

Exploring for the Future: a new initiative to unlock Northern Australia's minerals, energy and groundwater resources

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Introduction

Mineral, energy and groundwater resources are not only essential for life; they are key drivers of the Australian economy. Minerals and energy resources together contribute around \$200 billion annually towards our export income while the water-dependent agricultural sector contributes a further \$41 billion. Domestically, mining and agriculture are also a significant source of employment, particularly in rural and remote areas, as is the related Mining Equipment, Technology and Services sector. *Exploring for the Future* aims to ensure these national benefits continue into the future.

Exploring for the Future is a four-year, \$100.5 million program designed to investigate the potential of mineral, energy and groundwater resources in Northern Australia and parts of South Australia, both areas where the resource potential is relatively poorly known (Figure 1). Over the course of the program, a suite of precompetitive data and information will be released to support and de-risk investment in exploration and industry expansion.

Previous work undertaken by Geoscience Australia (and its predecessor) has proven that investing in precompetitive data acquisition activities can generate significant long-term returns for the nation:

- In 1996, Geoscience Australia undertook \$3 million of analysis in the offshore Browse Basin. This helped identify the Ichthys field, discovered by Inpex, which is expected to produce more than \$70 billion in export earnings over the next 40 years.
- Geophysical data acquired across South Australia in the 1960s, costing around \$350 000, helped Western Mining Corporation identify the resource potential of the Gawler Craton and ultimately led to the discovery of the Olympic Dam deposit, one of the world's largest orebodies, worth an estimated \$1 trillion.
- A \$6 million data acquisition program to identify areas suitable for irrigation and or at risk of salinity in the Ord Valley, Western Australia, led to the government and industry investing \$1.2 billion in infrastructure.

The new program is unique in terms of scale, scope and skills. Collaboration with Northern Territory, Western Australia, Queensland and South Australian government agencies is vital to achieve its ambitious objective.

In terms of scale, several projects will acquire data across all of Northern Australia, covering about 50% of the continental landmass.

In terms of scope, several regions of Northern Australia will be the focus for acquisition of multiple datasets, which

will make them some of the best geologically-characterised regions in Australia.

In terms of skills, the program is drawing together a broad range of scientific capability and expertise from across the Commonwealth, State and Territory governments, and academia to address key scientific questions.

A significant focus for the program is the acquisition of new precompetitive or non-rivalrous data from both air-borne and ground-based sources. Geoscience Australia will be working closely with the relevant State and Northern Territory government agencies to arrange access where required. This will include full engagement with Aboriginal groups, Traditional Owners, local communities and pastoralists. All field activities will be conducted according to relevant legislation and community expectations.

Three components of the program

The minerals component focuses on understanding the geological evolution of the entire northern Australia region and through that, identifying which geological provinces have greater potential for various mineral deposit types. The activities are aligned with the UNCOVER priority areas identified in the AMIRA Roadmap for Exploration Under Cover.

The energy component focuses on exploring sedimentary basins across Northern Australia for potential oil and gas resources.

The groundwater component focusses on assessing the location, quantity and quality of groundwater, and rates of use or depletion, to identify potential opportunities for irrigated agriculture, mineral and energy development, and community water supply. The focus will be on the collection and interpretation of a range of geological, geophysical and hydrogeological datasets to understand groundwater systems in a number of key regional areas across Northern Australia. Although these projects are aimed at ascertaining the potential for sustainable development and management of these water resources for agricultural, industry and community supply, many of the datasets collected will also be of value for mineral and energy exploration.

Northern Australia project activities

The first activities for the mineral and energy components of the program are underway; many are concentrated on the region from Tennant Creek in the Northern Territory to Mount Isa in Queensland. This region is also the starting point for several projects that span all of Northern Australia, including:

1. A deep-looking long-period magnetotelluric (MT) project known as AusLAMP. AusLAMP is a national project aimed at imaging the conductivity structure of the deep crust and lithospheric mantle with MT

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soundings spaced every 55 km in a grid. The *Exploring for the Future* component of AusLAMP is underway; it has already acquired 6 sites between Tennant Creek and Mount Isa prior to the current wet season.

2. AusAEM is the national wide-spaced airborne electromagnetic survey that will acquire ~20 km flight-line spaced airborne electromagnetic (AEM) data across most of Northern Australia. Flying is expected to commence in April 2017 and includes an expression of interest to industry for concurrent infill flying.
3. An isotopic atlas of Northern Australia is being compiled. The data in this project is an important input into the 3D geological model as well as resource assessments. The data include U–Pb (age dating), and isotopic fingerprinting using Pb, Hf–O, Sm–Nd and Ar.

4. A metamorphic map of Northern Australia will bring together the disparate academic and geological survey studies into one GIS and database that, together with the isotopic datasets, will inform on the geodynamic evolution of the region. This analysis will be a key input in any mineral system assessment.
5. All the new *Exploring for the Future* data will be integrated with existing data into a new 3D model for Northern Australia. The starting point for this will be the Tennant Creek to Mount Isa region.

Regional project activities

In addition to the ‘all of Northern Australia’ studies are a series of regional projects and focussed data acquisition

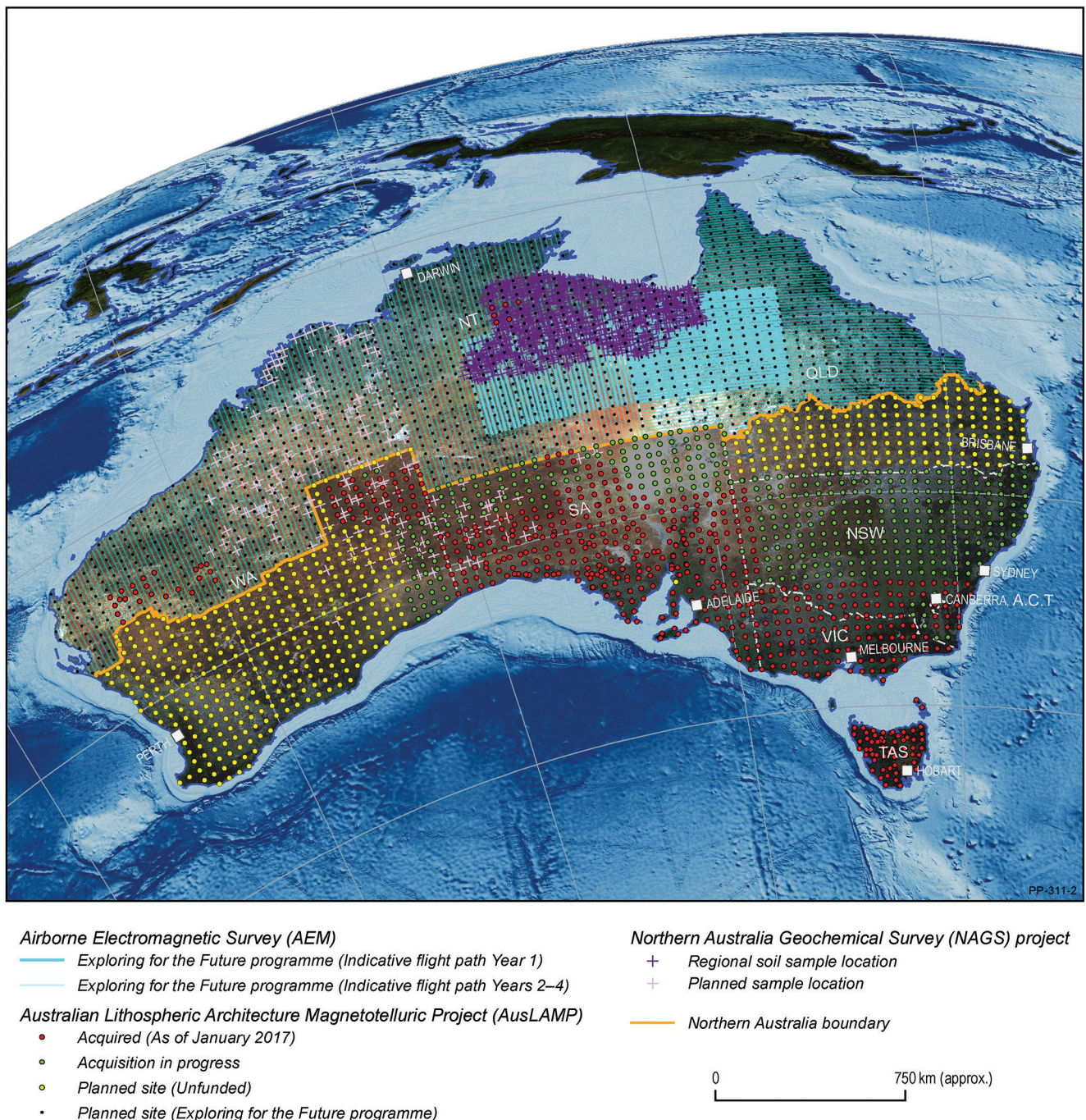


Figure 1. Map of current project activities of *Exploring for the Future*.

programs across Queensland, Northern Territory, Western Australia and South Australia.

The route for a >550 km-long, \$4.6 million, deep seismic reflection survey from the northwestern Mount Isa Inlier through the Nicholson Basin and into the southern McArthur Basin has been scouted and is scheduled to commence in May. This is also a collaborative project with Northern Territory and Queensland governments and AuScope, who are contributing \$1.1 million to the survey. Public release of the data is expected in March-April 2018. The data will be used to site a series of stratigraphic drillholes to identify and characterise petroleum systems in the region.

Specialised passive seismic recording equipment has been commissioned and will be deployed at the AusLAMP sites as part of the AusARRAY project. AusARRAY is a national effort to better map the velocity structure of the crustal and lithospheric mantle. It builds on the work by university groups, with the plan to complete a wide strip of new acquisition from Mount Isa in the east across the Northern Territory to the Western Australian border. Some instruments will be deployed into Western Australia on a semi-permanent basis in areas where major data gaps exist and national velocity models are poorly constrained.

Areas in Northern Australia where the gravity coverage is spaced greater than 4 km apart will be the focus of an infill gravity program. This will improve the understanding of the density distribution of the rocks in these regions and add to the national gravity database. Upgrades to the Australian Fundamental Gravity Network, to which all gravity surveys are levelled, will also be ongoing.

The region between Tennant Creek and Mount Isa (TISA) will also be the focus of surface geochemical sampling and analysis in a manner consistent with the National Geochemical Survey of Australia (NGSA). The aim of this project is to better characterise the chemistry of the surface materials at a moderate resolution as a way of determining the background values. The project has many benefits (including soil character), but one of the purposes is to map any 'distal footprints' from buried mineral deposits. Related to this project is a systematic sampling and multi-element analysis of existing water bores. This too will provide key

baseline information as well as possible indicators of buried deposits.

Drilling is the only method that provides an actual physical sample of any subsurface rocks. The minerals, energy and groundwater components will all be testing geological models through targeted drilling. The first of these drilling projects starts in South Australia.

- Minerals component: The Coompana Drilling project with Geological Survey of South Australia will commence in April–May 2017, with early results expected to be released in late 2017. This project aims to better characterise the basement geology by drilling beneath the Nullarbor Plain on the western edges of the Gawler Craton into the very poorly known Coompana Province.
- Energy component: Planning is underway for two stratigraphic drilling projects to answer energy questions. The first project will be in the South Nicholson basin following the acquisition of the deep seismic reflection data. A second stratigraphic drilling project is planned for Western Australia in the final two years of the program.
- Groundwater component: The groundwater projects across Queensland, Northern Territory and Western Australia will drill and log holes to ground-truth or calibrate high-resolution AEM data. Drilling will also provide new geological and hydrogeochemical samples for analysis and interpretation.

Conclusion

Exploring for the Future is an exciting program that will deliver new data and knowledge in areas of geological uncertainty and hence reduce exploration risk. The program is unprecedented in terms of the scale, scope and skills being focussed onto the strategic questions regarding future minerals, energy and groundwater resources in Northern Australia.

To find out more about this comprehensive *Exploring for the Future* Program, or to access data released to date, visit www.ga.gov.au/eftf.