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20 November 2018

The Manager Companies
ASX Limited
20 Bridge Street
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(24 pages by email)

HPA FIRST PROJECT - PRE-FEASIBILITY STUDY (PFS)

- **The HPA First PFS has delivered a compelling business case for the development of a High-Purity Alumina (HPA) production facility using the Company's licenced proprietary solvent extraction (SX) and refining technology**
- **PFS Highlights include:**
  - **Production rate of 10,200tpa HPA**
  - **Unit cash costs of A$8,538 (US$6,403)/t HPA after by-product credits**
  - **Annual EBITDA of A$248M (US$186M)**
  - **Annual pre-tax free cash flow (FCF) of A$247M (US$185M)**
  - **Project CapEx of A$215M (US$161M)**
  - **Capital intensity of A$21,043 (US$15,783)/t HPA**
  - **Sensitivity Analysis shows a highly resilient project that is strongly profitable at HPA prices as low as US$10,000/t**

The Directors of Collerina Cobalt Limited ('Collerina' or 'the Company') are pleased to provide the outcomes of the Pre-Feasibility Study (PFS) on the HPA First Project. The HPA First Project is the application of the Company's licenced proprietary solvent extraction (SX) and refining technology to produce High Purity Alumina (HPA) from an industrial feedstock, as adopted by the Company in July 2018.

The PFS has delivered a highly attractive business case, capable of delivering the production of 10,200tpa 4N (99.99% purity) HPA into the HPA market.

Managing Director, Rimas Kairaitis, commented "*We are delighted that the PFS has delivered such a compelling business case for the HPA First Project. These highly attractive financial metrics capture the unique opportunity that the Company has been provided to disrupt the existing HPA production technologies and to supply the fast growing HPA market as it expands with the burgeoning battery sector. The Company is now committed to immediately transitioning to a higher-confidence Definitive Feasibility Study to position the Company to make a Final Investment Decision*".

PFS Summary

The key financial metrics of the PFS are presented below.

As the HPA First Project is not constrained by mine life, there is no fixed project life, and therefore a discounted cash flow (DCF) analysis was not performed. Rather, the financial analysis is presented on an EBITDA basis. Subject to the assumptions made, Collerina expect the projected earnings to be maintained over the long term, providing an extremely attractive investment proposition.

HPA First Project Key Project Parameters	A$	US$
A$/US$ Exchange Rate	0.75	
HPA Production (t/y)	10,200	
HPA Price Assumption ($/t HPA)	$33,333	$25,000
Annual Revenue (including by-products)	$384 million	$288 million
Annual Average Cash Operating Cost	$131 million	$98 million
Unit Cash Cost ($/t HPA)	$12,852	$9,639
Unit Cash Cost accounting for by-products ($/t HPA)	$8,538	$6,403
Annual Free Cash Flow (FCF)	**$247 million**	**$185 million**
Annual EBITDA	$248 million	$186 million
Aluminium Feedstock Processed (t/y)	65,753	
Pre-Production Capital Cost	$215 million	$161 million
Capital Intensity (CapEx$/ per tpa HPA)	$21,043	$15,783
Gross margin % (FCF/ Revenue)	64%	
Payback (years)	Less than 2 years	

Next Steps

On the basis of the PFS delivering a technically viable project with a very attractive business case, the Company intends to immediately transition to a Definitive Feasibility Study (DFS) for the purposes of validating the project to the detail to allow the Company to make a Final Investment Decision (FID). The DFS is expected to be significantly based off a pilot scale processing plant, to be constructed and run within the dedicated secure premises in Brisbane which housed the recent second mini-rig SX program. The pilot plant program will seek to validate the process at a larger scale and on a continuous basis, to further de-risk the process flow sheet. The Company has already built a pilot plant equipment list and placed orders for a number of long-lead items required for the pilot plant.

The DFS pilot plant has been scheduled to run from March to May 2019.

In parallel, the Company has set out plans for a program of technical interim works, required to maximise the technical confidence of the upcoming DFS.

The Company has also commenced its engagement with potential HPA offtake parties which includes visits to interested parties in Asia later in November 2018.

In addition, the Company is seeking at its upcoming Annual General Meeting shareholder approval for a change of name to Alpha HPA Limited, to better reflect the Company's immediate focus on High Purity Alumina.

Collerina Project - Nickel-Cobalt-Scandium Potential

The HPA First Project provides the opportunity for the cheaper, faster and more readily permitted component of the Collerina Project (HPA) to be fast tracked. The Company still considers that the chemical characteristics of the Collerina Project ore represent a unique opportunity to produce nickel, cobalt, scandium (and HPA), when compared to other nickel-cobalt laterite proponents. However, further studies will be required to assess the technical and financial case for the integration of the Collerina Project into the HPA First Project and to expand the revenue base into these other products. The Company remains committed to realising full value for shareholders from the advancement of its Collerina Project.

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Competent Persons Statement (Process Development Testwork)

Information in this announcement that relates to metallurgical results is based on information compiled by or under the supervision of Dr Stuart Leary, an Independent Consultant trading as Delta Consulting Group. Dr Leary is a Member of The Australasian Institute of Mining and Metallurgy (AusIMM). Dr Leary has sufficient experience 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'. Dr Leary 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 6 September 2018, 31 August 2018, 9 July 2018, 30 April 2018, 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.

Cautionary Statement

The Pre-Feasibility Study (PFS) referred to in this announcement has been undertaken to assess the technical and financial viability of the HPA First Project. Further evaluation work including a Definitive Feasibility Study (DFS) is required before the Company will be in a position to provide any assurance of an economic development case. The PFS is based on the material assumptions described in the body of this report and summarised in the Summary of Material Assumptions and Summary of Modifying Factors in Appendix 1. These include assumptions about the availability of funding and the pricing received for HPA. While the Company 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 PFS will be achieved. To achieve the range of outcomes indicated in the PFS, Pre-Production Capital in the order of A$215 million plus working capital will likely be required. Investors should note that there is no certainty that the Company will be able to raise the 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 the Company's existing shares. It is also possible that the Company 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 the Company's proportionate ownership of the Project. Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the PFS.

Forward Looking Statements

This PFS contains certain forward-looking statements with respect to the financial condition, results of operations, and business of the Company and certain plans and objectives of the management of the Company. These forward-looking statements involve known and unknown risks, uncertainties and other factors which are subject to change without notice, and may involve significant elements of subjective judgement and assumptions as to future events which may or may not occur. Forward-looking statements are provided as a general guide only and there can be no assurance that actual outcomes will not differ materially from these statements. Neither the Company, nor any other person, gives any representation, warranty, assurance or guarantee that the occurrence of the events expressed or implied in any forward-looking statement will actually occur. In particular, those forward-looking statements are subject to significant uncertainties and contingencies, many of which are outside the control of the Company. A number of important factors could cause actual results or performance to differ materially from the forward looking statements. Investors should consider the forward looking statements contained in this PFS in light of those disclosures.

HPA FIRST PRE-FEASIBILITY STUDY (PFS)

1. Overview

The PFS and report were completed by Prudentia Process Consulting Pty Ltd (Prudentia) of Brisbane, Australia, with inputs from Collerina and the Licensor from whom the Company has licensed the proprietary solvent extraction (SX) and refining technology.

The financial analysis and overall economics of the HPA First Project have been completed with an overall accuracy expected to be -15% to +30%.

The capacity of the project is 10,200 dry tonnes per annum (dtpa) of High Purity Alumina (HPA) produced by the Project from a blended industrial aluminium chemical feedstock. There is no mine generated feedstock assumed in the HPA First PFS.

In addition to the primary HPA product, two fertiliser by-products are produced for sale, being approximately 43,000 tonnes per annum (tpa) of Fertiliser A, and approximately 73,000 tonnes per annum of Fertiliser B.

The PFS has been constructed under the following responsibilities:

Table 1: PFS Responsibilities

Study Area	Responsibility
Testwork Development	Licensor with assistance from Prudentia
Process Flow Sheet	Licensor with assistance from Prudentia
Process Engineering and Design	Prudentia
Site and Surrounding Infrastructure	Prudentia
Environment and Community	Collerina/AECOM
Cost Estimates	Prudentia
Marketing	Collerina/CRU
Risk Assessment	Prudentia/Licensor/Collerina
Financial Analysis	Prudentia/Collerina

2. Project Description

The process plant treats a blended aluminium chemical feedstock sourced from third parties to produce (HPA). The technology is mostly a hydrometallurgical process, meaning the chemical treatment occurs in aqueous or organic solutions with unit operations such as solvent extraction, crystallisation and filtration. In addition to the primary HPA product, the process produces significant volumes of fertiliser by-products, termed fertiliser by-products A and B.

The Project development and commissioning schedule includes a two year construction period and for the purposes of the PFS it was assumed that the Project would start execution in CY2019, with initial commissioning expected in late CY2021. A 2-year ramp-up period to nameplate capacity of 10,200 tpa of HPA has been adopted.

The development timeframes proposed within this PFS are considered conservative, reasonable and appropriate. While there is no mining operation and associated permitting or baseline environmental studies, the Company is pioneering a new solvent extraction and refining process that will require continuing testwork and engineering development, and the construction of a pilot plant to de-risk the process during the DFS.

Table 2: Key Operating Parameters

HPA First Project Key Operating Parameters	Pre-Feasibility Study Result
<u>Production Parameters</u>	
Aluminium Feedstock Processed (t/y)	65,753
Aluminium Recovery Efficiency	98%
Initial Production Year	2021
Ramp-Up Rate (months to nameplate)	24
Plant Availability	92%
HPA Production (t/y)	10,200
HPA Product Grade	99.99% (4N)
Fertiliser By-Product A (t/y)	42,821
Fertiliser By-Product B (t/y)	72,863
<u>Cash Modelling Parameters</u>	
First HPA Production	FY2022
Sustaining Capital	approx. $1.4M pa
CapEx Contingency (applied to Direct + Indirect Costs)	18%
Price or Cost Escalation	None
A$/US$ Exchange Rate	0.75

3. PFS Financial Highlights

A summary of the key financial results from the PFS is presented in Table 3, below.

Note: All dollar figures are expressed in Australian Dollars (A$) unless otherwise noted and all tonnes references are intended to be metric tonnes, throughout the report.

Table 3: Summary Financial Highlights

HPA First Project Key Project Parameters	A$	US$
A$/US$ Exchange Rate	0.75	
HPA Production (t/y)	10,200	
HPA Price Assumption ($/t HPA)	$33,333	$25,000
Annual Revenue (including by-products)	$384 million	$288 million
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Pre-Production Capital Cost	$215 million	$161 million
Capital Intensity (CapEx$/ per tpa HPA)	$21,043	$15,783
Gross margin (FCF/ Revenue)	64%	
Payback (years)	Less than 2 years	

4. Plant Location

The plant is proposed to be located at an industrial site within the Newcastle Port area in New South Wales, Australia. The Newcastle metropolitan area has a population around 322,000 people, with established industrial processing facilities, infrastructure, and the workforce and businesses are appropriately skilled to construct and support the process plant. The proposed area has large bulk and container port facilities to utilise for the import of feed materials, goods or reagents and export of product.

The major required reagents are either stored or manufactured in large quantities and/or available for potential purchase proximal to the proposed Project site or via access to the Newcastle Port bulk berths. In addition, the proposed Project site lies proximal to potential customers and logistics for the sale of fertiliser by-products.

The Company has commenced discussions with respect to a number of potential Project sites.

Figure 1: Possible areas to locate the plant within the Newcastle Port Industrial area

5. Project Permitting

The Company has appointed AECOM consultants as advisors to the environmental and government permitting process.

The proposed Project site/s are zoned SP1 Special Activities pursuant to State Environmental Planning Policy (Three Ports) 2013. It is considered that the Project would most appropriately be classified as a development for the purposes of chemical, manufacturing or related industries. A development of this nature within the SP1 zone is permissible with consent.

The Project would be classified as a State Significant Development (SSD) pursuant to Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011 (S&RD SEPP). Given that it is for the purposes of chemical, manufacturing and related industries with a capital investment value of more than $30M, the Project would be considered State Significant Development (SSD). An Environmental Impact Statement (EIS) would therefore be required to be prepared for the Project for consideration and assessment by the Minister for Planning or their delegate. The EIS would need to address the Secretary's Environmental Assessment Requirements (SEARs) for the Project which are typically obtained via the preparation and submission of a Preliminary Environmental Assessment (PEA) and SEARs request to the Department of Planning and Environment (DPE).

The Company has already commenced preparation of the PEA with assistance from AECOM engineering.

6. Process Flow Sheet and Metallurgical Development

The PFS process flow sheet has been developed from a proprietary solvent extraction (SX) and refining technology licensed to a wholly owned subsidiary of the Company. The Licensor was engaged to direct all relevant process test work and process flow sheet development. The key advantages of the licensed technology over existing and proposed HPA process flow sheets are the limited number of processing steps, process simplicity and the recovery of reagents as saleable by-products. In comparison to other HPA proponents the licensed process purifies using a low temperature atmospheric hydrometallurgical process, avoiding the high temperature processing, recovery and re-use of chlorides and hydrochloric acid.

Following extensive bench scale testwork, in July 2018, a continuous SX mini-rig was operated for 24 hours per day over 3.5 days, employing stages for extraction, washing, and stripping. The mini-rig achieved a maximum 69.4% aluminium extraction, however higher recoveries are expected at a larger pilot scale as the mini-rig has only single stage mixer-boxes and the pilot scale rig has dual mixer-boxes, providing longer extraction time.

The aluminium loaded solution generated from the SX mini-rig run was successfully refined into HPA in 3 batches. Each of these batches was sampled and sent for purity, crystal form and sizing analysis. Using the preferred assay technique, Glow Discharge Mass Spectrometry (GDMS), the HPA assays were confirmed as 4N, or 99.99% purity, on an elemental basis (i.e. total impurities on an elemental basis are subtracted from 100%). In addition to purity, the HPA was analysed by X-Ray Diffraction (XRD) which confirmed that the HPA is 100% alpha (α) crystal form, as required by end-users in the production of sapphire glass and lithium-ion battery separators.

A further bench scale testwork program was run to incorporate key feedback from the first SX mini-rig run and to develop a number of process flow sheet improvements. These improvements were incorporated into the second SX mini-rig run completed in October 2018 where the mini-rig was operated 24 hours per day over 6 days, achieving up to 87.4% aluminium extraction by day 6. HPA refining from the second SX mini-rig program was underway at the time of this report. As the aluminium recovery is largely restricted by vessel sizing, the technical and financial assumptions in this report assume that 98% recovery of feed aluminium is achieved once further testwork and larger volume piloting are performed.

A simplified process flow sheet is presented as Figure 2, below.

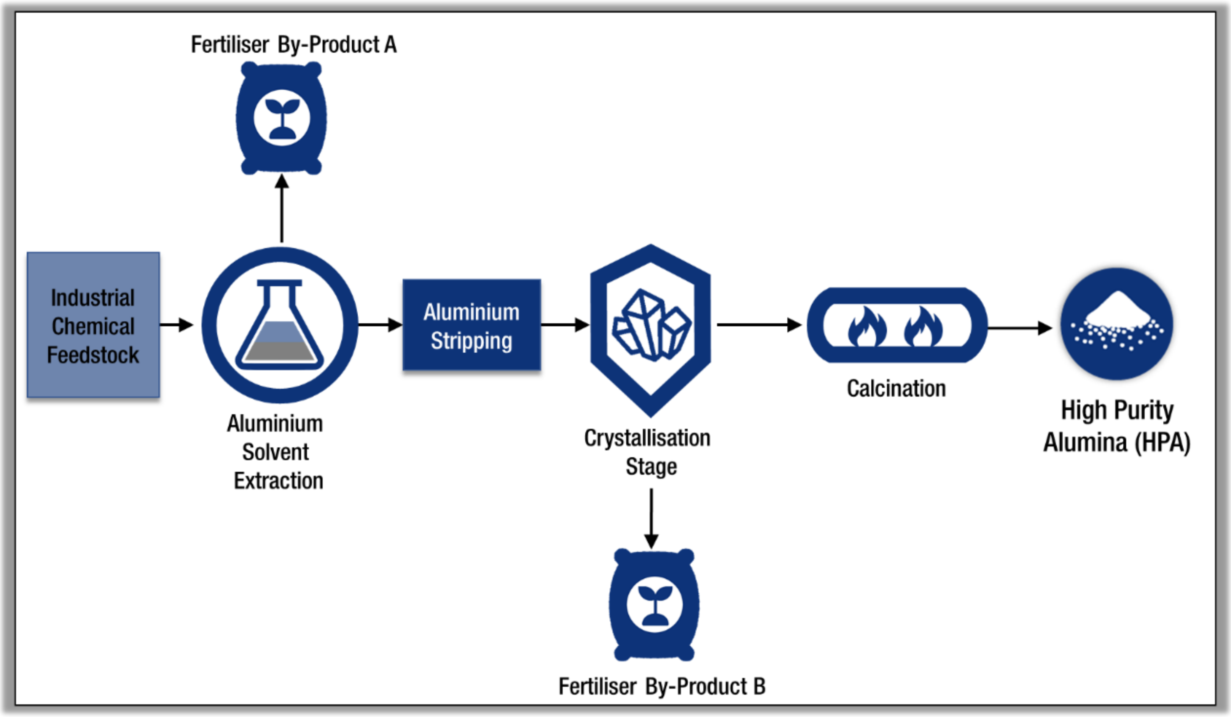

Figure 2: HPA First - Simplified Process Flow Sheet

7. Process Plant Engineering

The study and engineering methodology undertaken for the PFS is considered conventional for this category of project. The fundamental steps and workflow are summarised in Figure 3, below, and can be described as follows:

- The proprietary flowsheet was developed using testwork results and the project design basis.
- A detailed mass and energy balance calculated the material flowrates through equipment, reagent use, by-product quantities and utilities demand such as cooling water and steam.
- All required equipment and the interaction between equipment is documented on the Process Flow Diagrams.
- Each equipment item was sized and specified with key properties such as materials and dimensions and then costed. Power consumption and motor sizes were also calculated for each energized equipment item.
- A preliminary 3D model was developed incorporating basic equipment dimensions, bunded plant areas, preliminary plant structures, storage sheds and support buildings, pipe-racks, roads, electrical infrastructure and ponds.
- A separate design review and risk review workshop was undertaken with outcomes either incorporated into the study or recorded for further investigation.
- The Project Capital Cost was estimated as described in Section 11.
- The Project Operating Cost was estimated as described in Section 12.
- A financial analysis was undertaken using the capital and operating cost estimated as the key basis.
- All study results and findings are documented in a detailed PFS report with a copy of supporting deliverables attached.

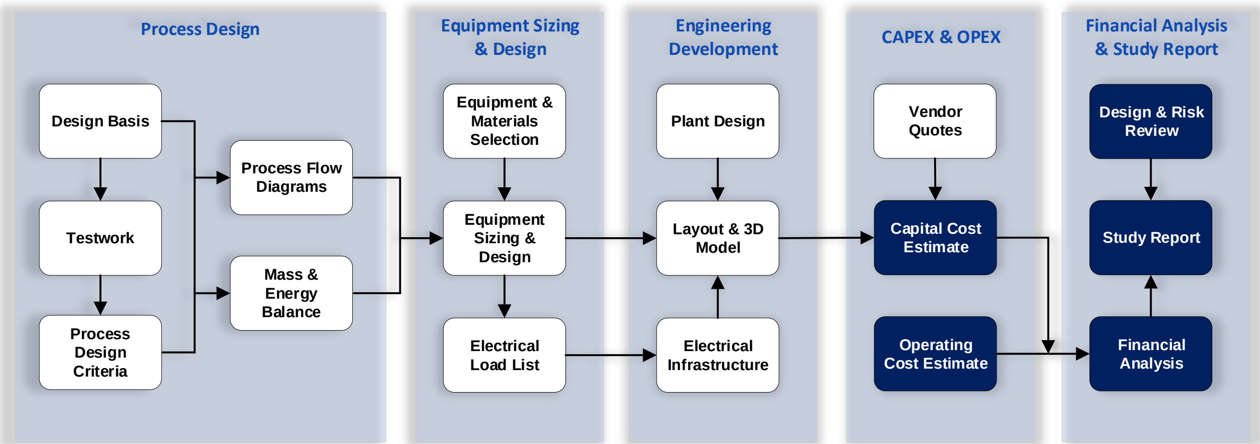

Figure 3: Summary workflow diagram of the PFS methodology

8. Process Plant Detail

The process plant operation can be summarised by the following sequential activities:

1. The preparation of the industrial feedstock blend
2. Solvent extraction of the feedstock solution to produce an aluminium strip liquor and an aqueous solution of diluted fertiliser by-product A (raffinate).
3. Production of fertiliser by-product A from the raffinate involving evaporative crystallisation, dewatering, drying and packaging.
4. Crystallisation of the aluminium salt from strip liquor.
5. Production of HPA pre-cursor.
6. Calcining of HPA pre-cursor to HPA, micronizing and packaging.
7. Evaporation circuit to produce fertiliser by-product B

A simplified schematic 3D model of the processing plant is presented in Figure 4, below.

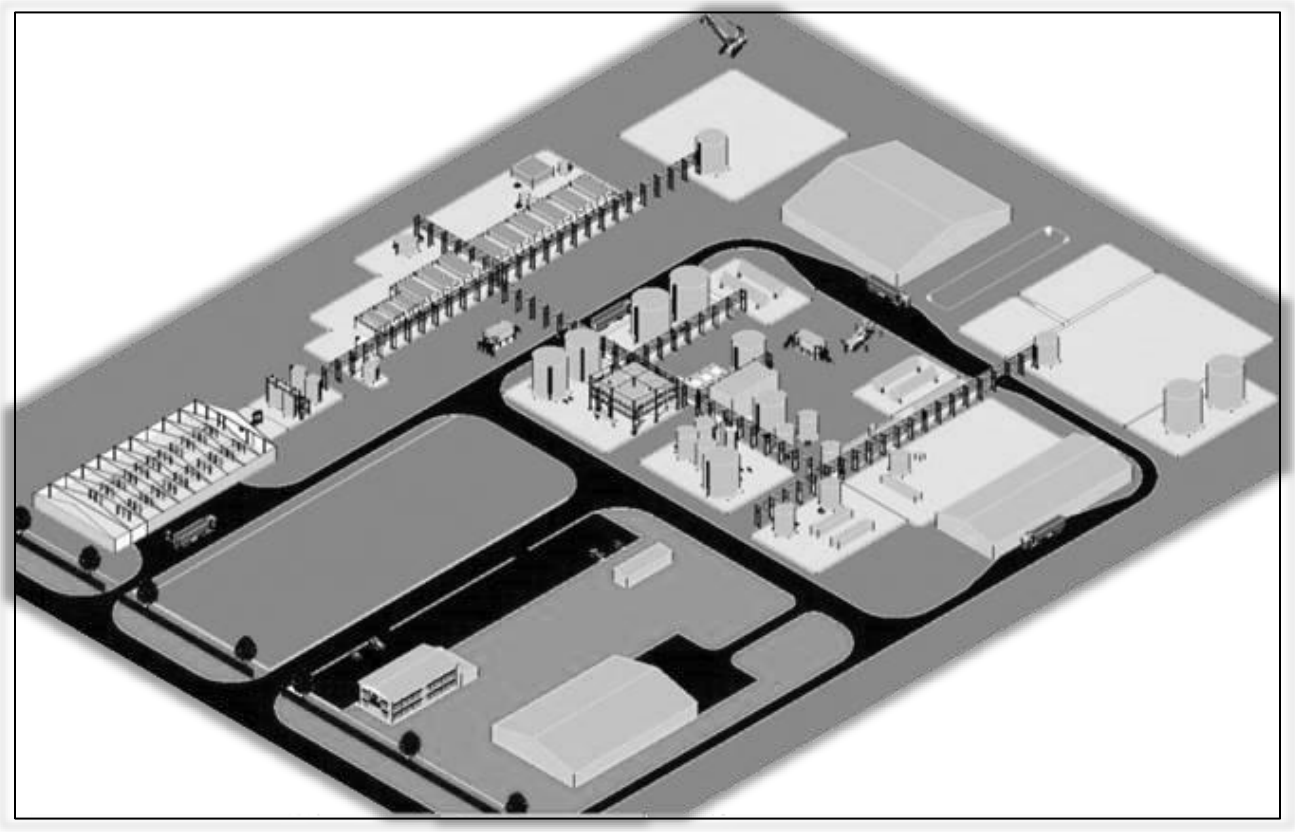

Figure 4: HPA First processing plant preliminary layout model with detail removed

9. Marketing

Collerina commissioned the independent research group CRU to complete an HPA market study. As part of this study CRU made direct contact with 23 existing HPA market participants in China, Japan and Taiwan. The key conclusions of the study included:

- The HPA global market is expected to increase from around 35kt in 2017 to 125kt in 2025, driven primarily by strong growth in demand for lithium-ion battery (LIB) separator coating see **Figure 5**, below.

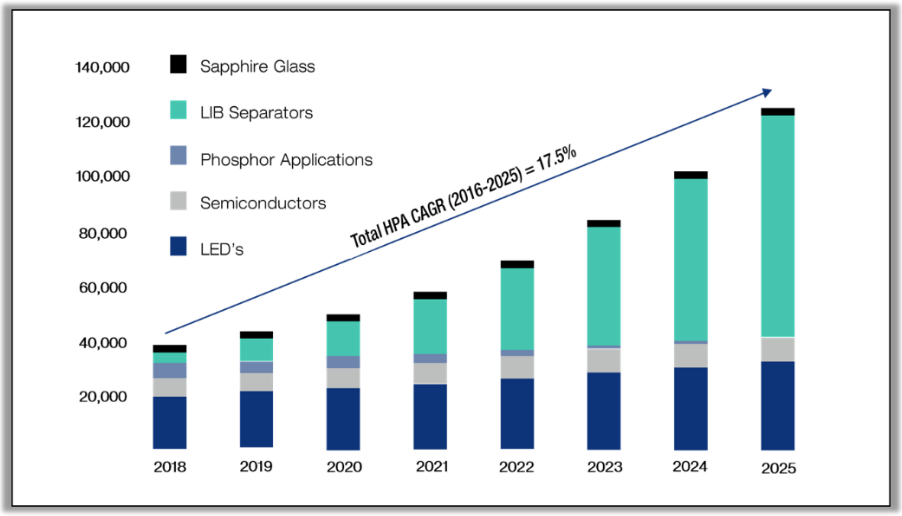

Figure 5: Forecast HPA demand 2018-2025 (source CRU)

- The lower-quality end of the market is primarily located within China, while higher-quality product is centred around Japan, South Korea, Taiwan and the USA.
- The established producers are Sumitomo Chemical and Nippon Light Metal in Japan, Sasol in the USA and Baikowski in Europe. These companies have been producing HPA for a number of years and have strong, deep-seated relationships with key customers.
- HPA output from China has increased significantly in recent years, in response to growing demand from the domestic light emitting diode (LED) industry. Chinese material tends to be of lower quality than that produced by the established ex-China companies. However, in the future, it is expected that Chinese producers will increasingly attempt to push into the high quality, higher value part of the market.
- There are a limited number of projects in the pipeline and few that are advanced in the development process. Hence, there is significant opportunity for new entrants into the market.
- Prices are determined by product purity, the physical characteristics of the products, being able to deliver consistent product quality and the end-use application.
- A strong demand outlook and rising cost inputs are expected to place upwards pressure on prices. The main downside risk is increased competition from Chinese producers and changes to technology which reduce HPA intensity in manufacturing processes.

- Existing demand by region is overwhelmingly in Asia (refer **Figure 6**, below), with 53% of the current HPA demand used for LED's with the increasing demand for HPA coming from LIB separators (refer **Figure 5**, above). The manufacturing demand is expected to remain dominated by the expanding battery manufacturing base in Asia. The Company notes it has commenced direct market engagement with existing and potential end-users of HPA, which includes marketing visits set out for November 2018. Based on these engagements, the Company considers the attitude to new HPA market entrants from existing end-users to be enthusiastic and supportive.

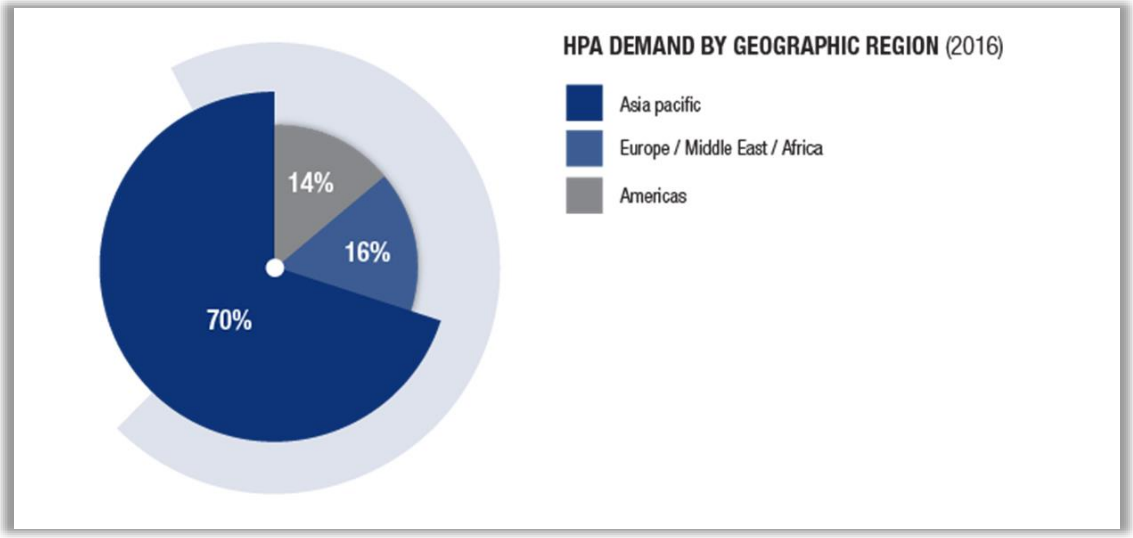

Figure 6: HPA market demand by region (source CRU)

With respect to HPA pricing, CRU's assessment of current pricing is summarised in the table below:

Table 4: Assessment of current HPA market and Prices

HPA Product description	Price Range 2017	Comments
Sub-4N, Chinese 4N (often with poor physical characteristics)	US$10-25/kg	Poor quality material used for low quality LED's, semi-conductors or coatings
4N produced by established suppliers in Japan, South Korea, USA and Europe	US$25-50/kg	Producers include Nippon Light Metal, Sumitomo, Sasol and Baikowski
Higher quality, made to order 4N material by established producers	US$50-$100/kg	Developed in close co-operation with customer
5N or purer	US$100/kg	

The Company has been able to confirm the 4N HPA pricing ranges by direct engagement with existing suppliers.

Based on the CRU research, and reasonable expectations around purity and physical characteristics of HPA production by the Company, a conservative HPA price of US$25,000/t has been adopted for the purposes of the PFS financial analysis.

10. Production Rate

The Company has calibrated its HPA First Project production rate at 10,200tpa of HPA. This market entry rate was established based on the following:

Capital Efficiency

Examination of capital intensity curves across a range of production rates indicated peak capital efficiency at around 10,200tpa of HPA.

Market Gap Analysis

A market gap analysis conducted as part of the independent HPA market study was completed by CRU (refer Section 9). The analysis includes the high assumption that 35% of possible new HPA projects come online and concludes that the Company's entry is readily absorbed by the market, adjusted for predicted growth, as per Figure 7, below. It is anticipated by the time Collerina's first HPA is ready for delivery in early 2022, the global HPA market is projected to have grown to +60ktpa.

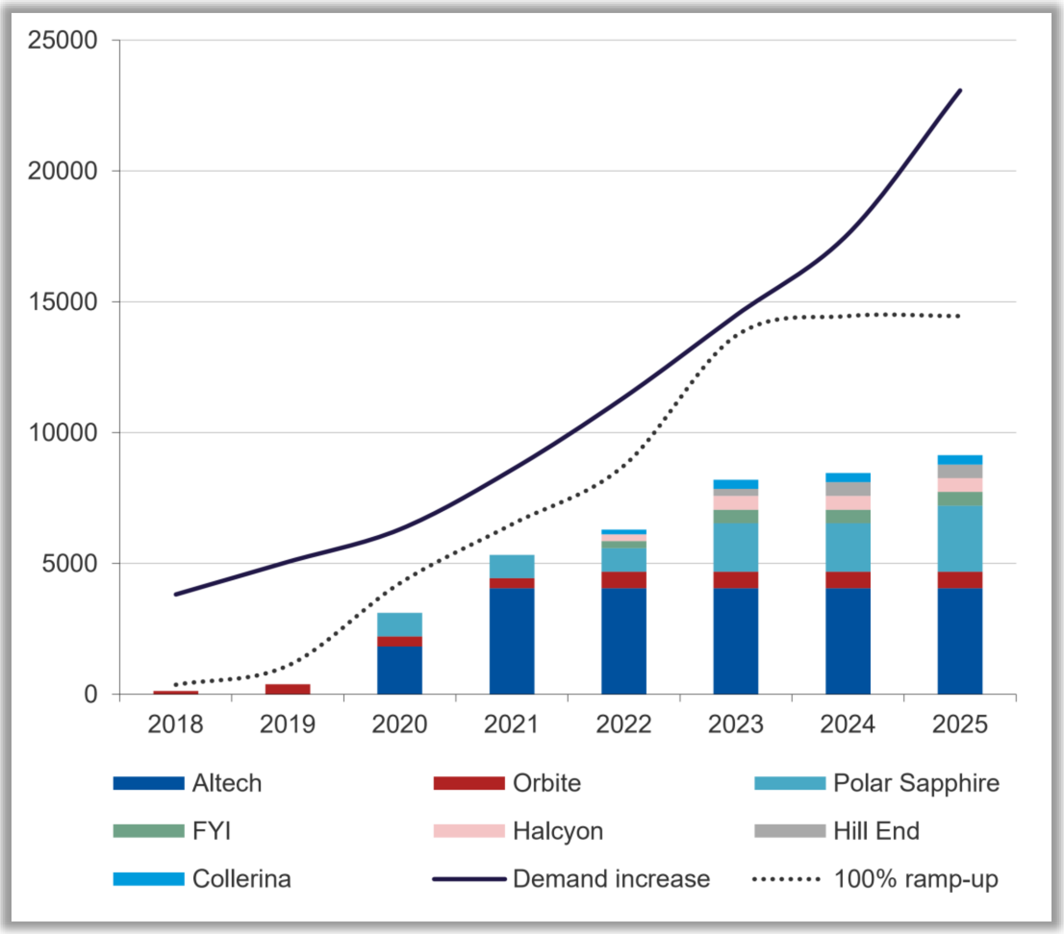

Figure 7: HPA market supply identified from new projects versus incremental HPA demand (tpa) (CRU)

11. Project Capital Cost

The capital cost estimate for the Project is A$214.6 million. The capital cost estimate is provided at an accuracy level of -15% to +30%. A summary of the initial capital estimate for the proposed plant is shown in Table 5, below.

The capital cost estimate has been based on the implementation of an Engineering, Procurement, Construction Management (EPCM) contracting strategy.

- Pricing for mechanical equipment and packages are based on budgeted quotes sourced from reputable vendors or internal database information and scaled accordingly.
- Contingency of 18% has been added to the total reflecting the status of engineering, maturity of the process technology and data contained within this PFS.
- No allowance for taxes, import duties, value added tax (VAT), goods and services tax (GST) and the like was made.

The direct capital cost for the Project is based on mechanical equipment pricing obtained from vendors, historical database or internal estimates. Installation, civils, structural, piping, electrical and instrumentation are factored to the mechanical equipment pricing using experience, judgement and database from similar projects.

The indirect capital costs for the Project are estimated by factoring from the direct costs using factors derived from reference projects and adjusted to suit the HPA First Project specific requirements as required.

Collerina engaged a third party expert to verify the direct factors, indirect factors and contingency against similar projects.

Table 5: Capital Cost Summary

HPA First Project Capital Cost Summary	Initial Project Capital Cost (A$ million)	(US$ million)
Direct Costs	$136.6	$102.5
Indirect Costs	$45.3	$34.0
Contingency (18%)	$32.7	$24.5
Total Project Capital Cost	**$214.6**	**$161.0**

The total capital cost estimate is based on the direct cost of mechanical equipment delivered and installed at site. The cost of the mechanical equipment is based on the process flow diagrams, stream table, design criteria and equipment list.

Over 75% of mechanical pricing is based on vendor budgeted quotes with the remainder a mix of Prudentia database, internal estimates, factored estimates and internet sourced data and allowances.

12. Project Operating Cost

The operating cost estimate has been calculated based on a first principle build-up including reagents, utilities, consumables, labour, general expenses, maintenance and contract services to operate the plant. The operating costs were apportioned into fixed costs and variable costs with adjustments made to variable costs in the financial model for annual tonnage with ramp-up.

Labour costs have been built up from an organisational chart typical of a processing facility of this scale.

The annual operating costs at year 3 (full ramp-up) are summarised in Table 6 and Figure 8 below and are considered accurate to +/- 25%.

Table 6: Operating Cost Summary

HPA First Project Operating Cost Summary	Cost (A$ million per year)	Cost (US$ million per year)
Variable Costs		
Aluminium Feedstock	26.3	19.7
Reagents	67.6	50.7
Utilities	12.8	9.6
Consumables	2.7	2.0
Total Variable Costs	109.5	82.1
Fixed Costs		
Labour	12.6	9.5
General Expenses	3.3	2.5
Maintenance	4.8	3.6
Contract Services	0.9	0.7
Total Fixed Costs	21.6	16.2
Annual Cash Operating Cost	131.1	98.3

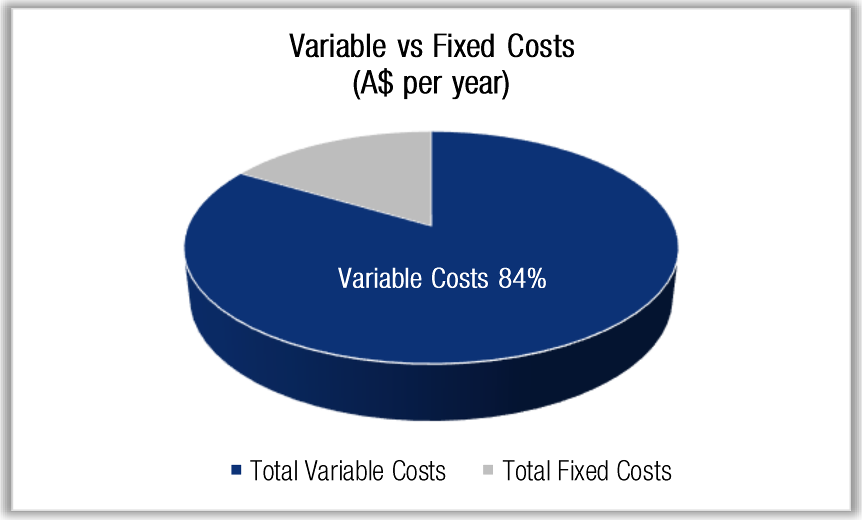

Figure 8: Relative percentage breakdown of fixed and variable operating costs

13. Financial Summary and Sensitivity Analysis

The base case EBITDA at nameplate production is A$248.1 million per annum.

Sensitivity cases were considered by flexing key model inputs including sale price, operating costs and foreign exchange. The key outcomes are shown in Table 7, and **Figure 9**. The sensitivity analysis has been reported on an EBITDA basis as there is no mine limiting the HPA First Project life. As expected with the high operating margin, the Project is most sensitive to changes in the HPA product price in comparison to the other sensitivity factors modelled. However the Project is highly resilient to HPA pricing, remaining strongly profitable at prices as low as US$10,000/t.

Foreign exchange has the next biggest impact on the project's EBITDA because the HPA price is traded in US$. The project is fairly resilient to changes in operating cost.

Table 7: Project Price Sensitivity

Sensitivity to Financial Parameters	EBITDA (A$ million/pa)
Pre-Feasibility Study Result	248
<u>Operating Cost Sensitivity</u>	
Cost Increase (+15%)	233.2
Cost Decrease (-15%)	272.5
<u>Foreign Exchange Sensitivity</u>	
A$ to US$ increases from 0.75 to 1.0	162.1
A$ to US$ decreases from 0.75 to 0.5	417.1
<u>HPA Price Sensitivity</u>	
HPA price decreases from US$ 25,000/t to 10,000/t	47.1
HPA price increases from US$ 25,000/t to 40,000/t	513.8

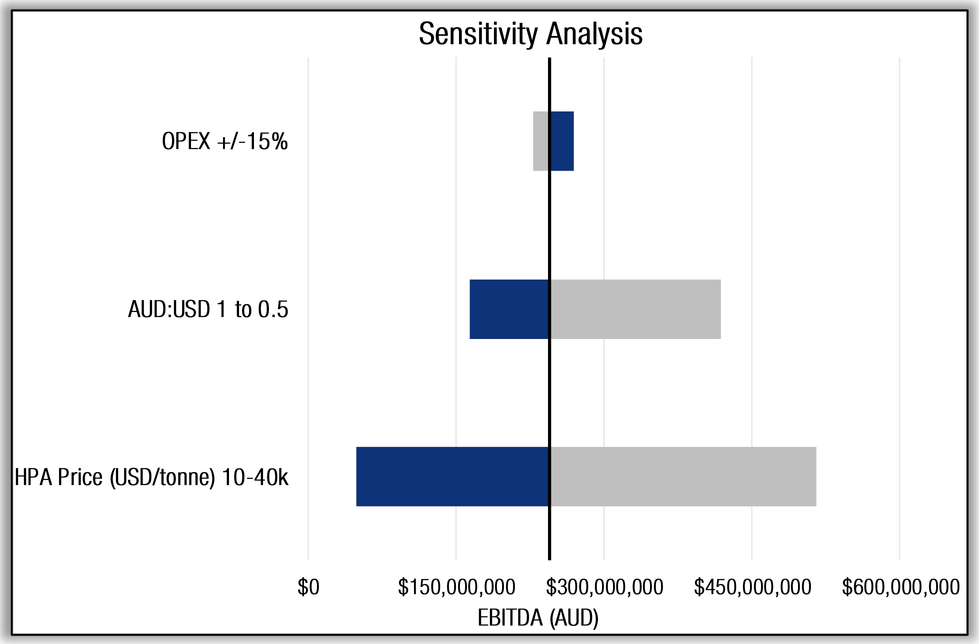

Figure 9: EBITDA Sensitivity Analysis

14. Pre-Production Capital

The PFS financial analysis estimates A$215 million plus working capital will likely be required for the construction of the Project. Although not concluded, the Company is actively considering the following sources of funding:

- Strategic Funding: As the HPA First Project represents a potentially disruptive entry to the HPA market in terms of both HPA quality and cost base, the Company believes the Project will naturally attract investment interest from both the supply and end-user sectors of the HPA market. The Company is at the initial stages of end-user offtake interaction but notes a preferred offtake partner or an existing HPA producer would each represent a logical strategic partner to fund the majority of pre-production capital in return for a minority project interest. The Company's officeholders have had direct and recent successful experience with offtake linked finance for individual projects up to the value of A$155 million.

- Export Credit Agency (ECA) Funding: Final equipment selection or EPC/EPCM Contractor selection will likely either individually or collectively involve off-shore providers, which in turn would likely enliven the potential for access to ECA funding where governments provide support for major off-shore development projects. ECA funding traditionally represents long-term, low-coupon, low-covenant funding, well suited to technology intensive projects like the HPA First Project. The Company notes that in particular, the solvent extraction area of the proposed plant lends itself to vendor packaging to offshore providers, which in turn provides the opportunity to be supported with ECA funding.

- Project Finance: The strong financial business case presented by the HPA First Project suggests the Project is in part, readily financeable with debt finance. The Company notes traditional project finance would normally require a significant component of pre-debt unsecured funds, potentially provided by strategic, ECA or equity providers.

- Equity: The strong financial business case presented by the HPA First Project infers a significant component of the pre-production capital may be funded by the equity market. The Company recognises that equity investor appetite within the sector is cyclical, and there is no guarantee that market demand for the Company's securities will be sufficient to meet requirements.

15. Project Schedule

A project implementation schedule has been prepared and a summary schedule is shown in Figure 10. The critical path for the Project is the delivery of the long lead equipment. An indicative delivery period of 14 months was obtained from equipment vendors. Further work will be performed as part of the DFS to establish opportunities to reduce this lead time or consider pre-commitments.

Key schedule basis and assumptions:

- EPCM delivery structure
- Schedule delays are excluded, such as those caused by the following; unexpected site conditions, labour disputes and force majeure
- Regulatory approval in late 2019
- Financial approval shortly after regulatory approval
- A maximum delivery period of 14 months for long lead equipment
- Civil and structural work commence prior to the delivery of long lead equipment.

The critical path for the project can be summarised as:

- March 2019 – Construction and operation of a pilot plant
- November 2019 – Completion of a DFS
- December 2019 – Regulatory and financial approval
- March 2020 – Order long lead equipment
- July 2020 – Complete detailed engineering
- June 2021 – Long lead equipment delivered
- October 2021 – Construction complete
- February 2022 – Commissioning complete
- February 2022 – Start production.

Task	From	To
PRE-CONSTRUCTION		
Pilot Plant + DFS	1/03/19	30/11/19
EIS	1/11/18	30/10/19
Regulatory Approvals	1/11/18	29/11/19
Marketing and Offtake	1/11/18	26/06/19
Financing	10/06/19	6/12/19
PROCESS PLANT	30/09/19	18/02/22
Establishment	30/09/19	31/12/19
Detailed Engineering	9/12/19	17/07/20
Procurement	6/01/20	4/06/21
Construction	30/09/19	8/10/21
Commissioning	11/10/21	18/02/22
Production Ramp-Up	21/02/22	9/02/24

Figure 10: Summary Project Implementation Schedule

16. Process Feedstock

The HPA First Project sources its feedstock from the global aluminium chemicals market. The feedstock is a blend of chemicals which delivers aluminium units to the Solvent Extraction (SX) process for the selective extraction of aluminium. The aluminium feedstock chemicals used by the Company are used in the textile, paper and water treatment industries. This market is greater than US$20 billion in size with over 200 global suppliers.

Collerina's feedstock requirement is estimated to represent less than 1% of the global market for the aluminium feedstock chemicals used. The feedstock chemicals are already in active bulk use by an estimated 200 Australian industrial facilities.

The Company obtained feedstock pricing for this study after seeking 5 separate quotations and is based on a landed (bulk) cost to the proposed site at Newcastle Port.

17. By-Products

As described above, two fertiliser by-products are produced for sale, being approximately 43,000 tonnes per annum of Fertiliser A, and approximately 73,000 tonnes per annum of Fertiliser B. The Company notes that total by-product sales represents only 12% of the projected annual project revenue. Each of these fertilisers is actively traded within Australia and globally.

Fertiliser By-Product A

Fertiliser A is an agricultural fertiliser with an estimated global size of US$5 billion in 2014. As a fertiliser it can be delivered and applied in either solid (granular or crystal) or concentrated liquid form, with solid form accounting for over 75% of current market demand.

Collerina's anticipated production of 43,000 tonnes per annum of Fertiliser A, would represent 0.1% of the global market.

The Asia Pacific market, including Australia is the largest global consumer of Fertiliser A, representing approximately 35% of the market in 2014. Countries such as China, India, Malaysia, Indonesia, Vietnam, and Singapore are expected to deliver demand growth in the Asia Pacific region driven by government initiatives to increase crop yields and land efficiency. Global pricing for Fertiliser A has been steadily increasing based largely on rising demand in the Asia Pacific (see **Figure 11**, below).

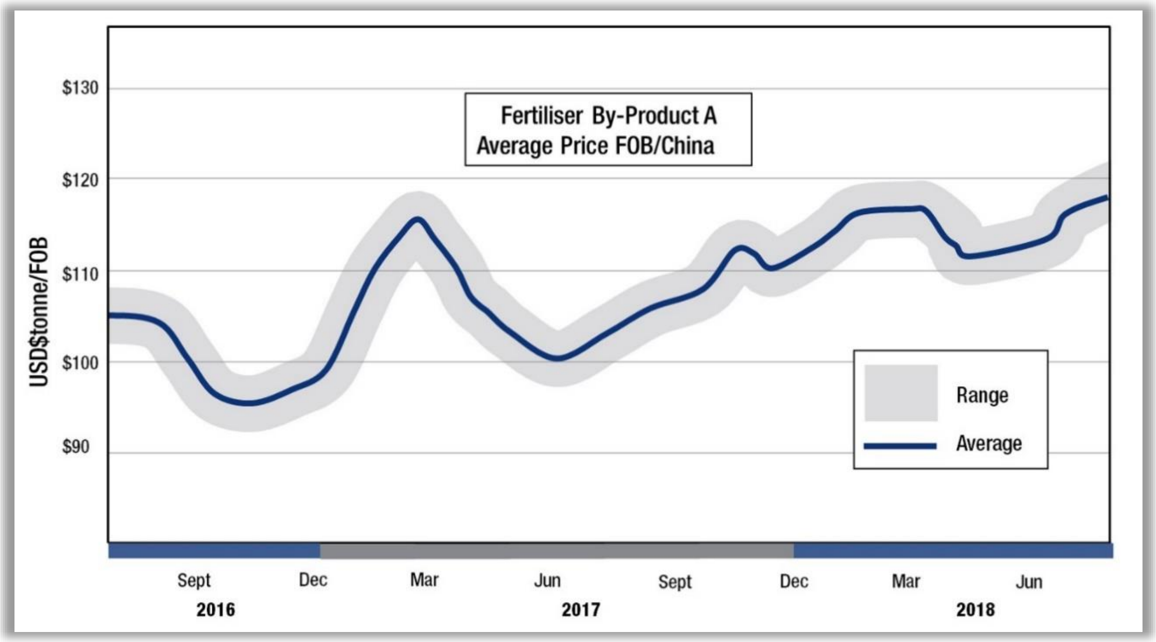

Figure 11: Recent Price History – Fertiliser By-Product A

Fertiliser A is actively marketed in Australia by more than 5 wholesale distributers and multiple retail distributers. The Company notes that Fertiliser A is readily saleable based on discussions with large Australian market wholesale distributers.

The Company obtained indicative Fertiliser A pricing for use in the PFS financial analysis directly from wholesale distributors and its own market research.

Fertiliser By-Product B

Fertiliser B is an agricultural fertiliser with an estimated global market size of >200 million tonnes (or >US$80 billion) in 2016. Europe is the major global market for Fertiliser B with over 30% of the global demand, followed by North America, with strong recent demand in Asia Pacific, particularly in eastern Australia. There are currently four existing manufacturing sites in Australia for this by-product.

As a fertiliser it is manufactured, distributed and applied in liquid form.

Collerina's anticipated production of 73,000 tonnes per annum of Fertiliser B, would represent 0.03% of the global market and approximately 4% of the domestic production market.

The Company plans to negotiate sales of Fertiliser B to existing manufacturers and producers, to augment their existing businesses and have engaged with existing producers on this basis. Interaction with existing manufacturers of Fertiliser B indicates a healthy demand for additional volumes with confirmation that the pricing used in this PFS are reasonable.

18. Opportunities

The primary opportunity identified during the PFS was the identification of a modified chemical feedstock blend. The modified chemical feedstock blend would have the following potential advantages:

- A higher aluminium feed grade
- A further simplification of the flow sheet, with substantial CapEx and OpEx reductions
- An increase in the volume of the higher-value Fertiliser by-product B

Offsetting these benefits the modified feedstock blend:

- Is more expensive per aluminium unit
- Is not as deeply traded as the feedstock blend assessed in the PFS

Further bench-scale testwork and market investigation on this modified feedstock will be completed prior to pilot plant construction.

Further potential opportunities identified during the PFS include:

- Refinement of the HPA pre-cursor circuit, to reduce reagent consumption and equipment sizing in this area of the process plant.
- Potential production of gamma alumina for the catalyst industry and other applications.

19. Risks

The PFS study included a detailed risk assessment, including contemplation of mitigation strategies to address all key technical and commercial risks.

Project risks with a ‘high’ risk weighting are set out in Table 8, below:

Table 8: Highest rated project risks and relevant controls

Risk Cause	Impact	Risk Mitigation Measure
Process technology doesn't achieve target specs. (4Ns quality, crystal, phase)	HPA revenue reduced significantly	Multiple lab scale testwork and a pilot plant
Dryer, calciner operation causes issues related to high temp. accretion, dust, materials of construction, maintenance costs, properties of material for transfer during calcination	Loss of revenue due to downtime or off specification product	Bridging testwork/ engineering Engage specialist consultant Pilot plant testwork for DFS
Project delivery timeframe allows competitors to copy the process technology.	Reduced revenue	Security & confidentiality protocols
The Permitting requirements delay the project.	Delayed revenue and increase CAPEX	Not yet identified
Long lead equipment procurement period delays the project	Delayed revenue and increase CAPEX	Review schedule and timing of front-end engineering, multiple vendors identified,
Reagent supply disruptions	Loss of revenue/Increased OpEx	Seek alternative market competitive options

20. Confidentiality and Trade Secrets

The HPA First Project uses the Company’s licenced proprietary SX and refining technology. The details of the technology are a Trade Secret and commercial in confidence, and accordingly the following notes are made with regard to the PFS:

- The process flow sheet, and associated process plant areas have been simplified in this public announcement of the study. However, the Company notes that the PFS participants had full access to the process flow sheet under confidentiality agreements and the PFS has been subject to engineering and costing using the Licensed flow sheet consistent with the requirements of a PFS.
- The industrial feedstock blend, which provides aluminium units in solution to the SX circuit, is not identified in this announcement of the study and is not considered price sensitive. For more details on the feedstock please refer to Section 16.
- The dominant Project reagents are not identified in this public announcement of the study. The Company notes that there is an active domestic and international market for each of the dominant Project reagents, and third-party pricing from active manufacturers/distributers of these reagents have been sought for the purposes of this study.
- The two fertiliser by-products (Fertilisers A and B), are not identified in this public announcement of the study and are not considered price-sensitive. For more details on the by-products please refer to Section 17.

21. Licence Agreement

The Company is a party to an Intellectual Property Licence Agreement via its 100% owned subsidiary, Solindo Pty Ltd, which provides for the access to the proprietary aluminum solvent extraction and HPA refining technology, and rights to commercialise that technology in a production facility.

The key terms of that agreement are set out below:

- Licence Term: 20 years, commencing 1 June 2018, subject to the Company meeting a number of Project Milestones.
- Rollover Period (Licence extension): Rolling 5 year option
- Licence Counterparty: HPAlumina Pty Ltd
- Annual Licence Fee: $50,000
- Licence Royalty; 1% of HPA Sales.

22. Next Steps

On the basis of a very attractive business case and technical viability, the Company intends to complete a DFS for the purposes of assessing the Project to a detail to allow the Company to make a FID on the Project. The DFS is expected to be significantly based off a pilot scale processing plant, likely to be constructed and run within the dedicated secure premises in Brisbane which housed the recent second mini-rig SX program. The Company has already built a pilot plant equipment list and placed orders for a number of long-lead items required for the pilot plant.

The DFS pilot plant has been scheduled to run from March-May 2019.

In parallel, the Company has set out plans for a program of technical interim works, required to maximise the technical confidence of the upcoming DFS. These works include:

- Materials of construction testing
- Refinement of HPA pre-cursor operating conditions
- Filtration, micronizing and calcination testwork with vendor input
- Additional bench scale SX trials to capture incremental improvements in impurity rejection
- Trade-off studies of alternative feedstock.

In addition, the Company, at its upcoming Annual general Meeting, is seeking shareholder approval for a change of name to Alpha HPA Limited, to better reflect the Company's immediate focus on HPA.

Appendix 1:

SUMMARY OF MATERIAL ASSUMPTIONS

The key assumptions relevant to the financial analysis are;

Item	Assumption	Commentary
A$/US$ Exchange Rate	0.75	Based on an average of 5-year average and consensus forecasts
HPA Sales Price	US$25,000/tonne	Based on commissioned detailed marketing research by CRU
Fertiliser By-Product A Sales Price	A$160/tonne	Quoted Price
Fertiliser By-Product B Sales Price	A$510/tonne	Industry enquiry
Construction Commencement	CY2019	Based on reasonable assumptions for completion of a DFS, financing and project permitting
Initial Production	CY2021	Based on conservative estimates for construction completion
Production Ramp-Up	2 years 50% nameplate: Year 1 85% nameplate: Year 2	Based on Prudentia experience of hydrometallurgical process plant ramp-up and McNulty curves
Sustaining Capital Requirements	1% of CapEx: Years 2-7 2% of CapEx: Years 7-14 2.5% of CapEx: >14 years	Typical for similar process plants
Pre-Production Operating Expenses	Construction Year 1: 2% of Capital Construction Year 2: 3% of Capital Construction Year 3: 4% of Capital	Typical for similar process plants

SUMMARY OF MODIFYING FACTORS

Criteria	Commentary
Study Status	The HPA First Project PFS indicates the Project is technically and financially viable. The Study was completed by Prudentia Process Consulting, with input from the Company and other specialist consultants. The activities and findings of all other disciplines are summarised in the PFS document, and detail derivation of other modifying factors such as processing recoveries, costs, revenues, government and permitting. Overall the results of the PFS demonstrate that the HPA First Project is technically and financially robust.
Mining factors or assumptions	The HPA First Project PFS does not assume any material sourced from a mining operation
Processing (including Metallurgical factors or assumptions	The production of HPA using a Solvent Extraction (SX) based process is a novel process flow sheet. The process plant design can be summarised by the following sequential activities: • The preparation of the industrial feedstock blend • Solvent extraction of the feedstock solution to produce an aluminium strip liquor and aqueous solution of dilute fertiliser by-product (raffinate). • Production of fertiliser by-product A from the raffinate involving evaporative crystallisation, dewatering, drying and packaging. • Crystallisation of the aluminium salt from aluminium strip liquor.

Criteria	Commentary
	• Production of HPA pre-cursor. • Calcining of HPA pre-cursor to HPA, micronizing and packaging. • Evaporation circuit to produce fertiliser by-product B The process flow sheet has been validated for the purposes of the PFS through the following testwork: • Bench scale SX and batch HPA refining • 2 x continuous SX mini-rig campaigns to produce aluminium strip liquors • 2 x processing of SX aluminium strip liquors to HPA assaying 99.99% purity The process testwork was conducted on a blend of industrial aluminium chemicals from 2 x different vendors. Some minor feedstock variability between vendors was noted.
Environmental and Permitting	Collerina has engaged AECOM Consultants to assist with the environmental and regulatory approvals process required for the preferred Project site at Newcastle Port, NSW. At the time of this report, AECOM are preparing a Preliminary Environmental Assessment (PEA), being the first stage of the NSW Approvals process for a State Significant Development (SSD)
Financial	Project costs have been estimated by Prudentia Process Consultants on the basis below. **CapEx:** The capital cost estimate is provided at an accuracy level of -15 to +30% The capital cost estimate has been based on the implementation of an Engineering, Procurement, Construction Management (EPCM) contracting strategy. • Pricing for mechanical equipment and packages are based on budget quotes sourced from reputable vendors or internal database information and scaled accordingly • Contingency of 18% has been added to the total reflecting the status of engineering, maturity of the process technology and data contained within this pre-feasibility study • No allowance for taxes, import duties, value added tax (VAT), goods and services tax (GST) and the like was made The total capital cost is based on the direct cost of mechanical equipment delivered and installed at site. The cost of the mechanical equipment is based on the process flow diagrams, stream table, design criteria and equipment list. Over 75% of mechanical pricing is based on vendor budget quotes with the remainder a mix of Prudentia database, internal estimates, factored estimates, internet sourced data and allowances. **OpEx:** The operating cost estimate has been calculated based on a first principle build-up including reagents, utilities, consumables, labour, general expenses, maintenance and contract services to operate the plant. The operating costs were apportioned into fixed costs and variable costs with adjustments made to variable costs in the financial model for annual tonnage with ramp-up. Labour costs have been built up from an organisational chart typical of a processing facility of this scale. The annual operating costs at year 3 (full ramp-up) are summarised in Table 6, above, and are considered accurate to +/- 25%. **Sensitivities:** Sensitivity cases were considered by flexing key model inputs including sale price, operating costs and foreign exchange. The sensitivity analysis has been reported in EBITDA as there is no mine limiting the HPA First Project life. As expected with the operating margin the project is most sensitive to changes in the HPA product price in comparison to the other sensitivity factors modelled. Foreign exchange has the next biggest impact on the Project's EBITDA because the HPA price is traded in US$. The Project is fairly resilient to changes in operating cost.

Criteria	Commentary
Marketing	Collerina commissioned the independent research group CRU to complete an HPA market study. The key conclusions of the study included: • The HPA global market is expected to increase from around 35kt in 2017 to 125kt in 2025, and 4N HPA produced by established suppliers in Japan, South Korea, USA and Europe is trading within the range of US$25-US$50/kg • A strong demand outlook and rising cost inputs are expected to place upwards pressure on prices. The main downside risk is increased competition from Chinese producers and changes to technology which reduce HPA intensity in manufacturing processes.
Social, legal and Governmental	The final Project location has yet to be determined, however the Company is investigating a number of sites within the Industrial Port area of Newcastle, NSW The Company is advised by AECOM consultants with respect to government permitting and environmental studies.

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