

GROUNDWATER AVAILABILITY IN THE GWYDIR RIVER BASIN.

Published hydrogeology maps cover large areas of the Gwydir River Basin. These maps cover the Narrabri 1:250,000 (DWR, 1988) and Moree 1:250,000 (DWR, 1988) sheets and were used as a guide for the development of the Basin wide availability map.

The following discussion of groundwater characteristics is based on information contained in the “Groundwater in New South Wales” 1984 report, hydrogeologic experience as well as public domain data (Department’s Groundwater Data System (GDS)) used to publish the above mentioned hydrogeology maps.

Unconsolidated Sediments

Groundwater from the unconsolidated sedimentary aquifers of the Gwydir River Basin supply the area with irrigation, town water, stock and domestic as well as industrial and recreation uses. These aquifers are associated with alluvial deposits along the major river and creek systems.

Upstream of Biniguy in the Gwydir River Basin, little alluvium exists and the potential for groundwater is limited to stock and domestic uses. Downstream however, there is a rapid transition into an extensive riverine plain. This transition also marks the structural margin of the Great Artesian Basin in the area. A fan shaped area extending to some 40 kilometres beyond Moree, and up to about 30 kilometres wide, is underlain by irregularly distributed gravel aquifers from which water for Moree irrigation and industry is obtained. The thickness of alluvium increases with distance downstream; at Moree thicknesses between 60 and 75 metres exist. The maximum irrigation bore yield in the basin is in the order 60 L/s, with the majority of bores yielding between 12 and 40 L/s.

It is often difficult to locate high yielding aquifers and they become more sporadically distributed with distance downstream. Few bores fail to obtain stock water but outside the fan area, and particularly towards Collarenebri, the water is mostly brackish and sometimes too salty for stock. In some of the tributaries, such as Mosquito, Halls, Weah Waa, and Gurley Creeks, yields sufficient for limited irrigation have been obtained at depths less than 40m due to favourable local hydrogeologic conditions.

Porous Rocks

The porous rock aquifers of the Gwydir River Basin are minor and occur primarily in the Great Artesian Basin (GAB). The sedimentary rocks of the GAB essentially underlie the thick alluvial sequences. The eastern margins of the Great Artesian Basin represent the main aquifer intake zones where rainfall is higher and geologic conditions are favourable for recharge. This precipitation infiltrates and percolates through porous sediments to depths up to 1000m. The most important aquifers occur in the Jurassic aged Pilliga Sandstone (180 million years ago) and in the Bungil and Orallo Formations and the Mooga Sandstone of Early Cretaceous age (135 million years ago). The overlying confining layer is also of Early Cretaceous age and is comprised of a thick shale sequence, commonly more than 600m thick, referred to as the Rolling Downs Group. Bores drilled to penetrate the GAB are pressure cemented to avoid saline waters from the overlying unconsolidated and shale sequences, from contaminating the fresher artesian aquifers as well as corroding the bore casing.

Development and groundwater abstraction has been taking place from the Great Artesian Basin since the late 1800’s and has resulted in pressure drops throughout the entire basin

which has led in a decline in the spatial distribution of areas from which artesian conditions can be found.

Water quality in the Pilliga Sandstone is suitable for irrigation with some sub-artesian bores yielding up to 40 L/s. however, with distance into the Basin the proportion of alkali salts in the water increases making it unsuitable for irrigation though remaining useable for urban water supply. Notwithstanding, the predominant use of groundwater is for stock watering; without which the pastoral industry would be impracticable over most of north western NSW.

The sedimentary rocks of the New England Fold Belt in the eastern half of the Gwydir River Basin have been identified as porous rock aquifers. However they could also justifiably be classed as fractured rock aquifers as they are of a relatively old age (Permian, Carboniferous, Devonian), and have been subject to tectonic events resulting in the acquisition of a secondary porosity (ie. fractures). These sedimentary rocks typically contain groundwater of limiting water quality with salinities of 500 to 1500 mg/L and low yields between 0.5 and 1.5 L/s, although yields up to 5 L/s are possible from carefully sited bores.

Fractured Rocks

There are two main types of fractured rock aquifers within the Gwydir River Basin, they are; Tertiary basalts and the rocks associated with the New England Fold Belt.

The Tertiary basalt flows within the Gwydir River Basin are generally located in the hard rock terrain around the Basin boundaries in the east. This is due to their resistance to physical weathering resulting in a topographical boundary divide. These basalts provide groundwater from bores and occasional springs. Bore depths range up to 80m and produce relatively small yields generally less than 1.5 L/s with occasional failures more so in extended periods of drought. The salinity is generally low, however the water is usually hard, typical of basaltic groundwater.

The rocks associated with the New England Fold Belt are located within the eastern half of the Gwydir River Basin and generally form the topographic highs of the Basin. These include;

- The New England Batholith, a large granite mass, offering limited supplies with yields between 0.1 and 0.5 L/s. Water quality within the granite is generally good with bore depths usually ranging between 25 and 60m.
- Metamorphosed sedimentary rocks of Palaeozoic age, these rocks vary greatly in their groundwater potential. Depending on topography and metamorphic rock type, bore depths may vary from 15 to 90m, and yields from 0.2 to less than 5 L/s although failure can occur. The water is generally of good stock quality, typically 501 - 1500 mg/L total dissolved salt (TDS) ranging up to 3000 mg/L.

Potential for Land Salinisation

There is the potential for land salinisation to occur in some areas of the Gwydir River Basin. Land salinisation occurs when groundwater rises to or near the ground surface. The rise in groundwater results from the removal of native vegetation and modification of land use by activities such as clearing, grazing or by cropping and irrigating vegetation that use less water than the natural vegetation. This results in a more significant amount of surface water recharge to the groundwater. As the water table rises due to excessive recharge, it dissolves and accumulates naturally occurring salts in the soil profile and transports them to the near surface where the salt is concentrated by soil moisture evaporation. This concentration causes de-vegetation of the land of all but the most salt tolerant species.

REFERENCES

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