2 GEOLOGICAL DATA

2.1 Geological Summary

Elliott 1 was designed as a stratigraphic test to identify the type and nature of the sedimentary section in the southern part of a large gravity low, informally termed the Beetaloo Sub-Basin.

The Beetaloo Sub-Basin had originally been inferred from gravity and magnetic modelling to be a thickening of Roper Group sediments in an elongate depression stretching north from the Tennant Creek Block towards the Urapunga Tectonic Ridge. Three holes (**Altree 2**, **Walton 2** and **McManus 1**) drilled near the northern edge of the gravity low (in southern EP24) in late 1988 and 1989 had confirmed this thickening and provided minor, but encouraging hydrocarbon shows. In late 1990 another stratigraphic hole (**Jamison 1**) was drilled near the inferred centre of the sub-basin (in southern EP18) and intersected the thickest, most complete, uppermost Proterozoic section in this region. The stratigraphy penetrated in **Jamison 1** contained source, reservoir and seal rocks which yielded small quantities of live oil and gas upon testing, thereby greatly improving the prospectivity of the sub-basin.

Thus, **Elliott 1** sought to confirm the extension of this prospective stratigraphy into the southern half of the Beetaloo Sub-Basin.

However, rather than just drilling a straightforward repeat of **Jamison 1**, **Elliott 1** attempted to expand on play-type possibilities for the Proterozoic section.

Some regional seismic had been shot after drilling **Jamison 1**, including an extended line to the south (MA91-103) which showed the Proterozoic section gradually rising to the south and truncating against the base Cambrian unconformity.

Using a Preliminary Final Stack of this line the location for **Elliott 1** was chosen to fulfil the following objectives;

<u>Primary</u>

To investigate the reservoir potential of the Moroak Sandstone.

<u>Secondary</u>

a) to investigate the nature of the subcrop of the Jamison Sandstone (previously labelled Bukalorkmi Sandstone) beneath the base Cambrian unconformity, and

b) to confirm the extension of prospective source rocks into this part of the sub-basin.

The location ultimately selected (almost 100km south of **Jamison 1**) was interpreted to show the Moroak Sandstone at a depth of 1000-1500 metres on a slight, very broad anticlinal feature and the Jamison (previously Bukalorkmi) Sandstone severely truncated (possibly absent) beneath a laterally extensive unconformity (Figure 3).

Elliott 1 was spudded in unconsolidated to poorly consolidated mudstone of yellowish to brownish colour (weathered), with occasional silty and sandy intervals. From 48 to 127 metres (bdf) this changed to a slightly glauconitic black claystone (with occasional silt and sand), becoming paler in colour over the lowermost ten metres, above a zone of lost circulation (a cavern?). Below 133 metres drilling returns comprised fine to coarse sandstone and minor siltstone, with a patchily dolomitic matrix increasing with depth.

From 195 down to 210 metres the sandstone graded to siltstone with a muddy dolomitic cement, and this dolomitic siltstone dominates the section down to 409 metres, occasionally interspersed with intervals of limestone. Circulation was again lost temporarily between 274 and 294 metres, and then totally below 409 metres. No drilling returns were obtained prior to the start of coring (below the 5-inch casing shoe) at 595 metres. However, based on rate of penetration (ROP) changes during drilling and subsequent interpretation of downhole geophysical logs, the following subdivision is proposed (Table 5);

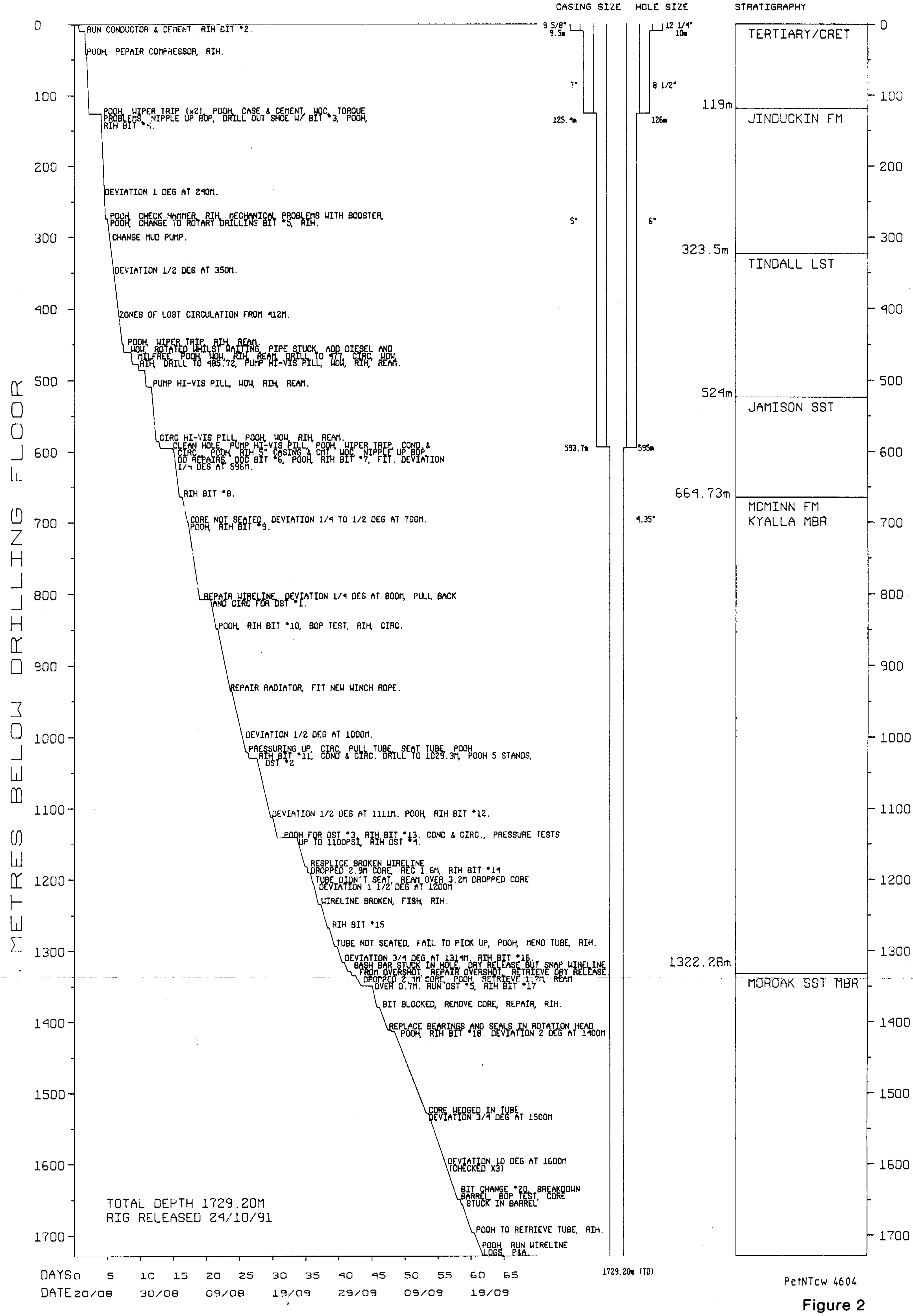
119-323.5 metres (bdf), interbedded clastic (mostly fine-grained) and carbonate (dolomite and limestone) units.

323.5-524 metres, thick/massive carbonate (limestone with patchy dolomitization) with occasional, thin fine-grained clastic interbeds.

524-595 metres, Jamison Sandstone (which continues below the casing shoe to 664.73 metres).

After setting the 5-inch casing just above 595 metres continuous coring commenced at 594.92m in a fine to very fine, light grey sandstone recognized as the Jamison Sandstone. Although seemingly finer on average than in **Jamison 1**, this sandstone contained the same types of thin greenish grey mudstone beds, laminae and clasts sporadically throughout, and a similar (slightly thicker) pebbly conglomerate unit at its base in **Elliott 1**. Unlike in **Jamison 1**, no hydrocarbon shows were encountered in this sandstone.

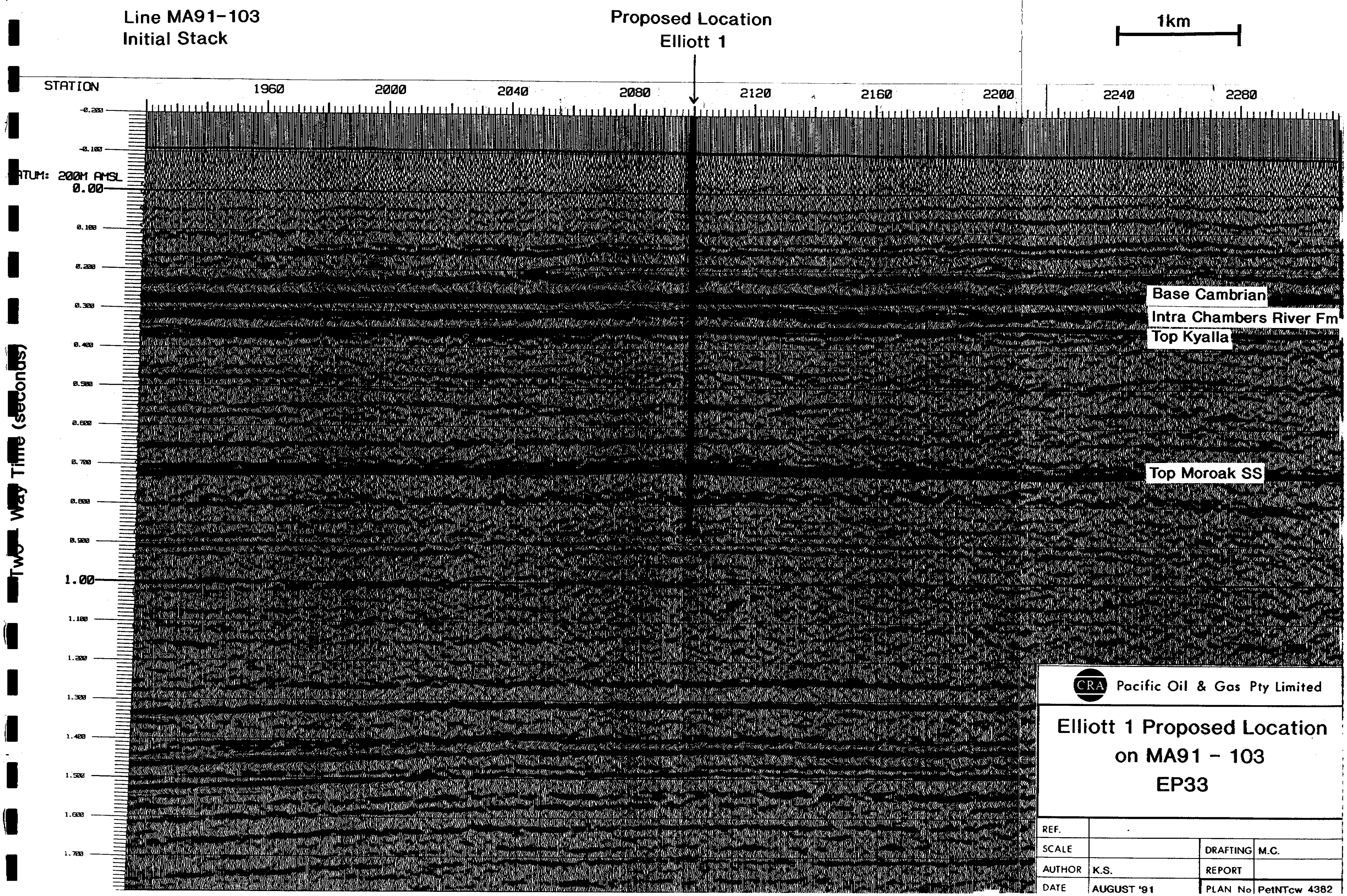
ELLIOTT 1 DRILLING PROGRESS CHART



PetNTcw 4604

Figure 2

Figure 3



CRA Pacific Oil & Gas Pty Limited

Elliott 1 Proposed Location on MA91 - 103 EP33

REF.			
SCALE		DRAFTING	M.C.
AUTHOR	K.S.	REPORT	
DATE	AUGUST '91	PLAN No	PetNTcw 4382

The basal contact of the conglomerate is sharp and reasonably planar, suggesting that the underlying mudstone may have been indurated when the conglomerate was deposited, thus implying a significant hiatus. This differs with the interpretation of the same contact in **Jamison 1**, where only a minor hiatus was inferred.

Below the conglomerate a thick interval (664.73-1322.28m) predominantly comprising grey to black silty mudstone with variable proportions of siltstone and fine sandstone interbeds was intersected. This has been labelled as the Kyalla Member of the McMinn Formation due to its strong lithologic resemblance (including the presence of the distinctive "molar" structures) with Kyalla sections encountered elsewhere and its relative position in the penetrated stratigraphy.

A notable feature of this interval in **Elliott 1** (compared to intersections in other holes) is the occurrence of several sub-intervals where sandstone interbeds thicken and increase in abundance to become dominant over the silty mudstone. These sub-intervals range 2-35 metres in thickness and consistently show gradational transitions (at both the top and base) to the adjacent silty mudstone, suggesting a repeated gradual waxing and waning of sand supply.

The sand mostly comprises interbeds and sets of fine to very fine, relatively clean sandstone, with occasional 0.3-25cm thick beds of medium to very coarse, well rounded grains in a muddy matrix which tend to become less common with depth. The latter units have been informally termed pseudo-oolites because of the distinctively coarse, well rounded grains, and they are inferred to be poorly developed examples of the oolitic facies of the Sherwin Ironstone Member of the McMinn Formation, which is encountered in outcrop and drill holes over 200km to the north.

Below about 720 metres gas readings began to rise slightly through these sandier sub-intervals, and below 790 metres fluorescence began to become evident. These shows of gas and fluorescence became ubiquitous with depth, mostly occuring (patchily) throughout the sand-rich sub-intervals.

Thus, these sub-intervals of increased sand content demonstrate a reservoir potential (albeit poor) not previously encountered within the Kyalla Member. However, this increase in reservoir potential due to increased sandy sub-intervals appears to be at the expense of source rock potential, as the Kyalla Member in **Elliott 1** is of considerably leaner organic content than it is in **Jamison 1**.

Beneath 1310 metres the proportion of sandstone to silty mudstone increases again, providing a gradual transition to the underlying Moroak Sandstone Member, the top of which is picked at 1322.28m due to the presence of thicker sandstone beds and the dearth of mudstone interbeds. The Moroak Sandstone in **Elliott 1** is very similar to the sixty metres penetrated at the bottom of **Jamison 1**, mostly comprising fine to coarse, clean, very silicified, massive to crudely planar- and cross-bedded quartzose sandstone.

In addition to the silicification, other diagenetic modifications include pressure solution features, oxidation effects and (near the top) brittle fracturing associated with anhydrite veins, including a 2.6 metre thick zone of coarse crystalline anhydrite with brecciated margins (1327.55-1330.15m).

Although gas readings had fallen off somewhat, fluorescence shows continued in the sandstone sub-intervals, and persisted into the top of the Moroak Sandstone down to about 1346 metres (roughly coincident with the brittle fracturing and anhydrite veining).

Below about 1428 metres sub-intervals (10-100cm) with thin silty mudstone interbeds start to appear, commonly displaying the same "molar" structures which are so distinctive in the overlying Kyalla Member.

These spasmodically become thicker and more frequent with depth, and below 1495 metres the drilled section becomes a repetitive series of alternations between sub-intervals of sandstone and thinly interbedded sandstone/silty mudstone. The proportion of the latter gradually becomes dominant below about 1620 metres, but significant intervals of thick sandstone beds were still occurring down to the total depth (TD) of 1729.20 metres (driller). This continuing alteration between sandstone and thinly interbedded sandstone/silty mudstone down to TD is inferred to be a broad (and very gradual) transition to either the Velkerri Formation or a sub-Moroak extension of Kyalla facies within the McMinn Formation. However, due to the lack of an unequivocal point at which this transition could be said to terminate it was decided to include all of this section within the Moroak Sandstone Member. (Alternatively, it could be labelled as "undifferentiated McMinn Formation" below the thick sandstone section).

AGE	FORMATION	ACTUAL (m)	PROGNOSED (m)	DIFF. (m)
Tertiary/ Cretaceous	Undifferentiated	Surface	Surface	0
Cambrian	Jinduckin Formation	119	-	-
	Tindall Limestone	323.5	100	-223.5
	Nutwood Downs Volcanics	-	300	-
	Cox Formation	-	540	-
	Bukalara Sandstone	-	560	-
Proterozoic	Jamison Sandstone	524	581	+57
	McMinn Formation Kyalla Member	664.73	621	-43.73
	Moroak Sandstone Member	1322.28	1412	+89.72
	Velkerri Formation "Upper"	-	1641	-
	TOTAL DEPTH	1729.20	1700.0	-29.20

Table 5: Actual Vs. Prognosed Formation Tops - **Elliott 1**

NOTE: All depths are measured from the drilling floor, 2.4 metres above ground level.

2.2 Well Objectives versus Performance

Elliott 1 was designed as a stratigraphic test of the presence and hydrocarbon prospectivity of a thickened Roper Group section, inferred from regional gravity and seismic data to be the southern extension of the Beetaloo Sub-Basin.

In the previous year **Jamison 1** (drilled approx. 90km to the north) had penetrated a thick Proterozoic succession in what seems to be the centre of this sub-basin. **Jamison 1** had encountered prospective source, reservoir and seal, coupled with minor amounts of oil and gas being flowed on testing. However, it did not adequately investigate the reservoir potential of the Moroak Sandstone, in which it was terminated.

Thus, a location was sought where the Moroak could be intersected at shallower depth. Interpretation of the regional seismic suggested that the Moroak Sandstone was 300-500 metres shallower at the **Elliott 1** location than in **Jamison 1**, as well as being near the crest of a gentle, but very broad anticlinal feature.

The main objectives of drilling the hole were:

<u>Primary</u> To investigate the reservoir potential of the Moroak Sandstone.

<u>Secondary</u> a) to investigate the nature of the subcrop of the Jamison Sandstone beneath the base Cambrian unconformity, and
b) to confirm the extension of prospective source rocks into this part of the sub-basin.

This location was also approximately coincident with the zone where the Jamison Sandstone subcropped the Cambrian unconformity (as the pre-Cambrian section shallowed to the south), allowing an attempt to investigate whether or not this subcrop had any potential as a play concept.

Additionally, the drilling of **Elliott 1** sought to provide data on the quality and maturity of the Kyalla Member source rock in the southern half of the sub-basin, rather than relying on the lengthy extrapolation from **Jamison 1**.

The primary objective of **Elliott 1** was satisfied in that the Moroak Sandstone was reached just below 1320 metres and appeared to be passing gradationally back into a mudstone sequence at 1729 metres (TD), with the highest proportions of sand occurring above 1500 metres.

Despite its reasonably clean appearance and fine to coarse grainsize the reservoir properties of this sandstone were somewhat disappointing, with porosities mostly ranging 1-8% and permeabilities mostly less than 5 millidarcies (Appendix 4). Extensive diagenetic effects including silicification, stylolitization and clay authigenesis seem to have considerably occluded the primary porosity, thereby limiting the Moroak's reservoir potential. Some secondary porosity created by brittle fracturing was evident (especially towards the top) and this produced slightly better values (porosities up to 9.2% and permeabilities up to 274 millidarcies), but appears to have been restricted by an associated phase of anhydrite precipitation within fractures.

A drill stem test (DST 5) conducted over a zone of good fluorescence coincident with these anhydrite-filled brittle fractures produced about 5200 litres of very saline formation water in 98 minutes of flow. Despite not yielding any major trace of hydrocarbons, this test indicated an encouraging potential for flow from secondary (fracture) porosity.

The objective of investigating the Jamison Sandstone's truncation against the base Cambrian unconformity was not achieved in **Elliott 1**. Due to the total loss of circulation between 420 metres and the 5-inch casing point (595 metres) no cuttings were brought to surface over this interval and therefore, no geological data is available for the base Cambrian section, the top 60 metres of the Jamison Sandstone, or the intervening contact. Apart from indicating the approximate depth of this contact, the available downhole geophysical logs (gamma, density and neutron) don't contribute much to understanding the nature of this part of the section.

The other secondary objective of **Elliott 1**, to investigate source rock potential, was satisfactorily achieved by the complete penetration and continuous coring of the Kyalla Member. A suite of core chip samples was taken throughout and submitted for Rock Eval pyrolysis, the results of which (Appendix 5) indicate that;

(i) overall the Total Organic Carbon (TOC) content was lower than for the equivalent section in **Jamison 1**, ranging mostly 0.1-0.8% in the top half and mostly 0.5-2.5% in the lower half, and

(ii) the Kyalla section went from immature to marginally mature at the top, through optimally mature and was trending towards overmaturity, near the base. (The basal 10 metres showed gross overmaturity due to hydrothermal effects from the Moroak Sandstone immediately below).

The lower organic content is thought to be related to the increased incidence of sandstone interbeds which, while decreasing source rock properties, have the benefit of providing proximal reservoir horizons for the generated hydrocarbons. Hence, there were several sandy intervals within the Kyalla which contained fluorescence and minor gas. Although these were too tight to yield any significant hydrocarbons on test they provide a reservoir potential which had not been previously encountered.

2.3 Stratigraphy

(see Appendix 6 for detailed descriptions).

Undifferentiated Tertiary/Cretaceous

Surface to 119(?) metres (119 metres thick?).

Pink, orange and yellowish mudstone with minor sandstone changing to brown black claystone below 48 metres, and paling to off-white over lowermost 10 metres. (Note: base picked from logs; cuttings listed as down to 127m).

Jinduckin Formation

119(?) - 323.5 metres (204.5 metres thick?).

Down to 210 metres the section comprises grey to pale brown, very fine to coarse argillaceous sandstone interbedded with pale to reddish brown siltstone which becomes increasingly dolomitic with depth. Below 210 metres the dolomitic siltstone becomes dominant, with frequently interbedded greyish and yellowish limestone, dolomite, and dolomitic limestone becoming more common with depth.

(Note: this formation exhibits a transition from dominantly clastic at the top to dominantly carbonate at the base. The underlying formation is dominantly carbonate throughout, and the boundary between them was nominally chosen (from logs) as the top of the thicker limestone units).

Tindall Limestone

323.5 - 524 metres (200.5 metres thick).

Pale to moderate yellow brown, microcrystalline, blocky to sub-fissile, variably dolomitized limestone with occasional thin sub-intervals of light bluish grey, calcareous siltstone. (Note: no cuttings below 409 metres due to lost circulation).

Jamison Sandstone

524 - 664.73 metres (140.7 metres thick).

Very light to light grey (occasionally slightly greenish grey), very fine to medium quartzose sandstone with thin, sparse greenish grey mudstone interbeds and clasts, and a pebbly conglomerate at the base. Stratification is mostly "massive" to vaguely chaotic, with intervals of planar and rare cross-bedding. Quartz overgrowths and clays are evident in the matrix throughout, and no traces of hydrocarbons were encountered.

McMinn Formation

Kyalla Member

664.73 - 1322.28 (657.55 metres thick).

Medium grey to black silty mudstone with variably interbedded light grey siltstone and very fine to fine sandstone, the latter locally dominating in 2-35 metre sub-intervals. Stratification comprises planar to wavy planar, variably complete, upward fining cycles with mostly minor, but ubiquitous soft sediment disturbance throughout, most notably "molar" structures. Variable organic richness in the mudstones and patchy to solid fluorescence and traces of gas in the siltstones and sandstones were observed through much of this interval (see Appendix 7 and Enclosure 4).

Moroak Sandstone Member

1322.28 - 1729.20 metres (TD) (406.92 metres thick).

Medium to light grey (locally yellowish to reddish), fine to coarse grained quartzose sandstone with generally "massive" to poorly-defined planar bedding, locally chaotic or cross-bedded. Below 1495 metres sub-intervals of silty mudstone with thin sandstone/siltstone interbeds alternate with sub-intervals of sandstone, and gradually start to become dominant with depth. Silicification and pressure solution are evident throughout, with local brittle fracturing and anhydrite veining towards the top. Patchy to solid fluorescence occurs down to 1346 metres (see Appendix 7 and Enclosure 4).

2.4 Mud Logging

Mud logging services were provided by Halliburton Geodata. Rate of penetration, total gas detection, gas chromatography, pump strokes, fluorescence, calcimetry and H_2S detection were monitored, and a continuous mud log was prepared at a scale of 1:500. A copy of this formation evaluation log is included in this report as Enclosure 4 (PetNTcw4603) and some items are included on the 1:1,000 Composite Log (Enclosure 1, PetNTcw4393). Mud logging personnel also assisted Pacific staff in the recovery of sample, and in the handling and marking of core.

2.5 Geophysical Logging

2.5.1 Magnetic Susceptibility

Magnetic susceptibility measurements were taken (using a hand-held meter) from representative cuttings samples every three metres throughout those parts of the hole which were air drilled or rotary drilled with mud. Measurements were taken at two metre intervals over the entire length of core. The magnetic susceptibility log is included in Enclosure 2 (PetNTcw4397).

2.5.2 Spectral Gamma Ray

Spectral Gamma Ray readings were taken (using a hand-held spectrometer) from representative cuttings samples every three metres throughout those parts of the hole which were air drilled or rotary drilled with mud. Measurements were taken every two metres over the entire length of core. Total count, Uranium, Potassium and Thorium counts were all sampled four times over a ten second sample window and the results averaged and displayed on the log included in Enclosure 2 (PetNTcw4397).

2.5.3 Wireline Logging

After reaching Total Depth (TD) at 1729.20 metres (driller) a full suite of wireline logs, comprising of Spontaneous Potential, Dual Focussed Resistivity, Gamma Ray, Bulk Density, Neutron Porosity and Sonic were run as per Table 6. These appear on the Composite Log (Enclosure 1, PetNTcw4393) at 1:1,000 scale, and copies of each log at 1:500 scale are provided in Enclosure 3 (PetNTcw4398, 4399 and 4400).

LOG TYPE	DEPTH (metres bdf)	
	FROM	TO
SP-Dual Resistivity	1729	575
Sonic	1729	575
Gamma-Density-Neutron	1729	Surface

Table 6: Elliott 1 Wireline Logs Summary

2.5.4 Bottom Hole Temperature

Bottom hole temperatures were recorded on each wireline run. A maximum bottom hole temperature of 84 degrees Celsius was recorded during the final logging run at 1729 metres.

Assuming a 25°C surface temperature this equates to a geothermal gradient of 34.1 degrees Celsius per kilometre.

2.5.5 Well Velocity Survey

A 12-level velocity survey was recorded in Elliott 1 by Velocity Data Pty Ltd, a report of which is provided in Appendix 8.

2.5.6 Synthetic Seismogram

Check shot, sonic and density data recorded in Elliott 1 have been used to produced synthetic seismograms, on which a full report is provided in Appendix 9.

2.6 Formation Sampling

2.6.1 Rotary Cuttings

Cutting samples were collected every three metres; from below the centrifuge when drilling with air, and from the shale shakers when rotary drilling with mud. All samples were washed, described and split into two bags, one of which was submitted to the Northern Territory Department of Mines and Energy, and one retained by Pacific Oil & Gas. Cuttings were not collected during coring.

2.6.2 Continuous Core

From 594.92 metres below the drilling floor the well was drilled using a wireline continuous coring technique. Upon recovery the core was pieced together and cleaned with a damp rag. The core was then indelibly marked with a blue line and a red line (red to the right when looking up the core) and a mark on the core every twenty centimetres (annotated every metre). A core block with the drillers depth was placed at the end of each run and a chip sample was taken every two metres for the mudlog description and then stored in a Samplex tray. The core was also examined under ultraviolet light for fluorescence, and if present, the core was photographed under ultraviolet light. The core was then photographed under white light (both wet and dry) and laid out for further description prior to being packaged for dispatch to the CRAE core storage facility in Darwin. A core tally summarizing amounts of core cut and recovered is provided in Appendix 10.

Notes: 1. Except for intervals where core was obviously lost from one run and recovered subsequently, each core interval is marked using the driller's depth (marked on the previous block) as the next datum to avoid compounding minor discrepancies from each core run.

2. In some intervals core recovery is consistently greater than 100%. This was found to be due to a combination of decompaction (due to release from lithostatic pressure) and expansion (due to hydration of clays).

Grind samples for routine mineral analysis were taken for each 5 metre interval over the entire length of the core.

Core with significant hydrocarbon shows was sealed using aluminium foil, plastic cling wrap and shrink wrap before being despatched to the Amdel Core Services laboratory in Adelaide to be photographed and held in storage pending further analytical work.

2.7 Hydrocarbon Shows

Numerous hydrocarbon shows were encountered in **Elliott 1** (see Appendix 10 and Enclosure 4 (mud log), and these are summarized below.

Kyalla Member, McMinn Formation

GAS:

Below 710 metres total gas readings (almost all methane) began to show increases above the 40 ppm baseline, usually coincident with penetration of the sandier subintervals. With depth these increases got progressively larger, rising to about 4000 ppm total gas around 1250 metres. The gas detected also got progressively heavier with depth, peaking with small amounts of C_5 (pentane) being detected sporadically below 1100 metres. Below 1250 metres the amount of gas declined (rapidly at first, then more gradually) to around 100 ppm total gas at the base of the member.

FLUORESCENCE:

790.7 - 801.1m Sparse, patchy and mostly dull to moderately bright blue-white fluorescence (solid over small intervals) associated with tight porosity in some sandstone beds within sandy subintervals. The

	brightest bands (between 793.2 and 793.5m) coincide with oil patches and a light brownish staining of the sandstone.
886.0 - 890.0m	Patchy to solid, dull to bright blue-white fluorescence becoming very common to solid below 887 metres, again associated with tight porosity in some sandstone beds within a sandy subinterval. Light brownish oil staining is readily apparent over the brighter bands of fluorescence (below 887 metres).
1008.8 - 1076.0m	Sparse to abundant, dull to moderately bright blue-white fluorescence associated with very tight porosity in thin (mostly <2cm) sandstone interbeds within a dominantly silty mudstone subinterval. Pin-point bleeds of brightly fluorescing light oil emanate from many of these beds and occasionally along fracture planes. As above, intervals of the brightest fluorescence were associated with a light brown staining of the core under normal light. Some thin sandstone beds (most notably between 1017-1057m) showed a dull yellow-orange fluorescence.
1118.4 - 1145.9m	Common to abundant, patchy to solid mostly moderate to very bright blue-white fluorescence occurring within tight to low permeability porosity sandstone beds up to 50cm thick. Pin-point bleeds of brightly fluorescing light oil (and minor gas) occur commonly to profusely throughout (emanating from porosity in slightly coarser laminae and fractures) resulting in a light brownish oily film saturating the core surface. Rare thin bands and patches of dull yellow-orange fluorescence were also observed sporadically. Rare, sparse to patchy bleeds in some sandstone beds occur over the following; 1152.7-1153.0m,

1153.7-1153.9m, 1154.7-1154.9m, 1156.4-1156.5m, 1156.9-1157.0m and 1159.0-1159.15m.

1171.8 - 1219.4m	Very sparse, very dull to (rarely) moderately bright blue-white fluorescence occuring as thin, irregular bands and patches (weak pin-point bleeds) within some of the mostly thin sandstone interbeds. Over 1191.0-1191.2m and 1191.6-1191.75m profuse bleeds of blue-white fluorescence occur, and saturate the core surface. Even more rarely, patches and bands of dull yellow-brown fluorescence were observed very sporadically throughout.
1288.5 - 1303.3m	Sparse to very sparse, dull to moderately bright blue-white fluorescence occurring as irregular bands and patches (weak pin-point bleeds) within some of the mostly thin sandstone interbeds. The best of these (especially between 1295.2-1297.8m) show a brownish oil staining under normal light. As above, rare bands of a dull yellowish fluorescence were observed sporadically.
1316.5 - 1320.8m	Sparse to common, dull to moderately bright blue-white fluorescence occurring as weak to profuse pin-point bleeds emanating from pores and fractures within sandstone beds. Most of these are evident under normal light as oily patches soaking the core (but should not be confused with core soaked with the super saline formation water). The more active pin-point bleeds also yield the super saline water, which precipitates salt on the core surface.

<u>Moroak Sandstone Member, McMinn Formation</u>

GAS:

No significant gas shows were detected. The background decreased gradually from about 100 ppm total gas to 10-20 ppm around 1500 metres, with only a slight increase between 1340-1360 metres (which is partly interfered with by an adjustment to the gas trap).

Below 1500 metres total gas readings rose gradually again, mostly up to a few hundred ppm and infrequently peaking around 1000 ppm down to 1700 metres.

FLUORESCENCE:

1322.4 - 1346.4m Sparse to abundant, dull to very bright blue-white fluorescence, most commonly below 1340 metres. Occurs as thin to irregularly thick bands and patches (from pin-point bleeds) apparently concentrated in coarser laminae and fractures within this thick sandstone sequence. This fluorescence is ubiquitously associated with dark brownish oily patches under normal lights, also with common salt crystals precipitated from saline formation water bleeding from pores.

Note: bright purplish fluorescence was observed to be associated with anhydrite veins.

Shows were reported to have stopped abruptly (at the end of a coring run) at 1346.38m, although no major change occurred in the lithology.

2.8 Analyses

2.8.1 Source Rock Geochemistry

Ninety nine small (30-50 gram) samples were taken at frequent intervals throughout the core (with emphasis on the darkest and finest-grained units) to assess source rock potential and maturity levels. All samples were submitted to Amdel Core Services (Adelaide) and, following determination of Total Organic Carbon (TOC) content, those reporting greater than 0.4% TOC were subjected to Rock-Eval pyrolysis using a Girdel IFP-Fine Mark 2 instrument. Results of these analyses are given in Appendix 5.

2.8.2 Reservoir Analysis

Eighty two core samples from Elliott 1 were submitted to Amdel Core Services (Adelaide) for reservoir analysis. For most a one-inch core plug was cut and analysed for ambient porosity and permeability, with some samples also analysed for grain density and pore fluid saturations. Three full-diameter core samples were analysed for porosity and horizontal and vertical permeability at ambient pressure. Results of these analyses are given in Appendix 4.

2.8.3 Water Analysis

Water samples taken from the water bore, mud tanks, and Drill Stem Test intervals were submitted for standard water analysis and the result are included in Appendix 11.

2.8.4 Gas Analysis

Gas samples were collected from the bubble hose in gas bombs prior to and/or during the venting of gas collected from closed chamber Drill Stem Tests. Results of these analyses are included in Appendix 11.

2.8.5 Oil Analysis

Samples of liquid hydrocarbons were taken from fluids recovered during Drill Stem Tests and extraction from core samples. Results of these analyses are presented in Appendices 11 and 12.

2.9 Contributions to Geological Knowledge

Elliott 1 has provided a major contribution to the knowledge of the Beetaloo Sub-Basin, as well as having wider implications for the distribution and stratigraphy of the uppermost Proterozoic section.

It has;

(1) in conjunction with seismic data, confirmed the southward extension of the uppermost Proterozoic (Roper Group) section beneath the Phanerozoic cover,

(2) identified a Cambrian section in which:

- (i) the basal volcanics appear to be absent,
- (ii) the "massive" carbonate of the Tindall Limestone is of similar thickness to that in **Jamison 1**, and
- (iii) the interbedded clastic/carbonate section (tentatively equated to the Jinduckin Formation) is much thicker than in **Jamison 1**, apparently due to less post-Cambrian uplift around **Elliott 1**,

(3) confirmed the Kyalla Member in this area to have suitable organic content and maturation to be a prospective source rock for hydrocarbons,

(4) encountered unexpected, thick subintervals of sandstone within the Kyalla Member, thereby identifying a series of potential reservoir units not previously seen in the sub-basin. (Also, associated with these were some thin, poorly developed "pseudo-oolitic" beds possibly equivalent to the Sherwin Ironstone),

(5) demonstrated that at least one generation of oil has been matured from source beds within the Kyalla Member and migrated locally to adjacent sandstones,

(6) provided the thickest and coarsest Moroak Sandstone Member section yet encountered (in outcrop or the subsurface), in which diagenesis has severely limited reservoir properties, except for some late development of fractures, and

(7) proven that oil and gas reservoired in Proterozoic sediments can be sufficiently sealed and preserved to warrant viable exploration targets.

KEYWORDS

Petroleum, Proterozoic, Drill Stratigraphic, Hydrocarbon Potential.

LOCATION

Approximately 30km northeast of Elliott.

AMG: E 368 118.4
N 8 076 830.1

Latitude: 17°23'25.191" S

Longitude: 133°45'30.601" E

1:100,000 sheet Beetaloo 5663
1:250,000 sheet Beetaloo SE53-6

LIST OF DPO'S

78102, 78103, 78104, 78105, 78106, 78107, 78108, 78109, 78110, 78111, 78112, 78113, 78114, 78115, 78116, 78117, 78118, 78119, 78120, 78121, 78123, 78124, 78125, 78126, 78136, 78036, 77709.