Ardea Resources Limited

ASX & Media Release

24 July 2018

ASX Symbol

ARL

Ardea Resources Limited

Suite 2, 45 Ord St
West Perth WA 6005

PO Box 1433
West Perth WA 6872

Telephone

+61 8 6244 5136

Email

ardea@ardearesources.com.au

Website

www.ardearesources.com.au

Directors

Katina Law
Executive Chair

Ian Buchhorn
Executive Director

Wayne Bramwell
Non-Executive Director

Issued Capital

Fully Paid Ordinary Shares
104,990,413

Unlisted options exercisable at $0.25
12,310,022

Directors/Employee Performance Rights
2,990,000

ABN 30 614 289 342

2.25Mtpa Goongarrie Nickel Cobalt Project Expansion Study Demonstrates Enhanced Project Economics

Cautionary Statement

The Expansion Study referred to in this announcement is a study of the potential viability of the Goongarrie Nickel Cobalt Project at a 2.25Mtpa scale. It has been undertaken to understand the potential economic benefits of maximising throughput in a single autoclave train.

The Company has previously released the results of a Pre-Feasibility Study (and maiden Ore Reserve) on 28 March 2018 demonstrating the economic viability of the Goongarrie Nickel Cobalt Project at 1Mtpa and 1.5Mtpa. The Expansion Study is more than a preliminary technical and economic study given the work undertaken for the PFS but is not advanced enough to support the estimation of Ore Reserves at 2.25Mtpa scale and further evaluation work and appropriate studies are required before Ardea will be in a position to estimate additional Ore Reserves or to provide assurance of an economic development case at 2.25Mtpa scale.

The Expansion Study includes a proportion of JORC classified inferred material. There is a lower level of geological confidence associated with the inferred mineral resources and there is no certainty that further exploration work will result in the determination of indicated mineral resources or that the production target will be realised. The Company confirms the use of inferred material is not a determining factor to the project's viability at 2.25Mtpa.

This study is based on the material assumptions outlined elsewhere in this announcement and summarised in Appendix B. These include assumptions about the availability of funding. While Ardea considers all of the material assumptions to be based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by this study will be achieved. To achieve the range of outcomes indicated in the Expansion Study, funding in the order of A$1,200 million will likely be required. Investors should note that there is no certainty that Ardea will be able to raise that amount of funding when needed. It is also possible that such funding may only be available on terms that may be dilutive to or otherwise affect the value of Ardea's existing shares.

It is also possible that Ardea could pursue other 'value realisation' strategies such as a sale, partial sale or joint venture of the project. If it does, this could materially reduce Ardea's proportionate ownership of the project.

Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the Expansion Study.

Ardea Resources Limited ("Ardea" or "the Company") is pleased to announce the results from its recently completed 2.25Mtpa Expansion Study at the Company's flagship Goongarrie Nickel Cobalt Project ("Goongarrie", "GNCP"). Goongarrie is a large mineral resource and this study evaluates the option of a higher throughput base case than that in the Pre-Feasibility Study ("PFS"). The Expansion Study showed significant improvements in the value of the project, the rate of return and the payback period compared to the 1.0Mtpa and 1.5Mtpa PFS results (see ASX announcement 28 March 2018).

Expansion Study Highlights– 2.25Mtpa over an initial 25-year mine life

- Annual production of over **10,000 tonnes of cobalt sulphate** (2,100 tonnes contained cobalt) and over **81,000 tonnes of nickel sulphate** (18,000 tonnes contained nickel)
- **Enhanced NPV from previous PFS estimates**

Case	*Pre-tax NPV_8*	*Unleveraged Post-tax NPV_8*	*Post-tax IRR*	*Payback*
2.25Mtpa	**A$3.1 billion**	**A$2.3 billion**	**27 %**	**5.1 years**
Previous PFS results				
1.0Mtpa	A$1.43 billion	A$1.04 billion	25 %	5.3 years
1.5Mtpa	A$1.93 billion	A$1.40 billion	25 %	5.6 years

- **Cobalt recovery of approximately 95 %** and **nickel recovery of approximately 93** % (life of mine)
- Initial capital cost of approximately A$1,165 million inclusive of 20% contingency
- **Competitive LOM C1 cash cost of approximately US$4.63 / lb nickel metal** (before cobalt credits)
- **LOM C1 cash cost of approximately US($0.34) / lb nickel metal** (after cobalt credits)

Key Points

- 2.25Mtpa base case is easily capable of further expansion using modular processing trains to reflect the true scale of the project
- The on-site neutraliser source also contains nickel and cobalt mineralisation, which could further reduce operating costs and provide up to an additional 10% production of nickel and cobalt sulphates (not included in the Expansion Study revenue stream)
- Further upgrade options include scandium production, High Purity Alumina production and in-pit neutraliser optimisation
- Definitive Feasibility Study (DFS) programs underway including a 7.5 tonne pilot run
- Goongarrie already attracting strong interest from potential strategic and offtake partners

1 – GNCP is part of the Kalgoorlie Nickel Project KNP, the developed world's largest cobalt resource
2 - The 28 March 2018 PFS announcement provide a 1.0Mtpa base case and a 1.5Mtpa option

Overview

The purpose of the 2.25Mtpa Goongarrie Expansion Study was to investigate the optimal throughput that could be achieved using one autoclave processing train. The positive results reflect the favourable metallurgical characteristics of the Goongarrie orebody which enables extremely short residence time in the autoclave, with no significant loss in metal recovery.

These outstanding metallurgical characteristics and rheology have resulted in an extremely robust unleveraged pre-tax NPV of approximately A$3.1 billion, with a pre-tax IRR of approximately 31% and a rapid payback period of 5.1 years for a 2.25Mtpa operation.

The 2.25Mtpa start-up option can easily be expanded by adding modular processing trains to take advantage of the full scale of Goongarrie's world-class resource base.

Commenting on the Expansion Study results, Ardea Executive Chair Katina Law said *"We are pleased with the results of this Expansion Study as it highlights the upside potential of Goongarrie and its competitive economies of scale. The primary goal of the Company is to determine a cost-effective start-up scenario and also provide an upside case more suited to a financier or partner seeking a long life, lower cost, sustainable production base in a stable jurisdiction. The results have shown the benefits of scale, demonstrating Goongarrie as a unique battery metals project that can become a significant global producer over a long life."*

Table 1: Summary of Approximate Outcomes

Parameter	**Assumption/Outcome $US******	Assumption/Outcome $A
Autoclave Throughput*	2.25Mtpa	
Initial Life of Mine	25 years	
Average Annual EBITDA	**US$ 354 million**	$ 450 million
Pre-production Capital Estimate**	**US$ 918 million**	$1.165 billion
Net Present Value (NPV) (post tax)***	**US$ 1.805 billion**	$2.29 billion
Internal Rate of Return (IRR) (post tax)	27%	
Average C1 operating cash costs – inclusive of by-product credits	**(US$0.34)/lb Nickel**	($0.43)/lb Nickel
Average C1 operating cash costs– exclusive of by-product credits	**US$4.63/lb Nickel**	$5.88/lb Nickel
Project payback (simple)	5.1 years	

*Autoclave throughput rate following 24-month commissioning and ramp up period

**Includes $192 million contingency on capital costs

***8% discount, 100% equity, real terms

**** Exchange rate used AUD:US 0.788 as March 2018 PFS

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

Ardea Resources:
Katina Law
Executive Chair, Ardea Resources
Tel +61 8 6244 5136

Media or Investor Inquiries:
Michael Weir
Citadel Magnus
Tel +61 8 6160 4900

Appendix A - Expansion Study Summary

Resources

The total resource within the Cobalt Zone of the Goongarrie global resource is 83.1 Mt at 0.10 % cobalt and 0.81 % nickel, for 81,700 tonnes of contained cobalt metal and 672,300 tonnes of contained nickel metal (ASX announcement 28 March 2018). This is part of the overall Goongarrie resource, which is defined as **215.6Mt at 0.06 % cobalt and 0.71 % nickel**, and includes **130,700 tonnes of contained cobalt metal**, and **1,522,700 tonnes contained nickel metal**.

The Goongarrie Expansion Study focused on a small part of the Goongarrie resource estimated by Hyland Geological and Mining Consultants Pty Ltd (HGMC), based on over 115,000 metres of drilling in over 2,370 drill holes (ASX announcement 14 March 2018).

A full breakdown of the Goongarrie Resource is provided in Table 2. This resource includes all of the Cobalt Zone resource and additionally the greater tonnes of lower grade material outside of the Cobalt Zone.

Table 2 – Summary of total mineral resources within the Goongarrie Nickel Cobalt Project area, comprising resources at Goongarrie Hill, Goongarrie South, Big Four, and Scotia Dam (14 March 2018).

Camp	Domains	Cut-off %	Resource category	Size (Mt)	Cobalt (%)	Nickel (%)	Contained metal Co (t)	Contained metal Ni (t)
Goongarrie Hill	Ni & Co	≥ 0.5% Ni or > 0.08% Co	Inferred	52.5	0.04	0.65	21,600	340,400
			Subtotal	*52.5*	*0.04*	*0.65*	*21,600*	*340,400*
Goongarrie South	Ni & Co	≥ 0.5%Ni or > 0.08% Co	Measured	10.3	0.10	0.98	10,200	101,200
			Indicated	56.2	0.07	0.72	37,200	407,000
			Inferred	32.2	0.06	0.69	20,300	221,200
			Subtotal	*98.7*	*0.07*	*0.74*	*67,700*	*729,300*
Big Four	Ni & Co	≥ 0.5%Ni or > 0.08% Co	Indicated	45.5	0.06	0.71	28,200	320,700
			Inferred	9.9	0.06	0.63	6,100	61,900
			Subtotal	*55.4*	*0.06*	*0.69*	*34,300*	*382,700*
Scotia Dam	Ni & Co	≥ 0.5% Ni or > 0.08% Co	Indicated	3.3	0.09	0.81	3,000	26,900
			Inferred	5.7	0.07	0.76	4,100	43,300
			Subtotal	*9.0*	*0.08*	*0.78*	*7,100*	*70,200*
Total	All	≥ 0.5% Ni or > 0.08% Co	Measured	10.3	0.10	0.98	10,200	101,200
			Indicated	105.0	0.07	0.72	68,400	754,600
			Inferred	100.3	0.05	0.67	52,100	666,900
Goongarrie Resource Global			TOTAL	215.6	0.06	0.71	130,700	1,522,700

Note: All nickel and cobalt domains are included, and are encapsulated by an envelope defined by nickel grades equal to or greater than 0.5%. Note that figures are rounded to reflect degree of certainty and may not tally.

The Mineral Resources above were first reported by the Company in its announcement released to ASX on 14 March 2018. The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement, and in the case of estimates of Mineral Resources or Ore Reserves, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

Mining schedule and cost adjustment

Table 3 – Mining Schedule Outputs

		1.5Mtpa PFS Level*			2.25Mtpa Expansion Study Level		
Mining schedule parameter		Total	Measured + Indicated	Inferred	Total	Measured + Indicated	Inferred
High Grade Ore	High Grade Cut-off	1.0 % Ni equivalent[1]			1.0 % Ni equivalent[1]		
	Tonnes Input to Mill	32.6	30.9	1.7	56.6	44.5	12.0
	Co grade Input to Mill	0.11%	0.11%	0.13%	0.10%	0.10%	0.11%
	Ni grade Input to Mill	0.93%	0.93%	0.92%	0.88%	0.87%	0.78%
Low Grade Ore	Low Grade Cut-off	0.81 % Ni equivalent[2]			0.81 % Ni equivalent[2]		
	Tonnes Input to Mill	4.4	4	0.4	-	-	-
	Co grade Input to Mill	0.05%	0.05%	0.05%	-	-	-
	Ni grade Input to Mill	0.57%	0.57%	0.57%	-	-	-
	Tonnes to Stockpile	5.9	5.3	0.7	22.0	17.1	4.8
	Co grade Input to S/pile	0.06%	0.05%	0.05%	0.05%	0.05%	0.05%
	Ni grade Input to S/pile	0.56%	0.56%	0.56%	0.56%	0.56%	0.55%
	Total LG Tonnes	10.3	9.2	1.1	22.0	17.1	4.8
	Co grade	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
	Ni grade	0.56%	0.56%	0.59%	0.56%	0.56%	0.55%
Total Mill Feed	Tonnes to Mill	37	34.8	2.1	56.6	44.5	12.0
	Co grade Input to Mill	0.10%	0.10%	0.12%	0.10%	0.10%	0.11%
	Ni grade Input to Mill	0.89%	0.89%	0.86%	0.88%	0.87%	0.78%
Waste Tonnes		~63.0 Mt			~115.1 Mt		
Mining Life		23 years			~25 years		
Processing Life		25 years			~25 years		

*See PFS announcement released to ASX on 28 March 2018.

1. *Using a nickel equivalent cut of >1.0%, which used inputs of A$18,900/t nickel and A$120,750/t cobalt. (US$15,120/t Ni and US$96,600/t Co, 0.8 exchange rate). Nickel equivalent (Nieq %) = Ni grade+(Co grade × Co price)/ Ni price . Prices used are US$15,120/t for nickel and US$96,600/t for cobalt. No assumption about recovery is included here. Recoveries are addressed elsewhere throughout the mining schedule and financial model. See ' Metallurgical factors or assumptions' criteria of Appendix B.*

2. *Using a nickel equivalent cut of >0.81 %, which used inputs of A$18,900/t nickel and A$120,750/t cobalt. (US$15,120/t Ni and US$96,600/t Co, 0.8 exchange rate). Nickel equivalent (Nieq %) = Ni grade+(Co grade × Co price)/ Ni price . Prices used are US$15,120/t for nickel and US$96,600/t for cobalt. No assumption about recovery is included here. Recoveries are addressed elsewhere throughout the mining schedule and financial model. See ' Metallurgical factors or assumptions' criteria of Appendix B.*

The material in the mining schedule was sourced from the pit optimisation shells for Goongarrie South, Big Four and Scotia Dam, using the same input parameters as the PFS Ore Reserve mining schedule, with the addition of JORC classified inferred material.

The PFS Ore Reserve pit designs deliver ~33Mt of material at greater than or equal to a 1.0% nickel equivalent high-grade grade cut-off. A further ~24Mt at greater than 1.0% nickel equivalent grade was sourced from pit shells created by deepening the open pits.

Note that mineralisation in pit shell areas may not form part of an Ore Reserve but is appropriate for use in a high-level Expansion Study. Relevant proportions of measured, indicated and inferred material are presented in Table 3 and Figure 1 below. In summary, the 2.25Mtpa mining schedule is based on 44.5Mt

of measured plus indicated resources (79% of total mill feed) and 12Mt of inferred resources (21% of total mill feed). The inclusion of the inferred material is not a determining factor for the project's viability at 2.25Mtpa, and as seen in Figure 1 below, the inferred material does not feature heavily in the proposed mining schedule.

The Mineral Resources underpinning the production target have been prepared by Competent Persons in accordance with the requirements in Appendix 5A (JORC Code). Unit mining costs were kept the same as for the PFS mining schedules, with adjustments in mining rate applied in order to meet the increased throughput requirement. In operations, higher throughputs normally generate lower unit mining costs.

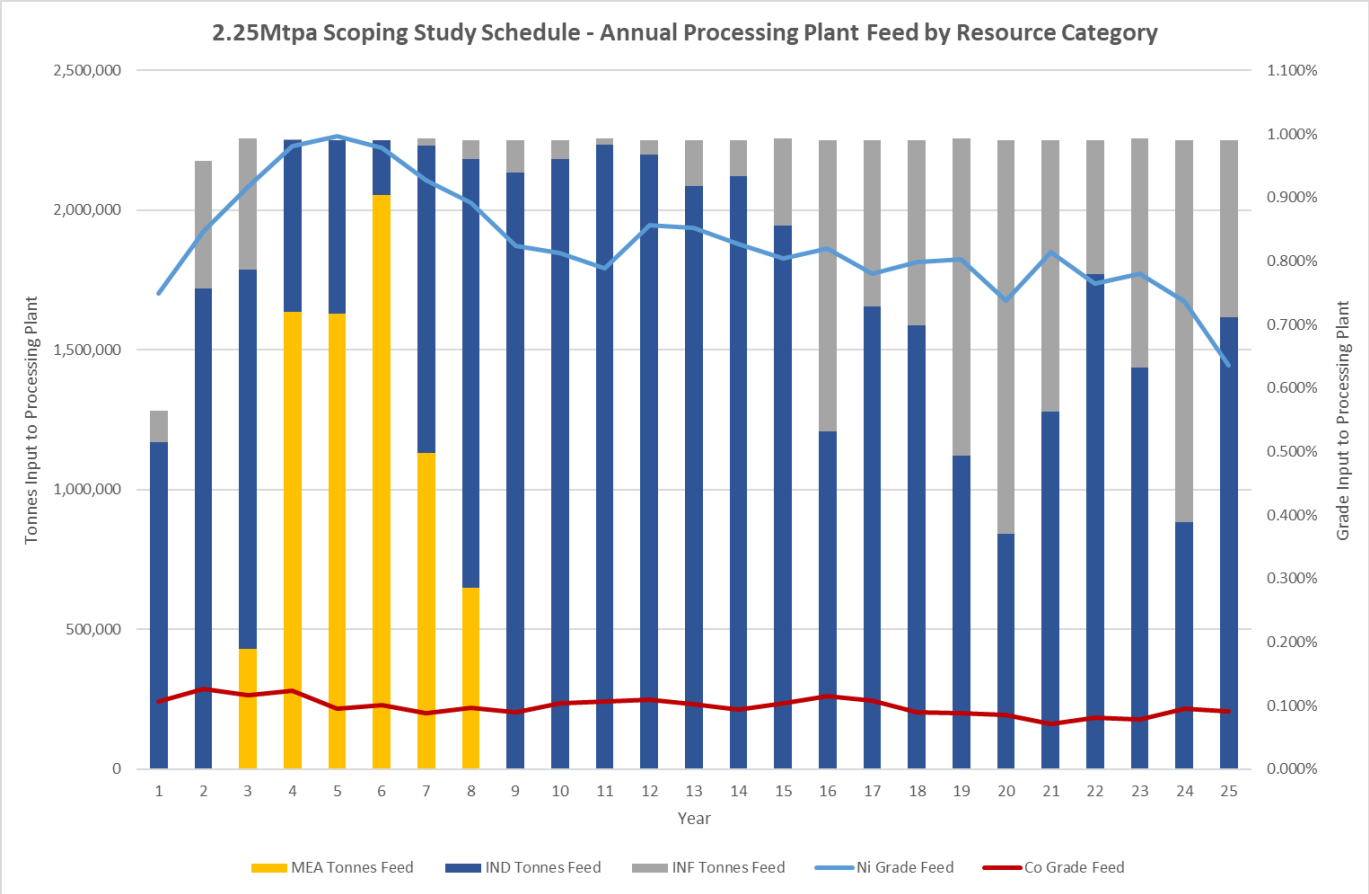

Figure 1 Proportion of measured, indicated and inferred material processed for the 2.25Mtpa Expansion Study

Metallurgy, Processing and Infrastructure

The Goongarrie Expansion Case evaluates production of **high-purity cobalt sulphate and nickel sulphate** for sale to the lithium ion battery industry, with both products playing a vital role in the manufacturing of cathodes for lithium ion batteries amongst other uses. The flowsheet (identical to the PFS flowsheet) is designed to deliver high-purity products to maximise Goongarrie revenue.

Metallurgy

Extensive test work was completed during the 2005-2009 Vale Inco PFS (refer Heron Resources Limited announcements 2 and 9 February 2009). The Vale Inco study focussed on the Goongarrie South deposit and used a Sherrit-style PAL flowsheet to produce a mixed sulphide product.

For the PFS, further testwork was completed by Simulus Engineers on composite drill core samples selected from Ardea's 2017 core drilling program at Goongarrie South. These samples have high iron and low magnesium content. These are indicative of the scheduled geo-metallurgy for the payback period.

The PFS testwork program and engineering study investigated the strengths and weaknesses of various leach arrangements. The outcome of this assessment was the selection of Pressure Acid Leach (PAL) as the preferred leaching process, with this also being adopted in the Expansion Study.

The key outcomes from the leach selection work were:

- Very high nickel and cobalt extraction exceeding 94.5 % from both PAL sulphuric leaching and atmospheric hydrochloric leaching
- Very high, uneconomic acid consumption in atmospheric sulphuric acid leaching
- Low sulphuric acid consumption from PAL leaching
- Lower operating costs for PAL leaching compared to atmospheric hydrochloric leaching

Following the selection of the PAL as the preferred leaching arrangement, a downstream testwork program for the PFS was completed to support the overall design of the process, and replicated in the Expansion Study.

For the PFS, mixed sulphide (MS) precipitation was selected as a suitable intermediate step to enable the following key attributes to be realised:

- Utilisation of an established unit operation in use at commercial scale
- Decoupling of the leach and refinery plants
- Production of a high grade intermediate product and reducing the size of the refinery process equipment
- Primary rejection of manganese and magnesium to achieve battery grade sulphate products

The testwork conducted for the PFS (and replicated in the Expansion Study) successfully confirmed the suitability of the process to achieve these objectives.

Flowsheet and processing

For the PFS, the Company selected proven technology for the processing of the Goongarrie laterites. The flowsheet comprises proven 5th generation PAL process with MS precipitation, resulting in highly efficient extraction of cobalt and nickel from Goongarrie ore to produce cobalt sulphate and nickel sulphate for the battery industry.

The PFS flowsheet (replicated in the Expansion Study) follows the proven PAL/MS process with production of an intermediate sulphide product. The downstream refinery produces battery-quality nickel and cobalt sulphate crystals. The process comprises four basic sequential steps, all of which are well proven and commonly used in the wider metallurgical industry to provide high recoveries of base metals.

Stage 1 is an aqueous pressure leach in an acidic sulphate medium to dissolve the base metals while minimising dissolution of the iron and silica gangue. The conditions used are typical for base metal dissolution from lateritic ore sources. The discharge from the autoclave is filtered and the solids dry stacked.

Stage 2 is primary impurity removal and nickel/cobalt sulphide recovery from the autoclave filtered solution. The filtered pregnant liquor solution proceeds to two-stage neutralisation for removal of the free acid, iron and aluminium. The iron-free solution is then exposed to sulphide precipitation to recover a high-grade nickel/cobalt sulphide product with minimal impurities.

The filtration of tailings provides an advantage over traditional flowsheets, in that the filtered solids are washed and dry stacked, negating the need for a tailings storage facility or counter current decantation that have caused operational issues and bottlenecks in earlier laterite flowsheets.

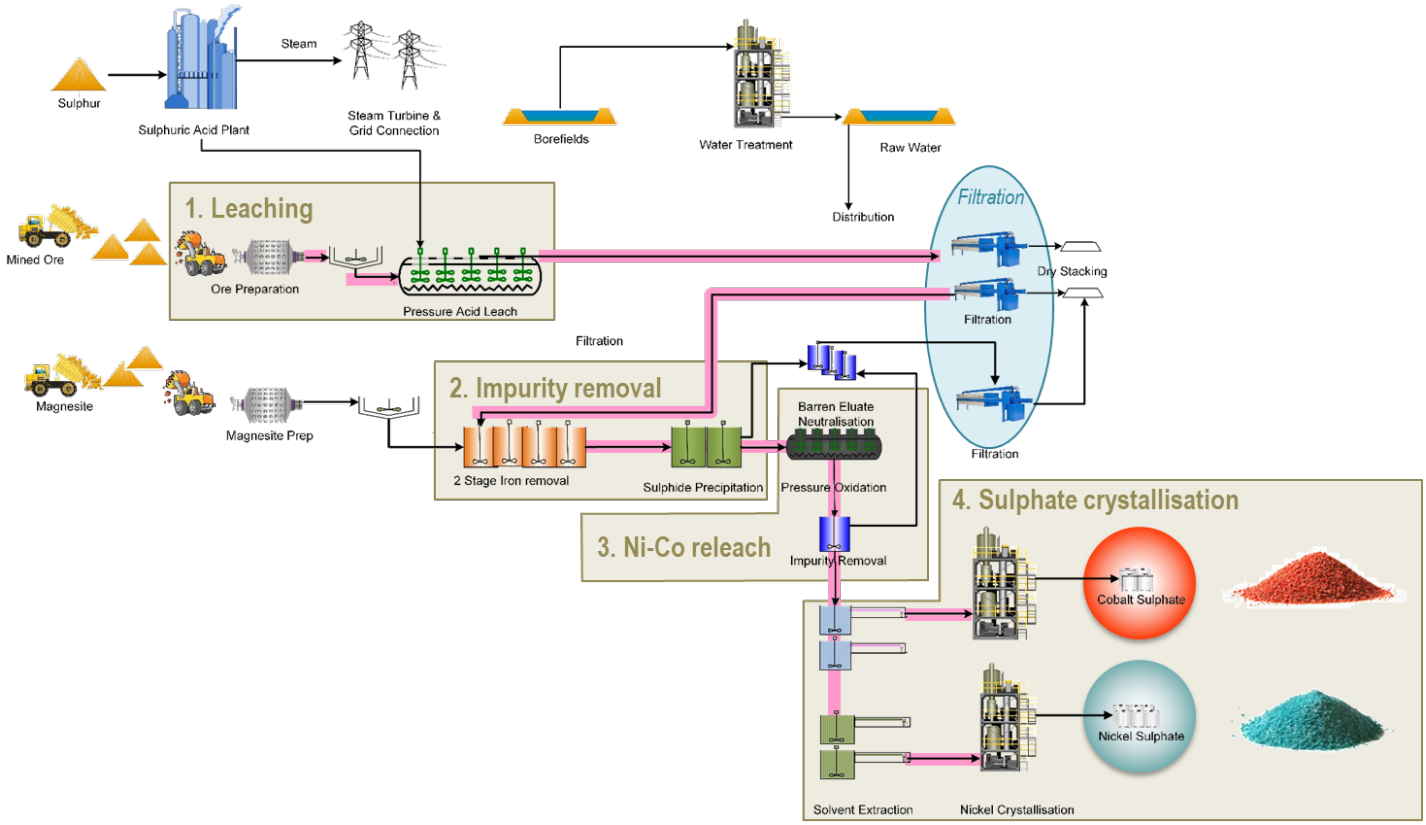

Figure 2 – PAL/MS flowsheet for the Goongarrie Nickel Cobalt Project PFS

Stage 3 is nickel and cobalt oxidative re-leach and secondary impurity removal. The nickel and cobalt-rich sulphide intermediate product is oxidised and re-leached under medium pressure and temperature to provide a high concentration, small volume metal stream.

Stage 4, the final stage, is the crystallisation of high-purity and separate nickel sulphate and cobalt sulphate, with solvent extraction being used to separate the nickel and cobalt. The separate nickel and cobalt sulphate streams are concentrated to saturation point via thermal and mechanical energy input. This causes the metals to begin crystallising from solution as metal sulphate hydrates. The specific form of crystal as required by off-takers is manipulated by controlling the temperature of crystallisation.

The nickel circuit uses a falling film evaporator followed by a mechanical vapour recompression crystalliser. For cobalt crystallisation this is achieved in a single unit operation due to the relatively small scale of production.

Reagents used include sulphur, liquefied oxygen, magnesite (mined on site), caustic, and minor reagents such a selective organic extractants, ion-exchange reagents, flocculants, and water treatment chemicals.

Tailings are mostly derived from the barren solution from base metal sulphide precipitation, and the final washed filter cake from the acid leach.

Processing and design advantages

Design

The plant design (taken from the PFS) is based on maximising the modularisation and prefabrication of structures and process units. Modules are fitted with as much equipment, piping, valving and instrumentation as possible to maximise off-site testing and to minimise on-site connections.

The neutraliser for the process is sourced from the overburden and base of the scheduled mining pits.

Laterite processing -benchmarks

For the PFS Ardea reviewed in detail the most recent operations globally that have the used PAL and MS precipitation flowsheet. Successful operations at Moa Bay, Coral Bay 1 & 2 and Taganito produce nickel and cobalt via the PAL and MS route. Extensive operating and design data was collated on each of the operating plants to enable Ardea to incorporate key learnings from these projects into the PFS, and replicated in the Expansion Study.

Table 4 shows the production and the ramp up time for these operations. It can be seen from this data that the third and later generation operations improved from the first and second-generation PAL counterparts. Third and fourth generation plants have extensively documented the ramp up and operational optimisations. Goongarrie as a fifth-generation operation has minimised technical risk.

Table 4 – Comparison of production at various PAL-MS plants globally, showing two possible scenarios for Goongarrie.

Operation	Gen	Flowsheet	Start	Status	Design Cobalt (tpa)	Design Nickel (tpa)
Moa Bay Revitalisation *(Sherrit)*	1st	PAL-MS	1995	• Ramp up within a year, currently operating at 32,000tpa Nickel and 3,800tpa Co	3,000	25,000
Murrin Murrin *(Glencore)*	2nd	PAL-MS- Hydrogen Reduction	1999	• Currently operating at approximately 85%	5,000	45,000
Coral Bay *(Sumitomo)*	3rd	PAL-MS	2004	• Stage 1, achieved 90% capacity in 15months. Currently operating at 120% of design capacity	750	10,000
	3rd	PAL-MS	2009	• Stage 2, achieved 100% capacity in 9 months. Currently operating at 120% of design capacity	750	10,000
				Coral Bay Total	*1,500*	*20,000*
Ambatovy *(Sumitomo, KRC, Sherrit)*	4th	PAL-MS-Hydrogen reduction	2012	• Achieved 80% nameplate in 4 years	5,600	15,000
Taganito *(Sumitomo)*	4th	PAL-MS	2013	• Achieved 90%+ nameplate within 3 years.	2,600	30,000
Goongarrie *(Ardea)*	5th	PAL-MS-Crystallisers	Early 2020s	• 1.0 Mtpa option: Ramp up to 100% in 15 months	1,180	9,300
	5th	PAL-MS-Crystallisers	Early 2020s	• 1.5 Mtpa option	1,450	12,350
	5th	PAL-MS-Crystallisers	Early 2020s	• 2.25Mtpa option	2,150	18,000

Autoclave residence time

The 2.25Mtpa Expansion Study case has an identical flowsheet and the same sized autoclave as the GNCP 1.5Mtpa PFS Case. The key difference is that the 2.25Mtpa Expansion Study assumes a 40-minute residence time in the autoclave compared to the 1.5Mtpa case which utilises a 60-minute residence time in the autoclave, allowing a larger annual output.

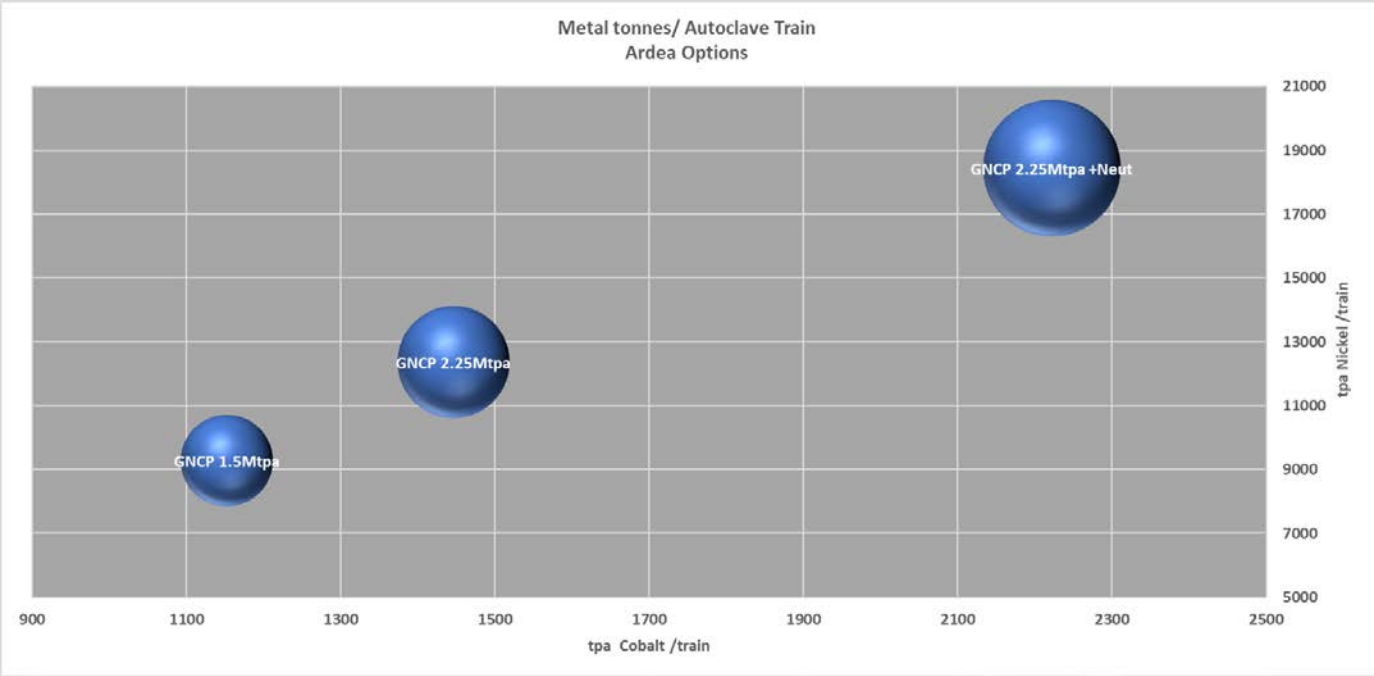

Figure 3 – The range of throughput options assessed for the Goongarrie Nickel Cobalt Project in terms of cobalt metal and nickel metal produced.

Autoclave feed density

Ardea has recently completed additional rheology test work and the results align with the extensive test work completed in 2009 by Vale Inco's PFS on the KNP. The test work indicates that the slurry density feeding the autoclave can be substantially increased without detriment, whilst maximising single autoclave throughput.

Mineralogical studies completed by Ardea confirm the premium rheology ore is dominantly the hydrated iron oxide mineral goethite, with accessory maghemite, magnetite, kaolinite and gibbsite. There is an absence of the problematic nontronitic-style swelling clays.

Engineering

The size selection of the autoclave has been benchmarked against other key laterite HPAL and PAL plants (Figure 4 below). The size of the train has been selected ensuring the engineering does not provide any further technical risk to the project. Ardea has also confirmed the autoclave dimensions and weight with respect to road transport from port to site. As can been seen in Figure 3 the autoclave size, diameter and length are within industry standards.

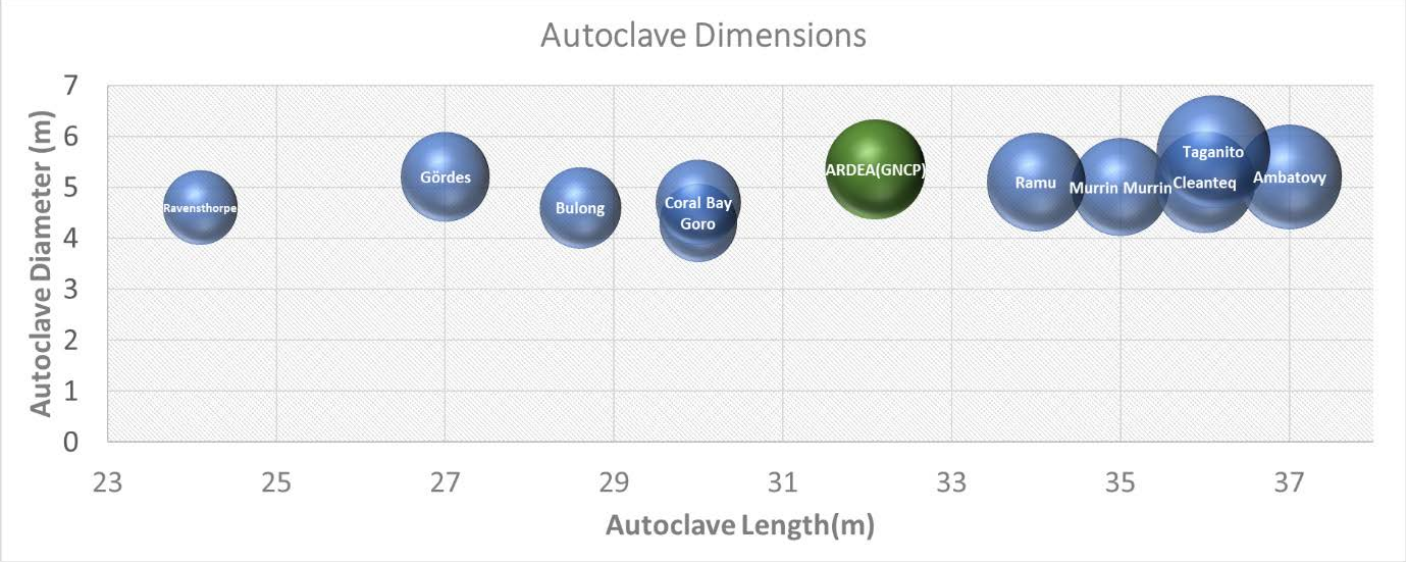

Figure 4 – Autoclave dimensions for various laterite nickel and cobalt projects globally. The diameter of the balls indicates autoclave volume.

Infrastructure

Location and Access

Per the PFS, the plant site is situated approximately 1km east of the Goldfields Highway and Railway between the Highway and Goongarrie South deposits on granted mining lease M29/272. A sealed, highway provides access to the plant and the camp.

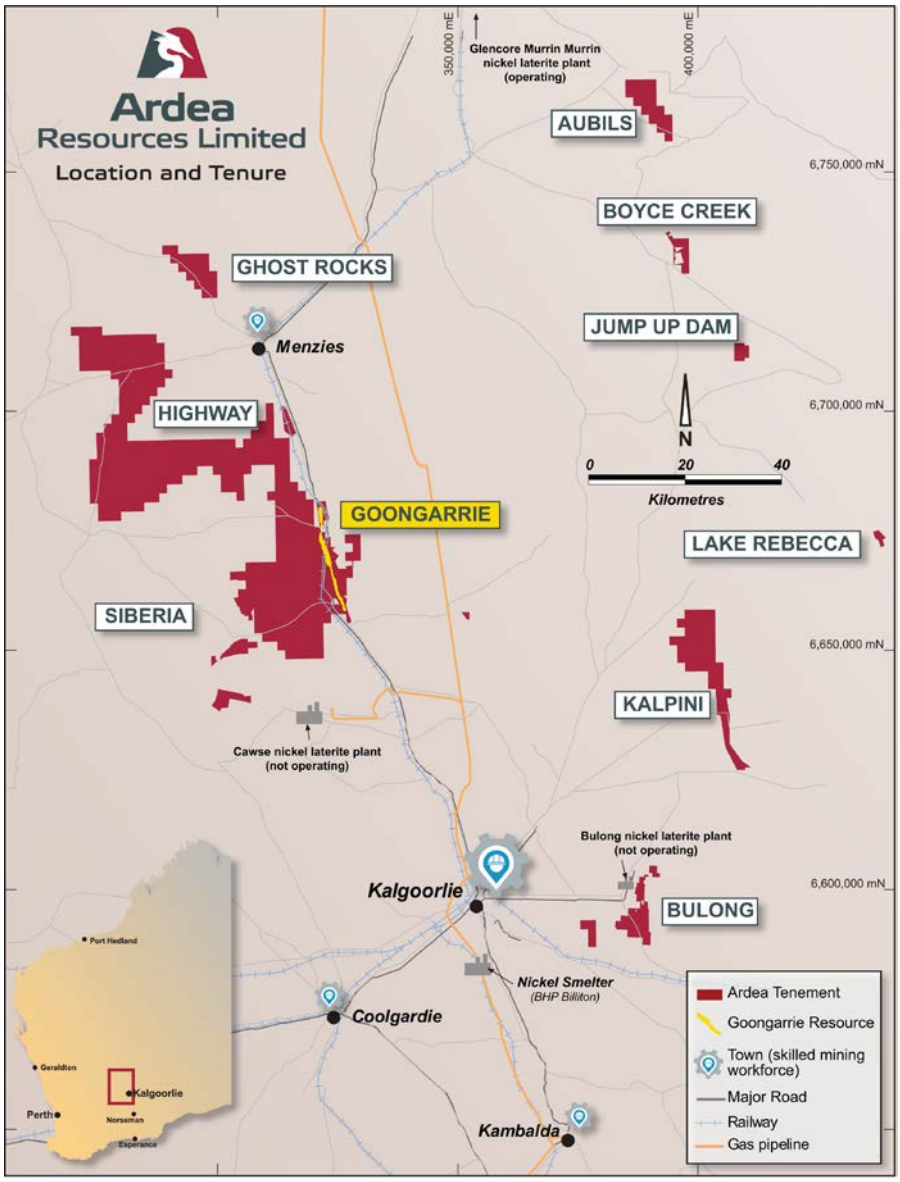

Figure 5 – Locaton map for the Goongarrie Nickel Cobalt Project, showing infrastructure throughout the Eastern Goldfields near Kalgoorlie.

Transport and Shipping

Per the PFS. imported reagents are received at the Port of Kwinana and transported to site via the existing public road and rail network. The nickel sulphate and cobalt sulphate products are exported from the Port of Esperance via the existing public roads. The Expansion Study replicates the PFS and assumes that the products are shipped to east Asia on a CIF basis. Sulphur is unloaded in bulk and stored in a dedicated storage facility at the Port of Esperance. A front-end loader is used to load bulk materials trucks for transport to site. All other reagents are received at Goongarrie in containerised form.

Water Supply and Distribution

Per the PFS, raw water is to be supplied from paleochannel borefields on granted Ardea tenure at Highway, Siberia North and Big Four, and from Ardea tenement applications at Goongarrie West and Papertalk Creek. The installed field has a total of 15 active bores.

Power Supply and Distribution

Per the PFS, the Goongarrie flowsheet reduces power costs by using the heat from the acid plant to generate electricity. Sulphur is burned to produce acid in the acid plant and steam is generated as a by-product which is used in the leach and crystallisation process. The remaining steam is fed into a steam turbine to generate power to run the process plant. Additional power can be taken from the local power grid running through the mining tenements. Diesel generation is used for backup power.

Service Buildings and Ancillaries

Per the PFS, service buildings are located to the southeast of the process plant to facilitate ease of access from the camp without need to enter the process plant. Camp and plant waste water are low salinity products that are re-used in the plant.

Site Accommodation Village

Per the PFS, a permanent site accommodation village is to be located to the southeast of the process plant. The village will accommodate 130 personnel at any one time which is approximately half the estimated work force. It is assumed that the remaining workforce will live and commute from Kalgoorlie-Boulder on a daily basis.

A temporary construction village adjacent to the main village will cater for the construction phase and accommodate up to 500 personnel.

Financials

Capital Cost Estimates

The capital cost estimate for Goongarrie has an accuracy level of ±35% and includes a 20% contingency on direct and indirect costs. It includes all associated infrastructure including power and water supply and road upgrades. Capital estimates for the 2.25Mtpa throughput option were developed by factoring the equipment cost from the base case 1.5Mtpa throughput PFS option, an approach which Ardea considers is reasonable and appropriate in the circumstances.

Table 5 Capital Expenditure (Approx)

Initial Capital Expenditure Breakdown		
Capital Item	**A$M**	**US$M[1]**
Pre Production Mining	10	8
Site Preparation	43	34
Processing Plant	601	474
Utilities	97	76
Services	6	5
Total Direct Capital	757	597
Owners Costs	26	21
Indirect Costs	164	129
First Fills & Spares	23	18
Other Capital	214	168
Contingency	194	153
Total Capital Expenditure	**1,165**	**918**

1 Exchange rate used AUD:US 0.788

Numbers may not add due to rounding

Operating Cost Estimates

The plant operating cost estimates were completed to a PFS level of detail. Ardea's estimated general and administration operating costs were assumed to be fixed across the different throughput options, being driven primarily by manning numbers which do not change.

Table 6 Operating Costs (Approx)

Unit Costs	USD / lb
Unit Cost Breakdown	
Mining	0.46
Processing	3.54
Tails Disposal	0.15
General & Admin	0.21
Haulage & Port	0.28
Sub Total C1 Costs	**4.63**
By-Product Credits	(4.98)
Total C1 Costs	**(0.34)**
Sustaining Capital	0.19
Royalty	0.35
All In Sustaining Cost	**0.20**

Numbers may not add due to rounding

Financial Outcomes

The 2.25Mtpa scenario is expected to generate approximate pre-tax real discounted cash flows totalling approximately **A$3.146 billion** based on a discount rate of 8 % and post-tax real discounted cash flows totalling approximately **A$2.29 billion**. The pre-tax and post-tax, ungeared Internal Rate of Return (IRR) of the project is forecast to be 31 % and 27 % respectively. The project has an estimated payback period of 5.1 years. See Table 7 for further details.

Table 7 - 2.25Mtpa Expansion Study

Parameter		Units	
Life Of Mine		Years	25
AutoClave Feed Grade LOM	Nickel	%	0.9%
	Cobalt	%	0.1%
Production LOM average	Nickel sulphate	tpa	81,400
	Cobalt sulphate	tpa	10,300
Production LOM average	Contained Nickel	tpa	18,000
	Contained Cobalt	tpa	2,150
Recovery LOM average	Nickel	%	93%
	Cobalt	%	95%
Nickel sulphate price#		USD /lb	8.84
Cobalt sulphate price#		USD /lb	41.63
Exchange Rate		AUD:USD	0.79
Initial Capital		AUD M	1,165
Sustaining Capital		AUD M	248
C1 Cash Cost	before Co credits	USD /lb	4.6
	after Co credits	USD /lb	(0.3)
Pre-Tax NPV @ 30 Jun 20, 8.0% (real)		AUD M	3,150
Pre- Tax IRR (real)		%	31%
Post-Tax NPV @ 30 Jun 20, 8.0% (real)		AUD M	2,300
Post-Tax IRR (real)		%	27%
Payback		Years	5.1

#Nickel sulphate and cobalt sulphate prices are average recorded transaction prices for February 2018 in the People's Republic of China, the world's largest consumer of these products (Source: SMM, see Section 13). Note: production tonnages are rounded to reflect degree of certainty

Sensitivity Analysis

In addition to determining the expected financial outcomes, a series of sensitivities were performed for changes in product prices, exchange rate, operating costs, capital expenditure and process plant recoveries. The sensitivity analysis results showed that the project's cash flow returns are robust and can provide a sustained future economic return. Significant positive NPV was returned even at negative 20 % sensitivity, confirming Goongarrie as a robust project throughout alternative pricing.

A sensitivity analysis for the project was carried out to determine the effects of key variables in relation to the Base Case post-tax NPV of A$2.29 billion at a discount rate of 8 %. The results of the sensitivity analysis are presented in Table 8 below.

Table 8– Sensitivity analysis for a 2.25Mtpa. All values in A$ millions

2.25 Mtpa – Post-Tax NPV @ 30 Jun 20, 8.0% (real)						
% Δ	Price	Exchange rate (US$:A$)	Capital	Opex	% Δ	Recoveries
- 20%	1,314	3,489	2,544	2,622	**- 4%**	2,100
- 15%	1,559	3,146	2,481	2,539	**- 3%**	2,148
- 10%	1,803	2,829	2,418	2,457	**- 2%**	2,195
- 5%	2,047	2,547	2,355	2,374	**- 1%**	2,243
Base	2,291	2,291	2,291	2,291	**Base**	2,291
+ 5%	2,534	2,059	2,226	2,208	**+ 1%**	2,339
+ 10%	2,776	1,847	2,162	2,124	**+ 2%**	2,387
+ 15%	3,018	1,654	2,097	2,041	**+ 3%**	2,434
+ 20%	3,259	1,478	2,033	1,958	**+ 4%**	2,481

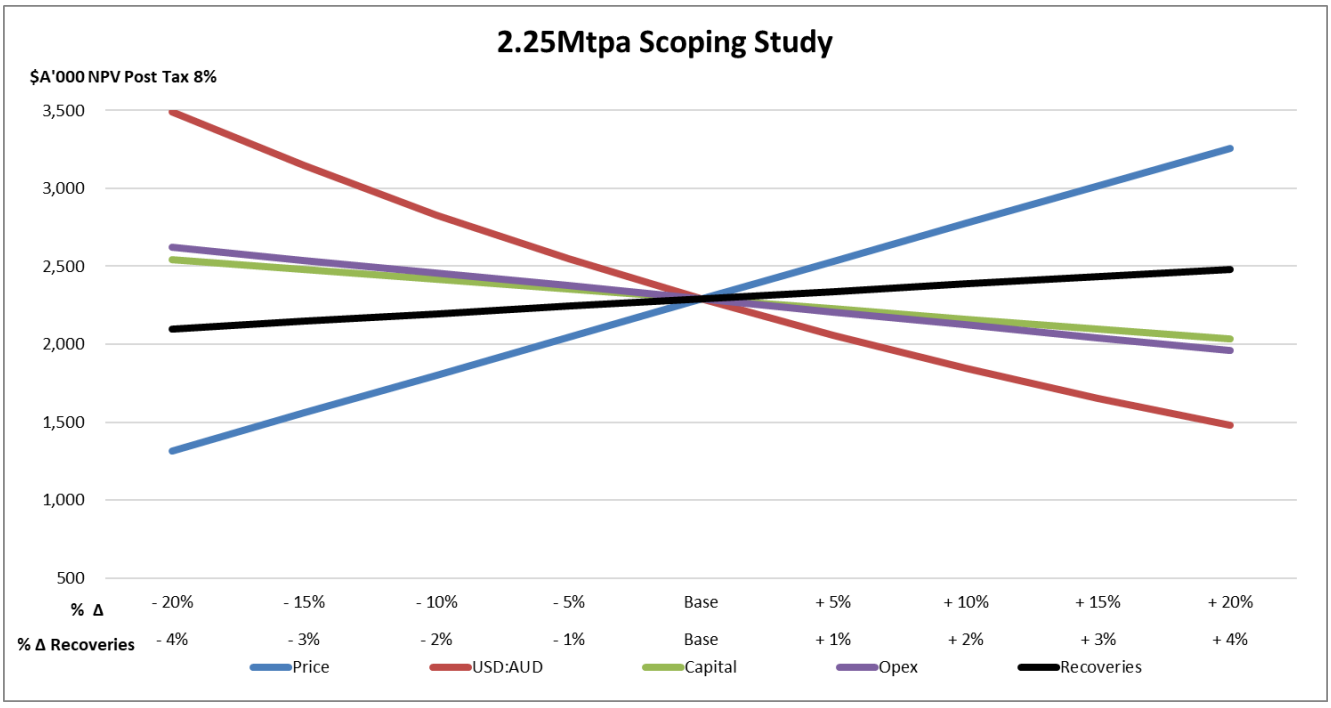

Figure 6 - Sensitivity Analysis

Sensitivity analysis was also conducted on the Base Case post-tax NPV of A$2.29 billion for a range of discount rates. The Base Case discount rate of 8% (which was used in the PFS) takes into account the location of the Goongarrie project in a jurisdiction with low political risk and minimal technical risk due to the use of "off-the-shelf" technology. In addition, the Company has considered the discount rates used in studies by industry base metal (notably nickel laterite) peers for projects elsewhere in Australia (including more challenging jurisdictions) and found that the applied discount rate of 8% is comparable. The results of sensitivity analysis at a range of discount rates are shown in the table below:

Table 9 – Discount rate Sensitivity Analysis

Discount Rate	Pre-Tax NPV @ 30 Jun 20 AUD M (real)	Post-Tax NPV @ 30 Jun 20 AUD M (real)
4%	5,404	4,007
6%	4,100	3,017
8%	3,146	2,291
10%	2,434	1,748
12%	1,892	1,334
14%	1,474	1,014

It should be noted that financial performance remains robust even at high discount rates.

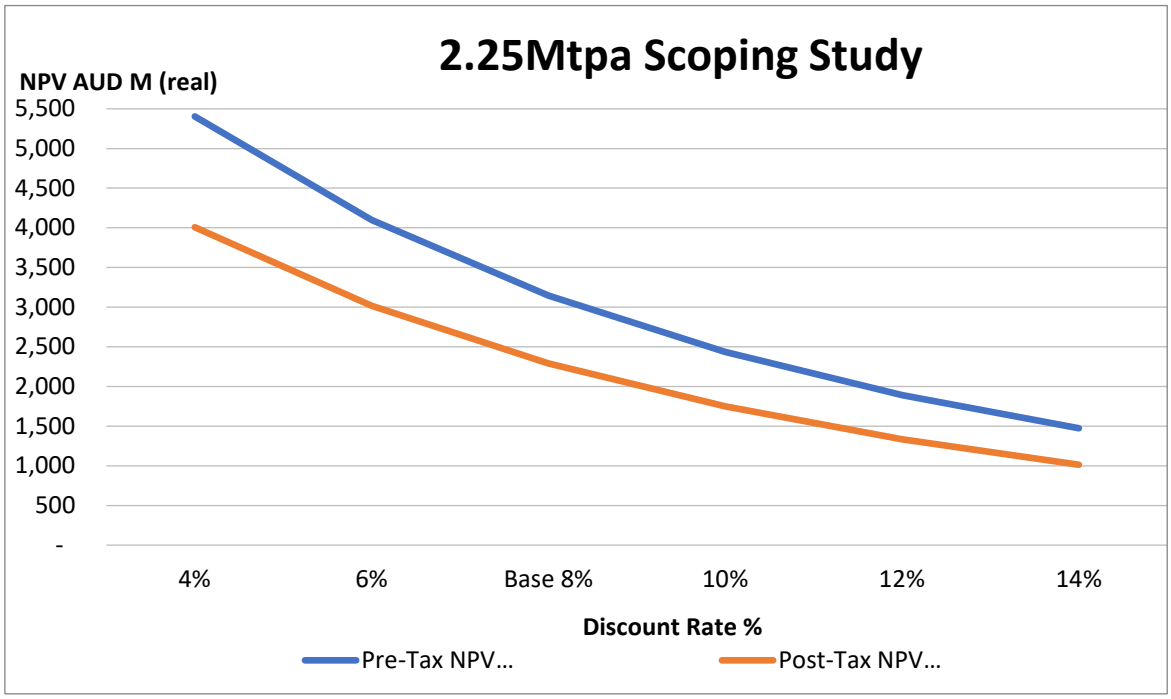

Figure 7 – Discount rate Sensitivity Analysis

Nickel Sulphate and Cobalt Sulphate pricing

Nickel sulphate and cobalt sulphate prices used in the Expansion Study are shown in the table below. These prices are based on average recorded transaction prices for February 2018 in the People's Republic of China, the world's largest consumer of these products (as per ASX announcement 28 March 2018).

Table 10 - Nickel and Cobalt Pricing

Battery metal sulphate		Price date	Units	US$ / t	US$ / lb
Cobalt sulphate *(contains 20.97% cobalt)*	PFS	Feb 2018 (avg)	*Contained metal equiv.*	**$91,771**	$41.63
Nickel sulphate *(contains 22.33% nickel)*	PFS	Feb 2018 (avg)	*Contained metal equiv.*	**$19,486**	$8.84

The justification for the use of the average February 2018 pricing for cobalt sulphate and nickel sulphate has been defined as follows:

- Requirement to have consistently derived values for both cobalt sulphate and nickel sulphate pricing. A thorough check of global analysts showed that Ardea's consultant SMM could provide this at the time of modelling and writing.
- Market forecast pricing for cobalt sulphate and nickel sulphate is simply not available.
- All pre-2018 long-term forecast data consulted showed predicted pricing for these metals in 2018 to be substantially below actual current values, severely diminishing their credibility. This is a result of recent rises from historic lows and a structural change in the price of cobalt in particular.
- Consensus forecasts suffer from a similar problem to the long-term forecasts, with 6 month old forecasts showing radically lower values to recent actual prices. Consultant CRU's cobalt metal and nickel metal forecasts are recent (February 2018 for cobalt, November 2017 for nickel) and reflect up-to-date information, and so were used as a proxy for cobalt sulphate and nickel sulphate forecasts.
- The rapidly changing (increasing) commodity prices for cobalt and, to a lesser extent, nickel reflect structural market change that is now starting to reflect their essential use in lithium ion batteries in general and in electrified vehicles in particular. EV manufacturing and sales are predicted to increase significantly in coming years by the substantial majority of forecasters.
- The selected pricing is for the Chinese market, the most comprehensively covered for sulphates and the greatest consumer of sulphates globally.
- The selected pricing is significantly lower than the proxy forecasts for cobalt and nickel metal as predicted by respected analysts CRU Group.

Alternative Pricing Scenarios

100 Year Average Prices

Ardea has reviewed nickel and cobalt metal pricing data for the past 100 years which is shown in Figure 5. The average metal prices are US$7/lb for nickel and US$27/lb for cobalt. The NPV after tax for the 2.25Mtpa Expansion Case using this pricing is A$1.143billion with an IRR of 18%.

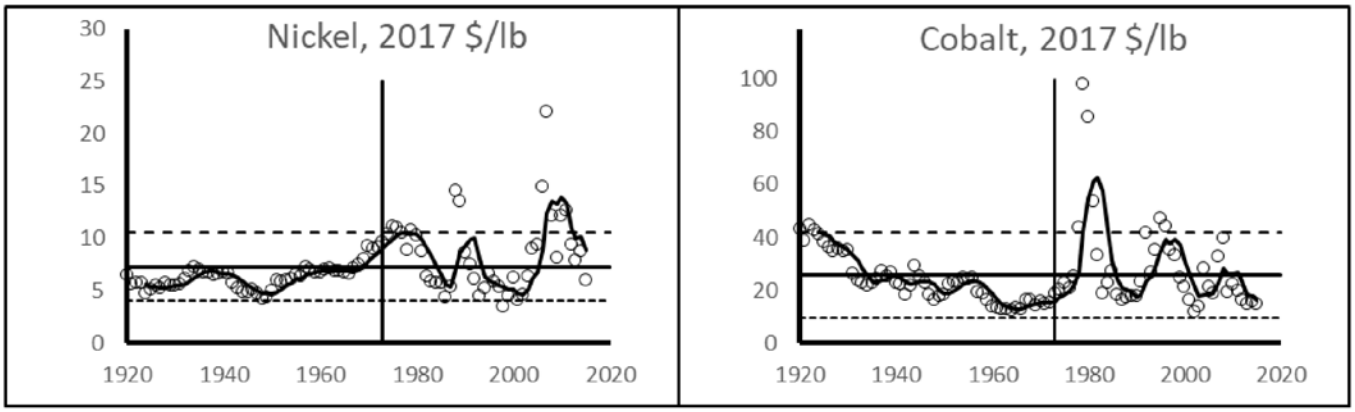

Figure 8 - Source Laterite and the commodity price cycle Mike Dry 2018.

Alternative Pricing Scenario

A third pricing scenario of US$7/lb nickel with a US$0.70 nickel sulphate premium and US$27/lb cobalt was also considered. The NPV after tax for the 2.25Mtpa Expansion Case using this pricing scenario is A$1.404 billion with an IRR of 21%.

Table 11 Sensitivity on Pricing

	PFS Pricing	100yr Average prices	Alternative Pricing Scenario[2]
US$/lb(Ni)	8.84	7.00	7.70
US$/lb(Co)	41.63	27.00	27.00
NPV_8 A$M	2,291	1,143	1,404
IRR	27%	18%	21%
AUD:USD	0.788	0.75	0.75

[2] Alternate prices are derived from the 100-year average plus a 10% premium for Nickel Sulphate. No premium is assumed for Cobalt.

Funding and Marketing

There is a strong level of market interest in the Electric Vehicle (EV) and Energy Storage System (ESS) sectors and growing industry concerns over securing long term, sustainable and non-conflict cobalt supply. This is driving a high level of corporate activity in the Australian junior “battery metal” mining sector.

Increased demand for cobalt sulphate is driven by the higher energy density it provides to EV and ESS batteries.

Adding to this market growth for cobalt and cobalt sulphate is the increasing ethical concerns over supply of cobalt from the Democratic Republic of Congo (~60% of global supply).

Apple has stopped sourcing cobalt from DRC and has opted to pay a premium for its cobalt from regulated industrial mines. More global manufacturers are anticipated to follow Apple in sourcing alternative supply, with demand for alternative and ethical cobalt supplies driving new mine development and product pricing.

As such the Company has been approached and had preliminary discussions with multiple interested parties with respect to potential offtake and /or equity investment at the asset or corporate level.

The potential strategic partners have the balance sheet support and capability of providing the required funding for the GNCP development. The potential strategic partners showing interest include global industrial conglomerates, battery manufacturers, automotive manufacturers, trading houses, and mining strategics.

In recognition of the approaches by potential strategic partners the Company has engaged KPMG Corporate Finance’s specialist Metals and Mining M&A team as its global Strategic Advisor to commence a competitive process to manage and secure strategic financing partners (Strategic Partners) that will provide an optimal outcome for the Company in financing the selected development scenario . KPMG was the leading mid-market M&A advisor in 2017 in Australia and globally (Source: MergerMarket). It has a worldwide reach with offices in over 80 countries and extensive cross-border abilities (see ASX announcement dated 14 June 2018).

The PFS financial, economic and marketing metrics are robust and the resource base at Goongarrie has the potential to deliver a multi-decade production opportunity. In addition, the project’s location is within a mature, low sovereign risk mining jurisdiction which is also very attractive to these interested parties.

Since listing on ASX in early 2017, the Company has experienced strong growth in investor interest and has grown its market capitalisation from A$13 million to approximately A$90 million (as at the date of this announcement). The Company has a simple ownership structure, “clean” capital structure and does not carry debt on its balance sheet. All of these factors are expected to be attractive to potential Strategic Partners and provide flexibility with potential debt funding structures.

The Company has formed the view that there are reasonable grounds to assume that, provided a Strategic Partner is secured (for which a competitive process is under way), a combination of offtake, finance, debt and equity will likely be successfully raised and be sufficient to cover the estimated capital and working capital costs as and when required. Investors should however note that there is no certainty that the Company will be able to raise the amount of funding required when needed, and it is also possible that such funding may only be available on terms that may be dilutive to or otherwise affect the value of the Company's existing shares.

Going forward, the Company will continue to assess all possible commercial mechanisms to determine the optimum financing solution during the DFS period. The Company will continue to explore options in relation to securing financing from one or more Strategic Partners for the project, as discussions progress in relation to securing binding offtake commitments.

Appendix B

Material Assumptions

<table>
<tr><th>Criteria</th><th>Commentary</th></tr>
<tr><td>Study status</td><td>The Expansion Study is an expansion case of the PFS released on 28 March 2018. The production targets and forecast financial information in this release are based on this Expansion Study. The material in the mining schedule was sourced from the pit optimisation shells for Goongarrie South, Big Four and Scotia Dam, using the same input parameters as the PFS Ore Reserve mining schedule, with the addition of JORC classified inferred material. The Expansion Study is considered more advanced than a scoping study, but not advanced enough to support the estimation of Ore Reserves and further evaluation work and appropriate studies are required before Ardea will be in a position to estimate any Ore Reserves or to provide assurance of an economic development case at 2.25Mtpa scale.</td></tr>
<tr><td>Mining factors or assumptions</td><td>Technical work and data consolidation were performed by Steve Lampron and Dennis Morrison of Auralia Mining Consulting Pty Ltd.

The material in the mining schedule was sourced from the pit optimisation shells for Goongarrie South, Big Four and Scotia Dam, using the same input parameters as the PFS Ore Reserve mining schedule, with the addition of JORC classified inferred material.
Reserve project costs and parameters were either supplied by various contracting companies tendering on the project, Auralia's own internal database or by Ardea Resources.
Industry standard mining methods using excavator and trucks are employed. A combination of 120t excavators and 90 tonne rigid trucks are currently being considered for the surface mining at the KNP Cobalt and Nickel Project.
Optimisation and design constraints during the Pre-Feasibility study were based on prior existing geotechnical investigations and recommendations resulting from a desktop review by Golders Associates Ltd in 2008.
<table>
<tr><th>KNP</th><th>Bench Face Angle (°)</th><th>Bench Height (m)</th><th>Bench Width (m)</th><th>Ramp Gradient (1:X)</th><th>Ramp Width (m)</th></tr>
<tr><td>Surface to Pit Floor</td><td>70</td><td>20</td><td>5</td><td>10</td><td>22</td></tr>
</table>
A 5% mining dilution was used.
A 98% mining recovery was used.

Test work has been undertaken on the processing recoveries at the KNP Project by The Simulus Group and flat processing recoveries were applied, Nickel 93.5% and Cobalt 95%
The processing all-inclusive operating cost varies by deposit, and is comprised of the following:
A$110.19/t processing cost provided by Ardea
A$10.91/t G&A overheads cost provided by Ardea
A$0.29/t grade control cost based on assumptions provided by Ardea as follows:
10m x 10m RC drill pattern to 20m depth
Drilling cost of A$25/m
2m sample intervals at A$27.50/sample
Rehandle and haulage costs, variable by deposit. Haulage cost (including stockpile rehandle) was assumed as A$0.12/t/km (inclusive of fuel and loading). Approximate haulage distances were calculated for each deposit, resulting in the following:
Goongarrie South: A$0.30/t of ore
Big Four: A$0.60/t of ore
Tailings disposal costs were calculated based on assumptions provided by Ardea Resources and mining contractor budget pricing.
Filter cake tailings, 1.29Mtpa produced from 1Mtpa plant throughput, plus 31.9% moisture results in 1.89Mt filter cake per 1Mt of ore fed to the processing plant
Contractor budget pricing of A$1.90/t to rehandle and place the tailings from conveyor discharge points to waste co-disposal dumps
Tailings disposal cost A$3.59/t of ore (A$1.90/t x 1.89)
Product transport cost
Ardea estimated the product transport cost at A$132/t based on transport from site to the Esperance port, and shipping to China
Product specifications (sourced from a 2017 Leach Selection Study completed by The Simulus Group):
Nickel Sulphate – 22.33% Nickel
Cobalt Sulphate – 20.96% Cobalt</td></tr>
</table>

Criteria	Commentary
	The following tables include the minimum A$/t mining cost by bench in each deposit. These budget costs were based on data provided to Auralia by reputable independent mining contractor tendering on the KNP project

Bench Toe	Goongarrie South		Big Four	
	Ore Mining Cost	Waste Mining Cost	Ore Mining Cost	Waste Mining Cost
385	$7.81	$7.93	$7.70	$7.89
380	$5.35	$5.54	$5.25	$5.45
375	$5.32	$5.52	$5.32	$5.52
370	$5.38	$5.59	$5.38	$5.59
365	$5.45	$5.66	$5.45	$5.66
360	$5.52	$5.73	$5.52	$5.73
355	$5.59	$5.80	$5.59	$5.80
350	$5.66	$5.89	$5.66	$5.89
345	$5.80	$6.06	$5.80	$6.06
340	$5.87	$6.13	$5.87	$6.13
335	$5.94	$6.20	$5.94	$6.20
330	$6.00	$6.30	$6.00	$6.30
325	$6.07	$6.39	$6.07	$6.39
320	$6.14	$6.46	$6.14	$6.46
315	$6.21	$6.55	$6.21	$6.55
310	$6.28	$6.63	$6.28	$6.63
305	$6.35	$6.72	$6.44	$6.69
300	$6.51	$6.85	$6.62	$6.82
295	$6.76	$7.08	$6.69	$7.00
290	$7.01	$7.31	$6.76	$7.18
285	$7.26	$7.54	$6.83	$7.36
280	$7.51	$7.77	$7.70	$7.89

	The Western Australia state government royalty of 2.5% metal product royalty was applied for both Cobalt and Nickel. Minimum mining widths of 20m were applied as pit design constraints appropriate to the 90 tonne truck fleets.
Metallurgical factors or assumptions	Processing of the ore comprises of: ore comminution, High Pressure Acid Leaching (HPAL), mixed sulphide precipitation, sulphide reduction for nickel and cobalt sulphate, and purification via solvent extraction and crystallisation. Waste streams are neutralised and filtered prior to dry stacking in waste landforms. HPAL) for laterite mineralisation is widely used within industry. The downstream processes are also well proven and commonly used in the wider metallurgical industry. Metallurgical test work has been carried out on several ore types and composites over the Project. Variability testing was completed on mineral samples which represented the first 5 to 10 years of production. Based on the results of the metallurgical testing and process modelling, final nickel and cobalt recoveries are estimated at 93.5 % and 95% respectively
Environmental	Environmental studies have commenced and will be completed upon moving to a Definitive Feasibility study. The tailings will be in a dry filter cake form. The dry tailings disposal strategy involves encapsulation of the tailings in mine waste for optimal long term environmental stability.
Infrastructure	Raw water is supplied from the Papertalk paleochannel via a borefield. The installed field has a total of 15 active bores. The design borefield supply for a 1Mt/a plant is 3.0 ML/day of raw water. Applications for water exploration licences have been lodged for Papertalk Upper and Halfway Bore areas 70km northwest on Goongarrie. The project lies within several granted mining licences that will provide adequate availability of land for plant development. An application for a further mining licence along the eastern side of existing mining licences will allow further flexibility for mine planning in the event of higher-throughput scenarios. Water rights are secure for all mining licences. To supplement these, addition General Purpose Licences are under application to source water from defined palaeo-channels to the west and northwest should the need arise. The site has access to excellent infrastructure, being well serviced by a sealed highway, active railway, and reticulated high-voltage power which all cross the project site. Road and rail upgrades are not required. Labour is expected to be sourced and maximised from the City of Kalgoorlie-Boulder (80 km to the south), and will be augmented by fly in-fly-out

<table>
<tr><th>Criteria</th><th>Commentary</th></tr>
<tr><td></td><td>employees (via Kalgoorlie-Boulder) as required. On-site accommodation will be provided for FIFO.

Transport of bulk commodities will be via rail or road, with direct connection between site and major ports at Esperance and Fremantle.

Processing plant and associated infrastructure is provided for in the project capital cost, including power and water supplies, off-site road upgrades</td></tr>
<tr><td>Costs</td><td>No capital costs were included in the Whittle optimisations. Capital costs have been included in the economic analysis conducted by Ardea Resources.

Operational costs were provided by contract mining companies. Processing costs as were factored on the PFS costs completed by The Simulus Group at a Pre-Feasibility level of accuracy, deemed to be ±35%.

The Western Australia state government royalty of 2.5% metal product royalty was applied for both Cobalt and Nickel. (refer to above section).

The exchange rate used by Ardea Resources was US$0.788=A$1.00.

The additional cost of hauling the ore material from each deposit to the existing processing plant was included, and appropriately adjusted, to provide final tailored processing costs per site.</td></tr>
<tr><td>Revenue factors</td><td>The head grade is derived from the Mineral Resource and Modifying Factors as described above.

The sell prices were based on the current values at the time and they are as follows. Due to the purity of the final product a 120% payability factor is expected. This payability figure was sourced from Macquarie Group research data as well as a public domain study.

<table><tr><th>Commodity</th><th>Sell Price (US$) - Inclusive of the 120% Payability</th></tr><tr><td>Nickel</td><td>15,120 $/t</td></tr><tr><td>Cobalt</td><td>96,600 $/t</td></tr></table></td></tr>
<tr><td>Schedule and Timeframe</td><td><table><tr><th>ACTIVITY</th><th colspan="4">2018</th><th colspan="4">2019</th><th colspan="4">2020</th><th colspan="4">2021</th><th colspan="4">2022</th></tr><tr><td>GNC Project</td><td>q1</td><td>q2</td><td>q3</td><td>q4</td><td>q1</td><td>q2</td><td>q3</td><td>q4</td><td>q1</td><td>q2</td><td>q3</td><td>q4</td><td>q1</td><td>q2</td><td>q3</td><td>q4</td><td>q1</td><td>q2</td><td>q3</td><td>q4</td></tr><tr><td>Drilling</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Pilot Work</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>DFS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Project Primary Approvals</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>FEED/Engineering</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Construction</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Plant Startup/ Mining</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Marketing Assessment</td><td>The Project will produce and sell sulphates, so market prices for cobalt sulphate and nickel sulphate are sourced from respected analysts. Cobalt and nickel metal pricing is not appropriate as neither are sufficiently representative of sulphate pricing, however they are used for forecast conditions due to lack of sufficient forecast data for sulphates. For cobalt sulphate, pricing is presently around parity with equivalent metal pricing, but has fluctuated significantly in response to battery mineral demand. For nickel sulphate, long-held premiums to equivalent metal pricing are a mainstay of the industry and are a function of widespread nickel sulphate production from briquettes.

Outlook pricing for nickel sulphate and cobalt sulphate is not readily available. However, sulphate pricing is linked to the metal pricing for each commodity. Renowned global analysts CRU show substantial growth in both metals for the foreseeable future, particularly for cobalt. Cobalt demand is predicted to outstrip supply due to widespread uptake of lithium ion batteries (contained cobalt-bearing cathodes) in the automotive sector in particular. Predicted substitution of cobalt (typically by nickel) is predicted to be more than offset by massively increased demand for these batteries. Such predictions assume projected mine expansion rates and maintaining of political stability in dominant producer, the Democratic Republic of Congo. Supply constriction below predicted increased rates due to sovereign risk in the DRC would see further positive gains in cobalt prices. For nickel sulphate, long-held premiums to equivalent metal pricing are the result of processing of suitable briquettes for nickel sulphate production, with outlook suggesting that these premiums will be either maintained or, at worst, nickel briquette pricing rising to equivalent sulphate prices. As such, prices selected for this study are expected to be substantially</td></tr>
</table>

Criteria	Commentary
	below forecast prices for the commencement of mining should that occur in the early 2020s. No other projects are known to the Company use cobalt sulphate and nickel sulphate pricing in their Pre-Feasibility Studies. High-purity nickel sulphate and cobalt sulphate will be produced on site with pricing to be determined with each customer in a supply contract.
Funding	There is a strong level of market interest in the Electric Vehicle (EV) and Energy Storage System (ESS) sectors and growing industry concerns over securing long term, sustainable and non-conflict cobalt supply. This is driving a high level of corporate activity in the Australian junior "battery metal" mining sector. Increased demand for cobalt sulphate is driven by the higher energy density it provides to EV and ESS batteries. Adding to this market growth for cobalt and cobalt sulphate is the increasing ethical concerns over supply of cobalt from the Democratic Republic of Congo (~60% of global supply). Apple has stopped sourcing cobalt from DRC and has opted to pay a premium for its cobalt from regulated industrial mines. More global manufacturers are anticipated to follow Apple in sourcing alternative supply, with demand for alternative and ethical cobalt supplies driving new mine development and product pricing. As such the Company has been approached and had preliminary discussions with multiple interested parties with respect to potential offtake and /or equity investment at the asset or corporate level. The potential strategic partners have the balance sheet support and capability of providing the required funding for the GNCP development. The potential strategic partners showing interest include global industrial conglomerates, battery manufacturers, automotive manufacturers, trading houses, and mining strategics. In recognition of the approaches by potential strategic partners the Company has engaged KPMG Corporate Finance's specialist Metals and Mining M&A team as its global Strategic Advisor to commence a competitive process to manage and secure strategic financing partners (Strategic Partners) that will provide an optimal outcome for the Company in financing the selected development scenario . KPMG was the leading mid-market M&A advisor in 2017 in Australia and globally (Source: MergerMarket). It has a worldwide reach with offices in over 80 countries and extensive cross-border abilities (see ASX announcement dated 14 June 2018). The PFS financial, economic and marketing metrics are robust and the resource base at Goongarrie has the potential to deliver a multi-decade production opportunity. In addition, the project's location is within a mature, low sovereign risk mining jurisdiction which is also very attractive to these interested parties. Since listing on ASX in early 2017, the Company has experienced strong growth in investor interest and has grown its market capitalisation from A$13 million to approximately A$90 million (as at the date of this announcement). The Company has a simple ownership structure, "clean" capital structure and does not carry debt on its balance sheet. All of these factors are expected to be attractive to potential Strategic Partners and provide flexibility with potential debt funding structures. The Company has formed the view that there are reasonable grounds to assume that, provided a Strategic Partner is secured (for which a competitive process is under way), a combination of offtake, finance, debt and equity will likely be successfully raised and be sufficient to cover the estimated capital and working capital costs as and when required. Going forward, the Company will continue to assess all possible commercial mechanisms to determine the optimum financing solution during the DFS period. The Company will continue to explore options in relation to securing financing from one or more Strategic Partners for the project, as discussions progress in relation to securing binding offtake commitments.

Criteria	Commentary
Economic	The financial model uses updated assumptions. These differ slightly to the ones applied to the Ore Reserve to better represent today's market. It assumes a discount rate of 8% for a pre-tax NPV of approximately A$3,146M and a post-tax NPV of approximately A$2,291M. Sensitivity analysis was also conducted on the Base Case post-tax NPV of A$2.29 billion for a range of discount rates. The Base Case discount rate of 8% (which was used in the PFS) takes into account the location of the Goongarrie project in a jurisdiction with low political risk and minimal technical risk due to the use of "off-the-shelf" technology. In addition, the Company has considered the discount rates used in studies by industry base metal (notably nickel laterite) peers for projects elsewhere in Australia (including more challenging jurisdictions) and found that the applied discount rate of 8% is comparable: No inflation or escalation assumptions were made. A company tax rate of 30% was applied. Sensitivity analysis of +20% and -20% of key variables were carried out, with post tax NPV8 ranging from approximately A$3,489M to A$1,478M. Key sensitivities include autoclave feed grade, nickel sulphate and cobalt sulphate pricing, metal sulphate recovery rates, capital and operating costs, and exchange rate. Economic analysis was undertaken based solely on the Ore Reserve pit designs from the PFS (noting though no Ore Reserves are being declared as part of this Expansion Study as further evaluation work is required). A life of mine (LoM) study which included all open pit designs was used as the basis of the economic analysis. JORC classified Measured, Indicated and Inferred Material was included in the analysis; all other material was treated as waste. A pre-tax NPV of approximately A$3,146M and an IRR of 31% was calculated from the economic analysis of the KNP Cobalt and Nickel Project LoM. Inputs to the economic analysis include Modifying Factors as described above. Cobalt sulphate: RMB 121,600 /t (equivalent to a contained cobalt pricing of US$41.63/lb metal) Nickel sulphate: RMB 27,500 /t (equivalent to a contained pricing of US$8.84/lb metal)
Social	Voluntary discussions with local and state government bodies shows support for the project. Both the City of Kalgoorlie-Boulder and the Shire of Menzies (the project straddles the boundary) have expressed strong support, with the City of Kalgoorlie-Boulder aiming to become a hub for battery mineral mining and processing. Ardea is developing numerous community support programs in Menzies and Kalgoorlie-Boulder. The Company is abiding by Native Title regulations, with no issues flagged to date with a Native Title application that covers a large part of the Eastern Goldfields mining province, including the Goongarrie project area. The Company has held voluntary discussions with indigenous stakeholders regarding establishment of an infant health care centre and secondary school bursary in Kalgoorlie-Boulder, as well as vocational education and training for mine site roles.
Other	The Company has long-standing granted mining licences extending the full strike length of the project area, with an additional mining licence application submitted to the east of Goongarrie South that will ensure capture of all peripheral mineralisation and allow greater flexibility in mining, processing and infrastructure planning. There are no known significant naturally occurring risks to the project.

Criteria	Commentary
Classification	The current 2.25Mtpa Expansion Study relies solely upon Mineral Resources. There is no requirement for nor reliance upon an Ore Reserve. The Goongarrie Nickel Cobalt Project includes Ore Reserves which were estimated based on Mineral Resource estimates classified as 'Measured' and 'Indicated' after consideration of all mining, metallurgical, social, environmental and financial aspects of the project for the 1.0Mtpa and 1.5Mtpa options. All Proved Ore Reserves for the previously reported (28 March 2018) 1.0Mtpa and 1.5Mtpa options were derived from the Measured Mineral Resources and all Probable Ore Reserves were derived from the Indicated Mineral Resources, noting no Ore Reserves are being declared as part of this Expansion Study as further evaluation work is required. The previously reported Ore Reserve and Mineral Resource classifications reflect the Competent Person's view of the deposit. The previously reported estimated Ore Reserves and Mineral Resources were, in the opinion of the Competent Person, appropriate for this style of deposit.
Audit or reviews	The current 2.25Mtpa Expansion Study resource estimate has not required an independent audit or review. Extensive internal reviews of the previously reported Ore Reserve Estimates were completed by Ardea and contributing independent consulting groups. No external Audits of the Goongarrie Nickel Cobalt Project were undertaken prior to publication. Auralia Mining Consulting previously has completed an internal review of the Ore Reserve estimate for the 1.0Mtpa and 1.5Mtpa options.