | 158.28 | 52.90 |
| 1488.39 | 14.15 | 48.82 | 1467.01 | 1390.81 | 100.16 | 131.56 | 0.00172 | 100.16 | -100.2 | 165.35 | 52.72 |
| 1517.49 | 14.58 | 47.96 | 1495.20 | 1419.00 | 104.96 | 136.96 | 0.00836 | 104.96 | -105 | 172.55 | 52.53 |
| 1546.83 | 15.25 | 49.88 | 1523.55 | 1447.35 | 109.92 | 142.65 | 0.01451 | 109.92 | -109.9 | 180.09 | 52.38 |
| 1575.87 | 15.13 | 50.23 | 1551.58 | 1475.38 | 114.80 | 148.48 | 0.00265 | 114.80 | -114.8 | 187.69 | 52.29 |
| 1605.25 | 15.22 | 48.95 | 1579.93 | 1503.73 | 119.79 | 154.34 | 0.00605 | 119.79 | -119.8 | 195.37 | 52.18 |
| 1633.85 | 15.79 | 50.05 | 1607.49 | 1531.29 | 124.75 | 160.15 | 0.01118 | 124.75 | -124.8 | 203.01 | 52.08 |
| 1652.03 | 15.86 | 47.3 | 1624.98 | 1548.78 | 128.03 | 163.88 | 0.01314 | 128.03 | -128 | 207.96 | 52.00 |
| 1668 | 15.91 | 45.13 | 1640.34 | 1564.14 | 131.05 | 167.03 | 0.01040 | 131.05 | -131.1 | 212.31 | 51.88 |

# Melba 1  Deviation plots



# APPENDIX VI: DRILL STEM TEST DATA

No drill stem tests were conducted at the Melba 1 location.

# APPENDIX VII: WELL LOCATION SURVEY

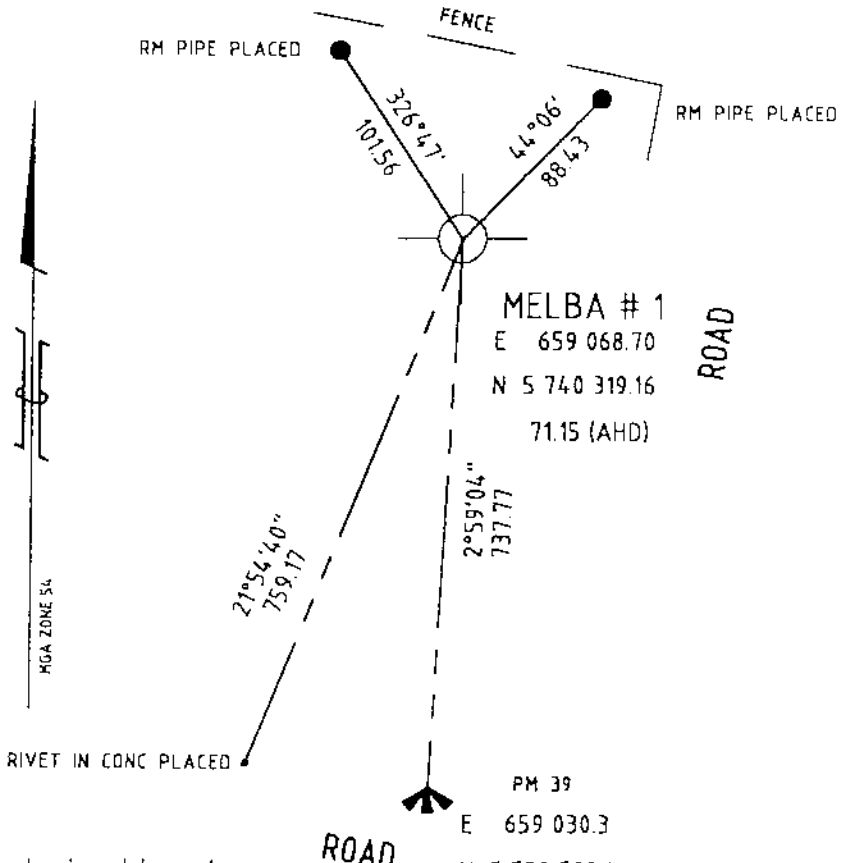
VICTORIA

# PROPOSED GAS WELL LOCATION

## REFERENCE MARKS SKETCH PLAN

## EXPLORATION LICENCE PEP 154

| | | | |
|---|---|---|---|
| Well Name | MELBA # 1 | | |
| Map | | | |
| Spheroid | GDA94 | MGA 94 | ZONE 54 |
| Latitude | S 38°28'16.58" | Measurement units | (metres) |
| Longitude | E 142°49'24.36" | Easting | 659 068.70 |
| Convergence | 1°08'02" | Northing | 5 740 319.16 |
| Scale Factor | 0.99991114 | Elevation | 71.15 (AHD) |




NOTES : This sketch plan is not to scale.
Distances shown are PLANE distances.
Bearings shown are computed grid bearings.

DATUM : The origin of coordinates was Land Victoria's Survey Mark Enquiry Service (SMES) AG066 (AMG Zone 54) then transformed to GDA94 (MGA Zone 54) using GDAit software.
Height datum is to AHD originating from SMES.

Estimated Horizontal error is less than +/- 0.15 metre.
Estimated Vertical error is less than +/- 0.2 metre.
Date of Survey : 25 / 2 / 2003


Paul Crowe Surveyor
ABN 58521601183
"Ambleside" 192 Koroit Street
Warrnambool 3280
Ph. (03) 5561 1500


REF 1181

Date 26 / 2 / 2003

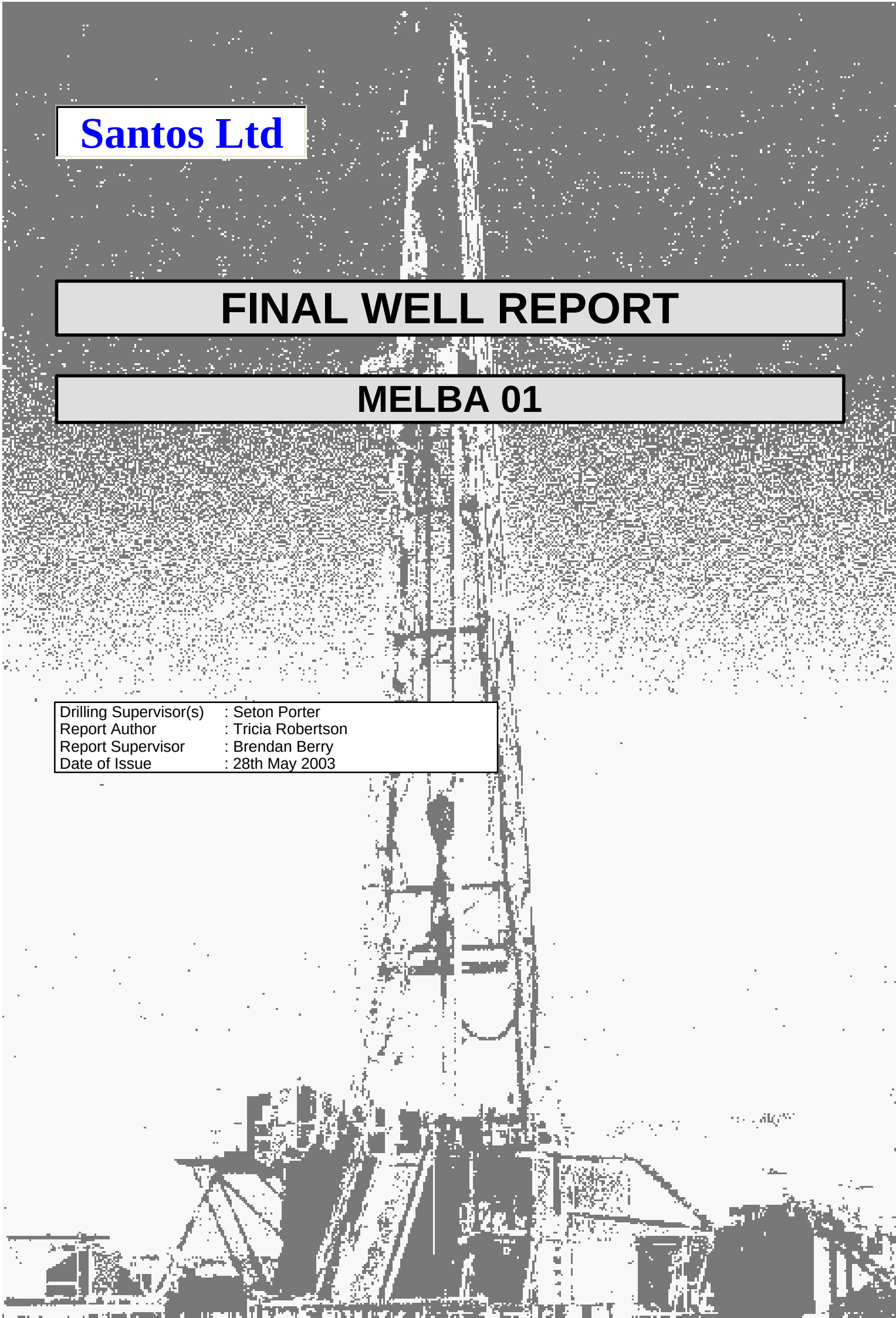
LICENSED SURVEYOR

# APPENDIX VIII: DRILLING AND CASING REPORT

Santos Ltd

# FINAL WELL REPORT

# MELBA 01



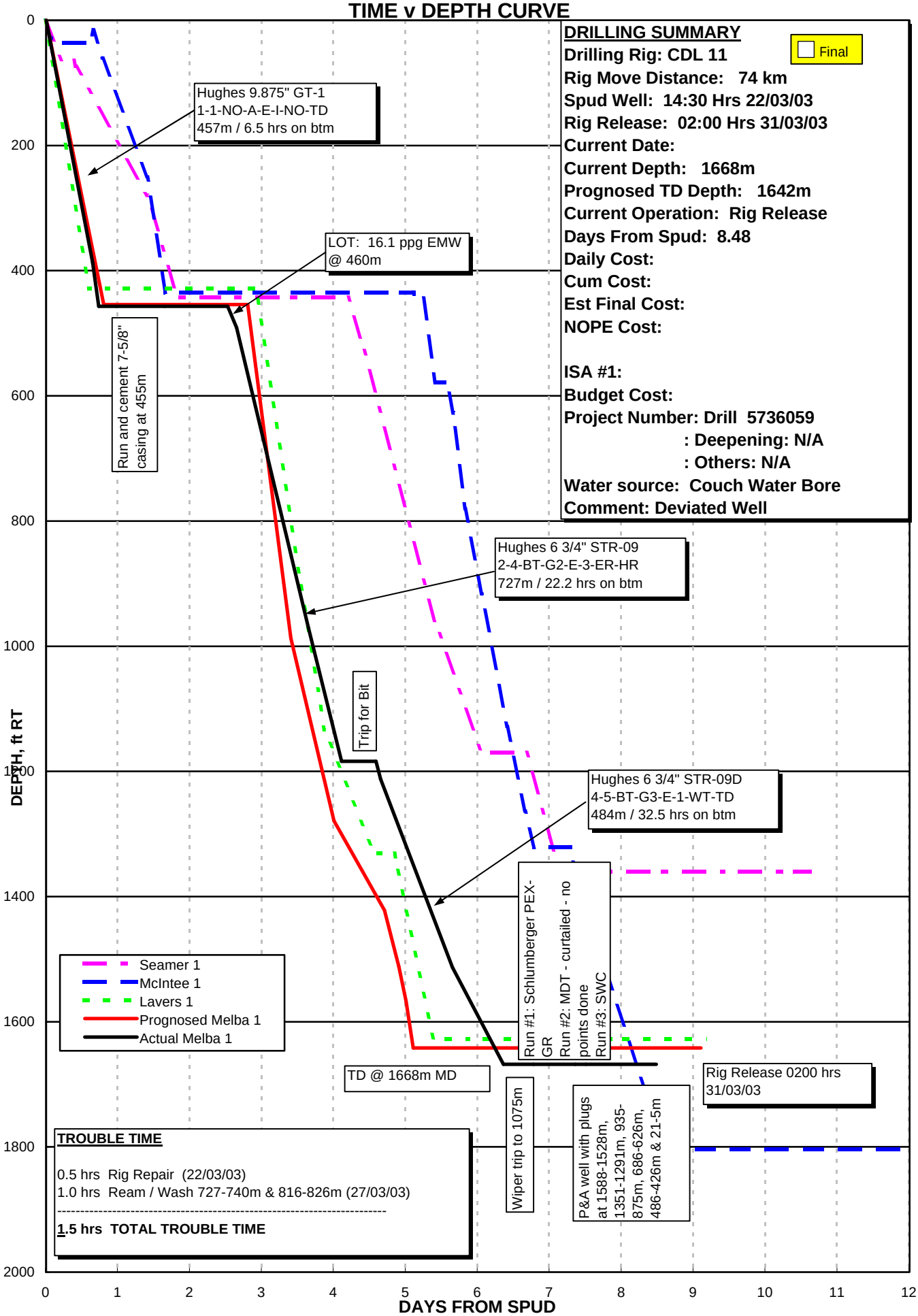
| | |
|---|---|
| Drilling Supervisor(s) | : Seton Porter |
| Report Author | : Tricia Robertson |
| Report Supervisor | : Brendan Berry |
| Date of Issue | : 28th May 2003 |

# Table of Contents

Section 1 – Well Summary

Time vs Depth Curve

# MELBA 1
## TIME v DEPTH CURVE



Section 2 – Well History

Well History Report

## MELBA 01

**Drilling Co.:** Century **Rig:** Century #11

| | | | |
|---|---|---|---|
| RT above GL: 5 m | Lat : 38 deg 28 min 16.58 sec | Spud Date: 22/03/2003 | Release Date: 31/03/2003 |
| GL above MSL : 71 m | Long : 142 deg 49 min 24.36 sec | Spud Time: 14:30:00 | Release Time: 2:00:00 |

# Well History

| # | DATE | DEPTH | WELL HISTORY ( 24 Hr Summary ) |
|---|---|---|---|
| 1 | 17/03/2003 | | Hold Ice-Breaker safety meeting in Brisbane with all crew & service hands |
| 2 | 18/03/2003 | | Crew travelled from Brisbane to Warrnambool |
| 3 | 19/03/2003 | | Move & set up camp. Move part of the rig from Warrnambool to Melba 1. Full crew on site. DSV travelled from Brisbane to site |
| 4 | 20/03/2003 | | Moved balance of rig on site. Rigging up. Raised lower section of mast. Camp & rig 100% moved. Camp 100% rigged up. Rig 40% rigged up |
| 5 | 21/03/2003 | | Rigging up. Crew worked till 2100 hrs, other crew finished at 1400 hrs to come back at midnight. Geoservices crew & Mud Engineer arrived. Halliburton brought in the cement unit. |
| 6 | 22/03/2003 | 232 | Rig up, drill & set Rat & Mouse holes. Spud in at 14:30 hrs & drill ahead with MSS surveys |
| 7 | 23/03/2003 | 232 | Drilled 9-7/8" hole to 457m. Condition hole, hoist laying out 6.5" DC's & 4.5" HWDP. Run casing & cement at 455m. Wait on cement |
| 8 | 24/03/2003 | 232 | Wait on cement. Slack off & install Bradenhead. NU & test BOPE. Make up Directional Drilling Assembly & run in hole |
| 9 | 25/03/2003 | 865 | Run in hole picking up HWDP. Drill out shoe track & 3m of new hole. Run L.O.T to 16.1ppg EMW & drill ahead to kick-off point at 816m. Slide drill to commence kick-off |
| 10 | 26/03/2003 | 1,184 | Drilled 6-3/4" hole from 865 to 1184m. KOP at 816m, built angle & continued drilling to 1184m. Total K-Revs on bit, 376. Trip for bit. |
| 11 | 27/03/2003 | 1,450 | Run in hole, reaming 2 tight spots. Drill from 1184 to 1450 m with DH motor & MWD |
| 12 | 28/03/2003 | 1,668 | Drill 6-3/4" hole from 1450 to 1668m with DH motor & MWD. Circulate hole clean & begin wiper trip |
| 13 | 29/03/2003 | 1,668 | Hoist, run PEX & SWC logs with Schlumberger. Run in to lay out BHA |
| 14 | 30/03/2003 | 1,668 | Lay out BHA. Run in open-ended & run 5 abandonment plugs. Lay out pipe. Tag cement at 411m up inside casing. Lay out pipe. Nipple up BOP's |
| 15 | 31/03/2003 | 1,668 | Remove Bradenhead & release rig at 02:00 hrs, 31-3-03. Run 16m surface cement plug & attach well sign to casing |

Section 3 – Drilling Data

Bit Record

FIT/LOT Report

# MELBA 01

**Drilling Co.:** Century

**Rig :** Century #11

RT above GL : 5 mtrs
GL above MSL : 71 mtrs

Lat : 38 deg 28 min 16.58 sec
Long : 142 deg 49 min 24.36 sec

Spud Date: 22/03/2003
Spud Time: 14:30:00

Release Date: 31/03/2003
Release Time: 2:00:00

## BIT RECORD

| DATE | BIT# | SIZE " | IADC | SER | MFR | TYPE | JETS | D.IN mtrs | D.OUT mtrs | MTRG | HRS o/b | SPP psi | FLW gpm | WOB k-lbs | RPM | MW ppg | TFA sq.in | VEL mps | HHP /sq" | ROP m/hr | I | O1 | D | L | B | G | O2 | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23/03/2003 | 1 | 9.88 | 116 | A28JW | HUGHES | GTC1 | 3x16 | 0 | 457 | 457 | 6.5 | 1198 | 502 | 10.0 | 110 | 9.0 | 0.589 | 83 | 2.27 | 70.3 | 1 | 1 | NO | A | E | I | NO | TD |
| 26/03/2003 | 2 | 6.75 | 437 | 5020202 | HUGHES | STR 09 | 3x13 | 457 | 1,184 | 727 | 22.2 | 1200 | 252 | 10.0 | 120 | 8.8 | 0.389 | 63 | 1.35 | 32.7 | 2 | 4 | BT | G2 | E | 3 | ER | HR |
| 29/03/2003 | 3 | 6.75 | 437 | 5020057 | HUGHES | STR 09D | 3x13 | 1,184 | 1,668 | 484 | 32.2 | 1571 | 253 | 10.7 | 120 | 9.0 | 0.389 | 63 | 1.40 | 15.0 | 4 | 5 | BT | G3 | E | 1 | WT | TD |

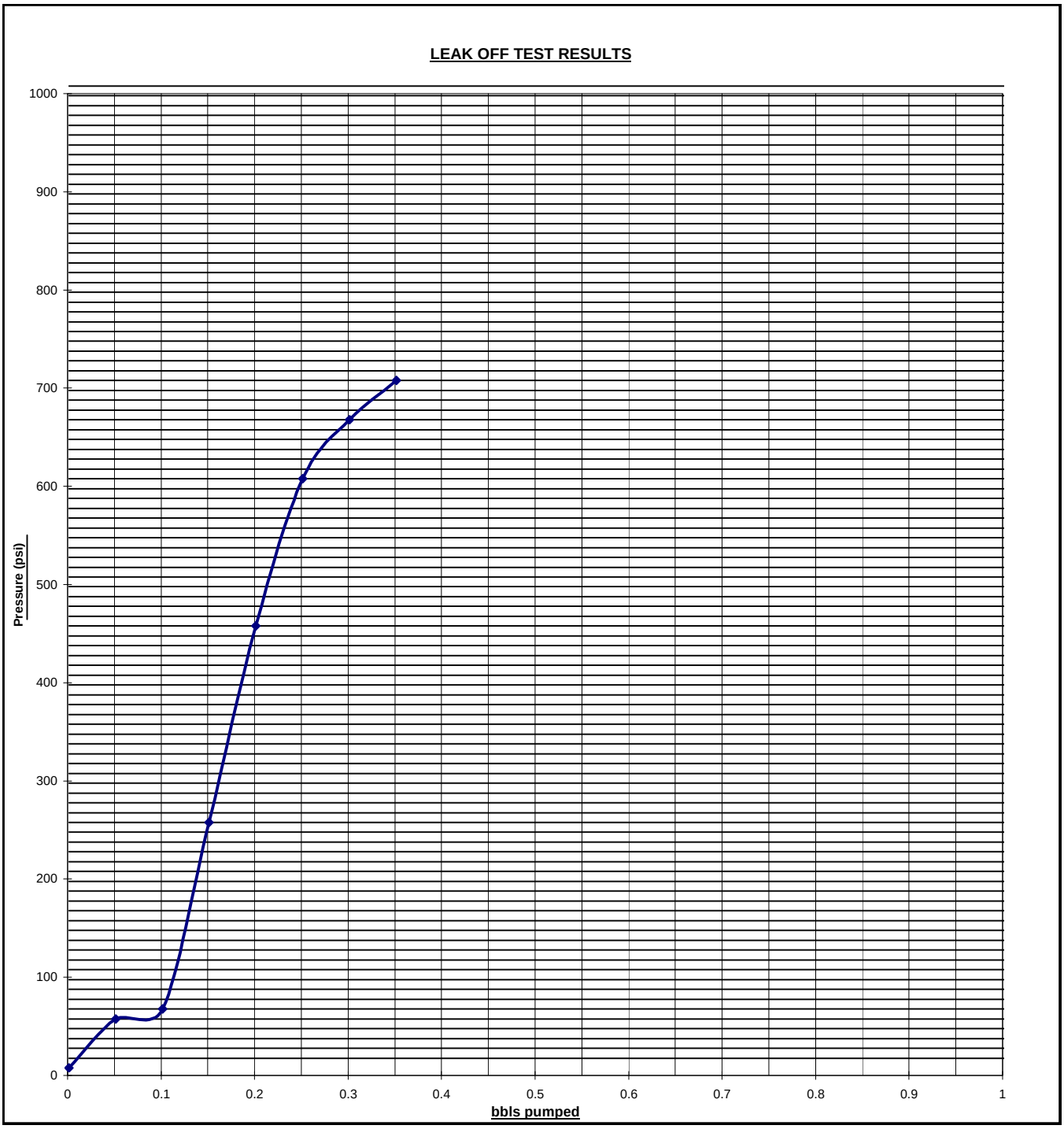
| Santos | DRILLING SERVICES LEAK OFF TEST RESULTS | DQMS F- 214 |
|---|---|---|

**WELL:** **Melba 01** **RIG:** **Century Resources - 11** **25-Mar-03**

CASING SIZE: **9-5/8"** SANTOS SUPERVISOR: **Seton Porter**

| | | |
|---|---|---|
| A. MUD DENSITY IN USE: | **8.40** | ppg |
| B. HOLE DEPTH: | **460** | m |
| C. SHOE DEPTH: | **456** | m |
| D. LEAK-OFF PRESSURE (GRAPH): | **600** | Psi |
| E. EQUIVALENT DENSITY: LEAK-OFF PRES. (D) (psi) / SHOE DEPTH (C) (m) x 0.1706 + MUD DENSITY IN USE (A) (ppg) | **16.1** | **(ppg) (EMW)** |
| F. MAXIMUM PRESSURE RECORDED: | **700** | psi |
| G. VOLUME PUMPED: | **0.5** | bbls |
| H. VOLUME REGAINED: | **0.45** | bbls |

| bbls | 0 | 0.05 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 | 0.55 | 0.60 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Psi | 0 | 50 | 60 | 250 | 450 | 600 | 660 | 700 | | | | | | | | | | |



Section 4 – Casing and Cementing

Casing and Cementing Report/s

Wellhead Installation Report/Plug and Abandonment Report

# Santos — SANTOS CASING AND CEMENTING REPORT — DQMS F-220

| | | | |
|---|---|---|---|
| **WELL:** | **Melba 01** | **DATE:** | 23-Mar-03 |
| **ELEVATIONS:** | **RT:** 63.71 m | **T.D:** | 457 m |
| | **GL:** 58.51.0 m | **PBTD:** | 443 m |
| **CASING BOWL SIZE:** | 11" 5K x 7-5/8" API BTC WG-22-L | **SERIES:** | 5000 |
| **STRING TYPE:** | Surface | | |

**CASING AND EQUIPMENT RECORD AS RUN FROM BOTTOM TO TOP**

| SIZE OD. | WEIGHT lb/ft | GRADE | No. of JOINTS | THREAD | LENGTH | FROM | TO | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 7-5/8" | --- | L-80 | --- | BTC | 0.37 | 455.63 | 456.00 | Float Shoe |
| 7-5/8" | 26.4 | L-80 | 1 | BTC | 12.25 | 443.38 | 455.63 | |
| 7-5/8" | --- | L-80 | --- | BTC | 0.31 | 443.07 | 443.38 | Float Collar |
| 7-5/8" | 26.4 | L-80 | 36 | BTC | 438.01 | 5.06 | 443.07 | |
| 7-5/8" | 26.4 | L-80 | --- | BTC | 7.04 | -1.98 | 5.06 | Landing Joint |
| | | | | | | | | |
| | | | | | | | -1.98 | Stick up |
| | | | | | | | | |
| | | TOTAL JOINTS | 37 | | | | | |
| | | | | TALLY TOTAL | 457.98 | | | |

CASING LANDED AT : **456.00 m**

RT TO TOP OF BRADEN HEAD : **4.70 m**

**CENTRALIZERS LOCATED AT - RT.**

| | | |
|---|---|---|
| 453 | 394 | 296 |
| 430 | 369 | 17 |
| 418 | 333 | |

**PREFLUSH** Dam Water

**Volume:** 20 **Density:** 8.4 **Additives:** Water only

**LEAD CEMENT**

| | | | | Additives | % | Amount Used |
|---|---|---|---|---|---|---|
| **Brand:** | **Class:** | **No. sx:** | | | | |
| **Mixwater:** | **Slurry Vol:** | **Density:** | | | | |
| **Gals/Sack** | **Yield:** | | | | | |

**TAIL CEMENT**

| | | | | | | Additives | % | Amount Used |
|---|---|---|---|---|---|---|---|---|
| **Brand:** | ABC | **Class:** | G | **No. sx:** | 297 | Bentonite | 1.5 | 327 lbs |
| **Mixwater:** | 63 bbls | **Slurry Vol:** | 89.6 bbls | **Density:** | 13.5 ppg | | | |
| **Gals/Sack** | 8.87 | **Yield:** | 1.66 cu.ft/sack | Cement volume calculated at 50% on hole volume, no caliper available. | | | | |

**DISPLACEMENT**

| | | | | | |
|---|---|---|---|---|---|
| **Fluid:** | Water | **Calc. Displacement:** | 68.4 bbls | **Plug Bump:** | Yes |
| **Density:** | 8.4 | **Actual Displacement:** | 69.5 bbls | **Bleed Back:** | 0.5 bbls |

**TIME:-**

| | |
|---|---|
| STARTED IN HOLE: | 15:50 Hr. |
| FINISHED RUNNING CASING: | 16:00 Hr. |
| START CIRCULATING: | 18:30 Hr. |
| STOP CIRCULATING: | 20:45 Hr. |
| START CEMENTING: | 21:10 Hr. |
| FINISH CEMENTING: | 21:35 Hr. |
| START DISPLACEMENT: | 21:37 Hr. |
| FINISH DISPLACEMENT: | 21:55 Hr. |

**CASING RECIPROCATED DURING**

| | |
|---|---|
| **CIRCULATING:** | Yes |
| **CEMENTING:** | Yes |
| **DISPLACING:** | Yes |

**WIPER PLUGS**

| | |
|---|---|
| **TOP:** | Yes |
| **BOTTOM:** | Yes |

**CEMENT JOB DETAILS / REMARKS:-**

Drilling Supervisor: Seton Porter

Casing ran to 446m OK. Circulated casing down to 456m. Pumped idcide treated mud, water pre-flush & pressure tested lines to 2500 psi. Mixed & pumped cement, displaced with Halliburton. Did not get any cement returns, nor water pre-flush. Bumped plug to 2000 psi, floats held. With cement stinger at 25m RT, topped up with 129 sacks of cement, 29.8 bbls. Left cement in conductor for over an hour, but it slumped back to 3 metres below the cellar.

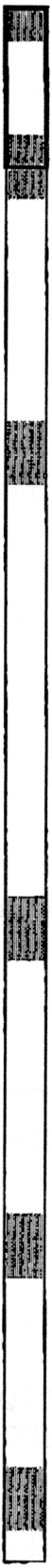
.

Topped up conductor annulus with 2 cu.m of ready-mix concrete.

RT - top of Bradenhead = 4.70m

# Melba 01

## Plug & Abandon Programme



7-5/8" Casing
set at 456m

Surface Plug No 6, 21 - 5m
12 sacks 'G' cement

Plug No 5, 486 - 426m
55 sacks of 'G' cement

Formation Tops, metres:

| | |
|---|---|
| Clifton | 509 |
| Narrawaturk | 530 |
| Mepunga | 569 |
| Dilwyn | 656 |

Plug No 4, 686 - 626m
55 sacks of 'G' cement

| | |
|---|---|
| Pember | 860 |
| Pebble Point | 905 |
| Paaratte | 929 |

Plug No 3, 935 - 875m
52 sacks of 'G' cement

| | |
|---|---|
| Skull Creek | 1222 |
| Nullawaare | 1321 |

Plug No 2, 1351 - 1291m
45 sacks of 'G' cement

| | |
|---|---|
| Belfast | 1485 |
| Flaxman | 1538 |
| Waare | 1558 |
| Eumeralla | 1601 |

Plug No 1, 1588 - 1528m
39 sacks of 'G' cement
Total Depth, 1668m

# APPENDIX IX: RIG SPECIFICATIONS

# RIG SPECIFICATIONS

# CENTURY RIG 11

# RIG INVENTORY FOR RIG # 11

| | |
|---|---|
| **CARRIER:** | Cooper LTO 750 Carrier with triple front and rear axles 54,000lb front and 70,000lb rear. All necessary highway equipment. Unit levelled with hydraulic jacks when stationary |
| **SUBSTRUCTURE:** | 17' floor height – 14' below table beams with plates in base |
| **DRAWWORKS:** | Cooper 750 HP Double Drum Drawworks<br>3000 metres $^{9}/_{16}$" sandline |
| **ENGINES:** | Driven by 2 each Caterpillar 3406 TA Diesel Engines |
| **BRAKE:** | Parmac V80 Hydromatic |
| **ROTARY TABLE:** | National Rotary Table Model C-175 |
| **DERRICK:** | Cooper Derrick Model 118-365. Ground height 118'<br>Maximum rated static hook load 35,0000 lbs with 10 lines Mast raised, lowered and telescoped hydraulically |
| **CROWN BLOCK:** | Cooper Crown Block with 4 working sheaves. Fast line sheave and dead line sheave. All grooved for $1^{1}/_{8}$" line. Sandline sheave grooved for $^{9}/_{16}$" line.<br>National Hook Block Model 435 G-175. 175 ton capacity 4 - 35" sheaves grooved for $1^{1}/_{8}$" line. |
| **SWIVEL:** | P-200 National |
| **SLUSH PUMPS:** | 2 Gardner Denver PZ-7 Triplex Pumps driven by Cat 379TA Diesel Engines Rated 550 HP each.<br>Liner sizes 5 $^{1}/_{2}$" and 6". |
| **MUD SYSTEM:** | 2 × 300 bbl tanks incorporating 80 bbl pill tank and 54 bbl trip tank. |
| **SHAKERS:** | 2x Triton NNF Screening Machine (Linear Motion). |
| **DEGASSER:** | Drilco Atmospheric Degasser Standard Pit. $7^{1}/_{2}$ HP 60 Hz, 230v. |
| **MUD / GAS SEPARATOR** | Minimum 36" separator with 10ft. maximum mud seal. |
| **VENT LINE:** | Minimum 6" vent line from Separator to flare pit, 200 ft. length. |
| **DESANDER:** | Demco Model 122. Two, 12" cone with Warman 6" × 4" Centrifugal pump driven by 50 HP Electric Motor. |
| **DESILTER:** | Pioneer Economaster Model T12-E4. 12 × 4" cones with Warman 6" × 4" Centrifugal pump, driven by a 50 HP Electric Motor. |
| **MUD MIXING PUMP:** | Warman 6" × 4" Centrifugal pump driven by a 50 HP Electric Motor |
| **MUD AGITATORS:** | 4 only Brandt Mud Agitator Model MA 7.5 |
| **BOP's & ACCUMULATOR:** | Annular: 11" 5,000psi Shaffer Spherical<br>11" 5,000psi Shaffer Double Gate Model 'LWS' Complete with $2^{3}/_{8}$", $2^{7}/_{8}$", $3^{1}/_{2}$", $4^{1}/_{2}$", $5^{1}/_{2}$", 7" and Blind Rams<br>Accumulator: Koomey Model 100-11S |

| | |
|---|---|
| **CHOKE MANIFOLD:** | Cameron 5,000 psi, as per attached drawing but with hydraulic choke fitted and pressure tested with remote control panel |
| **KELLY COCK: (Upper)** | Packard 5000 PSI upper kelly cock with 6 $^{5}/_{8}$" reg. LH connections. |
| **KELLY COCK: (Lower)** | Packard 5000 PSI upper kelly cock with 4" IH connections |
| **DRILL PIPE SAFETY VALVE:** | 1 x 4" IF Inside BOP (Gray)<br>1 x 4" IF full Operating Stab Valve |
| **SPOOL:** | 1-11" 5,000psi Flanged Drilling Spool with 3$^{1}/_{8}$" 5,000psi Flanged Choke Line out and 2$^{1}/_{16}$" 5,000 psi Kill Line Outlet<br>1-11" 5,000 psi to 11" 3,000psi Kill Line Double Studded Adaptor<br>1-11" 5,000 psi to 7$^{1}/_{16}$" 5,000 psi Double Studded Adaptor |
| **KILL LINE VALVES:** | 2-2$^{1}/_{16}$" 5,000psi Manual Flanged Valves |
| **CHOKE LINE VALVES:** | 1-3$^{1}/_{8}$" 5,000psi Manual Flanged Valve<br>1-3$^{1}/_{8}$" 5,000 psi HCR Flanged Valve |
| **INSTRUMENTATION:** | Martin–Decker 6 pen Record-O-Graph<br>Martin–Decker Weight Indicator Type FS<br>Martin–Decker Mud Pressure Gauge<br>Martin–Decker Rotary RPM Indicator<br>Martin–Decker Pump Stroke Indicator (2 off)<br>Martin–Decker Rota Torque Indicator<br>Martin–Decker Tong Torque Indicator<br>Martin–Decker Mud Flow Sensor<br>Martin–Decker Mud Flow Fill System<br>Martin–Decker Mud Volume Totaliser (MVT) |
| **AUTOMATIC DRILLER:** | Satellite Automatic Driller Model SA100-50-1500 |
| **KELLY SPINNER:** | Foster Model K-77 |
| **KELLY:** | 1-5$^{1}/_{4}$"Hex Kelly. 2$^{13}/_{16}$" ID × 40' long with 6$^{5}/_{8}$" API Reg LH Box up 4" IF Pin Down |
| **UPPER KELLY VALVE:** | Upper Kelly Cock. 10,000 test 6$^{5}/_{8}$" API Reg LH Connections. |
| **LOWER KELLY VALVE:** | 1 – Hydril Kelly Guard 6$^{1}/_{4}$" OD 10,000 psi, 4" IF (NC46) Pin and Box Connection |
| **KELLY DRIVE BUSHING:** | Varco Type 4 KRS Kelly Drive Bushing |
| **DRILL PIPE AND TOOLS:** | 6 joints 4$^{1}/_{2}$" Range II Hevi Wate Drill Pipe with 18$^{0}$ Taper 4" IF (NC46) Connections.<br>10,000ft. 3 ½" 13.3lbs/ft Grade 'G" Drill Pipe<br>30 x 4 ¾" slick Drill collars 3 ½ " IF<br>1 x 4 ¾" pony collar, 3 ½" IF, 10 ft. long<br>9 x 3 ½" HWDP, 3 ½" IF<br>4 ¼" Hexagonal Kelly, 6 $^{5}/_{8}$" Reg LH Box up, 3 ½" IF Pin Down<br>4 ¾" Lower Kelly Valve, 3 ½" IF<br>4 ¾" Inside BOP / Stabbing Valve, 3 ½" IF<br>4 ¾" Bit Sub, 3 ½" IF Box Up, 3 ½" Reg Box Down<br>3 ½" rotary slips<br>3 ½" elevators |

All cross-over, lifting and saver subs to match above tools
4 ¾" drill collar slips

**DRILL COLLARS:**

4 - 8" Drill Collars, Range II, with $6^{5}/_{8}$" Reg. Connections.
24 – $6^{1}/_{4}$" Drill Collars, Range II, with 4" IF (NC46) Connections.
1 x 6 1/4" Monel Drill collar

**FISHING TOOLS:**

1 only Bowen $6^{1}/_{4}$" OD Type Z Fishing Jar
1 only Bowen $8^{1}/_{8}$" Series 150 FS Overshot
1 only Bowen $7^{7}/_{8}$" Reverse Circulating Junk Basket
1 only Junk Sub – $8^{1}/_{2}$" Hole
1 only Flat Bottom Mill – $8^{1}/_{2}$" Hole

**HANDLING TOOLS:**

**Elevators:**
1 Set $9^{5}/_{8}$" Casing
1 Set 7" Casing
1 Set $5^{1}/_{2}$" Casing
1 Set $9^{5}/_{8}$" Single Jt
1 Set 7" Single Jt
1 Set $5^{1}/_{2}$" Single Jt
2 Sets $4^{1}/_{2}$" DP 18 Degree
1 Set $3^{1}/_{2}$" Tubing Elevators
1 Set $2^{7}/_{8}$" Tubing Elevators
1 Set $2^{3}/_{8}$" Tubing Elevators

**Safety clamp**
1 Safety clamp for 8" and 6 1/4" Drill Collars.

**Slips:**
1 set $9^{5}/_{8}$" Casing
1 Set 7" Casing
1 Set $5^{1}/_{2}$" Casing
2 Sets $4^{1}/_{2}$" Drill Pipe
1 Set $3^{1}/_{2}$" Tubing Slips
1 Set 8" DC Slips
1 Set 6 1/4 DC Slips
1 Set 2 7/8 tubing slips

**Tongs:**
1 set BJ Type 'B' Rotary Tongs
1 set Farr Hydraulic Power Tongs
Jaws to suit $5^{1}/_{2}$", 7", $9^{5}/_{8}$" and $13^{3}/_{8}$"

**PIPE SPINNER:**

Varco SSW-10 Spinning Wrench

**SUBS:**

1 - $6^{5}/_{8}$" Reg. X $6^{5}/_{8}$" Reg. Bit Sub (Double Box)
2 – $4^{1}/_{2}$" Reg. X 4" IF (NC46) Bit Subs
1 – $6^{5}/_{8}$" Reg. X 4" IF (NC46) Crossover Sub (Pin x Box)
2 – 4" IF (NC46) Saver Subs (Pin x Box)
3 – $6^{5}/_{8}$" Reg. Lift Nubbins
11 – 4" IF (NC46) Lift Nubbins

**CASING / TUBING DRIFTS:**

| | |
|---|---|
| 1 – $9^{5}/_{8}$" | 36 lb/ft |
| 1 - 7" | 26 lb/ft |
| 1 - 7" | 23 lb/ft |
| 1 – $5^{1}/_{2}$" | 17 lb/ft |
| 1 – $5^{1}/_{2}$" | 15.5 lb/ft |

**THREAD PROTECTORS:**

3 – $9^{5}/_{8}$" Klampon Style
3 - 7" Klampon Style
3 – $5^{1}/_{2}$" Klampon Style

| | |
|---|---|
| **WELDING EQUIPMENT:** | Lincoln Electric Welder Model 400AS |
| **AIR COMPRESSORS:** | Sullair compressor Package Model 10-30L - 100 cfm @ 125 psi Gardner Denver - 20 HP 80 cfm @ 110 psi. |
| **AC GENERATOR:** | 2 each Caterpillar 3408TA AC Generator Model SR-4. 1,800 rpm 60 hz 275 kw. |
| **FUEL TANKS:** | 2 each 10,000 litre - Skid Mounted |
| **WATER TANK:** | 400 BBL tank with two Warman 3×2 pumps driven by 24 HP electric motors |
| **PIPE RACKS:** | 5 sets 30ft in length |
| **CATWALKS:** | 2 piece Catwalk drill pipe construction 42" height |
| **COMMUNICATION:** | Westinghouse Satellite Phone and Fax |
| **SURVEY UNIT:** | Totco $8^0$ Deg. Recorder |
| **MUD LAB:** | Baroid Rig Laboratory Model 821 |
| **RATHOLE DRILLER:** | Manufactured Rat Hole Driller for $5^1/_4$" Kelly |
| **MUD SAVER:** | Harrisburg Unit with $4^1/_2$" Sealing Rubbers |
| **CELLAR PUMP:** | 1 only 3" Pacific Diaphragm Unit |
| **WATER PUMP:** | 1 only Centrifugal Pump Unit |
| **FIRE EXTINGUISHER:** | 1 lot as per State Mining Regulations for Rig and Camp |
| **PIPE BINS:** | 3 only 36' L × 10' W × 42" H |
| **CUP TESTER:** | Cameron Type 'F' Cup Tester Mandrel with 4" IF Connections. $9\ ^5/_8$" 47- 36 lbs rubber for cup tester. |
| **PRESSURE TEST PUMP** | 1 "Nearwhich" 3000 psi test pump with chart recorder. |
| **HAMMER UNIONS:** | Replace all 2" hammer unions with 1502 Welded Hammer Unions. |
| **TRANSPORTATION:** | International 530 Payloader or equivalent<br>Toyota 4 × 4 Pickup<br>Toyota 4 × 4 Crew Vehicle |
| **RIG ACCOMMODATION:** | 2 Skid-Mounted Rig Manager/Companyman Units<br>1 Communication Hut 40ft. X 10ft. which will accommodate Anadrill office requirements. |
| **FORKLIFT:** | One (1) |
| **INTERCOM:** | 4 stations unit, borrowed from CDL 27 if possible. |
| **CAMP:** | 1–Camp Generator House 31' long × 10' wide skid-mounted complete with 2 – 3304 T 80 Kw, 50 Hz, 200 – 400 volt generators, camp distribution panel. 6,794 litres fuel storage, 12,000 litres fresh water storage and 24,000 litres shower water storage. |

| | |
|---|---|
| 1-Kitchen/Dining Room | 40' × 10' × 10' |
| 1-Recreation Room | 40' × 10' × 10' |
| 1-Ablution/Laundry | 40' × 10' × 10' |
| 4-12 Man Bunkhouses | 40' × 10' × 10' |
| 1-Cooler/Freezer | 20' × 8' × 8’ |
| 1-Female Ablution Block | 20’ x 8’ x 8’ |

# ENCLOSURE I: 5" = 100' COMPOSITE LOG

# ENCLOSURE II: 5" = 100' MUDLOG

# ENCLOSURE III: DEPTH STRUCTURE MAP

# ENCLOSURE IV: LOG ANALYSIS PLOT