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SOURCE ROCK PROPERTIES OF CAMBRIAN CUTTING
SAMPLES FROM WELL ALICE-1, AMADEUS BASIN,
NORTHERN TERRITORY, AUSTRALIA.

by

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code: 774.103

BUREAU OF MINERAL RESOURCES

CORE AND CUTTINGS
LABORATORY

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AM

Investigation

9.12.480

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KONINKLIJKE/SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM

RIJSWIJK, THE NETHERLANDS

(Shell Research B.V.)

CR82/06

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Figure 1 : Location map

Table I : Source rock properties

Enclosure 1 : Geochemical log

I INTRODUCTION

A source rock investigation has been carried out on a suite of cutting samples from well ALICE-1, Amadeus Basin, Northern Territory, Australia. The approximate location of the well is shown on Figure 1.

The samples derive from three formations, all of Cambrian age.

Source rock evaluation commonly comprises determination of:

1. the presence (or absence) of hydrocarbons source material in the rock samples;
2. the quality of the organic matter as well as the distribution of its specific constituents;
3. the degree of organic metamorphism (= level of maturity).

A source rock is identified by measuring the amount of temperature reactive ("live") organic matter present, i.e. the amount of organic matter that yields hydrocarbons upon pyrolysis. The method excludes any ("dead") organic matter such as inertinites.

In addition, the total organic carbon content can be determined which gives the sum of "live" and "dead" organic carbon. Rocks containing less than 0.5 % organic carbon are not considered to have a potential for commercial oil accumulations.

The source rock indications (SRI), which are a measure of the amount of pyrolysable organic matter, are determined on the original samples and in certain cases also after extraction with organic solvents. A systematically lower value after extraction is due to the presence of extractable hydrocarbons. These may consist of trapped oil, oil generated in situ by a source rock, or e.g. gasoil used in the drilling fluid.

In general, samples with source rock indications of 30 or less do not represent (immature or mature) source rocks. Values between 30 and 100 generally indicate marginal source rocks, while values above 100 commonly indicate good source rocks.

Intervals or samples with high source rock indications are investigated under a microscope to ensure that the high values indicate genuine source rock properties and are not due to contaminants of an organic nature such as lost circulation material.

The quality of a source rock for oil/gas generation depends on the type of organic matter present. Five categories of organic matter can be distinguished, viz.: humic, mainly humic, mixed, mainly kerogenous, kerogenous. This classification

is based on the hydrogen content of the organic matter.

Source rocks with organic matter of kerogenous, mainly kerogenous and/or mixed type generate predominantly oil. Organic matter of humic type generates gas only. Strata with organic matter of mainly humic quality generate either gas, or gas and oil.

In addition to the type and the concentration of the organic matter, the source rock quality is also characterised by the distribution of the typical organic constituents, or macerals¹, in the sediments. The maceral distribution can be used to further qualify the source rock, especially when mainly humic quality is found. For this purpose a microscopic investigation on polished rock fragments is carried out.

The maturity of source rocks is expressed in terms of degree of organic metamorphism. With increasing degree of organic metamorphism the organic matter is gradually carbonised while generating hydrocarbons. With increased carbonification the light reflectance of vitrinite, one of the coal macerals, increases. The degree of organic metamorphism can be assessed by measuring this reflectance.

- 1) maceral: an organic constituent which can be recognised with the microscope (with objectives 25x to 50 x).

II RESULTS

The results are given in Table I and on the geochemical log (Enclosure 1). The results may be summarised as follows :

a) Source rock indications (SRI)

No significant SRI-values (>30) have been encountered in any of the cuttings.

b) Organic carbon content

The darkest samples have been selected:

depth, ft	C _t , wt%
3460	0.1
4950	0.1 - 0.1
6500	0.2
7400	0.1

III DISCUSSION AND CONCLUSION

All cuttings of the three Cambrian formations encountered in this well show insignificant source rock indications.

The organic carbon content, in the range 0.1 - 0.2 wt%, is too low to consider these sediments to be even postmature source rocks.

Therefore, the Cambrian sediments penetrated in well Alice-1 do not contain source rocks.

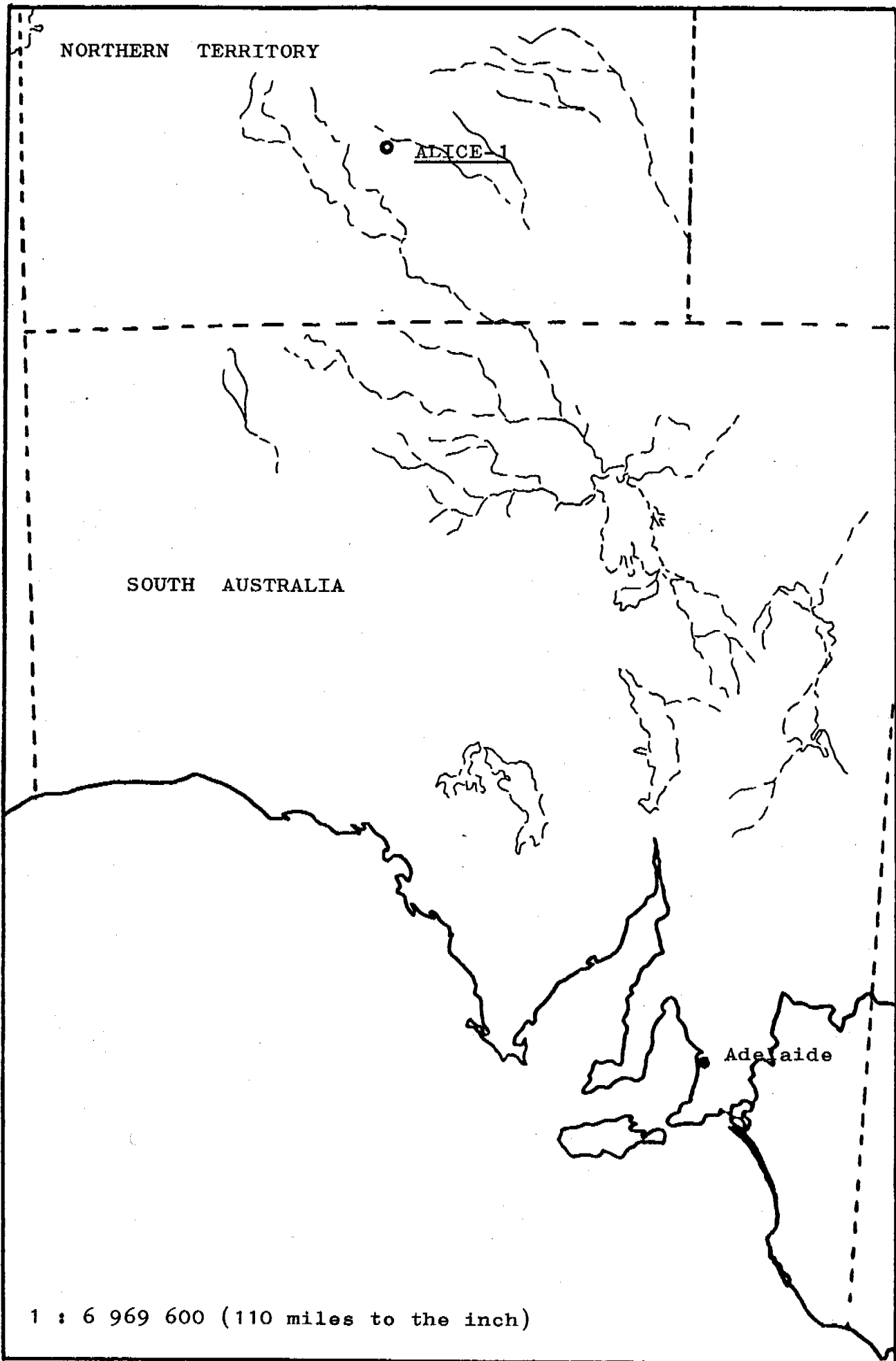


Figure 1 : Location map of well Alice-1.

TABLE I (PART 1)

WELL: ✓ ALICE-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION	SOURCE ROCK INDICATION	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT
F		BEFORE EXTR.	AFTER EXTR.		%W
3100	C	5	-		-
3230	C	5	-		-
3250	C	10	-		-
3300	C	5	-		-
3350	C	5	-		-
3400	C	5	-		-
3460	C	15	-		.1
3540	C	15	-		-
3675	C	15	-		-
3800	C	5	-		-
3850	C	5	-		-
3900	C	5	-		-
3950	C	5	-		-
4000	C	5	-		-
4050	C	5	-		-
4100	C	5	-		-
4150	C	5	-		-
4200	C	5	-		-
4250	C	5	-		-
4300	C	5	-		-
4350	C	5	-		-
4400	C	5	-		-
4450	C	20	-		-
4500	C	5	-		-
4550	C	5	-		-
4600	C	5	-		-
4650	C	5	-		-
4700	C	5	-		-
4750	C	5	-		-
4800	C	5	-		-

TABLE I (PART 2)

WELL:

ALICE-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION	SOURCE ROCK INDICATION	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT
F		BEFORE EXTR.	AFTER EXTR.		%W
4850	C	5	-		-
4900	C	5	-		-
✓ 4950	C	5	-		.1
* 4950	C	5	-		.1
5000	C	5	-		-
5050	C	5	-		-
5100	C	5	-		-
5150	C	5	-		-
5200	C	5	-		-
5250	C	5	-		-
5300	C	5	-		-
5350	C	5	-		-
5400	C	5	-		-
5450	C	5	-		-
5500	C	5	-		-
5550	C	5	-		-
5600	C	5	-		-
5650	C	5	-		-
5700	C	5	-		-
5750	C	5	-		-
5800	C	5	-		-
5950	C	5	-		-
6000	C	5	-		-
6050	C	5	-		-
6100	C	5	-		-
6150	C	5	-		-
6200	C	5	-		-
6250	C	5	-		-
6300	C	5	-		-
6350	C	5	-		-

TABLE I (PART 3)

WELL:

ALICE-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION	SOURCE ROCK INDICATION	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT
F		BEFORE EXTR.	AFTER EXTR.		%W
6400	C	5	-		-
6450	C	5	-		-
* 6500	C	5	-		.2
6550	C	5	-		-
6600	C	5	-		-
6730	C	5	-		-
6750	C	5	-		-
7010	C	5	-		-
7165	C	5	-		-
7200	C	5	-		-
7250	C	5	-		-
7305	C	5	-		-
7350	C	5	-		-
7400	C	5	-		-
* 7400	C	5	-		.1
7500	C	5	-		-

TYPE OF SAMPLE C = CUTTINGS, R = CORE, S = SIDEWALL SAMPLE

CONTAMINATION : W = WALNUT FRAGMENTS OR SOME SIMILAR PRODUCT,
E = CELLOPHANE SHREDS, F = FIBRES, P = PLASTIC OR PAINT AND
C = CONTAMINATED BUT KIND NOT SPECIFIED

A DASH (-) INDICATES TEST NOT MADE, ASTERISKS INDICATE THE
ORGANIC CARBON CONTENT IS THE AVERAGE FOR THE SAMPLES CONCERNED

INITIAL DISTRIBUTION

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GEOCHEMICAL LOG

SCALE 1:5000

WELL

ALICE-1

LOCATION

REGEO IDENTIFIER

AGE	FORMATION	DEPTH IN F	LITHOLOGY	DOM(VR)	SOURCE ROCK INDICATION OF ORIGINAL SAMPLE						TYPE OF SAMPLE	SOURCE ROCK INDICATION OF SAMPLE AFTER EXTRACTION WITH CHLOROFORM						CONTAMINATION	DEPTH IN F	ORG. CARBON (PCT. WT)	TYPE OF ORGANIC MATTER
					100	200	300	400	500	600		100	200	300	400	500	600				
CAMBRIAN	GOYDER	3000														3000					
	JAY CREEK	3500														3500	0.1				
		4000														4000					
		4500														4500					
		5000														5000	0.1 0.1				
		5500														5500					
		6000														6000					
		6500														6500	0.2				
		7000														7000					
	ARUMBERA	7500	TD 75:8													7500	0.1				
		8000														8000					

VALUES SMALLER THAN 30 ARE CONSIDERED
NOT TO BE OF SIGNIFICANCE

ALL INVESTIGATED SAMPLES CAN
BE LEFT OUT OF CONSIDERATION
TO REPRESENT SOURCE ROCK.

NUMBER OF SAMPLES ANALYSED 76

NUMBER OF SAMPLES ANALYSED 0

LEGEND
 TYPE OF SAMPLE G = CORE
 P = SIDEWALL SAMPLE
 CONTAMINATION C = UNSPECIFIED
 W = WALNUTS
 E = CELLOPHANE
 F = FIBRES
 P = PLASTIC OR PRINT

KONINKLIJKE/ONNEN
 EXPLORATIE EN PRODUCTIE LABORATORIUM

**GEOCHEMICAL LOG OF
 ALICE-1
 AUSTRALIA**

AUTHOR: GTE DATE: NOVEMBER 1961
 REP: 01-208-170 ENCL: 1 DRAW: NO: J