

South West Yarragadee Blackwood Groundwater Area

FactSheet

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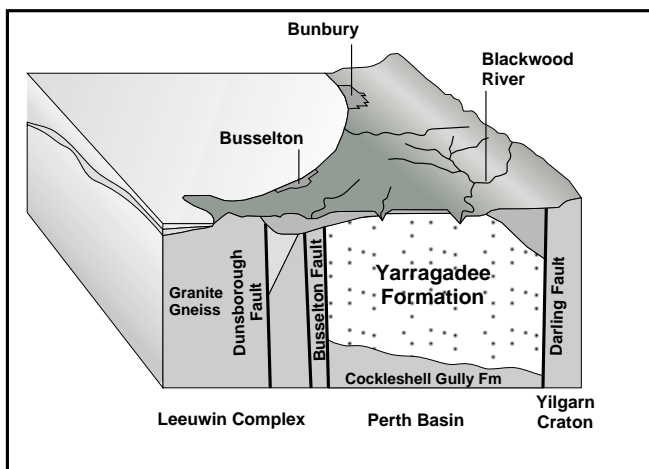
The South West Yarragadee aquifer

The South West Yarragadee aquifer is the largest fresh groundwater body in the South West, and is one of Western Australia's most important water resources. It is a valuable resource for human use, and is also important in maintaining important ecological values. This aquifer has been known about for over 30 years, with current investigations building our knowledge about how the aquifer can best be used, managed and protected.

This Factsheet describes the geological formation and associated aquifer properties, how the aquifer was formed and how it functions.

The South West Yarragadee Geological Formation

The 'South West Yarragadee Geological Formation' is about 45 km from east to west across the Blackwood Plateau, and about is 150 kilometres long from its northern extremity near Kemerton, down to the south coast just west of Point D'Entrecasteaux. Its maximum thickness exceeds 1,500 metres, and it lies above the Cockleshell Gully Geological Formation. The cross section can be seen in the diagram.



Cross-section of the Yarragadee aquifer west of Nannup

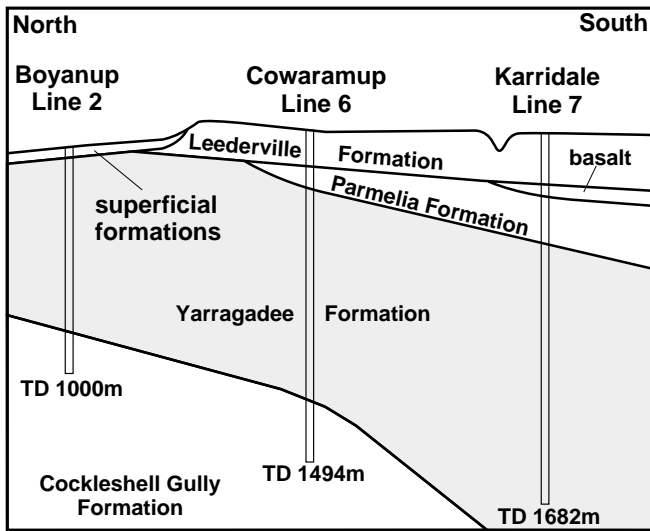
The sediments of the South West Yarragadee Formation lie in the bed of an ancient rift valley, known as the 'Perth Basin'. The formation lies in part of the basin called the Bunbury Trough, where the sediments are thickest, bounded to the east by the Darling Fault, which runs N-S through Nannup, and to the west by the Busselton Fault, which runs N-S from Busselton to the south coast. The South West Yarragadee Formation is mostly unconsolidated coarse white quartz sand and gravel, with some shale and clay 'lenses' through the profile.

The formation was formed during the Jurassic Period – between 180 million and 140 million years ago – from river sediments of sand and gravel that flowed into the rift valley. In effect, the South West Yarragadee Formation is a buried alluvial plain. The formation once extended further to the north, but the part of the South West Yarragadee Formation between Kemerton and Mandurah was subsequently removed by erosion. The northern part of the Yarragadee extends northwards from Mandurah as far as Geraldton.

Over most of the total area – about 6,000 square kilometres, the South West Yarragadee Formation is covered by younger material of different geological origins. Most of the covering is called the 'Leederville Geological Formation', which was laid down after the South West Yarragadee formed. The Leederville material is mostly shales and clays. In other areas, the 'Parmelia Geological Formation' and the 'Bunbury Basalt' lie across the South West Yarragadee. A surface layer of sand and gravel – the 'superficial formations' - occurs on the Swan and Scott Coastal Plains as a thin layer (20m deep) across these formations. Over most of its area, the top of the South West Yarragadee Formation is about 100 to 200 m below the surface.

The South West Yarragadee Formation 'outcrops', that is it can be seen at the land surface, in a few places – most notably two areas in the State Forest about 20 km west of Nannup. The South West Yarragadee Formation occurs just below the superficial formations on the ocean floor near Bunbury and Black Point, adjacent to outcrops of basalt.

Three different vertical sections through the South West Yarragadee Formation show the relationships with other geological formations.



North-south cross-section showing aquifer relationships in three bores

The South West Yarragadee aquifer

The coarse sands and gravels of the South West Yarragadee Formation have between 10 to 30 per cent ‘voids’ – spaces between the particles. ‘Groundwater’ is water that occupies these voids. The coarse, unconsolidated structure of the South West Yarragadee aquifer makes it ideal for the storage of large volumes of groundwater.

The volume of water stored in the South West Yarragadee aquifer is very large – about 400 cubic kilometres, or 40 ‘Lake Argyles’.

Most of the groundwater stored in the South West Yarragadee is ‘confined’ by the Leederville, Parmelia and Bunbury Basalt Formations above it, and is thus under pressure. Bores need to be 100 to 200 m deep to access the groundwater in the South West Yarragadee aquifer.

The water in the South West Yarragadee is fresh – ranging from 180 mg/L total dissolved solids (TDS) in the central Blackwood Plateau area to around 350 mg/L TDS at

Bunbury. For comparison, the upper limit for water quality for domestic uses is normally set at around 500 mg/L TDS.

The water in the aquifer comes from two sources.

- Two recharge areas on the land surface in the State Forest, north and south of the Blackwood River, about 20 km west of Nannup provide recharge from rainfall direct into the South West Yarragadee aquifer.
- Elsewhere on the Blackwood Plateau and Scott Coastal Plain recharge is indirect - by leakage from the overlying superficial and/or Leederville aquifers, which lie over most of the South West Yarragadee.

The volume of the water in the aquifer is very large when compared to annual recharge, and groundwater moves very slowly both northwards to Geographe Bay, and southwards to the Southern Ocean. Thus the water pumped from the aquifer that is used by residents in Bunbury is about 40,000 years old.

The South West Yarragadee has been an important source of water for south west communities since the early 1900s. Currently, about 7 GL/year is used in Bunbury and about 1.5 GL/year is used in Busselton.

Other aquifers - Cockleshell Gully and Leederville aquifers

Underneath the South West Yarragadee, the Cockleshell Gully Formation generally contains salt water, with impermeable shale layers preventing mixing of the water bodies. Above the Yarragadee aquifer, the Leederville aquifer contains fresh water in the sand layers. Although it is a much smaller aquifer, this water resource is useful especially in the Jindong and Dardanup areas. In these areas, the Leederville Formation is sandier, and the water is more easily pumped (‘abstracted’) from the aquifer for horticultural developments. Water from the Leederville aquifer also supplies Dunsborough and Donnybrook, and forms part of Busselton’s supply.

A gigalitre is equal to one million kilolitres, or one billion litres of water.

For more information contact

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