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

AMRIT-1

INTERPRETED DATA REPORT

PREPARED BY:
R. Subramanian
(Consultant)
May 2005

AMRIT-1

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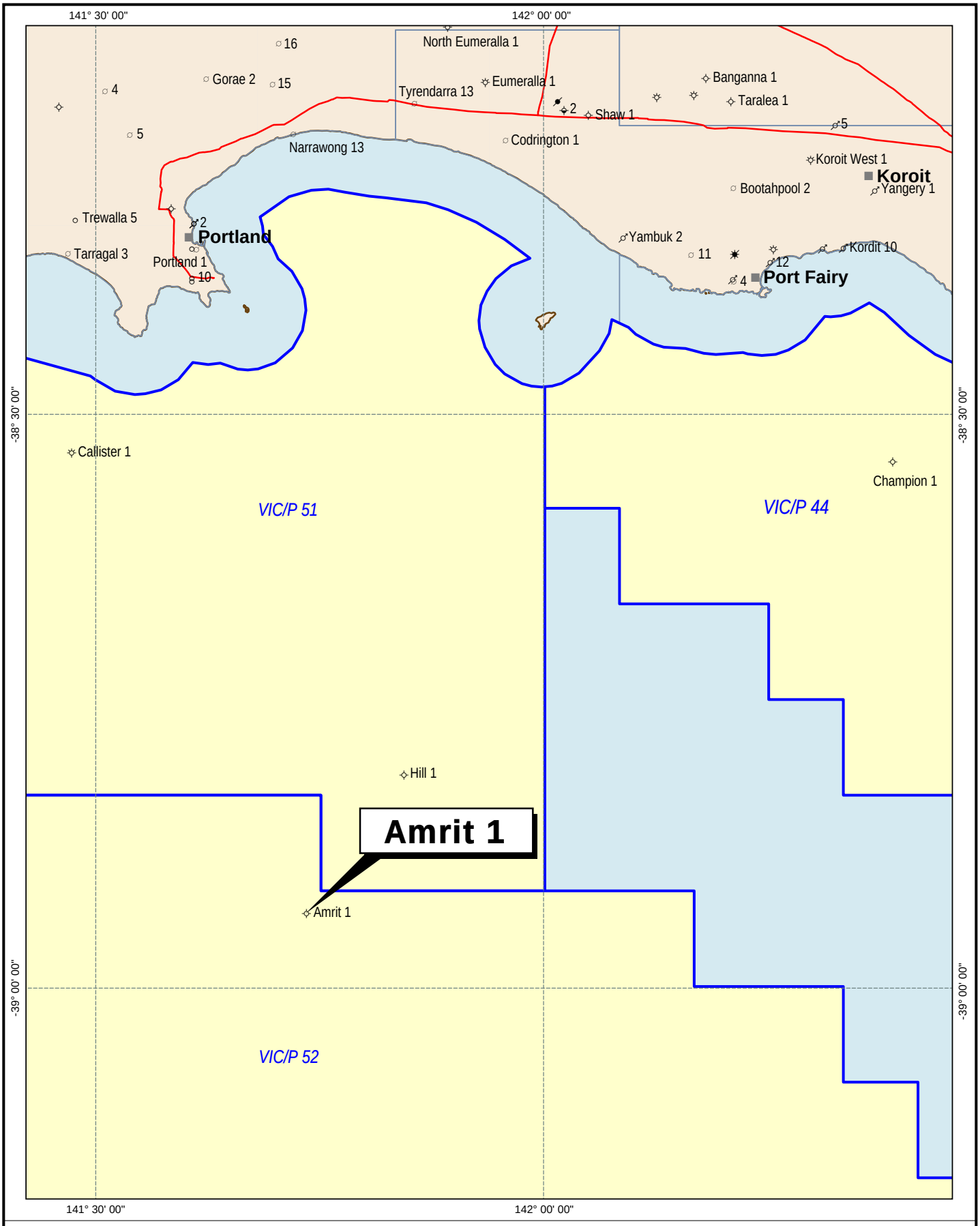
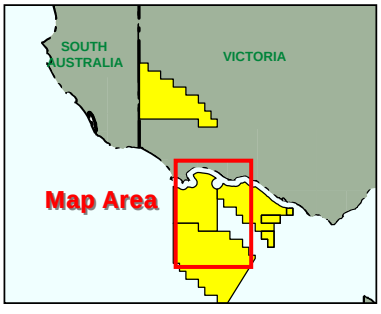
LOCATION MAP





Legend

Santos Permit

Santos

VIC/P 51 - Victoria

Amrit 1

Location Map

10 0 10 20

Kilometres

Scale: 1:500 000

Date: April 2005, File No. OTWAY 640

GDA

WELL CARD

WELL: AMRIT-1	**WELL CATEGORY**: OFFSHORE OIL/GAS EXPLORATION WELL	**SPUD:** 20-11-04 **TD REACHED:** 07-12-04
		RIG RELEASED: 17-12-04 **CMPLT**: -
	WELL INTENT: OIL/GAS	**RIG**: JACK BATES
		STATUS: PLUGGED AND ABANDONED
SURFACE LOCATION: (GDA94)		**REMARKS**:
LAT: 38° 56' 05.20" S **LONG:** 141° 44' 07.08" E		
NORTHING: 5690204.1M **EASTING:** 563729.6M		
SEISMIC STATION: OS02 3D SURVEY IL7404 XL1967		
ELEVATION SEA FLOOR: -1425M LAT **RT** +29M LAT		
BLOCK/LICENCE: VICTORIA – OTWAY BASIN VIC/P52		
TD 2979 M (LOGR EXTRAP) 2979 M (DRLR)		
PBTD - M (LOGR) - M(DRLR)		

TYPE STRUCTURE: FAULT BOUND STRUCTURAL/ STRATIGRAPHIC CLOSURE	**HOLE SIZE**	**CASING SIZE**	**SHOE DEPTH**	**TYPE**
	660MM	508MM	1822M	198 KG/M X56
TYPE COMPLETION: NIL	445MM	340MM	2454M	101 KG/M L80 TER
ZONE(S): -	311MM	-	-	-

AGE	**FORMATION OR ZONE TOPS**	**DEPTH (M)**		**THICK-NESS (M)**	**HIGH (H) LOW (L)**
		DRILLERS RT (M)	**SUBSEA (M)**		
	SEA LEVEL	29	0	1396	0
	SEA FLOOR	1425	-1396	568	1M LOW
EOCENE	WANGERRIP GROUP: T20 = T15	1993	-1964	53	144M LOW
	BASE TERTIARY : T1	2046	-2017	33	1M HIGH
LATE CRETACEOUS	UPPER TIMBOON SANDSTONE	2079	-2050	75	0
LATE CRETACEOUS	TIMBOON MUDSTONE	2154	-2125	396.5	0
LATE CRETACEOUS	PAARATTE FORMATION K94	2550.5	-2522	4.5	23.5M HIGH
LATE CRETACEOUS	PAARATTE FORMATION K93	2555	-2526	24	39M HIGH
	TOTAL DEPTH (LOGGER EXTRAP)	2979	-2950		

LOG INTERPRETATION					
INTERVAL (M)	**Ø %**	**SW %**	**INTERVAL (M)**	**Ø %**	**SW %**
NO PAY					

PERFORATIONS	
FORMATION	**INTERVAL**
NIL	

CORES				
FORM	**NO.**	**INTERVAL**	**CUT**	**REC**

PRODUCTION TEST RESULTS
NO PRODUCTION TEST CONDUCTED.

TYPE OF LOG	FROM (m)	TO (m)	REPEAT SECTION	TIME SINCE LAST CIRC	BHT
MWD LOGGING:					
Run 1: Res-GR-Surveys-Ann Press	1425	1835			
Run 2: Res-GR-Surveys-Ann Press	1835	2459			
Run 3: Res-GR-Surveys-Ann Press	2459	2695			
Run 4: Res-GR-Surveys-Ann Press	2695	2979			
WIRELINE LOGS					
RUN 1: PEX-HALS-DSI					
GR	2945	2454	Down log	22.25 hrs	56.11°C
Resistivity	2945	2454			
SP	2945	2454			
Caliper	2945	2454			
Dt (Full waveforms)	2945	2454			
X-Y Neutron-Density (Dual axis)	2945	2454			
RUN 2: VSP (50m Intervals)	2940	1790		34.25 hrs	62.2 °C
RUN 3: SWC One gun – 30 shots Recovered 21, 3 Misfire, 6 Empty.	2925m	2494m			

SUMMARY:

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Amrit-1 was drilled as an oil-prospect but there was a possibility that gas would be encountered in the reservoir. Amrit-1 was to be drilled as a vertical well to a Total Depth of 2979m (or to an alternative, deeper Total Depth of 3179m in the case of encouraging shows).

The Amrit Prospect is located on a tilted fault-block and was designed to test the fault-bound stratigraphic/structural potential of the Paaratte Formation primary target (K94/K93) at a depth of 2574m. The prime target was the top Paaratte delta section with the secondary target being the intra-Paaratte K91 amplitude anomaly.

Amrit-1 was a critical test of one of a series of amplitude features at the top Paaratte Formation. The well was planned to assist in establishing whether an oil model would be applicable to the area and confirm the top seal potential of the Timboon Formation-equivalent section encountered in the recently drilled Hill-1.

A successful oil result would have a significant impact on Paaratte prospects and leads in the VIC/P52 license and the Southern Margins in general.

SUMMARY: (Continued)

Amrit-1 was spudded at 17:15 hrs on the 20th of November 2004 utilising the semi-submersible drilling facility "Jack Bates". 760mm (30") conductor and 660mm (26") BHA was run with the Drillquip CADA tool on drillpipe and the conductor jetted with the shoe at 1509.5m. The 660mm (26") section was drilled from 1510m to section total depth at 1835m with returns to the seafloor . A string of 762mm (20") (198 kg/m X56) casing was run and set at 1822m. After running the blowout preventers stack on the marine riser, the 445mm (17.5") hole section was drilled from 1835m to 2459m. A wiper trip was performed and a string of 340mm (13.375") (101 kg/m L80 TER) casing was run and set at 2454m. Two bits were required to drill the 311 mm (12.25") section from 2459m to the Total Depth of 2979m which was reached at 03:30hrs on the 7th of December 2004. The entire well 1425m to 2979m was logged while drilling with Anadrill Schlumberger MWD CDR-Powerpulse tools to record Gamma Ray, Resistivity, Annular Pressure and Deviation Survey data. At Total Depth wireline logs were recorded as outlined in the Wellcard. After rigging down wireline logging, Amrit-1 was plugged and abandoned.

Amrit-1 was drilled as a vertical hole with deviation under 1° throughout the well. At the Total Depth of 2979mRT (D), the estimated displacement was 12.5m towards 232.8°T direction. At total depth it is estimated that the TVD would be 2978.9m and the well was drilled within the Target tolerances specified in the program.

While drilling Amrit-1, the penetrated depths of most formations were between 1m and 39m of their respective prognosed depths. The Wangerrip Group (T20=T15) came in 144m low to prognoses but this was due to a mis-correlation and is not considered significant. The primary target Paaratte Formation was intersected 23.5m high to its predicted depth. The target Paaratte Formation sands did not indicate any significant gas shows; however trace fluorescence was observed in the top 7m of the Paaratte Formation. While drilling, the CO^2 readings were typically in the 460-500 ppm range.

Amrit-1 addressed an unproven play in the Otway Basin; Paaratte Oil sourced from the Belfast Mudstone. Shows encountered in the Paaratte sands are still being analysed but suggest an active petroleum system may be at work but with doubt over the volumes of generated hydrocarbons. Amrit confirmed the presence of reservoir quality sands and an overlying seal facies in mudstones age-equivalent to the more proximal Timboon Sandstone.

Amrit-1 was prognosed to intersect four Paaratte Sandstones based on seismic interpretation correlated to the offset Hill-1 well in VIC/P51. These comprised two upper sands (K94, K93) and two lower sands (K92, K91). The upper sands would consist of a basal Timboon sandstone (K94) directly (though unconformably) overlying an upper K93 sandstone and a lower K93 Sandstone beneath that, separated by a mudstone unit. The K94 sandstone was prognosed to be shallow marine to barrier bar, while the K93 sandstones were prognosed to be deltaic in origin. The K92 and K91 sandstones are of uncertain depositional environment but probably shoreface to shallow marine.

Amrit intersected the K94/K93 sandstones more or less as predicted though the K94 was less well-developed (4.5m intersected compared to 20m prognosed). However the K92 and K91 sands were entirely absent, despite seismic attribute anomalies associated with the K92 seismic marker which strongly suggested the presence of sand. It is possible the well missed the sand due to a local shale-out and it is present away from the well-bore but the potential volumes associated with this sand are not sufficient to justify a stand-alone target.

The Amrit-1 well proposal prognosed 31m of net pay for oil with an average porosity of 21%. Petrophysical analysis indicated 42.5m of Net Sand with an average porosity of 16.2%. Porosity was lower than anticipated due mainly to higher than expected clay contents reducing the effective porosity.

Amrit-1 was plugged and abandoned. Cement plugs were set as per program, Plug 1: 2386m-2490m and Plug 2: 1460m-1557m. The rig was released at 16:00 hours on December 17, 2004.

1. GEOLOGY

1.1 INTRODUCTION

Amrit-1 was drilled as an Otway Basin oil/gas exploration well in the Victoria Offshore VIC/P52 license. The Surface Location is Latitude: 38° 56' 05.20" South, Longitude: 141° 44' 07.08" East (GDA94), Northing: 5690204.1m, Easting: 563729.6m (MGA-94). The Seismic Reference is OS02 3D Survey IL7404 XL1967. The location lies approximately 68 km south of the town of Portland, 50 km SE of Bridgewater Bay-1, 18 km SW of Hill-1 (see Location Map).

Amrit-1 is a "deep water" well located in 1396m of water and was drilled by the semi-submersible drilling rig "Jack Bates". Amrit-1 was drilled as an oil-prospect but there was a possibility that gas would be encountered in the reservoir. Amrit-1 was to be drilled as a vertical well to a Total Depth of 2979m (or to an alternative, deeper Total Depth of 3179m in the case of encouraging shows).

The Amrit Prospect is located on a tilted fault-block and was designed to test the fault-bound stratigraphic/structural potential of the Paaratte Formation primary target (K94/K93) at a depth of 2574m. The prime target was the top Paaratte delta section with the secondary target being the intra-Paaratte K91 amplitude anomaly.

Amrit-1 was a critical test of one of a series of amplitude features at the top Paaratte Formation. The well was planned to assist in establishing whether an oil model would be applicable to the area and confirm the top seal potential of the Timboon Formation-equivalent section encountered in the recently drilled Hill-1.

A successful oil result would have a significant impact on Paaratte prospects and leads in the VIC/P52 license and the Southern Margins in general.

1.2 FIELD DESCRIPTION (after Amrit-1 Well Proposal)

Geological/Geophysical Summary

The Amrit-1 well was a test of the top Paaratte faulted deltaic section. At the prospect location, faulted dip closure occurs to the south and west, dip closure or stratigraphic closure to the east and back fault closure to the north. A secondary objective had been defined at the intra-Paaratte K91.

The Amrit Prospect location was chosen based on the following criteria :

- to test a thick, higher-amplitude section of the (K93) deltaic lobe,
- to test the observed intra-Paaratte amplitude anomaly section (K91) that was the driver for entering the permit,
- to avoid potential shallow drilling hazards including amplitude events near the base of the Tertiary section and interpreted mobile mudstones at a shallower level.

In satisfying these criteria, no suitable location within the small amount of three way upthrown fault closure occurred. The well was located approximately 50m downdip of the crest of the Paaratte Delta (K93). In the event of failure the updip potential would be uneconomic.

If drilling provided encouragement, the well was to be deepened to intersect an interpreted Nullawarre-equivalent section at approximately -3020mSS (alternative pick -3120mSS). In this instance the TD of would be increased to -3150mSS. Below the Nullawarre section ~4000m of Belfast Mudstones overlie the Waarre Formation. This put the Waarre Formation at a depth of approximately -7000mSS (>5500mBML) and was not a viable target.

The Amrit Prospect has potential to satisfy all the necessary prerequisites for a commercial hydrocarbon accumulation, namely closure, reservoir, seal and charge. Charge for oil was identified as the primary risk but if the possibility of gas was taken into account then the major risk becomes cross-fault seal. The geological input into the risk and resource parameters used in the economic evaluation are described below.

The Amrit Prospect was well-imaged on the OS02 3D seismic survey. Beneath the shallower water and shelf-break the data quality was compromised by velocity and refraction issues, but in the deeper water data quality was excellent. The data were interpreted to show a lobate deltaic section overlain by a blander Timboon-equivalent mudstone section.

Amplitude Variation with Offset (AVO) modelling at Bridgewater Bay-1 and Hill-1 had demonstrated that the rock physics properties of the primary target were dominantly associated with a Class 4 response. The characteristic of this class is that there is very little AVO observed on the modeled gathers. This was supported by 3D gathers. The increased amplitude over the prospect area was at least indicating a high likelihood of sandstone development beneath cemented mudstones/sandstones. Modelling at Hill-1 highlighted the complex nature of the interfaces between the mudstones, porous sandstones and cemented sandstones streaks. The modeled addition of hydrocarbons at Hill-1 reduced the amplitude of seismic events. The 3D gathers in the Amrit area show a predominantly Class 4 response. It was interpreted that at Amrit, a hard zone (either mudstone or cemented sandstone associated with a marine transgression) would overly porous sandstones.

On the 3D volume the seismic amplitudes do not exhibit a conformance with structure. A stratigraphic trapping component to the east could be inferred by the drop in amplitude response indicating a lack of sandstone deposition associated with the limit of the K93 delta. A commercial success required the back-fault (north) to seal. It was not possible, on available seismic data, to differentiate between water, oil or gas, even utilising the recently acquired Hill-1 well information.

Play

The Paaratte Play was unproven for both oil and gas.

Closure

The Amrit complex encompassed by the resource distribution includes; the Amrit A block (well location), the two north-south bound fault blocks to the west, the Amrit B block to the north and in the high-side case the southern fault block. Approximately half the potential of the Amrit B block crosses into VIC/P51.

The Amrit Prospect was defined on the OS02 3D seismic dataset, as a fault bound feature requiring cross fault seal to the southwest and northeast. The well was located beyond the limit of the small three-way dip closure of the Paaratte section. The preferred (likely) model for the Amrit area was that the resource potential was limited to the east by sandstone pinch-out rather than structural spill (less likely). The western control on the Amrit feature was provided by a channel (K94.5) that eroded the Paaratte delta.

Reservoir

Reservoir was highly likely to occur in the Paaratte Formation. The Paaratte was mud-prone to the east of the Amrit Prospect in the VIC/P44 area, but was very well developed in the northwest, in the Bridgewater Bay/Discovery Bay area. Reservoir quality sands were also intersected in the Hill-1 well, based on petrophysical interpretation and MDT mobilities.

3D seismic data exhibited an area of higher amplitudes that were highly likely to be associated with a deltaic, prograding system, linked to a northwestern sediment source. The presence of strong amplitude events within the section, its polarity and an amplitude character that was consistent with the presence of sandstone provide a high confidence that some potential reservoir section would be present at the Amrit location. Seismic inversion of the data volume supports the presence of a low velocity zone at the top of the primary target interval. The Paaratte Formation was prognosed to have a gross thickness of approximately 500m and was likely to consist of a transgressive sandstone (K94) overlying a thick deltaic package (K93), underlain by a series of thinner interbedded sandstones (K92, K91, K90).

The top of the deltaic package was mapped as the K93 horizon. At Hill-1 this section contained 46m of net reservoir quality sandstones. Reservoir potential was also included at the K92, K91, and K90 levels. At these levels thinner (<20m) sandstones were anticipated related to lowstand delta-slope deposits or shallow water turbidites rather than the exposed delta system.

The nature of the amplitude anomaly associated with the K91 section suggested that this event was associated with either a thin porous sandstone that was hydrocarbon charged, or a low impedance mudstone overlying a higher impedance sandstone. At Hill-1 the latter occurred.

Seal

Seal was considered a high to moderate risk for the Amrit Prospect. Geological success required the Lower Timboon Formation to form an effective top-seal and cross-fault hanging-wall seal to the Paaratte reservoir. Upside volumes required back-fault (foot-wall) seal of the Paaratte against Skull Creek/Belfast Formation Mudstones that contained interbedding Paaratte and Nullawarre-equivalent sandstones though of low overall Net:Gross.

The results of the recent Hill-1 well have confirmed the pre-drill model that the lower Timboon in the Amrit area consisted of distal marine mudstones rather than sandstones as observed in more nearshore environments. Seismic data, tied to Hill-1, support the presence of a bland section overlying the reservoir target which was consistent with the presence of a thick (300+m at the well location) mudstone section capable of providing top seal.

Intra-formational seals allow for the potential of stacked pay within the structure, but these were regarded as upside and did not affect the primary risk.

Cross-fault seal was required to trap hydrocarbons in the laterally extensive sandstone-dominated upper Paaratte deltaic section. To the south, the interval between the K99 and K94 was expected to be of a sufficiently low net to gross to allow seal through mudstone smear along the fault-plane. To the north, the mudstone dominated interval between the base of the deltaic package and the deeper K91 was required to provide downthrown cross-fault seal to trap hydrocarbons within the delta package at Amrit.

Breaching of traps due to recent fault movements was a recognised risk in the Otway Basin and had been invoked to explain a number of failed wells. However, seismic data show that, unlike adjacent areas to the northwest, faulting in the Amrit area largely ceased at the end of the Cretaceous and few faults are seen to cut the overlying Tertiary section. Breaching and trap-leakage are therefore considered less of a risk in the Amrit area.

The probability of adequate seal allowed for the uncertainty of the top-sealing quality of the overlying sediment, the vertical fault seal and cross fault (upthrown and downthrown) seal, and the chance of breaching and trap-leakage.

Probability of seal was considered moderate to low.

Charge

Charge was the largest unknown, particularly the type of hydrocarbon expected. The Amrit Prospect was being targeted for its oil potential, but there is considered a higher likelihood of gas-charge in the area.

The Amrit Prospect lay within the Paaratte Play Fairway which relied upon either the unproven Belfast/Paaratte Petroleum System or an alternate liquids source from the Waarre/Flaxmans sequence for oil success. The proven gas-prone Eumeralla-Waarre Petroleum System worked in the Port Campbell Embayment and Shipwreck Trough area of the Otway basin, however, in the northern VIC/P52 area, modelling suggested that the Eumeralla section generated prior to the emplacement of the Paaratte and was subsequently over-mature for generation. The Belfast Mudstone was proposed as a possible mature, oil-prone source rock, in the deep-water of the Otway Basin as it was within the current-day active oil-window. Onshore and nearshore, the Belfast Formation was a generally poor to gas-prone source but it was postulated that source quality would improve basinwards.

The presence of an active liquids-prone source on the southern margins was supported by the presence of bitumen strandings on the coast-line, and sampling of sea-floor seeps with liquids signatures. Geochemical studies also indicate possible dual-charge episodes in the Shipwreck Trough, from an early dry-gas source (Eumeralla) and a later, more liquids-prone source (Waarre/Flaxmans or Belfast).

The change of seismic amplitude character within the lower Paaratte was likely to be associated with fluids migrating up faults. It was envisaged that fluids migrating vertically up faults enter and fill the first sandstones encountered, thus preferentially located on the downthrown portion of the fault, prior to filling sandstone sections higher. The Amrit area had unusually good fault plane reflections within the Belfast (mudstone) section underlying the Paaratte section. It was postulated that fault plane reflections have been enhanced by fluid migration (gas component?).

Total chance of hydrocarbon charge is considered to be approximately 60%. Gas was considered twice as likely as oil. Gas and gas liquids indications occurred in the lower part of Hill-1 supporting a (local) charge mechanism. A mixed oil/gas case has been accommodated by using wide ranges of oil and gas ratios.

1.3 WELL LOCATION

Amrit-1 was drilled as an Otway Basin oil/gas exploration well in the Victoria Offshore VIC/P52 license. The Surface Location is Latitude: 38° 56' 05.20" South, Longitude: 141° 44' 07.08" East (GDA94), Northing: 5690204.1m, Easting: 563729.6m (MGA-94). The Seismic Reference is OS02 3D Survey IL7404 XL1967. The location lies approximately 68 km south of the town of Portland, 50 km SE of Bridgewater Bay-1, 18 km SW of Hill-1 (see Location Map). Amrit-1 is a "deep water" well located in 1396m of water and was drilled by the semi-submersible drilling rig "Jack Bates"

The Surface Surveyed Location for Amrit-1 is :

Latitude:	038° 56' 05.20" South
Longitude:	141° 44' 07.08" East (GDA-94).
Easting:	563729.6m
Northing:	5690204.1m (MGA-94)

The Seismic Location for Amrit-1 is:

OS02 3D Survey, Inline 7404, Crossline 1967

2. RESULTS OF DRILLING

2.1 STRATIGRAPHY & GEOPHYSICAL PROGNOSIS

The Well Card at the front of this report, indicates the depths at which the various horizons were penetrated in Amrit-1. These were between 1m and 39m of their respective prognosed depths. The Wangerrip Group (T20=T15) came in 144m low to prognoses but this was due to a mis-correlation and is not considered significant. The primary target Paaratte Formation was intersected 23.5m high to its predicted depth. The target Paaratte Formation sands did not indicate any hydrocarbon shows.

2.2 STRATIGRAPHY (Drillers MDRT Depths)

The following table outlines the elevations and thicknesses of formations penetrated in Amrit-1. Detailed descriptions can be found in Section 2.1 of the Basic Data Report.

AGE	FORMATION OR ZONE TOPS	DEPTH (M)		THICK-NESS (m)	HIGH (H) LOW (L)
		Drillers RT (m)	Subsea (m)		
	Sea Level	29	0	1396	0
	Sea Floor	1425	-1396	568	1m Low
Eocene	Wangerrip Group: T20 = T15	1993	-1964	53	144m Low
	Base Tertiary : T1	2046	-2017	33	1m High
Late Cretaceous	Upper Timboon Sandstone	2079	-2050	75	0
Late Cretaceous	Timboon Mudstone	2154	-2125	396.5	0
Late Cretaceous	Paaratte Formation K94	2550.5	-2522	4.5	23.5m High
Late Cretaceous	Paaratte Formation K93	2555	-2526	24	39m High
	Total Depth (Logger Extrap)	2979	-2950		

2.3 HYDROCARBON SUMMARY (Logger's MDRT Depths)

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, butane and pentane). Gas compositions are quoted as the percentage ratios of these five gases (i.e. 94/2/1/1/1 denotes 94% C1, 2% C2, 1% C3, 1% C4 and 1% C5). Ditch cuttings were tested for hydrocarbon fluorescence by using an ultra-violet fluoroscope.

Since returns were to the seafloor in the 914mm (36") and 660mm (26") sections to 1835m, gas readings are not available. After drilling out the 762mm (20") casing shoe at 1822m returns were to the surface and realtime gas monitoring was possible. From the casing shoe at 1822m to the top of the target Paaratte Formation at 2550.5m, Total Gas ranged from 1 to 53 units but typically in the 5-12 units range with a gas composition consisting 100/trace % to 99/1/trace %. In the Paaratte Formation from 2550.5m to 2695m, background gas ranging from 2 to 39 units was recorded and consisted of 99/1/trace 0%. The top 7m of the Paaratte Formation indicated trace fluorescence. In the section from 2695m to total depth at 2979m, the background gas increased to range between 7 and 146 units and comprised of varying gas ratios ranging from 93/3/2/1/1 % to 91/5/3/1/trace %.

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Amrit-1 was drilled as a vertical hole with deviation under 1° throughout the well. At the Total Depth of 2979mRT (D), the estimated displacement was 12.5m towards 232.8°T direction. At total depth it is estimated that the TVD would be 2978.9m and the well was drilled within the Target tolerances specified in the program.

While drilling Amrit-1, the penetrated depths of most formations were between 1m and 39m of their respective prognosed depths. The Wangerrip Group (T20=T15) came in 144m low to prognoses but this was due to a mis-correlation and is not considered significant. The primary target Paaratte Formation was intersected 23.5m high to its predicted depth. The target Paaratte Formation sands did not indicate any significant gas shows; however trace fluorescence was observed in the top 7m of the Paaratte Formation. While drilling, the CO^2 readings were typically in the 460-500 ppm range.

Amrit-1 addressed an unproven play in the Otway Basin; Paaratte Oil sourced from the Belfast Mudstone. Shows encountered in the Paaratte sands are still being analysed but suggest an active petroleum system may be at work but with doubt over the volumes of generated hydrocarbons. Amrit confirmed the presence of reservoir quality sands and an overlying seal facies in mudstones age-equivalent to the more proximal Timboon Sandstone.

Amrit-1 was prognosed to intersect four Paaratte Sandstones based on seismic interpretation correlated to the offset Hill-1 well in VIC/P51. These comprised two upper sands (K94, K93) and two lower sands (K92, K91). The upper sands would consist of a basal Timboon sandstone (K94) directly (though unconformably) overlying an upper K93 sandstone and a lower K93 Sandstone beneath that, separated by a mudstone unit. The K94 sandstone was prognosed to be shallow marine to barrier bar, while the K93 sandstones were prognosed to be deltaic in origin. The K92 and K91 sandstones are of uncertain depositional environment but probably shoreface to shallow marine.

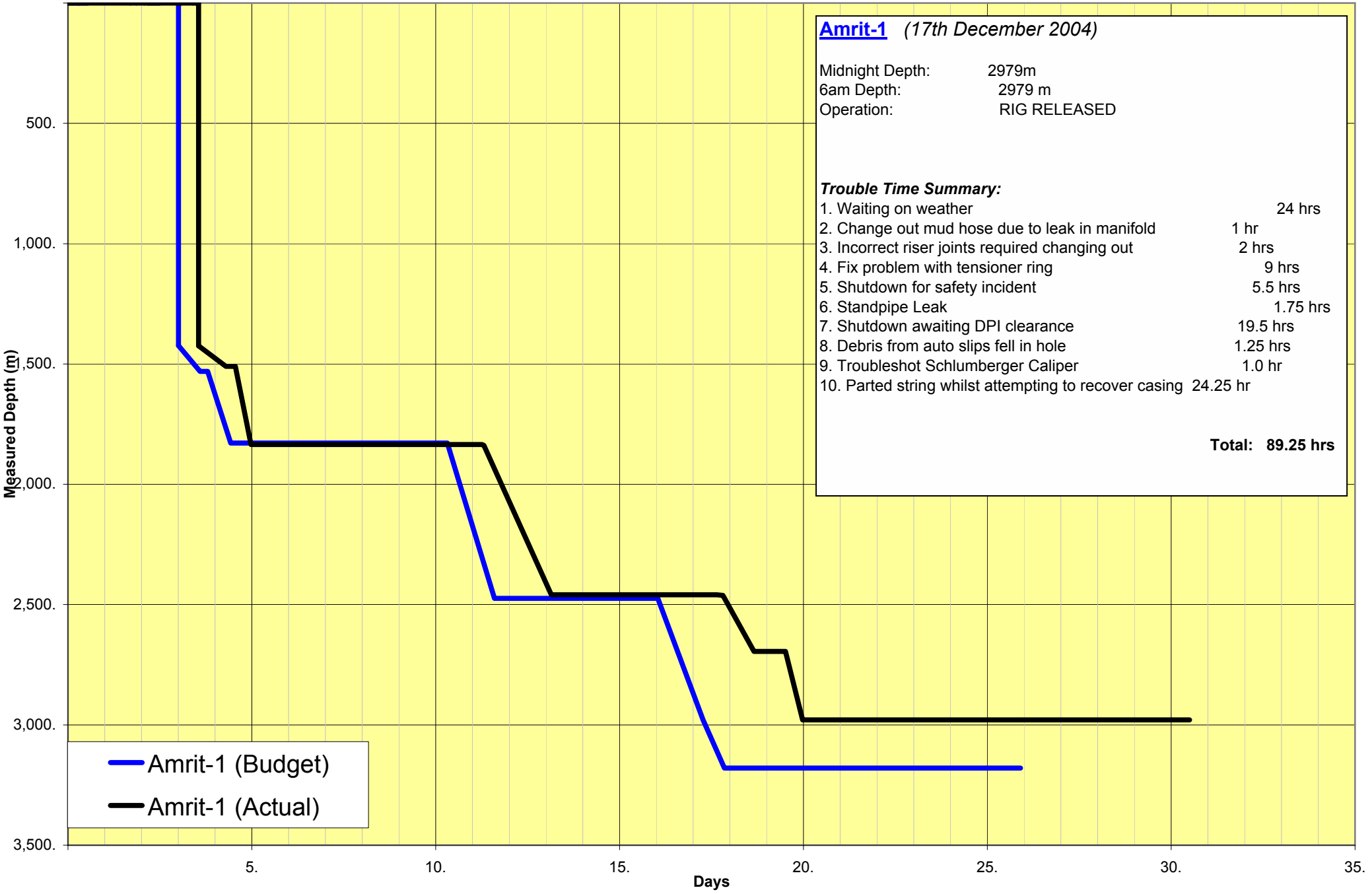
Amrit intersected the K94/K93 sandstones more or less as predicted though the K94 was less well-developed (4.5m intersected compared to 20m prognosed). However the K92 and K91 sands were entirely absent, despite seismic attribute anomalies associated with the K92 seismic marker which strongly suggested the presence of sand. It is possible the well missed the sand due to a local shale-out and it is present away from the well-bore but the potential volumes associated with this sand are not sufficient to justify a stand-alone target.

The Amrit-1 well proposal prognosed 31m of net pay for oil with an average porosity of 21%. Petrophysical analysis indicated 42.5m of Net Sand with an average porosity of 16.2%. Porosity was lower than anticipated due mainly to higher than expected clay contents reducing the effective porosity.

Amrit-1 was plugged and abandoned. Cement plugs were set as per program, Plug 1: 2386m-2490m and Plug 2: 1460m-1557m. The rig was released at 16:00 hours on December 17, 2004.

3. REFERENCES

Santos, 2004	Amrit-1 Well Proposal, prepared for Santos Ltd, (unpublished).
Subramanian, R., 2004	Amrit-1 Basic Data Report, prepared for Santos Limited, (unpublished).


Amrit-1 (17th December 2004)
Midnight Depth: 2979m
6am Depth: 2979 m
Operation: RIG RELEASED
Trouble Time Summary:
1. Waiting on weather 24 hrs
2. Change out mud hose due to leak in manifold 1 hr
3. Incorrect riser joints required changing out 2 hrs
4. Fix problem with tensioner ring 9 hrs
5. Shutdown for safety incident 5.5 hrs
6. Standpipe Leak 1.75 hrs
7. Shutdown awaiting DPI clearance 19.5 hrs
8. Debris from auto slips fell in hole 1.25 hrs
9. Troubleshot Schlumberger Caliper 1.0 hr
10. Parted string whilst attempting to recover casing 24.25 hr
Total: 89.25 hrs
Measured Depth (m)
500.
1,000.
1,500.
2,000.
2,500.
3,000.
3,500.
5.
10.
15.
20.
25.
30.
35.
Days
Amrit-1 (Budget)
Amrit-1 (Actual)

APPENDIX I: ELECTRIC LOG EVALUATION RESULTS

AMRIT 1
LOG ANALYSIS

AMRIT 1 - LOG ANALYSIS

Amrit 1 wireline logs were analysed from 2456m to 2979m (L). No gas pay was identified in and Amrit 1 was subsequently plugged and abandoned with no shows.

Amrit 1 was drilled in 1396m (D) of water as the first major Deep water operation Santos had operated. A 660mm hole was drilled to 1826m (D) and 508mm casing was set at 1822m. (D). A 445mm hole was then drilled to 2460m (D) using MWD (Navigation, Resistivity and Gamma Ray) and 340mm casing was set at 2455m (D). A 311mm hole was drilled with KCl-PHPA to a total depth of 2979mm (D) with MWD (Navigation, Resistivity and Gamma Ray). Wireline logging was carried out as described below.

Unless otherwise specified, all depths mentioned below are logger's depths referenced to the drill floor.

Conventional Pay Summary ***(ϕ_e>10% & Swt<70%)***

FORMATION	SAND INTERVAL	GROSS SAND (m)	NET SAND (m)	AVG PHIs (%)	NET PAY (m)	AVG PHIp (%)	WT.AVG SW (%)
MID TIMBOON MUDSTONE	2456-2550	15.4	0	-	0	-	-
PAARATTE FORMATION K94	2550-2558	7.8	6.1	17.4	0	-	-
PAARATTE FORMATION K93	2558-2953	70.1	36.4	16	0	-	-

Logs Acquired (wireline)

Run 1	GR	2945m – 2454 m	
	HALS	2945m – 2454 m	
	HCAL	2945m – 2454 m	
	SP	2945m – 2454 m	
	DT	2945m – 2454 m	Upper dipole and waveforms
	RHOB	2945m – 2454 m	
	TNPH	2945m – 2454 m	
	PE	2945m – 2454 m	
Run 2	VSP	2945m – 1790m	50 intervals.
Run 3	SCT-GR	2925m – 2494m	30 fired (21 good, 6 missing, 3 misfire)

Mud Parameters

Mud Type	KCl Polymer
KCl Content	10.0%
Mud Density	1.15 SG
Rm	0.108 ohmm @ 22 DEGC
Rmf	0.091 ohmm @ 22 DEGC
Rmc	0.129 ohmm @ 22 DEGC

Log Processing and Remarks

- Resistivity affected by metal junk left in borehole from drilling. Metal 'fin' was observed to be stuck in the HILTD centraliser when pulled to surface.
- TNPH log appears very spiky. TNPH corrected at wellsite by high resolution caliper. Caution was used when interpreting the neutron log responses.
- Logging tools could not pass 2454m (L) due to hang up (Possible caused by junk in centraliser).
- VSP affected by water depth

Interpretation Procedures and Parameters

A deterministic approach was used in the analysis. Primary total porosity was calculated primarily from the density-neutron crossplot, with subsequent edits to Raymer-Hunt-Gardner Sonic porosity when the nuclear logs were affected by bad borehole. The following parameters were used in the analysis-

- **Volume Of Shale**

The shale volume (Vsh) was calculated using the Density-Neutron xplot technique and a linear Gamma Ray. The equations are:

$$V_{SH}DN = \frac{(a-b)}{(c-d)}$$

where:

$$a = (\rho ma - \rho fl) * (nphi_{fl} - nphi)$$
$$b = (\rho - \rho fl) * (nphi_{fl} - nphi_{ma})$$
$$c = (\rho ma - \rho fl) * (nphi_{fl} - nphi_{sh})$$
$$d = (\rho sh - \rho fl) * (nphi_{fl} - nphi_{ms})$$

ρ = density (K/M3)
fl = fluid properties
sh = shale properties
ma = matrix properties
nphi = neutron log (environmentally corrected)

$$VSH_{GR} = \frac{GR - GR_{Cl}}{GR_{Sh} - GR_{Cl}}$$

where;
GR_{Cl} = Gamma ray response in clean sand
GR_{Sh}= Gamma ray response in shale

- **Porosity**

Total Porosity, PHIT (ϕ_t) was using the following relationships:

$$sphi = \frac{(DT - 55.5)}{DT} * 0.625,$$

$$dphi = \frac{\rho ma - \rho}{\rho ma - \rho fl},$$

$$nphi = nphi_{ss},$$

$$phix = \frac{(dphi + nphi_{ss})}{2},$$

$$dphix = \min(dphi, phix) \quad \&$$

$$phit = badhole > 0.1, sphi, dphix$$

Effective Porosity, PHIE (ϕ_e) is calculated as follows:

$$phie = phit - (phi_{sh} * Vsh)$$

where;

$phi_{sh} = 0.33$

- **Water Saturation**.

The water saturation was derived using the Dual Water Saturation Equation as defined below:

$$C_t = \frac{1}{a}\phi_t^m S_{wt}^n \left[\left(\frac{S_{wt} - S_{wb}}{S_{wt}} \right) C_w + C_{bw} \frac{S_{wb}}{S_{wt}} \right]$$

Therefore, the effective porosity ϕ_e is

$$\phi_e = \phi_t (1 - S_{wb})$$

And the effective water saturation S_{we} is

$$S_{we} = \frac{S_{wt} - S_{wb}}{1 - S_{wb}}$$

Where

S_{wb}	=	Clay bound water saturation
c_w	=	Formation water conductivity
c_{bw}	=	Clay bound water conductivity

Southern Margin Cut-off values

The following cut-off values were used in defining pay,

$$\phi_e > 10\% \ \& \ Swt < 70\%$$

Conclusions

1. No Net pay was identified.
2. Amrit 1 was plugged and abandoned with gas shows.

Attached is the well evaluation summary (WES) plot for Amrit 1.

/data/wes_ot/amrit1_04146.cgm

APPENDIX II: HYDROCARBON SHOW REPORT

SANTOS LIMITED

OIL SHOW EVALUATION REPORT

WELL: Amrit-1 **GEOLOGIST:** R. Subramanian
INTERVAL: 2550.5'-2559'
FORMATION: Paaratte

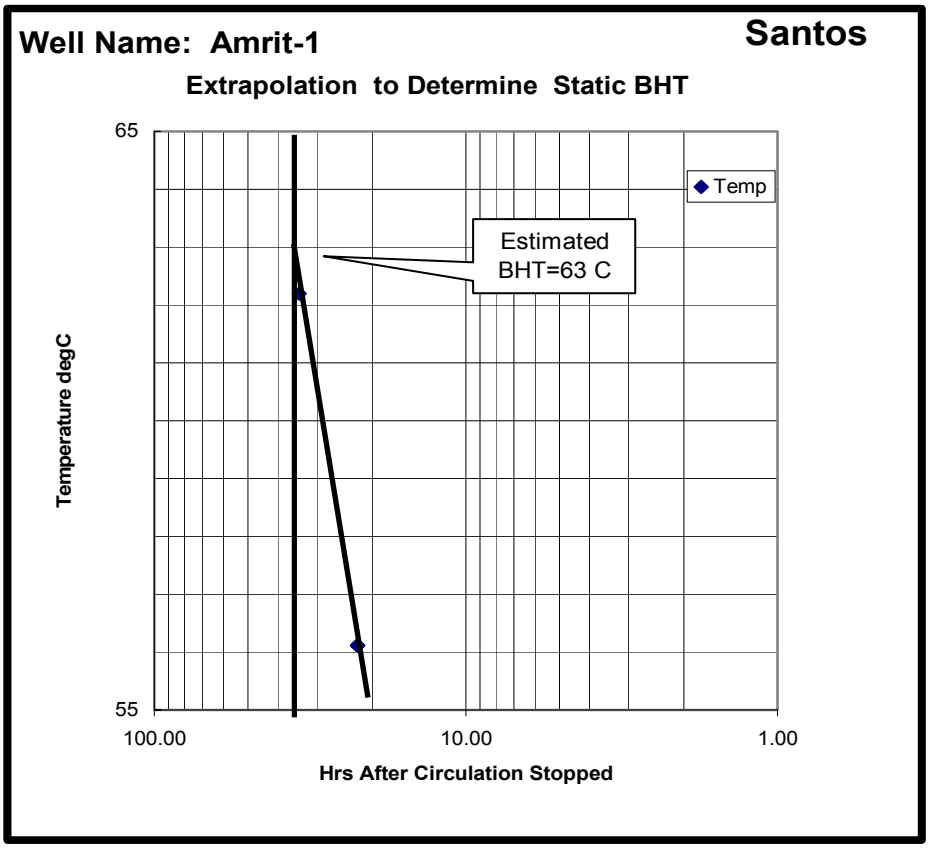
C1 ppm	<5k	10k	20k	30k	40k	50k	100k	150k	200k	>250k
C2+ ppm	<500	750	1k	2k	3k	4k	5k	7.5k	10k	>15k
Porosity Ø	tight			poor		fair		good		
% with fluorescence	trace	10	20	30	40	50	60	70	80	>90
Fluorescence appearance	trace		spotted			streaked		patchy		solid
Brightness of fluorescence	v. dull		dull		dim			mod bright	v. bright	glowing
Type of cut	trace	v. slow crush cut	Weak crush cut	instant crush cut	v. slow streaming cut	slow stream	moderate streaming	streaming	Fast Streaming	instant
Residue on spot plate	trace	heavy trace	v. thin ring	thin ring	Moderately thick ring	v. thick ring	thin film	thin film	thick film	solid
Show rating	trace		poor		fair		good			
Comments:	Yellow fluorescence.									

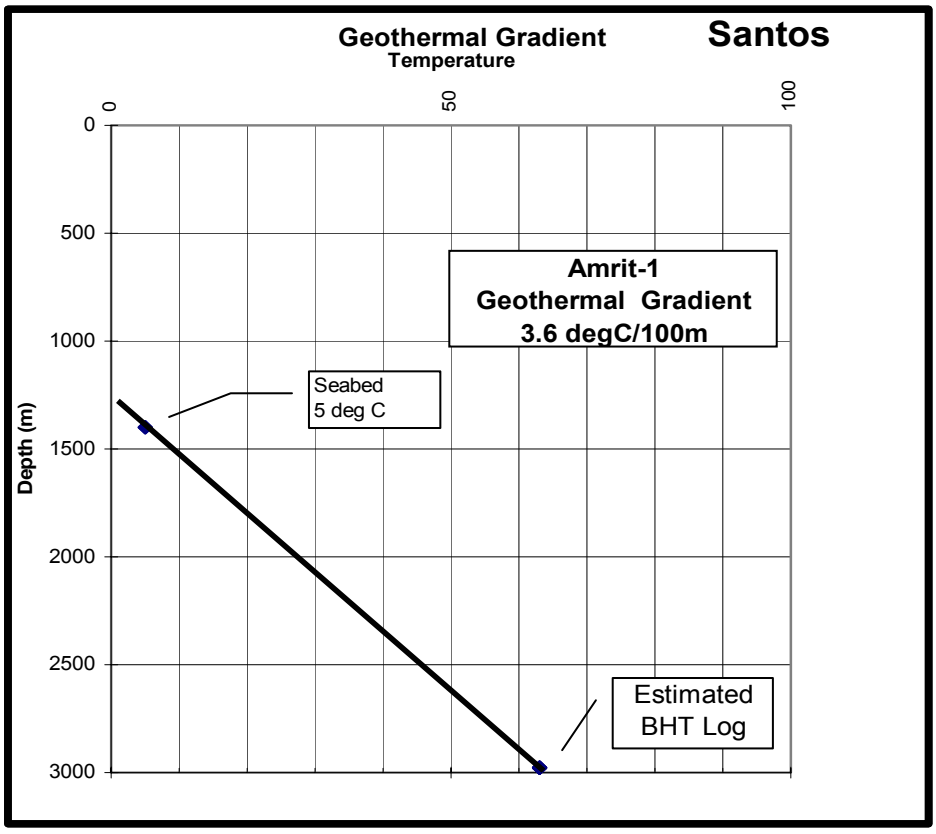
APPENDIX III: GEOTHERMAL GRADIENT

Data from Wireline Logs were used to estimate a Geothermal Gradient. An extrapolated static bottom hole temperature of 62.5°C at 2979m (total depth) and a geothermal gradient of 3.6°C/100m were calculated from downhole temperatures recorded during logging operations.

LOG	TEMP (°C)	DEPTH (m)	TIME SINCE LAST CIRCULATION
PEX	56.1	2979	22.25 hrs
VSP	62.2	1790	34.25 hrs
SEABED	5	1425	

The results are depicted graphically overleaf.


Well Name: Amrit-1
Santos
Extrapolation to Determine Static BHT
65
55
Temperature degC
Temp
Estimated
BHT=63 C
100.00
10.00
1.00
Hrs After Circulation Stopped


Geothermal Gradient
Temperature
Santos
0
50
100
0
500
1000
1500
2000
2500
3000
Depth (m)
Amrit-1
Geothermal Gradient
3.6 degC/100m
Seabed
5 deg C
Estimated
BHT Log

APPENDIX IV: PETROLOGY REPORT

No petrology was done on Amrit 1 samples.

APPENDIX V: PALYNOLOGY REPORT

SANTOS STRATIGRAPHIC SERVICES
GEOSCIENCE & NEW VENTURES

Palynology Report No. 2004/34

Author: G.R. WOOD

Date: 2nd May, 2005

PALYNOLOGICAL REPORT NO. 2004/34
PALYNOSTRATIGRAPHICAL ANALYSIS

AMRIT NO. 1

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

Introduction

Sixteen sidewall core samples from Amrit No. 1 located in the Otway Basin were examined palynologically so as to assess their palynostratigraphic position.

The results of this study are presented on Table 1 and outlined in detail on Table 2. Figure 1 outlines the palynostratigraphic scheme adopted and the known relationships of the palynological zones to the lithostratigraphy. Range charts of the palynomorphs identified in this study are presented in Appendix 1.

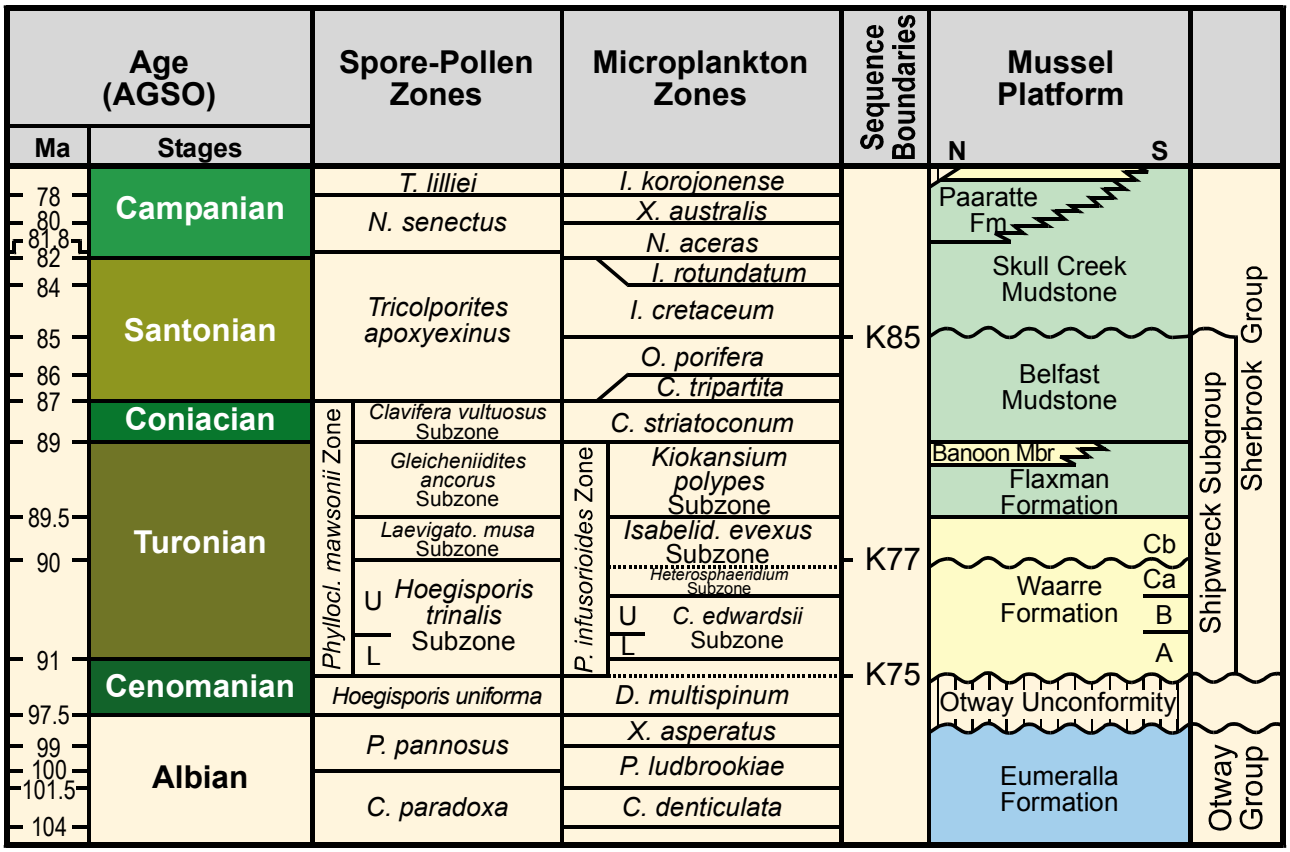
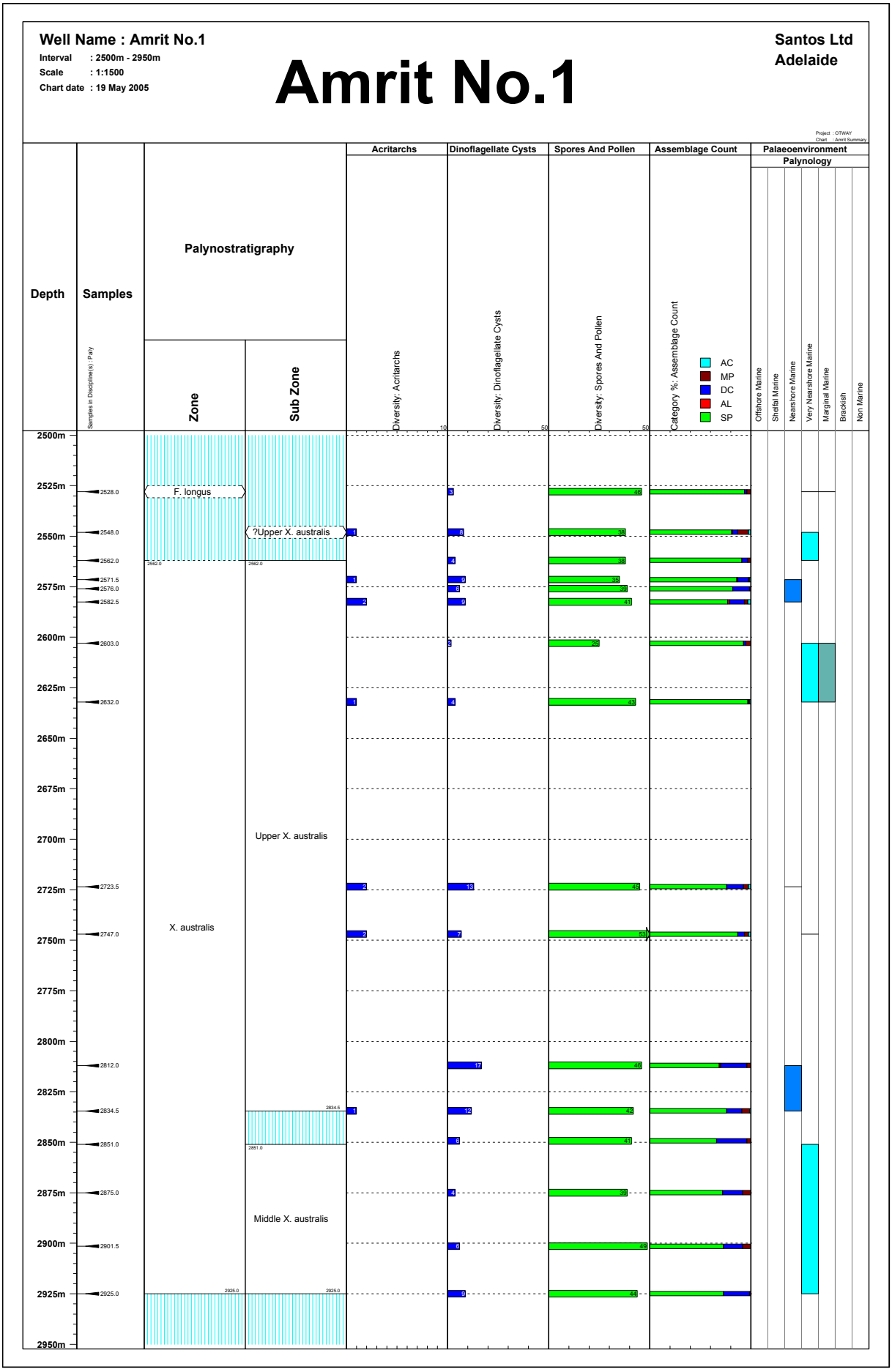


Figure 1: From Sharp & Wood, (2004).

An assessment of the depositional environment in Table 1 is derived from the palynomorph assemblages. Both the content and diversity of saline microplankton relative to freshwater algae and terrestrial spores and pollen are utilised in this assessment.


Well Name : Amrit No.1
Interval : 2500m - 2950m
Scale : 1:1500
Chart date : 19 May 2005
Amrit No.1
Santos Ltd
Adelaide
Depth
Samples
Palynostratigraphy
Zone
Sub Zone
Acritarchs
Dinoflagellate Cysts
Spores And Pollen
Assemblage Count
Palaeoenvironment
Palynology
Diversity: Acritarchs
Diversity: Dinoflagellate Cysts
Diversity: Spores And Pollen
Category %: Assemblage Count
AC
MP
DC
AL
SP
Offshore Marine
Shelfal Marine
Nearshore Marine
Very Nearshore Marine
Marginal Marine
Brackish
Non Marine
F. longus
?Upper X. australis
Upper X. australis
X. australis
Middle X. australis
2500m
2525m
2550m
2575m
2600m
2625m
2650m
2675m
2700m
2725m
2750m
2775m
2800m
2825m
2850m
2875m
2900m
2925m
2950m

Santos

PALYNOSTRATIGRAPHICAL DATA

Report No. 2004/34

Study: **Amrit No.1**

Table 2

Author: G.R. Wood

SAMPLE	DEPTH (metres)	PALYNOSTRATIGRAPHICAL UNIT (Age)	STRATIGRAPHICAL UNIT (Environment)	REWORKED ELEMENTS %	REWORKED ELEMENTS AGE	PRESERVATION	YIELD	DIVERSITY	REMARKS
SWC 29	2528	*?F. longus* (Maastrichtian)	?Timboon Sandstone (Estuarine to Very Nearshore Marine)			Fair	Low	Mod.	Spore pollen dominate (98%) with common *Alisporites spp, Cyathidites spp & Proteacidites spp*. Prominent components include *G. rudata, F. longus & M. fromensis*. Trace microplankton including *X. australis* (?reworked) noted.
SWC 28	2548	Upper *X. australis to T. longus*	?Timboon Sandstone (Very Nearshore Marine)	7	Permian	Fair	Low	Mod.	Spore pollen dominate (90%) with common *Alisporites spp, Cyathidites spp*, frequent *Dictyophyllidites spp, Podocarpidites spp & Proteacidites spp. F. stipulatus* noted. Microplankton includes *X. australis, A. wisemaniae, A. coronata & A. crassipellus*.
SWC 25	2562	Upper *X. australis* (Campanian)	Paaratte Formation (Very Nearshore Marine)	3	Permian	Fair	Low	Mod.	Spore pollen dominate (90%) with common *Alisporites spp, Cyathidites spp*, frequent *Dictyophyllidites spp, P. mawsonii & Proteacidites spp. F. stipulatus, M. fromensis & O. sentosa* noted. Microplankton includes *X. sarjeantii, T. castanea & Spiniferites spp.*
SWC 24	2571.5	Upper *X. australis* (Campanian)	Paaratte Formation (Nearshore Marine)	Tr	Permian	Fair	Low	Mod.	Spore pollen dominate (88%) with common *Alisporites spp, Cyathidites spp & Proteacidites spp, F. sabulosus, M. fromensis & O. sentosa* noted. Microplankton includes prominent A. crassipellus, *X. sarjeantii, T. castanea O. porifera & X. australis.*
SWC 23	2576	Upper *X. australis* (Campanian)	Paaratte Formation (Nearshore Marine)	1	Permian	Fair	Low	Mod.	Spore pollen dominate (83%) with common *Proteacidites spp*, *Cyathidites spp & Latrobosporites spp*, frequent *Alisporites spp, Podocarpidites spp & Araucariacites spp*, *F. stipulatus, P. gillii, H. elliottii & O. sentosa* noted. Microplankton includes frequent *X. sarjeantii,Exochosphaeridium spp & X. australis.*

Santos **PALYNOSTRATIGRAPHICAL DATA** Report No. 2004/34

Study: **Amrit No.1** Table 2

Author: G.R. Wood

SAMPLE	DEPTH (metres)	PALYNOSTRATIGRAPHICAL UNIT (Age)	STRATIGRAPHICAL UNIT (Environment)	REWORKED ELEMENTS %	REWORKED ELEMENTS AGE	PRESERVATION	YIELD	DIVERSITY	REMARKS
SWC 22	2582.5	Upper *X. australis* (Campanian)	Paaratte Formation (Nearshore Marine)	3	Permian	Fair	Mod.	Mod.	Spore pollen dominate (83%) with common *Alisporites spp & Podocarpidites spp,* frequent *Araucariacites spp & Proteacidites spp*, *F. stipplatus, P. gillii, H. elliottii & O. sentosa* noted. Microplankton includes frequent *Xenascus spp.,Heterosphaeridium spp, H. paracostata & X. australis.*
SWC 21	2603.0	Upper *X. australis* (Campanian)	Paaratte Formation (Estuarine to Very Nearshore Marine)	4 1	Permian Triassic	Fair	Ext. low	Very low	Sparse assemblage. Spore pollen dominate (98%) with abundant small *Proteacidites spp*, common *Alisporites spp,& Cyathidites spp*, *O. sentosa* noted. Trace microplankton including *Xenascus sp & O. operculata.*
SWC 14	2632.0	Upper *X. australis* (Campanian)	Paaratte Formation (Estuarine to Very Nearshore Marine)	1	Permian	Fair	Low	Mod.	Spore pollen dominate (98%) with common *Proteacidites spp*, *Cyathidites spp & Alisporites spp*, frequent *Latrobosporites spp & Gleicheniidites spp*, *F. sabulosus, G. rudata,N. senectus, G. wahooensis, H. elliottii & O. sentosa* noted. Microplankton includes trace *Xenascus spp, A. wisemaniae, I. nuculum & X. australis.*
SWC 10	2723.5	Upper *X. australis* (Campanian)	Paaratte Formation (Nearshore Marine)	2	Permian	Fair	Mod.	Mod.	Spore pollen dominate (82%) with common *Proteacidites spp*, *Alisporites spp & Latrobosporites spp*, frequent *Cyathidites spp & Dictyophyllidites spp, G. edwardsii, G. rudata, R. mallatus & O. sentosa* noted. Microplankton includes frequent *Xenascus spp & X. australis, T. castanea, A. wisemaniae, & O. porifera.*

Santos **PALYNOSTRATIGRAPHICAL DATA** Report No. 2004/34

Study: **Amrit No.1** Table 2

Author: G.R. Wood

SAMPLE	DEPTH (metres)	PALYNOSTRATIGRAPHICAL UNIT (Age)	STRATIGRAPHICAL UNIT (Environment)	REWORKED ELEMENTS %	REWORKED ELEMENTS AGE	PRESERVATION	YIELD	DIVERSITY	REMARKS
SWC 9	2747.0	Upper *X. australis* (Campanian)	Paaratte Formation (Very Nearshore Marine)	2	Permian	Fair	Mod.	Mod.	Spore pollen dominate (90%) with common *Alisporites spp, Cyathidites spp*, frequent *Dictyophyllidites spp, Latrobosporites spp & Proteacidites spp,. E. crassiexinus, G. rudata & O. sentosa* noted. Microplankton includes frequent *X. australis*, *X. sarjeantii, T. castanea, Spiniferites spp.& A. wisemaniae.*
SWC 6	2812.0	Upper *X. australis* (Campanian)	Paaratte Formation (Nearshore Marine)	3	Permian	Fair	Mod.	Mod.	Spore pollen dominate (75%) with common *Cyathidites spp*, frequent *Alisporites spp, C. tectifera & O. sentosa* noted. Diverse microplankton suite includes prominent *X. australis X. sarjeantii, T. castanea, A. wisemaniae & C. diversispinosum, Spiniferites spp, O. porifera & D. acuminatum* noted.
SWC 5	2834.5	Upper *X. australis* (Campanian)	Paaratte Formation (Nearshore Marine)	5	Permian	Fair	Mod.	Mod.	Spore pollen dominate (85%) with common *Cyathidites spp* & *Alisporites spp,* frequent *Dictyophyllidites spp, Latrobosporites spp & Proteacidites spp, M. fromensis & F. sabulosus* noted. Diverse microplankton suite includes prominent *X. australis & O. porifera, X. sarjeantii, T. castanea, A. wisemaniae & C. diversispinosum* noted.
SWC 4	2851.0	Middle *X. australis* (Campanian)	Paaratte Formation (Restricted Shallow Marine)	4	Permian	Fair	Mod.	Low	Spore pollen dominate (70%) with common *Alisporites spp & Gleicheniidites spp*, frequent *Dictyophyllidites spp & Cyathidites spp, P. gillii, F. sabulosus & O. sentosa* noted. Restricted microplankton suite includes abundant *X. australis(29%), A. wisemaniae & Oligosphaeridium spp.*

Santos **PALYNOSTRATIGRAPHICAL DATA** Report No. 2004/34

Study: **Amrit No.1** Table 2

Author: G.R. Wood

SAMPLE	DEPTH (metres)	PALYNOSTRATIGRAPHICAL UNIT (Age)	STRATIGRAPHICAL UNIT (Environment)	REWORKED ELEMENTS %	REWORKED ELEMENTS AGE	PRESERVATION	YIELD	DIVERSITY	REMARKS
SWC 3	2875	Middle *X. australis* (Campanian)	Paaratte Formation (Restricted Shallow Marine)	8	Permian	Fair	Mod.	Low	Spore pollen dominate (85%) with common *Cyathidites spp* & *Alisporites spp,* frequent *Gleicheniidites spp, Latrobosporites spp & Proteacidites spp, O. sentosa* noted. Restricted microplankton suite includes abundant *X. australis(20%) &N. aceras.*
SWC 2	2901.5	Middle *X. australis* (Campanian)	Paaratte Formation (Restricted Shallow Marine)	3	Permian	Fair	Mod.	Mod.	Spore pollen dominate (80%) with common *Cyathidites spp* & *Alisporites spp,* frequent *Dictyophyllidites spp, Latrobosporites spp & Proteacidites spp M. fromensis,E. scabratus, F. sabulosus & O. sentosa* noted. Restricted microplankton suite includes abundant *X. australis(17%) &O. porifera.*
SWC 1	2925.0	Middle *X. australis* (Campanian)	Paaratte Formation (Restricted Shallow Marine)	1	Permian	Fair	Mod.	Mod.	Spore pollen dominate (74%) with common *Cyathidites spp* & *Alisporites spp,* frequent *Araucariacites spp*, *Dictyophyllidites spp, Gleicheniidites spp & Proteacidites spp M. fromensis,P. gillii, G. rudata,N. senectus, F. sabulosus & O. sentosa* noted. Restricted microplankton suite includes abundant *X. australis(22%), N. aceras &Spiniferites spp.*

ENCLOSURE I: COMPOSITE LOG (1:500 SCALE)

ENCLOSURE II: DEPTH STRUCTURE MAP

ENCLOSURE III: WELL EVALUATION SUMMARY (WES) PLOT