

Geology of the Aberfoyle district: Water resources

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This topic provides a summary of the geology of the Aberfoyle district - covered by the British Geological Survey. 1:50k geological map sheet 38E (Scotland).

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The north-western part of the district is important in terms of water resources. High rainfall supplies the water storage system based on the reservoirs of Loch Katrine and Glenfinglas, ultimately providing Glasgow's water. Glenfinglas was dammed in the 1950s and supplies water to Loch Katrine on a top-up basis, so as to maintain the appearance of the former for the tourist trade and to maintain the water supply.

With regard to groundwater resources, the lithological units in the Aberfoyle area may be grouped into three broad hydrogeological categories: psammitic to pelitic and meta-igneous lithologies in the Southern Highland Group; the sedimentary rocks of the Lower Devonian and lower Carboniferous essentially south of the Highland Boundary Fault, and water-bearing superficial deposits.

The metasedimentary and metaigneous rocks of the Southern Highland Group have very little intergranular porosity, and can only store and transmit groundwater via fractures (Ball, 1999^[1]). The location and extent of any fractures controls the flow of groundwater and determines the direction of movement. Water-bearing fractures can occur at a wide range of depths below the surface; water abstraction boreholes have been drilled to depths of 100 m elsewhere in the Southern Highlands in order to intercept a reasonable flow.

Shallow, weathered strata, immediately below rockhead, can supply a useful source of groundwater, and water in this zone of enhanced productivity has long been exploited via dug wells. Modern boreholes, where sited on the lower parts of the valleys, are commonly 30 to 40 m deep and yield small volumes of water of the order of 5-10 m³/day, sufficient to supply one or two domestic properties. Water quality is generally good, but sources located amongst marshy, poorly drained land often suffer from high concentrations of iron and manganese, caused by the low-oxygen, reducing conditions in the local groundwater system.

The lower ground of the Midland Valley, between Aberfoyle, Drymen and Balfron, is underlain by Lower Devonian strata belonging to the Arbuthnott, Garvock and Stathmore Groups. Little is known about the hydrogeological characteristics of these rocks in the area owing to the small number of abstraction boreholes constructed. The annual rainfall in the area is relatively high compared to the dryer, eastern, part of Strathmore, and there is less demand for groundwater, particularly for irrigation. The area is considered to have good groundwater resource potential as these aquifers have supplied high yields in more eastern parts of Strathmore.

The sandstone units are the most permeable rocks, with estimated porosities of between 10 per cent and 20 per cent. Despite these relatively high porosities, most groundwater moves via fractures and fissures within the sandstones. Typical borehole yields are expected to be in the range 100-800 m³/day.

Although data are sparse, water quality is generally expected to be good. Problems may arise where

there has been intensive use of nitrogen fertilisers and/or prolonged disposal of animal wastes over limited areas, leading to localised zones of high concentration. Pollution of groundwaters by nitrate and phosphate may reach depths in excess of 50 m.

Extensive areas of moundy glaciofluvial deposits, to the south of the Lake of Menteith (Browne, 1977^[2]), mostly lie above the water table. However, in low-lying areas, groundwater tends to occur at shallow depths and it may be present in these aquifers in considerable quantities on a local scale (Ball and MacDonald, 1997^[3]). In general, glaciofluvial deposits yield less groundwater than gravelly alluvium because of their lithological complexity. Thus, the resource potential of the zone of hummocky ground between Lake of Mentieth to near Arnprior is likely to be limited. The raised marine deposits in the Flanders Moss area contain a large proportion of sand in overbank deposits, with fine to coarse gravel in the river channel (Browne, 1977^[2]). There are no data on the permeability or porosity of these deposits, but the water table is shallow and the basal section of them will be saturated with groundwater.

References

1. [↑](#) Ball, D F. 1999. An overview of groundwater in Scotland. *British Geological Survey Technical Report*, WD/99/44.
2. [↑](#) ^{2.0} ^{2.1} Browne, M A E. 1977. Sand and gravel resources of the Central Region, Scotland. *Report of the Institute of Geological Sciences*, No. 77/9.
3. [↑](#) Ball, D F, and Macdonald, A M. 1997. Scottish rural water supplies: the role of groundwater. *British Geological Survey Technical Report*, WD/97/41.

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