GISERA
Gas Industry Social and Environmental Research Alliance

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SURFACE AND GROUNDWATER FACTSHEET

Groundwater flows in the Hutton Sandstone and Precipice Sandstone aquifers

CSIRO is undertaking a study to better understand groundwater flow in two Queensland aquifers which provide an important resource for domestic and stock water supply.

Where is the Hutton Sandstone and Precipice Sandstone aquifers?

These aquifers are located in the northern Surat Basin in Queensland, see Figure 1. The aquifers feed into Great Artesian Basin (GAB), Australian's largest groundwater basin.

This data will be used to refine existing groundwater models of this area which are used by both industry and government to support decisions on the sustainable use of water supply in the basin. The Surat Basin is one of Australia's largest coal seam gas (CSG) regions. Over the coming years, production of gas will increase as Liquefied Natural Gas (LNG) facilities come online. The impact of this industry on groundwater in these two aquifers can only be assessed if their flow systems are better understood.

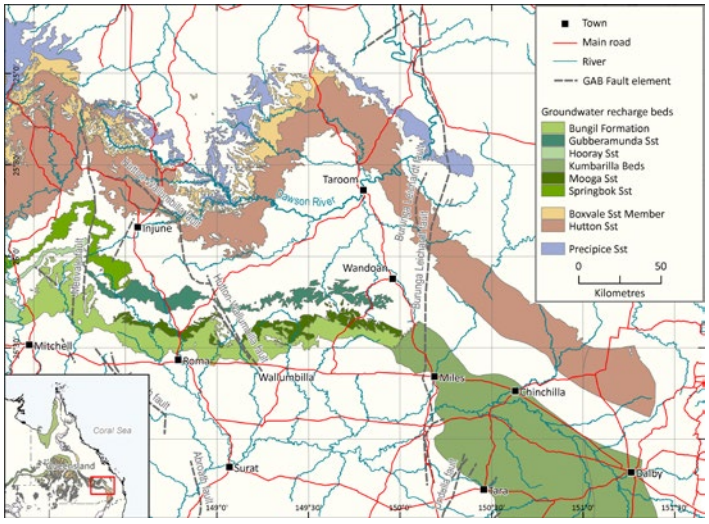

Figure 1: Location of the Hutton Sandstone and Precipice Sandstone aquifers noted in purple and red.

What are we looking at?

This project involves sampling selected groundwater bores that tap into the Hutton and Precipice Sandstone aquifers (see Figure 2 overleaf). We are sampling the bores to determine groundwater flow and velocity. The water from groundwater bores is sampled to analyse for environmental tracers. These natural trace substances can assess the "age" of the water.

The age of the water indicates the time the water spends on its underground pathway. The water infiltrates at the surface in the recharge areas in the north (see Figure 2 overleaf, noted as Recharge) and flows through the aquifer to the bore. Knowing the time this process takes, and the volume of the aquifer, indicates the volume of groundwater that is recharged every year into these aquifers.

This study by the Gas Industry Social and Environmental Research Alliance (GISERA) follows an earlier project 'Geochemical baseline monitoring' which looked at the flow system of the Hutton Sandstone aquifer and the permeability of aquitards in the same region. You can read more about this previous project on www.gisera.org.au

Why is this research important?

By understanding the groundwater flows, we can improve the existing three-dimensional (3D) groundwater modelling used by both the CSG industry and Queensland Government. These results will improve our knowledge about the amount of water that can be sustainably extracted.

What are environmental tracers?

Environmental tracers are substances that naturally occur in the environment. They are called tracers because they 'trace' the water movement, and also due to the very small amounts of these substances commonly found in the water. Some of them can give information on age; for instance the helium concentration increases the longer water stays in the aquifer. Others like the noble gases neon, argon, krypton, xenon can give information on the recharge conditions, like the temperature of the soil thousands of years ago when the water infiltrated.

In this study, we use a variety of tracers to study different aspects of groundwater flow and groundwater mixing in these aquifers. Sampling for these tracers may be as simple as filling water into a bottle or as complicated as extracting the gases of a large quantity of water with a field-going vacuum system over several hours. To measure these samples we use highly specialised instruments, some of these CSIRO instruments are the only ones in existence in the Southern hemisphere.

Some common environmental tracers include:

- Isotopes of the water molecule: of oxygen (^{18}O) and of hydrogen (deuterium (^{2}H) and tritium (^{3}H)
- Radioactive isotopes of argon (^{39}Ar) and krypton (^{85}Kr and ^{81}Kr) and radon (^{222}Rn)
- Radiocarbon (^{14}C)
- The radioactive isotope of chloride (^{36}Cl)
- The concentrations of all noble gases (helium, neon, argon, krypton, xenon).

These tracers are naturally occurring in the groundwater.

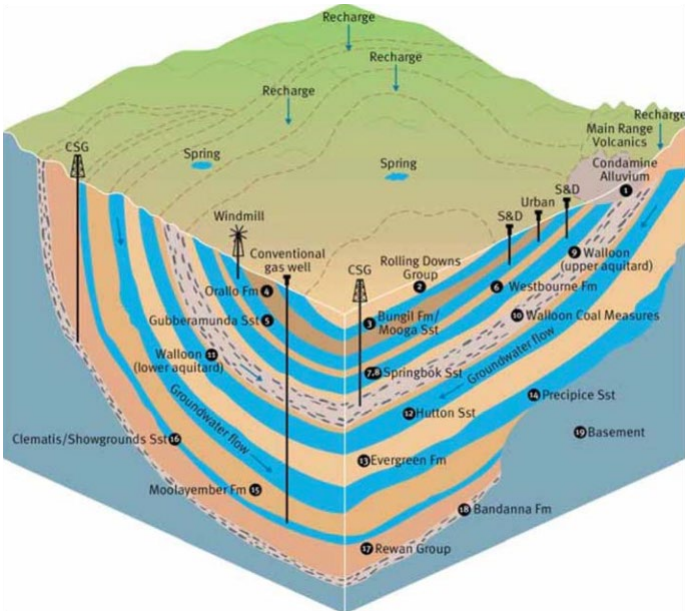

Figure 2: Conceptual model of the groundwater systems in the Surat Cumulative Management Area (Queensland Water Commission 2012).

The next phase

Once we have the environmental tracer data of the water, that data is used to derive a better conceptual model of the Hutton and Precipice Sandstone aquifers. A final report will be made available on www.gisera.org.au. The data is then used to improve 3D groundwater modelling for the area. All results will be made publicly available for government, industry, and other users for assessments going forward.

Field-going vacuum system used to collect samples.

Argon and krypton purification system, one of the CSIRO instruments used to analyse water samples.

ABOUT GISERA

The Gas Industry Social and Environmental Research Alliance (GISERA) is a collaborative vehicle established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research. Visit gisera.org.au for more information about GISERA's governance structure, projects and research findings.

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