OOLLOO AQUIFER

Australian Government
National Water Commission

Northern Territory Government

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GDA

kilometres 0 5 10 20 30 kilometres

Black numbered lines are 25 000 metre intervals of the Map Grid of Australia (MGA) Zone 52
Transverse Mercator Projection Horizontal Datum: GDA 94

AQUIFERS

Cretaceous

Minor porous sand aquifers, but mostly unsaturated. Sand and clay.

Fractured Rock Aquifers

Florina formation

Local aquifers, yields to 20 L/s. Limestones locally cavernous. Limestone and glauconitic sandstone. (Note: This formation has only been recently recognised and has not yet been formally defined)

Fractured and Cavernous Aquifers

Oolloo Dolostone

"Massive" unit. Major widespread aquifer. Yields to 100 L/s. Dolostone.

"Bedded" unit. Localised aquifers. Yields to 5 L/s, locally cavernous, and higher yielding, 20 to 100 L/s, especially north of Cadell Road. Dolostone.

A—B Line of Cross-section

WATER RESOURCES FEATURES

- Limit of Oolloo Dolostone
- Major Spring
- Spring
- Seepage
- Sinkhole / Cave
- Licensed Water Bore (as of 2011)
- 32750 Monitoring Bore with registered number
- Water Bore
- G8140205 Stream gauging station

Cross Section features

- 33308 Registered number of bore
- Natural surface
- Standing Water Level
- Total Depth

GENERAL FEATURES

- Property Boundary
- FLORINA Pastoral Station
- Park or Reserve
- KATHERINE Major Town
- Pine Creek Minor Town
- Binjari Minor Aboriginal Community
- Union Town Locality
- Florina Pastoral Homestead
- Railway
- Gas Pipeline
- Highway
- Main Road
- Minor Road; sealed / unsealed
- Local Road / Track
- Drainage Line
- Swamp / Subject to inundation

WHAT IS THE OOLLOO AQUIFER?

It consists of a network of solution cavities and fractures (cracks) that permeate a geological formation known as the Oolloo Dolostone. The formation was originally deposited in the sea some 500 million years ago as layers of sand and mud composed of calcium carbonate. The sediment hardened to a rock known as dolostone, a variety of limestone rich in magnesium. The change from sediment to rock would have led to widespread cracking of the rock due to shrinkage.

The sea retreated and the rock was exposed to the atmosphere. As rainwater percolated down the cracks, the rock dissolved and extensive solution cavities formed, particularly in the upper part of the formation.

At about 480 million years ago the sea returned and the Florina formation was deposited on top of the Oolloo Dolostone. The sea finally retreated and the region gradually sagged forming the elongated basin structure known as the Daly Basin. For the most part the area has remained above sea level and subject to erosion.

SINKHOLES

are closed drainage depressions, often circular in plan view and varying in size from a kilometre in diameter down to a few tens of metres across. Most were mapped from satellite imagery but smaller ones were observed in the field.

Subterranean cavities formed by the dissolution of dolostone eventually collapse. If the collapse reaches the surface a sinkhole is formed. Some have openings at the surface that allow direct access to the watertable. Most however are filled with soil and some contain ephemeral wetlands. Sinkholes are important in relation to groundwater recharge because they provide channels through which surface water can rapidly reach the watertable.

SPRINGS & SEEPAGES

Springs are points where groundwater discharges to the surface, usually in the banks and beds of the rivers. Individual discharges are typically up to 5 L/s but major springs can range up to 1000 L/s. Few springs discharge directly from the Oolloo Dolostone, most pass through a thin veneer of Cretaceous sediments or of alluvial deposits.

Seepages are more diffuse spring discharges covering 10's to 100's of metres of river bank. In reality the springs and seepages form a continuous series from distinct discharge points to broad seepage zones.

The high watertable experienced over the past 15 years has increased the number and discharge of springs along the rivers. One consequence is that the riverbanks have become unstable due to their constant saturation. Many of the springs now issue from the base of landslips.

MAJOR SPRINGS

There are numerous springs along the banks and bed of this 7 km stretch of river. They contribute more than half of the total discharge from the Oolloo aquifer to the river. During October 2009 for example the total discharge was 15,500 L/s of which 8,800 L/s was sourced from this group of springs.

The Katherine and Daly Rivers are the lowest parts of the landscape, so groundwater naturally drains to them. In the Daly River upstream of these springs, discharge from the Oolloo aquifer is not possible because it is confined by the Florina formation and Cretaceous shale. The major springs begin at the point where the confining beds are either not present or are thin enough for channels to the surface to be created by sinkhole collapses in the underlying Oolloo Dolostone (see Cross Section C - D).

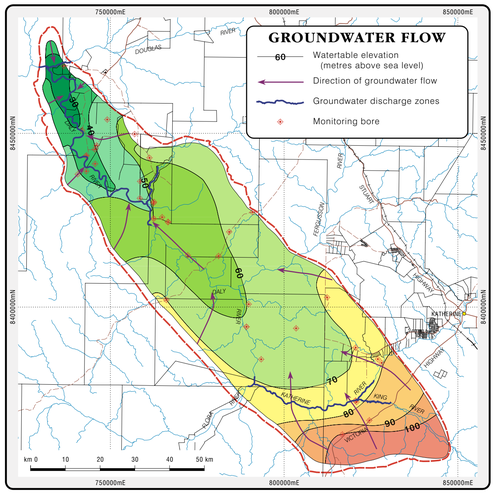
The sparse springs on the Daly River between approximately 5 km north of the Flora River and northwards to the start of the major spring area are sourced from minor aquifers in Cretaceous beds or the Florina formation. The discharge is less than 500 L/s. at the end of the Dry season.

This group of springs issue from the basal limestone unit of the Florina formation. They discharge of the order of 500 L/s at the end of the Dry season.

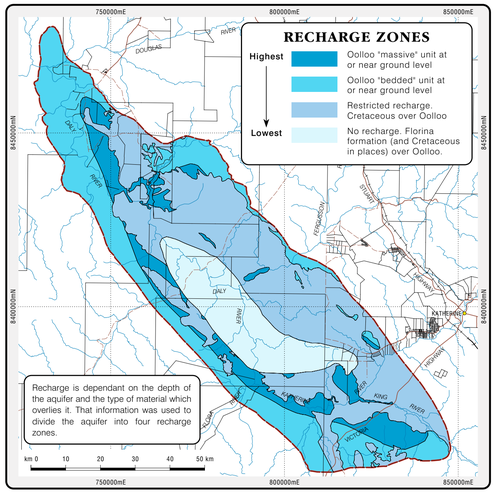
Although springs are numerous along the Katherine River they typically contribute less than 1000 L/s to the river at the end of the Dry season. All of them are sourced from the Oolloo aquifer.

Recharge is dependant on the depth of the aquifer and the type of material which overlies it. That information was used to divide the aquifer into four recharge zones.

GROUNDWATER FLOW



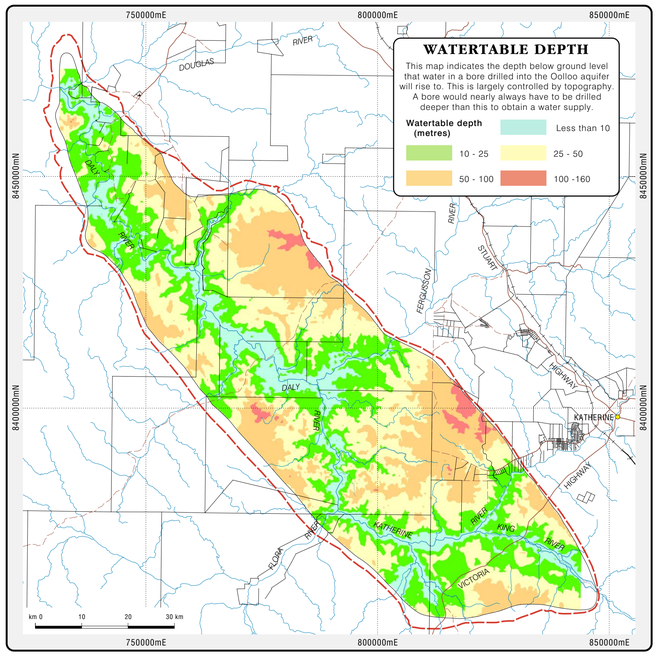
RECHARGE ZONES



WATERTABLE DEPTH

This map indicates the depth below ground level that water in a bore drilled into the Oolloo aquifer will rise to. This is largely controlled by topography. A bore would nearly always have to be drilled deeper than this to obtain a water supply.

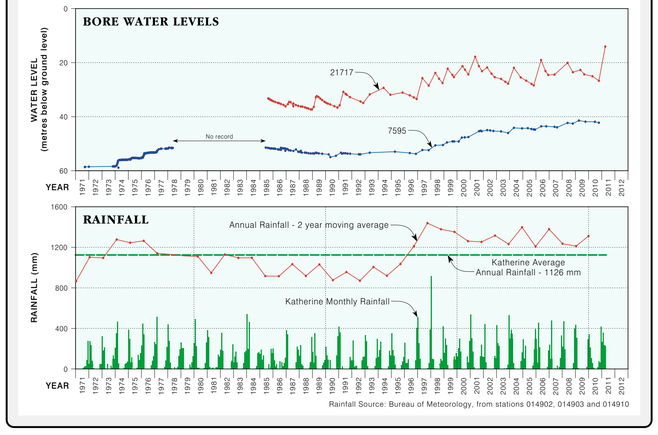
Watertable depth (metres)			
10 - 25		Less than 10	
50 - 100		25 - 50	
		100 -160	



GROUNDWATER LEVELS

are closely related to rainfall. Higher rainfall increases the potential for recharge. Increased recharge raises groundwater levels which results in higher spring flows. The Oolloo aquifer in observation bore 7595 is confined by 50 m of low permeability Cretaceous sediments and shows a muted water level response. The long term trend due to rainfall is dominant over seasonal changes. In contrast, in bore 21717 the aquifer is unconfined . It has a strong seasonal signature superimposed on the longer term trend.

The two bore hydrographs are typical of other observation bores in the Oolloo aquifer. They show water levels are at or near their highest points since observations started in the early 1970's. This is related to two particularly wet periods, 1973 to 1977 and 1996 to the present. Above average rainfalls predominated in those periods. Should the climate revert to the lower rainfalls of the 1960's groundwater levels and spring flows will also decline correspondingly.



Rainfall Source: Bureau of Meteorology, from stations 014902, 014903 and 014910

BOREHOLE IMAGES

Captured with a dowhole scanner, they give a 360° view of the borehole wall. Depths are in metres below ground level.

37043

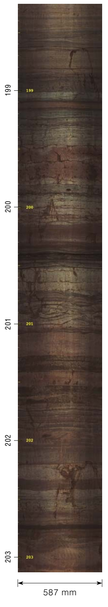
This image shows the "massive" unit of the Oolloo aquifer

Much of the rock is permeated with millimetre to centimetre scale solution cavities. The network of these fine spaces makes for a high transmission rate of groundwater. The 'massive' unit represents a weathered zone formed on the Oolloo Dolostone when it was exposed to the atmosphere before the Florina formation was deposited on top of it.

Solution cavities like this one are developed along fractures in the rock. The cavities make the aquifer capable of transmitting large volumes of groundwater.

7838

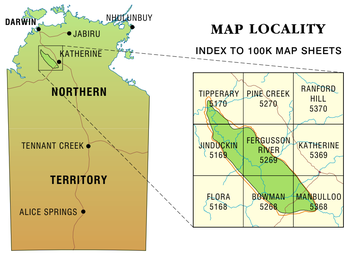
This image shows the "bedded" unit of the Oolloo aquifer



The "bedded" unit represents the unweathered section of the Oolloo Dolostone. The original sedimentary layers are clearly visible and the rock has only sparse fine solution cavities and small fractures. A section of rock such as this hosts only localised fractured rock aquifers.

MAP LOCALITY

INDEX TO 100K MAP SHEETS



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Cartography by L. J. Fritz, Spatial Data & Mapping Branch, Natural Resources Division
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Revisions and updates have been made since the initial publication of this map.
Edition 1 - June 2011
Reference: Oolloo Aquifer Water Resources www.nt.gov.au/nreta/nretasmaps/

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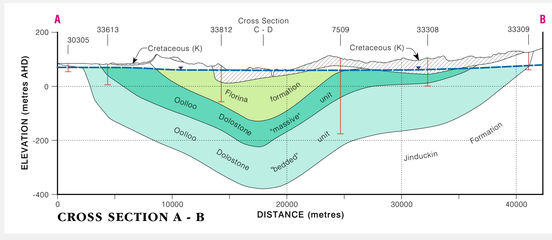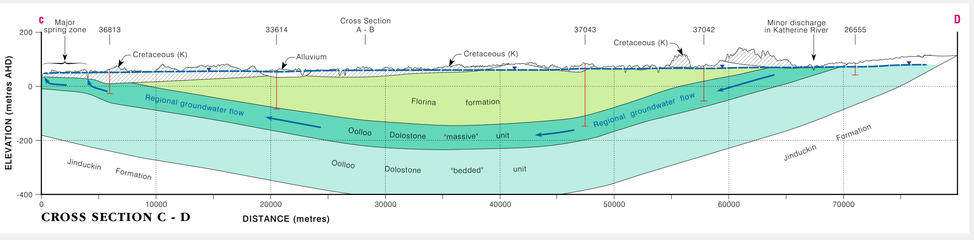
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