DEPARTMENT OF MINES AND ENERGY

GEOLOGICAL SURVEY

SOUTH AUSTRALIA

REPORT BOOK 92/8

INVESTIGATION OF POSSIBLE OVER-PUMPING IN THE BRIDGEWATER AREA

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Groundwater and Engineering

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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Investigation of Possible Over-pumping in the Bridgewater Area

P TEWKESBURY

An investigation in the Bridgewater area was undertaken after a number of letters from concerned residents were received. Their concern was that a well, being used for commercial purposes (mineral water) may be having a detrimental effect on the groundwater. Standing Water Depths (SWDs) were measured, comparisons were made with historical well information and the well owners were interviewed. From the information gathered, it was concluded that there is a decline in SWD. The cause of this decline is an increase in the number of wells pumping. This area should be monitored to confirm declining water level trends and its groundwater resources assessed.

INTRODUCTION

The South Australian Department of Mines and Energy undertook a preliminary investigation in the area just north of the township of Bridgewater in late November 1991. This investigation was to determine if pumping of a well, for the purpose of commercial use (so called "springwater"), is having a detrimental effect on groundwater in the region.

This was carried out in response to the receipt of a number of letters from concerned residents within this area (See Appendix B). The residents are not connected to mains water and the groundwater is their only source of supply.

The preliminary investigation consisted of the following:

1. Identification of the well used for commercial use and the determination of the amount of water pumped from it.
2. Measurement of Standing Water Depths (SWD) of wells in the region and comparisons with previous SWD values.
3. Interviewing owners of wells to see if they noticed any marked changes in SWD, salinity and yield.
4. Identification of aquifer pumped for commercial use.

LOCATION

The area of concern is located approximately 20km south east of Adelaide along the SE freeway just north of the township of Bridgewater (Figure 1).

GEOLOGY OF THE AREA

Wells in this area have been drilled into Aldgate Sandstone. Aldgate Sandstone is a micaceous sandstone and arkose with heavy-mineral laminations and interbedded sandy shale (See Table 3).
The region has undergone Palaeozoic deformation consisting of folding and faulting in a northeast-southwest direction. A second deformation along the same trends occurred in the Tertiary.

The formation in this region strikes approximately north-south and dips easterly between 30-45^{o}.

HYDROGEOLOGY

Groundwater is stored in, and flows through fissures or fractures in the hardrock. Well yield and quality are controlled by the rock type, degree of fracturing, rainfall and recharge.

Well yields in the region vary from 0.5 l/s to 6.5 l/s and the quality of the groundwater ranges from 150 to 500 mg/L. (Table 2). The area of recharge and the recharge rate are unknown.

INVESTIGATION RESULTS AND DISCUSSION

The owner of well 6627-80 has been pumping from this well to supply a spring water company. This pumping has been occurring over the last two years with the frequency of one to two tanker loads a day. The tanker capacity is thought to approximate 6 800 litres (1 500 gallons). In comparison, the residents in the surrounding area pump between 4 000 to 20 000 litres per day per household for domestic purposes. The majority of residences are pumping in the vacinity of 4 000 litres per day.

Standing Water Depths (SWD) were taken at a number of wells in the region on the 28/11/91. These were compared with other SWDs taken in previous years. These data are shown in Table 2. Based on limited data, a number of wells show a decline in SWD from these results. However, some wells in this region show a decline before 1980.

Wells 6627-83 and 6628-6702 show that SWDs have been steadily declining over the past 30 to 40 years (approximately 100mm per year). The Reduced Standing Water Level (RSWL) surface of the area in 1978 and 1991 (Figures 2 and 3) also show a decline in water levels over time. Figure 2 and 3 were determined from information contained in Table 1 and 2.

A resident in the area has noted a pond fed by a spring has dried up earlier than it has done in previous years.

Salinity and yield, although not investigated here seem to show little, if no change. (See Table 2).

The drop in SWD may be due to one of two possibilities.

The first possibility is the pumping of wells in the area. If pumping of wells is greater than recharge then the SWD will drop. The number of wells within the area has been slowly increasing over the past 30

years, causing a greater demand on the resource. It is possible that this increase has caused groundwater withdrawals to exceed recharge of the area.

The second possibility is a reduction in recharge. This can occur in two ways. The first is a decrease in rainfall during the recharge period. The second is increased urbanisation of the area which can cause the area of recharge to be reduced and in turn reduce the amount of recharge. The only major construction in the area however, was the building of the freeway just to the south in the 1960s.

Some apparent SWD declines may in fact be due to seasonal fluctuations.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that:

1. All wells located are drilled into Aldgate Sandstone and groundwater is stored in and moves through fissures and fractures. Location of recharge is unknown but is likely to be topographically controlled.

2. Well 6627-80 is possibly only pumping marginally more than wells of other residents in the area.

3. Based on limited data, a drop in SWD in the region over the past 30 to 40 years has been noted. The main cause is thought to be due to an increase in the number of wells pumping in the area, placing a greater stress on groundwater.

It is recommended that:

1. SWD and salinity of wells in the region be monitored on a regular basis to confirm the declining water level trend. In order to quantify the seasonal changes, monthly monitoring should be carried out for at least 1 year.

2. Assessment of recharge and groundwater resources in Adelaide Hills be continued.

3. Introduction of some management control, particularly for industrial, irrigation purposes, should be considered.

4. Groundwater useage should be regularly reviewed.

APPENDIX A

TABLE 1 - HYDROGEOLOGICAL INFORMATION

Well no.	Total Depth (m)	Water Cut(m)	Water Depth(m)	Ground Elevation (m)	Salinity TDS (mg/L)	Supply (L/s)	Date drilled
6627-28	92.44			446	403 (1978)		?
6627-76	53.6	12 15 48 51.7	2.7	424	301 267 322 430	0.56 1.12 1.25 5.6	8/10/77
6627-78	35.36	14.5 28	2.7	416	161 168	0.02 0.44	19/3/77
6627-79	7.5		1.0 (1978)	413	218 (1978)		~1900
6627-80	76.8	44 54 68 73	15	443	221 259 348 435	0.3 0.62 1.68 4.37	11/5/77
6627-81	36.6		1.0 (1991)	427	353 (1978)		~1964
6627-82	3.0		0.3 (1978)	424	535 (1978)		~1900
6627-83	47.6		3.5 (1964)	426	285 (1964)		~Late 50s
6627-84	37.8	9.1 30.5	1.2	423	250	1.5 6.3	~1965
6627-85	81.4	25 51.5 72.9 76.5	16.7	425	530 375 312	0.02 0.04 0.5 1.6	18/3/77
6627-86	59.75			433			~1920
6627-6313	72	40 70	6.0	418	197 229	0.45 0.6	8/8/90
6627-7222	110.3	35.5 58.5 105.8	3.7	418	294 296 344	0.3 0.5 0.63	29/11/84
6627-7498	59.5	26.5 44.9 54	Flowing	413	231 195 206	0.38 2.5 3.25	23/1/86
6627-8326	72.2	19 37 53 70	3.0	414	561 545 538 524	0.75 1.5 1.88 1.88	18/12/90

TABLE 1 - HYDROGEOLOGICAL INFORMATION (Continued)

Well no.	Total Depth (m)	Water Cut(m)	Water Depth(m)	Ground Elevation (m)	Salinity TDS (mg/L)	Supply (L/s)	Date Drilled
6628-6702	70.1	7.0 25.6 64.6	 3.7	431	 286 299	0.02 0.38 1.9	27/3/52
6628-6703	83.8		1.15 (1978)	425	249 (1978)	2.5 (1978)	~1961
6628-6705	76.2		21.0 (1978)	462	239 (1978)	1.4 (1978)	~1963
6628-6706	49		2.54 (1978)	442	270 (1978)	1.74 (1978)	?
6628-6710	69.7		11.68 (1978)	445	370 (1978)	1.53 (1978)	~1945

(1991): Date measured

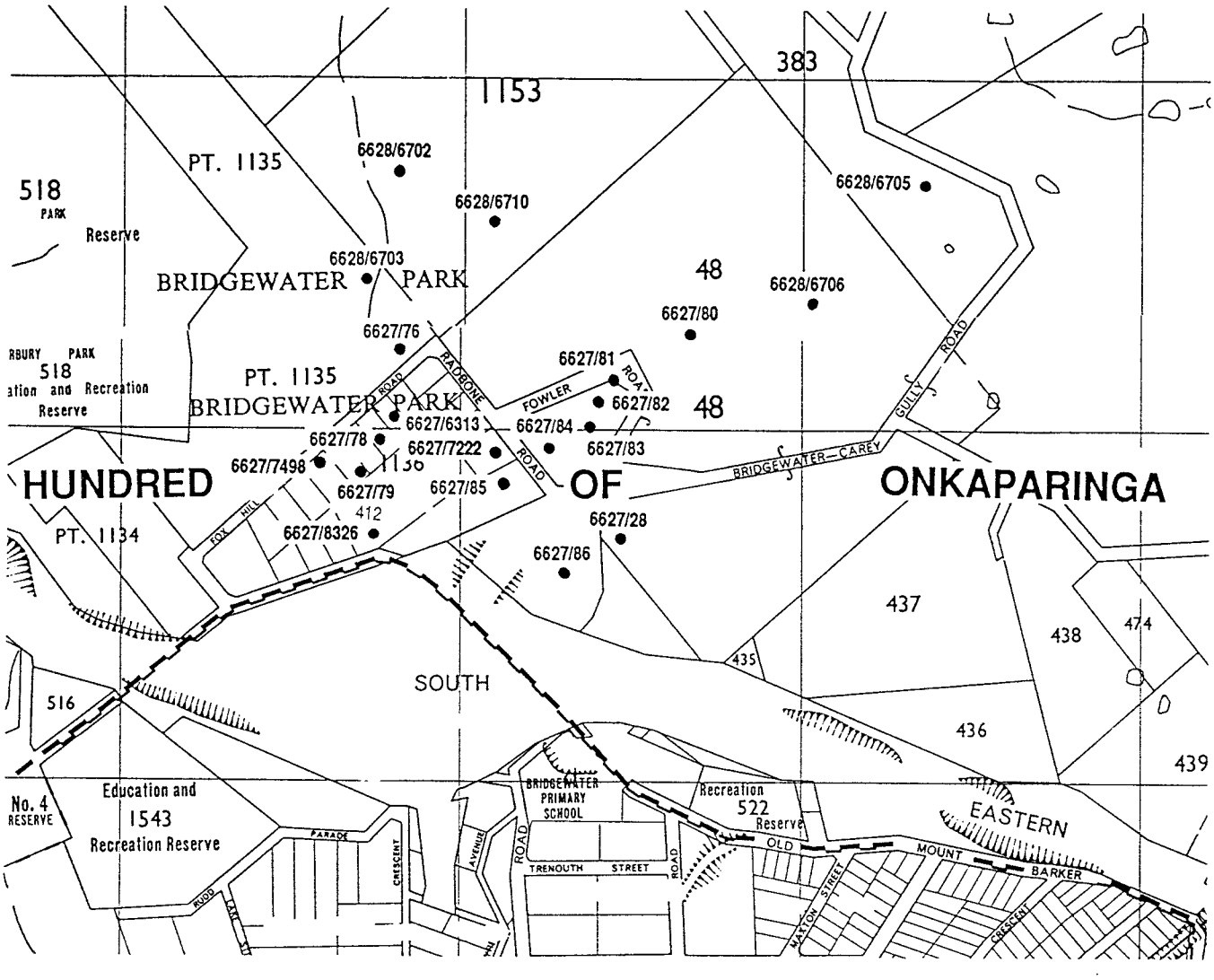
A-2

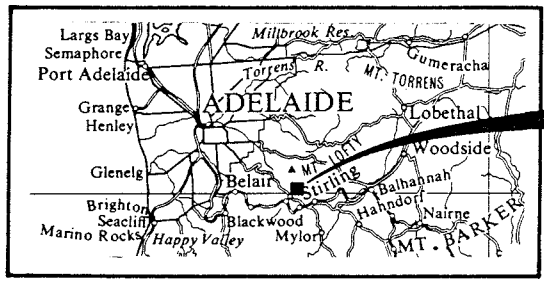
TABLE 2 - TIME SERIES INFORMATION

Well no.	Date	SWD (m)	TDS (mg/L)	YIELD (L/s)	COMMENTS
6627-76	8/10/77 26/4/78 28/11/91	2.7 2.8 2.63	430 515	5.6 5.6	Date drilled
6627-78	19/3/77 13/5/78	2.7 14.34	168 150	0.44 1.9	Date drilled
6627-80	11/5/77 1/5/78	15 13.5	435 280	4.37 5.1	Date drilled
6627-81	27/4/78 28/11/91	 1.0	353	5.8	
6627-82	24/6/78 28/11/91	0.3 1.0	535		
6627-83	21/9/64 24/6/78 28/11/91	3.5 4.92 6.39	285 280	1.3 0.5	
6627-84	22/6/65 28/4/78	1.2 1.66	250 291	6.3 6.4	
6627-85	18/3/77 28/4/78	16.7	 280	1.63 7.5	
6627-86	4/3/53 3/5/78	3.05 10.5	286 394	2.5 2.5	
6628-6702	27/3/52 27/4/78 28/11/91	3.7 5.6 6.28	299 259	1.9 1.9	Date drilled
6628-6703	1/7/78 28/11/91	1.15 ~2m	249	2.5	Pumping just stopped
6628-6705	1/7/71 2/5/78	16.76 21.0	230 239	2.5 1.4	

TABLE 3 - GEOLOGICAL INFORMATION

Well No.	Depth (m)		Lithology
6627-76	0	3	Grey clay
	3	13	Soft grey mudstone
	13	30	Grey slaty sandstone
	30	40	Sandstone and blue slate
	40	49	Hard sandstone and fractured sandstone
	49	53	Firm grey sandstone & broken s/s + Qtz
	53	54	Grey slate
6627-80	0	4	Clay and mudstone
	4	68	Variously coloured sandstone
	68	77	Slaty sandstone + Milky quartz
6627-78	0	9	Fine orange sand
	9	23	Fine grey sandstone
	23	27	Course grey/white sandstone
	27	35	Fine blue slate
6627-83	0	24	Soft slate
	24	49	Sandstone
6627-6313	0	13	Brown sandstone
	13	45	Grey brown to blue grey shaley slate
	45	72	Soft shaley slate and quartz
6627-7222	0	4	Top soil
	4	46	Sandstone (Grey, white, blue)
	46	101	Sandstone and interbedded shaley slate
6627-7498	0	6	Grey clay
	6	18	Coarse sandstone
	18	19	Grey slate
	19	23	Sandstone
	23	32	Clay and siltstone
	32	54	Sandstone and shaley slate
	54	59	Fracture shale and soft sandstone
6627-8326	0	72	Sandstone and layer of clay and slate
6628-6702	0	1	Sandy loam
	1	7	Yellow clay to sandy clay
	7	10	Decomposed sandstone
	10	11	Clay slate
	11	27	Sandstone and grey sandstone
	27	70	Grey slate interbedded sandstone





Bridgewater Area

Figure..... 1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED P. TEWKESBURY	C.D.O. 3·3·92 DATE
BRIDGEWATER AREA INVESTIGATION	DRAWN B. DONOVAN	SCALE 1:10000
WELL LOCATION PLAN	DATE JAN. 1991	PLAN NUMBER **92-20**
	CHECKED	

5529

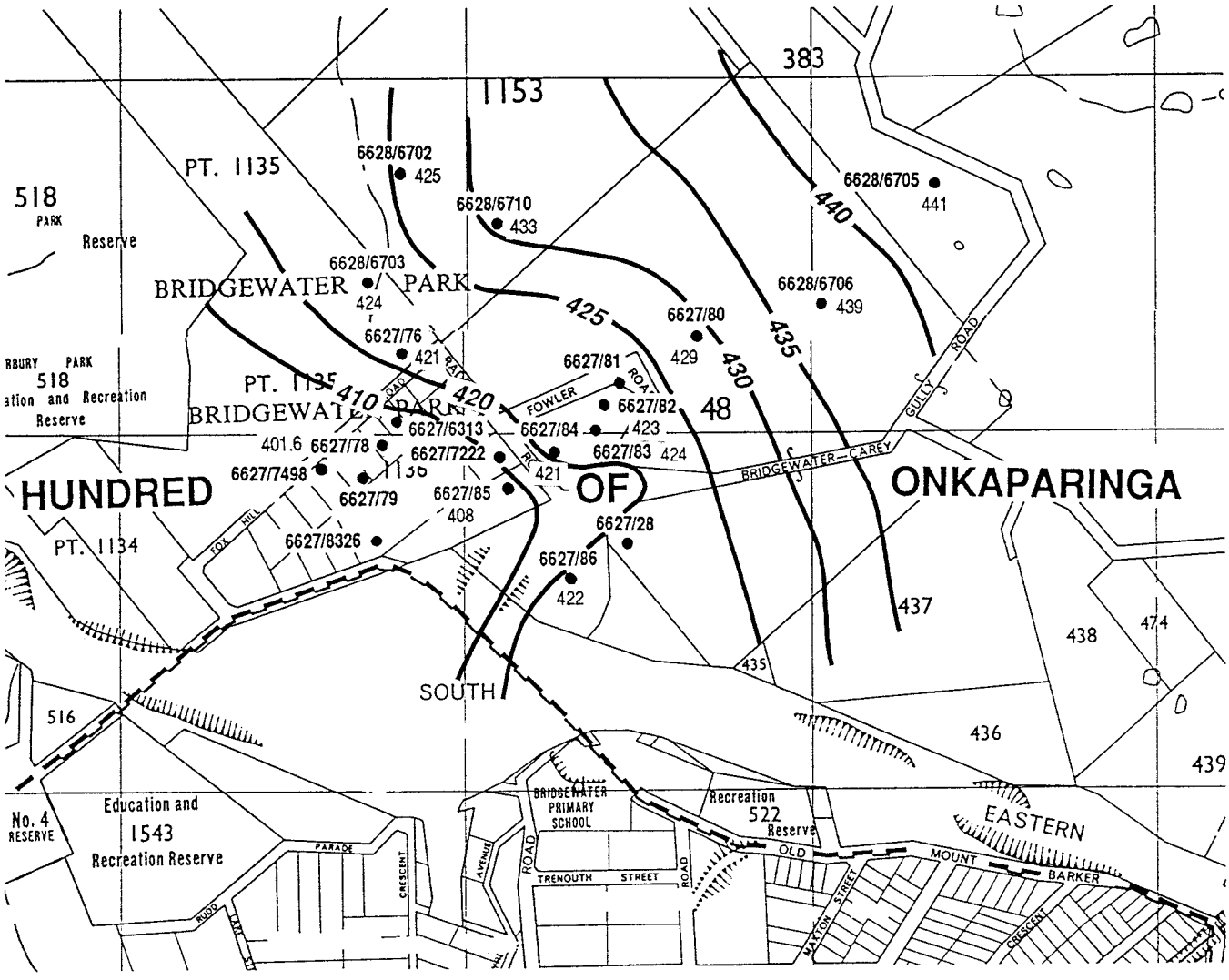


Figure..... 2

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

BRIDGEWATER AREA INVESTIGATION

RSWL SURFACE 1978

COMPILED P. TEWKESBURY	C.D.O.	3·3·92 DATE
DRAWN B. DONOVAN	SCALE 1:10000	
DATE JAN. 1991	PLAN NUMBER	
CHECKED	92-21	

5529

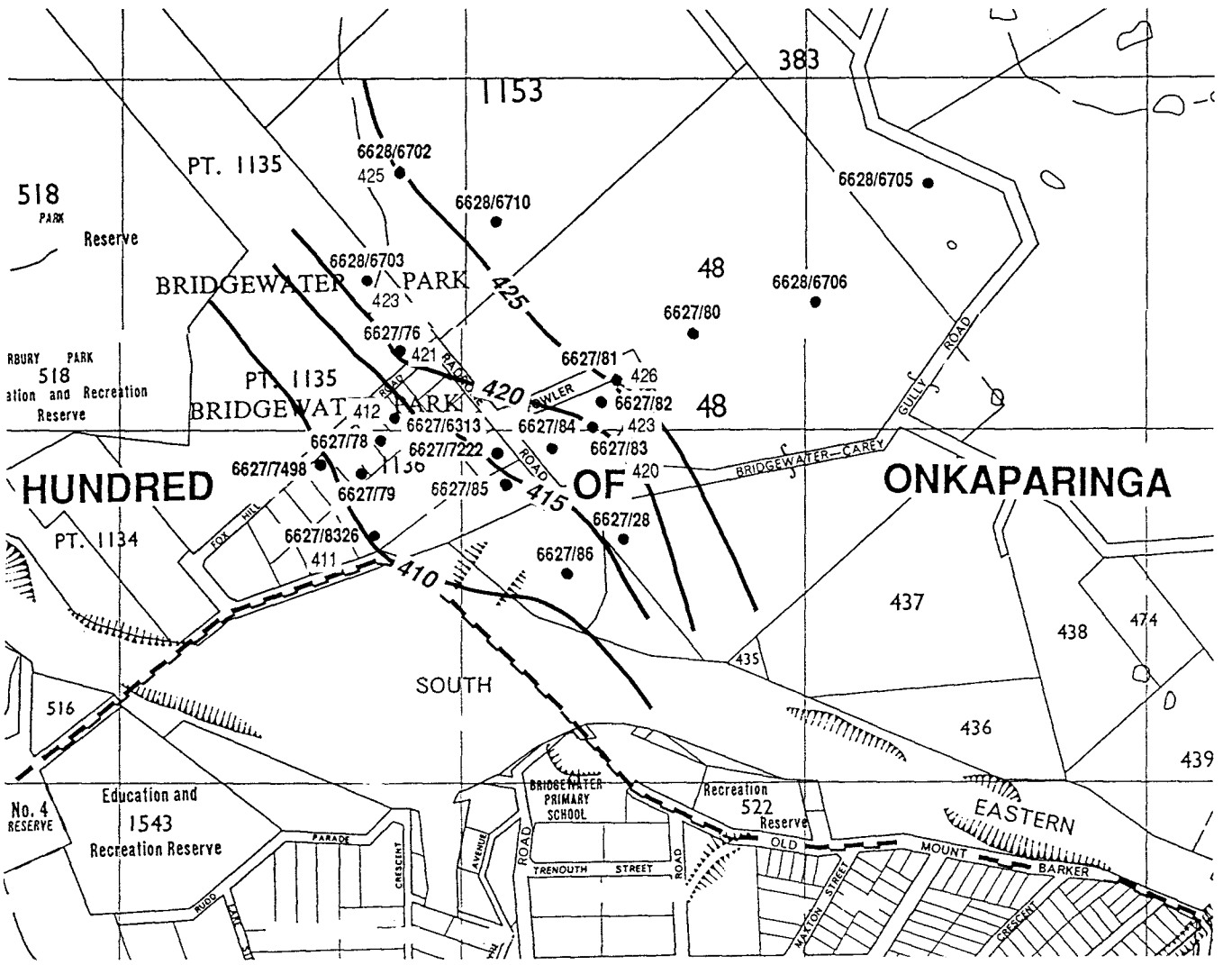


Figure..... 3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED P. TEWKESBURY	3-3-92 C.D.O. DATE
BRIDGEWATER AREA INVESTIGATION	DRAWN B. DONOVAN	SCALE 1:10000
RSWL SURFACE NOV.1991	DATE JAN. 1991	PLAN NUMBER 92-22
	CHECKED	

5529