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Groundwater investigation at 'Toddys Plains', Waterhouse.

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At the request of Mr L.H. Corney a groundwater investigation was undertaken over the eastern half of his property, 'Toddys Plains' at Waterhouse [EQ495650]. This part of the farm has no surface water in summer.

GEOLOGY

'Toddys Plains' is situated on the coastal terrace that forms the Waterhouse coastal plain. The area investigated was near the inland margin of this plain. On the south-eastern side is a low ridge which is the northern extension of the contact metamorphosed zone of slate of the Mathinna Beds. South of 'Toddys Plains' this contact zone forms a high ridge marking the contact between the slate and granodiorite to the west.

In the area investigated no outcrops of these Mathinna sediments were found on the ridge because of a covering layer of windblown sands. A few boulders of Mathinna slate were present on the ridge. On the flats west of this ridge only alluvial sand and clay was present.

GEOPHYSICAL WORK

A seismic spread, 213 m in length, with a geophone spacing of 15 m was fired on the flats at the base of the ridge in an attempt to establish, if any Tertiary sediments were present below the ground surface, their thickness and to identify the underlying basement rock type.

Four velocity layers were present:

<i>West end of spread</i>		<i>East end of spread</i>	
<i>Layer</i>	<i>Seismic velocity (m/s)</i>	<i>Layer</i>	<i>Seismic velocity (m/s)</i>
V <sub>0</sub>	1520	V <sub>0</sub>	610
V <sub>1</sub>	2130	V <sub>1</sub>	1520
V <sub>2</sub>	3350	V <sub>2</sub>	3350
V <sub>3</sub>	6400	V <sub>3</sub>	9450

At the east end of the spread the slow surface layer (V<sub>0</sub> = 610 m/s) is thought to be windblown sand, 4.2 to 5.5 m thick, that has accumulated at the base of ridge of Mathinna Beds. At the west end of the spread the windblown sand layer, if present, was too thin to be differentiated from the surface layer (V<sub>0</sub> = 1520 m/s). This 1520 m/s layer is thought to be Quaternary and Tertiary sand gravel and clay forming the marine terrace. These sediments are calculated to be 12-15 m thick and overlie granodiorite. The granodiorite is weathered and has a seismic velocity of 2130 m/s at the west end of the spread. At the east end the uppermost granodiorite layer is harder with a seismic velocity of 3350 m/s. This upper granodiorite layer is underlain by a granodiorite layer with much higher seismic velocities (V<sub>3</sub> = 6400-9450 m/s).

The resistivity probe data indicated a simple two layer case: a dry sand layer overlying water saturated sediments of clay, silt and sand of the coastal plain, with the water table at a depth of 4.5 m. In the second layer the resistivity values increase with depth. This feature indicates that the green micaceous clay, over 30 m of which were encountered in the Department of Mines Percussion Bore 2 [EQ542551] on the Waterhouse road, 2 km to the west, are not present in any great thickness above the granodiorite in this area.

GEOHYDROLOGY

Toddys Plain is situated on the eastern margin of the Scottsdale Tertiary basin. Bores in the eastern section of this basin have lower yields (generally of 10-150 l/m) compared with bores in the western half of the basin. These lower yields are thought to be due to the presence of a thick layer of clay, which sometimes retains a granitic texture, overlying the granodiorite in the eastern half of the Tertiary basin. The clay has the same seismic velocity as the Tertiary gravel and sand aquifers. The presence of such a clay horizon above the granite reduces the thickness of the water producing horizons within calculated thickness of 12-15 m for the Tertiary sediments in the 1520 m/s velocity layer. The low velocity ( $V_1 = 2130$  m/s) for weathered granodiorite at the western end of the spread indicates that some of the overlying 1520 m/s layer would be the clay derived from the weathering and chemical decomposition of the granodiorite. The low but steadily rising resistivity values of the second layer would also indicate a transition from clay to weathered granodiorite.

A thickness of only 12-15 m of Tertiary sediments is generally considered marginal for producing adequate groundwater supplies unless a clean gravel horizon or lens exists. To date none has been drilled in the Toddys Plain area of the Scottsdale Tertiary basin. The yield anticipated in this area is expected to be similar to that of the Department of Mines Percussion Bore 2, i.e. 76 l/m. The quality of the water in the eastern section of the basin is also variable although the dissolved salt content seldom exceeds 1000 ppm.

It appears that a more reliable potential source for groundwater than the Tertiary sediments at this locality would be the slate forming the ridge immediately south-east of the area investigated.

Nearby bores drilled along this ridge have all been successful (two at Dornauf's, 2 km to the east; three at Brooker's, 3 km to the south-east and one at Abraham's and Gregg's, one kilometre to the north), although none has been located as close to the granodiorite-Mathinna Beds contact as at 'Toddys Plains'.

Expected yields of 70-210 l/m are more than adequate for stock purposes. Water quality is variable but is generally good. A bore in these rocks would need to be drilled to a depth of about 45 m.

RECOMMENDATIONS

A bore drilled into Tertiary sediments at 'Toddys Plains' is considered to be a marginal prospect with an expected yield similar to the Department of Mines Percussion Bore 2, although with the use of bore screens in place of slotted casing the yield could probably be increased.

A bore drilled on the slate ridge adjoining the area investigated appears to be a less risky venture. A bore situated on this ridge would entail greater pumping costs although water reticulation would be simpler.

The cost of either bore is likely to be of the same order. A Tertiary bore would require slotted casing or screens whereas a bore in the slate would be deeper but would require only casing in the top 4-7 m.

[19 July 1974]