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1980/48. Groundwater prospects at Trefoil Island

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Abstract

The rocks on Trefoil Island are fractured basalt and breccia above more compact basalt and pyroclastic rocks. These favour a perched water table which produces springs on all sides of the island.

The water could be exploited by a deep borehole, by control of suitable springs, or possibly by shallow holes in pebble beaches. Quality is probably good and yields to bores would be of the order of 15-30 *l*/min.

Trefoil Island was visited by geologists P.C. Stevenson, R.C. Donaldson, and D.J. Jennings on 18 November. The party was on the island from about 10 a.m. to 2.30 p.m.

GEOLOGY

The rocks of the island are basalt lavas and related basaltic breccia, and thinly bedded compact water-laid tuff. The succession is a complex one and little attempt was made to evolve a detailed picture of it. Hydrologically, the situation is much more readily understood.

HYDROLOGY

There is no permanent surface drainage on the island. The cliffs or steep slopes which run all around the island are not always accessible and only the cliffs on the south, east and north-east sides were examined on the ground. At several places on these sides a line of springs is seen on the cliff and at each the nature of the rocks controls the position of the spring-line.

At the most southerly point of the island, fractured and permeable lavas and breccias overlie compact and unfractured pyroclastic mudstone, and springs issue along the contact, which is sub-horizontal and about five metres above sea level.

Small shows of water also occur at the easterly point of the island, where fractured and moderately weathered basalt lava overlies relatively unfractured compact lava at five to ten metres above sea level. The same conditions appear to apply at several points on the north-east coast, where slopes run down to terminate in low (10 m) cliffs above the shore. Here the geology is not clearly exposed, but the water appears to be controlled by the bedding of successive lava flows.

Well defined springs occur in the low cliffs at the back of the prominent cove half way along the north-east coast, about 100 m south of this point, and particularly about 150 m north of it. At this last position, a cistern has been constructed to collect the water, but the area is overgrown and neglected and overflow has made the surroundings saturated and swampy.

Other shallow springs occur further south, again appearing to represent the contact between permeable rocks above and less permeable rocks below.

The western cliffs were not accessible, but from the aircraft it was possible to see that a similar line of springs had caused green plant growth in several places.

A further prospect was briefly examined. At several places on the shore, low terraces of basalt pebbles lie at the foot of the island slopes at levels of two to three metres above high tide. The largest of such areas is at the south-east end of the island, to the west of the point where the inland track comes down to the shore. An attempt was made to hand auger a bore through this terrace in the expectation of there being fresh groundwater at or near sea level, as may often occur in this situation. The size of pebbles was too great for a bore to be made by this simple method and no useful result was obtained.

Samples of water from springs were taken from a spring on the cliff line at CQ047997, and at springs on the cliffs in the cove at CQ045998. Analyses are being made.

CONCLUSIONS

There appear to be three possible sources of permanent groundwater supply.

The common occurrence of springs around the island cliffs indicates that a body of water accumulates in the more permeable rocks forming the upper part of the island and is draining out over the less permeable rocks below. This water body would be expected to be thickest in the centre of the island and could best be exploited by a bore hole sunk conveniently close to the houses near the airstrip. The bore would need to penetrate almost the full thickness of rocks down to sea level, that is about 60 m. Yields of 15-30 *l*/min have been obtained from these rocks at Marrawah, and quantities of less than 500 mg/*l* of total dissolved solids are usual.

The second source is the group of springs near the prominent cove on the north-east coast. Some attempt has been made to utilise this water, but this work needs to be reconstructed so that a reserve is created that is free from pollution and is not overflowing to waste.

The third source is the supposed occurrence of water in the low gravel terraces, which could easily be checked by excavating pits with a back-hoe. If no useable supplies were shown, then no great expense would have been incurred.

RECOMMENDATION

The choice of source is dependent on the location of need and the intended uses.

The springs in the region of the existing cistern appear to be the most easily exploitable groundwater source. Some cleaning and excavation, and the construction of a new and larger cistern is required and some protection of the storage from pollution by man, animals and birds is necessary.

The drilling of a bore would be a considerable expense and successful supplies could not be guaranteed.

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