



Western Australia's groundwater resources

Groundwater is a significant source of water supplies in Western Australia and is very important to the environment. This Fact Sheet explains where WA's most important groundwater resources are found, and the importance of using them wisely.

Groundwater is found in aquifers

Groundwater is water that occupies the pores or crevices of soil or rock.

An aquifer is a geological formation or group of formations capable of storing and providing significant quantities of water.

Geological formations that are good aquifers have highly connected pore spaces or fractures that allow water to move through at volumes high enough to produce a water supply from bores. Good aquifer materials are highly

permeable (allow water to pass through pores and crevices). Such materials include sand, gravel and sandstone.

Materials of low permeability allow water to move through only very slowly. Clay and crystalline bedrock such as granite and dolerite have low permeability.

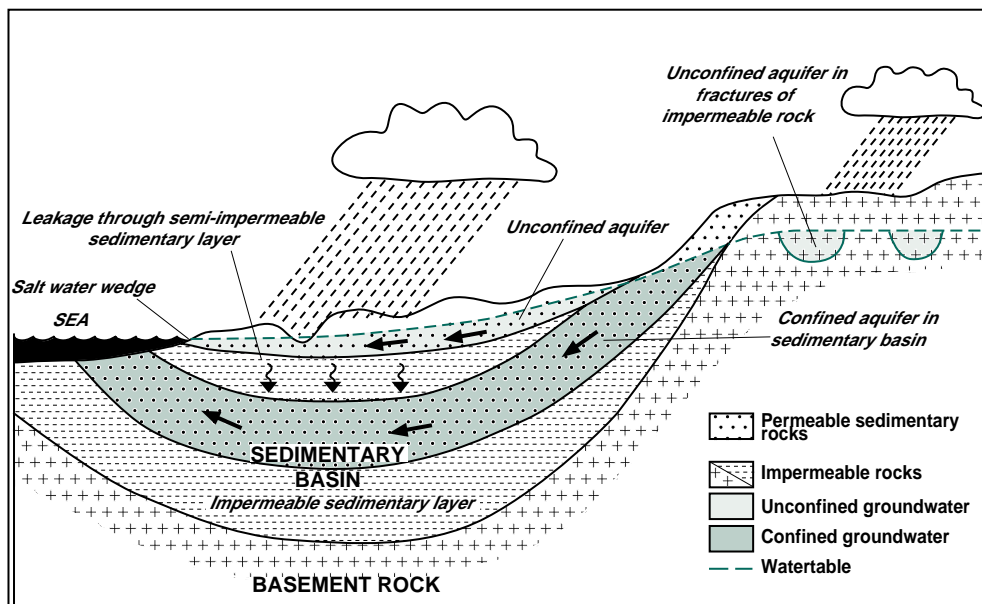
There may be a series of aquifers lying one on top of another, separated by impermeable layers.

Unconfined aquifers

An aquifer close to the surface which receives direct recharge from rainfall is called an *unconfined aquifer*. Household garden bores draw water from the unconfined aquifer. The top of the saturated zone in an unconfined aquifer is the *watertable*.

Confined aquifers

Aquifers deeper under the ground which are overlain by materials such as rock or clay that do not transmit water are called *confined aquifers*. Groundwater in confined aquifers is under pressure and the water will rise up a borehole. An *artesian flow*, where water flows out under its own pressure, may occur in low-lying areas. Confined groundwater is a very important source of public water supply. Confined aquifers are recharged either by 'leakage' from overlying aquifers, or from a considerable distance away where the aquifer 'outcrops' at the surface.



Where is WA's groundwater found?

Groundwater basins

The largest bodies of groundwater are found in extensive deposits of sand or sandstone. These cover 40% of Western Australia (see map), and may be as much as 20 kilometres thick. They are called *sedimentary basins*. Fresh groundwater generally occurs in the uppermost few hundred metres but can extend down to a depth of three kilometres. Below this, groundwater is mostly saline (salty).

The confined aquifers in the sedimentary basins contain most of the state's groundwater resources. The Canning Basin has the largest amount of stored groundwater. The map shows the distribution of Western Australia's major groundwater resources.

Other sources

Unconfined groundwater can also be important for water supplies. The largest unconfined groundwater source currently used for water supply is the Gnangara Mound just to the north of Perth. Deposits of sand, gravel and limestone near river beds can also yield groundwater supplies.



Measuring and monitoring water resources and water quality provides the information to guide planning and sustainable development.

Where is groundwater not available?

The remaining 60% of the State is made up of hard crystalline basement rocks, such as granite and basalt, or of sedimentary rocks which have no pore spaces. These rocks may contain some water in fractures in the upper few hundred metres which can provide small local sources of groundwater. There are poor prospects of groundwater from the weathering of these rocks.

How much groundwater?

The confined aquifers in the sedimentary basins contain most of the State's groundwater. The largest groundwater resource is believed to be the Canning Basin, which has an estimated storage of over 12 million gigalitres (one gigalitre is a thousand million litres).

Groundwater which is fresh enough to contribute to use for water supply may contain up to 1500 milligrams per litre total dissolved salts (mg/L TDS). Groundwater in some areas is only suitable for stock (up to 14 000 mg/L), or ore processing (up to 200 000 mg/L).

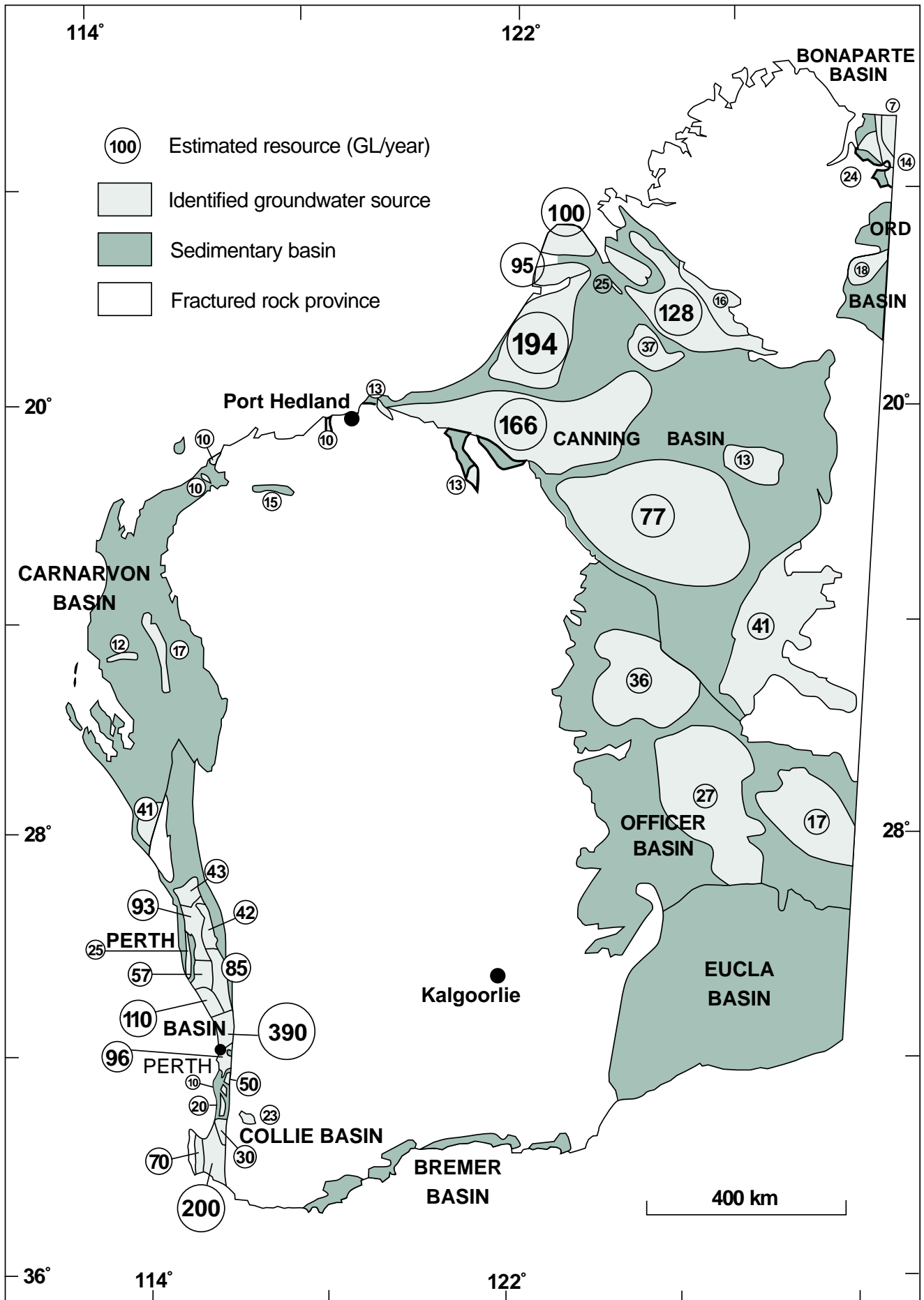
The annual renewable amount of groundwater in Western Australia's sedimentary basins that is fresh enough to contribute to water supplies is estimated to be about 2500 gigalitres per year, of which approximately 1400 gigalitres is in the Perth Basin. This is about twelve times Perth's current scheme water consumption.



Groundwater in some areas has been polluted by industry or other land uses. The extent and severity of the pollution can be assessed by drilling and constructing monitoring bores.



Location and estimated renewable yields of major known and inferred groundwater sources (gigalitres per year of groundwater less than 1500 mg/L TDS)



From: Allen A.D., Laws A.T., Commander D.P., 1992, *A review of the major groundwater resources in Western Australia*, Report to Kimberley Water Resources Development Office, December 1992.



A renewable resource

Much of our rainfall flows away as surface runoff, evaporates or is used by vegetation. However, a proportion of rainfall percolates below the reach of plant roots and recharges aquifers. The proportion of rainfall contributing to groundwater (*recharge*) ranges from nearly 50% below pasture in the wetter south west of the state, to a fraction of a per cent in desert areas. Of the 1700 million kilolitres of rainfall that fall on the Gnangara Mound on average each year, about 500 million kilolitres recharges the Mound.

The recharge is a *renewable resource* and this quantity can be used each year on a sustainable basis. The amount of renewable groundwater is small in comparison to the total amount of groundwater stored beneath the ground. Fresh groundwater storage in the sedimentary basins is estimated to be over a thousand times the renewable quantity. The additional groundwater storage can be drawn upon in times of drought, when the rainfall supply is insufficient.

Further reading

Groundwater pollution, Water Facts 10, Water and Rivers Commission, 1998.

Hydrogeology and groundwater resources of the Perth Metropolitan Area, Geological Survey of Western Australia, Bulletin 142.

The water cycle, Water Facts 7, Water and Rivers Commission, 1998.

What is groundwater? Water Facts 8, Water and Rivers Commission, 1998.

The role of the Water and Rivers Commission

The Water and Rivers Commission manages Western Australia's water resources to enable sustainable development and maintain environmental and social values.

The Commission manages *use of groundwater resources* to balance the needs of people and the environment by:

- carrying out *research, investigations and monitoring* to provide the information needed to guide planning and management
- *allocating* groundwater to make sure that it is shared fairly between users and the environment is protected

Allocation involves:

- allocating water for uses including public and private water supplies
- planning for future water supplies
- licensing surface and groundwater use, including the Water Corporation's public water supply developments
- education and training on the efficient use of water.

The Commission also has an important role in protecting water quality (see Water Facts 10).

For more information contact



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This Water Facts sheet is one in a series providing information on water issues of interest to the community.

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