

17. Representative basin study: Flowerdale River, north-western Tasmania.

W.C. Cromer

The geological factors controlling the occurrence and movement of ground-water within the catchment area of the Flowerdale River in north-western Tasmania have been investigated at the request of the Rivers and Water Supply Commission as part of the Australian Water Resources Council's Representative Basin Program (fig. 28).

The catchment is bounded to the east by the Moorleah-Preolenna main road, and in the west by the road passing through Lapoinya and Milabena. The gauging station on the Flowerdale River near Moorleah [39/642540] and the bridge over the river [39/563355] south of Preolenna are the northern and southern limits respectively.

The area thus defined is approximately 130 km². The greater part of the area is included in the Table Cape (Gee, 1966) and Burnie (Gee et al., 1967) Geological Atlas 1 mile series maps.

PHYSIOGRAPHY AND LAND USE

The more elevated parts of the area represent a dissected undulating Tertiary basalt surface which decreases in altitude from 300-350 m in the south-west to 150 m in the north-east. Throughout the area investigated the Flowerdale River has exposed through erosion, and is deeply incised into, Precambrian basement rocks. The land thus falls relatively steeply from the dissected but flatter basalt plateau levels to the river, which has an average fall of 5-6 m/km.

Although the basalt soils originally supported sclerophyll forest, much of this has been cleared for intensive dairy farming. The poorer soils developed on the Permian and Precambrian rocks have not been utilised to the same degree, and support mainly sclerophyll and temperate rain forest species.

GEOLOGY

The geology of the northern part of the area has been described by Gee (1971) and an account of the southern part of the area is in preparation. Only brief comments are therefore needed here.

Precambrian and Permian

Schist, phyllite and minor quartzite of the Keith Metamorphics are the oldest exposed rocks, cropping out over a major portion of the area investigated. Regional structural trends are along NE-SW axes, but locally great variation is encountered.

The rocks are well exposed in the bed of the Flowerdale River, but elsewhere outcrops are uncommon and the schist and phyllite weathers to poor clayey soils. The quartzites produce thin sandy loams.

Upper Permian rocks (Flowerdale Sandstone and Preolenna Coal Measures) crop out over a limited area in the southern and south-eastern parts of the catchment, and are therefore of limited importance to this study.

Tertiary

Gravel and sand are exposed at a number of places along the Moorleah-

Preolenna road where they are overlain by Tertiary basalt. It has not been established that they underlie the basalt everywhere, but it is probable they formerly covered extensive areas.

The extrusion and subsequent weathering and leaching of the overlying volcanic rocks have silicified the gravel in places, resulting in a hard impervious siliceous conglomerate. The degree to which silicification has occurred is unknown, but is unlikely to be a factor of hydrological importance.

Tertiary basalts are common in the catchment area, forming extensive sheets in the Preolenna and Milabena districts, and elsewhere occurring as small isolated remnants of the former surface.

Thick weathering profiles have developed over much of the basalt area. In places, however, fresh exposures occur (e.g. the columnar basalt in a road cutting 6 km south of Preolenna).

Contacts between Tertiary rock and the underlying Permian and Precambrian have not been seen. However, the base of the Tertiary sequence is often indicated by seepages and springs, which are exceptionally common throughout the area and which collectively are an important aspect of the hydrological cycle.

HYDROLOGY

Primary hydrological properties (formed at the same time as the rock) and secondary features (formed later) both play important roles in controlling groundwater movements within the Flowerdale catchment area. Of the former, the vesicular nature of the Tertiary basalt is perhaps the most significant.

Basalt is generally regarded as a reliable source of good quality groundwater. This is mainly due to its primary vesicularity which on weathering produces an interlocking network of cavities ('honeycomb basalt'), and also to the development of crumbly, permeable and often deep soil profiles which permit rapid downward movement of water. The small number of bores in the Preolenna area all obtain water from the basalt. Infiltration rates are difficult to estimate because of the many inter-related factors involved, but are probably high.

Because of their porous nature the sub-basaltic gravel and sand freely yield any water they may contain. Because it overlies less permeable rocks, the base of the Tertiary sequence is thus marked by numerous springs and seepages. The silicification (and resulting loss of permeability) of the sediments by the overlying basalt is locally important but regionally insignificant.

Elsewhere in Tasmania Precambrian rocks are considered to be a reliable source of underground water as a result of extensive fracturing. This may not be the case in the Flowerdale catchment. The Keith Metamorphics, except for the quartzites, have a high clay content and any near-surface secondary openings have probably been effectively sealed by weathering products. Infiltration rates are low, and most surface water finds its way directly to the river. Because of their limited occurrence in the catchment area, the Permian rocks are not considered hydrologically significant.

CONCLUSIONS AND RECOMMENDATIONS

The high infiltration and permeability rates of the Tertiary basalts result in these rocks containing most of the groundwater present in the catchment area. Much of this water is delivered eventually to the Flowerdale River via springs at the base of the Tertiary sequence. The Precambrian rocks may not be reliable sources of groundwater.

It is recommended that drilling should be carried out at two sites (each with a separate observation hole).

A bore placed on the cleared area above the gauging station near Moorleah [39/642540] will penetrate and monitor Precambrian quartzite.

The Tertiary basalt some 4 km north-east of Preolenna [39/613423] should also be drilled. Bores already exist in the sheet basalt at Preolenna, and more valuable information may be obtained from the smaller basalt outcrop to the north-east. The bore may penetrate the underlying gravels.

REFERENCES

GEE, R.D. 1966. Geological atlas 1 mile series. Zone 7 sheet 22 (8016S).
 Table Cape. Department of Mines, Tasmania.

GEE, R.D. 1971. Geological atlas 1 mile series. Zone 7 sheet 22 (8016S).
 Table Cape. Explan.Rep.geol.Surv.Tasm.

GEE, R.D.; GULLINE, A.B.; BRAVO, A.P. 1967. Geological atlas 1 mile series.
 Zone 7 sheet 28 (8015N). Burnie. Department of Mines, Tasmania.

[4 October 1973]

These sediments dip at about 10-12° NW and consist of white to cream quartz sandstone, feldspathic or lithic sandstone and shale. The quartz sandstone is usually massively bedded and contains somewhat cross-bedded portions. The examination of a thin section of a specimen of this rock indicated that it had a low porosity. The feldspathic sandstone and shale which apparently overlie the quartz sandstone do not crop out as strongly as the quartz sandstone and where they occur at higher levels they are covered by dolerite tuff. Landslips, both present day and past have developed in these areas. The feldspathic sandstone is a speckled, brown rock. The shale is usually of a medium brown colour and contains plant fossils; a small area of black carbonaceous shale was located in a stream bed.

Fine to medium-grained dolerite is exposed in the area. At some locations the dolerite appears to be concordant with the intruded sediments and at others it appears to be discordant. Areas of fine-grained dolerite near the centre of the area appear to be probably intruded along faults.

Basalt occurs mainly in the eastern part of the catchment. Some of

Reports 17-19 are concerned with areas investigated at the request of the Rivers and Water Supply Commission as part of the Australian Water Resources Council's Representative Basin Program. The location of the catchment areas is shown in Figure 28.

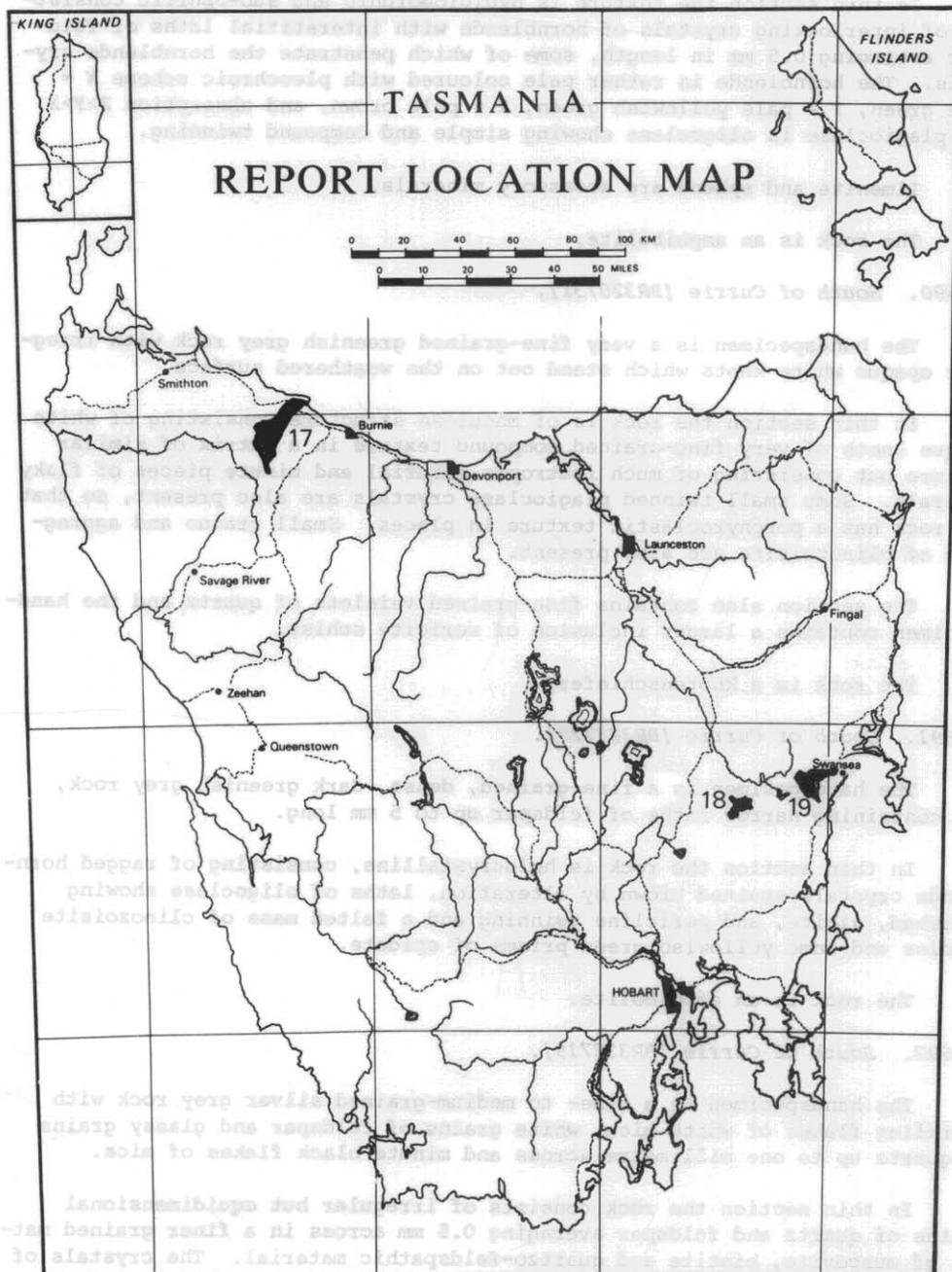


Figure 28. Location of catchment areas: 17 Flowerdale River, 18 Birralee Creek, 19 Meredith River.

