WOODSIDE

THA01, 02, 03 & 04, Well Completion Report, Interpretive Data

T/L2, Otway Basin, September 2007

WELL COMPLETION REPORT

THA01, THA02, THA03 & THA04

Interpretive Data

(T/L2, Otway Basin)

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1 INTRODUCTION

THA01, THA02, THA03 and THA04 were drilled from the Thylacine-A platform by the jack-up drilling rig Maersk Guardian, as deviated (THA01) and horizontal (THA02, THA03 and THA04) production wells on the Thylacine Field. The Field is located in Production Licence T/L2 of the offshore Otway Basin, situated 70 km south of Port Campbell, Victoria (Figure 1). The Thylacine Field was discovered by Thylacine-1 (2001), which penetrated a 274 metre gross gas column in Late Cretaceous sands of the Sherbrook Group. This field was further appraised by the drilling of the appraisal well Thylacine-2.

The Maersk Guardian came on contract on 17 March 2006 and spudded an exploration well Thylacine South-1 from the platform on the same day. The top hole section of this well (to the 473mm (18.625") casing shoe) was subsequently used for the THA04 production well, and the 17 March 2006 is considered the spud date for the THA04 well.

The slot used from the Thylacine platform for each well is given below:

Well Name	Internal Well Name	Slot #
THA01	TA1	1
THA02	TA3	5
THA03	TA4	3
THA04	TA2	2

Once operations on the exploration well were complete, the rig was skidded to the THA01 development well slot on 12 April 2006, which was spudded on the following day. A total depth (TD) of 2634mRT was reached on 13 May 2006. The THA01 well was suspended and the rig was skidded to the THA02 well on 20 May 2006; this well was spudded and the 660mm (26") conductor was run on the same day. The rig was then skidded to the THA03 well, which was spudded on 22 May 2006 and drilled to the 473mm (18.625") casing shoe. The rig was then skidded back to the THA02 slot on 26 May 2006. The THA02 well was drilled to a TD of 4101mRT, which it reached on 15 June 2006. The THA02 well was perforated on 27 June 2006 and, following a clean up flow, drilling and completion operations were finished on this well on 07 July 2006.

The rig was then skidded to the THA01 well on 7 July 2006. The well was perforated on 11 July 2006 and, following a clean up flow, drilling and completion operations were finished for THA01 on 19 July 2006. The rig was then skidded back to the THA03 well location, where the well had been suspended at the 473mm (18.625") casing shoe. The THA03 well reached a TD of 3780mRT on 2 August 2006. THA03 was displaced to brine and suspended while the rig was skidded to the THA04 location on 10 August 2006.

The cement plug from the Thylacine South exploration well at the 473mm (18.625") casing shoe was drilled and the THA04 well was drilled to a TD of 3987mRT which it reached on 26 August 2006. The THA04 well was perforated on 2 September 2006 and the completion was run; operations were suspended on the well on 10 September 2006 when the rig was skidded back to THA03. THA03 was perforated on 13 September 2006, completion was run, and following a clean up flow, the well was handed over to production on 22 September 2006. The rig then returned to finish operations on the THA04 well, which was handed over to production on 24 September 2006. From 24 September to 31 October 2006, the rig was used for production operations prior to leaving the platform.

The total time on the THA01 to THA04 wells was 49.54 days, 43 days, 38.9 days and 39.5 days, respectively. The estimated final costs were A$37.3MM, A$32.2MM, A$30.9MM and A$29.7MM, respectively.

Table 1

WELL INDEX SHEET

WELL:	**THA01***	*WD:*	**99.3 m (LAT)**	*Rig on Contract:*	**12 April 2006**	*LAT:*	**039° 14' 14.41"**
PERMIT:	**T/L2**	*RT:*	**50.5 m (LAT)**	*Date on Location:*	**12 April 2006**	*LONG:*	**142° 54' 07.74"**
BASIN:	**OTWAY**	*TD:*	**2634.2 mRT**	*Spud Date:*	**13 April 2006**		**GDA 94**
OPERATOR:	**WOODSIDE**		**2339.4 mTVDSS**	*Date at TD:*	**13 May 2006**	*Easting:*	**664 164.9 m**
RIG:	**MAERSK GUARDIAN**	*Well Status:*	**Completed - Gas Well**	*Rig Released:*	**19 July 2006**	*Northing:*	**5 655 161.4 m MGA Zone 54S**
		Seismic Ref.:	**Investigator 3D PreSDM**				

** NB: the internal designation for this well is TA1.*

Formation	Age	Marker	Depth		Lithology
			mRT	mTVDSS	
RECENT to TERTIARY					
Port Campbell Lmst (inf.)	*Recent -Miocene (inf.)*	**WB**	149.8	99.3	Returns to seafloor above 638.1 mRT.
TERTIARY					
Gellibrand Marl (inf.)	*Miocene to Oligocene (inf.)*	**TG**	408.6	357.9	Calcareous claystone, argillaceous calcilutite and calcilutite.
Narrawaturk Marl	*Late Eocene (inf.)*	**TO**	1223.3	1115.6	Calcareous claystone and calcilutite.
Mepunga Sandstone	*Middle Eocene (inf.)*		1295.1	1177.8	Sandstone, silty claystone, argillaceous calcilutite & mnr carbonaceous claystone.
Dilwyn Formation	*Early Eocene (inf.)*		1357.5	1232.2	Sandstone, silty claystone, argillaceous calcilutite and argillaceous sandstone.
CRETACEOUS					
Massacre Formation	*Maastrichtian (inf.)*	**T**	1496.9	1353.4	Argillaceous sandstone, silty claystone, claystone & mnr argillaceous sandstone.
Paaratte Formation	*Maastrichtian to Campanian (inf.)*		1609.7	1450.4	Silty claystone and rare sandstone.
Skull Creek Sst (Napier Mbr)	*Campanian to Santonian*		1803.4	1616.3	Silty claystone.
Belfast Formation	*Santonian to Turonian*				
Thylacine Sst Mbr (Unit 1)		**KT**	2270.2	2018.4	Silty claystone and sandstone.
Thylacine Sst Mbr (Unit 2)			*2363.3*	2100.0	Silty claystone and sandstone.
Unit 3			2393.0	2126.1	Silty claystone and sandstone.
Flaxman Fm (Unit 4)	*Turonian*		2394.4	2127.3	Silty claystone and sandstone.
Waare Fm (Unit 5)	*Turonian*		2520.6	2238.4	Silty claystone and sandstone.
Total Depth			2634.2	2239.4	

HOLE SUMMARY

Size	Depth (mRT)	Casing	Shoe (mRT)	FIT	MW (sg)	Mud	Cement Plugs (mRT)
762mm	220 mRT	660mm	220		1.06	Seawater/PHG sweeps	n/a
584mm	638 mRT	473mm	633	2.0 sg EMW @ 641 mRT	1.06	Seawater/Guar/PHG sweeps	
444mm	2240 mRT	339mm	2230	1.5 sg EMW @ 2243 mRT	1.25-1.27	SBM	
311mm	2634.2 mRT	244mm	2631		1.25-1.28	SBM	

SAMPLE RECORD

Type	No.	Interval (mRT)	Remarks
Ditch Cuttings		640.1-2634.2	5 to 10 metre intervals
Conv. Core	1	2387-2440.6	54.15 m cut, 54.15 m (100%) rec.
Conv. Core	2	2440.6-2494.7	53.98 m cut, 53.98 m (100%) rec.
Conv. Core	3	2494.7-2541.2	46.24 m cut, 45.32 m (98.01%) rec.
Conv. Core	4	2541.2-2595.4	54.25 m cut, 54.25 m (100%) rec.

NB: conventional coring depths have been shifted to match logging depths.

MWD

Run No.	Interval (mRT)	Remarks
1	149.8-220	ESS - surveys
2	220-638	Directional - surveys
3	638-1173.8	DM-DGR-DDS- EWR-P4
4	1173.8-1357.8	DM-DGR-DDS- EWR-P4
5	1357.8-1530.2	DM-DGR-DDS- EWR-P4
6	1530.2-2240	DM-DGR-DDS- EWR-P4
7	2240-2387.4	CTN-ACAL-ALD-DM-PWD-DGR-EWR-P4
8	2387.4-2634.2	CTN-ACAL-ALD-DM-PWD-DGR-EWR-P4

WIRELINE LOGS

Suite & Run	Log	Interval (mRT)	MRT °C
n/a			

RCI / MDT / RFT / GeoTap

Sample No.	Depth (mRT)	Interpreted Fluid
n/a		

PRODUCTION TESTING

TEST	DEPTH (mRT)	RECOVERY			
		OIL (BOPD)	GAS (MMscf/d)	CHOKE	°API
1	2374.62-2379.14, 2395.08-2399.08, 2406-2422.5, 2427-2435.41, 2469-2474, 2479-2484, 2494-2501.92, 2526.5-2558.2		49.7	60"/64"	

Subsequent to drilling THA01, an error in the drill pipe tally was identified The errors in the revised tally increase with depth according to the table to the left. The depths in this Well Index Sheet have been adjusted accordingly.

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

Table 2

WELL INDEX SHEET

WELL:	**THA02***	*WD:*	**99.3 m (LAT)**	*Rig on Contract:*	**20 May 2006**	*LAT:*	**039° 14' 14.47"**
PERMIT:	**T/L2**	*RT:*	**50.5 m (LAT)**	*Date on Location:*	**20 May 2006**	*LONG:*	**142° 54' 07.58"**
BASIN:	**OTWAY**	*TD:*	**4026 mRT**	*Spud Date:*	**20 May 2006**		**GDA 94**
OPERATOR:	**WOODSIDE**		**2289.7 mTVDSS**	*Date at TD:*	**15 June 2006**	*Easting:*	**664 161.0 m**
RIG:	**MAERSK GUARDIAN**	*Well Status:*	**Completed - Gas Well**	*Rig Released:*	**07 July 2006**	*Northing:*	**5 655 159.6 m**
							MGA Zone 54S
		Seismic Ref.:	**Investigator 3D PreSDM**				

** NB: the internal designation for this well is TA3.*

Formation	Age	Marker	Depth		Lithology
			mRT	mTVDSS	
RECENT to TERTIARY					
Port Campbell Lmst (inf.)	*Recent -Miocene (inf.)*	**WB**	149.8	99.3	Returns to seafloor above 638 mRT.
TERTIARY					
Gellibrand Marl (inf.)	*Miocene to Oligocene (inf.)*	**TG**	408.7	358.0	Calcareous claystone, argillaceous calcilutite and calcilutite.
Narrawaturk Marl	*Late Eocene (inf.)*	**TO**	1196.4	1142.7	Calcareous claystone and calcilutite.
Mepunga Sandstone	*Middle Eocene (inf.)*		1253.0	1198.9	Sandstone and silty claystone.
Dilwyn Formation	*Early Eocene (inf.)*		1308.8	1254.2	Sandstone and silty claystone.
CRETACEOUS					
Massacre Formation	*Maastrichtian (inf.)*	**T**	1438.1	1382.0	Silty claystone and sandstone.
Paaratte Formation	*Maastrichtian to Campanian (inf.)*		1512.0	1455.0	Sandstone and silty claystone.
Skull Creek Sst (Napier Mbr)	*Campanian to Santonian (inf.)*		1713.1	1653.7	Silty claystone.
Belfast Formation	*Santonian to Turonian (inf.)*				
Thylacine Sst Mbr (Unit 1)		**KT**	2287.0	2053.8	Silty claystone and argillaceous sandstone.
Thylacine Sst Mbr (Unit 2)			3814.2	2143.5	Silty claystone and argillaceous sandstone.
Unit 3			3839.4	2158.4	Silty claystone and argillaceous sandstone.
Flaxman Fm (Unit 4)	*Turonian (inf.)*		3841.2	2159.5	Silty claystone, argillaceous sandstone and silty sandstone.
Waare Fm (Unit 5)	*Turonian to Cenomanian (inf.)*		3989.3	2262.4	Silty sandstone.
Total Depth			4026.0	2289.7	

HOLE SUMMARY

Size	Depth (mRT)	Casing	Shoe (mRT)	FIT	MW (sg)	Mud	Cement Plugs (mRT)
762mm	219.9 mRT	660mm	219		1.06	Seawater/PHG swee	n/a
584mm	638.0 mRT	473mm	632.9	2.0 sg EMW @ 641 mRT	1.06	Seawater/Guar/PHG sweeps	
311mm	2299.0 mRT	244mm	2293.4	2.0 sg EMW @ 2302 mRT	1.20-1.26	SBM	
216mm	4026.0 mRT	178mm	4022.5		1.25-1.26	SBM	

SAMPLE RECORD

Type	No.	Interval (mRT)	Remarks
Ditch Cuttings		645-4026	5 to 10 metre intervals

MWD

Run No.	Interval (mRT)	Remarks
1	149.8-219.9	ESS-surveys
2	219.9-638.0	Directional-surveys
3	638.0-2299.0	ABG-DDS-PWD-EWR-P4-DGR-DM
4	2299.0-3510.0	ABG-DM-EWR-P4-ALD-ACAL-CTN-GeoTap-PWD
5	3510.0-4026.0	ABG-DM-DGR-EWR-P4-ALD-ACAL-CTN-GeoTap-PWD

WIRELINE LOGS

Suite & Run	Log	Interval (mRT)	MRT °C
n/a			

RFT/MDT/RCI/GeoTap

Sample No.	Depth (mRT)	Interpreted Fluid
n/a		

PRODUCTION TESTING

TEST	DEPTH (mRT)	RECOVERY			
		OIL (BOPD)	GAS (MMscf/d)	CHOKE	°API
1	2609.5-2747.3, 2990.1-3155.6, 3495.2-3653.7, 3744.2-3972		62	72"/64"	
2	2609.5-2747.3, 2990.1-3155.6, 3495.2-3653.7, 3744.2-3972		52.5	68"/64"	
3	2609.5-2747.3, 2990.1-3155.6, 3495.2-3653.7, 3744.2-3972		65	76"/64"	

Table 3

WELL INDEX SHEET

WELL:	**THA03***	*WD:*	**99.3 m (LAT)**	*Rig on Contract:*	**21 May 2006**	*LAT:*	**039° 14' 14.38"**
PERMIT:	**T/L2**	*RT:*	**50.5 m (LAT)**	*Date on Location:*	**21 May 2006**	*LONG:*	**142° 54' 07.49"**
BASIN:	**OTWAY**	*TD:*	**3780.0 mRT**	*Spud Date:*	**22 May 2006**		**GDA 94**
OPERATOR:	**WOODSIDE**		**2111.9 mTVDSS**	*Date at TD:*	**02 August 2006**	*Easting:*	**664 159.0 m**
RIG:	**MAERSK GUARDIAN**	*Well Status:*	**Completed - Gas Producer**	*Rig Released:*	**22 September 2006**	*Northing:*	**5 655 162.4 m MGA Zone 54S**
		Seismic Ref.:	**Investigator 3D PreSDM**				

** NB: the internal designation for this well is TA4.*

Formation	Age	Marker	Depth		Lithology
			mRT	mTVDSS	
RECENT to TERTIARY					
Port Campbell Lmst (inf.)	*Recent -Miocene (inf.)*	**WB**	149.8	99.3	Returns to seafloor above 638 mRT.
TERTIARY					
Gellibrand Marl (inf.)	*Miocene to Oligocene (inf.)*	**TG**	408.7	358.0	Calcareous claystone and argillaceous calcilutite.
Narrawaturk Marl	*Late Eocene (inf.)*	**TO**	1180.9	1127.4	Argillaceous calcilutite and minor calcareous claystone.
Mepunga Sandstone	*Middle Eocene (inf.)*		1246.8	1193.0	Sandstone, silty claystone and rare argillaceous calcilutite.
Dilwyn Formation	*Early Eocene (inf.)*		1321.7	1267.6	Sandstone.
CRETACEOUS					
Massacre Formation	*Maastrichtian (inf.)*	**T**	1417.5	1363.1	Silty claystone and minor sandstone.
Paaratte Formation	*Maastrichtian to Campanian (inf.)*		1489.9	1435.2	Silty claystone and minor sandstone.
Skull Creek Sst (Napier Mbr)	*Campanian to Santonian (inf.)*		1698.4	1642.8	Silty claystone, claystone and sandstone.
Belfast Formation	*Santonian to Turonian (inf.)*				
Thylacine Sst Mbr (Unit 1)		**KT**	2139.5	2052.1	Silty claystone and argillaceous sandstone.
Thylacine Sst Mbr (Unit 2)			2288.2	2139.6	Sandstone and claystone.
Unit 3			2345.8	2162.8	Sandstone and claystone.
Flaxman Fm (Unit 4)	*Turonian (inf.)*		2348.7	2162.8	Sandstone, argillaceous sandstone and claystone.
Belfast Formation	*Turonian to Santonian (inf.)*				
Unit 3			2582.9	2172.9	Claystone and sandstone.
Thylacine Sst Mbr (Unit 2)			2591.1	2172.3	Claystone and sandstone.
Thylacine Sst Mbr (Unit 1)			2688.8	2164.4	Claystone, silty claystone, argillaceous sandstone and sandstone.
Total Depth			3780.0	2111.9	

HOLE SUMMARY

Size	Depth (mRT)	Casing	Shoe (mRT)	FIT	MW (sg)	Mud	Cement Plugs (mRT)
762mm	218.4	660mm	217.5		1.06	Seawater/PHG sweep	n/a
584mm	638.0	473mm	632.6	2.0 sg EMW @ 641 mRT	1.06	Seawater/Guar/PHG sweeps	
311mm	2148	244mm	2141.7	2.0 sg EMW @ 2151 mRT	1.24-1.26	SBM	
216mm	3780	178mm	3777		1.25-1.26	SBM	

SAMPLE RECORD

Type	No.	Interval (mRT)	Remarks
Ditch Cuttings		640-3780	5 to 20 metre intervals

MWD

Run No.	Interval (mRT)	Remarks
1	149.8-218.4	ESS-surveys
2	218.4-638.0	Directional-surveys
3	638.0-2148.0	ABG-PWD-EWR-P4-DGR-DM
4	2148.0-3780.0	ABG-DM-EWR-P4-ALD-ACAL-CTN-GeoTap-PWD

WIRELINE LOGS

Suite & Run	Log	Interval (mRT)	MRT °C
n/a			

RFT/MDT/RCI/GeoTap

Sample No.	Depth (mRT)	Interpreted Fluid
n/a		

PRODUCTION TESTING

TEST	DEPTH (mRT)	RECOVERY			
		OIL (BOPD)	GAS (MMscf/d)	CHOKE	°API
1	2270.80-2353.56, 2409.16-2478.34, 2540.89-2561.64, 2589.44-2693.21, 2975.75-3058.75, 3490.17-3711.54		47.8	64"/64"	

Table 4

WELL INDEX SHEET

WELL:	**THA04***	*WD:*	**99.3 m (LAT)**	*Rig on Contract:*	**17 March 2006**	*LAT:*	**039° 14' 14.56"**
PERMIT:	**T/L2**	*RT:*	**50.5 m (LAT)**	*Date on Location:*	**17 March 2006**	*LONG:*	**142° 54' 07.58"**
BASIN:	**OTWAY**	*TD:*	**3987.0 mRT**	*Spud Date:*	**17 March 2006**		**GDA 94**
OPERATOR:	**WOODSIDE**		**2203.3 mTVDSS**	*Date at TD:*	**26 August 2006**	*Easting:*	**664 161.0 m**
RIG:	**MAERSK GUARDIAN**	*Well Status:*	**Completed - Gas Producer**	*Rig Released:*	**24 September 2006**	*Northing:*	**5 655 156.84 m MGA Zone 54S**
		Seismic Ref.:	**Investigator 3D PreSDM**				

** NB: the internal designation for this well is TA2.*

Formation	Age	Marker	Depth		Lithology
			mRT	mTVDSS	
RECENT to TERTIARY					
Undifferentiated	*Recent -Miocene (inf.)*	**WB**	149.8	99.3	Returns to seafloor above 638 mRT, then calcilutite and calcareous claystone.
TERTIARY					
Narrawaturk Marl	*Late Eocene (inf.)*	**TO**	1270.0	1144.2	Calcilutite and calcareous claystone.
Mepunga Sandstone	*Middle Eocene (inf.)*		1345.0	1207.2	Sandstone and silty claystone.
Dilwyn Formation	*Early Eocene (inf.)*		1560.0	1389.1	Sandstone and silty claystone.
CRETACEOUS					
Massacre Formation	*Maastrichtian (inf.)*	**T**	1606.0	1428.1	Silty claystone and sandstone.
Paaratte Formation	*Maastrichtian to Campanian (inf.)*		1654.0	1469.0	Silty claystone and sandstone.
Skull Creek Sst (Napier Mbr)	*Campanian to Santonian (inf.)*		1896.5	1674.6	Silty claystone and sandstone.
Belfast Fm	*Santonian to Turonian (inf.)*				
Thylacine Sst Mbr (Unit 1)		**KT**	2561.9	2163.4	Silty claystone, sandstone and argillaceous sandstone.
Skull Creek Sst (Napier Mbr)	*Santonian to Campanian (inf.)*		3108.0	2195.1	Silty claystone and sandstone.
Belfast Fm, Thyl Sst Mbr (U1)	*Santonian to Turonian (inf.)*		3176.4	2185.2	Argillaceous sandstone and silty claystone.
Skull Creek Sst (Napier Mbr)	*Santonian to Campanian (inf.)*		3501.0	2164.0	Argillaceous sandstone and silty claystone.
Belfast Fm, Thyl Sst Mbr (U1)	*Santonian to Turonian (inf.)*		3524.6	2163.4	Argillaceous sandstone and silty claystone.
Skull Creek Sst (Napier Mbr)	*Santonian to Campanian (inf.)*		3673.2	2172.0	Argillaceous sandstone and silty claystone.
Total Depth			3987.0	2203.3	

HOLE SUMMARY

Size	Depth (mRT)	Casing	Shoe (mRT)	FIT	MW (sg)	Mud	Cement Plugs (mRT)
762mm	217.0	660mm	217		1.06	Seawater/PHG swee	n/a
584mm	638.0	473mm	633.4	2.36 sg EMW @ 641 mRT	1.06	Seawater/Guar/PHG sweeps	
311mm	2751	244mm	2742.8	2.0 sg EMW @ 2754 mRT	1.25	SBM	
216mm	3987	178mm	3985		1.25-1.26	SBM	

SAMPLE RECORD

Type	No.	Interval (mRT)	Remarks
Ditch Cuttings		640-3987	5 to 20 metre intervals

WIRELINE LOGS

Suite & Run	Log	Interval (mRT)	MRT °C
n/a			

MWD

Run No.	Interval (mRT)	Remarks
1	149.8-217.0	ESS-surveys
2	217.0-638.0	Directional-surveys
3	638.0-2751.0	ABG-PWD-EWR-P4-DGR-DM
4	2751.0-3194.0	ABG-DM-DGR-EWR-P4-ALD-ACAL-CTN-PWD
5	3194.0-3987.0	ABG-DM-DGR-EWR-P4-ALD-CTN-PWD-ACAL

RFT/MDT/RCI/GeoTap

Sample No.	Depth (mRT)	Interpreted Fluid
n/a		

PRODUCTION TESTING

TEST	DEPTH (mRT)	RECOVERY			
		OIL (BOPD)	GAS (MMscf/d)	CHOKE	°API
1	2743.17-2798.51, 2812.35-2936.88, 2992.48-3068.57, 3151.41-3165.25, 3213.9-3310.75, 3339.42-3601.30, 3670.80-3712.31, 3833.78-3881.90		18.43	64"/64"	

2 GEOLOGICAL SUMMARY

The THA01, THA02, THA03 and THA04 deviated development wells were drilled in Production Licence T/L2 within the Otway Basin. The wells were drilled to recover gas optimally from the various reservoir intervals (Lower Belfast, Flaxman, and Waarre) within the Thylacine gas field, and ensure minimal intervention during the project life.

A comparison of prognosed versus actual depths is presented in Tables 5 to 8 and Figures 8 to 11. Well profiles in depth are shown as Figures 3 to 6. The interpreted reservoir properties are detailed in Appendix 2 and summarised in Table 9. THA01 is the only well that crosses the free-water level and reveals gas down to 2586.4mMD (2296.8mTVDSS). Decreasing reservoir quality does not allow a direct inference of the free-water level at this well location. Due to no indication of a change in the predicted free-water level, the field wide free-water level is believed to be 2298mTVDSS as identified from previous MDT surveys.

In THA02, seven valid formation pressures were acquired while drilling using the Sperry-Sun GeoTap tool (Appendix 3). Nineteen further tests were attempted, and while not valid formation pressures, several are close enough to being stable that they provide indication of compartmentalisation along the well. In THA03, five valid formation pressures were acquired while drilling using the Sperry-Sun GeoTap tool (Appendix 4). Five further tests were attempted, but provided no use for interpretation.

No sidewall samples were taken. Conventional core was cut in THA01 only (Enclosure 1). Palynological analysis was performed on nineteen cuttings samples and 34 conventional core samples from the Belfast, Flaxman and Waare formations. The stratigraphy is shown on the Composite Well Logs (Enclosures 2 to 5) and Predicted versus Actual sections (Figures 8 to 11). A generalised stratigraphic scheme for the Otway Basin is presented as Figure 2.

Waarre Formation - Reservoir Unit 5

The Waarre Formation was interpreted to have accumulated in a fluvial to shallow marine environment. Only wells THA01 and THA02 have added to the geological understanding of the Waarre Formation, and for the first time, core was cut (in THA01) in this stratigraphic interval.

Preliminary examination and interpretation of that core material suggests in the Thylacine Field, the Waarre Formation was deposited in a tidally influenced deltaic setting. Tidal indications include:

- Abundant, well developed mud drapes
- Herring bone type cross lamination in some zones
- Varied and abundant ichnofauna in some zones

The reservoir elements are interpreted to have been deposited as proximal mouthbars and distributary channels (as intra channel bars). Architecturally this would suggest linear and lobate features, the combination of these, and the high net to gross, suggest that both lateral and vertical connectivity is good and this is supported by the presence of a regional pressure gradient consistent between Thylacine-1 and THA02 (no pressure information available from THA01).

Individual coarsening up cycles can be recognised and correlated from one well to another, thereby providing a high frequency framework.

Flaxman Formation - Reservoir Unit 4

In addition to THA01 and THA02, which penetrated the entire Flaxman Formation, THA03 also intersected the uppermost sand. From preliminary core investigation (THA01), the Flaxman Formation accumulated in a very similar setting to the Waarre Formation.

The boundary between the underlying Waarre Formation and the Flaxman Formation is characterised by a rapid change from fluvio-deltaic sandstones to a marine succession dominated by siltstones and minor very fine to fine grained bioturbated to finely laminated sandstones.

The previous interpretation of the uppermost Flaxman Formation in Thylacine-1 as being deposited as an incised valley fill is no longer believed, instead the entire Flaxman interval would appear to be part of a low order, large scale delta progradation.

Coarse clastic pulses resulted in excellent quality reservoirs, deposited by higher frequency cycles of progradation. Individual sand elements are proximal to distal mouthbars and intra-distributary channel bars. As observed in the Waarre Formation core (from THA01) there are abundant features consistent with deposition in a tidally influenced deltaic setting.

The one exceptional interval is the uppermost Flaxman Formation interval in the core from THA01 – this sandstone interval has no ichnofauna represented, and rock quality looks different to other distributary deposited sands. This is currently interpreted as the only truly fluvial section seen in the core.

The Upper boundary of the Flaxman Formation is marked by the C. striatoconus sequence boundary, which locally forms a significant angular unconformity as demonstrated by seismic, dip-meter & core data in Thylacine-2, but in core from THA01 is very poorly developed.

The two valid pressures acquired in THA02 fall on the gradient seen in Thylacine-1, while the pressures acquired in the upper portions of Unit 4 appear to be approximately 10psi higher in pressure. This, however, may be attributed to the questionable quality of the data acquired, all of which could not be conclusively classed as valid tests. One pressure was measured in THA03 and it lies on the primary field wide gradient initially seen in Thylacine-1.

Belfast Formation, Thylacine Sandstone Member Reservoir Units 1 - 2 and Non Reservoir Unit 3

New penetrations of the Thylacine Sandstone Member were drilled in all wells – THA01, THA02 and THA03 all penetrated the entire section, THA04 was confined to “Unit 1”.

The Belfast Formation accumulated in a shelfal marine environment and is Coniacian to Late Santonian in age. The basal Belfast Formation is represented by reservoir Unit 3 dominated by massive, glauconitic, silty claystone in the Thylacine-2 area, and by a silty interval in the THA01 area. The contact between these claystones and the underlying silty sandstones is an angular unconformity. This interval is thin (<5 m) over Thylacine but significantly thicker (circa 46 m) in Geographe-1. The contact is interpreted to represent a major flooding event, but unlike previous models is not thought to barrier vertical flow.

The Thyalcine Sandstone Member Unit 2 comprises multi-storey stacked very fine to fine grained, massive to faintly laminated sandstones locally interrupted by thin, bioturbated layers of argillaceous siltstone and thin beds of claystone pebbles. The base of the interval is sharp and scoured as demonstrated by core (Thylacine-2), and in the THA01 area this scouring may have removed the flooding shale completely. The sandstones are interpreted to represent lowstand, prodelta mass flows or turbidites. Their thickness would appear to have been controlled by the underlying topography.

Reservoir Unit 1 overlies Unit 2. In Thylacine the interval is dominated by coarsening upward cycles as demonstrated by GR logs, core and rotary sidewall cores. The cycles typically coarsen upwards from intensely bioturbated sandy, argillaceous siltstones to fine grained sandstones. The cycles are interpreted to represent progradation. A top reservoir depth structure map is presented as Figure 7.

Pressure tests from THA02 and THA03 confirmed that shale draping the foresets of Unit 1 have the potential to compartmentalize this reservoir. In THA02, one valid pressure was acquired in Unit 2 and it directly overlays the gradients in both Thylacine-1 and Thylacine-2. Two valid formation pressures were measured in Unit 1, both of which were approximately 50 psi below the observed pressure regime in Thylacine-1 and 16 psi below the pressure regime observed in Unit 1d of Thylacine-2. This suggests that the second progrades of Unit 1 intersected by THA02 is not in communication with the Thylacine-1 or Thylacine-2 gas system.

In THA03, one valid pressure was achieved in Unit 2 and it overlays the field wide Unit 2 gradient as observed in Thylacine-1, Thylacine-2 and THA02. Three valid formation pressures were measured in Unit 1 (in 3 separate progrades) and they point to three separate pressure regimes within Unit 1 in THA03. The first prograde intersected falls on the Thylacine-1 gradient. The second prograde lies within a new pressure regime that is 8psi higher than the Thylacine-1 gradient. The third and northern-most prograde is believed to be in hydraulic communication with the gas column that was intersected in the western-most prograde (prograde 3) in THA02 and in Unit 1d of Thylacine-2.

Table 5. THA01 Predicted and Actual Depths

Marker	Formation	Predicted Depth (mtvdss)	Error (m)	Actual Depth (mRT)	Actual Depth (mtvdss-LAT)	Error (mtvd)
WB	Port Campbell Limestone	101	(+/-1.5)	149.8	99.3	1.7 H
TG	Gellibrand Marl	358	(+/-5)	408.6	357.9	0.1 H
TO	Narrawaturk Marl	1134	(+/-8)	1223.3	1115.6	18.4 H
	Mepunga Sandstone	1167	(+/-9)	1295.1	1177.8	10.8 L
	Dilwyn Formation	1331	(+/-10)	1357.5	1232.2	98.8 H
T	Massacre Formation	1442	(+/-10)	1496.9	1353.4	88.6 H
	Paaratte Formation	1492	(+/-10)	1609.7	1450.4	41.6 H
	Skull Creek Sst (Napier Mbr)	1630	(+/-10)	1803.4	1616.3	13.7 H
	Belfast Formation	1693	(+/-10)	np	np	-
KT	Thylacine Sst Mbr (Unit 1)	2017	(+/-6)	2270.2	2018.4	1.4 L
	Thylacine Sst Mbr (Unit 2)	2099	(+/-6)	2363.3	2100.0	1.0 L
	Unit 3	2125	(+/-8)	2393.0	2126.1	1.1 L
	Flaxman Fm (Unit 4)	2159	(+/-10)	2394.4	2127.3	31.7 H
	Waare Fm (Unit 5)	2228	(+/-12)	2520.6	2238.4	10.4 H
TD		**2308**		**2634.2**	**2239.4**	

np= not picked

Table 6. THA02 Predicted and Actual Depths

Marker	Formation	Predicted Depth (mtvdss)	Error (m)	Actual Depth (mRT)	Actual Depth (mtvdss-LAT)	Error (mtvd)
WB	Port Campbell Limestone	99.5	(+/-1.5)	149.8	99.3	0.2 H
TG	Gellibrand Marl	358	(+/-5)	408.7	358.0	0.0
TO	Narrawaturk Marl	1137	(+/-8)	1196.4	1142.7	5.7 L
	Mepunga Sandstone	1168	(+/-10)	1253.0	1198.9	30.9 L
	Dilwyn Formation	1336	(+/-11)	1308.8	1254.2	81.1 H
T	Massacre Formation	1375	(+/-12)	1438.1	1382.0	7.0 L
	Paaratte Formation	1477	(+/-12)	1512.0	1455.0	22.0 H
	Skull Creek Sst (Napier Mbr)	1642	(+/-12)	1713.1	1653.7	11.7 L
	Belfast Formation	1676	(+/-12)	np	np	-
KT	Thylacine Sst Mbr (Unit 1)	2049	(+/-16)	2287.0	2053.8	4.8 L
	Thylacine Sst Mbr (Unit 2)	2143	(+/-20)	3814.2	2143.5	0.5 L
	Unit 3			3839.4	2158.4	-
	Flaxman Fm (Unit 4)	2171	(+/-20)	3841.2	2159.5	11.5 H
	Waare Fm (Unit 5)	2202	(+/-20)	3989.3	2262.4	60.4 L
TD		**2297**		**4026.0**	**2289.7**	

np= not picked

Table 7. THA03 Predicted and Actual Depths

Marker	Formation	Predicted Depth (mtvdss)	Error (m)	Actual Depth (mRT)	Actual Depth (mtvdss-LAT)	Error (mtvd)
WB	Port Campbell Limestone	101	(+/-1.5)	149.8	99.3	1.7 H
TG	Gellibrand Marl	357	(+/-5)	408.7	358.0	1.0 L
MM	Mid Miocene	437	(+/-5)	489.7	438.8	1.8 L
	Near Top Oligocene	719	(+/-5)	816.0	763.9	44.9 L
TO	Narrawaturk Marl	1137	(+/-8)	1180.9	1127.4	9.6 H
	Mepunga Sandstone	1201	(+/-10)	1246.8	1193.0	8.0 H
	Dilwyn Formation	1334	(+/-12)	1321.7	1267.6	66.4 H
T	Massacre Formation	1369	(+/-13)	1417.5	1363.1	5.9 H
	Paaratte Formation	1428	(+/-13)	1489.9	1435.2	7.2 L
	Skull Creek Sst (Napier Mbr)	1632	(+/-13)	1698.4	1642.8	10.8 L
	Belfast Formation	1659	(+/-13)	np	np	-
KT	Thylacine Sst Mbr (Unit 1)	2073	(+/-15)	2139.5	2052.1	20.9 H
	Thylacine Sst Mbr (Unit 2)	2158	(+/-17)	2288.2	2139.6	18.4 H
	Unit 3	np		2345.8	2162.8	-
	Flaxman Fm (Unit 4)	np		2348.7	2162.8	-
	Belfast Fm	np		2582.9	2172.9	-
	Unit 3	np		2582.9	2172.9	-
	Thylacine Sst Mbr (Unit 2)	np		2591.1	2172.3	-
	Thylacine Sst Mbr (Unit 1)	np		2688.8	2164.4	-
TD		**2135**		**3780.0**	**2111.9**	

np= not picked

Table 8. THA04 Predicted and Actual Depths

Marker	Formation	Predicted Depth (mtvdss)	Error (m)	Actual Depth (mRT)	Actual Depth (mtvdss-LAT)	Error (mtvd)
WB	Port Campbell Lmst	101	(+/-1.5)	149.8	99.3	1.7 H
TG	Gellibrand Marl	357	(+/-5)	np	np	-
TO	Narrawaturk Marl	1150	(+/-8)	1270.0	1144.2	5.8 H
	Mepunga Sst	1240	(+/-10)	1345.0	1207.2	32.8 H
	Dilwyn Fm	1410	(+/-12)	1560.0	1389.1	21.9 H
T	Massacre Fm	np		1606.0	1428.1	-
	Paaratte Formation	1505	(+/-10)	1654.0	1469.0	36.0 H
	Skull Creek Sst (Napier Mbr)	1753	(+/-10)	1896.5	1674.6	78.4 L
	Belfast Formation	1775	(+/-10)	np	np	-
KT	Thylacine Sst Mbr (Unit 1)	2245	(+/-16)	2561.9	2163.4	81.6 H
	Skull Creek Sst (Napier Mbr)	np		3108.0	2195.1	-
	Belfast Fm, Thyl Sst Mbr (Unit 1)	np		3176.4	2185.2	-
	Skull Creek Sst (Napier Mbr)	np		3501.0	2164.0	-
	Belfast Fm, Thyl Sst Mbr (Unit 1)	np		3524.6	2163.4	-
	Skull Creek Sst (Napier Mbr)	np		3673.2	2172.0	-
TD		**2189**		**3987.0**	**2203.3**	

np= not picked

Table 9. Reservoir Properties

Well	Top	Bottom	Gross	Net Reservoir Properties					
				Net	NTG	Φ	K Arith		Sw
	(mMDRT)	*(mMDRT)*	*(m)*	*(m)*	*(v/v)*	*(v/v)*	*(mD)*		*(v/v)*
THA01	2270.4	2634.2	363.8	230.8	0.634	0.158	466.8		0.472
THA02	2287.0	4025.9	1738.9	683.5	0.393	0.159	63.3		0.412
THA03	2139.5	3779.9	1640.4	790.2	0.482	0.153	112.7		0.418
THA04	2743.5	3987.0	1243.5	863.8	0.695	0.137	0.668		0.435

3 REFERENCES

1. Development Well Proposals for the Thylacine Field, WEL; September 2005.
2. THA01 Drilling and Completion Programme, WEL; September 2005.
3. THA02 Drilling and Completion Programme, WEL; April 2006.
4. THA03 Drilling and Completion Programme, WEL; June 2006.
5. THA04 Drilling and Completion Programme, WEL; July 2006.
6. THA01 Well Completion Report, Basic Data, WEL; August 2007.
7. THA02 Well Completion Report, Basic Data, WEL; August 2007.
8. THA03 Well Completion Report, Basic Data, WEL; August 2007.
9. THA04 Well Completion Report, Basic Data, WEL; August 2007.

Thylacine Development Location Map

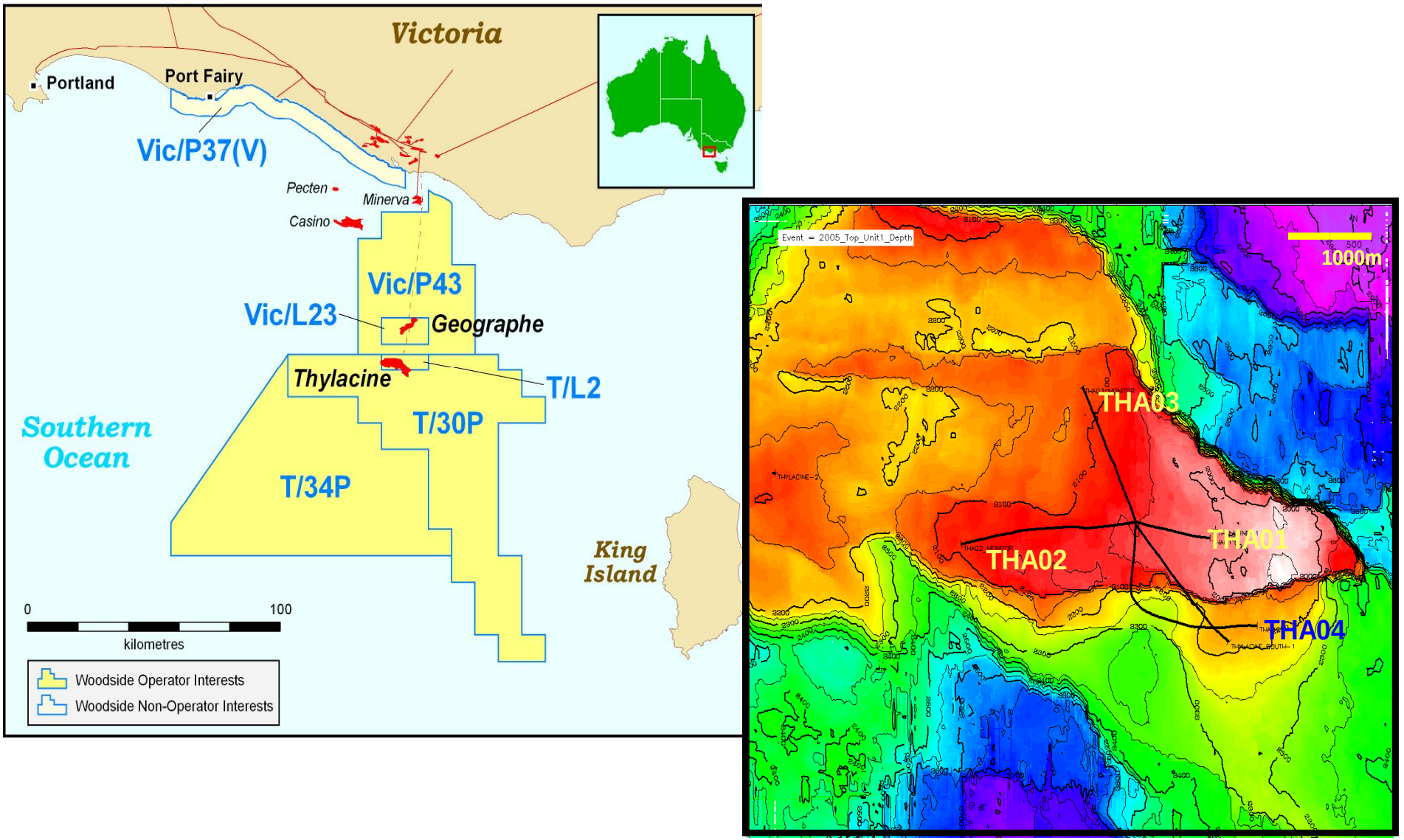


Figure 1

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

Age (ma) | Era | Sub-Era Period | Epoch / Stage | Dinoflagellate Zones (Helby et al, 1987 and others) | Spore - Pollen Zones (EAST & SOUTH, Helby et al, 1987 and others) | Regional Tectonics Summary (Blocks Rifted from Australia: Antarctica, Lord Howe Rise)

0
10
20
30
40
50
60
70
80
90
100
110
120
130
140

CAINOZOIC

TERTIARY

QUAT. Holo./ Pleist.

NEOGENE

Pliocene

Late
Middle
Early
Miocene

PALEOGENE

Late
Early
Oligocene

Late

Middle
Eocene

Early

Thanetian
Danian
Paleocene

MESOZOIC

CRETACEOUS

Late

Maastrichtian

Campanian

Late

Santonian

Coniacian

Turonian

Cenomanian

Late

Middle
Albian

Early

Early

Aptian

Barremian

Hauterivian

Valanginian

Berriasian

Dinoflagellate Zones (Helby et al, 1987 and others)	Spore - Pollen Zones (EAST & SOUTH, Helby et al, 1987 and others)
	pleistocenicus
	M.lipis
	C.bifurcatus
	upper T.bellus
	lower T.bellus
	P.tuberculatus
P.comatum	upper N.asperus
C.incompositum	middle N.asperus
D.heterophylcta	
A."australicum"	lower N.asperus
	P.asperopolus
	upper M.diversus
	middle M.diversus
	lower M.diversus
	upper L.balmei
A.homomorphum	
E.crassitabulata	lower L.balmei
T.evittii	
M.druggii	upper T.longus
	lower T.longus
I.korojonense	T.lillei
X.australis	N.senectus
N.aceras	
I.cretaceum	upperT.apoxyexinus
O.porifera	lowerT.apoxyexinus
C.striatoconus	P.mawsonii
P.infusorioides	
D.multispinum	A.distocarinatus
X.asperatus	P.pannosus
P.ludbrookiae	
C.denticulata	C.paradoxa (upper / lower)
M.tetracantha	C.striatus
D.davidii	
O.operculata	C.hughesii (upper / lower) (P.notensis/ Morgan et al 1995)
A.cinctum	
M.australis	
	F. wonthaggiensis (upper / lower) (C.stylosus/ Morgan, 1985)
M.testudinaria	
P.burgeri	
S.tabulata	
S.areolata	
E.torynum	
B.reticulatum	C. australiensis
Iobispinosum	
C.delicata	

Fast Southern Ocean Drifting

Slow Southern Ocean Drifting

Cretaceous Magnetic Quiet Zone ?

Tasman Sea 24 ? 33 34

M10 = Perth

M14 = Cuvier

Otway Group

Heytesbury Group
Niranda Group
Wangerip Group
Sherbrook Group

Onshore Otway | Otway Shelf | Morum/Nelson Sub - Basin

Port Campbell Limestone
Clifton Formation
Gellibrand Marl
Narrawaturk Marl
Mepunga Sandstone
Dilwyn Fm
Pember Mudstone
Pebble Point
Massacre Formation
Timboon Fm
Paaratte Formation
Minerva Sst
Napier Sst
Skull Creek
Nullawaare
Thylacine Sst
Belfast
Flaxmans
Upper Waarre
Lower Waarre
Eumeralla Formation
Katnook Sst
Laira Formation
Pretty Hill Formation
Casterton

Otway Basin: Regional Picks	Play Names	Sub-Plays
TPL		
TM1		
	T30	
TO		
TE		
		T26
TE1	T20	
		T24
TP1		
	T10	
T		
	K60	
KS/C		
		K58
KS2	K50	
		K56
KS1		
KT		K55
KTC		K54
KC		K53
	K40	
KA		
	K30	
MAM		
	K20	
KV		
K	K10	

NV / D.Cliff, C.Cubitt / 03June2004 / 400-19136

OTWAY BASIN STRATIGRAPHIC COLUMN

Figure 2

WOODSIDE AUSTRALIAN ENERGY

Thylacine THA01 Well Profile in Depth

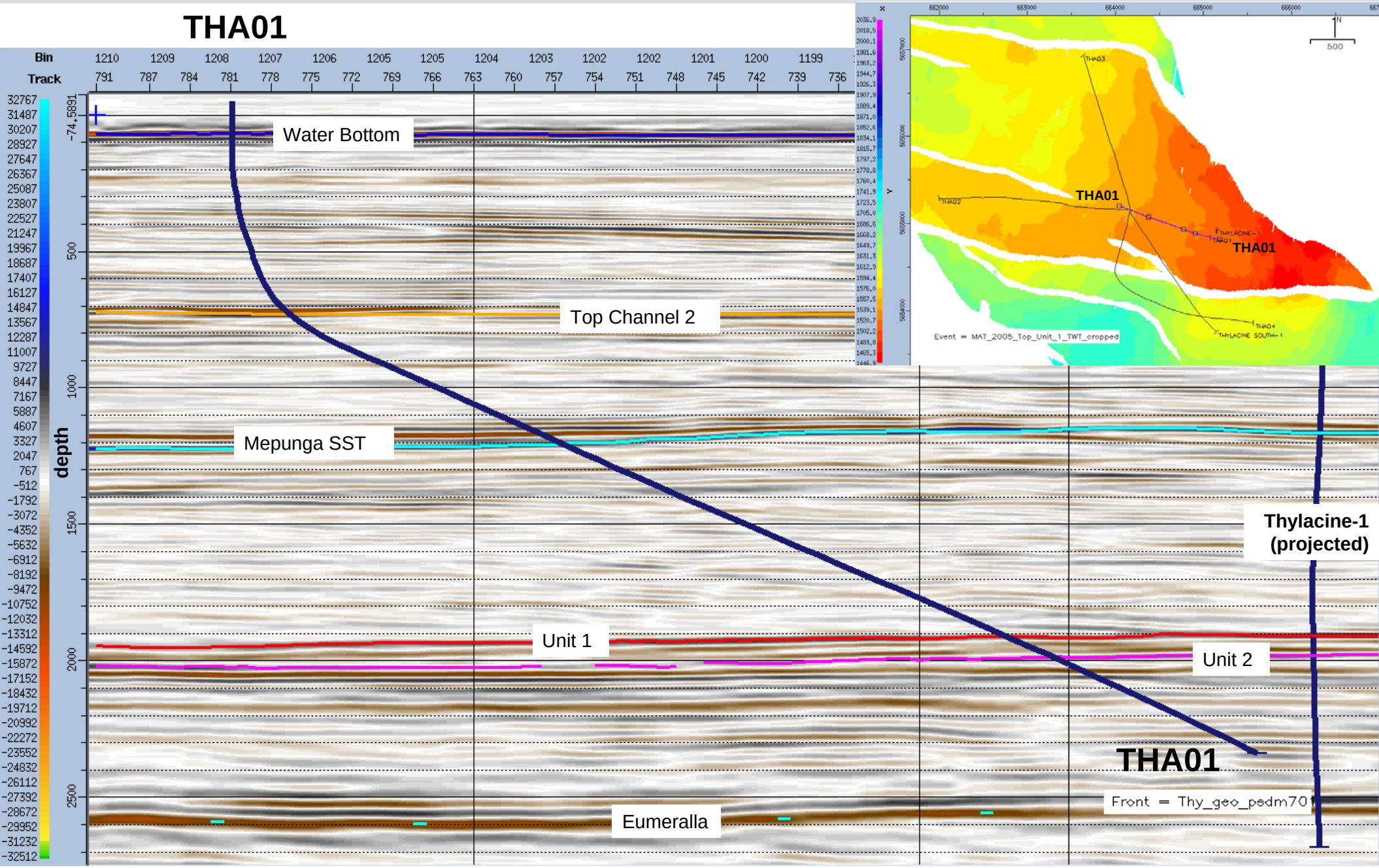
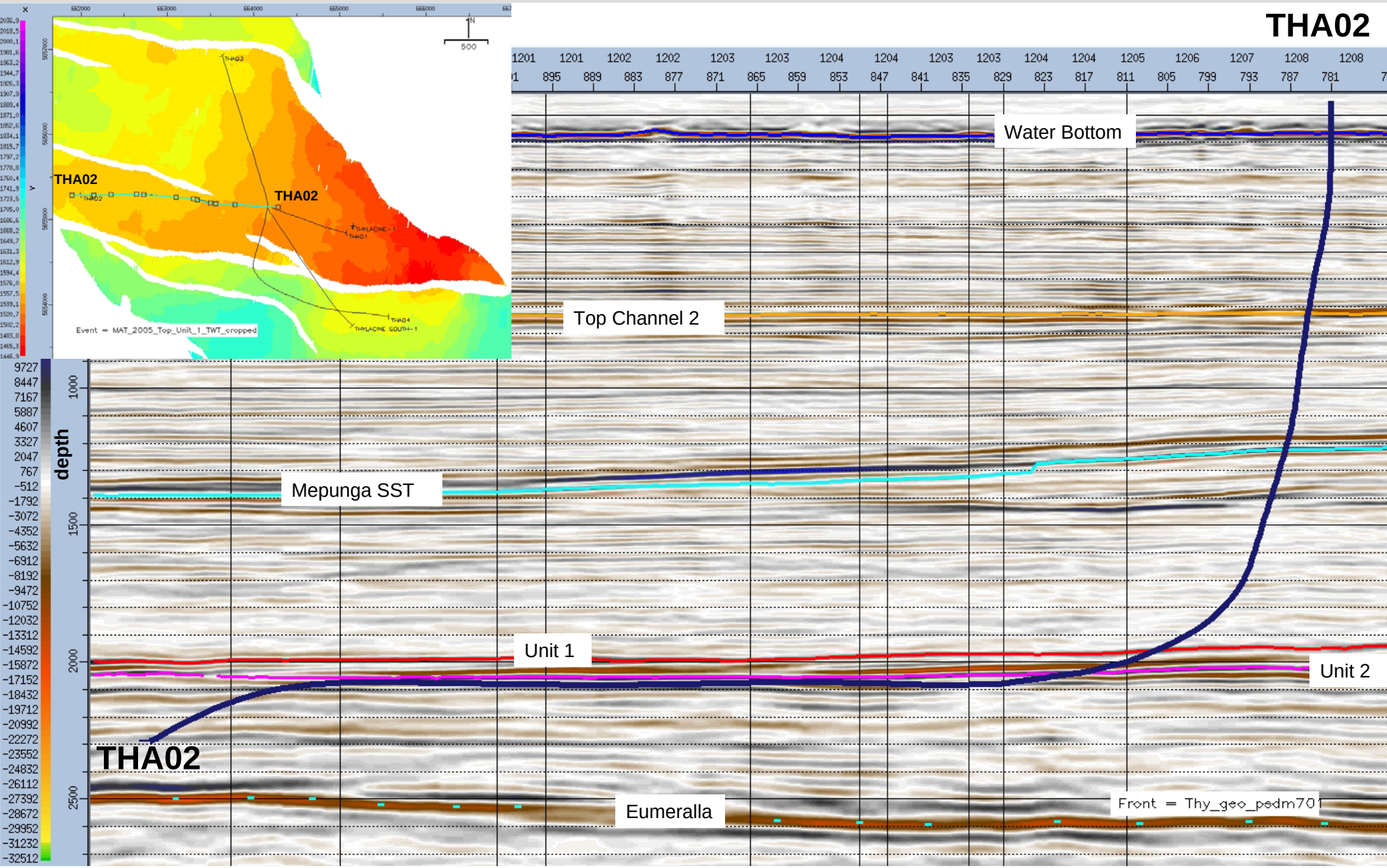
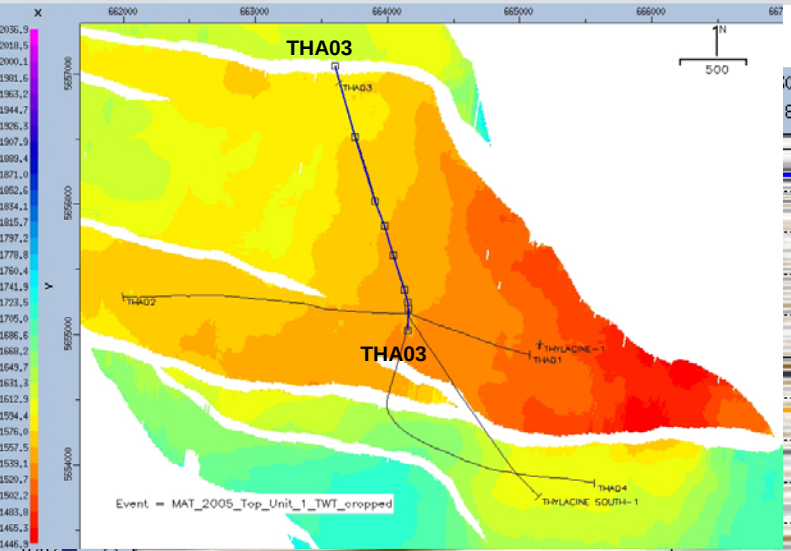


Figure 3

Thylacine THA02 Well Profile in Depth



Thylacine THA03 Well Profile in Depth



THA03

Water Bottom

Top Channel 2

Mepunga SST

Unit 1

Unit 2

THA03

Front = Thy_geo_pedm701

Eumeralla

depth

Figure 5

Thylacine THA04 Well Profile in Depth

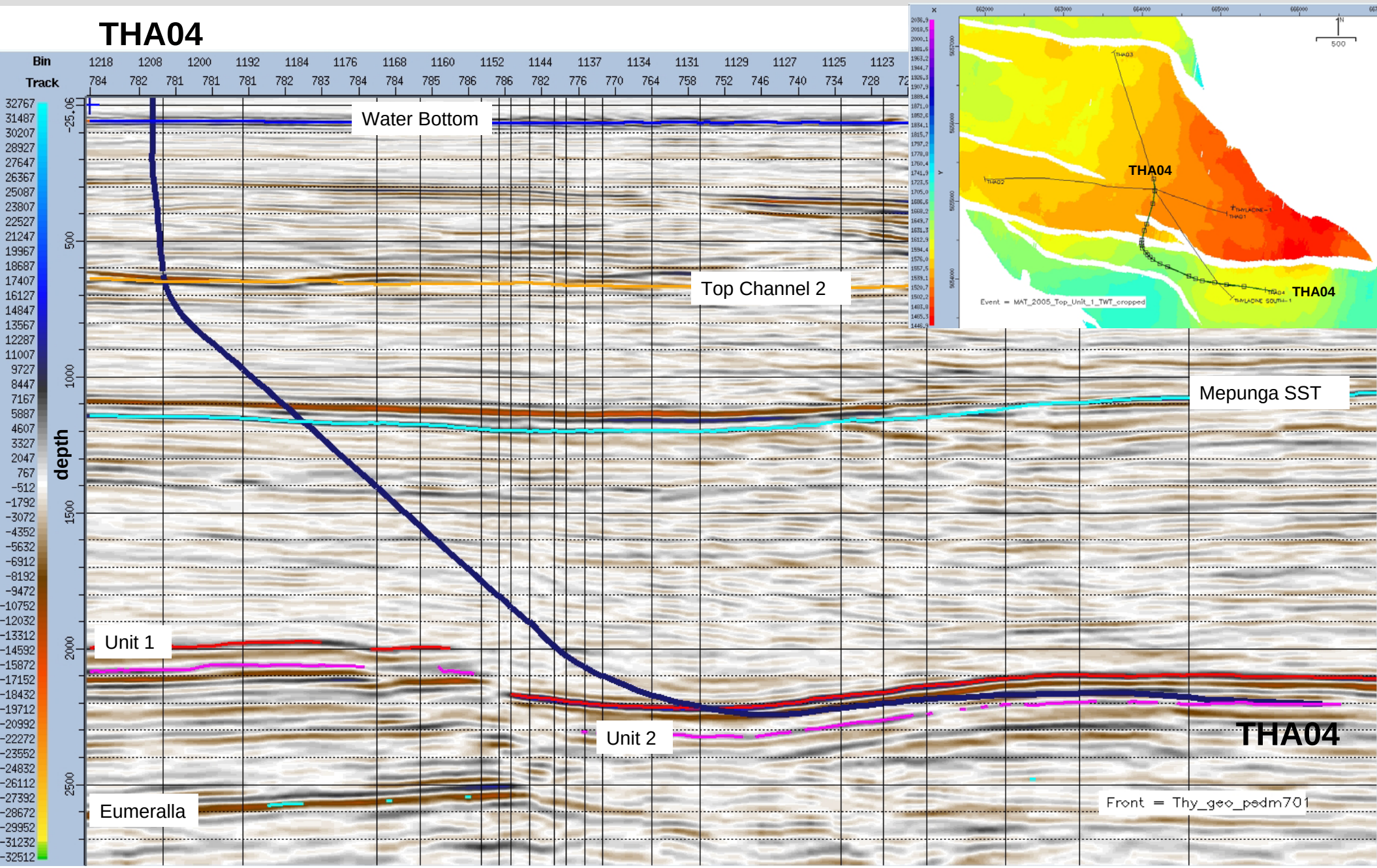


Figure 6

Thylacine Development Post-drill Structural Map

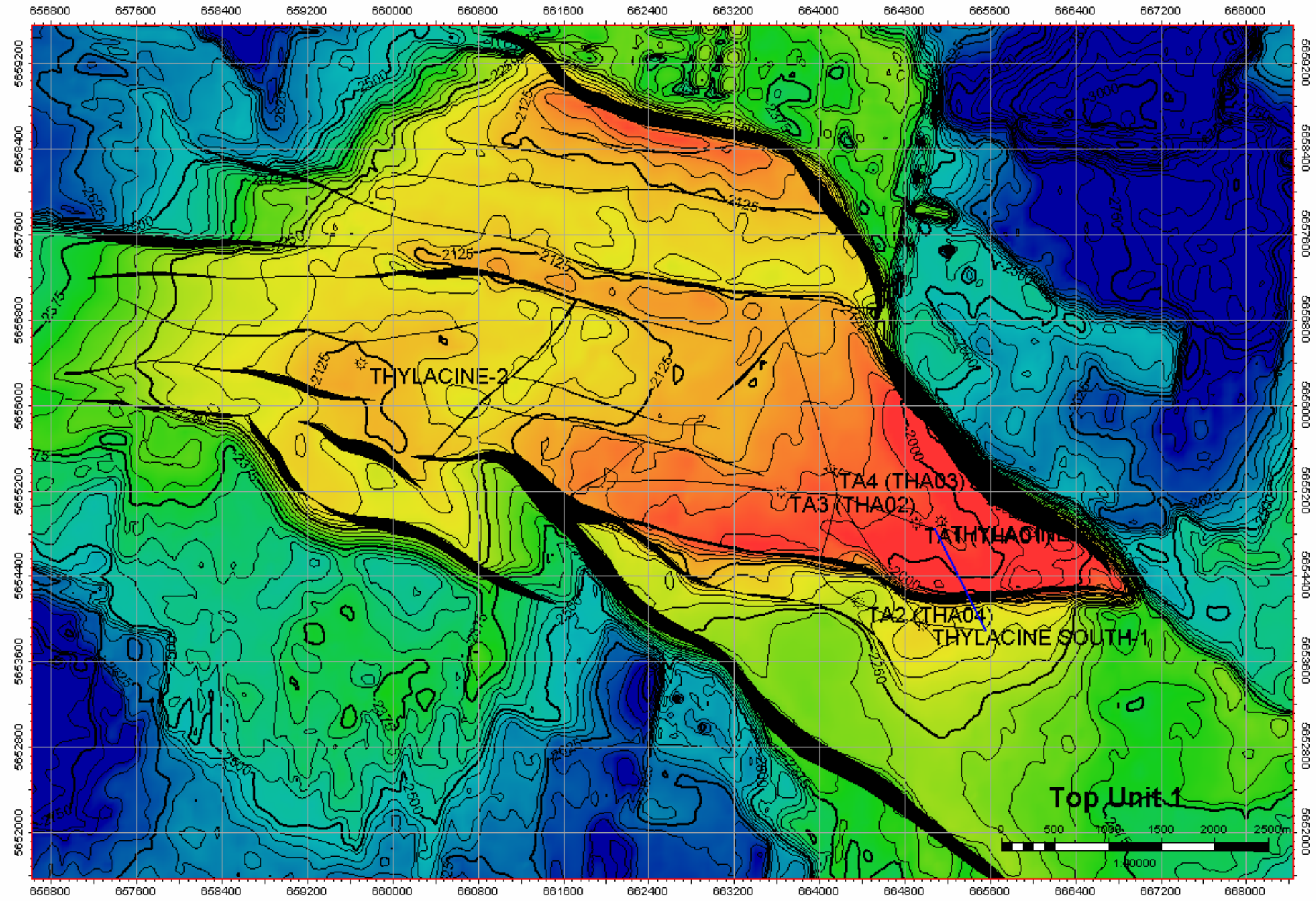


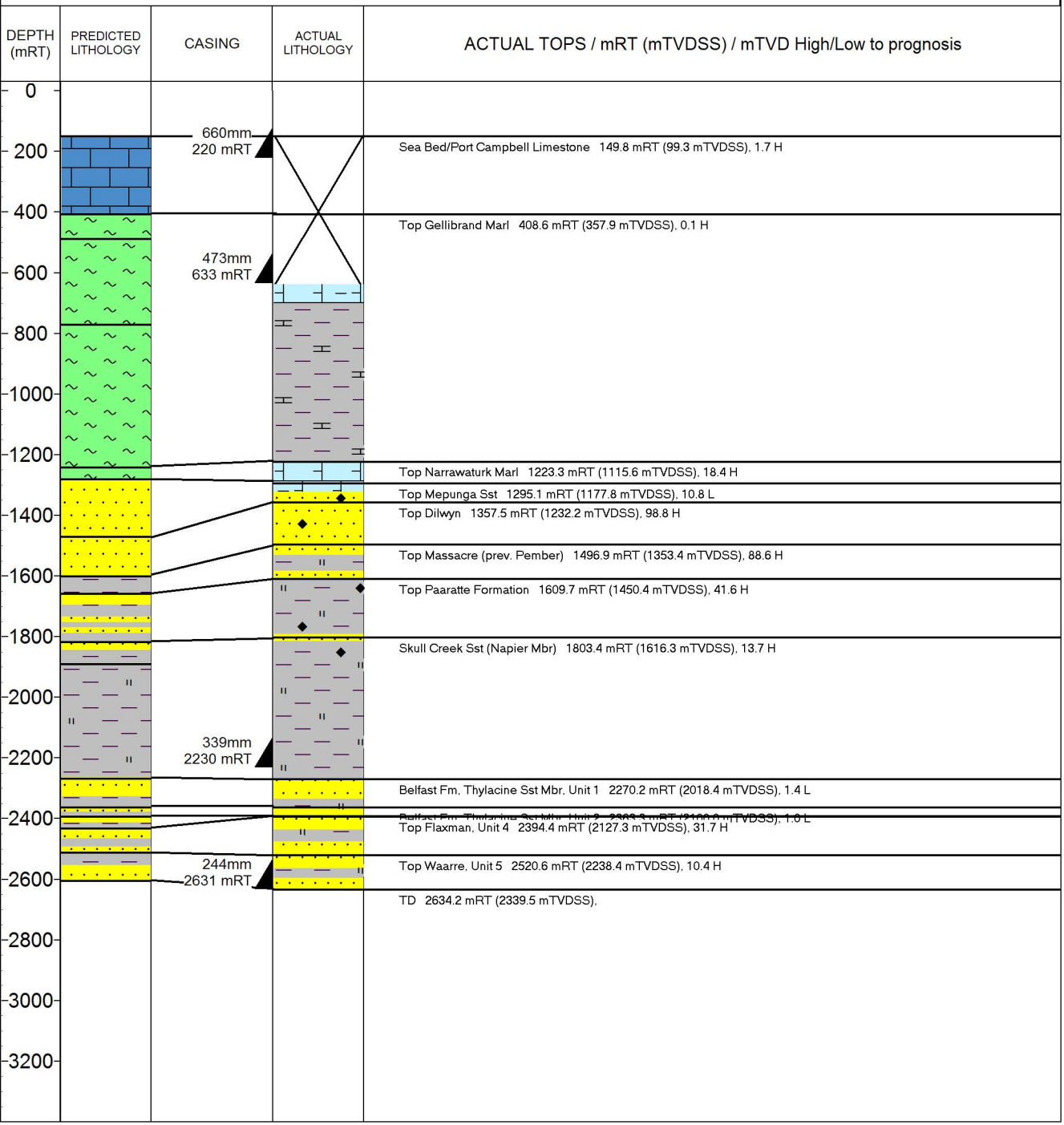
Figure 7

Figure 8

WOODSIDE Predicted vs. Actual Section: THA01*

* NB: the internal designation for this well is TA1.

Permit:	T/L2	**Latitude:**	39° 14' 14.41" S	**Rig:**	Mærsk Guardian
Basin:	Otway	**Longitude:**	142° 54' 07.74" E	**Date on Location:**	12/04/2006
Country:	Australia	**Datum:**	GDA94	**Date Spudded:**	13/04/2006
Sea Level Datum:	LAT	**Easting:**	664164.9 m E	**Date Total Depth:**	13/05/2006
Water Depth:	99.3 m	**Northing:**	5 655 161.4 m N	**Date Rig Released:**	19/07/2006
Rotary Table:	50.5 m	**UTM Zone:**	MGA Zone 54S		
Total Depth:	2634.2 mMDRT 2339.4 mTVDSS	**Seismic Line:**	Investigator 3D PreSDM	**Well Status:**	Completed - Gas Well
				Author:	C.Ellis/D.Moir



WOODSIDE Predicted vs. Actual Section: THA02*

* NB: the internal designation for this well is TA3.

Permit:	T/L2	**Latitude:**	39° 14' 14.47" S	**Rig:**	Maersk Guardian
Basin:	Otway	**Longitude:**	142° 54' 07.58" E	**Date on Location:**	20/05/2006
Country:	Australia	**Datum:**	GDA94	**Date Spudded:**	20/05/2006
Sea Level Datum:	LAT	**Easting:**	664161.0 m E	**Date Total Depth:**	15/06/2006
Water Depth:	99.3 metres	**Northing:**	5 655 159.6 m N	**Date Rig Released:**	07/07/2006
Rotary Table:	50.5 metres	**UTM Zone:**	MGA Zone 54S		
Total Depth:	4026 mMDRT 2289.7 mTVDSS	**Seismic Line:**	Investigator 3D PreSDM	**Well Status:**	Completed - Gas Producer
				Author:	C.Ellis/D.Moir

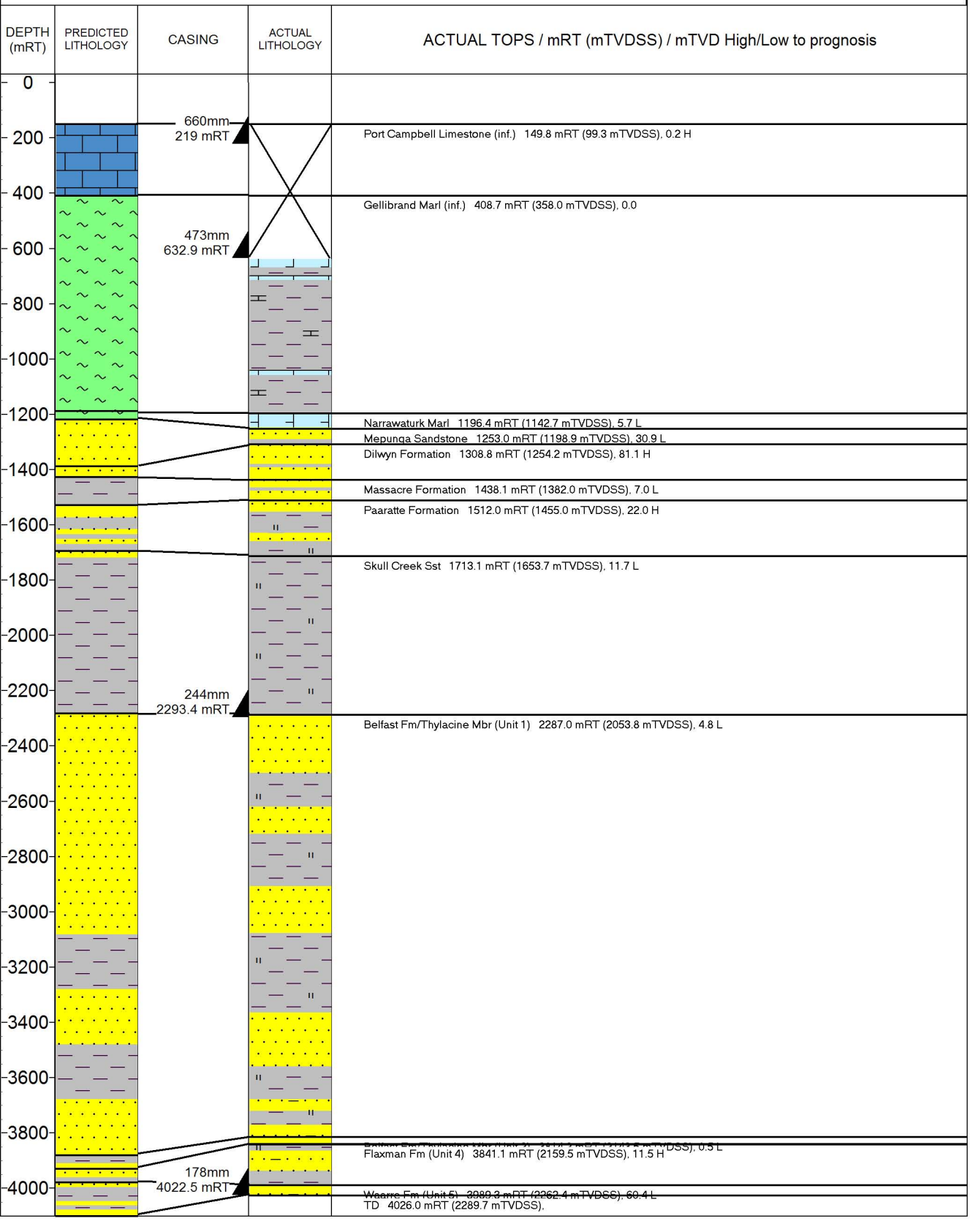


Figure 10

Predicted vs. Actual Section: THA03*

* NB: the internal designation for this well is TA4.

Permit:	T/L2	**Latitude:**	39° 14' 14.38" S	**Rig:**	Maersk Guardian
Basin:	Otway	**Longitude:**	142° 54' 07.49" E	**Date on Location:**	21/05/2006
Country:	Australia	**Datum:**	GDA94	**Date Spudded:**	22/05/2006
Sea Level Datum:	LAT	**Easting:**	664159.0 m E	**Date Total Depth:**	02/08/2006
Water Depth:	99.3 metres	**Northing:**	5 655 162.4 m N	**Date Rig Released:**	22/09/2006
Rotary Table:	50.5 metres	**UTM Zone:**	MGA Zone 54S		
Total Depth:	3780.0 mMDRT 2111.9 mTVDSS	**Seismic Line:**	Investigator 3D PreSDM	**Well Status:**	Completed - Gas Producer
				Author:	C.Ellis/D.Moir

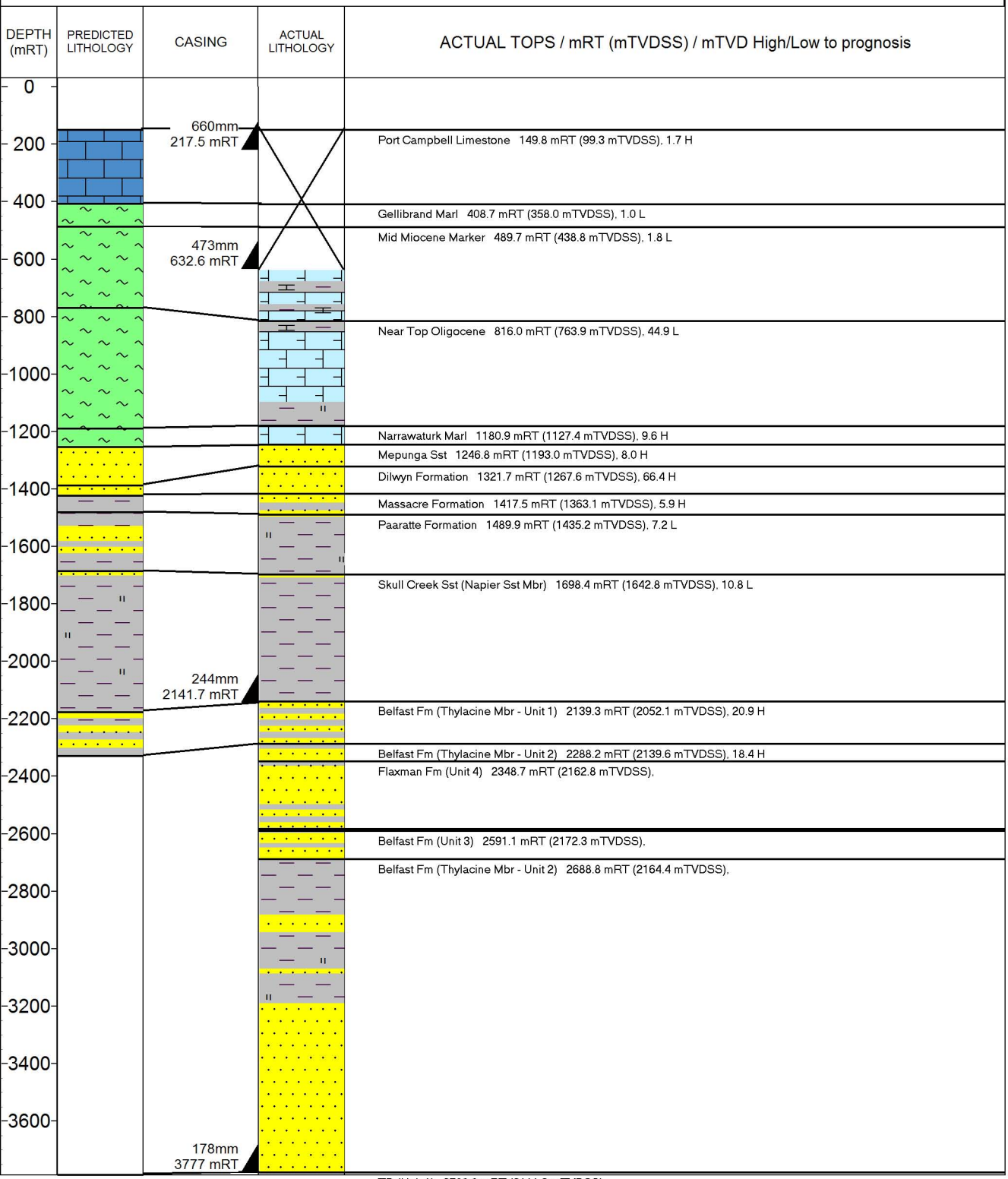
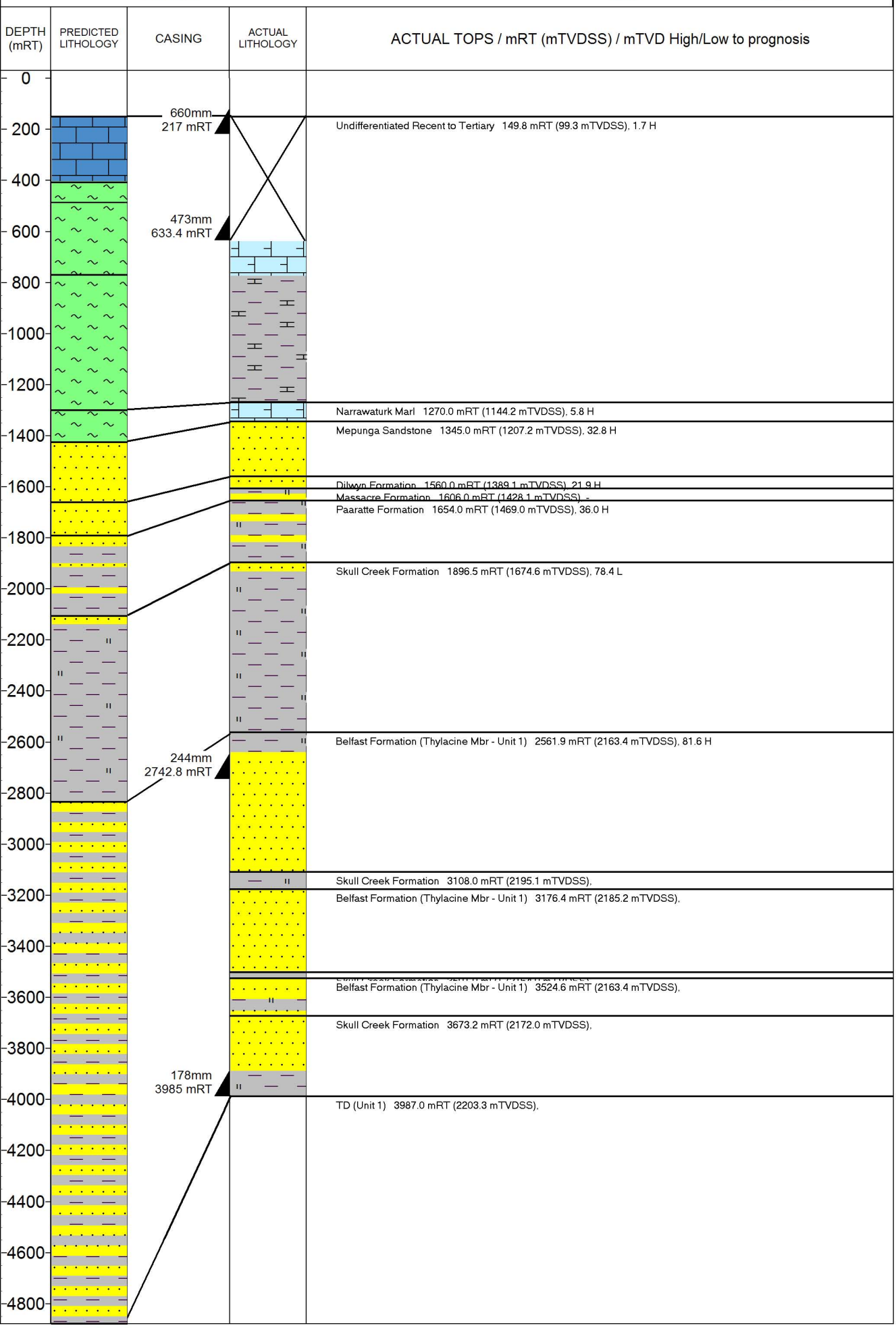


Figure 11

Predicted vs. Actual Section: THA04*

* NB: the internal designation for this well is TA2.

Permit:	T/L2	**Latitude:**	39° 14' 14.56" S	**Rig:**	Maersk Guardian
Basin:	Otway	**Longitude:**	142° 54' 07.58" E	**Date on Location:**	17/03/2006
Country:	Australia	**Datum:**	GDA94	**Date Spudded:**	17/03/2006
Sea Level Datum:	LAT	**Easting:**	664 161.0 m E	**Date Total Depth:**	26/08/2006
Water Depth:	99.3 metres	**Northing:**	5 655 156.8 m N	**Date Rig Released:**	24/09/2006
Rotary Table:	50.5 metres	**UTM Zone:**	MGA Zone 54S		
Total Depth:	3987.0 mMDRT 2203.3 mTVDSS	**Seismic Line:**	Investigator 3D PreSDM	**Well Status:**	Completed - Gas Producer
				Author:	C.Ellis/D.Moir



Thylacine - A01

Core Description

WOODSIDE

Drawing No: 4396979 — Date: 23 January 2007 — Author: T. Pham — Date Logged:

Units Logged: — Country: Australia — Basin: — Sub-basin:

Permit: — Spud date: — TD: — Well classification:

Facies Associations (Depositional Environment)

Fluvial Fan; Point Bar; Braided River (Low sinuosity); Meander Channel (High sinuosity); Swamp; Lacustrine; Braided Lacustrine; Flood Plain / Over bank; Crevasse Splay; Proximal; Distal; Paleosol Soil; Basal Transgressive sand; Prodelta; Distal Delta Front - Tidal Delta Flats; Proximal Delta Front; Distributary Channels; Mouth Bars; Interdistributary Bay; Tidal Channel; Tidal Mud Flats; Tidal Sand Flats; Interdistributary (Undiff); Heterolithics; Storm Beds; Interdistributary Flats (Lagoonal Fines); Shoreface; Upper; Middle; Lower; Lagoon; Turbidites; Deltaics; Grain Flows; Slumps; Hemipelagics; Basins; Inner Shelf; Outer Shelf

Proglacial (Active): Proglacial Outwash Fans (braided channel); Proglacial Outwash Fan (meander channel); Terminoglacial Sub-aqueous Outwash Fans; Terminoglacial Rainout Diamictite; Terminoglacial Push Moraine; Glacio-Lacustrine; Glacio-Marine; Glacio-Gravity Flows

Lithofacies Descriptions

Gmm, Gms, Gmms, Gt, Sh, St, Sp, Sl, Se, Ss, Sr, Sm, Shb, Fh, Fl, Fsc, Fm, Hh, Hr, Hm (Matrix/clast supported conglomerates, horizontally bedded, trough cross-stratified, planar cross-stratified, low angle cross bedded, scour fill, rippled, massive sandstones, "herring bone" cross-bedded, "flip-up" sandstone, shelly sandstone, laminated heterolithics, bioturbated heterolithics, laminated, rippled, massive mudstones, bioturbated mudstone, coal, shelly siltstone)

*Lt: Rhythmic · *Sl: Laminated

Fluvial Facies

Sc: Bedload Channel Sca · Sf: Mixed Load to Bed Sus Crevasse Splay · Fs: Suspended Load - Abandoned Channels · Sus: Suspended Load · Cs: Clay Palaeosol · Cf: Clay Flatwater · Cl: Coal · L: Lacustrine

Turbidite Facies

Ta: Turbidites (massive, graded) · Tb: Turbidites (parallel laminae) · Tc: Turbidites (ripples, wavy or convoluted laminae) · Td: Turbidites (upper parallel laminae) · Te: Turbidites (pelagic mud)

Soil Maturity

ND: Not developed · VWD: Very weakly developed · WD: Weakly developed · MD: Moderately developed · SD: Strongly developed · VS: Very strongly developed

Lithology

Carbonaceous claystone; Clayey silt Mudstone; Carbonaceous clay Mudstone; Variable coloured clay Mudstone; Silty clay Mudstone; Silt or sand dominated Mudstone

Sequence

Highstand System Tract · Transgressive System Tract · Lowstand System Tract

Permeability to Water

Nil to Low · Poor to Fair · Moderate to Good · Good to High · Excellent to High

Boundary Types

Erosive - Sand / Sand; Erosive Sand/Sand; Erosive - Clay Laminae / Clay; Sharp - Clay Laminae / Clay; Erosive - Rip up Clasts; Erosive (Mud/Sand); Erosive (Mud/Sand); Erosive (Sand/Sand); Erosive (Sand/Sand)

Pyrite; Sulphur; Glauconite; Calcite; Siderite; Dolomite; Yellow Stain; Red Stain; Iron Stain; Clay Inclusion (or ??); Quartz

Samples

Thin section Petrology · Plug (pore perm) · Biostratigraphy · Geochemistry · Geomechanics · Core photo snapshot

Load Type

BL: Bed Load · SL: Suspended Load · ML: Mixed Load

Sedimentary Structures — **Trace Fossils**

Vertical Scale - 1 : 50 (2cm = 1metre)

(Printed: 21 Feb 07)

WOODSIDE

Composite Well Log

THA01*

* NB: the internal designation for this well is TA1.

1:1000

Well:	THA01	**Sea Level Datum:**	LAT	**Date on Location:**	12/04/2006	**Rig:**	Mærsk Guardian
Permit:	T/L2	**Water Depth:**	99.3 m	**Date Spudded:**	13/04/2006	**Drilling Contractor:**	Maersk
Basin:	Otway	**Rotary Table:**	50.5 m	**Date Total Depth:**	13/05/2006	**Wireline Logs:**	Schlumberger
Country:	Australia			**Date Rig Released:**	19/07/2006	**MWD:**	Halliburton Sperry Sun
						Mud Logging:	GeoServices
						Cementing:	Halliburton

Latitude:	39° 14' 14.41" S	**Total Depth:**	2634.2 mMDRT 2339.4 mTVDSS	**Well Status:**	Completed - Gas Well	**Wellsite Geologists:**	J.Hobday S.Robbie D.Thornton
Longitude:	142° 54' 07.74" E						
Datum:	GDA94						
Easting:	664164.9 m E						
Northing:	5 655 161.4 m N						
UTM Zone:	MGA Zone 54S	**Abandonment Plugs:**	n/a			**Wellhead Fitting:**	Cameron
						Drilling Method:	Rotary

Seismic Line: Investigator 3D PreSDM

Author: C.Ellis/D.Moir

WIRELINE LOGGING DATA

Suite/ Run	Log	Date	Top Depth	Base Depth	Interval	Casing Logger	Casing Driller	TD Logger	TD Driller	Mud Type	Density	Viscosity	Max.Rec. Temp.°C	Rm @°C	Rm @ MRT°C	Fluid Loss	pH	Origin of Sample	Rmf @ °C	Rmc @ °C	Salinity	Bit Size	Casing Size	Circ. Time	Time Since Circulation	Recorded By	Witness
	n/a																										

*A GR-CCL log was run after setting 7" liner

MWD

Run No.	Hole Size	Top Depth	Base Depth	Comments
1	762mm	149.8 mRT	220 mRT	ESS - surveys
2	584mm	220 mRT	638 mRT	Directional - surveys
3	444mm	638 mRT	1173.8 mRT	DM-DGR-DDS- EWR-P4
4	444mm	1173.8 mRT	1357.8 mRT	DM-DGR-DDS- EWR-P4
5	444mm	1357.8 mRT	1530.2 mRT	DM-DGR-DDS- EWR-P4
6	444mm	1530.2 mRT	2240 mRT	DM-DGR-DDS- EWR-P4
7	311mm	2240 mRT	2387.4 mRT	CTN-ACAL-ALD-DM-PWD-DGR-EWR-P4
8	311mm	2387.4 mRT	2634.2 mRT	CTN-ACAL-ALD-DM-PWD-DGR-EWR-P4

CASING AND HOLE RECORD

Casing Size	Top Depth	Casing Shoe	Bit Size	Section TD
660mm	Surface	220.0 mRT	762mm	220 mRT
473mm	Surface	633.0 mRT	584mm	638 mRT
339mm	Surface	2230.0 mRT	444mm	2240 mRT
244mm	2079 mRT	2631.0 mRT	311mm	2634.2 mRT

LOT/FIT	Depth (mRT)	EMW
FIT	641	2.0 sg
FIT	2243	1.5 sg

SAMPLE RECORD

Type	Top Depth (mRT)	Base Depth (mRT)	Remarks
Cuttings	640	2629	5 to 10 metre sampling intervals
Core	2382.4	2436.55	54.15 m cut, 54.15 m (100%) rec.
Core	2436.55	2490.53	53.98 m cut, 53.98 m (100%) rec.
Core	2490.53	2536.77	46.24 m cut, 45.32 m (98.01%) rec.
Core	2536.77	2591.02	54.25 m cut, 54.25 m (100%) rec.

FORMATION TOPS

Formation	Depth (mRT)	Depth (mtvdss)
Sea Bed/Port Campbell Limestone	149.8	99.3
Top Gellibrand Marl	408.6	357.9
Top Narrawaturk Marl	1223.3	1115.6
Top Mepunga Sst	1295.1	1177.8
Top Dilwyn	1357.5	1232.2
Top Massacre (prev. Pember)	1496.9	1353.4
Top Paaratte Formation	1609.7	1450.4
Skull Creek Sst (Napier Mbr)	1803.4	1616.3
Belfast Fm, Thylacine Sst Mbr, Unit 1	2270.2	2018.4
Belfast Fm, Thylacine Sst Mbr, Unit 2	2363.3	2100.0
Belfast Formation, Unit 3	2383.0	2126.1
Top Flaxman, Unit 4	2394.4	2127.3
Top Waarre, Unit 5	2520.6	2238.4
TD	2634.2	2339.5

WIRELINE FLUID SAMPLES

Suite/Run	Sample No.	Depth (mRT)	Interpreted Fluid	Remarks
n/a		0		

PRODUCTION TESTS

Test No.	Top Depth	Base Depth	Oil	Gas	Condensate	Water/Filtrate	Choke	CGR	°API
1a	2374.62	2379.14		49.7 MMscfd/day			60"/64"	3.26 bbl/MMscf	
1b	2395.08	2399.08		"			"	"	
1c	2406	2422.5		"			"	"	
1d	2427	2435.41		"			"	"	
1e	2469	2474		"			"	"	
1f	2479	2484		"			"	"	
1g	2494	2501.92		"			"	"	
1h	2526.5	2558.2		"			"	"	

KEY

Rock Types

Limestone, Dolomite, Calcilutite, Calcisiltite, Calcarenite, Marl, Coal, Salt, Tuff, Volcanic, Plutonic, Chert, Claystone, Siltstone, Sandstone, Conglomerate

Cements/Matrix

Clay, Silt, Sand, Pebbles, Recrystallised, Calcite, Dolomite, Siderite, Pyrite, Silica

Accessories

Chert, Calcite crystals, Glauconite, Pyrite, Mica, Quartz crystals, Concretions/Nodules (general), Chlorite, Carbonaceous, Coal, Bituminous, Lithics, Haematite, Feldspar, Salt, Anhydrite, Volcanics (general)

Fossils

Bioclastic, Fossils (general), Brachiopods, Bryozoa, Corals, Crinoids, Echinoderms, Foraminifera, Gastropods, Inoceramus, Molluscs, Oolites, Ooids general, Ostracod, Plant remains, Radiolaria, Rudists, Spicules

Engineering

Casing Shoe; Casing Hanger; Sidewall Core - Recovered; Sidewall Core - No Recovery; Rotary Sidewall Core - Recovered; Rotary Sidewall Core - No Recovery; Cored Interval; - Recovered; - No Recovery; Fluid Sample; Production Test Interval; Survey (TVDRT: 234 m, Incl: 25, Azi: 45)

LITHOLOGICAL DESCRIPTIONS

Seabed to 638 mRT (488.2 metres)
Riserless drilling, returns to seabed.

638 to 835 mRT (197 metres)
CALCILUTITE, ARGILLACEOUS: light olive grey to medium grey, trace off white, very soft to soft, tending soft to firm at depth, blocky, amorphous, 20% clay, trace brown coral fragments, trace carbonaceous matter, trace pyrite.

interbedded with CLAYSTONE, CALCAREOUS: light olive to olive grey, medium dark grey, soft to firm, blocky, occasionally sub-fissile, 20 to 30% calcareous clay, rare silt, trace corals, trace carbonaceous matter, trace pyrite.

835 to 1000 mRT (165 metres)
CLAYSTONE, CALCAREOUS: light olive grey to olive grey, off white in part, trace dark yellow brown, soft to firm, blocky to sub-blocky, 20% calcareous clay, trace coral fragments.

1000 to 1173 mRT (173 metres)
CLAYSTONE, CALCAREOUS: medium grey to olive grey, brownish grey, trace dark yellow brown, soft to firm, blocky to sub-blocky in parts, 20% calcareous clay, 10% silt.

1173 to 1295.1 mRT (122.1 metres)
Interbedded CLAYSTONE, CALCAREOUS: medium grey to olive grey, minor light olive grey, predominantly soft to moderately hard, blocky to sub-blocky, 20% calcareous clay, 10% silt, trace carbonaceous specks and micro-laminations, trace glauconite,

and CALCILUTITE: off white to light olive grey, light grey in part, soft to firm, blocky to sub-blocky, 20% clay, trace to 2% glauconite.

1295.1 to 1357.5 mRT (62.4 metres)
SANDSTONE: clr to trans, lt olv gry, to opq pl brn at dpth, l to hd, pred m to crs, com v crs & f, rr gr, v pr-pr sorted, sbang-sbrnd, sbelon-sbsph, rr sil & rr pyr cmt, rr pyr, tr glauc, tr liths, gd inf por,

interbedded with CLAYSTONE, SILTY: lt-dk brn, brn-blk, frm-mod hd, blky-sbblky, 10% calc cly, 20% slt, tr sil sd, 3% carb mat,

CALCILUTITE, ARGILLACEOUS: off wh-lt ol gy, lt gy, s-fim, 20% cly, rr glauc,

and occasionally interbedded with minor CLAYSTONE, CARBONACEOUS: dk brn gry-brn blk, frm, blky-sbblky, 20% slt, tr sd, tr carb spks and calc crys.

1357.5 to 1440 mRT (82.5 metres)
SANDSTONE: clear to translucent, opaque, frosted pale brown, grey green, loose to hard, 10 to 20% clay, predominantly fine to medium, abundant coarse, minor very coarse and very fine grains, poor to moderately sorted, sub-angular to sub-rounded, slightly elongated to slightly spherical, 5% siliceous and 5% pyrite cement, trace nodular pyrite, trace glauconite and lithics,

interbedded with CLAYSTONE, SILTY: light to dark brown, brownish black, olive grey, firm to moderately hard, blocky to sub-blocky, 10% calcareous clay, 20 to 30% silt, trace siliceous sand, 3% carbonaceous material and specks,

and interbedded with rare CALCILUTITE, ARGILLACEOUS: off white to light olive grey, light grey, soft to firm, 20% clay, trace glauconite.

1440 to 1496.9 mRT (56.9 metres)
SANDSTONE, ARGILLACEOUS: clear to translucent, frosted pale brown to brownish black, greyish green, loose to hard, 20% clay, very fine to coarse, trace granules, predominantly fine to medium, 5% very coarse grains, moderate to poorly sorted, sub-angular to sub-rounded, slightly spherical, trace siliceous cement, trace disseminated pyrite and glauconite, fair inferred porosity,

interbedded with CLAYSTONE, SILTY: medium to dark brown, brownish black, olive grey, light brownish grey in parts, firm to moderately hard, blocky to sub-blocky, trace calcareous clay, 25% silt, trace siliceous sand, 3% carbonaceous material and specks.

1496.9 to 1529 mRT (32.1 metres)
SANDSTONE, ARGILLACEOUS: generally as above,

interbedded with CLAYSTONE, SILTY: generally as above,

and CLAYSTONE: dk yelsh brn-dsky yel brn, frm -mod hd, blky-sbblky, 10% slt, tr carb mat, tr liths mat, tr calc crys.

1529 to 1609.7 mRT (80.7 metres)
CLAYSTONE: mottled dark yellow brown to dusky yellow brown, dark olive grey to greenish black, dark reddish brown to very dusky red, firm to moderately hard, blocky to sub-blocky, 10% silt, trace very fine to fine grained quartz, trace carbonaceous material, trace lithic material,

interbedded with minor SANDSTONE, ARGILLACEOUS: generally as above.

1609.7 to 1732 mRT (122.3 metres)
CLAYSTONE, SILTY: medium to dark grey, dark olive grey to greenish black, decreasing dark reddish brown to very dusky red, firm to moderately hard, blocky to sub-blocky, 15 to 20% silt, 5% siliceous sand, rare carbonaceous specks and material, rare pyrite, trace lithics, trace very fine to fine grained quartz,

occasionally interbedded with rare SANDSTONE: clear to translucent, pale brown, trace pink and orange grains, loose, angular fracture, predominantly coarse to very coarse, 10% granules, moderately to well sorted, sub-rounded to sub-angular, sub-spherical, no visible matrix or cement, good inferred and visual intergranular porosity.

1732 to 1803.4 mRT (71.4 metres)
CLAYSTONE, SILTY: dark grey to olive black, soft to moderately hard, blocky to sub-blocky, 20% silt, trace siliceous sand, trace carbonaceous specks and macro-laminations,

interbedded with rare SANDSTONE: pale grey, translucent, frosted, minor clear, soft to friable, blocky, 15% clay, very fine to fine, 10% medium grains, trace granules, trace siliceous grey clay matrix, trace siliceous cement, trace carbonaceous specks, trace pink garnets, fair inferred intergranular porosity.

1803.4 to 2164 mRT (360.6 metres)
CLAYSTONE, SILTY: dark grey to olive black, brownish grey to brownish black, trace light to medium brown in part at depth, soft to moderately hard, blocky to sub-blocky, 20% silt, trace siliceous sand, trace carbonaceous specks and laminations, trace pyrite, micromicaceous, trace calcite crystals.

2164 to 2270.2 mRT (106.2 metres)
CLAYSTONE, SILTY: generally as above, trace micromicaceous, trace calcareous fragments, trace glauconite.

2270.2 to 2402 mRT (131.8 metres)
CLAYSTONE, SILTY: generally as above, trace to 10% very fine siliceous sand grains,

interbedded with SANDSTONE: clear to translucent, frosted, opaque white, off white, loose, becoming friable at depth, 15% clay, minor silt, very fine to coarse, dominantly fine to medium grained, dominantly very fine to fine at depth, moderate to well sorted, sub-angular to sub-rounded, slightly spherical, trace white argillaceous matrix, trace siliceous cement, trace glauconite, fair to good inferred porosity.

2402 to 2494.4 mRT (92.4 metres)
CLAYSTONE, SILTY: dark grey to grey black, trace medium grey, soft to moderately hard, blocky to sub-blocky, 20% quartz silt, rare quartz sand, trace to rare carbonaceous specks and micro-laminations, trace micromicaceous, trace disseminated pyrite,

interbedded with SANDSTONE: clear to translucent, frosted, opaque white, dark yellow brown to brownish grey, dominantly friable aggregates, trace to minor loose, 5 to 15% clay, 5 to 15% silt, very fine to medium, trace to 10% coarse grains, moderately to well sorted, sub-rounded to sub-angular, slightly spherical, trace white argillaceous matrix, trace carbonaceous specks and laminae, trace lithic fragments, trace pyrite, poor visual to inferred fair porosity.

2494.4 to 2634.2 mRT (TD) (139.8 metres)
CLAYSTONE, SILTY: dark grey to greyish black, greyish brown, olive black, trace medium grey to medium brown, soft to moderately hard, hard in parts, blocky to sub-blocky, 20% quartz silt, rare very fine quartz grains and carbonaceous micro-laminae and specks,

interbedded with SANDSTONE: clear to translucent, off white, pale grey, tending light to medium brown at depth, friable, trace loose, 10 to 15% clay, 15% silt, very fine to coarse, predominantly very fine to fine, trace coarse to very coarse grains, moderately to well sorted, sub-rounded to sub-angular, slightly spherical, rare siliceous cement, trace carbonaceous material and specks, trace lithic fragments, trace pyrite, poor visual to fair inferred porosity.

THA01

2634.2 mMDRT
2339.4 mTVDSS

WOODSIDE

Composite Well Log

THA02*

1:1000

* NB. The internal designation for this well is TA3.

Well:	THA02	**Sea Level Datum:**	LAT
Permit:	T/L2	**Water Depth:**	99.3 metres
Basin:	Otway	**Rotary Table:**	50.5 metres
Country:	Australia		
Latitude:	39° 14' 14.47" S	**Total Depth:**	4026 mMDRT
Longitude:	142° 54' 07.58" E		2289.7 mTVDSS
Datum:	GDA94		
Easting:	664161.0 m E		
Northing:	5 655 159.6 m N		
UTM Zone:	MGA Zone 54S	**Abandonment Plugs:**	n/a
Seismic Line:	Investigator 3D PreSDM		

Date on Location:	20/05/2006	**Rig:**	Maersk Guardian
Date Spudded:	20/05/2006	**Drilling Contractor:**	Maersk
Date Total Depth:	18/06/2006	**Wireline Logs:**	n/a
Date Rig Released:	07/07/2006	**MWD:**	Sperry
		Mud Logging:	GeoServices
		Cementing:	Halliburton
Well Status:	Completed - Gas Producer	**Wellsite Geologists:**	J.Hobday, S.Robbie, B.Fawcett
		Wellhead Fitting:	Cameron
		Drilling Method:	Rotary

Author: C.Ellis/D.Moir

WIRELINE LOGGING DATA

Suite/ Run	Log	Date	Top Depth	Base Depth	Interval	Casing Logger	Casing Driller	TD Logger	TD Driller	Mud Type	Density	Viscosity	Max.Rec. Temp.°C	Rm @ °C	Rmf @ Max°C	Fluid Loss	pH	Origin of Sample	Rmf @ °C	Rmc @ °C	Salinity	Bit Size	Casing Size	Circ. Time	Time Since Circulation	Recorded By	Witness
	n/a																										

MWD

Run No.	Hole Size	Top Depth	Base Depth	Comments
1	762mm (30")	149.8 mRT	219.9 mRT	ESS - surveys
2	584mm (23")	219.9 mRT	639.0 mRT	Directional - surveys
3	311mm (12¼")	632.9 mRT	2289.0 mRT	ABG - DDS - PWD - EWR-P4 - DGR - DM
4	216mm (8½")	2299.0 mRT	3510.0 mRT	ABG - DM - EWR-P4 - ALD - ACAL - CTN - GeoTap - PWD
5	216mm (8½")	3510.0 mRT	4026.0 mRT	ABG - DM - DGR - EWR-P4 - ALD - ACAL - CTN - GeoTap - PWD

CASING AND HOLE RECORD

Casing Size	Top Depth	Casing Shoe	Bit Size	Section TD
660mm	Surface	219.9 mRT	762mm	219.9 mRT
473mm	Surface	632.9 mRT	584mm	639.0 mRT
244mm	Surface	2293.4 mRT	311mm	2299.0 mRT
178mm	2181 mRT	4022.5 mRT	216mm	4026.0 mRT

LOT/FIT	Depth (mRT)	EMW
FIT	641.0	2.0 sg
FIT	2302.0	2.0 sg

SAMPLE RECORD

Type	Top Depth	Base Depth	Remarks
Cuttings	645 mRT	4026 mRT	5 to 10 metre intervals

FORMATION TOPS

Formation	Depth (mMDRT)	Depth (mTVDSS)
Port Campbell Limestone (inf.)	148.8	99.3
Gellibrand Marl (inf.)	408.7	359.6
Narrawaturk Marl	1199.4	1142.7
Mepunga Sandstone	1253.0	1199.9
Dilwyn Formation	1308.8	1254.2
Massacre Formation	1438.1	1382.0
Paaratte Formation	1512.0	1455.0
Skull Creek Silt	1713.1	1653.7
Belfast Fm/Thylacine Mbr (Unit 1)	2287.0	2053.8
Belfast Fm/Thylacine Mbr (Unit 2)	3814.2	2143.5
Belfast Fm (Unit 3)	3839.4	2156.4
Flaxman Fm (Unit 4)	3841.1	2158.5
Waarre Fm (Unit 5)	3989.3	2282.4
TD	4026.0	2289.7

WIRELINE FLUID SAMPLES

Suite/Run	Sample No.	Depth (mRT)	Interpreted Fluid	Remarks
n/a		0		

PRODUCTION TESTS

Test No.	Top Depth	Base Depth	Oil	Gas	Condensate	Water/Filtrate	Choke	CGR	°API
1a	2509.5mRT	2747.3mRT	n/a	52.6MMscf/d*	n/a*	n/a*	72/64"	n/a	*
1b	2990.1mRT	3155.6mRT	-	-	-	-	-	-	-
1c	3495.2mRT	3653.7mRT	-	-	-	-	-	-	-
1d	3744.2mRT	3972.9mRT	-	-	-	-	-	-	-
2a	2509.5mRT	2747.3mRT	n/a	52.5 MMscf/d	116 bpd	74 bpd	68/64"	n/a	*
2b	2990.1mRT	3155.6mRT	-	-	-	-	-	-	-
2c	3495.2mRT	3653.7mRT	-	-	-	-	-	-	-
2d	3744.2mRT	3972.9mRT	-	-	-	-	-	-	-
3a	2509.5mRT	2747.3mRT	n/a	65 MMscf/d*	n/a*	n/a*	76/64"	n/a	*
3b	2990.1mRT	3155.6mRT	-	-	-	-	-	-	-
3c	3495.2mRT	3653.7mRT	-	-	-	-	-	-	-
3d	3744.2mRT	3972.9mRT	-	-	-	-	-	-	-

*Not flowed through the test separator as the main objective is to unload and cleanup the well. Gas rates are estimated. Condensate & water rates are not available.

KEY

Rock Types: Limestone, Dolomite, Calcilutite, Calcisiltite, Calcarenite, Marl, Coal, Salt, Tuff, Volcanic, Plutonic, Chert, Claystone, Siltstone, Sandstone, Conglomerate

Cements/Matrix: Clay, Silt, Sand, Pebbles, Recrystallised, Calcite, Dolomite, Siderite, Pyrite, Silica

Accessories: Chert, Calcite crystals, Glauconite, Pyrite, Mica, Quartz crystals, Concretions/Nodules (general), Chlorite, Carbonaceous, Coal, Bituminous, Lithics, Haematite, Feldspar, Salt, Anhydrite, Volcanics (general)

Fossils: Bioclastic, Fossils (general), Brachiopods, Bryozoa, Corals, Crinoids, Echinoderms, Foraminifera, Gastropods, Inoceramus, Molluscs, Ooliths, Ooids general, Ostracod, Plant remains, Radiolaria, Rudists, Spicules

Engineering: Casing Shoe, Casing Hanger, Sidewall Core - Recovered, Sidewall Core - No Recovery, Rotary Sidewall Core - Recovered, Rotary Sidewall Core - No Recovery, Cored Interval - Recovered - No Recovery, Fluid Sample, Production Test Interval, Survey (TVDRT: 224 m, Incl: 25, Azi: 48)

LITHOLOGICAL DESCRIPTIONS

Seabed to 608 mRT (458.2 metres)
Riserless drilling, returns to seabed.

608 to 765 mRT (157 metres)
CLAYSTONE, CALCAREOUS: olive grey to minor light olive grey, medium dark grey, trace off white, firm to soft, blocky, amorphous, 20% calcareous clay, nil to 10% silt, trace carbonaceous material and laminations, trace glauconite, trace shell fragments.

Interbedded with CALCILUTITE, ARGILLACEOUS: light olive grey to medium grey, trace off white, soft to firm, blocky, amorphous, 20 to 30% clay, nil to 10% silt, trace carbonaceous specks, trace glauconite specks.

765 to 883 mRT (118 metres)
CLAYSTONE, CALCAREOUS: olive grey to minor light olive grey, medium dark grey, trace off white, firm to soft, occasionally amorphous, blocky, 20% calcareous clay, nil to 10% silt, trace carbonaceous material and laminations.

Interbedded with CALCILUTITE: light olive grey, off white, soft to very soft in parts, blocky, 10% clay, trace carbonaceous specks, trace glauconite specks.

883 to 1199.4 mRT (316.4 metres)
CLAYSTONE, CALCAREOUS: olive grey to light olive grey, medium dark grey, trace off white, soft to firm, becoming soft to moderately hard at depth, amorphous to blocky, 20% calcareous clay, 5% silt, trace carbonaceous material and laminations.

occasionally interbedded with minor CALCILUTITE: light olive grey, off white, soft to very soft in parts, blocky, amorphous, 5% clay, 5% silt, trace carbonaceous specks.

1199.4 to 1253 mRT (53.6 metres)
CALCILUTITE: light olive grey, medium light grey, off white, soft to moderately hard, blocky to amorphous, minor clay, minor silt, trace carbonaceous specks, trace glauconite specks, trace carbonaceous material and laminae.

Interbedded with CLAYSTONE, CALCAREOUS: medium grey, light olive grey to olive grey, minor off white, soft to firm, blocky to occasionally sub-fissile, occasionally amorphous, 20% calcareous clay, common silt, trace carbonaceous specks.

1253 to 1439.1 mRT (186.1 metres)
SANDSTONE: clear to translucent, dusky yellow, pale brown at depth, loose, nil to 10% clay, very fine to very coarse grains, predominantly fine to coarse, rare to common very fine grains, trace to rare granules, moderately to well sorted, sub-rounded to sub-angular, slightly spherical to elongate, trace siliceous cement, trace dark and light lithics, trace carbonaceous specks, trace glauconite, good inferred porosity.

Interbedded with CLAYSTONE, SILTY: medium dark to light olive grey, medium to light brown, soft to moderately hard, blocky, 25% silt, trace very fine grains, 5% carbonaceous specks, trace disseminated pyrite, trace glauconite.

1439.1 to 1512 mRT (72.9 metres)
CLAYSTONE, SILTY: dark grey to greyish black, dark brown to brownish black, olive black, soft to firm, blocky, amorphous, 25% silt, trace carbonaceous specks, trace glauconite, trace disseminated pyrite.

Interbedded with SANDSTONE: clear to translucent, dusky yellow, pale brown, loose, very fine to coarse grains, predominantly medium to coarse grains, trace to rare very fine and granular grains, minor clay, moderately sorted, sub-rounded to sub-angular, slightly spherical to spherical, trace siliceous cement, trace lithics, trace disseminated pyrite, trace glauconite, trace carbonaceous material, good inferred porosity.

1512 to 1713.1 mRT (201.1 metres)
SANDSTONE: clear to translucent, frosted, dusky yellow, pale brown, loose, becoming loose to moderately hard at depth, dominantly medium to coarse grained, becoming dominantly very fine to fine at depth, nil to rare granular grains, poor to moderately sorted, becoming moderately well sorted at depth, sub-rounded to sub-angular, slightly spherical to spherical, trace lithics, trace disseminated pyrite, fair to good inferred porosity.

Interbedded with CLAYSTONE, SILTY: dark grey to dark brown, light olive to dark olive grey, soft to firm, blocky to sub-fissile, amorphous, 25% silt, trace to minor carbonaceous specks and laminae, trace glauconite, trace disseminated pyrite.

1713.1 to 1881 mRT (167.9 metres)
CLAYSTONE, SILTY: medium to dark grey, dark brown, light olive to dark olive grey, soft to firm, blocky to minor sub-fissile, 25% silt, trace to rare sand, trace carbonaceous specks and micro-laminations, trace lithics.

1881 to 2287 mRT (406 metres)
CLAYSTONE, SILTY: medium to dark grey, grading to predominantly dark grey to greyish black at depth, dark brown, light olive to dark olive grey, soft to firm, moderately hard in parts, blocky to minor sub-fissile, 25% silt, trace very fine grains, trace carbonaceous specks and micro-laminations, trace glauconite, trace disseminated pyrite, micromicaceous in part.

2287 to 2455 mRT (168 metres)
CLAYSTONE, SILTY: predominantly dark grey to greyish black, dark brown, olive black, soft to moderately hard, blocky to sub-fissile, 25% silt, trace very fine quartz sand, trace carbonaceous specks, occasional trace glauconite and disseminated pyrite.

Interbedded with SANDSTONE, ARGILLACEOUS: clear to translucent, medium dark grey to dark grey, brownish grey, loose to firm, 20 to 30% clay, 10 to 15% silt, very fine to coarse, dominantly very fine grained, trace medium to coarse grains, moderately to well sorted, sub-angular to sub-rounded, slightly spherical to spherical, trace carbonaceous specks and material, trace lithic fragments, poor to fair visual to inferred porosity.

2455 to 2625 mRT (170 metres)
CLAYSTONE, SILTY: dark grey to greyish black, dark brown, olive black, light brown, soft to moderately hard, blocky to sub-fissile, 25% silt, trace to rare very fine quartz sand, 3% carbonaceous specks and laminae, trace disseminated pyrite, trace lithics.

2625 to 2740 mRT (115 metres)
CLAYSTONE, SILTY: dark grey to greyish black, dark brown, olive black, soft to moderately hard, blocky to sub-fissile, 25% silt, trace very fine quartz sand, 3% carbonaceous specks and laminae, trace disseminated pyrite.

Interbedded with SANDSTONE, ARGILLACEOUS: clear to translucent, medium dark grey, olive grey, loose to friable, 20 to 30% clay, 10 to 20% silt, very fine to medium, dominantly very fine grained, well sorted, sub-angular to sub-rounded, slightly spherical to spherical, carbonaceous fragments, trace lithic fragments, poor to fair visual inferred porosity.

2740 to 3000 mRT (260 metres)
CLAYSTONE, SILTY: generally as above, also light brown.

occasionally interbedded with rare SANDSTONE, ARGILLACEOUS: dominantly loose, dominantly fine grained, moderate to well sorted.

3000 to 3148 mRT (148 metres)
SANDSTONE: clear to translucent, white to frosted, light olive grey to olive grey, brown grey, loose to friable, nil to 20% clay, nil to 20% silt, very fine to very coarse, dominantly very fine to fine grained, moderate to poorly sorted, sub-angular to sub-rounded, sub-elongate to occasionally spherical, trace siliceous cement, trace dark and green lithics, trace carbonaceous material, fair visual and inferred porosity.

interbedded with CLAYSTONE, SILTY: dark grey to greyish black, light to dark brown, olive grey to olive black, soft to moderately hard, blocky to sub-fissile, 20% silt, trace to 5% very fine to fine quartz sand, 3% carbonaceous specks, trace pyrite.

3148 to 3250 mRT (102 metres)
CLAYSTONE, SILTY: generally as above, dark grey to greyish black, dark brown grey, 5% loose very fine to fine quartz sand and as micro-laminae.

3250 to 3455 mRT (205 metres)
CLAYSTONE, SILTY: generally as above, 20 to 25% silt.

occasionally interbedded with minor SANDSTONE, ARGILLACEOUS: clear to translucent, white to frosted, light olive grey to olive grey, brownish grey, loose to friable, 20 % clay, 10% silt, very fine to medium grains, dominantly very fine, poor to moderately sorted, sub-angular to sub-rounded, sub-elongate to spherical, trace carbonaceous specks, trace lithics, inferred minor clay and silt in undisturbed sample, poor visual inferred porosity.

3455 to 3515 mRT (60 metres)
CLAYSTONE, SILTY: dark grey to greyish black, dark brown grey, soft to moderately hard, blocky to sub-fissile, 25% silt, trace sand, 3% carbonaceous specks.

occasionally interbedded with minor SANDSTONE, ARGILLACEOUS: light to medium grey, white to translucent, clear, loose to friable, 30% clay, 20% silt, very fine to fine, dominantly very fine grained, moderately sorted, sub-rounded to sub-angular, slightly spherical to slightly elongate, trace lithics, poor porosity.

3515 to 3655 mRT (140 metres)
SANDSTONE, ARGILLACEOUS: light grey, white to translucent, clear, loose to friable, blocky to sub-blocky, 30 to 50% clay, 10 to 20% silt, very fine to coarse, dominantly very fine grained, moderate to well sorted, sub-angular to rounded, slightly elongate to spherical, 100% siliceous cement, trace carbonaceous specks, trace lithics, poor visual and inferred porosity.

interbedded with CLAYSTONE, SILTY: dark grey to greyish black, dark brown grey, soft to moderately hard, blocky to sub-fissile, 20% silt, trace quartz sand, trace to rare carbonaceous specks and micro-laminae, trace pyrite.

3655 to 3752 mRT (97 metres)
CLAYSTONE, SILTY: dark grey to greyish black, dark brownish grey, soft to moderately hard, blocky to sub-fissile in parts, 25% silt, trace sand, trace carbonaceous specks.

interbedded with minor SANDSTONE, ARGILLACEOUS: clear to translucent, white to off white, yellowish grey, loose to hard, blocky to sub-blocky, 35% clay, 15% silt, very fine to coarse, dominantly very fine, moderately well sorted, sub-angular to occasionally rounded, slightly spherical to spherical, rare siliceous cement, trace carbonaceous specks, trace lithic fragments, poor inferred porosity.

3752 to 3910 mRT (152 metres)
SANDSTONE, ARGILLACEOUS: generally as above, 20 to 25% clay, trace very coarse and granular grains, dominantly very fine to medium, trace glauconite grains.

interbedded with CLAYSTONE, SILTY: generally as above, also minor medium grey, yellowish grey, 35% silt.

3910 to 4026 mRT [TD] (116 metres)
SANDSTONE, SILTY: clear to translucent, white to off white, yellowish grey, loose to hard, blocky to sub-blocky, 5% clay, 20% silt, very fine to very coarse grains, dominantly very fine to fine, moderately well sorted, sub-angular to rounded, slightly spherical to spherical, rare siliceous cement, trace carbonaceous specks, trace lithics, trace pyrite frosting on quartz aggregates, good inferred porosity.

THA02

4026 mMDRT
2289.7 mTVDSS

WOODSIDE

Composite Well Log

THA03*

1:1000

* NB. the internal designation for this well is TA4.

Well:	THA03	**Sea Level Datum:**	LAT	**Date on Location:**	21/05/2006	**Rig:**	Maersk Guardian
Permit:	T/L2	**Water Depth:**	99.3 metres	**Date Spudded:**	22/05/2006	**Drilling Contractor:**	Maersk
Basin:	Otway	**Rotary Table:**	50.5 metres	**Date Total Depth:**	02/08/2006	**Wireline Logs:**	n/a
Country:	Australia			**Date Rig Released:**	22/09/2006	**MWD:**	Sperry
						Mud Logging:	Geoservices
						Cementing:	Halliburton
Latitude:	39° 14' 14.38" S	**Total Depth:**	3780.0 mMDRT	**Well Status:**	Completed - Gas Producer	**Wellsite Geologists:**	J.Hobday
Longitude:	142° 54' 07.49" E		2111.9 mTVDSS				S.Robbie
Datum:	GDA94						B.Fawcett
Easting:	664159.0 m E						
Northing:	5 655 162.4 m N						
UTM Zone:	MGA Zone 54S	**Abandonment Plugs:**	n/a			**Wellhead Fitting:**	Cameron
						Drilling Method:	Rotary
Seismic Line:	Investigator 3D PreSDM						

Author: C.Ellis/D.Moir

WIRELINE LOGGING DATA

Suite/ Run	Log	Date	Top Depth	Base Depth	Interval	Casing Logger	Casing Driller	TD Logger	TD Driller	Mud Type	Density	Viscosity	Max.Rec. Temp.°C	Rm @°C	Rm @ MRT°C	Fluid Loss	pH	Origin of Sample	Rmf @ °C	Rmc @ °C	Salinity	Bit Size	Casing Size	Circ. Time	Time Since Circulation	Recorded By	Witness
	n/a																										

MWD

Run No.	Hole Size	Top Depth	Base Depth	Comments
1	762mm (30")	149.8 mMDRT	218.4 mMDRT	ESS - surveys
2	584mm (23")	218.4 mMDRT	638.0 mMDRT	Directional - surveys
3	311mm (12¼")	638.0 mMDRT	2148 mMDRT	ABG - PWD - EWR-P4 - DGR - DM
4	216mm (8½")	2148 mMDRT	3780.0 mMDRT	ABG - DM - DGR - EWR-P4 - ALD - ACAL - CTN - GeoTap - PWD

CASING AND HOLE RECORD

Casing Size	Top Depth	Casing Shoe	Bit Size	Section TD
660mm	Surface	217.5 mRT	762mm	218.4 mRT
473mm	Surface	632.6 mRT	584mm	638.0 mRT
244mm	Surface	2141.7 mRT	311mm	2148.0 mRT
178mm	2056.5 mRT	3777.0 mRT	216mm	3780.0 mRT

LOT/FIT	Depth (mRT)	EMW
FIT	641	2.0 sg
FIT	2151	2.0 sg

SAMPLE RECORD

Type	Top Depth	Base Depth	Remarks
Cuttings	640 mRT	3780 mRT	5 to 20 metre intervals

FORMATION TOPS

Formation	Depth (mRT)	Depth (mtvdss)
Port Campbell Limestone	149.8	99.3
Gellibrand Marl	408.7	358.0
Mid Miocene Marker	489.7	438.8
Near Top Oligocene	816.0	763.9
Narrawaturk Marl	1180.9	1127.4
Mepunga Sst	1246.8	1193.0
Dilwyn Formation	1321.7	1267.6
Massacre Formation	1417.5	1363.1
Paaratte Formation	1489.9	1435.2
Skull Creek Sst (Napier Sst Mbr)	1698.4	1642.8
Belfast Fm (Thylacine Mbr - Unit 1)	2139.3	2052.1
Belfast Fm (Thylacine Mbr - Unit 2)	2288.2	2139.6
Flaxman Fm (Unit 4)	2348.7	2162.8
Flaxman Fm (Unit 4)	2582.9	2172.9
Belfast Fm (Unit 3)	2591.1	2172.3
Belfast Fm (Thylacine Mbr - Unit 2)	2688.8	2164.4
TD (Unit 1)	3780.0	2111.9

WIRELINE FLUID SAMPLES

Suite/Run	Sample No.	Depth (mRT)	Interpreted Fluid	Remarks
n/a		0		

PRODUCTION TESTS

Test No.	Top Depth (mRT)	Base Depth (mRT)	Oil	Gas	Condensate	Water/Filtrate	Choke	CGR	°API
1a	2270.80	2353.56		47.8 MMscf/d			64/64"		
1b	2409.16	2478.34		"			"		
1c	2540.89	2561.64		"			"		
1d	2589.44	2693.21		"			"		
1e	2975.75	3058.75		"			"		
1f	3490.17	3711.54		"			"		

KEY

Rock Types

- Limestone
- Dolomite
- Calcilutite
- Calcisiltite
- Calcarenite
- Marl
- Coal
- Salt
- Tuff
- Volcanic
- Plutonic
- Chert
- Claystone
- Siltstone
- Sandstone
- Conglomerate

Cements/Matrix

- Clay
- Silt
- Sand
- Pebbles
- Recrystallised
- Calcite
- Dolomite
- Siderite
- Pyrite
- Silica

Accessories

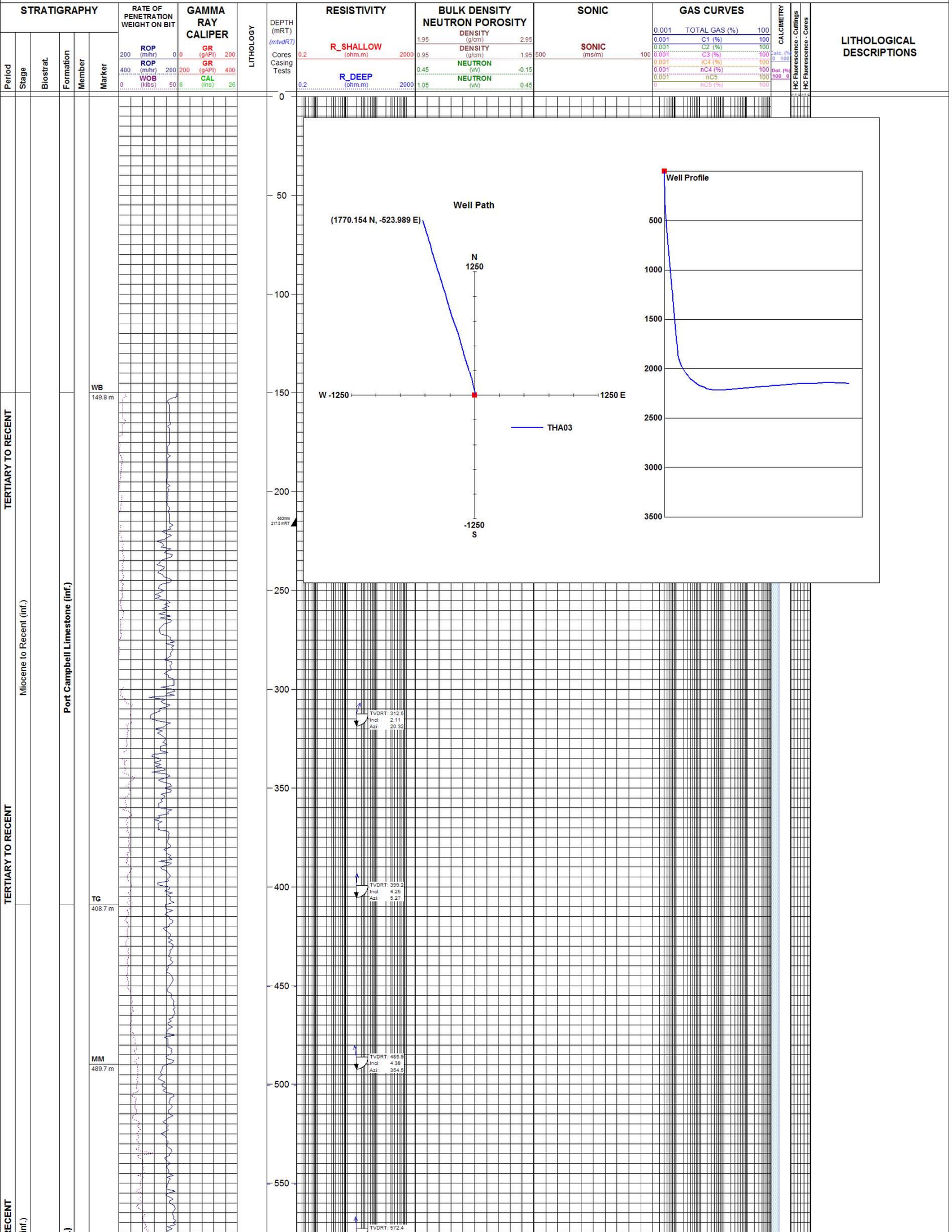
- Chert
- c Calcite crystals
- Glauconite
- Pyrite
- Mica
- q Quartz crystals
- Concretions/Nodules (general)
- Chlorite
- Cb Carbonaceous
- Coal
- Bituminous
- L Lithics
- He Haematite
- F Feldspar
- Salt
- Anhydrite
- Volcanics (general)

Fossils

- Bioclastic
- Fossils (general)
- Brachiopods
- Bryozoa
- Corals
- Crinoids
- Echinoderms
- Foraminifera
- Gastropods
- Inoceramus
- Molluscs
- Oolites, Ooids general
- Ostracod
- Plant remains
- Radiolaria
- Rudists
- Spicules

Engineering

- **Casing Shoe**
- Casing Hanger
- Sidewall Core - Recovered
- Sidewall Core - No Recovery
- Rotary Sidewall Core - Recovered
- Rotary Sidewall Core - No Recovery
- Cored Interval
- 1 - Recovered
- - No Recovery
- Fluid Sample
- Production Test Interval
- Survey (TVDRT: 234 m, Incl: 25, Azi: 40)


STRATIGRAPHY
Period
Stage
Biostrat.
Formation
Member
Marker
RATE OF PENETRATION WEIGHT ON BIT
ROP (m/hr) 200 0
ROP (m/hr) 400 200
WOB (klbs) 0 50
GAMMA RAY CALIPER
GR (gAPI) 0 200
GR (gAPI) 200 400
CAL (ins) 6 26
LITHOLOGY
DEPTH (mRT)
(mtvdRT)
Cores
Casing
Tests
RESISTIVITY
R_SHALLOW (ohm.m) 0.2 2000
R_DEEP (ohm.m) 0.2 2000
BULK DENSITY NEUTRON POROSITY
DENSITY (g/cm) 1.95 2.95
DENSITY (g/cm) 0.95 1.95
NEUTRON (v/v) 0.45 -0.15
NEUTRON (v/v) 1.05 0.45
SONIC
SONIC (ms/m) 500 100
GAS CURVES
TOTAL GAS (%) 0.001 100
C1 (%) 0.001 100
C2 (%) 0.001 100
C3 (%) 0.001 100
iC4 (%) 0.001 100
nC4 (%) 0.001 100
nC5 0.001 100
nC5 (%) 0 100
CALCIMETRY
HC Fluorescence - Cuttings
HC Fluorescence - Cores
LITHOLOGICAL DESCRIPTIONS
TERTIARY TO RECENT
Miocene to Recent (inf.)
Port Campbell Limestone (inf.)
WB
149.8 m
TG
408.7 m
MM
489.7 m
Well Path
(1770.154 N, -523.989 E)
N
1250
W -1250
1250 E
-1250
S
THA03
Well Profile
500
1000
1500
2000
2500
3000
3500
660mm
217.5 mRT
TVDRT: 312.5
Incl: 2.11
Azi: 20.32
TVDRT: 399.2
Incl: 4.25
Azi: 5.27
TVDRT: 485.9
Incl: 4.38
Azi: 354.5
TVDRT: 572.4
0
50
100
150
200
250
300
350
400
450
500
550

TERTIARY TO RECENT

Oligocene to Miocene (inf.)

Gellibrand Marl (inf.)

600

473mm
632.6 mRT

650

700

750

800

816 m

850

900

950

1000

1050

1100

1150

TO

TVDRT: 654.6
Incl: 5.64
Azi: 6.14

TVDRT: 740.9
Incl: 6.01
Azi: 345.48

TVDRT: 827.4
Incl: 5
Azi: 358.78

TVDRT: 913.8
Incl: 5.75
Azi: 343.9

TVDRT: 1000.2
Incl: 5.17
Azi: 336.08

TVDRT: 1086.5
Incl: 4.86
Azi: 342.41

TVDRT: 1172.9
Incl: 4.89

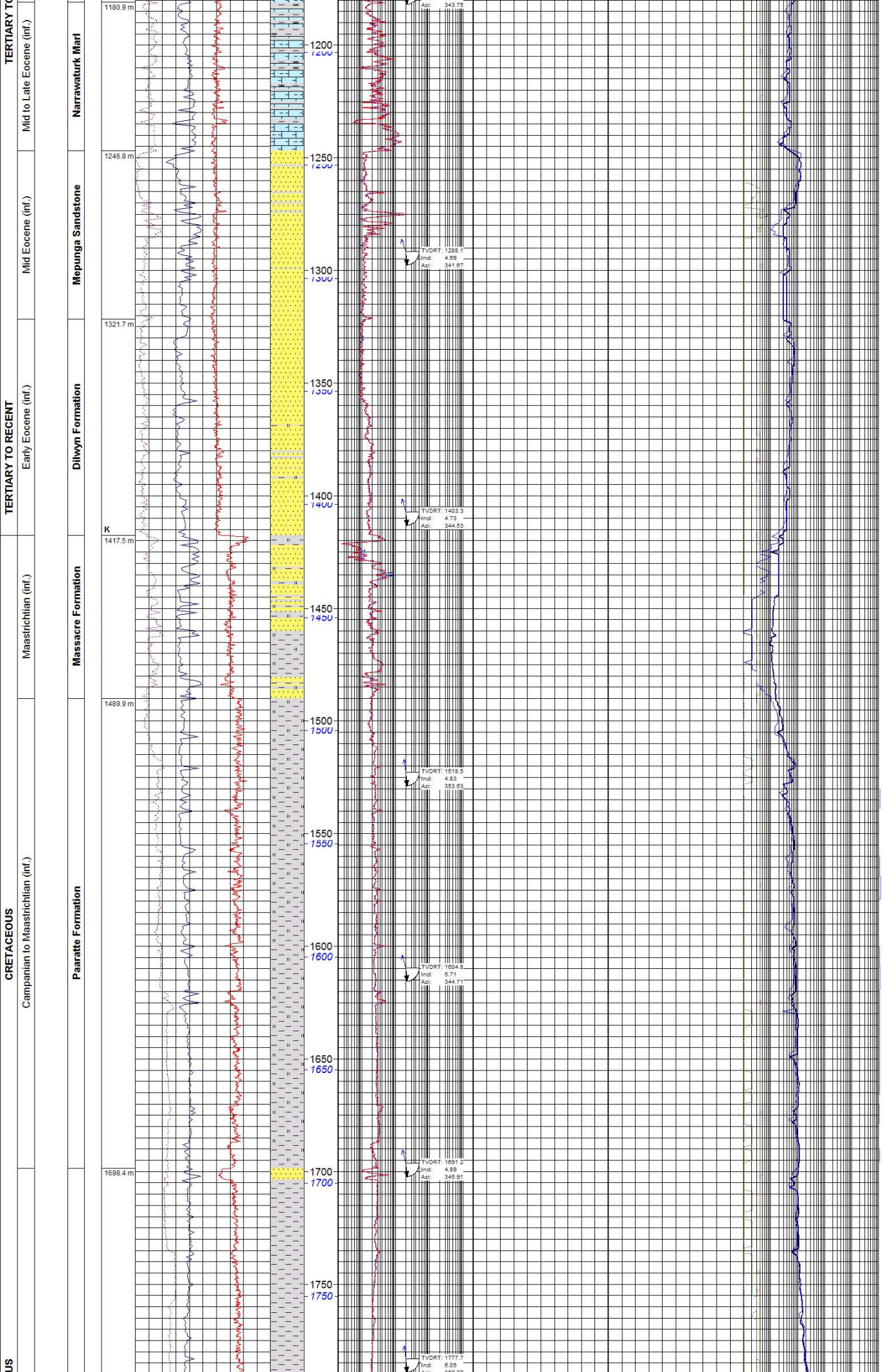
Seabed to 638 mRT (488.2 metres)
Riserless drilling, returns to seabed.

638 to 720 mRT (82 metres)
CLAYSTONE, CALCAREOUS: light olive grey to medium olive grey, decreasing in medium olive grey with depth, trace brownish grey, soft to firm, blocky, 30% calcareous clay, 5% silt, trace carbonaceous specks and material,

interbedded with CALCILUTITE, ARGILLACEOUS: light olive grey to medium grey, off white, soft to very soft in parts, blocky, amorphous, 20% clay, trace broken coral fragments.

720 to 1180.9 mRT (460.9 metres)
CLAYSTONE, CALCAREOUS : generally as above, becoming medium dark to dark grey at depth,

interbedded with CALCILUTITE, ARGILLACEOUS : generally as above, trace glauconite, trace carbonaceous material.



1180.9 to 1246.8 mRT (65.9 metres)
CALCILUTITE, ARGILLACEOUS: wh-off wh, lt grnsh gry, lt olv gry-lt brnsh gry, v sft-firm i/p, blky-ang, 20% cly, rr glauc, trace lam carb mat i/p,

interbedded with minor CLAYSTONE, CALCAREOUS: generally as above.

1246 to 1321.7 mRT (75.7 metres)
SANDSTONE: clr-trnsl, opq brn, pl yel, lse, 100% sd, f-gran, tr f, mnr med, abdt crs & v crs grns, rr grnlr, gr szs dec w dpth, mod-wll srtd, sbrnd-sbang, sl sph, tr sil cmt, tr glauc, rr pyr nod, rr lith,

interbedded with common CLAYSTONE, SILTY: med-dk brn, brnsh blk, sft-frm, blky, 25% slt, tr v f qtz, rr dk grn lith,

and occasionally rare CALCILUTITE, ARGILLACEOUS: wh-off wh, lt grnsh gry, lt ol gry-lt brnsh gry, v sft-frm i/p, blky-ang, 20% cly.

1321.7 to 1417.5 mRT (95.8 metres)
SANDSTONE: clear to translucent, dominantly opaque brown to brown grey, pale yellow, loose, very fine to very coarse, trace very fine, dominantly coarse, rare very coarse grains, moderately to well sorted, sub-rounded to rounded, slightly spherical to spherical, trace pyrite and carbonaceous fragments, trace to rare lithic fragments, fair to good inferred porosity.

1417.5 to 1489.9 mRT (72.4 metres)
CLAYSTONE, SILTY : dark grey to grey black, olive grey to olive black, dark brown grey, dominantly grey black to olive black, soft to moderately hard, amorphous to blocky, 20% silt, trace carbonaceous material, trace pyrite,

interbedded with minor SANDSTONE: clear to translucent, dominantly brown to brown grey, pale yellow, loose, very fine to very coarse, dominantly medium to coarse tending fine and very coarse at depth, moderately
sorted, sub-rounded to rounded, slightly spherical to spherical, trace pyrite and carbonaceous fragments, trace lithic fragments, fair inferred porosity.

1489.9 to 1698.4 mRT (208.5 metres)
CLAYSTONE, SILTY: grey black to olive black, dark brown grey, tending light to medium grey at depth, soft to moderately hard, tending soft to firm at depth, amorphous to blocky, 20 to 25% silt, trace carbonaceous material, trace nodular pyrite.

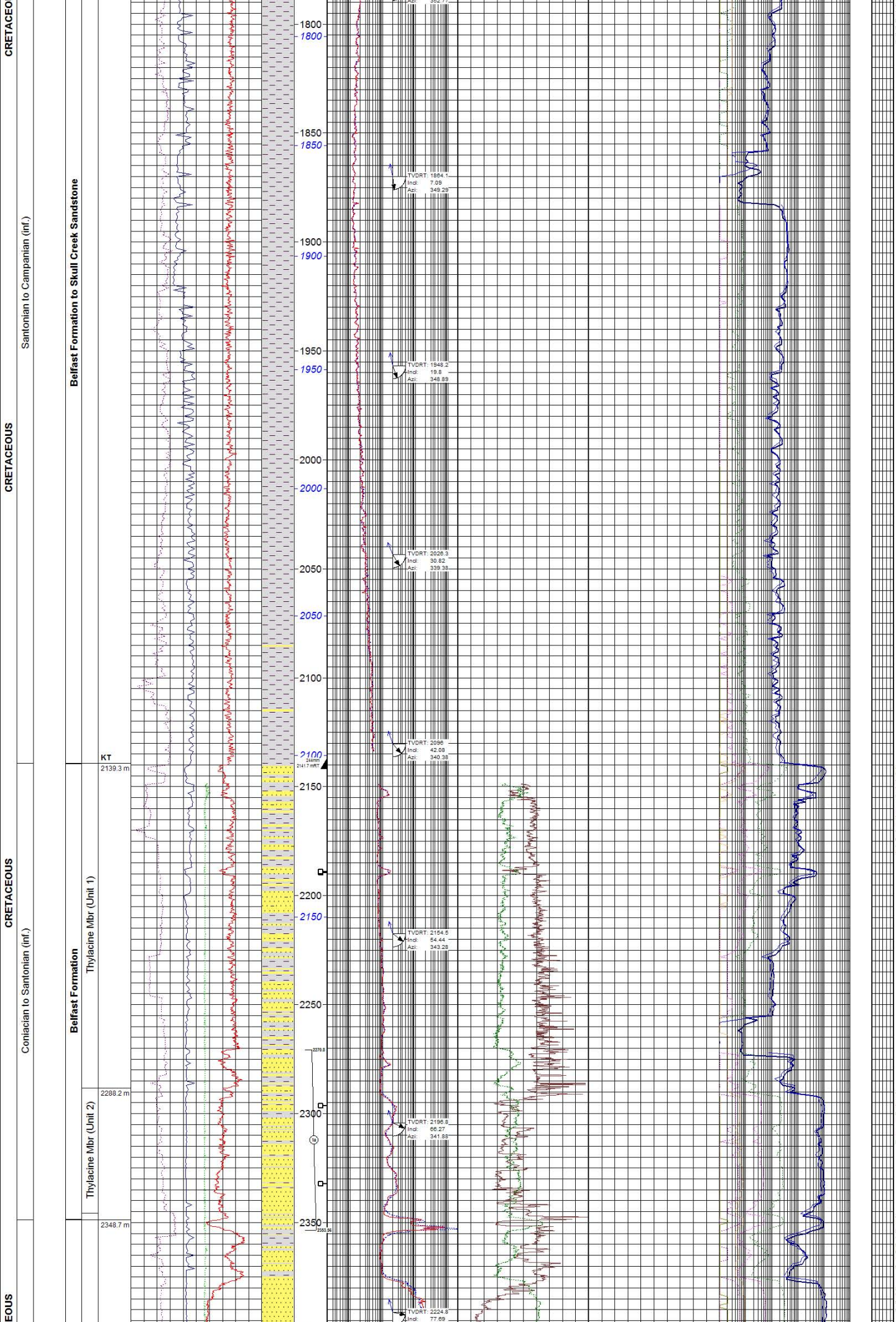
occasionally interbedded with minor SANDSTONE: generally as above, dominantly fine and very coarse, poor to moderately sorted.

1698.4 to 1720 mRT (21.6 metres)
CLAYSTONE, SILTY: gry blk-olv blk, dk brn gry, sft-frm, amor-blky, 20% slt, tr carb mat, tr nod pyr,

interbedded with SANDSTONE: clr-trnsl, frstd, pl gry, lse, 20% slt, 10% sd, v f-v crs, pred v f-crs grns, grdg to v f-f w dpth, mod-local pr srtg, grdg to wll srtd w dpth, sbrnd-ang, sbsph, tr colrd lith, fr inf por.

1720 to 1770 mRT (50 metres)
CLAYSTONE, SILTY: medium grey, greyish black to olive black, dark brownish grey, soft, blocky, amorphous in parts, 20% silt, trace to 10% very fine sand, trace carbonaceous specks, trace pyrite nodules,

2043 to 2139.3 mRT (96.3 metres)
CLAYSTONE: dark grey to grey black, minor medium grey in parts, tending brownish grey to dark brownish grey at depth, soft to firm, blocky, 5% silt, trace carbonaceous material, trace glauconite.



occasionally interbedded with rare SANDSTONE: clear to translucent, minor pale grey to off white, frosted in parts, loose, very fine to medium, predominantly fine, poorly sorted, sub-rounded to angular, sub-elongated to sub-spherical, trace calcareous cement, poor inferred porosity.

2139.3 to 2288.2 mRT (148.9 metres)
CLAYSTONE: dark grey to grey black, olive black in part, firm tending firm to soft at depth, blocky to sub-fissile, 10 to 15% very fine sand grains, trace to rare carbonaceous material and micro-laminae, trace lithic fragments,

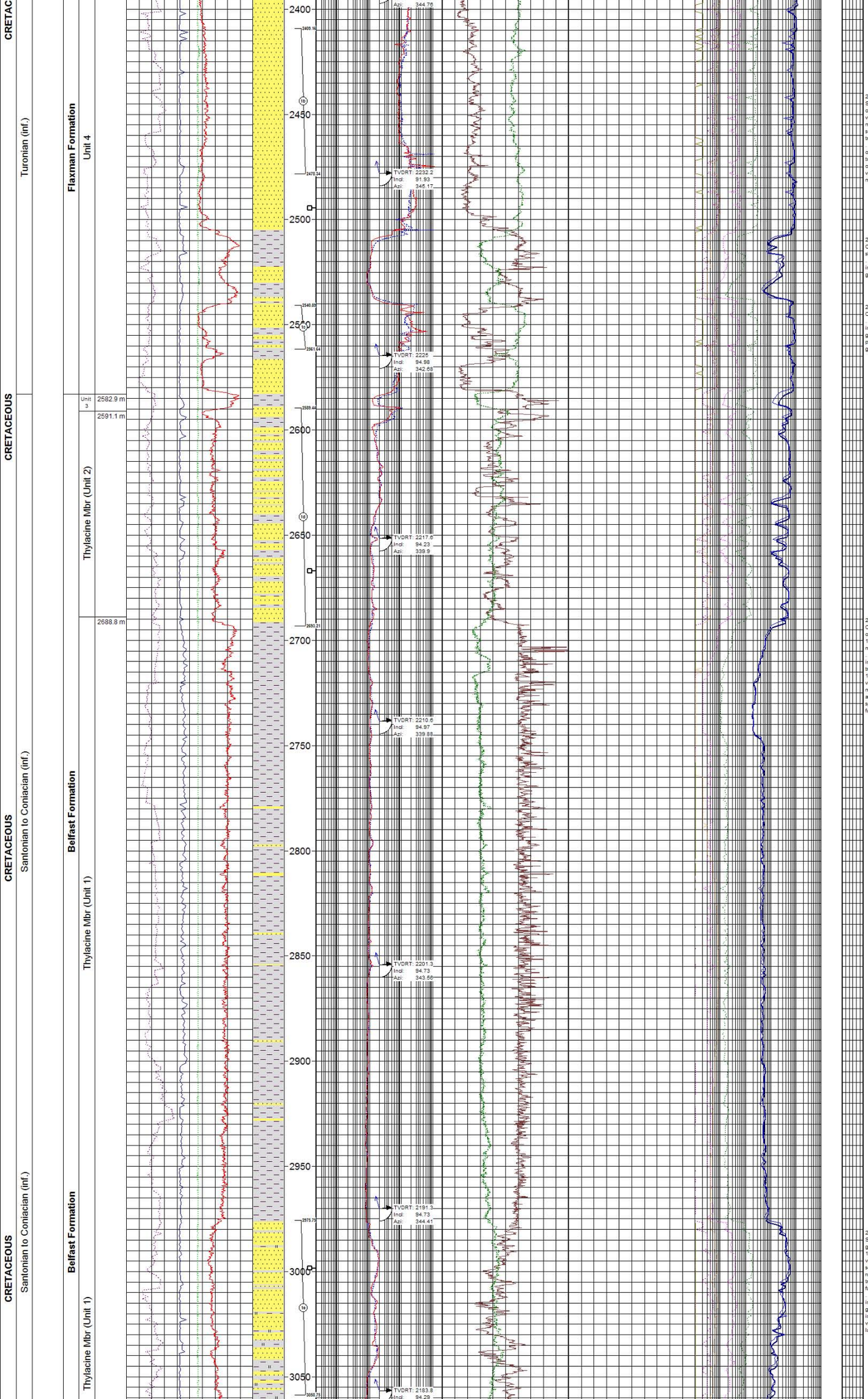
interbedded with SANDSTONE, ARGILLACEOUS : clear to white, medium dark grey, brown grey to olive grey, loose to firm, 20% clay, very fine to coarse, dominantly very fine to fine, moderately sorted, sub-angular to sub-rounded, sub-elongated to sub-spherical, trace to rare carbonaceous material and micro-laminae, trace lithic fragments, trace glauconite, poor to fair inferred porosity.

2288.2 to 2345.2 mRT (57 metres)
SANDSTONE: clr-trans, wh, yelsh gry, lt brn gry i/p, lse, frm i/p, omn cly, v f-crs, pred f, tr crs grns, mod srtd, sbang-sbrnd, sbsph, tr carb spks & micro-lams, tr colrd liths, tr glauc, pr-lody fr inf por,

interbedded with CLAYSTONE: dk gry-gry blk, olv blk i/p, blky-sbfiss, 15% v f qtz grns, rr carb mat & micro-lam,

2345.2 to 2440 mRT (94.8 metres)
SANDSTONE: clear to translucent, white, yellowish grey, pale brown, loose to firm, nil to 15% clay, very fine to coarse, predominantly very fine to fine tending medium grained with depth, moderately to poorly sorted, sub-rounded to minor sub-angular, sub-spherical to spherical, trace carbonaceous specks, trace coloured lithics, fair to good inferred porosity,

interbedded with CLAYSTONE: light to medium grey, pale brown, dark grey to grey black, olive black in part, firm to soft, blocky to sub-fissile, 10 to 20% very fine sand, rare carbonaceous material and micro-laminae, grading to Sandy Claystone in part.



2440 to 2508 mRT (68 metres)
SANDSTONE, ARGILLACEOUS : clear to translucent, off white, yellowish grey, pale brown, loose, 20% clay, very fine to coarse, predominantly fine grained, moderately sorted, sub-rounded to minor sub-angular, sub-spherical to spherical, trace carbonaceous specks, trace coloured lithics, fair inferred porosity,

occasionally interbedded with rare CLAYSTONE: light to medium grey, pale brown, dark grey to grey black, olive black in part, firm to soft, blocky to sub-fissile, 15% very fine sand, trace to rare carbonaceous material and micro-laminae.

2508 to 2540 mRT (32 metres)
CLAYSTONE: med-dk gry, gry blk-olv blk i/p, sft-frm, blky-sbfiss, 15% v f qtz grns, rr carb mat & micro-lam, tr dis pyr,

interbedded with SANDSTONE, ARGILLACEOUS: generally as above.

2540 to 2688.8 mRT (148.8 metres)
CLAYSTONE: generally as above,

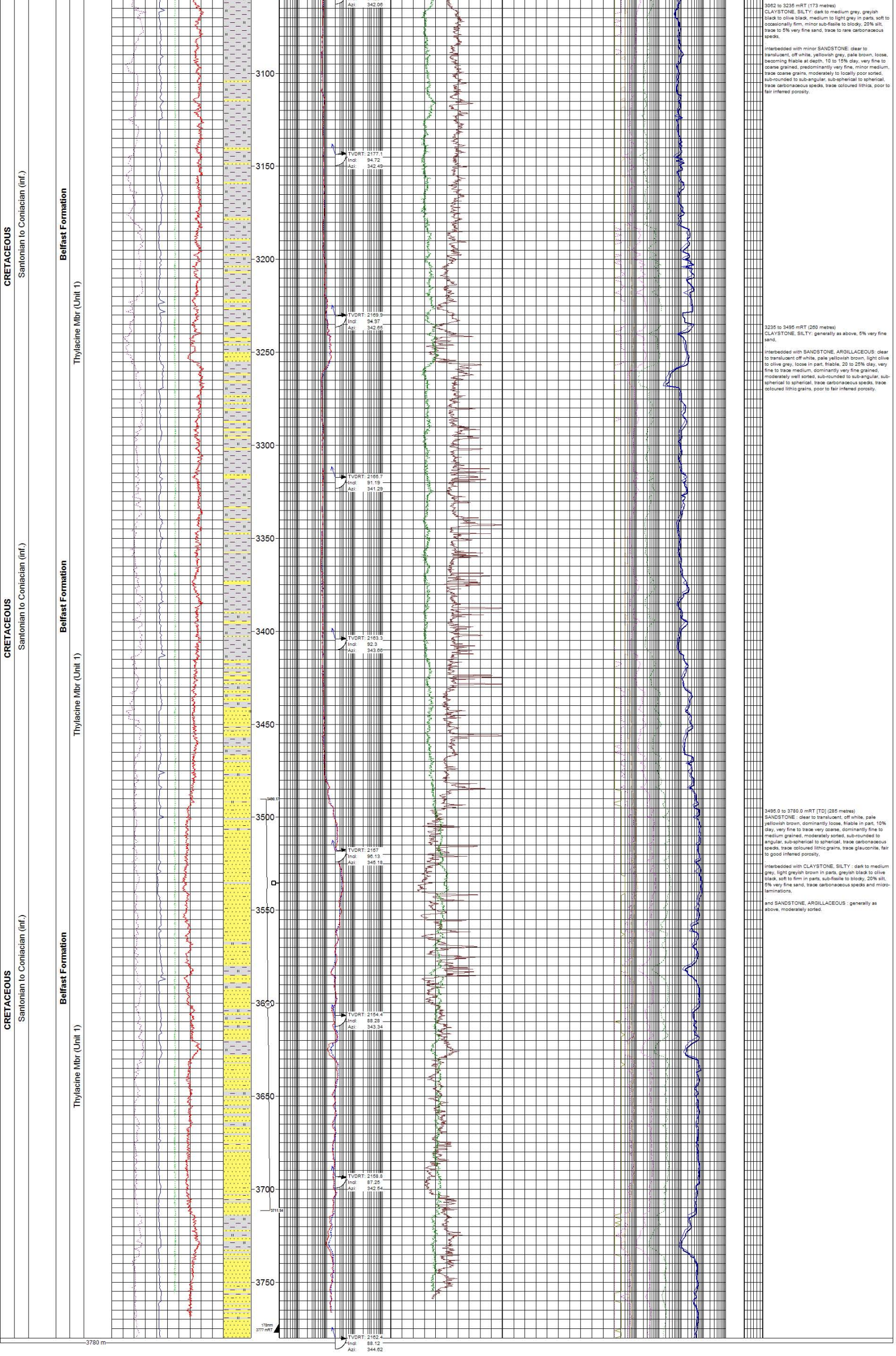
interbedded with SANDSTONE: clr-trans, off wh, yelsh gry, pl brn, lse, 10-20% cly, v f-v crs, pred f grnd, mod-prly srtd, sbrnd-ang, sbsph-sph, tr carb spks, tr clrd lith, tr glauc i/p, fr-gd inf por.

2688.8 to 2980 mRT (291.2 metres)
CLAYSTONE: dark to medium grey, greyish black to olive black, soft to firm in part, sub-fissile to blocky, nil to 15% silt, 5 to 15% sand, trace carbonaceous specks and micro-laminations,

interbedded with minor SANDSTONE: clear to translucent, off white, yellowish grey, pale brown, loose, 15% clay, very fine to coarse grained, predominantly very fine to fine, minor medium, trace coarse grained, moderately to locally poor sorted, sub-rounded to sub-angular, sub-spherical to spherical, trace carbonaceous specks, trace coloured lithics, trace glauconite, poor to fair inferred porosity.

2980 to 3062 mRT (82 metres)
SANDSTONE: clear to translucent, off white, yellowish grey, pale brown, loose, trace firm aggregates in parts, 10% clay, 15% silt, very fine to coarse, predominantly very fine to fine grained, moderately to locally poor sorted, sub-
rounded to angular grains, sub-spherical to spherical, trace carbonaceous specks, trace coloured lithic grains, fair inferred porosity,

interbedded with CLAYSTONE, SILTY: dark to medium grey, greyish black to olive black, medium to light grey in parts, soft to firm, sub-fissile to blocky, 20% silt, 5% very fine sand, trace carbonaceous specks and micro-laminations.



THA03

3780.0 mMDRT
2111.9 mTVDSS

WOODSIDE

Composite Well Log

THA04*

1:1000

* NB: the internal designation for this well is TA2.

Well:	THA04	**Sea Level Datum:**	LAT	**Date on Location:**	17/03/2006
Permit:	T/L2	**Water Depth:**	99.3 metres	**Date Spudded:**	17/03/2006
Basin:	Otway	**Rotary Table:**	50.5 metres	**Date Total Depth:**	26/08/2006
Country:	Australia			**Date Rig Released:**	24/09/2006

Rig: Maersk Guardian
Drilling Contractor: Maersk
Wireline Logs: n/a
MWD: Sperry
Mud Logging: Geoservices
Cementing: Halliburton

Latitude: 39° 14' 14.56" S
Longitude: 142° 54' 07.58" E
Datum: GDA94
Easting: 664 161.0 m E
Northing: 5 655 156.8 m N
UTM Zone: MGA Zone 54S

Total Depth: 3987.0 mMDRT 2203.3 mTVDSS

Well Status: Completed - Gas Producer

Wellsite Geologists: J.Hobday, S.Robbie, B.Fawcett

Abandonment Plugs: n/a

Wellhead Fitting: Cameron
Drilling Method: Rotary

Seismic Line: Investigator 3D PreSDM

Author: C.Ellis/D.Moir

WIRELINE LOGGING DATA

Suite/Run	Log	Date	Top Depth	Base Depth	Interval	Casing Logger	Casing Driller	TD Logger	TD Driller	Mud Type	Density	Viscosity	Max.Rec. Temp.°C	Rm @°C	Rm @ MRT°C	Fluid Loss	pH	Origin of Sample	Rmf @ °C	Rmc @ °C	Salinity	Bit Size	Casing Size	Circ. Time	Time Since Circulation	Recorded By	Witness
	n/a																										

MWD

Run No.	Hole Size	Top Depth	Base Depth	Comments
1	762mm (30")	149.8 mRT	217 mRT	ESS - surveys
2	584mm (23")	217 mRT	638 mRT	Directional - surveys
100	311mm (12¼")	638 mRT	2751 mRT	ABG - PWD - EWR-P4 - DGR - DM
200	216mm (8½")	2751 mRT	3194 mRT	ABG - DM - DGR - EWR-P4 - ALD - ACAL - CTN - PWD
300	216mm (8½")	3194 mRT	3987 mRT	ABG - DM - DGR - EWR-P4 - ALD - CTN - PWD - ACAL

CASING AND HOLE RECORD

Casing Size	Top Depth	Casing Shoe	Bit Size	Section TD
660mm	Surface	217.0 mRT	762mm	217.0 mRT
473mm	Surface	633.4 mRT	584mm	638.0 mRT
244mm	Surface	2742.8 mRT	311mm	2751.0 mRT
178mm	2655.0 mRT	3985.0 mRT	216mm	3987.0 mRT

LOT/FIT	Depth (mRT)	EMW
LOT	641 mRT	2.36 sg
FIT	2754 mRT	2.0 sg

SAMPLE RECORD

Type	Top Depth	Base Depth	Remarks
Cuttings	640 mRT	3987 mRT	5 to 20 metre intervals

FORMATION TOPS

Formation	Depth (mRT)	Depth (mtvdss)
Undifferentiated Recent to Tertiary	149.8	99.3
Narrawaturk Marl	1270.0	1144.2
Mepunga Sandstone	1345.0	1207.2
Dilwyn Formation	1560.0	1389.1
Massacre Formation	1606.0	1428.1
Paaratte Formation	1654.0	1469.0
Skull Creek Formation	1896.5	1674.6
Belfast Formation (Thylacine Mbr - Unit 1)	2561.9	2163.4
Skull Creek Formation	3108.0	2195.1
Belfast Formation (Thylacine Mbr - Unit 1)	3176.4	2185.2
Skull Creek Formation	3501.0	2164.0
Belfast Formation (Thylacine Mbr - Unit 1)	3524.6	2163.4
Skull Creek Formation	3673.2	2172.0
TD (Unit 1)	3987.0	2203.3

WIRELINE FLUID SAMPLES

Suite/Run	Sample No.	Depth (mRT)	Interpreted Fluid	Remarks
n/a		0		

PRODUCTION TESTS

Test No.	Top Depth	Base Depth	Oil	Gas	Condensate	Water/Filtrate	Choke	CGR	°API
1a	2743.17	2798.51		18.43 MMscf/d			64/64"	4 bbl/MMscf	
1b	2812.35	2936.88		"			"	"	
1c	2992.48	3068.57		"			"	"	
1d	3151.41	3165.25		"			"	"	
1e	3213.90	3310.75		"			"	"	
1f	3338.42	3601.30		"			"	"	
1g	3670.80	3712.31		"			"	"	
1h	3833.78	3881.90		"			"	"	

KEY

Rock Types

Limestone, Dolomite, Calcilutite, Calcisiltite, Calcarenite, Marl, Coal, Salt, Tuff, Volcanic, Plutonic, Chert, Claystone, Siltstone, Sandstone, Conglomerate

Cements/Matrix

Clay, Silt, Sand, Pebbles, Recrystallised, Calcite, Dolomite, Siderite, Pyrite, Silica

Accessories

Chert, Calcite crystals, Glauconite, Pyrite, Mica, Quartz crystals, Concretions/Nodules (general), Chlorite, Carbonaceous, Coal, Bituminous, Lithics, Haematite, Feldspar, Salt, Anhydrite, Volcanics (general)

Fossils

Bioclastic, Fossils (general), Brachiopods, Bryozoa, Corals, Crinoids, Echinoderms, Foraminifera, Gastropods, Inoceramus, Molluscs, Oolites, Ooids general, Ostracod, Plant remains, Radiolaria, Rudists, Spicules

Engineering

Casing Shoe
Casing Hanger
Sidewall Core - Recovered
Sidewall Core - No Recovery
Rotary Sidewall Core - Recovered
Rotary Sidewall Core - No Recovery
Cored Interval
- Recovered
- No Recovery
Fluid Sample
Production Test Interval
Survey (TVDRT: 234 m, Incl: 25, Azi: 40)

Palynology Report

PALYNOLOGY OF

THYLACINE THA-01 WELL

OFFSHORE OTWAY BASIN, AUSTRALIA

BY

ROGER MORGAN

for **WOODSIDE ENERGY LTD** **JULY 2007**

REF: OTW.THA-01 REPORT

PALYNOLOGY OF

THYLACINE THA-01 WELL

OFFSHORE OTWAY BASIN, AUSTRALIA

CONTENTS **PAGE**

1 SUMMARY

2230/35 m (cutts) : *N. aceras* Zone, lower subzone [and *T. apoxyexinus* Zone, upper subzone] : Campanian : shelfal marine : immature

2240/50 m (cutts) – 2325/30 m (cutts) : *I. cretaceum* Zone, upper subzone (2240/50 m – 2255/60 m upper b subzone, 2280/85 m – 2325/30 m upper a subzone) [and *T. apoxyexinus* Zone, upper subzone] : Santonian : shelfal marine and nearshore marine : immature

2335/40 m (cutts) : Indeterminate : nearshore marine : marginally mature for oil, immature for gas/condensate

2340/45 m (cutts) – 2345/50 m (cutts) : *I. cretaceum* Zone, lower a subzone [and *T. apoxyexinus* Zone, middle subzone] : Santonian : nearshore marine : marginally mature for oil, immature for gas/condensate

2350/55 m (cutts) – 2383.83 m (core) : *O. porifera* Zone, upper subzone [and *T. apoxyexinus* Zone, middle subzone] : Santonian : very nearshore to nearshore marine : marginally mature for oil, immature for gas/condensate

Missing : *O. porifera* Zone, lower subzone to *C. striatoconus* Zone, lower subzone [*T. apoxyexinus* Zone, part middle subzone to *T. apoxyexinus* Zone, part lower subzone] : Coniacian

2384.80 m (core) – 2568.28 m (core) : *P. infusorioides* Zone, upper subzone (2384.80 m – 2426.62 m upper c subzone, 2433.58 m – 2443.52 m upper b subzone, 2450.62 m – 2568.28 m upper a subzone) [and *T. apoxyexinus* Zone, lower subzone] : part Turonian : marginal marine to shelfal marine : marginal mature

2578.44 m (core) – 2625/29 m (cutts) : *P. infusorioides* Zone, middle c subzone [and *P. mawsonii* Zone, upper subzone] : part Turonian : marginal marine to non-marine : marginally mature for oil, immature for gas/condensate

2 INTRODUCTION

A total of 53 samples (19 cuttings, 34 conventional cores) have been studied from **THA-01** for Woodside Energy Ltd.

The extensive sample suites studied in the Thylacine-Geographe wells produced a high resolution palynology zonation, as summarised in Figure 1. Figure 2 shows the maturity profile. Figure 3 shows the zonation of Partridge (1998). Figure 4 compares the zonation with that of Partridge (1998) and the lithostratigraphy of Partridge (1998, 2001). Table 1 summarises the palynological details of the samples, and the core corrections applied. In the text and charts, corrected (log) depths are used.

Raw palynological data are included in Appendix 1. The data are based on a 200+ specimen count in swcs and core from which an indication of marine microplankton to terrestrial palynomorph proportions can be derived. The microplankton percentages are listed in Table 1, which also summarizes other palynological details. Environmental assessments are derived from the palynomorph counts using content and diversity of saline taxa (dinoflagellates and spiny acritarchs), other microplankton (mostly freshwater algae), and terrestrial spores and pollen. The criteria for these assessments are defined in Table 1. However, dinoflagellate content and diversity in the Otway Basin are lower than might be expected from other data sources, especially sedimentology in the offshore marine shales. It may be that dinoflagellate productivity is suppressed by lowered salinity or restricted oceanic circulation caused by the enclosed nature of a long narrow marine gulf. Environments interpreted here may therefore underestimate marine influence in this section with environments really being more marine than interpreted here. In running text, frequency of taxa is discussed in the following intervals: Very rare = <1%, Rare = 1-3%, Frequent = 4-10%, Common = 11-29%, Abundant = 30-49%, Super-abundant = 50-100%.

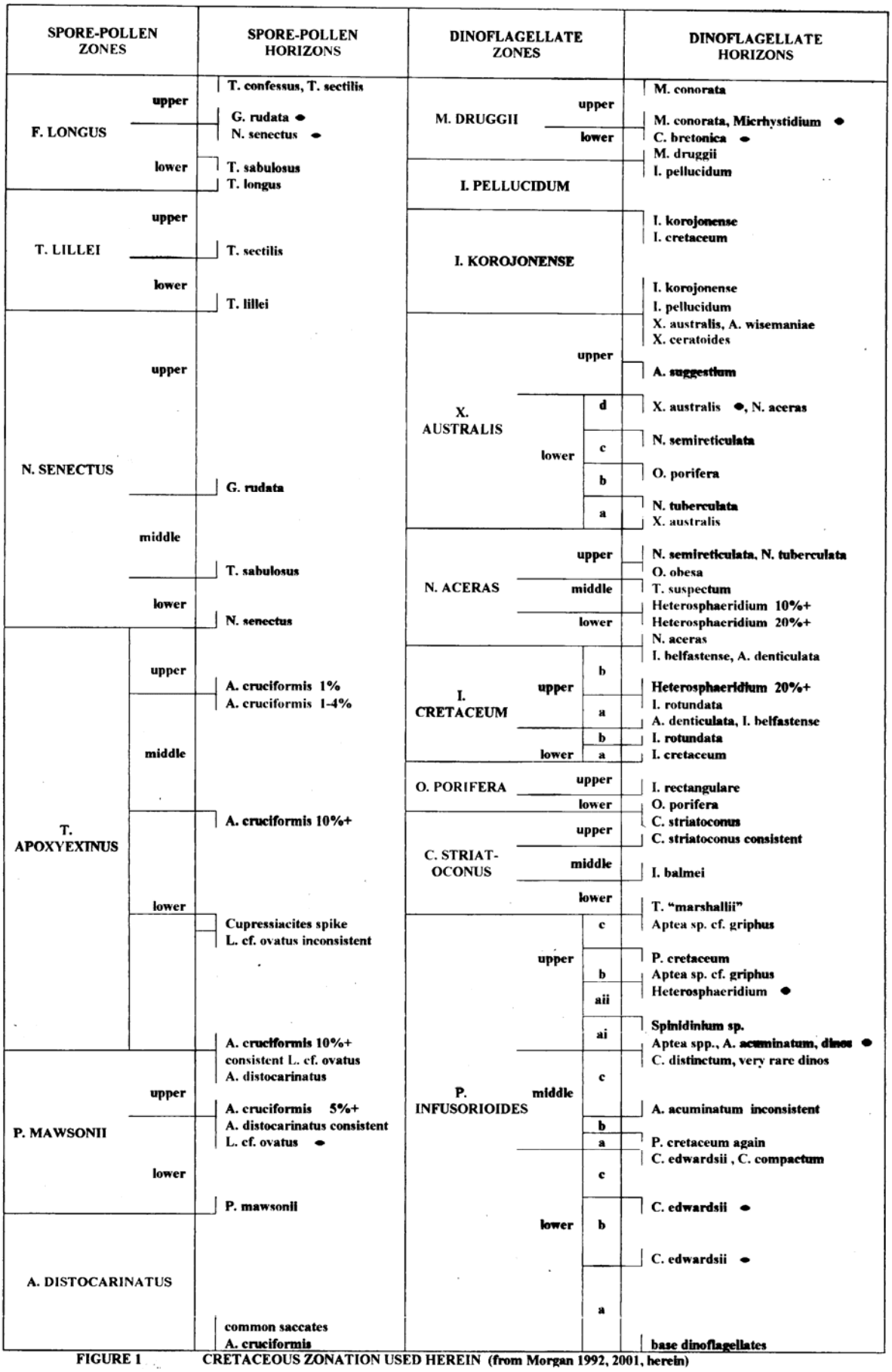
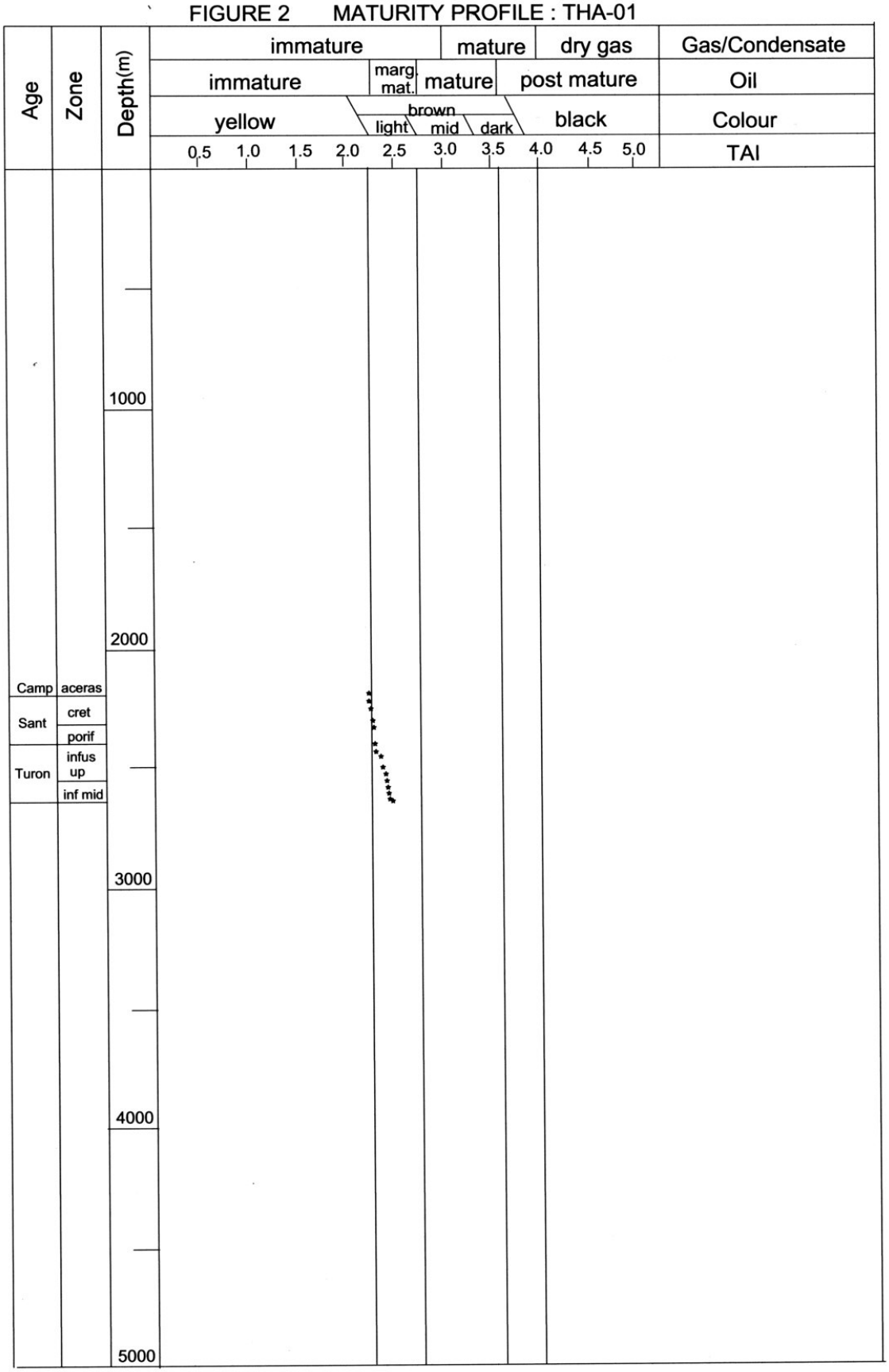


FIGURE 1 CRETACEOUS ZONATION USED HEREIN (from Morgan 1992, 2001, herein)

● = frequent (4-10%) ● = common (11-30%)

FIGURE 2 MATURITY PROFILE : THA-01



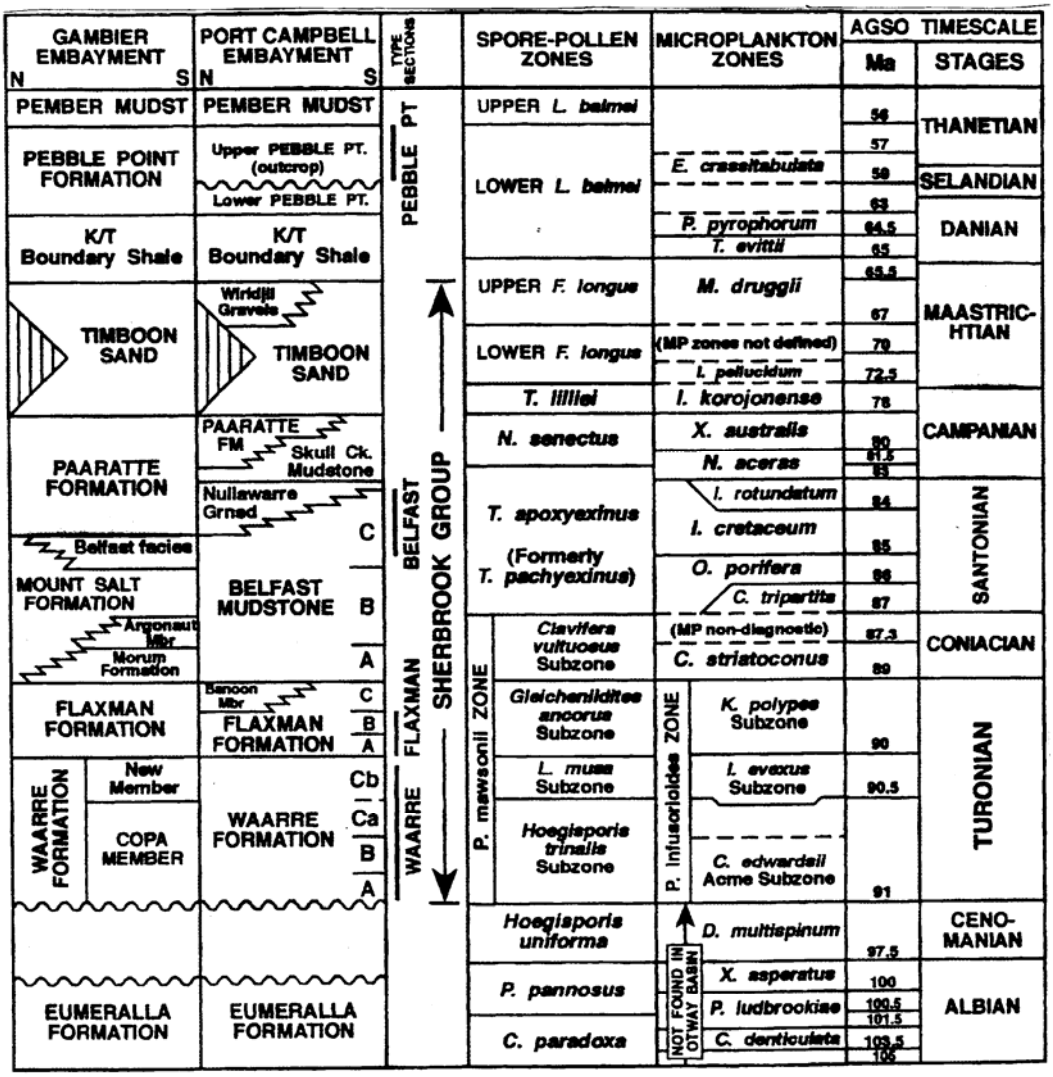


Figure 3 : **Revised Sherbrook Group stratigraphy and palynological timescale. (from Partridge 1998)**

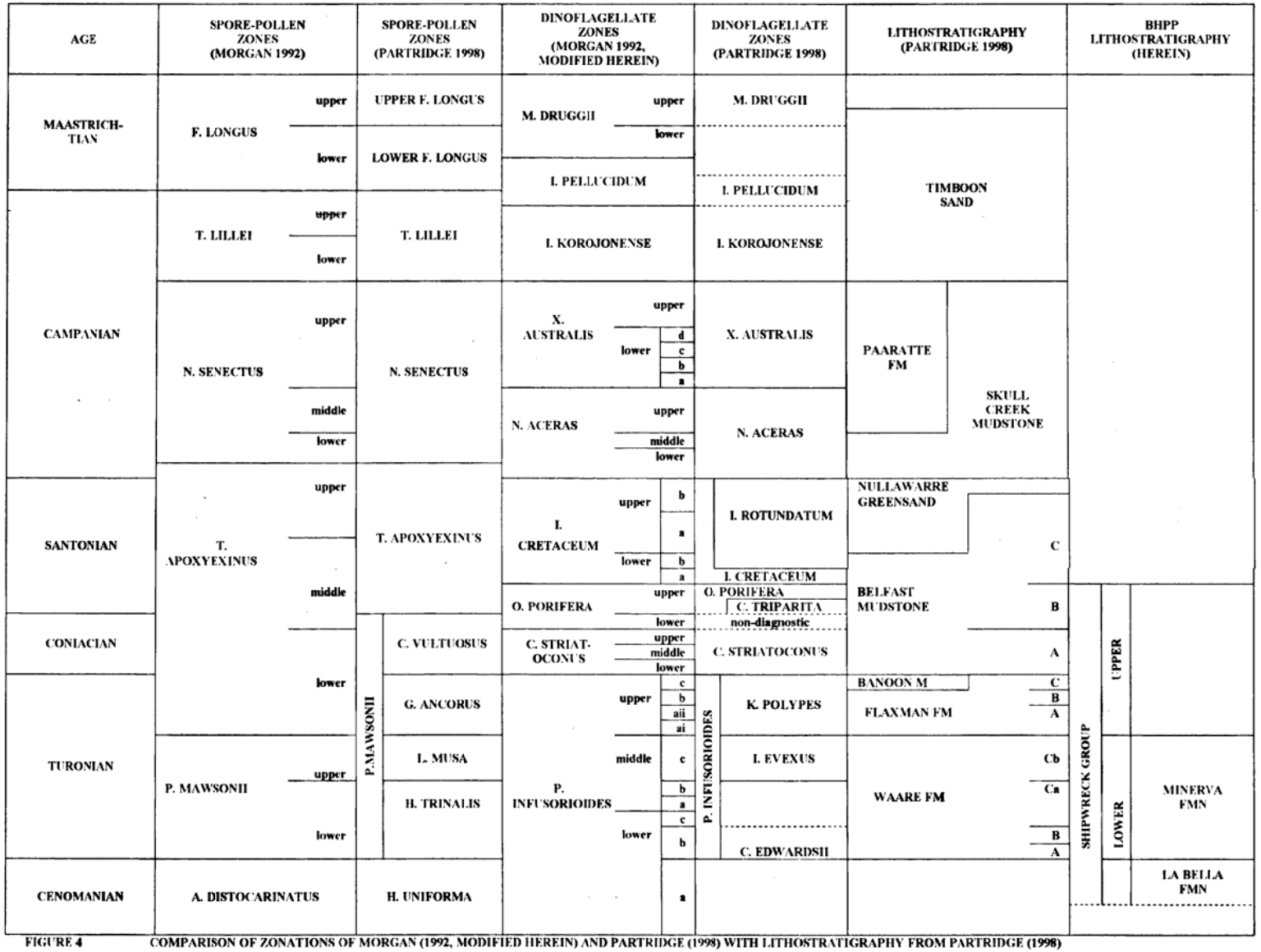


FIGURE 4 COMPARISON OF ZONATIONS OF MORGAN (1992, MODIFIED HEREIN) AND PARTRIDGE (1998) WITH LITHOSTRATIGRAPHY FROM PARTRIDGE (1998)

3 PALYNOSTRATIGRAPHY

3.1 2230/35 m (cutts) : *N. aceras* Zone, lower subzone [and *T. apoxyexinus* Zone, upper subzone]

Assignment is indicated at the top by youngest *Nelsoniella aceras, Eucladinium kaikourense* and common *Heterosphaeridium* (>20%), and at the base by the absence of older markers. The presence of *E. kaikourense* (= *Isabelidinium "rotundatum"* usage of Partridge) indicates the lowest part of the lower subzone. This is equivalent of part of the *N. aceras* Zone as used by Partridge (1998).

Of the dinoflagellates, common is *Heterosphaeridium conjunctum* (= previous *H. "solida"* of Morgan) with frequent *N. aceras* and consistent *Muduradinium pentagona, Odontochitina "obesa", Odontochitina porifera, Oligosphaeridium complex* and *Palaeohystrichophora infusorioides*. Very rare is *Amosopollis cruciformis*. Considered caved is rare *Xenikoon australis*.

Spores and pollen are co-dominant with the marine dinoflagellates, and the absence of *Nothofagidite senectus*, presence of frequent *Proteacidites* spp. and very rare *A. cruciformis* indicate the spore-pollen assignment (sensu Morgan). This is equivalent to the *T. apoxyexinus* Zone, upper subzone sensu Partridge.

Of the spores and pollen, abundant is *Falcisporites similis* with common *Cyathidites minor* and frequent *Osmundacidites wellmanii, Phyllocladidites mawsonii* and *Proteacidites* spp. A single *Appendicisporites distocarinatus* is present.

Shelfal marine environments are indicated by the co-dominance of terrestrial spores and pollen and marine dinoflagellates.

Yellow to light brown spore colours indicate immaturity for hydrocarbons.

3.2 2240/50 m (cutts) – 2325/30 m (cutts) : *I. cretaceum* Zone, upper subzone (2240/45 m -2255/60 m upper b subzone, 2280/85 m – 2345/50 m upper a subzone) [and T. apoxyexinus Zone, upper subzone]

Assignment is indicated at the top by youngest *Amphidiadema denticulata* and *Isabelidinium belfastense "belfastense"*, and at the base by oldest *I. belfastense "belfastense"*. However, since the interval is only cuttings controlled, this base may

be caved and therefore be picked too low. The real base may therefore be somewhat shallower. Within the interval is oldest *E. kaikourense* (2255/60 m) marking the base of the "upper b" subzone and the base of the *I. rotundatum* subzone of Partridge. Again, in cuttings this may be picked slightly too low. The base of *A. denticulata* occurs at 2280/85 m (cutts).

Amongst the dinoflagellates, *H.conjunctum* is abundant (2240/50 m – 2295/00 m) to frequent (2315/20 m – 2325/30 m) with frequent *Odontochitina* spp. and *Trithyrodinium* spp. From the top are four assemblages with

frequent *O. "obesa", O. porifera, T. vermiculatum* (2245/50 m – 2250/55 m)

frequent *O. operculata, O. "stubby", T. glabrum, T. vermiculatum* (2255/60 m – 2280/85 m)

frequent *O. operculata, O. "stubby", T. glabrum, T. "marshallii"* (2295/00 m)

rare *Odontochitina* spp., frequent *T. "marshallii"* only)2315/20 m – 2325/30 m)

These subunits may correlate within the field, but probably would not correlate outside it.

Rare dinoflagellates include *A. denticulata, Chatangiella victoriensis, I. belfastense "belfastense"* and *Isabelidinium cretaceum "elongatum"*. Very rare is *A. cruciformis.*

Spores and pollen are co-dominant at the top, but dominant at the base. Assignment is indicated by rare *A. cruciformis* with frequent *Proteacidites* spp. and rare *Australopollis obscuris* and is equivalent to the *T. apoxyexinus*, upper subzone sensu Partridge.

Of the spores and pollen, abundant is *F. similis* with common *Dictyophyllidites* spp. and *Dilwynites granulatus*. Frequent elements include *C. minor, Microcachyidites antarcticus, P. mawsonii* and *Vitreisporites pallidus*. Rare Permian and Triassic reworking is present, most frequent at 2315/20 m.

Shelfal to nearshore marine environments are indicated by the co-dominant to dominant terrestrial spores and pollen, and the co-dominant to subordinate marine dinoflagellates.

Yellow to light brown spore colours indicate immaturity for hydrocarbons.

3.3 2335/40 m (cutts) : Indeterminate

This sample is dominated by inertinite with very few recognisable palynomorphs, precluding assignment. Dinoflagellates comprise only *Heterosphaeridium* spp. while the dominant spores and pollen comprise mostly *F. similis*. Some Permian reworking was seen.

Nearshore marine environments are indicated by the dominant terrestrial spores and pollen and subordinate marine dinoflagellates.

Light brown spore colours indicate marginal maturity for oil and immaturity for gas/condensate.

3.4 2340/45 m (cutts) – 2345/50 m (cutts) : *I. cretaceum* Zone, lower a subzone [and *T. apoxyexinus* Zone, middle subzone]

Assignment is indicated at the top by youngest *Isabelidinium rectangulare "contractum"* and *I. rectangulare "rectangulare"* and at the base by oldest *I. cretaceum "elongatum"*. This is equivalent to part of the *I. cretaceum* Zone sensu Partridge.

Of the subordinate dinoflagellates, frequent to common are *H. conjunctum* with frequent *Heterosphaeridium heteracanthum*. Rare elements include *I. cretaceum "elongatum", I. rectangulare, Odontochitina "stubby", T. glabrum* and *T. "marshallii"*.

Spores and pollen are totally dominant, and very rare *Proteacidites* spp. without older markers indicate the spore-pollen assignment. This is equivalent to the *T. apoxyexinus* Zone, lower subzone of Partridge.

Of the spores and pollen, super-abundant is *F. similis* with common *D. granulatus* and *Dictyophyllidites* spp. and frequent *Cyathidites australis, C. minor, M. antarcticus, P. mawsonii* and *V. pallidus*.

Nearshore marine environments are indicated by the dominant terrestrial spores and pollen and subordinate marine dinoflagellates.

Light brown spore colours indicate marginal maturity for oil and immaturity for gas/condensate.

3.5 2350/55 m (cutts) – 2383.83 m (core) : *O. porifera* Zone, upper subzone [and *T. apoxyexinus* Zone, middle subzone]

Plant debris dominate these assemblages. Assignment is indicated at the top by *I. retangulare "contractum"* without younger markers and at the base by oldest *I. rectangulare "contractum"*. This is equivalent to the *O. porifera* Zone sensu Partridge, with the subinterval 2382.97 m – 2383.83 m equivalent to the *C. tripartita* subzone of Partridge.

Of the subordinate dinoflagellates, frequent is *H. heteracanthum* with consistent *I. rectangulare "contractum", O. operculata, O. porifera* and *T. "marshallii"*. At 2382.97 m, *Chantangiella tripartita* is a rare element. Frequent throughout is *A. cruciformis.*

Spores and pollen are dominant, and rare *Proteacidites* spp. with frequent *A. cruciformis* indicate the spore-pollen assignment. This is equivalent to the *T. apoxyexinus* Zone, lower subzone sensu Partridge.

Spores and pollen are dominant and include super-abundant *F. similis* with common *Dictyophyllidites* spp. and *D. granulatus,* and frequent *C. australis, C. minor, M. antarcticus, P. mawsonii* and *V. pallidus*. Permian reworking is minor throughout.

Nearshore to very nearshore marine environments are indicated by the dominant terrestrial spores and pollen and minor marine dinoflagellates.

Light brown spore colours indicate marginal maturity for oil and immaturity for gas/condensate.

3.6 Missing : *O. porifera* Zone, lower subzone to *C. striatoconus* Zone, lower subzone [and *T. apoxyexinus* Zone, part middle subzone to *T. apoxyexinus* Zone, part lower subzone]

These subzones are missing on a significant unconformity of the same magnitude as in Thylacine-1, but removing more section than in Geographe-1 and Geographe

North-1 (where the *O. porifera* Zone, lower subzone is present). This missing interval is equivalent to the part *O. porifera* Zone to *P. infusorioides* Zone, *Trithyrodinium* subzone sensu Partridge.

3.7 2384.80 m (core) – 2568.28 m (core) : *P. infusorioides* Zone, upper subzone [and T. apoxyexinus Zone, lower subzone]

This interval is dominated by plant debris with dinoflagellates more frequent towards the base. Assignment is indicated at the top by youngest *Kiokansium unituberculatum* (=previous *K. polypes*) and at the base by the base of frequent dinoflagellates.

The upper part (2384.80 m – 2426.62 m) is totally dominated by plant debris with rare dinoflagellates. The most persistent taxa are *Aptea* sp. cf. *griphus*, *Circulodinium longispinatum* (=previous *C. "solida"*), *K. unituberculatum*, *H. heteracanthum* and *Leiosphaeridia* spp.

The lower part (2433.58 m – 2568.28 m) is more cuticle dominated and much more marine with frequent to abundant *Heterosphaeridium* spp., frequent to common *A. cruciformis* and frequent *C. longispinatum, K. unituberculatum* and *O. operculata*.

Within the interval, the following dinoflagellates subzones can be recognised

2384.80 m (core) – 2426.62 m (core) : **upper c subzone** (top *K. unituberculatum* to top *Palaeoperidinium cretaceum*

2433.58 m (core) – 2443.52 m (core) : **upper b subzone** (top *P. cretaceum* to top *Heterosphaeridium* acme

2450.62 m (core) – 2468.28 m (core) : **upper a subzone** (top *Heterosphaeridium* acme to base *Aptea* sp. and frequent dinoflagellates

Spores and pollen are dominant throughout and include super-abundant *F. similis* and common *C. minor, Dictyophyllidites* spp., *Dilwynites* spp., *F. similis* and *M. antarcticus.* Rare and inconsistent elements include *Laeviatosporites "musa"* (= previous *L.* cf. *ovatus)*, *Clavifera "vultuosus"* and *Gleicheniidites "ancorus"*. These are too few and inconsistent to assign the spore-pollen subzones of Partridge. Spore-pollen zonal assignment is thus based on the intermittently common *A. cruciformis*.

Within the interval, the following events have potential for further detailed correlation. Possible correlation depths in Thylacine-1 are shown in brackets.

2384.80 m (core) : top *K. unituberculatum*
: marine spike with frequent *C. longispinatum* (2168.37 m T-1)
: top inconsistent *L. musa*
2385.04 m (core) : less dinoflagellates (2172.37 m T-1)
2396.75 m (core) : top *C. nyei*
2415.50 m (core) : top *Dilwynites* acme (2189.52 m T-1)
2426.62 m (core) : base *Dilwynites* acme (2197.51 m T-1)
2433.58 m (core) : top *P. cretaceum* (2193.07 m T-1)
: top increased dinoflagellates (2203.43 m T-1)
2438.36 m (core) : base consistent *A.* cf. *griphus*, increased *A. cruciformis* (2203.43 m T-1)
2450.62 m (core) : top major *Heterosphaeridium* influx (2203.43 m T-1)
2482.51 m (core) : major dinoflagellate maximum (2246.5 m T-1)
2496.28 m (core) : top consistent *I. "evexa"* (Partridge = previous *A.* cf. *acuminatum)*
2512.32 m (core) : acme *I. "evexa"*
2568.28 m (core) : base common dinoflagellates, *Aptea* sp. (2295.0 m T-1)
: base common *A. cruciformis* (2295.0 m T-1)

Several other marine maxima occur within this interval, but confident correlation of them would require a log panel to test their validity. Overall, marine content increases from the base to a maximum at 2482.51 m, then decreases to 2433.58 m, decreasing further to the top of the interval.

Environments are initially nearshore to marginal marine, deepening to shelfal marine, then shallowing to very nearshore to marginal marine at the top, as shown by the changing content of marine dinoflagellates agmonst terrestrial spores and pollen.

Light brown spore colours indicate marginal maturity for oil and immaturity for gas/condensate.

3.8 2578.44 m (core) – 2625/29 m (cutts) : *P. infusoriodes* Zone, middle c subzone [and *P. mawsonii* Zone, upper subzone]

Assignment is indicated at the top on very rare dinoflagellates, and at the base on oldest *I. "evexa"* and the absence of older markers. This is equivalent of the *I. evexus* subzone of Partridge.

Amongst the minor dinoflagellates, the most consistent are *C. longispinatum, H. heteracanthum* and *K. unituberculatum*. Very rare and inconsistent is *I. "evexa"*. Rare acritarchs include *Nummus* spp. and *A. cruciformis*.

Spores and pollen are dominant and include rare *A. cruciformis* with consistent *L. "musa"* and without *Hoegisporis "trinalis"* or *A. distocarinatus*, indicating the assignment. This is equivalent to the *L. musa* subzone of Partridge.

Of the spores and pollen, common to abundant are *Dictyophyllidites* spp., *F. similis* and *M. antarcticus*, with common *D. pusillum*. Very rare but consistent taxa include *L. musa* and *P. mawsonii*.

Events for possible correlation to Thylacine-1 (shown in brackets) include

2610/15 m (cutts) : acme M. *antarcticus*, Permian reworking (2334.8 m T-1)
2610/15 m (cutts) : acme *D. harrisii* (2397.7 m T-1)
: acme *L. musa*
2620/25 m (cutts) : acme *Dilwynites* spp. (2384.0 m T-1)

Marginal marine to non-marine environments are indicated by the totally dominant terrestrial spores and pollen and minor marine dinoflagellates.

Light brown spore colours indicate marginal maturity for oil and immaturity for gas/condensate.

4 REFERENCES

Helby, R., Morgan, R., & Partridge, A.D., (1987) A palynological zonation of the Australian Mesozoic. Mem. Assoc. Aust. Palaeontol. 4, 1-94.

Morgan, R.P., (1992) Overview of new cuttings based Late Cretaceous correlations, Otway Basin, Australia. Unpubl. rept. for BHPP

Morgan, R.P., (1994) Palynology of BHPP Minerva-2A, Offshore Otway Basin, Victoria, Australia. Unpubl. rept. for BHPP

Morgan, R.P., (2001) Palynology of Thylacine-1, offshore Otway Basin, Australia, Unpubl. rept. for Woodside Energy Ltd.

Partridge, A.D., (1997) New Upper Cretaceous palynology of the Sherbrook Group, Otway Basin. In Victoria Supplement PESA News April/May p. 9

Partridge, A.D., (1998) Biostratigraphy and interpreted stratigraphy of Champion-1 and Conan-1 from open file basic data. Unpubl. rept. Biostrata 1998/02

Partridge, A.D., (2001) Revised stratigraphy of the Sherbrook Group, Otway Basin In Hill, K.C. and Bernecker, T. (Eds) Eastern Australian Basins Symposium, a refocused energy perspective for the future PESA spec. Publ. 455-464

TABLE 1: SUMMARY PALYNOLOGICAL DATA, THA-O1

RT=m

LOG DEPTH [mbRT]	CORE DEPTH [mRT]	SAMPLE TYPE	ORGANIC YIELD *1	MICROFOSSIL YIELD	PRESERVATION *2	PERCENTAGE				DIVERSITY *3		DINOCYSTS ZONE / SUBZONE	SPORE-POLLEN ZONE / SUBZONE	ENVIRONMENT *4
						MICROPLANKTON			SPORE-POLLEN	MICROPLANKTON	SPORE-POLLEN			
						DINOFLAG.	SPINY AC.	OTHER						
2230/35		CUTTS	0.023	FAIR	GOOD (3)	38	0	3	59	HIGH	MOD	N. ACERAS, LOWER	T. APOXYEXINUS, UPPER	SHELFAL MARINE
2240/50		CUTTS	0.017	FAIR	GOOD (3)	47	0	4	49	HIGH	MOD	I. CRETACEUM, UPPER b	T. APOXYEXINUS, UPPER	SHELFAL MARINE
2250/55		CUTTS	0.020	FAIR	GOOD (3)	14	0	5	81	MOD	MOD	I. CRETACEUM, UPPER b	T. APOXYEXINUS, UPPER	NEARSHORE MARINE
2255/60		CUTTS	0.013	FAIR	GOOD (3)	48	0	1	51	HIGH	HIGH	I. CRETACEUM, UPPER b	T. APOXYEXINUS, UPPER	SHELFAL MARINE
2280/85		CUTTS	0.032	FAIR	GOOD (3)	54	0	1	45	HIGH	MOD	I. CRETACEUM, UPPER a	T. APOXYEXINUS, UPPER	SHELFAL MARINE
2295/00		CUTTS	0.013	FAIR	GOOD (3)	53	0	6	41	HIGH	MOD	I. CRETACEUM, UPPER a	T. APOXYEXINUS, UPPER	SHELFAL MARINE
2315/20		CUTTS	0.010	FAIR	GOOD (3)	14	<1	4	82	MOD	MOD	I. CRETACEUM, UPPER a	T. APOXYEXINUS, UPPER	NEARSHORE MARINE
2325/30		CUTTS	0.006	FAIR	GOOD (3)	12	0	3	85	MOD	MOD	I. CRETACEUM, UPPER a	T. APOXYEXINUS, UPPER	NEARSHORE MARINE
2335/40		CUTTS	0.005	EX LOW	GOOD (3)	21	0	10	69	EX LOW	LOW	INDETERMINATE		NEARSHORE MARINE
2340/45		CUTTS	0.011	FAIR	GOOD (3)	10	0	2	88	MOD	MOD	I. CRETACEUM LOWER a	T. APOXYEXINUS, MIDDLE	NEARSHORE MARINE
2345/50		CUTTS	0.009	FAIR	GOOD (3)	19	0	1	80	MOD	MOD	I. CRETACEUM LOWER a	T. APOXYEXINUS, MIDDLE	NEARSHORE MARINE
2350/55		CUTTS	0.009	FAIR	GOOD (3)	9	0	5	86	LOW	MOD	O. PORIFERA, UPPER	T. APOXYEXINUS, MIDDLE	NEARSHORE MARINE
2355/60		CUTTS	0.013	FAIR	GOOD (3)	9	1	8	82	LOW	MOD	O. PORIFERA, UPPER	T. APOXYEXINUS, MIDDLE	NEARSHORE MARINE
2360/65		CUTTS	0.016	FAIR	GOOD (3)	5	1	5	89	MOD	MOD	O. PORIFERA, UPPER	T. APOXYEXINUS, MIDDLE	VERY NEARSHORE MARINE
2379.35	2383.95	CORE	0.004	EX LOW	GOOD (3)	12	0	0	88	EX LOW	MOD	INDETERMINATE		VERY NEARSHORE MARINE
2382.97	2387.57	CORE	0.019	FAIR	GOOD (3)	9	0	5	86	LOW	MOD	O. PORIFERA, UPPER	T. APOXYEXINUS, MIDDLE	VERY NEARSHORE MARINE
2383.83	2388.43	CORE	0.01	FAIR	GOOD (3)	12	0	7	81	MOD	HIGH	O. PORIFERA, UPPER	T. APOXYEXINUS, MIDDLE	NEARSHORE MARINE
2384.80	2389.40	CORE	0.012	FAIR	GOOD (3)	27	<1	16	57	MOD	HIGH	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2385.04	2389.64	CORE	0.003	EX LOW	GOOD (3)	27	<1	3	72	EX LOW	LOW	INDETERMINATE		NEARSHORE MARINE
2392.66	2397.41	CORE	0.028	LOW	GOOD (3)	8	0	11	81	MOD	MOD	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	VERY NEARSHORE MARINE
2394.65	2399.40	CORE	0.011	LOW	GOOD (3)	8	0	7	85	MOD	HIGH	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2396.75	2401.50	CORE	0.013	LOW	GOOD (3)	10	<1	7	83	MOD	MOD	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	VERY NEARSHORE MARINE
2402.06	2406.18	CORE	0.042	LOW	GOOD (3)	1	<1	5	94	EX LOW	HIGH	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	VERY NEARSHORE MARINE
2408.10	2412.50	CORE	0.042	LOW	GOOD (3)	<1	0	9	91	EX LOW	HIGH	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	MARGINAL MARINE
2415.50	2419.64	CORE	0.040	LOW	GOOD (3)	1	0	2	97	LOW	MOD	P. INFUSORIOIDES, ?UPPER	T. APOXYEXINUS, LOWER	MARGINAL MARINE
2421.36	2425.50	CORE	0.030	LOW	GOOD (3)	4	0	3	93	LOW	HIGH	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2426.62	2430.76	CORE	0.059	LOW	GOOD (3)	<1	0	4	96	EX LOW	HIGH	P. INFUSORIOIDES, UPPER c	T. APOXYEXINUS, LOWER	MARGINAL MARINE
2433.58	2437.72	CORE	0.021	LOW	GOOD (3)	24	0	8	68	HIGH	MOD	P. INFUSORIOIDES, UPPER b	T. APOXYEXINUS, LOWER	SHELFAL MARINE
2438.36	2442.50	CORE	0.007	LOW	GOOD (3)	32	0	16	52	HIGH	MOD	P. INFUSORIOIDES, UPPER b	T. APOXYEXINUS, LOWER	SHELFAL MARINE
2443.52	2447.66	CORE	0.022	LOW	GOOD (3)	30	0	12	58	MOD	MOD	P. INFUSORIOIDES, UPPER b	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2450.62	2454.76	CORE	0.015	LOW	GOOD (3)	54	0	10	36	MOD	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	SHELFAL MARINE
2455.57	2459.71	CORE	0.016	LOW	GOOD (3)	32	1	14	53	MOD	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	SHELFAL MARINE
2465.95	2469.95	CORE	0.104	LOW	GOOD (3)	4	0	13	83	LOW	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2469.73	2473.73	CORE	0.051	LOW	GOOD (3)	15	0	10	75	LOW	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2475.25	2479.65	CORE	0.012	LOW	GOOD (3)	28	0	17	55	MOD	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2483.51	2487.91	CORE	0.033	LOW	GOOD (3)	62	1	14	23	MOD	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	SHELFAL MARINE
2496.28	2500.68	CORE	0.026	LOW	GOOD (3)	8	1	3	88	LOW	HIGH	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2504.28	2508.68	CORE	0.061	LOW	GOOD (3)	12	0	4	84	MOD	HIGH	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2507.90	2512.30	CORE	0.067	LOW	GOOD (3)	5	0	4	91	LOW	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	VERY NEARSHORE MARINE
2512.32	2516.72	CORE	0.037	LOW	GOOD (3)	22	0	9	69	HIGH	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2524.45	2528.85	CORE	0.011	EX LOW	GOOD (3)	17	0	4	79	LOW	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2535.98	2540.38	CORE	0.015	LOW	GOOD (3)	37	0	15	48	MOD	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2543.92	2547.95	CORE	0.063	LOW	GOOD (3)	5	0	6	89	MOD	HIGH	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2554.93	2559.33	CORE	0.05	LOW	GOOD (3)	3	0	8	89	LOW	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	MARGINAL MARINE
2559.38	2563.78	CORE	0.023	LOW	GOOD (3)	15	0	15	70	MOD	MOD	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2568.28	2572.68	CORE	0.021	LOW	GOOD (3)	12	0	16	72	MOD	HIGH	P. INFUSORIOIDES, UPPER a	T. APOXYEXINUS, LOWER	NEARSHORE MARINE
2578.44	2582.84	CORE	0.024	LOW	GOOD (3)	1	0	3	96	EX LOW	HIGH	P. INFUSORIOIDES, MIDDLE c	P. MAWSONII, UPPER	MARGINAL MARINE
2585.52	2589.92	CORE	0.052	LOW	GOOD (3)	7	0	2	91	LOW	HIGH	P. INFUSORIOIDES, MIDDLE c	P. MAWSONII, UPPER	MARGINAL MARINE
2600/05		CUTTS	0.009	LOW	GOOD (3)	0	0	2	98	EX LOW	MOD	P. INFUSORIOIDES, MIDDLE c	P. MAWSONII, UPPER	NON-MARINE
2610/15		CUTTS	0.013	LOW	GOOD (3)	<1	0	2	98	EX LOW	MOD	P. INFUSORIOIDES, MIDDLE	P. MAWSONII, UPPER	MARGINAL MARINE
2615/20		CUTTS	0.022	LOW	GOOD (3)	1	0	4	95	EX LOW	MOD	P. INFUSORIOIDES, MIDDLE	P. MAWSONII, UPPER	MARGINAL MARINE
2620/25		CUTTS	0.02	LOW	GOOD (3)	1	0	7	92	LOW	HIGH	P. INFUSORIOIDES, MIDDLE c	P. MAWSONII, UPPER	MARGINAL MARINE
2625/29		CUTTS	0.017	LOW	GOOD (3)	2	0	2	96	LOW	MOD	P. INFUSORIOIDES, MIDDLE c	P. MAWSONII, UPPER	TRACE MARINE

*1 ORGANIC YLD=VOL(cc)/WGHT(g)
<0.01 : EXTREMELY LOW
0.01 - 0.10 : LOW
0.1 - 0.5 : MODERATE
>0.5 : HIGH

*2 NOTE:PRESERVATION (FRAGMENTATION INDEX)
1 = SUPERB
2 = EXCELLENT
3 = GOOD
4 = FAIR
5 = POOR

*3 DIVERSITY	
V HIGH	30+ SPECIES
HIGH	20-29 SPECIES
MOD	10-19 SPECIES
LOW	5-9 SPECIES
EX LOW	1-4 SPECIES

*4 ENVIRONMENTS	DINOFLAGELLATE CONTENT %	DINOFLAGELLATE DIVERSITY	FRESHWATER ALGAE CONTENT%
OFFSHORE MARINE	67 to 100	VERY HIGH	LOW
SHELFAL MARINE	34 to 66	HIGH	"
NEARSHORE MARINE	11 to 33	MODERATE	"
VERY NEARSHORE MARINE	5 to 10	MODERATE-LOW	"
MARGINAL MARINE	<1 to 4	LOW-VERY LOW	"
BRACKISH	0, SPINY ACRITARCHS ONLY	EXTREMELY LOW	"
NON-MARINE (UNDIFF)	0, NO SPINY ACRITARCHS	NIL	LOW <3
NON-MARINE (LACUSTRINE)	0, NO SPINY ACRITARCHS	NIL	MODERATE 3-10+

Well Name : THA-01

Operator : WOODSIDE ENERGY

Interval : 2215m - 2649m Palynological Data Chart : INTERPRETIVE DATA

Scale : 1:2000 % Abundance histogram : Highest occurrence

Chart date: 03 July 2007 Roger Morgan

THA-01

Morgan Palaeo Associates
Maitland, South Australia

Enclosure 1

Sampling
Cutting
Core
Sidewall core

Text Keys
*1 % within discipline (40mm=100%)
*2 In-Situ occurrences
*3 ALBO

Depth | Samples (Samples in Discipline(s) : Paly) | Chronostratigraphy: Period/Epoch, Age | DINOCYST ZONES (HMP 1987, Morgan 2001): Zone, Sub Zone | MIOSPORE ZONES (HMP 1987, Morgan 2001): Zone, Sub Zone

Period/Epoch: Cretaceous
Age: Campanian; Santonian; Turonian
DINOCYST Zone: N.aceras; I.cretaceum; O.porifera; P.infusorioides
DINOCYST Sub Zone: lower; upper b; upper a; (Indeterminant); lower a; upper; upper c; upper b; upper a; middle c
MIOSPORE Zone: T.apoxyexinus; P.mawsonii
MIOSPORE Sub Zone: Upper; Middle; Lower; Upper

Dinoflagellate Cysts — % within discipline (40mm=100%); In-Situ occurrences

Eucladinium kaikourense
Exochosphaeridium phragmites
Heterosphaeridium cf. heterobrachius
Heterosphaeridium conjunctum
Heterosphaeridium heterocanthum
Hystrichodinium pulchrum
Isabelidinium baltrei
Maduradinium pentagonum
Nelsoniella aceras
Odontochitina "obesa"
Odontochitina cribropelta
Odontochitina operculata
Odontochitina porifera
Oligosphaeridium complex
Oligosphaeridium pulcherrimum
Palaeohystrichophora infusorioides
Pterodinium cingulatum
Trichodinium castaneum
Xenikoon australis
Amphidiadema denticulata
Canningia rotundata
Isabelidinium "belfastense" "belfastense"
Trithyrodinium vermiculatum
Odontochitina "stubby"
Batiacasphaera kekerengensis
Chatangiella micracantha
Chatangiella victorensis
Trithyrodinium "marshallii"
Trithyrodinium glabrum
Chatangiella victorensis
Isabelidinium cretaceum "cretaceum"
Odontochitina "prima"
Odontochitina "operculata"
Trithyrodinium suspectum
Callaiosphaeridium asymmetricum
Circulodinium lorigispinatum
Odontochitina costata
Isabelidinium rectangulare "contractum"
Isabelidinium belfastense "rotundatum"
Isabelidinium cretaceum "elongatum"
Isabelidinium rectangulare "rectangulare"
Trithyrodinium rectangulare "diversum"
Isabelidinium sp.
Circulodinium deflandrei
Odontochitina "indistincta"
Odontochitina operculata
Aptea sp. cf. grigshus
Isabelidinium "arexa"
Isabelidinium latum
Krokansium uniturberculatum
Chlamydophorella nyei
Cyclonephelium cf. compactum
Escharisphaerida spp.
Palaeoperidinium cretaceum
Chlamydophorella "minutum"
Heterosphaeridium "minutum"
Tanyosphaeridium salpinx
Cynososphaeridium benmorensis
Aptea sp.
Chlamydophorella nyei
Odontochitina operculata
Palaeocarinella indentata
Apteodinium granulatum

AC: *1 *2 — *Nummus spp.*, *Verychachium spp.*, *Microdinium spp.*, *Nummus micrioculatus*, *Microfoams*
FT: *1 *2 — *Leiosphaeres thick*, *Leiosphaeres*
AL: *1 *2 — *Leiosphaeres spp.*, *Arkhangelskiella cladiformis*
SP: *1 *2 — *Reworking - Permian*, *Reworking - Triassic*
MP: *1 *2 — *Aequitriradites spinulosus*, *Aequitriradites verrucosus*, *Balmeisporites holodictyus*, *Camerozonosporites ohaiensis*, *Cicatricosporites australiensis*, *Cyathidites australis*, *Cyathidites minor*, *Dictyophyllidites spp.*
FU: *1 *2 — *Fungae*

Spores And Pollen — % within discipline (40mm=100%); In-Situ occurrences

Dilwynites granulatus
Falcisporites grandis
Falcisporites similis
Gleicheniidites spp.
Microcachryidites antarcticus
Osmundacidites wellmanii
Phyllocladidites mawsonii
Proteacidites spp.
Vitreisporites pallidus
Araucariacites australis
Callialasporites dampieri
Clavifera triplex
Cyclogalites follicularis
Ornamentifera sentosa
Ceratosporites equalis
Cicatricosporites hallei
Stereisporites antiquasporites
Foraminisporis dailyi
Australopollis obscurus
Tricolpites reticulatus
Callialasporites triobatus
Coptospora "pliocsa"
Callialasporites turbatus
Cicatricosporites ludbrookiae
Plicosispontes notensis
Corollina torosa
Tetracolporites camanunensis
Laevigatosporites ovatus
Corollina meyeriana
Gleicheniidites ancorus
Laevigatosporites "musa"
Cupressacites spp.
Phyllocladidites echmuchus
Kuylisporites scaberis
Tricolpites spp.
Dilwynites "pusillum"
Perinopollenites elatoides
Cyathea/dites fecifera
Clavifera vulhuosus ms
Hoegisporis "hirsalis"
Tricolpites radiatus
Tricolpites simplex
Fungae

Samples (Samples in Discipline(s) : Paly)

Total Count — In-Situ occurrences; Total count: Total Count

% Category — In-Situ occurrences; Category %: % Category; FU, AL, AC, FT, DC, ALBO, MP, SP

Depth	Samples	Total Count	% Category
2235.00m CU	2235.00m CU	296	
2250.00m CU	2250.00m CU	259	
2255.00m CU	2255.00m CU	257	
2260.00m CU	2260.00m CU	359	
2285.00m CU	2285.00m CU	266	
2300.00m CU	2300.00m CU	268	
2320.00m CU	2320.00m CU	248	
2330.00m CU	2330.00m CU	274	
2340.00m CU	2340.00m CU	23	
2345.00m CU	2345.00m CU	342	
2350.00m CU	2350.00m CU	314	
2355.00m CU	2355.00m CU	282	
2360.00m CU	2360.00m CU	339	
2365.00m CU	2365.00m CU	328	
2379.35m CO	2379.35m CO	25	
2382.97m CO	2382.97m CO	244	
2383.83m CO	2383.83m CO	372	
2384.80m CO	2384.80m CO	254	
2385.04m CO	2385.04m CO	18	
2392.66m CO	2392.66m CO	210	
2394.65m CO	2394.65m CO	333	
2396.75m CO	2396.75m CO	260	
2402.06m CO	2402.06m CO	173	
2408.10m CO	2408.10m CO	218	
2415.50m CO	2415.50m CO	233	
2421.36m CO	2421.36m CO	356	
2426.62m CO	2426.62m CO	295	
2433.58m CO	2433.58m CO	325	
2438.36m CO	2438.36m CO	237	
2443.52m CO	2443.52m CO	226	
2450.62m CO	2450.62m CO	311	
2455.57m CO	2455.57m CO	329	
2465.95m CO	2465.95m CO	300	
2469.73m CO	2469.73m CO	326	
2475.25m CO	2475.25m CO	296	
2483.51m CO	2483.51m CO	252	
2496.28m CO	2496.28m CO	230	
2504.28m CO	2504.28m CO	262	
2507.90m CO	2507.90m CO	287	
2512.32m CO	2512.32m CO	317	
2524.45m CO	2524.45m CO	145	
2535.98m CO	2535.98m CO	205	
2543.92m CO	2543.92m CO	268	
2554.93m CO	2554.93m CO	185	
2559.38m CO	2559.38m CO	296	
2568.28m CO	2568.28m CO	226	
2578.44m CO	2578.44m CO	214	
2585.52m CO	2585.52m CO	136	
2605.00m CU	2605.00m CU	60	
2615.00m CU	2615.00m CU	185	
2620.00m CU	2620.00m CU	215	
2625.00m CU	2625.00m CU	253	
2629.00m CU	2629.00m CU	189	

Petrophysical Interpretation Report

Appendix 2

WOODSIDE ENERGY LIMITED

T/L2 & T/30P

Petrophysical Interpretation of Otway (THA) Development Wells

Petrophysics Report

OTWAY SUBSURFACE TEAM
January, 2007

DRIMS #2655333

1. SUMMARY

This report documents the formation evaluation data acquisition and interpretation of four development wells that were drilled in permits T/L2 and T/30P of the Otway Basin, Tasmania (see Figures 1 & 2). Four reservoir units were targeted for the campaign, with different wells designed to intersect different units and fault compartments. The four wells are THA01, THA02, THA03 and THA04. The four reservoir units are Unit 1 & 2 (Thylacine Member), Unit 4 (Flaxmans Member) and Unit 5 (Waarre Formation). Unit 3 is a field-wide shale that separates Unit 2 from Unit 4.

THA01 was a deviated 12 ¼" hole that drilled through all four reservoir units, and was completed in Unit 4 and 5. THA02, THA03 and THA04 are 8 ½" horizontal wells that targeted Units 1 and 2 to increase productivity from these low quality reservoirs. The toe of the THA02 well dipped down into Units 4 and 5, while a portion of the THA03 horizontal dipped into Unit 4.

All four wells were drilled from a central drilling location by the Maersk Guardian rig in approximately 100m of water. All four wells were logged while drilling by Halliburton. THA01 was spudded on 12/04/2006 and THA04 was cleaned up at final TD of 3987mRT on 24/09/2006.

Issues were discovered on THA01 that result in a variation between original drillers (FEWD) depth and the final depth. This was rectified in the three subsequent wells.

The interpreted reservoir properties are summarised below.

Well	Top	Bottom	Gross	Net Reservoir Properties					
				Net	NTG	Φ	K Arith		Sw
	(mMDRT)	*(mMDRT)*	*(m)*	*(m)*	*(v/v)*	*(v/v)*	*(mD)*		*(v/v)*
THA01	2270.4	2634.2	363.8	230.8	0.634	0.158	466.8		0.472
THA02	2287.0	4025.9	1738.9	683.5	0.393	0.159	63.3		0.412
THA03	2139.5	3779.9	1640.4	790.2	0.482	0.153	112.7		0.418
THA04	2743.5	3987.0	1243.5	863.8	0.695	0.137	0.668		0.435

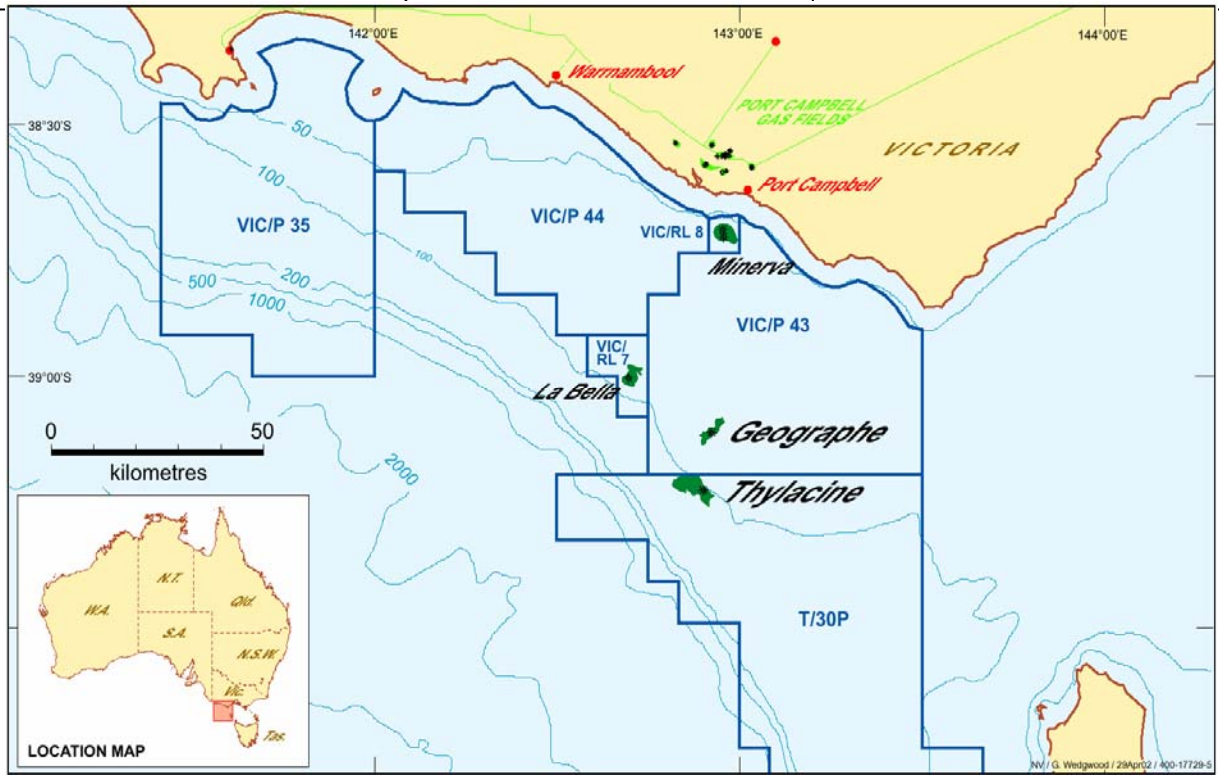


Figure 1: Field and location

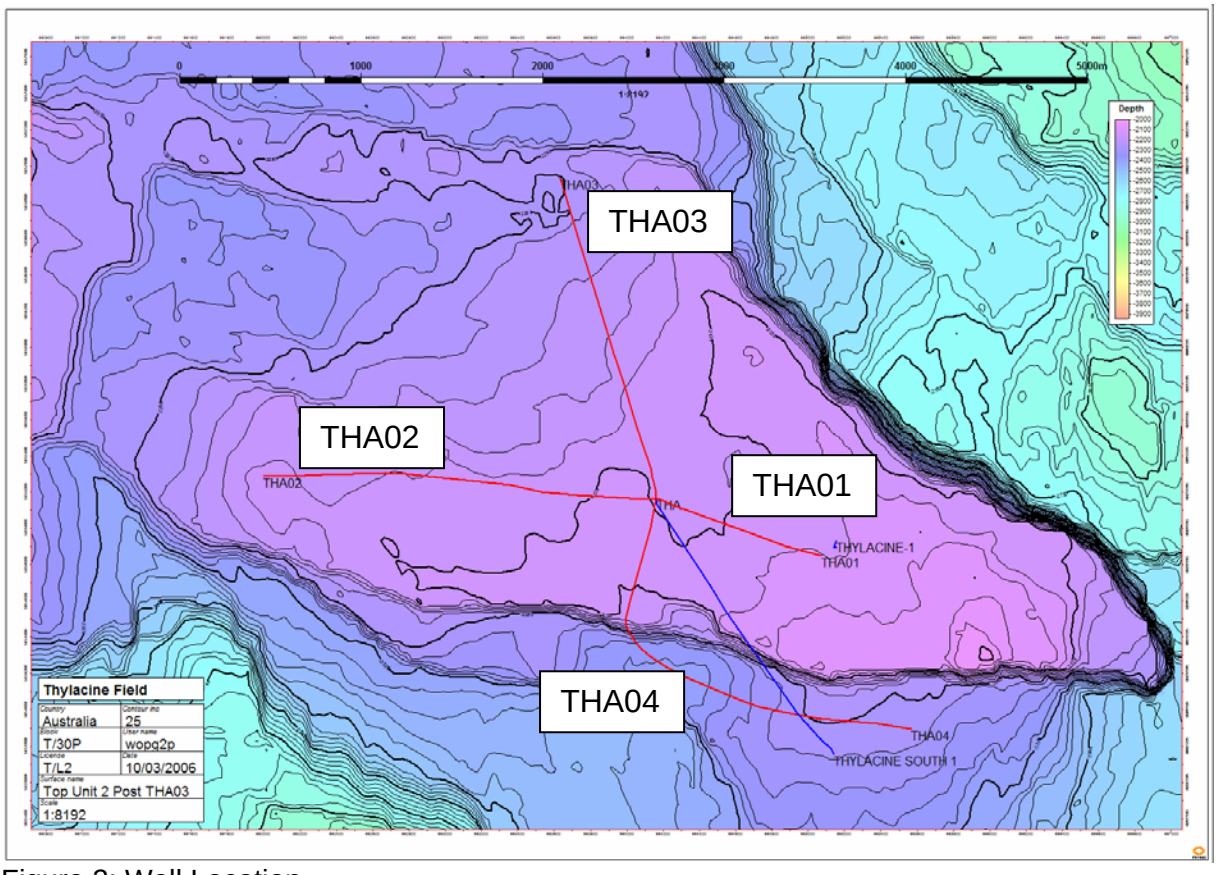


Figure 2: Well Location

DRIMS #2655333

2. DATA ACQUISITION

2.1. Formation Evaluation while Drilling

Formation evaluation while drilling services were provided by Halliburton (Sperry-Sun). Table 1 summarises the logs acquired in each of the four development wells. A summary of operational issues while logging is found below.

Table 1: THA FEWD and Wireline Summary

FEWD Data Acquisition Summary				
Well	*THA01*	*THA02*	*THA03*	*THA04*
17 ½" Hole	GAB/ DGR/EWR	-		
12 ¼" Hole	GAB/DGR/EWR/ALD/CTN/ ACAL	GAB/ DGR/EWR		
8 ½" Hole	-	GAB/DGR/EWR/ALD/CTN/ACAL/GeoTap		GAB/DGR/EWR/ ALD/CTN/ACAL
Wireline Data Acquisition Summary				
Well	*THA01*	*THA02*	*THA03*	*THA04*
17 ½" Hole	No wireline run			
12 ¼ Hole"	No wireline run			
8 ½" Hole	No wireline run			
Core Acquisition Summary				
Well	*THA01*	*THA02*	*THA03*	*THA04*
17 ½" Hole	No core cut			
12 ¼ Hole"	209m of core cut	No core cut		
8 ½" Hole	No core cut			

FEWD Mnemonics
GAB – At Bit Gamma Ray, DGR – Gamma Ray, EWR – Induction Resistivity, ALD – Azimuthal Density, CTN – Compensated Neutron, ACAL – Acoustic Caliper

2.1.1. THA01

Other than issues with the mud pumps, mud motor and bit in the 17 ½" hole, no issues were experienced with the LWD tools/data. The majority of the LWD data in the 12 ¼" hole section was acquired while "wiping" after coring all of Unit 4 and Unit 5 down to the FWL.

2.1.2. THA02

No issues were experienced in the 12 ½" landing section. One GeoPilot failure in the 8 ½" hole section caused a trip for replacement at 3510mMDRT. 7 of 26 GeoTap formation pressures were acquired successfully in the 8 ½" hole section (3 supercharged, 6 no seals, 10 low perm).

2.1.3. THA03

No issues were experienced in the 12 ½" landing section or the 8 ½" reservoir section. 9 from 10 GeoTap formation pressures were successfully acquired in the 8 ½" hole section (4 tests were deemed to be supercharged).

2.1.4. THA04

No issues were experienced in the 12 ½" landing section. Communications with the LWD and directional tools were lost at 3194mMDRT, resulting in a trip. No formation pressures were acquired in this hole.

The data provided was generally of good quality and has been used in the petrophysical evaluation.

2.2. Hole Conditions and Drilling Fluid

The hole conditions in all four wells were good, based on the acoustic caliper readings, where they were acquired. The properties of the mud system present during each hole section are summarised below in Table 2.

Table 2: Borehole fluid properties in Otway development wells

Hole \ Well		*THA01*	*THA02*	*THA03*	*THA04*
17 ½"	*Drilling Fluid*	SynTeq (SBM)			
	Oil Water Ratio	71:29			
	% Solids/% Sand	13.3 / 0.5			
	Rm	N/A			
	Rmf	N/A			
	Fluid Density (SG)	1.25			
	Fluid Viscosity (cp)	41			
	Max Circ Temp (°C)	84			
12 ¼"	*Drilling Fluid*	SynTeq (SBM)	SynTeq (SBM)	SynTeq (SBM)	SynTeq (SBM)
	Oil Water Ratio	68:32	72:28	69:31	72:28
	% Solids/% Sand	13.2 / 0.5	13.7 / 0.5	13.6 / 0.5	14.4 / 0.3
	Rm (Ωm@°C)	N/A	N/A	N/A	N/A
	Rmf	N/A	N/A	N/A	N/A
	Fluid Density (SG)	1.24	1.25	1.25	1.25
	Fluid Viscosity (cp)	45	38	40	41
	Max Circ Temp (°C)	94	96	96	104

Hole \ Well		*THA01*	*THA02*	*THA03*	*THA04*
8 ½"	*Drilling Fluid*		SynTeq (SBM)	SynTeq (SBM)	SynTeq (SBM)
	Oil Water Ratio		77:23	76:24	74:26
	% Solids/% Sand		13.9 / 0.3	17 / 0.25	14.4 / 0.6
	Rm		N/A	N/A	N/A
	Rmf		N/A	N/A	N/A
	Fluid Density (SG)		1.26	1.25	1.25
	Fluid Viscosity (cp)		35	37	35
	Max Circ Temp (°C)		112	109	115

3. PETROPHYSICAL EVALUATION

3.1. Evaluation methodology

The petrophysical evaluation consists of:

- Log environmental corrections (where & if required)
- Depth shifting and splicing
- Shale Volume (Vsh)
- Porosity and Water Saturation evaluation
- Core Analysis Integration
- Permeability evaluation
- Contacts
- Cut-offs & Results (Sums & Averages)

3.2. 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.

3.3. Depth Shifting and Splicing

A drill pipe tally error was identified after drilling THA01. As the errors in the drill pipe tally are spread throughout the tally (Appendix 2, Figure 8), it is not appropriate to apply a single correction to all depths. Figure 9 (in Appendix 2) illustrates the variability between the actual pipe length variations and the approximate shift that has been applied to the FEWD data. Table 7 (in Appendix 2) shows the algorithms that have been used to correct the FEWD data.

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 in Appendix 3.

The core was acquired at drillers depth, and as such requires a similar depth shift. This has been done by placing the core photos next to the logs and determining the plug position relative to the logs, where possible. The depth shift that has been applied to the core is also captured in Appendix 3.

3.4. 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 3: Shale Volume Parameters

Parameter	THA01	THA02	THA03	THA04
Matrix gamma ray (GAPI)	28.5	20	25	20
Shale gamma ray (GAPI)	120	125	150	135
Matrix tool density (g/ cm^3)	2.25	2.5	2.35	2.35
Matrix Neutron porosity (v/v)	0.11	-0.07	-0.07	0.11
Shale tool density (g/ cm^3)	2.66	2.63	2.63	2.63
Shale Neutron porosity (v/v)	0.31	0.3	0.3	0.24
Fluid tool density (g/ cm^3)	1	1	1	1
Fluid neutron porosity (v/v)	1	1	1	1

3.5. Porosity and Water Saturation Calculation

Total porosity (POR) and Water Saturation (SW) was calculated for these four wells using a 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 4: Porosity and Saturation Parameters

Parameter	THA01	THA02	THA03	THA04
Density log	SBD2			
Matrix Density (g/cc)	Variable			
Gas Density (g/cc)	0.167			
OBM filtrate density (g/cc)	0.743			
Formation Water Density (g/cc)	0.974			
Cementation Exponent (m*)	Variable			
Saturation Exponent (n*)	Variable			
B	13			
Qv	Variable			
Formation Water resistivity (ohmm)	0.15			
SFILT (Mud filtrate in invaded zone)	Variable			

The variable input parameters are due to changes in the lithology, and drilling parameters/conditions. A short note on the justification for each of the above input parameters can be found below.

Matrix Density

The variability of the matrix grain density has been defined based on previous core analysis. The mode (rather than straight average) of core grain densities has been chosen for petrophysical analyses. Therefore the matrix grain density used in Unit 1 and Unit 2 is 2.68gm/cc while Unit 4 and Unit 5 has a grain density of 2.65gm/cc. Using these values gives good agreement with the measured core porosity within Unit 2 and Units 4 & 5 in THA01.

Gas Density

Gas density was determined via the integration of PVT gas density estimates with formation pressure data. This resulted in a gas density of 0.167gm/cc. This is equivalent to the gas density used in the evaluation of Thylacine-1.

OBM filtrate density

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.

Formation Water Salinity/Resistivity and Density

Formation water resistivity and density have been estimated from petrophysical solutions (Rwa) in the intersected water leg of THA01 (2588m-2615mMDRT). Therefore formation water salinity 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 13,000-16,000ppm due to filtrate contamination of sample). The formation water density was calculated using this salinity value at insitu conditions.

Cementation Exponent and Saturation Exponent

The “m*” and “n*” values that have been used as input into this Waxman-Smits water saturation equation, have been taken from SCAL experiments that have been performed on cores from the Thylacine and Geographe fields. The variability in “m*” and “n*” that has been used in this interpretation is summarised below.

m* = 2.2	(Units 1 & 2)
m* = 2.0	(Units 4 & 5)
n* = 2.3	(Units 1 & 2)
n* = 2.35	(Units 4 & 5)

B

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.

Qv

The cation exchange capacity per unit pore volume (Qv) has been chosen to reflect the variation in lithology between Units 1 & 2 and Units 4 & 5. Figure 3 shows the variation in Qv with porosity. Based on this variation Qv has been chosen to be equal to 0.6meq/cm^3 in Units 1 & 2 and 0.35meq/cm^3 in Units 4 & 5.

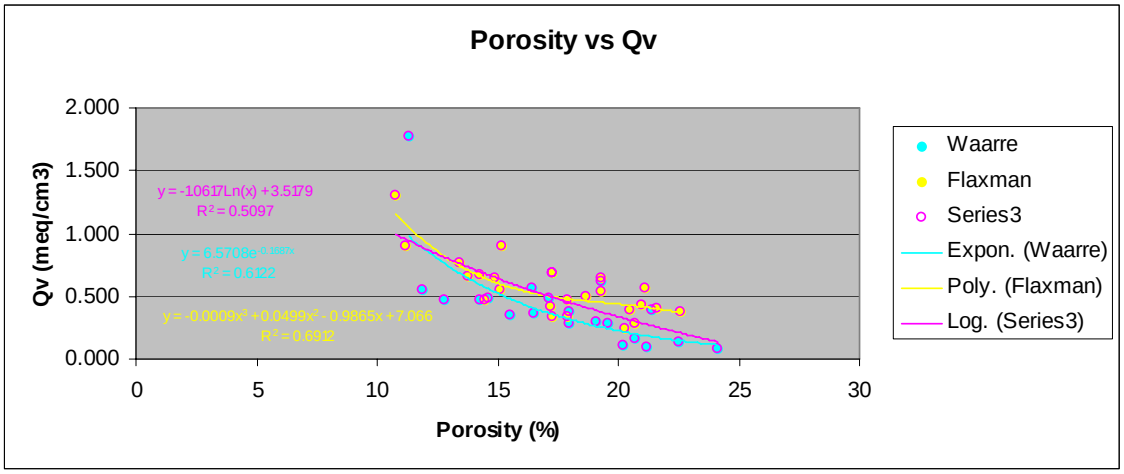


Figure 3: Cation exchange capacity variation with porosity

SFILT

The SFILT parameter defines the volume of mud filtrate (base oil) has invaded into the near wellbore region. The variation is inferred due to deeper filtrate invasion in lower permeability reservoir, due to slow mud cake build-up. Deeper invasion is also inferred from the coring process over Units 4 & 5 in THA01. Coring is performed in multiple runs and at significant over-pressure. It is believed that the disturbance of the mud cake while coring has led to significantly higher mud filtrate invasion in Units 4 & 5 of THA01. These parameters have been calibrated to match the core porosity in THA01.

Formation Temperature

Formation temperature has been estimated using well specific temperature gradients used in previous work. Due to no wireline being run in these wells, only circulating temperatures were read in these wells. Therefore the temperature gradient has been taken from Thylacine-1 (4.4degC/100m) as it is the closest to these well locations. Seafloor temperature is assumed to be 10°C (in line with previous work).

3.6. Core Analysis Integration

209m of core was cut in THA01, across Units 4 and 5. The reason for the core being cut was to determine the weak sand intervals that would produce sand if they were perforated. For this reason, minimal routine core analysis has been performed. This included Dean-Stark experiments, and porosity and permeability readings. The core plugs were chosen to represent the variation in reservoir properties and to verify the petrophysical model that had been previously defined.

The core analysis report can be found in a separate section of this Well Completion Report.

The match between the previously defined petrophysical model and the core analysis that was performed was very good. For this reason no additional core analysis has been performed to date. The match between the petrophysical interpretation and the core analysis is shown graphically in Appendix 1 (Reservoir Summary Plot).

3.7. Permeability Evaluation

The Thylacine-Geographe core porosity – permeability relationship has been defined in previous petrophysical work on the field. The methodology is called PERM_VSH.

The PERM_VSH methodology involves deriving two regression lines that envelope the majority of the poro-permeability data, an upper line representing a clean sand trend (PERM_MAX) and a lower line representing a shaly sand trend. Given any combination of porosity and clay volume, permeability may then be determined on the basis of a weighted average of the clean and shaly sand trends.

PERM_VSH = 10^((min(1,(VSHAL / VSH_LIMIT))) * log(PERM_MIN) + (1-(min(1,(VSHAL / VSH_LIMIT)))) * log(PERM_MAX))

where: VSHAL = shale volume

VSH_LIMIT = VSHAL at PERM_MIN (in this case 0.3V/V)

PERM_MIN = 10^(-4.52 + 0.157 * (POR * 100) + (0.00638* ((POR * 100)^2)) -0.0000576 * ((POR * 100)^3))

PERM_MAX = 10^(-7.21 + 0.838 * (POR * 100) - 0.0138 * ((POR * 100) ^2) - 0.0000694 * ((POR * 100)^3))

POR = total porosity

The PERM_VSH methodology results in a good match to available core and MDT-derived permeability calibration data as measured in the appraisal wells.

3.8. Saturation Height Function

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.

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.

3.9. Contacts

THA01 is the only well that crosses the free-water level and reveals gas down to 2586.4mMD (2296.8mTVDSS). Decreasing reservoir quality does not allow a direct inference of the free-water level at this well location. Due to no indication of a change in the predicted free-water level, the field wide free-water level is believed to be 2298mTVDSS as identified from previous MDT surveys.

3.10. Cut-offs

The criterion for net reservoir has been defined as PERM > 0.1md.

3.11. Individual Well Results

The results of the petrophysical analysis of the THA development wells are presented in the reservoir plot in Figures 4-7 and summarised in Table 5 below.

Table 5: THA Development Wells Sums and Averages

Well	Formn	Top	Bottom	Gross	Net Reservoir Properties					
					Net	NTG	Por	K Arith	Kh	Sw
		(mMDRT)	(mMDRT)	(m)	(m)	(v/v)	(v/v)	(mD)	(mD)	(v/v)
THA01	Unit 1	2270.4	2362.9	92.50	59.40	0.642	0.152	0.95	56.50	0.481
	Unit 2	2362.9	2393.5	30.60	28.80	0.941	0.139	0.29	8.50	0.429
	Unit 4	2394.3	2521.0	126.70	66.00	0.521	0.173	1199.70	79177.40	0.365
	Unit 5	2521.0	2587.8	66.80	53.50	0.801	0.162	532.40	28481.80	0.468
	BelowFWL	2587.8	2634.2	46.40	23.10	0.500	0.148	0.39	9.00	1.000
THA02	Unit 1	2287.0	3814.2	1527.20	567.75	0.372	0.157	5.37	3050.10	0.421
	Unit 2	3814.2	3841.1	26.90	15.00	0.558	0.182	18.10	271.40	0.342
	Unit 4	3841.1	4026.0	184.90	100.75	0.545	0.166	396.20	39916.60	0.374
THA03	Unit 1	2139.5	2288.4	148.90	20.70	0.139	0.129	0.09	1.90	0.789
	Unit 2	2288.4	2345.8	57.40	51.10	0.889	0.162	0.94	48.10	0.387
	Unit 4	2348.5	2581.9	233.40	184.10	0.789	0.183	482.20	88754.60	0.147
	Unit 2	2590.0	2692.4	102.40	86.40	0.844	0.153	0.68	59.00	0.464
	Unit 1	2692.4	3780.0	1087.60	447.10	0.411	0.141	0.42	186.00	0.541
THA04	Unit 1	2743.5	3112.5	369.00	320.90	0.870	0.131	0.61	194.70	0.463
	Unit 1	3175.7	3512.5	336.80	306.40	0.910	0.139	0.20	61.40	0.424
	Unit 1	3519.4	3596.6	77.20	69.20	0.896	0.165	4.27	295.75	0.264
	Unit 1	3675.1	3987.0	311.90	163.80	0.525	0.137	0.15	24.97	0.487

4. SUMMARY OF RESULTS

THA01, THA02, THA03 and THA04 intersected reservoir sandstones of the Thylacine Member, Flaxmans and Waarre Formations within several gas columns. The average petrophysical parameters, per well, are tabulated below.

Table 6: THA Sums and Averages per Well

Well	Top	Bottom	Gross	Net Reservoir Properties					
				Net	NTG	Φ	K Arith		Sw
	(mMDRT)	*(mMDRT)*	*(m)*	*(m)*	*(v/v)*	*(v/v)*	*(mD)*		*(v/v)*
THA01	2270.4	2634.2	363.8	230.8	0.634	0.158	466.8		0.472
THA02	2287.0	4025.9	1738.9	683.5	0.393	0.159	63.3		0.412
THA03	2139.5	3779.9	1640.4	790.2	0.482	0.153	112.7		0.418
THA04	2743.5	3987.0	1243.5	863.8	0.695	0.137	0.668		0.435

5. REFERENCES

1. "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.

6. APPENDICES

6.1. Appendix 1: Reservoir Summary Plots

Petrophysical Interpretation Summary

WOODSIDE

THA01

COMPANY: Woodside Energy Ltd
LOCATION: T/L2
LATITUDE: -39.2373
LONGITUDE: 142.9021
X COORDINATE: 664165.51
Y COORDINATE: -4344854.01
HORIZONTAL UNITS: METRES
DATE PLOTTED: 08-Mar-2007

DATUM FOR ELEVATION: LAT
SURFACE ELEVATION: 99.54
MEASUREMENT REF.: DF
ELEVATION MEAS. REF.: 50.50
DRILLED DEPTH: 2634.00
VERTICAL UNITS: METRES
DATE PRINTED: 14/05/06
VERTICAL SCALE: 1:1000

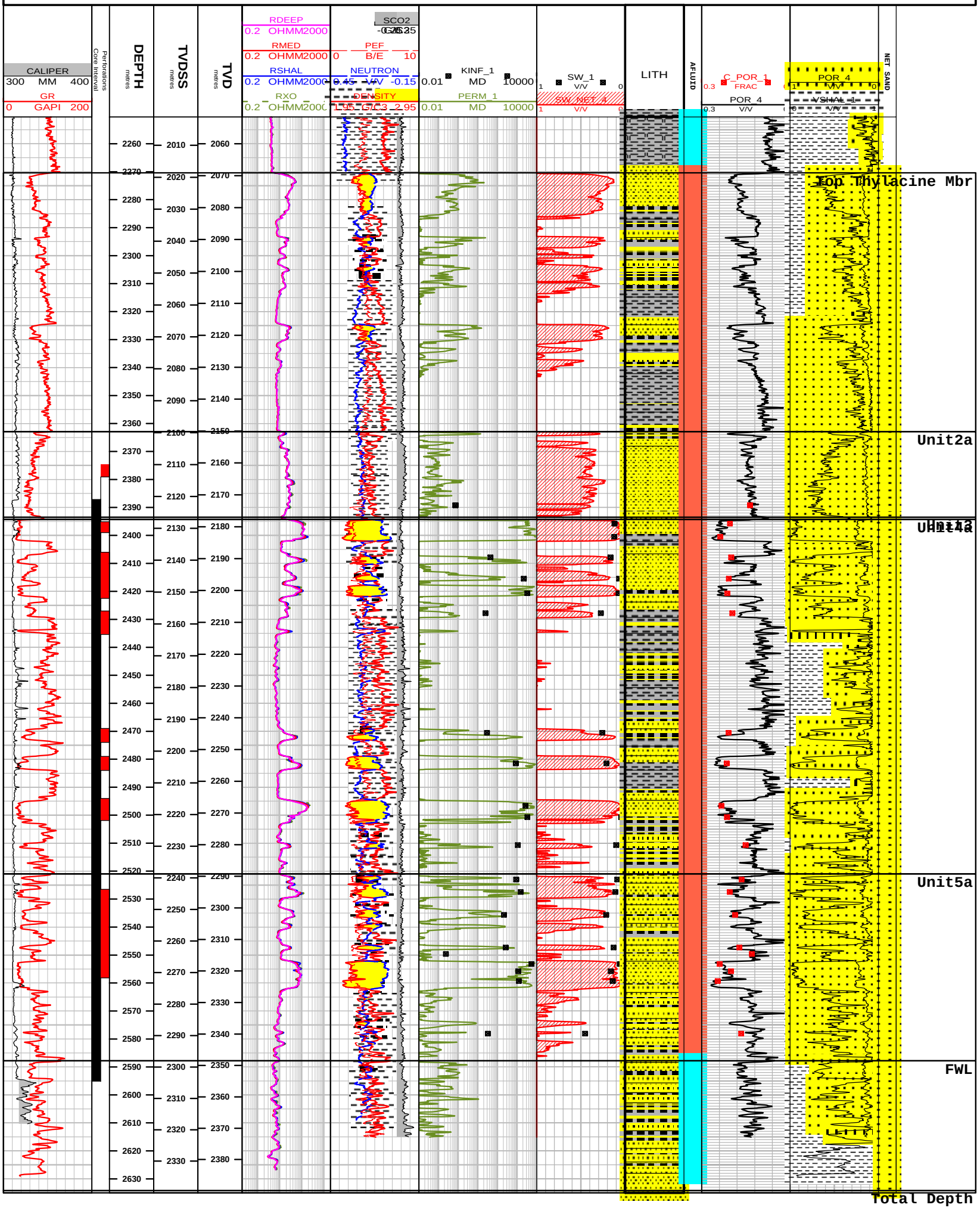


Figure 4: THA01 Reservoir summary plot.

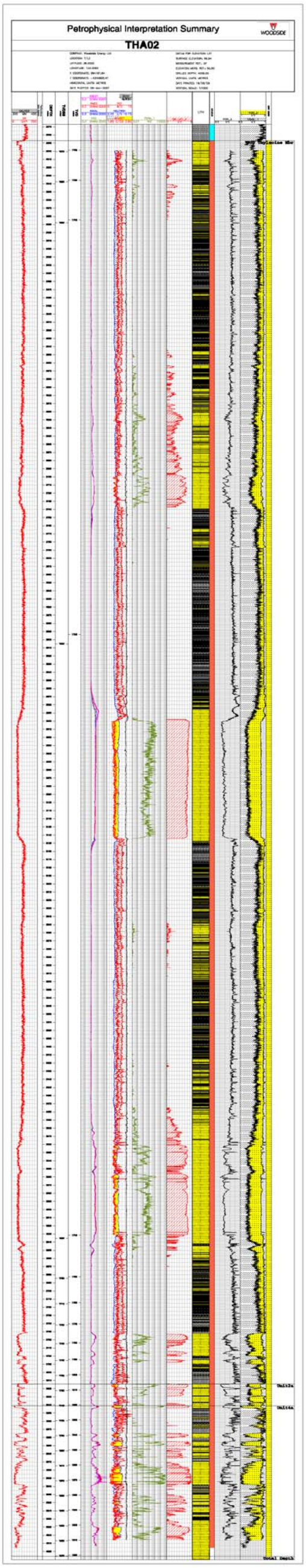


Figure 5: THA02 Reservoir Summary Plot – Double click to open in Adobe Acrobat

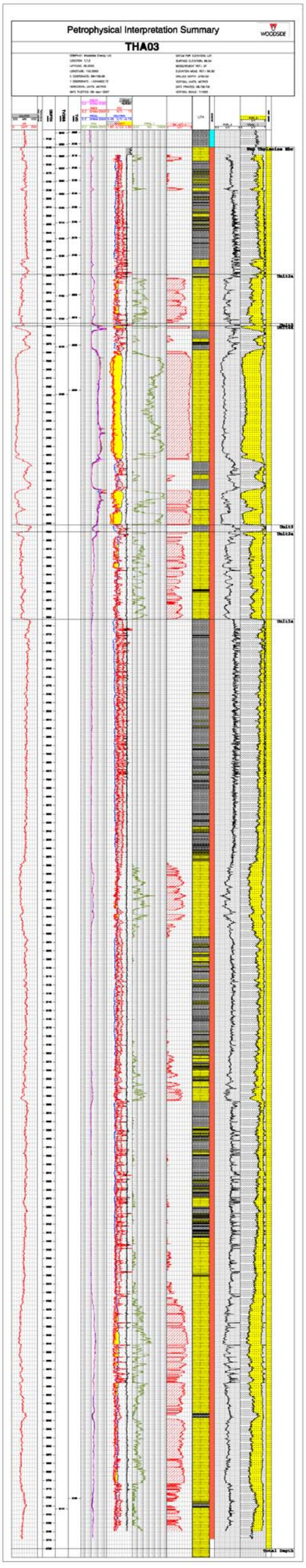


Figure 6: THA03 Reservoir Summary Plot – Double click to open in Adobe Acrobat

DRIMS #2655333

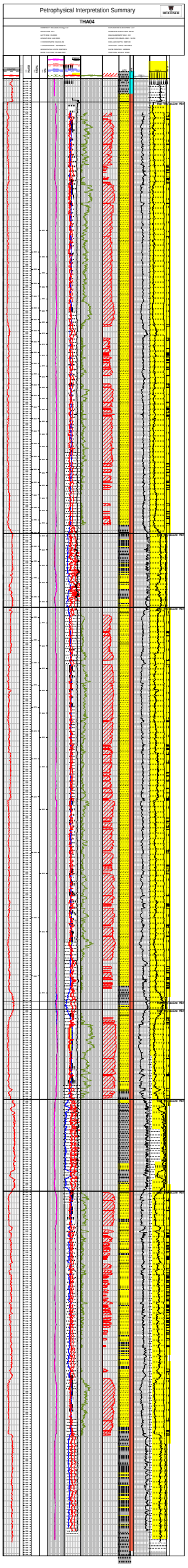


Figure 7: THA04 Reservoir Summary Plot – Double click to open in Adobe Acrobat

6.2. Appendix 2: THA01 Drillpipe Tally Error Correction Details

Figure 8: *Pipe tally measurements*

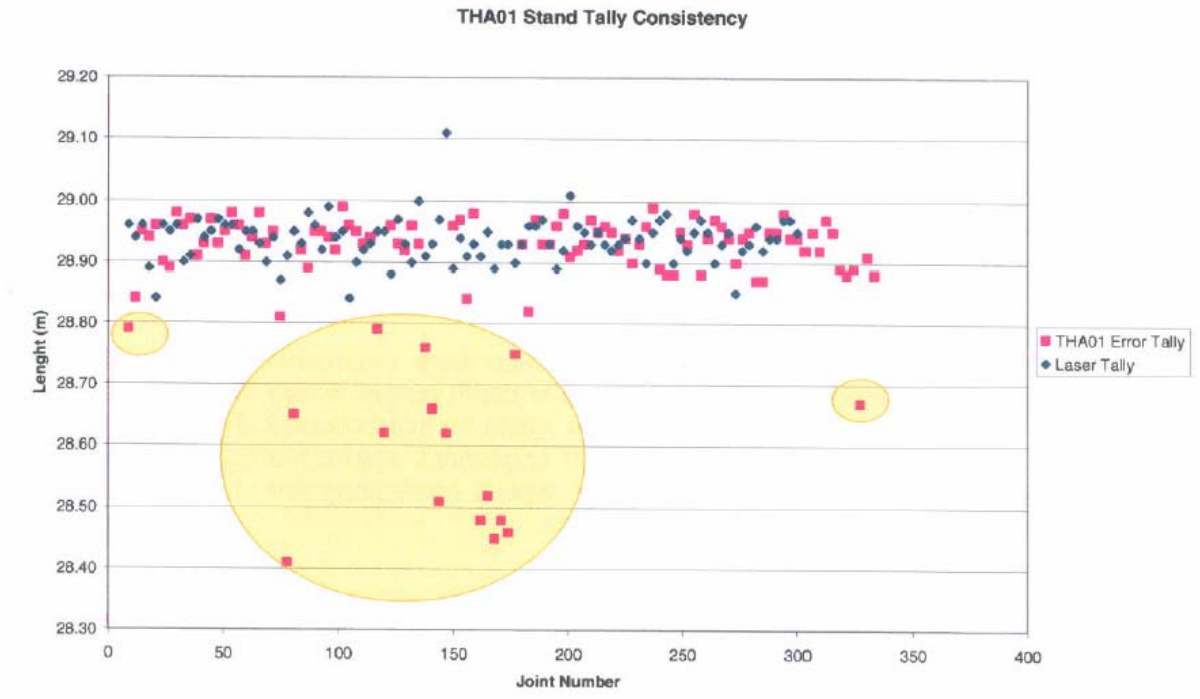


Figure 9: *Pipe tally correction (graphical)*

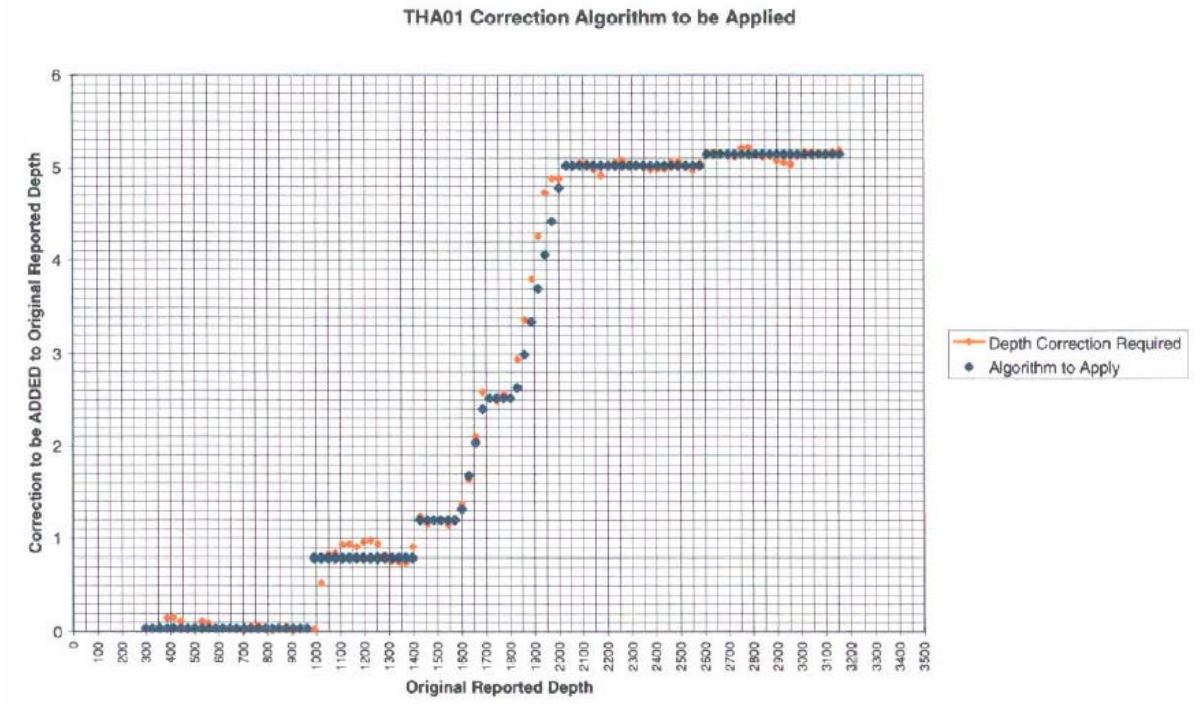


Table 7: *Pipe tally correction algorithm*

Depth corrections to be applied to all depths originally reported for THA01.

Depth Range	Correction to Apply
0m – 279.99m	No correction
280m – 983.99m	Add 0.04m
984m – 1406.99m	Add 0.79m
1407m – 1589.99m	Add 1.20m
1590m – 1694.99m	Add [(((2.52-1.20)/(1695-1590)) x (depth-1590)) +1.20]
1695m – 1819.99m	Add 2.52m
1820m – 2019.99m	Add [(((5.02-2.52)/(2020-1820)) x (depth-1820)) +2.52]
2020m – 2599.99m	Add 5.02m
2600m - TD	Add 5.15m

6.3. Appendix 3: Shift sets for each log in THA01

Density Shift

```
~Version Information Block
VERS .                  2.00:  CWLS
LOG ASCII STANDARD - VERSION 2.00
WRAP .                    NO:  One
line per depth step
~Well Information Block
#MNEM.UNIT        Data Type
Information
#---------- ---------------  ----
-------
STRT .M             2223.2:
START DEPTH
STOP .M               2615:  STOP
DEPTH
STEP .M                  0:  STEP
NULL .              -999.25:  NULL
VALUE
COMP .                    :
COMPANY
WELL .               THA01:  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_DEN:
~Other Information Block
~A        DEPTH      DEPTH_COR
      2223.2000     2222.3000
      2270.2000     2269.3000
      2286.4000     2287.0000
      2293.1000     2293.1000
      2298.1000     2297.4000
      2299.6000     2299.5000
      2303.9351     2303.0000
      2314.7964     2313.8000
      2319.5482     2318.6000
      2324.3000     2324.0000
      2327.4750     2327.1000
      2337.0000     2336.8000
      2362.7231     2362.4000
      2364.8088     2364.8000
      2372.4941     2371.9000
      2380.1000     2379.3000
      2393.5000     2393.6000
      2402.0000     2402.3000
      2404.5000     2405.4000
      2411.1376     2410.7000
      2413.0008     2412.7000
      2418.3000     2417.9000
      2429.5000     2429.5000
      2433.9000     2434.3000
      2441.1557     2442.1000
      2446.1202     2447.1000
      2447.5574     2448.7000
      2454.5385     2455.2000
      2456.6632     2457.7000
      2461.5195     2462.1000
      2469.8460     2469.7000
      2473.4000     2473.2000
      2478.8000     2478.2000
      2501.7000     2501.6000
      2508.7000     2508.6000
      2512.4000     2512.3000
      2517.5000     2517.1000
      2524.2000     2523.9000
      2530.2000     2529.9000
      2533.6000     2533.1000
      2538.6000     2538.3000
      2546.1000     2545.6000
      2561.9000     2561.7000
      2563.6000     2563.1000
      2571.1000     2570.8000
      2578.0000     2577.7000
      2581.4000     2581.2000
      2589.7000     2589.3000
      2601.7000     2601.4000
      2607.3731     2607.5000
      2611.7000     2611.8000
      2615.0000     2615.1000
```

Neutron Shift

```
~Version Information Block
VERS .                  2.00:  CWLS
LOG ASCII STANDARD - VERSION 2.00
```

```
WRAP .                    NO:  One
line per depth step
~Well Information Block
#MNEM.UNIT        Data Type
Information
#---------- ----------------  ----
-------
STRT .M              2220.9:
START DEPTH
STOP .M              2608.2:  STOP
DEPTH
STEP .M                   0:  STEP
NULL .               -999.25:  NULL
VALUE
COMP .                    :
COMPANY
WELL .                THA01:  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_NEUTRON:
~Other Information Block
~A        DEPTH      DEPTH_COR
      2220.9000     2219.6000
      2222.2000     2220.9000
      2254.3000     2253.0000
      2270.8000     2270.1000
      2278.9180     2279.0000
      2283.3784     2284.2000
      2285.7655     2286.4000
      2293.2000     2293.3000
      2298.4000     2297.3000
      2299.8000     2299.3000
      2303.4000     2302.9000
      2304.7000     2303.7000
      2305.7000     2304.7000
      2310.4000     2309.4000
      2324.2000     2323.9000
      2332.3000     2332.2000
      2336.8000     2336.7000
      2352.6000     2352.6000
      2353.7000     2354.2000
      2363.8000     2364.7000
      2371.1000     2371.8000
      2375.3623     2375.5000
      2379.9611     2379.7000
      2382.1000     2382.6000
      2393.0000     2393.7000
      2401.8338     2402.3000
      2406.1975     2406.1000
      2406.5654     2407.0000
      2409.6000     2409.8000
      2417.5000     2417.5000
      2422.2045     2422.2000
      2424.1493     2423.5000
      2425.3648     2424.8000
      2426.8168     2427.6000
      2428.7000     2428.8000
      2433.7000     2434.1000
      2468.0541     2468.4000
      2478.3000     2478.5000
      2499.4851     2499.6000
      2501.6940     2501.8000
      2503.2000     2503.3000
      2510.1000     2510.3000
      2517.2000     2517.1000
      2518.6571     2518.5000
      2524.0000     2524.1000
      2524.7000     2524.5000
      2530.4000     2530.3000
      2535.1000     2534.9000
      2536.4067     2536.1000
      2539.3000     2539.4000
      2551.7000     2551.8000
      2558.6000     2558.6000
      2562.3724     2562.6000
      2563.3155     2563.1000
      2608.2000     2607.9845
```

Resistivity Shift

```
~Version Information Block
VERS .                  2.00:  CWLS
LOG ASCII STANDARD - VERSION 2.00
WRAP .                    NO:  One
line per depth step
~Well Information Block
#MNEM.UNIT        Data Type
Information
#---------- ----------------  ----
-------
```

```
STRT .M                  638:
START DEPTH
STOP .M              2626.7:  STOP
DEPTH
STEP .M                   0:  STEP
NULL .               -999.25:  NULL
VALUE
COMP .                     :
COMPANY
WELL .                THA01:  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
~A        DEPTH      DEPTH_COR
       638.0000      637.7000
      2270.5000     2270.2000
      2279.2152     2279.1000
      2285.8000     2286.0000
      2293.2000     2293.3000
      2295.6000     2295.2000
      2300.8000     2300.8000
      2307.0778     2306.3000
      2310.6817     2309.4000
      2325.0000     2324.7000
      2337.9000     2337.6000
      2362.8000     2362.5000
      2363.4841     2363.5000
      2367.1000     2366.9000
      2368.4000     2368.6000
      2370.7000     2370.6000
      2380.2000     2379.3000
      2383.3000     2382.5000
      2388.7748     2388.7000
      2393.6000     2393.6000
      2397.5900     2397.3000
      2399.9000     2399.6000
      2402.4000     2402.1000
      2406.6000     2406.0000
      2416.6000     2416.5000
      2424.1213     2424.0000
      2425.9785     2426.6000
      2429.3000     2429.5000
      2433.1233     2433.4000
      2435.5000     2435.5000
      2446.4000     2446.6000
      2463.0429     2462.8000
      2469.7000     2469.7000
      2473.8000     2473.6000
      2478.2000     2478.2000
      2484.2000     2484.0000
      2495.1000     2494.8000
      2499.8000     2499.7000
      2502.1000     2501.9000
      2507.3048     2507.7000
      2509.2055     2509.3000
      2510.1000     2510.2000
      2517.2000     2517.1000
      2524.8762     2524.7000
      2529.6000     2529.7000
      2535.2000     2534.9000
      2552.1000     2551.9000
      2554.9914     2555.0000
      2555.9950     2555.6000
      2558.5696     2558.5000
      2561.1725     2561.4000
      2585.9000     2585.8000
      2607.3000     2607.3000
      2626.7000     2626.7000
```

Core Shift

DEPTH	DEPTH_COR
2384.6000	2389.2000
2391.0400	2395.7930
2395.7200	2400.4700
2403.7100	2407.8290
2411.0500	2415.4500
2416.5500	2420.6940
2423.6500	2427.7940
2466.5400	2470.5420
2477.0700	2481.4700
2492.4400	2496.6530
2496.3000	2500.7000
2506.2800	2510.6800
2518.6000	2523.0000
2523.0600	2527.4600
2531.2400	2535.6400
2542.9000	2547.3000
2545.6000	2549.6250
2548.7900	2553.1900

2551.6900	2555.7840
2554.8900	2559.2900
2573.6700	2578.0700

THA02 GeoTap
Interpretation Report

Appendix 3

WOODSIDE

MEMORANDUM

TO	:	Steve Twartz
FROM	:	Tim Duggan/Yousof Hourani
c.c.	:	Otway Subsurface Team (GP, DT, MT)
DRIMS Ref	:	2717880
DATE	:	27th September 2006
SUBJECT	:	**Otway: THA02 - Formation Pressure Interpretation**

1 Executive Summary

In THA02, seven valid formation pressures were acquired while drilling using the Sperry-Sun GeoTap tool. Nineteen further tests were attempted, and while not valid formation pressures, several are close enough to being stable that they provide indication of compartmentalisation along the well.

The two valid pressures acquired in Unit 4 falls on the gradient seen in Thylacine-1, while the pressures acquired in the upper portions of Unit 4 appear to be approximately 10psi higher in pressure. This however may be attributed to the questionable quality of the data acquired, all of which could not be conclusively classed as valid tests.

One valid pressure was acquired in Unit 2 and it directly overlays the gradients in both Thylacine-1 and Thylacine-2.

Two valid formation pressures were measured in Unit 1, both of which were approximately 50 psi below the observed pressure regime in Thylacine-1 and 16 psi below the pressure regime observed in Uint 1d of Thylacine-2. This suggests that the second prograde of Unit 1 intersected by THA02 is not in communication with the Thylacine-1 or Thylacine-2 gas system.

2 Offset wells

Two offset wells have been used for comparison. Well Thylacine-1 is in the main block of the Thylacine field and contained a uniformly pressured gas column underlain by an aquifer. Thylacine-2 is situated approximately 2 km to the west of the Thylacine field main block. Well Thylacine-2 consisted of 5 multiply stacked gas columns, all of which are in a separate pressure regime. The aquifer sand in Thylacine-2 was shown to be in the same pressure regime as the aquifer penetrated in Thylacine-1. A plot of the pressure data from this acquisition programme is shown alongside the offset well pressures for comparison.

3 Data Acquisition

Formation pressure data was acquired using the Sperry GeoTap tool taken during and after drilling operations in the THA02 well on 11th to 13th June 2006. Pre- tests were attempted in Units 1, 2 and 4. Of 26 attempted pre-tests, 7 were deemed to be valid, 6 are not fully stabilised, 6 failed due to lack of seal, 4 failed due to a lack of permeability and 3 points were deemed to be supercharged. A summary is shown in Table 1.

Unit	Number of pre-tests	Valid Tests	No Seal	Low Perm	Super-charged	Other
Unit 1	**16**	2	4	3	3	4 not fully stabilised
Unit 2	**4**	1	2	1	0	
Unit 4	**6**	4	0	0	0	2 not fully stabilised

Table 1: Summary of pre-tests

4 Compartmentalisation and Pressure Uncertainty

It is important to quantify the range of uncertainty surrounding each measured pressure in order to understand whether or not a sand is compartmentalised or in communication. Prior to this discussion, it should be noted that "communication" refers to the hydraulic communication over geological time and may not necessarily be the same as communication over the field production life. For a field to be in communication over geological time we would expect that all the pressures would line up on a single hydraulic gradient line. The accuracy of this hydraulic gradient line is in effect a function of the accuracy of the measured pressures and the depth control on each data point. Uncertainty in the measured pressures may be attributed to the accuracy of the tool itself as well as the accuracy of our depth.

In terms of the tool, the actual gauge accuracy may be broken up into the following components:

Accuracy +- 1 psi + 0.01% (3300ps) ~ +- 1.33 psi
Repeatability +- 1 psi

Depth control for these horizontal wells may be achieved to within an accuracy of +- 5m. The average gas gradient seen in Thylacine wells is 0.26 psi/m. This translates to a pressure uncertainty due to depth control of the order of +- 1.3 psi. A combination of the above errors results in a +- 4psi uncertainty range. Therefore, in determining whether or not a pressure is indeed off-line and is representing an alternative compartment, an offset of greater than 4 psi, from the average gradient is required. Such an uncertainty range is typical of Thylacine pressure acquisition.

5 Data Quality

The pressure-time plots for each point that achieved a seal are shown in Figures 1 – 17. This illustrates the difficulties of attaining a valid formation pressure so soon after drilling, with many tests being supercharged. It is hard to tell (even with three drawdowns) whether all of the supercharging is removed for several tests. Figure 18 shows the position along the wellbore that each pressure test was acquired. A brief comment on each test follows.

1) This test used three drawdowns and while the third test appears to stabilise, the first two are clearly supercharged. This raises a question in the validity of whether the final pressure is formation pressure.
2) The first of three build-ups is supercharged, but the second two build-ups appear quite stable, with slightly different (<1 psi) final pressures as is common in multiple sequential pretests. This was considered a valid test.
3) Only one drawdown was used for this test and it is clearly supercharged. A final stable formation pressure is never attained.
6) Three drawdowns were used and a stable pressure was never reached. The first build-up was the closest to a stable pressure (though likely to be supercharged) with the second two build-ups indicating that the permeability for this test is poor.
7) Only one drawdown was used in this test and it does not stabilise. Based on comparison to other pressures, it appears supercharged.
8) The first drawdown shows supercharging, but the second two build-ups show stable pressures. The second drawdown may still be showing evidence of some supercharging, but the final pressure in the third build-up is believed to be formation pressure.
9) The first drawdown shows supercharging, but the second two build-ups show stable pressures. The second drawdown may still be showing evidence of some supercharging, but the final pressure in the third build-up is believed to be formation pressure.
10) There is a question of whether this test was ever drawn down below formation pressure. Supercharging is apparent through the test. The final build-up appears to be stabilising, and as such, the final pressure may be close to formation pressure (if the draw down was far enough).
11) Two drawdowns were used and none are completely stable. The first appears close to stable (at around 3331psi) but the second is still building. This could be indicating poor permeability.

12) Three drawdowns were used, with the first two showing supercharging. The third build-up was insufficient to stabilise at formation pressure, but appears within 3psi of being stable.

13) Once again three drawdowns were employed, with the first two showing clear supercharging. The final pressure is stable and appears to reflect formation pressure.

17) While the first two drawdowns show supercharging, it appears that the third build-up is stable and representative of formation pressure. However, due to the apparent lack of considerable drawdown, the test is considered suspect.

18) Three drawdowns were performed with supercharging in the first and probable in the second. While the third build-up is not stable, it appears to be within 1-2psi of formation pressure.

19) Only one drawdown was attempted, and while supercharging is apparent, the pressure appears to be dropping back to a stable pressure. It is anticipated that the final pressure is within 2psi of being stable.

20) Three drawdowns with supercharging apparent in the first two build-ups. The third build-up is not stable but is likely to be within 3pis of being stable.

21) Three drawdowns with supercharging apparent in the first build-up. The second two build-ups are not stable, but appear within 1-2psi of stability.

22) Three drawdowns with supercharging clear in the first two build-ups. There is more noise in the data than previously witnessed, but the final pressure appears relatively stable.

The poor success rate of the GeoTap tool in attaining valid formation pressures was due to:

1) First implementation of the GeoTap tool within Woodside, meaning optimisation of the tools capabilities was not possible.

2) The poor QC possible on real-time pressures, compared to what is possible once the memory data is attained on surface.

3) Poor reservoir quality in Units 1 and 2.

The combination of these factors meant that inappropriate tool settings were used in poor quality reservoir, which meant many repeat tests were required to better define compartmentalisation along the well.

6 Interpretation

An analysis is presented on a unit by unit basis from the deepest unit drilled, Unit 4 to the shallowest, Unit 1. Refer to Figure 19 showing the pressure versus depth plot for further clarification of the discussion presented below.

6.1 Unit 4

Out of the 6 attempted pre-tests 2 appear to be valid formation pressures (tests 8 and 9), 2 have suspect drawdowns (10 & 17) and 2 incomplete build-ups (11 & 12). These tests were performed at six different depths. The reason for the incomplete build-ups is that the build-up times programmed allowed only 96 seconds for the pressure to stabilise.

The two valid formation pressures (8 & 9) are within gauge and depth uncertainty of lying on the gas gradient intersected in Thylacine-1. Test 8 is 0.5psi below and test 9 is 1.1psi above the Thylacine-1 gradient.

The remaining four tests (10,11,12 and 17) although appearing to be in communication and at a higher pressure regime are not valid enough tests to allow us to conclude that they are indeed representing another compartmentalised sand in Unit 4.

It may be argued that suspect drawdown formation pressure tests (10 & 17) are 11psi higher than the gas gradient seen in Thylacine-1; The remaining two incomplete build-ups lie between the depths that the two suspect pressures were acquired, and it is seen that they are trending toward agreement with the gradient (shown in Figure 19) defined by tests 10 and 17. A summary of the position of these points in relation to the gradient displayed in Figure 19 is shown below.

Test Number	Pressure difference (psi)	Comment
10	+0.7	Stable
11	-2.8	Not Stable Test
12	-5.5	Not Stable Test
17	-0.2	Stable

Table 2: Pressure offset in Unit 4 from predicted gas gradient (as shown in Figure 19)

This would mean that there are two separate gas columns in Unit 4 in this location. The barrier between these two columns lies in the shale between 2220mTVDSS and 2240mTVDSS. The two gas gradients are shown in Figure 19. It is believed that the inflated pressures in the upper portions of this unit are localised to the western portion of the field.

NOTE: Unit 4 in Thylacine-2 has higher pressure than the pressures seen in this well, so the higher pressures in the upper section of Unit 4 in this well could indicate some pressuring up of this localised compartment from the Unit 4 sands further to the west (as seen in Thylacine-2).

6.2 Unit 2

The Unit 2 sands provided 1 valid test (test 13). This test is 1.8psi below the Thylacine-1 gas gradient and is believed to be within gauge and depth uncertainty of being coincident with the Thylacine-1 gradient. The Thylacine-2 gas gradient within Unit 2 is also coincident with this point.

The three unsuccessful tests are believed to be due to the apparent cementing that has occurred in the lower three quarters of the Unit 2 sands.

6.3 Unit 1

16 pressure measurements were attempted in Unit 1. It is believed that 2 of the 10 tests that achieved seals are valid (tests 2 & 23), while the other 8 tests are either supercharged due to the short elapsed time before testing (3, 7 & 19) or were not allowed time to stabilise to formation pressure (1, 6, 18, 20 & 22).

The valid points lie approximately 50 psi below the Thylacine-1 gas gradient, which is clearly a different gas column. They also lies approximately 16psi below the upper Thylacine-2 gas gradient which suggests that this point is in a separate compartment to both Thylacine-1 and Thylacine-2. Tests 1 and 22 are not fully stabilised, but are interpreted to be stabilising at points that would agree with the gradient defined by tests 2 and 23. These points lie within the second prograde system, as labelled on Figure 18 which supports the view that this entire second progrades intersected by THA02 is internally within pressure communication.

While tests 3, 19 and 20 are either supercharged (3 & 19) or not fully stabilised, it is believed that the formation pressure lies somewhere between these three points. An estimated gas gradient is shown on Figure 19 and shows good agreement with the upper gas gradient intersected in Thylacine-2. These points lie in the third prograde system and the pressures suggest that this prograde is separated from prograde 2 and is in pressure communication with the gas column intersected in the upper part of Thylacine-2.

A summary of the pressure difference for each test compared to the predicted gradient (as shown in Figure 19) is shown below.

Test Number	Pressure difference (psi)	Comment
1	-2.5	Not Stable Test
2	-6.5	Stable
3	+5.3	Supercharged
6	-214.7	Not Stable Test
7	+54.3	Supercharged
18	-0.9	Supercharged?
19	+3.4	Supercharged
20	-1.6	Not Stable Test

22	-1.6	Not Stable Test
23	+0.1	Stable

Table 3: Pressure offset in Unit 1 from predicted gas gradient (as shown in Figure 19)

In summary for Unit 1 (as illustrated in Figure 18), has three separate prograde. The first was not intersected and, as such, it is not known whether communication with the second prograde occurs. Of the two prograde that were intersected in this well we can see good communication within each prograde and there is an 8psi pressure differential between each prograde. The third prograde is the western-most prograde intersected, and is in agreement with the gas gradient witnessed in Unit 1d of Thylacine-2 (the western-most well).

7 References

Ref 1: THA02 and THA03 GeoTap Pressure Summary Spreadsheet - DRIMS#2762250

Ref 2: THA02 GeoTap QC Spreadsheet - DRIMS#2635556

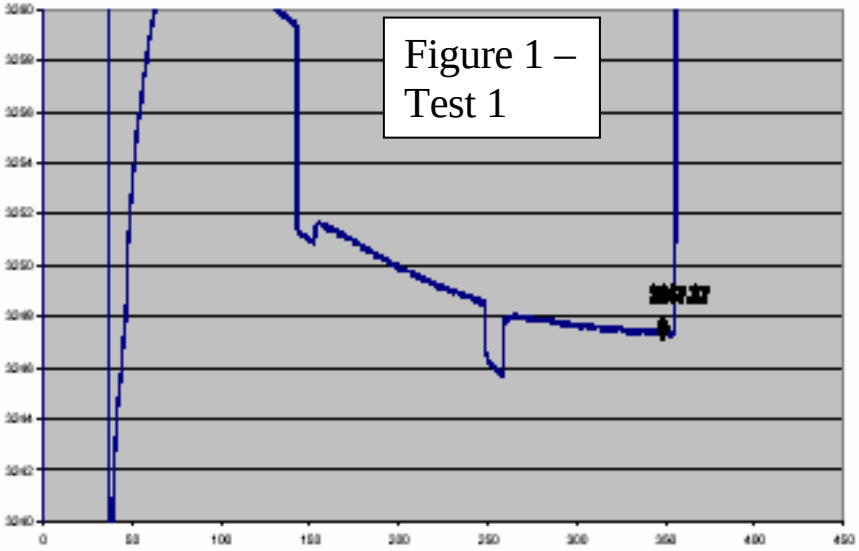


Figure 1 – Test 1

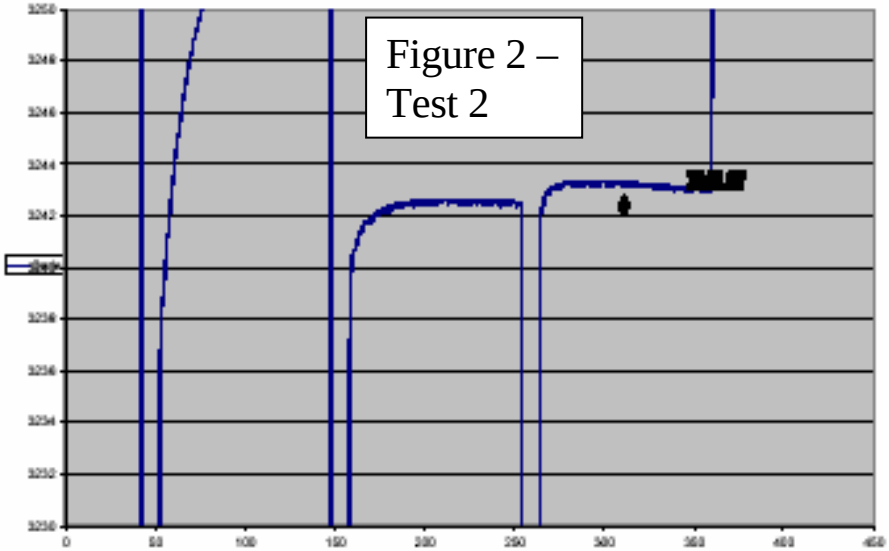
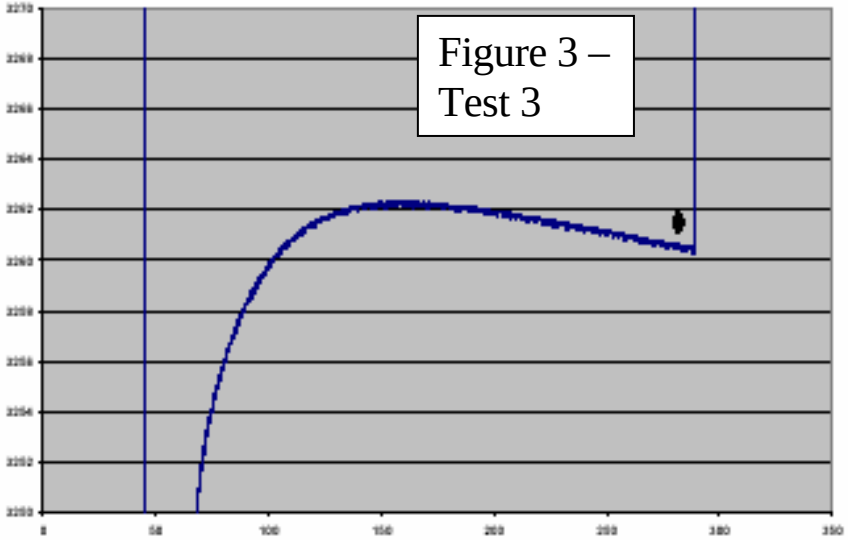


Figure 2 – Test 2



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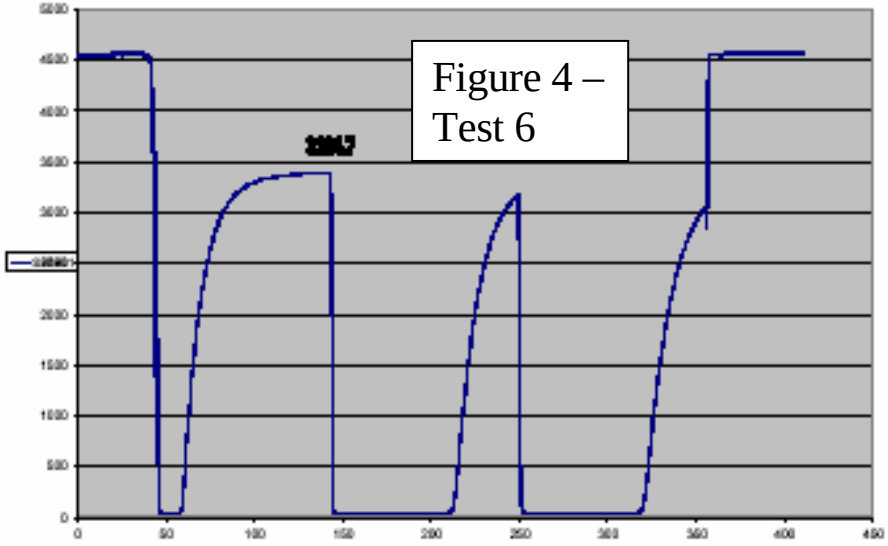


Figure 4 – Test 6

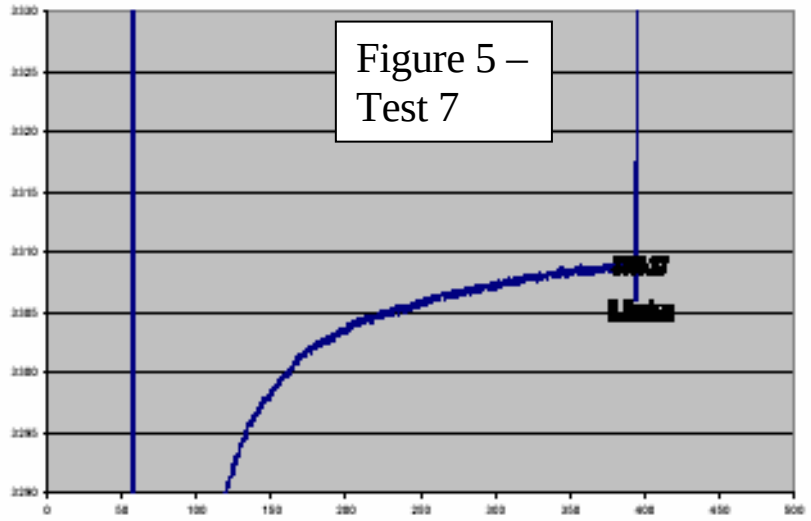


Figure 5 – Test 7

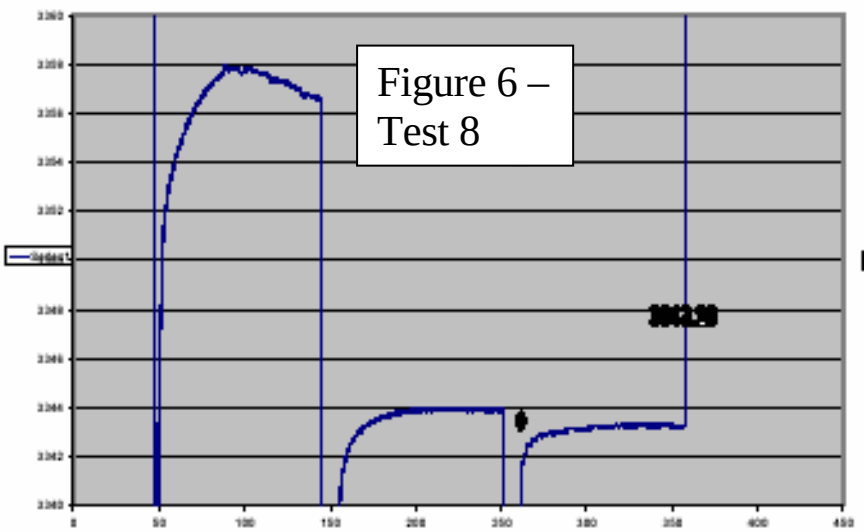


Figure 6 – Test 8

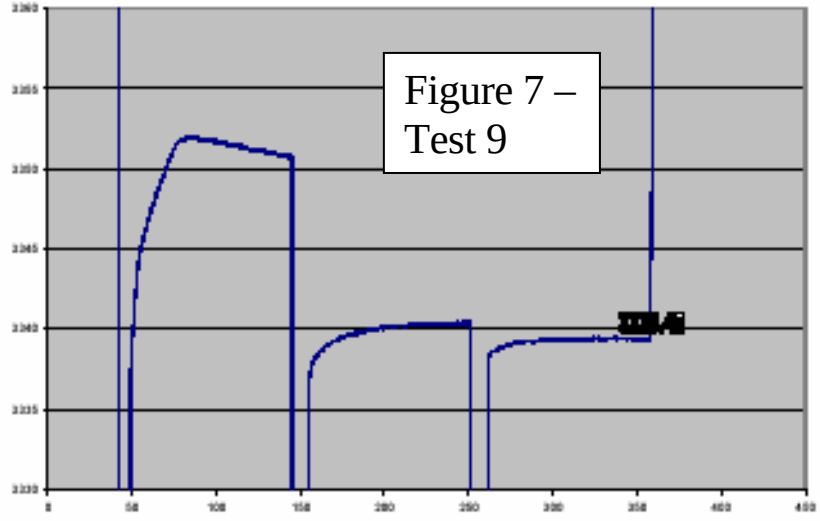
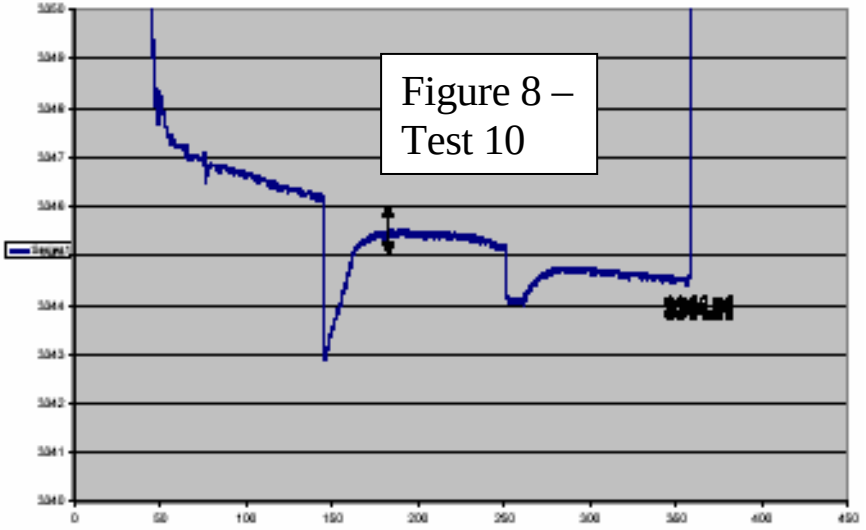


Figure 7 – Test 9



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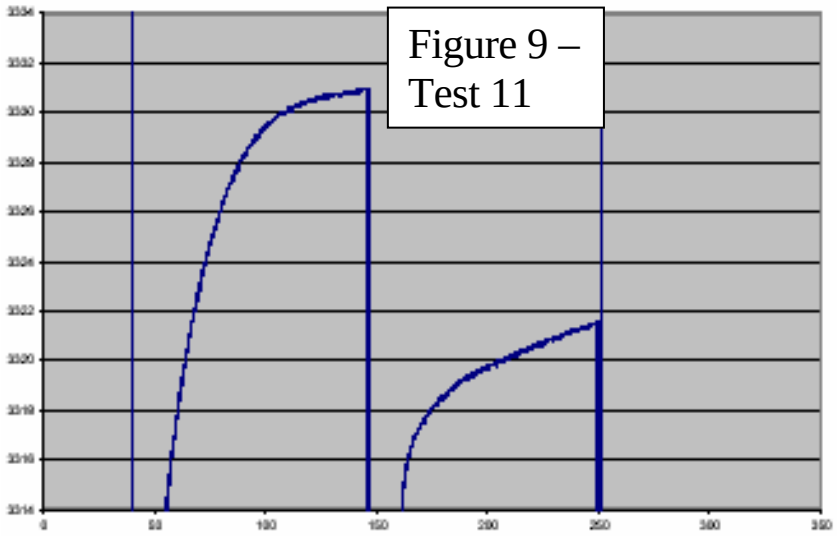

Figure 9 – Test 11

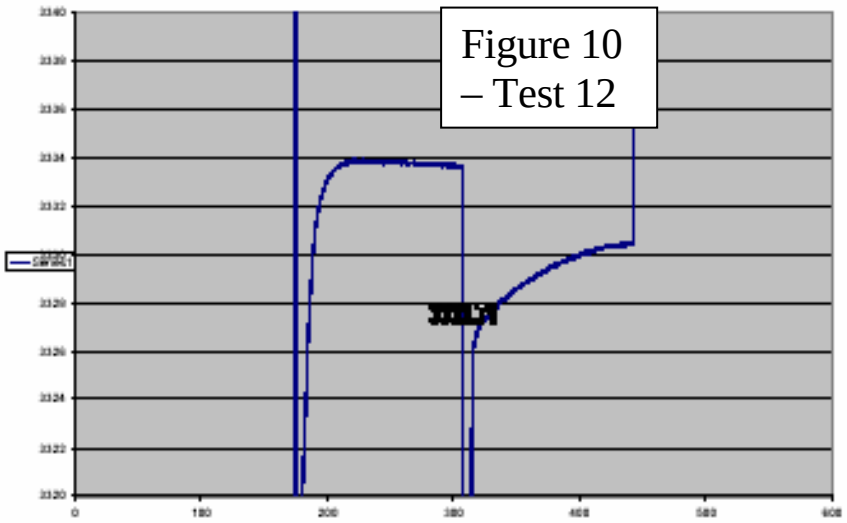

Figure 10 – Test 12

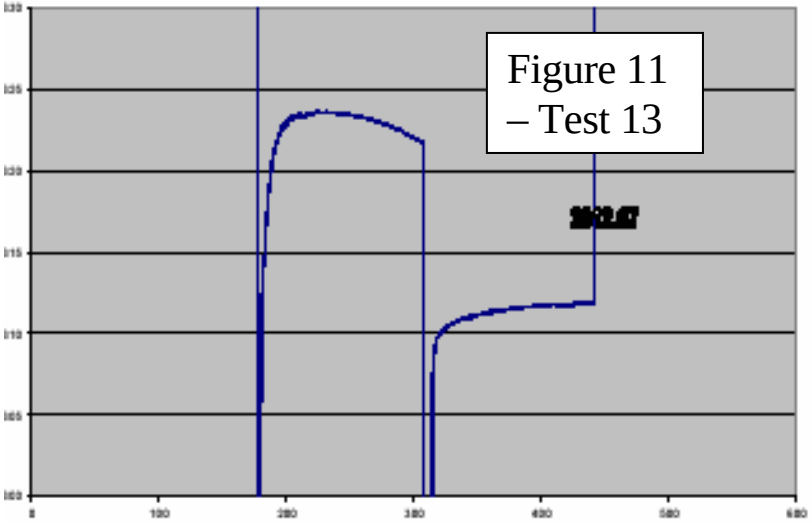

Figure 11 – Test 13

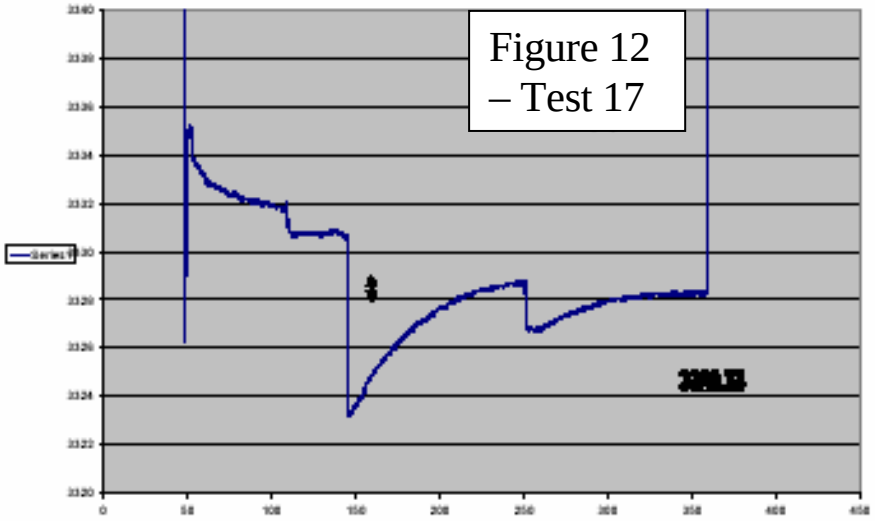

Figure 12 – Test 17

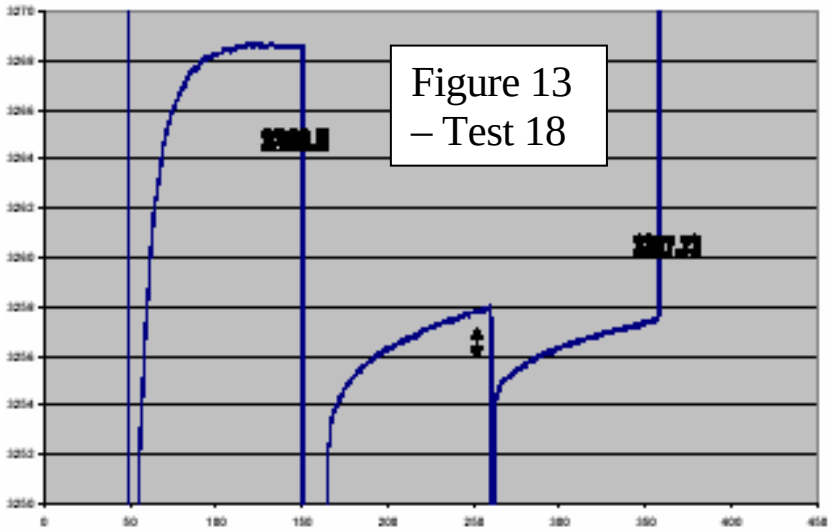

Figure 13 – Test 18

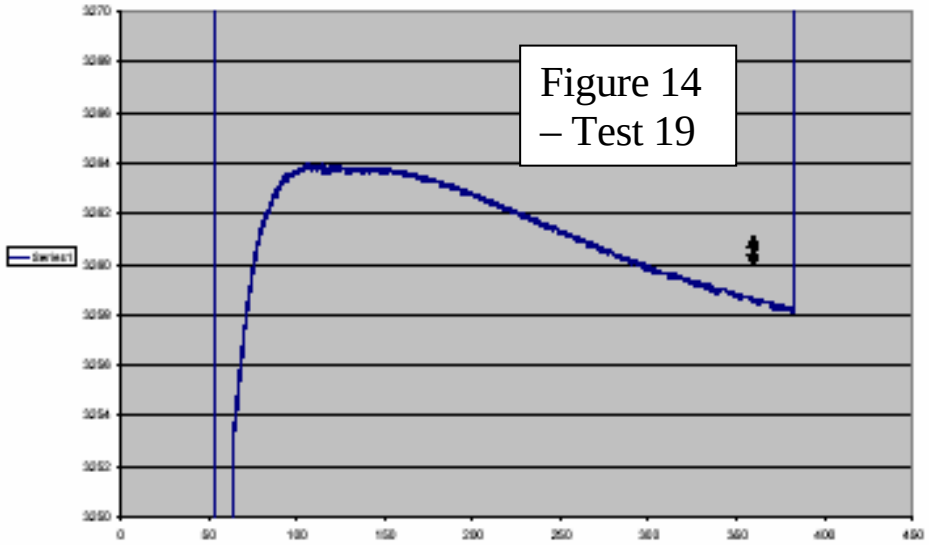

Figure 14 – Test 19

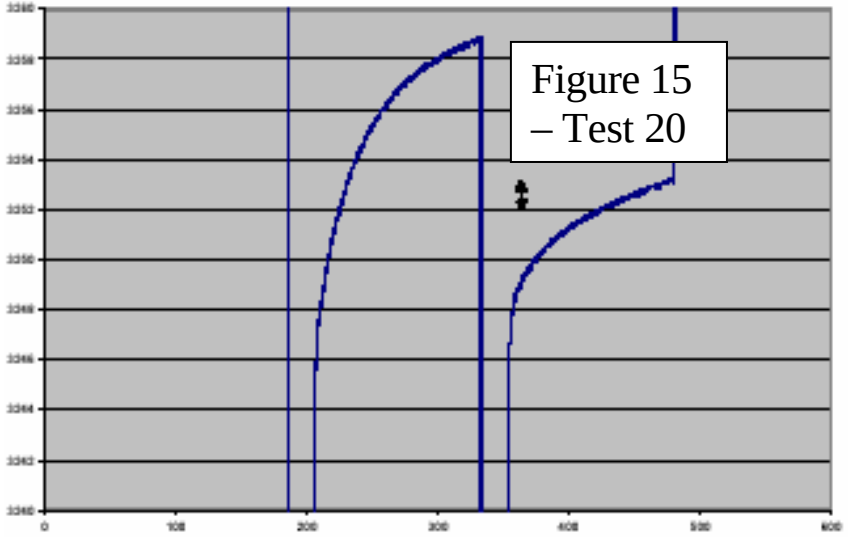

Figure 15 – Test 20

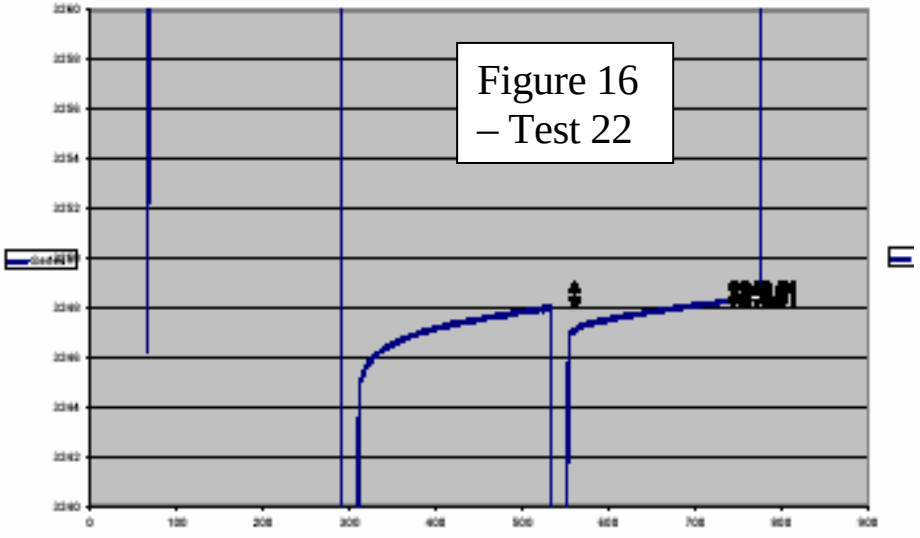

Figure 16 – Test 22

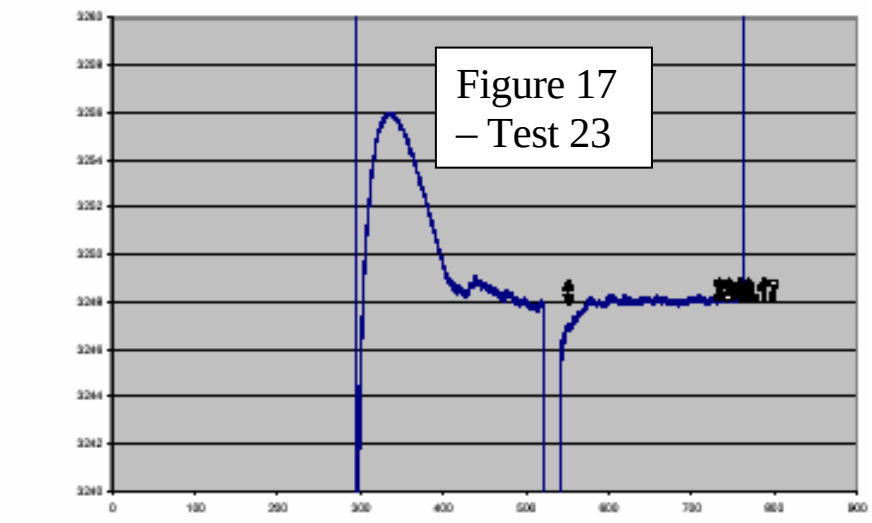

Figure 17 – Test 23

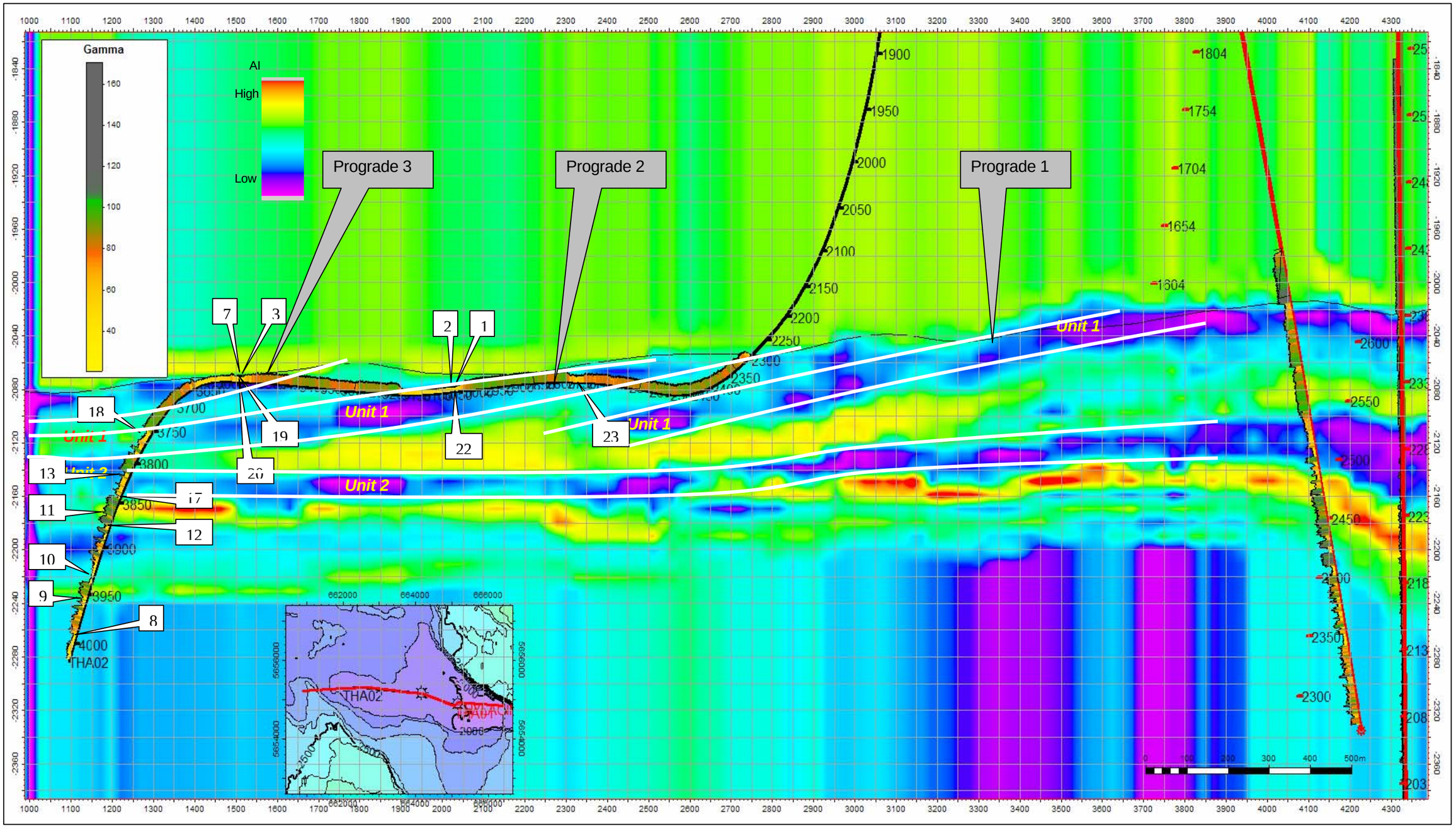

Figure 18: Positions of test points along wellbore

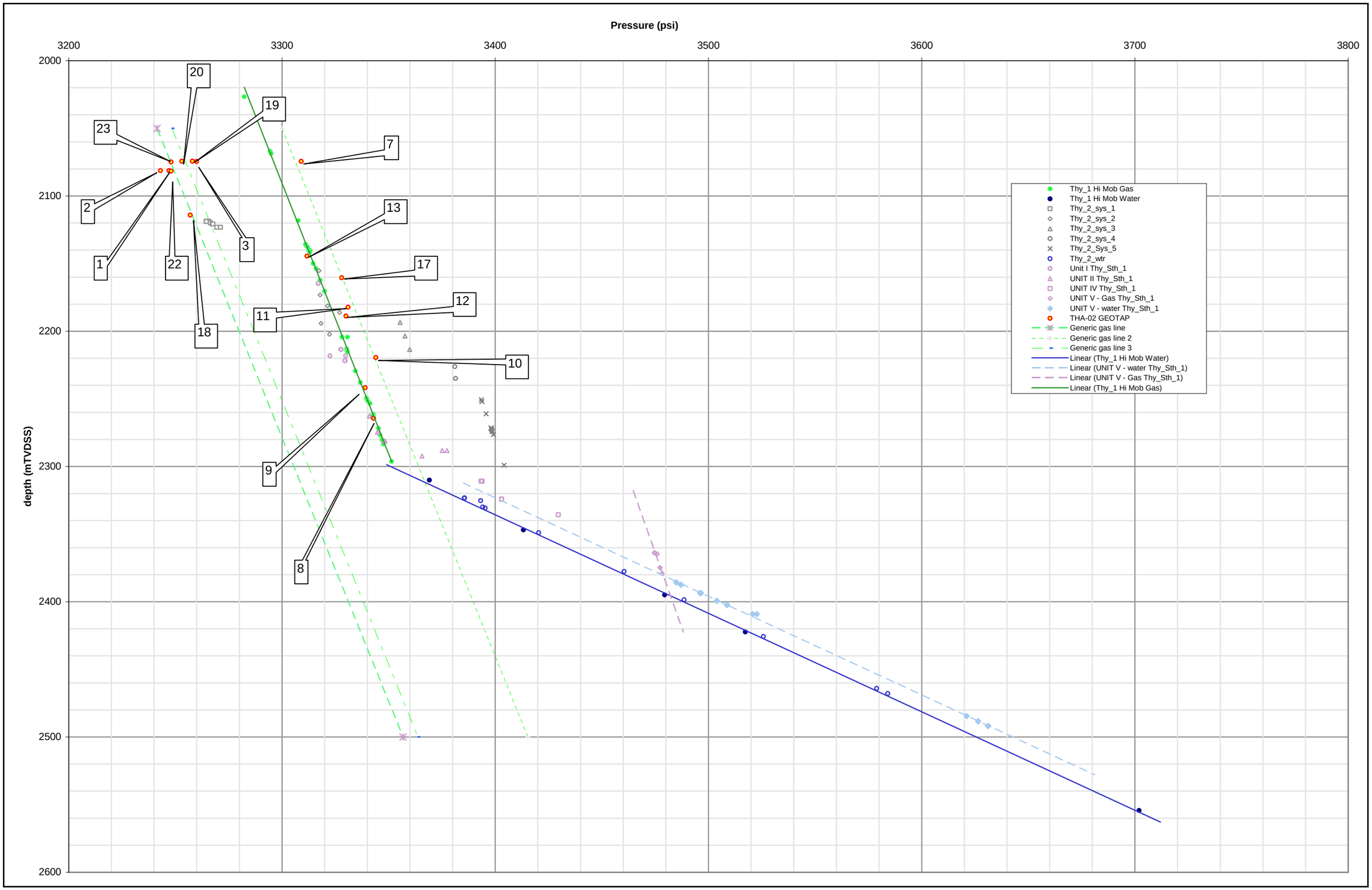

Figure 19: Pressure versus depth points, with labels to show where each test plots.

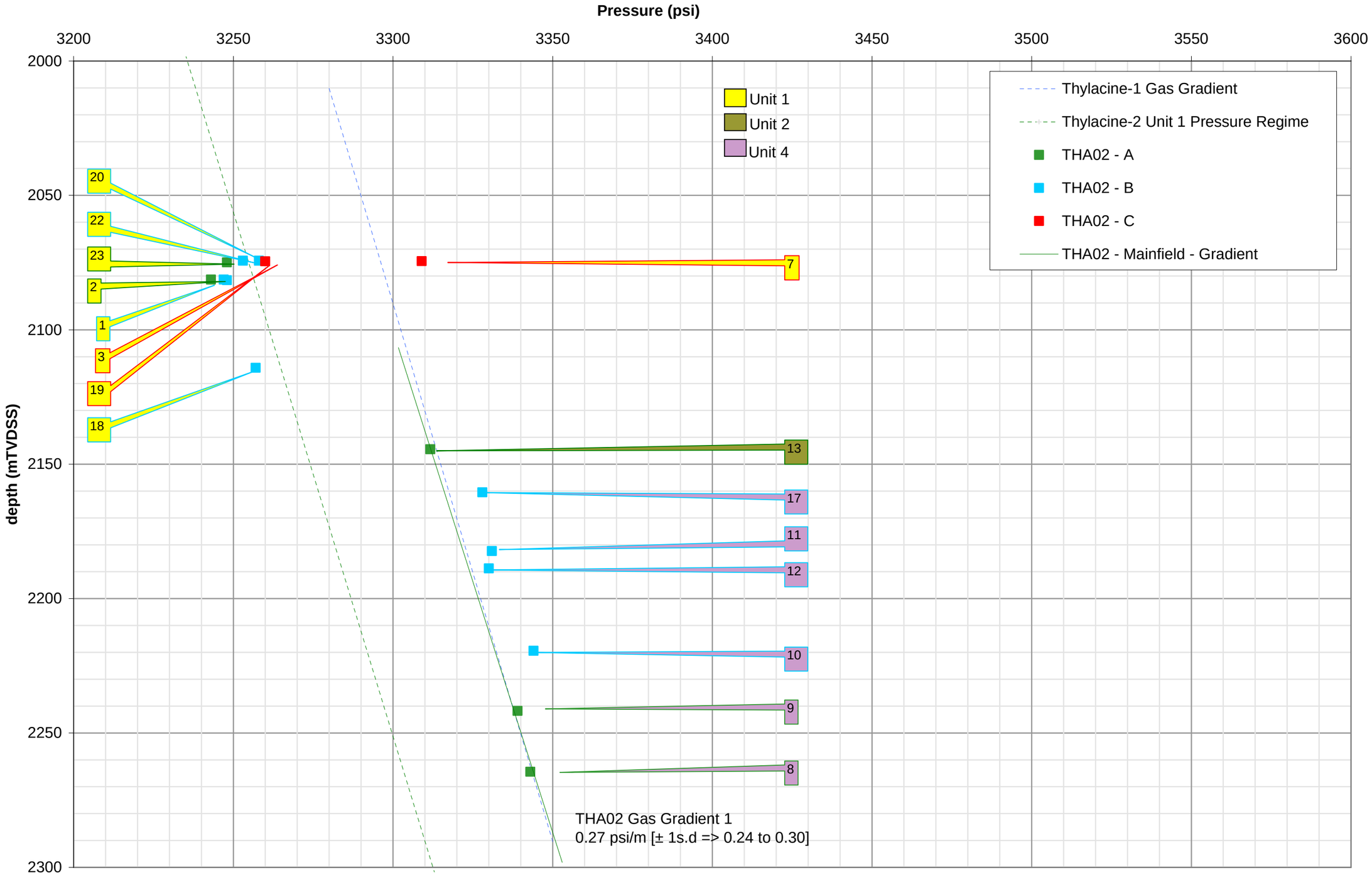

Figure 20: Pressure versus depth points, with labels to show Units intersected and quality of the tests.

THA03 GeoTap
Interpretation Report

Appendix 4

WOODSIDE

MEMORANDUM

TO	:	Steve Twartz
FROM	:	Tim Duggan/Yousof Hourani
c.c.	:	Otway Subsurface Team (GP, DT, MT)
DRIMS Ref	:	3123107
DATE	:	27 September 2006
SUBJECT	:	**Otway: THA03 - Formation Pressure Interpretation**

1 Executive Summary

In THA03, five valid formation pressures were acquired while drilling using the Sperry-Sun GeoTap tool. Five further tests were attempted, but provided no use for interpretation.

One pressure was measured in Unit 4 and it lies on the primary field wide gradient initially seen in Thylacine-1.

One valid pressure was achieved in Unit 2 and it overlays the field wide Unit 2 gradient as observed in Thylacine-1, Thylacine-2 and THA02.

Three valid formation pressures were measured in Unit 1 (in 3 separate prograde) and they point to three separate pressure regimes within Unit 1 in THA03. The first prograde intersected falls on the Thylacine-1 gradient. The second prograde lies within a new pressure regime that is 8psi higher than the Thylacine-1 gradient. The third and northern-most prograde is believed to be in hydraulic communication with the gas column that was intersected in the western-most prograde (prograde 3) in THA02 and in Unit 1d of Thylacine-2.

2 Offset wells

Two offset wells have been used for comparison. Well Thylacine-1 is in the main block of the Thylacine field and contained a uniformly pressured gas column underlain by an aquifer. Thylacine-2 is situated approximately 2 km to the west of the Thylacine field main block. Well Thylacine-2 consisted of 5 multiply stacked gas columns, all of which are in a separate pressure regime. The aquifer sand in Thylacine-2 was shown to be in the same pressure regime as the aquifer penetrated in Thylacine-1. A plot of the pressure data from this acquisition programme is shown alongside the offset well pressures for comparison. .

3 Data Acquisition

Formation pressure data was acquired using the Sperry GeoTap tool taken during and after drilling operations in the THA03 well on 27th July to 2nd August 2006. Pre- tests were attempted in Units 1,2 and 4. Of 10 attempted pre-tests, 5 were deemed to be valid, 1 failed due to lack of seal, 1 failed due to a lack of permeability and 3 points were deemed to be supercharged. A summary is shown in Table 1.

Unit	Number of pre-tests	Valid Tests	No Seal	Low Perm	Super-charged	Other
Unit 1	**6**	3	1	0	2	
Unit 2	**3**	1	0	0	2	
Unit 4	**1**	1	0	0	0	

Table 1: Summary of pre-tests

4 Compartmentalisation and Pressure Uncertainty

It is important to quantify the range of uncertainty surrounding each measured pressure in order to understand whether or not a sand is compartmentalised or in communication. Prior to this discussion, it should be noted that "communication" refers to the hydraulic communication over geological time and may not necessarily be the same as communication over the field production life. For a field to be in communication over geological time we would expect that all the pressures would line up on a single hydraulic gradient line. The accuracy of this hydraulic gradient line is in effect a function of the accuracy of the measured pressures and the depth control on each data point. Uncertainty in the measured pressures may be attributed to the accuracy of the tool itself as well as the accuracy of our depth.

In terms of the tool, the actual gauge accuracy may be broken up into the following components:

Accuracy +- 1 psi + 0.01% (3300ps) ~ +- 1.33 psi
Repeatability +- 1 psi

Depth control for these horizontal wells may be achieved to within an accuracy of +- 5m. The average gas gradient seen in Thylacine wells is 0.26 psi/m. This translates to a pressure uncertainty due to depth control of the order of +- 1.3 psi. A combination of the above errors results in a +- 4psi uncertainty range. Therefore, in determining whether or not a pressure is indeed off-line and is representing an alternative compartment, an offset of greater than 4 psi, from the average gradient is required. Such an uncertainty range is typical of Thylacine pressure acquisition.

5 Data Quality

The pressure-time plots for each point that achieved a seal are shown in Figures 2 – 17. This illustrates the difficulties of attaining a valid formation pressure so soon after drilling, with three of the first 4 tests being supercharged. This is believed to be due to poorer mud cake development than had been previously seen in THA02. Due to this, the remaining 6 pre-tests were performed after TD of the well. Figure 18 shows the position along the wellbore that each pressure test was acquired. A brief comment on each test follows.

1) This test is tight
2) This test is supercharged. The pressure doesn't stabilise.
3) As for the second pre-test, this test is supercharged.
4) Due to the high permeability of this reservoir (Unit 4 – Flaxmans), the mud cake has developed quickly and a good stable test is the result. Note: the first drawdown shows a small amount of supercharging.
5) As for pre-tests 2 & 3, this test is supercharged.

After this point, the pre-tests were performed after well TD, to allow further time for the mud cake to develop.

6) No seal
7) A good stable pre-test for all three drawdowns. There is noise evident in the pressure (approx +/-0.5psi) which is believed to be the result of poor mud-cake development.

NOTE: all of the remaining pre-tests exhibit the same +/-0.5psi to +/-0.75psi noise level.

8) Slightly less stable test (lower permeability) than seen for test #7. The first two drawdowns do not appear to fully stabilise, with the potential that the final pressure at the end of the third drawdown is still not quite up to formation pressure.*
9) Good mobility is seen by this test resulting in 3 stable formation pressures (ignoring the noise as mentioned above).
10) Some minor supercharging is apparent in the first build-up curve, but is removed for the second two build-ups, resulting in a stable pressure reading.

* an alternative interpretation of test #8 could be that the mud cake is not fully developed and the slight step increase in pressure with each drawdown is due to the wellbore pressure increasing the pressure measured by the gauge. That is, this point is becoming increasingly supercharged at a very slow rate.

Based on learnings from THA02, the pressure measurements using the GeoTap tool was much more successful. It was apparent from THA02 that the permeability in Unit 1 and 2 was too low for a stable pressure measurement to be read in 96 seconds. For this reason, the build-up time was lengthened to 224seconds.

It was also apparent that the formation pressures that were acquired soon after drilling were exhibiting supercharging in the low permeability formations (Unit 1 & 2). Due to this the remaining pressures were left until after the well reached TD before testing. It is apparent from the final recorded ASCII data from the GeoTap tool that the mud cake in this well was not as effective as for the previous well (THA02), resulting in supercharging in the early tests; and in noise in the pressure measurement (between +/-0.5psi to +/-0.75psi) for the latter tests. It is believed that the average pressure reading is accurate as the final build-up pressure.

6 Interpretation

An analysis is presented on a unit by unit basis from the deepest unit drilled, Unit 4 to the shallowest, Unit 1. Refer to Figure 19 showing the pressure versus depth plot for further clarification of the discussion presented below.

6.1 Unit 4

Only one pre-test (#4) was taken in this unit, with a good stable test evident. Due to the close proximity to the Thylacine-1 gas gradient (+0.9psi) no further pressures in Unit 4 were believed necessary. The inference is that Unit 4 in this location is in communication with the gas column in Thylacine-1.

6.2 Unit 2

The Unit 2 sands provided 1 valid test (#9). This test is 4 psi above the Thylacine-1 gas gradient. which is equivalent to the uncertainty value associated with pressure acquisition in this well. It is therefore inferred from the pressure result that Unit 2 is in hydraulic communication with Unit 1 (prograde 1) and Unit 4.

6.3 Unit 1

6 pressure measurements were attempted in Unit 1. It is believed that 3 of the 5 tests that achieved seals are valid (#7, #8 & #10), while 1 test was supercharged due to the short elapsed time before testing (#2) and 1 test was tight (#1).

All three of the valid pressures lie on different gradients.

Test 7 is taken in prograde 3 (as seen in Figure 18) and lies 0.7psi above the Unit-1d Thylacine-2 and the Unit 1 THA02(prograde 3) gradient.. For this reason it is believed that this prograde (#3 in Figure 18, the northern most prograde intersected) is in communication with prograde 3 in THA02 (the western most prograde intersected) and Unit 1d in Thylacine-2 (the western-most well in the field).

Test 8 lies 8psi above the Thylacine-1 gas gradient. This is significant enough to suggest that the 2nd prograde in Unit 1 is in a separate compartment that has not been intersected by the other wells.

Test 10 is 0.1psi below the gas gradient defined in Thylacine-1. For this reason it is assumed that prograde 1 (as labelled in Figure 18) is in communication with the Thylacine-1 gas column. This is also logical, as prograde 1 is the closest to the Thylacine-1 well location.

In summary; Unit 1 (as illustrated in Figure 18) has three separate prograde in three different pressure regimes. The first prograde showed very poor reservoir development where it was intersected, and lies on the Thylacine-1 gradient. Of the other two prograde only one pressure point was taken and, as such, it is not possible to infer lateral connectivity within each. The second prograde is believed to be in a separate compartment to any of the other pressure tested prograde and is 8psi higher in pressure than the Thylacine gas gradient. The third prograde is the most northerly intersected sand and is approximately 40psi below the Thylacine-1 gradient. This pressure lies on the gradient defined in Unit 1d of Thylacine-2 and THA02 (in prograde 3). This suggests that communication exists between Unit 1d in Thylacine-2 and the third prograde in THA03.

7 References

Ref 1: THA02 and THA03 GeoTap Pressure Summary Spreadsheet - DRIMS#2762250

Ref 2: Otway – THA02 – Formation Pressure Interpretation - DRIMS#2717880

Ref 3: THA03 GeoTap Recorded ASCII - DRIMS#3121515

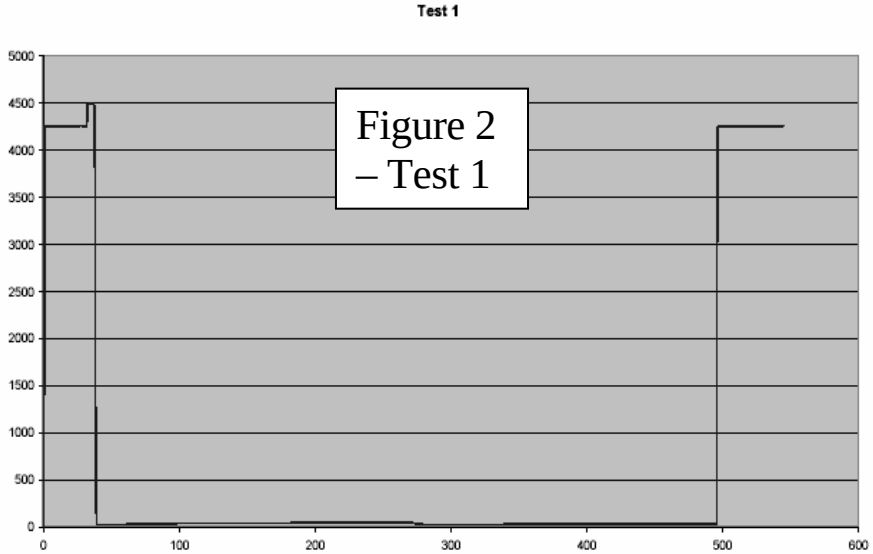

Figure 2 – Test 1

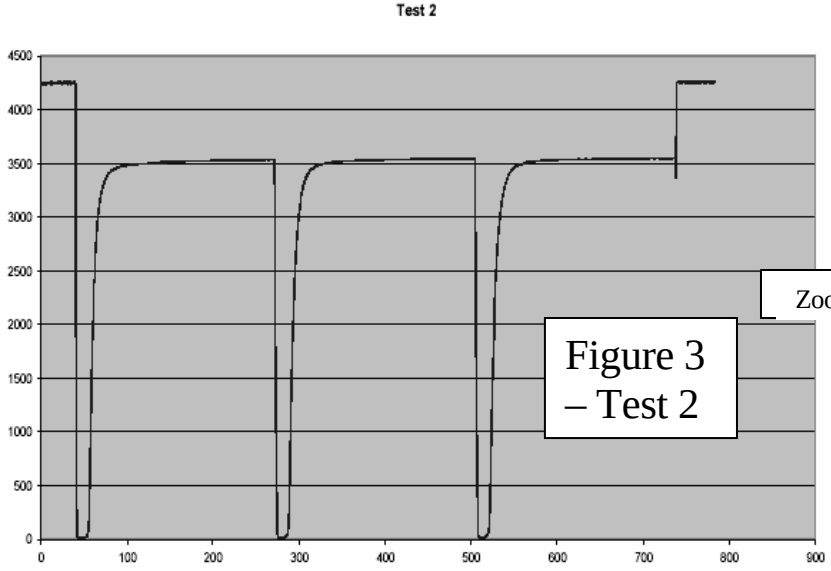

Figure 3 – Test 2

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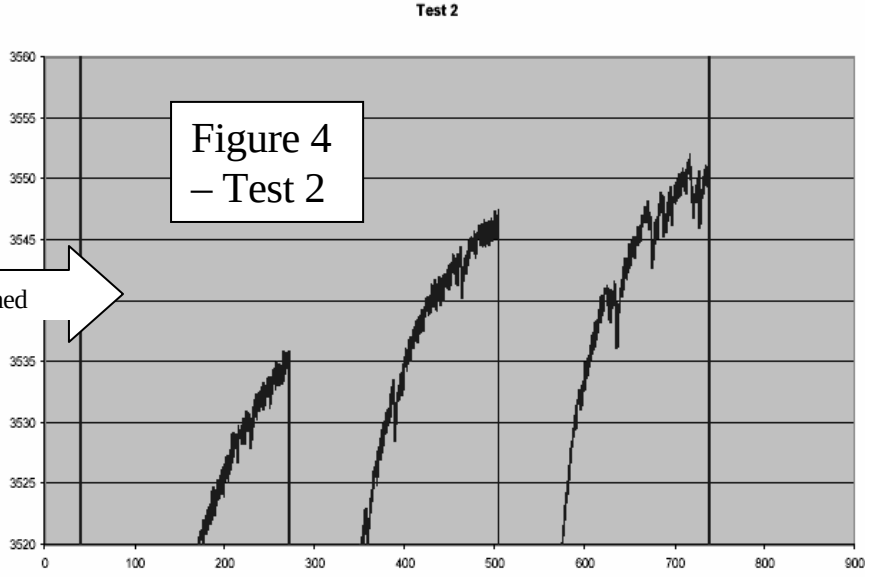

Figure 4 – Test 2

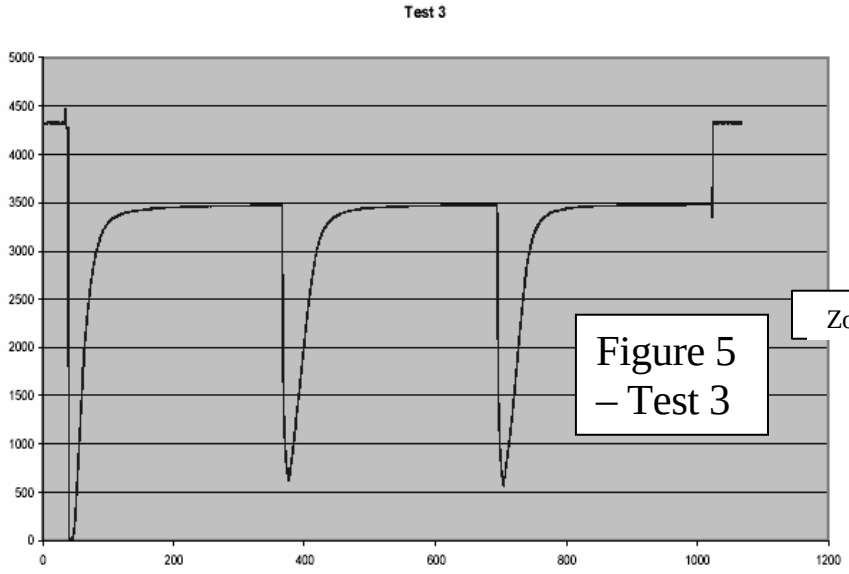

Figure 5 – Test 3

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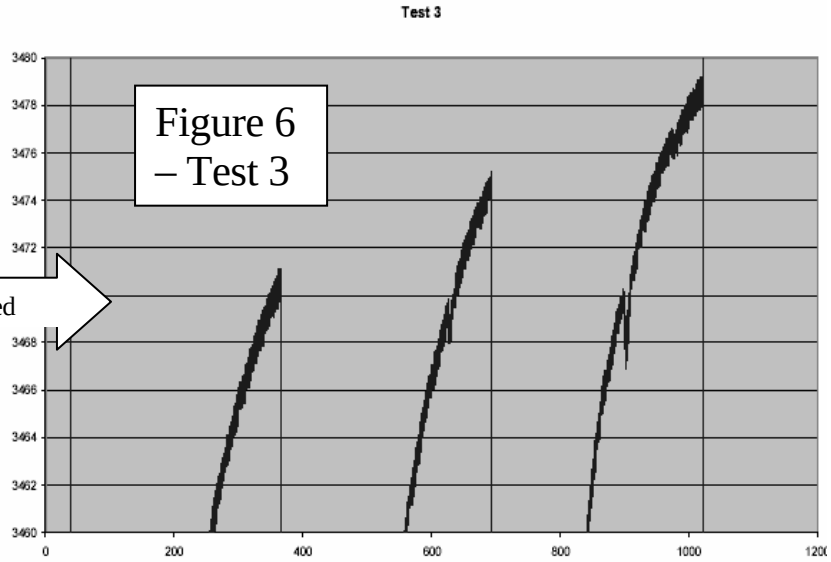

Figure 6 – Test 3

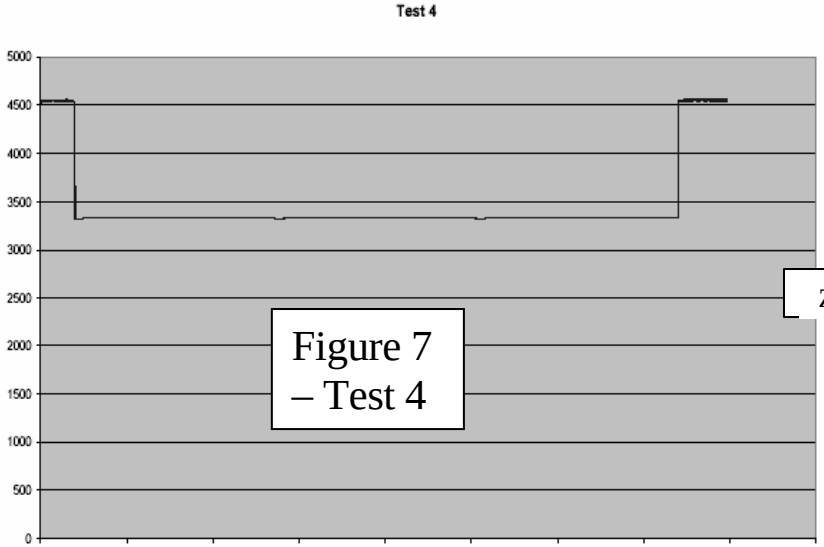

Figure 7 – Test 4

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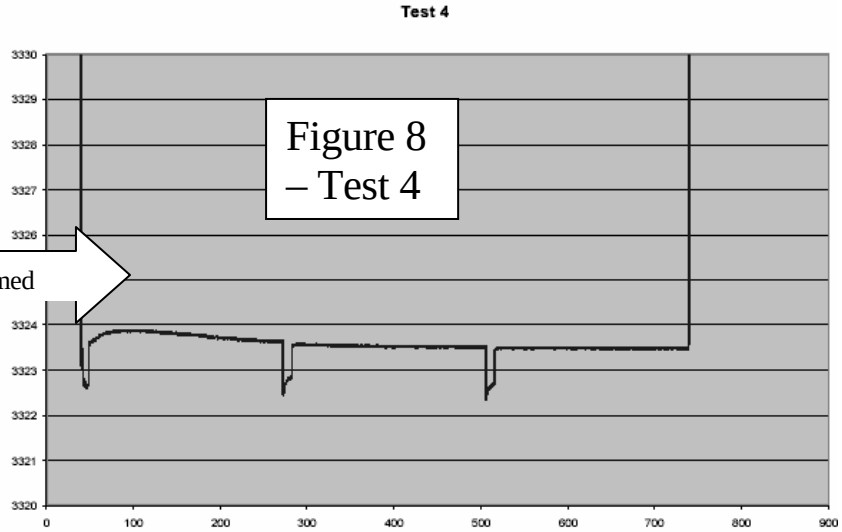
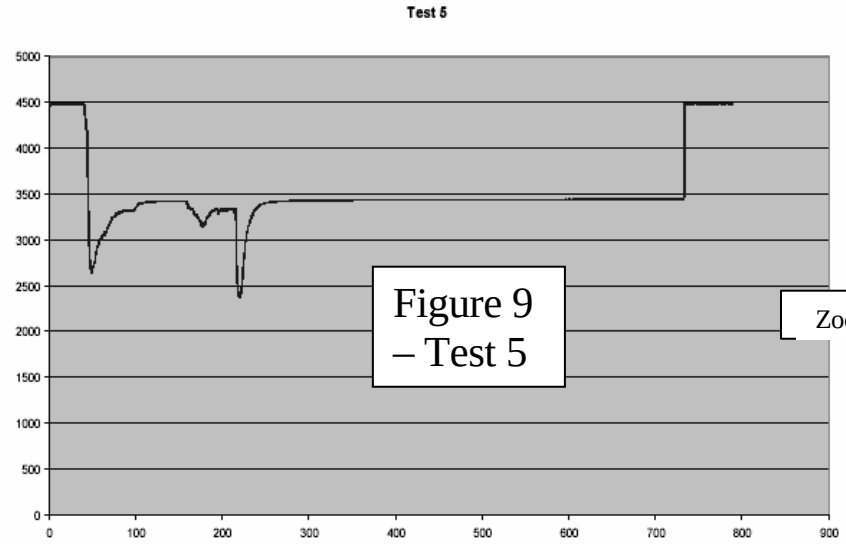


Figure 8 – Test 4



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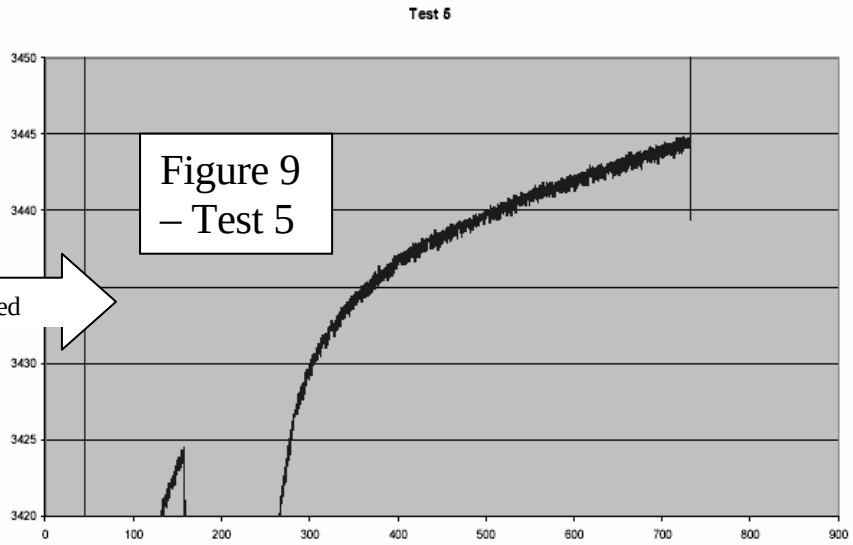

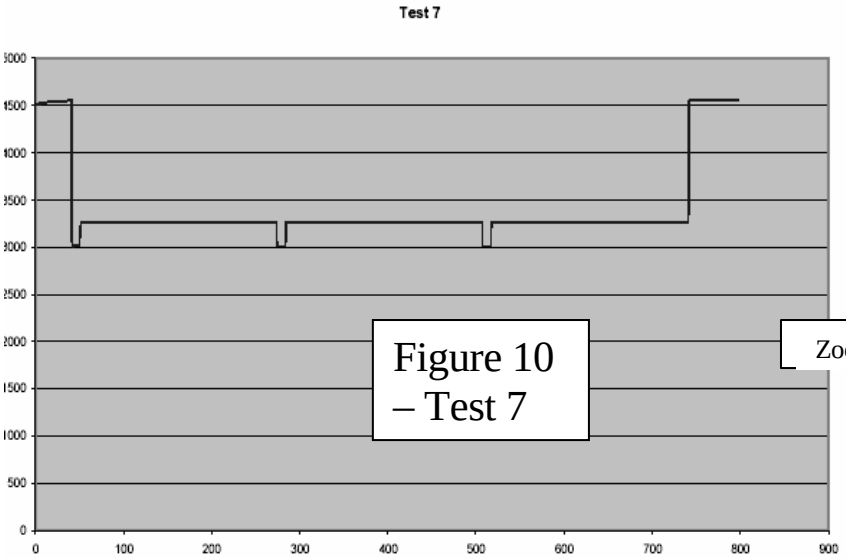

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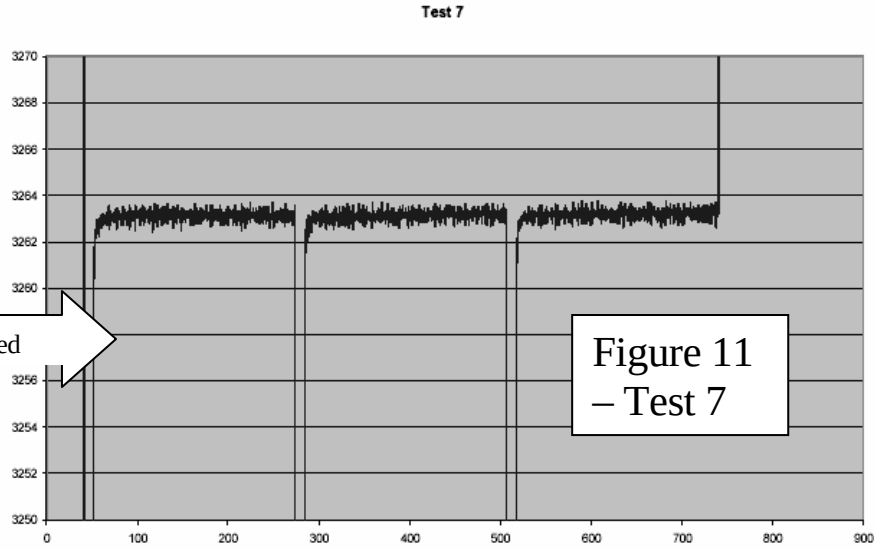

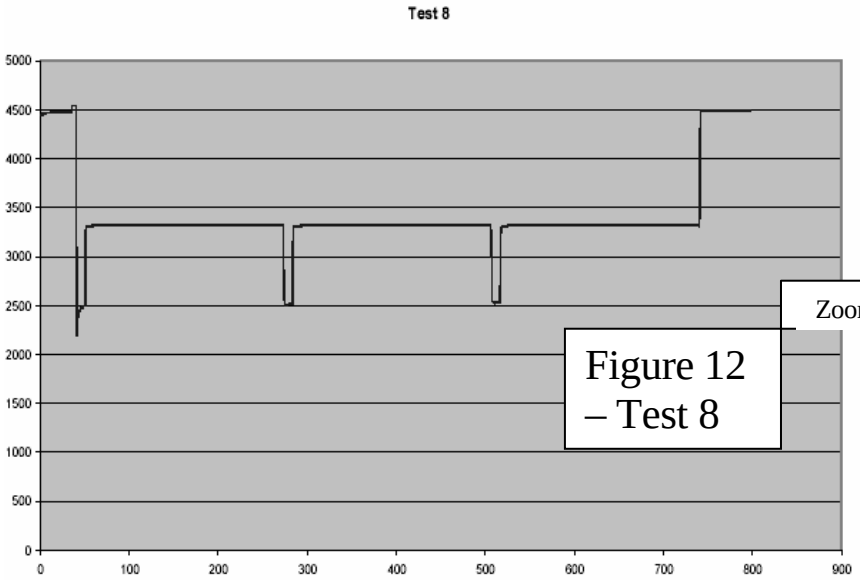

Figure 12 – Test 8

Zoomed

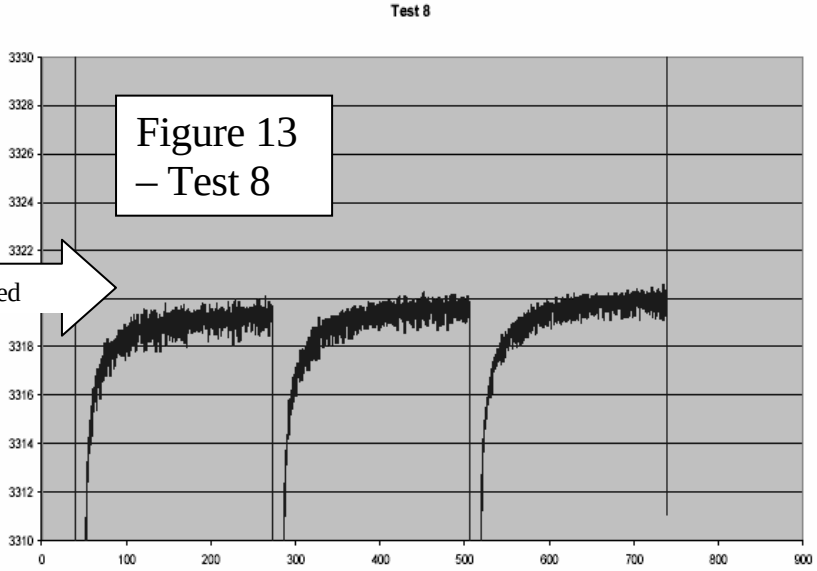

Figure 13 – Test 8

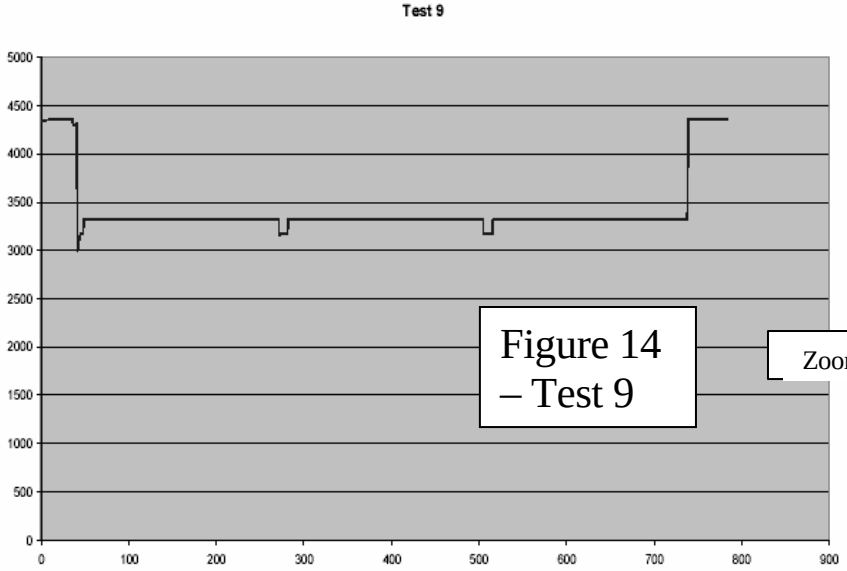

Figure 14 – Test 9

Zoomed

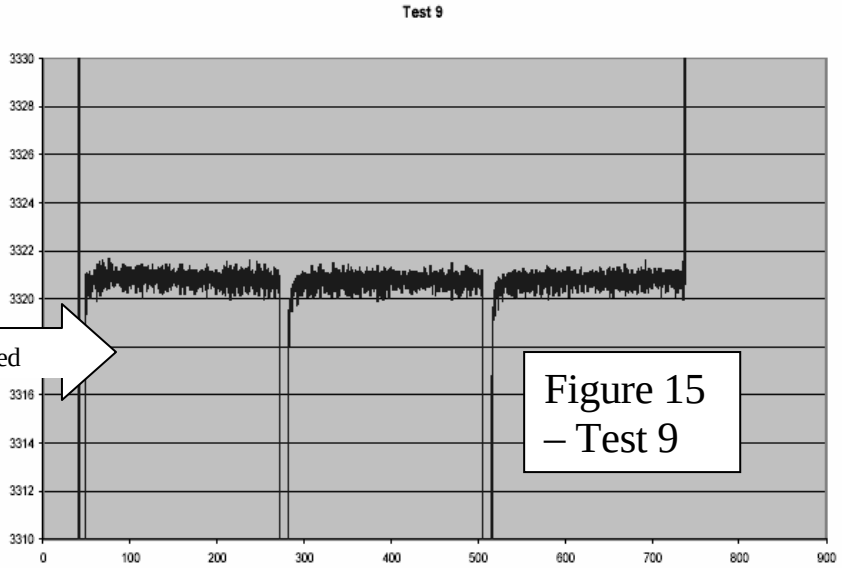

Figure 15 – Test 9

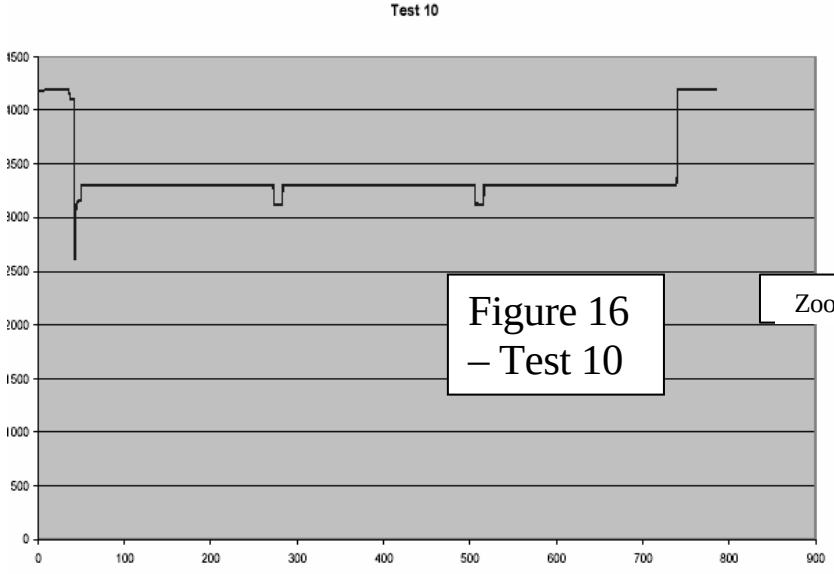

Figure 16 – Test 10

Zoomed

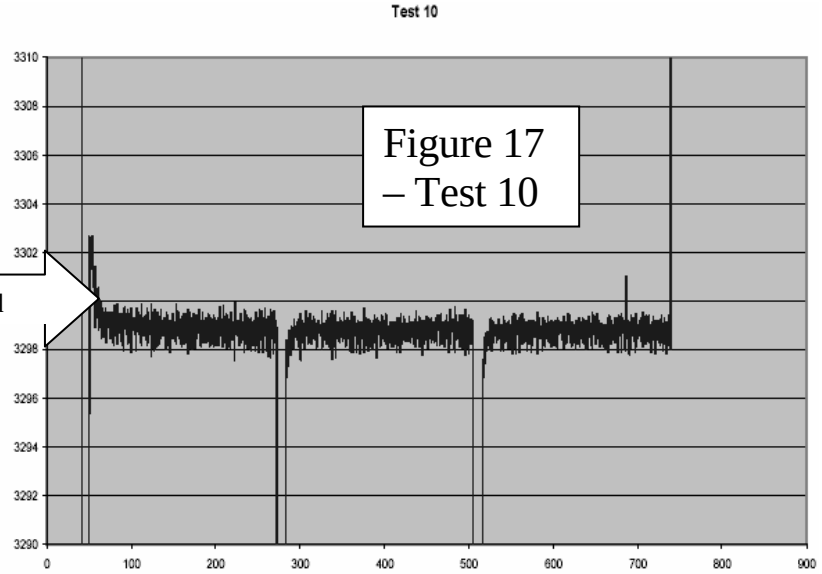

Figure 17 – Test 10

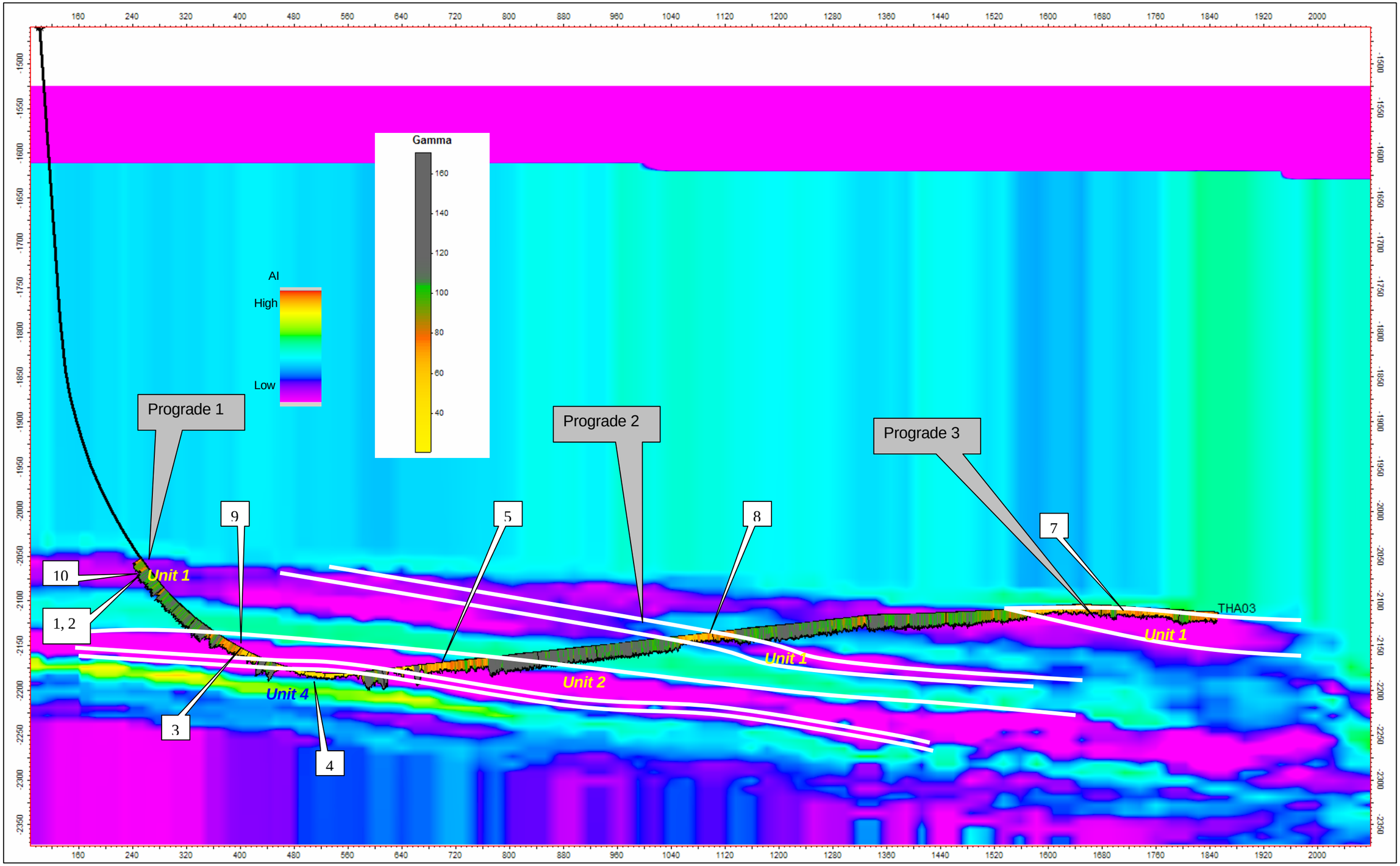

Figure 18: Positions of test points along wellbore.

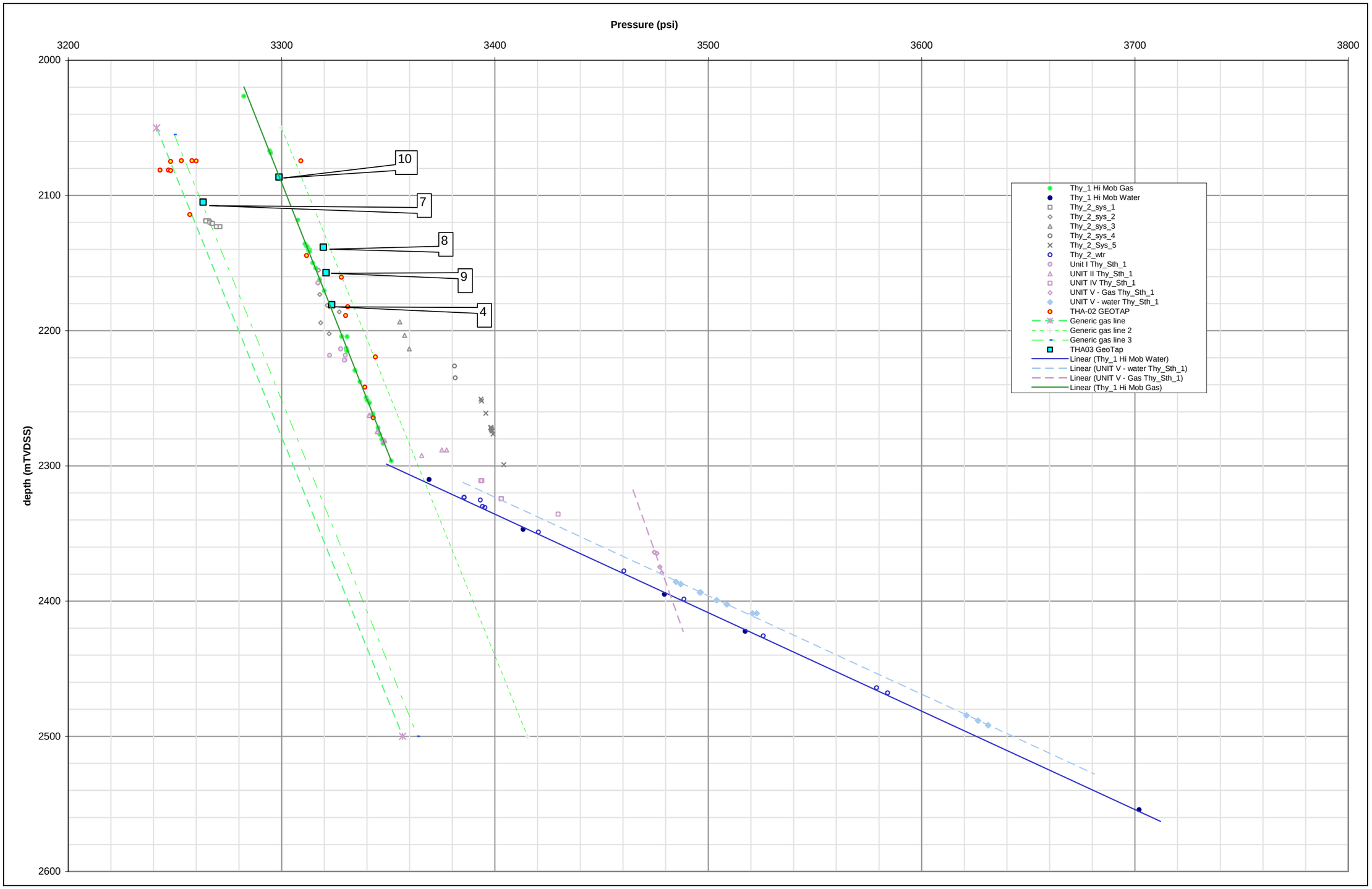

Figure 19: Pressure versus depth points, with labels to show where each test plots.

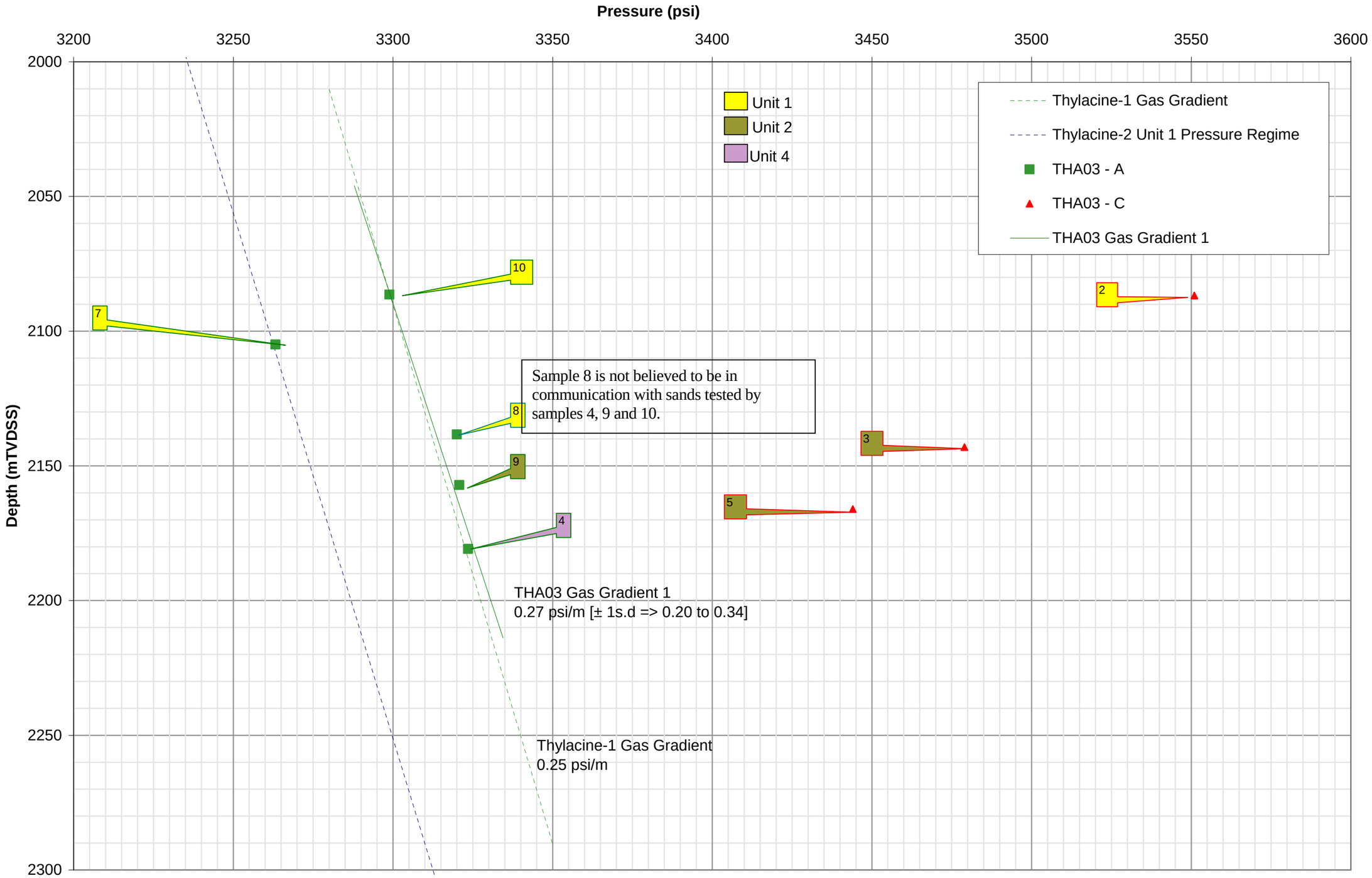

Figure 20: Pressure versus depth points, with labels to show Unit intersected and test quality.