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Geological and Bioregional Assessment Program

Fact sheet 8

Characterising the connectivity between the Cooper Basin, Great Artesian Basin and shallow aquifers

Groundwater samples collected from the Cooper Basin, Great Artesian Basin (GAB) and shallow aquifers were analysed for a range of environmental tracers (Figure 1). These environmental tracers can be used to identify if there is a connection between different aquifers and whether there is mixing of fluids from different sources. Three types of groundwater samples were collected:

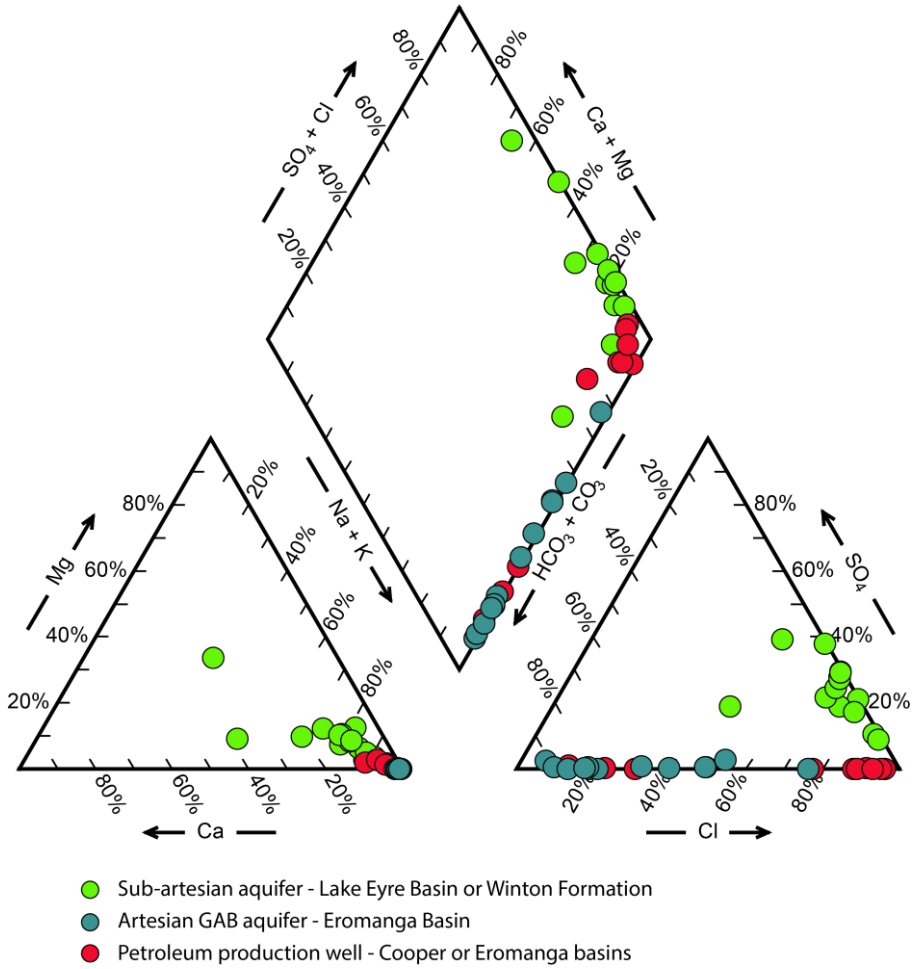
- shallow sub-artesian aquifer – Lake Eyre Basin or Winton Formation
- artesian GAB aquifer – Eromanga Basin
- petroleum production wells – Cooper or Eromanga basins.

Early results indicate that there is likely to be a degree of connectivity between the Cooper Basin and the overlying Eromanga Basin (GAB), however the timescale on which such exchanges occur is unknown. For example, measurable concentrations of methane and hydrocarbons were observed in all GAB groundwater bore samples. These dissolved hydrocarbons are likely to have originated through migration from the deeper Cooper Basin at some time in the geological past. Strontium isotopes and hydrochemical data also suggest that water chemistry in GAB bore samples at some sites may be influenced by mixing with groundwater from the Cooper Basin (Figure 2). However, contributions of groundwater from the Cooper Basin to the GAB are likely to be relatively minor.

The absence of methane and hydrocarbons in all but one sample from shallow aquifers and the clear distinction in hydrochemistry of Cooper and Eromanga basin samples compared to the shallower Lake Eyre Basin (Cenozoic) and Winton Formation groundwater samples, suggests that there is no, or only a very limited connection, between the GAB and the overlying aquifers (Figure 2).

Figure 1 Groundwater sampling, Cooper Basin

Figure 2 Piper diagram showing the major ion chemistry of the Lake Eyre Basin and Winton Formation, Eromanga Basin and petroleum production wells (Cooper or Eromanga basins)



The GBA Program

The $35.4 million Geological and Bioregional Assessment (GBA) Program is assessing the potential impacts of shale and tight gas development on water and the environment to inform regulatory frameworks and appropriate management approaches. The geological and environmental knowledge, data and tools produced by the GBA Program will assist governments, industry, land users and the community by informing decision-making and enabling the coordinated management of potential impacts.

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The findings of this investigation are currently being drafted for submission to Journal of Hydrology.

Find out more

Datasets that support this work are available at data.gov.au:

- Geological and Bioregional Assessment Program (2020) Hydrogeochemistry and environmental tracers of Cooper Basin, GAB and shallow groundwater [text].

More information is available at bioregionalassessments.gov.au/gba.