



**Ardea**  
Resources Limited

# Kalgoorlie Nickel Project - Goongarrie Hub

## *A multi decade nickel-cobalt operation*

Andrew Penkethman  
Managing Director & CEO

Noosa Mining Conference  
17 – 19 July 2024



Australian Federal Government  
- Major Project Status



Digbee ESG™



# Disclaimer

## Important notice

This presentation contains general information only and is, or is based upon, information which has been released to ASX or is contained in the Ardea Resources Limited (Ardea or the Company) prospectus dated 9 November 2016 (including supplementary prospectuses dated 18 November 2016 and 6 January 2017), High-grade nickel-cobalt mineralization extended at Goongarrie (8 October, 2018), Goongarrie Pilot Plant trial produces battery grade crystals (31 October 2018), Emu Lake Discovery (3 December 2021, 14 January 2022, 7 February 2022), Goongarrie Hub Feasibility Study Update (25 January 2022), High-grade Nickel-Cobalt Confirmed at Kalpini with Scandium and Rare Earth Elements (14 March 2022), Kalgoorlie Nickel Project Recognition on All Tiers of Australian Government (21 March 2022), Confirmation of High-Grade Nickel-Cobalt from Goongarrie South Metallurgical Drilling (16 May 2022), Kalgoorlie Nickel Project: Metallurgical Update – Mineralised Neutraliser (16 November 2022), Ardea Completes KNP ESG Accreditation from Independent Leading Global Platform (24 November 2022), Nickel sulphide anomalism from aircore drilling at Kalpini Project (2 May 2023), Mineralised Neutraliser Global Patent Lodged (15 June 2023), Kalgoorlie Nickel Project Mineral Resource Estimate Exceeds 6 Million Tonne Contained Nickel (30 June 2023), KNP Goongarrie Hub Ore Reserve and Feasibility Study Defines +40 Year Operation with Strong Financial Metrics (5 July 2023), Ardea Kalgoorlie Nickel Project – MOU with Sumitomo Metal Mining, Mitsubishi Corporation, and Mitsui & Co., Ltd (5 July 2023), Kalgoorlie Nickel Project Goongarrie Hub Tenement Consolidation (17 July 2023), Ardea Quarterly Activities Report June 2023 (27 July 2023), Ardea Annual Report 2023 (27 September 2023), Ardea and Japanese Consortium Update on MOU (29 September 2023), Nickel Sulphide Prospectivity Confirmed and Lithium-Caesium-Rubidium bearing intrusives in Highway EIS drillhole (15 December 2023), Ardea and Japanese Consortium: Update on Progress on KNP - Goongarrie Hub (21 December 2023), Ardea Quarterly Activities Report December 2023 (31 January 2024), Ardea and Japanese Consortium: Update on Progress on KNP - Goongarrie Hub (29 February 2024), Ardea and Japanese Consortium: Update on Progress on KNP - Goongarrie Hub (27 March 2024) ), Ardea Quarterly Activities Report March 2024 (26 April 2024), ARL SMM and MC to form a JV to develop KNP Goongarrie Hub ASX Announcement (29 April 2024), Ardea Completes Updated Kalgoorlie Nickel Project ESG Accreditation From Independent Leading Global Platform (9 May 2024), Ardea receives \$1.1 million R&D Rebate (13 June 2024), Kalgoorlie Nickel Project - Goongarrie Hub DFS Drilling Underway (4 July 2024), and Kalgoorlie Nickel Project - Goongarrie Hub DFS Underway (8 July 2024).

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The Goongarrie Project has completed the Pre-Feasibility Study phase and has commenced programs that are part of the Definitive Feasibility Study. Though reasonable care has been taken to ensure that the facts are accurate and/or that the opinions expressed are fair and reasonable, no reliance can be placed for any purpose whatsoever on the information contained in this document or on its completeness. Actual results and developments of projects and the market development may differ materially from those expressed or implied by these forward looking statements depending on a variety of factors. A key conclusion of the Pre-Feasibility Study, which is based on forward looking statements, is that the Goongarrie Project is considered to have positive economic potential.

No stock exchange, regulation services provider, securities commission or other regulatory authority has approved or disapproved the information contained in this news release.



# Experienced Board, Supportive Shareholders & Tight Capital Structure



**Mat Longworth** Non-Executive Chair

*Experienced across exploration, project evaluation / development including KNP and corporate management*



**Andrew Penkethman** Managing Director & CEO

*Experienced geologist with strong technical and corporate focus including discovery and strategic partner success and ASX, TSX and AIM experience*



**Maree Arnason** Non-Executive Director

*Highly experienced director and executive in the natural resources, energy and manufacturing sectors*



**Ian Buchhorn** Executive Director

*Mineral economist and geologist, with significant Eastern Goldfields of WA, exploration, evaluation, development and operations experience*



**Sam Middlemas** Company Secretary

*Chartered Accountant experienced in providing Company Secretary services*



**Listed on ASX (ARL)**

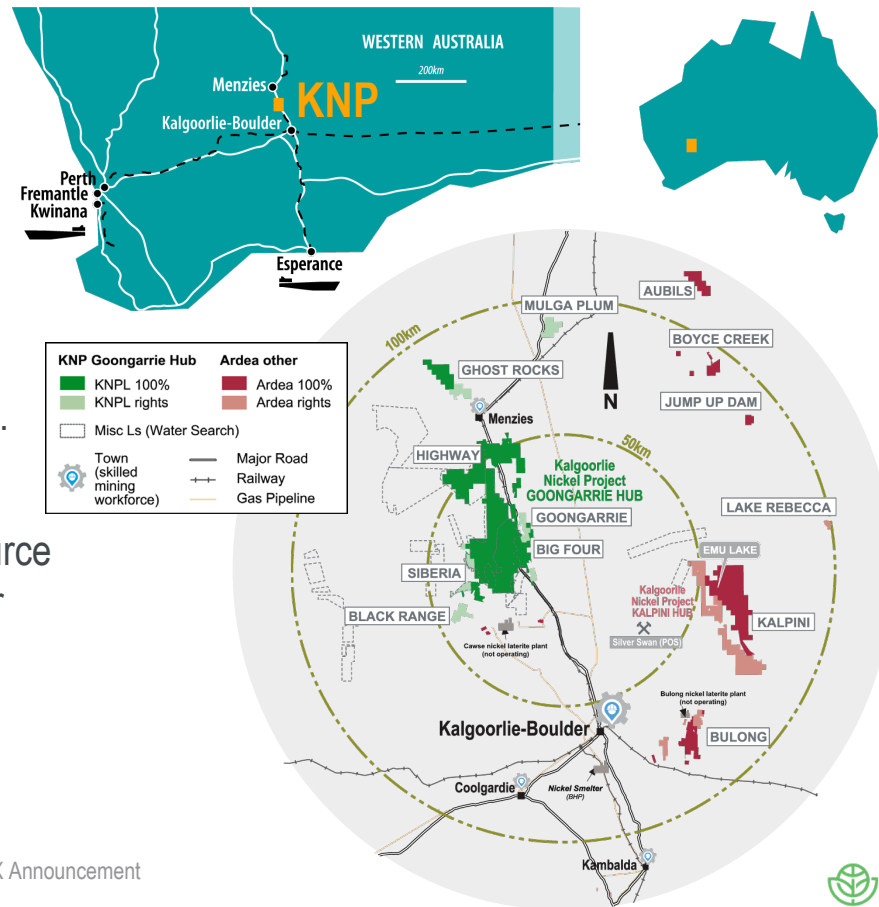
Shares on Issue	199,682,915	Cash (31 Mar 2024)	A\$17M
Performance Rights	3,316,400	R&D Rebate (13 Jun 2024)	A\$1.1M
Options	3,000,000	Board and Management	~10% equity
Share Price (12 Jul 2024)	\$0.49	Top 40 Shareholders	~60% equity
52 week high / low	\$0.95 / \$0.34	DFS budget being fully funded by Consortium <sup>1</sup>	A\$98.5M
Market Capitalisation	\$98 million		

1. Ardea signed a milestone Cooperation Agreement with a Consortium consisting of Sumitomo Metal Mining (SMM) and Mitsubishi Corporation (MC) who will fully fund KNP Goongarrie Hub Definitive Feasibility Study (DFS) up to budget A\$98.5M. See ARL ASX Cooperation Agreement Announcement 26 April 2024



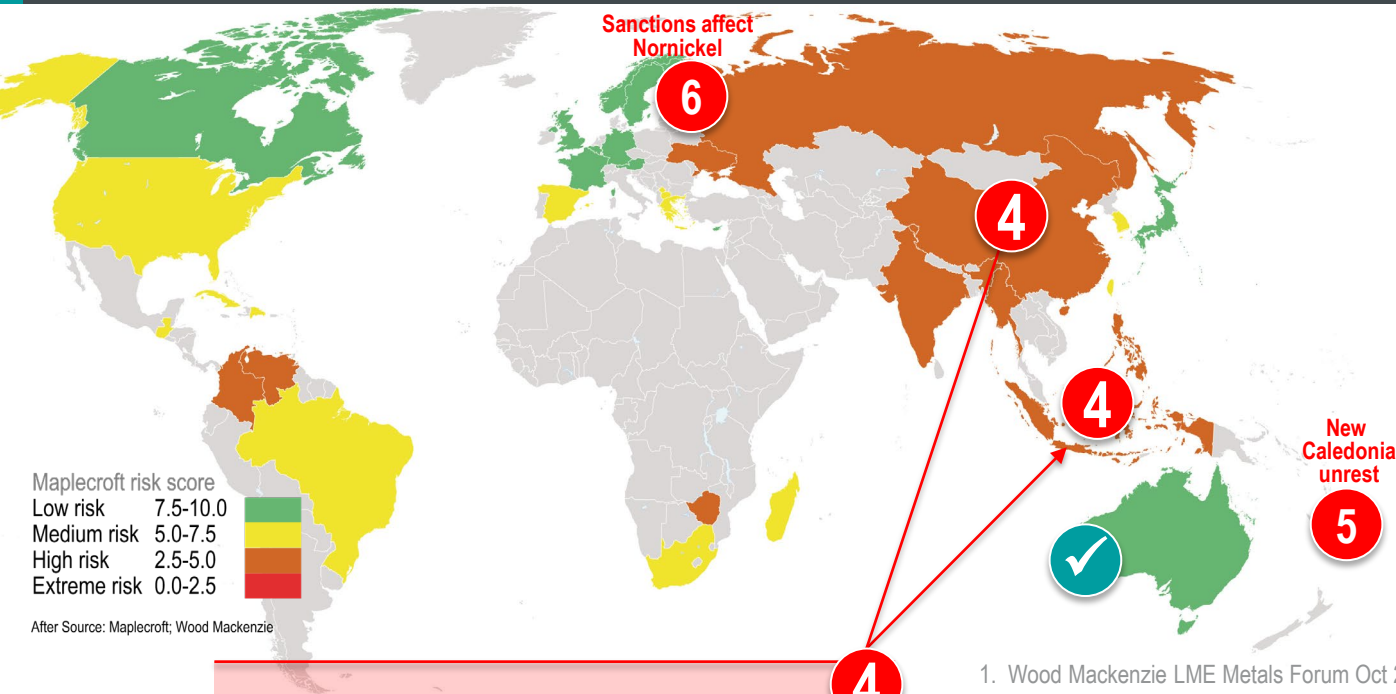
# Kalgoorlie Nickel Project – Globally Significant Nickel & Cobalt Resource

- KNP – Goongarrie Hub, 70km northwest of the City of Kalgoorlie-Boulder is in the **best operating jurisdiction in the world** with collaboration agreement with best possible **Partners, SMM and MC**<sup>1</sup>
- **Major Project Status**, with support at Local, State and Federal levels. Ready access to skilled personnel, and key infrastructure, including road, rail, power and gas. Two well serviced port options (Esperance and Kwinana)
- The Kalgoorlie Nickel Project (KNP) global Mineral Resource Estimate<sup>2</sup> (MRE) is 854Mt at 0.71% Ni and 0.045% Co for **6.1Mt contained nickel and 386kt contained cobalt**
- The KNP Goongarrie Hub MRE<sup>2</sup> is 584Mt at 0.69% Ni and 0.043% Co for **4Mt of nickel and 250kt of cobalt**





# All Nickel Supply Chains are NOT Equal



✗ High Risk/Of Concern Jurisdictions<sup>1</sup>  
 ✗ Significant number of nickel projects may not comply with IRA, FEOC, EU CRMA making them less desirable to OEMs<sup>4</sup>



**Kalgoorlie  
Nickel Project  
Goongarrie Hub**

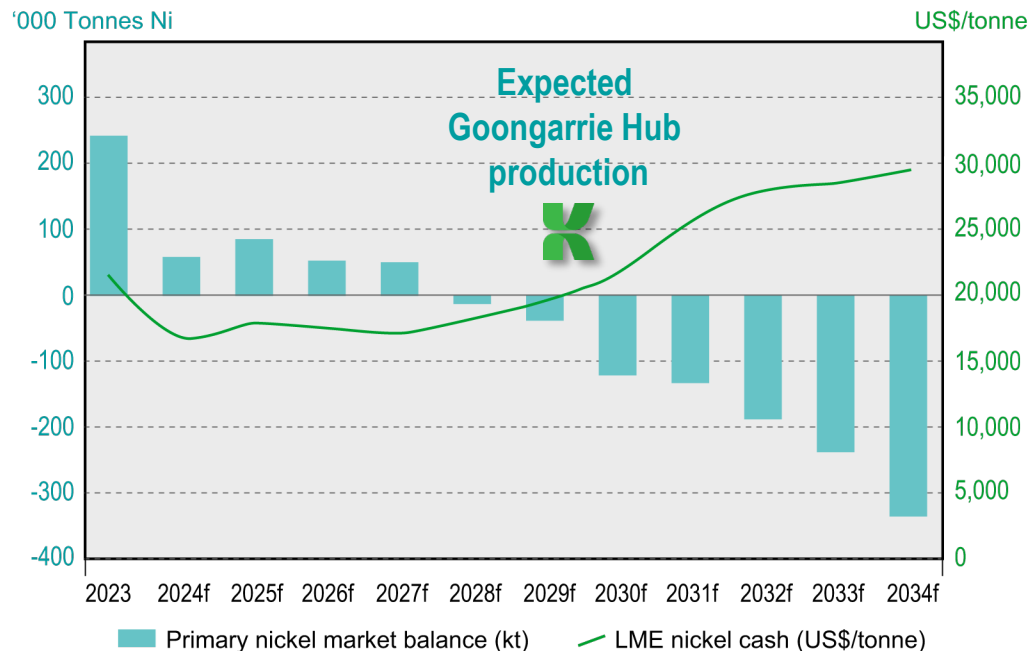
- ✓ Low Risk/Low Concern jurisdiction<sup>1</sup>
- ✓ Large resource, multi-decade operation, robust financial metrics, low Opex - strategic asset attractive to OEMs<sup>2</sup>
- ✓ Complies with IRA, FEOC, EU CRMA
- ✓ Working with Japanese Consortium to form KNP Goongarrie Hub JV<sup>3</sup>

1. Wood Mackenzie LME Metals Forum Oct 2022. Benchmark Minerals World Tour 2024
2. ARL PFS ASX Announcement, 5 July 2023
3. ARL Cooperation Agreement, 29 April 2024
4. US Inflation Reduction Act (IRA), Foreign Entity of Concern (FEOC) & EU Critical Raw Materials Act (CRMA)
5. Amid growing social unrest, New Caledonia's nickel industry is also in turmoil - [link](#)
6. LME plans to suspend nickel brand produced by a plant in Finland owned by Russian metals giant Nornickel - July 2024 [link](#)

# Current Nickel output cuts to pressure near term surpluses lower

- 2023 large nickel surplus led to significant drop in LME nickel cash price
- Higher cost producers have responded by cutting / ceasing production which in turn has put pressure on supply
- Critical mineral supply chains in poor ESG jurisdictions at risk
- 2024-2027 forecast showing reducing surplus, with supply gap increasing progressively from 2028, with forecast LME nickel prices correspondingly rising
- **Security and diversity of nickel supply is imperative with Goongarrie Hub production perfectly timed**

## Nickel Market Balance and Price Forecast



After Source: Fastmarkets Long Term Forecasts 2024

# Significant Critical Minerals Collaboration

*The Goongarrie Hub DFS is the first Critical Minerals collaboration between Australia and Japan, with the project expected to be a multi decade nickel-cobalt operation that provides supply chain diversity, security and meets the high ESG standards expected from Australia and Japan*



**Ardea**  
Resources Limited

KNPL is a 100% subsidiary of **Ardea** and holds the **KNP Goongarrie Hub**. Ardea are forming a **Joint Venture** with the **Consortium** who will contribute **financially and technically** to ultimately earn a 50% interest in KNPL. Ardea to retain 50% KNPL interest



**KALGOORLIE**  
**NICKEL**

Kalgoorlie Nickel Pty Ltd (KNPL)  
(Goongarrie Hub Project Company,  
managing KNP Goongarrie Hub DFS)



**SUMITOMO**  
**METAL MINING**



**Mitsubishi Corporation**

Sumitomo Metal Mining (SMM) and Mitsubishi Corporation (MC), together the **Consortium**, **fully funding DFS** up to **A\$98.5M** to earn 35% interest in KNPL, and a further 15% interest in KNPL on Final Investment Decision (FID). Consortium to assist KNPL in optimising debt financing

# What the Partners are Bringing to the Joint Venture...



## Globally Significant Asset

Goongarrie Hub – **MRE 4Mt contained Ni & 250Kt contained Co Ore Reserve of 1.36Mt of contained Ni & 99Kt contained Co<sup>1</sup>**

## Wealth of data and knowledge

Comprehensive drillhole and sample database.

Detailed geometallurgical material types and data from past studies.

Experienced and respected Corporate and Technical team.

## Strong Stakeholder Support

Major Project Status.

Ardea is expected to have enhanced access to financing under Australia's \$4 billion Critical Minerals Facility.

Excellent stakeholder relationships, including Local, State & Federal Governments



## SMM and MC will fully fund the KNP Goongarrie Hub DFS

The Consortium will provide technical input into the DFS and assist KNPL in optimising debt financing and FID.

The Consortium will have access to 75% of the off-take, which is in the best interests of the project in being able to access the most competitive debt terms. Off-take will be on commercial terms.

## SMM and MC will collaborate with Ardea and KNPL on the Goongarrie Hub DFS

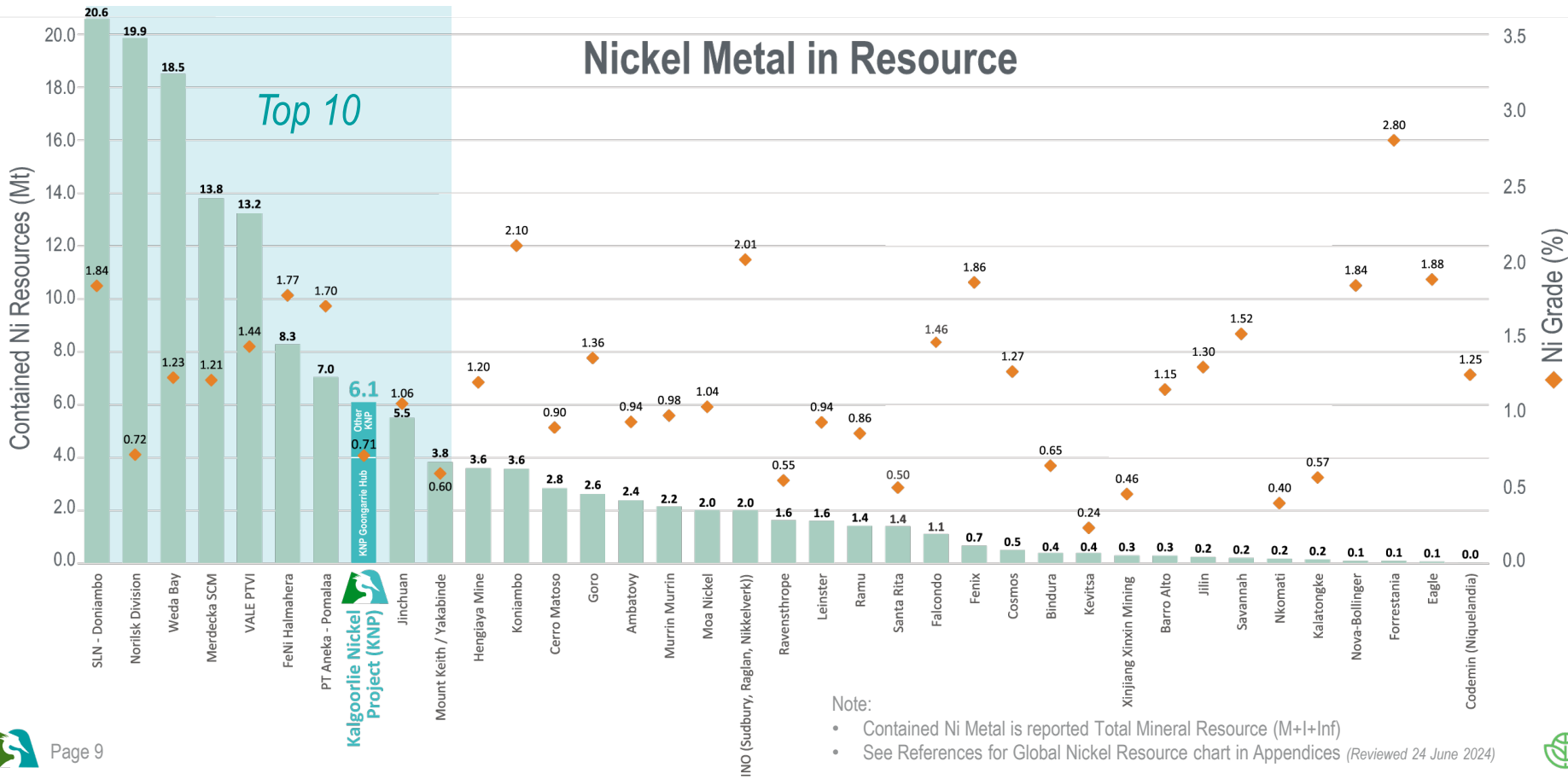
**SMM** is a pre-eminent nickel-cobalt laterite development and production company, operating the Coral Bay and Taganito HPAL nickel operations and the Niihama Nickel Refinery and Harima Refinery.

**MC** is one of Japan's largest and premier general trading and investment companies with decades of experience in supporting the Australian resources sector

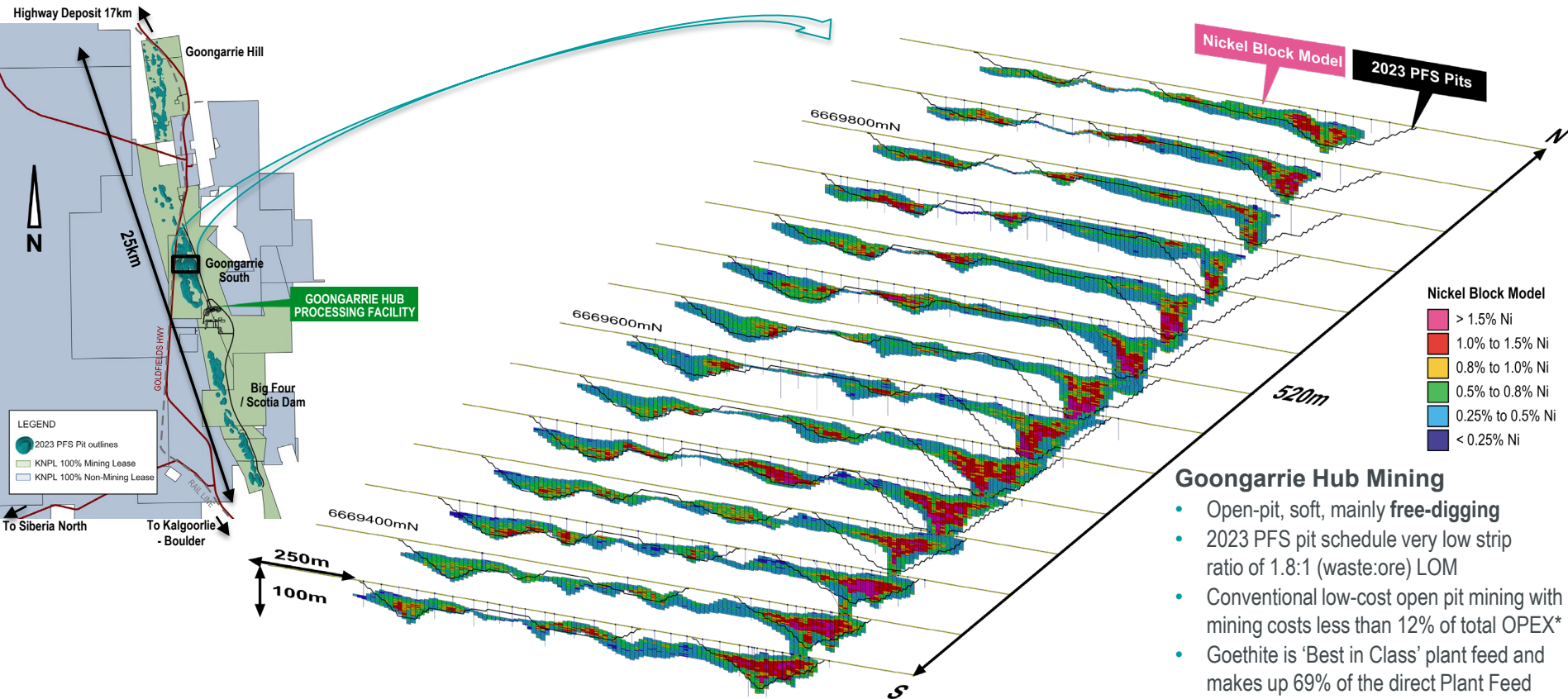




# Kalgoorlie Nickel Project Resource in Top 10 Globally

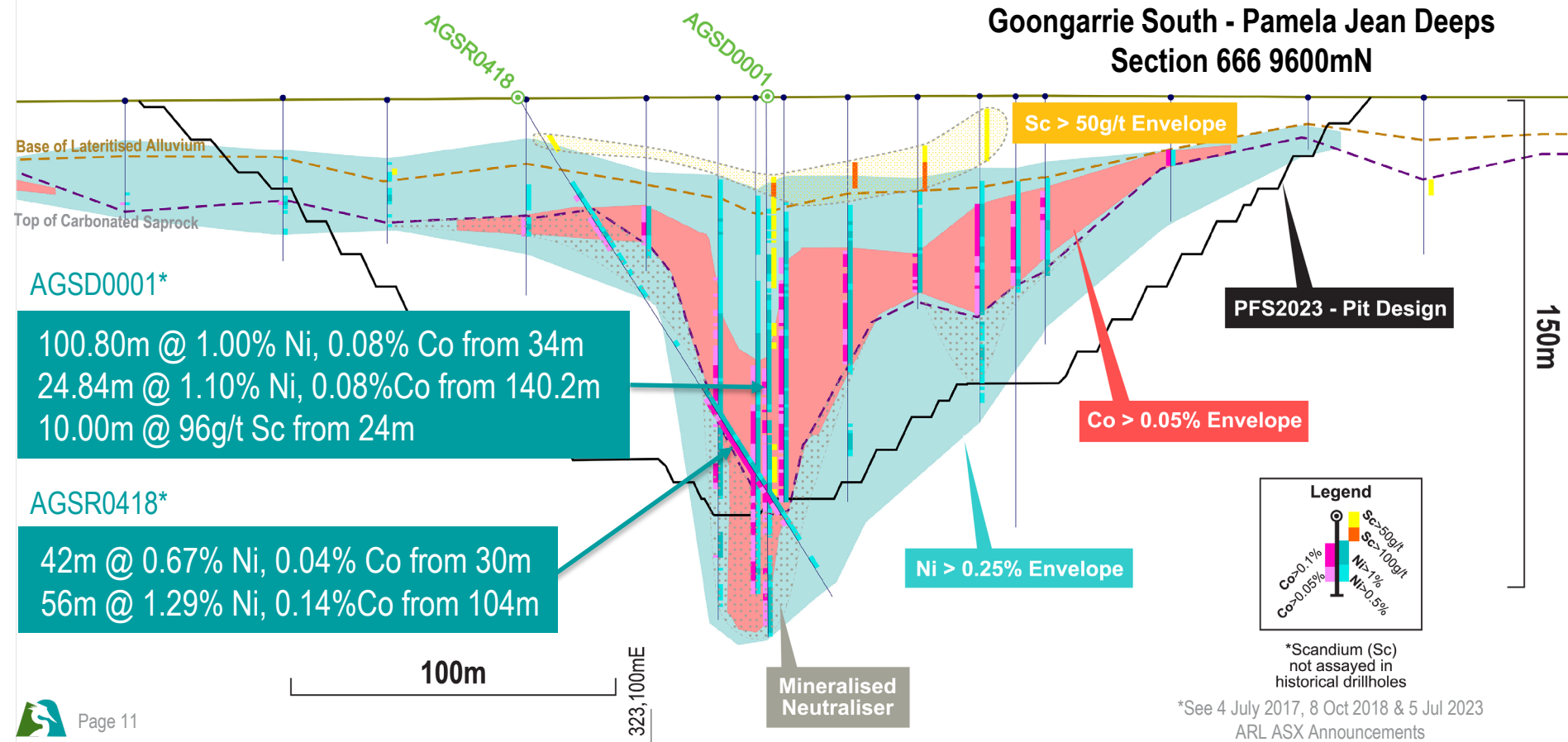


# Premium Goethite Nickel and Cobalt Ore



# KNP Goongarrie Hub – Shallow, Thick, High-Grade Nickel

## Goongarrie South - Pamela Jean Deeps Section 666 9600mN



**Highway Section 669 9364mN**

Base of Lateritised Alluvium  
Top of Carbonated Saprock

PFS2023 - Pit Design

Mineralised Neutraliser

Ni > 0.25% Envelope

Co > 0.03% Envelope

AHID0012\*

Mineralised Neutraliser

Legend

- Sc > 50g/t
- Sc > 100g/t
- Ni > 1%
- Ni > 0.5%
- Co > 0.1%
- Co > 0.03%

\*Scandium (Sc) not assayed in historical drillholes

150m

**AHID0012\***

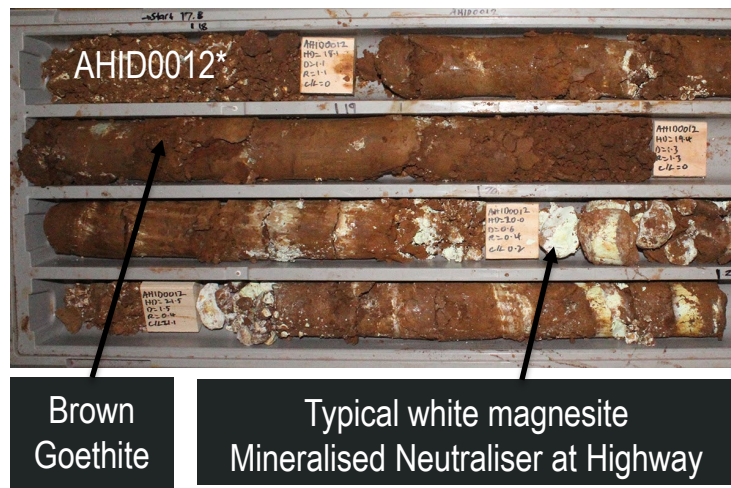
20m @ 1.14% Ni, 0.037% Co & 4g/t Sc from 4m  
inc 4m @ 2.31% Ni, 0.132% Co & 8g/t Sc from 4m – HPAL feed  
& inc 8m @ 1.30% Ni, 0.015% Co & 3g/t Sc from 16m –  
Mineralised Neutraliser (see Core Tray photograph for part interval)

Brown Goethite

Typical white magnesite Mineralised Neutraliser at Highway

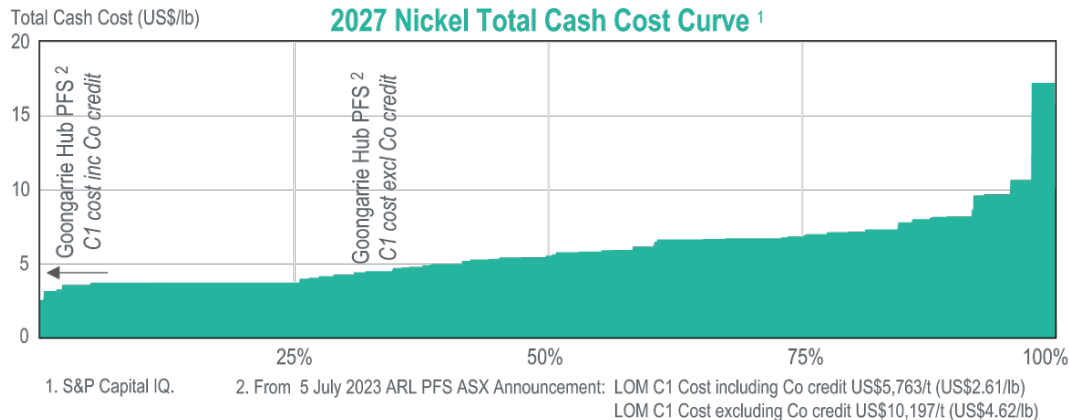
AHID0012\*

20m @ 1.14% Ni, 0.037% Co & 4g/t Sc from 4m  
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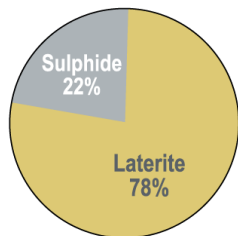




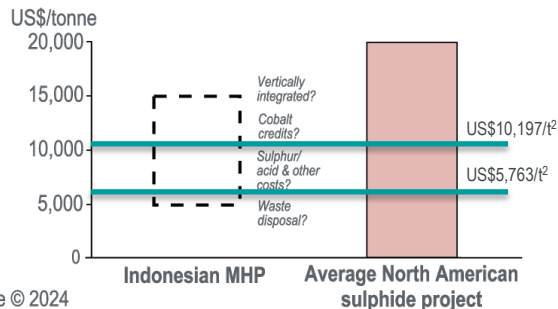
# Kalgoorlie Nickel Project – Robust Goongarrie Hub PFS Delivers



Share of 2023 nickel production  
by ore type



Approximate Ni production costs by route

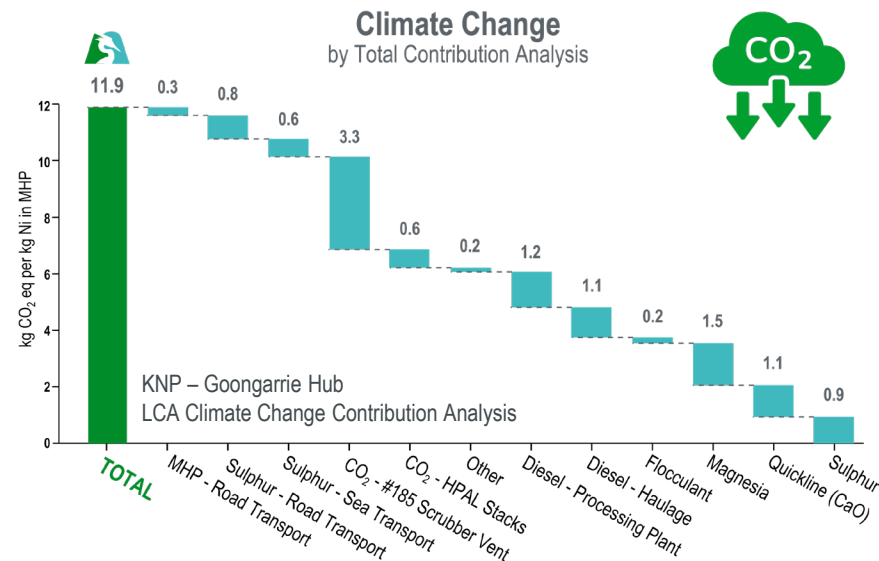
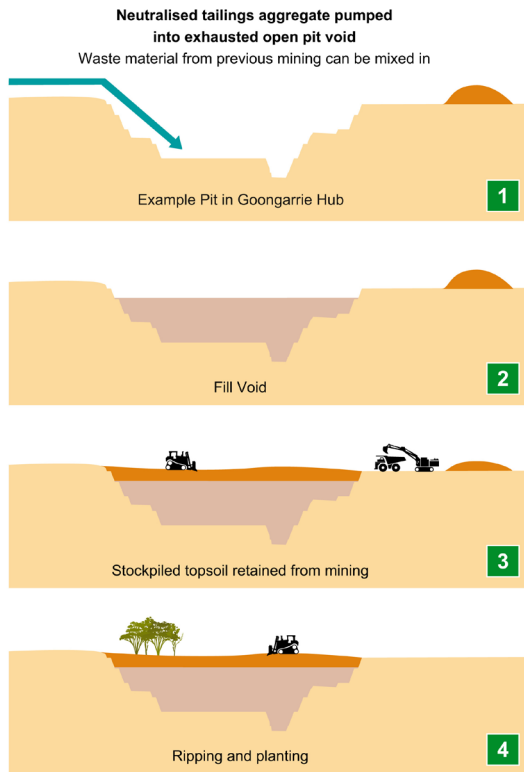


- Goongarrie Hub Ore Reserve<sup>2</sup> **194.1Mt at 0.70% Ni and 0.05% Co** for **1.36Mt of nickel** and **99,000t of cobalt** to sustain production of approximately **30,000t of nickel** and **2,000t of cobalt per year** for **> 40 years**
- Strong financial metrics with average annual **EBITDA of A\$800M**, and Post-tax **NPV<sub>7</sub> of A\$4,980M (IRR 23%)<sup>2</sup>**
- KNP Goongarrie Hub Low C1 Opex after Cobalt credit of **US\$5,763/t Ni** in MHP LOM<sup>2</sup> compares well with Indonesian Opex and lower than most sulphide producers



# ESG Credentials Strengthened During PFS

In-pit tailings disposal<sup>1</sup> **minimises environmental footprint** and enables mine site rehabilitation, concurrent with steady-state mine operation.



Life Cycle Assessment (LCA) is expected to be 11.9 kg CO<sub>2</sub> eq. per kg nickel in MHP based on Ardea's Scope 1, 2 and upstream Scope 3 emissions<sup>1</sup>. **This compares favourably to the global average of ~13.0 kg CO<sub>2</sub> eq. per kg nickel produced.**

1. See 5 July 2023 ARL PFS ASX Announcement.

# KNP Goongarrie Hub DFS has commenced



- **KNPL** is a 100% subsidiary of **Ardea** with the **Consortium** progressively earning a 50% interest. KNPL holds **the Goongarrie Hub** and will manage KNP Goongarrie Hub DFS<sup>1</sup>
- Ardea, SMM and MC representatives will be on the KNPL steering committee. Significant technical and commercial input to the DFS will be made by Ardea, SMM and MC team members
- The DFS will evaluate increasing processing capacity from 3.5Mtpa (PFS) to **4Mtpa**, through reducing residence time in autoclave from 70 mins to 60 mins (Ardea metallurgy testwork returned results as low as 40 mins<sup>2</sup>)
- Infill Drilling underway to upgrade definition of Mineral Resources into Measured category within the first five year pit shells as part of the DFS, that will be available for conversion to Proven Ore Reserve<sup>3</sup>
- Engineering firm Ausenco awarded the Process Plant contract<sup>3</sup>

*Andrew Penkethman and Matt Read with Sumitomo Metal Mining and Mitsubishi Corporation representatives - Niihama Nickel Refinery, Japan June 2024*



*KNP Goongarrie Hub Joint Venture being managed by KNPL*



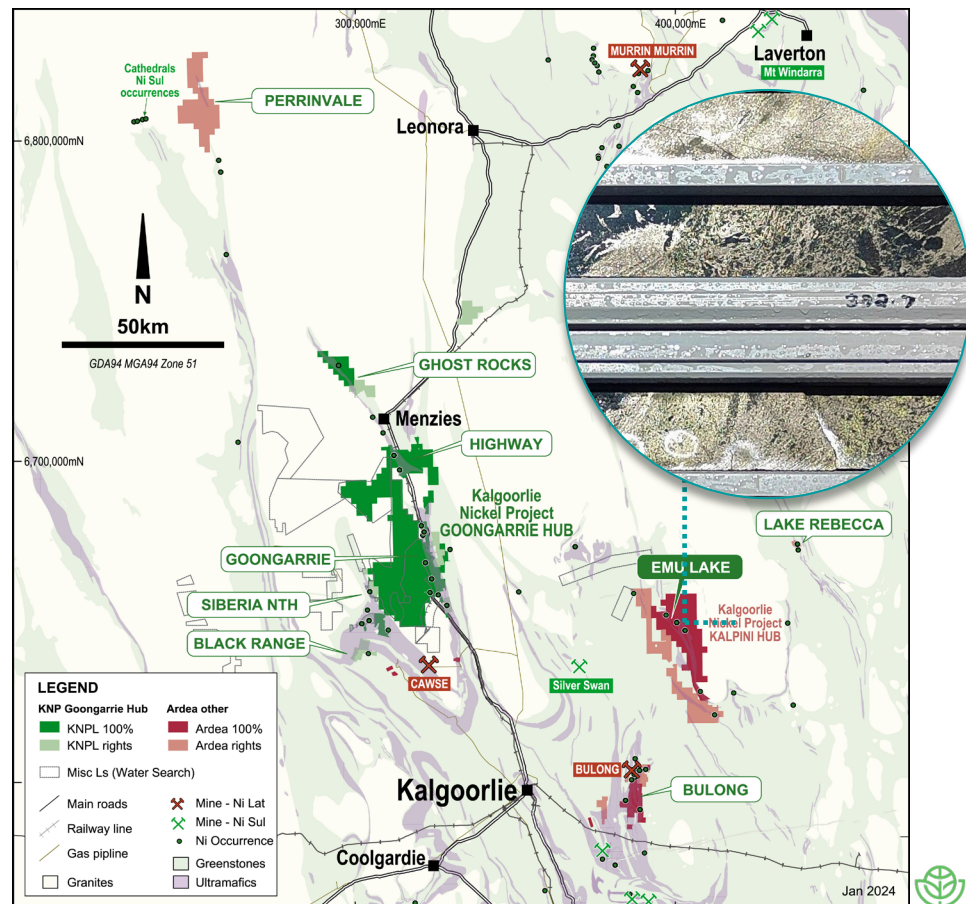
1. See 26 April 2024 ARL, SMM and MC to form a JV to develop KNP Goongarrie Hub ASX Announcement
2. See 24 July 2018 Goongarrie Expansion Study ASX Announcement
3. See 8 July 2024 Kalgoorlie Nickel Project - Goongarrie Hub DFS Underway ASX Announcement



# Ardea Exploration Pipeline Upside

Ardea controls **~3,500km<sup>2</sup> of tenure in the Eastern Goldfields of WA** with unrivalled **Battery and Critical Mineral** exploration potential

- **Kalpini Project - Massive nickel-copper-PGE sulphides discovered** at Emu Lake (AELD0003: 2.72m at 5.42% Ni & 0.85% Cu from 391.04m) within largely untested 20km of strike<sup>1</sup>
- **Scandium and Rare Earth Elements (REE)** identified at Ardea's **KNP Kalpini<sup>2</sup>** tenure
- Ardea retain 100% ownership of non-Goongarrrie Hub KNP projects providing an internal pipeline for future growth





# Key Investment Considerations – For a Must Have Nickel-Cobalt Stock



**Ardea, Sumitomo Metal Mining and Mitsubishi Corporation** to form a Joint Venture to develop the Kalgoorlie Nickel Project (KNP) – Goongarrie Hub; DFS, managed by KNPL, has commenced



**KNP** is a strategic asset which includes the Goongarrie Hub, (part of joint venture with the Consortium), and remaining KNP Hubs (being owned 100% by Ardea). The global KNP **Ni-Co resource is the largest in Australia and in top 10 globally**, making it of a scale that is incredibly rare and important in the World's journey to Net Zero



Goongarrie Hub PFS starter project with **> 40 year mine life producing ~30ktpa nickel and 2ktpa cobalt**, with **strong earnings**, project **payback in 3.1 years** and **low C1 cost** will provide resilience throughout the price cycle<sup>2</sup>



Located in the **premier resources operating jurisdiction in the World**, compliant under US Inflation Reduction Act and Foreign Ownership criteria and EU Critical Raw Materials Act



Ardea controls **~3,500km<sup>2</sup> of tenure in the Eastern Goldfields of WA** with unrivalled **Battery and Critical Mineral** exploration potential



The **Ardea Team** have relevant experience, local knowledge and are working with **well-regarded partners** to advance the globally significant KNP Goongarrie Hub project, to deliver quality outcomes to benefit all stakeholders

1. See 26 April 2024 ARL SMM and MC to form a JV to develop KNP Goongarrie Hub ASX Announcement
2. See 5 July 2023 ARL PFS ASX Announcement and full Financial Metrics. See Appendices in this presentation





# Ardea Resources Limited

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or follow our socials



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*Our team welcome your questions*  
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**Ardea**  
Resources Limited


## Kalgoorlie Nickel Project Goongarrie Hub

*A multi decade nickel-cobalt operation*

Appendices:  
Full tables and  
supporting references



*Australian Federal Government  
- Major Project Status*





# Leveraging KNP Goongarrie Hub Material Types



*The KNP Goongarrie Hub nickel-cobalt laterite deposits have developed from intense tropical weathering of the Walter Williams Formation (WWF), an olivine cumulate ultramafic volcanic rock, and preferential weathering of the Bardoc Tectonic Zone crustal scale structures*

**High grade, consistent mineralisation at Goongarrie** is due to deep, intense ground-water leaching/ weathering beneath palaeo-lake/channels, resulting in the deep “V” shape of the Goongarrie South deposit. Intense leaching of silica and magnesia minerals has resulted in strong hydrated iron oxide enrichment, being the **premium Goethite nickel-cobalt ore**

Areas with less intense leaching retain **relic carbonate saprock** as a near surface perched horizon, typically white magnesite fragments ‘floating’ in mineralised clay-goethite. The beneficiated screen oversize is the source of **Mineralised Neutraliser (MN)**. The **Fines** are an **additional feed** to the Atmospheric Leach (AL) circuit. MN also may occur at the Saprock interface as magnesite in mineralised clay-goethite

**Premium Goethite** grind and beneficiation **ore** as HPAL feed comprise 69% and 17% respectively of the plant leach feed. MN material sourced from within the optimised open pits, provides a low-cost neutralisation alternative to limestone from third-party suppliers, and contributes 16% additional nickel-cobalt metal



# Competent Persons

Information in this presentation has been summarised from ARL ASX MRE Announcement 30 June 2023, ARL ASX PFS Announcement 5 July 2023 and ARL ASX MOU Announcements 5 July 2023, 29 September 2023, 21 December 2023 and 31 January 2024.

## Resource Estimation, Exploration Results, and Industry Benchmarking

The Resource Estimation, Exploration Results and Industry Benchmarking summaries are based on information reviewed or compiled by Mr Ian Buchhorn, and Mr Andrew Penkethman. Mr Buchhorn is a Member of the Australasian Institute of Mining and Metallurgy and Mr Penkethman is a Fellow of the Australasian Institute of Mining and Metallurgy and a Member of the Australian Institute of Geoscientists. Both Mr Buchhorn and Mr Penkethman are full-time employees of Ardea Resources Limited and have sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking to qualify as a Competent Person as defined in the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'.

Mr Buchhorn and Mr Penkethman have reviewed this press release and consent to the inclusion in this report of the information in the form and context in which it appears. Mr Buchhorn and Mr Penkethman own Ardea shares.

Ardea wishes to clarify that its current Kalgoorlie Nickel Project (KNP) Mineral Resource Estimate (MRE) following JORC Code (2012) guidelines is:

					Contained	Contained
KNP	Resource Category	Size (Mt)	Ni (%)	Co (%)	Ni (kt)	Co (kt)
Kalgoorlie Nickel Project Total	Measured	22	0.94	0.079	207	17
	Indicated	361	0.73	0.047	2,622	169
	Inferred	471	0.70	0.043	3,272	200
KNP	Grand Total	854	0.71	0.045	6,101	386

Note: 0.5% nickel cutoff grade used to report resources. Minor discrepancies may occur due to rounding of appropriate significant figures.

The Mineral Resource Estimate information shown in this ASX release has been previously released on the ASX platform by Ardea in ASX release 30 June 2023, in accordance with Listing Rule 5.8.

The Company confirms that it is not aware of any new information or data that materially affects the information included in the previous market announcement noted above and that all material assumptions and technical parameters underpinning the Mineral Resource Estimate in the previous market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Persons' findings are presented have not been materially modified from the original market announcement.

## Ore Reserves

Information in this presentation that relates to Ore Reserves at the Kalgoorlie Nickel Project Goongarrie Hub is based on and fairly represents information and supporting documentation compiled by Mr Jake Fitzsimons, a Competent Person who is a full-time employee of Orelogy Mine Consulting, a company engaged by Ardea. Mr Fitzsimons is a Fellow of the Australasian Institute of Mining and Metallurgy. Mr Fitzsimons has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which is being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012 JORC Code). Mr Fitzsimons does not hold securities in Ardea and consents to the inclusion in this announcement of all technical statements based on his information in the form and context in which they appear.

The Ore Reserve information shown in this ASX release has been previously released on the ASX platform by Ardea in ASX release 5 July 2023, in accordance with Listing Rule 5.9.

					Contained	Contained
Goongarrie Hub	Ore Reserve Category	Size (Mt)	Ni (%)	Co (%)	Ni (kt)	Co (kt)
Ore Reserve	Proven	16.7	0.96	0.09	160	15
	Probable	177.4	0.68	0.05	1,204	84
	Grand Total	194.1	0.70	0.05	1,365	99

Note: Minor discrepancies may occur due to rounding of appropriate significant figures.

Full details on the Ore Reserve are available in the 5 July Ardea ASX announcement, see Section 5 and Appendix 1.

The Ore Reserve information shown in this ASX release has been previously released on the ASX platform by Ardea in ASX release 5 July 2023, in accordance with Listing Rule 5.9.

The Company confirms that it is not aware of any new information or data that materially affects the information included in the previous market announcement noted above and that all material assumptions and technical parameters underpinning the Ore Reserve in the previous market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Persons' findings are presented have not been materially modified from the original market announcement.



# KNP Global MRE

The Competent Persons (CP) for the Mineral Resources, are Mr Ian Buchhorn and Mr Andrew Penkethman, both are full-time employees of Ardea and consider the resource classification applied to the KNP resource models to reflect appropriate confidence in the input exploration data, geological interpretation and resource grade and tonnage estimates.

Various ASX market releases for the Mineral Resources described have been competed by Ardea, notably:

- 30 June 2023 'Kalgoorlie Nickel Project Mineral Resource Estimate Exceeds 6 Million Tonne Contained Nickel'.
- 16 June 2021 'Highway Nickel Deposit -Mineral Resource Estimate 92 million tonnes at 0.69% nickel and 0.038% cobalt'.
- 15 February 2021 'GNCP High Grade Resource -60 million tonnes at 1.0% nickel Sustainable Long-life Battery Metal Resource Confirmed'.

## KNP Global nickel and cobalt Mineral Resources based on a 0.5% Ni cut-off grade

					Contained	Contained
KNP Hub	Resource Category	Size (Tonnes)	Ni (%)	Co (%)	Ni (kt)	Co (kt)
Goongarrie Hub	Measured	18,200,000	0.94	0.085	171	15
	Indicated	276,500,000	0.70	0.046	1,923	127
	Inferred	289,300,000	0.67	0.037	1,951	108
	<b>Sub Total</b>	<b>584,000,000</b>	<b>0.69</b>	<b>0.043</b>	<b>4,044</b>	<b>250</b>
Kalpini Hub	Indicated	15,900,000	1.06	0.055	169	9
	Inferred	113,600,000	0.76	0.047	859	53
	<b>Sub Total</b>	<b>129,500,000</b>	<b>0.79</b>	<b>0.048</b>	<b>1,028</b>	<b>62</b>
Yerilla Hub	Measured	3,800,000	0.94	0.048	36	2
	Indicated	68,400,000	0.78	0.049	531	33
	Inferred	67,800,000	0.68	0.057	462	39
	<b>Sub Total</b>	<b>140,000,000</b>	<b>0.73</b>	<b>0.053</b>	<b>1,028</b>	<b>74</b>
Kalgoorlie Nickel Project Total	Measured	22,000,000	0.94	0.079	207	17
	Indicated	360,800,000	0.73	0.047	2,622	169
	Inferred	470,700,000	0.70	0.043	3,272	200
KNP	<b>Grand Total</b>	<b>853,500,000</b>	<b>0.71</b>	<b>0.045</b>	<b>6,101</b>	<b>386</b>

Minor discrepancies may occur due to rounding of appropriate significant figures.



# KNP Goongarrie Hub MRE

The Competent Persons (CP) for the Mineral Resources, are Mr Ian Buchhorn and Mr Andrew Penkethman, both are full-time employees of Ardea and consider the resource classification applied to the Goongarrie Hub resource models to reflect appropriate confidence in the input exploration data, geological interpretation and resource grade and tonnage estimates.

Various ASX market releases for the Mineral Resources described have been completed by Ardea, notably:

- 30 June 2023 'Kalgoorlie Nickel Project Mineral Resource Estimate Exceeds 6 Million Tonne Contained Nickel'.
- 16 June 2021 'Highway Nickel Deposit -Mineral Resource Estimate 92 million tonnes at 0.69% nickel and 0.038% cobalt'.
- 15 February 2021 'GNCP High Grade Resource -60 million tonnes at 1.0% nickel Sustainable Long-life Battery Metal Resource Confirmed'.

## KNP Goongarrie Hub nickel and cobalt Mineral Resources based on a 0.5% Ni cut -off grade

Prospect	Resource	Size	Ni	Co	Contained Metal		Estimation Details		
	Category	(Mt)	(%)	(%)	Ni (kt)	Co (kt)	Method	Source	Year
Goongarrie South	Measured	18	0.94	0.085	171	15	LUC	Ardea	2021
	Indicated	82	0.71	0.049	584	40	LUC	Ardea	2021
	Inferred	10	0.64	0.033	61	3	LUC	Ardea	2021
Highway	Indicated	71	0.69	0.038	487	27	LUC	Ardea	2023
	Inferred	21	0.67	0.04	141	8	LUC	Ardea	2023
Ghost Rocks*	Inferred	47	0.66	0.042	312	20	OK	Snowden	2004
Goongarrie Hill	Indicated	40	0.65	0.037	259	15	LUC	Ardea	2021
	Inferred	29	0.6	0.025	176	7	LUC	Ardea	2021
Big Four	Indicated	49	0.71	0.047	346	23	LUC	Ardea	2021
	Inferred	14	0.68	0.043	96	6	LUC	Ardea	2021
Scotia Dam	Indicated	12	0.71	0.065	82	7	LUC	Ardea	2021
	Inferred	5	0.72	0.043	37	2	LUC	Ardea	2021
Goongarrie Subtotal	Measured	18	0.94	0.085	171	15			
	Indicated	253	0.69	0.044	1,758	112			
	Inferred	127	0.65	0.037	823	47			
	Combined	398	0.69	0.044	2,753	175			
Siberia South*	Inferred	81	0.65	0.033	525	27	OK	Snowden	2004
Siberia North	Indicated	14	0.72	0.042	102	6	Ni (UC), Co (OK)	Snowden	2009
	Inferred	72	0.74	0.034	534	25	Ni (UC), Co (OK)	Snowden	2009
Black Range*	Indicated	9	0.67	0.09	62	8	OK	HGMC	2017
	Inferred	10	0.69	0.1	68	10	OK	HGMC	2017
Siberia Subtotal	Indicated	24	0.7	0.061	165	14			
	Inferred	163	0.69	0.038	1,127	61			
	Combined	186	0.69	0.04	1,292	75			
KNP Goongarrie Hub TOTAL	Measured	18	0.94	0.085	171	15			
	Indicated	277	0.7	0.046	1,923	127			
	Inferred	289	0.67	0.037	1,951	108			
	Combined	584	0.69	0.043	4,044	250			

\*Note - Mineral Resources that are not considered in 2023 PFS.

# KNP Goongarrie Hub Ore Reserve Summary

KNP Goongarrie Hub Ore Reserve Summary consisting of ore above 0.5% Ni as the feed stock for the processing facility, and ore as Mineralised Neutraliser above 0.5% Nieq and LOI above 25%

## Notes:

- The Ore Reserve is reported in accordance with JORC Code 2012.
- Ore reserves are reported at a cut-off of 0.5% Ni for primary feed stock to the processing facility, plus mineralised neutraliser as ore at a cut-off of 0.5% Ni Equivalent (NiEq) and Loss on Ignition (LOI) above 25%.
- NiEq defined using  $Ni + 2.32 \times Co$ .
- The Ore Reserve was evaluated using a base price of US\$22,000/t for Ni and US\$51,000/t for Co at 85% payable for a Mixed Hydroxide Precipitate (MHP) product, and an exchange rate 0.69 USD/AUD. In view of forward metal price projections averaging US\$25,000/t Ni, the Ore Reserve can be considered conservative.
- Ore Reserves account for mining dilution and mining ore loss.
- Ore Reserves are reported on a Dry Tonnage Basis.
- Proven Ore Reserves are based on Measured Mineral Resources only and Probable Ore Reserves are based on Indicated Mineral Resources only.
- The sum of individual amounts may not equal due to rounding.
- This Ore Reserve estimate is for a subset of the KNP Goongarrie Hub deposits being Goongarrie South, Big Four / Scotia Dam, Goongarrie Hill, Highway and Siberia North.
- The Ore Reserve Summary was detailed in ARL ASX PFS Announcement, 5 July 2023.
- Minor discrepancies may occur due to rounding of appropriate significant figures.

Deposit	Ore >= 0.5% Ni					Ore > 0.5% NiEq and LOI > 25%					Total Ore				
	Mt	Ni %	Co %	Ni kt	Co kt	Mt	Ni %	Co %	Ni kt	Co kt	Mt	Ni %	Co %	Ni kt	Co kt
<b>Proven</b>															
Goongarrie South	16.7	0.96	0.09	160	15	0.05	0.43	0.03	0.20	0.01	16.7	0.96	0.09	160	15
<b>Sub-total</b>	<b>16.7</b>	<b>0.96</b>	<b>0.09</b>	<b>160</b>	<b>15</b>	<b>0.05</b>	<b>0.43</b>	<b>0.03</b>	<b>0.20</b>	<b>0.01</b>	<b>16.7</b>	<b>0.96</b>	<b>0.09</b>	<b>160</b>	<b>15</b>
<b>Probable</b>															
Big Four/Scotia Dam	34.9	0.76	0.07	265	23	0.8	0.38	0.04	3	0	35.7	0.75	0.06	268	23
Goongarrie South	33.6	0.79	0.07	265	23	1.8	0.40	0.03	7	1	35.4	0.77	0.07	272	24
Goongarrie Hill	15.8	0.70	0.04	110	7	0.1	0.44	0.02	0	0	15.9	0.70	0.04	111	7
Highway	54.0	0.70	0.04	380	22	27.2	0.39	0.01	106	4	81.2	0.60	0.03	486	26
Siberia North	9.2	0.74	0.05	68	4	-	-	-	-	-	9.2	0.74	0.05	68	4
<b>Sub-total</b>	<b>147.4</b>	<b>0.74</b>	<b>0.05</b>	<b>1,087</b>	<b>79</b>	<b>29.9</b>	<b>0.39</b>	<b>0.02</b>	<b>117</b>	<b>5</b>	<b>177.4</b>	<b>0.68</b>	<b>0.05</b>	<b>1,204</b>	<b>84</b>
<b>PROVEN AND PROBABLE TOTAL</b>															
Big Four/Scotia Dam	34.9	0.76	0.07	265	23	0.8	0.38	0.04	3	0	35.7	0.75	0.06	268	23
Goongarrie South	50.2	0.85	0.08	425	38	1.9	0.40	0.03	7	1	52.1	0.83	0.07	432	39
Goongarrie Hill	15.8	0.70	0.04	110	7	0.1	0.44	0.02	0	0	15.9	0.70	0.04	111	7
Highway	54.0	0.70	0.04	380	22	27.2	0.39	0.01	106	4	81.2	0.60	0.03	486	26
Siberia North	9.2	0.74	0.05	68	4	-	-	-	-	-	9.2	0.74	0.05	68	4
<b>TOTAL</b>	<b>164.1</b>	<b>0.76</b>	<b>0.06</b>	<b>1,247</b>	<b>94</b>	<b>30.0</b>	<b>0.39</b>	<b>0.02</b>	<b>117</b>	<b>5</b>	<b>194.1</b>	<b>0.70</b>	<b>0.05</b>	<b>1,365</b>	<b>99</b>



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# KNP Goongarrie Hub Ore Reserve<sup>1</sup>

- 1.36Mt of nickel metal
- 99kt of cobalt metal

Cross Section  
669 9364mN

Highway

RAIL LINE

Goongarrie Hill

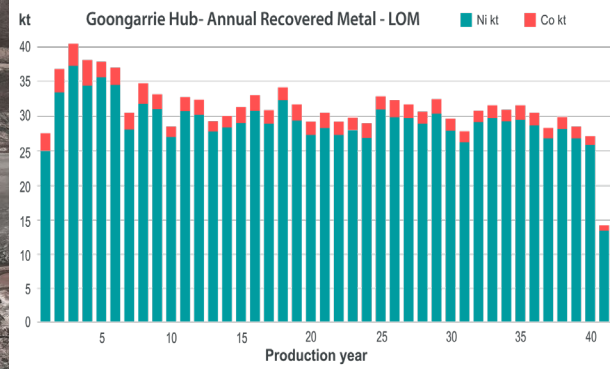
Cross Section  
666 9600mN

Goongarrie South

GOONGARRIE HUB  
PROCESSING FACILITY

Big Four /  
Scotia Dam

Siberia North



70km to Kalgoorlie-Boulder

GOLDFIELDS HWY

# PFS Key Financial Metrics

## PFS defines > 40-year operation with strong financial metrics<sup>1</sup>:

- Pre-tax NPV<sub>7</sub> of **A\$7,625M** (IRR 30%)
- Post-tax NPV<sub>7</sub> of **A\$4,980M** (IRR 23%)
- Average **Annual EBITDA of A\$800M**
- Project **pay back within 3.1 years**
- Low cost after Cobalt credit of **US\$5,763/t Ni in MHP LOM**

1. See 5 July 2023 ARL PFS ASX Announcement.
2. Post tax.
3. From start of operation.

### Financials

Nickel Revenue	A\$ M	44,429
Cobalt Revenue	A\$ M	7,880
Revenue - combined	A\$ M	52,309
EBITDA LOM	A\$ M	34,217
EBITDA Annual (average)	A\$ M	800
EBITDA margin	%	65%
Net Cash Flow (Pre-tax)	A\$ M	31,100

### Valuation

Net Present Value (NPV <sub>7</sub> ) <sup>2</sup>	A\$ M	4,980
Internal Rate of Return (IRR) <sup>2</sup>	%	23%
Total Capital Payback <sup>3</sup>	years	3.1

### Assumptions

Exchange rate	AUD:USD	0.67
Nickel Price	US\$/t	25,000
Cobalt Price	US\$/t	60,000

# PFS 2023 – Capital Cost Estimate

## KNP – Goongarrie Hub

- Contingency considered appropriate to the level of the capital cost estimate has been included
- Base date March 2023
- Refer to 5 July 2023 ARL PFS ASX Announcement for full details and Reasonable Basis Statement

Preproduction Cost Category	Costs (A\$)
Mining – overheads, mobilisation, pre-strip and other	98M
Process plant & infrastructure	2,264M
Sulphuric acid, steam and power plant	574M
Borefield	181M
<b>Total Capital Cost<sup>1</sup></b>	<b>3,117M</b>

Ardea 5 July 2023 PFS capital cost estimate based on a 3.5Mtpa processing operation consisting of x2, 1.5Mtpa HPAL autoclaves and a 0.5Mtpa Atmospheric leach circuit.

# DFS Key Budget Items

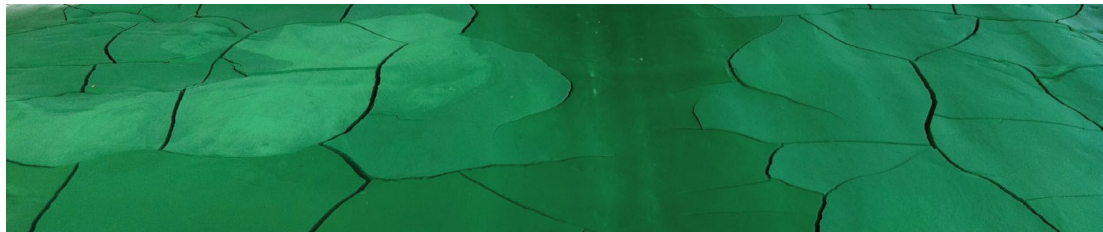
**The Consortium (SMM and MC) will fund 100% of the KNP Goongarrie Hub DFS costs, up to the agreed budget of A\$98.5 million**

DFS Cost Centre	Costs (A\$)
Drilling	13.4M
Metallurgical Test Work	2.3M
Mine Design (incl dewatering & geotechnical)	15.0M
Process Plant Design	28.3M
Buildings and Camp Design	5.3M
Approvals	4.9M
Staff, Corporate and Other	26.2M
Other Expert Consultants	1.5M
Tenement Costs	1.6M
<b>DFS Total Budget</b>	<b>98.5M</b>



# KNP – Goongarrie Hub Superior HPAL Intensity

- ✓ Good ore grade + good slurry density = Lower Capex & Opex \$\$\$
- ✓ Atmospheric leach = stable operation, utilizes saprolite resource
- ✓ MHP & MSP Product = known technology & good market acceptance



## Operating data from Australian HPAL Producers

Performance Driver	Ardea	Bulong#	Cawse#	Murrin	RNO^	Metric	Ardea Rank	Comment
Atmospheric Leach	Yes	No	No	No	Yes	-	#1	Stable operation and full resource utilisation
HPAL Feed Density	45%	31%	35%	38%	42%	% Solids	#1	The higher the better = Maximises plant throughput
Residence Time	70*	75	105	90	60	minutes	#2	The lower the better = Maximises plant throughput
Slurry Grade Ni	7.55	2.89	3.07	3.87	7.39	Ni kg/m3	#1	The higher the better = Increased revenue stream
Slurry Grade Co	0.59	0.23	0.24	0.34	0.31	Co kg/m3	#1	The higher the better = Strategic Co-Product credits

### Data Sources

Ardea – Goongarrie Hub testwork results from PFS and Expansion Study, ASX release 28 March 2018 & Goongarrie Expansion Study, 24 July 2018 and ongoing project assessment as part of completing the DFS.  
 Bulong, Cawse, Murrin - ALTA 1999, An Engineering Comparison of the Three Treatment Flowsheets In WA Nickel Laterite Projects.  
 RNO – ALTA 2001, Observations from the RNO Pilot Plant at Lakefield Research, 2000 AD.

^Ravensthorpe Nickel Operation (RNO) figures based on design numbers on upgraded beneficiated ore from the Halleys Deposit which has since been mined out. # Bulong & Cawse – care and maintenance  
 Ardea data is based on non-beneficiated material (with always an option to beneficiate selected KNP geo-met types, notably at Highway & Goongarrie Hill).

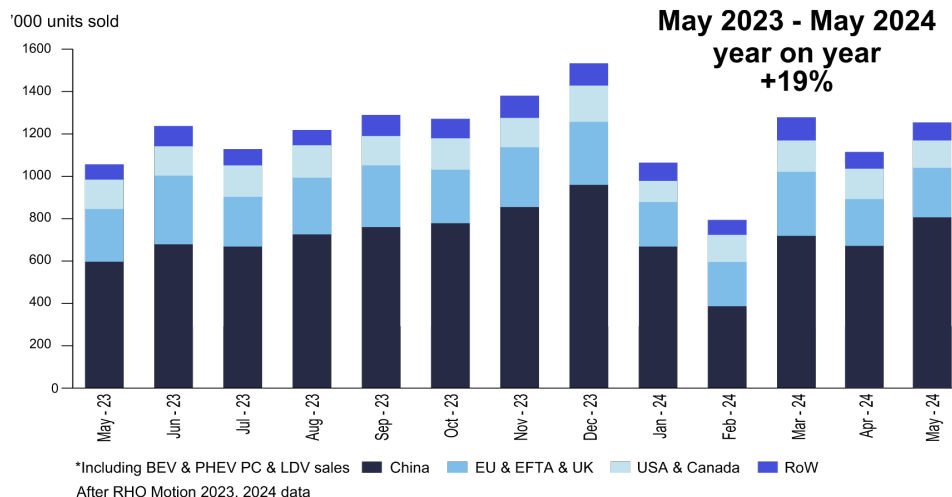
\*Goongarrie Hub DFS to assess reduction in Ardea residence time from 70 minutes to 60 minutes.  
 Residence time 45 minutes estimated in Goongarrie Expansion Study (ASX announcement 24 July 2018)



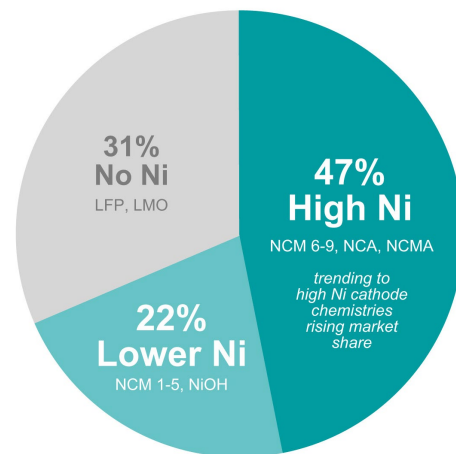
# EV Sales Grow – High Nickel Batteries hold increasing share of market

- **Nickel** batteries, which have nearly **twice the energy density of other materials**, are leading EV applications in Domestic, Commercial and Public Transport
- Global EV sales\* for May 2024 **1.3 million units**. Year to May 2024 **19% increase** compared to year to May 2023<sup>1</sup>

- **Nickel** batteries hold a large share of the EV landscape. **High Ni cathodes** favoured, with increasing market share.<sup>2</sup> Developers moving towards **>90% Ni cathodes**



**Nickel Cathode Chemistry**  
Share of EV market by MWh Jul 2023



# Ardea Receives Improved ESG Certification Score 2024



  
Australian Federal Government  
- Major Project Status

2024 Overall ESG score: Ardea Resources Ltd

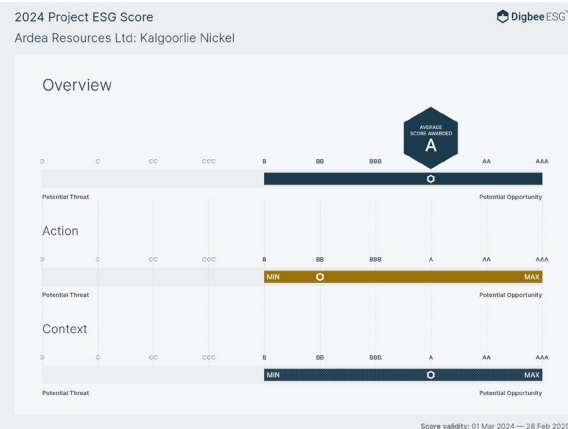


Score validity: 01 Mar 2024 — 28 Feb 2025

## 2024 ESG Scores for Ardea



Score validity: 01 Mar 2024 — 28 Feb 2025



Score validity: 01 Mar 2024 — 28 Feb 2025

Ardea's work practices are aimed at meeting or exceeding the high ESG standards expected by modern society with continuous improvement shown in the two Digbee ESG™ surveys completed

# Unlocking Value of Kalgoorlie Nickel Project



**Ardea**  
Resources Limited

NON KNP Goongarrie Hub  
Projects

KNP Goongarrie Hub

Non KNP Goongarrie Hub Projects including:

- KNP Kalpini Hub MRE 1Mt Ni & 62kt Co
- KNP Yerrila Hub MRE 1Mt Ni & 74kt Co
  - Kalpini Project - Massive Nickel Sulphide discovery at Emu Lake
- Scandium and Rare Earth Elements identified at KNP Kalpini
- Perrinvale Project prospective nickel sulphide



**SUMITOMO**  
**METAL MINING**



**Mitsubishi Corporation**

80%

20%

Incorporated  
Joint Venture (IJV)



**KALGOORLIE**  
**Nickel**

Kalgoorlie Nickel Pty Ltd (KNPL)  
**KNPL is 100% subsidiary of Ardea and  
holds the KNP Goongarrie Hub.**

Forming a Joint Venture with the Consortium,  
who will contribute financially and technically  
to ultimately earn a 50% interest in KNPL\*,  
Ardea will retain 50% interest into production

\* The Consortium comprised of  
Sumitomo Metal Mining (SMM) and  
Mitsubishi Corporation (MC) are fully funding  
DFS to A\$98.5M and assisting KNPL in  
optimising debt financing to earn:

MILESTONE	INTEREST IN KNPL
DFS 50% Complete:	17.5%
DFS Completion:	35.0%
FID Approval:	50.0%

