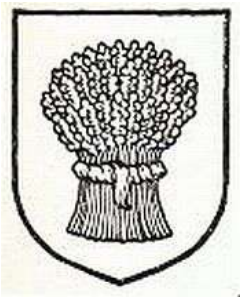
Tuesday, May 2, 2023



HALLGARTEN + COMPANY

Initiation of Coverage

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Southern Hemisphere Mining

(ASX:SUH, FSE:NK4)

Strategy: LONG

Key Metrics	
Price (AUD)	$0.015
12-Month Target Price (AUD)	$0.06
Upside to Target	300%
12mth high -low	$0.013 to 0.0274
Market Cap (AUD mn)	$7.09
Shares Outstanding (mns)	472.4
Fully diluted	510.6

Tuesday, May 2, 2023

Southern Hemisphere Mining

An Unsung Potential Mid-Tier Copper Player

- ➕ After a long period of flying under the radar, the company, and its projects (in Copper and Manganese), has emerged from hibernation since 2021
- ➕ Copper prices, a couple of years ago, broke out of their decade-long malaise and despite some setbacks have largely trended higher, now standing above $4/lb
- ➕ Drilling recommenced in 2021 after a long hiatus and several campaigns (including testing previously unassayed core) lays the ground for a revised resource estimate
- ➕ New geological interpretation on the possible linkage between the Cerro De Oro-Ferrocarril deposits may change the past thinking on this projects scale by prior owners/JV's
- ➕ Presence of Molybdenum at Llahuin adds extra juice to that project now that Moly has risen from its long slumber
- ➕ The increasing appreciation of the role of Manganese in battery formulations holds the potential for a major revaluation of the company's Los Pumas project in northern Chile
- ➕ The company is trialing the Manganese processing technology of Mn Energy, with a goal of producing High Purity Manganese Sulphate Monohydrate (HPMSM) at site
- ➕ A sale/JV or spin-out of the Manganese assets could provide a bonus for Southern Hemisphere's shareholders
- ✖ Chile has become a concern for investors due to political sabre-rattling by a recently installed Leftist government, though recent announcements are all related to Lithium
- ✖ A PEA is still required to start to put some practical underpinnings in place for investors to assess the production potential at Llahuin

Potentially Feeding the Insatiable Desire for Copper

Intriguingly, the company's name alludes to the Southern Hemisphere, but like most companies on the ASX, its activities are in that hemisphere, hence nothing of particular note. However, the name relates back to the origins of the company for it was originally listed on the TSX-v and then, in 2014, completed a full migration to the ASX.

In this initiation, we shall look at its principal project at Llahuin, which encompasses a large Copper-Gold system in central-northern Chile, with potential to grow larger. We shall also look at Molybdenum's revival, as it is part of the potential metals mix at Llahuin. Then we also look at the Los Pumas Manganese project which has recently revived as a focus of interest due to the pivotal role of Manganese in the battery metal supply chain.

The Llahuin Project

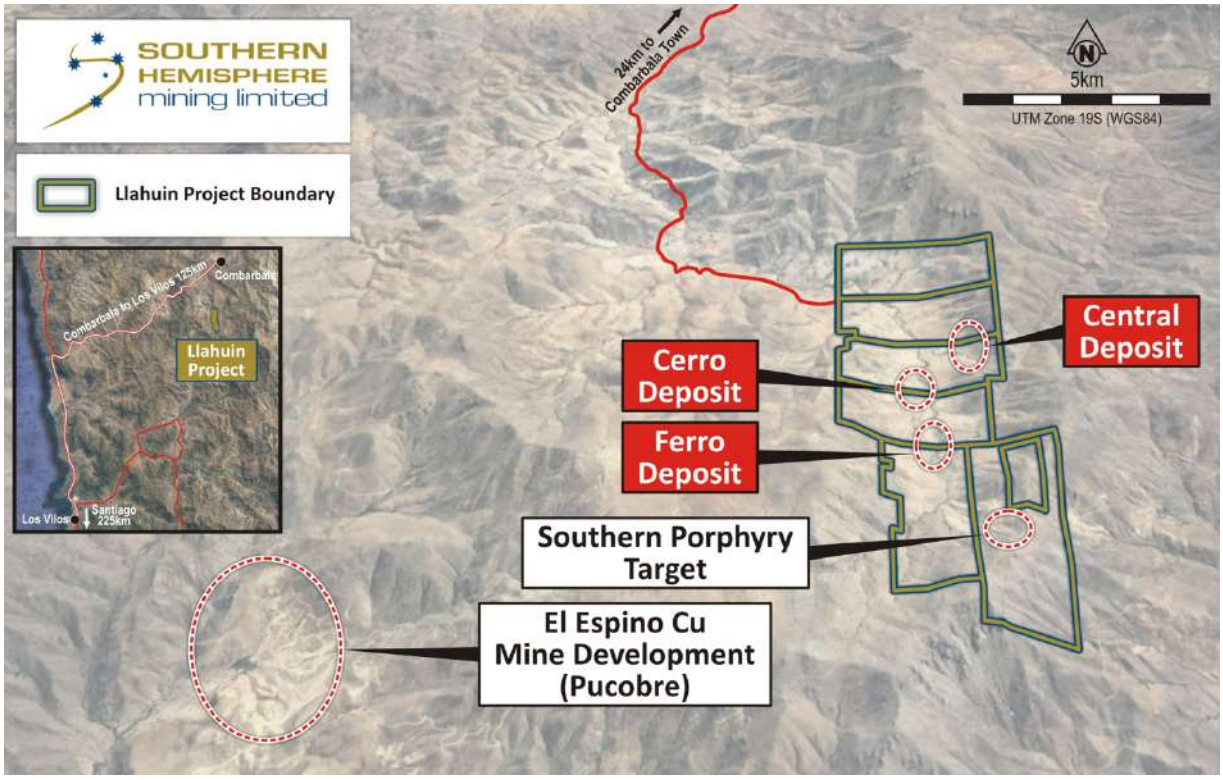
This Copper/Gold/Moly project is in the Coquimbo region of central Chile, some 350km north of

Santiago, 24km south of the town of Combarbalá and 56km inland from the coast. The Andocollo mine of Teck (TSX: TECK.A and TECK.B, NYSE: TECK) is also in the same region.

By Chilean standards the project is at very accessible elevations, at an altitude of 1,300m -1,500m ASL.

A farm-in arrangement between SUH and Lundin Mining (TSX:LUN) commenced in November of 2012 and ended in 2014 when Lundin returned the property to focus on its newly acquired Candelaria mine.

SUH is the sole registered and beneficial holder of six contiguous mining licenses covering 13.72 km^2 and the three advanced zones of interest – the Central Porphyry Zone, Cerro de Oro Zone and Ferrocarril Zone.



As far as local communities are concerned, in December of 2012, SUH signed a 30-year Easement Agreement with the local El Espino Community. Under the terms of the Easement Agreement, SUH is allowed access to all community land for exploration, exploitation, mining, processing, plant, utilities and infrastructure activities within a 2,500 hectare area around the Llahuin project. This has been renewed under the new management.

Infrastructure

The NI43-101 states that access to the project area is good, with a high-tension electricity line located around 5km of the project which is capable of delivering sufficient power needs for the project and associated infrastructure.

There is a railway line near the project area which extends to two ports (Los Vilos and Coquimbo), but we note the non-seriousness of the Chilean governments since the days of Pinochet towards rail transport. There is also a new sealed airstrip within 20km of the project.

History

The area of Llahuin (otherwise known as the El Espino mining district) is an old mining district that has historically been mined for gold and copper mineralization.

The first works date back to Hispanic times when zones of highly amalgamable gold were mined. Since then, mining has continued in an intermittent way, with the development of many small mining scale works that are focused on the oxidized zone of sulphur enrichment and the larger mineralized structures. The primary zone has not been mined due to difficulties working below the water table for local artisanal miners. Artisanal mining activities have focused mainly upon higher grade, vein-style mineralization near surface.

The Llahuin Central deposit (with an exploration adit leading off it) is shown above. Mining of this zone dates back to the 18th century, with active mining in this area continuing up until around 2010.

A vein in the centre of the pit was mined at widths of between 1m to 3m with reported grades between 1% and 10% Cu, and between 1g/t and 5g/t Au, although there are no formal records extant as to the material and grades mined from the adits or a small open pit.

The Lundin Deal 2012-14

Lundin Mining entered a substantial option agreement in 2012 to acquire up to 75% of the Llahuin project via staged funding of exploration works up to the value of US$35mn.

Lundin exited the deal in 2014 when they purchased the Candelaria mine and returned the asset to SUH after investing ~US$7.5mn.

Exploration

In the past, there have been various exploration campaigns undertaken by the aforementioned majors across the Llahuin group of concessions. The known history of the project in recent decades begins with Cominco Resources (later to become Teck), which undertook exploration activities in 1983.

In 1983, Cominco undertook surface sampling and geophysical profiles of induced polarization along with completing seven drill holes.

Antofagasta acquired the project before 2002 and aggregated numerous small mining properties to create a unified and simplified area for exploration. The amalgamated extension of the mining concession covers almost 4 km in North-South strike and 2 km in East-West strike.

In 2004, Antofagasta conducted a prospecting program in the area that included a geological mapping at a scale of 1:2000 and three RC and two DC holes. The drill holes were concentrated in the area of Llahuin porphyry below the small open pit. These holes identified several zones of Cu, Au and Mo mineralization.

In their final report, Antofagasta noted that the project might reach a maximum of 100 million tonnes with 0.2% Cu and 0.1 g/t Au. This was not deemed to be of sufficient size for them to pursue. The project was then placed for public sale and then bought by SUH.

Geology

The Llahuin project is located on the flanks of the Llahuin Valley, with the area characterized by a moderate relief depicted by mountain ranges and flat zones with deep ravines and steep slopes, with altitudes ranging from 1,000 to 1,500m above sea level.

Llahuin is regarded as being a porphyry breccia copper-gold system, with medium-sized early dioritic stocks that exhibits propylitic to potassic (biotite) alteration. It is emplaced in a north-south trending regional fault system.

Argillic-quartz sericite alteration zones are evident in both the upper zones and margins of the hydrothermal system within the volcanic wall rocks.

At the project, a NNE-trending elongated late granodioritic stock intrudes the early dioritic porphyry. Mineralization within porphyry breccia zones is typically related to early dioritic porphyry stock, with abundant stockworks of quartz and variable amounts of magnetite, biotite, tourmaline, actinolite, calcite, copper oxides, iron oxides and some pyrite, chalcopyrite, covellite, chalcocite and molybdenite.

Mineralization is mainly associated with veinlet systems, with copper mineralization present mainly as chalcopyrite with subordinate malachite, azurite, chalcocite, bornite and covellite.

The Llahuin project, shown in a panoramic view below, can be said to consist of three zones: the Central Porphyry Zone, the Cerro de Oro Zone and the Ferrocarril Zone. The Central Porphyry Zone is a typical Cu-Au porphyry system with associated breccia stockwork mineralization. The Cerro de Oro Zone lies almost entirely within volcanic rock and is interpreted as the stockwork cap to an underlying porphyry system. There are explosive breccia-style textures associated with this deposit. The Ferrocarril Zone remains underexplored and is not well understood.

Recent advances in understanding the historical geophysical data using the 3D magnetic model suggest the root stock is one large porphyry intrusion at depth which has driven the emplacement of the porphyry breccias near surface. The resistivity and chargeability data strongly suggests the Cerro De Oro and Ferrocarril zones might be one system.

Above: An encompassing view of Llahuin: from on top of Central Deposit, looking SE, with an artisanal pit in foreground, Cerro across the valley, and Ferrocarril to the south of Cerro

At the bottom of the preceding page can be seen the Central deposit showing drill pads and rig on site. All exploration drilling has now been completed and the team is ready to progress to mining studies.

Exploration by SUH

SUH commenced drilling at the Llahuin property in June 2011 and by March 2013 had completed a total of 33,732.2m of RC in 188 holes and 20,787.6m of diamond drilling, in 59 holes, across the Llahuin project area. In summation, the work undertaken by SUH before the 2013 resource included:

- Regional reconnaissance, rock chip sampling and geophysics
- Project scale mapping at 1:2000 scale across the project
- 59 diamond drill holes for a total of 20,787.6m
- 188 reverse circulation holes for a total of 33,732m, of which a total of 25 holes were drilled as pre-collars to diamond drill holes

Mineralisation was found to commence at surface and remains open at depth. The main focus had been on the higher-grade core within the Central Porphyry Zone.

In December 2021, the company began an RC drilling campaign at Llahuin. This was the first major work after the pandemic induced hiatus. The remaining results for the RC drilling program were published in April of 2022. The program had consisted of 24 holes drilled for a total of 2,787m.

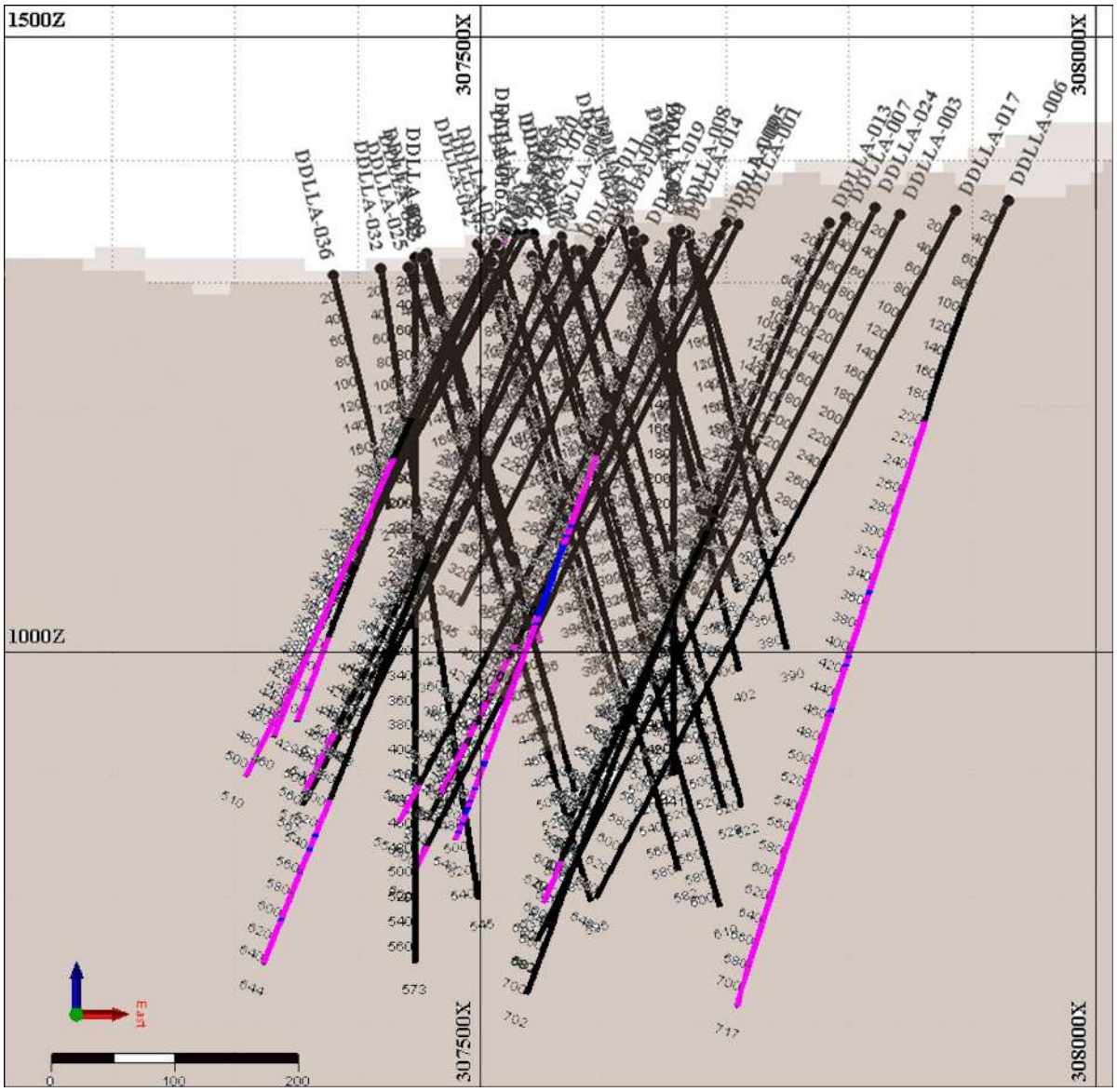
The Central Porphyry returned the best result in hole 22LHRC022 of 104m at 0.51% CuEq from 6m to end of hole, meanwhile the best result at Cerro de Oro was in 22LHRC013 which intersected 51m at 0.48% CuEq from 7m depth to end of hole.

The campaign also brought to light a new target at the Southern Porphyry, when the drills intersected a zone of 11m at 0.25% CuEq from 58m depth, while testing a previously untested IP target.

The main goal of this RC program was to test near-surface higher-grade targets to get an understanding of the mineralized system and correct drilling orientation, and thus most holes ended in mineralisation.

In mid-2022, the company undertook the assaying of several unsampled parts of historical diamond core holes at the Central Porphyry dating back to the aforementioned programs of 2012/13. This core was recovered at Llahuin and has been relogged and sampled on 1m intervals.

As can be noted below, the assayed material (in magenta) gives significant downward extension to the knowledge base.



The recovery of this old drill core is a very interesting development, not only for assay but geotechnical, SG, waste rock characterisation etc. for mining studies and resource updates.

The company was able to gain the expanded data set for the cost of core cutting and assaying only. It estimates the savings at over $0.6mn of the diamond drilling and associated costs. It was not clear why the previous management & technical team had omitted to assay this material.

In the assaying of old core, a total of 1,717 one-metre samples were cut and sent to the ALS Laboratory in Chile for analysis. The best result recorded was 31m at 0.57% CuEq from 0m depth, intersected in drillhole DDLLA016A which is in the core of the Central Porphyry.

This effort ran parallel to a diamond drill program in mid-2022 (beginning in May). A targeted diamond

drill program at Llahuin started the program with two orientated drill holes. Then the team moved on to undertake 4-6 orientated diamond holes at Colina. These were to follow up on the initial discovery results of 2021 drilling, which included 34m @1.39g/t Au from 24m.

In late April of 2023, the company announced the results of geological mapping of areas previously unexplored within the project area that identified additional mineralised veins in areas outside known resources in the project area.

The high-grade rock chips assayed at up to 7.28% Cu, 18.65g/t Au and 55g/t Ag.

The high-grade gold rock chips came from a vein 500m north of Cerro de Oro, which was revisited, with five samples collected, crushed and panned for gold at site. All five showed visible gold tails in the pan.

One sample of about half-a-fist size, produced a 2.5cm-long gold tail with further methodical sampling planned to test the vein in the historical adit.

Several north trending and east dipping veins were sampled west of Ferrocarril, with high grade copper being encountered.

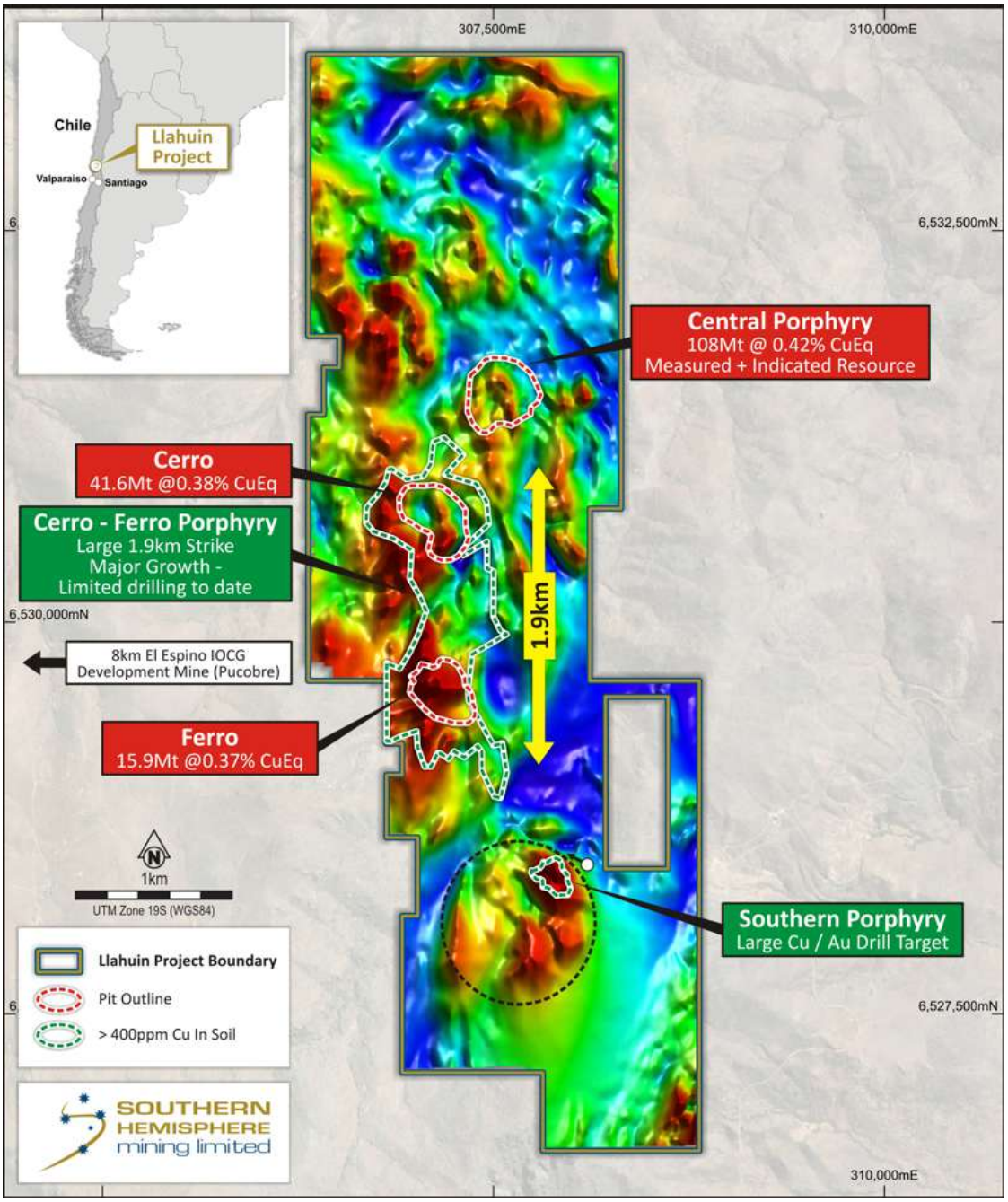
The mapping and sampling program is continuing in 2023 to add to the understanding of the veins and vein swarms to assist in refining drill locations. Further exploration work continues to expand the target opportunities for resource expansion within the concessions.

Met Work

SUH completed preliminary metallurgical test work in 2012-13. Bulk samples for metallurgical test work were collected from only the Central Porphyry zone. The test work indicated that the Llahuin project's mineralization is highly amenable to a conventional flotation process.

The recoveries of copper varied between 75% Cu and 91% Cu with the weighted average of the results being 84% Cu, which was deemed to be a typically acceptable commercial level. Meanwhile, the recoveries of gold varied between 41% Au and 57% Au, which was in line with expectations given the relatively low gold grades within the deposit.

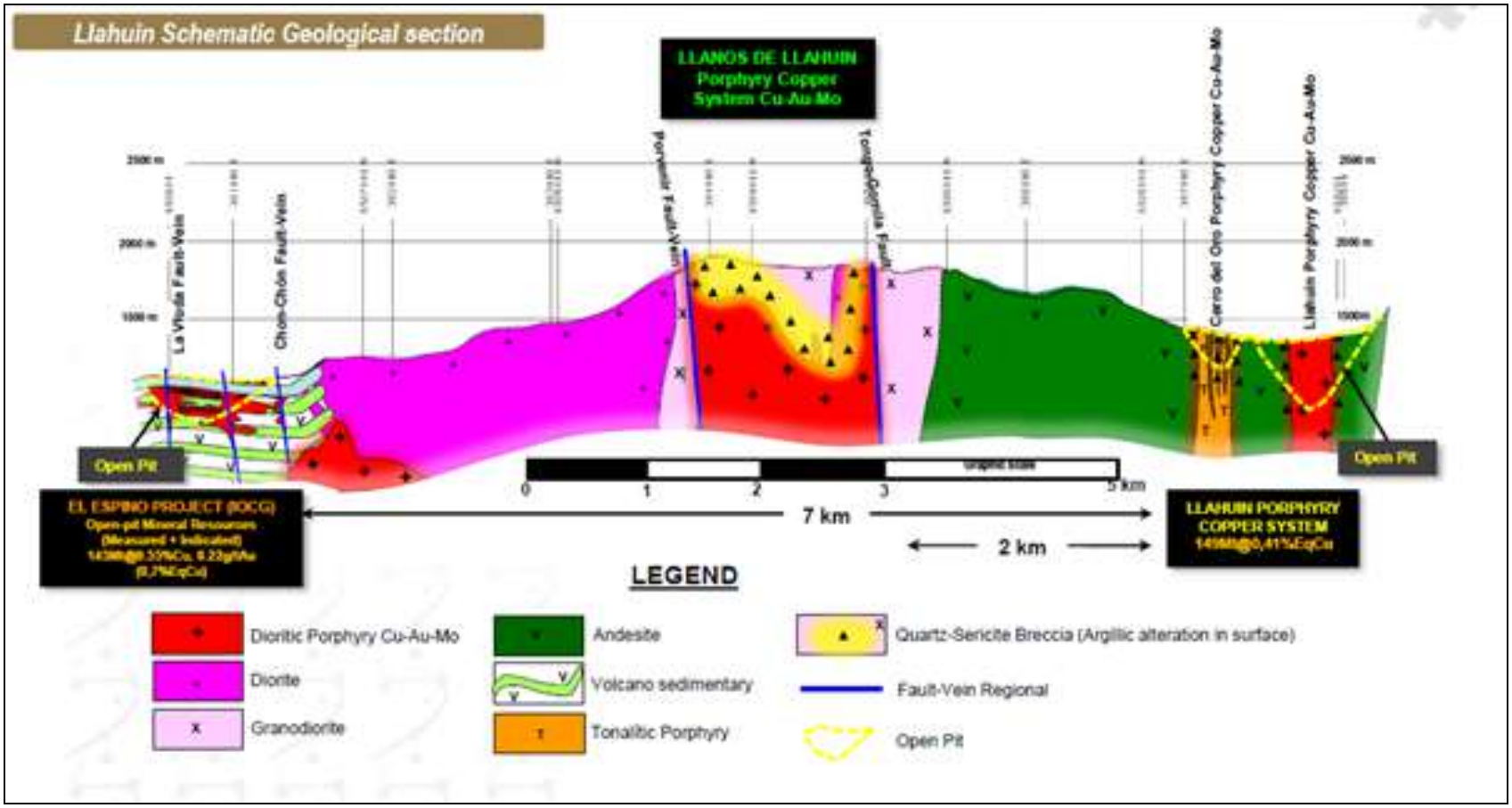
Flotation concentrates produced during testing contained the resource-weighted average copper grade of 28% Cu and 4.9g/t Au, and also displayed low levels of deleterious materials in the concentrate.



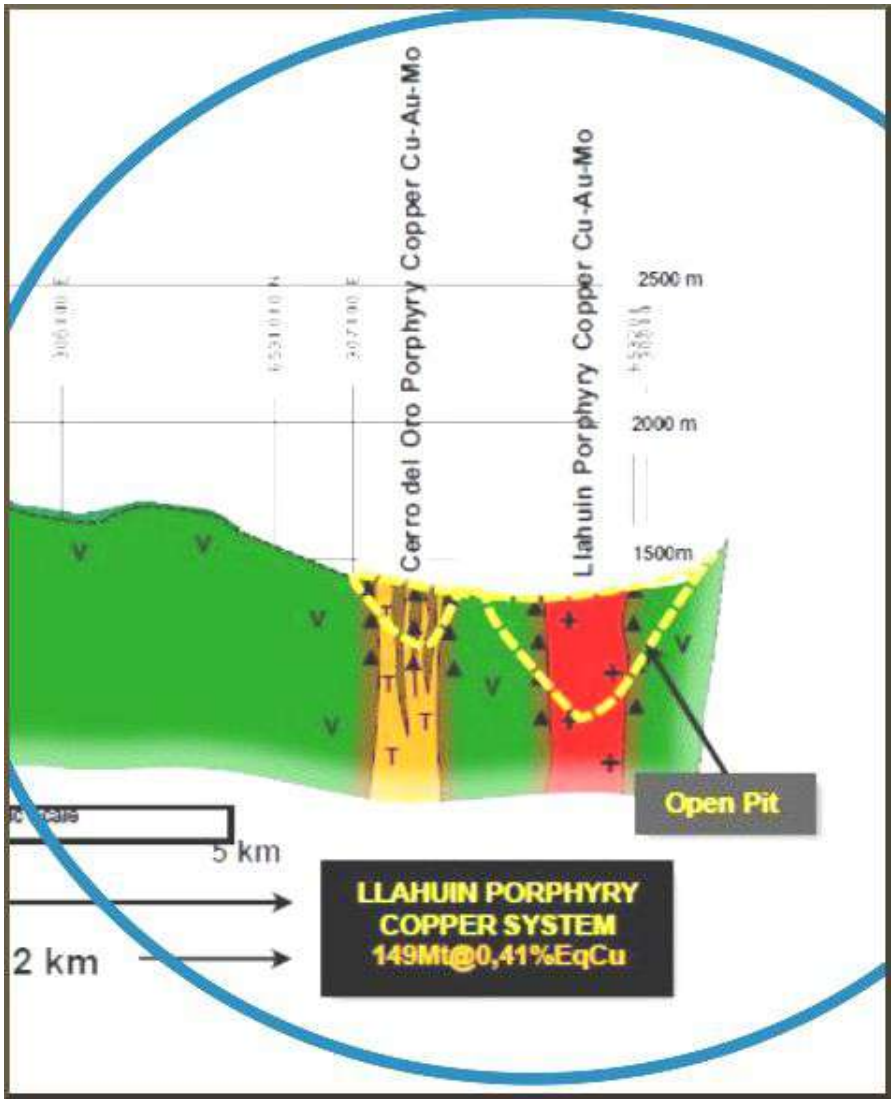
Infrastructure

Access to the project area is 20kms, from the established mining town of Combarbalá (population 14,000). The town has a sealed airstrip and potentially provides a pool of skilled local labour.

The project site is ~5km from grid power.


Llahuin Schematic Geological section
LLANOS DE LLAHUIN
Porphyry Copper
System Cu-Au-Mo
La Viuda Fault-Vein
Chon-Chon Fault-Vein
Cerro del Oro Porphyry Copper Cu-Au-Mo
Llahuin Porphyry Copper Cu-Au-Mo
Open Pit
Open Pit
EL ESPINO PROJECT (IOCG)
Open-pit Mineral Resources
(Measured + Indicated)
LLAHUIN PORPHYRY
COPPER SYSTEM
0 1 2 3 5 km
7 km
2 km
LEGEND
Dioritic Porphyry Cu-Au-Mo
Diorite
Granodiorite
Andesite
Volcano sedimentary
Tonalitic Porphyry
Quartz-Sericite Breccia (Argillic alteration in surface)
Fault-Vein Regional
Open Pit

The area of the pitshells can be seen more clearly is the blown-up version below:



The Llahuin Resource Estimate(s)

In late March 2012, Andes Mining Services (AMS), based in Lima, Peru, completed a mineral resource estimate which was based on 17 DC holes (6,991m) and 81 RC holes (14,728m) drilled at a spacing of between 50m x 50m to 100m x 100m. Only data received as at the 30th of March 2012 was used in that resource estimate which was constructed within 0.15% Cu and 0.10g/t Au grade shells. Molybdenum grade shells were not considered for the 2012 resource estimate.

The most recent Mineral Resource update dates from June of 2013, so quite a while ago. The NI 43-101 compliant resource estimate was completed by Bradley Ackroyd, Regional Manager and Principal Consulting Geologist with AMS.

The June 2013 update included the drilling up to the end of March 2013 including that under the Llahuin JV arrangement with Lundin Mining.

The Measured, Indicated and Inferred mineral resource estimate is based on 59 diamond holes (20,787.6m) and 188 reverse circulation holes (33,732.2m) drilled at a spacing of between 50m x 50m to 200m x 200m.

Llahuin Copper/Gold/Moly Project

@0.28% Cu Equiv cut off

Category	Tonnes mns	Cu %	Au g/t	Mo %	CuEq %
Measured	112	0.31	0.12	0.0008	0.42
Indicated	37	0.23	0.14	0.0007	0.37
M&I Total	149	0.29	0.12	0.0008	0.41
Inferred	20	0.20	0.19	0.0005	0.36

Below one can see the resource parsed into the three zones:

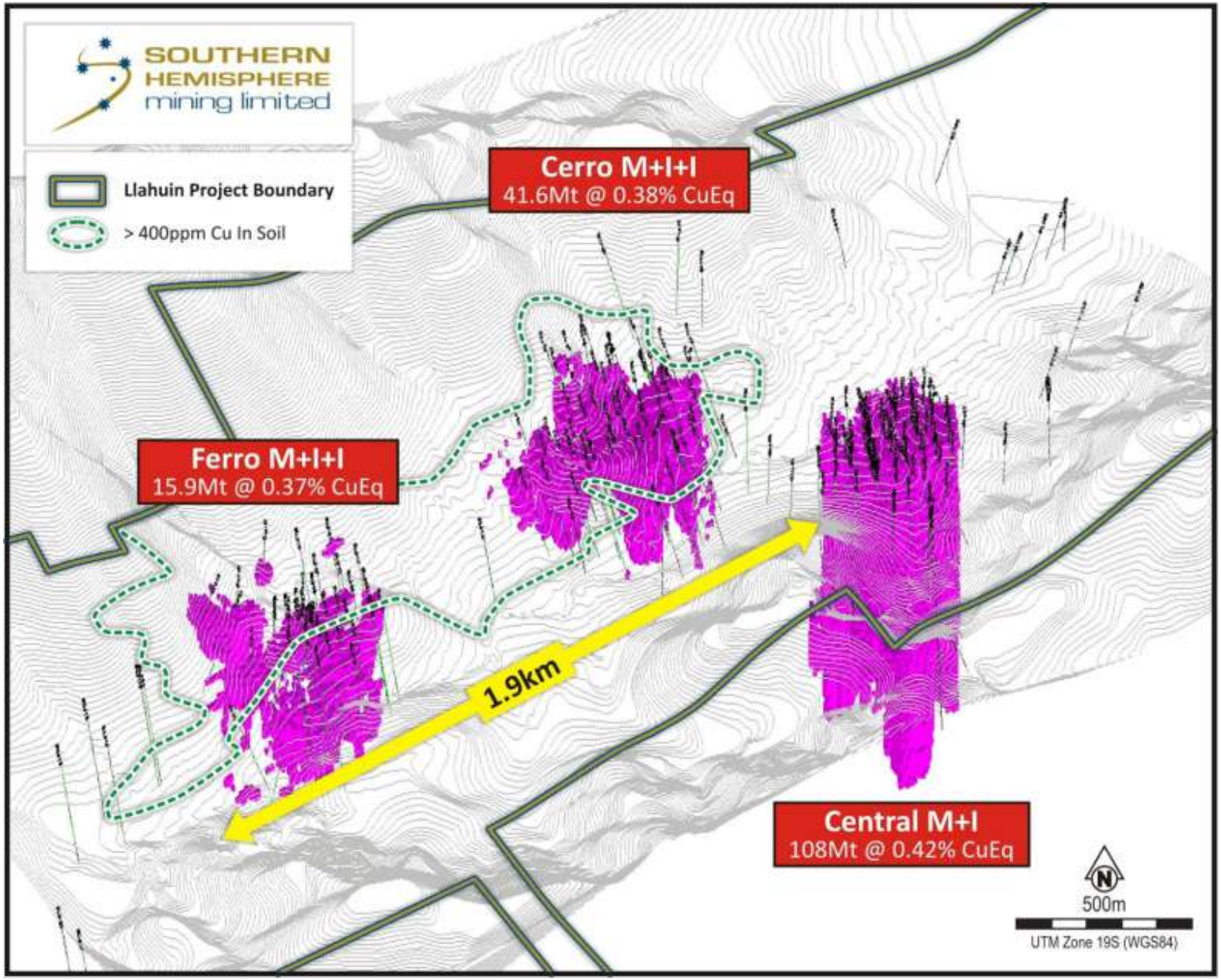
Llahuin Resource by Zone

@0.28% Cu Equiv cut off

Zone	Measured		Indicated		M & I		Inferred	
	tonnes (mn)	CuEq Grade	tonnes (mn)	CuEq Grade	tonnes (mn)	CuEq Grade	tonnes (mn)	CuEq Grade
Central Porphyry	101.2	0.43%	7.3	0.34%	108.5	0.42%	2.8	0.32%
Cerro de Oro	10.8	0.39%	15.2	0.38%	26	0.38%	15.6	0.37%
Ferrocarril			14.4	0.37%	14.40%	0.37%	1.5	0.34%
Total (rounded)	112	0.42%	37	0.37%	149	0.41%	20	0.36%

The Ferrocarril Zone, although outcropping and drilled systematically, was only classified as Indicated and Inferred as this zone required more detailed logging, mapping, and drilling to elevate it to Measured status. Interestingly the author of the estimate report noted two high-grade Au and Mo drill hole intercepts at depth within the Ferrocarril zone (RC-LLA-141 and DDH-LLA-031 respectively), which lacked sample support from surrounding drill holes. It is worth noting that Mo hole 031 at Ferrocarril assayed ~196m @ 215ppm moly (plus Cu & Au).

Below can be seen visualisation of the known mineralisation, below ground, at Llahuin:


SOUTHERN HEMISPHERE mining limited
Llahuin Project Boundary
> 400ppm Cu In Soil
Cerro M+I+I
41.6Mt @ 0.38% CuEq
Ferro M+I+I
15.9Mt @ 0.37% CuEq
1.9km
Central M+I
108Mt @ 0.42% CuEq
N
500m
UTM Zone 19S (WGS84)

Water Rights

In recent times, the issue of water rights has become increasingly critical. The mining concessions held by Southern Hemisphere grant it, as the concessionary, the right to use the water resources found while developing exploration and/or exploitation works, only for the purposes of the exploration and/or exploitation works.

Water is available in the region in surface springs and underground aquifers. Water for exploration purposes is readily available according to the most recent NI43-101.

Scope and Potential

Chile is the home of some of the largest copper mines in the world. However, the country has a much more diversified mining space than just megamines. The Chilean Copper Commission (Cochilco) recently released a study: "Monitoring of relevant variables and indicators of medium and small Chilean mining" in which it concluded that small mining generates a significant amount of employment in Chile. Of the roughly 290,000 people employed in the mining industry, at least 28,000 would be considered to work in the small- to medium-size segment.

Medium-size mining in Chile is undertaken by around twenty companies. In 2021, they collectively recorded a production of 215,036 tons of copper, with an export value of $2.3bn. These medium-size miners produce as much income as whole sectors of the Chilean economy such as wine and forestry products. This militates against the Chilean government upsetting the apple cart by treading too heavily in the copper mining space.

Cochilco estimates investment in medium-size operations for the period 2023-2031 will be around US$2.6bn. Projects (with capex of under US1bn) that Cochilco expects to be added to the production mix between 2023 and 2013 include:

Sierra Norte – this operation is scheduled to start operations in 2023. Compañía Minera Sierra Norte has invested around ~US$597mn. The project entails an open-pit mine, a plant with a capacity to process some 100mn tpa, from a 2,000 tpd hydrometallurgical treatment plant, and a 24,000 tpd concentration plant.

Michilla – a project to extend the LoM of the Michilla copper mine in Antofagasta region by 21 years. This involves an expected investment of US$235mn. The project is currently under environmental review.

Costa Fuego – a development of Hot Chili (ASX: HCH) with capex currently mooted at ~ US$725mn and operations scheduled to begin post-2025. The company has been expanding resources with drilling with a goal of delivering a Pre-feasibility Study (PFS) in early 2024.

Ciclón Exploradora –a project developing two underground mines to extract copper, zinc, silver, lead and gold with a 1,500 tpd processing plant. The capex is estimated at around US$110mn. The project

stalled out in the environmental evaluation and will need to present a new environmental impact study.

Arqueros – a US$200mn capex project expected to start operations in 2023/4. Construction of the underground mine includes a concentrator plant, a tailings deposit, and complementary works for the supply of water, energy, and other services. The mine is expected to extract 5,000t/d. The Environmental Impact Study was approved by regulators in 2022.

Playa Verde – a US$95mn project planned to start operations in 2024. Works include dredging old tailings deposits from the Playa Grande beach at Chañaral. The mineral extracted will be processed in a metallurgical plant to obtain copper in cathodes and concentrates. It aims to process 5mn tpa for seven years.

El Espino – a US$624mn project, being developed by Pucobre, that is expected to start operations after 2024. This open-pit mine, 8kms west of Llahuin, will have a production capacity of 26,000 tons of copper per year (with ~ 13,000 ounces of gold per annum).

This universe of mid-sized mines could potentially expand further due to copper majors selling deposits that cannot be developed into large-scale mines. This could boost the roll of medium-sized mining in the Chilean copper mining industry.

Our Take on Copper

The Russian invasion of the Ukraine in early 2022 and the global outbreak of inflation (with the cure being higher interest rates) has put paid to the dreams of those that hoped that a new paradigm of Copper at $5 per lb or higher might be established.

The lengthy period of underinvestment in copper exploration and capacity has laid the ground for a supply crunch. Below $3 there was little incentive to build new mines and below $2.50 (pre-November 2016) there was no incentive to explore either as despair was the only sentiment around.

As the chart on the following page shows, after mid-2018, the price doodled about, but mainly lower. It plunged to a five-year low on the outbreak of the pandemic. In 2020 copper then “turned on a dime” going from a low of $2.50 to over $3.50, showing that the metal has the potential to move far and fast.

It then powered on to nearly $5 per lb before the rug was pulled out from under it. Unfortunately, the price was sustained above $4 for only a year and now crept back in that price range.

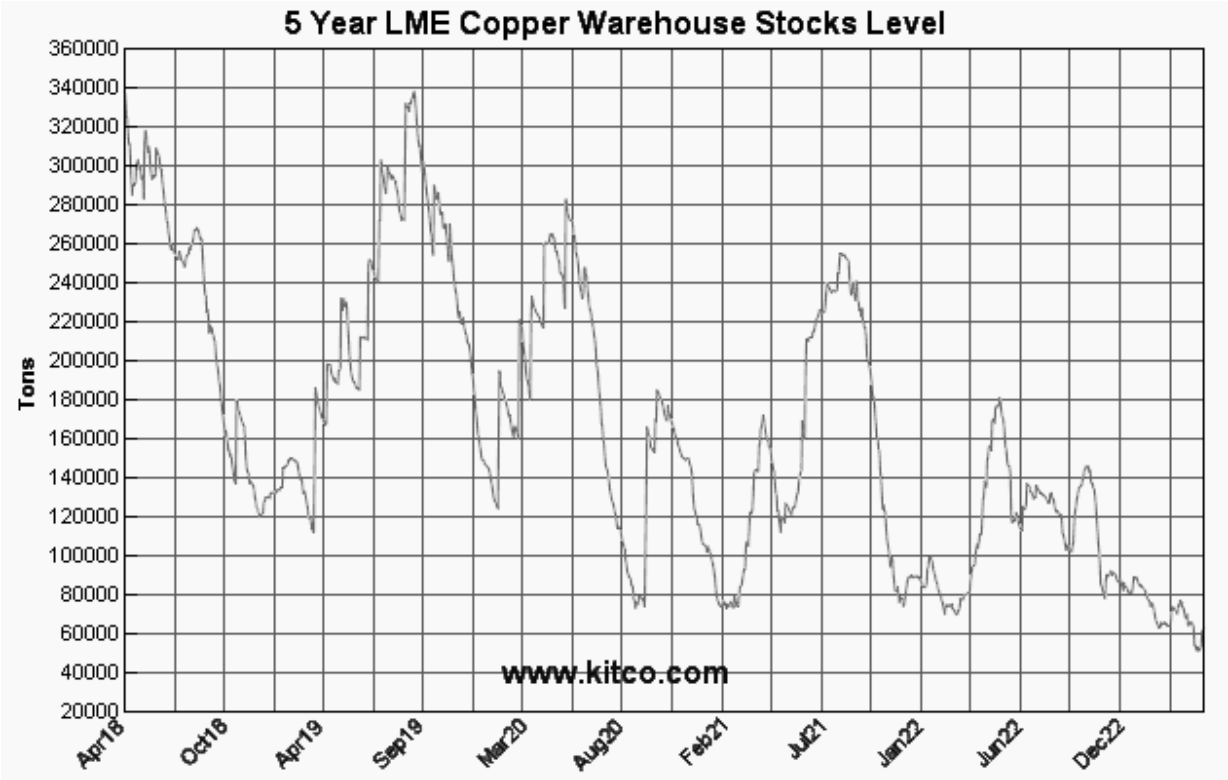
The outbreak of war could be blamed for the retreat in 2022 or China's ludicrous Zero-Covid phase but, as usual, we always look for the hidden hand of China, using onshore stocks to bludgeon the price lower, to suit some bizarre goal that cheap copper now (with its attendant lower investment in new development) might somehow be in China's longer-term interest. Sigh….

The following chart shows the LME warehouse stocks. This shows an interesting seesaw action in recent times. It is clearly evident that the trend is down and yet someone keeps moving in stocks to make it look like a stock build and then it gets slapped down again.

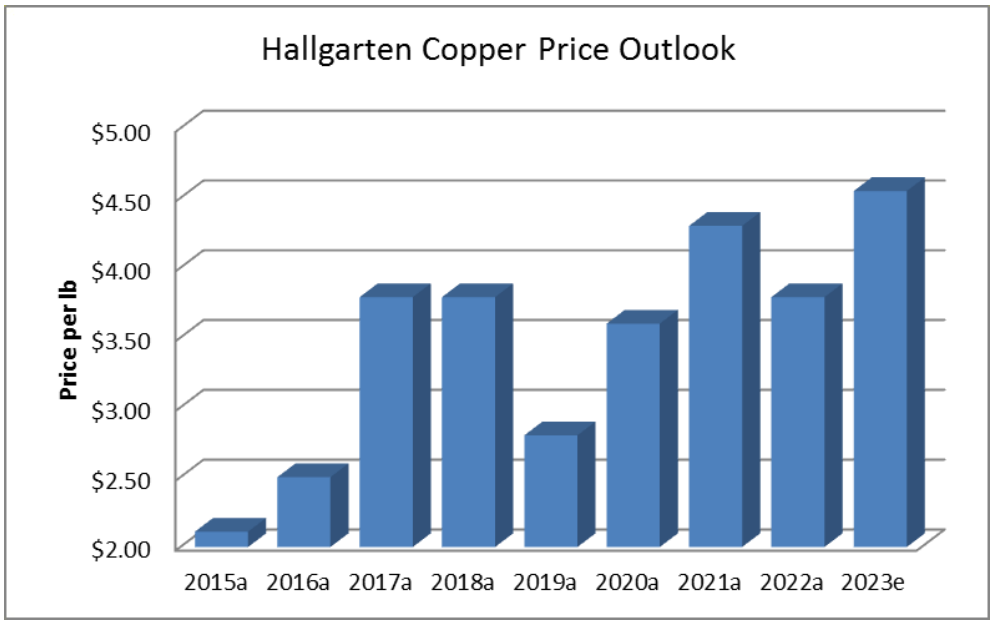
We have long mooted resistance at US$4 per lb, not so much from the general marketplace, but from the Chinese. They do not want to be at the mercy of "Western" miners again in this metal.

Unlike metals like Zinc/Lead and Nickel, there was some copper development during the downtime (e.g., Las Bambas, Constancia etc.) but this was nowhere near sufficient to replace mines that have exited or reduced production and deal with even conservative forecasts of growth in consumption.

If the Copper price had held up for longer it would have greenlit those few projects sitting on the launch pad without precipitating a production surge because there is not that much capacity to "turn on" and the unbuilt potential is small and a long way from actualization. It did, however, prompt the appearance of (and funding thereof) various explorers.



As the chart that follows shows, we are bullish on the copper price outlook into 2023, despite recent weakness.



In any case, the Copper price lingering between the current levels and $5 is a sound scenario and we

view any price over $3.50 as a good place to be for copper miners and it ensures that mines with fair grades and CapEx numbers "within the ballpark" will be seen as doable and desirable. This then will have knock-on benefits for those junior explorers trying to fill the pipeline with new projects and resources.

In Summation

One does not need to be a subscriber to apocalyptic views of shortages caused by the EV revolution to be nevertheless bullish on copper. The metal has not been as underinvested in recent times as say, Zinc, but the long period of quiescence in mining markets meant exploration was minimal and development to mining status was largely in the hands of the Chinese, (e.g. MMG at Las Bambas). While it is not said out loud in public "Peak Copper" in Chile is a real threat and now it is further complicated by confused signals out of the new government in Santiago.

The price trend for Copper frequently defies the long-term good/bad outlook. Bad, in that there is not a strong pipeline of very large projects to make up for mine retirements/exhaustion of reserves. Good, in that this dryish pipeline augurs well in the long term for prices.

Then one should not underestimate China's desire not to be a price-taker in Copper (rather a price-maker). They have shown themselves, we believe, to be proactive in resetting the price. This seems to be achieved by using onshore stocks to push prices of various metals around. On this score the Chinese firepower is considerable and should not be underrated.

It would appear that the Chinese took advantage of the onset of the Russo-Ukrainian war to set the copper price lower. Longer term we regard this as a Sisyphean exercise, but in the short term it always seems to work for them.

Molybdenum – Finally Turned for the Better

Molybdenum, a key alloy metal suffered a "lost decade" with wallowing prices and minimal interest form investors or project developers. Moly joined Uranium in the ranks of massive underperformers since 2010. Recently though Moly has become the word on everyone's lips, making a Lazarus-like revival from the depths of despair.

But what are the dynamics of Moly and why has it resurged?

The product categories that utilize Moly reads like a list of the sectors most closely linked to global economic growth. This is particularly true of specialist construction steels and stainless steel. This relationship is what produced the precipitous price fall in 2008 and then prolonged the agony for Moly. However, the Moly bulls would argue that a significant component of the construction steel demand comes from infrastructure investment (desalinization plants, natgas pipelines, OCTG, marine applications like rigs), which is continuing to be a priority despite flaccid global economies. In one particular twist, one of the highest ratios (7%) of moly usage in alloys is in steels for nuclear power plants.

Moly alloys, because of their resistance to sulphur, are also prominently used in cracking plants at oil refineries. Increased usage of heavy crudes (with their high-sulphur content) increases demand even more. When oil (and natgas) prices are high then investment demand should be strong particularly in pipelines and well-casings that have a heavy Moly component. Moly is thus linked into high-tech applications of high-nickel stainless, not into run-of-the-mill construction steels, automotive uses and whitegoods that are highly recession-sensitive.

Looking forward, Molybdenum is expected to continue to make strong contributions in global power generation and infrastructure projects as countries begin to prioritize climate change.

It's worth noting that Molybdenum is recycled as a component of catalysts, ferrous scrap, and superalloy scrap. The amount of Molybdenum recycled as part of new and old steel and other scrap may be as much as 30% of the apparent supply of Molybdenum.

The Surge

Standard & Poor's attributed the price rise in recent times to four factors:

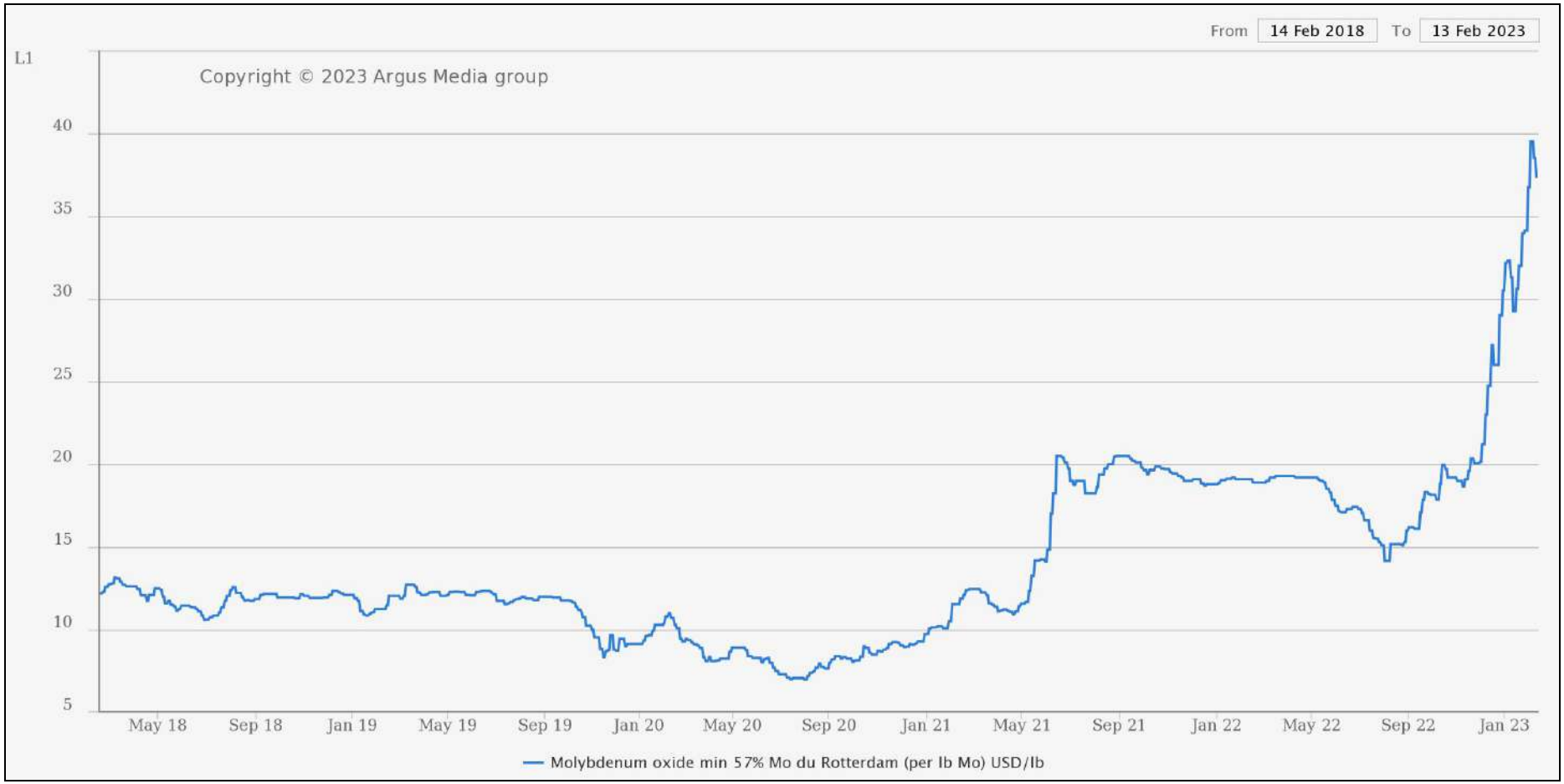
- Demand volatility - demand for moly-bearing carbon steel from the offshore drilling sector has stayed strong, as offshore drilling activity has remained high due to the elevated oil price
- Supply deficits – caused by the lack of production pipeline due the failure/disappearance of so many players over the last decade (discussed anon)
- Disruptions at key mines, principally Las Bambas in Peru, due to popular uprisings, as well as at the Antapaccay mine of Glencore in the same country
- Production issues in Europe, particularly at the Climax Moly Refinery of Freeport in Rotterdam

Molybdenum producers in China, in the USGS's opinion, continued to face difficulties owing to tightening of environmental regulations making it more difficult to obtain mining permits. Molybdenum prices in China reached decade-high levels as Molybdenum-bearing steel consumption remained high. In Chile, Molybdenum producers continued to struggle with persistently lower ore grades.

Production

According to the USGS, global Molybdenum production in 2022 was essentially unchanged compared with that in 2021.

In descending order of production, China, Chile, the United States, Peru, and Mexico provided 93% of total global production.



Source: Argus Metals

Moly Players – Thinned Ranks

When price rises like this occur a flood of companies suddenly "find religion" (or rather Moly) hidden in their ignored assay results or darker corners of their NI43-101s. How to capitalize on Moly's rise if the metal is well-buried in a deposit that is unlikely to be developed?

Standard & Poor noted that no significant secondary Molybdenum production from primary Copper mining had come online since Las Bambas in Peru began producing in early 2016. There are no new mines in any advanced state of planning or permitting, let alone under construction.

Los Pumas - the Manganese Target

The Los Pumas Project is approximately 175kms, or three hours', drive east of Arica, the major port city in Region XV of Chile. Access from Arica to the project is via the International Highway from Arica to La Paz, Bolivia (CH11) to the regional administrative centre of Putre, then via the all-weather gravel road (A023) to the project area.

The project is comprised of seven granted exploitation concessions covering an area of 1,209ha.

The Mn mineralisation is from surface and considered amenable to low-cost open pit mining. The site is near to the port of Arica for simple export to the West Coast of the US and from there on to the USA's burgeoning battery Gigafactory complexes. Chile's free trade agreement with USA could have positive implications for the project.

Manganese on the Rise

The market for HPMSM is forecasted to grow tenfold to 2030 based on EV demand, to 3.1mn tonnes per annum and a deficit of 1.5mn tonnes (CPM Group forecast 2021). The majority (90%) of the current supply chain is produced in China, and the EV manufacturers are seeking to balance supply from a range of sources. The demand for North American high purity manganese is expected to rise to approximately 200,000 tonnes per annum metal equivalent by 2031. As yet, there is no current processing capacity and production of battery-grade Manganese in North America.

The Manganese ore from Los Pumas is a specific mineralogy (Cryptomelane), which is deemed optimal to produce HPMSM.

History

The Los Pumas mineralisation was first identified during World War II when a German company excavated a number of small trenches and underground openings in both the manto and vein mineralisation. Interestingly, German companies had a degree of free rein in Argentina, Chile and Bolivia during World War II, before the US pushed countries in the region to commit to one side or another.

The results of the German work are not available. Neither is there any record of additional exploration up until the work commenced by SUH in September 2008.

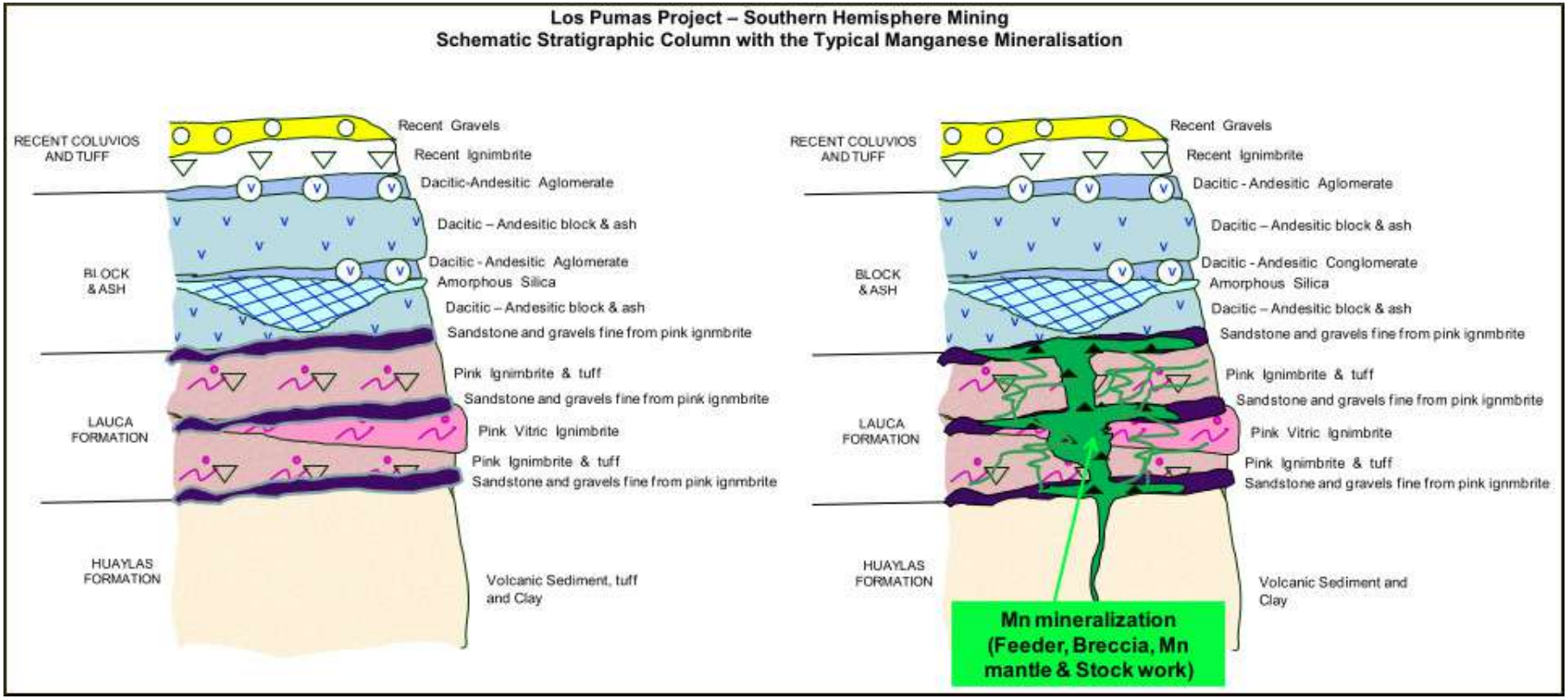
Geology

The Los Pumas manganese project is located immediately to the west of the Taapaca volcano in a geographical area called the “altiplano” (high plateau) area. It is adjacent to the north-south trending river Lluta, where several other minor manganese occurrences have been identified.

The geology of the project area is dominated by volcanic rocks of the Huaylas Formation (Upper Miocene age) and the Lauca Ignimbrite (Upper Pliocene). These have been subsequently overlain by Pleistocene pyroclastics, andesites and dacites and sedimentary units including primarily pumice, ignimbrites and a mixture of acid volcanic rocks (dacites and rhyodacites). Six major volcanic centres are clearly visible from the Los Pumas project, with the closest being approximately 4km to the east.

The primary exploration model associated with the Los Pumas Project is “manto‟ style mineralisation comprising sub-horizontal, stratabound deposits (or mantos) and their postulated sub-vertical feeder zones.

The manganese mineralisation at Los Pumas is divided into the north and south targets and is separated by the Taapaca Volcanic dacitic-andesitic flow (approximately 1km apart). The north target is approximately 1.7km by 0.6km in aerial extent and approximately 1m to 10m in thickness, while the south target is 1km by 0.2km in area and approximately 1m to 10m thickness.


Los Pumas Project – Southern Hemisphere Mining
Schematic Stratigraphic Column with the Typical Manganese Mineralisation
RECENT COLUVIOS AND TUFF
Recent Gravels
Recent Ignimbrite
Dacitic-Andesitic Aglomerate
Dacitic – Andesitic block & ash
BLOCK & ASH
Dacitic - Andesitic Aglomerate
Amorphous Silica
Dacitic – Andesitic block & ash
Sandstone and gravels fine from pink ignmbrite
Pink Ignimbrite & tuff
Sandstone and gravels fine from pink ignmbrite
LAUCA FORMATION
Pink Vitric Ignimbrite
Pink Ignimbrite & tuff
Sandstone and gravels fine from pink ignmbrite
HUAYLAS FORMATION
Volcanic Sediment, tuff and Clay
RECENT COLUVIOS AND TUFF
Recent Gravels
Recent Ignimbrite
Dacitic - Andesitic Aglomerate
Dacitic – Andesitic block & ash
BLOCK & ASH
Dacitic - Andesitic Conglomerate
Amorphous Silica
Dacitic – Andesitic block & ash
Sandstone and gravels fine from pink ignmbrite
Pink Ignimbrite & tuff
Sandstone and gravels fine from pink ignmbrite
LAUCA FORMATION
Pink Vitric Ignimbrite
Pink Ignimbrite & tuff
Sandstone and gravels fine from pink ignmbrite
HUAYLAS FORMATION
Volcanic Sediment and Clay
Mn mineralization (Feeder, Breccia, Mn mantle & Stock work)

Mineralisation outcrops from surface in most cases (as evidenced in photo below), extending up to a maximum depth of 30m below surface.

Mineralogy completed by SUH indicates that of the predominant manganese mineral is Cryptomelane.

Exploration

The Los Pumas Project was drilled between 2008 and 2010, with a total of 32 diamond drillholes for a total of 652.2m and 487 reverse circulation holes for a total of 14,204m. Holes were predominantly drilled vertically to approximately 5m below the ignimbrite into the volcanic sediments. Holes were drilled predominantly on a spacing of approximately 50m by 50m and varying up to 200m by 200m in the south. Around the time of the resource estimate it was noted that some infill RC drilling to 25m by 25m had occurred in the northern target area.

The consultants for the resulting resource deemed that the drilling, sampling and analytical methods are appropriate for the style of mineralisation.

The Los Pumas Resource Estimate

Before the latest resource which came in in the first days of May 2023 the previous resource dated back to March of 2011. That resource model (by Andes Mining Services) employed a nominal 4% Mn cutoff.

Los Pumas Manganese Project

@ 4% Mn cut off

Category	Tonnes mns	Mn %	SiO2 g/t	Fe2O3 %	Al %	Contained Mn tonnes
Measured	5.27	7.39	57.85	2.78	5.62	389,453
Indicated	13.06	7.65	55	2.96	5.64	999,090
M&I Total	18.34	7.58	55.82	2.91	5.62	1,388,543
Inferred	5.39	8.59	51.44	2.72	5.49	463,001

Metallurgical studies had demonstrated that greater than 38% Mn concentrates were achievable by Dense Media Separation (DMS) with low impurities and a high-silica product.

Southern Hemisphere Mining Limited had requested the consultants Global Commodity Solutions (GCS) to complete a (JORC 2012 compliant) Mineral Resource Estimate (MRE) and review of the current status of drilling for the Los Pumas Manganese Project.

Using a cut-off grade of 2.5% Mn this resulted in nominally indicated and inferred resources totaling 30.2mt at 6.24% Mn as shown below:

Los Pumas Manganese Project

@2.5% Mn cut off

Category	Tonnes mns	Mn %	SiO2 g/t	Fe2O3 %	Al %	Contained Mn tonnes
Indicated	23.3	6.21	57.07	2.78	5.71	1,446,930
Inferred	6.94	6.34	54.61	3.05	5.49	439,996

It was concluded that there was further upside evident for exploration of Manganese feeder zones within the orebody which outcrop at surface and have had little or no prior exploration.

The Envisaged Mn Product

In January of this year, the company advised the market that studies were being undertaken to evaluate potential for production of High Purity Manganese Sulphate Monohydrate (HPMSM) at site, to supply the North American EV market.

The company is working with Mn Energy Limited to conduct preliminary test-work on the Los Pumas ore employing the Mn Energy patent pending leach-purification method for HPMSM manufacture. Samples

of ore from Los Pumas deposit have been collected from site and are in transit to Mn Energy for this first phase of test-work.

Mn Energy is a participant in the Cathode Precursor Pilot Plant Project of the Future Batteries Industry Cooperative Research Centre (FBICRC) in Western Australia. Mn Energy has provided samples of its HPMSM for use in ongoing test work and development. FBICRC has successfully utilised a sample of Mn Energy's HPMSM in the first Australian production of high-quality precursor cathode active material (P-CAM).

The Los Pumas ore achieved ~99% extraction of manganese under standard leach conditions, producing a leach solution (PLS) containing 80 g/L manganese. The leach amenability test-work determined that the Los Pumas manganese ore was suitable for High Purity Manganese Sulphate Monohydrate production.

The Mn Energy HPMSM production process is a significant improvement on current HPMSM operations, as it has six fewer processes in the stream, as well as other efficiencies.

Compared to the previously mooted flowsheet, the Mn Energy technology incorporates significant changes, including the removal of the roasting step, reduction in the number of PLS purification processes and removal of the electrowinning step.

The potential benefits of this approach include reduced energy and reagent requirements.

Also worth noting is that, as well as manganese extraction, there were no deleterious elements that might be cause for concern in future stages.

Comps

As the claimants to primacy in the battery metal manganese space are disparate in their state of advancement, we decided to compare them just on the M&I resources. We have covered all of these in one form or another. Here are the metrics:

Resource Comps - Battery Manganese Space

(M&I only)	Project	Jurisdiction	Tonnage mns	Mn grade %	Contained Mn tonnes
Southern Hemisphere	Los Pumas	Chile	18.34	7.58	1,388,543
Manganese X	Battery Hill	New Brunswick	34.86	6.42	2,238,012
Euro Manganese	Chvaletice	Czech Republic	26.96	7.33	1,976,168
Giyani Metals	K-Hill	Botswana	2.1	19.30%	410,000

Development

Next steps for this project, beyond a refreshed resource, are less clear. The company feels that the attractions are compelling for a battery/chemical company to take this on. They see the mining as easy, while the factory and market/battery products are the expertise of these type of companies.

Our experience though is that Mn majors (e.g. South32) are not interested in small projects and anything less than DSO. None of the comparatives we cite have received a bid and we doubt that they will. The best way to make value here may be to effect a spin-out and let the deposit make its own future as part of a standalone listed entity.

On Chile & Perceptions

In recent years, the Chilean government has made noises of the resource nationalist type, which have concerned mining companies (and their investors) looking to establish substantial new capacity in the country. The effect has been to drive interest across the border into Argentina, where San Juan province has become the "new Chile".

Serious riots several years ago brought to international attention the income disparities in the country and eventually led to change of government to one of a leftist slant. Previous left-leaning governments in Chile had been rather indistinguishable from the right-leaning ones. The public seemed to be favorable to a swing against *laissez-faire* in the mining space. This augured ill, when the change of government happened, then curiously the Constitutional Assembly that was convened seemed to favour minimal change and miners breathed a sigh of relief. The judges are still out.

That said, Chile is a well-established mining jurisdiction and Moody's has afforded it an A2 credit rating, which other Latin American countries have been unable to attain, let alone sustain.

The latest announcement of a National Lithium Company, in that sub-space, has caused consternation. However, the broader mining sector may not have need for concern, as recent acquisitions by major copper producers in the country attest to its attributes. Examples in recent times include South32's purchase of 45% of Sierra Gorda for US$1.55bn in November of 2021 and Lundin Mining's purchase of 51% of Casserones Copper mine for US$950mn in recent months.

Shareholders & Financing

After the demise of the agreement with Lundin in 2014, it is believed that their significant holding was leaked out into the market.

In November of 2022, the company announced a non-renounceable pro-rata entitlement offer to raise approximately $2.5mn before costs.

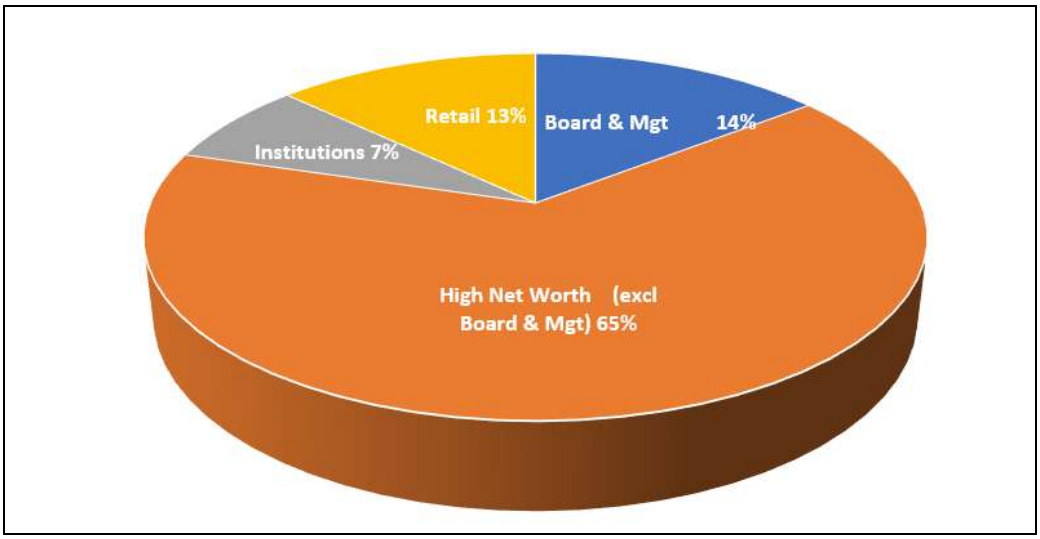
The offer consisted of one fully paid ordinary share for every two fully paid ordinary shares held at an issue price of $0.015. The issue price represented a 23.92% discount to the 30-day volume weighted

average price (VWAP) and a 16.67% discount to the VWAP for shares last traded on the 1st of November 2022.

The offer was not underwritten and is subject to a minimum subscription of $340,713. At the time of the deal's announcement, it was stated that the directors, who collectively held 45,428,466 shares, intended to take up some, or all, of their entitlements.

In mid-December the company announced the results of the financing, raising a total of AUD$1.83mn, before costs, from the non-renounceable rights issue. The entitlement offer was well-supported by major shareholders and directors.

The pie below shows the current shareholder distribution:



Board & Management

Mark Stowell, Chief Executive Officer, an experienced resource sector executive and chairman was the founding Chairman of Mawson West Ltd; an international copper producer and explorer which completed an IPO on the Toronto Stock Exchange in one of the largest base metal IPOs of 2011. He was a founder and non-executive director of Incremental Petroleum Limited and Anvil Mining Ltd.

David Frances, a non-executive director, is currently Managing Director of Province Resources Ltd (ASX:PRL). He led Mawson West (TSX: MWE) from 2006 2012; he was instrumental in developing MWE from a Western Australian gold hopeful into a significant international copper producer, developer and explorer in the DRC. He formerly managed the South Australian office for Dominion Mining.

Natalie Dawson, a non-executive director, has significant Australian and international experience as a Director / CFO / Major Projects Commercial Director having had reporting lines to CEO's, COO's & Board; her experience includes global multinational publicly listed companies (Rio Tinto ASX50, BlueScope ASX50, Whitehaven AXS100, Macmahon ASX100 & Clough ASX200), large scale complex JV projects (the

Chevron Exon Shell Gorgon LNG JV $50b Project & UBS REST JV $750m Renewable Energy Project) & private companies (Nippon Steel BlueScope P/L, Port of Brisbane & JV subsidiaries of Clough and Macmahon.

Richard Caldwell, a non-executive director, has a strong background advising natural resource Australian companies and assisting with IPO, equity capital markets and project development financing. He was formerly Head of Corporate Finance and Equity Capital Markets at StoneBridge, Head of Equity Capital Markets at Burdett Buckeridge and Young; before holding several senior management positions at Citibank Sydney, JP Morgan London and formerly Chairman of the Ascham School Foundation, an unlisted public company.

Adam Anderson, exploration manager, has Australian and international expertise in exploration interpretation and resource definition to advanced project development status. He was Involved in discovering the Golden Cities project in WA, taking it to prefeasibility study level. His accomplishments include planning and drilling the discovery hole for the Certej deeps, which ultimately saw the resource increase from 2Mozs to over 4mn ozs and in another company was responsible for seven JORC Compliant Copper Resources in the DRC**.**

Risks

There are a number of potential risks that should be taken into consideration:

- Global economic conditions deteriorate due to a rising interest rate scenario or slowing growth, or both
- That the Copper price loses upward momentum
- Political risk in Chile evolves against foreign copper miners
- Financing difficulties for larger projects

The copper market has been stronger over the last few years, but doubts still exist as to whether this is a secular change, prompted by long term lack of new projects & development, or whether it is a surge in demand. We would still signal caution as the long-term economic effects of the current pandemic are still not clear. A number of Western economies have been severely battered and are showing decreased, or negative, growth.

The copper price could weaken again if it rises too far too fast, if interest rates perk up or if China shows significant slowdown due to the effects of retaliatory measures against the country or just slower exports to the West. As noted earlier, China has an interest in lower prices and has significant stockpiles and trading positions that it can exploit to play whackamole with the prices of metals it wishes to see lower.

The pipeline of mega copper projects is largely dry, with no new Chuquicamata's waiting in the wings… or even mini-Chuquis. For Chile to maintain its copper dominance projects like Llahuin need to move forward.

Chile in recent years has not been the Chile that investors knew, loved and rhapsodized over. After a change of government to one of a leftist slant, international investor concern was piqued. Previous left-leaning governments in Chile had been rather indistinguishable from the right-leaning ones. The public seemed to be favorable to a swing against *laissez-faire* in the mining space. This augured ill, when the change of government happened, then curiously the Constitutional Assembly that was convened seemed to favour minimal change and miners breathed a sigh of relief. The judges are still out. The travails of Pascua Lama, shut on the Chilean side due to glacier impact and NGO support of protests and legal challenges, even pre-riots, signaled that Chile was not the happy hunting ground it once was and that the world's largest projects could fall afoul of the government, NGO's and local populace. That said, copper mines, particularly mid-tier or smaller ones, are not likely to be targets for resource nationalism.

The hope is that insufficient projects will appear to satisfy demand, thus extending the cycle and making a sustained period of higher copper prices more likely. At the moment, this looks the most probable scenario.

Conclusion

Chile is still the copper destination *par excellence* despite rumblings to the contrary. Moreover, with its largest mines now rather "long in the tooth" the hunt must intensify for replacement sources of supply. While it is not said out loud in public "Peak Copper", from the megamines in Chile, is a real threat.

Southern Hemisphere has flown under the radar for too long and its Llahuin project has not yet come to investors' attention for what it is, a copper project at the larger end of medium sized projects. It is exactly the type of project required to fill the gap in future demand in the absence of megamines being added to the global inventory.

As we noted earlier, one does not need to be a subscriber to apocalyptic views of shortages caused by the EV revolution to be nevertheless bullish on copper. There is not a strong pipeline of large projects to make up for mine retirements/exhaustion of reserves and this dryish pipeline augurs well in the medium-term for prices.

The management at Southern Hemisphere do not see themselves as minebuilders at Llahuin, despite the team having built small, high-grade mines in the past. Rather they intend to grow the project for a mid-tier/major to acquire it. The company regards its expertise as being in unlocking what has been missed, and cheaply for an asset of this size.

Then there is the sleeper component in the form of the Los Pumas manganese project that represents an exposure to the battery metals surge. Manganese is a pivotal, yet unheralded, component of most Lithium-Ion battery formulations. Of all the battery metals, it is the one least credited for its role and the one where commentators tend to be most blasé about its future availability and pricing. We suspect that in the longer term this asset could be the foundation stone of a new listing via a sale/JV or spin-out or some other form of monetization.

Clearly, Southern Hemisphere has flown under the radar for too long, a situation that is now being remedied. The current market capitalization of just over AUD$7mn (and even more derisory at US$4mn) has no relationship to the potential (or even actuality) of Llahuin as a mid-tier copper asset, let alone whatever value might be applied to the scarcely noted (by investors) Manganese asset.

It is particularly poignant to look at the current minuscule market cap of SUH compared to say, Capstone (TSX:CS), which holds the Santo Domingo project, with an almost identical Cu grade on its M&I resource to that of Llahuin's M&I resource.

We are initiating Southern Hemisphere Mining with a **LONG** rating and propose a 12-month target price of AUD$0.06.

Important disclosures

I, Christopher Ecclestone, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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