

Khoemacau to put Botswana on the map as a copper producer

While Botswana has been a copper producer for many years (mainly through BCL's Selebi-Phikwe nickel/copper mine), production has typically been very small, almost insignificant, on a world scale. This is set to change as mines are established in the country's emerging new copper province, the 'Kalahari Copperbelt', which extends from south-west of Maun through to Ghanzi and beyond. The company which can claim prime mover status in this area is US-based Cupric Canyon Capital (Cupric) which – through its wholly owned subsidiary in Botswana, Khoemacau Copper Mining (Pty) Ltd (Khoemacau) – is planning to develop a substantial underground copper/silver mining operation at its Zone 5 site.

Set to come into production in mid-2018, the Zone 5 mine will not be the first mine in the Kalahari Copperbelt. This distinction belongs to the nearby Boseto open-pit mine, developed by Australia's Discovery Metals Limited (DML) that opened in 2012. Burdened by a huge strip ratio of 13 to 1 (this is life of mine average although some mining phases would have been as high as 50 to 1) and challenged by a declining copper price, Boseto failed to meet its ore production targets from the start, leading to it being put on care and maintenance in early 2015. There is now consensus amongst experts that DML – in choosing to adopt open-pit methods – made the wrong decision and that underground mining is the optimal route for most deposits in the area.

Certainly this is the view of Cupric which has been emphatic since 2013 – when it first became involved in the Kalahari Copperbelt after acquiring the assets of Canadian junior Hana Mining – that it would pursue an underground mining solution at its Zone 5 deposit.

When *Modern Mining* last covered Khoemacau in detail a year ago, the company was planning a 10 000 tonne per day (t/d) operation able to produce about 50 000 t of copper annually. While this plan has not changed substantially in the intervening 12 months, the development strategy for the mine and the 'blue sky' potential of the project have evolved considerably as a result of two major developments during 2015.

"The first of these occurred several months ago when we acquired the assets of DML's



subsidiary, Discovery Copper Botswana, including the 3 Mt/a Boseto concentrator, the water system, the mine housing estate (at Toteng village) and associated infrastructure, as well as additional ore resources and targets," explains Cupric's CEO for Africa, Sam Rasmussen. "The concentrator probably ranks as the most important of these assets and our intention is to

incorporate it into our Zone 5 project.

"The second development is that we have updated our Zone 5 resource, which now stands at just over 100 Mt of ore in the measured, indicated and inferred categories grading 1,95 % copper and 20 g/t silver. To get to this point we've undertaken one of the most intensive drilling exercises ever seen in Africa with

Top: The Boseto plant. It was designed to treat 3 Mt/a of 20 % oxide ore and 80 % sulphide ore. The Khoemacau team is confident that – with upgrades – its capacity can be increased to 3,6 Mt/a of sulphide ore.

Left: Drill sites at Zone 5. The drilling campaign undertaken last year saw up to 27 rigs on site simultaneously. Although the mineralisation in the Zone 5 area was discovered in 1962, the definition of the Zone 5 resource is almost entirely due to Cupric Canyon. Hana Mining also drilled extensively when it owned the Khoemacau properties but its efforts were primarily focused on the Banana Zone much further south (photo: Khoemacau).

Right: Just some of the core stored at the Zone 5 site.



Above: Pictured at the Zone 5 core shed are geotechnical engineer Puso Akanyang (left) and Mompoti Babusi, acting Operations Manager, Khoemacau.

Centre: Another view of the Boseto plant looking towards the ROM pad and primary and secondary crushers.



Stewart Wallace (left), acting Operations Manager at Boseto, pictured with electrical engineer Emmanuel Ntshwarang.

up to 27 diamond drilling rigs – sourced from Capital Drilling, Remote Drilling Services, Geosearch and Rotsdrill – on site over the past year. We completed around 70 000 m of drilling in 2015 – which means that, all told, we’ve now put around 194 000 m of drilling into Zone 5 since acquiring the property. The key point about this new resource – which contains 2 Mt of copper and 64 Moz of silver – is that it will enable Zone 5 to support a much bigger mine than originally anticipated.”

Detailing how Cupric will bring Zone 5 to account, Rasmussen says the mine will start off very much as was envisaged a year ago. “In essence, we’re looking at a 10 000 t/d ‘starter’ or phase one operation producing 50 000 t of copper and 1,4 Moz of silver a year – contained in a concentrate grading 42 % copper – from three decline systems along strike in Zone 5 with the ore being treated at the Boseto concentrator. Since this facility is approximately 35 km from the Zone 5 site we will need an ore transportation system. Currently, we are undertaking trade off-studies between the two preferred solutions – road trucking or a rail system – to see which would be optimal for the project.”

He adds that the Boseto process plant is entirely suitable for treating Zone 5 ores, provided some circuit modifications are made. “We carried out an intensive due diligence process before acquiring the DML assets and concluded that the concentrator was an exceptionally good facility that worked very well during the period it was in operation,” he notes. “Boseto’s problems – in our opinion – were all related to the mining approach and had nothing to do with the process plant.

“We’ve also concluded that the nameplate capacity of the mill can easily be increased

from 3 Mt/a to 3,6 Mt/a – or from 8 200 t/d to 10 000 t/d. This is sufficient for the phase one project and means that our capex reduces quite considerably from a year back when we were still contemplating building our own mill for the first phase of Zone 5. In fact, we estimate capex reduces by as much as US\$120 million to US\$150 million.”

The proposed modifications to the Boseto plant will include the installation of a new higher throughput secondary cone crusher, an IsaMill (to enable the fine grinding that the Zone 5 ore requires) and a Larox filter to replace the existing plate and frame filter which is unable to produce a concentrate within the required moisture level. The tailings facility will also have to be expanded. It was designed by DML to take 3 Mt of tailings per annum over a design life of 10 years whereas the new requirement will be 3,6 Mt/a.

Cupric has retained Sedgman, the designer and builder of the Boseto concentrator, as one of its engineering advisers. Along with other professional consultants, Sedgman has contributed to the ‘Combined Case’ feasibility study which has now been completed. Cupric completed a feasibility study on a standalone project at Zone 5 last year and the Combined Case study essentially updates this to take into account the availability of all the Boseto assets, most importantly the Boseto plant.

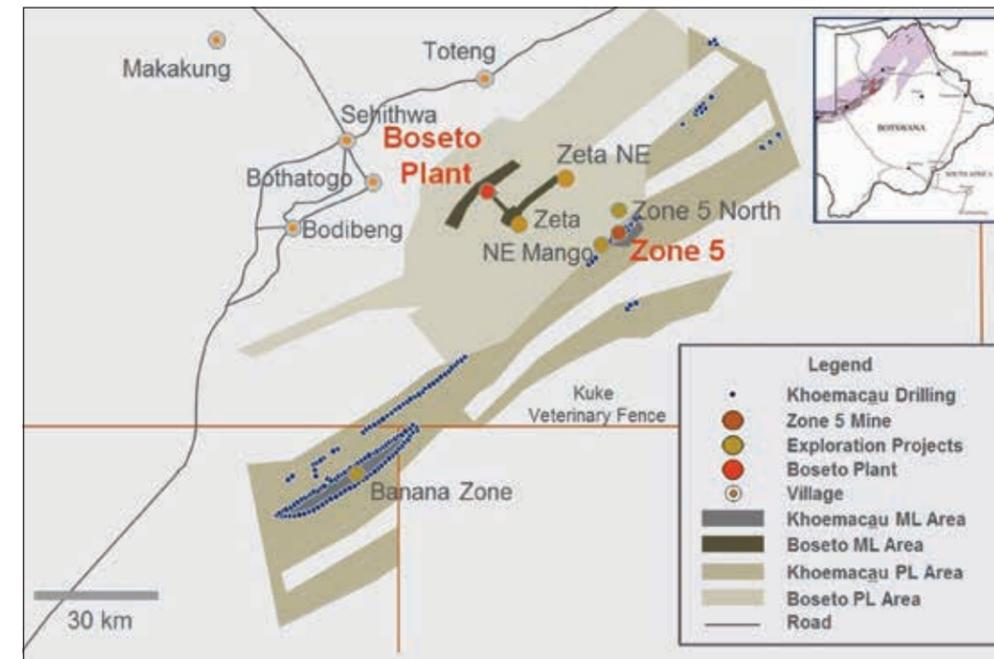
Of course, additional processing capacity is going to be necessary if Zone 5 is to be fully exploited. Says Rasmussen: “Based on our resource and on our recently completed pre-feasibility study, Zone 5 can easily support a

production rate of 16 800 t/d – 6,1 Mt/a – and our aim will be to move to this level of production – which would deliver about 89 000 t/a of copper and 2,5 Moz/a of silver – once we have our initial operation up and running and once market conditions warrant it. We are looking at various options that would allow us to achieve the capacity to treat this additional tonnage. One possibility would be to construct a dedicated processing facility at Zone 5, which would then free up the Boseto plant to treat ore from other deposits within the combined licence area.”

Elaborating, Rasmussen says that Cupric

could pursue DML’s planned underground operation at Zeta (one of the deposits on the Boseto property) but points out that the company only defined a 7 Mt M&I reserve for the project. “We will need to undertake further exploration to see if we can get this figure up to a more viable level,” he notes. “Looking beyond Boseto, our tenements cover a vast area of 4 000 km² and include a number of high-grade mineral targets. We believe there is every possibility that ultimately the entire district could support an ore production rate of up to 30 000 t/d – which translates into 140 000 t/a of copper.

“Given these considerations, you can see that we have some important decisions to make in terms of how we provide the required



The Khoemacau tenements lie to the south-west of Maun, with Zone 5 being roughly 90 km – as the crow flies – from the town.



Part of the Zone 5 camp, where currently approximately 60 employees of Khoemacau are housed (photo: Khoemacau).

processing capability. The Boseto facility will service the ‘starter’ project but what do we do when we need to move up to 16 000 t/d and eventually – depending on our exploration success – to as much as 30 000 t/d? Clearly there are multiple permutations we could adopt combining existing and new capacity and they’re all currently being intensively studied.”

Moving to the proposed mining operation at Zone 5, the deposit is a sedimentary rock-hosted stratiform body with an average width of 10 m, a strike length of 4,2 km, a dip of 56 to 60 degrees and competent stratigraphy. “It’s an orebody that lends itself to low cost, mechanised underground mining using the sub-level open stoping mining method,” says Rasmussen. “No backfilling of the stopes would be required. While the sulphide ore – and the Khoemacau mine will be a sulphide ore-only operation – is first encountered at 70 m below surface, the orebody is open at depth and along strike and recent deep drilling to 1 200 m continues to show high grades and wide intercepts. In its initial phases, the mine will be relatively shallow, with mining starting at about 150 m below surface, with decline access being sufficient but consideration will be given to a vertical shaft as the mining depth increases.”

According to Rasmussen, Cupric will initially make use of a mining contractor to establish the footprint of the mine but will transition to owner mining with the goal of achieving an operation which maximises employment opportunities for Botswanan citizens. “Botswana does not have many underground mines – in fact only four, namely the Morupule coal mine, BCL, the Ghaghoo diamond mine and the Mupane gold mine – so underground mining skills are not abundant,

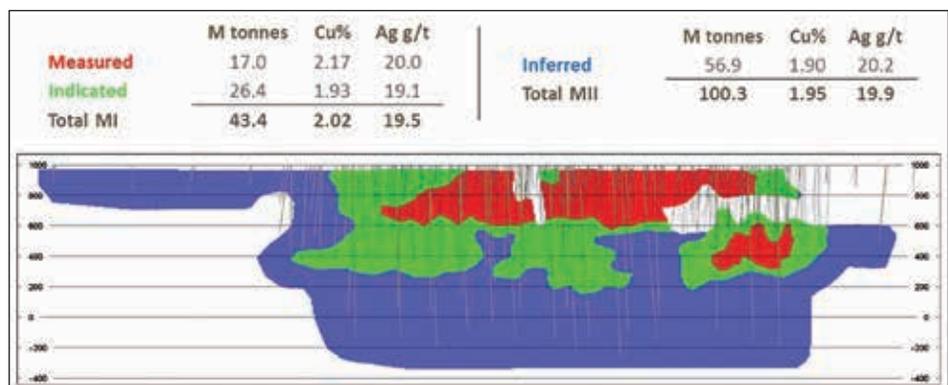
hence our preference for a contractor-mining operation initially. An effective programme of skills transfer will, however, be an important aspect of the mining contract.”

The economics of the Zone 5 mine are compelling with the latest feasibility results indicating a C1 cash cost in the range of US\$1,05 to US\$1,20 per pound of copper, which is in the lowest quartile of the industry cost curve. The capex to achieve a 10 000 t/d operation is estimated at US\$350 million, which gives a capital intensity of US\$6 460 per tonne of annual copper equivalent production. This is less than half of the industry average for brownfield projects of US\$12 000 per tonne.

Water for the mine will be supplied from a nearby wellfield which has already been permitted for 12 000 m³/d, and whose capacity can be doubled without negatively affecting the aquifer. In addition, the Boseto plant is supplied by its own wellfield. As regards electric power, Boseto already has an 18 MVA diesel genset facility (which Cupric is planning to expand to 22 MVA) and additional genset capacity will be installed at Zone 5.

Says Rasmussen: “The Botswana Power Corporation (BPC) has indicated to us that we will have a grid connection by mid-2018, which will coincide with the commissioning of the Zone 5 mine. Should there be any delays

November 2015 resource tabulation for Zone 5 (1 % cut-off, sulphide only).

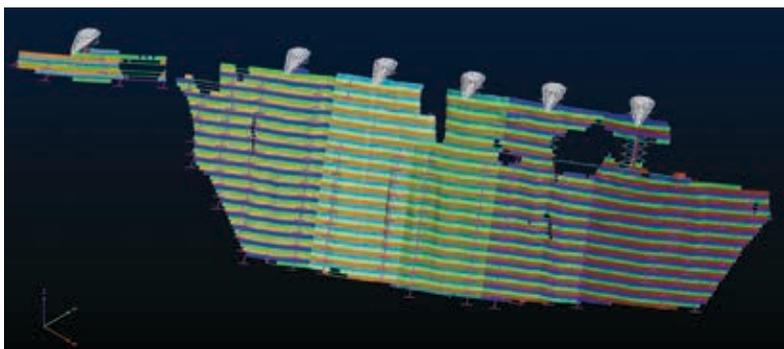


to the grid power connection, we will be able to start-up the mine on the gensets. However, we see them having mainly a standby role. As you know, genset power is extremely expensive – probably four or five times the cost of grid power in the case of this particular project – so we will want to minimise its use.”

Khoemacau received its mining licence in March 2015 – covering not only Zone 5 but the NEF deposit in the Banana Zone, another promising deposit roughly 60 km south-west of Zone 5 – and now has all the permitting necessary to proceed into mine development. To implement the project, Rasmussen has assembled a highly competent team which now consists of around 115 full time employees (including around 30 key people inherited from Boseto). In South Africa the team includes Rob Dey (Project Director), John Deane (Head of Exploration), Clare Calver (Head of Human Resources) and Dale Quaker (CFO).

The key figures in Botswana are Mompoti Babusi, who is acting Operations Manager of Khoemacau with special responsibility for the Zone 5 site, and Stewart Wallace, who is acting Operations Manager at the Boseto site. Babusi, who has a BEng (Minerals Processing) from the University of Queensland in Australia, is a highly experienced metallurgist (he was previously Manager Ore Processing at Tati Nickel) while Wallace, who has a BEng (Mechanical Engineering) from the University of Botswana and an MSc from the University of Salford in the UK, was Engineering Manager at Boseto prior to its acquisition by Cupric. Johannes Tsimako, the Country Manager, continues to represent the company from the Gaborone office.

Looking at the road ahead, Rasmussen says that construction of the mine could start in late 2016. “We are still busy with studies and, of course, we still have to tie up the financing, in which task we are being assisted by Citi,”



he states. “We have, however, given the government an understanding that we will start on construction by January 2017, and there is every possibility that we might bring this date forward.

“Whatever the case, we are targeting first production, as I’ve said, by mid-2018. We’re very excited and believe the commissioning of the mine will be a milestone event for Botswana, signifying the opening up of a new copper-producing province and reducing the country’s current high dependence on diamond mining.”

Photos by Arthur Tassell (unless otherwise acknowledged)

Mine design for Zone 5. Eventually the mine will feature six boxcuts and an extensive spiral decline system. The boxcuts will be excavated through 30 m of Kalahari sand. The large profile mine will be capable of accepting the largest underground haul trucks.

Copper mining industry veterans lead Cupric

Based in Scottsdale, Arizona in the US, Cupric Canyon Capital was founded in 2010 by several copper mining industry executives, all with a background with Phelps Dodge or its successor company, Freeport-McMoRan Copper. The new company was backed from the start by the Barclays National Resources Investment division of Barclays (which has now become Global Natural Resources Investments (GNRI) after a recent management buyout).

The company is chaired by Tim Snider, who has over 45 years of experience of copper mining (and who ended his career, prior to starting Cupric, as President and COO of Freeport-McMoRan), while the CEO is Dennis Bartlett, a 30-year veteran of the industry, who spent most of his career with Phelps Dodge, eventually serving as a Senior Vice President.

Sam Rasmussen, CEO of Cupric’s African operation, also has a background with Phelps Dodge and Freeport-McMoRan. He was GM of Freeport’s Tenke-Fugurume copper mine in Katanga in the DRC (from 2006 to 2009) before moving on to become first the MD of Lundin’s Zinkgruvan mine in Sweden and then GM of Los Bronces copper mine in Chile.