Open File Envelope No. 3169

EL 346 AND EL 355

CURDIMURKA AND MARREE AREA

PROGRESS AND FINAL REPORTS FOR THE PERIOD 11/8/77 TO 10/2/79

Submitted by

Consolidated Gold Fields of Australia Ltd and Comalco Ltd
1979

Enquiries: Customer Services
Ground Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

PRIMARY INDUSTRIES AND RESOURCES SA

CONTENTS ENVELOPE 3169

TENEMENTS: EMLS 346 & 355

TENEMENT HOLDER: CONSOLIDATED GOLD FIELDS OF AUSTRALIA LTD. FROM AUGUST 1977. Joint Venture with Comalco from early 1978

REPORTS:

NOTE: Compsite Logs of 355/1 & 355/2 are missing 7.1.80

000003

GOLD FIELDS EXPLORATION PTY. LIMITED

GOLD FIELDS HOUSE, SYDNEY COVE, SYDNEY, N.S.W. 2000
328 Great Eastern Highway, REDCLIFFE. W.A. 6104.

TELEPHONE: 2 0512
TELEGRAMS: CONGOLD
TELEX: AA 20373
Tel. 277-7814

GPM:rjc
22nd February 1978.

The Director General,
Department of Minerals & Energy,
P.O. Box 151,
EASTWOOD. S.A. 5063.

Dear Sir,

RE: STATUS E.L. 355 AT END FIRST QUARTER

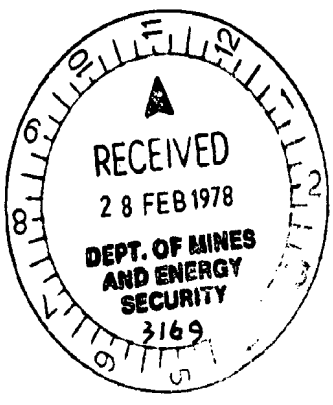
As part requirement for reporting on the E.L., below is a statement on the exploration status after the initial program.

"The bentonite potential is effectively untested in this E.L. but could be regarded as similar to that for E.L. 346. The targets for bentonite have been upgraded in potential and at present limits are unknown. Deposits are expected to be closely associated with active springs. This encouragement is despite significant conflict in analytical results and assessments of the commercial value of the bentonite. Hopefully more sampling will give more consistent results. Its commercial value can not be assessed at this stage.

Trona targets have generally been limited in number as outlined for E.L. 346. One prospect only was tested and although trona was present the potential for economic accumulations was downgraded."

Yours faithfully,
CONSOLIDATED GOLD FIELDS AUSTRALIA LIMITED

G. P. MOORE
Senior Geologist
Western Australia



E.L. 355

QUARTERLY REPORT

for period

31.8.77-30.11.77

CONSOLIDATED GOLD FIELDS AUSTRALIA LIMITED

G. P. MOORE
January 1978

I N D E X

1. INTRODUCTION

Exploration License No. 355 in the Maree area of Northern South Australia was granted on 11th August 1977 for trona, bentonite, chlorite, kaolinite, atapulgite and uranium.

It covers an area of 1,755 square kilometres and is located along the Maree-Alice Springs Railway Line centred on Maree. Location Plans showing the E.L. and defining latitudes and longitudes is enclosed as Figures 1 and 2 in this Report.

Access is good throughout the E.L. along the Stuart Highway and subsidiary roads and tracks servicing all artesian bores and wells. Access off the tracks requires 4-wheel drive vehicles over sand dunes and creeks.

Climate is typical of arid central Australia with intermittent summer rains.

2. OBJECTIVES

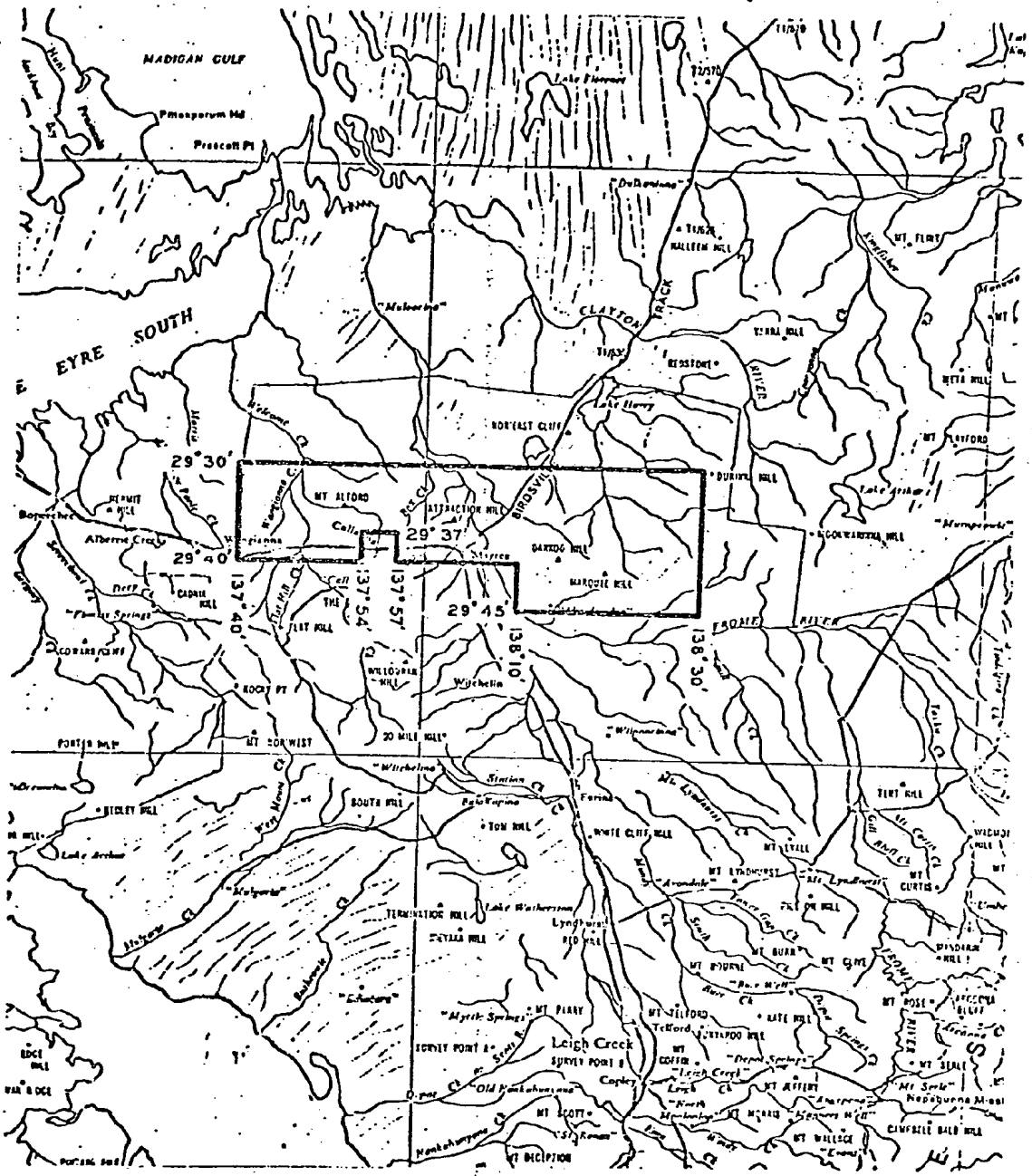
The project area was selected originally for its potential to contain deposits of trona or sodium carbonate rich brines. After some literature research and field reconnaissance it was also considered prospective for occurrences of sodium bentonite. Both these targets were associated with alkaline artesian spring waters rich in sodium carbonate along the southern rim of the Great Artesian Basin.

3. PROGRAM

Work to date has consisted of two field programs plus literature surveys and inspection of available data on artesian waters. The field programs have been firstly regional reconnaissance mapping and sampling, then auger drilling of favourable environments.

One auger hole to 6m. has been drilled during a larger program on E.L. 346.

SCHEDULE A



SCALE 1:1 000 000

KILOMETRES 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 KILOMETRES

EXPLORATION LICENCE No. 355

THE MINISTER OF MINES AND ENERGY
ADELAIDE

Signature (licensor) .....

Signature (licensee) .....

FIGURE 2

FIG 1

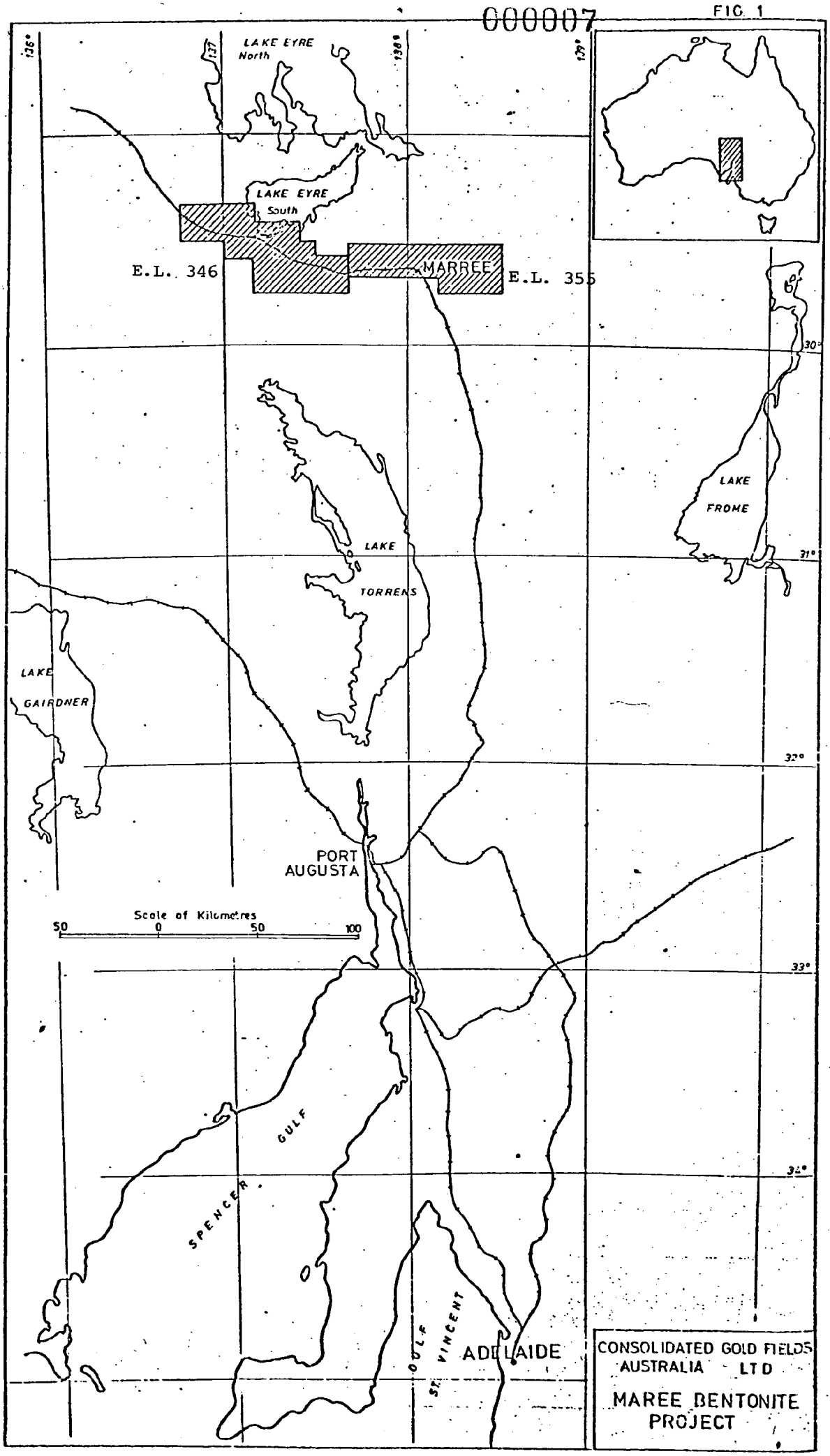


FIGURE 1

4. REGIONAL GEOLOGY

The E.L. covers the southern rim of the Great Artesian Basin and the underlying basement. Sediments are gently northerly dipping Cretaceous shales and sandstones unconformably overlying Middle Proterozoic sediments. Tertiary and Quarternary sediments, wind blown sands and evaporites overly the Cretaceous sediments. Further information on the regional geology is available in Mines Department publications.

The basal member of the Cretaceous sequence is a coarse sandstone which is the main artesian aquifer. This is overlain by a 200m. thick shale unit of the Maree Formation. The top flat-lying, black shale unit outcrops or is just below the present land surface throughout the area. This unit is montmorillonitic throughout, and bentonitic where tested adjacent to active sodium carbonate rich spring waters.

Regionally the springs occur along linear zones which are probably basement or recent faults. The faults provide channelways for the waters, and the springs are more active in the project area, due to the proximity of the aquifer to the surface on the basin rim. The springs and faults appear to have been active for long periods since the Cretaceous.

Trona occurs throughout the area intimately associated with active springs. Acid surface conditions and gypseous sands neutralize the alkaline spring solutions at surface close to the springs; however, the alkalinity has been proven to persist sub-surface up to 3-4 kms. downstream from the springs. The artesian waters at surface contain up to 8grms/litre of sodium carbonate and trona is usually deposited as thin salt units and within natural mound accumulations in the immediate spring area.

Bentonite has only been proven to date in areas of active alkaline groundwater movement near the springs. The sodium rich groundwaters have apparently beneficiated the montmorillonite by cation exchange of calcium by sodium. The areal extent and shape of these zones of alteration are unknown.

5. DETAILED INVESTIGATIONS

The specific targets generated from the reconnaissance work prior to drilling were:-

1. Economic, recent surface, or ancient buried, accumulations of trona-rich evaporites, particularly within closed drainage basins.

2. Sufficient volumes of brines rich in sodium carbonate concentrated by evaporation and preserved in near-surface aquifers.

3. Bentonitic shale deposits, either associated with alteration zones adjacent to springs or as primary sedimentary bodies.

4. The artesian waters with highest concentrations of sodium carbonate could be amenable to articicial surface entrapment and evaporation or other metallurgical extraction. There are obvious conservation restrictions on this target type.

Drill hole location on Lake Pinnarie is shown on Figure 4. The drill log for this hole is included as Appendix I. Detailed trona analyses are included as Appendix II.

5.1 Trona

Results of the initial evaluation program have been discouraging with respect to the potential for an easily accessible economic deposit of trona or sodium carbonate. Sodium carbonate is ubiquitious in the area, adjacent to active artesian springs, but it is usually present as very thin (0.1-0.5m.) surface evaporite crusts, in the spring drainage channels. The crusts average 1-15% Na_2CO_3. Mobile ground waters containing 1-2% Na_2CO_3 are present to depths of <0.5 metres within recent sandy alluvium. The underlying black shales are damp beneath the drainage channels and contain up to 1.5% Na_2CO_3.

There were no erosion channels or sedimentary basins observed of sufficient depth to allow economic accumulations of trona-rich evaporites or brines. Their existence would be limited by the flat lying basement of impermeable and relatively resistant montmorillonitic black shales.

The artesian springs within the project area are related to minor faults and permeable discontinuities at the edge of the Great Artesian basin where the Cretaceous aquifer is high enough for minor structures to penetrate the overlying sediments. The persistant downstream shallow ground water flow from the springs is also a function of the flat lying impermeable basement sediments.

Lake Pinnarie offered potential as a closed basin possibly during a long period and hence could allow significant accumulations of evaporites. Sodium carbonate rich water from a spring flows into portion of the Lake. However, the small flow is overpowered rapidly and neutralized by the surface acid conditions and gypseous surface snads. There could be some potential still for a buried evaporite deposit which is protected from the surface and which was deposited prior to development of these conditions. The thin accumulations of sediment probably do not offer the potential for existence of aquifers containing sub-surface concentrated brines in sufficient quantities.

Detailed regional stratigraphic analysis and construction of structure contours on top of the Cretaceous shales could outline buried sedimentary basins or depressions other than the ones observed at surface.

5.2 Bentonite

The high swelling bentonite found downstream from Davenport Springs is unusual in respect to deposits in other countries. Firstly, there are no known volcanics of middle to late Cretaceous age found in any of the areas bordering ancient Lake Winton. Secondly, they appear to be associated with alteration haloes around the drainage of sodium carbonate rich springs. A diagram published by Kurt Linn shows the relative stability fields of calcium and sodium bentonite. This phase diagram shows that a change in Na/Ca ratio and a basic Ph are the only requirements to affect alteration of calcium (non-swelling) bentonite to sodium (swelling) bentonite. Other bentonite deposits have been clearly identified with contental soda lakes in closed basins, while still another variety have been identified with hydrothermal alteration patterns around fractures associated with presumably basic hot springs.

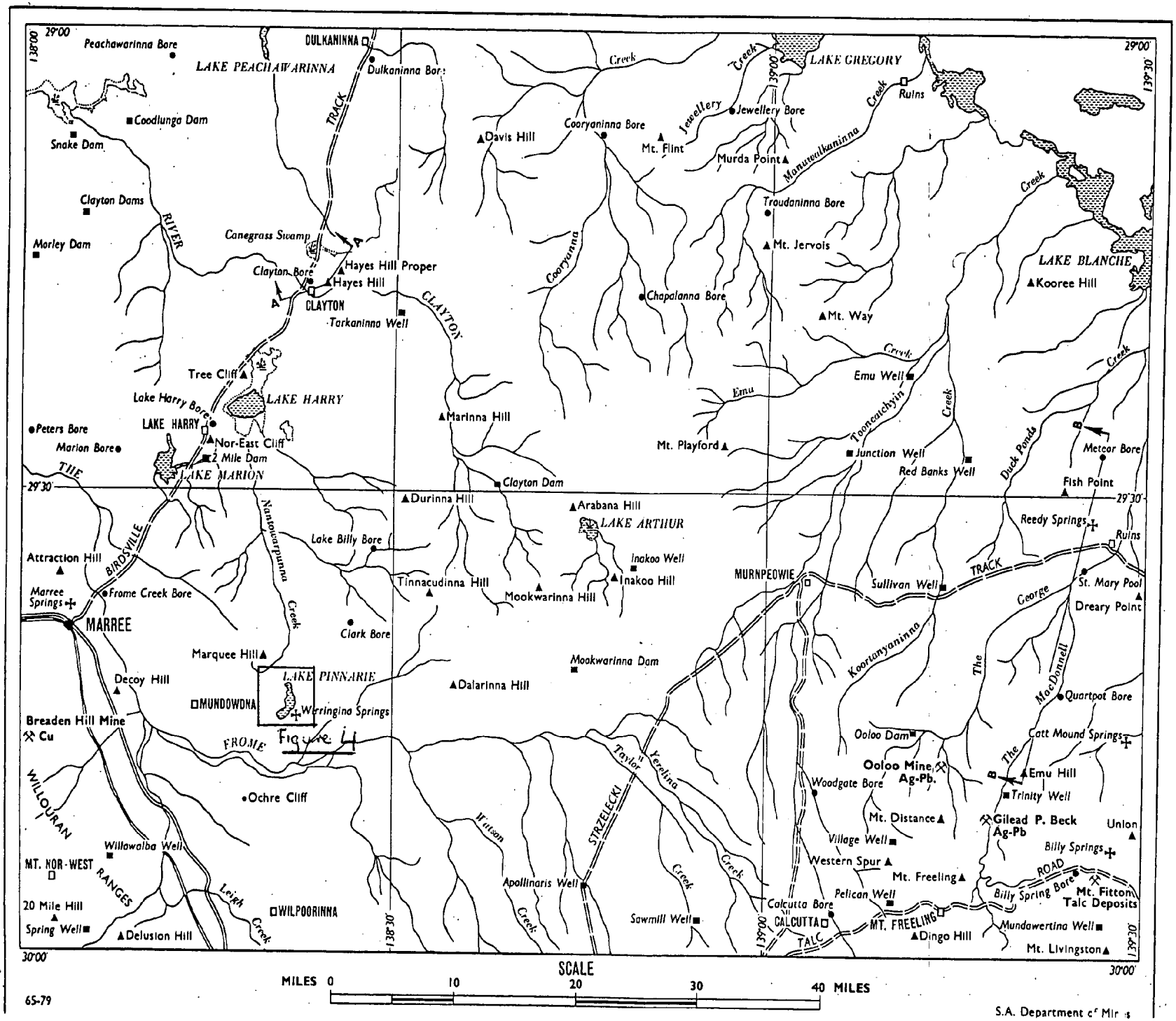
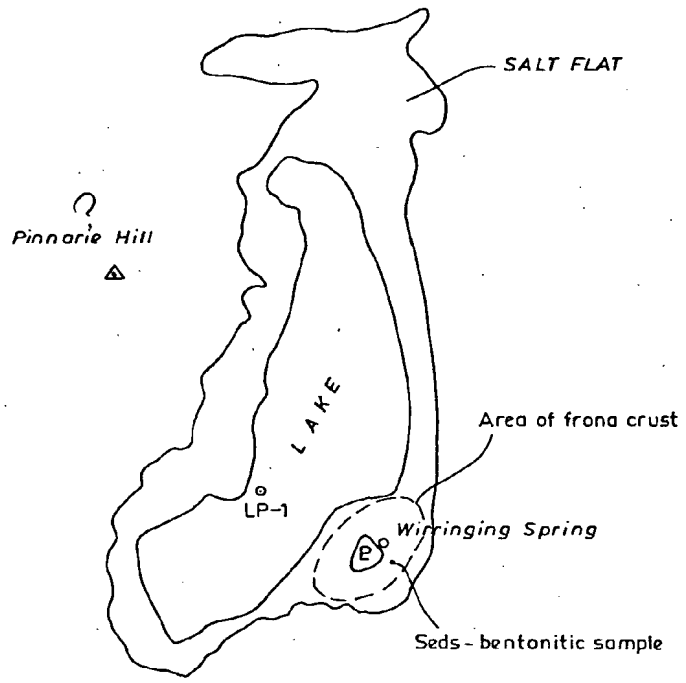


FIGURE 3
Geography-Maree Shee
A



LP-1	15878	- 15883	(non bentonitic)

CONSOLIDATED GOLD FIELDS AUSTRALIA LIMITED

MAREE/BENTONITE?

LAKE PINNARIE

Scale 1"to1mile

FIGURE 4

Occurrences of bentonite or sub-bentonitic material have been identified from the following localities which are not necessarily within the E.L.:-

Reedy Springs (original discovery)
Davenport Springs
Davenport Creek (Site of DS-3)
Finnis's Swamp (Bopeechie Springs)
Gosses's Springs
Emerald Springs
Jersey Springs - Elizabeth Springs one sample

However, analyses of the bentonitic qualities by a number of laboratories have given conflicting results to date. The bentonite apparently has reasonable gel strength and viscosity yield on mixing with water but binding strengths are unusually weak. Further sampling and laboratory test work is necessary before the economic potential can be assessed.

The next stage of mapping and drilling sampling will hopefully define more favourable sections of the shale unit which can then be tested where sodium rich waters have been active. Davenport Springs is the most promising target to date and warrants follow-up grid drilling to outline possible areas of higher quality bentonite.

6. RECOMMENDATIONS

Work to date has defined the most prospective targets that should be sought in future. The potential existence for bentonite deposits has been up-graded despite conflicting analyses. The number of trona targets have been limited and the overall potential probably down-graded from that held prior to drilling.

Future programming should include detailed analysis of stratigraphy and surficial basins in the Cretaceous and Tertiary sediments, followed by more intensive reconnaissance auger drilling and concurrent grid evaluation drilling of promising areas.

The targets for future programs, in order of current priorities, are:-

1. Sodium carbonate rich brines in near-surface aquifers or basins. Richer artesian waters either at surface or within a primary sodium carbonate rich aquifer are an alternative solution target.

2. Bentonitic shale deposits at Davenport Springs or elsewhere in favourable stratigraphy as defined by reconnaissance drilling.

3. Accumulations of trona-rich evaporites in concealed basins. Structural contours constructed on the top of the Maree Formation could indicate areas prospective for near-surface evaporite accumulations. Again the reconnaissance drilling program should provide important data for this work.

APPENDIX I

HOLE NO. L.P. 1 LAKE PINARRIE NO. 1

From	To	No.	Description
0	1	15878	Crust of NaCl + Na_2CO_3, minor $CaSO_4 2H_2O$ bright yellow sandy clay
1	2	15879	Bright yellow clay - brown at base
2	3	15880	Grey clay, acidic gypsum, rich (authigentic)
3	4	15881	Grey clay
4	5	15882	Grey clay - moist
5	6	15883	" " "

There are no included salines in the upper 6.0m. of Lake Pinarrie. Below 3m. the sediments appear to be Cretaceous.

APPENDIX II

ANALYSES

Central Mineralogical Services Pty. Ltd.

231 Magill Road
Maylands, S.A. 5069
Telephone 42 5659

18th March 1977

Mr. Ian R. Pontifex,
Pontifex & Associates Pty. Ltd.,
26 Kensington Road,
ROSE PARK. S.A. 5067

REPORT CMS 77/3/6

YOUR REFERENCE: Order No. 11

DATE RECEIVED: 14th March 1977

SAMPLE NO.: FT6

SUBMITTED BY: Mr. I.R. Pontifex

WORK REQUESTED: Mineralogy

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 18th March 1977

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
FT6
EVAPORITE MINERALS

Job No. CMS 77/3/6 Date Received: 14.3.77

Reference Order No. 11

Sample No. FT6

Nature of Sample: Mineral specimen

DESCRIPTION **SECTION No.-**

a. Hand Specimen:

-

b. Microscopic:

The sample was examined optically in the first instance to obtain a general idea of the mineral assemblage. Quartz, clays, minute, well-formed gypsum crystals, and an evaporite phase, were identified.

In order to determine the particular evaporite species, a small piece of a white encrustation was hand-picked, which appeared homogeneous under the stereo-binocular microscope. Since many evaporite minerals contain water of crystallisation, careful grinding was necessary to avoid modifying the composition. Hence the X-ray powder pattern was not as sharply-defined as with other minerals.

However, the mineral was identified as trona ($Na_3H(CO_3)_2.2H_2O$), and additional optical determinations confirmed this. Trona is the major evaporite mineral present; minor thermonatrite ($Na_2CO_3.H_2O$) may also occur but this is an inference from weak lines in the pattern.

H.W. Fander, M.Sc.

Ian R. Pontifex & Associates Pty. Ltd. 000018

TEL. 332 6744
A.H. 31 3816

26 KENSINGTON ROAD, ROSE PARK
SOUTH AUSTRALIA

P.O. BOX 91, NORWOOD
SOUTH AUSTRALIA 5067

MINERALOGICAL REPORT NO. 2119

31st March, 1977

TO: Mr. F. Trask,
Universal Milling Co. Pty. Ltd.,
P.O. Box 15,
BENTLEY, W.A. 6102

YOUR REFERENCE: Order No. 1883
(Also personal communication)

MATERIAL: Evaporite sample delivered 14/3/77

IDENTIFICATION: FT-6

WORK REQUESTED: Identification of mineral phases and chemical analysis

PONTIFEX & ASSOCIATES PTY. LTD.

Sample FT-6

This sample was submitted to CMS for x-ray powder diffraction analysis. A copy of the CMS report is attached.

Essentially CMS identified trona as the major phase in white crusty material in this sample.

Optically, Pontifex found that accessory to minor quartz, gypsum, clays and halite were present, and in view of the apparently significant importance of the exact composition of this sample, two further portions were also submitted to CSIRO for x-ray powder diffraction analysis. These constituted (1), a sample of hand-picked mixed pseudo-cubic, prismatic and acicular crystals, and (2), a sample of extremely fine crystalline white crust.

This CSIRO analysis revealed the presence of essential trona, a similar amount of halite, and minor quartz, clay and gypsum impurities, in both sample.

In summary, the collective evidence from mineralogical analysis of material hand-picked to eliminate obvious quartz sand contamination (thus assumed to be representative of the evaporite mineral content), is as follows:-

trona	)	essential
halite	)	
quartz	)	
clays	)	accessory to minor
gypsum	)	
? thermonatrite	)	

..../

A more precise mineralogy quantitative determination would require XRD analysis (as carried out by AMDEL on samples FT1 to FT5).

Chemical analysis of FT-6 was carried out by ACS Laboratories. These results are summarised as follows:-

Na	13.0%
K	0.24%
Ca	0.1%
SO_4	0.56%
Cl	7.5%
CO_3	7.0%
HCO_3	7.6%

LOI at 110^oC 7.7% ($H_2O \pm CO_2$)

Total dissolved solids may be calculated as 36% of the sample. The insoluble residue was measured by weight to be 65%.

On the basis of these analyses, Roy Beevers interpreted the following salts to constitute the water soluble portion of the sample:-

NaCl	13%
$NaCO_3$	12.5%
$NaHCO_3$	10%
Ca_2SO_4	0.4%
K_2SO_4	1%

APPENDIX III

E.L. 355 - STATEMENT OF EXPENDITURE FOR PERIOD 31.8.77-31.11.77

Total expenditure for the period was $4,522 being made up of:-

Salaries and Wages	$ 826
Stores and materials	502
Transport	404
Travel and Accommodation	421
Overheads	700
Consultants	1,292
Drilling Contractors	377
TOTAL	$ 4,522

G. P. MOORE
Senior Geologist
Western Australia

000022

EXPLORATION LICENCE NO. 355

Second Quarterly Report

12.11.77 - 12. 2.78

by

S. K. Chaku

Comalco Limited,
95. Collins Street,
Melbourne,
Victoria 3000.

28th February, 1978.

CONFIDENTIAL STATEMENT

to

The Director General of Mines and Energy

on

bearing of work for quarter to 12.2.78 on E. L. 355

The preliminary work outlining a sodium carbonate anomaly in the Marree area is considered to provide a worthwhile lead for follow up investigations.

(Dr.) A. H. White
Senior Geologist.

CONTENTS

EXPLORATION LICENCE NO. 355

Quarterly Report for period 12.11.77 - 12.2.78

During the quarter a joint venture agreement was negotiated between Comalco Limited, Consolidated Goldfields of Australia Limited and United Milling Corporation (reference letter to Director of Mines and Energy from Comalco Limited dated 14th February, 1978), for exploration and location of sodium carbonate and other minerals within Exploration Licence 355 (Figure 1). Comalco assumed responsibility as operator for all the exploration carried out in the Exploration Licence area under the terms of this agreement.

Exploration Programme

In the earlier phase of the exploration programme initiated by the joint venture partners to locate sodium carbonate deposits, a sub-economic soda bentonite occurrence was located around the Devonport Springs area by shallow auger drilling. Besides this bentonite occurrence, minor surface occurrences of trona, nahcolite and soda bentonite were located around various mineral springs in the general area (Figure 2). The presence of the sodium carbonate minerals in itself indicates the prospectivity of these areas for locating sodium carbonate enriched brines within the Exploration Licence. Hence an exploration programme under the terms of the agreement between the new joint venture partners was initiated.

The first phase of this programme is underway and consists of a detailed study of all the available water bore information,

including water salinity and stratigraphic and structural information. Two maps have been compiled, one showing total salinity in bore waters in the south western artesian basin in South Australia (Figure 3) and the other showing carbonate content of ground water around the Curdimurka and Marree sheet areas (Figure 2). Contours on the total salinity map of bore waters (Figure 3) show the areas with highest dissolved salts. However the map does not differentiate the chemical character of the ground water, i.e. whether the bore waters are carbonate, sulphate or chloride enriched. In order to differentiate the chemical character of the bore waters all the available chemical analyses for Marree and Curdimurka were gathered from the Department of Mines water bore cards and the values for sodium carbonates, sodium chloride and sodium sulphate content of bore waters and mound springs plotted on the maps. The values for sodium carbonate were contoured and the resulting map (Figure 2) clearly indicates an area of high sodium carbonate activity in bore waters between Marree and Curdimurka. While the results from Figure 2 are quite significant, one major problem that remains is that the available water analyses from the bores represent the total analyses of water produced from each bore, and therefore do not distinguish between waters in different aquifers. An early examination of available geophysical logs (stratigraphic logs etc.) from various bores in the area, indicates at least two to three identifiable aquifers in the area. Since it is possible one or more of these aquifers is charged with sodium carbonate brines, work is planned to identify these aquifers from the available geophysical logs, stratigraphy bore logs etc. in order to define a stratigraphic drilling target within the zone of high soda carbonate activity outlined in Figure 2.

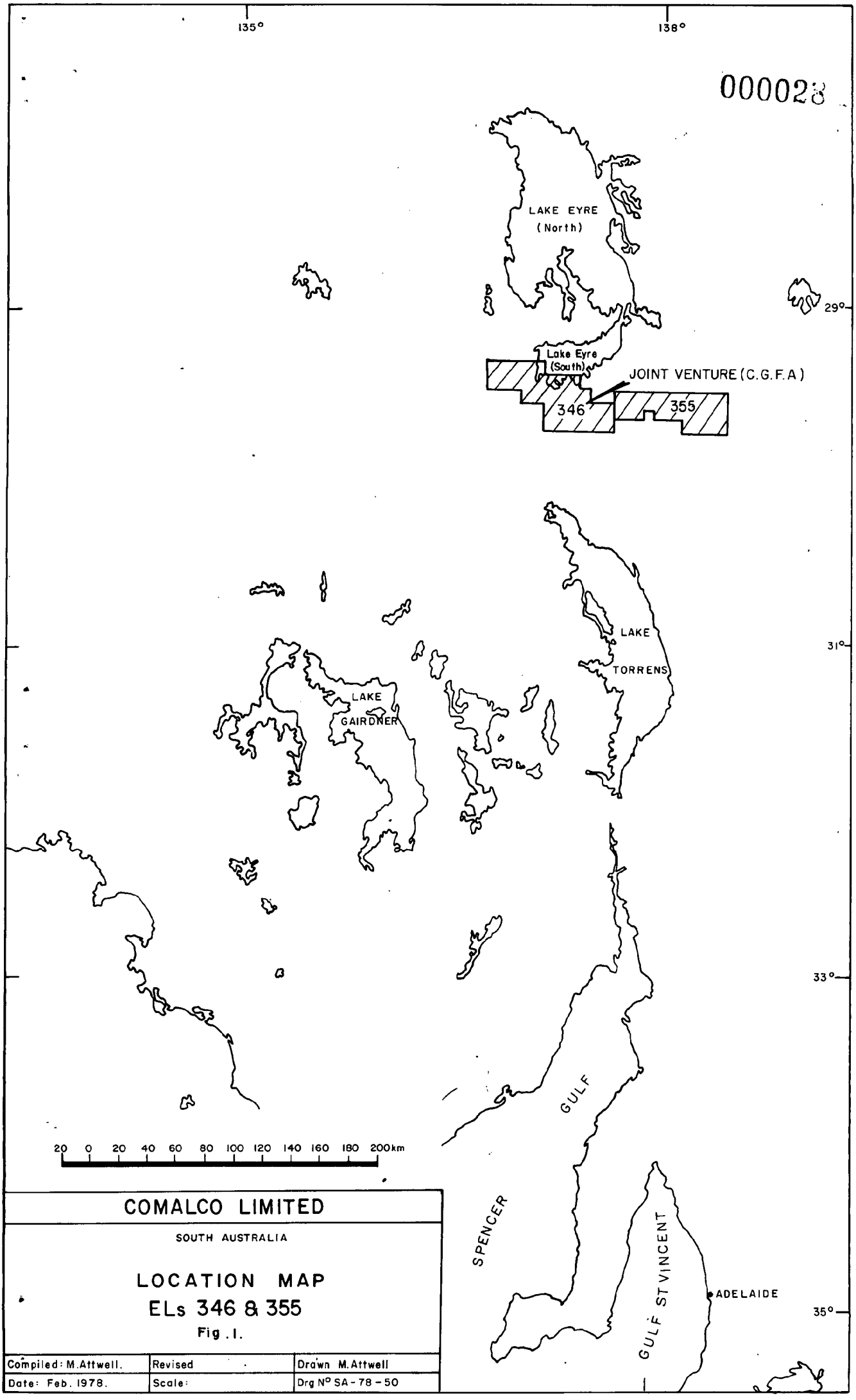
The drilling programme will be followed up in Phase II of the exploration programme.

STATEMENT OF EXPENDITURE

12.11.77 - 12.2.78

E.L. 355

Geological and Geophysical	400.00
Drilling	Nil
Logistics:	
a. Geologists' salaries	1 250.00
b. Field assistants' salaries	250.00
c. Camp costs	Nil
d. Vehicles, maintenance etc.	100.00
e. Reports, maps, reproductions, drafting	200.00
Administration	110.00
	$2 310.00



COMALCO LIMITED

SOUTH AUSTRALIA

LOCATION MAP
ELs 346 & 355

Fig. 1.

Compiled: M.Attwell.	Revised	Drawn M.Attwell
Date: Feb. 1978.	Scale:	Drg N° SA-78-50

000029

CONFIDENTIAL STATEMENT

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063.

Dear Sir,

Re: E.L.'s 346 and 355 - Marree area

I wish to report that work done during the quarter 12.2.78 to 12.5.78. does not alter the prospectivity of the areas held under Exploration Licences.

Yours faithfully,
COMALCO LIMITED.

(Dr.) A. H. White
Senior Geologist

000030

STATEMENT OF EXPENDITURE

EXPLORATION LICENCE 346

and

EXPLORATION LICENCE 355

The following expenditure was incurred during the quarter ending 12th May, 1978 on E.L. 346 and E.L. 355.

E.L. 346

Geologists' salaries	2025.00
Administration	300.00
	$2350.00

E.L. 355

Geologists' salaries	2025.00
Administration	300.00
	$2350.00

COMALCO

COPY FOR THE ATTENTION OF MR. R. SHEPHERD

COMALCO LIMITED

Incorporated in Victoria

000031

95 Collins Street
Melbourne Australia

Please reply to: Adelaide Regional Office,
Exploration Department,
P.O. Box 20,
PLYMPTON, S. A. 5038.

AHW/SW

1st September, 1978.

The Director General,
South Australian Department of Mines and Energy,
191. Greenhill Road,
PARKSIDE, S.A. 5063.

Dear Sir,

Re: Proposed drilling programme E.L. 346 and E.L. 355

I wish to notify you of our plans to drill four holes, two in E.L. 346 and two in E.L. 355, to obtain stratigraphic information and uncontaminated water samples from the Cretaceous sequence at the edge of the Great Artesian Basin. The purpose of this sampling is to obtain further information on a sodium carbonate anomaly present in bore waters flowing from wells in the Marree area.

Our drilling proposal, as was explained yesterday to Mr. R. Shepherd of your Department, is as follows: At Location 1 on the attached map, to drill one hole with mud to 300 metres or prior basement, and to obtain SP, resistivity, gamma ray, neutron and, if available, sonic logs of the hole. Another hole will be drilled a short distance (~100 metres) from the first and uncontaminated water samples will be taken from significant sand intervals, using the logs and cuttings from the first hole as a guide to locating these sand intervals. The second hole on drilling to 300 metres or prior basement will also be logged and a seismic velocity survey will be carried out in the well. Other holes will be drilled at locations 2 and 3 (see attached map); however no pilot holes are planned because we anticipate that any significant sand intervals should be continuous over this distance. A Comalco geologist will be on site during the drilling and will be observing the penetration rate during drilling as a further guide to the occurrence of sand intervals. Samples will be circulated to surface while drilling is suspended to check any suspected sand intervals.

GPO box 2773Y Melbourne Vic. 3001
Telegraphic 'Forcomal' Telex 30108
Telephone 63 0491

We have contracted Thompson Drilling Co. Pty. Limited to carry out the drilling, which is planned to commence in November. The contractors will be precollaring each hole with 30 metres of pressure cemented PVC casing, and adequate barytes will be on site to control high aquifer pressures, if encountered. On completion each hole will be backfilled to surface with cement.

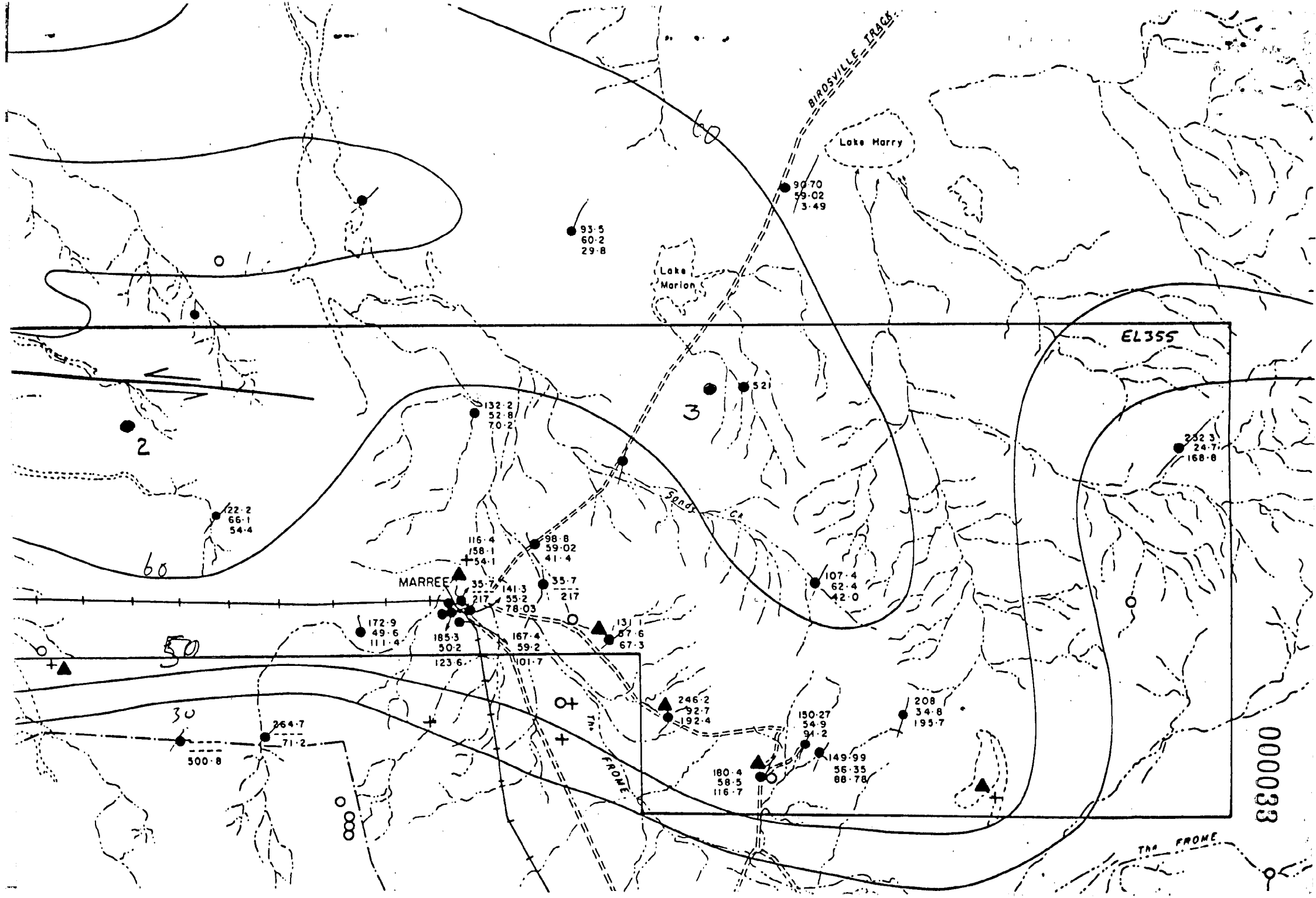
No access tracks are planned to be constructed for this drilling programme as drill sites are located so as to be readily accessible from the main roads.

Yours faithfully,
COMALCO LIMITED.

(Dr.) A. H. White
Senior Geologist.

Encl. (2).

c.c. Mr. R. Shepherd, S.A.D.M.
Mr. D. G. Reynolds CGFAL.
Mr. A. H. Bartlett, Comalco, Melbourne.


BIRDSVILLE TRACK
Lake Harry
Lake Marion
EL355
MARREE
Sandy Ck
The FROME
90·70
59·02
3·49
93·5
60·2
29·8
521
132·2
52·8
70·2
22·2
66·1
54·4
116·4
158·1
54·1
98·8
59·02
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111·4
185·3
50·2
123·6
167·4
59·2
101·7
131·1
87·6
67·3
107·4
62·4
42·0
232·3
24·7
168·8
246·2
92·7
192·4
150·27
54·9
94·2
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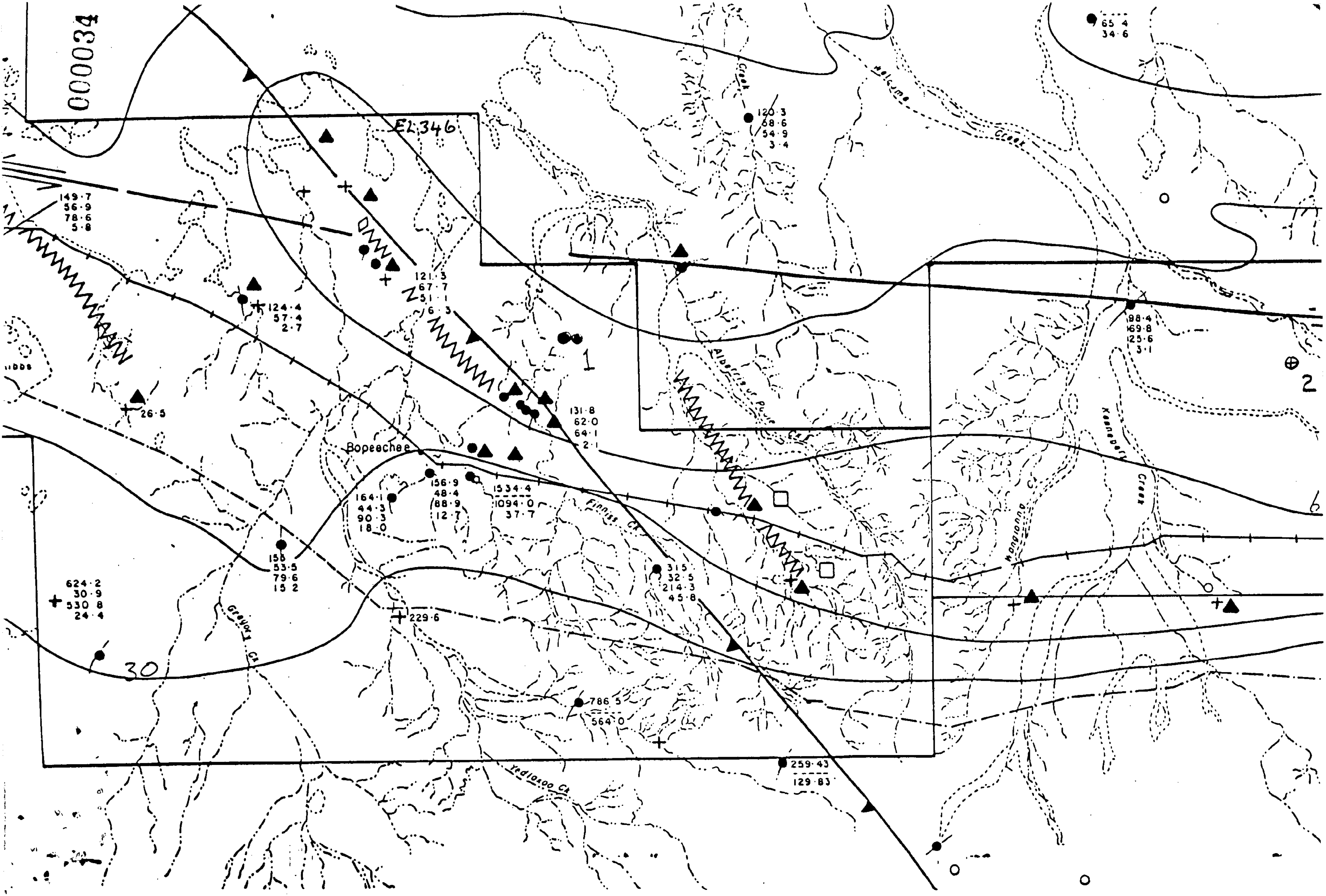

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EL346
Bopeechee
Finniss Ck
Yedlonoo Ck
Greyley Ck
Holcombe Creek
Creek
Alberrie Ck
Mongianna Ck
Kanneparry Creek
30
2
6
1
149·7
56·9
78·6
5·8
121·3
67·7
51·1
6·3
124·4
57·4
2·7
26·5
131·8
62·0
64·1
2·1
156·9
48·4
88·9
12·7
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44·3
90·3
18·0
1534·4
1094·0
37·7
156
53·5
79·6
15·2
624·2
30·9
530·8
24·4
229·6
315
32·5
214·3
45·8
786·5
564·0
259·43
129·83
120·3
68·6
54·9
3·4
65·4
34·6
98·4
69·8
125·6
3·1

COMALCO

000035

COMALCO LIMITED

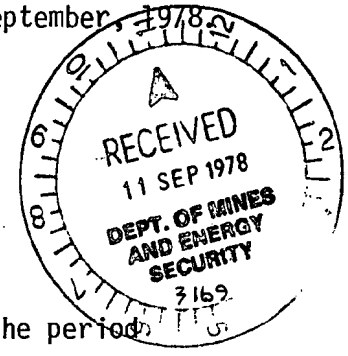
Incorporated in Victoria

95 Collins Street
Melbourne Australia

Please reply to: Adelaide Regional Office,
Exploration Department,
P.O. Box 20,
PLYMPTON, S. AUST. 5038.

AHW/SW

5th September, 1978.



The Director General,
South Australian Department of Mines and Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063.

Dear Sir,

E.L. 346 and E.L. 355. Quarterly Report for the period 12.5.78 - 12.8.78.

I wish to report during the quarter the following work was carried out.

1. Geology:

In a previous report (first quarterly report 1977) the presence of bentonitic material in the vicinity of Davenport Springs (E.L.346) was described. Further investigations of this occurrence were carried out during the quarter. Several mound spring localities were visited, Gosse Spring, McLachlan Spring, Fred Springs, and the geology of two (Finniss Springs and Davenport Springs) were studied in detail.

At each locality visited, dark grey shales of the Cretaceous Marree Formation outcrop and are overlain by a very thin veneer of unconsolidated Tertiary sands. Coarse intraformational shale breccia was found at Finniss Swamp. North of Alberrie Creek railway siding (Fig. SA78/44) a large, low mesa occurs, comprised of Marree Formation shales overlain by a weathered gypsiferous and limonitic layer of shale, capped by up to two metres of limestone. The limestone is thickly bedded, and has a travertinous appearance due to colloform banding, with abundant mud cracks visible on bedding plane surfaces.

At the mound springs, the Marree Formation is brecciated (as distinct from intraformational breccia) and altered to pure white clay along fractures, to a distance up to 3 cm from the fracture planes. The white clay is of no commercial significance.

GPO box 2773Y Melbourne Vic. 3001
Telegraphic 'Forcomal' Telex 30108
Telephone 63 0491

000036

CONFIDENTIAL STATEMENT

to

The Director General of Mines and Energy

on

bearing of work for quarter to 12. 8.78 - E.L.'s 346 and 355

I wish to report that work done during the quarter 12.5.78 to 12.8.78. does not alter the prospectivity of the areas held under Exploration Licences.

(Dr.) A. H. White
Senior Geologist.

Exposures in several erosion gullies indicated that the top metre or two of Marree Formation is weathered and has the appearance of the bentonitic shale found in earlier work. However below the weathered surface the shale is fresh and did not show any significant swelling in crude field testing. The weathering is most pronounced in the channels draining the mound spring areas. Away from the mound spring areas the weathered shale interval is highly gypsiferous.

The field investigations were made after heavy rains. Sampling of surface effluorescence in the vicinity of the mound spring areas found only moderately alkaline soils (pH 7-8). Highly alkaline soils and salt effluorescence (pH 9-10) were only found in the actual mound spring areas (e.g. Finniss Springs). Trona (?)crystals were found in Finniss Springs.

The limestone capping on the mesa may be of considerable importance in explaining the absence of surface alkali deposits. The waters emanating from mound springs are highly alkaline, and if favourable conditions had existed, the quantity of sodium carbonate supplied to the surface over the life of the mound springs should have formed considerable alkali salt deposits. Instead, it is postulated that the alkalis combined with the gypsum already existing and depositing at the surface, to form limestone. The very large area (30 square kilometres) of post gypsite travertine limestone, formed in a swampy or sub-aerial environmment as evidenced by the mud cracks, may be the product of this combination, and may have formed in a large swampy area draining north into Lake Eyre from the Davenport and Finniss mound springs.

2. Drilling:

The proposed drilling to test aquifers in the Cretaceous sequence (third quarterly report) was deferred owing to our inability to obtain a suitable drilling contractor. A contract has now been signed for the work and drilling is scheduled to commence in November, 1978. For this reason, application was made to extend the term of the two Exploration Licences.

Yours faithfully,
COMMONWEALTH ALUMINIUM CORPORATION LIMITED.

(Dr.) A. H. White
Senior Geologist.

Encl. Figure SA78/44. Sodium carbonate bore hole analysis.
Please note - a transparency of this figure was included in 'Second quarterly report E.L. 355 and E.L. 346 for period 12.11.77 - 12.2.78'

STATEMENT OF EXPENDITURE

Exploration Licence 346

and

Exploration Licence 355

The following expenditure was incurred during the quarter ending 12th August, 1978 on E.L.'s 346 and 355.

E. L. 346	
Geologists' salaries	2000.00
Field assistants' salaries	1000.00
Vehicle expenses	750.00
Camp costs	500.00
Administration	750.00
	$5000.00

E.L. 355	
Geologists' salaries	2000.00
Field assistants' salaries	1000.00
Vehicle expenses	750.00
Camp costs	500.00
Administration	750.00
	$5000.00

COMALCO

000039

COMALCO LIMITED

Incorporated in Victoria

95 Collins Street
Melbourne Australia

Adelaide Regional Office,
Exploration Department,
P.O. Box 20,
PLYMPTON, S. AUST. 5038.

AHW/SW

23rd November, 1978.

The Director General,
South Australian Department of Mines and Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063.

Dear Sir,

Exploration Licence 355

Quarterly Report for the period 12.8.78 - 12.11.78

I wish to report that during the quarter a review of data was completed prior to drilling. Drill sites were located in the field and drilling actually commenced on 23rd November, 1978.

Expenditure:

Geologists' salaries	500.00
Vehicle expenses	100.00
Administration	50.00
	? $400.00

Yours faithfully,
COMALCO LIMITED.

(Dr.) A. H. White
Senior Geologist

Encl.

RECEIVED
27 NOV 1978
DEPT. OF MINES AND ENERGY
SECURITY
3169

GPO box 2773Y Melbourne Vic. 3001
Telegraphic 'Forcomal' Telex 30108
Telephone 63 0491

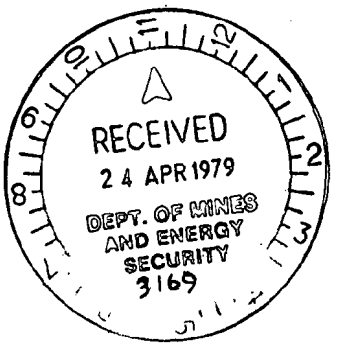
000040

EXPLORATION LICENCE ~~355~~ 346

SOUTH AUSTRALIA

FINAL REPORT

S.K. Chaku



Commonwealth Aluminium Corporation Limited,
Exploration Department,
10. Hampton Road,
Keswick,
ADELAIDE, S. Australia.

March, 1979.

CONTENTS

EXPLORATION LICENCES 346 AND 355

FINAL REPORT

Introduction

Exploration Licences 346 and 355 covering an area totalling 4100 square kilometres in the Marree area were granted to Consolidated Gold Fields of Australia Limited (CGFAL) and United Milling Corporation (UMC) in August, 1977. The exploration licences are located along the Marree-Alice Springs railway line and centred on Marree. A location plan showing the exploration licences and defining longitudes and latitudes is enclosed as Figure SA78/50.

A joint venture agreement was sought and finalised by Commonwealth Aluminium Corporation Limited (CACL) with CGFAL and UMC on the two exploration licences in early 1978. CACL thus became the Operator of the project and this report summarises the work completed to date on the joint venture project.

Previous Work

After a literature survey by CGFAL the area was selected for its potential to contain deposits of bedded trona in closed basins and sodium carbonate brines in near surface aquifers. Alkaline artesian spring waters rich in sodium carbonate along the southern rim of the Great Artesian Basin were regarded as likely sources of soda. Subsequent field reconnaissance indicated some potential for sodium bentonite clays.

Field investigations and an auger drilling programme carried out by CGFAL failed to locate any bedded trona deposit, but a sub-economic sodium bentonite clay occurrence was located around the Davenport Springs area west of Marree. Besides this bentonite clay occurrence, minor surface occurrences of trona and nahcolite were located around various mound springs in the area (Moore, 1978).

Objectives

CACL joined the venture to search for a sodium carbonate deposit in the form of bedded trona or brines in near surface aquifers associated with sodium carbonate rich waters of the Great Artesian Basin.

On reviewing the work undertaken by CGFAL it became apparent that the possibility of locating any bedded trona deposit in a closed late Tertiary basin in the area was remote. This observation was based on the presence since late Tertiary times of a widespread gypsum surface. The presence of gypsum is a serious inhibiting factor in deposition of trona deposits, even though abundant sodium carbonate was supplied to the surface by the numerous mound springs formed where artesian aquifers leaked to the surface at the margin of the Great Artesian Basin.

Thus two targets emerged from the above review, as follows:

1. near surface aquifers with sodium carbonate rich brines associated with alkaline artesian waters
2. further reappraisal for sodium bentonite clays.

Programme

Work to date has consisted of detailed field reconnaissance in reassessing the potential of the bentonitic clays, followed by the collection of water quality data on artesian bore holes located in the Exploration Licences. This water quality data was used to define sodium carbonate water anomalies. These anomalies were rotary drilled and electrically logged.

Regional Geology

The exploration licences includes rocks in part of the southern rim of the Great Artesian Basin and the underlying Adelaidean Basement rocks. Northerly dipping Cretaceous shales and sandstone unconformably overlie Middle Proterozoic sediments in the south and Jurassic sandstones in the north. Tertiary and Quaternary sediments, wind blown sands and evaporites overlie the Cretaceous sediments.

The dark grey shales of the Cretaceous Marree Formation subcrop just below the thin veneer of unconsolidated Tertiary sands throughout the area (Forbes, 1966). This unit is montmorillonitic throughout the area, and bentonitic adjacent to active sodium carbonate rich spring waters. Near some mound springs the unit is brecciated and altered to pure white clay along fractures up to three centimetres distance from the fracture planes.

The Tertiary outcrop is very limited and restricted to flats on the top of mesas which dominate the flat undulating topography of the area. The only recognisable unit noted was a flat-lying limestone capping a mesa north of Alberga Creek Railway Siding. The limestone is thickly bedded with abundant mud cracks visible on bedding plane surfaces and has a travertinous appearance due to colloform banding.

The whole area is dominated by mound springs issuing alkaline rich artesian waters, very high in sodium carbonate content, with values up to 8 gms/litre. Trona springs occur along linear zones which are probably basement or recent faults. The faults provide channelways for the movement of artesian water from the aquifers to the surface on the basin rim. Besides these present day active mound springs there are numerous extinct mound springs, remaining as domed travertinous limestone areas, indicating that the mound springs have been active for long periods of time.

Detailed Investigations

Sodium bentonite clays

The sodium bentonite clays were located during the course of exploration programmes carried out by CGFAL for trona. Bentonitic clays were first discovered adjacent to a trona-rich spring at Reedy Springs. Subsequent auger drilling and field reconnaissance located sub-bentonitic clays in and around various springs in the area, of which Davenport Springs was considered the most promising target.

A detailed follow-up by CACL to assess the nature and distribution of the clay occurrences involved examination of numerous outcrops of Marree Formation in and around these mound spring areas. The outcrops examined in deeply incised sections and gullies showed that the top metre or so of Marree Formation is deeply weathered and has the appearance of bentonitic shale found in earlier work. However, below the surface, the shale is fresh and did not show any significant swelling in the field testing. The weathered profiles of the shales were most pronounced in the channels draining the mound spring areas, while away from these drainage areas the shales are generally fresh and highly gypsiferous.

This field examination clearly demonstrated that the sub-bentonitic sodium clays were restricted alteration haloes around the drainage areas of active mound springs. The sodium carbonate rich waters emanating from the mound springs are thought to have beneficiated the montmorillonite by cation exchange of calcium by sodium.

No further investigations of the altered clays is warranted because of their very restricted distribution and sub-bentonitic qualities.

Sodium carbonate brines

The remaining target was sodium carbonate brines in near surface aquifers, rich in sodium carbonate content, thought to be initially associated with Great Artesian waters.

Numerous water bores occur in the area and information on bore location and chemical character of water were available in Department of Mines records. All data relating to chemical character of water and bore location was collected and plotted (Figures SA78/44 and SA78/49). Figure SA78/79 shows the total salinity of ground water in the bores located along the southern rim of the South Australian part of the Great Artesian Basin. While the map clearly indicates an increase in total salinity towards the rim of the basin and the mound spring areas, it does not differentiate chemical components of the artesian waters. Thus individual analyses of sodium carbonate, sulphide and chloride were plotted (Figure SA78/49) and sodium carbonate values contoured. These showed a distinct 60 g/gallon (850 ppm) sodium carbonate anomaly. The anomaly was considered significant, but does not approach any where near economic grades for brines of this type, which are generally considered to be over 6000 ppm. A problem that remained was that the water analysis from the bores represented the total analysis of water produced from each bore, and therefore did not distinguish between waters possibily contributed by different aquifers. An early examination of two very poor quality logs from the area and available stratigraphic information had indicated the possibility of two or more aquifers existing in the anomaly area. This limited sub-surface information on aquifer characteristics of the areas opened up a possibility that the anomaly shown on Figure SA78/44 reflected composition of mixed waters from various aquifers. It was considered possible therefore that one of the aquifers could contain more concentrated sodium carbonate brines or waters. Three holes were drilled to test for (i) number of aquifers and (ii) composition of the water in the aquifers.

Drilling Results

A Mayhew 1000 Rotary drill, with special adaptation for water sampling was used for the drilling programme to evaluate the sodium carbonate bore water anomaly. In early November 1978 three holes totalling 426 metres were drilled to basement. The location plan of the drill holes is enclosed as Figure SA78/140, with detailed composite geological and electric logs in Appendix 1.

426.
283
143

The drilling proved that there are no intermediate, near surface aquifers within the Cretaceous sequence and that there is only one, basal Cretaceous aquifer which was very thin. The possibility of an aquifer with high sodium carbonate being diluted with water from the main aquifer to produce the surface sodium carbonate anomaly is thus excluded.

346 located E of 346

Drill hole EL355/1 located north of Finnis Railway Siding penetrated 146 metres of monotonous section of Marree Formation, constituted of grey siltstones and shales, with minor bands of limestone and silty fine grained sands, passing into the main Cretaceous/Jurassic aquifer sands below 146 metres, where the hole was plugged. High artesian pressures of around 35 p.s.i. were encountered after penetrating only one metre of the sand sequence. Besides the main artesian aquifer no other aquifer was intersected in this hole. A detailed chemical analysis of water from the hole is enclosed in Appendix II.

355 located E of 355

Drill hole EL346/1, located one kilometre northeast of Wangianna Creek Railway Siding, intersected a monotonous sequence of grey shales and siltstones of the Marree Shale, with minor bands of limestone and silty sand bands, passing into sands about 3-4 metres thick of basal Cretaceous age constituting the aquifer at 125 metres. The hole was plugged at 137 metres in basement of

hard grey quartzites of Adelaidean age. The bore showed that the artesian aquifer pinches out very rapidly towards the rim of the basin.

355 located E of 355

Drill hole EL346/2, located six kilometres west of Marree, intersected a more varied sequence of Marree Formation consisting of shales and siltstones with various bands of limestones containing fossil fragments, and minor greywackes, and basal pyritic sand, partly carbonaceous and lignitic, which constitutes the main Cretaceous aquifer around Marree. The hole was plugged in basement of dark grey quartzite of Adelaidean age. No water sample was collected, because of the inability to control the flow of water.

Conclusions and Recommendations

The detailed field investigations and drilling carried out in Exploration Licences 346 and 355 failed to define any economic targets for sodium bentonite clays, trona or sodium carbonate brines. In view of these results, it is recommended that the joint venture agreement with CGFAL and UMC be terminated and that the South Australian Department of Mines and Energy be advised of this recommendation.

References

Forbes, B.G., 1963: Gypsum in the Marree region. Quarterly Geol. Notes No. 8, Geol. Surv. S. Australia.

Forbes, B.G., 1966: The geology of the Marree 1:250 000 Map Area. S. A. Mines Dept. Rept. of Invest. 28.

Johnson, W., 1957: Artesian water supply for the Marree-Birdsville stock route in the vicinity of Marree. S.A. Dept. Mines Min. Rev. 106, p. 14.

Kerr, D.S., 1963: Hydrology of the Great Australian Artesian Basin in South Australia, a preliminary report. S.A. Dept. Mines Rept. Bk. 57/52 (unpubl.).

Moore, G.P., 1978: Quarterly Report E.L. 355. to S.A.M.D. CGFAL.

000053

STATEMENT OF EXPENDITURE

EXPLORATION LICENCE ~~355~~ 346

The following expenditure was incurred during the quarter ending 12th November, 1978 on Exploration Licence ~~355~~. 346

Geologists' salaries	1 500.00
Field assistants' salaries	600.00
Vehicle expenses	500.00
Camp costs	900.00
Drilling	5 087.00
Logging	1 200.00
Maps, reports, drafting	100.00
Administration	200.00
	$10 087.00

APPENDIX I

Composite Drill Logs

APPENDIX II

Chemical Analyses

000056

amdel
The Australian Mineral Development Laboratories
Flemington Street, Frewville, South Australia 5063
Phone Adelaide 79 1662, telex AA 82520

Pilot Plant: Osman Place, Thebarton, Sth. Aust.
Phone Adelaide 43 8053
Branch Offices: Perth and Sydney
Associated with: Professional Consultants Australia Pty Ltd.

Winner of Award for Outstanding Export Achievement, 1975

Please address all correspondence to Frewville.
In reply quote: AC 3/1/4/0. - 3142/79

PART REPORT 1

NATA CERTIFICATE

14 February 1979,

Mr. S. K. Chaku,
Comalco Limited,
P.O. Box 20,
PLYMPTON S.A. 5038.

REPORT AC 3142/79

YOUR REFERENCE:	Reference No. OL204.
IDENTIFICATION:	As listed.
DATE RECEIVED:	1 February 1979.

Enquiries quoting AC 3142/79 to the Manager please

D. K. Rowley
Manager
Analytical Chemistry Division

for Norton Jackson
Managing Director

dg

000057

WATER ANALYSIS REPORT

AMDEL COMPUTER SERVICES

SAMPLE ID. SKC/355/1

JOB NO. 3142-79

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	12	.6
MAGNESIUM	(MG)	3	.2
SODIUM	(NA)	840	36.5
POTASSIUM	(K)	12	.3
IRON	(FE)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO3)		
BICARBONATE	(HCO3)	1076	17.6
SULPHATE	(SO4)	14	.3
CHLORIDE	(CL)	629	17.7
BROMIDE	(BR)		
FLUORIDE	(F)		
NITRATE	(NO3)	<1.0	
PHOSPHATE	(PO4)		

TOTALS AND BALANCE

CATIONS (ME/L)	37.7	DIFF =	2.0
ANIONS (ME/L)	35.7	SUM =	73.4

DIFF*100. / SUM = 2.8 %

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 3472.

	MILLIGRAMS PER LITRE MG/L
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	2039.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	42.
CARBONATE HARDNESS AS CACO3	42.
NON-CARBONATE HARDNESS AS CACO3	<1.
TOTAL ALKALINITY AS CACO3	882.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

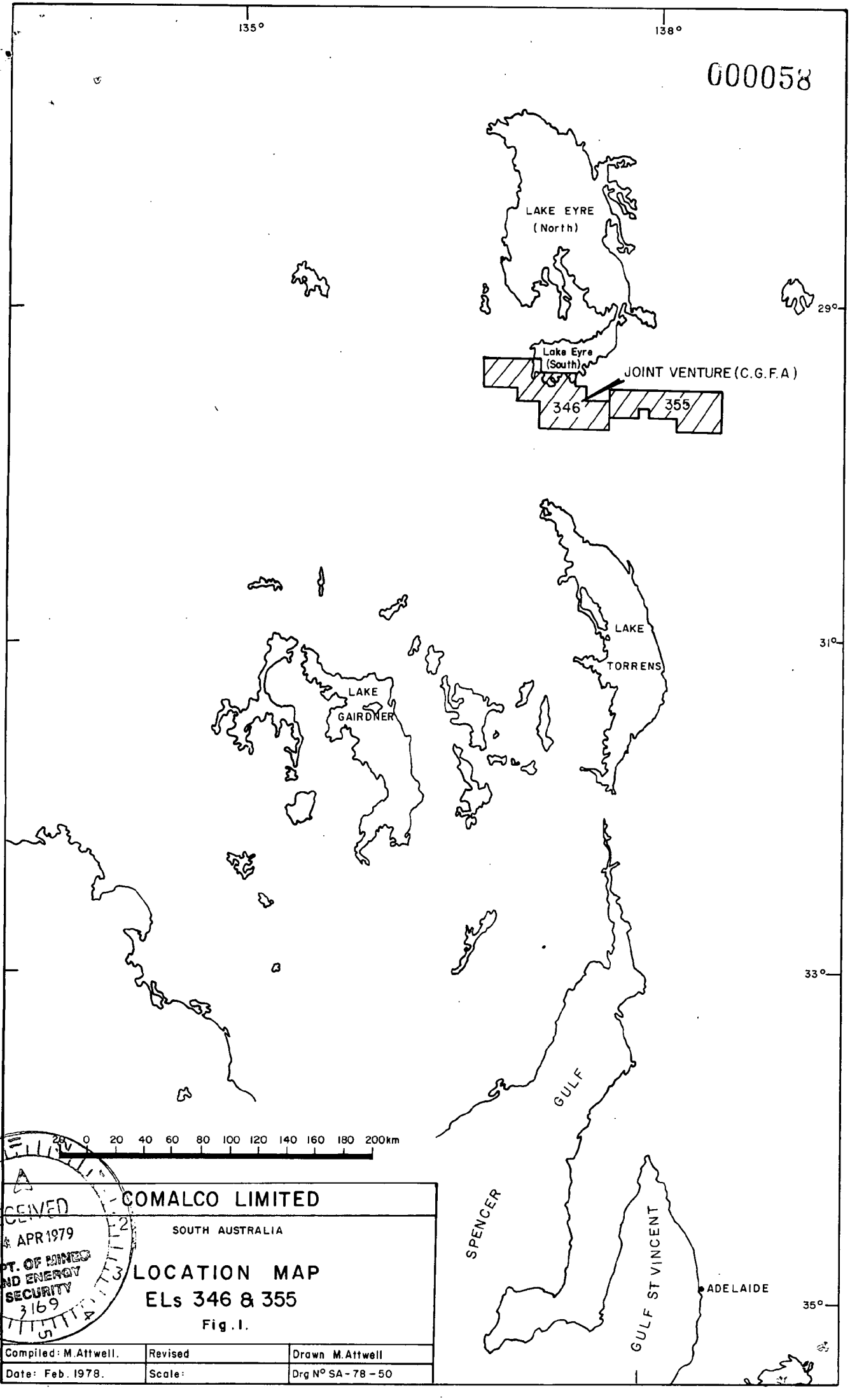
	UNITS
REACTION - PH	8.0
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	96.9 %

REMARKS

NAME- COMALCO LTD
ADDRESS-P.O. BOX 20
PLYMPTON SA. 5038
ATTN S K CHAKU
DATE COLLECTED
DATE RECEIVED

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-



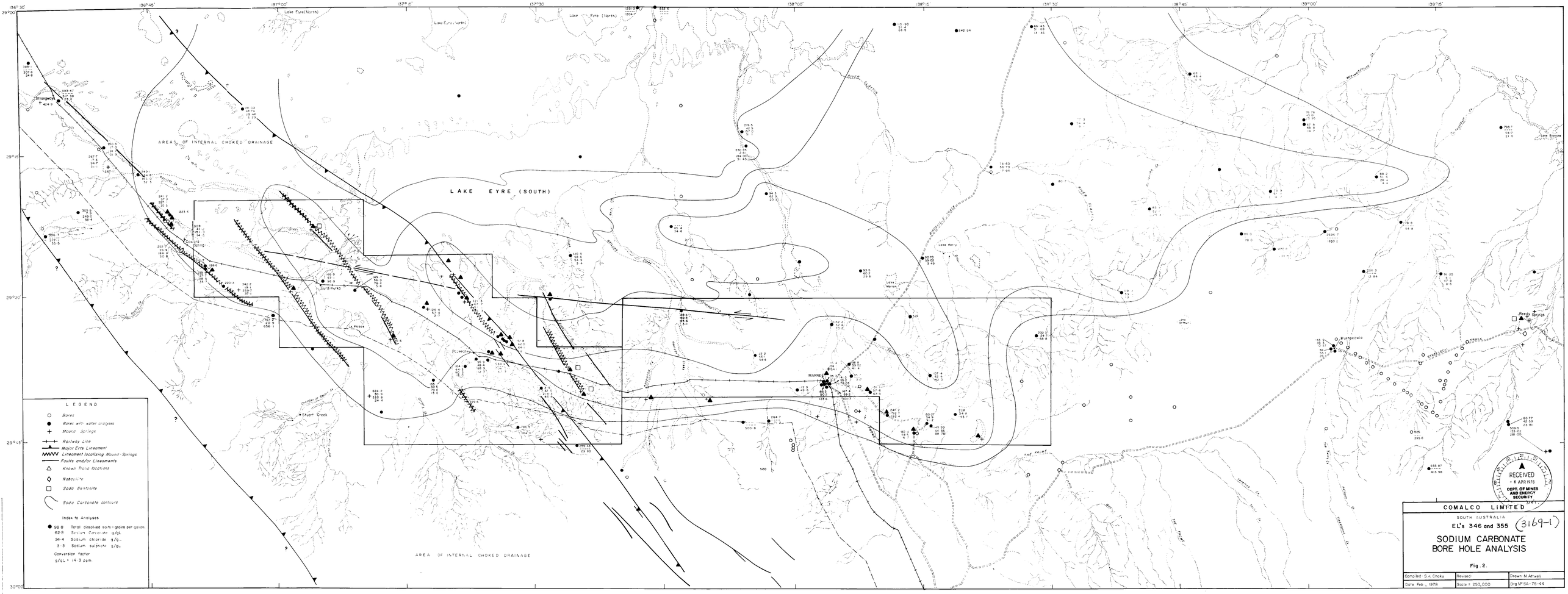
COMALCO LIMITED

SOUTH AUSTRALIA

LOCATION MAP
ELs 346 & 355

Fig. 1.

Compiled: M. Attwell.	Revised	Drawn M. Attwell
Date: Feb. 1978.	Scale:	Drg N° SA-78-50



LEGEND

- Bores
- Bores with water analyses
- Mound springs
- Railway Line
- Major Eyre Lineament
- Lineament localizing Mound Springs
- Faults and/or Lineaments
- Known Trivia locations
- Nobcuvite
- Soda Bentonite
- Soda Carbonate contours

Index to Analyses

- 98·8 Total dissolved salts - grains per gallon
- 62·8 Sodium Carbonate g/gL
- 24·4 Sodium chloride g/g..
- 3·5 Sodium sulphate g/gL

Conversion factor g/gL = 14·3 ppm

COMALCO LIMITED

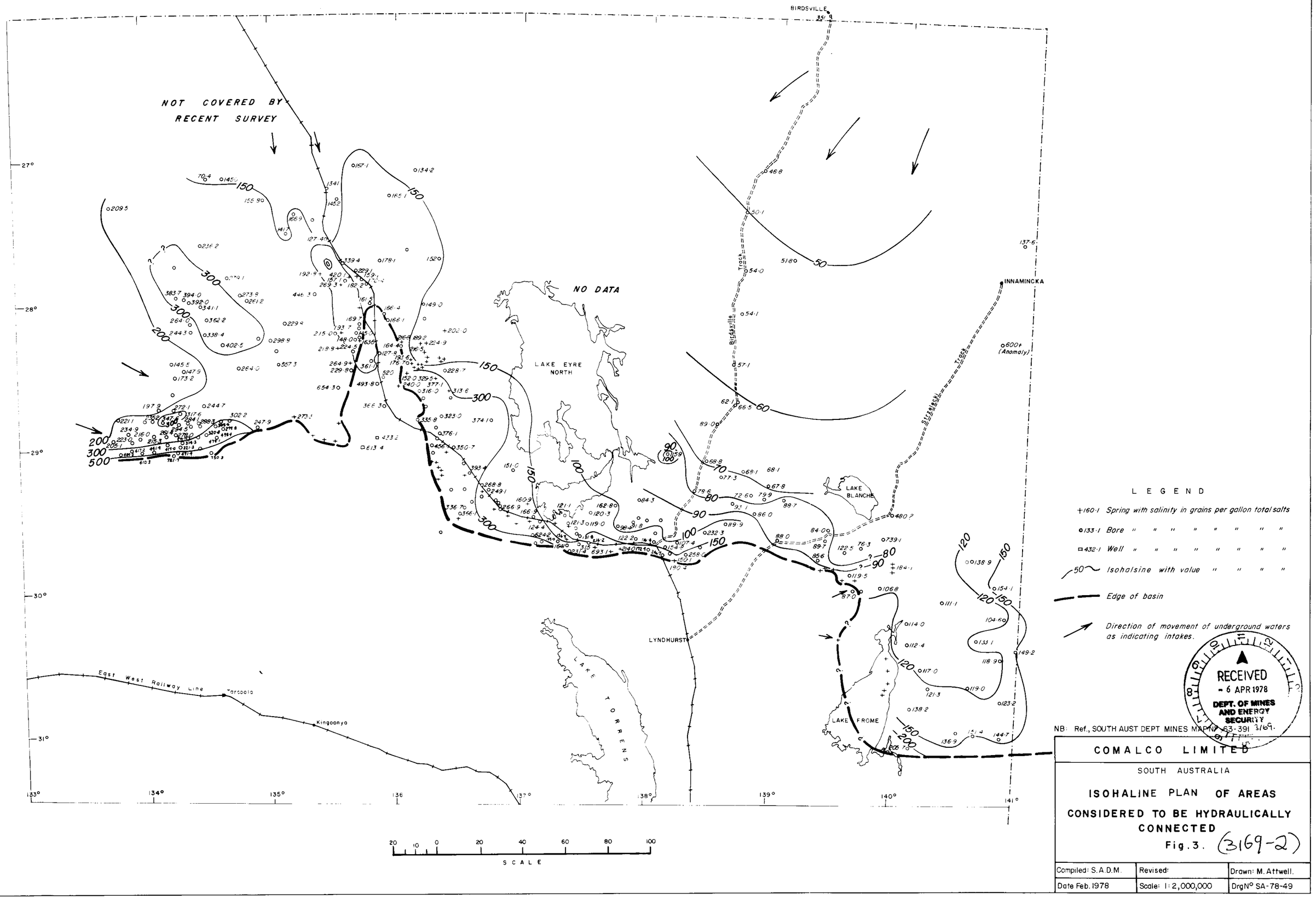
SOUTH AUSTRALIA

EL's 346 and 355 (3169-1)

SODIUM CARBONATE BORE HOLE ANALYSIS

Fig. 2.

Compiled: S. K. Choku	Revised	Drawn: M. Attwell
Date: Feb., 1978	Scale 1: 250,000	Drg No SA-78-44



L E G E N D

+160·1 Spring with salinity in grains per gallon total salts

o133·1 Bore " " " " " " " "

□432·1 Well " " " " " " " "

50 Isohalsine with value " " " "

Edge of basin

Direction of movement of underground waters as indicating intakes.

NB: Ref., SOUTH AUST DEPT MINES MAP No 63-391 3169.

COMALCO LIMITED

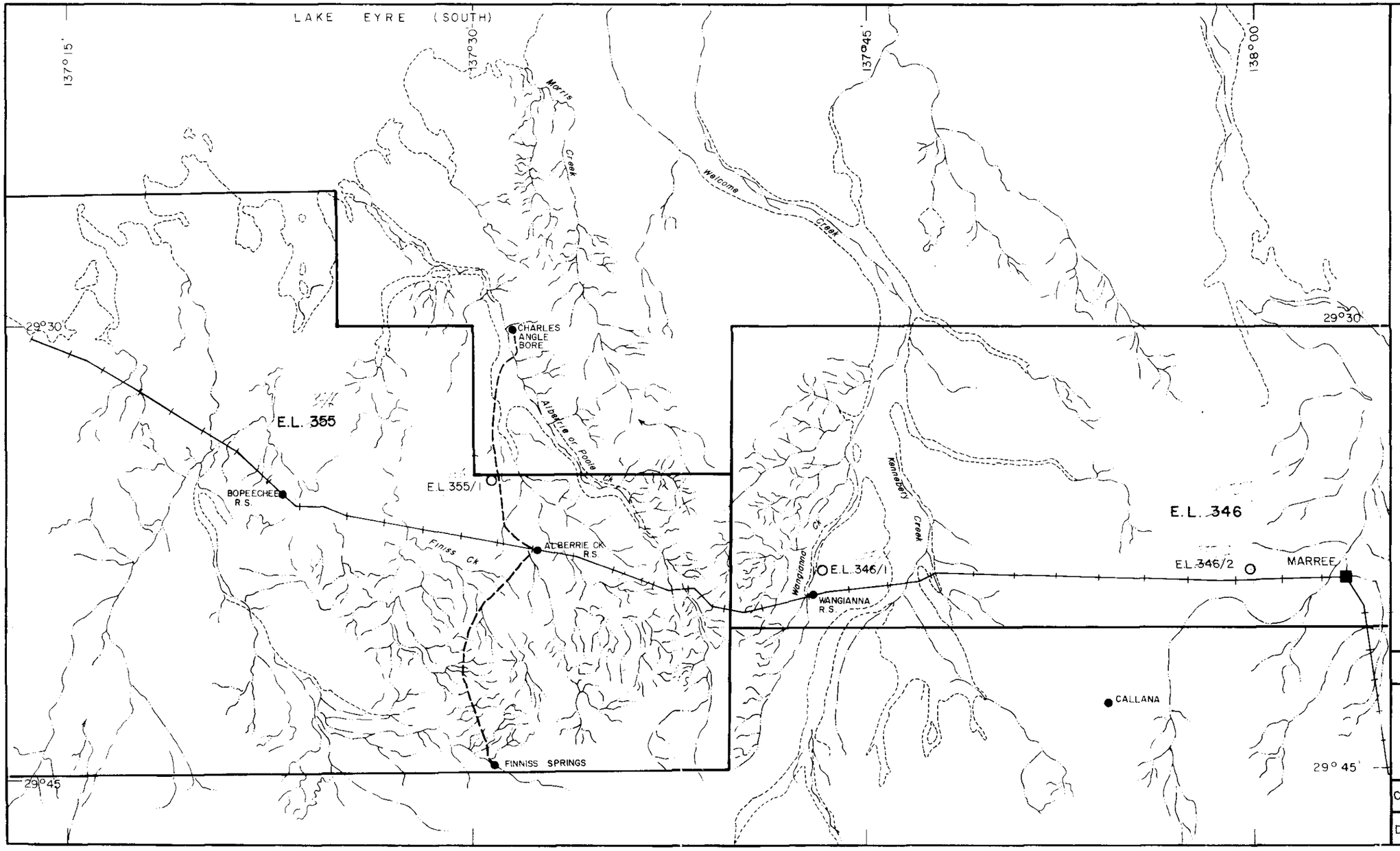
SOUTH AUSTRALIA

ISOHALINE PLAN OF AREAS CONSIDERED TO BE HYDRAULICALLY CONNECTED

Fig. 3. (3169-2)

Compiled: S.A.D.M.	Revised:	Drawn: M. Attwell.
Date Feb. 1978	Scale: 1:2,000,000	DrgN° SA-78-49

LAKE EYRE (SOUTH)
Lake Eyre (North)
AREAS OF INTERNAL CHOKED DRAINAGE
AREA OF INTERNAL CHOKED DRAINAGE
Strangways
Coward Spring
Curdimurka
Bopeechee
Stuart Creek
MARREE
Lake Harry
Lake Arthur
Mundowdna
Murnpeowie
Lake Blanche
THE FROME
LEGEND
Bores
Bores with water analyses
Mound Springs
Railway Line
Major Erts Lineament
Lineament localizing Mound-Springs
Faults and/or Lineaments
Known Trona locations
Nahcolite
Soda Bentonite
Soda Carbonate contours
Index to Analyses
98·8 Total dissolved salts - grains per gallon.
62·8 Sodium Carbonate g/gL
24·4 Sodium chloride g/gL
3·5 Sodium sulphate g/gL
Conversion factor
g/gL = 14·3 ppm.
COMALCO LIMITED
SOUTH AUSTRALIA
EL's 346 and 355
SODIUM CARBONATE
BORE HOLE ANALYSIS
(3169-3)
Fig. 2.
DEPT. OF MINES AND ENERGY SECURITY 3169
Compiled: S.K. Chaku
Revised:
Drawn: M. Attwell
Date Feb., 1978
Scale 1: 250,000
Drg No SA-78-44



E.L. 346/1 — Drill hole locations

Railway line

R.S. — Railway siding

COMALCO

SOUTH AUSTRALIA
E.L. 346 and 355

DRILL HOLE LOCATION MAP

(3169-4)

Compiled: S.K.C.	Rev	Drawn: S. H.
Date: January, 1979	Scale 1:250,000	Drg. No: SA-79-140

(3169-5)

COMALCO

SOUTH AUSTRALIA

GREAT ARTESIAN BASIN

E.L. 355 [illegible]

COMPOSITE WELL LOG - DRILL HOLE E.L.355/1

Compiled: S.K.C.	Revised:	Drawn: S. H.
Date: March, 1979	Scale: 1 : 200	Drg No: SA / 79 / 152

Location: Latitude: 29° 30° 34" 30" S

Longitude: 137° 30' 30" E

Date Spudded: 23 - 11 - 78

Date completed: 24 - 11 - 78

Drilled by: Thompson Drilling Co.

Drill: Mayhew 1000

Well site Geologist: S.K. Chaku/G.Cucuzza

Logged by: Geoscience Associates

Logging unit: A.L. - 7

Logger: R. Waldron

Elevation: m a.s.l.

Casing: 5" P.V.C. 0 - 30 m

Hole diameter: 8" from 0 to 30 m; 4 3/4 from 30 to T.D.

Logs run:	S.P.	Resistivity		Gamma ray	Density
Logged depth:	155 m	Not run due to malfunction of panel		154 m	
S.P. scale:	080	Resistivity scale:	Range (Full scale):	200	Background count 16 cps
Paper speed:	1 cm/m			1 cm/m	
Logging speed:	9 m / min			9m / min	
Probe size:	2"			2"	
Type:	3/4" x 1"			3/4" x 1"	
Bias:	080			Probe number:	326
				Time constant:	2
				Standard (cps):	4495
				Dead Time:	6
				Amp gain:	600
				Rotameter No:	906
				K factor:	3.9 x 10^{-6}
Bore Hole medium:	B.H.T.			Rmf: ohms at °C	Rm: ohms at °C

Digital readout:

Time base (sec)

Sand / sandstone

Silt / siltstone

Diatomite

Clay / claystone

Limestone / Lime / mud

Gravel / conglomerate

Lignite / coal

Sandy / silty / clayey

Calcareous

py - pyritic; qtz - quartzose; fld - feldspathic; lit - lithic; mic - micaceous; carb - carbonaceous

Gy - gypsum

g - glauconite

f - fossil and shell fragments

BIT TYPE: Hughes Blue Devil

CASING & PLUGS: P.V.C. casing; Hole plugged with 40 bags of cement

LITHOLOGY & SEEPAGE LOG

DEPTH (m)

INTERPRETED LITHOLOGY

S.P. | RESISTIVITY | GAMMA RAY | ρs (DENSITY)

0 40 60 80 cps

S.P. out of fluid

LITHOLOGICAL DESCRIPTION

STRATIGRAPHIC COLUMN

Quaternary, clayey sand

Grey to light grey siltstone in parts sandy, with Fe mottling in top ten metres. Minor bands of grey, lime mudstone and Gypsum

Grey, pyritic, fine grained sandstone

Grey to greenish grey claystone, in parts silty

Mod hard grey limestone

Grey to greenish grey, silty claystone - towards top grading into a claystone - with minor bands of silty sandstone, in places pyritic

Fine grained silty sandstone - pyritic

Claystone (as above), with possible bands of limestone

Mod hard grey limestone

Greenish grey claystone, with fossiliferous limestone and gypsum

Mod hard grey limestone

Claystone with considerable calcite veining / or calcite

Claystone as above

Grey sandy siltstone, glauconite

Greenish grey claystone

Grey, fine grained, sandy siltstone / silty ss

Greenish grey claystone in parts, sandy / silty

Fine to medium grained, clean quartz sands, pyritic

Marree Formation

Cretaceous

Jurassic - Lower