# COLLERINA COBALT LTD (ASX:CLL) METALS OF THE FUTURE

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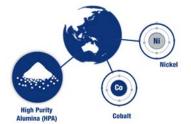
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# 02 Investment Highlights













A unique HPA-nickel-cobalt project favourably located in one of Australia's most prolific mining jurisdictions

Proximal to CleanTeq's Sunrise and Australian Mines' Flemington projects Proprietary processing technology capable of delivering strong economics

Exclusive IP applied to established processing technologies of CCAL & Solvent extraction

Multiple high-value products with strong demand fundamentals that are at the forefront of the world's technology revolution

CLL's intended HPA and nickel/cobalt products are the feedstock for the devices, applications and vehicles of the future Project economics befitting a junior miner

Anticipated modest capex, high margins, rapid payback

Highly experienced Board and management team with a track record in exploration success & project development

Seasoned judgement and prudent financial management to underpin project advancement

## 03 Corporate Snapshot



#### TRADING INFORMATION

12.0c
2.1c - 18.0c
508.3M
8.0M (expiring 21 October 2018)
30.0M (expiry 31 October 2019)
\$65.5M
\$0.7M
\$64.8M
\$

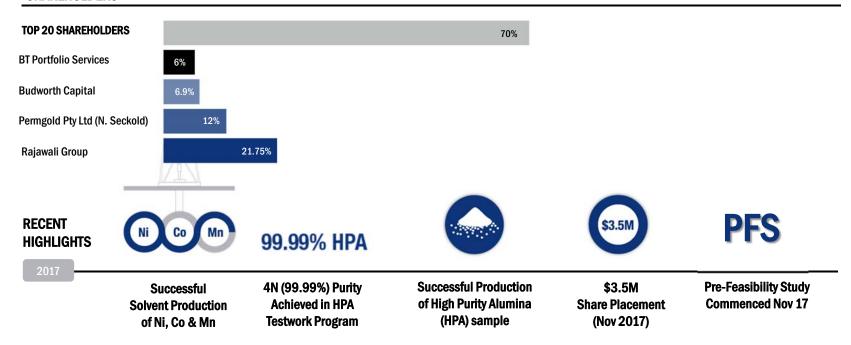
#### **SHARE PRICE PERFORMANCE**



## 03 Corporate Snapshot



#### SHAREHOLDERS



# 04 Board & Management





#### Norman Seckold Chairman

30+ years in the full time management of natural resource companies.
Past Chairman and Director of listed companies including Bolnisi Gold NL, Timberline Minerals Inc., Perseverance Corporation Limited, Valdora Minerals NL, Palmarejo Silver and Gold Corp. and Cockatoo Coal Limited. Currently Chairman of Santana Minerals Limited and Planet Gas Limited and unlisted public company Nickel Mines Limited.



## Justin Werner Managing Director

20+ years' mining and management experience.
Previously consulted to a number of blue chip mining companies including BHP, Rio Tinto and Freeport McMoran.
Successful track record of mine discovery and development.
Currently a Director of unlisted public company Nickel Mines Limited.



## **Peter Nightingale**Director and CFO

20+ years as a Director or
Company Secretary for a range
of resource companies including
Pangea Resources Limited,
Timberline Minerals Inc.,
Perseverance Corporation
Limited, Valdora Minerals NL,
Mogul Mining NL, Bolnisi Gold
NL, Cockatoo Coal Limited and
Sumatra Copper and Gold plc.
Currently a Director Planet Gas
Limited and unlisted public
companies Nickel Mines Limited
and Prospech Limited.



## Rimas Kairaitis Technical Director

20+ years experience in minerals exploration and resource development in gold, base metals and industrial minerals. Led the geological field teams to the discovery of the Tomingley and McPhillamy's gold deposits in NSW and steered the Hera gold-lead-zinc Project from discovery through to successful commissioning and commercial production. Previously founding Managing Director and CEO of ASX-listed Aurelia Metals.



**Tony Sgro**Non-Executive Director

Chemical Engineer with 45+ years' senior management experience in the supply of specialised equipment to the process industries with an emphasis on mining and oil & gas.

Co-founder, Director and General Manager of Kelair Pumps for 36 years.

#### 05 Collerina Project

- The Collerina Project area (EL 6336 & EL8703) covers ~224km²
- Mineralisation lies between surface and ~60m. Deposit remains open at depth and along strike
- Unique serpentinite geology and favourable Fe:Al ratio provides the amenability to low Capex, Counter-Current Atmospheric Leach (CCAL) process and the extraction of high-value HPA and Ni-Co precursors via exclusively licensed proprietary flowsheet processes

The Homeville deposit has a current Mineral Resource of:

- 16.3 million tonnes at 3.1% aluminium, 0.93% nickel and
   0.05% cobalt for 505,300 tonnes of aluminium, 151,000 tonnes of nickel and 8,100 tonnes of cobalt (cut-off 0.7% nickel)
- PFS due mid-CY2018





JORC Category	Cut-off Grade Ni%	Tonnes (Mt)	Ni%	Co%	Fe%	AI%
Indicated	0.5	6.4	0.87	0.06	21	3.7
	0.7	4.4	0.99	0.06	20	3.4
	1	1.8	1.21	0.05	19	3
Inferred	0.5	20.7	0.78	0.05	18	3
	0.7	11.9	0.91	0.05	18	3
	1	3.1	1.16	0.05	17	2.7
TOTAL	0.5	27.2	0.8	0.05	19	3.2
	0.7	16.3	0.93	0.05	19	3.1
	1	4.9	1.18	0.05	18	2.8

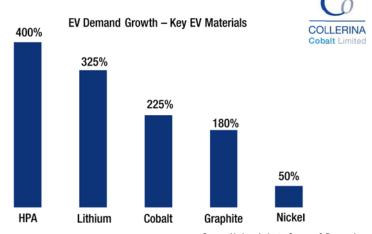


## 06 High Purity Alumina (HPA)



- HPA is the pure form of aluminium oxide (Al<sub>2</sub>O<sub>3</sub>) HPA is the pre-cursor material for the manufacture of sapphire glass and ceramic coated Lithium-Ion-Battery (Li-B) separators
- Its value derives from its physical properties of extreme hardness & chemical stability
- Purity is determined by the concentration of trace elements in the alumina compound eg, iron, magnesium, sodium
- Price and performance of HPA varies upon product density, crystal structure, particle size and distribution and degree of purity

4N HPA is the largest sector of the HPA market and is seen by CLL as the most logical sector of the market in which to focus in terms of demand volumes and margin optimisation

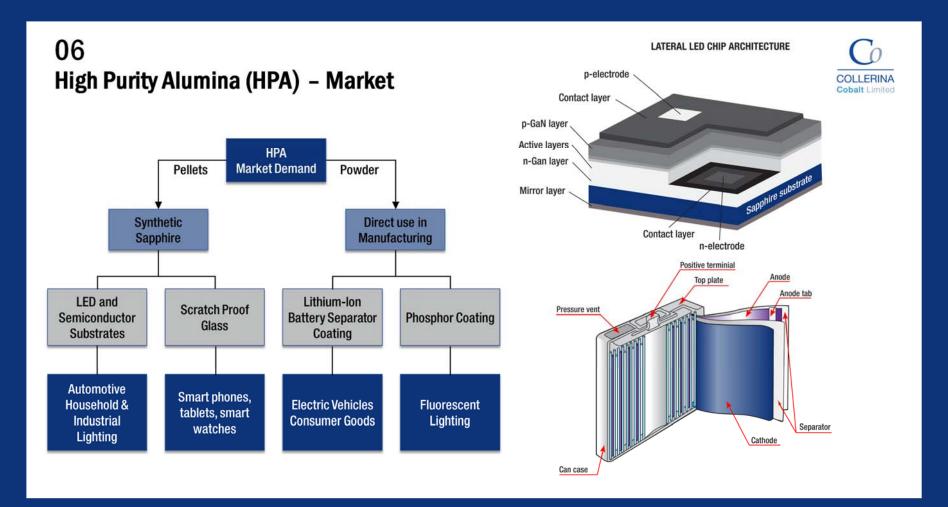


Source: Various Industry Sources & Research

#### PRICE FOR PURITY

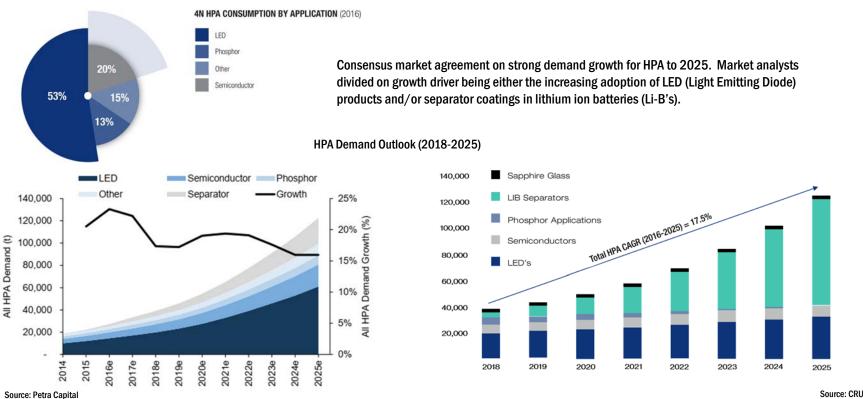
SGA	99.5% purity	~US\$400/t
3N HPA	99.9% purity	~US\$10-25/kg
4N HPA	99.99% purity	~US\$25-50/kg
5N HPA	99.999% purity	~US\$50-100/kg
6N HPA	99.9999% purity	By negotiation in a very limited market.

Source: CRU



## 06 High Purity Alumina (HPA) – Demand Outlook

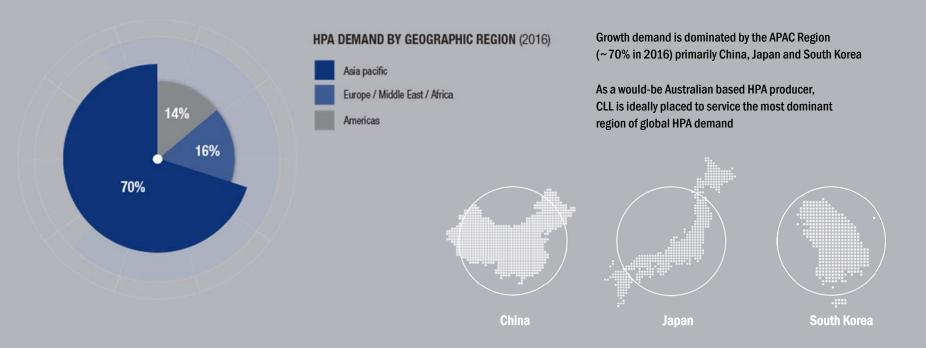




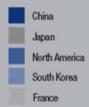
## 06 Demand for HPA – Regions



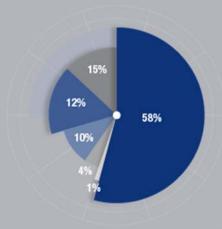
Demand for HPA is primarily being driven by the increasing adoption of LED (Light Emitting Diode) products, separators in lithium ion batteries (Li-B's) and scratch resistant artificial sapphire glass for smartphone screens and watches

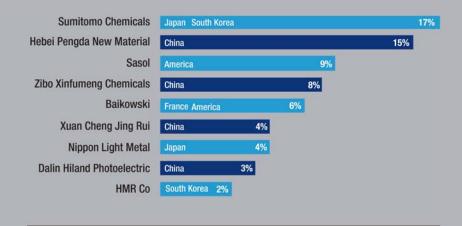


# 06 Supply of HPA



Russia





#### GLOBAL HPA SUPPLY DISTRIBUTION - 2016E

 Current HPA supply is concentrated in the Asia Pacific region (~83%) with China the most prolific producer



 dominated by large diversified chemical companies where HPA is a non-core product and an immaterial percentage of revenue (< 5% for Sumitomo Chemicals)

- as a focused HPA producer to:
  - Become a genuine
    alternative supply source
    to the existing dominant
    APAC producing countries,
    and more importantly
  - Fill an expected supply shortage as forecast HPA demand escalates over the next decade
- extremely low-cost HPA producer with its product mix of Ni-Co products offering potentially significant coproduct credits

% EXPECTED 2016 OUTPUT

 Strong potential exists for longterm offtake agreements prior to commercial production

SOURCE: PERSISTENCE MARKET RESEARCH

CLL sees enormous opportunity

CLL stands to become an

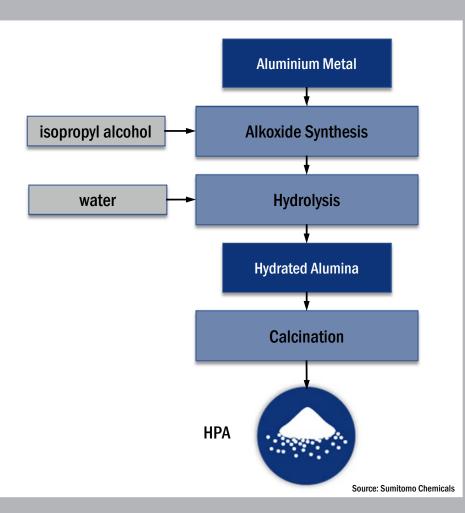
# 07 Existing HPA Production Process

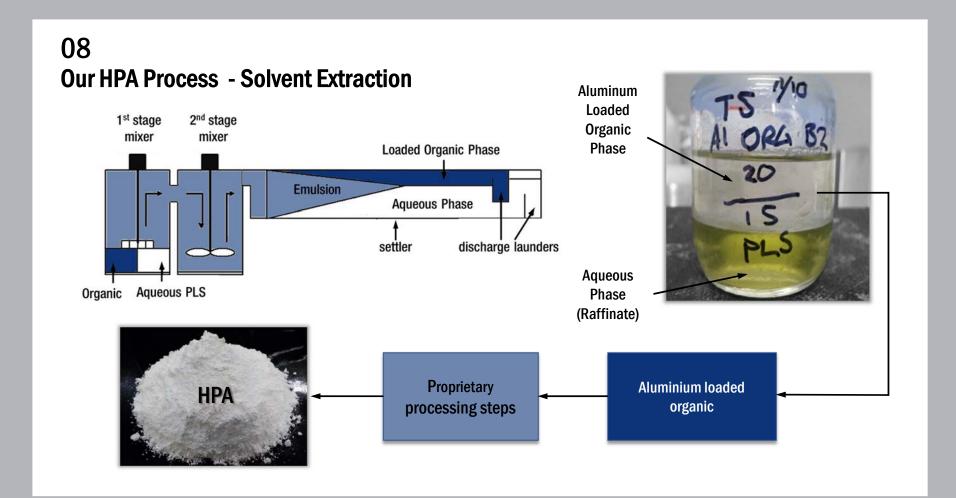
Existing HPA production is synthesised from Al metal feedstock.

Aluminium alkoxide is synthesized from aluminium metal and alcohol, and hydrated alumina is produced by hydrolysis of alkoxide, and finally high purity alumina is obtained by calcination.

**High Cost:** Contains the inherited process cost of Al Metal feedstock (Bayer Process+ Hall-Héroult Process)







# **08 Our HPA Process - Solvent Extraction**

The Solvent extraction process operating on a continuous basis inside the 'mini-rig'

Aluminum Loaded Organic Phase

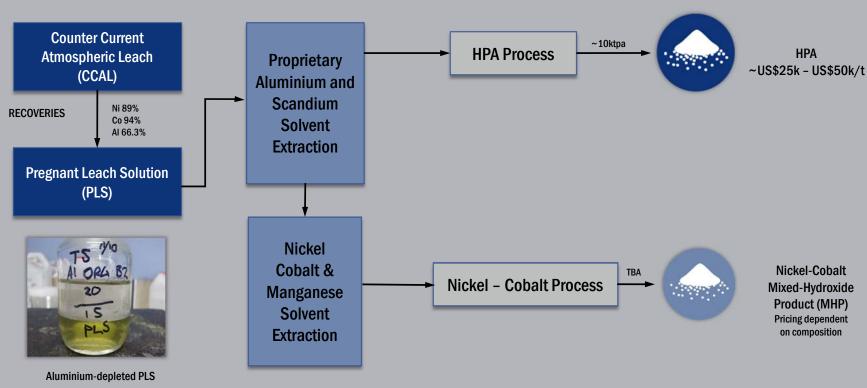
Aqueous Phase (Raffinate)



#### **Metallurgical Testwork - CLL Process Flowsheet**



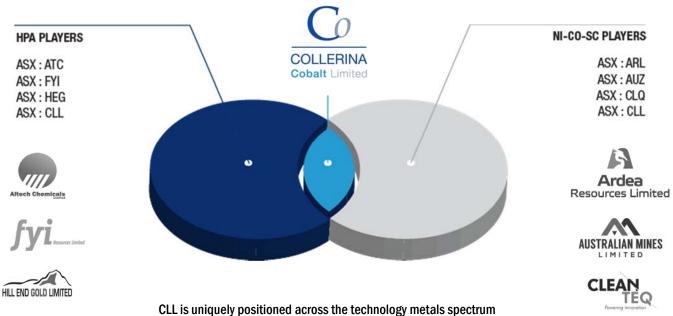
CLL's process flowsheet utilises established technologies capable of delivering several high-end specialty product streams



#### **A Unique Product Offering**



Deposit geology and exclusive process flowsheet IP uniquely positions CLL for the production of multiple high value revenue products of HPA + nickel & cobalt + scandium oxide



## **Peer Comparison - HPA Players**

CLL plans to distinguish itself from its peers by producing 4N HPA from Laterite Ore



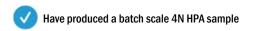




Cobalt Limited



FEEDSTOCK	LATERITE ORE	KAOLIN	KAOLIN	KAOLIN	KAOLIN
Targeted Products	4N HPA Significant co-products	4N HPA No co-products	4N HPA No co-products	4N HPA No co-products	4N HPA No co-products
Project Stage	PFS July 2018	PFS Q2 2018	PFS Q2 2018 DFS mid-2019	BFS 2015 FID Approved	Companies' Creditors Arrangement Act
Metallurgical Process	CCAL + proprietary processes	Acid leaching + proprietary processes	Acid leaching + proprietary processes	Acid leaching + proprietary processes	Acid leaching + proprietary processes
Acid Type	Sulphuric Acid H <sub>2</sub> SO <sub>4</sub>	Hydrochloric Acid HCl	Hydrochloric Acid HCl	Hydrochloric Acid HCl	Hydrochloric Acid HCl
Process Pros/Cons	Leaching at atmospheric pressures. No Pyro-Hydrolysis Lower technical risk	Leaching at high pressures & temp. Pyro-hydrolysis Higher technical risk	Leaching at high pressures & temp. Pyro-hydrolysis Higher technical risk	Leaching at high pressures & temp. Pyro-hydrolysis Higher technical risk	Leaching at high pressures & temp. Pyro-hydrolysis Higher technical risk
Targeted Production	~10,000 tpa	5,000 -10,000tpa	???	4,500 tpa	???
Capex	???	???	???	US\$298M	C\$498.5M



## **Peer Comparison - Nickel/Cobalt Players**











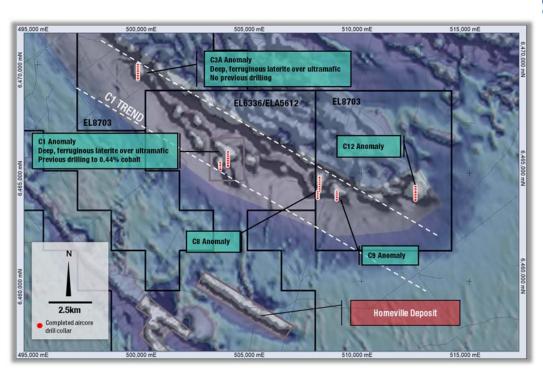
PROJECT(S)	COLLERINA	KNP/COBALT ZONE	SCONI/FLEMINGTON	CLEAN TEQ SUNRISE
Targeted Products	Ni/Co sulphate or MHP, Scandium oxide + HPA	Ni/Co Sulphate Scandium Oxide	Ni/Co Sulphate Scandium Oxide	Ni/Co Sulphate Scandium Oxide
Project Stage	PFS July 2018	PFS Q1 2018 DFS mid 2019	PFS 2016 BFS June 2018	PFS 2016 DFS Q1 2018
Metallurgical Process	CCAL + proprietary processes	Pressure Acid Leach (PAL)	Conventional HPAL + SX	Conventional HPAL + Resin-in-Pulp (RIP)
Acid Type	Sulphuric Acid H <sub>2</sub> SO <sub>4</sub>	Sulphuric Acid H <sub>2</sub> SO <sub>4</sub>	Sulphuric Acid H <sub>2</sub> SO <sub>4</sub>	Sulphuric Acid H <sub>2</sub> SO <sub>4</sub>
Targeted Production	PFS Outcome	Nickel Sulphate 41.5kt-70kt pa Cobalt Sulphate 5.5kt-8kt pa	Nickel Sulphate ~24kt pa* Cobalt Sulphate ~ 3kt pa* Scandium Oxide???	Nickel Sulphate ~85kt pa Cobalt Sulphate ~15ktpa Scandium Oxide ???
Сарех	PFS Outcome	\$599M (PFS)		US\$680M
Market Capitalisation (Fully Diluted)	\$64.8m	\$136.7m	\$221.7m	\$877.0m

<sup>\*</sup> Sconi project only

# 10 Exploration

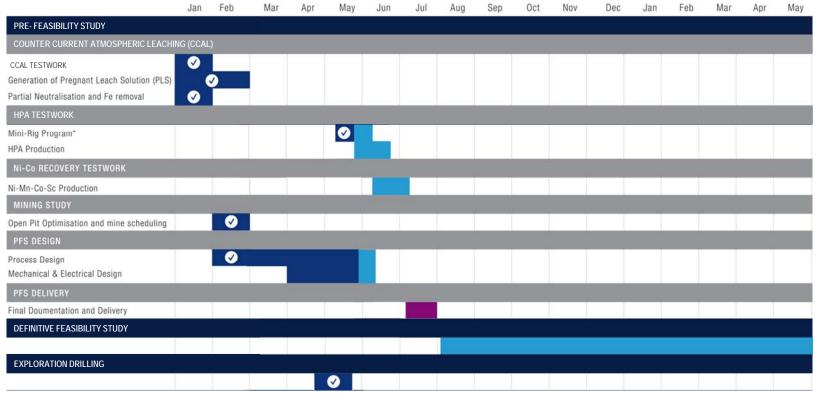
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- CLL has recently completed a 42 drill hole exploration programme along the C1 Trend
- Strong results from limited previous exploration on this trend
- Deep, ferruginous laterite profile recorded over the C1 and C3A anomalies
- Assay results pending



## 11 Indicative Timetable





#### **Collerina Cobalt – Investment Proposition**









HPA demand highly leveraged to the EV & technology revolution



Existing HPA supply holds an inherited high cost base from Aluminium metal as a pre-cursor



New entrant HPA suppliers exposed to significant process risk and 1<sup>st</sup> generation technology risk



CLL process is unique from both existing and proposed HPA processes on a cost and risk basis

- Atmospheric
- Uses established SX equipment



CLL should represent the default equity market exposure to HPA Norman Seckold

Chairman

nseckold@collerinacobalt.com.au

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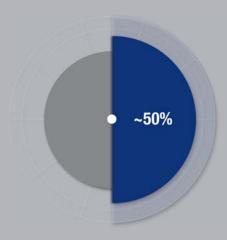
## COLLERINA COBALT LTD (ASX:CLL)

Appendices

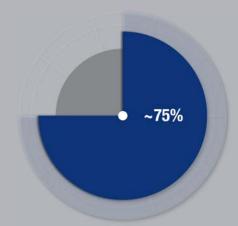
#### 01 appendices Li-Bs are Driving Nickel - Cobalt Demand



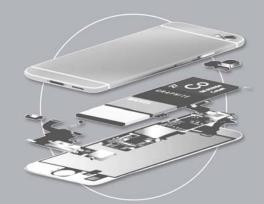
Cobalt is a critical component in the cathode of rechargeable lithium-ion batteries (Li-B's), playing an important role in improving battery life, energy density and stability



~50% of world cobalt demand comes from the
Li-B market with this percentage set to grow to >75%
by 2025

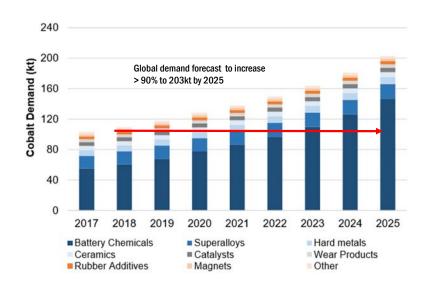


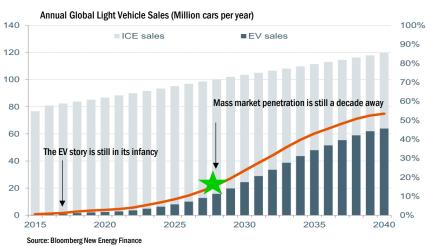
~75% of all batteries are expected to contain cobalt in some capacity led by the continued adoption of mobile phones and EV's



## 01 appendices Li-Bs are Driving Nickel - Cobalt Demand







# Nickel-Cobalt Sulphates are in hot demand





# 02 appendices Cobalt - the Supply Equation

~95% of global cobalt production results as a by-product of copper and nickel mining meaning future supply is susceptible to the outlook for these metals

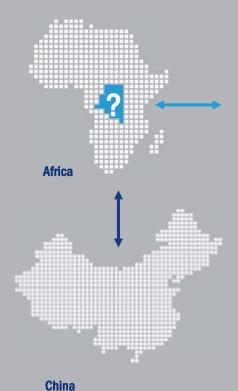


~56% of global production comes from the Democratic Republic of Congo (DRC) of which nearly half is thought to be via artisanal mining



~40% of refined cobalt production comes from China, with ~60% of China's unrefined cobalt sourced from the DRC









Questions remain over the DRC's political stability with ongoing violence and the constant threat of civil war. The country's widespread use of child labour is also bringing increased scrutiny on the sector's informal mining practices which serve as a threat to continued supply

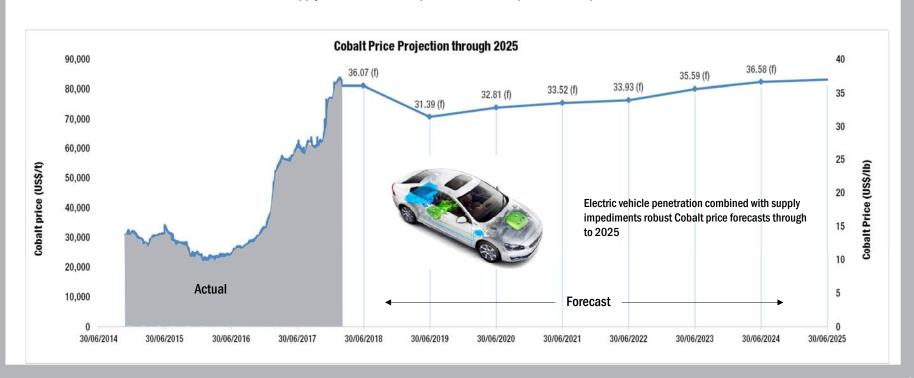


With the DRC and China dominating the global cobalt trade there is concentrated supply risk for the remainder of the market

# 03 appendices Cobalt Price Projection Through 2025



Robust demand fundamentals and a constrained supply-side outlook underpin cobalt's recent price rise and positive outlook



#### appendices **Battery Costs Will Underpin EV Penetration** Forecast demand for key battery materials Metal demand (thousand metric tons) Batteries with lower cost structures and greater energy densities will drive EV penetration and demand for battery metals 295 300 250 1200 200 150 100 Battery Costs (US\$/kWh) 800 2025 2030 ■Lithium ■Manganese ■Cobalt ■Copper ■Aluminum ■Nickel Tesla Model S Source: Bloomberg New Energy Finance 400 \$240/kWh **Tesla Model 3** Battery costs (represented in US\$/kWh) have fallen by \$190/kWh **Auto Industry target** approximately 20% pa since 2010 to approximately \$100/kWh US\$270/kWh....but are heading much lower 2008 2010 2012 2014 2016 2020

# 05 appendices The CCAL / HPA process



#### CCAL - Stage 1

Ore is leached in a lower concentrate free acid solution producing a pregnant leach solution (PLS) with relatively low residual acidity. The leach residue solids from the first stage are then washed and forwarded to the second stage of leaching.



#### CCAL - Stage 2

A concentrated sulphuric acid is used to liberate the more tenacious material. The leach solution from the second stage, with a much higher residual acid concentration, is recycled to the first stage leach as the acid source.



#### **HPA Processing**

A low acidity Pregnant Leach Solution (PLS) from the CCAL process is subject to propriety solvent extraction and refining steps with the aim of producing a 4N (99.99% purity) HPA.



#### **Nickel and Cobalt recovery**

Testwork is using proprietary processes are being investigated to produce high purity/high value Ni-Co products from residual solution.



# **06** appendices **Statement of Compliance**



Information regarding the Mineral Resource at the Collerina project was prepared and first disclosed under the 2004 Edition of the 'Australasian Code for Reporting of 'Exploration Results, Mineral Resources and Ore Reserves'. See ASX announcement dated 23 June 2011. It has not been updated since to comply with the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves' on the basis that the Company is not aware of any new information or data that materially affects the information and, in the case of the resource estimate, all material assumptions and technical parameters underpinning the estimate continue to apply and have not materially changed.

The information in this report that relates to Mineral Resources is based on information compiled by Collerina Cobalt staff and contractors and approved by Mr Michael Corey, PGeo., who is a Member of the Association of Professional Geoscientists of Ontario (APGO) in Canada. Mr Corey is employed by the Company and has sufficient experience which is 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 Corey has consented to the inclusion in this report of the matters based on his information in the form and context in which they appear.

Information in this announcement relating to the Process Development Testwork is based on testwork results compiled by Mr Boyd Willis, an Independent Consultant trading as Boyd Willis Hydromet Consulting. Mr Willis is a Fellow and Chartered Professional of The Australasian Institute of Mining and Metallurgy (AusIMM). Mr Willis has sufficient experience which is relevant to metal recovery from the style of mineralisation and type of deposits under consideration and to the activity which he is undertaking to qualify as a Competent Persons under the 2012 Edition of the 'Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves'. This includes over 21 years of experience in metal recovery from Laterite ore. Mr Willis consents to the inclusion of the technical data in the form and context in which it appears.

For further information on testwork results and processes see ASX announcements dated 26 April 2018, 21 March 2018, 6 March 2018, 21 February 2018, 8 December 2017, 30 November 2017, 29 November 2017, 24 November 2017 and 13 November 2017.

The information in this report that relates to Exploration Results is based on information compiled by Rimas Kairaitis, who is a Member of the Australasian Institute of Mining and Metallurgy. Rimas Kairaitis is a Director of Collerina Cobalt Ltd and has sufficient experience which is 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 Kairaitis consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.