AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

Critical Minerals and the Future of Mining in Australia

Allison Britt

Director Mineral Resources Advice and Promotion

Australian Government

Geoscience Australia

Geoscience Australia

Mission: to be the trusted source of information on Australia's geology and geography for government, industry and community decision making

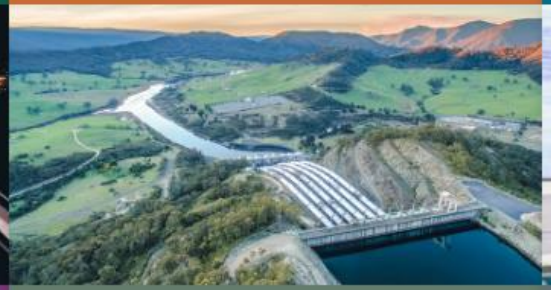
Building Australia's resources wealth

Supporting Australia's community safety

Securing Australia's water resources

Managing Australia's marine jurisdictions

Creating a location-enabled Australia



Enabling an informed Australia

Ensuring a high performing organisation

AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

- Australia’s eight geological surveys working together to attract investment into Australia’s minerals sector
- Expert scientists and regulators who understand Australia
- Trade and investment specialists who can connect you with the right people and projects
- Building on Australia’s reputation for successful mineral discovery and mining
- Making it easier to invest, partner and succeed

Australian Government Geoscience Australia

NSW Government

Australia’s Northern Territory

Queensland Government Australia

South Australia Government of South Australia Department for Energy and Mining

Tasmanian Government

Victoria State Government

Department of Energy, Mines, Industry Regulation and Safety Geological Survey of Western Australia

Multiple global drivers for critical minerals security

Net-zero emissions

World events

Geopolitics

Concentrated markets

My presentation today

- Understanding the Australian Government's policy framework for critical minerals
- Government action to support Australia's critical minerals industry
- Australia's critical mineral resources and the natural partnership with Japan
- How government geoscience makes an impact

Reducing Australia's greenhouse gas emissions to net zero by 2050

Australia's targets:

- 43% reduction by 2030
- net zero emissions by 2050

Japan's targets:

- 46% reduction by 2030
- net zero emissions by 2050

AZEC
Asia Zero Emission Community

The Future Made in Australia

"…we need to aim high, be bold and build big to match the size of the opportunity in front of us."

Prime Minister Albanese, 11 April 2024

$22.7B over 10 years

Net zero transition stream

- **Renewable hydrogen**
- **Green metals**
- **Low carbon liquid fuels**

Economic resilience & security stream

- **Critical minerals processing**
- **Clean energy manufacturing**

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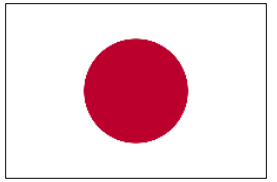
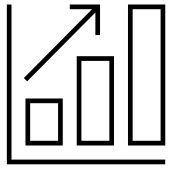
Foreign Investment

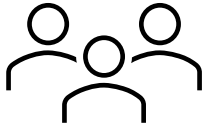
Australia welcomes foreign investment

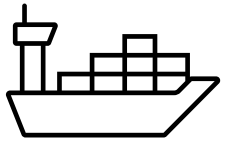




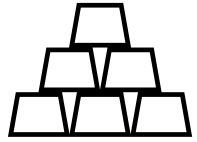

Economic growth


Good infrastructure


Skilled workforce


Proximity to Asia


Strong governance



Resources wealth

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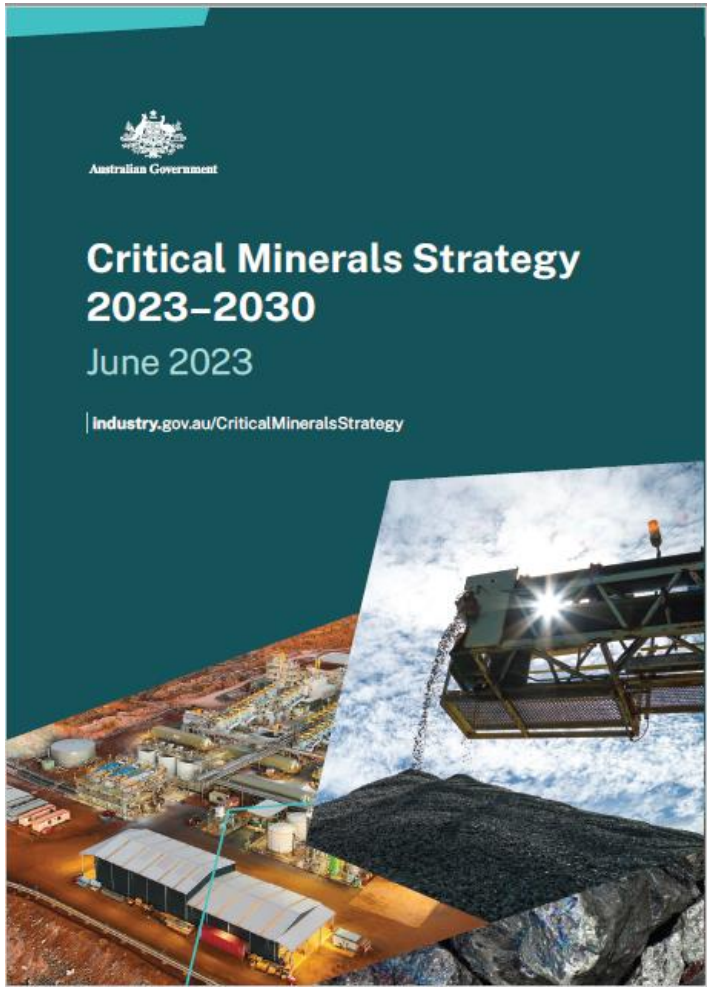
The Future Made in Australia – critical minerals



- $15b National Reconstruction Fund
  - $3b Renewables and low emissions technologies
  - $1b Value-adding in resources
- $7b Northern Australia Infrastructure Facility
- $7b Critical Minerals Production Tax Incentive
- $4b Critical Minerals Facility
- $3.4b Resourcing Australia's Prosperity initiative, 35 years
  - $566.1m over first 10 years
- $50m Critical Minerals Development Program
- $50m Critical Minerals R&D Hub
- $40m International Partnerships in Critical Minerals

Resourcing Australia's Prosperity

$3.4b over 35 years

- $566.1m over first 10 years

Key deliverables by 2060:

- Resource potential maps for all 36 critical minerals and strategic materials
- 12 multi-commodity deep dive studies

Australia-wide geoscience data

Four inter-related components

Provide necessary data

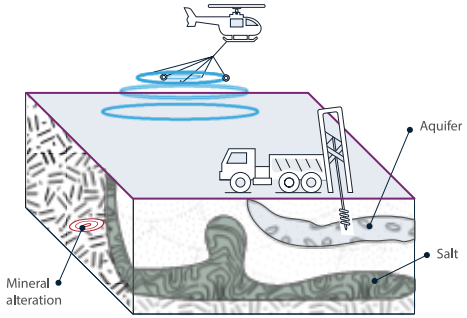
Improve data resolution

Provide necessary data

Guide data priorities

Data and engagement

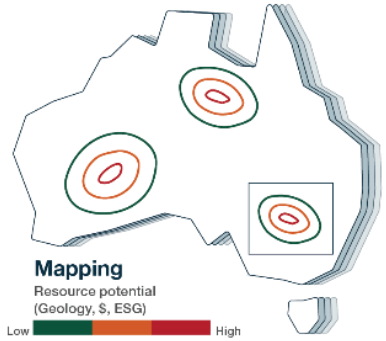
Deep dive regions



Inform selection

Validate and improve

National resource assessments



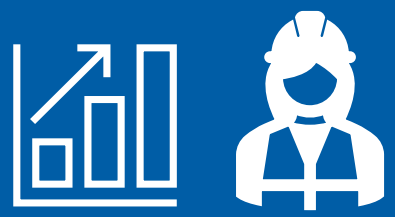
Australian Critical Minerals Research and Development Hub

ANSTO

CSIRO

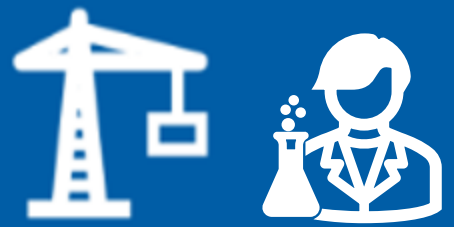
Australian Government
Geoscience Australia

Scaling-up and commercialising critical minerals R&D



Coordinating, guiding, and prioritising critical minerals R&D expertise across Australia

Connecting critical minerals projects to technical and research experts



Supporting strategic international critical minerals collaboration

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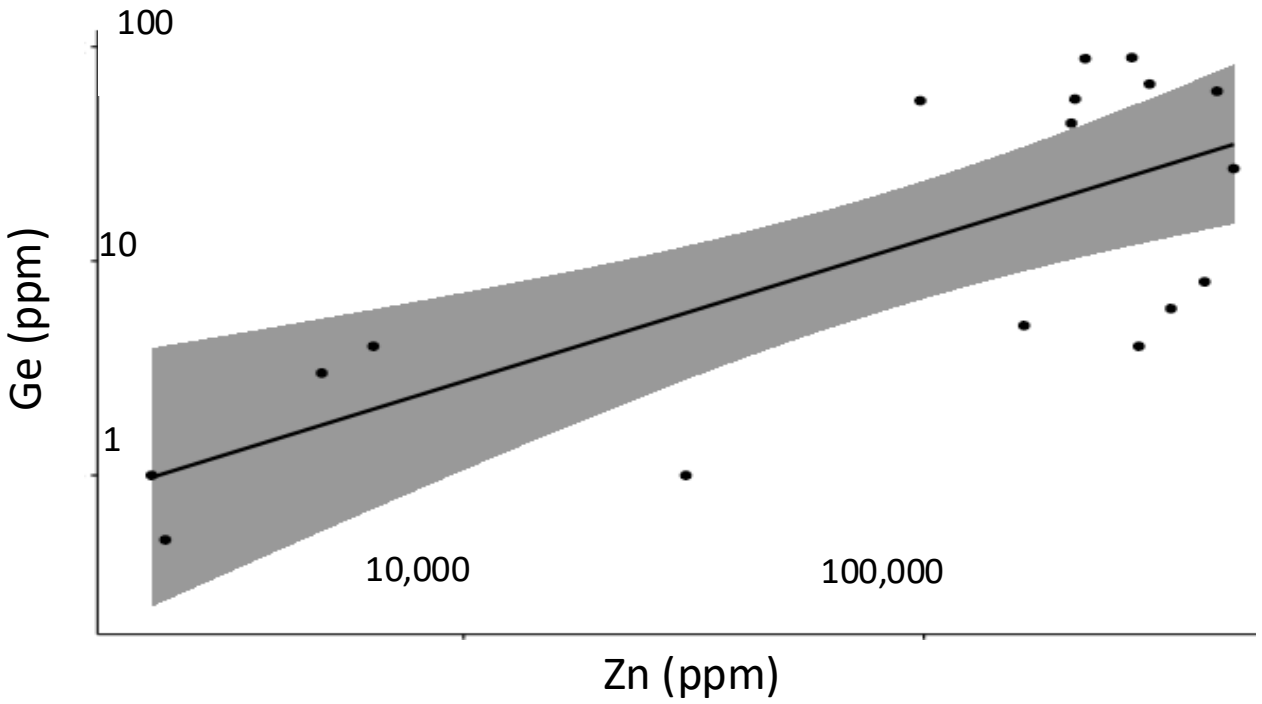
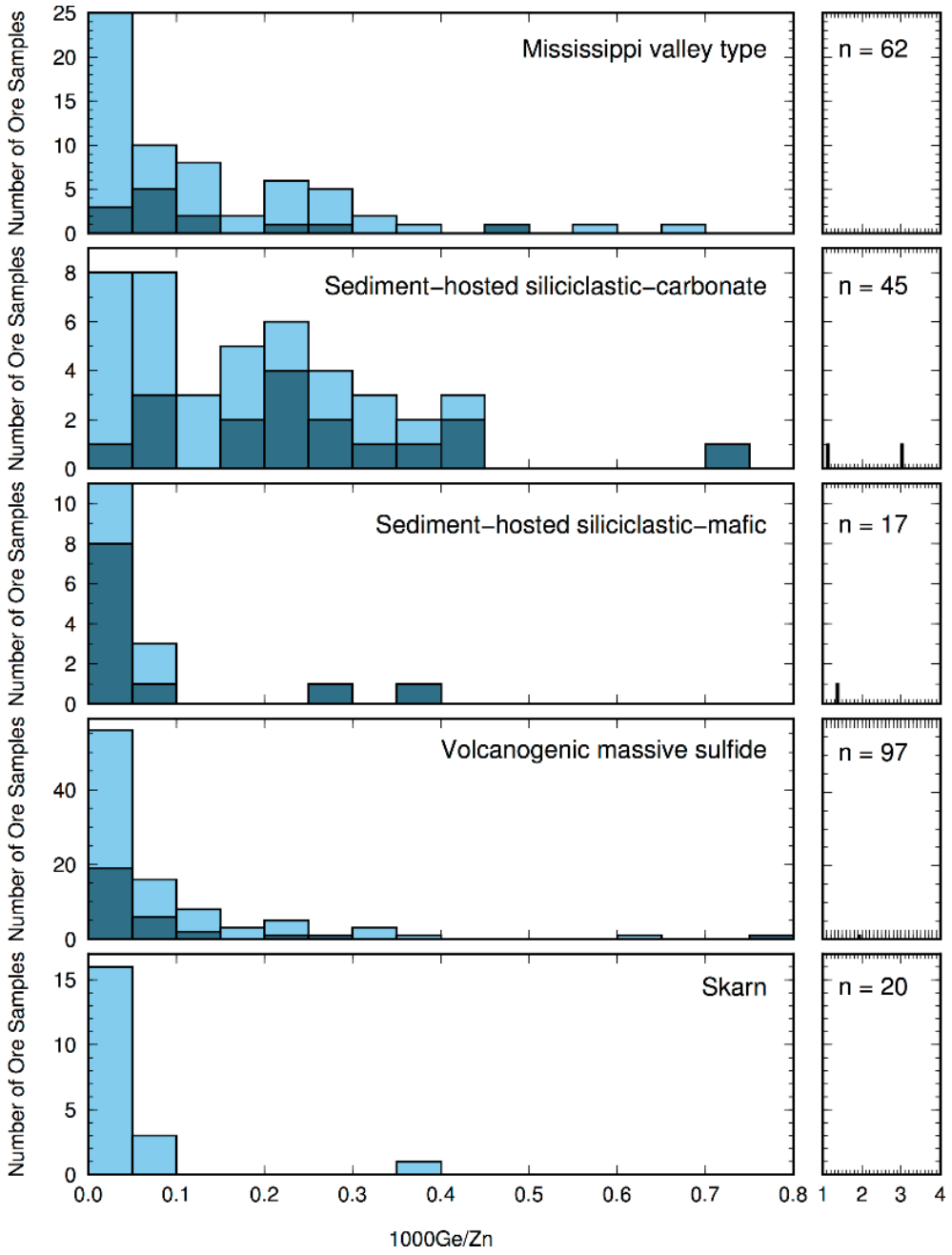
Identifying sources of germanium from zinc ores





Bastrakov and Huston (in review)

Results are indicative only using global deposit endowment and require confirmation

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International critical minerals collaboration

STANDARDS Australia

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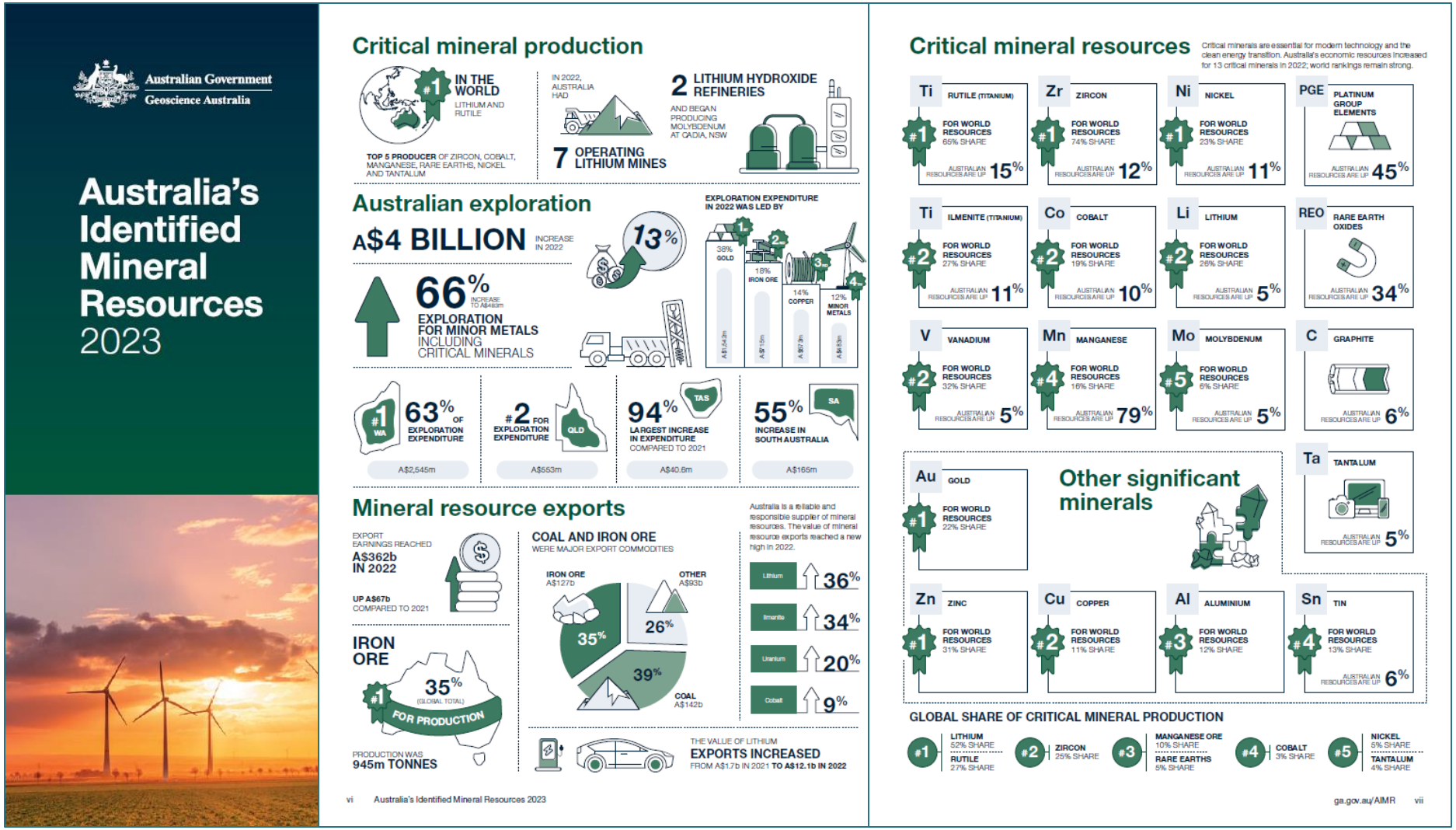
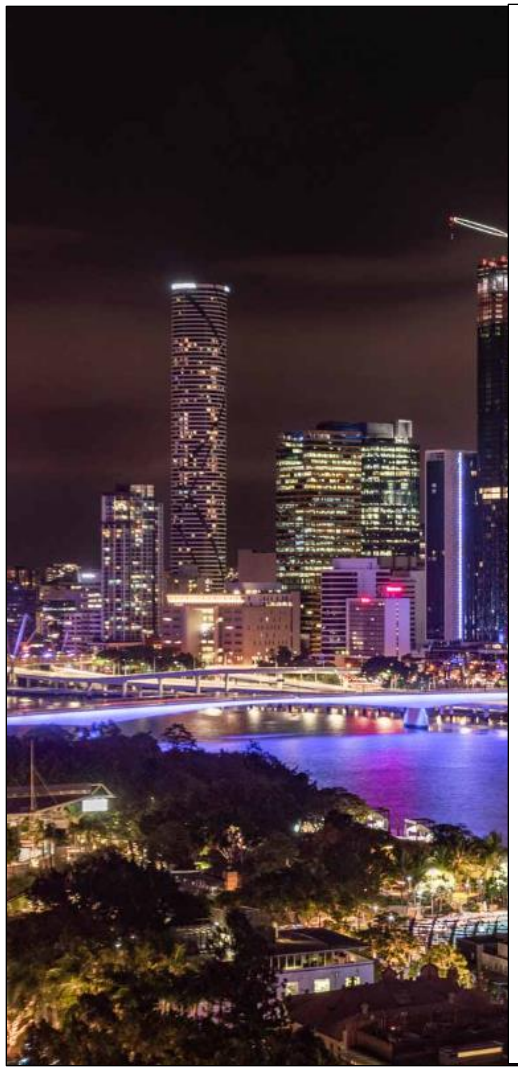
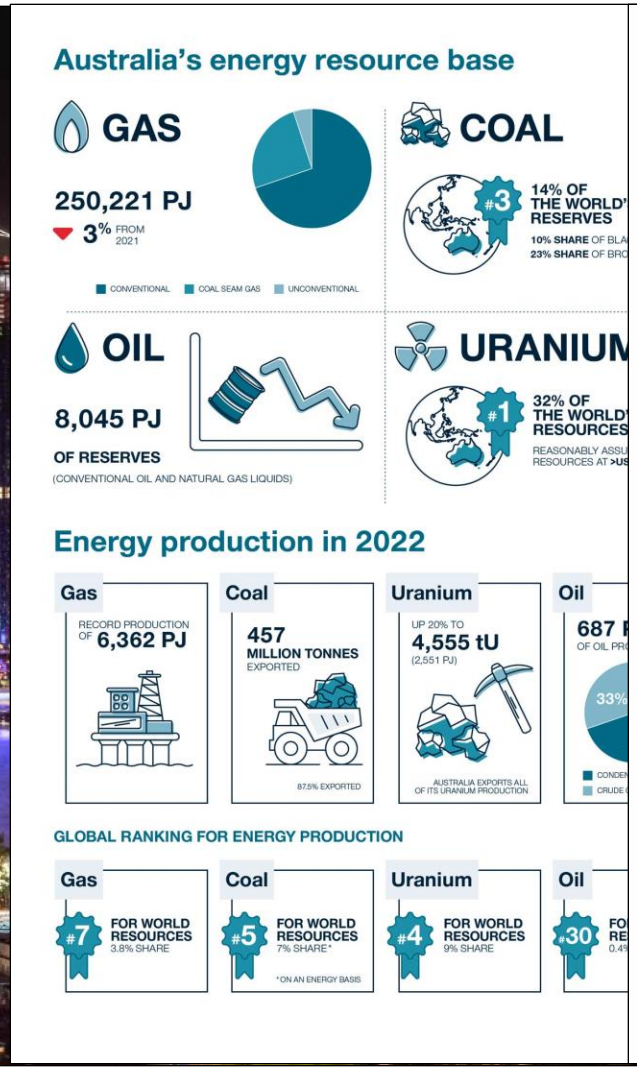
Australia's Identified Minerals Resources

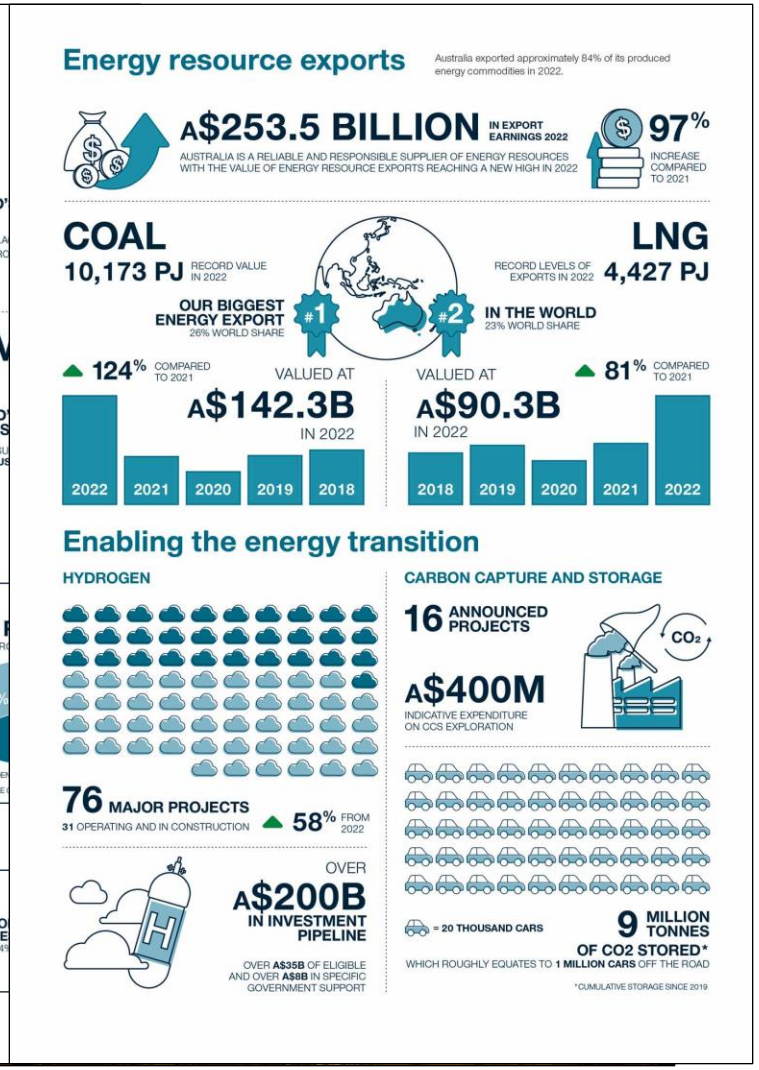


ga.gov.au/aimr

Australia’s Energy Commodity Resources

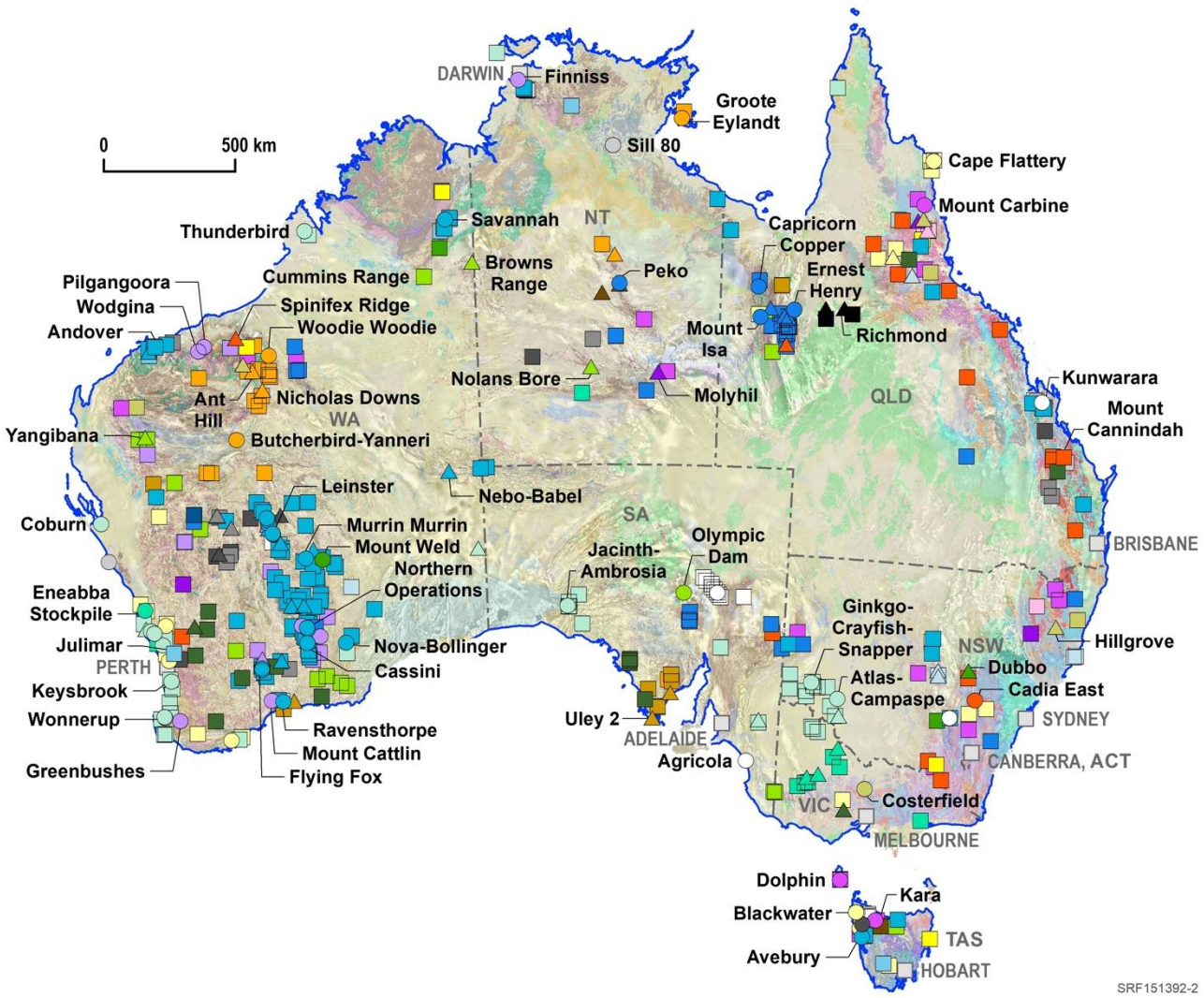






ga.gov.au/aecr2024

Australia’s critical mineral resources



Australian Critical Minerals Map 2023

477 deposits with a critical mineral resource

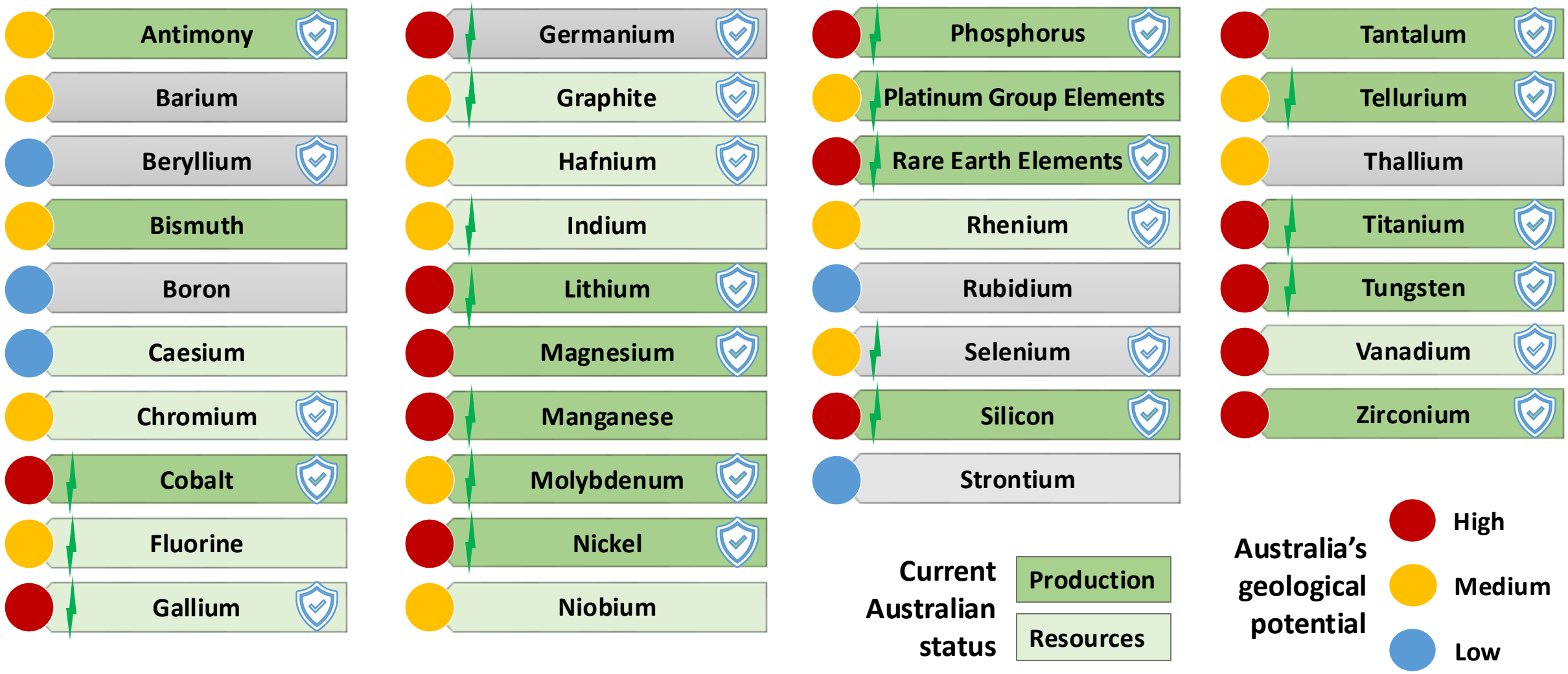
- 62 operating mines
- 32 under development
- 23 on care and maintenance
- 75% undeveloped

80% of land mass covered by younger sediments

Commodity Type

- *Antimony*
- *Bismuth, +/- Cobalt, +/- Indium*
- *Chromium, +/- Cobalt, +/- Nickel, +/- PGE*
- *Cobalt*
- *Nickel, +/- Cobalt, +/- PGE*
- *Platinum Group Elements (PGE), +/- Cobalt, +/- Nickel*
- *Scandium, +/- Cobalt, +/- PGE, +/- Nickel*
- *Fluorine*
- *Graphite*
- *High Purity Alumina*
- *Indium*
- *Lithium, +/- Tantalum, +/- Niobium*
- *Magnesium*
- *Manganese*
- *Molybdenum, +/- Rhenium*
- *Heavy Mineral Sands (HMS) – Titanium, Zirconium*
- *HMS – Titanium, Zirconium, REE*
- *Rare Earth Elements (REE)*
- *REE, Zirconium, Niobium, +/- Hafnium, Lithium, Tantalum, Gallium*
- *Silicon (High Purity Silica/Quartz)*
- *Tungsten*
- *Tungsten, Molybdenum*
- *Titanium*
- *Titanium, Vanadium*
- *Vanadium*
- *Vanadium, Molybdenum*

Japan's critical minerals list and Australia's geological potential to supply



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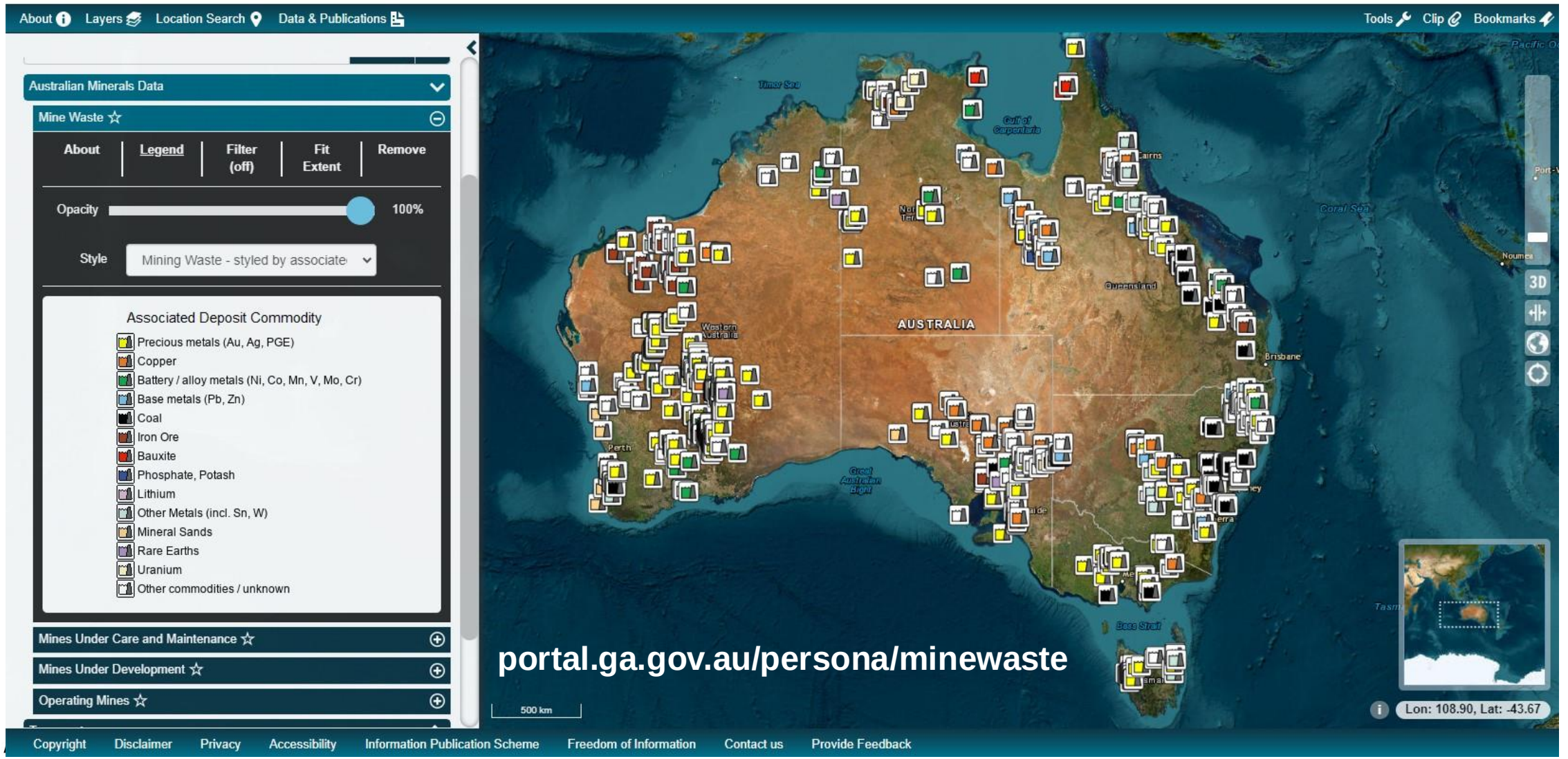
Environment, Social, Governance (ESG) in Australia

- Commitment to net zero
- State & federal environmental laws
- Land and water management
- Community development
- Regional benefits
- Strong and mature legislation
- Health & safety laws and culture
- JORC Code
- Transparent taxation, regulated banks
- Standards development and traceability
- Circular economy and recycling

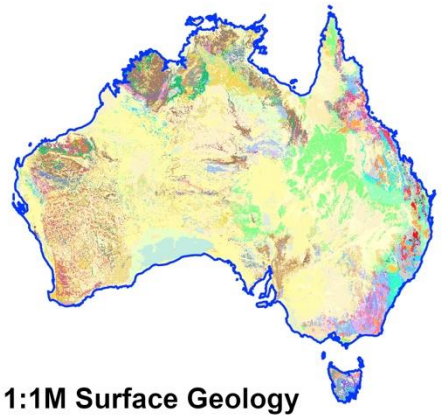
Atlas of Australian Mine Waste



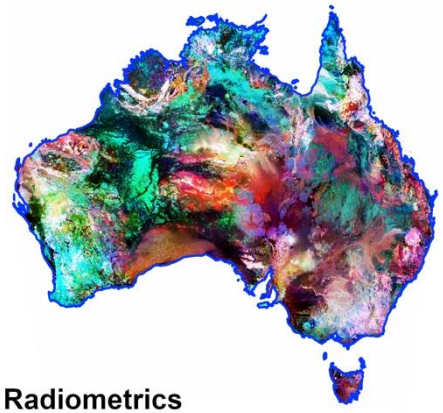
Australia-wide geoscience data

- Spans fields of geology, geochemistry and geophysics, resource agnostic
- Continued improvement of established but incomplete coverages
- Rapid collection of new national data coverages
- World-leading and freely available

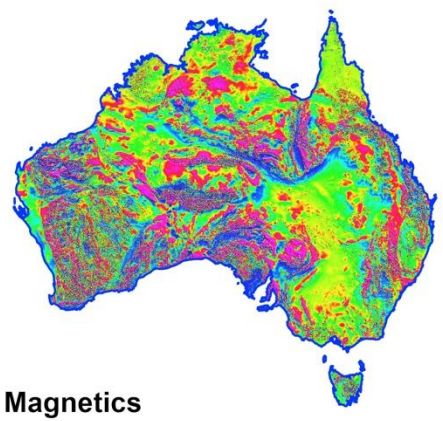
Gold standard datasets continue to be improved and update



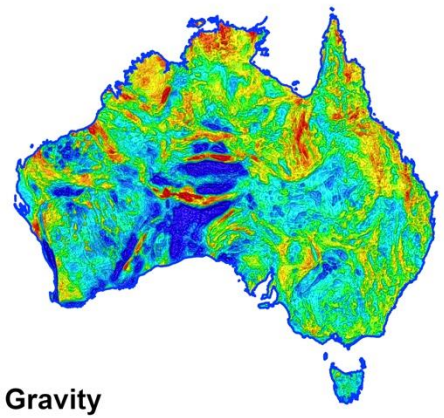
1:1M Surface Geology



Radiometrics

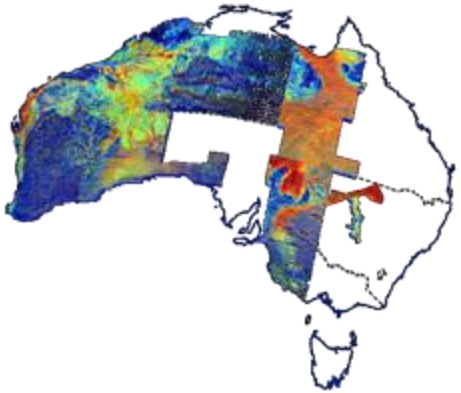


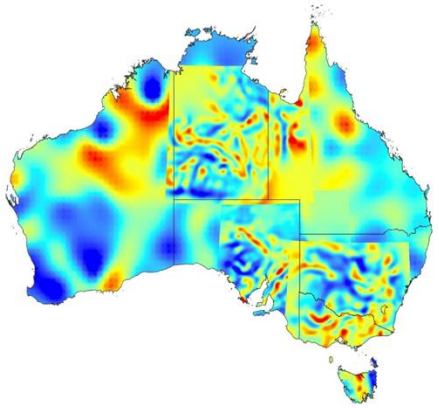
Magnetics

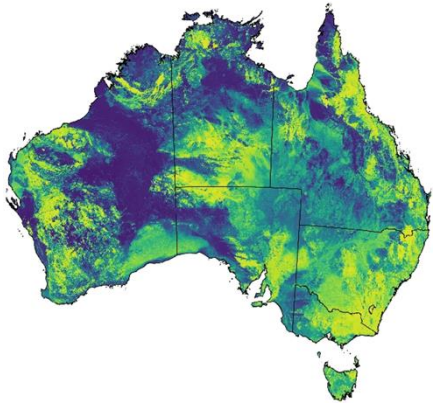


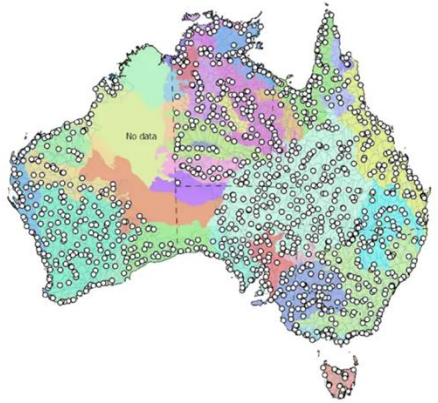
Gravity

Examples of new innovative datasets are being added:





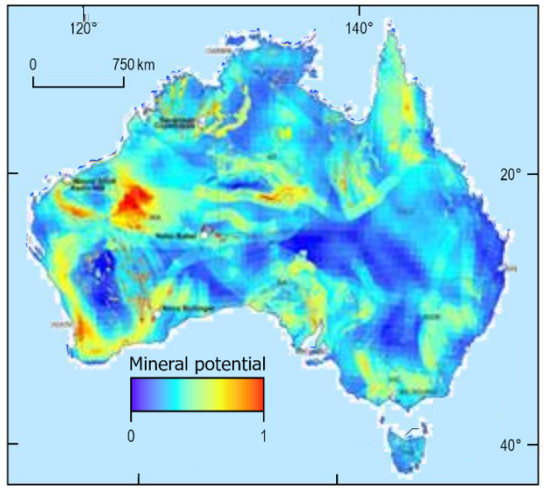




National resource potential assessments

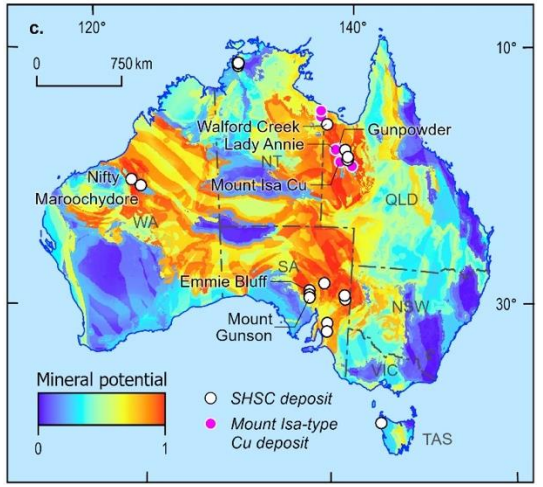
- Multi-criteria resource potential assessments
- Economic fairways mapping to inform project costs
- Identifying green metal opportunities and costs
- Resource potential of mine waste

Tholeiitic magmatic



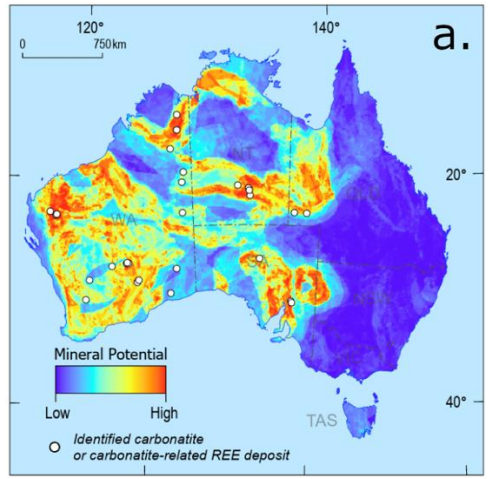
Dulfer et al. (2016)
http://dx.doi.org/10.11636/Record.2016.001

Sediment-hosted



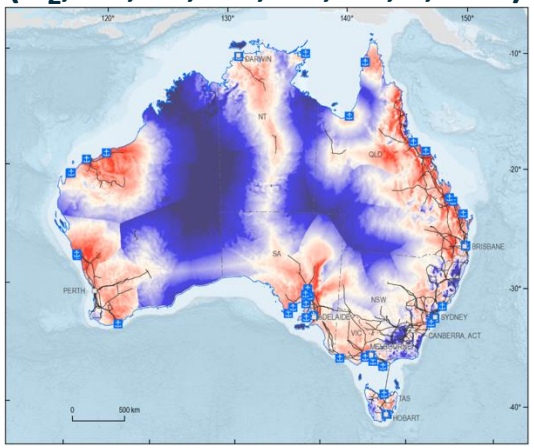
Cloutier et al. (2023)
https://dx.doi.org/10.26186/147539

Carbonatite-related



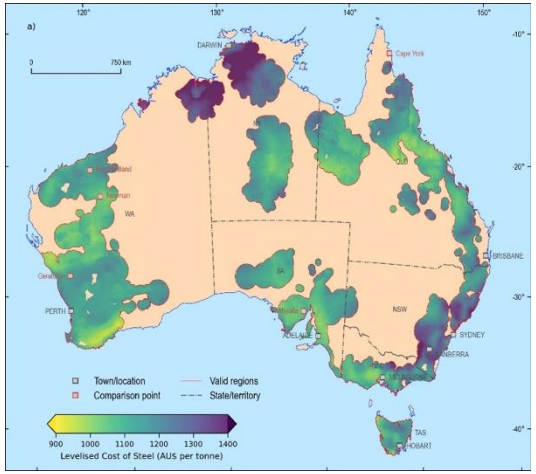
Ford et al. (2023)
https://dx.doi.org/10.26186/147865

Economic Fairways (H_2, Cu, Ni, Au, Pb, Zn, P, CCS)



Cloutier et al. (2023a)
https://dx.doi.org/10.26186/147540

Levelized cost of green steel



Wang et al. (2023)
https://doi.org/10.1016/j.ijhydene.2023.05.041

Atlas of Australian Mine Waste

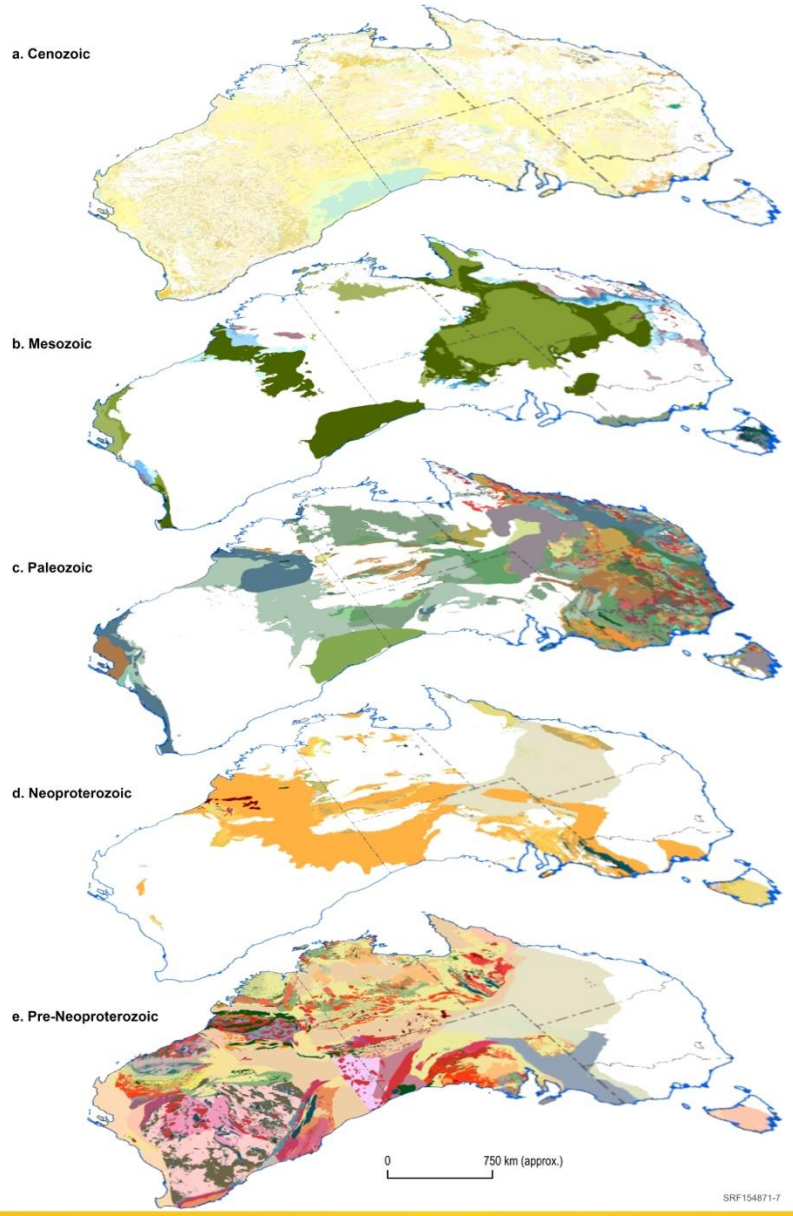
Thorne et al. (2023)
https://portal.ga.gov.au/persona/minewaste

World-first layered geology of a continent

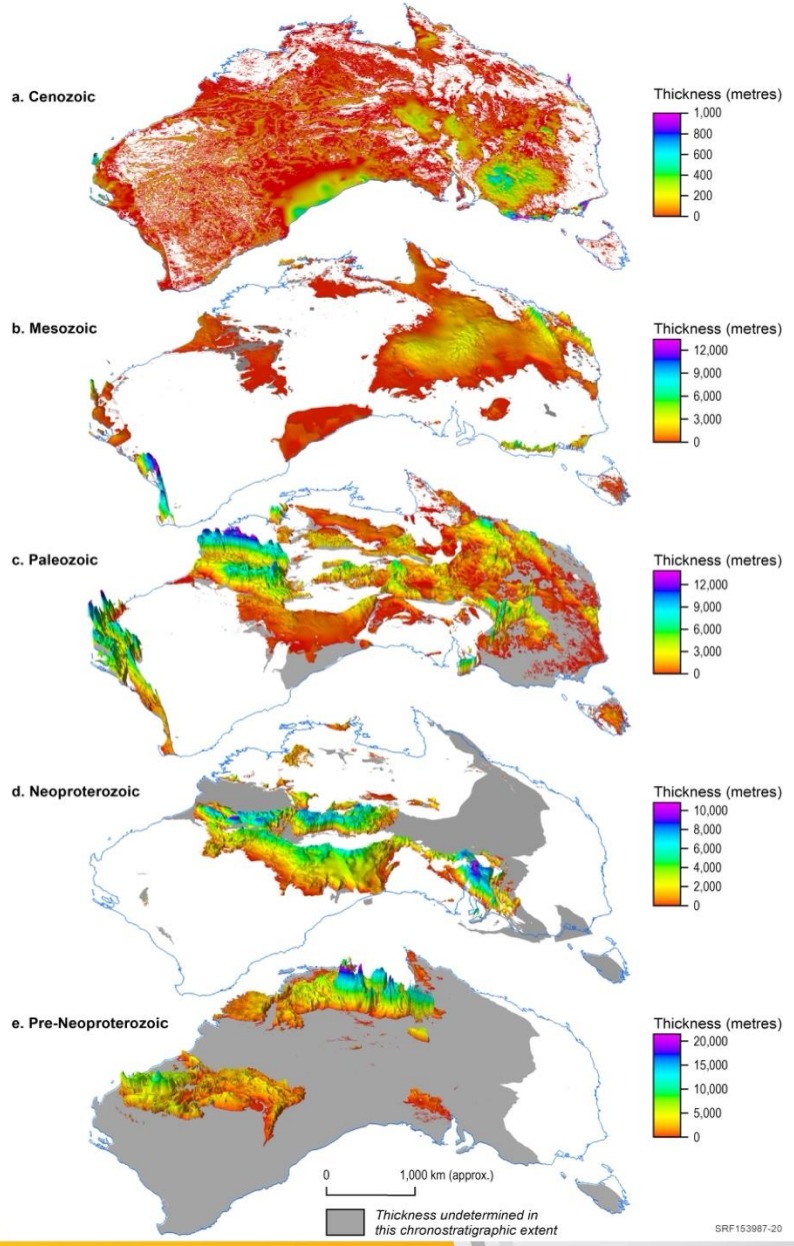
- 7,600 individual geological units mapped
- Multiple time periods
- Layer thickness maps to support development of new national 3D geology model

Sanchez et al., 2024
https://dx.doi.org/10.26186/149391
Rollet et al., 2024
https://dx.doi.org/10.26186/149418

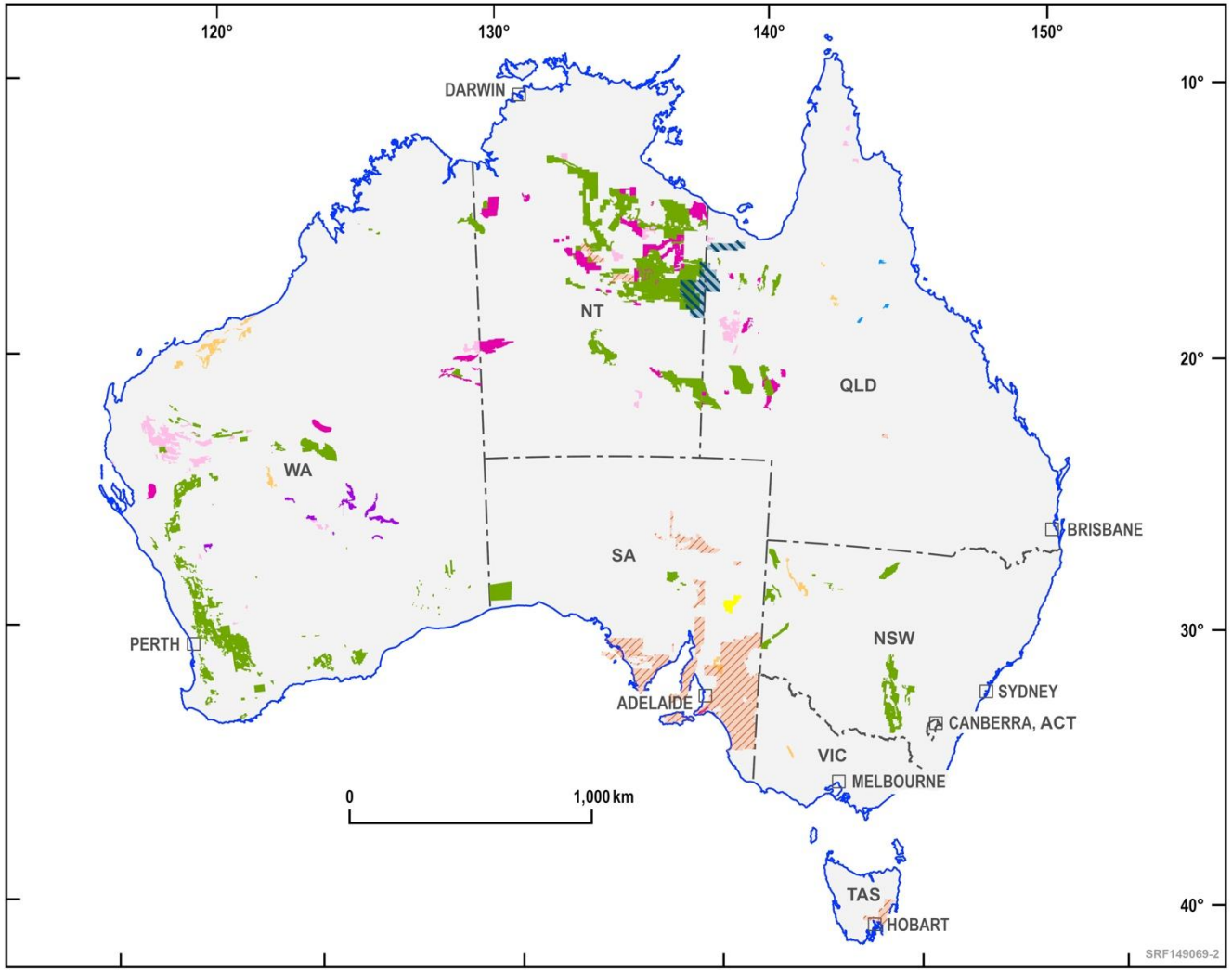
Layered geology maps



Layer thickness maps



Impact of government geoscience on exploration in Australia since 2016



Tenements taken up or reinvigorated by government geoscience since 2016
(as at January 2024)

- Critical Minerals
- Rare Earth Elements
- Hydrogen
- Other minerals
- Petroleum
- Gold
- Potash
- Carbon Capture & Storage
- Uranium

- 168 companies
- 1,283 tenements
- 532,000 km^2

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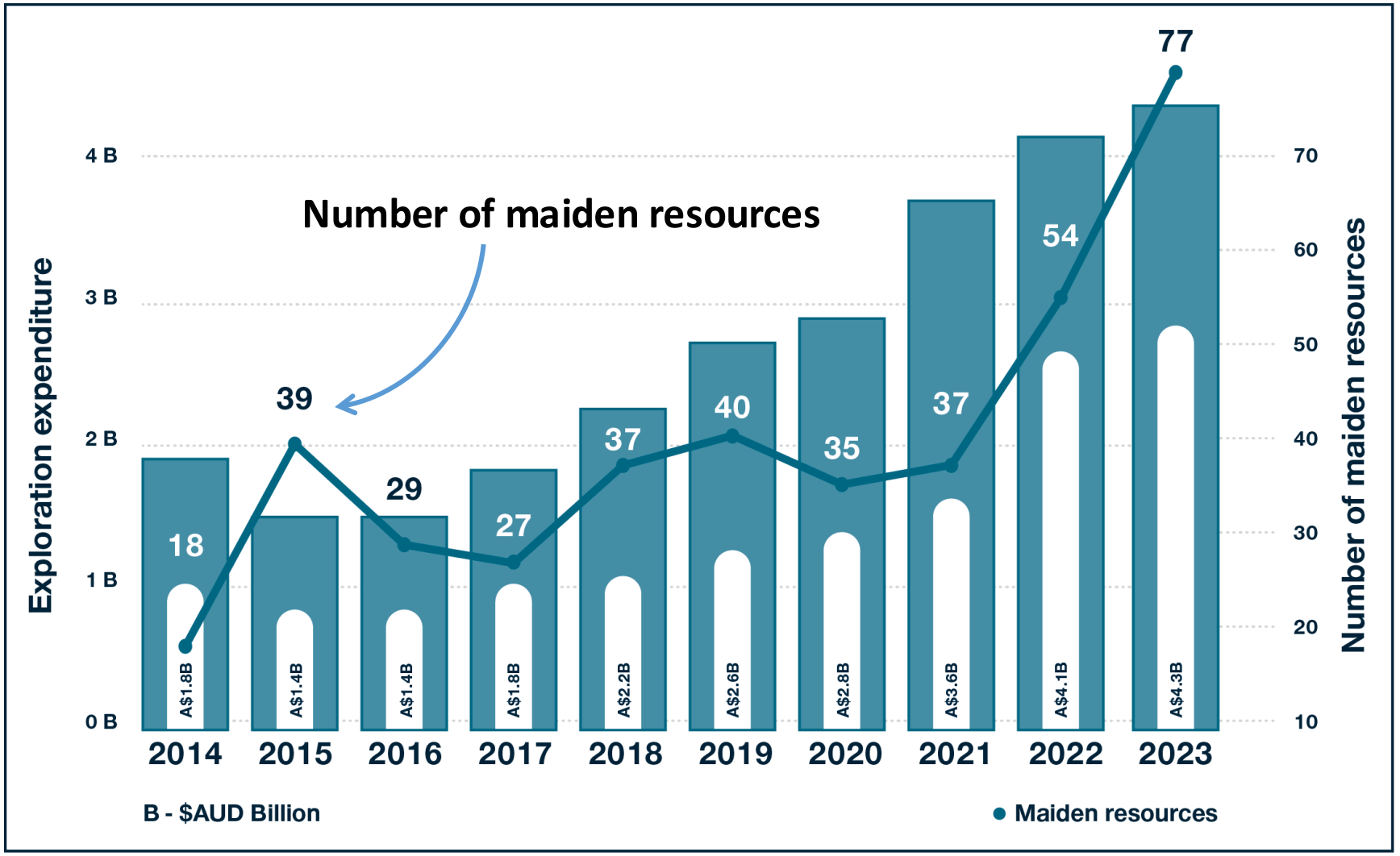
Exploration expenditure and maiden resources 2014 – 2024



In 2023:

- 77 new deposits
- 36 with critical minerals
- 21 with strategic materials

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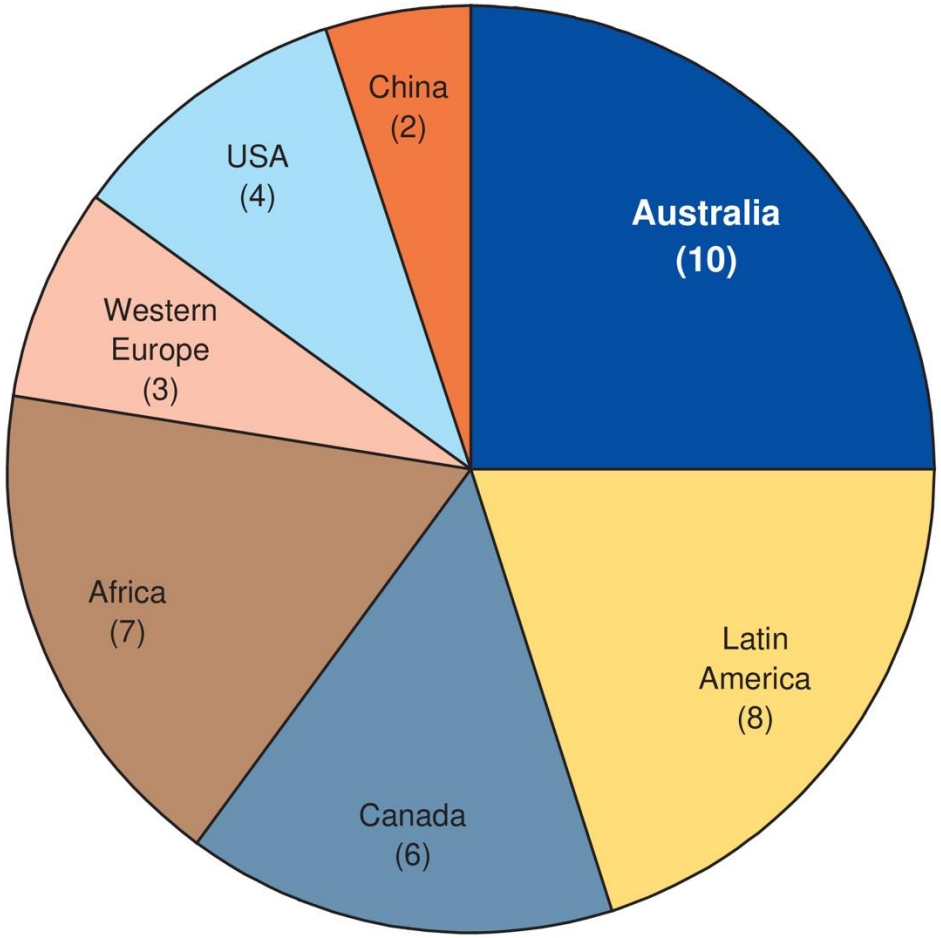
From: Australian Mineral Exploration Review 2023

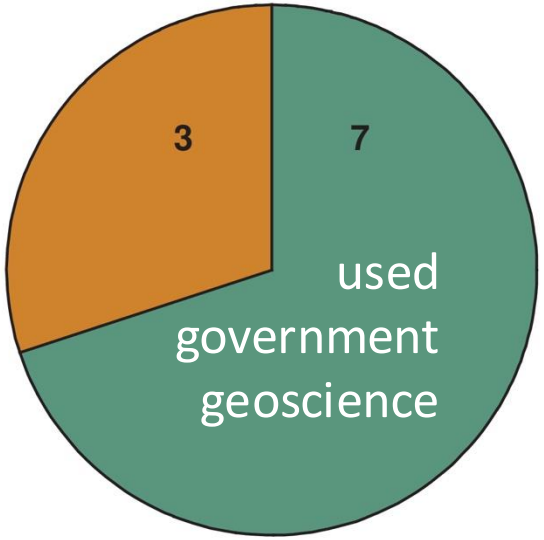
World-class discoveries since 2017

- 10 out of 41 world-class discoveries in Australia
- Government geoscience has supported 70% of these discoveries

World



Australia



Note: Number of discovered world-class deposits (NPV >$200 m) will grow as deposits are drilled out and reported
Source: MinEx Consulting @July 2024

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Please visit us at the
Australia Minerals table in the foyer

Websites: www.australiaminerals.gov.au, ga.gov.au

Data Discovery Portal: https://portal.ga.gov.au

Contacts: mineral.promotions@ga.gov.au, rapinitiative@ga.gov.au

Australian Government

Geoscience Australia

AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

South Australia: Home To The World's Largest Uranium Resource

Critical Minerals | Defence Investment Security | Japan

Dr Bronwyn Camac & Daniel Radulovic
Department for Energy and Mining
Geological Survey of South Australia

SOUTH AUSTRALIA

Government of South Australia
Department for Energy and Mining

3 Key Messages

1. South Australia has the largest Uranium resource in the world
2. South Australia facilitates uranium exploration, production and export
3. South Australia is your key partner to meet net-zero targets

Global Distribution of Identified Uranium Resources & Global Production

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Kazakhstan	22,451	23,127	23,607	24,689	23,321	21,705	22,808	19,477	21,819	21,227
Canada	9331	9124	13,325	14,039	13,116	7001	6938	3885	4693	7351
Namibia	4323	3255	2993	3654	4224	5525	5476	5413	5753	5613
Australia	6350	5001	5654	6315	5882	6517	6613	6203	4192	4087
Uzbekistan (est.)	2400	2400	2385	3325	3400	3450	3500	3500	3520	3300
Russia	3135	2990	3055	3004	2917	2904	2911	2846	2635	2508
Niger	4518	4057	4116	3479	3449	2911	2983	2991	2248	2020
China (est.)	1500	1500	1616	1616	1692	1885	1885	1885	1600	1700
India (est.)	385	285	385	385	421	423	308	400	600	600
South Africa (est.)	531	573	393	490	308	346	346	250	192	200

map source NEA 'Red Book' April 2023
Red Book - Uranium Resources, Production and Demand (Red Book) 2022

History of Uranium Mining in South Australia

1906
Radium & Uranium first discovered
1906

1954 – 1962
New interest in Uranium during the “Atomic Era”

1970
Australia signs the Nuclear Non-Proliferation Treaty

1988
Uranium production starts at Olympic Dam

2001
Discovery at Four-Mile & Production starts at Beverley Nth

2010
Production starts at Beverley Nth

2011
Discovery at Samphire; Production starts at Honeymoon (halts in 2014)

2014
Production starts at Four Mile East

2018
Copper & Uranium discovered at Oak Dam; Production starts at Four Mile West

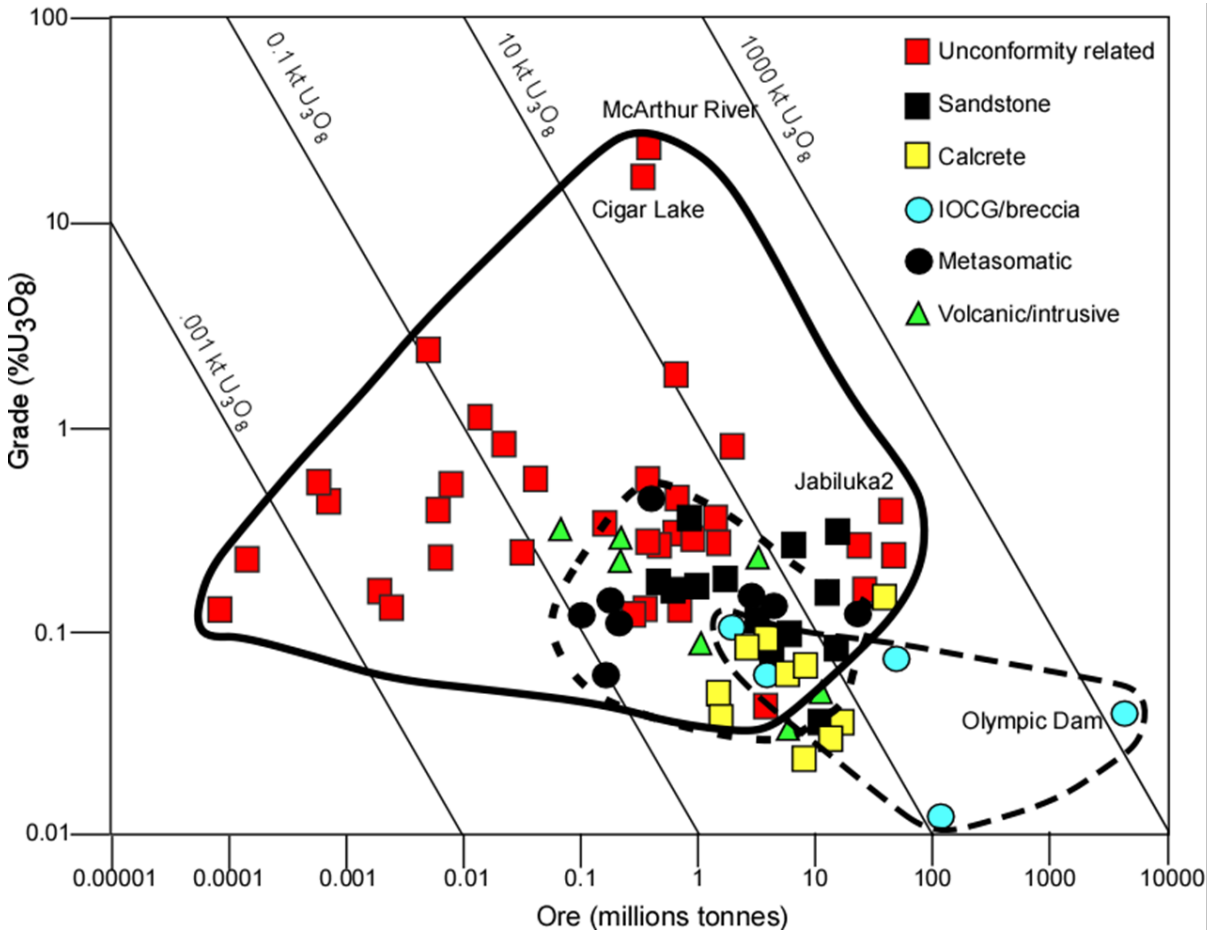
2023
Honeymoon returns to production

2024-25
Field recovery trial at Samphire*

2025
Advanced underground exploration / decline at Oak Dam*

*pending approvals

Giant Uranium Deposits



From: Kurt Kyser IOGOD Conference 2010

Structure believed to be a uranium ore 'rollfront'. This is where groundwater came into contact with organic material in the host rock. Dead Tree Creek, South Australia. Source: Wikimedia Commons

South Australia: The Home of the Giants – Mines & Projects

Aerial view of Four Mile uranium well house. (Courtesy Heathgate Resources; photo 415063)

- **Olympic Dam:** BHP (1988)
- **Beverley:** Heathgate Resources (2001)
- **Beverley North:** Heathgate Resources (2010)
- **Honeymoon:** Boss Energy (2011 & 2023)
- **Four-Mile:** Quasar Resources (2014 & 2018)

SA URANIUM PROJECTS

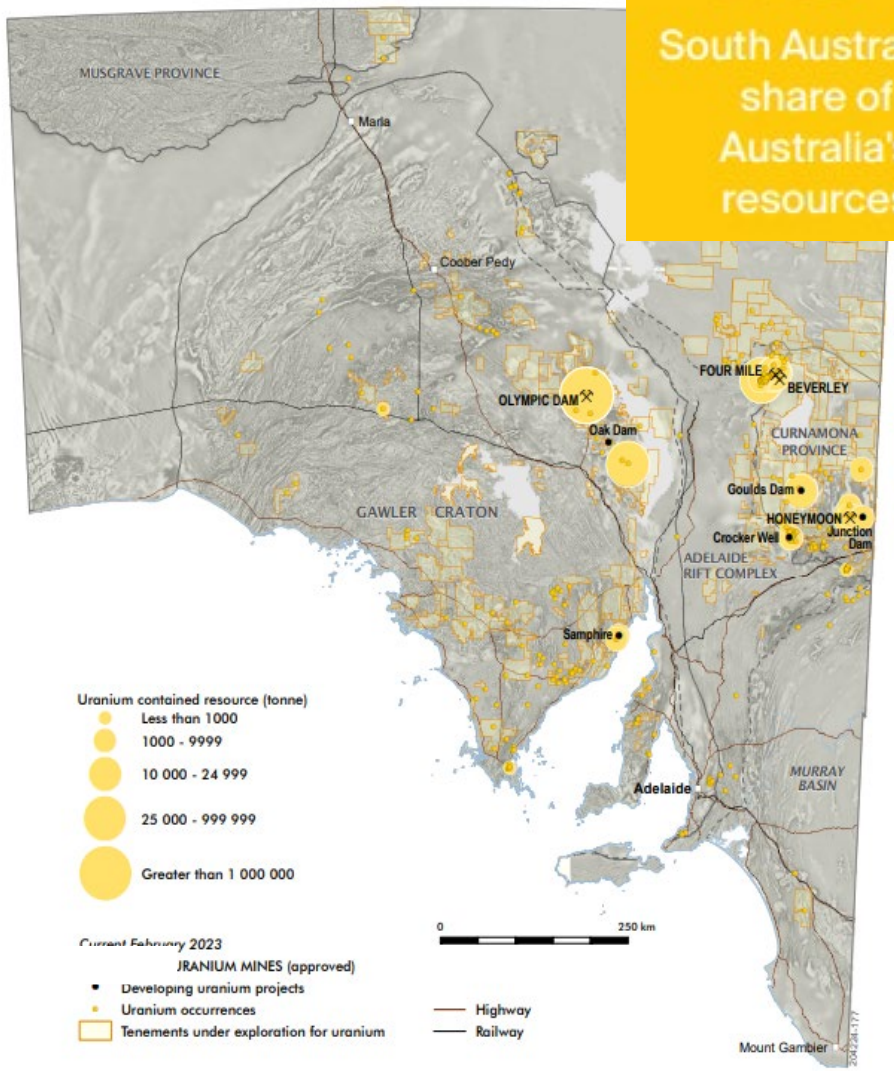
- **Samphire:** Alligator Energy
- **Gould's Dam**: Boss Energy
- **Jasons:** Boss Energy
- **Junction Dam:** Marmota Energy
- **Crocker Well:** Sinosteel

SA URANIUM PROSPECTS

Big Lake Oak Dam Wirrda Well

79%

South Australia's share of Australia's resources



AUSTRALIA MINERALS | SOUTH AUSTRALIA

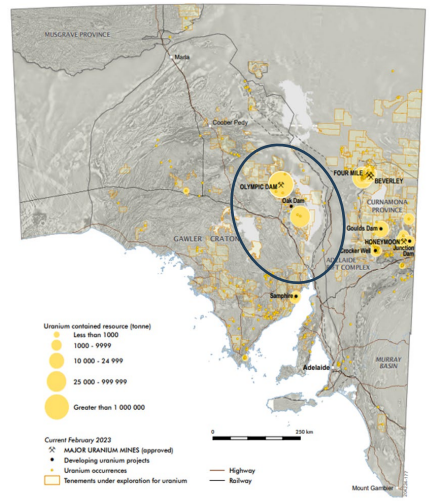
South Australia – Favourable for Uranium Mineral Systems

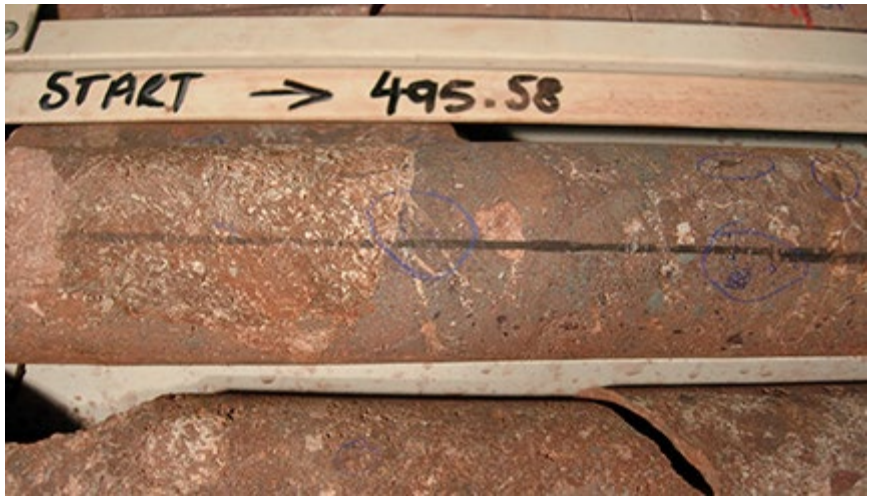
- South Australia - one of the most prospective regions in the world for uranium discoveries.
- Uranium mineralisation is widespread and found in most geological provinces throughout South Australia
- Uranium exploration has largely focused on four uranium mineral systems:
  - **Hybrid-uranium mineral system** – breccia complex, iron– oxide–copper–gold ± uranium (IOCG±U), e.g. 'Olympic Dam' style.
  - **Basin and surface-related uranium mineral system** – palaeochannels, unconformity related e.g. Four Mile, Beverley, Beverley North, Honeymoon, Samphire, Eridani (new discovery).
  - **Magmatic-related uranium mineral system** – e.g. Crocker Well.
  - **Metamorphic-related uranium mineral system** – e.g. Curnamona Province, Radium Hill, Mount Painter region and Adelaide Geosyncline.

South Australia – IOCG

Olympic Dam - Carapateena - Wirrda Well

- Associated ca.1590 Ma Mesoproterozoic thermal event introduced highly anomalous uranium throughout the crust.
- Formation of these huge deposits is coincident with emplacement of Hiltaba Suite granites and Gawler Range Volcanics and equivalents, affected all the central and eastern Gawler Craton as well as the central and northern Curnamona Province.
- A very large region prospective for hard rock IOCG±U deposits.
- The dense, hematite-rich mineralised systems are readily identified by detailed gravity survey data.



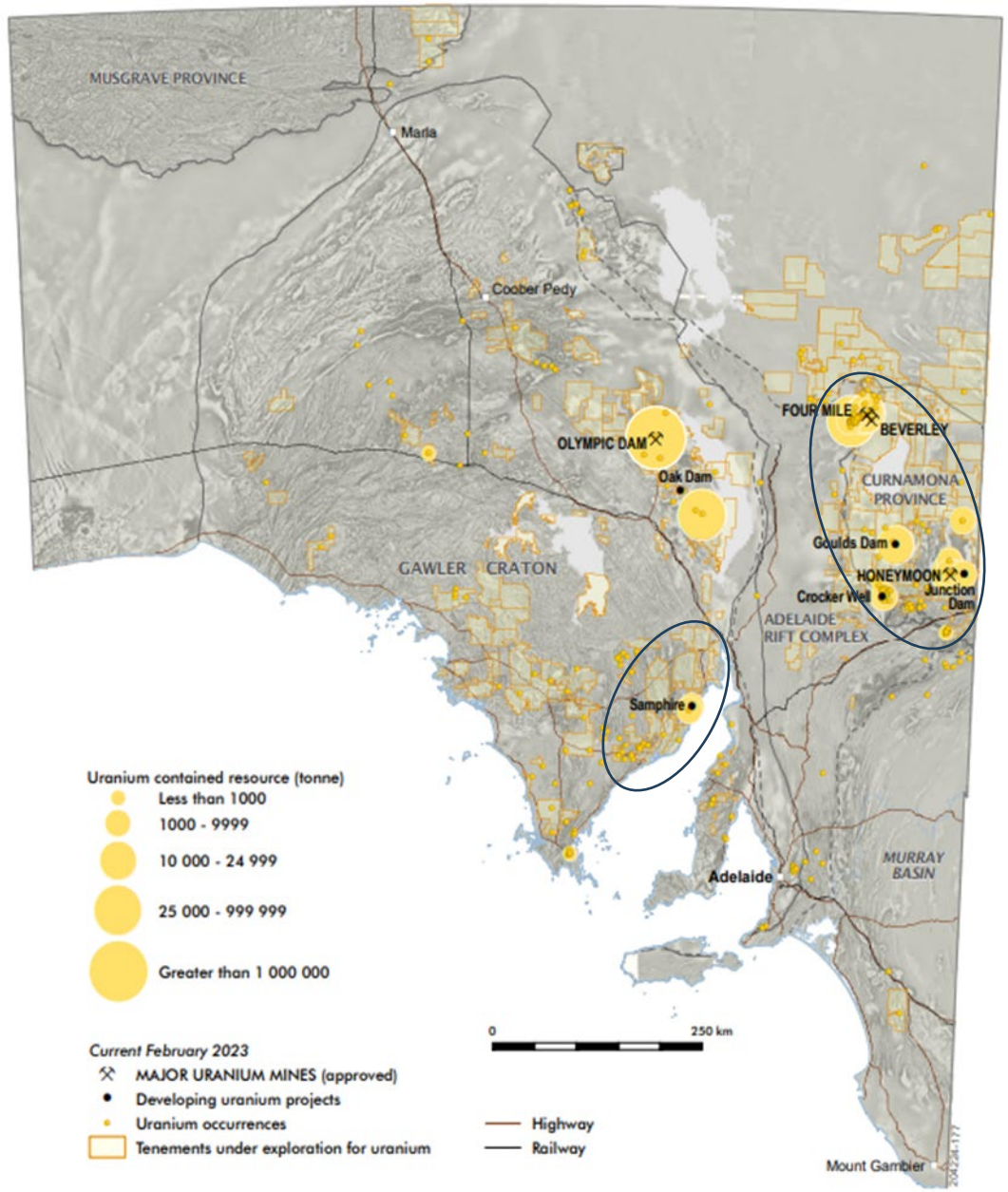


Core sample from the PACE co-funded discovery hole of the Carrapateena deposit, CAR002, showing bornite mineralisation in hematite breccia. (Photo 401840)

South Australia – Sandstone-hosted

Honeymoon – Beverley – Four-Mile – Samphire

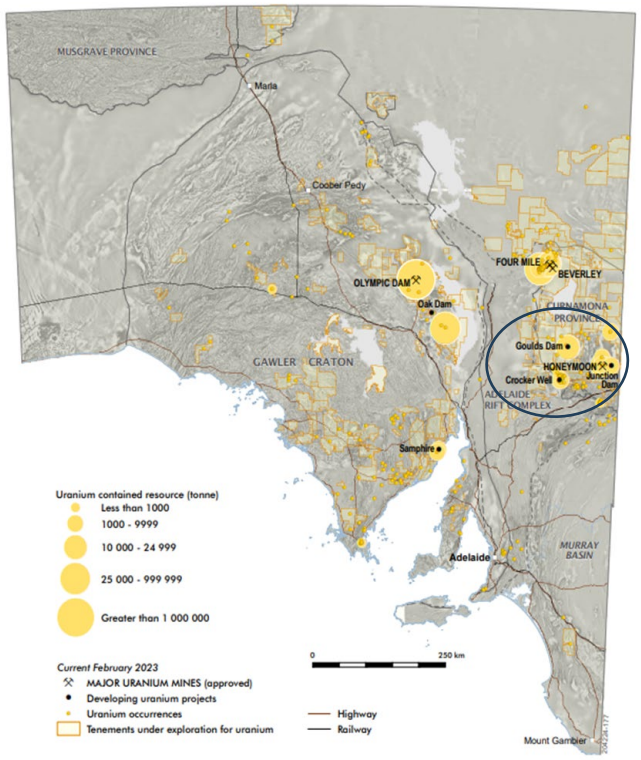
- The Gawler Craton and central Curnamona Province were eroded by widespread major river systems during the Cenozoic
- Uranium has been deposited in reduced lithologies within these channel systems
- At the Honeymoon deposit, the damming of the river systems and subsequent precipitation of uranium appears to be controlled by minor movements along small-scale faults within underlying basement
- Cenozoic palaeochannnels have been explored and remain targets for uranium exploration



South Australia – Magmatic & Metamorphic-related

Crocker Well : Magmatic-related

- Uranium primarily occurs as a disseminated accessory mineral or in fractures, breccias or quartz veins in sodic, plagioclase-rich granitoids and gneisses
- Uranium in the form of davidite occurs in the east of the deposit and at Mount Victoria.



In South Australia, examples of metamorphic-related uranium systems occur in the Curnamona Province, Radium Hill, the Mount Painter region and the Adelaide Geosyncline.

Radium Hill (Mt Painter): Metamorphic-related

- Involves deposition from either true metamorphic fluids, or fluids that have extensively reacted with metamorphic rocks at elevated temperatures.
- Metasomatic and some vein-style deposits are probably derived from a range of magmatic-hydrothermal to metamorphic fluids.

South Australia Regulatory Framework – World's Best-practice

Uranium exploration and mining in South Australia is governed by:

- *Mining Act 1971* and Mining Regulations 2020
- *Radiation Protection and Control Act 2021*
- *Roxby Downs (Indenture Ratification) Act 1982*
- *Environment Protection and Biodiversity Conservation Act 1999* *(Cwth)*

Over 30 years of bi-partisan support

- The Australian regulatory framework for the uranium industry is widely recognised as being effective and representing world's best practice.
- Export licences are granted under strict Commonwealth legislation that ensures that uranium is used solely for the generation of electricity.
- South Australia exports **all** the uranium oxide concentrate that is produced. No enrichment is undertaken in Australia. It is exported exclusively for the generation of electricity in civil nuclear reactors. Contracts are in place with the United Kingdom, France, China, Sweden, Finland, Belgium, Japan, South Korea, Taiwan, Canada, the United States and Spain.

Forms, legislation and guidance | Energy & Mining (energymining.sa.gov.au)

Why choose South Australia for Uranium Exploration and Mining?

- South Australia hosts ~23% of Global Uranium Resources and ~79% of Australia's Uranium Resources.
- South Australia was the 4th largest uranium producer in 2022, similar ranking in 2023 (awaiting 2023 global production data).
- South Australia has world class geology that supports uranium mineralisation.
- Geological data available via the South Australian Resources Information Gateway (SARIG).
- South Australia is the only Australian jurisdiction with active uranium exploration and mining.
- South Australian government political support for uranium – Over 30 years of bipartisan support.
- Uranium exploration and mining is regulated under the South Australian *Mining Act 1971* (just like any other mineral commodity).
- Collaborative State and Commonwealth regulatory approach.
- The Port of Adelaide (South Australia) is the only port in Australia permitted to export uranium.
- Leading performance based regulatory framework.
- South Australian Government Transparency and Accountability.

South Australia – Your partner of choice

World Class Resources:
- Copper
- Iron-Ore - Magnetite
- Critical Minerals – Graphite, HMS &
- **Uranium**

First Class ESG:
- Renewable Energy 100% by 2027
- Hydrogen plant by 2027
- Indigenous Engagement
- Circular Economy

Government backed:
- Northern Water Project
- Ports / Transport
- Low sovereign risk
- Best-in-class Regulatory support

3 Key Messages

1. South Australia has the largest Uranium resource in the world
2. South Australia facilitates uranium exploration, production and export
3. South Australia is your key partner to meet net-zero targets

AUSTRALIA MINERALS
REALISE THE OPPORTUNITY

Thank you

Dr. Bronwyn Camac
Geological Survey South Australia
Department for Energy and Mining

SOUTH AUSTRALIA

Government of South Australia
Department for Energy and Mining

Useful Links

- South Australian Department for Energy and Mining (DEM) Minerals and Mining: https://www.energymining.sa.gov.au/industry/minerals-and-mining
- South Australian Resources Information Gateway (SARIG) - https://map.sarig.sa.gov.au/
- DEM Investment - https://www.energymining.sa.gov.au/industry/minerals-and-mining/invest
- South Australia and Uranium (plus other minerals) - https://www.energymining.sa.gov.au/industry/minerals-and-mining/mineral-commodities
- Major and developing project page (Olympic Dam, Beverley, Four Mile, Honeymoon mine pages): https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/major-projects-and-mining-activities
- Critical Minerals South Australia - https://www.energymining.sa.gov.au/industry/geological-survey/gssa-projects/critical-minerals-south-australia
- For a series of animations explaining the process and regulation of mining follow this link: https://www.energymining.sa.gov.au/industry/minerals-and-mining/communities-and-land-access
- Guidelines: https://www.energymining.sa.gov.au/industry/minerals-and-mining/forms-legislation-and-guidance/regulatory-guidelines
- DEM Regulatory Reports: https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/regulating-mining-activity/mineral-resources-regulation-reports

Why choose South for Uranium exploration and production?

New research by Geological Survey SA has updated the exploration model for critical metal migration through sediments along the edge of the Flinders Ranges, expanding exploration frontiers under cover

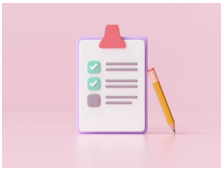
South Australia remains one of the most prospective regions in the world for uranium discovery. Uranium mineralisation is widespread and found in most geological provinces throughout South Australia.

South Australia is recognised for its high prospectivity for uranium and proven track record of uranium mining:

SA contains 23% of the world's uranium resources and produces 10% of world's uranium

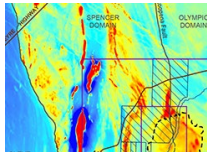
Experience with technologies & processing

Safe handling & transportation processes



Strong & Effective Regulatory framework and government support

Recent geoscientific studies have increased prospectivity for Uranium with new information revealing:



New uranium provinces proven to be highly prospective for new styles of mineralisation

Download now: https://www.energymining.sa.gov.au/industry/minerals-and-mining/mineral-commodities/uranium

AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

How The Northern Territory Can Support Japan's Critical Minerals Supply Chain

Dorothy Close
Director Regional Geoscience
Northern Territory Geological Survey

AUSTRALIA'S NORTHERN TERRITORY

Northern Territory’s trading relations and resources sector

- The Northern Territory is Australia’s closest jurisdiction to SE Asia
- Japan is the Territory's largest export market: 10% of Japan’s LNG sourced from Darwin
- The Northern Territory - major producer of **manganese**, **bauxite**, **lead-zinc-silver** and **gold**
- Production of **lithium** currently suspended. Near-term production planned for **rare earths**, **phosphate** and **copper**
- 18 projects in the approvals or financing process, primarily for **critical minerals**, **copper** and **gold**

Critical minerals in the Northern Territory

- The Northern Territory has defined mineral resources in 17 critical minerals as defined by key trading partners
- An overview of the Northern Territory's critical minerals resource inventory plus case studies on advanced projects are provided in the Critical Minerals in the Northern Territory (Japanese language version)

AUSTRALIA MINERALS | NORTHERN TERRITORY

Pipeline of critical minerals projects: REEs

Advanced development

Arafura Rare Earths - Nolans NdPr project

- World-class resource of magnet-feed rare earths (NdPr),
- On-site downstream processing to produce separated rare earths (including NdPr oxide)
- Binding offtakes with Siemens Gamesa, Hyundai Motor Co and Kia;
- Debt funding now secured
- Approvals in place, targeting FID late 2024, enabling construction works completed in 2023

Advanced exploration

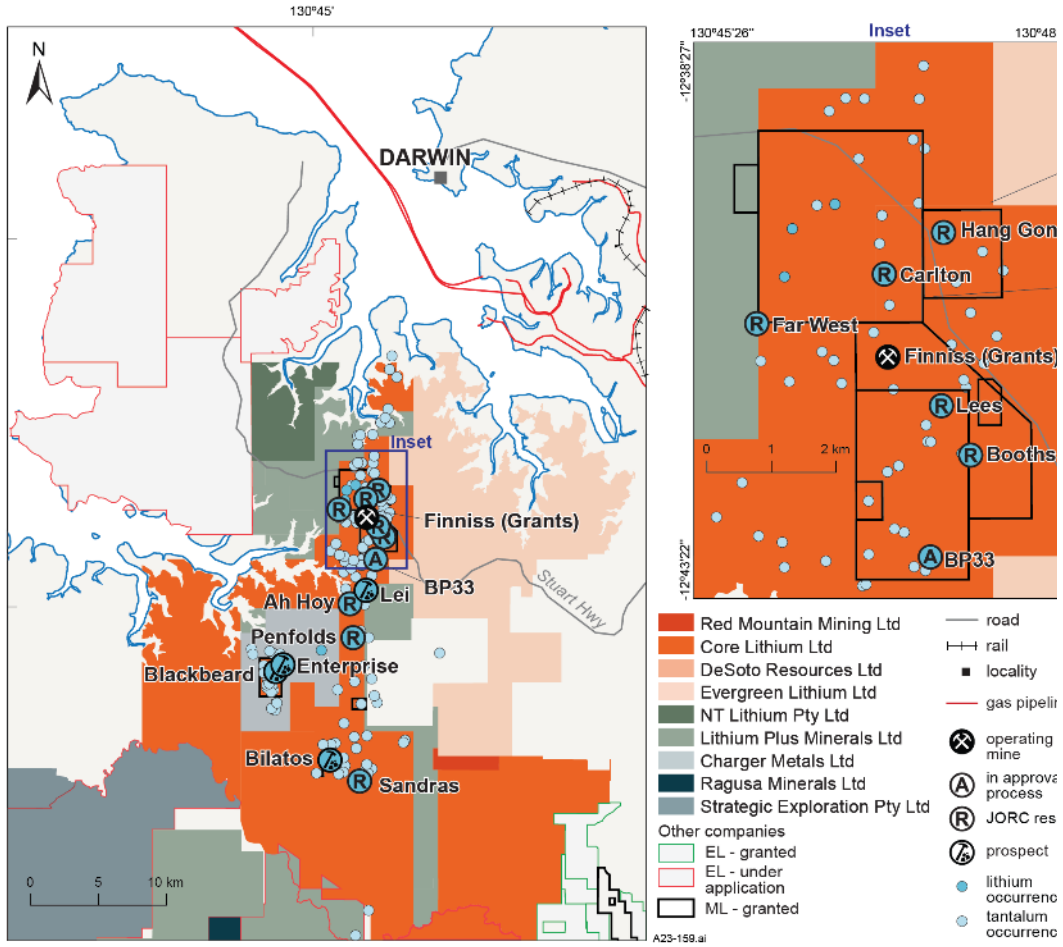
- Diverse opportunities, including clay-hosted, unconformity-style and carbonatite-hosted mineralisation

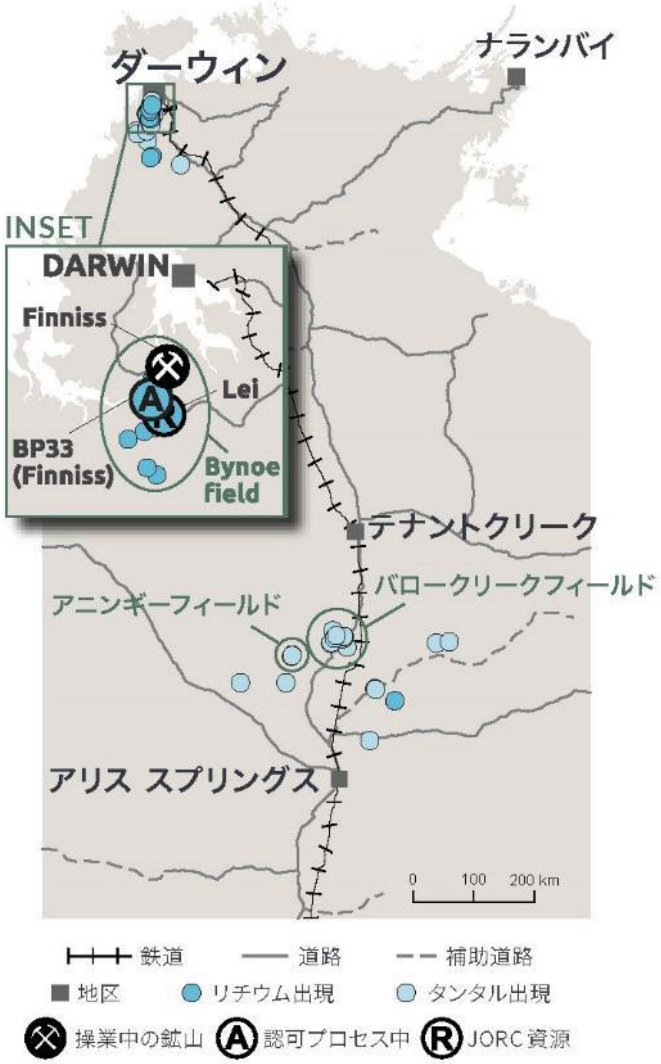
Pipeline of critical minerals projects: Lithium

Advanced development

Core Lithium- Finniss

- Mining suspended following 85% fall in spodumene price – entered temporary care and maintenance in June 2024
- 250% increase in contained Li since start of 2023
- Combined Finniss Mineral Resource upgraded to **48.2 Mt @ 1.26% Li_2O**
- BP33 upgraded to 10.5Mt @ 1.53% Li_2O
- Lees-Booths now 14.5Mt @ 1.11% Li_2O



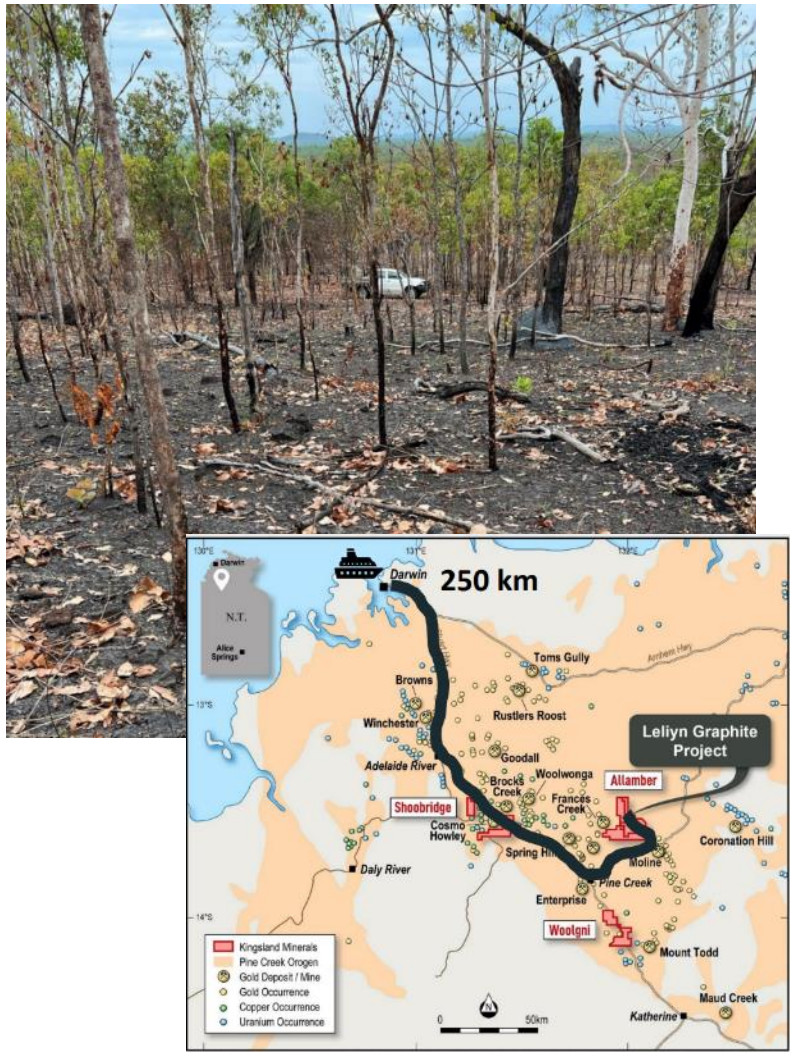


Pipeline of critical minerals projects: Graphite

Advanced exploration

Leliyn – Australia's largest graphite deposit

- 20 kilometre-long graphitic schist
- Exploration Target 700-1100 Mt @ 7-8% TGC
- Flake size <150 microns, favourable for anode material
- Maiden Resource: 194.6 Mt @ 7.3% TGC (14.2 Mt contained graphite
- Flotation test-work has produced a commercial grade concentrate >94% TGC



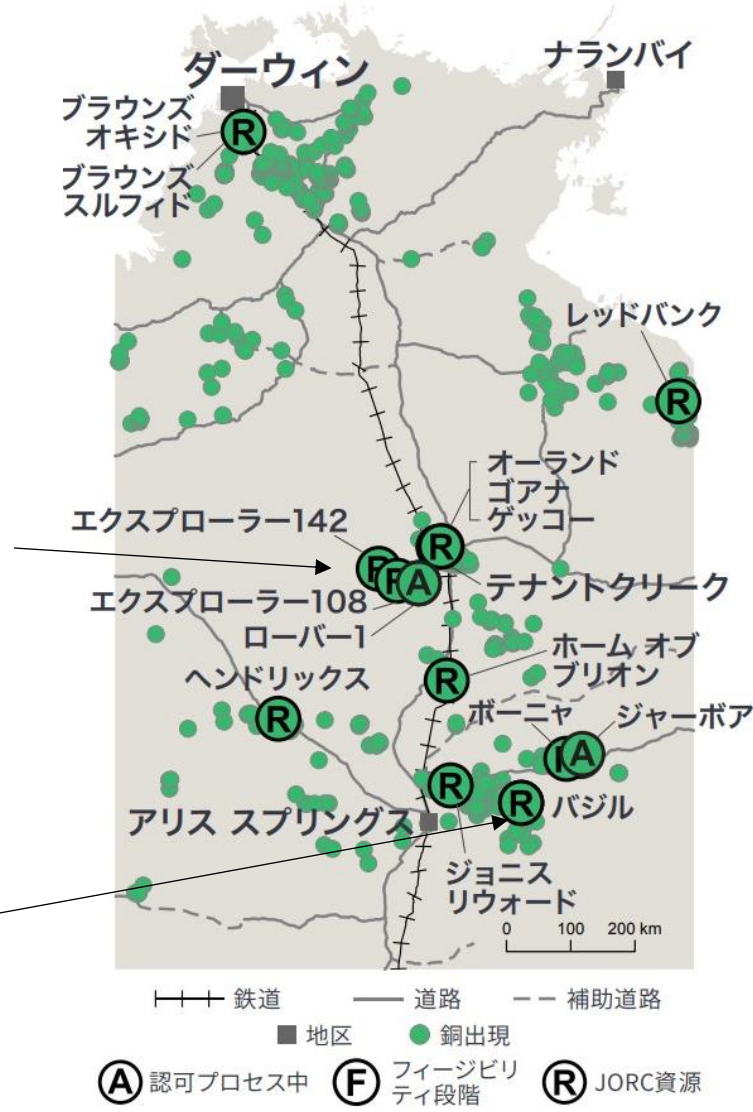
Pipeline of critical minerals projects: Copper and cobalt

Multiple advanced projects

Northern Territory has high-grade copper resources with plans for downstream processing

- Multiple high-grade copper-gold-cobalt deposits at Tennant Creek
- **Castile Resources Ltd** planning future production of copper metal, gold and cobalt at the Middle Arm precinct, with ore sourced from their Rover 1 deposit and possible third-party deposits in the NT
- Further copper-gold discoveries being made in Tennant Creek area (**Emmerson Resources Ltd** and **Tennant Minerals Ltd**)

- **KGL Resources Ltd** approaching FID on Jervois copper-silver mine : Updated Resource: **23.37 Mt @ 2.02% Cu, 26.0 g/t Ag, 0.26 g/t Au**



Pipeline of critical minerals projects: Phosphate

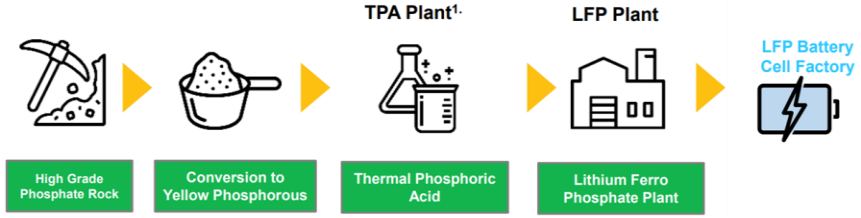
In approvals process

Australia's largest undeveloped phosphate deposits

- Potential for production of phosphoric acid, fertiliser and $LiFePO_4$ (LFP) battery cathode material

Avenira Ltd - Wonarah project

- Planning direct shipping ore (66 Mt @ 30% P_2O_5) operation
- Scoping Study released for an LFP Cathode Manufacturing Plant utilising phosphate from Wonarah.
- Avenira and Taiwan's Aleees have a licence and technology agreement to progress an LFP cathode project at Middle Arm Development Precinct
- Planning Yellow Phosphorus project at the mine site, and thermal phosphoric acid plant at Middle Arm



Northern Territory Government support – minerals processing hub

Middle Arm Sustainable Development Precinct

- Strategically located common user infrastructure and services
- Co-located with Santos Darwin LNG and INPEX Ichthys LNG processing facilities
- Focus on low emission hydrocarbons, hydrogen, advanced manufacturing, CCS and minerals processing
- Support the use of renewable energy
- Incorporate CCS from local/international sources; offshore geological storage
- Early stage scoping downstream processing of vanadium, copper, cobalt, phosphate

Northern Territory Government support – advancing resource development

Resourcing the Territory

- Northern Territory Geological Survey funded to undertake geoscience studies and collaboration to improve the understanding of the critical mineral potential
- Competitive exploration grant scheme available to industry to support and de-risk exploration
- For further information:

Resourcing the Territory website
www.resourcingtheterritory.nt.gov.au

Geoscience data and products
gemis.nt.gov.au
or email: geoscience.info@nt.gov.au

Geoscience and titles web mapping
strike.nt.gov.au

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Thank you

Dorothy Close
Director Regional Geoscience, Northern Territory Geological Survey

AUSTRALIA'S NORTHERN TERRITORY

AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

Critical Minerals in Tasmania

A new look at old deposits

Dr Andrew McNeill
Chief Government Geologist
Mineral Resources Tasmania

Tasmanian Government

Tasmania

The “Island State”

- 0.9% of Australia’s landmass
- 2.1% of Australia’s population

- Known for wilderness, wine and wildlife
- Colonization commenced in 1803
- First mining in 1820

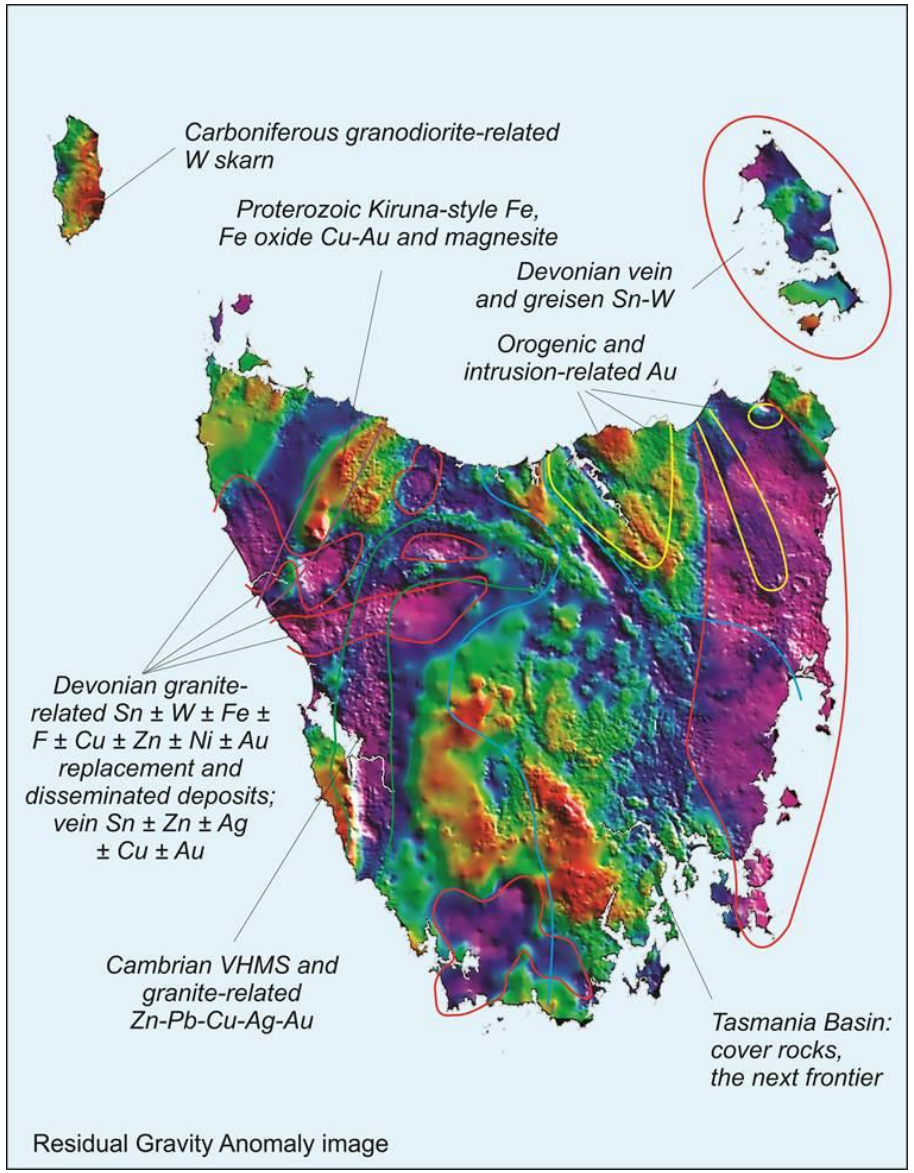
- In year ending June 2024, Tasmania had the third highest exploration spend per square kilometre in Australia
- Critical mineral ‘deposit’ density of 25 per 100,000 sq km (WA is next highest at 6) (GA, 2023)
- Products of mining and mineral processing constitute >60 per cent of mercantile exports

Why Tasmania?

Mineral endowment

Current **production** of, and projects for, diverse commodities:

- **Cu, Zn, Pb,** Sb
- **Au, Ag**
- **Sn, W**, F
- Ni, Co, Li
- REE
- **Fe** (**magnetite**, hematite), Mg
- **Al (bauxite)**
- **Si (silica flour)**
- **Heavy mineral sands (Ti, Zr)**
- **Coal**, oil, geothermal, hydrogen
- **Limestone, dolomite**

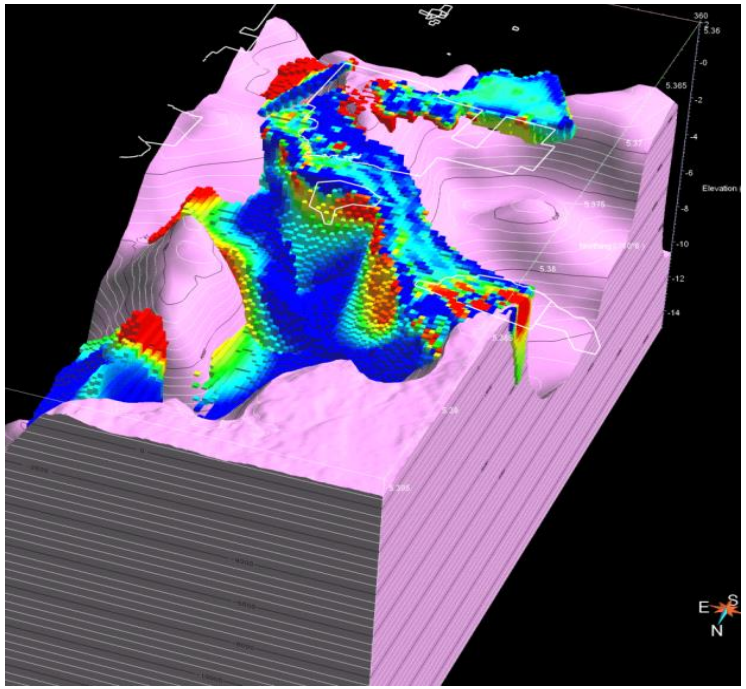


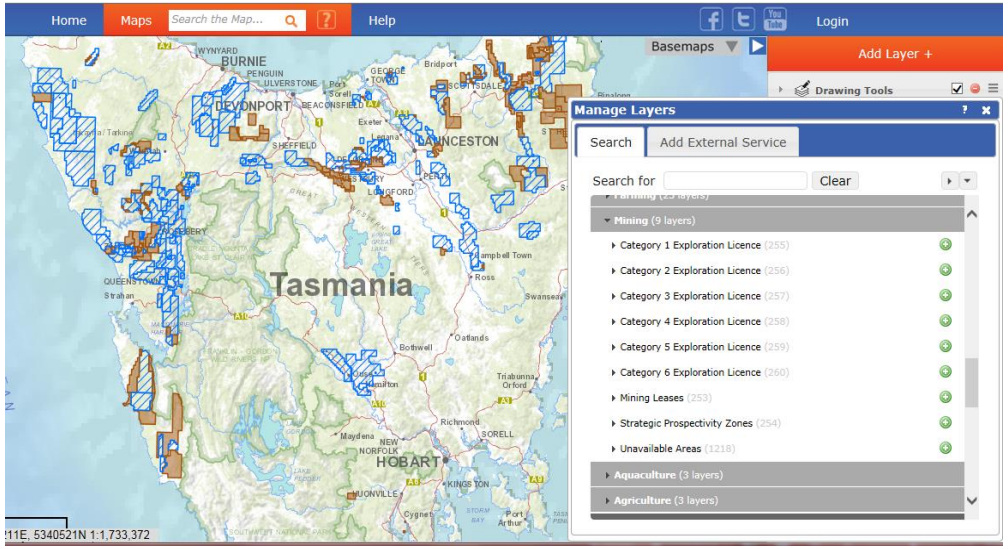
Setting – energy and infrastructure

- Currently net zero emissions (2013–2023)
- 100 percent self-sufficient in renewable energy
- Aiming for 200 percent renewable energy supply by 2040 (solar, wind, pumped-hydro)
- Green Hydrogen - site works commenced on Abel Energy Project in Tamar Valley
- Well-developed infrastructure to support mining
- Capacity upgrades to rail and ports—funded by government
- Marinus Link to mainland– stage 1 (750 Mw) in approvals process.

Pre-competitive data

- Detailed geological mapping – 70% of state at 1:25,000 (all at 1:250,000).
- Statewide geophysical datasets, including physical properties.
- Mineral occurrence, drilling, geochronology datasets
- Geophysically corroborated 3D modelling of prospective regions.
- Reports and plans:
  - >17,000 maps, tenement charts and mine plans (from 1880)
  - >14,000 government and company reports (from 1823)
- Free on-line delivery of data through three portals





Pre-competitive "legacy" data

Legislated requirement to report on Exploration and on 'major' mining tenements

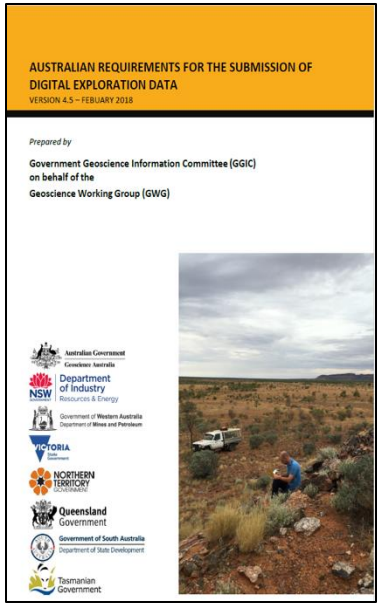
- Confidentiality periods
- Standards for report and data presentation
- Searchable, digital data captured

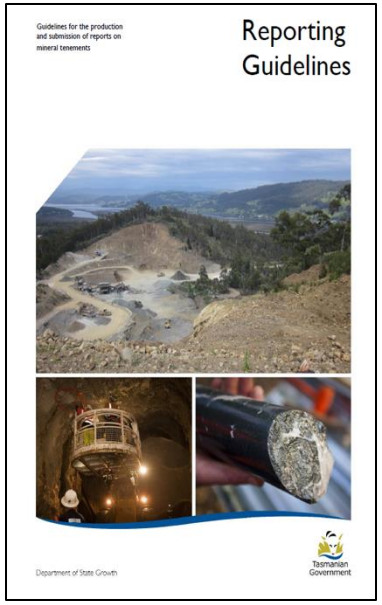
Legislated requirement to provide drill samples

- Core and chips
- Both exploration and mining tenements
- Confidentiality – as for reporting
- Value adding – Hylogger and the NVCL

Drill samples available for viewing and sampling

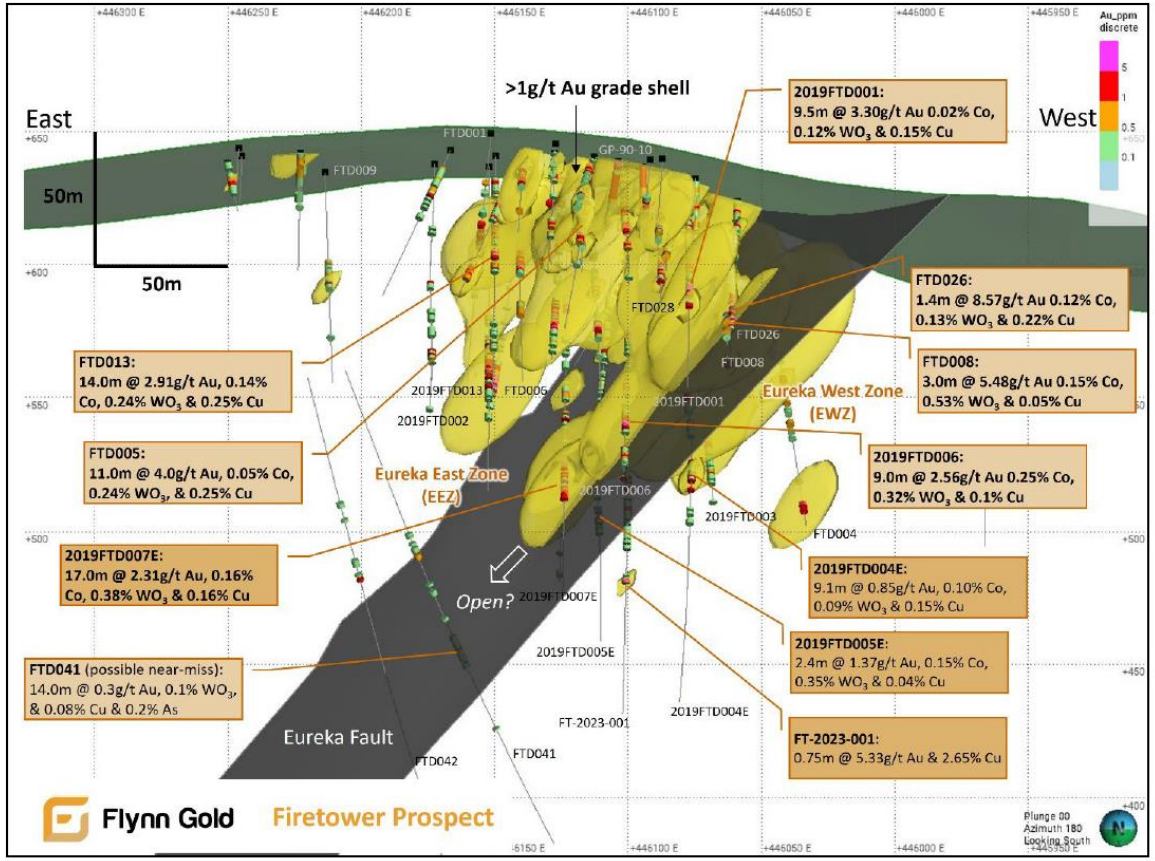
Currently Tasmania stores approximately 820 km of drill core and drill chips and 70,000 rock/soil samples

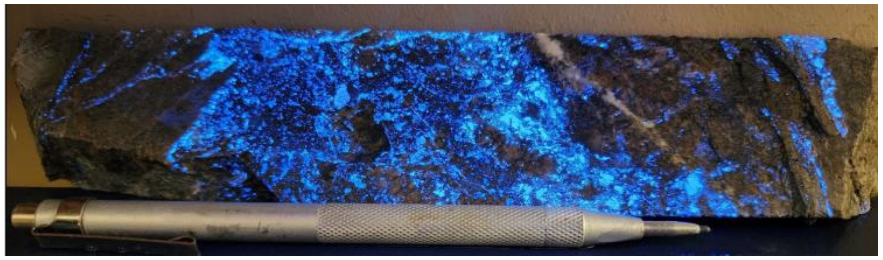




Example - Firetower Au-Co-W

- Explored since 1970s for gold
- <10% of samples assayed for W – some anomalous
- New geological interpretation – defined Eureka East Zone
- Re-assaying of old core (MRT core library) & new drilling
- best intersection:
- 5.5m @ 3.27g/t Au, 0.24% Co, 0.53% WO_3 and 0.33% Cu in extension to existing hole.

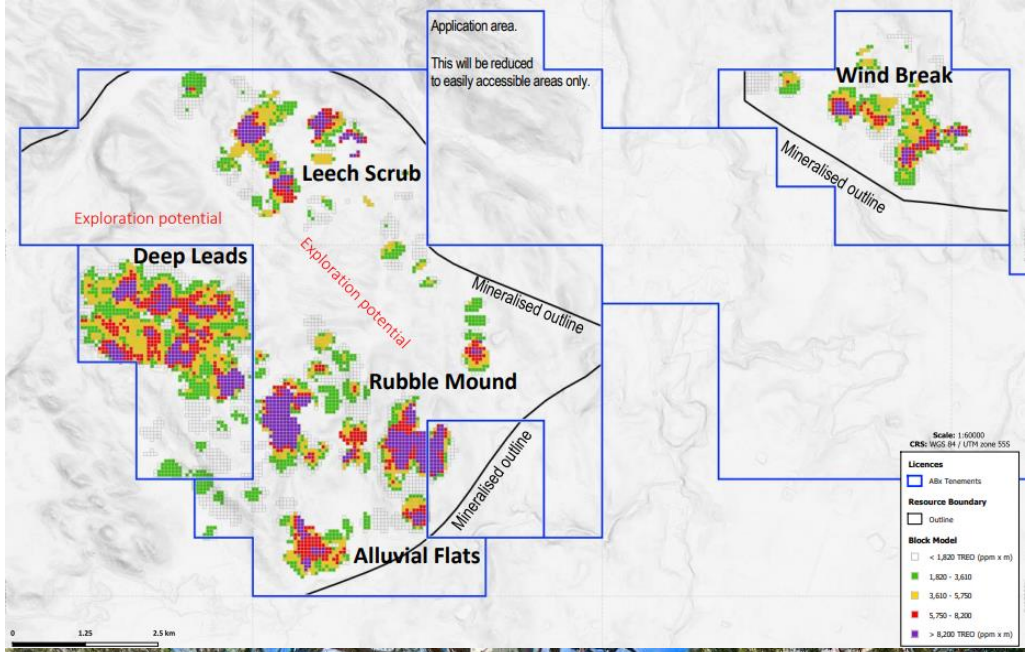




Investment opportunities – Deep Leads

Rare earth elements

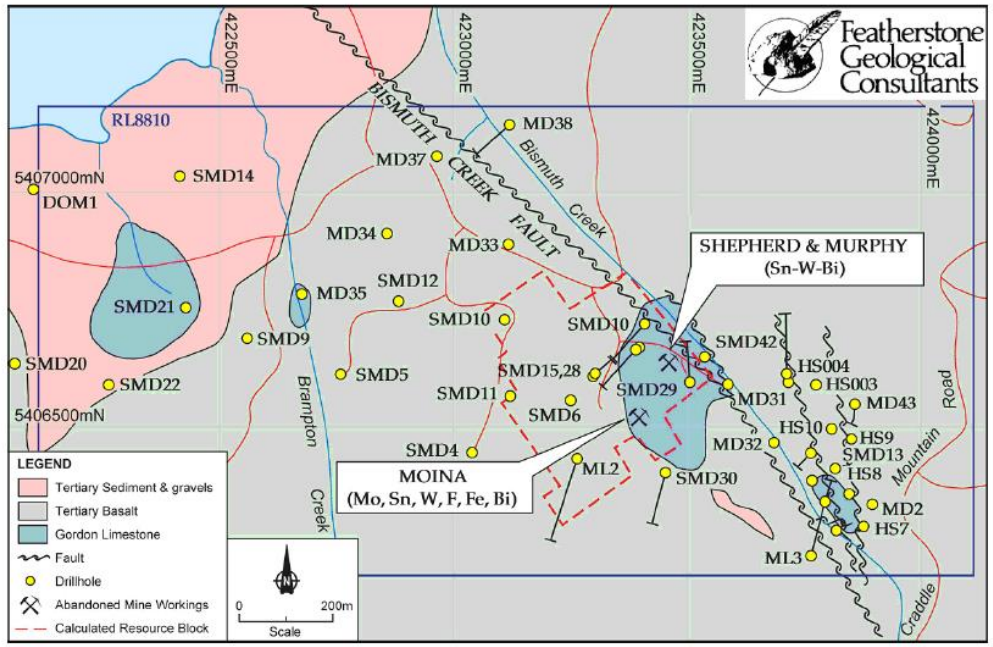
- Mn-rich clays underlying bauxite on Jurassic dolerite
- “Evolved” dolerite
- Analysed historic drill samples for REE
- Drilling program in northern Tasmania by ABx (with Government co-funding)
- 56.4 Mt inferred, Indicated, and measured resource
- 1,010 ppm TREO; Low U and Th (6.2 & 1.8 ppm average)
- Ionic adsorption Clay (IAC) type
- Initial test work indicates good recovery by leaching
- Drilling ongoing

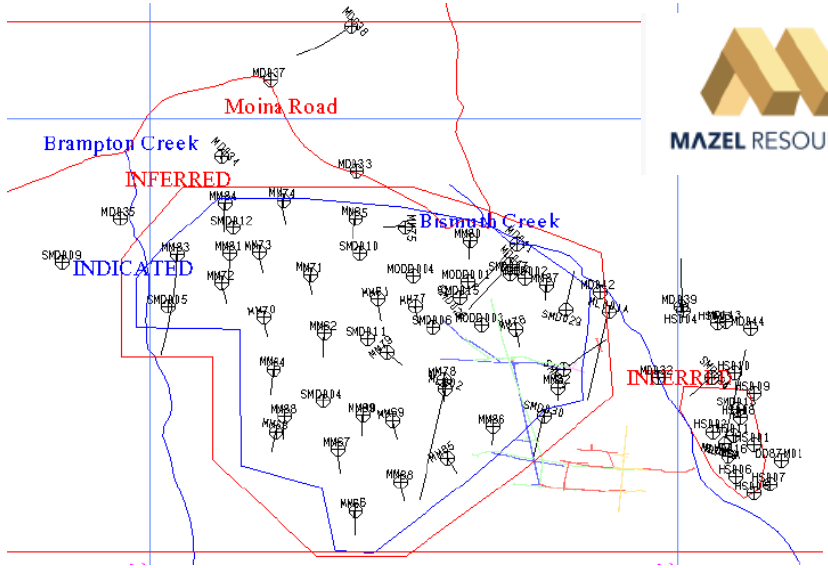


Investment opportunities - Moina

Fluorite

- Shepherd and Murphy skarn intermittently mined for Sn, W Bi until 1956.
- Subsequent sporadic exploration for F, Sn, W, Au and Zn
- Historic drill recent drilling have been used to define a resource at the Moina Wrigglite Skarn:
  - 38.7 Mt (at 7.2% F) indicated, with 01.2% Sn and 660pm W.
- Smaller inferred resources at Hugo (with Zn, Au) and the calc-silicate skarn.
- Drilling planned to bring inferred resources to indicated
- Pre-feasibility studies in progress





Summary

- Diverse mineralisation with long-life (>100 years) mining operations
- 100 percent self-sufficient in renewable energy
- Aiming for 200 percent renewable energy supply by 2040
- Products of mining and mineral processing constitute >60 per cent of mercantile exports
- Highly supportive government with policies and legislation to reduce sovereign risk
- High quality, freely available pre-competitive geoscience datasets to de-risk exploration
- Pre-competitive data is particularly relevant for critical minerals which may not have previously been considered targets

For further information

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Thank you

Dr. Andrew McNeill
Mineral Resources Tasmania

Tasmanian Government

AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

The Critical Mineral Processing

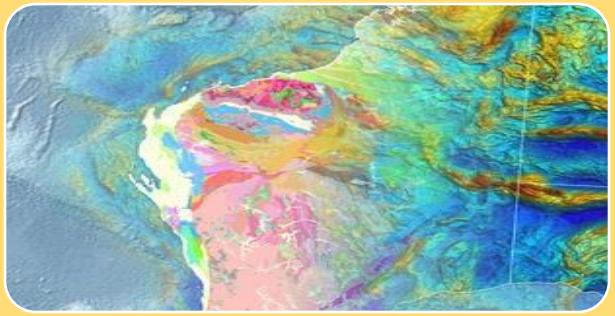
Current state and potential in Western Australia

Dr. Charlotte Hall
General Manger Investment
Department of Energy, Mines, Industry Regulations and Safety

GOVERNMENT OF WESTERN AUSTRALIA
Department of
Energy, Mines, Industry Regulation and Safety

Geological Survey of Western Australia

GSWA - The trusted source of geological knowledge



GSWA

✓ Collection and interpretation of statewide data: Geology, geophysics, energy, CCS
✓ Sharing pre-competitive data: maps, reports, atlas
✓ Promoting investment in the resource sector
✓ Geoscience education

Resource Tenure

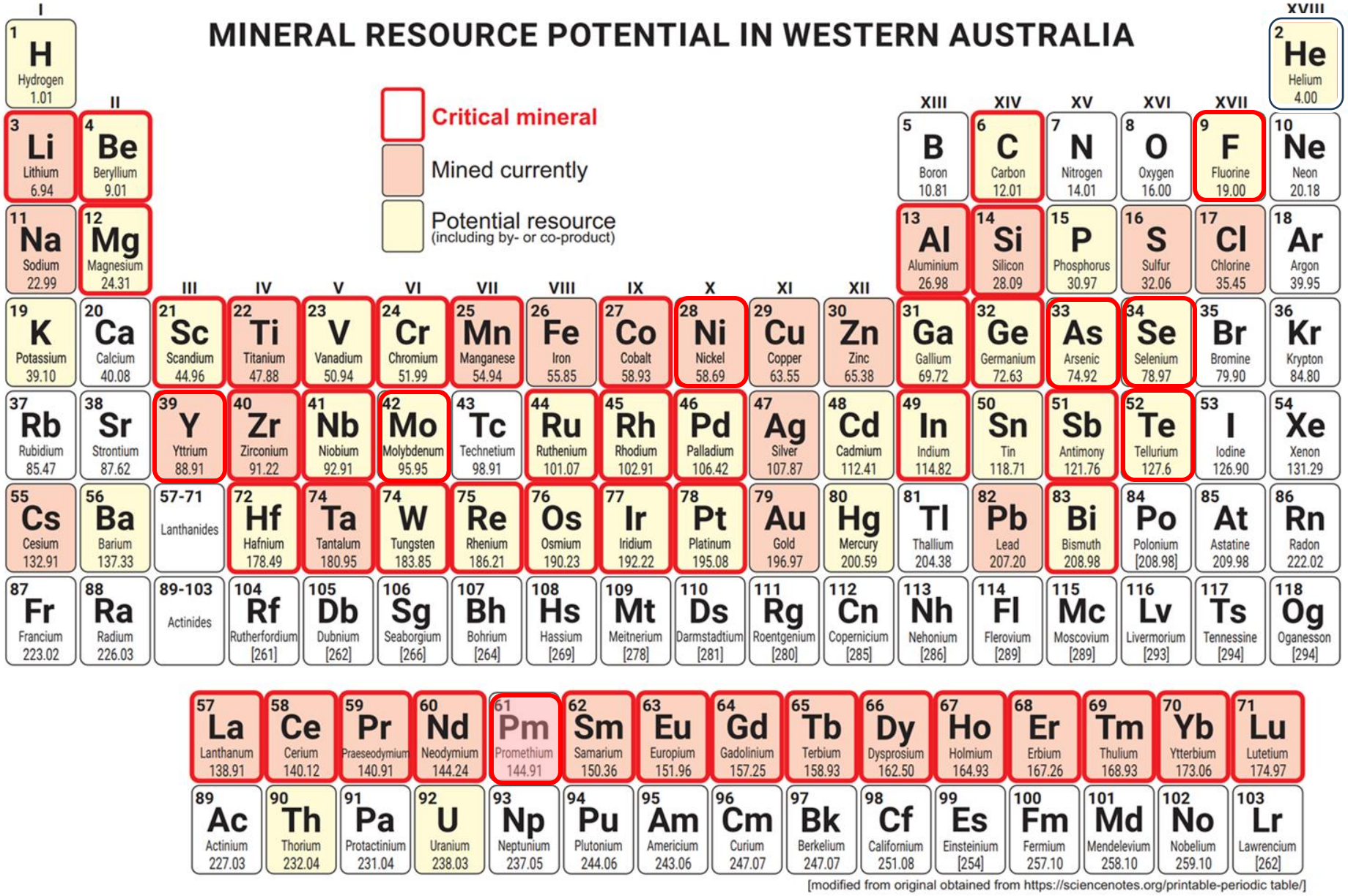
✓ Manage mineral titles: applications, approvals, rent payments
✓ Provides guidance on policy, codes of practice, royalties
✓ Wardens Court

Resource and Environmental compliance

✓ Risk based compliance monitoring and enforcement of parts of Mining Act
✓ Lifecycle compliance: exploration, mining, decommissioning
✓ Rehabilitation and closure outcomes

Minister
The Hon David Michael MLA

- Mines and Petroleum
- Ports
- Road safety



[modified from original obtained from https://sciencenotes.org/printable-periodic table/]

WA Lithium - World Class

Mining
8 mining operations

Processing
Kemerton plant - 50ktpa commissioned 2022
Expansion plans to 100ktpa
Kwinana plant 24ktpa - commissioned 2022
Expanding to 48ktpa and plan to 96Ktpa

Projects
Neometals - Li chemical production facility
Pilbara Minerals - expansion of concentrate facility
Covalent Lithium - 50ktpa Lithium Hydroxide plant
Liontown - expansion of concentrate for 500ktpas to 700ktpa
Liontown - study of mid-stream processing
Pioneer Dome, Manna Lithium - mine PFS
Widgie Nickel - Mt Edwards Lithium - Scoping study

Exploration
Maiden Mineral Resources declared for many junior explorers

1st Production world ranking

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WA Ni-Co - A sleeping giant?

Nickel sales $4.7B (US$ 2023) down 25% from highest levels

The decline continued in 2024…

6th Production world ranking

Latent capacity - facilities in Care & Maintenance

BHP NickelWest mining operations

BHP cobalt - Nickel refinery

FQM - Ravensthorpe

Wyloo - Cassini mine

Survivors

Glencore - Murrin Murrin

IGO- Nova Operations

Exploration continues at pace

➔Shovel ready projects

Mineral Resource disclosures

Legend Mining - Mawson Deposit

Galileo Mining - Callisto Deposit

Lunnon Metals - Silver lake Deposit

Exploration – discoveries

MTM Critical Minerals - Seahorse (laterite)

Maximus Resources - Misho +++

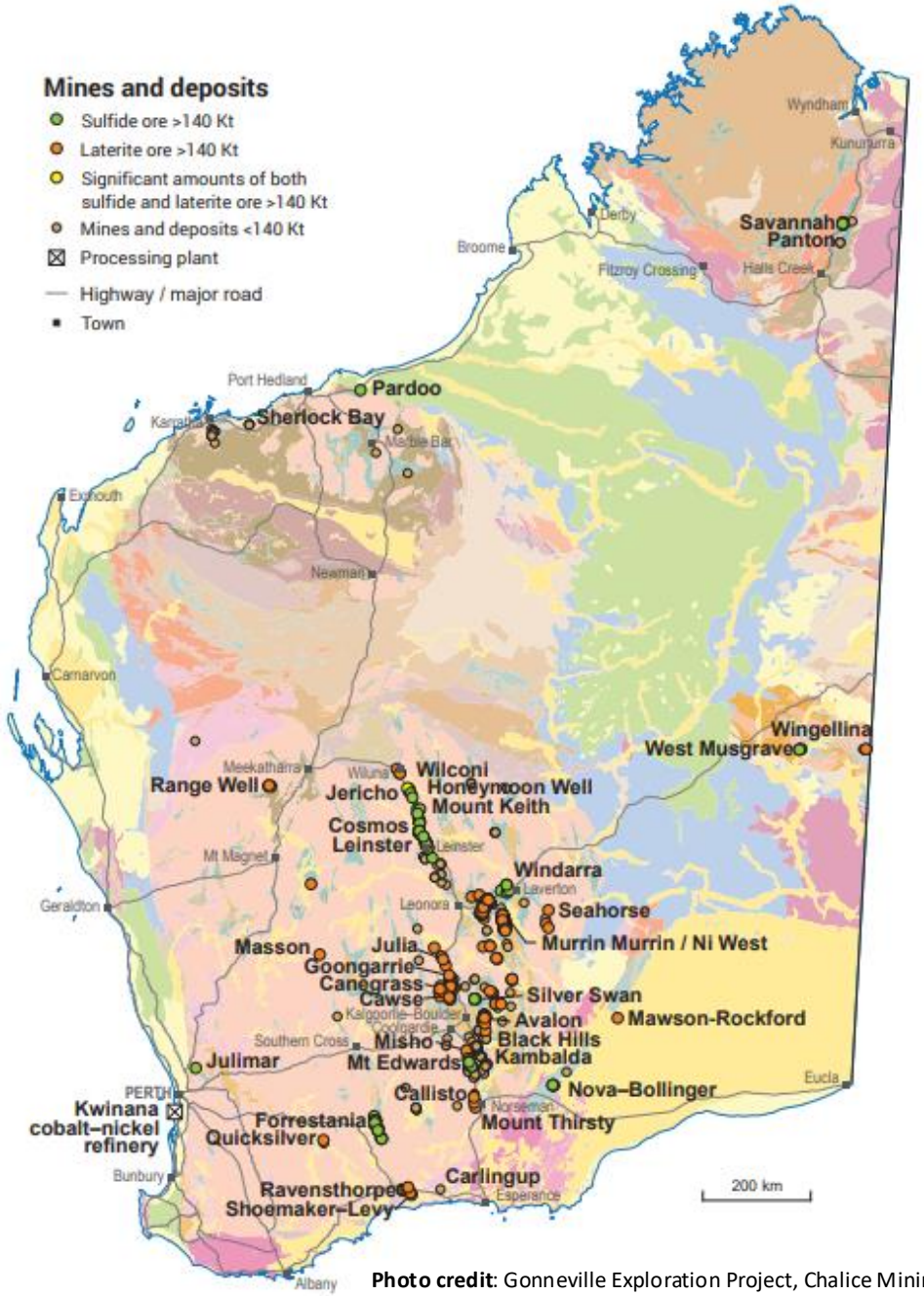


Photo credit: Gonneville Exploration Project, Chalice Mining

WA REE - Growth market

The full potential of the REE sector in WA has yet to be developed

Mining

Mt Weld Mine and Concentrator - 20+ year mine life

3rd Production world ranking

Processing

Lynas Rare Earth Ltd - Kalgoorlie refinery ramp up to 9ktpa NdPr Oxide

Advanced projects

Iluka - Eneabba Refinery 17ktpa TREO
Hastings Technology - Yangibana Project 37ktpa NdPr Oxide
Lynas rare Earth Ltd - Mt Weld expansion stage 1 &2
Northern Minerals - Browns Range project

Mineral Resources updates - Exploration - discoveries

Victory Metals - North Stanmore
RareX - Cummins Range
Heavy Rare Earths - Cowalinya
West Cobar Metals - Salazar Project
White Cliff Minerals - Hines Hill
Ardea Resources - Goongarrie

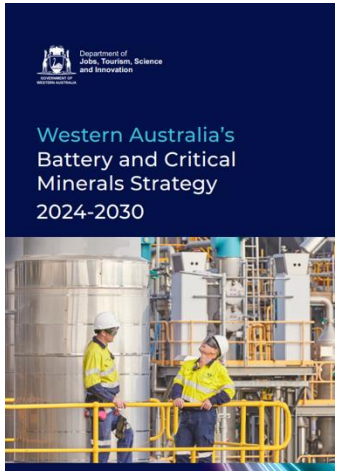
Photo credit: Lynas Rare Earth, Mt Weld

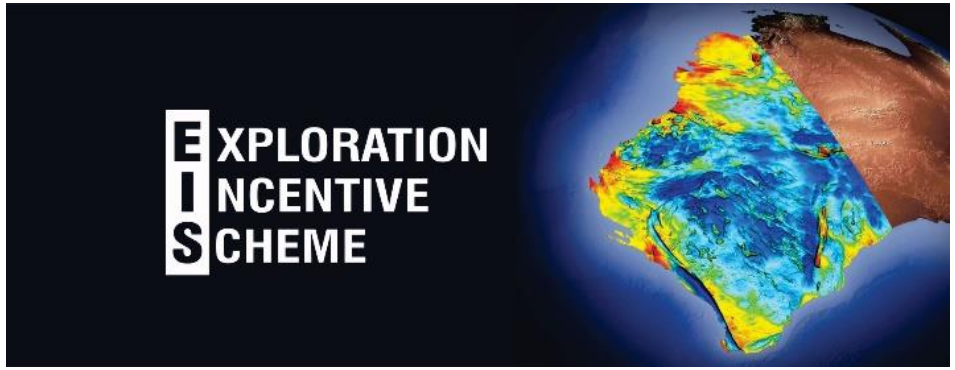
Risk for critical mineral companies

Rank	Category	status
1	Climate Change	✓ Increased transparency in reporting to improve risk management ✓ Mining industry ahead of the curve
2	Community relations Social license to operate	✓ Authentic opportunities to demonstrate respect for Traditional Owners ✓ Sharing project benefits
3	Robust growth strategy Security risk Economic uncertainty	✓ Safe democracy, rule of law ✓ Skilled workforce
4	Environmental risks	✓ Clarity in regulatory environment ✓ Shift to renewables
5	Access to Resources	Diminishing resources/access to resources ✓ YoY increase in exploration expenditure ✓ Progressive mining jurisdiction

The Western Australia advantage

- ✓ Resource-rich state
- ✓ Our resource sector success is underpinned by
  - ✓ the provision of world class geoscience data
  - ✓ a robust regulatory and tenure system
  - ✓ strong research sector
  - ✓ a highly skilled workforce
  - ✓ an emerging mid-stream processing industry
  - ✓ strong government support at both state and federal levels





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mriwa
Minerals Research Institute of Western Australia

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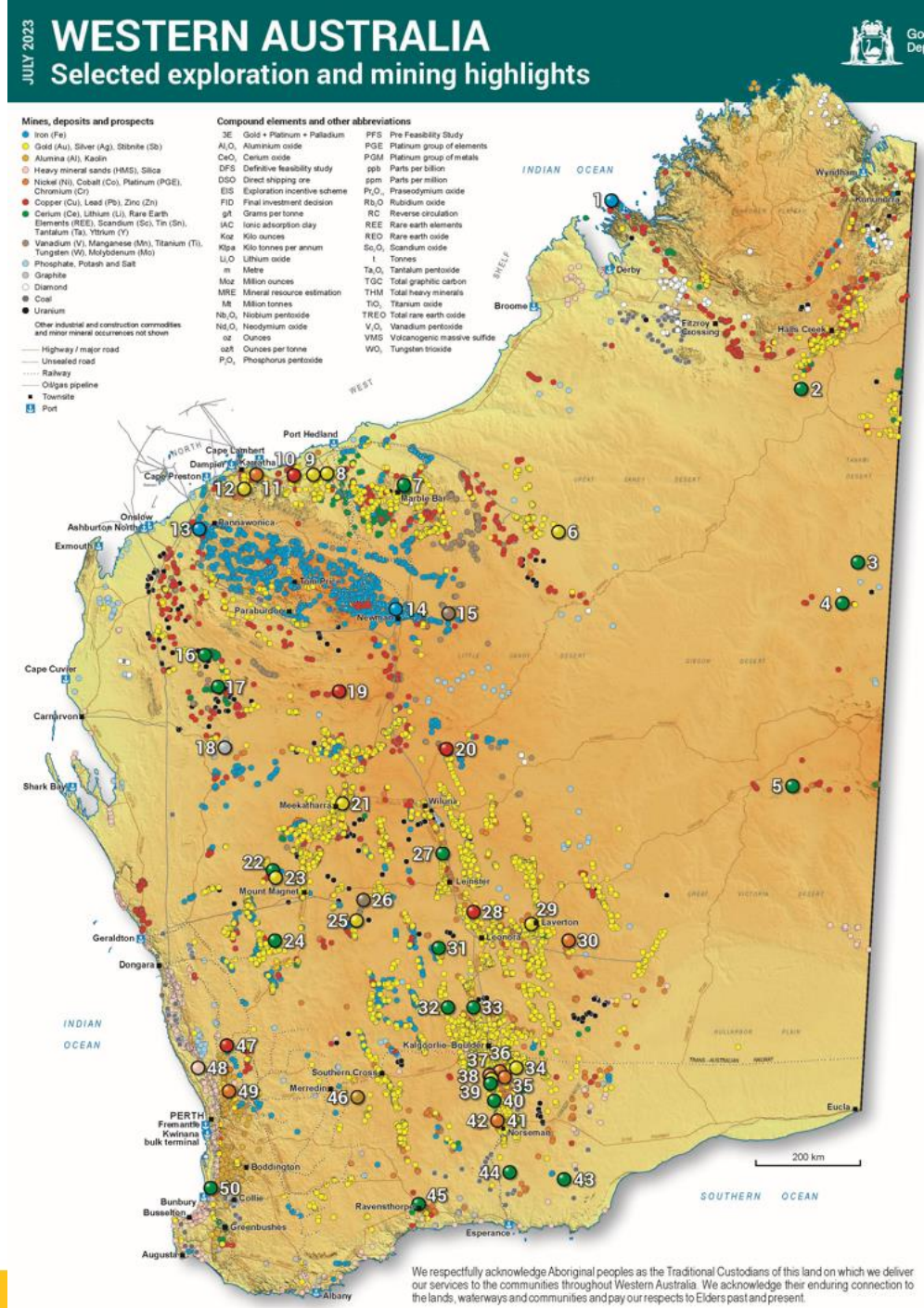

Questions?

Contact us

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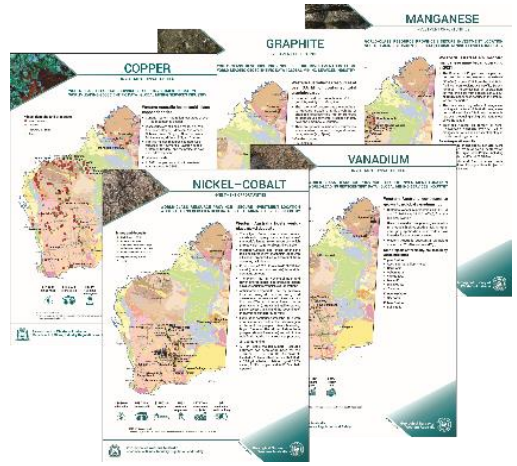
Information on commodities



Legislation and compliance

Icons by Freepik https://www.freepik.com

Thank you for listening, please look us up!

Photo courtesy of Fortescue: Eliwana mine site