



C3 Metals Top Pick by Northern Miner

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Copper snapshot: Eight companies with promising assets

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C3 Metals



C3 Metals Jasperoide Project in Southern Peru. Copper Gold Skarn mineralization last drilled in 2012

C3 Metals (TSXV: CCCM) is a copper-gold explorer, whose flagship asset is the 57-sq.-km Jasperoide project in southern Peru's producing Andahuaylas-Yauri belt.

Prior exploration work at this site defined copper-gold mineralization within a magnetite skarn, with a proximal hydrothermal alteration signature suggestive of an underlying copper porphyry system. High-grade copper-gold skarn outcrops have been mapped over 3 km of strike.

C3 sees potential for a stacked skarn system at the property, with a near-surface oxide copper zone that has deeper porphyry-style mineralization.

According to a September press release, C3 has identified three key surface exploration and drill targets at the property: Montana de Cobre, Cresta Verde and Callejon de Oro.

Montana de Cobre features copper-gold mineralization traced 1.5 km of strike, in skarns, which coincides with a geophysical anomaly. Highlights from prior drilling (completed in 2011 and 2012) include 185 metres of 1% copper and 0.39 gram gold starting at 22 metres; and 115 metres of 0.97% copper and 0.37 gram gold from 37 metres.

At Cresta Verde, outcropping skarn mineralization also coincides with a geophysical anomaly. A drill hole completed in 2011 into this area hit 24 metres of 1.86% copper starting at 19 metres. There are three kilometres of untested strike within this target area for step-out drilling.

Callejon de Oro also includes a magnetic anomaly, with past trenching returning high-grade epithermal-style gold mineralization. One of the trenches returned an 11-metre interval of 19.5 grams gold.

According to Tony Manini, C3's executive chairman, the geology at Jasperoide is "consistent with several of the major deposits discovered in the district," and "the soil geochemistry and geophysics clearly indicates a far bigger system than has been tested by drilling to date."

No drilling has been completed at this site since 2012. Surface exploration work is now underway, with a 3,500-metre drill program expected to follow.

The company also holds 207 sq. km of ground in Jamaica, prospective for copper and gold mineralization, in addition to two porphyry copper-gold properties in B.C. and the Stewart Brook gold project in Nova Scotia's Meguma gold belt.

In August, C3 closed a C\$2.4-million private placement, with proceeds intended for exploration at Jasperoide.

C3 Metals has a C\$18.8-million market capitalization.

Arizona Metals (TSXV: AMC) wholly owns the Kay Mine and Sugarloaf Peak projects in Arizona.

Kay Mine, with a history dating back to the nineteenth century, lies within an established mining district in Yavapai County, with 60 past-producing operations within a 150-km radius. A historical reserve estimate for Kay previously defined 5.8 million tonnes grading 2.2% copper, 3.03% zinc, 55 grams silver per tonne and 2.81 grams gold per tonne at the volcanogenic massive sulphide deposit.

In September, Arizona released drill results for holes completed at Kay, which hit massive sulphide mineralization up- and down-dip of prior drilling. Notable intercepts include 38 metres of 2.9% copper-equivalent, 50 metres down-dip of an intersection announced in August; and 40 metres of 3.4% copper-equivalent, 50 metres up-dip of the recent drilling. According to Arizona, these hits appear to be from a newly defined gold-zinc-rich lens.

The Kay deposit extends over 320 metres of strike, with permitting underway for

additional drill pads to test a further 500 metres of strike to the north and an additional 300 metres of strike to the south. Arizona is also permitting drill pads for the Central and Western targets, 500 metres and 1,000 metres west of Kay, respectively.

The Sugarloaf property, in La Paz County, features a historical resource of about 90.7 million tonnes grading 0.5 gram gold. This deposit, a heap leach target that starts at surface, is also open for expansion, with exploration targets nearby. Geophysical anomalies at the site indicate potential for higher-grade feeder zones at depth. In August, Arizona completed a 1,700-metre drill program with four holes testing these areas. Notable results include 137 metres of 0.53 gram gold starting at surface, from an area 45 metres below prior drilling. Additional assays are pending for two holes drilled in an untested target area, which has potential to be a higher-grade feeder zone.

Metallurgical testing is also ongoing on the Sugarloaf material.

Arizona Metals has a \$C42.9-million market capitalization.

Atico Mining (TSXV: ATY) is focused on advancing copper-gold projects in Colombia and Ecuador.

The company's principal asset is the producing, 90%-held El Roble underground copper-gold-silver mine in Colombia, 145 km from Medellin. At this 63.6-sq.-km site, a 1,000 tonne-per-day underground mine extracts ore from volcanogenic massive sulphide lenses to produce a copper concentrate with gold and silver by-products. The concentrate is then trucked from the El Roble mine to the port of Buenaventura.

El Roble has been in production for over 23 years and has produced over 1.5 million tonnes of material, at an average head grade of 2.5% copper and 2.5 grams gold per tonne.

In the first six months of this year, El Roble generated 9.4 million payable lb. copper, at cash costs of \$1.03 per lb. of payable metal, net of by-product credits.

Reserves across the El Roble property total 1.5 million tonnes grading 3.4%

copper and 1.88 grams gold.

Exploration work at the site has identified a 10-km prospective host rock package, with VMS-style mineralization across the entire strike. There are 15 exploration targets identified within the land package to date. On a near-mine basis, six geophysical anomalies lie within 2 km of the existing operation, with 13,000 metres of drilling scheduled for 2020.

In October, the company announced that it entered into a \$2.5-million loan with Export Development Canada. The 30-month facility is expected to provide financial flexibility and contribute funds towards a new dry stack tailings facility at El Roble. In Ecuador, Atico holds a 60% stake (and may earn up to a 75% interest) in the 23-sq.-km La Plata gold-copper-zinc-silver project. This road-accessible property is 100 km from the capital city of Quito and prospective for VMS deposits.

A 2019 estimate for the project defined an inferred resource of 1.9 million tonnes grading 4.1 grams gold, 50 grams silver, 3.3% copper, 0.6% lead and 4.6% zinc (12.9 grams gold-equivalent).

In August, the company announced that it had hired G Mining, as it aims to deliver a feasibility study for the asset by early 2022.

With over 9 km of favourable strike at the site, Atico has defined potential for extensions to the current resource model and defined additional exploration and regional targets for follow-up.

In September, Atico released exploration results from the North Block at La Plata, reporting wider-than-anticipated intercepts of precious metals-rich VMS mineralization. Drill highlights include 11 metres of 1.03 gram gold, 11.47 grams silver, 1.62% copper and 0.2% zinc starting at 15 metres; and 17 metres of 3.42 grams gold, 53.97 grams silver, 3.23% copper and 1.65% zinc from 32 metres. Atico Mining has a C\$58.3-million market capitalization.

Doré Copper (TSXV: DCMC) holds approximately 105 sq. km of ground in the Lac Doré-Chibougamau mining camp in Quebec. The holdings include three copper-gold deposits: Corner Bay, Cedar Bay and Devlin, with additional historic

resources at Copper Rand. Cedar Bay and Copper Rand are past-producing sites, with a 2,700-tonne-per-day processing plant at Copper Rand, in addition to a previously permitted tailings facility. The company's mineral assets are within 60 km of the mill complex.

A 35,000-metre drill program is now underway across the properties, ahead of a resource update and preliminary economic assessment release next year.

Exploration at Corner Bay has been ongoing for over 20 years. The deposit was first discovered in 1982. By 2008, an underground bulk sample program recovered approximately 40,000 tonnes of material, grading 2.48% copper and 0.44 gram gold per tonne. A ramp extends down to a depth of 115 metres, with 2 km of development over three levels.

Based on a 2019 resource estimate, Corner Bay resources total 1.4 million indicated tonnes at 3.01% copper and 0.27 gram gold, with a further 1.7 million inferred tonnes grading 3.84% copper and 0.27 gram gold. The deposit is open for expansion at depth and along strike.

In September, Doré announced drill results from Corner Bay, which extended the main deposit by 125 metres to the south and over approximately 300 metres down-dip. Notable intercepts included 6 metres of 3.03% copper, 0.11 gram gold and 6.6 grams silver; and 7 metres of 4.1% copper, 0.38 gram gold and 13.2 grams silver. Cedar Bay, northwest of Corner Bay, generated 3.8 million tonnes grading 1.63% copper and 3.1 grams gold between 1958 and 1990, and includes a shaft down to a depth of 1,036 metres, with development extending down to the 754-metre level. Current resources at Cedar Bay stand at 130,000 indicated tonnes at 9.44 grams gold and 1.55% copper, with a further 230,000 inferred tonnes grading 8.32 grams gold and 2.13% copper.

Also in September, the company released drill results from Cedar Bay, which hit extensions of three existing veins at the site. Drill highlights include 3 metres grading 6.92% copper, 3.1 grams gold and 24.2 grams silver; and 2 metres of 7.57 grams gold, 1.65% copper and 15.8 grams silver.

The company also has the option to earn a 100% interest in the past-producing

Joe Mann property, 60 km from the Copper Rand mill, with remaining payments of C\$3.5 million in cash and C\$2 million in shares due by January 2023. As part of the option agreement, Doré also needs to spend C\$2.5 million on exploration at the project.

Doré Copper has a C\$19-million market capitalization.

Filo Mining (TSXV: FIL) is working to advance the Filo del Sol copper-gold-silver deposit on the Argentina-Chile border, 140 km from Copiapo in Chile. The two countries have established a Mining Integration and Complementation Treaty for cross-border mining projects.

The property contains a high-sulphidation deposit, associated with a porphyry system, and includes an upper oxidized portion. Current drilling has defined this system over an area of at least 3.7 km by 1 km.

Resources at Filo del Sol total 425.1 million indicated tonnes at 0.33% copper, 0.32 gram gold and 10.7 grams silver, with a further 175.1 million inferred tonnes grading 0.27% copper, 0.33 gram gold and 6.2 grams silver. This inventory includes an oxide component of 349.6 million indicated tonnes grading 0.34% copper, 0.32 gram gold and 12.6 gram silver, and 103.9 million inferred tonnes at 0.26% copper, 0.32 gram gold and 8.7 grams silver.

A 2019 prefeasibility study for Filo del Sol outlines a 14-year, 60,000-tonne-per-day open pit operation, with conventional crushing, heap leaching and hydrometallurgical processing to produce copper cathodes and gold-silver doré .

The operation would produce an average of 67,000 tonnes copper, 159,000 oz. gold, 8.7 million oz. silver, at average cash costs of \$1.23 per lb. copper, on a co-product basis, over the life of the mine. With an initial capital cost estimate of \$1.27 billion, the after-tax net present value estimate for the project came in at \$1.28 billion, at an 8% discount rate, with a 23% internal rate of return.

The most recent, 8,000-metre drill program at Filo del Sol “transformed our understanding of the size and scale of the Filo system,” according to Jamie Beck, Filo’s president and CEO. Beck noted that the results of the drill program confirm

“the enormous potential for resource expansion that exists at Filo.”

Notable intercepts from this drilling included 1,009 metres of 0.95% copper-equivalent; 1,034 metres of 0.68% copper-equivalent; and 73 metres of 2.04% copper-equivalent. The intercepts are from areas mostly outside current resource boundaries.

In its upcoming drill program, the company plans to drill additional deep holes, in an attempt to find the limits of the Filo del Sol system.

Filo is part of the Lundin Group of companies and has a C\$216-million market capitalization.

Kutcho Copper’s (TSXV: KC) flagship asset is its 171-sq.-km Kutcho copper-zinc property in northern British Columbia.

A 2017 prefeasibility study for the project outlines a 12-year, 2,500-tonne-per-day underground operation producing an average of 33 million lb. copper and 46 million lb. zinc annually, in addition to gold and silver by-products. With unit operating costs pegged at 59¢ per lb. copper, net of by-product credits, and with initial capital costs of C\$221 million, the after-tax net present value estimate for the project is C\$265 million, at an 8% discount rate, with a 27.6% internal rate of return.

Mineralization at Kutcho is made up of three known volcanogenic massive sulfide deposits. The largest deposit, Main, outcrops at surface along a plunging trend, with Sumac, and then Esso, down plunge to the west.

A feasibility study for the project is now expected in the first half of 2021.

Last year, the junior updated resources for Kutcho. The site features measured and indicated resources of 17.3 million tonnes grading 1.85% copper, 2.72% zinc, 0.49 gram gold and 33.9 grams silver and inferred resources of 10.7 million tonnes at 1.18% copper, 1.76% zinc, 0.26 gram gold and 21.5 grams silver.

Metallurgical test results released in June, completed on an expected life-of-mine blend of feed from the Main and Esso lenses, suggest combined flotation and tailings leach recoveries of 96.4% for copper, 75.1% for zinc, 70.4% for gold, and

82.9% for silver.

The updated results will be incorporated into the upcoming feasibility and, according to Kutcho, are expected to positively impact project economics.

In 2017, Kutcho signed a \$65-million precious metals purchase agreement with **Wheaton Precious Metals** (TSX, NYSE: WPM). This financing package provided over \$100 million in funding, with up to \$20 million available towards development, in the event that Kutcho expands towards a 4,500-tonne-per-day operation. The streamer has also loaned Kutcho \$20 million in a convertible term debt loan. As a result of the financing package, the pre-producer estimates that approximately 8% of project revenues are connected to a stream.

In September, Kutcho closed a C\$2.2-million private placement.

On the exploration front, the company has identified near-resource targets between the Main and Sumac deposits, down-dip of the three deposits, and to the west of Esso.

Kutcho Copper has a C\$17-million market capitalization.

PolyMet Mining (TSXV: POM; NYSE: PLM) is looking to restart the LTV Steel processing site in northeastern Minnesota by developing its NorthMet copper-nickel-PGM-cobalt deposit, which is part of the Duluth geological complex. The developer wholly owns the past-producing project, which also includes rail, roads and utilities connecting the orebody to the plant, 11 km away.

Proven and probable reserves at NorthMet stand at 290 million tons, grading 0.29% copper, 0.08% nickel, 0.26 gram palladium, 0.08 gram platinum, 0.04 gram gold and 74 grams cobalt.

PolyMet has also identified opportunities to grow current resources and reserves, with undrilled up-dip potential around existing pit designs.

NorthMet is permitted for construction and operations. Although PolyMet has permits in hand, the permits have been subject to ongoing litigation. Thus far, the company has successfully defended itself in at least six of 11 state and federal cases challenging the project.

PolyMet is looking to develop a staged operation at NorthMet. The first phase would feature an open pit operation producing copper and nickel concentrates. To develop this part of the project, the company would need to refurbish existing facilities, install new processing equipment and upgrade the tailings basin. This first stage could operate at 59,000 tonnes per day, and produce, on average, 155 million lb. copper-equivalent per year, at cash costs of 72¢ per lb., with additional expansion potential. With a project capital cost estimate of \$1.1 billion, the net present value estimate for this development stands at \$751 million, at a 7% discount rate, with an 18% internal rate of return.

A second phase would involve the construction of a 1,000-tonne-per-day hydrometallurgical facility, to improve metal recoveries and produce value-added products, such as nickel-cobalt hydroxide, a platinum group metal precipitate and higher-quality copper concentrate. To build the second stage, PolyMet would need an additional \$259 million.

Glencore (LON: GLEN) is PolyMet's largest shareholder, and has established an offtake agreement with the company. The junior is now looking to secure debt and equity financing for project optimization and construction.

PolyMet Mining has a C\$521.6-million market capitalization.

Trilogy Metals (TSXV: TMQ) has a 50% stake in a joint-venture partnership with Australia's **South32** (ASX: S32) covering the Upper Kobuk copper-zinc-lead-gold-silver-cobalt properties within the Ambler mining district in northwest Alaska. The Arctic project, 470 km northwest of Fairbanks, is the most advanced holding within Upper Kobuk.

In August, Trilogy announced the results of a feasibility study for Arctic. This study outlines a 10,000-tonne-per-day, 12-year open pit operation, with a conventional mill and flotation process, producing copper, zinc and lead concentrates. These would be transferred by truck to the Alaska railroad.

This operation would produce an average of 155 million lb. copper, 192 million lb. zinc, 32 million lb. lead, 32,165 oz. gold and 3.4 million oz. silver annually, at all-in

cash costs (which include initial and sustaining capital, as well as operating and closure costs, net of by-product credits) of US98¢ per lb. payable copper.

With an initial capital cost requirement of \$905.6 million and base-case long-term metal prices of \$3 per lb. copper, \$1.1 per lb. zinc, \$1 per lb. lead, \$1,300 per oz. gold oz. and \$18 per oz. silver, the after-tax net present value estimate for the project is \$1.1 billion, at an 8% discount rate, with a 27% internal rate of return and a 2.6-year payback period.

According to Tony Giardini, Trilogy's president and CEO, the Arctic project is unique due to its high-grades and polymetallic content in an open-pit mining scenario.

The Arctic deposit includes a reserve of 43.4 million tonnes at 2.24% copper, 3.12% zinc, 0.54% lead, 0.47 gram gold and 34.69 grams silver.

Trilogy has now started the permitting process for Arctic, which is expected to take three years to complete, ahead of a three-year engineering and construction period.

Geophysical surveys have also identified prospective anomalies around the Arctic deposit.

Trilogy also has a local partnership with NANA, an Alaska Native regional corporation, with a framework for exploration and development within the area, and an additional infrastructure partnership with the state.

Trilogy Metals has a C\$331.8-million market capitalization.

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