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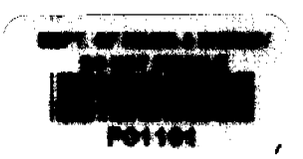
SANTOS LIMITED

(A.C.N. 007 550 923)

WEST MEREENIE 15

WELL COMPLETION REPORT

Prepared By:
Mark Lawrence
(Consultant)
February, 2000



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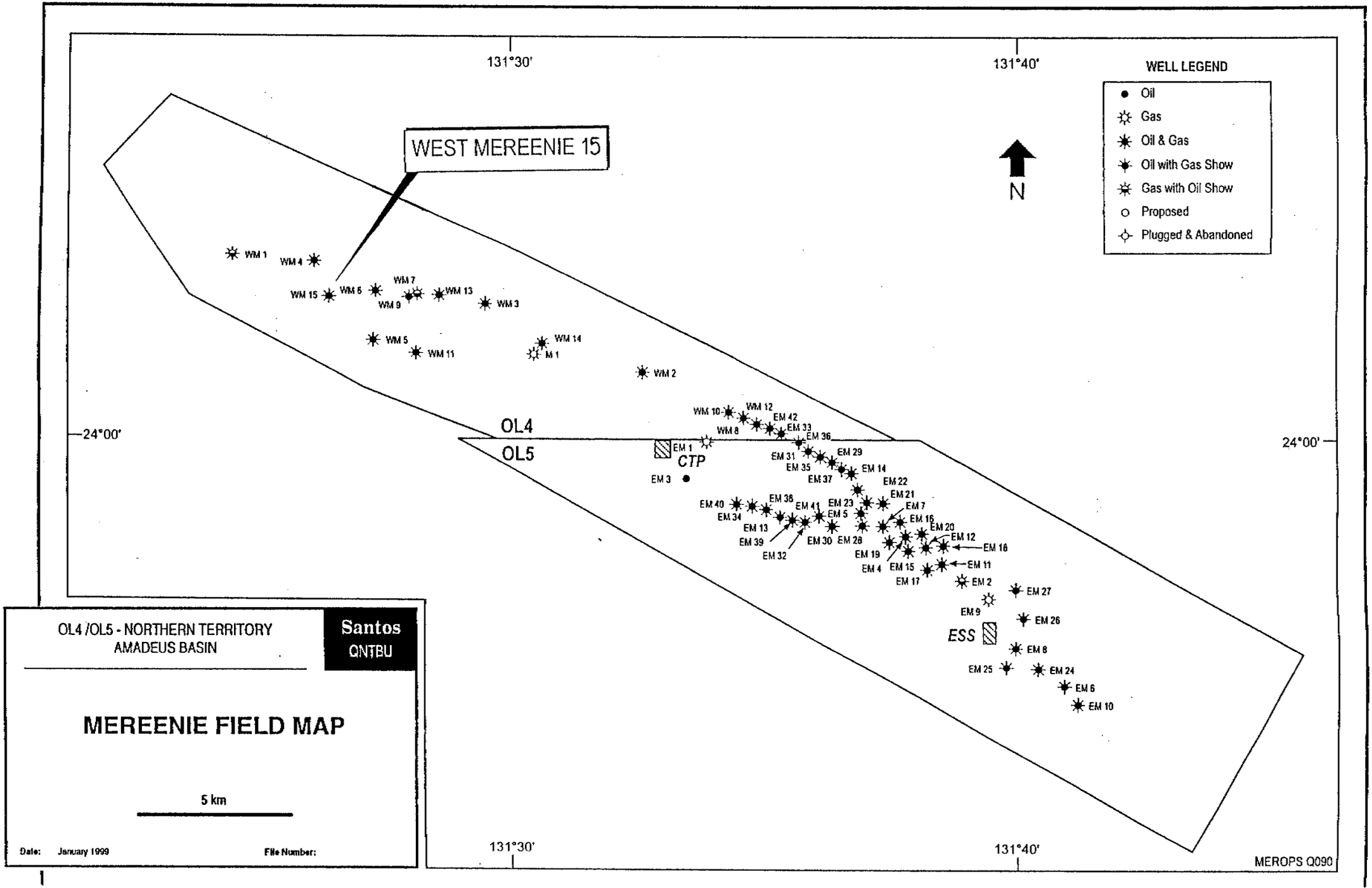
LOCATION MAP


131°30'
131°40'
24°00'
WELL LEGEND
Oil
Gas
Oil & Gas
Oil with Gas Show
Gas with Oil Show
Proposed
Plugged & Abandoned
N
WEST MEREENIE 15
WM 1
WM 4
WM 15
WM 6
WM 7
WM 9
WM 13
WM 3
WM 5
WM 11
WM 14
M 1
WM 2
WM 10
WM 12
WM 8
EM 42
EM 33
EM 36
OL4
OL5
EM 1
CTP
EM 3
EM 31
EM 29
EM 35
EM 14
EM 37
EM 22
EM 21
EM 40
EM 38
EM 41
EM 23
EM 7
EM 34
EM 5
EM 16
EM 13
EM 20
EM 39
EM 30
EM 28
EM 12
EM 18
EM 32
EM 19
EM 4
EM 15
EM 11
EM 17
EM 2
EM 27
EM 9
EM 26
ESS
EM 8
EM 25
EM 24
EM 6
EM 10
OL4 /OL5 - NORTHERN TERRITORY
AMADEUS BASIN
Santos
QNTBU
MEREENIE FIELD MAP
5 km
Date: January 1999
File Number:
MEROPS Q090

WELL DATA CARD

WELL: WEST MEREENIE 15	**WELL CATEGORY:** DEV **WELL INTENT:** GAS	**SPUD:** 13:30 hrs 9/6/99	**TD REACHED:** 17:00 hrs 21/6/99
		RIG RELEASED: 24:00 hrs 27/6/99	**CMPLT:** C&S
LAT: 23° 57' 36.3" S	**LONG:** 131° 26' 31.7" E	**RIG:** MEREENIE RIG 1	
SEISMIC STATION: 12.5m WEST OF SP490 LINE M87-09		**STATUS:** CASED & SUSPENDED	
ELEVATION GND: 763.54m	**RT:** 769.34m	**REMARKS:** STAIRWAY & PACOOTA SST GAS PRODUCER	
BLOCK/LICENCE: OL4			
TD: 1446m (Logr Ext)	1445m (Drlr)		
PBTD: (Logr)	1428.3m (Drlr)		
TYPE STRUCTURE: FOUR WAY DIP CLOSURE			
TYPE COMPLETION: CASED AND SUSPENDED			
ZONE(S): STAIRWAY SST & P1/P3 PENDING			

CASING SIZE	SHOE DEPTH	TYPE
16"	33.72m (D)	
10¾"	530.5m (L)	
7"	1440m D	

AGE	FORMATION OR ZONE TOPS	DEPTH (m)			HIGH (H) LOW (L)
		LOGGERS	SUBSEA	THICKNESS	
Late Silurian - Mid Devonian	Mereenie Sandstone	Surf	+763.5	350.8	-
Late Ordovician	Carmichael Sandstone	356.6	+412.7	87.6	9.9 H
Middle - Late Ordovician	Stokes Formation (Upper)	444.2	+325.1	258.3	17.3 H
Middle Ordovician	Stokes Formation (Lower)	702.5	+66.8	82.0	19.0 H
Middle Ordovician	Stairway Sandstone (Upper)	784.5	15.2	57.5	17.0 H
Middle Ordovician	Stairway Sandstone (Middle)	842.0	72.7	113.0	20.5 H
Middle Ordovician	Stairway Sandstone (Lower 2)	955.0	185.7	60.4	21.5 H
Middle Ordovician	Stairway Sandstone (Lower 1)	1015.4	246.1	33.0	21.7 H
Early Ordovician	Horn Valley Siltstone	1048.4	279.1	84.1	21.0 H
Early Ordovician	Pacoota Sandstone (P1)	1132.5	363.2	17.9	18.9 H
Early Ordovician	Pacoota Sandstone (P1-60)	1150.4	381.1	7.3	NP
Early Ordovician	Pacoota Sandstone (P1-80)	1157.7	388.4	3.1	19.4 H
Early Ordovician	Pacoota Sandstone (P1-110)	1160.8	391.5	14.2	NP
Early Ordovician	Pacoota Sandstone (P1-120)	1175.0	405.7	11.5	NP
Early Ordovician	Pacoota Sandstone (P1-200)	1186.5	417.2	6.8	NP
Early Ordovician	Pacoota Sandstone (P1-210)	1193.3	424.0	7.1	NP
Early Ordovician	Pacoota Sandstone (P1-240)	1200.4	431.1	13.9	NP
Early Ordovician	Pacoota Sandstone (P1-280)	1214.3	445.0	6.2	19.0 H
Early Ordovician	Pacoota Sandstone (P1-310)	1220.5	451.2	12.5	NP
Early Ordovician	Pacoota Sandstone (P1-350)	1233.0	463.7	5.2	NP
Early Ordovician	Pacoota Sandstone (P2)	1238.2	468.9	67.0	19.1 H
Early Ordovician	Pacoota Sandstone (P3-10)	1305.2	535.9	18.1	18.1 H
Early Ordovician	Pacoota Sandstone (P3-70/90)	1323.3	554.0	13.7	NP
Early Ordovician	Pacoota Sandstone (P3-120)	1337.0	567.7	14.3	16.3 H
Early Ordovician	Pacoota Sandstone (P3-150)	1351.3	582.0	4.7	NP
Early Ordovician	Pacoota Sandstone (P3-190)	1356.0	586.7	29.8	23.8 H
L Cambrian - E Ordovician	Pacoota Sandstone (P4)	1385.8	616.5	60.2+	19.5 H
	Total Depth	1446.0	676.7	-	-

LOG INTERPRETATION (Interval Averages)

INTERVAL(ft)	Ø %	SW %	INTERVAL(ft)	Ø %	SW %
Upper Stairway			1214.3-1220.5	7.3	8.3
770.4-838	6.8	37.6	1220.5-1233	5.3	37.5
Lower Stairway			1233-1305.3	6.1	15.2
(2) 957.6-1015.4	5.6	58.2	Pacoota P3		
(1) 1015.4-1133	4.5	42	1305.3-1323.4	7.9	23.4
Pacoota P1			1323.4-1337	7.4	36.7
1133-1150.5	5.9	47.1	1337-1351.7	7.7	12.5
1150.5-1157.7	10.6	47.8	1351.3-1356	6.8	72.4
1157.7-1164.8	6.8	36.4	1356-1385.7	7.4	32.1
1164.8-1175	-	-	Pacoota P4 Gas		
1175-1186.5	-	-	1385.7-1425	6.6	18.7
1186.5-1193.4	5.7	52.1	Pacoota P4 Oil		
1193.4-1200.5	10.4	62.6	1425-1435	6.8	18.4
1200.5-1214.3	6.9	59.8			

PERFORATIONS (4 shots/ft)

FORMATION	INTERVAL
N/A	

CORES

FORM	NO.	INTERVAL	CUT	REC
N/A				

LOG	SUITE/ RUN	INTERVAL	BHT/TIME/ REMARKS	LOG	SUITE/ RUN	INTERVAL	BHT/TIME/REMARKS
PEX			54°C/8.0 hrs	FMS-DSI	1/2		57°C/16.75 hrs
SP	1/1	1431.2-530.5		FMS		1445.5-754.0	
HALS	1/1			DSI		1445.5-742.5	
HLLS-HLLD		1443.7-530.5		MDT-GR	1/3		60°C/24.5 hrs. 5 Dual
HRMS	1/1						Packer, 1 successful, 10
RHOZ-MCFL		1440.6-751.0					Single Probe, 3 dry 4 tight
HCAL		1440.6-751.0					3 good.
HGNS	1/1			HALS-GR	1/4		Re-run and merged with
GR		1438.5-61.5		HLLS-HLLD		1443.7-530.5	Run 1 after HALS failure.
TNPH		1441.1-751.0		GR		Depth control	Only

FORMATION TESTS

NO.	INTERVAL (m)	FORMATION	FLOW (mins)	SHUT IN (mins)	PANEX GAUGE IP/FP (psia)	SIP psig	MAX SURF PRESS (psia)	FLUID TO SURF (mins)	TC/ BC	REMARKS
FT1	830-839	Upper Stairway Sst	35	0	N/A	N/A	330	N/A	¾"	Stabilised Q=4.5mmcfgd No build up required.
FT2	830-1028	L-U Stairway Sst	40	0	N/A	N/A	155	N/A	1"	Stabilised Q=3.3mmcfgd No build up required.
FT3	830-1055	Stairway Sst	40	0	N/A	N/A	170	N/A	1"	Stabilised Q=3.6mmcfgd No build up required.
FT4	830-1220	Pacoota Sst. (P1-280)	40	0	N/A	N/A	718	N/A	1"	Stabilised Q=15.2mmcfgd No build up required.
FT5	830-1338	Pacoota Sst (P3-120)	35	0	N/A	N/A	311	N/A	1½"	Stabilised Q=15.4mmcfgd No build up required.
FT6	830-1355	Pacoota Sst (P3-150)	30	0	N/A	N/A	364	N/A	1½	Stabilised Q=18.0mmcfgd No build up required.
FT7	830-1390	Pacoota Sst (P3-190)	25	0	N/A	N/A	351	N/A	1½"	Stabilised Q=17.4mmcfgd No build up required.
IS1	1332-1351 (D & L)	Pacoota Sst. (P3-120)	62	373	328/489	1607	261	N/A	½"	Stabilised Q=1.26mmcfgd

SUMMARY:

West Mereenie 15 is a development well located on the crest of the Mereenie Anticline. The nearest offset wells are West Mereenie 6, 1.86km to the northeast and West Mereenie 5, 2.0km to the southeast. The well design and location was optimised for gas deliverability and to mature reserves in the Stairway Sandstone. The current phase of drilling, West Mereenie 14 and 15, is the first drilling in the crestal area of the Mereenie Field since East Mereenie 1 in 1964.

Gas development drilling, of which West Mereenie 15 was the final well in the current drilling phase, was required to increase gas deliverability and mature gas reserves to satisfy Northern Territory gas contracts and also provide reserves for spot sales. This function is currently being fulfilled from solution gas not re-injected during oil production from flank wells at East Mereenie. This programme will reduce the rate at which the reservoir pressure in the oil zones depletes, hence extending the economic life of the current oil production wells while still maximising gas sales opportunities as they arise.

The well was drilled with air/foam from surface to 1414m RT where a NaCl Polymer, mud system was built and circulated to the wellbore. Further air drilling was considered environmentally unsound as the lower portion of the drilled section penetrated the gas-oil contact for the Mereenie Field and there was concern contamination of the surface lease area may occur if the well produced oil in substantial volumes. Drilling with mud continued to 1446m (Lgr) when wireline logs were run. The wireline logging programme included a formation pressure survey utilising the MDT tool. One of the objectives of this survey was to record the current reservoir pressure of the Pacoota Sandstone (P3-120) reservoir horizon. Unfortunately this was not achieved with the MDT tool and an inflate straddle DST was run to obtain this data.

All formations were intersected between 16m to 22m high to prognosis and was the result of predictions based on poor well control in the crestal area of the field.

Gas was encountered while drilling the Upper Stairway Sandstone at 830m and was flow tested at 4.5MMCFD. Studies are currently underway to quantify the additional reserves proven in the Stairway Sandstone. Preliminary indications suggest the contribution to additional sales gas is expected to be substantial. A significant increase in gas flow rate was noted during the drilling of the Pacoota Sandstone P1-280 reservoir unit and flow testing indicated a stabilised rate of 15.2MMCFD. This reservoir unit currently supplies 35% of the sales gas for the Northern Territory market and at West Mereenie 15 was one of the primary development targets. Further incremental gas flows were evident from the Pacoota Sandstone P3-120 reservoir unit. Flow Test No.6 at 1335m flowed gas at the rate of 18.0MMCFD. This unit was also a primary development target at West Mereenie 15.

At total depth a suite of wireline logs were run. Anomalous resistivity data was noted on the PEX run. The tool problem was found during acquisition of the MDT data and a second run with the HALS-GR was recorded. This data was merged with the remaining good data from the PEX run to compile the standard log presentations. The development objectives were met at West Mereenie 15 with substantial additional reserves having been delineated from in excess of 70m of net pay. Accordingly 7" production casing was run and cemented. The well has been suspended for later completion as Stairway Sandstone and Pacoota Sandstone gas producer.

AUTHOR: M.G. Lawrence

DATE: July 1999

WELL HISTORY

1. GENERAL DATA

Well Name:	West Mereenie 15	
Well Classification:	Gas Development/Appraisal	
Participation Factor:	Santos Group	65%
	Magellan Petroleum NT Pty Ltd	20%
	United Oil & Gas Co NT Pty Ltd	15%
Block:	Mereenie	
License:	PL4	
Operator:	Santos Ltd	
Surveyed Location: (ANS)	Latitude: 23° 57' 36.3" South Longitude: 131° 26' 31.7" East	
Surveyed Elevation: (AHD)	Ground Level: 763.54m Rotary Table: 769.34m	
Seismic Location:	12.5m west of SP490, Line M87-09	
Seismic Survey:	Mixed vintages	
Total Depth	Driller: 1445.0m Logger (Extrapolated): 1446.0m	
Status:	Cased and suspended for future completion as a Stairway Sandstone and Pacoota Sandstone P1, P3 and P4 gas producer.	

2. DRILLING DATA

Date Drilling Commenced:	13:30 Hours, 9th June 1999
Date Drilling Completed:	17:00 Hours, 21st June 1999
Date Rig Released:	24:00 Hours, 27th June 1999
Contractor:	MJV Rig manned under contract by OD&E Ltd
Rig:	No.1
Rig Specifications:	Refer to Appendix VII

3. DRILLING SUMMARY

(a) **Drilling Summary** (All Depths Driller's RT)

A 12 ¼" pilot hole was drilled to 33.72m prior to the hole being opened to 17 ¾". A 16" conductor was then run to bottom and cemented in place.

West Mereenie 15 was spudded at 13:30 hrs on 9th June 1999. A 13 9/16" hole was drilled with air and a hammer drilling assembly to 319m where the hammer spotted firing. The hammer drilled 285m at an average ROP of 21,9m/hr and was pulled 75% worn, in gage with broken inserts. A new 13 9/16" hammer bit was subsequently run in the hole on a t180 hammer but was pulled due to the inability to rotate the bit on bottom. A re-run 13 ½" ATJ55 insert bit was then run and the hole was air/foam drilled to a section total depth of 532m. The ATJ55 drilled 213m at an average rate of penetration of 12.2 m/hr and was graded 3-3-WT-G-E-I-NO-TD

The rotating head was layed down and 10 ¾" 40.5lb/ft K55 STC casing was run and cemented at 527.23m with 350 sacks of class 'G' cement with 1% calcium chloride. A 100 sack top up job was also performed. After waiting on cement for 5 hours the braden head was installed and the BOP's nippled up and pressure tested. A 9 7/8" re-run bit was run in the hole and the shoetrack was drilled out along with 1m of new formation. A Formation Integrity Test was run to 16.4ppg equivalent without leak off.

A 9 ½" Drillquip hammer bit was run in the hole on a T80 hammer and air/mist drilling commenced. The 9 ½" hammer bit drilled 306m at an average rate of penetration of 34m/hr and was pulled 85% worn and approximately ½" under gauge. An 8 ½" Reed HP64DKP was then run in the hole on a slick assembly and drilling continued with flow tests and surveys to 1153m where the bit was pulled (by stripping through the rotating head) prior to drilling the P1-280 sand. The HP64DKP drilled 315m at an average rate of penetration of 11.9m/hr and was graded 2-3-WT-A-E-I-NO-FM. An 8 ½" Hughes EP4623 (IADC 627) was run in the hole on a slick assembly and mist drilling continued with flow tests and surveys to 1338m where erratic torque and a pressure increase was observed. A flow test was conducted at 1220m which measured approximately 15.2MMCFGD. The well was killed prior to pulling out of the hole. The EP6423 drilled 185m with an average rate of penetration of 6.3m/hr and was graded 8-8-LT-A-F-36-PB-PR. A new F5OD was run in the hole, reaming 38m to bottom, and the well was unloaded. A flow test was run recording approximately 15.4MMCFGD. Drilling then continued to 1414m where the well was killed prior to drilling the gas-oil contact. A flow test was conducted at 1355m measuring approximately 18MMCFGD. The F5OD drilled 76m at an average rate of penetration of 3.4m/hr and was graded 6-4-FC-A-E-I-NO-HR. A new F5OD was then run in the hole on a packed assembly and drilling continued with mud to total depth at 1445m. The F5OD drilled 31m at an average rate of penetration of 2m/hr and was graded 3-3-CT-A-E-I-NO-TD.

Four logging runs were then conducted, including a re-run of the PEX due to a tool failure. A wiper trip was made prior to running in the hole with DST tools. A DST was then conducted over the interval 1332-1351m. A wiper trip was then made prior to running the production casing. The 7" 23/26lb/ft K55 BTC casing including an external casing packer and stage cementing tool was run to 1441m and cemented back to surface with 783 sacks of class 'G' cement.

The rig was released at 24:00 hrs 27 June 1999, cased and suspended as a future gas producer.

TABLE 1: CASING, HOLE AND CEMENT DETAILS

BIT SIZE	DEPTH	CSG SIZE	CSG DEPTH	JNTS	CSG TYPE	CEMENT
13 ½"	532m	10 ¾"	527.23m	45	40.5#/Ft K55 STC	350 sx Class 'G', 100sx Class 'G' top up
8 ½"	1445m	7"	1441m	90 26	26#/Ft K55 LTC 23#/Ft K55 LTC	Stage 1: 508 sx Class 'G', 0.4% HALAD413, 0.4% GASSTOP, 0.1%HR5 Stage 2: 275sx Class 'G' 2.3% Bentonite

TABLE 2: SUMMARY OF MUD SYSTEMS

MUD TYPE	INTERVAL
Air/Mist/Foam	Surface – 1414m
NaCl/Polymer	1414m - 1445m

(b) Lost Time

Specific lost time details for West Mereenie 15 are available from Santos Drilling (Brisbane). West Mereenie 15 was drilled in 19 days, 4 days quicker than predicted.

(c) Water Supply

Make up water was trucked from the Mereenie Production Facilities, 15km to the east of the well.

(d) Mudlogging Services

Mudlogging services were provided by Colin Higgins & Associates. Samples were collected, washed and described at 10m intervals from surface to 841m and at 3m intervals from 841m to total depth. Due to poor sample returns while drilling with air, cuttings over the intervals 967 to 1219m, 1291 to 1321m and 1354 to 1390m are either unavailable or poorly represented. All samples were checked for oil shows using an ultraviolet fluoroscope. Gas levels and compositions were monitored from surface to TD using a Hot Wire total gas detector and FID gas chromatograph respectively. Other parameters monitored included rate of penetration, mud pit levels and pump strokes. There were no instrument failures noted while drilling West Mereenie 15. All mudlogging equipment functioned within acceptable limits throughout drilling operations.

(e) Testing

There was one drillstem test conducted at West Mereenie 15. The interval 1332m to 1351m was straddle tested after wireline log acquisition utilising inflatable packers. This test resulted in a stabilised gas flow to surface measured at 1.26 MMCFD through a ½" choke. Details are included as Appendix IV. In addition 7 open hole flow tests were run as summarised in the table below and in Appendix IV.

TABLE 3: SUMMARY OF FLOW TEST OPERATIONS

NO.	INTERVAL (m)	FORMATION	FLOW (mins)	MAX SURF PRESS (psig)	TC	REMARKS
FT1	830-839	Upper Stairway Sst	35	330	3/4"	Stabilised Q=4.5mmcfgd No build up required.
FT2	830-1028	L-U Stairway Sst	40	155	1"	Stabilised Q=3.3mmcfgd No build up required.
FT3	830-1055	Stairway Sst	40	170	1"	Stabilised Q=3.6mmcfgd No build up required.
FT4	830-1220	Pacoota Sst. (P1-280)	40	718	1"	Stabilised Q=15.2mmcfgd No build up required.
FT5	830-1338	Pacoota Sst (P3-120)	35	311	1½	Stabilised Q=15.4mmcfgd No build up required.
FT6	830-1355	Pacoota Sst (P3-150)	30	364	1½	Stabilised Q=18.0mmcfgd No build up required.
FT7	830-1390	Pacoota Sst (P3-190)	25	351	1½	Stabilised Q=17.4mmcfgd No build up required.

These flow tests were run in an attempt to identify zones of additional incremental gas flow and or assess the impact of well kill operations.

(f) Coring

No full hole cores were cut at West Mereenie 15.

(g) Electric Logging

One suite of electric logs were run as detailed below. Quantitative analysis of these logs have been conducted in house and the results of porosity and water saturation calculations are presented in Appendix II and summarised on Enclosure III. Wellsite processing of the FMI data was limited to dip/direction computations and LQC requirements. Full analysis of the computed borehole images are currently underway and have not been included in this review. It is expected that this data will provide useful information with respect to characterising the reserves potential of the Stairway Sandstone in the crestal area of the Mereenie Field.

TABLE 4: SUMMARY OF ELECTRIC LOGGING OPERATIONS

LOG	SUITE/RUN	INTERVAL	BHT/TIME
PEX			54°C/8.0 hrs
SP	1/1	1431.2-530.5	
HALS	1/1		
HLLS-HLLD		1443.7-530.5	
HRMS	1/1		
RHOZ-MCFL		1440.6-751.0	
HCAL		1440.6-751.0	
HGNS	1/1		
GR		1438.5-61.5	
TNPH		1441.1-751.0	
FMS-DSI	1/2		57°C/16.75 hrs
FMS		1445.5-754.0	
DSI		1445.5-742.5	
MDT-GR	1/3		60^0C / 24.5 hrs. 5 Dual Packer, 1 successful, 10 Single Probe, 3 dry 4 tight, 3 good.
HALS-GR	1/4		Re-run and merged with
HLLS-HLLD		1443.7-530.5	Run 1 after HALS failure.
GR		Depth control	only

(h) Geothermal Gradient

An extrapolated bottom hole temperature of 60.0°C was recorded from the total depth logging run temperature data. A geothermal gradient of 2.7°C/100m was calculated from this data. A surface temperature of 21°C was assumed. This data is presented in Appendix III.

(i) Hole Deviation

Deviation data for West Mereenie 15 was acquired using a Totco single shot survey tool. Deviation results are summarised in Appendix VI (c) and annotated on the composite and mud logs.

(j) Velocity Survey

No velocity survey was conducted at West Mereenie 15.

(k) Completion Summary

West Mereenie 15 was cased and suspended as a Middle Ordovician Stairway Sandstone and Early Ordovician Pacoota Sandstone gas well. Production casing consisting of 90 joints of 26#/ft predominantly K55 and 26 joints of 23#/ft K55 7" casing was run to a depth of 1441.0m and cemented. Full details of the completion of West Mereenie 15 are provided in Appendix VI.

GEOLOGY

1. PRE-DRILLING SUMMARY (After Well Proposal)

West Mereenie 15 is a crestal gas development/appraisal well located on the axis of the Mereenie Anticline, 1.86km southwest of West Mereenie 6 and 2km northwest of West Mereenie 5. The well was designed and located for optimal gas deliverability and to mature reserves in the Stairway Sandstone and Pacoota Sandstone (P1, P3 and P4 stratigraphic units). West Mereenie 15 developed approximately 12.45 BCF and 23.7 BCF of proved and probable raw gas reserves respectively. Additionally a further 12.4 BCF of possible reserves were appraised in the Stairway Sandstone. Based on the P1-280 and P3-120 primary reservoir targets the well will address risked reserves of 10.7 BCF. The risked incremental initial rate of the well is 3.8 MMCFD.

2. DRILLING RATIONALE (After Well Proposal)

The field development plan incorporates a series of crestal wells for the purposes of deliverability and reserve maturation. In this regard the location and objectives of the West Mereenie 15 well are entirely consistent with the development strategy for the field. Gas development is required to increase Mereenie gas deliverability to service gas contracts and spot sales. There is an urgent need to substitute gas production from the Pacoota Sandstone P-3 oil zones to dedicated gas reservoirs (those with uneconomic oil rims) thus reducing further P3 Unit pressure decline. Year end 1997 net gas production, after re-injection, from the P3 Unit was 45 BCF. This has resulted in a pressure depletion in the reservoir (as low as 800psi in some areas) to the point where drilling for primary oil recovery is no longer economic. Only 4 of the 57 wells drilled on the field are accessing gas cap gas.

The location of West Mereenie 15 was considered to be low risk to achieve the aim of enhancing gas deliverability. An open hole test of the P1-280 reservoir at West Mereenie 1 flowed 10.1 MMCFD, most of which is interpreted to be from the P1-280 reservoir. Flow rates in excess of 10 MMCFD have been recorded from other wells eg West Mereenie 2, with an initial reservoir pressure of 1800psi. However current reservoir pressure is of the order of 1300 psi to 1500 psi due primarily to production at East Mereenie 1 and West Mereenie 1. Despite this, the P1-280 flowed gas at rates of approximately 10 MMCFD at West Mereenie 15.

Good quality reservoir has been intersected in the Pacoota Sandstone P3-120 reservoir. This reservoir is the most significant oil producing zone in the field. The gas cap in this part of the field will be blown down within the next decade to supply gas for market. In the short term this zone will provide back-up and security for gas deliverability.

The Stairway Sandstone flowed gas at the rate of 0.35 MMCFD from two zones at Mereenie 1 and 0.44 MMCFD at West Mereenie 1. This formation provides the largest possible gas reserves for the field. Significant deliverability issues for this unit have been recognised and the presence and intensity of natural fractures in the Stairway Sandstone may play a pivotal role in the optimisation of gas deliverability from this unit.

Objectives of the Well

The Stairway Sandstone and Pacoota Sandstone represented the target formations for the West Mereenie 15 well. The Pacoota Sandstone has been informally subdivided in four stratigraphic units using mainly gamma ray response. Individual reservoir units have been named according to their stratigraphic position below the top of each subunit.

The Pacoota Sandstone P1 and P3 units represented the primary target for this development well with production for the Northern Territory gas markets established predominantly from the P1-280 and P1-80 reservoir units. The Pacoota Sandstone P3-120 and P3-190 reservoir units were also primary targets. These units are currently on production primarily for oil in flank wells on the Mereenie Field. At West Mereenie 15 these reservoir units, located in the field gas cap, will provide access to sales gas within the next decade.

Substantial Proved, Probable and Possible gas reserves have been established in the Stairway Sandstone at Mereenie. This resource has been left undeveloped to date due to the historic focus on the more highly productive reservoirs at deeper structural levels across the field. The Stairway Sandstone has informally been subdivided into upper middle and lower units. The lower unit has been further subdivided into LS2 and LS1. It is the LS1 that accounts for the majority of the gas flows from the Stairway Sandstone. The formation is generally tight on the northern flank of the structure with only minor gas flares noted whilst drilling with air. Crestal, southern flank and eastern nose wells frequently flow gas at rates varying from 0.2 to 1.2 MMCFD with East Mereenie 8 flowing 7.9 MMCFD in open hole test. Gas flows of 0.35 and 0.3 MMCFD were recorded from the Upper Stairway and lower Stairway respectively at Mereenie 1 and 0.44 MMCFD from the Upper Stairway at West Mereenie 1. West Mereenie 15 was designed to gather data on the fracture density present in the Stairway Sandstone which is expected to play a key role in the productivity of the formation and hence the evaluation of the economic worth of the undeveloped Stairway Sandstone gas resource.

The Pacoota Sandstone P4 reservoir at the West Mereenie 15 location represented a lower priority reservoir target. This stratigraphic unit has been completed within the oil leg of the Field in flank wells in recent years. Post frac production results have generally been poor due to the poor reservoir quality. At West Mereenie 15 potential gas pay was expected to be intersected in the upper P4 with the well providing valuable information on the fracture density across the crest of the Mereenie Field in this reservoir unit.

3. RESULTS OF DRILLING

(a) Stratigraphy

The stratigraphic sequence penetrated at West Mereenie 15 is summarised in the table below and discussed briefly following the table. Lithological descriptions of the cuttings samples collected at West Mereenie 15 are included as Appendix 1 (a). For specific details of each stratigraphic unit penetrated reference should be made to the numerous published reports and articles widely available.

TABLE 5: COMPARISON OF ACTUAL AND PREDICTED STRATIGRAPHY

AGE	FORMATION OR ZONE	ACTUAL DEPTH	SUBSEA DEPTH	DIFF HI/LO	ACTUAL THICK
Late Silurian - Mid Devonian	Mereenie Sandstone	Surf	+763.5	-	350.8
Late Ordovician	Carmichael Sandstone	356.6	+412.7	9.9 H	87.6
Middle - Late Ordovician	Stokes Formation (Upper)	444.2	+325.1	17.3 H	258.3
Middle Ordovician	Stokes Formation (Lower)	702.5	+66.8	19.0 H	82.0
Middle Ordovician	Stairway Sandstone (Upper)	784.5	15.2	17.0 H	57.5
Middle Ordovician	Stairway Sandstone (Middle)	842.0	72.7	20.5 H	113.0
Middle Ordovician	Stairway Sandstone (Lower 2)	955.0	185.7	21.5 H	60.4
Middle Ordovician	Stairway Sandstone (Lower 1)	1015.4	246.1	21.7 H	33.0
Early Ordovician	Horn Valley Siltstone	1048.4	279.1	21.0 H	84.1
Early Ordovician	Pacoota Sandstone (P1)	1132.5	363.2	18.9 H	17.9
Early Ordovician	Pacoota Sandstone (P1-60)	1150.4	381.1	N/P	7.3
Early Ordovician	Pacoota Sandstone (P1-80)	1157.7	388.4	19.4 H	3.1
Early Ordovician	Pacoota Sandstone (P1-110)	1160.8	391.5	N/P	14.2
Early Ordovician	Pacoota Sandstone (P1-120)	1175.0	405.7	N/P	11.5
Early Ordovician	Pacoota Sandstone (P1-200)	1186.5	417.2	N/P	6.8
Early Ordovician	Pacoota Sandstone (P1-210)	1193.3	424.0	N/P	7.1
Early Ordovician	Pacoota Sandstone (P1-240)	1200.4	431.1	N/P	13.9
Early Ordovician	Pacoota Sandstone (P1-280)	1214.3	445.0	19.0 H	6.2
Early Ordovician	Pacoota Sandstone (P1-310)	1220.5	451.2	N/P	12.5
Early Ordovician	Pacoota Sandstone (P1-350)	1233.0	463.7	N/P	5.2
Early Ordovician	Pacoota Sandstone (P2)	1238.2	468.9	19.1 H	67.0
Early Ordovician	Pacoota Sandstone (P3-10)	1305.2	535.9	18.1 H	18.1
Early Ordovician	Pacoota Sandstone (P3-70/90)	1323.3	554.0	N/P	13.7
Early Ordovician	Pacoota Sandstone (P3-120)	1337.0	567.7	16.3 H	14.3
Early Ordovician	Pacoota Sandstone (P3-150)	1351.3	582.0	N/P	4.7
Early Ordovician	Pacoota Sandstone (P3-190)	1356.0	586.7	23.8 H	29.8
L Cambrian - E Ordovician	Pacoota Sandstone (P4)	1385.8	616.5	19.5 H	60.2+
	Total Depth	1446.0	676.7	-	-

Drilling was terminated after penetrating 60.2m of the Late Cambrian to Early Ordovician Pacoota Sandstone P4 unit. As indicated in the above table all formation tops were penetrated within 24m of the predicted subsea depths. The difference is generally between 15m and 20m and is due to poor near surface seismic velocity control in the crestal area of the Mereenie Field.

The PACOOTA SANDSTONE P4 (Late Cambrian to Early Ordovician) consists of predominantly clear but also translucent medium grained sub rounded quartzose sandstone with quartz overgrowths, rare lithic inclusions, and siliceous cement. Porosity is described as poor to fair. A widespread sheet flood depositional environment is interpreted for this stratigraphic unit.

The PACOOTA SANDSTONE P3 (Early Ordovician) unit is thought to have initially been deposited in a bed load fluvial depositional environment that passed into deposition in a shoreface environment as relative sea level rose. The lower part of the P3 unit, the P3-120 and below, is representative of a the bed load fluvial deposition and consists of sandstone, very fine to medium grained, sub rounded, moderately well sorted, quartzose, with common iron staining, abundant quartz overgrowths and occasional lithic grains. Siliceous cement is common and porosity is described as poor.

The upper P3, a shoreface sandstone is predominantly very fine to fine grained, sub angular to sub rounded, well sorted with occasional lithic grains and quartz overgrowths. Siliceous cement is common and visual porosity is poor.

The PACOOTA SANDSTONE P2 (Early Ordovician) is represented by a sequence of interbedded sandstones and siltstones deposited in a nearshore/shoreface environment. The sandstone is predominantly clear but also translucent, very fine to medium grained, predominantly fine grained, sub angular to sub rounded, quartzose with occasional lithic inclusions. Quartz overgrowths and siliceous cement are common, porosity is generally poor to fair. The siltstones and medium grey, argillaceous micromicaceous with rare ?bryzoan fossil fragments. The siltstones are indurated and hard.

The PACOOTA SANDSTONE P1 (Early Ordovician) is lithologically similar to the P2 and is represented by interbedded sandstones and siltstones. The sandstone is white to light grey, very fine to fine grained, sub angular, moderately well sorted, quartzose, with common lithics, pyritic with rare dolomitic cement and common siliceous cement and poor porosity. The siltstone is light to medium grey, argillaceous, ?dolomitic, with rare lithic inclusions and occasional disseminated pyrite.

The HORN VALLEY SILTSTONE (Early Ordovician) overlies the Pacoota Sandstone and is interpreted to have been deposited in a euxinic environment. The formation consists of dark grey pyritic siltstone. The Horn Valley siltstone is thought to be the source rock for the Mereenie Field hydrocarbons.

Overlying the Horn Valley Siltstone at West Mereenie 15 is the STAIRWAY SANDSTONE (Middle Ordovician), a sequence of interbedded sandstones and siltstones interpreted to have been laid down in an intertidal depositional environment. The siltstones are medium grey to medium grey brown, arenaceous but grading to argillaceous in parts, lithic with rare glauconitic inclusions. The sandstones are clear to predominantly white, very fine to fine grained, generally sub rounded, well sorted, quartzose with abundant siliceous cement and poor to very poor porosity.

Shallow marine depositional conditions predominated during deposition of the STOKES FORMATION (Mid to Late Ordovician) which overlies the Stairway Sandstone. The Stokes Formation consists of siltstone with interbeds of sandstone. The siltstone is brick red brown to brown, greenish grey to grey and also brownish grey. The lithology is generally argillaceous, with recrystalised silica forming a very hard, brittle indurated rock. The sandstone is white to light grey, very fine to fine grained, grading to arenaceous siltstone in parts, sub rounded well sorted, quartzose with abundant siliceous cement and poor porosity.

The CARMICHAEL SANDSTONE (Late Ordovician) overlies the Stokes Formation and was deposited in estuarine conditions. The formation is represented by a sequence of sandstones with thin interbeds of siltstone. The sandstones are clear to translucent, medium grained with common iron staining. They are quartzose with abundant siliceous cement and poor porosity. The siltstone interbeds are described as red brown to medium brown in colour, argillaceous, with occasional lithic and feldspathic inclusions.

The MEREENIE SANDSTONE (Late Silurian to Mid Devonian) outcrops at the West Mereenie 15 location and overlies the Carmichael Sandstone. Deposition initially commenced under shallow marine conditions but as the relative sea level dropped, aeolian conditions predominated. The sandstone is described as clear, translucent, medium grained, sub rounded to rounded, quartzose with abundant quartz overgrowths and silica cement.

(b) Geophysical Prognosis (Reproduced from the well proposal)

The surface location for West Mereenie 15 is approximately 12.5m west of shotpoint 490 on seismic line M87-09. Seismic interpretation and mapping undertaken in 1994 indicated the structural dip at the well location was negligible. No adjustment to the vertical trajectory was required to intersect the reservoir targets as planned from this location.

(c) Hydrocarbon Summary

Ditch gas was monitored and recorded in gas units (U) using a Hotwire Total Gas Detector. The Total Gas Detector was calibrated such that 200 ppm (parts per million) of methane gas in air gave a chart deflection of one unit. The ditch gas was also monitored for hydrocarbon gas composition using a FID (Flame Ionisation Detector) gas chromatograph. Gas composition refers to percent components of the hydrocarbon alkane series: (methane, ethane, propane and butane). Ditch cuttings were tested for hydrocarbon fluorescence using an ultraviolet fluoroscope.

Surface to the Upper Stairway Sandstone

No gas or fluorescence was recorded during the drilling of the section from surface to the Upper Stairway Sandstone. This is consistent with the offset wells adjacent to West Mereenie 15. As the basal reservoir of the Upper Stairway Sandstone was penetrated by the drill bit at 830m, a continuous gas flare was noted at the blooie line. The Total Gas Detector indicated 300 units measured through the gas sample lines. The composition of this gas was noted as 53% C1, 21% C2, 17% C3, and 9% C4. A flow test conducted 8m into this reservoir section at 838m resulted in a measured flow rate of 4.5 MMCFD.

Middle Stairway Sandstone to the base of the Lower Stairway (2)

This flow rate as well as total measured gas and composition continued as the well was drilled through the Middle Stairway Sandstone to and including the base of the Lower Stairway (2).

Base of the Lower Stairway (2) to the base of the Horn Valley Siltstone

Drilling with air continued with the measured gas flow of 3.3 MMCFD (Flow Test 2) through the top of the Lower Stairway (1) stratigraphic unit to and including the Horn Valley Siltstone. Flow Test 3 was conducted 7m in to the Horn Valley Siltstone and confirmed a flow of 3.6 MMCFD indicating an incremental flow from the Lower Stairway (1) 0.3 MMCFD. Total gas through this interval was measured as 200 to 400 units 66% C1, 21% C2, 8% C3, and 5% C4.

Pacoota Sandstone P1

The Pacoota Sandstone P1 was drilled with air with a continuous gas flare at the blooie line. From approximately 1210m a significant increase in gas flow from the blooie line was noted and drilling continued to the interpreted base of the P1-280 reservoir unit. Flow test 4 was run and a stabilised flow rate of 15.2 MMCFD was recorded. Coincident with the observed increased flow rate, total gas measured through the sample lines increased to 700 to 800 units, 53% C1, 22% C2, 16% C3, 9% C4.

Pacoota Sandstone P2

The P2, essentially non reservoir section was drilled with air and was accompanied by the continuous gas flare from the Blooie line

Pacoota Sandstone P3

The upper part of the P3 was drilled with air with no apparent increase in flow rate at the blooie line. Drilling continued with air to the P3-120 was penetrated and Flow Test 5 was run resulting in a stabilised rate of 15.4 MMCFD, suggesting this reservoir interval contributed an incremental 0.2 MMCFD to the flow. However it must be remembered that the P3-120 is pressure depleted due to oil production from flank wells at Mereenie and the results of Flow Test 5 should be interpreted with caution. Minor 10% patchy, dull to dim, yellow green fluorescence with a very slow streaming cut was described over the interval 1338m to 1351m, equivalent to the P2 to P3-150 reservoir interval. These shows are consistent with the oil flows from down dip flank wells. After drilling continued with air through to the base of the P3-190 reservoir unit, Flow Test 6 was run resulting in a stabilised flow rate of 18.0 MMCFD suggesting an incremental 2.6 MMCFD from the P3-150 and P3-190 reservoir units. Total gas measured from the sample lines increased to approximately 1000 units as the P3-150 unit was drilled. The gas composition was similar to previous determinations. A flow test was conducted at the base of the P3 unit and resulted in a stabilised flow rate of 17.4 MMCFD

Pacoota Sandstone P4

The P4 unit was also drilled with air to just above the gas oil contact at 1414m. The gas flare at the blooie line together with sample gas levels and composition were similar to those recorded while drilling the base of the P3 unit. Flow Test 8 was run at 1414m with no incremental increase in gas flow relative to the P3 unit. However cuttings samples indicated the section to be well cemented with the inferred permeability lower than the P3. This most likely accounts for the lack of measurable increases in flow rate through this section given the wireline log interpreted pay over this interval. The well was killed with mud and the remainder of the P4 was drilled with mud to a well total depth of 1445m. Fluorescence over the interval 1420m to 1445m described as 20% patchy dull to dim yellow green fluorescence with a slow streaming cut and thin ring residue is indicative of drilling the upper part of the oil column at the crest of the Mereenie structure. The P4 oil leg is not interpreted to be economically producible at West Mereenie 15.

4. SUMMARY

West Mereenie 15 is a development well located on the crest of the Mereenie Anticline. The nearest offset wells are West Mereenie 6, 1.86km to the northeast and West Mereenie 5, 2.0km to the southeast The well design and location was optimised for gas deliverability and to mature reserves in the Stairway Sandstone. The current phase of drilling, West Mereenie 14 and 15, is the first drilling in the crestal area of the Mereenie since East Mereenie 1 in 1964.

Gas development drilling, of which West Mereenie 15 was the final well in the current drilling phase, was required to increase gas deliverability and mature gas reserves to satisfy Northern Territory gas contracts and also provide reserves for spot sales. This function is currently being fulfilled from solution gas not re-injected during oil production from flank wells at East Mereenie. This programme will reduce the rate at which the reservoir pressure in the oil zones depletes, hence extending the economic life of the current oil production wells while still maximising gas sales opportunities as they arise.

The well was drilled with air/foam from surface to 1414m RT where a NaCl Polymer, mud system was built and circulated to the wellbore. Further air drilling was considered environmentally unsound as the lower portion of the drilled section penetrated the gas-oil contact for the Mereenie Field and there was concern contamination of the surface lease area may occur if the well produced oil in substantial volumes. Drilling with mud continued to 1446m (Lgr) when wireline logs were run. The wireline logging programme included a formation pressure survey utilising the MDT tool. One of the objectives of this survey was to record the current reservoir pressure of the Pacoota Sandstone (P3-120) reservoir horizon. Unfortunately this was not achieved with the MDT tool and an inflate straddle DST was run to obtain this data.

All formations were intersected between 16m to 22m high to prognosis and was the result of predictions based on poor well control in the crestal area of the field.

Gas was encountered while drilling the Upper Stairway Sandstone at 830m and was flow tested at 4.5MMCFD. Studies are currently underway to quantify the additional reserves proven in the Stairway Sandstone. Preliminary indications suggest the contribution to additional sales gas is expected to be substantial. A significant increase in gas flow rate was noted during the drilling of the Pacoota Sandstone P1-280 reservoir unit and flow testing indicated a stabilised rate of 15.2MMCFD. This reservoir unit currently supplies 35% of the sales gas for the Northern Territory market and at West Mereenie 15 was one of the primary development targets. Further incremental gas flows were evident from the Pacoota Sandstone P3-120 reservoir unit. Flow Test No.6 at 1335m flowed gas at the rate of 18.0MMCFD. This unit was also a primary development target at West Mereenie 15.

At total depth a suite of wireline logs were run. Anomalous resistivity data was noted on the PEX run. The tool problem was found during acquisition of the MDT data and a second run with the HALS-GR was recorded. This data was merged with the remaining good data from the PEX run to compile the standard log presentations. The development objectives were met at West Mereenie 15 with substantial additional reserves having been delineated from in excess of 70m of net pay. Accordingly 7" production casing was run and cemented. The well has been suspended for later completion as Stairway Sandstone and Pacoota Sandstone gas producer.

5. REFERENCES

Moonie Oil Pty Ltd, March 1999	West Mereenie 15 Well Proposal. Santos Ltd (Unpublished Report).
Lawrence, M.G., 1999	West Mereenie 15 Raw Data Report. Santos Ltd (Unpublished Report).