RB 53/18

DEPARTMENT OF MINES

SOUTH AUSTRALIA

FINAL REPORT

GROUNDWATER INVESTIGATIONS - EYRE HIGHWAY

WUDINNA-MINNIPA SECTION

Highways & Local Government Department.

by

R. G. Shepherd
Geologist.

GEOLOGICAL SURVEY

HYDROLOGY SECTION

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G.S. 2065
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19th July, 1961

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GROUNDWATER INVESTIGATIONS - EYRE HIGHWAY

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INTRODUCTION:

Following investigations along this section of the Eyre Highway during June 1960, four sites were selected for initial drilling. It was considered that additional sites would possibly be necessary, depending on results obtained. Drilling commenced at No. 4 bore during November 1960 and was completed on this section of the Highway in January 1961. The bores were drilled at the positions shown on plan No. 60-331 and it was found necessary to drill one additional bore south east of Wudinna.

Pump tests were conducted on those bores which yielded a moderate supply, the remainder were abandoned and the casing withdrawn.

RESULTS OF DRILLING:

At Bore No. 4, where drilling commenced, bedrock of hard granite was reported by the driller to occur at 155 feet. The weathered zone, consisting of sand and grit with fragments of weathered granite, was entered at 145 feet, above which is a series of sands and clays, with dense travertine near the surface.

Water occurred in the sands and clays at a depth of 62 feet but only in the form of a seepage. The sediments were found to contain water to 145 feet, but a bailer test, during which the bore was uncased, indicated a maximum yield of approximately 80 gallons per hour. Bore No. 4 was then abandoned and the drilling plant moved to site No. 3, south of Yaninee.

Weathered granite was found to occur at 95 feet at this site and drilling was discontinued at 98 feet. A relatively large supply of highly saline water was obtained at a depth of 24 feet. The aquifer, which consists of fine to coarse sand with some grit and clay, extends to 43 feet, and overlies a thin clay bed. Below the clay the sediments consist of fine sand and grit with some clay and yielded a small supply of saline water from 76-95 feet. The small yield probably indicates that replenishment is very slow, and, in addition, the sediments of this aquifer appear to have a low permeability. The upper aquifer was developed and pump tested, the bore being fitted with 45 feet of 6" casing, 20'5" of which was slotted.

Bore No. 1, approximately 4 miles south of Minnipa, yielded only a small seepage and drilling was discontinued at 208'. The sediments penetrated consisted mainly of sand and clay with some limestone and lateritic sandstone, down to 114 feet. Below this depth a cream gritty clay with mica occurs and appears to be a bedrock derivative.

When Bore No. 1 was abandoned a new site was selected on the main road approximately 2½ miles south east of Wudinna in the Hundred of Wannamana as water for road works was urgently required in that area.

In this bore (No. 5) water occurs at a depth of 24 feet, the aquifer consisting of sand, grit and gravel with only minor quantities of clay. Finer grained sediments occurring at 43 feet apparently contained little water and drilling was discontinued in grit at 46 feet. It was considered that the sediments occurring below 43 feet would be unlikely to yield greater quantities than the 24-43 feet zone, where it was expected that 1,000 gallons per hour or more would be obtained.

The Highways Department considered that additional supplies would probably be required along this section and requested that No. 2 bore be drilled. This bore, which is situated 3½ miles south of Yaninee, yielded a very small supply from fine sand at 23 feet. A larger supply occurs in lignitic sand and grit at 92 feet, below which is a light grey clay with

quartz grit apparently derived from the underlying granite. The lower aquifer was developed and pump tested, as it was considered that it would probably yield up to 1,000 gallons per hour.

PUMP TESTS:

These were carried on for period of up to 12 hours on bore Nos. 2, 3 and 5; bores 1 and 4 being abandoned.

The total yield of these three bores was found to be more than 3,000 gallons per hour and was considered to be sufficient for this section of Eyre Highway.

Details of the various pump tests are as follows:-

Bore No. 2

Static water level in this bore which is equipped with 94 feet of 6" casing, is 45 feet below the surface. The pump was set at 60 feet and a maximum yield of 750 gallons per hour was obtained with a drawdown of almost 15 feet. In an attempt to obtain a larger supply the pump was lowered to 80 feet, but the yield increased to only 800 gallons per hour. At this rate the drawdown was 35 feet, which was the level of the pump. A yield of 800 gallons per hour continuously therefore appears to be beyond the capacity of the bore.

As a result of the pump test, which was continued for 11½ hours, it is considered that the maximum continuous yield of the bore is not greater than 750 gallons per hour. Lowering of the pump to 90 feet is not expected to result in any significant increase in supply and it is suggested that, when the bore is equipped, the pump be set at 60 feet.

Bore No. 3

Before commencing pumping the static water level was 22 feet from the surface, the pump being set at 42 feet. Pumping commenced at the rate of 1,100 gallons per hour which resulted in a drawdown of 3'10". The pumping rate was increased to 1,600 gallons per hour, causing a rapid fall of 20 feet in the water level. This yield could only be maintained for a short period, when it dropped to 1,350-1,400 gallons per hour with the

water level at the bottom of the pump.

With the pump reduced to normal working speed and yielding 1,200 gallons per hour the water level rose to 28 feet from the surface.

Results of the pump tests can therefore be summarised as follows:-

Rate	Drawdown
1,100 g.p.h.	3'10"
1,200 g.p.h.	6'
1,350-1,400 g.p.h.	20'

Following the pump test at 1,200 gallons per hour the water level recovered rapidly to the original static level of 22 feet. It is therefore considered that 1,200 gallons per hour is the maximum continuous yield to be expected from this bore, with the pump set at 40 feet below the surface.

Bore No. 5

This bore was found to be somewhat difficult to develop because of the fine sand and clay occurring in the aquifer. However, it was successfully developed using $\frac{1}{8}$" slotted casing. Pump testing commenced with the pump set at 42 feet, the static water level being 24 feet from the surface.

After 10 hours continuous pumping at 1,200 gallons per hour the drawdown was 6'2" and at the end of this period the water level recovered rapidly to 24 feet.

This bore appears to be similar to bore No. 3 in that the maximum safe yield is probably 1,200 gallons per hour and it is suggested that, when equipped, the pump should be set at 40 feet in both bores. A plan showing location of the various bores is included, together with logs.

SUMMARY AND CONCLUSIONS:

Moderate supplies of highly saline water were proved in three bores on this section of Eyre Highway and two bores were abandoned because of very small supply.

The total yield is approximately 3,150 gallons per hour, consisting of 1,200 g.p.h. each for bore Nos. 3 and 5 and 750 g.p.h. for bore No. 2.

It is considered that these three bores should provide sufficient water for road works on the Wudinna-Minnipa section. Bore No. 5, which has already yielded large quantities for road works in the area, will probably also be used at a later date during reconstruction of the Koongawa-Wudinna section.

The drilling in this area has shown that moderate supplies are likely to be obtained only in the vicinity of salt lakes, where there is a possibility that sand or gravel occurs at shallow depth. Elsewhere the sediments overlying weathered bedrock apparently contain a considerable proportion of clay and yield only small supplies of water.

Lignitic sediments of possible Tertiary age were encountered in Bore No. 2 on the eastern side of the large Lake Yaninee depression.

These sediments which consist of sand, clay and grit with fragments of lignite, are water bearing and may extend beneath the whole Lake Yaninee depression in addition to other salt lakes in the area.

In view of this possibility drilling sites were selected in the vicinity of salt lakes along other sections of Eyre Highway, particularly near Kyancutta.

R. G. Shepherd
Geologist,
HYDROLOGY

RGS:CERF
19/7/61

H. & L.G. DEPT.

ADELAIDE

MINNIPA

1

657/60
Road Reserve Adjoining Sec. 1.

LOCK

22/11/60

7/12/60

0 - 1'	Red brown fine sand with limestone nodules.
1 - 3'	Buff dense sandy travertine.
3 - 11'	Light brown clayey fine sand with limestone nodules.
11 - 25'	Yellow brown clayey fine sand with sub-angular quartz grit.
25 - 45'	Red brown clayey fine sand with quartz grit.
45 - 82'	Light brown medium grained clayey sand and dense fine grained lateritic sandstone.
82 - 90'	Cream fine sand and silt.
90 - 103'	White fine sand.
103 - 106'	Grey gritty clay.
106 - 108'	Yellow brown and grey sandy clay with abundant quartz grit.
108 - 111'	Buff clayey fine sand and sub-angular quartz grit.
111 - 114'	Buff clayey fine sand with quartz grit and pockets of kaolin.
114 - 208'	Cream gritty kaolin with mica.

208'

NIL

120

Seepage only

2,835

LW 122/61

Abandoned - insufficient supply.

R. G. SHEPHERD

8/3/61

H. & L.G. DEPT.

ADELAIDE

YANINEE

2

657/60
Road Reserve Adjoining Sec. 12

LOCK

11/1/61

18/1/61

0	- 1'9"	Light brown sandy soil.
1'9"	- 4'	White and light brown sandy clay.
4'	- 18'	Light brown slightly clayey fine sand and silt.
18'	- 18'6"	Light brown fine grained dense sandstone.
18'6"	- 23'	Light grey dense fine grained sandy limestone and pink dense sandstone.
23'	- 27'	Light brownish grey clayey fine sand and silt.
27'	- 33'	Grey fine sand and silt with some quartz grit and pockets of white clay.
33'	- 40'	Light grey sandy clay with quartz grit.
40'	- 62'	Brownish grey slightly clayey fine sand.
62'	- 72'	Light greenish grey sandy clay with quartz grit.
72'	- 90'	Dark grey dense sandy lignitic clay and silt.
90'	- 97'	Grey sandy clay with abundant sub-angular quartz grit, and fragments of lignite.
97'	- 100'	Light grey silty clay with abundant quartz grit.

100'

94' of 6"

23	23	small			
92-97	45	800	11½hours pump	1,100+	LW 214/61

Pump set at 60' supply 750 g.p.h.; pump set at 80' supply 800 g.p.h. (Max) drawdown 35'.

R. G. SHEPHERD

24/2/61

H. & L.G. DEPT.

ADELAIDE

YANINEE

3

657/60
Road Reserve Adjoining
Section 20

LOCK

0 - 1'	Light brown sandy soil.
1 - 5'	Light brown dense nodular sandy limestone.
5 - 17'	Buff clayey fine sand with limestone nodules.
17 - 27'	Buff clayey fine sand and silt with pockets of grey clay.
27 - 36'	Greyish pink clay with lime nodules and quartz grit.
36 - 43'	Light brown and grey clayey coarse sand with pockets of yellow clay.
43 - 50'	Grey gritty clay.
50 - 52'	Light brown medium grained clayey sand and grit.
52 - 62'	Dark brown clayey fine sand with abundant sub-angular quartz grit.
62 - 76'	Buff silty clay with sub-angular quartz grit and mica and silt.
76 - 95'	Greyish brown clayey fine sand and silt with quartz grit.
95 - 98'	Grey clayey quartz grit with felspar and weathered granite.

98'

45' of 6" including
20'5" of slotted 6"

24-43	22	1,200	pump	1100+	LW 81/60
76-95	75	Small		1100+	LW 82/60

Following results obtained with pump set at 42' below surface.

Pumping 1100 g.p.h. drawdown 3'10"

" 1600 " " 20'

" 1200 " " 6' - rapid recovery to original static level.

R. G. SHEPHERD

8/3/61

H. & L.G. DEPT.

ADELAIDE

PYGERY

4

657/60
Road reserve adjoining Section 12

LOCK

0 - 1'10"	Light brown sandy soil with nodules of lime.
1'10 - 3'	Brown slightly clayey fine sand with dense light brown nodular travertine.
3' - 15'	Light brown clayey fine sand and silt with limestone nodules.
15' - 26'6"	Brown fine-coarse sand and grit, with lateritic sandstone gravel.
26'6" - 51'	Light brown fine sand with abundant sub-angular quartz grit.
51' - 54'	Cream slightly clayey fine sand with abundant sub-angular quartz grit and pockets of white clay.
54' - 62'	Light brown clayey fine sand with quartz grit and nodules of kaolin.
62' - 96'6"	Buff gritty clay.
96'6" - 145'	Light grey gritty fine sand and silt with pockets of kaolin.
145' - 155'	Light grey coarse sand and grit with fragments of weathered granite and felspar.
155'	Granite.

155' NIL

62-145	70	80	Bailer	1,745	LW123/61

Abandoned - insufficient supply

R. G. SHEPHERD

10/3/61

H. & L.G. DEPT.

ADELAIDE

657/60

Road Reserve Adjoining Sec. 13

WANNALIANA

5

LOCK

0 - 5'	Brown slightly clayey fine sand.
5 - 28'	Brown clayey fine sand with nodules of lime, and rounded quartz grit.
28 - 38'	Brown clayey fine sand with abundant sub-angular quartz grit.
38 - 40'	Grey sub-angular quartz grit and gravel with dark brown fine sand.
40 - 43'	Grey sub-angular quartz grit and gravel with minor quantities of sand.
43 - 44'	Light grey clayey fine sand and silt with abundant quartz grit.
44 - 46'	Light brown fine-coarse sub-angular quartz grit.

46'

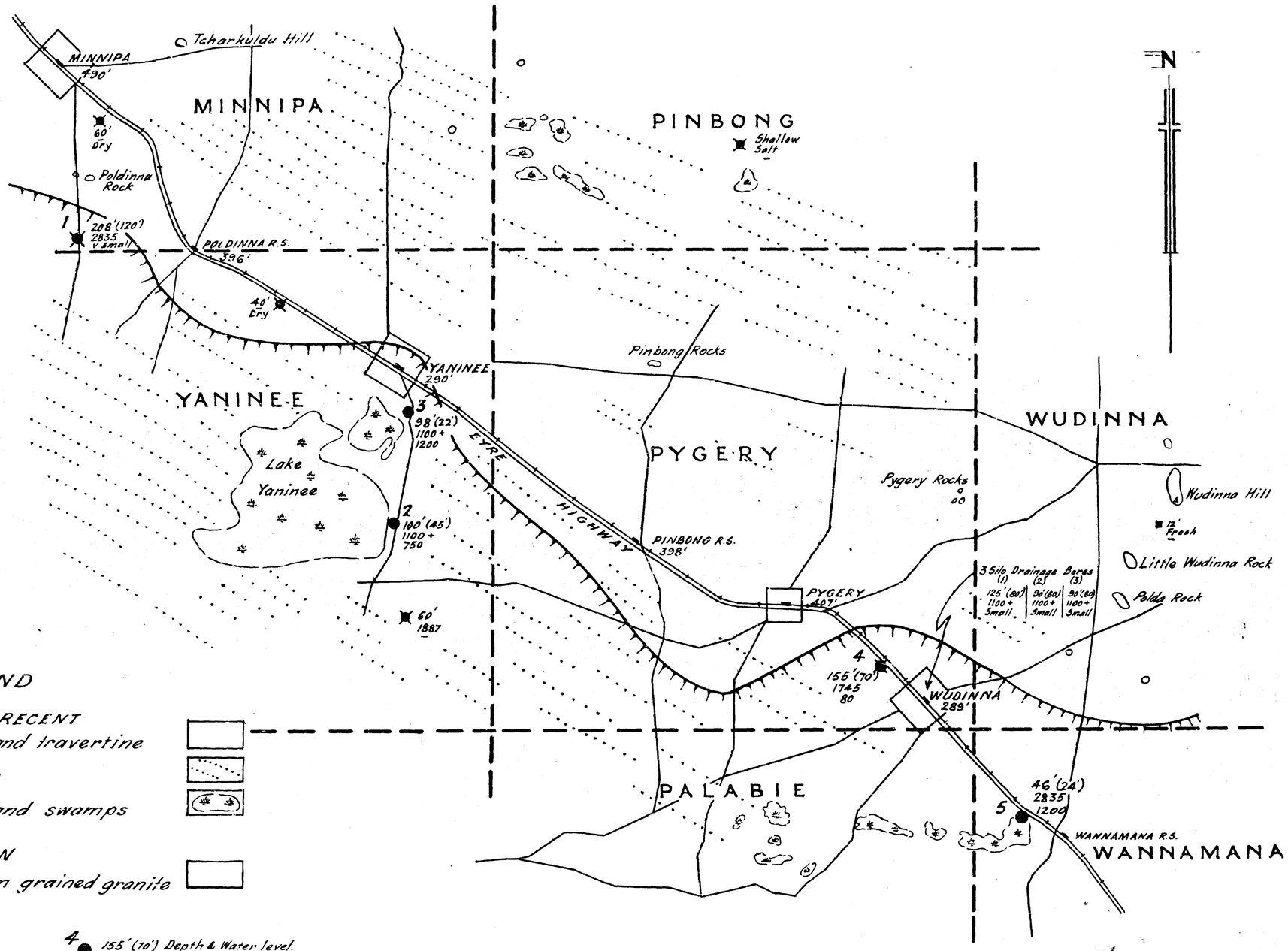
44'9" of 6"

24	24	1200	Pump 10 hours	2835	LW 129/61

Drawdown 6'2" pumping 1,200 g.p.h. for 10 hours. Water level recovered rapidly to original static level.

R. G. SHEPHERD

8/3/61



LEGEND

PLEISTOCENE RECENT
- Sandy clay and travertine
- Sand dunes
- Salt lakes and swamps

?PRE-CAMBRIAN
- Pink medium grained granite

Bore sites — 4 ● 155'(70') Depth & Water level. 1745 Salinity - Grains/Gall. 80 Supply - Galls./hour.

Abandoned Bores

Margin of high ground (Approx)

Height above sea level 398'

To accompany report by R.G. Shepherd.

S.A. DEPARTMENT OF MINES

GROUNDWATER INVESTIGATION
EYRE HIGHWAY
WUDINNA - MINNIPA SECTION
H. & L.G. DEPT.

Approved: Director
Passed:
Drn. A.G.S. Tcd. A.R. Ckd. Exd.
Scale: 2 Miles to 1"
61-4
Dn. 1/5+8/9
Date 8-8-61

No.	Amendment	Exd.	Date