DEPARTMENT OF MINES

SOUTH AUSTRALIA

GEOLOGICAL SURVEY

ENGINEERING GEOLOGY

MARINO GOLF COURSE GROUNDWATER INVESTIGATION

PROGRESS REPORT No. 1

by

M. STADTER,
GEOLOGIST.

Rept.Bk.No. 77/25
G.S. No. 5853
Eng. No. 76-60
D.M. No. 544/76

21st February, 1977.

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

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MARINO GOLF COURSE GROUNDWATER INVESTIGATION

PROGRESS REPORT No. 1

SUMMARY AND CONCLUSIONS

The investigation has involved a survey of known wells followed by the drilling of two rotary holes into dolomites of the Tapley Hill Formation. These have been abandoned due to high salinity and low yield. It is considered that the likelihood of obtaining the required groundwater supply in the vicinity of the proposed golf course is very poor.

An alternative source of groundwater exists north of the Eden-Burnside Fault in the Adelaide Plains Groundwater Basin. This could be investigated by scout drilling after delineating the fault line by geophysical means.

Three possible dam sites have been selected on the golf course and these could be used to augment the main water supply.

INTRODUCTION

A request was made by the Marion City Council in August, 1976 to investigate the possibility of obtaining a suitable groundwater supply for irrigation of a proposed golf course in Section 197 and Part Sections 245 and 246, hundred of Noarlunga (see Fig. 1). A supply of about 2 180 m^3/day, with an upper salinity limit of 1 500 mg/litre, was sought. The golf course extends over land now occupied by the Quarries Industries Ltd. Linwood Quarry.

A well survey was carried out in the vicinity of the proposed golf course to provide the basic data for the hydrogeological investigation. The locations of all wells are shown in Fig. 2, and the well data is presented in Appendix I.

Four drilling sites were recommended on completion of the investigation and two of these were then rotary drilled in the period 7th September, 1976 to 29th October, 1976 (see Fig. 3). Both wells were abandoned due to their insufficient supply.

An alternative water supply, obtained by constructing a dam across one of the creeks in the area, was recommended.

HYDROGEOLOGY

The rock types of the area are meta-sediments of Proterozoic age (Marinoan and Sturtian Series) and their distribution is shown in Fig. 3. The Sturtian rocks consist of laminated grey shales and siltstones, overlain by blue-grey calcareous and dolomitic siltstones with dolomite bands (Tapley Hill Formation), which in turn are overlain by blue-grey limestone and dolomitic limestone (Brighton Limestone). Overlying the Sturtian rocks are the Marinoan slates and shales with minor thin quartzites.

The Sturtian and Marinoan slates and shales were considered to be low potential aquifers because of their fissile nature and because they are unlikely to have well developed joints and fractures within which water could be stored. Although the Brighton Limestone has favourable aquifer properties (its relative hardness and its likelihood to have solution cavities and a well developed joint and fracture system), it wasprecluded from consideration of a long term reliable groundwater supply because of its narrow thickness (5 to 10 metres) and corresponding low storage capacity.

The Tapley Hill Formation offered the best prospects for a groundwater supply due to its considerable thickness (about 500 metres) and its well jointed and fractured nature under deformation.

DRILLING

A well was drilled at Linwood Quarry, in 1973, into dolomitic limestone of the Tapley Hill Formation to a depth of 98 metres. A 24-hour constant discharge pump test was carried out and the results showed the well to be capable of yielding 873 m^3/day (Smith, 1974). It should

be noted that a marked increase in the salinity of the groundwater (from 850 to 1 660 mg/litre) was observed during the test.

During this investigation the two most favourable of the four recommended drilling sites (sites 1 and 2) were rotary drilled (see Fig. 3).

The first hole was drilled at site 1 which was considered to be the most favourable site with regard to recharge and shallow depth to water. Water was cut at 56, 92 and 100 metres but the supply did not exceed 80 m^3/day. The salinity of the water ranged from 1 540 to 1 645 mg/litre. The predominant rock types penetrated were dolomitic limestone and dolomitic siltstone of the Tapley Hill Formation, and the geological log is given in Appendix II. The hole was abandoned at 106 metres due to the insufficient supply.

The second hole was drilled about 50 metres west of site 2, which was chosen because it occurred within an area of considerable structural deformation. Water was cut at 79 metres but the supply was too small to be measured with the equipment available (<50 m^3/day). The main rock types penetrated were dolomitic limestone and calcareous siltstone of the Tapley Hill Formation, with a minor amount of pale grey clay suggesting a nearby fault (geological log is given in Appendix II). The hole was abandoned at 100 metres.

DAM SITES

As a result of the unsuccessful drilling, an alternative water supply by constructing a dam across one of the creeks in the area was recommended. A report on three possible dam sites (Boucaut, 1976) is given in Appendix III and their locations are shown in Fig. 3.

FURTHER PROSPECTS AND RECOMMENDATIONS

Better prospects of obtaining the required groundwater supply occur in an area north of the Eden-Burnside Fault and about 2 km north of the golf course.

A gravity survey to accurately locate the position of the fault is recommended. Following the geophysics, two or three scout holes should be drilled in the area north of the fault to test the quality and quantity of the groundwater.

21st February, 1977
MS:ST

M. STADTER,
GEOLOGIST.

REFERENCE

Smith, P.C., 1974. Completion and Pump Test Report - Linwood Quarry. S.A. Dept. Mines unpublished report 74/130.

APPENDIX I

Well Data

Well No.	State No.	Depth (m)	Salinity (mg/l)	Supply (m^3/day)
1	775547027	98	1070	873
2	775547021	-	-	-
3	775547001	13	1120	"good"
4	775547026	8	385	-
5	775547003	10	2350	-
6	775547019	6	3130	-
7	775547025	25	4845	44
8	775547016	20	4600	185
9	775547017	12	1020	11
10	775547015	10	4840	76
11	775547023	19	4950	-
12	775547013	15	3120	"large"
13	775547012	9	1570	-
14	775547014	11	2750	-
15	775547010	10	1950	55
16	775547011	11	990	-
17	775547018	13	2000	-
18	776547002	42	3710	131
19	776547001	37	2680	9
20	775547020	23	9920	-
21	776547011	120	3310	764
22	776547012	56	5390	"small"
23	776547010	82	1640	164
24	776547009	23	1780	22
25	776547005	27	-	-
26	776547008	24	870	327
27	776547003	21	3600	393
28	776547007	68	1590	546
29	776547006	26	1200	"large"
30	776547004	24	1360	546
31	771547043	57	1115	327
32	771547025	5	-	-
33	775547009	111	1990	873
34	775547008	40	1530	-
35	775547007	12	1750	-
36	775547006	34	1560	218
37	775547005	84	1190	764
38	775547004	84	-	764
39	770547083	85	1200	655
40	775547024	12	1170	-
41	770547056	10	1160	-
42	770547052	98	1150	546
43	770547051	10	1450	-
44	770547082	90	1522	655
45	770547050	92	1330	546
46	770547053	20	1250	44
47	771547023	9	-	-
48	771547021	92	-	764
49	771547022	14	1390	327

APPENDIX II

Geological Logs

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

PROJECT: Marino Golf Course

LOCATION OR CO-ORDS:

SEC. 197 HD. Noarlunga

EL Surface

EL ref. point

Datum

HOLE NO. 1

UNIT/STATE NO: 775547028

SERIAL NO: 908/77

FOLDER NO.

DEPTH TO* WATER CUT (m)	DEPTH TO STANDING WATER (m)	SUPPLY *m³/day	SUPPLY Method of test	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W. NO.
56	Seepage	-		775	
92	?	27		1540	
100	?	78.6		1645	

HOLE Dia.	DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from	to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
			1.	0	2	Clay Medium yellow/brown, with some red/brown mottling, and occasional fragments of blue/grey dolomite limestone.					
			10.	2	4	Siltstone. Buff, very firm and hard, fragments commonly coated with deep red clay					
			10.	4	6	Siltstone. Pale brown to buff, with red/brown mottling. Occasional fragments of white material.					
			13&14	6	20	Dolomitic Limestone. Grey to blue/grey, hard, strongly calcareous. Occasional calcite fragments and some fragments of red/brown siltstone.					

5

10

15

*NOTE: 1000 gals./hr. = 110 m³/day

REMARKS

DRILL TYPE rotary

LOGGED BY: CJWB

CIRCULATION:

DATE: Dec. 1976

START: 7/9/76

TRACED BY:

FINISH: 1/10/76

DATE:

SHEET 1 OF 5

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 1

UNIT/STATE NO:
775547028

HOLE DIA. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from	to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
15										
20		13& 14	20	42	DOLOMITIC LIMESTONE. Essentially as above, colour varies from dark grey, blue/ grey, brown, red/brown. Grading in parts to calcareous siltstone, some impure calcite vein material.					
25										
30					Becoming more dominantly silty.					
35										
40										

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 1

UNIT/STATE NO:
775547028

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) From	To	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
40		13 & 14	42	48	DOLOMITIC LIMESTONE. As above but uniform medium blue/grey colour.					
45		13 & 14,17	48	52	DOLOMITIC LIMESTONE & CALCAREOUS SILTSTONE. Medium grey limestone. Medium brown, hard and strongly calcareous siltstone.					
50		13 & 14	52	76	DOLOMITIC LIMESTONE. Medium grey, hard, finely textured, silty in parts. Some dark grey and pale grey banding Rare red/brown material.					
55					Becoming generally grey/brown with depth.					
60										
65										

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 1

UNIT/STATE NO:
775547028

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
65									
70									
75									
		17	76 - 82	DOLOMITIC SILTSTONE. Medium brown, slightly banded with some preferred orientation of minerals, very finely textured. Subordinate amounts of grey dolomitic limestone.					
80									
		17	82 - 88	DOLOMITIC SILTSTONE. As above, becoming medium to pale grey					
85									
		17	88 - 92	DOLOMITIC SILTSTONE. As above, becoming darker grey.					
90									

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 1

UNIT/STATE NO:
775547028

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from	to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
90		17	92	106	DOLOMITIC SILTSTONE. As above, becoming dark brown, brown/grey, red/brown. Rare yellow and reddish coloured calcite. Lithic fragments.					
95										
100										
105			106	end						
110										
115										

SHEET 5 OF 5

PROJECT: Marino Golf Course

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

HOLE NO. 2

LOCATION OR CO-ORDS:

UNIT/STATE NO: 775547029

SEC. 215 HD. Noarlunga

EL Surface
EL ref. point
Datum

SERIAL NO: 926/77

FOLDER NO.

DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	SUPPLY *m³/day	SUPPLY Method of test	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W. NO.
79	78.5	Not tested			

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from – to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
0			0 – 4	CLAY. Brown to light grey, with fragments blue/grey limestone and red/pale brown calc-siltstone. Rare calcite fragments.					
		1							
			4 – 10	CALCAREOUS SILTSTONE. Red and reddish-brown, grading to light and dark grey. Some calcite fragments					
5									
		17							
			10 – 32	CALCAREOUS SILTSTONE. Predominantly pale to dark grey, with some reddish-brown and yellow fragments. Fragments commonly coated with pale grey/buff clay.					
10									
		17							
15									

REMARKS

*NOTE: 1000 gals./hr. = 110 m³/day

DRILL TYPE rotary
CIRCULATION:
START 26/10/76
FINISH 29/10/76

LOGGED BY M.H.S.
DATE Jan. 1977
TRACED BY:
DATE:

SHEET 1 OF 5

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 2

UNIT/STATE NO:
775547029

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from	to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
15										
20										
25					Rare pyrite crystals. Some calcite vein material					
30										
		13 & 14	32	38	DOLOMITIC LIMESTONE. Pale to dark grey, occasional banding. Some grey calc-siltstone fragments. Calcite fragments common. Minor amount of pale grey clay.					
35										
		17	38	56	CALCAREOUS SILTSTONE. Pale grey, greenish-grey, some yellow and red fragments. Few dolomitic limestone fragments. Some calcite fragments					
40										

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 2
UNIT/STATE NO:
775547029

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
40				Minor amount of pale grey clay.					
45									
50									
55			56 - 64	DOLOMITIC LIMESTONE AND CALCAREOUS SILTSTONE. Pale red-yellow limestone and pale grey calc-siltstone. Rare yellow ?Mn stained calc-siltstone fragments. Some calcite fragments. Minor amount of pale grey clay					
		13 & 14,17							
60									
			64 - 74	DOLOMITIC LIMESTONE. Pale to dark grey. Some pale grey calc-siltstone.					
65		13 & 14							

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 2

UNIT/STATE NO:
775547029

HOLE Dia. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from : to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
65				fragments. Calcite fragments common, Minor amount of pale grey clay.					
70									
		17	74 - 80	CALCAREOUS SILTSTONE. Pale to dark grey. Calcite fragments common. Fragments commonly coated with pale grey clay					
75									
80		13 & 14	80 - 82	DOLOMITIC LIMESTONE. Pale to dark grey. Fragments coated with pale grey clay.					
		17	82 - 90	CALCAREOUS SILTSTONE. Pale to dark grey, with rare reddish-brown fragments Few calcite fragments. Minor amount of pale grey clay.					
85									
90									

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT:

BORE LOG

CONTINUATION SHEET

HOLE NO. 2

UNIT/STATE NO: 775547029

HOLE DIA. DEPTH m	CORE	GRAPHIC LOG	DEPTH (m) from – to	GEOLOGICAL DESCRIPTION OF SAMPLE	UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
90		13 & 14	90 – 94	DOLOMITIC LIMESTONE. Pale to dark grey, becoming silty towards base with fragments of pale grey, pale green and reddish-brown calc-siltstone. Calcite fragments common. Minor amount of pale grey clay.					
		17	94 – 96	CALCAREOUS SILTSTONE. Pale grey. Rare calcite fragments. Sub-ordinate amount of pale grey clay.					
95		13 & 14	96 – 100	DOLOMITIC LIMESTONE. Pale to dark grey. Fragments commonly coated with pale grey clay.					
100			100 end						
105									
110									
115									

APPENDIX III

Report On Three Possible Dam Sites

DEPARTMENT OF MINES

MARINO GOLF COURSE

POSSIBLE DAM SITES

Three alternative dam sites appear feasible in the creeks adjacent to the proposed course and their locations are shown in Fig. 3.

1. A dam in creek A immediately upstream of the quarry limits.

2. A dam in creek B using the existing fill material for the bulk of the embankment.

3. Enlargement of the present proposed dam in creek B.

General

Creek A has the largest catchment of the two creeks and annual run-off would be a significant volume of water. However topography in this creek is steep and storage area would be small in relation to the size of the dam, i.e. for the volume of storage required a high and hence expensive dam may be required.

Creek B has flatter gradient and a large storage could be relatively easily obtained.

Storages on creek B would require supplementing as the catchment is not sufficient to supply the volume of water required. This could be by:

(a) Pumping from the existing bore.

(b) Diversion of Creek A into Creek B by means of a small concrete weir across Creek A and diversion of the creek flow through a pipe placed around the contour and discharging into Creek B. Each dam would be seated on calcareous siltstones which would provide an adequate foundation for any dam proposed. However joints in the rock are often slightly open and leakage through them could be expected. A programme of grouting would be required at each site to ensure water-tightness.

With the ready availability of fill material only a rock-fill dam with a central clay core is considered as this should be the most economical.

Clay could be obtained within 15 km of the site in the Reynella/Morphett Vale area.

Site 1 - The narrow steep sided valley is topographically a good dam site. At this site a spillway would be required.

Site 2 - The large volume of fill placed here would provide a storage of more than adequate capacity. Probably no spillway would be required.

The fill could be made impermeable by

(a) Placement of clay on the upstream face,

(b) The use of a bituminous membrane on the upstream face,

(c) the use of plastic sheeting on the upstream face.

Site 3 - The wider valley in this area would require a larger volume of material than for Site 1. A spillway, if required would be of small dimension, and hence of low cost.

Summary

Three possible dam sites occur and of these, site 2 would be most economical and provide most storage with site 1 being most expensive with least storage. A cost of a pipeline from Creek A to Creek B should be included in estimating the cost of each dam on Creek B.

The E. & W. S. Department or a firm of consulting engineers should be engaged to determine the hydrology of the streams and prepare estimates of cost.

W.R.P. Boucaut

24th November, 1976.

W.R.P. Boucaut,
CHIEF GEOLOGIST - SERVICES.

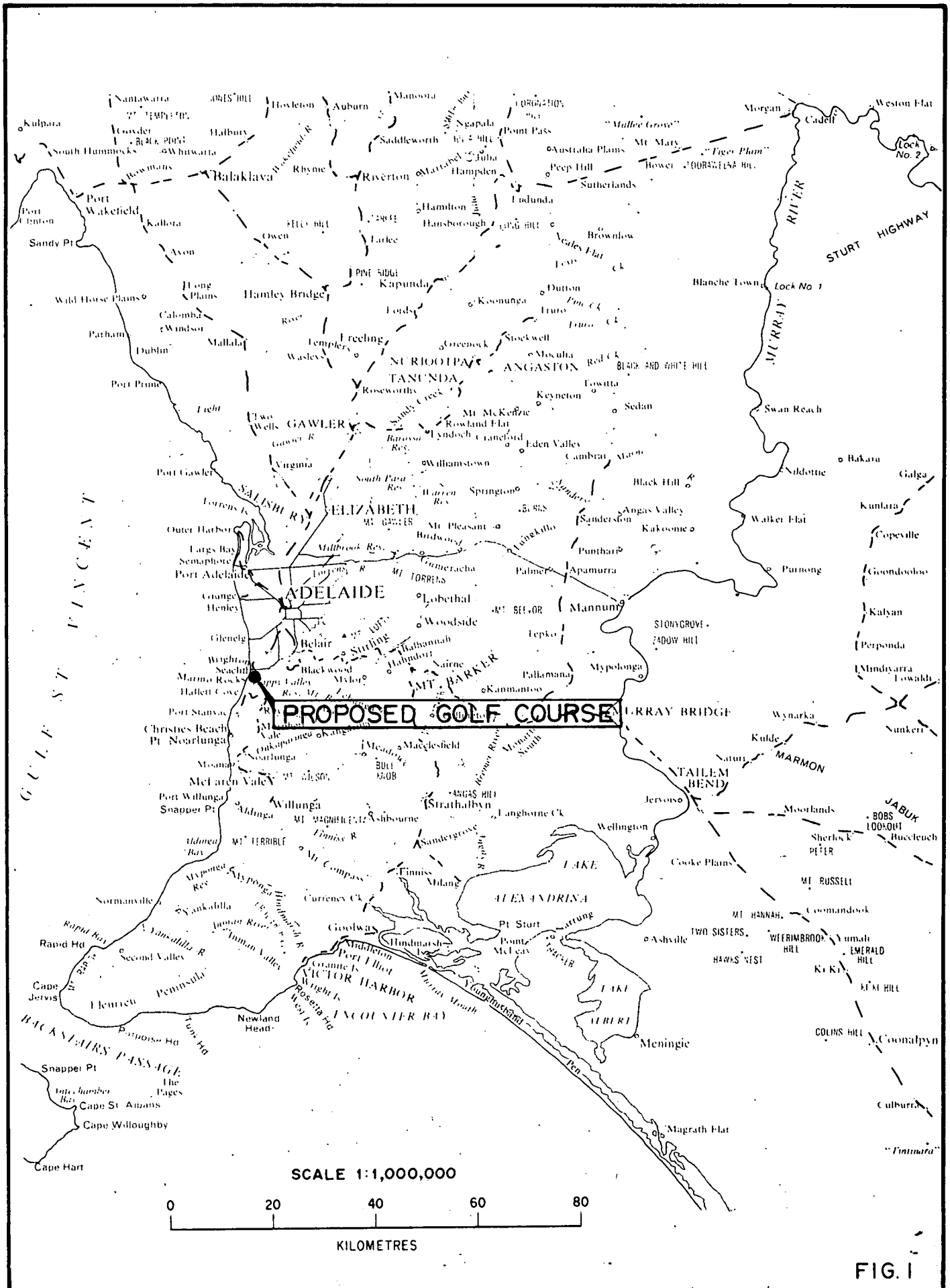

FIG. 1

	DEPARTMENT OF MINES – SOUTH AUSTRALIA	SCALE As shown
COMPILED M.H.S	MARINO GOLF COURSE – GROUNDWATER STUDY	DATE 17 · 2 · 77
DRN P.D	LOCALITY PLAN	PLAN NUMBER S 12598

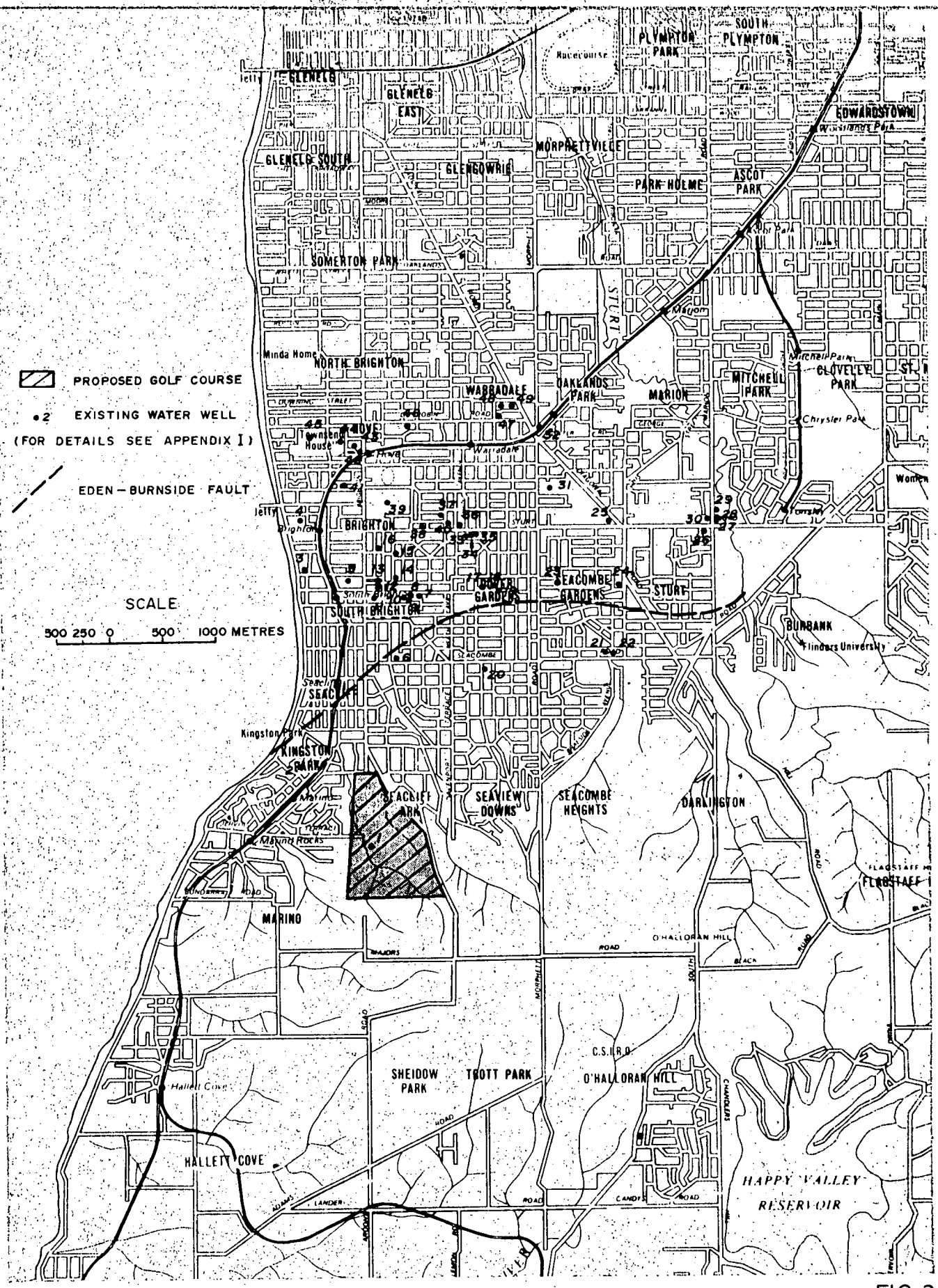

FIG. 2

	DEPARTMENT OF MINES–SOUTH AUSTRALIA	Scale: 1:50,000
Compiled: M.H.S.	MARINO GOLF COURSE–GROUNDWATER STUDY	Date: 16 · 2 · 77
Drn. P.D. | Ckd.	WELL LOCATION PLAN	Drg. No. S 12597

500—11.76 H1081 O

SCHOLEFIELD RD.

NEWLAND AVE.

DUDLEY CR.

PT 245

Presumed extension of Brighton Limestone

3

Dam site 2

HIGHWAYS DEPT. DEPOT

Dam site 3

PROPOSED LAKE

OCEAN BOULEVARD

NORTH STREET

PT 246

197

CREEK B

JERVOIS TCE.

60-70°

Well
SWL 73·5m.
Yield 10 l/sec.

YALPA RD.

Pipeline (Approximate)

4

SPINKS RD.

LINWOOD QUARRY

2

PT 215

Dam site 1

CREEK A

196

247

195

LEGEND

PROTEROZOIC

Marinoan

Laminated purple siltstone and shale

BRIGHTON LIMESTONE
Buff, pink and grey-blue limestone and dolomitic limestone
Oolitic in parts

Sturtian

Blue-grey calcareous and dolomitic siltstones with dolomite bands

Laminated grey shales and siltstones

Plunging anticlinal structure

Plunging synclinal structure

Quarry

Proposed golf course

4 Recommended drilling sites

Rotary drilled sites.

Existing well

Proposed dam site

Area of proposed golf course 0·297 Km.^{2}

SCALE IN METRES

50 0 100 200

N

FIG. 3

DEPARTMENT OF MINES-SOUTH AUSTRALIA

MARINO GOLF COURSE - GROUND WATER STUDY

GEOLOGICAL PLAN

	COMPILED M.H.S.	DRN T. E.	SCALE 1 2500	PLAN NUMBER
DIRECTOR OF MINES		CKD	DATE AUGUST 1976	77-169

G627-11