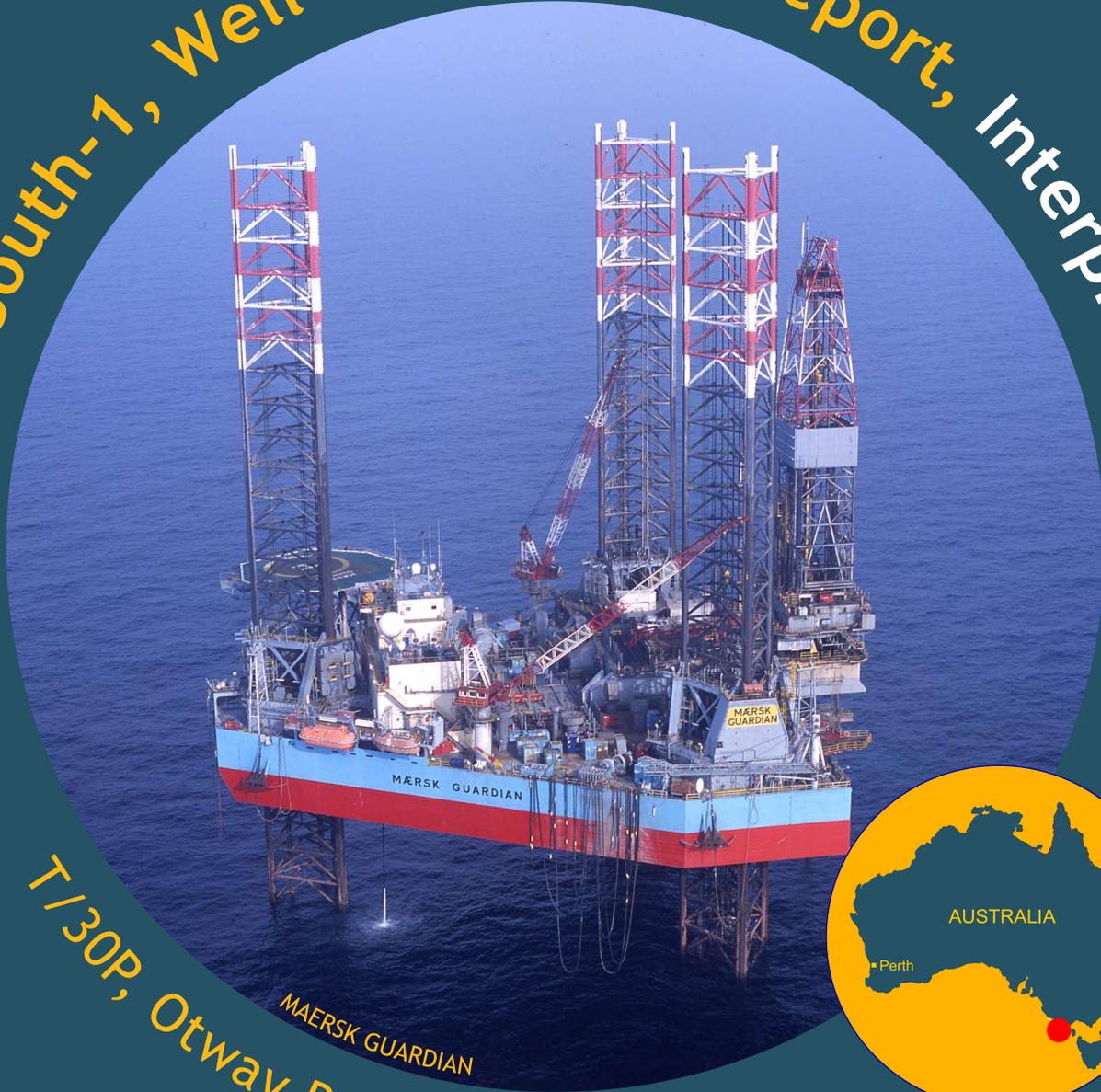




Thylacine South-1, Well Completion Report, Interpretive Data



T/30P, Otway Basin, June 2007



WELL COMPLETION REPORT

Thylacine South-1

Interpretive Data

(T/30P, Otway Basin)



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Thylacine South-1 Well Completion Report (Interpretive)



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Table 1

WELL INDEX SHEET

WELL:	THYLACINE SOUTH -1	WD:	99.3 m (LAT)	<i>Rig on Contract:</i>	17 March 2006	LAT:	039° 14' 14.56" S	
PERMIT:	T/L2 & T/30P	RT:	50.5 m	<i>Date on Location:</i>	17 March 2006	LONG:	142° 54' 07.58" E	
BASIN:	OTWAY	TD:	3250.2 mMDRT	<i>Spud Date:</i>	17 March 2006		GDA 94	
OPERATOR:	WOODSIDE	<i>Well Status:</i>	P & S, gas discovery	<i>Date at TD:</i>	5 April 2006	<i>Easting:</i>	664 161.0 m	
RIG:	MAERSK GUARDIAN	<i>Rig Released:</i>		12 April 2006		<i>Northing:</i>	5 655 156.8 m	
		<i>Seismic Ref.:</i>	Investigator 3D: Inline 781, Crossline 1209					MGA Grid Zone 54

Formation	Age	Marker	Depth		Lithology
			mRT	mtvdss	
QUATERNARY - TERTIARY					
Seabed/Port Cambell Lmst	Miocene to Recent (inf.)	WB	149.8	99.5	NB Sample collection commenced @ 638.1 mRT
TERTIARY					
Gellibrand Marl	Miocene (inf.)	TG	not picked		
Mid Miocene	Miocene (inf.)	MM	not picked		
Lower Gellibrand Marl	Oligocene to Miocene (inf.)		not picked		Calcareous claystone interbedded with argillaceous calcilitite & minor calcilitite.
Narrawatuk Marl	Late Eocene (inf.)	TO	1305.2	1123.6	Calcareous claystone interbedded with argillaceous calcilitite.
Mepunga Sandstone	Late Eocene (inf.)		1388.4	1179.9	Sandstone interbedded with minor silty claystone.
Dilwyn Sandstone	Early to Mid Eocene (inf.)		1469.2	1235.4	Sandstone interbedded with minor interbedded silty claystone.
CRETACEOUS					
Lower Massacre Formation	Maastrichtian (inf.)	K	1700.6	1394.1	Silty claystone with interbedded sandstone.
Timboon Formation	Campanian to Maas. (inf.)		1803.8	1463.5	Sandstone with interbedded silty claystone.
Skull Creek Fm	Santonian to Campanian (inf.)		1911	1700.5	Silty claystone with minor interbedded sandstone.
Belfast Fm	Santonian (inf.)	KT	2806.8	2157.2	
Unit 1 (Thylacine Mbr)	Santonian (inf.)		2806.8	2157.2	Coarsening upward cycles comprising sandstones grading to silty claystones.
Unit 2 (Thylacine Mbr)	Santonian (inf.)		2937.8	2260	Sandstone with minor interbedded silty claystone.
Unit 3	Santonian (inf.)		2987.01	2299.5	Silty claystone.
Flaxman Fm (Unit 4)	Turonian		2989.9	2301.9	Interbedded sandstones and silty claystones.
Waarre Fm (Unit 5a)	Turonian		3062	2361.4	Interbedded sandstones and silty claystones.
Total Depth			3250.2	2524.6	

HOLE SUMMARY

Size	Depth (mRT)	Casing	Shoe (mRT)	FIT	MW (sg)	Mud (sg)	Cement Plugs (mRT)
762mm	217.1	660mm	217.1		1.06	SW & Guar/Gel sweeps	604.1-840.1
584mm	638.1	244mm	633.1	2.36sg @	1.05	SW & Guar/Gel sweeps	2760.2-3000.2
216mm	3250.2			641.1 mRT	1.25	AUS CF2004SBM	3000.2-3250.2

SAMPLE RECORD

Type	No.	Interval (mRT)	Remarks
Ditch Cuttings		638.1-3250.2	5 to 20 metre intervals

MWD

Run No.	Interval (mRT)	Remarks
1	217.1-638.1	DWD
2	638.1-3250.2	DGR-EWR-P4-ALD-CTN-ACAL-BAT-PWD-DDS

WIRELINE LOGS

Suite & Run	Log	Interval (mRT)	MRT °C
1 1	MDT-GR	n/a	106
1 2	MDT-GR	3213.1-2809.2	114

MDT

Sample No.	Depth (mRT)	Interpreted Fluid
1-3	3065.2	Gas/Condensate
4-9	2816.2	Gas/Condensate

PRODUCTION TESTING

TEST	DEPTH (mRT)	RECOVERY					
		CONDENSATE (stbd)	GAS (MMscf/d)	WATER (bwpd)	CHOKE	*API	CGR (bbl/MMscf)
n/a							

1. INTRODUCTION

1.1 Overview

The Thylacine South-1 exploration well was drilled by Maersk Contractors' jackup drilling unit Maersk Guardian in Exploration Permit T/30P from the Thylacine-A platform in T/L2 (Figure 1) within the Tasmanian sector of the offshore Otway Basin, some 70km south of Port Campbell, Victoria. Thylacine South-1 was drilled to test a previously unproven gas pool in Units 1 and 2 (Thylacine Sandstone Member) in a downfaulted structural nose south of the main Thylacine horst. Secondary objectives included Unit 4 (Flaxman Fm) and Unit 5a and deeper (Upper Waarre Fm).

Thylacine South-1 was spudded on 17 March 2006 and reached the total depth of 3250.2 mRT in sandstones of Turonian age, on 5 April 2006. The well encountered gas and condensate in both primary and secondary objectives.

Thylacine South-1 was then plugged and suspended and the rig was released from contract on 12 April 2006. The drilling of Thylacine South-1 fulfilled the Year 5 work programme for T/30P.

*NB: Subsequent to the drilling Thylacine South-1, an error in the drill pipe tally was identified. The errors in the revised tally increase with depth according to the table below. Note that the main text of this report refers to the revised pipe tally. However, the data within the appendices **HAVE NOT** been adjusted to reflect the revised tally unless specified.*

Table 2: Pipe Tally Corrections

Depth Range	Correction to Apply
0m – 169.99m	No correction
170m – 868.49m	Add 0.08m
868.5m – 1274.99m	Add 0.89m
1275m – 1464.99m	Add 1.24m
1465m – 1550.99m	Add $\left[\frac{((2.57-1.24)/(1551-1465)) \times (\text{depth}-1465)}{1} + 1.24 \right]$
1551m – 1694.99m	Add 2.57m
1695m – 1889.99m	Add $\left[\frac{((5.06-2.57)/(1890-1695)) \times (\text{depth}-1695)}{1} + 2.57 \right]$
1890m – 2489.99m	Add 5.06m
2490m - TD	Add 5.19m

1.2 Exploration History

The permit was awarded on 10 July 1997 to Benaris International NV. Origin Energy Resources Ltd farmed into the Permit on 6 July 1999. Woodside farmed into Origin's interest in December 1999 (farm-in agreement executed 26 June 2000). Woodside assumed operatorship on 17 February 2002. Following an equalisation of equity with the joint venture in adjacent permit VIC/P43 and a transfer of equity between CalEnergy Gas (Australia) Ltd and Origin Energy Resources Ltd, T/30P is now held by a joint venture comprising:

Woodside Energy Ltd. (Operator)	51.55%
Origin Energy Resources Ltd	30.75%
Benaris International Pty Ltd	12.7%
CalEnergy Gas (Australia) Ltd	5%

Following the relinquishment of 50 graticular blocks at the end of the initial six-year exploration period, the remaining 52 graticular blocks of the permit, covering an area of 3206km², were renewed for a further five-year term on 11 December 2003.

2. REGIONAL GEOLOGY

The Otway Basin is one of a series of Late Jurassic to Tertiary basins that developed along the southern margin of Australia in response to the break-up of Eastern Gondwana (Norvick, M.S, and Smith, M.A., 2001). It is a composite basin consisting of an early, non-marine, intracratonic rift basin of Late Jurassic to Early Cretaceous age, overlain in part by a marginal marine rift basin of Late Cretaceous age, which is in turn succeeded by a fully-marine basin of Tertiary age.

The first rift event began with the Callovian (c. 159 - 165 Ma) rifting in the western Bight Basin. During the Tithonian (c. 142 - 146 Ma), rifting extended eastwards into the Otway and Gippsland Basins. In the Otway Basin rifting extended into the Barremian (c. 115 - 123 Ma) resulting in a series of half-grabens which were in-filled with Casterton Formation and Crayfish Subgroup. In the early Aptian the Otway Basin underwent a period of regional sag during which the Eumeralla Formation was deposited. This event lasted up to the end of the Albian.

The second rift event began during the Cenomanian (c. 92 - 97.5 Ma) with uplift in eastern Australia, stress reorganisation and divergence of basin development. The Otway and Great South basins formed in a transtensional regime resulting in trap generation through faulting, local inversion and wrenching. During the Santonian, oceanic spreading began in the southern Tasman Sea (c. 85 Ma). Slow extension caused thinning of the continental crust in the Bight and Otway basins and subsidence into deeper water. Ocean crust formed south of the Bight Basin in the Early Campanian (c. 83 Ma) and also started extending along the eastern Australian coast. During this time period the Thylacine and Geographe reservoir units of the Waarre, Flaxman and Belfast formations were deposited in a deltaic to marginal marine to shelfal setting in response to marine encroachment from the west as Australia and Antarctica moved apart.

The final stage of development commenced in the Eocene and was caused by an increase in spreading rate in the Southern Ocean (c. 44 Ma), final separation of Australia and Antarctica and cessation of Tasman Sea spreading. These events caused collapse of continental margins and widespread marine transgression. This created a starved margin culminating in the deposition of the carbonate-rich Nirranda and Heytesbury Groups. At the end of the Late Miocene (c. 12 Ma) the Otway Basin underwent another period of compression resulting in significant folding, uplift and erosion both onshore and offshore.

The Otway Basin chronostratigraphic scheme is presented as [Figure 2](#).

3. SEISMIC INTERPRETATION

The Thylacine field is covered by the Investigator 3D seismic survey, which was acquired by Western Geophysical in 1999/2000. The survey covers an area of 986 km². The acquisition geometry initially consisted of eight 4600 m streamers; however, the number of cables deployed was reduced to six early in the survey due to operational conditions. The CMP line shot and group intervals were 25 m and 12.5 m respectively giving nominal 92 fold data. Final processed bin sizes were 12.5 m in both in-line and cross-line direction.

Initial processing of the 3D seismic data was contracted to Veritas DGC Asia Pacific Ltd in their Singapore processing centres. Processing commenced on 1st April 2000, and was completed on 26th September 2000. The seismic data were subsequently reprocessed in-house using iterative 3D Pre-Stack Depth Migration (PSDM). The objective of the PSDM processing was to improve imaging below complex overburden and to improve the amplitude fidelity as a basis for quantitative interpretation and seismically constrained reservoir modelling. The PSDM processing was completed in May 2002.

Seismic interpretation in support of Thylacine South-1 was carried out using the PSDM time-linear data and also depth-linear versions of the full stack and far offset stack PSDM data. Depth conversion used the well-corrected PSDM velocity dataset.

The predicted vs actual stratigraphy is shown in [Table 3](#). The objectives were within acceptable error margins. A raw well log synthetic and seismic tie for Thylacine South-1 is presented as [Figure 3](#).

Table 3: Thylacine South-1 Predicted vs Actual Seismic Markers

Formation	Marker	TWT (ms)	Prognosed		Actual Depth (mtvdss)	Difference (metres)
			Depth (mss)	(Error) (metres)		
Seabed/Port Campbell Lmst	WB	-	101	(+/-1.5)	99.5	1.5 H
Top Gellibrand Marl	TG	-	357	(+/- 5)	np	
Mid Miocene	MM	-	435	(+/- 10)	np	
Near Top Oligocene	TO	-	750	(+/- 10)	np	
Top Narrawaturk Marl	TN	-	1120	(+/- 10)	1123.6	3.6 L
Top Mepunga Sandstone		-	1196	(+/- 10)	1179.9	16.1 H
Top Dilwyn Sandstone		-	1290	(+/- 15)	1235.4	54.6 H
Top Lower Massacre Fm		-	1450	(+/- 15)	1394.1	54.1 H
Top Timboon Formation		-	1562	(+/- 15)	1463.5	1.5 L
Top Skull Creek Formation		-	1618	(+/- 20)	1700.5	82.5 L
Intra Skull Creek Marker		-	1732	(+/- 20)	np	
Top Belfast Fm / Top Unit 1	KT	-	2173	(+/- 25)	2157.2	15.8 H
Top Unit 2		-	2286.1	(+/- 30)	2260	26.1 H
Top Unit 3		-	-	-	2299.5	
Top Flaxman Fm (Unit 4)		-	2323.1	(+/-40)	2301.9	21.2 H
Top Waarre Fm (Unit 5a)		-	2385.7	(+/-40)	2361.4	24.3 H
TD	TD	-	2600		2524.6	

np = not picked

The post-drill depth structure at the top of the Thylacine Sandstone Member (top reservoir and top of Unit 1) shown in [Figure 4](#) is based on the pre-drill structural interpretation and depth conversion and has been depth-shifted to tie with the actual well penetration point. The predominant structure in the Thylacine South area is a south-plunging anticline, downthrown to the south of the main Thylacine horst by a major east-west fault. The Thylacine South-1 well tested this anticline near its axis and some 60 m downdip from its crest. This anticline dips steeply to the east and is truncated to the south and southwest by a fault (maximum throw is about 60 m). The reservoir section dips westward into a small syncline before rising over another small south-plunging anticline.

The post-drill depth structure at the top of the lower hydrocarbon pool (top of the Waarre Formation and top of Unit 5) shown in [Figure 5](#) is also based on the pre-drill structural interpretation and depth conversion and has been depth-shifted to tie with the actual well penetration point. The structural form is very similar to that at top Unit 1, but with somewhat steeper dip to the east resulting from eastward thickening of the intervening section. The projection of the observed GWC at 2378mTVDSS onto the depth structure is highlighted by the red contour and illustrates the extension of the hydrocarbon pool into graticular blocks 2795 and 2796.

4. WELL STRATIGRAPHY

Figure 6 and Table 1 illustrate the stratigraphy seen in Thylacine South-1. A more detailed lithological and biostratigraphic breakdown is given on the Composite Well Log (Enclosure 1).

The following stratigraphic description is a summary of the lithologies seen in the well, based on their broad lithostratigraphic subdivisions. All depths are given with reference to the Rotary Table (mRT), which is 50.5 metres above sea level (LAT).

QUATERNARY to TERTIARY (inferred) Seabed 149.8 to 1700.6 mRT (1550.8 metres)

Undifferentiated Recent to Oligocene (inferred) 149.8 to 1305.2 mRT (1155.4 metres)

Cuttings samples were collected from 638.1 mRT. Below this depth, this interval comprised calcareous claystone interbedded with argillaceous calcilutite and minor calcilutite. The calcareous claystone was described from cuttings as olive grey to brown grey, occasionally pale brown, soft to occasionally firm and blocky, with 25 to 30% calcareous clay, traces of calcareous silt, up to 10% siliceous silt, traces of glauconite, pyrite nodules and carbonaceous debris. The argillaceous calcilutite is light olive grey to off white, soft to occasionally moderately hard, blocky, amorphous and 20 to 35% argillaceous, with traces of silt and glauconite in part, and minor broken coral fragments. The calcilutite is off white to light grey, soft to firm, blocky and 15% argillaceous, with traces of calcareous silt and coral fragments in part. The base of the sequence is represented by the TO seismic marker picked at a slight decrease in gamma ray response and an increase in resistivity and density readings.

Eocene (inferred)

Narrawaturk Marl 1305.2 to 1388.4 mRT (83.2 metres)

This formation consists of light olive grey, soft to firm, calcareous claystone interbedded with off white to pale brown, soft, argillaceous calcilutite. The claystones and calcilutites contain traces of glauconite and carbonaceous material. The base of the sequence is picked at a slight decrease in gamma ray response and an increase in resistivity and density readings.

Mepunga Sandstone 1388.4 to 1469.2 mRT (80.8 metres)

The Mepunga Sandstone comprises a sequence of translucent, fine to very coarse-grained sandstone interbedded with minor dark grey, silty claystone. The sandstones are well sorted and contain 2% quartz cement as overgrowths, traces of siderite cement, and traces of lithics as inclusions around cemented grain contacts. The claystones are soft to firm with 20% silt, and traces of lithics and micromica. The base of the formation is picked at the top of the Dilwyn Sandstone indicated by a decrease in gamma ray, resistivity and density and an increase in sonic velocity.

Dilwyn Sandstone 1469.2 to 1700.6 mRT (231.4 metres)

The Dilwyn Sandstone consists of sandstone with minor interbedded silty claystone. The sandstone was described as loose, dominantly medium to coarse-grained, moderately to well sorted, with traces of siliceous cement and glauconite in part. The silty claystone

contains 40% silt and traces of coloured lithics. The gamma ray response is fairly even. The base of the formation corresponds to the K seismic marker and is picked at an increase in gamma ray, density and sonic velocity response.

CRETACEOUS 1700.6 to 3250.2 mRT (TD) (1549.6 metres)

Maastrichtian to Santonian (inferred)

Lower Massacre Formation 1700.6 to 1803.8 mRT (103.2 metres)

This sequence of silty claystone with interbedded sandstone is interpreted as the Lower Massacre Formation. The claystones are medium to dark grey, greyish brown, greyish green in parts, soft, blocky and dispersive, with 40% silt and traces of coloured lithics. The sandstones are loose, dominantly medium-grained and well sorted, with traces of siliceous cement and glauconite in part. The base of the formation corresponds to an increase on the gamma ray, resistivity and sonic velocity logs.

Timboon Formation 1803.8 to 1911 mRT (107.2 metres)

The Timboon Formation comprises sandstone with interbedded silty claystone. The sandstone was described as translucent, pale brown, brownish orange, pale grey, minor clear in parts, loose, dominantly fine-grained, well sorted, with traces of siliceous cement and pyrite in part, and 1% pyrite cement in part. The claystone is dark grey, greyish black and brown, soft to moderately hard, with 40% silt, up to 50% pyrite, and traces of siderite and coloured lithics. The base is picked at the top of a slightly decreasing gamma ray response.

Skull Creek Formation 1911 to 2806.8 mRT (895.8 metres)

The Skull Creek Formation is composed of light grey to grey black, soft to moderately hard, silty claystone with minor interbedded clear to translucent, pale brown to orange and off-white, predominantly fine to medium-grained, poorly to well sorted sandstone. The claystones have rare to 10% calcareous clay, 20 to 35% silt, traces of very fine sand in part, up to 2% disseminated and nodular pyrite in part, and traces of glauconite, carbonaceous material, micromica and off white lithic fragments. The base of the formation is marked by a decrease in gamma ray and density and an increase in resistivity log responses.

Santonian to Turonian (inferred)

Belfast Formation 2806.8 to 2987 mRT (180.2 metres)

The Belfast Formation has been subdivided into Reservoir Units 1, 2 and 3 as described below. The Thylacine Member comprises Units 1 and 2.

Reservoir Unit 1 2806.8 to 2937.8 mRT (131 metres)

This interval is dominated by coarsening upward cycles comprising sandstones grading to silty claystones. The sandstones were described as loose, friable, dominantly fine to medium-grained, poorly to well sorted, with up to 5% siliceous cement as overgrowths, minor carbonaceous specks in part, traces of lithics and glauconite in part and good intergranular porosity. The silty claystones are firm to moderately hard, and contain 30 to 40% silt, up to 5% sand, traces of carbonaceous specks and micro-laminations and traces of off-white to pale brown lithics in part. The base of the formation is reflected by a decrease in gamma ray response and an increase in resistivity and sonic velocity.

Reservoir Unit 2 2937.8 to 2987 mRT (49.2 metres)

Unit 2 consists of fine to medium grained sandstones with minor interbeds of silty claystones. The sandstones were described as loose, friable, moderately to well sorted, with up to 5% siliceous cement as overgrowths, minor carbonaceous specks in part, traces of calcite cement, lithics and glauconite in part and good intergranular porosity. The silty claystone is generally as described above with traces of glauconite. The base of the formation corresponds to an increase on the gamma ray and sonic logs.

Reservoir Unit 3 2987 to 2989.9 mRT (2.9 metres)

Unit 3 is composed of silty claystone, which is similar to that described in the overlying unit.

Flaxman Fm (Reservoir Unit 4) 2989.9 to 3062 mRT (72.1 metres)

The Flaxman Formation consists of a sequence of interbedded sandstones and silty claystones, which are similar to those described in Unit 2. The gamma ray log is variable, reflecting the interbedded nature of the sediments. The base of the sequence corresponds to a decrease in gamma ray and resistivity readings and a decrease in density readings.

Palynological analysis ([Appendix 1](#)) within this interval had poor results; the depositional environment was determined to be marine.

Waarre Fm (Reservoir Unit 5) 3062 to 3250.2 mRT [TD] (188.2+ metres)

This unit consists of an interbedded sequence of sandstones and silty claystones. The sandstones are loose to moderately hard, predominantly coarse to very coarse then very fine to fine then fine to medium-grained with depth, poorly to well sorted, with minor to 5% siliceous cement, traces of calcite cement in part, rare carbonaceous specks and laminations in part, traces of lithics, and very poor to good intergranular porosity. The claystones contain 35 to 40% silt, up to 5% sand and carbonaceous material and laminations, and traces of disseminated pyrite.

Palynological analysis ([Appendix 1](#)) within this interval had poor results; the depositional environment was determined to be marine.

5. PROSPECT EVALUATION

Thylacine South-1 encountered two hydrocarbon pools. Hydrocarbons were recovered to surface from both pools. The upper pool is reservoired within the Thylacine Sandstone Member of the Belfast Formation (Unit 1 and Unit 2 of the informal nomenclature used to subdivide the reservoir section within the Thylacine Field). Pressure measurements indicate that this pool is an extension of the gas accumulation previously penetrated by Thylacine-1.

The Flaxman Formation section (Unit 4) contains several poorly-developed sands. Most of these are tight; pressure measurements obtained at three points within this section are consistent with presence of isolated gas-bearing sands. The relationship of these sands to the overlying gas accumulation is unclear.

A second, deeper accumulation is reservoired within the Waarre Formation, or Unit 5 of the informal Thylacine Field nomenclature. Formation pressures indicate that this column is not in communication with either the overlying Unit 1 / Unit 2 pool or the gas column encountered in Thylacine-1.

The pressure differences between the hydrocarbon pools and between aquifers in Thylacine South-1 and Thylacine-1 confirm the presence of intraformational seals within the reservoir section in the Thylacine area.

5.1 Trap

The predominant structure at the top of the Thylacine Sandstone Member (top reservoir and top of Unit 1) in the Thylacine South area is a south-plunging anticline, downthrown to the south of the main Thylacine horst by a major east-west fault. The Thylacine South-1 well tested this anticline near its axis and some 60m downdip from its crest. This anticline dips steeply to the east and is truncated to the south and southwest by a fault (maximum throw is about 60m). The reservoir section dips westward into a small syncline before rising over another small south-plunging anticline.

The structural form at the top of the lower hydrocarbon pool (top of the Waarre Formation) is very similar to that at the top of the thylacine Sandstone Member, but with somewhat steeper dip to the east resulting from eastward thickening of the intervening section.

5.2 Seal

Top and lateral seal to the Thylacine Field is provided by marine claystones of the Skull Creek Formation.

5.3 Reservoir

The reservoir section encountered in Thylacine South-1 is very similar to that encountered in Thylacine-1, drilled in May 2001.

Analysis of pressure test data from the well suggests that it penetrated two separate gas accumulations. Based on preliminary stratigraphic correlations the upper accumulation

occurs within the Thylacine Sandstone Member of the Belfast Formation (Unit 1 and Unit 2 of the informal nomenclature used to subdivide the reservoir section within the Thylacine Field).

Gas pressures measured in Unit 1 and the upper part of Unit 2 lie directly on the pressure gradient for the Thylacine field measured in Thylacine-1, suggesting that the Thylacine South-1 well encountered an extension of the existing Thylacine field. Pressure points near the base of Unit 2 may be a result of supercharging, or alternatively may represent isolated gas-bearing sands.

A second accumulation is present from 3058m MDRT (2409m TVDRT) down to an observed gas-water contact (based on MWD logs and pressure data) at 3082m MDRT (2428m TVDRT; 2378m TVD subsea). This accumulation appears to be a new hydrocarbon pool, reservoired within the Waarre Formation, or Unit 5 of the informal Thylacine Field nomenclature (based on preliminary stratigraphic correlations). Formation pressures indicate that this column is not in communication with either the overlying Unit 1 / Unit 2 pool or the gas column encountered in Thylacine-1.

The aquifer present beneath the Unit 5 (Waarre Formation) gas column in Thylacine South-1 has a different pressure gradient to the aquifer observed in section of similar age penetrated in Thylacine-1, suggesting the presence of a pressure seal separating the two aquifers.

5.4 Charge

Thylacine South-1 encountered two separate hydrocarbon pools. Gas samples were recovered to surface from each of the two gas accumulations, at depths of 2816.2m MDRT (near top of Unit 1) and 3065.2m MDRT (near top of Unit 5). The gas fraction composition from the upper sample closely resembles gas analyses from Thylacine-1 and Thylacine-2 and its CO₂ concentration is also very similar, further supporting the interpretation that Thylacine South-1 penetrated an extension of the main Thylacine accumulation.

The lower accumulation differs in composition from the upper pool and from the Thylacine Field. Notably, its CO₂ concentration is 1 mol% lower than the lowest recorded CO₂ concentration in Thylacine; its methane concentration is 3 mol% higher than the previous recorded highest; and its ethane concentration is 1.5 mol% lower than the previous lowest.

6. PETROPHYSICAL EVALUATION AND CORE ANALYSIS

6.1 Petrophysics

Petrophysical analyses were performed over the reservoir intervals encountered in the well.

The well intersected Santonian to Turonian-aged reservoir sandstones of the Thylacine Member, Flaxman and Waarre Formations with two gas columns:

- | | |
|---|---------------------|
| 1) 140.5m gross gas column | 2157.5-2298mTVDSS |
| 80.2m of net pay | net-to-gross of 57% |
| Within the hydrocarbon-bearing interval an; | |
| Average log porosity | 13.5% |
| Average water saturation | 59% |
| 2) 73.3m gross gas column | 2308.8-2382.1mTVDSS |
| 33.5m of net pay | net-to-gross of 46% |
| Within the hydrocarbon-bearing interval an; | |
| Average log porosity | 14.4% |
| Average water saturation | 51% |

The MDT pressure data indicates Free-water Levels (FWL) at 2984.6mMDRT (2298mTVDSS) within Unit 2 and at 3085.9mMDRT (2382.1mTVDSS) within Unit 5. A gas-water contact was observed within Unit 5 at 3082m MDRT (2378mTVDSS) based on MWD logs and pressure data.

The full petrophysical report is contained in [Appendix 2](#).

6.2 Coring

No coring was carried out in Thylacine South-1.

7. HYDROCARBONS

7.1 Occurrence

Chromatographic breakdown of the ditch gas, total gas and trip gas was recorded from below 638 mRT to TD and is detailed in the Thylacine South-1 Well Completion Report, Basic Data, Appendix 7, and shown on the Composite Well Log ([Enclosure 1](#)). Minor C₄ and C₅ gases were recorded throughout the Tertiary and Cretaceous sequence penetrated in the well.

No hydrocarbon fluorescence was described from cuttings samples in Thylacine South-1.

7.2 Geochemical Analysis and Maturation Studies

No geochemical analyses were performed on lithological samples from Thylacine South-1.

Mud gas isotope analyses were performed on mud gas samples and the results are presented in [Appendix 3](#).

8. FORMATION TESTING

8.1 Formation Pressure Testing

Schlumberger carried out a single run with the Modular Dynamic Tester (MDT) in Thylacine South-1. A total of 45 pressure tests were attempted from 3213.1 to 2809.2 mRT resulting in 31 valid pressures ([Appendix 4](#)). Sampling was undertaken at 2 depths, 3065.2mRT (3 450cc MRMS samples attempted, 3 recovered) and 2816.2mRT (3 450cc MRMS samples attempted, 1 recovered); refer to [Table 4](#) and [Appendix 5](#).

Table 4: Fluid Samples

Sample No.	Depth (mRT)	Interpreted Fluid
1-3	3065.2	Gas/condensate
4-6	2816.2	Gas/condensate

The MDT pressure data indicates Free-water Levels (FWL) at 2984.6mMDRT (2298mTVDSS) within Unit 2 and at 3085.9mMDRT (2382.1mTVDSS) within Unit 5. ([Appendix 2](#), [Figure 5](#)).

8.2 Production Testing

Production testing was not undertaken in Thylacine South-1.

9. CONTRIBUTIONS TO GEOLOGICAL KNOWLEDGE

The Thylacine South-1 exploration well was drilled in permit T/30P within the Otway Basin, Tasmania. The primary objective was the Thylacine Sandstone Member (Units 1 and 2) in a down-faulted structural nose south of the main Thylacine horst. Secondary objectives included Flaxman Fm (Unit 4) and Upper Waarre Fm (Unit 5a and deeper).

The well encountered the top of a gross hydrocarbon-bearing interval of 223m TVD at 2803m MDRT (2205m TVDRT) with 80.2m of net pay and a net-to-gross of 57%, based on petrophysical interpretation of MWD logs. The hydrocarbon bearing interval has an average log porosity of 13.5% and an average water saturation of 59%. The penetration point at the top of the reservoir is approximately 39m north of the southern boundary of Production Licence T/L2. The well crossed the southern boundary of graticular block 2795 into exploration permit T/30P at a depth of 2885m MDRT (2270.2m TVDRT), some 65m vertically below the top of the reservoir section. The reservoir section encountered in the well is very similar to that encountered in Thylacine-1, drilled in May 2001.

Analysis of pressure test data from the well suggests that it penetrated two separate gas accumulations. Based on preliminary stratigraphic correlations the upper accumulation occurs within the Thylacine Sandstone Member of the Belfast Formation (Unit 1 and Unit 2 of the informal nomenclature used to subdivide the reservoir section within the Thylacine Field).

Gas pressures measured in Unit 1 and the upper part of Unit 2 lie directly on the pressure gradient for the Thylacine field measured in Thylacine-1, suggesting that the Thylacine South-1 well encountered an extension of the existing Thylacine field. Pressure points near the base of Unit 2 may be a result of supercharging, or alternatively may represent isolated gas-bearing sands. A Free-water Level (FWL) was interpreted at 2984.6mMDRT (2298mTVDSS) within Unit 2.

The Flaxman Formation (Unit 4) contains several poorly-developed sands. Most of these are tight; pressure measurements obtained at three points within this section are consistent with the presence of isolated gas-bearing sands.

A second accumulation is present from 3058m MDRT (2409m TVDRT) down to an observed gas-water contact (based on MWD logs and pressure data) at 3082m MDRT (2428m TVDRT; 2378m TVD subsea) with 33.5m of net pay and a net-to-gross of 46%. The hydrocarbon-bearing interval has an average log porosity of 14.4% and an average water saturation of 51%. This accumulation appears to be a new hydrocarbon pool, reservoired within the Waarre Formation, or Unit 5 of the informal Thylacine Field nomenclature (based on preliminary stratigraphic correlations). Formation pressures indicate that this column is not in communication with either the overlying Unit 1/ Unit 2 pool or the gas column encountered in Thylacine-1. A Free-water Level (FWL) at 3085.9mMDRT (2382.1mTVDSS) within Unit 5 is indicated from pressure data.

The aquifer present beneath the Unit 5 (Waarre) gas column in Thylacine South-1 has a different pressure gradient to the aquifer observed in section of similar age penetrated in Thylacine-1, suggesting the presence of a pressure seal separating the two aquifers.

Gas samples were recovered to surface from each of the two gas accumulations in the well, at depths of 2816.2m MDRT (near top of Unit 1) and 3065.2m MDRT (near top of Unit 5). The gas fraction composition from the upper sample closely resembles gas analyses from Thylacine-1 and Thylacine-2 and its CO₂ concentration is also very similar, further supporting the interpretation that Thylacine South-1 penetrated an extension of the main Thylacine accumulation.

The lower accumulation differs in composition from the upper pool and from the Thylacine Field. Notably, its CO₂ concentration is 1 mol% lower than the lowest recorded CO₂ concentration in Thylacine; its methane concentration is 3 mol% higher than the previous recorded highest; and its ethane concentration is 1.5 mol% lower than the previous lowest.

10. REFERENCES

1. Development Well Proposals for the Thylacine Field, DRIMS#398429-v3, WEL, September 2005.
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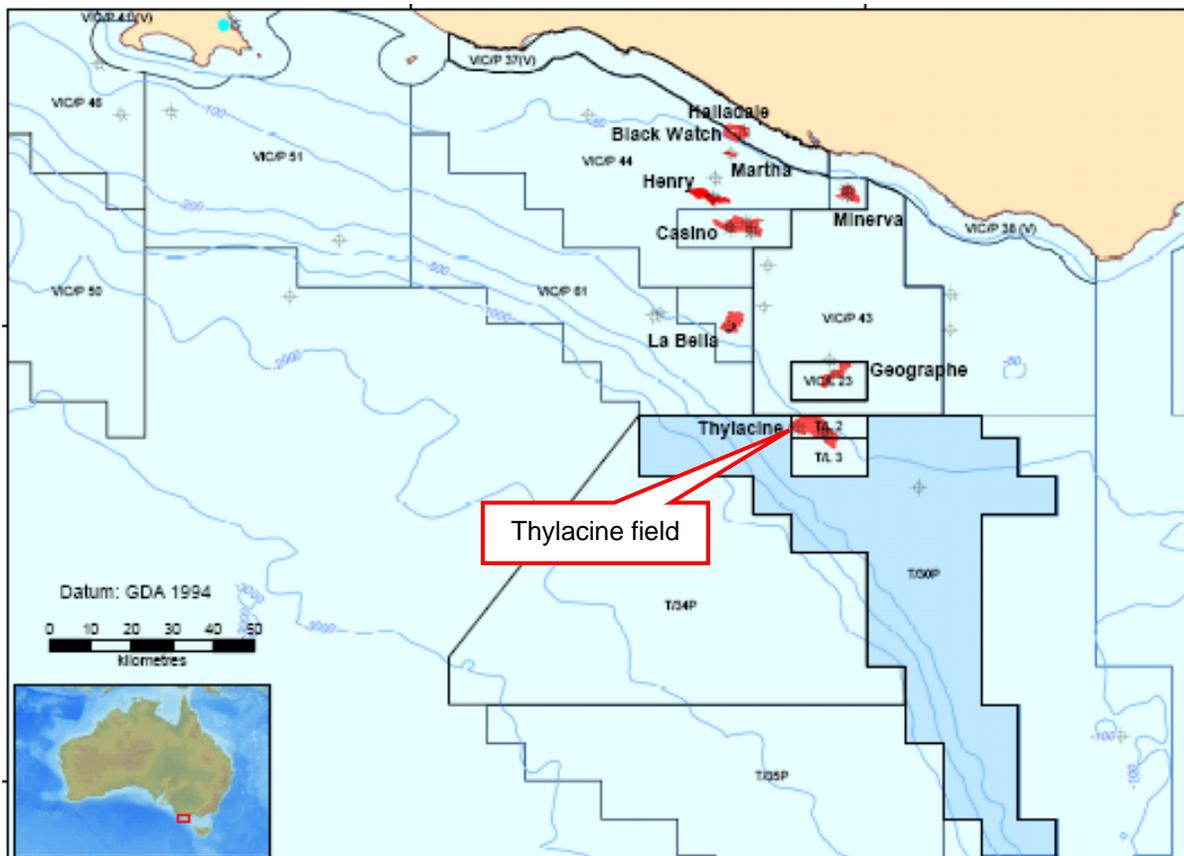


Figure 1a: Thylacine Field Location Map
(NB: T/L3 awarded post Thylacine South)

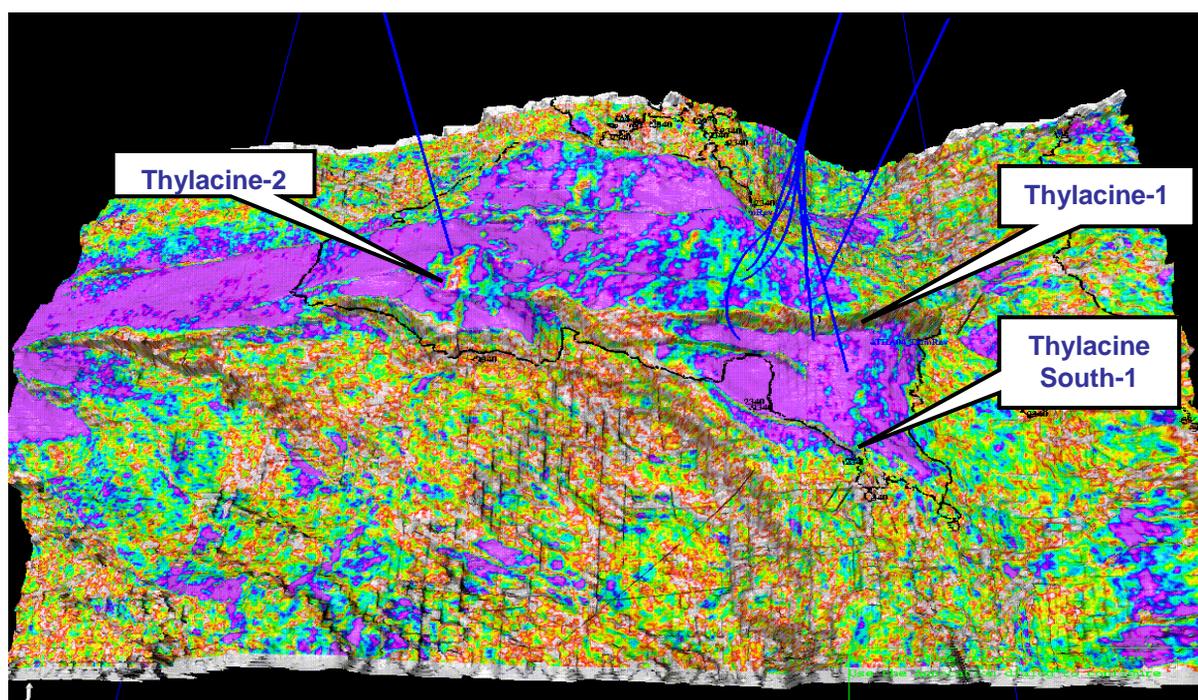


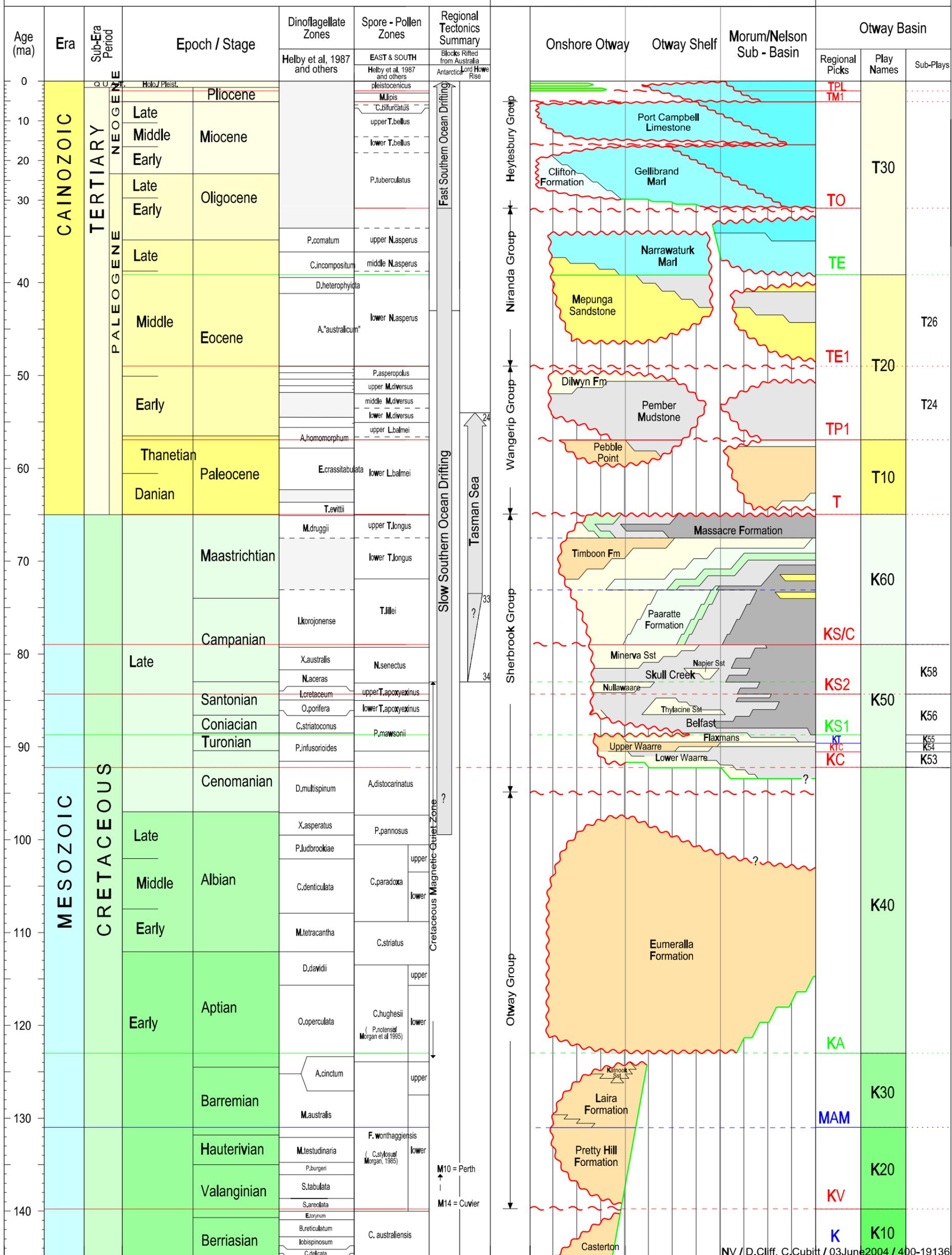
Figure 1b: Amplitude draped over top Thylacine Member structure map showing location of Thylacine South-1 relative to main Thylacine field.

Mesozoic - Tertiary Timescale and Biozonation Chart Eastern and Southern Australia

Jurassic - Tertiary Timescale : modified from Harland et al (1990)
Paleozoic - Triassic Timescale : AGSO (1997) ; Nicoll and Foster (1998)

Otway Basin

Woodside
Sequence /
Play Names



OTWAY BASIN STRATIGRAPHIC COLUMN



NV / D.Cliff, C.Cubitt / 03 June 2004 / 400-19136

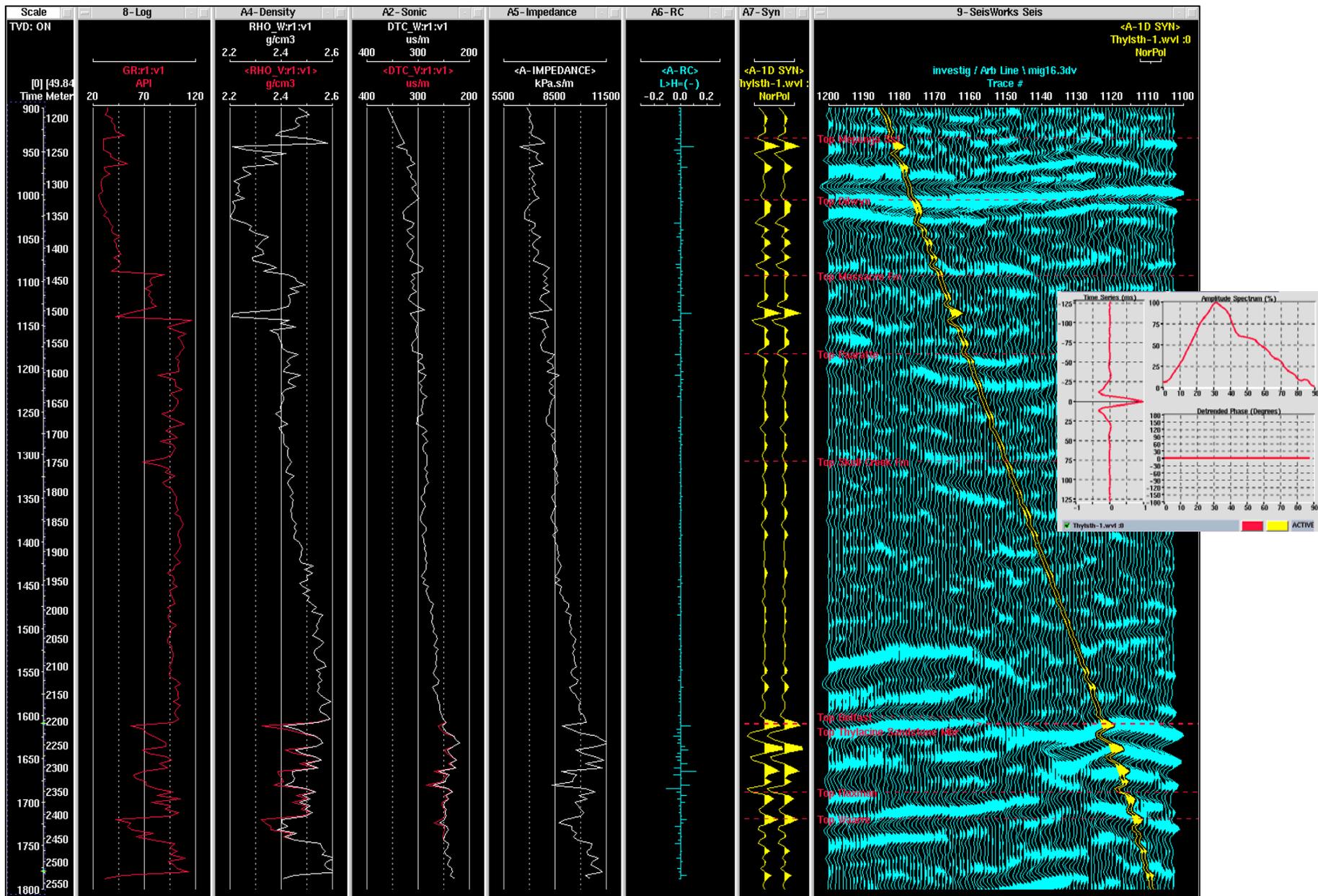


Figure 3: Raw well log synthetic and seismic tie (Thylacine South-1 well)

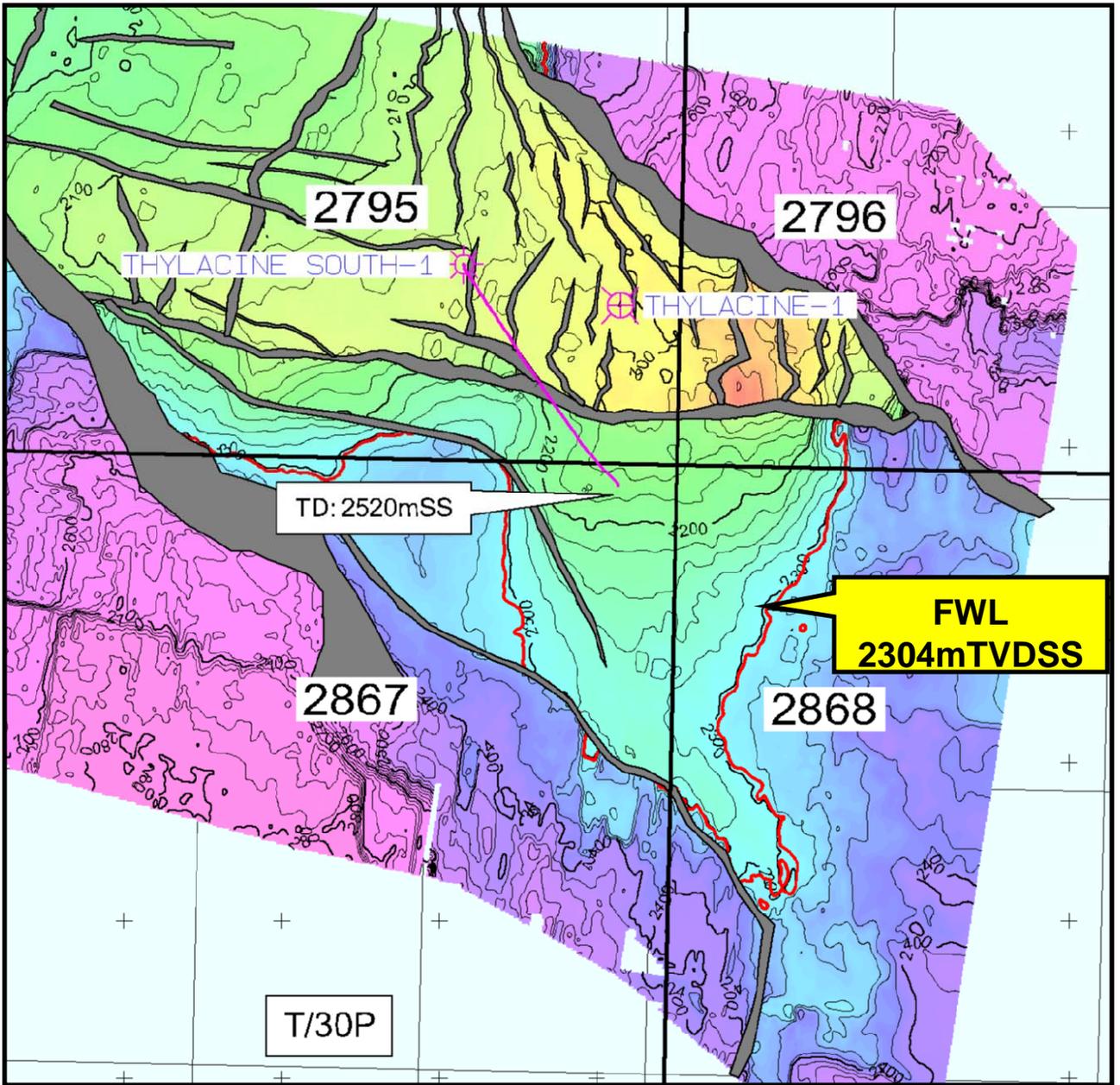


Figure 4: Depth structure map, top of Thylacine Sandstone Member (top of reservoir), Thylacine South area

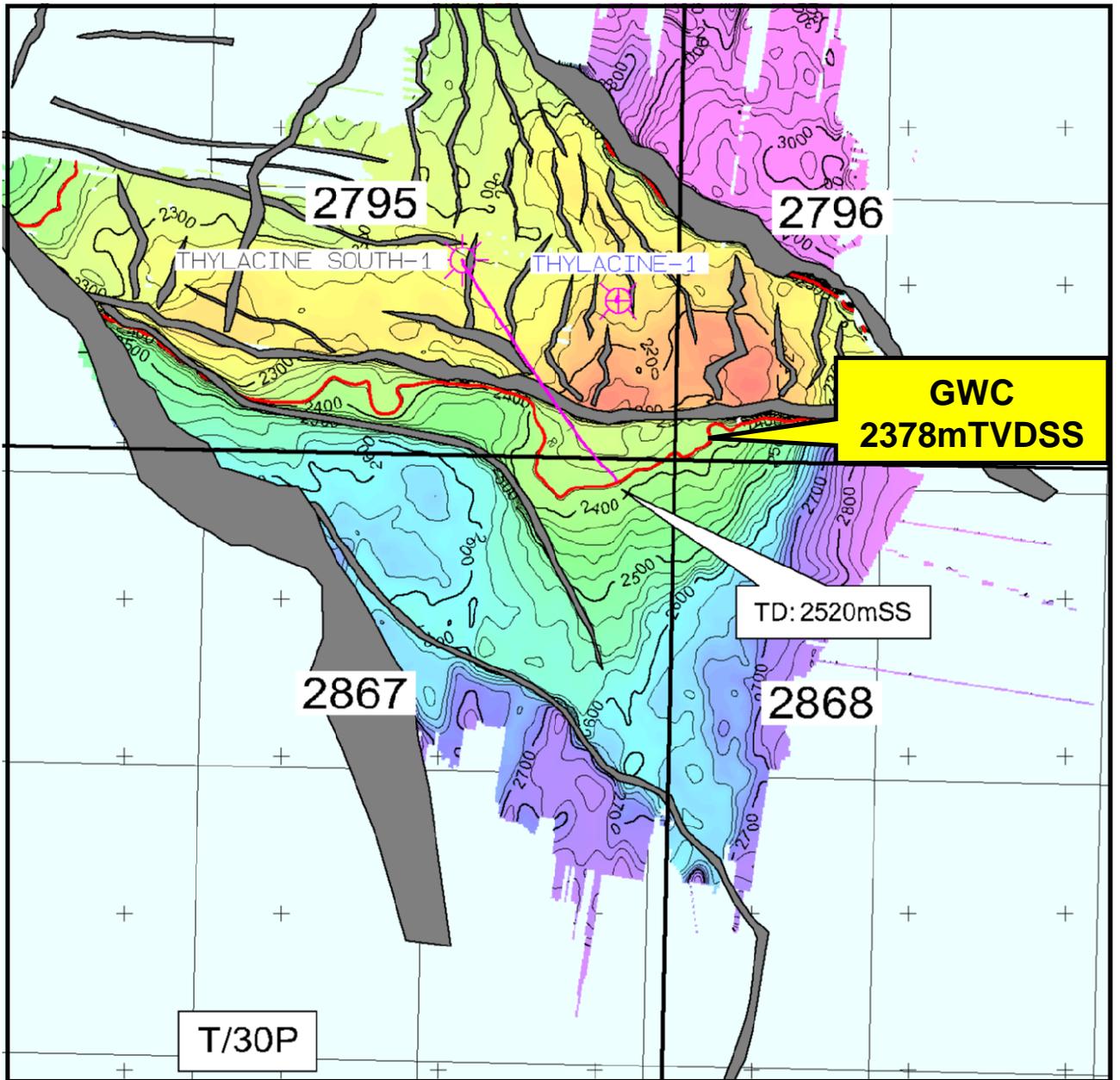


Figure 5: Depth structure map, top of Waarre Formation, Thylacine South area

Palynology Report

Backhouse Biostrat Pty Ltd

BB125

**Palynology of 3 cuttings samples from Thylacine
South-1**

by

John Backhouse

Prepared for
Woodside Energy Ltd

May 2006

Backhouse Biostrat Pty Ltd

Report BB125 Palynology of 3 cuttings samples from Thylacine South-1

INTRODUCTION

This report covers 3 cuttings samples from Thylacine South-1. Samples were examined on a quick-look basis and the results presented in tabular form.

Range Charts were not completed due to the very poor faunas encountered in the samples.

[Table 1.](#) Thylacine South-1: palynological review of 3 cuttings samples.

TABLE 1: THYLACINE SOUTH-1, 3 URGENT SAMPLES 5 APRIL 06 (J. BACKHOUSE)

CORE DEPTH [mbRT]	SAMPLE TYPE	ORGANIC YIELD	PALYNO. CONC.	PRES.	ZONE/AGE	ENVIRONMENT	COMMENTS
3050.00	CUTTS	0.013	EX LOW	POOR	PROBABLY MESOZOIC, OTHERWISE INDET.	MARINE	Palynomorphs identified: 2 Cyathidites, 2 bisaccates, 1 C. dampieri, 1 dinocyst indet. (form with short capitate spines, shape uncertain) (1K and 2 biostrat slides).
3090.00	CUTTS	0.016	EX LOW	POOR	PROBABLY MESOZOIC, OTHERWISE INDET.	MARINE	Palynomorphs identified: 1 Cyathidites, 4 bisaccates, fragments of dinocysts (sections with processes), a few unidentified palynomorph fragments (1K and 2 biostrat slides).
3131.00	CUTTS	0.003	BARREN		INDETERMINATE		Completely barren of anything identifiable and very little organic material at all (1 K slide and 1 small biostrat slide).

Palynofacies: The two productive samples contain a reasonable amount of unstructured inertinite and brown organic material including some obvious woody material and rare sheets of cuticle. The palynological residues mounted on the slides do not show any obvious signs of residual oil (as represented by subcircular clumps of organic material in an oily looking membrane), so the low yield may not be entirely due to failure to adequately remove the oil.

Petrophysics Report



WOODSIDE ENERGY LIMITED

T/L2 & T/30P

Thylacine South-1

Petrophysics Report

OTWAY SUBSURFACE TEAM
August, 2006



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1 SUMMARY

Thylacine South-1 exploration well was drilled in permits T/L2 and T/30P of the Otway Basin, Tasmania (see [Figure 1](#)). The well was drilled as a deviated well with maximum inclination of 48degrees by the Maersk Guardian rig in approximately 100m of water. The closest offset wells are Thylacine-1 (located 990m to the N and 134m up-dip at top reservoir), Thylacine-2 (located 5.8 km to the NW and 39.5m up-dip at top reservoir).

Thylacine South-1 was spudded on 17/03/2006 and reached a TD of 3250mRT on 07/04/2006.

Issues were discovered on THA01 (well drilled subsequent to this one) that result in a variation between original drillers (FEWD) depth and the final depth.

The well intersected reservoir sandstones of the Thylacine Member, Flaxmans and Waarre Formations with two gas columns.

1)	140.5m gross gas column	2157.5-2298mTVDSS
	80.2m of net pay	net-to-gross of 57%
Within the hydrocarbon bearing interval an;		
	Average log porosity	13.5%
	Average water saturation	59%
2)	73.3m gross gas column	2308.8-2382.1mTVDSS
	33.5m of net pay	net-to-gross of 46%
Within the hydrocarbon bearing interval an;		
	Average log porosity	14.4%
	Average water saturation	51%

The well was logged while drilling and pressure tested/sampled.

Thylacine South-1 was plugged and abandoned as a successful exploration well on 12/04/2006. The top hole section of this well will be used for the THA04 development well.

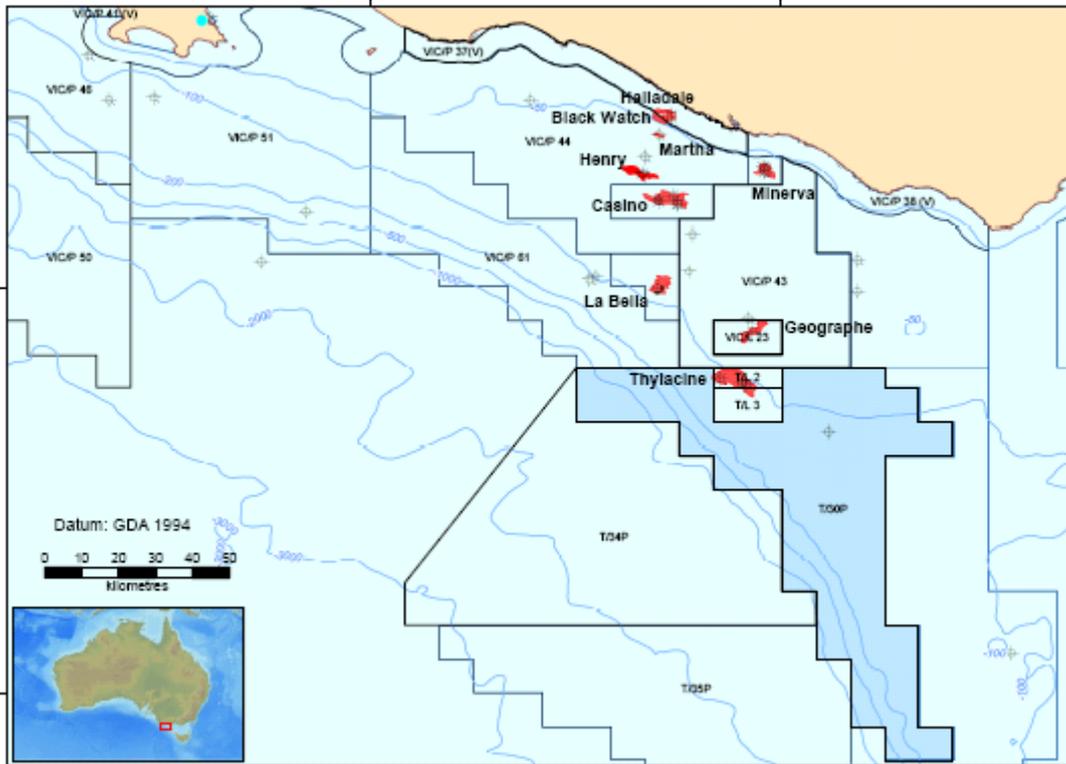


Figure 1 Field and location (NB: T/L3 awarded following drilling of Thylacine South-1)

Table 1 Thylacine South-1 Predicted v Actual Formation Tops

Marker	Formation	Prognosed Depth m TVD RT	Actual Depth m TVD RT	Variance (m TVD)
WB	Seabed	151	150	-1
TG	Gellibrand Marl	407	406.8	-0.2
TO	Narrawaturk Marl	1170	1174.1	+4.1
	Mepunga Sandstone	1246	1230.4	-15.6
	Dilwyn Sandstone	1340	1285.95	-54.05
K	Lower Massacre Fm	1500	1444.6	-55.4
	Timboon Fm	1612	1514	-98
	Skull Creek Sandstone	1668	1751	+83
KT	Thylacine Member (Unit 1)	2223.5	2207.75	-15.7
	Unit 2	2336.6	2310.5	-26.1
	Unit 3	-	2350	-
	Flaxman Fm (Unit 4)	2373.6	2352.4	-21.2
	Waarre Fm (Unit 5)	2436.2	2411.9	-24.3
	Total Depth	2700	2575.1	



2 OPERATIONAL OVERVIEW

30" (762mm) Hole Section

The 30" casing from seabed 150mRT to 218mRT was drilled with Gel/Seawater mud with no problems.

No wireline or FEWD logs were obtained.

23" (584mm) Hole Section

The 23" section drilled riserless from 218mRT – 638mRT with Gel/Seawater mud.

No wireline or FEWD logs were obtained.

12.25" (311mm) Hole Section

The 12 ¼" section, from 638mRT – 3250mRT, was drilled with SBM in two runs. The first run was from 638mRT to 3139mRT, the second from 3139mRT to 3250mRT.

LWD: GABI-DGR-EWR-ALD-CTN-BAT (GABI=Gamma-at-bit, DGR=GR, EWR=Resistivity, ALD=Azimuthal Density, CTN=Neutron, BAT=Sonic) were run in this section.

Wireline logs included the following Schlumberger tools:

- MDT-GR (Modular Dynamic Tester)

The MDT was attempted on wireline but experienced larger than expected overpulls once reservoir depth was reached. The decision to POOH and run the MDT in TLC was made with no further operational issues encountered.



FEWD Data

Formation evaluation while drilling services were provided by Sperry-Sun. Two runs with these services were run, amid intermittent operational issues with the CTN tool.

Table 2: Thylacine South-1 FEWD Summary

Hole Section	Bit Run	Service	Date	Depth Interval Main Log		Max Temperature	Comments
				From (m) MDRT	To (m) MDRT	Temp (DegC)	
23"	2	-	21/03/06 – 22/03/06	217	638	-	Drilled riserless
12 ¼"	3	GABI-DGR-EWR-P4-ALD-CTN-BAT	28/03/06 – 03/04/06	638	3139	104 / EWR-P4	CTN data from 1828-2338mRT was obtained while RIH prior to Run 300 due to CTN failure. CTN data from 2338-2442mRT was from Run 200 while drilling. CTN data from 2442-2748mRT was obtained while RIH prior to Run 300 due to CTN failure. CTN data from 2748-3108mRT was control wiped at 50m/hr.
12 ¼"	4	GABI-DGR-EWR-P4-ALD-CTN-BAT	05/04/06	3139	3250	101 / EWR-P4	

The data provided was generally of good quality (with the exception of missing CTN data above reservoir) and has been used in the petrophysical evaluation.



Wireline Logs

Wireline logging services on Thylacine South-1 were provided by Schlumberger. One logging suite comprising 2 runs was acquired in the well ([Table 3](#)). The first run for the MDT experienced excessive drag prior to taking any pre-tests and the run was aborted. The second MDT run was performed on pipe.

Table 3: Thylacine South-1 Wireline Logging Summary

Suite No.	Run No.	Log	Interval (mMDRT)	Comment
1	1	MDT-GR		Aborted due to excessive over-pull prior to any pre-tests being taken.
1	2	MDT-GR	2804mRT – 3207.9mRT	47 Pretests taken. 4 samples recovered

The wireline log data acquired was generally of good quality, and has been used in the petrophysical evaluation.

Hole Conditions and Drilling Fluid

The objective reservoir section in Thylacine South-1 was drilled with an 8 ½” bit, and the ultrasonic caliper (from the neutron tool) information across the open hole section indicates that borehole conditions are very good. The properties of the mud system present during logging are shown summarised below in [Table 4](#).

The maximum recorded temperature in Thylacine South-1 was 114°C - wireline logging Run 2 (MDT-GR), a static (Horner) temperature was calculated @ 115°C.

Table 4: Borehole fluid properties in Thylacine South-1 (06/04/06)

Mud Type	Synteq (SBM)
Bit size	12 ¼”
Last casing	633m
Mud Weight	1.25sg
Viscosity	107
Mud chlorides	52,000 mg/L
% Solids	5.1
Oil:Water Ratio	73:27
pH	N/A
Rm/Temp	N/A
Rmf/Temp	N/A
Rmc/Temp	N/A



Wireline Formation Tester (Suite #1 Run#2)

18 valid pre-test pressure points were acquired (refer [Table 5](#) and [Figure 5](#)), from a total of 47 points

Table 5: Thylacine South-1 Pretests

PRETEST #	MEASURED DEPTH mRT	FORMATION PRESSURE psia	MOBILITY md/cp	VALID	NO SEAL	OTHER	COMMENTS
2	2804.0	2,789.07	0.38			x	Supercharged
1	2804.6	2,736.82	0.26			x	Supercharged
73	2811.0	3,316.95	34.69	x			Good test
72	2811.5					x	Dry Test
4	2811.5	3,317.05	22.34	x			Good test
5	2821.9	2,899.39	0.61			x	Supercharged
7	2830.0					x	Dry test
6	2831.0				x		Lost Seal
9	2835.5				x		Lost Seal
8	2836.0				x		Lost Seal
11	2874.1	3,327.78	1.18			x	Supercharged
13	2880.0	3,329.87	0.66			x	Supercharged
16	2884.6	3,329.45	0.99			x	Supercharged
14	2885.2				x		Lost Seal
17	2916.1					x	Dry Test
18	2917.5					x	Dry Test
19	2919.1					x	Dry Test
21	2936.1	3,341.04	7.89	x			Good test
23	2951.1	3,344.78	0.90			x	Supercharged
25	2959.2	3,347.75	1.12			x	Supercharged
27	2968.0	3,375.32	0.46			x	Supercharged
71	2973.0	3,365.79	0.10			x	Supercharged
28	2980.5					x	Dry Test
29	2981.5				x		Lost Seal
31	2996.2	3,393.91	8.65	x			Good test
33	3012.5	3,402.99	27.38	x			Good test
34	3019.9					x	Dry Test
36	3026.5	3,430.00	0.47			x	Supercharged
69	3032.0					x	Dry Test
68	3032.4					x	Dry Test
67	3032.6	3,398.72	0.16			x	Supercharged
42	3060.0	3,474.52	137.58	x			Good test
38	3060.2	3,474.93	957.93	x			Good test
41	3068.1	2,021.56	51.17			x	Supercharged
43	3068.1	3,475.89	3.17			x	Supercharged
45	3073.0	3,477.24	9.47	x			Good test
47	3078.0	3,478.27	113.55	x			Good test
49	3086.0	3,484.90	93.59	x			Good test
51	3088.0	3,487.14	171.73	x			Good test
53	3095.2	3,496.52	11.48	x			Good test
55	3102.0	3,503.95	64.30	x			Good test
57	3105.5	3,508.55	2.50	x			Good test
58	3112.9					x	Dry Test
60	3113.3	3,520.75	3.77	x			Good test
62	3199.5	3,621.06	68.57	x			Good test
64	3204.0	3,626.48	503.90	x			Good test
66	3207.9	3,631.17	32.32	x			Good test



The following gas samples were collected.

Table 6: Thylacine South-1 Gas Samples

SAMPLE #	MEASURED DEPTH mRT	TVD mRT	TVD mSS	INTERP. FLUID	REASON (eg Res, OFA)	COMMENT
1	3060.0	2409.2	2358.7	Gas/Cond	OFA	OK
2	3060.0	2409.2	2358.7	Gas/Cond	OFA	OK
3	3060.0	2409.2	2358.7	Gas/Cond	OFA	OK
4	2811.0	2159.3	2159.3	Gas/Cond	OFA	OK
5	2811.0	2159.3	2159.3	Gas/Cond	OFA	Failed to open
6	2811.0	2159.3	2159.3	Gas/Cond	OFA	Did not close

3 PETROPHYSICAL EVALUATION

Data acquisition and log quality

FEWD: GR, resistivity, density-neutron and sonic data were used for the petrophysical evaluation and TD decision.

Wireline logs: MDT data was also used in the petrophysical evaluation.

Evaluation methodology

The primary objective was appraisal of the reservoir sandstones in the Thylacine Member, Flaxman and Waarre Formations. The petrophysical evaluation consists of:

- Log environmental corrections (where & if required)
- Depth shifting and splicing
- Shale Volume (Vsh)
- Porosity and Water Saturation evaluation
- Permeability evaluation
- Contacts
- Gassmann Substitution
- Cut-offs & Results (Sums & Aves)
- Summary



Log environmental corrections

Environmental corrections have been performed on the GR log. All other logs are field corrected and used as supplied by Sperry-Sun.

Initial quality control was performed by checking consistency between the shale responses (where mud type and invasion effects are considered to be practically negligible) in this well and those of Thylacine-1. All logs appear to be reading consistently and are therefore considered to be good data.

Depth shifting and splicing (References 12 & 13)

A drill pipe tally error was identified after drilling THA01 (subsequent well). Investigation has shown that the same tally errors were present in Thylacine South-1. As the errors in the drill pipe tally are spread throughout the tally (Figure 2), it is not appropriate to apply a single correction to all depths. Figure 3 illustrates the variability between the actual pipe length variations and the approximate shift that has been applied to the FEWD data. Table 7 shows the algorithms that have been used to correct the FEWD data.

Figure 2: Pipe tally measurements

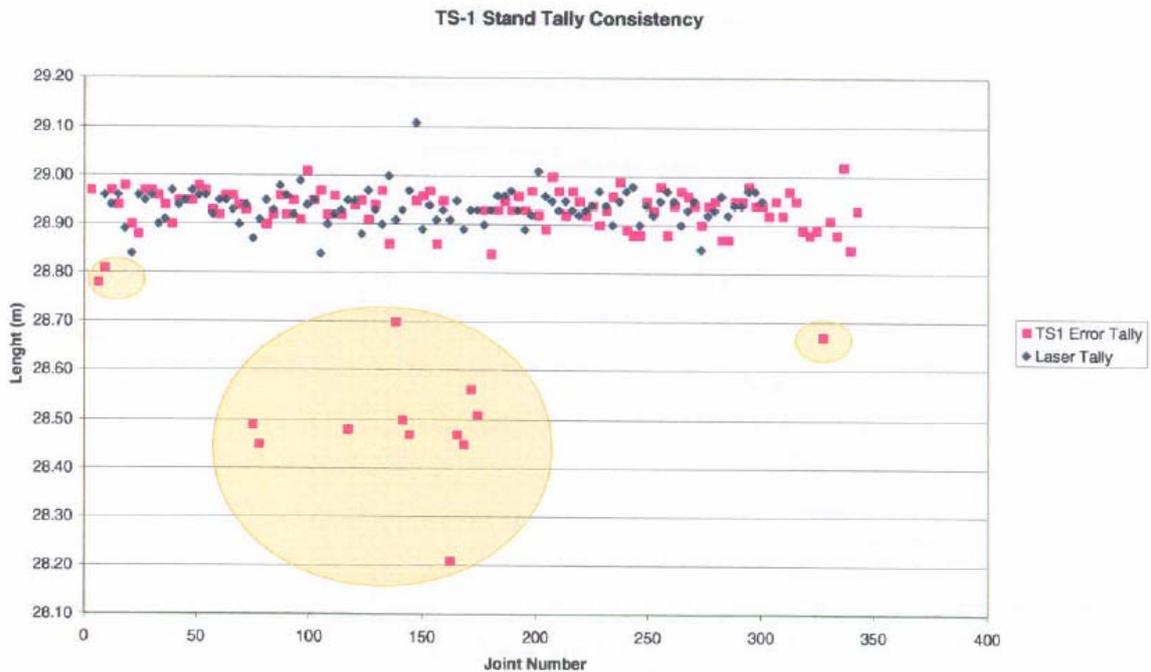




Figure 3: Pipe tally correction (graphical)

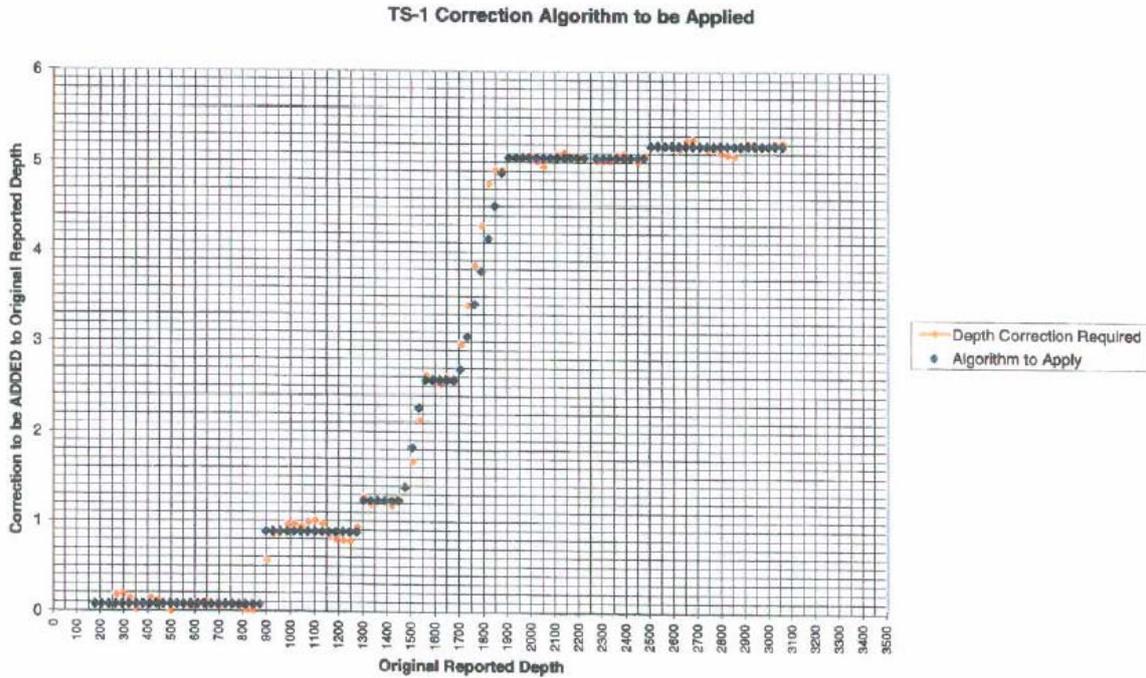


Table 7: Pipe tally correction algorithm

Depth corrections to be applied to all depths originally reported for Thylacine South-1.

Depth Range	Correction to Apply
0m – 169.99m	No correction
170m – 868.49m	Add 0.08m
868.5m – 1274.99m	Add 0.89m
1275m – 1464.99m	Add 1.24m
1465m – 1550.99m	Add [(((2.57-1.24)/(1551-1465)) x (depth-1465)) +1.24]
1551m – 1694.99m	Add 2.57m
1695m – 1889.99m	Add [(((5.06-2.57)/(1890-1695)) x (depth-1695)) +2.57]
1890m – 2489.99m	Add 5.06m
2490m - TD	Add 5.19m

Subsequent to the above depth correction, it was noted that each of the FEWD logs were off depth with respect to each other. Therefore the FEWD data was depth shifted (stretched and squeezed) by comparing the FEWD Combined Gamma Ray log to that from the wireline suite. The shifts applied to each of the FEWD logs and the MDT data are captured at the back of this report.



Shale Volume

Shale volume was calculated from the Gamma ray, and compared to the Density/Neutron derived log. Gamma ray was chosen due to the gas effect on the Density and Neutron logs. The following inputs were used to calculate the shale volume:

Table 8: Thylacine South-1 Shale Volume

Parameter	Unit 1	Unit 2	Unit 4	Unit 5
Matrix gamma ray (GAPI)	25	25	25	25
Shale gamma ray (GAPI)	130	130	130	130
Matrix tool density (g/ cm ³)	2.33	2.33	2.33	2.33
Matrix Neutron porosity (v/v)	0.11	0.11	0.11	0.11
Shale tool density (g/ cm ³)	2.63	2.63	2.63	2.63
Shale Neutron porosity (v/v)	0.24	0.24	0.24	0.24
Fluid tool density (g/ cm ³)	1	1	1	1
Fluid neutron porosity (v/v)	1	1	1	1

Porosity and Water Saturation Evaluation

Total porosity (POR) was calculated for Thylacine South-1 using the **SATCP_WS_OBM** (GEOLOG Loglan) which calculates, porosity and saturation corrected for Z/A and invasion effect using the Waxman-Smits method, with the following input parameters:

Table 9: Thylacine South-1 Porosity and Saturation

Parameter	Unit 1	Unit 2	Unit 4	Unit 5
Density log	SBD2	SBD2	SBD2	SBD2
Matrix Density (g/cc) ¹	2.68	2.68	2.65	2.65
Gas Density (g/cc) ²	0.17	0.17	0.17	0.17
OBM filtrate density (g/cc) ³	0.743	0.743	0.743	0.743
Formation Water Density (g/cc) ⁴	0.974	0.974	0.974	0.974
Cementation Exponent (m*) ⁵	2.2	2.2	2.0	2.0
Saturation Exponent (n*) ⁵	2.3	2.3	2.35	2.35
B ⁶	13	13	13	13
Qv ⁶	0.6	0.6	0.35	0.35
Formation Water resistivity (ohmm) ⁴	0.15	0.15	0.15	0.15
SFILT (Mud filtrate in invaded zone) ⁷	0.3	0.3	0.1	0.1

¹ Based on the data from core analysis, the Flaxman and Waarre Formations (Units 4 & 5) have a grain density of 2.65 g/c³ and all other units intersected in this well have a grain density of 2.68g/c³. These numbers are the mode grain density as shown in Reference 10.

² Gas density was determined via the integration of PVT gas density estimates with formation pressure data. This resulted in a gas density of 0.17g/c³ being used in this well. This is the equivalent to gas density used in the evaluation of Thylacine-1.



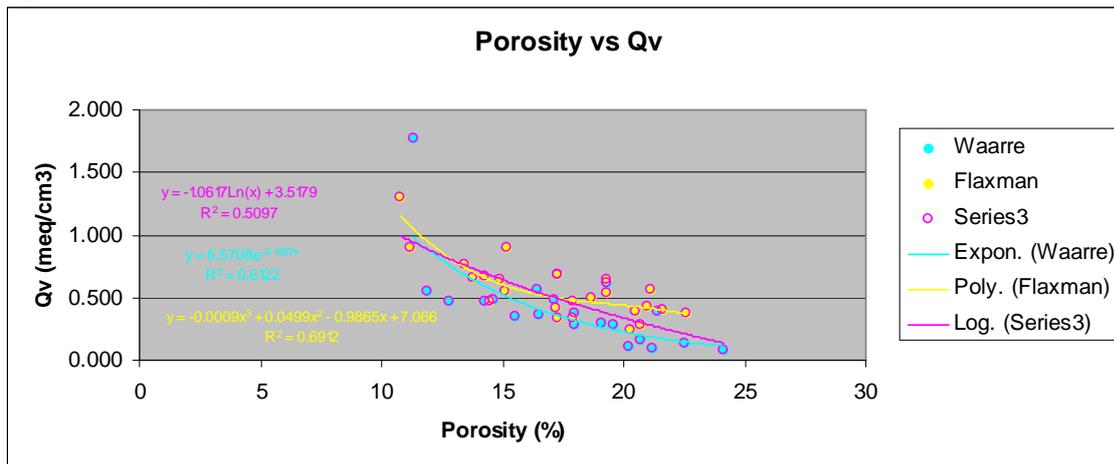
³ OBM filtrate density has been assumed to be 0.743g/c3 (at reservoir temperature and pressure) based on a base oil density of 0.783g/c3 supplied by the mud engineer.

⁴ Formation water resistivity and density have been estimated from petrophysical solutions (Rwa) in the intersected water leg (3198m-3210mMDRT). Rw has been estimated at 14,000ppm which is in line with the MDT water samples that were recovered from Thylacine-1 (formation water salinity within the range from 13,000-16,000 ppm due to filtrate contamination of sample). The formation water density was calculated from Flag 4, using this salinity value at insitu conditions.

⁵ Average unit specific m* and n* have been taken from the SCAL data for Thylacine and Geographe fields. See Reference 7.

⁶ Qv (cation exchange capacity per unit pore volume) was input as an average for each unit. These average values were taken from the below graph which shows core-derived Qv data plotted against porosity (from Reference 7). B (the factor used to transform Qv to an equivalent conductivity) was calculated using the Juhasz Method on the basis of temperature and formation water salinity. This is based on "I. Juhasz, Normalized Qv - The key to shaly sand evaluation using the Waxman Smits approach in the absence of core data", SPWLA 22nd annual Logging Symposium, June 1981.

Figure 4: Porosity vs Qv plot (from Reference 7)



⁷ SFILT defines the percentage of base oil that is present in the near well bore region due to invasion. The difference in inferred invasion is due to deeper invasion in poorer quality reservoirs.

Formation temperature has been estimated using well specific temperature gradients (from Reference 6). The gradient of Thylacine-1 (4.4degC/100m) is the closest to this well location. Seafloor temperature is assumed to be 10°C (in line with previous work). This results in a BHT of 116°C, which is in line with the measurements read during the MDT run.

Permeability Evaluation

A series of unit specific porosity-permeability transforms has been developed for the Thylacine-Geographe Fields (Reference 11). These transforms were derived through the evaluation of core porosity - permeability relations for a series of reservoir units identified via core and FMI studies.



For each reservoir unit or group of units five transforms were derived. Four of these transforms have been calculated in this petrophysical interpretation. These are:

1. best-fit (mean) transform
2. plus 1 standard deviation (s.d.) transform
3. minus 1 s.d. transform

The ± 1 s.d. transforms represent a 68% confidence band around the best-fit transform.

Unit 1 porosity-permeability transforms

Best-fit transform $K = 2.30E-05 * (e^{(0.672 * \text{porosity} * 100)})$
Plus 1 s.d. transform $K = 5.27E-05 * (e^{(0.672 * \text{porosity} * 100)})$
Minus 1 s.d. transform $K = 1.00E-05 * (e^{(0.672 * \text{porosity} * 100)})$

Unit 2 porosity-permeability transforms (exponential)

Best-fit transform $K = 9.46E-05 * (e^{(0.584 * \text{porosity} * 100)})$
Plus 1 s.d. transform $K = 2.25E-04 * (e^{(0.584 * \text{porosity} * 100)})$
Minus 1 s.d. transform $K = 3.98E-05 * (e^{(0.584 * \text{porosity} * 100)})$

Unit 4B/C/E porosity-permeability transforms

Best-fit transform $K = 9.15E-06 * (e^{(0.773 * \text{porosity} * 100)})$
Plus 1 s.d. transform $K = 2.97E-05 * (e^{(0.773 * \text{porosity} * 100)})$
Minus 1 s.d. transform $K = 2.82E-06 * (e^{(0.773 * \text{porosity} * 100)})$

Unit 4D porosity-permeability transforms

Best-fit transform $K = 1.33E-05 * (e^{(0.827 * \text{porosity} * 100)})$
Plus 1 s.d. transform $K = 8.80E-05 * (e^{(0.827 * \text{porosity} * 100)})$
Minus 1 s.d. transform $K = 2.01E-06 * (e^{(0.827 * \text{porosity} * 100)})$

where: K is klinkenberg-corrected dry overburden permeability (mD)
Porosity units in v/v

The Unit 5 reservoir porosity-permeability are not represented by RCA data. Consequently, the similarity between Unit 4D and Unit 5 means that the Unit 4D poro-perm relationship will be used to determine permeability in Unit 5.

A comparison between the calculated permeability and the inferred permeability that is calculated from the mobility data (using 0.21cp for gas and 1cp for water) shows a reasonable fit. This suggests that the porosity-permeability relationships that were derived for the "main" field are reasonable estimators in this well.



Saturation-Height

A series of field and unit specific saturation-height functions have been developed for the Thylacine and Geographe Fields. These functions have been derived using a regression technique, informally known as the correlation coefficient method, which relates saturation to permeability and height above free water level.

Application of the height functions in the Thylacine and Geographe wells, results in saturations that closely match those derived from resistivity logs in the Thylacine and Geographe Fields. References to the generation and implementation of the Thylacine-Geographe height functions are detailed in Reference 8.

These saturation-height functions have been used to check the resistivity calculated saturations. These have not been used in the calculation of average petrophysical parameters.



Contacts

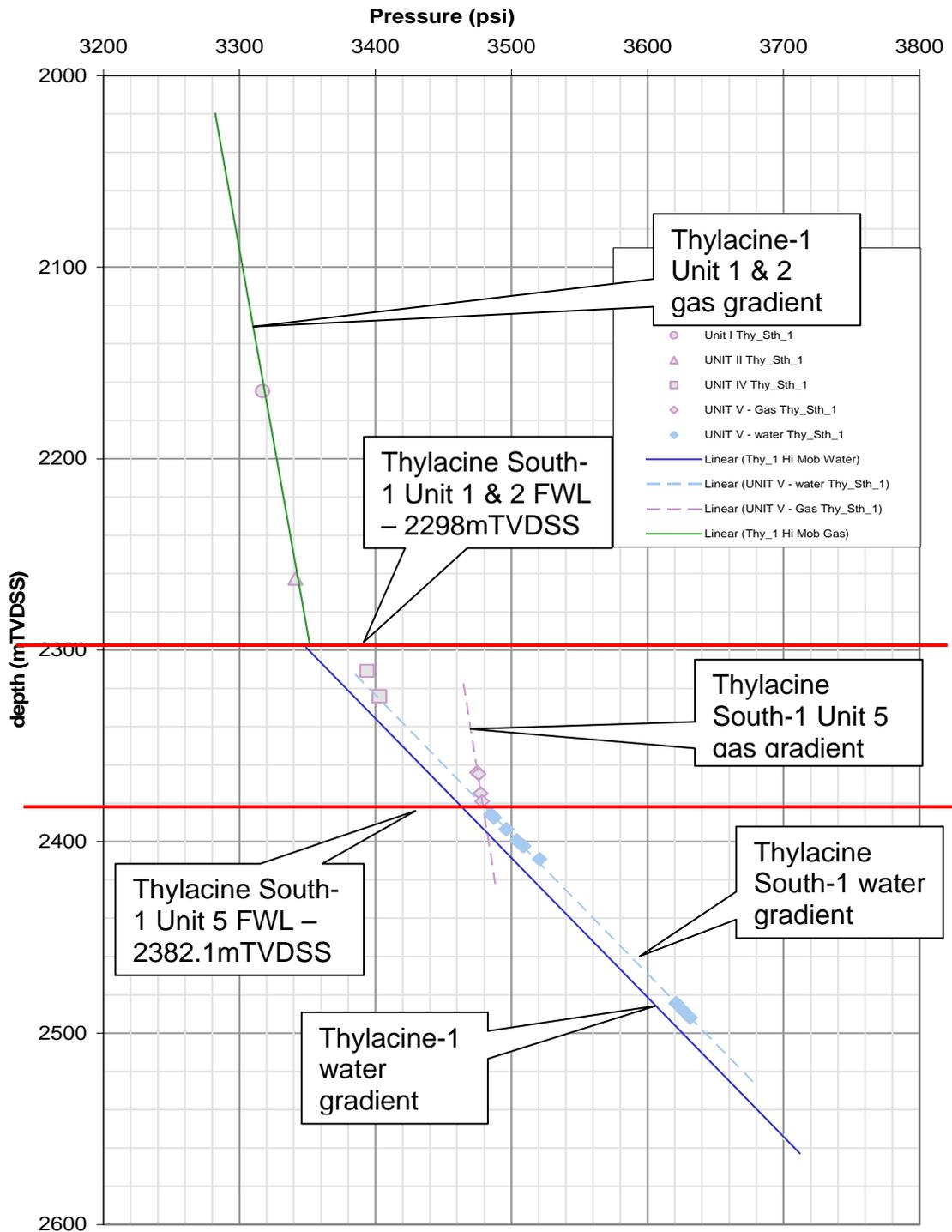


Figure 5: Pressure Depth Plot



Two clear gas gradients are seen on the above pressure-depth plot. The resistivity and two valid MDT points in the lower Unit 2 and Unit 4 suggest small gas columns that lie between the two columns.

The upper column has a FWL at 2984.6mMDRT (2298mTVDSS) within Unit 2. This is based on the coincidence of the Thylacine South-1 Unit 1 and Unit 2 pressures with the gas gradient seen in Thylacine-1, suggesting communication between the two accumulations. For this reason the current interpretation is that the aquifer within Unit 1 and Unit 2 is the same as was seen in Thylacine-1. The gas saturations calculated from the resistivity data support this conclusion.

The lower column has a FWL at 3085.9mMDRT (2382.1mTVDSS) within Unit 5. The reservoir quality is sufficient to show clear aquifer and gas gradients. The change in aquifer pressure from what was seen in Thylacine-1 indicates that there is no pressure communication from this lower column up into the above units.

The gas gradients, taken from the line of best fit through the above MDT pressure data, is 0.24 psi/m which equates to a gas density of 0.17 g/cm³.

Gassmann Substitution

A Gassmann Fluid substitution was performed using the **GASSMANN_2X3** (GEOLOG Loglan). The following input parameters were used:

Table 10: Thylacine South-1 QI Parameters

Parameter	Value	Comments
Brine Density	0.974 g/cm ³	From Flag 4 (based on Salinity)
Oil Density	0.743 g/cm ³	Default
Gas Density	0.17 g/cm ³	From Pressure Plot
Mud Type	OBM	
Poisson's Ratio of rock frame	0.18	Default
Min porosity for fluid substitution	0 v/v	
Brine Velocity	1598 m/s	Flag 4
Oil Velocity	1200 m/s	Flag 4
Gas Velocity	505 m/s	Flag 4
Bulk Modulus of Quartz	37,000 MPa	Default
Bulk Modulus of shale	17,000 MPa	Default

From this, fluid substituted curves of density, shear and compression sonic were generated.

Cut-Offs

The criterion for net reservoir was defined as PERM > 0.1md and VSH < 0.6.



Results

The results of the petrophysical analysis of Thylacine South-1 are presented in the reservoir plot in [Figure 6](#) and summarised in [Table 11](#) below. Histograms of the porosity and water saturation per unit (as input into GeoX for volumetric estimates) are attached in [Figures 7 - 14](#).

Table 11: Thylacine South-1 Sums and Averages

Measured Depth

Interval	Top m	Base m	GROSS m	NET m	NTG	POR	Sw
Unit 1*	3757.00	3782.20	131.0	58.4	0.44	0.127	0.61
Unit 2*	3782.20	3838.40	49.2	45.2	0.92	0.145	0.58
Unit 4*	3838.40	3929.20	72.1	18.35	0.25	0.127	0.72
Unit 5*	3958.00	4124.00	23.9	21.8	0.91	0.158	0.37

True Vertical Depth

Interval	Top m	Base m	GROSS m	NET m	NTG	POR	Sw
Unit 1*	3757.00	3782.20	103.0	45.7	0.44	0.127	0.61
Unit 2*	3782.20	3838.40	39.5	36.3	0.92	0.145	0.58
Unit 4*	3838.40	3929.20	59.7	15.2	0.25	0.127	0.72
Unit 5*	3958.00	4124.00	20.2	18.4	0.91	0.158	0.37

*HC bearing interval

Summary of results

Thylacine South-1 intersected the reservoir sandstones of the Thylacine Member, Flaxman and Waarre Formations with two gas columns.

- 1) 140.5m gross gas column 2157.5-2298mTVDSS
80.2m of net pay net-to-gross of 57%
Within the hydrocarbon bearing interval an;
Average log porosity 13.5%
Average water saturation 59%
- 2) 73.3m gross gas column 2308.8-2382.1mTVDSS
33.5m of net pay net-to-gross of 46%
Within the hydrocarbon bearing interval an;
Average log porosity 14.4%
Average water saturation 51%

The well was:

1. Pressure tested and sampled



4 References

All references are contained in the following folder: DRIMS#

1. Otway Well BfWD: Thylacine South-1 DRIMS #2020581
2. Thylacine South-1 Formation Evaluation Programme DRIMS #2416062
3. Directional Drilling EOWR – Thylacine South-1 DRIMS #2687425
4. Wireline Operations Report – Thylacine South-1, Schlumberger
DRIMS #2687397v1
5. MDT Quicklook Interpretation Report – Thylacine South-1, Schlumberger
DRIMS #2687429
6. Kelly, J., Select Phase – Petrophysical Review of the Thylacine and Geographe Gas Fields” DRIMS #179500
7. Kelly, J., 2002, Thylacine & Geographe SCAL Electrical Properties & CEC Workbook
DRIMS #147028.
8. Kelly, J., 2002, The Application of Correlation Coefficient Derived Saturation-Height Functions in Thylacine & Geographe DRIMS #130456
9. Kelly, J., 2002, Thylacine & Geographe Net to Gross Sensitivity
DRIMS #151730.
10. Kelly, J., 2002, Analysis of RCA Grain Density Data for the Thylacine & Geographe Fields DRIMS #137699.
11. Kelly, J., 2002, Porosity & Permeability Transforms for the Thylacine & Geographe Fields DRIMS #133326.
12. Thylacine South-1 Drill pipe Tally Error Correction DRIMS #2570915v1
13. Thylacine South-1 CCR16 DRIMS #2114655
14. "I. Juhasz, Normalized Qv - The key to shaly sand evaluation using the Waxman Smits approach in the absence of core data", SPWLA 22nd annual Logging Symposium, June 1981.

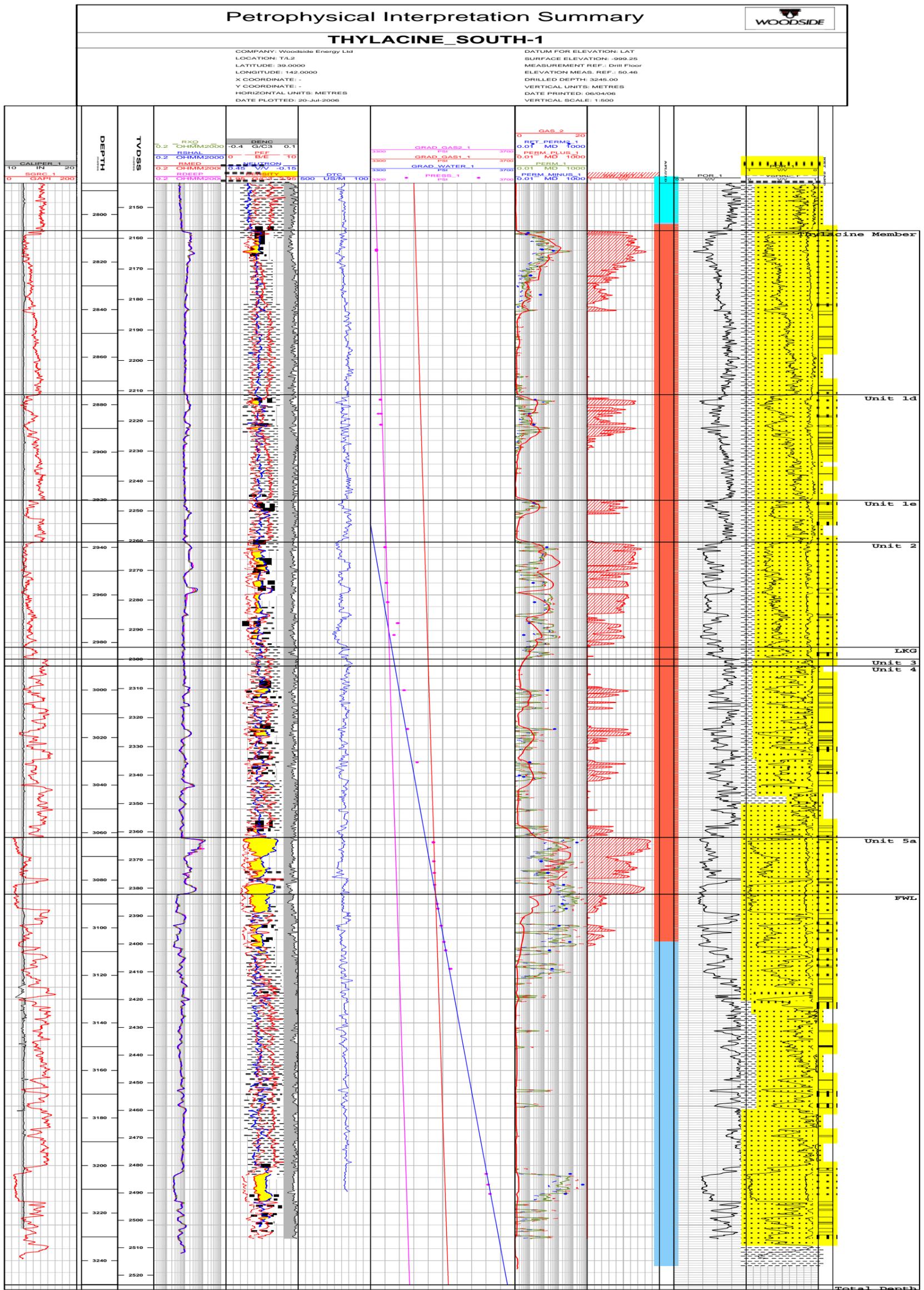


Figure 6: Reservoir summary plot.

DRIMS #2655333

SHIFT sets (for each log)

Density Shift

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UWI .                :       UNIQUE WELL ID
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		3225.3000	3225.7000

Neutron Shift

```

~Version Information Block
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VERSION 2.00
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STOP .M              3225.3:  STOP DEPTH
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COMP .               :     COMPANY
WELL .              THYLACINE_SOUTH-1: WELL
FLD .               :     FIELD
LOC .               :     LOCATION
PROV .              :     PROVINCE
UWI .               :     UNIQUE WELL ID
SRVC .              :     SERVICE COMPANY
DATE .              :     LOG DATE
~Curve Information Block
#MNEM.UNIT           API CODE   Curve Description
#-----
DEPTH.M              :
DEPTH_COR.M          :
~Parameter Information Block
#MNEM.UNIT           Value     Description
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SET .                SHIFT_NEUTRON:
~Other Information Block
~A      DEPTH      DEPTH_COR
626.2000  626.4000
643.5000  643.7000
650.1000  650.1000
650.6000  650.7000
679.5000  679.6000
696.5000  696.6000
716.8264  717.0000
723.7000  724.3000
729.6000  729.9000
771.0000  771.2000
787.8000  787.4000
792.3000  791.7000
794.4000  794.0000
804.8000  804.4000
810.7000  811.1000
823.9000  824.1000
840.1000  840.6000
864.7219  865.7000
880.5000  880.8000
906.6000  906.9000
967.1000  967.4000
973.6000  973.6000
979.8000  980.0000
985.3000  985.8000
994.1000  994.5000
1007.1000 1007.4000
1011.6000 1012.5000
1029.1000 1029.4000
1032.4000 1032.5000
1035.8000 1035.7000
1046.2244 1047.3000
1050.7322 1051.6000
1062.5000 1062.7000
1064.9862 1065.4000
1069.4332 1071.1000
1077.1726 1077.9000
1080.6000 1081.2000
1090.1000 1090.7000
1092.5000 1092.7000
1101.7000 1102.2000
1113.5000 1114.0000
1124.2000 1125.7000
1126.9000 1128.0000
1131.1000 1132.0000
1138.1000 1138.6000
1143.3000 1143.6000
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1230.5000 1231.1000
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1236.4143 1236.5000

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Resistivity Shift 1

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VERSION 2.00
WRAP .                NO: One line per depth step
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STOP .M              3236.9:  STOP DEPTH
STEP .M              0:     STEP
NULL .              -999.25:  NULL VALUE
COMP .               :     COMPANY
WELL .              THYLACINE_SOUTH-1: WELL
FLD .               :     FIELD
LOC .               :     LOCATION
PROV .              :     PROVINCE
UWI .               :     UNIQUE WELL ID
SRVC .              :     SERVICE COMPANY
DATE .              :     LOG DATE
~Curve Information Block
#MNEM.UNIT           API CODE   Curve Description
#-----
DEPTH.M              :
DEPTH_COR.M          :
~Parameter Information Block
#MNEM.UNIT           Value     Description
#-----
SET .                SHIFT_RES:
~Other Information Block

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~A	DEPTH	DEPTH_COR			
	626.1000	625.9000		3130.2000	3130.0000
	643.7000	643.5000		3168.7000	3168.5000
	648.6000	648.6000		3174.7000	3174.7000
	661.6000	661.7000		3202.3000	3202.3000
	668.4000	667.9000		3215.6000	3215.4000
	675.8381	675.9000		3219.2000	3218.8000
	682.6000	682.6000		3227.2000	3227.2000
	685.2000	685.5000		3236.9000	3236.9000
	710.0162	710.5000			
	715.1630	716.2000			
	718.3118	719.0000			
	724.0000	724.9000			
	770.7000	771.1000			
	784.4000	785.4000			
	791.9000	793.0000			
	803.6000	805.0000			
	811.3000	811.9000			
	814.6181	814.6000			
	817.1353	817.0000			
	823.7000	823.8000			
	858.7000	859.0000			
	986.0000	986.1000			
	988.6357	988.2000			
	994.2000	994.5000			
	1003.2000	1003.7000			
	1012.5000	1012.7000			
	1080.6000	1081.2000			
	1126.1000	1126.1000			
	1132.5341	1132.0000			
	1138.2000	1138.7000			
	1242.9000	1243.4000			
	1245.6000	1245.4000			
	1249.3000	1249.1000			
	1254.7000	1255.0000			
	1287.0000	1287.3000			
	1305.5000	1305.1000			
	1307.5743	1307.1000			
	1312.1000	1312.1000			
	1348.5000	1348.6000			
	1358.6000	1358.9000			
	1361.6000	1361.0000			
	1366.1000	1365.2000			
	1370.0138	1369.7000			
	1371.4000	1371.7000			
	1381.0000	1381.2000			
	1389.3000	1389.3000			
	1403.0000	1403.0000			
	1403.6000	1403.9000			
	1404.8000	1405.3000			
	1420.8000	1420.9000			
	1424.1733	1423.8000			
	1425.4000	1425.4000			
	1437.9000	1437.9000			
	1447.5000	1447.6000			
	1462.7000	1462.8000			
	1466.5000	1467.0000			
	1497.8000	1498.3000			
	1507.0000	1507.3000			
	1611.8000	1612.3000			
	1647.7372	1648.0000			
	1652.9000	1652.9000			
	1686.2000	1686.3000			
	1692.5099	1692.9000			
	1700.2000	1700.5000			
	1793.6000	1793.9000			
	1796.0000	1796.0000			
	1813.0000	1812.7000			
	1826.5000	1826.0000			
	1828.9000	1828.1000			
	1832.5000	1832.3000			
	1891.5000	1891.3000			
	1906.0000	1906.0000			
	1912.1000	1912.1000			
	1938.3000	1938.4000			
	1963.2000	1963.6000			
	1987.1000	1987.4000			
	2020.6000	2019.7000			
	2028.9696	2027.8000			
	2035.4407	2035.7000			
	2038.1000	2038.1000			
	2072.5000	2072.9000			
	2151.0000	2151.0000			
	2154.0538	2154.1000			
	2154.4239	2154.7000			
	2160.0000	2160.2000			
	2206.2000	2206.2000			
	2467.1000	2466.9000			
	2816.8000	2816.4000			
	2840.7000	2840.0000			
	2896.6000	2896.4000			
	2957.9000	2957.3000			
	2958.9000	2958.9000			
	2968.1000	2968.5000			
	2999.9000	3001.4000			
	3023.3000	3024.8000			
	3039.6000	3039.1000			
	3068.1000	3067.8000			
	3085.6000	3085.6000			
	3100.2702	3099.0000			
	3108.2000	3108.4000			
	3120.7000	3120.9000			

Resistivity Shift 2

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VERSION 2.00
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STOP .M              3236.9:  STOP DEPTH
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COMP .               :  COMPANY
WELL .              THYLACINE_SOUTH-1:  WELL
FLD .               :  FIELD
LOC .               :  LOCATION
PROV .              :  PROVINCE
UWI .               :  UNIQUE WELL ID
SRVC .              :  SERVICE COMPANY
DATE .              :  LOG DATE
~Curve Information Block
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DEPTH_COR.M          :
~Parameter Information Block
#MNEM.UNIT           Value  Description
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~Other Information Block
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        680.6000    680.8000
        683.4000    683.3000
        719.0367    718.9000
        724.0000    724.2000
        783.5000    786.0000
        789.3000    791.6000
        804.2299    804.3000
        812.2000    812.0000
        861.3000    861.2000
        956.9000    956.6000
        986.2000    985.6000
        1003.6340   1003.2000
        1007.2000   1006.8000
        1030.1000   1029.7000
        1044.2000   1043.3000
        1062.1000   1061.8000
        1070.2000   1069.6000
        1092.4000   1092.1000
        1127.2000   1126.9000
        1130.0000   1129.2000
        1132.6090   1131.7000
        1138.6000   1138.1000
        1231.0000   1230.8000
        1305.0040   1304.9000
        1306.0000   1306.1000
        1325.6000   1325.4000
        1334.8000   1334.3000
        1340.3000   1339.9000
        1358.8000   1358.6000
        1406.0000   1405.8000
        1447.8000   1447.6000
        1451.2000   1450.8000
        1498.1000   1498.0000
        1724.0000   1723.9000
        1793.9000   1793.4000
        1803.7000   1802.5000
        1804.9535   1804.8000
        1811.4000   1811.1000
        1815.9000   1816.3000
        1832.2000   1832.8000
        1889.3000   1889.7000
        1912.2000   1912.3000
        1987.6000   1987.4000
        2028.0000   2027.8000
        2072.9000   2073.0000
        2151.3000   2151.2000
        2816.6000   2815.8000
        2892.8380   2893.6000
        2896.2000   2896.3000
        2919.7000   2919.5000
        2925.4000   2925.4000
        2968.5000   2968.7000
        3000.4000   3001.3000
        3008.3000   3009.0000
        3050.5000   3050.4000
        3067.8000   3068.0000
        3075.9725   3076.2000
        3078.6286   3078.6000

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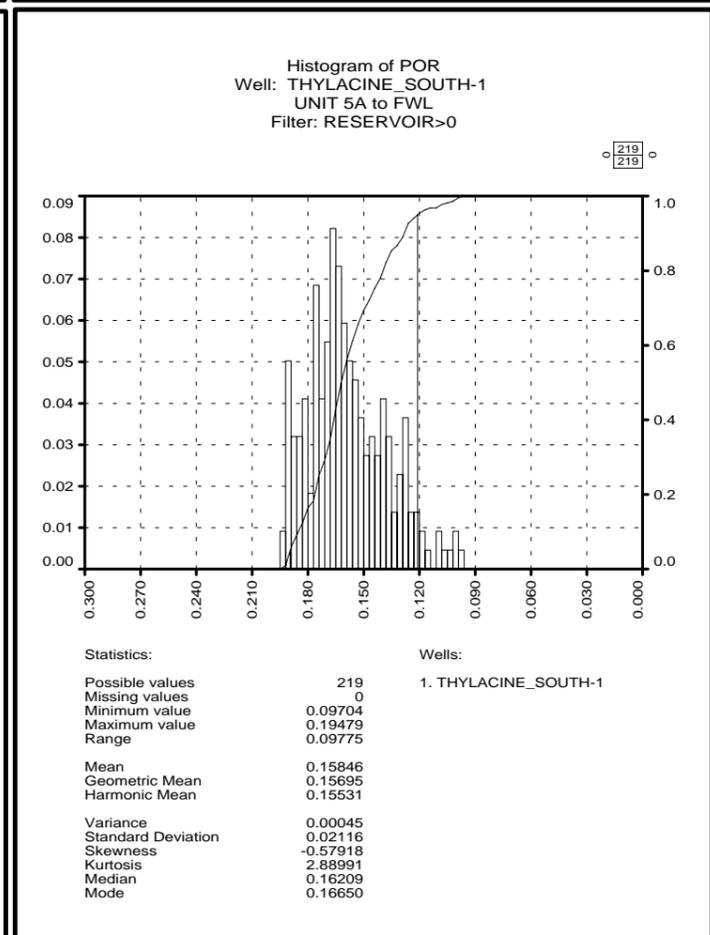
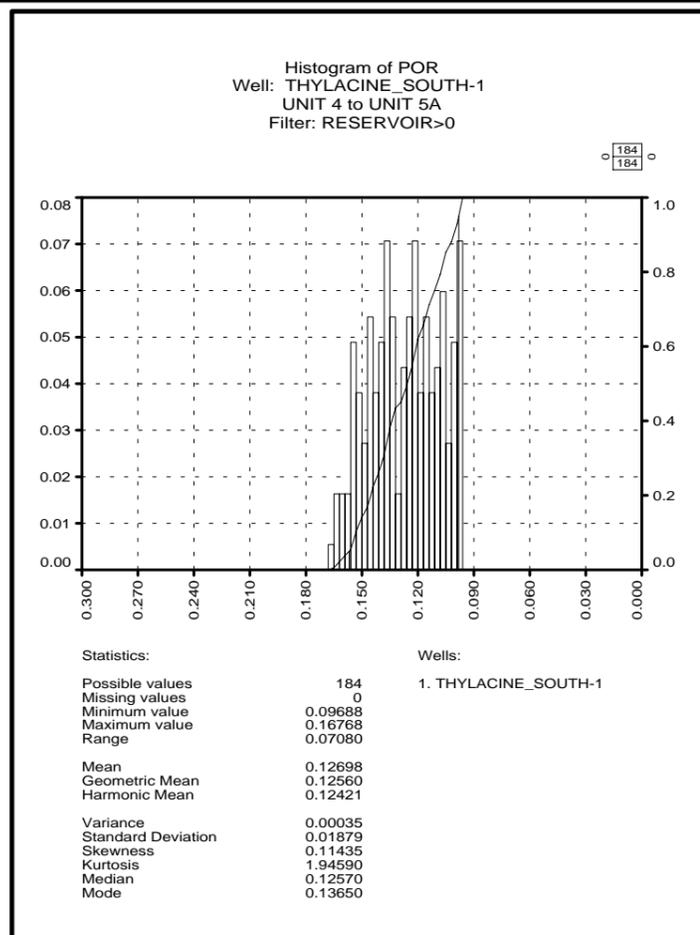
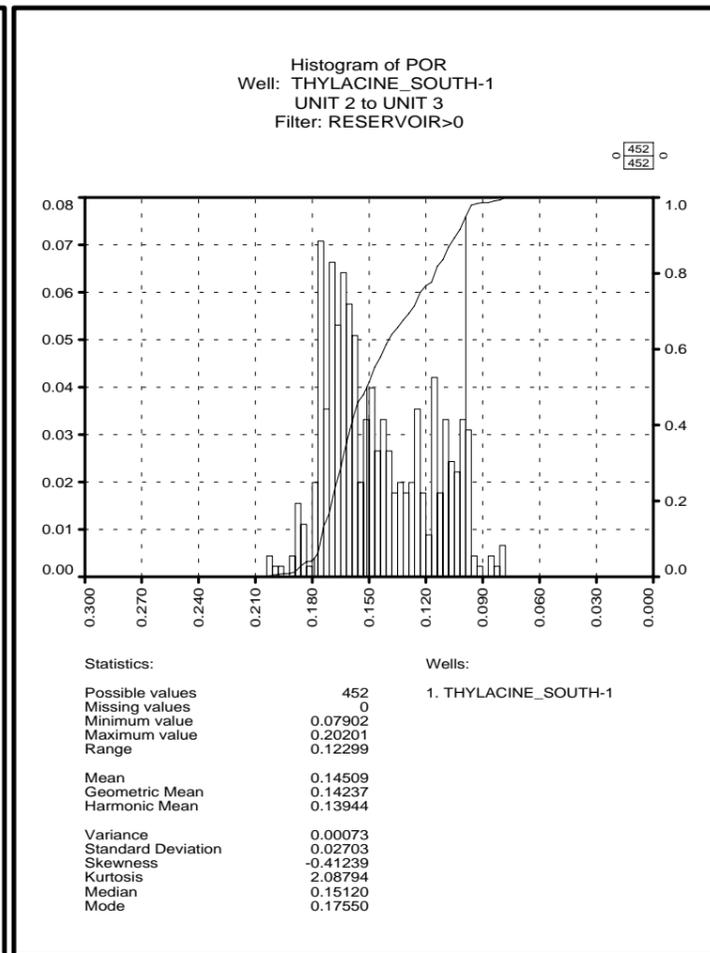
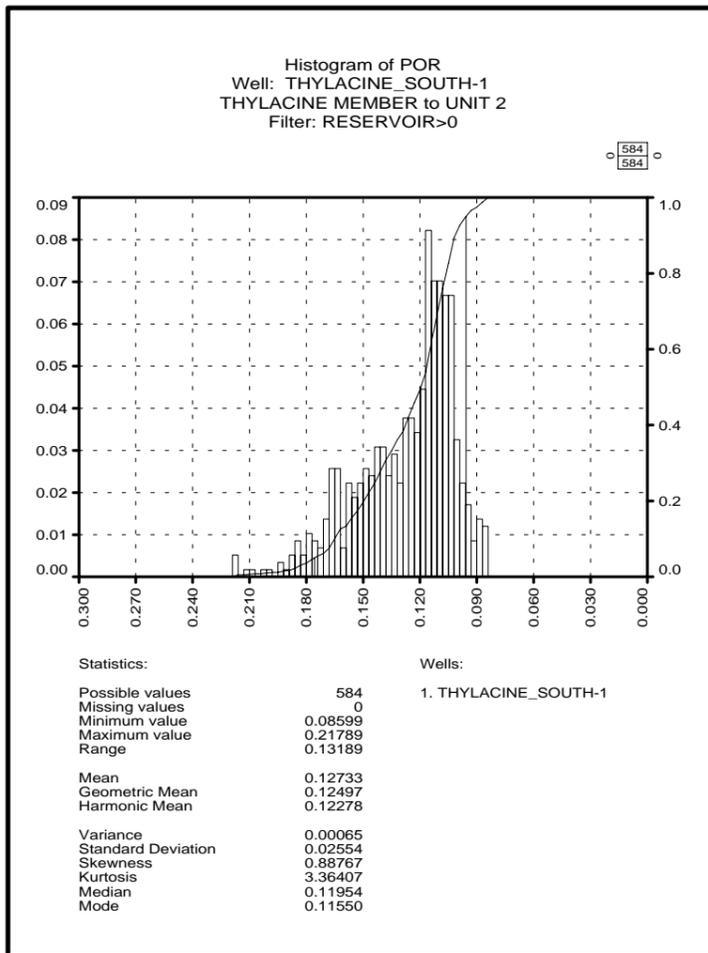
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MDT Shift

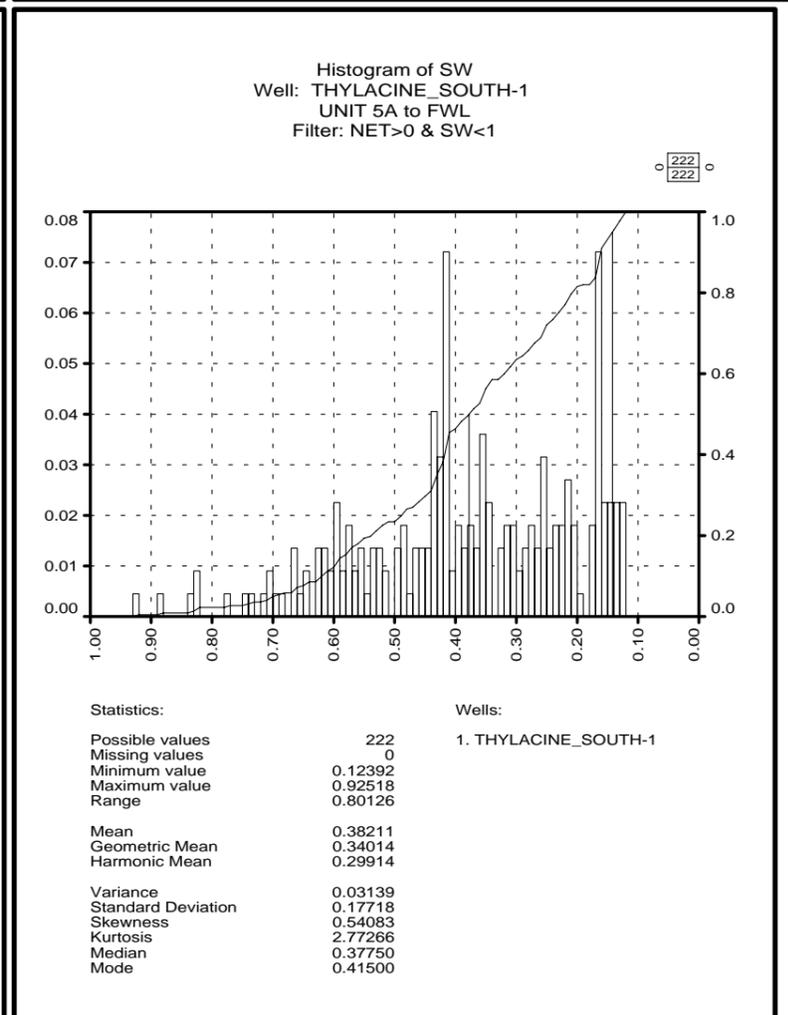
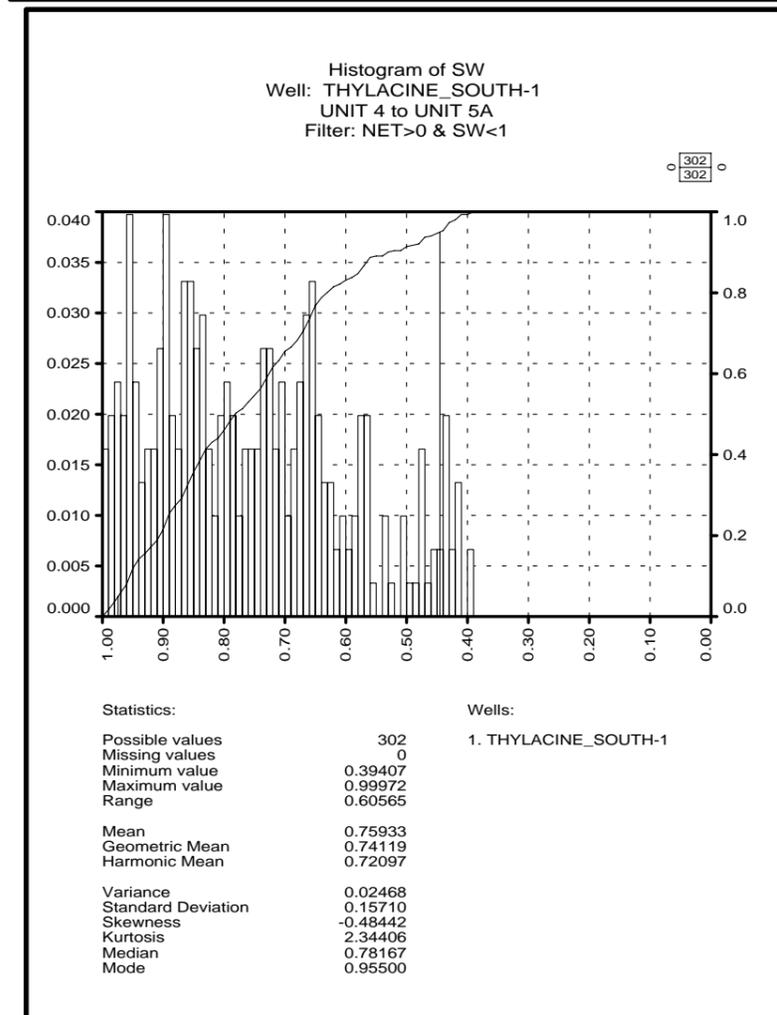
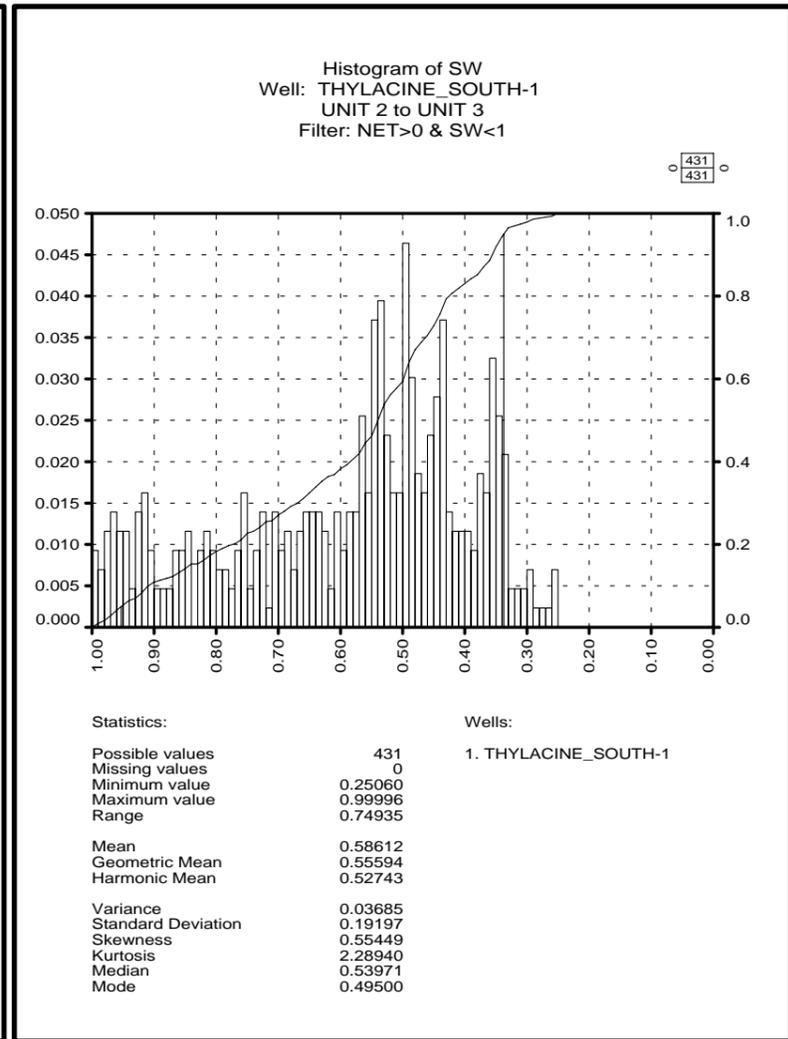
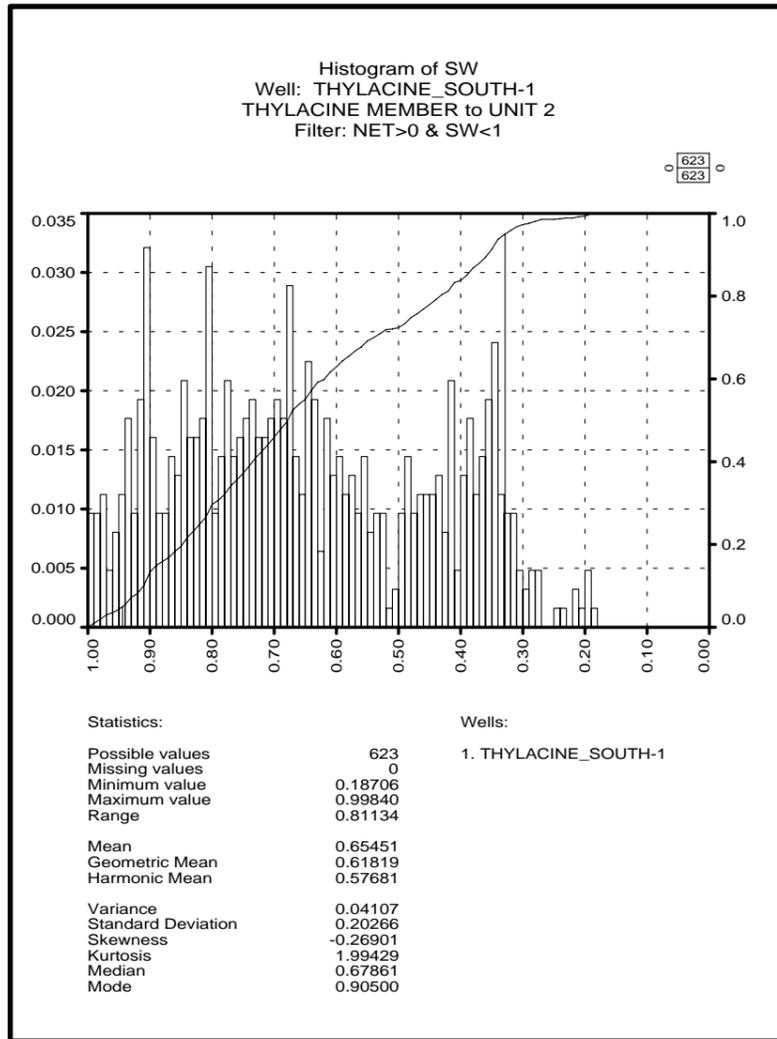
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VERSION 2.00
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~Well Information Block
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STOP .M              3207.9:  STOP DEPTH
STEP .M              0:      STEP
NULL .              -999.25:  NULL VALUE
COMP .               :      COMPANY
WELL .              THYLACINE_SOUTH-1:  WELL
FLD .               :      FIELD
LOC .               :      LOCATION
PROV .              :      PROVINCE
UWI .               :      UNIQUE WELL ID
SRVC .              :      SERVICE COMPANY
DATE .              :      LOG DATE
~Curve Information Block
#MNEM.UNIT           API CODE   Curve Description
#-----
DEPTH.M              :
DEPTH_COR.M         :
~Parameter Information Block
#MNEM.UNIT           Value     Description
#-----
SET .                SHIFT_PRESSURES:
~Other Information Block
~A      DEPTH        DEPTH_COR
      2804.0000      2807.6576
      2811.3228      2814.9804
      2821.0764      2825.1912
      2873.0448      2876.8548
      2886.6084      2889.9612
      2979.5724      2982.9252
      2993.5932      2997.8604
      3037.4626      3041.1420
      3071.7616      3076.6512
      3089.3004      3094.3296
      3207.9000      3212.9292

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Figures 7 – 10: Net porosity distributions for Unit 1, 2, 4 & 5.

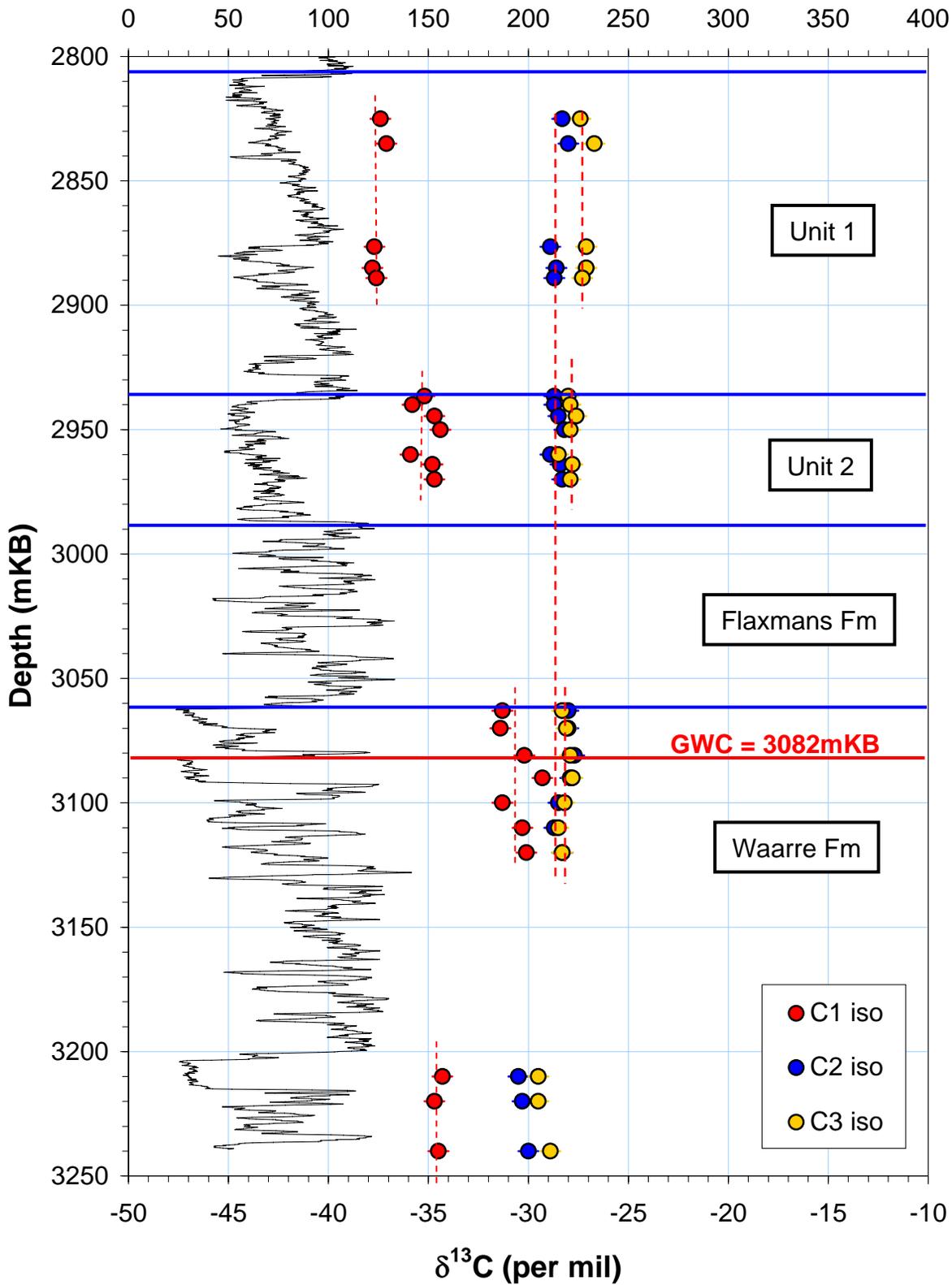


Figures 11 – 14: Net water saturation distributions for Unit 1, 2, 4 & 5.

MGIL Interpretation

Thylacine South-1 MGIL Profile

GR (API)



MDT Interpretation Report

Company **Woodside Energy Ltd**

Schlumberger

Well Name **Thylacine South-1**

Field Name **Thylacine South**

Field Location **Permit: T/30P & T/L2**

Engineer's Name **Tim Hopper / Ron Clark**

Date **8-Apr-2005**

Interpreted by Miguel Muruais

Modular Formation Dynamics Tester

Level-0 Quick Look Interpretation Report



**Innovations in
Formation Testing**

PD Plot 6

Ver 6.0.211

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Well Path Plots	12

MDT was run in Thylacine South-1 with the objectives of measuring pressures and recovering hydrocarbon samples from four intervals:

- **Thylacine Sandstone Member** (Top @ 2155.07m TVDSS ,, 2803.65m MD)
- **Belfast Formation** (Top @ 2296.17m TVDSS ,, 2982.34m MD)
- **Flaxman Formation** (Top @ 2299.43m TVDSS ,, 2986.39m MD)
- **Waarre Formation** (Top @ 2359.03m TVDSS ,, 3058.51m MD)

In order to fulfill this goal, 47 pressure tests and 2 sampling stations were attempted. Out of the 47 pretests, 31 were valid, 10 were dry and 5 were lost seals. 18 pressures were used for gradients interpretation; the other 14 tests were either supercharged or prematurely stopped before reaching a stable reliable pressure reading.

Thylacine: 22 pressure tests attempted. Recorded mobility range is 0.1 - 34.69 md/cp. A gas gradient of 0.245 psi/m derived from this interval. Assuming a single water system throughout the survey, the GWC would be found at 2280.6m TVDSS.

Belfast: No pretests were conducted in this interval.

Flaxman: 9 pressure tests attempted. Recorded mobility range is 0.47 - 27.38 md/cp. Pressure gradient could not be derived due to insufficient data, but out of the two valid points in this interval, one falls on the water baseline and the other falls above it, suggesting possible hydrocarbons.

Waarre: 16 pressure tests attempted. Recorded mobility range is 2.5 - 957.93 md/cp. Only one dry test. A gas gradient of 0.234 psi/m and water gradient of 1.373 psi/m derived from this interval. The GWC was found at 2377.0m TVDSS.

Four hydrocarbon samples were recovered from two sampling depths using the low-shock sampling technique. Downhole fluid analysis (DFA) was carried out using LFA.

2811.0m MD (2160.7m TVDSS): 1 x 450 cc gas sample. Drawdown kept within 85 psi from formation pressure. DFA confirms that reservoir fluid is gas.

3060.0m MD (2360.3m TVDSS): 3 x 450 cc gas samples recovered. Drawdown kept within 20 psi below formation pressure. DFA confirms that reservoir fluid is gas. OBM contamination potentially high due to insufficient cleanup.

Note: After a first unsuccessful attempt to run the tool on wireline, it was then conveyed on drillpipe to acquire the data.

Pressure Gradients

Formation Gradients

Formation	Gradient PSI/M	Density g/cc		R ²	STD PSIA
Formation Pressure Lines					
	-0.234	0.164		0.9927	0.1900
	-0.245	0.172		1.0000	0.0000
	-1.373	0.965		0.9997	1.2400

Mud Column Gradients

Formation	Gradient PSI/M	Density lb/gal		R ²	STD PSIA
Mud Before Lines					
	-1.737	10.192		0.9880	18.4200
Mud After Lines					
	-1.729	10.147		0.9907	15.8900

Test Point Table

File No.	Test No.	Test MD	Test TVD	Test Subsea	Formation Pressure	Mud Before	Drawdown Mobility	Test Type	Mud After
		M	M	M	PSIA	PSIA	md/cp		PSIA
75	2	2804.00	2205.79	-2155.29	2789.07	3979.5	0.38	Volumetric Limited draw-down	3980.84
74	1	2804.55	2206.22	-2155.72	2736.82	3979.27	0.26	Volumetric Limited draw-down	3981.08
125	73	2811.02	2211.22	-2160.72	3316.95	3984.76	34.69	Normal Pretest	
124	72	2811.50	2211.6	-2161.1		3987.26		Dry Test	3987.25
76	4	2811.52	2211.61	-2161.11	3317.05	3989.31	22.34	Volumetric Limited draw-down	3989.7
77	5	2821.91	2219.67	-2169.17	2899.39	4003.11	0.61	Volumetric Limited draw-down	4003.86
80	7	2830.01	2225.96	-2175.46		4013.59		Dry Test	4013.49
79	6	2831.04	2226.77	-2176.27		4013.34		Lost Seal	4013.38
82	9	2835.54	2230.26	-2179.76		4020.54		Lost Seal	4020.34
81	8	2835.98	2230.6	-2180.1		4020.03		Lost Seal	4018.92
83	11	2874.07	2260.38	-2209.88	3327.78	4063.79	1.18	Volumetric Limited draw-down	4066.95
84	13	2880.01	2265.05	-2214.55	3329.87	4075.45	0.66	Normal Pretest	4077.7
86	16	2884.62	2268.68	-2218.18	3329.45	4088.32	0.99	Volumetric Limited draw-down	4086.52
85	14	2885.17	2269.11	-2218.61		4085.98		Lost Seal	4085.17
87	17	2916.06	2293.55	-2243.05		4124.01		Dry Test	4123.92
88	18	2917.45	2294.66	-2244.16		4130.05		Dry Test	4128.76
89	19	2919.14	2296	-2245.5		4134.43		Dry Test	4132.9
90	21	2936.06	2309.52	-2259.02	3341.04	4153.25	7.89	Volumetric Limited draw-down	4153.29
92	23	2951.10	2321.56	-2271.06	3344.78	4175.39	0.9	Volumetric Limited draw-down	4177.02
93	25	2959.18	2328.03	-2277.53	3347.75	4187.76	1.12	Volumetric Limited draw-down	4188.77
94	27	2967.96	2335.08	-2284.58	3375.32	4201.66	0.46	Normal Pretest	4201.01
122	71	2972.99	2339.12	-2288.62	3365.79	4218.17	0.1	Normal Pretest	4212.57
95	28	2980.53	2345.18	-2294.68		4218.28		Dry Test	4216.34
96	29	2981.49	2345.96	-2295.46		4222.54		Lost Seal	4220.08
97	31	2996.19	2357.82	-2307.32	3393.91	4238.84	8.65	Volumetric Limited draw-down	4238.85
98	33	3012.46	2371.1	-2320.6	3402.99	4261.67	27.38	Volumetric Limited draw-down	4261.91
99	34	3019.89	2377.21	-2326.71		4273.25		Dry Test	4272.79
100	36	3026.53	2382.71	-2332.21	3430	4282.79	0.47	Normal Pretest	4284.1
121	69	3032.00	2387.25	-2336.75		4302.91	0.13	Dry Test	4299.22
120	68	3032.40	2387.58	-2337.08		4303.97		Dry Test	4301.97
119	67	3032.57	2387.73	-2337.23	3398.72	4304.49	0.16	Volumetric Limited draw-down	4301.73
104	42	3060.02	2410.77	-2360.27	3474.52	4344.79	137.58	Volumetric Limited draw-down	4339.5
101	38	3060.21	2410.92	-2360.42	3474.93	4330.96	957.93	Volumetric Limited draw-down	4229.71
103	41	3068.05	2417.53	-2367.03	2021.56	4225.91	51.17	Volumetric Limited draw-down	4345.95
105	43	3068.07	2417.54	-2367.04	3475.89	4346.7	3.17	Volumetric Limited draw-down	4348.6
106	45	3073.04	2421.74	-2371.24	3477.24	4360.02	9.47	Volumetric Limited draw-down	4355.2
107	47	3078.03	2425.96	-2375.46	3478.27	4366.54	113.55	Volumetric Limited draw-down	4361.94
108	49	3086.00	2432.7	-2382.2	3484.9	4375.17	93.59	Volumetric Limited draw-down	4371.53
109	51	3088.02	2434.42	-2383.92	3487.14	4380.93	171.73	Volumetric Limited draw-down	4376.32
110	53	3095.17	2440.5	-2390	3496.52	4388.88	11.48	Volumetric Limited draw-down	4385.71
111	55	3101.98	2446.32	-2395.82	3503.95	4398.36	64.3	Volumetric Limited draw-down	4395.13
112	57	3105.53	2449.35	-2398.85	3508.55	4403.84	2.5	Volumetric Limited draw-down	4401.57
113	58	3112.91	2455.68	-2405.18		4415.56		Dry Test	4412.94
114	60	3113.34	2456.05	-2405.55	3520.75	4418.97	3.77	Volumetric Limited draw-down	4414.27
115	62	3199.45	2531.38	-2480.88	3621.06	4541.42	68.57	Volumetric Limited draw-down	4542.28
116	64	3203.96	2535.33	-2484.83	3626.48	4554.16	503.9	Volumetric Limited draw-down	4551.35
117	66	3207.92	2538.81	-2488.31	3631.17	4560.73	32.32	Volumetric Limited draw-down	4558.23

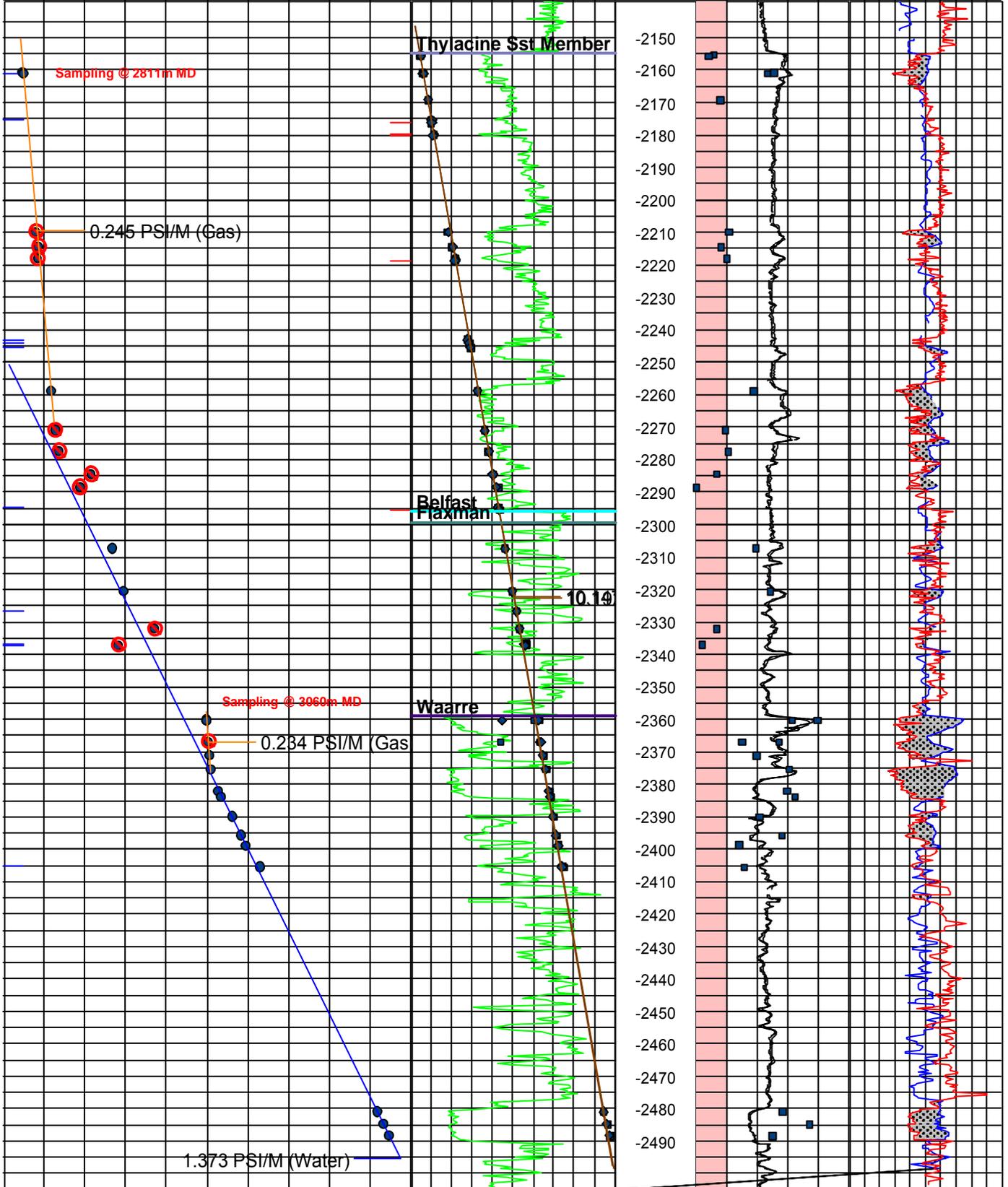
Note: Tests marked in red have not been used for gradients interpretation, as they are supercharged

COMPANY:		Woodside Energy Ltd						
WELL:		Thylacine South-1						
FIELD:		Thylacine South						
Rig:		Maersk Guardian			State:		Australia	
Rig: Maersk Guardian Field: Thylacine South Location: Permit: T/30P & T/L2 Well: Thylacine South-1 Company: Woodside Energy Ltd				MDT-GR				
				Modular Formation Dynamic Tester				
				Pretest Print				
	Location			Permit: T/30P & T/L2		Elev: K.B. 50.5 M		
				Eastings (m): 664 161.00		G.L. -99.3 M		
			Northing (m): 5 655 156.80		D.F. 50.5 M			
			Permanent Datum:		LAT		Elev: 0 M	
			Log Measured From:		D.F.		50.5M above Perm. Datum	
			Drilling Measured From:		D.F.			
			State:		Max Deviation		Latitude	Longitude
			Australia		48.50 deg		39 14' 14.560"S	142 54' 7.580"E
Logging Date			8/04/2005					
Run Number			Suite-1,Run-1,2					
Depth Driller			3245 M					
Schlumberger Depth			999 M					
Bottom Log Interval			3207.9 M					
Top Log Interval			2804 M					
Casing Drilling Size			@ Depth	18.63 in	633 M			
Casing Schlumberger			999 M					
Bit Size			12.25 in					
Type Fluid in Hole			SBM (Amodrill 1235)					
Mud	Density	Viscosity	1.25 lb/gal	36 cp				
	Fluid Loss	PH	2.4 ml	1				
	Source of Sample		PIT					
RM	@ Measured Temperature	1	@ -17.8 DEGC			@		
RMF	@ Measured Temperature	1	@ -17.8 DEGC			@		
RMC	@ Measured Temperature	1	@ -17.8 DEGC			@		
Source RMF		Source RMC		PRESS	PRESS			
RM	@ MRT	RMF	@ MRT	0.17	114.4 DEGC	0.17	114.4 DEGC	
Maximum Recorded Temperatures			114.4 DEGC		-17.8 DEGC	-17.8 DEGC		
Circulation Stopped			Time	6/04/2006	1:20			
Logger On Bottom			Time	9/04/2006	1:30			
Unit Number		Location		571	AUSL			
Recorded By			Tim Hopper / Ron Clark					
Witnessed By			Dave Thorton / John Hobday					

P vs D - General

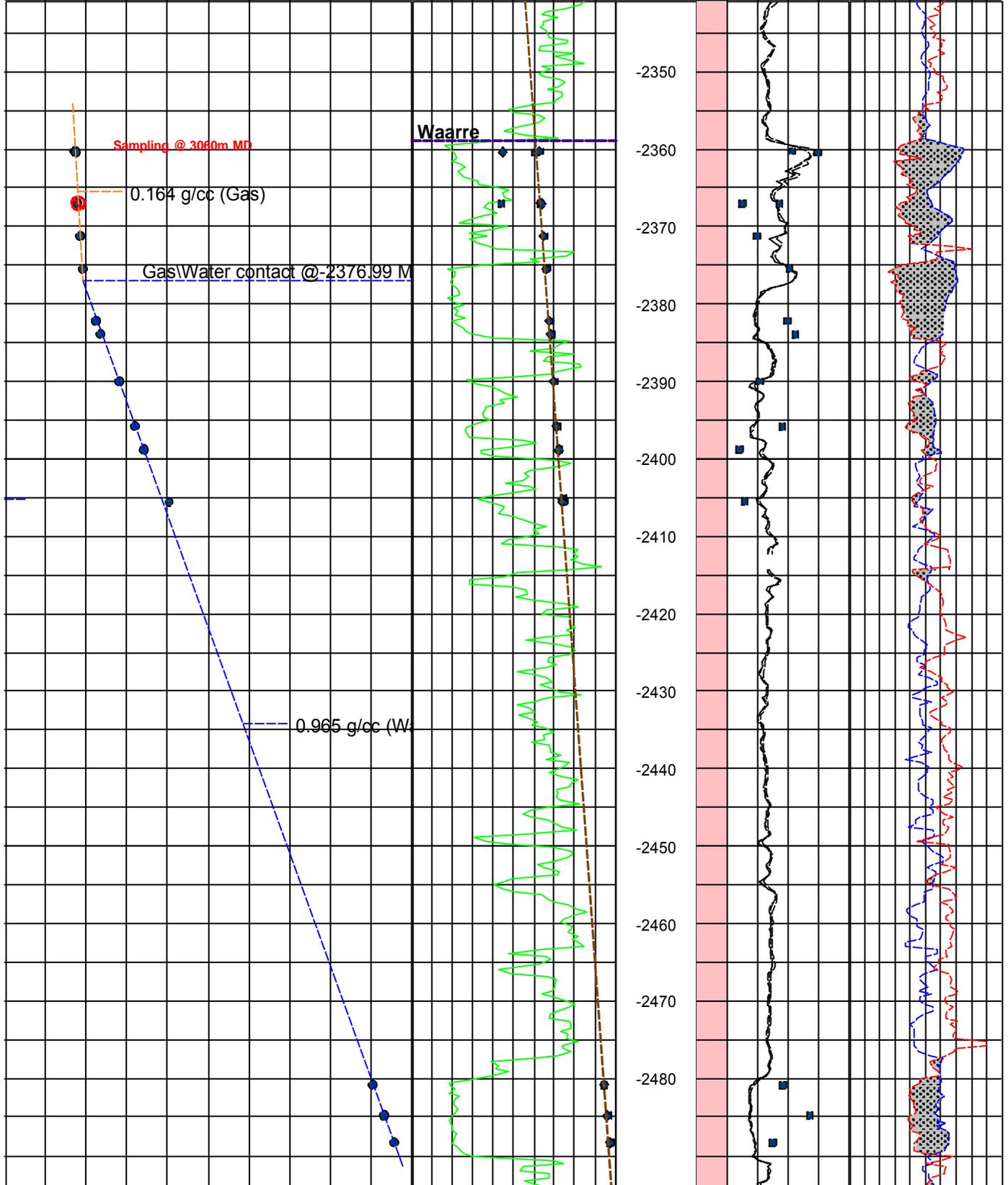


3300 Dry Test	FORMATION (BQP1 psia)	3650	MUD BEFORE (BQP1 psia)	1:1629 (m) ss	SESP 0.1 1000	TNPL (v/v) 0.45 -0.15
	Lost Seal 3950 4575	MUD AFTER (BQP1 psia) 3950 4575	SGRC 0 150	SEDP 0.1 1000	SBD2 (g/cc) 1.95 2.95	
					DRAWDOWN MOBILITY (BQP1) 0.1 10000	



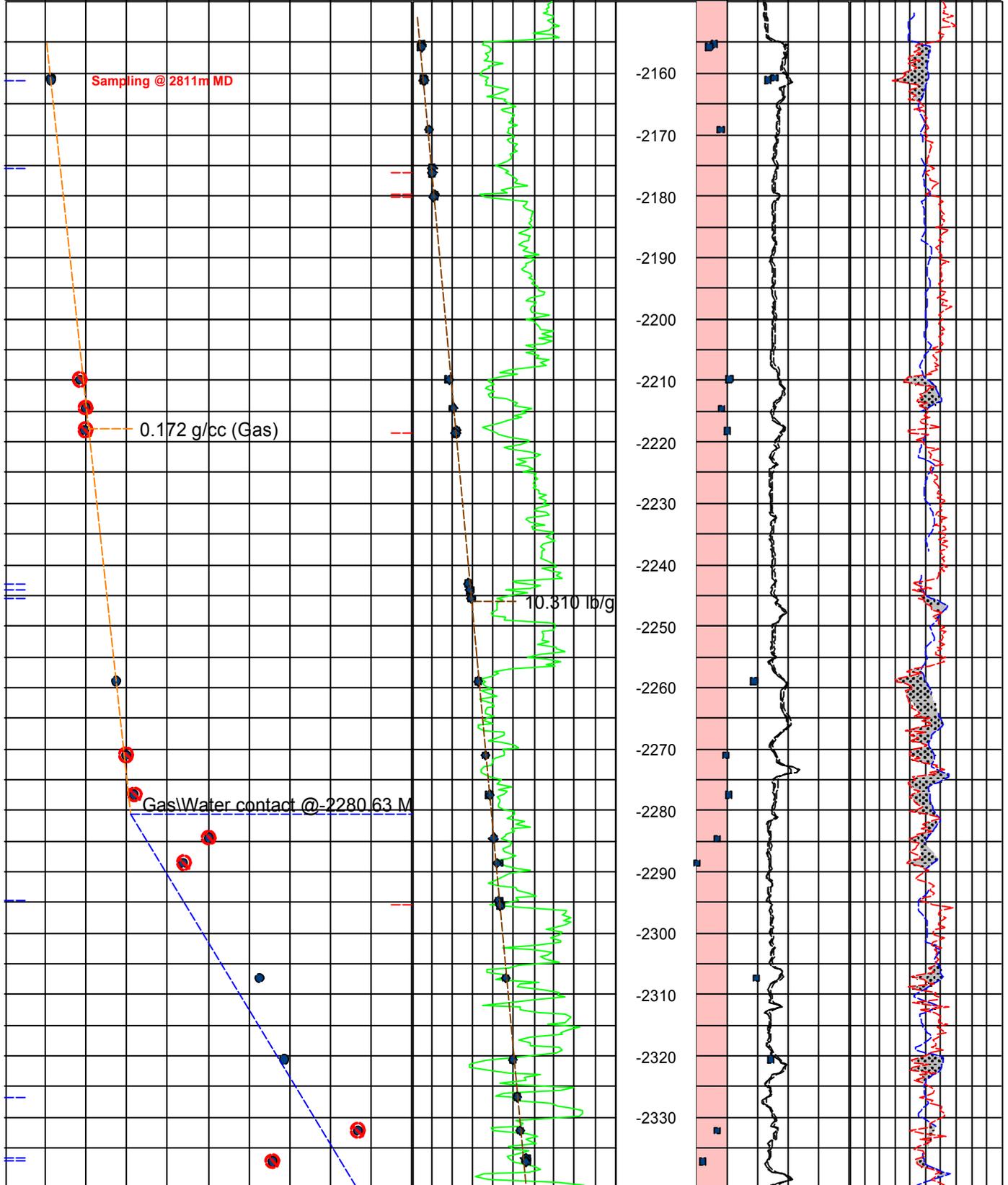
P vs D - Lower interval

3440 Dry Test	FORMATION (BQP1 psia)	3640	MUD BEFORE (BQP1 psia)	1:682 (m) ss	SESP	TNPL (v/v)
	Lost Seal	3950	4575		0.1 1000	0.45 -0.15
	MUD AFTER (BQP1 psia)	3950	4575		SEDP	SBD2 (g/cc)
					0.1 1000	1.95 2.95
	SGRC	0	150		DRAWDOWN MOBILITY (BQP1)	
					0.1 10000	



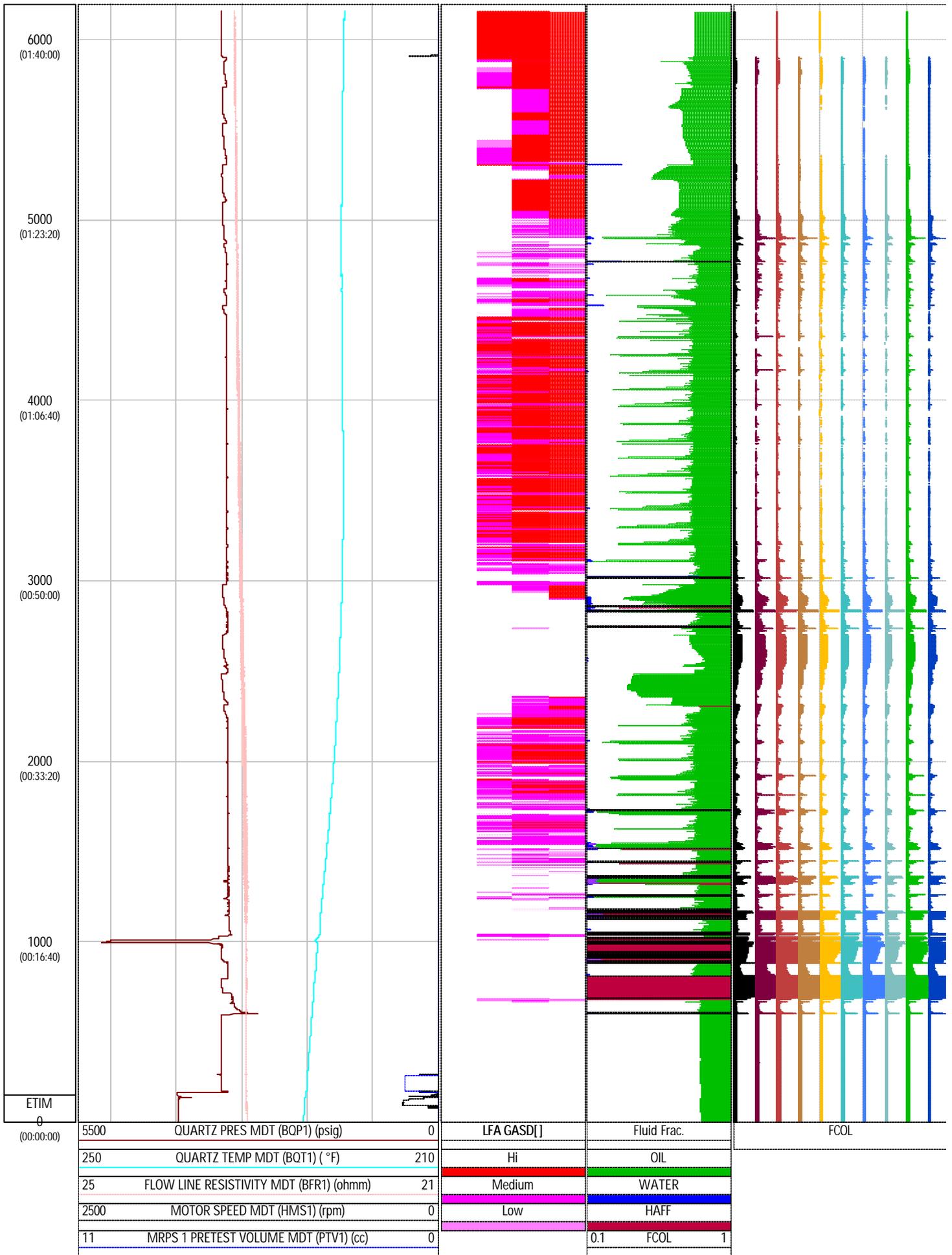
P vs D - Upper interval

3300 Dry Test	FORMATION (BQP1 psia)	3450	MUD BEFORE (BQP1 psia)	1:860 (m) ss	SESP	TNPL (v/v)
	Lost Seal	3950	4575		0.1 1000	0.45 -0.15
	MUD AFTER (BQP1 psia)	3950	4575		SEDP	SBD2 (g/cc)
					0.1 1000	1.95 2.95
	SGRC	0	150		DRAWDOWN MOBILITY (BQP1)	
					0.1 10000	

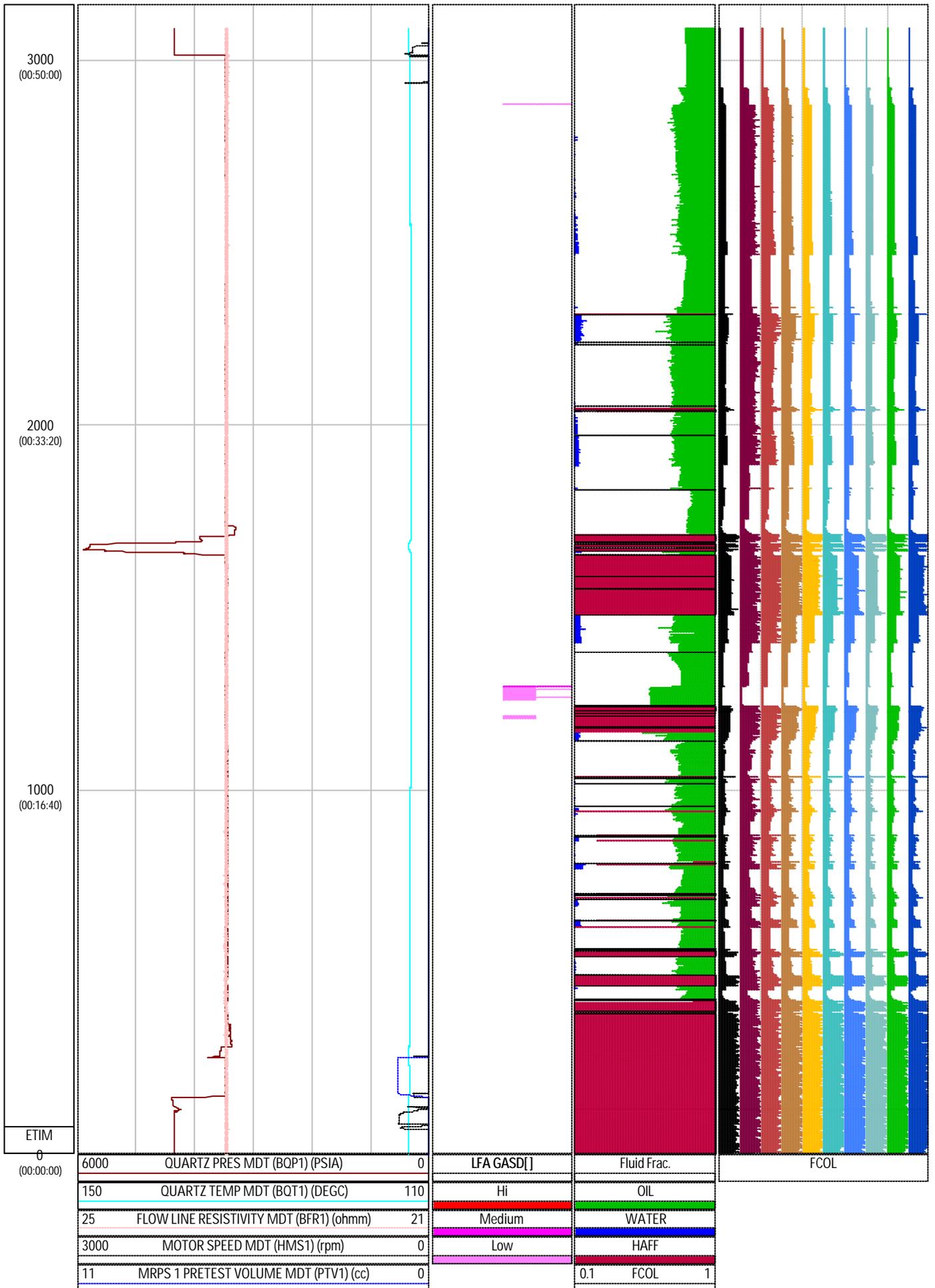


Thylacine South-1

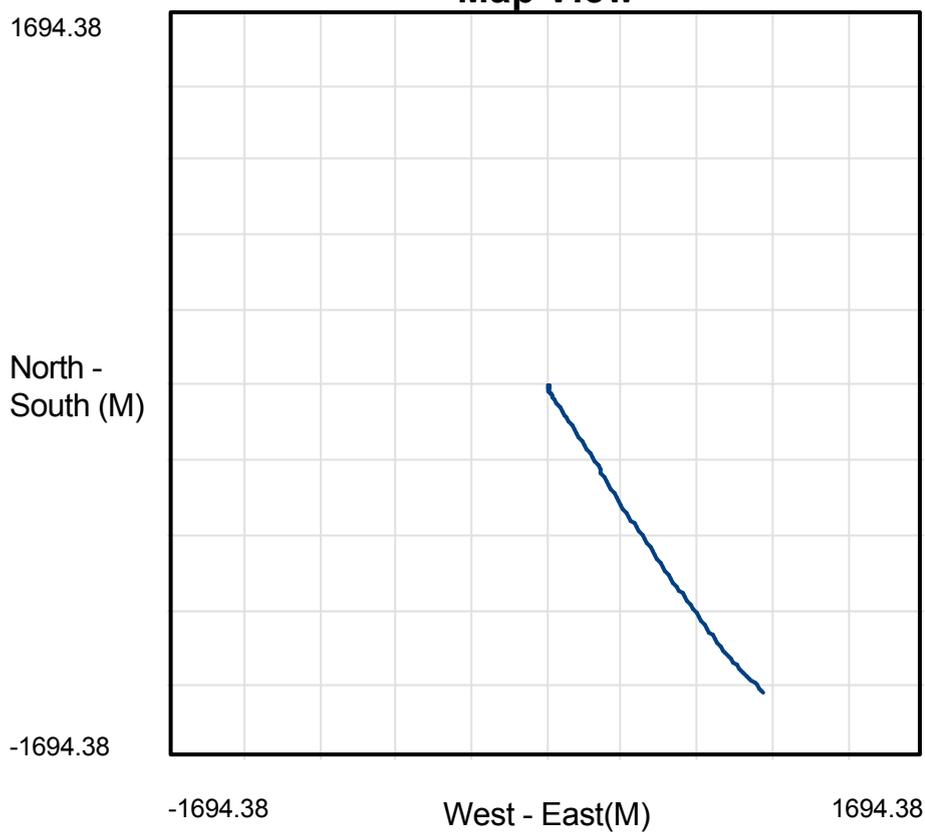
LFA Analysis Plot File 0 Test 73 2811.02 m (MD)



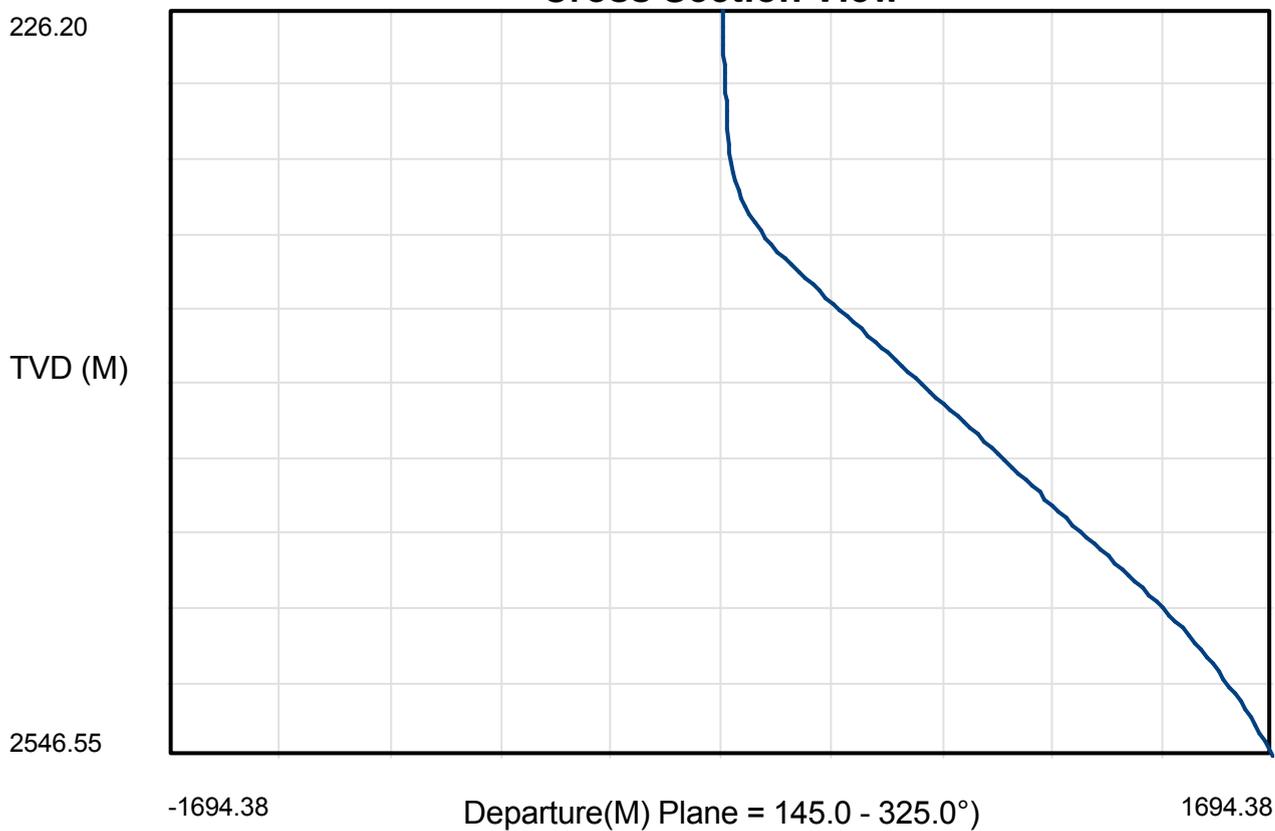
LFA Analysis Plot File 0 Test 42 3060.02 M (MD)



Map View



Cross Section View



Fluid Analysis Interpretation Report

MEMORANDUM

TO : Steve Twartz
FROM : Darren Hunter
c.c. : Otway Subsurface Team, Mark Taylor
DRIMS Ref : 2442832
DATE : 16 March 2006
SUBJECT : **Otway: Thylacine-South-1 Gas Compositions for Unit 1 and Unit 5 with a view to the Southern Block Connectivity to the Main Block**

1 Executive Summary

Subsurface samples have been acquired and analysed from Units 1 and 5 of the Thylacine South Appraisal well. The purpose of the analysis was to determine the gas compositions and make a judgement on the potential for the gas to be of the same origin as the Thylacine Main Block gas and whether or not the two blocks were in communication. Formation pressure data were also used to make this assessment.

Initial sample analysis determined that there were high levels of OBM contamination in all samples.

The Unit 1 gas in the Thylacine South is both of similar composition and in the same pressure regime as the Thylacine-1 main block gas column. The concentrations of the C7+ fractions are much lower than for the Main Block samples but this is thought to be due to combined errors in acquisition, transfer and analysis although this is not proven. It is postulated that the Unit 1 gas is in pressure communication and of similar composition to the gas found in the main block.

The Unit 5 gas in the Thylacine South carries much more ambiguity as it has a slightly more dissimilar composition to the Main block gas. Combined with the offset in its pressure regime by 100psi it has been postulated that the Unit 5 gas is a separate pool and is likely to have a slightly different composition than the main block gas with a higher methane concentration. The Unit 5 gas will not be developed due to a low GIIP.

The results of this analysis do not impact the Otway project development and should be sufficient for the purposes of a Production License application for the Thylacine South block.

2 Data Acquisition

2.1 Thylacine_South Description

The Thylacine South block is an extension of the Thylacine Block located in licence block TL-2. The Thylacine South Block extends into graticular blocks 2867 and 2866 within the Exploration Permit T/30P as shown in Figure 1.

The Thylacine South 1 (TS1) Well was drilled in April/May 2006 and penetrated Units 1, 2, 4 and 5 as shown in the annotated well logs in Figure 2.

2.2 Formation Pressure Data and Sample Capture

Formation pressures (Ref 1) were taken in all units and are plotted in Figure 3. The plot shows the TS1 Units 1 and 2 pressure data to lie on the same pressure gradient as the Thylacine-1 gas pressures. Unit-4 pressures are offset from this gradient and could be interpreted as either a water gradient (albeit with some noise) or three pressure separated gas columns. The gas column found in Unit 5 is offset from the gradient observed in Thylacine-1 and TS1 units 1 and 2 by 110 psi. Underlying the Unit 5 gas is an aquifer, the pressure gradient through which is offset from the common aquifer observed in Thylacine-1 and Thylacine-2 by 25 psi.

Three samples were taken from the Unit 5 sand and three samples were taken from the Upper sand in Unit 1. Of the three samples taken from Unit 1 only one was successful.

The four valid samples were handled by Corelab in Perth, WA. Upon arrival the samples were QC'd, heat treated, checked for water/filtrate and transferred to Corelab's piston cylinders. The QC data is tabulated in Table 1.

Sample Number	Cylinder Number	Unit	Laboratory Opening		Free water Recovered (cc)	Sample Volume (cc)
			Pressure (psig)	Temp (degC)		
POS 1	SN 2055	5	3990	16.0	70	320
POS2	N 2055	5	3980	16.0	10	360
POS 3	SN 2057	5	3991	16.2	6	340
POS 4	SN 2100	1	3820	16.4	25	320

Table 1. Sample Transfer Data for the four valid gas samples in the Thylacine South 1 well.

Of the four samples the Unit 1 sample (SN 2100) and a Unit 5 sample (SN 2057) were subjected to Flash Chromatography analysis.

3 Gas Composition

3.1 Analysis

The results of the gas chromatography showed significant levels of OBM contamination in both samples with C12+ concentrations of 2.5 mol% and 2.4 mol% in the Unit 1 and Unit 5 respectively. This compares unfavourably with an average C12+ concentrations of 0.1 mol% from 12 samples in the previous two appraisal wells.

The relative concentrations were corrected to yield a C12+ concentration for 0.1 mol%. The raw compositions and the corrected compositions are shown in Table 2. For comparison the representative fluid samples from Thylacine -1 and Thylacine-2 (Ref 2) are also shown.

		Corrected for C12+ Contamination						
		Thy1 PT-4001	Thy2 SN-193	Thy2 SN-157	raw TS1 MPSR-2057	raw TS1 MPSR-2100	corr TS1 MPSR-2057	corr TS1 MPSR-2100
		Unit 1 mol%	Unit 1 mol%	Unit 2 mol%	Unit 5 mol%	Unit 1 mol%	Unit 5 mol%	Unit 1 mol%
Hydrogen	H2							
Hydrogen Sulphide	H2S							
Nitrogen	N2	1.38	1.25	1.39	1.65	1.55	1.69	1.59
Carbon Dioxide	CO2	9.29	8.8	8.22	7.05	8.77	7.22	8.99
Methane	C1	81.13	83.9	80.6	84.89	79.26	86.92	81.24
Ethane	C2	4.88	3.64	5.56	2.12	4.92	2.17	5.04
Propane	C3	1.61	1.07	2.09	0.96	1.75	0.98	1.79
i-Butane	iC4	0.29	0.18	0.41	0.12	0.29	0.12	0.30
n-Butane	nC4	0.39	0.26	0.51	0.21	0.37	0.22	0.38
i-Pentane	iC5	0.15	0.1	0.21	0.06	0.15	0.06	0.15
n-Pentane	nC5	0.11	0.07	0.15	0.05	0.10	0.05	0.10
Hexanes	C6	0.14	0.11	0.19	0.07	0.11	0.07	0.11
Heptanes	C7	0.23	0.19	0.26	0.12	0.11	0.12	0.11
Octanes	C8	0.21	0.21	0.22	0.13	0.06	0.13	0.06
Nonanes	C9	0.06	0.08	0.06	0.07	0.01	0.07	0.01
Decanes	C10	0.03	0.03	0.03	0.04	0.01	0.04	0.01
Undecanes	C11	0.02	0.02	0.02	0.03		0.03	
Dodecanes plus	C12+	0.08	0.09	0.08	2.43	2.54	0.10	0.10
		100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 2. Flash Chromatography analysis of Thy thylacine South samples with C12+ contaminations set to be 0.1mol%. Also shown are representative samples from Thylacine-1 and Thylacine-2.

A spider chart showing the same information is shown in Figure 4. Log and Linear plots showing the distributions in mol% concentrations for each fraction across **all** of the previous analyses are shown in Figure 5 and Figure 6.

In general it can be observed that the concentration of C7+ is very small, at around 0.5 mol% with the dominant compound being C1 followed by CO₂, C2 and C3.

As can be seen the Unit 1 samples have similar concentrations to the Thy-1 and Thy-2 samples up to C7. For C7+ the concentrations begin to diverge with the Thylacine South sample having considerably less of these fractions although the concentrations of these fractions are very low in all cases (≤ 0.2 mol%). Additionally the CO₂ concentrations in unit 1 are very similar to the Thylacine1 representative samples

The Unit 5 sample, whilst similar, shows higher methane concentrations and lower C2-C8 concentrations than any of the previously analysed samples. Additionally the CO₂ concentration in the unit 5 sample is lower than any of the previous compositional analyses.

3.2 Interpretation: Unit 1

The interpretation for the Unit 1 gas is that it is likely that is from the same pool and is of similar in composition to the gas found in Thylacine-1. There are two main contributing factors behind this assertion:

1. The CO₂ concentrations are very similar to those seen in the main block appraisal wells. CO₂ concentrations are very sensitive to the source gas and the mineralogy in the reservoir so the similarity shown here is a reasonable indication that the two columns (Thylacine Main block and Thylacine South 1 Unit 1) are part of the same pool.
2. The **gas** fraction concentrations lie within the same range as seen in the main block appraisal wells indicating a similar composition for the majority of the light end components.
3. The formation pressures in Unit 1 lie on exactly the same pressure gradient as observed in the gas leg in the Thylacine-1 appraisal well.

The discrepancy in the concentration of C7+ is in the fractions with very small mol fractions and could be explained by a combination of errors arising from sampling acquisition, sample transfer and Chromatographic analysis which may have lead to either liquid drop out or misreading of fractions present in low concentration.

3.3 Interpretation: Unit 5

Unit 5 gas from Thylacine-South-1 shows a greater discrepancy with the Thylacine-1 samples compared the TS1 Unit 1 sample: the CO₂ concentration is 1mol% lower than the lowest recorded CO₂ concentration; the methane concentration is 3 mol% higher than the previous recorded highest and the ethane concentration is 1.5 mol% lower than the previous lowest. Coupled with the fact that the gas column is obviously not in pressure communication with either the Unit 1 reservoir in the TS-1 well or the gas column in the Thy-1 appraisal well suggests that the TS-1 Unit 5 gas may be materially different and in a separate compartment. Alternatively it could be argued that the discrepancy in concentrations is not large enough to definitively say that the TS-1 U5 gas column is a fundamentally different gas type. Without further gas isotope analysis it is impossible to say whether the Unit 5 gas column is compositionally different to the columns found in Thylacine-1 or TS-1 Unit 1.

As a base case the recommended base case assumption would be that the gas in U5 is (a) pressure separated and (b) is likely to be isotopically different to the TS-1unit 1 and Thy-1 gas columns (to conclusively show this would require a geochemical analysis). From a practical point of view the gas in Unit 5 will not be produced due to the uneconomic volumes in place so a conclusion on the relative difference in gas compositions is not required at his point. However, samples from Unit 5 will be retained in case such a study is required in the future.

4 Conclusions

4.1 Unit 1

- The base case assumption is that the Unit 1 gas is an extension of the same gas reservoir found in the main block by the Thylacine-1 appraisal well and has similar composition.

- It is impossible to make a definitive conclusion due to the ambiguity surrounding the low concentrations of C7+ in the TS-1 sample.

4.2 Unit 5

- It is impossible to definitively prove that the Unit 5 gas is of the same compositional make-up as the Thylacine-1 gas or the TS-1 Unit 1 gas. However, it is definitely pressure separated.
- Based on the fact that the compositions suggest a slightly different composition and that the Unit 5 gas is pressure separated from Unit 1 and Thy-1 gas pressure regime it is concluded that the Unit 5 gas is in a separate pool
- The unit 5 composition has no impact on the Otway development project as the Southern block Unit 5 gas will not be produced.

5 References

Ref 1: "Otway: Consolidated Formation Pressure Sheet"; Hunter, D; DRIMS 2488248; April 2006

Ref 2: "Thylacine Gas Field Fluid Compositions"; Ribul, W; DRIMS 63907; July 2002

6 Figures

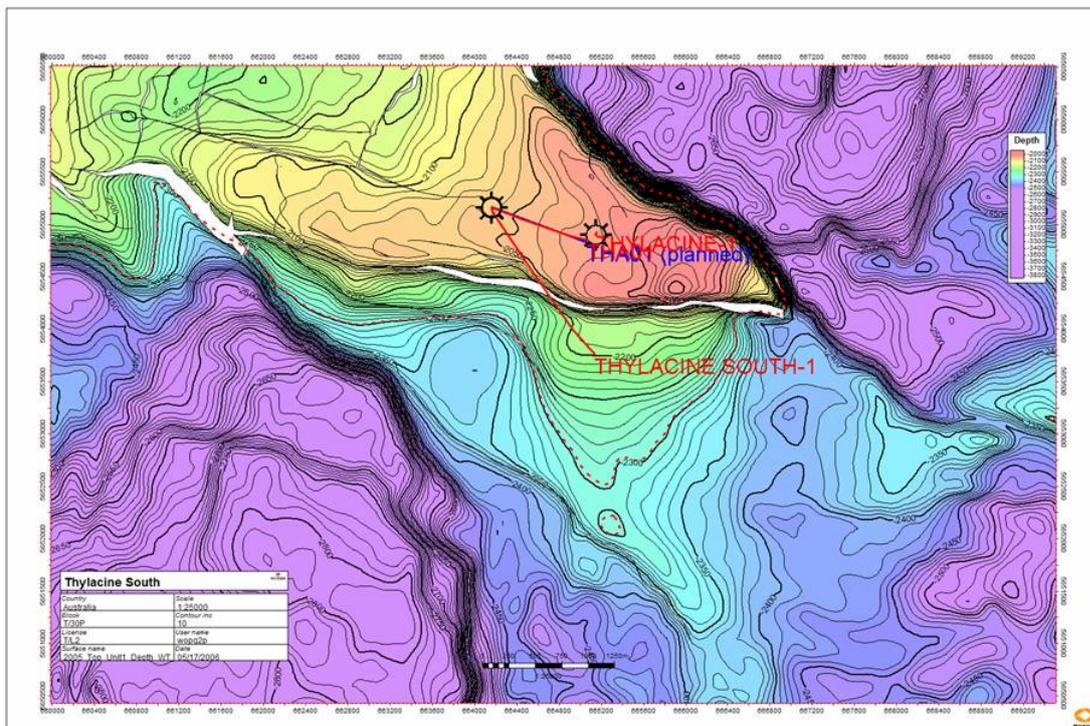


Figure 1. Thylacine Map

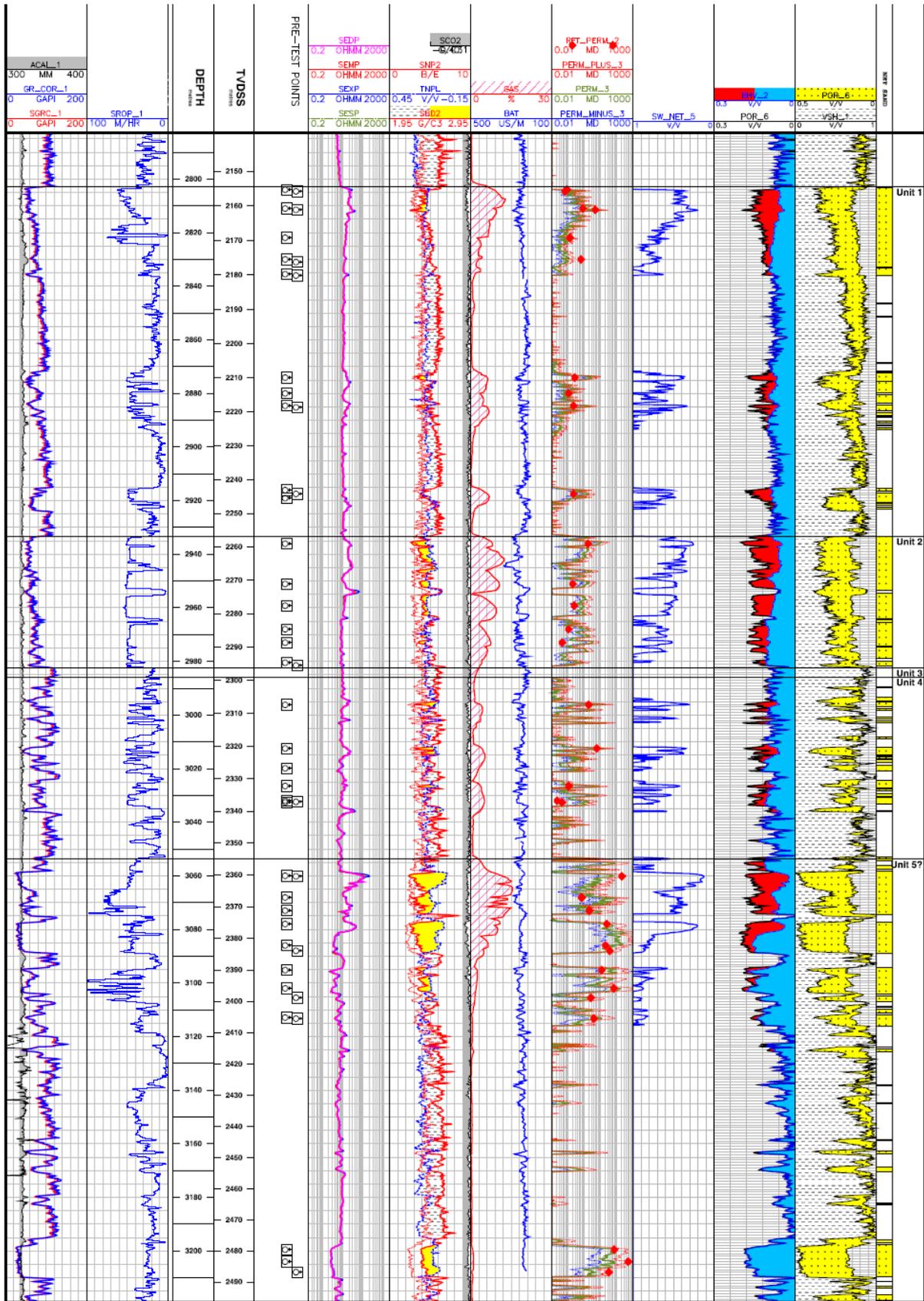


Figure 2. Thylacine_South_1 Well Logs

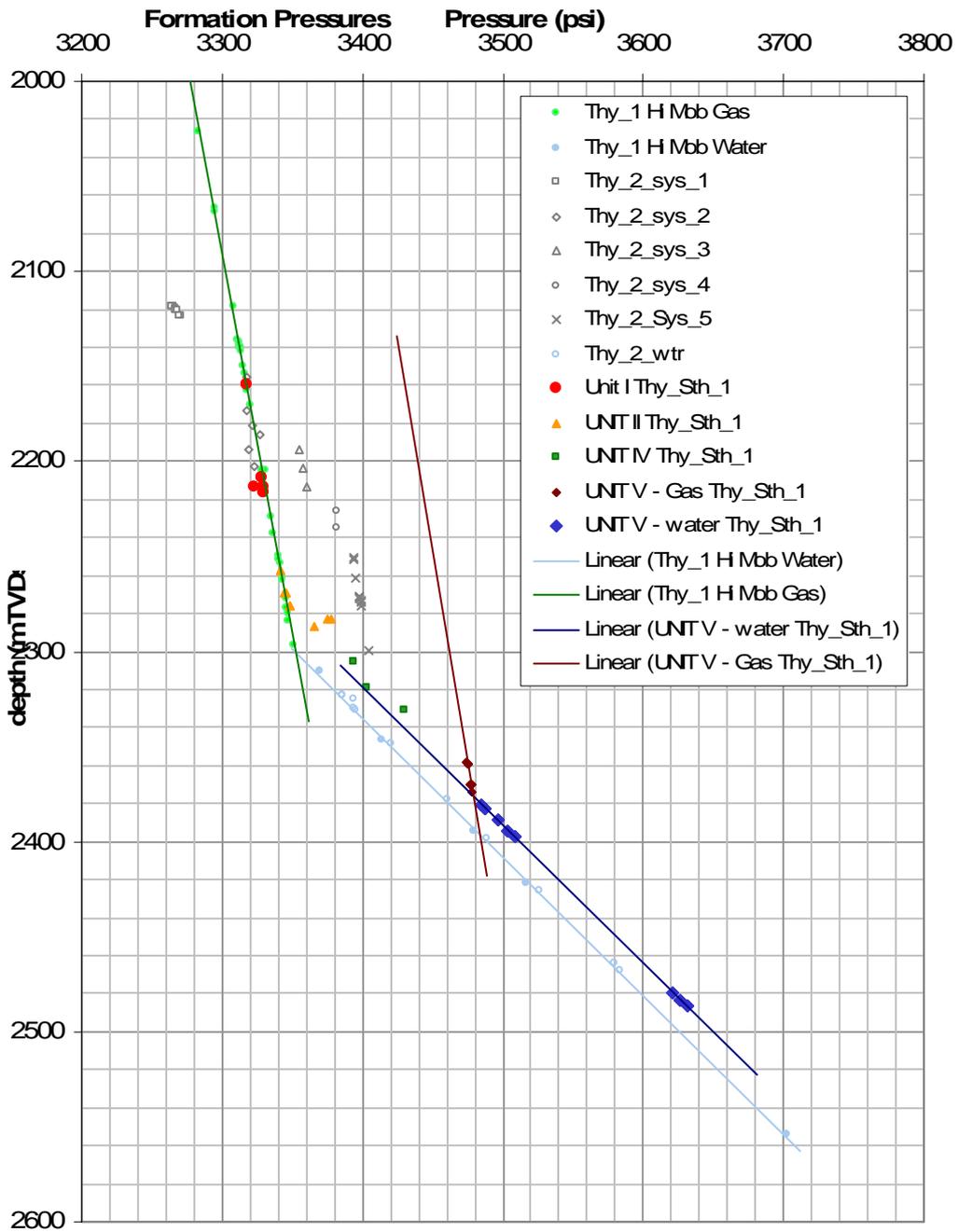


Figure 3. Thylacine Formation pressure data

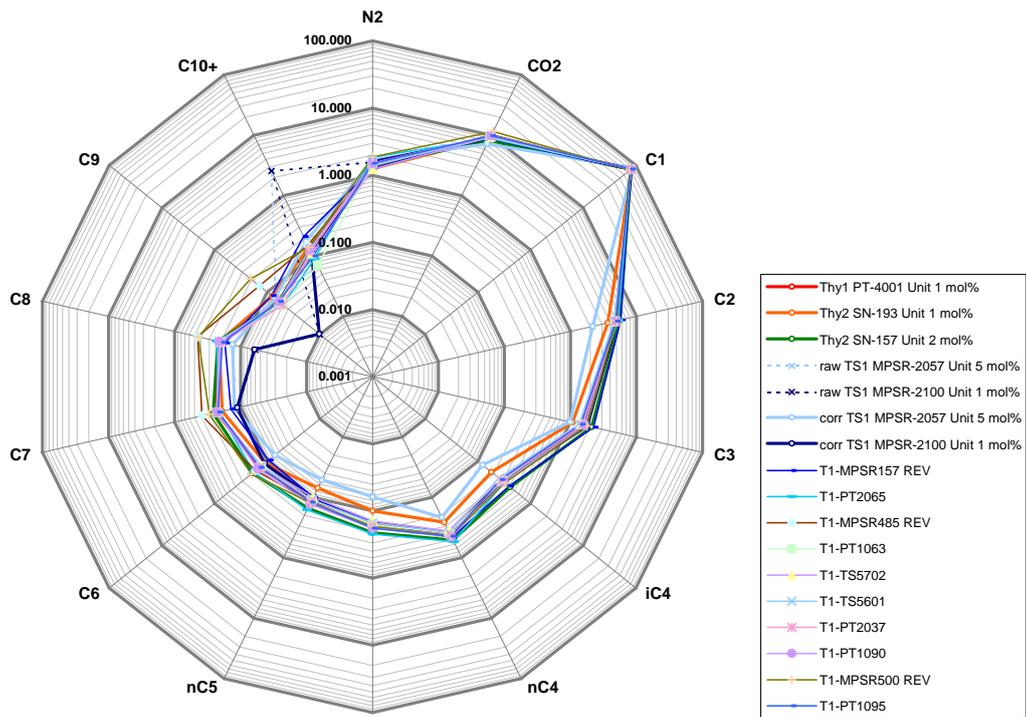


Figure 4. Spider plot of Thylacine South Gas Compositions compared to representative samples from Thylacine -1 and -2.

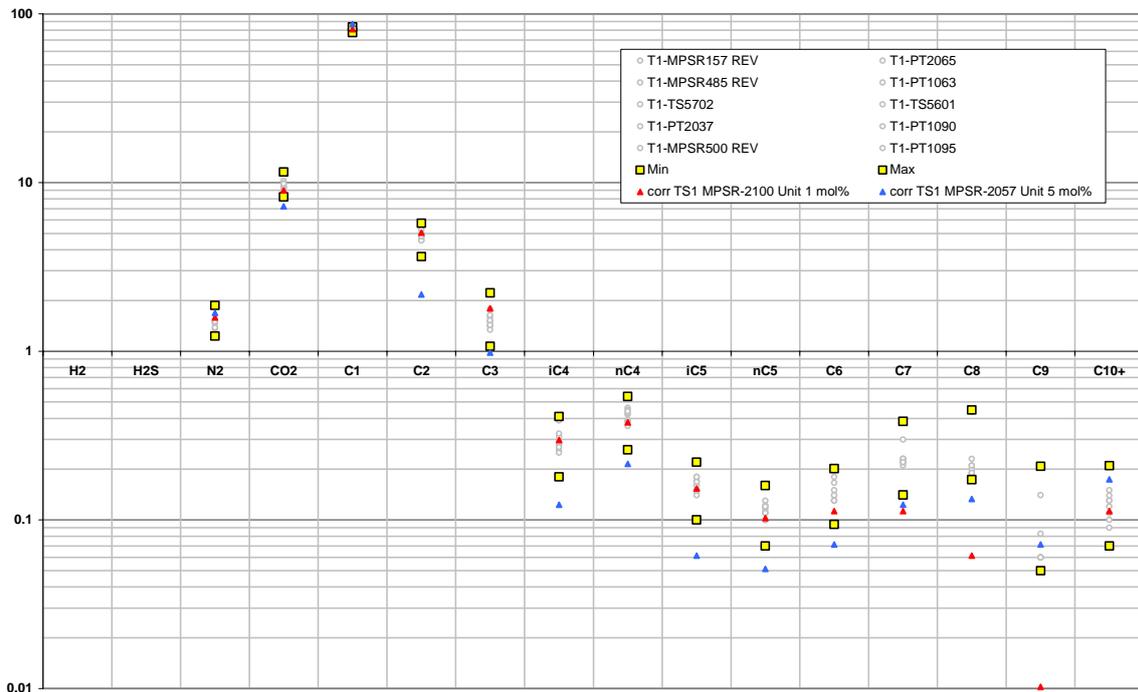


Figure 5. Log plot of Compositions of all analysed samples highlighting minimum, maximum and those from the Thylacine South 1 well. (The open square points represent the maxima and minima for the compositional analysis in the Thy-1 and Thy-2 appraisal well samples. The grey circles represent the intermediate points. The red and blue data points represent the TS-1 Unit 1 and Unit 5 points respectively)

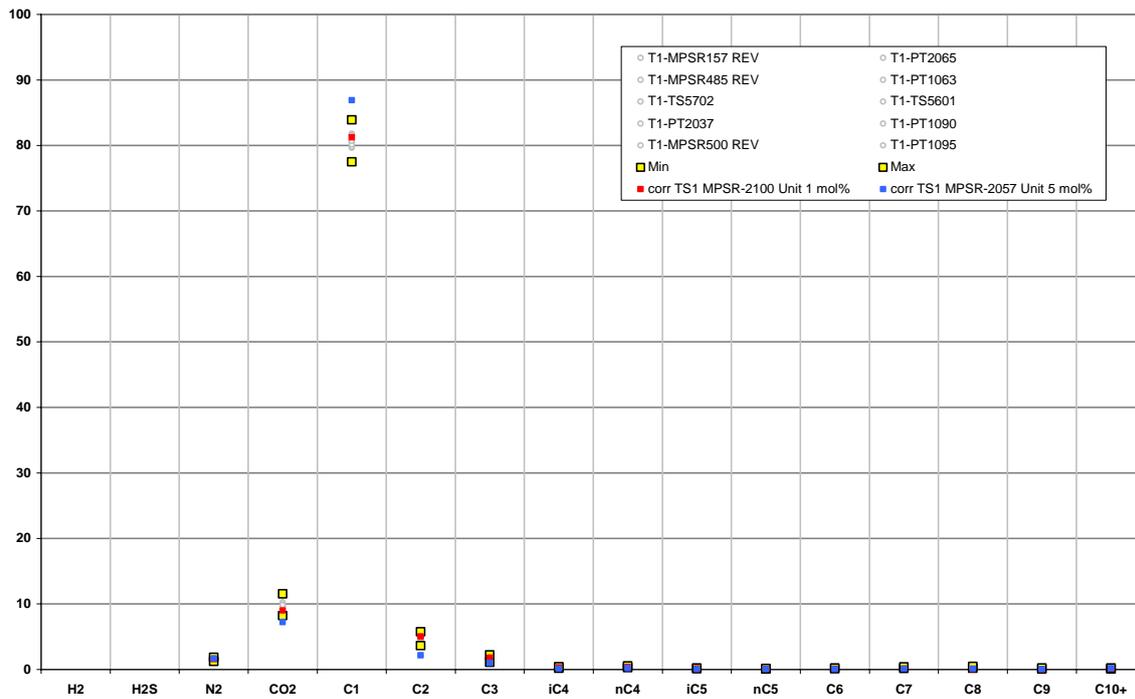


Figure 6. Linear plot of Compositions of all analysed samples highlighting minimum, maximum and those from the Thylacine South 1 well. (The open square points represent the maxima and minima for the compositional analysis in the Thy-1 and Thy-2 appraisal well samples. The grey circles represent the intermediate points. The red and blue data points represent the TS-1 Unit 1 and Unit 5 points respectively)