DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 79/142
PORT MACDONNELL AND SOUTHEND
TOWNSHIP WATER SUPPLY PROSPECTS

GEOLOGICAL SURVEY

By

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ABSTRACT

Shallow exploration drilling of prospective areas near each township has shown that provision of a water supply from shallow open trenches is impracticable in both cases.

At Port MacDonnell the Gambier Limestone aquifer has low permeability in the area investigated and would not yield the required supply. Moreover, salinity of the shallow groundwater increases rapidly with depth to values above 1 500 mg/l TDS.

At Southend a rapid increase in salinity to over 3 000 mg/l TDS occurs at shallow depth and the presence of loose unconsolidated sand would make excavation of the trench extremely difficult.

Drilling nearby for Carpenter Rocks town water supply has shown that regional salinity levels in the Gambier Limestone aquifer increase rapidly with depth near the coast. It is concluded that drilling to the Dilwyn Formation artesian aquifer which occurs at a depth of from 350 to 400 m below ground is the only guaranteed groundwater source satisfying both quantity and quality criteria. Another option would be to drill inland into the Gambier Limestone aquifer, as at Carpenter Rocks, after carrying out a resistivity survey to locate the fresh/salt water interface.

INTRODUCTION

Informal requests were received from the E. & W.S. Department, Southern Region in mid 1978 on groundwater prospects for township supplies for Port MacDonnell & Southend. See Fig. 1 for locations.

Both supplies are designated uneconomic, in that the cost of installing and operating a reticulated supply is greater than consumer returns. As a consequence, it is desirable that expenditure be kept as low as possible.

Port MacDonnell and Southend are fishing ports with large seasonal variations in population and hence water demand. Neither support secondary industry apart from small scale fish processing.

Port MacDonnell currently obtains its reticulated supply from a spring located about two kilometres west of the township. The proximity of the spring to a septic tank outlet and its questionable capacity to provide future water demand has prompted the E. & W.S. Department to seek alternatives.

Individual landholders provide their own supplies at Southend by rainwater collection or shallow wells. Increased development as a tourist centre and a possible increase in fish processing facilities has led to a reticulated supply being investigated.

HYDROGEOLOGY

Port MacDonnell (Fig. 2)

The present water supply derived from the spring in Clarke Park occurs at the contact between the Gambier Limestone and the overlying permeable Bridgewater Formation calcareous aeolianites. Water quality from the spring is 485 mg/l TDS.

Within the Gambier Limestone a marked salinity increase with depth has been noted at Carpenter Rocks by Barnett (1976) and Roberts (1976). Thus, any water supply well tapping the Gambier Limestone near the coast is restricted by depth.

The uppermost Dilwyn Formation aquifers are expected at a depth of between 350 and 400 m (Cameron 1976). Water quality is expected to be potable with confined aquifer salinity of about 650 mg/l. Beachport, in a similar geographical position, obtains a potable supply from this formation.

Southend (Fig. 3)

Surrounding the township on the landward side is a sequence of unconsolidated calcareous and siliceous dune material forming relatively low rises with an interdunal areas of finer grained sediments to the east. The interdunal deposits are a westerly extension of Lake Frome.

Cropping out on the coast and forming Cape Buffon, are the consolidated aeolianites of the Bridgewater Formation.

Most shallow wells developed for domestic supplies tap the unconsolidated Recent aeolianites or interdunal deposits.

These wells provide water of potable quality with salinity incresing with depth as the salt water interface is approached. Because of their proximity to septic tanks, a number of domestic supply wells are polluted as indicated by high nitrate values.

Groundwater flow direction within the unconfined aquifer is west to southwest with a gradient of about 1×10^{-3}.

The Dilwyn Formation confined aquifer occurs at a depth greater than about 375 m Cameron (1976) with groundwater quality expected to be similar to Beachport.

A summary of hydrogeologically important units for both sites is presented in Table 1.

WELL SURVEYS

All wells in proximity to the areas of interest were located and well data recorded. Nitrate analyses were carried out on water representative samples. Results are tabulated for Port MacDonnell and Southend in Appendices I and II respectively. Well data is for the upper part of the unconfined aquifer only.

Results for Port MacDonnell show salinity in the range 275 to 1 325 mg/l (mean 750 mg/l) with nitrate in the range 2.7 to 22.1 mg/l (mean 12.6 mg/l).

Wells are shallow-in the range 4.6 to 36.6 m-with standing water depth (SWD) between 0.9 and 15.2 m depending on topography. Yields are low and are generally obtained by windmill, jet, centrifugal or jack pumps. Wells tap either the Gambier Limestone or Bridgewater Formations.

Table I: Hydrogeological Summary

Age	Formation Name	Type	Lithology	Thickness (m)	Water Quality (mg/l)	Depth to Water (m)
Holocene (Phe/Qho)	Semaphore Sand/ St. Kilda Fm.	Unconfined	Wind blow sands & interdunal, esturinal deposits	variable	350 to 2 000+ (Southend)	Near surface on flats 30 to 40 m under dunes
Pleistocene (Qpb)	Bridgewater Fm.	Unconfined	Calcarenite, consolidated to unconsolidated	variable	300 to 1 300+ (Pt MacDonnell)	1 to 15 m depending to topography
Tertiary (Tmg)	Gambier Limestone	Unconfined/ Confinded	Bryozoal limestone to marl	300+	300 to 1 300+ (Pt MacDonnell)	1 to 15 m depending on topography
Tertiary (Twd)	Dilwyn Fm.	Confined	Sands to gravel lenses in fine organic clays etc.	350 (Southend) 800+ (Pt MacDonnell)	(?)600	Artesian at both sites expected

The situation at Southend is similar in that salinity and yields are relatively low with well depths and SWD shallow. However, the units exploited are the Bridgewater Formation in Cape Buffon and the Recent, dunal and interdunal deposits in the township area and to the east. Water quality varies between 360 and 2 070 mg/l (mean 812 mg/l) with nitrate in the range 0.4 to 318.7 mg/l (mean 6.3 mg/l - excluding two high values). Highly saline analyses from fish processing water have been ommitted.

The two high nitrate values were obtained after heavy rain and caused septic tank overflow and are not reprsentative of groundwater nitrate in the longer term. However, they do serve to indicate the ease with which the unconfined aquifer can be contaminated.

Some shallow wells also produce water with a typical "swampy" odour which may prohibit use as a reticulated township supply. There are suggestions that iron may be a problem.

WATER SUPPLY OPTIONS

The following alternatives were considered for each township prior to exploratory drilling:-

1. a trench with approximate dimensions 15 x 2 x 4 to 6 m deep orientated normal to groundwater flow direction tapping the upper portion of the unconfined aquifer. The hydraulics of such a trench are shown in Appendix III.

2. a series of well points (screened in unconsolidated material) linked by a manifold to a centrifugal pump tapping the upper portion of the unconfined aquifer.

3. one or a number of wells drilled deeper in the unconfined portion of the Gambier Limestone aquifer.

4. wells drilled into the upper aquifers of the Dilwyn Formation confined aquifer system.

Alternatives 1 and 2 are essentially the same hydrogeologically but differ in method of groundwater collection.

Alternative 3 is not considered worth persuing because of probable upwelling of the salt water interface. Experience at Carpenter Rocks (Barnett, 1976) and data gathered during the well surveys leads to this conclusion.

Alternative 4 is the only choice remaining if either of Alternatives 1 or 2 fail. However, the cost of drilling wells to the depths envisaged (350 to 400 m in both cases) may preclude this option. Current costs range between $40 000 to $50 000 per well dependant upon well design and materials.

INVESTIGATION METHODS AND RESULTS

Following the completion of the field survey, several shallow investigation wells were drilled in prospective areas near both townships.

Well locations are shown in Figs. 2 and 3 with well details shown on Table 2.

Port MacDonnell

Eight wells were drilled and completed as observation wells with P.V.C. pipe slotted within the aquifer. The holes were in pairs about 30 m apart and designed to act as observation wells during any test pumping of proposed trenches.

However, on subsequent pumping with a small centrifugal pump, the wells (with the exception of one) failed to produce sufficient water to maintain the pump yield. The low permeability of the aquifer is also indicated by the results of a production test on a well at Dingley Dell - about 1.5 km north

Table 2. Drilling Data

Hole No.	Depth (m)	S.W.D. (m)	Salinity (mg/l)	Nitrate (mg/l)	Casing/Comments
		Port MacDonnell (Fig. 2)			
ADH 1	4.6	0.49	815	1.5	PVC 81 mm to 4.6 m slotted 3 to 4.6 m
ADH 2	9.5	2.05	935	1.0	81 mm PVC to 9.5 m slotted 5 to 9.5 m
ADH 3	7.0	0.91	1 350	3.1	81 mm PVC to 5.6 m slotted 1 to 2.6 m
ADH 4	7.1	1.60	1 350	1.0	81 mm PVC to 6 m slotted from surface to 6 m
ADH 5	7.0	1.00	740	7.3	81 mm PVC to 5.5 m slotted from surface to 5.5m
ADH 6	7.0	0.85	1 745	1.0	81 mm PVC to 7.0 m slotted from 2.2 to 7 m
ADH 7	7.0	1.66	765	17.7	81 mm PVC to 7 m slotted from 2.2 to 7 m
ADH 8	4.9	-	660	24.3	81 mm PVC to 4.9 m slotted from surface to 4.9m
		Southend (Fig. 3)			
ADH 1	9.4	approx 3	-	-	collapsed after flight withdrawal. Backfilled & abandoned
ADH 2	5.5	2.1	925	1.0	Backfilled & abandoned
ADH 3	8.2	2.1	3 380	1.0	"
ADH 4	5.5	2.96	960	1.0	"
ADH 5	7.9	2.96	765	1.0	"

Note: Drilled under permit 90,236 using Gemco auger rig operated by J. Jenson of the drilling area. From this test, a transmissivity value of only 40 m^3/day/m was obtained from a tested aquifer interval of 10 m giving a permeability of approx. 4 m/day/m^2.

There is a possibility that intervals of higher permeability could be intersected in the aeolianites of the Bridgewater Formation particularly near its contact with the underlying Gambier Limestone. In fact, the one well which managed to hold pump suction intersected unconsolidated sands of the Bridgewater Formation.

Water quality information given in Table 2 indicates there is likely to be a rapid increase in salinity with depth. Well 6 yielded water with a salinity of 1 745 mg/l and Wells 3 and 4 both gave salinity values of 1 350 mg/l. Wells 7 and 8 located about 100 m south east of some houses produced water with nitrate values of 18 and 24 mg/l respectively (S.A. Health Commission limit for drinking water is 30 mg/l).

In summary, the provision of a town water supply from trenches within the Gambier Limestone in the area tested is improbable both for quantity and quality reasons.

Southend

Five wells were drilled about 0.6 km east of the township in Recent unconsolidated interdunal/shell deposits, four of which were able to be sampled and water level data recorded. Drilling data are sumarised in Table 2.

Results show that for water quality reasons - increase in salinity with depth, hydrogen sulphide and probable iron, alternative drilling sites will be required. Areas within the adjacent Canunda National Park could be investigated with the approval of the National Parks & Wildlife Service, but are unlikely to give significantly better results.

SUMMARY & CONCLUSIONS

Field surveys, previous geophysical surveys in similar hydrogeological environments, and exploration drilling indicate that shallow potable groundwater abstraction from trenches for both sites is impracticable.

For Port MacDonnell both quantity and quality criteria are unlikely to be met whilst for Southend groundwater quality and difficulties with trench excavation are problems.

Sites further inland from both townships defined by resistivity surveys could be exploited using deeper wells tapping the Gambier Limestone water table aquifer. This alternative would need to be weighed against increased mains costs.

The only guaranteed, potable, groundwater source in immediate proximity to the towns is to drill wells to about 400 m into the confined Dilwyn Formation aquifers.

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APPENDIX I

Well Data - Port MacDonnell

Note 1. Unit Nos. preceded by 7021004WW except 3161 and 3162 which are preceded by 7021994WW

2. All wells in Hd. MacDonnell

Unit No.	Name	Sec	Depth (m)	SWL (m)	Casing From (m)	Casing To (m)	Diam (mm)	TDS mg/l	NO_3^- mg/l	Logs Avail.
3087	Mrs P. Taylor	792	36.58 (orig)	6.10 (orig)	0	1.21	175	700	22.1	–
3162	C.B. Moritz	118	18.0 (orig)	1.64	-0.2	?	127	1240	7.5	–
3161	KW Palamountain	118	16.5	1.64	+0.1	?	152	640	11.1	–
3086	D Cawthorne	118	18.0 (orig)	2.29	-0.2	0.8	152	710	11.5	✓
1295	RD Perryman	794	32.8	0.9	0	3.66	104	650	2.7	–
1296	R Elliot	682	27.8	15.16	-0.05	?	102	–	–	–
1297	"	801	7.0	2.39	-0.17	?	127	625	11.1	–
1294	G Phillips	118	22.6	2.32	-0.12	?	152	1240	9.3	–
1304	PJ Lattin	119	32.7	2.83	-0.2	1.22	152	690	22.1	–
1305	"	119	26.0	12.92		12.19	152	<362	–	–
[illegible]303	"	120	5.9	3.42	0	minor	152	>475	–	–
1306	"	119	24.38 (orig)	–	0	6.10	152	1325	–	–
1307	"	796	22.6	1.33	0	0.61	152	660	–	–
1308	"	802	6.0	2.41	-0.15	4.57	127	610	–	–
1037	AC Uphill	118	20.5	1.18	-0.3	3.66	152	1325	–	–
1298	K Milstead	136	26.8	2.58	-0.17	0.61	203	655	–	–
1309	"	E			Spring			590	15.9	–
1302	"	123	16.3	4.38	-0.16	12.19	152	275	–	–
3078	"	123	4.6	3.0	-0.4	8.23	100	680	–	–

A-2

Unit No (6922009WW)	Name	Sec/Allt	Depth (m)	SWL (m)	Casing From (m)	Casing To (m)	Diam (mm)	TDS mg/l	NO_3 mg/l	Logs Avail.
3228	D.Burnett	Allt 112	5.5	4.11	0	5.5	152	1050	–	–
249	"	"	6.45	4.01	-0.16	?	140	1235	–	–
297	J.Coleman	141	8.8	4.8	-0.05	8.8	152	525	–	–
		Yield 110m^3/day								
298	"	"	8.0	4.75	0	8.0	152	416	–	–
299	"	137	7.1	4.74	0	7.1	152	440	–	–
309	Ocean Foods	Harbour Res.	183(orig) 76(pres)	–	0	76.2	152	>13000	–	–
310	"	"	8.53	8.0	-0.15	8.5	152	<17000	–	–
311	"	"	38.1	8.52	0	38.1	152	7000	–	–
		(2 of J. Sims logs available for this area)								
250	P. Rapp	86	6.8	4.24	0	6.8	152	680	–	–
251	P.Jauregui	85	5.6	3.3	0	5.6	152	660	–	–
252	L. Galli	30	8.7	4.97	0	8.7	152	880	–	–
253	"	"	6.7	4.0	-0.15	6.7	127	<880	–	–
3224	Galli Farmers	92	6.0	3.46	-0.1	6.10	152	660	–	–
3214	F. Fabris	95	5.4	3.66	0.15	5.40	152	900	–	–
255	G. Galli	99	6.7	3.96	0	6.7	152	145?	–	–
308	E. Puccetti	1	16.7	–	0	16.7	152	1020	–	–
256	M.Osbo rne	103	6.6	4.8	0	6.6	102	965	–	–
257	C.Bradshaw	104	6.10	–			well	995	–	–
258	A. Wallis	105	6.65	4.47	-0.05	6.7	152	980	–	–
259	J.Warden	97	7.15	4.41	0	7.15	127	825	–	✓
260	A. Auld	96	6.7	4.35	–	–	–	<1095	–	–
261	A.Witkin	94	7.62	–	-0.13	7.62	152	810	–	–
262	K.Bedson	93	5.0	3.30	0	5	152	645	–	–
3211	B.Chambers	89	5.7	4.17	0	5.7	152	<130?	–	–
3215	A. Galli	90	6.7	4.22	-0.16	6.7	152	740	–	–
3218	M.Fedden	79	6.1	3.43	0	6.1	152	660	–	–
263	W.Conlin	83	7.9	3.51	0	7.9	140	815	–	✓
		Yield 220m^3/day								
3225	W. Kable	77	5.9	3.28	0	5.9	152	565	–	–
264	"	"	6.7	3.28	-0.1	6.7	127	810	–	✓
		Yield 220m^3/day								
312	Fishbrook	Harbour Res.	4.0	2.22	-0.08	4.0	152	>13000	–	–
313	SAFCOL	"	5.0	2.16	-0.11	5.0	152	1980	–	–
265	E.Johnson	84	7.4	3.42	-0.11	7.92	152	830	–	–
3217	R.Woyde	82	6.6	3.8	-0.11	6.6	152	770	–	–

A-3

Unit No (6922009WW)	Name	Sec/Allt	Depth (m)	SWL (m)	Casing (m) From	To	Diam (mm)	TDS mg/l	NO_3 mg/l	Logs Avail.
3216	E.McGrata	87	6.7	4.09	0	6.7	152	690	–	–
3222	N.McArthur	78	6.1	3.47	0	6.1	152	465	–	–
266	B.Horrigan	81	6.0	3.42	-0.05	6.0	152	690	–	–
268	S.Crowhurst	80	7.3	3.74	0	7.3	127	575	–	–
3219	G. Fabris	74	6.0	3.13	-0.15	6.1	152	440	–	–
269	R.Watson	74	7.0	3.56	-0.4	7.0	152	660	–	–
3223	L. Brooks	75	6.1	3.48	0	6.1	127	530	–	–
3226	A.Jackway	69	6.65	4.53	0	7.0	152	475	–	–
300	G.Fennell	134	6.8	4.42	0	6.8	152	380	–	–
3209	S. Hales	57	5.8	4.39	0	6.7	102	565	–	–
270	A.Millard	70	5.0	3.47	-0.25	5.0	140	>403	–	–
179	D.Powell	71	8.4	4.01	-0.06	8.4	127	740	–	✓
178	A. Warden	72	8.2	3.57	-0.08	8.2	127	710	–	–
271	"	"	6.7	3.14	-0.2	6.7	127	675	–	–
3220	P.Harvey	66						705	–	–
272	A.Tebbutt	65	5.3	3.0	-0.37	5.3	152	525	–	–
3227	M.Whittington	68	6.71	–	0.1	6.71	152	440	25.2	–
273	K.Campbell	67	5.2	3.01	-0.04	5.2	152	<375	–	–
301	G.Watson	132	5.6	3.26	-0.06	5.6	152	570	13.7	–
302	P.Farrow	129	6.3	3.2	-0.2	6.3	152	530	1.8	–
303	Meredith	131	5.75	3.09	0	5.75	152	475	–	–
304	D.Sapiatzer	139	6.2	4.74	-0.01	6.2	102	<610	–	–
305	L.Chambers	138	5.8	4.59	-0.02	5.8	102	765	–	–
306	J.Redman	136	5.15	4.11	0.9	5.15	152	390	2.7	–
274	L.Cabot	47	7.4	4.33	-0.1	7.40	152		–	–
275	J.Altschwager	46	7.4	5.6	0	7.4	127		–	–
276	H.Sweetman	42	8.8	5.19	-0.33	8.8	152		–	–
277	B. Tedham	48	9.3	5.21	-0.15	9.3	152		–	–
278	"	"	7.1	5.21	0	7.10	152	800	6.6	–
279	R.Chambers	58	6.4	–	0.3	6.4	152	<140?	–	–
314	South End Community Centre	407	5.4	3.42	-0.3	5.4	152	343	–	–
307	M.Skrijel	130	5.7	3.18	0	5.7	152	540	–	–
3204	J.Kenworthy	41	8.2	5.0	-0.32	8.2	152	525	–	–
280	Youth Camp	39	9.0	5.89	-0.25	9.0	102	680	–	–
281	ER.Chambers	35	7.8	4.85	0.13	7.8	152	860	4.9	
		Yield 130m^3/day (new) 98m^3/day (present)								
282	B. Osis	34	8.7	4.82	-0.15	8.7	127	670	0.9	–
283	"	"	10.9	4.85	-0.11	10.9	127	740	–	–

APPENDIX II

Well Data - Southend

Note 1. All wells in Hd. Rivoli Bay

2. Selected wells only on Fig. 3. See plans 6922 - 009 or 6922 - 004 for other locations

Unit No (6922009WW)	Name	Sec/Allt	Depth (m)	SWL (m)	Casing From	To (m)	Diam (mm)	TDS mg/l	NO_3 mg/l	Logs Avail.
284	B.Fabris	33	5.79	4.95	-0.08	5.79	152	710	-	-
285	P.Chambers	12	7.0	5.54	0	7.0	127	435	-	-
3202	A.Mathison	13	10.2	6.22	-0.22	10.2	102	980	-	-
164	J.Stuckey	14	9.0	5.51	-0.06	9.0	127	735	-	✓
286	A.Campbell	16	7.1	4.22	-0.09	7.1	152	740	-	-
287	M. Thorn	37	7.6	6.09	0	7.6	203	735	-	-
3206	G.Stratford	44	6.7	5.11	-0.3	6.7	102	780	-	-
288	"	"	6.95	5.03	-0.04	6.95	152	<360	-	-
289	B. Haines	29	7.5	5.94	-0.24	7.5	152	965	-	-
290	"	"	7.9	5.57	0.25	7.9	152	1230	318.7 201.4	-
291	Chuck	28	6.9	5.9	0	6.9	152	1775	-	-
292	R. Auld	9	7.15	4.4	0		152	745	1.8	-
293	"	"	6.8	4.07	0.1		152	1060		
294	D. Bell	8	5.49	-	0	5.49	152	-		
295	G. Black	7	7.95	3.83	0	7.95	152	475	0.4	-
3165	D.C.Millicent	391	5.3	4.91	-0.36	5.3	152	1100	-	-
3168	"	1960	5.9	4.02	-0.16	5.9	152	1265	-	✓
3169	"	"	8.35	4.29	-0.2	5.18	152	540	-	✓
3167	"	"	7.1	4.31	0	4.87	152	790	-	✓
315	I. Smith	356	4.85	4.25	-0.25	4.85	102	1100	2.7	-
324			2.0	-	-	-	152	640	8.9	-
330	I. Smith	358	Drain	-	-	-	-	865	-	-
296	D.Walker	25	6.2	5.23	0.15	6.2	152	830	-	-
316	D. Sporer	18	7.4	6.4	-0.03	7.4	152	890	-	-
317	D. Martin	31	3.66	-	0		?	1450	-	-
199	G. Yates	17	5.8	4.38	-0.2	5.8	102	950	-	-
318	S.Fennell	15	6.15	4.3	-0.1	6.15	152	1150	-	-
319	A.Patten	14	6.8	4.19	0.2	6.8	127	1265	-	-
320	J. Ellis	13	9.3	7.71	0	9.3	102	1440	-	-
321	"	10	15.0	8.18	-0.46	9.14	152	>6500	-	-
(6922004WW)										
326	I. Smith	356	4.3	3.47	0.1	4.3	102	2070	0.9	-
325	"	358	4.1	1.06	0	4.1	102	1070	0.1	-
(6922009WW)										
322	R.Lawrie	9	14.4	-	0	14.4	102	1200	-	-
3182	A.Pegler	2	19.1	12.11	-0.13	14.5	140	1255	-	-
323	E.Telfer	3	17.5	13.04	-0.28	-	152	805	-	-
3229	P.Reilly	138	15.0		-0.23	-	152	2950	-	✓
3170	R.Shurdington		27.4		0	18.2	127	705	-	✓
3177	Nat. Parks	396	21.3		-0.09	17	152	1590	-	✓

APPENDIX III

Hydraulics of a Trench

(calculations by D. Armstrong)

APPENDIX III

Hydraulics of a Trench Discharge may be estimated by applying a simplified form of the equation for a Pantly Penetrating Trench in Unconfined Aquifers, (Butler, Engineering Hydrology p. 142)

Discharge per unit length of trench = $q = \frac{\Pi ks}{2.3 \log 10 \ (R/r)}$

in which S = drawdown at trench

R = radius of influence of trench (the distance at which s=0)

r = effective radius of trench = $\frac{2a+w}{\Pi}$

a = depth of water when pumping
w = width of trench

The following values were assumed

$k = 4 \ m^3/day/m^2$ (from Dingley Dell Pump Test)
$s = 3$ m
$r = 30$ m
$w = 2$m
$a = 2$m
$r = \frac{6}{\Pi} = 1.9$

$$q = \frac{\Pi ks}{2.3 \log 10 \ (R/r)} = \frac{\Pi \times 4 \times 3}{2.3 \log 10 \ (30/1.69)} = \frac{37.7}{2.87} = 13 \ m^3/day/m$$

A simple flow net analysis resulted in a discharge per metre length of 12 m^3/day which is in good agreement with the calculated value.

The required discharge at Pt MacDonnell is 1 640 m^3/day which would require a trench of $\frac{1640}{13}$ = <u>126 metres length</u>

The low permeability of the Gambier Limestone exposed at the surface in the area of the proposed trench would appear to exclude the possibility of suitable supply being obtained from a trench.

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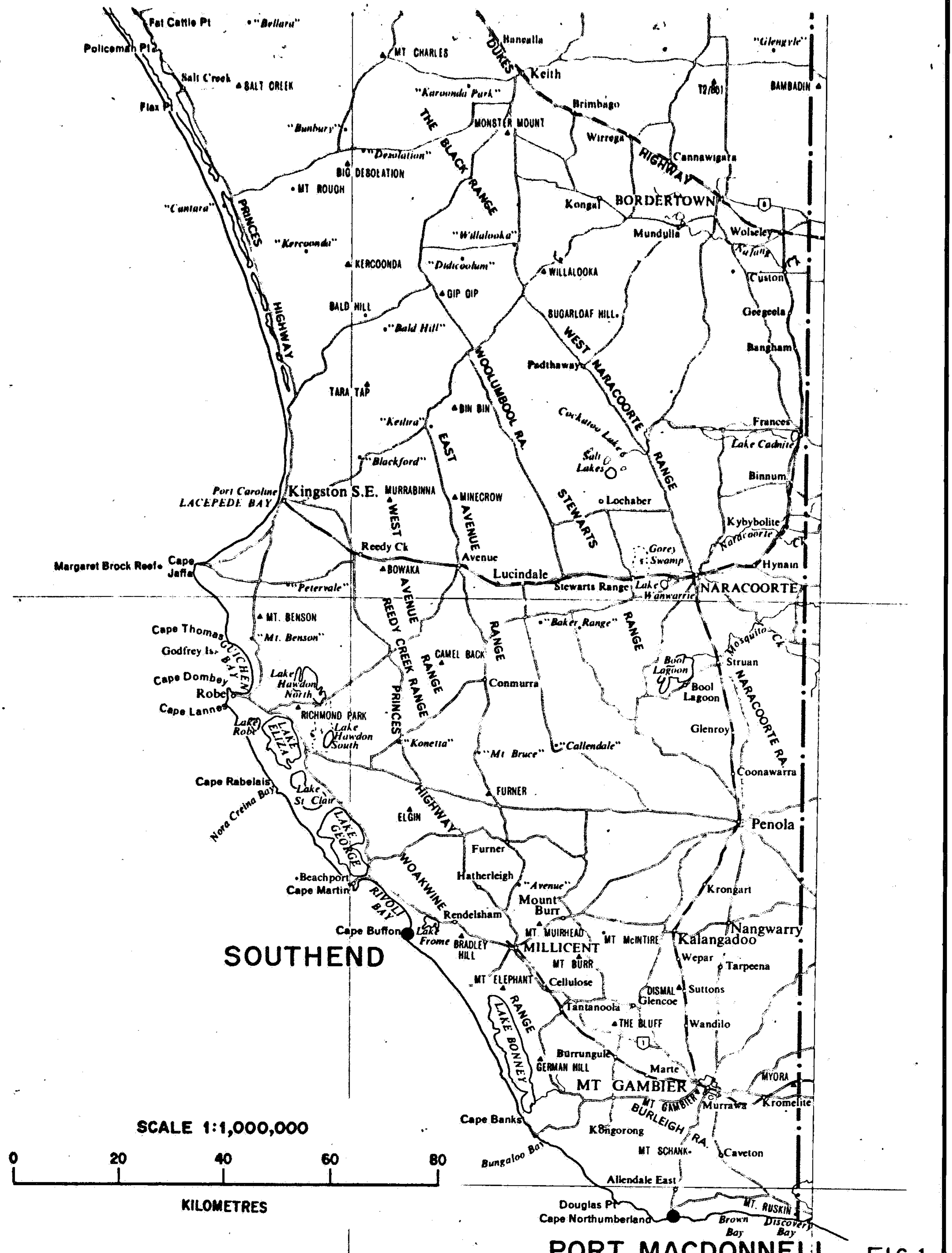
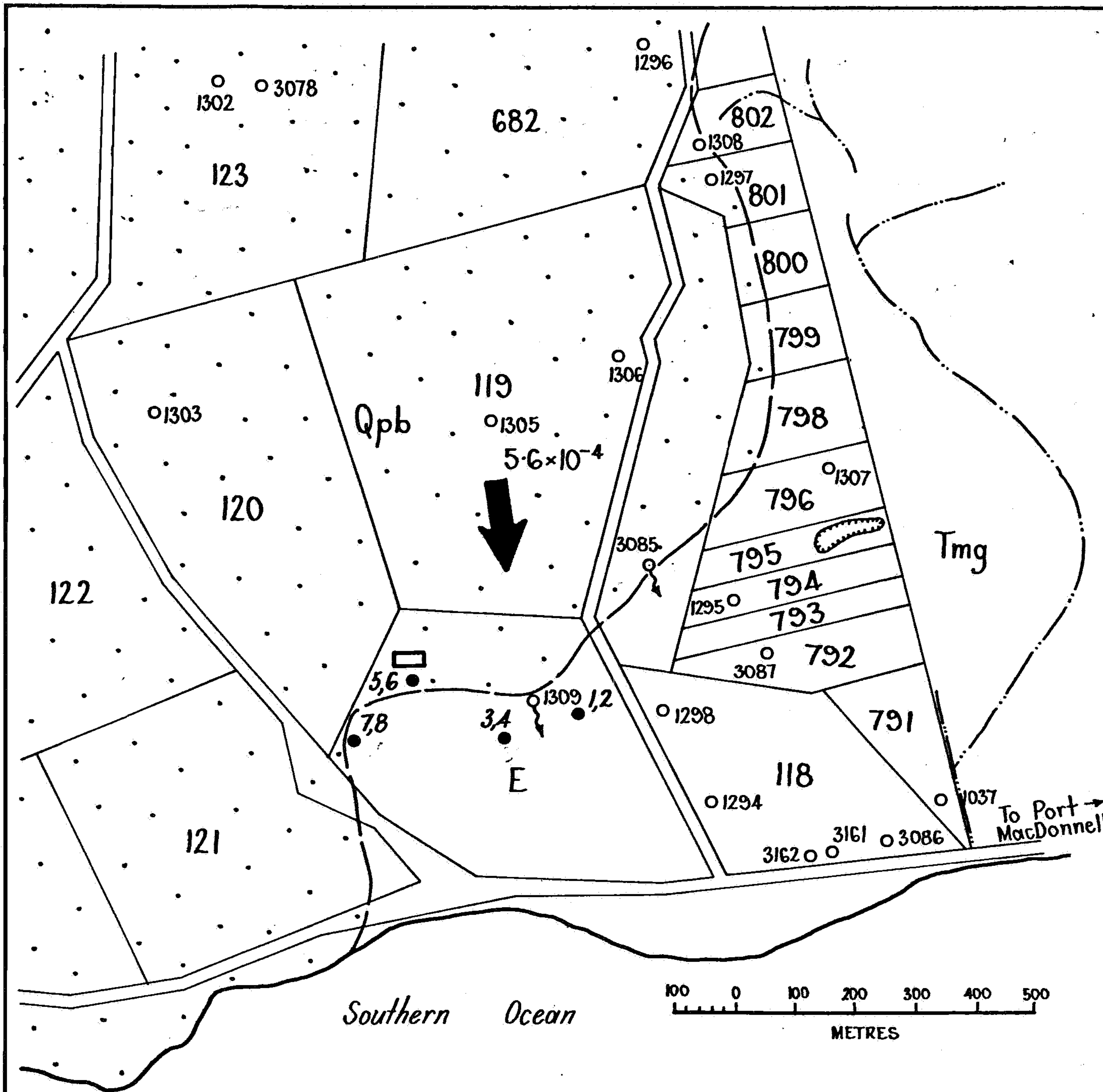


FIG.1

	DEPARTMENT OF MINES – SOUTH AUSTRALIA	SCALE 1:1000,000
COMPILED: P.C.S.	PT. MACDONNELL AND SOUTHEND TOWN WATER SUPPLIES	DATE Nov. 1979
DRN: R.H. CKD.	LOCALITY PLAN	PLAN NUMBER S14412



Qpb Bridgewater Formation - calcarenite, aeolianite.

Tmg Gambier Limestone - bryozoal limestone to marl.

Quarry

5·6×10^{-4} Groundwater Flow Direction (sub-regional) with gradient.

1308 Well (prefixed by 7021004WW0 for Unit Nº)

Spring

Owner: Sect. E - K. Milstead

3,4 Exploration Augerholes

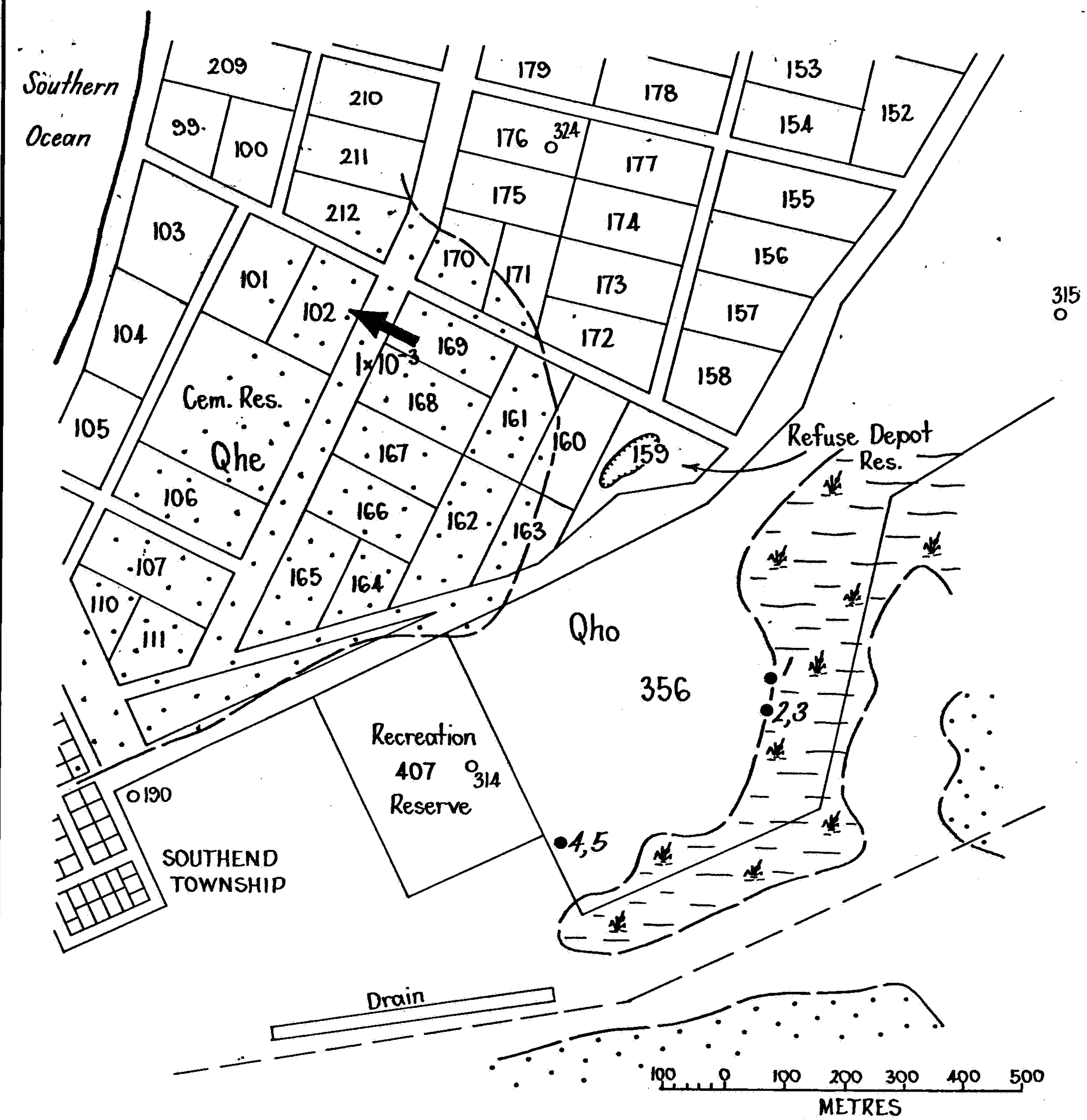
Proposed Trench

Shallow drain

FIG. 2

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:10000
COMPILED: P.C.S.	PT. MACDONNELL TOWN WATER SUPPLY	DATE: Nov. 1979
DRN: R.H. CKD:	PROSPECT PLAN	PLAN NUMBER S14 413

1708



1×10^{-3} Groundwater Flow Direction (sub-regional) with gradient.

314 Well (prefixed by 6922090WW0 for Unit Nº)

4,5 ● Exploration Augerholes.

Lessee : Sect. 356 – I. Mc Smith.

See Appendix 2 for well details.

Qhe Semaphore Sand :- coastal dune deposits.

Qho St Kilda Formation :- esturinal deposits with shell beds.

Land subject to inundation

FIG. 3

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:10000
COMPILED: P.C.S.	SOUTHEND TOWN WATER SUPPLY	DATE: Nov 1979
DRN: R.H. CKD:	PROSPECT PLAN	PLAN NUMBER S14414

1708