Gloucester
Our local
matters

Protecting Gloucester's water

Water: The basics

AGL understands that protecting water is the crucial yardstick the community will use to measure the success of our work. That's why we go to great lengths to understand and look after the water in the local communities where we work.

When we talk about producing natural gas from coal seams, we're also talking about groundwater. That's because groundwater holds the gas in place underground. We need to remove the water to allow the gas to flow. Understanding the different groundwater systems, and their interaction with surface water at Gloucester, is an important foundation for understanding natural gas extraction.

The Gloucester Basin will be one of the most understood water basins in Australia well before first gas production starts in 2016.

Working with Gloucester Council

AGL recognises that independent scientific water studies have a major role in the management and regulation of the coal seam gas industry.

That's why we developed a cooperation agreement to with Gloucester Council. The agreement will see the delivery of free water sampling reports for landowners, accelerated basin-wide water studies, more peer reviews and funding for a Council-appointed water environmental scientist who will provide independent analysis of water in the basin.

AGL believes this independent scientific support will build understanding of coal seam gas activities in the Gloucester community.

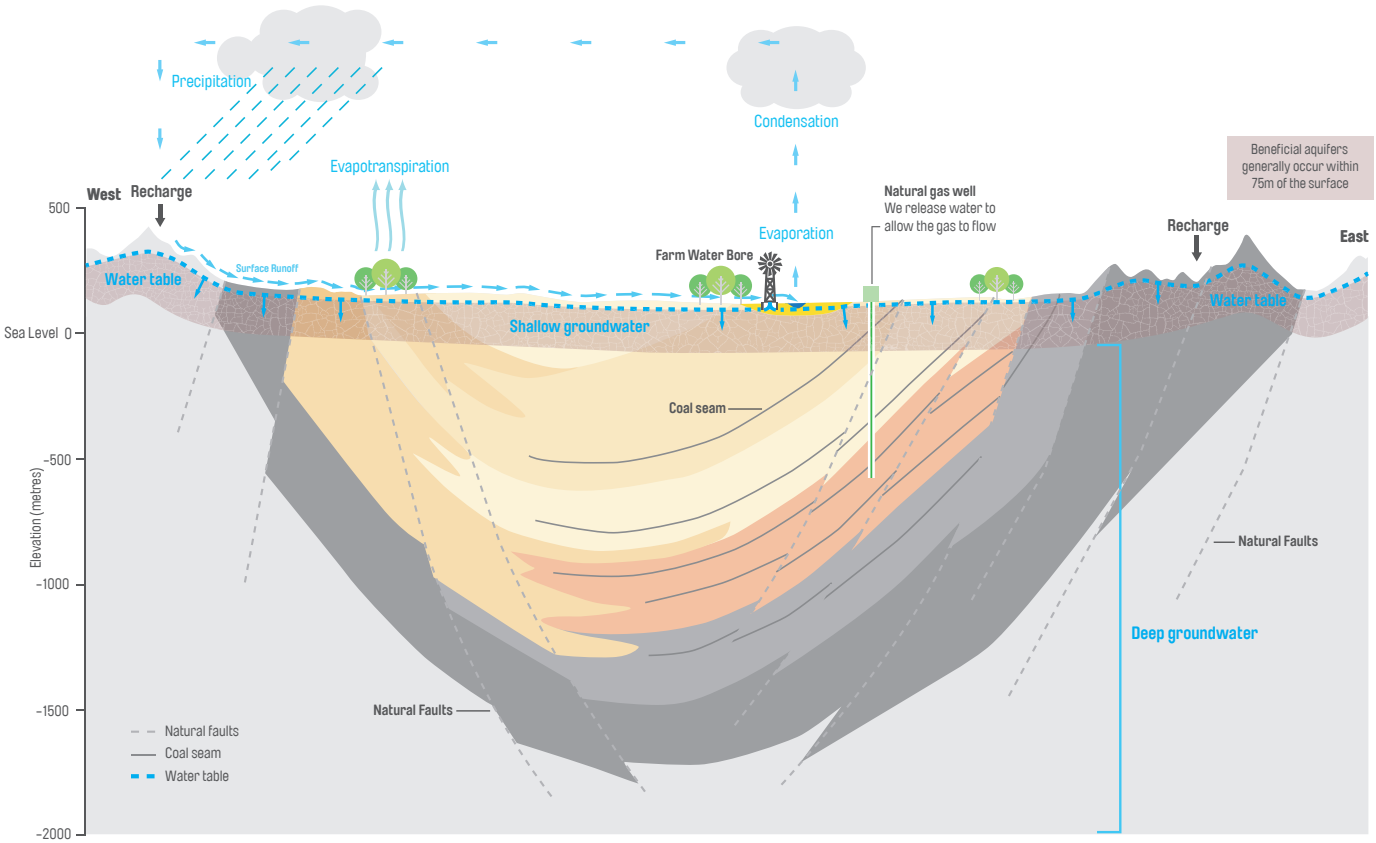
By the end of 2013 AGL will have:

45 water monitoring bores in Gloucester

Comprehensive water level and water quality data for over **40 sites**

Water level trend data published every **3 months** on our website

The Gloucester Water Cycle



When it rains, the majority of the water runs over the surface of the land and a small amount seeps into the water table.

Once underground, a proportion (above the water table) is used by native vegetation, pastures and crops while a smaller amount penetrates to the water table. The water table beneath the floodplain is relatively shallow and the alluvial sands and gravels contain mostly good to brackish quality water. Groundwater beneath the hillside areas is typically much poorer. Beneficial aquifers mostly occur within 75 metres of the surface.

Over thousands of years a very small amount of shallow groundwater seeps through the underlying rock, to replenish deep groundwater in the deeper rocks. This water is very old and can be quite salty as it contains minerals from the rocks it has travelled through.

Because Gloucester is located in a high rainfall area, there is little use of the groundwater resources from the shallow beneficial aquifers. Beneficial uses are restricted to stock and limited domestic purposes. Most people use surface water because it is easily accessible, more reliable, better quality and cheaper to access. Gloucester town sources its water from the Barrington River and it is treated at the Gloucester Water Treatment Plant.

What you need to know about groundwater

Beneficial aquifer: A beneficial aquifer is an aquifer than can produce enough water of a quality that can be used for domestic or agricultural purposes.

Shallow groundwater: Shallow groundwater is often isolated from deeper groundwater by layers of virtually impermeable rock. It is low yield and quite variable in water quality and rarely used by landowners.

Deep groundwater: Deep groundwater is old water which has travelled over thousands of years to deep underground. This water is typically slightly salty and usually needs treatment before being used.

Why does groundwater need to be removed?

Coal seams are created over millions of years, and over time natural gas is generated and held within the coal by groundwater pressure. To bring the gas to the surface, we need to decrease pressure by removing the water from within the coal seams. At first, more water than gas is removed, but as the gas flow increases over time, water flow decreases.

How much groundwater is removed?

Of all of the water that is deep underground, only a small amount is removed to allow the gas to flow. In Gloucester, less than 1% of the deep groundwater in storage is removed for this purpose over the entire life of the project.

Our water studies tell us:

- Groundwater is replenished when it rains.
- After rainfall you can notice changes in the groundwater. Deeper aquifers don't react the same way.
- Only about 3.5% of rainfall refills the groundwater, the rest runs off and refills dams, creeks and rivers (47.2%), or is taken up immediately by plants or evaporates (49.3%).
- In the Gloucester Basin the groundwater is refilled across the flats and where rocks outcrop around the edges of the Basin.
- Water in the ground moves very slowly through the rock layers and eventually the groundwater feeds into local waterways.
- There are layers of rock that act as a barrier between shallow groundwater and deep groundwater, such that very little water travels between the two.

What do we do with the water we remove?

The water removed to allow the gas to flow is known as produced water and is collected at the surface. There are a number of options for using this produced water.

Options for using produced water:

Blended with fresh water for agricultural irrigation

Treated and desalinated to provide water for drinking, domestic and agricultural purposes

Safely disposed of at a treatment facility

What you need to know about produced water from coal seams

- ☑ It is old water that is a bit salty
- ☑ It is not toxic
- ☑ There are strict rules for how this water is handled

When we use produced water from coal seams for irrigating crops, where does that salt go? Will it harm the soil, crops or run off into the river?

Water from coal seams is first blended with fresh water to reduce salt concentration before being used for irrigation. Following irrigation, some salt is absorbed into the plants, but most goes into the soil with the largest proportion migrating below the root systems to be trapped at or above the water table.

Gas from NSW for NSW

NSW has an abundant supply of clean, safe, natural coal seam gas. Extracting this gas is crucial to supplying the more than one million gas users in our state with energy over the coming years. All the gas from Gloucester will supply NSW families, communities, local manufacturing, agriculture and hospitals with a vital energy source.

Your checklist:
How AGL protects water

Studies:

- ☑ Scientific reports on water levels before work starts (known as baseline studies)
- ☑ Additional Federal Government studies of the Gloucester Basin
- ☑ Independent water scientist working for Gloucester Council overseeing Gloucester Basin studies

Gas Well Construction:

- ☑ Wells designed and built to protect against leaks
- ☑ Four barriers – two cement and two steel – protecting surface groundwater

Government checks:

- ☑ An independent water scientist working for the Gloucester Shire Council to manage key water studies across the Gloucester Basin
- ☑ Environment Protection Agency and NSW Office of Water audit
- ☑ Independent studies conducted by the NSW Chief Scientist & Engineer, Professor O'Kane
- ☑ Substantial Part 3A and EPBC planning approvals for our Stage 1 gas development project
- ☑ Strict limits on the amount of groundwater extracted to 2 ML/day across the project (less than one Olympic-sized swimming pool per day)

Monitoring

- ☑ Regular monitoring of water levels so we can immediately detect changes and quickly act
- ☑ Network of 45 water bores throughout the Basin monitoring water levels and providing crucial data

Openness:

- ☑ AGL team living and working in Gloucester
- ☑ Information available for everyone to view on **www.agl.com.au/gloucester**

Learn more

Join AGL's online community
www.yoursayagl.com.au

NSW Government
www.csg.nsw.gov.au

NSW Office of Water
www.water.nsw.gov.au

The NSW Chief Scientist & Engineer's interim report on coal seam gas
www.chiefscientist.nsw.gov.au

Industry Association
Australian Petroleum Production & Exploration Association
www.appea.com.au

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AGL