Exploring for the Future
A program to discover the resource potential of northern Australia
Australia’s National Resource Wealth

• “The north has untapped promise, abundant resources and talented people. It is also Australia’s closest connection with our key trading markets and the global scale changes occurring in Asia.” White Paper on Developing Northern Australia
Australia seen as a ‘mature’ exploration destination

- Australia’s percentage of global resources exploration investment has decreased significantly
- Greenfield and brownfield expenditure has dropped dramatically
- A focus on brownfield exploration has seen fewer large discoveries

Declining investment in resource exploration will affect the Mining Equipment, Technology and Service (METS) sector
The National Picture

Contributes an estimated ~$6.8bn per annum to GDP.

Groundwater plays a critical role in National Water Security:

- Water is required for resource and agricultural development and for community supply.
- Groundwater represents ~17% of available water within Australia.
- Many mineral & energy deposits occur in remote areas where groundwater is the only secure local water source.
- Recently, the development of new energy sources has identified the potential for impacts on groundwater.
Examples of Pre-competitive Return on Investment

Ichthys Project (Energy – offshore WA; 1996)
• Largest liquid petroleum discovery since 1960’s
• Australian Government Expenditure: $3M
• Industry Expenditure: $34B
• Export Revenue (40 years): $72B

Olympic Dam (Minerals – SA; 1960s)
• Giant copper-gold-uranium mine discovery
• Australian Government Expenditure: $350K
• Value of ore body: $1T

Ord Valley Irrigation Expansion (Water – WA; 2005-10)
• Ord River Irrigated Agriculture
• Australian Government Expenditure: $6M
• Industry and Infrastructure Investment: $1.2B
Exploring for the Future

• A major new investment in pre-competitive geoscience from the Minister for Resources and Northern Australia

• Federal Budget measure of $100.5 million over 4 years (2016 to 2020)

• Comprises three integrated elements:
  • Minerals
  • Energy
  • Groundwater
Exploring for the Future

A resources prospectus for Northern Australia

…. a targeted resource prospectus aimed at attracting industry investment through the delivery of a suite of new pre-competitive geoscience data and knowledge across tropical Western Australia, Queensland, all of the Northern Territory and parts of South Australia.

….. deliver a vastly improved understanding of the resource potential of selected regions of Northern Australia, where the resource potential is limited or unknown
Exploring for the Future – Aim and Approach

• Aim is to increase the attractiveness for exploration investment by technically de-risking key underexplored greenfield regions in northern Australia

• A prospectus to inform the integrated assessment of mineral, energy and groundwater resource potential based on:
  • New pre-competitive data acquisition, analysis and interpretation, and
  • Novel regional studies addressing specific prospectivity questions

• Undertaken by Geoscience Australia in collaboration with State/Northern Territory government agencies
Northern Australia: where is it?

Approximately 40% of Australia’s land area.

Plus parts of South Australia
Minerals: Value Proposition

- Northern Australia has vast potential for under cover mineral resources
  - *Exploring for the Future* is a major contribution to the National Mineral Exploration Strategy and the UNCOVER Initiative
  - Minerals activities are focussed on delivery of UNCOVER’s Highest and High Priority knowledge/data gaps

Sources:
- MinEx Consulting
- Australian Bureau of Statistics
Energy: Value Proposition

• Northern Australia hosts vast amounts of untapped oil & gas resources.

• Australia’s domestic gas market requires security of supply to satisfy increasing energy demand

• LNG is the third largest export after iron ore and coal (Department of Foreign Affairs and Trade, 2015)

• Australia’s LNG exports predicted to be the World’s largest in 2019-20 (Department of Industry and Science, 2015)

• Natural gas is an energy commodity that will help limit Australia’s greenhouse gas emissions
Groundwater: Value Proposition

- Major gaps in our knowledge of the location, size and quality of groundwater resource, and rates of use or depletion.
- Lack of relevant data to inform potential alternative groundwater-related options including water banking opportunities.
- Due to the seasonal nature of surface water and high evaporation rates in northern Australia, groundwater resources represent a significant opportunity for water security.
- Need to de-risk resource and agricultural investment, and inform water management options, including infrastructure development.
Proposed Activities: all Northern Australia

AusAEM:

- Airborne electromagnetics
- Systematically map thickness and character of cover
- 175,000 line-km
- 20 km line spacing
Proposed Activities: all Northern Australia

AusLAMP:
- Magnetotellurics
- Map deep conductivity structure
- Building on data in southern Australia
- 1244 stations
Proposed Activities: all Northern Australia

AusARRAY

- Passive seismic using distant earthquakes
- GA earthquake catalogue recalculation
- Map deep velocity structure
- Links with AusLAMP magnetotellurics
- Builds on RSES deployments
Proposed Activities: all Northern Australia

Isotopic Atlas of Northern Australia

- Improve national crustal age map (neodymium)
- Collect lead, hafnium-oxygen isotopes
- Uranium-lead and argon ages
- Map the fundamental structure of Northern Australia crust
- Determine timing
- Minerals in basement
- Basins evolution (energy and groundwater)

White very old
Brownish old
Yellow intermediate
Green young
Proposed Activities: all Northern Australia

National Geochemical Survey of Australia

- Complete gap in national coverage
- National benchmark/background
- Full multi-element geochemistry and select isotopes
- Predict buried mineralisation
Proposed Activities: Regional studies

Hydrogeochemistry Survey

- Focused studies in regional projects
- Characterise groundwater
  - Link to AEM data
- Map potential buried mineralisation through groundwater
- Full multi-element geochemistry and selected isotopes
Proposed Activities: Regional studies

Regional Gravity

• Map density structure
• 16,000 stations in low spatial density regions (black)
• Towards a national 4 km grid
Proposed Activities: Regional studies

Regional Airborne electromagnetic data

• Targeted surveys with ~1-5 km line spacing, focused on top ~200 m
• Map near surface stratigraphy and structure
• Identify variations in conductivity associated with fresh vs saline groundwater
Proposed Activities: Regional studies

Remote Sensing data

- Use of Australia Geoscience Data Cube at the regional to local scale
- Map surface water availability, water balance
- Predict soil moisture & recharge-discharge
- Estimate vegetation condition & ecological response to water budget
- Bare earth derivatives for improved mineral maps
Proposed Activities: Regional studies

Groundwater projects will integrate AEM inversions, drilling, hydrogeology, hydrochemistry, elevation models and remote sensing data to:

- develop 3D maps describing the depth of bedrock, distribution of aquifers and aquitards, groundwater salinity, hydraulic properties and bedrock geology;
- identity salt store and groundwater salinity hazard maps (and seawater intrusion in coastal zones);
- document potential risks to agricultural, mineral and energy development and environmental assets.
Proposed Activities: Regional studies

Regional 2D seismic data

- Identification of sedimentary depocentres
- Imaging of tectonic architecture
- Assessing the regional extent of key sequences
Proposed Activities: Regional studies

Stratigraphic Drilling:

• Energy, Mineral and Groundwater systems synthesis
• Site selection informed by new geophysical data
• Penetration of sedimentary sequences and into the basement
• Full multi-element geochemical sampling, and selected isotopes
• Sampling and analysis of 300 existing water bores (hydro-geochemistry)
• Collect samples for a range of geoscience analysis
Proposed Activities: Regional studies

Data capture progress: Mesozoic distribution 28/10/2016

Solid Geology

- Chronostratigraphic geological maps of Northern Australia
- Seamless digital GIS datasets linked to the Australian Stratigraphic Units Database (ASUD)
- Cover-thickness estimates → basis for 3D model
Proposed Activities: Regional studies

3D visualisation and integrated analysis, interpretation and mapping

• Build an updated 3D Northern Australia Architecture Model (including cover)

• Resource potential assessments for basin Cu, IOCG, Au, U....

• Tool kits including
  • Build on our virtual laboratory (ANVGL)
  • How to Explorer Guides
Data and Information Delivery

A suite of existing publicly available web-based platforms
Outsuts

• Annual delivery of pre-competitive data and regional geological studies that technically de-risk greenfield regions to:
  • Help identify the location, quantity and quality of new mineral, energy and groundwater resource potential in northern Australia, and
  • Allow for the rapid, quantitative and cost-effective mapping, characterisation and assessment of resource systems

• Data and information that can help underpin a co-ordinated and consistent approach to mineral, energy and groundwater resource assessment

• Provision of authoritative, independent information and advice to stakeholders
Exploring for the Future: Outcomes

- Safeguarding Australia’s future economic prosperity
- Positioning Australia for the next wave of exploration investment
  - For Government: A resources prospectus
  - For Industry: A foundation for new discoveries
- Redress Australia’s declining share of global resource exploration investment
Exploring for the Future

Web: www.ga.gov.au/eftf
Email: eftf@ga.gov.au
Address: Cnr Jerrabomberra Avenue and Hindmarsh Drive, Symonston ACT 2609
Postal Address: GPO Box 378, Canberra ACT 2601