

BASIN – OMV - SANTOS - TRINITY

COMPILED FOR

SANTOS LIMITED

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

BALEEN 4

INTERPRETED DATA REPORT

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BALEEN 4

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I Electric Log Evaluation Results

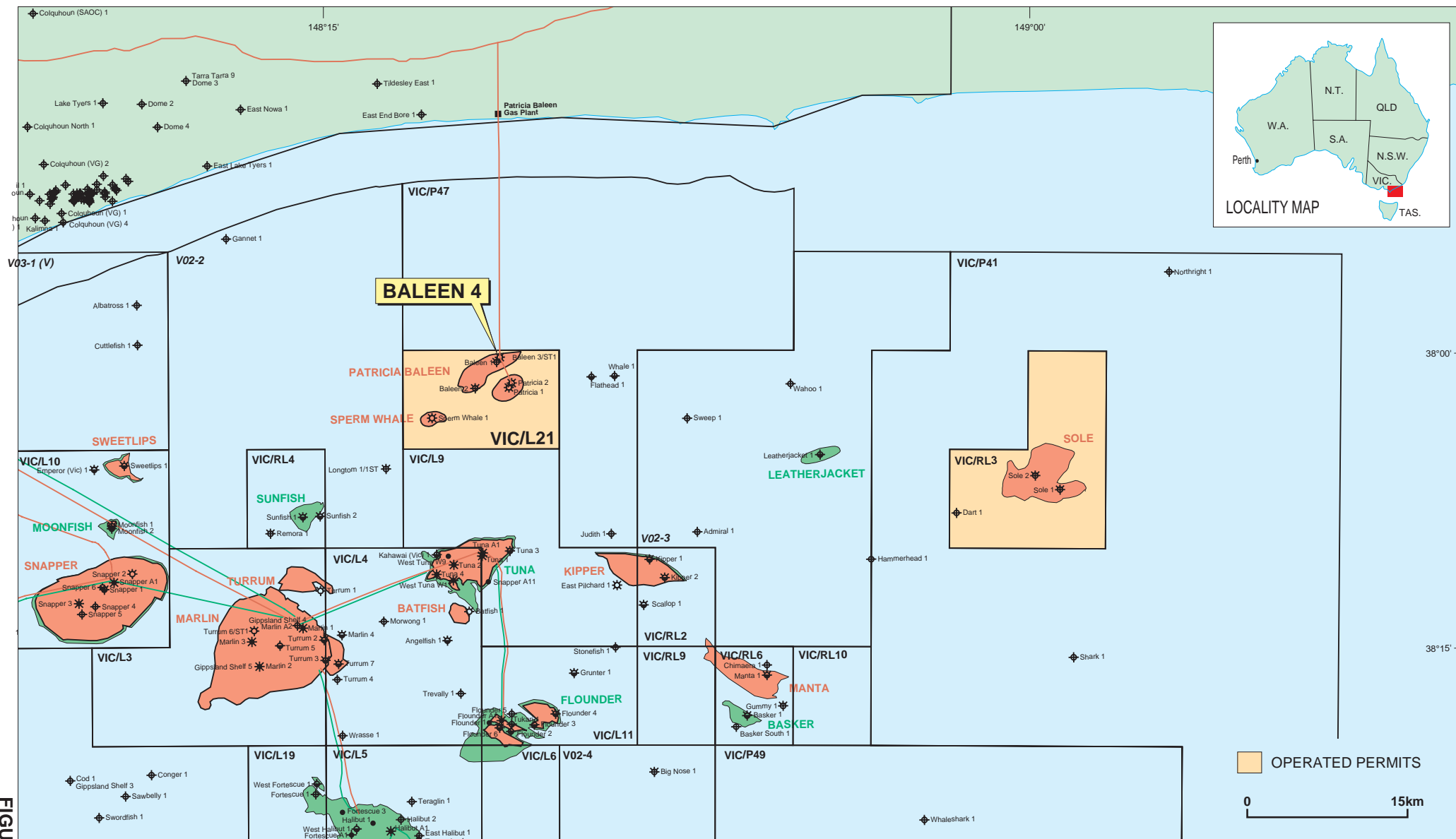
ENCLOSURES:

- I Composite Log (1:500 Scale)
- II Seismic Traverse on Well Path
- III Top Gurnard Porosity Depth Structure Map

LOCATION MAP

LOCATION MAP

GIPPSLAND BASIN



SECTION 1: WELL CARD

WELL: BALEEN 4	WELL CATEGORY: HORIZONTAL DEVELOPMENT	KICK-OFF DATE: 15:00 27/09/2004			
	WELL INTENT: GAS	TD REACHED: 17:00 22/10/2004			
SURFACE LOCATION: (AGD66) LAT: 38° 00' 20.98" S LONG: 148° 26' 34.43" E NORTHING: 5792541.5 m N EASTING: 626676.2 m E		RIG RELEASED: 10:30 10/12/2004			
		CMPLT: 28/11/2004			
SEISMIC STATION: Inline 209, Xline 3786, Baleen 3D 2000		RIG: OCEAN BOUNTY			
ELEVATION SEA FLOOR: 78.1 m MSL RT: 25.0 m MSL		STATUS: SINGLE COMPLETION GAS PRODUCER (SCG)			
WATER DEPTH: 53.1 m		REMARKS:			
BLOCK / LICENCE: VIC / L21		HOLE SIZE	CASING SIZE	SHOE DEPTH	TYPE
TD: 2290 m MDRT (Driller), 716.95 m TVD (Driller)		311 mm 12 1/4"	244 mm 9 5/8"	1885 m	L80
PBTD: N/A		216 mm 8 1/2"	168 mm 6 5/8"	2290 m	24 ppf, CR13 screens
TYPE STRUCTURE: ANTICLINE					
TYPE COMPLETION: SUBSEA GAS PRODUCER					

AGE	FORMATION OR ZONE TOPS	DEPTH (m)		SUBSEA (m)	THICK (m) TVD
		DRILLERS MDRT (m)	DEPTH TVDRT (m)		
	Water Depth	53.1	53.1	-	-
Early Miocene	Gippsland Limestone	340.0	338.8	-313.8	286.2
Late Oligocene	Lakes Entrance Formation	1190.0	625.0	-600.0	75.5
Middle Eocene	Gurnard Formation	1730.0	700.5	-675.5	16.4+
Middle Eocene	Top Gurnard Porosity	1790.0	708.0	-683.0	-

LOG INTERPRETATION (Interval Averages)					PERFORATIONS				
Formation	Interval (m)	Net Pay (m)	Ø %	SW %	FORMATION		INTERVAL (m)		
No Petrophysical Analysis was undertaken.					Gurnard Formation		1890 – 2290		
							Screened open hole.		
					CORES CUT				
					FORM.	NO.	INTERVAL (m)	CUT	REC.
							No Cores Cut.		

WIRELINE

RUN NO.	TYPE OF LOG	FROM (m)	TO (m)	DATE
1&2	Back-Off & CCL	275.9	319.6	01/10/2004
3&4	Back-Off & CCL Drift	277.9	311.7	04/10/2004
5	Back-Off	289.8	289.8	05/10/2004
6	Back-Off	289.7	289.7	05/10/2004
7	Back-Off	300.9	300.9	07/10/2004
8	USIT-GPIT-GF	75.0	328.0	09/10/2004

MWD

RUN NO.	MWD / LWD	INTERVAL (m)
1	PowerPulse / ARC	336.0 – 733.0
2	PowerPulse / ARC	733.0 – 1890.0
3	PowerPulse / ARC	1890.0 – 2010.5
4	PowerPulse / ARC	2010.5 – 2290.0

SUMMARY:

The rig Ocean Bounty was towed from New Zealand to the Baleen 3 location. The move was planned for 10 days but actually took 15 due to rough weather.

After anchoring up on Baleen 3 the well was re-entered, the tubing pulled and abandoned by setting an EZSV retainer at 796m MD. 39 bbls (190 sacks) of cement were pumped below the retainer with 2 bbls (10 sacks) left on top of the retainer. The 9 5/8" casing was cut at 396m MD and pulled. A second cement plug, 72 bbls of 16.8ppg dense cement set from 435m MD across the cut 9 5/8" casing up to above the 13 3/8" shoe at 256m, doubled as an abandonment plug and kick off plug. The plug was tagged at 254m MD with the drill out BHA. The BHA got stuck in the 13 3/8" casing while drilling out cement to the kick off depth. The BHA was retrieved after 5 days of fishing.

Once drilling operations resumed the cement was drilled and dressed off at 336m MD. At this point the drilling fluid was changed to a PetroFree Ester Based SOBM. 12 1/4" hole was directionally drilled as planned to 1890m MD, 712m TVD using 9.1ppg PetroFree SOBM. The 12 1/4" hole was then cleaned up with a specific clean out BHA. An 80bbl 11.6ppg Settable Spotting Fluid (SFF), Channel Seal II, was spotted on bottom up to 1727m with a 10.4ppg Tuned Spacer from 1727m to 1629m MD. The 9 5/8" centralized production casing was floated into the hole using the Davis Lynch system and pushed to bottom into the SSF. The casing was cemented with 315 sacks of 12.8ppg lead cement followed by 546 sacks of 15.8ppg tail slurry. The cement activated the SSF which then set up like cement in the channels that the cement did not displace. This ensured the cement was fully cemented to avoid water channelling. The 9 5/8" casing was drilled out and a leak off test conducted to 11.2ppg EMW. 400m of 8 1/2" horizontal production hole was then directionally drilled to TD at 2290m MD using a 9.2ppg water based KCl mud. At TD the well was circulated clean and the string pulled out of the hole. Due to over pull and tight hole a clean up assembly was made up and run in the hole to clean it out. The hole was displaced to 9.1 ppg clear KCl brine prior to running sand screens. 38 joints of Baker 6 5/8" 24 ppf, Cr13, Single Wrapped Excluder 200 mesh screens with Spirolizer zinc type centralizers were run in the hole on 4 joints of 7" 29 ppf CR13 and rotated to bottom. The line packer was set at 1838m MD and tested.

The 5 1/2" 17ppf, Cr13 completion was run with a stinger on bottom that stabbed into the 7" PBR, (polished bore receptacle), at 1834m. A SSSV was run with the completion and set at 139m MD and tested. The hanger was set in the wellhead and tested successfully. The well flowed gas through burner booms for 38.5hrs and cleaned up to 5bbls/mmscf of water at which point it was handed over to production.

1. GEOLOGY

1.1 INTRODUCTION

Baleen 4 was drilled as a result of Baleen 3 and Baleen 3ST1 suffering from premature water break-through. Baleen 3 and Baleen 3ST1 were drilled in the offshore Gippsland Basin as a crestal horizontal gas development well on the Baleen gas field. This is situated in permit VIC/L21 (see location map).

The primary objective was the Gurnard Formation reservoir and following water breakthrough a detailed geotechnical study and mathematical reservoir simulation showed that a new horizontal well located off the crest and stratigraphically high would drain the bulk of the gas in place in the Gurnard Formation by pressure depletion. Baleen 4 was designed to meet this requirement and maintain sufficient physical separation from the known water conduits of Baleen 3 and its sidetrack.

Baleen 4 was drilled from the existing Baleen 3 subsea well by cutting and retrieving the 244mm (9 5/8") casing and sidetracking in new 311mm (8 1/2") hole.

Baleen 4 was drilled by the semi submersible rig Ocean Bounty. The surface location is Latitude: 38° 00' 20.98" South, Longitude: 148° 26' 34.43" East (AGD66), Easting: 626676.2m, Northing: 5792541.5m (AGD66), and the surface seismic reference is Inline 209, Crossline 3786. The water depth at the well location was 53.1m.

1.2 FIELD DESCRIPTION

Baleen 4 is located in the offshore Gippsland basin. The well location lies within the Patricia Baleen development in permit VIC/L21, approximately 570 km from Geelong and some 280km from Port Welshpool. The field is on the northern edge of the basin, between the Rosedale and Lake Wellington Faults. The offshore Patricia-Baleen gas production facilities are located in 50 to 60 m of water, 23 km south of the town of Orbost in south eastern Victoria.

The primary objective was to drill and complete, a 400 m horizontal section through the Gurnard Formation Reservoir.

1.3 WELL LOCATION

Baleen 4 is located in the offshore Gippsland Basin in Permit VIC/L21. When the Baleen 3 and Baleen 3 ST 1 wells suffered premature water breakthrough a new well, Baleen 4, was designed to drain the bulk of the gas remaining in the Gurnard Formation whilst maintaining sufficient physical separation from the known water conduits of Baleen 3 and its side track. Baleen 4 was drilled from the existing Baleen 3 subsea well by cutting and retrieving the 244mm (9 5/8") casing and sidetracking in 311 mm (12 1/4") hole.

The surface location is Latitude: 38° 00' 20.98" South, Longitude: 148° 26' 34.43" East (AGD66), Easting: 626676.2m, Northing: 5792541.5m (AGD66), and the surface seismic reference is Inline 209, Crossline 3786. The water depth at the well location was 53.1m.

2. **RESULTS OF DRILLING**

2.1 **STRATIGRAPHY & GEOPHYSICAL PROGNOSIS**

TABLE 1: SUMMARY OF FORMATION TOPS

FORMATION	DEPTH MDRT (m)	DEPTH TVDRT (m)	SUBSEA (m)
Gippsland Limestone	340.0	338.8	-313.8
Lakes Entrance Formation	1190.0	625.0	-600.0
Gurnard Formation Tight Band	1730.0	700.5	-675.5
Top Gurnard Porosity	1790.0	708.0	-683.0

2.2 **STRATIGRAPHY & DEPOSITIONAL ENVIRONMENT**

The Gippsland Basin is an asymmetric East-West graben which initially formed during the break-up of Australia and Antarctica in the Early Cretaceous. During continental rifting the basin was filled by non-marine clastics of the Strzelecki Group, in part volcanolithic and containing coal beds.

The overlying alluvial sediments of the late Cretaceous Golden Beach Group represent a second phase of rift fill associated with the Tasman Sea rift. Following continental break-up in the Campanian, the Latrobe Group was deposited as a transgressive sequence of marine and coastal plain sediments. Thermal subsidence from the Oligocene to Recent was accompanied by the deposition of marine marls and limestones of the Lakes Entrance Formation and Gippsland Limestone.

While extensional rifting and thermal subsidence have dominated the depositional history of the Gippsland Basin, a dextral east-west wrench regime has been active intermittently from the late Palaeocene to the Pleistocene, with the most intense effects evident in the Middle Miocene. This has resulted in anticlinal structuring on generally northeast – southwest axes, and the re-activation of many normal faults as reverse or wrench faults.

Marine inundation of the Latrobe Group Coarse Clastics in the Middle Eocene, coupled with low subsidence and sediment input rates, resulted in deposition of a condensed, glauconitic, sandy siltstone known as the Gurnard Formation. This formation is a widespread shallow marine transgressive unit, discontinuous in places and overlain by the Oligocene Lakes Entrance Formation. The Lakes Entrance Formation is the main regional seal for the Gippsland Basin.

A brief description of lithology follows. More detailed descriptions can be found in the Baleen 4 Basic Data Report.

GIPPSLAND LIMESTONE (Tertiary, Early Miocene)

The section was composed predominantly of calcilutite and calcareous claystone. Calcarenite content decreased with depth. The basal section comprised entirely of calcareous claystone.

The calcilutite varied in colour from very light grey to medium grey but also occasionally off white or light olive grey. It was silty in part and ranged from soft and plastic to firm and sub blocky, occasionally moderately hard. Accessories included common fossils including Foraminifera, as well as rare carbonaceous material.

The calcareous claystone ranged from medium dark grey through medium grey to commonly dark grey. It ranged from firm to hard and sub blocky to blocky. Accessories included common fossils including Foraminifera, traces of pyrite, and rare carbonaceous material.

The calcarenite was moderately hard to hard with a minor unconsolidated component. Grain size ranged from very fine to medium, angular to sub round, moderately well sorted with a calcareous cement and common argillaceous matrix. Accessories included fossil fragments, Foraminifera, traces of crystalline calcite. Porosity was poor and there were no significant hydrocarbon shows.

LAKES ENTRANCE FORMATION (Tertiary, Late Oligocene)

This formation was composed predominantly of claystone and calcareous claystone. In the upper section there was some calcilutite and calcarenite as per the Gippsland Limestone interval.

The calcareous claystone ranged from light grey through medium dark grey to olive grey. It ranged from moderately hard to hard and sub blocky to blocky. Calcareous content decreased with depth and silt content increased. Accessories included common fossils including Foraminifera, and trace to rare glauconite.

Claystone colour ranged from light grey to medium grey and light olive grey to olive grey. The claystone was soft to moderately hard and ranged from sub blocky to blocky. Silt content increased with depth and accessories included foraminifera and glauconite.

GURNARD FORMATION (Tertiary, Middle Eocene)

This formation consisted of siltstone and silty sandstone.

The siltstone ranged from medium light grey to medium grey and greyish brown. The siltstone ranged from soft to moderately hard and was sub-blocky to blocky. It was sandy in part and contained common to abundant glauconite.

The sandstone ranged from medium to dark brownish grey, to olive black but occasionally was mottled greyish yellow or greyish orange. The sandstone was very fine grained, occasionally medium, firm to moderately hard and the grains were predominantly loose, sub-angular to sub-round and well sorted. Friable aggregates had a silty clay matrix. There were trace to common glauconite and traces of pyrite, muscovite and biotite. Visual porosity was very poor to poor, inferred porosity poor to fair. There were no hydrocarbon fluorescence shows.

2.3 **HYDROCARBON SUMMARY**

While drilling Baleen 4, gas levels were monitored and drilled cuttings were collected and examined for hydrocarbon fluorescence from the kick-off point at 260m MDRT to a total depth of 2290m MDRT.

Ditch gas values were monitored and recorded in %, by F.I.D (flame ionisation detector) Total Gas detector, where one percent is equivalent to 50 units or 10,000 ppm (parts per million) of methane gas in air. The ditch gas was also monitored for hydrocarbon gas composition by a chromatograph. Gas composition refers to percent components of the hydrocarbon alkane series: (methane, ethane, propane, butane and pentane). Ditch cuttings were tested for hydrocarbon fluorescence by using a ultra-violet fluoroscope.

Continuous background gas was first observed from 580m MDRT, in the Gippsland Limestone Formation. The background gas in this formation averaged around 0.58% with a maximum peak of 2.53% at 861m MDRT. The gas comprised of C1 only.

Gas in the Lake Entrance Formation averaged 1.48% with a maximum peak of 3.22% at 1498m MDRT. The gas comprised of C1 only.

Gas levels increased significantly in the Gurnard Formation averaging around 6% to 7% with maximum gas peaks up to 33%. Gas was predominantly C1 with small amounts of C2 up to 800 ppm.

3. **REFERENCES**

OMV Australia, Dec 2004

Baleen 4 End of Well Report Volume 1
Drilling and Engineering Data.

OMV Australia,

Baker Hughes Inteq, End of Well Report
Baleen 4.

APPENDIX I: ELECTRIC LOG EVALUATION RESULTS

No conventional open hole logs were run to TD on Baleen 4.

Basic LWD measurements were recorded in the 12 ¼" and 8 ½" sections of the hole. These were real time and recorded mode GR and resistivity.

No porosity measuring devices were run and consequently no petrophysical evaluation was undertaken for Baleen 4.

ENCLOSURE I: COMPOSITE LOG (1:500 SCALE)

**ENCLOSURE II: SEISMIC TRAVERSE ALONG THE BALEEN 4
WELLPATH**

**ENCLOSURE III: TOP GURNARD POROSITY DEPTH
STRUCTURE MAP**