Utilising Airborne Electromagnetics (AEM) to Map Key Elements of the Hydrogeological System and Salinity Hazard in the Ord Valley, Western Australia.

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The Ord Valley Airborne Electromagnetics (AEM) Interpretation Project was co-funded by the Australian Government and the Western Australian Government to provide information in relation to salinity and groundwater management in the Ord River Irrigation Area (ORIA). The project area covers the existing ORIA Stage 1, and the ORIA Stage 2 areas earmarked for irrigation extension. The project included the acquisition of 5,936 line km of AEM data acquired using the SKYTEM time domain system.

The SkyTEM AEM system successfully mapped key elements of the hydrogeological system over most of the project area. In general terms, the modelled conductivity structure defined from the SkyTEM smooth model Layered Constrained Inversion (LCI) matches that defined from available bore data exceptionally well, with an adjusted $R^2 = 0.843$ determined.

Overall, the AEM survey has provided enhanced spatial delineation of key elements of the hydrostratigraphy in 3D, including sand- and gravel-filled palaeochannels, and clay and silt distribution, as well as salt stores and groundwater quality. The study found significant areas of high salinity hazard in several of the Stage 2 areas earmarked for irrigation development, with salt stores and groundwater salinity often higher than in the Stage 1 areas.

This study has demonstrated the effective role that AEM methods can play as part of a 'hydrogeological systems' approach to the management of groundwater in existing and future irrigation developments in Northern Australia. The study has also demonstrated the potential for 'calibrated' AEM systems and Fast Approximate Inversion software to significantly shorten AEM project timelines.

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