

## Our centre

The National Centre for Groundwater Research and Training (NCGRT) was established in June 2009 to better understand and manage Australia's precious groundwater resources. It has funding of over \$55 million from the Australian Research Council, the National Water Commission and a range of other partners.

The NCGRT represents a nationwide alliance of 22 university, government and industry partners, and it promotes global collaboration between nearly 200 Australian and international researchers all undertaking projects conducted by the centre. The NCGRT's large projects span the spectrum from fundamental research to applied research.

By drawing upon its wide range of partners, the centre can leverage additional external expertise where needed.

The NCGRT's mission is to be an institution of national and international standing with the capacity, through the development of people, knowledge and technologies, to support the sustainable management of Australia's groundwater resources.

## Our partners

Established partnerships with national and international organisations allow us access to world-leading expertise across a wide range of research fields, including coal seam and unconventional gas.

These partnerships have allowed the NCGRT to bring prominent international experts to Australia and hold events such as CSG leadership workshops and free seminars around the country. Collaboration with these experts also underpins the quality of NCGRT industry training short courses and professional education.

## Capacity building

Building capacity in Australia's professional groundwater community is a major focus for the NCGRT. We are doing this by attracting top researchers and students from Australia and around the world, offering access to world-class infrastructure, equipment and information, and providing professional groundwater training to stakeholders.

The NCGRT's industry training program has been successfully operating for over 20 years and is the industry leader in groundwater professional education.

It offers short courses, technology transfer, technical training, and thought leadership workshops across Australia. Many of these are directly relevant to CSG and unconventional gas industries, and are presented by national and international experts.

Some key courses include:

- the science of coal seam and shale gas
- groundwater in mining
- well design
- groundwater and vegetation
- advanced aquifer testing.

**For world-leading, independent technical advice on groundwater and hydrogeology, or to learn more about our professional training courses, contact the NCGRT.**

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## Understanding the groundwater impacts of coal seam gas



# The CSG challenge

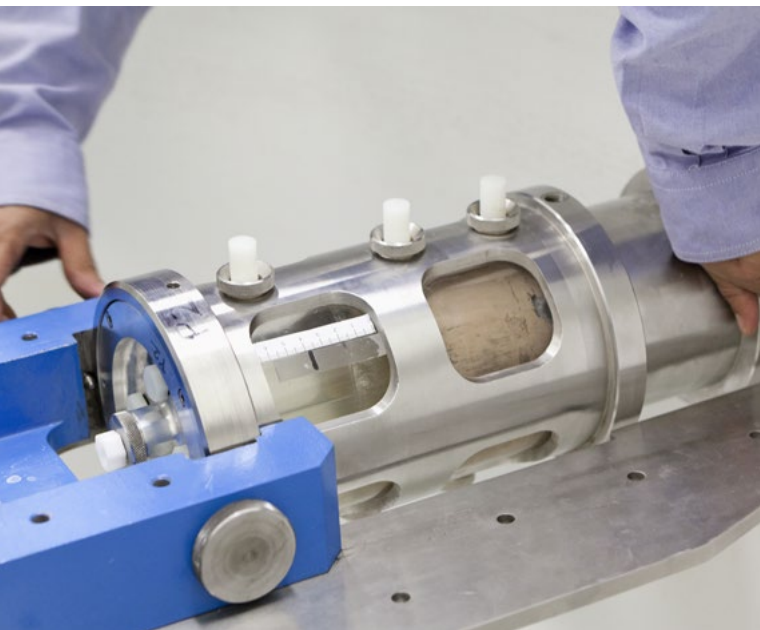
Australia's coal seam gas (CSG) industry is growing rapidly. Billions of dollars are pouring into regional Australia – particularly in southern Queensland and northern New South Wales – as global miners rush to exploit vast reserves of natural gas buried deep underground in coal seams.

To release the gas, mining companies sink wells deep underground and depressurise the coal beds. This involves removing huge amounts of groundwater, raising questions about potential impacts on freshwater aquifers such as the Great Artesian Basin. There are also issues surrounding the responsible disposal of extracted water which may have various impurities.

Unlike in previous Australian resource booms where mining took place in remote outback areas, CSG is found under farmland and country towns. This has resulted in concern from many regional communities about the potential impacts of sharing limited groundwater and the risks of contamination.

The scientific community is urging a measured approach. Hydrologists point to major gaps in our understanding of groundwater dynamics and the chemistry of Australia's aquifer systems. Current analyses are focused on individual mines or tenements, and therefore more work is needed to assess cumulative impacts.

There is a real need to measure, manage, reduce and communicate the potential risks associated with coal seam gas and unconventional gas in Australia.



# Our people

The NCGRT brings together a wide range of groundwater researchers from universities and research organisations across the country, and has a uniquely strong and large pool of experts from which to draw.



## Professor Peter Cook

Flinders University

**Key Skills:** hydrology, ecohydrology, isotope hydrology and unsaturated zone flow.



## Professor Tony Jakeman

The Australian National University

**Key Skills:** integrated decision support systems.



## Professor Craig Simmons

Flinders University

**Key Skills:** hydrogeology, ecohydrology, modelling and contaminant hydrology.



## Professor Malcolm Cox

Queensland University of Technology

**Key Skills:** hydrogeochemistry, isotope hydrology and modelling.



## Professor Derek Eamus

University of Technology, Sydney

**Key Skills:** ecohydrology and ecophysiology of groundwater dependent ecosystems, climate-vegetation interactions.



## Dr Wendy Timms

University of New South Wales

**Key Skills:** aquitard hydrogeology, mine water and waste, geochemical and isotope tracers, seepage barrier technology.



## Dr Ilka Wallis

Flinders University

**Key Skills:** hydrogeology, numerical modelling and managed aquifer recharge.



## Dr John Kozuskanich

Flinders University

**Key Skills:** hydrogeology, isotope hydrology and numerical modelling.



## Professor Allan Curtis

Charles Sturt University

**Key Skills:** social science, natural resource management and decision support systems.

# Our projects

The NCGRT has built extensive team experience and knowledge through a range of research activities. Projects relevant to CSG that we have been involved in include:

- Changes in aquifer connectivity related to coal seam gas exploitation
- Hydrogeological investigation into the groundwater and surface-water regime in the eastern mallee region of New South Wales and Victoria
- Environmental water requirements of groundwater-dependent ecosystems
- Leading practices for assessing the integrity of confining strata: application to coal-seam gas extraction and mining (eastern Australian coal basins)
- Desktop review of potential groundwater interconnectivity between the Arckaringa and Great Artesian basins, South Australia
- Landform and geological assessment of the south well spring mound spring complex, proposed Sibsey 1 exploration well site, Nilpina station, South Australia
- Numerical groundwater flow and transport modelling of major water inflows into mines and the connectivity of overlying aquifers due to the resulting depressurisation
- Reactive transport of dissolved gases through subsurface strata (synthetic systems)
- Measuring subsidence due to depressurization using remote sensing technology
- The National Groundwater Modelling Guidelines.

# Our resources

To enable our world-leading research, the NCGRT is heavily involved in the development of vital research infrastructure at many sites around Australia.

The NCGRT is also commissioning research tools such as the new centrifuge permeameter at the University of New South Wales (pictured far left). This machine is one of only two of its kind in the world, and is used for assessing porous materials including geological core samples. Centrifugation can directly address questions about subsurface groundwater flow at scales that are otherwise not otherwise possible, simulating thousands of years within weeks or months.

Projects led by Dr Wendy Timms have tested several shales and mudstones overlying coal. While these very low permeability strata can form important seepage barriers, this research is identifying issues that require more attention such as the effect that moisture-saturation states play in controlling leakage.