DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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SAMPLING AND MEASUREMENT OF MOUND SPRINGS GREAT ARTESIAN BASIN SOUTH AUSTRALIA
Progress Report No. 3

WARRINA, OODNADATTA, BILLAKALINA AND CURDIMURKA SHEETS.

GEOLOGICAL SURVEY

ENGINEERING DIVISION

By

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SAMPLING AND MEASUREMENT OF MOUND SPRINGS GREAT ARTESIAN BASIN SOUTH AUSTRALIA

Progress Report No. 3

WARRINA, OODNADATTA, BILLAKALINA AND CURDIMURKA SHEETS

ABSTRACT

This report virtually completes a systematic survey of mound springs around the south western edge of the Great Artesian Basin in South Australia. There are as yet about twenty left unsampled, most on BILLAKALINA in the Francis Swamp and Margaret Creek areas. Difficulty in matching previously recorded data with that obtained in this series of surveys was experienced in many cases due to poor original locality information. Often a spring actually consisted of groups of discrete springs which varied in flow and also water quality. Aerial and ground photographic locations should now make future identification easy and thus enable temporal comparison of the above parameters.

The wealth of chemical data in this and the other two reports in the series together with that available for many of the flowing wells in the area provides ample material for a hydrochemical study of the South Australian portion of the Great Artesian Basin. The subject appears suited to an Honours Science thesis but may require a field trip to measure other spring water parameters such as dissolved oxygen, carbon dioxide, hydrogen sulphide and pH.

INTRODUCTION

This is the third in a series of reports summarising the results of systematic sampling of mound springs along the southwest margin of the Great Artesian Basin in South Australia (Fig. 1). Areas covered included the WARRINA and OODNADATTA and parts of the BILLAKALINA and CURDIMURKA 1:250 000 sheets. The original survey was initiated through a request by the Bureau of Mineral Resources for information on the natural

discharge of the Great Artesian Basin in South Australia. Field surveys by Williams et al (see Williams, 1974) and Cobb et al (Cobb, 1975) in 1974 showed 95% of the natural discharge occurred at Dalhousie even though many springs on WARRINA had not yet been visited.

The sampling programme continued erratically during the period 1974 to 1978 and was carried out in conjuction with a detailed study of the relationship between spring discharge, the area of swamp and open water supported by the discharge, and evaporation rate. Such a relationship is linear as proved by Williams and Holmes (1978) though complicating factors may arise (Williams, Hall, Henschke and Holmes, in prep.). Field parties during this period included staff from both Flinders University and the Department of Mines and Energy and were as follows:-

	Party		Period	Area
1.	A.F. Williams, W.R.P. Boucaut	SADME	30/10/74 to 9/11/74	WARRINA CURDIMURKA
	Prof. J.W. Holmes,	Flinders Uni.		
	P. Manoel	E.&W.S.		
2.	A.F. Williams, J.C. Beal	SADME	15/9/76 to 24/9/76	WARRINA
3.	A.F. Williams	SADME	14/11/77 to 25/11/77	
	B.A. Eberhard			
	Prof. J.W. Holmes	Flinders Uni.		CURDIMURKA
	C. Henschke	" "		WARRINA
	plus others			OODNADATTA
4.	A.F. Williams	SADME	16/5/77 to 26/5/77	CURDIMURKA
	J. Selby			
	K. Dennis			
	J. Hall	Flinders Uni.		

There are still springs in the area that have not been visited. These will be sampled if other field work is necessary in the vicinity. They are as follows:-

OODNADATTA SHEET

Mt. Toondina Spring

Little Cadnaowie Spring

Ockenden Bore and Spring

Unnamed - 6042 00004

" - 6042 00009

WARRINA SHEET

Peak Creek Spring
or Allandale

Coorandatana Spring

Edadurrana Spring

Giddigiddina Spring

Ooglelima Spring

Castine Spring

Eurylina Spring

Widigiedona Spring

Kerlatroboorntallina Spring

Little Perry Spring

Levi Spring

Milne Spring

Edith Spring

Spring Hill Spring

BILLAKALINA SHEET

Margaret Spring

William Spring (6139 00013)

Fenced Spring and others nearby

Tom Tom Spring

Bishop Spring

Wishart Spring

Two Sisters Springs

Little Depot Spring

Big Depot Spring and others in the Francis Swamp group

MARREE SHEET

Catt Mound Spring

SAMPLING AND DISCHARGE MEASUREMENTS

In all cases where possible the following measurements were carried out.

1. Spring source temperature.
2. Flow - measured with pipes, bucket and stopwatch, a current meter or on occasions when the spring discharged within a flat swamp, the area was measured and multiplied by an evaporation rate appropriate for that time of year.

3. Field conductivity (Electrical Conductivity Bridge Type MC 3).
4. Field pH (Pye Unicam Model 293).
5. In cases where flow could be measured easily, areas of swamp were measured using plane tabling technique or tape and graph paper. The resultant plot of flow versus area for a number of springs could then be used to derive an evaporation rate.

Measurements on springs reported in Cobb (1975) taken during a number of visits during 1974-1979 are included in the Appendix. It is hoped further measurements can be made on selected springs (e.g. The Bubbler and Emerald Spring) to show if any temporal variation occurs in flow and/or conductivity. Although some data is available in this report and that by Cobb (1975), no analysis of results is attempted.

SPRINGS ON WARRINA 1:250 000 SHEET

Name

PRIMROSE SPRING

Location

WARRINA Sheet SH53-3 approximate co-ordinate 441509(Fig. 2)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 Run 2 Photo 0126/1
Dept. Mines Unit No: 6141 00002
Access: Left bank of Neales River from Woodduck Bore or north of Outside Springs till due west of Primrose hill (no track), then cross country to Neales-sandy crossing, dangerous in certain seasons. May also approach from southeast from Flint Mound Dam on LAKE EYRE.

General

History: Probably discovered by Stuart as gathered from account on p.103 of his journals (Hardman, 1865) "From this (the Neale) I went in a north east direction to a mound I had seen on my former journey, and found it to be hot springs with a large stream of warm water flowing from them - nearly as large as the Emerald Springs and as it seemed to me, warmer. It was a very hot day and I have been riding fast. It was as much as I could bear to keep my hand in the spring for a few minutes 6 inches below the surface I put in a staff about four feet long, but could find no bottom - nothing but very soft mud; the staff cam up quite hot. It is a very remarkable hill. From the west side it would be taken for a very high sand hill with scrub growing on it - in fact it is so. The springs are not seen unti the top is reached. From them all the east side is covered with green reeds to the base of the hill. The hot springs are near the top and the cold ones are on one side to the south; some are at the bottom and some half way up".

Reference to Primrose Spring - camp (p.106)
Description of Area: The springs occur on the edge of a breakaway or escarpment capped by the gypsite profile developed in Bulldog Shale.
Description of Springs: There is one main spring on the north eastern side of a large mound and two smaller seeps to the north of it sand is rising from the main spring. Chugg reports small flow only (RB 37/46).

Field Results

Visited by: AFW, JCB on 19/9/76
Water temperature: Main Spring 37^{o}C
Small Seeps 25^{o}C
Field conductivity: Main Spring 5.5 x 10^{3} @ pH 8.25 @ 28^{o}C
Small Seep 5.4 x 10^{3} @ 24^{o}C
Discharge: Measured with bucket at 11m^{3}/day (0.13 1/sec)
Seeps negligible
Other: Photo

Chemistry

(1) Date 5/6/23 Analysis No 2/372

	mg/l				meq/l		
Ca	155	HCC_3	339	Ca	7.8	HCC_3	5.6
Mg	43	SO_4	360	Mg	3.5	SO_4	7.7
Na	864	Cl	1256	Na	37.6	Cl	35.4

T.D.S. 2880 mg/l SiO_2 18.5 mg/l. Also odour of H_2S noticed.

Chemistry

(2) Date 19/9/76 Analysis No 4508/76

	mg/l				meq/l		
Ca	123	HCO_3	265	Ca	6.1	HCO_3	4.4
Mg	33	SO_4	443	Mg	2.7	SO_4	9.2
Na	881	Cl	1284	Na	38.3	Cl	36.2
K	28	F	0.4	K	0.7		
SiO_2	23	NO_3	2				
B	0.75						

T.D.S. 2924 mg/l pH (lab) 8.0

Name

MILNE SPRING

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 408496 (Fig. 2)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 RUN 3 PHOTO 110/1
Dept. Mines Unit No: 6141 00003. Chugg's No. 36 on plan L 54-1, RB 37/46
Access: As for Milne Bore - on track from Peake H.S. to Hawker Springs. Road good.

General

History: Mentioned in Hardman (1865) on p. 124, 127, 133, 477 as camp sites only.
Description of Area; Large outcrop of basement rock - elongate in a north easterly direction.
Description of Springs: Not visited but believed to be a few small seeps around the edge of the above mentioned outcrop. Flow small (Chugg RB 37/46).

Field Results

Not visited.

Chemistry

Date 14/8/53 Analysis No. 73/2173

	mg/l				meq/l	
Ca	81	HCO_3	248	Ca	3.0	HCO_3 4.6
Mg	19	SO_4	501	Mg	1.5	SO_4 10.4
Na	1057	Cl	1251	Na	45.4	Cl 34.9

T.D.S. 3090 mg/l

Suggest compare analysis with that of nearby Milne Bore (6141 00004).

Name

OUTSIDE SPRINGS (also BULLDOG SPRINGS in Chugg, 1954)

Location

WARRINA Sheet SH53-3 - approximate co-ordinate 422495 (Figs.2 and 3)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 Run 3 Photo No. 0113/5A to 9A
Dept. Mines
Unit No: 6141 00005 UMBUM RUN 3 1113/7A - Chugg's No. 41
00006 " " 6A " " 40
00007 " " 5A " " 39
00049 " " 8A not previously record.
" " 9A " " "
Access: As for Fountain Spring.

General

History: Discovered by ?Stuart (Hardman, 1865) as outlined on p.104 "...On approaching the south west angle of the second run (Parry Spring Run) I discovered three other springs close to the boundary of the first run. Two of them are outside and one inside, or rather on the boundary. The latter is a large spring, having seven streams of water coming from it, one large, the others smaller. The other two have an abundance of water covered with reeds".
Description of Area: As for Fountain Spring - cluster of springs in slightly lower area.
Description of Springs: There are five springs in an area of several hectares. Two are extinct, two have reasonable flows and the remaining is a large mound with several seeps. Fig. 3 shows each location. Chugg reports good flow only (RB 37/46).

Field Results

Visited by: AFW, WRPB, JWH, PM on 4/11/74
Water temperature: UMBUM/3/0114/5A - source not tested
" " 6A - spring extinct
" " 7A - 27°C
" " 8A - 29°C
" " 9A - spring extinct
Field conductivity: UMBUM/3/0114/5A - 6.1×10^3 @ 22.5°C
" " 7A - two channels tested at 5.3×10^3 @ 27°C and 5.1×10^3 @ 27°C
UMBUM/3/0114/8A - two channels tested at 5×10^3 @ 29°C and 5.1×10^3 @ 28°C
Discharge: Flow measured at Springs UMBUM/3/0114/7 and 8 Gauged with current meter
UMBUM/3/0114/7A - 250m^3/day (2.9 l/sec)
" " 8A - 60 " " (0.7 l/sec)
Other: Photo of both outlets.

Chemistry

UMBUM/3/0114/5A or Unit No. 6141 00007
Date 14/8/53 Analysis No. 73/2188

mg/l				meq/l			
Ca	112	HCO_3	70	Ca	3.1	HCO_3	1.1
Mg	28	SO_4	491	Mg	2.3	SO_4	10.2
Na	1009	Cl	1404	Na	43.9	Cl	39.5

T.D.S. 3210 mg/l
Date 4/11/74 - not sampled

Chemistry

UMBUM/3/0114/7A or Unit No. 6141 00005

(1) Date 14/8/53 Analysis No. 73/2170

mg/l				meq/l			
Ca	62	HCO_3	70	Ca	3.1	HCO_3	1.1
Mg	23	SO_4	424	Mg	1.9	SO_4	8.8
Na	903	Cl	1220	Na	39.3	Cl	34.4

T.D.S. 2700 mg/l

(2) Date 4/11/74 Analysis No. 6554/74

mg/l				meq/l			
Ca	122	HCO_3	280	Ca	6.1	HCO_3	4.6
Mg	27	SO_4	417	Mg	2.2	SO_4	8.7
Na	873	Cl	1209	Na	38.0	Cl	34.1
K	23	F	0.4				
SiO_2	15						
B	0.65	PO_4	0.04				
		NO_3	3				

T.D.S. 2812 mg/l pH 7.5 (lab)

UMBUM/3/0114/8A

Date 4/11/74 Analysis No. W6550/74

T.D.S. 2450 mg/l pH 7.3 (lab)

Name

FANNY SPRINGS

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 425488 (Figs. 2 & 4)
Pastoral Station: The Peake
Aerial Photograph: UMBUM SVY 1503 Run 3 Photo 113/1,2,3
Dept. Mines
Unit No.: 6141 00009 - UMBUM/3/113/1 or MA 76 Chugg's No. 34A
6141 00010 - " "/2 or MA 77 " " 33B
6141 00011 - - - -
6141 00012 - " "/3 - " " 32D
Access: Cross country from Twelve Mile Spring - good going.

General

History: Discovered before Stuart's expeditions. Mentioned on p.99 (Hardman, 1865) as a camp site.
Description of Area: The springs occur north and north east of a large outcrop of Precambrian rock on slightly undulating ground, much of which is covered by a white crust of salt.
Description of Springs: There are up to 8 springs in the area. four of which are virtually extinct. The others are small seeps issuing from either samll grassy mounds of black clayey material (MA 76, 77) or small open ponds (UMBUM/3/113/3).

Field Results

Visited by AFW, JCB on 18/9/76
Water temperature: MA76 - 23°C
MA77 - 25°C
UMBUM/3/113/3 - 25°C
Field conductivity: MA76 - 6.5×10^3 @ 23°C
MA77 - 5.4×10^3 @ 24°C
UMBUM/3/113/3 - 6.2×10^3 @ 25°C
Discharge: MA76 - 1 m^3/day (0.01 l/sec) - estimated from evaporation theory (area about 200 m^2)
MA77 - 1 m^3/day (0.01 l/sec) - measured by container
UMBUM/3/113/3 - 0.8 m^3/day (0.008 l/sec) - estimated from evaporation theory (area about 150 m^2)
Note - all 4 with unit nos. 00009 - 12 stated as having small flows (Chugg RB 37/46).
Other: Photographs of MA76 & MA77.

Chemistry

MA76 - 6141 00009 - No analysis
MA77 - 6141 00010

(1) Date 14/8/53 Analysis No. 73/2181

T.D.S. 3850 mg/1

(2) Date 18/9/76 Analysis No. W4504/76

Ca	146	HCO_3	229	Ca	7.3	HCO_3	3.8
Mg	30	SO_4	550	Mg	2.5	SO_4	11.5
Na	915	Cl	1286	Na	39.8	Cl	36.3
K	23	F	0.4	K	0.6	F	-
SiO_2	15	NO_3	2			NO_3	-
B	0.65	PO_4	0.08			PO_4	-

T.D.S. 3065 mg/1, pH 7.3

6141 00011

Date 14/8/53 Analysis No. 73/2178

	mg/l				meq/l		
Ca	138	HCO_3	200	Ca	6.9	HCO_3	3.3
Mg	35	SO_4	494	Mg	2.9	SO_4	10.3
Na	966	Cl	1348	Na	41.4	Cl	37.6

6141 00012 - No analysis

Note: MA77 may in fact be 6141 00011. Confusion arises between aerial photo UMBUM RUN 2 PHOTO 1794 and RB 37/46, plan L 54-1 as two sets of numbers are used for the springs by Chugg. The correlating numbers are as follows:-

Author's temp.No.	Author's photo No. (all UMBUM /3/113)	Unit No.		Chugg's photo No. (all UMBUM /2/1974)	Chugg's Plan No. (L 54-1)
MA76	1	6141	00009	34	42A
MA77	2	6141	00010	33	42B
Not visited	-	6141	00011	31	42C
-	3	6141	00012	32	42D

Chugg's and the author's photo numbers correspond well but MA77 could be either 42B or 42C (i.e. 6141 00010 or 00011) as there is little correlation between Chugg's two number systems apart from the spring's juxta position.

Name

THE VAUGHAN SPRING

Location

WARRINA Sheet SH53-3, approximate co-ordinates 426492 (Fig. 2)
Pastoral Station: Peake
Aerial Photo: Warrina SVY 1503 Run No. 3, Photo No. 114/4
Dept. Mines Unit No.: 6141 00013
Access: As for the Fountain Spring

General

History: Discoverer not known
Description of Area: As for the Fountain Spring
Description of Springs: Broken eastern side of mound. Chugg reports flows only (RB 37/64).

Field Results

Visited by - AFW, WRPB, JWH, FM on 4/11/74
Water temperature: Not taken
Field conductivity: 5,200 @ 25°C
Discharge: 20m^3/day (0.2 1/sec) - estimated
Other: Photo

Chemistry

(1) Date 14/8/58? Analysis No. unknown

T.D.S. 3050 mg/1 (may not be Vaughan Spring)

(2) Date 4/11/74 Analysis No. W6549/74

T.D.S. 2650 mg/1 pH 7.3

Name

TWELVE MILE SPRING

Location

WARRINA Sheet SH53-3, approximate co-ordinates 427490 (Figs. 2 & 5)
Pastoral Stations: Peake
Aerial Photograph: Warrina SVY 1503 Run No. 3 Photo No. 114/3
Dept. Mines Unit No.: 6141 00014
Access: As for Fountain Spring

General

History: Discovered by ?Stuart (Hardman, 1865). Stuart states on p. 102 "Found another batch of springs close to north west boundary of large run covering four to five acres of ground with an immense quantity of reeds; they are not so active as the others. The ground round is very soft and the water is most excellent.

Description of Area: At least eight small springs form a large complex over several hectares. Estimates of flow only have been made and 5 measurements of conductivity and temperature taken. Chugg reports large flow (RB 37/46).

Field Results

Visited by: AFW, WRPB, JWH, PM On 4/11/74
Water temperature: 24°C
Field conductivity: 5,500 @ 24°C (see plan for others)
Discharge: total of 90 m^3/day (1 l/sec)
Other: photo.

Chemistry

(1) Date 14/8/53 Analysis No. 73/2185

	mg/l			meq/l	
Ca	124	HCO_3	59	5.6	1.0
Mg	33	SO_4	532	2.7	11.1
Na	1035	Cl	1467	4.5	41.3

T.D.S. 3240 mg/l

(2) Date 4/11/74 Analysis No. W6548/74

T.D.S. - 2880 mg/l pH = 7.4 (lab)

Name

THE FOUNTAIN SPRING

Location

WARRINA Sheet SH53-3, approximate co-ordinates 430485 (Fig. 2)
Pastoral Station: Anna Creek
Aerial Photograph: Warrina SVY 1503 Run No. 3, Photo No. 114/1
Dept. Mines Unit No: 6141 00016
Access: Via track from William Creek, Loddon Spring, Outside Spring, Milne Bore etc, easily approachable from south, east or west.

General

History: Discovered by Stuart (Hardman, 1865) - described (p.101) a "a very large fountain about twenty yards in diameter, quite circular and apparently very deep from which there is running a large stream of water of the finest description; it is one of the largest reservoirs I have yet seen, three times the size of the one at Hamilton Springs (presumably Blanche Cup - AFW) with abundance of water for any amount of cattle: the water is running a mile below it".
Description of Area: Low angle gibber slopes and gypsite scarps over Cretaceous - either Bulldog Shale or Oodnadatta Formation.
Description of Spring: Mound with central pool 10-15m across, shallow (infilled by cattle?) with a break on the north side from which the main flow issues. Chugg estimated a flow of about 55 m^3/day (RB 37/46).

Field Results

Visited by: AFW, WRPB, JWH, PM on 3/11/74
Water temperature: 25°C
Field conductivity: 6.4×10^3 @ 23°C
Discharge: 80m^3/day (bucket)
Other: Photo

Chemistry

(1) Date 14/8/53 Analysis No. 93/2182 pH 7.0

	mg/l				meq/l		
Ca	153	HCO_3	148	Ca	7.7	HCO_3	2.4
Mg	37	SO_4	540	Mg	3.0	SO_4	11.3
Na	1134	Cl	1649	Na	49.3	Cl	46.5

T.D.S. = 3660 mg/l pH 7.0 (Merck paper field)

(2) Date 3/11/74 Analysis No. 6553/74

	mg/l				meq/l		
Ca	178	HCO_3	247	Ca	8.9	HCO_3	4.0
Mg	38	SO_4	549	Mg	3.1	SO_4	11.4
Na	1175	Cl	1696	Na	51.1	Cl	47.8
K	27	PO_4	0.02	K	0.7	NO_3	0
SiO_2	1.6	NO_3	2				
B	0.7						

T.D.S. = 3786 mg/l pH 7.7 (lab)

Name

LITTLE PERRY SPRING

Location

WARRINA Sheet SH53-3, approximate co-ordinates 440494 (Fig. 2)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 Run 3 Photo 0116/1
Dept. Mines Unit No.: 6141 00017
Access: Not visited on this survey but cross country from North i.e. Lagoon Hill.

General

History: Probably discovered by Stuart (Hardman, 1865) but uncertain of his description which is as follows (p84) "At four miles, crossed the Salt Creek coming from Hawker Springs. At eight miles crossed three salt and soda lagoons surrounded by lime and gypsum mounds in which are numerous springs all around them. I have named these hills Parry Hills after Samuel Parry, Esq.".
Description to Area: The springs occur at the contact between Cretaceous Bulldog Shales and Precambrian basement.
Description of Springs: Not visited. Bore to 90 m at spring site Flow very small.

Field Results

Nil.

Chemistry

(1) Date 5/6/23 Analysis No. 2/375

	mg/l				meq/l		
Ca	178	HCO_3	209	Ca	9.4	HCO_3	3.2
Mg	39	SO_4	480	Mg	3.2	SO_4	10.0
Na	1004	Cl	1513	Na	43.6	Cl	4216

T.D.S. 3356 mg/l, SiO_2 21 mg/l.

Name

BIG PERRY SPRINGS (WEST)

Location

WARRINA Sheet SH53-3 approximate co-ordinates 438487 (Figs. 2 & 6)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 RUN 3 Photo 0117/2 and 3
Dept. Mines Unit No.: 6141 00018
Access: As for Big Perry Springs (South) but continue over creek along track to springs.

General

History: See Big Perry Springs (south)
Description of Area: See Big Perry Springs (south) - mostly low shrub growth.
Description of Springs: The Springs issue from a large mound about 25 m in diameter and 5-7m high. Two reasonably strong discharges are found on the southwestern and southeastern sides (MA79 & 80 respectively) and a few very minor seeps on the northern side (not measured).

Field Results

Visited by: AFW & JCB on 18-19/9/76
Water temperature: MA79-29°C: MA80-28.5°C
Field conductivity: MA79*7.5 x 10^3 @ 28°C; MA80 4.7 x 10^3 @ 21°C pH 7.5 @ 24°C.
*Suspected error.
Discharge: MA79 measured with bucket at 40 m^3/day (0.46 1/sec)
MA80 " " " " 38 " " (0.44 1/sec)
Seeps to north - negligible
i.e. total flow 78 m^3/day (0.9 1/sec). Chugg reports a flow of 55-110 m^3/day in Sept. 1953 (RB 37/46).
Other: Photo of MA79,80.

Chemistry

(1) Date 20/9/53 Analysis No. 73/2186 (either MC79 or 80)

	mg/l				meq/l		
Ca	77	HCO_3	534	Ca	3.9	HCO_3	8.7
Mg	117	SO_4	478	Mg	9.5	SO_4	9.9
Na	414	Cl	452	Na	18.0	Cl	12.8

T.D.S. 1804 mg/l - unlikely result salinity should be approximately double. Completely different Ca/Mg ratios to W4506/78 and other results in surrounding areas - possible sample mix up.

(2) Date 18/9/76 Analysis No. 4506/76 (MC79)

	mg/l				meq/l		
Ca	154	HCO_3	229	Ca	7.7	HCO_3	3.8
Mg	31	SO_4	508	Mg	2.5	SO_4	10.6
Na	1025	Cl	1530	Na	44.6	Cl	43.1
K	31	F	0.55	K	0.8		
SiO_2	17	NO_3	3				
B	0.6	PO_4	0.01				

T.D.S. 3396 mg/l pH = 8.0

(3) Date 18/9/76 Analysis No. 4507/76 (MC80)

T.D.S. 3380 mg/l pH 7.3

Name

BIG PERRY SPRINGS (SOUTH)

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 438485 (Fig. 2 & 6)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 Run 3 Photo 0117/1
Dept. Mines Unit No: 6141 00019
Access: Turn off track from Loddon Spring to Fountain Spring to track to Big Perry Spring, driving cross country before large creek is crossed. Last 200 m must be walked as spring surrounded by boggy ground.

General

History: Probably discovered by Stuart (Hardman 1865) but no obvious mention made - suggest one his South Parry group (p.109).
Description of Area: Low lying swampy area with saline flats surrounding spring and further out, low angle hills of Cretaceous shale (Bulldog).
Description of Spring: A mound approximately 3-4 m in height and 5-8 m in diameter. The western is eroded showing a crust of carbonate rock overlying black (?Cretaceous) muds from which a small stream issues. Chugg reports a small flow only (RB 37/46)

Field Results

Visited by AFW, JCB on 18/9/76
Water temperature: 25°C - MAZ8
Field conductivity: 6.4×10^{3} @ 25
Discharge: measured with bucket at 5 m^3/day (0.06 1/sec)
Other: Photo

Chemistry

(1) Date 20/9/53 Analysis No. 73/2172

	mg/1			meq/1		
Ca	198	HCO_3	165	Ca 9.9	HCO_3	2.7
Mg	42	SO_4	688	Mg 3.4	SO_4	14.3
Na	1195	Cl	1705	Na 52.0	Cl	48.0

T.D.S. 3920 mg/1

(2) Date 18/9/76 Analysis No. 4505/76

T.D.S. 3660 mg/1 pH 7.6 (lab)

Name

BIG PERRY SPRINGS (NORTH)

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 437486 (Fig. 2 & 6)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 RUN 3 Photo 0117/4
Dept. Mines. Unit No: 6141 00020
Access: As for Big Perry Springs (West) but continue north on tract for about 1.5 km

General

History: See Big Perry Springs (West)
Description of Area: as above
Description of Spring: Mound about 40 m in diameter and 2-3 m high with reeds and a few small seeps. Could not locate a distinct source. Chugg reports only a small flow (RB 37/46).

Field Results

Visited by: AFW & JCB on 19/9/76
Water temperature: no source located
Field conductivity: 6×10^3 @ 21^oC
Discharge: Estimated by area evapo-transpiration as about 2 m^3/day (0.02 1/sec)
Other: Photo

Chemistry

(1) Date 20/9/53 Analysis No. 73/2184

	mg/l			meq/l		
Ca	206	HCO_3	305	Ca	10.8	HCO_3 5.0
Mg	44	SO_4	697	Mg	3.6	SO_4 14.5
Na	1443	Cl	2035	Na	62.7	Cl 57.3

T.D.S. 4590 mg/1.

Note - rather high c.f. other results from Big Perry Springs area - possibly affected by evaporation (note comment on bore card - "spring cool").

(2) Not sampled in 1976 - field conductivity gives salinity of seep as approximately 3900 mg/1.

(3) Small spring (UMBUM 3/117/5) to the north of the above spring visited and tested cosists of a small pool, 3 m in diameter, and sample had a field conductivity of 8.3×10^3 @ 16^oC i.e. 6000 mg/1 - affected by evaporation.

Name

LEVI SPRINGS

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 416482
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 RUN 4 Photo 033 (Fig. 2)
Dept. Mines Unit Nos. 6141 000022 and 00024
Access: Via track from Milne to Hope Creek bore. Levi bore visited only on this survey.

General

History: Not known who discovered these but in general area of Hawker Springs group.
Description of Area: As for Spring Hill Spring
Description of Springs: -

Field Results

Nil.
Not visited.
Both flow only slightly

Chemistry

(1) Unit No. 6141 00022
Date 3/7/53 Analysis No. 72/1851

mg/l				meq/l		
Ca 72	HCO_3	318	Ca	3.7	HCO_3	5.4
Mg 16	SO_4	391	Mg	1.4	SO_4	8.2
Na 807	Cl	1078	Na	38.6	Cl	30.1

T.D.S. 2620 mg/l pH 7.0 (Merck paper - field).

Date 5/7/53 Analysis No. 72/1850

mg/l				meq/l		
Ca 56	HCO_3	378	Ca	2.8	HCO_3	6.1
Mg 27	SO_4	650	Mg	2.2	SO_4	13.5
Na 1619	Cl	1965	Na	69.4	Cl	54.8

T.D.S. 4520 mg/l

Both analyses are different in total dissolved solids and ionic ratios. The latter sample may have been affected by evaporation.

Note: Correlation between Chugg's photo and plan no's are as follows-

		Plan L54-1	UMBUM RUN 4 Photo 1840
6141	00022	57B	17
6141	00024	57A	16

Name

HAWKER SPRINGS GROUP (includes springs west of Spring Hill but not that right at Spring Hill)

Location

WARRINA Sheet SH53-3 - approximate co-ordinates, East 419 to 423 North 473 to 478 (large area) (Figs. 2 & 7)
Pastoral Station: Peake
Aerial Photograph: SVY 1503 RUN 4 Photo 033/1, 2, 6, 7, 8, 9, 10
Dept. Mines Unit No's:

6141	00025	Not visited
6141	00026	" "
6141	00027	" "
6141	00028	" "
6141	00030	UMBUM RUN 4/033/2 (MA 72)

Springs visited on survey but not in records
UNMBUM RUN 4
PHOTO 033

1	MA71 - 6141	00050
6	MA74 -	00051
7,9,10	Small flows, not sampled	
8	MA75 - 6141	00052

Access: Via tracks from north via Milne, Levi Bores or south via Davenport Well, Hope Creek Bore. The old track through the centre of the spring group is passable only at the northern and southern ends. A detour to the west of Spring Hill has now replaced it.

General

History: Discovered and named by Stuart (Hardman, 1865) who describes them as follows (p.17).
"Started at 9 a.m. for the springs and arrived there in the afternoon. Travelled over a stony but very good feeding country which became better as we approached the springs. There is a creek with a later water hole, and around the small hills are numerous springs. On the banks of the creek and round the springs an immense quantity of rushes, but rushes and other water plants are growing. The quantity of land they cover is very great, amounting to several square miles. Some of the springs are choked up, others are running, though not so active as those further to the south. Round about them is a thin crust of saltpetre, magnesia and salt. The water of these springs is very good but that of the creek is a little brackish, but will do very well for cattle. Round the samll hill where I am now camped, there are twelve springs, and the water is first rate. I have named them "Hawker Springs" after G.C. Hawker, Esq., MLA".
Two other references (p. 84, 99) concern overnight camps at the springs.
Description of Area: The springs occur over a wide are but all within a general depression east of Spring Hill and other basement inliers. Confining beds are Bulldog Shale, the uppermost portions being gypsified - especially on surrounding tableland.

Description of Springs: They vary from low mounds to flat open ponds, all with very small discharges. Interspersed between the active springs are many extinct mounds, few rising more than 1-2 m above the general base level. This area is very similar to Dalhousie Springs (Williams, 1974) but on a much smaller scale. Springs 00025 to 28 and 00030 all have small flows according to Chugg (RB 37/46).

Field Results

Visited by AFW, JCB on 18/9/76

Water temperature:	MA 71 (UMBUM RUN 4/033/1)	-	25°C.
	MA 72	" " " 2	Source unlocated.
	MA 74	" " " 6	22°C.
	-	" " " 7	25°C.
	MA 75	" " " 8	25°C.
Field conductivity:	MA 71	" " " 1	7.5×10^3 at 24°C. Field pH 8.0 at 18°C.
	MA 72	" " " 2	7.5×10^3 at 19°C.
	MA 74	" " " 6	7.2×10^3 at 22°C. Field pH 6.8 at 24°C.
	-	" " " 7	7.8×10^3 at 24°C.
	MA 75	" " " 8	7.4×10^3 at 24°C. Field pH 6.9 at 25°C.
Discharge:	MA 71	" " " 1	1 m^3/day (0.01 1/sec) - estimated.
	MA 72	" " " 2	15 m^3/day (0.17 1/sec) - by bucket method.
	MA 74	" " " 6	3 m^3/day (0.03 1/sec) - estimated from evaporation theory (area 600 m^2 x 5 mm/day).
	-	" " " 7	As above MA 74.
	MA 75	" " " 8	5 m^3/day (0.06 1/sec) by bucket method.

Other: Photo's of MA 71, 72, 74 and 75.

Chemistry

(A) Unit No. 6141 00025 - no analysis available
(B) Unit No. 6141 00026 -

Date 27/7/53 Analysis No. 72/1856

	mg/l			meq/l		
Ca	141	HCO_3	226	Ca 7.2	HCO_3	3.8
Mg	24	SO_4	474	Mg 2.0	SO_4	9.9
Na	1038	Cl	1435	Na 44.6	Cl	40.1

T.D.S. 3240 mg/l

(C) Unit No. 6141 00027 - no analysis available
(D) Unit No. 6141 00028 - no analysis available
(E) Unit No. 6141 00030 - (MA 72)

Date 5/6/23 Analysis No. 2/374

	mg/l			meq/l		
Ca	230	HCO_3	239	Ca 11.6	HCO_3	4.0
Mg	60	SO_4	640	Mg 5.0	SO_4	13.4
Na	1438	Cl	2181	Na 61.7	Cl	60.9

T.D.S. 4705 mg/l

(2) Date 6/11/62 Analysis No. 140/2607

	mg/l			meq/l		
Ca	202	HCO_3	151	10.1	HCO_3	2.5
Mg	46	SO_4	605	3.8	SO_4	12.6
Na	1480	Cl	2230	63.4	Cl	62.2

T.D.S. 4670 mg/1

Date 17/9/76 Analysis No. 4500/76

	mg/l			meq/l		
Ca	221	HCO_3	224	11.0	HCO_3	3.7
Mg	47	SO_4	691	3.9	SO_4	14.4
Na	1445	Cl	2214	62.9	Cl	62.4
K	41	NO_3	5	1.0	NO_3	0.1
SiO_2	15	F	0.75		F	0
B	0.75	PO_4	0.42		PO_4	0

T.D.S. 4776 mg/1

(F) MA 71 (UMBUM RUN 4/033/1)
Date 17/9/76 Analysis No. W4499/76

T.D.S. 4430 mg/1, pH 7.2

(G) MA 74 (UMBUM RUN 4/033/6)
Date 18/9/76 Analysis No. W4502/76

	mg/l			meq/l		
Ca	223	HCO_3	196	11.1	HCO_3	3.2
Mg	47	SO_4	595	3.9	SO_4	12.4
Na	1305	Cl	2107	56.8	Cl	59.4
K	41	NO_3	3	1.0	NO_3	0.1
SiO_2	13	F	0.75		F	0
B	0.70	PO_4	0.03		PO_4	0

T.D.S. 4420 mg/1, pH 7.7

(H) MA 75 (UMBUM RUN 4/033/8)
Date 18/9/76 Analysis No. W4503/76

	mg/l			meq/l		
Ca	205	HCO_3	229	10.2	HCO_3	3.8
Mg	44	SO_4	593	3.6	SO_4	12.4
Na	1295	Cl	2025	56.3	Cl	57.1
K	39	NO_3	3	1.0	NO_3	0.1
SiO_2	15	F	0.5		F	0
B	0.75	PO_4	0.02		PO_4	0

T.D.S. 4320 mg/1, pH 7.6

Note: List of springs sampled and visited by the author and Chugg and their corresponding temporary/Unit No.s is as follows.

Unit No	Chugg's Photo No. (UMBUM RUN 4 PHOTO 1866)	Chugg's RB37/46 No.	Authors Temp.No. No.	Autors Photo No. (UMBUM RUN 4 PHOTO 033)
6141 00025	23	57A	Not visited by Author	
6141 00026	22	57B	Not visited by Author	
6141 00027	24	57C	Not visited by Author	
6141 00028	25	57D	Not visited by Author	
6141 00039	?	58	MA 72	2
Not visited by Chugg		-	MA 71	1
" " " "		-	MA 74	6
" " " "		-	Not sampled	7
" " " "		-	MA 75	8
" " " "		-	Not sampled	9,10.

Name

SPRING HILL SPRING

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 416477 (Figs. 2 & 7)
Pastoral Station: Peake
Aerial Photograph: SVY 1503 RUN 4 Photo 033
Dept. Mines Unit No.: 5141 00029 (Chugg's No. 56, RB 37/46 and 19 on UMBUM RUN 4 Photo 1840).
Access: Via track from Milne, Levi Bore and Spring to Hope Creek Bore. Spring is slightly south of Spring Hill, a few hundred metres east of the bypass track around Hawker Springs.
This spring was not visited on this survey.

General

History: Discovered by Stuart?
Description of the Area: As for Hawker Springs. The srping is located just at the toe of a large Precambrian basement outcrop.
Description of Springs: Not visited

Field Results

Not visited

Chemistry

	Date 5/6/23 mg/l				Analysis No. 2/373 meq/l		
Ca	190	HCO_3	222	Ca	9.6	HCO_3	3.7
Mg	47	SO_4	565	Mg	3.9	SO_4	12.6
Na	1258	Cl	1859	Na	54.7	Cl	51.9

Note - Silica 21 mg/l

T.D.S. 4065 mg/l

	Date 3/7/53 mg/l				Analysis No. 72/1853 meq/l		
Ca	187	HCO_3	765	Ca	9.5	HCO_3	12.7
Mg	101	SO_4	1516	Mg	8.3	SO_4	31.6
Na	881	Cl	416	Na	38.1	Cl	11.6
		Silica	21				

T.D.S. 9685 mg/l

Note discrepancy in last analysis between T.D.S. and sum from individual ions (3866 mg/l) - suggest Na Cl value is 483.80 g.p.g. not 48.38 g.p.g. This then gives Na = 3320 mg/l or 144.4 meg/l and Cl = 4160 mg/l or 117.2 meg/l and T.D.S. of 9705 mg/l.

The two analyses are quite different not only in T.D.S. but also in ionic ratios (Ca/Mg = 2.5 vs 1.1, HCO_3/SO_4 = 0.29 vs 0.40 respectively) which seems to indicate different origins of the two waters. The other possibility is that the second sample may have come from an evaporating pond and does not represent the water escaping directly from the aquifer. Additional sampling should resolve the problem.

Name

EDITH SPRINGS

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 409471 (Fig. 2)
Aerial Photograph: UMBUM SVY 1503 RUN 4 PHOTO 031/1
Dept. Mines Unit No's.: 6141 00031 and 00032. Chugg's 55B and 55A on plan L54-1, RB37/46
Access: Cross country from Hawker Springs - Milne Bore track. Reasonable travelling.

General

History: Discoverer not known
Description of Area: Springs occur about 100-200 west of faulted edge of basement i.e. in basement rocks c.f. Mesozoic
Description of Springs: Two springs, in north south juxta positions, both small flows (Chugg - RB37/46)

Field Results

Not visited

Chemistry

Unit No. 6141 00031 - no results
Unit No. 6141 00032

Date 29/6/53				Analysis No. 72/1854			
Ca	108	HCO_3	344	Ca	5.5	HCO_3	5.7
Mg	123	SO_4	510	Mg	10.1	SO_4	10.1
Na	372	Cl	542	Na	15.9	Cl	15.1

T.D.S. 2175 mg/l

Note: Ca/Mg = 0.5 and SO_4/Cl = 0.7 quite different to other springs in area which have values of Ca/Mg = 2.5 - 3.5 and SO_4/Cl = 0.1 - 0.3. Suggest different waters to G.A.B. groundwaters. See also TARLTON SPRINGS.

Name

1. ALLANDALE SPRING

2. PEAKE CREEK SPRING (also known as KEKWICK PILE)

Location

WARRINA Sheet SH53-3, approximate co-ordinates 370, 526, 370, 525 (Fig. 2)
Pastoral Station: Allandale
Aerial Photgraph: WARRINA SVY 1504 RUN 1 Photo 031
Dept. Mines Unit No's. 6041 00002 and 00003
Access:

General

History: Discovered by?
Description of Area: On flood plain of Peake Creek
Descritpion of Springs: Not visited

Field Results

Not visited

Chemistry

1. Spring 6041 00002
A.T.S. only 2680 mg/1 - no analysis No. or date

2. Spring 6041 00003

	Date 1/8/53 mg/1				Analysis No. 72/1857 meq/1		
Ca	130	HCO_3	278	Ca	6.6	HCO_3	4.6
Mg	46	SO_4	586	Mg	3.8	SO_4	12.3
Na	844	Cl	1067	Na	36.3	Cl	29.8

T.D.S. 2817 mg/1

Name

KERLATROABOORNTALLINA SPRINGS (Mt. Kingston Bore)

Location

WARRINA Sheet SH53-3 approximate co-ordinates 388 527 (Fig. 2)
Pastoral Station: Peake
Aerial Photograph: SVY 1504 RUN 1 Photo 025
Dept. Mines Unit No.: 6041 00006. Chugg's No. 13 - Plan L54-1
Access: From Peake Telegraph Station if Peake Creek crossing passable. Otherwise cross country, south from track along the Neales River.

General

History: Discovered by Stuart? Whilst in the Mt. Kingston area he described the following (p. 122 - Hardman, 1865). "Course of springs coming from the Kingston Hills and sandhills and emptying themselves into the creek. The water is delicious and plentiful and if open up, those springs will yeild an ample supply for all purposes". These may not be G.A.B. springs as the reference to sandhills does not fit but seems to indicate an area to the west of the above spring.
Description of Area: As for Freeling Springs
Description of Springs: ON level ground - not visited. Bore not now in use (Chugg, 1953). Static level - ground level.

Field Results

Not visited on mound spring survey but vicinity visited by author in October, 1972 as part of helicopter mapping survey. Number of damp patches on edge or range along fault line. Aquifer outcrops nearby.

Chemistry

Date 20/1/49

	mg/l			meq/l		
Ca	3	HCO_3	659	0.2	HCO_3	11.1
Mg	3	SO_4	28	0.3	SO_4	0.6
Na	1035	Cl	1196	44.6	Cl	33.4

T.D.S. 2600 mg/l

Note, H_2S present. pH value 6.8. Flourine 0.4 mg/1. Temp. cool.

Date 27/6/53

	mg/l			meq/l		
Ca	38	HCO_3	222	1.9	HCO_3	3.7
Mg	5	SO_4	439	0.4	SO_4	9.1
Na	1166	Cl	1419	50.1	Cl	39.6

T.D.S. 3190 mg/l

Note significant difference in HCO_3/SO_4 ratios (18.5 vs 0.4)

Name

FREELING SPRINGS

Location

WARRINA Sheet SH 53-3 - approximate co-ordinates 390519
Pastoral Station: Peake
Aerial Photograph: WARRINA SVY 1504 RUN 1 Photo 026/1A, 2A, 3A&4A.
Dept. Mines Unit Nos. 6041 00007 and 6041 00008
Access: On road from main Marree-Oodnadatta road to Old Peake Telegraph Station.

General

History: Discovered by Stuart (1862) who gives the following accoung on page. 75.
"At four miles and a half, struck a large broad valley in which are the largest springs I have yet seen. The flow of water from them is immense, coming in numerous streams and the country around them is beautiful. I have named these "The Freeling Springs".
Description of Area: The springs occur right at the edge of the rugged uplifted Precambrian Peake and Denison Ranges and the low angle gibber plain and dissected tableland of the Great Artesian Basin. Remnants of the gypsite surface and its associated sediments are clearly visible in the eroded banks of streams issuing from the ranges.
Description of Springs: The springs issue from at least four small but distinct seepages or pools on rather flat ground. Threee were visited and in addition a sample taken from a shallow pit. presumably an old working as copper is found in the hills about ½ km to the southwest.

Field Results

Visited by: AFW, JWH, WRPB, PM on 5/11/74
Water temperature: WARRINA RUN 1/0026/1A - 23°C
" " " " 2A - 22°C (?mine pit)
" " " " 3A - 26°C
" " " " 4A - 21°C
Field conductivities: WARRINA RUN 1/0026/1A - 4×10^3 at 23°C
" " " 2A - 6×10^3 at 22°C
" " " 3A - 4.1×10^3 at 26°C
" " " 4A - 4×10^3 at 21°C
Discharge: WARRINA RUN 1/0026/1A - less than 10 m^3/day (0.1 1/sec) estim.
" " 2A as above
" " 3A About 10 m^3/day (0.1 1/sec)
" " 4A Very much less than 10 m^3/day
Other: Photo of spring 3A and seeps to south (not sampled)

Chemistry

(1) Date 27/6/53 Analysis No. 72/1855 (Unit No. 6041 00007 - R. Chugg's 14A Plan L54-1 - possibly WARRINA/RUN 1/0026/3A but uncertain).

	mg/l				meq/l		
Ca	46	HCO_3	192	Ca	2.3	HCO_3	3.5
Mg	7	SO_4	392	Mg	0.6	SO_4	8.2
Na	838	Cl	979	Na	36.1	Cl	27.3

T.D.S. 2375 mg/l

(2) Date 5/11/74 Analysis No. 6551/74
WARRINA/RUN 1/0026/3A

	mg/l			meq/l	
Ca	42	HCO_3	267	2.1	4.4
Mg	6	SO_4	357	0.5	7.4
Na	805	Cl	952	35.0	26.8
K	10	NO_3	2	0.3	0

2305 mg/l pH 8.0

Note: Chugg (1953) refers to 3 springs - 14A, 14B, 14C (see RB37/46) - Freeling Spring and/or bore Unit No. 6041 00007. 14? - Freeling Spring at edge of fault. Unit No. 6041 00008. Just how Chugg's No's., Departmental unit No's. and the author's No's. tie up is uncertain. This is not important as they are all minor seeps and do have similar field conductivities. For convenience, the author equates Chugg's 14A (unit No. 6041 00007) with WARRINA/RUN 1/0026/3A though it may be incorrect. 6041 00008 is apparently a bore drilled into one of the springs in the Freeling Springs group but was not located.

Name

Unnamed

Location

WARRINA Sheet SH53-3 - approximate co-ordinate 389521 (Figs. 2 & 8)
Pastoral Station: Peake
Aerial Photograph: WARRINA SVY 1504 RUN 1 PHOTO 026/5
Dept. mines Unit No.: 6041 00076
Access: as for Freeling Springs

General

History: Probably discovered by Stuart
Description of Area: as for Freeling Springs
Description of Springs: Spring on flat ground and consists of a small pool with fish. Flows down a channel some 500 m into Peake Creek.

Field Results

Visited by: AFW, JWH, WRPB, PM on 5/11/74
Water temperature: 25°C
Field conductivity: 4.3×10^3 at 24°C
Discharge: Estimated (from evaporation theory) 45 m^3/day (0.5 1/sec)
Other: Photo

Chemistry

(1) Date 5/11/74 Analysis No. W6552/74

	mg/1			meq/1		
Ca	42	HCO_3	277	2.1	HCO_3	4.5
Mg	7	SO_4	352	0.6	SO_4	7.3
Na	825	Cl	964	35.9	Cl	27.2
K	10	NO_3	1	0.3	NO_3	0

T.D.S. 2337 mg/1 pH 7.9

Name

WILLOW SPRINGS - ONE TREE BORE (overgrown, indistinguishable from each other - R. Chugg). Also called COOTANOORINA SPRING?

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 348, 504 (Figs. 2 & 9)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 2 PHOTO 145 pt. (1)
Dept. Mines Unit No. 6041 00016 (bore) - spring given a number 00034
Access: From Old Nilpinna, Weedina Waterhole or track from northeast which crosses Nilpinna Creek at its junction with Peake Creek. Spring/bore is just to east of Mole Hill Ruins (Cootanoorina)

General

History: Discovered by?
Description of Area: Low lying salt flats covered by samphire and overlying Cretaceous Shale (Bulldog).
Description of Spring: The spring? consists of a mound, overgrown by a few reeds and an athol pine. A damp/wet area about 20 m in diameter surrounds the spring. The exact source was unlocateable.

Field Results

Visited by: AFW, BAE on 21/11/77
Water temperature: MC 09 - 23°C near but not at source
Field conductivity: 5.4×10^3 @ 25°C
Discharge: Estimated less than 1 m^3/day (0.01 1/sec). Note original flow stated as 50 m^3/day 90.5 1/sec) - see SADME records.
Other: Photo of MC 09

Chemistry

		Date 1/11/14			Analysis No. 1/200	
Ca	210	HCO_3	394	Ca	10.5	HCO_3 6.4
Mg	96	SO_4	584	Mg	8.0	SO_4 12.2
Na+K	792	Cl	1183	Na+K	33.5	Cl 33.3

T.D.S. 3080 mg/l SiO_2 18.5 mg/l

		Date 4/9/40			Analysis No. 15/4263	
		mg/l			meq/l	
Ca	157	HCO_3	286	Ca	7.9	HCO_3 4.6
Mg	56	SO_4	670	Mg	4.7	SO_4 14.0
Na+K	887	Cl	1154	Na	38.6	Cl 32.5

T.D.S. 3073 mg/l

Date 21/11/77 Analysis No. W6984/77

T.D.S. 2970 mg/l pH 7.4

Name

CARDAJALBARRANA SPRING (MOLE HILL SPRINGS)

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 352 505 (Figs. 2 & 9)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 2 PHOTO 0145 pt. (2) - temp. no. MC10.
Dept. Mines Unit No. 6041 00017
Access: As for WILLOW SPRINGS

General

History: Discovered by?
Description of Area: Low lying salt flats covered by samphire and overlying Cretaceous Shale. The spring lies almost in the centre of this area.
Description of Spring: This spring consists of a large mound some 30-50 m in diameter with a pool at the top surrounded by reeds. There are two main outlets, one natural, the other consisting of an asbestos pipe driven into the side of the mound, the other end emptying into a corroded steel trough. Small seeps occur elsewhere on the mound.

Field Results

Visited by: AFW, BAE on 21/11/77
Water temperature: 25°C at source
Field conductivity: (1) natural outlet - 4.8 x 10^3 @ 28°C - MC 10
(2) pipe outlet - 4.5 x 10^3 @ 25.5°C
Discharge: (1) natural outlet 1.05 l/sec (gauged with bucket)
(2) pipe outlet 0.32 l/sec (gauged with bucket)
i.e. total about 1.4 l/sec say 1.5 l/sec with seeps included i.e. 130 m^3/day. This should be compared with estimates of 3300 m^3/day in November 1914 and 110 m^3/day in May 1953.
Other: Photo

(1) Date 1/11/14 Analysis No. 1/204

	mg/l				meq/l		
Ca	184	HCO_3	257	Ca	9.2	HCO_3	4.2
Mg	78	SO_4	601	Mg	6.5	SO_4	12.5
Na	688	Cl	1044	Na	29.9	Cl	29.4
K	24			K	0.6		

T.D.S. 2760 mg/l
SiO_2 14 mg/l

(2) Date 27/5/53 Analysis No. 72/1841

T.D.S. 2540 mg/l

(3) Date 21/11/77 Analysis No. W6985/77

	mg/l				meq/l		
Ca	171	HCO_3	260	Ca	8.5	HCO_3	4.3
Mg	73	SO_4	619	Mg	6.0	SO_4	12.9
Na	700	Cl	1036	Na	30.4	Cl	29.2
K	34	NO_3	2	K	0.9		

T.D.S. 2760 mg/l pH 8.1

Note close agreement in results between samples from 1914 and 1977.

Name

COORANDATANA SPRINGS

Location

WIRRINA Sheet SH53-3, approximate co-ordinates 364 505 (Fig. 2)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 2 PHOTO 145 pt. (4)
Dept. Mines Unit No. 6041 00018
Access: Cross country - north of track from Old Nilpinna to Mole Hill Ruins.

General

History: Discovered by?
Description of Area: On left bank of Nilpinna Creek - in flood out area underlain by Bulldog Shale.
Description of Spring: Not visited

Field Results

Not visited - only record is that of Chugg who states spring flows

Chemistry

No analysis at all available.

Name

BIRRIBIRRIANA MOUND SPRING & BORE (bore apparently drilled into spring about 1914 to 24 m)

Location

WARRINA Sheet SH53-3, approximate co-ordinates 368 503 (Figs. 2 & 10)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 2 PHOTO 141 pt. (1)
Dept. Mines Unit No. 6041 00020 - MA 84 Chugg's No. 32 on Plan L54-1, RB 37/46
Access: From track to Old Nilpinna from main road (leaves main road at junction of Edward and Bungadillina Creek).

General

History: Discovered by?
Description of Area: In flattish area of samphire and salt flat (seepage from shall aquifer). Cadnaowie Formation outcrops within 200 m of the spring.
Description of the spring: Two springs occur hrere, the northerly one being extinct. The southerly one consists of a pond at the top of a small mound (1-2 m high) surrounded by bamboos.

Field Results

Visited by: AFW, JCB on 21/9/76
Water temperature: 16°C (pool)
Field conductivity: 4.5×10^3 @ 19°C
Discharge: less than 1 m^3/day (<0.01 1/sec). Flow rate obviously greater in past as a feeder pipe to an adjacent trough is set at higher level than present day pool level. Chugg reports a good flow in 1953. Nearby flowing shot holes and Shell exploration wells (drilled 1968-73) may well have cut flow back. Otherwise aquifer or confining bed collapse since 1953 may have reduced flow. If the former were responsible, head may increase as all recent exploration wells have been plugged.
Other: Photograph of MA 84

Chemistry

(2) Date 10/11/14 Analysis No. 1/199
(Recorded at Birribirriana Bore)

	mg/l				meq/l		
Ca	130	HCO_3	264	Ca	6.5	HCO_3	4.3
Mg	52	SO_4	520	Mg	4.2	SO_4	10.3
Na	647	Cl	880	Na	28.1	Cl	24.8
K	40	SiO_2	17	K	1.0		

T.D.S. 2420 mg/l Temp 25°C

(2) Date 27/5/53 Analysis No. 72/1843
(Recorded as Birribirriana Mound Spring and Bore)

	mg/l				meq/l		
Ca	129	HCO_3	309	Ca	6.6	HCO_3	5.2
Mg	48	SO_4	491	Mg	4.0	SO_4	10.3
Na	662	Cl	844	Na	28.4	Cl	23.5

T.D.S. 2330 mg/l - Temp. - cool.

(3) Date 21/9/76 Analysis No. 4510/76

T.D.S. 2970 mg/l pH 7.3

This sample may be affected by evaporation e.g. compare 25°C temperatures taken in 1914 with that of 16°C taken in 1976. The 25°C reading is consistent with others in the area.

Name

NILPINNA SPRING (adjacent to Old Nilpinna H.S.)
(includes bore to 24 m)

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 366 502 (Figs. 1 & 10)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503, RUN 2, PHOTO 141 pt. (7)
Dept. Mines Unit No. 6041 00022
Access: Via track from Old Nilpinna Ruins to Mole Hill Ruins

General

History: Discovered by?
Description of Area: Low angle gibber flats and rises with sandhills to north and south.
Description of Spring: Now consists of a small depression with just a seep in the centre. original shape of spring area probably altered by man's activities as it formed the water supply for Old Nilpinna Station. Bore in centreaccording to Well record card.

Field Results

Visited by: AFW, BAE on 22/11/77
Water Temperature: Not measured
Field conductivity: " "
Discharge: " " but seepage only less than 0.1 m^3/day (0.001 l/sec). Flow reported in 1915 as 550 m^3/day (6.4 l/sec) and 110 m^3/day (1.3 l/sec) in 1953. Diminishing flow maybe a result of aquifer, confining bed collapse - perhaps a consequence of drilling the spring in the early 1900's. It may also relate to seismic and other drilling in area which left several flowing well in area.

Chemistry

(1)		Date 26/2/15				Analysis No. 1/203	
Ca	111	HCO_3	282	Ca	5.6	HCO_3	4.6
Mg	45	SO_4	436	Mg	3.7	SO_4	9.1
Na	589	Cl	768	Na	25.6	Cl	21.6
K	19	SiO_2	14	K	0.5	SiO_2	-

T.D.S. 2125 mg/1 Temp. water 27°C

(2) Date 27/5/53 Analysis No. 72/1840

T.D.S. 2025 mg/1

Name

SOUTH WELL SPRING

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 530 493 (Fig. 2)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 3 PHOTO 098, pt. (1) - MC 08
Dept. Mines Unit. No. 6041 00023
Access: Via track from Weedina Waterhole or seismic line from Mole Hill Ruins, Willow Springs and Old Nilpinna

General

History: Discovered by?
Description of Area: In low level area with sand patch to cast and low angle gibber slopes to west.
Underlain by Bulldog Shale.
Description of Spring: Spring in centre of swamp, small mound (less than 30 cm high) presumed source (not obvious though).

Field Results

Visited by: AFW, BAE on 21/11/77
Water temperature: 25°C at source?
Field conductivity: 5×10^3 @ 27°C
Discharge: Area of transpiring swamp measured approximately as 6 000 m^2 i.e. flow estimated as 40 m^3/day (0.4 l/sec) (using evaporation rate as 6.5 mm/day - see Williams and Holmes, 1978).
Other: No photo.

Chemistry

(1) Date 5/10/53 Analysis No. 73/2191

		mg/l				meq/l	
Ca	235	HCO_3	257	Ca	11.9	HCO_3	4.3
Mg	110	SO_4	791	Mg	9.1	SO_4	16.6
Na	729	Cl	1124	Na	31.3	Cl	31.4

T.D.S. 3120 mg/l

(2) Date 21/11/77 Analysis No. 6983/77

		mg/l				meq/l	
Ca	224	HCO_3	282	Ca	11.2	HCO_3	4.6
Mg	111	SO_4	798	Mg	9.1	SO_4	16.6
Na	705	Cl	1142	Na	30.7	Cl	32.2
K	41	NO_3	<1	K	1.0	NO_3	-

T.D.S. 3160 mg/l pH 7.4

Note similarity in analysis - pool sampled is probably very near to source.

Name

WEEDINA SPRINGS

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 362 480 (Figs. 2,5, & 11)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 4 PHOTO 021 pt.(3) a,b,c,d,
Dept. Mines Unit No.: 6041 00029 - MA 88, 89A Chugg's No. 47, Plan L54-1, RB 37/46.
Access: On track that continues from Warrangarrana Bore & Spring

General

History: Discovered by?
Description of Area: Low lying saline flats surrounded by sand dunes. Underlain by Bulldog Shale and Cadnaowie Sandstone.
Description of Springs: 4 springs were located within an area of 20-50 m and consisted of either small pools or swampy patches (see Fig. 5).
Other: Photograph of MA88

Field Results

Visited by: AFW, JCB on 22/9/76

Water temperature: WARRINA RUN 4/021/3A - MA 88 - 23°C (source?)
" " " 3B - - not measured
" " " 3C - MA 89A 16°C
" " " 3D - - 21°C disturbed by cattle

Field conductivity: " " " 3A - 6.3×10^3 @ 21°C
" " " 3B - 8.5×10^3 @ 20°C - affected by evaporation
" " " 3C - 5.3×10^3 @ 18°C
" " " 3D - 6.0×10^3 @ 19°C

Discharge: " " " 3A - 0.25 m^3/day (0.003 1/sec) estimated from area 35 m^2 x E. rate 6.5 mm/day. Small swamp
" " " 3B - 0.3 m^3/day (0.003 1/sec) estimated as above - 8m dia. pool
" " " 3C - 0.02 m^3/day, estimated as above 2m diam. pool in limestone
" " " 3D 0.02 m^3/day, (.002 1/sec) estimated as above, area 30 m^2 - irregularly shaped pool.

i.e. total from 4 springs is about 0.75 m^3/day (.001 1/sec)

Unable to match Chugg's or Unit No. with author's numbers.

Chemistry

(1) Date 3/11/14 Analysis No. 1/209

mg/l				meq/l			
Ca	204	HCO_3	308	Ca	10.2	HCO_3	5.0
Mg	123	SO_4	609	Mg	10.0	SO_4	14.6
Na	951	Cl	1556	Na	41.4	Cl	43.8
K	67	SiO_2	21	K	1.6	SiO_2	-

T.D.S. 3777 mg/l

Slight odour of H_2S. Temp. 25°C

(2) MA 88 - Date 22/9/76 Analysis No. W4513/76

mg/l				meq/l			
Ca	209	HCO_3	316	Ca	10.4	HCO_3	5.2
Mg	121	SO_4	739	Mg	10.0	SO_4	15.4
Na	1025	Cl	1682	Na	44.6	Cl	47.4
K	47	F	0.9	K	1.2		
SiO_2	12	NO_3	1.0				
B	1.25	PO_4	.01				

T.D.S. 3980 mg/l, pH 8.0

(3) MA 89A - Date 22/9/76 Analysis No. W4514/76

T.D.S. 3810 mg/l, pH 7.2

Name

Unnamed - northwest of Weedina Springs

Location

WARRINA Sheet SH53-3, - approximate co-ordinates 360 481 (Fig. 2)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 4 PHOTO 21, pt. (4)
Dept. Mines Unit No: 6041 00074 (new spring) - MA 89
Access: As for Weedina Springs then 3-3.5 km northwest cross country - reasonable travelling.

General

History: Unknown
Description of Area: Low sand spread and dunes with sandstones (Cadnaowie Sandstone) outcropping in drainage lines.
Description of Spring: A linear seepage about 250 m in length and 2-3m in width and consisting of a number of interconnected pools up to 5-8 m long and 0.5 m deep. Aquifer outcrops at site. May not be artesian basin water - see salinity results. Similar perhaps to saline spring at Reedy Springs on MARREE (see Cobb, 1976). At least 3 species of fish (gobi, perch and minnow like).

Field Results

Visited by: AFW, JCB on 22/9/76
Water temperature: 23°C
Field conductivity: 3 different pools 30×10^3 @ 22.5°C
28×10^3 @ 23°C
19×10^3 @ 22°C
Discharge: Approx. 10 m^3/day (0.1 l/sec) - measured by bucket
Other: Photograph of MA 89

Chemistry

	Date 22/9/76			Analysis No. 4515/76			
Ca	394	HCO_3	310	Ca	19.7	HCO_3	5.1
Mg	790	SO_4	5253	Mg	65.0	SO_4	109.4
Na	7225	Cl	10766	Na	314.3	Cl	303.6
K	338	F	1	K	8.6		
B	11.2	NO_3	4				
SiO_2	14	PO_4	0.11				

T.D.S. 24925 mg/l pH 7.5

It is interesting to compare the results of this analysis with that for Weedina Springs. Ionic ratios for both are as follows:-

	Weedina Spring		Saline Spring
	MA88 (W4513/76	1/209	Ma89 (W4515/76)
Ca/Mg	1.04	1.02	0.30
Mg/Na	0.22	0.24	0.21
HCO_3/SO_4	0.34	0.34	0.05
SO_4/Cl	0.32	0.33	0.36

It appears that the only ions to change proportion are Ca and HCO_3, the rest remaining constant.

Name

EDADURRANA SPRING

Location

WARRINA SHEET SH 53-3 approximate co-ordinates 360 478 (Fig. 2)
Pastoral Station: Nilpinna
Aerial Photograph: SVY 1503 RUN 4 PHOTO 020 - location uncertain
Dept. Mines Unit No. - Nil - Records only on topographic sheet SH53-3
Access: West of track to Weedina Springs from Warrangarrana Bore and Nilpinna Station.

General

History: Discovered by?
Description of Area: see that for Weedina Springs
Descritpion of Springs: not visited - shown on National Mapping 1:250 000 topographic sheet as position doubtful. Also appears on pastoral plan for Nilpinna Station.

Name

GIDDI GIDDINA SPRINGS

Location

WARRINA SHEET SH53-3, - approximate co-ordinates 315 433 (Fig. 2)
Pastoral Station: Anna Creek, Mt. Barry or Nilpinna?
Aerial Photograph: SVY 1502 RUN 7 PHOTO 30
Dept. Mines Unit No. 5940 00001

General

History: Discovered?
Description of area: Not visited by author. See Plate No. 5. Interstate conference on Artesian Water, 1924. Mason (pers. comm. op. cit) reported the water level to be about 1 m below surface in May 1975.

Field Results

Nil

Chemistry

Date 17/10/79 Analysis No. 1/257

	mg/l				meq/l		
Ca	223	HCO_3	304	Ca	11.8	HCO_3	5.0
Mg	142	SO^3_4	716	Mg	11.2	SO^3_4	14.9
Na	999	$C1^4$	1650	Na	43.4	$C1^4$	46.5

T.D.S. 3900 mg/1 SiO_2 20 mg/1

Name

OOLGELIMA SPRING

Location

WARINNA Sheet SH53-3 - approximate co-ordinates 328 422 (Fig. 2)
Pastoral Station: Anna Creek
Aerial Photograph: SVY 1501 RUN 8 PHOTO 244
Dept. Mines Unit No.: 5940 00002
Access: Presumably across country from Anna Creek, Coober Pedy road.

General

History: Discovered by?
Description of Area: Not visited by author or Chugg
Description of Spring: Described as bore in records. No detail except 13.2 m deep and water slightly brackish. Mason (pers. comm. 1979, Australian Selection Pty. Ltd.) reports the water lever as being about 1 m below ground surface in May 1975 (see also Mason 1975).

Field Results

Nil

Note: Other springs in this general area on the WARRINA SHEET shown at or near the following grid references, 322 424 (2); 318 422 (3); 299 442 (4); 300 428 (1); 298 429 (1); 296 425 (1); 296 427 (1) are photo-interpreted and may either be extinct or non existant (probably the latter - M.G. Mason, op. cit). See Fig. 2.

Name

EURILYANA SPRING

Location

WARRINA SHEET SH53-3 - approximate co-ordinates 341 416 (Fig. 2)
Pastoral Station: Anna Creek
Aerial Photograph: SVY 1501 RUN 8 PHOTO 248
Dept. Mines Unit No: Nil
Access: Presumably cross country from Anna Creek, Coober Pedy main road.

General

No record apart from reference on the WARRINA SHEET

Name

CASTINE SPRING

Location

WARRINA SHEET SH53-3 - approximate co-ordinates 348 414 (Fig. 2)
Pastoral Station: Anna Creek
Aerial Photograph: SVY 1501 RUN 8 PHOTO 248
Dept. Mines Unit No: Nil
Access: As for Eurilyana Spring

General

As for EURILYANA SPRING

Name

WIDIGIEDONA SPRING

Location

WARRINA SHEET SH53-3 - approximate co-ordinates 350 427 (Fig. 2)
Pastoral Station: Anna Creek
Aerial Photograph: SVY 1502 RUN 7 PHOTO 0022/1
Dept. Mines Unit No. 6040 00008
Access: Presumably cross country from Nilpinna, Willow Creek Bore, Coober Pedy road.

General

Not visited by author or Chugg. No data on record.

Name

BRINKLEY SPRING

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 432466 (Figs. 2 & 12)
Pastoral Station: Peake
Aerial Photograph: UMBUM SVY 1503 RUN 4 PHOTO 0037/1, a,b,c.
Dept. Mines Unit No. 6140 00001. Chugg's No. 64 on plan L54-1 (RB 37/46).
Access: Cross country a few kilometres south of McLeans Bore (good travelling)

General

History: Discoverer unknown
Description of Area: Low angle gibber flats and alluvial plains over Cretaceous Shale - Bulldog Shale probably.
Description of Springs: 3 mounds, northerly one extinct. The largest and southerly most one has three small seeps, one of which was sampled (MA67) and the central one has one seep only, the largest flow in the group, also sampled (MA 68) - see Fig. for sketch

Field Results

Visited by: AFW, JCB on 17/9/76
Water temperature: UMBUM RUN 4/0037/1a - unable to test (MA 67)
" " " 1b - 23°C
" " " 1c - 30°C (MA 68)
Field conductivity: " " " 1a - 8×10^3 @ 20°C (MA 67)
" " " 1b - 7.6×10^3 @ 22°C
" " " 1c - 8×10^3 @ 25°C (MA 68)
Discharge: Flow rate from main mound (1a, 1b) estimated as 1-1.5 m^3/day (0.1 l/sec). Chugg's estimated 55m^3/day in 1953 - see RB 37/46).
Other: Photos (3) of both MA 67, 68

Chemistry

Spring 6140 00001

(1) Date 26/9/53 Analysis No. 73/2179

mg/l				meq/l			
Ca	256	HCO_3	139	Ca	12.8	HCO_3	2.3
Mg	53	SO_4	727	Mg	4.4	SO_4	15.2
Na	1398	Cl	2136	Na	59.9	Cl	59.6

T.D.S. 4650 mg/l

Spring 6140 00001

(2) Date 6/11/62 Analysis No. 2599/62

mg/l				meq/l			
Ca	218	HCO_3	195	Ca	11.0	HCO_3	3.3
Mg	55	SO_4	598	Mg	4.5	SO_4	12.5
Na	1401	Cl	2142	Na	60.1	Cl	59.8

T.D.S. 4520 mg/l

Spring MA 68 - assume this is also 6140 as it has a similar flow rate. 00001

(3) Date 17/9/76 Analysis No. W4497/76

T.D.S. 4270 mg/1 - pH 7.2

Spring MA 67 -

Date 17/9/76 Analysis No. W4496/76

	mg/l			meq/l			
Ca	270	HCO_3	243	Ca	13.5	HCO_3	4.0
Mg	53	SO_4	730	Mg	4.4	SO_4	15.2
Na	1555	Cl	2450	Na	67.6	Cl	69.1
K	50	F	0.5	K	1.3	F	.0
SiO_2	17	NO_3	2			NO_3	.0
B	0.85	PO_4	0.05			PO_4	.0

T.D.S. 5230 mg/1, pH 7.4

Name

TARLTON SPRINGS

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 410463 (Figs. 2 & 12)
Pastoral Station:
Aerial Photograph: ANNA CREEK SVY 1503 RUN 5 PHOTO 053/1
Dept. Mines Unit No: 6140 00002
Access: Cross country from track from Hope Creek to George Creek Bores. Reasonable going.

General

History: Discoverer unknown
Description of Area: As for Edith Springs - on edge of fault
Description of Springs: At least 7 distinct outlets along fault. See Fig. 12 for location. First, second (MA 69) and small flow only (RB/46)

Field Results

Visited by: AFW. JCB on 17/9/76
Water temperature: ANNA CREEK /5/053/1a - 21°C
1b - 21°C at edge of pool
1b - 25°C in middle of pool
1f - 24°C
Field conductivity: ANNA CREEK /5/053/1a - 3.0×10^3 @ 21°C
1b - 3.5×10^3 @ 21°C
1b - 4.0×10^3 @ 25°C middle of pool
Field pH 7.7 at 22°C
1f - 3.0×10^3 @ 23°C
Discharge: Not measured - estimated as less than $1 m^3$/day (0.01 l/sec)
Other: Photo

Chemistry

(1) Date 14/8/53 Analysis No. 73/2171

	mg/l			meq/l		
Ca	130	HCO_3	91	Ca	6.5	HCO_3	1.5
Mg	37	SO_4	541	Mg	3.1	SO_4	11.4
Na	1094	Cl	1566	Na	47.0	Cl	43.7

T.D.S. 3420 mg/l
(for spg. 6140 00002)

(2) MA69 Date 17/9/76 Analysis No. W4498/76

	mg/l			meq/l		
Ca	55	HCO_3	394	Ca	2.7	HCO_3	6.5
Mg	121	SO_4	634	Mg	10.0	SO_4	13.2
Na	509	Cl	579	Na	22.1	Cl	16.3
K	37	F	1.4	K	0.9	F	0.1
SiO_2	38	NO_3	46			NO_3	0.7
B	1.0	PO_4	0.04			PO_4	0

T.D.S. 2180 mg/l pH 8.0

Note: Unsure of relationship between sample MA 69 and Unit No. 6140 00002. Completely different chemistry as can be see by ionic ratios.

		Ca/Mg	SO_4/Cl
6140	00002	2.1	0.26 - affected by evaporation??
MA 69		0.3	0.81 - similar
6141 (Edith Spgs)	00003	0.5	0.7 - groundwater

Name

LODDON (LOUDEN) SPRINGS

Location

WARRINA Sheet SH53-3 - approximate co-ordinates 352505 (Fig. 2)
Pastoral Station: Peake
Aerial Photograph: ANNA CREEK SVY 1503 RUN 5 PHOTO 047/1
Dept. Mines Unit No. 6140 00004. Chugg's 67 on Plan L54-1, RB/46.
Access: On track from William Creek to Umbum.
Easy going.

General

History: Discovered by Stuart (Hardman, 1865), as indicated in the following passage on p. 85.
".... and at three miles and a half observed a perculiar looking sport to the southwest which had the appearance of springs. Changed my course for it and at 6 miles came upon a hill of springs surrounded by a number of smaller ones, with an ample supply of first rate water. The hill is covered with reeds and rushes, it..... . On the hill where the springs are, we found lava."
Description of Area: Low angle gibber flats and alluvial plain over Cretaceous shale - either Bulldog Shale or Oodnadatta Formation.
Description of Springs: Single mound with numerous outlets all but one of which appears to have dried up, probably within the last 50-100 years. A small springs on the north side was sampled but the sample is suspect and probably affected by evaporation.

Field Results

Visited by: AFW, JCB on 17/9/76
Water temperature: MA66 - 15°C cooled through evaporation
Field conductivity: " " - 9 x 10^3 @ 15°C - concentrated through evaporation?
Discharge: 1 m^3/day (0.01 1/sec) estimated
(compare with Chugg's 33 m^3/day estimate in 1953)
Other:

Chemistry

(1) Date 26/8/53 Analysis No. 73/2175

	mg/l			meq/l	
Ca	223	HCO_3 187	Ca	11.2	HCO_3 3.1
Mg	54	SO_4 612	Mg	3.9	SO_4 12.2
Na	1375	Cl 2104	Na	58.9	Cl 58.7

T.D.S. 4470 mg/l

(2) Date 17/9/76 Analysis No. W4495/76
T.D.S. 6500 mg/l pH 7.3
(affected by evaporation)

SPRINGS ON THE OODNADATTA 1:250 000 SHEET

Name

Unnamed

Location

OODNADATTA SHEET SH53-15, - approximate co-ordinates 364553 (Fig. 13)
Pastoral Station: Allandale
Aerial Photograph: Algebuckina Run 1 Photo 3410 (old series-Chugg)
Dept. Mines Unit No: 6042 00004
Access: Northwest of Mt. Dutton, near main road

General

History: No known
Description of Area: In sandy country with scattered outcrops of Algebuckina Sandstone/Cadnaowie Formation around spring
Description of Spring: Not visited

Field Results

Not visited

Chemistry

	Date 14/10/53 mg/l				Analysis No. 73/2197 meq/l		
Ca	90	HCO_3	756	Ca	4.6	HCO_3	12.6
Mg	75	SO_4	860	Mg	6.2	SO_4	17.9
Na	2081	Cl	1501	Na	89.5	Cl	69.8

T.D.S. - 6013 mg/l

This result is too high for artesian groundwaters in the area and it is suspected the sample has been affected by evaporation. Ionic ratios when compared with those for Big and Little Cadnaowie Springs which are in the same vicinity are quite different. This groundwater is probably derived from a different origin than others in the area.

Name

Unnamed

Location

OODNADATTA SHEET SH53-13 - approximate co-ordinates 365552 (Fig. 13)
Pastoral Station: Allandale
Aerial Photograph: Algebuckina Run 1 Photo 3410 (Old series - Chugg)
Dept. Mines Unit No. 6042 00006. Chugg's No. 4A. Plan L54-1, RB/37/46
Access: Just north of main road from William Creek to Oodnadatta - north of Mt. Dutton.

General

History: Possibly discovered by Stuart
Description of Area: Adjacent to area of basement outcrops. Cadnaowie Formation aquifer fairly close to ground level. Outcrops in vicinity of spring (ferruginised).
Description of spring: Consists of a 5 x 10 m seep lined with limestone blocks. No obvious source - much disturbed by cattle. Spring supports about 60 -80 m^2 of wet ground below main seep i.e. total area about 120 m^2.

Field Results

Visited by: AFW, BAE on 22/11/77
Water temperature: 24.5°C - in muddy part of source
Field conductivity: 5.9×10^3 @ 28°C - no sample taken, probably affected by evaporation.
Discharge: 0.8 m^3/day (estimated on basis area x evap. i.e. 120 m^2 x 6.5 mm/day)

Chemistry

(1) Date 26/9/53 Analysis No. 73/2195

	mg/l				meq/l		
Ca	92	HCO_3	373	Ca	4.7	HCO_3	6.4
Mg	28	SO_4	635	Mg	2.3	SO_4	13.2
Na	1088	Cl	1225	Na	46.8	Cl	34.2

T.D.S. - 3270 mg/l

(2) No sample in 1977 as considered affected by evaporation.

Name

LITTLE CADNAOWIE SPRINGS

Location

OODNADATTA SHEET SH53-15, - approximate co-ordinates 367554 (Fig. 13)
Pastoral Station: Allandale
Aerial Photograph: Algebuckina Run 1 Photo 3410 (Old series - Chugg)
Dept. Mines Unit No.: 6042 00007. Chugg's No. 4B Plan L54-1, RB 37/46
Access: Just north of main road from William Creek to Oodnadatta - northwest of Mt. Dutton R.S.

General

History: Not known. Possibly Mildred Springs as mentioned by Hardman (1865) on p. 123
Description of Area: Adjacent to area of basement outcrops. Cadnaowie Formation aquifer fairly close to ground level. Ferruginised outcrops near spring.
Description of spring: Not visited.

Field Results

Not visited

Chemistry

	Date 26/9/53 mg/l				Analysis No. 73/2196 meq/l		
Ca	54	HCO_3	183	Ca	2.7	HCO_3	3.0
Mg	21	SO_4	458	Mg	1.7	SO_4	9,5
Na	760	Cl	879	Na	32.6	Cl	24.5

T.D.S. - 2270 mg/l

Name

Unnamed

Location

OODNADATTA SHEET SH53-15, - approximate co-ordinates 365546 (Fig. 13)
Pastoral Station: Allandale
Aerial Photograph: Algebuckina RUN 2A, Photo 1755 (Old series - Chugg)
Dept. Mines Unit No: 6042 00009. Chugg's No. 6, plan L54-1, RB 37/46
Access: Cross country from Ockenden Spring - near Big Cadnaowie Spring

General

History: possibly discovered by Stuart
Description of Area: as for Big Cadnaowie Spring
Description of Springs: Not visited.

Field Results

Not visited.

Chemistry

	Date 11/10/53 mg/l				Analysis No. 73/2194 meq/l		
Ca	97	HCO_3	305	Ca	4.9	HCO_3	5.1
Mg	48	SO_4	510	Mg	4.0	SO_4	10.9
Na	858	Cl	1008	Na	36.9	Cl	29.8

T.D.S. - 2750 mg/l

Name

BIG CADNAOWIE SPRING

Location

OODNADATTA SHEET SH53-15, approximate co-ordinates 364545 (Fig. 13)
Pastoral Station: Allandale
Aerial Photograph: Algebuckina Run 2A Photo 1754 (Old series - Chugg)
Dept. Mines Unit No: 6042 00010. Chugg's No. 7 on plan L54-1, RB 37/46. Temporary No. MC 12
Access: Cross country south west of Mount Dutton (there is probably a track from Ockenden bore and spring but author did not look for it).

General

History: Not known but probably visited by Stuart. Possibly McEllister Springs as mentioned by Stuart on p. 477
Description of Area: Minaly stony ridges with sandy slopes and flats. Both Cadnaowie Formation and Algebuckina Sandstone outcrop in vicinity according to geological map.
Description of spring: Flows from small escarpment on to a flat area which supports a swamp of about 650 m^2 in area.

Field Results

Visited by: AFW, BAE on 22/11/77
Water temperature: 24°C
Field conductivity: 5.2×10^3 @ 25°C
Discharge: 140 m^3/day (1.6 l/sec) - measured with bucket and stopwatch. Note estimate 55-110 m^3/day (0.6 - 1.3 l/sec) in 1953.
Other: Photograph of MC 12

Chemistry

(1) Date 5/8/53 Analysis No. 72/1859

	mg/l				meq/l		
Ca	115	HCO_3	244	Ca	5.8	HCO_3	4.1
Mg	69	SO_4	677	Mg	5.7	SO_4	13.1
Na	880	Cl	1116	Na	37.8	Cl	31.1

T.D.S. - 2990 mg/l

(2) Date 22/11/77 Analysis No. 6487/77

	mg/l				meq/l		
Ca	122	HCO_3	270	Ca	6.1	HCO_3	4.4
Mg	46	SO_4	758	Mg	3.8	SO_4	15.8
Na	995	Cl	1210	Na	43.3	Cl	34.1
K	28	NO_3	2	K	0.7	NO_3	0

T.D.S. - 3290 mg/l, pH 7.7

Name

OCKENDEN SPRING & BORE

Location

OODNADATTA SHEET SH53-15, - approximate co-ordinates 372547 (Fig. 13)
Pastoral Station: Allandale
Aerial Photograph: Algebuckina Run 2A Photo 1753 (Old series - Chugg)
Dept. Mines Unit No. 6042 00011. Chugg's No. 8, plan L54-1, RB37/46
Access: Just west off main William Creek, Oodnadatta road, south of Mt. Dutton R.S.

General

History: Not known but probably visited by Stuart. Could be McEllister Springs as mentioned by Stuart on p. 477
Description of Area: Low angle gibber slopes and flats in vicinity; Spring on edge of stream system a few metres in diameter.
Description of Spring: Small mound a few metres in diameter with bore to depth of about 45 m (originally)

Field Results

Not visited on these surveys

Chemistry

(1) Date 20/1/49 Analysis No. 28/8154

	mg/l				meq/l		
Ca	107	HCO_3	328	Ca	5.4	HCO_3	5.4
Mg	19	SO_4	527	Mg	1.6	SO_4	11.0
Na	840	Cl	962	Na	36.5	Cl	27.3

T.D.S. - 2610 mg/l

(2) Date 9/9/53 Analysis No. 72/1844

T.D.S. - 2410 mg/l

(3) Date Oct 1965 Analysis No. 160/280

	mg/l				meq/l		
Ca	109	*HCO_3	256	Ca	5.5	HCO_3	4.2
Mg	18	SO_4	534	Mg	1.5	SO_4	11.1
Na	802	Cl	936	Na	34.9	Cl	26.5

*Stated as 128 mg/l CO_3 on bore card

T.D.S. 0 2530 mg/l

(4) Date 6/9/75 Analysis No. 5619/75

	mg/l				meq/l		
Ca	105	HCO_3	254	Ca	5.2	HCO_3	4.2
Mg	19	SO_4	529	Mg	1.6	SO_4	11.0
Na	787	Cl	929	Na	34.2	Cl	26.2
K	17	F	0.65	K	0.4	F	0
Fe	0.5	NO_3	13	Fe	0	NO_3	0.2
		SiO_2	18				
		B	0.79				

T.D.S. - 2525 mg/l, pH 7.7

Name

MT. TOONDINA SPRING

Location

OODNADATTA SHEET SH53-15, approximate co-ordinates 330534
Pastoral Station: Allandale
Aerial Photograph: -
Dept. Mines Unit No.: 5942 00003?
Access: Main track to Mt. Toondina from Oodnadatta Marree road south of Algebuckina

General

History: Not known
Description of Area: Mt. Toondina itself is a piercement structure with Algebuckina Sandstone and Cadnaowie Formation sediments lapping into Permian Mt. Toondina Beds (see OODNADATTA 1:250 000 geological sheet). The spring(s) are presumably related to this piercement structure.
Description of spring: Not visited.

Field Results

Not visited

Chemistry

A sample taken in 1962 (W114/62) is recorded by Freytag as having excessive salinity (6370 mg/l) - probably as a result of evaporation. A sample taken from the nearby Mt. Toondina No. 2 Bore gave results more typical of those expected. They are as follows:-

Date - August 1965				Analysis No. 160/283			
mg/l				meq/l			
Ca	116	HCO_3	310	Ca	5.8	HCO_3	5.0
Mg	45	SO_4	446	Mg	3.7	SO_4	9.3
Na	606	Cl	756	Na	26.4	Cl	21.4

T.D.S. 2280 mg/l

SPRINGS ON THE BILLAKALINA 1:250 000 SHEET

Springs on BILLAKALINA occur in the vicinity of Lake William, Francis Swamp and along the Margaret (see Fig. 14). Two, namely Emily and Billakalina Spring were reported by Cobb (1976). In addition general comments were made re Francis Swamp which derives its name from the large number of low flowing and extinct springs in the area. The following springs which are shown on the BILLAKALINA 1:250 000 topographical map (see Fig. 14) have not been visited.

Lloyd Bore ?Spring
Tom Tom Spring
Wishart Spring
Bishop Spring - all Francis Swamp
Two Sisters Spring
Little Depot Spring
Big Depot Spring and
numerous other unnamed springs
Margaret Spring
Fenced Spring and at least five other unnamed springs - all in the vicinity of the Margaret, between east grid lines 440 and 460 and north grid lines 340 and 350.

Two other springs are - namely Francis and William Springs have limited records but were not visited during any survey.

Details are as follows.

Name

FRANCIS SPRING

Location

BILLAKALINA SHEET SH53-7, approximate co-ordinates 429394 (Fig. 14)
Pastoral Station: Anna Creek
Aerial Photograph:
Dept. Mines Unit No: 6139 00003
Access: On track through Francis Swamp from Anna Creek Station

General

History: -
Description of Spring: -
Description of Area: As for MC 06

Field Results

Not visited

Chemistry

(1) Date 1891 Analysis No. (unreadable)?

T.D.S. - 5490 mg/1

Name

WILLIAM SPRING

Location

BILLAKALINA SHEET SH53-7, approximate co-ordinates 442405 (Fig. 14)
Pastoral Station: Anna Creek
Aerial Photograph:
Dept. Mines Unit No. 6139 00013
Access: Cross country along west side of Lake William from main Marree - Oodnadatta road.

General

History: -
Description of Area: on edge of large salt pan
Description of Spring: -

Field Results

Not visited

Chemistry

Not results available

Name

Unnamed Spring

Location

BILLAKALINA SHEET SH53-7, approximate co-ordinates 432392 (Fig. 14)
Pastoral Station: Anna Creek
Aerial Photograph: IRRAPATANA SVY 592 RUN 2 PHOTO 0034/1
Dept. Mines Unit No.: 5139 00023 - temporary number MC 06
Access: Track from Anna Creek Station to Leonard Bore - then wheel tracks down to yard about 5-6 km south. Spring almost 300 m due south of yard.

General

History: Not known
Description of Area: In large area of small mound springs, saline and alluvial flats. Many springs extinct, others very small seeps (Francis Swamp complex)
Description of Spring: A small circular pool about 3 m in diameter virtually at ground level and surrounded by a limestone rim.

Field Results

Visited by: AFW, BAE on 20/11/77
Water temperature: 24°C
Field conductivity: 8.5×10^3 @ 24.5°C
Discharge: 70 m^3/day (0.8 l/sec) - measured with bucket and stopwatch and checked with peanut.
Other:

Chemistry

(1) Date 20/11/77 Analysis No. W6981/77

Ca	212	HCO_3	279	Ca	10.6	HCO_3	4.6
Mg	58	SO_4	645	Mg	4.8	SO_4	13.4
Na	1700	Cl	2609	Na	73.9	Cl	73.6
K	62	NO_3	11	K	1.6	NO_3	0.2

T.D.S. - 5430 mg/l, pH 7.9

Name

Unnamed Spring

Location

BILLAKALINA SHEET SH53-7, - approximate co-ordinates 432392 (Fig. 14)
Pastoral Station: Anna Creek
Aerial Photograph: IRRAPATANA SVY 592 RUN 2 PHOTO 0034/2
Dept. Mines Unit No. 6139 00024 - temporary number MC 07
Access: as for MC 06 but 200 m further southeast

General

History: Not known
Description of area: see MC 06
Description of spring: small mound, 1-2 m high and 2.5 m in diameter - mainly mud/vegetation. Small flow travels out on to a flat swamp area.

Field Results

Visited by: AFW, BAE on 20/11/77
Water temperature: 23.3°C
Field Conductivity: 9.5×10^3 @ 27°C
Discharge: 3.5 m^3/day (0.04 1/sec) - measured by bucket and stopwatch
Other:

Chemistry

(1) Date 20/11/77 Analysis No. 6982/77

T.D.S. - 5200 mg/1, pH 7.4

SPRINGS ON THE CURDIMURKA 1:250 000 SHEET

Name

EMERALD SPRING

Location

CURDIMURKA SHEET SH53-8, approximate co-ordinates 513359 (Fig. 15)
Pastoral Station: Stuart Creek
Aerial Photograph: Curdimurka SVY 1564 Run 4 Photo 138
Dept. Mines Unit No. 6339 00001
Access: Track to spring from just west of Stuart, Margaret Creek crossing.

General

History: see RB 75/90 - Cobb, 1975
Description of area: Area of low north-south trending sand dunes and claypans. Spring flows out on to a long claypan underlain by shelly sands and clays, occasionally lime cemented and up to 1.5 m thick. These in turn are underlain by Bulldog Shale.
Description of spring: A large mound up to 40 m in diameter with a large closed pool at the top covered in reeds. Flow is tapped by two pipes driven into the side of the mound (as for Cardajalburra Spring on WARRINA).
Other:

Field Results

Visited by: AFW/BAE 24/11/77; AFW/js 18/5/78; AFW 5/4/79.
Water temperature: 30°C on 24/11/77
Field conductivity: 24/11/77 - 4.2 x 10^3 @ 30°C
18/5 /78 - 3.3 x 10^3 @ 22°C
20/5 /78 - 3.4 x 10^3 @ 21°C

Discharge:

As measured by	Babbage	(1858)	(Threadgill 1922) -	9.3 l/sec
" "	Goyder	(1860)	" " "	1.1 "
" "	Dept. Mines	(1923)	- well records	2.7 "
" "	" "	(1961)	" "	" "
" "	AFW/BAE 24/11/77			3.2 "
" "	AFW/JS 18/5/78	- 1200 hrs		2.25 "
" "	" " "	1715 hrs		2.19 "
" "	" " 19/5/78	0845 hrs		2.23 "
" "	" " 20/5/78	1100 hrs		2.21 "
" "	AFW - 5/4/79	-		2.25 "

Chemistry

(1) Date 23/5/23 Analysis No. 2/368

	mg/l		meq/l	
Ca	57	HCO_3 897	Ca 2.9	HCO_3 14.6
Mg	49	SO_4 292	Mg 4.1	SO_4 6.1
Na	1339	Cl 1575	Na 55.8	Cl 44.4
		SiO_2 10		SiO_2 0.2

(2) Date 4/11/61 Analysis No. 1823/61

	mg/l		meq/l	
Ca	26	HCO_3 1184	Ca 1.3	HCO_3 19.4
Mg	30	SO_4 54	Mg 2.5	SO_4 1.1
Na+K	865	Cl 740	Na+K 37.6	Cl 20.9
		F 2.7		F 0.1
		NO_3 - present		

(3) Date 24/11/77 Analysis No. 6990/77

	mg/l				meq/l		
Ca	22	HCO_3	1142	Ca	1.1	HCO_3	18.7
Mg	25	SO_4	24	Mg	2.1	SO_4	0.5
Na	835	Cl	729	Na	36.3	Cl	20.5
K	24	NO_3	<1	K	0.6	NO_3	0

T.D.S. - 2220 mg/l, pH 8.2

Note that analysis (2) and (3) are in close agreement. Analysis (1) shows completely different ionic ratios, a higher salinity and the sums of cations and anions do not balance. It seems unlikely therefore that this sample is at all representative of the groundwater emanating from Emerald Spring or there is a serious error in the analytical calculations.

Name

Unnamed - in Elizabeth Springs group

Location

CURDIMURKA Sheet SH53-8 - approximate co-ordinates 482363 (Fig. 15)
Pastoral Station: Stuart Creek
Aerial Photograph: SVY 2098, Photo 0083/1
Dept. Mines Unit No: 6239 00029. Temp No. MC01
Access: Just to north to main Marree-Oodnadatta road in centre of group.

General

History: see Cobb 1975
Description of Area: see Cobb 1975
Description of Spring: On edge of limestone mound - spring empties into an alluvial valley with sands and gravels in the creek bed.

Field Results

Visited by: AFW, BAE, 17/11/77
Water temperature: 24.5°C
Field conductivity: 9.5×10^3 @ 26°C
Discharge: 0.1 l/sec (bucket & stopwatch). Area of swamp etc. measured as 720 m^2 .

Chemistry

Date 17/11/77 Analysis No. 6976/77

T.D.S. 6000 mg/l, pH 8.7

Name

JERSEY SPRING, COWARD SPRING, THE BUBBLER, WARBURTON SPRING and 6239 00021.

Location

General

See Cobb, 1975 for details.

Field Results

Summarised in Appendix 1.

Name

Unnamed - in STRANGWAYS SPRINGS group

Location

CURDIMURKA SHEET SH53-8, approximate co-ordinates 458387 (Fig. 15)
Pastoral Station: Anna Creek
Aerial Photograph: SVY 2099 /PHOTO 090 PTS. 1 & 2 respect.
Dept. Mines Unit No: 6239 00030 and 31. Temp No. MC03 and MC04
Access: MC03 - on north side of main mound, just south of main Marree Oodnadatta road.
MC04 - on northeast side of main mound near ruins of Strangways Telegraph Station.

General

History: See Cobb, 1975
Description of Area: See Cobb, 1975
Description of Springs: MC03 - on northern edge of limestone mass forming main mound. Spring consists of small pool about 3 to 4 m diameter with reeds etc., in centre and issues down small gully.
MC04 - on northeastern edge of limestone mass forming main mound. Spring similar to MC03. Has remains of old stock fence around rim.

Field Results

Visited by: AFW, BAE, 19/11/77
Water temperature: MC03 - not measured
MC04 - " " - both affected by surface cooling
Field conductivity: MC03 - 12 x 10^3 @ 35°C
MC04 - 15.5 x 10^3 @ 35°C
Discharge: MC03 - 0.07 l/sec - measured by bucket and stopwatch
MC04 - 0.03 l/sec - " " " " "

Chemistry

MC03 Date 19/11/77 Analysis No. 6978/77

T.D.S. 6500 mg/l, pH 7.5

MCO4 Date 19/11/77 Analysis No. 6969/77

T.D.S. 7500 mg/l pH 7.4

Name

Unnamed - in Blache Cup Springs group

Location

As for Blanche Cup - see Cobb 1975. (Fig. 15)
Aerial Photograph: SVY 1564 /PHOTO 132 /Pt. 1.
Dept. Mines Unit No: 6239 00028. Temp No. MC05
Access: Just east of the Bubbler and northeast (200 m) of Blanche Cup Mount Spring

General

History: See Cobb, 1975
Description of Area: see Cobb, 1975
Description of Spring: Spring consists of small discharge issuing from a mound about 3 m high and 5-7 m in diameter. Water flows down slope into a sandy stream bed.

Field Results

Visited by: AFW, JWH, GL., on 19/11/77
Water temperature: Not measured (unrepresentative)
Field conductivity: 4.9×10^{3} @ $23^{\circ}C$
Discharge: 0.2 1/sec - bucket & stopwatch

Chemsitry

Date 19/11/77 Analysis No. 6980/77

T.D.S. 2840 mg/1, pH 7.6

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17/5/79

A.H. William

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APPENDIX 1

Conductivity, flow measurements from springs in detail 1974-1979

EMERALD SPRING (6339000WP00001)

Date, time	Conductivity micro-s/cm	pH	Anal. No.	Salinity mg/l	Source Temp.	Flow 1/sec.	Method
24/11/77	3854	8.2	6990/77	2220 (calc)	30°C	3.2	Bucket & stopwatch
24/11/77 but 2 hrs later	*Flow in pipe dropped from 0.32 to 0.2 1/sec					*3.1	
18/5/78 1200 hrs	4020	8.0	2850/77	2340	N.M.	2.25	"
18/5/78 1715 hrs						2.19	
19/5/78 0845 hrs						2.23	"
20/5/78 1100 hrs	3750	7.9	2851/77	2175	N.M.	2.21	"
5/4/79	-	-	-	-	N.M.	2.25	"

WARBURTON SPRING (6239000WP00029)

12/8/74	6640	7.8	4240/74	3830 (calc)	26°C	0.3	Estimate
						0.9	From evaporation technique
18/11/77	6400	7.6	6993/77	3960	27°C	2	Bucket & stopwatch
21/5/78 1500 hrs.	6400	7.8	2847/78	3960	27°C	1.83	"
22/5/78 1715 hrs					N.M.	1.88	"

THE BUBBLER (6239000WP00023)

13/8/74	5300	7.6	4239/77	3042 (calc)	30°C	7.5	Current meter
16/11/77	5200	7.4	6995/77	3100	N.M.	6.6	Bucket & stopwatch
5/4/79	-	-	-	-	N.M.	3.0	"

COWARD SPRING (6239000WP00017)

17/8/74	5480	8.0	4238/74	3710 (calc)	28°C	0.8	Estimate
						1.2	From evaporation technique
1891	-	-	Ref. Ward, 1946	3330	-	-	See Cobb, 1975
3/11/61	-	-	1827/61	4180	-	-	" " "
16/11/77	6300	7.7	6992/77	3960	29°C?	2.7	Bucket & Stopwatch

JERSEY SPRING (6239000WP00010)

2/11/61	-	-	1829/61	3950	-	-	
12/8/74	5640	7.8	4241/74	3580 (calc)	26°C	1.0	Estimate
19/11/77	5800	7.4	6991/74	3520	31°C	1.7	Bucket & stopwatch

UNNAMED - JERSEY GROUP (6239000WP00021)

12/8/74	5225	7.5	4242/74	3200 (calc)	30°C	1.7	Estimate
17/11/77	5300	7.4	6994/77	3170	31°C?	2.1	Bucket & Stopwatch

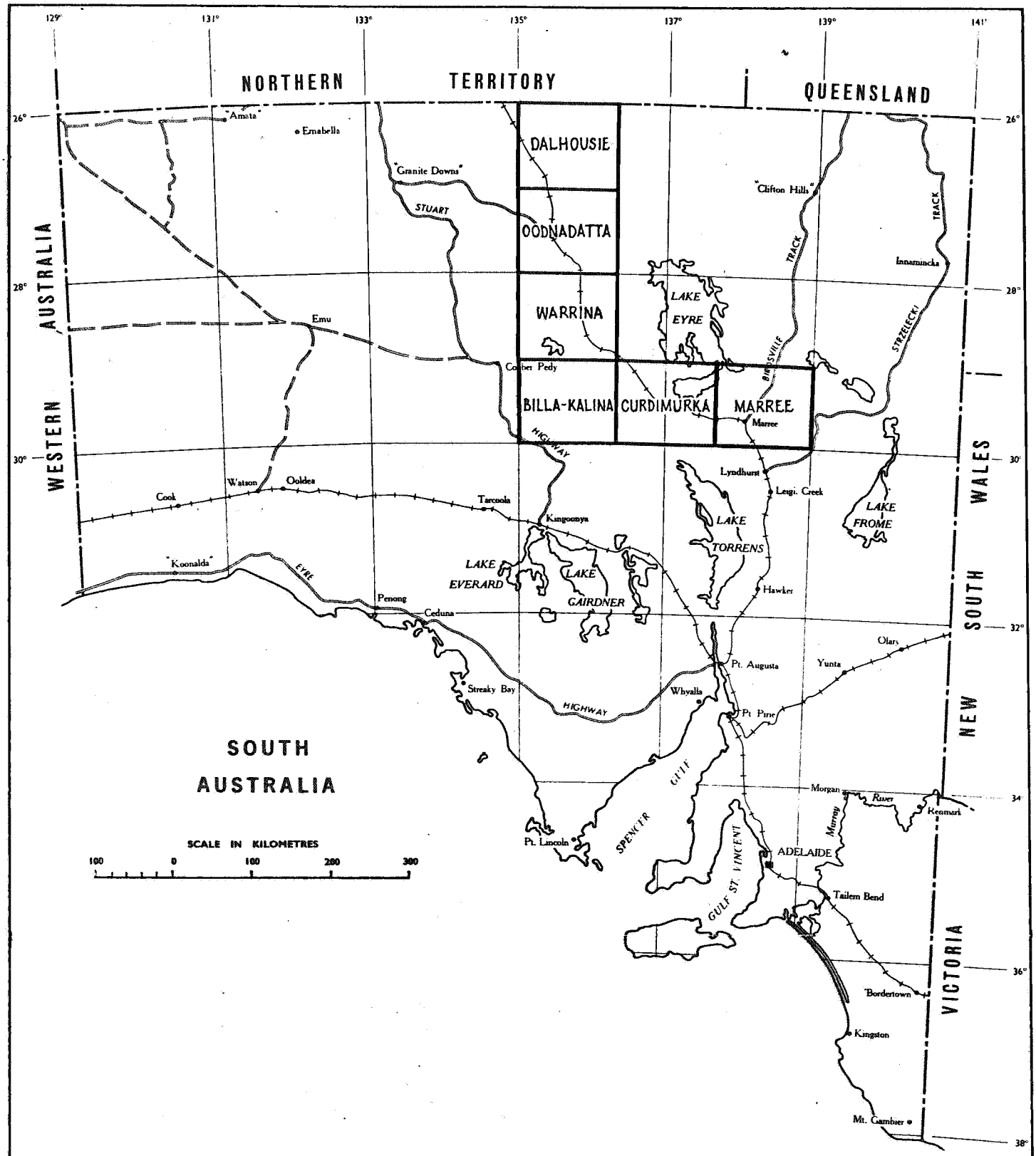


Fig. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Compiled. A. F. Williams	G.A.B. MOUND SPRING SURVEY	Date: 13th June 1979
Drn. T.E. Ckd.	LOCALITY PLAN	Drg. No. S 14109

1421

135°00'
136°30'
28°00'
29°00'

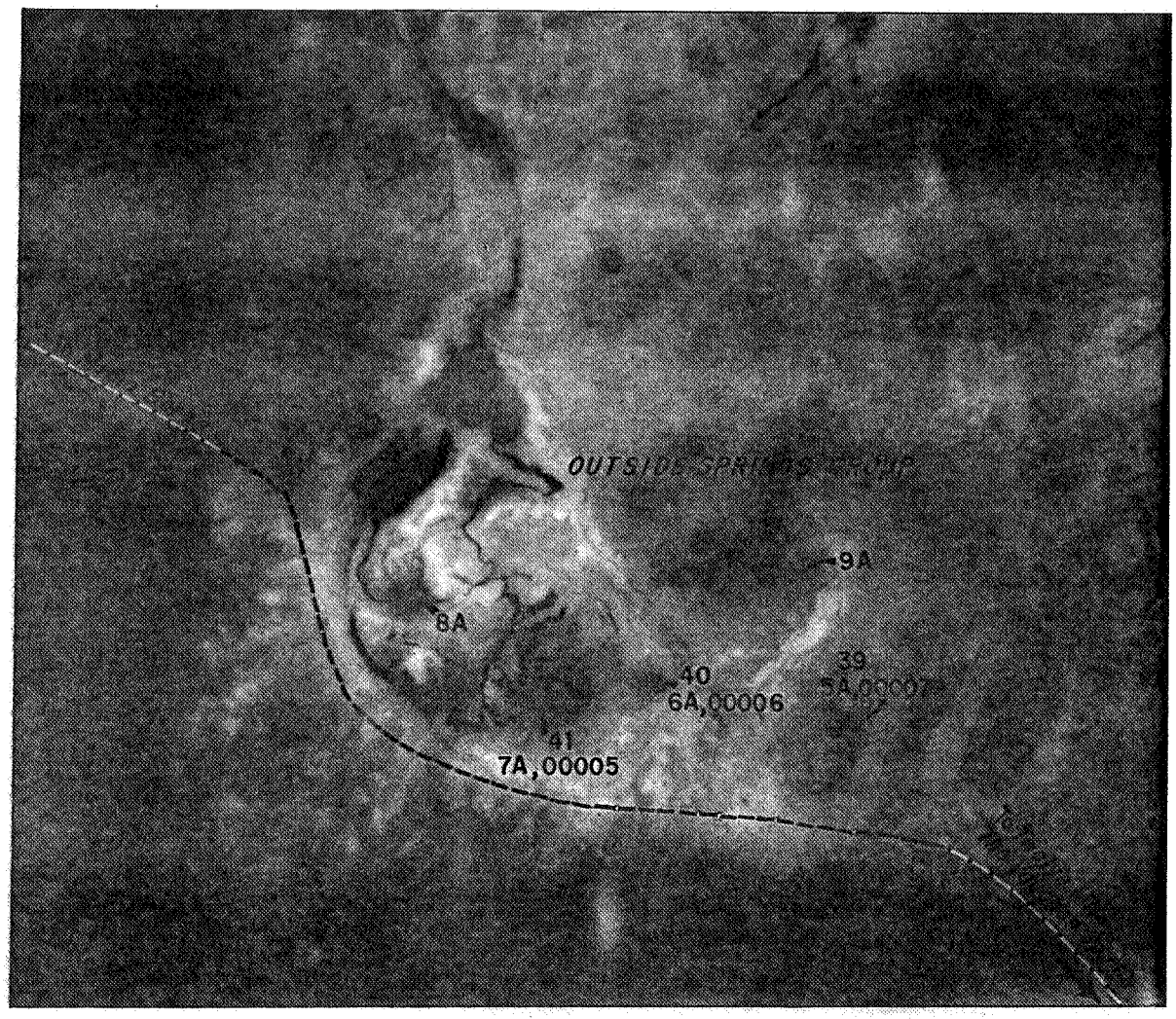
Aloorina Ck
Yijulka Ck
Peake Ck
Nilkinina Ck
Eurelyana Ck
Weedina Ck
Edward Ck
Edwards Ck
Duff Creek
Aimee Ck
Giddi Giddinna Ck
Bulldog Ck
Levi Ck
George Ck
Davenport Ck
Sunny Creek
Douglas Creek
Anna Ck
Box Creek
William Ck
Blyth Ck
NEALES

Allandale and Peake Creek Springs
MT KINGSTON
Keriatreaboorntalling Springs
Fig.8 Freeling Springs
"Peake"
MT DENISON
PRIMROSE HILL
Primrose Spring
Warrina
Cardajalburrana Springs
Coorandatana Springs
Birribirriana Spring
Fig.9
Fig.10
NULTADDY HILL
Willow Spring
NILPINNA PILE
Nilpinna Spring
South Well Spring
CROSSLAND HILL
Saline Springs
Fig.11,5
Weedina Springs
Eddadurrana Spring
Fig.3 Outside Springs
Milne Spring
The Vaughan Spring
Little Perry Spring
Twelve Mile Spring
Fig.4
Fig.5
Fanny Springs
Big Perry Springs
Fig.6
The Fountain Spring
Levi Springs
SPRING HILL
Fig.7
Spring Hill Spring
Hawker Springs Group
Edith Spring
"Umbum"
"Nilpinna"
MT MARGARET
Fig.12 Brinkley Springs
Fig.12 Tarlton Springs
Loddon Spring
MT ANNA
Giddi Giddinna
Giddigiddina Springs
LAKE
Widigiedona Spring
CADIBARRAWIRRACANNA
OOLGELIMA
Ooglelima Spring
WIRRACANNA
Eurilyana Spring
Castine Spring
Anna Ck
"Anna Ck"
William Ck

Fig.2

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:500,000(orig.)
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY WARRINA 1:250,000 SHEET GENERAL LOCALITY MAP	DATE JUNE 1979
DRN: E. C. CKD: TJR		PLAN NUMBER 79-384

1421



8A etc prefixed by UMBUM Run 3/0113/ - author's numbers

00005 etc - unit numbers

39, 40 etc - Chugg's numbers

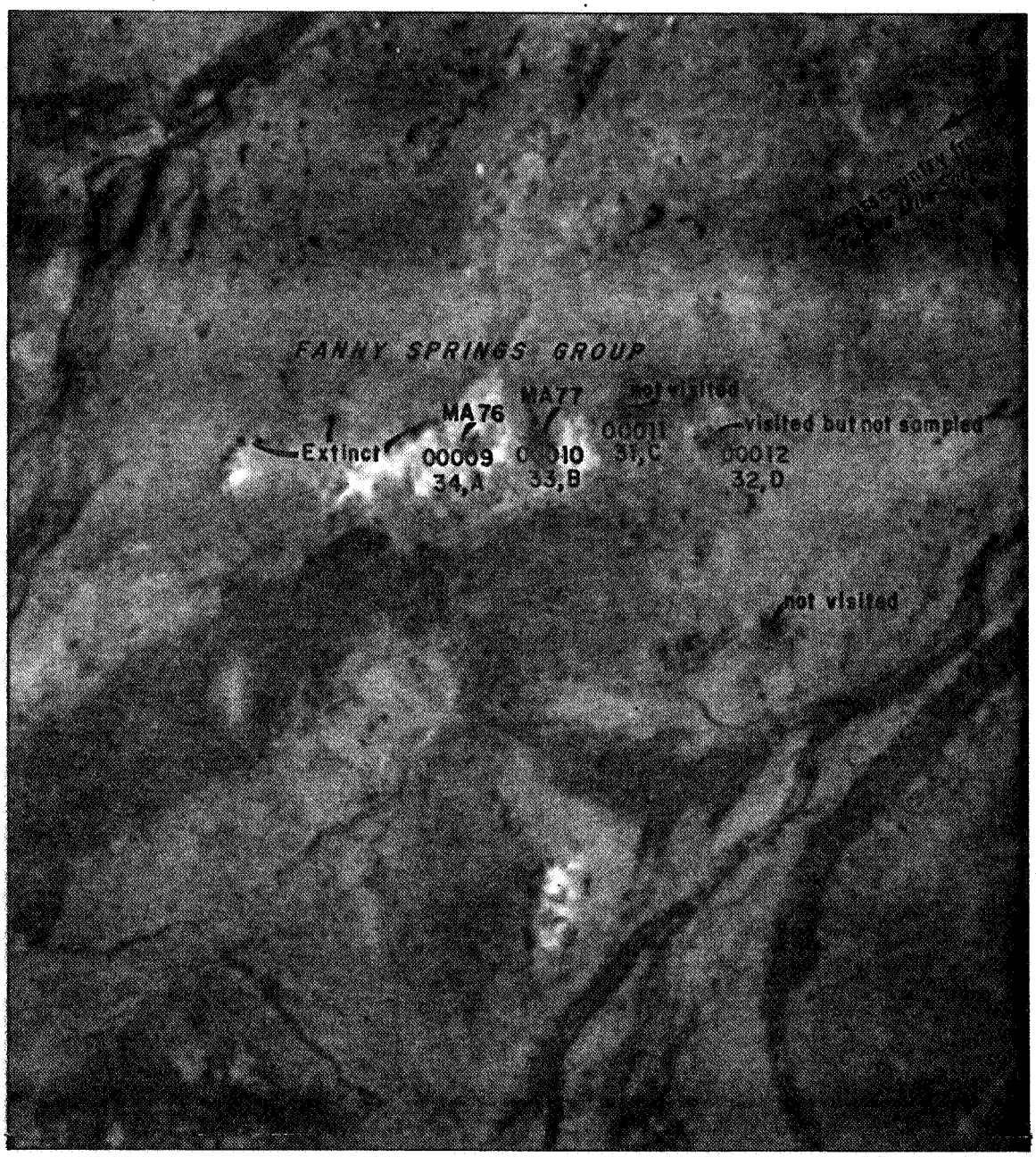
LOCALITY

5941	6040	6141 ■
5940	6040	6140

Photo: S.A. Dept. of Lands
SVY 1503 - 114

Fig. 3

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:25 000
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET	PLAN NUMBER
	OUTSIDE SPRINGS GROUP	S14020



00009etc - unit numbers
34,A etc - Chugg's numbers

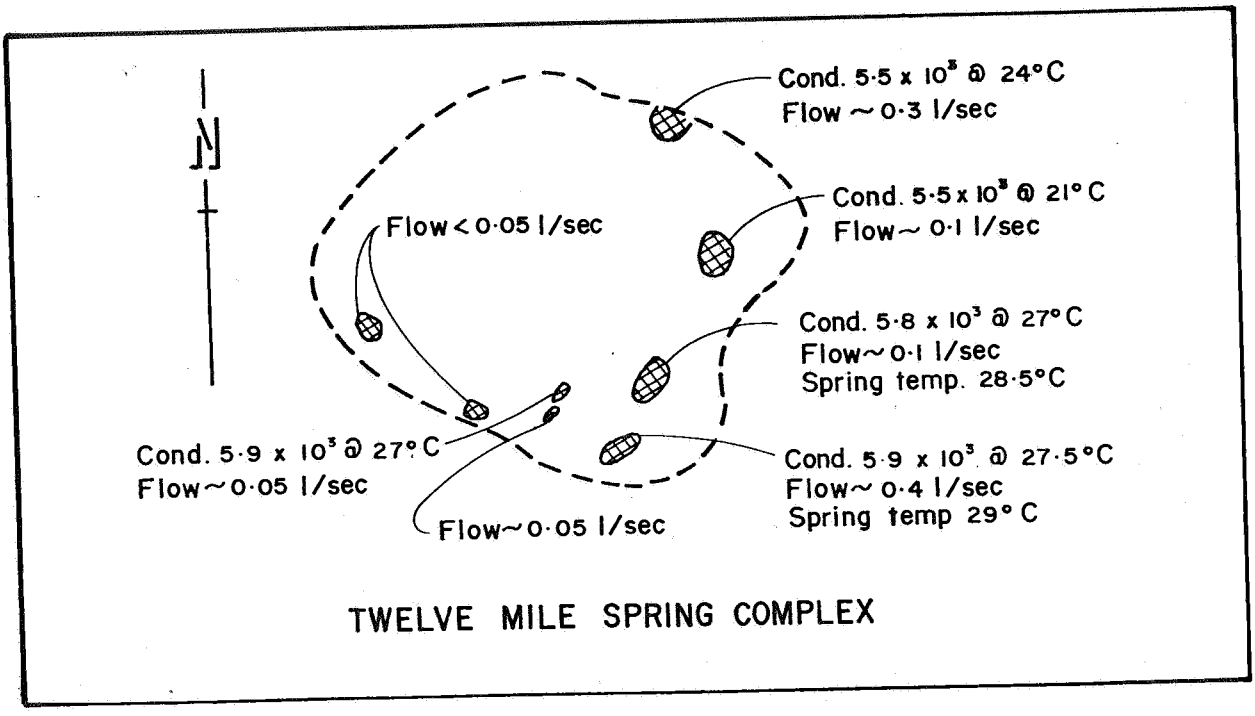
LOCALITY

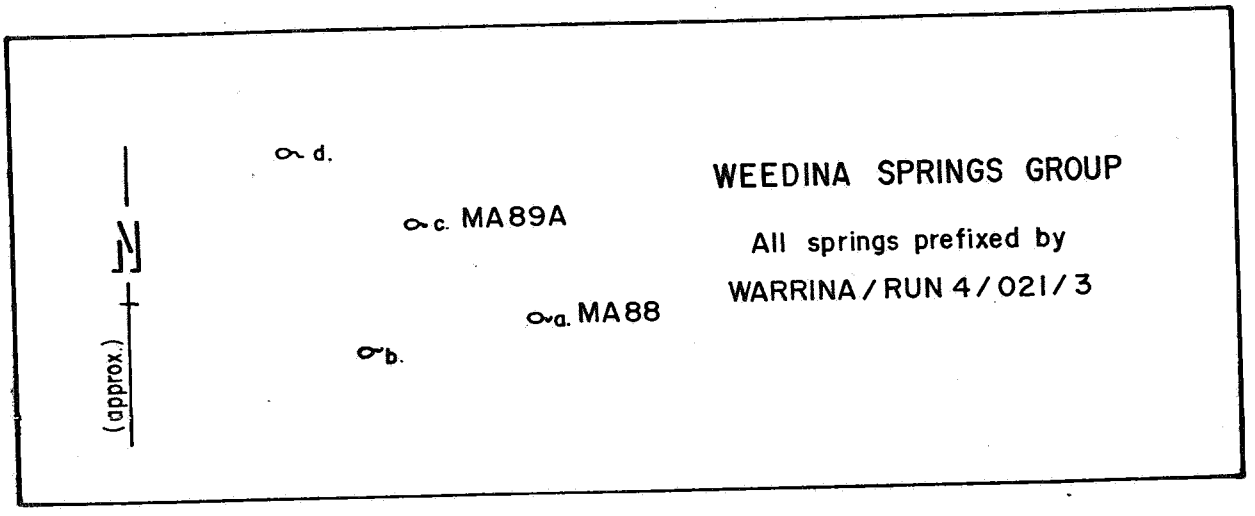
5941	6041	6141 ■
5940	6040	6140

Photo : S.A. Dept. of Lands
SVY 1503 - 114

Fig. 4.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:25000
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET	PLAN NUMBER
	FANNY SPRINGS GROUP	S 14021





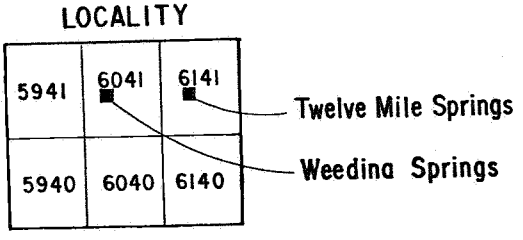
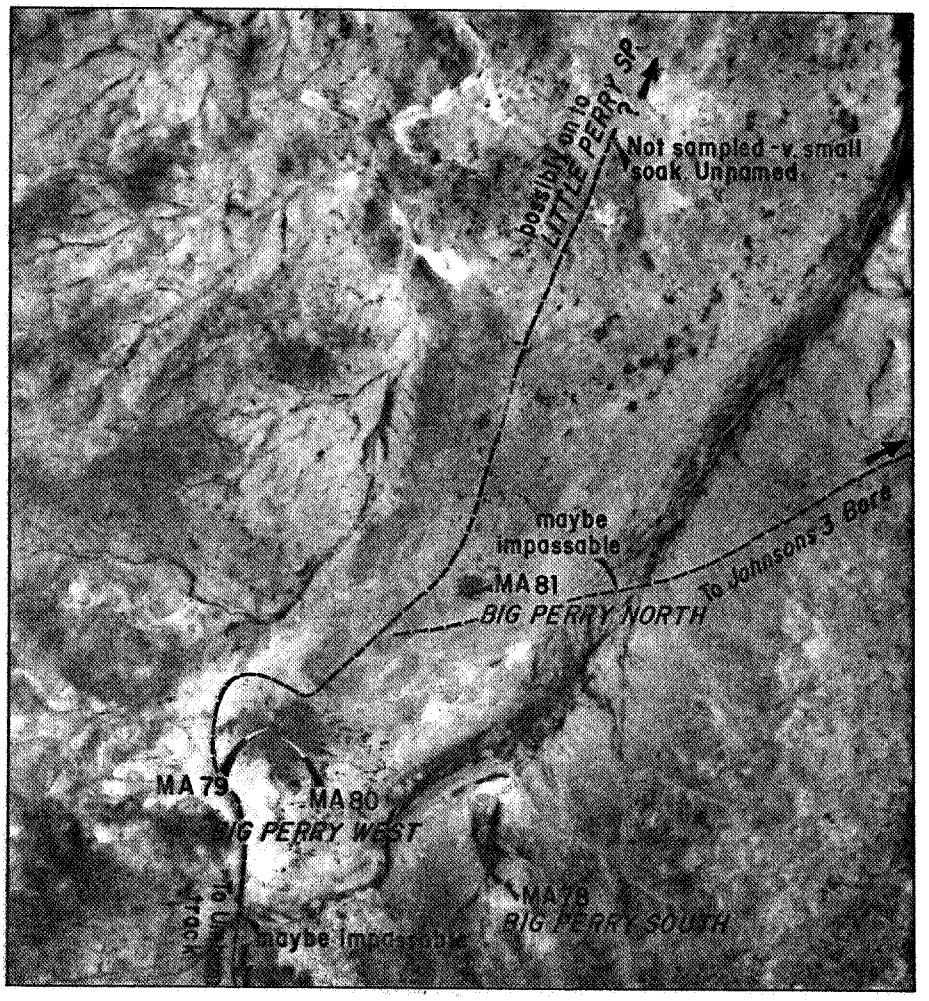


Fig. 5

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE NOT TO SCALE
COMPILED A.F.W	G.A.B. MOUND SPRING SURVEY WARRINA 1:250 000 SHEET	DATE 26 · 4 · 79
DRN K.J. CKD	SKETCHES OF TWELVE MILE AND WEEDINA SPRINGS COMPLEX	PLAN NUMBER S 14022

Job No. 1421



N

LOCALITY

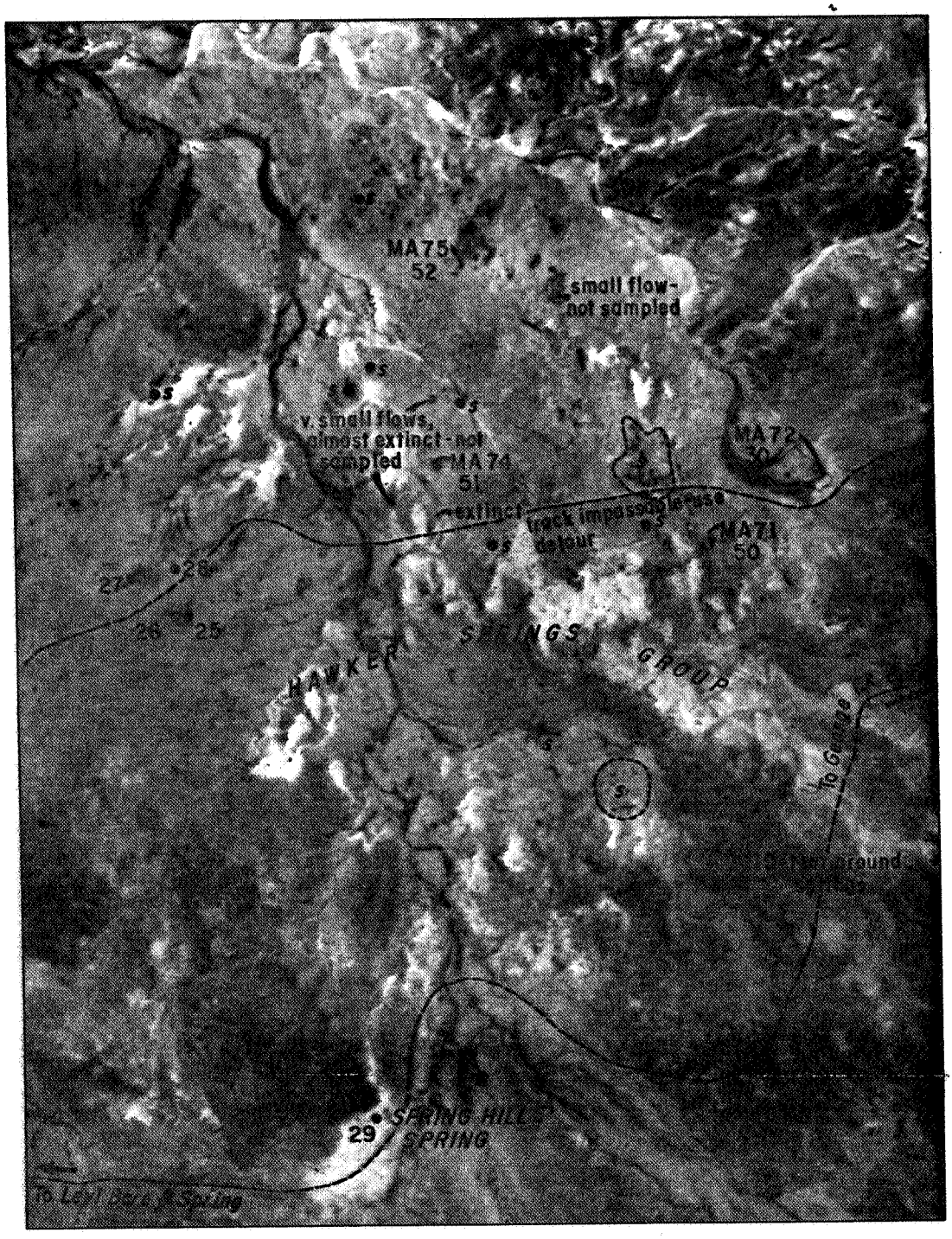
5941	6041	6141 ■
5940	6040	6140

Photo: S.A. Dept. of Lands
SVY 1503-116

Fig. 6

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:40 000
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET	PLAN NUMBER
	BIG PERRY SPRINGS GROUP	S 14023

Job No. 1421



Nos. 25-29 not visited by author. All located by Chugg, 1953
Numbers preceded by 6141 -000 (unit nos.)

Springs or groups of springs not visited -extinct or nearly extinct..... • S

LOCALITY

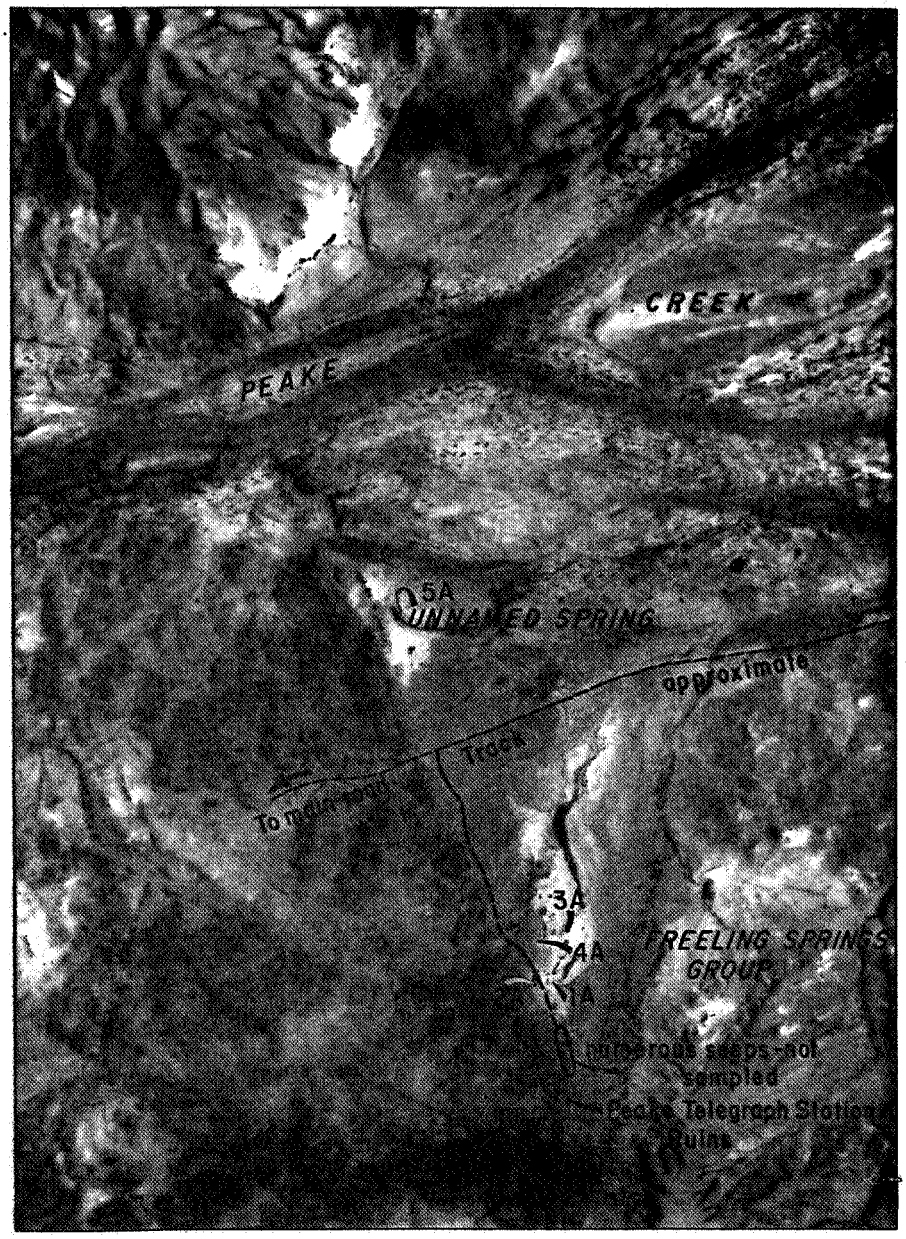
5941	6041	6141 ■
5940	6040	6140

Photo: S.A. Dept. of Lands
SVY 1503-034

Fig. 7

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:40 000
COMPILED: A.F.W.	G.A.B. MOUND SPRINGS SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET HAWKER SPRINGS GROUP & SPRING HILL SPRING	PLAN NUMBER S 14024

Job No. 1421



All numbers prefixed by WARRINA/Run1/026/

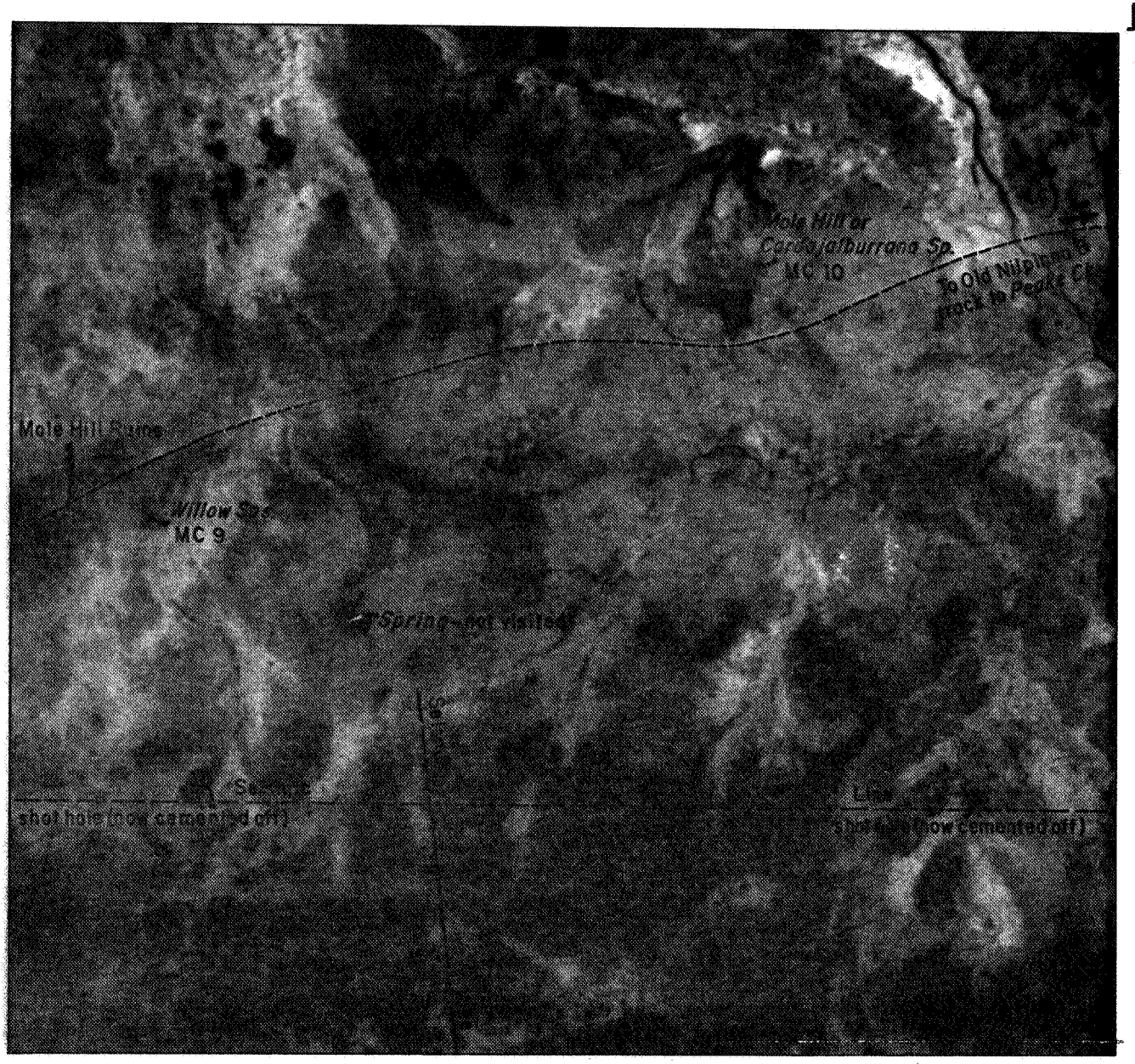
LOCALITY

5941	6041 ■	6141
5940	6040	6140

Photo: S.A. Dept. of Lands
SVY 1504 -025

Fig. 8

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:40 000
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET FREELING SPRINGS GROUP	PLAN NUMBER S 14025



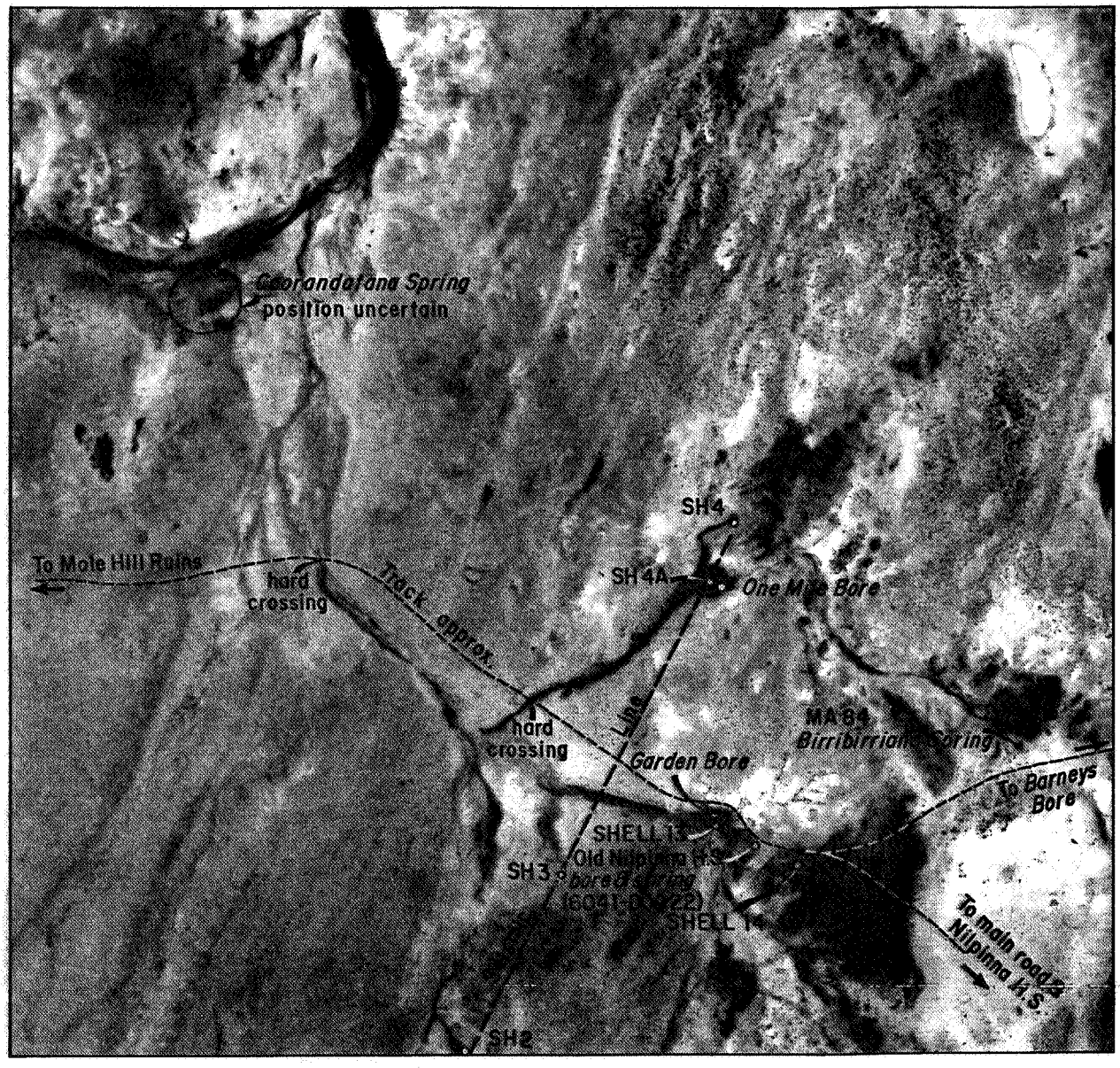
LOCALITY

5941	6041	6141
5940	6040	6140

Photo : S.A. Dept. of Lands
SVY 1503-146

Fig. 9

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:25 000
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET	PLAN NUMBER
	CARDAJALBURRANA AND WILLOW SPRINGS	S 14026



SH 2,3,4,4A – seismic shot holes and SHELL 13,14 – now cemented off.

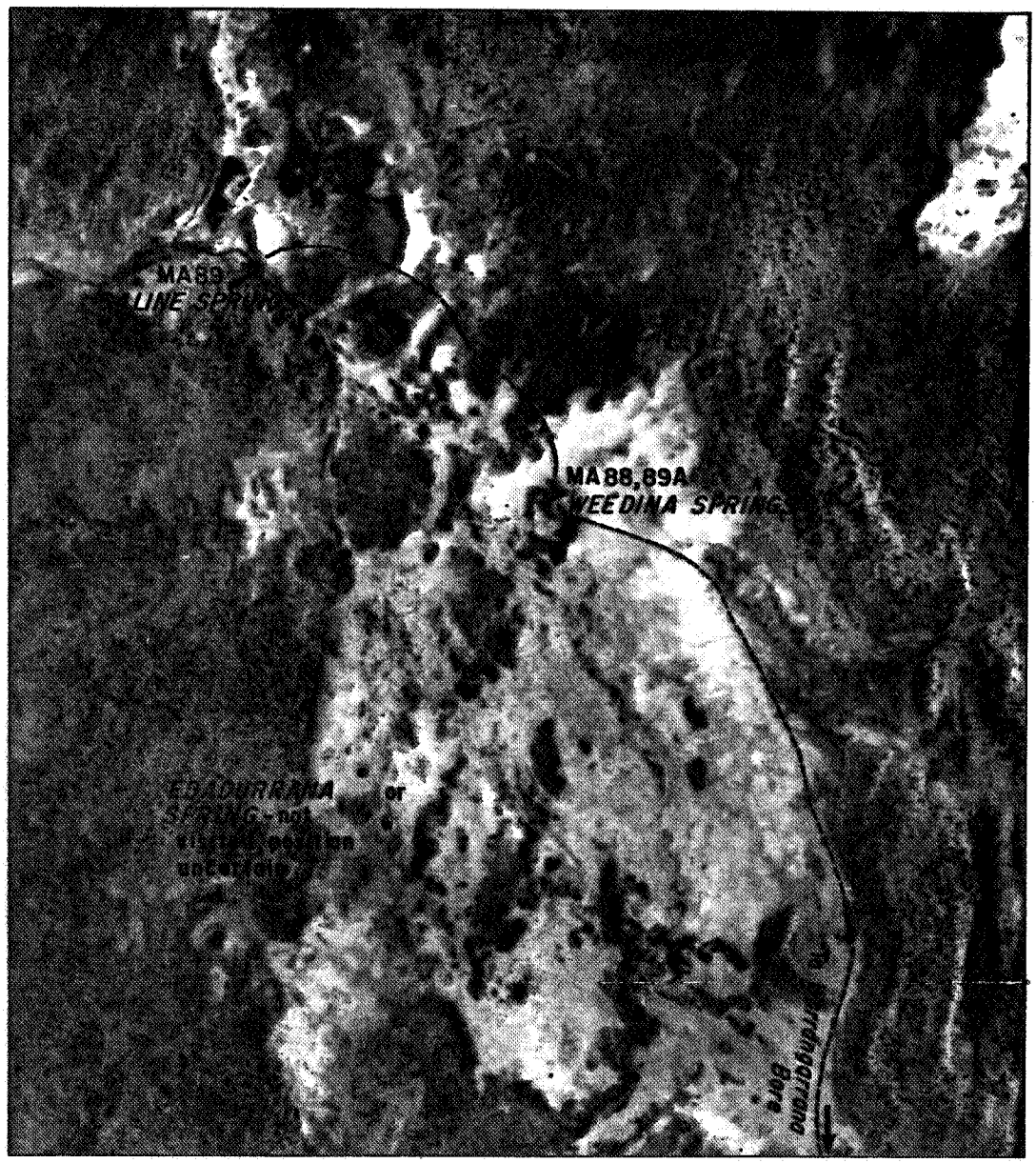
LOCALITY

5941	■ 6041	6141
5940	6040	6140

Photo : S.A. Dept. of Lands
SVY 1503 - 142

Fig. 10

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:40 000
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET	PLAN NUMBER
	OLD NILPINNA AREA	S 14027



LOCALITY

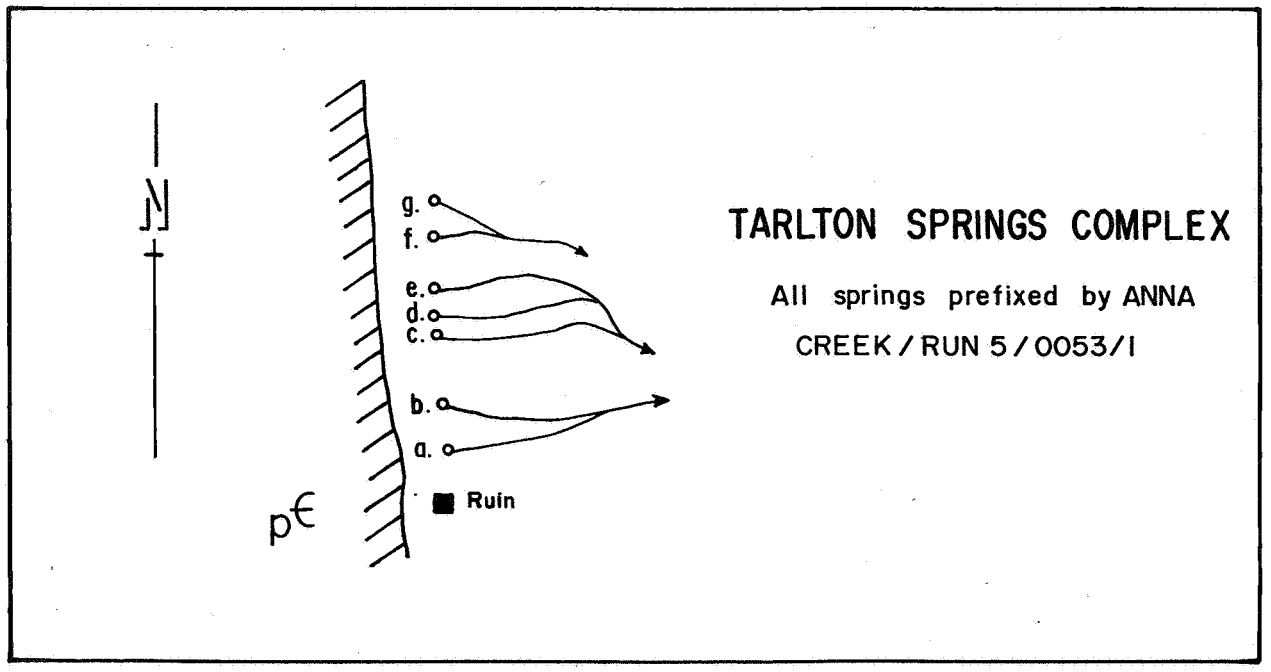
5941	6041 ■	6141
5940	6040	6140

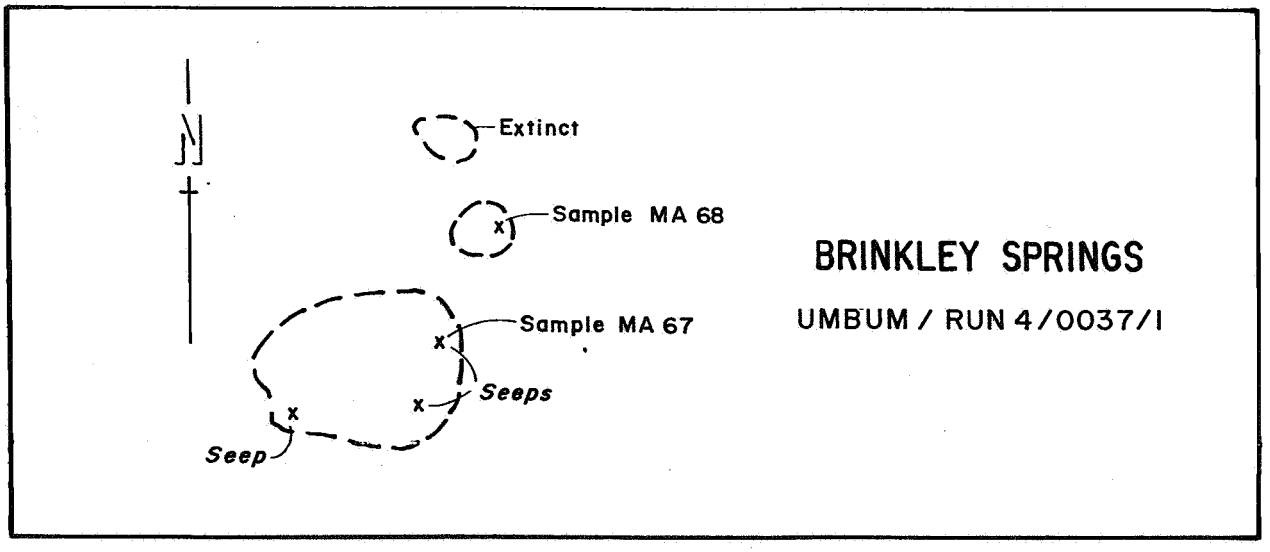
Photo: S.A. Dept. of Lands
SVY 1503-019

Fig. 11

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1: 40 000
COMPILED: A. F. W.	G.A.B. MOUND SPRING SURVEY	DATE: 26·4·79
DRN: J.G. CKD:	WARRINA 1:250 000 SHEET	PLAN NUMBER
	WEEDINA & SALINE SPRINGS MA89	S 14028

JOB NO. 1421





LOCALITY

5941	6041	6141
5940	6040	6140

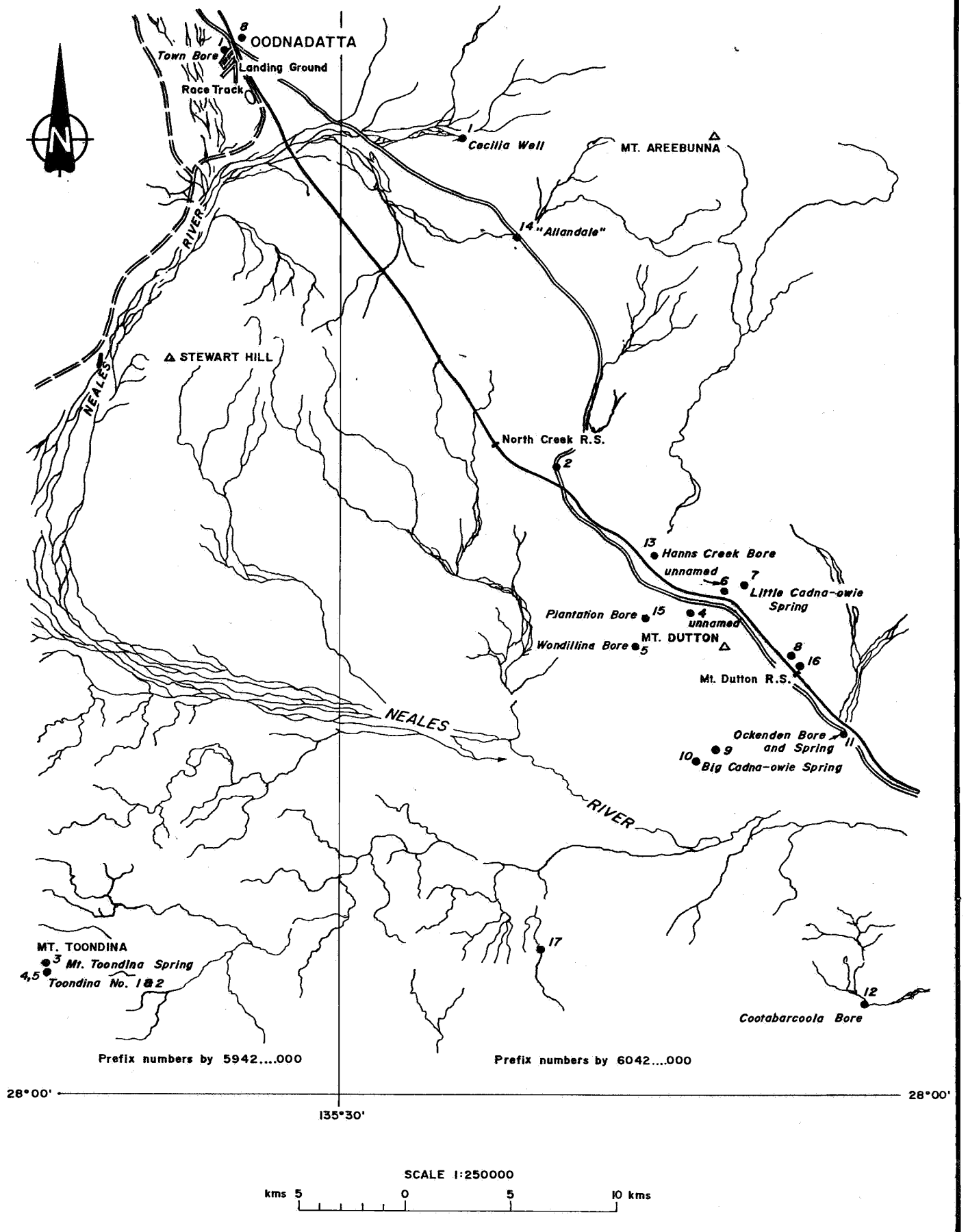
Tarlton Springs

Brinkley Springs

Fig. 12

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE NOT TO SCALE
COMPILED: A.F.W.	G.A.B. MOUND SPRING SURVEY	DATE 26·4·79
DRN: K.J. CKD	WARRINA 1:250 000 SHEET	PLAN NUMBER
	SKETCHES OF TARLTON AND BRINKLEY SPRINGS COMPLEX	S 14029

Job No. 1421



Above plan portion of the S.A. Dept. of Mines & Energy Well Location Plan 1:250,000 Series — OODNADATTA

Fig. 13

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:250,000
COMPILED: A.F.W.	G.A.B. MOUND SPRINGS SURVEY	DATE 13th June 1979
DRN T.E. CKD	PORTION OODNADATTA 1:250,000 SHEET	PLAN NUMBER
	LOCATION OF WELLS AND SPRINGS	S 14110

1421

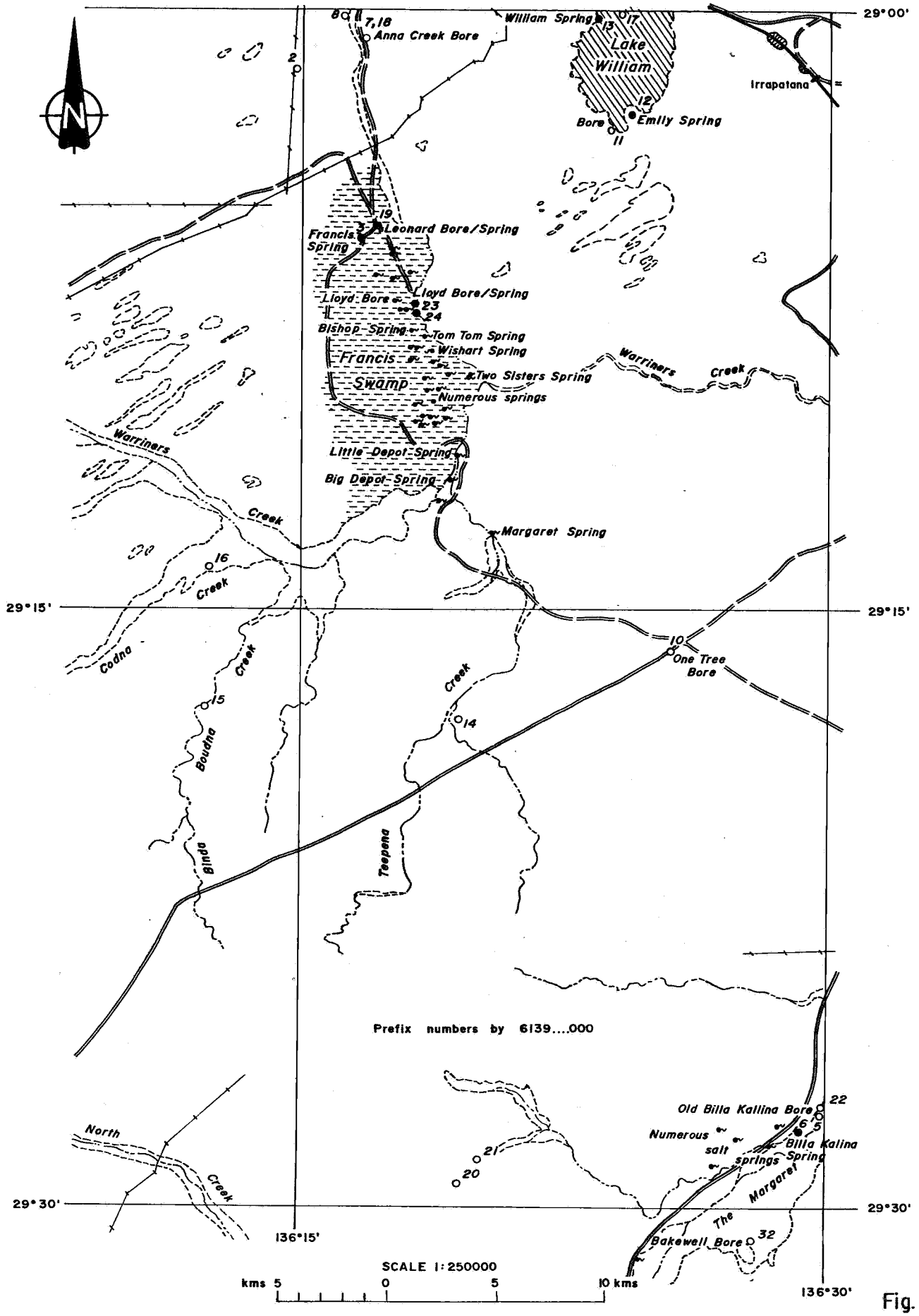
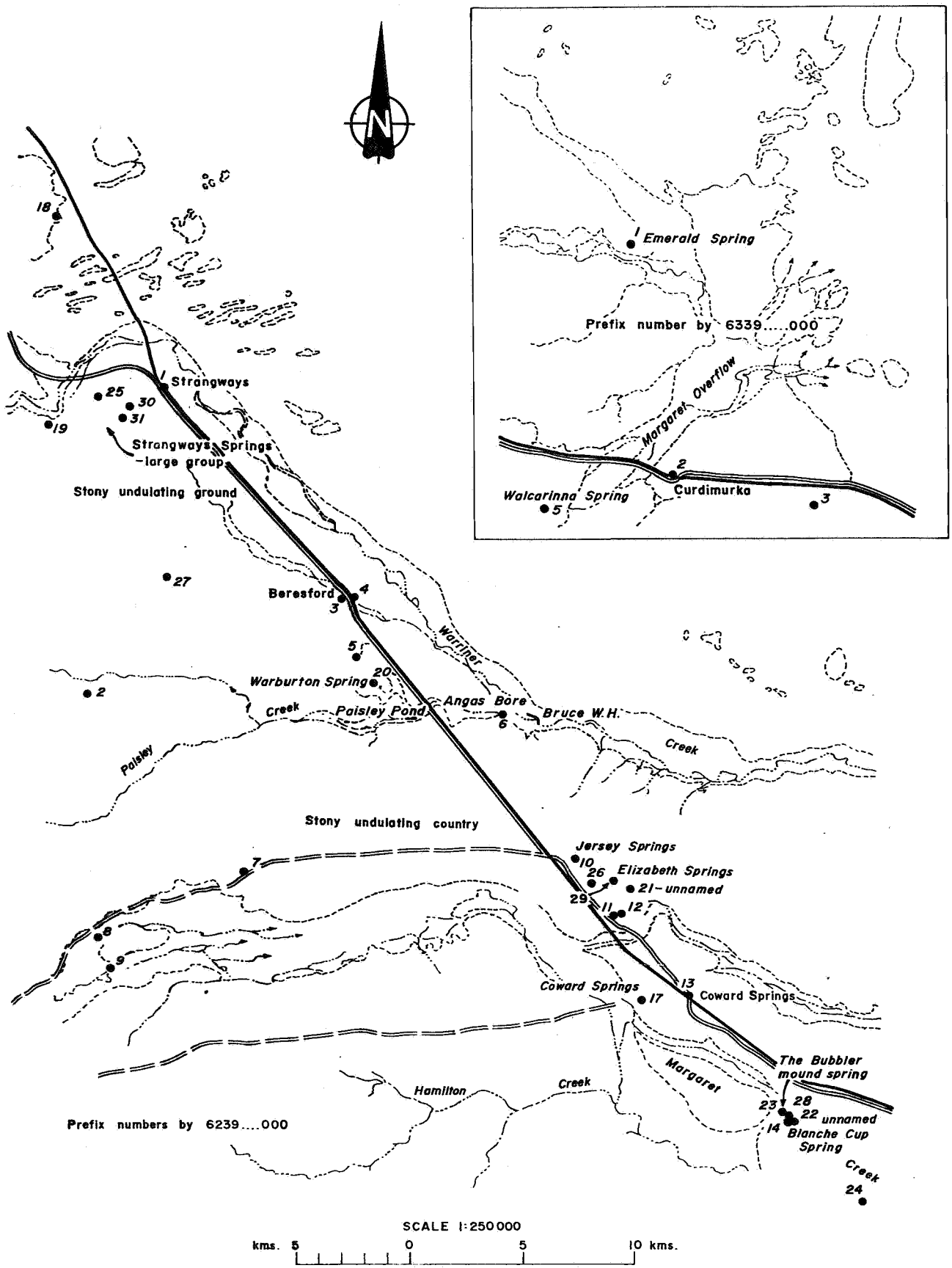


Fig. 14

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:250 000
COMPILED: A.F.W.	G.A.B. MOUND SPRINGS SURVEY	DATE 13th JUNE 1979
DRN: T E / CKD: EJR	PORTION BILLAKALINA 1:250,000 SHEET LOCATION OF WELLS AND SPRINGS	PLAN NUMBER S 14111

1421



Above plans portions of the S. A. Dept. of Mines & Energy Well Location Plan 1:250,000 Series — CURDIMURKA

Fig. 15

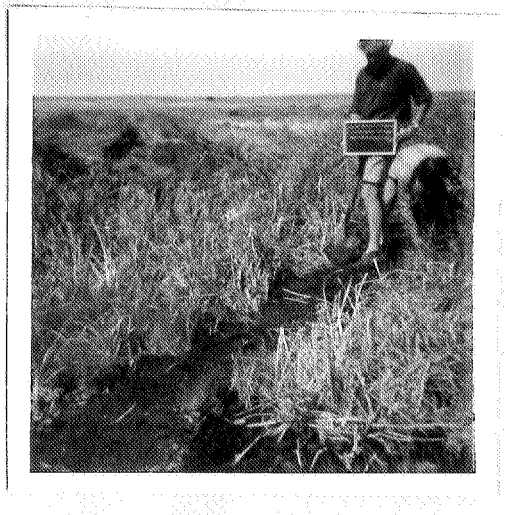
	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:250000
COMPILED A.F.W.	G.A.B. MOUND SPRINGS SURVEY	DATE 13th JUNE 1979
DRN TE / CKD	PORTION CURDIMURKA 1:250,000 SHEET	PLAN NUMBER
	LOCATION OF WELLS AND SPRINGS	S 14112

1421

PLATE 1

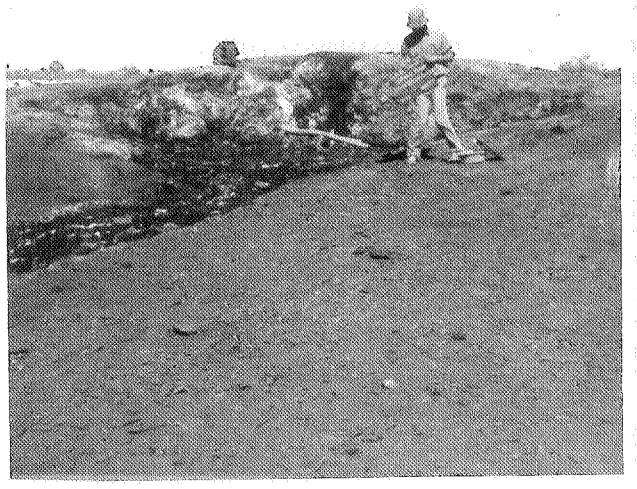
PRIMROSE SPRING MA82 - AT MAIN SOURCE
NEGATIVE NO. 30583

PLATES 2 & 3



OUTSIDE SPRINGS (two gauging points)
NEGATIVE NO.'S 25997(L) & 25998(R)

PLATE 4



FANNY SPRINGS - MA77
NEGATIVE NO. 30578

PLATE 5

FANNY SPRINGS - MA76
NEGATIVE NO. 30600

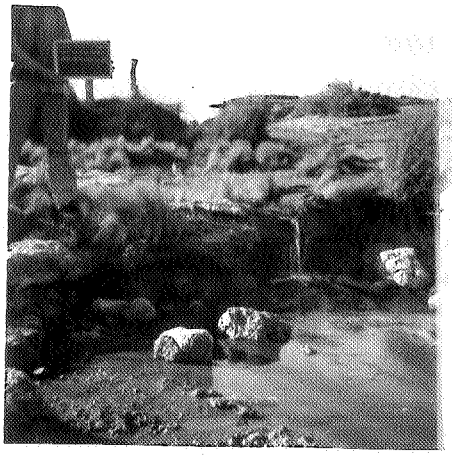
PLATE 6

THE VAUGHAN SPRING
NEGATIVE NO. 25996

PLATE 7

TWELVE MILE SPRING
NEGATIVE NO. 25995

PLATE 8



THE FOUNTAIN SPRING
NEGATIVE NO. 25994

PLATE 9

BIG PERRY SPRING (WEST) MA79
NEGATIVE NO. 30580

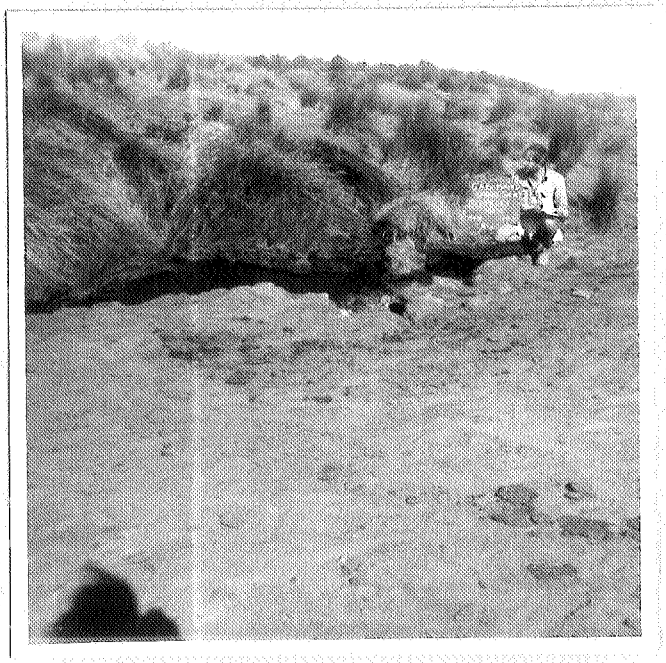
PLATE 10

BIG PERRY SPRING (WEST) MA80
NEGATIVE NO. 30581

PLATE 11

BIG PERRY SPRINGS (SOUTH - NOT EAST) MA78
NEGATIVE NO. 30579

PLATE 12



BIG PERRY SPRINGS NORTH - MA81
NEGATIVE NO. 30582

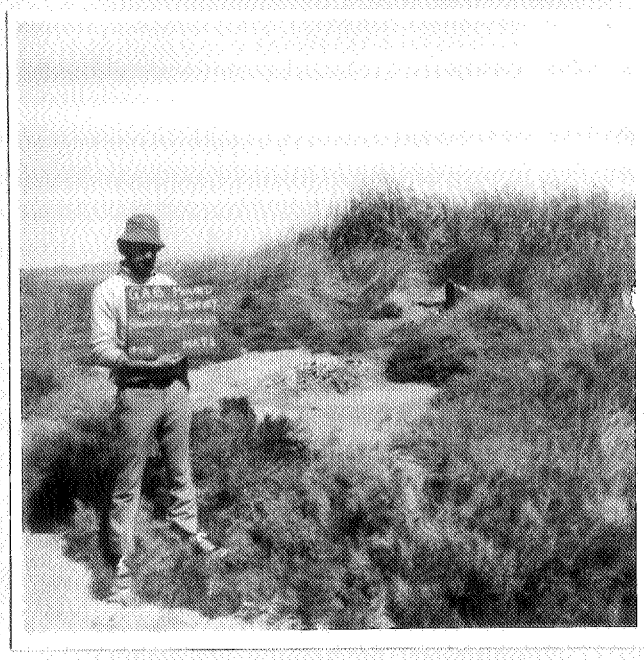
PLATE 13

HAWKER SPRINGS GROUP - MA71
NEGATIVE NO. 30595

PLATE 14

HAWKER SPRINGS GROUP - MA72
NEGATIVE NO. 30596

PLATE 15



HAWKER SPRINGS GROUP MA74
NEGATIVE NO. 30598

PLATE 16

HAWKER SPRINGS GROUP - MA75
NEGATIVE NO. 30599

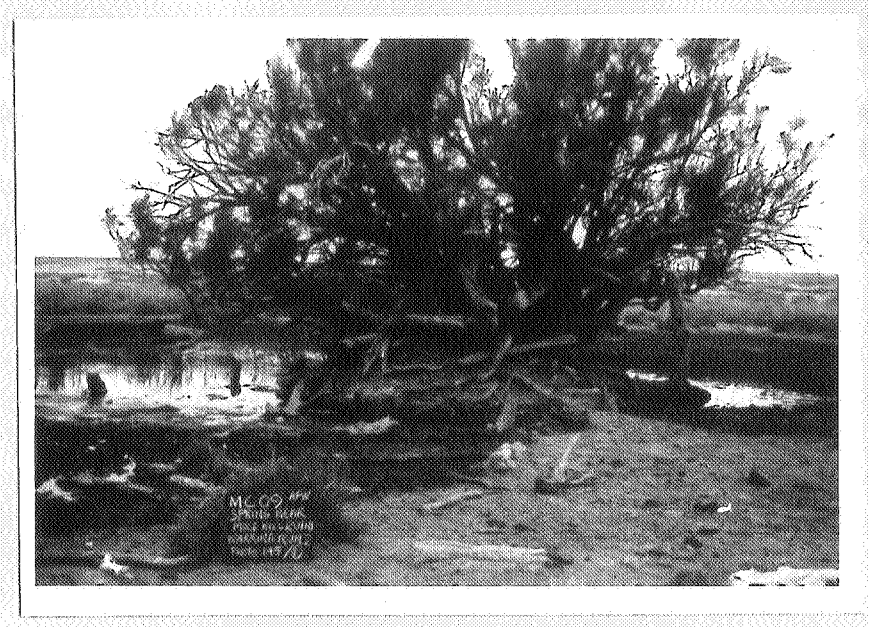
PLATES 17 & 18

FREELING SPRINGS GROUP - WARRINA RUN 1/026/3 & 5
NEGATIVE NO.'S 26002 AND 26003?

PLATE 19

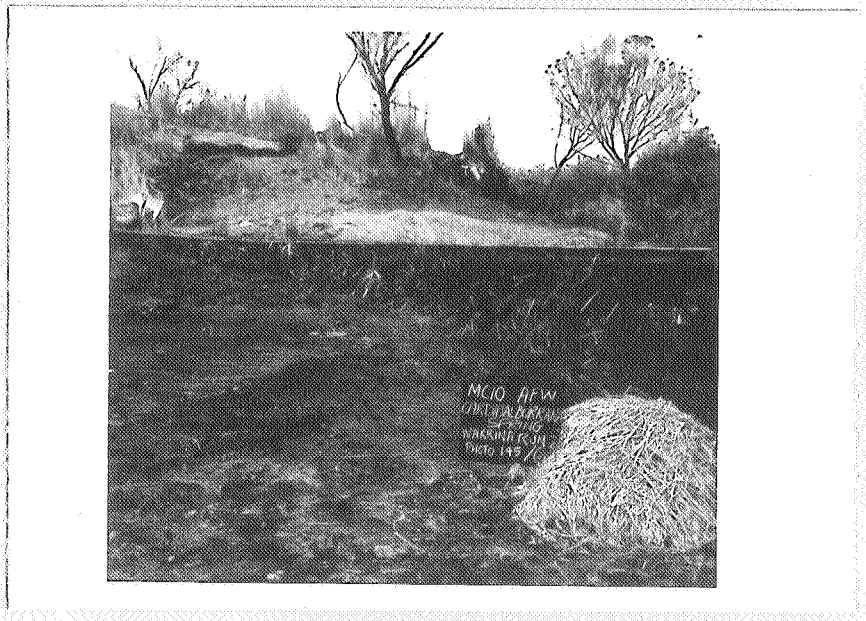
FREELING SPRINGS GROUP - PEAKE RUINS
SLIDE NO. 14360

PLATE 20



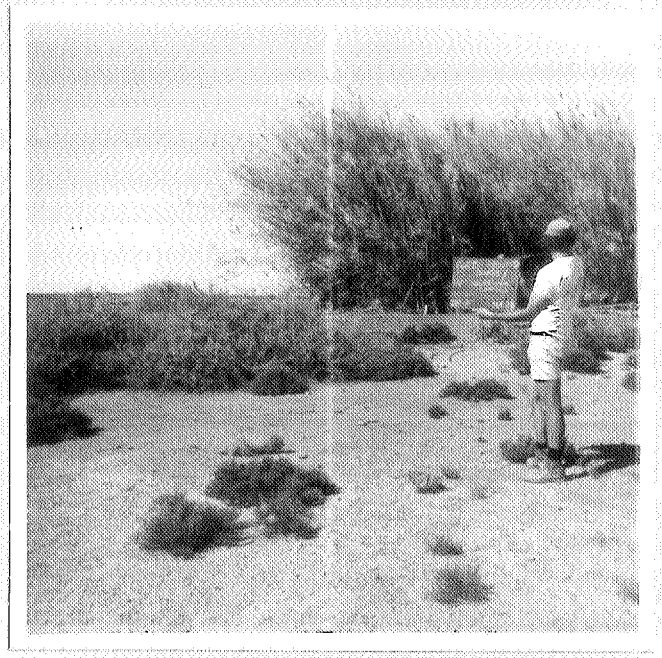
WILLOW SPRINGS - ONE TREE BORE - MC09
SLIDE NO. 14361

PLATE 21



CARDAJALBURRANA SPRING - MC10
SLIDE NO. 14362

PLATE 22



BIRRIBIRRIANA SPRING - MC84
NEGATIVE NO. 30585
(Note - wrong name on blackboard)

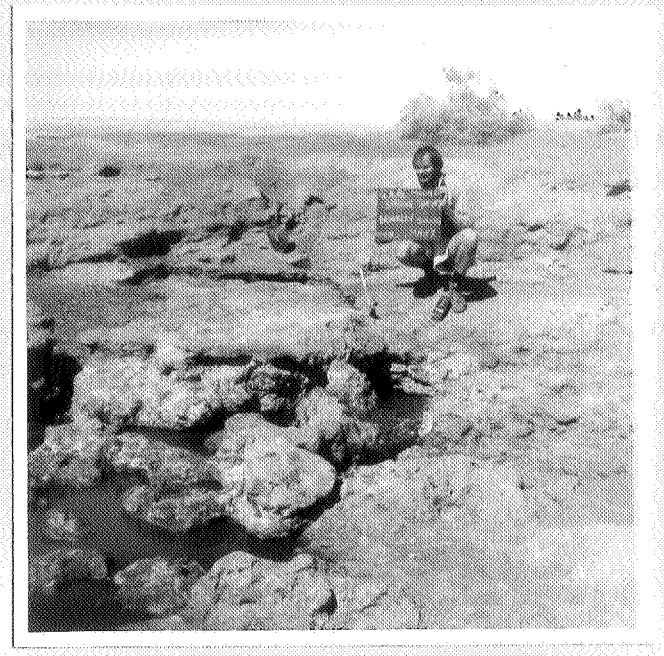
PLATE 23

WEEDINA SPRINGS MA88
NEGATIVE NO. 30601

PLATE 24

SALINE SPRING - MA89
NEGATIVE NO. 30602

PLATE 25

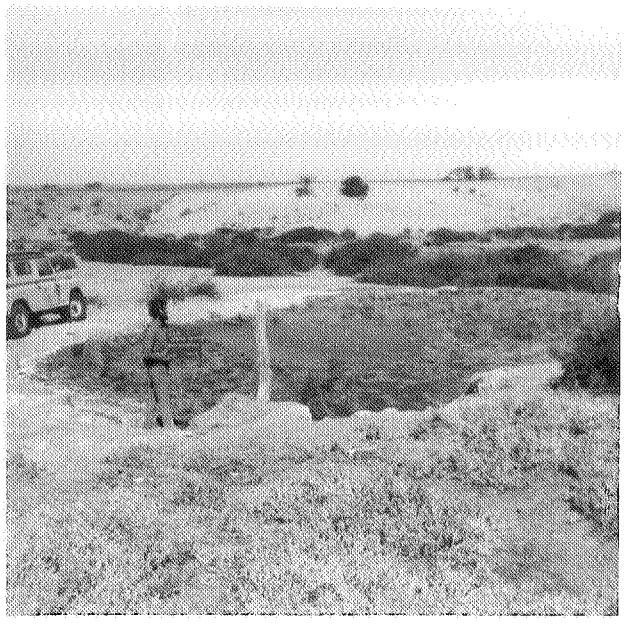


BRINKLEY SPRINGS - MA67
NEGATIVE NO. 30590

PLATES 26 & 27

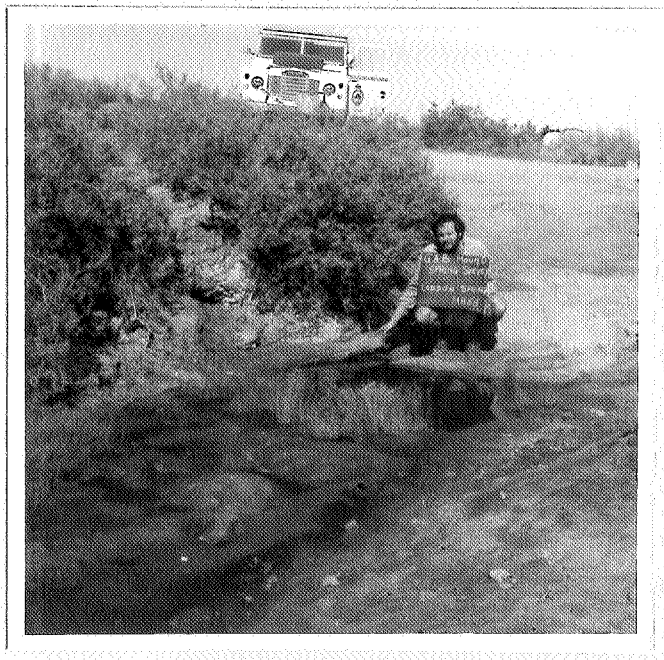
BRINKLEY SPRING - MA 68
NEGATIVE NO. 30591(L) AND 30592(R)

PLATE 29



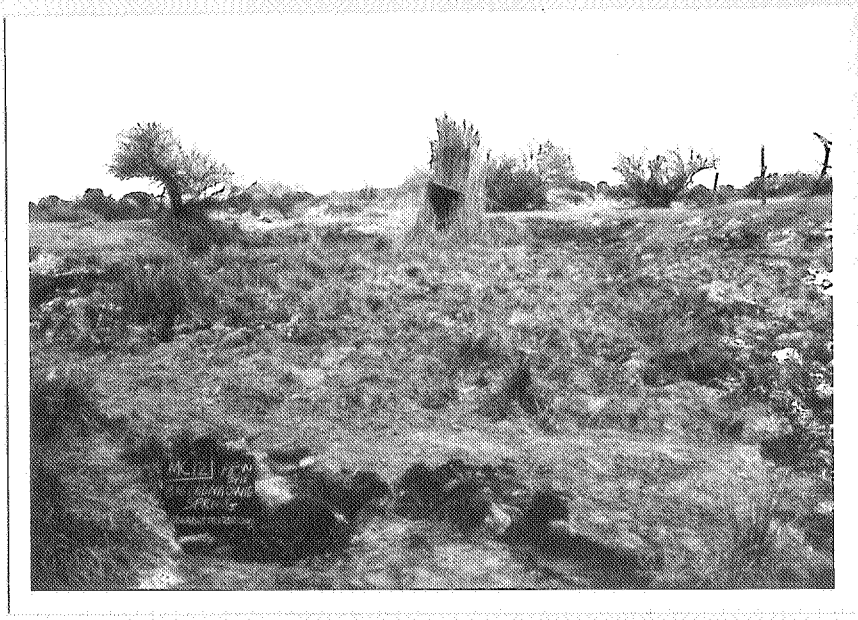
TARLTON SPRINGS - MA69
NEGATIVE NO. 30593

PLATE 30



LODDON SPRING MA66
NEGATIVE NO. 30589

PLATE 31



BIG CADNAOWIE SPRING - MC12
SLIDE NO. 14363

PLATE 32

EMERALD SPRING
SLIDE NO. 14364