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Report Title	Hale River No.1 Mineral Analysis XRD Analysis on two Selected Samples
DAR Number	DAR0243
Operator	Amdel
Contractor	Santos
Date of Report	March 1977
Confidentiality	
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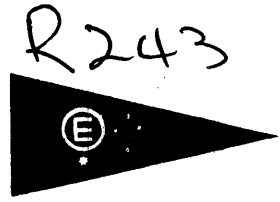
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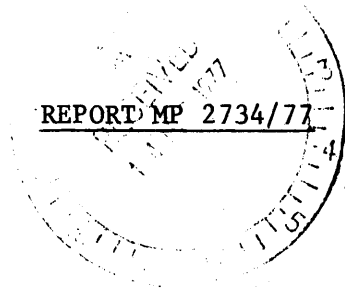
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11th March, 1977

Santos Limited,
183 Melbourne Street,
NORTH ADELAIDE, SA 5006

Attention: Mr R.G. Mollan



YOUR REFERENCE:

Application dated 23/2/77

MATERIAL:

Four mudstone samples

IDENTIFICATION:

HR/2, 4, 6 & 8

DATE RECEIVED:

25/2/77

WORK REQUIRED:

Mineral analysis by XRD. Clay mineral analysis on two selected samples

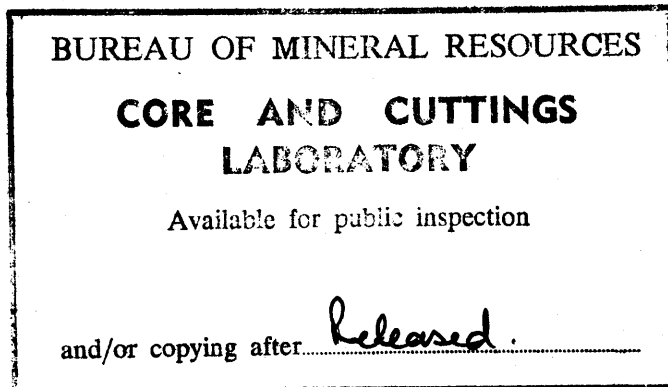
Investigation and Report by: Dr R.N. Brown

Officer in Charge, Mineralogy/Petrology Section: Dr K.J. Henley

K.J. Henley

for F.R. Hartley
Director

mhb



EXAMINATION OF FOUR MUDSTONE SAMPLES

1. INTRODUCTION

A series of eight borehole samples (HR 1-8) from Santos Ltd. corresponded with anomalously high in-hole gamma activity. Analytical work had not shown the presence of elements capable of explaining this activity. Mr R.G. Mollan requested a mineral and clay examination of selected samples in case this might throw some light on the problem. After discussion, the four samples HR 2, 4, 6 & 8 were chosen for bulk mineralogical examination by XRD. Of these four samples, two were to be chosen subsequently for further clay analysis by XRD examination of an oriented -2 μm size fraction.

2. PROCEDURE

Subsamples of the four samples HR 2, 4, 6 & 8 were used to produce X-ray powder diffractometer traces using cobalt radiation. These were interpreted according to standard procedures. Although inter-sample variation was not great, two of the four were chosen as covering the range of mineralogy present, and these were dispersed in water and allowed to sediment, and -2 μm e.s.d. clay material was obtained by the pipette method. This was examined on a plummet balance to determine its solids content, and was used to produce oriented clay material on ceramic plates. Two such plates were prepared for each sample, both saturated with Mg^{++} ions and one in addition treated with glycerol. When air-dry these plates were examined in the X-ray diffractometer, and the glycerol-free plate was re-examined hot (at about 140°C).

3. RESULTS

All four samples were shown in the bulk XRD examination to consist largely of clay, with moderate to minor amounts of quartz and (plagioclase) feldspar, and in two cases a little calcite. As tends to be the case in such bulk examinations, information on the 'clay' component was somewhat indefinite, especially with regard to the montmorillonite component, although kaolinite and mica/illite are detected with more reliability. The situation is much improved when oriented preparations of the separated clay fraction are examined, as was the case with the two selected samples HR-4 and HR-8.

The results are presented in the form of two tables. Table 1 covers the mineralogy of the four bulk samples and is somewhat indefinite with regard to the specific make-up of the clay present. Table 2 gives the mineralogy of the -2 μm ("clay") fraction of the two samples HR-4 and HR-8, derived from the specific examination of the clay fraction and giving improved clay mineral information (e.g. improved assessment of relative amounts of clay minerals, and the recognition of the presence of a little chlorite in both samples).

In each table the minerals found are listed in approximate order of decreasing abundance using semiquantitative abbreviations as defined below.

TABLE 1: BULK XRD EXAMINATIONS

<u>HR-2</u>		<u>HR-4</u>	
Clay (incl. K)	D	Clay (esp. Mo, minor K, M)	D
Q	SD	Q	SD
F?	Tr	F	A
Cal?	Tr		

<u>HR-6</u>		<u>HR-8</u>	
Clay (as for HR-4)	D	Clay (as for HR-4)	D
Q	SD	Q	A-SD
F	A	Cal	A
		F	A

TABLE 2: MINERALOGY OF -2 μm FRACTIONS

-2 μm fraction, %:- Mineralogy	<u>HR-4</u>		<u>HR-8</u>	
	57		75	
	Mo	D	Mo	D
	RI	SD	RI	A
	K	Tr	K	A
	C	Tr	C	A
	M	Tr	Q	Tr-A
	Q	Tr	M	Tr
			Cal	Tr

Mineral Key

C	Chlorite	M	Mica/illite
Cal	Calcite	Mo	Montmorillonite (smectite)
F	Feldspar (plag.)	Q	Quartz
K	Kaolinite	RI	Randomly-interstratified clays of indeterminate type



amdel

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NATA CERTIFICATE

24 February 1977

The Director,
Santos Limited,
183 Melbourne Street,
NORTH ADELAIDE SA 5006

REPORT AN 2643/77

YOUR REFERENCE: Application dated 16/2/77
IDENTIFICATION: As listed
DATE RECEIVED: 16 February 1977

Enquiries quoting AN 2643/77 to Officer in Charge please

Officer in Charge, Analytical Section: D. K. Rowley

for F. R. Hartley
Director

hjj



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ANALYSIS

AN 2643/77

SAMPLE MARK	URANIUM U ppm	THORIUM Th ppm	BISMUTH Bi ppm	γ COUNT AS EQUIVALENT U ppm	P ₂ O ₅ %
HR -1	6	10	<4	<10	0.20
2	6	8	<4	<10	0.15
3	<4	10	<4	<10	0.15
4	6	10	<4	<10	0.20
5	4	6	<4	<10	0.20
6	<4	8	<4	<10	0.20
7	<4	6	<4	<10	0.25
8	<4	10	<4	<10	0.25
METHOD:	B1	B1	B1	J1/4	F4/1

NOTE: γ equivalent uranioms have been corrected for the acitivity due to Thorium.

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