SECTION 2 - GEOLOGICAL DATA

2.1 Geological Summary

Alexander-1 was spudded in the Moroak Member of the McMinn Formation of the late Proterozoic Upper Roper Group. Cuttings samples were taken at 2 metre intervals from the top of the hole to a depth of 46m. from where the hole was fully cored.

The well penetrated an Upper Roper Group section and essentially followed the prognosed section even though there was a distinct lack of well control in the area. Table 3 summarises the actual versus prognosed formation tops.

Numerous fluoresence and a few very minor oil shows were encountered during the drilling of Alexander-1. The fluorescence/shows are detailed in Enclosure 1. The main occurrences of interest are as follows:-

1. Moroak member - bitumen blebs in vugs and in part entirely infilling porosity.

2. Velkerri Formation - distinct kerosene odour throughout.
   - minor oil bleeds mainly associated with small carbonate veinlets.
   - dull brown/gold/white fluorescence at approximately 372m.
   - orange/brown fluorescence at approximately 550m.

3. Bessie Creek Sandstone - Pore-filling bitumen throughout.
   - Bright orange fluorescence in fractures, yellow/white speckled fluorescence in places.

The well was terminated in the Corcoran Formation, the unit directly underlying the primary reservoir target - the Bessie Creek Sandstone (Figure 3 shows porosity/permeability results).

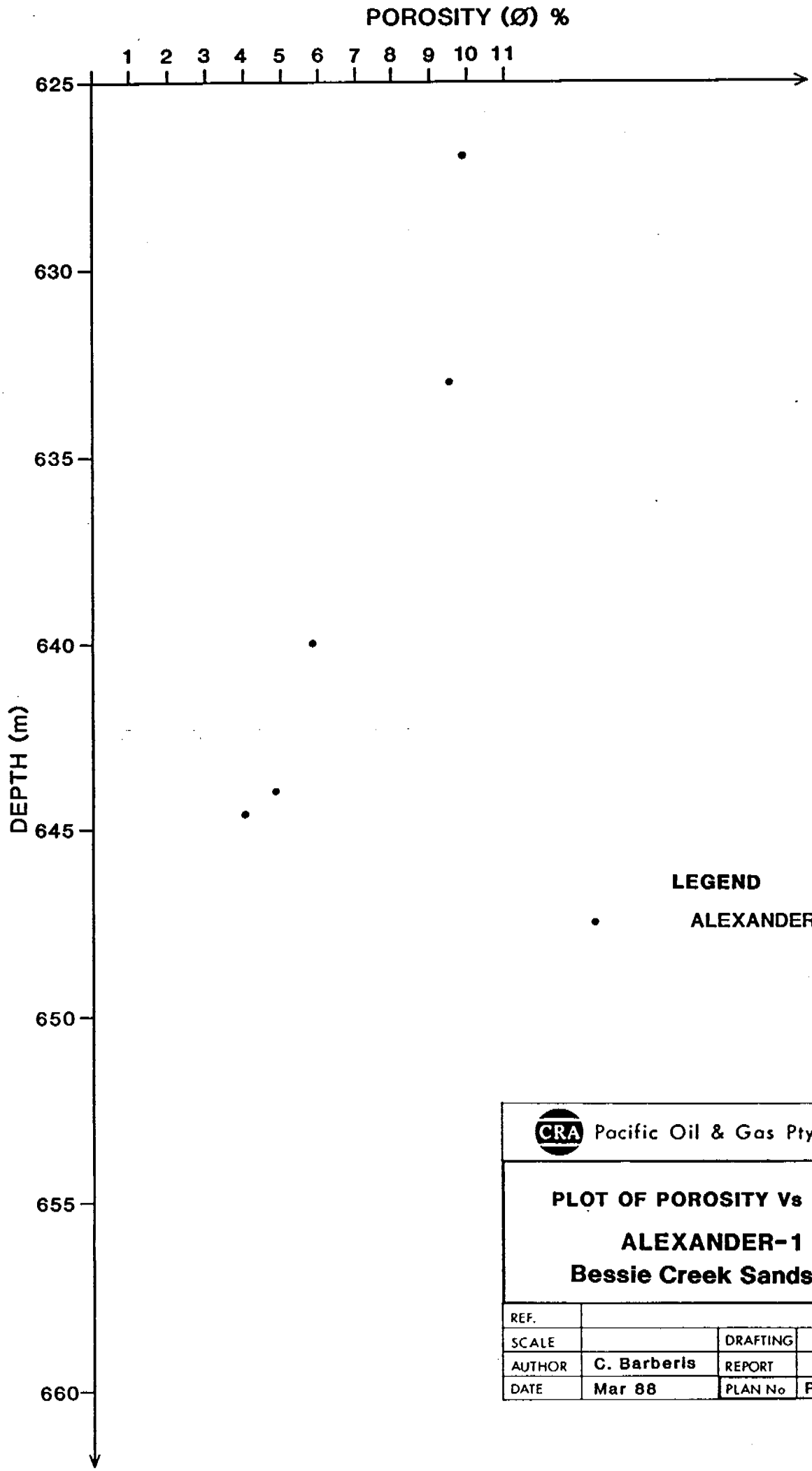
An on-site evaluation of the wireline logs indicated no zones that warranted testing. The well was then plugged and abandoned in the approved manner.

TABLE 3

ACTUAL VERSUS PROGNOSED FORMATION TOPS

WELL: Alexander-1
PERMIT: EP4, Northern Territory

A G E	FORMATION	DEPTH TO FORMATION TOP		
		ACTUAL DEPTH	PROGNOSED DEPTH	DIFFERENCE
Proterozoic	Kyalla Member		Surface	
	Moroak Sandstone Member	Surface	25	
	Velkerri Fm.	62	140	- 78
	Bessie Ck Sst	617	590	+ 27
	Corcoran Fm.	661	680	- 19
	TD	689.6	710	- 20



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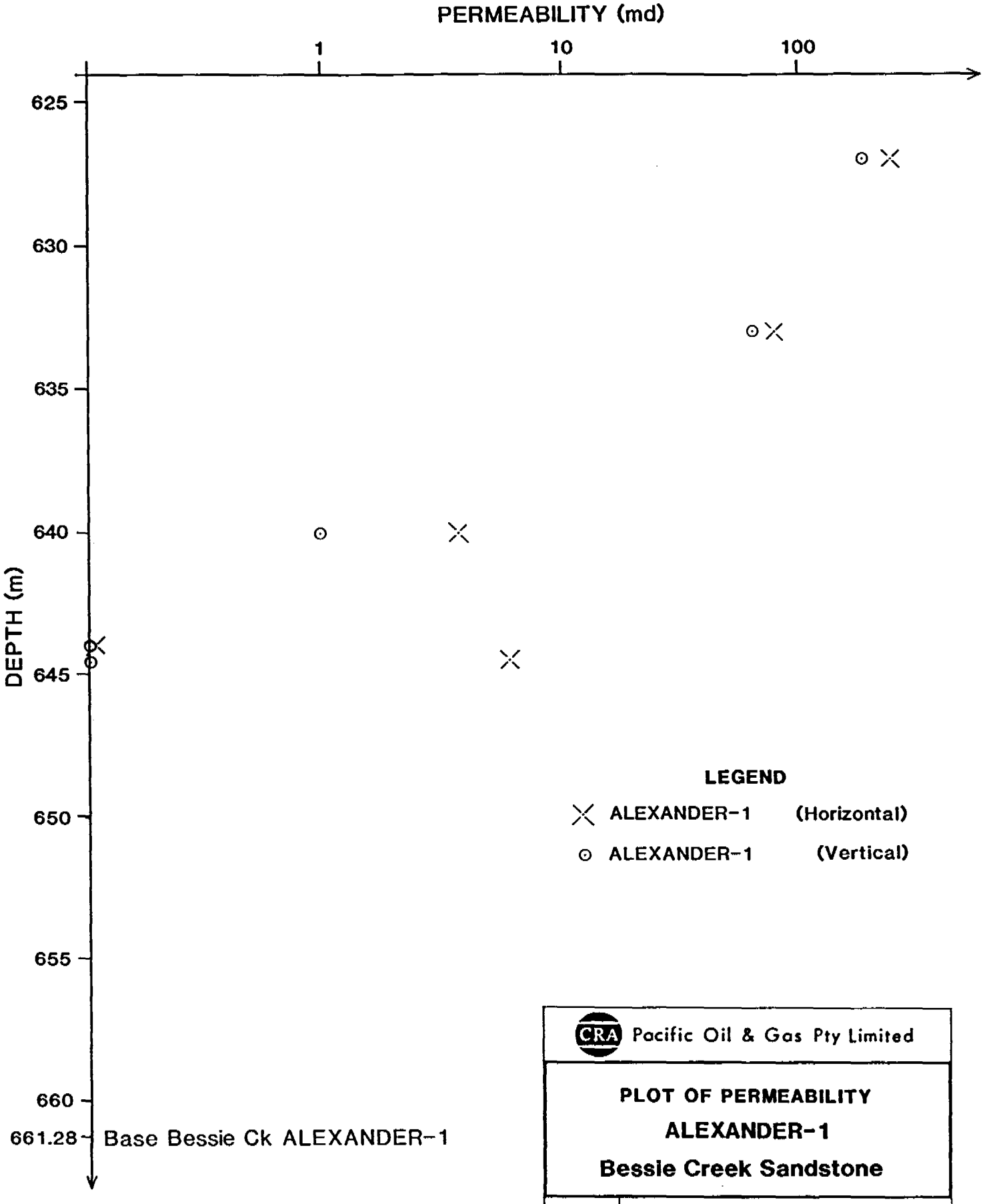
PLOT OF POROSITY Vs DEPTH

ALEXANDER-1

Bessie Creek Sandstone

REF.			
SCALE		DRAFTING	
AUTHOR	C. Barberis	REPORT	
DATE	Mar 88	PLAN No	PetNTcw 651

Figure 3A



CRA Pacific Oil & Gas Pty Limited

PLOT OF PERMEABILITY
ALEXANDER-1
Bessie Creek Sandstone

REF.			
SCALE		DRAFTING	
AUTHOR	C. Barberis	REPORT	
DATE	Mar 88	PLAN No	PetNTcw 653

Figure 3B

2.2 Well Objectives

A. To obtain a full stratigraphic and lithological section of the Upper Roper Group, McArthur Basin.

B. To obtain a full source rock quality profile through the whole stratigraphic sequence, including oil and gas generative potential.

C. To provide preliminary data on reservoir horizons.

D. To provide well control for the seismic data obtained by Amoco in 1983.

E. To test a seismically defined structure on a north south fault appearing to exhibit fault independent closure.

2.3 Performance vs. Objectives

The performance versus objectives are discussed below using the same subsections as section 2.2 above.

A. A full stratigraphic and lithological section of the McArthur Basin Upper Roper Group was intersected by Alexander-1.

B. A full source rock profile was obtained over the entire stratigraphic sequence in Alexander-1. Samples were taken at five metre intervals through all potential source horizons (Moroak member/Velkerri Formation/Corcoran Formation). All samples were analysed for TOC, and those samples with a TOC > 0.4% were analysed by the Rock-Eval pyrolysis technique. Results are located in Appendix III.

Based on the results of the geochemical analyses, it was possible to highlight organic-rich oil-prone source horizons. The middle part of the Velkerri Formation appeared to be the best source horizon.

C. The reservoir horizon intersected (namely the Bessie Creek Sandstone) was tested for porosity/permeability.

Figure 3. shows a graphical representation of the results. These results can be found in Appendix IV.

D&E. The validity of the test is uncertain. The quality of seismic data available is very poor and a reprocessing/reinterpretation excercise is currently underway to identify the structure more clearly.

2.4 Stratigraphy

The nomenclature used in the following discussion and stratigraphic table (Table 4) is based on a compilation of all available data concerning the stratigraphy of the McArthur Basin.

PROTEROZOIC

Moroak Member
Surface to 62 metres. (thickness 62 metres plus).
Siltstone/coarse to medium grained sandstone. Interbedded, current-laminated siltstone and crossbedded medium to coarse grained sandstone. Some scour and high energy bedding features are present.

Colours are dark greenish grey, dusky red laminations with dusky green, yellowish grey and red brown associated.

Velkerri Formation
62 to 617 metres (thickness 555 metres)
Very fine sandstone/siltstone/mudstone.
The Velkerri Formation can be divided into three sections as follows:-

1. Upper Velkerri - 62-280m (thickness 218m.)
   62-90m
   Gradational boundary consisting of current laminated thinly interbedded fine sandstone/siltstone to dominantly siltstone with minor claystone.
   Yellowish grey, pale olive, greyish yellow green and olive black to light brown.

   90-127m
   Thinly interbedded very fine sandstone/siltstone. Sandstone has regular laminated bedding. No current bedding structures.
   Dark grey to grey black
   Intervals of black carbonaceous material up to 0.45m thick.

127-225m
Mainly varved (1mm-5mm) mudstone/siltstone sequence, regularly bedded and structureless. Siltstone and mudstone have black carbonaceous interlaminae rhythmically bedded within them. The entire interval consists of 3 fining upward cycles from fine grained silty sandstone grading up into structureless silty mudstone with organic matter increasing upwards.
Black grey to dark grey.

225-280m
Glauconitic interbedded siltstone and rare mudstone. Organic matter content generally decreases with depth towards middle of interval and then increases to base. Olive grey/olive black to brown black colouring.

2. Middle Velkerri 280-446m (thickness 166m)

280-446m
Massive to laminated highly carbonaceous mudstone/shale. Pyrite is common. Occasional oil bleeds occur from calcareous lenses and veinlets. Olive black to black colouring.

3. Lower Velkerri 446-617m (thickness 171m)

446-565m
Carboncaceous mudstone (partly glaucontic) exhibiting conchoidal fracture, often slumped, wispy and flecked carbonaceous material. Most of the unit has carbonate infilled fractures. Medium bluish grey to dark green grey.

565-617m
Organic rich thinly bedded mudstone becoming generally slightly less organic matter rich towards the base. Grey black/brown black to black.

Bessie Creek Sandstone
617-661m (thickness 44m)

Sandstone
Cross bedded fine to medium grained sandstone with abundant shale intraclasts. Numerous stylolites present. Pinkish "clouds" of organic matter with associated pyrite, colour generally being medium dark grey to dark grey.

Corcoran Formation
661-689.6m (thickness 28m plus)

Sandstone/siltstone
Thinly interbedded fine to very fine sandstone and siltstone. Numerous soft sediment deformation features are present and provide a diagnostic character for the interval.

STRATIGRAPHY – ROPER GROUP

<table>
<tr><td colspan="2">CHAMBERS RIVER FORMATION</td><td rowspan="2">COBANBIRINI FORMATION</td></tr>
<tr><td>McMINN FORMATION</td><td>KYALLA MEMBER
SHERWIN IRONSTONE
MOROAK SANDSTONE MEMBER</td></tr>
<tr><td colspan="2">VELKERRI FORMATION</td><td>LANSEN CREEK SHALE</td></tr>
<tr><td colspan="3">BESSIE CREEK SANDSTONE</td></tr>
<tr><td colspan="3">CORCORAN FORMATION</td></tr>
<tr><td rowspan="3">ABNER SANDSTONE</td><td colspan="2">HODGSON/MUNYI SANDSTONE MBR.</td></tr>
<tr><td colspan="2">JALBOI MEMBER</td></tr>
<tr><td colspan="2">ARNOLD SANDSTONE MEMBER</td></tr>
<tr><td colspan="3">CRAWFORD FORMATION</td></tr>
<tr><td colspan="3">MAINORU FORMATION</td></tr>
<tr><td colspan="3">LIMMEN SANDSTONE</td></tr>
</table>

2.5 Mud Logging

No mud logging services were contracted for Alexander-1.

2.6 Electrical Logging and Other Surveys

At total depth, the following logs were run by BPB Instruments (Australia) Pty Limited.

L O G	R U N	INTERVAL (m)	D A T E
Gamma, density, caliper and porosity	3, 4	5 - 682	5/09/87
Self potential, dual spaced focussed	1, 2	68 - 683	
Gamma, caliper, sonic	3, 5	5 - 677	

Copies of all well logs are included as Enclosure 2.

2.7 Bottom Hole Temperature

Bottom hole temperature recorded at 683.28m (logger) was 58°C.

2.8 Formation Sampling

2.8.1 Ditch Cuttings

Ditch cuttings were collected at two metre intervals down the hole from 0 metres to 46 metres. A washed sample from each interval was described by the company geologist in detail and a portion of the sample submitted to the mines branch.

2.8.2 Conventional Cores

Alexander-1 was a fully cored hole from 46m to 689.6m (T.D.). Core is stored at the CRA Exploration Pty Limited core shed in Darwin.

2.9 Petrology

Two samples were submitted for petrographic studies to AMDEL. Descriptions were as follows:-

46.6m Silica-cemented sandstone

This rock is a silica-cemented sandstone; many of the cavities between the grains contain friable secondary iron oxide/hydroxide material.

Detrital material consists entirely of quartz and (rare) quartzite grains which have been well-sorted about an average size of 0.35mm. Virtually all of the grains have a rim of optically continuous overgrowth and the development of this has been responsible for lithification of the rock. Within the angular, straight-sided cavities that remain are remnants of soft goethitic or limonitic material. These are near-opaque, brownish aggregates which are dark between crossed Nicols. These are traces of brown/green indeterminate "clay".

Authigenic quartz is common in these parts of the rock, shows rational crystal faces against the limonite/goethite and, in the author's view, pre-dates the iron oxide phases.

In one part of the thin section, however, there is a translucent brown material which fills all the intergranular space and here authigenic quartz is absent. This is thought to be an instance of early deposition of organic material which has inhibited pore water flow and consequently inhibited the development of quartz overgrowths.

48.3m sandstone

The thin section shows that it is a sandstone. There are abundant well-rounded quartz grains 0.3 to 1mm in size and between these is an aggregate of quartz, opaques and carbonate in which the average crystal size is less than 0.05mm.

2.10 Reservoir Potential

Details are contained in Appendix IV and Figure 3 for the seven samples submitted for reservoir analysis to AMDEL from Alexander-1.

2.11 Hydrocarbon Shows

Numerous fluorescence and a few very minor oil shows were encountered during the drilling of Alexander-1. Results are detailed in Enclosure 1.

2.12 Geochemistry

2.12.1 Analyses

A total of 54 core samples from Alexander-1 were sent to AMDEL in Adelaide for geochemical analyses. Samples were selected from the section 90 to 620m. at approximately five metre intervals. Every second sample was analysed for Total Organic Carbon (TOC), if this was ≥0.4 then the sample was analysed by the Rock-Eval pyrolysis technique.

The analyses provided by AMDEL were internally consistent and the service excellent.

The analytical results from AMDEL are included as Appendix III and a diagramatically represented as Enclosure 3.

2.13 Geophysics

2.13.1 Core Gamma Ray

Core gamma ray measurements were taken over the entire interval from 0 - 689m in Alexander-1. Results can be found as Enclosure 4.

2.13.2 Magnetic Susceptibility

The entire core from Alexander-1 was measured for magnetic susceptibility. Results are included as Enclosure 5.

2.14 Contributions to Geological Concepts

Prior to the drilling of Alexander-1 there was a paucity of hard data available in the McArthur Basin.

Alexander-1 provided a full stratigraphic sequence through Upper Roper Group of the McArthur Basin, evaluation of its hydrocarbon potential is now possible.

Alexander-1 demonstrated that fair to reasonable quality reservoirs exist in the Upper Roper Group and excellent quality source rocks in the Velkerri Formation.