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HYDROGEOLOGICAL REPORT ON PROPOSED IRRIGATION AREA - CALLINGTON

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Department of Mines
South Australia —

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
ENGINEERING DIVISION

HYDROGEOLOGICAL REPORT ON PROPOSED IRRIGATION AREA

CALLINGTON

by

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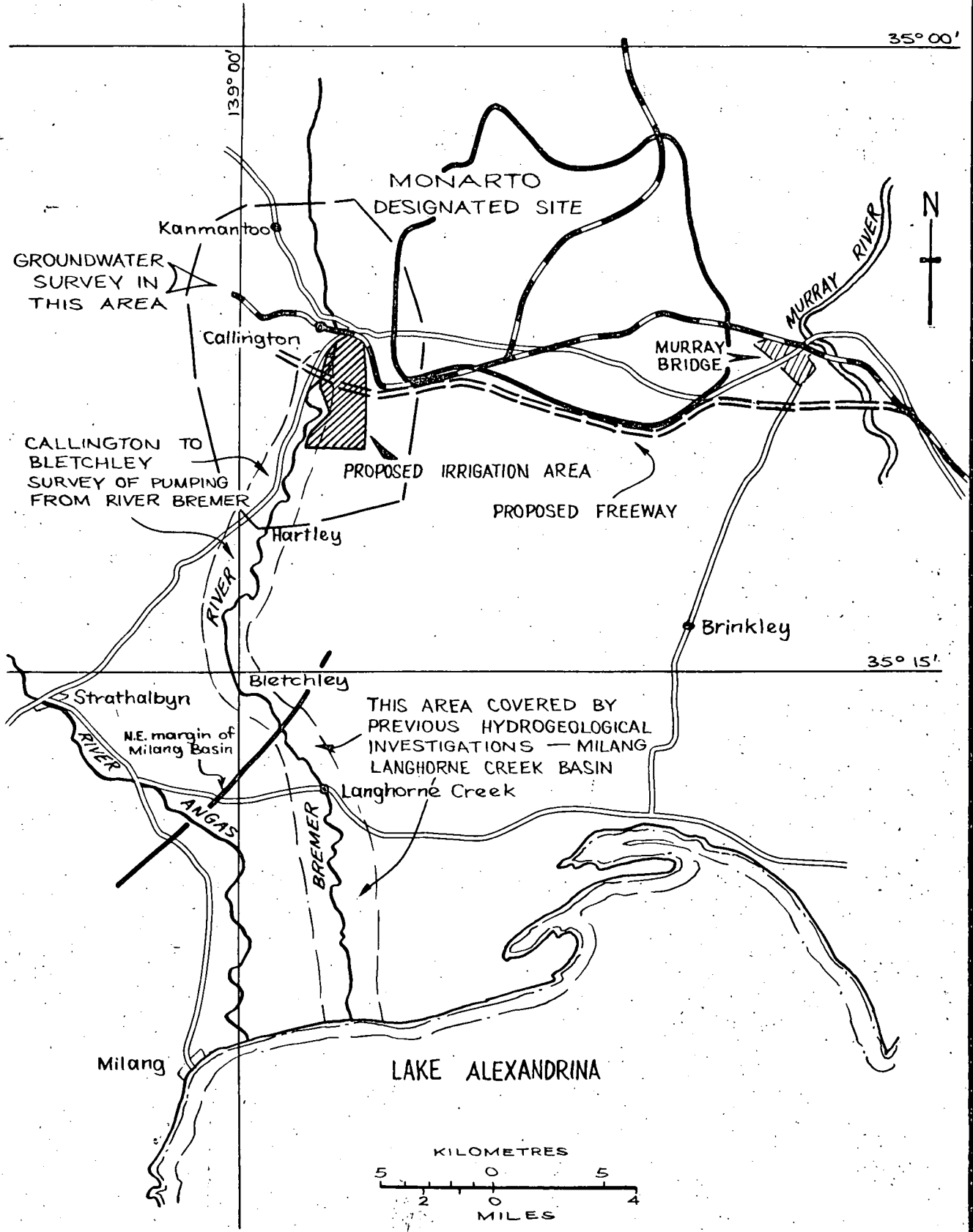

FIG. 1.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

HYDROGEOLOGY SECTION	Drn. A.F.W.	MONARTO PROJECT PROPOSED IRRIGATION AREA AND ENVIRONS	SCALE: 1:250 000
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GEOLOGIST:	Ckd. L.V.W.		DATE: 3-4-74
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ABSTRACT

This report summarises the known hydrogeology along the Bremer River in the vicinity of Callington where it has been suggested that an irrigation area be established to use sewage effluent - derived from a treatment works adjacent to Monarto.

Groundwater use along the Bremer from the Murray Bridge-Onkaparinga pipeline to Lake Alexandrina is also summarized.

It is suggested that further work by the Department of Mines be discontinued until results of investigations by the Soils Branch of the Department of Agriculture are known.

INTRODUCTION

A request was received (8/8/73) from the Engineering and Water Supply Department to investigate the likely fate of effluent drainage water from a proposed irrigation area in the vicinity of Callington. The Department was also asked for information on groundwater supplies developed along the Bremer River. The area in question and the proposed irrigation area is outlined in Fig. 1.

Some information in this report has been gained from liaison with Department of Agriculture personnel (Messrs. Max Till and David Chittleborough from the Soils Branch) who have been involved in the investigation.

Geology and Topography of Proposed Irrigation Area

(in part from the Mobilong 1:63 360 geological sheet)

The proposed investigation area lies on the eastern slopes of a north-south trending valley at the base of which is the Bremer River. The valley sides and ridges are composed of Cambrian (Kanmantoo) schists, phyllites and thin quartzites. These also underlie younger sediments which form the valley floor. Maximum depth to bedrock is unknown but may be up to 40 metres on the eastern flank adjacent to the Bremer Fault. Heights in the area range from about 150 m above sea level along the flattish ridges to 60 m above sea level at the southern end of the valley. The valley sides have been dissected by ephemeral streams which flow into the Bremer River.

Overlying the Cambrian bedrock in most parts of the valley and exposed in the south of the irrigation area is limestone of Miocene age (Mannum Formation) capped by calcrete. This in turn is partly overlain by sands correlated with the Parilla Sands exposed near Renmark. These sands have been encountered in bores drilled by the Department of Agriculture at Callington (Chittleborough pers. comm., 1974) and near Bletchley and Belvidere during stratigraphic drilling carried out by the Department of Mines (author).

The younger units in the area comprise the "Bremer Clay" (an informal name used by Chittleborough) which is alluvium deposited by and in vicinity of the Bremer River and the Pooraka Formation - found mainly on the eastern side of the valley and consisting of sandy clays with thin pebble lenses mantled by aeolian sand not more than 1 metre thick. Up to 7 different soil units, based on parent materials have been recognised by Chittleborough (pers. comm., 1974) during field work. These units will be described by Chittleborough in a proposed report.

Irrigation Effects on the Proposed Area

To quantitatively evaluate the likely fate of drainage water from the proposed irrigation area a more detailed picture of the soils and geology of the area is required e.g. soil patterns, thicknesses and distributions of the Parilla Sand equivalent and Mannum Formation and bedrock profiles across the valley should be known. Only then may hydraulic properties of the aquifer and overlying beds be determined. This would involve shallow drilling, pump testing and limited geophysical work.

A preliminary assessment of the area indicates that consequences of irrigation will be either

(1) development of perched water tables (saline - the order of 6 000 mg/l - allowing for a four fold concentration of initial irrigation water).

(2) a rising groundwater table - also saline and of the order of 4-6 000 mg/l.

both of which may result in saline inflow into the River Bremer. This is highly undesirable for two reasons

(a) Some 300 mega litres per annum are withdrawn from the Bremer River for lucerne irrigation between Callington and a few kilometres north of Langhorne Creek (figures provided from a field survey by D. Coley B.Sc. - field assistant with Mines Department -)

(b) Bremer water is used for flood irrigation of vines and pasture in the vicinity of Langhorne Creek and down stream to Lake Plains. No figures are available yet as to how much water is used for this purpose, but stream gauging this winter should provide some answers. It is suggested that it may well be similar to the figure in part (a) - depending on the season.

Some idea of irrigation problems in the area may be taken from the experience of landholder Mr. W. Jaensch of Callington, who, after irrigating lucerne in the same paddock using Bremer water for 15 years, could not continue due to saline build up in the soil. The lucerne refused to grow (D. Coley, pers. comm., 1974).

Thus it appears that soils in the area concerned will determine whether irrigation is feasible or not. The Department of Agriculture over the last 7 months (September to March) has been carrying out soil and geological mapping, rainfall simulation studies and soil hydraulic conductivity measurements and until a decision has been made based on these results it is suggested that the Department of Mines should not proceed with further investigations.

Groundwater supplies - Callington to Lake Alexandrina in the vicinity of the Bremer River

This section is discussed in two zones, the first from near Callington to a few kilometres north of Langhorne Creek (the northern boundary of the Milang groundwater basin) and the second from the latter locality to Lake Alexandrina.

Zone 1

A survey of river water and groundwater use was carried out by D. Coley in this zone. Some information was already obtainable from Departmental records. Here, groundwater occurs in Cambrian bedrock, creek alluvium and very rarely in Mannum Limestone. The aquifer is a water table aquifer. Maximum bore depth is 140 m with the average depth ranging from 30-70 m. A few shallow wells have been dug to 10-15 m. Salinities range from a low of 1 300 mg/l to a high of 15 000 mg/l with average values being about 2 200-3 000 mg/l (Coley, pers. comm.). Yields varied from 0.05 l/sec (50 gph) to 0.65 l/sec (500 gph) with a few larger supplies where bores intersected thin quartzite beds at the water table. Bore water in this zone is used mainly for stock with limited domestic and irrigation application.

River water in this zone is used for lucerne irrigation and stock. As mentioned above, Coley estimates about 300 megalitres per annum are withdrawn from the river.

Locations and specific details of bores and withdrawal points are available from Departmental records and files.

Zone II

Information in this zone is also available from Departmental records and reports. This zone is part of an area which has been and is being studied by the Hydrogeological Section of the Department of Mines. The author has been in charge of the project since June, 1973.

Groundwater occurs in two aquifers, an upper water table aquifer (Quaternary alluvium) and a lower confined aquifer (Tertiary limestone and quartz sands). Flood irrigation using Bremer water takes place during winter (outlined above).

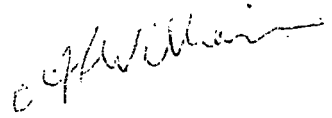
(i) Water table aquifer

About 100 bores adjacent to the River Bremer intersect this aquifer. Water is used for limited stock and domestic purposes. Depths of bores and wells vary from a few to 30 metres. Supplies are generally of the order of 0.6 l/sec (500 gph). Salinity varies from about 1 500 to over 5 000 mg/l. This aquifer is recharged by both Bremer water and local precipitation - to what extent is unknown. Contamination of this aquifer by pollutants entering the Bremer upstream is likely.

(ii) Confined Aquifer

There are some 200 bores supplying over 90% of the groundwater used along the Bremer is this zone. Depths vary from 40-70 m. Usable water withdrawn from the basin has salinities ranging from 1 000-3 500 mg/l (selected observation bores are measured in March and September for salinity and water level in the Milang basin). Supplies of up to 38 l/sec (30 000 gph) are common.

The water is used for irrigation of lucerne (estimated 900 ha), vines (350 ha) and dry land (200 ha). These figures were provided by members of the Angas Bremer Irrigators Association - a body of local landowners interested in the welfare and management of the Milang basin. Total withdrawal from this portion of the basin is estimated at 10 000 megalitres/annum. Recharge of this aquifer is unknown at present. Drilling in the near future may determine whether the Bremer contributes any water to this basin. It may well be that water removed from this aquifer during pumping is replaced only by saline water either side of the River.



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