APPLICATION OF MAGNETIC RESONANCE DATA FOR GROUNDWATER PROSPECTIVITY IN THE FITZROY BASIN, WESTERN AUSTRALIA

KokPiang Tan[1], Neil Symington[2], Ken Lawrie[3], Alastair Hoare[4], Elliot Grunewald[5], Larysa Halas[6]

Geoscience Australia, kokpiang.tan@ga.gov.au1, Geoscience Australia, neil.symington@ga.gov.au[2], Geoscience Australia, ken.lawrie@ga.gov.au[3], Western Australia Department of Water, Alastair.HOARE@water.wa.gov.au[4], Vista Clara, Elliot@vista-clara.com[5], Geoscience Australia, larysa.halas@ga.gov.au[6]

In northern Australia, groundwater investigations in remote areas face challenges including the cost and difficulty in obtaining drilling permit due to lengthy heritage and environmental approvals processes. Non-invasive geophysical techniques, including airborne electromagnetics (AEM), Ground Magnetic Resonance (GMR) and borehole Nuclear Magnetic Resonance (NMR), are particularly attractive in these circumstances, as key hydrogeological parameters including depth to water table, porosity and transmissivity can be obtained with limited clearance approvals required.

In the Fitzroy Basin of Western Australia, both surface and borehole MR have been applied to groundwater prospectivity assessment of the Cenozoic sediments, and the Palaeozoic and Mesozoic sandstone aquifers. Eight GMR sites were acquired across the basin, which include Mowanjum, Willare – lower Fitzroy, Mount Anderson, and May – Lennard River areas. These sites were selected based on interpretation of the AEM data.

The GMR results with good resolution to 100 m depth were compared against borehole NMR and lithostratigraphic information, and found to be consistent. Both sets of MR data support that the Palaeozoic (Grant Group and Poole Sandstone) are excellent aquifers. At other sites, the lack of water content in some of the water profiles indicates the presence of aquitards such as Blina Shale and Jarlemai Siltstone.

GMR data indicates that the floodplain alluvium of the intermittent Fitzroy River contains little ‘mobile’, or free-draining, water (~3 vol %) at the end of the dry season. The water table at the site was ~30 m depth, most likely beneath the alluvium in the Mesozoic sedimentary rock.