CONTINENTAL RESOURCES N.L.

BIG DESERT NO. 1

WELL COMPLETION REPORT

P.E.P. 121 MURRAY BASIN - VICTORIA

CONTINENTAL RESOURCES N.L.

BIG DESERT NO. 1

WELL COMPLETION REPORT

P.E.P. 121 MURRAY BASIN - VICTORIA

Prepared by

I.B. CAMPBELL

with contribution by A. Tabassi

September, 1992

Continental Resources N.L.
Level 2, 969 Burke Road,
Camberwell Vic., 3124

APPENDICES - VOLUME 1

SUMMARY

Big Desert-1 was drilled as a deep stratigraphic well in PEP 121, Murray Basin, Victoria. The Operator, Continental Resources N.L., was the sole participant in the well. Big Desert-1 was located 15 km south of the town of Murrayville and 10 km south of the government bore, Gunamalary-2. The primary objective of the well was to evaluate the hydrocarbon prospectivity of the Palaeozoic Netherby Trough, an infra-basin beneath the Murray Basin, which is largely unexplored.

Drilling commenced on 13th May, 1991 and reached a total depth of 1254.4 m (KB) on 14th June, 1991.

At total depth the following logs were run:

- Dual Laterolog / Microspherically Focused Log / GR
- Lithodensity / Compensated Neutron Log / GR
- Bottom Hole Compensated Sonic Log / GR
- Velocity Survey and Vertical Seismic Profile
- Sidewall Cores

Six conventional cores were cut. No drill stem tests were carried out.
Residual light oil was extracted from five cores taken in Permo-Carboniferous and ?Devonian sequences, although no major hydrocarbon indications were observed during drilling. Log interpretation of these sequences confirmed the presence of hydrocarbons in both Palaeozoic formations.

The well achieved the objective of confirming the presence of a thick pre-Tertiary sequence in an interpreted gravity low anomaly and established that the Netherby Trough is an "oil prone" hydrocarbon province, with potential reservoir, seal and mature source rocks present in the trough. Further detailed exploration in the area should provide better data on the structural configuration and play prospects in the trough.

The well was plugged and abandoned on 15th June, 1991.

WELL CARD

CONTINENTAL RESOURCES N.L.

PEP 121, MURRAY BASIN **BIG DESERT NO. 1**

Location:	Lat. 35° 23' 40.568" S Long 141° 13' 09.298" E	**Hole Size:**	12 1/4" to 256 m, 8 1/2" to TD
		Casing Shoe:	95/8" @ 239.9 m
Seismic:	Nil	**Plugs:**	550-490m, 285-215m, Surface
Elevation:	G.L. 82.05 m ASL	**Spudded:**	13.5.91 @ 1300 hrs
	K.B. 85.10 m ASL	**T.D. reached:**	14.6.1991 @ 1100 hrs
Status:	P & A	**Rig released:**	15.6.1991 @ 2400 hrs

		DEPTH (M)		
AGE	**ROCK UNIT**	**K.B.**	**Sub-sea**	**Thickness (m)**
Tertiary	Parilla Sand	Surface	+ 82.1	100
Tertiary	Duddo Limestone	103.5	- 17.9	137.5
Tertiary	Ettrick Marl	241.0	- 155.4	16.0
Tertiary	Olney Formation	257.0	- 171.4	160.5
Tertiary	Warina Sand	417.5	- 331.9	37.5
Permo-Carboniferous	Urana Formation	455.0	- 369.4	137.0
?Devonian	Grampians Group/ Mulga Downs Group Equiv.	592.0	- 506.4	+ 662.0

TOTAL DEPTH **Driller:** 1254.4 m (K.B.)
Logger: 1254.0 m (K.B.)

Logs: DLL/MSFL/GR, LDL/CNL/CR, BHC/CR, Vel Sur, Mud Log

Cores:
Conventional: Six cores were cut, five recovered.
Sidewall Cores: 30 sidewall cores attempted, twenty one recovered.

Tests: Nil

Comments: First deep stratigraphic well for petroleum exploration in the Netherby Trough. Thick Permo-Carboniferous and ?Devonian sequences were encountered. Residual light oil was recovered from both Palaeozoic sequences.

OBJECTIVES

Big Desert-1 was the first deep stratigraphic well to be drilled as part of a petroleum exploration programme in the Netherby Trough. It tested and evaluated the reservoir and source rock potential of pre-Permian sediments beneath those encountered in the government bore Gunamalary-2, some 10 kilometres to the north.

The objectives of the Big Desert-1 drilling operation were to:

- Drill a stratigraphic section in a previously untested deep part of the Netherby Trough (as defined from gravity survey) in order to obtain the most complete record of the geological succession as possible. It was not sited on a structural high.

- Provide key control data for future interpretation and evaluation of the Netherby Trough and for correlation with other Palaeozoic sequences.

- Drill at a surface fracture intersection that coincides with a previously identified surface geochemical anomaly and thus test for presence of petroleum at depth.

- Thoroughly monitor and sample for all aspects of source, reservoir and seal assessment in the pre-Permian sequence - e.g. regular coring, vertical wireline logging, hydrocarbon monitoring, age determination, maturation evaluation, porosity, permeability, bulk density, etc.

- Provide a datum column for previous (i.e. gravity) and other planned geophysical surveys (e.g. seismic).

CONTINENTAL RESOURCES N.L.

GENERAL LOCALITY MAP

NETHERBY TROUGH - PEP 121

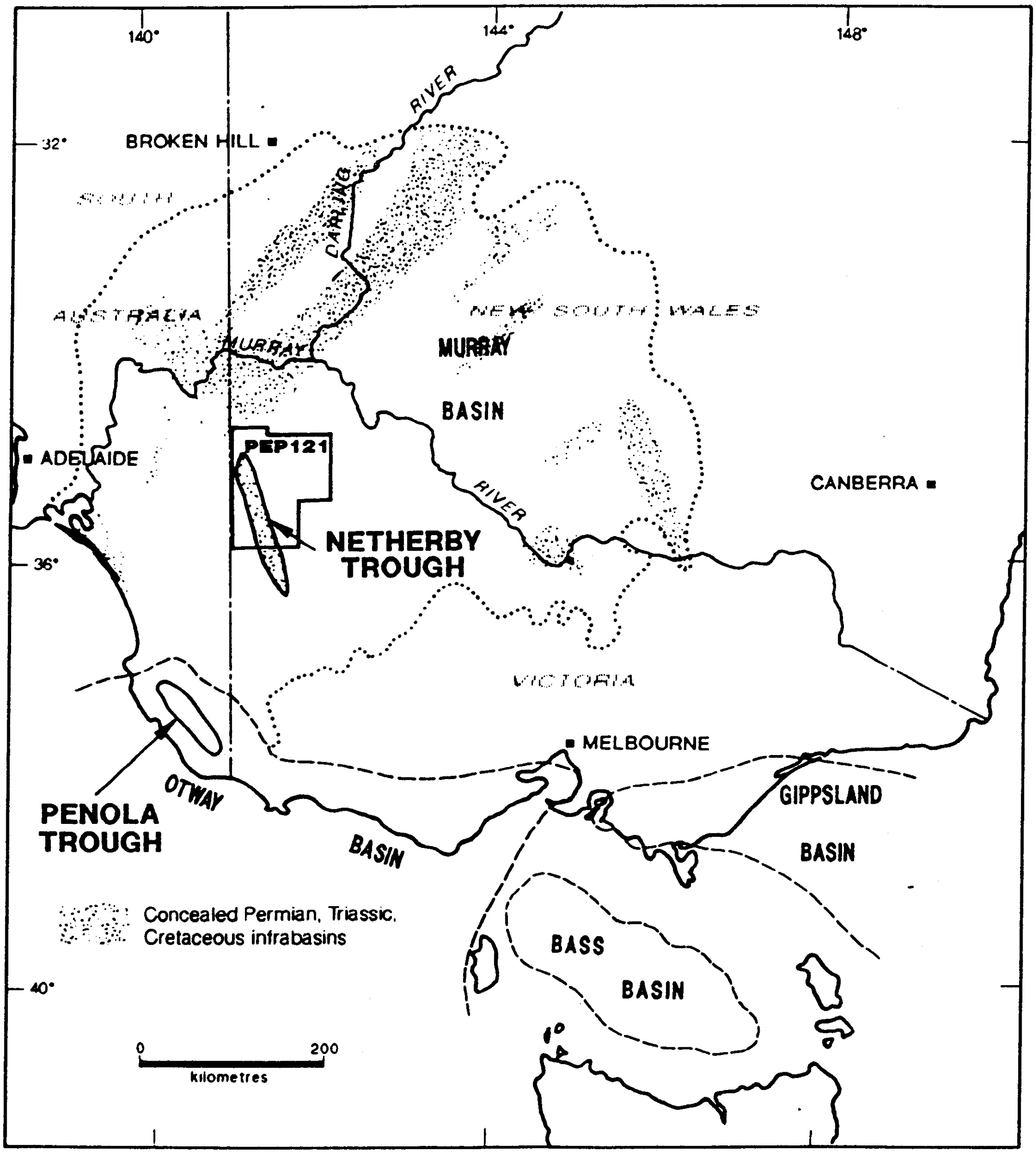


FIGURE 1

(iii cont.)

- Supply basic data for the modelling of hydrocarbon sourcing, generation, migration and other parameters relevant to assessment of hydrocarbon prospectivity and resource potential in the trough.

- Further increase the understanding of the Netherby rift system and provide a link to the understanding of its petroleum potential and other rifted sequences beneath the Murray Basin (e.g. Renmark & Tarrara Troughs) and Otway Basin (e.g. Penola Trough).

CONCLUSIONS

As the first deep stratigraphic well drilled by an exploration company in the Netherby Trough, Big Desert-1 achieved its primary objective of testing the hydrocarbon potential of the prognosed pre-Tertiary stratigraphic succession.

A number of significant conclusions are able to be drawn from the results of drilling this well.

- Thick sequences of Permo-Carboniferous sediments were encountered in the well beneath 455 metres of Tertiary Murray Basin sediments, confirming that the Netherby Trough is a deep Palaeozoic infra-basin. A Cretaceous section was absent in this well as prognosed.

- The well intersected 1254.4 metres of sediments and provides a vital datum column for future drilling and for structural control of future seismic work.

- In the Palaeozoic formations of the trough, potential reservoir, seal and mature source rocks for hydrocarbon accumulation have been established.

- Residual crude oil extracted from cores in both Palaeozoic sections were confirmed by wireline log interpretation.

The exploration potential of the Netherby Trough has been considerably upgraded as a result of Big Desert-1. Preliminary indications suggest that the basin is an "oil prone" hydrocarbon province.

RECOMMENDATIONS

The following recommendations for future exploration in the Netherby Trough are based on results obtained from the drilling of Big Desert-1.

- A seismic programme should be acquired over the area that ties in Big Desert-1 to Gunamalary-2 and surrounding bores in order to delineate and identify the major seismic markers, target horizons and potential traps in the trough.

- Future drilling in the trough should include a programme of thorough hydrocarbon extraction from cores, sidewall cores and / or cuttings taken in the pre-Tertiary succession, so that hydrocarbons, if present, can be positively identified.

- Future drilling activities should revise mud programming to avoid overbalancing viscosity and prevent unnecessary damage to the deeper reservoirs.

CONTENTS

(VOLUME 1)

FIGURES

TABLE

902053 014

APPENDICES

(VOLUME 1)

1. Details of Drilling Plant - Rig 21 Specifications (DMID)

2. Summary of Wellsite Operations - (Tabassi & Associates)

3. Drilling Fluid Recap (Halliburton Geodata)

4. Cutting Descriptions (Halliburton Geodata)

5. Core Descriptions (Halliburton Geodata)

6. Sidewall Core Descriptions (Halliburton Geodata)

7. Petrology Report; X-Ray Diffraction Report (Amdel Core Services)

8. Extraction of Residual Oil and Geochemistry - Big Desert-1; Porosity / Permeability Analysis (Amdel Core Services)

9. Palynology Report - Big Desert-1 (Roger Morgan)

902053 015

ENCLOSURES

(VOLUME 2)

		Scale
1.	Composite Well Log	1:1000
	(Continental Resources N.L. & Tabassi & Associates)	1:1000
2.	Mud Log (Halliburton Geodata)	1:500
3.	Wireline Logs - (Schlumberger)	
	DLL/MSFL/GR	1:200 & 1:500
	LDL/CNL/GR	1:200 & 1:500
	BHC/GR	1:200 & 1:500
	Cyberlook	1:500
4.	Velocity Survey (Schlumberger)	

1. INTRODUCTION

Big Desert-1 was drilled by Continental Resources NL (CRNL) in PEP 121, north-western Victoria, as a deep stratigraphic well. The well penetrated a thick stratigraphic succession and tested the hydrocarbon potential of the pre-Tertiary sediments in the underexplored Netherby Trough. It is the deepest well drilled in this trough to date.

The well was drilled during May and June, 1991 and reached a total depth of 1254 metres. Mud logging and continuous hydrocarbon monitoring were conducted throughout the well. Conventional and side-wall cores were taken in the targetted sections beneath the Tertiary. At total depth a comprehensive suite of wireline logs were run.

Small amounts of residual oil were extracted from cores in the Permo-Carboniferous and ?Devonian sequences, and its presence in these rocks was confirmed by log interpretation.

The actual formation tops were found to be slightly higher than prognosed and all but one of the anticipated formations were encountered in the well. Big Desert-1 was a successful stratigraphic well and provides new geological and hydrocarbon data which will assist future seismic studies and drilling operations in the trough.

2. WELL HISTORY

2.1 Location (see figures 1 & 2)

Co-ordinates:	Latitude: 35° 23^{1} 68" S Longitude: 141° 13^{1} 16" E
Geophysical Control:	None
Real Property Description	County of Weeah Parish of Big Desert Shire of Walpeup
Property Owner:	Crown

2.2 General Data

Well Name:	Big Desert
Operator:	Continental Resources NL Level 2, 969 Burke Road, Camberwell Vic 3124
Participants:	Continental Resources NL 100%
Elevation:	Ground Level 100.0 m ASL Kelly bushing 103.5 m ASL (Unless otherwise stated, all depths refer to Kelly bushing)
Total Depth:	Driller: 1254.4 m Wireline Logger: 1254.0 m

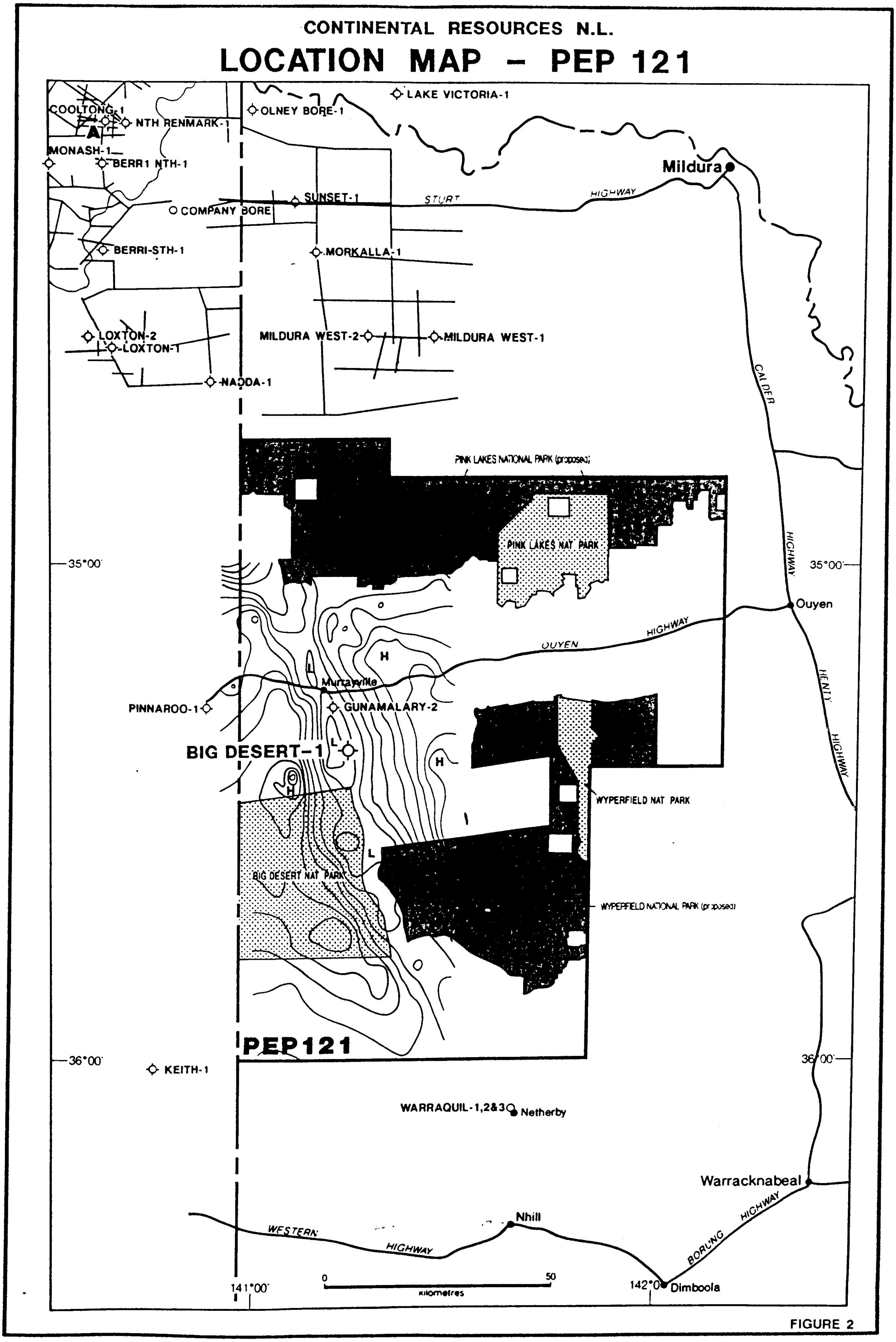

CONTINENTAL RESOURCES N.L.
LOCATION MAP - PEP 121
LAKE VICTORIA-1
COOLTONG-1
NTH RENMARK-1
OLNEY BORE-1
MONASH-1
BERRI NTH-1
Mildura
SUNSET-1
COMPANY BORE
STURT HIGHWAY
BERRI-STH-1
MORKALLA-1
LOXTON-2
LOXTON-1
MILDURA WEST-2
MILDURA WEST-1
NADDA-1
CALDER HIGHWAY
PINK LAKES NATIONAL PARK (proposed)
PINK LAKES NAT PARK
35°00'
Ouyen
OUYEN HIGHWAY
HENTY HIGHWAY
Murrayville
PINNAROO-1
GUNAMALARY-2
BIG DESERT-1
WYPERFIELD NAT PARK
BIG DESERT NAT PARK
WYPERFIELD NATIONAL PARK (proposed)
PEP121
36°00'
KEITH-1
WARRAQUIL-1,2&3
Netherby
Warracknabeal
Nhill
WESTERN HIGHWAY
BORUNG HIGHWAY
141°00'
0
50
kilometres
142°0'
Dimboola

FIGURE 2

Drilling Commencement:	13th May 1991 @ 1300 hrs
Total Depth Reached:	14th June 1991 @ 1100 hrs
Rig Released:	15th June 1991 @ 2400 hrs
Drilling Time to T.D.:	33 days (including 5 days break)
Status:	Plugged and Abandoned

2.3 Drilling Data (see Appendices 1 & 2)

2.3.1 Drilling Contractor

Department of Manufacturing and Industry Development (DMID) Drilling Unit

2.3.2 Drilling Rig

DMID Rig 21

2.3.2 Casing and Cementing Details

A 16" Conductor pipe was set @ 4.9 m

Surface Casing

Size:	95/8"
Weight and Grade:	47 lb/ft, R3 P110
Float Collar:	239.92 m
Shoe:	251.92 m
Cement:	140 sacks Class "A" neat and 270 sacks Class "A" with 1% Ca Cl.
Method:	Single plug displacement
Equipment:	Halliburton Services

Cement Plugs

Plug No. 1

Interval:	550.0 - 490.0 m
Cement:	80 sacks Class "A" neat
Method:	Balanced
Tested:	No

Plug No. 2

Interval:	285.0 - 215.0 m
Cement:	85 sacks Class "A" neat
Method:	Balanced
Tested:	10,000 lbs.

Plug No.3

Interval:	Surface
Cement:	40 sacks Class "A" neat

2.3.4 Drilling Fluid (see Appendix 3)

The 12 1/4" hole was spudded with a prehydrated BENTONITE spud mud. Drilling continued uneventfully to the 9 5/8" casing point at 256.0m. The float collar, cement and casing shoe were drilled out using fresh water only. The 8 1/2" hole was then drilled with fresh water/gel/ polymer mud and it immediately experienced loss of mud properties due to unexpected lithologies. This was eventually solved by continuous addition of CMC - Hi Vis and Bentonite. No other further difficulties were experienced.

3.3.5 Water Supply

Drilling water was obtained from a water bore drilled on site prior to spud.

2.4 Formation Sampling and Testing

2.4.1 Cuttings (see Appendix 4)

Cutting samples were collected at 5 m intervals from surface to total depth. Each sample was washed, air dried and divided into four splits, three of which were stored in labelled polythene bags and the fourth was stored in labelled plastic trays.

One set of the washed and dried samples in the bags was shipped to the corelab of DMID in Port Melbourne and the reminder were retained by the operator. In addition, from surface to T.D. unwashed samples were collected at 10 m intervals. These samples were stored in labelled cloth bags and retained by the operator.

2.4.2 Cores (see Appendix 5)

(i) Conventional Cores

A total of six conventional cores was cut;

Core No.1	504.28 - 506.03 m	Recovered 90%
Core No.2	639.20 - 640.30 m	Recovered 38%
Core No.3	748.17 - 752.17 m	Recovered 96%
Core No.4	880.00 - 882.10 m	Recovered 92%
Core No.5	1060.35 - 1061.66 m	Recovered 92%
Core No.6	1254.21 - 1254.40 m	Recovered NIL

(ii) Sidewall Cores (see Appendix 6)

Thirty sidewall cores were attempted of which twenty-one were recovered. These samples were used for various analyses, such as palynology, source rock analysis and petrography.

2.4.3 Tests

No drill stem tests were carried out.

2.5 Logging and Surveys (see Enclosures 1 to 3)

2.5.1 Mud Logging (see Enclosure 2)

A standard skid-mounted Halliburton (Geodata Division) unit was used to record penetration rate, continuous mud gas monitoring, intermittent mud and cutting gas analysis, pump rate and mud volume data.

2.5.2 Wireline Logging (see Enclosure 3)

Wireline logging was performed by Schlumberger Seaco Inc. using a standard truck mounted unit. One suite of logs consisting of the following logs were carried out at total depth.

Suite 1	**Interval (m)**
Dual Laterlog/Microspherically Focused Resistivity and Gamma Ray Log (DLL/MSFL/GR)	1248.5 - 252.0 (GR to Surface)
Bore Hole Compensated Sonic and Gamma Ray Log (BHC - GR)	1248.5 - 252.0
Lithodensity/Compensated Neutron and Gamma Ray Log (LDL/CRL/GR)	1253.0 - 450.0
Cyberlook	1250.0 - 500.0

2.5.3 Deviation Surveys

Hole deviation surveys were conducted regularly with the following results.

Depth (m)	Deviation (deg)
154.0	0
250.0	3/4
376.0	1/4
495.0	1
630.0	1 1/2
780.0	1/2
875.0	1

926.0	3
981.0	5
1036.0	7
1050.0	7 +
1073.5	7
1093.0	7
1145.0	6 1/2
1254.0	5 1/2

2.5.4 Velocity Survey (see Appendix 4)

A velocity survey, including VSP, was carried out by Schlumberger Seaco Inc.

3. RESULTS OF DRILLING

3.1 Stratigraphy

The stratigraphic succession encountered in Big Desert-1 differed slightly from the prognosis (Fig 3), which was based on well correlation with Gunamalary-2 and detailed gravity profiles. All but one of the prognosed units were present in the section; the shallow Tertiary Bookpurnong Beds were absent at this site. Consequently, the underlying stratigraphic units came in slightly higher than predicted. The generalised stratigraphy and hydrocarbon potential of the Netherby Trough are shown in Figure 4. Table 1 shows the stratigraphic succession encountered in Big Desert-1.

UNIT	DEPTH (K.B.) (metres)	THICKNESS (metres)
Tertiary		
Parilla Sand	~~0.0~~ 3.5 (David Wong 21/6/99)	100.0
Duddo Limestone	103.5	137.5
Ettrick Marl	241.0	16.0
Olney Formation	257.0	160.5
Warina Sand	417.5	37.5
Permo-Carboniferous		
Urana Formation	455.0	137.0
?Devonian		
Grampians Group/Mulga Downs Group Equivalent	592.0	+662
Total Depth	**1254.4**	

Table 1

BIG DESERT-1 : STRATIGRAPHIC SUMMARY

CONTINENTAL RESOURCES N.L.

BIG DESERT No.1

PROGNOSED AND ACTUAL STRATIGRAPHY

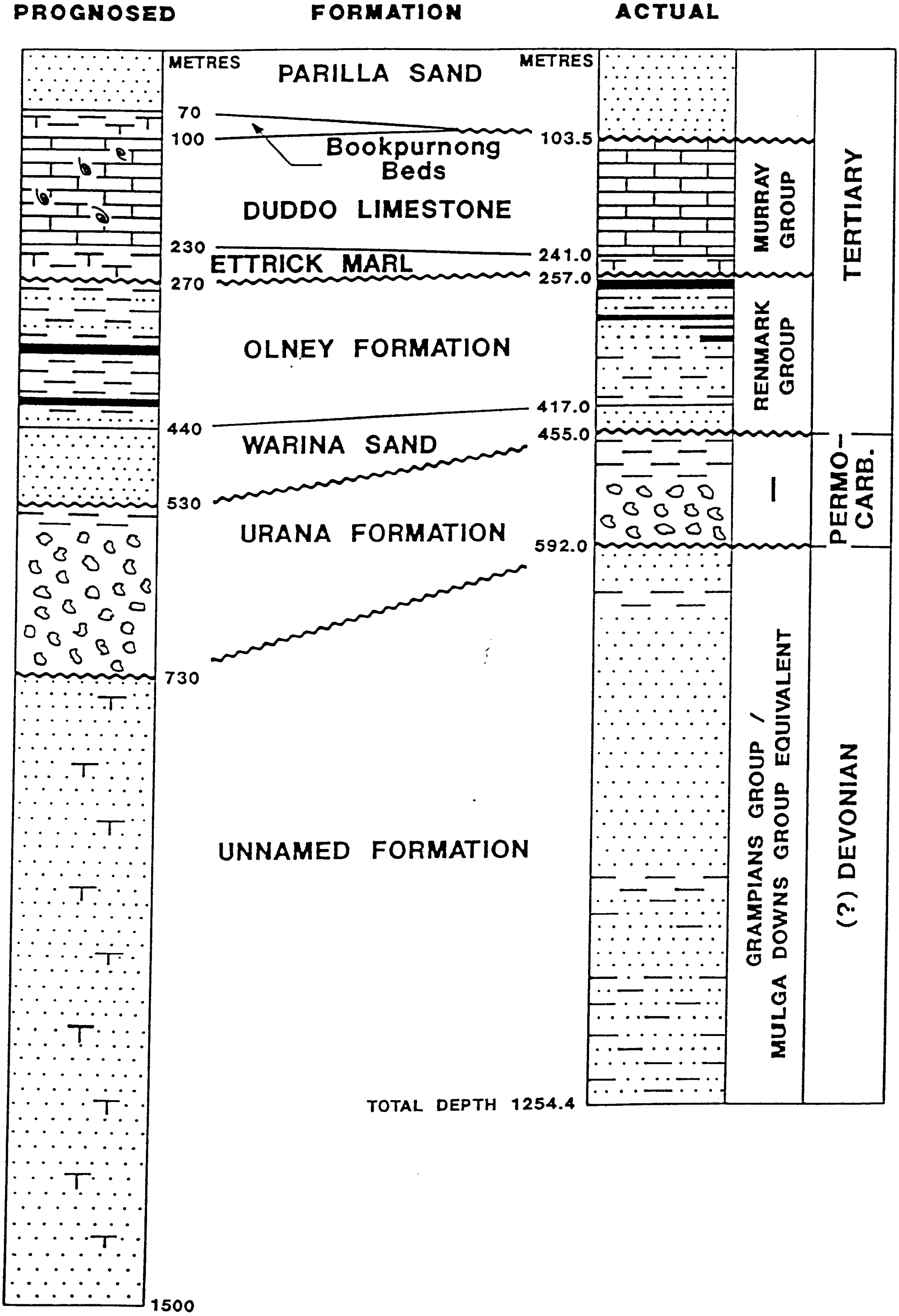


FIGURE 3

CONTINENTAL RESOURCES N.L.

PROVISIONAL STRATIGRAPHY AND HYDROCARBON PROSPECTIVENESS OF THE NETHERBY TROUGH

PERIOD	GROUP	FACIES: LITHOLOGY	FACIES: DEP.-ENV.	HYDROCARBON POTENTIAL: RESERVOIR	HYDROCARBON POTENTIAL: SOURCE	HYDROCARBON POTENTIAL: SEAL
TERTIARY	Wunghnu Group	clays	non-marine			
	Murray Group	limestones marls	marine		thermally	
	Renmark Group	clays	marine		immature	
		sands	non-marine	good if not flushed		
LOWER CRETACEOUS	Millewa Group	shales siltstones basal sandstone	mainly non-marine minor marine influence		thermally immature	
LOWER PERMIAN TO UPPER CARBONIFEROUS	Cape Jervis Beds equivalent (Urana Fm.)	mudstones diamictites sandstones siltstones conglomerates	non-marine glacio-marine	?	thermally mature but source poor ?	
LOWER CARBONIFEROUS TO M./LOWER DEVONIAN	Mulga Downs Group	sandstones conglomerates minor shales siltstones	non-marine fluvial to lacustrine	good to excellent ø	thermally mature good source in adjoining Renmark Trough	?
M./LOWER DEVONIAN TO UPPER SILURIAN	? Winduck- ? Amphitheatre Group (equivalent) ?	sandstones minor shales siltstones	shallow marine marine	good to excellent ø	mature	?
	Grampians Group (equivalent)	sandstone siltstones	continental to shallow marine			
? ORDOVICIAN	? ?					
CAMBRIAN	? St.Arnaud Beds equivalent	sandstones shales mudstones minor mudstones	marine	low ø and K ?	?	?
	Kanmantoo Group + equivalents	metasediments phyllites includes Mount Stavely Volcanic Complex	deep marine	?	?	?

Source Brown, 1986 ; Sniffin, 1986 ; Orth, 1986; Crawford, 1988.

ø = porosity ; K = permeability

3.2 Lithological Description

The following is a summary of the lithologies of the main rock units in Big Desert-1. Stratigraphic intervals have been delineated using penetration rate, cutting and core analyses, wireline log interpretation and palynology (see appendices).

3.2.1 Parilla Sand (0 - 103.5 m)

This unit consists predominantly of a medium to coarse, unconsolidated to firm quartz sandstone with rare claystone bands. The grainsize becomes coarser with depth and grains are generally subangular to subrounded, though subrounded to rounded above 25 m and angular to subangular from 75 to 90 m. Sorting is moderate from 0 to 60 m and moderate to well sorted below. The sand is clear to translucent with occasional ironstaining at the top, occasionally pink to orange grey and white below 60 metres. Rare pyrite cement and common loose mica occur throughout. The unit has good visual porosity.

Discussion: This unit is 41.5 metres thicker at this site than in Gunamalary-2. This may be due to the aeolian nature of the upper part of the Parilla Sand. The base of the unit is seen as an unconformity on the gamma ray (GR) log at 103.5 m. This is interpreted as a change from the marked marine conditions during the deposition of the underlying Duddo Limestone to nearshore and coastal terriginous conditions of the Parilla Sand.

3.2.2 Duddo Limestone (103.5 - 241 m)

This interval consists predominantly of grey to white, highly fossiliferous calcarenite with minor scattered lenses of glauconite and layers of marl throughout. From 140 to 220 m, the unit becomes very fossiliferous with major components of >95% bryozoans, with minor coral and shell fragments. Below 220 m, the calcarenite becomes harder and less fossiliferous with occasional glauconite bands towards the base.

Discussion: Marine conditions are indicated from the lithology throughout the unit. Thickness of this unit is consistent with Gunamalary-2 (127 m) and much further north at Olney-1 (127 m).

3.2.3 Ettrick Mark (241 - 257 m)

This unit consists of medium light grey to medium grey, occasionally white, hard, blotchy marl with common glauconitic specks and occasional fossils towards the base.

Discussion: This transitional unit marks the onset of marine conditions between the non-marine clastics of the underlying Renmark Group and carbonates of the overlying Duddo Limestone. Log characters of resistivity and gamma ray curves indicate an unconformity at the base of the unit.

3.2.4 Olney Formation (257 - 417.5 m)

This unit consists predominantly of fine quartz sand / sandstone interbedded and interlaminated with micaceous siltstone and dark carbonaceous claystone and minor brown coal bands. Brown coal seams from 1 to 8 m thickness are present at 258 m, 322 m, 335 m, 342 m and 368 m.

The sandstone consists of clear, fine to medium, angular to subrounded quartz grains, generally unconsolidated with good visual porosity. The siltstone is medium grey to dark grey, moderately hard, calcareous and micaceaous in part, occasionally glauconitic and pyritic, slightly carbonaceous. The claystone is brownish black, soft, dispersive, usually carbonaceous. The coal is black to brownish black, dull firm, sub-fissile to crumbly, moderately soft to moderately firm, occasionally platey and iron-stained.

Discussion: The top of this unit is indicated by a lithologic change from the overlying marine carbonates into predominantly non-marine sediments. A brown coal (lignite) interval of 5 metres occurs at the top of the unit.

The resistivity and gamma ray curves show a typical response to an interbedded and interlaminated sequence. The depositional environment is interpreted as deltaic, lagoonal, tidal flat and swamp from core evidence in other wells in the basin (Nott, 1989).

3.2.5 Warina Sand (471.5 - 455 m)

This unit is predominantly a soft, unconsolidated quartz mica sandstone. The sand grains are clear to translucent, moderately sorted, medium to coarse, becoming coarse to very coarse with depth, subangular to subrounded quartz, and have a dispersive grey clay matrix. The unit has good visual porosity.

Discussion: The Spontaneous potential (SP) log character shows this unit as a clean sandstone and is distinguished from the overlying Olney Formation by the lack of lignitic bands and by the downwards coarsening of the quartz grain size. The drilling penetration curve is very high in this sand, and the friable nature of the unit is interpreted as the reason for the largely increased hole diameter on the caliper log. This unit forms an excellent regional aquifer as confirmed by tests in the Gunamalary-2 and Olney-1 bores and in many other water bores in the area. The base of the unit lies with marked unconformity on the underlying Palaeozoic rocks.

3.2.6 Urana Formation (455 - 592 m)

The upper 63 m of this unit consists of light greenish grey, soft to firm, dispersive claystone, becoming brownish grey with depth and is subfissile in part, silty and occasionally sandy and noncalcareous, containing laminae and lenses of angular pyrite and quartz sands. Below 518 m, the lithology change to a very hard tillite/diamictite made up of clasts from a variety of sources (including pink and white granite, quartz biotite gneiss, mica schist, altered volcanics, quartzite) in a reddish brown argillaceous matrix which is silty and calcareous in part, firm to hard and containing rare pyrite.

Discussion: An unconformity at the top of the Urana Foundation is indicated by a sharp drilling break from the soft overlying Warina Sand into the harder Urana Formation. The density, sonic, resistivity and gamma ray curves also show definite character change below 455 m. The unit is broken up into two sub-units that can be distinguished quite clearly on log profiles and lithology:- the upper claystone unit 455 - 518 m and the lower tillite / diamictite unit 518 - 592 m. The upper sub-unit has an extremely high sonic velocity. The total thickness of the Urana Formation is 43 m thicker than at Gunamalary-2. Palynological evidence (App. 9) indicates that this unit is latest Carboniferous to earliest Permian in age. Depositional environment appears to be glacigene (O'Brien, 1986; N. Alley, pers. comm.).

3.2.7 Grampians Group / Mulga Downs Group Equivalent (592 - 1254+ m)

This unit consists predominantly of clear to translucent sandstone (quartz arenite), iron-stained near the top and decreasing with depth with minor iron staining at the base. The grain size varies from fine to medium, with rare coarse grains at the top. Grains are dominantly subangular to subrounded, mostly moderately to poorly sorted, but occasionally well sorted. There is a common ferruginous clay matrix at the top, becoming less common and non-ferruginous with depth, and shows trace to common silica cement. The unit is firm at the top, becoming hard to very hard with depth. Cores from this interval generally indicate a massive nature for the sandstone with common cross-bedding. Between about 745 and 780 m, the sandstone contains abundant white to light grey argillaceous matrix, rare lithics and is soft to moderately firm.

Discussion: The top of this unit shows a sharp lithologic change from the overlying Urana Formation and a major unconformity exists. Wireline log profiles have monotonous uniformity until about 1100 m, and certainly by 1172 m, where beds with increased clay content become evident. These may represent a transitional change to a new sub-unit. The age of the unit is indeterminate as it is apparently barren of fossil remains. It is suggested that the unit is a lithological equivalent of either the Grampians Group (Silurian to Early Devonian) or the Mulga Downs Group (Early / Middle Devonian to Early Carboniferous). The composition of the sediments suggests a source derived from a granite dominated provenance. The sediments are interpreted as being deposited in an oxidised, nearshore, marine shelf environment (App.7).

3.3 Hydrocarbon Indications

3.3.1 Mud Gas Readings

The mud gas detection equipment was operational from surface to 1254.4 m (Total Depth). The only mud gas reading in this well was encountered at 740 m where a trace of C_1 was recorded. Minor indications of CO_2 were also reported at various depths. The level of CO_2 were less than detection capabilities of the system.

3.3.2 Sample Flurescence

Cutting samples were continuously inspected for fluorescence at 5 m intervals from surface to 1254.4 m (Total Depth). No fluorescence or oil staining were reported in any cuttings or side wall core samples. A residual light oil was extracted from Cores 1,2,3,4 & 5 by Amdel Core Services (see section 5.2 and Appendices 5 and 7 for details).

4. GEOLOGY

4.1 Regional Setting

The Murray Basin in a shallow, Cainozoic, intracratonic basin that extends over large parts of inland New South Wales, South Australia and Victoria. This basin is underlain by a number of older concealed infra-basins (usually correlated with the Palaeozoic Darling Basin). The axes of these infra-basins clearly indicate an inherited strike alignment parallel to the underlying basement grain, as revealed from regional aeromagnetic shadow pixel maps (Tucker et al., 1985).

The largest known pre-Cainozoic infra-basin in Victoria is the Netherby Trough. It is located almost entirely in PEP 121 in the north-west of the State and has been relatively unexplored to date. The NNW trend of this trough is shown on the pixel map of the Murray Basin as a linear, magnetically quiet zone, parallel to the highly magnetic Stavely Belt. These two tectonic features lie within the major Port Campbell-Netherby (PC-NB) structural corridor (Campbell, 1989). This corridor extends NNW into South Australia and to the SSE where it encompasses the Grampians and further southwards to include the Port Campbell gas fields of southern Victoria. The PC-NB corridor is believed to be an ancient basement feature, part of a network of continental lineaments that controlled the tectonic history of the Netherby Trough. The trough is believed to contain more than 3 km of ?Devonian, Permo-Carboniferous, ± Cretaceous and Cainozoic sediments.
Detailed gravity surveys show the trough to be a half-graben with a steep western margin, containing several depocentres and volcanics along the eastern margin at depth (GEC, 1988). It appears to be compartmentalized by faulting in a similar manner to other rift sequences in northern infra-basins of the Murray Basin, such as the Tarrara Trough (Anfiloff, 1988). A suggested stratigraphy of the Netherby Trough is summarised in Figure 4.

4.2 Previous Exploration

No petroleum exploration wells have been drilled in PEP 121 and no seismic surveys conducted. Until recently, the Netherby Trough has been essentially unexplored and little was known of the exact nature and extent of the infra-basin in the Big Desert area.

Pre-1987

Prior to 1987, no specific exploration programmes were conducted in the Netherby Trough.

Previous exploration work has been entirely of a regional nature and includes:

* gravity and aeromagnetic surveys by Bureau of Mineral Resources (BMR),
* aeromagnetic surveys by various mineral exploration companies (no data available),
* surface geochemical surveys by Comserve to the north of PEP 121, followed by the Mildura West seismic survey,
* several exploration wells (Mildura West-1 & -2, Morkalla-1, Sunset-1) drilled to north of PEP 121,
* surface geological mapping by Geological Survey of Victoria and the BMR,
* groundwater bores drilled by the Geological Survey of Victoria.

No exploration wells have been drilled in the permit. However, a stratigraphic/water observation bore (Gunamalary-2) was drilled by Department of Manufacturing and Industry Development (DMID), previously Department of Industry, Technology and Resources (DITR), in 1986 at a site near Murrayville to a total depth of 717 m (Orth, 1986).

The drilling results, together with the post-drilling analysis conducted by CRNL, is one of the most significant data acquired in this permit. The well penetrated a marine and continental Cainozoic sequence, Permo-Carboniferous diamictite, and a ?Devonian indurated sandstone possibly belonging to the Grampians Group.

Post-1987

Continental Resources NL (CRNL) conducted a number of specific exploration programmes in PEP 121 for the following primary objectives:

* to establish the presence of potential hydrocarbon bearing traps,
* to define and/or confirm reservoir potential of the Permo-Carboniferous and older sequences,
* to define and evaluate the potential for source rock, stage of maturation, and hydrocarbon generation, migration and traps.

The following is a summary of the exploration carried out by CRNL in PEP 121 :

Comprehensive Post-Drilling Analysis on Gunamalary-2 Samples included palynology, reservoir analysis, Rock Eval, Tmax and vitrinite studies. The extracted residual crude oil from cores in ?Devonian sandstone was analysed for source affinity and hydrocarbon type (Amdel, 1987 a,b,c).

Remote Sensing Fracture Analysis conducted in mid-1987 from which two fracture map interpretations were produced (Geo-Flite, 1987, 1988).

Soil Gas Geochemistry conducted first in November 1987 followed by continuous soil gas sampling throughout 1988 by monitoring hydrocarbon emissions at established anomalies and at control sites (Amdel, 1988).

Reprocessing and Modelling of the Aeromagnetic Data confirmed the configuration of the Netherby Trough and its associated magnetic basements (GEC, 1989).

Reprocessing the BMR Gravity Data to further delineate the Netherby Trough and define its structure (GEC, 1989).

Detailed Gravity Survey conducted over the study area in December 1988 by CRNL for detailed structural analysis (GEC, 1989).

5. CONTRIBUTIONS TO GEOLOGICAL KNOWLEDGE AND RELEVANCE TO THE OCCURRENCE OF HYDROCARBONS

5.1 Confirmation of Palaeozoic Infra-basin

Big Desert-1 was successful in accomplishing the task of investigating the stratigraphic succession of the Netherby Trough down to the ?Devonian (Grampians Group or Mulga Downs Group 592-1254+m) . It intersected a thick Tertiary sequence (marine and non-marine Murray and Renmark Groups 0-455 m) unconformably overlying a non-marine to glaciomarine Permo-Carboniferous section (Urana Formation 455-592 m) and reached a total depth of 1254 metres in ?Devonian continental to shallow marine sandstone.

5.2 Hydrocarbon occurrences in the Netherby Trough

Small amounts of residual oil were extracted from both Permo-Carboniferous and ?Devonian sandstones. The Permo-Carboniferous/Tertiary unconformity and associated shaley beds apparently form a seal at this site. The chemical signature of extracted hydrocarbons in both reservoir units is similar (light, biodegraded oil) which may indicate a common source rock. In addition, the surface soil hydrocarbon signatures at this site are similar to the deeper extracted oils. The source affinity study suggests an algal origin for the oil in Big Desert-1 (App.8). The Tertiary rocks are thermally immature. The Permo-Carboniferous formations are non-marine or glacigene in general. The source rocks, therefore, could be Devonian or perhaps older.

Detailed lithofacies and geochemical studies indicate that the geologic history of this area is complex. The direction of hydrocarbon migration (vertical vs. lateral) is not yet clear.

In addition there is a similarity in the geochemistry of oil samples from ?Devonian sandstones at Gunamalary-2 and Big Desert-1 samples. Reservoir characteristics of quite moderate porosities and low permeabilities were recorded in most of the sandstones in both Palaeozoic sequences in Big Desert-1.

The presence of a light oil in Palaeozoic reservoirs in Big Desert-1 confirms that a mature source is present in the basin. This oil appear to have has migrated into reservoirs prior to the beginning of the Tertiary.

Big Desert-1 is the first well in Victoria (onshore and offshore) to encounter a Palaeozoic sequence with potential reservoirs (Urana Formation and ?Grampians Group equivalent). Source rocks are probably local and also Palaeozoic in age. On the limited information available, it can now be said that the Netherby Trough is an "oil prone" hydrocarbon province.

5.3 New stratigraphic Findings

5.3.1 Tertiary

The Renmark Group in Big Desert-1 was found to contain brown coal members which can be correlated with those in Gunamalary-2 indicating stable conditions in the early Tertiary in this area.

5.3.2 Permo-Carboniferous

The Urana Formation in Big Desert-1 has been dated by palynological analysis as latest Carboniferous to earliest Permian (i.e. Permo-Carboniferous) It shows the presence of laminated claystone, in part interlaminated with fine silts and angular sands. These are underlain by a diamictite made up of angular to subrounded, conglomerate consisting of cobble-sized erratics of granite, greywacke, hornfels, quartzite, volcanics, biotite schist, etc. These lithologies indicate possible provenance during the Permo-Carboniferous from a basement exposure to the west (?Kanmantoo Fold Belt).

5.3.3 Devonian

A thick ?Devonian sedimentary sequence was drilled and encountered massive indurated crossbedded sandstones (quartz arenites) with secondary ferruginous red-staining in the upper section and becoming clayey in the lower section. These sandstones become hard and more indurated with siliceous cement with depth. Primary and secondary porosities are believed to be present and have been modified by compaction and framework grain dissolution.

The composition of these sediments suggests a source from a granite dominated provenance. The high textural and mineralogical maturity and hematite cementation during early diagenesis suggests that the sediments were deposited in an oxidized, nearshore, marine shelf environment (App. 7).

6. ACKNOWLEDGEMENTS

The operator wishes to thank D. Gravestock and N. Alley of SADME and R. Glenie, Consultant, for helpful discussions on the Palaeozoic stratigraphy encountered in this well and also the people of Murrayville for their active support during the operation.

7. REFERENCES

Amdel, 1987 (a). Hydrocarbon extraction from sandstone core, Gunamalary-2. *Unpubl. Amdel Rept. F 6878/88 for CRNL.*

Amdel, 1987 (b). Thermal maturity of hydrocarbons extracted from core 32, Gunamalary-2. *Unpubl. Amdel Rept. F 6878/88 - Pt. 2 for CRNL.*

Amdel, 1987 (c). Source rock and reservoir evaluation, Gunamalary-2. *Unpubl. Amdel Repts. F 6629/87 & F 6629/87 (addendum) for CRNL.*

Amdel, 1988. Hydrocarbon microseepage survey, PEP 121, Murray Basin, Victoria. *Unpubl. Amdel Rept. F 7069/88 for CRNL.*

Anfiloff, V., 1988. Rifting and basement ridges in the Murray Basin Region. *In*: C.M. Brown & W.R. Evans (Compilers), Murray Basin 88 Conference: Abstracts. *Bur. Min. Res. Record 1988/8: 7 - 12.*

Anfiloff, V., Barlow, B.D., Murray, A.S., Denham, D. & Sanford, R., 1976. Compilation and production of the 1976 Gravity Map of Australia. *Jour. Aust. Geol. & Geophys. Bur. Min. Res. Vol.1(4): 273 - 276.*

Brown, C.M. and Stephenson A.E., 1985. Geology of the Murray Basin 1:1,000,000 sheet, preliminary edition. *Bur. Min. Res. Geol. & Geophys.*

Brown, C.M. and Stephenson A.E., 1986. Murray Basin, southeastern Australia: subsurface stratigraphic database. *Bur. Min. Res. Geol. & Geophys. Rept 262, 60pp.*

Campbell, I.B., 1989. The Port Campbell - Netherby north-northwest structural corridor in southeastern Australia. *In*: R. Le Maitre (Editor-in Chief), Pathways in Geology - Essays in Honour of Edwin Sherbon Hills: *Blackwell Scientific Publications (Aust.) Ltd. 280 - 303.*

Geo-Flite Research Pty Ltd., 1987. A hydrocarbon related fracture analysis, Big Desert region, Ouyen, Victoria, Australia. *Unpubl. Rept. for CRNL/NBHP.*

Geo-Flite Research Pty Ltd., 1988. Supplementary report, airborne multispectral analysis of microfractures, Big Desert Area, Ouyen, Victoria. *Unpubl. Rept. for CRNL/NBHP.*

Geophysical Exploration Consultants, 1989. A report on detailed gravity and reprocessed airborne magnetic data from Murrayville, N.W. Victoria, PEP 121 Murray Basin. *G.E.C. Unpubl. Rep. for CRNL.*

Lawrence, C.R., 1973. Ouyen 1:250 000 geological sheet (S1 54-15). *Geol. Surv. Vict.*

Nott, R.B., 1989., Preliminary hydrogeological assessment of the Mallee/Wimmera region of northern Victoria: summary of data from the deep drilling program 1986-88. *Dept. Water Res. Publ.*

O'Brien, P.E., 1986. Stratigraphy and sedimentology of Late Palaeozoic glaciomarine sediments beneath the Murray Basin, and their palaeogeographic and palaeoclimatic significance. *Jour. Aust. Geol. & Geophys. Bur. Min. Res.*

Orth, K., 1986. Well Completion Report, Gunamalary-2. *D.I.T.R. Petroleum Division, Unpubl. Rept.*

Sniffen M.J., 1985. Petroleum data package: Murray Basin, New South Wales. *NSW Geol. Surv. Rept. GS 1985/008, 122pp.*

Tucker, D.H., Anfiloff, V. & Luyendyk, A., 1985. New large area standard pixel maps of Australia. *Exploration Geophysics. Vol. 16 (2/3), 294 - 299.*

APPENDIX 1

DETAILS OF DRILLING PLANT

RIG 21 SPECIFICATIONS

(DMID)

SUMMARY

RIG 21 - SPECIFICATIONS

1 1/8" Wire rope max allowable load is 578 kilonewtons which i.e. 59 metric tonnes.

Travelling block is Emsco type R-30-3-H100 hydra - hook. Total capacity rated at 100 tons. Weight of block is 4677 lbs. 3-30" dia sheaves grooved for 1 1/8" wire line.

Kelly 4 1/4" x 40" overall length 6 5/8" API Left hand box and 3 1/2" API full hole pin bottom.
Total weight of Kelly 1850 lbs.

Static hook load capacity 180 000 lbs.

Emsco type L-40 ton swivel. Weight 1240 lbs.
Mast rating 300 000 lbs.
Set back capacity of 7200 feet of 4 1/2" drill pipe 16.6 lbs/ft Grade E

8 of 6" x 30 feet drill collars, bore 2 1/4". 4 1/2" API Reg Integral double box. 83 lb/ft.
8 of 4 1/2" x 30 feet drill collars, bore 2". 3 1/2" API Reg Integral double box 43 lb/ft.

6000 feet - 3 1/2" OD 13.3 lbs/ft. Grade E, Range 2. Internal upset API seamless steel drill pipe with 3 1/2" API full hole tool joint attached.

RIG 21

SPECIFICATIONS

EMSCO GB-250-THB TRAILER MOUNTED DRILLING RIG AS DESCRIBED BELOW, COMPLETE WITH EMSCO GB CATHEADS, CATHEAD CONTROLS AND FLOOR MOUNTING TYPE ROPE ROLLER, HYDROMATIC BRAKE PACKAGE POWERED. BY -

ONE GENERAL MOTORS TWIN - 6-71 MODEL 12103 TORQUE CONVERTER DIESEL ENGINE
AND WITH 97 FT. L.C. MOORE DUAL TRAILER MOUNTED CANTILEVER DRILLING MAST.

DRAWWORKS

WINCH DRUM:	16" dia. x 40" long, plain
BRAKE RIMS:	7-3/4" face x 38" diameter Enclosed water cooling system
BRAKE:	Type "J" with 350 degree arc of contact
SHAFTS:	Drummshaft max. dia. 6-1/4" Cathead shaft max. dia. 4-13/16" Rotary Countershaft max. dia. 4-1/4"
CLUTCHES:	Drum disc type Emsco C-227 Rotary, disc type Emsco C-314 Transmission low, Spline, air controlled Transmission high, Spline, air controlled Transmission reverse, Spline, air controlled
CHAIN:	Drum drive 1-1/2" double Cathead Shaft Drive 1-1/2" double Engine, 1" quadruple Reverse 1-1/2" double Rotary 2" or No. 3 single Hydrotarder 1-1/2" double
CONTROLS:	Driller's control console includes all operating control except engine power take-off clutch.

Combination Air Clutch, Throttles and Speed Selector Controls, main Drum Brake is manual. Air actuated neutral brake.

TORQUE CONVERTER:

Twin Disc left hand series 11,500 mounted in Rigs.

CATHEADS:

LEFT Emsco GB air operated friction Spinning Cathead with rope separator and guard.

RIGHT Emsco GB air operated friction breakout Cathead with rope separator and guard.

SANDREEL:

GB-250, 5-11/16" max diameter shaft 12-3/4" x 40" long fee spooling drum,
7 1/2" wide 34" dia. brake rims capacity for 11,870' 1/2" or 9,520'9/16" Wireline, Emsco C218 disc type clutch

Hydrotarder No. 19635-X Parkersburg 22" type "BC" Single Rotor Hydromatic Brake with shaft extension, chain driven from drum shaft. Jaw type disconnect clutch on drum shaft.

General Motors Twin 6-71 Model 12103 Engine with Heavy Duty Power Transfer, Gear Ratio 1:1 and Standard Equipment Consisting of the following:

Heavy Duty Radiators
Lubricating Oil Coolers
Lubricating Oil Filters
Fuel Filters (Primary and Secondary)
Water Outlet Manifold and Thermostat Assemblies
Fuel Oil Circulating Pumps
Exhaust Manifold and Companion Flanges
Engine Water Circulating Pumps
Engine Disengaging Clutches

Battery Charging Generator
I Beam Front Supports and Base
Governor, includes Throttle
Control set at 1600 RPM full
load.
Fan.
Air Cleaner and Air Inlet Housing
without Shutdown
Wisconsin Gasoline starting Engine
600MM Injector

MAST

97' Lee C. Moore Dual Trailer Mounted Cantilever Drilling Mast No. 27217, static hook load capacity 180,000lbs.(equivalent to standard Derrick Capacity of 300,000 lbs.), 2'7-1/2" wide x 4'0" top 8'5" clear width at base between front legs, horizontally retracting top section, reversible crown block consisting of five 30" OD Manganese steel roller bearing working sheaves grooved for 1-1/8" diameter line and one 30" OD Manganese steel roller bearing sandline sheave grooved for 5/8" diameter line, all on 5-1/2" diameter shafts, and equipped with line guards, racking finger capacity of 7200' of 4-1/2" diameter drill pipe; 15" diameter swinging catline sheave; welded ladder; crown safety platform; tong counterweights complete; fifth wheel hoist and inverted fifth wheel for adjusting mast elevation to enable making connections; semi-trailer mast base complete with two supporting screw jacks.

ROTARY TABLE

Emsco Type P-17-1/2" -44" Rotary Machine with completely enclosed rectangular fabriform case, manual locks, sealed rotary mechanism, split table bushing and hook for 6" conventional type drill stem bushing. (LESS: Drive sprocket and Drill Stem Bushing)

SWIVEL

Emsco type L-140 Swivel complete with female Thread gooseneck, cartridge type washpipe packing, sleeve or coupling thread protectors and bail bumper, including 2 1/4" ID Washpipe and 96387-C sleeve couplings, 6-5/8" API L.H.Pin 19".

KELLY

Emsco 4-1/4" x 40' overall length 37' working length 6-5/8" API Reg. L.H. box top and 3-1/2" API Reg. Pin bottom connection, steel kelly.

TRAVELLING BLOCK

Emsco type R-30-3-H100 Hydra-hook Travelling block with 3-30" dia. Roller Bearing Forged Sheaves. Sheaves grooved for 1-1/8" wire line. Sheaves Rolled Forged Steel, mounted on Double Race Tapered Bearings; Rope Grooves Flame-hardened; Roller Steel Side Plates; Reversible Sheave Bearing Lubrication Cartridge Oil-Bath Lubrication for Main Bearings, Main Springs and Plunger, Locking Mechanism (8 equally spaced positions). (Total rated capacity 100 tons).

MUD PUMP UNIT

Unitized Gardner Denver 7-1/4" x 12 Model FZ-FXZ Power Slush Pump driven by General Motors 6-71 Model 12107 Torque converter-Diesel Engine complete with standard accessories. Unit to be Trailer Mounted complete with necessary sprockets, chains, chain guards, 3 member light steel skid, and manifold fittings, including 0-3000lbs. pressure gauge, shear relief valve, 3" Cameron valves on mud lines, wing unions, suction hose. Trailer, Hobbsmodel 74105.

902053 048

APPENDIX 2

SUMMARY OF WELLSITE OPERATIONS

(TABASSI & ASSOCIATES)

SUMMARY OF WELLSITE OPERATIONS

The Big Desert-1 drill site was prepared by DMID Drilling Unit. The DMID Rig 21 was rigged up and Big Desert-1 was spudded at 1300 hrs on 13th May 1991.

Drilling 12 1/4" hole continued to 256.0 m where the 95/8" casing was run and converted with shoe @ 251.92 m.

The B.O.P.'s, choke manifold and flareline were installed and the B.O.P.'s were successfully tested to the following pressures:

Blind Rams	1500 Psi
Piper Rams & Manifold	1300 Psi
Hydrill	1300 Psi

The cement and casing shoe were drilled out and after drilling 5 metres of new hole, a formation integrity test was carried out. The formation held pressure equivalent to 12.54 ppg mud weight.

Drilling 8 1/2" hole continued uneventfully to 506 m. At 506 m more than a day was lost waiting on repair to Hydrill.

At 619 m, cut core No. 1 then lost 24 hours on fishing BHA. At this point, the crew took 5 days break.

The 8 1/2" hole was deepened to 1061.7 m Core No's 2 and 3 were cut in this interval.

At a depth of 1061.7 m a total of 3 1/2 days were lost waiting for rig repair and fishing the drilling string.

The drilling of 8 1/2" hole continued to 1254.2 m where a day was lost on fishing stabilizer.

An attempt was made to cut core No. 6 at 1254.2 m. The extremely indurated lithology damaged the core head beyond repair at 1254.4 m on 14th June, 1991 at 1100 hrs.

The following logs were then run by Schlumberger Seaco Inc.:

DLL/MSFL/GR
BCS/GR
LDL/CNL/CR
SWC
Velocity Survey

Cement plugs were then set over intervals 550 - 490 m, 285 - 215 m and at surface.

The rig was released at 2400 hrs, 15th June, 1991.

WELL SUMMARY

Operator	:	Continental Resources N.L.
Well Name	:	Big Desert No.1
Location	:	Murray Basin, Victoria
Contractor/Rig	:	DMID Rig 21
Rig on Location	:	7/5/91
Spud Date	:	13/5/91
RKB Elevation	:	3.5 m
Total Depth	:	1254.41 m
Date Reached TD	:	14/6/91
Total Days Drilling	:	29
Rig Released	:	15/6/91 @ 2400 hrs
Total Days on Well	:	35

Drilling Fluid Type	Interval	Hole Size	Cost (A$)
Bentonite	0.256	12 1/4 "	$ 2278.53
KCI Polymer	256-1254	8 1/2 "	$16775.42

Mud Materials Charged to Drilling			$19053.95
Engineer on Location from Spud to T.D.			
Total Cost Drilling Materials			$19053.95
Mud materials not charged to drilling			

Casing Programme	:	9 5/8 " to 252.52 m
Drilling Supervisor	:	G. Nicot
Drilling Fluid Engineer	:	C. Menhennitt

CONTINENTAL RESOURCES N.L.

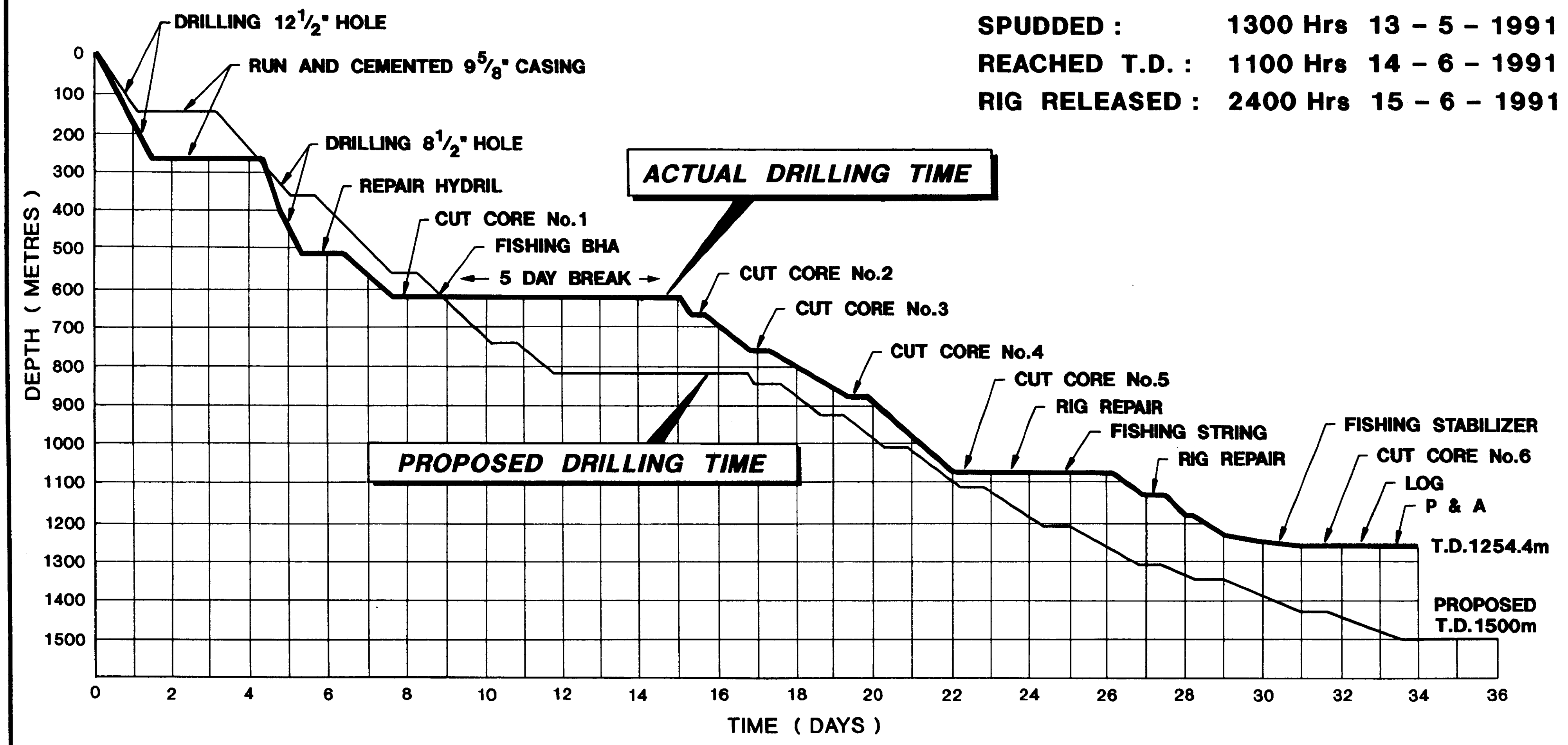
BIG DESERT No.1

PROPOSED AND ACTUAL DRILLING TIME

SPUDDED : 1300 Hrs 13 - 5 - 1991

REACHED T.D. : 1100 Hrs 14 - 6 - 1991

RIG RELEASED : 2400 Hrs 15 - 6 - 1991



APPENDIX 3

DRILLING FLUID RECAP

(HALLIBURTON GEODATA)

902053 054

CONTINENTAL RESOURCES N.L.

DRILLING FLUIDS RECAP

BIG DESERT NO. 1

PEP 121, MURRAY BASIN, VICTORIA

Prepared by: C. Menhennitt

Dated : 18/6/91

902053 055

TABLE OF CONTENTS

DISCUSSION BY INTERVAL

12 1/4" Hole (Surface to 256 m) - 1 day
9 5/8" Casing Set at 252.5m

The well was spudded with a lime flocculated Bentonite spud mud as per the recommended drilling fluid programme. The casing depth of 256m was reached after 23.5 hours drilling time. Lithologies penetrated were unconsolidated sands, limestone and marl. No problems or complications were experienced in this operation. When 256m depth was reached a wiper trip to surface was performed. The hole was then circulated for one hour before pulling out to run casing. 9 5/8" casing was run to 252.5Rm and cemented with 410 sacks of class A cement.

The casing point was approximately 14% deeper than prognosed, resulting in slightly higher than anticipated mud consumption.

DISCUSSION BY INTERVAL (cont.)

8 1/2" Hole (256 m to 1254 m) - 28 days

The float collar, cement and casing shoe were drilled out using fresh water. A Formation Integrity Test was carried out. After the test drilling continued with the bentonite mud formula while a Potassium Chloride - Polymer batch was being mixed. Almost immediately a substantial unit of ligneous sands was encountered. The lignite in the sands caused thinning of the mud and loss of properties. Plastic Viscosity and yield point were severely affected resulting in hole cleaning problems.

The problem was addressed by the addition of CMC Hi Vis and Bentonite in larger quantities than were prognosed. The problem was contained but required constant monitoring and maintenance throughout the hole so that required drilling fluid performance was maintained.

The addition of larger than anticipated amounts of Bentonite and CMC-Hi Vis meant that other mud properties such as weight and funnel viscosity were generally higher than what was desirable. The limitations of both the size and number of mud tanks on the rig meant that this had to be tolerated in order to maintain Plastic viscosity and Yield point. As a result of the higher amounts of CMC Hi-Vis being used water loss was effectively controlled and lesser amounts of CMC Lo Vis were required.

Fluid loss to the formation was within tolerable levels and kept well under control by the mud formula. The hole reached a maximum of 20% overgauge at one point. This was due almost entirely to the ligneous sand section which was generally poorly consolidated. Overall the drilling fluid programme proved quite effective for the hole and was easy to manage and maintain.

902053 058

MATERIAL RECAP

COMPANY	Continental Resources	HOLE SIZE	12¼
WELL	Big Desert #1	CONTRACTOR/RIG	DMID 21
LOCATION	Murray Basin Victoria	MUD TYPE	Bentonite

INTERVAL TO (m)	256	DRILLING DAYS	1	COST/DAY	$ 2278.53
FROM (m)	0	ROTATING HRS.	23.5	COST/M	$ 8.90
DRILLED (m)	256			COST/BBL	
DATE	18/6/91	MUD CONSUMPTION FACTOR (bbl/m)			

MATERIAL	UNIT	UNIT COST	QUANTITY EST	QUANTITY ACT	CONC (ppb) EST	CONC (ppb) ACT	TOTAL COST (A$) ESTIMATE	TOTAL COST (A$) ACTUAL
Barite								
Aquagel	100lb	19.74	75	110			1480.50	2171.40
Caustic Soda	25kg	33.37	2	3			66.74	100.11
Lime	25kg	7.02	4	1			28.08	7.02
DIESEL	Bbls							
CHEMICAL VOLUME	Bbls							
FRESH WATER	Bbls							
SEA WATER	Bbls							
TOTAL MUD MADE	Bbls							
COST LESS BARYTES								
COST WITH BARYTES								
							1575.32	2278.53

COMMENTS

Casing was set deeper than was proposed, resulting in slightly higher than anticipated mud consumption.

MATERIAL RECAP

COMPANY	Continental Resources	HOLE SIZE	8½
WELL	Big Desert #1	CONTRACTOR/RIG	DMID 21
LOCATION	Murray Basin Victoria	MUD TYPE	KCl Polymer

INTERVAL TO (m)	125	DRILLING DAYS	22	COST/DAY	$ 762·52
FROM (m)	256	ROTATING HRS.		COST/M	$ 16·8
DRILLED (m)	998			COST/BBL	
DATE	18/6/91	MUD CONSUMPTION FACTOR (bbl/m)			

MATERIAL	UNIT	UNIT COST	QUANTITY EST	QUANTITY ACT	CONC (ppb) EST	CONC (ppb) ACT	TOTAL COST (A$) ESTIMATE	TOTAL COST (A$) ACTUAL
Barite								
Aquagel	100lb	19·74	250	248			4935·0	4895·52
Caustic Soda	25kg	33·37	17	6			567·29	200·02
Potassium Chloride	50kg	20·49	310	117			6348·80	2397·33
CMC HiVis	25kg	90·04	60	83			5402·40	7473·32
CMC Lo Vis	25kg	85·81	70	21			6006·70	1802·01
Lime	25kg	7·02		1				7·02
DIESEL	Bbls							
CHEMICAL VOLUME	Bbls							
FRESH WATER	Bbls							
SEA WATER	Bbls							
TOTAL MUD MADE	Bbls							
COST LESS BARYTES								
COST WITH BARYTES								
							23260·19	16775·42

COMMENTS

Hole was terminated approximately 250 m short of prognosed T.D. resulting in a lower than anticipated overall consumption.

902053 060

MATERIAL SUMMARY

COMPANY Continental Resources
WELL Big Desert #1
LOCATION Murray Basin Victoria
CONTRACTOR/RIG DMID Rig 21

INTERVAL	DRILLED	DAYS	HOURS
0	256	1	23.5
256	1254	22	
TOTALS	1254	23	

MUD TYPES: Bentonite, KCl Polymer

COST/DAY $828.41
COST/M $15.19
COST/BBL
MUD CONSUMPTION FACTOR (bbl/m)

RECAP BY C. McNHennitt
DATE 18/6/91

MATERIAL	UNIT	UNIT COST	QUANTITY ESTIMATE	QUANTITY ACTUAL	TOTAL COST (A$) ESTIMATE	TOTAL COST (A$) ACTUAL
Barite						
Aquagel	100lb	19.74	325	358	6415.50	7066.92
Caustic Soda	25KG	33.37	19	9	634.03	300.33
Potassium Chloride	50KG	20.49	310	117	6351.90	2397.33
CMC-Hi Vis	25KG	90.04	60	83	5402.40	7473.32
CMC-Lo Vis	25KG	85.81	70	21	6006.70	1802.01
Lime	25KG	7.02	4	2	28.08	14.04
DIESEL	Bbls					
CHEMICAL VOLUME	Bbls					
FRESH WATER	Bbls					
SEA WATER	Bbls					
TOTAL MUD MADE	Bbls					
COST LESS BARYTES						
COST WITH BARYTES						
					24838.61	19053.53

COMMENTS

PROPERTY RECAP

DMID 21

COMPANY Continental Resources
WELL Big Desert #1
LOCATION Murray Basin Victoria

CONTRACTOR/RIG

DATE 1991	DEPTH m	HOLE SIZE in	F'LN TEMP F	MUD WT ppg	VIS sec	PV cp	YP	GELS 10 sec	GELS 10 min	FILTRATION API ml	FILTRATION CAKE mm	pH	Pf	Mf	Cl mg/l	Ca mg/l	SD %	RETORT SOL %	RETORT H2O %	RETORT OIL %	MBC ppb	REMARKS/TREATMENT
13/5	75	12¼		8.8	36																	
14/5	256	12¼		9.2	46																	
15/5	256	12¼		9.2	47																	
18/5	394	8½		8.7	35	8	1			14	1.5	12			15K							
19/5	506	8½		9.4	40	11	7	2	6	9	1	10			11K	480	0					
20/5	538	8½		9.0	42	11	9	2	6	9	1	10			11.5K	400	0					
21/5	565	8½		9.5	39	9	35			12	1	9			16K	247	.5					
21/5	619	8½		9.3	41	11	6	4	7	7	2	9			14K	430	0					
																						BREAK
28/5	640	8½		9.4	36	9	2	2	4	8	1.5	7			16K	440	0					
24/5	682	8½		9.6	41	15	7	7	13	9	2	8			15K	234	1/4					
29/5	727	8½		9.5	46	15	9	3	9	7	1	8			16K	220	1/4					
30/5	750	8½		9.5	46	12	6	2	6	8	1	8			16K	248	1/4					
30/5	752	8½		9.4	42	14	6	2	7	8	2	9			16K	144	1/4					
31/5	769	8½		9.4	44	15	7	2	7	7	½	11			16K	40	0					
31/5	780	8½		9.4	44	17	11	4	8	8	1	11			17K	40	0					
1/6	818	8½		9.3	46	17	11	5	9	8	1	11			18K	52	½					
1/6	853	8½		9.6	47	18	14	5	9	8	1	11			13K	52	0					
1/6	878	8½		9.5	46	17	11	3	8	7	1	10			16K	36	0					
2/6	881	8½		9.3	46	14	7	2	7	7.5	1	10			14K	64	0					
2/6	898	8½		9.4	54	20	17	6	11	8	1	10			10K	20	0					
2/6	915	8½		9.4	47	17	12	3	6	8	1	10			12K	80	0					
3/6	962	8½		9.3	45	17	9	3	6	6	1	10			13K	100	¼					
3/6	997	8½		9.6	46	19	18	3	7	9	1	10			14K	100	0					
3/6	1011	8½		9.3	46	18	12	3	7	8	1	10			17K	96	0					
4/6	1049	8½		9.6	47	18	10	3	6	12	1	9			13K	72	¼					FISHING

PROPERTY RECAP

COMPANY Continental Resources
WELL Big Desert #1
LOCATION Murray Basin Victoria

CONTRACTOR/RIG DMID 21

DATE 1991	DEPTH m	HOLE SIZE in	F'LN TEMP F	MUD WT ppg	VIS sec	PV cp	YP	GELS 10 sec	GELS 10 min	FILTRATION API ml	FILTRATION CAKE mm	pH	Pf	Mf	Cl mg/l	Ca mg/l	SD %	RETORT SOL %	RETORT H2O %	RETORT OIL %	MBC ppb	REMARKS/TREATMENT
7/6	1061	8½		9.4	38	6	1	1	2	9.5	1	8			13K	188	0					
7/6	470	8½		9.5	35	7	1	1	2	10	2	9			16K	184	.5					
8/6	1081	8½		9.6	44	12	5	2	6	12	2	9			13K	108	.5					
9/6	1116	8½		9.7	44	18	14	3	7	7	1	9			13K	108	.25					
10/6	1133	8½		9.8	46	19	8	3	7	6	1	9			17K	84	.25					
10/6	1147	8½		9.8	46	17	11	3	6	7	1	9			16K		.25					
10/6	1160	8½		9.4	44	18	9	3	8	7	1	10			19K		.25					
11/6	1199	8½		9.7	45	17	9	3	6	8	1	9			14K	116	.25					
12/6	1223	8½		9.7	44	16	9	3	6	8	1	8.5			13K		0					
13/6	1241	8½		9.6	43	12	8	3	5	8	1	8			13K	100	.25					
14/6	1254	8½		9.6	43	12	7	2	4	8	1	9			13K	84	0					

902053 062

902053 063

APPENDIX 4

CUTTING DESCRIPTIONS

(HALLIBURTON GEODATA)

CUTTINGS DESCRIPTIONS

DEPTH (m)	%	DESCRIPTION
5	100	Sandstone: Clear to translucent and occasionally iron stained grains, medium to predominantly coarse grained, occasional fine to medium grains, moderately sorted, subrounded to rounded, occasionally well rounded, unconsolidated, trace of calcite, good visual porosity.
10	100	As above.
15	100	As above.
20	100	As above.
NOTE:		Kelly Down @ 21.53m Bit balled up with dispersive sandy grey clay.
		Clay: White to very light grey, common fine to medium sand, soft and sticky to moderately firm, slightly dispersive, non calcareous.
25m	100	Sandstone: Clear to translucent, occasionally iron stained, medium to coarse grained, moderately sorted, sub angular to sub rounded, occasional greyish orange clay, calcareous in parts unconsolidated, good visual porosity.
30	100	As Above.
35	100	As Above.
40	100	As Above.
45	100	As Above.
50	100	As Above.
55	100	As Above.
60	100	Sandstone: Clear to translucent, occasionally pinkish and orangish grey, medium to occasionally coarse grained, moderately to well sorted, sub angular to sub rounded occasionally rounded, occasional clay matrix, occasional to common lithic grains, trace of calcite, unconsolidated good visual porosity.

DEPTH (m)	%	DESCRIPTION
65	100	As Above.
70	100	As Above.
75	100	Sandstone: Clear to translucent, predominantly coarse grained, well sorted, angular to sub angular occasionally sub rounded, rare pyrite cement, occasional lithic grains, common to abundant mica, unconsolidated, good visual porosity.
80	100	As above.
85	100	As above.
90	100	Sandstone: Clear to translucent, occasionally white, coarse to very course grained, well sorted, sub angular to sub rounded, abundant fossil fragments, occasional pyrite, occasional glauconite, occasional lithics, unconsolidated, good visual porosity.
95	100	As above.
100	100	As above.
105	95	As above.
	5	Limestone: Medium light grey to medium grey, occasionally very light grey, abundant fossils, moderately hard, sub blocky.
110	80	Limestone: As above.
	20	Sandstone: As above.
115	80	Limestone: As for 110m.
	20	Sandstone: As for 110m.
120	90	Limestone: As for 110m.
	10	Sandstone: As for 110m.
125	100	Limestone: As above.
130	100	Limestone: As above.

DEPTH (m)	%	DESCRIPTION
135	100	Limestone: As above.
140	100	Limestone: White calcarenite completely fossil fragments, bryozoans, corals, shells.
145	100	Limestone: As above.
150	100	As above.
155	100	As above.
160	100	As above.
165	100	As above.
170	100	As above.
175	100	As above.
180	100	As above.
185	100	As above.
190	100	Limestone: As above.
195	100	Limestone: As above.
200	100	Limestone: As above.
205	100	As above.
210	100	As above.
215	100	As above.
220	100	As above.
225	100	Limestone: Very light grey to white occasionally light grey, abundant fossils, occasional harder limestone bands, moderately firm to firm.
230	100	Limestone: Becoming harder and less fossiliferous, occasional glauconite.
235	100	As above.

DEPTH (m)	%	DESCRIPTION
240	100	As above.
245	90	Marl: Whitish grey, common glauconite, hard, blocky.
	10	Limestone: As above.
250	100	Marl: As above, occasional fossils.
255	100	Marl: As above.
260	100	Coal: Black to brownish black, dull, moderately firm to soft, sub fissile to crumbly.
265	70	Siltstone: Medium light grey - medium grey common glauconite, common medium to coarse sand, common cavings, soft calcareous.
	30	Coal: As for 260m.
270	100	Sandstone: Clear to translucent, occasionally light grey, fine to medium grained, well sorted, sub angular to sub round, occasionally round, occasional calcite cement, unconsolidated good visual porosity, occasional mineral fluorescence.
275	100	Sandstone: Clear to translucent, occasionally light grey very fine to fine grained, occasionally medium grained, well sorted, sub angular to sub rounded, occasional pyrite, occasional calcite, trace of mica, unconsolidated good visual porosity.
280	100	Sandstone: As above.
285	100	Sandstone: Clear to translucent, fine to medium and occasionally coarse grained, poor to moderate sorting, angular to sub angular, occasional calcite cement, common brownish black ligneous clay matrix, occasional to common pyrite and mica, unconsolidated good visual porosity.
290	90	Sandstone: As above.
	10	Clay: Brownish black, very soft and dispersive, non calcareous.
295	90	Sandstone: As for 290. 10% claystone as above.

DEPTH (m)	%	DESCRIPTION
300	80	Sandstone: As for 290. 20% claystone as above.
305	80	Claystone: Brownish black, occasional fine sand and mica very dispersive, occasional coal fragments, very soft non calcareous.
	20	Sandstone: As for 285m.
310	100	Sandstone: Clear to translucent, coarse to very coarse grained, poor-moderate sorting, angular to occasionally sub angular , trace of organic clay matrix, trace of pyrite rare coal fragments, unconsolidated, good visual porosity.
315	100	As above.
320	80	Sandstone: As above.
	20	Claystone: As above.
330	70	Sandstone: As above.
	30	Siltstone: Medium dark grey to dark grey, micaceous, common very fine sand, moderately hard to hard, non calcareous.
335	60	Claystone: Brownish black, ligneous, very dispersive, occasional mica, abundant fine to coarse sand, very soft non calcareous.
	40	Sandstone: Clear to translucent fine to coarse grained, poorly sorted, angular to sub angular, trace of pyrite, abundant ligneous argillaceous matrix, unconsolidated.
340	60	Claystone: As above.
	40	Sandstone: As above.
345	60	Claystone: As above.
	40	Sandstone: Clear to translucent, fine to medium grained, occasionally coarse grained, moderately to well sorted angular to sub rounded, commonly rounded, trace of pyrite, abundant ligneous argillaceous matrix, unconsolidated.
350	50	Claystone: As above.

DEPTH (m)	%	DESCRIPTION
	30	Sandstone: As above.
	10	Coal: Black, dull, firm to brittle, fissile, platy, silty in parts.
	10	Siltstone: Brown to grey brown, occasionally grading to fine sandstone, micaceous, soft to firm, very argillaceous.
355		As for 350m.
360	50	Sandstone: As above.
	50	Claystone: As above.
365		As for 360m.
370	50	Claystone: Light green to grey green, occasional glauconite, hard, slightly calcareous (cavings?).
	40	Sandstone: Clear to translucent, medium grained well sorted, occasionally coarse grained, sub angular to sub rounded, trace of pyrite, abundant ligneous argillaceous matrix, occasional fossil, unconsolidated.
	10	Siltstone: Brown, pyritic, micaceous, occasionally grading to fine sandstone, hard, crumbly.
375		As above.
380	60	Claystone: As for 335m.
	30	Sandstone: As above.
	10	Siltstone: As above.
385	60	Claystone: Brownish black, ligneous, very dispersive, occasional mica, common fine to coarse sand, very soft and dispersive. Non calcareous.
	20	Sandstone: As above.
	10	Siltstone: As above.
	10	Coal: Dark brown to black, dull, soft, occasionally firm, crumbly to blocky, occasionally platy.

DEPTH (m)	%	DESCRIPTION
390	60	Sandstone: Clear to translucent, occasionally white, fine to medium grained moderately sorted, sub rounded to angular, occasionally rounded, occasionally pyrite unconsolidated.
	40	Claystone: Medium brown to dark brown, soft dispersive, ligneous, non calcareous.
395	70	Sandstone: As above.
	30	Claystone: As above.
400	60	Sandstone: As above.
	30	Claystone: As above.
	10	Coal: Brownish black, dull, soft, commonly blocky, micro/aminations; firm.
405	70	Sandstone: As above.
	30	Claystone: As above.
410	80	Sandstone: As above.
	20	Claystone: As above.
415	100	Sandstone: Clear to translucent, coarse to very coarse, abundant fine to medium grains, poorly sorted, sub angular to sub rounded, rare pyrite, unconsolidated, good v/porosity.
420	100	Sandstone: As above.
425	100	Sandstone: As above.
430	100	Sandstone: As above.
435	100	Sandstone: As above.
440	100	Sandstone: As above.
445	100	Sandstone: Clear to translucent, coarse to very coarse grained abundant medium grains, moderately sorted, sub angular to sub rounded, occasionally rounded, unconsolidated, good visual porosity.

DEPTH (m)	%	DESCRIPTION
450	100	Sandstone: As above.
455	100	Sandstone: As above.
460	100	Sandstone: Clear to translucent, commonly white, coarse to very coarse grained, common medium grains, moderately to well sorted, sub angular to sub rounded, occasionally rounded, occasional light grey to medium light grey dispersive clay matrix unconsolidated good visual porosity.
465	100	Sandstone: As above and increasing clay matrix.
470	80	Claystone: Light greenish grey, common very fine sand, dispersive, very soft, sub blocky in parts, non calcareous.
	20	Sandstone: As above.
475	90	Claystone: Light greenish grey to greenish grey white in parts, common fine to coarse sand, dispersive, soft to firm, sub fissile in parts, trace of pyrite, occasionally sub blocky, non calcareous.
	10	Sandstone: White, fine to very fine grained, well sorted, sub rounded to rounded, common calcite cement, abundant light grey clay matrix, moderately firm to firm, poor visual porosity.
480	100	Claystone: Light greenish grey to greenish grey and light brownish grey, trace of silt, moderately firm to firm, sub fissile, slightly dispersive, blocky, non calcareous.
485	100	As above.
490	100	Claystone: Predominantly light brownish grey, common greenish grey, trace of silt, trace of mica, moderately firm to firm, slightly dispersive, blocky in parts, non calcareous.
495	100	Claystone: As above.
500	100	Claystone: As above.
505	100	Claystone: As above.
510	100	Claystone: As above.

DEPTH (m)	%	DESCRIPTION
515	100	Claystone: As above.
520	100	Claystone: As above.
525	80	Tillite: White, pink, orange, clasts of granite, schists, quartz & volcanics in an argillaceous, slightly calcareous matrix.
	20	Claystone: As above.
530	90	Tillite: As above.
	10	Claystone: As above.
535	90	Tillite: As above.
	10	Claystone: As above.
540		As above.
545		As above.
550		As above.
555		As above.
560		As above.
565		As above.
570		As above.
575	90	Tillite: Granitic, schistose, volcanic and sedimentary rock fragments, abundant coarse to very coarse quartz, abundant calcite, abundant claystone cavings common, pale reddish brown dispersive clay matrix.
	10	Claystone: Pale reddish brown occasionally silty, soft, dispersive.
580		As above.
590		As above.
595		As above.

DEPTH (m)	%	DESCRIPTION
600		As above.
605		As above.
610	100	Sandstone: Orangish red, occasionally clear to translucent and white, predominantly fine to medium grained, moderately to well sorted, quartzose, minor silica cement, common pale reddish brown dispersive clay matrix, soft to firm poor to fair visual porosity, Nil fluorescence.
615	100	As above.
620		1 metre sample after break. Predominantly cavings.
625	100	Sandstone: Clear to translucent, orangish iron staining throughout, fine to medium grained, predominantly medium, moderately to well sorted, sub angular to rounded common silica cement, occasional lithic grain, firm to very firm, poor visual porosity, nil fluorescence.
630	80	Claystone: Brownish Grey to medium grey, slightly silty, moderately firm, dispersive in parts, sub blocky to sub fissile, non calcareous (possible cavings).
	20	Sandstone: As above.
635	90	Sandstone: As above.
	10	Claystone: As above.
640	70	Sandstone: As above.
	30	Marl: Medium greyish brown, soft to firm, calcareous common glaueorite. Most likely cavings.
645	80	Sandstone: As above.
	20	Marl: As above (cavings).
650	50	Sandstone: As for 625m.
	40	Claystone: As for 630m.
	10	Marl: Cavings.

DEPTH (m)	%	DESCRIPTION
655	50	Sandstone: As above.
	50	Claystone: As above.
660	60	Sandstone: As above.
	40	Claystone: As above.
665	70	Sandstone: As above.
	20	Claystone: As above.
	10	Marl: Cavings.
670	70	Sandstone: As above.
	30	Claystone: As above.
675	90	Sandstone: Clear to translucent, commonly iron stained, predominantly medium to occasionally fine grained occasional course grains, moderately to well sorted, sub angular to sub rounded, common silica cement, common ferruginous clay matrix, occasional lithic grain, poor visual porosity visual, no shows.
675	10	Claystone: As above.
680		As for 675.
685	80	Sandstone: Clear to translucent, common orange staining medium grained, common fine and occasional coarse grains, moderately sorted, angular to sub rounded, common silica cement, common dark reddish brown clay (ferruginous) matrix, abundant cavings, firm to moderately hard, poor visual porosity, no shows (1 garnet noted - caving).
	20	Claystone: As above.
690	90	Sandstone: Clear to translucent, occasional orange staining, fine to medium grained, common coarse grains, moderately to poorly sorted, angular to sub rounded, common silica cement, occasional pyrite cement, occasional eithics (cavings?), abundant cavings, firm to moderately hard, poor visual porosity, no shows.

DEPTH (m)	%	DESCRIPTION
	10	Claystone: Dark reddish brown, commonly silty, firm blocky, non calcareous.
695	100	Sandstone: Clear to translucent, occasionally stained orange, fine to medium grained, common coarse grains, poor to moderately sorted, sub angular to sub rounded, abundant silica cement, abundant dark reddish brown ferruginous clay matrix, occasional lithics (cavings), firm to moderately hard, fair visual porosity, no shows.
700	100	Sandstone: As above.
705	100	Sandstone: As above.
710	100	Sandstone: Clear to translucent, minor orange staining, fine grained, occasionally medium to coarse grained, well sorted, sub rounded to rounded, occasional silica cement, rare clay matrix, sitty in parts, firm to moderately firm, fair visual porosity, no show.
715	100	Sandstone: As above.
720	100	Sandstone: As above.
725	100	Sandstone: Clear to translucent, occasionally white to orange, fine to medium grained, occasional very fine grains, sub angular to rounded, moderately sorted, common silica cement, common dark reddish brown ferruginous matrix, poor visual porosity, no shows.
730		As above.
735		As above.
740		As Above.
745		As above.
CORE # 3		
755	100	Sandstone: Clear to translucent, occasionally white to orange, fine to occasionally medium grained, sub angular to sub rounded, moderately sorted common silica cement, occasional ferruginous matrix, moderately hard to hard, friable, poor visual porosity, no shows.

DEPTH (m)	%	DESCRIPTION
760	100	Sandstone: Clear to translucent grains with moderate brown to occasionally moderate reddish brown staining, predominantly fine grained, grading to very fine in parts, occasional medium grains, moderately to well sorted, sub rounded to rounded, common silica cement, occasional moderate reddish brown matrix, firm to moderately hard, friable, poor to fair visual porosity, no shows.
765	100	Sandstone: As above.
770	100	Sandstone: As above.
775	100	Sandstone: As above.
780		As above.
785		As above.
790		As above.
795		As above.
800		As above.
805		As above.
810	100	As above.
815	100	As above.
820	100	As above.
825	100	Sandstone: Clear to translucent, stained moderate to dark reddish brown, fine to medium grained, occasional coarse grains, well to moderate sorting, sub angular to rounded, common silica cement, occasional dark reddish brown argillaceous matrix, occasional cavings, moderately firm to firm, friable, fair to moderate visual porosity, no shows.
830	100	As above.
835	100	As above.
840	100	As above.

DEPTH (m)	%	DESCRIPTION
845	100	As above.
850	100	As above.
855	100	Sandstone: Clear to translucent, moderate reddish brown to pale reddish brown staining, predominantly fine to occasionally medium grained, occasional coarse grain, well sorted sub rounded to rounded, common silica cement, occasional ferruginous argillaceous matrix, moderately firm to firm, friable, fair visual porosity, no shows.
860	100	As above.
865	100	As above.
870	100	As above.
875	100	Clear to translucent, moderate to pale reddish brown staining, up to 20% white (no staining), predominantly fine to occasionally medium grained, well sorted, sub rounded to rounded, common silica cement, ferruginous argillaceous matrix in parts, moderately firm to firm, fair to moderate vidual porosity, no shows.
880	100	Sandstone: As above with up to 50% white sandstone. * Testing with 32% HCI indicates staining is from iron.
885	100	Sandstone: Clear to translucent grains, stained moderate to dark reddish brown, occasionally white, predominantly fine to medium grained, occasional coarse grains, moderately to well sorted, sub angular to rounded, common silica cement, occasional ferruginous argillaceous matrix, occasional lithic grains, firm to moderately hard, slightly friable, fair to poor visual porosity, no shows.
890	100	As above.
895	100	As above.
900	100	As above.
905	100	As above.
910	100	As above.

DEPTH (m)	%	DESCRIPTION
915	100	As above.
920	100	As above.
925	100	As above.
930	100	As above.
935	100	As above.
940	100	As above.
945	100	As above.
950	100	As above. Rare pirite.
955	100	As above.
960	100	As above.
965	100	As above.
970	100	As above.
975	100	Sandstone: Clear to translucent grains stained moderate to dark reddish brown, occasionally pale reddish brown and white, predominantly fine to medium grained, occasional coarse grains, moderately to well sorted, sub angular to sub rounded, common silica cement, occasional ferruginous argillaceous matrix, occasional lithic grains, firm to moderately hard, slightly friable, fair to poor visual porosity no shows.
980	100	As above.
985	100	As above.
990	100	As above.
995	100	As above.
1000	100	As above.
1005	100	As above.

DEPTH (m)	%	DESCRIPTION
1010	100	As above.
1015	100	As above.
1020	100	As above.
1025	100	As above.
1030	100	As above.
1035	100	As above.
1040	100	As above.
1045	100	As above.
1050	100	As above.
1055	100	As above.
1060	100	As Above.
1065	100	Sandstone: Clear to translucent grains, with dark reddish brown to moderate reddish orange staining, predominantly fine grained, occasionally medium to coarse, moderately sorted, predominantly rounded, occasionally sub angular, common silica cement, occasional ferruginous argillaceous matrix, firm to hard, occasionally friable, poor visual porosity, abundant cavings, no shows.
1070	100	As above.
1075	100	As above.
1080	100	Clear to translucent grains stained dark reddish brown to moderate reddish orange, fine to medium grained, occasional coarse grains, moderately sorted, sub angular to rounded, occasionally angular, common silica cement, occasional ferruginous clayey matrix, moderately firm to firm, friable, fair to poor visual porosity, abundant cavings, no shows.
1085	100	As above.
1090	100	As above.

DEPTH (m)	%	DESCRIPTION
1095	90	Sandstone: Clear to translucent grains stained dark to moderate reddish brown to moderate reddish orange, unstained in parts, fine to medium grained, abundant very fine and occasional coarse grains, poorly sorted, sub rounded to rounded, occasionally sub angular, common silica cement, common ferruginous argillaceous matrix, firm to hard, slightly friable, fair to poor visual porosity, no shows.
	10	Claystone: Dark reddish brown, common very fine sand, moderately firm to firm, blocky to sub blocky, non calcareous.
1100	100	Sandstone: As above.
1105	100	As above.
1110	100	As above.
1115	100	As above.
1120	100	As above.
1125	100	Sandstone: Clear to translucent, common moderate reddish brown staining, fine to medium grained, occasional coarse grains, moderately sorted, sub rounded to rounded, occasionally angular, common silica cement, common dark reddish brown to moderate reddish orange clay matrix, firm to hard, occasionally friable, poor visual porosity, no shows.
1130	100	As above.
1135	100	As above.
1140	100	Sandstone: Clear to translucent quartz grains stained dark to moderate reddish brown, predominantly fine to medium grained, occasionally very fine grained, occasional coarse grains, poorly sorted, sub rounded to rounded, occasionally angular, common silica cement, common matrix as above, firm to hard, friable, poor visual porosity no shows.

DEPTH (m)	%	DESCRIPTION
1145	100	Sandstone: Clear to translucent quartz stained moderate to dark reddish brown, predominantly fine grained, commonly very fine, occasional medium to coarse grains, moderately to well sorted, sub rounded to rounded, occasionally silica cement, common dark reddish brown ferruginous clay matrix, moderately firm to firm, friable, poor visual porosity, no shows.
1150	100	Sandstone: Clear to translucent stained moderate reddish brown to moderate reddish orange, fine to fine grained, occasional medium grains, moderately to well sorted, sub rounded to rounded, common silica cement, abundant dispersive ferruginous clay dark reddish to moderate reddish brown, firm to moderately firm, friable, poor visual porosity, no shows.
* NOTE:		The clay matrix described above is highly dispersive and sample descriptions from approximately 1090m may not accurately reflect the true lithology. A more accurate estimate of lithology is an interbeded sequence of sands, sandy clay and clayey sands. The clay dispenses with only light washing of the sieve and degrades further when left in the sieve.
1160	100	Sandstone: Clear to translucent, occasional moderate reddish brown staining, predominantly unstained, very fine to fine grained, common medium and occasional coarse grains, moderately sorted, sub rounded to rounded, common silica cement, occasional dispersive ferruginous clay matrix, moderately firm, moderate visual porosity, no shows.
1165	100	Sandstone: Clear to translucent, abundant moderate reddish brown to moderate reddish orange, very fine to fine grained, occasionally medium grained, rare coarse grain, moderately to well sorted, sub rounded to rounded, common silica cement, abundant dark reddish brown clay matrix, moderately firm, friable, poor to fair visual porosity, no shows.
1170	100	Sandstone: Clear to translucent, abundant moderate reddish brown to moderate reddish staining, fine to medium grained common very fine grains, occasional coarse grains, moderately sorted, sub rounded to rounded, abundant silica cement, abundant dark reddish brown ferruginous clay matrix, moderately firm, friable, moderate vs. pr. no shows.

DEPTH (m)	%	DESCRIPTION
1175	100	Sandstone: Clear to translucent, occasional moderate reddish brown to moderate reddish orange staining. Predominantly medium grained, occasional fine and coarse grains, well sorted, rounded, common silica cement, occasional dark reddish brown ferruginous clay matrix, rare lithic grain, moderately firm, friable, moderate visual porosity, no shows.
1180	100	Sandstone: Clear to translucent, occasional reddish brown to reddish orange staining, predominantly fine to medium grained, moderately sorted, rounded, occasionally sub angular, common silica cement, common dark reddish brown ferruginous clay matrix, firm to hard, friable, poor visual porosity, no shows.
1185	100	As above.
1190	100	As above with abundant dispersive clay matrix.
1195	100	Sandstone: Clear to translucent, occasional orange staining, predominantly medium grained, common fine grains, occasional coarse grains, well sorted, rounded, occasionally sub angular to sub rounded, abundant silica cement, occasional dark reddish brown ferruginous clay matrix, firm to hard, friable, moderate visual porosity, no shows.
1200	100	Sandstone: Clear to translucent, medium fine grained, occasional coarse grained, moderately sorted, common silica cement, abundant dark reddish brown ferruginous clay matrix, firm to hard, friable, moderate visual porosity, no shows.
1205	100	Sandstone: Clear to translucent, moderate to coarse grains, moderately sorted, sub rounded to rounded, occasionally sub angular, common silica cement, rare dark reddish brown ferruginous clay matrix, moderately firm to firm, friable, fair to moderate visual porosity, no shows.
1210	100	Sandstone: Predominantly as above with abundant dark reddish brown ferruginous clay matrix which is ferruginous in parts.
1215	100	Sandstone: As for 1210m.

DEPTH (m)	%	DESCRIPTION
1220	100	Sandstone: Clear to translucent, occasional moderate reddish orange staining, fine grained, occasional coarse grain, common medium grains, well sorted, sub rounded to rounded, common silica cement, occasional dark reddish brown to moderate reddish orange clay matrix which is dispersive in parts, friable, hard, poor visual porosity, no shows.
1225	100	As above.
1230	100	As above.
1235	100	Sandstone: Clear to translucent, occasional dark reddish brown to moderate reddish orange staining, predominantly fine grained, common medium to coarse grains, moderately to well sorted, sub angular to sub round, common silica cement, common moderate to dark reddish brown clay matrix, rare pyrite, moderately hard to hard, poor visual porosity, no shows.
1240	100	As above.
1245	100	Sandstone: Clear to translucent, common medium to dark reddish brown staining, fine to medium grained, well sorted, sub rounded to rounded, common silica cement, common dark reddish brown argillaceous matrix, rare pyrite, occasional biotite (possibly cavings), moderately hard friable, poor to fair visual porosity, no shows.
* NOTE		Spot sample between 1245 and 1250 has metamorphic rock fragments, probably cavings.
1250	100	Sandstone: Clear to translucent quartz grains, common moderate reddish brown staining, predominantly medium to coarse grained, common fine grains, well sorted, sub rounded to rounded, common silica cement, occasional dark reddish brown ferruginous clay matrix, rare pyrite, occasional sandstone fragments with biotite (probably cavings) moderately firm to hard, fair to moderate visual porosity, no shows.
		T.D. 1254.41 m @ 1055 hrs 14/6/91.

APPENDIX 5

CORE DESCRIPTIONS

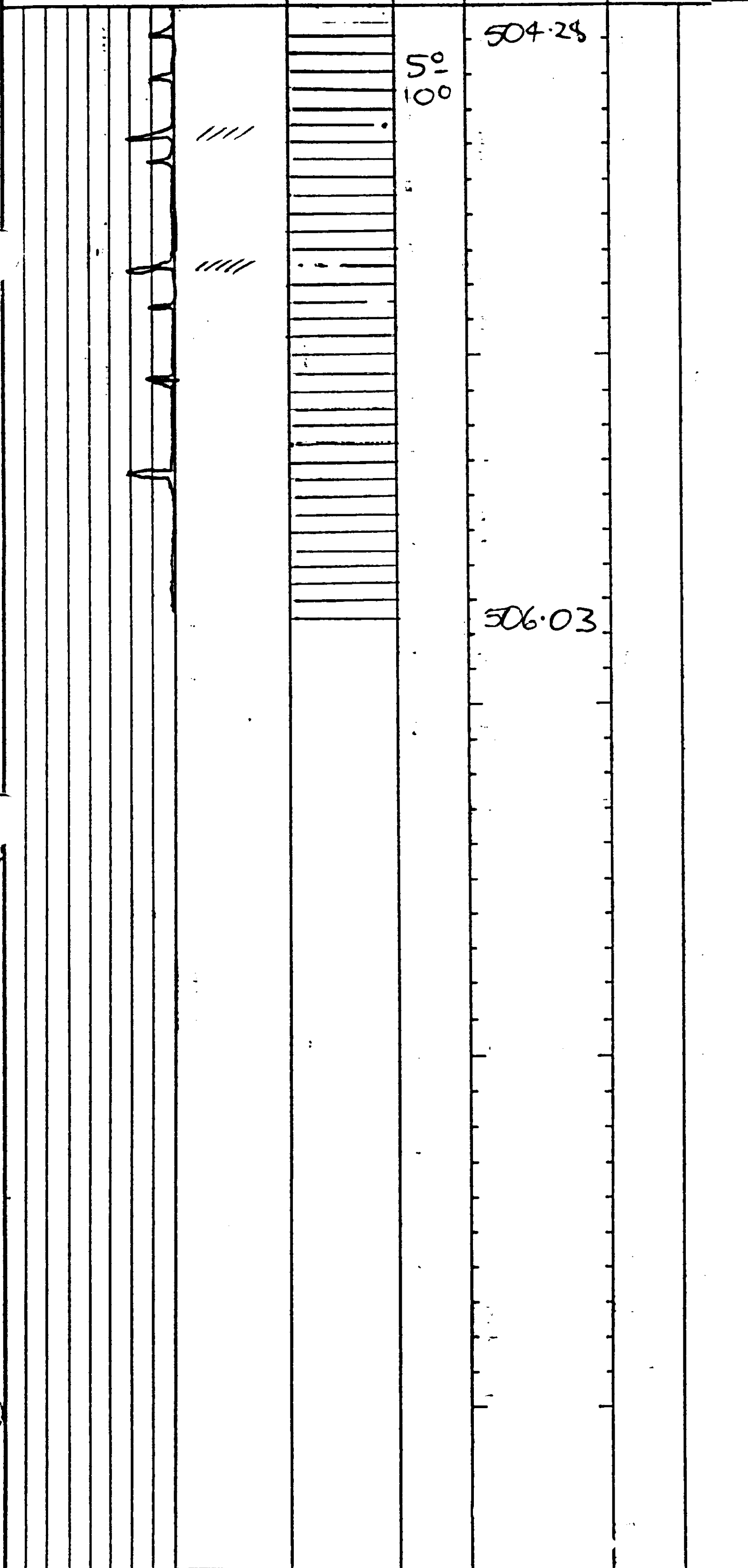
(HALLIBURTON GEODATA)

CONTINENTAL RESOURCES N.L.

CORE DESCRIPTION

WELL :	BIG DESERT NO. 1	CORE No.:	1 PAGE 1 OF 1
DATE :	19/5/91	INTERVAL :	504.28 - 506.03 m
FORMATION :	Urana Formation	RECOVERY :	90%
GEOLOGIST :	Cliff Menhennitt		FIGURE No.

GRAINSIZE AND STRUCTURES (P G VC C M F VF Silt Clay)	Lithology	DIPS	DEPTH (DRILLERS)	(MEASURED) Ø %	k mD	DESCRIPTION



DESCRIPTION

Upper 43 cm is a dark greenish grey claystone which is moderate brown to grayish brown in parts. There are common lenses and laminae of very fine sand and silt 5 m thick with some indication of cross bedding. Claystone is moderately firm to firm, fissile in parts and blocky. Apparent bedding angle 5°-10° no accessory material. Already beginning to disintigrate along bedding planes and near vertical joints.

Remainder of core is moderate brown to greyish brown claYst with laminae of dark greenish grey claystone and very light grey silts and sands that become less common with depth. Again sand and silt 5 mm. Contacts between beds abrupt but several fining upward events visible. Colour variation in claystones conforms to bedding planes. There is some slight reaction to HCI in the thicker sand laminae in the lower section of the core. The claystones are non calcareous.

CONTINENTAL RESOURCES N.L.
CORE DESCRIPTION

WELL : BIG DESERT NO. 1

CORE No.: 2

PAGE 1 OF 1

DATE : 28/5/91

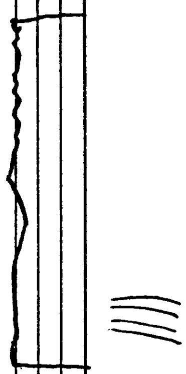
INTERVAL : 639.2 - 640.3

FORMATION : Mulga Downs

RECOVERY : 38%

GEOLOGIST : Cliff Menhennitt

FIGURE No.

GRAINSIZE AND STRUCTURES (P G VC C M F VF Silt Clay)	Lithology	DIPS	DEPTH (DRILLERS)	(MEASURED) Ø %	k mD	DESCRIPTION
		≈10°	639.22 – 640.27			**Sandstone:** Dark reddish brown, predominantly medium to occasionally fine grained, well sorted, sub rounded to rounded, common silica cement, abundant ferruginous clay matrix, firm to hard, poor visual porosity. Lowest 4 cm of core is very light grey to white and strongly silica cemented with no clay matrix material. Grain size etc as above. Poor visual porosity, non calcareous, nil flur-escence. Some apparent bedding towards base appears to be laminar, apparent angle 10°.

902053 087

CONTINENTAL RESOURCES N.L.

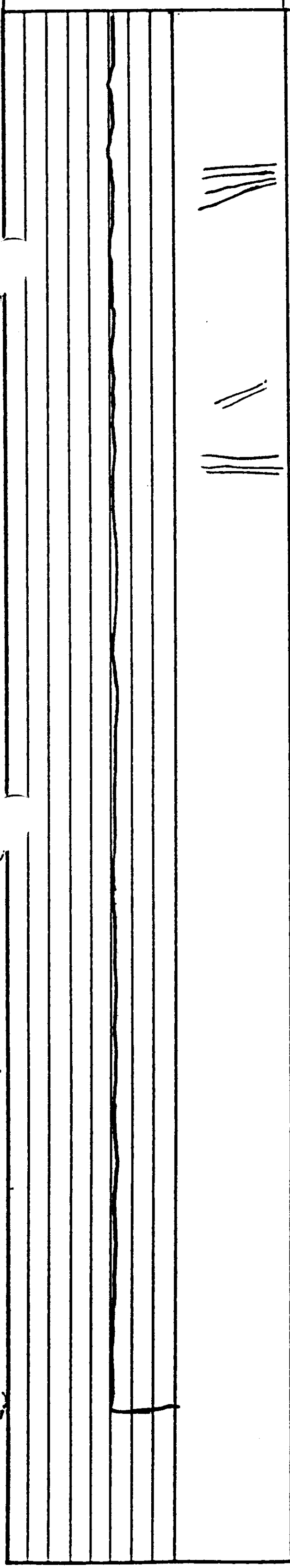
CORE DESCRIPTION

WELL : BIG DESERT NO 1 CORE No.: 3 PAGE 1 OF 1

DATE : 30/5/91 INTERVAL : 748.17 - 752.17

FORMATION : Mulga Downs RECOVERY : 96%

GEOLOGIST : Cliff Menhennitt FIGURE No.

GRAINSIZE AND STRUCTURES (P G VC C M F VF Silt Clay)	Lithology	DIPS	DEPTH (DRILLERS)	(MEASURED) Ø %	k mD	DESCRIPTION
	100% SANDSTONE	10°	748.17 – 752.17	749.0 – 749.12 SAMPLE SEAL PEELED AND SENT TO AMDEL.		Sandstone: Moderate brown with occasional moderate reddish brown laminae. Predominantly fine to occasionally medium grained, well sorted, sub rounded to rounded silica cement throughout, occasional lithic grains, very firm, friable, fair to moderate visual porosity. Small spots of pale yellow to yellowish white fluorescence in crushed samples, unable to be duplicated on larger fracture surfaces may be contamination. The core has parted along apparent horizontal and sub horizontal planes of weakness. These planes may cooincide with the moderate reddish brown laminae which appears to be slightly more argillaceous than other areas. This is difficult to ascertain in hand specimen. Core sections are rarely greater than 10cm in lengh and commonly less than 5 cm. Throughout the core the bedding appears to be laminar, where any at all can be discerned bedding angles, where apparent, range from horizontal to approximately 10°. Some thickness between beds is noted indicating non uniform bed thickness. Core is non calcareous but HCI is readily absorbed indicating porosity and permeability. Core is very firm requiring hammer blows to break pieces but is also friable in the hand.

902053 088

CONTINENTAL RESOURCES N.L.

CORE DESCRIPTION

WELL : BIG DESERT NO. 1 | CORE No.: 4 | PAGE 1 OF 1

DATE : 2/6/91 | INTERVAL : 880.0 - 882.1 m

FORMATION : Mulga Downs | RECOVERY : 92%

GEOLOGIST : Cliff Menhennitt

FIGURE No.

GRAINSIZE AND STRUCTURES (P G VC C M F VF Silt Clay)	Lithology	DIPS	DEPTH (DRILLERS)	(MEASURED) Ø %	k mD	DESCRIPTION
	100% SANDSTONE		882.10			Sandstone: Dark to moderate and occasionally pale reddish brown with very light grey to pinkish grey bands. Predominantly fine grained, occasionally very fine and occasional medium grains, well sorted, sub rounded to rounded, strongly silica cemented particularly in the non stained sections, dark reddish brown ferruginous matrix in stained sections, occasional lithic grains, moderately hard to hard slightly friable but less so in the light grey intervals. No HCI reaction and no fluorescence. Colour banding appears bedding related in parts with apparent bedding angle up to 10°. However colouring is also randomly distributed in other areas, possibly a porosity related phenomenon. Little grainsize variation throughout in indicate fining up or down very abrasive to drill bits!

902053 089

CONTINENTAL RESOURCES N.L.

CORE DESCRIPTION

WELL : BIG DESERT NO. 1 | CORE No.: 5 | PAGE 1 OF 1

DATE : 5/6/91 | INTERVAL : 1060.35 - 1061.66

FORMATION : Mulga Downs | RECOVERY : 92 %

GEOLOGIST : Cliff Menhennitt | FIGURE No.

GRAINSIZE AND STRUCTURES (P G VC C M F VF Silt Clay structure)	Lithology	DIPS	DEPTH (DRILLERS)	(MEASURED) Ø %	k mD	DESCRIPTION
	100% SANDSTONE.		1061.66M	SAMPLE SENT / PEELED AND SENT TO AMDEL		<u>Sandstone:</u> Predominantly stained moderate to dark reddish brown with intervals of yellowish grey and becoming pale reddish brown towards the base. Predominantly fine to medium grained, occasional medium to coarse grains, moderately to well sorted, sub angular to rounded, abundant silica cement, rare ferruginous matrix, occasional lithic grains, poor to very poor visual porosity, hard to very hard, no shows. Some of the colour variatioons appear to be bedding related with apparent angle up to 10° (Remember deviation). Other variations seem more likely to be diagenetic. Overall the core is harder, less friable and has apparently less porosity than core No.4 reaction to HCI.

902053 090

APPENDIX 6

SIDEWALL CORE DESCRIPTIONS

(HALLIBURTON GEODATA)

SIDEWALL CORE DESCRIPTIONS

BIG DESERT 1

DEPTH (m) (m) Rec. (mm)	PREDOMINANT LITHOLOGY	DESCRIPTION
SWC No.1 1253 m 15 mm	Sandstone	clear to translucent quartz, stained moderate reddish brown, predominantly very fine to fine grained, well sorted, sub rounded to rounded, occasional silica cement, abundant moderate reddish brown argillaceous matrix, soft to moderately firm in parts, poor visual porosity, no shows. NOTE - Sample contains core bullet fragments.
SWC No.2 1252 m	No recovery	
SWC No.3 1251 m	No recovery	
SWC No.4 1252.8 m 22 mm	Sandstone	clear to translucent quartz, stained moderate reddish brown, predominantly very fine to fine grained, well sorted, sub rounded to rounded, occasional silica cement, abundant moderate reddish brown argillaceous matrix, soft to moderately firm in parts, poor visual porosity, no shows. NOTE - Sample contains core bullet fragments.
SWC No.5 1251.5 m 18 mm	Sandstone	clear to translucent quartz, stained moderate reddish brown in parts, very fine to fine grained, occasional medium grains, well sorted, sub rounded to rounded, occasionally sub angular, occasional silica cement, abundant white and moderate reddish brown argillaceous matrix, firm to moderately hard in parts, poor visual porosity, no shows.
SWC No.6 1245 m	No recovery	
SWC No.7		

1240 m 12 mm	Sandstone	clear to translucent quartz, stained moderate reddish orange to moderate reddish brown, very fine to fine grained, occasional medium grains, well sorted, sub rounded to rounded, occasionally sub angular, common to abundant silica cement, common moderate reddish orange to moderate reddish brown argillaceous matrix, firm to moderately hard, poor visual porosity, no shows.
SWC No.8 1235 m	No recovery	
SWC No.9 1216 m	No recovery	
SWC No.10 1206 m	Sandstone	clear to translucent quartz, stained moderate reddish orange, very fine to fine grained, well sorted, sub rounded to rounded, occasionally sub angular, occasional to common silica cement,common moderate reddish orange to moderate orange pink argillaceous matrix, rare lithic grains, moderately firm to firm, no shows.
SWC No.11 1175 m	No recovery	
SWC No.12 1161.5 m	No recovery	
SWC No.13 1133 m 9 mm	Sandstone	clear to translucent quartz, very fine to fine grained, rare medium grain, well sorted, sub round to rounded, occasionally sub angular, occasional to common silica cement, abundant white to very light grey argillaceous matrix, rare lithic grain, firm to moderately firm, poor visual porosity, no shows.
SWC No.14 1093 m 30 mm	Sandstone	clear to translucent quartz, very fine to fine grained, rare medium grain, well sorted, sub round to rounded, occasionally sub angular, occasional silica cement, abundant white to very light grey argillaceous matrix, rare lithic grain, moderately firm, poor visual porosity, no shows.
SWC No.15		

1015 m 21 mm	Sandstone	clear to translucent quartz, stained moderate orange pink to moderate reddish orange, very fine to fine grained, occasional medium grains, well sorted, sub rounded to rounded, occasionally sub angular, occasional to common silica cement, abundant moderate reddish orange to white argillaceous matrix, moderately firm to soft, poor visual porosity no shows.
SWC No.16 975 m 24 mm	Sandstone	clear to translucent quartz, stained moderate reddish orange to moderate orange pink, very fine to fine grained, occasional to common medium grains, well sorted, sub rounded to rounded, occasionally angular, common silica cement, common to abundant moderate reddish orange argillaceous matrix, moderately firm to moderately hard, poor visual porosity, no shows. NOTE - Sample contains core bullet fragments.
SWC No.17 935 m 17 mm	Sandstone	clear to translucent quartz, stained moderate orange pink, very fine to fine grained, occasionally medium grained, well sorted, sub round to rounded, occasionally sub angular, occasional silica cement, common moderate orange pink to moderate reddish orange argillaceous matrix, occasional lithic grain, soft to moderately firm, fair to moderate visual porosity, no shows
SWC No.18 915 m 24 mm	Sandstone	clear to translucent quartz, stained moderate orange pink to moderate reddish orange, very fine to fine grained, well sorted, sub rounded to rounded, occasionally sub angular, occasional to common silica cement, common to abundant moderate orange pink argillaceous matrix, soft to moderately firm, poor visual porosity, no shows.
SWC No.19 845 m 20 mm	Sandstone	clear to translucent quartz, stained moderate orange pink to moderate reddish orange, very fine to fine grained, well sorted, sub rounded to rounded, occasional silica cement, common to abundant moderate orange pink argillaceous matrix, soft to moderately firm, poor visual porosity, no shows.

SWC No.20 800 m 20 mm	Sandstone	clear to translucent quartz, stained moderate orange pink to moderate reddish orange, very fine grained, occasionally fine grained, grading to siltstone in parts, well sorted, sub rounded to rounded, occasional silica cement, abundant silty to argillaceous matrix, soft to occasionally moderately firm, poor visual porosity, no shows.
SWC No.21 773.5 m 28 mm	Sandstone	clear to translucent quartz, very fine to occasionally fine grained, very well sorted, sub angular to sub rounded, occasionally rounded, rare silica cement, abundant white to very light grey argillaceous matrix, rare lithic grain, soft to moderately firm, poor visual porosity, no shows.
SWC No.22 736 m 18 mm	Sandstone	clear to translucent quartz stained moderate orange pink, very fine to fine grained, very well sorted, sub angular to sub rounded, common angular grains, trace of silica cement, common moderate orange pink to white argillaceous matrix, rare lithic grain, soft, fair to good visual porosity, no shows.
SWC No.23 699 m 22 mm	Sandstone	clear to translucent quartz occasionally stained moderate orange pink, very fine to fine grained, occasional medium grain, well sorted, sub angular to sub rounded, occasionally angular, rare silica cement, abundant white to moderate orange pink argillaceous matrix, rare lithic grain, soft, poor visual porosity, no shows.
SWC No.24 621 m 15 mm	Sandstone	clear to translucent quartz stained light brown to moderate reddish orange, very fine to fine grained, occasional medium grain, well sorted, sub angular to sub rounded, occasionally angular, trace of silica cement, abundant moderate reddish brown to moderate orange pink and occasionally white argillaceous matrix, rare lithic grains, soft to occasionally moderately firm, very poor visual porosity, no shows.

SWC No.25 605 m	No Recovery	
SWC No.26 595 m	No Recovery	
SWC No.27 567 m 47 mm	Diamictite	light brown, white, occasionally greyish brown and moderate reddish brown. Sample consists of weathered, predominantly igneous, rock fragments and weathered feldspar grains in a matrix of multi coloured sandy clays. The sand content is predominantly quartz from fine to coarse grained, with occasional limonite and abundant calcite. Soft to moderately firm.
SWC No.28 532 m 13 mm	Sandstone	very light grey to white, very fine to fine grained, occasional medium grains, well sorted, angular to sub angular, occasionally sub rounded, common calcite cement, common very light grey argillaceous matrix, common lithic and occasional feldspathic grains, moderately firm to firm, slightly friable, no visual porosity, no shows.
SWC No.29 529.5 m 26 mm	Sandstone	very light grey, very fine to fine grained, occasional medium grains, moderately to well sorted, angular to sub angular, occasionally very angular, abundant very light grey argillaceous matrix, occasional lithic and feldspathic grains, moderately firm, calcareous, very poor visual porosity, no shows.
SWC No.30 348.5 m 65 mm	Claystone	greyish black to brownish black, trace of very fine quartz sand, soft to moderately soft, non calcareous.

NOTE - All samples were tested for cut and crush cut fluorescence with trichloroethane, no hydrocarbon indications were detected.

APPENDIX 7

- PETROLOGY REPORT

&

- X-RAY DIFFRACTION REPORT

(AMDEL CORE SERVICES)

902053 097

AMDEL
CORE
SERVICES

X-RAY DIFFRACTION REPORT

BIG DESERT #1

Report prepared for Continental Resources

by

S E PHILLIPS

November 1991

Adelaide Office: P.O. Box 109, Eastwood, SA 5063 Australia.

Telephone: (08) 379 9888 Facsimile: (08) 379 9288

Amdel Core Services Pty Limited
(Incorporated in South Australia)
ACN: 008 273 005

1. INTRODUCTION

Continental Resources requested bulk and clay X-ray diffraction (XRD) analysis of Core Plug 2 from Big Desert #1. To determine bulk mineralogy by X-ray diffraction, the sample was hand ground in acetone and smeared onto a glass slide. A continuous scan was run from 3° to 75° 2 theta, at 1°/minute, using Co K alpha radiation, 50kV and 35mA, on a Philips PW1050 diffractometer. For detailed clay mineralogy a less than 5 micron size fraction was separated. This was done by hand crushing, addition of dispersion solution, mechanical shaking for 10 minutes and settling of the dispersed material in a water column according to Stokes' Law. The less than 5 micron fraction was pipetted off and prepared as an oriented sample on a ceramic plate held under vacuum. The sample was saturated with Mg solution and treated with glycerol. A continuous scan of the oriented clay sample was run from 3° to 35° 2 theta at 1°/minute. Peaks were identified by comparison with JCPDS files stored in a computer program called XPLOT.

2. X-RAY DIFFRACTION RESULTS

Big Desert #1, core plug 2
Quartz dominates the bulk XRD trace (Fig. 1a) of this sample. Minor proportions of feldspars and trace amounts of hematite and siderite are also present. The clay trace (Fig. 1b) reveals the presence of illite 1M, kaolinite, quartz and a randomly interstratified chlorite-smectite. Illite 1M is an authigenic variety of this clay.

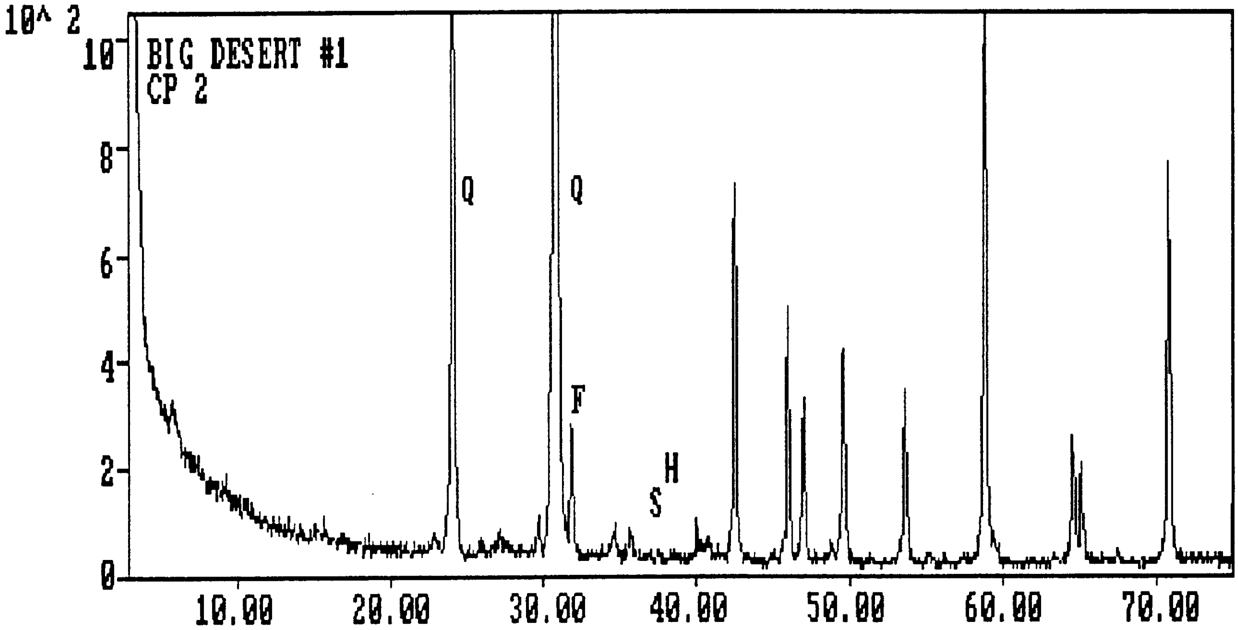


Figure 1a. Bulk XRD trace of core plug 2, Big Desert #1 Only the strongest peaks for each mineral identified have been labelled. Q=quartz, F=feldspar, S=siderite and H=hematite.

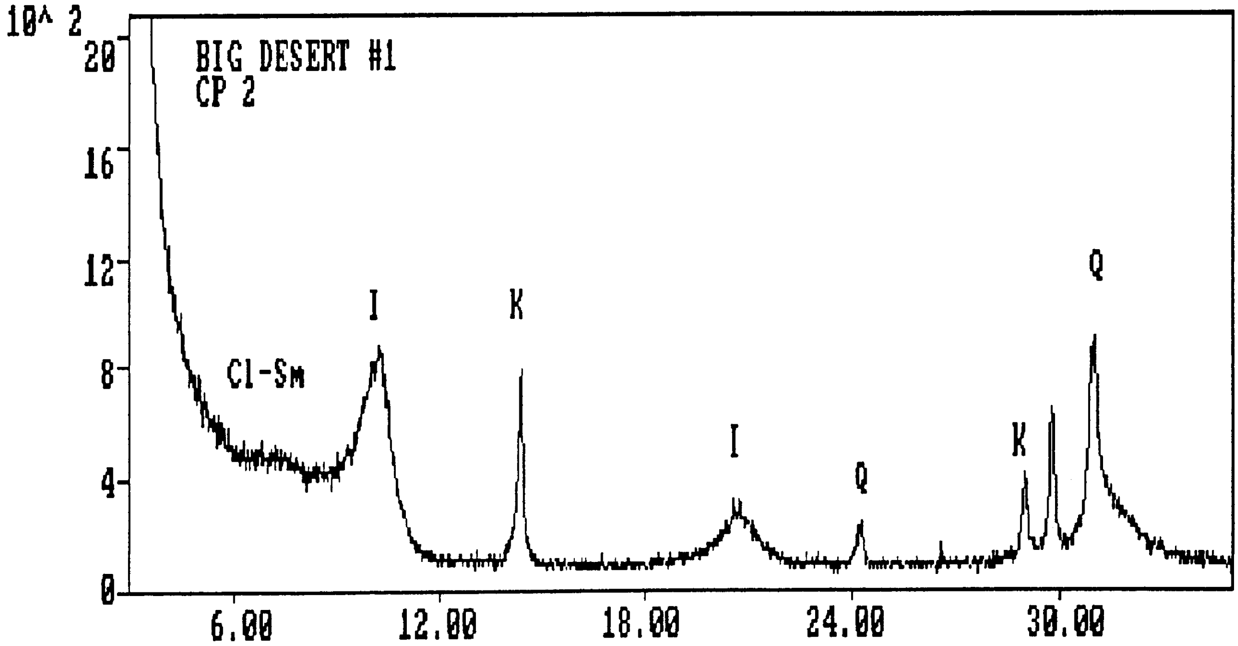


Figure 1b. Clay XRD trace of core plug 2, Big Desert #1. Only the strongest peaks for each mineral identified have been labelled. Cl-Sm=randomly interstratified chlorite-smectite, I=illite 1M, K=kaolinite and Q=quartz.

APPENDIX 7

PETROLOGY REPORT

BIG DESERT-1

GUNAMALARY-2

(AMDEL CORE SERVICES)

902053 101

AMDEL
CORE
SERVICES

PETROLOGY REPORT

BIG DESERT #1

GUNAMALARY #2

Report for Continental Resources

by

Drs PING LUO, N M LEMON & P TINGATE

National Centre for Petroleum Geology and Geophysics

on behalf of

Amdel Core Services
PO Box 109
Eastwood
SA 5063

October 1991

INDEX

1. SUMMARY

Five sidewall, plug and core samples, one from Gunamalary #2 and four from Big Desert #1 were submitted to the National Centre for Petroleum Geology and Geophysics by AMDEL Core Services, on behalf of the client, Continental Resources, for petrological analysis. This included thin section description with the aim of elaborating on their provenance, depositional environment and the relationship between diagenesis and porosity development.

The samples from these two wells all have the same mineralogical and textural characters. They are well sorted, fine to medium grained, subfeldspathic quartz arenites. Quartz dominates the framework grain suite with more monocrystalline grains of plutonic origin than of volcanic and metamorphic origin. K-feldspars are the second most common component but with less than 10%. Half of the feldspar is microcline with the rest composed of orthoclase. The heavy mineral suite in all samples is similar:- zircon, magnetite, and tourmaline. Biotite and muscovite make up the remainder of the framework suite.

Matrix is absent and cement is composed of quartz overgrowths, hematite, smectite/illite, chlorite and siderite.

The composition of the sediments suggests a source from a granite dominated provenance. Mineralogical and textural maturity, ripple cross lamination and early hematite cement are consistent with deposition in a paralic environment.

Porosity is modified by compaction and framework grain dissolution. Compaction and associated pressure dissolution with accompanying quartz cementation, are the main factors in reducing primary porosity. The framework grain dissolution created secondary porosity, including oversized and enlarged intergranular and intragranular pores. These are irregular in size and shape and some are micropores.

Another factor, albeit minor, affecting porosity is authigenetic clay growth. An encasing film of smectite/illite fibres on the grains is more common in samples which show hematite leaching. Small flakes and plates of chlorite form where the hematite is absent. It occurs in both hematite-cemented and de-hematized rocks but is more common in the hematite-cemented parts. While the thin film of smectite/illite has little effect on porosity reduction, it is likely to have severely limited permeability. Sandstones with hematite are less compacted.

Siderite is the latest pore filling cement and shows two stages of growth. An early micrite lines the pore walls and a later sparite fills pores, eroding quartz grains in small patches. Siderite occurs in the de-hematitized rocks and may be associated with magnetite dissolution.

The overall diagenetic sequence appears to be as follows:-

1/. Hematite cementation
2/. Minor compaction
3/. De-hematitization
4/. Smectite/illite growth
5/. Strong compaction and quartz cementation
6/. Leaching of grains and creation of secondary porosity
7/. Chlorite precipitation and alteration of hematite
8/. Siderite cementation

From the observations, potential porosity is preserved by hematite but

porosity is best where the hematite has been leached. In the leached zones, secondary porosity is also better. Although the leached rocks have the best porosity, they do have a problem with reduced permeability from clay coatings on the framework grains.

2. INTRODUCTION

Five plug, sidewall core, chip and core samples, four from Big Desert #1 and one from Gunamalary #2, were forwarded to the National Centre for Petroleum Geology and Geophysics by the client, Continental Resources, via AMDEL Core Services Pty Ltd.. The petrological analysis on each sample included thin section preparation, detailed petrographic description and photomicroscopy. The main aim of the study was to attempt an understanding of the provenance, depositional environment, diagenetic history and porosity development of these samples.

The samples received were labelled:-

Gunamalary #2
    Core 32

Big Desert #1

Core plug 2, 8-102	
Sidewall core 4	1252.8 meters
Core plug 5, 8-102	
Core plug 6	1354.0 meters (chip)

In the slide porosity estimations, the term "primary intergranular" is used to describe present interganular porosity even though much of it was probably once cemented by hematite. The term "secondary porosity" is used to decribe porosity caused by framework grain dissolution or intragranular porosity. The term "intragranular" is used to describe internal dissolution porosity where the pores are variable in size and shape. The term also covers microporosity.

3. METHODS

All the samples were first described in hand specimen. Part of each sample was then impregnated with blue-dyed araldite before thin section preparation in order to facilitate easy description of porosity. Thin sections were then scanned to determine lithology, composition, porosity and textural relationships then photographed. Rock composition and porosity were determined by visual estimation against graphic percentage charts. Grain size was estimated with the use of a visual grainsize comparator.

4. PETROLOGICAL DESCRIPTIONS

4.1 Gunamalary #2, Core 32

Hand specimen description

An off white, strongly cemented, well sorted, medium grained quartz arenite composed of well rounded and polished grains with small scattered white clay spots. The core received was 7 cm in diameter and 6.5 to 7 cm in length. A brown red band stained by ferric iron shows fine laminae detailing ripple cross bedding. The sample shows no reaction with 10% HCl.

Thin section description

The slide shows a well sorted, fine to medium grained feldspathic quartz arenite. The grains are subrounded to rounded with edges eroded by pressure dissolution (Fig.1).

Visual estimate of composition

Framework grains	Quartz		65%
	Feldspar		7%
	Rock fragments		2%
	Chert		3%
	Heavy minerals		2%
Cement	Quartz	overgrowths	4%
	Hematite		2%
	Siderite		3%
	Clay	chlorite	1%
		smectite/illite	1%
Porosity	Primary	intergranular	7%
	Secondary	intragranular	3%

Quartz dominates the framework suite with mainly monocrystalline grains of igneous origin. K-feldspar is common with nearly half being microcline and the rest slightly dirty and selectively leached orthoclase (perthitic). The remainder is minor volcanic rock fragments, chert clasts, biotite, muscovite and a heavy mineral suite composed of zircon, tourmaline and magnetite.

The main cement is quartz overgrowth, probably related to silica mobilized during pressure dissolution. Other cements include authigenic fibre-encrusting smectite (or illite), platy chlorite aggregates and scattered, sparry, pore filling siderite which slightly replaces quartz.

Compaction is moderately intense. Contacts between grains are straight line and concave with some faint quartz overgrowths without crystal facets, located at grain contacts (Fig.2).

Porosity is mainly intergranular with some microporosity (Fig.1). The microporosity results from internal dissolution of chert grains and volcanic rock fragments, and selective dissolution of feldspars. The intergranular porosity appears to be associated with leaching of an early hematite cement leaving a hybrid or quasi-primary porosity.

In the middle of the slide a 3mm hematite cemented zone possesses the same overall texture and mineral character but with less intense compaction. Away from this red zone, hematite and chlorite inclusions can be found within rock fragments, quartz and chert grains indicating that the precursor hematite cement was leached and chlorite formed early in the diagenetic history.

4.2 Big Desert #1, Core plug 2, 8-102.

Hand specimen description

A brown-red, moderately cemented, fine to very fine grained sandstone embedded with white, irregular diagenetic lenses parallel to bedding (the largest 5mm to 10mm thick and with a diameter of more than the plug, 35mm). A 4.5cm intact plug was received. There was no reaction with 10% HCl, either in the main red part of the sample or in the white lenses.

Thin section description

The slide depicts a well sorted, clean, fine grained quartz arenite. The grains are subrounded to rounded and modified by pressure dissolution at edges (Fig.3).

Visual estimate of composition

Framework grains	Quartz		67%
	Feldspar		4%
	Rock fragments		2%
	Chert		1%
	Heavy minerals		1%
Cement	Quartz	overgrowths	2%
	Hematite		8%
	Clay	chlorite	1%
		smectite/illite	1%
Porosity	Primary	intergranular	8%
	Secondary	intragranular	5%

Quartz dominates the framework suite with mainly monocrystalline grains of igneous origin. The remainder of this suite is composed of K-feldspar, rock fragments, muscovite, biotite and chert. The heavy minerals are zircon, tourmaline and magnetite. The microcline is clear while the orthoclase grains are "dirty" with vacuoles and clays and show slight to moderate selective dissolution.

Hematite is the major cement staining the rock a dull red colour (Figs.3,4). The dark red part shows hematite is dense and opaque. The light red parts have hematite that is transparent, stains the araldite and gives a leached or decoloured appearance. Very tiny chlorite flakes, associated with hematite alteration, fill pores and dissolution micropores inside quartz, chert, feldspar clasts and volcanic rock fragments. Authigenic smectite/illite encases the framework grains, particularly in the white lenses, where there are also pore-filling aggregates of tiny flakes of chlorite. Matrix is absent.

Compaction is moderate to intense. Contacts between framework grains are straight line to concave, partially from pressure dissolution and partially from quartz precipitation associated with that solution.

Porosity is of two types; primary intergranular and secondary. Intergranular pores in the red portion are partially filled by hematite. The intergranular pores in the white parts partly come from the hematite leaching (Fig.3). Microporosity, included with secondary porosity, is related to the dissolution of chert, volcanic quartz, feldspar and rock fragments.

4.3 Big Desert #1, Sidewall core 4, 1252.8 meters

Hand specimen description
A dull red, very fine to fine grained sandstone with no reaction to 10% HCl. The sample received was crushed and mixed with half-dried drilling mud from the sidewall sampling process. The 2cm of core had largely disintegrated into individual grains with only one piece keeping its original texture.

Thin section description
The slide depicts a moderately well sorted, very fine to fine grained quartz arenite interbedded with medium sand sized laminae. The grains are subrounded.

Visual estimate of composition

Framework	Quartz		72%
	Feldspar		7%
	Rock fragments		2%
	Chert		4%
	Heavy minerals		1%
Cement	Quartz	overgrowths	4%
	Hematite		8%
	Clay	chlorite	1%
		smectite/illite	1%
Porosity	no estimate given due to disaggregation of the core with only completely cemented chips remaining intact		

Most of the mounted slide is crushed with discrete chips mixed with drilling mud. One particle has preserved its texture relatively well and shows features similar to those of core 2 (Fig.5).

Quartz dominates the framework suite with grains of mainly igneous origin. The remainder of the suite contains K-feldspars, chert, mica, heavy minerals and minor rock fragments. Microcline is clear while orthoclase is dirty and shows selective leaching. Volcanic rock fragments, volcanic quartz, some feldspars and chert have all experienced dissolution or have been replaced by hematite and chlorite. The heavy mineral suite is composed of zircon, tourmaline and magnetite.

Hematite is the main cement and stains the rock red (Fig.5). Within the medium sand laminae, smectite/illite is developed, encrusting the quartz grains. Chlorite aggregates exist in inter- and intragranular pores.

Compaction is moderate to intense (Figs.5,6). The medium sand laminae show stronger compaction with slight to moderate quartz overgrowth and less leaching. Conversely, the very fine grained laminae have more intragranular, enlarged and even oversized pores with much more hematite cement.

Porosity is also associated with framework grain dissolution, ie., leaching on the edges of and within grains. Intergranular porosity is the main sort, including secondary enlarged and oversized pores resulting from edge erosion. Internal leaching gives quite high intragranular porosity.

4.4 Big Desert #1, Core plug 5, 8-102

Hand specimen description
A white, moderate to intensely cemented, well sorted, fine to medium grained (in alternate layers) quartz arenite with some shadowy diagenetic spots (around 2 mm in diameter). There was no reaction with 10% HCl. The 35mm diameter plug was 4.4 cm in length.

Thin section description
The slide shows a well sorted, fine to medium grained quartz arenite interbedded with fine sand layers. The grains are subrounded to rounded.

Visual estimate of composition

Framework	Quartz		68%
	Feldspar		3%
	Rock fragments		trace
	Chert		2%
	Heavy minerals		2%
Cement	Quartz	overgrowths	3%
	Siderite	patches	4%
	Clay	chlorite	1%
		smectite/illite	1%
Porosity	Primary	intergranular	9%
	Secondary	inter- and intragranular	7%

The dominant framework grains are monocrystalline igneous quartz with some metamorphic quartz (Fig.7). The remainder of the suite is K-feldspar (clear microcline and dirty orthoclase with selective dissolution), mica, minor chert and traces of volcanic rock fragments. The heavy mineral suite consists of 1% magnetite, and a few zircon and tourmaline grains. Many grains show red hematite inclusions.

Overgrowth quartz from pressure dissolution, grain-rimming smectite/illite and pore-filling chlorite and patchy siderite make up the cement suite. Siderite replaces the edges of quartz grains forming big patches, the spots described in hand specimen. Two generations of siderite are obvious; micrite lining the pore walls followed by spar filling the pores and replacing quartz.

Compaction is moderately intense. The contacts between grains are straight line and concave with moderate quartz overgrowth (Figs.7,8).

There are two types of porosity; intergranular primary pores and inter- and intragranular secondary pores. Oversized pores from framework grain dissolution and enlarged pores from edge erosion of quartz grains make up the secondary intergranular porosity (Fig.7). Leaching within the grains of volcanic quartz, some feldspars and chert has produced the secondary intragranular porosity.

Well TD'd at 1254 Core #6 had no recovery!

4.5 Big Desert #1, Core 6, 1354.0 meters

Hand specimen description
A half grey and half brown red, well sorted, fine grained quartz arenite that shows no reaction with 10% HCl. The sample received was a small chip 7mm wide and long, and 2mm thick, from a sidewall core.

Thin section description
The slide depicts a well sorted, fine grained feldspathic quartz arenite. The grains are subrounded to rounded. Of the original sample, only the white part was mounted on the glass. The red part looks like core 2 in Big Desert #1.

Visual estimate of composition

Framework	Quartz		70%
	Feldspar		8%
	Rock fragments		1%
	Chert		3%
	Heavy minerals		1%
Cement	Quartz	overgrowths	3%
	Siderite		trace
	Clay	chlorite	1%
		smectite/illite	2%
Porosity	Primary	intergranular	8%
	Secondary	intragranular	3%

Quartz dominates the framework suite with most grains of igneous origin. Some of these are volcanic with some hematite inclusions. The remainder of the framework suite contains K-feldspars, chert, mica and minor volcanic rock fragments. Zircon, tourmaline, and magnetite make up the heavy minerals.

The main cement is pore-filling chlorite and smectite/illite which encrusts the quartz grains, particularly where relatively tight areas form from quartz pressure dissolution and overgrowth. Some chlorite flakes line the pore walls in radiate form. One patch of siderite was observed with two stages of growth, early micrite and later spar (Figs.9,10).

Compaction is moderately intense. The contacts between grains are straight line and concave, partly from pressure dissolution and partly from the resultant quartz overgrowth.

Porosity consists of primary intergranular and secondary inter- and intragranular pores (Fig.9). The secondary intergranular pores are oversized, due to dissolution of grains like magnetite or enlarged by erosion of edges of grains. Internal dissolution has created intragranular pores in volcanic quartz, chert and rock fragments.

5. DISCUSSION AND CONCLUSIONS

All the sands investigated have a remarkably similar mineralogy, reflecting a common granitic source area mixed with a small proportion (around one fifth) of volcanic and metamorphic origin. They are all fine to medium grained, subfeldspathic quartz arenites and as such, mineralogically mature. The grains are subrounded to rounded and well sorted with no matrix indicating textural maturity.

The quartz types are mostly monocrystalline of igneous origin showing low strain, vacuoles and inclusions with some of metamorphic origin showing minor semi-composites and undulose extinction and some of volcanic origin, showing polycrystalline features, clay and aqueous inclusions. Some semi-crystalline quartz grains contain abundant clay, aqueous vacuoles and inclusions, indicating that they are devitrified volcanic glass. These grains are readily etched to form enlarged intergranular pores.

All samples show a small proportion of feldspars, lithics (probably volcanic fragments), chert, muscovite, biotite and heavy minerals. Half the feldspars are usually clear microcline and the rest K-feldspars, probably orthoclase, which show slight clay alteration and selective leaching. Chert is also unstable, being altered by hematite or/and chlorite and showing stronger leaching in the hematite-cemented bands. Volcanic rock fragments are partially dissolved and so it is hard to identify their internal textures from the remnant clay alteration products. Biotite undergoes some chlorite alteration.

Heavy minerals are zircon, tourmaline and magnetite (with a trace of limonite). Zircon and tourmaline are stable. Magnetite is absent in hematite-cemented laminae but found in hematite-free zones with slight to nearly complete dissolution. Stronger leaching of magnetite occurs in the rock with siderite patches.

Cements consist of quartz overgrowths, hematite, smectite/illite, chlorite, and siderite. Quartz overgrowth accords with pressure dissolution of framework quartz grains at contacts. Overgrowths are subtle at low magnification but can be clearly seen in high magnification. Most of them are precipitates near grain contacts and do not show crystal facets. This style makes the rock appear tight in hand specimen. Hematite seems to be the earliest cement. In some rocks or layers, it stays relatively intact, as in sample core 4, Big Desert #1. In some samples, it undergoes leaching to give a pale coloured rock and in the others it is almost totally dissolved but can still be seen as inclusions in some grains. Fibrous smectite or illite (cannot discriminate by microscopy) encases the grains, especially in compacted parts. Chlorite is in the form of flake aggregates which fill pores. A few cases of grain encrustation and pore lining were seen under very high magnification. Siderite grows in two stages, ie., early micrite lining pores with later spar filling pores and replacing quartz.

Compaction is moderately intense to intense. The contacts between grains are straight line and concave, caused partially by pressure dissolution and partially by associated quartz precipitation. This quartz overgrowth is without clay rims because of the lack of detrital clay and rapid deposition.

Quartz, clays, carbonate and compaction have all acted to reduce primary porosity. Authigenic quartz occurs as overgrowths on most of the framework quartz grains. Compaction and associated quartz precipitation has occluded most of the original primary porosity. Early hematite cementation, later smectite/illite encasing and chlorite filling are other factors reducing porosity and permeability. Clay minerals, in particular, will affect the permability. The latest cement is siderite. This fills pores completely and makes the rock much tighter.

Porosity occurs as primary intergranular and secondary inter- and intragranular pores. As mentioned above, primary porosity is reduced dramatically by compaction and immediate quartz cementation. Compaction is resisted in hematite-cemented layers. Rock fragments, feldspar, chert and volcanic quartz grains are easily leached to create oversized and enlarged intergranular and intragranular pores. Secondary porosity is significant in all these samples.

Chlorite is a minor clay mineral but it possesses diagenetic significance. Chlorite occurs in hematite cemented and non-hematite bands and in grains as inclusions with hematite but is more common where hematite and silica show leaching.

The high textural and mineralogical maturity and hematite cementation during early diagenesis suggest that the sediments were deposited in an oxidized, nearshore, marine shelf environment. All the arenites in the two wells were cemented early by hematite. Patchy de-hematitization began during later burial under reducing conditions. Later, smectite/illite encased the grains when compaction was active and primary porosity was being reduced. The dissolution of labile grains created secondary porosity in the mature stages of diagenesis and chlorite filled and lined pores at the expense of hematite. The last event is siderite cementation.

The overall diagenetic sequence of the samples investigated appears to be as follows:-

1/. Hematite cementation
2/. Minor compaction
3/. De-hematitization
4/. Smectitization/illitization
5/. Strong compaction and quartz cementation
6/. Leaching of grains and creation of secondary porosity
7/. Chlorite precipitation and alteration of hematite
8/. Siderite cementation

6. FIGURES AND CAPTIONS

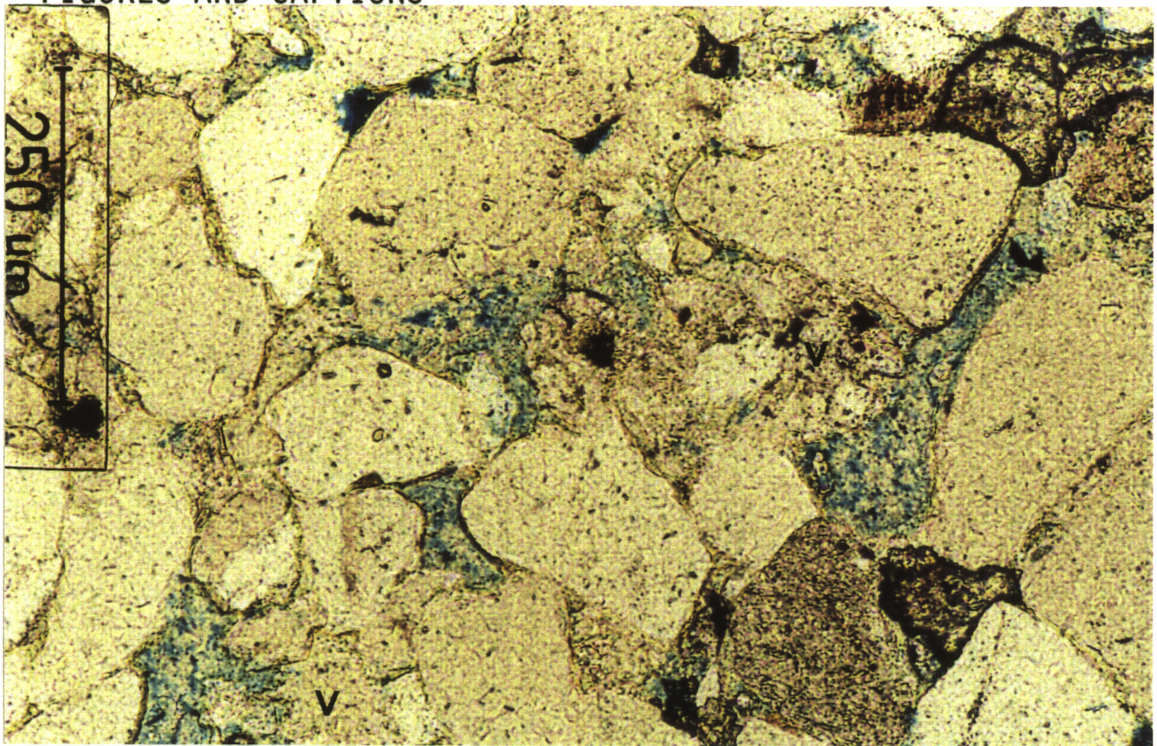


Figure 1. Gunamalary #2, core 32, (no depth given). (plane polarized light) Fair inter- and intragranular porosity in a well sorted quartz arenite. Siderite spar fills some pores. Two polycrystalline devitrified volcanic grains (V) are partially dissolved around the edges as well as inside. An altered detrital feldspar, which shows first illitization in weathering then chloritization in diagenesis, is slightly leached. Bar scale 250 microns.

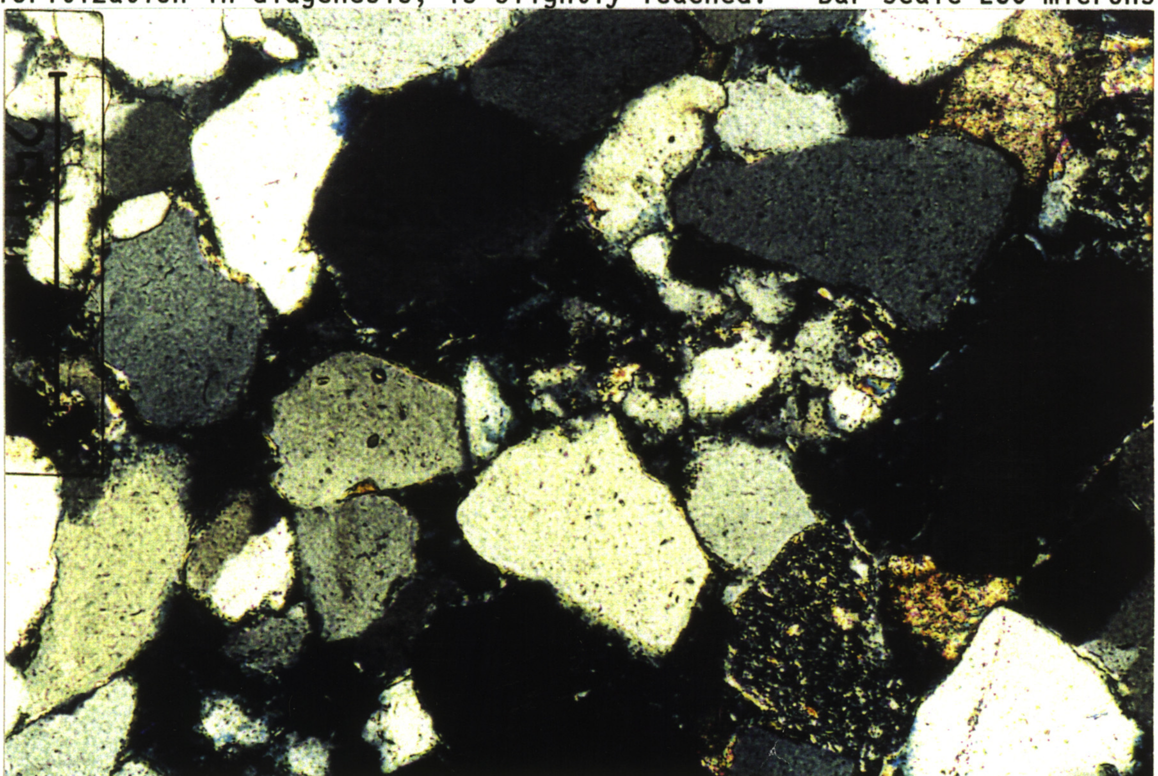


Figure 2. Gunamalary #2, core 32, (no depth given). The same field of view as Fig.1 under crossed polars shows internal texture in the altered grains. Smectite/illite rims on some grains gives high birefringence. The contacts between grains are straight line and concave. Quartz cement is subtle around grain contacts. Hematite and chlorite inclusions in grains are obvious.

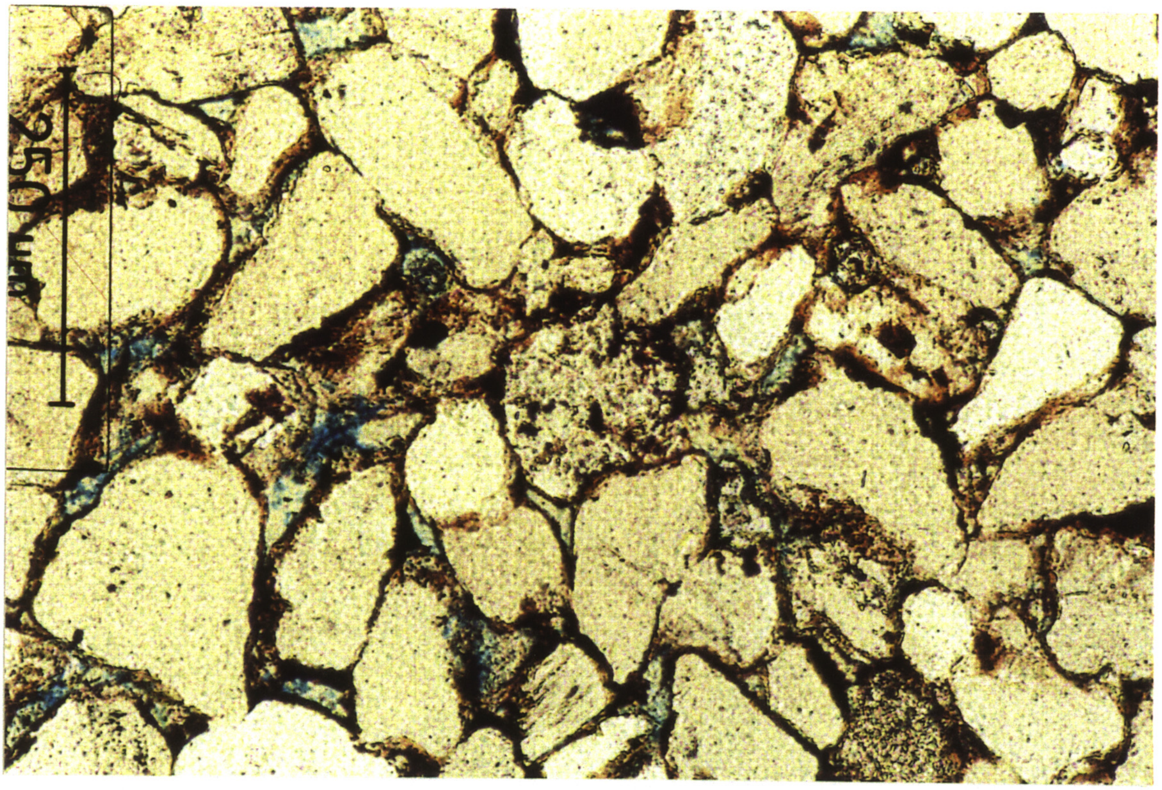


Figure 3. Big Desert #1, core 2, 8-102, (no depth given). (plane polarized light) A well sorted, subrounded, clean quartz arenite shows fair, slightly enlarged, intergranular and some intragranular porosity. Leached grains include quartz, feldspar and volcanics. Dull red hematite cement encases the grains and forms inclusions within them. Bar scale 250 microns.

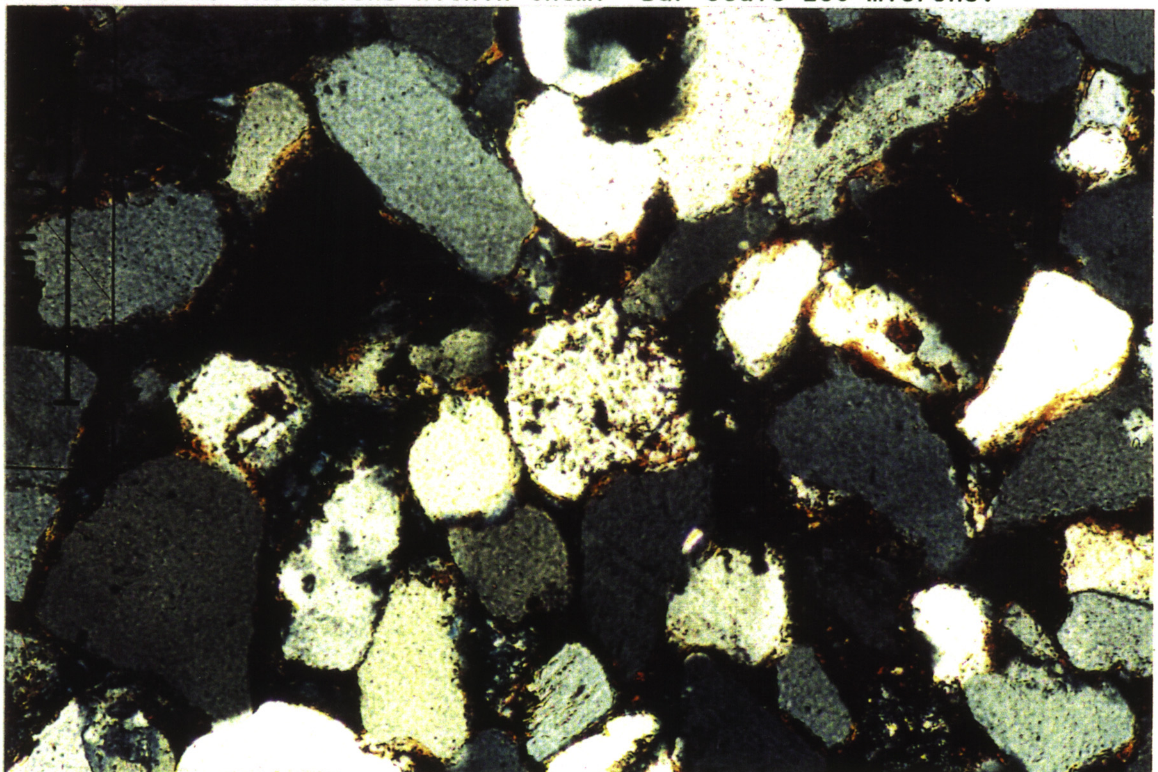


Figure 4. Big Desert #1, core 2, 8-102, (no depth given). The same field of view as Fig.3 under crossed polars shows moderately strong compaction with mainly straight line and minimal concave contacts of grains around which minor quartz cement is developed. Chlorite is seen within the hematite and detrital particles as inclusions. Smectite/illite partly rims some quartz grains with bright birefringence.

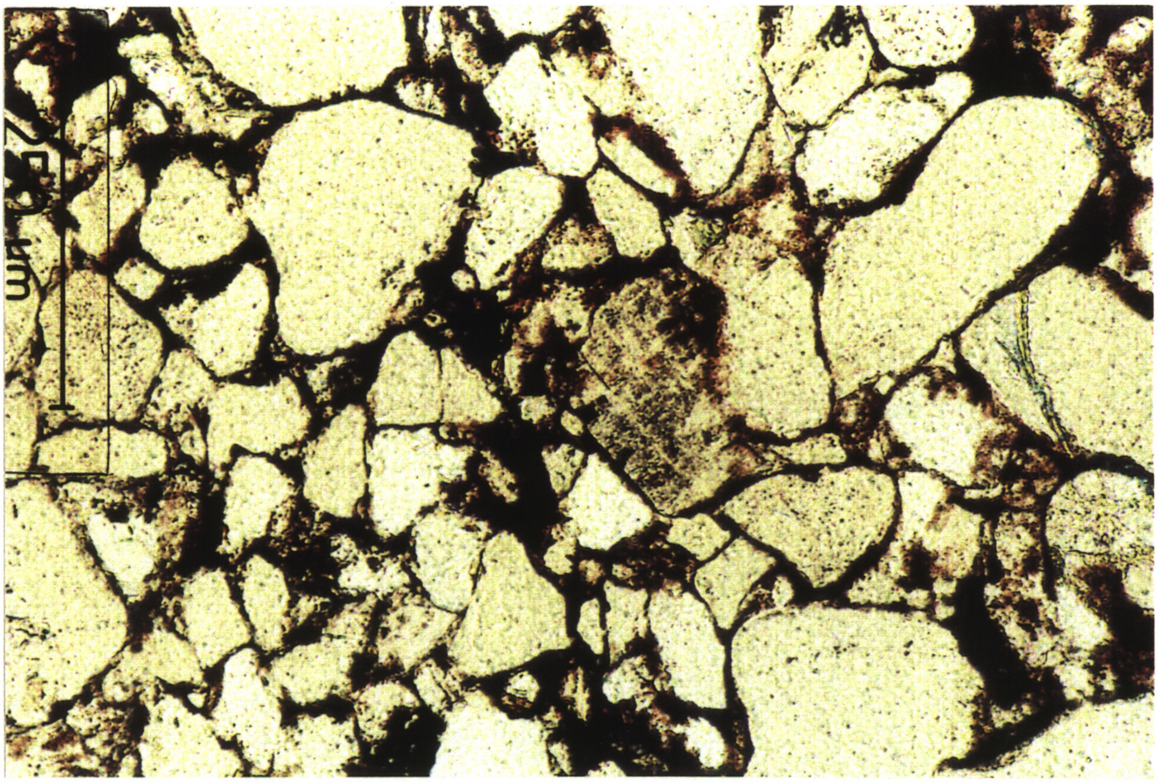


Figure 5. Big Desert #1, sidewall core 4, 1252.8 meters. (plane polarized light). Well developed intragranular porosity is hosted in a detrital microcline grain and to a lesser extent in several volcanic polycrystalline quartz clasts. Hematite cement partially fills the intergranular pores and etches framework grains. Bar scale 250 microns.

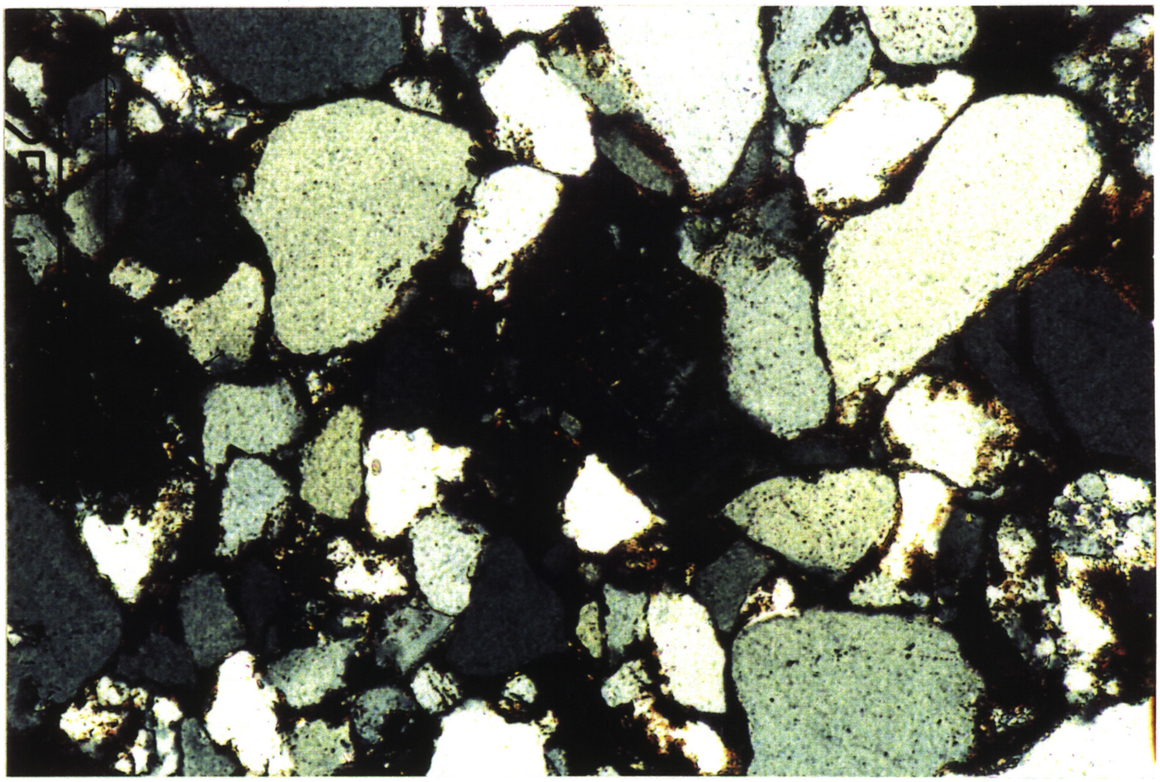


Figure 6. Big Desert #1, sidewall core 4, 1252.8 meters. The same field of view as Fig.5 under crossed polars shows areas of smectite/illite cement as well as hematite. Chlorite and hematite can be seen in a polycrystalline devitrified volcanic at the bottom left.

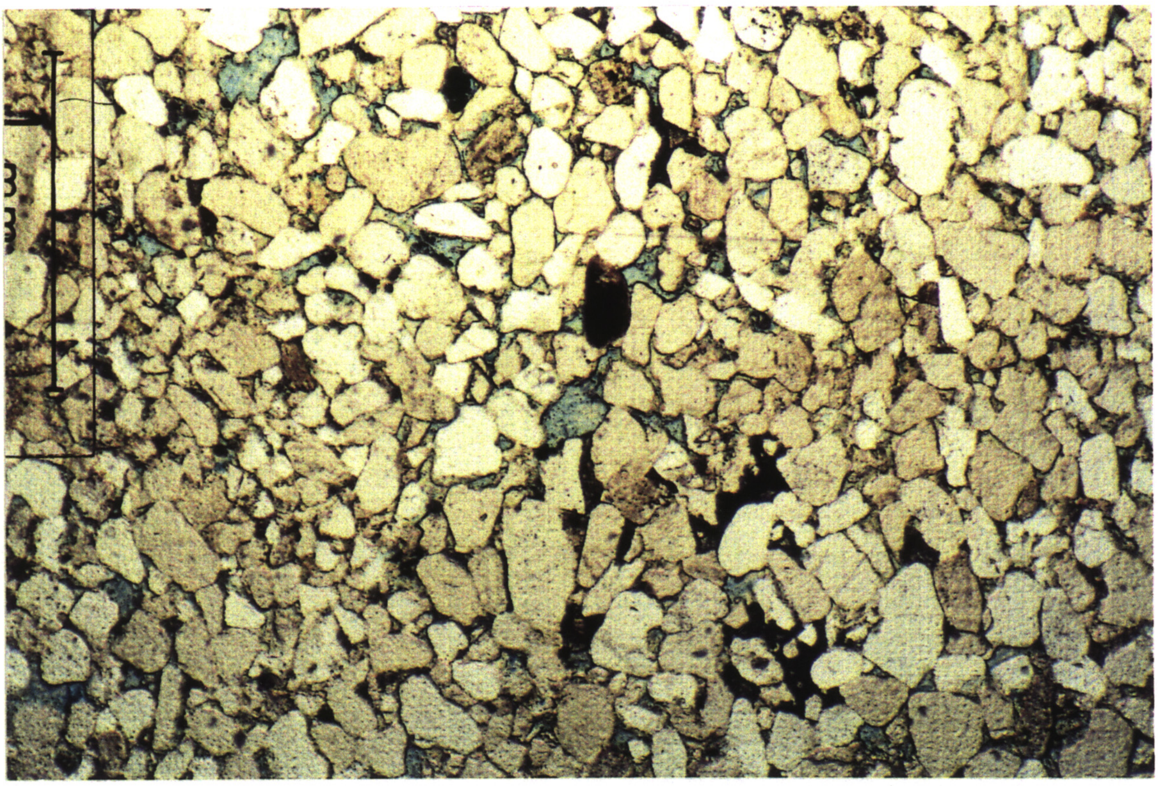


Figure 7. Big Desert #1, core 5, 8-102, (no depth given). (plane polarized light). A broad field of view shows the fair porosity in a clean, moderately well sorted, rounded grain quartz arenite with patches of siderite cement. Framework grain dissolution creates oversized pores with partial leaching at grain edges leading to enlarged intergranular pores. The brown red grain in the upper centre is hematite alteration of a volcanic fragment. Hematite inclusions also appear in quartz, chert and feldspar grains. Bar scale 1mm.

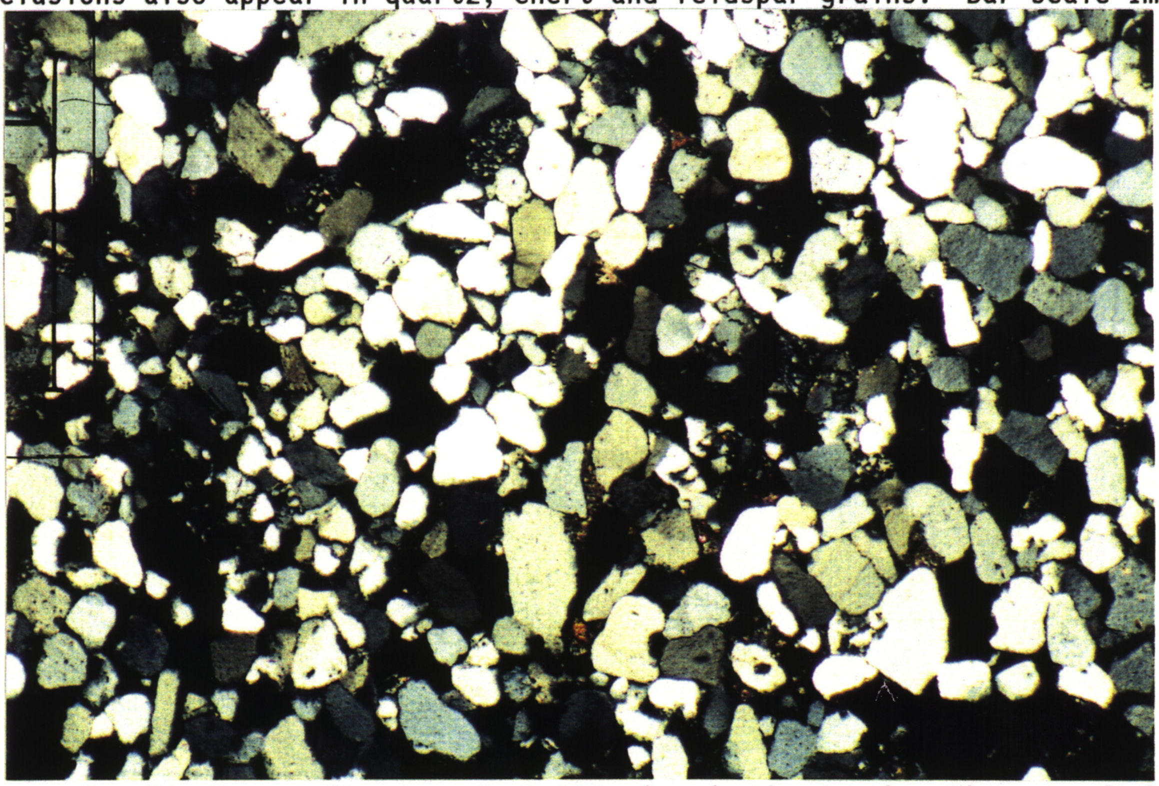


Figure 8. Big Desert #1, core 5, 8-102, (no depth given). The same field of view as Fig.7 under crossed polars allows discrimination between hematite-altered chert and quartz (dirty brown). Siderite is seen etching quartz grains.

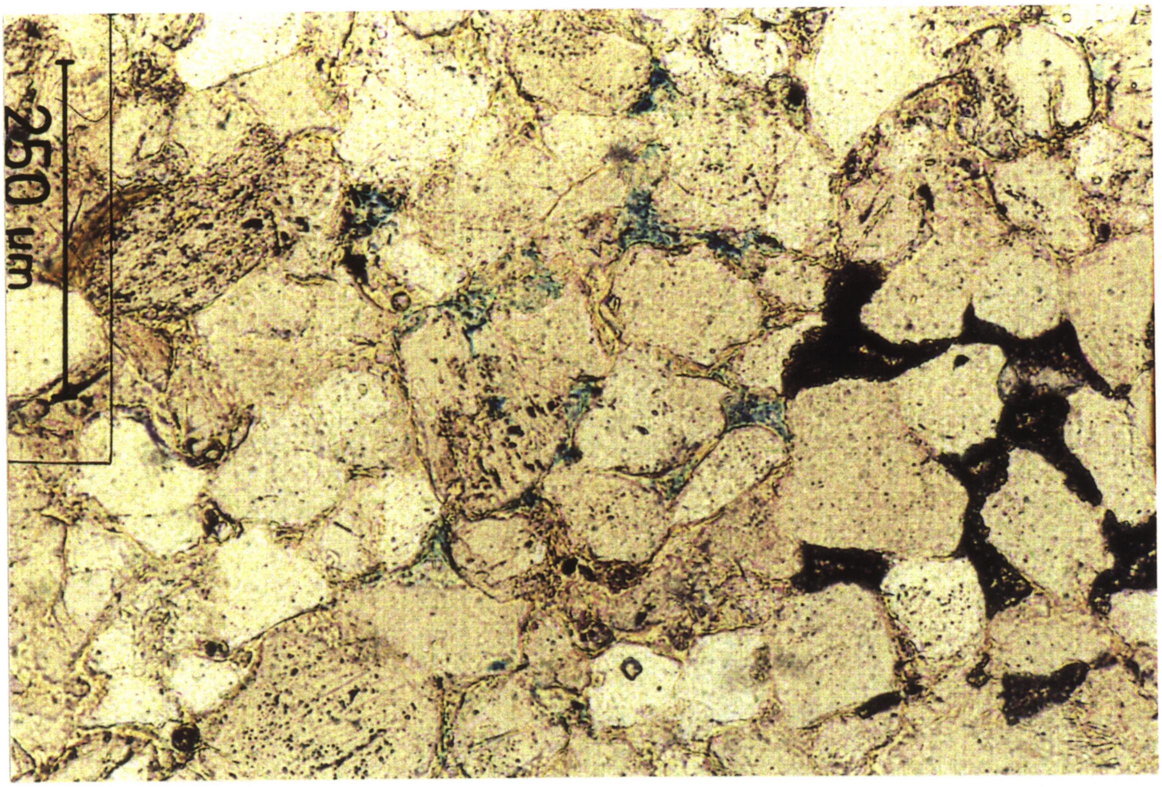


Figure 9. Big Desert #1, core 6, 1354.0 meters (chip). (plane polarized light). Detail from a sandstone chip shows fair intergranular porosity enhanced by further etching of framework grains. Quartz grains are deeply etched with no overgrowth evident. The feldspar is slightly altered to chlorite with intragranular microporosity. The dark areas are two stages of pore-filling siderite. The carbonate corrodes the edges of framework grains. Bar scale 250 microns.

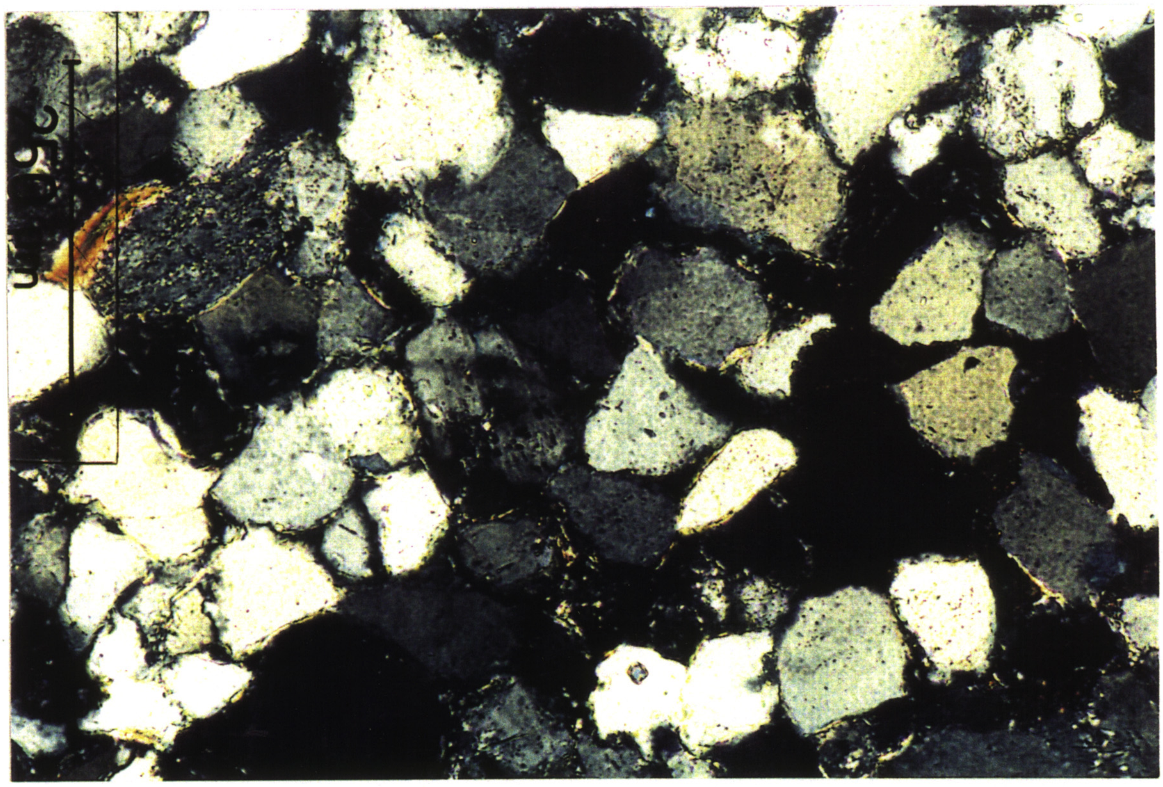


Figure 10. Big Desert #1, core 6, 1354.0 meters (chip). The same field of view as Fig.9 under crossed polars shows rims of smectite/illite encasing grains and a partially chloritized biotite grain.

APPENDIX 8

- EXTRACTION OF RESIDUAL OIL AND GEOCHEMISTRY

- POROSITY / PERMEABILITY ANALYSIS

(AMDEL CORE SERVICES)

AMDEL
CORE
SERVICES

11 December 1991

Continental Resources
Ground Floor
969 Birk Road
CAMBERWELL VIC 3124

Attention: Ingrid Campbell

REPORT: 009/1057

CLIENT REFERENCE: Telephone Request

MATERIAL: Cores 1 - 5

LOCALITY: Big Desert-1

WORK REQUIRED: Extraction of Residual Oil and Geochemistry

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

BRIAN L WATSON
Laboratory Supervisor
on behalf of Amdel Core Services Pty Ltd

Adelaide Office: P.O. Box 109, Eastwood, SA 5063 Australia.
[illegible]
Telephone: (08) 379 9888 Facsimile: (08) 379 9288

Amdel Core Services Pty Limited
(Incorporated in South Australia)
ACN: 008 273 005

1. INTRODUCTION

Core samples were received from Big Desert-1 for geochemical analyses. These analyses were determined in order to achieve the following aims:

- Residual oil content
- Genetic affinity of residual oil
- Maturity of the source of this residual oil at the time of expulsion
- Maturity of the sedimentary section intersected in the Big Desert-1 location

Results for this study were reported by phone and facsimile as this work was completed.

2. ANALYTICAL PROCEDURES

The analytical procedures used in this study are specified in Appendix 1.

3. RESULTS

Table 1 is a summary of the extract data for all the cores studied. Table 4 summaries the various aromatic maturity data. Figures 1 to 8 are chromatograms of the extracted organic matter from the five core samples studied, whilst Figures 9 and 10 are chromatograms of two possible sources of contamination of the residual oils extracted from the core samples.

Mass fragmentograms of the aromatic fraction of Core 5 are presented as Figures 11 and 12.

4. DISCUSSION AND INTERPRETATION

Gas chromatograms of hydrocarbons extracted from Big Desert-1 cores (core 1-5) indicate that these hydrocarbons consist of a mixture of residual oil and contaminants. Estimates of the concentrations of residual oil in these cores based on the chromatograms are as follows:

	Depth (m)	Total Hydrocarbons (ppm)	Residual Oil (ppm)
Core 1	504.05	20	5
Core 1	504.70	25	5
Core 2	?	35	15 - 20
Core 3	748.2 - 752.2	35	15 - 20
Core 4	880.9 - 881.0	57	25 - 30
Core 4	881.65 - 881.77	55	10 - 15
Core 5(a)	1050	19	5 - 10
Core 5(b)	1050	16	5 - 10

The residual oil portions of the extracted hydrocarbons appear to have been biodegraded. This biodegradation has removed much of the branched and straight-chain hydrocarbons leaving predominantly naphthenic residues. Therefore, very little source affinity information can be derived from this data.

Tri-aromatic maturity ratios (Table 2) indicate the maturity of the source of the residual oil at the time of generation and expulsion. These ratios indicate that the residual oil isolated from Core 5 was generated and expulsed from a mature source interval (equivalent Vitrinite Reflectance = 0.87 - 1.11%). The maturity of the source of this oil is significantly higher than that of the Gunamalary-2 residual oil (equivalent Vitrinite Reflectance = 0.72 - 1.02%) indicating the residual oils in these two wells are slightly different.

These different maturities may be due to the generation of these oils from a similar (or the same) formation which is slightly more mature at the Big-Desert-1 location than at Gunamalary-2. This trend is consistent with the location of the basin depocentre as indicated by the available gravity data (south of Big Desert-1).

The maturity of the sedimentary section intersected in the Big Desert-1 location has not been determined due to the paucity of organic matter in these sediments. However, the data available from the nearby Gunamalary-2 well in conjunction with maturity data available from several Renmark Trough wells suggest that a maturity corresponding to a Vitrinite Reflectance value of approximately 0.95% may be obtained at approximately 3000 metres depth in this location. This would suggest that the residual oil recovered from Big Desert-1 Core 5 may have been generated from a source rock as deep as 3000 metres depth in this location.

It should be noted here that this calculated depth is based on rather scant data and assumes a similar linear maturity gradient to that of sediments in the nearby Renmark Trough. Increased volcanism in this area would result in this maturity being attained at shallower depths.

TABLE 1

BIG DESERT-1

EXTRACTABLE ORGANIC MATTER

Code No.	Depth (m)	EOM (ppm)
1	504.05	20
1	504.70	25
2		35
3	748.2 - 752.2	35
4	880.9 - 881.0	57
4	881.65 - 81.77	55
5 (a)	1050	19
5 (b)	1050	16

TABLE 2

AROMATIC MATURITY DATA

SAMPLE	MPI	MPR	DNR	MPDF	VR CALC A	B	C	D	E	F
Big Desert-1 Core 5 1050m	1.179	0.849	7.592	0.501	1.11	1.59	0.87	4.38	1.05	0.96

FIGURE 1

BIG DESERT-1

CORE 1

504.05 m

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT

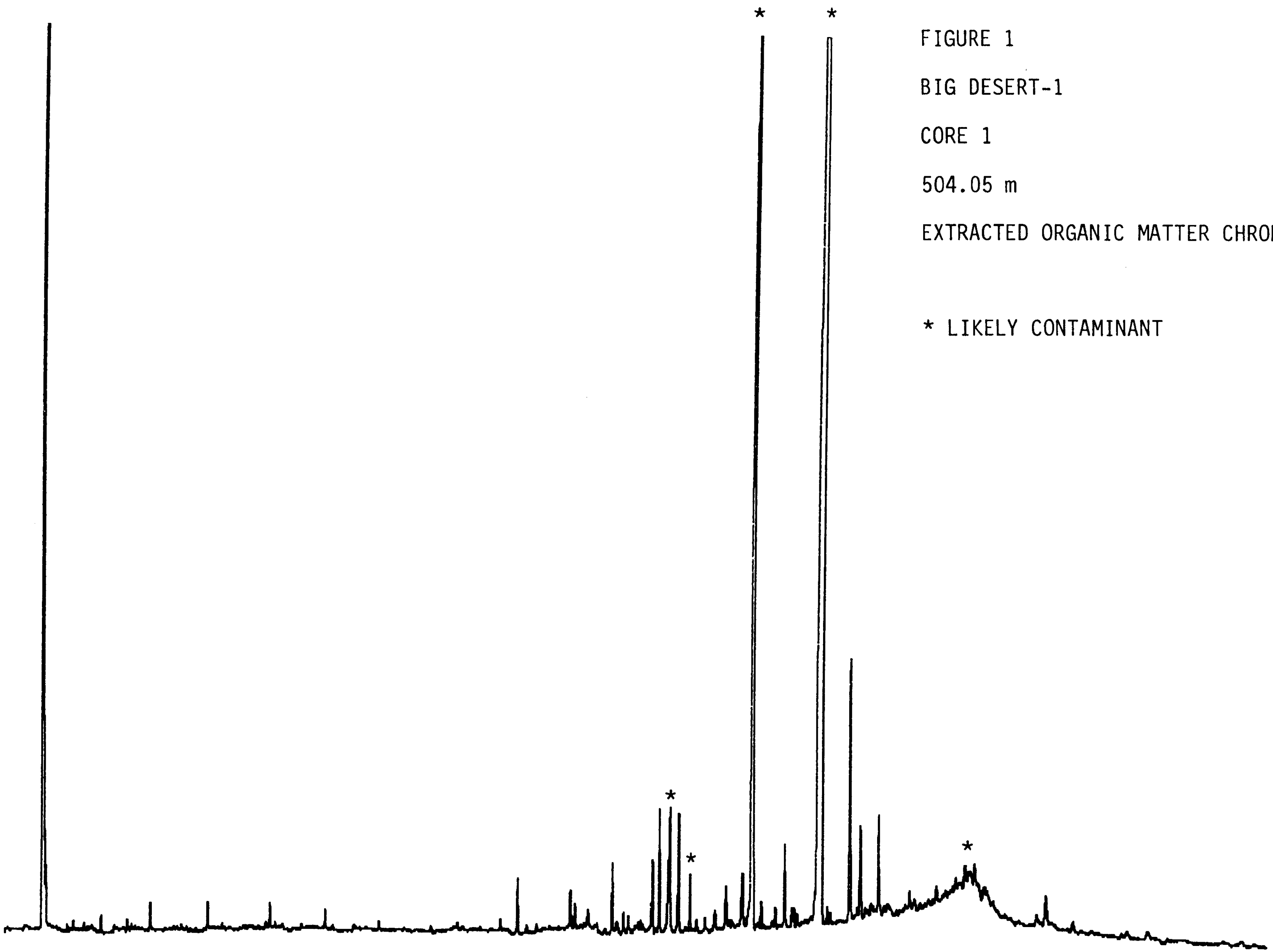


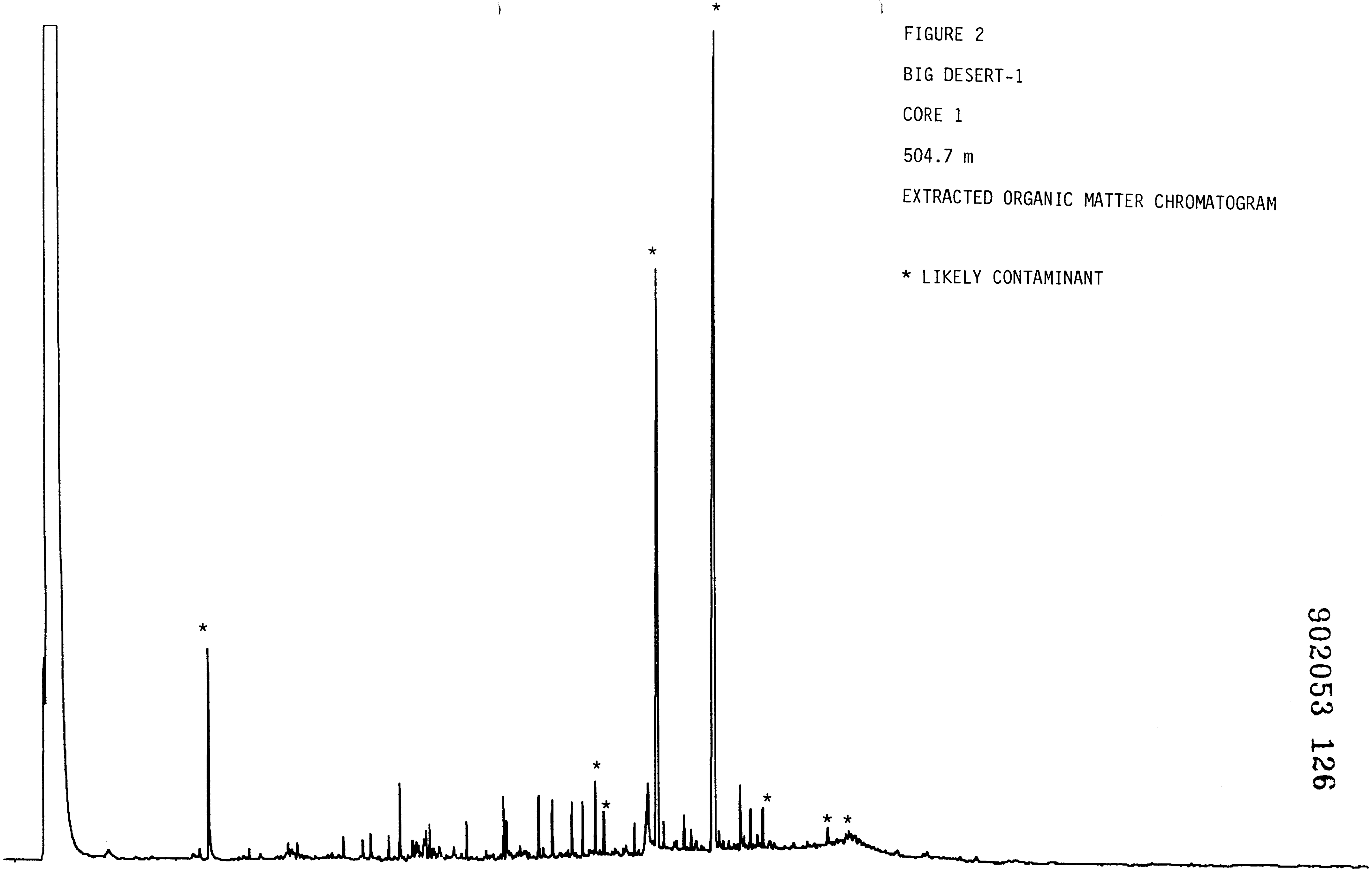
FIGURE 2

BIG DESERT-1

CORE 1

504.7 m

EXTRACTED ORGANIC MATTER CHROMATOGRAM



* LIKELY CONTAMINANT

GURE 3

BIG DESERT-1

CORE 2

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT

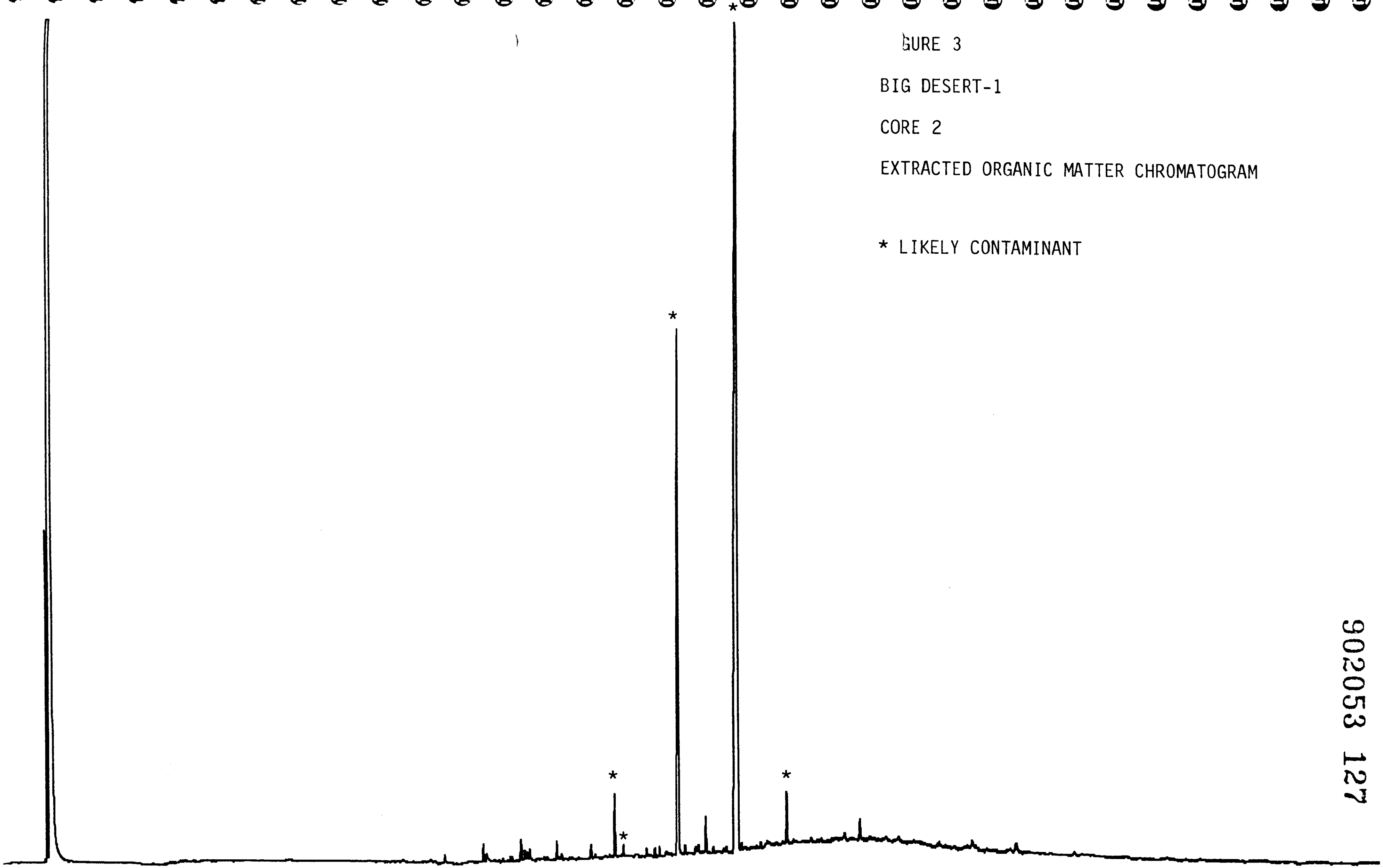


FIGURE 4

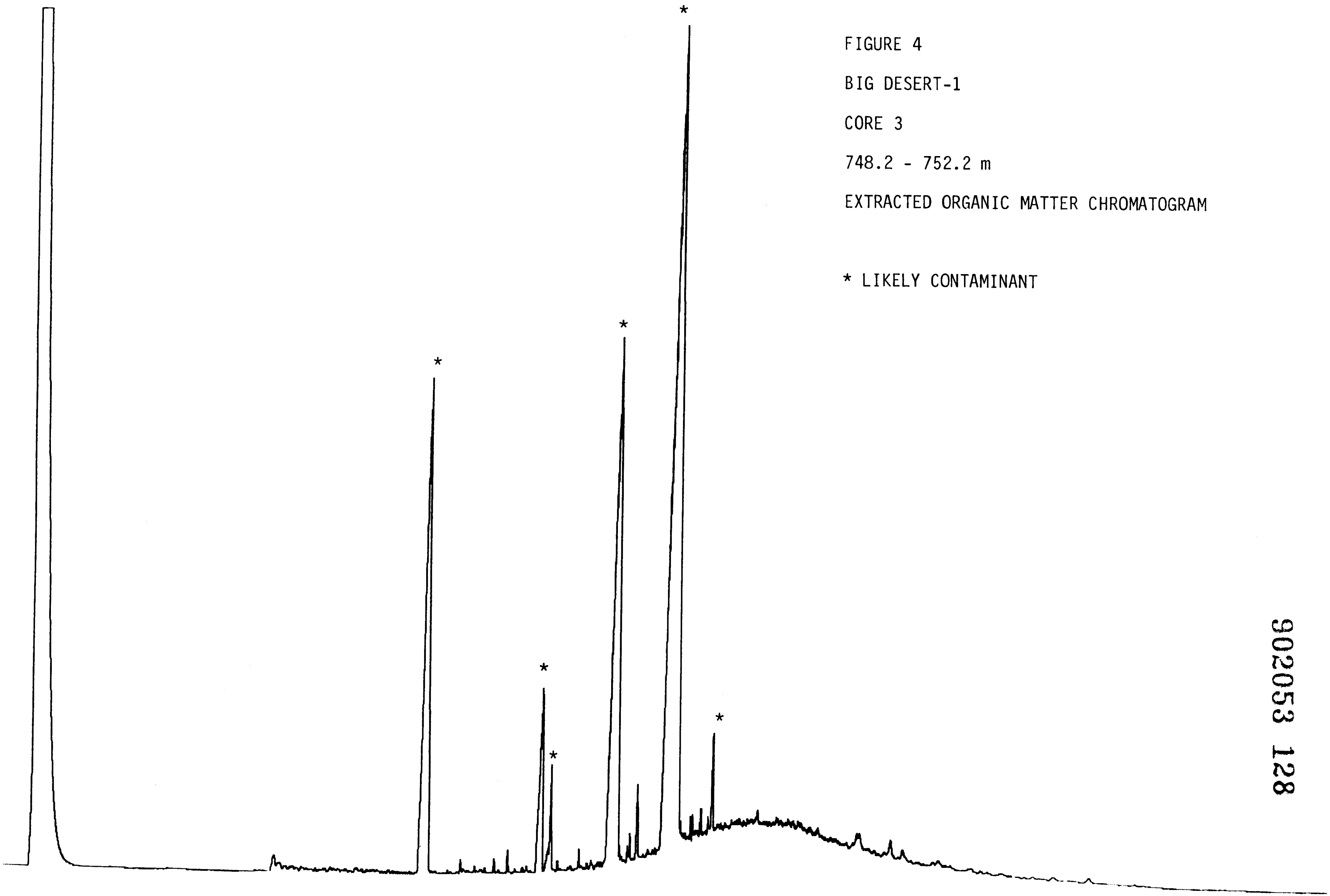
BIG DESERT-1

CORE 3

748.2 - 752.2 m

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT



902053 128

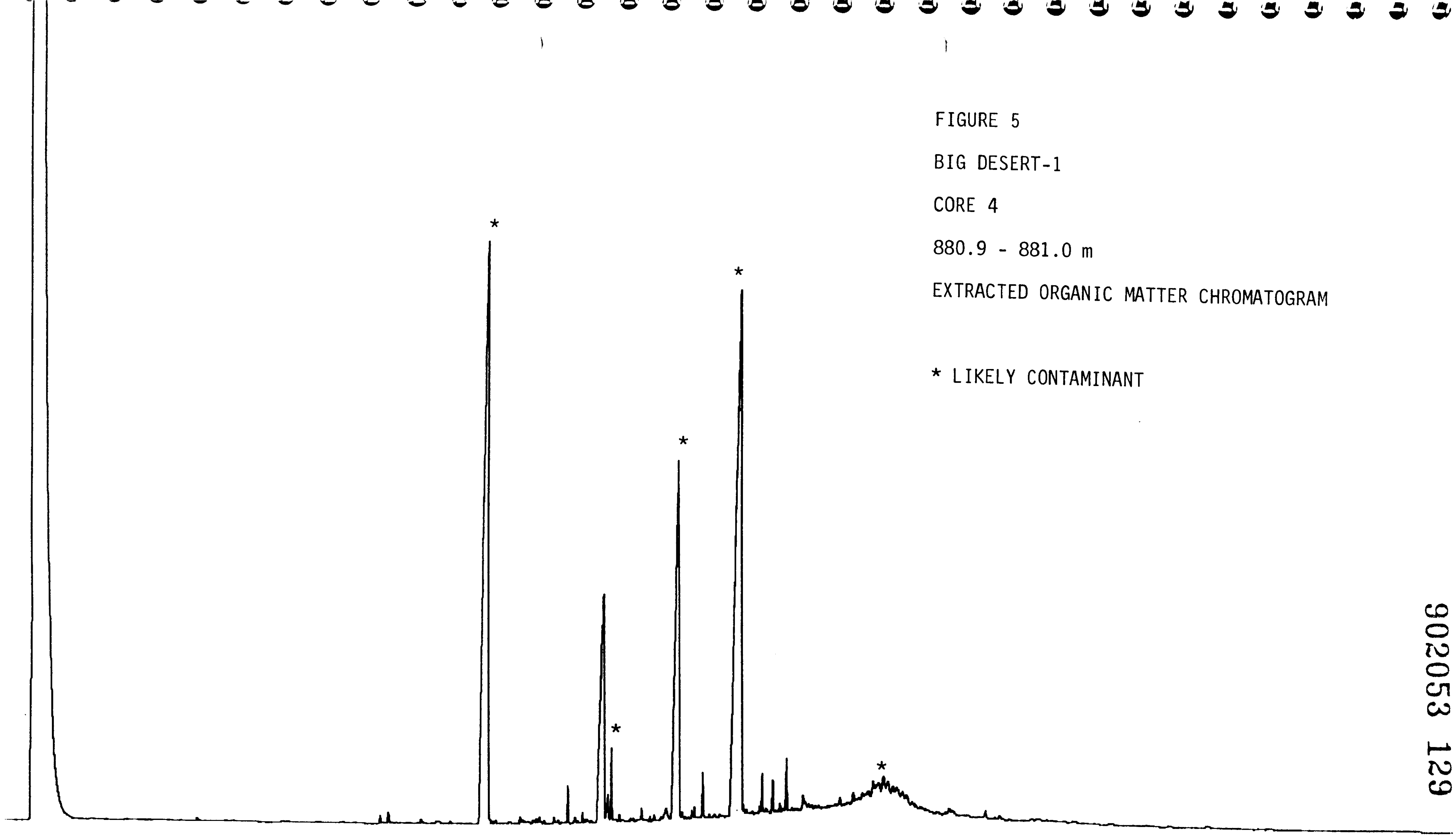


FIGURE 5

BIG DESERT-1

CORE 4

880.9 - 881.0 m

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT

FIGURE 6

BIG DESERT-1

CORE 4

881.65 - 881.77 m

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT

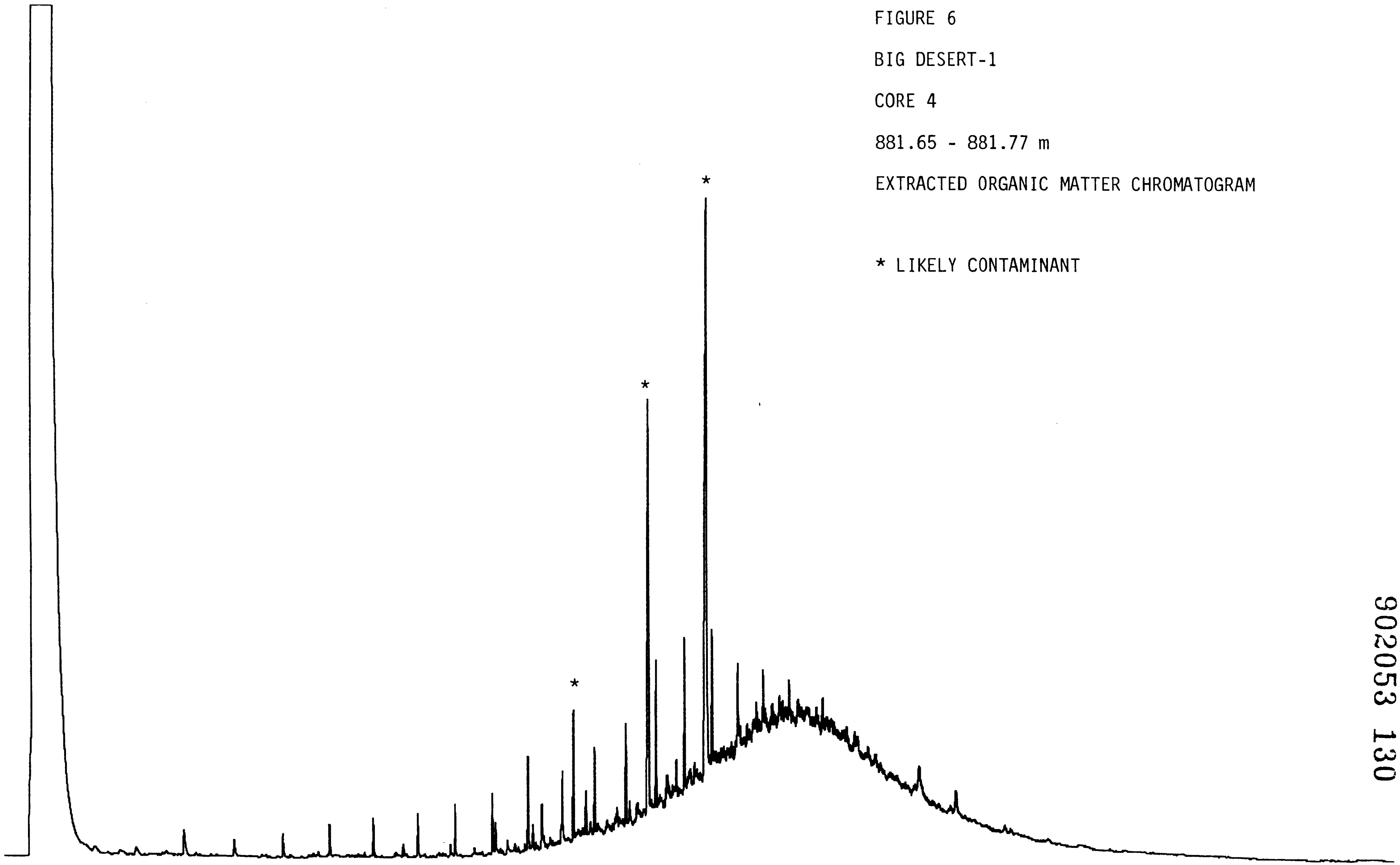


FIGURE 7

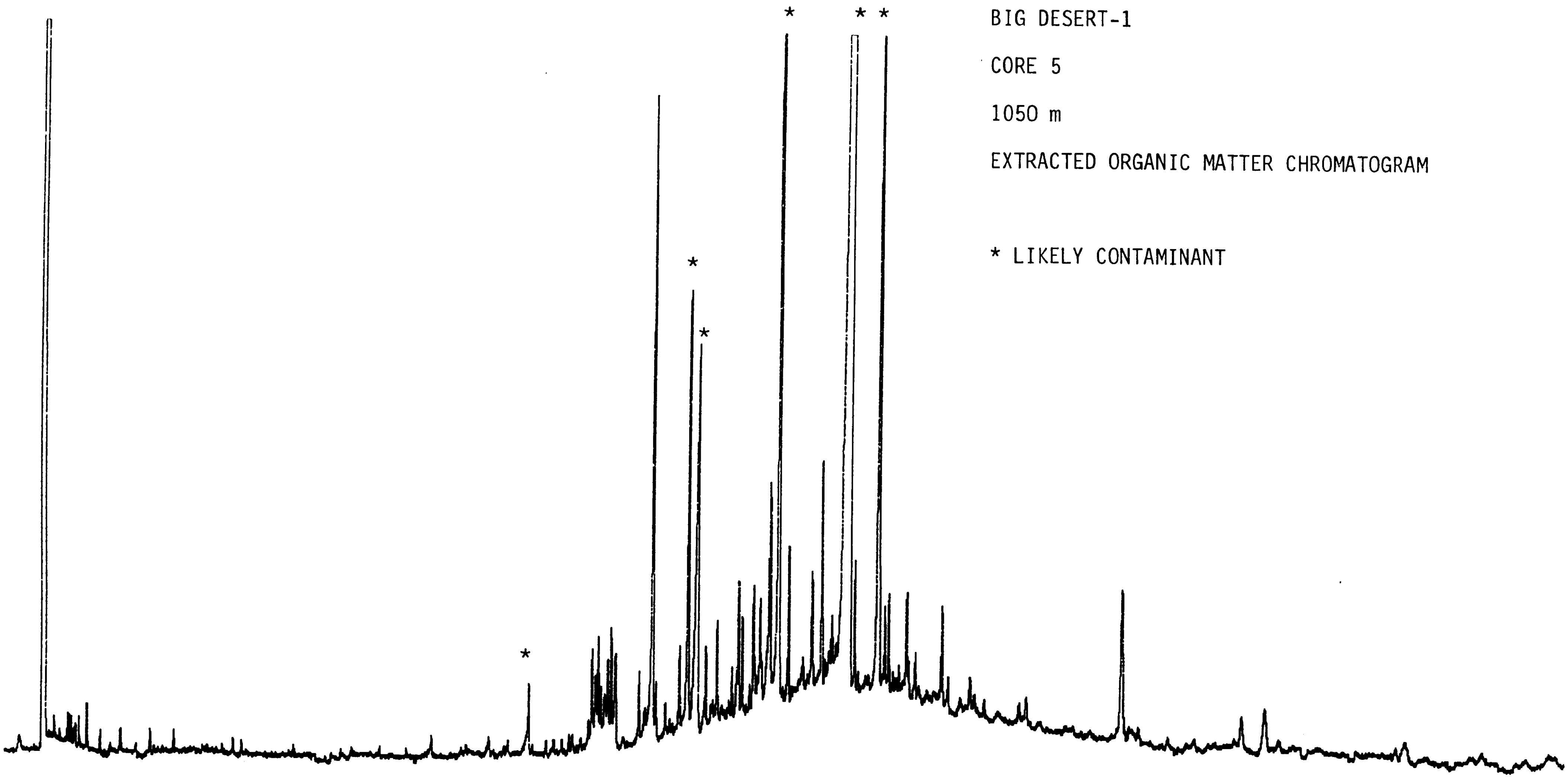
BIG DESERT-1

CORE 5

1050 m

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT



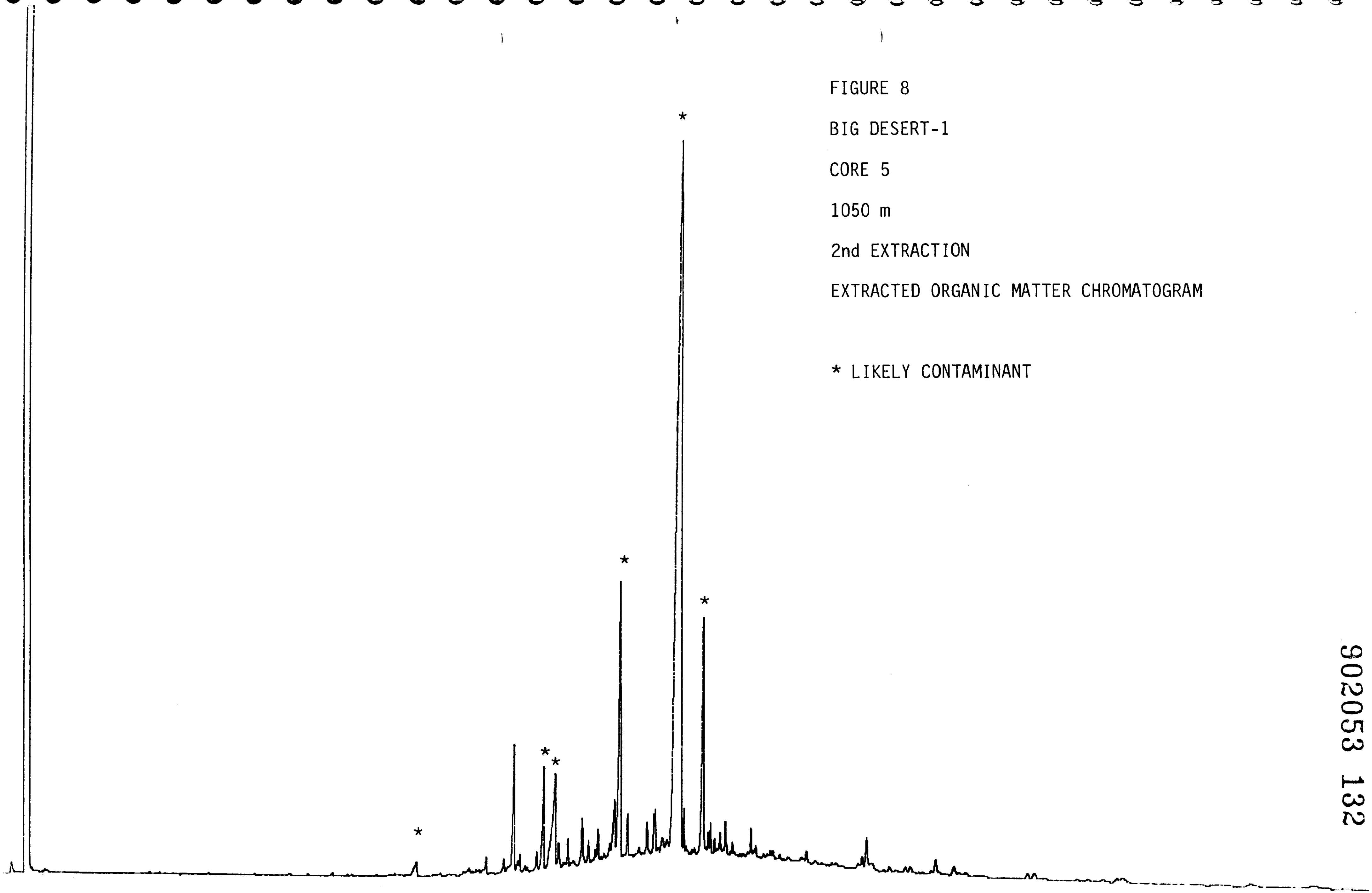


FIGURE 8

BIG DESERT-1

CORE 5

1050 m

2nd EXTRACTION

EXTRACTED ORGANIC MATTER CHROMATOGRAM

* LIKELY CONTAMINANT

FIGURE 9

DIESEL SAMFLE

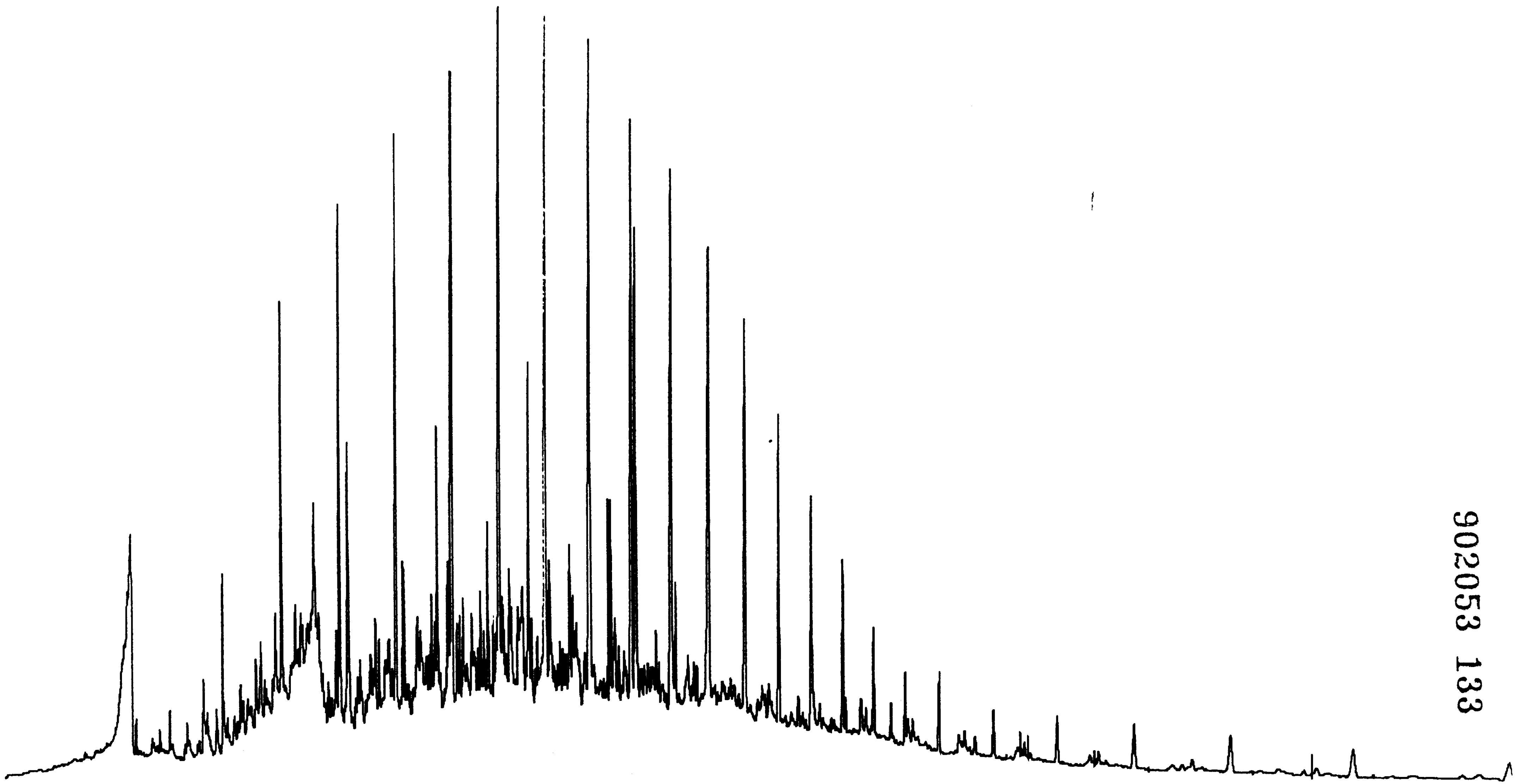
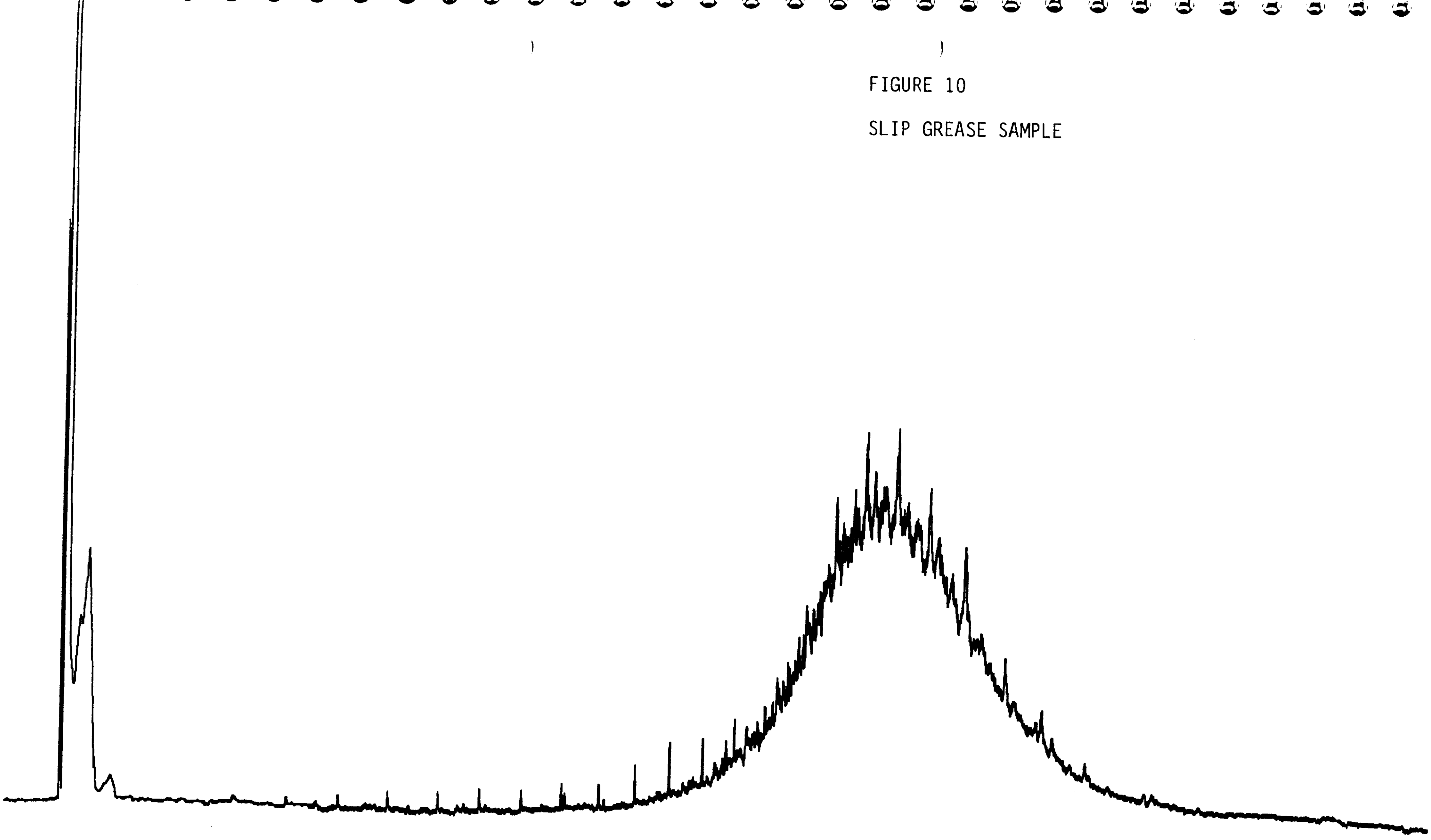
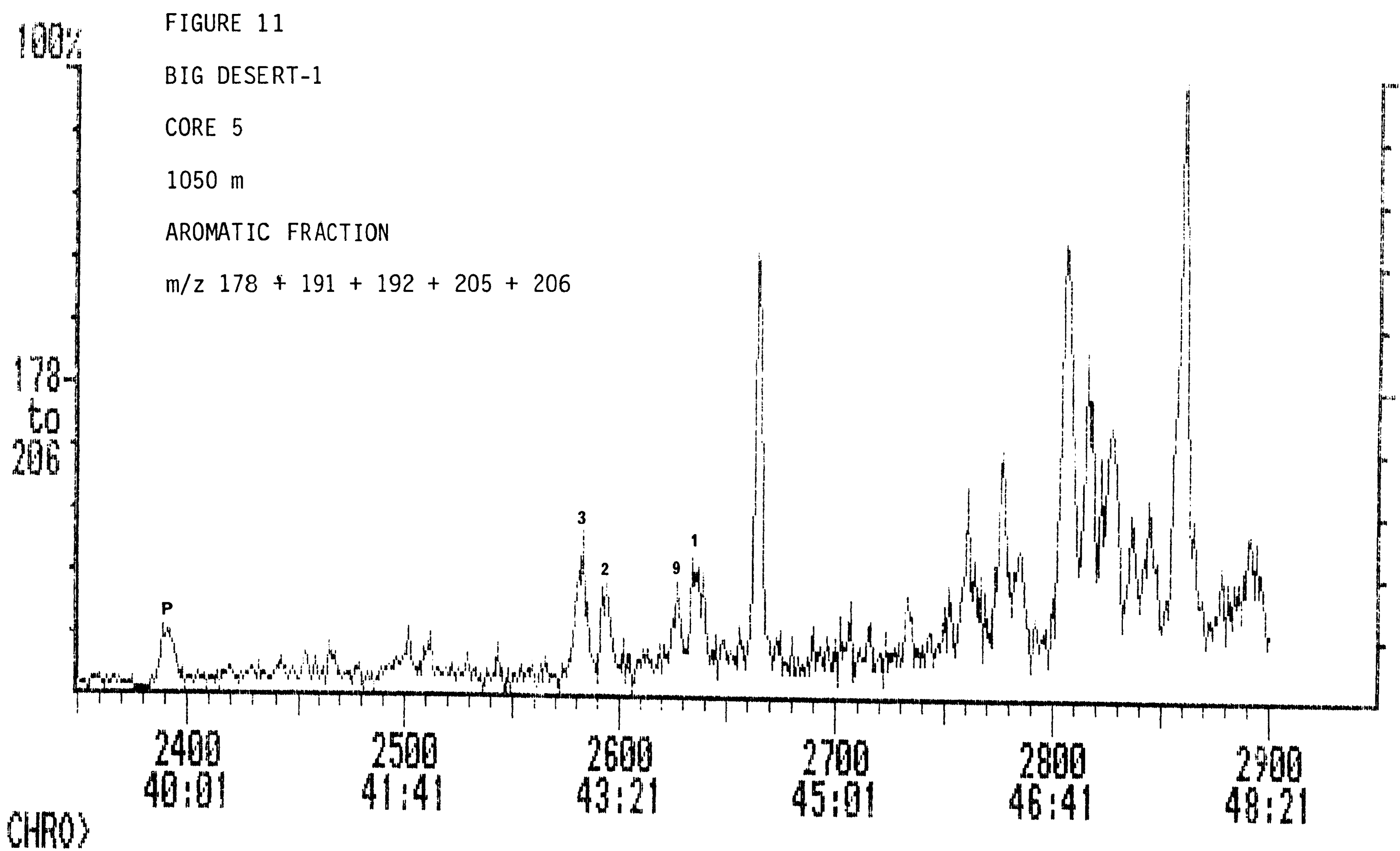


FIGURE 10

SLIP GREASE SAMPLE



Chromatogram DATA\ACS795 Acquired: Nov-15-1991 12:28:49
Comment: BIG DESERT-1 MPI AMDEL CORE SERVICES
Scan Range: 2350 - 2900 Scan: 2350 Int = 287 @ 39:11 100% = 7138



Chromatogram DATA\ACS795 Acquired: Nov-15-1991 12:28:49
Comment: BIG DESERT-1 MPI AMDEL CORE SERVICES
Scan Range: 1600 - 2100 Scan: 1600 Int = 14 @ 26:41 100% = 910

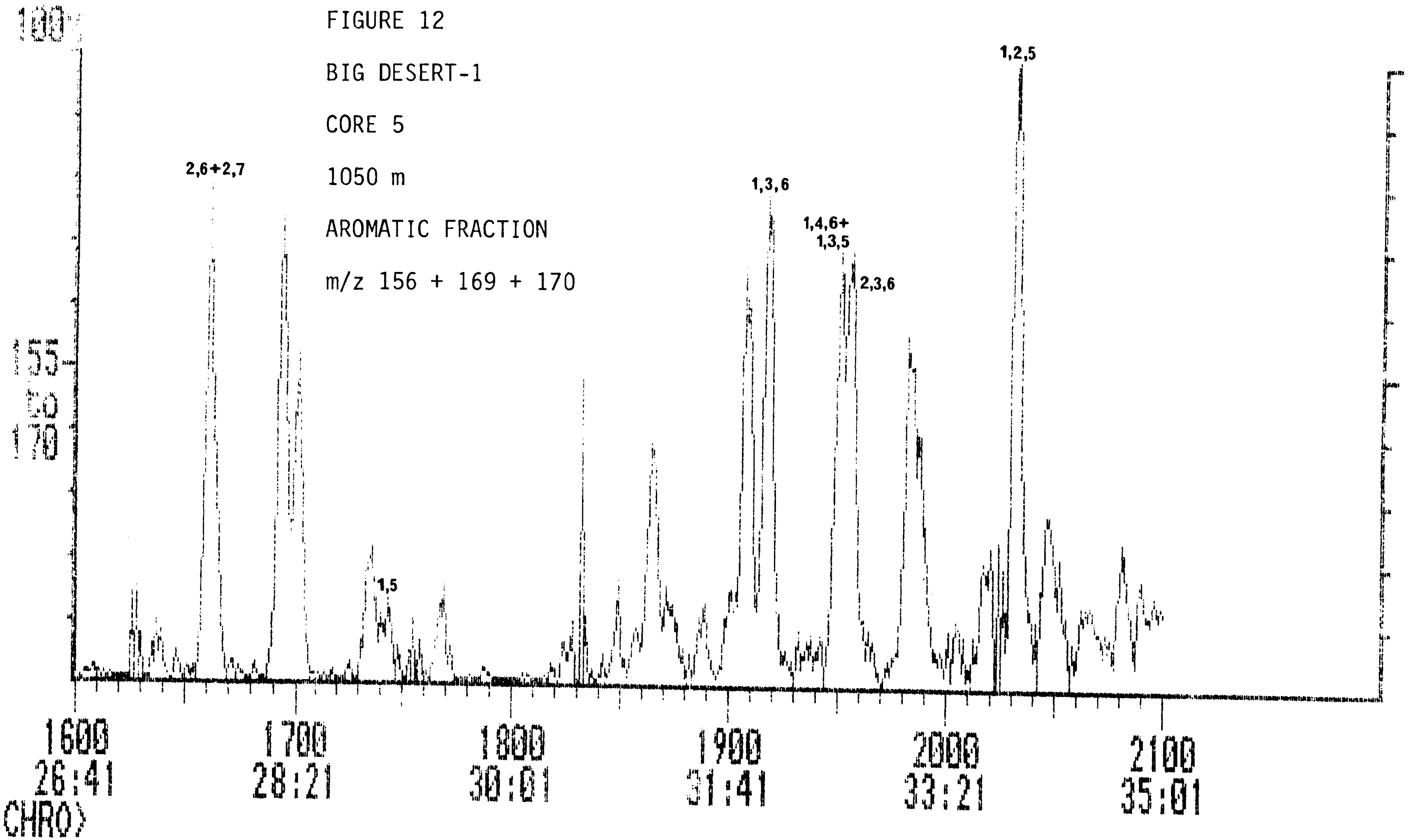


FIGURE 12

BIG DESERT-1

CORE 5

1050 m

AROMATIC FRACTION

m/z 156 + 169 + 170

APPENDIX 1

1. Isolation of Residual Oil

Crushed core samples were extracted with dichloromethane in Soxhlet apparatus for 8 hours. Subsequent removal of the solvent by careful rotary evaporation gave the residual oil nominal C_{12}+ fraction.

2. Gas Chromatography

The hydrocarbon fractions were examined by gas chromatography using the following instrumental parameters:

Gas Chromatograph:	Carlo Erba Mega Series operated in the split injection mode.
Column:	25 m x 0.3 mm fused silica, SGE QC3/BP1.
Detector Temperature:	300°C.
Column Temperature:	40°C for 1 minute, then 8° per minute to 300°C and held isothermal at 300°C until all peaks eluted.
Quantification:	Relative concentrations of individual hydrocarbons were obtained by measurement of peak areas with a Perkin-Elmer LCI 100 integrator. The areas of peaks corresponding to aromatic hydrocarbons were multiplied by appropriate response factors.

3. Thin Layer Chromatography (TLC)

Aromatic hydrocarbons were isolated from the extracted oil by preparative TLC using Merck GF_{254} silica plates and distilled AR grade n-pentane as eluent. Naphthalene and anthracene were employed as reference standards for the diaromatic and triaromatic hydrocarbons, respectively. These two bands, visualised under UV light, were scraped from the plate and the aromatic hydrocarbons redissolved in dichloromethane.

4. Gas Chromatography-Mass Spectrometry (GC-MS)

The di- and triaromatic hydrocarbons isolated from the extracted oil by thin layer chromatography were analysed by GC-MS.

GC-MS analysis of the aromatic hydrocarbons was undertaken in the selected ion detection (SID) mode. The instrument and its operating parameters were as follows:

System:	Hewlett Packard (HP) 5790 GC coupled with an HP5970A mass selective detector and HP9816S data system.
Column:	50 mm x 0.2 mm i.d. HP PONA cross-linked methylsilicone phase fused silica, interfaced directly to source of mass spectrometer.
Injector:	Split injection (40:1).
Carrier Gas:	He at 1.2 kg/cm^2 head pressure.
Column Temperature:	50-260°C @ 4°/minute.
Mass Spectrometer Conditions:	70 eV EI; 9-ion selected ion monitoring, 70 millisec dwell times for each ion.

The following mass fragmentograms were recorded:

m/z	Compound Type
155 + 156	dimethylnaphthalenes
169 + 170	trimethylnaphthalenes
178	phenanthrene
191 + 192	methylphenanthrene

The area of the phenanthrene peak was multiplied by a response factor of 0.667 when calculating the methylphenanthrene index (MPI).

902053 140

AMDEL CORE SERVICES

15 July 1991

Continental Resources
PO Box 306
KEW VIC 3101

Attention: Ms I Campbell

REPORT: 008/102

CLIENT REFERENCE: Verbal

MATERIAL: Core Sections

LOCALITY: Big Desert #1

WORK REQUIRED: Porosity/Permeability

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

RUSSELL R MARTIN
Laboratory Supervisor
Core Analysis/Special Core Analysis
on behalf of Amdel Core Services Pty Ltd

1. INTRODUCTION

Five sections of whole core from Continental Resources' Big Desert No. 1 were delivered to Amdel Core Services' (ACS) Adelaide Laboratory. It was requested that conventional core analysis be performed on particular sections of the core.

Included in this report is tabular data of ambient helium injection porosity, permeability to air and calculated grain density.

2. PLUG PREPARATION

1½ inch diameter plugs were taken from the core sections using tap water as the bit lubricant and coolant. Samples were trimmed square and the offcuts retained.

Residual hydrocarbons and salts are extracted from the plugs using a 3:1 chloroform/methanol mixture in a Soxhlet extractor. The solvent is recycled in the Soxhlet until the samples are free of soluble pore fluids.

After cleaning, the plugs are dried in a dry oven at temperatures not exceeding 80°C and are then stored in a desiccator and allowed to cool to room temperature.

3. PERMEABILITY TO AIR

A plug sample is used for this measurement and is placed in a Hassler cell to which a confining pressure of 200 psig (1380 kPa) is applied. This pressure is used to prevent bypassing of air around the sides of the sample when the measurement is made. A known pressure is then applied to the upstream sample face and the differential pressure (between the upstream and downstream faces) is monitored at the downstream face. Permeability is then calculated using Darcy's Law.

4. HELIUM INJECTION POROSITY

The porosity of a dry core plug is determined as follows: (a) it is first placed in a matrix cup; (b) a known volume of helium at a known pressure is expanded into the matrix cup which contains the core plug; and (c) the resulting pressure is recorded and the unknown volume (that is, the volume of the grains) is determined using Boyle's Law. The bulk volume is determined by mercury immersion. The difference between the grain volume and the bulk volume is the pore volume and from this porosity is calculated as the volume percentage of pores with respect to the bulk volume.

5. APPARENT GRAIN DENSITY

The apparent grain density is derived from the measurements described in Section 4, above, and is the ratio of the weight of the core plug divided by the grain volume.

CONVENTIONAL CORE ANALYSIS

Company Continental Resources
Well Big Desert #1
Location Victoria
Country Australia

Report 008/102
Date 18 July 1991

Table 1

Sample Number	Depth (m)	Porosity (%) He Inj	Porosity (%) Roll Av	Density Nat	Density Grain	Permeability (md) Ka	Permeability (md) Roll Av Ka	Summation of Fluids Por %	Summation of Fluids Oil %	Summation of Fluids Water %	Remarks
1	880.95	11.6			2.65	1.2					Core #4
2	881.71	11.8			2.65	4.4					Core #4
3		6.6			2.67	0.10					Core #2
4		12.6			2.65	15					Core #3
5		11.6			2.65	28					Core #5

VF = Vertical Fracture; HF = Horizontal Fracture; MP = Mounted Plug; SP = Short Plug;
C# = Top of Core; B# = Bottom of Core; OWC = Probable Oil/Water Contact;
Tr = Probable Transition Zone; GC = Probable Gas Cap

APPENDIX 9

PALYNOLOGY REPORT

BIG DESERT-1

(ROGER MORGAN)

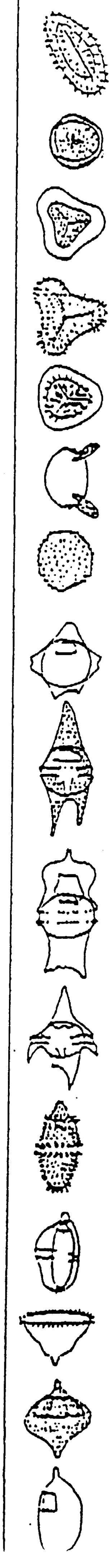
ROGER MORGAN PH.D.

PALYNOLOGICAL CONSULTANT

DELIVERIES:
1 Shannon Terrace
MAITLAND 5573
South Australia

POSTAL ADDRESS:
Box 161
MAITLAND 5573
South Australia

Phone (088) 322795
Fax (088) 322798



To : Ahmad Tabassi
Geol Surv. Vic   Fax 03 412 7803

Re : <u>Palynology of Continental Big Desert #1</u>

Core 1 had a meagre yield of superbly preserved pollen and spores of mid brown (early mature for oil) colour.

Common *Parasaccites*, rare *Potoniesporites* and very rare *Protohaploxypinus* without younger indicators produces assignment to Stage 2 or PP1 zone of latest Carboniferous to earliest Permian age.

Regards,

Roger Morgan
23.5.91

MORGAN PALAEO ASSOCIATES

PALYNOLOGICAL/PETROLEUM GEOLOGICAL CONSULTANTS

POSTAL ADDRESS: Box 161, Maitland, South Australia 5573
DELIVERIES: 1 Shannon Tce, Maitland, South Australia 5573
Phone (088) 32 2795 Fax (088) 32 2798

Fax to Ingrid Campbell
CONTINENTAL RESOURCES Fax (03) 862 1747

Re: Big Desert-1 palynology

1133m (swc): indeterminate as suspected. The sample is totally barren of in place palynomorphs

Regards,

Roger Morgan