

## Quarterly newsletter - May 2015

Copi North Heavy Mineral Sands Prospect



### Dear Shareholder and Broken Hill Prospecting Supporter,

Broken Hill Prospecting Ltd ('BPL') through a subsidiary Broken Hill Minerals Ltd (BHM) has hit the ground running at new heavy mineral sands (HMS) projects south of Broken Hill in western NSW. Five recently granted Exploration Licences contain titanium and zirconium deposits and are additional to BPL's large cobalt-pyrite (sulphuric acid) deposits SW of Broken Hill.

Drill testing of two HMS deposits has been completed (Copi North and Magic) with 6,000 metres of air-core drilling. Early assay results are now at hand and show that both deposits extend for more than 10km and in places are greater than 250m wide. Exceptional grades reaching more than 35% HM have been returned from initial analyses of Copi North samples and importantly, these occur beneath relatively shallow cover of barren sand and clay.

This newsletter outlines the timetable for a new Rights Issue, details BHM's recent drilling, and provides some industry news relevant to the Company's projects.

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### BPL Announces Rights issue

BPL recently announced a pro-rata non-renounceable Rights Issue of about 25 million new shares on the basis of 1 new share for every 4 shares held by eligible BPL shareholders on 26 May 2015. The issue price is 4 cents per new share, to raise approximately \$1m and 1 new option for every new share subscribed. New options are exercisable at 8 cents on or before 12 November 2019. The Offer is fully underwritten by International Pacific Capital Limited.

**The Offer opens on Friday, 29th May 2015 and closes at 5:00pm (EST) on Thursday 18th June 2015. Valid acceptances must be received before that time and eligible shareholders have the opportunity to apply for additional shares in excess of their pro rata entitlement.**

Proceeds from the issue will be used to progress work at BPL's mineral sands projects as well as provide the Company with general working capital.

## First Drill Samples Exceed Expectations

Multiple intersections of >20% (up to 35%) HM at Copi North (see map) were returned in the first results of 75 air-core drill samples from both the Copi North (EL8312) and Magic (EL8311) HMS deposits include some outstanding, shallow high-grade results.

At Copi North HMS contents range up to 35.4% and nine of the 44 samples contain more than 20% HM. Importantly, high grades are spread along a 10km length of the deposit.

In hole CNA063, near the centre of Copi North, high HM grade (32.51%) occurs between 11-12m depth within a five metre thick zone of more than 9% HM.

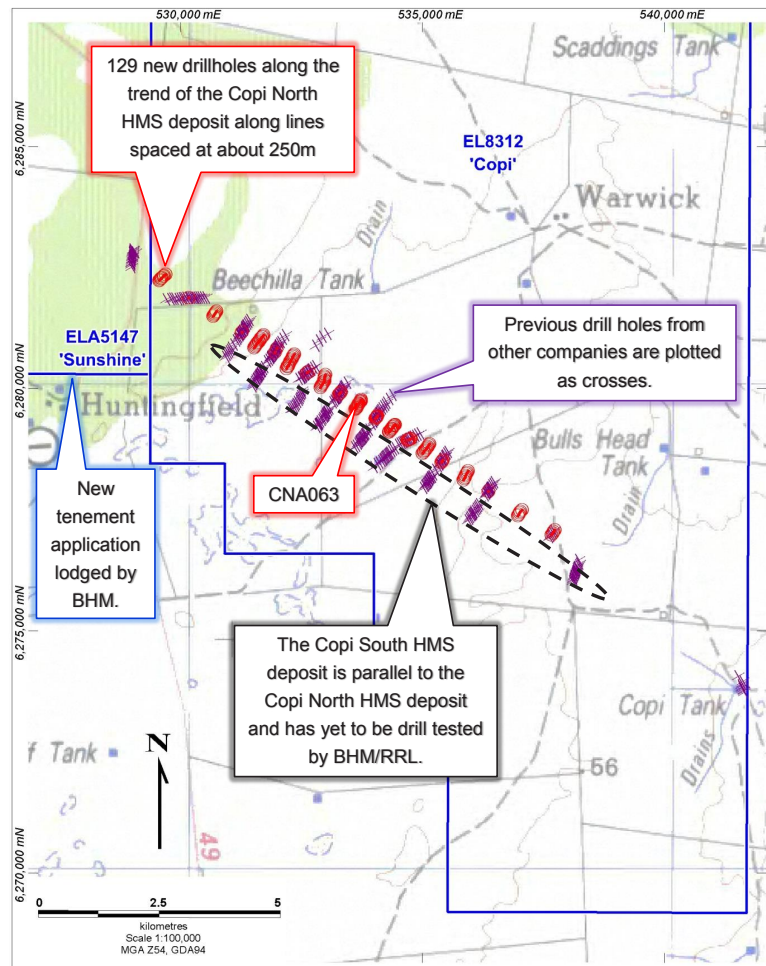
The unusually high-grades and shallow nature of several intersections distributed throughout the Copi North deposit has at this stage exceeded the Company's expectations.

HM content of the 31 selected Magic samples range up to 11.98% and five consecutive mineralised samples from 13m in hole MMA038 average 5.3% HM.

This first batch of HM samples is considered representative and was selected to provide an early indication of HM content and grain-size variability across each of the two deposits.

Results from sieving selected HM intervals from both of the deposits show that most (>95%) of the TiO<sub>2</sub> (rutile and ilmenite) and zircon is coarser than 0.053mm. BPL believes that this may mean that most of the HMS can be recovered using "off the shelf" mineral separation equipment and conventional processing. TiO<sub>2</sub> and zircon mineral proportions for the deposits will be determined as the analytical work progresses.

Work is funded by the private mining investment group Relentless Resources Limited (RRL) which is providing \$2m of funding through a recently announced Joint Venture to earn a 50% interest in the two tenements. Broken Hill Minerals Pty Ltd, a 100% owned subsidiary of BPL, is manager of the Joint Venture.



*Copi Deposit Drill hole locations.*

## Iluka - HMS Production Declines

Iluka Resources reported that HMS production was lower during the first quarter of 2015, partly due to temporary closure of the company's Hamilton mineral separation plant in Victoria during January-February.

Total production fell 24.4% in January-March from the previous year. Zircon production was 16% lower than for the March 2014 quarter, while rutile dropped 39%.

Sales volumes or costs of production aren't provided by Iluka at quarterly intervals. The miner said the prices received for its products were broadly in line with 2014 prices reported in the its full year report in February. Revenue for the quarter was \$115.2 million, 12% lower than a year ago and 51% less than the December quarter.

Iluka's mothballed Tutunup South mine in WA was restarted in February and the associated kiln was also placed back on-stream in March. Both had been idle since July 2013 because of weak prices and the restart reflects Iluka's growing confidence in the outlook for mineral sands.

## Dwindling HMS Grades are a Major Challenge

Decreasing zircon and rutile assemblages and valuable heavy mineral grades are the major challenges of the mineral sands industry according to Dr Victor Hugo, General Manager of Exploration and Geology at Iluka Resources.

Dr Hugo addressed the Informa Mineral Sands 2015 conference in Melbourne in March and described how heavy mineral sand mines have an average grade of around 4% HM and the "trash" proportion of many is close to 50%. He also noted that undeveloped high-grade deposits are typically in countries with high sovereign risks, such as Kenya and South Africa.





# Titanium Production is Labour and Energy Intensive

Titanium was first discovered by William Gregor, a chemist from Cornwall in 1791. However, it wasn't until 1910 when titanium was first manufactured by M.A. Hunter as the result of research at the General Electric Company. Hunter used titanium tetrachloride ( $\text{TiCl}_4$ , sometimes referred to as "tickle"), heat and sodium under a vacuum to create titanium.

Hunter's method was replaced by the multi-step labour- and energy-intensive Kroll Process which after more than ninety years is still used to create almost all the world's titanium.

The Kroll Process involves creating  $\text{TiCl}_4$  by heating titanium dioxide to about  $1,000^\circ\text{C}$  and reacting it with chlorine. Resulting "tickle" is covered with argon and reacted with magnesium at about  $850^\circ\text{C}$ . The process occurs in stainless steel flasks which react with titanium

and form a ferro titanium bi-product which has to be removed. Residual titanium sponge is melted into ingots.

Although expensive to produce, titanium is the only material that can be used for some applications because of its excellent resistance to corrosion, high strength to weight ratio, and ability to withstand high temperatures.

Iluka has signalled that in 2015 it will close mining operations in the US which will reduce output by ~35ktpa of zircon and 200ktpa of ilmenite. Several major projects such as Kwale, Grande Cote and Moma expanded mine-capacity in 2014 but these have suffered commissioning issues and are yet to achieve expected production.

BPL believes that 2015 will be an exciting year for new HMS projects as Ti and Zr output reduces and demand grows.

# Titanium Oxide Breakthrough in Artificial Photosynthesis

Revolutionary new technology using a hybrid of semiconducting nanowires and bacteria can absorb carbon dioxide and use solar energy to convert it into pharmaceutical drugs, biodegradable plastics or liquid fuels has been developed in the US. The system mimics natural photosynthesis, the process used by plants to take energy from sunlight and produce carbohydrates from water and  $\text{CO}_2$ .

The discovery has potential to fundamentally change the chemical

and oil industry to produce compounds and fuels. In the system, an "artificial forest" of silicon and titanium oxide nanowires in light-capturing arrays are seeded with bacterial populations, creating a solar-powered environment-friendly chemistry 'factory' that can use sequestered  $\text{CO}_2$  as a fuel. The procedure is capable of converting solar energy at an efficiency of around 0.38% under simulated sunlight, about the same level as a natural leaf.

# Some Facts on Zircon

The main source of zirconium is the zirconium silicate mineral, zircon ( $\text{ZrSiO}_4$ ).

Like cobalt and rare earth metals China dominates the downstream zirconium business at ~90% of market share.

Recently China declared zirconium a strategic metal and this introduced the possibility of world-wide supply issues for countries previously dependent on Chinese exports. As a result of possible future supply deficits zircon

prices increased by 50% during 2010 (to US\$1,500t) and reached \$2,600t in 2011. Although prices have settled to 2010 levels, they could rise higher and continue this trend.

Australia is well placed to take advantage of the zircon market and a supply crunch for zircon could have major implications for countries seeking to exploit nuclear energy.

- Australia leads the world in zircon mining, producing 37% of the world total and accounting for

# India Takes Steps to Secure Titanium Supplies

India's Department of Space together with Kerala Minerals and Metals Ltd (KMML) has built a 500t per annum titanium sponge plant at KMML's facility in Chavara Kerala. The Minister of State for Mines and Steel Vishnu Deo Sai said the India government was focusing on enhancing titanium production capacity.

India plans to use the metal for aircraft manufacture, including fighter aircraft as well as in nuclear plants, engine parts, ocean platforms, reactors, manufacture of dental implants and artificial bones.

# UK leading the Way in Titanium Powder

The UK government recently announced £3.1m of collaborative research effort with several titanium industry heavyweights and research centres. The collaboration, called the Titanium Powder for net-shaped component manufacture, or TiPOW, is intended to research development of a titanium powder that can be produced in large quantities.

TiPOW will provide a better understanding and insight into improving airplane and aerospace performance. Development of new titanium alloys and powders best suited for additive manufacturing will be a key feature for the new research. Most of the world's titanium is produced using the Kroll process, which is expensive and energy-intensive.

40% of resources.

- Zirconium is used in nuclear fuel cladding, chemical piping in corrosive environments, heat exchangers, and various specialty alloys.
- Zircon is the primary source of all hafnium. The major end uses of hafnium are in nuclear control rods, Ni-based super-alloys, nozzles for plasma arc metal cutting, and high-temperature ceramics.

## Cobalt Film Could Revolutionize Fuel Cells

Researchers at Rice University have discovered that a thin cobalt-based film can be used as a catalyst to produce both hydrogen and oxygen from water to feed fuel cells. The cobalt/phosphide/phosphate material is thinner than a hair can be used as both the anode and cathode in an electrolysis device.

The research showed the cobalt film to be superior, robust and less expensive than most commercial platinum catalysts. The film also produces oxygen so by alternating the current from positive to negative and back again, hydrogen and oxygen are produced from the same material.

Applying alternating current from wind or solar energy sources to cobalt-based electrolysis could provide a future environmentally friendly source of hydrogen and oxygen.

## Cobalt Battery Market in China Looking Up

China's lithium-cobalt ion battery market is expected to grow a staggering fivefold by 2017 according to recent research by Tyrepress. Chinese demand for electric vehicles is triggering an explosion of investment in the lithium-ion battery industry.

Battery manufacturers are already scrambling to meet accelerating demand. Samsung, LG, and Foxconn each invested more than US\$325m in China's lithium-ion battery market in 2014, and higher levels of investment are expected during 2015.

## DR Congo Moves May See Mine Closures

The Democratic Republic of Congo is planning both a hike in mineral royalties and to increase its ownership of future mining projects.

The DRC is Africa's largest copper producer and the world's leading source of cobalt. Annual cobalt output is close to 76,000 tons and an estimated 60% of world supply.

The proposed new code raises royalties on copper and cobalt revenue to 3.5% (from 2%) and on gold and other precious metals to 3.5% (from 2.5%). The royalty on diamonds and other

gems will increase to 6% (from 4%).

The government's free share of new mining projects will increase to 10% (from 5%) and the current profit tax will increase to 35% from the current 30%.

According to DRC's main business group, the Federation des Entreprises du Congo, plans to reduce the current 10-year guarantee before the amendments to 5 years for new projects as well as a proposed 50% windfall-profit tax will also discourage investment in the DRC.

## BPL - Where to From Here?

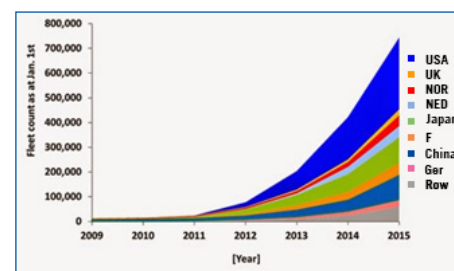
The rapid advance of two HMS deposits is a tremendous step forward for the Company. During the next few weeks analyses of the drill samples from both Copi North and Magic HMS deposits will be completed. BHM intend to complete JORC 2012 reporting on resource estimates during the next few weeks and, given encouraging results, work will proceed into prefeasibility studies for mining of at least one of the deposits. BPL anticipate this work can

be completed during 2015 with a view to fast track development and production.

In the next newsletter I hope to provide details on the heavy mineral sand make-up and resource estimates for these exciting high-grade HMS deposits. I remind BPL shareholders to carefully consider taking up their entitlements offered in the Rights Issue which opens on the 29th May and for which they will receive documentation. The proceeds

## Cobalt - The 'Great Enabler' for Batteries

Chris Berry, a well-known analyst and researcher on energy metals thinks that there is a looming need for a more secure cobalt supply. In an April InvestorIntel article Berry notes "Much of cobalt's appeal concerns the perceived need for a reliable source and supply chain as roughly 50% of global mined production comes from the DR Congo and the lion's share of refined cobalt comes from China. The real opportunity in cobalt lies in the lack of a longer-term pipeline of projects that can fill any supply gap in several years".



*Sales of electric vehicles. Many of these have lithium ion cobalt batteries (Image credit: Edie.net, Kirill Klip blogspot)*

will be put towards advancing the Company's exciting new HMS deposits.

Yours faithfully

Ian Pringle  
Managing Director

### Competent Person Statement

Exploration activities and results contained in this letter are based on information compiled by Dr Ian Pringle, a Member of the Australasian Institute of Mining and Metallurgy. Dr Pringle is the Managing Director of Broken Hill Prospecting Ltd and also a Director of Ian J Pringle & Associates Pty Ltd, a consultancy company in minerals exploration. He has sufficient experience which is relevant to the style of mineralisation and types of deposits under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code). Dr Pringle has consented to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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