

DEPARTMENT OF MINES
SOUTH AUSTRALIA

RB 67/22

DIAMOND-DRILLING OF PENRICE MARBLE DEPOSIT 1966
PROGRAMME

Sections 349, 1741, Hd. Mooroeroo, Co. Light

- I.C.I. Alkali (Aust.) Pty. Ltd. -

by

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NON-METALLICS SECTION

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ILLUSTRATIONS

<u>Plan No.</u>	<u>Title</u>	<u>Scale</u>
L68-23	Marble Deposit-Penrice Secs.303, 349, 1740 and 1741, Hd. Mooroeroo.	1 in. = 100ft.
68-492	Marble Deposit-Penrice, Secs.303, 349, 1740 and 1741, Hd. Mooroeroo, Cross Sections.	1 in. = 100ft.

Rept. Bk. No. 67/22
G.S. No. 4051
D.M. No. 567/66

30th July, 1968.

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1966 PROGRAMME

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ABSTRACT

In a continuing diamond-drill programme designed to define the quality of quarried marble, four inclined holes totalling 1,056.3 ft. were drilled for the Company in 1966. The marginal zone of inferior-grade material (below 95% CaCO_3) which has been defined previously was intersected as expected in two holes, and within about 60 feet in the other two. Reserves are not affected by these changes.

INTRODUCTION

The I.C.I. Alkali (Aust.) Pty. Ltd. quarries high-grade marble from a deposit situated on Sections 303, 349, 1740 and 1741, Hd. Moorooroo, at Penrice near Angaston. The stone, used in the manufacture of chemicals at the Company's plant at Osborne, must have a CaCO_3 content of not less than 95%. Stone from the middle of the bed fulfils this requirement, but towards the margins the marble is contaminated by calc-silicate minerals, and the Company uses diamond-drilling to define the cut-off boundary prior to quarrying.

This report describes the results of drilling four diamond-drill holes, during the period 19th July to 13th September, 1966. A total of 1,056.3 ft. was drilled in holes number 107-110 located on the eastern margin of the quarry. The core was split at Penrice and analysed at the Company's laboratories while some samples were submitted to the Australian Mineral Development Laboratories (AMDEL) for petrographic investigation. Results of the chemical and petrographic analyses appear in Appendices 1 and 2 respectively.

As a result of the drilling the limits of workable marble have been defined more accurately, as shown on the accompanying plan L68-23. The plan has been redrawn to incorporate all available information, showing quarry faces on 21st June, 1966.

PREVIOUS REPORTS

The Angaston district was first mapped in detail by J.D. Campbell in 1945 for the I.C.I.A.N.Z. Pty. Ltd, who in investigating the site of the present quarry, mapped it on a scale of 1 in. to 100 ft.

Miles (1949) supervised a diamond-drilling programme recommended by Campbell, which was later extended. Some 62 holes were drilled to the end of 1949 and logs and analyses of cores from all holes except numbers 46, 50, 54 and 57 are appended to that report. The location of these holes is shown on the present plan.

In 1964 the quality of marble fell below grade. Three holes (numbers 101, 102, 103), drilled by the Department of Mines showed this to be due to overbreak and the inclusion near the margins of the bed of lower-

grade marble containing calc-silicate minerals (Cramsie, 1967). In 1965, a further four holes (104 to 107) were drilled (Cramsie, 1965).

GEOLOGY

The regional geology of the Angaston area has been described in detail by Campbell (op.cit.) and Miles (op.cit.). The following is a short account of the site geology, as covered by the present plan. At the time of writing, stratigraphic names for the area have not been formalised. The name "Penrice Bed", as used by Campbell, is therefore retained for this report.

The pre-Recent geological succession, from youngest to oldest, is as follows: All the rocks are thought to be of Cambrian age.

<u>Lithology</u>	<u>Approximate thickness</u>
Mica schist with lenses of marble micaceous shale and sandstone and calcareous, micaceous gneiss.	100 ft. +
"Penrice Marble Bed".	400-1,000 ft.
Mica schist.	100-500 ft.
Marble and black limestone.	400 ft.
Sandstone, shale and mica schist.	250 ft. +

The rocks have been folded into an anticline with characteristic V-shaped outcrops. In addition, the whole block of country has been tilted some 45° southwards so that the beds in the vicinity of the nose of the fold dip very steeply. On the eastern limb of the fold, the "Penrice Marble Bed" has been overturned in places.

For the purposes of quarrying, the "Penrice Marble Bed" has been divided into a high-grade central zone, the division being taken at 95% CaCO_3 . In a few cases the

cut-off point of the high-grade zone has been extended to include a small amount of lower-grade material, so that a substantial amount of above-grade stone lying behind the low-grade material could be quarried.

The central, high-grade zone which is 100-300 ft. thick in the quarry area consists of a hard coarse-grained marble made up of interlocking crystals of calcite. The marble varies in colour from white to pale pink and pale grey, the latter apparently due to the presence of a few percent of brown and green mica and pyrite.

Zones of marginal grade crop out on both sides of the high-grade zone. This marble is darker because it contains more impurities. On the eastern side it contains lenses of mica schist, micaceous sandstone and micaceous shale. It ranges in width from 50-250 ft.

RESULTS OF DIAMOND-DRILLING

Four diamond-drill holes, inclined at 25° to the horizontal, were drilled in 1966 to define more accurately the marginal zone near the eastern edge of the quarry, particularly at the level of the present quarry floor. (Approx. R.L.1260). A total of 1,056.3 ft. was drilled, with a 90% core recovery, despite an almost total loss of drilling water over some intervals.

Good core recovery enabled the compilation of detailed logs (see Appendix 3) which are summarised below. Footages are given to the nearest whole number.

Hole 107

0 - 170 ft.	<u>Marble</u> , white to pale pink and grey, massive to lightly banded.
170 - 177 ft.	<u>Hornfels</u> , scapolite-phlogopite, medium grey.
177 - 201 ft.	<u>Marble</u> , white to grey, massive to banded.
201 - 211 ft.	<u>Schist</u> , scapolite-phlogopite, blue grey.

End of hole 211.1ft.

Hole 108

- 0 - 276 ft. Marble, white to grey, pink and yellow brown,
mainly massive.
- 276 - 277 ft. Hornfels, scapolite-phogopite, medium grey.
- 277 - 300 ft. Marble, grey, massive to strongly banded.

End of hole 300.0 ft.

Hole 109

- 0 - 299 ft. Marble, white to medium grey, pale brown and
pink.
- 229 - 230 ft. Sandstone, fine-grained, micaceous, non-
calcareous.

End of hole 230.0 ft.

Hole 110

- 0 - 30 ft. Marble, white to light grey, massive.
- 30 - 46 ft. Marble, brown, with ironstone 39.5-41.0 ft.
- 46 - 140 ft. Marble, white to light grey, massive.
- 140 - 315 ft. Marble, white to light grey, massive to
banded ending in 0.7 ft. of slightly
calcareous ironstone.

End of hole 315.2 ft.

Within the confines of the upper quarry face and
RL.1260, there is thought to be 1.3 million cu. yds. of
high-grade marble. The accuracy of the method is estimated
to be $\pm 20\%$.

CHEMICAL ANALYSIS

After logging, the core was split at Penrice, and
half submitted to the Company's laboratories at Osborne for
chemical analysis of CaCO_3 , MgCO_3 , Fe_2O_3 , Al_2O_3 . The complete
results, as supplied by the Company, are attached in Appendix 1.

The CaCO_3 values have also been plotted on the log-sheets (Appendix 3). Sample intervals were selected by the author on the basis of observable contamination.

In drill-hole 107, the first 60 ft. of core assayed 97.3% CaCO_3 . The next 37 ft. contained an average of 94.75% CaCO_3 . Beyond 97 ft. the grade deteriorated rapidly. The cut-off point is taken at 60 ft. In the vicinity of this hole the width of the high-grade zone as defined by Gramsle (1967) is reduced by about 60 ft. However, the 37 ft. of 94.75% CaCO_3 may be acceptable.

In drill hole 108 the cut-off point appears to be 145 ft. after which the grade is irregular.

Core from hole 109 is well above grade to 173 ft., where the cut-off point is taken; the next 43 ft. with 94.8% CaCO_3 may be acceptable.

In drill-hole 110 core between 23 and 46 ft. returned an average assay of 92.4% CaCO_3 . This section, containing an ironstone lode, can be by-passed during quarrying. The cut-off point is therefore taken at 205 ft. which is about 60 ft. to the east of the position given by Gramsle (1967). The width of the high-grade zone in the vicinity of this hole is thus increased, thereby compensating for the loss of reserves around hole 107.

SUMMARY

The I.C.I. marble quarry at Penrice is situated on the eastern limb of an anticline that pitches southwards at about 45° . In the quarry area the marble dips at $80^\circ - 90^\circ$ to the east and west. Above and below, the "Penrice Marble Bed" grades into mica schists through impure marble and calcareous hornfelses. The Company requires stone with a CaCO_3 content of 95% or greater.

In 1966, four inclined diamond-drill holes (total 1,056.3 ft.) were drilled in the eastern part of the quarry. The core was logged, split and partially analysed. Using a CaCO_3 content of 95% as cut-off value, the marginal zone of inferior-grade stone has been redefined.

RKT:JMM
30.7.68

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REFERENCES

- CAMPBELL, J.D. 1945. The Geology of the Angaston Marble Beds. Unpublished company report.
- CRAMSIE, J.N. 1965. Report on 1965 Programme of Diamond Drilling of Marble Deposits at Penrice, near Angaston. Unpublished Report, Rept. Bk. No. 62/90. S.A. Dept. Mines.
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- MILES, K.R. 1949. Diamond Drilling Marble Deposit at Penrice, near Angaston. Min. Rev. Adelaide, 88:103-134.

APPENDIX 1

Chemical analyses for CaCO_3 , MgCO_3 , $\text{Fe}_2\text{O}_3/\text{Al}_2\text{O}_3$,
holes 107, 108, 109, 110.

DRILL HOLE 107

Depth (feet)	CaCO ₃	MgCO ₃	Fe ₂ O ₃ /Al ₂ O ₃	Acid- Insolubles.
0-10	96.8	1.9	0.5	0.8
10-42	97.5	1.7	0.6	0.3
42-50	97.2	1.7	0.7	0.5
50-60	97.2	1.3	0.7	0.8
60-77	94.7	2.5	0.7	2.1
77-90	94.9	2.5	1.1	1.5
90-97	94.6	2.8	2.0	0.6
97-105	90.5	3.2	2.5	3.8
105-112	91.4	3.0	2.4	3.3
112-119	91.6	3.4	2.0	3.1
119-126	92.0	3.0	1.8	3.1
127-136	92.6	3.0	1.1	3.4
136-148	93.2	3.0	2.1	1.7
148-153.5	88.5	1.7	2.2	7.6
153.5-163	92.2	2.7	2.3	2.7
163-170	81.8	3.6	3.0	11.5

DRILL HOLE 108

0-17	95.6	1.7	1.7	1.0
17-28	96.2	1.7	1.1	1.0
28-48	96.0	1.1	2.3	0.6
48-57	95.9	1.3	1.8	1.0
57-69	97.5	1.3	0.6	0.6
69-83	97.2	1.7	0.5	0.6
83-107	97.5	1.7	0.2	0.7
107-125	97.3	1.7	0.5	0.6
125-145	97.5	1.3	0.6	0.6
145-155	93.9	1.9	2.2	2.0
155-172	94.4	1.7	2.2	1.7
172-179	94.4	1.5	3.0	1.1
179-202	94.5	1.7	1.8	2.1
202-215	95.6	1.5	1.8	1.1
215-229	93.7	1.7	2.6	2.0
229-240	93.1	1.7	1.7	3.4
240-255	89.8	2.1	4.6	3.5
255-268	96.4	1.3	1.5	0.8
268-276	95.8	1.5	1.4	1.3
276-288.5	85.8	2.5	2.6	9.1
288.5-296	66.6	4.2	6.3	22.9
296-300	79.7	5.1	3.4	11.8

Depth (feet)	CaCO ₃	MgCO ₃	Fe ₂ O ₃ /Al ₂ O ₃	Acid- insolubles.
0-18.5	97.9	0.8	0.8	0.5
18.5-25	98.1	1.1	0.5	0.4
25-37	97.5	0.8	1.1	0.5
37-56	97.7	1.3	0.5	0.6
56-62	97.4	1.3	0.5	0.8
62-80	97.5	1.5	0.5	0.6
80-100	97.7	1.5	0.2	0.6
100-120	96.4	1.7	0.7	1.2
120-140	97.3	1.3	1.1	0.4
140-160	96.8	1.3	1.7	0.3
160-173	97.3	1.3	0.7	0.8
173-185	94.0	1.5	1.2	3.3
185-195	95.7	1.3	1.3	1.8
195-205	94.6	1.9	2.1	1.5
205-216	95.2	1.7	2.3	0.8
216-228	93.2	2.1	1.5	3.3

DRILL HOLE 110

0-23	96.8	0.8	1.2	1.2
23-36	91.8	2.5	4.1	1.5
36-46	93.2	2.5	2.9	1.3
46-55	96.3	1.3	1.8	0.7
55-75	96.5	1.3	1.3	0.9
75-95	96.5	1.3	1.3	1.0
95-105	97.3	1.7	0.6	0.5
105-123	96.9	1.7	0.5	0.9
123-145	96.6	1.1	1.4	1.0
145-165	96.0	1.3	1.7	1.0
165-186	95.9	1.3	1.6	1.2
186-193	96.8	1.1	1.0	1.2
193-205	98.1	0.8	0.4	0.6
205-215	92.3	2.1	2.3	3.3
215-230	95.3	1.7	0.9	2.2
230-245	95.5	1.3	1.7	1.5
245-260	94.9	1.5	1.8	1.8
260-270	95.8	1.3	1.5	1.4
270-280	96.5	1.1	1.5	0.9
280-290	95.3	1.5	1.9	1.3
290-295	95.8	1.5	1.1	1.7
295-305	93.8	2.1	1.4	2.7
305-310	92.0	1.9	1.9	4.1
310-315	94.3	1.7	2.1	1.9

APPENDIX 2

Summary of AMDEL Petrological Report
MP1440-67 entitled -

"Some Metamorphosed Carbonate Rocks
from the Angaston Area, S.A."

by

G. Williams.

AMDEL Sample No.	Hole No.	Footage	Rock type	Calcite	Scapolite	Alkali feldspar	Quartz	Phlogopite	Sphene	Green Mica	Calcic Plagio- clase	Carbonate (not calcite)	Montmor- illonite	Opagues	Limonite	Ilmenite	REMARKS
P1211/66	107	163.25	Marble	60	15	5	15	2	3					acc			Core sample from this interval
P121/66		173	Hornfels	25	20		25	25	5					acc			
P1213/66		176-199	Marble	80	3	8	2	5	2					acc			
P1214/66		207	Schist	30	15		40	12	2					1			
P1215/66	108	295.5	Marble	50	6	4	20	12	2		acc	1		5			Opagues: ?pyrite Opagues: limonitic ? alteration product Quartz + phlogopite presumably 1% Green mica: ?biotite
P1216/66		297.5	Marble	60			20	20	acc					acc			
P1217/66	109	124	Marble	99			acc	acc									Montmorillonite on joints.
P1218/66	110	36	Marble	50						13		15		20		2	
P1219/66		190.5	Marble	90			4	6									
P1220/66		293	Marble	60	3	15	12	10	acc				acc		acc		
P1221/66		308	Marble	70	8		8	10	acc			4					

TABLE. Summary of mineralogy and approximate (visual) percentages of minerals from eleven calcareous rocks. Accessory minerals marked 'acc'.

The original report ends with the following discussion -

"These rocks are the result of metamorphism of a sequence of sedimentary rocks ranging in composition from calcareous sediments to pure limestone.

The mineralogy throughout is similar. Calcite and quartz are always present (quartz absent in P1218) together with some or all of the following:

phlogopite, scapolite, alkali, feldspar, sphene, magnetite, limonite, pyrite, green biotite, a second carbonate.*

The texture is granoblastic, and the occurrence of porphyroblasts of alkali feldspar and/or scapolite is common (e.g. P1213). The grain size is variable (coarse in P1217, fine in P1212). There may be a development of a lineation or lamination due to either the elongated form of calcite crystals (P1213) or to mineralogical banding (P1215).

The alkali feldspar was identified by both optic methods and the X-ray diffraction method, and occurs as either large idiomorphic cross sections or xenoblastic masses, with numerous rounded inclusions of carbonate."

* carbonate not calcite

APPENDIX 3

Detailed Logs, Holes 107, 108, 109, 110.

Fig. 11a.
FEATURE PENRICE MARBLE
LOCATION 1.75 mi. N. Angaston.

CO-ORDINATES 3120E. 3000N11
ANGLE FROM HORIZONTAL 25°
DIRECTION EAST

R.L. Surface Approx 1308 FT.
R.L. Collar 1308 FT.
Datum LWOST (Pt. Ad) = 1008 ft.

DESCRIPTION OF CORE	SW WEATH LAW ERING	CORE SIZE DEPTH LOG	LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS %	WATER LEVEL DATE	CASING DRILL WATER LOSS %	CaCO ₃
		1 4 16 64			5 50 10		0-100	80 90 100
MARBLE, white, coarse-grained (2-5 m.m.) equigranular; occasional black specks (less than 0.01%);				No noticeable bedding; joints uncemented, open; solution zones buff-coloured with 0.1 ft of major joints often limonite-coated. Joints tend to be either vertical or horizontal.				968
MARBLE very pale pink to light brown; coarse-grained (5-10 m.m.) small % oxidized pyrite & mica				No noticeable bedding; jointing prominent, commonly vertical; limonite-coated smooth joints & limonite-filled solution joints.				975
MARBLE changes from pale pink to white at 50.0 ft; coarse-grained (2-8 m.m.); v. low % black grains ? pyrrhotite.				Jointing much less dominant; in places vague layering 35° to axis of core.				972
MARBLE white; pyrrhotite, mica and minor chalcopyrite, 0.1%. Grain size 2-5 mm.				Jointing moderate, mainly iron stained, solution type.				947
MARBLE translucent; grain size 5-15 m.m.; pyrrhotite & brown mica up to 0.5%; one crystal epidote; below 80.0 ft v. little impurities, until 93.0 ft when mica concentration 0.5% & constant; at 114.5 ft and 121.0 ft pyrite grains & mica 0.5%.				No layering; in places little jointing.				949
								946
								905

WEATHERING

FR - Fresh
SW - Slightly weathered
MW - Moderately
HW - Highly
CW - Completely

FRACTURE LOG

Natural fractures per

Joints in relation to core-axis
- Approx. horizontal.
- Approx. vertical.
- Oblique.

NON-METALLICS SECTION

DRILL No. 24
TYPE
DRILLER Davidson
START 19-7-66
FINISH 5-8-66

LOGGED BY
M.G. Mason
DATE 11-8-66
TRACED J.M.W.
CHECKED L.V.W.

DESCRIPTION OF CORE	SW WEATH+ AW WEATH FW WEATH CL WEATH	CORE SIZE DEPTH C.R.L. FT.	LOG	FRACTURE LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS % 5 50 10	WATER LEVEL DATE	CASING LOSS % 0-100	DRILL WATER LOSS % 80 90 100	CaCO3
MARBLE as above grain size 10-40 mm.		110			0.5 ft zone of discoloured jointing.					
MARBLE as above, grain size 3.0 to 8.0 mm.		130			Highly jointed, horizontal					
MARBLE pale grey to pale brown; grain size 1.0-3.0 mm. epidote up to 5%, tremolite up to 5%		140			Layering 70° to axis of core.					
MARBLE white, almost translucent; grain size 3-8 mm		150			Vague layering 70° to axis of core.					
MARBLE pale grey to buff; grain size 1.3 mm.; epidote & tremolite less than 1%; dominant sulphide pyrite 0.3%		160			Tremolite crystals 5-10 mm. long oriented in plane of bedding. Little jointing, layering almost nonexistent.					
MARBLE white, almost translucent; grain size 3-8 mm.; brown mica less than 0.01%, little pyrite.		170			Petrological sample P1212/66: good layering 65° to core axis.					
MARBLE dark grey; grain size 0.5 to 2.0 mm; pyrite 1%, epidote 20%, tremolite 20%.					Vague layering.					
MARBLE pale grey; grain size 2.0-10.0 mm.; small% epidote, tremolite, pyrite etc.										

Continued on sheet 3 of 4 (S6466) at 1 in. = 5 ft.

LOCATION, 1.75 mi. N. Angaston

CLERK OF THE COURT
JAMES H. HARRIS
CLINTON, MISSISSIPPI

RL S. these Approx 1000 3 ft.
RL Color " " " 3 ft.
D. W. L. W. S. 1000 10 ft.

DESCRIPTION OF CORE	CC S2 DEPTH LOG	NTL LOG	DATE	80 90 100
Continued from sheet 2 of 4 (S6466). Note scale change.				
HORNFELS with 50% scapolite crystals 3-5 mm long; phlogopite 20%, rest calcite?	155			
MARBLE light gray; calcite 60%, rest clay derived from scapolite & epidote	160			
MARBLE with scapolite bands (see opposite) associated with fine epidote crystals; small % quartz, pyrite; at least 20% impurities. (scapolite?)	165			
CLAY + MARBLE granules	170			
MARBLE phlogopite up to 5%; pyrite < 1%; CaCO ₃ 70%	175			
MARBLE white, coarse-grained (to 5mm); disseminated epidote 2-3%; pyrite < 1%; phlogopite a few %	180			
MARBLE, medium-grained; phlogopite 5%; scapolite 20% in parts.	185			
MARBLE grey; phlogopite 5%; Pyrite 1%; feldspar up to 20%??	190			
MARBLE white, 95% CaCO ₃ ; rare thin layers weathered tremolite & epidote 1-2%; few impurities.	195			
MARBLE grey-blue; fine-grained calcite 80%; phlogopite 5%; tremolite 2%; epidote 5%	200			
Petrological sample P1212/66 jointing and layering at 50° to axis.				
applicable.				
Scapolite bands 5% of total rock, at 45° to core axis.				
Probably weathered from epidote - tremolite marble.				
Scapolite + epidote in thin layers total 10%				
Pyrite layering 60° to axis of core, < total				
Thin, highly weathered layer 5-10% epidote + tremolite, 12% to axis of core.				
A few thin layers of weathered epidote and tremolite, up to 5%				
Core broken into thin pieces normal to core axis.				
Layering at 45° to core axis.				

WEATHERING

FR -- Fresh
SV -- Slightly weathered
MA -- Moderately "
H -- Highly "
C -- Completely "

FRACT 1.0 LOG

Natural fractures per
foot of core

Petrological sample 172/3/66
from portion 176.5 - 189.5 ft.

100-2445

P. L. L. A. 100
 T. 100
 P. L. L. A. 100
 T. 100
 P. L. L. A. 100
 T. 100

FEATURE PENRICE MARBLE
LOCATION 1.75 mi. N. Angaston.

COORDINATES 3120E 3000N
ANGLE FROM HORIZONTAL 25°
DIRECTION EAST.

R.L. Surface Approx 1308 FT
R.L. Collar " 1308
Datum WOST. (P.A. det.) = 1008

DESCRIPTION OF CORE	WEATHERING FR MW HW CW	CORE SIZE DEPTH LOG FT.	FRACTURE LOG 1 4 16 64	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS % 5 50 100	DATE	WATER LEVEL DATE	CASING LOSS % 0-100	DRILL WATER LOSS % 0-100	CaCO ₃ 80 90 100
SCAPOLITE SCHIST, blue-grey; moderately hard; scapolite crystals $\frac{1}{4}$ - $\frac{1}{2}$ mm thick & 1 cm long, 15% of total; phlogopite 10%; small % pyrite, especially in joints; ? epidote 10%?		205 210		Calcified joints $\frac{1}{2}$ m.m. thick, 0-20° to axis of core. - Petrological sample P1214/66.						NOT ASSAYED
Note: joints not recorded in log for section of core 168-211 ft.				End of bore 211.1 ft						

WEATHERING

FR - Fresh
MW - Slightly weathered
HW - Moderately "
CW - Highly "
CW - Completely "

FRACTURE LOG

1 4 16 64 - Natural fractures per foot of core

NON-METALLICS SECTION

DRILL No 24
TYPE
DRILLER DAWSON
START 12-7-65
FINISH 5-9-66
DATE 11-8-66
BY J. MASON
J. MASON
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DESCRIPTION OF CORE	WEATHERING SW WEATH FW ERING MW ERING CW ERING R.L. FT.	CORE SIZE DEPTH LOG	FRACTURE LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS % DATE	WATER LEVEL DATE	CASING DRILL WATER LOSS % 0-100	CaCO ₃ % 80 90 100
MARBLE, white; moderately hard; coarse-grained (2-4 mm.); almost pure.				No Core				
MARBLE, similar above but yellow-brown.				No Core				95.6
MARBLE, similar 0-5 ft.; light grey; impurities: pyrite 1%, black, dendritic mineral (? pyrolusite) 1%.								96.2
MARBLE, similar above, but lightly stained with yellow-brown Fe oxides.								96.0
MARBLE, light grey; hard; coarse-grained; impurities (mainly pyrite) <1%; joints mineralised.				Joints with roundish masses 1/8 in. across, of soft, black amorphous mineral, film - thickness.				95.9
MARBLE, yellow-brown, pink and white portions; pyrite 1%; pale brownish-green ? Actinolite crystals 1%.				Solution joints with pink staining. Heavy Fe-staining near other joints				97.5
MARBLE, white to pale grey, in places stained pink; phlogopite appearing at about 70 feet and remaining at 1%; pyrite rare.								97.2
								97.5

DESCRIPTION OF CORE	WEATHERING SW MW HW CW	CORE SIZE DEPTH LOG FT.	FRACTURE LOG 1 4 16 64	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS % 5 50 10	WATER LEVEL DATE	CASING CORRELATION LOSS % 0-100	CO CO ₃ % 80 90 100
MARBLE, white, medium- to coarse-grained (2-6 mm.); disseminated phlogopite flakes and pyrite to 2%.		110		Limonite in joints. Joints mainly 20-45° to cross-section of core.				97.5
MARBLE, light grey to white; coarse-grained, v. hard; impurities 5%, mainly disseminated flakes of phlogopite and crystalline to massive pyrite.		120						97.3
		130						97.1
		140						97.0
		150		Pyrite forms indistinct bands a few mm. wide, giving grey colouration.				93.9
MARBLE, white to very light grey; coarse- grained; chief impurities 1) phlogopite and pyrite 1-2%. 2) quartz, pink feldspar and epidote, to 2%.		160						94.4
		170		Quartz and pink feldspar concentrated in stylolitic seams.				94.5
		180		2 Joints at 30° to axis of core. Others 50-60°.				
		190		Fracture zone stained pink.				
		200						

DESCRIPTION OF CORE	WEATHERING SW MW HW GW	CORE SIZE DEPTH R. FT.	LOG	FRACTURE LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS % 5 50 100 DATE	WATER LEVEL CASING DRILL WATER LOSS % 0-100	CaCO ₃ % Pb Zn Cu
MARBLE, light to medium gray, hard; coarse-grained (2-4mm); disseminated phlogopite and pyrite 2-5%.		210			Vertical, stylolitic joint with limonite. All joints 40° to 80° to axis of core. 2 joints 90° to core-axis - slickensided Joints with actinolite or scapolite needles.			94.5 95.6
MARBLE, white, very hard coarse-grained (2-4mm); phlogopite to 2%.		230			Most joints at 30°-80° to core axis. Joints with 2-3% epidote			93.7 93.1
MARBLE, grey, coarse-grained (2-4mm); phlogopite and pyrite 2-3%.		240			Joints with ? scapolite needles.			
MARBLE grey, very hard; coarse-grained (2-5mm); phlogopite and pyrite, 2%.		250			Shatter zone Shatter zone Joints with ? scapolite needles.		No Water Counted	89.8
MARBLE, grey, very hard; coarse-grained; pyrite and phlogopite 2-5%, a few ? scapolite needles.		270			Indistinct colour bands 30° to core-axis.			96.4 95.8
SCAPOLITE HORNFELS (similar P1212/66)		280			Light & dk. grey bands 1-2mm apart, 40° to axis. indistinct } banded due to concentration of phlogopite and pyrite. distinct indistinct			85.8
MARBLE, medium grey; coarse-grained (1-3mm); phlogopite 5-10%, pyrite rare.		290			Bands a few mm. wide of pyrite, at 15° to 50° to core-axis.			66.6
IMPURE MARBLE, strongly banded.					Petrological sample P1215/66 Petrological sample P1216/66			79.9
MARBLE, grey, hard.								
IMPURE MARBLE								
MARBLE, grey, hard								

DESCRIPTION OF CORE	WEATHERING SW MW HW CW	CORE SIZE DEPTH LOG FT.	LOG	FRACTURE LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS %	WATER LEVEL DATE	CASING CORNER LOSS %	CaCO ₃ % 80 90 100
MARBLE, white, hard, coarse-grained (2-5 mm); phlogopite 1% (disseminated as elsewhere in this bore)					All marble of mosaic calcite crystals massive, except for structures noted below.	5 50 10		0-100	
MARBLE similar above, but stained heavily in places by brown iron oxides; phlogopite 1-2%.									
MARBLE white, hard, coarse-grained (2-5 mm); phlogopite 1%.									
MARBLE white, medium gray, coarse-grained, hard, occasional pale green ? Actinolite needles					in places stained by limonite, e.g. at 53 ft.				
MARBLE mostly stained brown to pink; elsewhere white; coarse-grained; occasional flake of phlogopite; a few % black amorphous minerals ? MnO ₂ .					← moderately heavy limonite staining.				

FEATUREPENRICE MARBLE

CO-ORDINATES2000 N 2635 E

ANGLE FROM HORIZONTAL25°

R.L. Surface Appx 1325

FT.

LOCATION1.75 m N. ANGASTON

DIRECTIONEAST

R.L. Collar Appx 1325

FT.

Datum LWOST (PT Adc) = 100.8

DESCRIPTION OF CORE	WEATHERING SW MW HW CW R.L. FT.	CORE SIZE DEPTH LOG	FRACTURE LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT, CORE LOSS % 5 50 10 DATE	WATER LEVEL CASING DRILL WATER LOSS % 0-100	CaCO ₃ % 80 90 100
				Moderate to heavy solution of calcite, 100 to 126 ft			
		110					96.4
		120					
		130		Petrological sample P1217/66			97.3
		140		2 inches of core recovered			
		150					96.8
		160					
MARBLE white, hard, very pure, coarse-grained (1-4 mm)		170					97.3
		180		light grey bands, 1/8-1 inch wide, 70-80° to axis of core.			94.0
MARBLE white to pale grey, coarse-grained; disseminated phlogopite to 5%, especially 216-228 ft.; pyrite 1%		190					95.7
		200					94.6

WEATHERING FR - Fresh SW - Slightly weathered MW - Moderately " HW - Highly " CW - Completely " FRACTURE LOG Natural fractures per	NON-METALLICS SECTION DRILL No. 24 TYPE DRILLER DAVIDSON START 22 Aug 66 FINISH 30 Aug 66 LOGGED BY R. TARYDAS DATE 6 Oct 66 TRACED N.E. CHECKED L.V.W.
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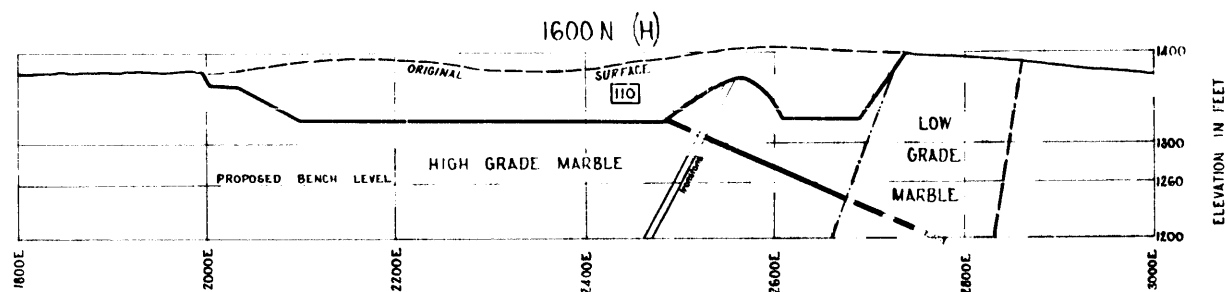
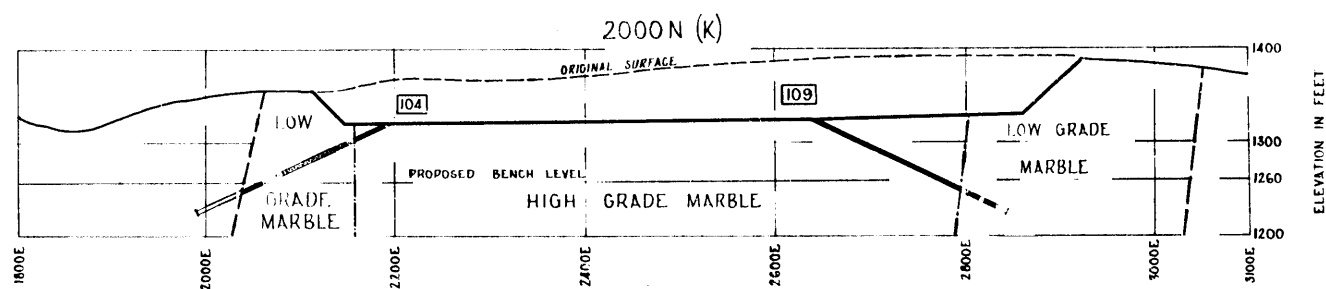
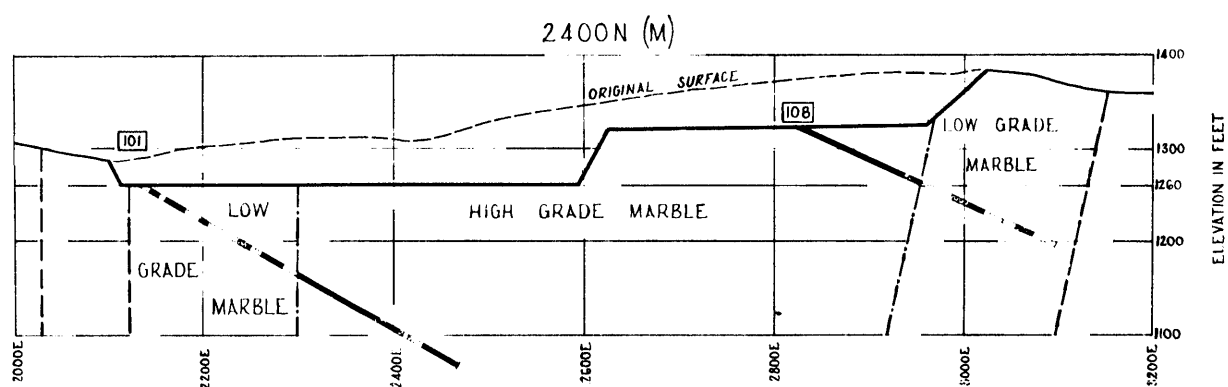
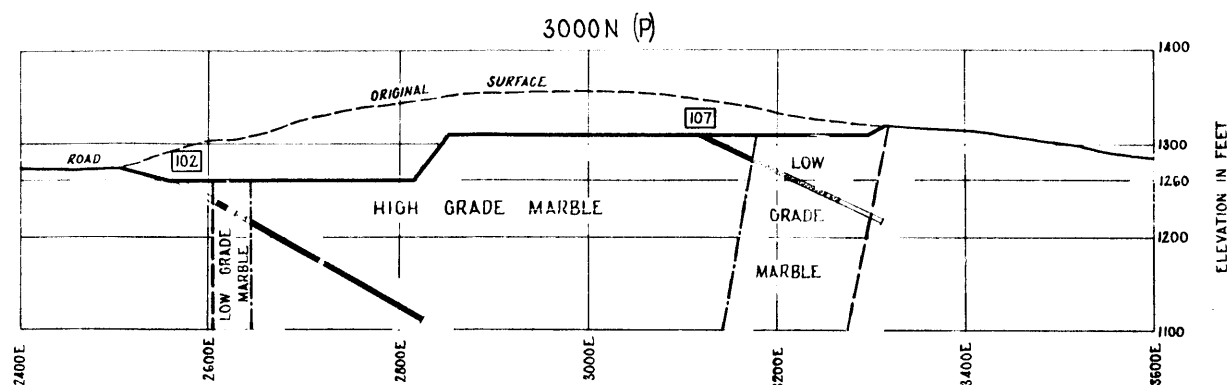
DESCRIPTION OF CORE	SW WEATH ⁺ FW ERING MW CW	CORE SIZE DEPTH R.L. FT.	LOG	FRACTURE LOG	STRUCTURES JOINTS, VEINS, SEAMS, SHEARED ZONES, CRUSHED ZONES	LIFT CORE LOSS %	WATER LEVEL DATE	CASING DRILL WATER LOSS %	Ca CO ₃ %
as above				1 4 16 64		5 50 10		0-100	80 80 100
		210			leached stylolitic seam with pink colouration and pellets of ?pyrolusite				94.6
		220							93.2
SANDSTONE fine grained, non-calcareous, quartz 80% muscovite 15% opaques 5%		230			contact with marble gradational over a few inches; in places separated by irregular lenses of muscovite 0.5 to 1 cm. thick; 1x0.2 cm lenses of muscovite in sandstone				
DRILLERS NOTE 0-146 ft. "Country very broken necessary to ream down casing behind the barrel; appears to be a sandy formation."					END OF BORE 230.0 ft				
		240							
		250							
		260							
		270							
		280							
		290							
		300							

R.L. Surface **Approx 1325** FT.
R.L. Collar " **1325** FT.
Datum **L.W.O.S.T. (P^rAd) = 100.8ft.**

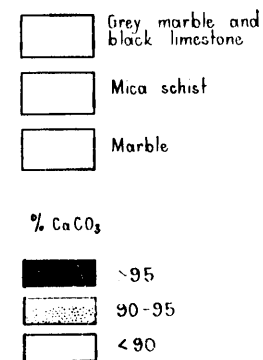
WEATHERING		NON METALLICS SECTION	
FR - Fresh		DRILL No 24	LOGGED BY
SW - Slightly weathered		TYPE	R. TARVYDAS
MW - Moderately "		DRILLER Davidson	DATE 7-10-66
HW - Highly "		START 2-9-66	TRACED D.S.
CW - Completely "		FINISH 13-9-66	CHECKED L.V.W.
FRACTURE LOG			
1 4 16 64 Natural fractures per foot, not core			

R.L. Surface Approx 1325 FT.
R.L. Collar " 1325 FT.
Datum LWOST (P'Ad) = 100.8 ft.

WEATHERING	NON METALLICS SECTION	
FR. - Fresh	DRILL No <i>24</i>	LOGGED BY <i>R. TARVYDAS</i>
SW - Slightly weathered	TYPE	DATE <i>7-10-66</i>
MW - Moderately "	DRILLER <i>Davidson</i>	TRACED <i>D.S.</i>
HW - Highly "	START <i>2-9-66</i>	CHECKED <i>L.V.W.</i>
CW - Completely "	FINISH <i>13-9-66</i>	
FRACTURE LOG		
1 4 16 64 Natural fractures per		



LEGEND



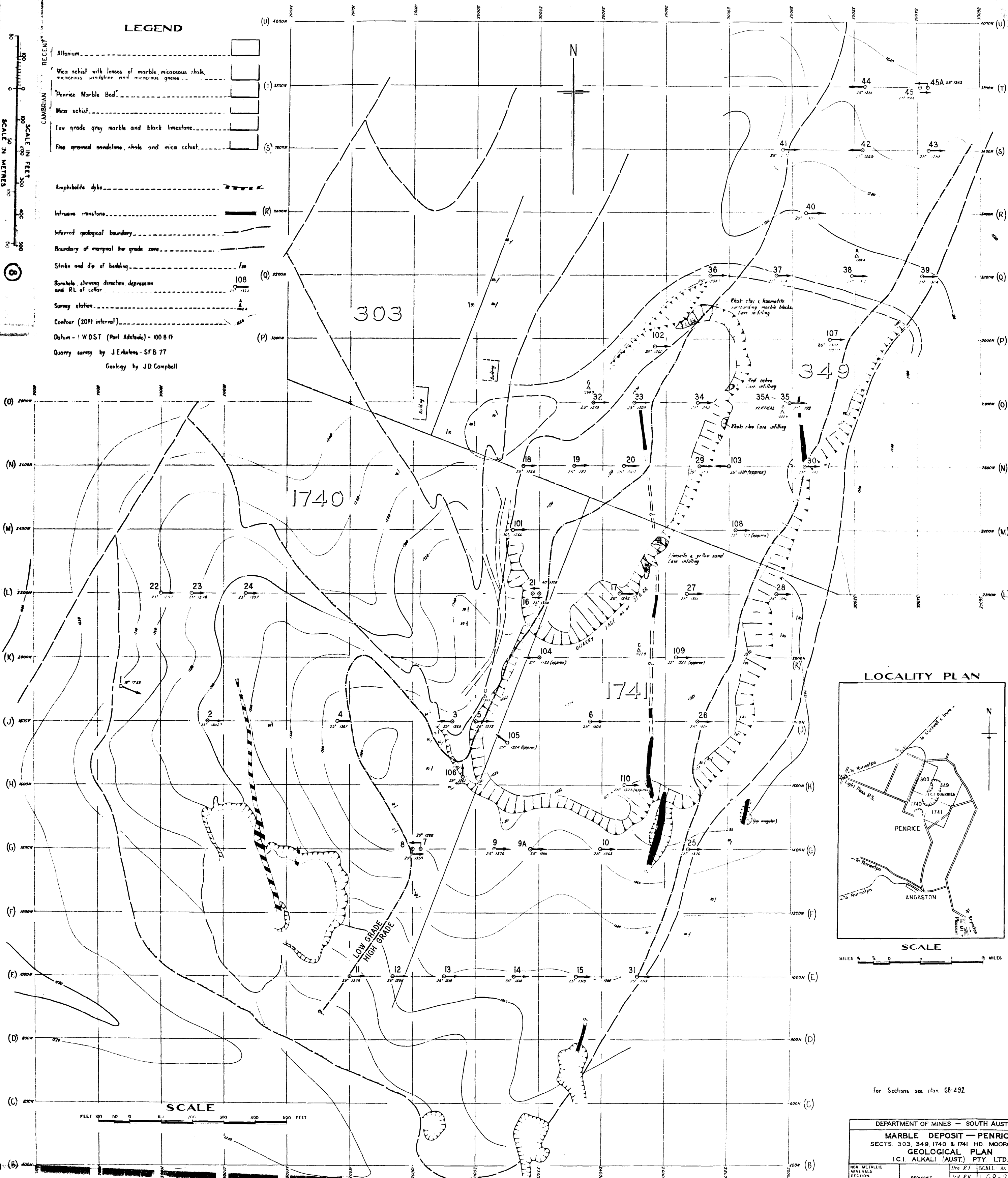
For location of Sections see plan L68-23

DEPARTMENT OF MINES — SOUTH AUSTRALIA			
MARBLE DEPOSIT — PENRICE			
SECTS 303, 349, 1740 E. 1741 HD MOOROOO			
CROSS SECTIONS			
ICI ALKALI (AUST) PTY LTD			
NON METALLIC MINERALS SECTION	GEOLOGIST	Drn. R.H. Tcd. R.H. Ckd. L.W. Exd.	SCALE: 1 inch = 100 ft
			68-492 Gk9
Director of Mines	SUP. GEOLOGIST		DATE: 13 June 1968

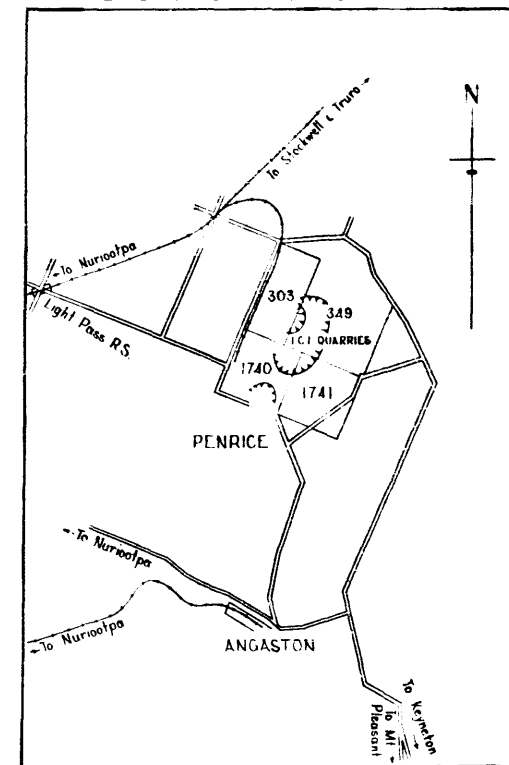
LEGEND

Alluvium
 Mica schist with lenses of marble, micaceous shale, micaceous sandstone and micaceous gneiss
 "Penrice Marble Bed"
 Mica schist
 Low grade grey marble and black limestone
 Fine grained sandstone, shale and mica schist

Amphibolite dyke
 Intrusive rhyolite
 Inferred geological boundary
 Boundary of marginal low grade zone
 Strike and dip of bedding
 Borehole showing direction, depression and RL of collar
 Survey station
 Contour (20ft interval)
 Datum - 1 WOST (Port Adelaide) - 100.8 ft
 Quarry survey by J.E. Stephens - SFB 77
 Geology by J.D. Campbell



LOCALITY PLAN



SCALE

MILES 0 1 2 3 4

For Sections see plan G8-492

DEPARTMENT OF MINES - SOUTH AUSTRALIA			
MARBLE DEPOSIT - PENRICE			
SECTS. 303, 349, 1740 & 1741 HD. MOOROOO00			
GEOLOGICAL PLAN			
I.C.I. ALKALI (AUST.) PTY. LTD.			
NON-METALLIC MINERALS SECTION	Geologist	Scale	As shown
	Ed. R.H.	L68-23	Gk9
Director of Mines	SUP. GEOLOGIST	DATE	20/10/68