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SANTOS LIMITED
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CASINO-5
INTERPRETED DATA REPORT

PREPARED BY:
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(Consultant)
October 2005

CASINO-5

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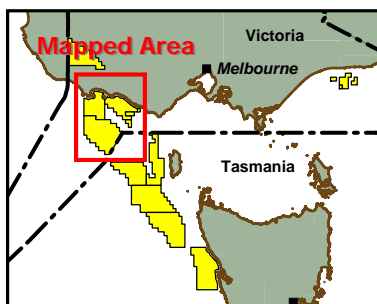
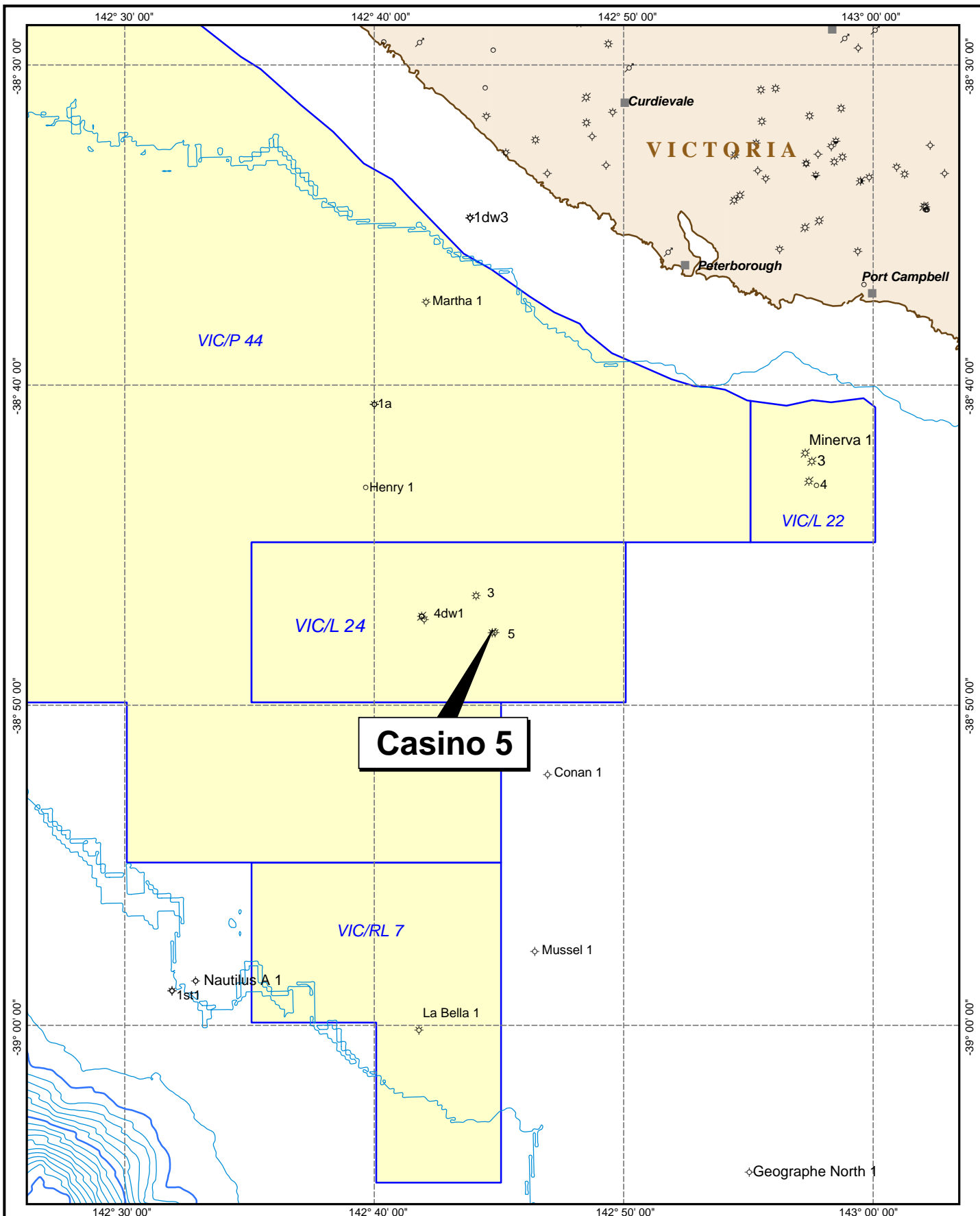
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LOCATION MAP



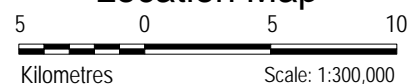
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Santos Permit

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VIC/L24 - Victoria
Otway Basin

**Casino 5
Location Map**



Date: Sept 2005, File No. OTWAY 659

WELL CARD

WELL: CASINO-5	WELL CATEGORY: OFFSHORE GAS DEV WELL INTENT: GAS	SPUD: 19:00hr on 16/5/05 TD REACHED: 19:00hr on 28/6/05 RIG RELEASED: 22:00hr on 08/07/05 CMPLT: 22:00hr on 08/07/05 RIG: OCEAN PATRIOT STATUS: Single Completion Gas Well (SCG)			
SURFACE LOCATION: LAT: 38° 47' 43.68" S LONG: 142° 44' 44.60" E (GDA94) NORTHING: 5704473.1m EASTING: 651604.4m		REMARKS:			
SEISMIC STATION: 2001 Casino-3D, 150m West of Casino 2		Single 7" completion with expandable sand screens			
ELEVATION SEA FLOOR: -68.2m LAT RT +21.5m LAT		over reservoir.			
BLOCK/LICENCE: OTWAY BASIN - VIC / P 44					
TD 1806 m (LOGR EXTRAP) 1806 m (DRLR)					
PBTD (LOGR) m (DRLR)					
TYPE STRUCTURE: TILTED FAULT BLOCK CLOSURE		HOLE SIZE	CASING SIZE	SHOE DEPTH	TYPE
TYPE COMPLETION: Single Completion		914mm	762mm	132m	461 kg/m X52
ZONE(S): WAARRE CB		445mm	340mm	655m	107 kg/m BTC L80
		311mm	244mm	1719.8m	70 kg/m BTC L80/13Cr80
		216mm	194mm	1800m	44.3 kg/m 13Cr80

AGE	FORMATION OR ZONE TOPS	DEPTH (M)		THICK-NESS (m)	HIGH (H) LOW (L)
		LOGGERS RT (M)	SUBSEA (M)		
MID-LATE MIOCENE	SEABED (TOP HEYTESBURY GP)	89.7	-68.2	68.2	1.8 H
EOCENE – OLIGOCENE	NIRRANDA GROUP: NARRAWATURK MARL	605	-583.4	77.49	NP
EOCENE	NIRRANDA GROUP: MEPUNGA FM	682.5	-660.9	92.49	1.9 L
EOCENE	WANGERRIP GROUP: DILWYN FM	775	-753.4	231.78	1.6 H
EOCENE	PEMBER MUDSTONE	1007	-985.2	75.74	NP
PALAEOCENE	PEBBLE POINT FORMATION	1083	-1060.9	67.67	4.9 L
PALAEOCENE	MASSACRE SHALE	1151	-1128.6	11.45	3.6 L
LATE CRETACEOUS	SHERBROOK GROUP: TIMBOON SANDSTONE	1162.5	-1140.1	183.67	4.1 L
LATE CRETACEOUS	SHERBROOK GP: PAARATE FM	1347	-1323.7	335.4	5.3 H
LATE CRETACEOUS	SHERBROOK GP: SKULL CREEK MUDSTONE	1684	-1659.1	61.14	169.1 L
EARLY - LATE CRETACEOUS	SHIPWRECK GROUP WAARRE FORMATION	1745.5	-1720.3	60.5	1.7 H
EARLY - LATE CRETACEOUS	WAARRE CB – MAIN PAY	1756.20	-1731.0	13.5	as prog.
EARLY - LATE CRETACEOUS	WAARRE CA - PAY	1769.70	-1744.5	15	4.5 L
	TOTAL DEPTH (LOGGER EXTRAP)	1806	-1780.8		

LOG INTERPRETATION						PERFORATIONS				
INTERVAL(M)	Ø %	SW %	INTERVAL(M)	Ø %	SW %	FORMATION		INTERVAL		
No wireline logs										
conducted										
						CORES				
						FORM	NO.	INTERVAL	CUT	REC

LOG	SUITE/ RUN	INTERVAL (M)	BHT/TIME COMMENTS
Wireline logs were not run during Casino 5			

LOG (MWD)	SUITE/ RUN	INTERVAL (m)	COMMENTS
GR-RES-SURVEYS	1 / 1	665m – 1160m	Real time failure at 940m
GR-RES-SURVEYS	1 / 2	1160m – 1392m	
GR-RES-SURVEYS	1 / 3	1392m – 1730m	
GR-RES-SURVEYS	2 / 1	1730m – 1806m	

PRODUCTION TEST RESULTS

At the completion of drilling Casino 5 the well was completed with 194mm (7-5/8") casing and expandable sand screens. The well was then flow tested over the primary reservoir zone to confirm reservoir flow characteristics. The test was conducted over the interval 1720m to 1806m and flowed at the maximum choke-constrained measured flow rate of 43 MMscf/d through a 23.8 mm (60/64") choke at a well head tubing pressure of 163534 kpa (2372 psig).

SUMMARY:

Casino-5 was drilled as an Otway Basin gas development well in the Victoria Offshore VIC/P44 licence. The Surface Location is Latitude: 38° 47' 43.68" S Longitude: 142° 44' 44.60"E (GDA94), Northing: 5704473.1m Easting: 651604.4m (MGA-94). The well lies approximately 150m west of Casino 2. The Casino Field lies approximately 29 km south west of the town of Port Campbell, 24 km WSW of the Minerva gas field and 22 km North of the LaBella gas field. The Casino field is situated towards the western limit of the productive Waarre Sandstone play fairway of the Port Campbell Embayment. Water depth at the Casino 5 location is 68.2m LAT.

The Casino structure is a tilted fault block with three way dip closure and up dip fault closure. Casino-1 and Casino-2 were drilled crestally on this fault block whereas Casino-3 was drilled in a down-dip location near the structural closure limit. Casino-1 and Casino-2 have established the presence of gas in the "Younger" and "Older" sands of the Waarre Sandstone.

The objective of Casino 5 was to develop the gas reserves of the Waarre C reservoir via a vertical well located near the crest of the reservoir. Dynamic modelling conducted during the development planning phase indicated that the entire Waarre C reserves can be developed by a single vertical well very close to the position of Casino-2.

Casino-5 was spudded at 19:00 hrs on 16/06/05. A 914mm (36") hole was drilled from the seabed at 89.7m to 133m. The 760mm (30") casing was run and set at 132m. A 445mm (17.5") hole was drilled in one bit run from 133m to 665m with returns to the seafloor and 340mm (13-3/8") casing run and set at 655m. The production tree was run followed by the blow out preventer and marine riser. A 311mm (12¼") drilling assembly was run in drilling the shoe track and 3m of formation. A leak-off test was conducted yielding an equivalent mud weight of 2.08sg. The 311mm (12¼") hole was drilled in 3 bit runs to section total depth at 1730m. 137 joints of 244mm (9 5/8") 70kg/m (47lb/ft) mixed L80/13Cr80 casing were run with the shoe set at 1720m. The 216mm (8½") hole section was drilled in one bit run from 1730m to 1806m. Total depth was reached at 19:00 hours on 28/06/2005. At the completion of drilling Casino 5 the well was completed with 194mm (7-5/8") casing and expandable sand screens. The well was then flow tested over the primary reservoir zone to confirm reservoir flow characteristics. The test was conducted over the interval 1720m to 1806m and flowed at the maximum choke-constrained measured flow rate of 43 MMscf/d through a 23.8 mm (60/64") choke at a well head tubing pressure of 163534 kpa (2372 psig). The rig was released at 22:00 hours on 8th July, 2005.

Formations were intersected from 1.6m high for the Dilwyn Formation to 169.1m low for the Skull Creek Mudstone. The primary target Waarre Formation was intersected 1.7m high to prognosis with the main pay Waarre CB intersected on depth at -1731mSS and the Waarre CA pay intersected at 1744.5m, 4.5 m low to prognosis. The top Skull Creek Formation was incorrectly prognosed due to faulting not previously recognised in Casino 2. This fault splay resulted in an additional lower Paaratte Formation in Casino 5 not seen in Casino 2.

Casino 5 was drilled as a vertical hole. Deviation Surveys were recorded utilising the LWD/MWD tools in the 311mm (12.25") and 216mm (8½") hole sections. An EMS survey was conducted in the 445mm (17½") hole section. At Total Depth, the estimated displacement from the wellhead was approximately 85m to 245°(T). At total measured depth, 1806m, the TVD was calculated at 1802m.

- Casino 5 achieved its key objectives in that:
- The top Waarre Formation was intersected close to prognosis confirming the pre-drill interpretation.
- The top Waarre Cb pay was intersected on prognosis at -1731.5mSS
- The Waarre Formation was developed as predicted with 14m of net Cb pay intersected versus 9m expected as at Casino 2
- Top Waarre Ca pay intersected at -1745mSS, 5m low to prognosis due to a thickening of the Waarre Cb pay. 15m of grosse Ca pay intersected versus 20m as at Casino 2. Reservoir quality better than expected as at Casino 2.
- Casino 5 was completed with 194mm (7-5/8") casing and expandable sand screens. The well was then flow tested over the primary reservoir zone to confirm reservoir flow characteristics. The test was conducted over the interval 1720m to 1806m and flowed at the maximum choke-constrained measured flow rate of 43 MMscf/d.

AUTHOR: J.PITMAN**DATE:** October 2005

1. GEOLOGY

1.1 INTRODUCTION

Casino-5 was drilled as an Otway Basin gas development well in the Victoria Offshore VIC/P44 licence. The Surface Location is Latitude: 38° 47' 43.68" S Longitude: 142° 44' 44.60"E (GDA94), Northing: 5704473.1m Easting: 651604.4m (MGA-94). The well lies approximately 150m west of Casino 2. The Casino Field lies approximately 29 km south west of the town of Port Campbell, 24 km WSW of the Minerva gas field and 22 km North of the LaBella gas field. The Casino field is situated towards the western limit of the productive Waarre Sandstone play fairway of the Port Campbell Embayment. Water depth at the Casino 5 location is 68.2m LAT.

The Casino structure is a tilted fault block with three way dip closure and up dip fault closure. Casino-1 and Casino-2 were drilled crestally on this fault block whereas Casino-3 was drilled in a down-dip location near the structural closure limit. Casino-1 and Casino-2 have established the presence of gas in the "Younger" and "Older" sands of the Waarre Sandstone.

The objective of Casino 5 was to develop the gas reserves of the Waarre C reservoir via a vertical well located near the crest of the reservoir. Dynamic modelling conducted during the development planning phase indicated that the entire Waarre C reserves can be developed by a single vertical well very close to the position of Casino-2.

Casino-5 was drilled by the semi-submersible drilling rig "Diamond Offshore Ocean Patriot".

1.2 FIELD DESCRIPTION

General Background

The Casino gas field is located in the southeast corner of the offshore Otway exploration block VIC/P44. The field lies in 70m of water and is 29km southwest of Port Campbell and 250km southwest of Melbourne.

The permit holders are: Santos Limited (50%) Operator
Peedamullah Petroleum Pty Ltd (AWE) (25%)
Mittwell Energy Resources Pty Limited (Mitsui) (25%)

Exploration History

The Casino field was discovered by the exploration well Casino-1. The well reached total depth of 2118m MDRT (-2093mSS) in Albian aged sediments of the Eumeralla Formation, part of the Otway Group. The top of a 48m thick gas column was encountered at -1740m MDRT (-1714mSS) in Waarre A sands, the lower part of the Waarre Sandstone, Shipwreck Sub Group, Sherbrook Group, with a GDT of 1788m MDRT (-1763mSS).

Casino-2, drilled immediately after the first well, is approximately 4km to the east-southeast of Casino-1. Casino-2 drilled through the Waarre A Gas Water Contact (GWC, -1839mSS) and MDT pressure data revealed that the Waarre A gas accumulation was approximately 200psi over pressured. The well also penetrated a younger, gas bearing sand (Waarre C) that was absent at

Casino-1 and that has a GDT of 1786m MDRT (-1761mSS). Casino-2 reached a total depth of 2112m MDRT (-2087mSS) and was plugged and abandoned as a gas discovery.

The Waarre C GWC was not encountered by Casino-2 (GDT -1761mSS) and no pressure data was available from the Waarre C water leg. The lack of a water gradient from the Waarre C was a major technical uncertainty. If the Waarre C was over-pressured to the same degree as the Waarre A only a short gas column could exist (GWC -1850mSS). If however the Waarre C was normally pressured the Casino-2 Waarre C gas gradient intersects the regional aquifer gradient at a depth of -2007mSS, suggesting a greater than 300m gas column.

The data from the two wells was only sufficient to declare the field a non-commercial discovery. Significant subsurface uncertainties remained, the most important being whether or not the Waarre C reservoir was over-pressured. If a similar pressure regime existed in the younger sand the field would keep its non-commercial status.

In the year separating Casino-2 from Casino-3 a detailed technical review was carried out. This included the integration of Casino-1 & -2 into the seismic interpretation, seismic inversion, core based sedimentology, petrology, palynology and the building of 3D static and dynamic reservoir models.

In addition to the technical work, commercial negotiations had been taking place between the VIC/P44 JV and TXU Australia. An innovative deal arose from these talks, whereby Casino gas was already contracted should an appraisal well, Casino-3, prove up sufficient reserves. This effectively removed both the risk of finding a market for the gas and the time needed to find a buyer: major hurdles that are usually addressed after a field has been appraised.

The net result of subsurface and commercial work was the recommendation for an appraisal well to be drilled, with the knowledge that a successful appraisal would guarantee the development of the field.

Casino-3, 3.3km northeast of Casino-1 and 2.4km northwest of Casino-2, was spudded on 14th Oct 2003 by the Ocean Epoch. Waarre C sands were encountered close to prognosis and 27m of core was cut (91.5% recovered). The sands are of a similar thickness to those at Casino-2 and most importantly are gas bearing, thus demonstrating that the Waarre C was not significantly over-pressured. The well reached a driller's depth of 2135m MDRT within the Waarre A. Casino-3 confirmed the following:

- Waarre C is in a separate pressure regime to Waarre A,
- 43.8m gross (23.5m net) gas column, proving a 304m gas column for the Waarre C,
- GWC -1999mSS,
- Excellent Waarre C reservoir properties. A DST (2004 to 2013m MDRT) was conducted and flowed at a maximum choke (1 inch) constrained rate of 45 MMscfd,
- The relationship between seismic amplitudes and gas bearing sands in the Casino structure.

Field Summary Post Appraisal

A detailed discussion on the petroleum geology of the Casino field is presented in the PFDP, but the field can be summarised as follows.

The structure is a tilted fault block with dip closure to the west, north and east. The Casino field has been penetrated by three wells (Casino-1, -2 and -3). The reservoir comprises Turonian aged sandstones from the Waarre Sandstone unit, part of the Shipwreck Sub Group, Sherbrook Group. Two reservoir intervals are present; the older Waarre A and the overlying Waarre C. The sandstones were deposited in fluvial to shallow marine environments.

The two reservoir intervals are in separate pressure regimes. The deeper Waarre A is almost 200 psi over-pressured compared the regional aquifer gradient. The Waarre C is only slightly over-pressured at 14 psi above the regional gradient.

In the Casino area the Waarre A gas bearing interval is approximately 50m thick and is subdivided into upper and lower units, ~20m and ~30m thick respectively. The Waarre A sands have fair reservoir properties with an average log porosity of 20%. Due to the absence of definitive core data significant uncertainty remains in the permeability of the Waarre A reservoir with average permeabilities expected to be in the range 5 – 100 mD.

The Waarre C is not present at Casino-1 having been eroded by a later erosive event. This truncation of the reservoir makes the Waarre C accumulation a combination structural/stratigraphic trap. The gross, gas bearing intervals in Casino-2 and -3 have a similar thickness; 38.6m and 43.8m respectively. The Waarre C reservoir has excellent reservoir qualities, with an average porosity of 22% and permeability ranging from 100s mD to greater than 10,000mD.

The gross Waarre A gas column is 206 m, with the GWC at -1839mSS. The Waarre C gas column is 304m with the GWC at -1999mSS.

Overview

The primary purpose of the development drilling campaign was to drill and complete a production well in each of the Casino reservoirs thus developing the reserves of the Casino gas field.

The objective of the Casino 5 well was to develop the gas reserves of the Waarre C reservoir via a vertical well located near the crest of the reservoir. Dynamic modelling conducted during the development planning phase indicated that the entire Waarre C reserves can be developed by a single vertical well very close to the position of Casino-2. Analysis of core and production test data obtained in Casino-2 and Casino-3 have also shown that the productivity of this well should be sufficient to meet the Daily Contract Quantity (DCQ) required under the Casino sales gas arrangements.

1.3 **WELL LOCATION**

Extensive reservoir simulation was carried out during the development planning stage to investigate the optimal number of wells and well locations under the range of possible reservoir scenarios. The results of this work are presented and discussed in the Preliminary Field Development Plan. This work showed that the field could be adequately drained by a well in each reservoir.

Well locations were based on the following;

- Results from the full-field reservoir simulation model (Section 4.2 of the Preliminary Field Development Plan) and
- A geophysical and geological review of each well target.

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The Surface Surveyed Location for Casino-5 is :

Latitude:	38° 47' 43.68" South
Longitude:	142° 44' 44.60" East (GDA-94).
Easting:	651604.4 m
Northing:	5704473 m (MGA-94)
Rig	Diamond Offshore - Ocean Patriot

The Seismic Location for Casino-5 is: 2001 Casino-3D, 150m West of Casino 2

2. **RESULTS OF DRILLING**

2.1 **STRATIGRAPHY & GEOPHYSICAL PROGNOSIS**

Casino-5 is located 150m west of Casino-2 hence the prognosed depths for the shallow stratigraphic intervals were expected to be very similar to Casino-2.

Formations were intersected from 1.6m high for the Dilwyn Formation to 169.1m low for the Skull Creek Mudstone. The primary target Waarre Formation was intersected 1.7m high to prognosis with the main pay Waarre CB intersected on depth at -1731mSS and the Waarre CA pay intersected at 1744.5m, 4.5 m low to prognosis. The top Skull Creek Formation was incorrectly prognosed due to faulting not previously recognised in Casino 2. This fault splay resulted in an additional lower Paaratte Formation in Casino 5 not seen in Casino 2.

TABLE 1: SUMMARY OF SEISMIC MARKERS

SEISMIC HORIZON	AGE	FORMATION	ACTUAL mRT	ACTUAL TVDSS	HIGH (H) LOW (L)
	MID-LATE MIOCENE	SEABED (TOP HEYTESBURY GP)	89.7	-68.2	1.8 H
	EOCENE – OLIGOCENE	NIRRANDA GROUP: NARRAWATURK MARL	605	-583.4	NP
	EOCENE	NIRRANDA GROUP: MEPUNGA FM	682.5	-660.9	1.9 L
	EOCENE	WANGERRIP GROUP: DILWYN FM	775	-753.4	1.6 H
	EOCENE	PEMBER MUDSTONE	1007	-985.2	NP
	PALAEOCENE	PEBBLE POINT FORMATION	1083	-1060.9	4.9 L
	PALAEOCENE	MASSACRE SHALE	1151	-1128.6	3.6 L
	LATE CRETACEOUS	SHERBROOK GROUP: TIMBOON SANDSTONE	1162.5	-1140.1	4.1 L
	LATE CRETACEOUS	SHERBROOK GP: PAARATE FM	1347	-1323.7	5.3 H
	LATE CRETACEOUS	SHERBROOK GP: SKULL CREEK MUDSTONE	1684	-1659.1	169.1 L
	EARLY - LATE CRETACEOUS	SHIPWRECK GROUP WAARRE FORMATION	1745.5	-1720.3	1.7 H
	EARLY - LATE CRETACEOUS	WAARRE CB – MAIN PAY	1756.2	-1731.0	as prog.
	EARLY - LATE CRETACEOUS	WAARRE CA - PAY	1769.7	-1744.5	4.5 L
		TOTAL DEPTH (LOGGER EXTRAP)	1806	-1780.8	

2.2 STRATIGRAPHY & DEPOSITIONAL ENVIRONMENT (Drillers MDRT Depths)

The well card at the front of this report tables the subsea elevations and thickness of formations penetrated in Casino-5. A brief description of lithology and interpreted environments of deposition follows. More detailed descriptions can be found in Section 2.1 of the Basic Data Report.

Total depth for Casino-5 was reached at 1806m (D), after penetrating pay in the primary target Waarre Formation.

The Waarre Formation was intersected at 1745.5m, was deposited as the initial post-rift sequence at the commencement of Turonian time. Microplankton at the base of the Waarre formation record the first evidence of wholesale marine incursion into the Otway Basin.

The top Waarre Cb pay was intersected on prognosis at -1731.5mSS. Casino 5 penetrated 14m of net Cb pay versus 9m expected as at Casino 2. Top Waarre Ca pay intersected at -1745mSS, 5m low to prognosis due to a thickening of the Waarre Cb pay. 15m of grosse Ca pay was intersected versus 20m as at Casino 2 however reservoir quality is better than expected as at Casino 2.

Waarre Unit "C" is characterised by initial estuarine/deltaic conditions succeeded by high-energy sands. The sandstone is translucent to clear, white to light grey, very fine to very coarse grained which are sub angular to sub round. There is trace calcareous cement with rare siliceous cement and minor light grey silty matrix. Accessories include trace nodular pyrite and trace fine glauconite

grains. The sandstone is predominantly loose with fair to good inferred porosity and no fluorescence.

The Skull Creek Mudstone, (sometimes considered part of the Paaratte Formation), unconformably overlies the Waarre Formation. The Belfast Mudstone and Nullawarre Greensand were not present at Casino 5. The top of the Skull Creek Mudstone was encountered at 1684mRT which was 169m low to prognosis due to being incorrectly prognosed due to faulting not previously recognised in Casino 2. This fault splay resulted in an additional lower Paaratte Formation in Casino 5 not seen in Casino 2. The Skull Creek Mudstone at the Casino 5 location consists of dark olive grey siltstone which is typically argillaceous, occasionally arenaceous grading to very fine sandstone. Accessories include trace carbonaceous specks, trace lithics and minor glauconite. The siltstone is firm, occasionally moderately hard and is sub blocky. A pro-delta environment of deposition is interpreted for the Skull Creek and an age of Santonian has been attributed to the Skull Creek Mudstone.

The Paaratte Formation conformably overlies the Skull Creek Mudstone and was intersected at 1347mRT which was 5.3m high to prognosis. The Paaratte Formation was thicker than prognosed at Casino 5 due to faulting not seen in Casino 2. The Paaratte Formation consists of siltstone with occasional sandstone interbeds. The siltstone is typically medium brown to dark olive green and is slightly arenaceous. The siltstone is firm and is sub blocky. Sandstones are translucent to clear, fine to medium grained, occasionally coarse with moderately strong siliceous cement and accessories including pyrite and glauconite. The sandstone has moderately hard aggregates but is commonly loose with fair inferred porosity.

The top of the youngest formation of the Sherbrook Group, the **Timboon Sandstone** was intersected at 1162.5m. The formation is 184m thick and consists of interbedded sandstone and siltstone. The sandstone is clear to translucent, predominantly fine to medium grained with trace coarse grains. The sandstone is moderately well sorted and the grains are subrounded to subangular in part. The sandstone has a weak siliceous cement, has trace lithic fragments and traces of disseminated pyrite. The sandstone is friable to loose, and occasionally in moderately hard aggregates. No hydrocarbon fluorescence was observed. The interbedded siltstone is light to medium brown to olive grey, argillaceous, slightly calcareous with minor disseminated pyrite. The siltstone is firm and sub blocky. The Timboon Sandstone was deposited in a deltaic environment, in this case, presumably delta plain, and has been dated to be Campanian to Maastrichtian in age in the Otway Basin.

The **Massacre Shale** overlies the Timboon Sandstone. It was penetrated at 1151m and is 11.5m thick. The formation consists of siltstone interbedded with sandstone. The siltstone is olive grey to olive brown, argillaceous, common disseminated pyrite and is moderately hard and generally sub blocky. The interbedded sandstones are translucent, clear, light to medium grey, medium to coarse grained. The sandstone is poorly sorted with sub angular to minor angular grains. The sandstone has common moderate strong siliceous cement and minor white argillaceous matrix. Accessories include pyrite and the aggregates are hard. The Massacre Shale forms the boundary between the Cretaceous and the Tertiary.

Overlying the Massacre Shale is the oldest unit in the **Wangerrip Group**, the **Pebble Point Formation**. At Casino 5, the Pebble Point is 68m thick and was intersected at 1083m. The formation is composed of interbedded claystone and sandstone. Sandstone is clear to translucent, fine to predominantly medium grained with minor coarse grained, poorly sorted, with sub angular to minor angular grains and occasionally subrounded grains. The sandstone has trace weak to

moderately strong siliceous cement. It is partly friable to moderately hard, generally loose and has fair inferred porosity but no hydrocarbon fluorescence. The interbedded claystone is brownish brown to dusky black, slightly arenaceous, partly silty, soft to firm with trace pyrite, glauconite and carbonaceous specks. The environment of deposition for the Pebble Point is interpreted to be shallow water, nearshore, restricted marine with periodic influxes of coarse detrital material. Various megafossils and microfossils have been identified in the formation that indicate an age ranging from Maastrichtian for the oldest strata, to Palaeocene, and even Late Palaeocene.

Conformably overlying the Pebble Point is the **Pember Mudstone**, which was intersected at 1007mRT. The formation consists mainly of claystone which is medium to dark brown, slightly arenaceous, silty, predominantly soft and minor firm, dispersive and amorphous to sub blocky. The claystones are interbedded with minor sandstones which are light brown, translucent, predominantly coarse grained, well sorted and with subrounded grains, with trace moderately strong to strong siliceous cement, with trace silty matrix. The aggregates are moderately hard to hard and loose in part with generally fair to good visual porosity and no hydrocarbon fluorescence. The Pember Mudstone was deposited in a marine environment where there was restricted circulation and low energy conditions, probably below or close to storm wave base. It has been given an age of Late Palaeocene to Early Eocene.

The **Dilwyn Formation** conformably overlies the Pember Mudstone at Casino-3 and was penetrated at 775m and is 232m thick. The section consists predominantly of sandstone with minor interbedded silty claystone. The sandstone is translucent to clear, light grey, is medium to very coarse grained, moderately well sorted, with predominantly sub rounded to rounded, with trace pyrite, trace lithic fragments and commonly loose. The sandstone has a fair inferred porosity but no hydrocarbon fluorescence. The claystone is medium to dark grey and dark brown, soft to firm, occasionally hard, with trace pyrite and is very soft, very dispersive and sub blocky. Both macrofossils and microfossils from the Dilwyn have been dated to be Early Eocene. The environment of deposition is interpreted to be shallow marine, with the cleaner sandy portions representing shoreface deposits of a coastal barrier system and the interbedded section possibly back beach lagoon sediments, with some breaching occurring.

The Dilwyn Formation is the youngest unit of the Wangerrip Group, and is unconformably overlain by the **Mepunga Formation**, the oldest formation of the **Nirranda Group**. In Casino 5 well the Mepunga was intersected at 682m. The massive sandstone is medium yellow brown, coarse to very coarse grained and minor medium grained, moderately well sorted, grains are sub rounded to sub angular. The sandstone has a weak siliceous cement and common Fe-staining. There are traces of glauconite and trace pyrite. The sandstone is poorly consolidated and loose in part and partly friable to moderately hard. The porosity is inferred to be fair with no hydrocarbon fluorescence being observed. Interbedded claystones are medium brown, slightly to very silty in part, with abundant dispersed very fine to quartz grains. The Mepunga Formation is Middle Eocene to Early Oligocene has been given. The sandstones have been interpreted as being deposited in beach and nearshore locations as barrier islands, whereas the claystones regarded as estuarine and some as deep lagoonal in origin.

The **Narrawaturk Marl** conformably overlies the Mepunga Formation. The marl was encountered behind the casing shoe at 605m. Only samples from the base of the Marl were observed at Casino 5 as all returns were to the seafloor prior to running the blow out preventer and marine riser. The formation is generally made up of a calcareous claystone / siltstone which is intergraded with and intergrading to marl and commonly has fossil fragments of echinoid spines and bryozoa. The fossil

fragments have been dated to be Late Eocene to Early Oligocene, but no older than Oligocene in age. The marl was deposited in an open marine environment, mostly below storm wave base.

Formations younger than the Narrawaturk Marl are behind casing and were not observed at Casino 5. These include formations (typically limestones) of the **Heytesbury Group** like the Clifton Formation which grades into the **Gellibrand Marl** which is overlain, with a transitional contact, by the **Port Campbell Limestone**, the topmost formation of the Heytesbury Group. The Port Campbell Limestone is Middle to Late Miocene in age and was deposited in a moderate-energy, continental shelf environment, above fair weather wave base. It is uncertain if all these formations were penetrated Casino 5 prior to installing the marine riser when all returns were to the seafloor.

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.

There were no returns to surface prior to running the 340mm (13 3/8") casing and marine riser at 665m. After drilling out the 340mm (13-3/8") casing shoe at 655m returns were to the surface and real-time gas monitoring commenced.

After drilling out the 340mm (13-3/8") casing shoe at 655m background gas in trace amounts up to 200ppm C1 were recorded. After penetrating the top of the Pebble Point Formation at 1083mRT background gas increased to 2 U (100% C1) and remained low throughout the formations drilled. From top Paaratte Formation at 1347mRT background gas slowly increased to 10 U at the top Skull Creek Mudstone reaching 20 U (98/2/trace) at the 244mm (9-5/8") casing depth at 1730mRT.

The top Waarre Formation was intersected at 1745.5mRT which was 1.7m high to prognosis. The primary target, the top Waarre Cb pay was intersected on prognosis at 1756.2mRT (-1731.5mSS). Casino 5 penetrated 14m of net Cb pay versus 9m expected as at Casino 2. Gas peaked at 800 Units (99/1/trace) above a background of 20 Units. No hydrocarbon fluorescence was observed.

Top Waarre Ca pay was intersected at 1769.7mRT (-1745mSS), 5m low to prognosis due to a thickening of the Waarre Cb pay. 15m of grosse Ca pay was intersected versus 20m as at Casino 2 however reservoir quality is better than expected as at Casino 2. Background gas peaked at 880 Units (97/2/1/trace). No hydrocarbon fluorescence was observed.

Wireline logs were not conducted at the Casino 5 well and hence no log analysis is available.

At the completion of drilling Casino 5 the well was completed with 194mm (7-5/8") casing and expandable sand screens. The well was then flow tested over the primary reservoir zone to confirm reservoir flow characteristics. The test was conducted over the interval 1720m to 1806m and flowed at the maximum choke-constrained measured flow rate of 43 MMscf/d through a 23.8 mm (60/64") choke at a well head tubing pressure of 163534 kpa (2372 psig).

Background gas decreased in the Base Waarre "C" to 30 Units at total depth.

TABLE 2: WAARRE FORMATION GAS SHOW

<i>INTERVAL /SAND</i>	<i>NET PAY</i>	<i>GAS PEAK/ BACKGROUND</i>	<i>BREAKDOWN</i>	<i>AVE POR</i>	<i>AVE SW</i>	<i>COMMENTS</i>
Waarre Cb 1756.2 – 1769.7	13.5	800 / 20 U	99/1/trace	-	-	
Waarre Ca 1769.7 – 1784.7	15	880 / 20 U	97/2/1/trace	-	-	

2.4 SUMMARY

Casino-5 was drilled as an Otway Basin gas development well in the Victoria Offshore VIC/P44 licence. The Surface Location is Latitude: 38° 47' 43.68" S Longitude: 142° 44' 44.60"E (GDA94), Northing: 5704473.1m Easting: 651604.4m (MGA-94). The well lies approximately 150m west of Casino 2. The Casino Field lies approximately 29 km south west of the town of Port Campbell, 24 km WSW of the Minerva gas field and 22 km North of the LaBella gas field. The Casino field is situated towards the western limit of the productive Waarre Sandstone play fairway of the Port Campbell Embayment. Water depth at the Casino 5 location is 68.2m LAT.

The Casino structure is a tilted fault block with three way dip closure and up dip fault closure. Casino-1 and Casino-2 were drilled crestally on this fault block whereas Casino-3 was drilled in a down-dip location near the structural closure limit. Casino-1 and Casino-2 have established the presence of gas in the “Younger” and “Older” sands of the Waarre Sandstone.

The objective of Casino 5 was to develop the gas reserves of the Waarre C reservoir via a vertical well located near the crest of the reservoir. Dynamic modelling conducted during the development planning phase indicated that the entire Waarre C reserves can be developed by a single vertical well very close to the position of Casino-2.

Casino-5 was spudded at 19:00 hrs on 16/06/05. A 914mm (36") hole was drilled from the seabed at 89.7m to 133m. The 760mm (30") casing was run and set at 132m. A 445mm (17.5") hole was drilled in one bit run from 133m to 665m with returns to the seafloor and 340mm (13-3/8") casing run and set at 655m. The production tree was run followed by the blow out preventer and marine riser. A 311mm (12¼") drilling assembly was run in drilling the shoe track and 3m of formation. A leak-off test was conducted yielding an equivalent mud weight of 2.08sg. The 311mm (12¼") hole was drilled in 3 bit runs to section total depth at 1730m. 137 joints of 244mm (9 5/8") 70kg/m (47lb/ft) mixed L80/13Cr80 casing were run with the shoe set at 1720m. The 216mm (8½") hole section was drilled in one bit run from 1730m to 1806m. Total depth was reached at 19:00 hours on 28/06/2005. At the completion of drilling Casino 5 the well was completed with 194mm (7-5/8") casing and expandable sand screens. The well was then flow tested over the primary reservoir zone to confirm reservoir flow characteristics. The test was conducted over the interval 1720m to 1806m and flowed at the maximum choke-constrained measured flow rate of 43 MMscf/d through a 23.8 mm (60/64") choke at a well head tubing pressure of 163534 kpa (2372 psig). The rig was released at 22:00 hours on 8th July, 2005.

Formations were intersected from 1.6m high for the Dilwyn Formation to 169.1m low for the Skull

Creek Mudstone. The primary target Waarre Formation was intersected 1.7m high to prognosis with the main pay Waarre CB intersected on depth at -1731mSS and the Waarre CA pay intersected at 1744.5m, 4.5 m low to prognosis. The top Skull Creek Formation was incorrectly prognosed due to faulting not previously recognised in Casino 2. This fault splay resulted in an additional lower Paaratte Formation in Casino 5 not seen in Casino 2.

Casino 5 was drilled as a vertical hole. Deviation Surveys were recorded utilising the LWD/MWD tools in the 311mm (12.25") and 216mm (8½") hole sections. An EMS survey was conducted in the 445mm (17½") hole section. At Total Depth, the estimated displacement from the wellhead was approximately 85m to 245°(T). At total measured depth, 1806m, the TVD was calculated at 1802m.

- Casino 5 achieved its key objectives in that:
- The top Waarre Formation was intersected close to prognosis confirming the pre-drill interpretation.
- The top Waarre Cb pay was intersected on prognosis at -1731.5mSS
- The Waarre Formation was developed as predicted with 14m of net Cb pay intersected versus 9m expected as at Casino 2
- Top Waarre Ca pay intersected at -1745mSS, 5m low to prognosis due to a thickening of the Waarre Cb pay. 15m of grosse Ca pay intersected versus 20m as at Casino 2. Reservoir quality better than expected as at Casino 2.

Casino 5 was completed with 194mm (7-5/8") casing and expandable sand screens. The well was then flow tested over the primary reservoir zone to confirm reservoir flow characteristics. The test was conducted over the interval 1720m to 1806m and flowed at the maximum choke-constrained measured flow rate of 43 MMscf/d.

3. REFERENCES

Santos, 2005	Casino-5 Well Proposal, Prepared for Santos Ltd, (unpublished).
J.Pitman, 2005	Casino-5 Basic Data Report, Prepared for Santos Limited, (unpublished).
Subramanian, R., 2002	Casino-1 Interpreted Data Report, Prepared for Santos Limited, (unpublished).
Subramanian, R., 2002	Casino-2 Interpreted Data Report, Prepared for Santos Limited, (unpublished).
Subramanian, R., 2003	Casino-3 Interpreted Data Report, Prepared for Santos Limited, (unpublished).

APPENDIX I : ELECTRIC LOG EVALUATION RESULTS

Wireline logs were not conducted at the Casino 5 location.

APPENDIX II : MDT PRESSURE SURVEY REPORT AND DATA

A pressure survey was not conducted at the Casino 5 location.

APPENDIX III: HYDROCARBON SHOW REPORT

No Fluorescence was observed in Casino-5.

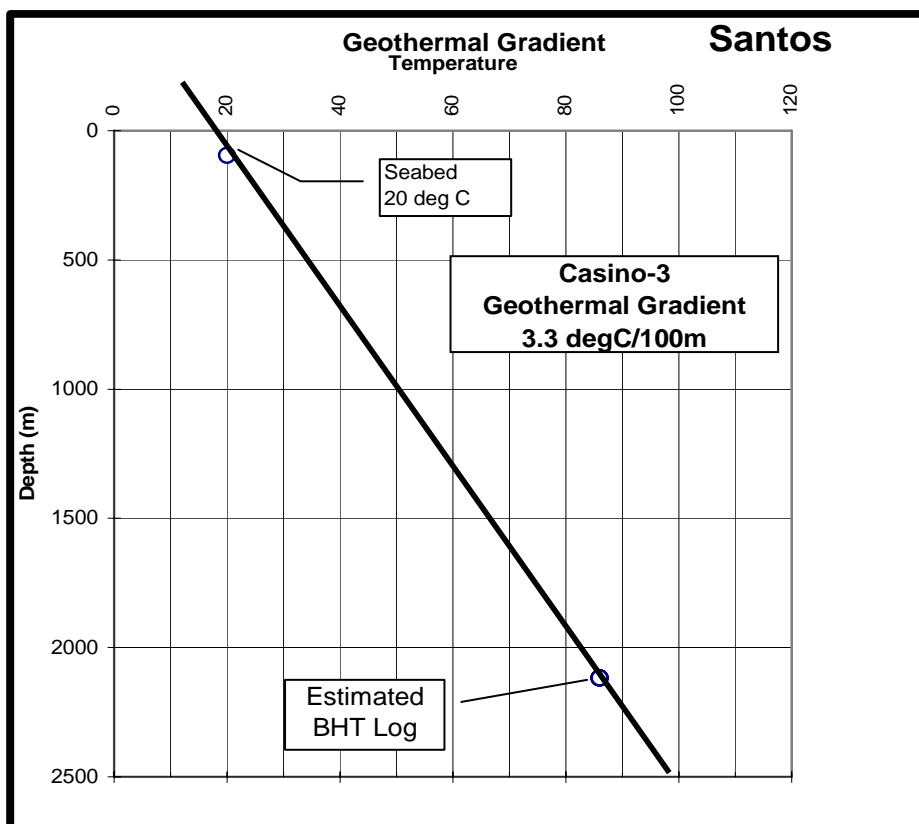
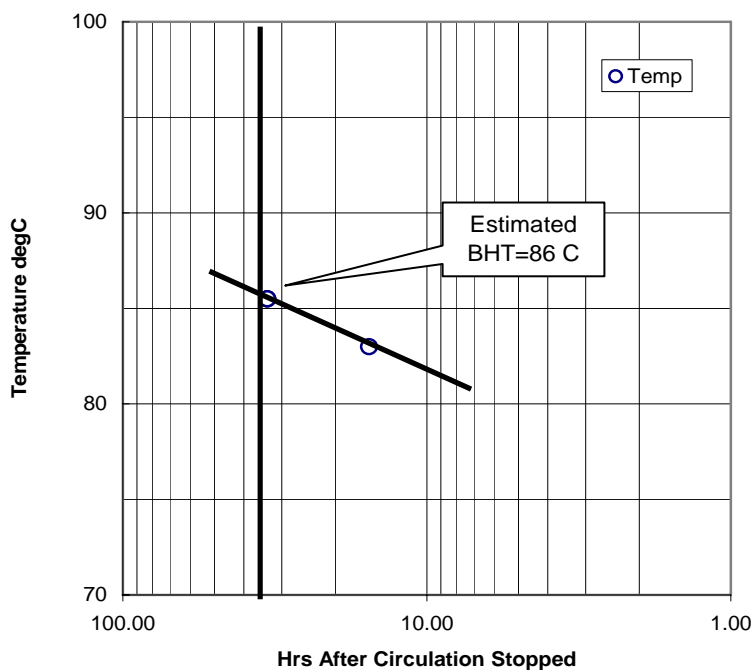
APPENDIX IV : GEOTHERMAL GRADIENT

Wireline logs were not conducted at the Casino 5 location. Based on data from Casino 3 a geothermal gradient of 3.3°C/100m was assumed. The Casino 3 data is depicted graphically overleaf.

Well Name: Casino-3

Santos

Extrapolation to Determine Static BHT



APPENDIX V : PETROLOGY REPORT

No petrology was done on Casino 5 samples.

APPENDIX VI : PALYNOLOGY REPORT

No Palynology work was done on Casino 5 samples.

APPENDIX VII : FLOW TEST REPORT

Casino 5 Flow-Back

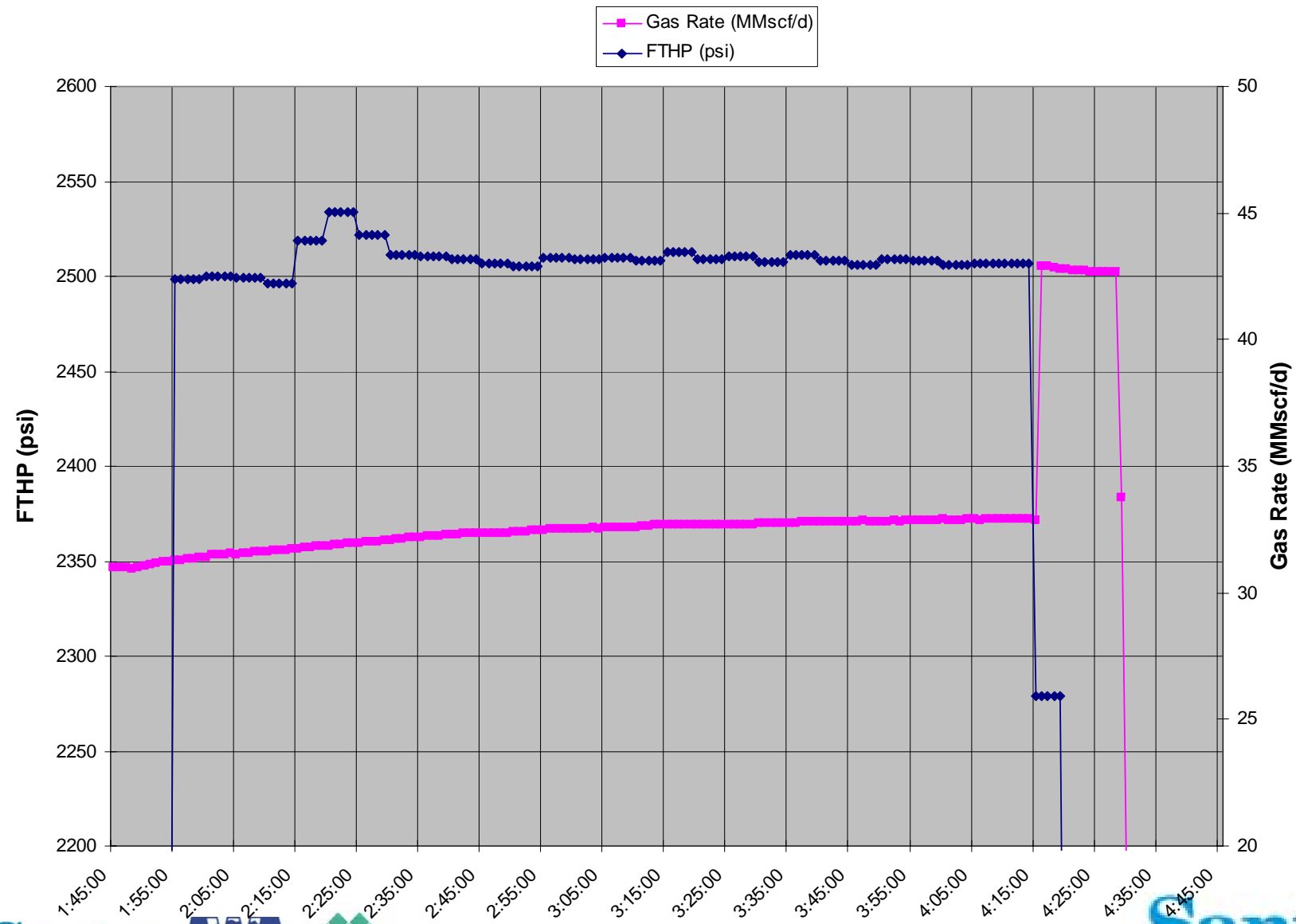
Review of Clean-Up



Flowback Summary

- Well opened at 22:43 4 July by-passing the separator
- Beaned up to 64/64th inch choke flowing direct to the flare
- Diverted to Separator at 01:55 5 July
- Flowed well on 60/64th choke through separator
- Clean-up terminated at 04:14 5 July
 - 2372 psig Flowing Pressure Upstream of the Choke
 - 43 MMscf/d, 60/64th inch choke
- Shut-in THP : 2502 psig at 04:15 (stable 1 min after shut-in)

Casino 5 Flowback



Santos



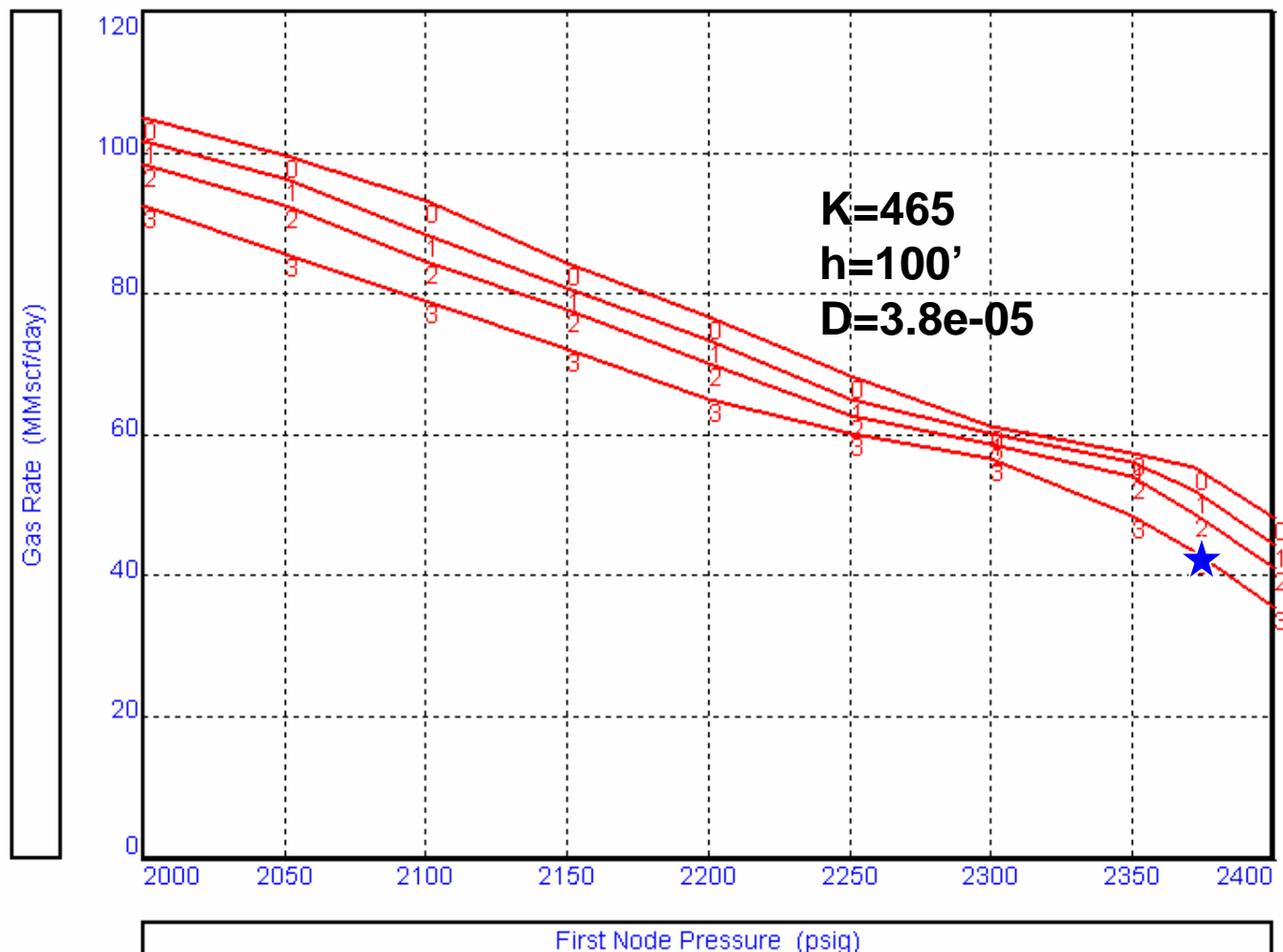
Santos

Santos Limited ABN 80 007 550 923

Interpretation of Results

- Results in-line or better than expected
- CO₂ 0.7% and H₂S 0ppm as expected
- No BH or PBU data – multiple interpretations
 - Permeability 320-465 md;
 - Darcy skin 5-24 (clean-up period only 2 hrs 20 min);
 - Flow contribution 60-100 ft;
 - Non-Darcy skin 5e-4-3.8e-5 1/MMscf
- **Casino 5 capable of >90 MMscf/d at 1500 psi line pressure**
 - Subject to erosion limits

Sensitivity plot - Reservoir Permeability = 465 (md) (Casino 5 05 Jul 05 09:24)

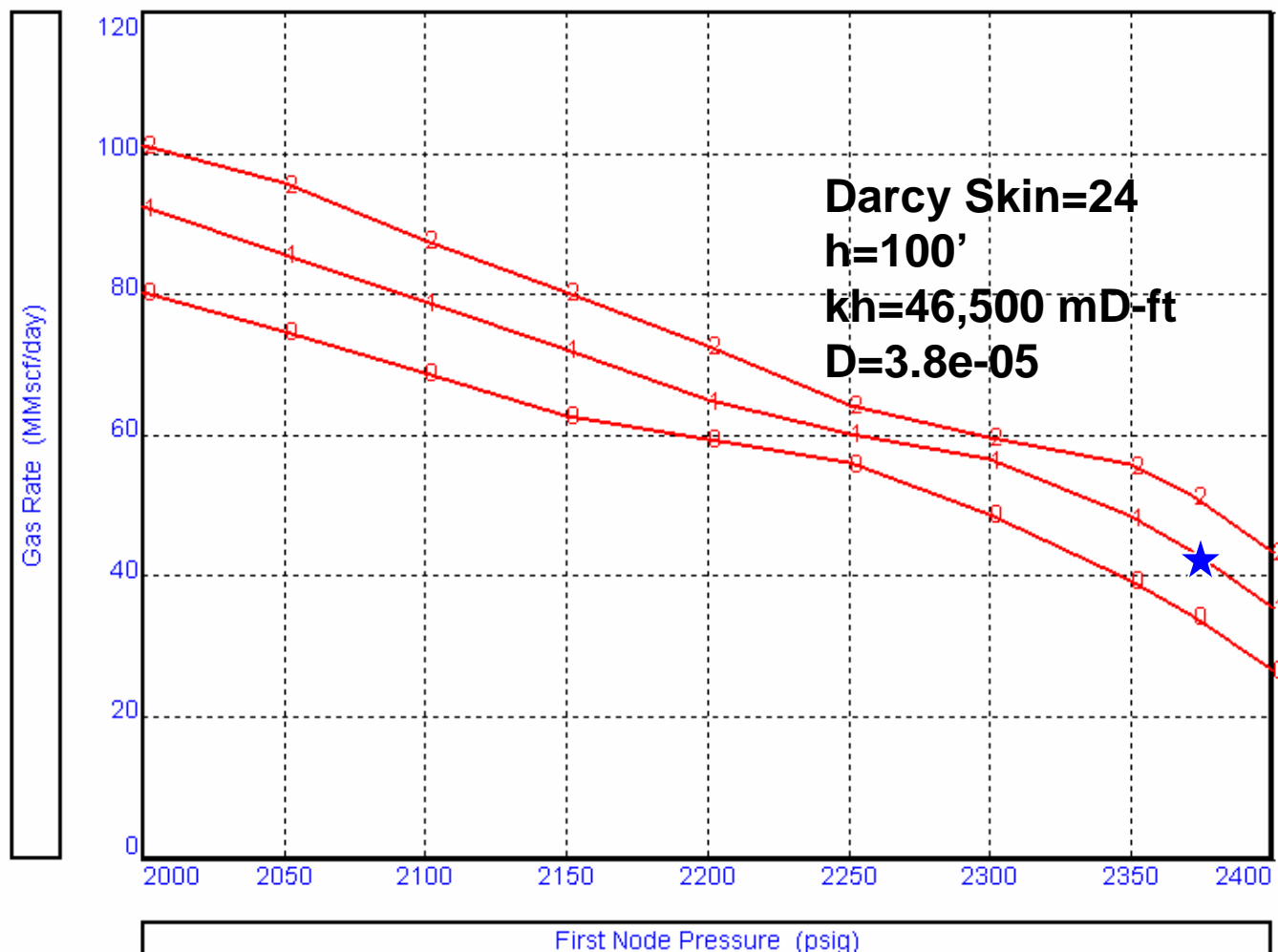


Skin

Curve 0 = 5
Curve 1 = 10
Curve 2 = 15
Curve 3 = 24

PVT Method Black Oil Fluid Gas Flow Type Tubing Well Type Producer Artificial Lift Lift Type Predicting Pressure and Temperature (P) Temperature Model Rough Approximation Company Field Casino	Bottom Measured Depth 5756.0 Bottom True Vertical Depth 5756.0 Surface Equipment Correlation Beggs and Brill Vertical Lift Correlation Petroleum Experts First Node 1 Manifold 0 Last Node 10 Tubing 5756.0	Inflow Type Single Branch Completion Open Hole Gravel Pack No Gas Coning Reservoir Model Petroleum Experts M&G Skin Model Enter Skin By Hand Reservoir Pressure 2815.00 (psig) Reservoir Temperature 175.00 (deg F)
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Sensitivity plot - Skin = 24 (Casino 5 05 Jul 05 09:44)



Reservoir Permeability

(md)

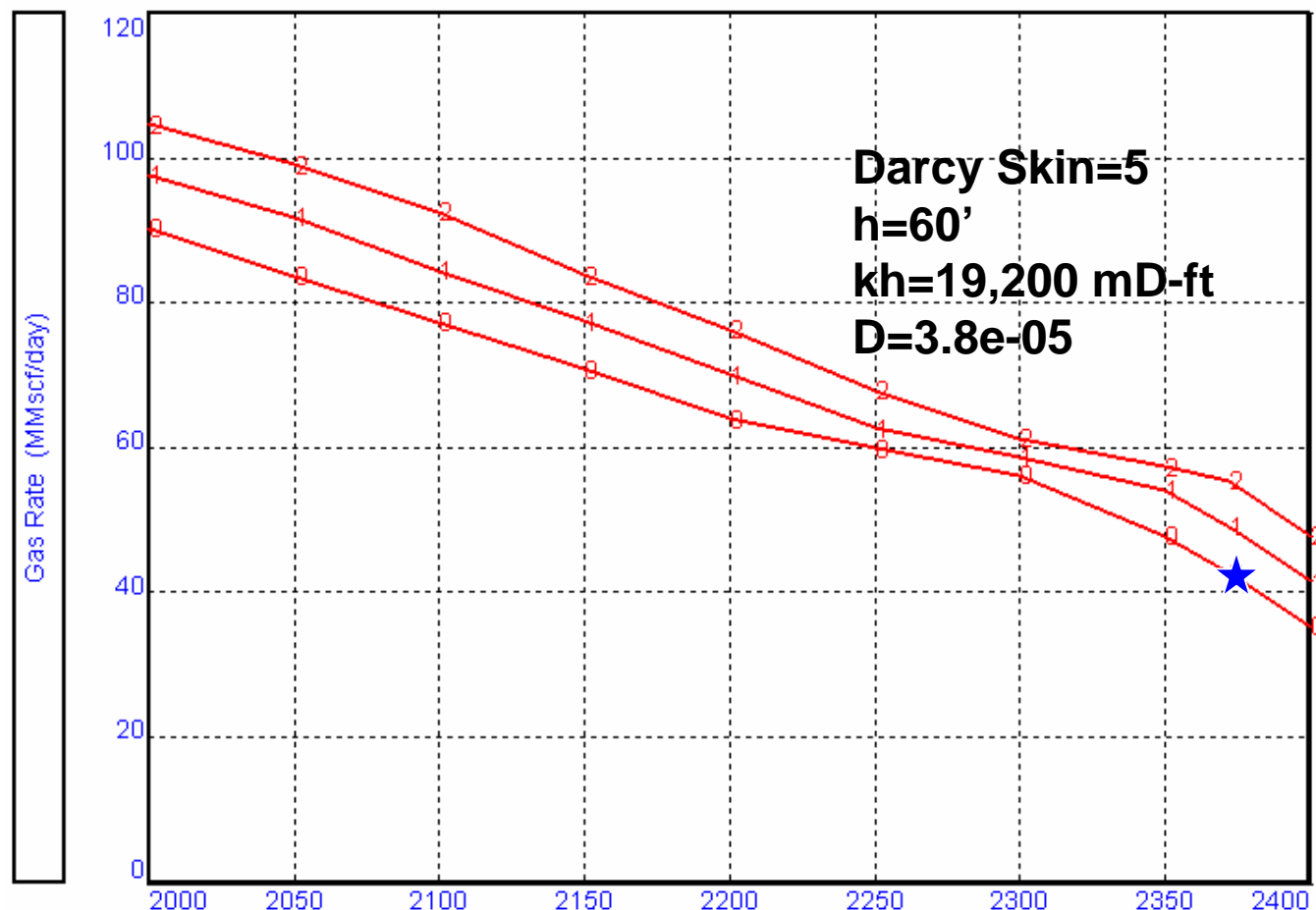
Curve 0 = 300
Curve 1 = 465
Curve 2 = 750

PVT Method Black Oil
Fluid Gas
Flow Type Tubing
Well Type Producer
Artificial Lift
Lift Type
Predicting Pressure and Temperature (P)
Temperature Model Rough Approximation
Company
Field Casino

Bottom Measured Depth 5756.0
Bottom True Vertical Depth 5756.0
Surface Equipment Correlation Beggs and Brill
Vertical Lift Correlation Petroleum Experts
First Node 1 Manifold 0
Last Node 10 Tubing 5756.0

Inflow Type Single Branch
Completion Open Hole
Gravel Pack No
Gas Coning
Reservoir Model Petroleum Experts
M&G Skin Model Enter Skin By Hand
Reservoir Pressure 2815.00 (psig)
Reservoir Temperature 175.00 (deg F)

Sensitivity plot - Skin = 5 (Casino 5 05 Jul 05 11:12) (Casino 5 05 Jul 05 11:12)



Reservoir Permeability

(md)

Curve 0 = 320
 Curve 1 = 465
 Curve 2 = 750

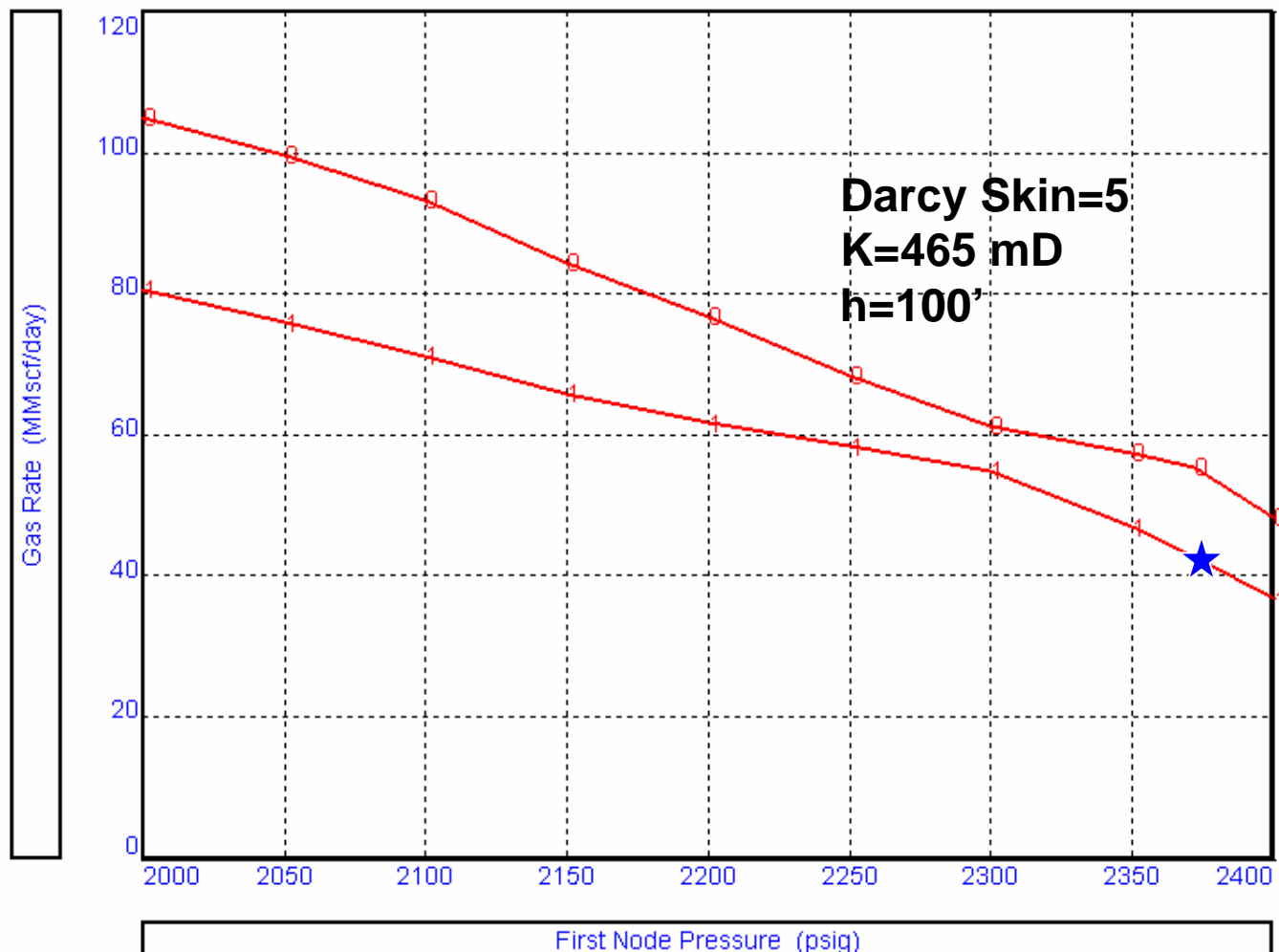
First Node Pressure (psig)

PVT Method Black Oil
 Fluid Gas
 Flow Type Tubing
 Well Type Producer
 Artificial Lift
 Lift Type
 Predicting Pressure and Temperature (P)
 Temperature Model Rough Approximation
 Company
 Field Casino

Bottom Measured Depth 5756.0
 Bottom True Vertical Depth 5756.0
 Surface Equipment Correlation Beggs and Brill
 Vertical Lift Correlation Petroleum Experts
 First Node 1 Manifold 0
 Last Node 10 Tubing 5756.0

Inflow Type Single Branch
 Completion Open Hole
 Gravel Pack No
 Gas Coning
 Reservoir Model Petroleum Experts
 M&G Skin Model Enter Skin By Hand
 Reservoir Pressure 2815.00 (psig)
 Reservoir Temperature 175.00 (deg F)

Sensitivity plot - Reservoir Permeability = 465 (md) (Casino 5 05 Jul 05 13:29)



D (Non Darcy) Factor

(1/(Mscf/day))

Curve 0 = 3.8e-005

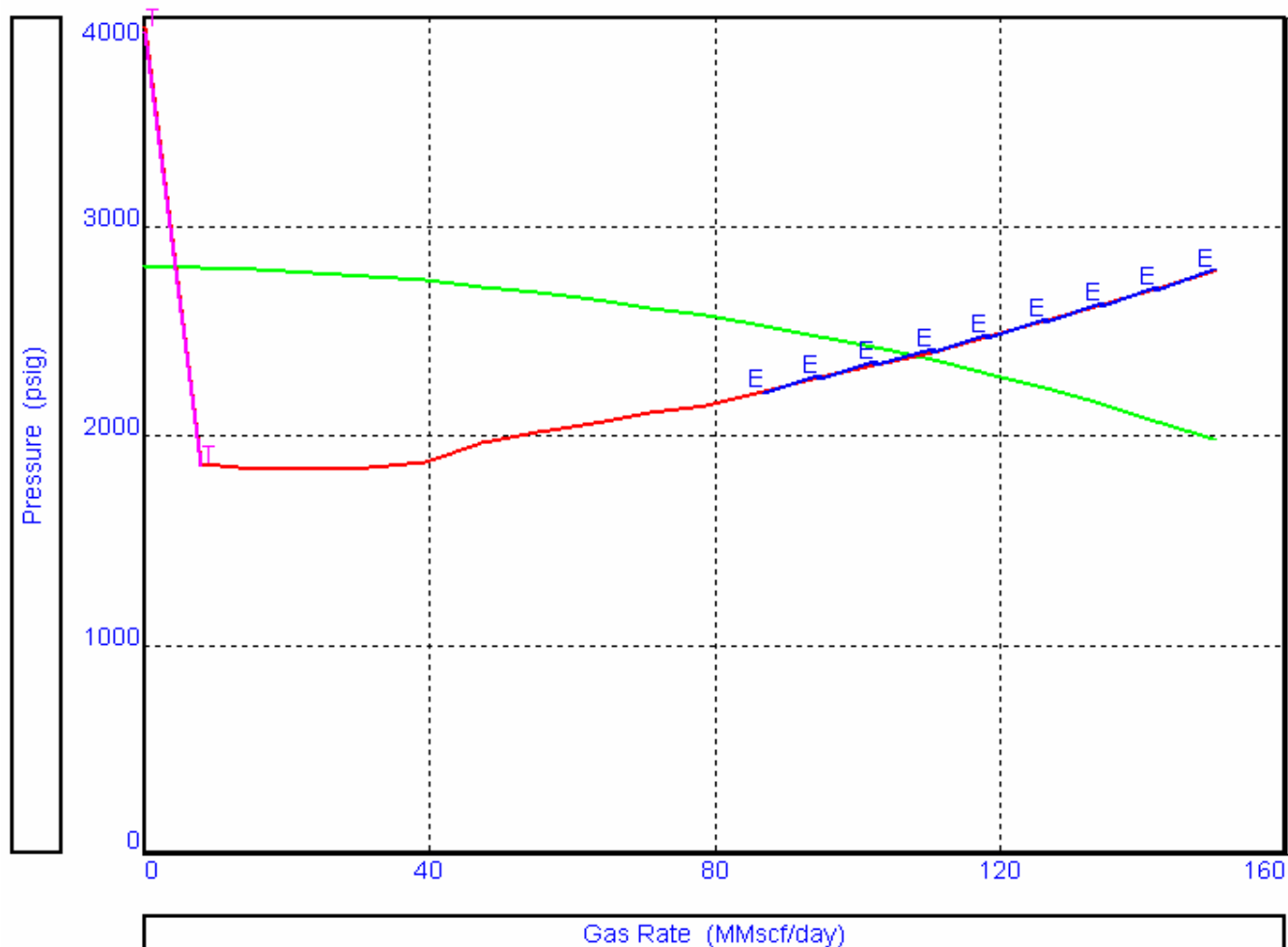
Curve 1 = 0.0005

PVT Method Black Oil
Fluid Gas
Flow Type Tubing
Well Type Producer
Artificial Lift
Lift Type
Predicting Pressure and Temperature (P)
Temperature Model Rough Approximation
Company
Field Casino

Bottom Measured Depth 5756.0
Bottom True Vertical Depth 5756.0
Surface Equipment Correlation Beggs and Brill
Vertical Lift Correlation Petroleum Experts
First Node 1 Manifold 0
Last Node 10 Tubing 5756.0

Inflow Type Single Branch
Completion Open Hole
Gravel Pack No
Gas Coning
Reservoir Model Petroleum Experts
M&G Skin Model Enter Skin By Hand
Reservoir Pressure 2815.00 (psig)
Reservoir Temperature 175.00 (deg F)

Inflow v Outflow Curves (Casino 5 05 Jul 05 13:52)



Darcy Skin=5
h=100'
k=465 mD
D=5e-04

PVT Method Black Oil Fluid Gas Flow Type Tubing Well Type Producer Artificial Lift Lift Type Predicting Pressure and Temperature (PT) Temperature Model Rough Approximation Company Field Casino	Top Node Pressure 1600.00 (psig) Water Gas Ratio 0.25 (STB/MMscf) Bottom Measured Depth 5756.0 (feet) Bottom True Vertical Depth 5756.0 (feet) Surface Equipment Correlation Beggs and Brill Vertical Lift Correlation Petroleum Experts Solution Node Bottom Node Left-Hand Intersection Disallow	Inflow Type Single Branch Completion Open Hole Gravel Pack No Gas Coning Reservoir Model Petroleum Experts M&G Skin Model Enter Skin By Hand Reservoir Pressure 2815.00 (psig) Reservoir Temperature 175.00 (deg F)
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ENCLOSURE I : COMPOSITE LOG (1:500 SCALE)

ENCLOSURE II : DEPTH STRUCTURE MAP

ENCLOSURE III : STRATIGRAPHIC CROSS SECTION