CBM 93-004

WELL COMPLETION REPORT
Basic

EP 93 - Northern Territory

4th Dec 2009 – 3rd Jan 2010

Central Petroleum Limited

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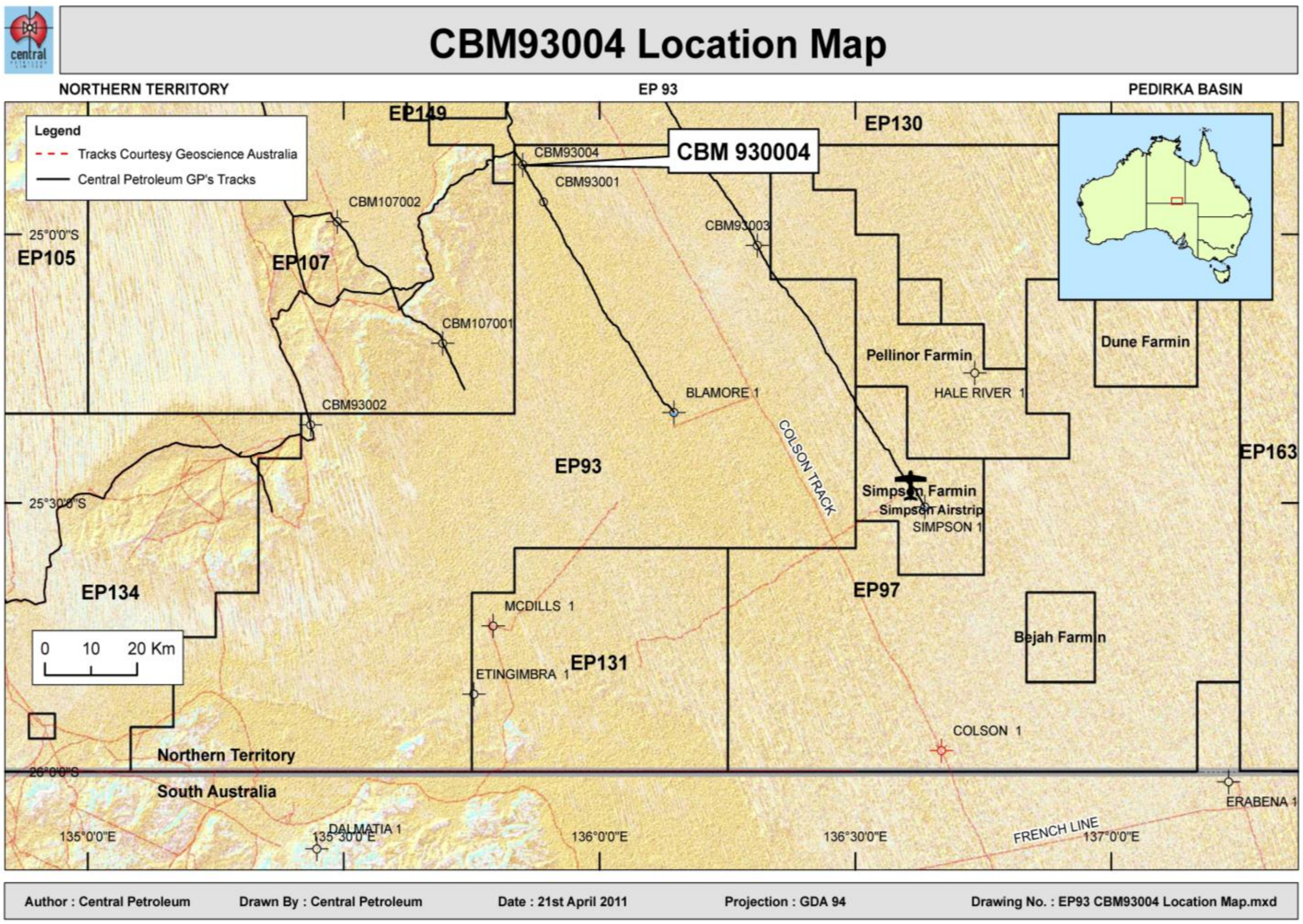
1.0 Introduction and Summary

CBM 93-004 was the exploration well of the five well Central Petroleum Limited 2009/2010 Pedirka Basin drilling coal bed methane drilling programme. CBM 93-004 was located approximately 9km northwest of the CBM 93-001 well drilled in late 2008, Figure 1. Both wells were located on seismic line CB08-01 with CBM 93-004 located at VP 2778.

Figure 1: CBM 93-004 location map



The principal objective of CBM 93-004 was the Purni Formation coal measures and this section was continuously cored in the well.

CBM 93-004 was spudded on 4th December 2009 and after setting surface and intermediate casing strings was fully cored from 503.5m to 978m, Total Depth. The well was drilled using Wallis Drilling, Rig D 39 heavy duty core rig. The wireline retrievable core system used a split inner core barrel that made for significantly faster recovery of coal core and thus improved desorption results compared to the earlier drilled CBM 93-001.

Coal thickness within the Purni Formation was 150.2m cumulative thickness of coal seams greater than 1m thick and 144m cumulative thickness of coal seams greater than 2m.

The well reached Total depth of 978m (Wireline Depth 979.2m) on 31st December 2009. After wireline logging, then running and cementing 2 ⅜" tubing to depth of 974m the well was suspended. The rig was released 3rd January 2010.

2.0 General Data

Table 1: CBM 93-004 Well Index Sheet

WELL NAME: CBM 93-004 **OPERATOR:** Central Petroleum Limited	**CLASSIFICATION:** Coal Bed Methane Exploration

Location: Latitude: 24° 52’ 10.92″ S Longitude: 135° 50’ 59.64″ E GDA 94 Zone 53 Seismic: CB08-01 VP 2778	**Rig Details** Rig Name: Wallis D 39 Contractor: Wallis Drilling Rig Type: Land – Core Rig	**Dates** Spud Date: 4th December 2009 TD Date: 31st December 2009 Rig Released: 3rd January 2010
Basin: Pedirka Permit: EP 93, Northern Territory	**Depths** Surface Elevation: (AHD): 185m Rig Datum: DF (AHD): 186m asl Total Depth: 978m (979.2m wireline log depth)	**Status:** Cased and Suspended
Casing/Liner Details Size Depth 10” 15m 7” : 245.51m 4 ½” (114mm) : 501m	**Mud Details** Mud Type 8 ½” & 6 ⅛” hole Gel KCl Polymer 3.78” core section from 501.9m Gel KCl CR 650	**Trajectory:** Vertical
Coring Details The well was continuously cored from 503.5m to 979.2m	**Sidewall Cores** Nil	**Cuttings** Interval Sample Rate 15-501.9m 6m

FORMATION	**MD (m)**	**Subsea (m)**	**Isopach (m)**	**TWT (msec)**	**Comments**
Holocene-Quaternary	1	+185	27		
Eyre Formation	28	+158	7		Tertiary
Undif. Winton-Oodnadatta	35	+151	318		Cretaceous
Fm)	353	-167	50.5		
Bulldog Shale	403.5	-217.5	4		Early Cretaceous
Cadna Owie Formation	407.5	-221.5	19.5		Late to Middle Jurassic
Murta Member	427	-241	116		Permian
Algebuckina Sandstone	543	-357	+436		Top coal 543.5m
Purni Formation	543	-357	282		
Upper Purni	825	-639	+153		Base coal 879.5m
Lower Purni	978	-792			TD Wireline 979.2m
Total Depth					

LOGGING

Date	**Depth (m)**		**Description**
	From	**To**	
1st Jan 2010	5	979.2	MDL MSS MPD MDM combination (2 runs due to first run malfunction)
2nd Jan 2010	501	978	CMI tool
2nd Jan 2010	186	978	VEOLCITY SURVEY SGS, 21 levels.

Well Testing: 4 Wireline Falloff Tests:
Test#1 612.9 – 621.0; Test#2 664.4 – 675m; Test#3 759.6 – 772.1m; Test#4 874.2 – 879m

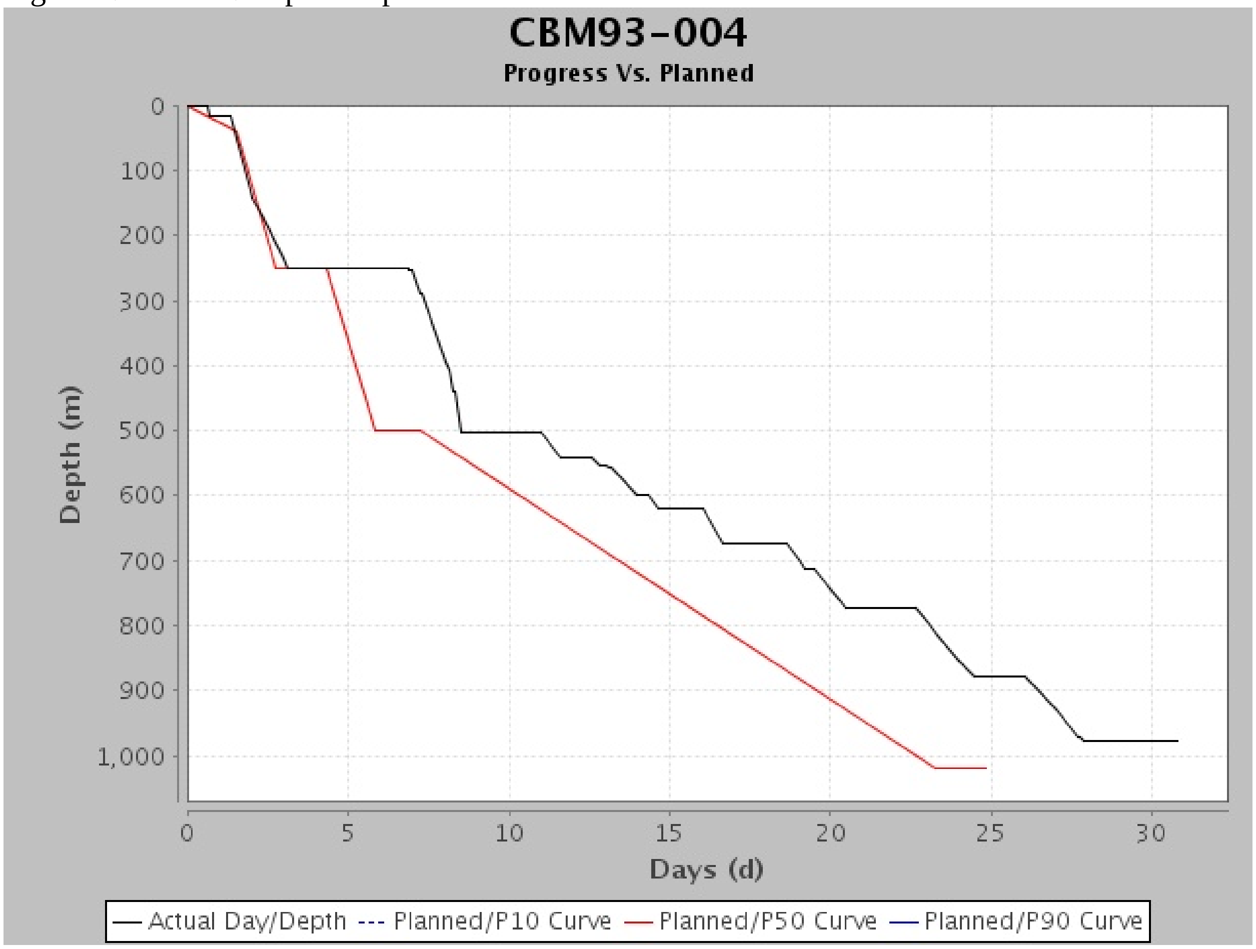
Well Name:	CBM 93-004
Well Classification:	Wildcat, Coal Bed Methane Exploration
Interest Holders:	Central Petroleum Limited (90%) Red Sky Energy Limited (10%)
Petroleum License:	EP 93
Location:	Latitude 24° 52' 10.92" South Longitude 135° 50' 59.64" East N: 7249212 E: 585855 Australian Map Grid Zone GDA 94, Zone 53
Ground Level (GL):	185m
Drill Floor (DF):	186m (Datum)
Total Depth:	978m (Wireline Log Depth 979.2m)
Rig:	Wallis Drilling, Delta (D) 39 Heavy Duty Core Rig
Contractors:	
Drilling:	Wallis Drilling 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 December 2000
Total Depth Reached:	31st December 2009
Rig Released:	3rd January 2010
Well Status:	Cased and suspended

3.0 Drilling

3.1 Summary of Drilling and Related Operations

A Time Depth Drilling Curve for the well is included as Figure 2.

Figure 2: Time vs. Depth Graph for CBM 93-004



CBM 93-004 was spudded on the 4th December 2009. Spud of the well was taken to be the drilling of the 12 1/4" conductor hole to a depth of 15m with 10" PVC conductor set and cemented at this depth.

The 8 ½" surface hole was drilled to a depth of 249.5m without incident. Top of the Cretaceous, Winton Formation was intersected at approximately 35m, with the upper portion to 68m drilling at 35 m/hr.; whereupon drilling rate slowed to approximately 5 m/hr. Note that bit selection was poor with a button bit used; a mill tooth bit would have been more appropriate. The faster drilling upper part of the Winton Formation probably represents the most unstable part of this formation. No cavings were detected; this in contrast to the CBM 93-001 well drilled 9km basinward of CBM 93-004 where cavings were heavy from the shallow section. With much of the upper part of the Winton Formation absent due to erosion in CBM 93-004, borehole stability was not a problem. No over pull was experienced prior to running casing.

7" casing was run free and cemented at 245.5m

After nipple up and testing of the BOP 6 1/8" hole was then drilled through the remainder of the Cretaceous claystone section with porous sandstones intersected below the top of the Cadna Owie at 403.5m. The Algebuckina Sandstone lying not far below this depth is the main aquifer of the Great Artesian Basin and the objective of this section of hole was to find a casing seat about the base of this aquifer and set 4 1/2" casing. A claystone was encountered at 497.5m and drilled to 501.9m was selected as the casing seat.

4 ½" casing was run and cemented to a depth of 501m.

After rotary drilling new hole to 503.5m a formation integrity test was conducted to 12ppg.

Continuous wireline retrievable coring operations then commenced to Total Depth. HRQ, 3.78" Corehead was utilized for coring.

It became apparent that the claystone seat selected was a claystone within the lower part of the Algebuckina Sandstone. Core recoveries were poor due to the friable sandstone encountered below this claystone. At 540m the bit sheared from the bottom reamer of the corehead. Two attempts were made to recover the fish before the decision was made to mill the fish. After coring/milling fish to depth of 552.3m the bit was pulled.

A soft formation core bit was then run in the hole to improve core recovery, lower circulation rates. This was another strange decision as the top of the Purni Formation had been intersected at 543m (wireline depth) and thus the formation was considerably firmer than the poorly consolidated Jurassic sands above 543m. The bit was prone to jamming as with lesser circulation due to the accumulation of kaolin clay between the inner core barrel and the core, the kaolin being associated with the firmer Purni Formation. At 599m the inner core barrel could not be released necessitating pulling out of the hole to recover the core.

More suitable core head was run in the hole and coring from 599m to total depth 978m with 100% core recovery and no significant operational difficulty. A total of ninety core runs were made.

Four Water Injection Falloff Tests were conducted in the well. The tests were conducted using a wireline tool and were made to determine the permeability of selected coal seams. After one of these tests at depth 773m the tool parted from the wireline requiring the trip out of drill pipe. While pulling out of the hole mud loss to the hole was detected, the loss presumed in the portion of Algebuckina Sandstone directly below the casing shoe. Mud weight was 8.7ppg heavy at this time. Application of LCM cured the problem.

Total Depth was called at 978m. Two wireline log runs were planned a standard combination suite and the running of a CMI tool as a separate run. Due to a fault the standard combination suite had to be re-run.

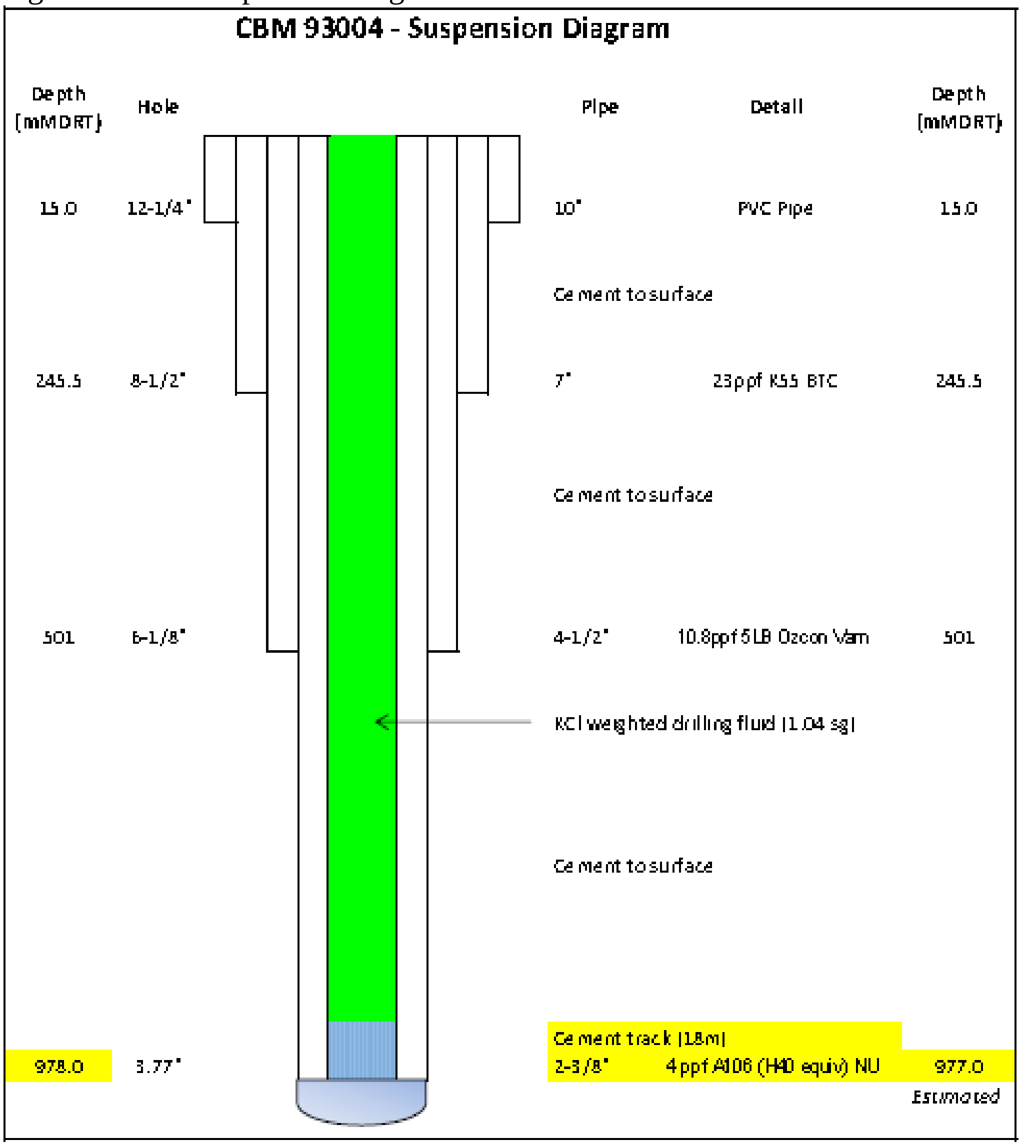
2 3/8" tubing was run and cemented to 974m to accommodate possible re-entry at a later date for additional testing.

3.2 Particulars of Drilling

3.2.1 Particulars of the equipment installed in or on the well

A well head cap flange and valve with a 5000psi pressure gauge is installed at the surface , Figure 3 Suspension Diagram is a well schematic illustrating hole casing and suspension tubing installed.

Figure 3: Well Suspension diagram



3.2.2 Particulars of the Casing and Well Status.

Conductor – 10” PVC conductor was run and cemented to 15m

7” Surface Casing was run to 245.5m being the containment string set in the claystones of the Cretaceous.

4 ½” Intermediate Casing was set at 501m to case off the Algebuckina Sandstone aquifer.

2 3/8” tubing was run to a depth of 974m.

3.2.3 Cementing operations

Cementing of the 10” conductor to 15m, 7” containment casing to 245.5m and 4 ½” intermediate casing to 501m were successfully carried out according to the drilling programme.

2 3/8” tubing was cemented as follows. Pump 5bbl water pre-flush. Pressure test of the surface lines up to1700psi was then made. Mix and pump 37bbls 12.5ppg cement slurry. Drop top plug and displace with 11.5bbl 8.7ppg KCl brine, bump plug and hold at 1500psi for 10 minutes. Install well head cap flange and valve, install needle valve and 5000psi pressure gauge.

3.2.4 Bit Records

Comprehensive details of bit records and drilling parameters are contained within Appendix 3 of this report, the IDS Final Well Report.

3.2.5 Deviation Surveys

No Deviation Surveys were carried out.

3.2.6 Drilling Fluids

Freshwater mud systems were used to drill the CBM 93-004. Daily parameters are summarized in the IDS report. More comprehensive reports on the drilling fluids utilized can be found in Appendix 11, Drilling Fluid Recaps, compiled by RMN Drilling Fluids.

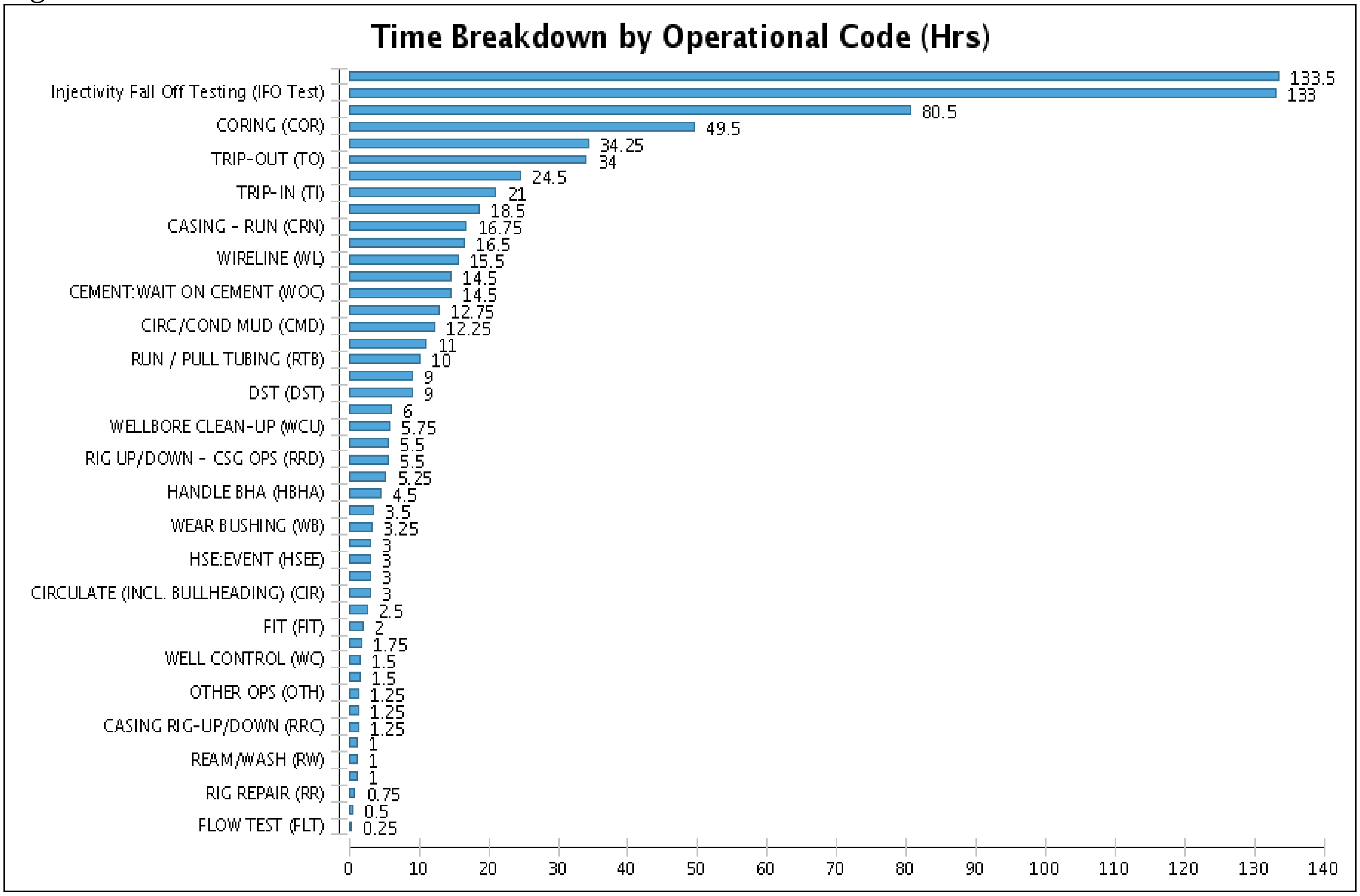
Simple water based Gel KCl Polymer mud was used during conventional rotary drilling to 501.9m.

From 501.9m polymer was eliminated from the system and core lubricant CR 650. Polymers were avoided as they were considered detrimental to the Water Injection Falloff tests programmed in the well.

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 3.

Figure 4: CBM 93-004 Time breakdown



3.2.8 Water Supply

Water was sourced from the Bravo Bore located close by and North North-West from the CBM 93-004 well location.

4.0 Logging, Sampling and Testing

4.1 Cuttings Samples Collected

Cuttings samples were collected and bagged at 6m intervals from 15m to 501.5m.

4.2 Coring

The well was continuously cored from 503.5m to Total Depth of 978m. 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. Core recovery was excellent for the most part, though poor recovery was experienced in the non-objective Jurassic aged Poolowanna Formation while coring poorly consolidated sandstone. Poor recovery in the upper part of the Permian aged Purni Formation for the most part related to the loss of the bit part of a corehead in the hole and subsequent milling of this fish.

A total of 90 coring runs were made and detailed records of these runs are contained within Daily Geological Report in Appendix 1.

Samples of core were selected for Palynological, Petrological and Geochemical analyses.

4.3 Mudlogging

Mudlogging services were provided by Weatherford. Problems were experienced at the time in obtaining a purpose built mudlogging unit. This was resolved by the provision a small hire container with equipment wired in on site. The container also incorporated laboratory facilities for measurement of gas desorption of coal core samples. Conditions were not ideal and certain equipment did not function ideally throughout the 2009/2010 drilling programme. Results obtained were however were just sufficient to provide for an assessment the gas potential of the Primary Objective, Purni Formation Coal measures.

4.4 Wireline Logging

Wireline logging services were provided by Weatherford.

A combination Resistivity, Sonic, Neutron Density tool, MDL_MSS_MPD_MDM, was run from Total Depth of 978m (wireline depth 979.2m). This combination tool was run twice after DLL, dual laterolog failed to record on the first run.

An additional log run with a CMI Tool was then run between 501m to 978m

Maximum bottom-hole temperature recorded was 80 degrees Celsius.

Wireline log data is included in Appendix 7.

4.4.1 Velocity Survey

A velocity survey conducted by Expertest Pty Ltd was then carried out using the Weatherford wireline.

Velocity survey Data is included in Appendix 8.

4.5 Water Injection Falloff Tests

Four Water Injection Fall Off tests were conducted in the well. These were conducted over the intervals 612.9m to 621m, 664.4m to 675m, 757.9m to 772.1m and 874.2m to 879m. The tests were carried out to measure coal permeability. They were 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. Reports on the results of these tests are included in Appendix 10

4.6 Coal Desorption Sampling

Coal desorption sampling was carried out by Weatherford. A total of 101 coal samples were placed in desorption canisters and desorbed on site. Results are discussed in Section 5, Formation Evaluation and basic and interpreted data is included in Appendix 5.

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 93-004 predicted vs. actual tops

Formation Tops	**Prognosed Depths**		**Final Depths**		**Difference High / Low**
	(mKB)	**(mSS)**	**(mKB)**	**(mSS)**	**(m)**
Surficial & Namba Fm	1	+185	1	+185	
Eyre Fm	np		28	+158	
Winton - Oodnadatta Fm	np		35	+151	
Bulldog Shale	np		353	-167	
Cadna-Owie Fm	435	-250	403.5	-217.5	32.5H
Murta Fm	np		407.5	-221.5	
Algebuckina Sandstone	np		427	-241	
Poolowanna Formation	np		np		
Purni Fm (L. Permian)	550	-365	543	-357	8H
Purni (E. Permian)	np		825	-639	
TD	1020	-835	978	-792	

Only 2 horizons were predicted from seismic and both were encountered close to their prediction.

The following summarizes lithologies observed from cuttings and core samples.

5.1.1 Holocene/Quaternary: 1m to 28m

CBM 93-004 was drilled in an interdune corridor with dunes approximately 5m above the drilling pad flanking the location to the east and west.

This interval consists of sandstone, brick red at the surface, light yellow grey when drill washed, loose, medium to very coarse, subangular to subround, with trace silcrete, in part very fine.

5.1.2 Eyre Formation (Tertiary): 28 m to 35m

Claystones and minor siliceous sandstone are assigned to the Tertiary Eyre Formation although they may simply represent a weathered top to the underlying Winton Formation. Claystones are off white, red stained in part, tan or orange brown, with traces of limonite fragments. White fine to very fine sandstone is partly silicified and is identified as silcrete.

5.1.3 Winton Formation to base Oodnadatta Formation, Undiff. (E. Cretaceous): 35m to 353m

(The Cretaceous stratigraphic nomenclature used to subdivide the lithological units intersected in the CBM 93-004 well is based on a paper entitled *Cretaceous of the South-western Eromanga Basin*, Moore P.S. and Pitt G.M., 1982.)

The Winton Formation is dominated by soft medium dark grey non-calcareous claystone with common fine to medium, rarely coarse grains and specks of carbonaceous fragments and coal. Faster drill rate suggests the more unstable part of the Winton Formation was intersected between 35m to 62m. Below 70m the carbonaceous material and coal is less common and finer, and the claystone is more micaceous, and generally samples are soft and sticky.

The MacKunda Formation is a sequence of Early Cretaceous age. The top of the formation was picked at 95m based on cuttings samples, in particular the appearance of glauconite in argillaceous sandstone (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. The sequence is dominated by claystone, medium dark to 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. Above 150m very fine white friable slightly calcareous glauconitic sandstone occurs in trace quantities. Below 150m the sequence is basically uniform claystone with only poor traces of glauconite and carbonaceous material. The claystone is occasionally calcareous with rare very fine calcite fragments.

The Oodnadatta Formation is Early to Late Albian age. In CBM 93-004 the top of the unit is placed at the first appearance of calcite prisms derived from the shells of the bivalve *Inoceramus,* first noticed at 276m. This appears deep to the pick made in CBM 93-001 where the appearance of elongate needle like “prisms” usually seen in the bottom of washed sample trays, Sample processing was not as thorough in CBM 93-004 as water supply was lacking and sample collection was by sieve directly from the mud stream, and this may be the reason the elongate needle like prisms were not seen.

The top of the unit between 276 and 285m consists of medium to dark grey soft silty claystone, grading in part to clayey siltstone. Traces of off white limestone, calcite, *Inoceramus* prisms, glauconite and fine coal or carbonaceous fragments are present.

Weakly to moderately calcareous medium dark grey claystone continues to the base, initially with traces of limestone and glauconite. Very dark green to black glauconite increases in abundance below 315m.

5.1.4 Bulldog Shale (Aptian): 353m to 403.5m

The top of the Bulldog Shale was picked at 353m from cuttings descriptions, where medium to dark greenish grey claystone with common very dark green to black glauconite this occurring as a thin bed.

This thin glauconitic bed a useful marker of the top of the Bulldog Shale and was also seen in Blamore-1 and CBM 107-001.

The Bulldog Shale below the glauconitic zone consists of medium dark grey soft non-calcareous claystone, grading to siltstone, sandy in part. Glauconite decreases to zero with depth.

5.1.5 Cadna Owie Formation (E. Cretaceous): 403.5m to 407.5m

A thin clean quartz sandstone immediately below claystones of the Bulldog Shale is identified as 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 Cadna Owie consisted of sandstone, light grey, unconsolidated, coarse, in part very coarse, well sorted, subangular to well rounded, with excellent inferred porosity. It consists of loose quartz grains, usually clear to translucent with traces of white clay adhering to some of them, with traces of pale yellow and pale orange grains.

5.1.6 Murta Member (Jurassic): 407.5m to 427m

The Murta Member is 20.5m thick in CBM 93-004. Wireline logs suggest it is an irregularly upward coarsening sequence of interbedded clean sandstones and more labile sandstones or siltstones.

Medium grey soft non-calcareous claystone was present at the top of the Murta Member, together with minor dark grey firm to hard claystone. Sandstones are similar to those of the overlying Cadna Owie, but quartz grains tend to be more angular. They appear to be interbedded with the claystones.

5.1.7 Algebuckina Sandstone (Permian): 427.5m to 543m

The Algebuckina Sandstone is generally very coarse at the base, and fining upward to medium grained.

The sandstones are typically light or medium grey, loose, medium to very coarse and subangular to angular. Rounded grains in the upper part may represent contamination from the Cadna Owie, or may be in situ in the upward coarsening sequence above 441m. Accessories include muscovite and traces of pyrite in the lower part. Between 441 and 457m includes siltstone, dark grey, soft to firm, grading in part to claystone but otherwise sandy, and grading downward to very fine loose clean sandstone.

The claystone was medium to dark brownish grey, soft, in part firm, slightly carbonaceous and micromicaceous including medium to coarse coal fragments.

Fine and very fine sandstone interbedded with thin beds of medium to dark grey carbonaceous claystone and siltstone were present in cores above 520m, an overall fining upwards sequence.

The remainder of the unit consisted of light grey fine to coarse friable sandstone, in part very coarse, with excellent visual porosity. The friable nature of the sandstone resulted in poor core recovery. Grains were subrounded to subangular moderately to well sorted quartz, occasionally with adhered white kaolinitic clay. Wireline logs indicate the sandstones are more thinly bedded than those in the upper part of the Algebuckina Sandstone.

5.1.8 Purni Formation (Permian): 543m to 979.2m TD (wireline depths)

This consists of stacked upward fining sequences of coarse to medium sandstones grading upwards to coals. The entire interval is identified as the Purni Formation.

The drilling of CBM 93-004 matched expectations in terms of coal thickness within the Purni Formation with 150.2m cumulative thickness of coal seams greater than 1m thick band 144m cumulative thickness of coal seams greater than 2m.There were five thick seams ranging in thickness from 9.3m to 16.4m thick.

The top of the Purni Formation is placed at the top of the uppermost coal seam, at 543m. Underlying sandstones differ from those higher in the sequence in much higher gamma ray values, it is quite “hot” and higher densities, considerably more compacted than the Jurassic.

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 93-004.

Upper Purni; 543 to 825m

The upper part of the Purni (543 - 825m) 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.

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.

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 or orange quartz is present in trace amounts. White muscovitic mica is generally visible, and dark mica (biotite) occurs in trace amounts in the lower half.

Poor, rarely fair visual porosity is occasional present to a depth of 572.2m, but for the most part intergranular spaces are filled with soft white kaolinitic clay, becoming a little firmer with depth and no porosity is evident.

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 706m.

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. Cleating 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.

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.

Lower Purni; 825 – 978 TD (TD Wireline 979.2m)

Basal sandstones in these predominantly upward fining sequences are usually similar to those in the upper part 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. 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.

A variation of the sandstone is present below 896.5m. It is mottled light and mid grey in colour and consists of coarse to medium grains of quartz and light grey feldspar. Accessories are the same as elsewhere, but the clay is usually white and soft. The rock itself is firm and can often be disaggregated by hand. Rare bands of sandstone to 30cm are friable and contain good visual porosity.

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 6m thick, with the thicker coals occurring towards the top of the interval.

In the upper part of the lower Purni, plant fragments are quite common on bedding planes, and include *Gangamopteris* and possibly *Glossopteris* leaves, plus indeterminate stems and thin branched fragments. They become rarer with depth.

Between 855 and 892m 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.

5.2 Hydrocarbon Indications and Sample Analysis

5.2.1 Oil Shows

No oil shows were detected in the well. When evaluating the samples from the Cadna Owie to Algebuckina level the Ultra Violet Box shorted out. Relevant samples from were stored damp in geologists fridge. A UV light was obtained later, samples were examined but no shows were detected. Cores cut through the Purni Formation were screened for oil shows at night using an Ultra Violet light on an extension cord; however no oil shows were detected.

5.2.2 Gas detection whilst drilling

There were a number of problems with the mudlogging services during the drilling of CBM 93-004 some, despite constant attention were not resolved for the entire five well drilling programme. These are addressed as they influence the interpretation of data gathered. There were multiple problems with equipment and reliability of results. The piecing together of the mudlog unit on site in very cramped conditions and the employment of equipment that was of a relatively new design with unresolved design flaws? The equipment not well understood by the mudlog personnel who turned out to have come from a company recently taken over by Weatherford. The flawed initial set up included a lack of any provision to remove water vapour from the gas sample line. There were additional problems related to placement of the mud motor, the drilling rig was new and operated by personnel not familiar with petroleum exploration. It was a very efficient heavy duty core rig, however improving the setup of the flowline to allow reasonable positioning of the mud motor in the flowline proved an ongoing problem involving conflict with drilling contractor personnel.

The mudlogging unit was pieced together on site. It consisted of a small converted hire container. Half the container was dedicated to coal desorption equipment (a desorption unit destined for the rig from India was held up in customs for the first three wells). Loose gas detection and other equipment were placed in the unit on limited desktop space; provision for storage was very poor. Equipment set up was delayed by late delivery of power generator that was only received at 7" casing point at depth 245.5m. At about 420m a further problem ensued caused by short circuit of a defective UV box, this resulting in the failure of the main computer this having some impact on the evaluation of data between 543m and 580m, the upper part of the Purni Formation with electronic gas data lost to a depth of 599m; see 6.3 below.

Provision for mud motor (gas trap) was a concern. The flowline consisted of a 10" poly pipe leading from the annulus to the mud pits at an inclined angle. An observation port was cut in the flowline close by the drill floor to allow the driller to observe mud circulation. The gas trap was placed in an open port some 5m from the annulus of the well. There was obvious likelihood of gas in mud dissipating prior to reaching the gas trap. On commencing 3.78" coring with a reduction of mud flow the effectiveness of the mud motor was further compromised and was particularly poor.

Coring commenced at 501.9m with the first coal intersected at 543m. (Wireline) labelled as 545.5m in core records, (the core hand assumed lost core was from the top of the core), however it appears from deeper coal seam core depth and wireline depth correlation that drill depths are about 1.5m deep to wireline log depths. Limited core recovery, between 540m and 552m related to the fact that the core bit used milled a fish being part of a core bit that had sheared off at 540m. Gas readings were compromised between 552m and 580m, as the bit selected was a low flow rate bit designed to direct mud flow away from the core resulting in no flow of mud through the mud motor. This situation was improved after installing a small weir below the mud motor in the flowline, initially only partly effective (it washed away), with a more robust weir put in after 580m

The corehead used from 552m to 599m (driller's depth) was specifically designed for the drilling of unconsolidated formation in the Algebuckina Sandstone, a curious choice as Permian coal had already been intersected. Incidentally the cores cut in the Permian sandstone with this bit had a propensity to jam as kaolin and other clays present in the sandstone accumulated between the core and the core barrel, resulting in some loss of core to the point when this bit was pulled at depth 599m.

Water Vapour in the gas flowline was also a problem. It was discovered during the next well, CBM 93-003, that there was no provision in the mudlog unit to scrub water vapour from the sample line from the mud motor right through to the gas detection equipment. The only provision for removing water vapour was a condensation bottle that was mounted in the sun close by the mud motor, thus was ineffective. Day time temperatures were high and therefore significant condensation would have occurred within the gas detection equipment as the sample from the mud motor entered the cooler environment of the mud logging unit. Erratic gas response of Total Gas and Chromatograph readings were considered likely to relate to this defect of gas system set up and there may have been actual progressive damage of equipment? The chromatograph was a Varium brand considered susceptible to the intrusion of water.

There were problems identified with the gas recording equipment, in particular there was poor correlation between Total Gas and Chromatograph readings with the chromatograph reading low. (See notes Appendix 10). The Total Gas equipment was, as it emerged over time during and after the 5 well CBM programme was a new equipment development that had not been in service for a great deal of time?

The mudloggers were generally variably experienced, from Malaysia, some frustrations with language, and more data loggers than technicians and likely to have been in situations offshore where functions are split and mud log unit properly setup. These personnel were diligent but perhaps overwhelmed by conditions and unfamiliar equipment as they were all from International Logging recently taken over by Weatherford.

Despite these concerns an interpretation of results from the drilling of the Purni Formation can be made that has relevance to the prospectivity.

Purni Formation-543m to 599m

The top of the Purni Formation is put at 543m from wireline logs and is represented by a thick section of coal. Core recovery was poor from 540m at which depth the lower part of the corehead twisted off, could not be recovered by fishing attempts and from 540m to 552m the core head in use was milling the fish and after pulling out of the hole at 552m was damaged, particularly the inner gauge, such that the bit was incapable of retaining core to any extent. Gas readings were poor largely due to problems with gas equipment. Insufficient coal was recovered to conduct desorption measurements. On a positive note the fish was milled and caused no further problems while drilling.

Desorption results were modest for the first seven canned core samples from depths 552m to 559.13m. For these samples measured raw desorption volumes varied from 220ml to 255ml, which translated to gas contents of 0.04 to 0.09 scc/g from the final desorbed gas plots.

A desorption sample at the base of this first coal seam (sample 8, 559.13m to 560.13m) displayed a raw desorption volume of 1200ml that translated to gas content of 0.19scc/g from the final desorbed gas plot.

Sample 9 from 562.39m to 563.39m was from a thin coal within a shaley sequence, likely in part claystone, yielded raw desorption volume of 200ml.

Sample 10, 565.85m to 566.85m within a 3m thick coal seam at the top of the seam recorded a raw desorption value of 2710ml that translated to a gas content of 0.68 scc/g from the final desorption plot. Gas was observed to be bleeding from the coal.

Gas readings particularly on the chromatograph stabilized after the installation of this weir. Methane values from the chromatograph stabilized for some minutes at 10 to 12ppm C1, negligible C2 plus. This was consistent with the sandstone lithology being cored. The gas then started rising to a very definitive gas peak of 20units of gas from 585m from summation of chromatograph values (Total Gas Chromatograph). Gas breakdown by the chromatograph was cohesive with maximum values recorded as follows:

Maximum Gas Peak 20units from 585m

C1: 2015ppm
C2: 203ppm
C3: 47ppm
iC4: 0
nC4: 6ppm
iC5: 0
nC5: 2ppm

This Gas Peak was the highest value peak in the entire well as based on chromatograph values.
The gas peak correlates with a coal cored from 582.8m to 585.9m. Desorption results from the two canned samples produced moderate amounts of desorbed gas. Sample 11, 582.9m to 583.9m recorded a raw desorption volume of 620ml which translated to a gas content of 0.15 scc/g and Sample 12, 583.9m to 584.9m recorded a raw desorption volume of 370ml which translated to a gas content of 0.08 scc/g.

The first coal interpreted drill depth 544.5m to 560.5m, 16m thick, was drilled with the gas detection system not operating. A good gas content result was obtained from the lowest desorption sample, Sample 8, this is consistent with the pattern of permeability of the thicker coals, where better coal permeability is observed towards the base of coals, as indicated by wireline log data and observations of core indicating more vitrinite layering with modest cleats.

The second coal, drill depth 566.5m to 569.5m, 3m thick is likely a continuation of the overlying coal sequence with intervening carbonaceous claystone deposited in a lacustrine environment This coal produced the best desorption result, was observed to be bleeding gas and although the mud motor was out of mud stream appeared to record a gas peak.

The third coal from 582.8m to 585.9m was 2m thick and with the mud motor finally sucking sufficient mud, produced the best gas reading for the well. It also produced a moderate amount of desorbed gas.

Purni Formation 599m to 979.2m

From 599m gas readings fell off with renewed drilling, perhaps not unexpected as sandstone was being cored with a few readings of 10ppm recorded with the chromatograph, however readings remained low when a coal was cored.

At 621m it was decided to conduct a Falloff Test No.1, the results of which are discussed below.

A summary log that is included within Appendix 9. The Total Gas detector was identified to be reading high compared to chromatograph readings, however the detector readings were highly erratic and did not in general match coal lithologies. Chromatograph readings were similarly poor with the chromatograph responding only at occasional points in time reading peaks of 10ppm to 42ppm C1. There was a general tendency for peaks to occur towards the base of coals where more permeability is seen in cores in the form of greater frequency of vitrinite layering and modest cleat development.

Desorption results were generally moderate with one reasonable result a high value Raw Desorbed Gas 1360ml gas content 0,36 scc/g from sample 59, 701.5 to 702.5m.

Below 836m there was no C1 recorded on the chromatograph. The base of the last significant coal was 879m. It is suspected that water build up in chromatograph was likely to have rendered it inoperable.

Below 900m in the well high Total Gas readings were recorded. It is likely that these readings were spurious? High CO2 readings were also noted.

5.3 Temperature Data

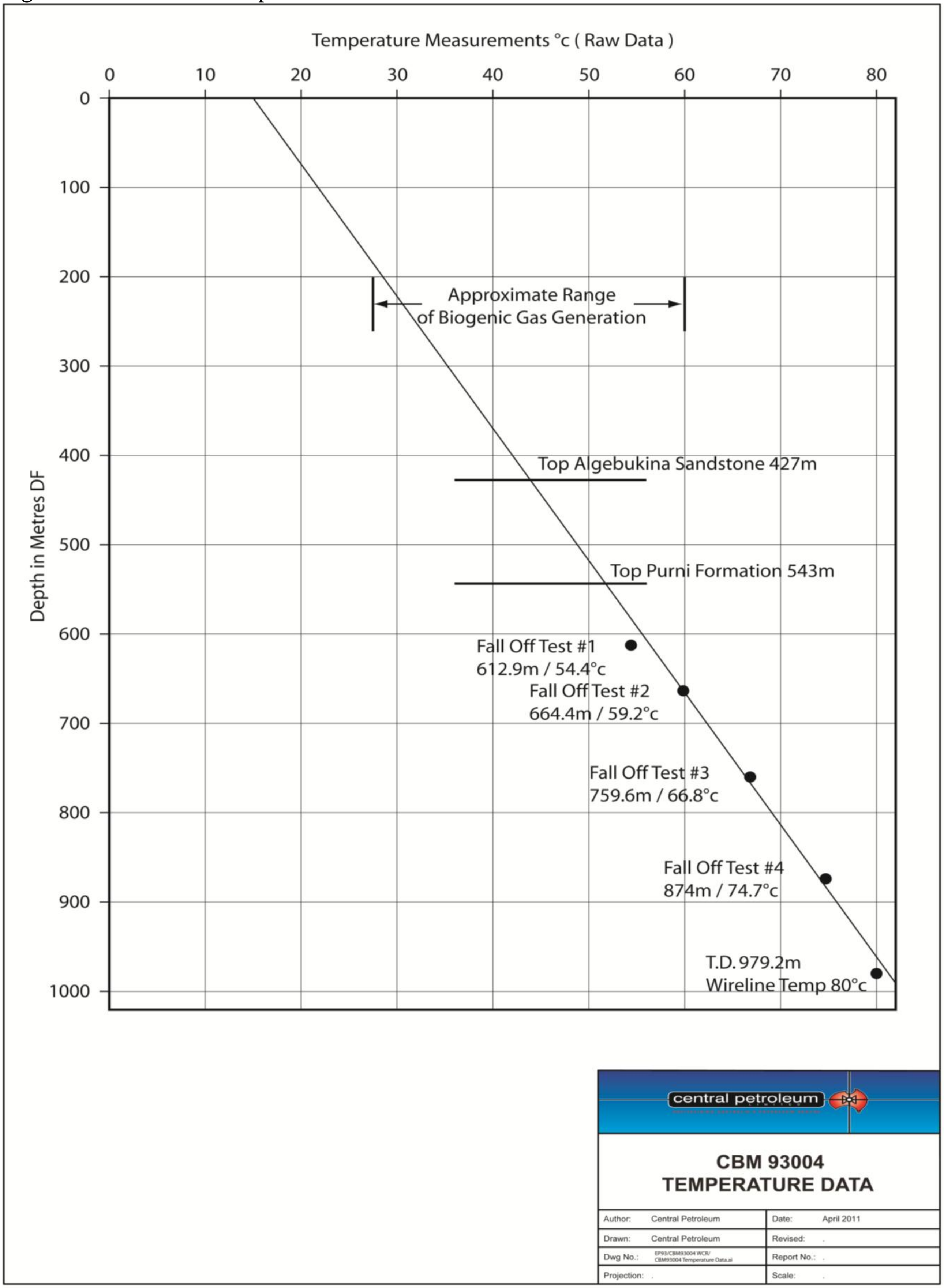
Temperature measurements were made during the Water Injection Falloff Tests conducted and from wireline logs at Total Depth. These are tabled below.

Table 3: CBM 93-004 Temperature data

Data Source	**Depth**	**Temperature**	**Comment**
Falloff test#1	612.9m	54.4^{0}C	
Falloff test#2	664.4m	59.2^{0}C	
Falloff test#3	759.6m	66.8^{0}C	
Falloff test#4	874m	74.7^{0}C	
Wireline Logs (TD)	979.2m	80^{0}C	14.75hrs from last circulation.

These data are plotted in Figure 5.

Figure 5: CBM 93-004 temperature data



5.4 Source Rock analysis

Numerous coal samples were evaluated for Maceral composition and Vitrinite Reflectance; and others were subjected to Rockeval Pyrolysis. CBM 93-004 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. The analyses of coal samples are included in Appendix 5

6.0 References

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