AUSTRALIAN
RESEARCH
INDEPENDENT INVESTMENT RESEARCH

Barra Resources Limited
Mt Thirsty Cobalt Project
Western Australia

November 2017

INDEPENDENT
INVESTMENT RESEARCH

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Contents

INDEPENDENT INVESTMENT RESEARCH

Barra Resources (ASX: BAR)

Limited Scope Review - November 2017

Note: This report is based on information provided by the company as at 15 November 2017

Investment Profile	
Share Price as at 15 Nov 2017	A$0.057
Issued Capital:	
Ordinary Shares	423.1m
Unlisted Options - Total	24.0m
Unlisted Options – In-Money	12.0m
Fully Diluted	467.7m
Market Capitalisation	A$24.2m
12 month L/H	$0.033/$0.14
Cash as at September 30, 2017	A$0.91m
Cash on Option Conversion	A$0.36m

Board and Management
Mr Gary Berrell: Executive Chairman
Mr Sean Gregory: Managing Director & Chief Executive Officer
Mr Grant Mooney: Non-Executive Director & Company Secretary
Mr Jon Young: Non-Executive Director
Mr Gary Harvey: Exploration Manager

Major Shareholders	
FMR Investments P/L	19.28%
Top 20	37.28%
Board and Management	2.3%

Price Chart

The company has instructed us to undertake a limited scope review focusing on a key project and has requested an independent review of this project. As such this review has not taken into account the usual form that would be contained in a initiation of coverage review and therefore we have not reviewed other aspects which would be usual in the circumstances including preparing a valuation. The company has stated that it will consider instructing our firm for a initiation of coverage review at some stage in the future.

The investment opinion in this report is current as at the date of publication. Investors and advisers should be aware that over time the circumstances of the issuer and/or product may change which may affect our investment opinion.

MT THIRSTY COBALT PROJECT, WESTERN AUSTRALIA - POTENTIAL LOW COST PRODUCER

Barra Resources Limited ("Barra" or "the Company") has recently competed a positive Scoping Study on the Mt Thirsty Cobalt Project ("Mt Thirsty" or "the Project") in Western Australia which it holds in a JV with ASX-listed Conico Limited (ASX: CNJ, "Conico"). Mt Thirsty is unique amongst Western Australian nickel-cobalt laterite deposits, in that the extreme weathering has resulted in the potential to extract the cobalt using an ambient pressure and moderate temperature sulphur dioxide leach process, rather than the significantly more expensive high pressure acid leach ("HPAL") processing required by most other WA laterites. Barra will now be looking towards funding for ongoing development studies, with a number of options on the table.

This is a limited scope review, looking at Mt Thirsty only, and not the Company's other projects.

KEY POINTS

Exposure to cobalt: Most forecasters see a strong future for cobalt, one of the key battery metals; demand is expected to be driven by the forecast increase in market penetration of electric vehicles, with an expected CAGR going forward of 6.9% to lead to a supply shortfall and drive prices - these have already have increased from around US$22,000/tonne in late 2015 to US$60,000/tonne now, and are forecast by a number of groups to remain strong for the foreseeable future.

Positive Scoping Study: The recently completed Scoping Study for a 21 year, 1.5mtpa operation has resulted in an un-risked, after tax NPV_8 valuation of A$290 million and an IRR of 21% - we see upside in this with the potential to lower costs and increase metallurgical recoveries with ongoing test work and development studies.

Low cost: With an estimated capex of A$212 million and operating costs (after nickel credits) of ~A$37,000/tonne cobalt Mt Thirsty shapes up as relatively low cost operation when compared to other laterite operations; our modelling of the Company's inputs indicates a life of mine revenue to operating costs ratio of 1.8:1.

Simple resource: Mineralisation at Mt Thirsty is hosted in a thick, flat lying zone, with a low 1.5:1 strip ratio and friable overburden and mineralisation that is amenable to free dig open cut mining - this will lead to a low cost and simple earth moving operation - JORC 2004-compliant resources total 31.94Mt @ 0.12% Co.

Simple metallurgy: This is vital to the potential success of the operation, in that up to 80% of the cobalt can be extracted by a simple ambient pressure leach process - this significantly reduces costs (both capital and operating) and plant complexity when compared with other laterite operations.

Potential resource expansion: The deposit extends onto a neighbouring tenement (which hosts an additional 16.12Mt of mineralisation), with this presenting the opportunity for an expanded operation through for example a possible acquisition or toll treating - this is dependent upon negotiations with the tenement holder taking place and proving successful.

Ready access to infrastructure: Also positively impacting on costs is the proximity to infrastructure - Mt Thirsty is just 5km from a sealed highway, rail and gas, and 225km from the port at Esperance.

Stable, well respected mining jurisdiction: Western Australia is a well regarded and stable mining jurisdiction, having a long history of mining for various commodities.

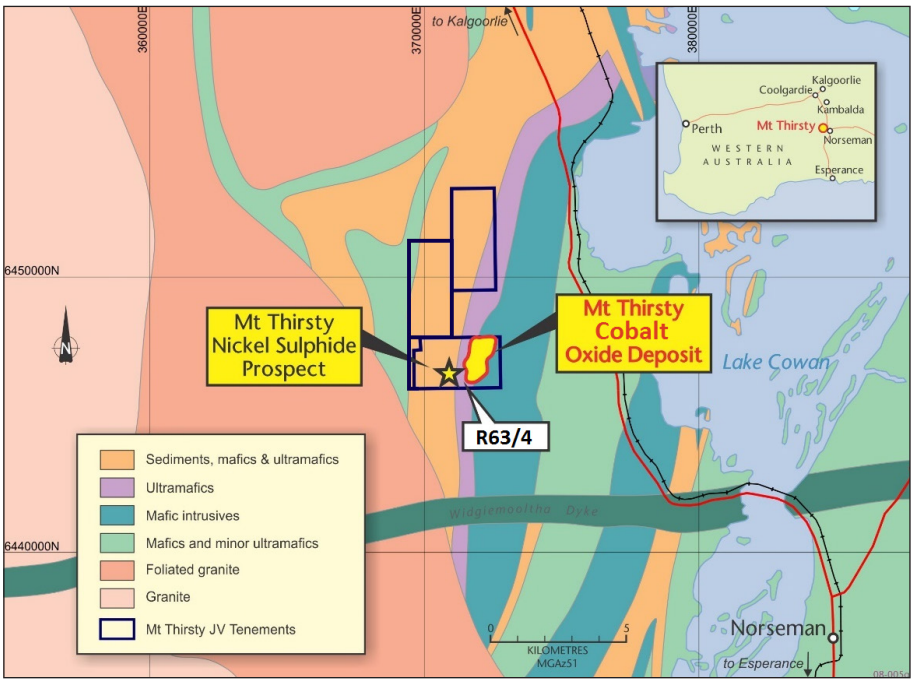
Upside: We have identified a number of areas, both on the revenue and cost side that have the potential to provide significant upside to the economics of any operation at Mt Thirsty.

OVERVIEW

STRATEGY AND PROJECT OVERVIEW

- Barra's key focus is on the 50% owned Mt Thirsty Cobalt Oxide Deposit, located 25km from the town of Norseman in southern Western Australia (Figure 1).
- The other 50% of Mt Thirsty is held by Conico Limited (ASX: CNJ, "Conico"), the operator of the Mt Thirsty JV ("MTJV").
- The strategy with regards to Mt Thirsty is to develop a relatively low cost cobalt production operation, possible by virtue of the unique properties of the Mt Thirsty laterite, in that it is more strongly weathered than most Western Australian Ni-Co laterites, and will not need expensive HPAL or similar processing for a viable operation.
- The MTJV has recently completed a positive Scoping Study for the Project, and will now look at various options to fund ongoing development studies.
- Barra also holds a number of gold projects in WA; given the focus of this report on Mt Thirsty these will not be discussed further.

Figure 1: Mt Thirsty project location and geology



Source: Barra

MT THIRSTY COBALT PROJECT – BAR 50%

Access and Tenure

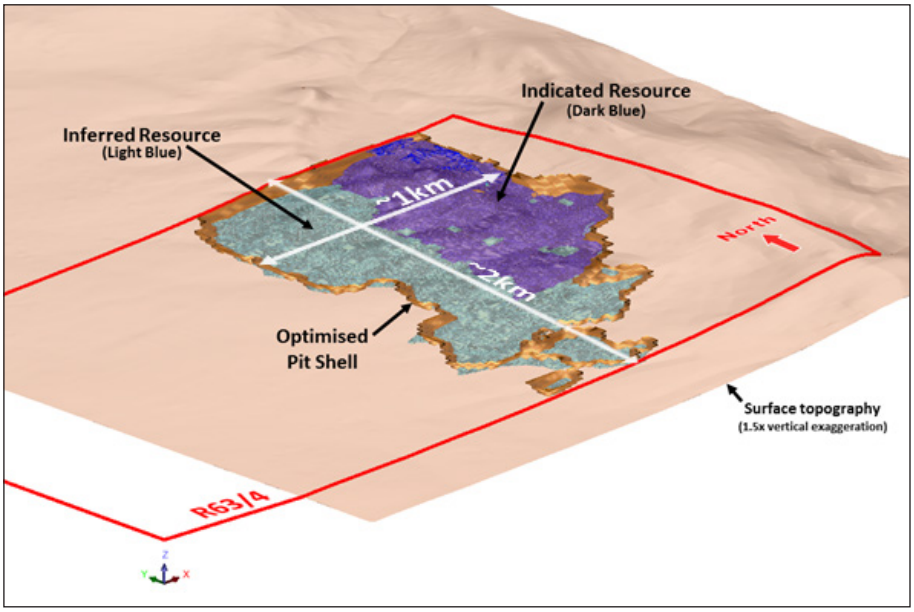
- The Project is accessible by 5km of station tracks from the Coolgardie-Esperance Highway, with the main railway line from Kalgoorlie to Esperance also paralleling the highway; the port at Esperance is some 200km south of Norseman.
- The Project includes four tenements for ~18km^2; Retention Licence R63/4 and Exploration Licences E63/1267 and E63/1790, and Prospecting Licence P63/2045 which all lie adjacent to the west and north of R63/4.
- All tenements are in good standing, with R63/4 being held in the name of Meteore Metals Pty Ltd ("Meteore"), a 100% held subsidiary of Conico, and all other tenements being held jointly by Barra and Meteore.

Geology and Mineralisation

- Mt Thirsty is located over units of the Norseman-Wiluna Greenstone Belt, within the Eastern Goldfields Province of the Archaean Yilgarn Craton.
- Locally the geology includes sediments, mafic and ultramafic volcanics and intrusives, with the package intruded by orogenic granites and having a general north-south strike (Figure 1).

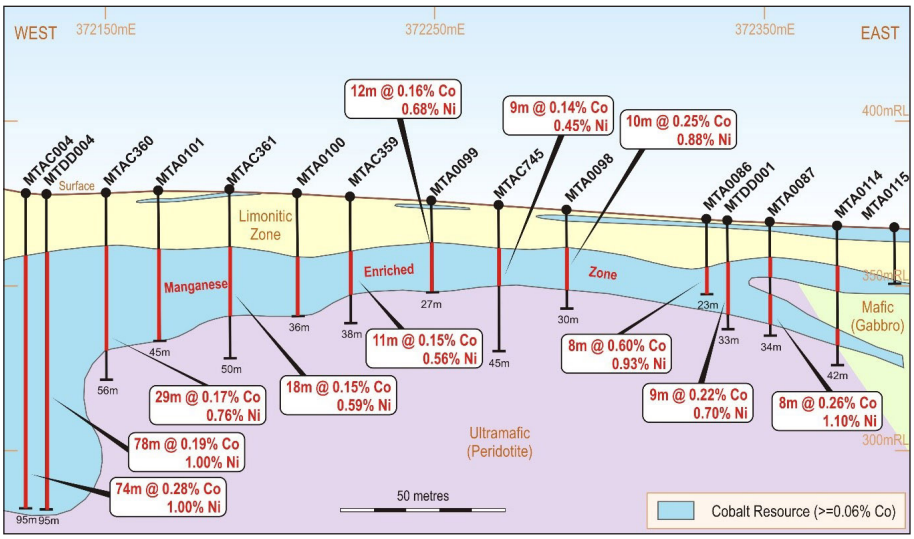
- Mineralisation at Mt Thirsty is lateritic in style, and is formed by the deep weathering of an ultramafic peridotite intrusive, with peridotites strongly anomalous in minerals such as nickel and cobalt.
- The deposit is a generally uniform tabular body, has a strike length of some 2km within R63/4 (however extends north into the adjoining tenement), has a width of up to 1,000m and an average thickness of 15m with areas of considerably greater thickness, possibly due to deeper weathering down structures (Figures 2 and 3).
- The deposit reportedly has an additional strike length of up to 700m in E63/1041, the tenement to the north which is held by Platx Ltd, a private company associated with Mark Creasy - the 2011 Annual Technical Report for R63/1041 (publicly available from the Western Australian Department of Mines and Petroleum) quotes a JORC 2004 Compliant Indicated and Inferred Mineral Resource Estimate ("MRE") for the mineralisation within E63/1041 of 16.12Mt @ 0.13% Co and 0.62% Ni, approximately 50% of that within R63/4 (discussed below).

Figure 2: Mt Thirsty oblique view looking northeast



Source: Barra

Figure 3: Mt Thirsty cross section, looking north



Source: Barra

- Lateritic weathering leads to the residual concentration of more immobile elements such as cobalt and nickel, with other elements being removed by the weathering process.
- Mt Thirsty is unique when compared to most other Western Australian Ni-Co laterites, in that it has undergone a significantly higher degree of weathering, resulting in a significant zone of cobalt enrichment with a low proportion of the silicates that cause an issue with processing.

- With most other laterites (such as Murrin Murrin), a proportion of the target minerals are associated with silicate minerals amongst others, which requires high pressure and temperature to extract the valuable metals.
- At Mt Thirsty, cobalt is enriched primarily in association with the manganese oxide mineral, asbolane, which forms a distinct manganese enriched zone below an upper, iron (plus some nickel only) rich limonitic clay zone (Figure 3).
- The association with manganese is important with regards to processing, with this only requiring ambient pressure and slightly elevated temperatures (discussed later) to leach the target metals.
- The weathering process has made the mineralisation and overburden extremely friable, making it suitable for relatively cheap, free dig mining; it is also has a relatively low moisture content and the water table is below the mineralisation.

Work Completed and Resources

- Barra's first involvement in Mt Thirsty was in late 2006, when the Company entered into the MTJV with then owners Select Minerals.
- Conico's (then Fission Energy Limited) entry into Mt Thirsty was in 2008, through the purchase of Meteore, who succeeded Select Minerals in the MTJV.
- Work over the next few years included resource drilling, with the resource being progressively updated, and metallurgical test work, which highlighted the potential for high metal recoveries though an ambient pressure leach circuit; this resulted in a metallurgical and engineering Pre-feasibility Study, released in January 2009, highlighting the potential of a 2mtpa operation.
- Infill drilling of the deposit (as well as some sulphide drilling) continued through 2009, 2010 and into 2011, with an updated Mineral Resource Estimate ("MRE") being released in January 2011.
- Due to the resources downturn, little further work was completed until April 2016, when the MTJV announced that it would commence a Scoping Study, which would include drilling to collect samples for a new round of metallurgical test work.
- Work has been ongoing, with the most recent milestone being the release of the Scoping Study on the back of the positive sulphur dioxide leach test work.
- Table 1 presents a summary of drilling and Table 2 the latest MRE.

Table 1: Mt Thirsty drilling summary

Mt Thirsty drilling summary					
Period	**Company**	**Drill Type**	**Holes**	**Metres**	**Comments**
1996-1998	Resolute Ltd	Aircore	137	4,853	
1996	Resolute Ltd	RAB	21	1294	Drilled in resource area but not used for estimation
2006-2011	MTJV	Aircore	523	22,808	
2008	MTJV	Diamond	7	337.5	Twin holes and used for metallurgical test work
2008	MTJV	RC	8	505	Twin holes and used for metallurgical test work
2010	MTJV	PQ Core	10	466	Twin holes/metallurgical testwork
2010	MTJV	RC	6	234	Twin holes/metallurgical testwork
Total			**712**	**30,497**	

Source: Barra

Table 2: Mt Thirsty JORC-2004 MRE - 0.06% Co cuf-off

Mt Thirsty JORC-2004 MRE - 0.06% Co cut-off							
Category	**Tomnnes (Mt)**	**Co%**	**Ni%**	**Mn%**	**Fe%**	**Mg%**	**Al%**
Indicated	16.60	0.14	0.60	0.98	25.18	2.63	4.26
Inferred	15.34	0.11	0.51	0.73	18.10	3.65	3.37
Total	**31.94**	**0.12**	**0.55**	**0.86**	**21.64**	**3.14**	**3.81**

Source: Barra

Mt Thirsty Scoping Study and Planned Operations

- The Company has recently released the results of the Scoping Study, assessing the viability of an atmospheric sulphur dioxide ("SO_2") leach to produce a mixed sulphide product ("MSP"), with a post-tax, ungeared NPV_8 of A$290 million.
- The Study envisages a 21 year, 1.5mtpa operation, producing a total of ~27,200t of cobalt and 34,900t of nickel to the MSP, with an average annual production of 1,300t of cobalt and 1,665t of nickel contained in around 6,000t of MSP.
- The average cobalt production over the first five years is 1,900tpa.
- Parameters of the study on a 100% basis are presented in Table 3.
- Note that the modelling assumes an 85% payability for the metals in the MSP.

Table 3: Mt Thirsty Scoping Study modelling parameters, 100% basis

Mt Thirsty Scoping Study and IIR modelling arameters, 100% basis		
Item	**Base Case - BAR**	**Range**
Process Plant Throughput	1.5Mtpa	
Cobalt Head Grade	0.12%	
Nickel Head Grade	0.52%	
Recovery Rate - Agitated Leaching – Cobalt	73%	73% to 80%
Recovery Rate - Agitated Leaching – Nickel	21.5%	20% to 27%
Construction and Commissioning Period	24 months	
Life of Mine	21 Years	
Life of Mine Strip Ratio	1.5:1	
Exchange Rate	US$/A$ 0.74	
Cobalt Price	US$62,000/t, 85% payability	Escalated at 1.5% pa from start of production
Nickel Price	US$12,240/t, 85% payability	Escalated at 2.5% pa from start of production
Operating Costs	A$43/t	A$38.7 to A$47.3/t
Capital Costs	A$212m	A$190m to A$232m
After Tax NPV_8	A$290m	A$245m to A$335m
Cumulative Net Cash Flow	A$746m	A$651m to A$840m
IRR (After Tax)	21.5%	18.7% to 24.3%

Source: Barra

- Metal price and exchange rate forecasts used by the Company are from JP Morgans - our view is that metal prices may be on the aggressive side, however they are within the range of those that we have seen from other parties - we have seen long term forecasts from major and reputable market participants generally ranging from between US$50,000 and US$70,000/tonne, however with some up to US$90,000/tonne.
- As shown in Table 3 the JP Morgan price forecasts include escalation - the Company states that these are real and not nominal escalations, however we have not been able to sight the document with the forecasts to verify this - in our experience it is uncommon to have price forecasts escalated in real terms, and if nominal price escalations are used to account for inflation escalations should also be applied to costs.
- The estimated capital costs of A$212 million are presented in Table 4, and operating costs in Table 5 - these have largely been calculated from first principles by CPC Engineering, an independent processing engineering, design, construction and maintenance consultant.
- The costs include an allowance for sustaining capital, and have been estimated to a +-35% accuracy as is usual for a study of this level.
- Our view is that the capital and operating costs appear to be reasonable - mining costs are what may be expected in a free dig operation moving an average of 2.25mtpa of material, and processing costs at ~ A$43/tonne are significantly lower than those expected for a HPAL operation of a similar size.

- A recently completed PFS by CleanTeq for the Syerston Project estimated processing costs of US$36.52/tonne for a 2.5mtpa operation - using an AUD/USD exchange rate of 0.75 and the "6/10's" rule for economies of scale results in an equivalent cost of A$66/tonne for a 1.5mtpa HPAL operation.
- The figure in the Scoping Study of A$43/tonne is generally higher than indicative costs for Australian gold and base metals operations scaled to 1.5mtpa, with these having an average of around A$24/tonne, however with base metals costs at the higher end and standard CIL gold processing costs at the lower end.
- Given that there are no equivalent operations globally we cannot make a direct comparison of costs - the closest analogue is the El Baleo Project in Mexico, which uses sulphur dioxide leaching to produce copper, cobalt and zinc.

Table 4: Estimated capital costs

Estimated capital costs	
Area	**A$m**
Process Plant Direct	102.4
Other Direct Costs	26.9
Indirect Costs	40.7
Owner's Costs	8.0
Contingency	33.9
Project Grand Total	**211.9**

Source: Barra

Table 5: Estimated operating costs

Estimated operating costs		
Item	**A$m/y**	**A$/t**
Mining Costs	6.9	4.60
Reagents	23.7	15.8
Labour	10.6	7.1
Power	12.4	8.2
G&A	6.0	4.1
Maintenance	4.1	2.7
Consumables	0.8	0.5
Total	**64.5**	**43.0**

Source: Barra

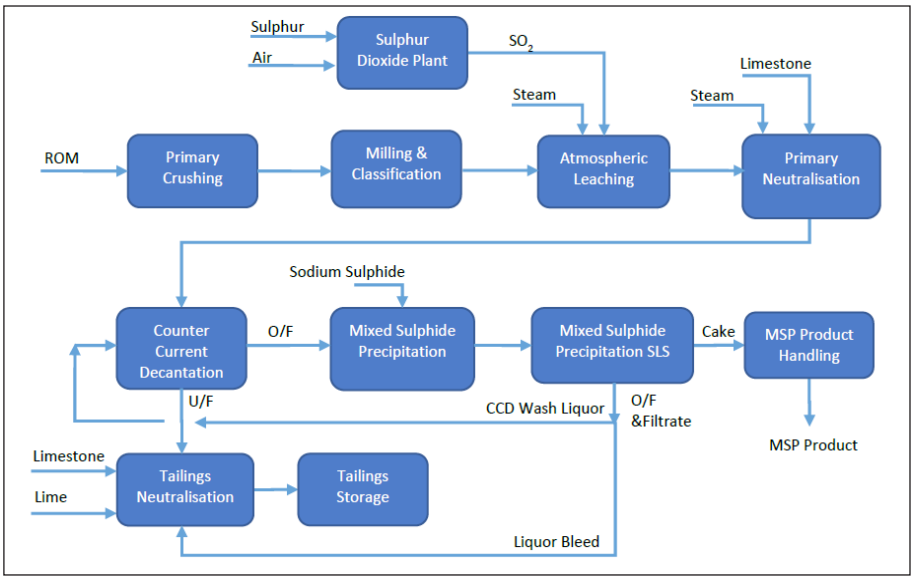
Mining

- The Study is predicated on contract free-dig open pit mining, with a cost of A$1.83 per tonne moved - given a LoM strip ratio of 1.5:1 this equates to a cost of A$4.60/ROM tonne.
- The Study assumed a 98% mining recovery, 5% dilution, a bench height of 5m and an overall pit slope angle of 38° - this has been estimated without any geotechnical work being completed, and is hence considered conservative.

Metallurgy and Processing

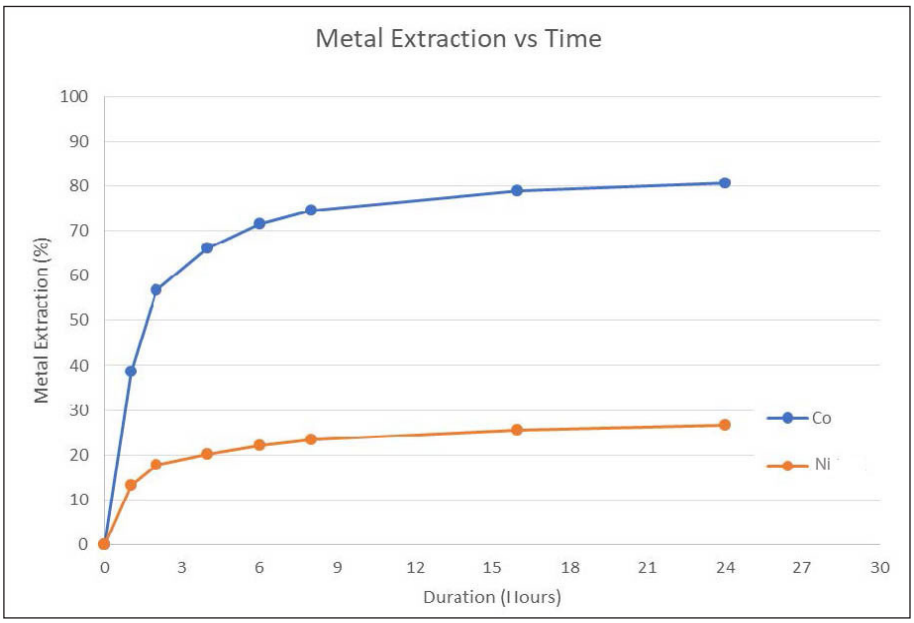
- As mentioned earlier, processing is predicated on producing MSP, with the conceptual circuit being presented in Figure 4.
- Processing will include a crushing and grinding circuit, followed by an agitated atmospheric low temperature leach using sulphur dioxide gas as the active leach reagent to extract cobalt and nickel from the enriched manganese ore.
- A base case overall metallurgical recovery of 73% for cobalt has been used in the Scoping Study - this includes a leach recovery of 79%, with leach performance shown in Figure 5.

Figure 4: Conceptual treatment circuit



Source: Barra

Figure 5: Leach performance



Source: Barra

- The circuit will also include a neutralisation circuit for impurity removal, a six stage counter current decantation circuit, and then precipitation of cobalt and nickel using sodium sulphide.
- Tailings will be neutralised to a pH of 7-8 prior to disposal into a tailings storage facility.

Utilities and Infrastructure

- Power costs have been estimated on using a mixture of diesel fuelled generators (operated by a third party on a build-own-operate "BOO" basis) and a steam turbine, driven by steam generated from waste heat from the exothermic production of SO_2 gas - power requirements are ~9.5MW with 15-20% recovered from waste heat.
- There may be the potential to provide some power from gas generators, with the Project being accessible to the Kambalda-Esperance Gas Pipeline; in addition there may be the potential to source some power from the 9MW diesel station located in Norseman.
- Water is expected to be sourced from a borefield, with the position yet to be confirmed.
- It is expected that products will be trucked from site, which is located within 5km of the sealed Esperance - Coolgardie Highway.

Permitting

- The Project is located on a Retention Lease, that will need to be converted to a Mining Lease prior to the commencement of any operation.

- Items that will be required to be completed before grant of an ML will include, but not be restricted to an agreement with the Ngadju Native Title Aboriginal Corporation and the completion of an Environmental Impact Assessment ("EIA").
- Reconnaissance flora and fauna surveys were completed in 2007, with the results of these being generally positive, with no factors identified which would likely preclude development.

Ongoing Activities

- The next stage of activities at Mt Thirsty will involve looking at strategies to advance the Project (including Pre-feasibility and Feasibility Studies) with options including, but not limited to:
  - Seeking a joint venture partner to fund upcoming development studies, and if positive, develop the Project,
  - Engage with potential cobalt offtake partners to enter into an offtake agreement and/or provide funding to advance the Project, and,
  - Investigate other ways of funding the next stage of studies.

UPSIDE POTENTIAL

INTRODUCTION

- As part of our review of Mt Thirsty, we have looked at the upside potential.
- On published data, the Project is very sensitive to revenue factors, including metal recoveries, resource grade, metal prices and exchange rates and less sensitive to costs, particularly capital costs.
- Table 6 shows sensitivity factors to various inputs - we have also split out revenue factors for cobalt only given that it provides the bulk of the revenue.

Table 6: Mt Thirsty post-tax NPV sensitivity factors

Mt Thirsty post tax NPV sensitivity factors				
Change	Revenue Factors - Cobalt Only	Revenue Factors - Combined Metals	Site Costs	Capex
-20%	0.50	0.37	1.31	1.22
-10%	0.75	0.69	1.15	1.12
0%	1.00	1.00	1.00	1.00
10%	1.25	1.31	0.85	0.87
20%	1.50	1.63	0.69	0.73

Source: IIR analysis

REVENUE FACTORS AND THROUGHPUT

- Of the revenue factors, assuming that the resource estimation has been completed to a high standard and accurately reflects what is in the ground the Company will only be able to effectively influence metal recoveries, and ongoing test work is planned to investigate the potential to increase these.
- A second area that would lead to significant increases in value is enlarging the resource base and hence increasing mine life and/or annual throughput.
- Given that the modelled mine life is already at 21 years, increasing throughput would be the preferred option should the resource inventory be increased.
- Increasing throughput should lower unit operating costs through economies of scale - in estimating the changes in costs we use the "6/10th's rule" where cost (new) = cost (base) * (base/new)^0.6 - this applies to operating costs, and inversely to capital costs.
- The benefit from lower unit operating costs should more than compensate for the increased capital required.
- Indicative modelled effects, using the 6/10's rule, of improvements in recovery and throughput on the base case post-tax NPV_8 are shown in Table 7.
- This shows resulting multiplier factors from changes in the two parameters (with all other factors remaining constant); for example a 4% increase in recovery led to a modelled 13% increase in the post-tax NPV.

- Percentage metallurgical recovery increases are relative to the base case, and not absolute; for example a 4% increase in cobalt recoveries equates to a revised recovery of 75.9% (73% x 1.04), and not 77% (73% + 4%).
- This also does not account for any potential increase in costs that may be associated with increased recoveries, and hence would decrease the magnitude of any improvement in NPV.
- Overall metal prices, exchange rates and grade can be substituted for metallurgical recoveries in Table 7 - changes in all of these revenue factors have similar effects on the NPV.

Table 7: Mt Thirsty post-tax NPV indicative multipliers

Mt Thirsty post-tax NPV indicative multipliers							
		Increase in metallurgical recovery (resource grade, metals prices)					
		0%	1%	2%	3%	4%	5%
Throughput scaling	100%	1.00	1.03	1.06	1.09	1.13	1.16
	110%	1.23	1.27	1.30	1.33	1.37	1.40
	120%	1.46	1.50	1.54	1.58	1.62	1.65
	130%	1.70	1.74	1.78	1.82	1.87	1.91
	140%	1.94	1.99	2.03	2.07	2.12	2.16
	150%	2.18	2.23	2.28	2.32	2.37	2.42

Source: IIR analysis

- The only way to increase laterite resources will be to negotiate with Platx to access the mineralisation on E63/1041 - our modelling does not take account of any consideration that would need to be paid to access the mineralisation - the modelling is done on a standalone project basis only.
- Such an arrangement could include an asset purchase, toll treatment or royalty agreement amongst others.
- Potential investors should not assume that such a deal will be negotiated - we have included this for illustrative purposes only, and the Company has not indicated to us that any such negotiations are under way.
- Given that the resource within E63/1041 is ~50% of that in the MTJV tenement, and with an expected high resource to reserve conversion factor given the style of mineralisation, we may expect the potential to increase throughput by close to 50% (assuming an unchanged project life) should the E63/1041 mineralisation be included in any future operation - modelling suggests that this has could have a significant effect on project economics as shown in Table 7.

CAPITAL AND OPERATING COSTS

- As mentioned previously, the Project is less sensitive to costs than it is to revenue factors and throughputs.
- Of these, it is least sensitive to changes in capital costs (Table 6).
- To decrease capital costs, the Scoping Study assumes a BOO power plant and contract mining, with the rest of the costs largely worked up from first principles.
- We would expect this figure to be refined as studies progress; this would particularly apply to the contingency of 15% used in the study, which is in line with the norm; we would expect this to decrease with ongoing cost refinements, however will only have an increment effect on the NPV.
- Similarly, ongoing work will be carried out to refine operating costs.
- One area that improvements may be seen in are power costs, which comprise some 21% of the total operating costs, with the current power generation (outside of that sourced from the processing) being costed at A$0.23/kWh for a BOO power plant.
- Different alternatives will be investigated in ongoing studies, including:
  - Including gas in the power mix,
  - Connecting to the 9MW Norseman power station, and,
  - Optimisation of heat recovery from processing.

- Both of the first two would require additional capex to the contract power provider, including a gas connection (~5km) and/or ~20km of power line, and would be charged back through supply charges.
- Either of these however would still require some on-site diesel generation, with the Norseman power station not having sufficient spare capacity for all of Mt Thirsty's requirements (also we are unsure of the contractual status of this station and given that it is on the closed Central Norseman mine site do the lease holders have first right of refusal to power generated should operations ever restart?).
- In the case of using gas, backup diesel generation will still be required in case of gas supply issues.
- 10% changes in power costs translate to 3% changes in the post-tax NPV.
- With regards to other operating costs, there may be changes to reagents and other consumables with ongoing metallurgical test work - this could move costs either way with these currently making up 38% of the total estimated operating costs.
- A 10% change in the costs of consumables will have a 4% change on overall costs, and according to our modelling,will result in a 6% change in post-tax NPV.
- It has been noted that the pit wall angle of 38° is considered conservative, and has been used given that no comprehensive geotechnical work has been completed.
- There is therefore the opportunity, with steepening this up, to decrease the strip ratio and hence overall mining costs; our view however is that given that mining costs only comprise some 11% of the estimate operating costs that any effect of steepening up the walls, particularly given the large area and shallow depth of the pit, would have an insignificant effect on overall costs.
- It needs to be noted that costs have been estimated to +-35%, and that the potential changes discussed above are within these limits of uncertainty, however when combined with positive changes in other inputs even minor decreases in costs could have significant effect on the Project NPV.

NICKEL AND MANGANESE RECOVERY

- 80% of the nickel and all of the manganese report to the tailings dam and waste dump and there may the potential to treat and recover these metals at a later date.
- This has not been investigated in detail or costed, and we would consider it as option value only.
- This also applies to the potential for an economic nickel sulphide discovery on the tenements.

RISKS

- **Technical:** Geologically the Project would appear to be largely de-risked, with the mineralisation being relatively simple; in addition results of metallurgical test work have been positive, however more work, including variability test-work will need to be completed as part of ongoing development studies.
- **Funding:** This is now the key risk for Barra, with the need to fund upcoming development studies and associated activities - the Company will be investigating various activities for this, and the quantum of any funding that the Company may require will depend upon the strategy taken.
- **Markets and Prices:** Cobalt is a "hot" commodity at the moment, and there is the risk of a fall in prices, which will affect the viability of Mt Thirsty, and the potential to fund upcoming activities; in addition the overall junior resources, although quite healthy, can turn on a dime - as mentioned previously the Project is highly sensitive to changes in metals prices and exchange rates.
- **Sovereign Risk and Permitting –** This should not be a significant risk, given that Western Australia is a well understood and relatively mining friendly jurisdiction, with a history of supporting resources projects, and that earlier environmental work did not uncover any major issues. A risk here however may be the time taken to permit any future operation, with delays in the permitting process common.

BOARD AND MANAGEMENT

- **Mr Gary Berrell – Executive Chairman:** Mr Berrell has a background in banking and finance and was an Executive Director of Macquarie Bank for seven years. He has had over 24 years' experience trading a broad range of products including foreign exchange, bonds, equities, futures and commodities. He has held a variety of management positions throughout this time. He has been involved in extensive committee work for financial markets associations covering areas of market regulation and prudential risk management, and has represented Australia at numerous overseas foreign exchange market conferences.
- **Mr Sean Gregory - Managing Director & Chief Executive Officer:** Mr Gregory has 18 years' experience in developing projects and supporting mining operations with BHP Billiton, Murchison Metals and Mineral Resources. Mr Gregory has worked on all aspects of the mineral value chain from geology, exploration, metallurgy, feasibility studies, approvals, construction, mining, logistics, economic evaluation and business development.

  Mr Gregory holds a Bachelor of Science (Hons) in Geology (UWA), MBA (UWA), Advanced Mergers & Acquisitions Program (University of Melbourne) and Company Directors Course Award (AICD).
- **Mr Grant Mooney – Non-Executive Director & Company Secretary:** Mr Mooney is the principal of Perth-based corporate advisory firm Mooney & Partners, specialising in corporate compliance administration to public companies. He has gained extensive experience in the areas of corporate and project management since commencing Mooney & Partners in 1999. His experience extends to advice on capital raisings, mergers and acquisitions and corporate governance.

  Currently, Mr Mooney serves as a director and company secretary to several ASX listed companies across a variety of industries including technology and resources. He is a Director of ASX listed resource companies Phosphate Australia Limited, Talga Resources Limited and renewable energy company Carnegie Wave Energy Limited. Mr Mooney is a member of the Institute of Chartered Accountants in Australia.
- **Mr Jon Young – Non-Executive Director:** Mr Young holds a Bachelor of Commerce Degree from the University of Western Australia and is a member of the Institute of Chartered Accountants in Australia. For nearly 30 years, Mr Young has worked in the financial markets and is currently Director Private Clients with Perth based national stock broking firm Patersons Securities Limited.

  For 12 years, until the sale of the underground mining contractor Barminco Limited in August 2007, Jon served as Non-Executive Chairman of the Barminco Group of companies, including Barminco Limited where he continues to serve as an alternate director.

  Mr Young is Chairman of Barra's major shareholder, FMR Investments Pty Ltd (formerly Barminco Investments Pty Ltd).
- **Mr Gary Harvey – Exploration Manager:** Mr Harvey graduated from the RMIT University with a BSc (Applied Geology) in 1994. He has over 20 years' experience in gold and nickel exploration with extensive experience ranging from grass-roots exploration through to near-mine evaluation and resource definition on a range of gold and nickel projects throughout the Eastern Goldfields of Western Australia.

  He has previously held project and senior exploration roles with Viceroy Australia Pty Ltd, Lionore Australia Pty Ltd, Forrestania Gold Ltd and Johnsons Well Mining NL. He has also held non-technical roles with Fortescue Metals Group Ltd and Hetherington Exploration and Mining Title Consultants.

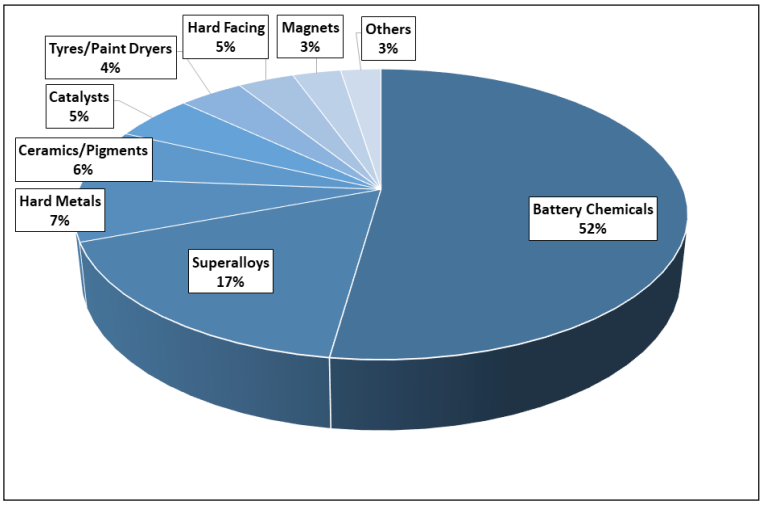
  Mr Harvey's particular fields of expertise are in target generation and evaluation of Archaean shear- and vein-style gold, and komatiite nickel sulphide deposits throughout the Eastern Goldfields of Western Australia.

BACKGROUND - COBALT AND MARKETS

USES

- Cobalt is a lustrous, greyish-silver metal with a high melting temperature (1,495° C), and retains it strength at high temperatures.
- It is one of only three naturally occurring magnetic metals (along with Fe and Ni), and can be alloyed with other metals, commonly to make so called "superalloys".
- It has a wide range of chemical and metallurgical uses as shown in Figure 6, with the major use being in batteries - it is expected that demand for batteries, particularly in electric vehicles, will drive overall demand for cobalt in coming years.

Figure 6: Cobalt uses

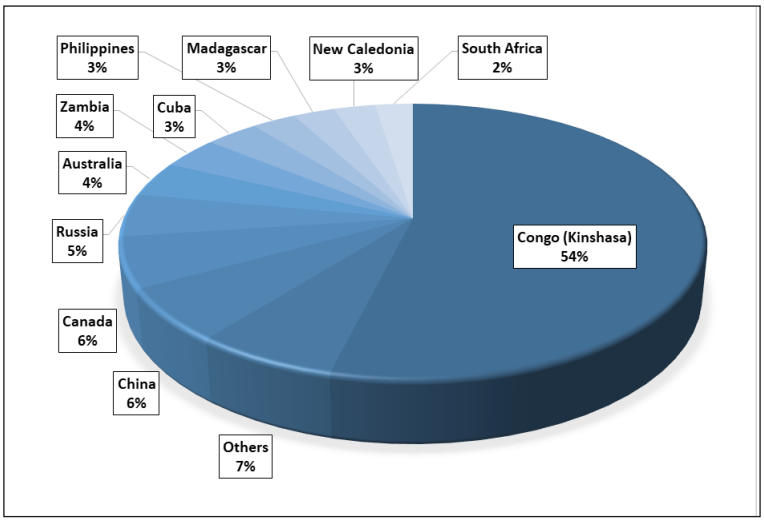


Source: UBS Global Research

PRODUCTION

- A notable feature of cobalt is that 99% of mine production is as a by-product of copper (~67%) or nickel (~32%), with only 1% from primary production.
- The majority of the copper associated production is in copperbelt style mineralisation, hence the concentration of production from the DRC (Congo-Kinshasa), with some from Zambia.
- Nickel associated cobalt production is largely from laterites, with this including production from New Caledonia, Madagascar, the Philippines and Cuba; cobalt is also a by-product of primary magmatic nickel deposits, including Sudbury in Canada.
- These are important points, in that cobalt supply is affected by the prices and hence production of nickel and copper.
- Figure 7 presents a breakdown of the 2016 mine production of an estimated 123,000t by country - this highlights the dominance of the DRC, with 54% of mine production.

Figure 7: 2016 mine production



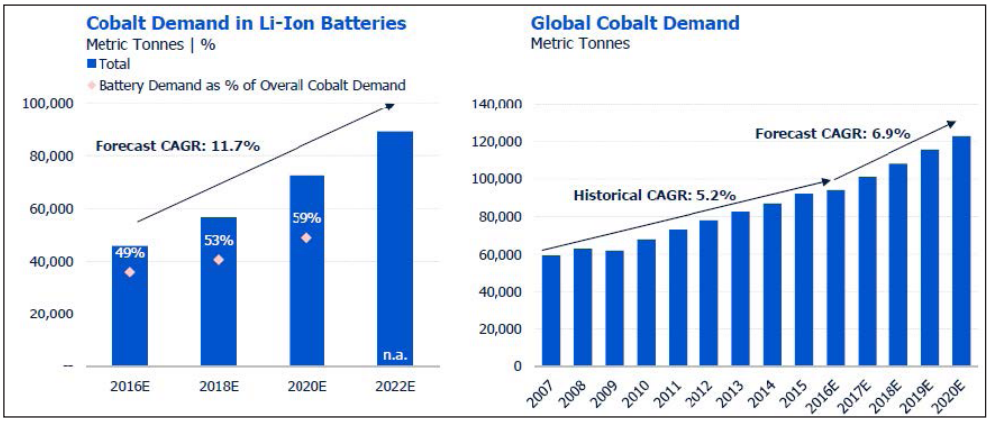
Source: USGS

- Mine production is also concentrated amongst producers; it has been estimated that Glencore produced some 24% of cobalt in 2016, mainly from Mutanda in the DRC, with Chine Moly contributing some 16% of global production from the Tenke operation in the DRC.
- There is significant latent capacity in the DRC, with the potential to add ~50kt over the next few years, including 30kt with the restart of Glencore's Katanga operation on which operations were suspended in September 2015.
- However this is at least partially offset by political and sovereign risks, with potential for supply disruptions; as such some end users may look for supply outside of this volatile region.

DEMAND

- Forecasters see overall cobalt demand being driven by the demand for Li-ion batteries, with cobalt being used in three main battery types due to its high energy density - this is presented in Figure 8.
- This shows forecast battery requirements doubling from 2016 levels by 2022, a CAGR of just under 12%- this does rely largely on assumed penetrations of electric vehicles into the overall vehicle market - forecasts range widely from ~20 million vehicles in 2030 to 140 million vehicles.
- The overall growth is forecast at 6.9% out to 2022, resulting in refined cobalt demand of over 120,000tpa - this follows on from robust growth of 5.2% CAGR from 2007 to 2016, driven by the growth in batteries.

Figure 8: 2016 mine production

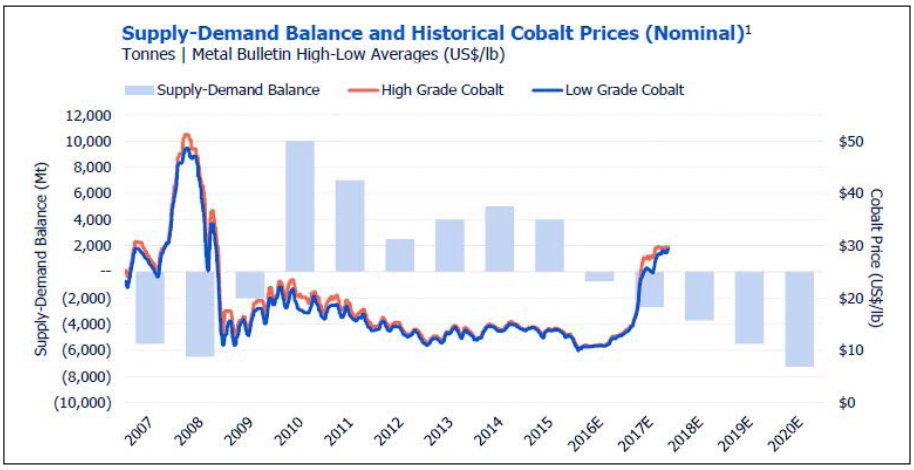


Source: Darton Commodities in UBS Global Research

PRICING

- Cobalt is characterised by highly volatile pricing, and reacting to stock levels - this is shown in Figure 9.
- This highlights the recent price rises, with the metal moving from US$22,000/tonne to US$60,000/tonne coincident with supply deficits and increasing demand.

Figure 9: Pricing and supply/demand balance



Source: Darton Commodities, Cobalt27, Metal Bulletin in UBS Global Research

- How pricing may play out in the future is hard to predict, with conflicting thoughts in the market place, however most commentators are bullish, with, as mentioned previously, long term forecasts ranging up to US$90,000/tonne, and more commonly in the range US$50,000 to US$70,000/tonne.
- The major unknown is the DRC, including the effect of the Katanga (and other) operations coming back on stream, however it would be expected that Glencore will ramp up production in a measured way to support prices.
- Given the forecast demand growth and potential for future supply risks, additional projects are required going forward, and these will rely on strong metals prices to be developed.

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