DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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# MURRAY BASIN HYDROGEOLOGICAL INVESTIGATION DATA ASSESSMENT UPPER MURRAY AND NORTHERN REGION

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by

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## ABSTRACT


To assist investigations by the Engineering and Water Supply Department into salinity control measures for the River Murray, the regional hydrogeology of a major portion (Counties Young, Hamley, part Albert and part Alfred) of the northern Murray Basin has been assessed.

Five main aquifer systems are defined. Two are pre-Tertiary (Devonian and basal Cretaceous) and restricted within a Mesozoic-Palaeozoic infrabasin at depths below 700 metres. Three are of Tertiary age and extend over the entire region.

The Lower Tertiary system (Renmark Beds) is confined and has no direct influence on the river. Groundwater movement appears to be from the north and east, towards the Morgan-Bungunnia region. The middle Tertiary system (Murray Group) is confined in the east and north, but unconfined elsewhere. The upper Tertiary system (Pliocene Sands) is unconfined, but only contains groundwater in the eastern and northern regions.

Unconfined groundwater in the two uppermost Tertiary systems is in direct hydraulic continuity with the River Murray. Hydraulic gradients are towards the river, with groundwater flows directed mainly towards the Waikerie to Berri region, where most salt inflow may be expected. Groundwater movement is mainly from the elevated basement areas to the west and north and from within the Basin to the southeast. The latter is associated with recharge from the Victorian highlands, the former with intake along the Basin margin.

Away from the river, hydrogeological data is sparse and the aquifer systems poorly defined, particularly in the northern region. Further investigations should be directed principally towards establishing groundwater movement and aquifer configurations, for the middle and upper Tertiary systems, in the northern, eastern and Morgan to Bungunnia region. General recommendations have been made for investigation drilling.


## INTRODUCTION

The River Murray is South Australia's most important single water resource, supplying on average about 50% of the

State's annual requirements. The quality of this resource is however, being threatened by increasing salinity, caused primarily by induced and natural inflows of saline groundwater. The Engineering and Water Supply Department is currently investigating methods for controlling such inflows, but if these investigations are to be effective there must be a proper understanding for the regional hydrogeology of the Basin.

The purpose of this report is to summarise, from existing data, the hydrogeology of the Upper Murray Region and thereby provide a basic framework for further investigation and assessment, including groundwater modelling. The main aquifer systems are defined and aquifer geometry, hydraulic properties, groundwater movement and salinity distribution are assessed. No detailed study was made of the River Murray flats or of the irrigation areas.

The report covers the Murray Basin from Morgan to the New South Wales-Victorian border, including Counties Young and Hamley to the north and part Counties Albert and Alfred to the south (Figs. 1 and 2).

## PREVIOUS INVESTIGATIONS

Most groundwater investigations in the Upper Murray Region have been directed towards solving local problems related specifically to the River Murray. Only two assessments have been made of the regional hydrogeology. The first was by Barnes (1951), who reported on the shallow unconfined aquifer system in Counties Albert and Alfred, using data from a 1946/47 field survey of private wells and from wells drilled by the Department of Mines and Energy. The second was by O'Driscoll (1960), who prepared a comprehensive assessment of the regional hydrogeology of the entire South

Australian portion of the Murray Basin. In the Upper Murray region, three Tertiary aquifer systems were defined and aquifer hydrochemistry discussed.

Between 1967 and 1969, the Department of Mines and Energy drilled twenty three investigation wells south of Morgan, at Lowbank and at Overland Corner, to establish the groundwater regime and determine its relationship to the river (Cramsie 1967; Harris 1969; Roberts 1968 and 1969). As part of this investigation, field surveys were carried out in 1967/68 for Hundreds adjacent to the river in northern Counties Albert and Alfred and southern Counties Young and Hamley. Selected private wells were accurately levelled in order to establish hydraulic gradients.

Other work in this period included drainage investigations in the Waikerie area, involving both drilling and aquifer testing (Cramsie 1966, 1967; Roberts 1965, 1967 and 1970) and shallow investigation drilling at the proposed Chowilla damsite (Roberts, 1966).

Between 1974 and 1976, as part of an examination of potential evaporation basin sites, forty two investiation wells were drilled into the shallow unconfined aquifer in the region between Overland Corner and the New South Wales - Victorian border (Williams 1974; Shepherd and Williams 1975; Williams 1976). Five of these wells were test pumped.

Recent investigations include six wells drilled into the Renmark Beds in the Upper Murray region between Waikerie and the Victorian border and thirteen shallow wells adjacent to the river between Waikerie and Lock 2. These were all drilled in 1979 by the Department of Mines and Energy (Edwards, 1979).

## DATA

Data was extracted from published and unpublished Departmental reports, well summary cards and exploration company reports. All unreliable data was disregarded and in the few instances where well card and report data differed, the reported values were used. The data is presented as contoured plans of aquifer and confining bed surfaces, hydraulic surfaces and salinity distribution.

The pre-Tertiary aquifer systems were defined and contoured from geological and geophysical logs of the petroleum exploration wells and from geological sections contained in Thornton (1974). The aquifer surfaces are reasonably well defined in the south-eastern sector, but elsewhere are extrapolated and these plans can only be considered as very broad generalisations.

More data is available for the Tertiary aquifer systems, which accordingly are better defined. However, not all this data could be used. In the northern region, most wells are not accurately levelled and topographic data is very poor. Most of the region is covered only by the uncontoured CHOWILLA 1:250 000 military survey plan and elevations could be estimated for the few wells at or near to spot heights. Such values are shown as estimated on the plans. Most wells were barometrically levelled by O'Driscoll in 1953, but these readings were considered inaccurate due to lack of control. Areas immediately north of the river are covered by contoured 1:50 000 topographic plans, from which elevations were estimated (APPENDIX C).

Potentiometric and aquifer suface contours for the northern region can only be considered as approximate. These contours are denoted as "inferred" on the plans, but probably reflect the regional trends. In general, the wells are sparse and the lithological description inadequate for other than approximate aquifer definition.

South of the river, investigation and privately owned wells are numerous and most have been accurately levelled to mean sea level Port Adelaide (Erkelens, 1968; Hack, 1968). Geological logs are available for the investigation wells and for private wells drilled by the Department of Mines and Energy. Consequently the aquifer systems are well defined and hydraulic surfaces are reasonably accurate, although in some cases aquifer definition is complicated by inconsistencies in geological description. Where the geological data is not clear, "approximate" contours have been drawn.

Groundwater data for private wells was obtained from field surveys in 1946/47 and 1967/68 of the southern region and in 1952/53 of the northern region. These surveys have provided the main source of data for areas away from the river. All private well data is summarised in APPENDIX C. Significant differences were generally found between water levels measured in 1946/47 and 1967/68, consequently only data measured during or near to the 1967/68 survey were used in the compilation of water table and potentiometric surface plans of the southern region. Data used in the northern region was from the 1952/53 survey.

Hydraulic parameters of the shallow aquifers have been determined by the Department of Mines and Energy from discharge and drainage tests. The data has not been re-analysed and values contained in APPENDIX B are as originally reported.

## PHYSIOGRAPHY AND CLIMATE

The region is part of a large plain, generally 35-50 metres above mean sea level, but rising to elevations of about 60-80 metres in the northern and southern-central areas and northeast of Renmark.

The River Murray is the most distinctive physiographic feature. Between Morgan and Overland Corner the river has incised Tertiary limestone, forming a gorge approximately 1.5 km wide. The river pattern is largely joint-controlled (Firman, 1972). Upstream, the river occupies a broad valley, 4 to 10 km wide, with extensive alluvial flats and backwaters. Here, the river's course appears to have been influenced by warping of the Tertiary sediments.

Average annual rainfall varies from about 200 mm in the north to about 300 mm in the south. Isohyets trend almost east-west. Average annual evaporation is about 1 700 mm in the north and about 1 550 mm near the river.

The River Murray supports large irrigation schemes in the Barmera-Renmark-Loxton and Waikerie-Morgan areas. North of the river, land use is mainly pastoral. Grazing and cereal cropping predominate to the south.

## GEOLOGY

The geology of the northern Murray Basin has been described in detail by O'Driscoll (1960), Ludbrook (1961), Firman (1972), Thornton (1974) and Rogers (1978). The main geological units are summarised in Table 1 and described more fully in Appendix 1.

The South Australian portion of the Murray Basin is generally less than 300 metres deep, with Tertiary sediments lying directly upon basement rocks. East of Morgan the basement deepens into a Middle Palaeozoic-Mesozoic infrabasin, containing Early Cretaceous, Early Permian and probable Devonian sediments beneath the Tertiary. The infrabasin comprises the northeasterly trending Renmark Trough, a half graben up to 3 500 metres deep, by the Canegrass Lobe and the Paringa Embayment (Thornton, op cit). Basement contours on Figure 4 were taken directly from Thornton.

TABLE 1

Summary of Murray Basin Geology and Hydrogeology

| AGE | UNIT/LITHOLOGY | THICKNESS(m) | HYDROGEOLOGY |
| --- | --- | --- | --- |
| QUATERNARY | WOORINEN FORMATION - aeolian, silty quartz sands | 3-6 | |
| QUARTERNARY | BLANCHETOWN CLAY - grey to red-brown clay and sandy clay, gypseous in part. | 5-20 | Low permeability clay. Causes drainage problems and perched groundwater in irrigation areas. |
| PLIOCENE | NORWEST BEND FORMATION - calcareous sands and sandy limestone, restricted to central and western regions | 5-15 | Above water table. Included in Pliocene Sands aquifer system for completeness. May contain drainage water beneath irrigation areas. |
| PLIOCENE | PARILLA SAND - fine to medium clayey quartz sands | 15-25 | PLIOCENE SANDS AQUIFER SYSTEM - Unconfined aquifer in eastern and northern regions, elevated above water table elsewhere. Salinity generally 20 000 - 90 000 mg/l. Hydraulically continuous with River Murray. |
| PLIOCENE | LOXTON SANDS - upper coarse, lower lower fine-medium, micaceous quartz sand. | 15-60 | |
| PLIOCENE | BOOKPURNONG BEDS - dark, carbon-aceous clays, silts and marls in eastern and northern regions. | 20-40 | UPPER TERTIARY CONFINING BED - includes upper clayey portions of Pata Limestone and Pata Limestone equivalents in north. |
| MIOCENE | PATA LIMESTONE - sandy clays, marls and limestones, mainly in eastern region. Clay equivalents in north. | 10-20 | MURRAY GROUP AQUIFER SYSTEM<br>__Unconfined__ - central, southern and western region. Hydraulically continuous with the River Murray. Salinities vary from 500 mg/l in the south, to 30 000 mg/l in the north. |

| AGE | UNIT/LITHOLOGY | THICKNESS(m) | HYDROGEOLOGY |
|---|---|---|---|
| MIOCENE | MORGAN LIMESTONE - bryozal limestone, marly limestone and marls. | 15-30 | Confined - northern and eastern region. Salinities generally 10 000 - 30 000 mg/L, but decreases to 3 000 mg/L in southeast. Probable low hydraulic conductivity in northern region. Hydraulically separate from River Murray. |
| MIOCENE | MANNUM FORMATION - fossiliferous quartz sandstone and sandy limestones. Mainly clays and marls, with minor limestone, in northern region. | 30-90 | |
| OLIGEOCENE | ETTRICK FORMATION - glauconitic clays, marls and minor limestone. | 10-40 | LOWER TERTIARY CONFINING BED - Also includes uppermost clays of Renmark Beds. |
| EOCENE | BUCCLEUCH BEDS - fine to coarse fossiliferous, silty sands and carbonaceous clays. Identified only in the Waikerie area. | 30-60 | RENMARK BEDS AQUIFER SYSTEM - confined. Comprises two lithologically and hydraulically distinct sub-systems:-<br>Upper Sub-system - argillaceous Upper Renmark Beds and Buccleuch Beds. Interbedded sands are clayey and hydraulically separated from the lower Sub-system over most of the region.<br>Lower Sub-system - arenaceous Lower Renmark Beds. Generally lower salinities, higher potentiometric levels and larger permeabilities than the upper Sub-system. |
| PALAEO-EOCENE | RENMARK BEDS<br>Upper - lignitic silts, clays and and clayey sands<br>Lower - fine to coarse, carbonaceous sands. | <br>60-150<br><br>80-230 | |
| CRETACEOUS | MONASH FORMATION<br>Coombool Member - plastic to silty clays. Minor fine sands.<br>Meretti Member - glauconitic shales and clays. | <br>30-200<br><br>50-150 | CRETACEOUS CONFINING BED<br>Sandstone interbeds generally tight, but locally may from minor aquifers.<br>Restricted to Mesozoic - Palaeozoic infrabasin. |
| CRETACEOUS | PYAP MEMBER - fine to coarse grianed, generally well sorted quartz sandstone. Clayey in part. | 30-110 | BASAL CRETACEOUS SANDS AQUIFER<br>Probably restricted to the Renmark Trough and Paringa embayment. Indicated good porosity and permeability. Salinities approximately 30 000 mg/L. |
| PERMIAN | UN-NAMED - mudstone, clay and siltstone. Clayey sandstones locally prominent. | 100-850? | PERMIAN CONFINING BED<br>Some interbedded sands have good porosity and permability and possibly good aquifer properties.<br>Groundwater is saline. |

| AGE | UNIT/LITHOLOGY | THICKNESS(m) | HYDROGEOLOGY |
| --- | --- | --- | --- |
| DEVONIAN | UN-NAMED - fine to coarse sandstone, with interbedded shale and siltstone. | 900? | DEVONIAN SANDSTONE AQUIFER |
| | KANAMANTOO GROUP - slate, metagreywacke and gneisss | | BASEMENT |
| | UN-NAMED - slates, phyllites | | |
| | WILLYAMA COMPLEX - metamorphics | | |

Post-Miocene tectonic movement caused warping of the basin sediments, reflected by the relatively elevated southern-central region between Waikerie and Overland Corner, and the downwarped areas at Morgan-Cadell and north of Loxton (Fig. 13). Prominent monoclinal folds trend northeasterly through Overland Corner and northwesterly to the south of Loxton (Fig. 1). The latter fold is part of the Murrayville Monocline of northwestern Victoria (Spence, 1958).

The warping resulted in a well defined pattern of northeast and northwest trending faults and major joints, within the Tertiary and younger surficial deposits (Firman, op cit). The north trending Morgan Fault, with a vertical displacement of about 30 metres, is prominent immediately west of the river at Morgan.

## HYDROGEOLOGY

The northern Murray Basin contains five main aquifer systems, namely: the (?) Devonian Sandstone; the Basal Cretaceous Sands; the Renmark Beds; the Murray Group; and the Pliocene (Parilla/ Loxton) Sands. The aquifers and confining beds have been named, for the purpose of this report, after the dominant geological unit. The aquifer systems have been defined on the basis of lithology and hydraulic characteristics and aquifer boundaries do not necessarily coincide with stratigraphic boundaries. The aquifer systems are described below and summarised in Table 1.

### Basement

The basement metasediments are considered to form an effectively impermeable base to the basin sediments. Core from Berri North No. 1 was tested and nil porosity and permeability were recorded (Laws and Heisler, 1967).

Wells 6830-07/08/09, located on the northwestern basement high (Fig. 4), probably intersected Adelaidean rocks. Groundwater of salinity 18 700 mg/I was recorded. The basement is confined by Pliocene clays and rises in water level were observed during drilling (APPENDIX C). Highly variable yields were recorded, ranging from 1 to 400 cubic metres/day.

(?) Devonian Sandstone

This unit probably forms the lowermost aquifer system within the Renmark Trough and Canegrass Lobe. Tests carried out on Tararra No. 1 gave permeabilities of up to 0.4 m/day and porosities up to 20.8%, with average values of $7.0 \times 10^{-3}$ m/day and 13.4% respectively (Boyd and Heisler, 1967). Permeabilities were particularly high in the top 500 metres of the sandstone. No other data is available.

Permian Confining Beds

The Permian sediments are mainly argillaceous and confine the underlying (?) Devonian Sandstone aquifer. Individual sand beds however, may have good aquifer properties. Sands intersected near the top of the unit in North Renmark No. 1, Berri North No. 1 and Monash No. 1 appear from electric logs to have good porosities.

A drill stem test indicated that the basal sand in Monash No. 1 had good permeability (Walter, 1965). Salt water was obtained from the formation and the water rose to an elevation of 8.8 metres above sea level. The water density was increased by mud contamination and it was considered that clean formation water would have been artesian.

The approximate outline and geometry of the top of the confining beds are shown on Fig. 5. Thickness is estimated as approximately 800 metres within the Renmark Trough and 300 metres in the Canegrass Lobe.

Basal Cretaceous Sand Aquifer

This aquifer system comprises the Lower Cretaceous Pyap Member plus the Lower Permian sands of Berri North No. 1.

The approximate outline and geometry of the upper surface is shown in Fig. 6. Average thickness is approximately 100 metres.

Drill stem and laboratory tests indicate that the medium to very coarse grained sands in Nadda No. 1 and Sunset No. 1 (in western Victoria) have good porosity and permeability (APPENDIX B). Test results from Berri North No. 1 were only approximate, as the tested interval had been "damaged" during drilling. The Berri North and Sunset wells yielded formation water of approximately 30 000 mg/I salinity.

Based on lithological similarity, the results from Sunset No. 1 can be extrapolated to the Berri North and Nadda No. 1 wells. Lower permeabilities may be expected at Berri South No. 1 and Monash No. 1, where the sands are essentially fine grained and argillaceous and probably at North Renmark No. 1, where the sands are mainly medium grained.

Cretaceous Confining Bed

The argillaceous Meretti and Coombool Members together form the Cretaceous Confining Bed above the basal Cretaceous aquifer. The geometry of the upper surface is shown on Fig. 7. This bed is both stratigraphically and lithologically distinct from the overlying arenaceous Renmark Beds. Average thickness of the confining bed is approximately 200 metres over the Paringa Embayment and Canegrass Lobe, and 300 metres in the Renmark Trough.

The only recorded hydaulic data is from Loxton No. 1 well, where water of salinity 4 760 mg/I was obtained from coarse sands near the top of the Coombool Member. The potentiometric level was 2.7 metres below sea level. The sands are separated from the overlying Renmark Beds up 50 metres of clay.

Renmark Beds Aquifer System

The top of this system is defined as the first recorded sands beneath the Ettrick Formation marls and upper lignitic clays of the Renmark Beds. The aquifer system can be subdivided into an upper argillaceous and a lower arenaceous part, roughly equivalent to the upper and lower Renmark Beds defined by Thornton. The aquifer surfaces proposed on Figs. 8 and 9 do not necessarily correspond with the stratigraphic boundaries.

Over most of the region, the two sub-systems are sufficiently distinct, lithologically and hydraulically, to warrant separate consideration.

1. <u>Lower Sub-system</u>

The Renmark Beds have only been completely penetrated by 12 wells, 9 of which are in the southeastern sector. Hence, data on the lower sub-system is limited.

The top is lithologically distinguished as the first appearance of clean sands beneath the upper clays, silts and clayey sands.

The sands are argillaceous in part, generally near the base, but also in the mid-portion at Berri North and South wells. The clay beds are estimated, from geological and geophysical logs, to generally occupy less than 10% of the total sub-system. The surface is broadly defined in the southeastern sector, but has been extrapolated elsewhere. Clean sands intersected at the base of the Canopus Nos. 1 and 2 wells and lower clayey sands in well 27W at Waikerie, are possibly part of the lower sub-system. Thickness is generally of the order 200 metres, but decreases to approximately 100 metres at Loxton Nos. 1 and 2 wells. The sands terminate against rising basement to the west of Waikerie and against faulted basement in the northwestern region.

Potentiometric levels and salinities have only been recorded in the Canopus Nos. 1 and 2, Waikerie 27W and Company wells. Salinities are of the order 9 000 - 12 000 mg/I, apart from Company Bore where an anomalously high value of 47 000 mg/I was recorded. This may have been a contaminated sample. Potentiometric levels were lowest at Waikerie 27W, indicating that hydraulic gradients and therefore groundwater movement, may be directed towards this area. However, this cannot be confirmed from the limited data available.

Groundwater is unlikely to be discharging from the sub-system at Waikerie, as the sands here terminate against low permeability basement and are overlain by approximately 100 metres of clays. Any upward leakage would be more likely in the region of Bungunnia Bore, where the overlying beds of the upper sub-system are arenacous and the confining clays of the Ettrick Formation only 10 metres thick. However, no hydraulic data is available to substantiate whether such discharge is actually taking place.

Lithological data is insufficient to permit other than a very general assessment of aquifer hydraulic characteristics. The sands are essentially medium to coarse grained in the southern-central region, fine grained at the Bungunnia, Company and Olney wells and fine to medium grained at Canopus Nos. 1 and 2 wells. This would indicate that hydraulic conductivities may decrease to the north and east.

2. Upper Sub-system

In the North Renmark, Monash, Olney, Company and Waikerie 27W wells, the sub-system is mainly lignitic clays or silts, with occasional thin sand beds. In these areas the two sub-systems are lithologically and hydraulically distinct. The lower sands in Waikerie 27W well had higher potentiometric levels and lower salinities than the sands of the upper sub-system.

In the Berri South, Berri North, Loxton Nos. 1 and 2 wells, the upper sub-system is more arenaceous, comprising upper clayey to silty sand and lower sandy to silty clays. The sands are estimated, from geological and geophysical logs, to occupy about 40-45% of the sub-system. Groundwater data was only available from Loxton No. 1 well, where the potentiometric level was below that for the lower sub-system. Salinities were similar. The two sub-systems are probably hydraulically less distinct, although permeabilities would still be significantly different.

The upper sub-system is absent at Nadda No. 1, where the top 30 metres of sandy clays form part of the confining beds. In Bungunnia Bore, the upper silty, fine to medium sands and the Buccleuch and upper Remark Beds are likely to have some hydraulic continuity.

In the northern region, most wells penetrated only 10 to 25 metres into the upper sub-system, which comprises mainly fine to coarse grained sands. The upper sequence appears to have been fully penetrated in the Canopus Nos. 1 and 2 wells, where the sediments comprise upper clays with thin sand beds, middle silty to clayey sands and lower clays. The middle clay sands are estimated ast45-55% of the upper sub-system.

In general, groundwater salinities of the upper sub-system are of the order 10 000 to 15 000 mg/I although values up to 23 000 mg/I were recorded in the clayey sequence at Waikerie 27W well. Lowest recorded salinity was 2 100 mg/I in Loxton No. 1 well. Potentiometric surface elevations in the Canopus No. 1, Loxton No. 1, Waikerie 27W and Triangle well (well no 7030-05) indicate that hydraulic gradients may be directed towards the Morgan-Waikerie area. This is supported by the generally higher groundwater salinities recorded in Waikerie 27W well.

Overall, it is evident that the upper sub-system would have lower horizontal and vertical hydraulic conductivities may be expected in the more arenaceous portions, at Bungunnia, Canopus, Loxton and Berri.

Lower Tertiary Confining Bed

The Renmark Beds Aquifer System is confined by the uppermost clays of the Renmark Beds and clays and marls of the Ettrick Formation. The confining bed is probably continuous over the entire region, although this cannot be definitely established as there are large areas where data is lacking. The top of the bed is shown on Fig. 10. Average thickness is approximately 20 metres. A maximum thickness of 65 metres was recorded at Monash No. 1 well and minimum thickness of 10 metres were recorded at Bungunnia and Olney wells.

Murray Group Aquifer System

This system comprises the Mannum Formation, Morgan Limestone and Pata Limestone. The sediments are continuous over the entire region, except for the northwest where they terminate against rising basement. In general, the aquifer is 120 to 150 metres thick to the east of the monocline through Overland Corner and 80 to 100 metres thick to the west. The aquifer surface is contoured on Figure 11. Surface configuration in the northern region is only approximate, as accurate well elevations are not available and lithological descriptions are generally poor.

The aquifer consists mainly of calcarenitic to sandy limestone, generally with good porosity and permeability.

Interbedded marls are particularly common throughout the sequence in the Olney Company, MC-66 and NR-1B wells. In general, the top 15 to 30 metres of the system is marly, although these upper marls are notably absent in the central region and in the area south of Morgan. In the northern region the sediments are mainly clay or marl, with interbedded limestone, although an upper marl and lower limestone sequence is still recognisable in the Canegrass (well no. 7030-04) and Oak Tank (7030-03) wells.

The Murray Group system is unconfined in the central and southwestern region, where the upper surface has been elevated above the water table. Elsewhere, the aquifer is depressed below the water table and confined by clays of the Bookpurnong Beds (or Pata Limestone equivalents in the north).

The hydraulic properties of the aquifer are not well known. The unconfined portion was tested in well 2 OC, at Overland Corner (Harris 1969), however the results have not yet been reported. Drainage and pump-in tests were made on wells at Waikerie and New Residence. Results of these tests are shown in Table 2, together with hydraulic conductivities measured at the Wanbie Experimental Station immediately south of the investigation area (Crawford and O'Driscoll, 1962).

In the northern region, hydraulic conductivities are expected to be low. Recorded well yields of the order 20 to 50 cubic metres/day tend to confirm this, although since usage is mainly for stock purposes, these values may not be a reliable indication of available aquifer yields. In the south, where limestones are dominant, permeabilities are generally moderate to high. Here, yields of 80 to 350 cubic metres/day are common, with some recorded up to 1 700 cubic metres/day. The uppermost marls have low hydraulic conductivities and are associated with drainage problems and the formation of perched groundwater bodies beneath the irrigation areas. In the unconfined portion of the aquifer these marls are depressed to the water table zone in the Waikerie-Cadell and New Residence - Overland Corner regions.

The upper marls exposed in cliffs at Waikerie contain numerous small solution features and cavities are reportedly common in wells in the Waikerie Irrigation Area (O'Driscoll, 1960). Such features would result in higher permeabilities than anticipated from lithological data. The extent of these solution features is not known, although sink holes are common in the southern central region, where the limestone is elevated to near surface, and may reflect the sub-surface nature of the aquifer.

Water Levels and salinities are contoured on Figs. 12 and 13. The 1946/47 and 1967/68 surveys showed very little difference in groundwater salinities, however significant water level differences were recorded between the two surveys. Accordingly, the water level contours south of the river have been compiled only from data collected during, or close to, the 1967/68 survey and from investigation drilling.

Most data relates to the unconfined portion of the aquifer. Apart from a small area south of Loxton, potentiometric levels of the confined part of the system have been estimated from sparse data. These contours, shown as "inferred" on Fig. 12, probably give a general trend for the system.

Groundwater movement is mainly towards the central riverine region between Waikerie and Loxton, from intake areas along the Basin margin to the north and northwest and from the central Victorian highlands to the southeast. West of the groundwater divide between Waikerie and Overland Corner (Fig. 12), hydraulic gradients essentially parallel the river and groundwater inflow between Waikerie and Morgan is probably small. A depressed water table zone is indicated south of Cadell where groundwater and river levels appear similar, although this cannot be definitely established from the limited data available.

Between Waikerie and Overland Corner, hydraulic gradients are relatively steep and directed towards the river. This reach is associated with the largest increase in river salinity (Till, Bleys and Kinnear, 1968), which can be attributed to inflows of saline groundwater from regions to the north and south. The aquifer here is elevated, forming a shallow anticline (Fig. 11), with which jointing may be associated. Such joints could facilitate groundwater inflow to the river.

In the upper River Murray region, the confined portion of the Murray Group system appears to discharge in a zone between Loxton and Overland Corner. Here the confining bed is thin and terminates against downwarped Murray Group limestones. The potentiometric surface in this region is only inferred from very limited data and cannot be regarded as accurate. However, this zone would be a logical discharge area for groundwater moving from the northeast and southeast, within the confined system.

Water levels of the Murray Group aquifer system are lower than potentiometric levels of the underlying Renmark Beds, except for well 27W at Waikerie, where subsurface drainage has resulted in locally higher heads for the limestone aquifer. Salinity differences indicate that the two systems are hydraulically separate.

Upper Tertiary Confining Bed

The eastern and northern portions of the Murray Group are confined by the Bookpuronong Beds or Pata Limestone equivalents in the north (Ludbrook, op cit.). The sediments comprise dark greenish grey to black, plastic clays and silts, grading in places to marls and very fine argillaceous, tight sands.

The confining bed is lithologically distinct in most areas, although the lower boundary is not always clearly defined in the northern region where the underlying Murray Group is particularly argillaceous. The bed appears to be continuous and extends across the northwestern margin of the Murray Group onto rising basement (Fig. 14). Thickness is generally of the order 40 to 60 metres in the north, 15 to 20 metres in the Loxton - Renmark area and 30 to 40 metres easterly.

Marked salinity and water level differences were recorded between groundwater in the confined portion of the Murray Group and in the overlying unconfined Pliocene sands (APPENDIX C). The water table is within portion of the confining bed southwest of Loxton and probably also north of Bungunnia Bore (Fig. 16).

Pliocene Sands Aquifer System

This system comprises all sands above the Upper Tertiary Confining Bed, or where this is absent, above the Murray Group. The Loxton and Parilla Sands are dominant in the eastern and southeastern portion, Norwest Bend Formation in the central and southwestern region and Loxton Sands in the north.

The Pliocene sands only contain groundwater in the eastern and northern portions. Elsewhere they are elevated above the water table, although locally, beneath the Waikerie and Cadell Irrigation Areas, the sands contain perched groundwater from irrigation drainage.

The water-bearing sands are generally fine to medium grained, but become mainly fine grained and silty to clayey towards Overland Corner and Loxton where lower hydraulic conductivities may be expected. Locally, in the Monash - Renmark, Nadda and Olney Bore regions, the sands are coarse grained to gravelly.

The aquifer has been discharge tested in the Noora (wells CTL7A, 9A and 10A), Paringa (well 3 Pr) and Chowilla (well PTQ19) areas. The hydraulic conductivity of sands in the Chowilla area was also separately measured by field and laboratory tests (Emerson, in Boucaut, 1967). The test results are included in APPENDIX B. All tests were made within the fine to medium grained portion of the aquifer and, apart from well no. CTL9A, the values are considered to be representative of this portion of the aquifer system. The results from well no. 3 Pr were considered to be unreliable (Williams, 1972) and have not been tabulated.

The configuration of the water table within the Pliocene sands is shown on Fig. 16, based on data from the 1967/68 well surveys and investigation drilling. Hydraulic gradients are directed towards the River Murray, which acts effectively as a groundwater drain. Saline seepage from above the Bookpurnong Beds, has been observed in the river cliffs downstream from Loxton (Roberts, 1968). In the Noora area, gradients are locally towards the proposed evaporation basin site, where the topography is depressed to within 1 metre of the water table and groundwater is subject to evaporation. Mounds beneath the irrigated areas have caused local variations in the regional flows.

The salinity of groundwater within the Pliocene sands is generally much higher than that in the Murray Group aquifer system. Values up to 93 000 mg/I were recorded in the Noora area (Fig. 17). The salinity distribution is consistent with the movement of groundwater towards the Berri-Barmera, Renmark and Noora areas.

The Pliocene sands are overlain in part by plastic clays of the Blanchetown Clay Formation. In the Chowilla region, the upper 1 metre of clay was estimated to have a hydraulic conductivity of 2.6 x $10^{-2}$ metres/day (Emerson, in Boucaut, 1967). Below this depth, the hydraulic conductivity was laboratory measured as 8.6 to 17.2 x $10^{-5}$ metres/day.

The low permeability of this clay could be expected to have some influence on recharge to, or discharge from, the Pliocene sands aquifer. The distribution and thickness of the Blanchetown clay was plotted on Fig. 18. Apart from the Noora area, where the absence of the clay permits evaporation from the near surface groundwater, there is no obvious correlation between the distribution of Blanchetown Clay and groundwater salinities.

SUMMARY

Five main aquifer systems are present in the northern Murray Basin in South Australia. The three Tertiary systems, viz; Pliocene Sands, Murray Group and Renmark Beds, are the most widespread and the only aquifers considered to have any hydrogeological importance in relation to the River Murray. These aquifers are separated from the Lower Cretaceous and (?) Devonian systems by up to 300 metres of confining clays and shales.

The Devonian sandstone is probably restricted to the deeper parts of the infrabasin and hydraulically separated from the other systems. This unit has not been positively identified in drill-holes and is only inferred on seismic evidence.

The basal Cretaceous aquifer (Pyap Member) has been encountered in 5 deep oil wells but only lithological data is available. Hydraulic characteristics have been extrapolated from Sunset No. 1 oil well in western Victoria. The aquifer contains saline water and is probably of little value as a resource. Preliminary computer modelling by the Engineering

and Water Supply Department, indicates that the sands should be suitable for disposal of brines from the evaporation of irrigation drainage water (Forth and Reed, 1978).

Throughout the region, very little groundwater data is available for the Renmark Beds aquifer system. Salinities are generally lower than in the overlying Murray Group aquifer, but measurements are too sparse to give any reliable indication of possible flow directions.

At the time of writing, accurate potentiometric levels were available from only seven wells, four of which were drilled during May-June, 1979. These indicate that hydraulic gradients are directed towards the Morgan-Bungunnia region, as concluded by Lawrence (1973) from computer simulation of the entire Murray Basin. Further drilling would be required to confirm the flow directions, to establish the hydraulic properties of the aquifer and the confining beds and to establish whether the system would have any value as a resource.

The Murray Group and Pliocene sands aquifers are better documented, although there are still large data gaps south of the river and over most of the northern region. The available data indicates that groundwater movement is principally towards the River Murray between Waikerie and Berri, where most salt inflow may be expected. Further drilling is required to confirm the postulated aquifer configurations and hydraulic gradients.

There is no apparent hydraulic connection between the Renmark Beds and the overlying Murray Group system. The potentiometric surface of the Renmark Beds system is above the water levels of the overlying systems and any leakage would therefore be upwards.

Hydraulic parameters have been measured for the Pliocene sands east of Overland Corner and for the Murray Group at

Waikerie and New Residence. Wells 27W and 28W at Waikerie were completed for testing of the Renmark Beds, however this has not yet been done.

## RECOMMENDATIONS

The regional hydrogeology of the northern Murray Basin, adjacent to the River Murray, is only partly defined. Further assessment will require investigation drilling and aquifer testing.

Initially, investigation should be directed towards better definition of hydraulic gradients, salinity distribution, configuration and properties of the Pliocene Sands and Murray Group aquifer systems. This data could then be used for optimum selection of aquifer test sites. The following programme is recommended.

1. Drilling to confirm postulated hydraulic gradients and salinity zones of the unconfined Murray Group aquifer in the Cadell - Morgan - Bungunnia region and in the Hundreds of Holder and Moorook.
2. General investigation drilling into both aquifer systems north of the river. As data in this area is sparse, drilling should be based, as far as practicable, on a large scale grid pattern.
3. Drilling of selected bores into the confined Murray Group east and northeast of Overland Corner.

All investigation bores should be completed for long term observation purposes.

As the last well surveys were in 1952/53 (northern region) and 1967/68 (southern region), this data should be upgraded to correlate with the proposed drilling. All previously drilled investigation wells should be located, checked and sampled. The elevation of well 1B in the Loveday Irrigation Area should be checked, as recorded water levels are anomalously low.

Levelling should be extended into the northern region to include all private wells with useful hydrogeological data. This is particularly important in order to establish preliminary hydraulic gradients and aquifer configuration of the Renmark Beds. Much data is potentially available from these existing wells, if accurately levelled.

Further investigation of the Renmark Beds should be directed towards determining whether hydraulic gradients are towards the Morgan-Bungunnia region, as postulated, and to determine whether there is any upward leakage to the Murray Group. Wells 27W and 28W were completed in 1969 for testing the Renmark Beds. If the wells are still in satisfactory condition, the testing should now be carried out. Aquifer parameters have not yet been measured for the Renmark Beds and by using existing wells the data could be obtained for minimum expenditure.

The hydrochemistry of the region has not been examined in any detail. It is therefore recommended that full chemical analyses be made on samples from all existing and proposed investigation wells and any suitable private wells. This would be useful in further assessment of groundwater movement both within and between the aquifer systems.

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# APPENDIX A

# SUMMARY OF GEOLOGY

# GEOLOGY

The South Australian portion of the northern Murray Basin contains up to 300 metres of Tertiary limestones and sands, above Early Cretaceous, Early Permian and probable Devonian sediments in the Renmark Trough and Canegrass Lobe infrabasins. A comprehensive description of the pre-Tertiary stratigraphy is contained in Thornton (1974). The Tertiary and younger stratigraphic units are described in O'Driscoll (1960), Ludbrook (1961) and Lindsay and Bonnett (1973).

The geology has been interpreted mainly from sub-surface data. Miocene and younger units are exposed in the River Murray cliffs, where the top of the Mannum Formation is the oldest unit to crop out. The main stratigraphic units are outlined below, in order of decreasing geological age and summarised in Table 1.

1. Basement

Slates and phyllites of probable Adelaidean age underlie the western margin of the Canegrass Lobe. Metagreywackes, slates and gneiss, tentatively identified as Cambrian Kanmantoo Group metasediments, were intersected in the Paringa Embayment. Rocks of the Willyama Complex may underlie the Canopus High, northwest of the Hamley Fault (Rogers, 1978).

2. (?) Devonian

Fine to coarse grained sandstone, with interbedded shale and siltstone, have been seismically interpreted in the axial zone of the Renmark Trough and in the Canegrass Lobe (Thornton, op. cit.). The presumed Devonian sandstone in Bungunnia Bore (Spence, 1958) can also be lithologically and geometrically correlated with the Renmark Beds and

Devonian sediments are probably restricted to the deeper portion of the Lobe.

3. Lower Permian

The sediments are mainly shale, mudstone and siltstone, with minor interbedded fine clayey sandstone. Fine to coarse grained argillaceous sandstone beds are prominent in North Renmark No. 1 and Monash No. 1.

The Lower Permian was intersected in the Paringa Embayment and has been seismically identified throughout the Renmark Trough and Canegrass Lobe (Thornton, op. ci.). Hard quartz sandstones intersected in wells CRC-1 and CRC-2, on the faulted northwestern margin of the Lobe, were considered from lithology and seismic properties to be of Permian age (Gould, 1975). However, Permian sediments were not identified in the nearby Bungunnia Bore and as there is no evidence of major upwarping east of the fault, the Permian is considered to be much deeper than proposed.

4. Lower Cretaceous

The Lower Cretaceous Monash Formation extends over the entire infrabasin and possibly continues northeasterly into the Great Artesian Basin (Lawrence, 1975). The formation comprises 3 members, described below in order of decreasing geological age.

(i) Pyap Member

A generally well sorted quartzose sandstone, conglomeratic in places and with minor interbedded shale and clay. The unit was only intersected on the edge of the

Renmark Trough and in the basement valleys of the Paringa Embayment. The sands are medium to very coarse grained in the Nadda and Berri North wells, medium grained at North Renmark, and fine grained and argillaceous at Monash No. 1.

(ii) Meretti Member

The sediments are mainly glauconitic shales and clays, with minor interbedded siltstone and fine, argillaceous sandstone.

(iii) Coombool Member

Mainly plastic, silty clays, with minor argillaceous fine sandstone beds near the base. The sediments become more arenaceous towards the Renmark Trough.

5. Tertiary

The lower Cretaceous is blanketed by non-marine and marine Tertiary sands and limestone. The sequence is everywhere complete, except in the northwest, where Pliocene sediments overlie basement. Thickness is generally of the order 400-500 metres.

The units are summarised below in order of decreasing geological age.

(i) Renmark Beds

Based on lithology and electric log characteristics, the unit is subdivided into the dominantly arenaceous lower Renmark Beds and the more argillaceous, silty and carbonaceous upper Renmark Beds (Thornton, op. cit.).

Lower Renmark Beds

Unconsolidated, generally clear, fine to coarse grained quartz sands, with minor thin clay and lignite beds. Clays are common in the middle of the sequence at Berri North and South wells and in the basal sands at North Renmark, Loxton No. 1 and Berri North wells. The basal 75 metres of Monash No. 1 are argillaceous. The beds terminate against rising basement west of Waikerie (Fig. 8).

Upper Renmark Beds

These vary from lignitic and pyritic silts and clays, to silty and clayey sands. The latter are prominent in the Berri North, Berri South, Loxton Nos. 1 and 2 and Bungunnia wells. They are distinguished from the underlying lower Renmark Beds by the higher fines content.

The sequence is generally between 80 and 100 metres thick, with a maximum thickness of 150 metres in North Renmark No. 1.

(ii) Buccleuch Beds

These were identified at Waikerie, where the sequence is 60 metres thick and comprises fine to coarse grained fossiliferous silty and clayey quartz sand (Lindsay and Bonnett, 1973).

The extent of the unit is not known. In Bungunnia Bore, fossiliferous sands below the Ettrick Formation are probable Buccleuch Beds.

(iii) Ettrick Formation

The Ettrick Formation is generally about 20-40 metres thick and consists mainly of glauconitic clays and marls, grading in part to marly limestone and sandy marl. In places the upper boundary is gradational and the unit is difficult to distinguish lithologically from the overlying Mannum Formation.

(iv) Mannum Formation, Morgan Limestone

Lithologically the two units are very similar. They can be distinguished in cliff exposures, but subsurface differentiation relies on palaeontological interpretation.

Generally, the Mannum Formation comprises bryozoal and sandy limestone, with subordinate marl. The overlying Morgan Limestone is usally more argillaceous, comprising interbedded marl, limestone and marly limestone.

In the northern region, stratigraphic interpretation is difficult due to paucity of reliable data.

The sequence has been palaeontologically identified in Canopus No. 1 (Ludbrook, 1961), but elsewhere identification is based on lithological extrapolation. In this region the sequence comprises mainly marls and clays, with hard limestone bands.

In the southern region, the units have a uniform thickness of between 100 and 120 metres. North of the river the sequence appears to be about 60-80 metres thick. Between Waikerie and Overland Corner, the Morgan Limestone forms the river cliffs above normal pool level, but is depressed below river level east of Overland Corner.

(v) Pata Limestone

The Pata Limestone comprises argillaceous to sandy glauconitic marl and limestone, with minor - interbedded sandstone and siltstone. The sediments are lithologically indistinguishable from the -

underlying Morgan Limestone and differentiation relies on palaeontological evidence.
Main development is east of Overland Corner, where the average thickness is between 15 and 20 metres.
Black clays in Canopus No. 1 have been identified as Pata Limestone equivalents (Ludbrook, op. cit.).
Sandy and shelly limestone at the base of CRC-1 and CRC-2 bores have been tentatively identified as Pata Limestone (Gould, 1975).
Due to their lithological similarity, the Pata Limestone, Morgan Limestone and Mannum Formation are referred to as the Murray Group.

(vi) Bookpurnong Beds

These comprise dark coloured, carbonaceous and glauconitic clays, silts, marls and fine sands, restricted in occurrence to the northern and eastern portions of the region. Between Overland Corner and Loxton, the beds underlie the river and are exposed at pool level at Pyap Lagoon and Great Pyap Bend (Ludbrook, op. cit). Elsewhere they are restricted to the sub-surface.
In the northwestern region, dark grey silts and marls intersected in CRC-1 and CRC-2 wells, have been palaeontologically identified as Bookpurnong Beds (Gould, op. cit.) and can be lithologically correlated with silts and marls in bores, Minad PV-2, 3 and 4 to the west.
In private wells south of Loxton, dark grey and black plastic clays and marls intersected above the Morgan Limestone, are inferred to belong to the Bookpurnong Beds.

(vii) Loxton Sands

These are fine to coarse grained and generally clayey to silty, particularly near the base. The unit is thickest and best developed east of Overland Corner. To the west, Loxton sands directly overlie Morgan Limestone.

(viii) Parilla Sand/Norwest Bend Formation

The Parilla Sand is a micaceous, fine to medium grained, clayey quartz sand, widespread in the eastern part of the basin, where it forms the main exposure in river cliffs upstream from Lock 4. The unit overlies the Loxton Sand and is equivalent in part to the calcareous sands and sandy limestone of the Norwest Bend Formation, which is dominant in the western region.

6. Quaternary

(ix) Blanchetown Clay

Clays and sandy clays of the Late Cainozoic Blanchetown Clay extend from Morgan to beyond the New South Wales - Victorian border (Fig. 18). The clays are discontinous, generally absent in topographic lows and of maximum thickness under topographic highs. They are commonly overlain by Bungunnia Limestone or calcrete.

# APPENDIX B

## Summary of Aquifer Test Results

TABLE 2

SUMMARY OF AQUIFER TEST RESULTS

| AQUIFER SYSTEM | TEST WELL NO. | SATURATED AQUIFER THICKNESS (m) | THICKNESS PENETRATED (m) | AQUIFER TYPE | TEST RESULTS TRANSMISSIVITY ($m^2$/day) | HYDRAULIC CONDUCTIVITY (m/day) | STORAGE COEFFICIENT | POROSITY % | TYPE OF TEST | REPORT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|
| Basement | Berri Nth No. 1 | - | - | - | - | Nil | - | 0 | Laboratory | Laws & Heisler, 1967 |
| Basal Cretaceous Sand | Sunset No. 1 | 51 | 51 | Confined | - | 1.5 | - | 38 | Laboratory | Derrington & Anderson, 1970 |
| | Nadda No. 1 | 73 | 73 | Confined | - | - | - | 26 | Laboratory | Derrington & Anderson, 1970 |
| Cretaceous Confining Bed | Berri Nth No. 1 | - | - | - | - | $4\text{-}240 \times 10^{-4}$ | - | 35 - 41 | Laboratory | Laws & Heisler, 1967 |
| Lower Renmark Beds | Sunset No. 1 | - | - | Confined | - | - | - | 26 | Laboratory | Derrington & Anderson, 1970 |
| Murray Group | New Residence NR1B | 140 | 73 | Unconfined | 58 | - | $2.5 \times 10^{-3}$ | - | Drainage | Cramsie, 1967a |
| | Waikerie - W2 | 105 | 105 | Unconfined | 100 - 150 | - | - | - | Pump-out | Cramsie, 1967b |
| | W14 | 90 | 39 | Unconfined | 240 - 480 | - | - | - | Drainage | Cramsie, 1967b |
| | W23 | 90 | 85 | Unconfined | 5 - 80 | - | - | - | Drainage | Cramsie, 1967b |
| | W27 | 106 | 106 | Unconfined | 160 - 800 | - | $1.3\text{-}7.8 \times 10^{-3}$ | - | Drainage | Roberts, 1970 |
| | W28 | 106 | 106 | Unconfined | 20 - 300 | - | - | - | Drainage | Roberts, 1970 |
| | S1A | 90 | | Unconfined | 5 - 8 | - | - | - | Drainage | Cramsie, 1967b |
| | S29 | 90 | 110 | Unconfined | 5 | - | - | - | Drainage | Cramsie, 1967b |
| | R25 | 90 | 56 | | 5 - 8 | - | | | | |
| | Wanbi Exp. Station | 67 | 67 | Unconfined | - | 8 | - | 40 - 45 | Pump-out | Crawford & O'Driscoll, 1962 |
| Pliocene Sands | Noora - CTL 7A | 30 | 30 | Unconfined | 100 - 130 | - | - | - | Pump-out | Williams, 1976 |
| | CTL 9A | 23 | 23 | Unconfined | 6 - 18 | - | $1.5 \times 10^{-2}$ | - | Pump-out | Williams, 1976 |
| | CTL 10A | 33 | 33 | Unconfined | 75 - 101 | - | $1.3 \times 10^{-3}$ | - | Pump-out | Williams, 1976 |
| | Chowilla PTQ 19 | - | - | Unconfined | 108 (ave.) | 4.3 | $1.2 \times 10^{-2}$ | - | Pump-out | Boucaut, 1967 |

# APPENDIX C

## Summary of Private Well Data

* See end of table for symbol code

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD (m3/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | HD. BOOKPURNONG | | | | | | | |
| P1 | 3A-01 | 58 (M) | 70.1 | - | 42.7 | 10 | 2 359 | 1946 | 22/6557 | | Murray Group | | C | - |
| | | | | | 39.6 | | 2 415 | 1967 | - | A | | | | |
| P2 | -02 | 58 (M) | 68.6 | 63.4 | 44.2 | 43 | 3 031 | 1963 | - | | Murray Group | | C | |
| | | | | | - | | 3 100 | 1967 | - | S | | | | |
| P3 | 4E-01 | 44.8 | 58.5 | - | - | | upper saline water recorded | | | | | | | |
| | | | | - | 25.9 | 10 | 2 900 | 1967 | 22/6428 | A | Murray Group | | C | |
| P4 | 4F-02 | 50 (M) | 57.9 | - | - | 10 | 2 416 | 1946 | 22/6556 | | Murray Group | | C | |
| | | | | | - | | 2 485 | 1968 | - | B | | | | |
| P5 | 4G-03 | 53.1 | 40.3 | 39.0 | 35.1 | 13+ | 4 504 | 1948 | - | | Pliocene Sands | 0-39 | U | 0-24 sand - yel. & red |
| | | | | 60.1 | 35.1 | | 6 506 | 1948 | 27/7844 | | Confining Bed | 39-60 | | 24-39 sand - fine, calc., yel. |
| | | | | | - | | 3 245, | 1967 | - | U | Murray Group | 60-71 | C | 39-55 sandy clay - grey, shelly |
| | | | | | 33.7 | | - | 1968 | - | | | | | 55-60 clay - blue, sticky |
| | | | | | | | | | | | | | | 60-71 limestone - grey, bryozoal |
| P6 | -04 | 50 (M) | 100.5 | - | - | | upper saline water recorded | | | | | | | 0-71 no record |
| | | | | 87.5 | 39.6 | 13+ | 3 905 | 1948 | 27/7949 | | | | | 71-88 grey clay with coral & shells |
| | | | | | - | | 2 615 | 1967 | - | S | Murray Group | | C | 88-100 coral and shells |
| P7 | 4K-06 | 47.6 | 67.0 | 27 | - | | upper saline water recorded | | | | | | | |
| | | | | 61 | - | - | 3 303 | 1947 | 23/6691 | A | Murray Group | | C | |
| P8 | -07 | 50 (M) | 67.0 | 27 | - | | bitter | - | - | | Pliocene Sands | | U | |
| | | | | 67 | 27.4 | - | 6 391 | 1947 | 23/6692 | | Murray Group | | C | |
| | | | | | 29.3 | | 6 455 | 1968 | - | S | | | | |
| | -08 | 47.6 | - | - | - | | 3 385 | 1967 | - | | Murray Group | | C | NB - well located 10 m from well 4K-06 |
| | | | | | 26.9 | - | - | 1968 | - | S | | | | |
| P9 | 5B1-02 | 30 (M) | 62.5 | 57.9 | 11.6 | 100 | 5 100 | 1976 | - | U | Murray Group | | C | |
| P10 | 7-01 | 41.9 | 76.2 | 32.3 | 27.4 | 110 | - | 1946 | | | Pliocene Sands | 0-28 | U | 0- 6 red clay |
| | | | | 55.5 | 27.4 | 340 | 5 720 | 1946 | 18/5339 | | Confining Bed | 28-32 | | 6-15 cse. sand |
| | | | | | 24.6 | | 2 900 | 1967 | | | Murray Group | 32-76 | C | 15-24 sandy clay - yel., grey |
| | | | | | 24.6 | | 2 685 | 1968 | | S&D | | | | 24-28 sandstone - yel., calc. |
| | | | | | | | | | | | | | | 28-32 sandy clay - grey, shelly |
| | | | | | | | | | | | | | | 32-42 sand - grey, shelly |
| | | | | | | | | | | | | | | 42-51 limestone - shelly, hard |
| | | | | | | | | | | | | | | 51-55 clay - grey |
| | | | | | | | | | | | | | | 55-76 limestone - clayey |
| P11 | 17B1-01 | 33.4 | 48.8 | - | - | 10 | 3 103 | 1946 | 22/6561 | A | Murray Group | | C | |
| P12 | 17B2-01 | 60-65(M) | 63.1 | - | - | - | 4 915 | 1967 | - | C | Murray Group | | C | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 29.0 | | 5 915 | 1967 | - | | Murray Group | | C | |
| | | | | | 29.0 | | 6 215 | 1968 | - | A | | | | |
| P14 | 17C-01 | 50 (M) | 85.4 | 38.1 | - | - | 11 699 | 1954 | W290/54 | | Pliocene Sands | 24-59 | U | 0-24 clay & sand layers |
| | | | | 81.4 | - | | 12 370 | 1972 | | S | Confining Bed | 59-80 | | 24-31 yel. rock & sand layers |
| | | | | | | | | | | | Murray Group | 80-85 | C | 31-40 sand - yel., cse. |
| | | | | | | | | | | | | | | 40-59 sand - black, fine - cse. |
| | | | | | | | | | | | | | | 59-73 silt & clay (layers very fine sand) |
| | | | | | | | | | | | | | | 73-80 clay - black, hard |
| | | | | | | | | | | | | | | 80-85 coral & sand (fine) |
| P15 | 22-01 | 60 (M) | 88.4 | - | 43.9 | - | 2 745 | 1946 | 22/6565 | C | Murray Group | | C | |
| P16 | 23-01 | 60 (M) | 94.1 | - | - | | 2 830 | 1946 | 22/6562 | A | Murray Group | | C | |
| P17 | 24-01 | 35-40(M) | 42.7 | - | 24.0 | | 2 931 | 1946 | 22/6431 | A(1953) | Murray Group | | C | |
| P18 | 25-01 | 42.4 | 54.3 | - | - | | 3 074 | 1946 | 22/6430 | A(1958) | Murray Group | | C | |
| | | | | | - | | 3 245 | 1967 | | | | | | |
| | | | | | 23.3 | | 3 030 | 1968 | - | | | | | |
| P19 | 60-01 | 65 (M) | 48.8 | - | 36.0 | 25 | 7 150 | 1946 | 22/6432 | A | Pliocene Sands | | C | |
| P20 | -02 | 54.2 | 71.7 | 38.1 | 33.5 | - | 6 720 | 1954 | - | | | | | 0- 2 limestone rubble |
| | | | | 65.6 | 36.3 | 25 | 2 500 | 1954 | 2166/54 | U | Pliocene Sands | 5-43 | U | 2- 5 yel. sandy marl |
| | | | | | 33.9 | | 2 155 | 1968 | - | | Confining Bed | 43-67 | | 5-21 very sandy clay |
| | | | | | | | | | | | Murray Group | 67-71 | C | 21-37 sand - yel., fine - cse. |
| | | | | | | | | | | | | | | 37-43 sand - grey, calc., very fine |
| | | | | | | | | | | | | | | 43-67 very fine sandy marl - grey |
| | | | | | | | | | | | | | | 67-71 clayey limestone |
| P21 | -03 | 50-55(M) | 80.8 | 24.4 | - | - | - | - | - | U | | | | 0- 5 limestone |
| | | | | 45.7 | - | | - | - | - | | | | | 5- 9 clay |
| | | | | 67.1 | - | - | 9 500 | 1967 | - | | Pliocene Sands | 9-58 | U | 9-21 sand |
| | | | | | | | 9 170 | 1968 | - | | Confining Bed | 58-69 | | 21-23 yellow clay |
| | | | | | | | | | | | Murray Group | 69-81 | C | 23-26 white marl |
| | | | | | | | | | | | | | | 26-58 sand - black |
| | | | | | | | | | | | | | | 58-69 black mud - shelly |
| | | | | | | | | | | | | | | 69-79 coral & clay |
| | | | | | | | | | | | | | | 79-81 black clay |
| P22 | 61-01 | 35 (M) | 57.0 | 15.9 | - | | salt | - | - | | | | | 0- 9 red clay & sand |
| | | | | 39.6 | - | | salt | - | - | | Pliocene Sands | 9-32 | U | 9-32 sand (fine-cse) |
| | | | | 51.8 | 44.8 | 10 | 3 031 | 1946 | 22/6426 | A | Confining Bed | 32-51 | | 32-51 blue clay |
| | | | | | | | | | | | Murray Group | 51-57 | C | 51-57 shell grit |
| | | | | | | | | | | | | | | 56-57 blue clay |
| P23 | 90-01 | 50.6 | 76.2 | - | - | | - | 1946 | - | | | | | |
| | | | | | 30.5 | 10 | 6 215 | 1967 | - | S | Murray Group | | C | |
| | | | | | 32.7 | | 5 845 | 1968 | - | | | | | |
| P24 | 93-01 | 40 (M) | 61.0 | - | 24.4 | 10 | 3 417 | 1946 | 22/6424 | S | Murray Group | | C | |
| | | | | | 21.3 | | 3 730 | 1965 | - | | | | | |
| | | | | | - | | 3 600 | 1967 | - | | | | | |
| P25 | 101-01 | 40 (M) | 62.8 | - | 21.3 | 1- | 2 475 | 1946 | 22/6544 | | Murray Group | | C | |
| | | | | | - | | 2 575 | 1947 | - | | | | | |
| | | | | | - | | 2 970 | 1965 | - | | | | | |
| | | | | | - | | 2 485 | 1967 | - | - | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIE[illegible] (m3/d) | [illegible]ALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPT[illegible] (m) | [illegible]PE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P26 | 120-01 | 53.7 | 60.0 | | - | 10 | 5 090 | 1946 | 22/6429 | | Murray Group | | C | |
| | | | | | 34.0 | | 4 215 | 1967 | - | | | | | |
| | | | | | - | | 3 655 | 1970 | - | S | | | | |
| P27 | 143-01 | 47.0 | 76.2 | - | - | | 4 976 | 1946 | 18/5205 | | Murray Group | | C | |
| | | | | | - | | 5 070 | 1967 | - | | | | | |
| | | | | | 28.5 | | 6 370 | 1968 | - | S | | | | |
| P28 | 145-01 | 58.1 | 76.9 | - | 30.5 | 10 | 3 589 | 1946 | 22/6425 | | Murray Group | | C | |
| | | | | | - | | 3 730 | 1967 | - | | | | | |
| | | | | | 40.4 | | 3 600 | 1968 | - | S | | | | |
| P29 | 146-01 | 50 (M) | 67.4 | - | 21.3 | 10 | - | 1946 | - | | Murray Group | | C | |
| | | | | | - | | 3 870 | 1967 | - | S | | | | |
| P30 | 171-01 | 49.3 | 79.3 | 33.5 | 27.4 | 110 | 4 361 | 1946 | - | | Murray Group | | C | |
| | | | | | 27.1 | | 3 245 | 1966 | - | | | | | |
| | | | | | 32.8 | | 3 520 | 1967 | - | | | | | |
| | | | | | 33.4 | | 3 100 | 1968 | - | S | | | | |
| P31 | 212-01 | 45-45(M) | 54.9 | - | 45.7 | 10 | - | 1946 | - | S | Murray Group | | C | |
| | | | | | - | | 8 370 | 1967 | - | | | | | |
| P32 | 219-01 | 40 (M) | 57.9 | - | 30.5 | 10 | 4 904 | 1946 | 22/6560 | A | Murray Group | | C | |
| P33 | 238-01 | 43 (M) | 61.0 | - | - | 10 | 2 575 | 1946 | 22/6563 | | Murray Group | | C | |
| | | | | | | | 2 755 | 1967 | - | S | | | | |
| P34 | 760-01 | 32.1 | 42.7 | 19.5 | - | - | salt | - | - | Dr | Pliocene Sands | 5-20 | U | 0- 5 red clay |
| | | | | | | | | | | | Confining Bed | 20-36 | | 5- 8 red clayey sand |
| | | | | | | | | | | | Murray Group | 36-43 | C | 8-20 yel. sand - fine to med. |
| | | | | | | | | | | | | | | 20-36 grey/green clay - sand, shelly |
| | | | | | | | | | | | | | | 36-43 grey limestone |
| P35 | 771-01 | 29.9 | 41.2 | - | - | - | - | - | - | Dr | Pliocene Sands | 6-17 | U | 0- 6 red sandy clay |
| | | | | | | | | | | | Confining Bed | 17-38 | | 6-17 yel. & red sands - med to cse |
| | | | | | | | | | | | Murray Group | 38-41 | C | 17-38 grey clay and sand - shelly |
| | | | | | | | | | | | | | | 38-41 grey sandy limestone |
| P36 | 708-125 | 40 (M) | 29.3 | 24.4 | 22.2 | - | 16 444 | 1959 | - | Dr | Pliocene Sands | 7-24 | U | 0- 7 red clay/calcrete |
| | | | | | | | | | | | Confining Bed | 24-29+ | | 7-20 sand (fine - med) |
| | | | | | | | | | | | | | | 20-24 yel. sandy clay |
| | | | | | | | | | | | | | | 24-29 sandy marl - shelly |
| P37 | 714-87 | 35.9 | 28.3 | 25.6 | 22.9 | - | 1 973 | 1959 | 113/729 | Dr | Pliocene Sands | 2-27 | U | 0- 2 red clay/calcrete |
| | | | | | | | | | | | Confining Bed | 27-28+ | | 2-27 sand (fine - cse) |
| | | | | | | | | | | | | | | 27-28 very fine sandy clay |
| P38 | 738-91 | 35.6 | 26.8 | 22.2 | 19.8 | - | 17 160 | 1958 | - | Dr | Pliocene Sands | 7-23 | U | 0- 3 marl |
| | | | | | | | | | | | Confining Bed | 23-27+ | | 7-23 yel. sand (fine - cse) |
| | | | | | | | | | | | | | | 23-27 blue clay |
| P39 | 739-76 | 40 (M) | 21.6 | 19.8 | 17.1 | - | 31 546 | 1958 | 103/[illegible] | [illegible] | Pliocene Sands | 8-20 | U | 0- 8 clay/calcrete |
| | | | | | | | | | | | [illegible]fining Bed | 20-22+ | | 8-20 yel. sand (fine - cse) |
| | | | | | | | | | | | | | | 20-22 silty marl - green/grey |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P39 | 739-76 | 40 (M) | 21.6 | 19.8 | 17.1 | - | 31 546 | 1958 | 108/1320 | Dr | Pliocene Sands | 8-20 | U | 0- 8 clay/calcrete |
| | | | | | | | | | | | Confining Bed | 20-22+ | | 8-20 yel. sand (fine - cse) |
| | | | | | | | | | | | | | | 20-22 silty marl - green/grey |
| | | | | | | | HD. CADELL | | | | | | | |
| P40 | 1-01 | 31.1 | 30.5 | - | 28.0 | | 7 807 | 1946 | | | Murray Group | | U | |
| | | | | | 27.6 | | - | 1966 | | | | | | |
| | | | | | 27.6 | | 10 630 | 1967 | | | | | | |
| P41 | 5-01 | 27.7 | 27.4 | - | 24.9 | | 745 | 1967 | | | Murray Group | | U | |
| P42 | 224-01 | 32.9 | 31.7 | 30.5 | 29.6 | | 6 034 | 1946 | | | Murray Group | | U | |
| | | | | | 30.6 | | 4 555 | 1967 | | | | | | |
| P43 | 305-01 | 32.6 | | | 29.2 | | | 1967 | | | Murray Group | | U | |
| | | | | | | | HD. GORDON | | | | | | | |
| P44 | 353-04 | 36.7 | 45.4 | - | 6.1 | - | - | 1958 | - | | Pliocene Sands | 6-22 | U | 0- 6 clay |
| | | | | | | | | | | | Confining Bed | 22-38 | | 6-22 fine sand |
| | | | | | | | | | | | Murray Group | 38-48 | C | 22-24 silt - shelly, green grey |
| | | | | | | | | | | | | | | 24-38 sandy marl - grey, shelly |
| | | | | | | | | | | | | | | 38-48 grey sandy marl - shelly |
| P45 | 377-01 | 35.5 | 90.0 | 39.6 | 13.1 | - | 11 611 | 1955 | 88/1812/55 | Dr | Pliocene Sands | 7-23 | U | 0- 7 clay |
| | | | | | | | | | | | Confining Bed | 23-38 | | 7-23 sand - yel., calc., fine - cse |
| | | | | | | | | | | | Murray Group | 38-90 | C | 23-32 silty, sandy marl |
| | | | | | | | | | | | | | | 32-36 silty sand |
| | | | | | | | | | | | | | | 36-38 marl - green grey, glaucon |
| | | | | | | | | | | | | | | 38-56 limestone |
| | | | | | | | | | | | | | | 56-60 green grey sandy marl |
| | | | | | | | | | | | | | | 60-90 grey marly limestone |
| P46 | 379-05 | 36.4 | 56.9 | 19.8 | | - | | | | Dr | Pliocene Sands | 7-28 | U | 0- 7 sandy clay & clay |
| | | | | 41.2 | 19.8 | | 17 160+ | 1959 | - | | Confining Bed | 28-46 | | 7-28 yel. fine - cse sand |
| | | | | | | | | | | | Murray Group | 46-57 | C | 28-43 dark grey sandy clay |
| | | | | | | | | | | | | | | 43-46 grey brown marl |
| | | | | | | | | | | | | | | 46-57 marly limestone |
| P47 | 396-01 | 26.8 | - | - | - | - | | | | Dr | Pliocene Sands | 11-36 | U | 0- 6 clay |
| | | | | | | | | | | | Murray Group | 36-38 | C | 6-11 sand and clay |
| | | | | | | | | | | | | | | 11-36 fine clayey sand - yel. grey |
| | | | | | | | | | | | | | | 36-38 grey sandy limestone |
| P48 | 439-15 | 31.4 | - | - | - | - | | | | | Pliocene Sands | 6-20 | U | 0- 6 sandy clay |
| | | | | | | | | | | | Confining Bed | 20-43 | | 6-20 sand - fine - cse, shelly |
| | | | | | | | | | | | Murray Group | 43-76 | C | 20-43 fine sandy clay |
| | | | | | | | | | | | | | | 43-76 shelly limestone |
| P49 | 478-22 | 40 (M) | 64 | | | - | 38 610 | | | Dr | Pliocene Sands | 0-29 | U | 0-29 sand - fine - cse |
| | | | | | | | | | | | Confining Bed | 29-49 | | 29-49 silty, sandy marl |
| | | | | | | | | | | | Murray Group | 49-64 | C | 49-51 clayey grit - yel. grey |
| | | | | | | | | | | | | | | 51-52 grey cse marly sand |
| | | | | | | | | | | | | | | 52-60 rubbly limestone & marl |
| | | | | | | | | | | | | | | 60-64 grey marl |
| | | | | | | | HD. HOLDER | | | | | | | |
| P50 | 1-01 | 64.2 | 63.1 | 59.2 | 59.8 | 10 | 5 849 | 1946 | 22/6546 | | Murray Group | | U | |
| | | | | | - | | 5 915 | 1967 | - | S | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD (m³/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P51 | -02 | 64.4 | 61.0 | 54.0 | 52.5<br>- | 25 | 5 920<br>5 744 | 1954<br>1967 | 81/2170<br>- | S | Murray Group | 11-61 | U | 0- 2 calcrete<br>2-11 red brown sandy marl<br>11-20 yel. grey sandy marl<br>20-61 yel. limestone |
| P52 | 2-01 | 60 (M) | 57.9 | - | 54.5<br>53.7 | 10 | 6 020<br>7 585 | 1946<br>1967 | 20/5758<br>- | S | Murray Group | | | |
| P53 | 3-01 | 64.5 | 58 | - | 52.5 | - | 5 915 | 1967 | - | S | Murray Group | 2-58 | U | 0- 2 earth & clay<br>2-58 cliff rock |
| P54 | 5-01 | 60 (M) | 64.7 | 59.5 | 59.5 | - | 5 600 | 1967 | | A | Murray Group | | U | |
| P55 | 6-01 | 63.1 | 57.3 | 54.9 | 54.8 | - | - | - | - | B | Murray Group | 18-57 | U | 0-18 earth & clay<br>18-57 cliff rock |
| P56 | 14-01 | 70 (M) | 54.9 | - | 50.5<br>- | 10 | 7 193<br>11 430 | 1946<br>1967 | 23/6646<br>- | - | Murray Group | | U | |
| P57 | 15-01 | 60 (M) | 57.0 | - | 54.5<br>- | 10 | 5 705<br>15 000+ | 1948<br>1967 | 23/6643<br>- | S | Murray Group | | U | |
| P58 | 16-01 | 57.3 | 50.3 | - | 45.1<br>44.5 | 10 | 2 460<br>- | 1946<br>1967 | 20/5760<br>- | - | Murray Group | | U | |
| P59 | 17-01 | 65 (M) | 57.9 | - | 53.1 | 10 | 1 707 | 1967 | 26/7754 | - | Murray Group | | U | |
| P60 | 24S-01 | 59 (M) | - | - | - | - | 7 436 | 1946 | - | S<br>A(1966) | Murray Group | | U | |
| P61 | 25-01 | 55.3 | 53.7 | - | 45.4 | 10 | 8 694 | 1946 | 20/5757 | A(1967) | Murray Group | | U | |
| P62 | -02 | 59.8 | 53.4 | - | 48.8<br>47.9 | 10 | 9 680<br>- | 1946<br>1967 | 23/6642<br>- | S<br>A(1967) | Murray Group | | U | |
| P63 | -03 | 63.6 | 52.1+ | - | 52.5 | - | 9 000 | 1967 | - | A | Murray Group | | U | |
| P64 | -04 | 58.2 | 48.2+ | - | 48.4 | - | 9 960 | 1967 | - | A | Murray Group | | U | |
| P65 | 59-01 | 68 (M) | 62.5 | 54.9 | 54.9 | 10 | 4 647 | 1946 | 22/6547 | - | Murray Group | | U | |
| P66 | 258-01 | 70 (M) | 57.0 | 54.9 | 54.9 | - | - | - | - | A(1967) | Murray Group | 12-57 | U | 0-12 earth & clay<br>12-57 cliff rock |
| P67 | 264-01 | 61.4 | 54.9 | - | 51.2<br>49.1 | 10 | 5 645<br>8 445 | 1946<br>1967 | 23/6647<br>- | S | Murray Group | | U | |
| P68 | 265-01 | 65 (M) | 55.8+ | - | -<br>56.0 | - | 6 200<br>7 000 | 1946<br>1967 | -<br>- | S&D | Murray Group | | U | |
| P69 | -02 | 64.7 | 61.0 | - | 54.9<br>54.9 | - | 5 320<br>5 600 | 1946<br>1967 | 23/6645<br>- | S | Murray Group | | U | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P70 | 297-01 | 65.6 | 61.0 | - | 54.8 | 10 | 13 655 | 1957 | - | - | Murray Group | | U | |
| P71 | 334-01 | 60.5 | - | - | 48.6 | - | 8 200 | 1967 | - | S | Murray Group | | U | |
| P72 | 332-01 | | 45.7 | - | - | - | 9 570 | 1967 | - | S | Murray Group | | U | |
| | | | | | | | HD. MARKARANKA | | | | | | | |
| P73 | 100-01 | 40 (M) | 115.8 | 29.0 | 0 | 0 | 21 000 | 1974 | - | - | Murray Group | 29-116 | U | 0-29 clay |
| | | | | | | | | | | | | | | 29-116 coral |
| | | | | | | | HD. MOOROOK | | | | | | | |
| P74 | 323-01 (Verco Bore) | 65 (M) | 152.7 | - | 41.5 | - | 18 789 | 1967 | - | A | | | | |
| | | | | | | | HD. POOGINOOK | | | | | | | |
| P75 | 8-01 | 50 (M) | 259.0 | - | - | - | 11 280 | 1953 | 13/3808 | | Renmark Beds (upper) | | C | |
| | | | | | | | 9 309 | 1958 | 13/3809 | A(1967) | | | | |
| P76 | 11-01 | 60 (M) | 51.8 | 45.7 | 39.6 | - | 20 320 | 1952 | - | S B(1967) | Murray Group | | U | |
| | | | | | | | HD. PYAP | | | | | | | |
| P77 | 1C-01 | 50 (M) | 64.4 | 57.9 | 39.6 | 10 | 3 646 | 1946 | 22/6569 | | Murray Group | | U | |
| | | | | | 36.2 | | 6 370 | 1967 | - | S | | | | |
| P78 | -02 | 55.5 | 67.0 | 43.0 | 38.4 | - | 11 583 | 1949 | - | | Pliocene Sands | 7-35 | U | 0- 7 clay/calcrete |
| | | | | 58.0 | 36.6 | 20 | 8 651 | 1949 | 30/8884 | | Confining Bed | 35-43 | | 7-27 sand, yel./red - fine/cse |
| | | | | | 22.9 | | 4 215 | 1967 | - | | Murray Group | 43-67 | C | 27-33 yel. clayey sand - fine |
| | | | | | 35.8 | | 3 800 | 1968 | - | | | | | 33-35 yel. limestone |
| | | | | | | | | | | | | | | 35-39 blue clay - shelly |
| | | | | | | | | | | | | | | 39-43 green sandy clay |
| | | | | | | | | | | | | | | 43-67 limestone |
| P79 | 1F-01 | 50.6 | 76.2 | 32.0 | 32.0 | - | 10 611 | 1946 | 18/5124 | | Pliocene Sands | 13-32 | U | 0- 4 red clay |
| | | | | 45.7 | 33.5 | - | 10 153 | 1946 | 18/5125 | | Confining Bed | 32-43 | | 4-13 sandy clay |
| | | | | | 33.5 | 110 | 8 680 | 1946 | 18/5126 | | Murray Group | 43-76 | C | 13-24 sand (fine - cse) |
| | | | | | 32.3 | | 4 770 | 1967 | - | | | | | 24-32 yel. fine sand & silt (calc. sandstone) |
| | | | | | 32.6 | | 4 630 | 1968 | - | A | | | | 32-43 dark grey clay - shelly |
| | | | | | | | | | | | | | | 43-72 silt & limestone (dark grey sandy clay) |
| | | | | | | | | | | | | | | 72-76 limestone |
| P80 | -02 | 50.9 | 53.4 | 42.7 | 30.5 | 1720+ | 3 032 | 1958 | - | | Murray Group | | C | |
| | | | | | 34.2 | | 2 970 | 1967 | - | | | | | |
| | | | | | 34.0 | | - | 1968 | - | S | | | | |
| P81 | -04 | 49.3 | 106.6 | 28.0 | 25.9 | | 6 364 | 1958 | - | | Pliocene Sands | 12-38 | U | 0-12 sandy clay |
| | | | | 36.5 | 32.9 | | 6 364 | 1959 | - | | Confining Bed | 38-52 | | 12-23 sand, gravel |
| | | | | 48.8 | - | - | - | - | - | I | Murray Group | 52-107 | C | 23-33 yel. clay |
| | | | | | 29.3 | 560+ | 2 900 | 1967 | - | | | | | 33-35 yel. rock |
| | | | | | | | | | | | | | | 35-36 gravel and shell |
| | | | | | | | | | | | | | | 36-38 soft limestone |
| | | | | | | | | | | | | | | 38-46 light grey clay |
| | | | | | | | | | | | | | | 46-52 blue clay |
| | | | | | | | | | | | | | | 52-107 coral limestone |
| P82 | 3 -01 | 50.8 | 30.5 | - | 30.5 | - | 4 462 | 1957 | - | | Murray Group | | U | |
| | | | | | 33.8 | | 6 845 | 1967 | - | S | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YI[illegible] (m$^3$/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEP[illegible] (m) | [illegible]YPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P83 | -02 | 55.1 | 45.7 | - | 39.5 | | 4 719 | 1948 | 22/6583 | | Murray Group | | U | |
| | | | (approx) | | - | | 4 700 | 1967 | - | | | | | |
| | | | | | 38.8 | | - | 1968 | - | S | | | | |
| P84 | -03 | 55.4 | 45.7 | - | - | | 7 585 | 1967 | | | Murray Group | | U | |
| | | | (approx) | | 38.8 | | | 1968 | | | | | | |
| P85 | -05 | 52.9 | - | - | - | | 3 689 | 1946 | 23/6613 | S | Murray Group | | U | |
| | | | | | 36.0 | | 3 730 | 1967 | | | | | | |
| | | | | | 37.5 | | 3 530 | 1968 | | | | | | |
| P86 | -07 | 55.6 | 45.7 | - | - | | 5 145 | 1967 | | | Murray Group | | U | |
| | | | | | 39.2 | | 4 430 | 1968 | | | | | | |
| P87 | 4A-01 | 58.4 | 54.9 | 42.7 | - | | salt | - | | | Murray Group | 42-55 | C | |
| | | | | 51.8 | 39.6 | 10 | 7 279 | 1946 | 22/6573 | | | | | |
| | | | | | 31.3 | | 7 445 | 1966 | | | | | | |
| P88 | 5A-01 | 40 (M) | 54.9 | - | 36.6 | 10 | 7 250 | 1946 | 22/6594 | | Murray Group | | C | |
| | | | | | | | 8 250 | 1966 | | | | | | |
| P89 | -02 | 48.9 | 64.0 | - | 45.7 | 10 | 7 993 | 1946 | 23/6617 | | Murray Group | | C | |
| | | | | | 36.7 | | 8 685 | 1966 | | | | | | |
| | | | | | 34.6 | | - | 1967 | | D | | | | |
| | | | | | - | | 7 000 | 1968 | | | | | | |
| P90 | 5C-01 | 57.6 | 64.0 | - | - | 10 | 6 292 | 1946 | | | Murray Group | | C | |
| | | | | | | | 6 675 | 1965 | | | | | | |
| | | | | | | | 6 845 | 1968 | | | | | | |
| P91 | -02 | 45.9 | 61.0 | - | 42.7 | 10 | 8 136 | 1946 | | | Murray Group | | C | |
| | | | | | 32.9 | | 7 445 | 1965 | | | | | | |
| | | | | | 31.1 | | 7 970 | 1968 | | D | | | | |
| P92 | 6A-02 | 60 (M) | 86.9 | 22.9 | | 10 | 17 731 | 1955 | | | Pliocene Sands | 13-47 | U | 0-13 red silty marl |
| | | | | 57.9 | 48.8 | 60 | 6 649 | 1955 | | | Confining Bed | 47-60 | | 13-21 marly sand |
| | | | | 81.7 | 45.7 | 110 | 3 260 | 1955 | W2008/55 | | Murray Group | 60-87 | C | 21-30 silt with cse sand |
| | | | | | | | | | | | | | | 30-42 fine sand with gravel |
| | | | | | | | | | | | | | | 42-47 marly fine sand |
| | | | | | | | | | | | | | | 47-60 grey sandy marl |
| | | | | | | | | | | | | | | 60-63 calcarenite |
| | | | | | | | | | | | | | | 63-81 sandy silt |
| | | | | | | | | | | | | | | 81-87 calcarenite |
| P93 | 7A-01 | 40 (M) | 48.8 | - | 30.5 | 10 | 4 704 | 946 | 23/6620 | | Murray Group | | C | |
| | | | | | | | 5 145 | 1965 | | | | | | |
| P94 | -02 | 45-48(M) | 70.8 | 30.5 | - | | salt | - | | | Pliocene Sands | 0-35 | U | 0- 9 yel. sand |
| | | | | 61.0 | - | | salt | - | | | Confining Bed | 35-58 | | 9-35 limestone - shelly |
| | | | | 68.6 | 34.7 | 60 | 2 974 | 1951 | W280/52 | | Murray Group | 58-71 | C | 35-58 grey clay |
| | | | | | | | | | | | | | | 58-71 limestone |
| P95 | -03 | 42 (M) | 95.1 | 70.0 | 34.2 | 110 | salt | 1951 | | | Pliocene Sands | 0-39 | U | 0- 3 yel. sandy clay |
| | | | | 85.0 | - | | fresh | 1951 | | | Confining Bed | 39-67 | | 3- 9 yel. sand |
| | | | | | | | | | | | [illegible] Group | 67-95 | C | 9-27 cliff rock |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P95 | -03 | 42 (M) | 95.1 | 70.0 | 34.2 | 110 | salt | 1951 | | A | Pliocene Sands | 0-39 | U | 0- 3 yel. sandy clay |
| | | | | 85.0 | - | | fresh | 1951 | | | Confining Bed | 39-67 | | 3- 9 yel. sand |
| | | | | | | | | | | | Murray Group | 67-95 | C | 9-27 cliff rock |
| | | | | | | | | | | | | | | 27-39 yel. sandy clay |
| | | | | | | | | | | | | | | 39-67 blue sandy clay |
| | | | | | | | | | | | | | | 67-95 grey coral |
| P96 | 7B-01 | 40 (M) | 36.0 | - | 18.3 | 10 | 4 904 | 1946 | 22/6597 | | Murray Group | | C | |
| | | | | | - | | 4 946 | 1947 | | | | | | |
| P97 | 7C-01 | 40 (M) | 54.0 | - | - | | upper saline water recorded | | | | Murray Group | | C | |
| | | | | - | 30.5 | | 4 833 | 1946 | 23/6625 | | | | | |
| | | | | | 23.6 | | 5 070 | 1965 | | | | | | |
| P98 | 8C-01 | 40 (M) | 57.9 | - | 30.5 | 10 | 4 205 | 1956 | 23/6633 | | Murray Group | | C | |
| | | | | | - | | 4 285 | 1965 | | | | | | |
| P99 | 13B-01 | 44.5 | 54.9 | - | - | | 7 970 | 1965 | | U | Murray Group | | C | |
| P100 | -02 | 50 (M) | 56.4 | - | 37.6 | 10 | 8 623 | 1946 | 23/66154 | U | Murray Group | | C | |
| P101 | 13C-01 | | 54.9 | - | - | | 8 007 | 1947 | 22/6589 | A(1965) | Murray Group | | C | |
| P102 | 14D-01 | 55 (M) | 51.8 | 42.7 | 33.0 | | 4 045 | 1946 | 19/5455 | | Murray Group | | C | |
| P103 | 14E-01 | 58.5 | 88.4 | 54.9 | 46.7 | | - | 1946 | | | Pliocene Sands | 13-52 | U | 0-13 sand and clay |
| | | | | 83.9 | 46.7 | 350 | 7 693 | 1946 | 18/5377 | | Confining Bed | 52-58 | | 13-24 med-cse sand |
| | | | | | 43.6 | | - | 1967 | | | Murray Group | 58-88 | C | 24-43 yel. sandy clay |
| | | | | | | | | | | | | | | 43-52 silty clay (yel. calc., sandstone) |
| | | | | | | | | | | | | | | 52-55 blue grey clay (black clay) |
| | | | | | | | | | | | | | | 55-58 blue grey clay (grey limestone) |
| | | | | | | | | | | | | | | 58-88 limestone (silty 72-84) |
| P104 | 14E-02 | 50 (M) | 64.0 | - | 39.6 | | 8 709 | 1946 | 22/6584 | | Murray Group | | C | |
| P105 | -03 | 60 (M) | 79.3 | 45.7 | 45.7 | | 6 363 | 1960 | | | Murray Group | | C | |
| | | | | | - | | 6 457 | 1965 | | | | | | |
| | | | | | 44.0 | | - | 1968 | | | | | | |
| P106 | 26-01 | 53.0 | 56.7 | - | 43.6 | 10 | - | 1946 | | | Murray Group | | U | |
| | | | | | 36.6 | | - | 1967 | | | | | | |
| | | | | | 36.2 | | 6 370 | 1968 | | A | | | | |
| P107 | 27S-01 | 53.8 | 50.3 | - | 39.6 | 10 | 4 533 | 1946 | 22/6571 | | Murray Group | | U | |
| | | | | | 36.8 | | 7 500 | 1967 | | | | | | |
| | | | | | 36.4 | | 4 770 | 1968 | | S | | | | |
| P108 | 28-01 | 57.2 | 70.1 | 43.6 | 31.4 | | - | 1946 | | | Pliocene Sands | 12-20 | U | 0- 8 silt/calcrete |
| | | | | 63.7 | 30.8 | | 3 846 | 1946 | 19/5408 | A | Confining Bed | 20-34 | | 8-12 red sandy clay |
| | | | | | 40.7 | | 3 455 | 1967 | | | Murray Group | 34-64 | C | 12-20 yel. fine - med sand |
| | | | | | | | | | | | | | | 20-28 yel. grey sandy clay |
| | | | | | | | | | | | | | | 28-34 yel. clay |
| | | | | | | | | | | | | | | 34-64 limestone |
| P109 | 33-01 | 46.0 | 54.9 | - | 30.5 | 10 | 4 376 | 1946 | 23/6616 | | Murray Group | | U | |
| | | | | | 29.5 | | 4 770 | 1967 | | | | | | |
| | | | | | 28.3 | | 3 870 | 1968 | | U | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD (m³/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P110 | 40-01 | 56.2 | 51.5 | 42.7 | - | | salt | - | | | Murray Group | | U | |
| | | | | 50.6 | 40.9 | | good | 1946 | | | | | | |
| | | | | | 39.6 | | 7 745 | 1967 | | | | | | |
| P111 | 41A-01 | 61.5 | 90.0 | 56.8 | 43.6 | | - | - | | | Pliocene Sands | 11-46 | U | 0- 6 sand/calcrete |
| | | | | 85.4 | 43.6 | | 7 493 | 1946 | 19/5410 | | Confining Bed | 46-56 | | 6-11 red sandy clay |
| | | | | | 45.9 | | 6 300 | 1965 | | | Murray Group | 56-90 | C | 11-33 yel. sand (fine-cse) |
| | | | | | 46.5 | | 6 145 | 1968 | | | | | | 33-41 fine sandy silty clay |
| | | | | | | | | | | | | | | 41-46 yel. calc. sandstone |
| | | | | | | | | | | | | | | 46-56 dark grey clay |
| | | | | | | | | | | | | | | 56-90 limestone |
| P112 | 42-01 | 55.1 | 79.3 | 45.1 | 41.2 | 60 | - - | 1946 | | | Pliocene Sands | 8-22 | U | 0- 8 rubbly clay |
| | | | | | 41.2 | 125 | 5 535 | 1946 | 18/5265 | | Confining Bed | 22-39 | | 8-22 clayey gravel |
| | | | | | 34.2 | | 4 355 | 1965 | | | Murray Group | 39-79 | C | 22-39 yel. silty clay-clayey silt (yel. sandstone) |
| | | | | | 39.2 | | 4 215 | 1968 | | | | | | 39-79 limestone |
| P113 | -02 | 42.3 | 42.7 | - | 25.9 | 10 | 10 553 | 1946 | | D | Pliocene Sands | | | |
| P114 | -03 | 51.6 | 79.3 | 44.5 | 41.2 | | - | 1946 | | | Pliocene Sands | 9-30 | U | 0- 9 clay |
| | | | | 70.1 | 38.1 | | 6 149 | 1946 | 18/5330 | | Confining Bed | 30-45 | | 9-30 fine-cse yel. sand |
| | | | | | 37.7 | | 5 845 | 1965 | | | Murray Group | 45-79 | C | 30-38 yel. clay silt (calc. sandstone) |
| | | | | | 36.2 | | 5 455 | 1968 | | | | | | 38-45 black clay |
| | | | | | | | | | | | | | | 45-79 grey sandy limestone |
| P115 | -04 | 47.0 | 109.7 | - | - | | 6 177 | 1960 | | | Murray Group | | C | |
| | | | | | 31.7 | | 5 285 | 1968 | | | | | | |
| P116 | 43-01 | 51.8 | 39.6 | - | 37.2 | 10 | 5 505 | 1946 | 22/6581 | | Pliocene Sands | | U | |
| | | | | | 36.2 | | 5 455 | 1968 | | | | | | |
| P117 | -02 | 60 (M) | 64.0 | 54.3 | 50.0 | 80 | 6 277 | 1955 | 2015/55 | | Pliocene Sands | 4-29 | U | 0- 4 pink brown sandy marl |
| | | | | | 45.6 | | 5 845 | 1968 | | | Confining Bed | 29-54 | | 4-20 buff sand & grit |
| | | | | | | | | | | | Murray Group | 54-64 | C | 20-29 yel. fine sand & silt |
| | | | | | | | | | | | | | | 29-40 yel. brown calc. silt |
| | | | | | | | | | | | | | | 40-46 silt & white limestone |
| | | | | | | | | | | | | | | 46-50 grey stiff clay |
| | | | | | | | | | | | | | | 50-54 grey marl |
| | | | | | | | | | | | | | | 54-64 limestone |
| P118 | 49-01 | 47.3 | 61.0 | - | 27.4 | 10 | 4 461 | 1946 | 22/6574 | | Murray Group | | U | |
| | | | | | 29.4 | | 4 500 | 1967 | | | | | | |
| | | | | | 29.6 | | - | 1968 | | | | | | |
| P119 | 50-01 | 56.4 | 51.8 | - | 36.6 | 10 | 4 961 | 1946 | 23/6622 | | Murray Group | | U | |
| | | | | | 39.7 | | 15 000+ | 1957 | | A | | | | |
| P120 | 51-01 | 55.3 | 70.1 | 41.2 | 40.3 | | 14 943 | 1948 | | | Pliocene Sands | 8-41 | U | 0- 8 yel. brown sandy clay |
| | | | | 57.6 | 38.7 | 140+ | 7 879 | 1948 | 27/7814 | | Confining Bed | 41-58 | | 8-30 yel. fine sand |
| | | | | | 39.1 | | 3 315 | 1967 | | A | Murray Group | 58-70 | C | 30-41 yel. calc. sandstone |
| | | | | | 38.9 | | 3 170 | 1968 | | | | | | 41-55 grey sandy clay |
| | | | | | | | | | | | | | | 55-58 blue sticky clay |
| | | | | | | | | | | | | | | 58-70 limestone |
| P121 | -02 | 52.1 | 61.0 | 38.4 | 24.4 | 10 | 2 889 | 1946 | | | Murray Group | | C | |
| | | | | | 35.1 | | 3 030 | [illegible] | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P121 | -02 | 52.1 | 61.0 | 38.4 | 24.4 | 10 | 2 889 | 1946 | 23/6632 | | Murray Group | | C | |
| | | | | | 35.1 | | 3 030 | 1967 | | | | | | |
| | | | | | 35.0 | | 2 900 | 1968 | | A | | | | |
| P122 | 52-01 | 40 (M) | 64.0 | - | - | | upper saline wter recorded | | | | Murray Group | | C | |
| | | | | | 24.4 | 10 | 4 561 | 1946 | 22/6596 | | | | | |
| | | | | | - | | 4 845 | 1965 | | A | | | | |
| P123 | 53-01 | 51.5 | 64.0 | - | 30.5 | 10 | 5 934 | 1946 | 22/6567 | | Murray Group | | C | |
| | | | | | 35.6 | | 5 744 | 1968 | | A | | | | |
| P124 | 57-01 | 50 (M) | 48.8 | - | 22.9 | 10 | 4 661 | 1946 | 23/6636 | | Murray Group | | C | |
| | | | | | 27.4 | | 4 557 | 1965 | | | | | | |
| P125 | 58.01 | 40.7 | 61.0 | - | - | 10 | 8 036 | 1946 | 23/6618 | | Murray Group | | C | |
| | | | | | - | | 9 100 | 1965 | | | | | | |
| P126 | 70-01 | 50 (M) | 54.9 | - | 42.7 | 10 | 4 890 | 1946 | 23/6626 | | Murray Group | | U | |
| | | | | | 32.7 | | 4 915 | 1967 | | S | | | | |
| P127 | 71-01 | 56.1 | 73.2 | 45.1 | 40.3 | 160 | 3 431 | 1948 | 25/7343 | | Pliocene Sands | 10-28 | U | 0-10 red sandy clay |
| | | | | | 37.8 | | 2 685 | 1967 | | | Confining Bed | 28-35 | | 10-23 yel. clayey sand & gravel |
| | | | | | 37.5 | | 2 685 | 19688 | | | Murray Group | 35-73 | C | 23-28 yel. calc. sandstone |
| | | | | | | | | | | | | | | 28-35 green grey clay |
| | | | | | | | | | | | | | | 35-40 cream limestone |
| | | | | | | | | | | | | | | 40-67 blue clay |
| | | | | | | | | | | | | | | 67-72 grey limestone (cse) |
| | | | | | | | | | | | | | | 72-73 blue clay |
| P128 | 71-02 | 53.9 | 45.7 | - | 36.6 | 10 | 3 489 | 1946 | 23/6614 | | Murray Group | | U | |
| | | | | | - | | 3 600 | 1967 | | S | | | | |
| P129 | 80-01 | 52.5 | 56.4 | 45.7 | 44.2 | 10 | 6 691 | 1946 | 23/6635 | | Murray Group | | C | |
| | | | | | 36.5 | | | 1967 | | | | | | |
| P130 | -01 | 55-60(M) | 56.7 | 46.7 | 44.2 | 10 | 7 350 | 1946 | 22/6588 | | Murray Group | | U | |
| | | | | | 45.7 | | 7 655 | 1965 | | D | | | | |
| P131 | 81-01 | 62.4 | 74.1 | - | - | 10 | 6 143 | 1965 | | | Murray Group | | C | |
| | | | | | 46.8 | | 6 070 | 1968 | | | | | | |
| P132 | 86-01 | | 79.3 | - | - | | 3 831 | 1946 | 22/6591 | A | Murray Group | | C | |
| P133 | 90-01 | 55 (M) | 54.9 | - | 39.6 | 10 | 7 364 | 1946 | 22/6575 | | Murray Group | | C | |
| | | | | | - | | 6 755 | 1965 | | | | | | |
| P134 | 92-02 | 59.7 | 67.1 | 53.7 | 49.1 | | 6 975 | 1955 | | | Pliocene Sands | 0-47 | U | 0-11 calc. sand & silt |
| | | | | 60.4 | 46.4 | | 6 306 | 1955 | 2014/55 | | Confining Bed | 47-58 | | 11-29 yel. brown sand (fine-cse) & silt |
| | | | | | 45.0 | | 6 870 | 1968 | | A | Murray Group | 58-67 | C | 29-41 yel. br. fine calc. sand & silt |
| | | | | | | | | | | | | | | 41-47 yel. br. fine calc. silt & limestone |
| | | | | | | | | | | | | | | 47-58 grey marl (carbonaceous) |
| | | | | | | | | | | | | | | 58-67 limestone |
| P135 | 130-01 | 51.6 | 54.9 | - | 39.6 | 10 | 5 390 | 1946 | 22/6572 | | Murray Group | | U | |
| | | | | | 34.8 | | 5 755 | 1967 | | | | | | |
| | | | | | 34.5 | | - | 1968 | | | | | | |
| P136 | 135-01 | 47.0 | 61.0 | 39.6 | 24.4 | 10 | 4 005 | 1946 | 22/6585 | | Murray Group | | C | |
| | | | | | - | | 8 600 | 1967 | | S | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD ($m^3$/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P137 | 155-01 | 46.1 | 50.3 | - | 27.4 | | - | 1946 | | | Murray Group | | U | |
| | | | | | 28.2 | | - | 1967 | | | | | | |
| | | | | | 27.7 | | - | 1968 | | S | | | | |
| P138 | 163-01 | 40.7 | 48.8 | - | 25.9 | 0.1 | 7 207 | 1946 | 22/6598 | | Murray Group | | C | |
| | | | | | 21.3 | | 7 214 | 1945 | | | | | | |
| | | | | | - | | 7 000 | 1968 | | | | | | |
| P139 | 180-01 | 45.0 | 41.2 | - | 30.5 | 0.1 | 9 194 | 1946 | 23/6628 | | Murray Group | | U | |
| | | | | | - | | 9 655 | 1967 | | | | | | |
| | | | | | 28.5 | | - | 1968 | | | | | | |
| P140 | 181-01 | 55.4 | 41.2 | - | 32.0 | 0.1 | 4 590 | 1946 | 23/6621 | | Murray Group | | U | |
| | | | | | - | | 4 500 | 1967 | | | | | | |
| | | | | | 39.4 | | - | 1968 | | | | | | |
| P141 | 182-01 | 54.1 | 50.3 | - | 41.2 | 0.1 | 3 389 | 1946 | 23/6623 | | Murray Group | | C | |
| | | | | | 37.2 | | 3 600 | 1967 | | | | | | |
| | | | | | 37.2 | | 3 385 | 1968 | | A | | | | |
| P142 | -02 | 51.9 | 64.0 | 44.2 | 36.6 | 0.5 | - | 1951 | | | Pliocene Sands | 6-34 | U | 0- 6 yel. sandy clay |
| | | | | | 34.9 | | 4 500 | 1967 | | A | Confining Bed | 34-43 | | 6-14 yel. sand |
| | | | | | 34.8 | | 4 430 | 1968 | | | Murray Group | 43-64 | C | 14-34 yel. cliff rock |
| | | | | | | | | | | | | | | 34-43 blue sandy clay |
| | | | | | | | | | | | | | | 43-64 limestone |
| P143 | 183-01 | 52.4 | 39.6 | - | 35.1 | | 5 445 | 1946 | 22/6570 | | Murray Group | | C | |
| | | | | | 35.8 | | - | 1967 | | | | | | |
| | | | | | 35.3 | | 4 985 | 1968 | | A(1961) | | | | |
| P144 | 185-01 | 60-65(M) | 47.3 | - | 35.1 | 0.1 | - | 1946 | | | Murray Group | | U | |
| | | | | | 32.7 | | - | 1967 | | S | | | | |
| P145 | 186-01 | 50 (M) | 54.9 | - | 33.5 | 0.1 | 4 804 | 1946 | 22/6595 | | Murray Group | | C | |
| P146 | 187-01 | 55.4 | 67.6 | 40.5 | 39.0 | 1.3 | -5 545 | 1946 | 18/5150 | | Pliocene Sands | 5-25 | U | 0- 5 dark red sandy clay |
| | | | | | 36.4 | | 3 530 | 1967 | | S | Confining Bed | 25-45 | | 5-25 yel. sand (fine-cse) |
| | | | | | 39.5 | | 4 143 | 1968 | | | Murray Group | 45-68 | C | 25-45 yel. silty-sandy clay |
| | | | | | | | | | | | | | | 45-61 silt (bryozoal) |
| | | | | | | | | | | | | | | 61-68 limestone |
| P147 | 189-01 | 53.1 | 59.5 | 37.2 | 35.1 | 0.8 | 4 490 | 1948 | 26/7638 | | Pliocene Sands | 7-30 | U | 0- 7 red sandy clay |
| | | | | | 39.1 | | 4 015 | 1967 | | | Confining Bed | 30-36 | | 7-24 yel. sand & gravel |
| | | | | | 35.2 | | 3 945 | 1968 | | | Murray Group | 36-60 | C | 24-30 yel. calc. sandstone |
| | | | | | | | | | | | | | | 30-36 blue sandy clay |
| | | | | | | | | | | | | | | 36-41 grey limestone |
| | | | | | | | | | | | | | | 41-50 grey sticky clay |
| | | | | | | | | | | | | | | 50-60 grey limestone |
| P148 | 189-03 | 51.8 | 63.4 | 32.3 | - | 0.1 | salt | - | | | Pliocene Sands | 0-30 | U | 0-24 rubble |
| | | | | 49.0 | 32.3 | | - | 1946 | | | Confining Bed | 30-49 | | 24-30 honeycomb rock |
| | | | | | 33.9 | | - | 1967 | | | Murray Group | 49-63 | C | 30-32 yel. clay |
| | | | | | 34.2 | | 4 215 | 1967 | | | | | | 32-49 blue clay |
| | | | | | | | | | | | | | | 49-63 cliff rock |
| P149 | 190-01 | 45 (M) | 42.7 | - | 33.5 | 0.1 | 4 175 | [illegible] | [illegible] | | Murray Group | | C | |
| P150 | -02 | | 64.7 | 57.0 | 29.0 | 0.5 | - | [illegible] | | | [illegible] Sands | 3-35 | | 3- 9 yel. sand |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P149 | 190-01 | 45 (M) | 42.7 | - | 33.5 | 0.1 | 4 175 | 1946 | 23/6624 | | Murray Group | | C | |
| P150 | -02 | | 64.7 | 57.9 | 29.0 | 0.5 | - | 1951 | | | Pliocene Sands | 3-35 | | 3- 9 yel. sand |
| | | | | | | | | | | | Confining Bed | 35-58 | | 9-35 cliff rock |
| | | | | | | | | | | | Murray Group | 58-64 | | 35-58 blue clay |
| | | | | | | | | | | | | | | 58-64 limestone |
| P151 | 195-01 | 45.4 | 73.8 | 39.0 | 30.8 | | 9 137 | 1946 | 18/5202 | | Pliocene Sands | 6-32 | | 0- 6 red clay |
| | | | | 64.0 | 30.8 | 3.3 | 6 106 | 1946 | | | Confining Bed | 32-45 | | 6-26 yel. fine clayey snad |
| | | | | | 30.5 | | 4 215 | 1968 | 18/5211 | | Murray Group | 45-74 | | 26-32 yel. silt (calc. sandstone) |
| | | | | | | | | | | | | | | 32-45 black clay |
| | | | | | | | | | | | | | | 45-58 grey silt (limestone) |
| | | | | | | | | | | | | | | 58-74 sandy limestone |
| P152 | 201-01 | 45.2 | 36.6 | - | 27.4 | 0.2 | 6 591 | 1946 | 23/6634 | | Murray Group | | U | |
| | | | | | - | | 5 915 | 1965 | | | | | | |
| | | | | | 29.9 | | 6 145 | 1968 | | D | | | | |
| P153 | 203-01 | 47.8 | 61.0 | - | 42.7 | 0.1 | 5 405 | 1946 | 22/6587 | | Murray Group | | C | |
| | | | | | 36.6 | | 5 914 | 1965 | | | | | | |
| √P154 | 204-01 | 45 (M) | 62.5 | 54.0 | 31.7 | 2.0 | 5.590 | 1955 | 2012/55 | | Pliocene Sands | 4-41 | U | 0- 4 buff sandy marl |
| | | | | | | | | | | | Confining Bed | 41-55 | | 4-11 red brown marly silt & fine sand |
| | | | | | | | | | | | Murray Group | 55-63 | C | 11-32 yel. fine sand |
| | | | | | | | | | | | | | | 32-36 buff marly fine sand |
| | | | | | | | | | | | | | | 36-41 grey calcarenite |
| | | | | | | | | | | | | | | 41-55 dark grey silty marl |
| | | | | | | | | | | | | | | 55-63 calcarenite |
| P155 | 205-01 | 45.4 | 48.8 | - | 39.6 | 0.1 | 6 534 | 1946 | 18/5267 | | Murray Group | | C | |
| | | | | | - | | 7 145 | 1965 | | | | | | |
| | | | | | 29.5 | | - | 1967 | | | | | | |
| P156 | 231-01 | 35-40(M) | 61.0 | 21.3 | - | | salt | - | | | Murray Group | | C | |
| | | | | 42.7 | 24.4 | 0.1 | 2 715 | - | | | | | | |
| | | | | | - | | 3 529 | 1965 | | | | | | |
| P157 | 235-01 | 43.2 | 36.6 | - | 25.9 | 0.1 | 7 650 | 1946 | 23/6629 | | Murray Group | | U | |
| | | | | | - | | 8 515 | 1965 | | | | | | |
| | | | | | 27.3 | | 9 300 | 1968 | | D | | | | |
| P158 | 242-01 | 40 (M) | 65.6 | 21.3 | - | | salt | - | | | Murray Group | | C | |
| | | | | 42.7 | - | | salt | - | | | | | | |
| | | | | 62.5 | 17.1 | 0.1 | 4 476 | 1946 | 23/6630 | | | | | |
| | | | | | - | | 4 500 | 1965 | | | | | | |
| | | | | | | | HD. STUART | | | | | | | |
| P159 | 22-01 | 30 (M) | 64.0 | - | 20.1 | | 4 984 | 1967 | | A | Murray Group | | U | |
| | | | (approx) | | | | | | | | | | | |
| P160 | 247-01 | 20 (M) | 119.9 | 117.8 | flows | 985 | 8 165 | 1925 | 2/613 | A | Murray Group | 0-92 | U | 0- 92 limestone |
| | | | | | | | | | | | Confining Bed | 92-117 | | 92-104 green blue clay - shelly |
| | | | | | | | | | | | Upper Renmark Bed | 117-120 | C | 104-117 blue clay |
| | | | | | | | | | | | | | | 117-120 med. sand & shells |
| P161 | 0-01 | 29.7 | 64.0 | 48.8 | 36.6 | 60 | 11 496 | 1952 | 62/2676 | B | Murray Group | | U | |
| | | | | | 26.4 | | 5 070 | 1968 | | | | | | |
| P162 | R-01 | 41.7 | 29.0 | - | 24.9 | | 7 515 | 1967 | | A | Murray Group | | U | |
| | | | (approx) | | | | | | | | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD ($m^3$/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | HD. WAIKERIE | | | | | | | |
| P163 | 1B-01 | 57.0 | 56.1 | - | 53.1<br>51.5 | 10 | 6 249<br>6 300 | 1946<br>1967 | 20/5763 | <br>U | Murray Group | | U | |
| P164 | -02 | 59.1 | 57.6 | - | 53.3 | 26 | 6 915 | 11967 | | U | Murray Group | | U | |
| P165 | 2-01 | 52 (M) | 56.4 | - | 51.8 | 10 | 6 406 | 1946 | 23/6665 | | Murray Group | | U | |
| P166 | 3-01 | 55.0 | 51.5 | - | 48.8 | | 7 070 | 1967 | | S | Murray Group | | U | |
| P167 | -03 | 51.4 | - | - | 44.8 | | 7 515 | 1967 | | U | Murray Group | | U | |
| P168 | 4-01 | 70 (M) | 72.9 | - | 70.1 | | 6 077 | 1946 | 19/5527 | B(1967) | Murray Group | | U | |
| P169 | -02 | 65.9 | - | - | 59.6 | | 7 445 | 1967 | | S | Murray Group | | U | |
| P170 | -03 | 65.9 | - | - | 60.6 | | 6 455 | 1967 | | U | Murray Group | | U | |
| P171 | 5B-02 | 36.2 | 33.5 | - | 31.4 | | 12 785 | 1967 | | A | Murray Group | | U | |
| P172 | 7-03 | 59.6 | - | - | 52.4 | | 5 915 | 1967 | | U | Murray Group | | U | |
| P173 | -04 | 57.2 | 52.4 | - | 50.8 | | 5 845 | 1967 | | U | Murray Group | | U | |
| P174 | 15A-01 | 51.7 | 50.9 | - | 49.1<br>48.3 | 10 | 7 035<br>6 600 | 1946<br>1967 | 20/5774 | D | Murray Group | | U | |
| P175 | -02 | 55 (M) | 50.9 | - | 49.1 | 10 | 6 845 | 1967 | | | Murray Group | | U | |
| P176 | -03 | 49.9 | 47.0 | - | 45.8 | | - | 1967 | | A | Murray Group | | U | |
| P177 | -04 | | 51.0 | | | | 6 670 | 1967 | | S | Murray Group | | U | |
| P178 | 16-02 | 53.2 | 57.3 | 47.9 | 46.0<br>46.1 | 17 | 5 720<br>8 845 | 1954<br>1967 | 79/W1635 | <br>S | Murray Group | 4-57 | U | 0- 4 brown sandy marl<br>4-10 grey limestone<br>10-48 yel. limestone<br>48-57 sandy limestone |
| P179 | -03 | 64.0 | - | - | 56.6 | | 5 685 | 1967 | | S | Murray Group | | U | |
| P180 | 29-01 | 57.4 | - | - | 48.4 | | 5 685 | 1967 | | A | Murray Group | | U | |
| P181 | -02 | 60 (M) | - | - | 56.5 | | 5 915 | 1967 | | U | Murray Group | | U | |
| P182 | 30-02 | 60.0 | 57.9 | - | 50.9<br>47.9 | | 5 660<br>6 670 | 1954<br>1967 | 2168/54 | <br>S | Pliocene Sands<br>Murray Group | 0-12<br>12-50 | <br>U | 0- 3 pink brown sandy marl<br>3- 9 yel. brown micac. sandy marl<br>9-12 yel. grey very sandy marl<br>12-50 yel. limestone |
| P183 | 31-01 | 63.2 | - | - | 52.2 | | - | 1967 | | U | Murray Group | | U | |
| P184 | -02 | | 53.4 | - | - | | 4 850 | 1975 | | U | Murray Group | | U | |
| P185 | 32-02 | 58.4 | 54.9 | - | 53.1<br>50.[illegible] | 10 | 5 435<br>- | [illegible]<br>[illegible] | | | [illegible] Group | | U | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P185 | 32-02 | 58.4 | 54.9 | - | 53.1 | 10 | 5 435 | 1946 | 23/6649 | A | Murray Group | | U | |
| | | | | | 50.9 | | - | 1967 | | | | | | |
| P186 | 33-01 | 58.1 | 54.9 | - | - | 10 | 5 949 | 1946 | 20/5770 | U | Murray Group | | U | |
| | | | | | 50.8 | | 6 300 | 1967 | | | | | | |
| P187 | 34-02 | 67.3 | 61.0 | - | 57.6 | | 6 300 | 1967 | | U | Murray Group | | U | |
| P188 | 35-01 | 59.5 | 54.9+ | - | - | | 8 107 | 1929 | 3/898 | | Murray Group | | U | |
| | | | | | 52.4 | | 8 535 | 1946 | 20/5762 | | | | | |
| P189 | 36-01 | 59.5 | 56.4 | - | 55.2 | | 6 406 | 1946 | 20/5765 | | | | | |
| | | | | | - | | 6 291 | 1959 | | A | Murray Group | | U | |
| | | | | | 52.5 | | 6 600 | 1967 | | | | | | |
| P190 | -02 | 60-65(M) | 56.4 | - | 53.4 | 10 | 6 905 | 1946 | 23/6662 | S | Murray Group | | U | |
| | | | | | - | | 7 445 | 1967 | | | | | | |
| P191 | 37-01 | 53.6 | 53.4 | - | 50.9 | 17 | 6 905 | 1946 | 23/6666 | U | Murray Group | | U | |
| | | | | | | | 7 193 | 1959 | | | | | | |
| P192 | -02 | 56.5 | 53.4 | - | 50.0 | 10 | 7 215 | 1967 | | U | Murray Group | | U | |
| P193 | 38-01 | 44.6 | 45.7 | - | - | 35 | 7 621 | 1946 | 23/6663 | U | Murray Group | | U | |
| | | | | | 39.2 | | 10 455 | 1967 | | | | | | |
| P194 | -02 | 45.7 | 54.2 | 42.1 | 41.2 | 17 | 10 867 | 1957 | | | | | | 0-11 yel. brown sandy limestone |
| | | | | | 39.9 | | 9 595 | 1957 | 101/1662 | | | | | 11-54 yel. limestone |
| | | | | | - | | 10 630 | 1967 | | U | Murray Group | 0-54 | U | |
| P195 | 39-01 | 36.9 | 33.5 | - | 31.1 | | 10 296 | 1957 | | A | Murray Group | | U | |
| | | | | | 32.4 | | 3 800 | 1967 | | | | | | |
| P196 | -02 | 39.6 | 35.1 | - | 32.6 | | 10 296 | 1957 | | A | Murray Group | | U | |
| | | | | | 35.3 | | 9 400 | 1967 | | | | | | |
| P197 | 40-01 | N51.8 | 42.7 | 41.8 | 42.1 | 10 | - | - | | A(1960) | Murray Group | | U | |
| P198 | -02 | N48.8 | 42.7 | - | 39.9 | 10 | 9 223 | 1946 | 23/6668 | B(1967) | Murray Group | | U | |
| P199 | 40S-03 | 46.4 | - | - | 40.7 | | - | 1967 | | S | Murray Group | | U | |
| P200 | 41-01 | 60-65(M) | 56.4 | - | 54.0 | 10 | 7 393 | 1946 | 20/5769 | D | Murray Group | | U | |
| | | | | | 44.7 | | - | 1967 | | | | | | |
| P201 | -02 | 50.2 | 45.7 | 41.2 | 30.5 | 10 | 8 923 | 1946 | 20/5768 | A(1967) | Murray Group | | U | |
| P202 | 42-01 | 63.6 | 50.9 | 44.2 | 38.7 | 10 | - | - | | U | Murray Group | | U | |
| | | | | | 53.5 | | - | 1967 | | | | | | |
| P203 | -02 | 60.5 | 50.9 | 44.2 | 48.2 | 10 | - | - | | U | Murray Group | 18-51 | U | 0-18 clay |
| | | | | | - | | 8 445 | 1967 | | | | | | 18-20 fine sand |
| | | | | | | | | | | | | | | 20-51 cliff rock |
| P204 | 44-01 | 44.0 | 92.3 | - | 36.5 | | - | - | | B(1957) | Murray Group | | U | |
| P205 | 221-01 | 59.9 | 54.9 | - | 50.3 | 10 | 5 575 | 1946 | 23/6648 | U | Murray Group | | U | |
| | | | | | 52.9 | | 5 155 | 1967 | | | | | | |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD (m3/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P206 | 223-01 | 37.5 | 36.6 | - | 35.7 | 10 | 2 600 | 1946 | 23/6669 | S | Murray Group | | U | |
| | | | | | 35.7 | | 1 820 | 1967 | | | | | | |
| P207 | -02 | 38.9 | 36.6 | - | 35.1 | 10 | 9 702 | 1946 | 23/6650 | U | Murray Group | | U | |
| | | | | | - | | 10 300 | 1967 | | | | | | |
| P208 | 224-01 | 41.3 | 38.1 | - | 36.1 | 17 | 9 500 | 1967 | | S | Murray Group | | U | |
| P209 | -03 | 39.6 | 38.1 | - | 36.6 | 10 | 9 209 | 1946 | 23/6667 | S | Murray Group | | U | |
| | | | | | 36.6 | | 10 215 | 1967 | | | | | | |
| P210 | 239-01 | 52.2 | - | - | 48.5 | | 7 585 | 1967 | | U | Murray Group | | U | |
| P211 | 266-01 | 60 (M) | - | - | 54.4 | | 5 845 | 1967 | | U | Murray Group | | U | |
| P212 | 272-01 | 60.7 | 56.7 | - | 47.6 | 10 | 7 250 | 1946 | 20/2761 | U | Murray Group | | U | |
| | | | | | 49.7 | | 7 970 | 1967 | | | | | | |
| P213 | -02 | 70.3 | 61.0 | - | 56.4 | | - | 1967 | | U | Murray Group | | U | |
| P214 | 372-01 | 46.4 | 51.2 | - | 49.7 | 10 | - | - | | A | Murray Group | | U | |
| | | | | | 48.7 | | - | 1967 | | | | | | |
| P215 | 405-01 | 32.6 | 36.6 | - | 35.1 | 10 | 2 460 | - | | U | Murray Group | | U | |
| | | | | | 28.0 | | 11 985 | 1967 | | | | | | |
| P216 | 406-01 | 34.7 | 39.0 | - | 29.4 | 10 | - | 1967 | | S | Murray Group | | U | |
| P217 | -02 | 33.7 | 30.8 | - | 29.0 | 5 | - | 1967 | | U | Murray Group | | U | |
| P218 | 410-01 | 58.4 | 50.9 | 48.8 | 47.8 | 25 | 7 779 | 1946 | 18/5133 | U | Murray Group | 12-51 | U | 0-12 clay<br>12-14 very fine sand<br>14-51 cliff rock |
| P219 | 416-01 | 60 (M) | - | - | 44.7 | | 6 600 | 1967 | | U | Murray Group | | U | |
| P220 | 417-01 | 60 (M) | 51.8 | - | 48.2 | 10 | 7 035 | 1946 | 23/6664 | U | Murray Group | | U | |

COUNTY HAMLEY

Renmark Irrigation Area

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD (m3/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P221 | 02 | - | 71.7 | 4.0 | 1.8 | | 46 046 | - | | Dr | Murray Group | | C | |
| | | | | 7.3 | 2.7 | | - | - | | | | | | |
| | | | | 20.4 | 1.8 | | 36 822 | - | | | | | | |
| | | | | 67.1 | 0.8 | | 79 308 | - | | | | | | |
| P222 | 03 | - | 24.7 | 4.1 | - | | 47 476 | - | | | | | | |
| | | | | 17.3 | - | | 18 304 | - | | | | | | |
| | | | | 23.5 | 2.3 | | 35 793 | - | 28/8161 | Dr | Pliocene Sands | | U | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P223 | 04 | - | 92.9 | - | - | | 38 753 | 1953 | | Dr | Pliocene Sands<br>Confining Bed<br>Murray Group | 0-19<br>19-63<br>63-93 | U | 0- 2 no data<br>2- 6 mud and sand<br>6-19 drift sand<br>19-42 clay<br>42-63 sandy clay (shelly)<br>63-84 coral<br>84-93 clay and stone |
| | | | | | | | OUT OF HUNDREDS | | | | | | | |
| 6830 | -01 | 45 (M) | 65.0 | 59.5 | 39.6 | 50 | 7 893 | 1952 | 63/2845 | | Murray Group | | C | yel. and blue clay. trace of limestone |
| | -02 | 40 (M) | 76.2 | 70.1 | 9.1 | | 37 180 | 1957 | | | Pliocene Sands<br>Murray Group | 0-15<br>15-76 | U | 0-15 yel. clay<br>15-67 grey shale<br>67-70 blue mud<br>70-76 grey shale & sand |
| | -04 | 45 (M) | 65.3 | 57.9 | 41.2 | 20 | 21 307 | 1952 | 61/2343 | | Murray Group | | C | |
| | -05 | 45 (M) | 64.7 | 57.9 | 39.6 | 50 | 17 730 | 1952 | | | Murray Group | | C | |
| | -06 | | 128.0 | - | - | | 12 150 | 1953 | | A | Basement | | | |
| | -07 | | 126.6 | 126.6 | 65.6 | 225 | 18 670 | 1953 | | | Pliocene Sands<br>Probably com-<br>pleted in<br>basement | 14-41 | U | 0- 14 clay<br>14- 39 sand<br>39- 41 sandy clay<br>41-127 light & black shale |
| | -08 | | 137.2 | 54.9 | 30.5 | 35 | 18 670 | 1953 | | A | Pliocene Sands<br>Probably com-<br>pleted in<br>basement | 6-24 | U | 0- 6 clay<br>6- 24 sand<br>24-122 light & dark clay<br>122-137 pink clay |
| | -09 | | 158.8 | 82.3 | 54.0 | 450 | 18 670 | 1953 | | A | Pliocene Sands<br>Confining Bed<br>Basement | 5-35<br>35-82<br>82-159 | U<br><br>C | 0- 5 clay<br>5- 22 sand<br>22- 35 yel. clay<br>35- 67 light shale<br>67- 82 black shale<br>82-159 grey rock |
| | -10 | | 29.0 | 27.4 | 27.4 | 0.2 | 3 130 | 1953 | | A | Pliocene Sands | | | 0- 3 clay<br>3-27 sand<br>27-29 yel. clay & shale |
| | -11 | 45-50(M) | 65.3 | 57.9 | 39.5 | 50 | 19 590 | 1952 | | | Murray Group | | C | yel. and blue clay |
| | -12 | 50-55(M) | 84.8 | near base | 33.5 | 25 | 13 670 | 1953 | | | Murray Group | | C | |
| | -13 | | 57.0 | - | 37.8 | | 19 019 | 1953 | | | | | | |
| | -14 | 60 (M) | 140.2 | 39.6 | 31.4 | | 23 390<br>23 430 | 1929<br>1930 | 10/2759<br>10/2760 | | Murray Group | | C | 0- 46 clay<br>46-140 grey calc. rock (shells) |
| | -16 | 45 (M) | 73.2 | 64.0 | 42.7 | 50 | 15 615 | 1952 | | | Murray Group | | C | 0-46 no data<br>46-51 drift sand |
| | -17 | 50 (M) | 51.8 | 51.0 (approx) | 27.4 | | - | 1952 | | A | Confining Bed<br>Murray Group | 6-52<br>52+ | C | 0- 6 red clay<br>6-52 blue clay<br>52- grey clay |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD (m3/d) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -18<br>(Bungunnia Bore) | 38 (M) | 388.6 | - | 30.5 | | salt | | | | Pliocene Sands<br>Confining Bed<br>Murray Group<br>Confining Bed<br>Renmark Beds-<br>- upper<br>- lower<br>Basement | 0- 22<br>22- 46<br>46-119<br>119-130<br>130-219<br>219-378<br>378-389 | U<br><br>C<br><br>C<br>C | 0- 5 yel. sandy limestone<br>5- 22 yel. sand<br>22- 46 blue-grey marl (fossilif)<br>46-119 blue-grey marl & saccharoidal limestone<br>119-130 grey glauconitic clay<br>130-162 grey brown fossilif sand<br>162-219 dark brown silty sand<br>219-378 buff-grey fine sandstone<br>378-389 weathered slate |
| | -19 | | 66.2 | 59.5 | 39.6 | | 19 590 | 1952 | | | Murray Group | | C | |
| | -20 | 45 (M) | 68.0 | 61.0 | 38.1 | 35 | 17 590 | - | | | Murray Group | | C | |
| | -29 | | 103.6 | 92.6 | 89.7 | | 20 320 | - | | | Pliocene Sands<br>Confining Bed-<br>Basement | 11-37<br>37-104 | | 0- 11 clay<br>11- 33 sand<br>33- 37 clay and sand<br>37-104 shale |
| 6831 | -09 | 102 (M) | 30.5 | 22.9 | - | | 31 170 | - | | | Pliocene Sands<br>Confining Bed | 0-23<br>23-31 | U | black clay at 23 m |
| | -10 | | 20.7 | 20.7 | 18.9 | | - | - | | | Pliocene Sands | 0-17 | U | 0- 2 soil<br>2- 6 sand<br>6-17 yel. fossilif. limestone |
| | -15 | | 46.7 | 24.4 | 24.4 | 17 | 3 130 | 1953 | | A | Pliocene Sands | 0-47 | U | 0- 2 clay<br>2-24 sand<br>24-47 yel. clay |
| | -16 | | 103.6 | 103.6 | 61.0 | 4 | 21 890 | 1953 | | A | Pliocene Sands<br>Confining Bed | 0- 46<br>46-103 | U | 0- 2 clay<br>2- 46 sand<br>46- 67 light shale<br>67- 85 black shale<br>85-103 light shale |
| | -17 | | 72.3 | 72.3 | 69.2 | 2 | 18 780 | 1953 | | A | Pliocene Sands<br>Confining Bed | 0-33<br>33-72 | U | 0-26 sand<br>26-29 clay and shale<br>29-33 shale and sand<br>33-72 light black shale |
| | -18 | | 30.5 | 27.4 | 27.4 | | 1 959 | 1952 | | | Pliocene Sands | | U | |
| | -20 | | 62.8 | 62.8 | 61.0 | | 19 760 | 1953 | | A | Pliocene Sands<br>Confining Bed | 8-33<br>33-63 | U | 0- 8 clay<br>8-21 sand<br>21-33 clay and sand<br>33-63 shale |
| | -32 | | 29.2 | - | 21.3 | | 4 110 | - | | | Pliocene Sands | | U | |
| | -34 | | 32.1 | - | 27.3 | | 1 870 | - | | | Pliocene Sands | | U | |
| | -35 | | 40.7 | - | 27.3 | | 1 130 | - | | | Pliocene Sands | | U | |
| 6930 | -01 | | 140.2 | 109.7 | 44.8 | | 24 295 | 19[illegible] | | | Murray Group | | C | yel. clayey sand |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6930 | -01 | | 140.2 | 109.7 | 44.8 | | 24 295 | 1953 | | | Murray Group | | C | yel. clayey sand |
| | | | | | | | | | | | | | | white sand |
| | | | | | | | | | | | | | | fossilif. grey blue clay |
| | | | | | | | | | | | | | | lignitic clay |
| | -02 | | 41.2 | - | 39.6 | | 24 310 | 1953 | | A | Pliocene Sands | | U | sandy yel. clay and coarse sand |
| | -05 | | 170.7 | 168.3 | 73.2 | 25 | 11 880 | 1932 | 9/2522 | A | Renmark Beds | | C | |
| 6931 | -16 | | 192.7 | 30.5 | - | | salt | 1953 | | | Pliocene Sands | 0- 56 | U | Ref. O'Driscoll for log |
| (Cockatoo Bore) | | | | 46.4 | - | | salt | | | | Confining Bed | 56-108 | | |
| | | | | 59.2 | 9.2 | | 14 070 | | | | Murray Group | 108-152 | C | |
| | | | | 126.8 | 73.2 | | salt | | | | Confining Bed | 152-169 | | |
| | | | | 159.4 | 109.7 | | brackish | | | | Renmark Beds | 169-187 | C | |
| | | | | 174.0 | 120.4 | | 10 696 | | | | | | | |
| | | | | 176.8 | 131.0 | | good | | | | | | | |
| | | | | 185.9 | 45.4 | | 10 010 | | | | | | | |
| | -17 | | 64.0 | - | - | | 12 870 | - | | A | Confining Bed | | | travertine and sandy clay |
| | | | | | | | | | | | | | | sand |
| | | | | | | | | | | | | | | greenish clay |
| 7030 | -01 | | 184.7 | 30.5 | - | | salt | | | | Pliocene Sands | 0- 61 | U | Ref. O'Driscoll for log |
| (Calladen Bore) | | | | 111.3 | - | | salt | | | | Confining Bed | 61-110 | | |
| | | | | 175.3 | 24.4 | | 13 070 | 1926 | 2/580 | A | Murray Group | 110-165 | C | |
| | | | | | | | 10 795 | 1952 | | | Confining Bed | 165-175 | | |
| | | | | | | | | | | | Renmark Beds | 175-185 | C | |
| | -02 | | 61.0 | 22.9 | - | | salt | 1953 | | | Pliocene Sands | 23-61 | U | 0-23 clay |
| | | | | | | | | | | | | | | 23-61 white & yel. sand |
| | -03 | | 196.3 | 45.7 | - | | salt | | | | Pliocene Sands | 8- 50 | U | Ref. O'Driscoll for log |
| (Oak Bore) | | | | 93.0 | - | | - | | | | Confining Bed | 50- 85 | | |
| | | | | 196.0 | 48.8 | 135 | 11 880 | 1953 | | A | Murray Group | 85-152 | C | |
| | | | | | | | | | | | Confining Bed | 152-178 | | |
| | | | | | | | | | | | Renmark Beds | 178-196 | C | |
| | -04 | | 207.3 | 12.2 | - | | salt | | | | Pliocene Sands | 0- 44 | U | Ref. O'Driscoll for log |
| (Canegrass Bore) | | | | 21.9 | - | | salt | | | | Confining Bed | 44- 55 | | |
| | | | | 106.7 | - | | salt | | | | Murray Group | 55-150 | C | |
| | | | | 137.1 | surface | | 15 630 | | | | Confining Bed | 150-198 | | |
| | | | | 207.0 | flowing | 20 | 14 900 | 1927 | 3/665 | A | Renmark Beds | 198-207 | | |
| | | | | | | | 10 950 | 1953 | | | | | | |
| | -05 | 55 (M) | 175.3 | 33.6 | - | | salt | | | | Pliocene Sands | 9- 32 | | Ref. O'Driscoll for log |
| (Triangle Bore) | | | | 65.9 | - | | salt | | | | Confining Bed | 32- 75 | | |
| | | | | 121.9 | 61.0 | | 18 760 | | | | Murray Group | 75-152 | | |
| | | | | 175.0 | 19.8 | 110 | 12 230 | 1952 | | | Confining Bed | 152-160 | | |
| | | | | | 19.1 | | - | 1967 | | A | Renmark Beds | 160-175 | | |
| | -06 | | 198.1 | 198.0 | 48.8 | 30 | 13 925 | 1932 | 9/2521 | | | | | |
| | | | | | | | 13 180 | 1950 | | A | Renmark Beds | | C | |
| 7031 | -01 | | 162.8 | 52.8 | - | | salt | | | | | | | |
| | | | | 157.6 | 54.9 | 85 | 10 050 | 1927 | 3/746A | A | Renmark Beds | | C | |
| | -03 | | 173.7 | 173.7 | 61.0 | 50 | 9 365 | - | | | Confining Bed | 140-163 | C | 0-140 no data |
| | | | | | | | | | | | Renmark Beds | 163-174 | | 140-158 green fossil clay |
| | | | | | | | | | | | | | | 158-163 brown shale |
| | | | | | | | | | | | | | | 163-174 sand |

| INDEX NO. | SECTION & WELL NO. | SURFACE ELEVn (m) | DEPTH (m) TOTAL | WATER CUT | WATER LEVEL | YIELD ($m^3/d$) | SALINITY (mg/L) | YEAR | FULL ANALYSIS NO. | WELL STATUS * | AQUIFER SYSTEM | DEPTH (m) | TYPE * | LITHOLOGY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -07 | | 175.3 | - | - | | 14 140 | 1950 | | | | | | |
| | | | | | | | 14 370 | 1953 | 64/3274 | A | Renmark | | C | |
| | -08 | 71.6 | 289.8 | 51.8 | 50.3 | | 71 500 | 1952 | | | Pliocene Sands | 0- 53 | U | Ref. O'Driscoll for log |
| | (Canopus No. 1) | | | 103.0 | - | | 20 020 | 1952 | | | Confining Bed | 53- 79 | | |
| | | | | 109.7 | 42.7 | 20 | 71 160 | 1952 | | | Murray Group | 79-149 | C | |
| | | | | 174.4 | 42.7 | 40 | 11 580 | 1952 | | | Confining Bed | 149-163 | | |
| | | | | | 35.1 | | 12 170/ 12 300 | 1952 | | | Renmark Beds | | - | |
| | | | | 213.4 | 38.1 | | 11 360/ 11 510 | 1953 | | | - upper | 163-277 | C | |
| | | | | 230.3 | 30.5 | | 11 580/ 11 870 | 1953 | | | - lower | 277-290 | C | |
| | | | | 277- 290 | - | 65-75 | 9 090/ 10 640 | 1953 | | | | | | |
| | | | | | 28.7 | | 7 290 | 1954 | | | | | | |
| | | | | | - | | 11 580 | 1967 | | | | | | |
| | -09 | | 306.0 | 54.9 | - | | 29 030 | 1953 | | | Pliocene Sands | 9- 63 | U | Ref. O'Driscoll for log |
| | (Canopus No. 2) | | | 121.2 | 91.4 | | 16 440 | 1953 | | | Confining Bed | 63- 76 | | |
| | | | | 138.7 | 91.4 | | 14 870 | 1953 | | | Murray Group | 76-155 | C | |
| | | | | 297.2 | 97.4 | | 9 750 | 1953 | | | Confining Bed | 155-174 | | |
| | | | | 304.2 | 40.5 | 55 | 10 010/ 10 300 | 1954 | | | Renmark Beds | | | |
| | | | | | - | | 9 735 | 1954 | 75/411 | A | - upper | 174-297 | C | |
| | | | | | | | | | | | - lower | 297-306 | C | |

Explanation of symbol code

Column Heading: (1) SURFACE ELEVATION

Symbols: (M) elevation estimated from 1:50 000 topo. map.

(2) WELL STATUS

A - abandoned
U - in use at time of survey (no other details)
I - irrigation usage
S - stock usage
D - domestic usage
Dr - drainage

(3) AQUIFER TYPE

U - unconfined
C - confined

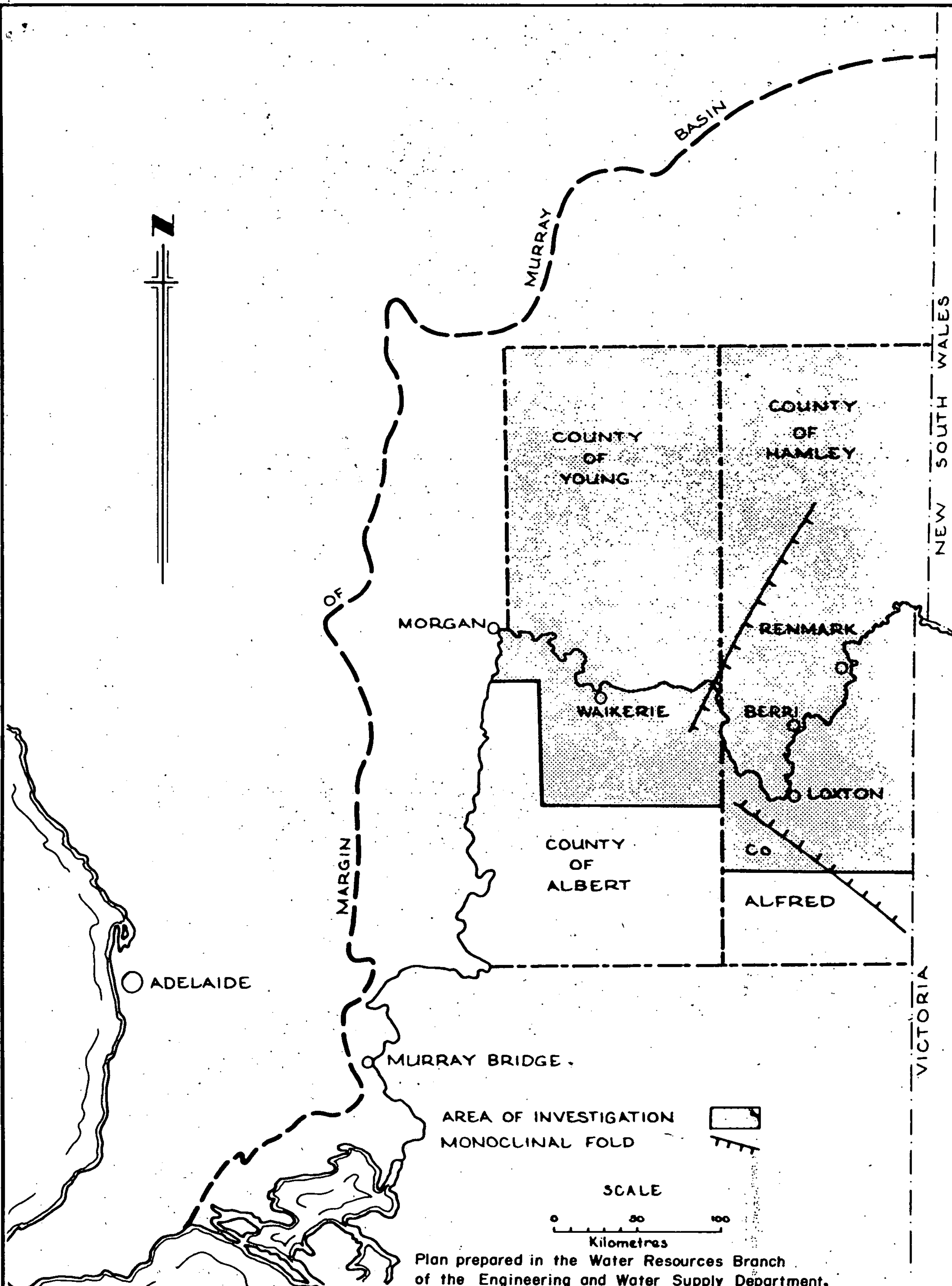
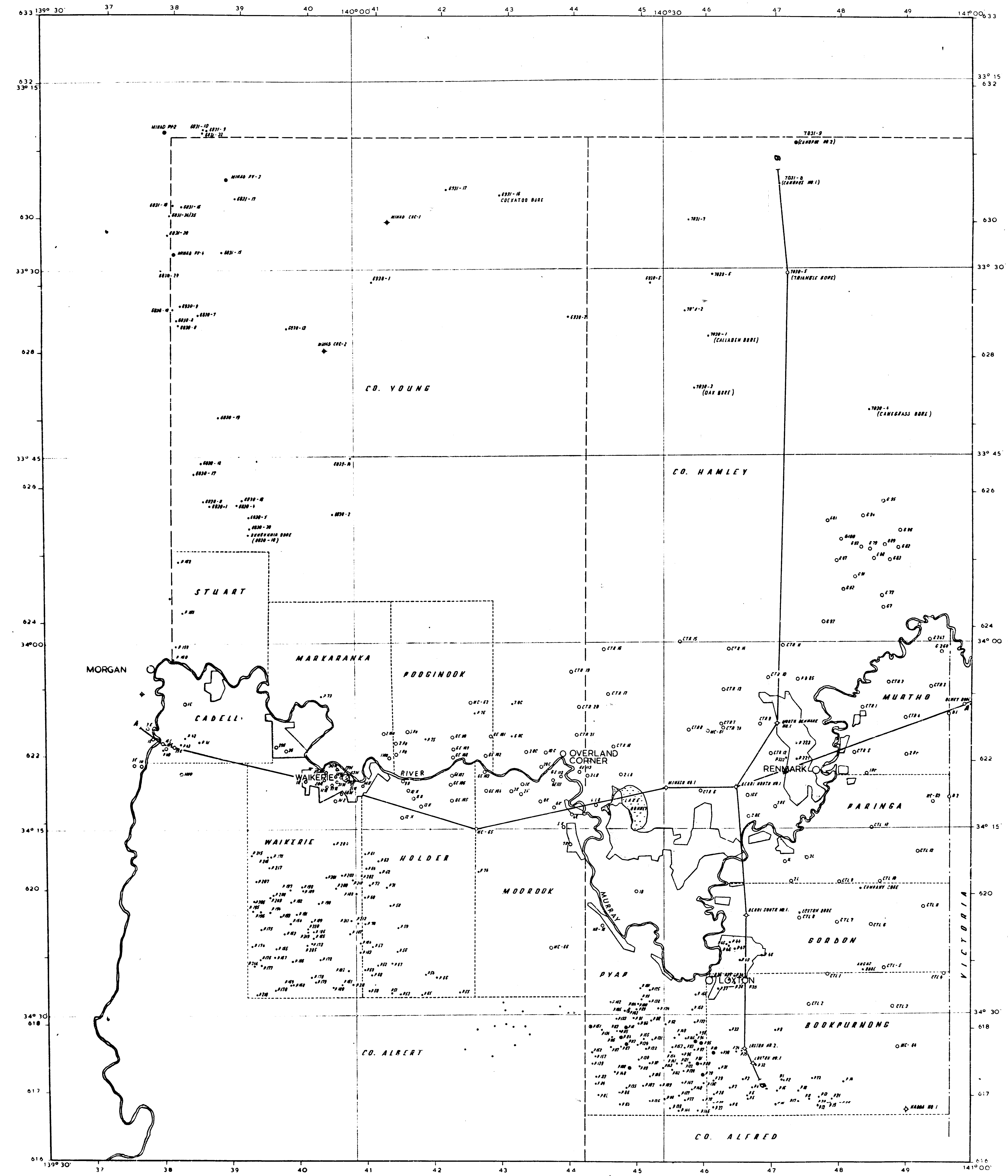



FIG. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

# UPPER MURRAY REGIONAL HYDROGEOLOGY
# LOCALITY PLAN

| | |
|---|---|
| COMPILED J.A. Reed | C.D.O. 16.7.80 DATE |
| DRAWN E. Calabio | SCALE 1:1,300,000 |
| DATE 6/6/80 | PLAN NUMBER |
| CHECKED | S14869 |




**LEGEND**

- HYDROGEOLOGICAL INVESTIGATION WELL — CTA 8
- PRIVATE WATER WELL — P100
  - DRILLED BY DEPT MINES & ENERGY — P10
- PETROLEUM EXPLORATION WELL
- MINERAL EXPLORATION WELL
- COAL EXPLORATION WELL
- GEOLOGICAL SECTION LINE (REFER TO FIG.3) — A A'
- IRRIGATION AREA

NOTE: REF. TO FIGS 15 18 FOR LOCATIONS OF SHALLOW INVESTIGATION WELLS IN CADELL WAIKERIE AREA

AMG 10,000 Metre grid shown 37 | 618

SCALE
0 5 10 15 20 25 km

Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-110

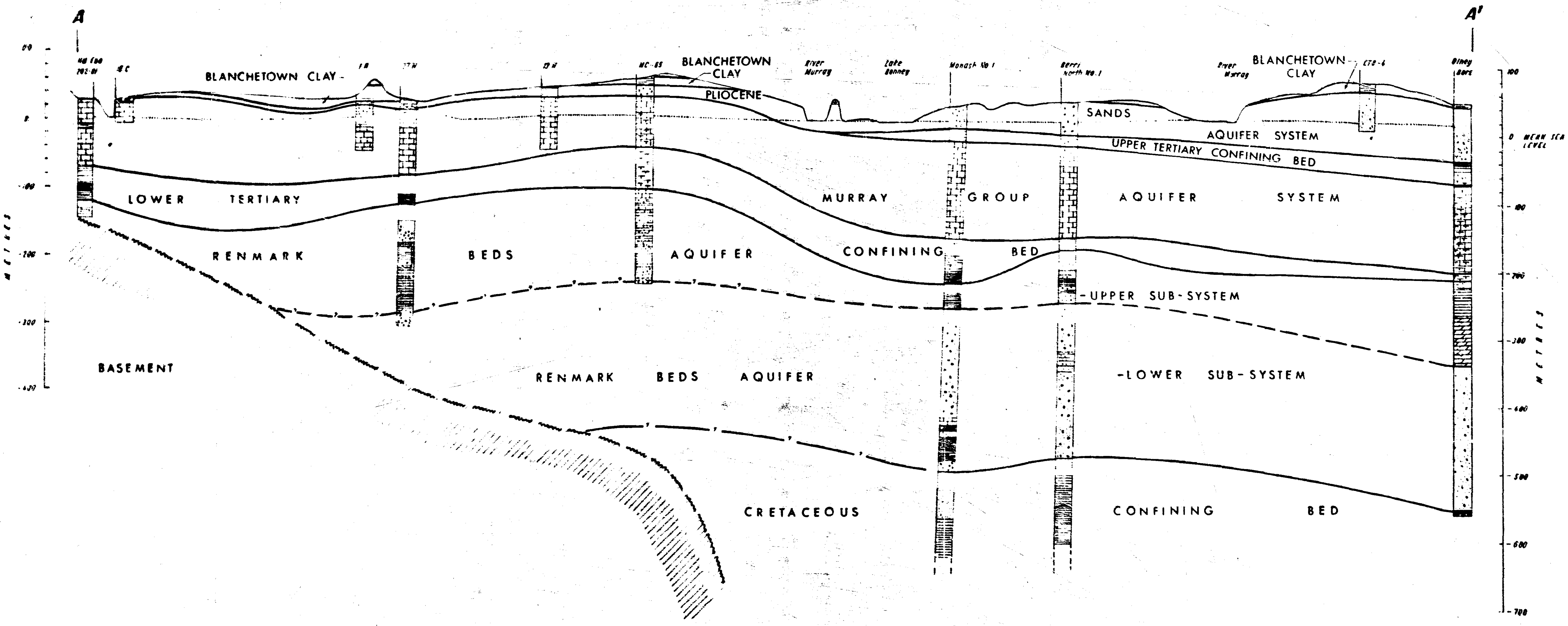
FIG. 2

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

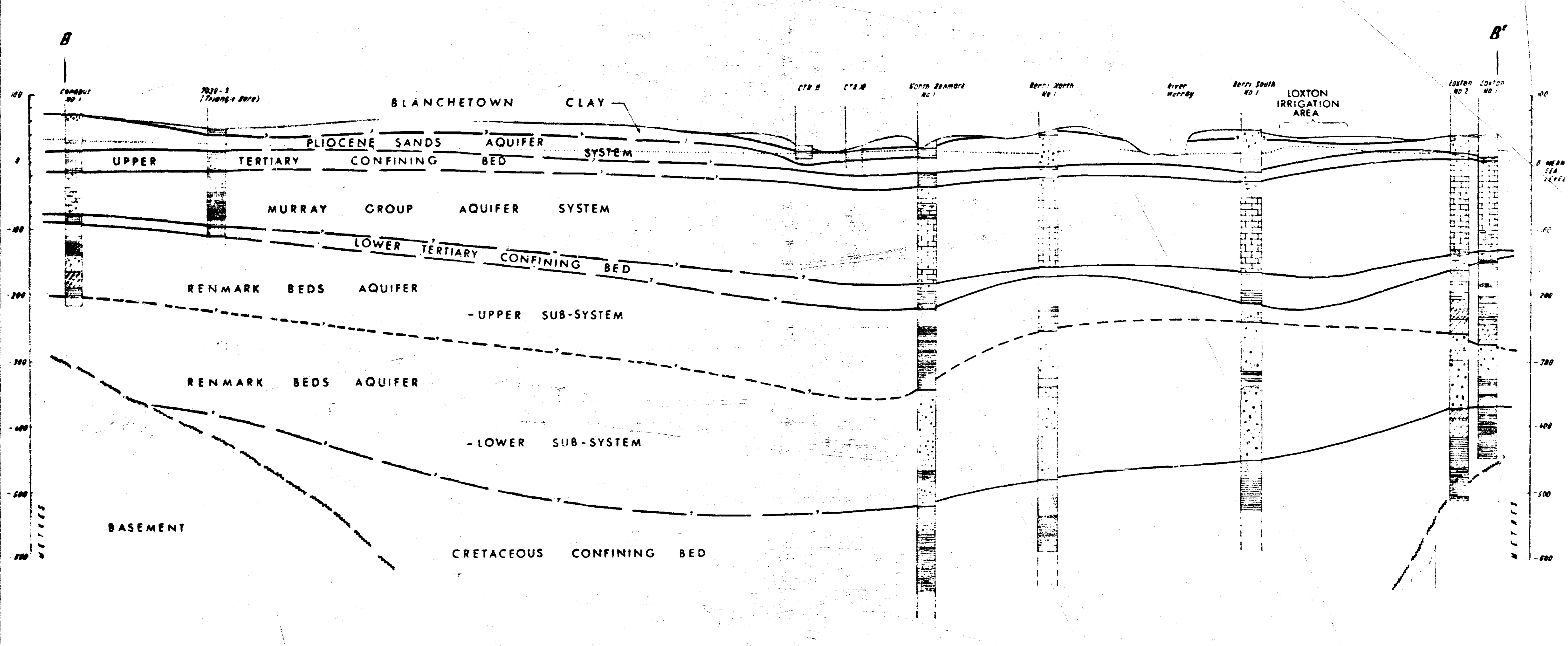
UPPER MURRAY REGIONAL HYDROGEOLOGY

LOCATION OF WELLS AND GEOLOGICAL SECTIONS

| | |
|---|---|
| COMPILED | J. A. Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-332 |




SECTION A-A'




SECTION B-B'

LEGEND

SAND: COARSE, MEDIUM, FINE
SILT
CLAY
LIMESTONE
MARL

WATER TABLE

SCALE

0 5 10 15

KILOMETRES

REFER TO FIG 2 FOR LOCATION OF SECTIONS

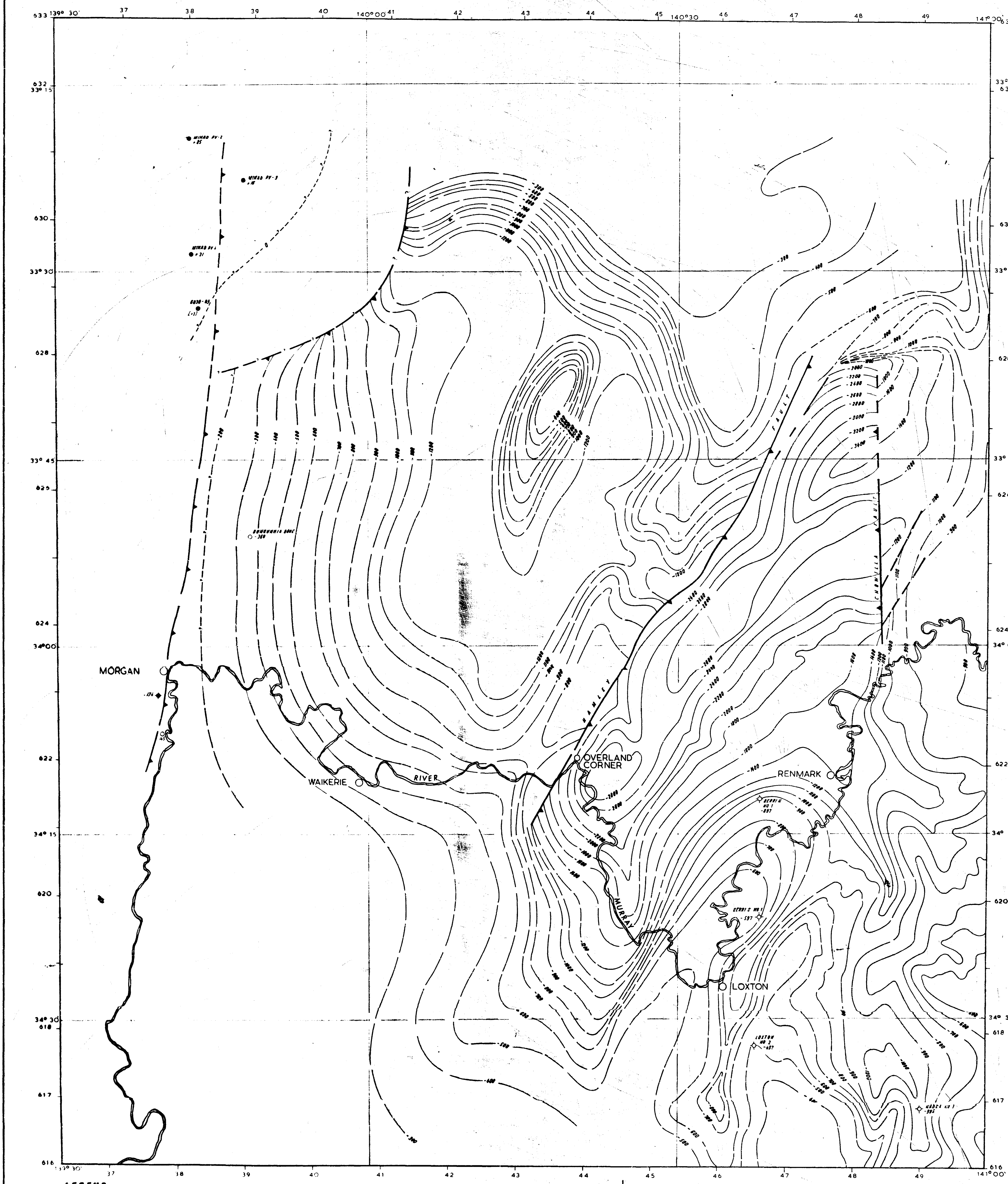
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-111

FIG. 3

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
GEOLOGICAL CROSS SECTIONS
A-A' AND B-B'

| | |
|---|---|
| COMPILED | J.A. Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | |
| C.D.O. | DATE |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-333 |




**LEGEND**

CONTOURS
- FROM THORNTON (1974)
- RE-INTERPRETED FROM THORNTON
- INFERRED

FAULT

OIL EXPLORATION WELL (WITH BASEMENT ELEVATION) -897

WATER WELL (WITH APPROX BASEMENT ELEVATION FROM 1:250000 TOPOGRAPHIC PLAN) (+3)

COAL EXPLORATION WELL (WITH BASEMENT ELEVATION) +21

MINERAL EXPLORATION WELL

DATUM – MEAN SEA LEVEL PT. ADELAIDE
ALL CONTOURS IN METRES

SCALE 0 5 10 15 20 25 Km

Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-112.

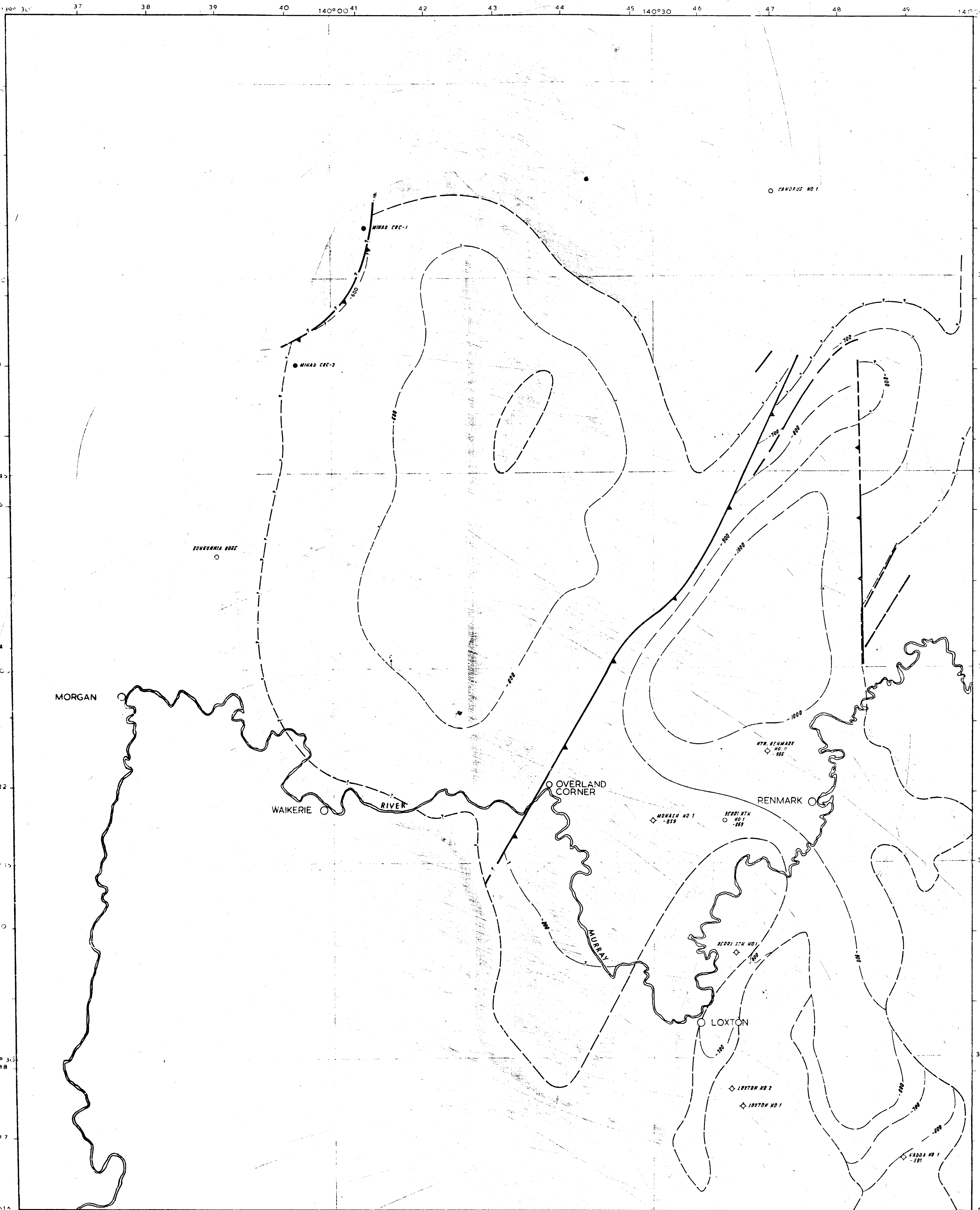
FIG. 4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY

BASEMENT CONTOURS

| | |
|---|---|
| COMPILED | J. A. Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | |
| CDO | DATE 16.7.80 |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-334 |




AMG 10,000 Metre grid shown

## LEGEND

CONTOURS – TOP OF PERMIAN
– FROM THORNTON, 1974 (INTERPRETED)
– INFERRED

MARGIN OF PERMIAN
– FROM THORNTON, 1974
– INFERRED

BASEMENT

FAULT

PETROLEUM EXPLORATION WELL (WITH ELEVATION OF TOP OF PERMIAN) -602

COAL EXPLORATION WELL CRC-1

WATER WELL

DATUM – MEAN SEA LEVEL PT ADELAIDE.
ALL CONTOURS IN METRES

SCALE
0 5 10 15 20 25 km

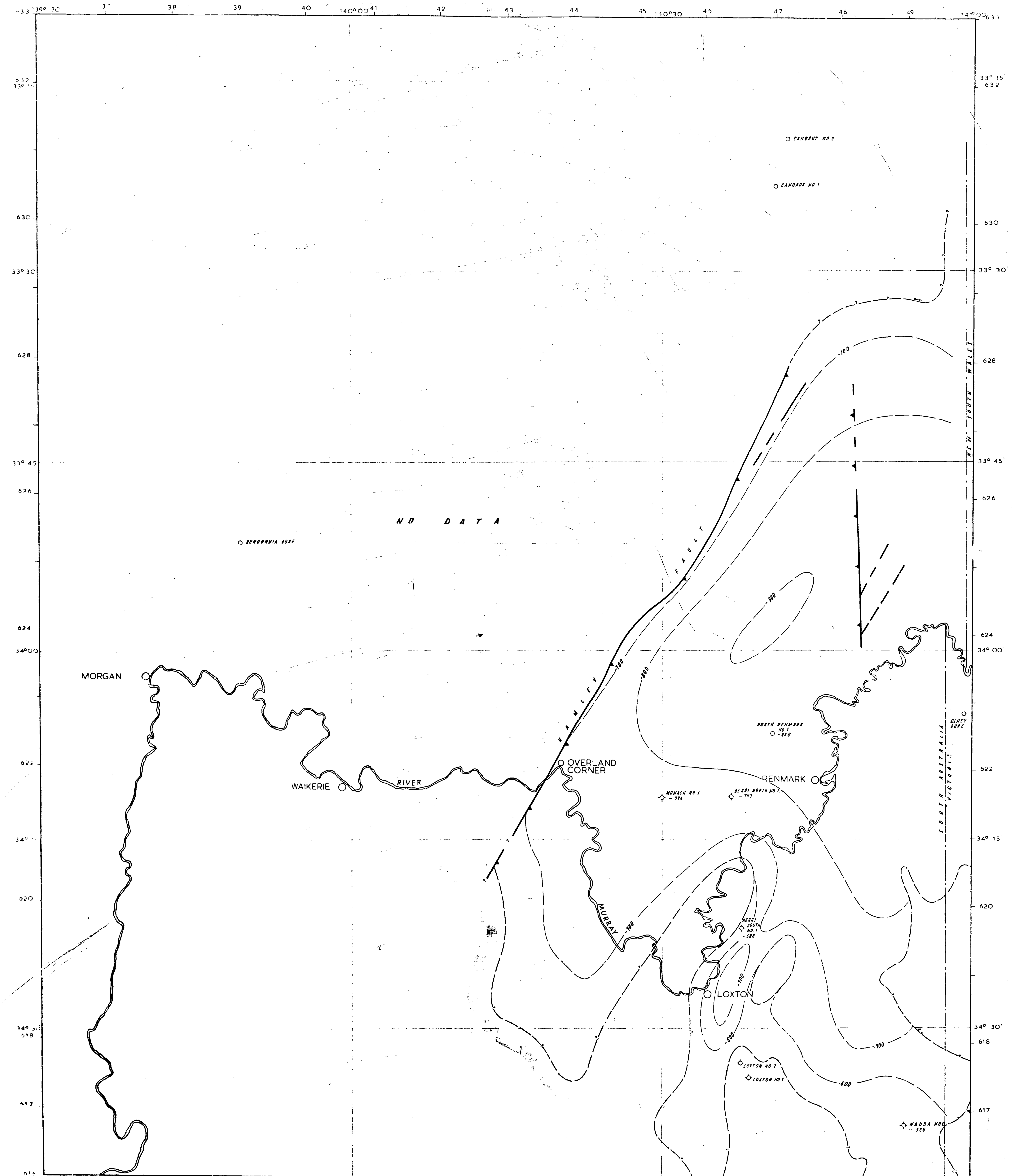
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-113

FIG. 5

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

# UPPER MURRAY REGIONAL HYDROGEOLOGY
# PERMIAN CONFINING BED
# CONTOURS OF TOP SURFACE

COMPILED J.A. Reed
DRAWN E. Calabio
DATE 6/6/80
CHECKED
C.D.O. DATE
SCALE 1:250,000
PLAN NUMBER
80-335




**LEGEND**

CONTOURS – TOP OF SANDS

– INFERRED FROM THORNTON (1974)

BASEMENT

FAULT

– OIL EXPLORATION WELL

– ELEVATION – TOP OF SANDS −776

– WATER WELL

DATUM – MEAN SEA LEVEL AT ADELAIDE.
ALL CONTOURS IN METRES.

AMG 10,000 Metre grid shown

SCALE

km 0 5 10 15 20 25 km

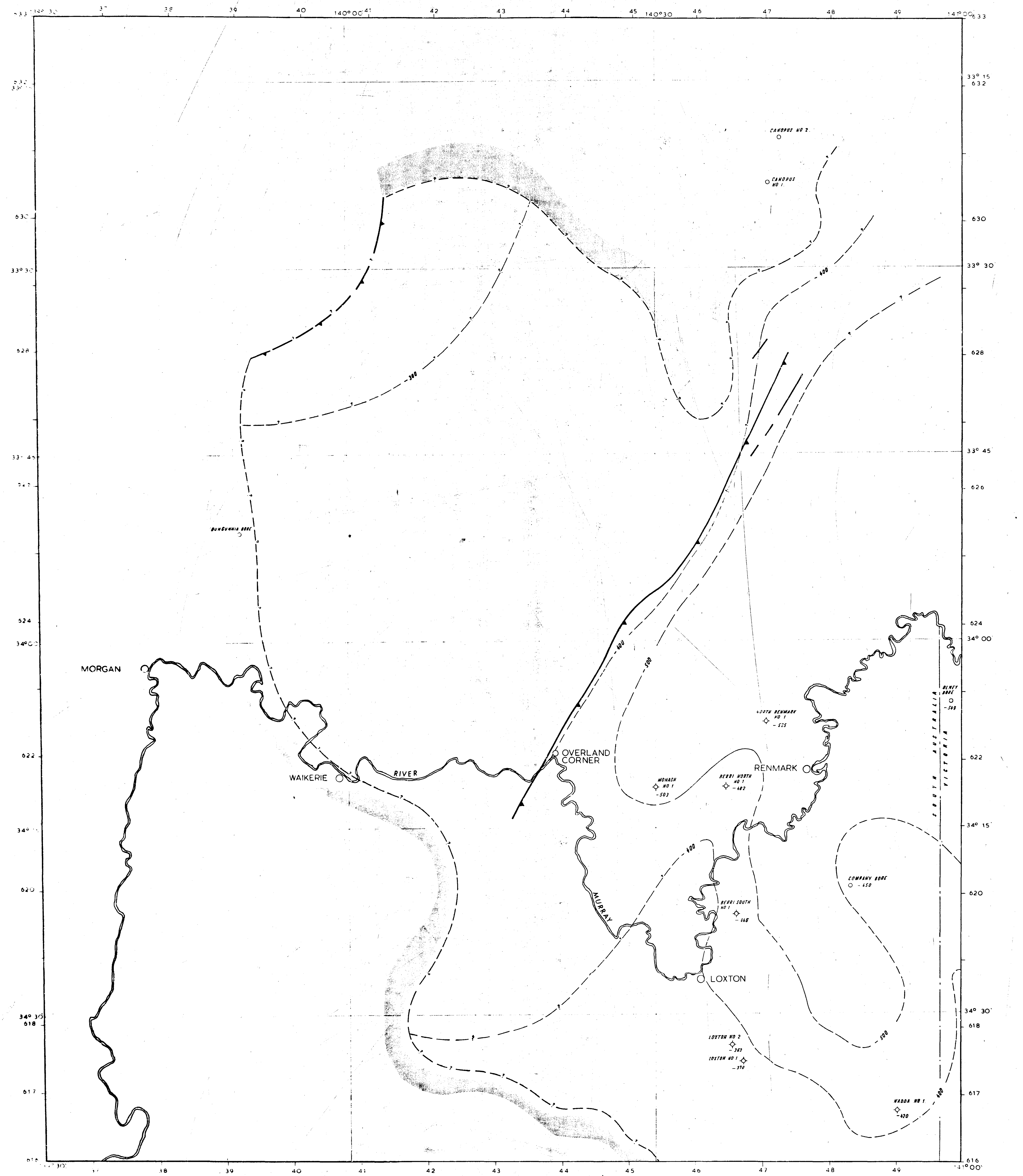
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-114

FIG. 6

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
BASAL CRETACEOUS SANDS AQUIFER
CONTOURS OF TOP SURFACE

COMPILED J.A.Reed
DRAWN E. Calabio
DATE 6/6/80
CHECKED
CDO DATE
SCALE 1:250,000
PLAN NUMBER
80-336




## LEGEND

CONTOURS — TOP OF LOWER CRETACEOUS

- FROM THORNTON (1974) (INTERPRETED)
- INFERRED
- INFERRED MARGIN OF LOWER CRETACEOUS
- BASEMENT

FAULT

- OIL EXPLORATION WELL (WITH ELEVATION OF TOP OF CRETACEOUS) -420
- WATER WELL

DATUM — MEAN SEA LEVEL AT ADELAIDE

ALL CONTOURS IN METRES

SCALE

km 0 5 10 15 20 25 km

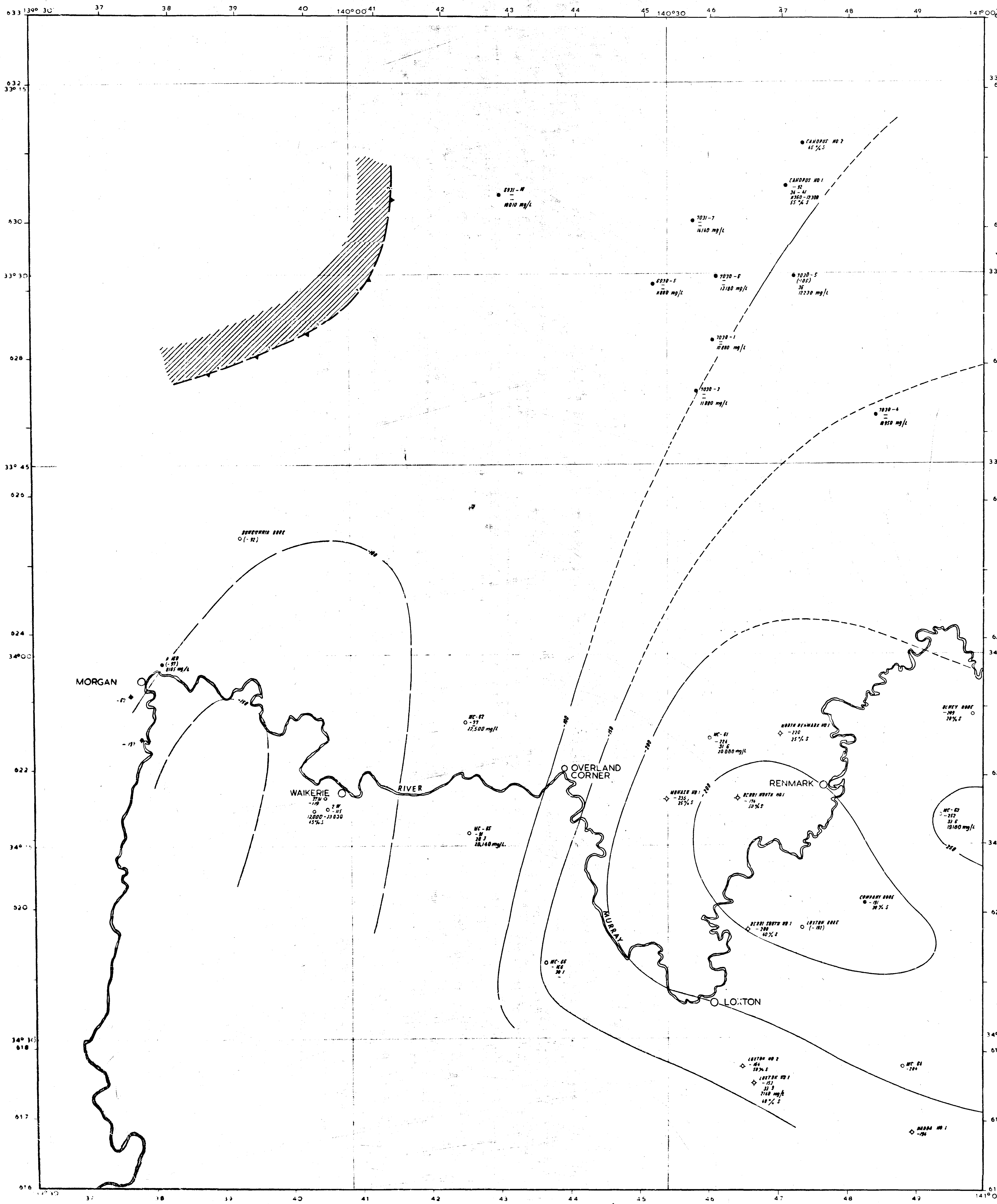
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-115

FIG. 7

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
CRETACEOUS CONFINING BEDS - CONTOURS OF TOP SURFACE

| | |
|---|---|
| COMPILED | J. A. Reed |
| DRAWN | E. Colabio |
| DATE | 6/6/80 |
| CHECKED | CDO DATE |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-337 |




LEGEND

CONTOUR OF UPPER SURFACE
– INFERRED
FAULT
BASEMENT

INVESTIGATION WELL
PETROLEUM WELL
PRIVATE WELL
– DRILLED BY DEPT MINES AND ENERGY

AQUIFER DATA
– ELEVATION OF TOP −153
(ESTIMATED) (−90)
– POTENTIOMETRIC SURFACE ELEVATION 33.9
– SALINITY 2160 mg/L
– ESTIMATED PROPORTION OF SAND BEDS 40% S

DATUM – MEAN SEA LEVEL AT ADELAIDE
CONTOURS IN METRES

AMG 10,000 Metre grid shown 618

SCALE
0 5 10 15 20 25 km

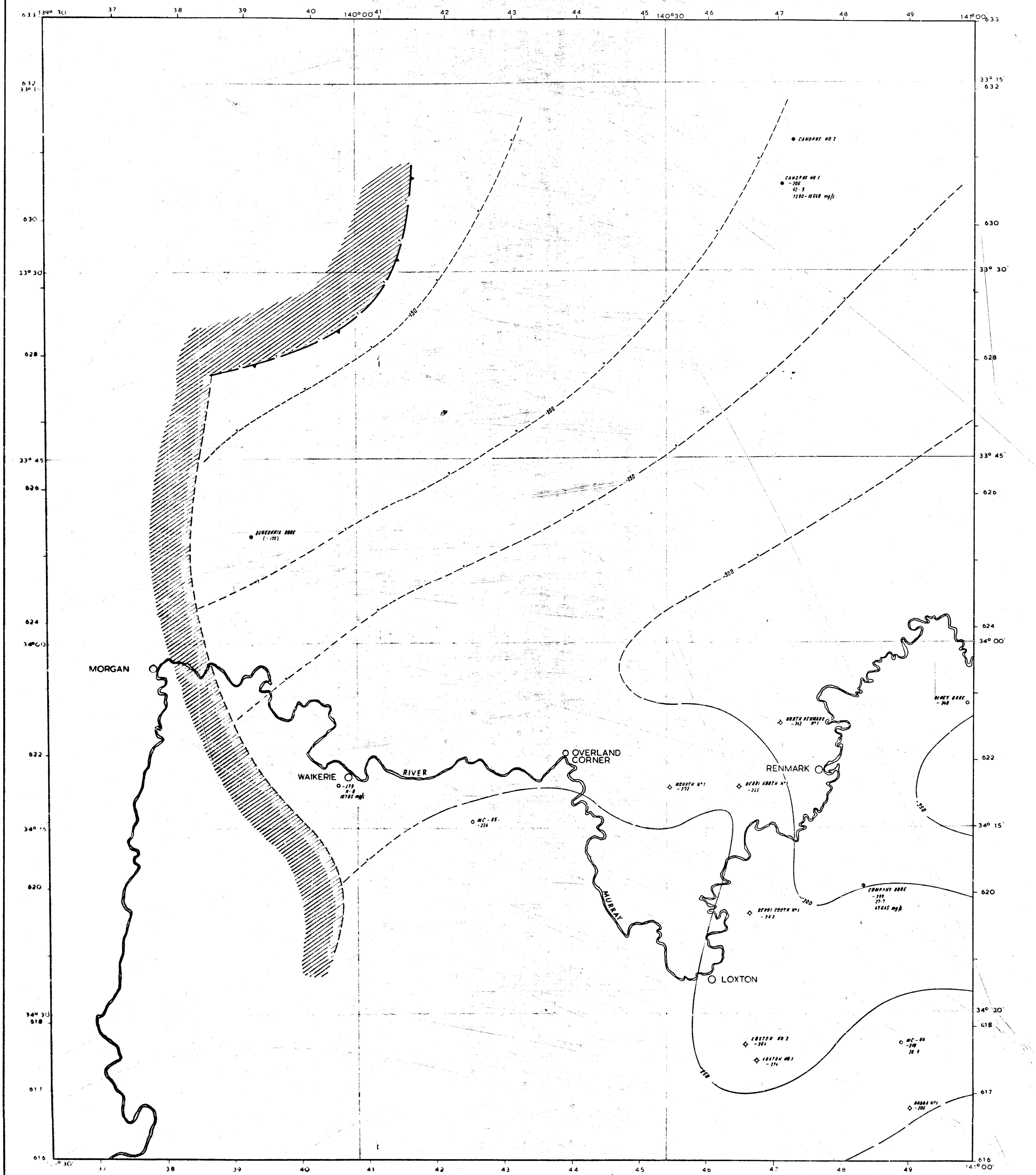
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-116

FIG. 8

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
RENMARK BEDS AQUIFER SYSTEM
CONTOURS OF TOP OF UPPER SUB-SYSTEM

COMPILED J. A. Reed
DRAWN E. Calabio
DATE 6/6/80
CHECKED
C.D.O. DATE
SCALE 1:250,000
PLAN NUMBER 80-338




LEGEND

CONTOUR OF TOP OF SANDS
- INFERRED
APPROXIMATE MARGIN OF SANDS
FAULT
BASEMENT

INVESTIGATION WELL
PRIVATE WELL
- DRILLED BY DME
PETROLEUM WELL
WELL DATA
- ELEVATION OF TOP OF SANDS −278
- POTENTIOMETRIC ELEVATION
- SALINITY 10785 mg/L

AMG 10,000 Metre grid shown

SCALE
0 5 10 15 20 25 km

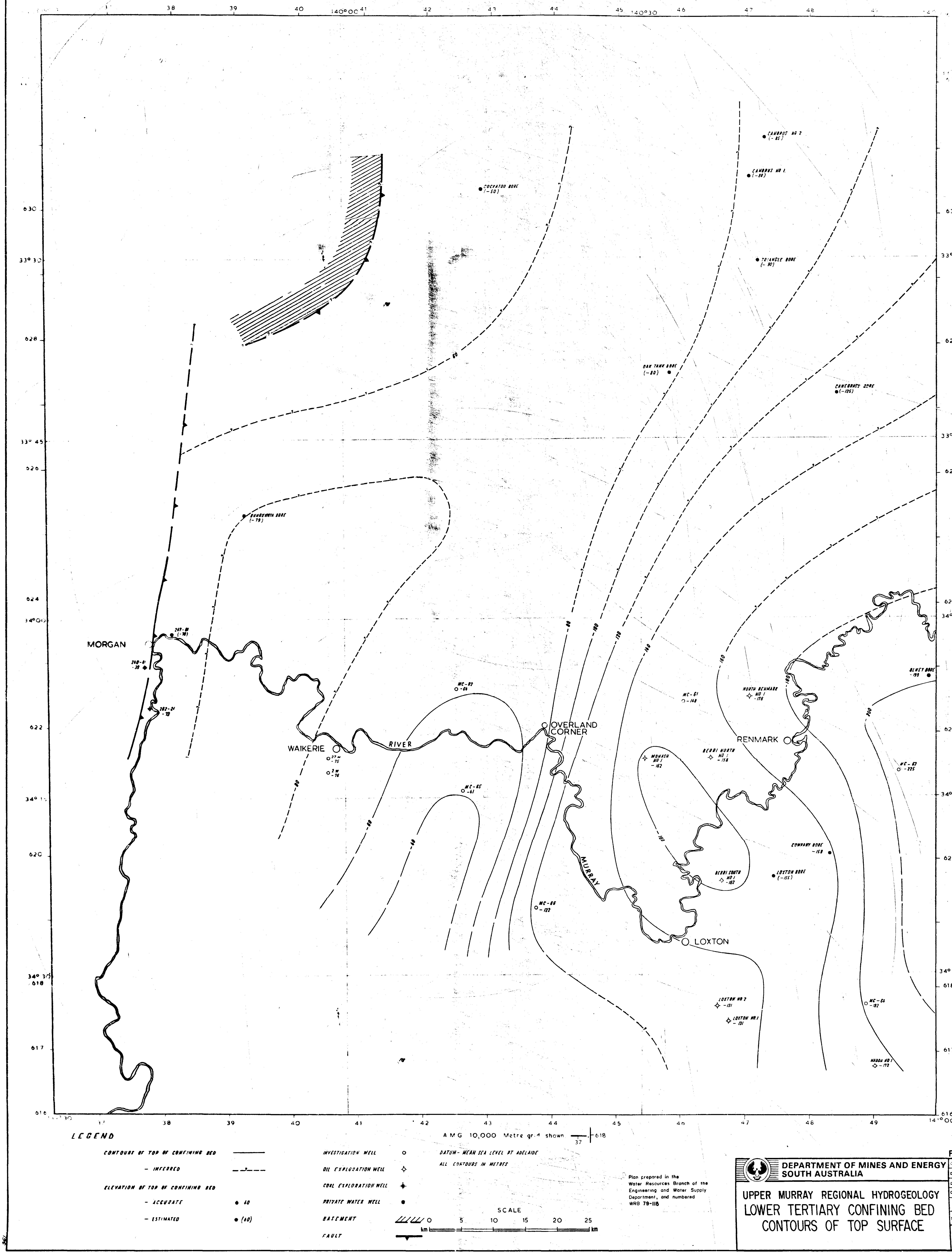
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WHR 79-117

FIG. 9

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
RENMARK BEDS AQUIFER SYSTEM
CONTOURS OF TOP OF LOWER SANDS

COMPILED J. A. Reed
DRAWN E. Colabio
DATE 6/6/80
CHECKED
CDO DATE
SCALE 1:250,000
PLAN NUMBER
80-339



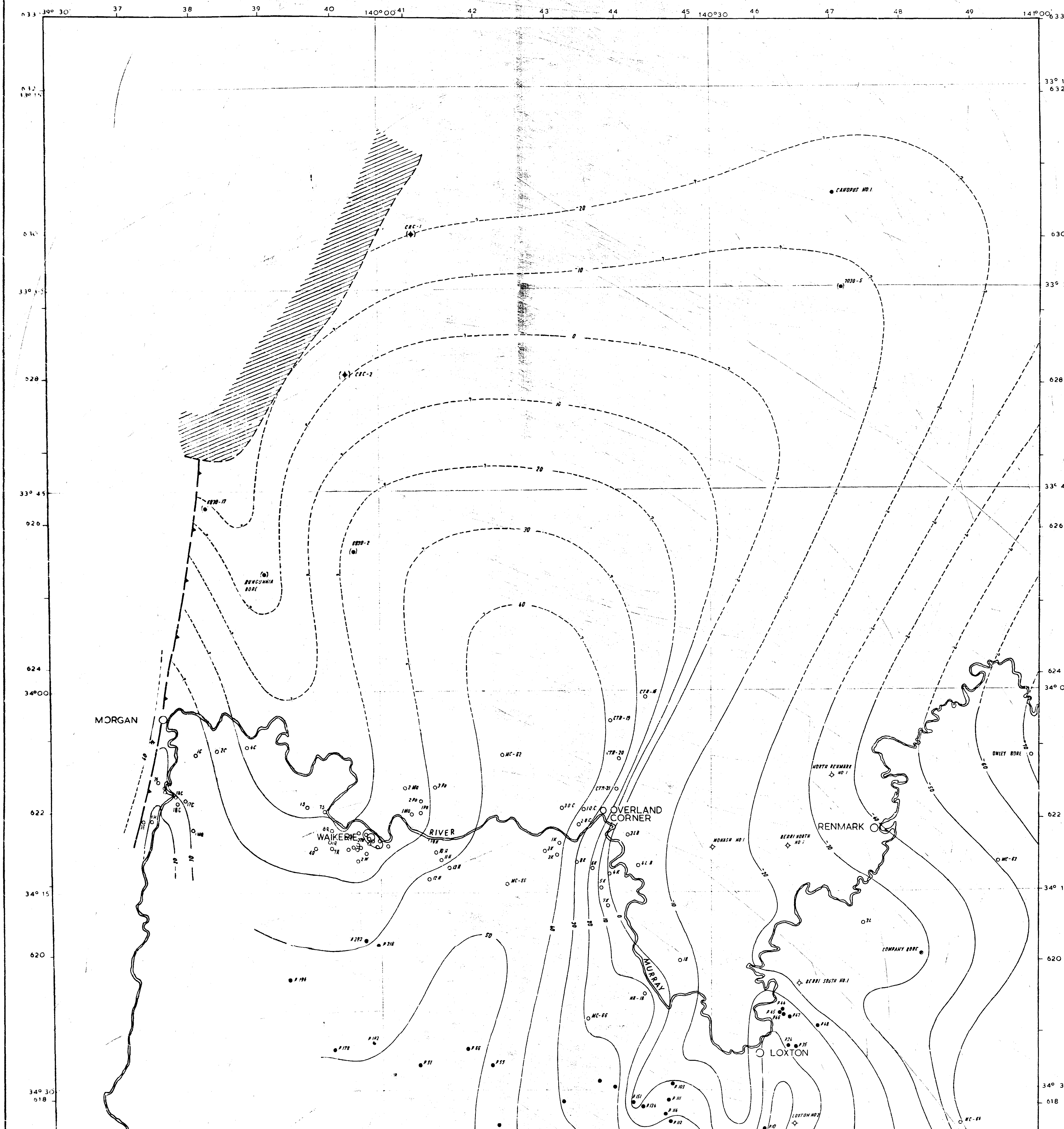

Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-116

FIG. 10

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
LOWER TERTIARY CONFINING BED
CONTOURS OF TOP SURFACE

| | |
|---|---|
| COMPILED | J.A.Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | |
| CDO | DATE |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-340 |




**LEGEND**

| | |
|---|---|
| CONTOUR – TOP OF MURRAY GROUP | —— |
| – INFERRED | – – ? – – |
| MARGIN OF AQUIFER (APPROX) | — — — |
| BASEMENT | (hatched box) |
| FAULT | —▼— |
| PETROLEUM EXPLORATION WELL | ⌖ |
| COAL EXPLORATION WELL | ◆ |
| HYDROGEOLOGICAL INVESTIGATION WELL | ○ |
| PRIVATE WELL – ACCURATELY LEVELLED | ● P5 |
| PRIVATE WELL – ELEVATION ESTIMATED FROM TOPOGRAPHIC PLAN (REF TABLE 2) | (●) 6830-2 |

A M G 10,000 Metre grid shown 37 618

SCALE

0 5 10 15 20 25 km

DATUM – MEAN SEA LEVEL PT. ADELAIDE.
CONTOURS IN METRES.

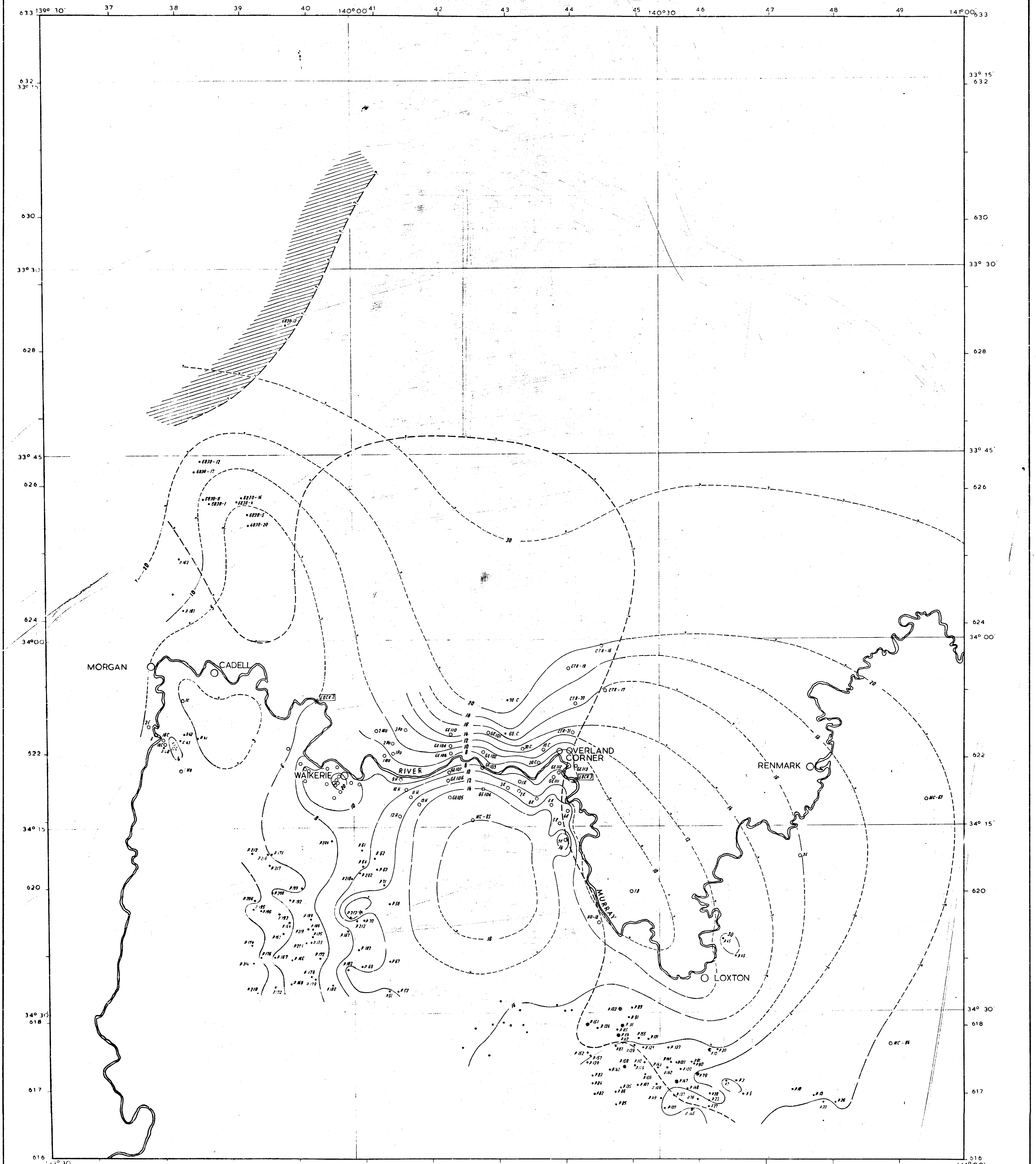
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-115

FIG. 11

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

# UPPER MURRAY REGIONAL HYDROGEOLOGY
# MURRAY GROUP AQUIFER SYSTEM
# CONTOURS OF TOP SURFACE

COMPILED J. A. Reed
DRAWN E. Colabio
DATE 6/6/80
CHECKED
C.D.O. DATE
SCALE 1:250,000
PLAN NUMBER 80-341




**LEGEND**

| | | | |
|---|---|---|---|
| POTENTIOMETRIC SURFACE CONTOURS – ESTABLISHED | ——— | MARGIN OF CONFINING BED – APPROXIMATE | – – – – |
| – INFERRED | –?–?– | – INFERRED | –?–?– |
| INVESTIGATION WELL | ○ CTR-19 | CONFINED MURRAY GROUP | ▭ |
| PRIVATE WELL | • P51 | BASEMENT | ▨ |
| – DRILLED BY DEPT MINES AND ENERGY | ● P151 | | |

AMG 10,000 Metre grid shown

SCALE 0 5 10 15 20 25 km

DATUM – MEAN SEA LEVEL PT ADELAIDE
ALL CONTOURS IN METRES

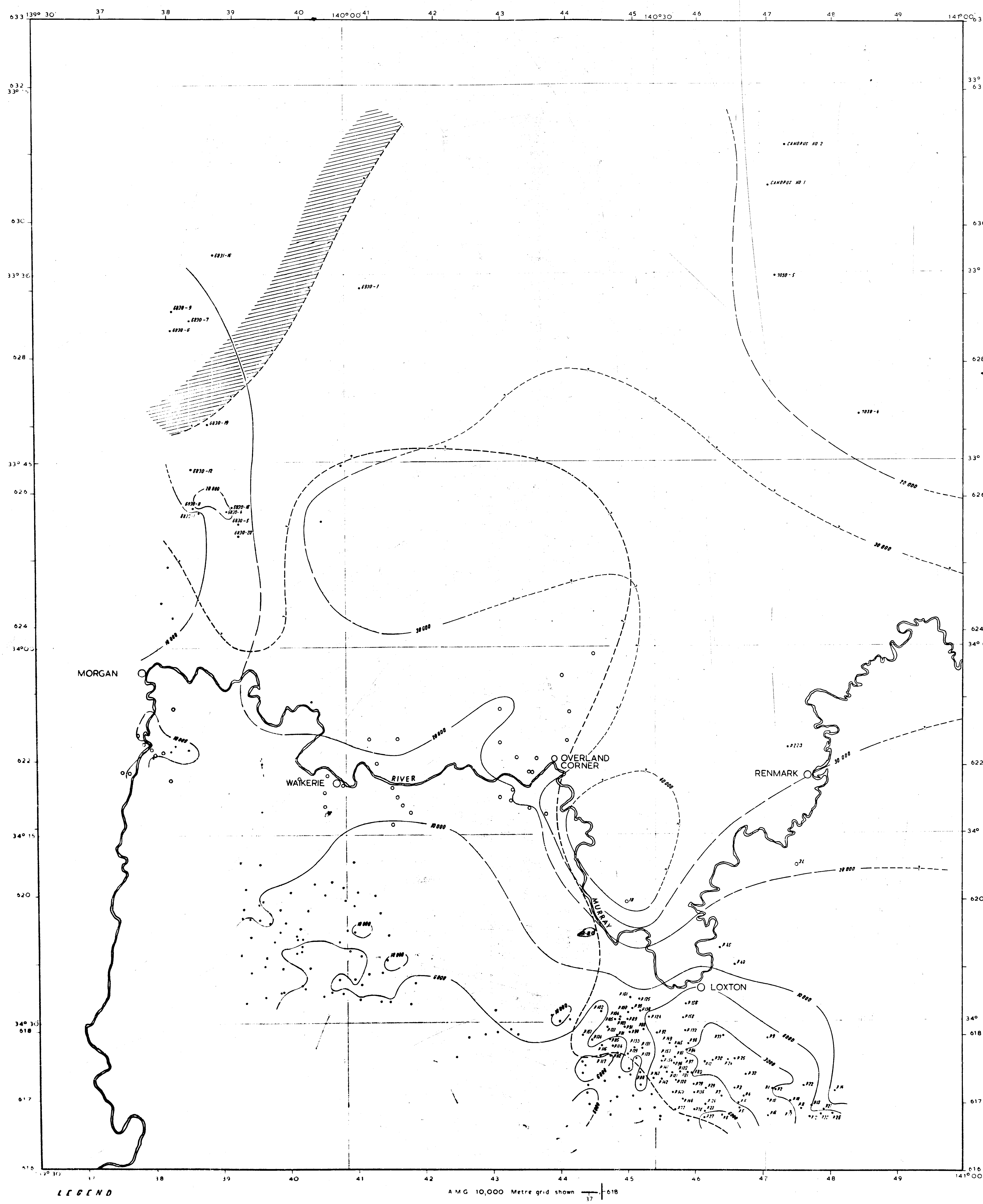
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-120

FIG. 12

**DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA**

## UPPER MURRAY REGIONAL HYDROGEOLOGY
## MURRAY GROUP AQUIFER SYSTEM POTENTIOMETRIC CONTOURS

COMPILED J.A. Reed
DRAWN E. Calabio
DATE 6/6/80
CHECKED
C.D.O. DATE
SCALE 1:250,000
PLAN NUMBER 80-342




AMG 10,000 Metre grid shown

**LEGEND**

ISOHALINE (Mg/L-TDS)
- APPROXIMATE
- INFERRED

MARGIN OF CONFINED AQUIFER
- APPROXIMATE
- INFERRED

INVESTIGATION WELL
PRIVATE WELL
CONFINED MURRAY GROUP AQUIFER
BASEMENT

SCALE 0 5 10 15 20 25 km

Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-121

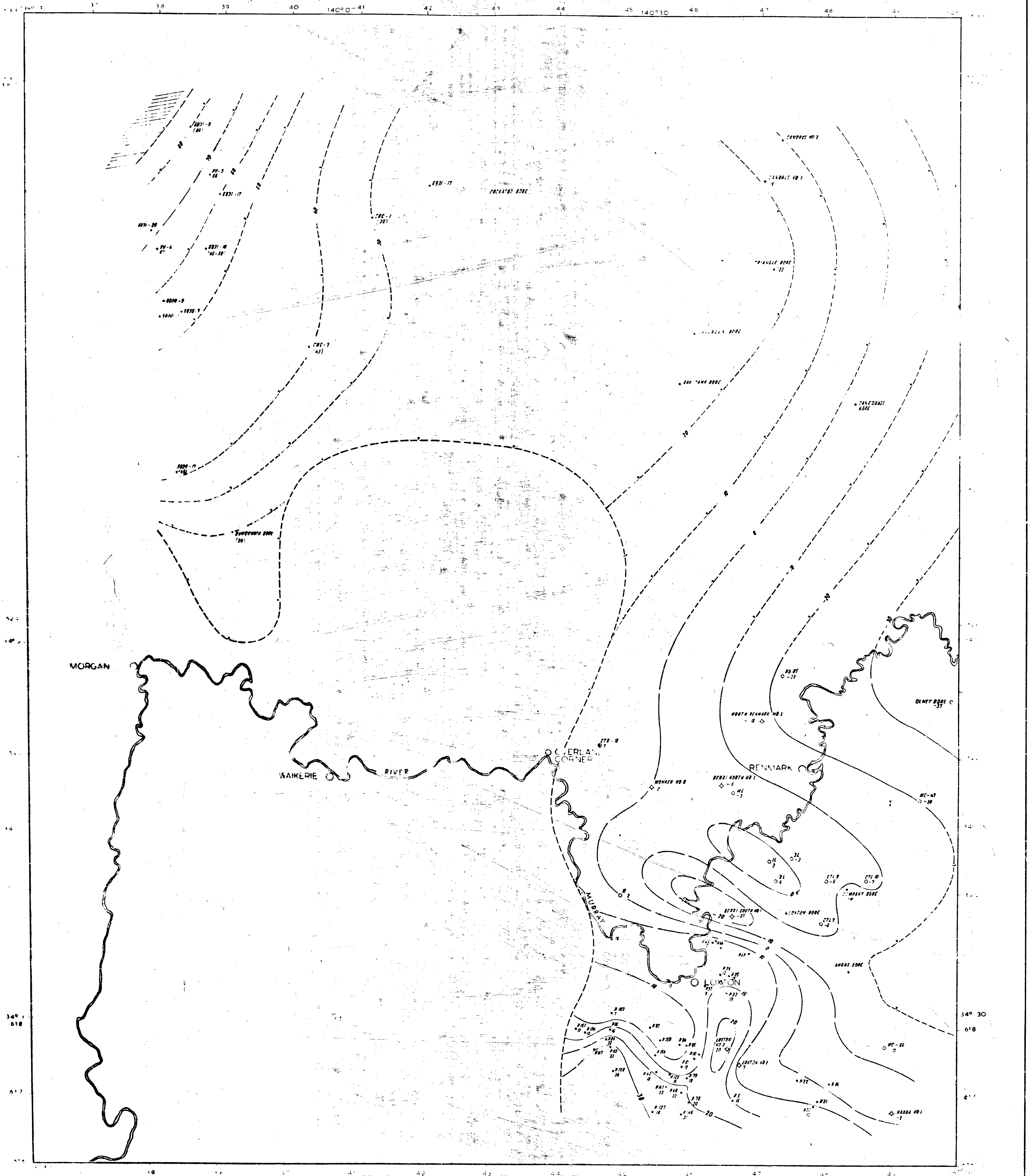
FIG. 13

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY

# MURRAY GROUP AQUIFER SYSTEM ISOHALINES

| | |
|---|---|
| COMPILED | J.A. Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-343 |




**LEGEND**

| | | | |
|---|---|---|---|
| CONTOURS — TOP OF CONFINING BED | ——— | OIL EXPLORATION WELL | ⬦ |
| — INFERRED | — —?— — | INVESTIGATION WELL | o |
| BOUNDARY OF CONFINING BED | | PRIVATE WATER WELL | • |
| APPROXIMATE | — — — — | OUTCROP | x |
| — INFERRED | — —?— — | ELEVATION OF TOP OF CONFINING BED | |
| BASEMENT | | — ACCURATELY LEVELLED | 45 |
| | | — ESTIMATED | (45) |

AMG 10 000 Metre grid shown —| 618

SCALE
0 5 10 15 20 25 km

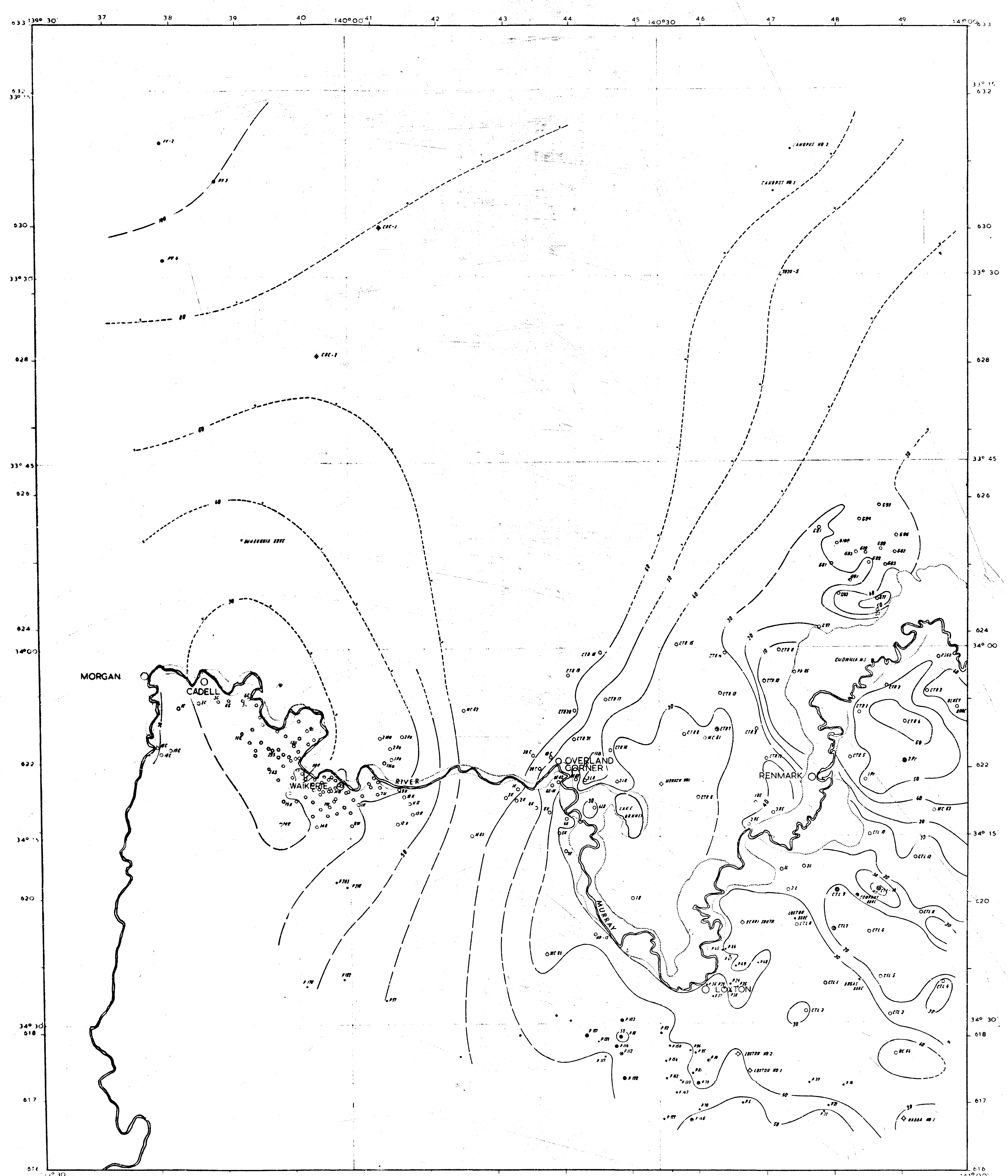
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-122

FIG.14

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
UPPER TERTIARY CONFINING BED
CONTOURS OF TOP SURFACE

COMPILED J.A Reed
DRAWN E. Calabio
DATE 6/6/80
CHECKED
C.D.O. DATE
SCALE 1:250,000
PLAN NUMBER 80-344




## LEGEND

CONTOUR – TOP OF PLIOCENE SANDS
– INFERRED
MARGIN OF RIVER VALLEY

NOTE: FOR DETAILS OF INVESTIGATION WELLS IN CADELL-WAIKERIE AREA REFER TO DM. REPORTS RB 61/96, RB 65/11, RB 70/104

INVESTIGATION WELL — CTL 10
AQUIFER TEST WELL — CTL 9
PRIVATE WELL — P 150
– DRILLED BY DEPT OF MINES & ENERGY
PETROLEUM WELL
MINERAL EXPLORATION WELL
COAL EXPLORATION WELL

ALL CONTOURS IN METRES
DATUM – MEAN SEA LEVEL AT ADELAIDE.

AMG 10,000 Metre grid shown 37 618

SCALE
0 5 10 15 20 25 km

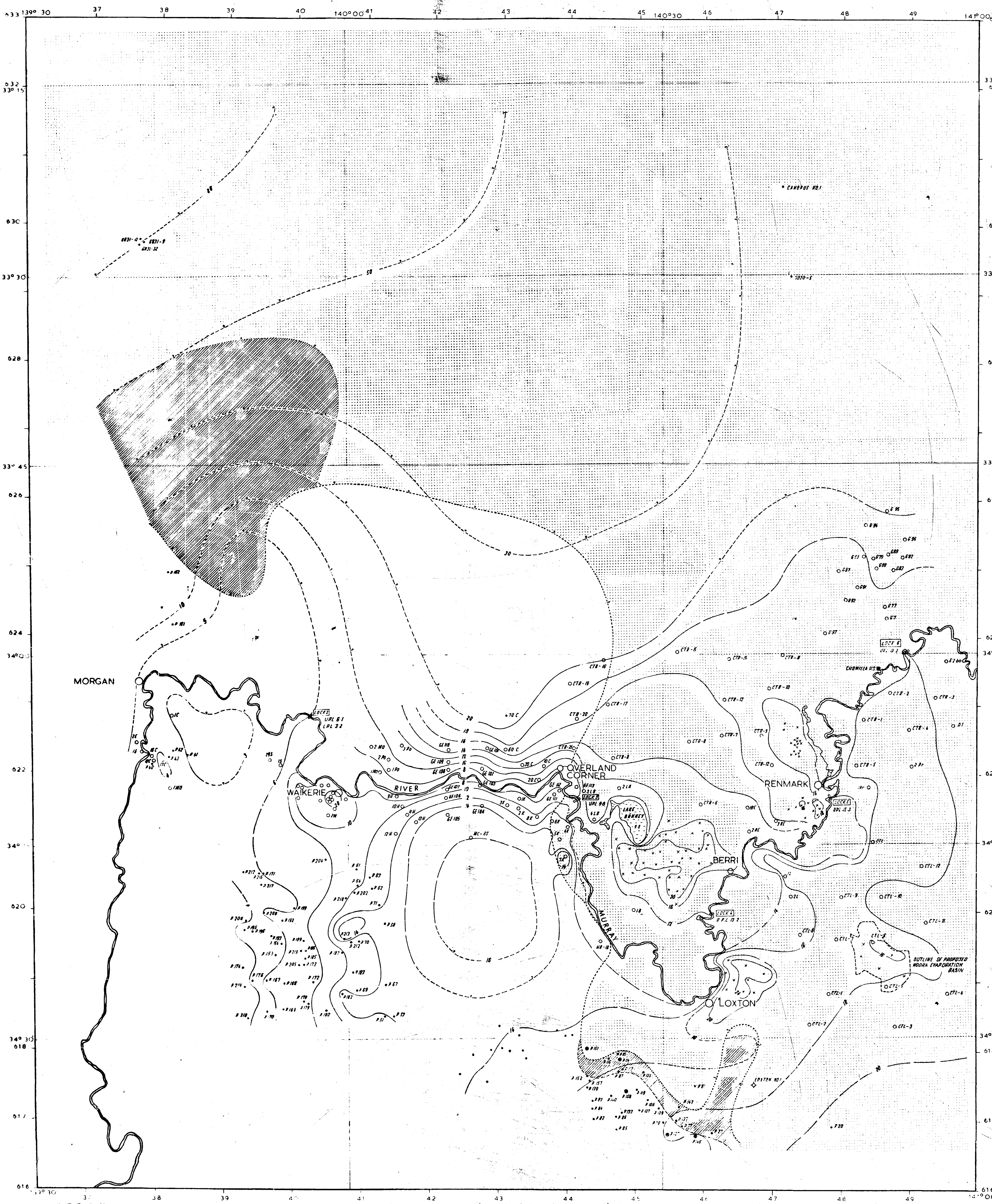
Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-123

FIG. 15

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
# PLIOCENE SANDS AQUIFER SYSTEM
# CONTOURS OF TOP SURFACE

COMPILED J.A. Reed
DRAWN E. Colobio
DATE 6/6/80
CHECKED
CDO DATE
SCALE 1:250,000
PLAN NUMBER 80-345




LEGEND

| | | | |
|---|---|---|---|
| WATER TABLE CONTOUR | —— | RIVER MURRAY LEVELS AT LOCKS | |
| – INFERRED | – – ? – – | – UPPER POOL LEVEL | U.P.L |
| | | – LOWER POOL LEVEL | L.P.L |
| INVESTIGATION WELL | ○ CTR-6 | LIMIT OF WATER TABLE IN LOXTON SANDS AQUIFER | |
| PRIVATE WELL | • P46 | – APPROXIMATE | ........ |
| – DRILLED BY DEPT MINES AND ENERGY | ● P108 | – INFERRED | ....?.... |
| EWS PIEZOMETER | × | | |

NOTE REFER TO DME REPORT RB 70/104 FOR DETAILS OF INVESTIGATION WELLS AT WAIKERIE

WATER TABLE IN LOXTON SANDS AQUIFER

WATER TABLE IN UPPER TERTIARY CONFINING BED

DATUM – MEAN SEA LEVEL AT ADELAIDE
ALL CONTOURS IN METRES.

AMG 10,000 Metre grid shown

SCALE 0 5 10 15 20 25 km

Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-124

FIG. 16

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY

WATER TABLE CONTOURS

| | |
|---|---|
| COMPILED | J.A.Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | |
| C.D.O. DATE | |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-346 |

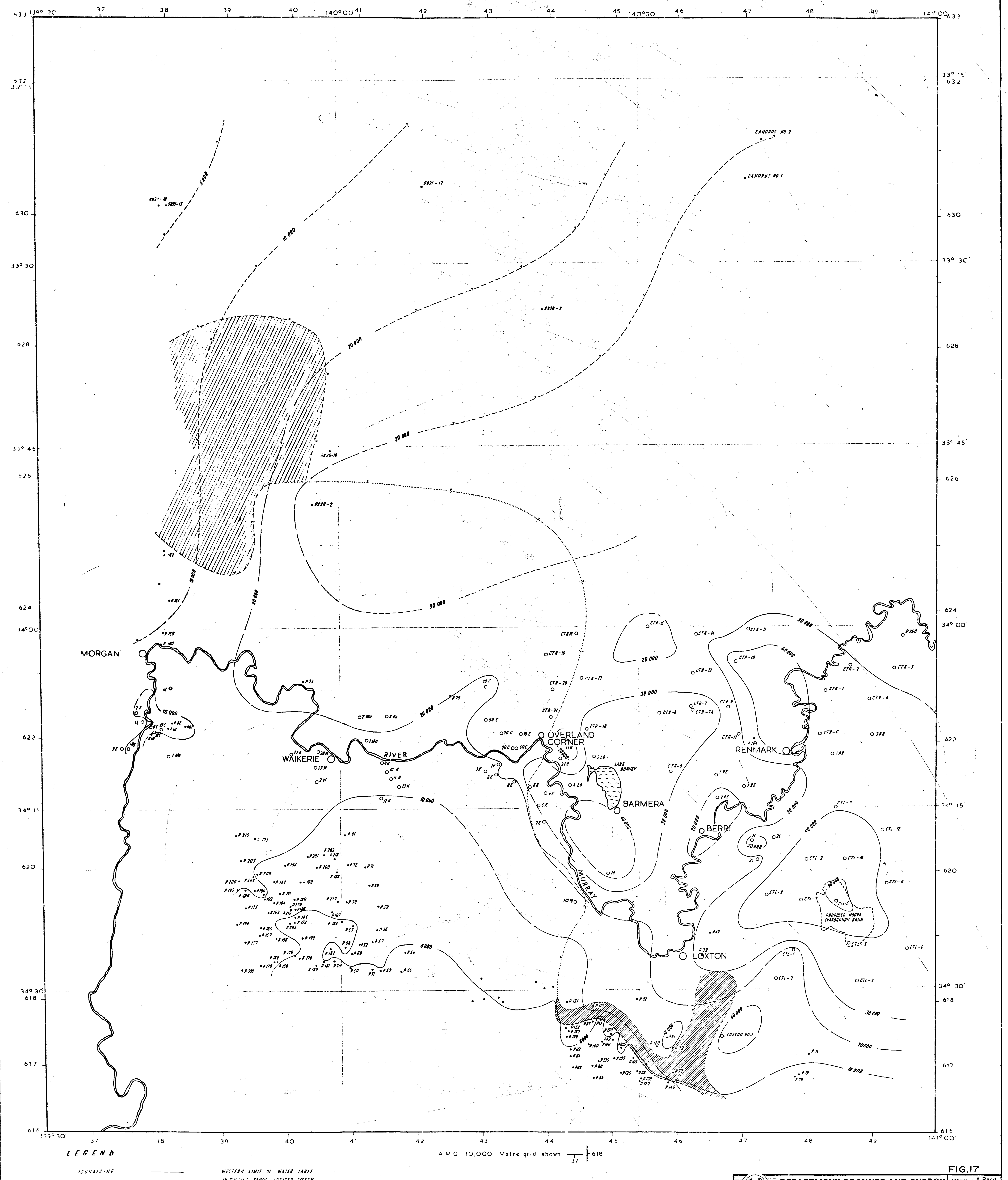
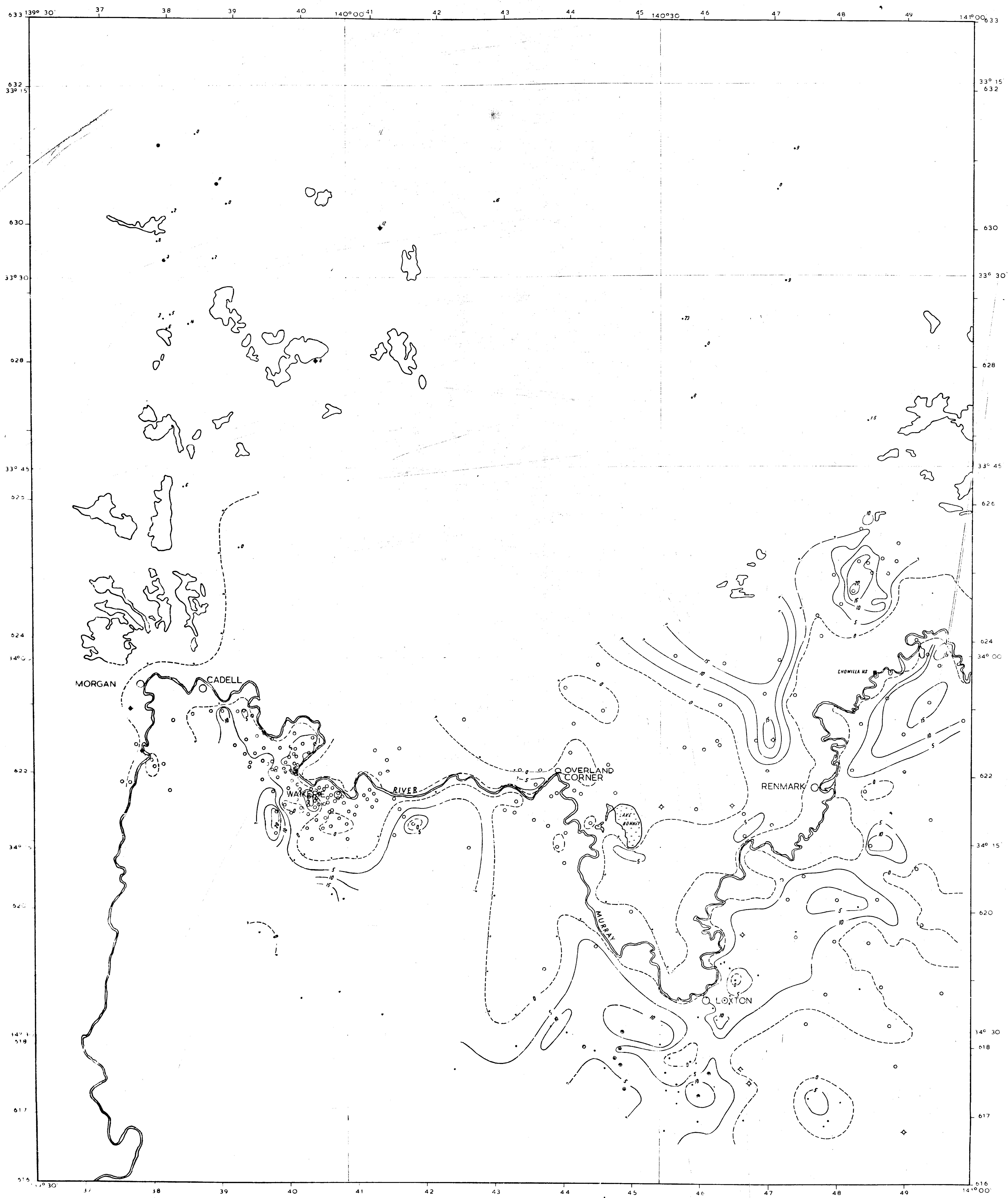



FIG.17

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
ISOHALSINES OF UNCONFINED AQUIFER
(mg/ℓ - T.D.S.)

COMPILED J.A Reed
DRAWN E. Calabio
DATE 6/6/80
CHECKED
CDO DATE
SCALE 1:250,000
PLAN NUMBER
80-347




**LEGEND:**

| | |
|---|---|
| MARGIN OF BLANCHETOWN CLAY | ---0--- |
| THICKNESS CONTOUR (METRES) | ——5—— |
| SURFACE EXPOSURE OF BLANCHETOWN CLAY (FROM CHOWILLA GEOLOGICAL MAP) | ▭ |
| INVESTIGATION WELL | ○ |
| PRIVATE WELL (WITH CLAY THICKNESS) | • 5 |
| PETROLEUM WELL | ⌖ |
| MINERAL WELL | ● |
| COAL EXPLORATION WELL | ◆ |

AMG 10,000 Metre grid shown 37 618

NOTE: 1. REFER TO FIGURES 2 AND 15 FOR WELL NUMBERS.
2. SHALLOW INVESTIGATION WELLS NOT SHOWN IN CHOWILLA REGION

0 5 10 15 20 25 km

Plan prepared in the Water Resources Branch of the Engineering and Water Supply Department, and numbered WRB 79-126

FIG. 18

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

UPPER MURRAY REGIONAL HYDROGEOLOGY
ISOPACH BLANCHETOWN CLAY

| | |
|---|---|
| COMPILED | J.A. Reed |
| DRAWN | E. Calabio |
| DATE | 6/6/80 |
| CHECKED | CDO DATE |
| SCALE | 1:250,000 |
| PLAN NUMBER | 80-348 |