

British Columbia's Mining Industry & Vancouver, the World's Mining Barometer

In spite of adverse economic conditions, mining in British Columbia stands in great stead for growth while Vancouver's myriad of mining companies continue to operate in all corners of the world.

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Building more than just a mine

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Beauty and the Beast

An Overview



Looking north, the new mill at the Copper Mountain mine. Photo courtesy of Copper Mountain Mining.

The provincial mammal endemic to British Columbia is the Kermode bear, a black bear with white fur due to a recessive genetic trait. Bears and recessive traits are fitting words to describe the state of the mining industry in the province, and indeed the world, since Global Business Reports last covered British Columbia in 2011. Yet with an abundance of natural resources, progressing infrastructure development and a new term in office for the mining friendly Liberal Party, a new dawn for the industry lies ahead.

British Columbia has all the characteristics of a first-class mining jurisdiction: access to booming Asian markets, good infrastructure, skilled labor, a pro-mining government and bounteous natural resources. It is also home to Vancouver, the world's exploration capital. With around 1,000 junior mining companies and 2,500 service companies, the city has grown from a staging post for the Klondike Gold Rush to a global mining hub. Vancouver-based mining companies now operate worldwide from Chile's Atacama Desert to the jungles of the Democratic Republic of the Congo.

As well as plentiful resources of gold, silver, zinc, lead and industrial minerals, British Columbia is Canada's primary exporter of coal, largest copper producer and only producer of molybdenum. 2012 was a difficult year as prices for all these commodities, except gold, dropped as a result of slowing demand from China and recession in Europe. Gold ultimately took the plunge in April this year. This drop, combined with rising costs of labor, energy and raw materials hit producers' bottom lines. According to PwC's latest survey of mining in British Columbia, 2012 mining revenues dropped to \$9.2 billion from \$9.9 billion in 2011;

earnings plummeted to \$1.8 billion, down from \$3.7 billion; and operational cash flow almost halved from \$4 billion in 2011 to \$2.2 billion.

Capital funding evaporated, falling from \$3.3 billion in 2011 to \$94 million in 2012. D. Brent Thompson, president of Mining and Minerals at Tetra Tech, explained the lack of investor confidence in the market: "Over the last number of years there was lots of money

available but investors never saw returns in terms of dividends or share price increase. Combined with global mining trends such as nationalization of mines, increased environmental regulations, sovereignty and tax increase issues, and the ever rising costs which have created a lack of confidence in capex predictions, the risk reward balance for the investment community started to become considerably out of sync."

Over the next 12 months, up to a third of the junior market could disappear. It is argued, however, that this "spring clean" may not be a bad thing due to the profusion of companies vying for market share who were drawn to the industry during the boom years despite no real understanding of mining. There are tough times ahead, but companies with good assets should look to the future with cautious optimism. Urbanization in the developing world is expanding the middle-class consumer base and hence demand for British Columbia's coal and mineral wealth. In the immediate term, the market presents a rare opportunity for companies to shop for great assets at bargain prices. Hunter Dickinson acquired the Gibraltar mine, during the "nuclear winter" of 1997: the Gibraltar mine is now the second largest open-pit copper-molybdenum mine in Canada.

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British Columbia

A Bright Future Ahead



Tanzilla project, Northern Stikine Terrane, British Columbia. Photo courtesy of West Cirque Resources.

The last-minute Liberal Party victory in the elections of May 14 elicited a sigh of relief from British Columbia's mining community, who were bracing themselves for a return to the National Democratic Party (NDP), which caused the stagnation of the 1990s. Coupled with the current investor environment, many believed that a NDP victory would have been the final nail in the coffin for mining in the province. However, despite Premier Christie Clark losing her own seat, the Liberals pulled off a last-minute and unexpected victory, winning 50 seats against the NDP's 33. With another four years in office and a newly appointed Minister of Energy and Mines, the Honorable Bill Bennett, the Liberals are now pressing ahead plans for growth. "Given our success at the polls, the provincial Liberal government has been provided with a mandate to continue to develop policies which encourage mining investment, development and the training of skilled workers. It has encouraged us to feature mining in our jobs plan and to provide the industry with a larger portfolio in our government than ever before," said Bennett.

Despite the recent scarcity of financing, over the last decade there has been a major resurgence of exploration interest back to British Columbia. "Last year we saw record-breaking expenditure of \$680 million in the province, 47% up from the previous year. In 2001, we were only attracting around 5% of overall investment in Canada, which equated to expenditure of around \$30 million. Over the last decade, there have been ups and downs but there has been a general trend up and British Columbia is now attracting around 20% of all expenditures in Canada," said Gavin C. Dirom, president and CEO of the

Association for Mineral Exploration British Columbia (AMEBC).

Dirom puts the resurgence of interest in the province down to stronger commodity price trends and a more favorable public policy with regards to attracting investment in the sector. Also important to note are geological factors and political issues in competing jurisdictions. "Today, the costs associated with operating in British Columbia are much better aligned, which together with stable mineral tenure and low country risk are making [the province] much more attractive," said Steve Vanry, chairman, West Cirque Resources.

Gilding the Lily: Attracting Exploration Expenditure

Geological wealth trumps all other factors in the mining industry, and a number of new discoveries have reminded junior companies that British Columbia has this in abundance.

Two new discoveries which have made waves in the province are New Gold's

100% owned Blackwater project and Colorado Resource's 100% owned North ROK. The Blackwater project is found southwest of Prince George and lies within a structurally raised block called the Nechako Uplift. Measured and indicated resources sit at 7.5 million oz gold and 28.3 million oz silver, while inferred resources total 2.7 million oz gold and 28.3 million oz silver. New Gold will look to continue drilling in the spring of 2014, in view to begin construction in 2015 for an operational start date in 2017.

Colorado Resources' North ROK porphyry copper-gold property is composed of 14 claims, totaling 5,188 hectares, and caused great excitement in the market back in April of this year. The company's first drill hole hit 242 meters of 0.63% copper and 0.85 g/mt gold, sending Colorado Resource's stock to \$1.53 from \$0.15. Colorado Resources is currently in Phase III drilling at the property, having intercepted 177 meters of 0.55% copper equivalent, including 68 meters of 0.79% copper equivalent, this October. According to Colorado Resources' president and CEO, Adam Travis, there is more excitement to come: "It is too early to predict how large North ROK's mineralization might be. We see all the right rock types and alteration levels [and] there has been huge interest in the project from the rest of the industry."

It has also been encouraging to see explorers, such as David Blann, president and CEO of Happy Creek Minerals, still actively in the hunt. Blann, inspired by his experience working in exploration, development and production saw a potential niche for an exploration company to focus on proximity to mines and infrastructure. Blann's company has chosen to diversify



Steve Vanry, chairman, West Cirque Resources.



David Blann, president and CEO, Happy Creek Minerals.

its mineral exploration activities in search of copper, molybdenum, tungsten, gold and silver. At the company's Fox property in the Cariboo region of British Columbia the company drilled 14.8 meters of 4.0% tungsten trioxide at its hole F12-27. Blann said: "These are arguably the best tungsten drill results for a new discovery in the Western world."

Highlighting the effectiveness of Happy Creek's approach, the company has also had some promising results at its Rateria property; four miles from Teck Resources' Highland Valley copper mine. "What Happy Creek found was similar grade to what is

being mined at Highland Valley... drill results include 95 meters of 0.67% copper in Zone 1 and 152.5 meters of 0.35% copper and 0.57 g/mt rhenium in Zone 2. The rhenium values in Zone 2 are actually very high on a global scale and could be a significant credit," said Blann.

These discoveries have been encouraged by a sensible system of incentives put in place by the Liberal administration. As resource nationalism and higher taxes become growing concerns in many formerly friendly mining jurisdictions, British Columbia has become more appealing. "For a long time South America attracted a lot of attention with a lot of great deposits; now they are getting into lower quality and less accessible ones and, combined with the emergence of various geopolitical issues, miners are turning their attention back to British Columbian deposits," said Marcel Bittel, operations manager for Vancouver at EPCM giant Fluor.


Steps taken by the provincial government include renewing the 20% mineral exploration tax credit. The credit is available to corporations engaged in exploration in the province for all base and precious metals, coal and some industrial metals. Many, including AMEBC, argue that the government should go a step further and continue the

mining flow-through share program, which is due to be discontinued at the end of the year. AMEBC is asking for a three-year extension or, preferably, to make it permanent. The flow-through share program has been highly successful in garnering investment by allowing investors in flow-through shares to claim a non-refundable tax credit of 20% of their flow-through mining expenditures in British Columbia.




The provincial government has also been working hard to reduce timeframes for permitting and environmental assessment licenses. A few years ago it took more than 100 days to get approval for a permit in British Columbia; that has now been reduced to around 80 days and they are working to a target of 60 days. Each permit is also confirmed with First Nations approval and environmental assessment. With regards to the latter, the federal and provincial governments are finally streamlining what was a bureaucratic and inefficient system whereby companies had to go through two assessment processes that often overlapped. The new process has been labeled "one project one process."

The success of these steps has been noted by industry players. "In the last three to four years, we have been doing much more work in British Columbia. It is an attractive


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Vasee Navaratnam, vice president and general manager of Mining and Metals at Fluor.

market for us to be involved in," said Vasee Navaratnam, vice president and general manager of Mining and Metals at Fluor.

The BC Jobs Plan: Ambitious Production Targets

To capitalize on continuing Asian demand, the provincial government is making steps to ramp up production. Through the BC Jobs Plan, the Liberals aim to open eight new mines and expand nine existing mines in British Columbia by 2015. The initiative will create \$1.6 billion in additional revenue and more than 10,000 jobs by 2020. "Commodity prices are off peak at present but there



Resolution copper HDS plant. Photo courtesy of CH2M HILL.

is always going to be a global demand for resources and British Columbia is a prime market for that. Despite the current fiscal climate, there is still exploration going on and there are still mines that are opening and expanding," said Heather MacDonald, Canadian environmental mining lead at full spectrum EPCM firm, CH2M HILL.

Considering the opening of Copper Mountain in 2011 was the first major metal mine to open in British Columbia since 1998, this is a very positive sign. Two mines have already been brought into production under this government initiative: New Gold's New Afton mine, with an annu-

al production of 85,000 oz gold, 75,000 lb copper and 214,000 oz silver, and Thompson Creek Metals' Mt. Milligan copper-gold mine. Five others are under construction or going through the permitting phase: Imperial Metal's copper-gold Red Chris mine; Anglo American's Roman mine; Teck Resources' Quintette coal mine; Barkerville Gold Mine's Bonanza Ledge mine; and Huldra Silver's already producing Treasure Mountain mine.

The plan also includes major expansions at six operating mines: Teck Resources' Highland Valley Copper and Elkview coal mines; Imperial Metals' copper-molybdenum Huckleberry mine; Hillsborough Re-

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source's underground coal operation at its Quinsam mine; Thompson Creek's surface molybdenum Endako mine and Taseko Mines' copper-molybdenum Gibraltar mine. These projects underscore that there is a bright future ahead for mining in British Columbia.

While investment is necessary for the province to grow and cater to global demand, a number of other challenges must be addressed by government and industry alike to ensure the success of the BC Jobs Plan. These can be categorized into three sections: environmental regulation, aboriginal relations and the labor shortage.

Winds of change: Water Treatment and Environmental Regulations

Great progress has been made with regards to reducing the environmental footprint of the mining industry over the past two decades. Canada leads by example in this regard and regulations are currently being tightened up further with Environment Canada rewriting the Metal Mining Effluent Regulations (MMER) guidelines. "The winds of change are blowing within water treatment in mining. We are now seeing very demanding discharge specs in the parts per billion range and so the whole technological



The Antapaccay M3000HF IsaMills, the first operating in South America. Photo courtesy of Xstrata Tech.

approach that the industry takes needs to change," said Andrew Hall, vice president of sales and marketing at BioteQ Environmental Technologies, a technology provider of specialized water treatment solutions to the mining industry.

As well as tightening up MMER regulations, new metals are also being added to the list including selenium, iron and aluminum. Selenium is currently an area of particular concern in British Columbia; in April, Teck Coal was ordered to clean up its act after high levels of the chemical were recorded near its mines in the Elk Valley watershed. Receiving water regulations permit

companies to discharge effluent into bodies of fresh water only at quantities that will not impact the overall quality of the water in the long term: if the water is very clean, the mine permit will be set below the regulations.

The tightening up of environmental regulations, combined with the need to increase efficiencies during these lean times, has led mining companies to turn to increasingly innovative solutions to meet their criteria. One firm that has seen a dramatic increase in business as a result is TOMRA Sorting Solutions, a Norwegian-listed sensor-based sorting company that helps miners create effi-

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MINING IN BRITISH COLUMBIA



Matthew Kowalczyk, sales and project manager for the Americas, TOMRA Sorting Solutions.

ciencies by analyzing their ore and removing uneconomic material at a very early stage, while also reducing their environmental impact. "As a result of the current economic climate, people are looking at how to increase recovery and throughput without doing a mill expansion. A small sorting plant ahead of a mill can potentially remove the need to add another line to a mill; equally, if you can build a smaller mill because you have thrown out 40% to 50% of the waste material before it hits the plant, the reduction in energy cost, footprint and amount of tailings being produced creates phenomenal savings. Furthermore, the obvious econom-

ic impact of building a mill that is up to 50% smaller is huge. As projects need to become leaner, sorting absolutely provides them with a way to optimize efficiency. People are accepting the fact that they cannot simply get bigger, consume more energy and hope for economies of scale," said Matthew Kowalczyk, sales and project manager for the Americas.

"Companies are looking for lower grade ores because the higher-grade ores are harder to find. They therefore require technology that is very efficient to offset their operating and capital costs," said Greg Rasmussen, process manager for mineral processing at Xstrata Technology. Increased efficiencies and lower environmental impact will inevitably dominate the future of mining in British Columbia and worldwide. "Going forward, the focus will be on green mining that is energy efficient and will reduce operating costs while also reducing footprint. Companies will be looking at how to exploit a mineral deposit at the lowest cost with the lowest impact on the environment possible. As mineral grades become lower and harder to mine there are innovative companies such as Planetary Resources who are looking into mining asteroids, which are abundant with minerals. The sky is not the limit for the mining industry."




Greg Rasmussen, process manager for mineral processing at Xstrata Technology.

Aboriginal relations: Putting the First Nations first

Relations with First Nations communities are particularly sensitive in British Columbia due to the fact that land disputes and treaties were never officially resolved in the province, unlike elsewhere in Canada. Conflicting views therefore often arise between First Nations communities over who owns what. "Around 125% of land area in British Columbia is under land claims between disputing First Nations communities," said Tony Wachmann, director of mining, metallurgy and infrastructure at Stantec.

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F11-07	14.30	4.70	1.02
F11-08	8.25	12.40	0.74
F11-09	22.05	7.30	0.33
F12-01	14.00	19.40	0.82
F12-09	15.00	11.00	0.80
F12-11	27.00	14.00	0.66
F12-13	19.00	3.40	0.64
F12-17	20.00	20.00	0.63
F12-18	18.00	24.70	0.68
F12-19	35.00	5.00	0.32
F12-20	24.00	9.00	0.42
F12-26	3.05	2.95	1.93
F12-27	1.90	4.10	1.78
F12-27	83.20	14.80	4.04
F12-27	136.00	24.00	0.79
F12-28	82.00	4.00	0.87
F13-03	20.0	22.0	0.76
F13-07	12.0	22.0	0.36

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E. (Liz) Van Warmerdam, project manager at CH2M HILL.

Despite diverging interests and aspirations between First Nations communities, confrontations tend to be rare for exploration companies if consultation is conducted in an appropriate way. "A big concern for the mining industry in British Columbia is the uncertainty created by the aboriginal rights issues. The provincial government has not reached a province-wide agreement with the First Nations, and the First Nations community is quite fragmented with different aboriginal groups having varying expectations and overlapping traditional territories. Despite this uncertainty, this is not a particularly difficult issue during the exploration stage. Conflicts

in British Columbia are rare if exploration companies go about the process appropriately by consulting with First Nations at an early stage, treating them with respect and letting them know their development plans," said Gregory C. Smith, partner and member of the mining group at national law firm, Miller Thomson LLP.

Addressing First Nations concerns prior to commencement is crucial to the success of any project in British Columbia. "In our experience, successful projects engage and collaborate with First Nations from the very beginning. There are numerous First Nations and each have their own unique cultures, values and traditions. Every First Nation has its own specific agreement and solutions must therefore address their respective needs and interests," said Liz Van Warmerdam, project manager at CH2M HILL.

Through the new mineral tax policy, British Columbia is the first province in Canada to share mineral tax revenues with First Nations communities local to new and expanding mines. Each agreement is made on a case-by-case basis and often the approval of a number of First Nations communities is required. The new policy is the first of its kind in Canada and will make steps towards appeasing First Nations concerns, one of the principal barriers to mine devel-



Gregory C. Smith, partner and member of the mining group at Miller Thomson LLP.

opment. There is, however, still some way to go according to Dave Porter, CEO of the First Nations Energy and Mining Council of British Columbia, a consortium of First Nations chiefs that represent First Nations communities with regards to energy and mining. "The mining tax policy change is a positive decision that will start to change the question of benefit to First Nations. We have advocated for years for revenue sharing and British Columbia has made a significant step forward to address the issue but it still needs improvement. The policy only applies to new mines; our position is that all mines should be the focus of revenue sharing," said Porter.

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**Labor Shortages:
A Lost Generation**

The shortage of skilled labor is a concern to the mining industry worldwide. According to PwC, over the next decade the mining industry in British Columbia will need to hire 15,000 new workers to keep up with its labor requirements. A large proportion of mining professionals in British Columbia are more than 50 years old and will be retiring in the coming years. Due to the cyclical nature of the industry, relatively few people in the 35 to 50 age bracket entered the mining sector and hence there is a vacuum of skilled labor that the industry urgently needs to fill.

“One way to address the issue is to hire people from different industries; I have hired people as metallurgists in the past not with a mineral processing degree but a chemical engineering degree,” said Ken Roberts, chair of the Mining Suppliers Association of British Columbia (MSABC).

MSABC, in collaboration with AMEBC, has launched a program called MineralsEd, which is designed to promote mining in schools. The University of British Columbia now has the most mining undergraduates of any university in Canada, with 40 graduating last spring. “The fact that people are getting into mining at a younger age is testament of the impact of programs such as MineralsEd,” said Roberts.

Recruitment firms are increasingly looking to bring in workers from abroad or from other industries. Rakia Recruiting, an international recruitment firm that specializes in placing workers in foreign



Amir Marciano, managing partner, Rakia Recruiting.

markets with labor shortages, is doing both. “The two main groups of foreign labor that we bring to Canada are from Eastern Europe and the Far East. The Canadian government understands the need to support the market by bringing in more people and they have implemented a new program to speed up temporary work visas,” said Amir Marciano, managing partner.

The company also poaches workers from other industries such as construction, manufacturing and logistics with the lure of mining salaries that are 20% to 30% higher.

The mining industry is also turning to First Nations communities to help alleviate the issue. Back in 2008, the industry

formed the British Columbia Human Resources Task Force for Mining, Exploration, Sand and Gravel, which concerned itself with all human resources related issues in these sectors. The following year the task force evolved into the Aboriginal Mine Training Association (BCAMTA) with an initial grant from the federal government of \$4.4 million and the vision to train aboriginals for employment in exploration, development and mining. In 2012, an additional \$10 million was granted. As it stands today, the association has now succeeded in training more than 500 aboriginals who are actively working in mine operations throughout the province.

In spite of the labor shortage issue, many companies believe that operating in British Columbia is more economical than other parts of the world in terms of labor costs. Ron Thiessen, president and CEO of Hunter Dickinson, cited labor and energy costs as key reasons to why British Columbia has become the com-

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pany's number one focus today: "There has been price inflation in terms of labor and energy costs in all areas of the world except North America. In Latin America and Africa, labor costs are up tenfold over the last decade; energy costs could be as much. Labor productivity in North America is very different than places like Latin America, where they typically employ between three and five times more people, so that makes our labor productivity so much more efficient. We started seeing these trends about five years ago and subsequently started focusing initially on North America, and lately British Columbia."

Infrastructure Development

British Columbia has historically lagged behind the rest of Canada in terms of infrastructure development. Its geological wealth is untapped due to a myriad of issues, including an inability to transport much needed energy to the province's northwest. This is all about to change, as the provincial government and BC Hydro are looking to bring the Northwest Transmission Line into service by the spring of 2014. Forecast to unlock billions in future revenue by making mining projects in the region economically viable, it is also an important facet of the BC Jobs Plan.

The Northwest Transmission Line is a 344 km, 229.6 kW project that will stretch from the Skeena Substation, near Terrace, to a new installation at Bob Quinn Lake. It has the possibility of unlocking 40 potential projects and providing power to remote First Nations towns, a note made by BC Hydro's Mike Brandson, senior key account manager - mining sector: "...Major independent power producers, large mining customers and communities like Iskut, will all benefit from the clean energy this project will deliver."

Ron Thiessen, of Hunter Dickinson sees the economic benefit of the Northwest Transmission Line and the hydroelectric power it carries: "Hydroelectric power is one of the most efficient, low cost energy sources; British Columbia has this in abundance while most other mining jurisdictions have to rely on some form of carbon power generation."

Bringing mines online is not the only focus of infrastructure development in the province. Asia, which has become the primary focus for British Columbia's mineral exporters, must still receive the province's geological wealth via the sea. To increase these export capabilities, large expansion projects have been initiated along the coast, with a particular focus on coal. Westshore Terminals completed a \$100 million expansion at its Roberts Bank facility, increasing its capacity to ship 33 million mt/y of coal, up from 23.5 million. Moving forward, there are two expansion plans to round out the development of British Columbia's coal exporting ports. Ridley Terminals is in the process of incrementally doubling the capacity of its Prince Rupert port to 24 million mt/y, costing \$200 million, by sometime next year. Unlike the changes made by Westshore and Ridley, the expansion project at Neptune Terminal has allocated \$65 million out of the \$400 million for improving their North Vancouver terminal's metallurgical coal capacity. This will expand the current 8.5 million mt/y to 18.5 million by 2015.

British Columbia on the Horizon

Outside of the BC Jobs Plan framework, companies are looking to complete expansion exploration programs, bringing their mines into production over the next five years, while others are looking to upgrade already successfully producing mines.

West Cirque Resources, a project generator focused on copper-gold porphyry deposits, has come together with Freeport-McMoRan Copper and Gold to advance three of its projects: Castle, Tanzilla and Pliny; clustered in the Northern Stikine Terrane. "This year,

together with Freeport we had another successful drilling round at Castle..." said Steve Vanry, chairman.

At Tanzilla the company has completed much of its pre-drilling groundwork and has developed drill targets for 2014. West Cirque's other two projects in the Quesnel Trough, Heath and Aspen Grove also hold exciting potential: "[At Heath] we have a great database of geophysics and geochemical results to work with and exploring this area is a matter of developing drill targets," said Vanry.

Moving forward, West Cirque looks to cement another partnership to begin aggressively exploring the area. "West Cirque will be one of the survivors of this challenging market. We benefit by having a corporate agenda, as a project generator, which has buffered us from the current downturn in the market."

Seabridge Gold's Kerr-Sulphurets-Mitchell (KSM) project is estimated to have a production cost of \$600/oz of gold thanks to a number of factors pointed out by Rudi Fronk, co-founder, chairman and CEO: "The first of which is the scale of our KSM project, which at this point is well over 1.8 billion mt of proven and probable reserves with a mine life of over 50 years."

High recoveries of both gold and copper, in relation to other porphyry deposits worldwide, and the project's proximity to the Northwest Transmission Line also help to ensure this low production cost. In the company's search for higher grade zones this year at the Deep Kerr target—in view of increasing the profitability of the project—26 of the 29 holes drilled were highly successful. Fronk highlighted the results: "Assays have been received to date for 15 of these 26 holes; all 15 have intersected wide intervals grading at or above 0.5% copper and 13 have major intercepts, averaging above 0.6% copper, which is about three times the grade of our existing reserves."

Moving forward into 2014 there is great upside potential at KSM, and Seabridge Gold believes that there is room to add up to 1

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billion mt of high-grade resource.

Also searching for a strategic partner to help with project financing and development is Yellowhead Mining. 2012 saw the company grow the measured and indicated resources at their Harper Creek copper project, northeast of Kamloops, to 815 million mt with a grading of 0.29%. In March of that year, Yellowhead Mining showcased the robust economics and 28 year mine life in its feasibility study. In this aforementioned search for a strategic partner, Yellowhead Mining has turned westward, highlighting an ongoing trend with companies in the development stage; a caffeinated search for Asian investment. "One of the advantages of the Harper Creek project is the clean copper concentrate it will produce...this product, coupled with the longevity of the mine, ensures that there will be a very strong demand from Asia and by extension Asian investment," said Frank Wheatley, CEO.

Avanti Mining has looked to a five bank syndicate and a life-of-mine sales agreement to fund its Kitsault molybdenum project—with measured and indicated resources of 321.8 million mt at an average grade of 0.071% molybdenum, containing 505.5 million lb molybdenum and 4.8 g/mt containing 49.5 million oz silver — that will produce 40,000 mt/d for 15 years. The agreement with German multinational ThyssenKrupp covers 50% of Kitsault's total production. "Due to the fact that molybdenum is a strategic raw material for Germany it qualifies under their raw material import policies for an untied loan guarantee program," said A. J. Ali, the company's CFO.



A. J. Ali, CFO, Avanti Mining.

This allows the two German banks, KfW-IPEX Bank and UniCredit to have most of their proposed loan amounts to Avanti Mining guaranteed by their own government due to the off-take agreement. Export Development Canada, a crown corporation with a mandate to develop international trade, and Caterpillar Financial Services have also sought to help with financing on the project. Rounding off this five bank syndicate is the Korean Development Bank, with which Avanti Mining is looking for a similar arrangement as its two German financial partners.

Other companies have sought more traditional methods of furthering their projects during this time of uncertainty.

Canarc Resource is already thinking into the future, the company is currently looking to bring in a partner to develop its 1.1 million oz, high grade, underground New Polaris gold mine project, located in northwestern British Columbia in view of going after a second asset either in Canada or the US. Bradford Cooke, chairman and CEO said: "We are searching for a partner who has the horsepower needed to finance, build and operate the New Polaris mine, one of the highest-grade gold resources ready for development in western Canada."

Also considering bringing on a major partner is Chieftan Metals, with its Tulsequah Chief polymetallic project in northwest British Columbia. The project's unusually high precious metal content is found within a VMS deposit, which according to the company's president and CEO Victor Wyprycky, provides a strong sign that the project's 6.5 million mt may lead to "an ultimate resource development of between three to six times the starting resource/reserve." Having completed a full feasibility in January of this year the company is currently engaged in project financing discussions. Construction, reliant on gaining the appropriate financing, is targeted for the spring of 2014.

Rounding out this overview of companies to watch over the next few years is Copper Mountain Mining. Led by recent inductee to the Canadian Mining Hall of Fame, Jim O'Rourke, the company looks to improve the efficiency of its Copper Mountain mine, south of Princeton. In the short term, the company has implemented three initiatives to provide finer sized ore to the SAG mill, including: increasing the powder factor when blasting ore to improve fragmentation; the utilization of a contractor to pre-crush around 5,000 mt/d ore to 5 cm and the recent installation of a new portable crusher with a target of pre-crushing 8,000 mt/d ore to 5 cm. These initiatives have allowed the mill to operate at 32,000 mt/d. in the longer term Copper Mountain Mining plans to add a permanent secondary crusher to pre-crush all of the feed prior to the SAG mill to minus 5 cm. According to O'Rourke: "Studies and test runs completed to date [provided] tonnages as high as 40,000 mt/d by pre-crushing the ore."

Exploration has also been completed on site and shows increased upside for the Copper Mountain mine. This has focused on both Pit 2 and Pit 3, confirming the extension of mineralization. One of these drill holes at Pit 2 highlighted 123 m of 1.0% copper, 0.75% of copper equivalent while another came back with 141m of 0.59% copper. At Pit 3 the company reported 94 m with a grading of 0.72% copper and an intersection of 102 m with a grading 0.7% immediately below the bottom of the company's Super Pit.

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Jackleg drillers working an ore heading in Guanaceví. Photo courtesy of Endeavour Silver.

Gold, the premier choice for investors the world over, has not looked so stable in 2013. Two days of carnage in the second quarter of this year saw gold drop a record 23% over April 15 and 16. Though there may be some relief ahead. RBC Capital Markets believes that the capital costs to build mines appear to have stabilized across the gold industry, after rising 60% from 2009 to 2012. Looking forward, RBC expects a reduction of 5% to 10% in 2014, because of higher productivity and lower activity levels across the sector. Analysts also predict that all-in sustaining costs could fall roughly by \$150/oz to an estimated \$917/oz due to cost cutting efforts and the fact that low cost mines are coming online.

Vancouver's wealth of mining companies includes many that focus on gold across the world. The following snippet of this myriad of gold explorers, developers and producers shows that while gold prices may have diminished, the search for this precious metal is alive and well.

Chasing the American Dream

Vancouver-based NOVAGOLD RESOURCES is set to make a big splash with its Donlin gold project, located in the historic Kuskowkim Gold Belt of southwest Alaska. Donlin, the largest undeveloped gold deposit in the world, with approximately 34 million oz of proven and probable gold reserves averaging 2.1 g/mt, has understandably become the company's number one focus. "Once in operation, it is expected to produce approximately 1.5 million oz/y



Aerial of the Donlin Gold project in Alaska. Photo courtesy of NOVAGOLD RESOURCES.

in the first five full years and 1.1 million oz/y over a 27-year mine life," said Gregory A. Lang, president and CEO.

It is also set to be among the lowest-cost producers in the world; setting the mine apart from the vast majority of projects.

Mineral Mountain Resources, led by the father-son team of Nelson and Bradley Baker is looking to make its mark in South Dakota. Mineral Mountain has grown its land holdings in excess of 10,000 acres in an area that was previously staked in a tremendously fractioned manner all the way back in 1876. Mineral Mountain now has up to 132 drill holes, with ore zones averag-

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Ivan Bebek, co-founder president and CEO, Cayden Resources.



First sample, first drill hole. Photo courtesy of Cayden Resources.

ing around 7 g/mt to 8 g/mt gold and over 7 meters wide at its Holy Terror project. Chief to their success in obtaining eight of the 10 deposits in the area was the fact that Mineral Mountain was the first company to fly high resolution airborne surveys over the entire property. "Since the gold mineralization is associated with a strongly magnetic and conductive iron formation, we flew an airborne magnetic and electromagnetic survey, which indicated that the host rocks for the gold mineralization were far more extensive than was previously thought," said Nelson Baker, president and CEO.

Mexico, Still Maintaining Interest

Mexico's Congress approved a new 7.5% mining royalty on earnings before interest, taxes, depreciation and amortization. Meant to increase the feeble tax revenues of the Mexican state, it has

instead elicited a strong response from mining companies who have threatened to cut investment.

Cayden Resources entered Mexico in a large way, with the purchase of its Morelos Sur property for \$25.5 million. At the La Magnetita East target the company found that a third of the material was running at over one gram on surface in August. The company also drilled in search of a scarn target and hit two meters of 7.5 g/mt gold and the same rock types at Goldcorp's nearby Los Filos mine. Cayden's other property, El Barqueno, 130 km west of Guadalajara, also showed some promising results in September. "In our initial drilling results we released on October 16, our best hole was 59 m of 2.2 g/mt gold and another 18 m of 1.9 g/mt in the same hole," said co-founder president and CEO, Ivan Bebek.

The company now plans to drill the 3 kms of strike length identified through trenching within the next six months, in the belief that the project will yield north of 1 million oz.

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Peruvian Gold

The Peruvian-Canadian Chamber of Commerce and Peru's Mines and Energy Ministry jointly announced on October 28 that for the first time ever this South American country would take part in the 2014 Prospectors and Developers Association of Canada (PDAC). With this sponsorship move, the government of President Ollanta Humala is signaling that Peru is open for business.

Already on the ground is the Vancouver-based explorer Lupaka Gold, whose Crucero gold project has over 2 million oz in pit-constrained resources. Significantly, Lupaka has only drilled one of the 11 known anomalies at the project. "This year we are doing fieldwork on the other 10 anomalies to identify the next drill targets. Lupaka believes that the long-term potential of the property is a multiple of the 2 million oz figure," said Eric Edwards, president and CEO.

The company's all-Peruvian technical team is currently in the process of defining the project's next drill targets. In addition to this property, Lupaka is also actively looking to move a robust long term strategy to fruition. This begins with the company's active search to find a Peruvian producer for its 1.2 million equivalent oz Invicta Gold project and continues with a structure and multi-layered line of attack; one which includes bringing in a partner for Southern Legacy Minerals' AntaKori project, of which Lupaka is the largest shareholder. "Lupaka has three main strategies that it is implementing. The first is near-term development and production [at Invicta]...the midterm strategy is resource expansion and discovery [at Crucero]...the long term strategy is project acquisition," said Edwards.



Clive T Johnson, president and CEO, B2Gold.



The camp at Lupaka Gold's Invicta project. Photo courtesy of Lupaka Gold.

Carving Up Turkey for Gold

Reuters reported in January of this year the gold production in Turkey is expected to rise to 36 mt from 29.5 mt in 2012. The Turkish Gold Miner's Association is predicting a jump to 50 mt in 2015, which would place the country in the top 15 producers of gold in the world. Overall, the mining sector has flourished, with exports jumping to \$3.3 billion over the first eight months of 2013, up 26.5% over the same period in 2012, according to the Istanbul Minerals and Metals Exporters Association.

Looking to take advantage of this upswing in mining activity is Pilot Gold, headed by president, CEO and director Matthew Lennox-King. Utilizing what the company describes as the "Science of Discovery", the application of strong exploratory science and aggressive drilling, the company is focusing on its TV Tower project in the Biga District, the location of a number of important deposits. "TV Tower is actually a district in its own right and Pilot Gold has defined drilling discoveries at both [the KCD and Kayali targets]," said Lennox-King.

On September 5 Pilot Gold acquired the Karaayi project, which the company views as the extension of the Kayali oxide gold target, the addition of which increases the allure of the southern part of the TV Tower tenure. Moving forward the company looks to effectively demonstrate that TV Tower is a district in its own right, with a number of strong deposits.

Producing Gold in Namibia

In the second quarter of this year gold production in Namibia declined by 3.1%, helping push the annual decline to an astonishing 37.3%. In response to diminished production of gold and slowdowns in mining the Namibian Ministry of Mines handed out 406 Exclusive Prospecting Licenses for exploration. This 53.8% increase, when compared to the same period in 2012, includes many for explorers of precious metals.

B2Gold is currently constructing its Otjikoto project, in view of bringing it into production during the fourth quarter of 2014. According to the latest reports, construction is both on schedule and within budget. No one is more excited about this prospect than B2Gold's president and CEO Clive T Johnson. "Otjikoto's feasibility study shows a 12-year mine life with 141,000 oz/y at an operating cost of \$534/oz for the first five years."

The extraordinary infrastructure at Otjikoto, its close distance to two towns and the fact that there are major aquifers on site have all helped to bring down costs. The company looks to ramp up this project in 2015 by 20%, bringing production to 170,000 oz/y. There is also potential upside at site as well. "The Wolfshag zone has shown some incredibly high grade results and indicates that

there is potential to expand reserves and mill throughput capacity," said Johnson.

An Inch of Time is an Inch of Gold

Chinese gold output rose 8.2% to more than 270 mt from January to August of this year, according to the China Gold Association, continuing the country's run as the world's largest gold producer for six consecutive years.

Playing a significant part in this production growth is China Gold International Resources, the Vancouver-based flagship and only overseas listing vehicle for China's largest gold producer, China National Gold. The company recently completed the construction of an additional 30,000 mt/d crusher and ADR plant at its CHS gold mine in the Inner Mongolia Region, with continued construction to be finished at the end of this year. The expansion is in view of im-

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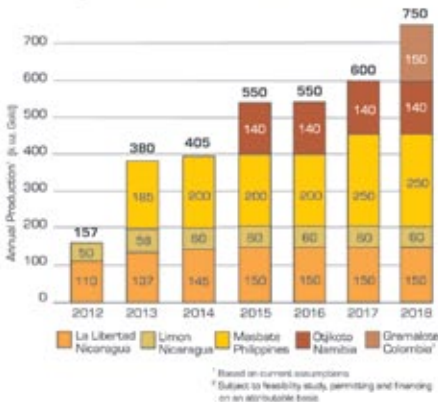
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Projected Gold Production



TSX: BTO
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- **Three mine development projects** - Jabali, La Libertad Mine (Nicaragua); Ojikoto (Namibia); and Gramalote (Colombia)
- **Construction underway at Ojikoto** - production expected Q4 2014
- **Several high quality exploration projects**
- **Strong financial position** - strong balance sheet and operating cash flow
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Jerry Xie, executive vice president and corporate secretary, China Gold International Resources.

mediately bringing production from 30,000 mt/d to 60,000 mt/d with an expected increase in output from 145,000 oz this year to a full capacity of 260,000 oz in 2015. China Gold's strategic overarching goal is what some would deem highly aggressive, to reach 500,000 oz/y gold and 330 million lb/y copper, in part through the expansion of the CHS gold mine and at the company's Jiama copper-polymetallic mine in the Tibet Autonomous Region. "The other half will be fulfilled through selective acquisition, to deliver the best returns to our shareholders" said executive vice president and corporate secretary, Jerry Xie.

Silver

Alongside gold, silver has taken a serious hit this year. The silver spot price has lost 26% year-to-date, trading around the low \$23 mark. Though not all is doom and gloom, commodities research firm CPM Group said silver could reach record highs over the next decade. The significant driving force behind this rise will be industrial demand, complemented by a supply drop.

Given this downturn in silver prices, mining companies have sought to drive down costs and increase operational performance. Silver Standard Resources unveiled a multistage process to enact cost saving measures at its Piriquitas silver-zinc mine in Jujuy Province, Argentina. "Our priority in 2011 was recapitalizing the company and bringing Piriquitas to a more stable format," said W. John DeCooman Jr., vice president for business development and strategy.

2012 saw the company exceed production levels and meet cost guidance and in 2013 the company entered into the next stage of recovery. "The restructuring program has focused on the basics: improving employee efficiency and ensuring that the mine can operate faster, cheaper and better across all facets of the operations."



Piriquitas mine, Jujuy Province, Argentina. Photo courtesy of Silver Standard Resources.

This cost reduction strategy has even extended to Silver Standard's relationship with smelters, which have allowed the company to secure better downside protection.

In Peru, Bear Creek Mining recently announced the approval of its Environmental and Social Impact Assessment (ESIA) for the company's Corani project, in the Department of Puno. The project, as highlighted in a feasibility study from 2011, has proven and probable mineral reserves of 270 million oz of silver, 3.1 billion lb of lead and 1.7 billion lb of zinc. "It has been the object of very strong interest from buyers in the form of off-take agreements, given

the large amount of high quality lead-silver concentrates," said president, CEO and director Andrew T. Swarthout.

The approved ESIA now provides the company with a strong base to attract funding and moving forward the company looks to have Corani producing 13 million oz/y of silver.

Over in Mexico, Endeavour Silver, led by Bradford Cooke, director and CEO, has successfully turned around the troubled El Cubo silver mine. "When we purchased El Cubo in 2012 the market looked like it was in a rebound and we believed El Cubo represented a tremendous opportunity to have a third core asset in the company," said Cooke.

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Bradford Cooke, director and CEO, Endeavour Silver.

Endeavour Silver, which had experience in reviving troubled mines, set out to install a \$70 million capex program to rebuild the mine's plant, redo surface infrastructure and underground access in order to make the project more efficient. "In the second quarter of 2013, I am proud to say that our team delivered the reconstruction on time and under budget and that in the third quarter operations are now making positive cash flow," said Cooke.

One of the major issues addressed by Endeavour Silver with this capex program was the attitude of the workforce, a holdover from the management style and history of the

mine. Within the last 12 months the company changed the safety culture, which has resulted in a 75% reduction in lost time accidents and an increase in production grades.

Copper

Supply of copper has risen significantly faster than demand in 2013, a trend which is expected to continue into next year, putting downward pressures on prices. The Chinese economy is seen as key to copper prices as the country consumes around 40% of global output. Though, GDP growth in the People's Republic is likely to slow further in the coming years, threatening to keep copper weak.

Vancouver-based Tintina Resources is looking to make its way in the copper market, irrespective of Chinese growth projections. As Jerry Zieg, vice president exploration said: "The corporate strategy is to develop the Black Butte property by carrying out the feasibility study, with production expected in late 2016 or early 2017."

Located in the State of Montana, Black Butte has more than 1 billion lb copper in the measured and indicated resource categories, found within the Johnny Lee upper and lower zones, plus the Lowry deposit. The average grade of resource on the property is more than 3% copper, while resources at the Johnny Lee upper and lower zones



Luquman Shaheen, president and CEO, Panoro Minerals.


have averaged 3.6% copper. This should not overshadow the fact that the lower zone has seen in excess of 2 million mt at 6.4% copper. Zieg, a native of Montana, looks to uphold the company's commitment to "doing it right." "Our open-door policy with the local community enables them to register any concerns and our transparency is greatly appreciated," he said.

Moving forward Tintina is planning an underground cut and fill mining operation on the Johnny Lee deposit that will produce about 3,300 mt/d of ore, for a mine life of 11 to 14 years.

Panoro Minerals, operating in Peru, is looking to the future as well. Panoro's drilling campaign this year indicated a continuity of the chalcocite high grade zone at its copper-gold-silver Cotabambas project. This theory was confirmed in a mineral resource estimate released in October, which increased copper and gold resources at the project by 40%. As it stands, Cotabambas has an indicated resource of 117.1 million mt at a grading of 0.42% copper, 0.23 g/mt gold, 2.74 g/mt silver and 0.001% molybdenum at a cutoff of 0.2% copper equivalent and inferred resource of 605.3 million mt at 0.3% copper, 0.17 g/mt gold, 2.33 g/mt silver and 0.002% molybdenum at a cutoff of 0.25% copper equivalent. The company's other property, the Antilla copper-molybdenum project, the company currently has an inferred resource of 154 million mt at grading of 0.47% copper and 0.009% molybdenum at a cutoff of 0.25% copper equivalent. "Panoro plans to update Antilla's resource estimate and commence a preliminary economic assessment later this year [in view] of completing the assessment during the first quarter of 2014," said president and CEO Luquman Shaheen.

Unlike the analysts quoted at the beginning of this section, Shaheen sees a bright future for copper projects, particularly after the predicted merger and acquisition storm.

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Jerry Zieg, vice president exploration, Tintina Resources.

"At that point there will be the realization that there are a deficient number of new copper projects...in turn there will be a spike in copper prices and an active search to acquire copper projects," he said. Panoro Minerals expects to be recognized for its Cotabambas project during this search.

Potash

Uncertainty has plagued the potash market since July of this year. The breakup of Belarus Potash, a joint venture between rival's Russian OAO Uralkali and Belarussian Belaruskali dismantled one of the two marketing alliances to sell potash to



Presentation to Farmer's Union members at the core shed on site at the Black Butte copper project. Photo courtesy of Tintina Resources.

the world and in turn sent prices of the mineral, which is used to make fertilizer, tumbling and big buyers are now waiting to see how far the price for potash will fall before signing any contracts.

A predicted fall in potash prices was on the mind of Western Potash Corp.'s executive vice president, Dean Pekeski. The company is currently at the construction stage at its Milestone property, southeast of Regina, Saskatchewan, and is looking to acquire the \$2.9 billion needed to develop the mine. "Western Potash Corp. took into consideration price sensitivity in our feasibility study...the company worked hard to

keep our costs low so that we could operate at lower potash prices," said Pekeski.

The company also actively searched for a strategic partner, having concluded an agreement with ChinaBlue Chemicals and Guoxin Investment for \$32 million. ChinaBlue Chemicals has both strong ties to state-owned banks in China and is a distributor of fertilizer. The company hopes that with the integration of these partners into various working groups Western Potash Corp. will be able to secure the required financing and in turn establish an operational relationship once the project enters development.

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Pueblo Viejo Gold Project in the Dominican Republic (Owner: Barrick Gold Corporation). Photo courtesy of Fluor.

Lithium

In October, Research and Markets released its Global Lithium Market 2012-2016 report which forecasts that the global lithium market will grow at a compound annual growth rate of 9.74% over the 2012 to 2016 period. Key to this demand is the use of lithium in Li-ion batteries, predominantly to store power for electric cars, something Jay Chmelauskas, president and CEO of Western Lithium USA, is looking to take advantage of with its Kings Valley project in Nevada. "Compared to a few years ago, electric vehicles are much less speculative and consumers have shown strong satisfac-

tion with the technology. With continued support for an electric car market, in the future, our lithium project will be in the right space to become financed for lithium production," he said.

Taking note of a current glut in the lithium space the company has decided to focus on specialty clay utilized in directional drilling for oil and gas that is also present at its Kings Valley property. "When we put hectorite clay through the organoclay process plant we create a hectorite organoclay...that has thermal stability characteristics, which enables it to be used at greater depths," said Chmelauskas.

Uranium

The price of uranium has plunged 40% since March 2011 when a tsunami wrecked Japan's Fukushima nuclear plant, causing mass contamination in the area. While Japan shut down all of its 50 reactors for a safety check, this Asian nation is set to restart some of its reactors in 2014, which will subsequently boost demand for nuclear fuel.

Looking to take advantage of this upswing in Uranium prices is Fission Uranium. The company has employed a radon survey and its patent pending SPI high resolution magnetic and radiometric airborne survey at its Patterson Lake South (PLS) project. Utilizing this technology the company has had a 100% success rate across a 1.78 km trend at the project, allowing for instant drill targets. "The uranium discovery at PLS is high grade and extremely shallow. Mineralization begins at 50 m below the surface and continues to a depth of 300 m," said Ross McElroy, president, COO and director.

The company has acquired its partner Alpha Minerals, to become the sole owner of the PLS project. After the acquisition the company has taken its remaining assets and spun them out into a new company known as Fission 3.0 Corp.



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Pebble crusher at Highland Valley Copper Mill project in British Columbia (Owner: Teck Highland Valley Copper Partnership). Photo courtesy of Fluor.

Vancouver is home to almost half of the world's exploration and mining companies. Given the province's long historical link to the mining industry, a wealth of supportive companies have sprouted up across the Greater Vancouver area. Front-end service providers in the realm of engineering, environmental consulting and employment, among others, work tirelessly to improve the efficiency of this global mining hub. Estimates put the number of companies directly related to the mining industry at 2,500, a statistic which has surely been affected by the global economic downturn and low commodity prices. While these companies provide a host of different services to the industry, they all agree on one simple fact; Vancouver is an important place in which to engage with domestic and international clients. "Vancouver is a city with a strong history of mining and success in the industry. To understand mining, no matter where in the world, it is important to have a presence in this city," said Dennis Maljevac, branch manager at GE Capital Solutions (Canada).

Low commodity prices and the overarching economic downturn have created two recent trends in capital raising according to Maljevac: "First of all, companies which traditionally raised capital in the high-yield notes or project financing markets are now looking for new sources of capital...increasing the demand for GE Capital's services and creative solutions..."

The second trend, according to Maljevac, is that as commodity prices have fallen, mining companies have an increased focus on lowering their production costs. Vancouver's support industry has sought to help its clients to do so across the various facets of exploration, development and production.

Labor, Increased Safety and Automation?

Mining companies are facing two correlated issues in the labor sector, the increasing labor costs and the shortage of skilled workers—with some predicting the deficit in British Columbia to be 15,000 workers over the next 10 years. To help alleviate employment costs, companies such as TPD (formerly The Personnel Department) have sought to act as their clients' human resource division. "With large multinational companies, TPD focuses on solutions ranging from international workforce plans to leasing and payroll services. For small- and medium-sized organization, TPD can act as a company's entire human resource department" said Leslie Meingast, CEO.

In furthering its ability to help drive down costs, TPD has also rolled out a temporary workers program, which has provided flex-

ibility to mining companies, given that they have fewer obligations to staffing companies than full time staff. To help support temporary workers TPD provides a benefits program. "This program includes healthcare, dental services and a myriad of benefits normally supplied by the employer," said Meingast.

TPD is not the only company helping mining employees with their benefits packages. Delta Pacific Benefit Brokers, headed by its president, Andrew Block, works hand-in-hand with employees to ensure that they understand their healthcare plans and the importance of financial security. "As an independent benefit broker



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consultant, Delta has access to virtually all insurance companies, which allows us to provide competitive pricing based on a full market survey” said Block.

One of the biggest challenges, according to Block, with the trend in the industry moving towards older and less healthy workers, is financial planning. “...we are finding many over the age of 50 are carrying a significant debt load and some in all age categories will withdraw non-locked-in retirement plan assets freely for the purchase of almost anything. Our goal is to ensure employees are appropriately invested in their company’s retirement plan and that they understand the approximate amount of retirement income they can expect.”

Workers exiting the industry are not the only ones being aided by Vancouver-based companies. SkillPlan, a not-for-profit that focuses on workplace education services and essential skills, focuses on linking the needs of the workplace and technical training to learning activities. Given the deficiency in reading, numeracy, computer skills, critical thinking and oral communication among workers in the mining industry, SkillPlan pinpoints foundational skills problems and designs curriculum and training programs to address these challenges. The biggest issue today in mining training revolves

around mentorship, according to SkillPlan’s CEO, Kyle Downie. “Mentorship has been a critical issue; while many mentors are highly skilled in their trade, they might not be effective in transferring their knowledge to the mentee,” said Downie.

In response, SkillPlan is implementing its mentorship program in numerous trade schools, technology institutes and mining companies, to teach workers how to pass along their job related knowledge in the most concise manner. On the ground SkillPlan employs its workforce development program, which consists of profiling the skill levels of selected mining jobs, assessing the corresponding skill set of the local workforce and then developing onsite training programs to address cognitive gaps.

Safety on site is also vital for mining companies, both from an economic standpoint—stoppages can cost around \$1 million/hour or more—and in terms of human security. An important part of creating a safe working environment is training employees to the highest possible standards. Highlighting the synergy between e-learning and simulator solutions is the current partnership between Immersive Technologies and ICOM Productions. “Our evolution as a whole is the gradual adaption to the feedback of our customers,” said Greg



Kyle Downie, CEO, SkillPlan.

Karadjian, senior product manager at Immersive Technologies. This partnership has seen ICOM Productions provide in class e-learning solutions which prepare employees to operate mining equipment in a safe and effective way, even before entering one of Immersive Technologies’ simulators.

Wenco International Mining Systems is ensuring the safety of open pit mine sites through its PitNav™ and PitNav with Fleet Awareness™ offerings. “PitNav™ is a GPS system modified to track roads within the mine, some of which change daily. Fleet Awareness™ allows [operators] to see other Wenco-monitored machines operating in the mine,” explained Glen Trainor, vice president for sales and marketing.

It is also causing a lot of excitement within the company as PitNav™ is part of the process towards automated trucking. “We are working with Hitachi [Construction Machinery] towards developing an autonomous trucking system and PitNav™ is part of Hitachi’s Multi-Generational Product Plan.”

Engineering Consultancies

Engineering companies have been among the the most adversely affected by the economic downturn and low commodity prices. In response, engineering firms have looked to help their clients increase the efficiency of mines. “This year we have seen good projects delayed while other junior companies continue to face funding issues” said Greg Smyth, senior project manager at Knight Piésold.

The result has been that companies have focused on more challenging deposits, in terms of land claims and regulatory framework, according to Smyth. In order to support these companies, engineers at Knight Piésold have focused on efficiency. In order to help its mining clients with their overseas project Knight Piésold has strived to be “local but global, small but big,” said Smyth,

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Ross Murray, division manager for environmental and water resources at McElhanney.



An underground gold mine near Barkerville; Photo courtesy of McElhanney.

relying upon local knowledge in specific jurisdictions, taking into consideration factors such as regulation, climate and fauna, all of which affect the mine design process.

Hatch, the global multidisciplinary consultancy, has seen a similar trend. "Big mining companies have had infrastructure and other challenges that have resulted in fewer new projects with more of a focus on optimizing existing operations," said Gavin Ritson, director of global mineral processing.

According to Ritson the service industry has now changed its approach, turning its attention to supporting operations where throughput and efficiency improvements are helping to maintain cash flow.

Other companies have continued to focus on their core specialties, while maintaining and expanding newer offerings. To make up for a downturn in demand for geographic information systems (GIS) software by exploration companies, McElhanney Consulting Services' mapping division has turned its attention to 3D terrain modeling, used to build accurate mine plans. "Our customers have either been currently producing mines or well-funded projects that are in the pre-feasibility stage" said Dan Tresa, branch manager for mapping.

The mapping of projects for reclamation has also seen a strong upturn for McElhanney, which completed three last year and is currently looking into another. Building upon the 103-year history of the company, McElhanney established a newer environmental branch in 2000. Ross Murray, division manager for environmental and water resources, is in part guiding this teenaged section of McElhanney, carving out a place among the more established industry players. "Moving forward, our goal is to have a local environmental professional in each office, while ensuring that the entire



KSM project. Photo courtesy of Seabridge Gold.

spectrum of environmental services is available to clients at each of these local branches," said Murray.

Like the traditional engineering and mapping services provided by the company, Murray looks to have a strong presence of environmental staff across western Canada.

Protecting the Environment

With the federal government actively looking to tighten the 2002 Metal Mining Effluent Regulations (MMER) and as the provincial Liberals move towards shortening permitting times, Vancouver's environmental consultancies have had their hands full. Now more than ever, mining companies in the province have looked to stringently adhere to environmental guidelines, particularly given the tremendous costs associated with a permit rejection by the Ministry of Energy and Mines.

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Clem Pelletier, principal partner, ERM Rescan.

ERM Rescan has proven to be both multifaceted and robust in their approach to environmental services. Clem Pelletier, principal partner, highlighted his company's work with Seabridge Gold's KSM project, which it has been working on since 2007. "The project is complex due to the multiple jurisdictions, including the Canadian Environmental Assessment Agency with a number of federal departments; British Columbia's Environmental Assessment Office with multiple ministries; four First Nations and a Treaty Nation; the state of Alaska and U.S. federal agencies," said Pelletier.



Pouring of a molten fire assay product. Photo courtesy of Met-Solve Laboratories.

This dizzying array of stakeholders is due to the location of the project and associated terrain and water management issues. ERM Rescan dealt with stakeholder relations while concurrently utilizing state-of-the-art environmental mitigation strategies and management plans to minimize the impact of the receiving environment; highlighting the company's collaborative and adaptive management approach.

For mines in operation, both underground and open pit, Xylem helps to reduce the use of water on site while protecting operations from the adverse effects of H₂O. "In underground mines we move water out of

the mine preventing costly flooding and in open pits we make sure that water running into the open pit is removed before it damages any equipment or the environment," said Jay Sommerfeld, regional sales manager for water solutions.

Having branched out through the purchase of technologies and other companies, Xylem now sends treatment plants to mine sites so that industrial and municipal water can be treated to meet industry regulations on effluent and wastewater.

After mines cease to operate, it is the turn of companies specializing in reclamation to ensure that adverse environmental effects are avoided. Enter O'Kane Consultants, led by Mike O'Kane, president, labels itself a leading expert in mine waste cover systems, final landform design and performance monitoring. O'Kane is adamant about ensuring that the specific characteristics of each individual mine site and individual design criteria are taken into consideration when the reclamation process begins. "For us, a project specific perspective is important. You need to make sure that there is a rational basis for the type of cover system required and think about what your landform needs to achieve; what are the design criteria and what are the closure objectives?"



Mike O'Kane, president, O'Kane Consultants.



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Scott Plummer, president, RMS-Ross.

This step-by-step and tailored professional process caught the attention of Aboriginal Affairs and Northern Development Canada, a federal body. O'Kane Consultants was the lead editor for a technical guidance document entitled 'Cover System Design in Cold Regions' commissioned by Aboriginal Affairs. "We are now in the process of writing a cover system design guidance document for temperate, arid and tropical areas, which is being funded by the International Network for Acid Prevention," said O'Kane.

Mineral Testing and Processing

An important facet of the mining process is knowing what is actually in the ground. The grade of mineralization at a project has important implications for its net present value for those looking to sell and for companies looking to mine, on project economics. Met-Solve Laboratories takes samples from projects as far away as Europe, Asia, the Middle East and South America. In order to differentiate itself from the competition, Met-Solve's president Ish Grewal has leaned on his expertise in implementing centrifugal gravity concentrators. "Many years ago I developed the mathematical model to determine the optimization, test work and integration of gravity into milling operations, which I con-

tinue to use to this day," said Grewal. This specialty, among the others in hydrometallurgy and scrubbing services, provided by the company has created international demand for Met-Solve's mineral and metallurgical testing solutions. "There are times when 90% of our samples come from outside of North America; they are sent by mining companies of all sizes." Moving forward the company has recently opened a new assay lab called Met-Solve Analytical Services, which is looking to expand its sample prep services.

BASF Canada's solution group provides chemicals for separation in mineral processing. To help guide its clients to make the right choices in chemical products, BASF has unveiled its total systems approach. Pablo Mendez, account manager for mining solutions, said: "The total systems approach is still being perfected as we work to better help our clients and continually grow."

The company works hand-in-hand with clients to identify where its chemical solutions can be applied.

Tenova Delkor Global helps its clients procure the right filtration, sedimentation, clarification, screening and flotation products, and has been doing so for over 35 years. The interaction begins at the development stage of the project and continues through the life of the mine. "At that stage our focus is primarily on defining the type of equipment required and the preliminary cost estimates for our service," said David Minson, group managing director. "Thereafter the project moves into a more detailed engineering phase and Tenova Delkor works with engineering companies to develop the specifications of the equipment and contract execution methods."

Combining heavy mineral equipment and thorough mineral analysis is RMS-Ross Corp, headed by president Scott Plummer. The company, which manufactures a line of heavy mineral processing equipment, puts its clients in contact with special mineralogi-



Superior Propane technician making up set-up adjustments to a vaporizer and pump system. Photo courtesy of Superior Propane.

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Drilling operation. Photo courtesy of Pacific Blasting and Demolition.

cal laboratories so that they obtain the most professional and comprehensive test results. "Target metals, liberation points, screen size analysis, associated metallurgy...this allows our clients to focus on other aspects of mine development and assists our engineers in the design of the most suitable recovery system for their specific project," said Plummer.

Two RMS-Ross products which Plummer is particularly proud of are the DEROCKER and the RMS Modular Skid Mounted Circular Jig Plants. The former is meant for mining projects with very large rock and boulder. "The DEROCKER creates a sine wave pattern on its heavy duty sealed pin and bushing articulating deck, which rolls the large rock and boulder over repeatedly while using high pressure spray water to remove all the fine gold and other target metal values which adhere to the surfaces..."

RMS-Ross also manufactures Modular Skid Mounted Circular design mineral jigs, which unlike the standard square and rectangular design jigs, rapidly increase in surface area, from the center feed point out to the discharge area, allowing for a dramatic slowing of the process flow and a better opportunity to retain the fine heavy mineral values. They are also designed very heavy duty and virtually bomb proof, while being designed to be extremely easy to operate, both of which are a huge advantage in the remote areas where many mine projects operate.

Reduce and Reuse

Pacific Blasting and Demolition was founded in the mid-1950s as a father and son blasting operation and has grown into a substantially large construction firm. Given the company's history and its substantial growth within the mining sector over the 15 years, some of its contracts are now made on a simple handshake. "Our personal and professional relationships have allowed Pacific Blasting and Demolition to minimize our clients' risks as well as our own; a factor which has allowed

us to become a premier provider of blasting and mining services," said Ron Woolf, vice president of Pacific's blasting division.

Standing out amongst its peers, the company has focused on high wall steepening, rock slope stabilization, complex drilling solutions and a number of other services. As part of the Pacific Group of Companies, Pacific Blasting and Demolition has had the malleability to adapt to the recent fall in commodity prices. "When certain sectors experience periods of slowdown, we are able to shift our employees into other areas. For example, our construction service has seen a tremendous increase in demand," Woolf said.

In the near term Pacific Blasting and Demolition is positioning itself for a significant expansion, with a special focus on the mining industry. "As part of this growth model the company is looking to expand its global reach into additional national and international markets," Woolf said.

Given the increasing remoteness of mine sites in British Columbia and the province's frigid temperatures, energy consumption is a focus of mining companies in the province. Superior Propane has worked since 1951 to provide resourceful energy solutions for mine heating and equipment, camp heating and cooking and end-to-end equipment



Carl Bitonti, senior mining consultant, British Columbia/Yukon, Superior Propane.



David Yochlowitz, CEO, ABC Recycling.

maintenance service programs. As Canada's only national provider, Superior Propane has begun providing customers with cost-saving solutions. "First, we have started to offer blended diesel fuel and propane as a way to create a more cost-effective and environmentally friendly option for rolling stock and stationary engines. Second, we help customers convert their gasoline or diesel powered mining fleets to propane to reduce fuel costs," said Carl Bitonti, senior mining consultant, British Columbia/Yukon.

Superior Propane is looking to take advantage of auto propane, which is making a strong come back in both the U.S. and Canada as a viable alternative transportation fuel.

Providing back end services is another family established company, ABC Recycling. Headed by David Yochlowitz, CEO, the fourth generation company celebrated its 100th anniversary in 2012. In order to cut costs and reach the company's various locations across British Columbia and one in Alberta, the company uses its 105 rail cars for shipping scrap metal. Yochlowitz is credited with turning ABC Recycling around, beginning in the late 1980s. "ABC diversified its portfolio to include non-ferrous metals and developed our infrastructure and facilities to accommodate scrap from Alberta and Saskatchewan," said Yochlowitz.

Today, the company performs daily bin and special scrapping services to Teck Resource's Highland Valley copper open pit mine and is also involved in special demolition projects at end-of-life mill facilities at the mine as well. "The company also performs service work with other mine sites that have different and specific requirements, as shown [with our] work at NewGold's New Afton gold mine," said Randy Kahlon, manager of business development, procurement and sales. "Our goal is to establish a benchmark for our industry, [to] be market leaders and furnish a comprehensive solution to the mining industry's scrap problem."

Corporate Social Responsibility

Setting the Standard



Cairn Built in northwestern British Columbia. Photo credit: Kay Jollymore, courtesy of ERM Rescan.

Corporate Social Responsibility (CSR) initiatives have two underlying goals: to reduce the negative impacts of mining and to improve the living conditions of local communities. For Vancouver-based companies operating overseas, this includes investment in infrastructure, social capital and the development of human capital.

Northeast of Prince Rupert, British Columbia, Avanti Mining has approached First Nations relations from an employment-based perspective. To help develop the skillset of the surrounding Nisga'a First Nation, Avanti has developed a strong relationship with a federally registered charity, the British Columbia Aboriginal Mine Training Association (BCAMTA). This partnership, in collaboration with the economic consuls in Nisga'a villages and the Northwest Community College, will provide tailored training specifically to fit the needs of Avanti's Kitsault molybdenum project. The support industry has also sought to develop robust initiatives with First Nations groups in British Columbia. The environmental consulting firm ERM Rescan is one such company.

ERM Rescan's experience working with indigenous groups in North and South America has provided the company with the knowledge required to establish a strong working relationship with the Tahltan Nation Development Corporation. The corporation, which was established to ensure the full participation of this community of 2,500 people in economic activities on traditional Tahltan territory, has had an established relationship with ERM Rescan since 2004. Clem Pelletier, ERM Rescan's principal



Avanti Mining provides funding for training for local Aboriginal and non-Aboriginal residents so they are prepared to work in mining. Photo courtesy of Avanti Mining.

partner, has labeled this relationship with the Tahltan as a great success story.

ERM Rescan is not the only service company working with aboriginals in Canada. Superior Propane, an energy provider to the mining industry, has been actively committed to, "Energizing the Future of aboriginal communities." For over 60 years the company has leveraged its national supply chain to provide heating and energy solutions to Aboriginal groups in remote locations. "Our national footprint and capabilities enable us to serve remote communities and [their] unique needs with customized end-to-end energy solutions in an en-



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An Archaeology Survey in northwestern British Columbia. Photo credit: Kay Jollymore, courtesy of ERM Rescan.

environmentally sustainable manner and within Aboriginal land use expectations,” said Carl Bitonti, senior mining consultant.

Early and sustained interaction can help mitigate unforeseen issues with a mining project. NOVAGOLD RESOURCES, through its Mining Matters campaign, has actively worked with aboriginal corporations and nearby communities since exploration began at their Donlin gold property in Alaska. “We have agreements in place with the Calista and the Kuskokwim corporations, who are actively involved in the project and look forward to seeing the fruits of our labor,” said Mélanie Hennessey, vice president for corporate

communications. The company was recently rewarded at its first public comment period for permitting. “The level of understanding that the 14 communities had of the project was really a testament to the work that has been done over the years by the Donlin Gold team,” said Gregory Lang.

Building up community support and working with local stakeholders as partners is part of breaking with the past actions of a few bad apples. No company is more cognizant of the need to distinguish itself from some of its not so socially conscious peers as B2Gold. When the company acquired its El Limon mine in Nicaragua it sought to immediately



Andrew T. Swarthout, president, CEO, and director, Bear Creek Mining.

implement CSR initiatives. According to Clive Johnson, president and CEO: “Other companies which had previously owned the mine were never committed to the long term.”

B2Gold asked the Nicaraguan government, local unions and nearby communities to give the company a year to enact its best practices. These initiatives were based on the corporate culture of B2Gold summarized by Johnson as, “fairness, transparency and respect.” Three years on and there has not been a single labor dispute at El Limon. The company has also established committees with local governments to discuss and implement projects which fit the needs of

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Afterschool youth skills development center for ages 12- 18 supported by B2Gold Namibia. Photo courtesy of B2Gold.



Jim O'Rourke, CEO, Copper Mountain Mining.

these communities. Moving forward, B2Gold has looked to implement its successful initiatives at its Otjikoto project in Namibia. According to Johnson, the government of Namibia is highly supportive of B2Gold's CSR initiatives and the company believes that it will set the standard for mining operations in the country.

The government of Peru has also been quite happy with the community initiatives put forward by another Vancouver-based mining company. Bear Creek Mining has made investments around its Corani project to the tune of \$1 million, with a focus on local education initiatives. This includes building and remodeling five schools and unveiling welding and mechanic courses to prepare locals for employment once production begins. Highlighting the growing understanding among the industry of the need for long term benefits for local communities, Bear Creek has also created a sustainable community development, establishing a \$1.5 million a year foundation with local communities to help guide them to long term economic development. Given these robust initiatives, it is no wonder that Bear Creek's approach has been, "...applauded by the Peruvian government, which has publically stated that our efforts should be emulated by other mining companies," said president, CEO, and director Andrew T. Swarthout.

China Gold International Resources is another company that has paved the way for more consciously developed CSR initiatives, in a region as politically contentious as Tibet. China Gold's Jiama copper polymetallic mine has been recognized as both a 'Green Mine' and a sustainably developed project by the governments of China and the Tibetan Autonomous Region. According to Jerry Xie, executive vice president: "We entered the region with the highest standard of environmental stewardship and community relations [which included] the development of infrastructure, schooling, water treatment, technological innovation and the involvement of local labor."

As a result of China Gold's program the average family income in the area of the Jiama mine grew approximately 12 times as individuals were hired and trained to company standards. Given this success and the substantial improvements made by China Gold, the Jiama project is now the benchmark for mining projects in Tibet.

These companies and others have set the standard for CSR in mining operations at home in British Columbia and around the globe. Increasingly executives are preempting and responding to the needs of those that live near their operations, highlighting the moral responsibility to interact equitably with surrounding communities.

Conclusion

Executives within British Columbia's mining industry continually point to the fact that the sector is characterized by a prevalent optimism. This ubiquitous positivism is far from misplaced

and British Columbia, under the guidance of a pro-mining provincial government, is set to establish itself as a first rate mining jurisdiction.

The BC Jobs Plan buoyed by infrastructure development and reduced times for permitting will allow the province to take advantage of its proximity to resource-hungry Asian markets. Vancouver-based mining companies that have continued to be active look to service companies in the Greater Vancouver area that have responded to depressed commodity prices and higher costs by increasing efficiencies in the mine life cycle. Underlying this optimism and mutual support is the interconnectivity of the sector. Mining hall of famer Jim O'Rourke put it plainly when discussing lessons learnt during his 48 years in the business, "People are key to the success of a mining company and personal relationships are highly important."

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