DEPARTMENT OF MINES

SOUTH AUSTRALIA

GYPSUM DEPOSIT - HD. MELVILLE, SECS. 72-74, 78.

(Pitt Limited)

by

R.K. Johns

SENIOR GEOLOGIST

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INTRODUCTION

On March 18th-19th, 1958 samples were taken by means of a post hole auger from the floor of a saline lake situated in Hd. Melville, sections 72, 73, 74 and 78, 3½ miles by road west south west of Yorketown on Southern Yorke Peninsula (See locality plan).

The samples were submitted to the Metallurgical Laboratories of this Department for determination of recoverable gypsum. The whole of each sample was washed by hand and the crystalline gypsum freed from slimes was assayed.

GEOLOGICAL SETTING

The lake tested is one of many situated on lower Yorke Peninsula which have been hollowed out of a superficial cover of sand, alluvium, travertine and Tertiary limestone which overlie an impervious floor of Permian fluvioglacial sediments. The lakes probably owe their formation to the combined agencies of wind erosion and groundwater solution of the limestone.

Low cliffs up to 10 feet in height flank the southern and northern shores of the lake and these show sandy clays over a crust of travertine. Scree material conceals the strata under the travertine but they are probably clays. Near the floor of the lake on the southern shore is a local outcrop of fossiliferous limestone.

Erratic boulders derived from the Permian till are littered near the southern shore of the lake and here consist of granitic, basic and hornfelsic rocks.

LAKE GYPSUM DEPOSITS

Boring has proved that gypsum bearing muds are present over the entire lake bed under a layer of salt and mud.

Salt has developed over the floor of the lake and occurs in crusts one inch thick to thin films at the margins; the salt would average perhaps a little less than one half inch in thickness overall. The salt will support the person when about one half inch thick.

Underlying the salt is a thin layer of soft black muddy ooze which varies from thin films to over three inches in thickness but in the boreholes it averaged two inches.

Under this ooze gypsum bearing muds occur - the gypsum zone varying from less than three inches thick near the lagoon margins to over nine inches over the lagoon proper, the overall average being about 9 inches. It was estimated at the time of the inspection that in situ gypsum made up at least 75% of this zone, the gypsum occurring as masses of flat to lens shaped crystals standing on edge within the mud matrix and decreasing in crystal grain size with depth. The crystals when washed clean of the enclosing black mud are mostly transparent though some show a little included mud. The topmost three inches of this zone is made up chiefly of gypsum crystals varying in size from discs up to two inches in diameter and up to three quarters of an inch thick and grading down in size to a mesh of crystals less than one quarter inch in diameter and of wafer thickness. The bottom one to two inches of this stratum consists of fine granular gypsum which would probably be unrecoverable in a washing process.

The gypsum stratum is underlain by dark blue-green clays which are soft and almost free of gypsum.

TESTING

A number of holes were drilled over the lake floor using a post hole auger and spade and these showed a fairly uniform assemblage throughout. The location of the boreholes is indicated in the accompanying plan enlargement.

The floor of the lake is at present covered by brine which is up to six inches deep. On the two succeeding days of the inspection the prevailing wind direction was from the south and the north and this served to bank the waters up at the northern and

southern ends of the lake respectively. The presence of water served to make the taking of samples difficult especially where soft muds were penetrated as they were not easily recoverable with the auger when inundated.

(1) Logs of boreholes.

Tabulated below are logs of the holes drilled - all were taken through the gypsum horizon and were completed in green-blue clay.

Bore No	Salt (inches)	Black ooze(ins.)	Gypsum(ins)
A1	½	-	3
A2	½	1½	6
A3	¾	2	9
A4	¾	¾	9
A5	¾	¾	9
A6	¾	1½	9
A7	¼	2	9
A8	nil	3	9
A9	thin film	3	9
A10	½	2	9
B1	½	2	6
B2	1	1½	6
B3	1	-	6
B4	½	1½	9
B5	¼	1½	9
B6	½	1	6

(2) Metallurgical separation and assay.

The whole of each sample was treated by the Research and Development Branch under the guidance of D.W. Read, Chief Metallurgist. The samples were washed thoroughly by hand and the crystalline gypsum washed free from slimes though some difficulty was experienced in separating the sticky black mud from the gypsum crystals.

The feed assays quoted were obtained by calculation as the nature of the material made it impracticable to cut out a represent-

ative sample.

Sample No.	Fraction	Weight %	Assay $CaSO_4 \cdot 2H_2O$	Approx. Moisture content of sample %
A1	Gypsum	73.5	86.0	
	Slimes	26.5	2.65	
	Feed	100.0	63.9	68
A2	Gypsum	72.1	98.0	
	Slimes	27.9	6.6	
	Feed	100.0	72.5	60
A3	Gypsum	58.0	99.0	
	Slimes	42.0	9.6	
	Feed	100.0	61.5	63
A4	Gypsum	56.5	98.6	
	Slimes	43.5	20.7	
	Feed	100.0	64.7	65
A5	Gypsum	64.4	98.2	
	Slimes	35.6	13.6	
	Feed	100.0	68.1	65
A6	Gypsum	73.6	99.1	
	Slimes	26.4	21.6	
	Feed	100.0	78.6	64
A7	Gypsum	71.4	99.4	
	Slimes	28.6	35.3	
	Feed	100.0	80.6	65
A8	Gypsum	66.7	99.7	
	Slimes	33.3	19.4	
	Feed	100.0	73.0	55
A9	Gypsum	68.4	99.0	
	Slimes	31.6	27.9	
	Feed	100.0	76.5	59

Sample No	Fraction	Weight %	Assay $CaSO_4.2H_2O$	Approx. moisture content of sample %
A10	Gypsum	63.5	99.4	
	Slimes	36.5	54.0	
	Feed	100.0	82.8	61
B1	Gypsum	76.6	98.6	
	Slimes	23.4	10.3	
	Feed	100.0	77.9	68
B2	Gypsum	69.5	98.9	
	Slimes	30.5	16.0	
	Feed	100.0	73.6	60
B3	Gypsum	64.5	99.3	
	Slimes	35.5	19.3	
	Feed	100.0	70.9	59
B4	Gypsum	61.3	98.0	
	Slimes	38.7	22.1	
	Feed	100.0	68.6	62
B5	Gypsum	69.3	99.1	
	Slimes	30.7	8.9	
	Feed	100.0	71.4	63
B6	Gypsum	46.7	99.3	
	Slimes	53.3	11.5	
	Feed	100.0	52.5	39

CONCLUSIONS

In order to compute reserves of gypsum the lake was assumed to have a radius of 300 yards and the depth of gypseous strata to be 9 inches. Assuming that one ton of gypsum occupies 18 cub. ft. and that 70% of the zone is recoverable as gypsum the reserves are estimated to be 21,000 tons.

Some difficulty was experienced in the separation of the gypsum crystals from the enclosing mud and it would appear that

simple sluicing would be inadequate to effect a satisfactory separation.

The material is high grade and contains up to 99.7 $CaSO_4 \cdot 2H_2O$.

Mining of the deposit on such a soft bottom in the presence of water is expected to present difficulties.

Whether the deposit can be economically exploited at the present time depends on satisfactory mining and separation of the product and though the gypsum is of high grade it is doubtful whether its recovery from such a thin bed can be made.

Other lakes in this district were not examined but they are expected to be similar to that investigated as regards mode of occurrence, grade etc.

RKJ:CERF
2.7.58

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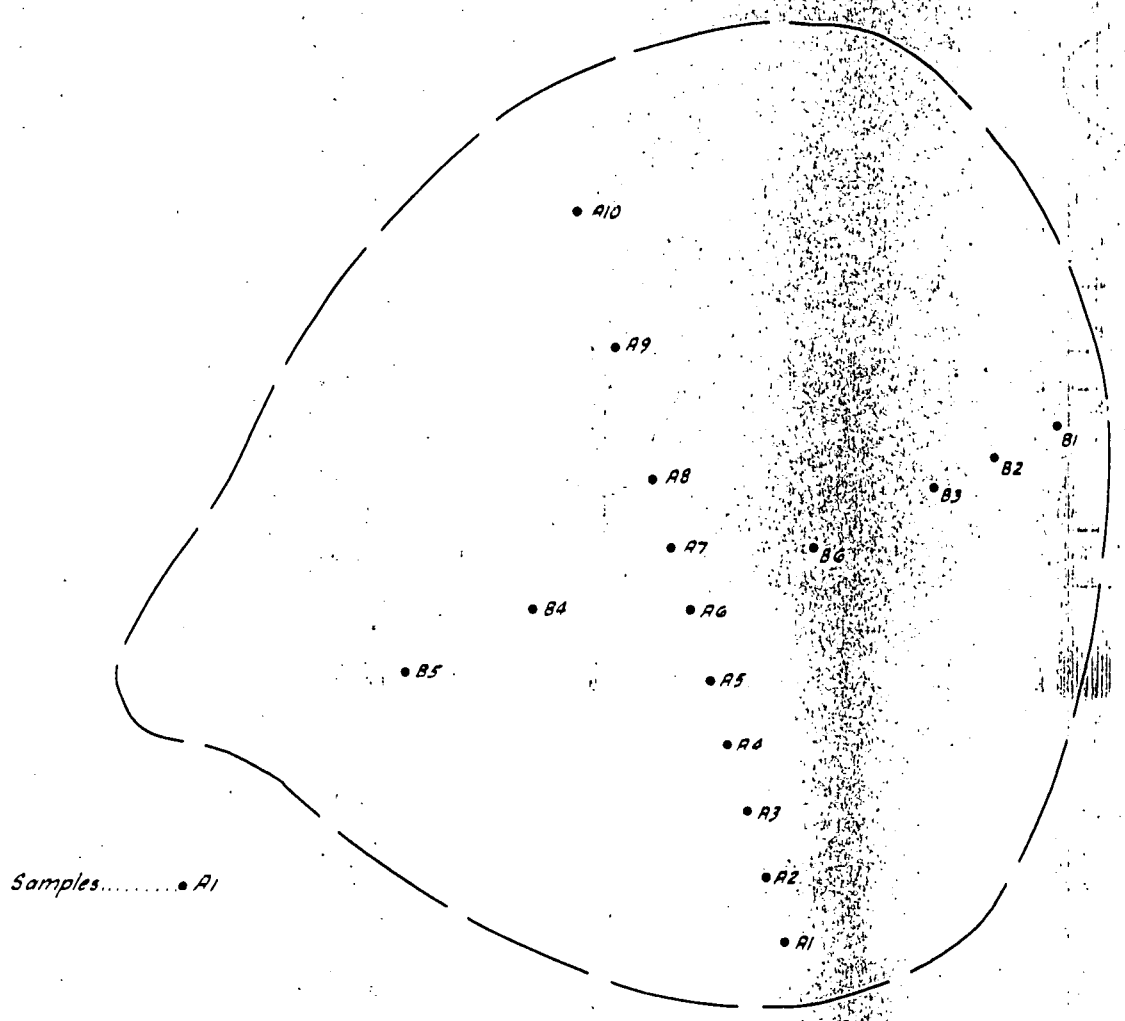
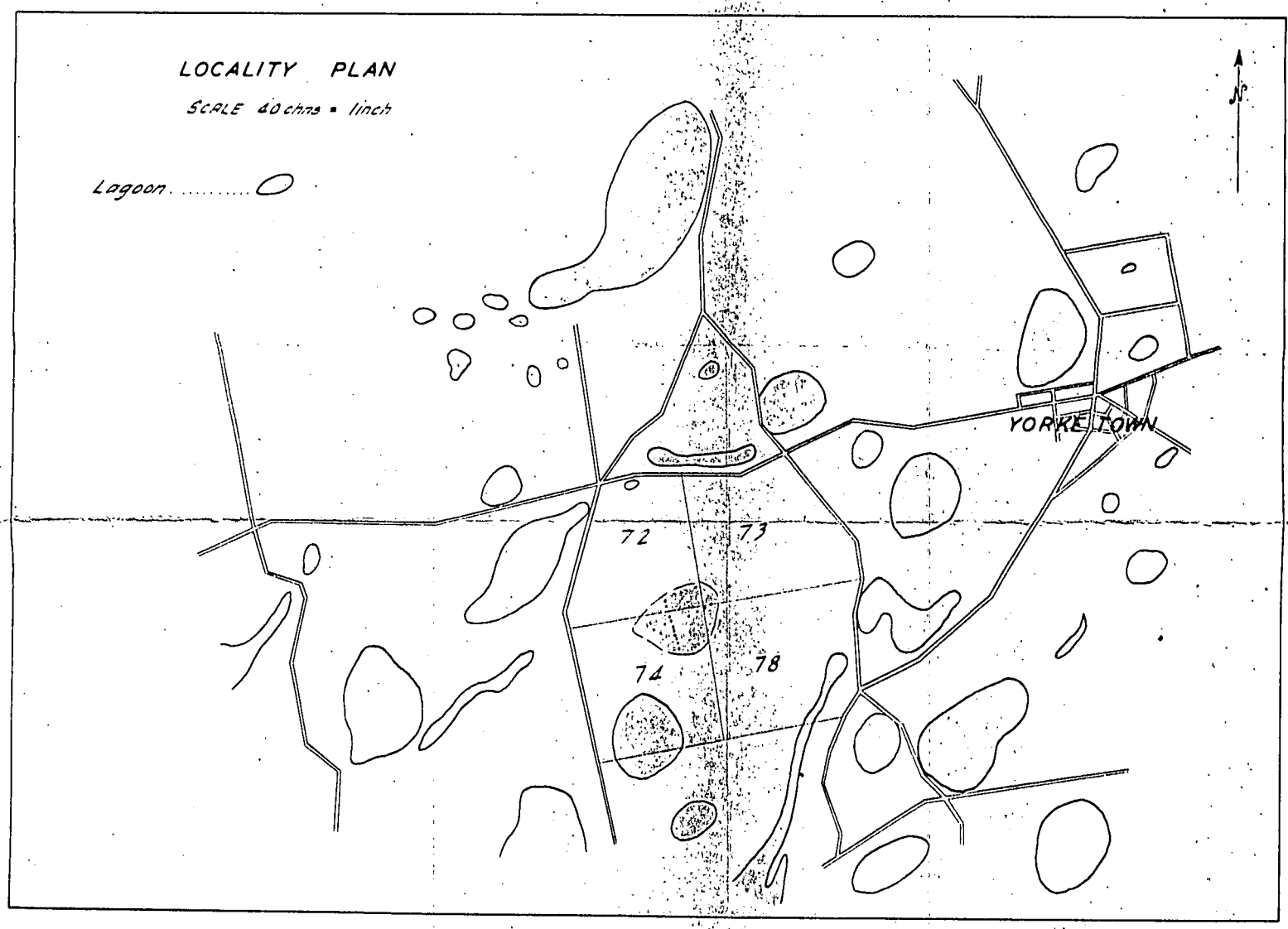


ENLARGED PLAN OF LAGOON

SCALE 100 yds. = 1 inch



To accompany report by R. K. Johns

S.A. DEPARTMENT OF MINES

GYPSUM DEPOSIT
HD. MELVILLE SECS. 72, 73, 74 & 78
(PITT LTD.)

No.	Amendment	Ext.	Date

Approved ____ Director

Passed

Drn. A W
Cert. R.R
Ext.

Scale: 50 - 54 G.S 16

Date 25-9-58