DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 83/43
A STUDY OF GROUNDWATER GEOCHEMISTRY AROUND BURRA BURRA MINE

GEOLOGICAL SURVEY

by

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 83/43
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A STUDY OF GROUNDWATER GEOCHEMISTRY AROUND BURRA BURRA MINE

ABSTRACT

Groundwater samples within a 10 km radius of Burra have been collected to determine the influence of Burra Burra Mine copper mineralization on groundwater geochemistry. Carbonate rich host rock and mine dewatering have minimised any heavy metal dispersion halo. However, a sulphate dispersion halo about 5 km across is centred over the mine. Hydrogeochemical anomalies were also detected about 3 km north and about 3.5 km west of the mine and follow up groundwater sampling is recommended.

INTRODUCTION

A regional geochemical study of groundwater in South Australia (Morris, 1982) indicated the potential of this technique as a base metal exploration tool.

To determine the extent that metallic mineral deposits can alter groundwater geochemistry, a sampling programme of 30 selected bores within a 10 km radius of Burra Burra Copper Mine was undertaken in August-September, 1982. Samples were collected by J. Safta and S. Ewen (Field Assistants), who completed some analysis in the field and samples were sent to Australian Mineral Development Laboratories (AMDEL) for further analysis.

The analytical methods used were:

Field Analysis (FA): conductivity, temperature and pH.

Standard Full Analysis (SFA): Calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), bicarbonate (HCO_3), sulphate (SO_4), nitrate (NO_3), conductivity, Total Dissolved Solids (TDS), total hardness, total alkalinity and pH.

Extended Full Analysis (EFA) as for SFA plus: total iron (Fe), fluoride (F), phosphate (PO_4), boron (B), and silica (SiO_2).
Heavy Metals (HM): copper (Cu), lead (Pb), zinc (Zn), manganese (Mn), aluminium (Al), cadmium (Cd), silver (Ag), nickel (Ni), barium (Ba), molybdenum (Mo), antimony (Sb), uranium (U), mercury (Hg), arsenic (As) and selenium (Se).

LOCATION AND HISTORY

Burra Burra Mine on the western side of the township of Burra, is situated 160 km north-northeast of Adelaide via the Barrier Highway, the main Adelaide to Broken Hill road (Figs. 1 & 2).

The mine originally known as Monster Mine, discovered in 1845 by a shepherd, Thomas Pickett, was worked by underground and open cut methods between 1845 and 1877 by South Australian Mining Association. A recorded 238 000 tonnes of hand-picked ore averaging 22% copper was produced. Exhaustion of rich carbonate ore, falling copper prices and high dewatering costs forced the closure of the mine in 1877.

Apart from a small amount of tributing, the mine remained dormant till 1971 when Samin Ltd. commenced open cut mining. The mine was taken over by Adelaide and Wallaroo Fertilizers Ltd. in 1978 and closed in 1981. Between 1971 and 1981, some 2 000 000 tonnes of carbonate ore averaging 2% copper were removed.

Dewatering was one of the major mining problems at the mine and between 1845 and 1981 about one hundred billion litres were pumped from the mine (Drexel, 1982).

TOPOGRAPHY AND CLIMATE

The geomorphology of the area is described by Johnson (1963a). Mature topography has resulted from several uplifts, in late Tertiary to Recent, of an already folded and faulted Precambrian sedimentary sequence. Tertiary fault lines are now obscured by Holocene erosion.

Burra Burra Mine is situated in a cluster of low hills formed by the convergence from the south of two prominent ranges. North of the mine, the hills give way to a broad valley.

The sheltered position of the mine probably accounts for its preservation from erosion, the depth of oxidation and the large accumulation of secondary copper ore (Dickinson, 1942).

The main stream in the area, Burra Creek, flows around the mine hills and south along the faulted axis of an anticlinal structure. Streams flow intermittently due to the low annual rainfall (451 mm) and the porous nature of the bedrock. Climate is Mediterranean with rainfall concentrated in the winter months.

REGIONAL GEOLOGY

As shown on Burra (Johnson, 1963b) and BURRA (Mirams, 1964), Burra copper deposits are situated in complexly folded Upper Proterozoic (Torrensian) dolomite, limestone and calcareous shale of Burra Group (Fig. 2).

Burra Burra Mine is near the faulted axial region of a major north plunging anticline which is one of a series of north-south trending folds of large amplitude and wavelength, characterisitic of the northern Mount Lofty Ranges.

The major axial plane fault south of Burra is termed the Kooringa Fault that has associated siliceous and ferruginous fault breccia. About 2.5 km south of the mine, Kooringa Fault changes strike from north-northwest to west-northwest and two

branches, Kingston's and Tinline's Faults, continue north-northwest through the mine area (Fig. 2). Kingston's Fault continues northwards as the main plane of displacement along the axis of the anticline (Wright, 1975).

An area of complex folding to the east of the mine and on the eastern limb of the main anticline is described by Dickinson (1942) and Thomson (1963).

Igneous rocks in the region are:

- dolerite and trachyte in Torrensian dolomite, 40 km northwest of Burra (Johnson, 1963).
- kimberlite intrusive, 36-70 km north and north-northeast of Burra (Colchester, 1972 and Morris, 1973).
- granodiorite intrusive, 70 km northeast of Burra (Langsford, 1971).
- syenite porphyry dykes near the western side of Burra Burra Mine (Nixon and Townend, 1966 and Nixon, Fairburn and Warne, 1965).

MINE GEOLOGY

Burra Burra ore body consists of secondary copper minerals in two irregular enriched zones overlying low grade sulphide mineralization and bounded by the north-northwest trending and easterly dipping Kingston's and Tinline's Faults.

Host rock is brecciated, complexly folded and faulted Skillogalee Dolomite comprising flaggy dolomite, calcareous sandstone-siltstone and carbonaceous, calcareous siltstone and shale. On the western margin of the ore zone, dolomite is brecciated and altered to kaolinised marble breccia up to 120 m wide, that extends parallel to sedimentary boundaries for about 800 m. The origin of the breccia is uncertain but may represent:

- tillite (Segnit, 1939)
- fault breccia or talus (Dickinson, 1942).
- diapiric intrusion (Coats, quoted in Thomson, 1963)
- preconsolidated slump breccia (Thomson, 1963)
- rupture breccia associated with hydraulic ramming of hydrothermal fluids (Nixon, Fairburn and Warne, 1965).

In the centre of the mineralized zone, several intrusive feldspar-porphyry dykes are thought to have associated hydrothermal activity that caused feldspathization, pyritization, silicification, sericitization, tourmalinization and brecciation to the surrounding rocks.

The ore zone is about 75 m wide, extends for about 240 m north-south and is oxidised to a depth of about 125 m. Secondary mineralization (average 1.5% Cu) consists of nodules and fissure fillings of malachite, azurite, chrysocolla with minor cuprite and native copper.

Primary mineralization of pyrite-chalcopyrite-bornite occurs as disseminations and in quartz-feldspar stockwork veins. Minor amounts of gold and silver are also present.

HYDROGEOLOGY

Skillogalee Dolomite, is the major permeable bedrock unit in the region, largely due to solution cavities along joints and fractures.

Natural water level at Burra Burra Mine is 36 m below the surface and for both underground and open cut mining, dewatering has been necessary.

At the closure of the mine in 1877, up to 8 800 kL/day were being pumped from Morphett Shaft. Between 1884 and 1966, Bon Accord air shaft was used as the Burra Town water supply. In 1906, an unsuccessfull attempt was made to dewater the open cut

using a 2 700 kL/day pump. Between 1975 and 1981 a pumping rate of up to 16 000 kL/day was necessary to dewater the mine. At present, about 4 500 kL/day are being pumped from two bores (W.1/82 and W.6/82, Fig. 2), 0.7 km east of the mine to maintain a recreation lake on Burra Creek.

Read (1980) has shown that dewatering over the last 130 years has produced a 5 km wide cone of depression of the water table centred on the mine (Fig. 3). The water table contours indicate that groundwater flow is toward the mine from all directions with the strongest flows from the northwest and southwest (Fig. 4). Before modification by dewatering, groundwater flow was probably to the southeast along the direction of Burra Creek.

Dewatering has also destroyed the natural chemical equilibrium between groundwater and mineralised country rock at the mine.

SAMPLING PROCEDURE

All wells were pumped prior to sampling, the well column being emptied about 5 times using existing pumping equipment. In this way, a water sample representative of the aquifer was obtained. The importance of flushing the well has been documented by Marsh and Lloyd (1980) who found increases in pH and heavy metals content and a decrease in total dissolved solids in groundwater lying stagnant in and reacting with well casing.

At each well site, three water samples were collected, each in a 0.5 litre polythene bottle. One sample, to be used for heavy metal analysis, was acidified with 5 mls of concentrated nitric acid. The remaining two samples were used for standard full analysis and extended full analysis.

RESULTS AND INTERPRETATION

Full water analysis, details of pumping equipment, method of sampling and aquifer type for all bores are detailed in Appendix A.

Total dissolved solids vary from 1 266 p.p.m. to 7 141 p.p.m., and to obtain relativity of heavy metal values between samples, the results were recalculated to a base of 1 000 p.p.m. total dissolved solids (Appendix B). Background and threshold heavy metal values are shown on Table 1. Background values for Pb, Cd, Ag, Ni, Mo, Sb, Hg, As and Se were not calculated as insufficient samples were above the analytical detection limit. Aluminium results were erratic and not considered, due to varying amounts of fine sediment in the samples.

TABLE 1

Threshold Heavy Metal Values (In parts per billion)

Element	Background (A.M.)	2nd Order Anomaly (A.M. + 1.S.D.)	1st Order Anomaly (A.M. + 2.S.D.)	Range
ORIGINAL DATA				
Cu	33.	58.	83.	0- 175
Zn	491.	895.	1 299.	0- 5 190
Mn	16.	30.	44.	0- 170
Ba	26.	49.	72.	0- 70
Fe	456.	1 249.	2 042.	0-17 000
U	3.7	6.4	9.1	1- 16
F	907.	1 197.	1 487.	450- 1 450
SO_4 (p.p.m)	195.	297.	399.	65- 540
T.D.S (p.p.m)	2 149.	2 994.	3 839.	1 266- 7 141
RECALCULATED DATA				
Cu	23.	47.	71.	0- 98
Zn	229.	403.	577.	0- 2 767
Mn	13.	33.	53.	0- 96
Ba	11.	21.	31.	0- 43
Fe	141.	366.	591.	0- 2 380
U	1.5	2.0	2.5	0.6-2.4
F	435.	639.	843.	103- 881
SO_4 (p.p.m)	89.	133.	177.	40- 200
T.D.S (p.p.m)	1 000.	-	-	-

No obvious heavy metal dispersion halo was detected around Burra Burra Mine for the following reasons:-

- The mine area has been the site of heavy dewatering and the focal point of groundwater movement for the past 130 years, and as a consequence any heavy metal dispersion halo that may have existed has been reduced greatly or destroyed.
- Heavy metals are rapidly immobilised by the highly calcareous country rock and under such conditions a dispersion halo of only about 500 m can be expected (Udodov and Parilov, 1961).

A sulphate dispersion halo about 5 km across, was detected over the mine area (Fig. 5) resulting from the oxidation of pyrite-chalcopyrite mineralization. Dewatering has lowered the water table and exposed a larger volume of rock to oxidation.

Anomalous sulphate was also detected in sample W.28/82 which lies in Auburn Dolomite, host to Princess Royal, Utica and Princess Elsie group of copper mines, 10 km south-southeast of Burra (Fig. 2).

Multi-element heavy metal anomalies were detected in samples W.20/82 and W.24/82 (Fig. 5) which lie close to Auburn Dolomite and may indicate that the unit is mineralized west of Burra Mines.

The highest copper values (Samples W.5/82, W.11/82 and W.20/82) detected are north of Burra Burra Mine (Fig. 4) and may indicate mineralization in this area particularly as W.5/82 and W.11/82 lie on the northern extension of Skillogalee Dolomite from the mine. Dickinson (1942) had suggested this area as a possible site of mineralization. Subsequent detailed mapping by Wegener (1952) indicated that the regional structure swings from

north-northwest to north-northeast and geophysical checking of the area was recommended. However, gravity, magnetic, self-potential and resistivity surveys failed to locate any anomalous areas (Kerr Grant, McPharlin and Knapman, 1952).

CONCLUSIONS AND RECOMMENDATIONS

Dewatering of Burra Burra Mines has produced a groundwater cone of depression disrupting the chemical equilibrium of groundwater with country rock.

No dispersion halo of heavy metals was detected over the mine because of the immobilising effect of carbonate country rock to heavy metals and the effect of dewatering, which has flushed surrounding groundwater toward the mine.

A dispersion halo, about 5 km across, of sulphate rich groundwater was detected over the mine.

Groundwater with anomalous copper content was found about 3 km north and along strike from the mine and may indicate copper mineralization. Follow up bedrock geochemical sampling is recommended in this area.

Base metal mineralization is indicated 3.5 km west of the mine where two samples gave multi-element anomalies, and follow up groundwater sampling is recommended.

A groundwater sampling programme is recommended around Princess Royal, Utica and Princess Elsie group of copper mines.

In view of the unfavourable environment of the study area for hydrogeochemical studies, the positive results show that groundwater sampling is an encouraging exploration tool. It is recommended that further hydrogeochemical studies be undertaken in more favourable environments with potential for mineralization, such as Stuart Shelf and Tarcoola region.

BJM:DP

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APPENDIX A

Well Data Sheets
(Assays extracted from AMDEL Report AC 1609/83).

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GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.1 UNIT No. 6630 1 6 WW 0 1 4 0 7 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2200	56	23	18	Submersible	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Dolomite	Skillogalee Dolomite	TORRENSIAN	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	165	132	330	13·2	-	356	370	667	0·94	21	<0·01	9·0	0·04

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
955	291		0·3	42·5	3038	1862	7·5	W1/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

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OBS. No. W.1 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug 82	<10	5	<10	<0.05	<2	<2	<0.1	2	<5	50	<10	20	2	W.1	Ag and Sb were below detection of
															0.5 and 1.0 respectively.

Analysis in micrograms / litre (µg/L)

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GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.2. UNIT No. 6,6,3,0 ,1,6 W,W ,1,3,4,8 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. °C	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug82	2200	7.1	23	30	Submersible	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Brecciated Marble	Skillogalee Marble	Torrensian	

Aquifer Types: U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug82	138	137	365	16		297	390	744	0.83	16.9	0.01	14	0.06

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
908	243		0.3	46.1	3195	1951	7.5	W2/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

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OBS. No. W.2.

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug 82	69	<5	<10	<0·05	24	2	<0·1	<2	5	<5	<10	40	4	W2/82	Ag and Sb were below detection of 0·5 and 1·0 respectively

Analysis in micrograms / litre (µg/L)

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GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.3 UNIT No. 6,6,3,0 ,1,6 W,W 0,1,2,7,1 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug 82	4500	6·6	21		W/Mill	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Shale and Siltstone	Appila Tillite ?	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug 82	260	285	1050	18·8		261	315	2622	1·05	18·9	0·02	44	0·03

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1822	214		0·6	55·3	7127	4724	7·5	W3/83	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

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OBS. No. W.3 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug 82	46	<5	145	<0.05	<2	<2	0.1	<2	<5	<5	<10	70	0.02	W3/82	Ag and Sb were below detection of 0.5 and 1.0 respectively.

Analysis in micrograms / litre (µg/L)

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GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.4. UNIT No. 6,6,3,0 , 1,6 W,W 0,0,9,1,2 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug 82	1600	7.7	15		W/Mill	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Shale	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined C - confined A - artesian

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug 82	103	87	230	11.5		303	100	558	0.76	11.4	0.01	27	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
615	248		0.2	44.3	2323	1266	7.8	W4/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

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OBS. No. W.4

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug 82	<10	<5	515	<0.05	30	<2	<0.1	<2	<5	<5	<10	<2	3	W4/82	Ag and Sb are below detection of 0.5 and 1.0 respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

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GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.5 UNIT No. 6,6,3,0 , 1,6 W,W 0,1,3,9,2 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug 82	2700	7.2	22		W/Mill	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Dolomite	Skillogalee Dolomite	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug 82	110	122	355	13		322	190	760	0.98	17.5	0.04	5	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
777	264		0.3	49.0	2989	1714	7.5	W5/82	

3068

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

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OBS. No. W5

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	122	<5	665	<0.05	10	<2	<0.1	<2	<5	<5	<10	38	1	W5/82	Ag and Sb are below detection of 0.5 and 1.0 respectively

3008

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

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GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.6 UNIT No. 6,6,3,0 ,1,6 WW 0,1,3,9,1 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug82	2900	7.4	21		Submersible	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Dolermite	Skillogalee Dolomite	Torrensian	U

Aquifer Types: U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	145	125	325	11.6		321	355	648	0.68	19.3	<0.01	23	0.01

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
876	263		0.3	44.2	2745	1792	7.4	W6/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

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OBS. No. W.6 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug 82	<10	<5	<10	<0.05	<2	<2	<0.1	<2	<5	<5	<10	54	3	W6/82	Ag and Sb were below detection of 0.5 and 1.0 respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W7 UNIT No. 6630 16 WW 0124 1 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP.	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug '82	2600	7.3	22		w/mill	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Carbonaceous Shale.	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug '82	115	134	298	17		370	103	765	0.88	18.2	0.03	19	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
839	303	—	0.2	45	2941	1634	7.5	W7/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W7

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
'82	45	<5	670	<0.05	27	<2	<0.1	<2	<5	<5	<10	15	0.03	W7/82	Ag and Sb were below detection of 0.5 and 1.0 respectively

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.8. UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,2,4 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. °C	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2900	7·1	20		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Dolomite	Skillogalee Dolomite	Torrensian	U

Aquifer Types: U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	95	104	508	26		433	175	875	1·38	13·7	0·07	4	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
665	355		0·6	61·3	3339	2001	7·7	W8/82.	

3068

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.8

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	26	<5	2519	<0·05	14	<2	<0·1	<2	<5	<5	<10	17	4	W8/82	Ag and Sb were below detection of 0·5 and 1·0 respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.9. UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,9,2 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2100	7.5	22		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic, Carbonaceous Shale.	Appila Tillite	Sturtian	U

Aquifer Types: U - unconfined C - confined A - artesian

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	149	163	325	149		361	109	935	0·7	16·7	0·02	<1	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1043	296		0·2	40	3101	1876	7·7	W9/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W9 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	36	<5	5190	<0·05	36	<2	<0·1	2	<5	<5	<10	44	3	W9/82	Ag and Sb were below detection of 0·5 and 1·0 respectively

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.10 UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,0,2 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2150	7.4	18		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic, carbonaceous Shale.	Appila Tillite ?	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	149	162	305	12.6		378	101	889	0.62	18.8	0.02	10	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1039	309		0.2	38.6	3063	1815	7.6	W10/82	

3068

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W10 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug' 82	<10	<5	505	<0.05	<2	<2	<0.1	<2	<5	470	<10	4	3	W10/82	

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.11 UNIT No. 6630 16 WW 00900 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2600	7.6	18		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
DOLOMITE	Skillogalee - Dolomite	Torrensian	U

Aquifer Types: U - unconfined A - artesian C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	110	100	230	11.6		328	65	568	0.62	17.1	0.14	27	0.02

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
686	269		0.2	41.7	1940	1273	7.5	W11/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.11 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	125	<5	485	<0.05	4	<2	<0.1	<2	<5	<5	<10	11	2	W11/82	Ag and Sb are below detection of 0.5 and 1.0 respectively

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.12 UNIT No. 6,7,3,0 , ,4 W,W 0,0,1,1,2 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. [°C]	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2250	7·5	18	30	W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Siltstones and slates.	Tapley Hill Formation	Sturtian	U

Aquifer Types : U - unconfined C - confined A - artesian

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	189	90	267	5·2		241	101	777	0·52	16·3	0·04	24	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
842	197		0·2	40·6	2610	1572	7·8	W12/82.	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.12 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	18	<5	210	<0.05	6	<2	<0.1	<2	<5	<5	<10	<2	3	W12/82	Ag and Sb are below detection of 0.1 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.13 UNIT No. 6730 4 WW 0012 8 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2200	7.1	23	12	WINDMILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Siltstones and Slates	Tapley Hill Formation	Sturtian	U

Aquifer Types : U - unconfined C - confined A - artesian

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	160	77	272	8.4		239	107	671	0.72	13.8	7.0	22	0.02

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
716	196		0.2	44.9	2538	1436	7.6	W13/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.13 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	37	<5	690	<0·05	39	<2	<0·1	<2	<5	55	<10	<2	3	W13/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W. 14 UNIT No. 6730 4 WW 0011 4 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	3400	6.9	24	36.4	Submersible	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Siltstones and slates	Tapley Hill Formation	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	162	114	515	6.6		332	167	1104	0.68	14.5	0.04	23	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
874	275		0.4	5.6	3530	2255	7.3	W14/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.14 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	31	<5	70	<0.05	10	<2	<0.1	<2	<5	<5	<10	21	3	W14/82	Ag and Sb are below detection of 0.5 and
															1.0 respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.15 UNIT No. 6630 1 WW 0098 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2800	7.2	28		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic slate	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	102	117	342	18.2		362	130	742	1.45	26	0.05	16	0.04

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
736	297		0.4	49.5	2391	1646	7.9	W15/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W-15 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	13	<5	645	<0.05	12	<2	<0.1	<2	<5	<5	<10	<2	3	W15/82	Ag and Sb are below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.16. UNIT No. 6,6,3,0, ,1,W,W,0,1,1,0,6 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	8000	6·7	33		Mono pump	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Slate	Umberatana Group	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	342	315	985	27		263	320	2750	0·7	10·5	0·09	31	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
2150	215		0·4	49·5	6335	4904	7·4	W16/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.16. GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	22	<5	2670	<0·05	105	<2	<0·1	<2	<5	<5	<10	<2	6	W16/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.17 UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,2,0 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. °C	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug 82	3700	7.2			pump jack	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Shale	Saddleworth Formation	Torrensian	V

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	120	146	640	20		316	250	1250	1.1	17.7	0.77	3	0.1

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
900	259		0.5	60.1	3801	2586	7.8	W17/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.17. GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	100	<5	1040	<0.05	52	<2	<0.1	<2	<5	15	10	32	4	W1	Ag and Sb are below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.18 UNIT No. 6,6,3,0 , , 1 W,W 0,1,1,7,8 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	5000	7·1	22		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
slate	Appila Tillite ?	Sturtian	U

Aquifer Types : U - unconfined C - confined A - artesian

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug 82	268	179	795	10·9		246	195	1924	0·58	13	0·04	22	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1406	201		0·5	54·9	5450	3516	8·1	W18/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.18 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	33	<5	550	<0·05	29	<2	0·1	<2	<5	5	<10	41	3	W18/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.19 UNIT No. 6,6,3,0 , ,1 W,W 0,1,1,8,0 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	8000	6·7	22		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Shale	TAPLEY HILL FORMATION	STURTIAN	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	325	290	1950	31		364	540	3802	1·2	20	17	22	0·04

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
2005	299		1·3	67·5	11545	7141	7·9	W19/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W 19 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug 82	124	7	670	<0·05	7	<2	<0·1	<2	10	20	12	42	16	W19/82	Ag and Sb are below detection of 0·5 and
															1·0 respectively

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.20 UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,3,8 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	3000	7.0	18		Pump jack	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Shale	Saddleworth Formation	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	158	152	440	9.5		336	125	1085	0.68	17.5	4.0	16	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1020	276		0.3	48.1	3801	2151	7.3	W 20/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.20

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	175	98	1030	<0·05	9	30	<0·1	<2	<5	5	45	55	4	W20/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.21 UNIT No. 6,6,3,0 , , 1 W,W 0,0,8,9,3 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	3000	7.9	13		W/Mill	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Shale	Appila Tillite	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	137	118	670	11.9		325	200	1218	0.82	16.1	1.3	25	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
828	267		16.1	63.4	4235	2541	7.7	W21/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.21 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	14	<5	415	<0.05	12	<2	0.1	<2	<5	20	<10	<2	4	W21/82	Ag and Sb were below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.22 UNIT No. 6,6,3,0 , , 1 W,W , , , , WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	5000	7.4	13		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Shale	Tapley Hill Formation	Sturtian	U

Aquifer Types: U - unconfined A - artesian C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	400	295	1120	21		193	480	2854	0·82	18·4	4·8	19	0·01

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
2213	158		18·4	52·1	8824	5284	7·3	W22/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.22 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	46	5	1570	<0.05	41	<2	0.1	<2	15	65	20	70	9	W22/82	Ag and Sb are below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.23 UNIT No. 6,6,3,0 , , 1 W,W 0,0,8,8,4 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug 82	2500	7.6	17		Electric operated	
					w/mill gear	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Sandstone	Tapley Hill Formation	Sturtian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	72	71	505	15.7		143	70	957	1.25	3.4	7.0	<1	0.01

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
472	117		0.4	69.1	3195	1763	7.8	W23/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.23 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	59	<5	410	<0.05	170	<2	<0.1	<2	<5	<5	<10	18	2	W23/82	Ag and Sb are below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.24 UNIT No. 6,6,3,0 , , 1 W,W 0,0,9,4,9 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2350	7·3	16		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Shale	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined C - confined A - artesian

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	70	94	455	19·2		373	157	755	1·3	16·4		<1	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
562	306		0·4	62·8	2953	1736	7·6	W24/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.24 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	79	112	49	0·05	105	20	<0·1	<2	<5	5	60	25	1	W24/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.25 UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,5,7 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	5500	6.9	16		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Slate	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	238	170	1130	20		134	310	2403	0.45	36		15	0.03

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1294	110		0.5	65.1	6335	4352	7.0	W25/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.25 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	102	<5	1210	<0·05	25	<2	<0·1	<2	<5	5	<10	56	4	W25/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.26 UNIT No. 6,6,3,0 , ,2 W,W 0,0,5,0,2 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	3500	7.1	16		Submersible	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Slate	Saddle Worth Formation	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	144	147	550	16.4		333	136	1231	0.76	14.3	<0.01	8	0

DERIVED

DATE	TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
Aug'82	964	273		0.3	54.8	4164	2397	7.3	W26/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.26 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	19	<5	10	<0·05	<10	<2	<0·1	<2	5	5	<10	<2	4	W26/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.27 UNIT No. 6,6,3,0 , , 1 W,W 0,0,9,5,5 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	2000	7.3	16		Submersible	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Slate	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	78	65	400	11		214	94	743	0.96	18.4		6	0.01

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
4.62	175		0.3	64.6	2383	1503	7.5	W27/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.27 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	<10	0·5	140	<0·05	4	<2	0·3	2	<5	10	<10	64	1	W27/82	Ag and Sb are below detection of 0·5 and 1·0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.28 UNIT No. 6,6,3,0 , , 1 W,W 0,0,9,5,8 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug 82	2500	7.0	15		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Pyritic Slate	Saddleworth Formation	Torrensian	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	107	145	435	27		492	290	786	1.45	19.1	1.3	6	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
864	403		0.3	51.3	2829	2039	7.5	W28/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.28.

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	29	<5	310	<0.05	14	<2	0.1	2	<5	15	<0.5	<2	3	W28/82	Ag and Sb are below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.29 UNIT No. 6,6,3,0 , ,1 W,W 0,0,9,1,3 WELL NAME:

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	3400	6.9	16		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Alluvium		RECENT	U

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	150	170	540	29		357	198	1220	0.94	16.8	0.36	47	0

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
1074	293		1.68	51.4	4309	2531	7.5	W29/82	

Analysis in milligrams/litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.29

GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug'82	29	<5	405	<0.05	2	<2	<0.1	2	<5	<5	10	10	4	W29/82	Ag and Sb are below detection of .05 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 138

GROUNDWATER ANALYSIS

OBSERVATION WELL No. W.30 UNIT No. 6630 6 WW 01254 WELL NAME: .....

FIELD

DATE	CONDUCTIVITY E.C. UNITS	pH	TEMP. (°C)	DEPTH TO WATER (m)	TYPE OF PUMP	REMARKS
Aug'82	3000	7.2	15		W/MILL	

AQUIFER GROUP No.

LITHOLOGY	STRATIGRAPHIC UNIT	AGE	AQUIFER TYPE
Marble	Skillogalee Dolomite	Torrensian	V

Aquifer Types : U - unconfined A - artesian
C - confined

LABORATORY

DATE	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	SiO_2	Fe	NO_3	PO_4
Aug'82	137	134	515	20		319	350	989	1.4	19.1		43	0.01

DERIVED

TOTAL HARD	Alk.	Free CO_2	B	Na/Cat. %	CONDUCTIVITY E.C. UNITS	T.D.S.	pH	ANALYSIS No	REMARKS
893	261		0.4	54.9	3801	2346	7.9	W30/82	

Analysis in milligrams / litre (mg/L)

See page 2 for heavy metals.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

MF 139

OBS. No. W.30 GROUNDWATER ANALYSIS - HEAVY METALS

DATE COLLECTED	Cu	Pb	Zn	Cd	Mn	Mo	Hg	As	Se	Al	Ni	Ba	U	Analysis No.	REMARKS
Aug '82	58	5	840	<0.05	13	<2	<0.1	2	<5	<0.5	<10	<2	3	W30/82	Ag and Sb are below detection of 0.5 and 1.0
															respectively.

Analysis in micrograms / litre (µg/L)

APPENDIX B

Recalculated Assay Results.

Sample No.	SO_4	Cu	Pb	Zn	Mn	Cd	Ni	Ba	Mo	Fe	U	F	Hg	As	Se
W1/82	199	-	3	-	-	-	-	11	-	-	1	505	-	1.1	-
W2	200	35	-	-	12	-	-	21	1	5	2	425	-	-	2.6
W3	67	10	-	31	-	-	-	15	-	4	0.8	222	0.02	-	3.2
W4	79	-	-	407	24	-	-	-	-	8	2.4	600	-	-	-
W5	111	71	-	388	6	-	-	22	-	23	0.6	572	-	-	-
W6	198	-	-	-	-	-	-	30	-	-	1.7	379	-	-	-
W7	63	28	-	410	17	-	-	9	-	18	1.8	539	-	-	-
W8	87	13	-	1259	7	-	-	8	-	35	2.0	690	-	-	-
W9	58	19	-	2767	19	-	-	23	-	11	1.6	373	-	-	-
W10/82	56	-	-	278	-	-	-	2.2	-	11	1.7	342	-	-	-
W11	51	98	-	381	3	-	-	8.6	-	110	1.6	487	-	-	-
W12	64	11	-	134	4	-	-	-	-	25	1.9	331	-	-	-
W13	75	26	-	481	27	-	-	-	-	4874	2.1	501	-	-	-
W14	74	14	-	31	4	-	-	9.3	-	18	1.2	302	-	-	-
W15	79	8	-	392	7	-	-	-	-	30	1.8	881	-	-	-
W16	64	4	-	544	21	-	-	-	-	18	1.2	143	-	-	-
W17	97	39	-	402	20	-	4	12	-	298	1.5	425	-	-	-
W18	55	9	-	156	8	-	-	12	-	11	0.9	165	-	-	-
W19	76	17	1	94	1	-	1.7	6	-	2380	2.2	168	-	-	2.7
W20/82	58	81	46	479	4	-	21	26	14	1860	1.9	316	-	-	-
W21	79	6	-	163	5	-	-	-	-	512	1.6	323	-	-	-
W22	91	9	1	297	8	-	4	13	-	908	1.7	155	0.02	-	2.8
W23	41	33	-	233	96	-	-	10	-	3971	1.1	709	-	-	-
W24	90	46	65	28	60	0.03	35	14	12	1843	0.6	749	-	-	-
W25	71	23	-	278	6	-	-	13	-	345	0.9	103	-	0.5	2.3
W26	57	8	-	4	-	-	-	-	-	-	1.7	317	-	-	2.1
W27	63	-	0.3	93	3	-	-	43	-	319	0.7	639	0.2	1.3	-
W28	142	14	-	152	7	-	-	-	-	638	1.5	711	0.05	1.0	-
W29	78	11	-	160	1	-	4	4	-	142	1.6	371	-	0.8	-
W30/82	149	25	2	358	6	-	-	-	-	789	1.3	597	-	0.9	-

(All assays in parts per billion, except SO_4 which is parts per million; Ag and Sb were not detected).

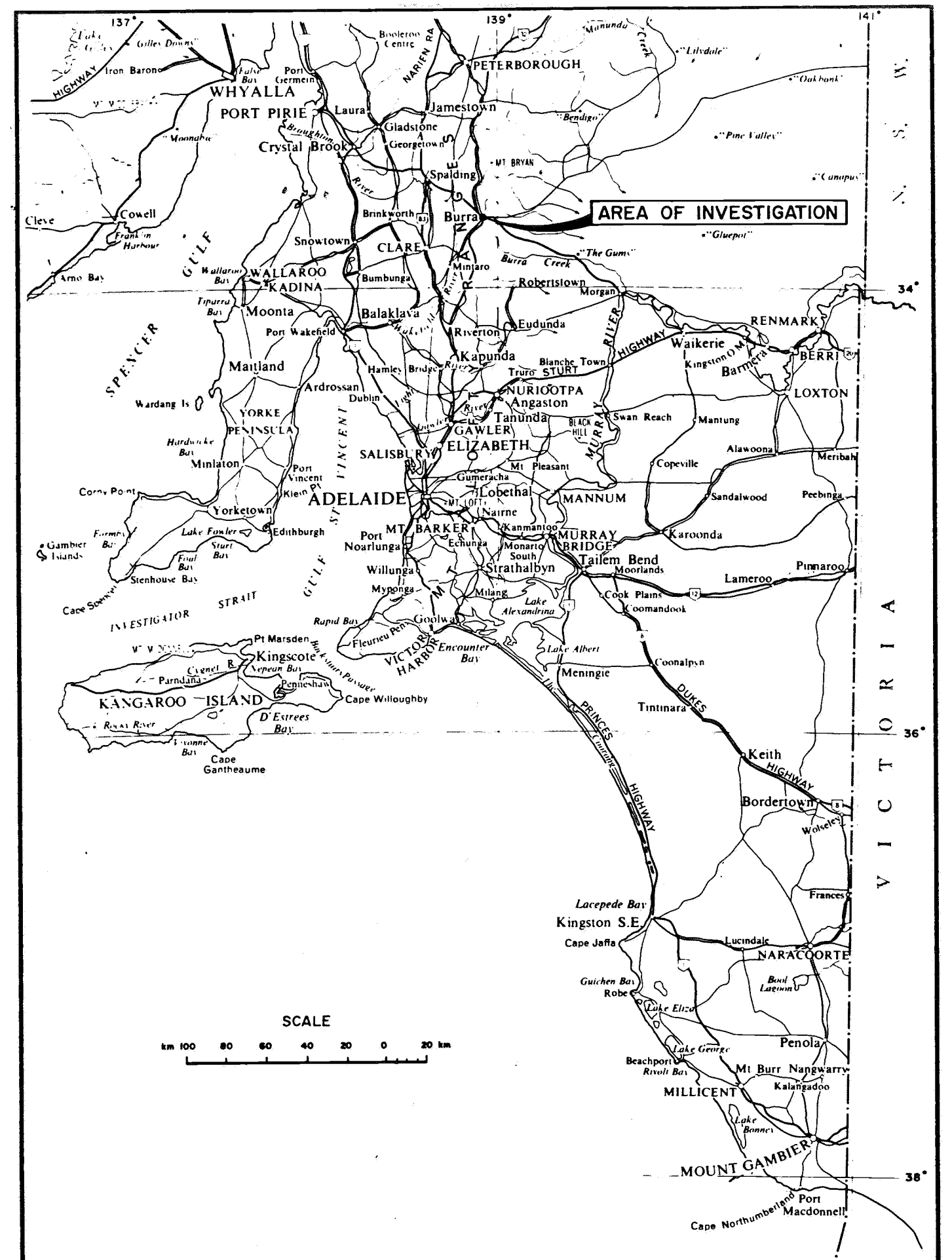
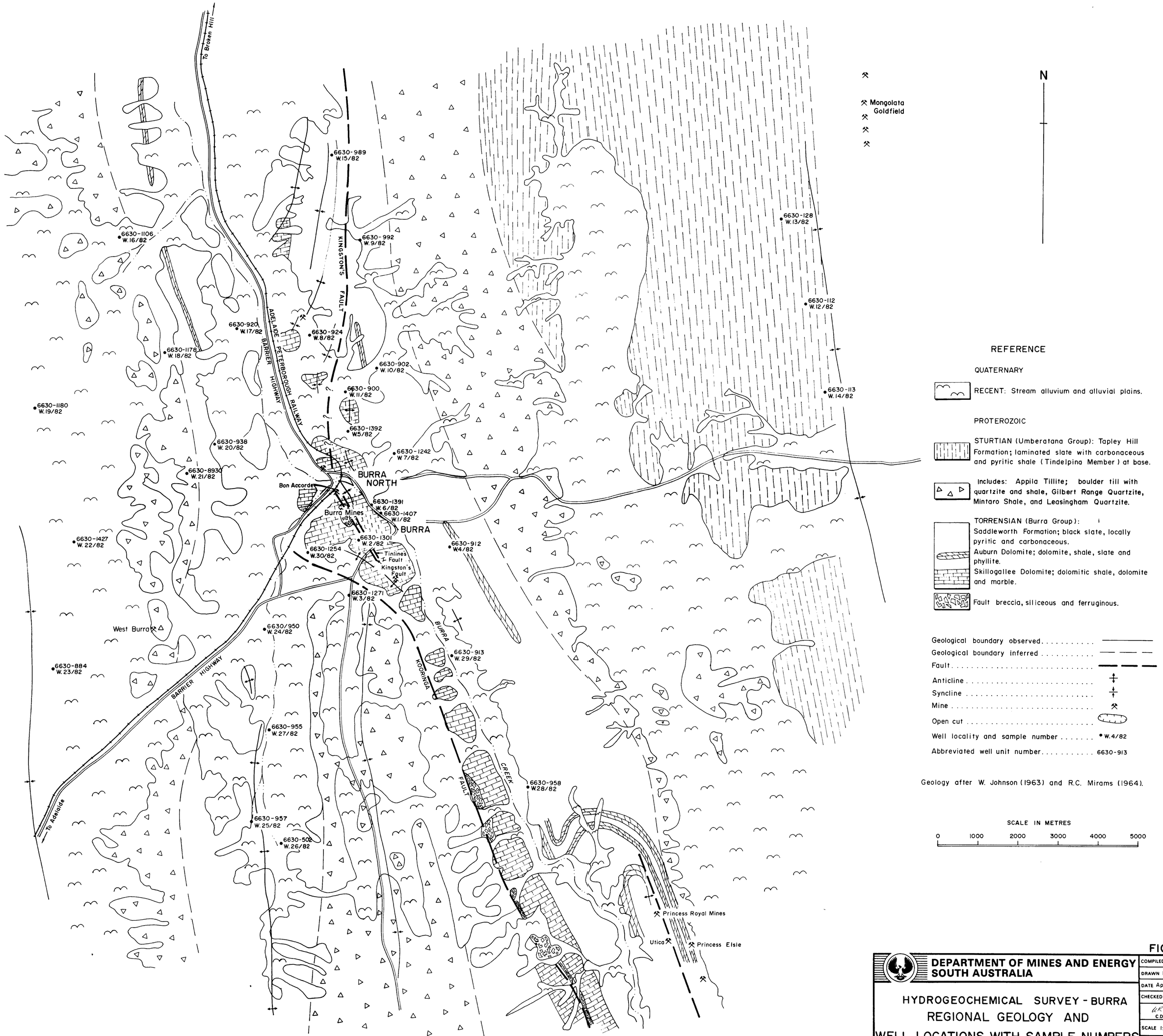


FIG. 1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED B.J. Morris	CDO	26·7·83 DATE
HYDROGEOCHEMICAL SURVEY – BURRA	DRAWN E. Calabio	SCALE 1 : 2 500 000	
LOCALITY PLAN	DATE April, 1983	PLAN NUMBER S16669	
	CHECKED		

3158



REFERENCE

QUATERNARY

RECENT: Stream alluvium and alluvial plains.

PROTEROZOIC

STURTIAN (Umberatana Group): Tapley Hill Formation; laminated slate with carbonaceous and pyritic shale (Tindelpina Member) at base.

Includes: Appila Tillite; boulder till with quartzite and shale, Gilbert Range Quartzite, Mintaro Shale, and Leasingham Quartzite.

TORRENSIAN (Burra Group):
Saddleworth Formation; black slate, locally pyritic and carbonaceous.
Auburn Dolomite; dolomite, shale, slate and phyllite.
Skillogallee Dolomite; dolomitic shale, dolomite and marble.

Fault breccia, siliceous and ferruginous.

Geological boundary observed
Geological boundary inferred
Fault
Anticline
Syncline
Mine
Open cut
Well locality and sample number ..... • W.4/82
Abbreviated well unit number 6630-913

Geology after W. Johnson (1963) and R.C. Mirams (1964).

SCALE IN METRES

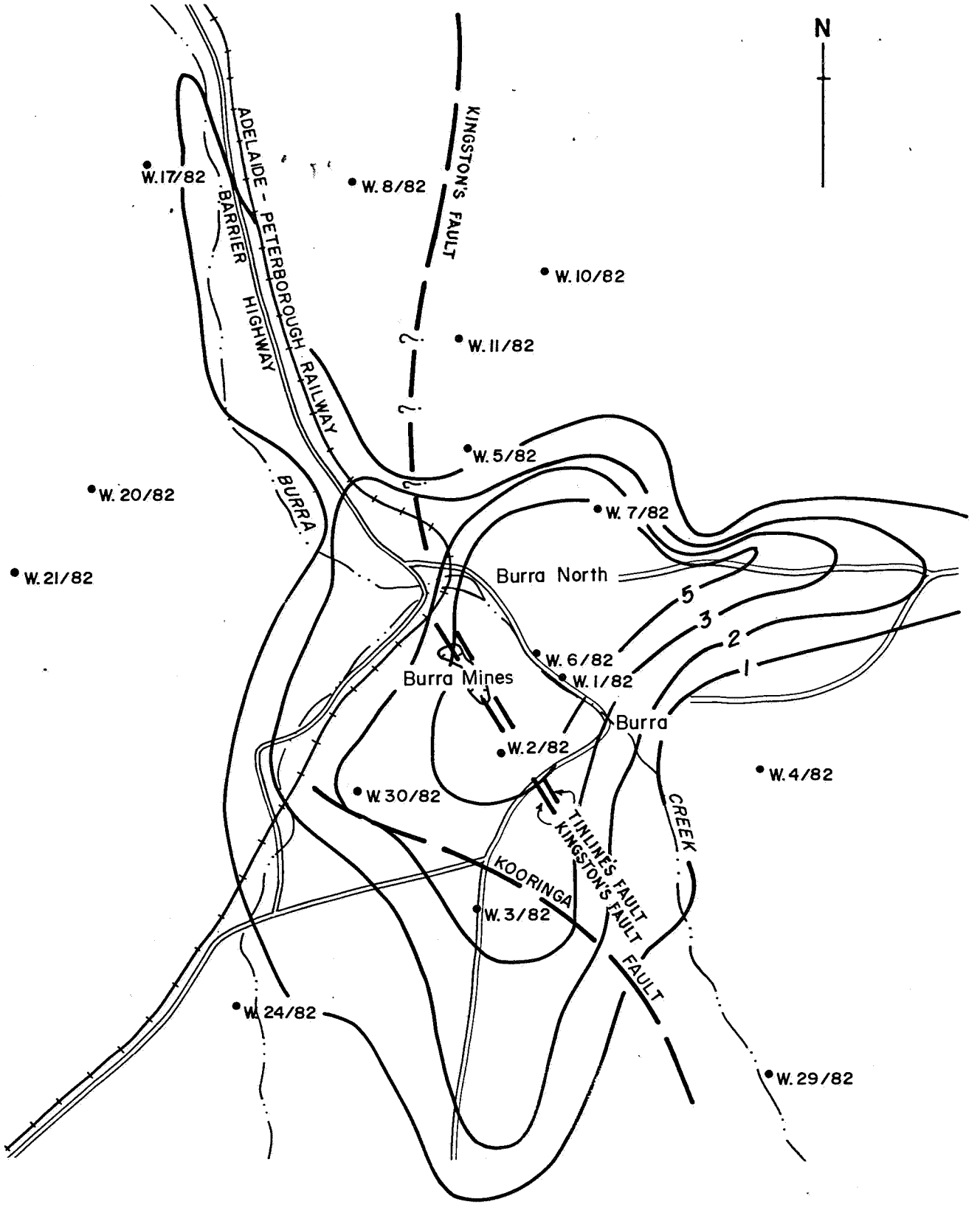
0 1000 2000 3000 4000 5000

FIG. 2

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

HYDROGEOCHEMICAL SURVEY - BURRA REGIONAL GEOLOGY AND WELL LOCATIONS WITH SAMPLE NUMBERS

COMPILED	B.J. Morris
DRAWN	E. Calabio
DATE	April, 1983
CHECKED	
C.D.O.	26 7 83 DATE
SCALE	1:50,000
PLAN NUMBER	83-176



REFERENCE

Contour of water table decline (metres) (Read, 1980) ..... —3—

Well location with sample number ..... • W.4/82

Elevation ..... Australian Height Datum

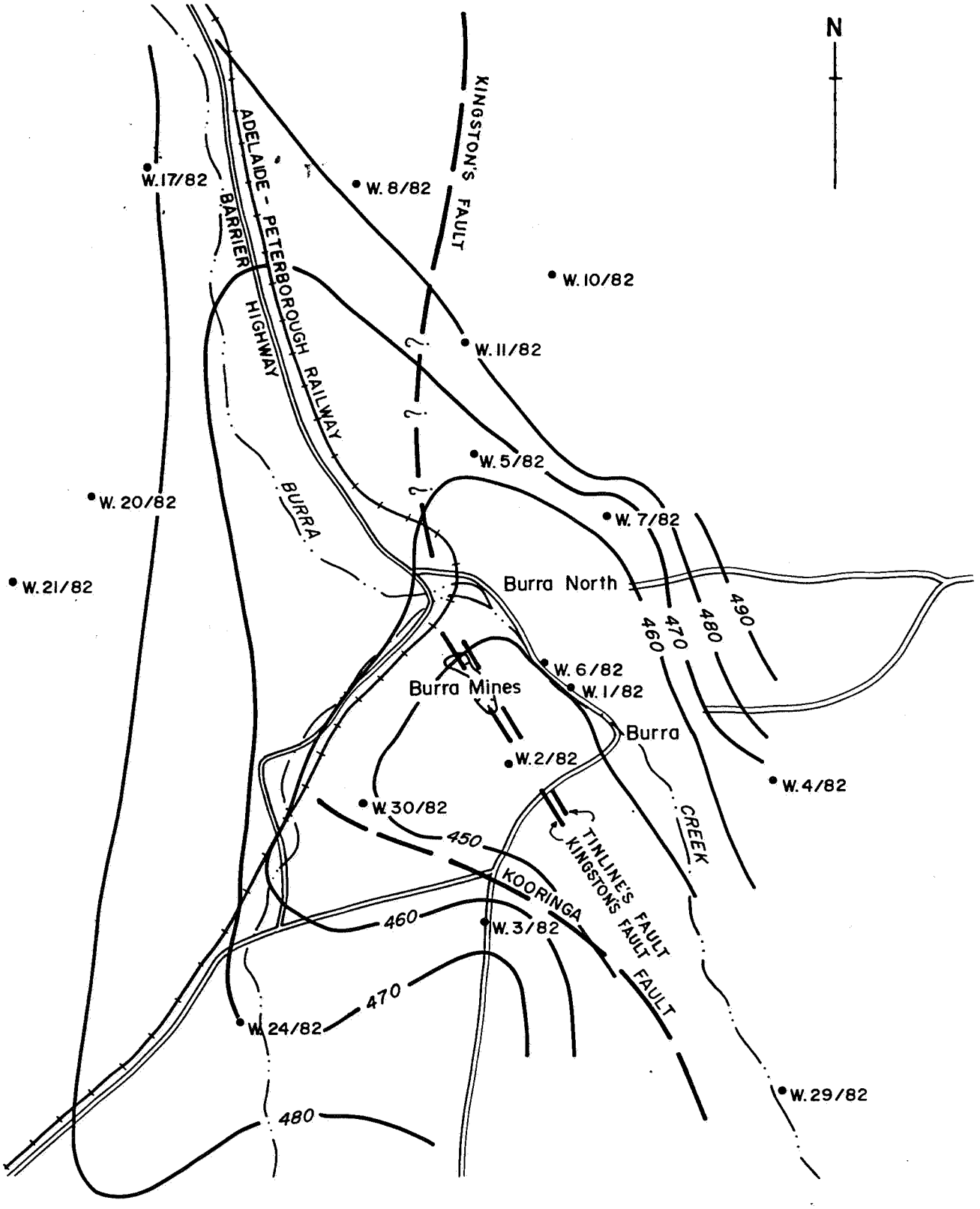
SCALE IN KILOMETRES

0 1 2

FIG. 3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED B.J. Morris	26·7·83 C.D.O. DATE
HYDROGEOCHEMICAL SURVEY – BURRA	DRAWN E. Calabio	SCALE 1:50 000
WATER TABLE DECLINE FEBRUARY 1975 — FEBRUARY 1980	DATE April, 1983 CHECKED	PLAN NUMBER S 16670

3/58



REFERENCE

Water table contour (metres A.H.D.)(Read, 1980)..... 480

Well location with sample number..... W. 24/82

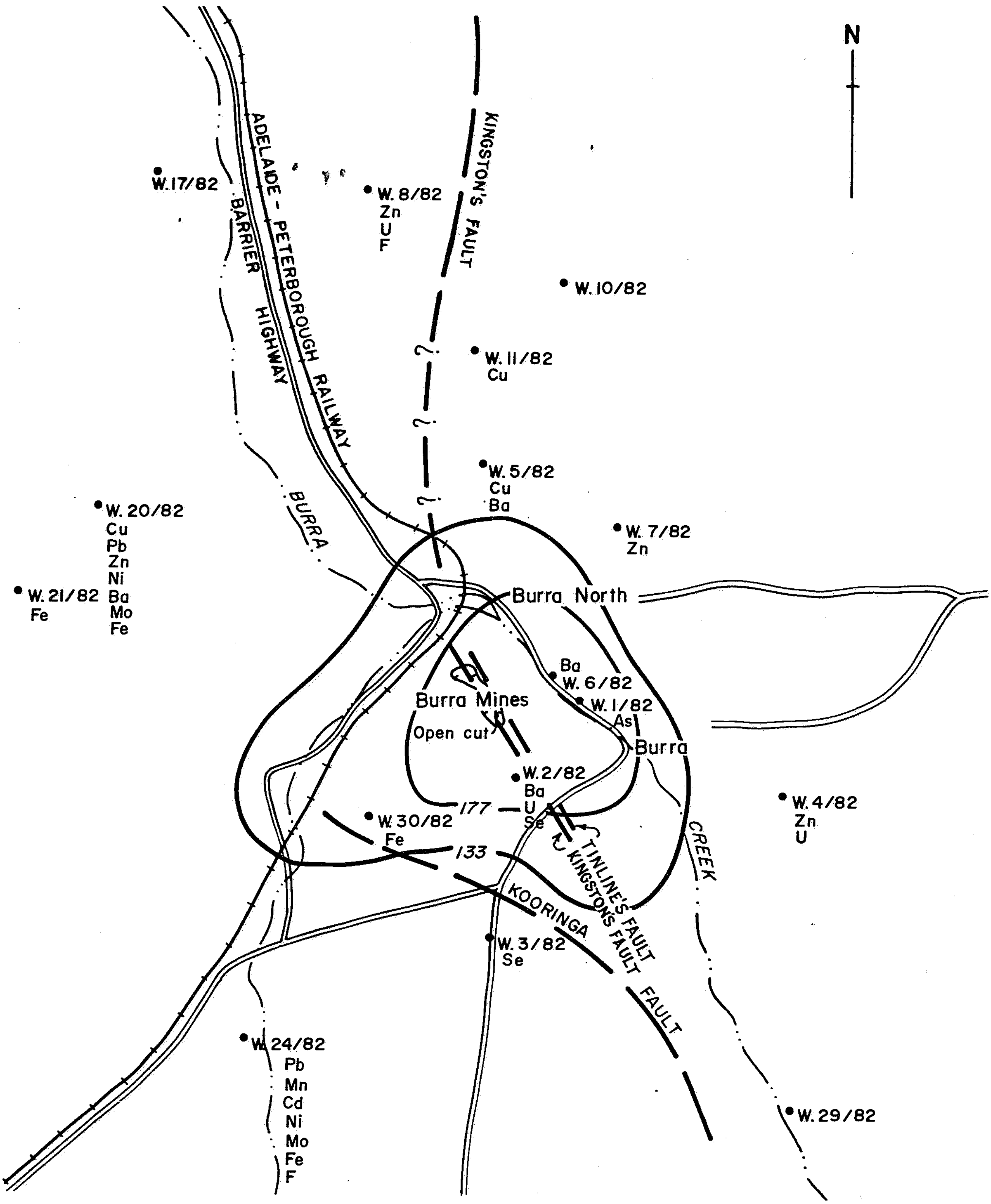
SCALE IN KILOMETRES

0 1 2

FIG. 4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED B. J. Morris	26·7·83 C.D.O. DATE
HYDROGEOCHEMICAL SURVEY – BURRA	DRAWN E. Calabio	SCALE 1:50 000
WATER TABLE CONTOURS FEBRUARY 1980	DATE April, 1983	PLAN NUMBER S 16671
	CHECKED	

3/58



REFERENCE

Contour of anomalous sulphate content . . . . —177—

First order anomaly . . . 177 p.p.m.

Second order anomaly . . 133 p.p.m.

Groundwater sample point with sample number and anomalous heavy metals present . . . . • W. 4/82 Zn U

SCALE IN KILOMETRES

0 1 2

FIG. 5

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

HYDROGEOCHEMICAL SURVEY – BURRA

SULPHATE DISPERSION HALO AND ANOMALOUS HEAVY METAL SAMPLE SITES

COMPILED B.J. Morris	C.D.O. *WR* DATE 26 · 7 · 83
DRAWN E. Calabio	SCALE 1:50 000
DATE April, 1983	PLAN NUMBER
CHECKED	S 16672