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THE AVAILABILITY OF GROUNDWATER AT BUSHY PARK HOMESTEAD

by

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SUMMARY

Groundwater at Bushy Park Homestead is contained in fractures in amphibolite, gneiss and schist underlying a thin cover of soil and alluvium. Results from drilling and constant separation resistivity traverses suggest that the weathering fractures, tapped by bores drilled to date, will not maintain adequate groundwater supplies. Further search should be for tectonic fractures which may be open to greater depth.

INTRODUCTION

Bushy Park Homestead is approximately 55 miles north of Alice Springs, Northern Territory. At the request of the lessee a visit was made to Bushy Park on 27th March, 1961 to assess the availability of groundwater at the homestead. A resistivity survey was recommended and a series of constant separation resistivity traverses was done by N.T.A. Water Resources Branch. The availability of groundwater at Bushy Park Homestead is reviewed following the drilling of three bores, sites for which were selected on the basis of the resistivity traverses.

GEOLOGY

Bushy Park Homestead is situated in an area of red earth soil, and there are no outcrops of rock in the immediate vicinity.

The geology of the area can only be determined from the cuttings submitted by the driller. The nature of the contacts, the gross lithology and the textures of rock types can only be inferred.

The area is underlain by an unknown thickness of alluvium overlying weathered granite (bore 103), amphibolite and gneiss (bores 104, 108, and 109) and by quartz biotite schist (110). Bore 111 may have been drilled into schist. The location of these bores is shown on Plate 1.

The granite is deeply weathered and partly decomposed. It does not contain much mica or ferromagnesian minerals. If it is an intrusive granite, its contact with the amphibolite and gneiss is irregular, and it will be between bore 103 and the Bushy Park Homestead.

The amphibolite contains some quartz and its constituent minerals are relatively unaffected by weathering. Some amphibolite cuttings are blocky and bounded by irregular fracture planes, some of which are stained with iron oxide. The quartz anhedra show slight iron staining. The gneiss is medium-grained and contains fresh feldspar and little mica. It is thought that the rapid changes in apparent resistivity along the traverse lines indicate that the amphibolite is finely interlayered with the gneiss. Such interlayering is typical of the Riddock Amphibolite and is "most pronounced at the ends of the amphibolite lenses, suggesting an original sill-like character, rather than lava flows" (Joklik 1955).

The quartz biotite schist encountered in bore 110 is inferred, from the drilling rate and the nature of the cuttings, to be coarsely banded. The banding is caused by variations in the mica content. The foliation planes have been opened by weathering to a depth of 70 feet. The cuttings between 70 feet and 93 feet, at the base of the weathered zone, are blocky. Below this depth the schist is relatively fresh.

The zone of steep gradient in the apparent resistivity (Plate 1) is taken to be the boundary between the schist and the amphibolite and gneiss. This zone appears to coincide with one of the linear features on the air photographs (Plate 1). The nature of these features is unknown but they may represent lines of fracturing.

HYDROLOGY

Results of Previous Drilling

Prior to March 1961 one bore (104) had been drilled at the homestead. It is approximately 67 feet deep and was originally tested at 700 gallons per hour, at which time the available drawdown was of the order of 10 feet. The water level in this bore has fallen and at March 1961 was believed to be at approximately 65 feet. The yield of the bore at that time had fallen to 200 gallons per hour.

Two of the later bores (108 and 109) were drilled on resistivity highs. Both bores were abandoned because of hard drilling in amphibolite at 14 feet and 23 feet respectively.

Bore 110 was sited on a resistivity low, and was abandoned at 111 feet after drilling through the weathered zone in the schist. A small supply of water (less than 30 gallons per hour) was struck at 85 feet.

Availability of Groundwater

Groundwater in metamorphic rocks is stored in fractures. Most fractures are the result of weathering and are superficial in that they close and disappear at the watertable. They become important aquifers if, at some time after their formation, the watertable rises. Those fractures which have been produced mechanically will extend below the watertable, and some will remain open to depths of up to 300 feet.

It is considered that the groundwater obtained to date is stored in superficial fractures in the schist and in the amphibolite and gneiss, which have been opened up by weathering. It can be expected that these fractures will be closed below a depth of 70 feet. The watertable now stands approximately 5 feet above the base of the weathering profile, and at bore 104 it has fallen approximately 5 feet in 10 years.

The permeability of the weathered zones developed on the schist and the amphibolite appears to be too low for a satisfactory supply to be obtained from bores with the limited available drawdown.

Exploration should be directed toward the location of tectonic fractures in the metamorphic rocks. The nature of the photo-lineaments is not known, but it is possible that they are lines of fracturing and they should be investigated, particularly in those areas where two sets may intersect.

REFERENCE

JOKLIK, G.F., 1955 - The geology and mica-fields of the Harts Range, Central Australia. Bur. Min. Resour. Aust. Bull. 26.

PLATE 1.

N

Scale 1" to 100'

F53/10 - 103

Approximate North

Scale 1:46,000

Red Earth Soil and Mulga

Photo linear feature

Photo linear feature

Bushy Park HS

F53/10 - 106, 108 and 112

F53/10 - 111

Laterite overlying Precambrian Schists

TRACING OF AIR PHOTOGRAPH 5061
RUN 14 ALCOOTA

320
426
401
382
494
629
546
578
F53/10 - 108
630
798
739
520
760
798
350
525
F53/10 - 109
875
410
376
370
326
394
320
439
157
452
37·5
333
268
163
F53/10 - 110
18·8
31·4
37·5
44·0
37·6
119
280
376
F53/10 - 101
69·0
62·8
226
75·3
81·6
106

Zone of Steep Gradient in Apparent Resistivity

APPARENT RESISTIVITY
100 ft CONSTANT ELECTRODE SEPARATION TRAVERSES
BUSHY PARK HOMESTEAD

F 53/10/1

Resident Geologists Office
Alice Springs.
November 1961