Unravelling South Australia’s critical mineral potential in South Australia

Geological Survey SA

CritCon | May 2023

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energymining.sa.gov.au

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Acknowledgement of Country

As guests here on Kaurna land, the Department for Energy and Mining (DEM) acknowledges everything this department does impacts on Aboriginal country, the sea, the sky, its people, and the spiritual and cultural connections which have existed since the first sunrise. Our responsibility is to share our collective knowledge, recognise a difficult history, respect the relationships made over time, and create a stronger future. We are ready to walk, learn and work together.

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Key Messages

- Critical Minerals are essential to national security, economic development and a green energy future
- A mineral or metal is considered critical if its supply to industry is at risk
- Efforts across the entire supply chain are ramping up throughout Australia, with support from federal and state governments

The South Australian government understands the need for:

- A continued drive for alternate energy sources including renewals
- Increased exploration and mining across critical minerals and other metals to support a carbon net-zero future

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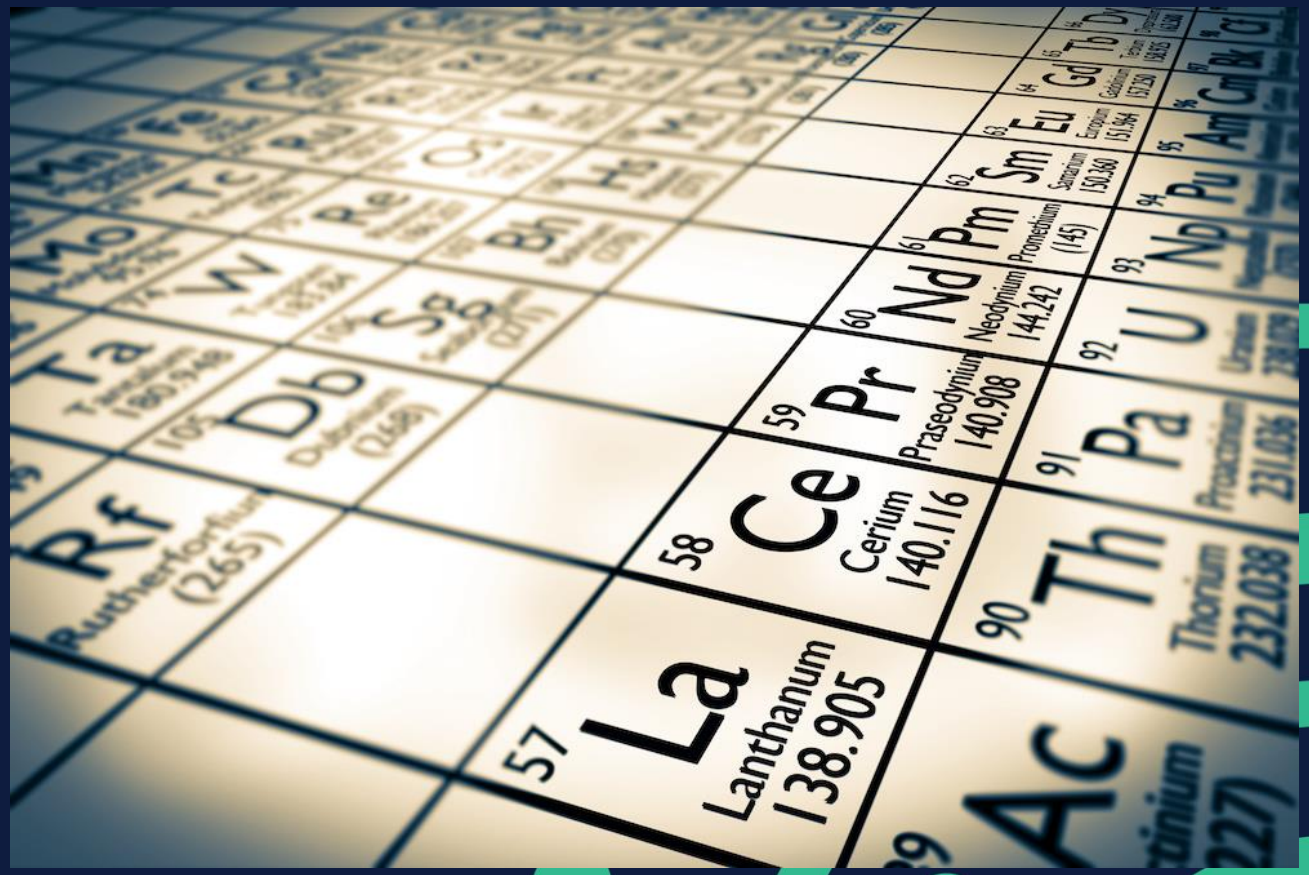
What’s on the list?

- Every list is a little different!!!
  - US has 50 as defined under directive of the Energy Act 2020
  - International Energy Agency → adopted US list
  - **Australia has 26 critical minerals listed**
  - **SA is looking at its prospectivity across the list**
  - **& Yes! Copper is recognised as essential**



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South Australia: Interest in Critical Minerals

- Recent announcements confirming the geographic location, recent activity - geological domains and mineral systems
- Increase in demand for legacy data and access to Drill Core Reference Library
- Increase in critical mineral exploration interest

But how well do we understand critical minerals in South Australia?

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What we know we have!

- Mineral sands
- Graphite
- Cobalt
- Rare Earth Elements
- Halloysite-Kaolin (HPA)
- Magnesium

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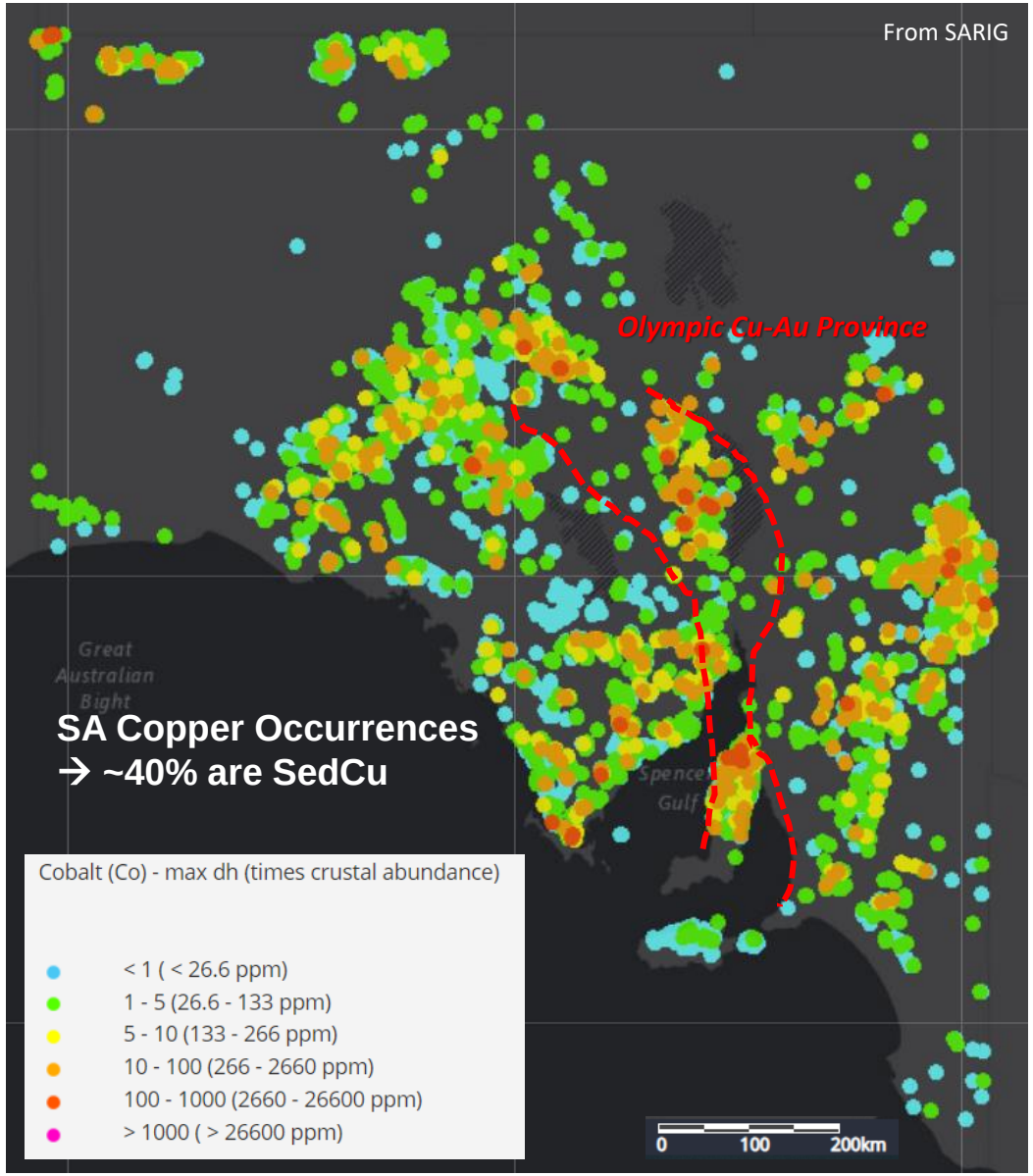
Renewed interest in Sed-Cu | Geochemistry data sets | Copper-Cobalt

- **CODA Minerals** – Elisabeth Creek
- **Taruga** – Worrumba Anticline
- **EnviroCopper** – progressing ISR project at Kapunda
- **ADI** Round 1-3 funding for several SedCu projects
- Other companies exploring in SedCu space in SA include:
  IGO, First Quantum, FMG, OZ Minerals, Gold Road



Critical Minerals South Australia Project

SA's Prospectivity

Stock-take

Geochemistry, Spectral scanning, Petrophysics

Secondary Potential (Mine-waste)

Critical Minerals Strategy SA

- A state government funded, precompetitive geoscience project over 2 years
- Will describe SA's potential and drive exploration and development of Critical Minerals
- Seeks to understand the economic potential of Critical Minerals to SA and deliver a state-wide strategy and action plan

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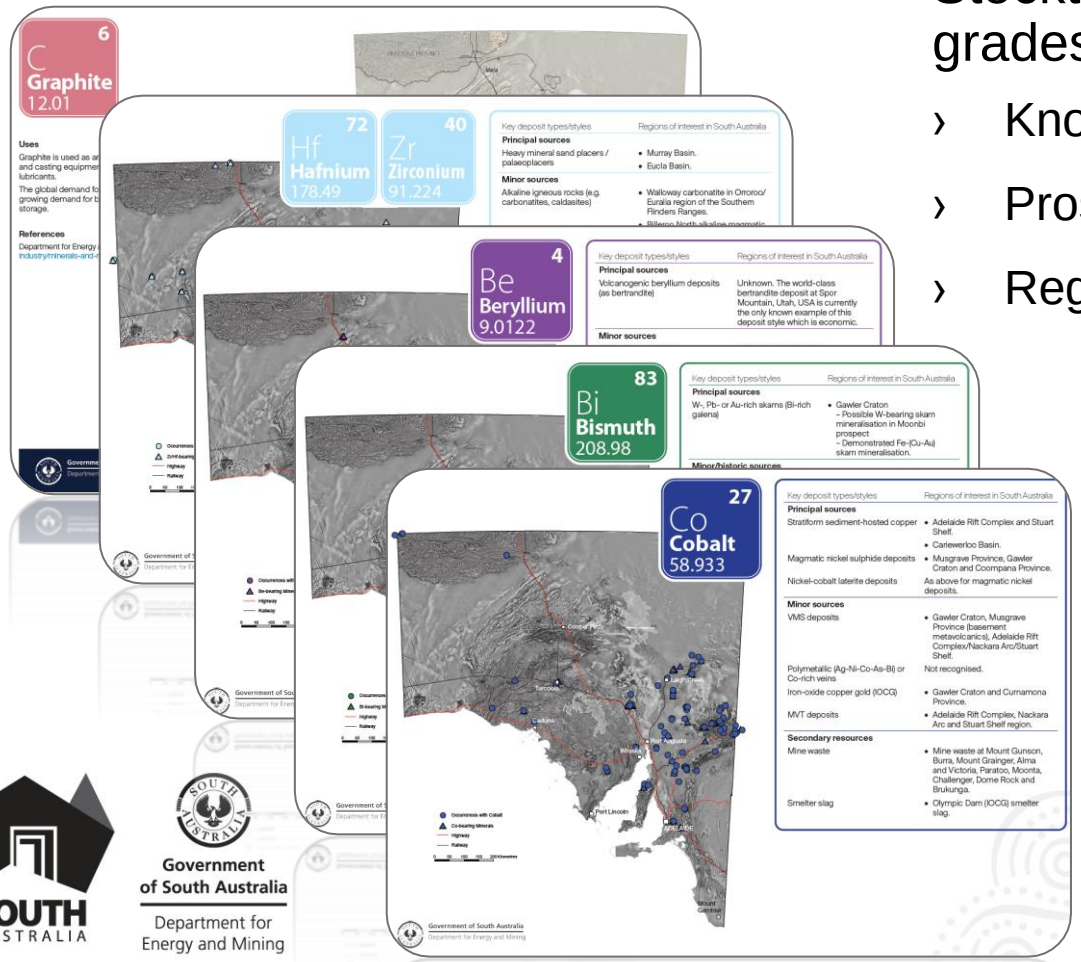
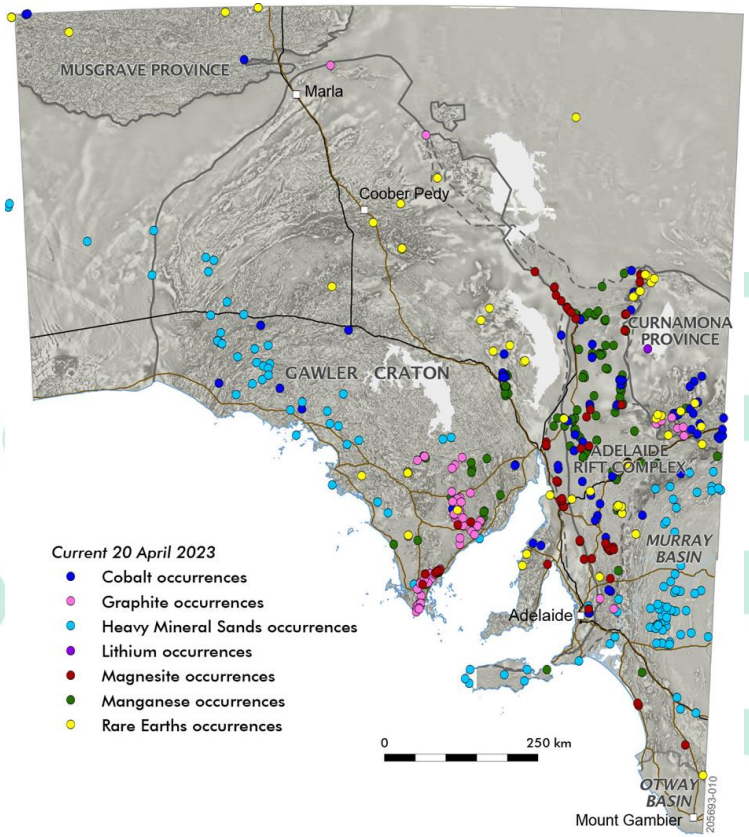
Stock-take
Commodity Summaries

What we know!



Stocktake of mineralisation styles that produce economic grades of key critical minerals; summaries prepared for

- Known occurrences
- Prospective deposit models
- Regions of interest in SA



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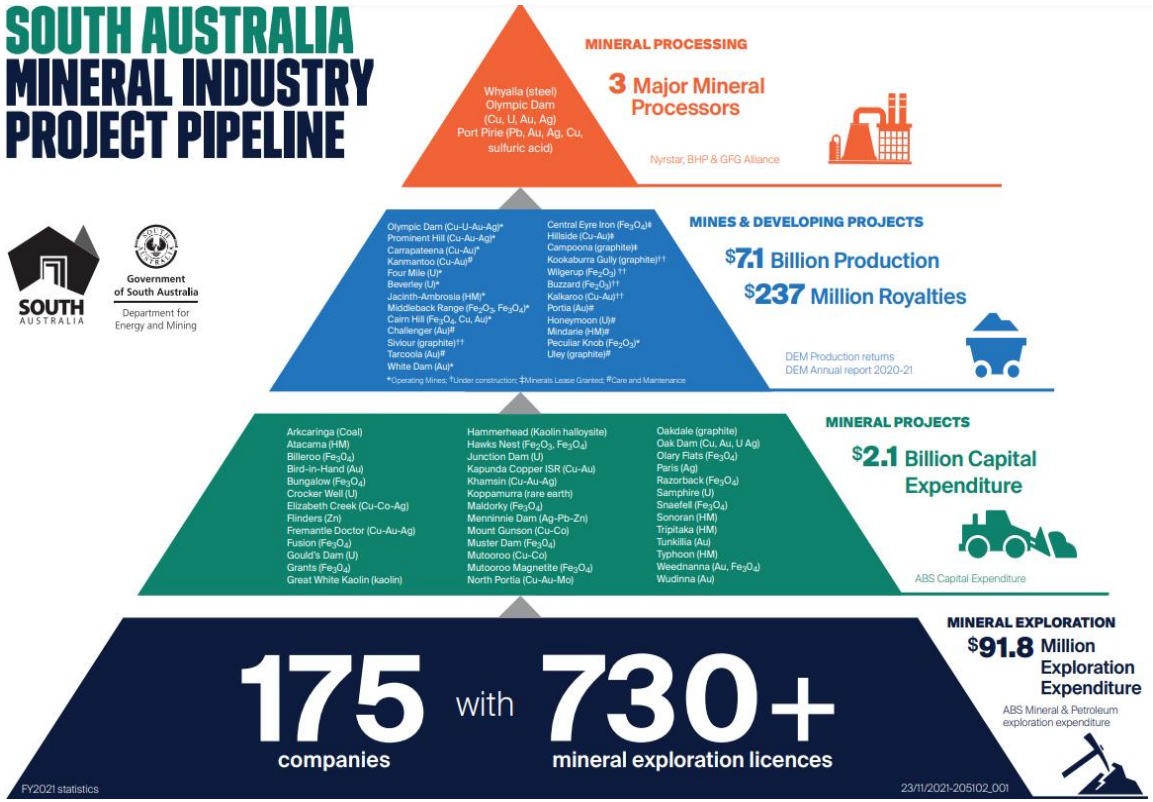
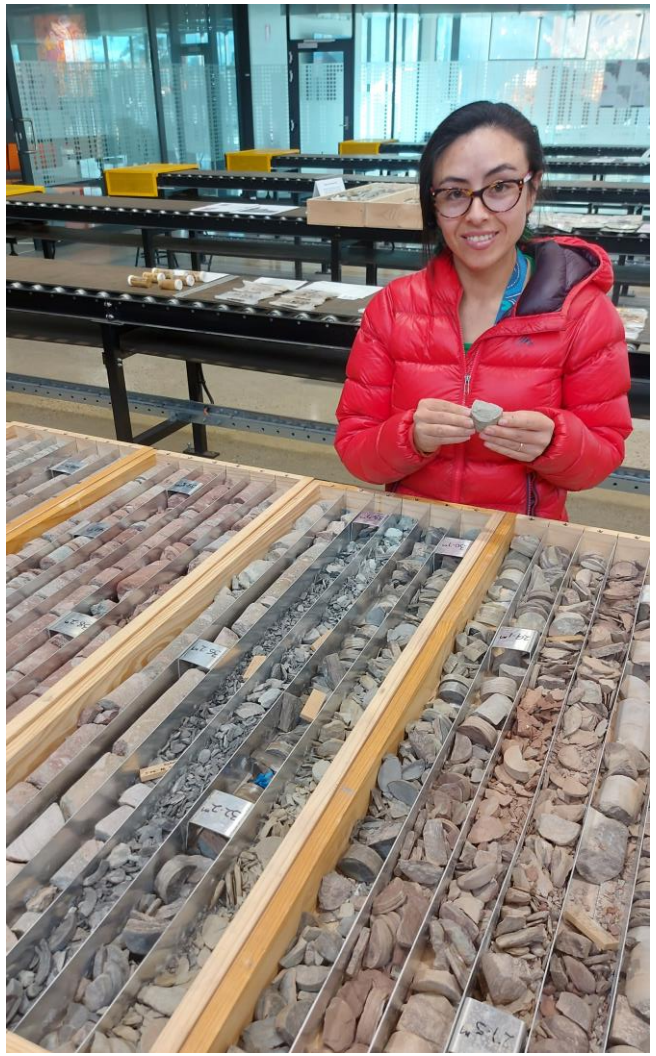
Geochemical Sampling Program
Evaluating the State's potential

What we don't know!

- Is there unrecognised CM potential in SA's major projects?
- Where are the unrecognised opportunities?





Rare-Earth Elements

SA is very fertile for REEs

- Mineral Sand – hosted
- IOCG – associated
- Ionic-clay – hosted
- Carbonatites? JURY'S OUT!

12 months study into deepening our understanding of SA's prospectivity in REEs is about to commence (Dr. Diana Zivak)

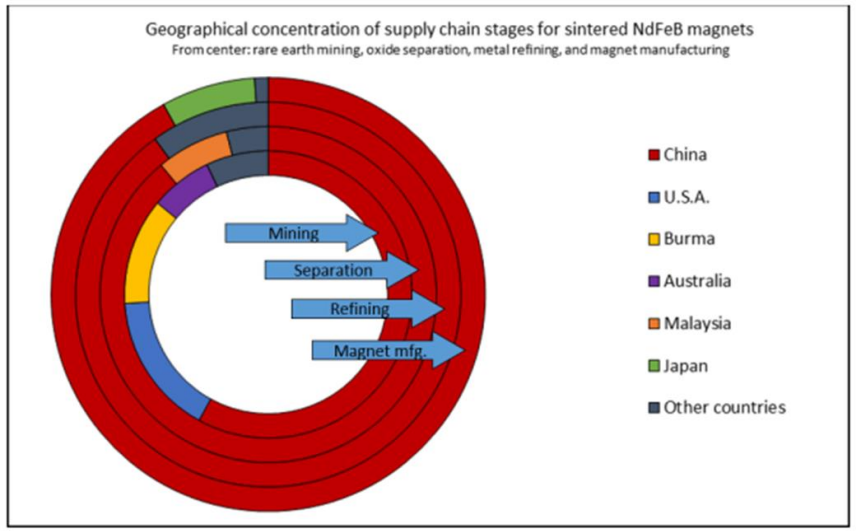
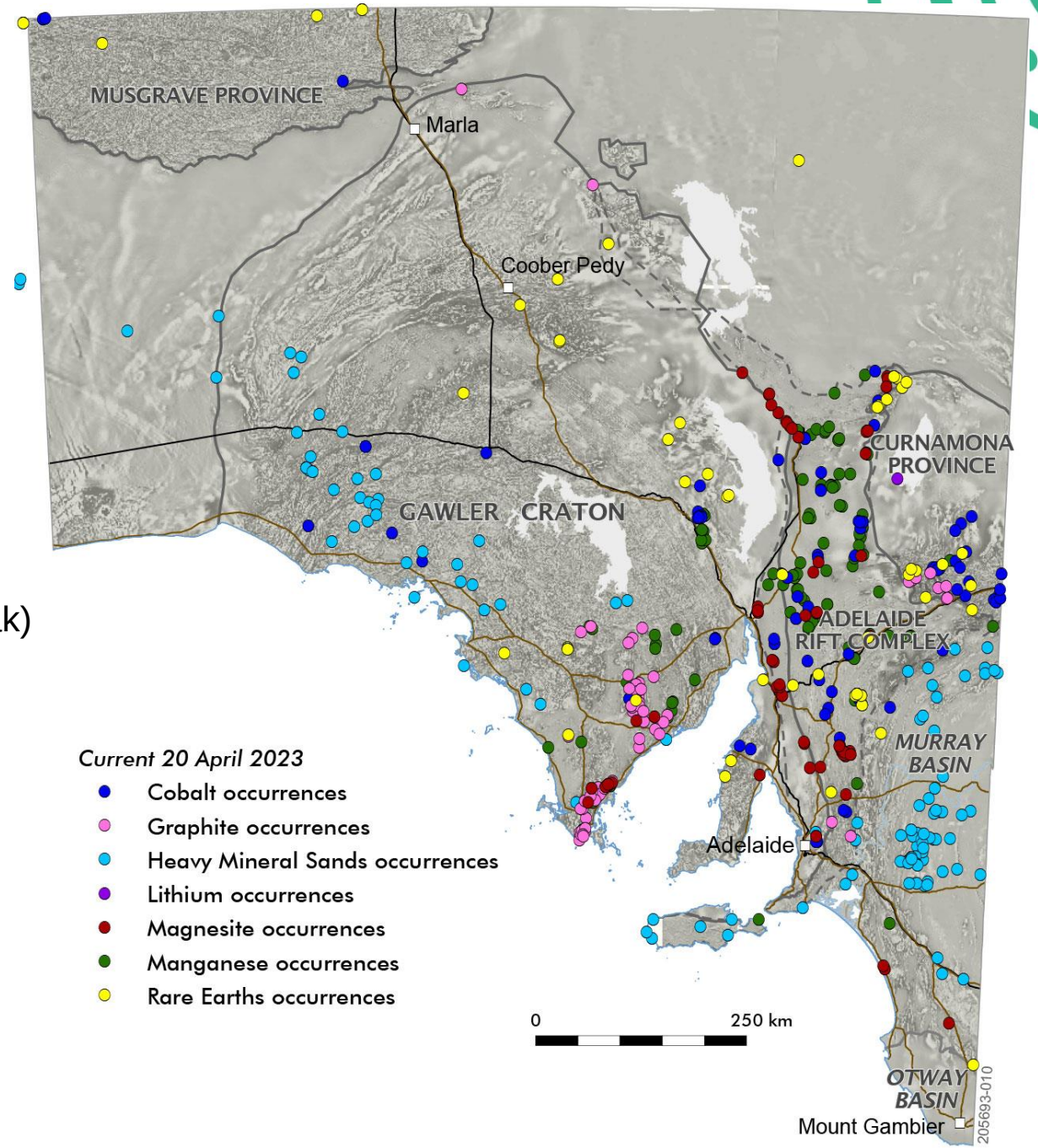
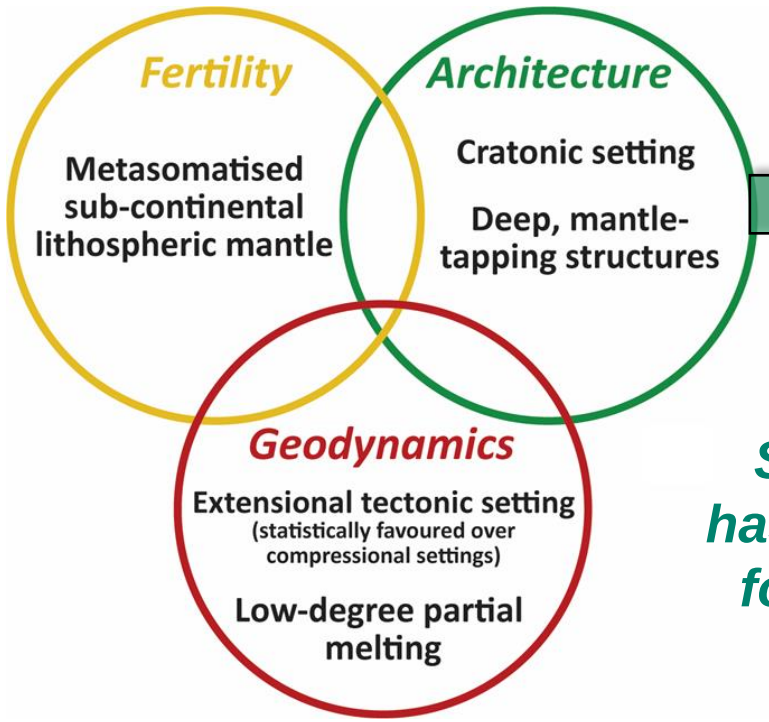


Figure 13. Geographical concentration of supply chain stages for sintered NdFeB magnets, 2019

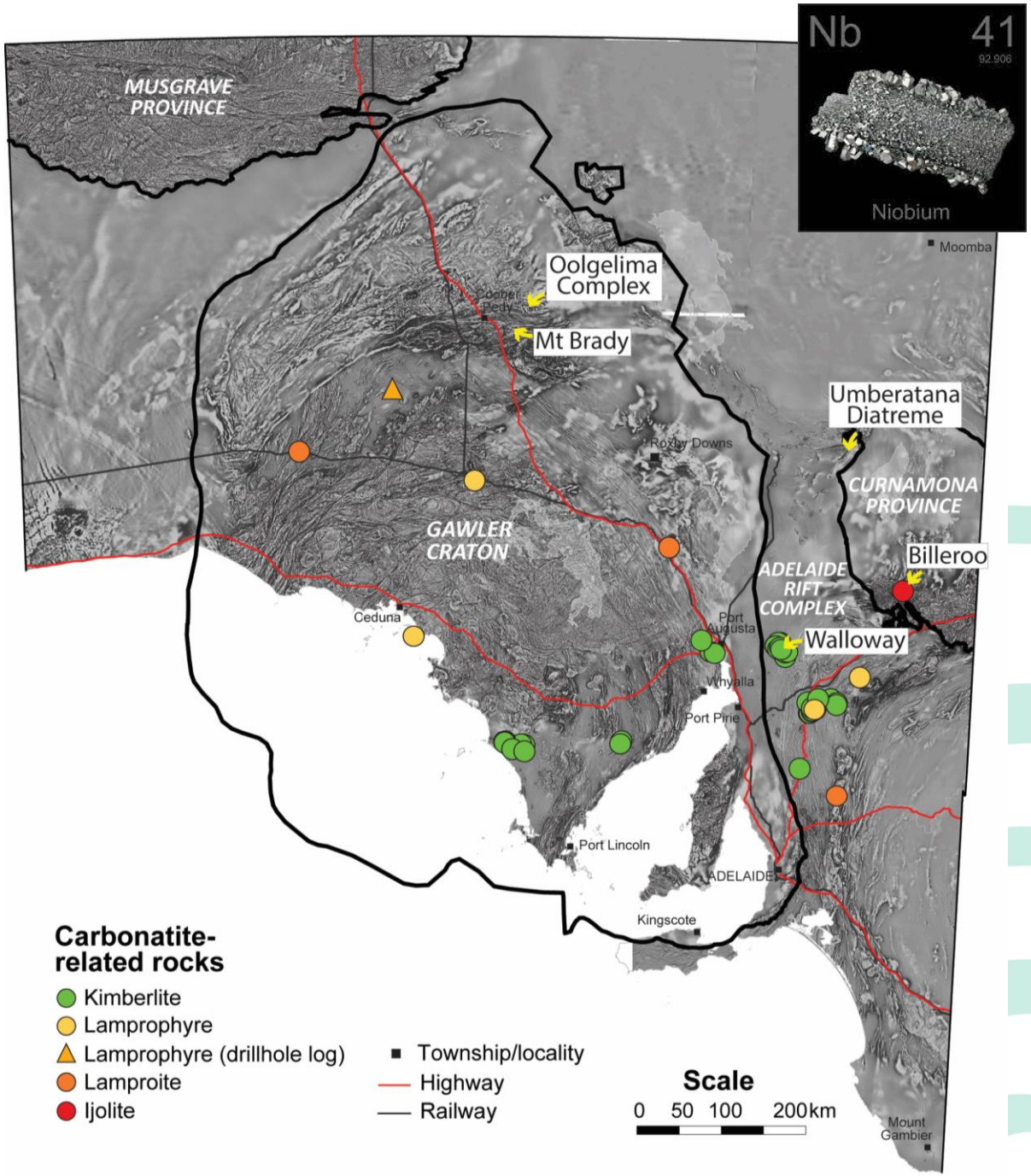


Carbonatites

- Major source of REE and Niobium
- Little is currently known about carbonatites in South Australia
- Potential carbonatites to be characterised to understand South Australia's potential
- Project led by Dr Mitchell Bockmann



South Australia has the ingredients for carbonatites!



Secondary Prospectivity of South Australia's Mine-waste

What we threw away!

Easy pickings?

- Tailings dams and other mine wastes are potential environmental hazards
- But they also offer an incredible opportunity to extract critical minerals that have been discarded over time
- With the added benefit of treating and cleaning up these historical sites

Circular Economy

- Potential stockpile of minerals on the surface
- Cleaning up existing sites

Mount Gunson mine waste – photograph by Carmen Krapf

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SA's Mine-waste Desk-top study: Review of MINDEP via SARIG & open file information

- ~1000 sites ranked using a newly developed system of weighted criteria in consultation with the Geological Survey SA
- Develop a top 30 ranked list of opportunities that could be further high-graded for site sampling and geochemical and mineralogical analysis
- Number of detailed case studies are also provided in the report

[Critical Minerals South Australia | Energy & Mining (energymining.sa.gov.au)]

Rank	Parameter (weighted)	"Better" Assumptions
1	Mine status	C&M, ceased, or abandoned
2	Known commodity	Ni, Co, Zn, Mn, Cu, Co, Au, Ag, Fe
3	Associated commodities	Known to have CM affinity
4	Discovery year	Older
5	Mine waste feature	Larger volume

Other considerations included: Distance to a major city, mine site or port; and environmental contamination

- South Australian mine waste is fertile in metals including Co, Cu, Ni, REEs and Au.
- The Middleback Ranges was recognised as a potential host for Mn, with notable enrichment likely in waste materials.
- The potential for bismuth in several sites

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Mine Waste Study

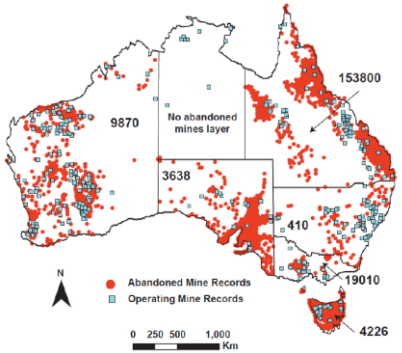

Table 10. Highest ranking sites for potential critical metal prospectivity in mine waste (n=30).

Rank	MINDEP_NO	DEP_NAME	Description	Score (/50)
1	3137	West Lagoon	Mount Gunson area	47
2	8908	Port Pirie (REE)	Radium Hill waste majority	42
3	3807	Burra	Historic/ tourist site	42
4	3088	Mount Gunson	Mount Gunson area	41
5	4856	Kapunda	Existing company activity	41
6	1933	Mount Grainger		41
7	1927	Paratoo		41
8	5104	Moonta Central Lode	Historic/ tourist site	41
9	3046	Challenger	Care and maintenance	40
10	5136	Moonta Eastern Lode	Historic/ tourist site	40
11	5967	Alma and Victoria		40
12	1025	Dome Rock		40
13	6644	Iron Knob	Existing company activity	39
14	7854	Beltana	Zinc in willemite	39
15	3206	Blinman	Historic/ Tourist site	39
16	842	Mutooroo		39
17	7300	Wallaroo		38
18	8256	Burra smelting works	Historic/ tourist site	38
19	962	Radium Hill	Radioactive hazard	38
20	1482	Brukunga		37
21	3057	East lagoon	Mount Gunson area	37
22	3002	Iron Monarch	Care and Maintenance	36
23	4401	Leigh Creek Lobe B		36
24	394	Perseverance		36
25	3051	Cattlegrid	Mount Gunson area	36
26	5208	Wheal Hughes		36
27	8203	Glenloth Government Battery		36
28	3029	Iron Prince	Existing company activity	35
29	3010	Peculiar Knob		35
30	4207	Rossman		35

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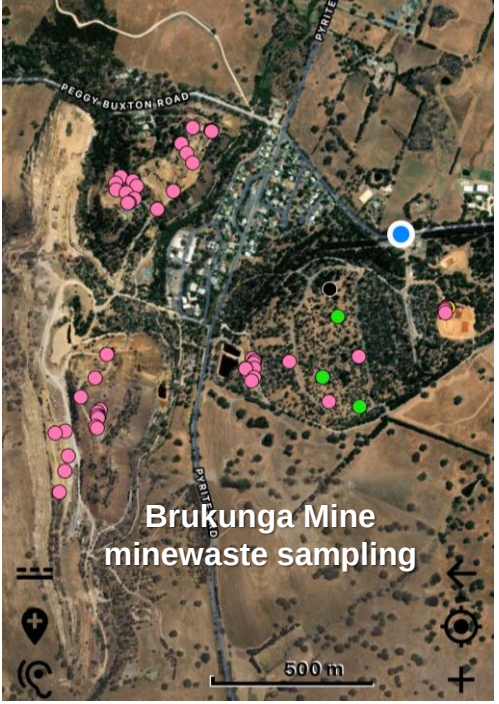




Brukunga Minewaste Sampling April 2023

1 diamond drillhole (courtesy Veracio)

3 auger holes

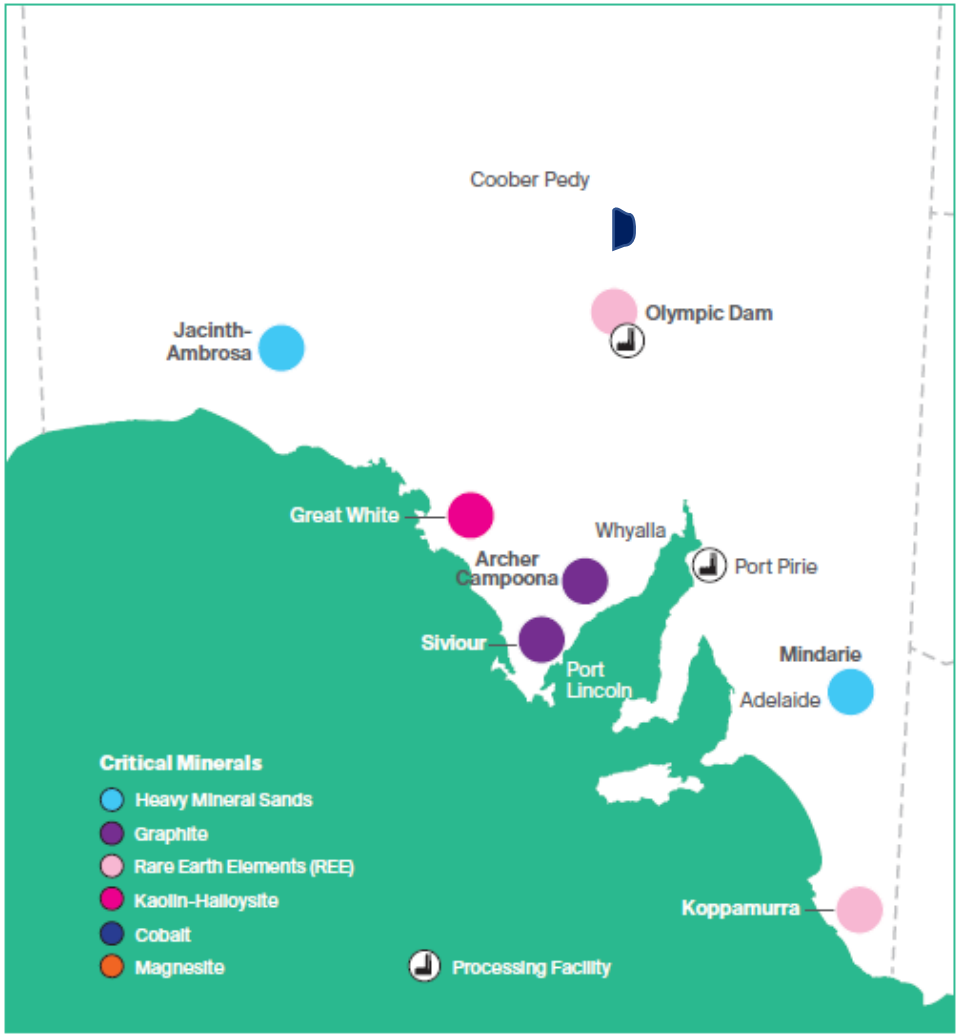
68 tailings, waste rock and slimes samples

sampling done by Dr Laura Jackson and Lexi King Sustainable Mineral Institute (UQ)

Brukunga Minewaste Sampling April 2023

Critical Mineral Strategy & Action Plan for SA: focus on doing what we do best; working together!

- Consolidated approach which draws together all sectors; addressing:
  - Supply chain diversity providing strategic advantages
  - Which minerals will see sustained demand – play to SA's strengths
  - Facilitate and support producers to meet demand
  - Have a clear understanding of our inventory – key characteristics? What new data is required to shift discovery to development?
  - Water and power – major barrier to delivery, how can we help
- Centralised processing hubs
- Geoscience, Metallurgy, Processing upskilling hub – R&D / education powerhouse



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