BASKER-3
WELL COMPLETION REPORT
VOLUME 2
INTERPRETIVE DATA

September 2007

VIC/L26
OFFSHORE GIPPSLAND BASIN
VICTORIA

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1. WELL DATA RECORD

Well Name	BASKER-3
Designation	Development
Permit Name	VIC/L26 Production Licence
Title Holders	Anzon Australia Limited (Anzon) 50% and Beach Petroleum Limited (Beach) 50%
Operator (per P(SL)A Well Operations Regulations)	Anzon Australia Limited
Surface Location (GDA94, GRS80, MGA, UTM Zone 55)	Latitude 38º 17’ 58.97”S Longitude 148º 42’ 24.94”E 649256.8mE 5759552.0mN
Bottom Hole Location	Latitude 38º 18’ 45.68”S Longitude 148º 43’ 34.13”E 650910.76mE 5758081.18mN
Project Manager	Upstream Petroleum Pty Ltd
Start of Basker-3 Operations	01:00 hrs 01 March, 2006
Spud Time/Date	04:30 hrs 01 March, 2006
TD date	14:30 hrs 27 April, 2006
End Batch Drilling/Start Batch Completion Phase	10:00 hrs 31 May, 2006
Final Rig Release from Basker-3 Batch Completions Operations	24:00 hrs 05 July, 2006
Total Time Rig on Basker-3 Operations	44.73 days
Water Depth	152.9m (LAT)
Rotary Table – Sea Level	21.5m
Difference MSL to LAT	0.866m
Drilling Contractor / Rig Name / Type	Diamond Offshore General Company / Ocean Patriot / Semi-submersible
Well Status	Suspended for production with sub-sea completion
Total Depth (Drillers)	4125mMDRT (3353.5mTVDRT)
Maximum Deviation	45.7° @ 2554.20mMDRT / 2056.29m TVDRT
Bottom Hole Location offset	1475.5m South and 1659.4m East, on an Azimuth of 131.6° from surface location

2. INTRODUCTION

The Basker-3 development well (Figures 2.1 and 2.2) was planned for oil and gas production and for possible use as a gas injection well. It was drilled as a deviated well with the "Ocean Patriot" semi-submersible drilling rig and was part of the 2006 Basker-Manta Project Full Field Development (FFD) drilling campaign. It was spudded in 152.9m of water on 1st March 2006, with a wellhead adjacent to the Basker Field sub-sea production manifold and reached a TD towards the south-east edge of the Basker Field on 27th April 2006 (Figure 2.3).

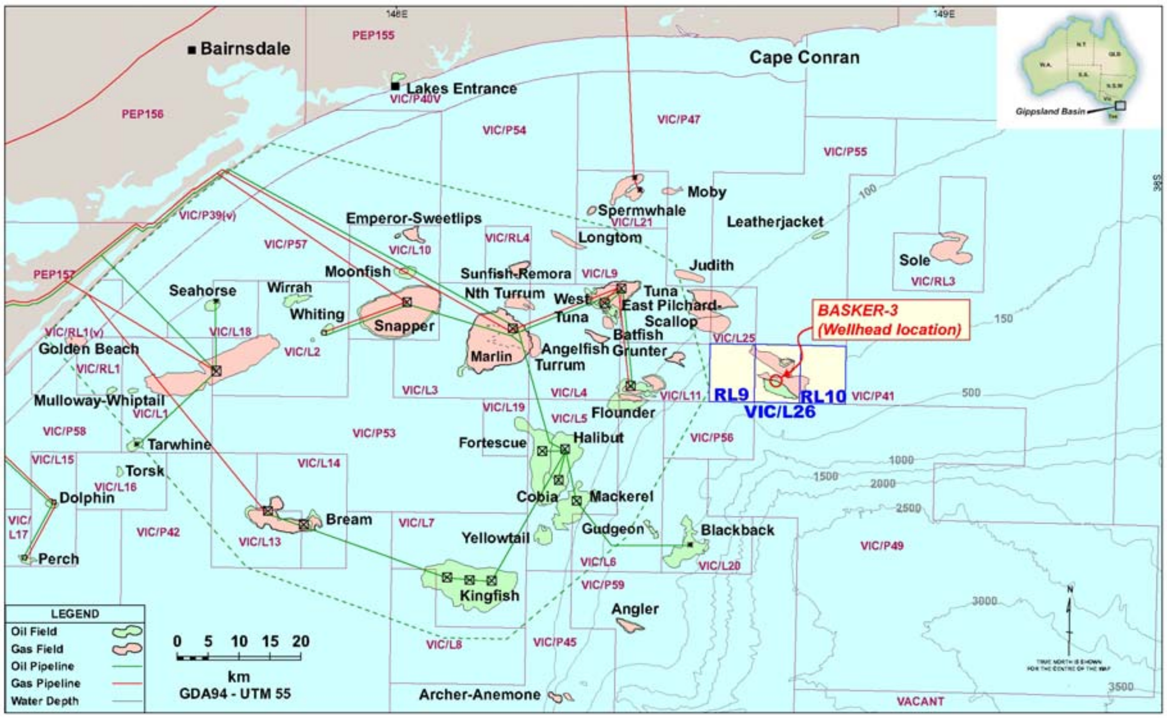

Figure 2.1 Basker-3 Location Map

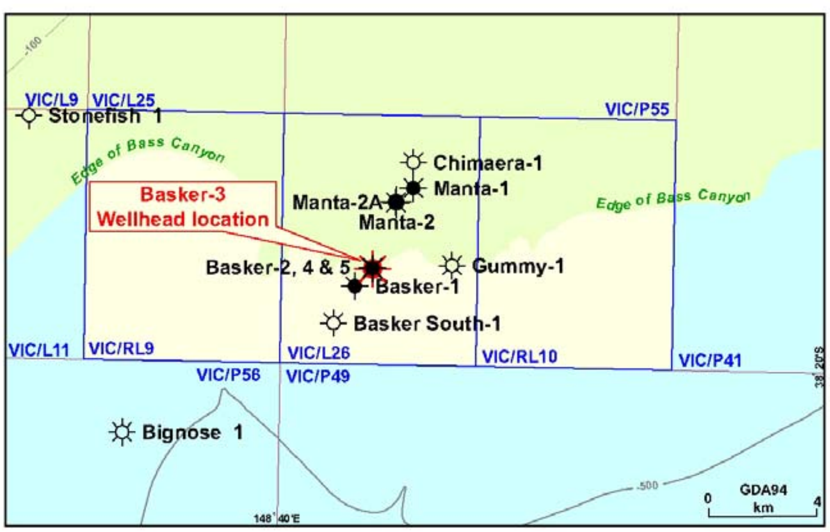

Figure 2.2 Basker-3 Location Map (Detail)

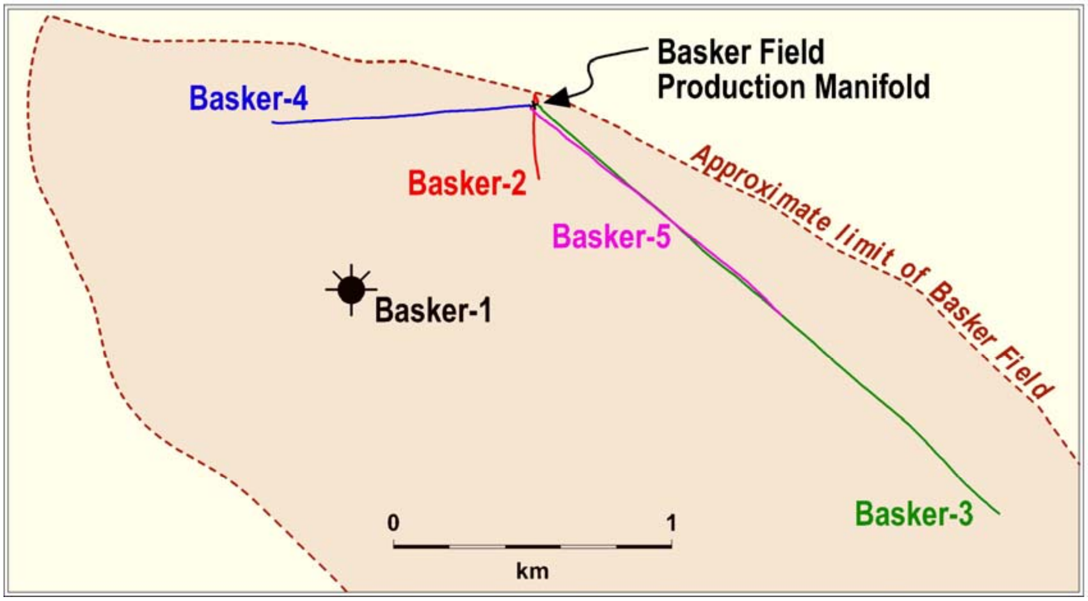

Figure 2.3 Basker Field Well Spider

The FFD well operations utilised "batch drilling and completion" wherever possible. Batch drilling and batch completion provided significant cost reductions and gains in operating efficiency. Rig time consumed in changing hole size was minimized by drilling all of the 36", 17½" and 12¼" holes in a continuous operation. Similarly, the completion phase of well operations was batched by running the completions back-to-back. The rig movement required to move the Ocean Patriot between wellheads (to facilitate batch drilling) was accomplished by adjustment of the rig's anchor chains.

Basker-3 was the last of the four FFD wells to be spudded (following Manta-2A, Basker-5 and Basker-4). It was the third well to reach total depth and the last well to be completed. The Ocean Patriot was released from the Basker-3 batch completion operations on 5th July 2006.

The primary objective of the well was to maximise future production from the oil and gas reservoirs discovered by Basker-1 and Basker-2, by intersecting them near the structural crest of the field. The well was also intended as a possible gas injection well, following evaluation of all four of the Basker development wells, to determine which was the most suitable for injection. The target for Basker-3 (at the top of the Zone 2 reservoir) was selected to conform with the 200 acre drainage circles allowed for each of the Basker FFD wells (so as to optimize development well spacing) and required drilling as a "build and hold" directional well (Figure 2.5). The TD is offset 2210.0m from the wellhead, on a bearing of 131.6° (Figure 2.4).

Basker-3 is currently being used for oil production in conjunction with Basker-2, Basker-5 and Manta-2A.

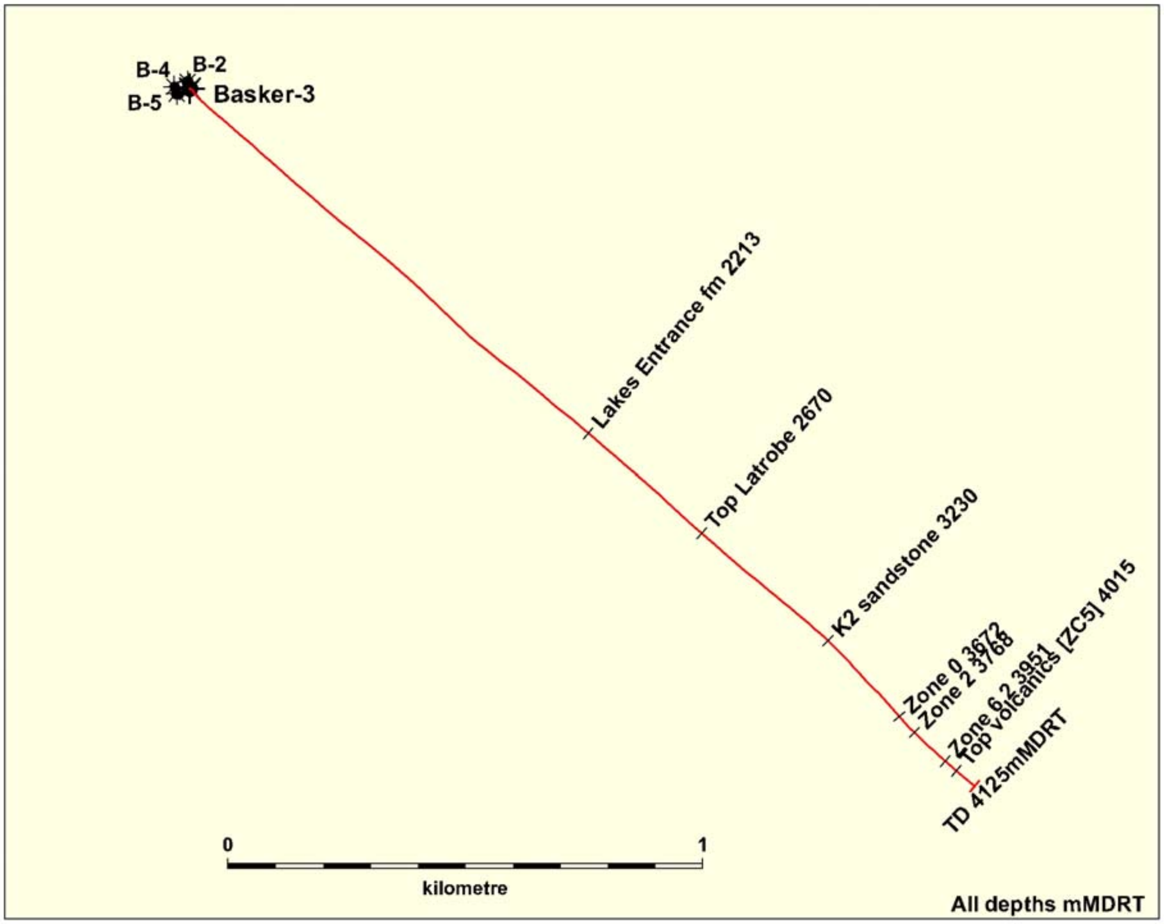

Figure 2.4 Plan View of the Basker-3 Well Path

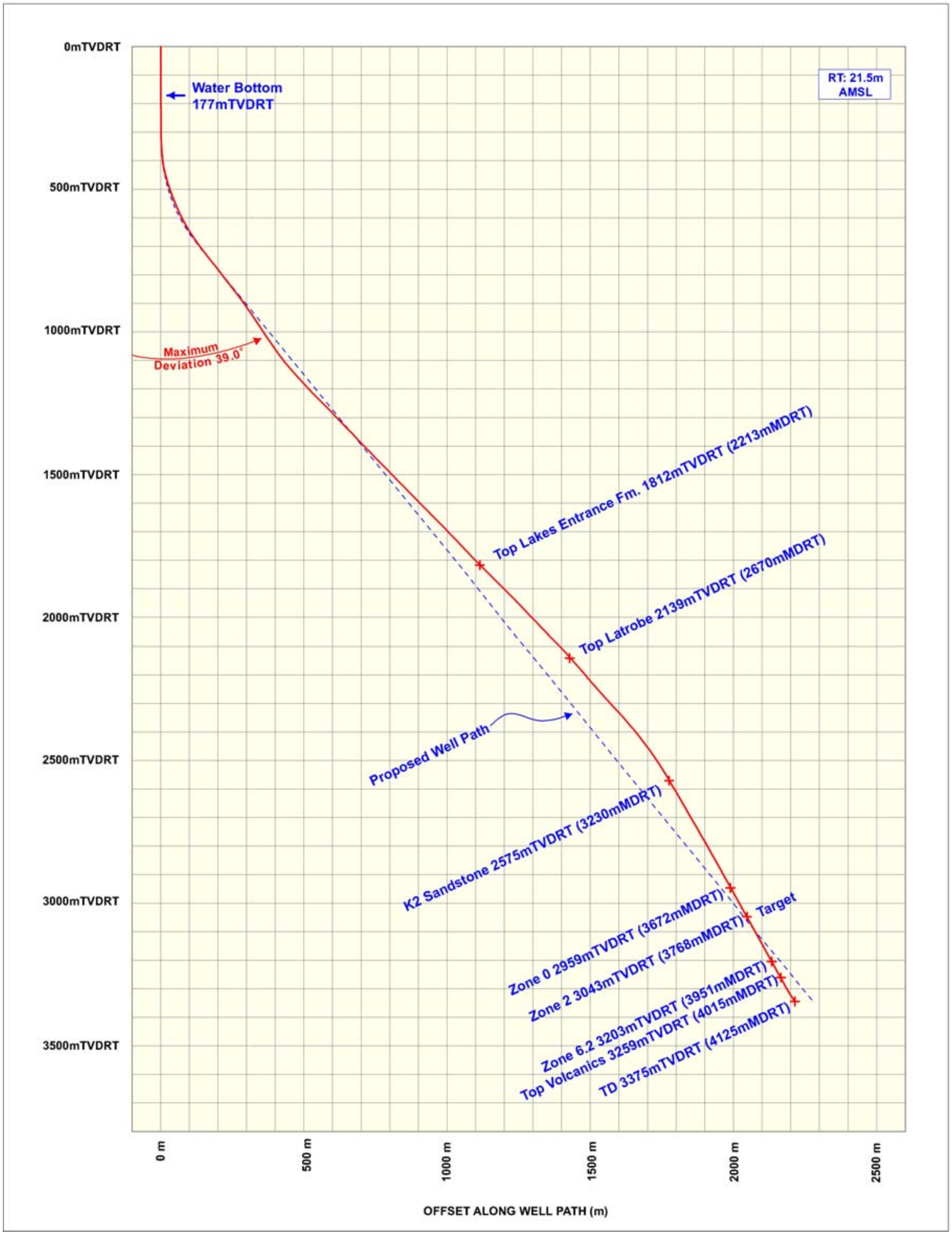

Figure 2.5 Vertical Cross Section along the Basker-3 Well Path

3. SUMMARY OF WELL RESULTS

The oil and gas reservoirs encountered in Basker-3 are similar to those encountered in the other Basker wells but there are a number of key differences (Enclosure 1):

1) Basker-3 is the highest well drilled to date in the field.

2) A number of new oil and gas bearing reservoirs were discovered in Zone -1.

3) The Zone 0 reservoir is present in Basker-3, is oil-bearing and is in pressure communication with the other wells (as indicated by pressure depletion); the sand quality is good.

4) Zone 1.1 contains mostly gas with an oil leg about 1m thick. Based on fluid identification from MDT pumpout, the GOC is at 2,977mTVDSS, and the OWC is at 2978mTVDSS.

5) The Zone 1.2 reservoir contains gas and is in pressure communication with the other wells.

6) Zone 2 contained one gas bearing sand in pressure communication with other nearby wells.

7) Zone 3 has no net reservoir.

8) A number of oil and gas reservoirs were intersected in Zone 4. Zone 4.4 was shown to be in communication with Basker-5 with the same GOC, 3,105mTVDSS.

9) Zone 5 contained one thin interpreted oil sand that is not in communication with nearby wells.

10) A number of thin gas reservoirs were intersected in Zone 6, of which Zone 6.2 is in pressure communication with nearby wells.

11) Zone 7 contains two thin gas reservoirs that are not in communication with nearby wells.

The interpreted total net oil pay was 16.6m and the total gas pay was 49.9m. Further details of the hydrocarbon intersections are provided in Section 6 and further details of the reservoir pressure interpretation in Section 7.

Basker-3 was perforated in the Zones -1, 0 and 4, as shown in the following table:

Table 3.1 Perforation Intervals

Reservoir Zone	Perforation Interval (mMDRT)	Perforation Interval (mTVDSS)	Total (mMDRT)
Zone -1 (Oil)	3592.0 to 3593.0	-2984.5 to -2989.5	1.0
Zone 0 (Oil)	3673.0 to 3675.0	-2993.4 to -2996.4	2.0
Zone 0 (Oil)	3681.5 to 3689.0	-3006.4 to -3009.3	7.5
Zone 4 (Oil)	3866.0 to 3867.0	-3012.3 to -3014.3	1.0
Zone 4 (Oil)	3903.0 to 3905.0	-3025.3 to -3029.3	2.0
		Total	13.5

The performance of Basker-3 during the well clean up operations is shown in the following figures.

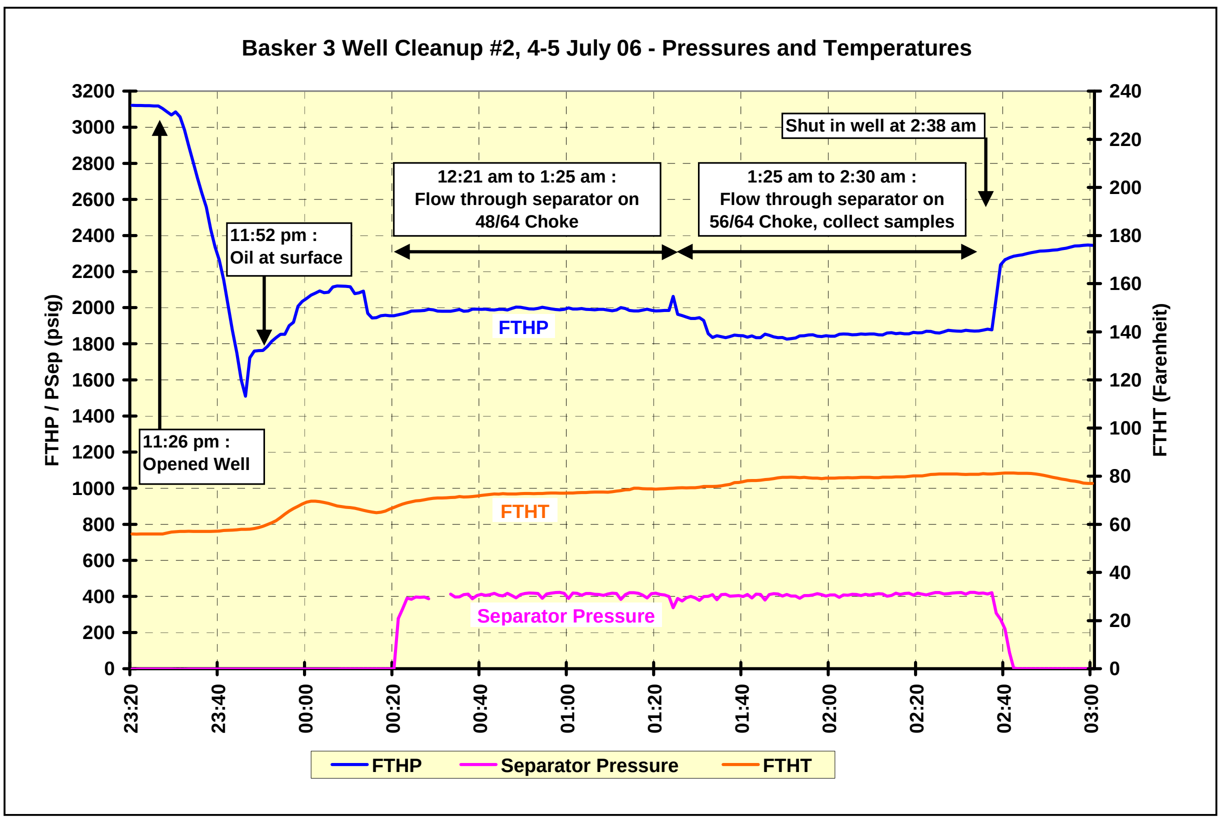

Figure 3.1 Separator Pressure and Temperature during the Well Clean-up Testing

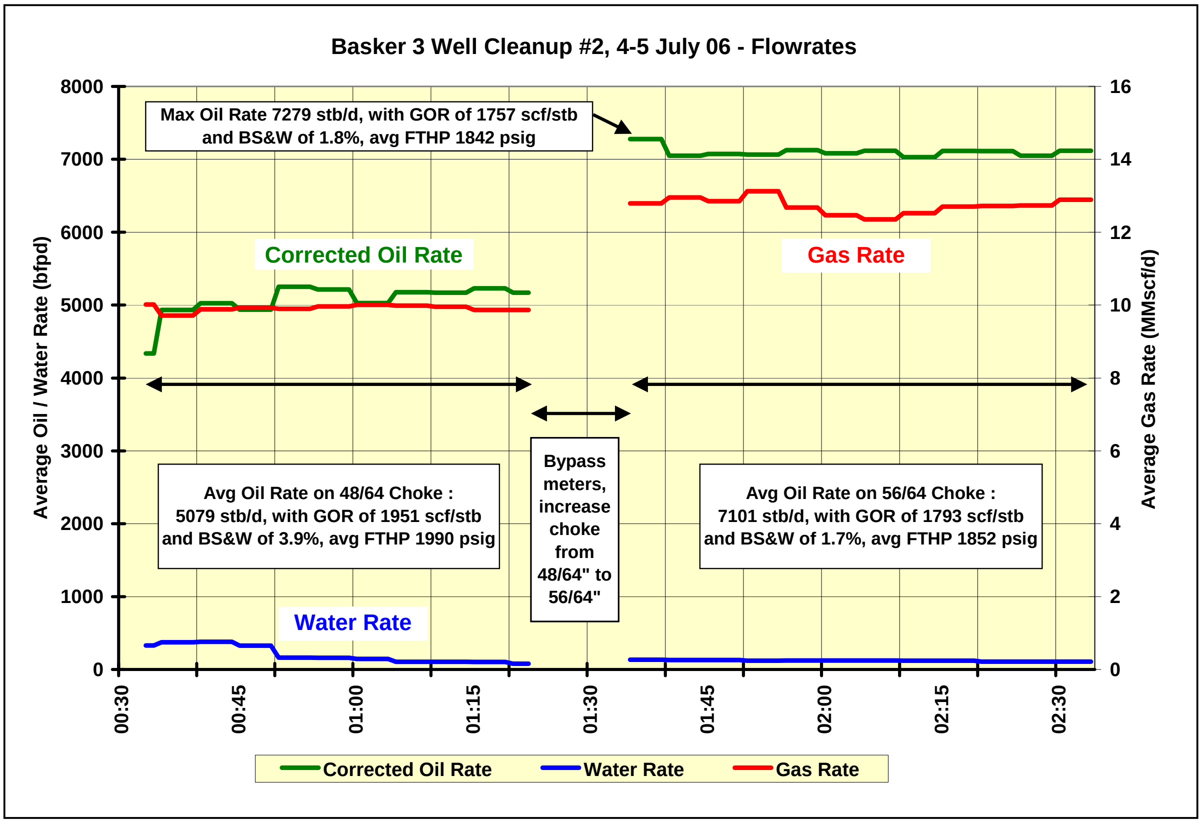

Figure 3.2 Separator Flow Rates Achieved During the Well Clean-up Testing

The predicted and actual formation tops penetrated in Basker-3 are summarised in Table 3.3. There was a degree of uncertainty with depth prediction in Basker-3 because of difficulties with both depth conversion (further discussed in Section 5) and reservoir correlation (further discussed in Sections 4 and 6).

The reservoir top picks shown in Table 3.3 are at the top of the uppermost hydrocarbon-bearing sand or at the equivalent stratigraphic level, if no reservoir quality sand is present. Depths were predicted for eight of the twelve reservoirs intersected by Basker-3.

Basker-3 intersected the reservoir intervals to the south east of all existing Basker wells. It has demonstrated that the eastern part of the Basker Field is shallower than was expected. All of the main reservoirs were high to prediction. This indicates that the south eastern extent of the field is potentially larger than as mapped pre-drill.

Table 3.2 Basker-3 Predicted Versus Actual Formation Tops

Formation:	Predicted Depth (mMDRT)	Predicted Depth (mTVDSS)	Actual Depth (mMDRT)	Actual Depth (mTVDSS)	Difference (mTVDSS)
Sea Floor	177.0	-155.5	175.3	-153.8	1.7m high
Top Lakes Entrance Formation	2198.2	-1817.0	2212.6	-1790.7	26.3 m high
Top Latrobe Group	2608.8	-2136.0	2669.6	-2117.8	18.2 m high
Top Zone 0 Reservoir Equivalent	3689.9	-2976.0	3671.9	-2937.8	38.2 m high
Top Zone 1.2 Reservoir	3794.2	-3057.0	3752.0	-3007.8	49.2 m high
Top Zone 2 Reservoir	3801.9	-3063.0	3767.7	-3021.6	41.4 m high
Top Zone 4 Reservoir	3858.6	-3107.0	3812.1	-3052.3	54.7 m high
Top Zone 5 Reservoir Equivalent	3935.8	-3167.0	3914.5	-3149.9	17.1 m high
Top Zone 6.2 Reservoir Equiv.	3987.3	-3207.0	3951.0	-3181.9	25.1 m high
Top Zone 7 Reservoir or Equiv.	4051.6	-3257.0	3993.8	-3219.3	37.7 m high
Top of Volcanics Unit 1	4064.5	-3267.0	4015.2	-3238.0	29.1 m high
Top Zone 8 Reservoir Equivalent	4107.0	-3300.0	NI	NI	NI
TD	4131.4	-3319.0	4125.0	-3353.5	34.5 m low

NI: not intersected

4. GEOLOGICAL DISCUSSION

The well drilled a section of Recent to Campanian age sediments. A generalised chronostratigraphic summary is presented in Figure 4.1. The hydrocarbon reservoir section is Lower F. longus to T. lilliei in age. TD of the well was 50mMD into the volcanic section. The ages are based on the correlation and the palynology carried out in Basker-1 and Manta-1.

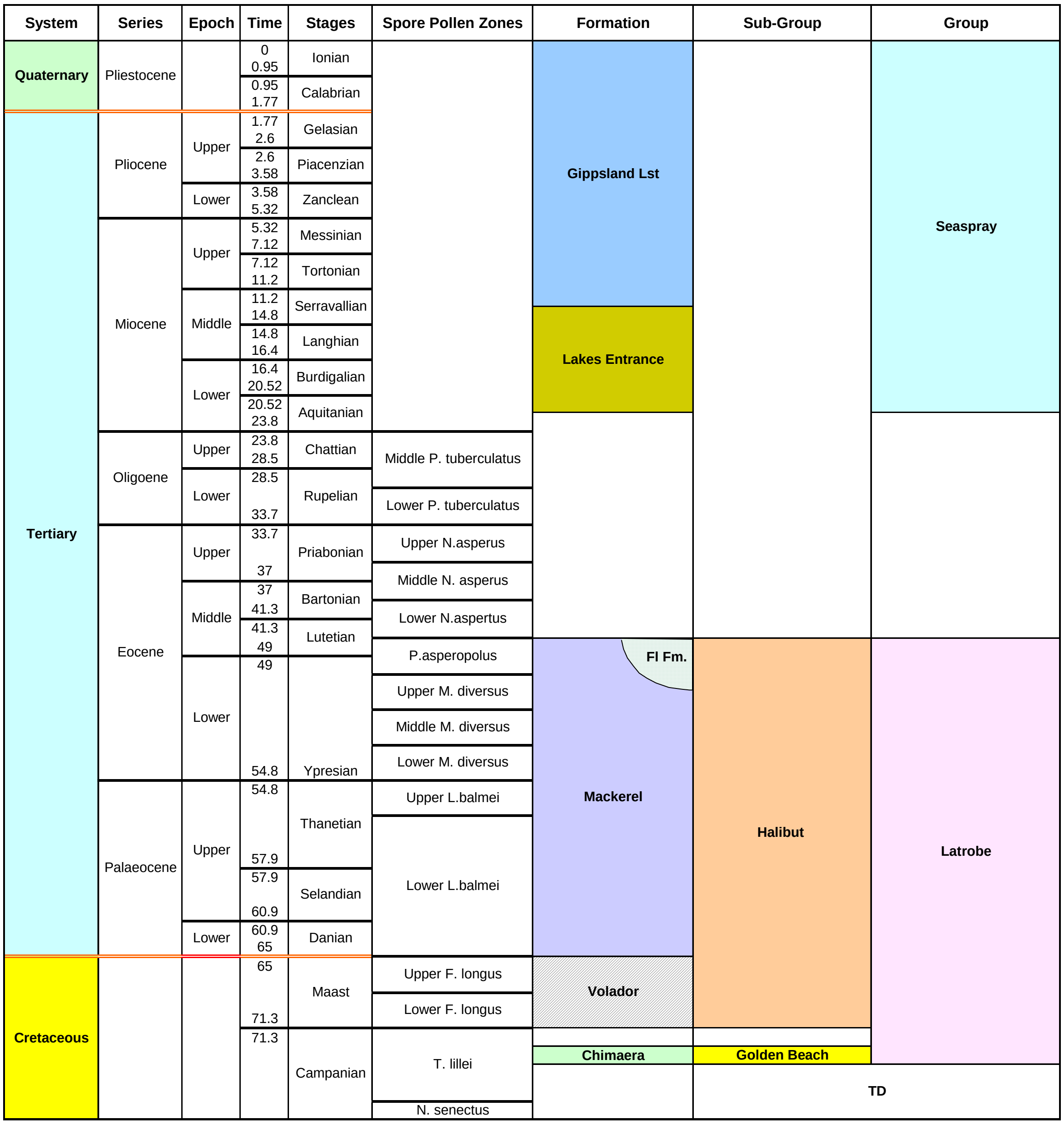

Figure 4.1 Basker-3 Chronostratigraphy

A summary of the palaeogeography for the Latrobe section can be found in Bernecker and Partridge (2005) and other papers.

The hydrocarbon reservoir section is located between the Ma2 Marker 3541.8mMDRT (-2824.2mTVDSS) and top Volcanics 4015.2mMDRT (-3237.9mTVDSS). Deposition occurred in a coastal plain environment consisting of interbedded sandstones, siltstones, claystones and coals.

The reservoir section is comprised of two sequences:

1) Sequence 1 is T. lilliei in age. The base is not interpreted in the well. The system tracts present are late HST (Highstand System Tract) and LST (Lowstand System Tract).

2) Sequence 2 is lower F. longus in age, a complete section is present.

The major sequence boundaries in Basker-3 are shown in Table 4.1

Table 4.1 Sequence Boundaries in Hydrocarbon Section

Sequence	mMD	mTVDSS
Sequence 3 Base	3567.1	-2846.2
Sequence 2 Base	3907.9	-3144.2
Sequence 1 Base	Not penetrated	

The distribution of sandstone reservoirs is influenced by their position in the sequence. Using the model of Bohacs and Suter (1997), sandstone bodies of late HST/ early LST are amalgamated, and have more sheet-like characteristics. In Basker this equates to Zones 0 - 2. Channel bodies in the other system tracts have a more meandering characteristic.

For the reservoir section the palaeo-transport directions for the different wells are summarised in Figure 4.2, over page.

Basker-3 Hydrocarbon zones and the major stratigraphic boundaries are identified in the Composite Well Log. (Enclosure 2)

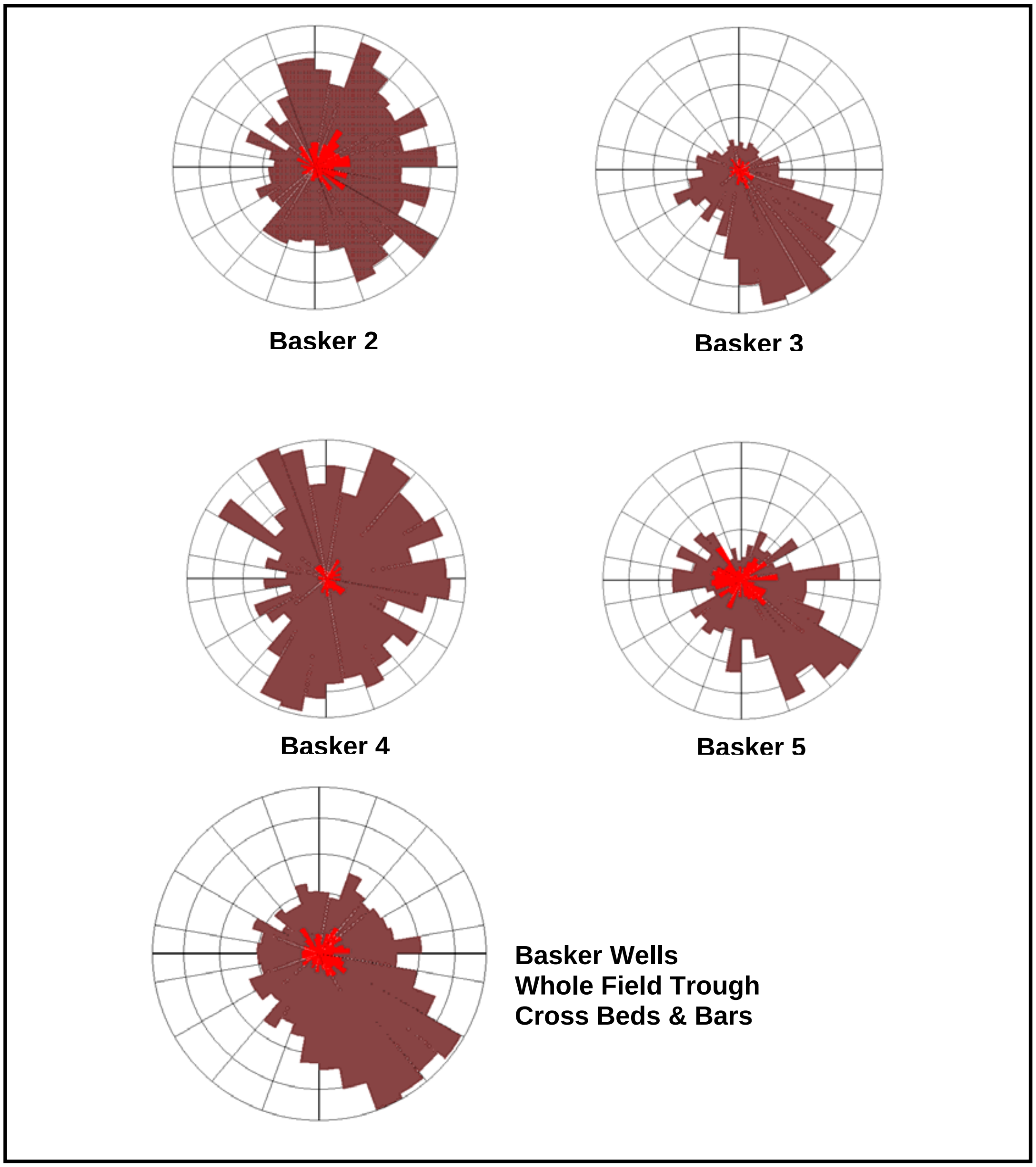

Figure 4.2 Basker Palaeo-transport directions for Basker-2, -3, -4 and -5

The well correlation across the field is presented in Enclosure 1. The pressure data had a significant influence on the well correlation. It indicated which reservoir units were in communication. Other units such as the hydrocarbons encountered in Zone 4, show a more limited areal distribution. The sandstone distribution can be explained by their relative position within a sequence. The major reservoirs are present between Zone 0 and Zone 2. These are interpreted to have been deposited during the late HST with channels migrating across the flood-plain resulting in sheet sands greater than 2km in diameter. Hence good connectivity is interpreted in these sand bodies.

The Seahorse unconformity between the Intra-Latrobe Siliclastics (Halibut Subgroup) and the Golden Beach (Bernecker and Partridge, 2005) is near the top of T. lilliei and the base of Lower F. longus. There is little evidence of a major unconformity in the BMG area. The FMI data shows little evidence of structural movement between the Golden Beach and Halibut sub-group at this time. Any hiatus present is likely to be of limited time duration. The QEMSCAN data clearly shows a variation in the mineralogy across the interpreted regional unconformity (Figure 4.3).

Anzon Australia LIMITED

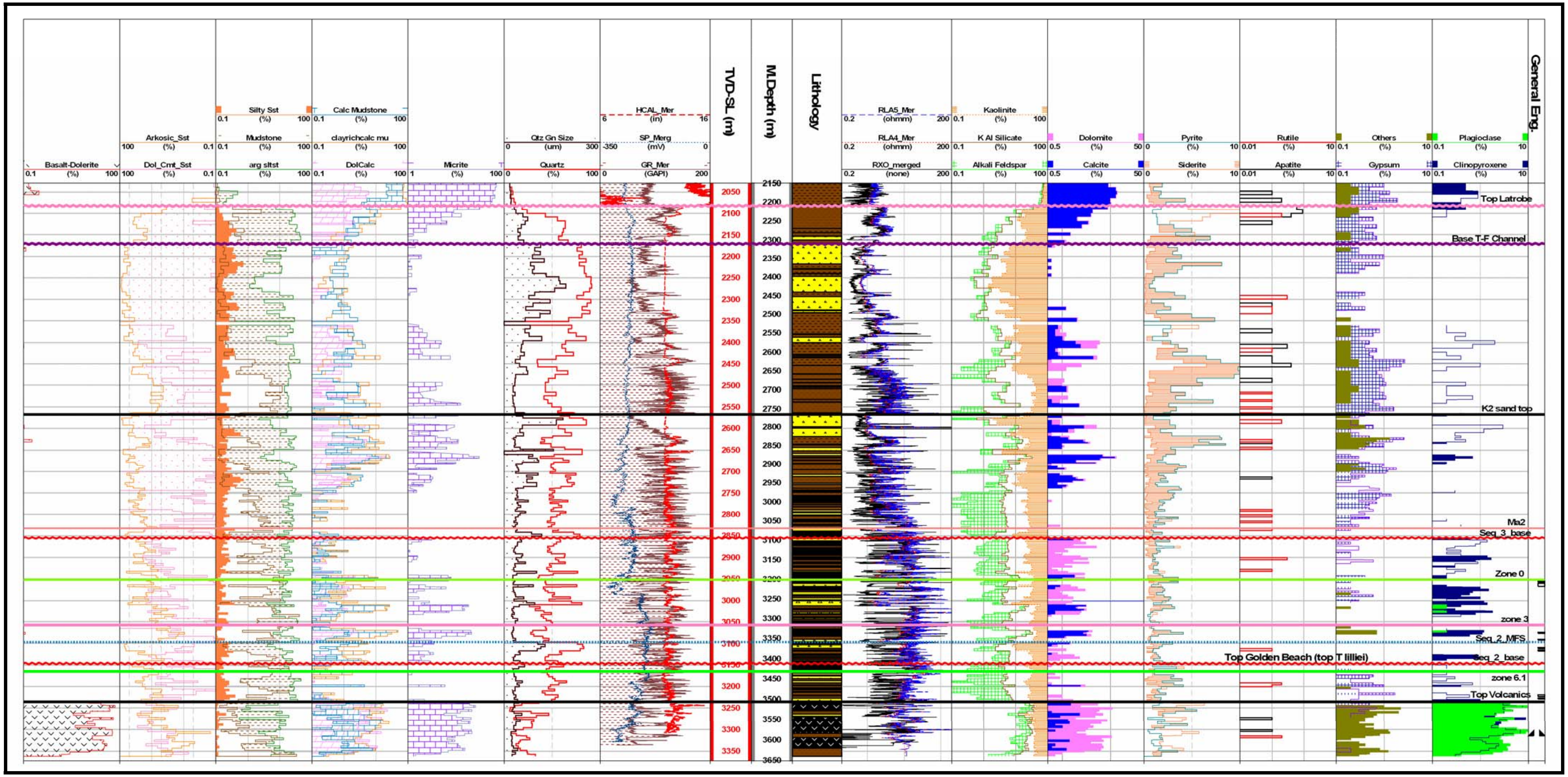

Figure 4.3 Example from Basker-5 showing results of QEMSCAN

Note: The top Golden Beach is a major unconformity to the east. QEMSCAN indicates a significant change in mineralogy across the unconformity.

References

T. Bernecker and A.D. Partridge, 2005, Approaches to Palaeogeographic reconstructions of the Latrobe Group, Gippsland Basin, Southeastern Australia, APPEA Journal, p581-600

Kevin Bohacs and John Suter, 1997, Sequence Stratigraphic Distribution of Coaly Rocks: Fundamental Controls and Paralic Examples, AAPG Bulletin, V81, No. 10 (October), p1612-1639

5. GEOPHYSICAL DISCUSSION

The trap for the Basker Field hydrocarbons is a fault-dependent closure on the downthrown side of a high-angle normal fault (the Basker Fault) which cuts across a south to southwest plunging nose which joins the Basker, Manta and Gummy fields (Figure 5.1).

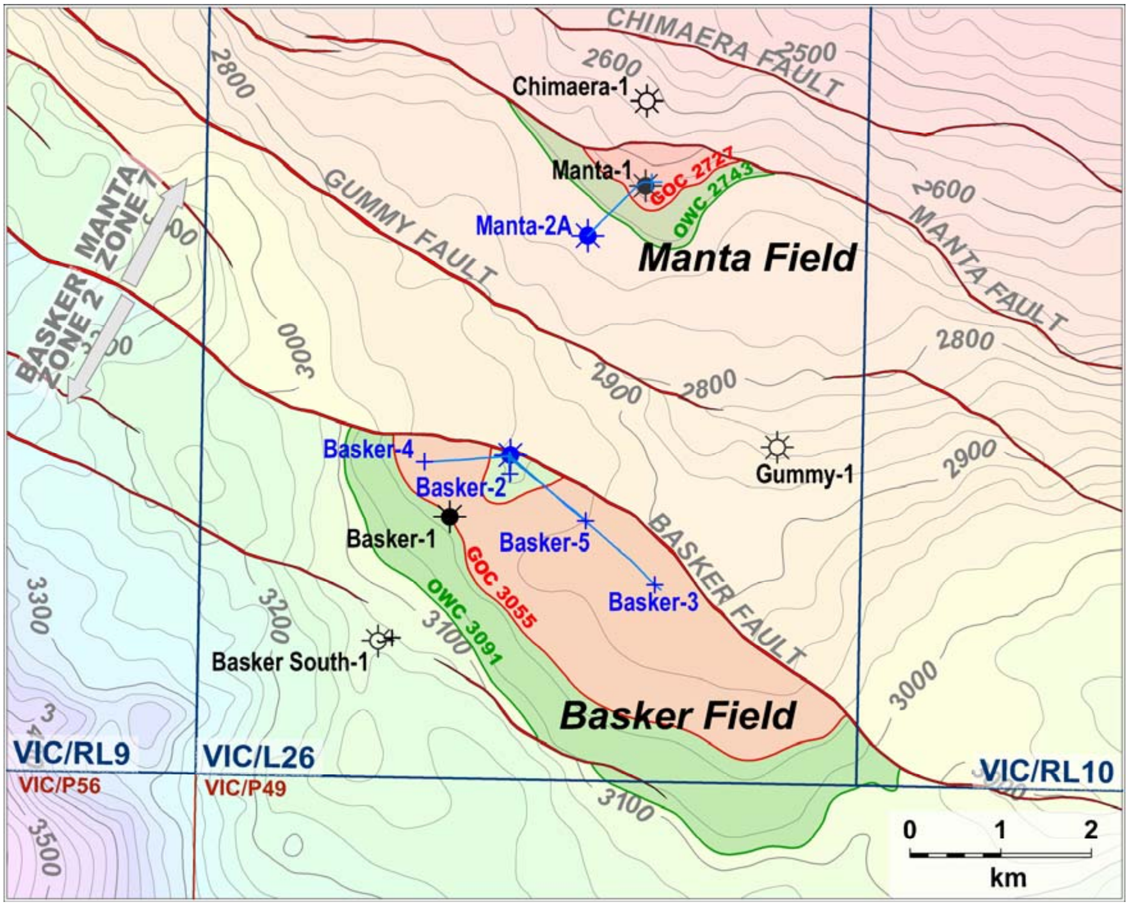

Figure 5.1 Composite Structure Map, Top of Basker Field Zone 2 Reservoir and Top of Manta Field Zone 7 Reservoir (Contour Interval 20m)

Six reservoir mapping seismic horizons (MZN2 and ZC1 to ZC5) have been mapped over the Basker Field, dividing the reservoir section into five intervals. Figure 5.2 (an arbitrary 3D seismic line through the Basker and Manta wells) shows the key Basker reservoirs in relation to the reservoir seismic markers. Enclosure 3 is an arbitrary 3D seismic line along the Basker-3 well path, showing all interpreted seismic horizons.

Seismic coverage for the Basker, Manta and Gummy fields is provided by the 1996 Basker-Manta 3D Seismic Survey. Two processed versions of this survey are presently available: the original 1997 processing by Shell's Melbourne Processing Centre and reprocessing completed by Woodside in 2001, which included both merging with the Kipper 3D and pre-stack depth migration (PSDM). The current reservoir maps were derived from Anzon's interpretation of the 2001 merged and reprocessed Kipper-Basker-Manta PSDM 3D seismic (KBM3D), after scaling from depth back to two-way time.

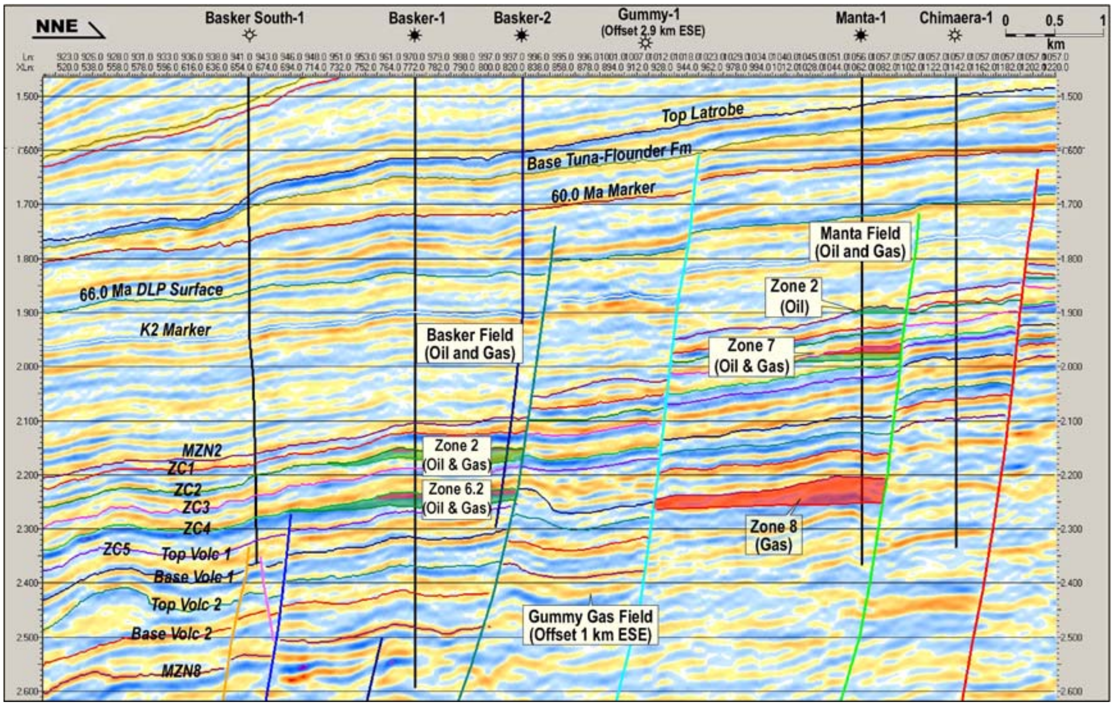

Figure 5.2 Seismic Line through the Basker and Manta Fields, Showing the Reservoir Intervals

The KBM3D seismic is nominally quadrature phase (zero phase with a 90º phase shift) and is displayed with the Australian normal polarity convention (an increase in acoustic impedance displayed as a trough). Hence the marked increase in impedance at the top of Latrobe appears at the zero crossing between a strong trough and peak on the KBM3D seismic (Figure 5.2).

Seismic data quality over the Basker Field is generally good from the surface to about the level of the K2 Marker (Figure 5.2). There is then some degradation in reflector continuity in the section immediately below the K2, probably because of low impedance contrasts at this level and because of interbed multiples sourced from the shallower Latrobe section. Interbed multiples continue to degrade data quality throughout the reservoir section and below. Reflector continuity is generally good across the reservoir interval (the interval between the MZN2 and ZC5 markers) but this continuity appears to be due in part to a contribution from interbed multiples (sourced from the numerous coals which are present within the reservoir section).

Boat-sourced vertical incidence vertical seismic profiles (VIVSPs) were planned for all four of the Basker development wells. The airguns used as the seismic source during a VIVSP are deployed from a workboat so that they can be positioned vertically above the well geophones as they are moved up the hole. VIVSPs were acquired successfully in Basker-2, Basker-3 and Basker-5 but the Basker-4 VIVSP was abandoned after recording at only three levels, because of deteriorating weather conditions. Nevertheless, sufficient data was acquired to facilitate the processing of the Basker-4 VIVSP as a checkshot survey.

Well-to-seismic ties are relatively straightforward for all of the Basker wells, with good agreement between the seismic and the synthetics over most of the logged section. There are however some difficulties with the synthetic ties at the level of the Basker reservoirs, because of interbed multiples. The Basker VIVSPs have demonstrated some multiple contamination for all events through the reservoir section, with the exception of the ZC1 and ZC4 events. Hence only the ZC1 and ZC4 horizons were used for the post-development reservoir mapping.

Within the Intra-Latrobe reservoir interval it is generally difficult to correlate individual sands, shales and coals, both within the Basker Field and between the BMG wells. The gross reservoir correlation was hence derived from the seismic interpretation. Six reservoir seismic markers (MZN2, ZC1, ZC2, ZC3, ZC4 and ZC5) were correlated on the seismic over the reservoir interval, on zero-crossings. Synthetic seismograms were then used to derive the gross well correlations.

Seismic time to depth conversion for the Basker Field is difficult. The combination of the rugose water bottom overlying the Basker Field (Figure 5.3) with rapid shallow lateral velocity variations in the section overlying the Latrobe (due to complex shallow channelling; Enclosure 3) makes accurate depth prediction difficult. Hence, there is an unusually high degree of uncertainty with the depth mapping of the Basker Field reservoirs.

The top of Latrobe was chosen as the key horizon, from which the ZC1 and ZC4 depth conversions were "hung". Six different depth conversion approaches were tested for the top of Latrobe (in order: stacking velocity, PSDM velocity, PSDM velocity slice, layer-cake, velocity function (V0-K) and Dix interval velocity). Two previous depth conversions (by Shell and by Woodside) were also re-visited. A final hand-drawn top Latrobe average velocity map was derived by combining (as top Latrobe average velocity) the output from all of these depth conversions.

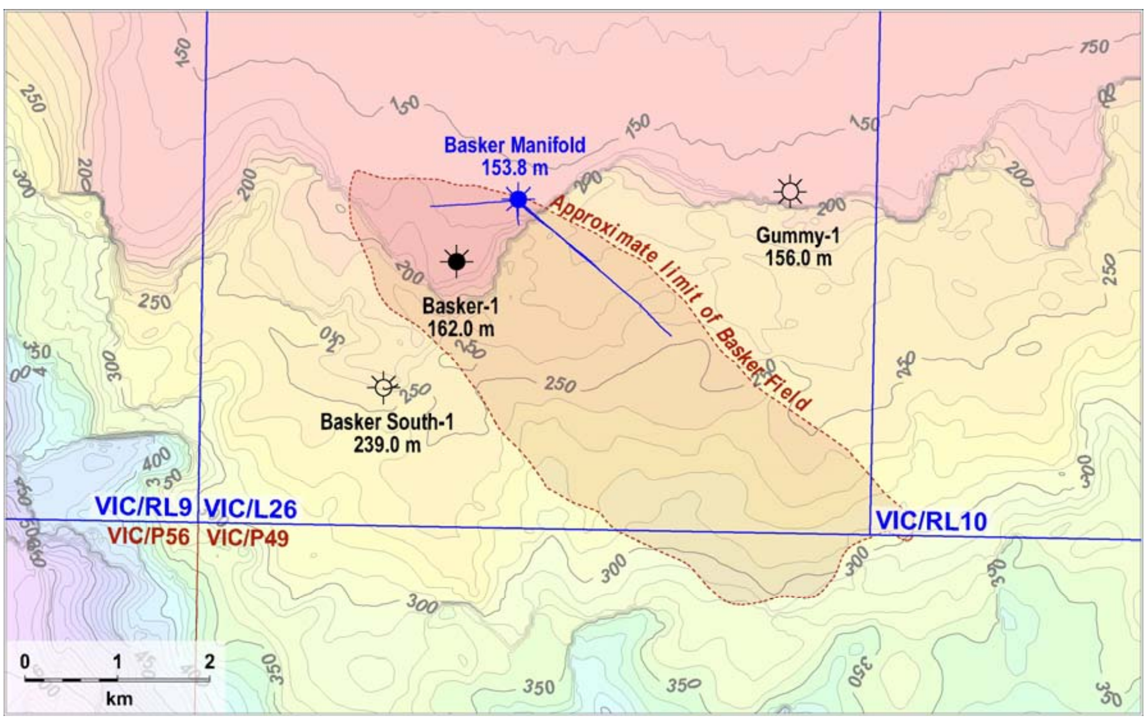

Figure 5.3 Bathymetry Map (Contour Interval 10m), Showing Location of the Basker Field

Average velocity grids for each of the two reservoir mapping horizons (ZC1 and ZC4) were derived from the top of Latrobe average velocity grid, using average velocity difference grids. These difference grids were generated from hand-drawn average velocity difference maps which were based on the well values and the form of maps of the top of Latrobe to ZC1 and ZC4 interval two-way time. Depth conversion for each of the Basker Field reservoirs was then achieved by phantoming from the nearest mapping horizon (ZC1 or ZC4). Reservoir maps for the three key Basker reservoirs are presented as Figures 5.4 to 5.6. In each case it has been mapped at the top of the uppermost sand of the reservoir or its stratigraphic equivalent.

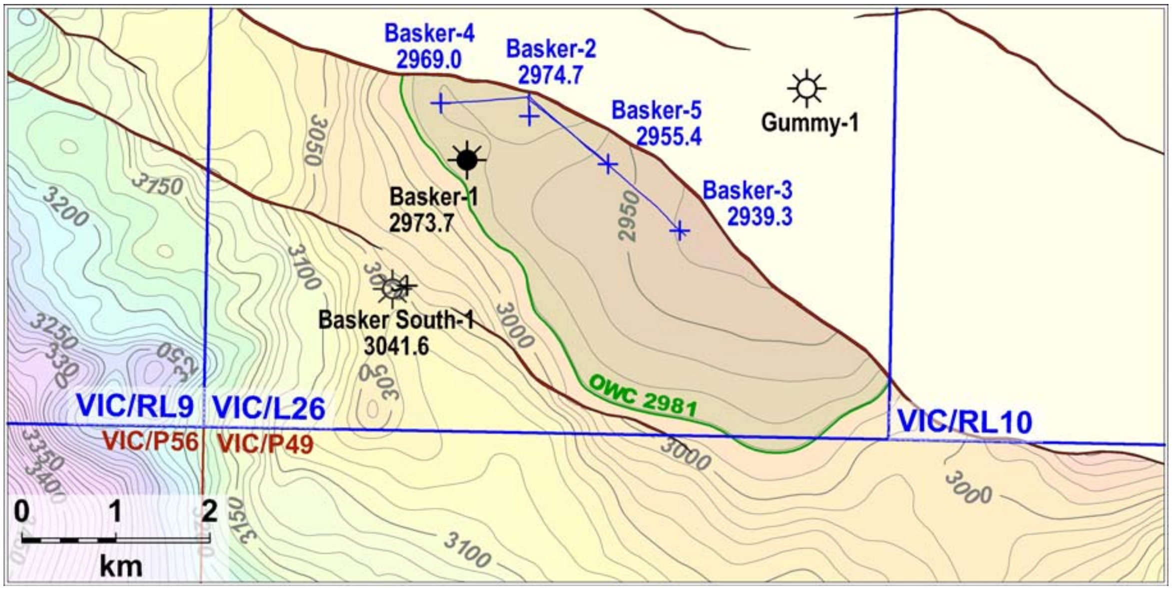

Figure 5.4 Structure Map, Top of Basker Zone 0 Reservoir (Contour Interval 10m)

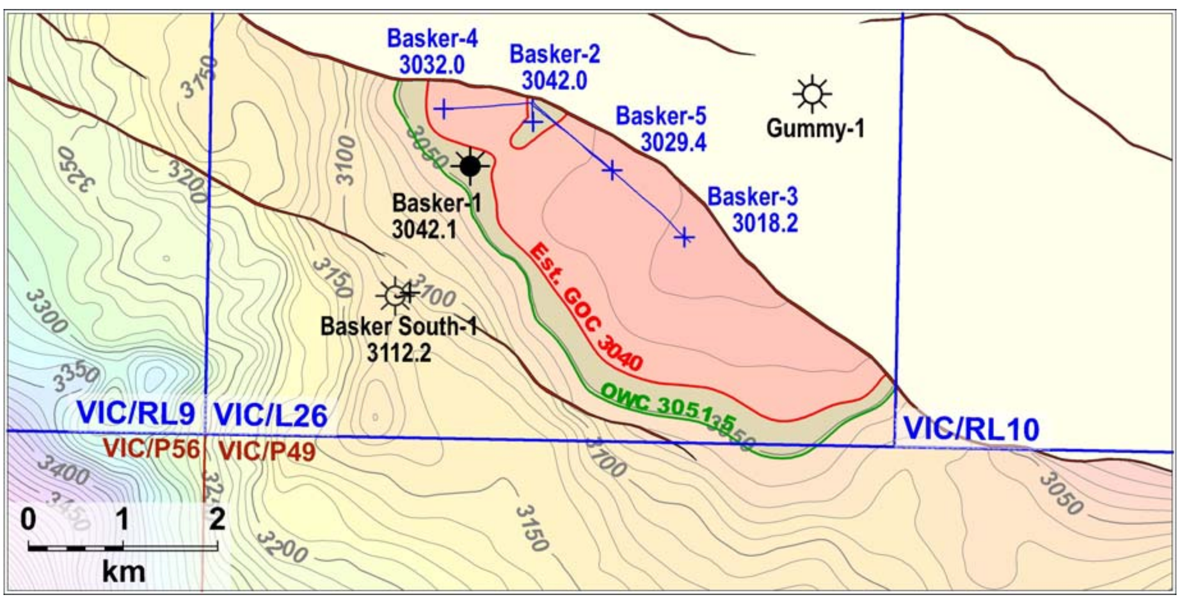

Figure 5.5 Structure Map, Top of Basker Zone 1.2 Reservoir (Contour Interval 10m)

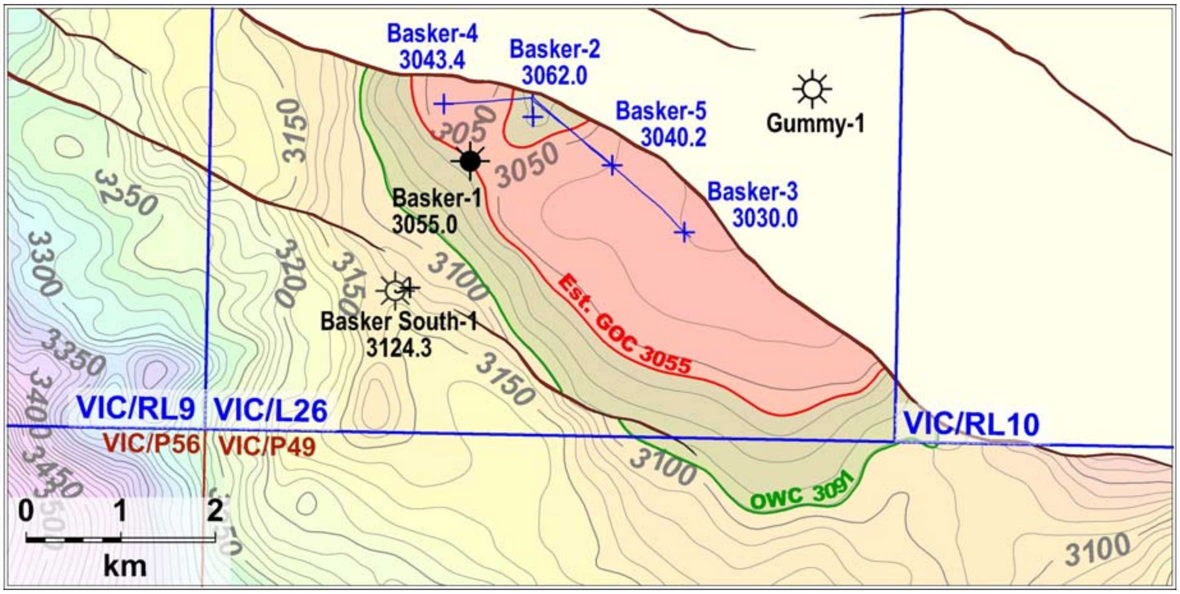

Figure 5.6 Structure Map, Top of Basker Zone 2 Reservoir (Contour Interval 10m)

6. OPEN-HOLE WIRELINE LOG ANALYSIS

Introduction

During drilling, Halliburton Sperry Drilling Services provided LWD tool suite for formation evaluation purposes from 1103-4125mMD. After total depth was reached Schlumberger provided Open-Hole Wireline Logging services with the PEX logging system and data was acquired from 3511-4120mMD (Loggers Depths).

This report presents an evaluation the Schlumberger Open-Hole Wireline Logs from 3512-4080mMD using Crocker Data Processing, Petrolog Complex Lithology Modules.

The results obtained and methods used are summarised in this report. All depths are relative to Schlumberger Gamma Ray Log.

A summary of the results obtained is presented in Table 6.2.

General Information

All depths quoted in this report are m MDKB.

Table 6.1 Open Hole Wireline Log Analysis General Data

Well Name	Basker-3				
Country	Australia				
Company	Anzon Australia Limited				
Location	VIC/L26				
State	Victoria				
Permanent Datum	MSL				
Elevation of DF (M)	21.5				
Depth to SF (M)	155.5				
Logging Co.	Schlumberger				
Logging Date	28 April 2006				
Logs Recorded	FMI-DSI-HRLA-PEX-HNGS MDT-GR				
Bottom Log Interval (M)		4120.0			
Top Log Interval (M)		3511.0			
Casing shoe (M)		3520.0			
Bit size (inch)		8.5			
Fluid Type		KCL/Polymer			
Density g/cc		1.108			
RM (Ohmm) @ TEMP (DegC)		0.148 @23.0			
RMF (Ohmm) @ TEMP (DegC)		0.129 @ 21.0			
RMC (Ohmm) @ TEMP (DegC)		0.178 @ 22.0			
Max Temp (DegC)		113			
Recorded by	S.Kasian/Kyaw Kyaw Aung				

Deviation

The hole deviation at T.D. was 35.76° at 4125.0mMD. Telemetry and directional data from the Sperry Sun LWD run were used as the basis to convert measured depth to true vertical in this interpretation.

Data Acquisition and Quality Control

Although depth offsets occur between LWD curve data and the Schlumberger wireline data, no depth alignments were carried out between the two data sets.

No problems were encountered during Schlumberger wireline operations and quality is acceptable.

The PEX tool was run in high resolution mode; tool string was run eccentered using 1.5" standoff. All curves were recorded in the same run, the caliper log indicates the hole was mostly in-gauge throughout the zones of interest. Digital data received were of acceptable quality, there were no cycle skips observed on the sonic log and no further processing undertaken.

Core Acquisition

Nil cut.

Log Compositing and Editing

The MDT data points (pre-tests and samples) acquired during drilling operations were depth referenced to the Schlumberger wireline GR. All other curves were examined for depth alignment using this reference, no log edits were applied as all log data were sufficiently on depth.

A composite display of input logs is presented together with the results composite plot (Enclosure 4).

Environmental Corrections

Environmental corrections were applied at wellsite.

Logs Used

The primary logs from Suite-1 Run-1 used in the interpretation were GR, RLA3 RLA5, RX08, RH08, HTNP, HDRA, PEF8, SP, DTCO, HTO, HURA, and HFK.

Temperature Gradient

A temperature gradient of 2.2DegC/100m was used in this interpretation.

Hydrocarbon Type Identification

The methodology used to identify hydrocarbon type consisted of a combination of the neutron-density log character, resistivity anomaly, ditch gas readings and hydrocarbon fluorescence shows described in the ditch cuttings.

At Basker-3 the identification of hydrocarbon zones was complex because of relatively low resistivity contrast between the hydrocarbon zones and the water sands due to clay mineral conductivity. Complex mineralogy and detritus e.g. pyrite, within the reservoir units also masked log responses.

An MDT programme was conducted to verify and validate the hydrocarbon type interpreted from the logs. The MDT programme consisted of pretests, fluid analysis using Schlumberger's Down-Hole Fluid Analyser (DFA). 2x450cc fluid (Oil) samples were recovered from 3864.5mMD

Using this methodology, several oil and gas zones were identified which are presented in Table 6.2, together with the results of the interpretation. A graphical example is presented in Figure 6.1.

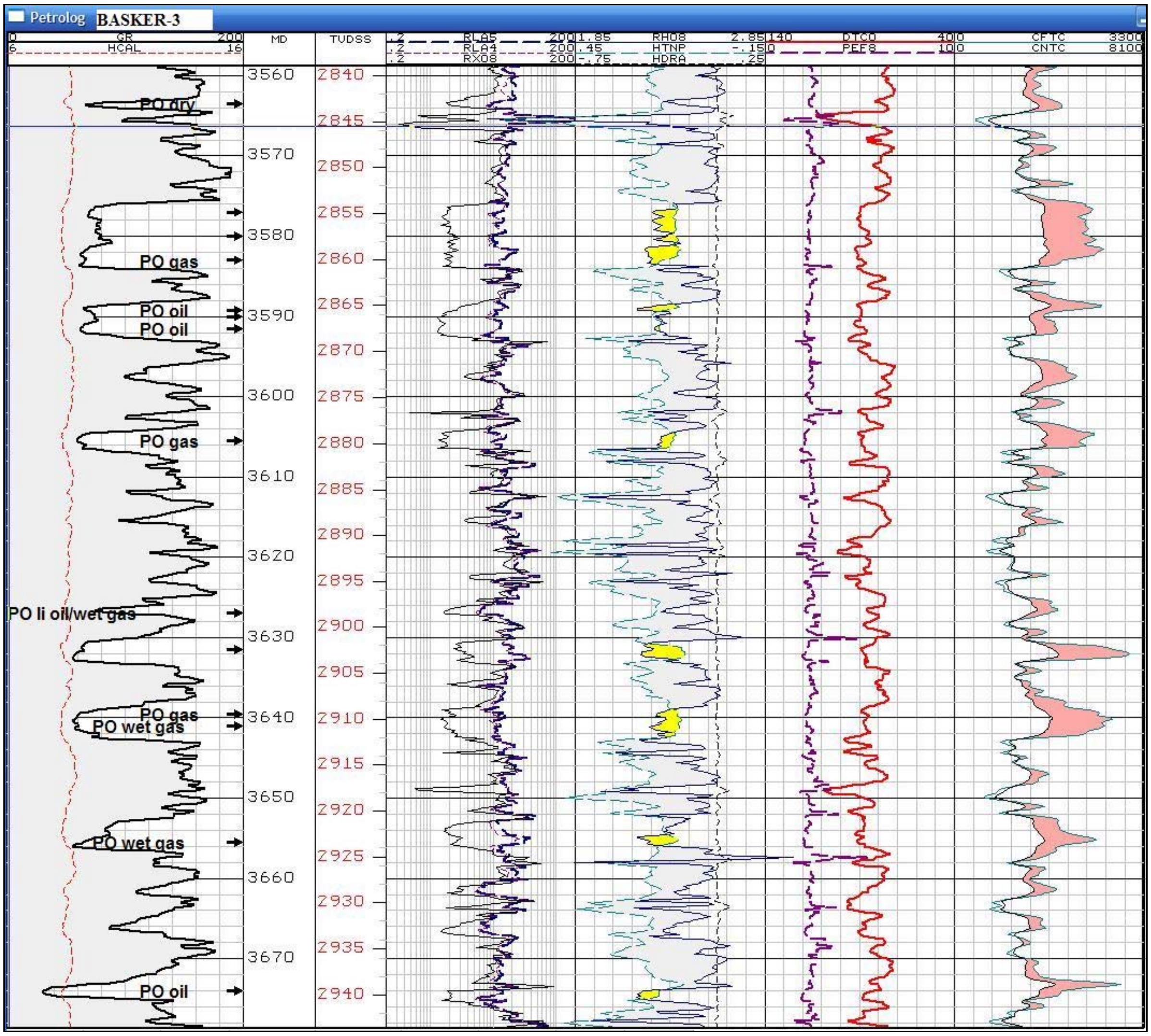

Figure 6.1 Basker-3 Hydrocarbon Type, example of methodology

Petrolog Model Selection

The deterministic Complex Lithology Model (CPX) was selected for the interpretation to compute Vsand, Vclay, Vdolomite, Vcoal, Vvolcanic, Porosity (PHIT and PHIE) and Water Saturation (SWT, SWE).

Complex Lithology

The Complex Lithology Model (CPX) was constructed to use a combination of D-N to compute Vsand, Vclay, Vdolomite, Vcoal, and Vvolcanic.

A colour composite of the Spectral GR displays the relative abundance of Thorium (Th) Uranium (U) Potassium (K), refer Figure 6.2, shows the mineral complexity throughout the section. Although the Th abundance is relatively constant, the K abundance is not uniform indicating changes in clay mineralogy. The high U concentrations indicate increases in organic matter.

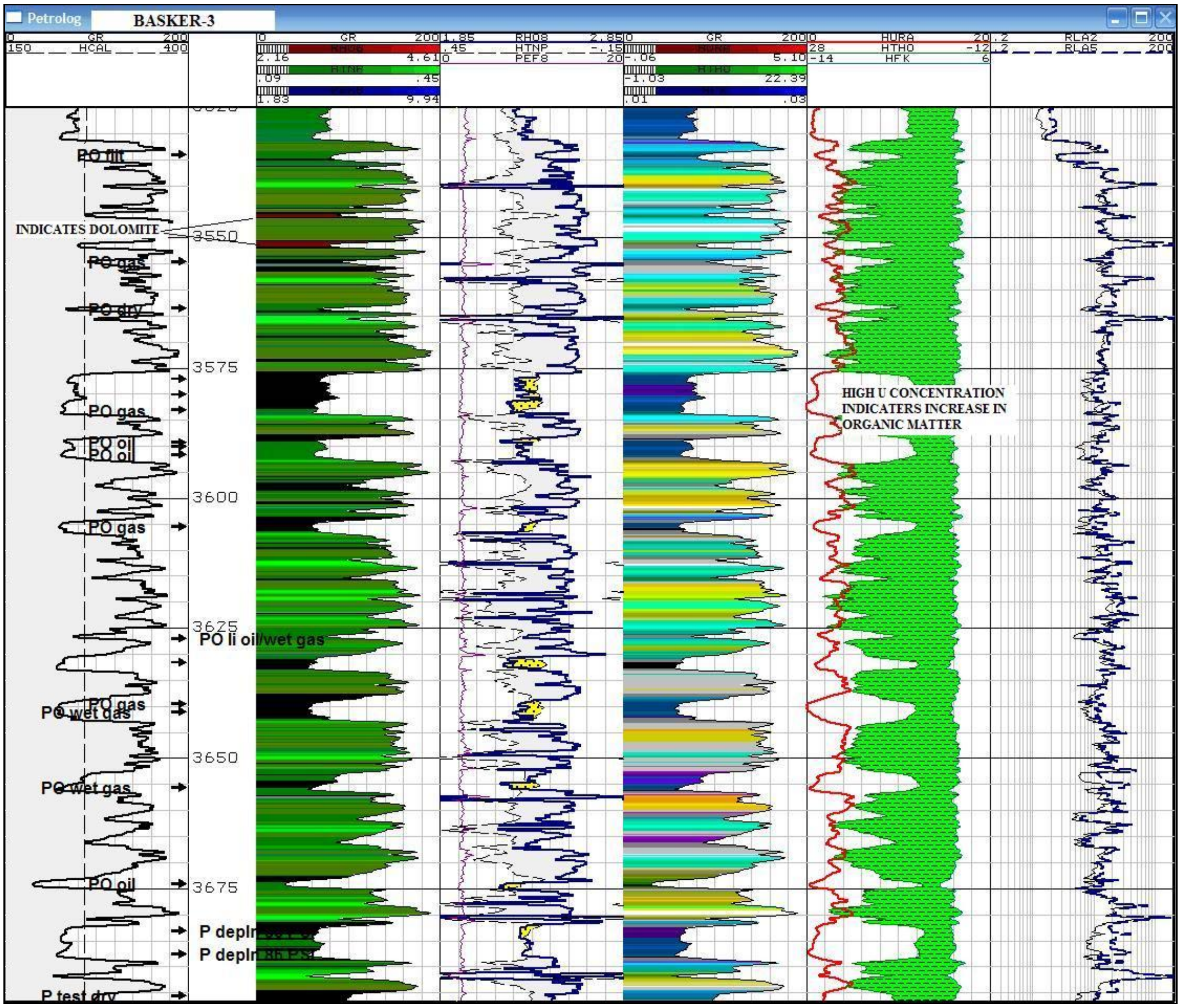

Figure 6.2 Basker-3 NGT Composite Plot

Porosity Determination

Total porosity (PHIT) was calculated using input logs D-N.
Effective porosity (PHIE) was calculated after Vcl determination.
PHIE = PHIT (1-Vcl)

RW Determination

In conventional log analysis, the calculation of hydrocarbon saturation assumes that the formation water salinity in the hydrocarbon zone is the same as that of the underlying water sands. The PHIT-RT crossplots across the water sands in Basker-3 indicate a water salinity of 15,000ppm NaCl equivalent i.e. Figure 6.4. It is considered that this value is inconsistent with salinity values for a near-shore fluvial depositional environment and use of this value would result in pessimistic hydrocarbon saturations.

However, it has been recognised in some regions within the offshore Gippsland Basin a period of meteoric water influx displaced the aquifer without flushing the emplaced hydrocarbons (Kuttan, Kulla and Neumann 1986), resulting in relatively fresh water aquifer underlying hydrocarbon reservoir systems.

As a consequence the assumption that the underlying aquifer is the same salinity as the associated hydrocarbon zones is not always correct. For the purpose of this interpretation a formation water salinity equivalent to 30,000ppm NaCl equivalent has been used to calculate hydrocarbon saturations (Figure 6.5 PHIT-RT crossplot) and 15,000ppm NaCl equivalent for the water zones. Analyses of water samples collected from the test separator during the extended production test support the use of these values.

To reduce the uncertainty of water salinity associated with the hydrocarbon zones, several MSCT samples were submitted for SCAL analysis, in particular capillary pressure measurements. At the time of writing this report the results were not available to verify input parameters and validate the computed hydrocarbon saturations.

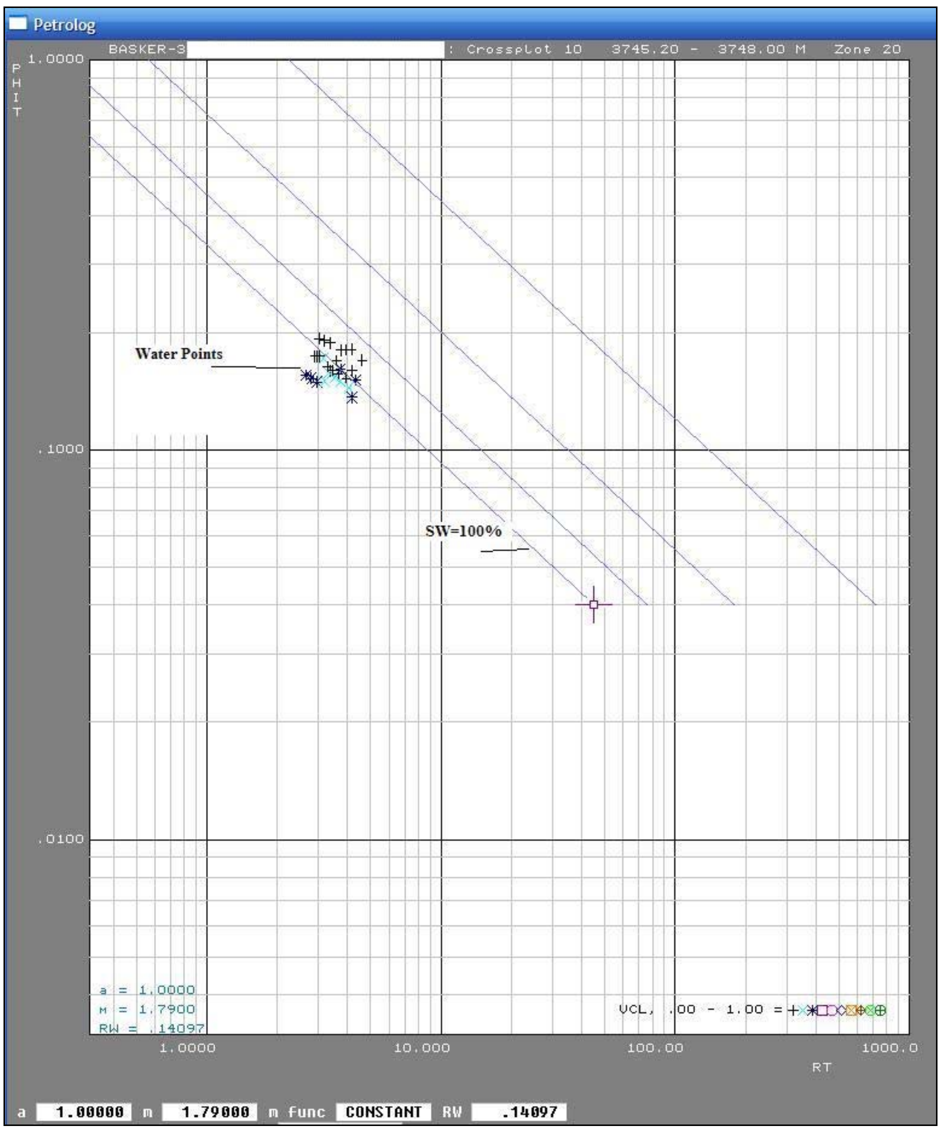

Figure 6.3 Basker-3 PHIT-RT crossplot water sand interval 745-3748mMD

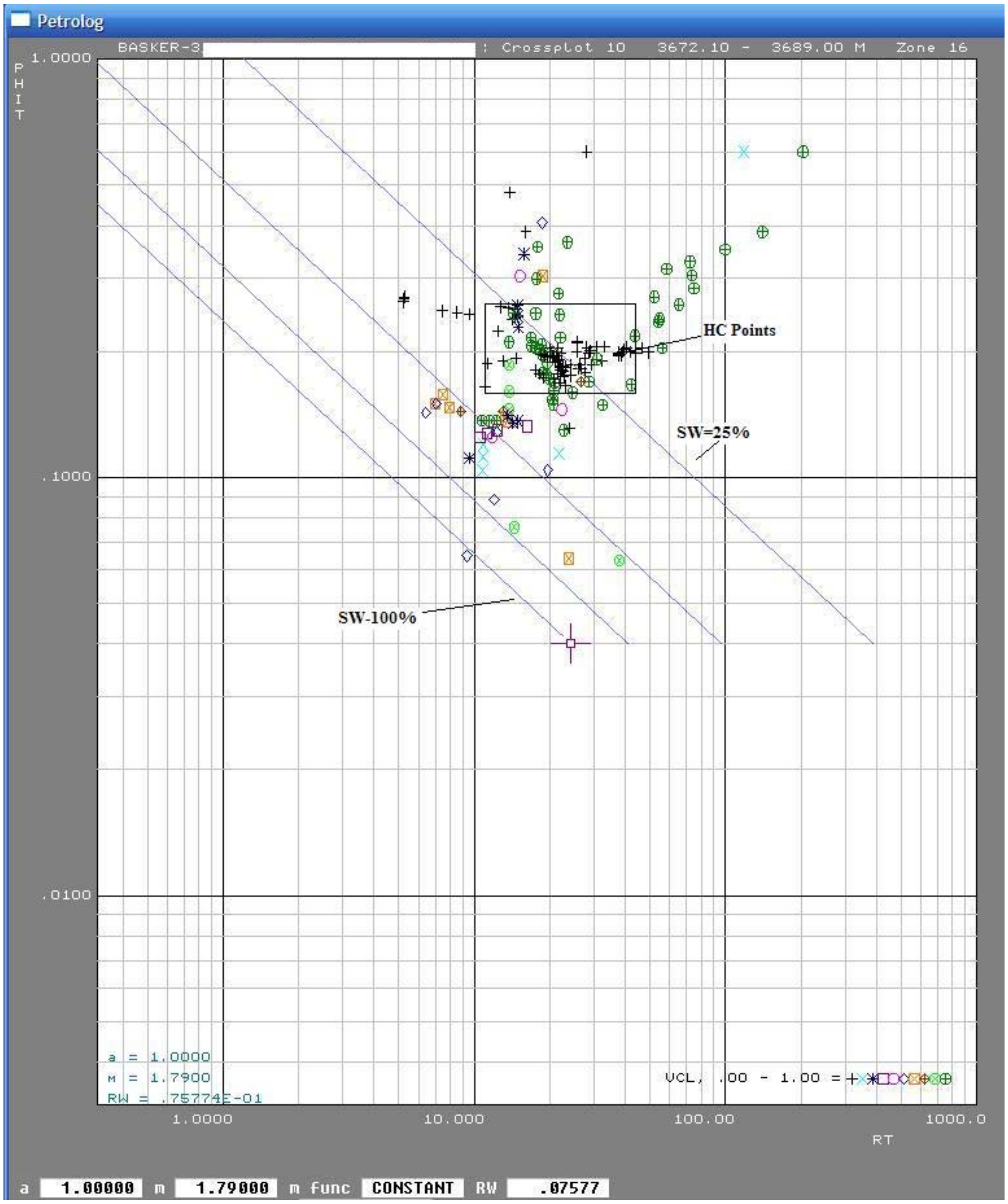

Figure 6.4 Basker-3 PHIT-RT crossplot Hydrocarbon Interval (Oil) 3672-3689mMD

Determination of Sw, a, m, n

For this interpretation the Simandoux equation was used to compute water saturation (Sw) and is defined as follows:

SWe = (a*Rw/(2.0*PHIE**m))*(SQRT((VCL/RCL)**2.0
+ 4.0*PHIE**m/(a*Rw*RT))-VCL/RCL)

In this interpretation a=1, m= 1.79 and n=1.83

The values a=1, m= 1.79 and n=1.83 were obtained from the Special Core Analysis Report Basker-1. A study of the Capillary Pressure measurements from Basker-1 conventional core was undertaken (refer Anzon Australia Ltd Report September 2005, Determination of Irreducible

Water Saturation using the Basker-1 Capillary Pressure Curves by Wong Shau Yee) where an average capillary pressure curve was converted to a height versus water saturation curve and used to calculate an average water saturation in Basker-1 Zone 2 (PcSw=24%).

A good match was achieved between the Log derived Sw in Basker-1 across Zone 2 and the calculated PcSw validated the use of these parameters in Basker-2. Preliminary SCAL results for the Basker-5 MSCT samples also support the use of these values. In Basker-5 the average m=1.77 and preliminary estimates for average n=1.83. The data for Shaly Sand equivalent m* and n* are not yet available.

Results

Table 6.2 lists the results of the interpretation. Based on cut-off parameters PHIE>=10%; Vclay<50% a total 16.6m net oil and 49.9m net gas was intersected by the well.

The PHIE cut-off for net reservoir and net pay determination was established using the core porosity-permeability relationship from Basker-5 MSCT SCAL. The cross-plot indicates that where core porosity @ overburden >10%, permeability (Kinf) @ overburden >1md (Figure 6.6). The SWE cut-off (<=75%) presented in Table 6.2 for net pay determination is based on basin knowledge.

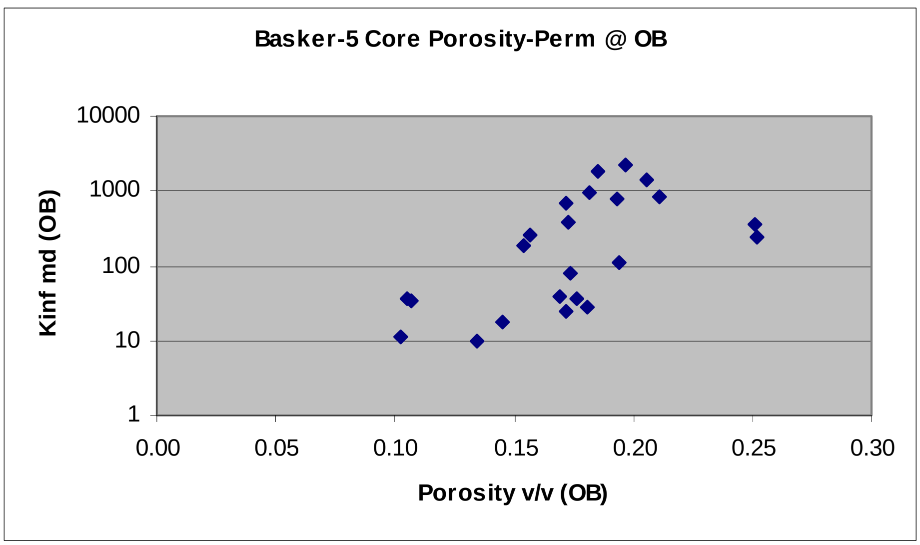

Figure 6.5 Basker-5 Core Porosity-Permeability Crossplot

The input parameters are presented in Table 6.3

Schlumberger PEX Log Suite-1 Run-1 information Table 6.4

Log Interpretation Plot 1:200 scale presented in Enclosure 4

Table 6.2 Basker-3 Reservoir Summation

top	base	top	base	top	base	reservoir					pay				
md	md	tvdkb	tvdkb	tvdss	tvdss	gross	net res	vcl	phie	swe	net pay	vcl	phie	swe	comments
						tvt	m tvt	%	%	%	mtvt	%	%	%	
3554.1	3554.7	2856.3	2856.8	2834.8	2835.3	0.53	0.50	2.4	16.7	44.0	0.50	2.4	16.7	44.0	MDT PO Gas @3554.5mMD
3562.9	3563.8	2864.0	2864.8	2842.5	2843.3	0.79	0.80	6.7	17.4	36.5	0.80	6.7	17.4	36.5	MDT PO Dry @ 3563.5mMD
3575.9	3583.9	2875.4	2882.4	2853.9	2860.9	6.99	7.00	0.2	19.8	32.6	6.92	0.2	19.8	32.6	MDT PO Gas @ 3580.0mMD
3588.1	3589.1	2864.3	2865.2	2842.8	2843.7	0.90	0.89	0.5	20.7	38.3	0.89	0.5	20.7	38.3	Z MDT PO Gas @ 3583.0mMD; GOC (LOGS) @ 3589mMD
3589.1	3593.5	2865.2	2868.3	2843.7	2846.8	3.10	3.05	3.0	24.5	44.8	3.05	3.0	24.5	44.8	MDT PO Oil @ 3591.5mMD
3604.0	3607.6	2899.7	2902.1	2878.2	2880.6	2.44	2.40	0.5	18.5	36.1	2.38	0.5	18.5	36.1	MDT PO Gas @ 3606.5mMD
3625.6	3627.0	2919.3	2920.0	2897.8	2898.5	0.68	0.70	8.5	18.2	45.7	0.70	8.5	18.2	45.7	MDT PO Li Oil/Wet Gas 3626.9mMD
3630.5	3633.1	2921.5	2925.5	2900.0	2904.0	4.03	2.60	3.36	21.74	24.35	2.60	3.36	21.74	24.35	Gas
3638.5	3643.0	2930.1	2934.1	2908.6	2912.6	4.00	4.00	0.3	19.8	35.3	3.79	0.3	19.8	35.3	MDT PO Gas @ 3639.5mMD & Wet Gas @ 3641.0mMD
3652.5	3656.0	2942.0	2945.5	2920.5	2924.0	3.50	3.40	4.3	19.5	26.6	3.33	4.3	19.5	26.6	MDT PO Wet Gas @ 3655.5mMD
3673.7	3675.4	2960.8	2962.2	2939.3	2940.7	1.38	1.40	4.6	23.4	30.1	1.40	4.6	23.4	30.1	MDT PO Oil @ 3674.0mMD
3681.7	3688.2	2967.8	2973.5	2946.3	2952.0	5.67	5.67	0.0	19.0	24.9	5.67	0.0	19.0	24.9	MDT P Depln @ 3683.0mMD & 3687.5mMD
3695.3	3695.7	2979.7	2980.0	2958.2	2958.5	0.35									MDT P Dry test @3695.5mMD & 3695.7mMD
3711.2	3717.0	2993.5	2998.5	2972.0	2977.0	4.98	5.00	1.2	20.2	44.8	5.00	1.1	20.2	44.3	MDT PO Gas @ 3712.5mMD & Gas/Oil @ 3716.5mMD; GOC @ 3717mMD
3717.0	3720.0	2998.5	3001.5	2977.0	2980.0	3.00	1.75	0.3	19.7	56.4	1.75	0.3	19.7	56.4	MDT PO Filtrate
3733.0	3733.7	3012.6	3013.2	2991.1	2991.7	0.61		0.0	20.0	100.0					Water Saturated, laminated sand unit, RT < 5ohmm,
3734.1	3734.6	3013.5	3014.0	2992.0	2992.5	0.44		0.0	17.8	100.0					
3735.0	3735.7	3014.3	3014.9	2992.8	2993.4	0.61		0.2	20.2	100.0					
3738.9	3739.3	3017.7	3018.1	2996.2	2996.6	0.35		20.5	28.3	100.0					
3745.8	3748.0	3023.8	3025.7	3002.3	3004.2	1.92		0.0	18.2	100.0					Water Saturated
3764.0	3767.8	3039.7	3043.0	3018.2	3021.5	3.33	3.30	1.1	22.3	18.3	3.30	1.1	22.3	18.3	MDT P Depln @ 3765.5mMD
3786.1	3791.2	3059.1	3063.5	3037.6	3042.0	4.46	4.00	1.1	22.9	19.0	4.00	1.1	22.9	19.0	MDT P Depln @ 3787.0mMD
3795.7	3798.2	3067.5	3069.6	3046.0	3048.1	2.19		10.5	18.4	33.1					MDT DRY test
3808.7	3810.1	3078.8	3080.0	3057.3	3058.5	1.22		6.1	17.3	37.6					Logs indicate possible gas,
3814.4	3815.4	3083.8	3084.7	3062.3	3063.2	0.87		0.8	20.4	34.8					laminated sand
3819.7	3822.3	3088.4	3090.7	3066.9	3069.2	2.28		10.8	14.4	61.2					MDT PO Filtrate
3831.4	3832.9	3098.7	3100.0	3077.2	3078.5	1.32		6.7	18.6	19.2					Logs indicate possible gas, laminated sand
3833.6	3833.9	3100.6	3100.9	3079.1	3079.4	0.26		8.9	13.5	47.2					
3834.0	3834.3	3100.9	3101.2	3079.4	3079.7	0.26		11.6	14.3	45.2					
3835.4	3835.7	3102.2	3102.4	3080.7	3080.9	0.26		14.5	16.9	32.7					
3835.9	3836.1	3102.6	3102.8	3081.1	3081.3	0.17		43.2	11.6	41.7					
3852.5	3853.0	3117.1	3117.6	3095.6	3096.1	0.44		0.0	16.6	100.0					Water Saturated,
3854.5	3855.1	3118.9	3119.4	3097.4	3097.9	0.53		20.3	13.4	100.0					
3860.8	3863.0	3124.3	3126.2	3102.8	3104.7	1.90	1.90	0.4	17.6	32.8	1.90	0.4	17.6	32.8	MDT PO GAS @ 3861.5mMD; GOC @ 3863.0mMD
3863.0	3866.5	3126.2	3130.0	3104.7	3108.5	3.00	2.97	0.0	18.2	33.7	2.97	0.0	18.2	33.7	MDT PO OIL @ 3864.5mMD, 2x450cc sample recovered
3876.9	3877.4	3138.5	3138.9	3117.0	3117.4	0.44		0.0	14.4	44.9					Thin Sand, beyond tool resolution
3883.5	3885.1	3144.2	3145.6	3122.7	3124.1	1.40		8.1	18.3	100.0					Water Saturated
3897.6	3899.0	3156.6	3157.8	3135.1	3136.3	1.22	0.70	14.5	15.4	51.8	0.70	14.5	15.4	51.8	MDT PO Tight
3903.2	3904.8	3161.5	3162.9	3140.0	3141.4	1.40	1.05	2.0	17.4	54.9	1.05	0.0	18.3	51.2	MDT PO Oil @ 3904.2mMD (flow after 25 mins)
3925.8	3927.3	3181.2	3182.6	3159.7	3161.1	1.31	1.31	6.0	18.8	28.9	1.31	6.0	18.8	28.9	MDT PO @ 3926.7mMD; 45psi drawdown, Oil+Gas flowing
3940.5	3941.5	3194.0	3195.0	3172.5	3173.5	0.96	0.90	3.0	16.2	30.0	0.90	3.0	16.2	30.0	MDT PO Gas
3942.8	3943.0	3196.0	3196.3	3174.5	3174.8	0.27		32.2	12.3	19.3					
3943.1	3943.9	3196.4	3197.1	3174.9	3175.6	0.70	0.70	8.6	13.9	34.7	0.70	8.6	13.9	34.7	Gas
3944.1	3944.2	3197.2	3197.5	3175.7	3176.0	0.27		9.4	13.3	28.7					
3945.0	3945.2	3198.0	3198.5	3176.5	3177.0	0.48		18.9	13.6	31.9					
3945.3	3945.9	3198.3	3199.2	3176.8	3177.7	0.92	0.50	3.0	19.1	30.8	0.50	3.0	19.1	30.8	Gas
3948.8	3950.0	3201.3	3202.4	3179.8	3180.9	1.04	0.80	6.4	16.9	31.2	0.80	6.4	16.9	31.2	Gas
3950.4	3951.1	3202.7	3203.3	3181.2	3181.8	0.34	0.34	10.8	14.4	42.7	0.34	10.8	14.4	42.7	Gas
3963.6	3966.5	3214.3	3216.8	3192.8	3195.3	2.54	2.50	0.3	17.2	23.7	2.50	0.3	17.2	23.7	Gas
3972.5	3973.3	3222.0	3222.7	3200.5	3201.2	0.70	0.70	1.2	15.1	38.9	0.70	1.2	15.1	38.9	Gas
3976.1	3977.0	3225.0	3226.0	3203.5	3204.5	0.97	0.80	2.0	19.5	31.3	0.80	2.0	19.5	31.3	Gas
3984.0	3986.3	3232.1	3234.1	3210.6	3212.6	2.01	1.90	2.8	15.7	38.7	1.90	2.8	15.7	38.7	Gas
3990.4	3992.7	3237.7	3239.7	3216.2	3218.2	2.01	1.90	0.2	16.0	33.1	1.90	0.2	16.0	33.1	Gas
3995.6	3995.9	3242.2	3242.5	3220.7	3221.0	0.26		0.5	15.1	76.8					Water Saturated
3996.2	3997.4	3242.7	3243.8	3221.2	3222.3	1.05		0.0	11.9	76.5					Water Saturated
3997.5	3998.0	3243.9	3244.3	3222.4	3222.8	0.43		0.0	12.8	84.2					Water Saturated
4005.8	4006.0	3251.1	3251.3	3229.6	3229.8	0.17		0.0	13.9	94.3					Water Saturated
4008.5	4009.5	3253.5	3254.5	3232.0	3233.0	1.02	1.00	3.4	19.1	41.2	0.81	3.4	19.1	41.2	Gas
TOTAL OIL							16.59				16.59				
TOTAL GAS							49.84				49.27				
Volcanics															
4023.2	4026.5	3266.32	3269.2	3244.8	3247.7	2.9	2.9	0.57	16.05	35.94	2.9	0.57	16.05	35.94	Gas

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Table 6.3 Analysis Parameters (Zones of Interest)

Basker-3		
Input Parameter		**Value**
Analysis Interval (mMD)		3510-4126mMD
Bit Size (inches)		8.5
Method	SW calculation	Simandoux
	Vclay calculation	N-D
	Porosity calculation	N-D
Formation Water Salinity	Rw HC Zone (salinity ppm NaCl equivalent)	30000*
	Rw water Zone (salinity ppm NaCl equivalent)	15000**
Electrical Properties	a	1
	m	1.79***
	n	1.83***
Fluid Properties	RHOH (g/cc)	0.2
	RHOF (g/cc)	1.03
	RHOMA (g/cc)	2.65
Clay Parameters	Rclay (ohm-m)	2
	PHIN clay (v/v)	0.27
	RHOB clay (g/cc)	2.4
	RHOB Dry Clay (g/cc)	2.77
	DT clay (usec/ft)	100
Special Minerals	RHOB dolomite (g/cc)	2.6
	RHOB volcanic (g/cc)	2.92
	RHOB coal (g/cc)	2
Reservoir Summation Cut-offs	VClay (v/v)	<=0.5
	PHIE (v/v)	>=0.1
	SWE (v/v)	N/A****
Temperature	Max Recorded Temp Deg C	113 @ 4120m
* Rw HC Zone	Initially estimated, subsequent water production from Basker Field HC producing zones indicating during extended production test, Fm water salinity measurements range from 30-35Kppm.	
**Rw Water Zone	crossplots (refer text Figure 4)	
*** m & n	Basker-1 SCAL, Basker-5 SCAL	
****RESERVOIR SUMMATION CUT-OFF SWE N/A	Basker-1, Basker-5 Por-Perm Relationship CorePHI>10% has core Kinf >1MD.	

Table 6.4 Schlumberger PEX Log Suite-1 Run1 Main Pass

~VERSION INFORMATION

VERS.	2.0 :	CWLS Log ASCII Standard - VERSION 2.0
WRAP.	NO :	One Line per depth step
PROD.	Schlumberger :	LAS Producer
PROG.	DLIS to ASCII 14C0-302	LAS Program name and version
CREA.	2006/04/28 12:52 :	LAS Creation date {YYYY/MM/DD hh:mm}
DLIS_CREA. :	2006-Apr-28 12:43	DLIS Creation date and time {YYYY-MMM-DD hh:mm}
SOURCE.	FMI_DSI_HRLA_TLD_018PUP.DLIS	DLIS File Name
FILE-ID.	FMI_DSI_HRLA_TLD_018PUP :	File Identification Number

~WELL INFORMATION

MNEM.UNIT	DATA	DESCRIPTION
STRT .M	4120.7436 :	START DEPTH
STOP .M	3511.6008 :	STOP DEPTH
STEP .M	-0.1524 :	STEP
NULL .	-999.25 :	NULL VALUE
COMP .	Anzon	COMPANY
WELL .	Basker 3	WELL
FLD .	Basker	FIELD
LOC .	VIC/L26	LOCATION
CNTY .	Ocean Patriot	COUNTY
STAT .	Victoria	STATE
CTRY .	Australia	COUNTRY
API .		API NUMBER
UWI .		UNIQUE WELL ID
DATE .	28-Apr-2006	LOG DATE {DD-MMM-YYYY}
SRVC .	Schlumberger	SERVICE COMPANY
LATI .DEG	38 17' 58.97" S	LATITUDE
LONG .DEG	148 42' 24.94" E	:LONGITUDE
GDAT .		GeoDetic Datum

~PARAMETER INFORMATION

MNEM.UNIT	VALUE	DESCRIPTION
RUN .	1 :	RUN NUMBER
PDAT .	Mean Sea Level :	Permanent Datum
EPD .M	0.000000 :	Elevation of Permanent Datum above Mean Sea Level
EPD .M	0.000000 :	Elevation of tool zero above Mean Sea Level
LMF .	Drill Floor :	Logging Measured From (Name of Logging Elevation Reference)
APD .M	21.500000 :	Elevation of Depth Reference (LMF) above Permanent Datum

~CURVE INFORMATION

MNEM.UNIT API CODE	DESCRIPTION
DEPT .M	DEPTH (BOREHOLE) {F10.4}
ANOR .M/S2	Acceleration Computed Norm {F13.4}
C1 .IN	Caliper 1 {F13.4}
C2 .IN	Caliper 2 {F13.4}
CDF .LBF	Calibrated Downhole Force {F13.4}
CFTC .HZ	Corrected Far Thermal Counting Rate {F13.4}
CNTC .HZ	Corrected Near Thermal Counting Rate {F13.4}
DEVI .DEG	Hole Deviation {F13.4}
DSO8 .IN	HRDD High Resolution Density Standoff {F13.4}
DT1 .US/F	Delta-T Shear - Lower Dipole {F13.4}
DT2 .US/F	Delta-T Shear - Upper Dipole {F13.4}
DT4P .US/F	Delta-T Compressional - Monopole P&S {F13.4}
DT4S .US/F	Delta-T Shear - Monopole P&S {F13.4}
DTCO .US/F	Delta-T Compressional {F13.4}
DTSM .US/F	Delta-T Shear {F13.4}
EHGR .GAPI	HiRes Gamma-Ray {F13.4}
FNOR .A/M	Magnetic Field Computed Norm {F13.4}
GR .GAPI	Gamma-Ray {F13.4}
HCAL .IN	HRCC Cal. Caliper {F13.4}
HCGR .GAPI	HNGS Computed Gamma Ray {F13.4}
HDAR .IN	Hole Diameter from Area {F13.4}
HDRA .G/C3	HRDD Density Correction {F13.4}
HFK .V/V	HNGS Formation Potassium Concentration {F13.4}
HSGR .GAPI	HNGS Standard Gamma Ray {F13.4}
HTHO .PPM	HNGS Formation Thorium Concentration {F13.4}
HTNP .V/V	HiRes Thermal Neutron Porosity {F13.4}
HURA .PPM	HNGS Formation Uranium Concentration {F13.4}
PEF8 .	HRDD High Resolution Formation Photoelectric Factor {F13.4}
PR .	Poisson's Ratio {F13.4}
RB .DEG	Relative Bearing {F13.4}
RHO8 .G/C3	HRDD High Resolution Formation Density {F13.4}
RLA1 .OHMM	HRLT Borehole Corrected Resistivity 1 {F13.4}
RLA2 .OHMM	HRLT Borehole Corrected Resistivity 2 {F13.4}
RLA3 .OHMM	HRLT Borehole Corrected Resistivity 3 {F13.4}
RLA4 .OHMM	HRLT Borehole Corrected Resistivity 4 {F13.4}
RLA5 .OHMM	HRLT Borehole Corrected Resistivity 5 {F13.4}
RM_HRLT.OHMM	HRLT Mud Resistivity {F13.4}
RSO8 .IN	MCFL High Resolution Resistivity Standoff {F13.4}
RXO8 .OHMM	MCFL High Resolution Invaded Zone Resistivity {F13.4}
SP .MV	SP Shifted {F13.4}
TENS .LBF	Cable Tension {F13.4}
VPVS .	Compressional to Shear Velosity Ratio {F13.4}

References

Kuttan, K. Kulla, J.B. & Neumann, R.G.: “Freshwater Influx in the Gippsland Basin: Impact on Formation Evaluation, Hydrocarbon Volumes, and Hydrocarbon Migration.” The APEA Journal 1986.

Basker-3 Well Completion Report, Volume 1, Basic Data, January 2007 Anzon Australia Limited

7. MDT PRESSURE INTERPRETATION, FLUID CONTACTS AND SAMPLING

MDT Pressure Data

A total of 43 MDT stations were picked from well logs and tested. A few of the tests were repeated. The pressure versus depth plot is shown in Figure 7.1 below.

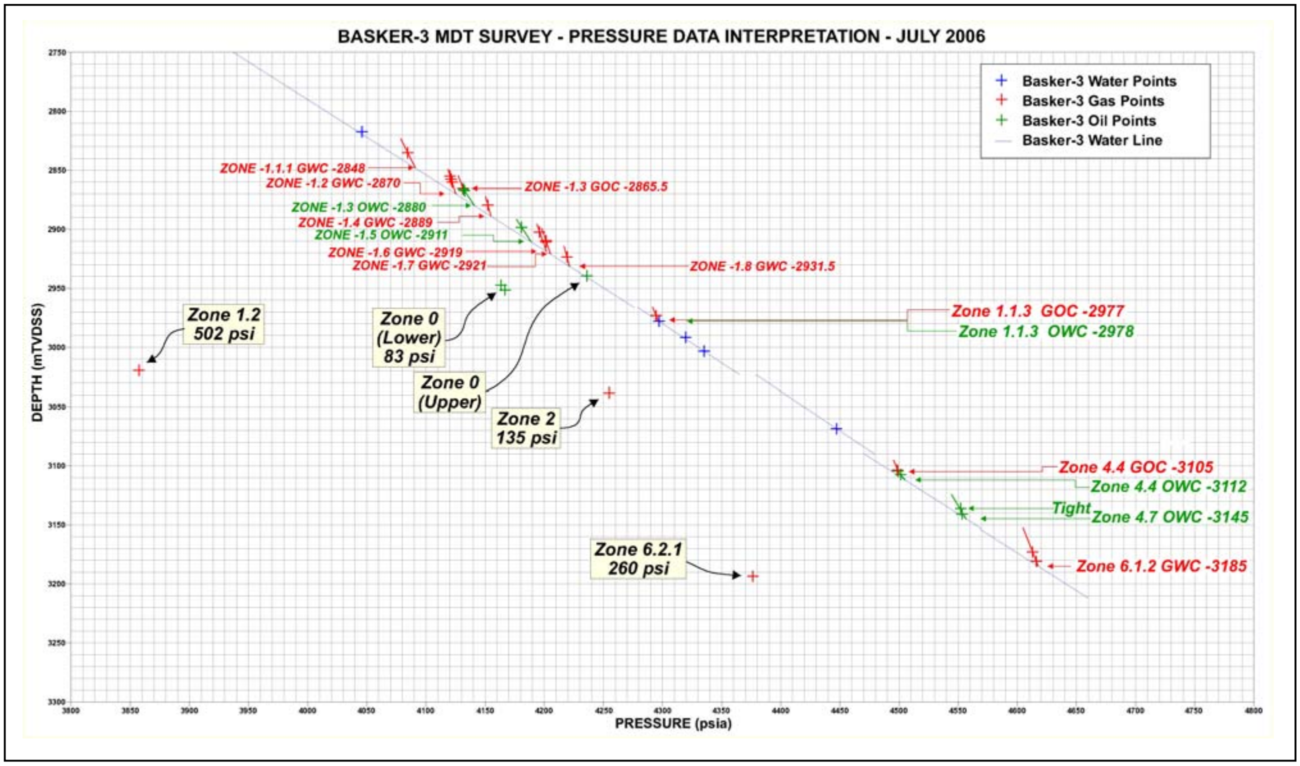

Figure 7.1 Basker-3 MDT Pressure vs Depth Plot

Basker-3 intersected a large number of sands in Zone -1 not previously seen in the other wells. The sands in Zone 0, 1.2, 2 and 6.2 were depleted as was seen also in Basker-5. The results are discussed in detail below.

(1) Water Line

There were only four pre-tests in apparently clean water sands. The trend line through the top three points, covering Zone -1 to Zone 2, virtually coincides with the water lines in Basker-2 and -5. The water gradient is 1.51 psi/m (0.46 psi/ft) which is slightly higher than the normal gradient for formation water. The aquifer pressure depletion is ~25 to 40 psi as seen in the other two wells.

(2) Pressure Depletion in Oil and Gas Sands

All of the sands in Zone -1 were undepleted. Zone 0 is oil-bearing in both Basker-3 and -5. It comprises two sand units, the upper unit being 2-3 metres thick and the lower unit about 7-8 metres thick. Both units are of good quality. Zone 0 upper was depleted by ~90 psi in Basker-5, but was undepleted in Basker-3. Zone 0 lower was depleted by ~56 psi in Basker-5 and by ~83 psi in Basker-3. Some discontinuity probably exists in Zone 0 upper between the two wells. The gas sands in Zone 1.2 were depleted by about the same amount in Basker-3 and -5.

Zone 2 (gas) exists as two sand units in Basker-5 (and in Basker-1 and -2 also), but only the lower unit was well intersected in Basker-3. The upper unit was either absent or poorly developed. Zone 2 lower was depleted by 135 psi in Basker-3 and by 102 psi in Basker-5. The sands in Zone 6.1.2 were very well developed in Basker-5 but appear as a few isolated thin and shaly sands in Basker-3. However, the pressures in these sands lie on a gas gradient and intersect the water line at 3185 mTVDSS which is identical to the GWC interpreted similarly in Basker-5. Only one Zone 6.2 sand, probably the lower unit, was intersected in Basker-3. This sand was depleted by ~260 psi compared to ~208 psi in Basker-5.

(3) Fluid Contacts

Most of the hydrocarbon-bearing sands have only one single pressure point. The identification of hydrocarbon type from the well logs or MDT is aided by the content of the pump out. Where two or more pressure points are available, the gradients are generally within the range 1.0±0.2 psi/m for oil and 0.3-0.4 psi/m for gas.

The small scale plot shown in Figure 7.1 does not allow any fluid contacts to be determined accurately. Certain parts of the plot were zoomed in on a large scale and the fluid contacts were read off the intersection of the various gradients where possible. Some inaccuracy is also introduced due to the uncertainty of the position of the water line. The following fluid contacts determined from the pressure versus depth plot for Basker-5 should be regarded as approximate estimates only.

Table 7.1 Pressure vs Depth contacts from Basker-3

Zone	Contact	Depth (mTVDSS)
-1.1	GWC	2848
-1.2	GWC	2870
-1.3	GOC	2865.5
-1.3	OWC	2880
-1.4	GWC	2889
-1.5	OWC	2911
-1.6	GWC	2919
-1,7	GWC	2921
-1.8	GWC	2931.5
1.1.3	GOC	2977
1.1.3	OWC	2978
4.4	GOC	3105
4.4	OWC	3112
4.7	OWC	3145
6.1.2	GWC	3185

(4) Sampling

The following MDT oil samples were recovered from Basker-3.

Table 7.2 MDT Oil Samples Recovered from Basker-3

Depth (mRT)	Depth (mTVDSS)	Zone	Samples Recovered
3674.0	2939.7	0	2 x 450 cc
3864.5	3106.2	4.4	2 x 450 cc

8. PVT STUDIES

PVT studies were performed on each of the Zone 0 and Zone 4.4 samples. The results are summarised in the table below.

Table 8.1 Samples from Zone 0 and Zone 4.4

		Zone 0	Zone 4.4
Initial reservoir pressure	psig	4220	4485
Reservoir temperature, T_R	ºF	230	239
Bubble point pressure, P_b	psig	4080	4220
Gas expansion factor	m3/m3	230.5	235.3
Initial solution GOR	scf/stb	1201	1022
Oil FVF @ P_b	rb/stb	1.689	1.605
Fluid density at P_b and T_R	g/cc	0.610	0.627
Stock tank oil gravity	ºAPI	42.9	39.8
CO_2	Mol %	6.58	3.88
N_2	Mol %	0.24	0.24