Chakana Copper

8 February 2021

Mining

Peruvian High-Grade Cu-Au-Ag Discovery, Enormous Upside

Key Data

Listing:	CVE
Ticker:	PERU
Shares Outstanding:	93.2m
Share Price:	C$0.58
Market Cap:	C$54.14m
Cash Balance:	C$3m
Options in the money	9.02 (0.32)
Asset Location:	PERU

Summary

- **Gold Fields increasing its holding from 16.8% to 19.99%**
- **16,000m infill drilling to target maiden Resource by end Q321**
- **Target Resource tonnage ~10Mt @ 2% Cu Eq.**
- **Breccia pipes are vertically extensive, open at depth**
- **Coalescing at depth, these larger pipes will increase tonnages significantly**
- **Identified 92 exploration targets**
- **Assuming US$7.7k/t Cu, EBIT margin >32% (including royalties)**

Located 260km north of Lima, Chakana has in its Soledad tenement package, a number of high-grade (>2% Cu Eq.) quartz-tourmaline-sulphide breccia pipes that outcrop at surface. All the drilled prospects associated with the Soledad project have depths greater than 300m, but importantly, hole SDH18-108 was in and out of mineralisation down to 887m below surface highlighting downdip extensional possibilities. Moreover, at least three sets of pipes, H1 & H2, B5 & B6 and potentially Paloma East and West are converging at depth, which will dramatically increase tonnages per vertical metre. An additional 10,000 metres of new drilling has been allocated to explore additional targets, of which there are an additional 85, above the seven which will have an estimated maiden resource by the end of the Q321.

To determine a rough in-situ value and how the orebody will potentially relate financially to that of an operating peer, we chose the Nifty copper deposit in WA, with similar scale and eventual mining method. The cost comparison period "Bear" scenario used 12-month rolling costs at a time when Nifty was operating at 40% nameplate capacity, and fixed costs had a disproportionate impact. Despite the high-cost input, assuming a US$7,700/t copper price, the resultant EBIT margin for the Soledad project would be ~32%. But if we assumed that mining and process costs could be lowered an approximate 20% less than what Nifty incurred (assuming everything else remained the same), the EBIT margin would increase to 39%, implying a capital payback in two and a quarter years.

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Follow the Money

One of the key developments in this recent capital raise is that Gold Fields is not only participating in this capital raise, but is increasing its holdings from 16.8% to 19.99%. Gold Fields own and operate mines in South Africa, Ghana, Australia and Peru. Interestingly, from a strategic view point, their growth efforts are primarily focussed in those regions where they currently operate, with corporate growth; in large part, driven by brownfields exploration on its existing land positions; but critically, they actively engage in mergers and acquisitions (M&A) within those same regions.

In Peru, Gold Fields operates the Cerro Corona mine, with Reserves that will be depleted by 2025. The key consideration behind their interest in the Soledad project is the belief in their own technical ability to identify projects at a very early stage. We would highlight Gold Fields interest in the Goldroad's "Gruyere Project" in Western Australia, which they eventually became 50/50 JV partners in; but not before they tried to acquire the company!

Table 1: Description for the use of proceeds (USD)

$5m	· Ramping up to three drill Rigs · 16,000m for infill drilling at Paloma East & West, Huancarama and B7. Expected to be completed by June · 10,000 allocated for new target testing (8 to 10 breccia occurrences). Expected to commence April and finish August 2021.
$100k	43-101 Resource Estimate
$150k	Metallurgical Programme
$250k	Permitting at Campanero and for underground development that will result in significant drill cost savings later on.
$450k	Additional geophysics, geotechnical, et.
$600k	Property payments, Condor & Rosales
$1.4m	Corporate and G&A

Source: Company reports, FD

M&A is not normally a cost-effective method of growth, because by definition whatever information is in the market place is available to everyone, and in a Perfect Market, assets are priced accordingly. Returns invariably never reach prior forecasts, the expected cost savings rarely materialise on time (or at all), usually the result of some "unforeseen" or "unanticipated" developing factors. But the main reason why almost all M&A transactions fail on a ROE basis is almost always down to the fact that these events involve a higher-than-anticipated price of acquisition.

Herein lies Gold Fields competitive advantage, having expertise in that specific field of endeavour, in-house proprietary knowledge, industry links, ability to get eyes on the ground and establish effective communication links with existing management; allows them to make educated projections/assumptions going forward, unmatched by anyone else. That is their competitive advantage. The fact that they are actively participating in this project, means that it has hit a number of key criteria, and the decision to invest funds has been taken at the highest level.

Gold Fields increased stake in Chakana fulfils two key objectives; namely (i) it provides pause for any other potential rival in acquiring a concern; and (ii) it gives them leverage at some stage into the future to either conduct either a production JV, and/or launch a takeover. We have personally seen Gold Fields take several positions in projects, and dispassionately dispose of them if they do not make the grade. The fact they are increasing their position gives insight into their thoughts on the project's potential.

Table 2: Select drill-holes completed on B1, B5, B6 and B7, Paloma East and West, as well as Huancarama. As Figure 15 in Appendix B demonstrates, there is apparent variation in commodity abundance from project to project and breccia pipe to pipe, even those that are interpreted to coalesce at depth.

Prospect	DDH	From (m)	To (m)	Interval (m)	Cu (%)	Au (g/t)	Ag (g/t)	Cu Eq. (%)*
B1	SDH17-018	0	209	**209**	0.96	2.22	69.6	**3.01**
	SDH18-059	0	233	**233**	0.85	1.36	57.2	**2.24**
	SDH18-077	0	244	**244**	0.91	1.41	55.6	**2.38**
B5	SDH17-041	0	176	**176**		1.81	27.5	
	SDH18-080	50	244	**194**	0.71	1.30	24.3	**1.77**
B6	SDH18-102	28	87	**59**	0.53	1.28	497.2	**5.63**
B7	SDH18-112	65	197	**132**	0.09	0.59	56.9	**0.96**
Paloma East	SDH20-133	132	148	**16**	0.89	0.50	24.2	**1.42**
	SDH20-135	0	173	**173**	0.35	0.31	13.2	**0.66**
	SDH20-138	3	229	**226**	0.36	0.34	16.9	**0.73**
Paloma West	SDH20-141	28	71	**43**	2.15	1.87	84.5	**4.09**
	SDH20-144	63	84	**21**	0.79	1.05	44.6	**1.84**
	SDH20-145	32	43	**11**	10.2	7.25	163.5	**16.34**
	SDH20-147	22	34	**12**	2.98	5.76	252.0	**8.90**
	SDH20-152	32	134	**102**	0.91	0.61	19.8	**1.48**
Huancarama	SDH20-159	71	210	**139**	0.29	0.30	39.2	**0.82**
	SDH20-160	93	219	**126**	0.53	0.31	34.6	**1.03**
	SDH20-161	86	193	**107**	0.48	0.28	33.7	**0.89**
	SDH20-162	101	173	**72**	1.32	0.79	46.9	**1.03**

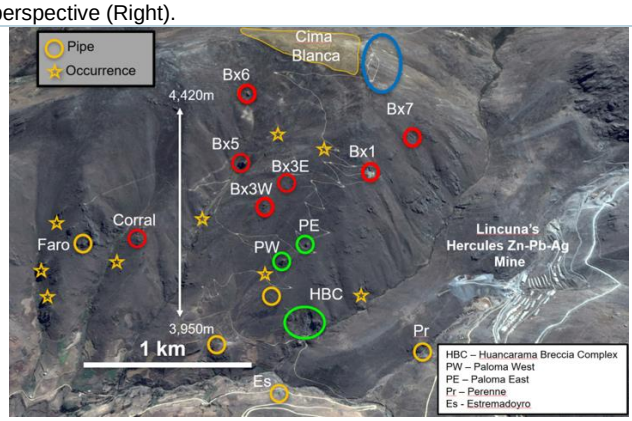
Source: Company reports, FD
* Cu Eq. (%) = Cu% + (Au g/t * 0.6556) + (Ag g/t * 0.00857).

Five million dollars of the funds for this current capital raise is designated toward a 16,000m infill drilling on Paloma East and West, Huancarama and B7, targeting the 0-300m depth range, not dissimilar to the densities that exist at B1, B5 and the upper part of B6. This drilling would be finished by the end of Q221, with a maiden Resource to be published by the end of Q321. There are plans to secure a permit to develop underground access to drill the downdip continuation (300-600m infill drilling) which should, in the long-term, be very cost effective. Management have also budgeted for 10,000m to target other areas of interest, in particular, the region around the Paloma fault, now believed to extend from the southwest to the northeast (*i.e*. B1 to B7 – see Figure 1).

Deposit Geology

The Soledad project is located approximately 260km north of Lima and 35km south of Barrick's Pierina mine, and is a region with a substantial history of copper, gold and silver extraction. The tenement package has a number of high-grade quartz-tourmaline-sulphide breccia pipes that outcrop at surface, originally centred around the Soledad and Companero districts (see Appendix A, Figures 10 & 11), which has been subsequently expanded and now includes 92 targets.

Figures 1 & 2: View looking north showing breccia pipes and occurrences within the northern Soledad cluster. Pipes that have been drilled in previous campaigns shown in red. Targets shown in green are the focus on this upcoming 15km drill campaign (Left); and looking northeast to the Huancarama Breccia Complex showing the five principal tourmaline breccia bodies exposed at surface (H1-H5 - located in and around the HBC in Figure 1). The breccia pipes typically form prominent outcrops with steep vertical walls. Drill rig in centre of image provides perspective (Right).



Source: Company reports (2021)

Copper-bearing tourmaline pipes are an uncommon but distinctive class of intrusion-related breccias that vary considerably in size and metal content. Hypothesised to form from granitic to granodioritic magmas, initiated at deeper crustal levels than much larger and more well-known copper porphyry deposits associated convergent margins. Management has three Re/Os molybdenite dates from three different tourmaline breccias that range in age from 15.16 to 15.33 Ma. The significance being that this is a relatively old age of formation, given the vast majority of large-scale Cu-Au porphyry deposits occurring on active craton margins globally are <20Ma[1], most of those occurring in far less dynamic region than that in Peru, implying that it took additional weathering time to expose these pipes at surface. Ironic that the tectonic processes responsible for their formation also ensure their rapid destruction.

Breccia pipe occurrences range from two to over 100, but typically occupy restricted areas geographically. No consistent structural control has been recognised. Most are sub-vertical. There is tremendous variability in pipe diameters, some as small as 3m, others 250 by 100m (*e.g*. Arauco), while at Los Bronces, one pipe had a diameter

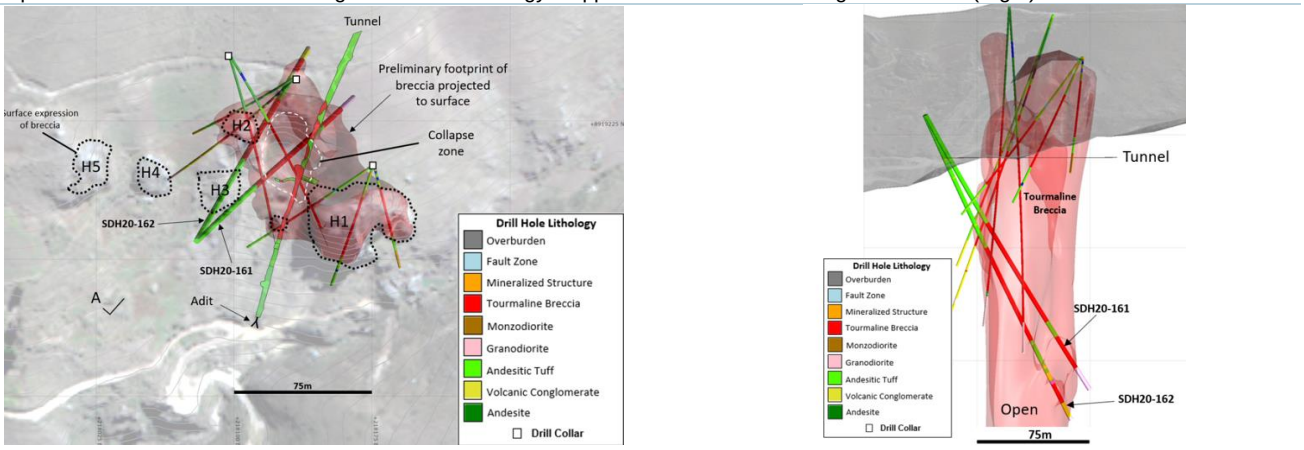
[1] Cooke, DR, Hollings, P and Walshe, JL (2005) "Giant Porphyry Deposits: Characteristics, Distribution, and Tectonic Controls". *Economic Geology*, v. 100 (5), pp. 801-818. doi: 10.2113/100.5.801. In contrast to porphyry copper deposits subtypes not based on tectonic settings, aka Singer, D.A., Berger, V.I., and Moring, B.C. (2008) *Porphyry copper deposits of the world—Database and grade and tonnage models*: U.S. Geological Survey Open-File Report 2008–1155. 56 p. Accessed at: *http://pubs.usgs.gov/of/2008/1155/*

of 1,200m. Whilst the top of these breccia pipes are readily recognised, rarely have they been documented at or near their bottom terminations. It is interesting in that context to note that on this basis, all the prospects at the Soledad project have interpreted depths much greater than 300m (see Figure 18). Which is also the reason why Management are keen to point out that SDH18-108 [2] was in and out of mineralisation to 887m depth, which is deeper than any known peers.

The geological model associated with these tourmaline breccia pipes is interpreted to be related to a deep, volatile-rich, intermediate intrusion, which we may (unfairly?) visualise as the shape of a relatively uniform magmatic diapir (see Figure 16). During crystallisation of the magma, volatiles accumulate in a cupola[3] developed on the intrusion until the pressure exceeds the overlying lithostatic/competency containment, resulting in hydrofracturing in the rock column above, creating a column of brecciated rock that tapers with distance above the intrusion. Therefore, each set of breccia pipes is related to a separate explosive event likely occurring above individual cupolas where volatiles and fluids accumulated. This geological model also implies that one would not expect any enormous variation in down-dip depth between individual breccia pipes from a single batholith, especially given many of them are expected to coalesce at depth.

Meaning, if a single (to date) pipe has been detected to 800m depth, and if all the pipes in the region are sources from that same intrusive, it is not an unreasonable assumption that other pipes will also approach those depths, which bodes well for future down-dip resource extensions.

Figures 3 & 4: Map of the Huancarama Breccia Complex* and drill hole lithology in holes completed to date. Red represents tourmaline breccia based on the first ten holes and lithology mapped in the underground tunnel. Black dotted outlines show surface expression of mapped breccias (Left); and x-section looking northwest highlighting the drill holes at Huancarama. Light red 3D shape shows preliminary shape of breccia based on the first eight holes and lithology mapped from within the underground tunnel (Right).



Source: Company reports (2021)

[2] https://www.chakanacopper.com/site/assets/files/3768/chakana_-_nr_2019-april_bx6_additional_drilling_results_final.pdf
[3] In geology, a "Cupola" is an upward protrusion from the roof of a large igneous intrusion, such as a batholith. But also refers to smaller bodies that connect at depth with larger masses.

The In-situ Value Proposition

Resource Tonnage Estimate

Management believes (*pers. comm*.) that the upcoming maiden resource calculations for seven of the breccia pipes are in the vicinity of 10Mt, which, we believe, could be conservative. The following discussion is neither JORC nor 43-101 compliant. It is merely using existing publicly available information and making projections covering potential resources, grade and mining comparison with a like methodology. It is completely outside the scope of this analysis to determine an NPV, which requires the calculation of Reserves[4].

Table 3: Ore resource parameters and estimates. Breccia pipes always have a primary oval orientation (see Appendix B, Figures 12 & 13) including B1 (Main and North zones), B5, B6 (upper breccia), B7, Paloma East, Paloma West and Huancarama. We understand that B1 will be calculated to approximately 350m below surface.

Soledad Shoot Dimension Assumptions	
Specific Gravity*	3
Dimensions (Width) metres	40
Dimensions (Length) metres	50
Shoot Height (B2 to B7)	300
Shoot Height (B1)	350
Pi	3.141592654

Tonnage per Shoot Est.	
Surface Dimensions (radius W x radius L x Pi) msq	1,571
Volume metres cubed	471,239
Tonnage per ore shoot	1,413,717
Six Shoots collectively	8,482,300
B1 Shoot Tonnage	1,649,336
Resource tonnage (Mt)	**10.13**

Source: Company reports, FD
* Used 3.0 for S.G., the first 50 density samples averaged 2.94, but the average included lighter density wall-rock samples.

Key Considerations and Assumptions

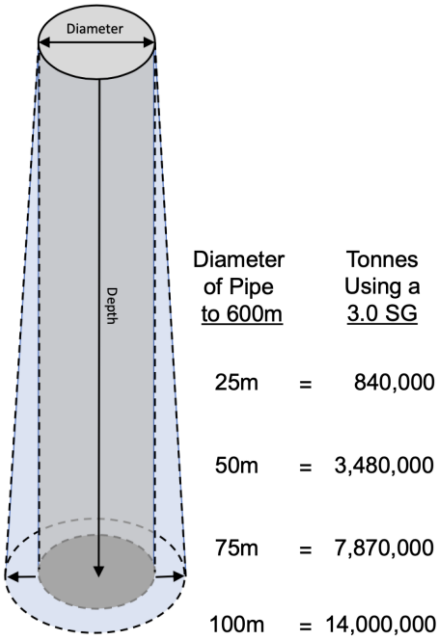
- Due to inherent regional stresses, brecciated pipes always have a primary oval orientation (see Appendix B). The Soledad breccia pipe width dimensions range from 25 to 200m. Separation at surface between the pipes is ~100-500m. To be accurate in our estimation, we calculated elliptical dimensions (using width x length x π).
- Back-calculating Management's resource objective, taking into account that the maiden resources will only incorporate the first 300m depth, implies that the average shoot cannot exceed 40 x 50m (see Table 2). Examining several x-sections, the average dimensions appear to be 50 by 70m, but that would suggest a tonnage of ~18Mt. Variation is the norm, Management makes the point that at Huancarama, approximate horizontal dimensions

[4] Reserves typically require a Measured and/or Indicated Mineral Resource overlain with a prefeasibility study, encompassing mining, processing, metallurgical, and economic parameters, demonstrating that at the time of reporting, economic extraction is possible.

are 50 by 100m, whilst at Paloma East, the breccia pipe starts with 25m diameter at surface, expanding to 50m diameter at 100m depth, then a 100m diameter at 200m depth.

- Tonnage estimate ignores the fact that the recent H1 and H2 discoveries at surface located approximately 80m apart and separated by andesitic tough; at depth appear to coalesce into a single large intrusion (see Figures 3 & 4), with apparent dimensions ~75 by 95m, several hundred metres below their subsurface outcrop. This observation fits with prevailing geological hypothesis as to their increased depth of their formation compared to their porphyry-related cousins, that typically flare upwards as a result of lessening lithostatic pressure.

Figure 5: Tonnage considerations – hypothetical tonnage of a pipe at various diameters. Note that this example is cylindrical, breccia pipe formation typically occur as ovals, hence we have incorporated that type of morphology in our tonnage estimates.



Source: Company reports, FD

- The working hypothesis is that many, if not all, nearby breccia pipes will unite into a single intrusive complex perhaps to the size of the original cupola zone. If true, the implication is that these coalescing pipes would, in time, dramatically increase ore tonnages per vertical metre of descent. Obviously, this would have a significant positive impact on the project economics.

Grade and In-situ Value Estimate

The publicly quoted target grade by Management is 2% Cu Eq. With 52 drill holes in B1 (totalling 6k, including the main zone and the adjacent North Zone), the average Cu Eq. grade was 2.90% Cu Eq. In contrast, B5 averaged 1.8% Cu Eq.

Table 4: Grade and implied in-situ value.

Soledad In-situ Value	
Resource tonnage (Mt)	10.13
Soledad Cu mined Grade	2% Cu Eq.
Copper in-situ (t)	202,633
Copper price per tonne (USD)	7,700
In-situ vaue $Bn	**1.56**
In-situ vale per tonne of ore (USD/t)	**154**

Source: Company reports, FD

Key Considerations and Assumptions

- Company Cu Eq. calculations use $2.90/lb Cu (current price 21% higher at $3.50/lb), $1,300/oz Au (current price 42% higher at $1,850/oz), and US$17/oz Ag (current price is 59% higher at $27/oz).
- The formula utilised to calculate Cu Eq. values is (%) = Cu% + (Au g/t * 0.6556) + (Ag g/t * 0.00857). Because there is no calculated Resource, we are unable to ascertain the relative abundances of precious metals to copper. Other than to point out that precious metals appear to be under-represented in the Cu Eq.
- No adjustments have been made for metallurgical recovery as the project is early-stage exploration. However, calculating Cu Eq. grades is a misnomer, in that a single number could reflect an orebody without taking in operating variables. For example, overall copper recoveries average ~86%[5] at Ok Tedi, whilst gold average is ~59%. Equivalent numbers are fraught with danger, in that they imply that recoveries for both metals are similar, which is patently not the case. Metallurgical characteristics vary significantly from porphyry deposit to porphyry deposit, ore types, even within a single Resource.
- We expect, within a single breccia pipe, to see internal grade variation as a genetic consequence of its formation (see Appendix B, Figure 12 & 13). The most permeable zones to induce mineralisation are located within the pipe lobes and around the pipe margins, contrasting with a relatively less permeable central zone adversely affect by rock flour generated from fluidised fracturing above cupola zone. This expected relationship has been confirmed at the Soledad project, with highest grades observed on the margins of the breccia ore bodies.

[5] Ok Tedi Mining Ltd Annual Review 2018 (2019) p.30-31 https://oktedi.com/wp-content/uploads/2019/05/OK-Tedi-Annual-Review-2018-Web.pdf

Mining Cost Comparison and Possible EBIT Margins

What is the in-situ value of the Soledad project and how does the orebody potentially relate financially to that of an operating peer?

We believe a directly comparable analogue is the Nifty Underground operation, with a similar mining method to that proposed for the Soledad project; open stoping methods with backfill, typically 25m wide, and 25 to 50m in length. The stratabound copper is structurally controlled, chalcopyrite replacing carbonaceous shales, with the majority of economic mineralisation hosted within the keel and northern limb of the syncline. Processing was via conventional comminution, grinding and flotation, producing a copper concentrate, which was transported 350km to Port Hedland.

Table 5: 12-month Operating Costs associated with Nifty Copper operations, WA.

Nifty Copper Comparison (BEAR CASE)	
Nifty Cu mined Grade	1.44%
Mine Type	Underground
Mining Method	Open stoping & backfill
Process	Flotation
Nifty Operating Costs (Q319 - 12 month rolling)	
AUD/USD	0.70
Mining Cost (USD/t)	45.52
Processing cost (USD/t)	24.45
Sustaining Capital (USD/t)	8.60
Exploration (USD/t)	1.67
TCRC (AUD/t Cu)	*15.23*
TCRC (USD/t)	10.66
Depreciation & Amortisation (AUD/t Cu)	*1,312*
Depreciation & Amortisation (USD/t)	9.14
Attributable Nifty Production Costs (USD/t)	**100.05**
Soledad Comparison using Nifty Operating Costs	
Peruvian Cu Royalities* (USD/t)	4.62
Soledad EBIT (USD/t)	49.33
Soledad Operating Margin (including Peruvian Royalities)	**32.0%**

Source: MLX (2019)[6], Company reports, FD
* Peru introduced a profit rather than a revenue-based royalty system. Given that this tax has several components, we have a vanilla 3% gross revenue.

Key Considerations and Assumptions

- Proposed mining method for Soledad and that used at Nifty are very similar.
- Soledad project will be significantly shallower for at least a decade, helped by topography, lowering need for decline development. The use of backfill will reduce trucking to a surficial waste/mullock dump.
- Breccia pipes have inherent grade variations. The opportunity exists in calculating Reserves to leave significant internal pillars (see Appendix B). Contacts between breccia pipes and wall rock are sharp, and generally marked by vertical, sheeted quartz-tourmaline veining. Grade control should be relatively accurate.

[6] https://www.metalsx.com.au/wp-content/uploads/2019/11/20190930-September-Qtrly-Report.pdf

- The application of Q319 Nifty 12-month rolling cost base represents the "Bear" scenario, as these inputs were incurred at a time when the project was operating far below nameplate capacity and was put on care and maintenance several months later. Implies that fixed costs had a disproportionate impact on reported figures.
- We estimate that if Nifty's cost base was applied to the Soledad project, the resultant EBIT would still have a 32% margin. But if we assumed that mining and process costs could be lowered an approximate 20% less than what Nifty incurred, which is not an unreasonable assumption given production was ~40% of design capacity, then EBIT margin would increase to a more realistic 39%, which implies a capital payback in two and a quarter years!

Summary

The most obvious comparison to this project is South American copper porphyries, which are several orders of magnitude larger, often at a fifth of the grade. Many require in excess of $100-150m for drilling, metallurgical and feasibility studies. Capex is in the billions, with large developmental lead times. Collectively, the accumulation of costs naturally precludes the vast majority of market participants, left to those select few who have the financial and technical resources to develop these deposits. If you are a junior/mid-tier producer, your business model is completely reliant on a third party buying the asset out-right or undertaking a corporate takeover.

The Soledad project, by comparison, is potentially a relatively modest-capex, high-grade selective mining operation, well within the funding and operating capabilities of a mid-tier miner. Hence the interest from Gold Fields, even for a company of its size, the idea of developing an in-country deposit with existing personnel, a 2% Cu Eq. grade, in the range of tens of millions of tonnes extractable resources, is an attractive proposition.

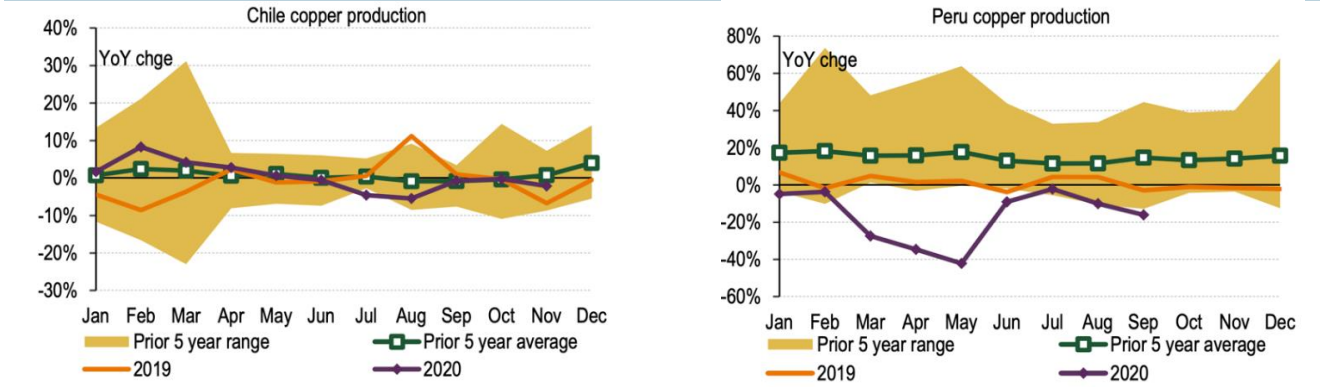
Breccia pipe occurrences typically occur within a restricted area geographically. A number of discrete pipes are expected to both increase in size and coalesce at depth, where it would be a reasonable assumption that tonnages would increase substantially per vertical metre. We fundamentally believe that the risk/reward equation is on the investor's side, with an ongoing extensional drill programme to increase current targets, with a separate allocation of 10,000 metres to be directed at new targets; and a maiden Resource due by the end of Q321.

Appendix A - Why Copper? In the Short-term, it's all about China

Copper is the consummate industrial metal, its demand a direct reflection of the global economy, and more recently, the electrification and industrialisation of countries such as India and China. However, as a result of economic disruption caused by COVID-19, there have been falls in demand in both the US (-5%), EU (-11%), and Japan (-17%). Despite this bleak situation, Chinese 2020 copper consumption was up 4% y-o-y, now estimated to be >13Mt. With primary mine supply estimated at around 20Mt, the Middle Kingdom now consumes ~65% of primary supply, or 52% including secondary stocks (up from 10% in 2000).

Copper supply has effectively plateaued over the past four years, with the advent of the covid pandemic, and production declines from Chile and Peru, which collectively account for ~40% of global primary supply. Declining Chilean production is the result of lower grades, strikes and weather-related disruptions. In Peru, Q320 production was down 9% y-o-y, including Antamina and Las Bambas, with strikes at the Candelaria. Zambian mined and refined copper output was negatively affected by new import duties on concentrate. The copper market in 2021 is likely to be in deficit.

Figures 6 & 7: Chile's copper production keeps contracting YoY (Left); as does Peru's production profile (Right).



Source: BofA (2021)

In China's most recent five-year plan (commencing in 2021), it highlighted the need for dramatic increases in state reserves of crude, strategic metals (including copper, cobalt and REEs) and farm goods. *Bloomberg* has reported that the State Reserve Bureau (SRB)[7] has been actively buying copper on-market to meet this strategic objective. Coupled with its deteriorating relations with the U.S. and its allies, fear of economic boycotts/retribution may have spurred additional purchases.

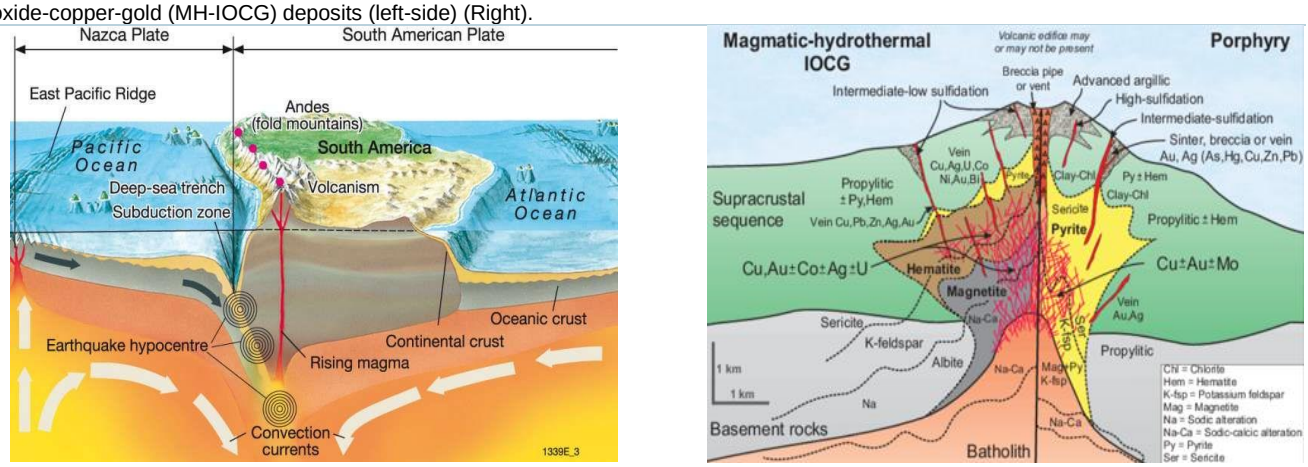
Purported future growth centres around the evolution of EVs and associated power infrastructure. *Citi* believe that primary demand is set to grow over the next five years by ~450ktpa (2% pa) in its base case, and ~670ktpa (3% pa) in the bull case.

[7] The SRB is the agency responsible for managing most of China's raw material stockpiles, its role is to maintain China's economic and geopolitical security by ensuring the country's industry can continue to function during major interruptions to commodities supply.

Appendix B - Regional Geology and the Porphyry Cu/Au Mineralisation Model Associated with Breccia Pipe Formation

Peru lies along the edge of the Pacific Ring of Fire, in a virtually continuous series of oceanic trenches and volcanic arcs/belts defining the edges of continental plate movements. It encompasses 75% of the world's active volcanoes, with all but three of the world's 25 largest volcanic eruptions over the last 11.7Ma, and is responsible for 90% of the world's earthquakes. The movement mechanism is thought to be related to convection in the earth's mantle (see Figure 8). This region has a high geothermal gradient, resulting from water-bearing rock in the form of subducting oceanic crust, forced beneath the adjacent continental crust; as it decomposes and melts, hydromagmatic diapirs are created.

Figures 8 & 9: The location and relative direction of movement of tectonic plates. Where the two plates meet, the denser oceanic lithosphere of the Nazca Plate[8] is forced down and under the more buoyant continental lithosphere of the South American Plate, in a process called subduction. This is marked on the ocean surface by the presence of the Peru-Chile (or Atacama) Trench. (Left); and magmatic-hydrothermal systems, illustrating the relationship between S-rich porphyry Cu ± Mo ± Au deposits (right-side) and S-poor magmatic-hydrothermal iron oxide-copper-gold (MH-IOCG) deposits (left-side) (Right).



Source: Richards *et al.* (2013)[9], USGS (2020), FD

Porphyry[10] copper deposits form in and around convergent plate-margin boundaries. These plutons rise as isothermal Newtonian fluids, until they reach isostatic equilibrium, forming from hydrous intermediate-to-felsic magmas emplaced within the upper 5km of the crust, from which hydrothermal fluids exsolve and deposit copper and gold via fluid–rock interaction. The associated fluids ultimately cool and eventually form economic concentrations within structural and stratigraphic traps.

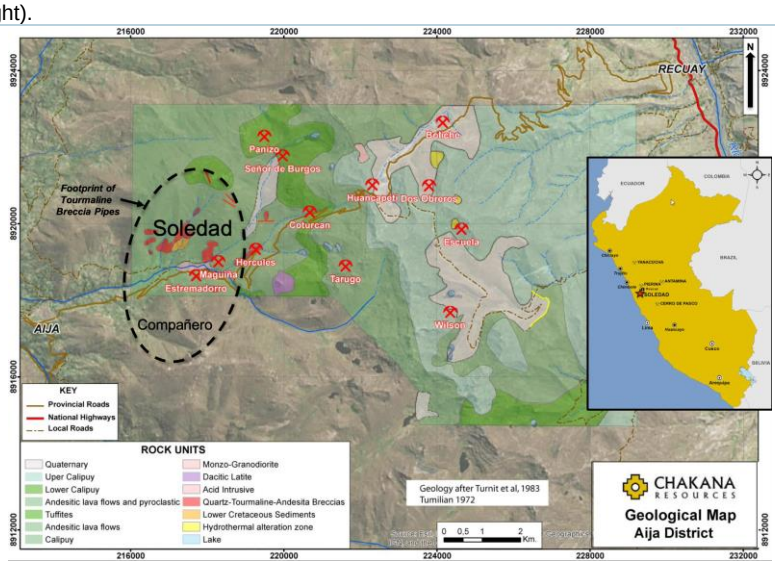
[8] Named after the Nazca region of southern Peru, it is an oceanic tectonic plate in the eastern Pacific Ocean basin off the west coast of South America, primarily responsible for the Andean orogeny. Approximately 15.6Mkm^2, it is the fastest moving plate in the Pacific Ocean, averaging 3.7cm per annum over the past 23Ma.

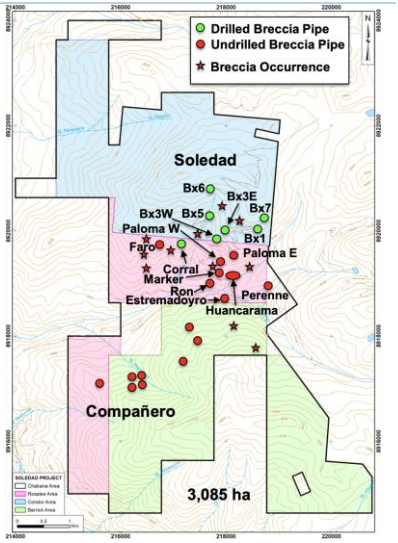
[9] Richards, J. & Mumin, H. (2013) "Magmatic-hydrothermal processes within an evolving Earth: Iron oxide-copper-gold and porphyry Cu Mo Au deposits". *Geology*, v. 41 - 10.1130/G34275.1

[10] Typically predating these fluids are vertical dikes of porphyritic intrusive rocks from which this deposit type derives its name.

Because their formation is associated with continental margin deformation, the vast majority of these large-scale porphyry deposits are typically less than 20Ma[11]; which by definition, also limits their geological preservation as the genetic tectonic processes responsible for their formation, also ensuring their rapid destruction. Management have three Re/Os dates on molybdenites from three different tourmaline breccias that range in age from 15.16 to 15.33Ma, which in porphyry terms, are quite old given its active tectonic environment.

Figures 10 & 11: Location of Soledad project in Central Peru (Left); and Soledad Project showing known breccia pipes and occurrences (Right).





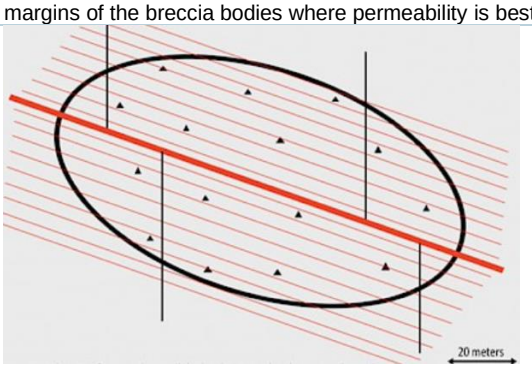
Source: Company reports (2021)

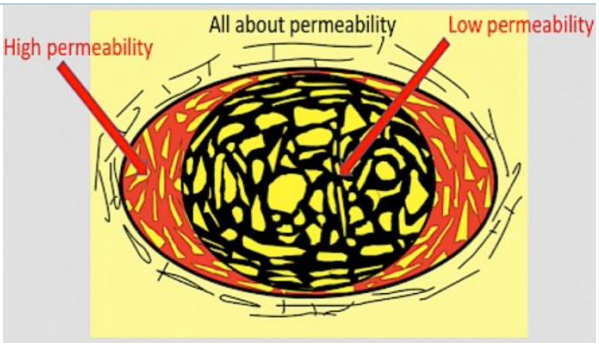
[11] Notable exceptions include the 438Ma Cadia-Ridgeway deposit, NSW, Australia.

Appendix C –Breccia Pipe Morphology and Genetic Formation

Copper-bearing tourmaline pipes are a distinctive class of intrusion-related breccias, which vary considerably in size and metal endowment and have particular emplacement morphology. Our understanding of geomechanics is that these pipes operate via three mutually perpendicular (normal) stress directions[12]; typically referred to as Sigma 1, Sigma 2, and Sigma 3. Because principal stresses are always perpendicular to principal plane[13], two stress directions (Sigma 1 and 3 - see Figure 12) are always perpendicular to each other. Sigma 1 is defined as the greatest compressive stress (*i.e*. represented by the shortest distance between the two sides of the Breccia pipe), whilst Sigma 3 is the direction of least principal stress (*i.e*. the longest distance between the two sides of the oval). Because Sigma 1 and 3 never exist in equal measure (*e.g*. hydrostatic pressure), breccia pipes always have a primary oval orientation.

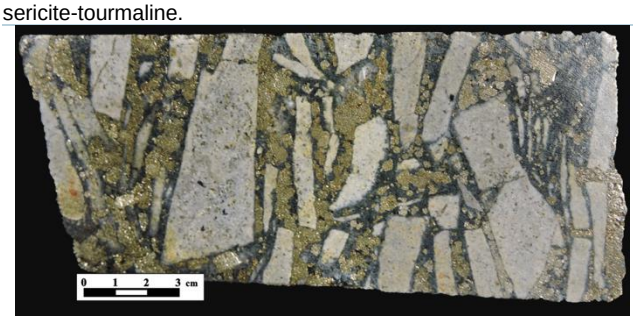
Figures 12 & 13: Tourmaline pipes always have a long axis parallel to the trend of the dominant local structure, given it's the path of least resistance (Left); and following the initiation of the pipe, the outside fracture zones become incorporated into the structure, as the wall rocks experience hydrologic failure. The most permeable zones for mineralisation, therefore, reside within the pipe lobes and margins, with the more fluidised central zone experiencing reduced permeability as a result of rock flour (Right). At Soledad, the highest grades are observable on the margins of the breccia bodies where permeability is best developed.





Source: Company Reports

Figures 14 & 15: Mineralised tourmaline breccia, Soledad Pipe 6, DDH108: 186m with 1.3g/t Au, 0.92% Cu, 159g/t Ag, 0.36% Pb and 0.42% Zn, showing distinctive breccia textures (Left); and Soledad Pipe 1, SDH17-034, 0.31g/t Au, 6.92% Cu, 124g/t Ag (Right). Within the breccia, sulphide mineralisation occurs in the matrix and as clast replacement. The clasts themselves are tabular, and strongly altered to quartz-sericite-tourmaline.

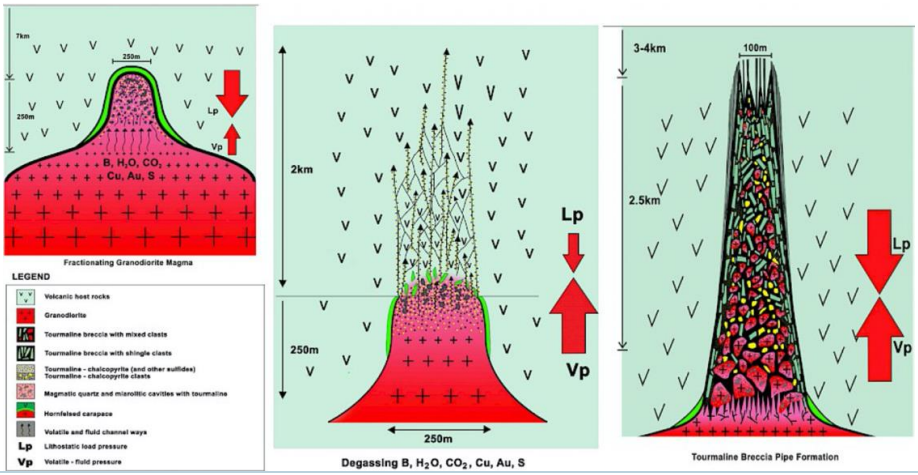


Source: Company Reports

[12] Sigma 2 is always vertical, and is best understood as the continual lithostatic pressure of the earth above.
[13] Defined as a plane where no shear stress exists.

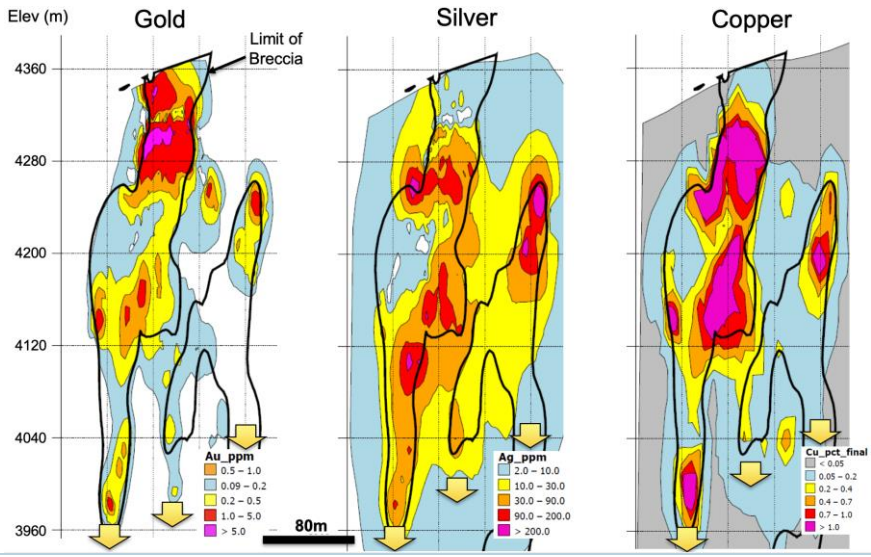
The breccia pipes are primarily hosted in the Calipuy group volcanic rocks, consisting of andesite flows, tuff and dacite, with a composite sequence thickness >2km. The secondary host is a monzodiorite intrusive. The highest metal concentration is typically observed near the inside margins of the tourmaline pipes, especially within the non-porphyries, where there is intense development of shingle breccias.

Figure 16: Hypothetical sections showing the three stages of tourmaline breccia pipe formation. Emplacement of volatile-rich intrusion (B, H_2O, CO_2) and subsequent accumulation of volatiles in apical positions during crystallisation (Left); and vapour pressure exceeds lithostatic pressure, leading to degassing and hydrofracturing above cupula with extensive alteration and sheeted veining (Middle); and finally catastrophic rupture of rock column, retraction of cupula zone, creating a void, with the resultant collapse of breccia into open space, followed by an implosion creating decompressive shock textures (Right).



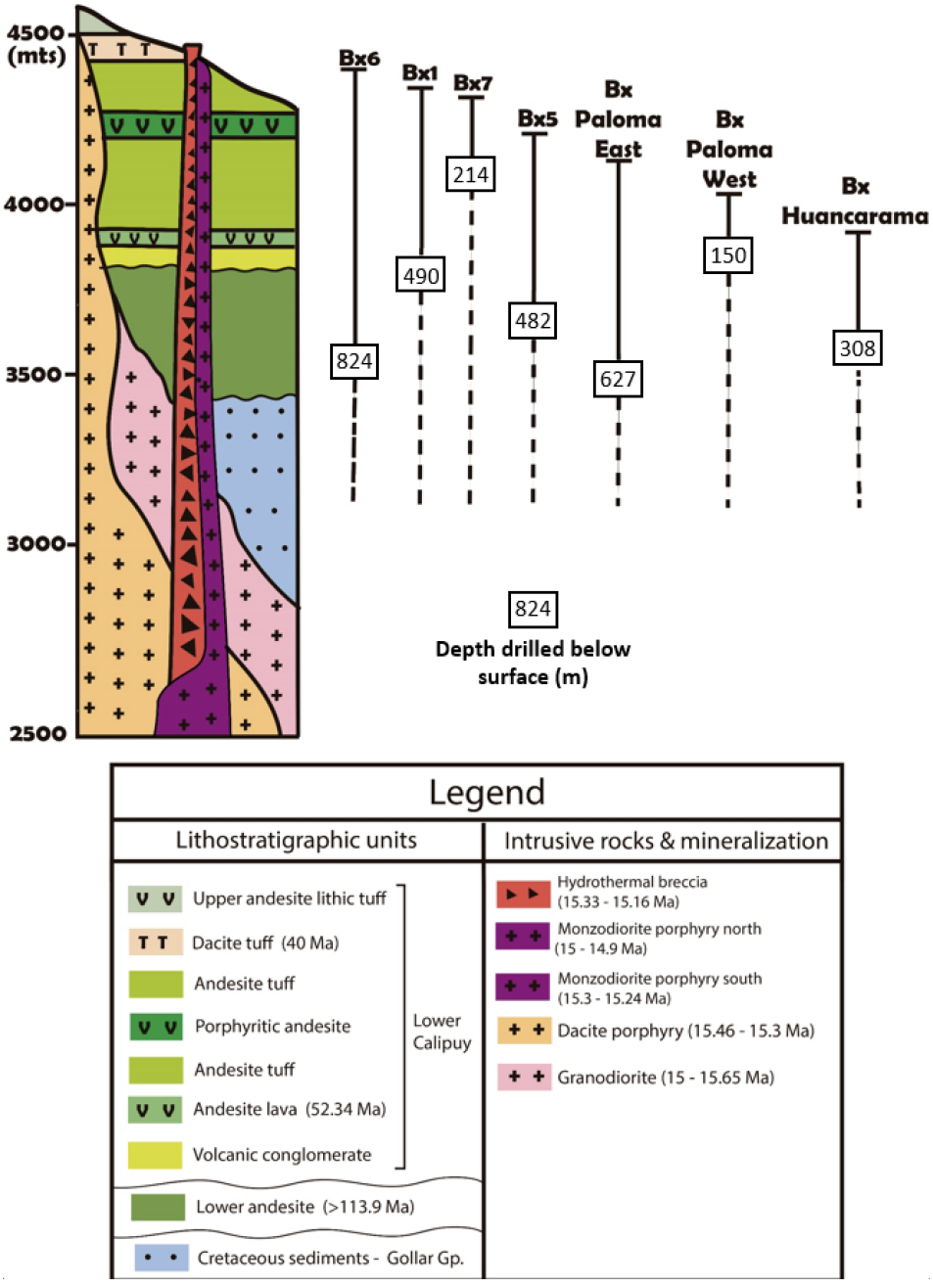
Source: Company reports

Figure 17: B1 Cross-section looking West showing mineral zonation's. Unusually, gold and copper mineralisation display disparate regions, normally they occur together. For example, thermodynamic data from VMS deposits, essentially a submarine high-sulphidation epithermal event, precipitates out different metals at varying temperatures once they hit the thermocline, (i) copper/gold initially, followed by (ii) zinc/lead, and then (iii) iron. In epithermal deposits, silver values increase markedly below the gold rich boiling zone. However, we accept the possibility that observable mineral relationships could be an artefact of insufficient drilling density.



Source: Company reports

Figure 18: The Soledad project stratigraphic column. The key point of interest is that the geological model associated with these tourmaline breccias should all be related to a single, relatively uniform, magmatic diapir (see Figure 16). Therefore, it is a reasonable assumption that there should not be any significant variation between the eventual depth in mineralisation associated with each breccia pipe, especially given many are expected to coalesce at depth. For example, the surface location of B6 is 500m higher RL than that at Huancarama, yet down dip drilling, on a stratigraphic basis, is remarkably similar. It also implies that ore shoots such as B7 will eventually be as deep as any other breccia pipe event.



Source: Company reports

Appendix D - Directors & Management

DAVID KELLEY (CEO) – Geologist/Geochemist with >25 years of exploration experience throughout the Americas, Central Asia and Australasia. Most recently, developing a programme at Las Bambas for MMG as GM of Exploration (Americas). Prior to that he worked for Oz Minerals, Zinifex, Newmont, WMC, BHP, Westmont Mining and Gold Standard. Involved in the discovery of the Zuun Mod Mo-Cu deposit in Mongolia, the Wayamaga Au deposit in French Guiana, and the High Lake East VHMS deposit in Nunavut. B.Sc. from Colorado State, M.Sc. in geology/geochemistry from the Colorado School of Mines. Past President of both the Society of Economic Geologists and the Association of Applied Geochemists.

DOUGLAS J. KIRWIN (Chairman) – 45 years of exploration experience, held senior positions with Anglo American and Amax, was a consulting firm MD, VP for Indochina Goldfields and Ivanhoe Mines. Director of South Gobi Energy, Jinshan Gold, and non-executive director of Ivanhoe Australia Ltd; including being an adjunct professor at James Cook University. Co-recipient of the PDAC Thayer Lindsley medal for the most significant international mineral discovery in 2004 (Hugo Dummett deposit, Oyu Tolgoi). Associated discoveries include the Jelai-Mewet and Seryung epithermal deposits in north east Kalimantan, the Eunsan-Moisan gold mines in South Korea, the Moditaung gold deposits in Myanmar and the Merlin Re-Mo deposit in Australia.

JOHN BLACK (Director) - Geologist with >30 years of exploration experience in the Americas, Central Asia, the SW Pacific, Eastern Europe and Western Asia. Founding President of Antares Minerals Inc., instrumental in acquiring the Haquira project in Peru and a key driver negotiating the sale of Antares to First Quantum Minerals for C$650m. Worked with Bear Creek Mining, Kennecott Minerals, Rio Tinto and WMC. Currently serves as a Director/Advisor for several private and public exploration companies. B.Sc. and a M.S. degree in Geology from Stanford University.

DARREN DEVINE (Director) - Principal of CDM Capital Partners, specialising in corporate finance. Director and/or officer to a number of junior public companies in the natural resource and technology sectors. Member of the TSX Venture Exchange's Local Advisory Committee. Qualified barrister/solicitor, practising in the area of corporate finance and securities law in British Columbia, England and Wales.

THOMAS E. WHARTON, JR. (Director) - >30 years of experience in the development, marketing, management, financing, sale of early-stage companies. Investment Manager for Saint Thomas Capital Partners, specialising in junior mining, O&G, and technology companies. Early management and initial financing of DoubleClick, now owned by Google. Equity financing of various internet companies including Vente and Cheetamail, later purchased by Experian; and Trancentrix, which was purchased by Ruesch. Director of Ely Gold Royalties, Dolly Varden Silver and Angel Gold. Bachelor's in Bus. Admin. from Creighton Uni.

XAVIER WENZEL (CFO) – Bi-lingual CPA, with >20 years of accounting/auditing experience, and has served as the CFO for a number of other exploration companies.

Appendix E - Peru Background, Economic Freedom & Transparency

Human history in Peru spans at least 11 thousand years, with some of the oldest civilizations appearing six millennia around the coastal provinces of Chilca and Paracas. It hosted the Norte Chico civilization (3100 to 1800 BC) regarded as the oldest civilization in the Americas and one of the sixth oldest globally; as well as the Inca Empire (1200 to 1572 AD), considered to be the largest and most advanced state in pre-Columbian America. In fact, the name "Peru" is derived from a Quechua Indian word implying land of abundance. Conquered and colonised by the Spanish, Peru gained independence in 1821.

Geographically, Peru can be divided into three broad longitudinal regions: (i) the western arid region is dominated by the cold Humboldt Current along the Pacific shoreline; (ii) the Sierra/Andes Mountain chain, the result of convergent plate-margin boundaries; and (iii) the tropical Amazon Basin to the east.

According to the CIA, overall Peruvian urbanisation is ~80%, with a third of the population residing along the desert coastal belt in the west, particularly around the capital city of Lima. Half of the population live within the Sierra/Andean highlands; whilst the Amazonian Basin portion is sparsely populated. Three-fifths of the population identify themselves as *Mestizos* (mixed Indian/European ancestry), the *Quechua* Indians make up a further 25%. In addition, there are a number of other significant minorities, including European, Aymara Indian and Japanese.

According to the World Bank, in recent decades Peru experienced two distinct economic periods. The Peruvian GDP grew 6.1% CAGR from 2002-13, with the poverty rate (US$5.5 pd) falling dramatically from 52.2% to 26.1% percent. Followed by an annual average rate of 3.1%, primarily as a result of lower international commodity prices, in particular copper, the leading Peruvian export commodity.

Peru is the second-largest producer globally in copper, zinc and silver. It is also the world's third largest lead, fourth-largest tin/molybdenum producer; and to cap it off, the eighth-largest gold producer.

The mining industry contributes around 10% of Peruvian GDP (2019), with the national Ministry of Energy and Mines estimating current investment intentions total around US$57Bn. Country exploration in 2020 (covering 64 projects) was estimated at $498.6m. Projects entering construction, of which 71% are copper related, total $40.9Bn.

According to the Index of Economic Freedom (2020), Peru's collective score was 67.9, unchanged from the previous year. Overall, it ranks as the 51st best placed country to do business globally, behind Belgium at 48 but ahead of Slovenia at 52. The top four places rated to do business are, in order, Singapore, Hong Kong(?), New Zealand then Australia. The United Kingdom came in 7th and United States 17th.

Peru rates relatively well in several areas: in tax burden, governmental spending, fiscal health, monetary, trade, and investment freedoms. The top personal income tax-rate is 30%, and the corporate tax rate is 28%. In the most recent year, overall tax revenue as a percentage of GDP fell to 13.7%. Total domestic government expenditures are ~21.3% of GDP, with budget deficits over the past three years averaging 2.4%; public debt is now ~26.8% of GDP. Domestic inflation in 2019 was 2.14%. The total value of exports and imports of goods and services equalling ~49% of GDP.

Transparency International's *Corruption Perceptions Ind*ex had Peru equal 101st to out of 180 nations, equivalent to countries such as Thailand, or Bosnia and Herzegovina. As of November 2020, no less than 68 of the 130 current parliamentarians are under criminal investigation. Francisco Sagasti, Peru's new centrist president, chosen in the wake of recent protests, was probably selected, in large part, due to the fact that he is not suspected of any corruption. Which is remarkable when one considers that seven of Peru's prior presidents have all been accused of exploitation, and are either indicted, arrested or already residing in gaol.

Research Disclosures


Gaius L.L. King

Gaius L.L King has 25 years' experience in mining, exploration, corporate finance, mineral economics, and as a resource analyst. As a geologist, he worked five years in various underground operations, and was involved in discovering and delineating ~2.6 Mt @ 3.5% Ni from a variety of ore bodies. Gaius has analysed fundamental supply and demand of iron ore, nickel, PGE, uranium, gold, REE, borate and lithium, among others. As an analyst, he has specialised in the mid-tier/junior sectors, covering mining stocks on the ASX and AIM.

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