CBM 107-001

WELL COMPLETION REPORT

Basic

EP 107

Northern Territory

4th – 23rd February 2010

Central Petroleum Limited

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1.0 Introduction and Summary

CBM 107-001 was drilled by Central Petroleum Limited in Northern Territory Exploration Permit 107.

Wallis Rig No 39 was mobilized to the CBM 107-001 after the drilling of CBM 93-004, located approximately 35km SW of the CBM 93-001 location. CBM 107-001 was spudded on 4th February 2010 and reached Total Depth of 1250.9m on 23rd February 2010.

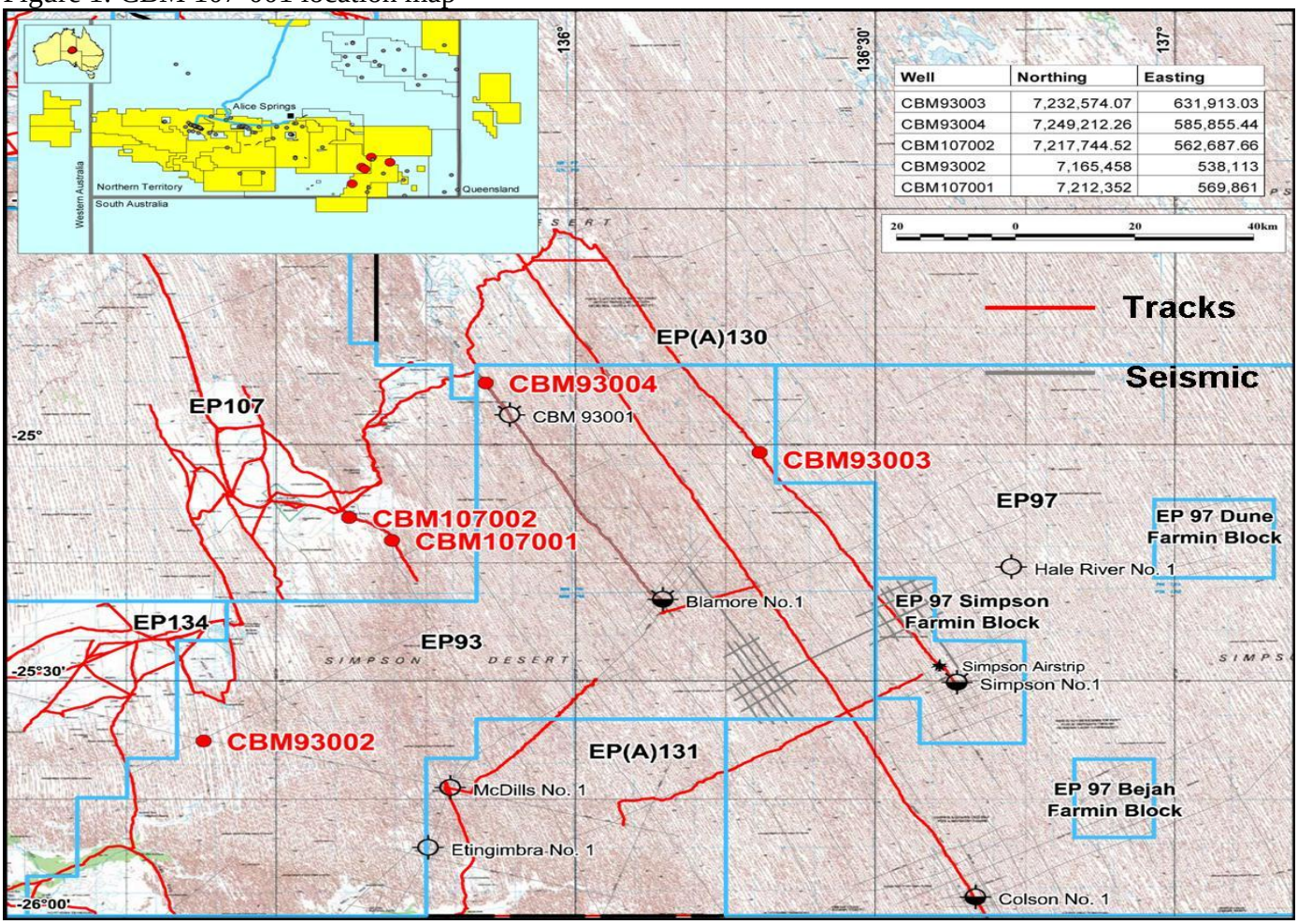
The well was drilled to investigate the potential for CBM (Coal Bed Methane) and UCG (Underground Coal Gasification) gas production from Permian Purni Formation coal seams.

CBM 107-001 intersected a number of thick coals in the Purni Formation with a net cumulative coal thickness of 119m, for coal seams greater than 2m thickness; with a total 153m thickness for all coals including thin beds (Al Maynard & Associates, 2009).

Ninety-nine 6m length HQ (63.5mm diameter) cores were cut using a continuous wireline retrievable coring system. Two drill stem tests conducted to assess coal permeability.

The well was plugged and abandoned at total depth. The rig was released on the 25th February 2010.

Figure 1: CBM 107-001 location map



2.0 General Data

Table 1: CBM 107-001 Well Index Sheet

WELL NAME: CBM 107-001 **OPERATOR:** Central Petroleum Limited		**CLASSIFICATION**: Exploration
Location: Latitude: 25° 12' 21.18" S Longitude:135° 41' 36.41 "E GDA 94 Zone 53	**Rig Details**: Rig Name: Wallis Rig D39 Contractor: Wallis Drilling Rig Type: Sandvick DE 880	**Dates**: Spud Date: 4th Feb 2010 TD Date: 23rd Feb 2010 Rig Released: 25th Feb 2010
Basin: Pedirka Sub-Basin **Field:** Wildcat Well **Permit:** EP 107, Northern Territory	**Depths**: Surface Elevation (AHD): 164.0m Rig Datum (AHD): KB: 165.3m Total Depth: 1250.9m	**Status**: Plugged and Abandoned
Casing/Liner Details: Size Depth 10" 4m 7" 245.1m 4½" liner 694m	**Mud Details**: Mud Type 8½ / 12 ¼ " hole section: Gel spud mud 8 ½" hole section: KCl-Polymer 6⅛" hole section: KCl-Polymer 4" hole section: KCl-Polymer 3¾" hole section: KCl CR650	**Trajectory**: Vertical

Coring Details: 99 (6m) HQ Cores were cut using a wireline retrievable system over the interval 696.7-1250.9ml	**Sidewall Cores**: Shot Recovered None	**Cuttings**: Interval Sample Rate 4m –697m 6m 697 - 1250.9m (Core)

FORMATION	RT (m)	MSL (m)	Isopach (m)	TWT (msec)	Comments
Eyre Formation	1.3	+164	+48	-	Quaternary
Winton Formation	50	+115.3	163	-	Tertiary
MacKunda Formation	213	-47.7	120	-	Cretaceous
Oodnadatta Fm.	333	-167.7	60	-	
Bulldog Shale	393	-227.7	49	-	
Cadna Owie Fm.	442	-276.7	41	-	
Murta Member	NP	-		-	
Algebuckina	483	-317.7	209	-	Early Cretaceous
Sandstone	708	-542.7	558+	-	L-M Jurassic
Purni Formation	1250.9	-1085.6		-	Permian
Total Depth					

LOGGING

Date	Depth(m)		Description
	From	To	
24-2-2010	1253.5m	5m	Dual Laterolog-Sonic-Density-Neutron , BHT 95° (9.5hrs)
24-2-2010	164	1245	SGS Checkshot survey, 31 levels, Weatherford wireline

Well Testing

DST#	Date	Method	Interval	Description
1	12/2/10	Injectivity	773.6-779.9m	8 hour injection,2.78l/min, 16 hour falloff
2	14/2/10	Injectivity	831.4-838.9m	8 hour injection,1.35-3.4l/min, 16 hour falloff

Well Name:	CBM 107-001
Well Classification:	Wildcat
Interest Holders:	Central Petroleum Limited (80%) Petroleum Exploration Australia (20%)
Petroleum License:	EP 107, Northern Territory
Location:	Latitude 25° 12’ 21.18″ S Longitude 135° 41’ 36.41” E Australian Map Grid Zone 53 MGA 94
Ground Level (GL):	164.0m
Kelly Bushing (KB):	165.3m
Total Depth:	1250.9m (driller’s)
Drilling Contractor:	Wallis Drilling
Drilling Rig:	Wallis Rig No. 39
Contractors:	
Drilling Fluids:	RMN Drilling Fluids
Coring:	Wallis Drilling
Mud Logging:	Weatherford
Wireline Logging:	Weatherford
Cementing:	Viking
Earth Works:	Crown Point Pastoral
DST Testing:	Weatherford
Spud Date:	4th February 2010
Total Depth Reached:	23rd February 2010
Rig Released:	25th February 2010
Well Status:	Plugged and Abandoned

3.0 Drilling

3.1 Summary of Drilling and Related Operations

Wallis Rig 39 was moved onto the CBM 107-001 location on the 1st February 2010.

8½x12¼" Hole section and 10" conductor

The hole was spudded at 02:00 Hours on the 4th February 2010 with an 8½" bit and drilled to 23.4mRT. The hole was then opened to 12¼" to 4m where hard rock was encountered and 10" conductor pipe was then run and cemented at 4m.

8½" Hole section

The 8½" surface hole was drilled was then drilled with gel and KCl polymer to 248.3m and a wiper trip was conducted and a hi vis pill was then pumped and the drill string pulled out to run 7" casing. The casing was then run to 245.1m and cemented. The BOP and flowline were then installed in preparation for the next section.

Drilling 6⅛" Hole

Drilling of the 6⅛" hole commenced on 6 February 2010, using a tricone bit to drill shoe track and to 249.7m. An FIT was then conducted to 100psi with 8.5ppg mud. Drilling then continued to 696.7m and the bit was pulled out to run 4½" casing.

4½" casing and 3¾" Hole section

The 4½" casing was set and cemented at 694m. After nippling up the BOP, a HQ coring string was run in the hole. The core barrel became stuck due to scale and cement dropping on top of the core barrel and stopping circulation. The string had to be pulled in order to remove the core barrel. New hole was drilled to 698.9m without a core barrel. An LOT was then performed with 8.7ppg mud. Leak off occurred at 340psi, giving 9.2ppg emw.

Coring then proceeded to 780m, whereupon sufficient coal had been intersected to warrant a Drill Stem Test. DST#1 was conducted as an open hole injectivity/falloff test over the interval 773.6-780m. The DST was then completed and upon pulling the test assembly, the Wireline came free at anchor point. This was then pulled out with the wireline, plastic tubing and core assembly and the Test assembly was recovered and downloaded.

A new bit was then made up and run in the hole to continue coring. Coring proceeded to 839.9m and DST#2 was run. This was another injectivity/falloff test over the interval 831.4-838.9m.

Coring continued to 905.9m to 942m and then the hole was circulated clean and a BOP test was conducted. Coring then continued to 965m and the string was pulled out for a bit change due to poor ROP.

Coring and core retrieval then continued to 1250.9m. The hole was then circulated out and the drill string pulled for final wireline logs.

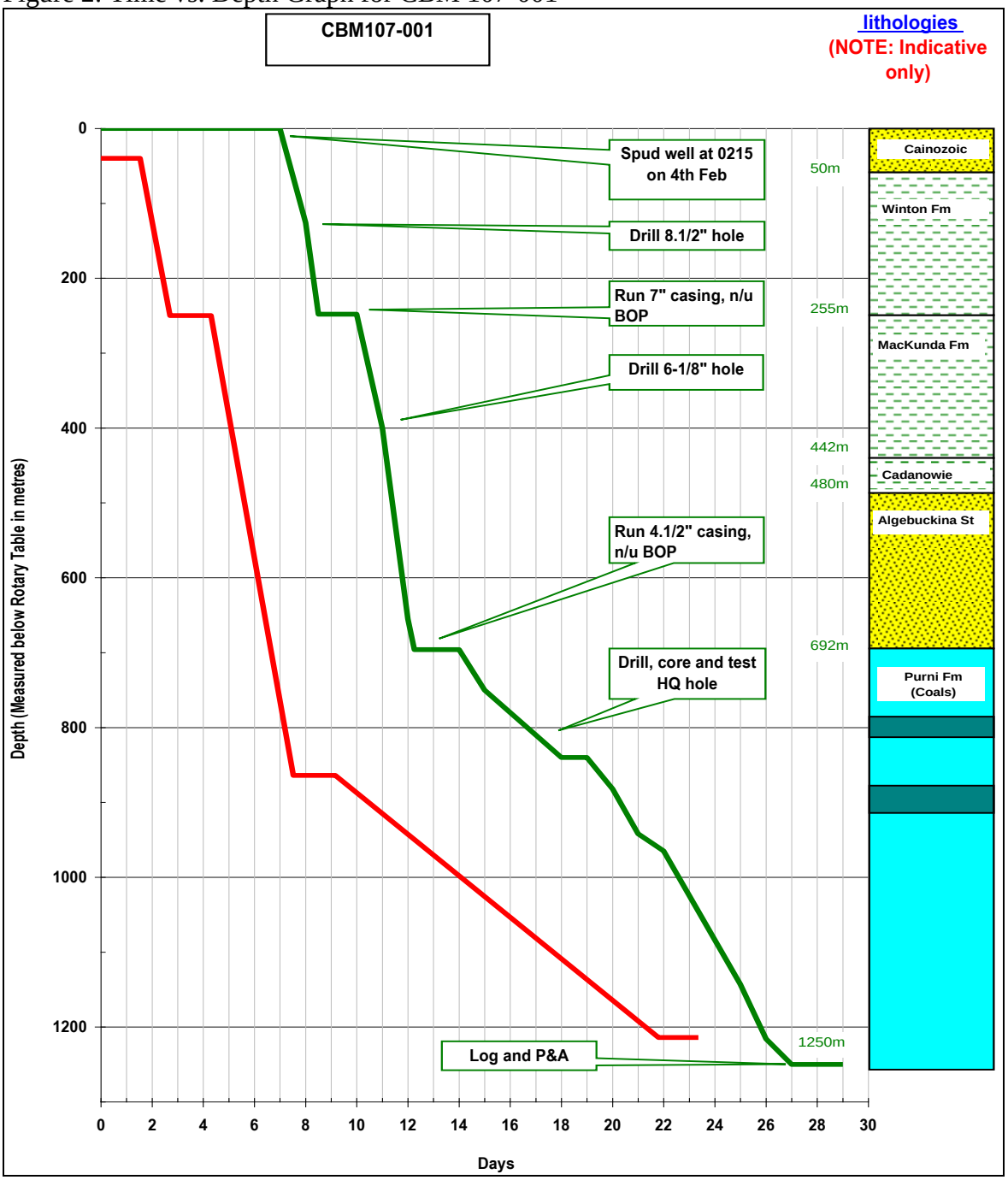
Wireline Logging and Well abandonment

Wireline logging commenced on the 23rd February 2010 and was completed in 15 hours (two logging runs).

Cement plugs were then set from 810-840m, across the casing shoe from 660-720 and at surface to 30m. The well was plugged and abandoned on the 25th February 2010

The rig was released at 2400hrs 25th February 2010.

Figure 2: Time vs. Depth Graph for CBM 107-001



3.2 Particulars of Drilling

3.2.1 Particulars of the equipment installed in or on the well

The Wallis Drilling Contractors rig Delta 39 was used to drill the CBM107-001 well. This rig is a 330 HP hydraulic rig with a 226kn (50,700lbf) pull capacity and capable of drilling to 1500m with HQ drill rods. The rig pumps are an FMC Q1832 Five Piston Pump powered by a 300 HP diesel engine driven hydraulic motor. The Diamond coring pumps are 2 x FMC Bean Model L1118SC pumps rated 246litres/min at 1800 psi. The mud system is a trailer mounted 2 mud tank unit rated at 8000 litres complete with agitators and mixing hoppers. This system is used in conjunction with 3 earth settling pits. The BOP system comprises a Hydril GK 7-1/16" x 3K Annular (double acting) with a 5 bottle Sanyi Model FK 125-3, 3000psi, 3 station, Accumulator Unit with a 3 station remote driller's control panel.

3.2.2 Casing and equipment installed in or on the well

10" casing was set and cemented at 4m.

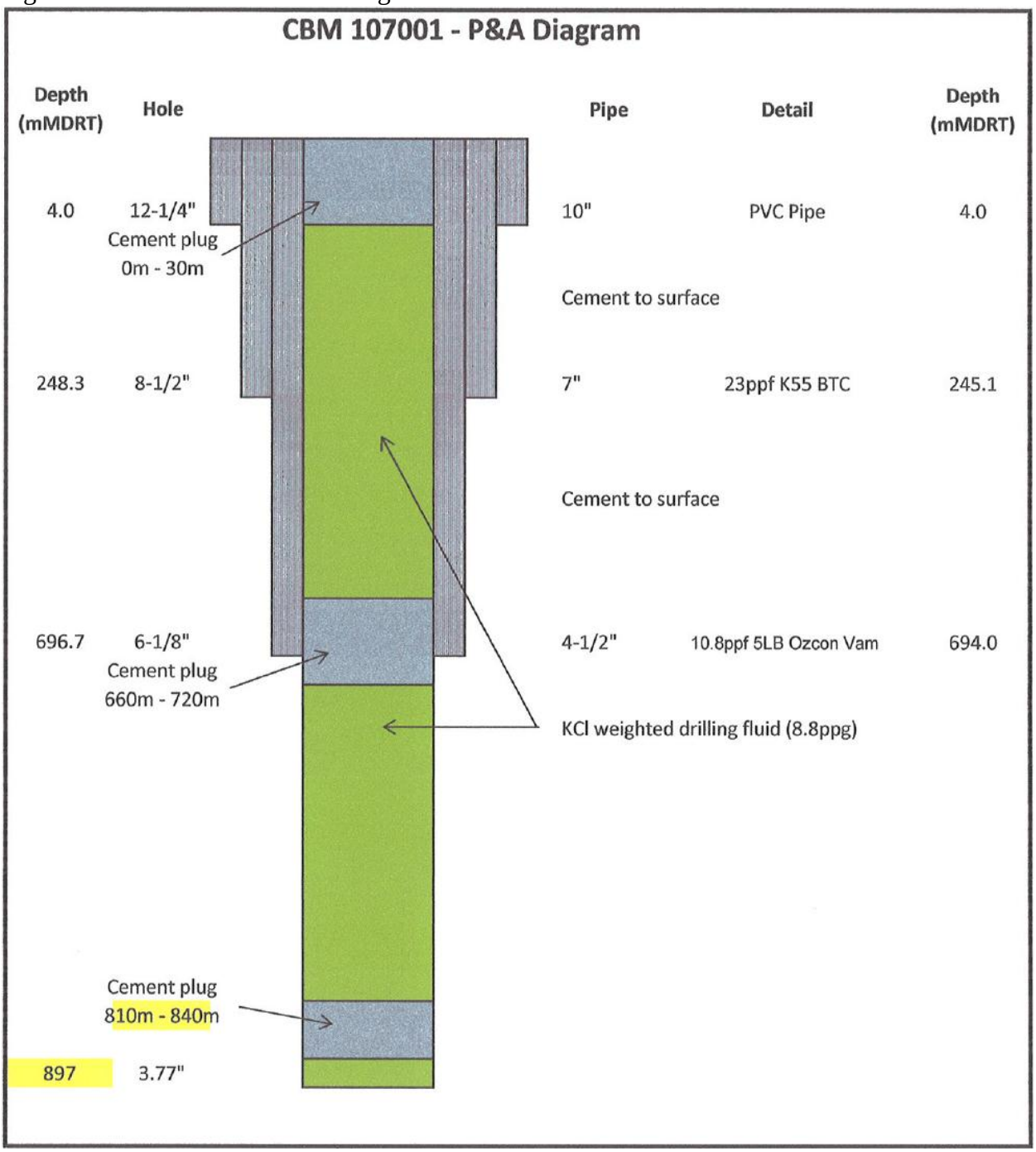
7" K55 casing was set at 245.m.

The 4½" L80 casing (liner) was set and cemented at 694m.

3.2.3 Cementing operations carried out, including details of abandonment

The surface hole was opened up to 12¼" from surface to 4m and 10' conductor pipe was run and cemented at 4m.

Figure 3: CBM 107-001 P & A Diagram



3.2.4 Bit Records

Comprehensive details of bit records and drilling parameters are contained the IDS Final Well Report in Appendix 8.

3.2.5 Deviation Surveys

No surveys were conducted in CBM 107-001 and the hole is assumed to be vertical.

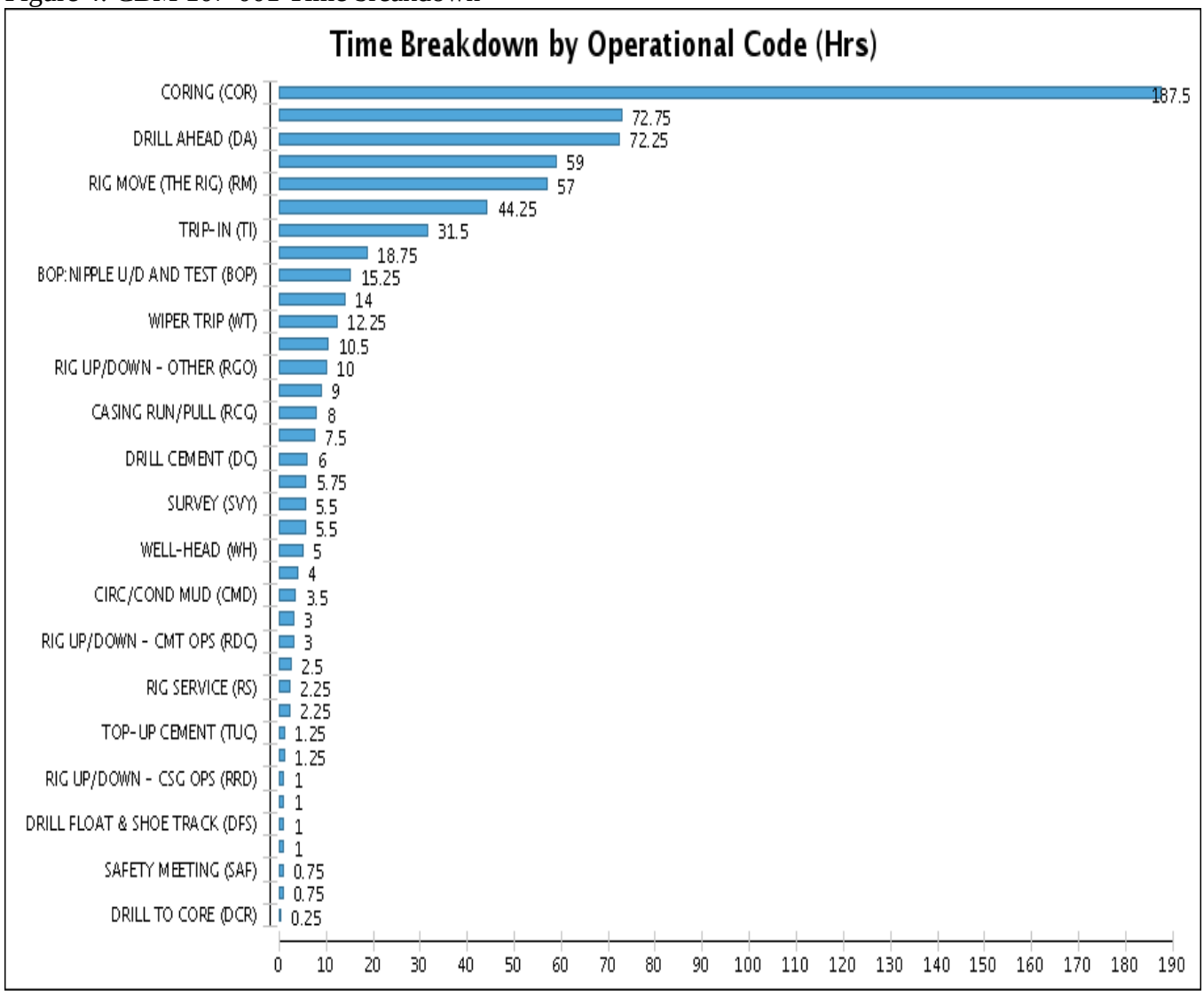
3.2.6 Drilling Fluids

RMN Drilling Fluids were contracted to supply and maintain drilling fluids.
After initially using gel water spud mud for the surface hole, a KCl/ Polymer mud system was utilized while drilling the 8.5" hole. A KCl/CR650 system was utilized for the coring section. (698-1250.9m). Drilling fluids parameters can be found in the IDS Final Well Report in Appendix 8.

3.2.7 Breakdown of Operational Activities and Lost Time

A breakdown of operational time and lost time is summarized in Figure 4 below. Further detail is contained in the IDS Final Well Report in Appendix 8.

Figure 4: CBM 107-001 Time breakdown



3.2.8 Water Supply

Water for drilling and consumption was sourced from the Bravo Bore located close by.

4.0 Logging, Sampling and Testing

4.1 Cuttings Samples Collected

Drill cuttings were collected from 4m to 697m at 6m intervals.

4.2 Coring

The well was continuously cored from 698.9m to Total Depth of 1250.9m. The Wallis D 39 drilling rig was a heavy duty coring rig well equipped to core and to recover cut cores with a wireline retrievable system. A total of 99 (6m) coring runs were made and detailed records of these runs are contained in the Core report in Appendix 4 and within the Daily Geological Reports in Appendix 2.

4.3 Mudlogging

Basic mudlogging services were provided by Weatherford (WFT), collecting and bagging samples and monitoring gas and drilling parameters. A mudlog was produced with lithological descriptions provided by the Wellsite geologists. WFT also provided laboratory facilities for measurement of gas desorption of coal core samples. Results obtained will be used to assess the gas potential of the Primary Objective, Purni Formation Coal measures. Mudlogs and data are provided in Appendix 7.

4.4 Wireline Logging

Wireline logging services were provided by Weatherford.

A combination Resistivity, Sonic, Neutron Density and other tool was run from Total Depth of 1250.90m (wireline depth 1253.50m), and also conducted SGS checkshot survey.

Maximum bottom-hole temperature recorded was 95 degrees Celsius.

Wireline log data and well survey data report are provided in Appendix 6.

4.5 Water Injection Falloff Tests

One Water Injection Fall Off tests was conducted in the well by Weatherford on an interval of 831.4m to 838.9m. The test was carried out to measure coal permeability and it was conducted using a wireline conveyed test tool with two flexible tubes run with the tool from the surface one providing pressure to set the packer and the other to pump water into the coal seam being tested. On setting the packer a water injection phase of 18 hours (variable) commenced, this followed by the falloff phase of 9 hours or approximately half the duration of the injection phase during which the coal zone being tested relaxes back towards static formation pressure. From pressure measurements recorded reservoir parameters of the coal zone, in particular coal permeability can be calculated. A report of the result of this test is provided in Appendix 9.

4.6 Coal Desorption Sampling

Coal desorption sampling was carried out by Weatherford. A total of 110 coal samples were placed in desorption canisters and desorbed on site. Results are provided in Appendix 5.

4.7 Coal Sample Analysis

Three samples from CBM107-001 taken at depths of 780m (sample 1), 880m (sample 2) and 1020m (sample 3) were sent to Bureau Veritas, Brisbane for analysis.

5.0 Geology and Formation Evaluation

5.1 Lithology and Formation Tops

The following is a comparison of predicted vs. actual formation tops.

Table 2: CBM 107-001 predicted vs. actual tops

Formation Tops Blamore-1	**Prognosed Depths**		**Final Depths**		**Difference High / Low To Prognosis**
	(mKB)	**(mSS)**	**(mKB)**	**(mSS)**	
Surficial/Namba Fm	4.5	0	4.3	0	
Eyre Fm			30	+116.3	
Winton Fm	164.5	-18	145	+1.3	+19.3
Oodnadatta Fm	664.5	-518	635	-488.5	+29.5m
Bulldog Shale	851.5	-705	835	-688.7	+16.5m
Cadna-owie Fm	1061.5	-915	960	-804.5	+101.5m
Murta Member			965	-818.5	
Algebuckina Ss	1083.5	-937	995.3	-889	+88.2m
Poolowanna Fm	1543.5	-1397	1278	-1131.7	+265.5m
Walkandi Fm			1286.3	-1139	Not prognosed
Purni Fm	1727.5 (1472)**	-1581	1533.7	-1387.3	+193.8m (-61.7m)
Tirrawarra Ss			2098	-1951.7	Close to top
Crown Point Fm	1918	-1742	+2128 (TD)	-	NP -180m (approx.)
Warburton Basin					Not Penetrated
Total Depth			2128	-1918.3	
** Top Purni Formation was re-prognosed at 965m casing point using RMS velocities					

The lithologies observed from cuttings and core samples of the Formations penetrated by the well are summarized.

5.1.1 Surficial & Namba Formation (Holocene/Quaternary): 1.0m to 10m

CBM 107-001 was drilled in an interdune corridor with dunes approximately 5m high flanking the location to the east and west.

A thin layer of loose fine orange stained quartz sand partly covered irregular blocks of lateritic and silicified sandstone, including billy, silcrete and chalcedony.

Surficial and near surface sandstone is light yellowish brown, fine to coarse, with a clay matrix, in part silicified, and occasional irregular patches of cream to light olive chalcedony

5.1.2 Eyre Formation (Tertiary): 10m to 50m

Claystones and minor siliceous sandstone are assigned to the Tertiary Eyre Formation although they may represent a weathered top to the underlying Winton Formation. Claystones are mottled yellow, orange,

red, ochre, and are soft to firm to rarely hard. Occasional hard red limonite is present and the claystones are in part slightly sandy.

5.1.3 Winton Formation (Cretaceous): 50m to 255m

The Cretaceous stratigraphy used to subdivide the lithological units intersected in CBM 107-001 is based on the "new stratigraphy" in a paper titled Cretaceous of the Southwestern Eromanga Basin, Moore P.S. and Pitt G.M., 1982.

The Winton Formation is a non-marine sequence of Early to Late Cretaceous age.

In CBM 107-001 it is thicker than in nearby wells, possibly due to the well's location closer to the basin margin. Glauconite grains and variably calcareous claystones typical of the underlying Mackunda Formation were not seen above 255m, although sampling arrangements were less than ideal. It is possible that marine conditions were replaced by non-marine earlier than elsewhere.

Wireline logs are strongly attenuated by two runs of casing, but an alternative top could be at 61.5m where the gamma increases abruptly. If so, the basal Eyre Formation is below the weathered zone, as all samples below 50m were a uniform grey in colour.

The base is also not clear on the logs and may be obscured by the surface casing shoe. A possible alternative is at 187m, at the top of a vaguely upward coarsening sequence, based on decreasing gamma values. This location is not supported by any change in cuttings composition, with neither glauconite nor calcareous claystone being observed.

The sequence is dominated by soft dark grey non-calcareous claystone with common fine to medium, rarely coarse grains and specks of carbonaceous fragments and coal. Below 150m the carbonaceous material and coal is less common and finer. Fine to very fine light grey clayey sandstone occurs as thin beds near the top, and increases to about 20% over the lower 40m

5.1.4 Mackunda Formation: 255m to 283m

The Mackunda Formation is a marginal marine sequence of Early Cretaceous age.

The top of the formation was picked at 255m based on cuttings samples, in particular the appearance of probable glauconite grains in variably calcareous claystone (although there is not much difference between rounded grains of lignite/coal and black glauconite pellets). There is no convincing character change in the wireline logs, although decreases in gamma values at 187 and 203.5m at the top of "upward coarsening" sequences are alternative tops not supported by obvious lithological changes.

The sequence is dominated by claystone, dark grey, soft, slightly micaceous, sometimes slightly calcareous, with traces of black glauconite grains and coal or carbonaceous fragments, the latter fine or very fine. Minor components are light grey and buff claystone, and light grey fine grained sandstone.

5.1.5 Oodnadatta Formation: 283m to 399m

The Oodnadatta Formation, of Early to Late Albian age, is considered to have been deposited in a low energy shallow marine environment.

In CBM 107-001 the top of the unit is placed at an increase in gamma values on the wireline log. There is little change in lithology, apart from the absence of sandstone. A single calcite prism similar to fragments of shells of the bivalve Inoceramus was noted at 303m.

Otherwise the unit is similar to the overlying Mackunda Formation, and is almost entirely dark grey, variable calcareous claystone with rare fine carbonaceous fragments and black glauconite grains. Below 333m the claystone becomes a little silty with slightly more common carbonaceous material and glauconite grains. Trace amounts to 5% of fine light grey quartz sandstone probably represent thin sandy bands. Glauconite becomes coarser and more common over the basal 10m.

5.1.6 Bulldog Shale: 399m to 446m

The top of the Bulldog Shale was picked at 399m as a distinctive low gamma event extending over 1m. It more or less coincides with the appearance of abundant fine to medium glauconite occurring as loose grains and embedded in a siltstone of sandstone matrix.

Claystone, slightly calcareous and mottled medium and dark grey makes up about half the samples from the top of this interval, and is accompanied by about 30% glauconitic siltstone grading to sandstone (20%). The glauconite occurs as fine blackish green pellets.

This highly glauconitic bed appears to be correlative with the Coorikiana Sandstone that is widespread glauconitic sandstone lying conformably at the top of the Bulldog Shale. In CBM 107-001 it appears to be a thin greensand, a useful marker of the top of the Bulldog Shale also seen in Blamore-1 and CBM 93-004.

The glauconitic zone extends down to 417m, and the remainder of the Bulldog Shale consists of dark grey partly silty claystone, with glauconitic siltstone and sandstone decreasing downwards to zero – some may be cavings. Scattered fine clear quartz grains occur near the base

5.1.7 Cadna Owie Formation: 446m to 450m

The nature and distribution of the basal Cretaceous - upper Jurassic sequence in the western Eromanga Basin sequence is not clear cut. As in CBM 93-001 and CBM 93-004, thin clean quartz sandstone immediately below claystones of the Bulldog Shale is identified with the Cadna-Owie Formation. Interbedded sandstones, siltstones and claystones underlying it are referred to the Jurassic Murta Member, and massive uniform quartzose sandstones below the Murta are more confidently correlated with the Algebuckina Sandstone.

The top of the Cadna Owie is not as clear cut on wireline logs as in other wells, but is marked by a lower Gamma Ray count. A dramatic increase in drilling rate occurred close to this depth. The Cadna Owie consists of sandstone, light grey, unconsolidated, fine to very fine, well sorted, subrounded to occasionally well rounded, with excellent inferred porosity. It consists of loose quartz grains usually clear with traces of black material, possibly bitumen, adhering to some of them.

5.1.8 Murta Member (Jurassic): 450m to 483.5m

The Murta Member, more generally known and better developed in the Eromanga Basin sequence overlying the Southern Cooper Basin, extends some distance from this depocentre into the Pedirka Basin and was 33.5m thick in CBM 107-001, where wireline logs suggest it is a sequence of interbedded clean

sandstones and more labile sandstones, siltstones and claystones. The log signature only partly conforms to upward coarsening intervals more typical of the lacustrine depositional environments interpreted for this interval (Ambrose et al, 1982), and the term is used for the mixed sediment types overlying the more massive sandstones of the Algebuckinna Sandstone.

The Murta Member and Namur Member, members of the Mooga Formation, are stratigraphic units used to the east of the Pedirka Basin (Ambrose et al 1982). In the Pedirka Basin the sequence of braided stream sandstones underlying the "Murta" is described as the Algebuckina Sandstone, the upper part of which is equivalent to the Namur Member.

Dark grey soft non-calcareous claystone was present at the top of the Murta Member, together with minor medium grey siltstone. Sandstones which make up about half of the interval are similar to those of the overlying Cadna Owie, but quartz grains tend to be slightly coarser and more angular. The sandstones appear to be interbedded with the claystones.

5.1.9 Algebuckina Sandstone: 483.5m to 661m

The Algebuckina Sandstone is a series of stacked braided fluvial sandstone beds, generally coarser near the base, and fining upward to medium grained.

On the wireline logs the top is placed at the top of a sequence of fairly uniform thick sandstones, well displayed by the gamma ray log. Occasional intervals of higher gamma represent more labile sandstones or siltstones and claystones not observed in the cuttings.

The sandstones are typically light grey, loose, medium to fine and subrounded to sub-angular and well sorted. Quartz grains are mostly milky or clear, with traces of yellow and pink grains.

5.1.10 Poolowanna Formation; 661 to 694m

The top of a possible equivalent of the Poolowanna Formation is picked at a claystone bed between 661 and 667m, these depths being taken from wireline logs. There is no obvious change in sonic travel time and this sequence seems better placed within the Jurassic than with older more dense units. Sandstone beds are thinner than in the overlying Algebuckina Sandstone.

Finer grained sediments were not represented in the cuttings, and the sandstones were not much different from overlying beds, being quartzose, fine - coarse, mostly medium, clear and mostly milky, uniform throughout, subrounded, and well sorted. Traces of pink garnet were observed near the base.

5.1.11 Walkandi Formation (Triassic?): 694m to 739m

This part of the sequence is difficult to relate to the stratigraphy in recently drilled nearby wells, and the top of the unit is also obscured by the intermediate casing shoe. Sonic and density logs are more comparable to those in the deeper Permian section (although perhaps with a slightly lower density) rather than to the slow travel times of the overlying Jurassic.

The top of the interval is further confused by a change from drilling to coring, but superficially there is little obvious difference in the sandstones from those above apart from the presence of a variably developed white clay matrix which was noticed in cuttings from the top of the unit adhering to some sand grains.

Between 708 - 715, and 720 - 725m are two intervals of mottled grey, light brown and purple claystone, interbedded with fine to coarse sandstone, in places strongly silicified. These may represent weathered horizons developed at a time of non-deposition, and such coloured rocks have not been seen in cores from undoubted examples of the Permian Purni Formation. In addition, sandstones between and below the coloured claystones have a slight yellowish or pinkish tint, again not recorded from the Purni Formation in the area, or lower in this hole.

These differences are regarded as sufficient to segregate this part of the sequence from the overlying less dense Jurassic and the underlying coal bearing Permian Purni Formation. Similar coloured sandstones and claystones in more central parts of the Pedirka Basin are referred to the Triassic Walkandi Formation, and subject to further information becoming available, this sequence is tentatively correlated with the Walkandi Formation.

Apart from the characteristics mentioned above, the remainder of the sequence consists of several upward fining sequences grading from coarse sandstones grading up to medium and fine and thence to light grey claystones. As mentioned, many of the sandstones are lightly tinted when fresh, and consist of clear and white quartz with moderately common yellow and brownish grains. The sandstones have fair to very good visual porosity, with weak silica cement developed at grain contacts in the more porous examples, and a soft white clay matrix otherwise.

Carbonaceous material is very rare through this interval.

5.1.12 Purni Formation (Permian): 739m to 1253.5m Total Depth (wireline depths)

The Permian part of the sequence in CBM 107-001 consists of stacked upward fining sequences of coarse to medium sandstones grading upwards to coals, including five seams greater than 10m thick, the thickest, between 1005.5 and 1038m, being 32.5m thick. The entire interval is identified with the Purni Formation and correlates well to similar intervals in Blamore-1, CBM 93-001 and CBM 93-004.

The top of the Purni Formation is placed at 739m, which is the top of a claystone sequence which grades from the top of the uppermost coal in the formation at 743m. Underlying sandstones differ from those higher in the sequence in much higher gamma ray values and higher densities, in part due to the presence of a well-developed white kaolinitic clay matrix. The location of this boundary is discussed in more detail in the preceding section of this report.

As in adjacent wells, the Purni Formation has been informally divided into the Upper Purni, with numerous thick coal seams, and a Lower Purni where coals are still present but are thinner and comprise a lower proportion of the sequence. The boundary is transitional and arguable, but is here placed at the base of the coal at 1110m.

This boundary, as here defined, may reflect local depositional conditions rather than a regional change. For example, in CBM 107-001 the upper Purni is 367m thick, with coal making up 30.5% of the sequence (almost half of which is in the lower 105m). In the nearby CBM 93-004 the upper Purni is only 282m thick, of which half is coal.

Comprehensive descriptions of the Purni Formation are available in the Completion Report for CBM 93-001, where cores alternated with cuttings in the upper part, and the rock types and sequence are very similar at CBM 107-001.

Upper Purni Formation: 739 to 1110m

The upper part of the Purni (739 – 1110m) is typified by stacked sequences of light to medium grey, medium to coarse quartzose sandstones, in part very coarse, which grade up rapidly through fine sandstones, medium grey siltstones and dark grey, in part carbonaceous claystones to thick, quite uniform coals. The transition from medium to coarse sandstones to coal is thin, rarely more than 2m in thickness. The proportion of coal in this interval is high - around 30%.

The upward fining sequences are more evident in the core than on the wireline logs, probably because of variations in the amount and type of clay matrix in the coarser sandstones, and the prevalence of fine to very fine quartz sandstones in the transition to claystone and coal.

The lower sandstones in each upward fining unit show subtle and irregular variations in grain size but overall appear quite uniform. Occasional cross laminae are present, as are thin claystone laminae, sometimes carbonaceous, and laminae dominated by fine to medium carbonaceous fragments and muscovite. Ripped up coal fragments are sometimes present near the base, which is usually sharp and probably erosive into underlying coals. Occasional coal or coalified wood fragments may be present higher up.

Below 900m occasional upward coarsening sequences are present, and the proportion of massive basal sandstones in many sequences is lower. Thinly bedded or laminated very fine sandstones and claystones may represent occasional lacustrine deposition.

The sandstones themselves are dominated by quartz, generally clear or white in the upper part, but becoming grey with depth. Rare dark grains of chert and black lithic fragments are present, pink garnet is occasionally common, particularly in finer bands, and yellow, brown or orange quartz is present in trace amounts in the top 75m. White muscovitic mica is generally visible, and dark mica (biotite) occurs in trace amounts in the lower half, first becoming a significant accessory below 970m.

Pink garnet is present throughout, usually in better sorted finer sandstones where it may comprise up to 20% of grains. It is often accompanied by very rare mauve grains, tentatively also identified as garnet, while a further brown variety was noticed in trace amounts between 960 and 1000m.

Mica is present throughout but is rarely common except on bedding planes where it is associated with carbonaceous fragments. Above 970m mica is predominantly muscovite, but below that depth biotite or some other form of dark mica becomes more common.

Poor visual porosity is occasional present in the upper 50m, but for the most part intergranular spaces are filled with soft white kaolinitic clay, becoming a little firmer with depth, and usually no porosity is evident. Occasional thin friable and more porous sandstones occur throughout.

In general the sandstones are choked with clay, mostly soft white kaolinitic clay in the upper part, but in deeper sandstones that are light grey, cream or buff firm clay is occasionally common, or even dominant. Usually both clays are present, with no obvious pattern to their occurrence. The firmer clay may represent altered feldspar, although little fresh feldspar was noticed in either hand specimen or under the microscope. However, the matrix at times appears to be far more abundant than necessary to fill initial voids, suggesting some alteration.

In the transition from medium sandstone to coal, fine to very fine quartzose sandstones are thinly interbedded or interlaminated with siltstone and claystone, the proportion of sandstone decreasing upwards. Claystones are most common at the top, and become carbonaceous and often grade into the overlying coal. Plant fragments may be quite common on bedding planes below 900m, but less so than at equivalent horizons in CBM 93-004.

Coals in the upper Purni are predominately very dark blackish brown to black and dull with occasional bright bands 2-3mm thick. They have a rough texture and may be quite porous. The detailed petrology of these and lower coals is described elsewhere. Cleat is visible only in the bright bands at intervals of 3-10mm, but vertical fractures are evident in most seams, usually as a single fracture through the core but occasionally two or three may be present. They are less well developed than in similar coals in CBM 93-004.

With depth the coal is black, predominantly dull with bright bands, but often with common discontinuous bright laminae up to 10mm in length. On bedding planes these bright laminae look like wood chips, with a fibrous woody texture. Occasional fragments have more regular striations and have a reedy appearance. The proportion of both bright bands and laminae increases gradually and irregularly with depth, but the coal is overall dull. This trend was also observed in CBM 93-001 and CBM 93-004 in hand specimens.

Lower Purni Formation: 1110 to 1253.5m TD

The lower part of the Purni is similar to that in CBM 93-004, and is also typified by upward fining sequences. However the coarser basal sandstones are thinner as are the coals at the top of each sequence, and the transition from sandstone to coal is thicker and more gradual. The proportion of bright components in the coals increases downwards, such that the lower coals contain fairly equal proportions of bright and dull coal. Discontinuous bright laminae are more common, but still have the appearance of wood or reed fragments on bedding planes.

Basal sandstones in these predominantly upward fining sequences are usually similar to those in the upper half of the Purni, although a little finer overall. Quartz is white to grey in colour, and black lithic and carbonaceous fragments are a little more common. Grey sedimentary fragments are also present. Pink garnet is still present in finer sandstones, but dark mica occurs in equal or sometimes greater amounts than muscovite.

White or light grey clay matrix is usually pervasive, and consists of varying proportions of softer white kaolinitic clay and more structured shiny light grey clay, often in booklets.

The coarser and more massive sandstones grade upwards to thinly bedded and laminated sequences of fine to very fine sandstone, siltstone and claystone, as in the upper part of the Purni Formation. In general grainsize and bed thickness both decrease upwards, with claystones becoming more carbonaceous and often, but not always, grading into coals of between 30cm and 2m thick (a 5m seam is present between 1162 and 1167m), with the thicker coals occurring towards the top of the interval. In some cases coals are not present at the top of an upward fining sequence, but while the base of the overlying sandstone is usually sharp, it is difficult to tell whether the coals are absent because of erosion or non-deposition.

Occasionally the upward fining sequences are accompanied by upward coarsening sequences, including laminated to very thinly bedded dark grey claystones and mid grey siltstones in the lower part of the sequence. They coarsen upwards to medium to fine sandstones, sometimes overlain by a thin bright coal.

These sequences may represent a brief episode of lacustrine sedimentation, interrupting a predominantly meandering stream depositional period.

5.2 Source Rock analysis

Numerous coal samples were evaluated for Maceral composition and Vitrinite Reflectance and others were subjected to Rockeval Pyrolysis. These results are not discussed in great detail here. However, deserve to be considered in a regional sense especially the hydrocarbon generative potential of the Purni Formation Coals in the deeper more thermally mature part of the Madigan Trough. CBM 107-001 is located northwest of the Madigan Trough in an area where the Purni Formation coals have never been deeply buried as demonstrated by low Vitrinite Reflectance values. Coal samples have been sent for analysis.

6.0 References

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