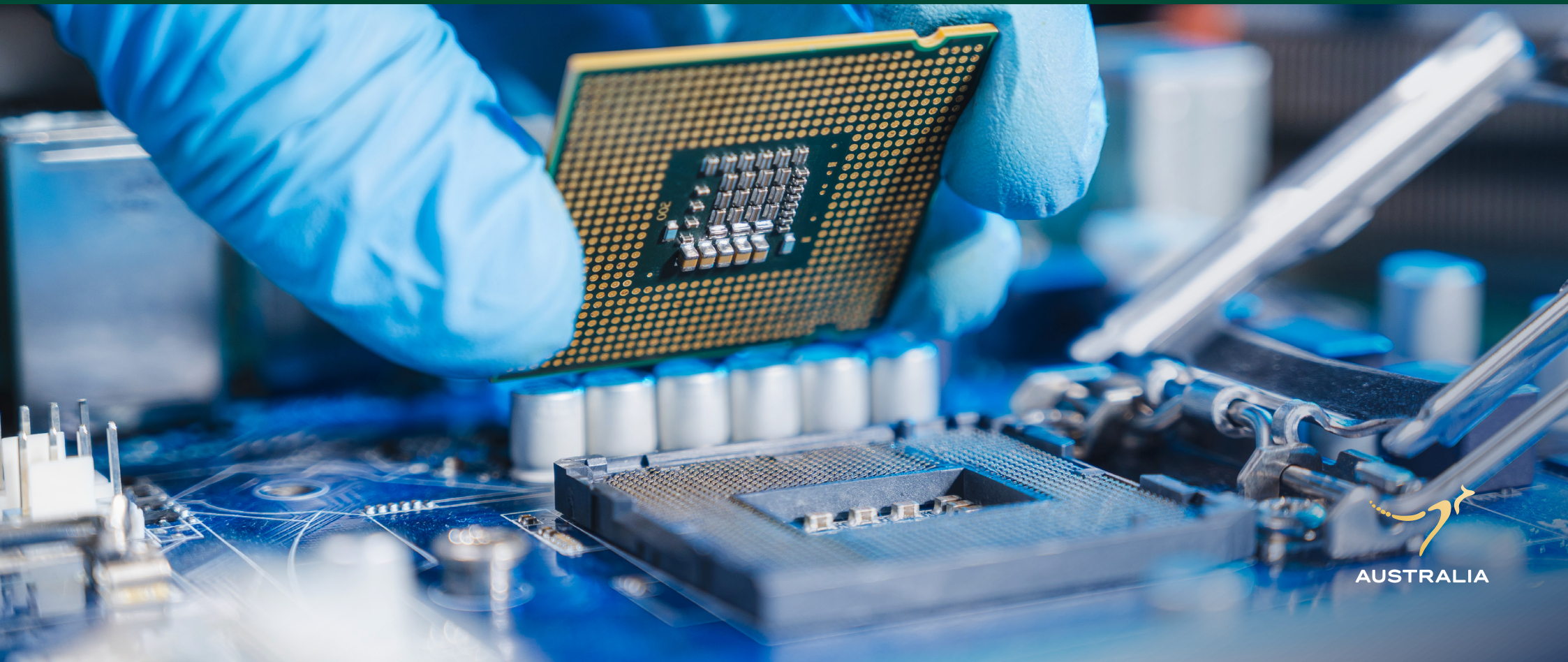
Australian Government
Australian Trade and Investment Commission

Australian Critical Minerals Prospectus

Scan the QR code to view the interactive, online version.



Acknowledgement of Country

In delivering the Australian Critical Minerals Prospectus, we pay respect to our First Nations peoples, their Elders, and their ancestors who have always cared and continue to care for our lands, water, and communities.

First Nations people are the Traditional Owners and custodians of the lands and waters on which critical minerals mining and processing takes place. Their voices and knowledge are critical to the success and sustainability of the critical minerals sector.

Austrade recognises First Nations people's continuing contribution towards creating a strong and prosperous nation, and we thank them for their custodianship of the Country that we live and work on today.

Published December 2024.

Australia: A secure, reliable source of critical minerals

Australia is home to some of the world's largest reserves of critical minerals, including lithium, cobalt and rare earths. We are a world leader in resources exploration, extraction, production and processing and our industry has a reputation for safety, high labour standards, First Nations engagement and environmental responsibility. Australia's critical minerals industry has the potential to build supply chain security and deliver on a net zero future.

The Australian Critical Minerals Prospectus is one way Austrade facilitates offtake and investment in critical minerals. Current as at December 2024, this document summarises the 55+ investment-ready projects featured in the interactive, online version of the Prospectus. To access the latest project information, and learn more about Australia's advantages and government support for critical minerals, scan the QR code or visit **international.austrade.gov.au/criticalminerals**.

The importance of critical minerals

Critical minerals and strategic materials are essential components of transformative technologies that will drive Australia's ambitions to become a renewable energy superpower and global energy partner of choice.

- electric vehicles
- hydrogen electrolysers
- solar panels
- wind turbines
- greener buildings
- batteries.

They are also crucial to the defence, technology, and medical sectors.

Growing global appetite for critical minerals

The critical minerals market has seen rapid growth over the past 5 years. It is expected to grow between two and fourfold by 2030[1]. There is also a need to diversify our trade. This is to avoid vulnerabilities arising from volatile prices or highly concentrated supply chains.

Australia is well positioned to meet this growing demand. We can become a globally significant, secure, and responsible supplier of raw and processed minerals, with benefits such as:

- a world-class mining industry, including expertise in mining equipment, technology and services (METS)
- a highly skilled workforce
- world leading environmental, social and governance (ESG) practices
- comprehensive financial incentives and whole of government support.

Critical Minerals Strategy

The Australian Government's Critical Minerals Strategy 2023–2030 sets out a vision to grow Australia's critical minerals wealth, create Australian and strengthen global clean energy supply chains. Implementation of the Strategy includes support to finance critical minerals mining and processing projects, and investing in our international partnerships.

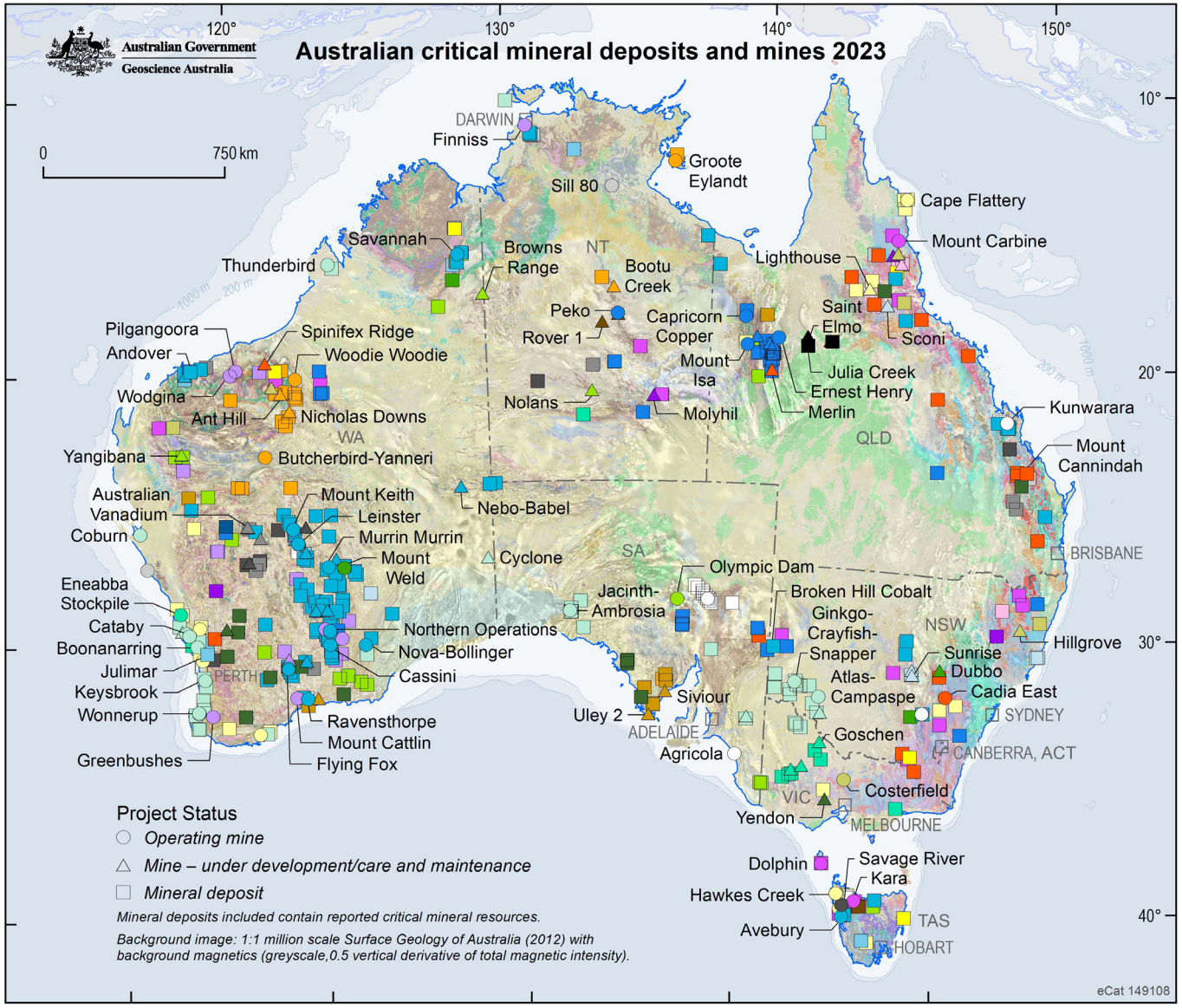
Future Made in Australia

Through the Future Made in Australia plan, the Australian Government will invest A$22.7 billion to maximise the benefits of the net zero transition and secure Australia's place in a changing global landscape.

For the critical minerals industry, this includes:

- Investments in mineral exploration and strengthened trade relationships
- A Critical Minerals Production Tax Incentive to support downstream processing and refining, offering a 10 per cent offset for eligible costs over 12 years starting in 2027–28.

1. *IEA (2023) World Energy 2023, IEA Paris*



Map courtesy of Geoscience Australia, December 2023

Investment summaries

This is a non-exhaustive list of advanced Australian critical minerals projects. There are more projects than those listed here. Austrade is able to facilitate introductions to other projects according to your specific needs.

For further information, please contact your local Austrade representative or email criticalminerals@austrade.gov.au

Scandium

Silicon

Titanium

Tungsten

Vanadium

Zirconium

Calidus Resources Ltd
ASX-listed (CAI)

Blue Spec

Investment summary

The Blue Spec Mineral Resource contains 190,000 ounces of gold at a grade of 24.4g/t Au and 242kt of antimony at a grade of 1.6% Sb. The Blue Spec Project is now fully permitted to commence development when Calidus decides is the appropriate time. Calidus will soon commence offtake and financing discussions with interested parties.

Project description

Blue Spec is located 20km east of Nullaine in the Pilbara, WA. It is a steeply dipping vertical/sub-vertical narrow vein deposit. There are two separate mining areas located ~1.2km apart along strike, named Blue Spec and Gold Spec. Ore will be mined via mechanised underground cut and fill techniques and trucked to a flotation plant to be constructed at the main gold processing plant located 75km away at Warrawoona. The Warrawoona site provides access to low cost power along with access to existing maintenance and support functions. The floatation plant at Warrawoona will produce a high-grade gold/stibnite concentrate for sale to an offtaker.

Commodity(ies): **Antimony**, Gold

Mineral Resources as at 29-Sep-22 (2.5g/t AuEq cut-off):

Resource Category	Tonnes (Mt)	Au (g/t)	Sb (%)
Indicated	0.094	31.1	1.8
Inferred	0.148	20.1	1.3
Total	**0.242**	**24.3**	**1.6**
Contained		**190koz**	**3.872kt**

Ore Reserves as at 29-Sep-22:

Reserve Category	Tonnes (Mt)	Au (g/t)	Sb (%)
Probable	0.2	11.4	0.75
Total	**0.2**	**11.4**	**0.75**
Contained		**83koz**	**1.500kt**

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
5

IRR
30% pre-tax

Capital Cost
A$34m

NPV
A$49m pre-tax 5%DR

Product & Annual Production Rate
- Stibnite concentrate (36-39% antimony and 250-300g/t gold): 4,500tpa

Study Date Jan 2022

Current as at September 2024

Cobalt Blue Holdings Ltd
ASX-listed (COB)

Broken Hill Cobalt & Kwinana Refinery

Investment summary

Cobalt Blue (COB) is developing the Broken Hill Cobalt Project (BHCP) to produce a cobalt rich mixed metal hydroxide (MHP) and high-purity elemental sulphur. EIS and First Nations approvals for the BHCP have been paused. COB, in partnership with Iwatani Australia, is developing Australia's first Cobalt sulphate refinery, in Kwinana, WA. The Refinery will produce US Inflation Reduction Act compliant cobalt sulphate, and also has the capacity to produce nickel sulphate. Environmental assessment to support the Refinery EIS application has commenced. COB is evaluating equity, debt and offtake partnerships for both the Refinery and BHCP.

Project description

The BHCP will produce an intermediate mixed cobalt-nickel hydroxide and elemental sulphur. A pilot plant was commissioned in 2021, and a larger scale demonstration plant commenced operations in 2022, continuing with test work. In 2022, the Australian Government granted Major Project Status to BHCP and a A$15m grant was awarded through the Critical Minerals Accelerator Initiative. In 2024, COB paused completion of the DFS and is currently undertaking a review to assess the viability of a condensed, higher margin project. COB completed its Refinery Feasibility Study in late 2023, and is now progressing engineering test work, feedstock agreements, permitting and financing, targeting construction commencement in 2025. Stage 1 of the refinery will produce 10,000 tpa cobalt sulphate for supply to pCAM manufacturers, with the opportunity to double capacity as a Stage 2.

Commodity(ies): **Cobalt**, Nickel, Iron, Sulphur

Mineral Resources as at Nov-23 (275 ppm CoEq cut-off):

Resource Category	Tonnes (Mt)	Co (%)	S (%)	CoEq (%)
Measured	24	917	9.6	1,143
Indicated	60	644	7.0	810
Inferred	43	629	7.0	795
Total	**127**	**690**	**7.5**	**867**
Contained (kt)		**87.3**		

No Reserve details available

Project Status
Pre Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
20

IRR
BHCP: 18.9% post-tax; Refinery: 27% post-tax

Capital Cost
BHCP: A$560m; Refinery: A$47m

NPV
BHCP: A$554m post-tax 7.5%DR; Refinery: A$118m post-tax 10%DR

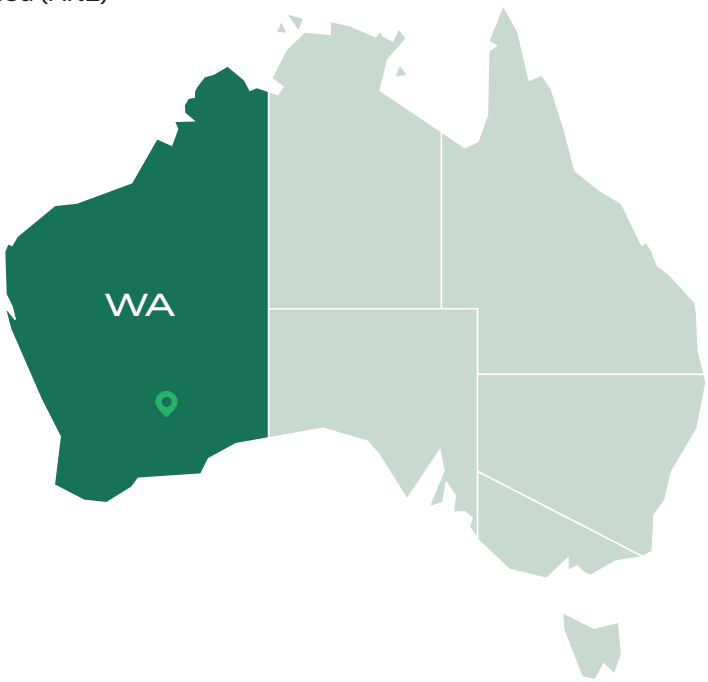
Product & Annual Production Rate
BHCP:
- Cobalt mixed hydroxide precipitate: ~10,000tpa (containing ~3,000tpa cobalt metal)
- Sulphur: ~300,000tpa

Refinery:
- Cobalt sulphate: ~17,000tpa (containing ~3,000tpa cobalt metal)

Study Date Jan 2020
Feasibility Study for Refinery completed in Nov-23.

Current as at September 2024

Ardea Resources Ltd
ASX-listed (ARL)



Commodity(ies): **Cobalt, Nickel**

Mineral Resources as at 30 June 2023 (0.5% Ni cut-off):

Resource Category	Tonnes (Mt)	Co (%)	Ni (%)
Measured	18	0.085	0.94
Indicated	277	0.046	0.70
Inferred	289	0.037	0.67
Total	**584**	**0.043**	**0.69**
Contained (kt)		**250**	**4,044**

Ore Reserves as at 6 July 2023:

Reserve Category	Tonnes (Mt)	Co (%)	Ni (%)
Proved	16.7	0.09	0.96
Probable	177.4	0.05	0.68
Total	**194.1**	**0.05**	**0.70**
Contained (kt)		**99**	**1,365**

KNP Goongarrie Hub

Investment summary

The Goongarrie Hub Project PFS completed in 2023 confirmed the Project's status as one of the world's largest, lowest-cost sources of battery materials. Mining Leases granted and expanded environmental baseline surveys finalised in 2024 for EPA referral. Ardea Resources' (ARL) ESG policies and governance structure ensures the Project will be undertaken to the highest ESG standards with the Company enjoying strong local stakeholder support. ARL completed its Strategic Partner process in April 2024 selecting Sumitomo Metal Mining and Mitsubishi Corporation as its development partners who are earning a 50% project interest in the Goongarrie Hub.

Project description

The Goongarrie Hub is the developed world's premier nickel-cobalt project with world-class supporting infrastructure in the well-established, community supportive Kalgoorlie mining district, WA. Open-pit mine with low strip ratio and 40+ year operation feeding 3.5Mtpa goethite dominated ore into two high-pressure acid leach autoclaves and 0. 5Mtpa into an atmospheric leach circuit. Proven hydrometallurgical processing technology will produce a mixed hydroxide precipitate (MHP) at 39.9% Ni and 2.9% Co containing 2,100tpa cobalt metal and 29,000tpa nickel metal. Power will be generated off-grid using excess steam from the onsite acid plant, which contributes to climate change impact with a Life Cycle Assessment of 11.9kg CO_2 eq. per kg nickel in MHP. The Project DFS has commenced. Goongarrie is part of ARL's Kalgoorlie Nickel Project (KNP), the largest nickel-cobalt project in the developed world providing optionality to develop multiple processing hubs and expand production. Ardea also controls 20km of strike at Kalpini that is highly prospective for primary nickel sulphides with results including 2.72m at 5.42% Ni and 0.85% Cu.

Project Status
Pre Feasibility Study

Offtake available
25%

Min Mine Life (Years)
40

IRR
23% post-tax

Capital Cost
A$3.117b

NPV
A$4.980b post-tax 7%DR

Study Date Jan 2023

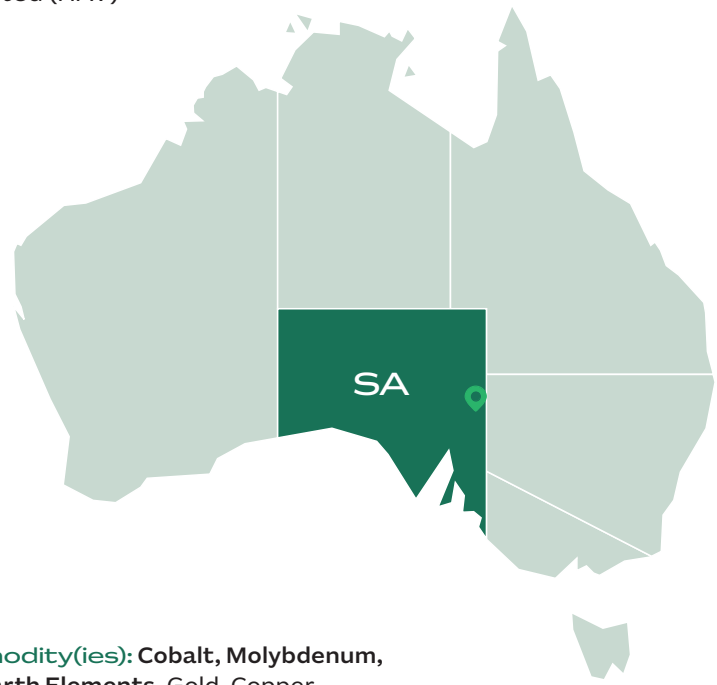
Product & Annual Production Rate

- Mixed hydroxide precipitate @39.9% Ni and 2.9% Co: 145.4ktpa (containing: 29ktpa nickel metal and 2.1ktpa cobalt metal)

*LOM averages, higher in initial years with Year 1 to 5 (post ramp up) production >34ktpa nickel and >3ktpa cobalt.

Current as at September 2024

Havilah Resources Ltd
ASX-listed (HAV)



Commodity(ies): **Cobalt, Molybdenum, Rare Earth Elements,** Gold, Copper

Kalkaroo

Investment summary

Kalkaroo is one of the largest undeveloped open-pit copper-gold-critical minerals deposits in Australia on a CuEq Ore Reserve basis, containing approximately 1.1m tonnes of copper, 3.1m ounces of gold and 23,000 tonnes of cobalt in JORC resources. The orebody is open at depth and along strike and has excellent potential for resource expansion with further drilling. Mining leases, a Native Title mining agreement and comprehensive environmental studies are in place for Kalkaroo. Havilah owns the surrounding pastoral property.

Project description

Kalkaroo is favoured by its proximity to the regional mining centre of Broken Hill with its skilled workforce, the transcontinental railway line and Barrier highway. It is an area that is endowed with abundant solar and wind energy opportunities and substantial groundwater suitable for ore processing purposes. Regional exploration during the past 12 months has advanced several nearby multicommodity copper-critical minerals prospects that could potentially provide additional ore feed for Kalkaroo. Mining is likely to be by conventional open-pit methods. The ore is amenable to standard flotation to produce a high-grade, low impurity copper concentrate and also a by-product cobalt-rich pyrite concentrate. Production of a by-product bastnasite concentrate, high in the more valuable REE's (Nd, Pr, Tb, Yb), is also under study as is recovery of by-product molybdenite.

Mineral Resources first stated Mar-18 (0.4% CuEq cut-off):

Resource Category	Tonnes (Mt)	Copper (%)	Gold (oz)	Cobalt (%)
Measured	97.6	0.50	0.47	–
Indicated	34.9	0.39	0.41	–
Inferred	113.0	0.42	0.33	–
Inferred (cobalt only)	193.3	–	–	0.012
Total	**245.5**	**0.45**	**0.40**	
Contained (kt Cu, Co & koz Au)		**1,097**	**3,105**	**23.2**

Ore Reserves first stated Jun-18:

Reserve Category	Tonnes (Mt)	Copper (%)	Gold (oz)
Proved	90.2	0.48	0.44
Probable	9.9	0.45	0.39
Total	**100.1**	**0.47**	**0.44**
Contained (kt Cu & koz Au)		**474**	**1,407**

Project Status
Pre Feasibility Study

Offtake available
Potentially

Min Mine Life (Years)
20 (based on recent BHP mining optimisation studies)

IRR
Being updated

Capital Cost
Being updated

NPV
Being updated

Product & Annual Production Rate

- Copper (metal and in concentrate): 30,000tpa
- Gold (metal and in concentrate): 72,000oz pa
- Cobalt (in pyrite concentrates): ~500tpa
- REE (in bastnasite concentrate): under study

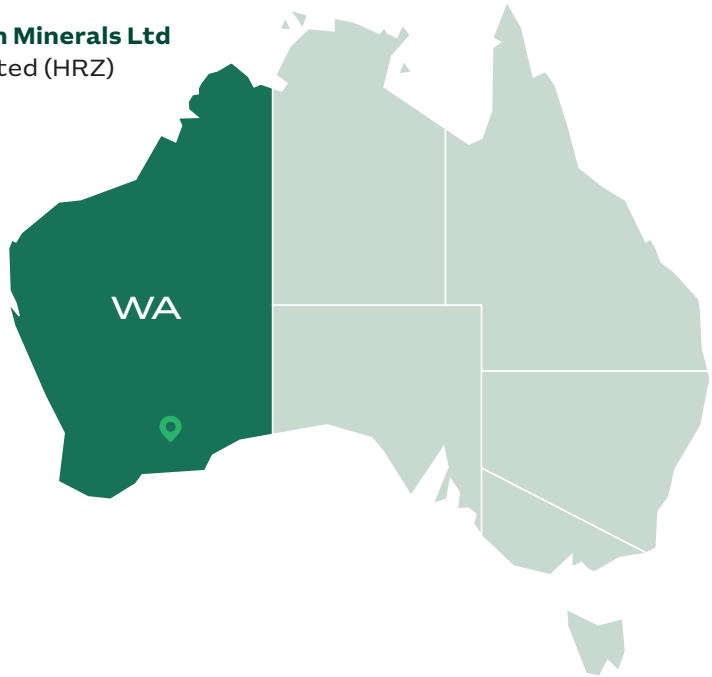
**Estimates only based on the 2019 PFS. Current study outcomes may alter these numbers.*

Study Date Jun 2019

Current as at September 2024

Conico Ltd
ASX-listed (CNJ)

Horizon Minerals Ltd
ASX-listed (HRZ)



Mt Thirsty

Investment summary

The Mt Thirsty Project is seeking to become Australia's first fully integrated cathode precursor project, with a single deposit containing all the necessary elements required to produce cathode precursor: high purity manganese sulphate, cobalt sulphate and nickel sulphate, all of which have a direct application in the manufacturing of batteries. Leveraging off the previously completed Pre Feasibility Study, an updated Scoping Study including a fully integrated cathode precursor and sulphate plant is expected to be completed in mid 2024. Previous environmental and heritage surveys have found no issues that would prevent moving to a mining stage, and the Joint Venture maintains a strong relationship with the local Njadju People.

Project description

The Mt Thirsty Project is focused on open pit mining and extraction of cobalt, nickel, and manganese from a large, flat-lying, shallow, and soft orebody. The Project is located in the heart of the WA mining industry, 150km south of Kalgoorlie and 180km north of the Port of Esperance, and is supported by extensive existing infrastructure (road, rail, power). Following a 146% increase in the Mt Thirsty resource in April 2023, the Joint Venture commenced a Scoping Study. The Scoping Study is evaluating high-pressure acid leaching (HPAL) as the ore processing method, followed by solvent extraction for the production of cathode precursor and sulphate products. This is favoured over atmospheric leaching used in previous studies due to significantly higher metal recovery rates associated with HPAL. HPAL also allows for the recovery of additional metals like scandium and manganese, not previously recovered by atmospheric leaching.

Commodity(ies): **Cobalt, Manganese, Nickel**

Mineral Resources as at 26-Apr-23 (0.25% NiEq cut-off):

Resource Category	Tonnes (Mt)	Ni (%)	Co (%)	Mn (%)
Indicated	30.2	0.51	0.1	0.69
Inferred (North)	4.2	0.43	0.05	0.29
Inferred (Main)	31.9	0.35	0.03	0.24
Total	**66.3**	**0.43**	**0.06**	**0.45**
Contained (Kt)		**283.7**	**40.5**	**297.1**

No Reserve details available

Project Status
Pre Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
Pending Scoping Study update

IRR
Pending Scoping Study update

Capital Cost
Pending Scoping Study update

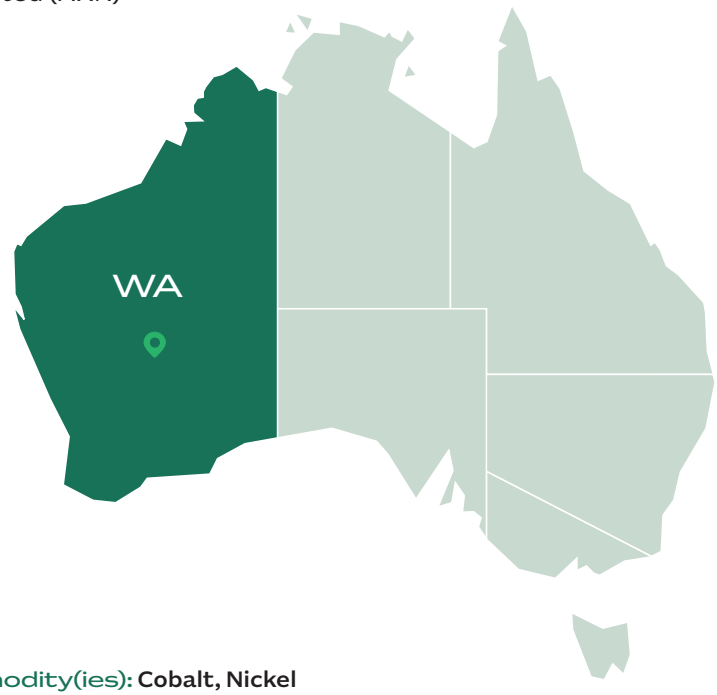
NPV
Pending Scoping Study update

Product & Annual Production Rate
Pending Scoping Study update

Study Date Jan 2020

Current as at September 2024

Alliance Nickel Ltd
ASX-listed (AXN)



Commodity(ies): **Cobalt, Nickel**

Mineral Resources as at Nov-18 (0.8% Ni cut-off):

Resource Category	Tonnes (Mt)	Ni (%)	Co (%)
Measured	17.77	1.07	0.069
Indicated	58.04	1.06	0.073
Inferred	17.59	0.94	0.060
Total	**93.40**	**1.04**	**0.070**
Contained (kt)		**971**	**65**

Ore Reserves as at 2018 (0.5% Ni cut-off):

Reserve Category	Orebody	Tonnes (Mt)	Ni (%)	Co (%)
Probable	Eucalyptus	32.2	0.87	0.05
Probable	Hepi	4.7	0.91	0.06
Probable	Mt Kilkenny	27.9	0.96	0.06
Total	**Total**	**64.9**	**0.91**	**0.06**
Contained (kt)			**592**	**38**

NiWest

Investment summary

Alliance Nickel (AXN) is an emerging integrated battery chemicals producer focused on developing its high grade NiWest Nickel-Cobalt Project, located near Leonora, WA, and adjacent to Glencore's Murrin Murrin Mine. Completion of the NiWest DFS is expected in H2 2024. EPA referral for the Project was submitted in September 2023 and review is underway. The Nyaipa Pirniku People are the Native Title claimant group. Mining tenure required for the project is in good standing. In May 2023, the Company announced a strategic partnership with Stellantis NV, that comprised an equity investment and an offtake agreement for approximately 40% of our future production. In February 2024, the signed a non-binding term sheet with Samsung SDI. Major Project Status awarded May 2024.

Project description

The Project is well serviced with existing infrastructure including rail, established mining towns, arterial bitumen roads, and communications. NiWest will be a low strip (2.0:1) shallow conventional open-pit mine, with approximately 2.6Mtpa run-of-mine ore mined at average grades of 1.05% Ni and 0.07% Co for the first 15 years. There is an opportunity to extend a high-grade profile through potential conversion of Inferred Resources. ROM ore will be heap leached with pregnant leach solution recovered from leaching and neutralised prior to recovery of nickel and cobalt via highly efficient direct solvent extraction (DSX) and crystallisation to produce high-purity (+99.95%) nickel and cobalt sulphate products for the battery market. Process recoveries of 75% for nickel and 80% for cobalt are expected with expected annual production of 90,000 tonnes nickel sulphate and 7,000 tonnes cobalt sulphate.

Project Status
Pre Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
Mining: 20;
Processing: 27

IRR
19.9% post-tax

Capital Cost
A$1,261m

NPV
A$1,587m post-tax ungeared levered 8%DR

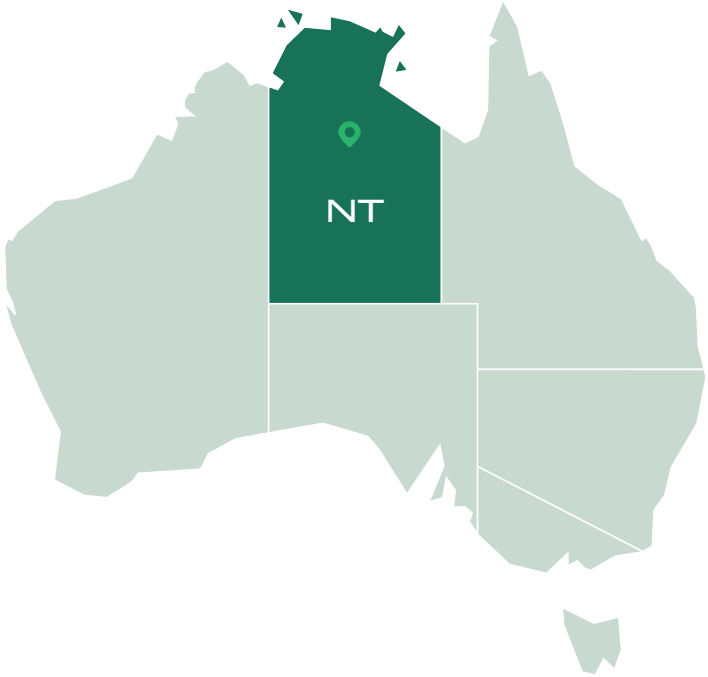
Product & Annual Production Rate

- Nickel sulphate: 90ktpa (hexahydrate 99.95% purity) containing 20ktpa nickel metal
- Cobalt sulphate: 6.8ktpa (hexahydrate >99. 9% purity) containing 1.4ktpa cobalt metal

Study Date Jan 2022

Current as at September 2024

Castile Resources Ltd
ASX-listed (CST)



Rover 1

Investment summary

Castile is developing the Rover 1 Project in the prolific gold-copper mining province of Tennant Creek, NT. Rover 1 is a polymetallic, high-grade iron oxide copper gold (IOCG) deposit that will produce gold dore, copper and cobalt metal and high-grade magnetite. High purity (99%) copper and cobalt metal produced will be available for direct sale to EV and battery manufacturers. The gold dore and 96.5% magnetite product (suitable for green steel) provide further diversity and revenue streams. Since completing the PFS in December 2022, final metallurgical analysis has been completed for pilot plant testing to begin. The Project EIS referral and Terms of Reference has been approved by the NT EPA. The development framework for First Nations approvals has been agreed with the Central Land Council. Rover 1 was awarded Major Project Status by the NT in May 2024. Castile is open to development funding proposals at either project or corporate level in addition to debt and offtake financing agreements.

Project description

Rover 1 will be a high-grade underground mine utilising long hole open stopping with battery electric load and haul vehicles. The magnetite product will be separated, and sulphides floated and oxidised with the solids treated using conventional carbon-in-leach. The pregnant liquor will be treated using EMEW technology to extract copper then cobalt, with all processing carried out on-site in accordance with Castile's strategy of extracting "every dollar of value from every tonne that we mine".
The Rover 1 deposit remains open at depth and there are similar underexplored prospects nearby on Castile's ground.

Commodity(ies): **Cobalt**, Gold, Copper, Iron

Mineral Resources as at Sep-22 (2g/t AuEq cut-off):

Resource Category	Tonnes (Mt)	Gold g/t	Copper (%)	Cobalt (%)	Magnetite (%)
Indicated	3.97	1.83	1.59	0.07	23.6
Inferred	1.61	1.57	1.25	0.07	22.1
Total	**5.58**	**1.76**	**1.49**	**0.07**	**23.2**
Contained		**315.2koz**	**83.2kt**	**4.0kt**	**1,295kt**

Ore Reserves as at Nov-22:

Reserve Category	Tonnes (Mt)	Gold g/t	Copper (%)	Cobalt (%)	Magnetite (%)
Probable	3.11	2.02	1.52	0.07	22.92
Total	**3.11**	**2.02**	**1.52**	**0.07**	**22.92**
Contained		**201.8koz**	**47.4kt**	**2.2 kt**	**713.3kt**

Project Status
Pre Feasibility Study

Offtake available
Yes, in 2006

Min Mine Life (Years)
8

IRR
45. 7% pre-tax;
34.5% post-tax

Capital Cost
A$280.2m

NPV
A$451.7m pre-tax 6.5%DR; A$302.6m posttax 6.5%DR

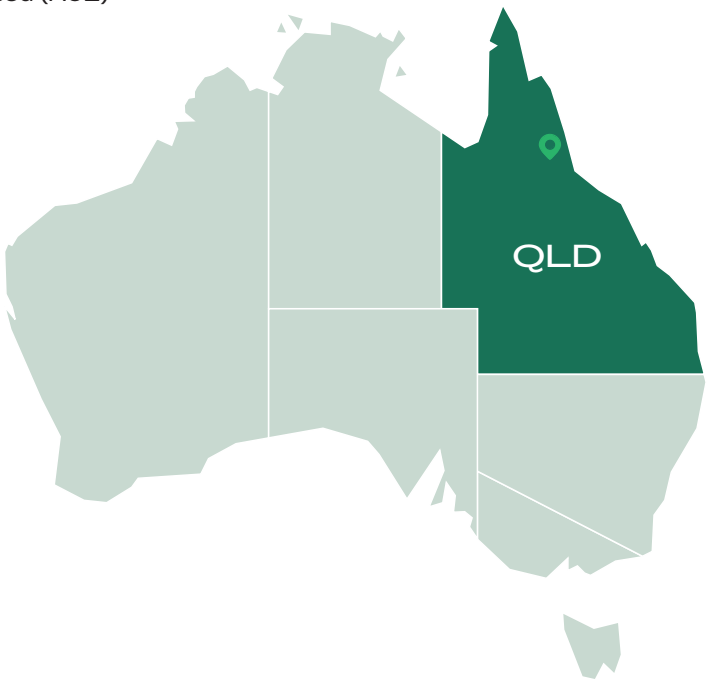
Product & Annual Production Rate
- Cu metal (99%): 6.9ktpa
- Au dore: 28.7kozpa
- Co metal (99%): 0.3ktpa
- Fe_3O_4 (96.5% magnetite): 75.3ktpa

(Steady state annual production rates)

Study Date Jan 2022

Current as at September 2024

Australian Mines Ltd
ASX-listed (AUZ)



Commodity(ies): **Cobalt, Scandium, Nickel**

Mineral Resources as of 30-Sep-21 (0.40-0.55% NiEq cut-off):

Resource Category	Tonnes (Mt)	Nickel (%)	Cobalt (%)
Measured	8.3	0.75	0.09
Indicated	49.2	0.60	0.08
Inferred	18.2	0.54	0.05
Total	**75.7**	**0.60**	**0.08**
Contained (Kt)		**456**	**57**

Ore Reserves as at 30-Sep-21 (0.45% NiEq cut-off):

Reserve Category	Tonnes (Mt)	Nickel (%)	Cobalt (%)	Scandium (ppm)
Proved	8.1	0.72	0.09	44
Probable	49.2	0.55	0.08	33
Total	**57.3**	**0.58**	**0.08**	**35**
Contained (kt)		**332**	**46**	**2**

Sconi

Investment summary

The Sconi nickel-cobalt-scandium project, 100% owned by Australian Mines, has the potential to produce on average, over a 30-year period, 46,800 tonnes of nickel sulphate and 7,000 tonnes cobalt sulphate per annum. The Project has been granted Mining Licenses (ML) and additional extensions to these MLs have been submitted. Australian Mines is actively de-risking the Project by completing the required environmental and heritage studies including applicable land access agreements, the key elements to secure project financing (including both debt and equity capital), for a positive FID. Australian Mines welcomes discussions regarding Project financing and/or offtake arrangements.

Project description

The Project is a world-class, Tier 1 project, producing ethically sourced battery minerals, as well as highpurity scandium oxide. According to an independent study in 2019 by CRU International, the Project is expected to be one of the lowest-cost nickel/cobalt projects in the world. The existing ore reserves are forecast to support a project life in excess of 30 years, with further mineral exploration upside. The Feasibility Study envisages a high-pressure acid leach processing facility to produce a mixed nickel-cobalt hydroxide precipitate (MHP), a proven process used by various MHP operations globally. Subsequently the production of sulphates of nickel and cobalt has been targeted to improve the project economics. Australian Mines is the only mineral resources company certified Carbon Neutral under the Australian Government's Climate Active program and the Sconi project will follow the internationally recognised ISO 14001 Standard for an effective Environmental Management System.

Project Status
Feasibility Study

Offtake available
Yes – option to provide nickel-cobalt MHP offtake to LG Energy Solution for the first 6 years

Min Mine Life (Years)
30

IRR
15% post-tax

Capital Cost
US$974m

NPV
A$817m post-tax 8%DR

Product & Annual Production Rate
Feb-19 Feasibility Study:
- Mixed nickel-cobalt hydroxide precipitate (MHP) @ >38% Ni and >3.8% Co containing: 11,833tpa nickel metal and 1,167tpa cobalt metal
- Scandium oxide: 48tpa

Updated Production Targets (Nov-22):
- Nickel sulphate: 47ktpa
- Cobalt sulphate: 7ktpa
- Scandium oxide: 74ktpa

Study Date Jan 2019

Current as at September 2024

Sunrise Energy Metals Ltd
ASX/TSX-listed (SRL)

Commodity(ies): **Cobalt, Scandium, Nickel**

Mineral Resources as at 28-Sep-20 (0.35% Ni-equivalent cut-off):

Resource Category	Tonnes (Mt)	Co (%)	Ni (%)	Sc (ppm)
Measured	69	0.11	0.65	61
Indicated	89	0.09	0.49	79
Inferred	17	0.10	0.26	289
Total	**177**	**0.10**	**0.53**	**92**
Contained (Kt)		**168**	**935**	**16**

Ore Reserves as at 28-Sep-20:

Reserve Category	Tonnes (Mt)	Co (%)	Ni (%)	Sc (ppm)
Proved	65.4	0.11	0.67	55
Probable	77.9	0.09	0.52	41
Total	**143.2**	**0.10**	**0.59**	**47**
Contained (kt)		**47**	**845**	**7**

Sunrise

Investment summary

Sunrise Energy Metals completed a DFS ("Project Execution Plan") for the Sunrise Project in late 2020. The Project Execution Plan confirmed the Project's status as one of the world's largest and lowest-cost new sources of critical battery materials. The Project is development ready with all technical studies completed and all key permits secured. The Company is in discussions for both investment and long-term offtake with a view to securing a funding package which will facilitate FID. The Company also holds an extensive portfolio of mineral exploration licenses within the Macquarie Arc.

Project description

Located in Central West NSW, the Sunrise Project will be a fully integrated supplier of high-purity nickel and cobalt sulphate for the EV battery supply chain, as well as one of the world's largest producers of scandium oxide. The Project consists of a shallow open-cut mine, a hydrometallurgical processing plant to leach and separate metals and a refinery for production of battery-grade nickel and cobalt sulphate and scandium oxide. Ore reserves support up to 50 years of operations. With approximately A$250m invested to date, the Project is development-ready, with all key permits secured, lowest-quartile operating costs and industryleading emissions performance. An energy supply study has confirmed the Project's electricity requirement can be fully supplied by renewable power. Technical studies have also demonstrated the Project's suitability for incorporation of additional equipment for on-site production of precursor cathode active material and battery black mass recycling.

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
50

IRR
15.4% post-tax

Capital Cost
US$1,826m

NPV
US$1,207m 10%DR

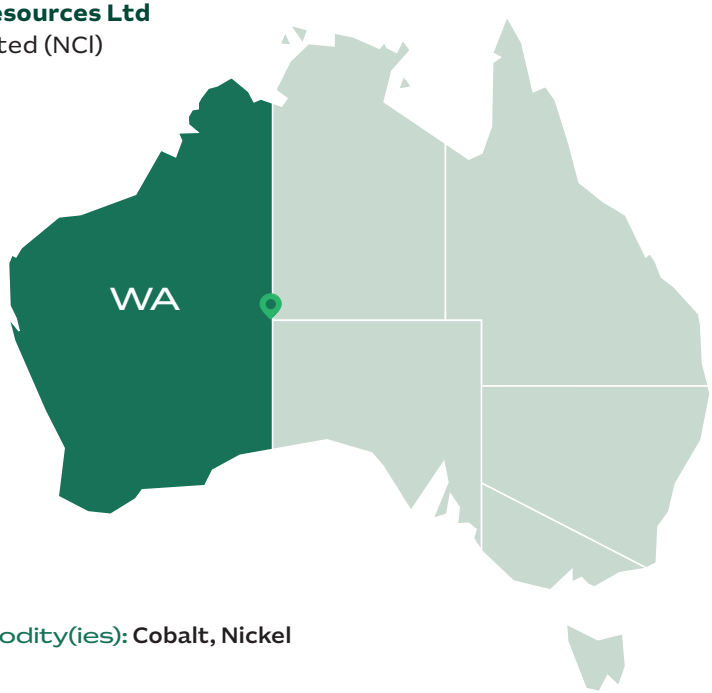
Product & Annual Production Rate
Annual average production years 2-11:

- Nickel sulphate: 96,800tpa (contained Ni metal: 21,300tpa)
- Cobalt sulphate: 21,000tpa (contained Co metal: 4,400tpa)
- Scandium oxide: 18tpa

Study Date Jan 2020

Current as at September 2024

Nico Resources Ltd
ASX-listed (NCI)



Commodity(ies): **Cobalt, Nickel**

Wingellina Mineral Resources as at 30-Jun-16:

Resource Category	Tonnes (Mt)	Ni (%)	Co (%)	Fe_2O_3 (%)
Measured	37.6	0.98	0.07	45.94
Indicated	130.9	0.91	0.07	45.55
Inferred	14.1	0.87	0.06	41.25
Total	**182.6**	**0.92**	**0.07**	**45.30**
Contained (kt)		**1,684**	**132**	

Wingellina Ore Reserves as at 2016:

Reserve Category	Tonnes (Mt)	Ni (%)	Co (%)
Probable	168.4	0.93	0.07
Total	**168.4**	**0.93**	**0.07**
Contained (kt)		**1,561**	**122.6**

The Wingellina Mineral Resource is part of the larger CMP, which has a Mineral Resource inventory containing approximately 2mt of nickel and 154,000 tonnes of cobalt. Financial analysis completed with macro-economic assumptions stated in 22-Dec-22 PFS announcement – "Base Case" assumptions.

Wingellina

Investment summary

Wingellina, Australia's largest undeveloped nickel-cobalt oxide deposit by reserves, stands as a development ready, long-life project. In December 2022, a PFS was completed, demonstrating attractive economics for the Project with an NPV8% of A$3.34b, an 18% IRR and a payback period of under five years. The Project is development ready with EPA approval granted in 2016 and a Native Title Project Development Agreement with the Ng Council registered in 2011. The Company is currently seeking a five-year extension of its EPA approval. Wingellina offers a number of development options, and the Company welcomes discussions with strategic investors and offtake partners alike.

Project description

Wingellina is a world-class nickel-cobalt oxide deposit and part of Nico Resources' Central Musgrave Project (CMP), spanning WA, SA, and NT. Notably, the Project benefits from the A$1.2b in government funding allocated to develop the Outback Way-an essential infrastructure corridor for project access. Low-cost open pit mining operations with a low strip ratio (1.1:1 LOM average) will produce an average of 4.3Mtpa ROM. Wingellina is one of the world's largest 'pure oxide' limonite nickel deposits, ideal for high-pressure acid leaching (HPAL) due to its high iron content and low magnesium grades. Ore will be processed on site to produce a mixed hydroxide precipitate (MHP) at 33% Ni and 3% Co containing ~40,000tpa nickel metal and ~3,000tpa cobalt metal. The Project will use over 90% renewable energy at steady-state operation, aligning with Nico's project design commitment to reducing CO_2 emissions for the life of the operation.

Project Status
Pre Feasibility Study

Offtake available
100%

Min Mine Life (Years)
42

IRR
18% post-tax

Capital Cost
A$2.9b

NPV
A$3.34b 8%

Product & Annual Production Rate
- Nickel-cobalt mixed hydroxide precipitate (33% Ni, 3% Co): 123ktpa (dmt)

Study Date Dec 2022

Current as at September 2024

Tivan Ltd
ASX-listed (TVN)

Speewah

Investment summary

The Speewah Fluorite Project, 100% owned by Tivan, hosts Australia's sole JORC compliant fluorite resource, with a High Grade Resource of 8.6mt@ 22.8% CaF_2 and a Total Resource of 37.3mt@ 9.1% CaF_2. Located in the East Kimberley region, the Project targets production of 97% acid-grade fluorspar ("Acidspar") for Asian offtake markets, commencing Ql 2027. The Project has Mining Leases granted and Tivan has Heritage Protection Agreements in place with the Kimberley Land Council. Tivan has HOAs with Glen Hill Pastoral Aboriginal Corporation and Cambridge Gulf Limited in support of regional collaboration, and a MOU with Pacific Hydro to source renewable power from Ord River Hydro. Baseline environment surveys are well advanced, with Tivan targeting regulatory approvals by Q3 2025. In June 2024, Tivan signed a Strategic Alliance Agreement with Sumitomo Corporation, targeting completion of a binding Joint Venture by end 2024.

Project description

The Speewah Fluorite Project is located 100km south of the Port of Wyndham. A Pre Feasibility Study was completed for the Project in July 2024 based on open-pit mining and on-site processing of 0.8mtpa ore, using a crushing, grinding and flotation flowsheet. Tivan aims to produce Acidspar for export and is evaluating the production of metallurgical grade fluorspar (Metspar) as a by-product. Acidspar is a critical feedstock in semiconductor and electric vehicle battery manufacturing. The Project has a well-defined resource expansion pathway, with an Exploration Target of +1.9-3.9m high grade tonnes. The Speewah site also hosts Australia's largest JORC compliant vanadium titanomagnetite resource. Tivan is committed to robust ESG practices and fostering durable alignment with stakeholders.

Commodity(ies): **Fluorine**

Mineral Resources as at Aug-24 (High Grade Mineral Resource @ 10% CaF_2 cut-off):

Resource Category	HG Resource Tonnes (Mt)	HG Resource CaF_2 (%)
Indicated	5.8	23.2
Inferred	2.8	21.9
Total	**8.6**	**22.8**
Contained (Kt)	**1,950**	**1,950**

No Reserve details available

Project Status
Pre Feasibility Study

Offtake available
100%

Min Mine Life (Years)
10.6

IRR
37.9% pre-tax;
33.2% post-tax

Capital Cost
A$236.3m

NPV
A$480.1m pre-tax 8%DR; A$354.7m post-tax 8%DR

Product & Annual Production Rate
- Acid grade flurospar (97% CaF_2): 140ktpa

Study Date Jul 2024
**Upon completion of binding JV, Sumitomo Corp. will be appointed exclusive distribution agent, with prescribed tonnage reserved for customers of Japan.*

The Total Mineral Resource for the Project is 37 .3Mt @ 9.1 % CaF_2, containing 3,330kt CaF_2.

Current as at September 2024

International Graphite Ltd
ASX-listed (IG6)

Commodity(ies): **Graphite**

Mineral Resources as at 12 September 2023 (2% TGC cut-off): Springdale Project

Resource Category	Tonnes (Mt)	TGC (%)
Indicated	11.5	7.5
Inferred	37.8	6.1
Total	**49.3**	**6.5**
Contained Graphite (Kt)		**3,200**

No Reserve details available

Collie

Investment summary

International Graphite is developing a mine-to-market supply of processed graphite to support the global battery industry. The company has two flagship developments in WA: a downstream processing hub at Collie and a world class deposit at Springdale. Commissioned in 2022, and upgraded in 2024, the Collie pilot plant has successfully produced micronised and spheroidised graphite for customer testing. Construction of a 4,000tpa commercial micronising facility is planned in 2025, when the Company anticipates seeking non diluting construction funding. The plant is located on freehold land in an established industrial estate and permitting is being finalised. Environmental baseline studies have been completed at Springdale and positive discussions have been held with the Wagyl Kiap Southern Noongar Aboriginal Corporation, representing the First Nations Custodians.

Project description

An integrated Scoping Study was released in January 2024, for a Battery Anode Material (BAM) Facility at Collie using feed from the Company's planned mine and concentrator at Springdale. Approximately 0.5Mt ore is expected to be mined from the Springdale open pit, at an average grade of 10.0% TGC, and processed on site via floatation, to produce 47ktpa graphite concentrate (95% TGC). Concentrate will be trucked to Collie and Bunbury and Fremantle Ports. Processing at the planned Collie plant will involve micronising, spheroidising and purification by non-HF chemical leaching, to produce uncoated spheroidised purified graphite (USPG), then carbon coating (roasting) to produce coated spheroidised purified graphite (CSPG) for Lithium-ion batteries. International Graphite has received A$13.2 million in support from Australian Governments and will deliver complete product stewardship from mine to market backed by the highest ESG standards.

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
Subject to feasibility

IRR
Stage 2: 30.5% pre-tax

Capital Cost
Stage 2: A$341m

NPV
Stage 2: A$603m pre-tax 10%DR

Product & Annual Production Rate
Stage 1
- Micronised graphite: 4ktpa

Stage 2
- CSPG (99.95%C): 18.6ktpa
- Micronised graphite by-product: 17ktpa

Study Date Mar 2023
Stage 1 Feasibility Study completed in Mar-23. Stage 2 Scoping Study completed in Jan-24.

Current as at September 2024

Lincoln Minerals Ltd
Lincoln Minerals Ltd

Commodity(ies): **Graphite**

Mineral Resources as at 15-Apr-24 (2% TGC cut-off):

Resource Category	Tonnes (Mt)	TGC (%)
Measured	1.0	11.8
Indicated	4.9	8.8
Inferred	7.0	6.1
Total	**12.8**	**7.6**
Contained (kt)		**973**

The Kookaburra Gully Mineral Resource includes a high-grade Core Total Mineral Resource of 2.9Mt@ 13.6% TGC commencing from surface.

No Reserve details available

Kookaburra Gully

Investment summary

Lincoln is developing its high-grade Kookaburra Graphite Project (KGP) located 35km north of Port Lincoln on SA's Eyre Peninsula. KGP is an advanced-stage, long-life project with pilot plant test work confirming the ability to produce high-quality graphite concentrate for EV battery markets. A "Mine to Battery" Scoping Study examining Purified Spherical Graphite production for use as Battery Anode Material is underway targeting completion in Q3 2024. Lincoln more than doubled its KGP Mineral Resource in April 2024, now the second largest graphite resource on Eyre Peninsula. Initial mining will commence on a granted ML. Native Title has been extinguished and Lincoln has an exploration agreement with the Barngala People. A draft PEPR application submitted in 2017 will be modified and re-submitted. Lincoln welcomes discussions with strategic investors and offtake partners.

Project description

A Feasibility Study on the Kookaburra Gully deposit completed in 2017 was based on shallow, open pit mining of high-grade graphite with on-site processing via floatation producing 35,000tpa graphite concentrate at >95% TGC. The project has easy access to water, renewable power, workforce and transport. In April 2024, Lincoln defined an Updated KGP Total Mineral Resource Estimate of 12.5mt@ 7.6% Total Graphitic Carbon (TGC), including a high-grade core of 2.9mt@ 13.6% TGC from surface, which underpins strong economics. EM surveys indicate likelihood for significant extensions of mineralization with an Exploration Target of 6-126 mt@ 4-16% TGC. An Updated PFS targeting 60,000 to 100,000 tpa graphite concentrate production (>95% TGC) is scheduled for completion in Q4 2024. An Updated Feasibility Study including BAM production is planned in 2025.

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
10

IRR
To be provided by Updated PFS in Q4 2024

Capital Cost
To be provided by Updated PFS in Q4 2024

NPV
To be provided by Updated PFS in Q4 2024

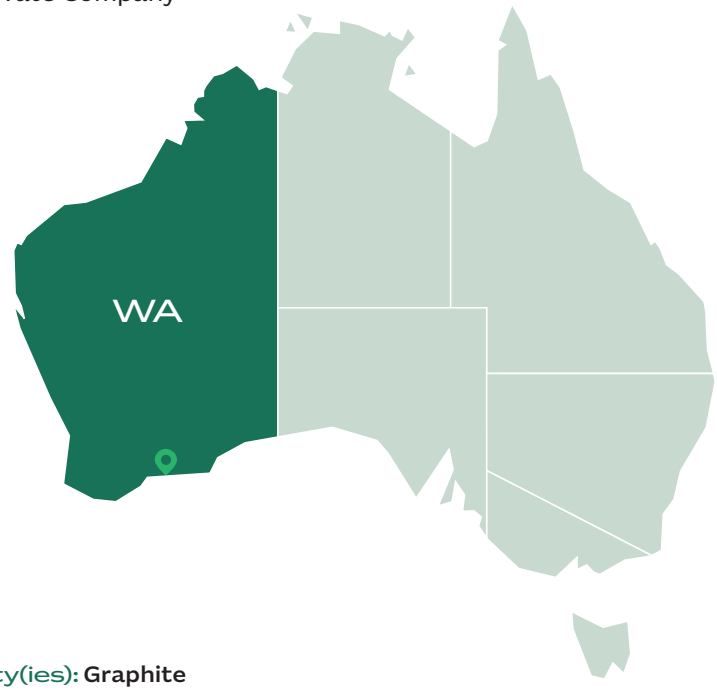
Product & Annual Production Rate
To be provided by Updated PFS in Q4 2024

Study Date Nov 17
Updated KGP Pre-Feasibility Study targeting 60,000 – 100,000 tpa graphite concentrate (>95% TGC) underway targeting completion Q4 2024

Current as at September 2024

Mineral Commodities Ltd
ASX-listed (MRC)

Gold Terrace Pty Ltd
Unlisted Private Company



Munglinup

Investment summary

Mineral Commodities is a global mining and development company focused on the development of high-grade industrial and critical minerals deposits. The Company owns and operates the Skaland Graphite Operation in Norway, the world's highest-grade flake graphite operation and the largest producer in Europe. The Munglinup Graphite Project environmental permits are the only remaining approvals required before commissioning and it is anticipated that the EPA approvals for the project will be completed by mid 2024. Mineral Commodities welcomes discussion regarding financing or offtake and seeks a strategic partner for project equity, JV, or offtake arrangements in both the concentrate and downstream businesses.

Project description

The Munglinup Graphite Project is free-dig, open-pit mining of high-grade graphite mineralisation, located within a granted Mining Lease in WA. ROM ore is processed through a relatively conventional, multi-stage milling and flotation process to produce high-grade graphite concentrates across a range of flake sizes. The resource is open at depth and along strike. The recent EM survey identified 12 new targets with 3,000m resource drilling planned for 2024 to update resource and reserve. MRC is working with partners, including CSIRO and Doral Fused Materials, and has completed a Cooperative Research Centres Project to develop a non-hydrofluoric acid purification process to produce high-purity value-added products from Munglinup concentrate, targeting production of battery anode materials. The Project achieved battery grades (99.95% purity) for spherical graphite with typical recoveries to product of 90%. Pilot plant operations and optimised integrated ore-anode DFS program underway, which will be 50% funded through Australian Government Critical Minerals grant funding.

Commodity(ies): **Graphite**

Mineral Resources as at 8-Jan-20 (5% TGC cut-off):

Resource Category	Tonnes (Mt)	TGC (%)
Indicated	4.5	13.1
Inferred	3.5	11.0
Total	**8.0**	**12.2**
Contained (Kt)		**975**

Ore Reserves as at 8-Jan-20:

Reserve Category	Tonnes (Mt)	TGC (%)
Probable	4.2	12.8
Total	**4.2**	**12.8**
Contained (kt)		**543**

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
14

IRR
30% post-tax

Capital Cost
US$61m

NPV
US$111m post-tax
7%DR

Product & Annual Production Rate
- Flake graphite concentrate: (>95% TGC): 52ktpa

Study Date Jan 2020

Current as at September 2024

Renascor Resources Ltd
ASX-listed (RNU)

Commodity(ies): **Graphite**

Mineral Resources as at Sep-23 (2.3% TGC cut-off):

Resource Category	Tonnes (Mt)	TGC (%)
Measured	16.9	8.6
Indicated	56.2	6.7
Inferred	50.5	6.5
Total	**123.6**	**6.9**
Contained (kt)		**8,500**

Ore Reserve as at Aug-23:

Reserve Category	Tonnes (Mt)	TGC (%)
Proved	16.8	8.2
Probable	45.0	6.6
Total	**61.8**	**7.0**
Contained (kt)		**4,300**

Siviour

Investment summary

Renascor is committed to powering the clean energy transition through the development of its Siviour Battery Anode Material (BAM) Project in South Australia, a vertically integrated graphite mine and manufacturing operation to produce sustainable and ethically sourced battery anode material for the lithium-ion battery market. The Project is in the advanced stages of development with a Definitive Feasibility Study completed in August 2023, the Mining Lease granted in April 2019 and the Program for Environment Protection and Rehabilitation approved in November 2022. The Project has been granted Major Project Status by the Federal Government and has received conditional approval for an A$185 million Loan Facility from Export Finance Australia via the Federal Government's Critical Minerals Facility. Renascor has commenced detailed design, procurement and long lead infrastructure works to minimise the construction period for the planned mining and processing operation. Renascor is considering both additional offtake and investment in the Project.

Project description

The project will combine:

- Shallow open-pit mining of the Siviour graphite deposit on Eyre Peninsula, SA, the largest graphite Reserve outside of Africa and second largest Proven Reserve globally;
- Nearby processing via crushing, grinding, floatation, filering, and drying to produce graphite concentrate at 94% to 95% total graphitic carbon (TGC);
- Processing facility in Bolivar, SA to manufacture purified spherical graphite (PSG) from Siviour concentrate through Renascor's eco-friendly purification process.
- Stage 1 will produce ~75,000tpa graphite concentrate initially for export then, commencing in Year 2, for processing into PSG. Stage 2 expansion, commencing in Year 4, will increase graphite concentrate production to ~150,000tpa and PSG production to ~100,000tpa.

Project Status
Pre Construction

Offtake available
100%

Min Mine Life (Years)
40

IRR
26% post-tax

Capital Cost
Stage 1
Mine and Processing Plant: A$214.5m
PSG Facility: A$394.6m

Stage 2
Mine and Processing Plant: A$173.3m
PSG Facility: A$377.2m
(August 2023)

NPV
A$1.5b post-tax 10%DR

Product & Annual Production Rate

- Graphite concentrate: (94 to 96% TGC): 75,000tpa to 150,000tpa
- Purified spherical graphite: 50,000tpa to 100,000tpa

Study Date Jan 2019

Current as at September 2024

Quantum Graphite Ltd
ASX-listed (QGL)

Commodity(ies): **Graphite**

Mineral Resources as at 18-Nov-21 (3.5% TGC cut-off):

Resource Category	Tonnes (Mt)	TGC (%)
Measured	0.8	15.6
Indicated	4.2	10.4
Inferred	2.2	8.9
Total	**7.2**	**10.5**
Contained (Kt)		**757**

Ore Reserves as at Dec-19 (3.5% TGC cut-off):

Reserve Category	Tonnes (Mt)	TGC (%)
Proved	0.81	11.66
Probable	3.19	11.95
Total	**4.00**	**11.89**
Contained (kt)		**476**

Uley 2 (Stage 1)

Investment summary

Quantum Graphite's (QGL) century-old Uley graphite mine is part of the broader Mikkira Deposit located in SA's Eyre Peninsula, one of the world's largest natural coarse flake graphite deposits. Uley 2 (Stage 1) is the only coarse graphite project which:

- is fully permitted and development ready;
- has decades long history of supplying global manufacturers and historical prequalification of its products;
- has an exclusive arrangement with Sunlands Energy Co. (Sunlands), a leading thermal energy storage technology company, for the refining of Flake Graphite to produce high-purity graphite (HPG 99.99% gC) and the manufacture of thermal energy storage media for the Sunlands long-duration energy storage cells; and
- has a binding offtake agreement with Swiss global metals and minerals trading group MRI Trading AG (MRI) for 100% of the first five years Uley 2 production.

Project description

Quantum's 2019 Uley 2, Stage 1 DFS reconfirmed superior returns achievable from production of high-purity large to extra-large coarse flake products from the historical Uley mines. The Project will process run-of-mine ore via floatation and proprietary sequential polishing sections. QGL's proprietary mechanical process enhances flake graphite recoveries, maximises coarse flake size and achieves very high purities. Subsequently, testwork has demonstrated HPG (99.99% gC) can be produced from Uley flake using the Sunlands proprietary thermal purification process. An updated DFS is underway targeting completion in late 2023 incorporating HPG production which is not included in the 2019 Mining Study economics. The updated DFS will also examine the potential for manufacture of energy storage media.

Project Status
Feasibility Study

Offtake available
50% offtake available; 50% offtake committed to MRI for first 5 years

Min Mine Life (Years)
12 (Stage 1 only)

IRR
41.17% pre-tax

Capital Cost
A$152m – excluding downstream purification facility to produce 99.99% gC (Dec 2023)

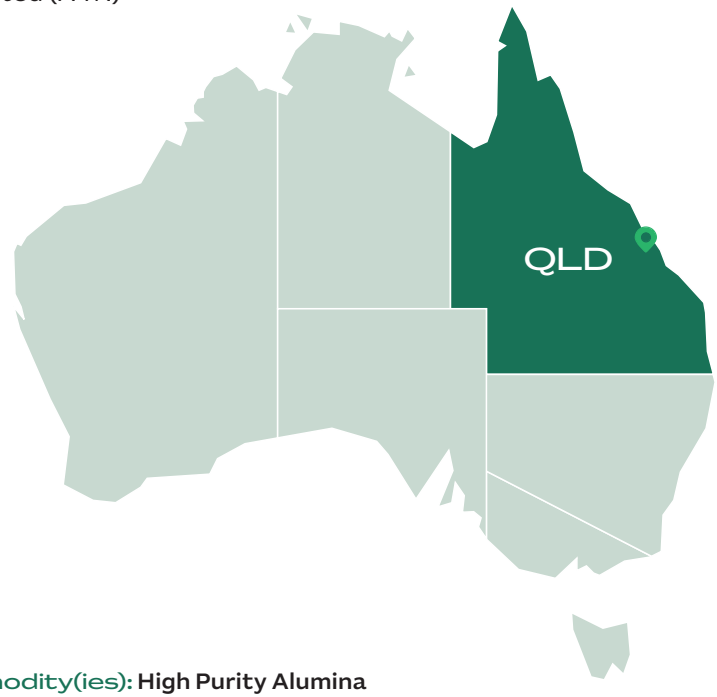
NPV
A$242m pre-tax 8.5%DR

Product & Annual Production Rate
- Graphite concentrate: 100ktpa, comprising:
  - Extra Large Flake +300µm, 97.8% gC,
  - Large Flake -300+150µm, 97.2% gC,
  - Med. Flake -150+75µm, 96.6% gC

Study Date Jan 2019

Current as at September 2024

Alpha HPA Ltd
ASX-listed (A4N)



Commodity(ies): **High Purity Alumina**

Alpha HPA's unique Smart SX purification process can deliver high-purity, low-cost, lowcarbon materials by leveraging the existing industrial infrastructure in the Gladstone region:

- Feedstock: Common industrial feedstock sourced directly from Rio Tinto's alumina refinery in Yarwun (2.5km away).
- Reagents: Sourced directly from Orica Yarwun (adjacent) with binding 10 + 10-year agreements in place.
- By-products: Reagents are recycled on a 100% basis and returned to Orica for further processing.

Alpha HPA's process can match or exceed best-in-class purity across its entire product range.

HPA First

Investment summary

With growing global demand for high-purity aluminium in LED lighting, synthetic sapphire, semiconductors, and lithium-ion battery industries, Alpha HPA is committed to supplying the world's most pure and sustainable ultra-high purity aluminium materials to market. Stage 1 of the HPA First Project, located in Gladstone, is currently in small-scale commercial production of Al-nitrates, high purity alumina powders, and pellets; high-purity boehmite (alumina-hydroxide); high-purity aluminium precursors (Al-sulphates). As of May 2024, Alpha HPA commences production of synthetic sapphire from its high-purity alumina pellets under a new business arm, Alpha Sapphire. Construction of the Stage 2 of the HPA First Project will commence mid-2024, and plans large-scale commercial production to commence in 2026 of the products above. The Company has been awarded up to A$112.2m in grants from the Commonwealth and Queensland Government and up to $400m in loans from Government agencies (NAIF and EFA). All key approvals in place. Now accepting individual offtake contracts.

Project description

- Alpha HPA's premium products are based on its unique Smart SX purification process, which represents the world's first application of solvent extraction purification technology for aluminium. The process is disruptive at a number of levels, including:
- Low carbon: By using a common industrial feedstock, recycling all reagents and using 100% renewable energy, the carbon footprint of high purity alumina production is reduced by ~70% compared to other processes.
- Low cost: The front end of the purification process is 100% wet-chemical and operates at atmospheric temperatures and pressures with a 100% reagent recycle.
- Flexibility: Able to produce a full range of high-purity aluminium materials from a single process.

Project Status
Operating

Offtake available
Yes

Min Mine Life (Years)
N/A

IRR
N/A

Capital Cost
Stage 1: A$50m (fully funded);
Stage 2: A$520m

NPV
N/A

Study Date May 2024
Stage 1: Operating since Nov-22;
Stage 2: Feasibility Study completed, and FID reached May-24.

Product & Annual Production Rate

Stage 1
- Al-nitrates+ Al-sulphate: +300tpa
- High purity alumina + boehmites: 10-15tpa
- Ultra sapphire (Al_2O_3)™: 7tpa low carbon synthetic sapphire

Stage 2
- Al-nitrates, Al-sulphate, high purity alumina and high purity

Current as at September 2024

Cadoux Ltd
ASX-listed (CCM)

Commodity(ies): **High Purity Alumina**

Cadoux Kaolin Mineral Resources as at Apr-22 (20% Al_2O_3 cut-off grade):

Resource Category	Tonnes (Mt)	Al_2O_3 (ppm)
Measured	0.481	23.56
Indicated	5.743	23.56
Inferred	5.046	21.45
Total	**11.269**	**22.51**
Contained (kt)		**2,537.0**

Cadoux Kaolin Ore Reserves as at Apr-22:

Reserve Category	Tonnes (Mt)	Al_2O_3 (ppm)
Proved	0.290	24.9
Probable	2.914	24.8
Total	**3.205**	**24.8**
Contained (kt)		**795.0**

HPA Project

Investment summary

Cadoux aspires to be a prominent global supplier of premium critical minerals, initially prioritising high purity alumina (HPA) for the burgeoning EV industry and other advanced applications. The first-phase small-scale production plant, underpinned by established technology, is near the finalisation of its preliminary design. In Q1 2024, we will initiate the permitting process for production facilities in the Kwinana-Rockingham Strategic Industrial Area. The Mining Lease, environmental and heritage approvals have been granted over the Cadoux mine site. Cadoux's Customer Centre of Excellence will ensure product customisation, facilitating product qualification and sales. Cadoux is open to engaging with interested parties to explore development endeavours further.

Project description

Cadoux has developed a groundbreaking, cost-effective, and environmentally-sensitive method for manufacturing premium HPA. The Company's vision is to revolutionise HPA production by leveraging its highgrade free-dig open-pit Cadoux Resource in a hydrochloric acid leach and precipitation process. Through a comprehensive end-to-end business model, encompassing the entire supply chain from mining to market, Cadoux ensures complete traceability and origin authenticity of the HPA we produce. This commitment guarantees the highest product quality and ESG certification for customers. Building upon the latest technological advancements and industry insights, in May 2023, Cadoux unveiled an updated development plan, that redefines and streamlines the Company's journey to bring a small-scale production plant (1,000tpa) to life. This strategic pivot serves to further mitigate risks and optimise the path to commercialisation. The revised plan melds the advantages of a high-volume commercial plant by adopting a staged and scalable development approach that leads Cadoux towards full-scale production.

Project Status
Feasibility Study

Offtake available
No (currently finalising offtake committments)

Min Mine Life (Years)
50

IRR
55% post-tax

Capital Cost
US$202m

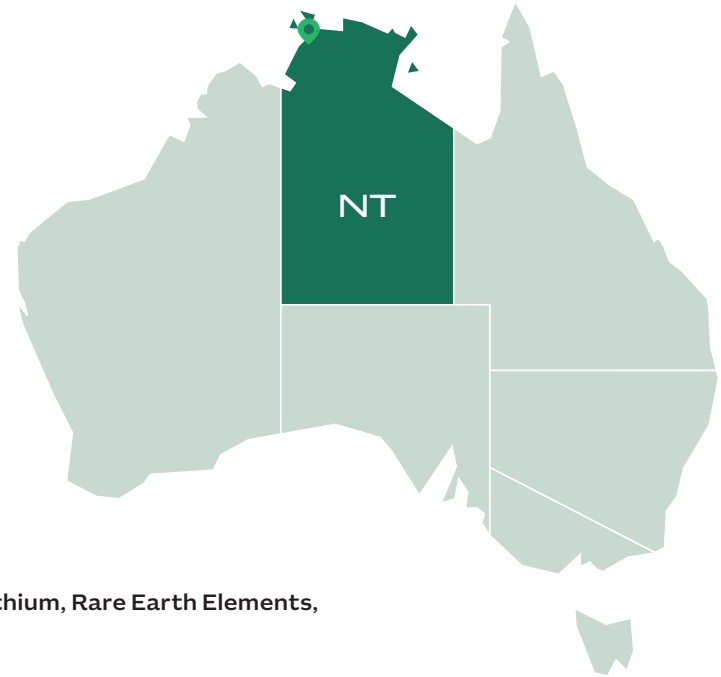
NPV
US$1.014b post-tax 8%DR

Product & Annual Production Rate
- Premium quality high purity alumina (>99.995% Al_2O_3): 10,000tpa

Study Date Jan 2021

Current as at September 2024

Core Lithium Ltd
ASX-listed (CXO)



Commodity(ies): **Lithium, Rare Earth Elements,** Uranium, Gold

Finniss

Investment summary

Core Lithium is an Australian mining and exploration company that commenced spodumene concentrate production from its Finniss operation (Grants open pit mine and dense media separation (DMS) plant) in early 2023. The BP33 underground project, located approximately 5km from the Grants open pit mine, is the second mine proposed to be developed at Finniss. A $45-50m BP33 early works program commenced on BP33 in late-2023, including site establishment, a box-cut development and water management infrastructure. In June 2024, the Finniss operation (Grants open pit mine, DMS and BP33 project) was placed on care and maintenance due to a significant downturn in lithium prices. Core remains in a strong financial position with no debt and can rapidly restart production with minimal capital expenditure when lithium market conditions are supportive.

Project description

The Finniss operation located near Darwin, includes Grants, BP33, Carlton, and several exploration targets. The Grants open pit mine and DMS were in production from early-2023 until June 2024, when the operation was placed in care and maintenance. An updated BP33 Feasibility Study largely completed in late-2023, is currently being updated to incorporate updated mineral resources, alternative processing and project cost options in the context of a continuing low-price environment. This is being done in conjunction with restart studies underway for Grants. The FY24 Ore Reserves update is planned for release in September 2024. The Finniss Operation produced 97kt of Spodumene Concentrate and 66kt Lithium Fines during FY24 and recorded record production in the June 2024 Quarter.

Total Finniss Project*[1] Mineral Resources as at 11-Apr-24 (0.5% Li_2O cut-off):

Resource Category	Tonnes (Mt)	Li_2O (ppm)
Measured	6.33	1.41
Indicated	21.6	1.30
Inferred	20.3	1.18
Total	**48.2**	**1.26**
Contained (Kt)		**412.1**

Total Finniss Project Ore Reserves as at 30-Jun-23*[2]:

Reserve Category	Open Pit*[3]		Underground*[4, 2]		Total (OP + UG)	
	Tonnes (Mt)	Li_2O (%)	Tonnes (%)	Li_2O (%)	Tonnes (Mt)	Li_2O (%)
Proved	1.7	1.4	3.7	1.3	5.4	1.4
Probable	1.4	1.3	3.8	1.2	5.2	1.3
Total	**3.1**	**1.3**	**7.5**	**1.3**	**10.6**	**1.3**
Contained (kt)		**42.0**		**99.8**		**141.8**

*1 Includes Grants, BP33, Carlton, Hang Gong, Lees, Booths, An Hoy, Sandras, Penfolds and Bilatos deposits.
*2 BP33 Resources as at 16-Oct-23 have not yet been incorporated into the Ore Reserves.
*3 Open Pit Ore Reserves include Grants and Hang Gong deposits.
*4 Underground Ore Reserves include Grants, BP33 and Carlton Deposits.

Project Status
Pre Feasibility Study

Offtake available
Yes – when mine restarts production

Min Mine Life (Years)
N/A

IRR
N/A

Capital Cost
N/A

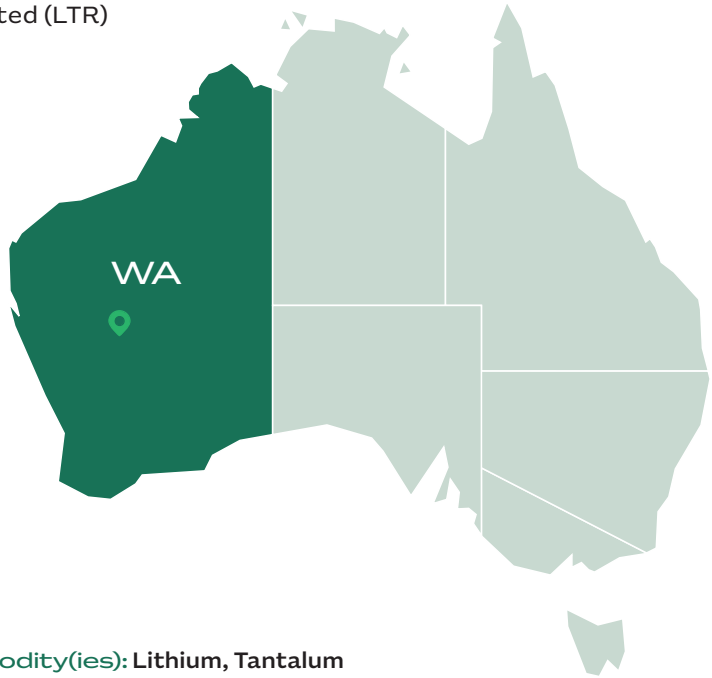
NPV
N/A

Product & Annual Production Rate
- Spodumene concentrate: N/A (currently on Care and Maintenance)

Study Date Jan 2020

Current as at September 2024

Liontown Resources Ltd
ASX-listed (LTR)



Commodity(ies): **Lithium, Tantalum**

Mineral Resources as at 30-Jun-23 (0.55% Li_2O cut-off):

Resource Category	Tonnes (Mt)	Li2O (%)	Ta_2O_5 (%)
Measured	20	1.3	145
Indicated	109	1.4	130
Inferred	27	1.3	113
Total	**156**	**1.4**	**130**

Ore Reserves as at Nov-21 (Open Pit: 0.5% Li_2O cut-off, Underground; 0.7 - 1.2% cut-off):

Reserve Category	Tonnes (Mt)	Au (%)	Sb (ppm)
Probable (Underground)	65.4	1.3	119
Total (Underground)	**65.4**	**1.3**	**119**
Proved (Open Pit)	2.7	1.3	141
Probable (Open Pit)	0.5	0.9	148
Total (Open Pit)	**3.2**	**1.2**	**142**
Total	**68.5**	**1.3**	**120**

Kathleen Valley

Investment summary

Kathleen Valley is a hard-rock lithium project with world-class scale and economics, located in a Tier 1 mining district. First production of approximately 500,000tpa of 6% lithium bearing spodumene concentrate is expected from mid 2024, with planned expansion to approximately 700,000tpa. As an independent, Australian-owned company, Liontown is funded (with some support from Australian Government lenders Clean Energy Finance Corporation and Export Finance Australia) to deliver Kathleen Valley into production and will deliver US Inflation Reduction Act-compliant material to Tier 1 customers. Liontown is progressing studies into downstream processing options to convert spodumene concentrate into higher grade outputs. The Company is ideally positioned to be a fully integrated lithium producer to capture long-term value from mine to end-use in the EV market. Kathleen Valley will also produce tantalum pentoxide, a valuable critical mineral used in electronic components, high-strength alloys, and optics manufacturing.

Project description

Mining occurs predominately underground, before undergoing on-site crushing, grinding, and flotation to produce a 6% spodumene concentrate over a 23-year mine life. The deposit is open at depth. The Project will be powered by more than 60% renewable energy generation from start-up and is expected to have the largest off-grid wind-solar-battery storage capacity of any mining project in Australia. The underground mining approach, allowing direct access to higher grade mineralisation, while minimising waste rock movement and environmental footprint, is a further example of the real action being taken by Liontown to deliver on its ESG objectives. The Project is also being delivered in meaningful partnership with the Tjiwarl Traditional Owners.

Project Status
Construction

Offtake available
Majority contracted. ~10% spodumene available for spot sale.

Min Mine Life (Years)
23

IRR
57% post-tax

Capital Cost
A$951m*

NPV
A$4.2b post-tax 8%DR

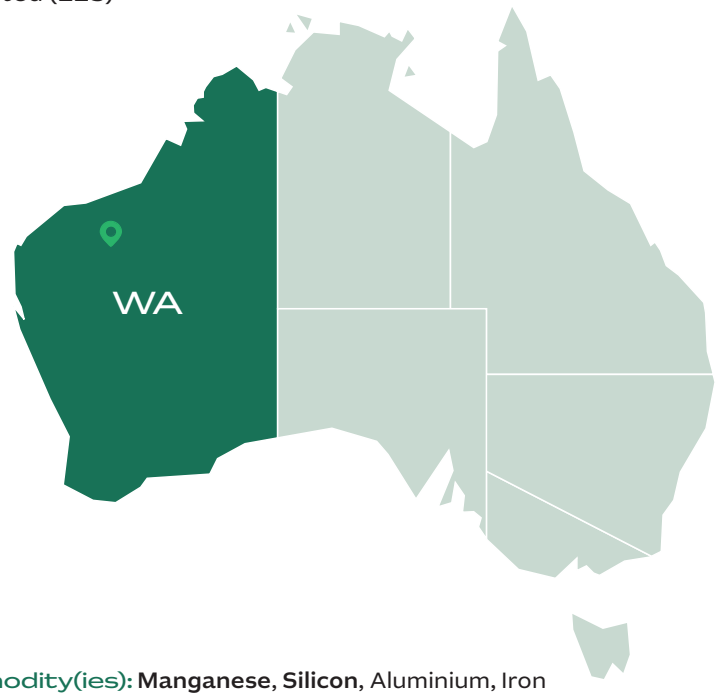
Product & Annual Production Rate
Initial Production from Mid- 2024:
- Spodumene concentrate (6% Li_2O): 500,000tpa

Planned Expansion:
- Spodumene concentrate (6% Li_2O): 700,000tpa

Study Date Jan 2021
**29-Sep-23 Kathleen Valley Project Update*

Current as at September 2024

Element 25 Ltd
ASX-listed (E25)



Commodity(ies): **Manganese, Silicon**, Aluminium, Iron

Mineral Resources as at 30-Jun-23 (7% Mn cut-off (Measured and Indicated), 8% Mn cut-off (Inferred)):

Resource Category	Tonnes (Mt)	Mn (%)	Si (%)	Fe (%)	Al (%)
Measured	14.1	11.4	20.6	11.7	5.7
Indicated	40.8	10.0	20.9	11.0	5.8
Inferred	206.0	9.8	20.8	11.4	5.9
Total	**260.9**	**9.9**	**20.8**	**11.4**	**5.9**
Contained (Kt)		**25.9**	**54.3**	**29.6**	**15.3**

Ore Reserves as at 30-Jun-23:

Reserve Category	Tonnes (Mt)	Mn g/t
Proved	13.0	11.1
Probable	36.2	10.1
Total	**49.2**	**10.2**
Contained (kt)		**5.0**

Butcherbird

Investment summary

Element 25 (E25)'s Butcherbird manganese mine hosts Australia's largest onshore manganese resource with >260Mt in JORC Resources. E25 is developing the first EV lithium-ion battery grade high-purity manganese sulphate monohydrate (HPMSM) facility in the US in partnership with Stellantis and General Motors. Further processing facilities are planned for Asia, the EU and other battery manufacturing hotspots. The US facility has been issued with an Air Permit, with construction expected to commence in 2024 and commissioning expected in 2026, subject to completion of financing. All facilities will process secure, ethical manganese supply from E25's Butcherbird Mine.

Project description

Butcherbird has installed processing capacity of ~250ktpa of medium grade concentrate for use in manganese alloys. Production was suspended following the Butcherbird Feasibility Study (Jan-2024). E25 has commenced a mine expansion programme with FEED activities underway to increase concentrate production to ~1.2Mtpa, sufficient to produce ~850ktpa of HPMSM, a critical raw material for EV batteries. The expansion is on track for completion in 2025, subject to financing and approvals. E25 has advanced financing discussions with NAIF and continues through the review process. E25's manganese concentrate is ideal for conversion into HPMSM and the large Butcherbird Mineral Resource will ensure long-term, secure manganese supply to E25's HPMSM refineries. The US HPMSM refinery in Louisiana will be designed for 130ktpa of HPMSM for US EV supply chains using E25 proprietary technology (patents pending). Major milestones achieved include offtake due diligence and acceptance testing, site selection and permitting. The schedule remains on track with early construction works planned for early 2025, subject to completion of financing.

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
42

Study Date Jan 2023

HPMSM Feasibility Study (Apr-23) based on 130,000tpa HPMSM from 2 trains with manganese concentrate supplied at arm's length market price. Economic results exclude mine and concentrator

IRR
HMSM: 29% pre-tax; Butcherbird Expansion: 113% pre-tax

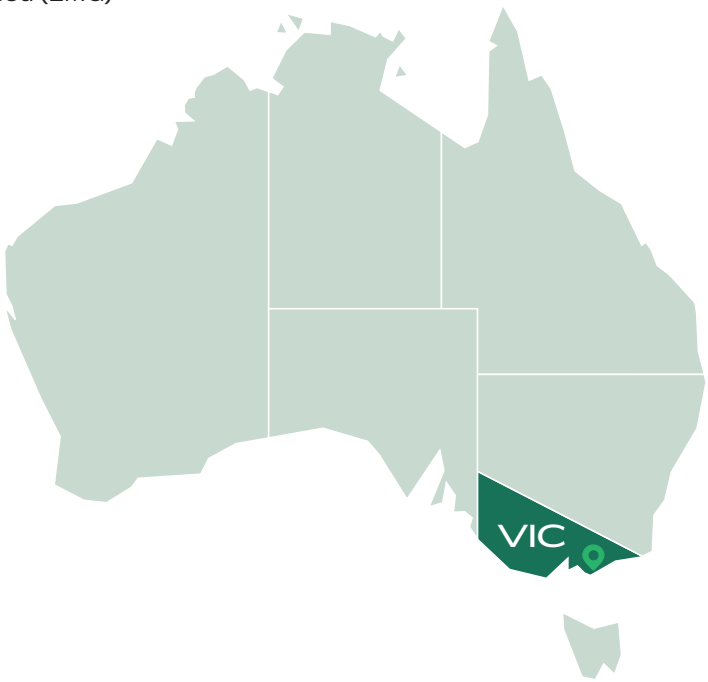
Capital Cost
HPMSM: US$289m for Train 1. Additional US$187m for Train 2; Butcherbird Expansion

NPV
HPMSM: US$1,662m pretax real 8%DR; Butcherbird Expansion: A$228m pre-tax 8%DR

Product & Annual Production Rate
- HPMSM (battery grade 99.99% purity): 65,000tpa expanding to 130,000tpa with the addition of a second train.
- Manganese concentrate (30-3% Mn): ~1.1Mtpa

Current as at September 2024

Latrobe Magnesium
ASX-listed (LMG)



Commodity(ies): **Magnesium**

1,000tpa Demonstration Plant and 10,000tpa Australian Commercial Plant: Based upon initial estimates from Yallourn of both the fly ash in landfill and the fly ash to be produced before closure, there is approximately 7m tonnes of fly ash at a 10% magnesium content. This resource would allow LMG to produce up to 700,000 tonnes of magnesium and operate a plant with a capacity of 10,000tpa magnesium for 70 years. For its 100,000tpa plant LMG has secured a supply agreement for 600,000tpa for 20 years (total of 12m tonnes) of ferro nickel slag (33% MgO, 9% Fe_2O_5 and 55% SiO_2) to be supplied from New Caledonia on an FOB basis by Societe Le Nickel, one of the world's largest ferro nickel producers. There is in excess of 28m tonnes of ferro nickel slag on the island and in excess of 20 smelters in the Southeast Asian region that produce similar slag.

Latrobe Magnesium Project

Investment summary

Latrobe Magnesium is constructing its 1,000tpa magnesium Demonstration Plant in the Latrobe Valley, VIC. The first hydromet stage has been completed and fully commissioned producing MgO in April 2024. Stage 2 will produce magnesium metal is on target for completion in 2024 Q4. Following successful commissioning, LMG plans to build its 10,000tpa plus magnesium Australian Commercial Plant. EPA and council approvals for the 10,000tpa plant are expected by the end of 2024. During 2023, LMG continued development studies on its 100,000tpa magnesium International Mega-Plant planned to be built in Sarawak, Malaysia. LMG welcomes discussions on investment and offtake for the commercial plants.

Project description

LMG has developed a unique hydrometallurgical process to process fly ash and ferro nickel slag into magnesium and other valuable products. The process will recycle 100% of these wastes. LMG owns an Ilha site in the Latrobe Valley where it will build both the 1,000tpa Demonstration Plant and the 10,000tpa Australian Commercial Plant processing Yallourn power station brown coal fly ash. The power station will produce enough fly ash before it closes in 2028 to supply a 10,000tpa plant for 20 years. LMG is also doing work with GHD on the landfill fly ash resource in 2024. During 2023, LMG finalised a PFS on development of a 100,000tpa magnesium International Mega-Plant in Sarawak, Malaysia which will process ferro nickel slag to be supplied from New Caledonia using hydro power. The LMG project is at the forefront of environmental benefit – by recycling plant waste, avoiding landfill, and producing 80% lower CO_2 emissions than the industry average.

Project Status
Construction

Offtake available
Yes (for the 100,000tpa plant

Min Mine Life (Years)
20

IRR
N/A

Capital Cost
N/A

NPV
N/A

Product & Annual Production Rate

Demonstration Plant:
- Magnesium metal (99.9% purity): 1,000tpa

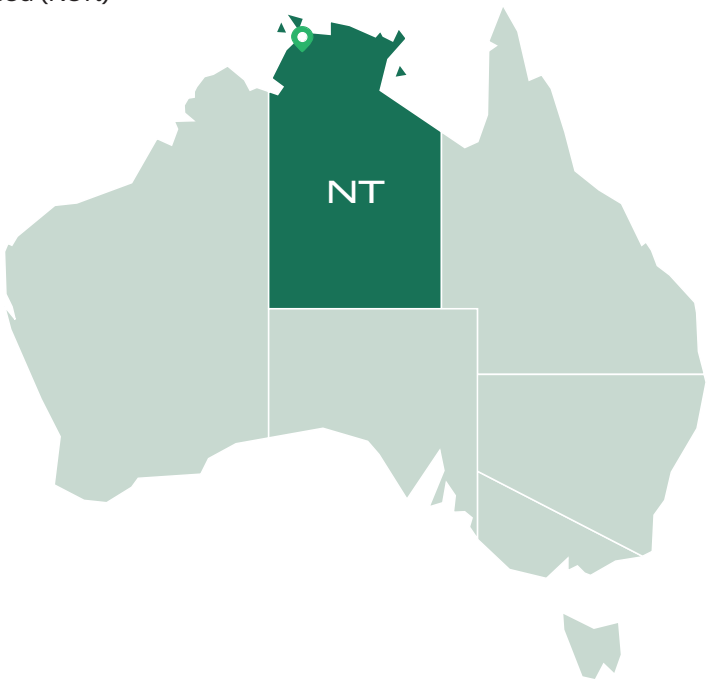
Australian Commercial Plant:
- Magnesium metal (99.9% purity): 10,000tpa

International Mega Plant:
- Magnesium metal (99.9% purity): 100,000tpa

Study Date Jun 2023
Demonstration Plant: Construction (Stage 2); Australian Commercial Plant: Feasibility Study planned; International Mega Plant: PFS.

Current as at September 2024

Korab Resources Ltd
ASX-listed (KOR)



Commodity(ies): **Magnesium**

Mineral Resources as at 16-Jul-07 (40% MgO cut-off):

Resource Category	Tonnes (Mt)	MgO (%)
Measured	0.0	0.00
Indicated	12.2	43.1
Inferred	4.4	43.6
Total	**16.6**	**43.2**
Contained Magnesium metal (Kt)		**4,329**

No Reserve details available

Winchester

Investment summary

In March 2022, Korab announced results of its Scoping Study into production of 50,000tpa magnesium metal from magnesium carbonate ore mined at Winchester which showed a pre-tax NPV12% of approximately A$1b. No environmental approvals have yet been secured for the Winchester Project which is located wholly within freehold land. Korab will protect any heritage, anthropological, and sacred sites. In May 2022, Korab received a Letter of Intent from Speira GmbH for purchase of magnesium metal, with commercial terms yet to be agreed. Other offtake and financing discussions are also underway. Korab welcomes discussions on additional offtake, partnerships or financing.

Project description

As per its 2018 Feasibility Study, in the initial stage of development, Korab plans to develop the Winchester Project as a quarry producing DSO magnesium carbonate rock to be crushed, screened, and sorted on-site, prior to transport to the Darwin Port for export. As Stage 2 of development, part of the production is planned to be sold as unprocessed DSO magnesium carbonate rock, and part is planned be processed off-site into magnesium oxide in the form of caustic calcined magnesia (CCM), and dead burned magnesia (DBM). Off-site processing is expected to be undertaken by means of toll-treatment in kilns owned by third parties, which would not require additional capital investment. As Stage 3, Korab plans to build a magnesium metal production plant to produce 50,000tpa of high-purity magnesium metal. Most of the energy needs can be supplied by two solar farms (10MW and 12.5MW) located within 1km of the project.

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
15

Study Date Mar 2018 Feasibility Studies for Stage 1 & 2 completed in 2018. Scoping Study for Stage 3 completed in 2022.

IRR
Stage 1: Magnesium carbonate DSO only – 160% post-tax; Stage 3: Maqnesium metal – ~55% post-tax

Capital Cost
Stage 1: Magnesium carbonate DSO only – A$2.4m-A$2.5m; Stage 3: Maqnesium metal – $410M

NPV
Stage 1: Magnesium carbonate DSO only – A$184m post-tax 12%DR; Stage 3: Magnesium metal – A$1000m pre-tax 12% DR

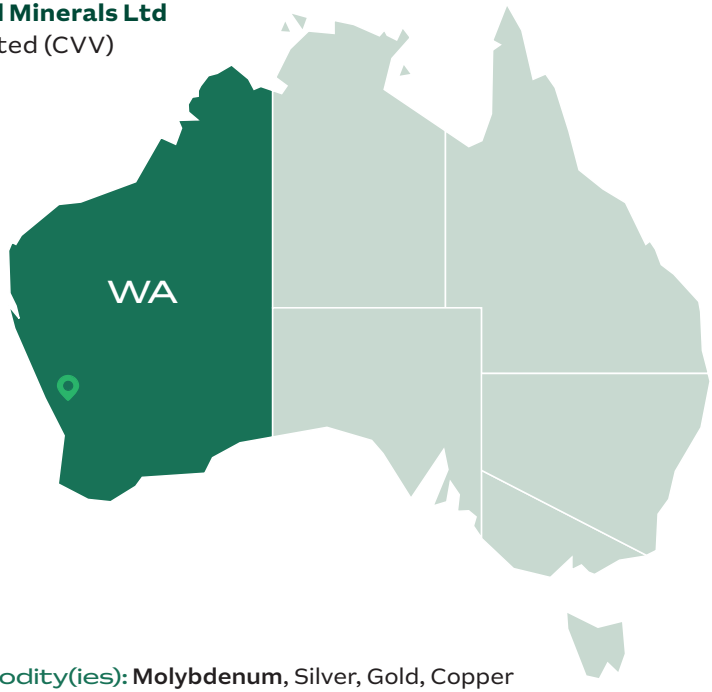
Product & Annual Production Rate

Stage 1:
- Magnesium carbonate DSO: 600,000-1,000,000tpa

Stage 2:
- Magnesium oxides DBM: 75,000-150,000tpa, CCM: 150,000-300,000tpa
- Magnesium carbonate DSO: 300,000-600,000tpa

Current as at September 2024

Caravel Minerals Ltd
ASX-listed (CVV)



Commodity(ies): **Molybdenum**, Silver, Gold, Copper

Mineral Resource as at Nov-23:

Resource Category	Ag and Au			Cu and Mo		
	Tonnes (Mt)	Ag (g/t)	Au (g/t)	Tonnes (Mt)	Cu %	Mo (g/t)
Measured		0.00	0.00	155.00	0.26	64.00
Indicated	681.00	1.20	0.02	544.00	0.24	46.00
Inferred	574.00	1.00	0.02	578.00	0.23	44.00
Total	**1,255.00**	**1.10**	**0.02**	**1,277.00**	**0.24**	**47.00**
Contained metal (kt)		**46,300**			**3032.5**	

Ore Reserves as at Jul-22 (based on Nov-21 Mineral Resource Estimate):

Reserve Category	Tonnes (Mt)	Cu (%)
Proved	105.4	0.27
Probable	478.0	0.24
Total	**583.4**	**0.24**
Contained (kt)		**1,420**

Note: 0.10% Cu cut-off, appropriate rounding applied

Caravel Copper Project

Investment summary

Caravel is Australia's largest undeveloped copper project with a Mineral Resource of >3m tonnes of contained copper plus >60,000 tonnes of molybdenum, and significant gold and silver content. The Project is progressing a Feasibility Study in CY2024 ahead of a development decision mid 2025. Key workstreams required to finalise the Feasibility Study include access to groundwater and grid power, land option agreements, and state approvals. The Project is based on proven, simple open-pit bulk mining, and processing techniques that create strong financial margins via low operating costs and large-scale production. The Company is focused on de-risking the Project ahead of FID and welcomes discussion with interested parties regarding investment and offtake.

Project description

Located within 150km of Perth, WA, the Project will produce ~65,000tpa of copper and significant precious metals as a high-quality bulk concentrate, plus ~800tpa of molybdenum metal as a by-product bulk concentrate. The Project has relatively simple mining and metallurgical process, which along with access to excellent infrastructure and a world-class mining workforce, attractive social-economic-political environment and sound ESG credentials all contribute to a low-risk operation for 25+ years. A large amount of study work has been completed since 2019, including two Scoping Studies and a PFS. Geological resource estimation and mine planning, metallurgical processing test work and design, environmental and heritage surveys, and community and Traditional Owners consultation are all well advanced. Engineering and infrastructure studies are underway for the Feasibility Study completion in 2024. The Company is negotiating several strategic partnering agreements with world-class equipment suppliers, technology developers, and service providers to further de-risk the Project.

Project Status
Pre Feasibility Study

Offtake available
Molybdenum 30%; Copper 30%; Precious Metals 100% (Year 1)

Min Mine Life (Years)
25

IRR
21% pre-tax

Capital Cost
A$1.676m

NPV
A$2.0b pre-tax 7%DR*

Product & Annual Production Rate
- Copper: ~65,000tpa (as 25% Cu in sulphide concentrate + precious metals)
- Molybdenum: ~800tpa (as 50% Mo in ferro-molybdenum concentrate)

Study Date Jan 2023
**DR & USD 4.001b Cu, 0.72 USD/AUD*

Current as at September 2024

Avebury

Avebury (Operating) Pty Ltd
Unlisted Private Company

Commodity(ies): **Cobalt, Nickel, Arsenic**

Investment summary

The Avebury Nickel Mine (Avebury) is owned by Avebury (Operating) Pty Ltd, currently in receivership. The receivership is currently subject to a Deed of Company Arrangement (DOCA) with Hartree Partners (USbased) as pending owner (seeking Foreign Investment Review Board approval). Avebury is seeking a funded partner to assist in re-starting production from the fully permitted, operational ready mine and concentrator on Care and Maintenance, to produce nickel concentrate for the battery market, powered by 100% hydroelectric power.

Project description

Avebury is located approximately 8km west of Zeehan in Western Tasmania. It is interpreted to be a hydrothermal Ni-sulfide type deposit. Although rare they can be a significant source of Ni, they may contain additional critical mineral resources, such as cobalt, PGEs, bismuth and antimony. Underground mining commenced in 2006, utilising a combination of transverse and longitudinal stoping. Ore is processed in an onsite concentrator via crushing, grinding, floatation and thickening with capacity to process 0. 9Mtpa ROM ore, producing 38,000tpa nickel concentrate (17-20% Ni) which is trucked to the Port of Burnie for export. The mine was placed on Care and Maintenance in 2009 after the global financial crisis and restarted again in 2022 after being acquired by Mallee Resources Ltd. In February 2024, declining global nickel prices forced Avebury to be placed on Care and Maintenance again. The mine has produced 1.34Mt of Ore at 0.9% Ni, processed on-site, yielding 9,077 tonnes of nickel in concentrate.

Mineral Resources as at Mar-24 (0.4% Ni cut-off):

Resource Category	Tonnes (Mt)	Ni (%)	Co (%)	As (%)
Measured	11.1	0.77	0.02	0.04
Indicated	10.5	0.72	0.02	0.03
Inferred	13.0	0.74	0.01	0.03
Total	**34.6**	**0.74**	**0.02**	**0.03**
Contained (Kt)		**256,000**	**5,400**	**11,000**

Ore Reserves as at 30-Jun-23:

Reserve Category	Tonnes (Mt)	Ni (%)	Co (%)	As (%)
Probable	6.43	1.02	0.02	0.04
Total	**6.43**	**1.02**	**0.03**	**0.04**
Contained (kt)		**66,000**	**1,700**	**2,300**

Project Status
Care and Maintenance

Offtake available
Yes (when production restarts)

Min Mine Life (Years)
209

IRR
N/A

Capital Cost
N/A

NPV
N/A

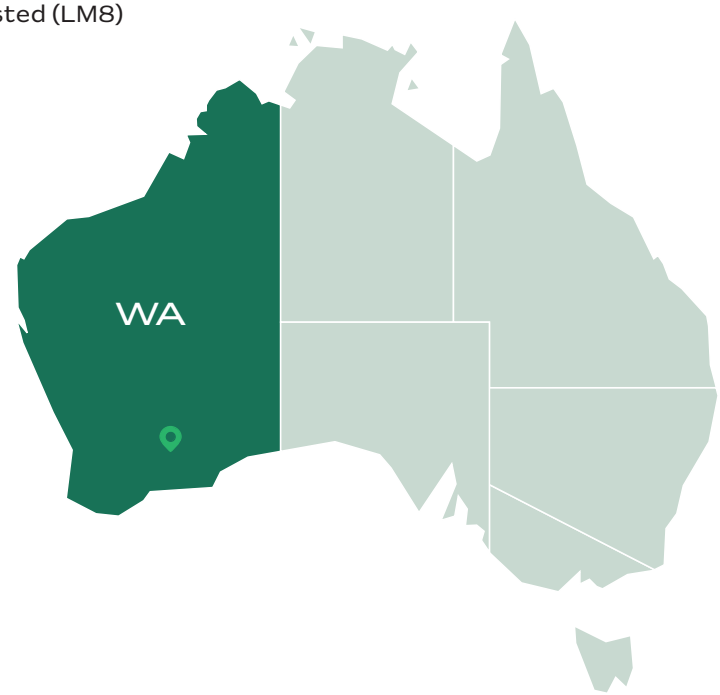
Product & Annual Production Rate

- Nickel concentrate (20% NiS): 38,000tpa before the mine went into Care and Maintenance in February 2024 (currently no production)

Study Date Jan 2022

Current as at September 2024

Lunnon Metals Ltd
ASX-listed (LM8)



Commodity(ies): **Cobalt, Platinum Group Elements, Nickel**, Gold, Copper

Baker Mineral Resources as at 11-Jun-24 (>1% Ni cut-off):

Resource Category	Tonnes (Mt)	Ni (%)	Cu (%)	Co (%)	As (ppm)	Al (%)
Measured	0.110	3.4	0.28	0.07	9	3.27
Indicated	0.622	3.7	0.31	0.07	81	3.68
Inferred	0.298	2.4	0.15	0.05	8	3.67
Total	**1.030**	**3.3**	**0.26**	**0.06**	**53**	**3,420**
Contained (Kt)		**33.7**	**2.6**	**0.66**		

Baker Ore Reserves as at May-23:

Reserve Category	Tonnes (Mt)	Ni (%)	Cu (%)	Co (%)	Pd (ppm)	Pt (%)	As (%)
Probable	0.612	2.86	0.24	0.052	0.49	0.20	110
Total	**0.612**	**2.86**	**0.24**	**0.052**	**0.49**	**0.20**	**110**
Contained (kt)		**17.5**	**1.5**	**0.32**	**0.30**	**0.12**	

Kambalda

Investment summary

The Baker nickel sulphide deposit is the most advanced asset within Lunnon's Kambalda Nickel Project (KNP). The KNP has a global MRE of 4.2Mt@ 2.7% Ni (113Kt contained nickel). The very high-grade of these assets makes the project robust at current nickel prices. All KNP deposits are located on granted Mining Leases which pre-date Native Title legislation. Although not a requirement, a mining rights agreement with the Ngadju People is close to settlement. No further environmental or other major approvals are required. Following the closure of BHP's Kambalda Concentrator in July 2024, no current processing facility is available for the project and Lunnon is open to collaboration on construction of a new concentrator.

Project description

The KNP is located in Kambalda, Australia's best endowed nickel sulphide belt, and is serviced by excellent transport links. A PFS completed in May 2023 on underground mining at Baker, delineated a ~210,000tpa high-grade nickel sulphide project within 350m of surface. The PFS was based on processing ore at BHP's Kambalda Concentrator to produce nickel concentrate containing ~4, l00tpa nickel. Metallurgical testwork demonstrates a clean, high-grade nickel sulphide concentrate, with excellent by-product credits and characteristics for downstream smelters (high Fe: MgO ratio), minimal deleterious elements and low carbon intensities. Underground mining in an area already rich in surface infrastructure after 60 years of historical production results in limited environmental disturbance. An updated KNP PFS is underway based on mining Foster and Baker deposits targeting 400,000tpa ore production. Lunnon has discovered over 74kt of nickel since listing in June 2021, highlighting the world-class discovery credentials of the Kambalda nickel district.

Project Status
Pre Feasibility Study

Offtake available
100% (Subject to BHP Nickel West's right of first refusal. In light of closure of Nickel West, it is considered likely that BHP will not pre-empt and will elect to receive 1% NSR)

Min Mine Life (Years)
4 (Based on initial Ore Reserve)

IRR
219% post-tax

Capital Cost
A$18.6m

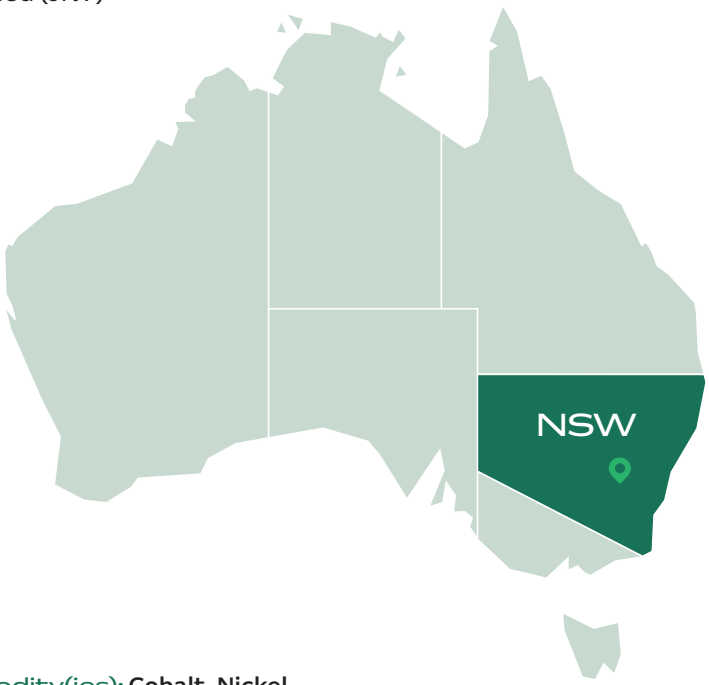
NPV
A$164m pre-tax
8 %DR

Product & Annual Production Rate
- Nickel concentrate (14.6% Ni): 28,000tpa

Study Date May 2023
Updated PFS underway including Foster and Baker deposits (due Q4 2024).

Current as at September 2024

Jervois Global Ltd
ASX-listed (JRV)



Commodity(ies): **Cobalt, Nickel**

Mineral Resources as at Jun-18 (0.5% Ni cut-off):

Resource Category	Tonnes (Mt)	Ni (%)	Co (%)	Mg (%)	Fe (%)	Al (%)
Indicated	3.2	0.67	0.04	5.15	15.7	3.27
Inferred	90.1	0.63	0.05	7.82	15.5	3.68
Total	**93.3**	**0.63**	**0.05**	**7.73**	**15.5**	**3.67**
Contained (Kt)		**589**	**46**	**7,211**	**14,468**	**3,420**

No Reserve details available

Nico Young

Investment summary

The Nico Young battery minerals project is located amongst existing infrastructure near the town of Young, NSW, Australia. Nico Young consists of two shallow and flat lying nickel-cobalt laterite deposits, Ardnaree and Thuddungra. In 2019, a Canadian National Institute 43-101 Preliminary Economic Assessment (PEA) and Australian JORC PFS were completed on the Project. The Project is on hold pending a sale or third-party project financing. Development Consent granted under the Environmental Planning and Assessment Act 1979 is required and includes an Environmental Impact Study which is anticipated to be completed over 18 months. There is no known Native Title, national parks, cultural or state heritage areas on the Project. Jervois welcomes discussion on acquisition or investment in the Nico Young project.

Project description

The PEA and PFS confirmed the technical and commercial viability of an open cut mine operation, with an initial mine life of 20 years, mining 3.0Mtpa nickel and cobalt laterite ore and on-site processing via heap leaching to produce an intermediate mixed hydroxide product (MHP) then refined through to battery grade nickel and cobalt sulphate. Since 1998, Jervois has invested over A$20m in drilling, environmental and technical studies. A drilling campaign was conducted in March 2023 with the intent to increase the proportion of mineralisation in the Indicated category from the Inferred category across the Ardnaree deposit. Samples are currently being stored at the Jervois warehouse in Young and are ready for transport for analysis.

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
20

IRR
16.9% nominal pre-tax

Capital Cost
US$779m

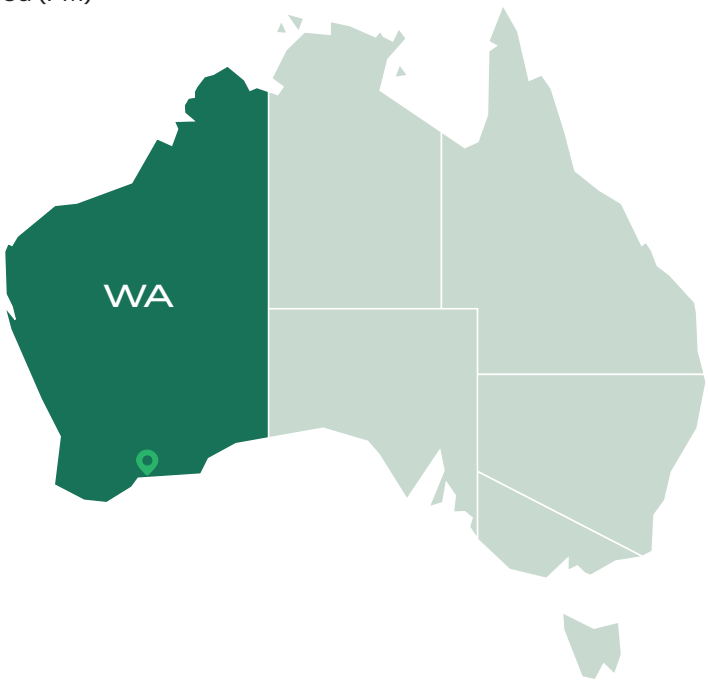
NPV
US$341m nominal pre-tax 8%DR

Product & Annual Production Rate
- Nickel sulphate and cobalt sulphide (containing 15,000tpa Ni and 1,350tpa Co respectively)

Study Date Apr 2019

Current as at September 2024

First Quantum Minerals Ltd
TSX-listed (FM)



Commodity(ies): **Cobalt, Nickel**

Mineral Resources as at 31-Dec-23 (cut-off grade 0.3% Ni):

Resource Category	Tonnes (Mt)	Ni (%)	Co (%)	Fe (%)	Al (%)	Mg (%)
Measured	95.0	0.57	0.03	12.54	1.35	4.01
Indicated	118.1	0.55	0.03	12.33	1.67	4.70
Inferred	68.2	0.52	0.02	11.79	2.36	4.95
Total Meas. Plus Ind.	**213.0**	**0.56**	**0.03**	**12.42**	**1.53**	**4.40**
Contained (Kt)		**1,192.8**	**63.9**	**26,454.6**	**3,258.9**	**9,372**

Ore Reserves as at 31-Dec-23:

Reserve Category	Tonnes (Mt)	Ni (%)	Co (%)	Ca (%)	Mg (%)
Proved	97.9	0.56	0.03	1.6	4.5
Probable	85.3	0.56	0.03	1.4	3.7
Total	**183.2**	**0.56**	**0.03**	**1.5**	**4.1**
Contained (kt)		**1,025.9**	**55.0**	**2,748.0**	**7,511.2**

Ravensthorpe

Investment summary

First Quantum Minerals (FQM) has a global portfolio of operating assets and is one of the world's top producers of copper. The company has significant interests in nickel projects, including its Ravensthorpe Nickel Operation (RNO) in Western Australia. In addition to these critical minerals, FQM also produces cobalt as a by-products during nickel extraction. In May 2024, RNO was placed into a care and maintenance process due to weak nickel prices and high operating costs. This was a strategic decision to preserve future value for the company rather than processing and selling nickel at a loss.

Project description

RNO is situated 550km southeast of Perth. It lies 35km east of Ravensthorpe along the South Coast Highway, readily accessible by an all-weather road. The mineral rights are primarily held by FQM Australia Nickel Pty Ltd; owned 75.7% by the company and 24.3% by South Korean steelmaker POSCO. RNO's mining licenses cover 338 square km of land containing nickel laterite deposits over Archean Ultramafic rocks in the Ravensthorpe Greenstone Belt. Nickel and cobalt are concentrated in weathered lateritic regolith, forming horizontally defined deposits. RNO holds all necessary permits for operation, with recent amendments to environmental review processes to reduce impact and improve regulatory compliance. Operations involve mining in open pits. Ore is processed in a beneficiation plant which includes a scrubbing and screening process. A combination of pressure acid leach and atmospheric leach, precipitation and filtration is used to produce a mixed hydroxide precipitate (MHP) product. MHP is transported by road to the port of Esperance and Fremantle.

Project Status
Care and Maintenance

Offtake available
60% (once operations restart)

Min Mine Life (Years)
17

IRR
N/A

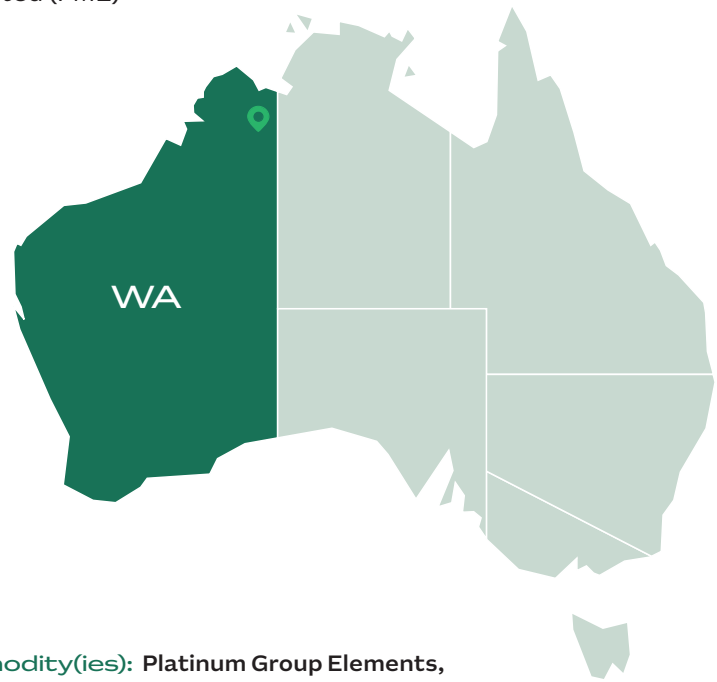
Capital Cost
N/A

NPV
N/A

Product & Annual Production Rate
- Mixed hydroxide precipitate (MHP) (23% to 25% Ni, 0.8% to 0.9% Co): 115,000tpa

Current as at September 2024

Future Metals NL
ASX-listed (FME)



Commodity(ies): **Platinum Group Elements, Nickel**, Gold

Panton

Investment summary

Panton is the highest-grade platinum group element (PGE) deposit in Australia and will support a long-life, expandable project on granted mining leases. The deposit hosts a resource mix that supports the growing demand for catalytic convertors, hydrogen electrolysers and fuel cells, batteries and ferrochrome. Located in the top-tier jurisdiction of WA, the Project offers a significant opportunity for diversification of PGM supply away from Russia and South Africa. Future Metals has a heritage protection agreement in place and permitting is advanced for the Project stage given prior environmental approvals. Future Metals is open to discussions with funding & offtake partners who can assist in the financing and development of the project.

Project description

Panton is located in close proximity to a sealed highway, airstrips, and deep-water port. The Project has been substantially de-risked with 20+ years of drilling and test work programs. A BFS was completed on the Project in 2003 and updated in 2011 based on a high-grade, low capital and long mine life operation. Future Metals acquired the project in 2021 and is expeditiously progressing Panton towards production. Future Metals has finalized a new Scoping Study focused on an initial high-grade predominantly underground mine and on-site processing of over 1Mtpa of ore via flotation to produce saleable PGM & chromite concentrates. Further on-site hydrometallurgical processing options are being explored. The Company plans to progress towards an Updated BFS following delivery of the Scoping Study.

Mineral Resources as at Oct-23 (Reef: No cut-off, High Grade Dunite: 1.4g/t PdEq cut-off, Bulk Dunite: 0.90 g/t PdEq cut-off):

Resource Category	Tonnes (Mt)	Palladium (g/t)	Platinum (g/t)	Gold (g/t)	Chromite (%)	Nickel (%)
Reef						
Indicated	4.5	2.6	2.4	0.4	14.0	0.25
Inferred	6.3	2.9	2.6	0.3	15.0	0.28
Total – Reef	**10.8**	**2.8**	**2.5**	**0.4**	**14.6**	**0.27**
Total – High Grade Dunite	**26.4**	**0.6**	**0.6**	**0.1**	**2.3**	**0.21**
Total – Bulk Dunite	**55.7**	**0.4**	**0.3**	**0.1**	**1.2**	**0.18**
Grand Total	**92.9**	**0.7**	**0.7**	**0.1**	**3.1**	**0.20**
Contained Total		**2,158koz**	**1,951koz**	**403koz**	**2.8Mt**	**185kt**

No Reserve details available

Note: The total High Grade Dunite and Total Bulk Dunite Resources above comprise of a mix of Indicated and Inferred Mineral Resources.

Project Status
Scoping Study

Offtake available
Yes

Min Mine Life (Years)
9

IRR
21% post-tax

Capital Cost
A$267m

NPV
A$250m pre-tax 8% DR; A$153m post-tax 8%DR

Product & Annual Production Rate

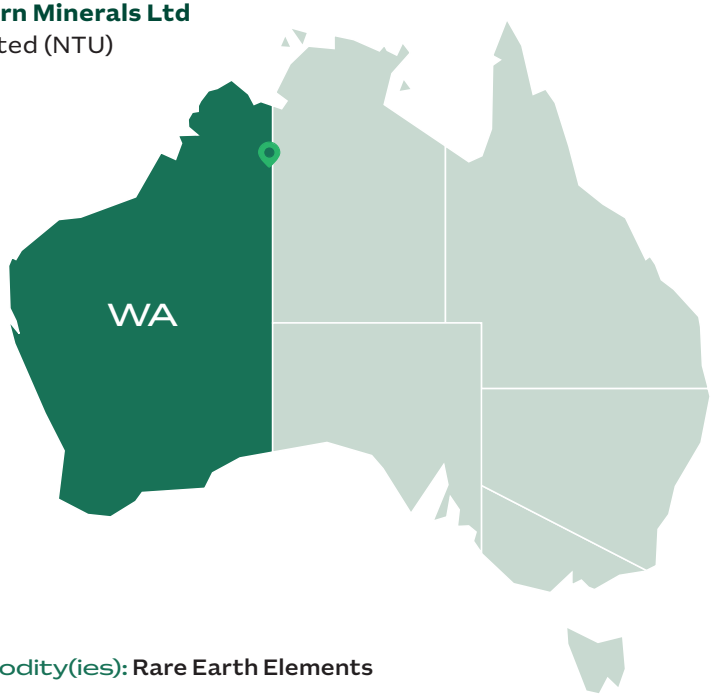
- Bulk PGE-Ni concentrate: (40-50g/t Pd, 30-40g/t Pt, 3% Ni): ~45ktpa (containing over 117koz pa PGE and 1,200t Ni pa for initial underground only project)*
- Chromite concentrate (40-42% Cr_2O_3): 135ktpa*

**Preliminary estimates*

Study Date Dec 2023

Current as at September 2024

Northern Minerals Ltd
ASX-listed (NTU)



Commodity(ies): **Rare Earth Elements**

Browns Range

Investment summary

Northern Minerals is focused on becoming a principal supplier of ethically produced dysprosium and terbium. All primary approvals required to progress through to FID are in place along with a co-existence agreement with the Jaru Traditional Owners. Northern Minerals has entered into a supply agreement with Iluka Resources covering 100% of planned production over the initial 8+ year mine life. Iluka is also providing a conditional funding package through a series of proposed investments in Northern Minerals. The Company is progressing towards FID and welcomes discussions regarding further financing for project construction.

Project description

The Browns Range Heavy Rare Earths Project is set to be the first significant producer of dysprosium and terbium-containing REE concentrate outside of China, and is understood to be the highest-grade dysprosium and terbium resource in Australia. The Project is located ~160 km southeast of Halls Creek in the east Kimberley region of WA. A DFS is underway based on mining the Wolverine deposit, delivering ore to a beneficiation plant at Browns Range to produce a concentrate containing ~25% TREO for supply to Iluka. The processing flowsheet is well-understood based on three years of pilot plant operations. Draft DFS completed Q1 2024, targeting final DFS completion in Q4 2024 prior to FID anticipated in Q1 2025, and project commissioning targeted in 2027. Exceptionally high-grade assays returned from drilling completed in Q1 2024 designed to increase Wolverine Indicated Mineral Resource targeting a Probable Ore Reserve. Significant exploration scope exists to develop adjacent deposits also abundant in heavy REE.

Wolverine Mineral Resources as at 10-Oct-22 (0.15% TREO cut-off):

Resource Category	Tonnes (Mt)	TREO (%)	Dy_2O_3 (kg/t)	Y_2O_3 (kg/t)	Tb_4O_7 (kg/t)	HREO (%)
Measured	0.14	0.70	0.61	3.99	0.09	88
Indicated	3.24	0.95	0.83	5.53	0.12	89
Inferred	3.05	0.98	0.84	5.68	0.13	89
Total	**6.44**	**0.96**	**0.83**	**5.57**	**0.12**	**89**
Contained (Kt)		**61**	**5**	**36**	**1**	**55**

Browns Range Total Mineral Resources as at 10 October 2022 (0.15% TREO cut-off):

Reserve Category	Tonnes (Mt)	TREO (%)	Dy_2O_3 (kg/t)	Y_2O_3 (kg/t)	Tb_4O_7 (kg/t)	HREO (%)
Measured	0.14	0.7	0.61	3.99	0.09	89
Indicated	4.9	0.78	0.67	4.46	0.1	87
Inferred	5.76	0.73	0.62	4.22	0.09	89
Total	**10.81**	**0.76**	**0.64**	**4.33**	**0.09**	**88**
Contained (Kt)		**82**	**7**	**47**	**1**	**72**

Note: The Wolverine Deposit Mineral Resource is a sub-set of the Browns Range Total Mineral Resource stated above. These figures are not additive.

Project Status
Feasibility Study

Offtake available
Supply agreement in place with Iluka covering the initial 8+ year mine life up to 5,500 tpa TREO in xenotime concentrate and 30,500 t TREO in total

Min Mine Life (Years)
8

IRR
N/A until completion of DFS

Capital Cost
A$617m (as at Q1 2024; excluding financing costs)

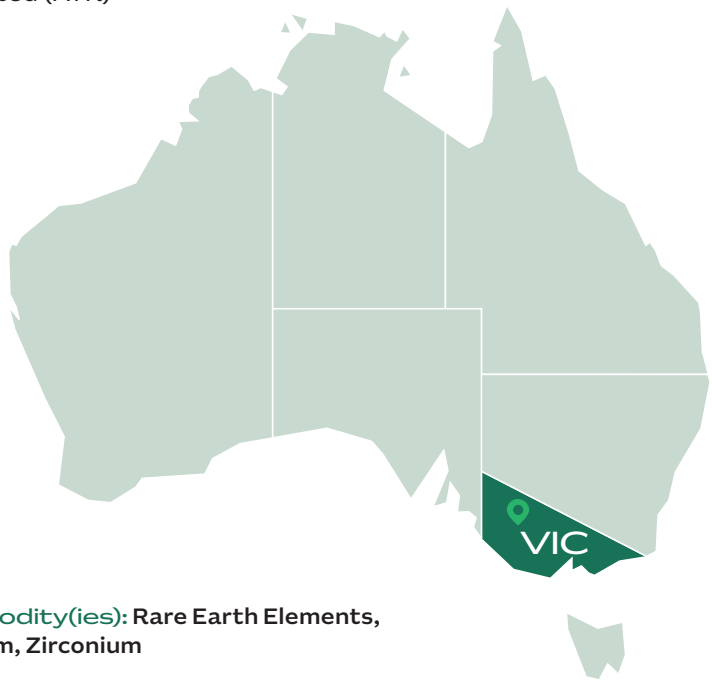
NPV
N/A until completion of DFS

Product & Annual Production Rate
- REE concentrate (~25% TREO): 18,800tpa (containing 4,700tpa TREO and 400tpa Dy_2O_3)

Study Date Jan 2015
2015 Feasibility Study based on production of RE carbonate. Targeting DFS completion in Q4 2024.

Current as at September 2024

Astron Corporation Ltd
ASX-listed (ATR)



Commodity(ies): **Rare Earth Elements, Titanium, Zirconium**

Mineral Resources as at 1 December 2022 (1% cut-off):

Resource Category	Tonnes (Mt)	HM (%)	Zircon (%)	Rutile/ Anatase (%)	Ilmenite (%)	Leucoxene (%)	Monazite (%)
Measured	579	4.6	18	8	25	22	1.9
Indicated	1,232	4.5	17	8	31	18	2
Inferred	822	4.7	18	9	33	17	2
Total	**2,634**	**4.6**	**18**	**8**	**31**	**18**	**2**
Contained (Kt)		**121,164**	**21,810**	**9,693**	**37,561**	**21,810**	**2,423**

Ore Reserves as at 1 December 2022:

Reserve Category	Tonnes (Mt)	HM (%)	Zircon (%)	Rutile/ Anatase (%)	Ilmenite (%)	Leucoxene (%)	Monazite (%)
Proved	415	4.8	18.6	7.2	25.7	22.6	1.8
Probable	410	4.1	16.9	7.3	31.5	19.4	1.6
Total	**825**	**4.5**	**17.8**	**7.2**	**28.4**	**21.2**	**1.7**
Contained (kt)		**37,125**	**6,608**	**2,673**	**10,544**	**7,871**	**631**

Note: Valuable Heavy Mineral grades are reported as a percentage of THM in MRE and Ore Reserve.

Donald

Investment summary

The Donald Rare Earth and Mineral Sands Project (Donald) is a Tier 1 critical mineral resource comprising the world's largest zircon resource and the fourth largest rare-earth resource outside of China. Donald is significantly advanced with a Phase 1 Definitive Feasibility Study completed in 2023 and is the only Victorian critical minerals project with a positively assessed EES, mining license and a Federal EPBC license. The Project has attractive economics and is being developed in two phases. Phase 1 of the Project accesses only 17% of resource and generates a NPV8% of A$852m (25.8% IRR) over a 41-year mine life. Phase 2 PFS demonstrates additional upside, driving a NPV8% of A$2.2b (30.3% IRR) over a 58-year mine life. Donald's Final Investment Decision is expected towards the end of 2024. Rare earth minerals from Donald are planned to be processed into oxides at Energy Fuels' White Mesa Mill in Utah. Heavy Mineral Concentrate (HMC) offtake negotiations are ongoing.

Project description

Mining operations will consist of conventional open-pit dry-mining methods. Phase 1 will produce 228.7ktpa of HMC containing zircon and titanium feedstock, and 7.2ktpa of rare earth element concentrate (REEC) bearing rare earth minerals of monazite and xenotime. Phase 2 will double mining throughput and add on-site processing of HMC to final zircon and titania products. Extensive metallurgical test work has produced a flowsheet with high recoveries, proven at a pilot-plant scale. Donald has an attractive mineral assemblage, a large proportion of the zircon resource is premium grade, and a significant heavy rare earth component crucial for permanent magnets.

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
HMC: Offtake Yes – Available Discussions underway and production expected to commence in 2026.

IRR
30.3% post-tax real

Capital Cost
Phase 1: A$364m;
Phase 2: A$566m

NPV
A$2.2b post-tax real 8%DR

Product & Annual Production Rate

Phase 1:
- Heavy mineral concentrate (HMC) (95% THM, 37% TiO_2, 20% ZrO_2): 228.7ktpa
- Rare earth element concentrate (REEC) (>60% TREO, Nd/Pr 20%, Dy/Tb 2%): 7.2ktpa

Phase 2:
- REEC: 13.0ktpa
- Premium zircon (>66% $Zr(Hf)O_2$): 84.6ktpa
- Standard zircon (<66%): 8.9ktpa

Study Date Apr 2023
Phase 1 Feasibility Study completed in April 2023.
Phase 2 Pre Feasibility Study completed June 2023.

Current as at September 2024

Australian Strategic Materials Ltd
ASX-listed (ASM)

Commodity(ies): **Rare Earth Elements**

Mineral Resources as at 19 September 2017:

Resource Category	Tonnes (Mt)	ZrO_2 (%)	HfO_2 (%)	Nb_2O5 (%)	Ta_2O_5 (%)	TREO (%)
Measured	42.8	1.89	0.04	0.45	0.03	0.88
Inferred	32.4	1.90	0.04	0.44	0.03	0.88
Total	**75.2**	**1.89**	**0.04**	**0.44**	**0.03**	**0.88**
Contained (Kt)		**1,421**	**30**	**331**	**23**	**662**

Ore Reserves as at 19 September 2017:

Reserve Category	Tonnes (Mt)	ZrO_2 (%)	HfO_2 (%)	Nb_2O5 (%)	Ta_2O_5 (%)	TREO (%)
Proved	18.9	1.85	0.04	0.44	0.03	0.87
Total	**18.9**	**1.85**	**0.04**	**0.44**	**0.03**	**0.87**
Contained (kt)		**350**	**8**	**83**	**5**	**165**

Dubbo

Investment summary

Australian Strategic Materials (ASM) is a vertically integrated producer of critical metals for growth industries, advanced technologies and sustainable energy solutions. The cornerstone of ASM's 'mine to metals' strategy is the Dubbo Project, a globally significant resource of rare earths, zirconium, niobium and hafnium. The Dubbo Project has all major approvals and permits in place and is construction ready. ASM is targeting a project financing strategy for the Dubbo Project based on a mix of equity and debt, supported by export credit agencies (ECAs) and bankable offtakes. ASM has received conditional letters of support from Australian, US and Canadian ECAs, offering debt funding packages for the construction phase of the Dubbo Project. ASM is continuing discussions with potential strategic investors, offtake partners and financial institutions, targeting final investment decision (FID) once current front-end engineering design (FEED) work is completed.

Project description

The Dubbo Project is located 25km from Dubbo, NSW, close to established infrastructure and within the Orana Renewable Energy Zone. Once operational, the project will extract, separate, and refine a range of oxides, including neodymium, praseodymium, terbium and dysprosium for processing into metals at ASM's metallisation plants. For 17 years, ASM has worked in partnership with ANSTO (Australia's Nuclear Science and Technology Organisation) to develop an advanced process flowsheet, completing significant successful test work to maximise oxide recoveries. ASM has appointed Bechtel Engineering to conduct non-process infrastructure and FEED work to support progress to FID and the construction phase of the project.

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
20 with potential for a further 50

IRR
23.5% pre-tax

Capital Cost
A$1,678m including contingency

NPV
A$2,361m pre-tax 8%DR; A$1,581m post-tax 8%DR

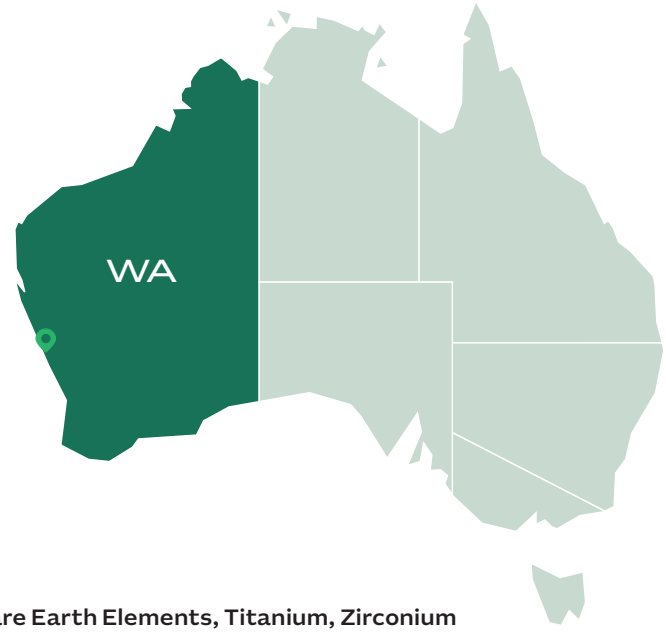
Product & Annual Production Rate

- Rare earth oxides: 1,506tpa (including NdPr oxide – 1,342tpa, Tb oxide – 22tpa, Dy oxide – 142tpa)
- Zirconia: 16,000tpa
- Ferroniobium: 2,650tpa
- Hafnium oxide: 30tpa

Study Date Jan 2021

Current as at September 2024

Iluka Resources Ltd
ASX-listed (ILU)



Eneabba Refinery

Investment summary

Iluka is building Australia's first fully integrated rare earths refinery at Eneabba in WA. Once commissioned in 2026, the refinery will produce both light and heavy seperated rare earth oxides. Iluka believes this represents a game changing development for the diversification of global supply chains and for domestic value addition to Australia's rare earth resources. Iluka has secured primary environmental approvals. Site earthworks were completed in 2023. Long lead time equipment has been ordered and procurement of the remaining equipment is in progress. Front End Engineering Design concluded in early 2024. The refinery receives funding via a loan under the Australian Government's Critical Minerals Facility.

Project description

Iluka's Eneabba refinery has been designed with the capacity and capability to process a broad range of feedstocks from Iluka's portfolio and from a range of third parties. The refinery will utilise roasting, leaching, purification, solvent extraction and product finishing to produce 17.5-23ktpa of rare earth oxides, subject to the feedstock used. The refinery will be fed initially from concentrate produced from Iluka's unique 1Mt rare earths stockpile, located at Eneabba. Thereafter, it will be fed by rare earths from Iluka's Australian operations and from third parties. In October 2022, Iluka concluded an agreement with Northern Minerals for future supply of rare earth concentrate from its Browns Range project. Iluka continues to progress other sources of feed including its Balranald mine in NSW (in Construction) and its Wimmera Project in Victoria (DFS underway). In August 2023, Iluka announced the commencement of a PFS into rare earth metallisation – the next step in the value chain.

Commodity(ies): **Rare Earth Elements, Titanium, Zirconium**

Eneabba MSP By-Product Stockpile Mineral Resources as at 31-Dec-23:

Resource Category	Tonnes (Mt)	In Situ HMTonnes (Mt)	Total HM Grade (%)	Percentage of Total Heavy Metals		
				Ilmenite Grade (%)	Zircon Grade (%)	Monazite + Xenotime Grade (%)
Measured	0.65	0.55	84.3	32	27	22.4
Indicated	0.43	0.33	75.6	36	26	13.6
Inferred	0.07	0.05	74.6	37	31	13.4
Total	**1.15**	**0.93**	**80.5**	**34**	**27**	**18.8**
Contained (kt)		**927**	**315**	**249**	**174**	**160**

Eneabba MSP By-Product Stockpile Ore Reserves as at 31-Dec-23:

Reserve Category	Tonnes (Mt)	In Situ HMTonnes (Mt)	Total HM Grade (%)	Percentage of Total Heavy Metals		
				Ilmenite Grade (%)	Zircon Grade (%)	Monazite + Xenotime Grade (%)
Proved	0.65	0.55	84.3	32	27	22.4
Probable	0.43	0.33	75.6	36	26	13.6
Total	**1.08**	**0.87**	**80.8**	**34**	**27**	**19.1**
Contained (kt)		**874**	**274**	**216**	**155**	**160**

Note: Valuable Heavy Mineral grades are reported as a percentage of THM in MRE and Ore Reserve.

Project Status
Pre Construction

Offtake available
Yes – detailed discussions are ongoing

Min Mine Life (Years)
Initial ~9 year life from Eneabba stockpile

IRR
N/A

Capital Cost
~A$1,700m-1,800m

NPV
<A$500m post-tax 8.25%DR

Product & Annual Production Rate

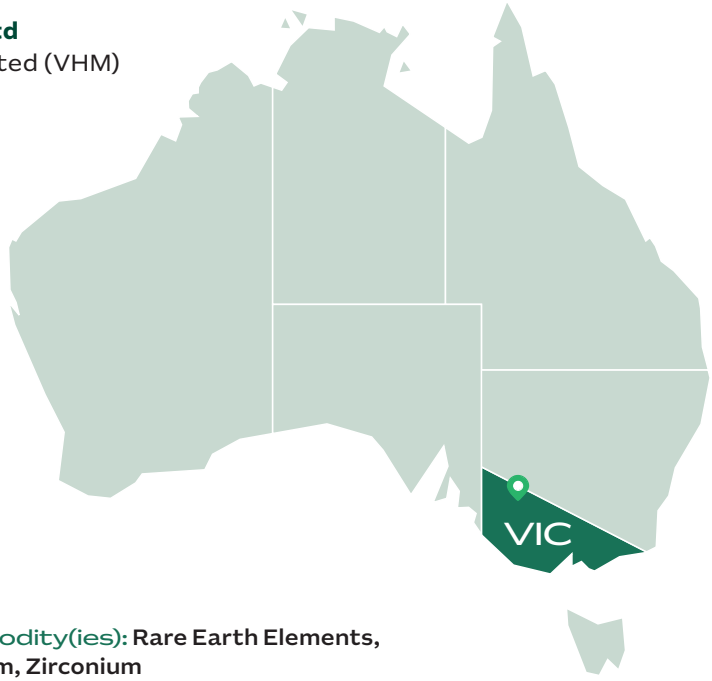
- 17.5-23ktpa rare earth oxides, subject to feedstock used

Product range will include neodymium (Nd) oxide; praesedymium (Pr) oxide, didymium (NdPr) oxide; dysprosium (Dy) oxide; terbium (Tb) oxide.

FID announced April 2022; EPCM contract awarded June 2022; groundworks commenced Q4 2022; FEED completed Q1 2024.

Current as at September 2024

VHM Ltd
ASX-listed (VHM)



Commodity(ies): **Rare Earth Elements, Titanium, Zirconium**

Goschen Mineral Resource as at 9-Apr-24 (cut-off grade of 1.0% Total Heavy Mineral):

Resource Category	Tonnes (Mt)	THM (%)	Zircon (%)	Rutile (%)	Leuco-xene (%)	Ilme-nite (%)	Mona-zite (%)	Xeno-time (%)
Measured	30.7	5.7	29.9	10.8	9.0	24.7	4.3	0.8
Indicated	359.8	3.2	20.4	10.2	8.6	24.5	3.4	0.7
Inferred	293.5	2.3	17.2	8.7	7.5	22.7	2.9	0.5
Total	**684**	**2.9**	**20.1**	**9.8**	**8.3**	**23.9**	**3.3**	**0.6**
Contained (Kt)		**20,100**	**4,060**	**2,000**	**1,660**	**4,800**	**660**	**130**

Global Ore Reserve as at 18-Sep-23:

Reserve Category	Tonnes (Mt)	THM (%)	Zircon (%)	Rutile (%)	Leuco-xene (%)	Ilme-nite (%)	Mona-zite (%)	Xeno-time (%)
Proved	24.5	5.4	29.9	10.8	9.0	24.7	4.3	0.8
Probable	185.7	3.6	20.9	9.8	8.4	25.7	3.4	0.6
Total	**210.2**	**3.8**	**22.4**	**10.0**	**8.5**	**25.5**	**3.6**	**0.7**
Contained (kt)		**8,040**	**1,800**	**800**	**680**	**2,050**	**290**	**53**

Note: Valuable Heavy Mineral grades are reported as a percentage of THM.

Goschen

Investment summary

VHM is developing the Goschen Rare Earths and Minerals Sands Project in the emerging critical minerals province of northwest Victoria. Goschen is a globally significant strategic rare earths deposit (neodymium, praseodymium, terbium, and dysprosium), as well as zircon and titania. The Project is in the advanced stages of permitting with VHM targeting first production in 2025. In June 2024, a recommendation from an independent committee was submitted to the Victorian Planning Minister on VHM's Environment Effects Statement (ESS) – a key step towards approval of the ESS and Mining License for the project. No Native Title or Aboriginal Cultural Heritage values have been identified for the mine footprint. Two agreements for the Project were reached during H1 2024; an offtake agreement for Phase 1 products; and a partnership for mining services. VHM welcomes further discussion on offtake, financing, and strategic partnerships to accelerate an FID and to bring Goschen into production.

Project description

The Goschen DFS completed in March 2023 defines a 5Mtpa nameplate shallow open-pit mine production rate for a 21-year mine life. The rare earths and heavy mineral sands bearing ore will be processed on site via a mining unit plant and wet concentrator to produce a heavy mineral concentrate (HMC). The HMC will undergo further processing to produce a rare earth mineral concentrate (REMC) and a zircon-titania HMC. A hydromet circuit will be constructed in Phase 1A to further process the REMC into a mixed rare earth carbonate (MREC). There is future potential to refine the HMC into premium zircon, zircon concentrate, HiTi rutile and leucoxene and low-chromium ilmenite mineral products.

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
21

IRR
44% pre-tax

Capital Cost
Phase 1: A$483m;
Phase 1A: A$124m

NPV
A$1.5b pre-tax 10%

Product & Annual Production Rate

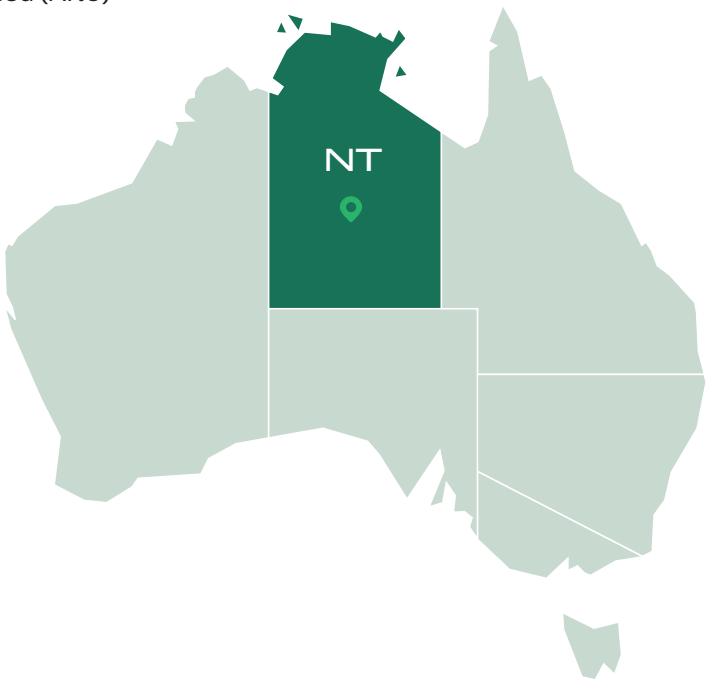
Phase 1:
- Rare earth mineral concentrate (REMC): 9,400tpa zircon-titania heavy mineral concentrate (HMC): 134,500tpa

Phase 2:
- Mixed rare earth carbonate (MREC): 8,500tpa zircon-titania heavy mineral concentrate (HMC): 134,500tpa

Study Date Jan 2023

Current as at September 2024

Arafura Resources Ltd
ASX-listed (ARU)



Commodity(ies): **Rare Earth Elements**

Mineral Resources as at 7 June 2017 (1% TREO cut-off grade):

Resource Category	Tonnes (Mt)	TREO (%)	P_2O_5 (%)	NdPr Enrichment (%)
Measured	4.9	3.2	13	26.1
Indicated	30	2.7	12	26.4
Inferred	21	2.3	10	26.5
Total	**56**	**2.6**	**11**	**26.4**
Contained (Kt)		**1,456**	**6,160**	**384**

Ore Reserves as at 16 March 2020:

Reserve Category	Tonnes (Mt)	TREO (%)	P_2O_5 (%)	NdPr Enrichment (%)
Proved	5.0	3.0	13	26.2
Probable	24.6	2.8	13	26.5
Total	**29.5**	**2.9**	**13**	**26.4**
Contained (kt)		**856**	**3,835**	**226**

Nolans

Investment summary

Nolans will recover NdPr and phosphate from a mine and processing facility, comprising beneficiation, extraction and separation plants. NdPr is essential in electric vehicles, wind turbines and other renewable technologies. As the world transitions to a lower carbon future, Nolans is key to meeting global NdPr demand and will contribute to growth in Australia's critical minerals sector. Environmental permitting, Mining Authorisation and Native Title Agreements are in place. In July 2024 Arafura announced the completion of its debt funding strategy after securing conditional approvals of more than US$1 billion from Australian and international export credit agencies and commercial lenders, including a US$533 million debt funding package through EFA and NAIF. Project funding activities are now focused on strategic equity investment. The Company also announced the potential of Phase 2 expansion to at least double the capacity of the processing facility and create a third-party processing hub. Binding offtake agreements are with Siemens Gamesa Renewable Energy and Hyundai and Kia. Offtake negotiations with other international OEMs and Tier 1 producers are well advanced.

Project description

Around 135km from Alice Springs, Nolans is a shovel-ready single-site ore-to-oxide operating model that has all mining, processing and waste management onsite, reflecting responsible mining and ESG commitments. The metallurgical process leverages natural characteristics of the orebody to deliver low operating costs and the ~38-year mine life will deliver inter-generational benefits to local communities and the broader region through job creation, training initiatives, new industry development, capability building and business opportunities. Flexibility: Able to produce a full range of high-purity aluminium materials from a single process.

Project Status
Pre Construction

Offtake available
58% of 80% offtake target secured

Min Mine Life (Years)
38

IRR
19.3% post-tax;
20.6% post-tax incentive case

Capital Cost
A$1,044m

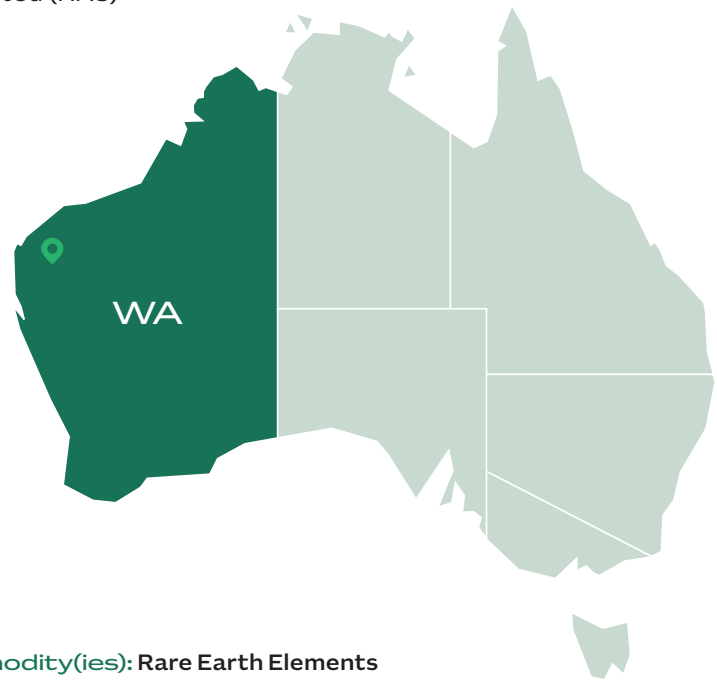
NPV
US$1.7b post-tax 8%DR

Product & Annual Production Rate
- NdPr oxide: 4,400tpa
- SEG/HRE oxide: 570tpa
- Phosphoric acid (fertilizer-grade, 54% P_2O_5): 144,393tpa

Study Date Jan 2022

Current as at September 2024

Hastings Technology Metals Ltd
ASX-listed (HAS)



Commodity(ies): **Rare Earth Elements**

Mineral Resources as at 11-Oct-22 (0.24% TREO cut-off (6 deposits), 0.2% Nd_2O_3+Pr_6O_{11} cut off (4 deposits):

Resource Category	Tonnes (Mt)	TREO (%)	$Nd_2O_3 + Pr_6O_{11}$ (%)
Measured	4.97	0.96	0.37
Indicated	19.51	0.88	0.32
Inferred	5.45	1.05	0.31
Total	**29.93**	**0.93**	**0.32**
Contained (kt)		**277**	**96**

Ore Reserves as at Jan-23:

Reserve Category	Tonnes (Mt)	TREO (g/t)	$Nd_2O_3 + Pr_6O_{11}$ (%)
Proved	4.89	0.95	0.37
Probable	16.03	0.88	0.32
Total	**20.93**	**0.90**	**0.33**
Contained (kt)		**188**	**69**

Yangibana

Investment summary

Located 250km NE of Carnarvon in WA's Gascoyne region, the Yangibana Project is underpinned by one of the world's most highly-valued deposits of neodymium and praseodymium (NdPr), with an average life of mine NdPr to total rare earth oxides (TREO) ratio of 37%. With an initial mine life of 17 years, Yangibana will become a globally significant source of NdPr, a critical component in permanent magnets used in advanced technology products, including EVs and wind turbines. Stage 1 of the Project is fully permitted and Hastings has an agreement in place with the TMWTJ people for development of the Project. Hastings is committed to developing and operating in a sustainable manner, with its strong ESG credentials subject to independent third-party ratings including by Sustainalytics and EcoVadis. Hastings has a strategic 21.15% shareholding in TSX-listed Neo Performance Materials – a leading global rare earth processing and advanced permanent magnets producer. providing the Company with the opportunity to explore the creation of a mine-to-magnet supply chain.

Project description

Hastings is focused on the development of Stage 1 of the Yangibana Project, including the construction of the mine and beneficiation plant to produce up to 37,000tpa of rare earth concentrate. Project execution workstreams have been significantly de-risked with $147 million invested in the completion of early site works – including an airstrip, village, access roads and water infrastructure – and procurement of long-lead critical path equipment. An Engineering, Procurement and Construction (EPC) contract is in place with GR Engineering Services (GRES) and detailed design and engineering for the beneficiation plant is at 75% complete.

Project Status
Pre Construction

Offtake available
Two-thirds of annual production under offtake with thyssenkrupp Materials

Min Mine Life (Years)
17

IRR
31. 28% post-tax*

Capital Cost
A$503m*

NPV
A$865m post-tax ungeard 11%DR*

Product & Annual Production Rate
- Rare earth concentrate: 27% TREO – 37,000tpa (containing around 3,400tpa NdPr oxide)

Study Date Jan 2023
ASX Release 16-Feb-24: Hastings and Baotou Sky Rock sign binding term sheet for integrated tolling and offtake arrangement

Current as at September 2024

Scandium International Mining Corp.
TSX-listed (SCY)

Commodity(ies): **Scandium**

Mineral Resources as at May-16 (100ppm Sc cut-off):

Resource Category	Tonnes (Mt)	Sc (ppm)
Measured	5.7	256
Indicated	11.2	225
Total	**16.9**	**235**
Contained (kt)		**4.0**

Ore Reserves as at May-16:

Reserve Category	Tonnes (Mt)	Sc (ppm)
Proved	0.8	394
Probable	0.6	428
Total	**1.4**	**409**
Contained (kt)		**0.6**

Nyngan

Investment summary

As the world's first scandium-only mining project, Scandium International (SYC) welcomes discussion regarding financing of the Nyngan Scandium Project. The Company is actively progressing offtake agreements focusing on solid-oxide fuel cells, 3D printing, and aluminium-scandium master alloy sales. An 11-hole drilling program was completed in August 2023 defining further near surface scandium enriched laterite at the western edges of the Mineral Resource. Early on-site construction works commenced in October 2023 including surveying of the site, removal and stockpiling of topsoil from the construction site, and construction of a temporary site office. The Company has completed its EIS and have development approval and clearances from Aboriginal Heritage.

Project description

The Nyngan Scandium Project is based on a shallow and surface-mineable lateritic clay deposit with an attractive scandium enrichment. Annual mining activity will be conducted in short campaigns lasting 4-6 weeks each. Mining and ore sizing will produce feedstock for a continuous high-pressure acid leach autoclave system (HPAL), followed by a solvent extraction (SX) concentration of scandium. Final scandium oxide product is made through an oxalate stage, calcine finish, and packaging. All processing, refining and packaging will be undertaken on-site to produce a saleable scandium oxide product (Sc_2O_3, or scandia). Considerable bench scale and small pilot metallurgical test work has been conducted with third party laboratories to finalize the flowsheet and SX specifics. A pilot testwork program completed in 2020 assessed production of aluminium-scandium master alloy (aluminium alloys containing 2% scandium) from scandium oxide using SCY's proprietary process. A patent was awarded to SCY in 2021 for this process.

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
20

IRR
33% post-tax

Capital Cost
US$87m

NPV
US$225m post-tax
7%DR

Product & Annual Production Rate

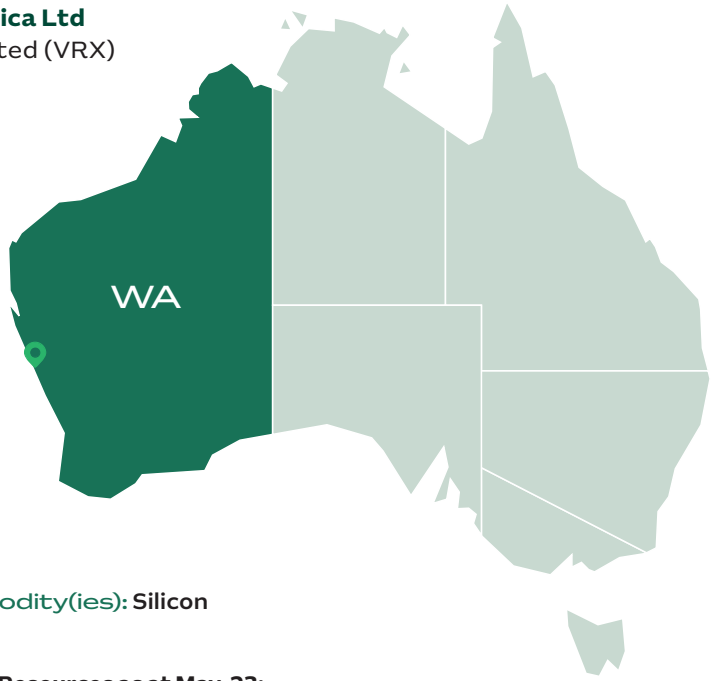
- Scandium oxide (Sc_2O_3): 38.3tpa

(Also potential to further refine scandium oxide to produce aluminum-scandium master alloys)

Study Date Jan 2016

Current as at September 2024

VRX Silica Ltd
ASX-listed (VRX)



Arrowsmith North

Investment summary

VRX Silica (VRX) has five high-grade, low impurity silica sand projects in WA boasting multi-decade scale deposits with a combined +1.38 billion tonne Mineral Resource of 99.6% to 99.9% SiO_2 grade silica sand. The Arrowsmith North Project is the first project to be developed. Mining Leases have been granted with Native Title and Aboriginal Heritage agreements in place. Environmental and mining approvals are well advanced, and completion expected late-2024. VRX is targeting commencement of production in 2025. Silica sand is the raw material required to produce critical silicon components to meet global decarbonisation commitments with global supplies of silica sand dwindling rapidly, particularly in Asia. Arrowsmith North Silica Sand range of uses include glassmaking, three foundry products, solar panel backing plate glass, thermal sponge "blade" for thermal protection between battery packs in Li-ion batteries, and high tensile fiberglass yarn that covers wind turbine blades. Offtakes have been agreed for export with indicative pricing for South Korean and Taiwanese foundry markets subject to final approvals.

Project description

Arrowsmith North is located 270km north of Perth adjacent to highway and rail connections to Geraldton Port. Exploration, metallurgical testwork, process circuit design and detailed engineering haves been completed. Loose sand will be mined from the surface to 8-12m deep with loaders feeding a mobile trommel and progressive Vegetation Direct Transfer (VDT) style of rehabilitation. Processing on-site will include screening, attritioning, flotation and classification to produce a range of silica products. With production anticipated in 2025, key items including a screen, trommel and modified loader bucket for VDT rehabilitation have been purchased.

Commodity(ies): **Silicon**

Mineral Resources as at May-23:

Resource Category	Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	TiO_2 (%)	LOI (%)
Measured	10	95.9	1.90	0.70	0.30	0.70
Indicated	237	97.7	1.00	0.40	0.20	0.50
Inferred	266	98.4	0.69	0.29	0.23	0.36
Total	**513**	**98.0**	**0.86**	**0.35**	**0.22**	**0.43**

Ore Reserves as at May-23:

Reserve Category	Product	Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	TiO_2 (%)	LOI (%)
Proved	AFS20	0.8	99.5	0.25	0.07	0.05	0.1
	AFS35	3.9	99.5	0.5	0.06	0.05	0.1
	AFS55	2.7	99.2	0.5	0.1	0.05	0.1
	Local	1.8					
Proved	**Total**	**9.2**					
Probable	AFS20	24.2	99.5	0.25	0.07	0.05	0.1
	AFS35	102.5	99.5	0.5	0.06	0.05	0.1
	AFS55	51.1	99.2	0.5	0.1	0.05	0.1
	Local	34.1					
Total Probable	**Total**	**212**					
Total		**221**					

Project Status
Pre Construction

Offtake available
Yes (from ~2025 and subject to final approvals)

Min Mine Life (Years)
25

IRR
79% post-tax ungeared

Capital Cost
A$67m

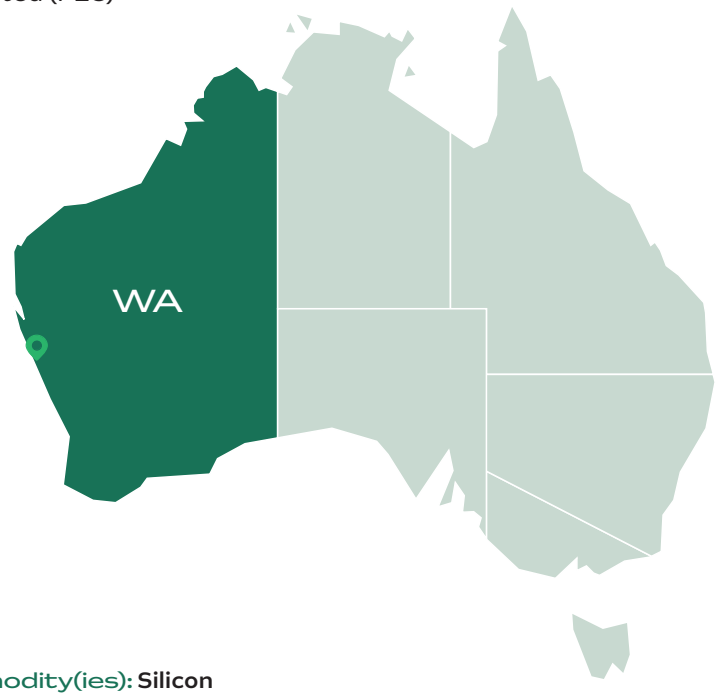
NPV
A$167m post-tax ungeared 10%DR

Product & Annual Production Rate
- Silica sand (99.7% SiO_2 and 500ppm Fe_2O_3 foundry and glassmaking sand): 2Mtpa

Study Date Jan 2019
See tech data on Reserve products: vrxsillica.com.au/resources/tech sheets/

Current as at September 2024

Perpetual Resources Ltd
ASX-listed (PEC)



Beharra

Investment summary

Beharra is the lowest known impurity silica sand project in WA's Mid West region. Metallurgical testing has led to further material improvements in final product quality enabling offtake discussions for both fully processed and unprocessed silica sand to be progressed. Environmental approvals are progressing, with remaining activities including flora, fauna and water studies in addition to a public comment period prior to EPA referral. A Heritage Agreement is in place with the Yamatji Southern Regional Corporation (YSRC), the local Indigenous group, with whom Perpetual has a strong working relationship. Perpetual is open to investment in Company and/or Project, as well as debt funding options.

Project description

The Beharra project is located 96km south of the deep-water port town of Geraldton. Perpetual completed a Pre Feasibility Study for Beharra in 2021 on production of +1.5mtpa of >99.5% SiO_2 purity silica sand with low impurities, targeting the high-end Asian float and cover glass markets. The Beharra orebody is freeflowing material and will be mined using dozers and front-end loaders. The silica sand will be processed using simple conventional gravity and magnetic separation, with product trucked to Geraldton port. The environmental footprint is small as the orebody is progressively mined and rehabilitated. The Beharra exploration license is only 40% explored with significant upside potential. The Beharra project was placed on hold in early-2024 due to low silica sand prices, with project development to recommence when prices improve.

Commodity(ies): **Silicon**

Mineral Resources as at 15-Dec-22 (no cut-off grade applied):

Resource Category	Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	TiO_2 (%)	LOI (%)
Measured – In-situ	44.7	98.6	0.45	0.18	0.33	0.23
Indicated – In-situ	93.1	98.6	0.41	0.26	0.35	0.24
Total	**137.8**	**98.6**	**0.42**	**0.24**	**0.34**	**0.24**

Ore Reserves as at 17-Mar-21 (no cut-off grade applied):

Reserve Category	Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	TiO_2 (%)	LOI (%)
Probable – In-situ	64.1	98.6	0.42	0.20	0.35	0.24
Probable – Saleable Product	47.6	99.6	0.18	0.028	0.035	0.1

Note: The Saleable Products Ore Reserve shown above is the saleable product reserve recoverable from the in-situ ore reserve. The saleable product ore reserve is a subset of the in-situ reserve and they are not additive.

Project Status
Pre Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
32

IRR
55% post-tax ungeared

Capital Cost
A$39m

NPV
A$231m post-tax ungeared 10% DR

Product & Annual Production Rate

- High-grade silica sand (>99.5% SiO_2 with low impurities <200ppm Fe_2O_3): > 1.5Mtpa

Study Date Jan 2021
Note: Impurity profile achieved in recent representative metallurgical test work is superior to that reported in the Mar-21 Reserve calculation.

Current as at September 2024

Metallica Minerals Ltd
ASX-listed (MLM)

Commodity(ies): **Silicon**

Cape Flattery

Investment summary

Metallica Minerals (MLM) welcomes potential offtake partners interested in securing a high-purity silica sand product from its Cape Flattery Silica (CFS) Project in Far North Queensland. Strategic investment opportunities to support commercialisation of the Project will also be considered. First production is forecast in Q4 2027.
The CFS Project has been designated a Coordinated Project by the Queensland Office of Coordinator General, which will help streamline interactions with the Federal and State Government agencies and departments responsible for project approvals. Terms of Reference for the EIS are currently out for public comment and negotiations with the Traditional Owners are ongoing. An Updated Definitive Feasibility study was released in November 2023.

Project description

The CFS Project is being progressed in the world class silica sand region of Cape Flattery. The DFS, completed in July 2023, confirms the Project's potential as a long-life, low-cost producer of high-purity silica sand suitable for use in the manufacturing of high-quality glass, in particular solar photovoltaic (PV) glass used in solar modules. The Project includes simple sand extraction using front end loaders, and proven processing methods with high yields to process the raw sand to a saleable high-purity silica sand. Approximately 1.85Mtpa of raw sand will be slurry pumped to the processing plant which will reduce Fe_2O_3 levels via screening, spirals, attritioning, classification, and magnetic separation, to produce approximately 1.45Mtpa of high-purity silica sand product. Product will be exported via a nearby barge loading facility, and a transhipment solution capable of loading cape size vessels.

Mineral Resources as at 17-Jul-23:

Resource Category	Tonnes (Mt)	SiO_2 (%)	Fe_2O_3 (%)	Al_2O_3 (%)	LOI (%)
Measured	16.1	99.20	0.08	0.22	0.13
Indicated	33.2	99.05	0.10	0.25	0.15
Inferred	0.2	99.00	0.12	0.28	0.13
Total	**49.5**	**99.10**	**0.09**	**0.24**	**0.14**

Ore Reserves as at 17-Jul-23:

Reserve Category	Tonnes (Mt)	SiO_2 (%)	Fe_2O_3 (%)	Al_2O_3 (%)	LOI (%)
Probable	47.0	99.11	0.09	0.15	0.24

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
15

IRR
32.19% pre-tax;
26.59% post-tax

Capital Cost
A$237m

NPV
A$702.4m pre-tax
10%DR

Product & Annual Production Rate
- High-purity silica sand (99.9% SiO_2, 100ppm Fe_2O_3): ~3Mtpa

Study Date Nov 2023

Current as at September 2024

Diatreme Resources Ltd
ASX-listed (DRX)

Galalar

Investment summary

Diatreme is seeking suitable project partners, whether for investment or offtake, for its high-grade silica sand projects in Far North Queensland, including its Galalar Silica Sand Project (GSSP) and Northern Silica Project (NSP). This includes partners for potential downstream processing opportunities in Townsville, QLD. Environmental and cultural heritage baseline studies for the EIS for the GSSP are well advanced. Diatreme has a close relationship with affected Native Title holders including Hopevale Congress.

Project description

GSSP is a high-grade silica sand project located around 20km north of Cooktown, QLD. The Project lies in close proximity to the world's largest operating silica sand mine at Cape Flattery. The GSSP PFS completed in November 2021 showed the potential to develop a long-life, low-capex and highly-profitable operation with attractive economics. The GSSP's high-purity, low-iron silica sand resource of 75Mt is part of a total resource of around 310Mt of high-grade silica sand across Diatreme's Galalar and adjacent NSP. A Scoping Study for the NSP demonstrated its potential to become a valuable long life mining operation, with a potential target production rate of 5Mtpa, capable of being sustained for 25 years. The Galalar Project's high-grade product satisfies the required specifications for the solar PV and other specialty glass markets, supporting global decarbonisation.

Commodity(ies): **Silicon**

Mineral Resources as at 13-Sep-21 (98.5% SiO_2 cut-off):

Resource Category	Silica Sand Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)
Measured	43.12	99.21	0.09	0.11
Indicated	23.12	99.16	0.09	0.13
Inferred	9.22	99.10	0.11	0.16
Total	**75.46**	**99.18**	**0.09**	**0.12**
Contained (kt)		**74,841**		

Ore Reserves as at 9-Nov-21 (98.5% SiO_2 and 1200ppm Fe_2O_3 cut-offs):

Reserve Category	Silica Sand Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)
Probable	32.5	99.20	0.08	0.11
Total	**32.5**	**99.20**	**0.08**	**0.11**
Contained (kt)		**32,240**		

Note: Ore Reserves are on an in-situ basis.

Project Status
Pre Feasibility Study

IRR
74% pre-tax

Product & Annual Production Rate
- High-grade silica sand (99.9% SiO_2, <110 ppm Fe_2O_3): 1.26Mtpa

Offtake available
Yes

Capital Cost
A$60.1m

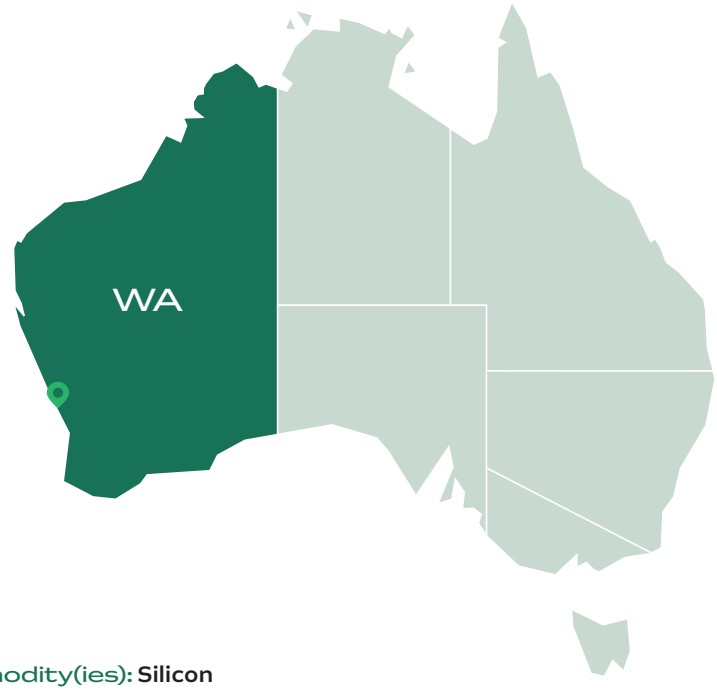
Min Mine Life (Years)
23.5

NPV
A$495m pre-tax
8%DR

Study Date Jan 2021

Current as at September 2024

VRX Silica Ltd
ASX-listed (VRX)



Muchea

Investment summary

VRX has five high-grade, low impurity silica sand projects in WA boasting multi-decade scale deposits with a combined Mineral Resource +1.38billion tonnes of 99.6% to 99.9% SiO_2 silica sand. The high-grade Muchea Silica Sand Project will be the second project to be developed following the Arrowsmith North project. One Mining Lease is granted with Native Title and Aboriginal Heritage agreements in place. Environmental studies are complete with WA EPA referral targeted late-2024. Muchea's high-grade silica sand is expected to be used in ultra-clear solar panel glass manufacture. Burgeoning uptake of solar panels is expected to drive exponential growth in demand for high quality silica sand. In July 2023, VRX Silica's application for the Investment Attraction Fund was accepted by the WA State Government, awarding a A$2 million grant. High Purity Quartz Flour is the main ingredient to produce LCD/LED/strengthened glass.

Project description

Muchea is located 50km north of Perth, adjacent to highway and rail connections to Kwinana Port and adjacent energy infrastructure. It is one of few world-class silica sand projects with an outstanding highgrade purity of 99.9% SiO_2 and <100ppm Fe_2O_5. Exploration, metallurgy and process circuit design is complete with detailed engineering underway. Processing on-site will include, screening, attritioning, flotation and classification to produce high-grade (99. 9% SiO_2) low iron sand for export via Kwinana or Bun bury Port. VRX intends to develop High Purity Quartz Flour utilising Muchea's coarse silica sand as the feedstock. A production circuit includes drying, ball milling, air classification and screening to produce a desired particle size distribution. Samples sent to three major global buyers receiving positive feedback.

Commodity(ies): **Silicon**

Mineral Resources as at May-23:

Resource Category	Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	TiO_2 (%)	LOI (%)
Indicated	29	99.6	0.09	0.03	0.07	0.22
Inferred	179	99.6	0.05	0.02	0.10	0.23
Total	**208**	**99.6**	**0.06**	**0.02**	**0.10**	**0.23**

Ore Reserves as at May-23:

Reserve Category	Product	Tonnes (Mt)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	TiO_2 (%)	LOI (%)
	F80	10.2	99.9	0.02	0.01	0.03	0.1
Probable	F80C	4.25	99.9	0.02	0.01	0.03	0.1
	F150	4.25	99.8	0.07	0.02	0.04	0.1
Probable	**Total**	**18.7**					
Total		**18.7**					

See tech data on Reserve products vrxsilica.com.au/resources/tech sheets/

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
25

IRR
96% post-tax ungeared

Capital Cost
A$50m

NPV
A$338m post-tax ungeared 10%DR

Product & Annual Production Rate
- High-grade silica sand at 99.9% SiO_2 with <150ppm Fe_2O_5: 2Mtpa

Study Date Jan 2019

Current as at September 2024

Iluka Resources Ltd
ASX-listed (ILU)

Balranald

Investment summary

The Balranald critical minerals development is the next evolution of Iluka's operations, located in the northern Murray Basin, NSW. It focuses on the high-grade West Balranald deposit, which contains significant quantities of rutile and zircon, as well as smaller but material quantities of rare earths. Iluka completed the Balranald DFS in late 2022, which confirmed the technical and commercial viability of Iluka's Underground Mining Method (UGM) technology. Iluka's Board approved the FID for Balranald in February 2023. The A$500m Balranald Project investment will be internally funded by Iluka. Construction activity commenced in August 2023 and is expected to take 18 months, with commissioning currently scheduled for Q1 2025.

Project description

Iluka has developed a novel, remotely-operated UGM to access the Balranald deposits, which are located ~60 metres below surface. Iluka's UGM technology enables access to ore bodies previously thought uneconomic, with marked reductions in both environmental disturbance and carbon intensity, relative to traditional mineral sands extraction techniques. ROM ore will be processed on-site to produce a heavy mineral concentrate which will be transported to the Company's processing and refining assets in WA for further value addition. Balranald's rare earths will be a supplementary source of feed for Iluka's Eneabba refinery. The Balranald development enhances Iluka's portfolio offering of high-grade, high-quality critical minerals products produced in Australia. This includes rutile, zircon, synthetic rutile, and rare earths.

Commodity(ies): **Rare Earth Elements, Titanium, Zirconium**

West Balranald Mineral Resource Estimate as at 31-Dec-22:

			Percentage of Total Heavy Metals			
Resource Category	**Resource Tonnes (Mt)**	**Total HM Grade (%)**	**Ilmenite Grade (%)**	**Zircon Grade (%)**	**Rutile Grade (%)**	**Monazite + Xenotime Grade (%)**
Measured	5.9	43.9	65	12	13	1.0
Indicated	26.3	32.6	64	11	12	0.9
Inferred	4.5	26.2	62	8	9	0.7
Total	**36.8**	**33.6**	**64**	**11**	**12**	**0.9**
Contained (kt)		**12,378**	**7,932**	**1,342**	**1,482**	**111**

No Reserve details available

Project Status
Construction

Offtake available
Yes

Min Mine Life (Years)
~9.5

IRR
N/A

Capital Cost
~A$500m

NPV
N/A

Product & Annual Production Rate

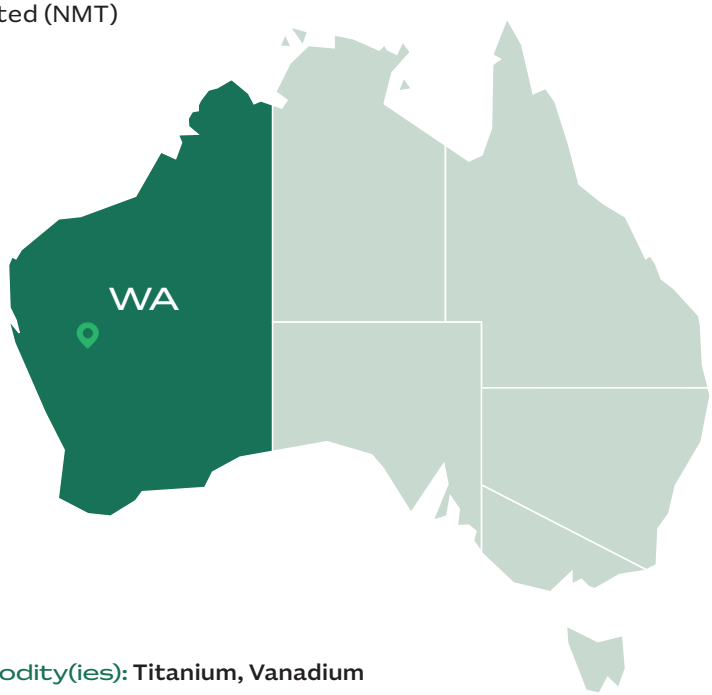
- Heavy mineral concentrate: 500ktpa* (containing 60ktpa rutile; 50ktpa zircon; 50-70ktpa synthetic rutile; 4ktpa rare earth concentrate (M+X); and 150ktpa sulphate ilmenite)

**Based on two mining units from commencement of operations.*

Study Date Dec 2022
DFS completed Q4 2022; FID in February 2023; Construction commenced in August 2023.

Current as at September 2024

Neometals Ltd
ASX-listed (NMT)



Commodity(ies): **Titanium, Vanadium**

Barrambie

Investment summary

With one of the world's largest and highest grade hard-rock titanium and vanadium deposits, Neometals welcomes discussions regarding project equity ownership, joint venturing, project financing and offtake for the Barrambie project. With a significant Mineral Resource Estimate and Ore Reserve, and a PFS completed in May 2023, the Project is mine-ready with a granted Mining Lease and EPA approval granted in 2012. Negotiations for a Native Title mining agreement are currently in progress.

Project description

Barrambie is unique owing to its exceptionally high-grade titanium resource coupled with high vanadium content and the weathered nature of the orebody (low contaminants). A number of flow sheets and target markets have been evaluated to maximise potential value. The Barrambie PFS is based on a capital-light development strategy including conventional open-pit mining of 2.18Mtpa (LOM ave) ore supplying an on-site Crush Mill Beneficiation (CMB) Plant producing a mixed titanium/vanadium/iron gravity concentrate. The mixed gravity concentrate will be exported via the Port of Geraldton. Offtakers will likely utilise the mixed gravity concentrate in the titanium pigment process, or target the ilmenite contained in the mixed gravity concentrate in a smelting process to produce a chloride-grade titanium slag as well as an iron vanadium product. Titanium slag is an intermediate product used to feed the fast-growing demands of the Chinese pigment and titanium metal market. A potential future option also exists to produce ilmenite and iron vanadium concentrate near Geraldton via a low-temperature reduction roast followed by magnetic separation (not included in the May 2023 PFS).

Mineral Resources as at 17-Apr-18:

Resource Category	0.2% V_2O_5 or 10% TiO_2 cut-off			High Grade TiO_2 (14% TiO_2 cut-off)		
	Tonnes (Mt)	TiO_2 (%)	V_2O_5 (%)	Tonnes (Mt)	TiO_2 (%)	V_2O_5 (%)
Indicated	187.10	9.61	0.46	39.30	21.18	0.65
Inferred	93.00	8.31	0.40	14.30	21.15	0.58
Total	**280.10**	**9.18**	**0.44**	**53.60**	**21.17**	**0.63**
Contained metal (kt)		**25,713**	**1,232**		**11,347**	**338**

Ore Reserves as at 15-May-23:

Reserve Category	Tonnes (Mt)	TiO_2 (%)	V_2O_5 (%)	Fe_2O_3 (%)	SiO_2 (%)	Al_2O_3 (%)
Probable	27.6	22.3	0.57	43.7	16.5	10.4
Total	**27.6**	**22.3**	**0.57**	**43.7**	**16.5**	**10.4**
Contained (kt)		**6,155**	**157**	**12,061**	**4,554**	**2,870**

Note: Cut-off is based on achieving an average concentrate grade of 32% TiO_2 (see 15-May-23 announcement for further information).

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
13

IRR
25% pre-tax

Capital Cost
A$215.3m

NPV
A$374.9m

Product & Annual Production Rate

- 1Mt DSO in first year, followed by1Mtpa of >35% TiO_2 mixed gravity concentrate in years 2 to 5, and then >30% TiO_2 for remainder of life

Study Date May 2023

Current as at September 2024

RZ Resources Ltd
Unlisted Private Company

Commodity(ies): **Rare Earth Elements, Titanium, Zirconium**

Copi

Investment summary

RZ is an Australian-owned critical minerals company with mining and processing capabilities, making it one of the few emerging miners able to establish sovereign supply chains and deliver final products. Its flagship mine, Copi, is one of the world's largest critical mineral deposits and will reliably produce globally significant volumes of titanium, zirconium, and rare earths for over 20 years. RZ completed its DFS in January 2024, confirmed a JORC resource of 2.54Bt, and anticipates receiving approvals by early 2025 (EIS lodged with no significant or national environmental issues, and no Native Title issues identified). RZ, through its existing Brisbane Mineral Separation Plant (MSP) will create finished products. RZ has MoU's for a large proportion of its products and will shortly progress to formal offtake agreements. RZ is interested in increasing offtake and considering all strategic opportunities.

Project description

Copi is in southwest NSW, 75 km northwest of Wentworth in a well-established critical mineral province. Onsite processing will remove heavy minerals, which will be transported via rail and road to Adelaide with certain separated minerals (ilmenite and rare earths) ready for direct international export and other minerals being transported to RZ's MSP. The MSP was previously owned and operated by Sibelco and !luka, and after certain upgrades (minimal compared to the cost of a new MSP) will create final titanium and zircon products for export. Both sites will be connected to the energy grid and at least 30% of power is anticipated to be from renewable sources. Copi will use a well-proven dredge mining technique allowing continuous rehabilitation throughout the Project.

Mineral Resources as at Sep-23:

Resource Category	Tonnes (%)	Total HM (%)	Ilme-nite (%HM)	Leuco-xene (%HM)	Rutile (%HM)	Zircon (%HM)	Monazite Xenotime (%HM)
Indicated	1,960	1.3	45	8.9	15	15	1.19
Inferred	580	0.9	43	9.4	15	12	0.98
Total	**2,540**	**1.2**	**45**	**9.0**	**15**	**15**	**1.15**
Contained (Kt)			**13,916**	**2,791**	**4,691**	**4,566**	**358**

Ore Reserves as at Jan-24:

Reserve Category	Tonnes (%)	Ilmenite (%)	Leucoxene (%)	Rutile (%)	Zircon (%)	Monazite Xenotime (%)
Probable	428	47	9.9	14	17	1.44
Total	**428**	**47**	**9.9**	**14**	**17**	**1.44**

Note: Valuable Heavy Mineral grades are reported as a percentage of THM in MRE and Ore Reserve.

Project Status
Feasibility Study

Offtake available
MOU's in place for ~70% of products (subject to formal offtake agreements being finalised), remainder of offtake is available.

Min Mine Life (Years)
17 (base case);
23 (expansion)

IRR
21% (base case);
24% (expansion)
pre-tax

Capital Cost
~A$977m

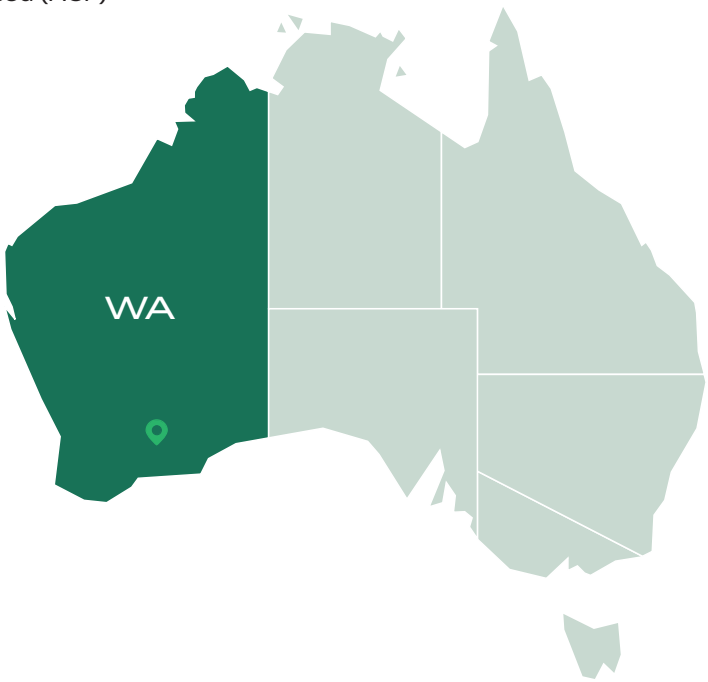
NPV
A$1,124m (base case);
A$1,655m (expansion)
pre-tax 8%DR

Product & Annual Production Rate
- Zircon: 80,000tpa
- Zircon concentrate 30,000tpa
- Rutile: 28,000tpa
- Leucoxene: 25,000tpa
- Ilmenite: 243,000tpa
- Monazite and xenotime: 6,000tpa

Study Date Jan 2021

Current as at September 2024

Audalia Resources Ltd
ASX-listed (ACP)



Medcalf

Investment summary

In 2022, Audalia completed an updated PFS on production of high-grade titanium lump ore (HTLO) from the Medcalf Project for use as a hearth liner in blast furnaces. Highlights from the PFS include a low capex of less than A$40m, and a six-year mine life. The Project has a granted Mining Lease and an agreement in place with the Traditional Owners. The Medcalf Project environmental review document was submitted to the WA EPA in July 2022 for assessment targeting environmental approval during the March quarter 2024. Audalia is seeking a potential purchaser of the vanadium-titanium-iron fines.

Project description

The Medcalf Project is located 470km from Perth, WA. The titanium-vanadium-iron deposit outcrops as surface and dips gently to the north. Approximately 1.5Mtpa ore will be mined from three open-pit mines over and initial 6-year mine life to a depth of around 50m below surface with no expected dewatering requirements. The DSO ore will undergo a two-stage crushing and screening process to meet the lump size (10-60mm range) requirement producing approximately 975ktpa of HTLO at a grade of 12.4% TiO_2, 0.7% V_2O_5, and 59.2% Fe_2O_5. Lump recovery is estimated at 65%. The HTLO product will be trucked 220km to the Port of Esperance for export to the Asian markets. The fines fraction will be stockpiled at the Medcalf site for potential future processing to produce a concentrate suitable for pelletisation as potential value addition to the Project. The Project has potential to expand through an upgrade in the Inferred Resource and additional exploration.

Commodity(ies): **Titanium, Vanadium,** Iron

Mineral Resources as at Mar-22 (6% TiO_2 cut-off):

Resource Category	Tonnes (Mt)	Al_2O_3 (%)	Fe_2O_5 (%)	SiO_2 (%)	TiO_2 (%)	V_2O_5 (%)
Indicated	15.0	8.5	56.4	15.3	11.01	0.60
Inferred	10.6	9.6	43.0	27.3	8.54	0.40
Total	**25.7**	**9.0**	**50.9**	**20.2**	**9.98**	**0.52**
Contained (Kt)			**13,081**		**2,565**	**134**

No Reserve details available

Project Status
Pre Feasibility Study

Offtake available
3.0Mt @ 12.4% TiO_2, 0.7% V_2O_5 and 59.2% Fe_2O_5 of fines (<10mm) from Year 5

Min Mine Life (Years)
5

IRR
146.3% pre-tax

Capital Cost
A$32.8m

NPV
A$177.9m pre-tax 8%DR

Product & Annual Production Rate
- High titanium lump ore (HTLO) (12.4% TiO_2, 0.7% V_2O_5 and 59.2% Fe_2O_5): 975kpta

Study Date Jan 2022

Current as at September 2024

Group 6 Metals Ltd
ASX-listed (G6M)

Commodity(ies): **Tungsten**

Bold Head

Investment summary

The Bold Head tungsten deposit is planned to be developed as a satellite mine to the larger Dolphin tungsten mine, supplying the existing Dolphin processing plant. The Bold Head Mining Lease has been granted, full Feasibility Studies are underway, and EPA Tasmania referral is targeted for the second half of 2024. Capital investment for the Bold Head project is expected to be provided from cashflow the larger Dolphin tungsten mine cashflow. Offtake agreements are in place with Wolfram Bergbau und Hutten AG and Traxys for 65% of the first four years production from the Dolphin tungsten mine. 20% of offtake remains available.

Project description

Group 6 Metals (G6M) are currently developing and commissioning the Dolphin open cut (OC) mine and processing plant. A PFS on mining the Bold Head deposit and processing at the Dolphin tungsten plant was completed in June 2023. The Bold Head satellite deposit is planned to be mined in parallel with the Dolphin operation when the Dolphin OC is at or near completion. Initially, 50kt of the Bold Head Probable Ore Reserves will be mined from a small OC at a strip ratio of 13:1, followed by underground (UG) mining of 390kt of the Bold Head Probable Ore Reserves over a four-year period. Ore produced will supplement production at the Dolphin Processing plant during and after the Dolphin mine OC-UG transition. Bold Head is planned to produce approximately 1,00ktpa ROM ore over a four to five year period, supplementing the 300-400ktpa ROM ore produced from the Dolphin mine.

Mineral Resources as at Nov-19 (0.2 % WO_3 cut-off):

Resource Category	Tonnes (Mt)	WO_3 (%)
Indicated	0.15	0.85
Inferred	1.61	0.92
Total	**1.76**	**0.90**
Contained WO_3 (Kt)		**16,080**

Ore Reserves as at Jun-23 (include open-pit reserve at 0.20% WO_3 cut-off and underground reserve at 0.70% WO_3 cut-off):

Reserve Category	Tonnes (Mt)	WO_3 (%)
Probable	0.45	0.9
Total	**0.45**	**0.9**
Contained WO_3 (kt)		**3,960**

Project Status
Pre Feasibility Study

Offtake available
100%

Min Mine Life (Years)
4

IRR
51% pre-tax

Capital Cost
A$19.5m

NPV
A$14.4m pre-tax
8%DR

Product & Annual Production Rate
- Tungsten concentrate (68% WO_3): >1,000tpa containing 680t of WO_3

Study Date Jun 2023

Current as at September 2024

Thor Mining PLC
ASX-listed (THR)

Investigator Resources Ltd
ASX-listed (IVR)

Molyhil

Investment summary

The Molyhil Tungsten project is owned by Thor Energy Pie, with Investigator Resources Ltd earning-in to a JV interest. The Project was awarded Major Project status by the NT Government in 2020. Thor's 2018 Feasibility Study confirmed Molyhil as a technically and economically viable project producing tungsten, molybdenum, and copper concentrates to be exported to customers for downstream processing. Investigator completed a small resource validation and extension drilling program in 2023, resulting in an updated Mineral Resource Estimate in May 2024. This is to be followed by an updated Feasibility Study in 2024 targeting securing project financing to commence rapid development of the Project. Environmental approvals are in place, along with an agreement over the project area with Native Title Group Arrapere Group and Central Lands Council.

Project description

The Molyhil deposits occur as skarn bodies containing scheelite, molybdenite, and chalcopyrite mineralisation. Thor's 2018 Feasibility Study was based on a single, simple open-pit mine, with a life of seven years. Molyhil ore will be processed on-site to produce tungsten, molybdenum, and copper concentrates using industry standard ore sorting and flotation processing techniques. Mineralisation has been identified below the planned open-pit with the potential to extend the mine life. In addition, the adjacent Bonya deposits, approximately 30km from Molyhil, host JORC 2012 Mineral Resources of 0.74Mt@ 0.21% WO_3 and 0.09% Cu and 0.2Mt@ 2.0% Cu, with the potential to extend the operational life of Molyhil for several years. Further mineralisation has been identified 30km to the north at Bonya Deposits which may further extend the Molyhil mine life.

Commodity(ies): **Molybdenum, Tungsten**, Copper

Molyhil Mineral Resources as at 28-May-24 (0.07% WO_3 cut-off):

Resource Category as at 31 March 2021	Tonnes (Mt)	WO_3 (%)	Mo (%)	Cu (%)
Measured	1.16	0.34	0.11	0.06
Indicated	1.66	0.27	0.10	0.05
Inferred	1.82	0.20	0.08	0.03
Total	**4.65**	**0.26**	**0.09**	**0.04**
Contained (tonnes)		**11,800**	**4,400**	**2,190**

No Reserve details available

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
7

IRR
59% post-tax

Capital Cost
A$69m

NPV
A$101m post-tax 5%DR

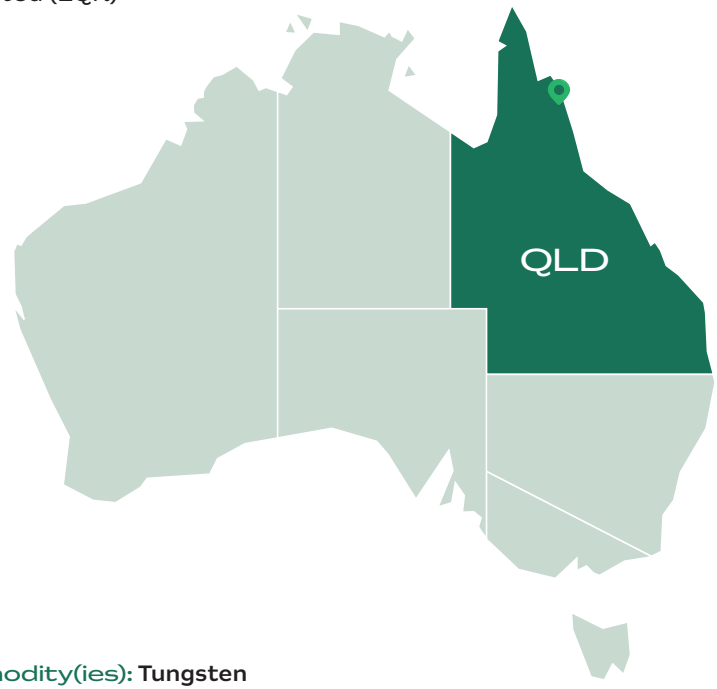
Product & Annual Production Rate

- Tungsten concentrate: (65% WO_3): 1,850tpa
- Molybdenum concentrate: (51.4% Mo): 850tpa
- Copper concentrates: minor

Study Date Jan 2018

Current as at September 2024

EQ Resources Ltd
ASX-listed (EQR)



Commodity(ies): **Tungsten**

Mount Carbine

Investment summary

EQR's Mt Carbine tungsten project, Australia's leading primary tungsten producer, boasts low-cost operations, tech integration, and a favourable commodity outlook. Ownership of leading European tungsten producer, Saloro S.L.U, and an exploration permit (EPM) covering 488km^2 over the Wolfram Camp tin-tungsten field in northern QLD positions EQR to become the leading Western tungsten producer. The Mt Carbine BFS demonstrates significant growth potential with only 17% of mineral resources currently utilised. Backed by Australian Government Critical Minerals Accelerator Initiative and a A$20m QLD Government QIC funding facility, EQR's strong ESG commitment, fast-growing supply and sales, and clear development phases make it an attractive prospect.

Project description

Mt Carbine is a fully permitted brownfields operation currently in production, undergoing a three-phase expansion initiated in 2019. Phase 1 included mining ore from the historic Low-Grade Stockpile (LGS) and early works upgrades. Phase 2 includes open pit mining and processing plant upgrades to expand capacity. Open pit mining from the 5.93Mt in-situ ore reserves commenced in Q2 2023 and efficiency and capacity enhancements are progressing on schedule. The currently defined resource feeds open pit ore and historic LGS ore to the processing plant for ~10 years. Phase 3 includes underground mining. EQR has scoped a 10-year underground mine with underground works set to begin with a A$2.8m drilling campaign and reopening of the historic decline starting in 2024. Trial underground mining activities are planned for early 2025. The project is acknowledged for its commitment to sustainability winning the 2022 AMEC Environment Award.

Mineral Resources as at 18-May-23:

Low Grade Stockpile + In-Situ Low Grade (0.05% WO_3 cut-off)

Resource Category	Tonnes (Mt)	WO_3 (%)
Indicated	10.13	0.08
Indicated	2.75	0.07
Inferred	0.83	0.06
Total	**13.71**	**0.07**
Contained (Kt)		**9.91**

In-Situ (0.08% WO_3 cut-off)

Resource Category	Tonnes (Mt)	Nickel (%)
Indicated	18.06	0.30
Inferred	10.68	0.30
Total	**28.74**	**0.30**
Contained (Kt)		**86.23**

Ore Reserves as at 18-May-23:

Low-Grade Stockpile

Reserve Category	Tonnes (Mt)	WO_3 (%)
Probable	9.77	0.075
Total	**9.77**	**0.075**
Contained (kt)		**7.33**

Open Cut

Reserve Category	Tonnes (Mt)	WO_3 (%)
Probable	5.93	0.28
Total	**5.93**	**0.28**
Contained (kt)		**16.60**

Project Status
Operating

Offtake available
First 25,000t WO_3 concentrate under offtake agreement with JV partner CRONIMET.

Min Mine Life (Years)
10

IRR
477% pre-tax (Phase 1 & 2)

Capital Cost
A$26.3m (Phase 1 & 2)

NPV
A$307.1m pre-tax 8%DR (Phase 1 & 2)

Product & Annual Production Rate
- Tungsten concentrate (50% WO_3): 4,060tpa

Study Date May 2023
Phase 1: Operating; Phase 2: Construction; Phase 3: Scoping Study

Current as at September 2024

Venture Minerals Ltd
ASX-listed (VMS)

Commodity(ies): **Tungsten**, Copper, Iron, Tin

Mount Lindsay

Investment summary

Venture Minerals completed a Feasibility Study in 2012 on the 100% owned Mount Lindsay tin-tungsten-magnetite project which is located within the world-class mineral province of north-west Tasmania and is one of the largest undeveloped tin-tungsten projects in the world. An updated Underground Mine Feasibility Study is underway, targeting Mount Lindsay to become a responsible producer of tin and tungsten by 2026, with access to renewable hydro and wind power, combined with the commitment to minimising the carbon and environmental footprint, through underground mining and simplified gravity-focused processing strategies. Venture welcomes discussion regarding financing of construction and/or offtake.

Project description

The 2012 Study was based on extracting 1.75Mtpa of tin, tungsten, magnetite, and copper bearing ore from an open-pit mine with minor underground development from the pit base to access some deeper mineralisation. Work completed includes over 83,000m of diamond core drilling within the Project's two highgrade orebodies defining a significant resource, along with extensive engineering, environmental, hydrogeological and metallurgical studies. The process plant was designed to concentrate magnetite, copper sulfides, tin oxide, and scheelite through flotation and/or gravity processing with the scheelite further upgraded to ammonium paratungstate, before being trucked to the Port of Burnie for export. The Project has access to existing infrastructure. The updated Study is focused on the higher-grade portions (0.7% SnEq cutoff: 4.7Mt@ 0.3% WO_3 & 0.4% Sn) using a more cost-effective, gravity-focused, processing flowsheet. Recently CSIRO determined that extraction of tin, boron, and iron from tin-borate minerals within the tailings stream was possible.

Mineral Resources as at 17-Oct-12 (0.2% SnEq cut-off):

Resource Category	Tonnes (Mt)	WO_3 (%)	Sn (%)	Cu (%)	Mass Recovery of Magnetic Iron (Fe) Grade*1 (%)
Measured	8.1	0.1	0.2	0.1	17
Indicated	17	0.1	0.2	0.1	15
Inferred	20	0.1	0.2	0.1	17
Total	**45**	**0.1**	**0.2**	**0.1**	**17**
Contained (kt)		**32**	**81**	**30**	**7,520**

Ore Reserves as at 7-Nov-12:

Reserve Category	Tonnes (Mt)	WO_3 (%)	Sn (%)	Cu (%)	Mass Recovery of Magnetic Iron (Fe) Grade*1 (%)
Proved	6.4	0.2	0.2	0.1	18
Probable	7.3	0.1	0.2	0.1	13
Total	**14.0**	**0.1**	**0.2**	**0.1**	**15**
Contained (kt)		**16**	**30**	**14**	**2,150**

**Mass recovery of the magnetic iron shown is determined mostly by Davis Tube Results. Pilot scale metallurgical testwork for the 2012 FS resulted in a recovery for iron in the form of magnetite at 98%, as a saleable concentrate with a grade of 65% Fe.*

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
9

IRR
21% pre-tax

Capital Cost
A$198m

NPV
A$143m pre-tax
8%DR

Product & Annual Production Rate

- Tin concentrate (45-50% Sn): 5,000tpa (tin in concentrate: 2,350tpa)
- APT (ammonium paratungstate): 1,500tpa
- Magnetite concentrate (65% Fe): 240,000tpa
- Copper concentrate (~24% Cu): 3,500tpa (Cu in concentrate: 800 tpa)

Study Date Jan 2012

Current as at September 2024

Tungsten Mining NL
ASX-listed (TGN)

Commodity(ies): **Molybdenum, Tungsten,** Silver, Gold, Copper

Mt Mulgine

Investment summary

Tungsten Mining NL {TGN) is an Australian based resources company focused on the development of tungsten projects in Australia. The Mt Mulgine Project is central to the Company's strategic development, aiming to establish a sustainable long-term mining operation. Subsequent to the 2021 PFS, the primary strategy was revised which now focuses on producing significant volumes of tungsten and molybdenum, two key critical minerals, along with a substantial by-product concentrate of copper, gold, and silver. The project is envisioned as a large-scale, long-life, low-cost mining and processing operation. This is intended to position the Company as the only primary producer of molybdenum in Australia and one of the few active tungsten producers. The Company is currently exploring development options following recent drilling that identified areas of high-grade molybdenum, and is confident in pairing an attractive development approach with the project. There is no Native Title, or Native Title claims and archaeological and ethnographic surveys have not identified any significant culturally sensitive areas or artefacts over the project area. The Company is progressing regulatory approvals and environmental studies with the intention of submitting an EPA referral in 2025.

Project description

Tungsten Mining's flagship Mt Mulgine tungsten project sits on three granted mining leases, located approximately 350km NNE of Perth in the Murchison Region of WA. The Project will include open-pit mining and processing of material via gravity concentration and flotation to produce tungsten, molybdenum and byproduct concentrates. Ongoing exploration, resource development, engineering, testwork and approvals submissions are underway, to add definition to the revised strategy.

Mineral Resources as at 4-May-20 (0.05% WO_3 cut-off):

Resource Category	Tonnes (Mt)	WO_3 (%)	Mo ppm	Au g/t	Ag g/t	Cu (%)
Indicated	183	0.11	290	0.13	5	0.04
Inferred	76	0.11	240	0.09	5	0.04
Total	**259**	**0.11**	**270**	**0.12**	**5**	**0.03**
Contained		**290 Kt**	**71 Kt**	**1,000 Koz**	**44 Moz**	**92 Kt**

Ore Reserves as at 29 January 2021 (0.074% WO_3 cut-off):

Reserve Category	Tonnes (Mt)	WO_3 (%)	Mo ppm	Au g/t	Ag g/t	Cu (%)
Probable	140	0.10	288	0.12	5.9	0.03
Total	**140**	**0.10**	**288**	**0.12**	**5.9**	**0.03**
Contained		**145 Kt**	**40 Kt**	**542 Koz**	**27 Moz**	**48 Kt**

Project Status
Feasibility Study

Offtake available
Yes

Min Mine Life (Years)
20

IRR
N/A

Capital Cost
N/A

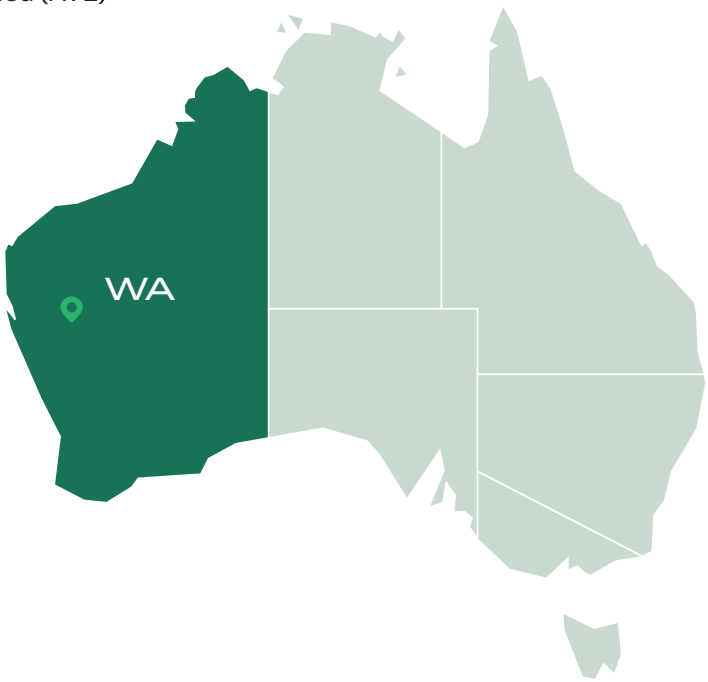
NPV
N/A

Product & Annual Production Rate
N/A

Study Date Jan 2021

Current as at September 2024

Australian Vanadium Ltd
ASX-listed (AVL)



Australian Vanadium Project

Investment summary

The Australian Vanadium Project is a world-class asset of scale, located in a Tier 1 mining jurisdiction. In May 2024, following a merger with neighbouring vanadium project developer Technology Metals Australia Ltd, a Global Mineral Resource Estimate for the consolidated project was released. AVL is undertaking an Optimised Feasibility Study, with the aim of integrating the TMT and AVL projects and improving the Project's technical and economic results. Project approvals continue to be progressed, including engagement with the Traditional Owners of the project minesite, the Yugunga-Nya People, exploring and further defining the basis for an enduring partnership. Environmental approvals are underway. Resource Capital Funds is a major shareholder. AVL is seeking offtake, debt and equity.

Project description

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Commodity(ies): **Vanadium**, Iron

Mineral Resources as at Nov-21:

Resource Category	Tonnes (Mt)	V_2O_5 (%)	Fe (%)
Measured	30.6	1.13	46.3
Indicated	136.6	0.85	37.8
Inferred	228.2	0.66	31.4
Total	**395.4**	**0.77**	**34.8**
Contained (kt)		**3,045**	**137,599**

No Reserve details available

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
25

IRR
Not yet available for consolidated project

Capital Cost
Not yet available for consolidated project

NPV
Not yet available for consolidated project

Product & Annual Production Rate
- V_2O_5 as mix of flake or powder: 11,200tpa
- Iron concentrate (60% Fe): 900 ktpa

Study Date Jan 2022
Previous Feasibility Studies completed in 2022 on separate AVL and TMT Projects.
Optimised Feasibility Study consolidating both projects underway.

Current as at September 2024

Richmond Vanadium Technology Ltd
ASX-listed (RVT)

Commodity(ies): **Vanadium**

Mineral Resources as at Dec-19 (0.30% V_2O_5 cut-off):

Resource Category	Tonnes (Mt)	V_2O_5 (%)
Indicated – Lilyvale	430	0.50
Inferred – Lilyvale	130	0.41
Inferred – Rothbury	1,202	0.31
Inferred – Manfred	76	0.35
Total	**1,838**	**0.36**
Contained (Kt)		**6,650**

Ore Reserves as at Jan-20 (0.30% V_2O_5 cut-off):

Reserve Category	Tonnes (Mt)	V_2O_5 (%)
Probable	459	0.49
Total	459	0.49
Contained (kt)		**2,250**

Richmond – Julia Creek

Investment summary

The world cannot achieve its energy transition targets without utility scale, long duration battery storage. Adoption of vanadium redox flow batteries is increasing due to safety concerns, battery life, recyclability and capability for longer duration energy storage. The Project is near development stage subject to submission of the Environmental Impact Statement (draft due Q3 2024) leading to the issuing of an Environmental Authority and Mining License, and the positive completion of a Bankable Feasibility Study due Q2 2025. Native Title has been extinguished over the Project area. The BFS may offer several development options with discussions welcome on financing or offtake agreements.

Project description

Project differentiators include a very large Mineral Resource and Ore Reserve, minimal environmental impact, progressive rehabilitation, low capex, conventional processing, non-toxic waste and a long mine life. The mineral resource is close to surface with open-cut, free-dig mining to occur at depths of 2-25 metres. Richmond Vanadium Technology (RVT) plans to mine and process 4.2Mtpa to produce ~790,000tpa of V_2O_5 concentrate at 1.8-2.0% V_2O_5 on-site, over a 25-year initial mine life. Potential exists to refine the concentrate to a high-grade flake, producing 12,700 Mtpa of V_2O_5. RVT's vision is to be mining, concentrating and producing high-purity vanadium in Australia, over the fence from electrolyte and battery makers. This is aligned with the recent collaboration agreement signed with world leading battery and renewable energy manufacturers, and the vision of the Queensland Government who are building a common user facility and funding construction of the CopperString 2032 electricity transmission line. RVT has adopted the World Economic Forum's ESG framework to guide progress.

Project Status
Pre Feasibility Study

Offtake available
100%

Min Mine Life (Years)
25 with potential for 100+

IRR
38% post-tax

Capital Cost
US$176.8m

NPV
US4.48m post-tax 10%DR

Product & Annual Production Rate

- Vanadium concentrate (1.82% V_2O_5): 790,000tpa (12,700tpa contained vanadium pentoxide flake (V_2O_5)

Study Date Jan 2021

Current as at September 2024

Surefire Resources NL
ASX-listed (SRN)

Victory Bore

Investment summary

The Company seeks investment, offtake and development partners for its Victory Bore Vanadium Project in Australia and the Kingdom of Saudi Arabia (KSA). Results of the recently completed Pre-Feasibility Study on the Project include an NPV of US$1.2b NPV and a 42% IRR. The Company has MoU's in place with the Saudi Arabian government and KSA companies for final products processing in KSA. A Mining License application is in place. Environmental and Native Title surveys have been completed with no impediments identified.

Project description

The Victory Bore project contains a large vanadium-titanium magnetite resource, located near existing road and power infrastructure in the mid-west of WA. The mineralization extends for 21km along strike with significant exploration potential to extend the current 465Mt Total Mineral Resource. Open-cut mining and onsite beneficiation will produce a magnetite concentrate to be shipped from Geraldton Port for final products processing in KSA. Low power and reagent costs in KSA will lower operating costs. A key objective of the Project is to produce high purity electrolyte grade vanadium pentoxide (V_2O_5) for production of battery grade vanadium electrolyte used in vanadium redox batteries. A new leach process for vanadium extraction has been developed by the Company to reduce carbon emissions for the project alleviating the need for rotary kiln heat treatment.

Commodity(ies): **Titanium, Vanadium,** Iron

Mineral Resources as at Dec-23 (0.15% V_2O_5 cut-off):

Resource Category	Tonnes (Mt)	V_2O_5 (%)	TiO_2 (%)	Fe (%)	Al_2O_3 (%)	SiO_2 (%)
Measured	25.3	0.35	4.96	19.20	17.0	34.9
Indicated	113.2	0.32	4.7	18.19	17.4	35.9
Inferred	326.1	0.28	5.28	17.41	16.0	36.4
Total	**464.6**	**0.30**	**5.12**	**17.70**	**16.4**	**36.2**
Contained (kt)		**1,394**	**23,793**	**82,223**	**76,174**	**168,169**

Reserve as at Dec-23 (0.15% V_2O_5 cut-off):

Reserve Category	Tonnes (Mt)	V_2O_5 (%)	TiO_2 (%)	Fe (%)
Probable	93.1	0.35	5.2	19.8
Total	**93.1**	**0.35**	**5.2**	**19.8**
Contained (kt)		**326**	**4,841**	**18,434**

Project Status
Pre Feasibility Study

Offtake available
100%

Min Mine Life (Years)
24

IRR
42% pre-tax

Capital Cost
US$498m

NPV
US1.2b pre-tax 10%DR

Product & Annual Production Rate

- 1.25Mtpa of vanadium-titanium magnetite concentrate to produce:
  - High-purity vanadium pentoxide (V_2O_5): 2,580tpa
  - Ferrovanadium (FeV): 5,760tpa
  - Titanium (TiO_2) slag: 192,880tpa
  - Pig iron (Fe): 364,480tpa
  - High-purity iron oxide pigment (Fe_2O_3): 245,480tpa
  - High-grade iron ore (Fe_2O_3): 245,480tpa

Study Date Jan 2023

Current as at September 2024

Atlantic Pty Ltd
Unlisted Private Company

Windimurra

Investment summary

Atlantic Vanadium (AVPL) owns 100% of the world-class Windimurra vanadium project. AVPL is completing an updated DFS for the Windimurra project development and expects to make a FID for the project development at end 2024. Windimurra has all development approvals in place. AVPL is currently in advanced discussions with prospective project financiers and strategic offtake partners for the Windimurra project, however AVPL welcomes interest from prospective project financiers and offtake partners.

Project description

Windimurra is expected to be the world's next major primary vanadium producer leveraging significant existing infrastructure at the project site. In particular, Windimurra enjoys the following competitive advantages:

- Significant historic investment, making it the lowest capital intensity primary vanadium project development in the world.
- Redevelopment works consist of new milling and beneficiation plant, and recommissioning of existing infrastructure, plant and equipment.
- All critical infrastructure (roads, mine pit, gas pipeline, kiln, power station, village) already constructed and under care and maintenance.
- Ore Reserves deliver an initial 31-year mine life with upside through additional large Mineral Resources.
- Attractive economics based on low strip ratio, legacy investment, proven exactration process, and long mine life.
- Attractive vanadium market fundamentals with forecast strong vanadium demand growth driven by Chinese rebar standards and vanadium flow battery demand.

The Windimurra project will produce a high-purity V_2O_5 flake product utilising proven open-cut mining and vanadium production processes including ore milling, magnetic separation, salt roasting, leaching, and vanadium recovery to produce the final product. AVPL continues to investigate and develop downstream processing options in anticipation of becoming a vertically integrated vanadium flow battery producer.

Commodity(ies): **Vanadium**

Mineral Resources as at December 2019 (0.28% V_2O_5 cut-off):

Resource Category	Tonnes (Mt)	V_2O_5 (%)
Measured	34.6	0.49
Indicated	123.5	0.50
Inferred	51.6	0.50
Total	**209.7**	**0.50**
Contained (kt)		**1,048**

Ore Reserves as at December 2019 (0.28% V_2O_5 cut-off, DFS 2020):

Reserve Category	Tonnes (Mt)	V_2O_5 (%)
Proved		
Probable	87.5	0.49
Total	**87.5**	**0.49**
Contained (kt)		**429**

Project Status
Care and Maintenance

IRR
Expected late 2024

Product & Annual Production Rate
- High-purity V_2O_5 flake: 7,600tpa

Offtake available
100%

Capital Cost
Expected late 2024

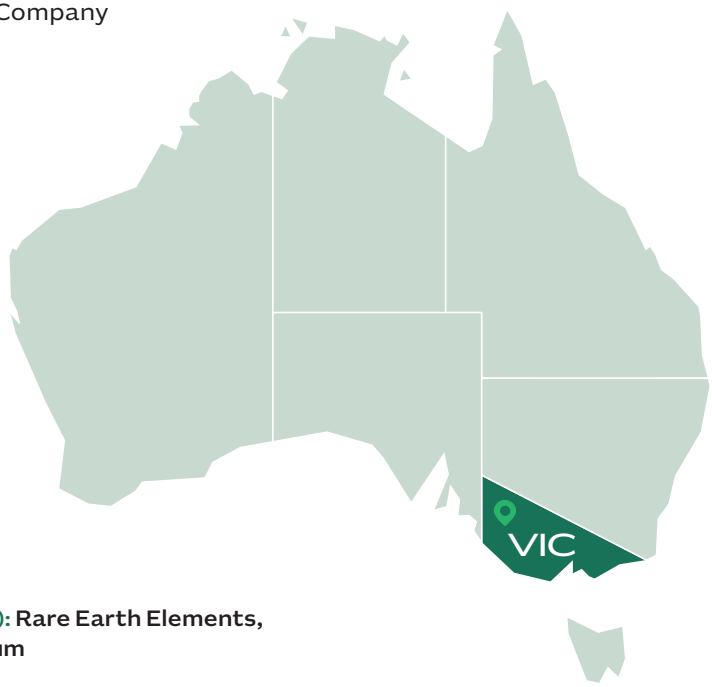
Min Mine Life (Years)
31

NPV
Expected late 2024

Study Date Jan 2020
Updated Definitive Feasibility Study underway targeting completion in late 2024.

Current as at September 2024

WIM Resource Pty Ltd
Unlisted Private Company



Commodity(ies): **Rare Earth Elements, Titanium, Zirconium**

Mineral Resources as at 31-Dec-17 (1% THM cut-off):

Resource Category	Tonnes (mt)	Total HM (%)	Zircon %	Rutile %	Leuco-xene %	Ilme-nite %	Mona-zite %	Xeno-time %
Measured	300	4.3	20	15	8.5	26	2.0	0.6
Indicated	150	3.6	19	17	9.3	28	1.9	0.6
Inferred	40	3.0	21	16	9.0	27	2.3	0.6
Total	**490**	**4.0**	**20**	**16**	**8.8**	**27**	**2.0**	**0.6**
Contained (kt)		**19,600**	**3,920**	**3,136**	**1,725**	**5,292**	**392**	**118**

Ore Reserves as at 1-Jun-18 (1% THM cut-off):

Reserve Category	Tonnes (mt)	Total HM (%)	Zircon %	Rutile %	Leuco-xene %	Ilme-nite %	Mona-zite %	Xeno-time %
Proved	220.4	4.4	20.2	14.9	8.4	26.4	2.0	0.6
Probable	91.4	4.0	19.3	16.9	9.1	28.5	2.0	0.6
Total	**311.8**	**4.3**	**19.9**	**15.4**	**8.6**	**27.0**	**2.0**	**0.6**
Contained (kt)		**13,407**	**2,668**	**2,065**	**1,153**	**3,620**	**268**	**80**

Note: Valuable heavy mineral grades are reported as a percentage of THM

Avonbank

Investment summary

Avonbank is a Tier 1, world class zircon-rich heavy mineral sands project, with proven and probable reserves underpinning a 36-year operation. WIM completed the Environmental Effects Statement (EES) in 2023, and Avonbank secondary approvals and a Mining License are on track to bring the Project to a shovel-ready stage by late 2024. The EES studies demonstrated that no significant adverse environmental or social impacts will occur. The EES studies also showed that there will be a significant positive economic impact for Victoria, as Avonbank will create 1000 FTE jobs per annum for 36 years. WIM welcomes discussions regarding product offtake or financing of Avonbank.

Project description

Avonbank will be the single largest zircon mine in Victoria when approved, and will be regarded as a Tier 1 zircon mine globally, based on its mine life, exceptional revenue to cost ratio, and return on investment. Avonbank will involve the mining of 10Mtpa of ore from a shallow, low strip ratio, open pit mine using dry mining with a rapid rehabilitation method, that will return land back it its pre-mining state within four years. A Trial Mine & Demonstration Scale Wet Concentration Plant have successfully demonstrated the ore is amenable to standard mineral sands gravity separation using conventional. Detailed downstream demonstration and product quality assessment trials have also been successfully completed. WIM has built a strong 'social and environmental license', having successfully rehabilitated the Avonbank Trial Mine within two years of mining, back to a productive broad acre agricultural crop.

Project Status
Feasibility Study

Offtake available
100%

Min Mine Life (Years)
42

IRR
Please contact WIM for further information

Capital Cost
Please contact WIM for further information

NPV
Please contact WIM for further information

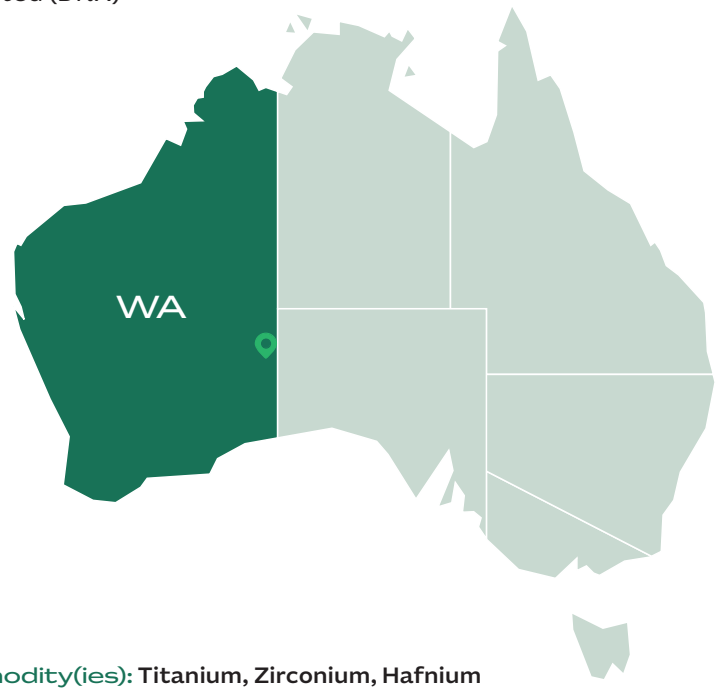
Product & Annual Production Rate

- Heavy mineral concentrate (30% zircon, 55% titanium and <2.5% rare earths by-products): 500,000tpa

Study Date Feb 2021

Current as at September 2024

Diatreme Resources Ltd
ASX-listed (DRX)



Commodity(ies): **Titanium, Zirconium, Hafnium**

Mineral Resources as at 31-Dec-21 (1% HM cut-off grade):

Resource Category	Tonnes (Mt)	Total HM (%)	Zircon (% HM)	Rutile (% HM)	Leuco-xene (% HM)	HiTi (% HM)	Altered Ilmenite (% HM)	Siliceous Ti-oxide (% HM)
Measured	156	2.4	28	3	6	24	12	22
Indicated	48	1.9	21	2	5	33	16	18
Total	**203**	**2.3**	**27**	**3**	**6**	**26**	**13**	**21**
Contained (kt)		**4,669**	**1,262**	**140**	**280**	**1,214**	**607**	**980**

Ore Reserves as at 31-Dec-21:

Reserve Category	Tonnes (Mt)	Total HM (%)	Zircon (% HM)	Rutile (% HM)	Leuco-xene (% HM)	HiTi (% HM)	Altered Ilmenite (% HM)	Siliceous Ti-oxide (% HM)
Probable	138	2.6	28	3	7	23	13	22
Total	**138**	**2.6**	**28**	**3**	**7**	**23**	**13**	**22**
Contained (kt)		**3,588**	**1,005**	**108**	**251**	**825**	**466**	**789**

Note: Valuable Heavy Mineral grades are reported as a percentage of THM.

Cyclone

Investment summary

Cyclone is an attractive investment opportunity amid the lack of suitable high-grade zircon supply. Diatreme is engaging in discussions and negotiations with a range of potential project partners including offtakers and technical partners, with the aim of either selling the Project or funding the development of this high-grade zircon project located in WA's zircon-rich Eucla Basin. The Project is 'shovel-ready' with primary approvals and permitting in place, including environmental and First Nations approvals. With a structural supply deficit of zircon projected amid shrinking supply and rising demand, Cyclone is an attractive opportunity for a development partner to advance Australia's zircon production for the global market, supporting the growth of this critical mineral industry.

Project description

Cyclone has the potential to become a significant global supplier of zircon, accounting for an estimated 6% of global zircon supply. Cyclone also contains titanium minerals such as leucoxene, rutile and ilmenite and has potential for supply of the rare critical mineral hafnium within the zircon component of its heavy mineral concentrate (HMC). Shallow free-dig mining using a bulldozer and dozer trap method with progressive rehabilitation as the pit advances, will mine approximately 10Mtpa ore supplied to a wet concentrator plant (WCP) on-site. The WCP will process the sand via several stages of gravity concentration using spirals, classifiers and shaking tables producing a HMC. Life of mine production is estimated at 1.94Mt of HMC containing 936kt of zircon and producing 772kt of final zircon product.

Project Status
Feasibility Study

IRR
27.2% post-tax

Product & Annual Production Rate
- HHMC: 147ktpa (containing 59ktpa zircon, 9ktpa HiTi87, 49ktpa HiTi67)

Offtake available
Yes

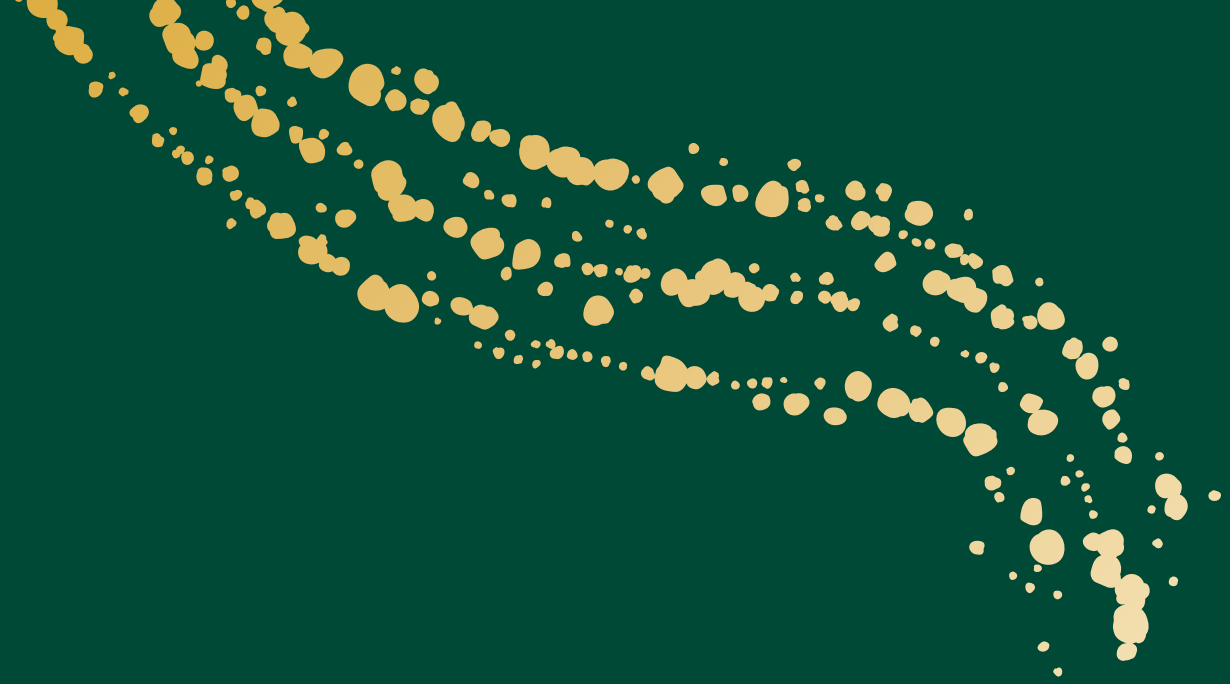
Capital Cost
A$135m

Min Mine Life (Years)
13.2

NPV
A$113m post-tax 10%DR

Study Date Jan 2018

Current as at September 2024



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AUSTRALIA