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Groundwater investigation, Bashan Plains, near Waddamana.

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At the request of K.T. Downie of Hamilton a groundwater investigation was undertaken on his property 'Bashan Plains' [DP786295], about 8 km south of Waddamana.

GEOLOGY

Bashan Plains is a narrow flat valley which is surrounded by low isolated basalt hills and narrow ridges. The area investigated was the headwaters of the Bashan Plains Rivulet which flows down the valley in a southeasterly direction to join the Ouse River. This rivulet, and Boggy Marsh Rivulet to the south, drain the high basalt plateau which forms the divide between Lake Echo and the Ouse River. Bashan Plains forms the eastern margin of this divide.

On the surface of the plateau no basalt outcrops were found but boulder trails occur and basalt boulders are scattered over the ground surface. The low hills and ridges have basalt scree on their slopes and crests and there are a few outcrops of basalt. The outcrops show well developed vertical, jointing and sub-horizontal jointing which frequently has a dip component towards the Bashan Plains valley. The outcropping basalt is vesicular, as are most of the boulders examined; only one boulder was found in which the vesicles were clay filled. The vesicularity of the basalt both at outcrop and in the boulders make this rock attractive as a groundwater prospect.

Two kilometres north of Bashan Plains the Waddamana road descends the steep scarp from the basalt plateau to the Ouse River. On this road the basalt appears to be very thick (>60 m). Although the section is poorly exposed and there is a considerable amount of landslide activity along the scarp the basalt appears to comprise several layers. If this observation is correct, the vesicularity of the basalt will not be confined only to the surface layer and this enhances its groundwater potential in the nearby Bashan Plains area. A line of springs occurs near the base of the basalt on this scarp.

GEOPHYSICAL WORK

In an attempt to establish the depth to which the slower seismic velocity layers occurred in the basalt two seismic spreads were fired. One spread of 213 m with geophone spacings of 15 m was fired NNW-SSE, parallel with Bashan Plains Rivulet, on the west bank immediately north of the homestead access road. The other spread parallel with this access road was 116 m in length with geophone spacings of 7.5 m.

Both spreads showed small stepped, but discrete, seismic velocity layering of 900-1200 m/s, 2400-3000 m/s, 3600-4200 m/s, 4900-5200 m/s and 6000 m/s. It should be noted that little is known or recorded about the effect of groundwater filled vesicles on the seismic velocity for Tasmanian basalts. It is suspected that rock with a seismic velocity in excess of 4500 m/s would probably contain no vesicles and its jointing would be so tight that it would contain little or no groundwater.

The surface layer of 900-1200 m/s is probably the black clay which underlies the surface soil layer seen in the shot holes. It may also include the surface layer of the weathered basalt, but with such a low velocity this would be unlikely to contain much water.

The two intermediate layers of 2400-3000 m/s and 3600-4200 m/s appear to be the likely source for any groundwater and the depths to the base of these two layers are calculated to be 8-11 m and 24-34 m. This would provide an adequate thickness for a porous rock fracture aquifer to produce reasonable supplies of groundwater.

GEOHYDROLOGY

Basalt is a reliable source of groundwater in north-western and north-eastern Tasmania, although its yield varies considerably within quite small distances.

The vesicularity of the basalt outcrops and of the boulders and the possibility of multiple layering within the basalt in this area make this rock an attractive prospect for groundwater from a geological point of view. The thickness of the intermediate seismic velocity layers suggested by the seismic survey supports this conclusion.

CONCLUSIONS

The Department has no records of drilling for water in the Waddamana area, so that despite the favourable geological and geophysical evidence there must be a high degree of uncertainty as to the results of drilling at Bashan Plains.

If the risk of drilling in a new area is accepted, the bore should be drilled by down-the-hole hammer to a minimum depth of 35 m. If the hole is making water and fragments continue to show that the basalt is vesicular or that there is a change in the texture of the basalt drilling should continue to a minimum depth of 60 m. If the yield increases with depth the hole should be continued to a maximum depth of 90 m.

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