APPRAISAL OF THE GROUNDWATER RESOURCES OF LANDER RIVER AREA, NORTHERN TERRITORY, 1966

by

K.J. Edworthy
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Records 1968/73

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CONTENTS

SUMMARY 1
INTRODUCTION 1
Location and Access 1
Description and Size of Area 2
Previous Work 2
PHYSIOGRAPHY 2
GENERAL GEOLOGY 3
Precambrian (Undifferentiated) 3
Upper Proterozoic 3
Quaternary and Tertiary 3
AVAILABILITY OF GROUNDWATER 4
BASEMENT TOPOGRAPHY 4
RECHARGE AND LOSS OF GROUNDWATER 5
WATER QUALITY 5
CONCLUSIONS AND RECOMMENDATIONS 5
REFERENCES 6

TEXT FIGURES

1. Locality plan. Scale 1:2,000,000
2. Physiographic units. Scale 1:1,000,000

PLATES

1. Geological map of Lander River area. Scale 1 inch : 4 miles.
2. Proposed test-hole locations. Scale 1 inch : 4 miles.

TABLES

1. Bores drilled within catchment area.
APPRAISAL OF THE GROUNDWATER RESOURCES OF LANDER
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SUMMARY

A large amount of groundwater is stored in sediments in the northern part of the Lander River area (see Plate 1). The sediments are probably thicker than 300 feet at the deepest part and range in age from Mesozoic to Recent. The sediments overlie a basement of igneous and metamorphic rocks (including metasediments).

Sediments in the south are thin, supplies of groundwater are small and quality variable; only small supplies are obtained from basement rocks, and possibilities of obtaining large supplies are poor in this area.

Only two bores have been drilled in the northern part of the area. A drilling programme is proposed to obtain more information.

INTRODUCTION

This report was prepared at the request of the Alice Springs District Engineer, Water Resources Branch, Northern Territory Administration.

A number of bores have been drilled in the area, but of the total of 25 from which data are known, only two bores lie within the predicted area of saturated sediment (see Plate 1). The geological map (Plate 1) covers part of two 1:250,000 Sheet areas, Napperby (F53/9) and Mount Peake (F53/5). Bore numbers in the text are prefixed by the appropriate sheet area number. A line has been drawn on the map showing the sheet boundary (22° latitude).

At present water is drawn from 16 bores which supply parts of five pastoral leases: Mount Barkly, Coniston, Pine Hill, Mount Allan and Napperby.

Only in the northern part of the area is there a possibility of obtaining adequate water. Comments refer solely to this part of the area, unless otherwise stated.

LOCATION AND ACCESS

The area lies 130 miles north-west of Alice Springs, at its nearest point, and extends northwards for more than 50 miles.

Access to the southern part of the area is good. Graded roads from the Stuart Highway link Aileron, Pine Hill and Coniston Homestead. There is a road to Coniston from Napperby, which is also linked to the Highway by graded road. Access from the west may be gained from the graded road between the Yuendumu beef road and Mount Allan Station.
DESCRIPTION AND SIZE OF AREA

The catchment area covers about 1,600 square miles and may be divided into two units:

1. The region typified by rugged terrain and patchily covered by thin, discontinuous sediments. Sediments are generally less than 50 feet thick. Prospects of obtaining large quantities of good quality groundwater are poor. The Reynolds Range, source of the Lander River, is situated in the south-east of this area. Two northerly-aligned valleys join and meet the Lander valley 3 miles farther north, to form the major surface drainage of the northern part of the area. This unit accounts for over 75% of the whole area.

2. The plain corresponds to physiographic division 5 (Figure 2). There is no outcrop in this region, the plain being surfaced by red soils. The unit is about 15 miles north-south, by 30 miles east-west, or approximately 450 square miles in extent.

The limits of the units have been plotted from aerial photographs.

PREVIOUS WORK

The only published work on the area is a description of the physiography, geomorphology, and flora of the area together with details of the geology, pedology and climate (Perry, et al., 1962). The groundwater resources of the area are mentioned in Perry, et al (1963).

The groundwater resources of the area immediately to the north, around Willova Station, were investigated by Quinlan and Woolley (1962), and Morton (1965).

Topographic maps of the Napperby and Mount Peake 1:250,000 areas were used as bases for Plates 1 and 2.

PHYSIOGRAPHY

The following divisions are based on the work of the C.S.I.R.O. (Perry, et al., 1962). (Refer to Figure 2 for map).

1. Steep-sided mountains and hills of metamorphic and granitic rocks; relief up to 1,000 feet in Reynolds Range area. Shallow stony soils. Minor narrow valleys in some areas with red clayey sands and coarse soils.

2. Piedmont gravel terraces and undulating plains dissected to a relief of up to 40 feet.

3. Upper and middle floodplains, and plains with gently sloping interfluves; slight relief. Alluvial argillaceous sands, sandy alluvial red-earths and red earths.
PHYSIOGRAPHIC UNITS (See text)
LANDER RIVER AREA
NORTHERN TERRITORY

10 0 10 20 30 MILES

5. Flat or gently undulating red-earth plains.

GENERAL GEOLOGY

Unconsolidated sediments of Recent and Pleistocene age cover much of the area. Over most of the area these deposits lie directly on Precambrian metamorphic rocks or granite of unknown age. In the north, however, where sediments of greater thickness are thought to exist, Tertiary or older sediments may underlie the Recent and Pleistocene sediments. Low grade metamorphic rocks of Upper Proterozoic age, such as those making up the Reynolds Range, occur as inliers in the region occupied by Precambrian rocks and granite.

PRECAMBRIAN (UNDIFFERENTIATED)

Schist and gneiss of the Arunta complex crop out extensively in the area.

UPPER PROTEROZOIC

These sediments make up the Reynolds Range, the Barkly Range, Mount Leichhardt, Mount Denison and several smaller outcrops. The contact between these rocks and the Precambrian rocks is probably faulted in the area.

Rock types present include quartzite, indurated sandstone, phyllite, and dolomite. The relationship of these to other Upper Proterozoic rocks in the Alice Springs area is not known.

QUATERNARY AND TERTIARY

Deposits of this age occur widely in the Lander River area. Alluvium is restricted to narrow deposits near the main surface drainage courses; it is no more than 50 feet thick.

Wash deposits of poorly-sorted gravel, sand, silt, and clay, form a roughly triangular area around Naval Action Bore (F53/9-79); they extend approximately 8 miles north-south.

Thin residual red-soil deposits cover much of the area.

Redeposited aeolian sand covers the northern part of the area. Piedmont gravels surround the high Reynolds Range area; they are considered to be of Quaternary age. Similar deposits of reputed Tertiary age were reported by Quinlan in Perry, et al (1963). Morton (1965) described 115 feet of Upper Tertiary sediments near Willowra Homestead, which he correlates with sediments exposed at Alcoota, also of upper Tertiary age (Pliocene). These sediments are not exposed but were intersected in most of the investigation bores drilled by Water Resources Branch.
A lateritic weathering profile is well developed at Willowra and it is expected that a similar profile exists in the present area. This is also believed to be of Tertiary age, possibly Lower Miocene.

**AVAILABILITY OF GROUNDWATER**

In the southern part of the area, water is drawn from shallow alluvium or basement rocks. Supplies are poor in most bores; it is thought that aquifers are of small volume (i.e. lenticular). For this reason the possibility of obtaining large quantities of groundwater for long periods from the south of the area is considered poor.

Only two bores have been drilled in the northern part of the area; Barkly Bore (F53/5-19) and Redbank Bore (F53/5-25). A good supply is obtained from seventy feet in Barkly Bore. The yield from Redbank Bore is not known.

The characteristics of the basin are therefore poorly known. Storage however, has been estimated and is believed to be of the order of one hundred thousand acre-feet (Perry, et al., 1963).

In the Willowra area (Morton, 1965), supplies have been drawn from the weathered basement, where it occurs below the piezometric surface. Supply and quality are variable. The main Tertiary aquifers are channel-sands which lie beneath, or parallel to, the present day Lander River drainage line.

Shallowness of sediment and the lack of depth below the piezometric surface render the Quaternary sediments of the Willowra area an unreliable source of groundwater.

Little is known of the hydro-geology of the northern margin of the saturated sediments (see Plate 1). The postulated area of deep sediment may extend a considerable distance to the west and north-west. An investigation of the area should be made to enable the possibility to be assessed.

**BASEMENT TOPOGRAPHY**

North of the high land and shallow basement of most of the southern part of the area, a relatively thick sequence of sediments has accumulated (greater than 300 feet) since Upper Mesozoic times.

Basement rocks are exposed in the northern part of the area.

The eastern and western margins of the area shown in Plate 1 have been arbitrarily correlated with the watershed boundaries. It is likely that the groundwater basin is continuous over a much larger area than that indicated. It is also possible, however, that the topographic high point marking the watershed in the east and west, reflects primitive basement ridges, which would have influenced sedimentation. If this is so, the watershed also marks the edge of the saturated sediments.
RECHARGE AND LOSS OF GROUNDWATER

The catchment area is large (950 square miles) and annual recharge has been calculated as ten thousand acre-feet (Perry, et al., 1963). The three main watercourse systems are the Crown and Warburton Creeks and the Lander River. These combine to form the main Lander River which flows across the area where saturated sediments are believed to occur. Owing to the sandy nature of the surface sediments in the basin area, run-off is slight.

Direct infiltration and recharge from the Lander River are the only two sources of recharge. There are no other major watercourses in the northern area.

Loss of groundwater by northward subsurface outflow along the Lander River is probably the main means of discharge.

WATER QUALITY

In the southern part of the area, water quality ranges from 191 parts per million (ppm) (F53/9-107) at Mount Allan Homestead Bore, to over 21,000 ppm at 441/6 Dud (F53/9-136). Quality is generally low.

In the northern basin area, quality is known to be poor at Redbank bore (F53/5-25). The water contains 8200 ppm salts. A possible explanation is that the water is obtained from a confined aquifer in which recharge is restricted. At Barkly Bore (F53/5-19) quality is good; it is believed that water is drawn from an unconfined aquifer.

CONCLUSIONS AND RECOMMENDATIONS

A programme of drilling is required to assess the extent of the sediments in the north of the area.

Two lines of holes are suggested to obtain the required information. The first is one north-south line of 6 holes spaced at 4-mile intervals. The line is planned to test the maximum width of the basin; the datum point is Redbank Bore, which is 6 miles east of the proposed site of the second bore from the southern end of the line (see Plate 2).

An east-west line of 9 test holes, through the 5th bore on the north-south line (measured from the southern end), should be drilled to enable the distribution of possible aquifers to be estimated. The remainder of the holes shown on Plate 2 should provide the necessary additional control. A total of 23 holes is recommended, involving an estimated 5,000 feet of drilling. Siting of additional holes may be required at a later stage.

All holes should be drilled to basement and water samples taken of all supplies encountered. Data should also be obtained from the test holes to enable determination of:

i. the hydrogeology of the sediments and,

ii. quantity of groundwater available from each part of the basin.

Standing water levels should be measured at each testhole and cuttings from each hole examined by a geologist.
REFERENCES


<table>
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<th>Bore Name</th>
<th>Total Depth (ft)</th>
<th>Standing Water Level (ft)</th>
<th>Elevation above sea-level (ft)</th>
<th>Supply (gallons/hour)</th>
<th>Salinity (parts per million)</th>
<th>Aquifer Information</th>
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<th>Total Depth (ft)</th>
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<td>96'</td>
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COMPILRED BY RESIDENT GEOLOGICAL SECTION DRAWN BY MINES BRANCH DRAUGHTING OFFICE DARWIN DEC’66  To accompany Record 1968/73

PROPOSED TEST-HOLE LOCATIONS
LANDER RIVER AREA
NORTHERN TERRITORY

G66/49D