Ardea Resources Limited

Goongarrie Hub Feasibility Study Update

- Gap Analysis Study (**GAS**) by international metallurgical consultant, Wood Engineers, on Ardea's Goongarrie Hub nickel-cobalt project completed and supports Ardea's increased project scale of 3.5Mtpa for the Definitive Feasibility Study (**DFS**).
- Feed grade is 1% Ni and 0.07% Co, reflecting the 0.8% Ni cut-off resource grade (ASX release 16 June 2021).
- Testwork commenced at the ALS metallurgical laboratory in Perth to confirm the improved flow-sheet with two High Pressure Acid leach (**HPAL**) autoclaves with each rated at 1.5Mtpa, as well as an Atmospheric Leach (**AL**) circuit of 0.5Mtpa.
- Independent logistics study confirms autoclave transport route through the Port of Esperance and via road to the Goongarrie plant site.
- Two groundwater extraction licences (**GWL**) have been applied for with the WA Department of Water and Environmental Regulation (**DWER**) to secure this water from tenements already held by Ardea, near the planned Goongarrie Hub processing plant.
- Accelerated engagement advances with key stake holders, such as the City of Kalgoorlie-Boulder (**CKB**) and Southern Ports Esperance with a cooperation Memorandum of Understanding (**MoU**) executed with the CKB.

Ardea's Managing Director, Andrew Penkethman, said:

"Ardea's Kalgoorlie Nickel Project is one of the largest nickel-cobalt resources in the world. In response to the growing demand for sustainably and ethically sourced minerals to assist with the transition to a low carbon future, the Goongarrie Hub project scale has been increased to 3.5Mtpa, utilising well understood and proven technology.

To build upon the successful feasibility study work completed in the past, the flow sheet has been enhanced to maximise resource utilisation and minimise carbon emissions with the addition of an Atmospheric Leach circuit. This will increase the sulphuric acid requirement and require a larger sulphur burning acid plant, with consequent increase in steam generation which facilitates the off-grid, carbon free, site energy balance.

The independent assessment by consultants Wood of the work completed to date by the Ardea team and service providers is supportive of the base case being carried forward to complete the DFS. Results from in progress metallurgical testwork will be used to refine the flow sheet and production mine plan, with additional results to be reported as they become available. "

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ASX Symbol

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Issued Capital

Fully Paid Ordinary Shares
138,830,219

Performance Rights
4,771,000

Options
4,000,000

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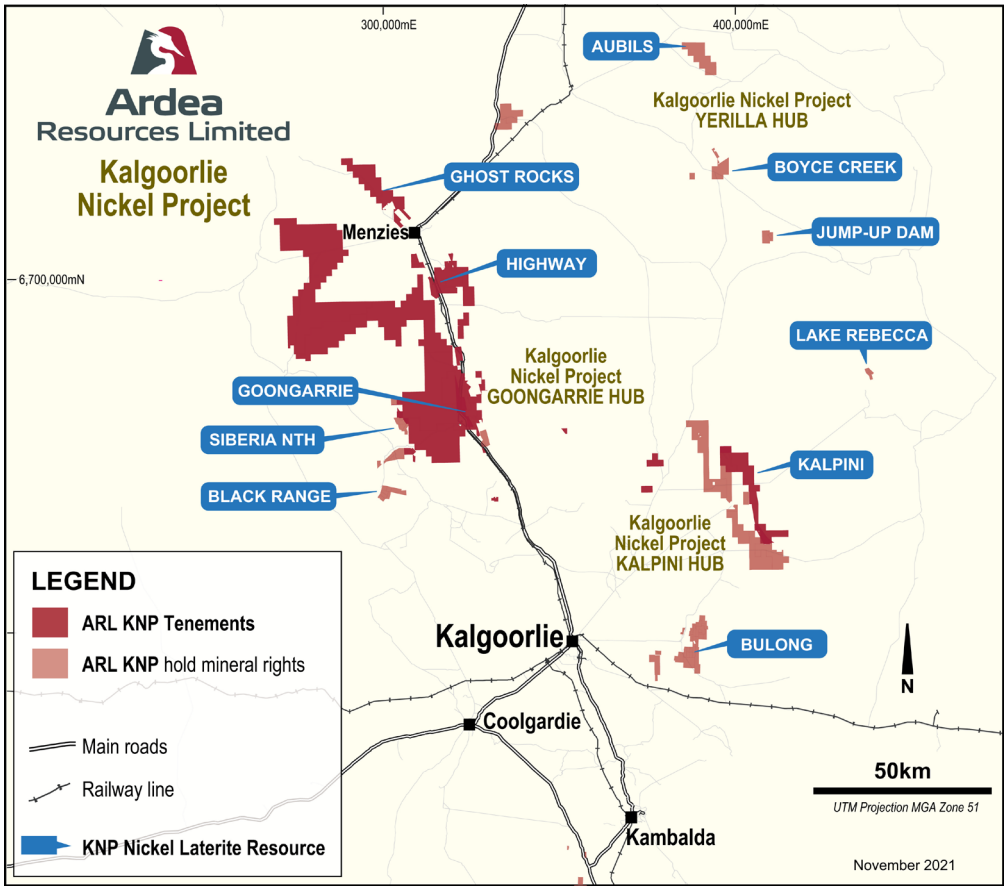
1. Background

The Kalgoorlie Nickel Project (**KNP**) Goongarrie Hub (**Goongarrie**) (Figure 1) is undergoing a Feasibility Study for a High Pressure Acid Leach (**HPAL**) and Atmospheric Leach (**AL**) processing operation using proven technology successfully in use at other operations, such as at Coral Bay in the Philippines and the Ravensthorpe Nickel Operation in Western Australia. The base case end product from Goongarrie will be Mixed Hydroxide Precipitate (**MHP**) which is the preferred nickel-cobalt product for the Lithium Ion Battery (**LIB**) sector.

Figure 1: Kalgoorlie Nickel Project (KNP) location plan.



In mid-2021, Ardea announced the commencement of a KNP Goongarrie Hub Feasibility Study (ASX Release 31 May 2021).

The original development targets included the following:

- Single train leaching circuit, treating 2.25Mtpa of goethite ore via HPAL.
- Potential Serpentine ore treatment via Atmospheric Leach.
- Mixed Hydroxide Precipitate (MHP) or PCAM final product.
- Recovery of Critical Minerals such as Sc, Nd, Pr to be evaluated.
- Optimisation strategies for leading ESG project development.

In-house engineering studies have been conducted, which involved the design of process models specific to the premium Goongarrie plant feed, peer operations analysis studies, operational calculations and the development of critical engineering documentation, such as Block Flow Diagrams, Process Descriptions, Mass and Energy Balances, Document Control Procedures, Work Breakdown Structures, Site CO_2 Emissions Modelling, Overall Design Basis, Process Design Criteria, Operating Cost Estimates, Process Financial Model, Vendor Registrations, Operations Risk Register and Process Sensitivity Analyses.

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The general conclusions from these investigations include:

- Baseline production capacity is to be 3.0Mtpa dry feed to a two-train HPAL circuit treating goethite and beneficiated siliceous goethite ore to maintain feed grades in excess of 1% nickel.
- Serpentine mineralisation will be utilised in an AL circuit treating 0.5Mtpa of leach feed.
- High grade MHP is to be the final product, pending specific input to the contrary from updated market analysis or key end-user requirements.
- Critical Minerals recovery, in addition to cobalt, is being determined by in progress metallurgical testwork.
- ESG policies and procedures have been reviewed by external consultants, and deemed as meeting industry standards and will continue to be updated in line with the growth of the Company.
- The site operating philosophy has been modified to maximise the energy recovery from the on-site sulphuric acid plant, and to reduce imported (fossil fuel based) site energy requirements.

The benefits of the upgraded circuit design are improved economic returns, lower carbon emissions, more reliable plant operation and strong end-user demand.

2. Gap Analysis Study

Global consulting engineering firm, Wood Engineers (**Wood**), working with the Ardea technical team, have completed a Gap Analysis Study (**GAS**), reviewing, and consolidating all KNP feasibility data, including Ardea's successful Goongarrie Prefeasibility Study (ASX release 28 March 2018) and Expansion Study (ASX release 24 July 2018).

The findings from the above internal investigations were reviewed by Wood, who have completed their GAS report to identify any potential flaws in the current and future workflows. This report ratified the work completed to date and the upcoming programs. High level operational factors that were material to the overall process viability were identified for further investigation. These were confirmation of the HPAL autoclave train capacity, and feasibility of the AL circuit.

These key items were subjected to separate reviews, which concluded that the autoclave sizing methodology was correct, but a volumetric increase of 6% was recommended to accommodate an anticipated increase in autoclave steam requirement. The AL circuit option is technically viable, and would improve the circuit's reliability and operational stability.

Wood concurred with Ardea's priorities in verifying the quantity and quality of water resource. A hydrogeology drilling program including production bores has been completed at Goongarrie (ASX release 27 October 2021) and another is scheduled to commence in the March Quarter 2022. In addition, Wood made several minor and miscellaneous recommendations, most of which are being prioritised for adoption, as feasibility study work streams continue.

3. Metallurgical Testwork

Diamond drilling commenced at the Goongarrie Hub on 18 July 2021 to obtain test material for bench-scale metallurgical studies. This drilling program was completed on 10 October 2021, with a total of 39 diamond drill holes for 3,203m drilled at the Goongarrie and satellite Highway deposits. Detailed logging of all holes was completed during the December 2021 Quarter. Metallurgical composites from Highway drill core samples have been prepared, analysed, and sorted into material type composites that match their appropriate processing requirements. These samples are presently undergoing ore preparation testwork at ALS Laboratory Group, Perth. The downstream leaching and hydrometallurgical tests will commence after the ore preparation work is completed and reviewed. This testwork will generate data for metallurgical and financial modelling, as well as input into the engineering calculations.

As well as conventional HPAL, the metallurgical test-work program will investigate atmospheric leaching of high-magnesium plant feed as well as the mineralised neutraliser, which would be performed in parallel to HPAL leaching of the iron-rich goethitic feed. From a process perspective, atmospheric leaching will be beneficial for stabilising the overall circuit, especially with regards to sulphuric acid plant production and its role in maintaining the off-grid, carbon free, site energy balance.

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4. Financial Modelling

The company has engaged UK-based consultant Ockham Group to develop an operating and financial model, allowing comprehensive evaluation of specialist metallurgical options including atmospheric leach efficacy, beneficiation parameters, and optimisation of mineralised neutraliser acid neutralisation capacity versus metal recovery. The model has been constructed using previous PFS parameters, and is progressively updated as current bench-scale metallurgical and ore schedules are finalised. The model is also used for development of projections for carbon accounting and financial planning, including evaluation of forward sales and financing strategies.

5. Stakeholder Engagement

In parallel with the ongoing feasibility study work, stake holder engagement continues to be accelerated with recent activities including:

- Memorandum of Understanding (MoU) with the City of Kalgoorlie Boulder, and regular update meetings.
- Formal dialogue with Southern Ports – Esperance - relating to construction and operational logistics requirements.
- Desktop heavy haulage road route study completed confirming autoclave delivery route trafficability.
- First Nations engagement, notably for Ardea operations staff.
- State and Commonwealth lead agencies, notably the Critical Minerals Facilitation Office through the Department of Industry, Science, Energy and Resources.

6. Next Steps

Multiple work streams are underway as Ardea advances the Goongarrie Hub DFS with the aim of developing an industry-leading nickel-cobalt production centre that can ensure ethical and sustainable mineral supply for the rapidly expanding LIB sector. These include:

- Completion of the metallurgical testwork programs at ALS Laboratory Group.
- Updating engineering documentation for detailed design needs.
- Water resource verification.
- Upgrading of the metallurgical (SysCAD) model to align with detailed energy balance requirements.
- Vendor register expansion.
- Materials and equipment supply and logistics studies.
- Final resource modelling, pit optimisation and scheduling as inputs to the DFS financial modelling.

Advanced discussions continue with potential offtake groups in respect of specific product requirements, DFS programs and funding mechanisms.

News flow over the coming months will include completion of the above work streams and reporting of results as they become available.

Authorised for lodgement by the Board of Ardea Resources Limited.

For further information regarding Ardea, please visit https://ardearesources.com.au/ or contact:

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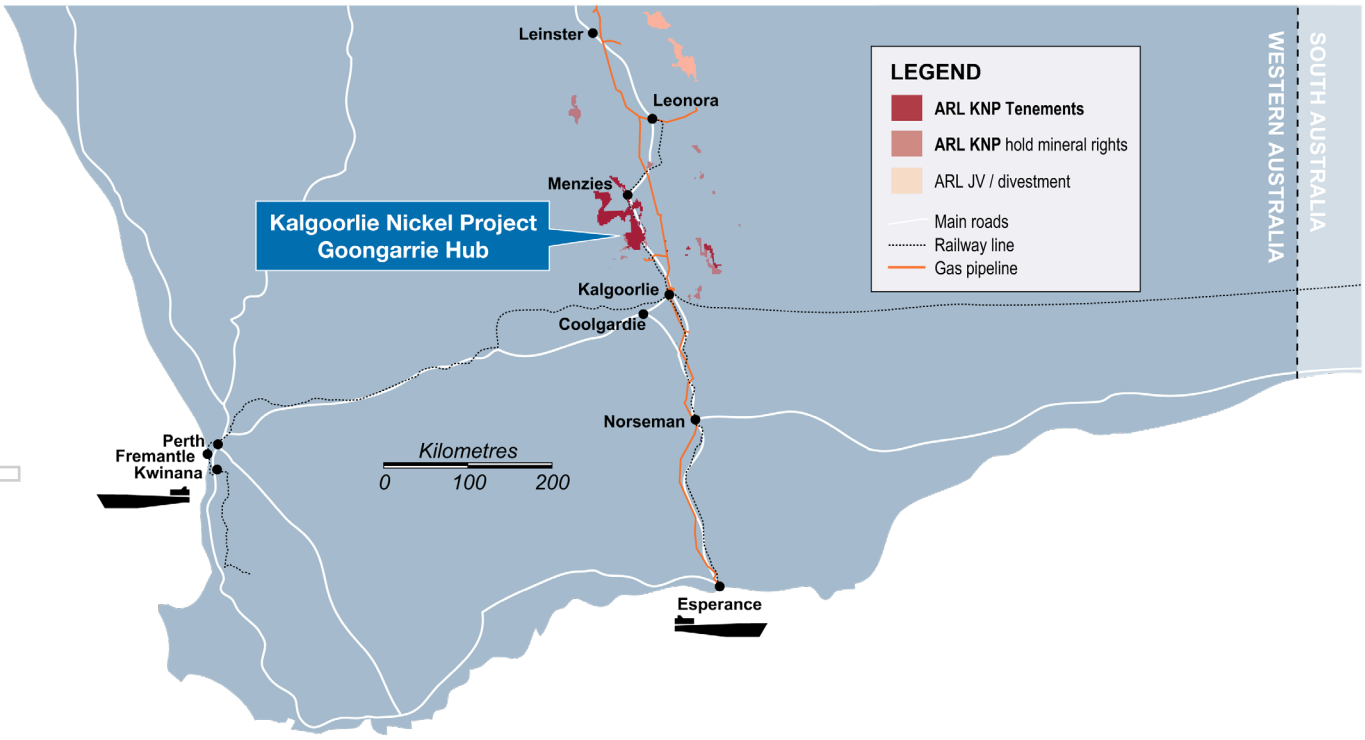
About Ardea Resources

Ardea Resources (ASX:ARL) is an ASX-listed resources company, with a large portfolio of 100%-controlled West Australian-based projects, focussed on:

- Development of the Kalgoorlie Nickel Project (**KNP**) and its sub-set the Goongarrie Hub, a globally significant series of nickel-cobalt and Critical Mineral deposits which host the largest nickel-cobalt resource in the developed world at **830Mt at 0.71% nickel and 0.046% cobalt for 5.9Mt of contained nickel and 380kt of contained cobalt** (ARL ASX announcement 15 February, 16 June 2021) located in a jurisdiction with exemplary ESG credentials.
- Advanced-stage exploration at compelling nickel sulphide and Critical Minerals targets within the KNP Eastern Goldfields world-class nickel-gold province, with all exploration targets complementing the KNP nickel development strategy.



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CAUTIONARY NOTE REGARDING FORWARD-LOOKING INFORMATION

This news release contains forward-looking statements and forward-looking information within the meaning of applicable Australian securities laws, which are based on expectations, estimates and projections as of the date of this news release.

This forward-looking information includes, or may be based upon, without limitation, estimates, forecasts and statements as to management's expectations with respect to, among other things, the timing and amount of funding required to execute the Company's exploration, development and business plans, capital and exploration expenditures, the effect on the Company of any changes to existing legislation or policy, government regulation of mining operations, the length of time required to obtain permits, certifications and approvals, the success of exploration, development and mining activities, the geology of the Company's properties, environmental risks, the availability of labour, the focus of the Company in the future, demand and market outlook for precious metals and the prices thereof, progress in development of mineral properties, the Company's ability to raise funding privately or on a public market in the future, the Company's future growth, results of operations, performance, and business prospects and opportunities. Wherever possible, words such as "anticipate", "believe", "expect", "intend", "may" and similar expressions have been used to identify such forward-looking information. Forward-looking information is based on the opinions and estimates of management at the date the information is given, and on information available to management at such time.

Forward-looking information involves significant risks, uncertainties, assumptions, and other factors that could cause actual results, performance or achievements to differ materially from the results discussed or implied in the forward-looking information. These factors, including, but not limited to, the ability to create and spin-out a gold focussed Company, fluctuations in currency markets, fluctuations in commodity prices, the ability of the Company to access sufficient capital on favourable terms or at all, changes in national and local government legislation, taxation, controls, regulations, political or economic developments in Australia or other countries in which the Company does business or may carry on business in the future, operational or technical difficulties in connection with exploration or development activities, employee relations, the speculative nature of mineral exploration and development, obtaining necessary licenses and permits, diminishing quantities and grades of mineral reserves, contests over title to properties, especially title to undeveloped properties, the inherent risks involved in the exploration and development of mineral properties, the uncertainties involved in interpreting drill results and other geological data, environmental hazards, industrial accidents, unusual or unexpected formations, pressures, cave-ins and flooding, limitations of insurance coverage and the possibility of project cost overruns or unanticipated costs and expenses, and should be considered carefully. Many of these uncertainties and contingencies can affect the Company's actual results and could cause actual results to differ materially from those expressed or implied in any forward-looking statements made by, or on behalf of, the Company. Prospective investors should not place undue reliance on any forward-looking information.

Although the forward-looking information contained in this news release is based upon what management believes, or believed at the time, to be reasonable assumptions, the Company cannot assure prospective purchasers that actual results will be consistent with such forward-looking information, as there may be other factors that cause results not to be as anticipated, estimated or intended, and neither the Company nor any other person assumes responsibility for the accuracy and completeness of any such forward-looking information. The Company does not undertake, and assumes no obligation, to update or revise any such forward-looking statements or forward-looking information contained herein to reflect new events or circumstances, except as may be required by law.

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

Compliance Statement (JORC 2012)

The information in this report that relates to KNP Exploration Results is based on information originally compiled by previous full time employees of Heron Resources Limited and or Vale Inco. The Exploration Results and data collection processes have been reviewed, verified, and re-interpreted by Mr Ian Buchhorn who is a Member of the Australasian Institute of Mining and Metallurgy and currently an executive director of Ardea Resources Limited. Mr Buchhorn has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the exploration activities 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'. Mr Buchhorn consents to the inclusion in this report of the matters based on his information in the form and context that it appears. Mr Buchhorn owns Ardea shares.

The information in this report that relates to Mineral Resources is based on information compiled by Mr James Ridley who is a Member of the Australasian Institute of Mining and Metallurgy, a full time employee of Ardea Resources and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is 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 Ridley consents to the inclusion in the report of the matters based on this information in the form and context in which it appears. Mr Ridley owns Ardea shares.

The information in this report that relates to Metallurgy is based on information compiled by Mr Mike Miller who is a Member of the Australasian Institute of Mining and Metallurgy, a consultant of Ardea Resources and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is 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 Miller consents to the inclusion in the report of the matters based on this information in the form and context in which it appears. Mr Miller owns Ardea shares.