The Great Artesian Basin

The Great Artesian Basin (GAB) is one of the largest artesian groundwater basins in the world. It extends 2 400 km from Cape York in the north to Dubbo in the south. At its widest it is 1 800 km from the Darling Downs to west of Coober Pedy. With an area of over 1.7 million square kilometres the Basin underlies approximately one-fifth of the Australian continent. (See Figure 1)

The GAB stores a huge volume of water that is estimated to be 64 900 million megalitres. It is enough water to fill Sydney Harbour 130 000 times.

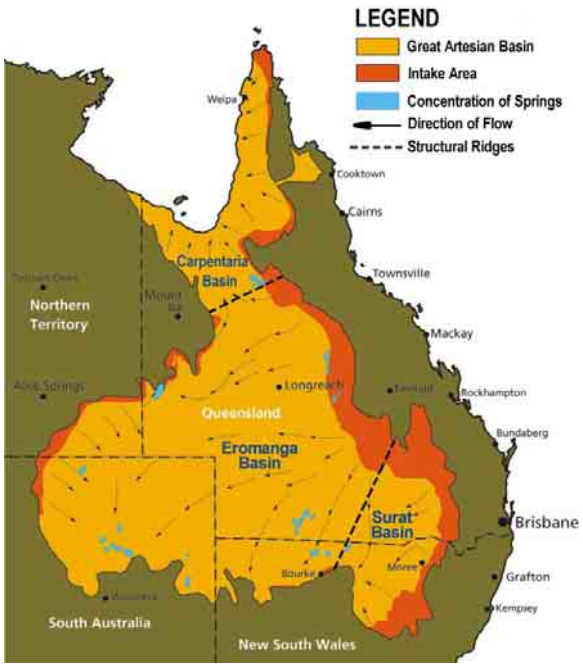

Figure 1 – The Great Artesian Basin

How was it formed?

Over many millions of years, the GAB was created by the deposition of sediments that eventually formed alternating layers of permeable sandstone and impermeable siltstones and mudstones. The deposits occurred in three major depressions; the Carpentaria, Eromanga and Surat basins which together form the GAB.

At the end of the Triassic period, uplift on the margins of these basins occurred and erosion of these areas led to sedimentation. Throughout the period, sand and gravel was deposited by streams and rivers and clays and clayey sands were laid down by floodplains and lakes. This process produced a profile of alternating layers.

As rivers eroded the steeper slopes, the land began to flatten, and deposition in lakes and large floodplains became more dominant. The sandy sediments consolidated to form the permeable sandstone from which the artesian water is now tapped and the clayey sediments became the impermeable layers. Thickness of the combined layers varies from less than 100 metres on the basin extremities to over 3 000 metres in the deeper parts. (See Figure 2).

During the Cretaceous period, down warping and high sea levels created a shallow sea over much of inland Australia (about 100 million years ago). This sea deposited mainly muddy sediments, which later consolidated forming the rolling downs that can be seen today.

As the Cretaceous period ended, about 65 million years ago, uplift ended sedimentation in the region of the Great Artesian Basin. Further uplifting and erosion resulted in the exposure of the permeable sandstones in the marginal areas of the Basin. This occurred mainly along the western edge of the present day Great Dividing Range. Rainfall began to infiltrate into the sandstones that led to the accumulation of the vast groundwater reserve.

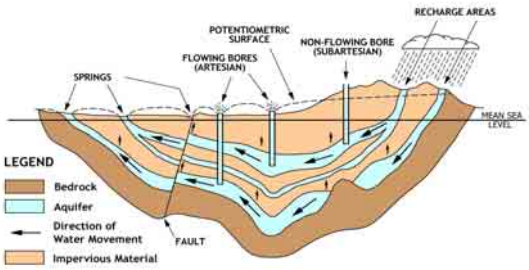

Figure 2 – Generalised cross-section of the Great Artesian Basin

What is artesian water?

Artesian water is underground water confined and pressurised within a porous and permeable geological formation. Formations that store and transmit water are referred to as aquifers. When one of these aquifers is tapped by a bore, artesian water may flow naturally to the surface.

In the GAB, these aquifers are sandstones and are recharged by rainfall and stream flow infiltrating into the exposed sandstones on the edges of the Basin. The water moves slowly down through the sandstone, filling the aquifer to the level of the intake area. (Figs 1 and 2).

Why an artesian bore flows?

As the aquifer is confined by an impermeable, overlying layer, the water becomes pressurised.

When a bore is drilled into one of the aquifers, the water will rise due to the pressure. The level to which it rises is called the potentiometric surface. If this surface is above ground level, then the bore will flow. In a sub-artesian bore the water does not rise above ground level. (Fig 2).

Maximum pressure recorded at ground level in the Basin is 1300 kilopascals (about 130 metres head).

Other facts

Across the basin, the average depth of bores is 500 m, but some bores have been drilled to 2 000 m depth.

Dating of the artesian water has given ages of almost 2 million years for the oldest water. This age water is found in the south-west of the Basin.

Water quality in the main aquifers is generally good for watering livestock but because of high levels of certain ions, is not suitable for irrigation. Measured in Total Dissolved Solids (TDS), water quality varies between 500 and 1 500 milligrams per litre. It is used for domestic purposes throughout the basin.

Water temperatures range from 30oC in shallow areas to 100oC at the surface in the deeper regions.

Water use in the GAB

Before European settlement

Prior to European settlement, Aborigines used the natural springs of the GAB and regarded them as significant to their traditional cultures. The springs are natural outlets of the artesian aquifers from which groundwater flows to the surface. (Fig 2). They were a reliable source of water in times of drought when other water sources were scarce. The springs were and still are valuable for the support of wildlife.

Many stories of Aboriginal ancestors involve GAB springs and their placement along travel routes. Some of these springs feature in Aboriginal myths and hold significant spiritual and cultural beliefs of indigenous communities.

Recent history and development

European settlers first discovered artesian water from the Great Artesian Basin in 1878 when a shallow bore sunk near Bourke in New South Wales produced flowing water. Many bores were soon drilled and by 1915 over 1 500 flowing artesian bores had been drilled throughout the Basin. The assurance of a reliable water supply for settlers and their stock meant the development of a valuable sheep and cattle industry.

Thousands of kilometres of bore drains were excavated to distribute the water around properties, thus allowing sheep and cattle to be raised on the vast Mitchell grass, Mulga and Spinifex plains.

Prior to development in the Basin, it is estimated that, excluding the Carpentaria Basin, 1040 megalitres of water entered the aquifers of the Great Artesian Basin in Queensland each day. All of this, together with the volume of recharge from other States, discharged as surface springs and a natural equilibrium of inflow to outflow was maintained.

Many bores initially flowed at rates of over 10 megalitres per day (ML/d). However, the majority now flow between 0.01 and 6 ML/d. Total outflow from the Basin reached a peak of over 2 000 ML/d around 1915. Since then, artesian pressure and flow rates have declined, while the number of bores has increased. The current total outflow from the Basin is about 1 500 ML/d.

Also, about one-third of all artesian bores which flowed when drilled have now ceased to flow and require pumps to bring the water to the surface.

Management of the GAB

The GAB is a vast resource that has allowed a major part of arid Australia to be turned into productive grazing country. The careful and sustainable management of this valuable natural resource is vital for future generations.

The Great Artesian Basin Sustainability Initiative (GABSI) is one incentive scheme that is in place to address water and land management issues in the GAB. GABSI is part of a collaborative 15 year Strategic Management Plan used by Qld, NSW, SA and the NT to achieve sustainability of the Basin and its resources. It is funded by both the State and Federal Governments and gives landholders the opportunity to access subsidies to cap and pipe their bores. The Great Artesian Basin Coordinating Committee (GABCC) is responsible for coordinating management of the GAB between the States and Territory involved.

Further information

For further information on the GAB or about other fact sheets, contact your local office of NRW or the GABCC.

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For further information phone 13 13 04