

USING HYDROGEOPHYSICAL TECHNIQUES TO CHARACTERISE AND MAP SEA WATER INTRUSION AND PREFERENTIAL FLOW PATHS IN HOWARDS EAST AQUIFER, DARWIN RURAL AREA, NORTHERN TERRITORY

Laura Gow¹, Melissa Woltmann², Niels B. Christensen³, Ken Lawrie¹, Des YinFoo², Eamon Lai¹, Sam Buchanan¹, Martin Smith¹, & KokPiang Tan¹

¹Geoscience Australia, laura.gow@ga.gov.au; ken.lawrie@ga.gov.au; sam.buchanan@ga.gov.au; kokpiang.tan@ga.gov.au

²Northern Territory Department of Environment and Natural Resources, melissa.woltmann@nt.gov.au; des.yinfoo@nt.gov.au

³Aarhus University, nbc@geo.au.dk

In the Howards East Aquifer (HEA) in Darwin's Rural District, groundwater resources in a dolomitic and karstic aquifer system provide important water security for Darwin and a large horticultural industry. Previously (2011), a widely-spaced (550m) regional airborne electromagnetics (AEM) survey in this area mapped conductivity anomalies that were interpreted as potential zones of seawater intrusion (SWI) coincident with major fault zones. Subsequent drilling confirmed elevated groundwater salinities in some bores marginal to the main aquifer. It was recommended that more detailed investigations be undertaken to better define the SWI risk.

The Howards East Project is an inter-disciplinary study which focussed on delineating and characterising the present SWI interface and potential future hazards from sea water intrusion. The Project is funded by Geoscience Australia (GA) as part of the Exploring for the Future (EFTF) Programme. New data acquisition includes 2,096 line-kilometres of 100 m line-spaced AEM and airborne magnetics data, ground magnetic resonance (GMR), and borehole nuclear magnetic resonance (NMR) data, drilling and pump testing; and hydrochemistry. The main aims of this study are to: (1) delineate potential SWI zones; (2) quantify the porosity, permeability and transmissivity of the Koolpinyah-Coomalie Dolomite aquifer along potential fault zones (coincident with magnetic anomalies) and (3) identify other structural and/or sedimentological preferential flow paths or barriers to ingress.

This paper reports on: (1) initial AEM inversion results and spatio-temporal changes in groundwater quality arising since acquisition of previous AEM in 2011, and (2) the interplay between the sea water intrusion interface and structural/sedimentological flow paths/barriers.