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INDUSTRY EXPLORATIONS



QUÉBEC MINING 2019



Institutional Support and Regulations - Investments - Battery Metals
Innovation and Industry 4.0 - Gold - Iron - Services and Support

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Dear Reader,

- Global Business Reports is delighted to be back in Québec, a world-class mining jurisdiction with unique institutional support. The following pages investigate the latest developments across the value chain, from the organizations and institutions that provide the sector with financial and regulatory stability and transparency, to the junior explorers, large producers and service-sector companies operating on the ground. GBR's research team travelled through Montréal, Québec City, Val-d'Or and Rouyn-Noranda for three months, conducting face-to-face interviews with key decision makers, to provide an up-to-date first-hand analysis from the figures who will shape the industry in the years ahead.

Since the end of the super cycle in 2012, Québec's mining industry has weathered a storm that has offered sparse opportunities for wealth creation and in recent years, new industries such as cryptocurrencies, blockchain and cannabis have compounded the challenge of sourcing investment from a finite pool. Yet there are plenty of reasons to be optimistic, as a diverse variety of new metals related to renewable energy, such as vanadium, lithium, cobalt and niobium, have caught the attention of a market looking towards a new, more sustainable energy future. Nemaska Lithium and BlackRock Metals have been able to raise billions of dollars to develop their projects in this field.

Meanwhile, a Chinese steel market looking to curb pollution has stimulated demand for high-grade iron ore from the Labrador Trough.

Nevertheless, the backbone of Québec's mining industry remains gold production from the Abitibi Greenstone Belt and James Bay. As Eldorado Gold continues construction of its Lamaque mine and Osisko Mining advances development at its Windfall deposit, a host of juniors look for the next discovery of significance, spurred on by the federal government's decision to renew the mineral exploration tax credit (METC) until 2024.

An emphasis on innovation has become crucial, as mining companies look to reduce costs and optimize efficiency. As the industry 4.0 movement gathers pace, a burgeoning Montréal tech community is collaborating with its international counterparts to develop solutions that are transforming processing technology, allowing companies to identify new deposits, and enhancing mine safety in jurisdictions across the globe. 'La Belle Province' is leading the drive for sustainable mining and is soon to be home to the world's first all-electric open-pit mine.

We would like to thank all our interviewees who have taken the time to provide their insights into the market. To all our readers, we always welcome your feedback or insights; please feel free to contact us at apascoletti@gbreports.com.



Alice Pascoletti
General Manager
Global Business Reports
GBR

Regulations and Governance

Québec offers a well regulated mining environment and offers attractive fiscal incentives

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Canada

- ★ National Capital
- Province Capital

Atlantic
Ocean



QUÉBEC MINING 2019
Industry Explorations
Global Business Reports

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0 75 150 Kilometers
0 75 150 Miles





Introduction to Mining in Québec

“Québec’s geology is rich and diversified and the government is doing a lot of work exploring the landscape in order to provide information relating to the geological potential of the province. Québec has political stability, and the new mining and tax acts have been implemented for over three years now, so are clearly understood by the industry.”

- Josée Méthot,
President & CEO,
Québec Mining Association (QMA)

Introduction to Mining in Québec

Balancing sustainability and permitting

Québec's mining history can be traced back as far as the discovery of North America, when Jacques Cartier discovered quartz and pyrite on the slopes of Cap Diamant. Since the discovery of lead in 1686 in the Abitibi-Témiscamingue region, followed by Québec's first gold rush in the 1840s after the discovery of a gold nugget in the Beauce region by Clothilde Gilbert, mining has

been fundamental to the development of 'La Belle Province.'

Today, mining remains the foundation of Québec's economy, and the industry itself, on the back of strong institutional support, remains in an enviable position, not just on a national level, but as a world-class mining jurisdiction. From mining-related associations (QMA and QMEA) to financial

organizations stimulating resource development (La Caisse de dépôt et placement du Québec, Ressources Québec, SOQUEM, SIDEX and BMO Capital Markets), Québec has the knowledge, means and geological endowment to prosper as global market conditions improve.

Balancing sustainability and permitting

In 2014 the Québec Mining Association (QMA) entered into an agreement with the Mining Association of Canada (MAC) for a four-year mandate to ensure that all mining installations implement the Towards Sustainable Mining (TSM) initiative – a performance system that helps mining companies evaluate and manage their environmental and social responsibilities. Having already achieved 92% of this target by Q3 2018, Josée Méthot, QMA's president and CEO, spoke of the willingness of the Québec mining community to demonstrate its commitment to sustainability: "[Mining companies] took the challenge head-on, therefore we did not have to implement tactics to influence them, they simply agreed to the process."

Despite its numerous advantages as a mature and predictable jurisdiction, the challenges of advancing an exploration project to production run deeper than commodity-market dynamics. Lengthy permitting processes at the provincial and federal levels are driving up costs and, in a challenging investment climate, undermining the economic feasibility of a project. Méthot lamented the amount of time it takes for explorers to obtain environmental authorizations, emphasizing the



Your great-great-great-great-great-great-great-great-great-great-grandfather would have loved metal.

 Québec Mining Association

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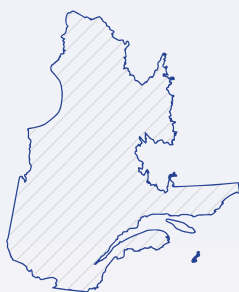
QUÉBEC AT A GLANCE

Source: Québec Gov. and United Nations

Provincial capital: Québec city

Premier: François Legault

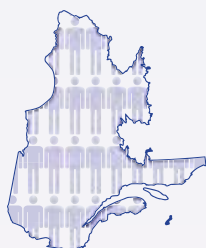
Total Surface
1.668 million km²



LAND SURFACE
78%

WATER SURFACE
22%

Population
8.394 million



Density
6.5 Inhabitants/km²

Unemployment Rate
5.5%

GDP Per Capita (PPP)
US\$41,572



need to streamline the processes: “We need this to be simplified, we need to improve interactions and harmonization between the federal and provincial processes,” she stated.

Mathieu Savard, president of the Québec Mineral Exploration Association (QMEA), echoed this sentiment, suggesting that the number of administrative steps required for permitting be reduced: “The process is vital, but the delay in obtaining these permits wastes shareholders’ and investors’ money.”

In his interview for this publication at the 2018 Québec Mines + Energy conference, Savard outlined the QMEA’s core priorities for 2019: to maintain and increase access to territory, define the parameters of current and future regulations, and to simplify the social-licensing process.

For Hugo-Pierre Gagnon, partner at Osler, Hoskin & Harcourt, new regulations should be introduced incrementally, and major changes in a short period of time should be avoided. Referencing how previous changes to the mining bill had resulted in a lack of clarity, Gagnon maintained that certain regulations have promoted exploration, reduced expenses, and addressed social issues: “It would be prudent that any new regulations should be introduced with the past in mind,” he reflected. **11>>**

AEMQ

**QUEBEC MINERAL
EXPLORATION ASSOCIATION**

The Quebec Mineral Exploration Association promotes sustainable and responsible exploration of Quebec's mineral resources, and their vital contribution to the economy.

QMEA's vision is to become the standard of expertise and development for mineral exploration in Québec.

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Jonatan Julien

Minister of Energy and Natural Resources
GOVERNMENT OF QUÉBEC

ly with regard to the challenges of energy transition. Our vision is to have a responsible development of our mineral resources for the durable prosperity of Québec. My priorities as minister are economic performance, environmental and social exemplarity, support of innovation, and the promotion of Québécois leadership. We want to accompany the industry so it can compete with other jurisdictions, favoring investment and contributing to the financing of structural mining projects, as well as participating in the development of the markets.

How much progress has been made since Plan Nord was launched, and what can the ministry do to advance its development?

The territory north of the 49th parallel presents particular issues due to its geographic, demographic, social and environmental characteristics. The North is also opportunity-rich and has not revealed all of its secrets yet. We will work together with the northern communities to better address their needs and priorities, and ensure the development of this potential in a responsible manner.

Many mining companies have spoken of the challenges of dealing with a lengthy and costly permitting. What can be done to address this issue?

I have already met several industry representatives and I understand their concerns well. We would like the different processes to be more predictable for mining companies, especially in terms of timings, so they can plan their activities and be ready and in good position whenever the market opportunities are optimal. This work has already started and you can be assured that we will pursue this objective diligently to obtain clear results.

What can the Ministry do to nurture a more favorable climate for investment in Québec mining?

We will bet on innovation to attract investors in projects that will offer competitive economics, but that will also contribute to the reduction of greenhouse gases, one of our era's greatest challenges.

Prime minister, Mr. Legault, is clear in his will of promoting Québec as a leader in energy efficiency. Québec's energy transition offers several opportunities for synergies

between the mining and energy industries. As an example, transport electrification is one area where Québec is very proactive in terms of R&D. We support initiatives such as Propulsion Québec, an industrial cluster mobilizing all actors in intelligent and electric land transportation around structural projects, especially in the field of lithium-ion batteries. Several mining companies are part of Propulsion Québec.

How important are initiatives that promote responsible mining, such as the Towards Sustainable Mining (TSM) initiative?

Initiatives such as TSM showcase the engagement of industry members to implement the necessary efforts to continuously improve practices. It is a pledge for quality and respect that can contribute to strengthen the industry's credibility. I sincerely believe that the social and environmental norms that we give ourselves as a society will be reflected by the quality and success of our industries in the long term.

Québec has risen to #6 in the Fraser Institute's ranking of global mining jurisdictions. What makes the province an attractive mining destination?

Québec is endowed with rich and diversified production, since, on top of our strong position in traditional metals like iron and gold, our territory hosts minerals like lithium, graphite and rare earths, which are highly strategic for the future. From my perspective, what makes Québec a leader is its people, companies, associations, research centers, universities and colleges – we have an expertise recognized worldwide.

Do you have a final message for the audience of *Global Business Reports*?

I would like to send a clear message to investors in terms of the stability and the business environment in Québec. We will be custodians and promoters of the competitive advantages that make Québec a business destination of choice.

Mining development will play a key role in the realization of our sustainable prosperity vision for Québec. This will be done respecting the efforts carried out by project developers, respecting the host communities and the native communities, and respecting the environment and the heritage we will leave for future generations. ■

■
On October 18, 2018, you were appointed Minister of Energy and Natural Resources in Premier François Legault's new government. What are the Ministry's priorities and how does the mining sector feature in its strategy?

The mining sector plays a neuralgic role in Québec's economy and in the dynamism of our regions. Our government relies on the significant contribution of this sector in a more sustainable economy, especial-

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Frank Mariage, former president of the QMEA and partner at Fasken, weighed in on the current exploration climate. Pointing to a drop-off in the investment curve for juniors compared to a more stable curve for mid-tier producers and majors, he explained that although juniors make the majority of discoveries, they often face an uphill battle to raise funds. While recognizing the difficulties that the industry has faced in attracting investment during the downturn, Mariage was more bullish regarding future market dynamics: “The mining industry has gone through a challenging period, particularly with the rise of the cannabis market limiting the flow of investment capital into the junior space. However, the fundamentals of metals are solid, and companies will need to invest to maintain supply,” he said.

Another Montréal-based law firm specializing in mining services is Lavery, which has seen an increase in Australian and Chinese companies seeking to acquire lithium and cobalt assets in Canada to aid in the production of batteries, according to partner René Branchaud. Suggesting that more leeway could be granted to local authorities such as civil servants and mayors to speed up the permitting process, Branchaud also touched on one of the major advantages afforded to mining companies active in Québec – the tax benefits: “If a company is not financed through flow-through shares (FTS) or does not renounce its exploration work to investors, it has access to large amounts of credits and can recover up to 35% of the cost incurred for exploration work,” he explained.

Can metals and innovation finance the future?

Financial incentives, such as the 30% to 40% tax credit available for exploration activities, make Québec a highly attractive mining destination, but mean little without access to capital. Fortunately, there are plenty eager to invest.

Chad Wells, VP of Altius Minerals, the royalty, streaming and investment company responsible for financing numerous projects across Canada, commented that Québec had the financial clout to back up its commitment to the industry: “In Québec, you not only have a jurisdiction that is willing to support mining at a community level, but there is also enough capital to finance the development.”

BMO Capital Markets, named by Global Finance as the world’s best metals and mining investment bank for the last nine consecutive years, assists mining clients through the development cycle and helps pair those seeking capital (issuers) with the right sources and structures. Nicolas Brunet, managing director of investment and corporate banking at BMO, highlighted the firm’s recently established new age metals team that targets issuers working in the lithium, cobalt and graphite space. Commenting on how BMO collaborated with other funds to facilitate the financing for Nemaska Lithium, the largest stand-alone lithium-financing operation to-date, Brunet stated: “It was critical for all financing sources that the financing package be complete, i.e. that the funds raised be sufficient to build the mine and transformation plant. It is highly unlikely that one source alone could have achieved this; cooperation was critical.”

As a subsidiary of Investissement Québec, Ressources Québec is the gateway for companies seeking to invest in the mining and hydrocarbon industries. In collaboration with the government, it has access to C\$1.5 billion to support mining projects in the region. In recent years, the organization has modified its mandate to add renewable energy as one of its focus areas, and has adapted its approach to form partnerships with major producers such as Agnico Eagle, Glencore, IAMGOLD and Hecla Mining, in addition to new project development.

Iya Touré, VP of Ressources Québec, elaborated on the evolution of the organization’s mandate: “The current green movement in the mining industry is having an impact on Ressources Québec’s policies and strategy. The Nemaska Lithium project, for example, has huge potential due to the growing interest in the electric vehicle market,” he explained, continuing: “The challenge now is to bring the projects to market. Ressources Québec’s credibility relies on these projects and we want to ensure that they are delivered on time. The Québec mining ecosystem also relies on these projects, and we believe that their success will attract more investment.”

SOQUEM, a subsidiary of Ressources Québec, works with its partners to develop projects at all stages of the exploration cycle. Innovation has been a key driver for SOQUEM in 2018, illustrated by a big data approach that succeeded in identifying six new exploration targets in partnership with

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GOLD GRAPHYTE EQUITY SOCIAL
ACCEPTABILITY IRON LITHIUM EQUITY
FUND ENERGY RARE EART EXPLORATION
REFONDABLE TAX CREDIT LOAN COPPER
RENEWABLE ENERGY
RISE MANAGEMENT DEBT FINANCING LOW
NICKEL SOCIAL ACCEPTABILITY NICKEL
TAX BENEFITS EQUITY FUND RARE EA
LOW ENERGY COST DIAMOND EXPLORATION
COPPER NICKEL FINANCING IRON
GOLD GRAPHYTE EQUITY SOCIAL
ACCEPTABILITY IRON LITHIUM EQUITY
FUND ENERGY RARE EART EXPLORATION
REFONDABLE TAX CREDIT LOAN COPPER
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LOW ENERGY COST DIAMOND EXPLORATION
COPPER NICKEL FINANCING IRON
GOLD GRAPHYTE EQUITY SOCIAL
ACCEPTABILITY IRON LITHIUM EQUITY



Josée Méthot

President & CEO
**QUÉBEC MINING
ASSOCIATION (QMA)**

The Québec Mining Association was founded in 1936. Its mission is to promote, support and play a proactive role in the development of a responsible, committed and innovative mining industry in Québec

How has the Québec Mining Association (QMA) progressed in its mandate to implement the Towards Sustainable Mining (TSM) initiative?

In 2014, the QMA entered into an agreement with the Mining Association of Canada (MAC) and was given four years to ensure that all mining installations in Québec implemented the Towards Sustainable Mining (TSM) initiative – a performance system that helps mining companies evaluate and manage their environmental and social responsibilities. It is a set of tools and indicators to drive performance and ensure that key mining risks are managed responsibly at participating mining and metallurgical facilities. We are happy to say that we have achieved 92% of this target so far. The mining industry has been collaborative and cooperative and took the challenge head-on, therefore we did not have to implement tactics to influence them, they simply agreed to the process.

Over 100 environmental laws and regulations govern mining companies in Québec. Does the QMA advise mining companies on how to adhere to these regulations?

Yes and no. We are not consultants but, in all our activities, we have different expertise and work with the industry across the value chain. If there are new environmental regulations or acts put in place or about to be, we ensure we have all the required information and make representations to the government on behalf of the industry to make sure that laws or regulations are adapted to the reality of the mining sector. We also work with our members to ensure they are aware of the coming new regulations so that they are able to face the new requirements.

In your opinion, what is the biggest challenge facing Québec's mining industry today?

At the moment, our environmental authorizations processes are taking too long and most projects our industry must go through two processes; one with the Québec government and one with the Federal government. We need to improve interactions and harmonization between the Federal and Provincial processes. QMA has been working in collaboration with the governments, suggesting substitution and improvements in order to speed up the process and reduce bottlenecks. Our industry has no problems with the envi-

ronmental requirements per say, our aim is to gain efficiency so that our industry does not miss economic windows of opportunity.

Québec is ranked by the Fraser Institute as the sixth best mining jurisdiction in the world. What are the reasons behind this?

Québec's geology is rich and diversified and the government is doing a lot of work exploring the landscape in order to provide information relating to the geological potential of the province. Québec has political stability and the new mining and tax acts have been implemented for over three years now, so are clearly understood by the industry. We are currently going through a revision of the federal environmental authorization process and hope that our comments and suggestions are taken into consideration. The mining expertise and tradition in Québec is also first-class, with well trained workers and good working conditions.

How does QMA help develop new talent in the industry?

QMA works with organizations that focus on training as well as government agencies in terms of education programs. We work with organizations such as the *Institut national des mines*, whose purpose is to ensure that there is no gap between the training given by institutions under the Ministry of Education in Québec and the needs of the industry. We also work with other training organizations such as the *Comité sectoriel de main-d'œuvre de l'industrie des mines* to exchange best practices on how to attract, recruit, train and retain employees with a focus on women and aboriginal groups. QMA is currently working on an international trade mission with the aim of recruiting foreign talent for mining companies in Québec.

What does the QMA hope to achieve in the Québec mining industry by 2020?

We want Québec to be the best mining jurisdiction in the world. To do this, the QMA will continue to make representations and liaise with the government so that Québec become more competitive to attract investments. The QMA will continue running its new communication campaign through various channels that aim to change the public perception towards mining, to ensure the public understand the benefits of the mining industry and how it positively influences their lives and improve social acceptability. ■



Mathieu Savard

President
**QUÉBEC MINERAL
EXPLORATION ASSOCIATION
(QMEA)**

The QMEA was created in 1975 to bolster mineral exploration in the province and support the development of Québec's mining companies

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What are the current priorities of the Québec Mineral Exploration Association (QMEA)?

Currently, the main priorities of the QMEA are to ensure a predictable regulatory framework that limits delays and improve tools of social acceptability. The main issue remains the access to the territory, particularly in the Plan Nord area where 20% of the territory is intended to be entirely protected, and 30% with a protection still undefined. Other priorities include addressing the issue of manpower, particularly in the northern Québec area. In the next 10 years, we will be seeing more AI, automation and machine learning in exploration, which may assist mineral exploration companies with some of the challenges faced today.

What kind of companies does the QMEA work with, and how does it support them?

QMEA has 1,200 individual members and 200 corporate members. We work with companies of all sizes, from juniors to, mid-tier producers, to majors (such as Goldcorp), and service providers, so across the full value chain of the industry. We work with all mineral exploration stakeholders, including ministries, municipalities and communities. The goal is to ensure that the regulations in place are consistent and effective.

Have updates to the mining act in 2013 led to a favorable mining climate?

The new bill is workable and has brought some favorable updates. However, there are still some areas of it that need work, such as access to territory. I believe there could also be greater support given to new mining municipalities. The truth is that Canada needs a world-class discovery to bring the buzz and activity back into the region. Osisko's windfall discovery made a tremendous impact and we need to see more activity of this type. We also saw that if a different model of exploration is used, there is potential for great success. Companies such as Sirios and Azimut in James Bay have shown this.

What can the new provincial government do to improve the mining industry in Québec?

There should be a drive to reduce administrative burdens on companies, such as the various steps for permitting. The process is vital, but the delay in obtaining these permits wastes shareholders' and investors' money. This is where the QMEA can help its members, as we know how and when to begin building the trust and to start the conversation with First Nations communities. Additionally, as mentioned, an improvement in access to the territory would be greatly beneficial, along with more clarity regarding regulations.

How do you see the current financing climate for juniors?

We need investors to see activity as a way of making major discoveries in the region, and then the climate will improve. There have been new players in the market such as marijuana and blockchain companies, and with all the new capital being created, investors are looking for shelters. The Super Flow Through and Tax Credit related to resources available in Québec are a key for that. Investors are more surgical in their approach now when choosing to invest and that is why I think it is best that exploration companies focus their time and effort on a few projects, rather than having a sprawling portfolio.

What are some of the main challenges facing the industry at the moment?

There needs to be more comprehensive training from universities, as we do not have enough people who have the know-how to work on mining projects – from exploration all the way through to the end of the journey. The lack of innovation will disrupt the industry and this is what needs to be considered by educational institutions. However, it is no easy task.

Do you have a final message for the readers of *Engineering & Mining Journal* and *Global Business Reports*?

The QMEA takes pride in supporting its members from day one of the process until the end. Social acceptability is one of the most challenging aspects and we have expertise and experience in this area. We also strive to keep members up to date with any regulatory changes or potential issues on the horizon, ensuring better business for all. Québec is a great place for exploration, and we look forward for improvements in the years to come. ■

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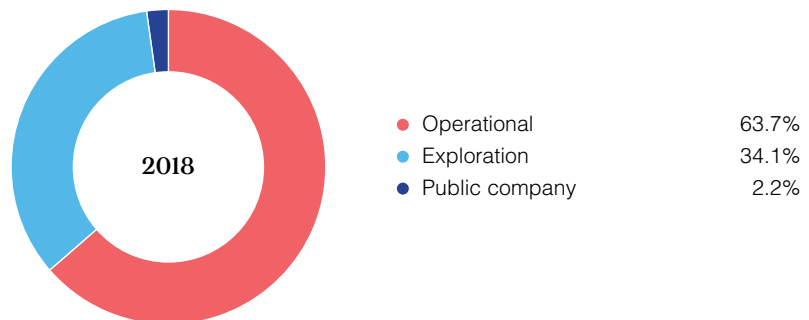
Azimut Exploration, four of which led to discoveries.

The future, however, needs more than just new technology and metals. While mining has always required long-term thinking on behalf of investors, the pursuit of short-term financial gains often characterized mining operations of the past. Today, the vision for an operation needs to stretch beyond financial gains and even beyond the span of a mine's life. An advocate of the benefits of responsible mining, Michel Gilbert, president of SOQUEM, emphasized the importance of how geology and economics combine with human resources, community engagement, and environmental sustainability. Explaining SOQUEM's forward-looking focus, Gilbert elaborated: "We are working not only on what mineral we should be focused on now, but also which metals and minerals will be important ten years from now; we are, after all, an exploration company."

Another institutional fund looking to work with innovative, smaller companies is SIDEX, a limited partnership that finances exploration companies and aims to encourage mineral diversification. In 2017, SIDEX financed new entrepreneurs Kintavar and Harfang Resources. Michel Champagne, CEO and general manager of SIDEX, outlined its strategy: "Creating new concepts and techniques within the mining industry can change the playing field and pave the road for more and better discoveries to be made," he said. "SIDEX has a focus on innovation with the hope to find the next transformational technology or technique for the global mining industry." ■

Expenditures on exploration and development work by type of company

Source: Québec Gov. 2018



Fraser Institute Mining Ranking

Source: Fraser Institute, 2017

Investment Attractiveness Index Ranking

6/91

Policy Perception Index Ranking

9/91

Best Practices Mineral Potential Index Ranking

10/91

SOQUEM

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In Québec's mineral exploration community, SOQUEM is known for its wealth of experience, its outstanding team, and its diverse and highly valued portfolio. With a significant exploration budget, SOQUEM is a leading player in Québec mineral exploration industry. We have helped create over 1,000 jobs and taken part in over 350 exploration projects.

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Iya Touré

General Manager

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As a subsidiary of Investissement Québec, Ressources Québec is the gateway for companies seeking to invest in the mining and hydrocarbon industries

What has Ressources Québec achieved over the last years?

Ressources Québec was launched in 2012, so we spent some time successfully putting a team into place, and getting our name in the industry. We manage our own budget, as part of Investissement Québec, but we were also entrusted with a provincial governmental fund. In 2011, when the initial Plan Nord was envisioned by Jean Charest's liberals, the idea was to give Ressources Québec C\$750 million to manage. In 2015, one year after Premier Philippe Couillard's election, the liberals renewed their promise and even supplemented it with C\$250 million, creating the Capital Mines Hydrocarbures (CMH) fund, for a total of C\$1 billion, which is fully operational now. Out of that, C\$500 million will be exclusively dedicated to Plan Nord projects.

Ressources Québec has made several investments in the market over the past years and, in 2015-2016, we had 10 interventions over a broad scope of companies at different development stages of their projects, for a total of C\$220 million. The two main projects we supported this year belonged to Osisko and Agnico-Eagle, but in the past, we also offered help to Stornoway Diamonds and Canadian Royalties.

What is the current status of SOQUEM?

SOQUEM continues its mandate of helping companies discover new projects in Québec, doing excellent work on that front – they have a total portfolio of around 70 projects, and they take on about 15-17 new tasks yearly. Their goal is to help mining companies to further develop their projects, making them marketable, and then finding partners that can bring those operations into production.

Stornoway Diamonds, Arianne Phosphate, Nemaska Lithium –just a few examples of solid projects moving ahead in Québec. Are we seeing increased mineral diversification today, and is iron ore still a valid mid-term option?

It is very encouraging to see mineral diversification happening in Québec, a province traditionally known for its iron ore and gold resources. More and more, new discoveries of rare earths, graphite, lithium, apatite, and even diamonds are making the headlines, strengthening Québec's brand as a mining industry, and offsetting the risks of being too focused on one or two commodities. In the short-term, it is unlikely for us to act in any way in regards to iron ore projects in Québec.

Since we are only a complementary financing actor, we need others to be involved as well, and that is not happening right now. However, in the long-run, we expect to become active in this segment again due to the large, untapped potential in the Labrador Trough.

What characteristics in a company make it an attractive target for Ressources Québec?

Ressources Québec will always be a complementary player on the financing scene. Therefore, the first thing we look at when deciding to invest in a project is whether there are other financial institutions backing it up as well. Afterwards, we obviously analyze the strength of that project's management team, the quality of its mineralization, and the global economics of the commodity involved. Our investment needs to have a direct, visible impact. Nowadays, you cannot finance an entire operation in one go – projects need to be delineated into development phases: that gives us more confidence that our money will be spent properly.

What makes Québec an attractive mining jurisdiction for foreign investors?

Because of the difficult global commodity climates, we are finding that financiers are more prudent now; however, they still see the potential here. Québec is a diversified and politically stable mining jurisdiction, with great geology, and it has also become predictable with the new mining regime passed in late 2013. Investors needed that, and they currently feel comfortable knowing the rules of the game. Moreover, there is a wealth of human expertise in the province: we have the schools, the mining companies, and the service support system, which all operate at a world-class level. Lastly, there is good access to capital in Québec, and also throughout Canada.

What should we expect from the mining sector moving forward?

We expect to see more M&A activity in the market, because some companies, especially in the exploration phase, will have to rethink their ways of developing their projects in this cash-tight investment scene. In the meantime though, Ressources Québec will continue to support the mining sector, as we know that the industry will come back. It is essential for projects to continue to be developed so that when the downturn finally ends, they are ready to tackle the markets and hit the ground running. ■



René Branchaud

Partner
LAVERY

An independent law firm offering a full range of legal services to business from offices in Montreal

How have Lavery's legal services and client portfolio evolved to cater to the mining industry in recent years?

In the past, Lavery's clients were mainly junior exploration companies who have matured over the years and several have reached production or preproduction. We are currently working with various companies who are either opening new mines or reopening former mines. Lavery has also seen an increase in Australian and Chinese companies becoming active in Canada, acquiring sites with a focus on lithium and cobalt used in the production of batteries. We have started working with and helped finance innovative companies such as Montréal-based NanoXplore, who makes graphene out of graphite for nano-technologies. Lavery has also overseen numerous acquisitions since 2016, as larger companies have taken advantage of the relative value available in the downturn.

As advanced-stage juniors make the transition into production, what support can Lavery provide?

Lavery assists with the construction agreements that need to be negotiated, as well as the buying and selling of required equipment. Other than financing, Lavery also assists with joint ventures and shareholder agreements. When companies are closer to production, tax planning, hiring of employees, and the negotiation of collective agreements all need to be addressed with care, particularly when companies are required to hire hundreds of employees. Lavery can assist with First nation negotiations, facilitating meetings and providing advice, but in recent years we have seen that this is being done in-house more frequently.

How do you think the legalization of cannabis will affect the mining industry?

Significant capital has been drawn towards this new market, so from a financing standpoint juniors have suffered. However, on the positive side we have seen more individual investors putting money into the cannabis industry, and moving forward this may entice people to invest in the mining industry to diversify risk.

From a legal standpoint, what are the main challenges the newly appointed Minister of Energy and Natural Resources could address to create a more favorable mining environment?

The Minister should provide more power and leeway to local authorities such as civil serv-

ants and mayors. We have seen several projects in the past delayed due to permits coming from past ministers. When the groundwork is done by the local employees of the Department of Energy and Natural Resources, permits still take months to obtain and delegation of powers should be passed down the ranks in order to improve and speed up this process.

What makes Québec an attractive mining jurisdiction?

Québec boasts large reserves of natural resources and the high tax deductions and tax credits available to mining companies and investors in the province has always made the region attractive. If a company is not financed through flow through shares or does not renounce its exploration work to investors, it has access to large amounts of credits and can recover up to 35% of the cost incurred for exploration work done. The government had previously tried to alter the Mining Act which affected Québec's ranking on the Fraser list, as a lot of uncertainty was created, but with the new and clearly understandable Mining Act, that doubt has been put to rest.

Has Lavery's HR approach evolved to accommodate an increasingly international client base?

Lavery hires 12 students every year with the goal of developing their skill sets as they grow and gain experience. We are seeing an uptake in interest from Chinese students looking to learn about the mining industry, which is of great benefit to Lavery as it opens up avenues to Chinese investors and increases its capabilities to serve the Asian market.

What milestones does Lavery expect to achieve by 2020?

Over the next year we expect to see more investment in Québec due to the increased interest in lithium and graphite used in the production of batteries. We are seeing at least two companies transforming from not only extracting minerals but also refining them, which is a significant step for the Québec mining industry.

We would like to see several of the projects that we are currently working on come into production. One such project is in Colombia, with the aim of constructing a mill that will serve local artisanal miners who currently implement harmful environmental practices. Lavery is also working in reopening a mine in Morocco, which should be completed by 2020. ■



Michel Gilbert

President
SOQUEM

SOQUEM was founded in 1965 and has played an instrumental role in Québec's mining industry by helping to broaden the range of natural resources under development

■ SOQUEM is a subsidiary of Ressources Québec. How do you work together to help exploration companies' advance their projects?

SOQUEM is viewed as an exploration company with its main shareholder being Ressources Québec. Ressources Québec aims to secure mining development in the province, and SOQUEM should be viewed as a developer not only at the exploration stage but rather the stage that provides the most efficient development. The relationship between the two is a lot more fluid than often understood and we work in unison at all stages of development.

We look at what would be the best scenario to advance development and then decide who has the best expertise for the specific project and who should manage it. SOQUEM currently has 20 projects all at different stages.

What does SOQUEM look for when assessing a new project?

SOQUEM does not choose projects only, per say, but tends to work with companies as long as there is a business plan that makes sense. These projects are not always early stage.

What is the focus of SOQUEM's strategic alliance with Azimut Exploration?

We have heard a lot about industry 4.0 and the utilization of big data, and this is where SOQUEM has been working with Azimut. The objective here is trying to define and focus Azimut's targeting on 10 properties. We have succeeded to define six of them, and on four of these Azimut has recently announced discoveries. These discoveries are tangible evidence that a big data approach is currently working.

At the early stage, this will be SOQUEM's approach – working with strategic alliances for new territory and for specific elements. We are working not only on what mineral we should be focused on now, but also which metals and minerals will be important ten years from now: we are after all an exploration company.

Can you explain how big data is utilized to make discoveries?

Using a software developed by our partner, we focus on a specific area for a specific mineral. The targets generated are val-

idated by fieldwork at prospection stage. Should it be confirmed we secure the land. Our partners have found tangible evidence that the software produces the right targets, and Azimut's four recent discoveries add credibility to this approach.

Do you think a big data approach to exploration will become more commonplace?

After the success SOQUEM has had we will start to see the big data approach becoming more widespread. However, everything related to industry or mining 4.0 is not only related to big data, it is also about the way we combine all the different components of a project to work together. In the mining industry we used to focus on geology and mining aspects separately to human resources, community engagement and environmental processes. Technical studies may show that a project will be economical, but this will not be the case as long as there is a lack of environmental consideration or a strong link with communities. Fortunately, the people who work with SOQUEM and the new generation of workers in the industry are aware of this and already have these values.

How do you view the current investment climate for junior exploration?

Programs such as the mineral exploration tax credit (METC) help. However, competition for funding from new industries such as cannabis and cryptocurrencies has really impacted the mineral exploration sector. The share prices of junior companies have continued to suffer. We must remember that the markets could be cyclical for these new industries too – similar investors and the same external impact on projects.

What are the main objectives for SOQUEM in the next 18 months?

You will see SOQUEM very active on the strategic alliance front, as the four discoveries we made with Azimut recently will provide us with interest from new investments and maybe new companies involved in this area.

The market is not easy, there are projects that need funding, and my message to the exploration community is that SOQUEM is designed to help projects at all stages of development. ■



Nicolas Brunet

Managing Director,
Investment & Corporate Banking
BMO CAPITAL MARKETS

BMO Capital Markets is the
investment banking subsidiary
of Canadian Bank of Montreal

How does BMO Capital Markets assist its clients in accessing capital?

BMO Capital Markets assists clients primarily by (utilizing our balance sheet to lend capital to our clients or by pairing issuers with capital providers. Capital providers may invest in various parts of the capital structure (i.e. debt or equity) or at the asset level. This process requires advanced planning and extensive knowledge of the market, the capital providers (which are not limited only to investors, but also include private equity, other companies, and royalty / stream providers, amongst others) and the companies themselves.

For the last nine consecutive years, BMO Capital Markets has been named by Global Finance as the world's best metals & mining investment bank. In 2018, BMO Capital Markets again advised on the most metals & mining M&A transactions globally, leveraging our global presence with metals & mining investment bankers based in North America, London, Melbourne and Beijing. We are, of course, very active in the Quebec market as well.

Recently, we assisted Nemaska Lithium with the equity component of the largest lithium financing package to date for a new, standalone project. Specifically, BMO Capital Markets was joint bookrunner on a US\$280 million equity issuance for Nemaska in May 2018.

In late 2017, we also assisted Osisko Gold Royalties in raising capital, namely acting as joint bookrunner on a US\$300 million issuance of convertible debentures to fund the acquisition of precious metal royalties, among other things.

Does BMO Capital Markets work in collaboration with other financial institutions in Québec?

Yes, coordination with the local Québec funds, which play a key role towards funding the development of local mining projects. Taking the Nemaska Lithium project as an example, it was critical for all financing sources that the financing package be complete, i.e. that the funds raised be sufficient to build the mine and transformation plant. Both the capital markets components and the contribution from Ressources Québec were key to getting the entire project funded. It's highly unlikely that one source alone could have achieved this.

Funds such as Ressources Québec, Caisse de dépôt et placement du Québec (La

Caisse), Sidex, and others play a critical role in the financing of mining projects in Québec.

The BMO Capital Markets global metals & mining conference celebrates its 28th anniversary in 2019. What does the conference aim to achieve?

The conference, held annually in Hollywood, Florida, will celebrate its 28th year in 2019, and seeks to pair investors with senior level executives of issuers in the metals & mining space. The event is by invitation only and, as one of the world's premier metals & mining conferences, there is significant demand for attendance. The conference has adapted to changes in the investor base; for instance, we now invite more private equity funds, and the number of high yield investors has increased over the last few years. The issuers market has also evolved, with increased representation from new age metals such as lithium, cobalt and graphite.

How has BMO Capital Markets evolved to cater for growing demand from the new metal markets?

BMO Capital Markets has developed a new age metals team that targets the companies in this sector. Last year, at our global metals & mining conference, we had a panel comprising of various executives from mining and automotive industries explaining the use of these metals and the expectations of the market going forward. Most of these new metals still represent small markets when compared to precious metals, base metals and bulk commodities, and it will take investors time to familiarize themselves with and understand how supply and demand will influence markets and pricing going forward.

Do you have a final message for the readers of *Global Business Reports*?

BMO Capital Markets is the most active metals & mining platform around the world, year on year, across the full mining spectrum of exploration, development and production, and we remain highly invested in and committed to the space. In Québec, we intend to play an active role in helping fund the emerging projects in new metals such as lithium, graphite and others. We also of course plan to remain active across the full spectrum of metals, as we have been in the past. ■



Frank Mariage

Partner
FASKEN

Fasken is a mining law firm

Fasken has been recognized as the world's top mining law firm by Who's Who Legal for four years running. Can you provide an overview of the current global footprint of Fasken and the significance of its Montreal office?

Fasken is a Canadian law firm with offices in Vancouver, Calgary, Toronto, Ottawa, Montreal and Québec with a staff of approximately 600 lawyers, with Montreal housing 190. Internationally, we have offices in London and Johannesburg, with a combined total of 700 professionals worldwide.

Fasken's global mining group of practitioners comprises of 125 to 150 employees who interact with all mining related issues such as raising capital, the purchase, development and sale of projects, securing titles, engaging Indigenous communities, governments or other stakeholders, structuring transactions, and resolving disputes. We boast a good footprint in Africa, South America, Asia and Australia, with a major focus on Europe and America. In each of these regions, we work with local law firms to ensure we have the best local knowledge and expertise.

Does Fasken engage with firms of all sizes or focus mainly on larger, more established firms?

Fasken has expertise in opening as well as closing mines and provides a "cradle-to-the-grave" experience. This allows us to work with start-ups in the mining sector by adapting our services and fee structures accordingly, and as these develop, work with the company throughout the project's lifecycle. We are also able to help sell companies or projects to the major firms and start over if required.

How has the demand for legal services changed as the market has evolved?

From a First Nations point of view, we are seeing firms looking to not only provide services to mines but now they are beginning to invest in mines and become partners. Québec is recognized for its proven track record of managing relations with indigenous peoples. These include historical agreements that have allowed for a better operating climate compared to the rest of Canada.

The government has become more stringent with regards to environmental rehabilitation requirements, such as mining com-

panies having to pay the total rehabilitation cost up front.

To what extent will the legalization of cannabis in Canada affect the mining industry?

In terms of health and safety for mining companies, I don't see much of an affect as mines already enforce a zero-tolerance policy relating to any substance, be that alcohol or drugs. In terms of the market – we are seeing stocks related to cannabis companies on a rollercoaster, and this has created a lot of quick capital, but I feel the hype will disappear. I do not see the demand for metals disappearing and, due to a possible lack of exploration projects and thus supply, commodity prices should skyrocket.

Can you outline the tax incentives for companies with mining operations in Québec?

Firstly, the Flow Through Share (FTS) regime, which is available throughout Canada and offers a 25% tax rebate, has two additional "super flow through" deductions totaling 40% in Québec. Secondly, the government will give you a mining resource tax credit if you do not utilize a flow through. If you can raise actual cash and depending on where the project is in northern Québec, you become eligible for the tax credit. Thirdly, the government will give you a smaller incentive on mining duties payable. Over the last decade, we have seen the combined Flow Through what is called a "charity offering" where a mining company will issue flow through stock at a huge premium to market, buyers will then donate that stock to a charity, who will then sell those shares to an end buyer, who will buy those shares at either market price or a slightly discounted rate.

What are the main objectives for Fasken in 2019?

Fasken has started exploring more opportunities in Africa and other jurisdictions further afield. The mining industry has gone through a challenging period, particularly with the rise of the cannabis market limiting the flow of investment capital into the junior space. However, the fundamentals of metals are solid and companies will need to invest to maintain supply. Fasken is well positioned to assist all companies within the sector in a wide variety of transactions. ■





Metals and Materials of the Future

“Car makers are making a transition toward electric vehicles and numerous battery facilities are being announced. The current market is roughly less than 100 MWH, but is expected to increase to more than 3 million MWH in roughly 15 years in order to meet the demand.”

- Benoît Gascon,
President & CEO,
Mason Graphite Inc



Metals and Materials of the Future

Lithium and vanadium projects attract substantial investment

■ Québec's mining industry was built upon gold from the Abitibi Greenstone belt, iron ore from the Labrador Trough and nickel from the Ungava belt. These resources remain the bedrock of today's industry, but the metals that underpin emerging technologies are now generating the most attention. In Québec, it is metals for use in renewable energy and battery technologies – lithium, vanadium, and others – that are attracting significant investment. Nemaska Lithium has managed to raise C\$1.1 billion, including Japan's SoftBank Group's first-ever resource investment, to advance construction at its Whabouchi mine and Shawnigan electrochemical plant to unearth long-term sources of lithium to power electric taxi fleets across Asia. In parallel to this, BlackRock Metals, owners of a vanadium and titanium-bearing magnetite (VTM) and ilmenite deposit, raised US\$890 million to construct the mine and concentrator at its

property in Chibougamau. Such vast sums of investment have been supported in part by institutional funds. For instance, Ressources Québec added renewable energy to its mandate and BMO Capital Markets created a new metals team. The global market gives sustenance to these projects, with ferro vanadium prices reaching a 13-year high of US\$123 per kg in Europe in December 2018.

In January 2018, a report by Morgan Stanley speculated there would be an oversupply of lithium from low-cost brine producers SQM and Albemarle in Chile that would cause the lithium price to crash in the first half of the year. These forecasts have not, however, come to pass, and the fundamentals for battery metals such as lithium and cobalt appear solid, underpinned by a growing demand from vehicle manufacturers looking to electrify their fleets. "Volkswagen has committed to making 30% of their sales electric by 2025, and this alone would require five mines like Whabouchi," stated Guy Bourassa, president and CEO of Nemaska Lithium. "In 2016, less than 12,000 tons were needed for car batteries, but this figure will rise to 550,000 tons by 2025."

In addition to the overall growing demand for lithium, Québec is a favorable lithium

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Michel Champagne

President & CEO
SIDEX

The mission of Sidex is to invest in companies engaged in mineral exploration in Québec in order to diversify Québec's mineral base

How has Sidex's approach to investments evolved over the past two years?

Sidex has shifted its focus to include more innovative companies and approaches into its scope of investment. The markets have been difficult over the last few years, and we continue to assist early stage junior companies within Québec mining industry that find it difficult to attract financing in challenging markets. We will invest in junior companies that focus on innovation and want to try different approaches to mining. When proposing new techniques, it can be difficult to create interest and attract clients that are willing to take the risk of trying a new technology.

Sidex is funded by the Government of Québec and the Fonds de Solidarité. Can you elaborate on the dynamic between these entities?

Sidex was financed with C\$50 million for the first five years of its establishment. We are still operating on these funds and have not yet had the need to refinance. The company has also returned capital, in the form of dividends, to sponsors. Sidex is dedicated to providing financing to smaller mining companies and thus, the investments that we make are not significantly large.

Has Sidex seen any recent return on investment, despite the difficult market conditions?

The market began decreasing in 2011, with 2015 being an extremely difficult year. In 2016, we started to see rejuvenation in the market and Sidex recouped all the investments the company had made since 2012 within one year. The rebound of the market did not last long, and in 2017, we again saw very difficult market conditions, continuing into 2018. For Sidex, whether the market is in a downcycle or an upcycle, we are always looking for projects that make sense economically.

How have new markets such as cannabis and cryptocurrencies affected the investment climate for exploration companies?

I believe that investments leaving the mining market are generally from speculative investors that follow the action within the markets. When there is action in the cannabis and cryptocurrency markets, speculative investors follow the trend, but as soon as the action is over, the investment again returns to more stable markets or markets

with more action at the time. The mining industry, especially junior companies, are affected by new markets such as cannabis and cryptocurrencies, but these markets are still speculative, and we believe that investment will return in time.

Why has Sidex decided to place a greater focus on innovation in recent times?

The mission of Sidex is to invest in companies engaged in mineral exploration in Québec in order to diversify Québec's mineral base by promoting projects with attractive market potential, stimulate investments for the exploration of existing mining districts that show strong potential for diversification and promote new entrepreneurs and innovation.

Creating new concepts and techniques within the mining industry can change the playing field and pave the road for more and better discoveries to be made. Sidex has a focus on innovation with the hope of finding the next transformational technology or technique to benefit the global mining industry.

Can you highlight one of Sidex's success stories?

Sidex financed Midland Exploration with the aim of developing a serious junior exploration company with larger means. Midland Exploration had to raise the same amount that we invested, and we required that they added more people to their team to develop concepts and ideas. They have made a success of that investment, and every year they are developing new projects. In 2017, Sidex financed new entrepreneurs such as Kintavar and Harfang Resources.

What would Sidex like to see in Québec's mining industry moving forward and how would the company play a part?

We currently need a proper discovery of significant stature in Québec to attract further investment into the province. Sidex is continuously developing, and we aim to try new approaches every year. In 2019, the company's strategy is to enhance its focus on innovation and support entrepreneurs and early stage juniors that have big ideas. We are part of a group in which industry and academic institutions are collaborating to solve real-time problems, and Sidex is here to support projects with high potential and innovative approaches that we hope will transform the industry in the near future. ■

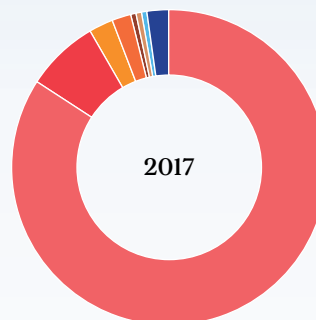
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jurisdiction due to its conducive geology. “In Canada, lithium is mainly found in hard rock, which is easier to access than brine, as the extraction and purification processes differ,” said Yves Rougerie, president and CEO of explorer Vision Lithium in which Nemaska Lithium is the largest shareholder. The company’s flagship resource is located within the 1,100-hectares Sirmac property that sits halfway between Chibougamau and Nemaska. In 2018, Vision Lithium launched an extensive exploration program that included geometry surveying, drilling, metallurgy and an update of resource estimation. The company’s aim is now to develop the resource towards a mineable size to attract the investment required for production.

Another player in the lithium space is Critical Elements, which completed a feasibility study on its Rose Lithium-Tantalum project in September 2017, followed by an environmental impact study in December 2017. The feasibility study indicates a 17-year mine

Expenditures on exploration and development by commodity

Source: Québec Gov. 2017



Precious metals	74.2%
Lithium	6.8%
Graphite	2.2%
Iron ore, titanium and vanadium	1.5%
Rare earth metals	0.6%
Phosphate	0.5%
Diamonds	0.5%
Other substances	1.8%

SIDEX provides financing to mineral exploration companies with promising projects in Québec while promoting mineral diversification, new entrepreneurs and innovation in exploration.

To join us:
www.sidex.ca

life, and the company is hoping to reach commercial production by 2021, according to CEO Jean-Sébastien Lavallée. It has completed two pilot plants, one to produce lithium carbonate and another lithium hydroxide: “It offers high conversion rates of spodumene to lithium carbonate or hydroxide,” said Lavallée, continuing, “the new battery generation is leading towards lithium hydroxide.” The expanding lithium market also opens doors for potential downstream processing. As Nemaska and North American Lithium plan to build a phase-two plant to process tailings from their mines, Jonathan Gagné, general manager of Sayona Lithium, sees the possibility of aiming for such a scenario for Sayona. “Authier on its own demonstrate a good potential, which could be strengthen if we make a discovery at our recently acquired Tansim lithium asset.” He added: “Québec demonstrates a real potential to become a top player in the lithium industry. We have good lithium deposits, a great mining expertise, cheap power, access to ports and rails and a good support from our Government.”

Sayona is focusing on its Authier Lithium project located in the municipality of La Motte, 45 km northwest of Val d’Or. The hard-rock spodumene lithium deposit is now entering in permitting phase.

As the use of lithium keeps snowballing, service providers are seeing opportunity for greening the cycle. Engineering and consulting firm Seneca is in the process of deploying the first automotive lithium-battery recycling hydro-power pilot plant. Lithion Recycling project consortium, of which Seneca is part of, received a C\$3.8 million funding in 2018 from Sustainable Development Technology Canada. Lithion Recycling is aiming for a worldwide commercialization of its technology, which will begin with the construction of a 200-tons per annum capacity pilot plant in Québec in 2019. VP and co-founder Raymond Simoneau commented that “[...] cu-

Currently, 90% of our projects are driven by the sustainability factor – mostly by either recycling of improving yields. The entire Québec region is focussed on sustainability, and the province’s low cost and renewable energy resources offer great opportunity.”

Another essential metal used in electric vehicle batteries is graphite, and the demand – primarily from the Chinese market – continued to increase throughout 2018. Montréal-based graphite mining and processing company Mason Graphite received government authorization for its Lac Guéret project in June 2018, and construction is scheduled to be completed by early 2020. “At this stage we will produce concentrates that will be used directly by customers and users in consumer electronics, friction brake pads, steel industry and flame retardant, to name a few,” said president and CEO Benoît Gascon. “We also developed the processes for the second transformation to produce products mainly used in the battery industry. The second transformation is not part of the current feasibility study, and a detailed study will be conducted early 2019 to advance the industrial design of this second production facility and refine the economics of the project.”

Nickel remains an important component in lithium-ion batteries as the battery’s energy density corresponds with the nickel content. While some companies scramble for solutions to reduce the nickel content as it detracts from the safety of each individual cell, the future market is more likely to demand higher nickel grades than to eliminate the component. High-grade nickel will mean higher production costs, but as the metal is primarily used for production of stainless steel – one of the most world’s most important metal markets – nickel will likely remain a wise investment in the foreseeable future. Orford Mining’s West Raglan is an advanced stage Ni-Cu-PGE exploration project in the Cape Smith Belt, Nunavik. The belt hosts high grade polymetallic nickel deposits, including two operating mines: Nunavik Nickel and Glencore’s Raglan operation. In 2016, a major gold discovery was made in the same belt which resulted in Orford shifting focus from nickel mining to gold mining. “The gold mining project, known as Qiqavik, is a 40 km long trend with potential for more than one deposit,” said president and CEO David Christie. “To the best of our knowledge, it is the first gold discovery of significance in the Cape Smith belt, with high grade showings across the entire property length, which is about the size of the island of Montréal.”

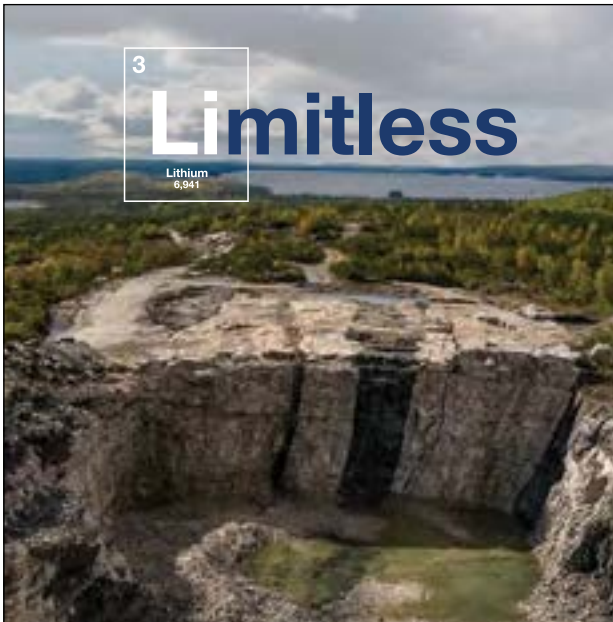
Vanadium: The key to sustainable energy

Prospects for vanadium, the strategic metal used primarily as a strengthening alloy to steel and titanium, boomed in 2018. Vanadium has four oxidation states and can conduct electricity with-

out generating heat. It represents approximately 80% of vanadium redox flow batteries (VRFB), of which the electrolyte within the flow battery is 100% reusable and lasts forever. Adriaan Bakker, president and CEO of VanadiumCorp, elaborated on the benefits of VRFBs: “VRFBs are a mature technology capable of storing an unlimited amount of energy. The batteries also have the unique ability to charge and discharge power at different rates, as vanadium is both the analyte and catholyte of the battery.”

VanadiumCorp has had a transformational year. After evaluating production models worldwide, the company’s team came to the conclusion that the techniques used in the vanadium industry for 50 years and in the steel industry for 100 years were now obsolete. Against this backdrop, VanadiumCorp decided to determine a new process technology, which led them to a partnership with Montréal-based Electrochem Technologies & Materials, a company that had

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f t i y

NEMASKA
LITHIUM



Guy Bourassa

President & CEO

NEMASKA LITHIUM

Nemaska Lithium intends to become a lithium hydroxide supplier and lithium carbonate supplier to the emerging lithium battery market

■

What have been the main milestones achieved by Nemaska Lithium in the last two years?

Commissioning the phase 1 plant in Shawinigan has begun and a small 500 mt/y demonstration electrical process plant was built and has been producing high purity lithium hydroxide since April 2017 on a continuous basis. Interestingly, it far exceeds the purity needed by battery manufacturers. We have achieved homogeneity, which is rare, and Nemaska Lithium is the first new producer in the last 25 years to perform such a process.

At what stage of development are the Shawinigan electrochemical plant and the Whabouchi mine?

Nemaska Lithium has two timelines: one for the Shawinigan electrochemical commercial plant and one for the Whabouchi mine. The mine is on a 15-17 month construction schedule, currently set to go into operation in October 2019. The electrochemical plant is planned to be ready by August 2020. In addition to the five off-take agreements for lithium salts, we will supply a significant quantity of spodumene concentrate on a take-or-pay basis. The supply period will commence after the construction of the Whabouchi mine and continue up to the full ramp-up of the electrochemical plant in Shawinigan.

How did Nemaska Lithium manage to raise over C\$1 billion in financing?

We updated our feasibility study in November 2017, and have to date raised C\$1.1 billion for Nemaska Lithium's proposed operations. To break down this package: we raised C\$454 million in equity from National Bank Financial, BMO Capital Markets and Cantor Fitzgerald Canada who purchased 280 million shares at C\$1 each in a bought deal, a placement of 80 million shares at C\$1 each with the Québec government, and SoftBank Group of Japan's investment of C\$93.8 million – their first ever resource investment. We also signed the first streaming agreement for a lithium project with Orion for US\$150 million, and secured a bond of US\$350 million alongside that. All in all, we were able to sign off-take agreements for 74% of Nemaska Lithium's nameplate capacity and granted a right-of first offer on 20% of production. Nemaska Lithium's largest single shareholder is Ressources Québec with 13%, and SoftBank is second with 9.9%.

What caused the dramatic share price fluctuation in the lithium space in 2018?

A report by Morgan Stanley from January 2018 speculated there would be an oversupply of lithium from low cost brine producers SQM and Albemarle in Chile, which caused share prices in the lithium market to suffer dramatically. However, SQM and Albemarle ran into issues with environmental permitting and conversion delays. The report also did not take two very important factors into consideration: that under the agreement Chile had with the government, 25% would be sold at a discounted price to attract manufactures; and the process they use currently evaporates large ponds and anything beyond capacity cannot be evaporated. The notion that it is possible to go from 50,000 mt/y to 500,000 mt/y in a few years is impossible.

How do you see the fundamentals of lithium evolving in the years to come?

Nemaska Lithium's clients have been requesting more material than what we agreed or were able to sell, so we know there is demand. Volkswagen (VW) have committed to make 30% of their sales electric by 2025, and this alone would require five mines like Whabouchi. There is a shift towards higher density batteries, so there is a big increase in demand for hydroxide. In 2016, less than 12,000 mt were needed for car batteries, but this figure will rise to 550,000 mt/y by 2025.

What will Nemaska Lithium's operations mean for the Cree communities near James Bay?

The Whabouchi mine will have a 33-year initial life, at 33,000 mt/y of carbonate equivalent. We estimate the sales will be C\$500 million per year, with C\$350 million per year of profit. We expect the project will create 300 jobs: 125 in Shawinigan and 175 at the mine. The mine is at driving distance from the Cree community of Nemaska and is the only project in James Bay in such close proximity to a community. Nemaska Lithium has a partnership with the Cree Community School Board and Cree Human Resource Development Corporation and has developed a permanent training commission for those finishing schooling and wanting to enter the industry. ■



Benoît Gascon

President & CEO
MASON GRAPHITE INC.

Mason Graphite is a Canadian graphite mining and processing company focused on the development of the Lac Guéret project located in north eastern Québec

What have been the main developments at the Lac Guéret project in recent years?

In December 2018, we filed an updated feasibility study and 43-101 compliant Technical Report. The Governmental Decree giving the go ahead to the Lac Guéret project was received in June 2018. In the updated feasibility study there is no change on the mineral resources, reserves and change in scope; the main changes are in the tailing maintenance facility, dry sector of the concentrator, environmental additional requirements from the authorities, costs escalation and inflation and crusher location. In the initial 2015 feasibility study, we had tailing management facility underwater with which dam failure can happen. Since the plant will be based in Baie-Comeau, we consulted with the community and decided to modify the way we were to manage the tailings. We are now going the dry stacking route for our tailings management, which needs the addition of a filtration plant. Mason Graphite has also implemented its Owners' Build construction strategy and will manage the construction of the project. Detailed engineering is well advanced: Mining sector is currently at 80%, the process itself is at 95%, and the construction and foundations are at 80-90%. The mills have been manufactured and will arrive in January 2019. The construction is scheduled to be completed by early 2020, and then commercial production should start towards the end of 2020.

Can you elaborate on the uses of the concentrate Mason Graphite will produce?

The current feasibility study is what we call the first transformation. At this stage, we will produce concentrates which will be used directly by customers and users in consumer electronics, friction brake pads, steel industry and flame retardant, to name a few.

We also developed the processes for the second transformation to produce products mainly used in the battery industry. The second transformation is not part of the current feasibility study; a detailed study will be conducted early 2019 to advance the industrial design of this second production facility and refine the economics of the project. The processing stage in the second transformation involves several steps, because of the wide range of specifications in the industry; each battery maker has its

own specifications. In November 2018, we announced an update on our work program. Today, after having worked with the National Research Council in Montreal, we meet all the performance requirements for batteries aimed at electric vehicles.

What role does graphite play in the Lithium battery industry?

Car makers are making a transition toward electric vehicles and numerous battery facilities are being announced. The current market is roughly less than 100 MWH, but is expected to increase to more than 3 million MWH in roughly 15 years in order to meet the demand. Today the supply of graphite for anodes is mainly from China, however, the exportation side is not stable and therefore battery makers outside of China want to reduce their reliance on this source.

Mason Graphite claims to have the highest-grade graphite content ore in the world. What are the characteristics of this deposit?

The carbon content in the ore is the highest, which makes it possible to process less ore in order to produce the same amount of concentrate. Mason Graphite has a 28% head grade for the first 25 years whereas most of the other projects are between 2 to 6%, which means they need to process much more rocks than us. This reduces production costs. During the first 25 years, we will use only 7% of our mineral resource.

What would you say to the Québec mining community and global investment community about Mason Graphite and its potential?

Mason Graphite has a strong, well-advanced project run by management with excellent experience in the graphite industry. We have more than 65 years' experience combined in the graphite mining industry, producing and selling graphite directly to end users. We also have a construction team with a wide level of experience. We are in a stable jurisdiction and have all of the necessary permits in place already. Due to the full social acceptance of the project by the local communities, the development is well supported and will provide economic prosperity for generations to come. The Lac Guéret project is also in a UNESCO biosphere reserve, which is unusual for a mining project. ■

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tested bulk samples from VanadiumCorp's Lac Doré project.

In August 2018, the jointly owned, patented VanadiumCorpElectrochem Processing Technology (VEPT) was announced, which allows users to process any material that contains vanadium and to recover vanadium, iron and titanium from magnetites of any shape or size. The process utilizes a sulfation technique similar to that used in the titanium pigment production industry, which digests rich vanadium feedstock into concentrated sulfuric acid in 100-cubic m vessels, Bakker explained.

VanadiumCorp can now focus on VEPT rather than production, transitioning from a mining company to a technology one. This

will also allow the company to become the discriminating customer of feedstock from around the world, according to Bakker. VanadiumCorp's goal is to lease out vanadium electrolytes that will provide people with free access to battery technology, significantly reducing the cost of energy storage. Discussing the potential of VanadiumCorp's new technology, he concluded: "With VEPT we have a disruptive technology that vastly supersedes any technology before it. We are confident VEPT will revolutionize the cost and sustainable nature of energy storage as well as vanadium, titanium and iron production worldwide."

Another company realizing success in the vanadium space in 2018 is BlackRock

Metals, whose project in Chibougamau neighbors VanadiumCorp's Lac Doré asset. Having raised a staggering US\$890 million to fund construction, which is due to commence in 2019, president and CEO Jean Rainville remains bullish on vanadium's market fundamentals: "There is a global shortage of vanadium mines and not many projects going into development. Even if other existing facilities expand production and the VTM project comes into production, there will still be a global shortage," he stated. BlackRock Metals is targeting first production in January 2021 and says that the project should create 500 jobs in the community of Chibougamau, according to Rainville.



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Exploiting the niches: Rare-earth elements and silicon

Québec is the second-largest niobium producer globally after Brazil, and with global demand appreciating at roughly 10% per annum, companies such as Commerce Resources and Saville Resources believe they are well positioned. Chris Grove, president of Commerce Resources, has observed a fundamental shift in the rare-earth elements (REE) market since 2016, as the global drive to find substitutes for REEs are used for magnets in electric motors proved unsuccessful, and more recently in October 2018, as China announced that imported REE feedstock has now surpassed domestic production. "The Chinese government has been very active in shutting down illegal producers of commodities and projects that pollute heavily inside China. This may provide opportunities for companies such as Commerce Resources," said Grove.

Commerce Resources' sister company, Saville Resources, has a 75% earn-in agreement on the Niobium Claim Group Property, and will be responsible for drilling the niobium-rich areas. Meanwhile, Commerce Resources continues to focus on developing its

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Adriaan Bakker

President & CEO
VANADIUMCORP

VanadiumCorp aims to become a leading supplier of battery materials and specialty metals for the emerging energy storage market

VanadiumCorp is transitioning from a junior mining company to a mining and technology company. Can you explain the circumstances that led to this recent evolution?

In 2007, we identified and acquired a strategic vanadiferous titanomagnetite “VTM” resource base with an extensive history of work, available infrastructure and great metallurgy. From 2013-2017, we evaluated conventional production methods for vanadium worldwide and realized that current pyrometallurgical methods were highly pollutive and inefficient. We further concluded that no current existing process technology could efficiently recover all three high-grade metals contained in our unique VTM resources (vanadium, titanium and iron). This led us to consult with Dr. Francois Cardarelli at Electrochem Technologies & Materials in Montreal, who is well known for the development of the only commercially demonstrated zero carbon technology for recovering high purity (electrolytic) iron from copperas.

How was the VanadiumCorp-Electrochem processing technology (VEPT) developed?

VanadiumCorp made a calculated risk to test novel approaches with Electrochem utilizing off the shelf equipment and affordable chemicals. This led to experimentation with a sulfation approach. Commercially, sulfation is used in a limited scope for digesting titanium rich ilmenite with concentrated sulfuric acid in 100 m3 vessels. Dr. Francois applied this approach successfully and proceeded with building a new flowsheet to extract all metals in high purity. On February 28th 2017, we announced the jointly owned, U.S. provisional patent application for VanadiumCorp-Electrochem Processing Technology (“VEPT”). With a custom built semi-pilot reactor and a commercial objective, we are now able to process virtually any material that contains vanadium and achieve direct recovery of vanadium, iron and titanium from a wide spectrum of magnetites.

What is the next step for VEPT?

On December 10th, 2018, VanadiumCorp and Electrochem signed a Patent Option Agreement for Ultra Power Systems to purchase an exclusive license for Australia. Ultra plans to utilize the Australian license of VEPT to expedite construction of the world’s first dedicated vanadium processing facility. Ultra’s core objective is to directly integrate low-cost battery grade vanadium electrolyte into vanadium redox batteries from virtually any source in a fraction of the time and the capital

requirements of current vanadium extraction processes. Their key incentive is that VEPT dramatically reduces emissions associated with vanadium extraction while also substantially offsetting the operating cost through the production of valuable by-products. Given the significant increase in use for vanadium in energy storage, VanadiumCorp is very optimistic about helping to build the first plant and additional licensing in other jurisdictions. VanadiumCorp plans to utilize this non-dilutive cash flow and risk mitigation to eventually build a VEPT plant in Canada and develop our 100% owned mining assets.

How do you see the fundamentals of vanadium moving forward?

The world now views vanadium as one of the most critical metals for sustainable energy storage, and our technology offers the unique method to reduce its cost and carbon footprint. Vanadium’s place in energy storage technologies is ensured as it has four oxidation states that allow it to conduct electricity without generating or dissipating heat and to change its molecular state at a nano level.

Can you elaborate on how VanadiumCorp plans to lease out vanadium electrolytes?

VanadiumCorp’s goal is to lease vanadium electrolyte (VE) produced, allowing for the lowest cost and most sustainable and reliable form of energy storage. Leasing a non-depreciating asset removes the upfront cost and amortizes the value of electrolyte over the uniquely long lifespan of vanadium batteries (25-50 years).

What are the characteristics and benefits of vanadium redox flow batteries (VRFBs)?

Vanadium represents approximately 80% of vanadium redox flow batteries (VRFB), and the electrolyte within the VRFB is 100% reusable and lasts forever. VRFBs are a mature technology capable of storing an unlimited amount of energy. VRFBs do not generate heat; they absorb intermittent renewable energy without issue; and they do not degrade and can deep cycle repeatedly without any degradation or thermal runaway. The batteries also have the unique ability to charge and discharge power at different rates as vanadium is both the analyte and catholyte of the battery, which means you have a full separation of power and energy. With VEPT, vanadium batteries would represent a truly sustainable energy storage technology many times cheaper than current energy sources. ■



Eric Desaulniers

President & CEO

NOUVEAU MONDE GRAPHITE

Nouveau Monde Graphite is pioneering the first ever all-electric open-pit mine

Nouveau Monde Graphite plans to build the first ever all-electric open pit mine. What is the timeline for its development?

A study done on the West Zone of the Saint-Michel-des-Saints deposit indicated the possibility for an all-electric open-pit mine, which can significantly reduce the project's carbon footprint. Medatech Engineering Services and ABB were responsible for developing technologies for the mine, which will be using a zero emissions all-electric fleet. We will be filing an environmental and social impact assessment (ESIA) this spring, thus triggering our commercial scale permitting process, and a full bankable feasibility report was released in December 2018. We hope to see the mill constructed in 2020 and be fully operational in 2022.

What are the risks involved in constructing and operating an all-electric mine?

Firstly, our project's initial CAPEX will be increased by roughly C\$31 million. However, we expect our OPEX per mt to be lower, as a result of advantageous rates for clean hydroelectricity. Also, the project being the first of its kind, we expect to encounter greater engineering costs. The mining fleet, which consists of electric mining trucks, electric front-end loaders, cable reel excavators and bulldozers, as well as electric service vehicles, needs to be adapted and designed properly; at this stage, a significant amount of procurement work remains to be achieved.

Once the initial costs will be absorbed, both medium and long-term economic benefits will be substantial. We want to encourage our province's mining industry to start considering electric fleets as it is more cost effective and environmentally friendly. Using electrical fleets is also beneficial for Nouveau Monde as the electrical equipment's batteries will require a significant amount of graphite for operational purposes.

Does Nouveau Monde have all the permits in place for the construction of the mine?

All our permits have not yet been obtained as we first decided to build a demonstration scale mine – which currently produces 1,000 mt/y of natural flake graphite and is fully permitted. In 2019, Nouveau Monde will be constructing a demonstration scale spherical graphite plant (the second phase of our current flake graphite pilot operation), which is also expected to produce 1,000 mt/y. Our commercial scale mine and plant will yield

100,000 mt/y for 25 years. The company is also developing a demonstration scale value-added processing facility.

Nouveau Monde will commence its commercial scale permitting process this spring, when we file our environmental and social impact assessment (ESIA). The duration of the permitting process is roughly 18 months; we plan on having all our commercial scale permits by 2020 to enable us to start building the commercial scale mine according to our schedule.

How has Nouveau Monde been able to fund the company's operations thus far?

Nouveau Monde has raised approximately C\$35 million in the capital markets, 30% of which came from institutional accounts such as Investissement Québec, the Caisse de Dépôt (CDPQ), SDEX and FTQ. We are also supported by other smaller institutions and local retail investors. We are in discussions with potential partners and investors from both the UK and the United States. Our current financing round should result in a C\$25 million capital influx and is expected to close by the end of H1 2019. We expect to go back to the markets in Q2 2020 for a C\$200 million raise to finance the construction of the commercial scale mine.

What employment opportunities will the all-electric mine present to the local communities?

We expect to employ approximately 160 people for our mining operations. Our mine is located only 90 minutes from Montreal, which will make it easier for us to attract talent in such a competitive environment. The company collaborates with educational institutions, which will also help our firm attract talent. Furthermore, we are establishing a First Nations schooling program, which will help us build enduring relationships with the communities that live close to where we operate.

What are Nouveau Monde's strategy and objectives moving forward?

We aim at securing additional offtake/joint marketing agreements in the likes of our major 25,000 mt/y offtake agreement with Traxys – announced in February.

Nouveau Monde is proud to be pioneering the first ever all-electric open-pit mine on the globe, and we hope many mining corporations will follow in our footsteps and further improve the ways we mine. ■

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Ashram REE project. The Niobium Claim group property is located within the central Labrador Trough, approximately 130 km south of Kuujuaq, Québec, and covers several prospective niobium-tantalum targets. Mike Hodge, president and CEO of Saville Resources, expanded on the eye-catching exploration results at the property: “Saville Resources currently has the highest grades of ground samples globally. For instance, our grades are at 16%, while others are at 0.6%,” he said.

GéoMéga Resources focuses on a lanthanide called neodymium, but has shifted attention from exploration to refining in recent years. Kiril Mugerman, president and CEO of GéoMéga, detailed the reasoning behind this shift in focus: “The biggest bottleneck in the mining industry is not actual mining or scarcity of resources, but rather lack of refining capacity,” he explained. GéoMéga has made significant progress in its refining processes, from running tests at 0.003 g of rare earth per liter in 2014, to over 100 g per liter in 2018



Image courtesy of Commerce Resources

When it comes to niche markets, Canadian Metals, as the only junior company in the silicon space, believes it can take advantage of the growing demand for silicon from the solar panel market, which is growing at 30% per year. Silicon does not exist in its pure state and must be extracted from quartz, one of the most abundant minerals

of the earth's crust. René Boisvert, president of Canadian Metals, wants to educate the market on the benefits of a material that is not well known: “Without silicon, many of the technologies that we use today would not exist and, to date, no other material has been found that can replace silicon in its application,” he revealed. ■

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Chris Grove

President

COMMERCE RESOURCES

Commerce Resources is an exploration and development company with a particular focus on deposits of rare earth elements and rare metals

■

How have developments in the market for rare earth elements affected Commerce Resources in the last two years?

In 2016, the drive to find substitutes for REE, for the manufacturing of permanent magnets for electric motors, was put to rest, as it was unsuccessful. As well, REE prices had reverted so much, that there was no reason to continue the R&D activities geared towards discovering REE substitutes.

The second fundamental shift in the REE market happened in October 2018. China announced that imported REE feedstock has now surpassed domestic production. The Chinese government has been very active in shutting down illegal producers of commodities and projects that pollute heavily.

Can you elaborate on Commerce Resources' relationship with Saville Resources and Ucore Rare Metals?

Québec is the second largest niobium producer globally with the Niobec mine, and global niobium demand continues to appreciate at ~10% per annum. Commerce Resources has the world class Ashram REE deposit, but we found that we did not have the financial wherewithal to also continue advancing what are spectacular niobium results, and so the company saw it as an attractive opportunity to partner with a close sister company, Saville Resources. Saville Resources will be responsible for drilling the niobium rich areas, while Commerce Resources continues to focus on the developments of our Ashram REE project.

As an REE processor, Ucore could use additional sources of REE feed stock and thus they can benefit from a relationship with Commerce Resources. As we are both still juniors, we are looking for a capital injection which will allow us to develop this association fully. ■



Kiril Mugerman

CEO

GÉOMÉGA RESOURCES

GéoMéga is developing refining capabilities for REE

■

GéoMéga focuses on a lanthanide called neodymium, but has shifted its attentions from exploration to refining. What prompted this change of strategy?

The biggest bottleneck in the mining industry is not actual mining or scarcity of resources, but rather lack of refining capacity. Companies began finding rare earth deposits all over the world but all would have to produce a concentrate that could be refined and processed in one country – China. This creates a monopoly.

We saw this as an opportunity and decided to shift focus from the development and construction of mines to the development of refining technology. GéoMéga has and continues to make significant progress regarding its refining processes.

How have the operations of GéoMéga been funded and are new sources of funding being explored?

GéoMéga has received several federal and provincial government grants as well as provincial level equity. Recently, the government granted us C\$350,000 and the re-

quired balance is sourced from equity and traditional public vehicles. We try to minimize cash expenditure with most expenditure going into research and as research advances, we source additional funding. Government subsidies cover costs of research (mainly salaries) and we input the balance for the equipment and up-scaling of materials as required. As additional capital is required, we intend to raise more, but we are also hoping to achieve cash flow soon.

What are the key priorities for GéoMéga going into 2019?

Firstly, to complete the development of the 200 liter unit for processing magnetic residues containing neodymium and dysprosium, and demonstrate its reliability and functionality which will allow us to increase our production capacity. This will include increasing the purity to 99.9% and higher and overall demonstrate that the process is competitive economically. Secondly, we want to secure contracts with end users and secure more feed supply from all over the world. ■



Jean-Sébastien Lavallée

President

CRITICAL ELEMENTS

Critical Elements is a junior mining company focused on lithium

What have been the key developments at Critical Elements over the past two years?

We have completed a feasibility study on the Rose lithium-tantalum project, which was released in September 2017, as well as an environmental impact study, completed and filed in December 2017. We have completed two pilot plants, one to produce lithium carbonate and another to produce lithium hydroxide, and both have been very successful with a recovery rate of 15% higher than Critical Elements' peers. We managed to obtain these results due to the impurity profile of the ore, which has a very low iron content and this leads to high recovery rates.

Can you provide details of the Rose project and its future potential?

The feasibility study indicated a 17-year mine life, and we are hoping to reach commercial production by 2021. The project has an after tax NPV (net present value) of C\$726 million dollars, based on a lithium carbonate price equivalent of US\$10,000. The project also offers high conversion

rates of spodumene to lithium carbonate or hydroxide, and will be mined depending on the requirements of the partner as some prefer one to the other, but more and more the new battery generation is leading towards lithium hydroxide.

When do you expect to obtain the mining permit for the project, and how will the construction be financed?

We are currently in the process and the goal is to have the permit in place by the end of Q2 2019 in order to begin construction. The project is going to be funded with the assistance of Canaccord Genuity as our Financial Advisors, who are helping Critical Elements source a strategic investor. This is a lengthy process as due diligence and data room reviews must be thorough, but we believe we are close.

Critical Elements' largest shareholder is JP Morgan in London, with a shareholding of roughly 9%. We raised C\$6.2 million dollars in May 2017, followed by an additional C\$7 million dollars in June 2018, so the company is financially healthy. ■



DO



ML

David Oliphant & Marc Laliberté

DO: Business Development
Heavy Industry

ML: Process Engineer
VEOLIA WATER TECHNOLOGIES

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Where does Veolia see the most opportunity for growth in the mining space?

Most of our mining activities in Canada are in Québec, British Columbia and Ontario. 60% of our projects are focused on gold mining, and we are also working with companies in base metals such as nickel and lithium. Gold mines have issues with mine water toxicity regulation that stipulates that mine water prior to discharge must be non-toxic. We have been able to implement viable solutions for them and have numerous repeat customers due to the success of our products.

In other parts of our business such as our evaporation and crystallization group, lithium has been an up and coming market, and we are in the process of working on lithium projects in Québec. It is a trend we see growing with the introduction of electric vehicles and batteries. This also has an impact on other commodities such as nickel and zinc that make up part of this market. Lithium mines are a good example of where a company like ours can assist; local communities want the water coming from the mine to remain clean to avoid polluting the

surrounding areas, and we will ensure that the water being dumped by the mine meets the legal requirements with regards to cleanliness by treating the water.

What innovations is Veolia working on?

The evaporation and crystallization technologies are a big part of our developments and we are currently looking at rare earth applications for these developments. Veolia prides itself on bringing solutions to the market place that have been proven as the mining sector wants to see proven solutions and do not want to be the guinea pig for testing solutions. Regarding research and development, we work with clients to develop pilot and demo facilities, and we also work closely with our research arm in Paris to develop solutions.

Canada is considered a cold weather climate, and a lot of the technology we bring to the market space is bio-based technology that needs to be proven in cold weather climates. We have facilities in Canada that allow us to test the solutions, and this gives our clients the confidence that products will perform. ■





Precious Metals

“When the sector was booming, there was a tremendous amount of exploration activity and development of greenfield properties. Currently, services related to those areas are in lower demand, and we are seeing an increased demand for 43-101 reports and resource assessments of past producers. Many closed mines are now becoming of interest again due to rebounding gold prices.”

- John Langton,
MRB & Associates

Gold Exploration in Québec

Time to reinvest and replenish

In 2014, Osisko sold its Canadian Malartic mine to Yamana Gold and Agnico Eagle for C\$4.3 billion after escaping a hostile takeover attempt by Goldcorp. It has since become the tenth largest producing gold mine in the world. Despite missing out on Canadian Malartic, Goldcorp reached commercial production at its US\$1.8-billion Éléonore mine in 2015. Since then, gold shipments from Québec have risen steadily, from just under 52 million g in 2016 to over 59 million g in 2018.

In 2019 alone, Hecla Mining has added another 400,000 oz of gold to its Casa Berardi mine in Western Québec. As of the end of 2017, the mine had produced approximately 1.9 million recovered gold oz since commencing production in 1988, including about 931,244 recovered oz since production recommenced in November 2006. In addition, Hecla recently announced an expansion of reserves and mine life at its 100%-owned Greens Creek mine in south-east Alaska. Greens Creek is one of the largest and lowest-cost primary silver mines in the world and the cash generating engine of the company. "In 2018, Hecla Mining invested heavily (US\$35 million) into our exploration, and it was a very good year as can be seen in our growth in reserves and

resources," said CEO Phil Baker. "Our Silver reserves increased with 8% and our gold reserves increased with approximately 20%. Due to the price environment that we are currently facing, we will spend less on our exploration activities in 2019, and only invest US\$25 million, with our focus being on Casa Berardi, San Sebastian, and our new assets in Nevada."

Yet a lack of new projects coming into production in the years since, combined with a number of gold mines across Canada nearing the end of their mine life, has heightened the need for new, large-scale discoveries. What is on the horizon?

Eldorado Gold and Osisko Mining advance progress at Québec's next gold mines

Québec's next gold mine belongs to Vancouver-based, multiasset, mid-tier Eldorado Gold, whose Lamaque mine in Val-d'Or is expected to reach commercial production in Q1 2019. As a minority shareholder and business partner of Integra Gold since 2015, Eldorado noticed the potential of the Lamaque project first-hand from an early stage, and finalized a friendly acquisition in July 2017. Adding a Canadian asset to a global portfolio that includes mines in Turkey and Greece and development-stage projects in Romania and Brazil, George Burns, president and CEO of Eldorado Gold, spoke of the potential he sees at Lamaque: "The initial life of mine is estimated at seven years, with an average annual gold production of 117,000 oz. We believe that is only the beginning and the potential of this district is enormous," he stated.

Eldorado's pre-feasibility 43-101 report released in March 2018 highlighted a current reserve of just under 900,000 oz, with 1.3 million oz of inferred resource potential to convert additional resources into reserves. Burns went on to detail the robust economics of the project, with an after-tax NPV-5% of US\$205 million, an after-tax IRR of 34%, and a payback period of 3.7 years. "We see it as the beginning of a long and valuable future for the surrounding community, the province and ourselves. Lamaque will be a source of employment and opportunity for years to come," concluded Burns. No other company has performed as much exploration in Québec in recent years as Osisko Mining. Since its restructuring in 2015, Osisko has managed to drill over 800,000 m in just over three years. Its flagship asset, the Windfall Lake property located in the Abitibi Greenstone Belt, James Bay, is a large, intrusive-related gold deposit with a 3.1 million-oz reserve defined from the Windfall deposit and its contiguous Lynx discovery. The newly discovered Triple 8 zone, located at a depth of 2 km at Windfall, and a secondary deposit of 510,000 oz at Osborne Bell, will be factored into a feasibility study due for completion by the end of 2019, according to Osisko's CEO John Burzynski.

Osisko expects to complete drilling in Q2/Q3 2019, and will apply for permitting with the feasibility study in hand by the end of the year. After permitting, construction at the site will take another 12 months, which will lead to commercial production by late 2021 or early 2022. Elaborating on his vision for the Windfall project, Burzynski said: "Osisko Mining intends to create the next intermediate Canadian mining com-



Phil Baker

CEO

HECLA MINING COMPANY

Hecla Mining Company is the oldest precious metals company in North America

Can you give a brief overview of Hecla Mining Company and some recent milestones that the company has achieved?

Hecla Mining has approximately 130 years of history. We publicly listed in 1913 and have continuously been listed on the New York Stock Exchange since 1964. We are known as a silver producer because we are the largest silver producer in the United States, and we are the third largest lead and zinc producer. Hecla Mining has also been a significant gold producer in the United States for the last 40 years, and at some stage we were the largest gold producer in Venezuela but sold these assets in 2008. In 2013, the company acquired Casa Berardi in Québec and has focused our attention on developing this project for the last five years.

Can you provide some insight into Hecla's flagship project in Alaska, the Greens Creek mine, and the company's outlook for 2019 and 2020?

The Greens Creek mine is currently Hecla Mining's most profitable asset. Greens Creek and Casa Berardi represent approximately 85% of the company's revenue and 100% of the free cash flow from our mines. We have had an ownership interest in the Greens Creek mine for over 30 years and have owned 100% of the mine for the last 10 years. Greens Creek is a mine that has been extraordinarily successful over its life, and we have just announced an expansion of the reserves as well as the mine life. Our expectation is that the mine should operate for another 15 to 20 years, and we expect to generate cash flow similar to what it has been in the past, which is billions of dollars.

Hecla Mining is increasingly intercepting better grades at the Greens Creek mine, and we expect this to continue moving forward. The mine plan has changed a bit, and we are now planning to mine the higher grades, particularly in 2020 through to 2023. The economics of the mine, which are spectacular, are continuously improving.

2018 was a very tough year for precious metals. How do you expect the precious metals market to evolve moving forward?

There have only been three occasions in the last 20 years where the gold-silver ratio has been as high as it is currently. The gold-silver ratio is the proportional relationship between the respective spot prices of gold and silver and describes how many ounces of silver can be bought with one ounce of gold. Gold has always been more expensive than silver, but where the ratio is typically 60:1, it is currently at approximately 85:1.

On all three occasions where we have seen this high ratio, the price of gold went up, and the price of silver went up more. I believe that we will again see a significant increase in both the gold and silver prices moving forward. The overall environment for precious metals looks promising for the prices to increase.

What are Hecla's exploration plans for the coming two years?

In 2018, Hecla mining invested heavily (US\$35 million) into our exploration, and it was a very good year as can be demonstrated by the growth in reserves and resources. Our silver reserves increased by 8% and our gold reserves increased by approximately 20%. As for the price environment that we are currently in, we expect to spend less on our exploration activities in 2019 and only invest US\$25 million, with our focus being on Casa Berardi, San Sebastian and our new assets in Nevada.

What are some of the key things the mining sector as a whole can do to remain attractive for investment?

I believe that the world is going to be shocked about the changes that are happening in mines. The way mines operate is changing completely with the autonomous revolution happening within the industry. Operations are being optimized and becoming safer and more productive. Optimizing operations will generate increased value for investors as companies will be able to produce more material, faster, safer and at a lower cost. The mining industry is going through a very thrilling time as these technological advances enter into the industry, and the industry is currently the place to be, both from an investor point of view as well as from a worker/career point of view. ■



John Burzynski

CEO
OSISKO MINING

Osisko is a mineral exploration company focused on the acquisition, exploration, and development of precious metals, with the main focus being on gold

Can you explain the circumstances surrounding the establishment of the second incarnation of Osisko Mining in 2015?

The first incarnation of Osisko Mining set out looking for low-grade bulk-tonnage gold deposits in Canada, something that had not been done before. We defined a new style of mineralization in Archean aged gold-only porphyries, and ultimately defined over 10 million oz of gold at Canadian Malartic. The mine was eventually sold to Yamana Gold and Agnico Eagle for C\$4.3 billion after a hostile takeover attempt by Goldcorp, and is now the 10th largest producing gold mine in the world.

On the back of this we formed Osisko Gold Royalties, but decided to keep most of our technical staff after the takeover, as we had spent years putting the team together and did not want to lose them. In summer 2015 we reformed Osisko Mining by taking one of the shell companies we had, with an C\$8 million-market cap and about C\$10 million cash, and did a succession of deals. We have built the company up and today Osisko Mining holds C\$150 million cash in equity positions and a market cap of around C\$700 million.

What have been the main milestones achieved by Osisko Mining in the past three years?

In just over three years Osisko has done approximately 800,000 meters of drilling and defined about 3.6 million oz at Windfall. We have made several significant discoveries, such as the Lynx discovery, which is a contiguous part of the Windfall deposit, and the new Triple 8 zone, located at 2 kilometres depth at Windfall.

We have completed approximately 50 deals in this time, acquiring six corporations and numerous properties to consolidate the land around Windfall and adjacent camps. Osisko's most recent acquisition, of Beaufield Resources in August 2018, secured land contiguous to some of the main blocks around Windfall.

Can you provide further details about the Windfall project?

Windfall, which includes the Lynx discovery, is a large intrusive-related gold deposit. It currently sits at 3.1 million oz, based on the first 700,000 meters of drilling. We also have a new discovery, Triple 8, which is not included in that figure. We have a secondary deposit, Osborne Bell, which has another 510,000 oz, located in close proximity to where we intend to put the mill. A feasibility study is planned to be completed by the end of 2019.

We will complete infill drilling in Q2/Q3 2019 and then finish the feasibility study. After this we apply for permitting, which we estimate at approximately 12 months in Québec, so this will take us into 2020/early 2021. The construction at the site will take another 12 months, and this will lead to production in late 2021/early 2022.

Osisko Mining intends to create the next intermediate Canadian mining company, and we believe Windfall has the potential to be Osisko's cornerstone asset.

Does Osisko intend to sell its other assets to focus on Windfall?

Osisko will very likely sell its additional assets. Once we realized the scale of Windfall we began to focus on this flagship asset. In the meantime, we have two deposits for sale with an aggregate of approximately 4 million oz in all resource categories, located near Canadian Malartic. At the Garrison project in Ontario, which is between 2 and 3 million oz and is located 15km from Kirkland Lake's Holt mill, we are putting out a new resource in 2019. We are working towards selling both of these deposits before the end of 2019.

Do you have a final message for the readers of *Global Business Reports*?

Osisko has been very successful in the past, and is probably one of the few companies that can say it has returned over C\$4 billion to its shareholders. We believe we are well on the way to being successful again, and Windfall has all the signs of a strong deposit that will become a major source of economic and employment opportunity for the province of Québec. ■

MAP OF CURRENT MINING PROJECTS

Source: Québec Government

◆ Apatite

1. Arnaud
2. Lac à Paul

Arnaud Mine
Arianne Phosphate

◆ Iron

3. BlackRock
4. Lac Doré Vanadium

BlackRock Metals
Vanadium Corp

◆ Graphite

5. Lac Guéret
6. Matawinie
7. Miller

Mason Graphite
Nouveau Monde Graphite
Canada Carbon

● Lithium

8. Authier
9. Rose
10. Whabouchi

Sayona Québec
Critical Elements
Nemaska Lithium

● Nickel

11. Dumont Nickel

Magneto
Investments Partnership

◆ Gold

12. Akasaba Ouest
13. Barry
14. Croinor Gold
15. Douay
16. Eau Claire
17. Fenelon
18. Granada
19. Home 5
20. Lac Windfall
21. Lamaque
22. O'Brien
23. Wasamac

Agnico Eagle
Bonterra Resources
Monarques Gold
Mines d'Or Maple
Eastmain Resources
Société Minière Wallbridge
Granada Gold Mine
Falco Resources
Osisko Mining
Eldorado Gold Corp.
Radisson Mining
Monarques Gold

◆ Rare Earth

24. Ashram
25. Kwyjibo

Commerce Resources
SOQUEM

● Zinc

26. Lac Scott

Yorbeau Resources



George Burns

President and CEO
ELDORADO GOLD

Eldorado is a Canadian mid-tier gold and base metals producer with operations in Europe, Canada and South America

Eldorado Gold is constructing Québec's next gold mine. What were the circumstances surrounding Eldorado's acquisition of Integra Gold and its Lamaque project in Val-d'Or?

The Lamaque project is an asset that we have been familiar with for many years now. Eldorado saw the potential of the project and invested in Integra Gold to become a minority shareholder and business partner in 2015. Getting in early and seeing the potential of the asset first-hand provided us with crucial insight when Integra advanced the project. Eldorado saw this as an opportunity to enter into a friendly acquisition, and the deal was finalized in July 2017.

Furthermore, there are a number of important factors that influenced the acquisition. Firstly, Québec is a fantastic jurisdiction. Secondly, the exploration potential at Lamaque is significant, and we believe we can grow the resources with further exploration. Another advantage is that we are a Canadian mining company that previously did not have an asset in Canada; the Lamaque project, in addition to its growth potential, therefore offers us corporate benefits, including tax.

What did the results of the 2018 pre-feasibility study for the Lamaque project show?

The pre-feasibility 43-101 report from March 2018 highlighted a current reserve of just under 900,000 oz, with 1.3 million oz of inferred resource potential to convert additional resources into reserves. The project has an after-tax NPV-5% of US\$205 million with an after-tax IRR of 34% and a payback period of 3.7 years. The development of the underground mine has enabled us to convert resources to reserves, and as this continues we will have the opportunity to perform infill drilling deeper into the deposit, which will increase the reserves further. We have already increased this maiden reserve through drilling; our recent reserve table published effective September 30, 2018, outlined an updated reserve at Lamaque of over 950,000 oz.

Is there existing infrastructure at the site, and what is the mill capacity?

The Lamaque site has a lot of initial infrastructure already in place. The site has a pre-existing mill, which we are refurbishing in preparation for commercial production. Our current forecasts are to process

1,600 mt per day, but the mill will be capable of processing at least 2,200 mt per day once fully commissioned. If we convert some exploration targets, we will have the option of increasing our feed to nameplate capacity.

We are also fortunate to be confirming laboratory metallurgical tests by taking bulk samples from underground and toll milling them nearby. Laboratory tests estimated gold recovery of around 95%, and this forecast has been slightly exceeded through our toll milling efforts.

How is Eldorado working towards more sustainable mining practices?

Today, it is expected that mining be done responsibly, so companies must prove they can develop, operate and close mines in a sustainable way. Eldorado focuses on decreasing its environmental impact by mitigating risks and increasing operational efficiency. Some of the technologies we are working on include: tagging and tracking underground people and equipment; remote operation of underground equipment from surface during shift change and blasting; and implementing ventilation on demand so that fans only run at the required electrical use when people or equipment are in certain parts of the mine. This helps us save energy and makes us a greener operation. We are also working with experts and regulatory authorities to evaluate dewatering or thickening our tailings and potentially depositing them in the historical Sigma pit. These technologies make tailings deposition safer and would minimize the project's footprint.

What will the development of the Lamaque project mean for the surrounding communities and the province of Québec?

As it currently stands the initial life of mine is estimated at seven years, with an average annual gold production of 117,000 oz. We believe that is only the beginning, and the potential of this district is enormous. We will continue to invest in exploration at the Lamaque project, as well as looking for other opportunities to expand business in this jurisdiction. We see it as the beginning of a long and valuable future for the surrounding community, the province and ourselves. Lamaque will be a source of employment and opportunity for years to come. ■

Frank Mariage & Mathieu Savard

FM: President

MS: President-Elect

XPLOR MINING CONGRESS



FM



MS

Xplor is an event organized by the Québec Mineral Exploration Association (QMEA)

Can you provide a brief overview of Xplor and what it aims to achieve?

FM: Xplor is an event organized by the Québec Mineral Exploration Association (QMEA), the first conference of which was held in 2014. The objective of the conference is to get the entire value chain of the mining exploration industry together, to showcase their companies and create networking opportunities. It is a commercial show for all mining related companies who hold their assets in Québec.

Since its conception in 2014, how has Xplor evolved?

FM: The Xplor conference began in very difficult market conditions, but the conference and its audience have grown year after year. We continue to add more value to the product and increase the quality of the seminars on show. There is a gala dinner where we bestow various awards for achievements within the exploration industry, such as mining entrepreneur of the year, discovery of the year, CSR achievement and environmental achievement. The goal is to attract investors to the Québec area and thus we want to expand our reach to investors outside of Québec as well.

MS: Montreal is a big city, but there are not many locations that can accommodate the size of the event. In 2019, the conference will be held at the Queen Elizabeth Hotel, which is a more convenient venue in terms of its size, structure and setting.

What opportunities does Xplor present to junior exploration companies?

FM: The mining exploration industry has seen some difficult times over the last few years, especially on the investment side. If you segregate mining exploration investment in terms of junior and major companies, you will see that the investment curve for junior companies changes significantly compared to a more stable curve for the major companies. What this tells us is that it is the junior companies that are doing the exploration work and finding the deposits. Xplor is a platform for the junior companies to attract investment for exploration, meet with potential investors face to face, and showcase the work they are doing.

Has the profile of the exhibitors at Xplor changed over the years?

MS: The exhibitors have certainly changed their approach over the years. The exploration and mining industry is a very innovative business, and if you want to be a leader in the market, you have to find ways to optimize your exploration operations. Service providers are continuously coming to the market with new technologies and Xplor is a good platform for them to showcase new ideas. Innovation at Xplor can be seen across the entire exploration spectrum, in areas such as Artificial intelligence, geophysics, and drilling equipment.

What are the main challenges the new minister for energy and natural resources should address?

MS: A major issue which needs to be addressed is permitting – the process needs to be more efficient. There have also been significant amendments to the environmental quality act that have not yet been implemented, and the responsibility now falls on the new government to implement these amendments. Another major issue to be addressed is access to territory for explorers. There is vast territory in Canada which has not been explored but obtaining access to this land is very difficult.

What makes Québec such a good mining destination?

MS: There are excellent incentives in terms of tax credits, and robust relationships with First Nation communities that have been developed over the years. For each dollar that is invested into exploration activities in Québec, you can receive a 30% to 40% tax credit. Québec is the only mining jurisdiction in the world that has such an incentive.

FM: The mining industry in Québec also has significant support from institutional funds, which is a great advantage. Although the sector has experienced a downturn, we still believe that the future of the industry looks bright and there are still significant opportunities, especially in a tier-one jurisdiction like Québec.

Do you have a final message for the readers of *Engineering & Mining Journal* and *Global Business Reports*?

FM: Xplor is very optimistic for the future. We will continue to increase our product every year and aim to build a significant investor network. QMEA's Xplor 2019 Conference will be held on October 23 and 24, 2019, at the Fairmont Queen Elizabeth Hotel in Montréal, and we look forward to and hosting our best event yet. ■

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pany, and we believe that Windfall has the potential to be Osisko's cornerstone asset. "As we drill out and advance exploration, the project will grow to world-class scale."

Golden opportunities: The juniors hunting for the next major deposit

Since winning discovery of the year at the 2016 Xplor conference for its flagship Cheechoo gold asset, located in James Bay a mere 7 km from Goldcorp's Éléonore mine, Sirios Resources has continued conducting intense exploration, reaching 50,000 m of drilling on the property. By the middle of 2019, Sirios will produce its first resource estimate, and capacity at the camp is being increased from 20 to 50 people, with improvements to road access allowing machinery to be transported to the site directly anytime of the year. Dominique Doucet, founder and CEO of Sirios, believes Cheechoo has the potential to host at least 3 million oz of gold, and is bullish on its chances of becoming a significant mine in the future: "I consider the probability of a mine being developed from the project to be greater than 75%, which is remarkably high considering that the probability of a grassroots project moving into production is far below 1%."

Another junior with ties to Goldcorp in James Bay is Eastmain Resources, which operates three different projects in northern Québec. Eastmain's flagship asset is the Eau Claire project on the Clearwater property, for which a preliminary economic assessment (PEA) was issued in May 2018. Eastmain's second asset, the Éléonore South project, is held in a joint venture agreement with Goldcorp and Azimut. Describing the six targets that the company is currently working on, Claude Lemasson, Eastmain's president and CEO, said: "We are trenching, stripping and drilling. The vision is to continue work on these targets, leading to further discoveries, and advance the project itself through pre-development," he said. Lemasson went on to praise the pro-development business approach of the Cree community in James Bay, and mentioned other benefits that mining brings to the district, including an extensive infrastructure network and the presence of HydroQuébec, which supplies energy across eastern Canada and the eastern seaboard of the United States.

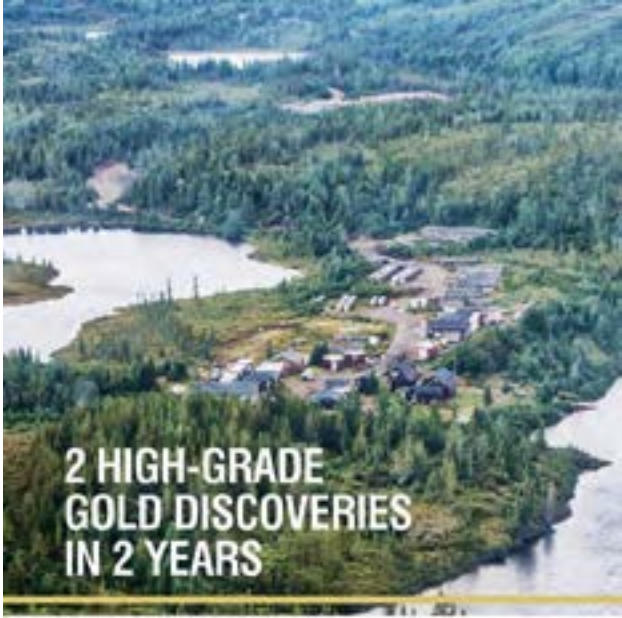
James Bay-focused gold explorer X-Terra Resources focuses on its Veronneau project that includes a camp-sized land package of 160 square km on the Colomb-Chaboullié greenstone belt located 200 km north of the town of Matagami. The company has already spent C\$1.4 million on the asset, and is in the process of a 100% acquisition. "The full acquisition of Veronneau will be in conjunction with the option agreement which X-Terra Resources recently signed on our new acquisition in New Brunswick," said president and CEO Michael Ferreira. "The company is currently working on securing C\$1 million in commitments for financing, which will close in March 2019."

One of the larger market cap juniors operating in Québec is Probe Metals, formed as a result of the sale of Probe Mines Limited to Goldcorp in March 2015 for over C\$500 million. In 2016, Probe

Metals acquired all of the outstanding common shares of Adventure Gold to create a well-funded Québec and Ontario-focused gold explorer and developer. The aim of the acquisition was to attain financing to rapidly advance the Val-d'Or East project, which Probe Metals has realized, with a shareholder base consisting of players such as Goldcorp, La Caisse de dépôt et placement du Québec, and SIDEX, among others. Marco Gagnon, executive VP of Probe Metals, detailed the mineralization found at Val-d'Or East: "We have already identified numerous gold zones, which are characterized by sulphide-bearing, quartz-tourmaline veins typically associated with mineralized diorite dykes," he explained.


Monarques Gold has been concentrating on consolidating the land package and property portfolio in the Abitibi mining camp near its flagship Wasamac deposit, acquiring up to 300 square km of land. This led the company to the acquisition of all of Richmond Mine's mining assets in the province of Québec in 2017. Monarques has gained a substantial market cap based on these transactions, and is now sitting on 300 square km of land, 3 million oz of 43-101 resource underground, and more than 150 employees. "Wasamac will be the game-changer for Monarques; it has a net present value of C\$525 million, with a current cash cost feasibility of US\$550 per oz to be produced," said president and CEO Jean-Marc Lacoste.

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2 HIGH-GRADE GOLD DISCOVERIES IN 2 YEARS

- Leading Gold Exploration in James Bay, Quebec
- 3 High-Grade Gold Assets
- Significant Exploration Planned in 2019; Expanding on Percival & Éléonore South Discoveries



EASTMAIN
TSX: ER OTCQX: EANRF
www.eastmain.com



Claude Lemasson

President & CEO
EASTMAIN RESOURCES

Eastmain is a junior exploration company, and operates three different projects in James Bay, northern Québec

Can you give a brief overview of your main project and your outlook for the upcoming months?

A new management team and board took the helm in April 2016 and began to implement a new strategy and vision. Eastmain's main project is called the Eau Claire project, a deposit on the Clearwater property. Most recently, we drilled extensively and issued a revised resource estimate on the project. Then, we prepared a PEA, which was issued in May 2018. We were then able to move forward with a two-fold approach in pre-development activities: the first steps being community engagement, environmental work, engineering studies, optimization and permitting. The second aspect was to complete more exploration drilling near the deposit on new targets on the Clearwater property. There are currently six key targets being worked on and some look very promising. Currently, we are trenching, stripping and drilling. The vision is to continue work on these targets, leading to further discoveries, and advance the project itself through pre-development. The project stands strongly on its own, but we are looking to add value. We may make a development decision in the next two to three years to raise money, enter into a joint venture, or facilitate an outright sale. However, our focus is to move the asset through the critical pre-development activities.

Can you expand on the other two projects that Eastmain operates?

We have a second asset, the Éléonore South Joint Venture with Goldcorp and Azimut. It is close to Goldcorp's Éléonore mine and has been in place for nine years. During that time, we have worked on it on-and-off. In October 2017, we made a discovery identifying a major gold system, and we continue to trench, drill and strip the area to expand it. The goal is to better understand what we have, to eventually get to a resource estimate, and I foresee this being in a year's time or so.

The third project is our Eastmain mine, which is a historic, shallow underground, gold-silver-copper deposit. Our approach for this property was two-fold: we completed a twin-hole campaign, reviewed data with independent consultants, and issued a maiden NI 43-101 resource estimate. We then explored on the mine trend roughly two to three kilometers from the deposit and discovered more mineraliza-

tion potential. This project is currently on hold, however, because of the current market conditions.

How have you been financing your projects and what is the current climate like?

Eastmain typically will complete a raise once or twice a year, depending on the market conditions. Our last raise was done in early July of 2018. We are currently well financed, as we have C\$6 million in the bank. We have seen a bit of an exodus of investors in the gold space because of the low gold price and the rise of cannabis and cryptocurrencies in the market. However, I believe that the cycle will turn again and that investors will return.

What makes the James Bay region unique?

James Bay is unique for three main reasons. The first is its indigenous population, the Cree of Québec. These people have developed an astute business sense and are pro-development. The second is the presence of the Hydro-Québec, and its projects, which has been developing massive dams in James Bay for over 60 years. These are powering most of eastern Canada but also the eastern seaboard of the US. The great thing about hydropower is that it is cheap and environmentally friendly. Thirdly, the James Bay region itself is sparsely populated: there are only nine Cree communities, spread over a massive territory. However, an extensive road network has been built, along with airports and airstrips, making the vast untapped resources in the area more accessible. Eastmain is the only advanced exploration player in the region on the ground with a project and resources – everything else is just early exploration.

Do you have a final message for the readers?

Canada, Québec, and James Bay in particular, are some of the best mining jurisdictions in the world because they are politically and financially stable, with strong environmental regulations and good relationships with its indigenous communities. Eastmain has a strong presence in James Bay and, with hard work and excellent partnerships in place, we are well placed to advance into the future and create significant for shareholders and stakeholders. ■

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Adding to the list of Val d'Or success stories is Golden Valley Mines, which has applied a unique and successful funding strategy for its projects. "Our business model is quite different as we do not spend our own money on exploration, with the joint venture partner having the obligation and responsibility to provide all of the funding," stated CEO and president Glenn J. Mullan. Golden Valley Mines has about 100 projects and focuses on gold, precious metals, energy minerals and base metals. The company has projects across Canada and abroad, but mostly focuses on Ontario and Québec, with project experience from the Nunavik region to Labrador, James Bay and the Abitibi region. In addition to joint ventures, funding also comes from Golden Valley Mines' own public subsidiaries. "We have formed three subsidiaries, Abitibi Royalties (RZZ), Val d'Or Mining Corporation (VZZ) and International Prospect Ventures (IZZ). The subsidiaries are all

publicly-listed, raise their own funding, and each one has their own business focus."

In December 2018, Amex Exploration released remarkable results from its drilling program at the Perron gold property near Rouyn-Noranda, with 269.2 g/t over 1.35 m on hole PE2018-17. The company's focus is the new Eastern Gold zone, located within the main property of Perron, and Amex is doing a 2,600 m priority 1 drilling campaign, which will be finished by the end of this year, after which the company will commence priority 2 and 3, another 1,500 m and 2,000 m respectively. "Despite Amex share price more than doubling since the exploration results in December, we believe we are still considerably undervalued, and we intend to get out message out to the market in 2019," said COO Pierre Carrier.

Not far away – just south of Rouyn-Noranda along the Cadillac-Larder Lake Break – sits junior exploration mining company Yorbeau Resources' main gold property:

the Rouyn property. Yorbeau has recently entered into an agreement with IAMGOLD, which has an operating mill with excess capacity approximately 40 km from the site. Yorbeau started drilling activities on the Rouyn project on in January 2019 and expects to have finished the first phase by May. "IAMGOLD's commitment is to do at least 20,000 m of drilling within the first two years, but the ongoing program is approximately 15,000 m, which means that within the first six months they would be very close to fulfilling their complete commitment," commented president G  rald Riverin. "IAMGOLD also agreed to spend C\$9 million over a period of four years." Continuing the theme of IAMGOLD partnerships, explorer TomaGold Corporation aims to develop high-grade gold properties with major mining companies. It currently has joint venture agreements with IAMGOLD for its Monster Lake project in northwestern Qu  bec, as well as with Goldcorp for its Sidace Lake property and with Goldcorp and New Gold for its Baird property in Ontario. TomaGold also has interest in six other properties in northern Qu  bec and has recently announced a strategic reorganization of the company's assets to increase shareholder value. "We plan to spin out its interests of the Monster Lake and Irene Lake exploration projects, in northern Qu  bec, into Monster Exploration, with the intent of listing the newly incorporated subsidiary on the TSX-V," said CEO David Grondin.

Brownfields: Capitalizing on old merits

The prospects of the next major discovery will always be seductive enough to guarantee a level of greenfield exploration, but resource companies and investors alike have become more cautious with their dollars and many favor brownfield projects as a low-risk option. With the mining sector still recovering from the latest dip in the cycle, and with cannabis as well as cryptocurrency diluting the investor wellspring, brownfield exploration will be critical in maintaining Qu  bec as a leading mining investment destination.

Explorer Cartier Resource's signature busi-

SIRIOS

**DISCOVERING GOLD
IN EASTERN CANADA
FOR MORE THAN 20 YEARS**

Contact: Dominique Doucet, CEO
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Dominique Doucet

Founder & CEO
SIRIOS RESOURCES

Sirios Resources' goal is to discover and develop world-class gold deposits in the James Bay area

Sirios Resources won the Xplor discovery of the year in 2016 for its Cheechoo property. What is the current status of the flagship gold asset and what progress has been made?

Since winning the award 'Discovery of the Year' in 2016 for our flagship Cheechoo gold project, located in James Bay, northern Québec, Sirios has continued conducting intense exploration, reaching 50,000 meters of drilling on the property. By the middle of 2019 we will be producing a first resource estimate. In early 2019 more in-depth metallurgical tests on larger gold-bearing rock material will be performed, which will provide precious information towards the preliminary economic assessment of the project. We are increasing investment on logistics and camp settlement capacity from the current temporary camp set-up that accommodates 20 people, to a permanent camp that will accommodate up to 50 people. Improvements on ground and road access will continue to allow machinery to be transported directly to site anytime of the year.

The Cheechoo property is located 7 km from the Éléonore gold mine. How is Sirios Resources' relationship with Goldcorp?

Sirios Resources signed an agreement with Goldcorp in 2016, and they are our largest shareholder, ensuring that the Cheechoo site and operating company have a good relationship with the Cree natives and the neighboring Éléonore mine.

Are the geological characteristics of the Cheechoo property similar to Goldcorp's Éléonore mine?

The gold mineralization at the Cheechoo deposit is hosted in a tonalite, a granite type of rock, whereas the nearby Éléonore mine is hosted in metasedimentary rocks. However, in both type of rocks we see the same type of alteration. Looking at grade and tonnage, Éléonore is an underground operation with grades varying between five and seven and a half g/t, whereas we expect that Cheechoo would be a low-grade with high tonnage. Within the low-grade ore envelope, we encounter frequent high-grade to very high grade (from five g/t to 800 g/t) veins.

The potential on the Cheechoo project is world-class which means potential for a gold deposit of at least 3 million ounces of gold and I consider the probability of a mine being developed from the project is now greater than 75%, which is remarkably high con-

sidering the probability of a grassroots project moving into production is far less than 1%.

Do you believe James Bay has the potential to become as prolific as the Abitibi Greenstone Belt?

Absolutely! James Bay is already one of the top-rated mining regions. Firstly, due to its rich geological diversity in which we can find gold and base metals, but also diamonds, lithium, vanadium, nickel, etc. In addition, because of early development in the 1970's by the Québec government for the major hydroelectric complexes that were constructed, the government signed the important James Bay and Northern Québec Agreement with the Cree and Inuit communities. It ensured that all rules and regulations with regard to natural resources were clearly defined and understood, allowing for a harmonious region to operate in.

Will Sirios go to the market to source additional funding?

Junior exploration companies first explore for money, and then explore for resources. Sirios' financial situation is healthy and working capital is strong – around C\$ 4 million. It is currently a bad period for raising capital with unfavorable market conditions, and Sirios' share price does not begin to reflect the great potential of the Cheechoo project. The short-term aim is to raise enough capital to optimize development, but not too much or too soon to over dilute the share structure.

What are Sirios' main objectives moving into 2019 and beyond?

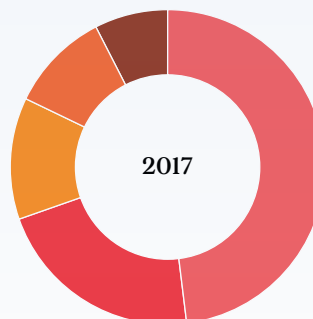
Sirios has established a talented team working on the strategic development and structure of the company, which will allow for additional growth and development with the capacity to create new job opportunities within the company. We have recruited youthful employees to ensure we take advantage of technological advances such as drones and newest geological technologies. We have strong support from various companies, but the door remains open for a significant shareholder to join our operation alongside Goldcorp. While the focus of the company will remain our flagship project, Cheechoo, we are considering all options to finance our other exploration projects, namely, our high-grade gold property, Aquilon. ■

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ness model is to acquire projects that have demonstrated their mineralized endowment at a time when drilling was conducted within a zero to 250 m range. Once they have acquired these projects, the company upgrades the database into a digital platform to better understand the characteristics of the mineralization in order to design an appropriate and modern exploration program. Cartier's straight-forward business model has been successful and attracted much attention from investors. "In December 2016, Agnico Eagle took a 19.9% interest in our shares for an investment of C\$4.5 million," said president and CEO Philippe Cloutier. "Subsequently, JP Morgan UK took a 9.9% interest in Cartier Resources. This gave us significant publicity, which attracted various other investment interests, and by the end of 2017, the company had C\$16 million." Concurrently, the company launched an aggressive diamond drilling program on its Chimo deposit that went from a 15,000 m drilling program to approximately 50,000 m from 120 holes. Out of the 23 individual mineralized zones to be explored at depth, Cartier launched a phase 2 program focusing on seven of the zones. Currently, three of the seven zones have emerged as significant and expectations are to bring a maiden resource calculation to market in the near future. Cloutier went on pointing out the advantages of rehabilitating an old mine, stating, "Chimo is a past producing

Distribution of development costs for mining by commodity

Source: Québec Gov. 2017



● Gold	48.2%
● Iron ore and titanium	21.6%
● Base metals	12.5%
● Diamond	10.3%
● Other substances	7.4%

mine, which means that we have all the past production statistics, metallurgical recoveries, rock mechanics and a very good handle on the structural and metallogenic controls of the ore. It is a project that benefits from a significant amount of data, which is generally the costly part of the project. The environmental aspect is also minimal to a great extent."

Another explorer that capitalizes on old asset merits is Radisson Mining that sits on a deposit that produced almost 600,000 oz at 15 g between 1932 and 1956. "Our main asset is the O'Brien gold project, which hosts near 600,000 oz of gold," said president and CEO Mario Bouchard. "From here, our next step is to go underground and we initially plan to go to 200 m at depth and take a first bulk sampling. Our resource is high-grade and stands at over 6.2 g/ton."

Since the 1930's, the Granada Gold Mine's Granada project has enjoyed a long but sporadic history of small-scale mining activities. The property, located in the Abitibi Greenstone Belt and along the prolific Cadillac trend, is easily accessible by road and surrounded by all the necessary infrastructure to support a possible large open-pit, bulk tonnage gold deposit. "To date, we have conducted bulk sampling, installed small-scale specialty milling activities and have completed more than 120,000 m of exploration drilling, leading to a recently-announced pit-constrained resource," commented president Eric Owens. "Our objective is to continue to advance this project toward a starter-pit production in the near term while also increasing the already substantial NI-43-101 resources for the longer term."

As market conditions have not favored the junior community since the end of the super cycle, a collaborative approach that brings together financial resources and expertise is becoming more commonplace. One such case is Québec Precious Metals Corporation

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A GREAT GOLD STORY BEGINS IN CAMEROON AND CENTRAL AFRICA

We offer our expertise to North American companies wishing to enter mining sectors in sub-Saharan African countries. These markets are often marginalized and neglected due to lack of reliable first hand information in spite of the excellent opportunities they present.

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David Grondin

CEO

TOMAGOLD CORPORATION

TomaGold is a Canadian mineral exploration company engaged in the acquisition, assessment, exploration and development of gold mineral properties

Can you give a brief overview of TomaGold and the evolution of the company and your joint ventures?

TomaGold was founded in January 2012 through an RTO from Carbon2Green when we acquired assets from Stellar Pacific. As soon as the company listed, we started drilling activities on the Monster Lake property and intersected the first high grade of 236 g/mt gold over six meters. The discovery of this type of grade put TomaGold on the radar of the mining community. We did some follow up drilling over the rest of the summer and then paused exploration activities while we put our efforts into compiling a database. We worked on the database in-house, but also acquired some external advice. In early 2013, we continued our drilling activities and continued to intersect high grades, which is what made the project what it is today.

We were approached by IAMGold, which was interested in a joint venture (JV) on the Monster Lake property. In November 2013, we entered into our first agreement with IAMGold. As our exploration continued, and with the JV agreement in place, the company aimed to secure as much of the ground around the Monster Lake property as we could. We were successful in acquiring more properties at a very low price. In 2014, IAMGold ran a drilling program and again achieved great results, after which the JV went into a normal evolution of drilling.

In 2015, the mining industry went through some very difficult times and we restructured the JV with IAMGold. The agreement was made that IAMGold would acquire 50% of the project through a cash payment. After 2015, the company's stock prices increased significantly but we strategically decided to still diversify our asset portfolio. The company went on to acquire the Obalski project and also entered into a JV with Goldcorp on the Sidace Lake project. We also started a gold trading division in South America, but ended up putting a halt to these efforts.

Can you tell us about the recent evaluation of your assets?

In the summer of 2018, TomaGold started to evaluate all our assets as we were looking at every option possible which could generate value for our shareholders. Subsequently, we have recently announced a strategic reorganisation of the company's assets, which will involve the spinning out of some assets into a new entity. We plan to spin out its interests of the Monster Lake and Irene Lake exploration projects in northern Québec into Monster Exploration, with the intent of listing the newly incorporated subsidiary on the TSX-V.

What has been the response from the market and shareholders?

The response from the market has been really great, but they are however still waiting to see if we can attain the financing. Concurrent with the spin-out, TomaGold intends to complete a financing of Monster Exploration for a total of C\$ 8 million. Subsequent to the completion of the spin-out, we also intend to pursue capital market opportunities to consolidate our share capital.

Will you continue your strategy of growing through joint ventures?

Although JV agreements are a great source of financing, TomaGold will not be looking for new JV partners in the near future. Our existing JVs with IAMGold and Goldcorp are very beneficial when approaching institutions, but the market tends to discount a company which enters into JVs. Our next step would be to complete the spin-out as well as the financing for the spin-out. We will then go to the market to pursue further opportunities. At this stage, our plans are progressing and the financing is doing well.

What is TomaGold's long-term vision?

With regards to Monster Lake, TomaGold will keep developing the area. We are developing our projects in such a way with the objective of being bought out. We are also in discussions with regards to consolidating and selling some of our assets moving forward. ■



Philippe Cloutier

CEO
CARTIER RESOURCES

Cartier Resources is a junior gold exploration company focused exclusively on the Abitibi Greenstone Belt

■ Would you elaborate on your business model of acquiring projects with already proven resources and tell us about your flagship project?

Cartier Resources is a junior gold exploration company focused exclusively on the Abitibi greenstone belt in Québec. The company's business model, although relatively simple, is anchored in a time-tested approach of adding value through exploration. We have built a portfolio of projects that have historical resource estimates. These estimates are not 43-101 compliant, simply because the drilling that followed discovery was completed prior to the 1997 Bre-X Minerals scandal. The 43-101 national instrument for the standards of disclosure for mineral project within Canada only came to light in 2001.

Cartier's signature business model was to acquire projects that had demonstrated their mineralized endowment at a time when drilling was conducted within a 0 m to 250 m range. The company's strategy, once having acquired these projects, was to upgrade the database into a digital platform to better understand the characteristics of the mineralization in order to design an appropriate and modern exploration program. We aim to explore the geometric extensions of the deposits.

■ Can you elaborate on Agnico Eagle's interest in Cartier?

In 2016, Agnico Eagle took an interest in Cartier Resources as they liked our robust and simple business model. They saw that we were on the verge of in-depth exploration on our deposits and, fortunately, they wanted to sponsor our drilling activities. In December 2016, Agnico Eagle took a 19.9% interest in our shares for an investment of C\$4.5 million. Subsequently, JP Morgan UK took a 9.9% interest in Cartier Resources. This gave us significant publicity, which attracted various other investment interests, and by the end of 2017, the company had C\$16 million.

Concurrently, we launched an aggressive diamond drilling program on our Chimo deposit. The Chimo project quickly went from a 15,000 m drilling program to now having approximately 50,000 m from 120 holes. All of the holes were drilled within a 500 m radius of the shaft, and we had two machines drilling around the shaft and two machines drilling deep beneath the historic main mine lands. In all, there were 23 individual min-

eralized zones to be explored at depth, and we were very successful in demonstrating that all of the mineralized zones extended depth. We realized that we would have to prioritize, and we thus launched a phase two program to focus on only seven of the 23 zones. Currently, three of the seven zones have actually emerged as significant. We hope to bring a maiden resource calculation to market in the near future.

■ Has the historical of the project been reflected in Cartier Resources' share prices?

The market does not appreciate the brown-field projects the way it should, and the value of the project has not been reflected in our share price. The value has not even been reflected within our peer group of investors; although we have exceeded expectations on the technical level, we have not been very focused on marketing. We have to educate the market on brownfield projects and explain the value proposition that these projects can hold.

Chimo is a past producing mine, which means that we have all the past production statistics, metallurgical recoveries, rock mechanics and a very good handle on the structural and metallogenic controls of the ore. It is a project that benefits from a significant amount of data, which is generally the costly part of the project. The environmental aspect is also minimal, and Chimo sits within a 50 km range from numerous mills that are all under capacity. There lies a substantial amount of value in rehabilitating an old mine as it has historical information, is proximal to infrastructure and has a qualifying workforce; there is no anticipated environmental or social pushback.

■ What can we expect from Cartier Resources moving forward?

The objective is always for Cartier Resources to be the preferred name within the industry. The end game in our business is to provide the industry with the gold ounces, as that is how we believe value is created. If you take as much risk out of the equation as you can, you are more likely to reward your investors. The Chimo project, for us, offers the lowest risk, highest reward situation. Having a multi-property brownfield project portfolio, sponsorship and money in the bank puts Cartier in an ideal position to benefit from a rising gold price moving forward. ■

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(QPM), which was formed in April 2018 as Canada Strategic Metals acquired Sphinx's three gold projects through an asset purchase and then teamed up with Matamec Explorations and the Sphinx management team to create the new gold exploration company. Goldcorp invested C\$4 million, and an initial exploration program commenced at the Sakami gold project in Q3 2018. Normand Champigny, CEO of QPM, outlined the reasoning behind this business model: "The industry requires consolidation, as there are currently too many junior companies with too little funding in the market. It is better to offer very high-quality projects that will attract investment and encourage development," he said.

The changing landscape of junior mining in Québec has also seen companies rebrand to convey a change in focus. In 2017, GFK Resources changed its name to Opus One Resources, as it highlighted a new geological approach and a sharpened focus on its three stand-out properties. Opus One has properties located above the 49th parallel and therefore qualifies for the Québec Plan Nord, which translates into better tax credits for both flow through investors and the company itself. Louis Morin, CEO and director of Opus One, detailed the upside potential of the assets: "Opus One's properties are well located, have favorable geology, are under explored and are in low-cost exploration areas. At this stage, only shallow drilling is required."

Toronto-based financial services firm Red Cloud Klondike Strike takes an innovative approach to sourcing investment for mining clients, and its spin-off company, Blue Thunder Mining, will follow suit by adopting innovative solutions to find mineral deposits at its Chibougamau-Chapais property in Québec. Blue Thunder will crowd source for innovative ideas by uploading geologic reports online, according to Chad Williams, Blue Thunder's chairman. Expanding on the theme of innovation, Williams continued: "We will be using artificial intelligence (AI) and drone-supported geophysics, as we have linked up with a big data/AI firm in Montréal that we will partner with going forward. This methodology should allow us to increase the odds of finding an economic mineral deposit."

The modernization of African gold mining

Many of the exploration companies based in Canada do not have assets in North America, but use the country as a base, taking advantage of Canadian mining expertise and proximity to money markets. Canadian Overseas Resources (COR) was created in May 2018 to promote the different activities of its partner companies operating in Cameroon, Gabon, Republic of the Congo, Central Africa Republic and the Democratic Republic of Congo (DRC). Through these African companies, COR holds dozens of artisanal mining sites and 11 research permits covering an area of 4,500 square km. COR's aim is to leverage Canadian mining knowledge to accelerate the research and prospecting that will help push its African activities into industrial gold mining by 2025. COR will launch the first stage of its drilling campaigns in Cameroon and Republic of the Congo in 2019.

Fabrice Ngondi Demtare, president of COR, is looking to draw on Canadian expertise, technology and investment to advance central-African projects that have previously relied on artisanal mining practices: "The land is gold-rich and has huge potential, but to realize it, operations must be modernized," he explained. "Sustainable development in the communities in which COR's partner companies operate is the ultimate goal."

Toronto-based Teranga Gold operates in three countries in West Africa - Senegal, Burkina Faso and Côte d'Ivoire. The company's vision is to create a multi-asset, mid-tier gold producer capable of producing 500,000 oz/y of gold. Its flagship in Senegal, the Sabodala mine, has been in production since 2009 and, in 2017, Teranga published an optimized mine plan which calls for over one million oz of production and C\$230,000 of free cash flow over five years, beginning in 2018. CEO Richard Young emphasized the importance of social programs to be successful in the region, and the company has been operating a CSR model based on the requirements of each local community. "At Sabodala they wanted agricultural food security, youth training, and stable economic opportunities," Young said. "Beyond that we have invested in clean water and the health and well-being of the community. Sabodala was one of the poorest regions in the country before the mine was built and famine was rife, but now it is one of the healthiest regions." ■



TOMA GOLD

ENDLESS POSSIBILITIES

Canadian Gold Explorer

- Monster Lake project (JV with IAMGOLD)
- Obalski gold project (100%-owned by Toma Gold)
- Sidace Lake project (JV with Goldcorp)
- Baird property (JV with Goldcorp and New Gold)

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Fabrice Ngondi Demtare

President

**CANADIAN OVERSEAS
RESOURCES INC.**

Canadian Overseas Resources
supports exploration projects
for precious metals in Africa

■ Can you introduce Canadian Overseas Resources (COR) and elaborate on its core objectives?

COR was created in May 2018 to promote the different activities of its partner companies operating in Cameroon, Gabon, Republic of Congo, Central Africa Republic and DRC. Through these African companies, COR holds dozens of mining sites and 11 research permits covering an area of 4,500 square km. We are mostly working with small artisanal gold mines that produce around 25 to 35 kg/Au per month. COR established itself in Canada with the aim of leveraging Canadian mining expertise and experience to accelerate the research and prospecting that will help push its African activities into industrial gold mining by 2025. In 2019, we will launch the first stage of drilling campaigns in Cameroon and the Republic of Congo.

How does COR intend to use its Canadian base to help modernize artisanal gold mining practices in Africa?

Artisanal mining has been performed for many years in Africa using old equipment. The land is gold-rich and has huge potential, but to realize this potential, operations must be modernized. In addition to the practical and operational benefits of modern mining techniques, establishing COR in close proximity to the international mining and money markets in Canada creates a greater platform for growth. We are in Canada to gain expertise because it has a deep rooted mining culture and the latest technologies are developed here. Sustainable development in the communities in which COR's partner companies operate is the ultimate goal.

Can you explain the relationship COR has with its partner companies across Africa?

We began in Cameroon in 2015 through IMC Cameroon and Southland Mining Cameroon. Since then, COR has partnered with Etoile Cameroon, IMG Gabon, IMC Congo, Southland Minerals Congo, Goldland Congo Services and Southland Gold Trading (Dubai, UAE) to create a strong network across four countries. We created COR to establish a Canadian base from which COR's partner companies could develop their businesses. COR will dictate 100% of the capital of its partner companies and their business strategy moving forward.

Can you provide details about the Mama Wassande property in Cameroon?

The Mama Wassande property held between COR and Southland is located in Adamaoua Region, Cameroon. It covers 350 square km and currently has intense artisanal mining activities; we produce around 14kg/Au monthly. Our major challenge is to specify the source of gold mined in the river coming from the buoyant veins zone. In July 2018 grades of 164 g per mt were discovered, which illustrates the quality of the resource. A drilling campaign will be launched in February 2019 and we are excited to see the results.

Do you think it is important to educate the North American market about the potential of mining jurisdictions in sub-Saharan Africa?

There is a general mistrust of the African economy often due to a lack of understanding from the North American market. The Chinese are much more integrated with Africa in that respect, as they understand that Africa is the richest continent in terms of mineralization and untapped potential for large, high-grade deposits.

Our duty is to demonstrate that Africa is not only corruption or war, but also a continent on an upward trajectory that has a lot to offer the global mining community. COR can show people investment opportunities that they previously would not have been aware of. Sometimes companies have cultural misunderstandings and this is another area where COR can help; there is a way to develop businesses while following different cultural rules.

Do you have a final message regarding the potential of Central Africa for our readership?

My message to the global mining community is to trust Africa. I think people know that certain countries in Africa have significant potential, but Central Africa has to prove it too. If investors are interested in the region, they should speak to COR as we have the local knowledge and a pipeline of projects with great upside. Africa has a lot to offer, and COR has the objective to present the continent positively. We are open for business and there is space for everyone. ■



Patrick Godin

CEO
STORNOWAY DIAMOND CORPORATION

Stornoway owns 100% of its world-class diamond asset, the Renard mine

■

Can you give a brief overview of Stornoway and the evolution of the company?

After the diamond discoveries in the Northwest Territories, there was a claim rush in Québec. In 1997, Ashton Mining and SOQUEM entered a joint venture partnership to start an initial regional exploration on the Renard property, with their first kimberlite discovery occurring in 2001. From 2001 to 2010, exploration work continued on the Renard property, and resources were developed to a pre-feasibility level. In 2006, Stornoway acquired Ashton Mining's 50% interest in the Renard project and subsequently bought SOQUEM's shares in the project in 2011. Today, Stornoway is a leading Canadian diamond mining company that has 100% ownership of its world-class asset, the Renard mine.

We started a feasibility study on the Renard project in 2011 and filed an ESIA in the same year. By the end of 2012, we were fully permitted and went on to complete a project financing of C\$946 million in July 2014. The company immediately started mine construction and preparing for commercial production. We started with open pit mining followed by a transition to underground mining in 2018, completing that transition in Q4 of 2018. We are currently processing an average of 7,000 mt per day in our plant: 6,000 mt from open pit mining and 1,000 mt from underground mining.

Stornoway currently employs approximately 600 people, in addition to nearly 100 sub-contractors. We have a strong focus on safety, and we provide the proper training for all employees on site.

Does Stornoway have any further exploration targets in 2019?

As we are just coming out of very difficult market conditions, we are trying to focus our attention on drilling activities to create more value for our shareholders. We are drilling both on surface and underground. The majority of our exploration investment in 2019 will be on the Renard property.

Can you elaborate on Stornoway's mining method and where underground mining is being implemented?

The Renard mine is a combined open pit and underground mining operation with AMEC Americas contracted to design the underground mine and processing plant and G Mining Services contracted for the design of the open pit mine. Underground mining is being implemented in Renard 2, 3, 4 and 9 pipes, which contribute approximately 57.5%, 3%, 25.5% and 14% of the underground material, respectively. Diamond production during the initial two years will mostly be derived from the Renard 2 and 3 open pits with the addition of underground mining operations.

In January 2013, Stornoway announced findings of a feasibility optimization study that incorporated certain design and cost optimization exercises, such as the deferral of shaft access for the underground mine and a modified underground mining sequence. The optimization study suggested that a ramp developed up to a depth of 510 m would be sufficient to access the underground mine to extract all mineral reserves and the inferred mineral resources at a planned production rate of 6,000 mt of ore per day. Access to a depth of 810 m is through a six meter-diameter shaft that allows mining of the Renard 2, 4 and 9 pipes.

During underground mining, two types of stoping methods are being used. The blasthole method is used for the Renard 3 and 9 pipes, and to provide additional ore, this technique is also selectively used on the Renard 2 pipe. Since the Renard 9 pipe is encroached under a body of water, it will not be mined to its surface, but instead requires a 100 m crown pillar. An assisted block caving method is used for the larger pipes of Renard 2 and 4 that are suitable for caving. Drill drifts or levels are installed at vertical intervals of 100 m and ore is brought to the surface by 60 mt trucks.

What is Stornoway's strategy and objectives moving forward?

Although Stornoway will focus its attention on the Renard Mine, we hope to see progress and growth in all our assets. Our aim is to create as much value as possible for our shareholders. Our dedicated team is the key to our success, and we aim to advance our operations further with the excellent expertise of numerous suppliers working with us. Our objective for 2019 is to improve productivity to increase our processing rate at Renard. ■





Iron Ore and Base Metals

“Major banks and experts that forecast iron ore prices have been saying the same thing for many years: that there will be a dip in the prices of iron ore a year or two in the future. This has not happened so far. China has now recognized the environment and cost advantage of using the highest quality ore.”

- Dean Journeaux,
Co-founder,
New Millennium Iron

Iron Ore and Base Metals

Premium-quality iron ore in high demand

The Labrador Trough, an extensive belt of mineralization running through the provinces of Québec and Newfoundland & Labrador, has been producing iron ore since the 1930s. Roughly 500 km south, the port of Sept-Îles – Canada's largest iron ore export port – ships product for steel production around the world, of which China accounted for 49.2% in 2017.

Although the price of regular-grade iron ore has slumped since 2015, higher-grade iron ore concentrate of 65% Fe and above, with a lower content of alumina, is attracting a price premium as China looks to reduce its carbon emissions. Tayfun Eldem, president and CEO of Alderon Iron Ore, explained: "China continues to drive the iron ore market, but in recent years, interest has shifted towards product quality, rather than being solely volume-based, due to the country's strict policies to curb air pollution."

Alderon's advanced-stage, premium-quality Kami Iron Ore project is fully permitted to commence construction. The project will contribute approximately C\$7.6 billion to workers and businesses across Canada during its lifecycle, according to Eldem. The Québec government's acquisition of Cliffs Natural Resources has opened up its ore-handling facilities into a multi-user arrangement, which has had implications in terms of access and capital rationalization. "Projects that mine bulk commodities are first and foremost infrastructure projects, and having access to good rail and port infrastructure is critical," stated Eldem.

While the general market may not yet be fully aware of the different markets for the varying grades of iron ore, the mining investment community has taken note, exemplified by Altius Minerals becoming a shareholder in Champion Iron and investing C\$10 million in a convertible debenture to help restart the Bloom Lake mine. Chad



Wells, Altius Minerals' VP, explained the investment: "Champion Iron is going to play a significant role in the bifurcation story of iron ore, as they are producing a significantly high grade with low impurities," he responded.

Tata Steel Minerals Canada (TSMC) is the Montréal-based mining arm of the Tata Steel Group, one of the world's largest steel producers with over 77,000 employees globally. TSMC is developing iron ore deposits in Québec and Newfoundland & Labrador, and started with a small, direct shipping ore (DSO) operation from a section of its deposit that could be extracted directly from the ground, crushed and screened. The sinter fines and pellet fines are then shipped to customers. PK Ghose, TSMC's CEO and MD, commented on how their product has been widely accepted across both Europe and China: "Over the last three years, we have extracted 6 to 7 million tons, with the majority shipped to China and later Tata Steel's European steel making facilities."

In 2017, TSMC signed a memorandum of understanding with Société du Plan Nord and Québec Iron Ore for the development and enhancement of the infrastructure facilities at Pointe-Noire in Sept-Îles via the limited partnership Société Ferroviaire et Portuaire de Pointe-Noire (SFPPN). The collaboration will facilitate the development of the Pointe Noire infrastructure to match the anticipated ore delivery needs of its partners. One of TSMC's partners is New Millenium Iron (NML), which completed a pre-feasibility study in 2016 for



Image courtesy of Alderon Iron Ore Corp.

its Taconite project, NuTac. Dean Journeaux, director of NML, provided details of the grade at Taconite: “Its concentrate grade is 67% Fe, with very low alumina and other deleterious elements, which commands a premium in the market,” he said.

Juniors restructure to focus on base metal exploration

After selling its gold assets in northern Québec to the newly formed Québec Precious Metals Corporation (QPM), Sphinx Resources chose to focus on zinc in southwestern Québec. Its Calumet-Sud discovery in the Pontiac regional county municipality, in collaboration with SOQUEM, has extensive zinc mineralization on the surface of the ground and rock, according to director Normand Champigny.

Normand also divulged Sphinx’ relationship with Osisko to explore for zinc in the Grenville geological province, characterized by the presence of zinc-rich dolomitic marble. Champigny compared the geology in the region to that of Australia, where half the world’s zinc has been produced, and explained its benefits: “One advantage of this rock is that it is basic, meaning that there is no acid mine-drainage. Additionally, it is soft and can be used to sell non-zinc material as a fertilizer.”

Another base metal-focused company working in the Grenville geological province is Kintavar, established in March 2017 as part of

a transaction between GéoMega Resources and a private company, and financed to the tune of C\$10 million. Kintavar’s Mitchi property is a stratiform copper-type deposit (SSC), with mineralization from-surface, which means it can be mined as an open pit and is thus more cost-effective. Kiril Mugerman, Kintavar’s CEO, revealed that results from trenching activities in 2017 did not fit into a traditional skarn model, and shared similar characteristics to sedimentary deposits from the DRC. Despite a decrease in the copper price in 2018 due in part to the tariff war between the United States and China, Mugerman sees strong fundamentals for copper moving forward: “It is now a good time for investors to look at the copper market. The macro picture suggests that the price will increase significantly. Major copper discoveries are rare, but demand is increasing,” he advised.

Galway Metals is one of two spin-off companies from the sale of Galway Resources for US\$340 million in December 2012. In addition to its gold-focused Clarence property, its Estrades property in the northern Abitibi region of western Québec has five metals – gold, silver, zinc, copper and lead. The overall metal content at Estrades has risen by 32%, with tons increasing by 47%, according to Louis Morin, CEO of Galway Metals, who elaborated on the features of the resource: “Crossing the Estrades property are two under-explored rhyolite units in which volcanogenic massive sulfide ore deposits are found, usually in clusters,” he said. ■



PK Ghose

CEO and Managing Director
**TATA STEEL MINERALS
CANADA (TSMC)**

Tata Steel Minerals Canada is the Montréal-based mining arm of the Tata Steel Group, one of the world's largest steel producers with over 77,000 employees globally

Can you introduce Tata Steel Minerals Canada and explain how it fits within the Tata Steel Group?

TSMC is developing iron ore deposits in Québec and Newfoundland & Labrador, and started with a small, direct shipping ore (DSO) operation with a section of our deposit that could be extracted directly from the ground, crushed, screened and the sinter fines then shipped to customers.

How has TSMC's direct shipping ore (DSO) operation developed in recent years?

Over the last three years, we have extracted 6 to 7 million mt, with the majority shipped to China and later Tata Steel's European steel making facilities. Over 2.5 million mt being shipped to Europe over the last two years. The product has been well accepted in Europe, with customers with stringent requirements regarding the standard and quality of product, as well as Chinese and Japanese customers

What are the latest developments regarding infrastructure improvements at shipping port of Sept-Îles?

In 2017, TSMC signed a Memorandum of Understanding (MoU) with Société du Plan Nord and Québec Iron Ore for the development and enhancement of the infrastructure facilities at Pointe-Noire in Sept-Îles via the limited partnership Société Ferroviaire et Portuaire de Pointe Noire (SFPPN). This collaboration will facilitate the development of the Pointe Noire infrastructure to match the anticipated ore delivery needs of the partners ensuring an efficient cost structure enabling the Labrador Trough to become competitive. A public-private partnership was established, based on the principals of equitable access to the port of Sept-Îles to ensure the development is as cost effective as possible.

What relationship does TSMC have with the Indigenous communities' present in the regions it operates?

As TSMC straddles both the Québec and Labrador & Newfoundland provinces, social agreements between the company and five different indigenous groups in these regions were established. The agreements are well structured and include aspects of revenue sharing, payments to support specific activities including sport, education and skills development, and ensuring the maintenance of local culture. We contribute towards employment in these communities and support local business, with over 100 jobs created in these regions to date. As our operations grow, so will the number of jobs we will create.

Who are the main stakeholders involved in TSMC?

Resources Québec invested C\$175 million in TSMC in 2016 in form of equity and loan and holds an 18% stake in the business, with Tata Steel holding 77% and 4% held by New Millenium Iron. The government of Québec has been supportive towards the entire mining industry in order to sustain and develop the economy in the province and the Northern territories, and this has been a huge help in the development of our business.

How has increased Chinese demand for high-grade iron ore affected TSMC?

Over the past 12 months, the premiums for 62% grade and 65% plus grade iron ore have become very attractive, and we believe this demand will continue to grow into the future. The reason for the fluctuation of the price of iron ore is a direct result of an increased demand for higher grade concentrates to reduce pollution in major regions like China.

What are the key objectives for TSMC over the next 24 months?

TSMC aims to ensure it meets a 4.5 million mt/y capacity of concentrate. Construction has recently been completed, and we are expecting to commission the concentrate in early 2019, and by 2020 we expect to be at full capacity. We want to increase volumes further. Canada has ore reserves that are some of the best quality in the world. ■



Tayfun Eldem

President & CEO
ALDERON IRON ORE CORP.

Alderon is looking to take its advanced-stage, premium-quality Kami iron ore project into construction

What have been the main developments at Alderon Iron Ore in recent years?

Alderon's advanced-stage, premium-quality Kami iron ore project is located next to the mining towns of Labrador City, Wabush and Fermont, near the provincial border between Québec and Newfoundland and Labrador. The Kami project aims to produce 65.2% Fe concentrate that attracts a significant price premium compared to the 62% Fe benchmark iron ore fines. The project has been fully permitted to commence construction and start commercial operations, subject to financing. We have advanced our engineering on the project with over 50% now complete. We were released from the environmental assessment (EA) processes for the Kami iron ore project in Q1 2014, which is when the iron ore markets started softening and it became difficult to raise the capital needed to build the mine. Since then, there has been a significant shift in the market, in particular, towards the high-grade products which are attracting a premium. This changes the economics of the high-grade projects including that of Kami's and has opened a window for Alderon to finance the Kami project and take it into construction.

How is Alderon preparing for the construction of the Kami Project?

The Kami product will originate in western Labrador and will be shipped through a newly commissioned multi-user, deep-water berth near the Port of Sept-Îles in Québec. There have also been some other developments in the region, in particular as a result of the Québec government's acquisition of Cliffs Natural Resources' ore handling facilities. They have now opened up these facilities into a multi-user arrangement, which has had implications in terms of access and capital rationalization.

Projects that mine bulk commodities are first and foremost infrastructure projects, and having access to good rail and port infrastructure is critical. In the Labrador Trough – a mining friendly jurisdiction, the infrastructure and skilled workforce already exist. Secured access to low-cost utilities and transport unlocks Kami's potential of year-round access to global markets, making it a sound investment opportunity.

To what extent does the Chinese steel industry influence the iron ore market?

China continues to drive the iron ore market, but in recent years, their influence has shifted towards product quality from being solely volume-based, due to the country's strict policies to curb air pollution. China's baseloads typically come from Australia, which is at a lower grade of between 58% Fe and 62% Fe and also has a high content of alumina. Historically, China used to offset this high content of alumina with domestic iron ore production. However, domestic production in China has been reduced by approximately 150 million mt/y. In the absence of this domestic iron ore production, China needs to target some other sources to aid in increasing iron content and keeping alumina levels low. Canadian iron ores come in at a higher Fe grade with ultra-low alumina and phosphorus levels.

Can you expand on Alderon's partnership with the HBIS group?

Alderon's strategic partnership with China's second largest steelmaker HBIS Group dates back to 2013. HBIS owns 25% of the Kami project and they also have a commitment to purchase 60% of production.

What are the production objectives of the Kami project, and how significant will the economic impact be?

Alderon has always had the goal to produce approximately 8 million mt/y of iron ore concentrate. The company has also conducted an independent economic impact assessment, which looked at the impact of the project in terms of aspects such as GDP, employment and treasury contribution. The report clearly showed that the economic benefits are significant to the people, communities and governments of Canada and the provinces of Québec, and Newfoundland and Labrador.

Over the project's lifecycle, there will be approximately C\$7.6 billion of income that will go to workers and businesses across Canada, of which approximately C\$3.3 billion will go to Québec and C\$2.2 billion to Newfoundland and Labrador. There will be approximately C\$21.3 billion in national GDP contribution over the life of the Kami project. The project will also contribute to over 100,000-person years of direct, indirect, and induced employment across Canada. ■





Innovative Solutions

“We are moving into a time when technology will revolutionize the mining industry. Both manual as well as intellectual labor will be replaced by machines. The industry has no choice other than to adapt and must prepare for the looming technological changes.”

- Réjean Girard,
President,
IOS Services Géoscientifiques

Innovative Solutions

You are constantly thinking about your business.
So are we.

No longer an afterthought,
but a necessity

Volatile commodity prices and a seven-year downturn forced the mining industry to think outside the box to maintain competitive cost structures, optimize processes and enhance security. Traditional methods become obsolete when they no longer guarantee profit, and the necessity to embrace change has fostered a robust, innovative ecosystem of small and medium-sized enterprises, multinationals and research organizations creating and developing technologies that are already transforming global mining operations. Québec is at the forefront of this charge, from its world-renowned artificial intelligence (AI)-research hub in Montréal to a mature service sector in Val-d'Or that constantly adapts to the evolving market. Capital development fund Fonds de Solidarité (FTQ) identified labor as one of the big risks facing the mining sector in 2018. "Labor and retention is a risk this year and will be a big challenge in the future. We need to make sure that our mines are at the top of the technology. We also need more collaboration between businesses, share experiences and network," reflected VP Dany Pelletier. Spearheading the development of mining innovation in Québec is COREM, the largest organization in Canada solely devoted to mineral processing R&D, with six fields of expertise – comminution, physical separation, flotation, extractive metallurgy/ hydro-metallurgy, pelletizing/thermal processes and mineralogy. Based in Québec City, COREM's facilities include 10,000 square m of offices, labs and pilot plants. A C\$16-million project to build a new hydrometallurgy platform, install new equipment and modernize COREM's buildings is due to be completed by the summer of 2019.

When asked about the pertinent challenges that the industry must address, COREM's president and CEO Francis Fournier highlighted energy consumption, water use, tailings and environmental issues, and suggested

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That's why we pair you with experts
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Dany Pelletier & Serge Cotes

DP: Vice President - Structuring Capital
SC: Energy, Environment and Mining
Senior Investment Advisor
FONDS DE SOLIDARITÉ FTQ.



DP



SC

The Fonds de solidarité FTQ is a Québec development capital organization whose mission is to invest in local businesses to further the economic development of the regions of Québec

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Can you please provide a brief overview of Fonds de solidarité FTQ?

The Fonds de solidarité FTQ is a development capital fund that calls upon the solidarity and savings of the Québécois to help fulfill its mission to contribute to Québec's economic growth by creating, maintaining or protecting jobs through investments in small and medium-sized businesses in all spheres of activity.

Thirty-five years ago, the biggest central labor body in Québec – FTQ – presented the idea of the fund to counter high interest rates and loss of jobs. This was an amazing innovation from a union with a target sum of C\$100 million – today, the fund has more than C\$14.8 billion in assets.

We are an investor that focuses on investing in companies that show promise for growth and job creation in Québec.

What does the Fonds offer specifically to the mining industry?

We began investing in mining 20 years ago, and our vision was to invest in exploration to ensure we have mines in the future. We invest small amounts of money in numerous junior companies that are exploring sites with different views, visions and approaches to ensure we have diversity and are invested in multiple territories.

In 2001, together with the government of Québec, we created SIDEXSI, an exploration fund dedicated to diversify our minerals and mining territories. At that time, the Cadillac break constituted the core of mining in the Abitibi region, and our vision was to further open up the north. Today, in 2019, there is a gold mine - Eléonore, that was not there at the time, and there is also the Renard diamond mine. Thus the north is now open, but there is still much room for further development and one of our additional goals is for tech to play a role in the expansion. In remote areas we need to reduce exploration costs using technologies such as big data, AI, drones and others.

What options are available to juniors looking for funding, taking the recent growth in the cannabis and crypto currency markets into consideration?

It is a challenge, and the question is how we are going to reinvent the financing model for junior mining exploration companies – we are trying to think out of the box to find solutions. In order to finance promising projects, we need to focus on talent management as well as innovative ideas.

Exploring an old mine with a similar vision to the past will not change anything. Widen your thinking and be innovative, and we will be willing to invest in your company.

AI, automation and digitization still play a relatively small part in the mining industry. What are the reasons for this?

It could be cultural in terms of focusing on day-to-day delivery and a matter of nature. A mine has a limited lifespan, and it is not viable to invest a substantial amount in IT if the lifespan of the mine is short. A wider vision needs to be adopted, in particular the realization that the mines of today will pilot technology that can be implemented in the future. For this to be successful, changes are needed at head-office level and not at a regional level.

What is Fonds's strategy for the future?

We would like to be more involved in the services industry. We want to look at secondary transformation such as the transition towards a low-carbon economy, clean power and green transportation. However, we first want to ensure that Québec is in the right position to achieve this and to become competitive worldwide. In terms of exploration, we will continue to do what we have done in the past, but in addition we want to have a different approach towards junior companies. A key aspect in serving juniors is to think ahead and anticipate what the capital market will look like in five years' time. This is how we can invest in the right projects. ■

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that a value chain-approach is required to maximize the benefits of innovation: “The work done in extraction has an impact on mineral processing as well as on tailings and environment. We cannot continue to develop innovation with a silo approach,” he responded.

This sentiment was echoed by Gianni Bartolacci, director at COREM: “The innovation ecosystem in Canada is fragmented and needs to work together and collaborate in order to fast-track the deployment of the innovation that will bring more value to the industry.”

Réjean Girard, president of IOS Services Géoscientifiques, the independent consulting group servicing Québec’s mining industry for 27 years, sees innovation as a necessity rather than a choice: “We are moving into a time when technology will revolutionize the mining industry. Machines will replace both manual as well as intellectual labor. The industry has no choice other than to adapt and must prepare for the looming technological changes,” he reflected.

The tools and software defining the march towards the digital mine

In 2008, Montréal-based Newtrax Technologies decided to focus 100% of its attention on the digitalization of underground metal mines, with the vision of becoming the global leader in wireless IoT and the preferred source of big data for AI, according to Alexandre Cervinka, Newtrax’ president and CEO. To produce this big data, Newtrax designs, builds and globally deploys purpose-built devices to monitor machines, people and the underground environment in which they operate. In the last three years, Newtrax has undergone dramatic growth, from 34 employees in 2016 to 128 today. Newtrax’ solutions help companies reduce overhead costs and enhance safety. One example is Agnico Eagle’s Goldex mine, which reported significant cost reductions on its tire expenditure and fuel consumption by implementing the Newtrax MET (Mobile Equipment Telemetry) system. Another major to have worked with Newtrax is Goldcorp at its Éléonore mine. After being recognized as the safest mine in Canada in 2016, Goldcorp mandated that its 660 workers wear fully integrated Newtrax-Enabled Personal Safety Devices.

Elaborating on Newtrax’ partnership with the Institute for Data Valorisation (IVADO), whose scientific director Yoshua Bengio is one of the three founders of deep learning, Cervinka explained: “There are three important pillars to deliver value with AI – application knowledge, quality of data and application of algorithms. In collaboration with IVADO, we have established machine learning pilot projects to test the quality of our datasets to understand if there are any gaps in the way we capture, consolidate and contextualize data.”

Mining software developer Micromine has a global footprint but puts emphasis on local service capabilities. The Perth-based company has offices around the globe, including Canada, the United States, Russia, Mongolia and Indonesia, as well as around Africa and South America, with new offices on the way in eastern Canada and Mexico. The company has three different software solutions – Geobank, Micromine and Pitram – that are aimed at maximizing asset value and increasing productivity throughout the whole mining life cycle. “By opening offices in the east, we hope to provide much more services to our clients based there,” commented general manager for Canada, Amélie St-Onge. “I spent a lot of time in Québec last year researching the market and found that there is this massive market gap that we have the right tools to fill.”

While the general perception may be that mining jurisdictions located in under-developed regions are not in a place to draw use of mine digitalization, Chuck Tollman, VP at predictive maintenance software company Dingo, points out that the inherent geographical independence of online systems rather works to the advantage of these regions: “Immature mining jurisdictions actually play into Dingo’s favor because we have the ability to do remote management. By having a web based system, anyone can easily access the system through our Trakka software from anywhere in the world.” In 2015, the company won the Austmine Innovation Award for its Trakka Field Inspection app, which is a end-to-end solution for field inspection data capture and analysis.

Commenting on the importance of data gathering, Christian D’Amours, owner and president of software manufacturer Geotic underlined how a well-organized and updated database is a necessity for making the right business decision and also minimizing the turnaround time for delivering a resource estimate. The company has developed tools for core logging and database maintenance that also includes 3D modeling. D’Amours explained: “Geological description is mostly based on subjective appreciation of any observed characteristic. For example, ‘fine grained,’ ‘highly silicified’ and more. Having access to the core photo when linking two drill holes in 3D space allows for more accurate modelling.” Currently, Geotic is developing software that will enable a hand-held tablet to record samples on site from surface or underground.

One of the pioneers in the 3D computerized resource modelling and estimation tools is software solutions provider Datamine, which was

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COREM

THE PARTNER FOR A COMPLETE AND INNOVATIVE SOLUTION IN MINERAL PROCESSING

COREM is the largest organization in Canada totally devoted to mineral processing R&D. Recognized as a world-class organization, COREM provides a wide range of mineral processing and analytical services to companies that explore and develop ore bodies, transform or recycle mineral substances.

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Francis Fournier & Gianni Bartolacci

FF: President & CEO
GB: Director
COREM



FF



GB

COREM is the largest organization in Canada totally devoted to mineral processing R&D

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Can you provide an overview of COREM's structure and how it collaborates with its members?

FF: COREM is the largest organization in Canada totally devoted to mineral processing R&D. The organization started in 1999 after the privatization of a group of Québec-based specialists in mineral processing. COREM is a nonprofit organization, but is run as a business. Our business model is based on membership, where we work collaboratively with our members and provide contractual services for our members and non-members (laboratory/pilot test work, etc.). Our pre-competitive research program is co-financed by the industry and the governments. Our pre-competitive research committee is led by member representatives who review the projects, approve the program and the budgets. COREM shares the benefits, risks and intellectual property of this work, and this makes up 40% to 45% of our business, with the remainder made up of contractual services.

How substantial are COREM's facilities in Québec?

FF: Regarding COREM's facilities, we have two main buildings: 10,000 square m of offices, labs and pilot plants. A C\$16 million project to build a new hydrometallurgy platform (completed in November 2018) to install new equipment and modernize COREM's buildings should be completed by the summer of 2019. As a nonprofit organization, COREM's partners in the federal and Québec governments are funding this project. However, COREM is not part of the government, but rather an important partner responsible for developing innovation in the mining industry and working with junior companies to develop their processes and flow sheets.

Has COREM seen an uptick in the adoption of new technologies in the last twelve months?

GB: The adoption of new technologies and processes often comes down to cost. Changing the equipment and processes at an active mine can be very costly, so the introduction of new technology often works better at a new mine rather than an established one. Innovation is often seen as a value chain where you start with research, then develop a system and then implement a system, but innovation can come from an existing system used in another sector. The question of the de-risking phase is critical and too often underestimated between the development of a pilot system at lab level and the commercialization and implementation of a system, which is costly and risky. The industry as well as the government should fund the de-risking phase.

What do you believe needs to change in terms of how the mining industry approaches innovation?

GB: There is a lack of knowledge and perhaps understanding of the importance of innovation and the impact it can have on the industry. Not enough investment is contributed to R&D; having an idea is just not good enough. Mining companies should put more effort into science by allocating more time and budget to find better solutions that will have a beneficial impact on processes. The integration and adoption of new technologies into the mining industry remains a challenge. Our members that are involved in R&D and participate in case studies are well positioned to understand innovation and its impact. The innovation ecosystem in Canada is fragmented and needs to work together and collaborate in order to fast track the deployment of innovation that will bring more value to the industry.

How does COREM work with universities to bridge the gap between research and innovation?

FF: Research costs money and requires investment to transform into a commercially viable idea. Innovation is transforming an existing idea into something that adds additional benefits – this can be financial, environmental or social. COREM works with universities and colleges at the earlier stages of development, which can be too risky and costly for mining companies to undertake. When an idea is mature enough and it is time to develop into innovation, it becomes COREM's role to take over and work with companies in the industry. ■



Réjean Girard

President

**IOS SERVICES
GÉOSCIENTIFIQUES**

IOS offers a wide range of services to mineral exploration companies, the mining industry, engineering firms, government agencies, industrial promoters and independent prospectors

IOS Services Géoscientifiques has been working with mining clients for 27 years. Can you provide an overview of the services it currently offers?

We offer a broad portfolio of service out of our three divisions: consulting, laboratory and logistics. IOS is able to provide turnkey solutions for its customers including project generating, staff leasing, supplying technologies, logistics, targeting, data management, sampling and drilling programs supervision. We offer services to various mining clients, including prospectors, junior explorers, multinational miners and governments. The company also has a set of services related to the environmental aspect of mining.

What is the capacity of IOS' workforce and fleet of equipment?

IOS currently has a team of 80 people, including approximately 40 professionals such as geologists, engineers, chemists, metallurgists and biologists. We also have a substantial fleet of equipment, from hydraulic excavators to scanning electron microscopes. We were initially known for our capacity to deploy services in areas where access is difficult, but progressively evolved into an innovative solution developer. For example, we modified an excavator so that it can be transport by helicopter in order to reduce environmental impact. IOS also participated in developing the Kaskoo-X04, a truck-sized, track-mounted amphibious ATV vehicle that allows us to conduct soil sampling in winter conditions.

Can you give an example of the innovation developed by IOS and how it is applied?

Technologies we developed range from field equipments to AI targeting. Our most recent success was in the field of automated mineralogy is receiving nationwide attention. The SEM-based technology is replacing visual mineral sorting, extensively used in diamond or gold exploration in glaciated terrain. Heavy mineral concentrates are now scanned, grain by grain, by an automated scanning electron microscope to detect the presence of chemically distinct indicator minerals. IOS is the only company in the world that has been able to automate the process of finding specific minerals during exploration activities. We are currently offering this technology to many major diamond explorers around the world, in addition to the less conventional application in base metal exploration.

Which of IOS' services and products have been in most demand in recent years?

There has been a significant increase in the demand for electron microscopy. An electron microscope is an extremely versatile machine and aligns with the current trend in the industry to not simply assay the rocks, but rather measure the amount of valuable minerals. The technology is very complex and specialized, and knowledge and experience is required for operating the machines.

IOS Services has recently acquired two Zeiss scanning electron microscope (SEM) with state-of-the-art Oxford detectors, combining the analytical abilities of a microscope, a QEMSCAN, an MLA and a microprobe. These high performance devices, in tandem with our post-processing algorithms, have a host of applications that surpass any previous technologies.

Can you elaborate on IOS' social responsibility initiatives?

Our corporate policy is to minimize the environmental footprint of our activities, and we have a team dedicated to environmental issues. To be able to operate with a low carbon footprint, mining companies need to adapt their operations and equipment. For example, a drum of fuel in the Arctic costs approximately C\$1,200, including transportation. At remote mining camp during the winter, a single tent uses a drum of fuel every two weeks. IOS has developed a heat exchanging system similar to geothermal heating but for temporary tent camps. We install a heat exchanger in a lake that is then able to provide heat or air-conditioning to the entire camp. This system enables energy saving in the order of 75%, decreasing consequently both operations cost for the client and their carbon output. In a similar manner, the Kaskoo ATV has been adopted to replace, in certain circumstances, the use of helicopter at a minimal fraction of its carbon footprint.

What advice would you give the mining industry with regards to innovation?

We are moving into a time where technology will revolutionize the mining industry. Machines will replace both manual as well as intellectual labor. The industry has no choice other than to adapt and must prepare for the technological changes that are looming. The younger generation should invest in their career and skill development because over time the industry will require less but more talented human resources. ■

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established already in 1981. Today, Datamine has 23 offices spread across 18 countries and recently acquired Flairbase, an established mining technology company based in Montréal. “The Flairbase Amine solution for underground mine survey has been integrated into our underground mine planning suite to create the complete underground toolkit covering strategic design, detailed planning and scheduling, drill & blast, survey and ventilation design,” commented operations manager Alain Robitaille.

As demonstrated by electrical production and design company Manufacture Adria, data modeling can also be an effective design tool. The Rouyn-Noranda-based company uses 3D-modeling when tailoring solutions for its clients. Manufacture Adria derives the majority of its revenue from the sale of portable underground substations. Other products include junction boxes from 35KV – 600 Volts, medium voltage switches, starter skid, mine construction panels (PTO) that form the connection between the substation and the pump/ diamond drill. “All engineering and design is done for each customer with 95% of our products tailored to the need of each project,” said commercial and marketing director Eric Gauvreau. “Some manufacturers have a standard-model substation, but these may not fit the requirements for each separate mine. Manufacture Adria has instead chosen to tailor our solutions and designs can be showcased using 3D models.”

The case for tailored solutions is echoed by Michael Gribbons, VP of mine ventilation and automation company Maestro Digital Mine: “Many mine supply companies will purchase commercial-grade equipment and wrap it in a hard box. This frustrates the mining industry as commercial equipment is available relatively cheaply, but product design or software changes to these products are not possible.” Maestro Digital Mine has developed a new system, Plexus PowerNet, that delivers a high speed, low-latency digital communication network that provides PoE+ power to wireless access points, cameras and any other IP based device. “With factors such as a blast concussion and damage due to mobile equipment movement, fiber optic cabling is at a major disadvantage. We designed a last-mile communication leg to extend the network from the level entry network switch to the face.”

Adapting to changing mining conditions, Mansour Mining Technologies has developed a spin cable application that allows for faster and safer operations. “Instead of a traditional cemented cable, it is a resin grounded cable and is basically a one-pass support system which gives the operator immediate support,” explained global sales VP Roger Coutu. “Compared to using cables with cement, which takes approximately 24 hours to cure and is a four-pass system, the resin cables allow for faster operations with immediate support.”

As the mining sector moves towards diesel independence, mobile equipment manufacturer Maclean Engineering has expanded its portfolio to include electric vehicles and currently has 15 of them working underground (six bolters and nine utility vehicles, including a grader) at Goldcorp’s Borden all-electric mine. “Electrification is only the first chapter of our innovation story, and the company is also investing in digitization and automation,” said Québec GM Tony Caron. “We have purchased a test mine in Sudbury and intend to use the mine as an innovation and development hub.”

While the electric vehicle trend becomes increasingly pervasive, mining companies looking to convert to a fully electrical fleet still face problems. As pointed out by Louis Valade, president of electric and electronic design and manufacturing company Meglab, companies worldwide are researching better ways of charging batteries and how

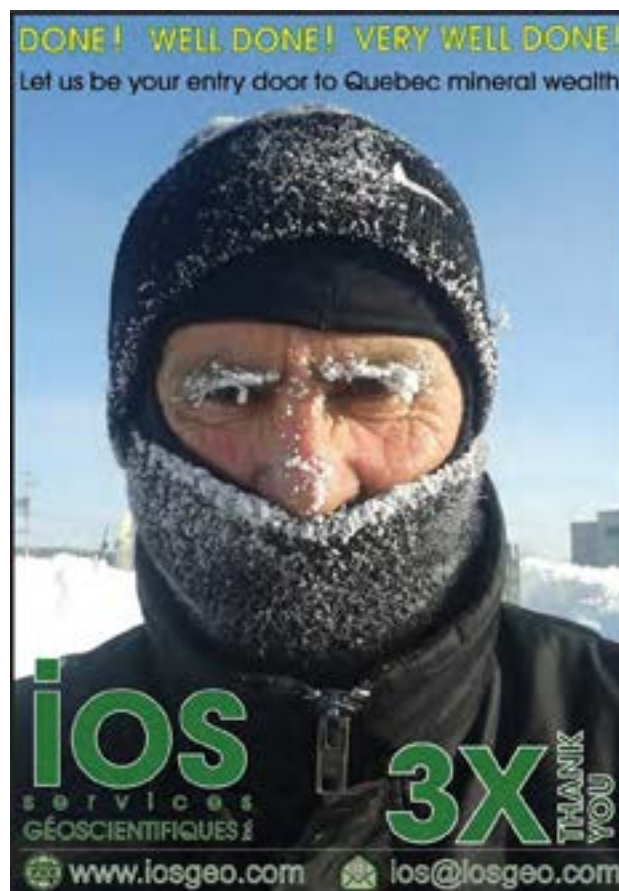
to transfer the energy to the battery in a short period of time. The mining industry requires batteries chargeable in the same amount of time it would take to refuel, which is 20 to 25 minutes. In the past, batteries were simply replaced, but today mining companies do not want to spend time on replacements, so they need to fast-charge whatever is on the machine. One solution is to install a transformer that will charge the battery in a short period of time, but this consumes significant energy, and when there is load sharing, a specific vehicle will have to be chosen for charging.

However, electrification still brings great benefits from both environmental and safety perspectives. Meglab has developed a tracking and ventilation system called Imagine that supports collision avoidance. “We can track personnel and machines, measuring the distance between them and stopping the machine before it strikes the worker,” Valade explained. “Our communication system includes a feature known as ‘ventilation on demand.’ By tracking workers and knowing where they are underground, we can control the ventilation and stop the ventilation if there is nobody in a particular area, thereby saving millions of dollars per year.”

Smart exploration

In mature mining jurisdiction like Québec, it is by now well understood that big data is more than just one of many ways to optimize operations; rather, it is a necessity in boosting efficiency, logistics, collaboration and intelligence, as well as safety and security. How-

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Alexandre Cervinka

President & CEO

NEWTRAX TECHNOLOGIES

Newtrax integrates IoT and analytics technologies to monitor and provide insights on underground operations

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Why did Newtrax Technologies decide to focus its attentions towards the mining industry?

Since 1999 when we have been involved in IoT ventures in a variety of verticals. In 2008, we decided to focus 100% of our attention on a specific market because we believed the only viable business strategy for a small high-tech startup was to pick a niche market. The target market selected was the digitalization of underground metal mines; based on the first few projects done in this industry it appeared to be a blue ocean of opportunity and a good fit for our expertise. Today, our vision is to be the global leader in wireless IoT and the preferred source of big data for AI. To produce this big data, Newtrax designs, builds and deploys globally purpose built devices to monitor machines, people and the environment in which they operate underground.

Newtrax caters to an international client base. How does the company's footprint support its global reach?

Newtrax' target customers today are the largest producers of base metals and precious metals in the world. We have a hit list of 720 mine sites, and we help these customers to digitalize their mines. Our solutions rely on a combination of software, hardware, deployment services and ongoing support. For the latter, several years ago, Newtrax decided to invest in building regional sales and service capability close to our customers. We therefore split the world in six and launched regional headquarters in Vancouver, Santiago, Perth, Moscow, Johannesburg and London. Finding and recruiting top talent in these regional business units was not easy. However, once we succeeded in attracting a few good players, it created a virtuous circle that attracted more and more good talent. Today, we truly have the best global team to achieve our vision, and customers value our staff as trusted advisors on the digitalization journey.

Can you elaborate on how Newtrax' solutions have helped clients reduce costs?

One of Newtrax' success stories is at Hecla's Casa Berardi mine, where we managed to effectively reduce the cost of operating their fleet of equipment by 7.8%. Another example is at Agnico Eagle's Goldex mine, which reported significant cost reductions on its tire expenditure, which is C\$15,000 per tire, as well as reducing fuel consumption of the equipment by implementing the Newtrax MET (Mobile Equipment Telemetry) system. Based on the insights the client received from this system, they realized they were able to produce at the same level by using only three trucks instead of four.

How do Newtrax' solutions help clients from a safety perspective?

The Newtrax system is able to detect early warnings of hazards in the environment by monitoring the ground, the quality of air and the water levels, and send an evacuation signal to all workers underground if required. During the evacuation, the system can track the location of all workers to confirm they reached their refuge stations safely. The system can also detect if someone falls unconscious to accelerate the rescue. Last but not least, the same personal safety devices that workers carry transmit a signal that makes them visible in the blind spots of the heavy machinery operators, to reduce the probability of collisions. As technology continues to evolve, more features are being added every year.

Newtrax has partnered with the Institute for Data Valorisation (IVADO) to create more value from the big data produced by Newtrax systems. What is the aim of this relationship?

There are three important pillars to deliver value with AI – application knowledge, quality of data and application of algorithms. In collaboration with IVADO, we have established machine learning pilot projects to test the quality of our datasets to understand if there are any gaps in the way we capture, consolidate and contextualize data. The sooner we fix these gaps, the higher the value of the data we will collect over the next 10 years. Newtrax also offers internships opportunities to PhD students from IVADO; for example we recently hired a student who did his thesis on short-term plan optimization of an underground gold mine. Having access talent of this quality that is fit for the challenges we face is a great advantage. ■

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ever, junior explorers – facing stiff competition and low availability of funds – are often hesitant to spend their dollars on IT, and much of the development towards smart solutions is pioneered by major players.

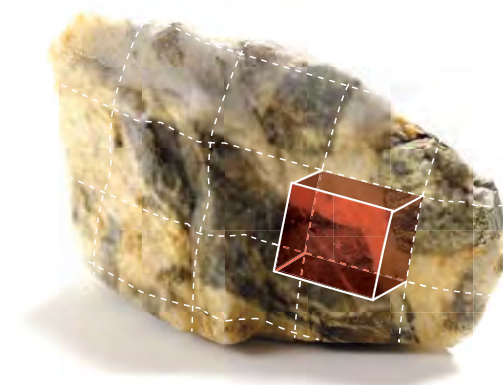
Azimut Exploration generates targets based on the advanced processing of large geoscientific databases. Over the past 15 years, Azimut has signed more than 30 exploration deals with players like Rio Tinto, Goldcorp, IAMGOLD and Hecla Mining – amounting to C\$100 million in work commitments. In addition, SOQUEM and Azimut combined their strengths in 2016 through a strategic alliance covering the James Bay region for gold exploration. For the first step, Azimut generated predictive mineral potential maps over the region and identified high-quality underexplored targets. Follow-up field work quickly validated those targets with the discovery of significant mineralized zones on the Munischiwan, Pikwa, Pontois and Galinée properties.

Azimut's big data technology was originally based on extensive geological databases collected over time by the Québec government. Looking for a way to better exploit the acquired data, the company built a methodology for extracting the statistical footprint of known deposits, which are then converted into discovery probability maps that identify and rank the new targets. "In contrast to AI, Azimut's method (AZtechMine) is a purely data-driven approach," said president and CEO Jean-Marc Lulin. "We describe it as a white box expert system. We consistently develop, test and operate it by incorporating scientific and operational knowledge. More importantly, it is not just about predictions; it has been clearly backed up with significant mineral discoveries. This dual approach – advanced data processing and solid operational capabilities – constitutes our distinctive exploration edge." Weighing in on the strong demand from major players, Alain Carrier, co-founder of mining consultant company InnovExplo, stated: "The difficulty that junior companies are currently experiencing is definitely reflected in our client base. Today, one third of our client base are established producers such as IAMGOLD, Goldcorp and Glencore. The junior companies that we are currently servicing are companies that are already engaged in advanced exploration or the pre-feasibility stages and still have some financing."

Another innovation-focused technology company is Maptek, which opened offices in Montréal and Vancouver in 2017, enhancing its international footprint to 14 offices in nine countries. The company attained 37 new mining clients in North America alone in 2018. Speaking of the importance of the Canadian market in a global context, Rob Hardman, general manager of Maptek North America, noted: "The Canadian mining industry transcends its own borders. The mines and projects in Canada have a very positive effect on the national economy as well as local communities, and decisions taken daily in headquarters across the country have a significant impact on the global mining industry." Maptek's range of solutions includes BlastLogic, an all-in-one data-management solution that assists with blast implementation decisions; Evolution 5.1 scheduling software that optimizes net present value using grade cut-off techniques; and PointStudio 8, the latest update of Maptek's I-Site Studio software, a new-generation 3D platform for modelling, analysis and reporting.

The theme of success in the mining software space continues with Promine, a software company that provides geology and engineering-related tools to exploration and development projects as well as engineering companies and producing mines. Promine experienced a 20% increase in sales in 2018, and, with a multi-lingual team, intends to penetrate the Latin American market. Highlighting the adaptability of Promine's service offering as a cost-effective subscription package, Yvan Dionne,

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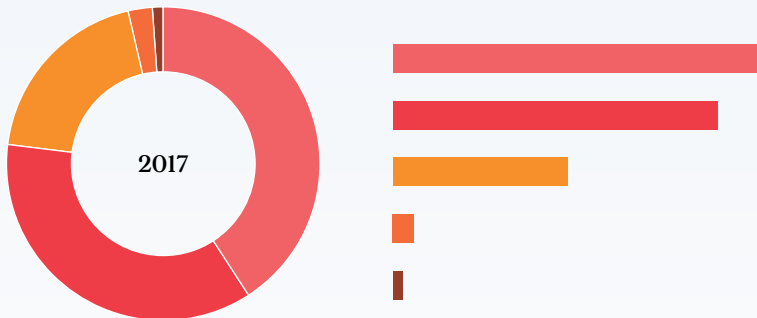
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Breakdown of mining investment by administrative region

Source: Québec Gov. 2017



● Northern Quebec	41.1%	C\$1,250 million	+20.8% from 2016
● Abitibi-Témiscamingue	36.0%	C\$1,095 million	+22.3% from 2016
● Côte-Nord	19.4%	C\$592 million	+5.7% from 2016
● Saguenay-Lac-Saint-Jean	2.5%	C\$75 million	+59.1% from 2016
● Other regions	1.1%	C\$34 million	+18.0% from 2016
Total 2017		C\$3,045 million	+18.7% from 2016

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founder and president of Promine, said: “If a client needs access to a certain function for their system that they have not signed up for, we can unlock this for them within a matter of minutes.”

The exploration sector is also moving away from the pick-and-shovel approach by adopting more efficient ways of gathering data. Unmanned aerial systems, or drones, are used by mining companies as a less invasive method and more efficient way of achieving high-resolution images of land. “Drone technologies are becoming increasingly popular within the mining industry as there are many benefits such as less costs for surveying, high-definition imaging without having to walk the entire property, and the need for fewer personnel in a current climate where it is quite difficult to attract talent,” said Gabriel McCrory, business development manager at ground data collection company Géophysique TMC. The Val d’Or-based company offers a range of geophysical ground surveys such as magnetic surveys, electromagnetic surveys, induced polarization, gravimetry, magnetotellurics, seismic and surface and

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NEWTRAX

NEWTRAX BELIEVES **THE FUTURE OF MINING IS UNDERGROUND**, NOT ONLY BECAUSE METALS AND MINERALS CLOSE TO THE SURFACE ARE **INCREASINGLY RARE**, BUT BECAUSE UNDERGROUND MINES HAVE A **SIGNIFICANTLY LOWER ENVIRONMENTAL FOOTPRINT**.

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Christian D'Amours

President
GEOTIC INC.

Founded in 2002, Geotic offers
specialized software for the
mining industry

■

Can you provide an overview of the company and your products?

From the drilling data capture to 3D modeling, our software is an integrated, safe and easy to use solution for the mining industry. We offer quality support in the software implementation for our customers and technical support throughout their use.

When Geotic was initially founded, our main objective was to develop data logging software. Before Geotic, I started a company called Geo Point Com, and we worked with databases in various formats including paper and text and excel documents. If a client requested a resource estimation, I would need to spend half of the time identifying relevant sections of the database and reorganizing the information in order to make it comprehensible. When a client returned a year later for further consultation, this process would need to be repeated, as the client did not utilize the data supplied to them correctly.

Various companies approached us to build software for core logging and maintaining a comprehensive database, and GeoticLog was born. Customers were initially satisfied with the software's basic functionality but began to request additional features. This led us to develop GeoticGraph and GeoticCAD software, providing 2D and pseudo-3D modeling, which allowed us to present geological information in a graphical environment. Not having a real 3D modeler in our series restricted our growth potential, and thus we began building GeoticMine. This software opened many doors for us in the mining exploration and production space.

One of the most appreciated features of the Geotic series is the capability to easily link the core photograph to all details described in the logging journal and present it in a 3D modeling environment.

What are the advantages of incorporating core photography in the modeling process?

Geological description is mostly based on subjective appreciation of any observed characteristic such as "fine grained" or "highly silicified." Having access to the core photo when linking two drill holes in 3D space allows for more accurate modeling. It is a crucial element for good decision-making.

Does Geotic have a specific geographic focus?

We are focused on Canada for now, but the mining industry is versatile with remote offices near and far from the actual mine site. As we are a software provider, this allows us to service clients remotely around the world. The client can easily modify the software to fit any type of project. Even the interface can be set to your preferred language. Our software is currently used on four continents.

Acquiring licenses and permits can be a cumbersome process in Québec. How does an accurate and updated database facilitate the process?

It is a question of having a good-standing database that ensures informed business decisions. If a database is not in good standing, other parties analyzing your database to make decisions on the viability of the project may not be able to provide accurate feedback. Simply put, it is important to have a structure for collecting, capturing and managing data in order to ensure that accurate assumptions can be made.

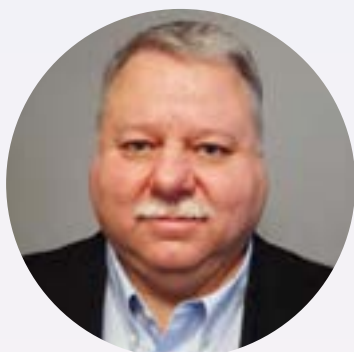
What is the vision for the future of Geotic within the next five years?

We are currently developing software that will enable a hand-held tablet to record samples on site from surface or underground. Some tablets do exist, but they require the export and import of data in the format of the main database. This process seriously affects the integrity of the data. The development of this software will allow our customers to geo-locate images and information that have been captured underground.

We are also working on a functionality that permits clients to recognize the rock type directly from the core photograph.

Do you have a final message to our readership?

With our products, data collected from beginning to end becomes a company asset. It not only allows our clients to make informed decisions, but also to make comparisons over long periods of time, which adds value to the company as a whole. The integrity and accuracy of the database is the cornerstone of any mining company. ■



Roger Coutu

VP
MANSOUR MINING
TECHNOLOGIES

Mansour is a manufacturer of integrated ground support solutions, smelter hardware, rock drilling tools, mine ventilation and custom fabricated products

Can you provide a brief overview of Mansour Mining Technologies and the evolution of the company since its establishment in 1976 in Sudbury, Ontario?

Mansour has 40 years of experience in the underground mining sector. We grew steadily over the years, and in the 2000s Mansour expanded beyond Sudbury and began serving clientele across Canada and Mexico.

In 2011, the company was purchased by two groups of Canadian private equity firms: Bingley Capital and Ursatur Capital Management. The main objective of the acquisition was to further grow the company, and after the acquisition we invested heavily in our manufacturing capabilities and technical support. The company name was changed to Mansour Mining Technologies to reflect innovation and our vision within our name.

Over the past several years, the company has expanded our service capabilities and our footprint to include sales and distribution centres in Saskatoon, Saskatchewan; Timmins, Ontario; Val d'Or, Québec; and we have recently added manufacturing capabilities in Chihuahua, Mexico. Our vision is to fill the needs of a growing number of clients by focusing on quality, innovation, strategic alliances and industry-leading expertise.

Can you elaborate on Mansour's custom-made products that are adapted to fit industry needs by the company itself?

One of the products that the company is currently working on and would like to highlight is our spin cable applications. Instead of a traditional cemented cable, it is a resin ground-cable and basically a one-pass support system that gives the operator immediate support. Compared to using cables with cement, which takes approximately 24 hours to cure and is a four-pass system, the resin cables allow for faster operations with immediate support. We are currently testing resin spin cable applications on cables up to 8 m. Being able to operate with immediate support allows for a faster, safer mine development, which saves a significant amount of costs for mining companies.

Mansour has a relatively broad portfolio. Did this help the company through the dip in the mining cycle?

The dip in the mining cycle had its challenges, and there were some very aggressive market changes. The key to pushing through these challenges was to spend time with our customers. Building strong relations through our excellent customer services is how Mansour differentiates itself in a competitive market. Having a diversified portfolio also helped us push through the downcycle, and we brought in extra capabilities and innovations, such as our rock drilling tools product and services offering, that allowed us to help our customers save even more money while still maintaining revenue in a difficult time. Our fabrication and ventilation services also give us an edge in the market, and we are in the process of developing these services further. These services are also helping us to penetrate other markets and sectors, such as the construction sector, which is an advantage during a mining downcycle. Our portfolio still consists of 90% mining and 10% construction, but Mansour is starting to expand and diversify into other sectors as well.

Can you elaborate on some of Mansour's key innovations over the last few years?

An innovation that emerged in the last couple of years is our Versabolt application. The Versabolt is a new type of bolt that we designed for specific environments or ground movement conditions. We also have the MCB bolts (modified cone bolts). This bolt can withstand a magnitude 3 earthquake, meaning it can ensure the integrity of deep underground openings where there are frequent small seismic movements and mitigate the damage that occurs. Both the Versabolt and MCB were developed based on customer demand as mines in Canada tend to be deep and can thus experience a significant amount of seismic activity that needs to be managed. We are also in the process of testing how the Versabolt can be applicable in settings that are not necessarily deep underground but that are still having challenges with controlling ground movement. ■

Tony Caron & Stuart Lister

TC: GM Québec

SL: Marketing & Communications
MACLEAN ENGINEERING



TC



SL

MacLean Engineering is a specialized manufacturer of mobile equipment solutions for underground mining

Can you give a brief overview of Maclean Engineering and the services the company offers?

Maclean Engineering has been in the manufacturing business for approximately 50 years, and we are the largest Canadian-based manufacturer of underground mining equipment. The company employs approximately 700 people globally. Our manufacturing platform is distributed between three plants in the Southern Georgian Bay region in Ontario. This distributed manufacturing approach gives the company access to a wider labor pool, which is a great advantage.

Maclean Engineering manufactures mining equipment in three broad categories, including ground support equipment such as bolters, shotcrete sprayers and cement truck haulage units; ore flow equipment such as water cannons and rock breakers; and utility vehicles or production support equipment. Approximately three years ago, we also introduced battery electric propulsion options in all of our equipment categories.

Can you tell us about your electric vehicle (EV) fleet at the Borden mine and your test mine in Sudbury?

In terms of our innovation story, our EV fleet has played a significant role. We have 15 EVs working underground at Goldcorp's Borden all electric mine, which consists of six bolters and nine utility vehicles, including a grader. As far as we know, our electric propulsion grader is a world first. The mining industry is moving towards being diesel free and being able to provide a battery propulsion fleet, which gives Maclean Engineering a great advantage. Electrification is only the first chapter of our innovation story, and the company is also investing in digitization and automation. We have purchased a test mine in Sudbury and intend to use the mine as an innovation and development hub. We have hired talent from the dissolution of Barrick's technology teams and have purchased their remote control company, which enabled us to now have in-house expertise and technologies to operate equipment remotely. Maclean Engineering is heavily investing in developing technologies and solutions in order to be ready for the mining industry's shift towards using advanced technologies.

Until recently, the successful implementation of technologies in mines has been challenged by the lack of maturity in the technologies. What has been the greatest

challenge for Maclean Engineering, especially when breaking new technological ground?

As a company, we have always been comfortable with pioneering design. We are in partnerships with our clients and implementing technologies is a team effort. Both sides have to be willing to learn and adjust their operations accordingly. It is always challenging to implement technologies underground, but these challenges can easily be overcome by having the support from the client as well as a great technical team.

Has Maclean Engineering experienced any difficulties and challenges with regards to integrating electrical and automated equipment within clients' existing systems?

The technologies and methodology that we utilized to integrate electrification into our equipment does differ from the methodologies used by other suppliers and is easier to integrate within the client's operations. With regards to battery life, Maclean Engineering elected to go with the best battery technology that we could find, and we also decided to integrate the battery chargers onboard of every machine. There is thus no need for battery charging stations as the batteries and the chargers are onboard the equipment. However, when utilizing electric machines, it is necessary for the client to have the sufficient substations on site.

Can you give some insights into Maclean Engineering's expansion plans?

With the EV mining momentum that is building within the industry, the market is changing, and Maclean Engineering aims to change with the market. We have built a business based on custom engineering and manufacturing, and we are well positioned to service any new demands coming from the industry.

Do you have a final message for our international readership?

Maclean Engineering has a great appreciation for the innovation and entrepreneurial spirit of the Québec mining region. We are focused on introducing improved efficiencies into the mining cycle and therefore invest heavily in innovation and technology development. Maclean Engineering is part of a great mining jurisdiction and we believe that the Québec mining industry is leading the way for the global mining industry. We look forward to transforming together, and we are willing and able to service the demands of the industry moving forward. ■



Jean Marc Lulin

President and CEO
AZIMUT EXPLORATION

Azimut is a mineral exploration company established in 1986 that specializes in project generation through targets based on the advanced processing of large geoscientific databases

■ Can you give a brief overview of Azimut Exploration and the company's development since establishment?

Our strategy changed beginning in 2003 to better manage exploration risk, with the key idea behind the company's new direction being to find a better approach to processing large databases in order to drastically improve the quality of exploration targeting. Quality targeting plays a critical role in our business, considerably enhancing the chances of finding economically viable deposits. Big data analytics is an essential tool, and Azimut's pioneering approach in that field is continuously enhanced by in-depth exploration experience. At the same time, we also focus on lowering the business risk by inviting partners to collaborate in exploring the targets we generate. Over the past 15 years, Azimut has signed more than 30 exploration deals across Québec amounting to C\$100 million in work commitments, proving that industry players recognize our expertise.

■ Can you elaborate on Azimut's partnership with SOQUEM as well as your approach to big data?

SOQUEM and Azimut combined their strengths in 2016 through a strategic alliance covering the James Bay region for gold exploration. For the first step, Azimut generated predictive mineral potential maps over the region and identified high-quality underexplored targets. Follow-up fieldwork quickly validated those targets with the discovery of significant mineralized zones on the Munischiwan, Pikwa, Pontois and Galinée properties. These projects will be advanced in 2019, particularly through drilling. Our work may very well produce a new wave of discoveries in the region. Azimut's big data technology was originally based on the huge geological databases collected over time by the Québec government. The question was, "is there a way to dramatically improve the odds of discovery by better exploiting this database?" Since then, we have built an efficient methodology for extracting the statistical footprint of known deposits. These results are then converted into discovery probability maps that identify and rank the new targets. In contrast to AI, Azimut's method (AZtechMine) is a purely data-driven approach. We describe it as a white box expert system. We consistently develop, test and operate it by incorporating scientific and operational knowledge. More importantly, it is not just about predictions; it has been clearly backed up with significant mineral discov-

eries. This dual approach – advanced data processing and solid operational capabilities – constitutes our distinctive exploration edge.

■ Aside from the available regional scale database, what was the reason behind Azimut shifting to a big data approach?

Since 2003, Azimut has had a clear focus on technology and innovation to increase the chances of making significant discoveries. Nowadays, a company cannot rely on luck to achieve that goal. From our perspective, high-value processed data is crucial to reducing the exploration risk. It is also important to develop a global vision in a familiar region. Fortunately, Québec has incredible databases, which makes Azimut's technological approach highly functional. On top of this, we believe the experience gained in Québec is fully exportable.

■ Is Azimut Exploration's approach something that the company would be able to commercialize?

Azimut has a tool that can generate value by making large discoveries. Although we are first and foremost a mineral exploration company, AZtechMine can provide an edge to companies with regional strategies driven by data, not single-prospect opportunities. With this in mind, Azimut is open to developing new ventures on a commercial basis with a few key companies to accelerate their discovery process.

■ What is Azimut's strategy for attracting investment?

A critical part of our strategy is to limit share dilution as much as possible. Keeping the number of outstanding shares small reflects the value of our discoveries much more accurately. Azimut has one of the lowest dilution rates in the junior exploration space in Canada. Our long-held strategy is to generate quality projects that attract a few select funding partners.

■ What are Azimut's strategy and objectives moving forward?

Azimut has a great team of data scientists and strong operational capabilities. Combined with a conservative financial approach, this recipe is key to creating wealth. The plan is to continue to nurture and develop strong partnerships in Québec, which offers a solid ground for this strategy. This approach can be expanded using our AZtechMine technology in other data-rich but underexplored regions. ■

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borehole TDEMs. Drone service is the latest addition to the company's service portfolio. "With the emergence of drones, we can eliminate the need for line cutting and costly field teams. For the cost of line cutting alone, drone services allow us to offer a large-scale magnetic survey, completed with a tighter line spacing, than what was previously thought to be economically possible."

As the mining sector opens up its eyes for the use of UAVs, French drone manufacturer Drone Volt is developing designs specifically aimed at mining operations. "We have realized that the drone industry can offer more to the mining industry than what we are offering now," said CEO Martin Laporte. "Expertise and technologies within the two industries can be merged

to develop systems that can provide optimized results in specific applications. Over the last few years, Drone Volt has been developing solutions like Thederd drone vertical take-off and landing drone call (VTOL) and autonomous charging systems for induction charging. The idea is that the drone can land on a docking station and charge itself without any human involvement."

Québec is home to numerous other French technology companies looking for a North American base – a natural fit due to language, proximity to Europe and culture. CORALIS, specialists in production planning and monitoring software for the mining industry, has been operating in France for 30 years and responded to increasing demand from the North American market by recently opening a Montréal office. Guy Donatini, co-founder and president, is counting on CORALIS' newly developed cloud software to boost business development: "This technology offers our customers better access to our software and their data, and an even more efficient technical customer service...with its monthly payments, the miner's cash flow is improved."

Since its foundation in 1991, Effigis has been pushing the boundaries of innovation, by conducting earth observation (EO) with satellite technology, and is now offering a range of products and solutions that include high-precision mapping from EO data, specialized monitoring tools for electromagnetic leakage and geospatial data collection. Effigis' EO division works with geospatial data collection,

which surveys underground infrastructure and has provided information to clients such as Osisko, Azimut and Glencore. Michel Rheault, VP of geology at Effigis, characterized the company's involvement in mineral discovery: "We first help clients understand the geology of the area they operate in by providing more accurate mineral information and faulting architecture of a mining property, for instance. Effigis steers its customers in the right direction – saving them valuable time and money," he explained.

Instrumentation GDD has been operating since 1977, developing and manufacturing a wide range of electromagnetic and induced-polarization geophysical instruments, including a recently developed tool for detecting conductors that can reach a depth of 3 m and can read up to 10 times per second, at up to 70 km per hour. Pierre Gaucher, GDD's president, provided some context: "To put this in perspective, a human being can only see 2% of the ground with his or her eyes. GDD's tool, the Beep Mat, makes it possible to scan 40%," he said.

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Michel Rheault & Mathieu Benoit

MR: VP Geology
MB: VP Earth Observation
EFFIGIS



MR



MB

Effigis is a one-stop shop for geospatial information that serves the mining industry and other verticals internationally

Can you provide a brief history of Effigis and its range of solutions?

Since its foundation in 1991, Effigis has been pushing the boundaries of innovation, initially connecting Earth Observation (EO) and positioning satellite technology. At the time, satellite imagery was in its early development, and Effigis integrated peripheral technologies and real-time positioning solutions into imagery. The company began with only five employees; today we have over 160 from a multitude of professional backgrounds, such as geologists, IT specialists, GIS specialists, geographers and other scientists. Effigis offers a range of products and solutions that includes high precision mapping from EO data, specialized monitoring tools for electromagnetic leakage and geospatial data collection on public utilities infrastructure to improve asset management. Effigis' EO division undertakes part of this, where we assist the mining industry.

Some of Effigis' mining clients include Osisko, Managem, SOQUEM and Glencore. What proportion of Effigis' business portfolio is comprised by the mining industry?

Mining currently makes up 10% of Effigis' business and has been growing internationally over the past three years. We are geospatial information providers and are involved with different players within the mining industry, from exploration to operations to reclamation. Effigis works with small, mid-size and large players. Our information is being used in both green and brownfield exploration for the monitoring mining operations and to support Environmental Impact Assessment (EIA) studies. Within the mining cycle, Effigis provides accurate land condition information and indicates the best targets to explore. We are innovative in our data modeling solutions, which integrate satellite imagery, geophysics and geochemistry.

How does Effigis' approach and technology help clients throughout the different stages of a project?

We first help clients understand the geology of the area they operate in by providing more accurate mineral information and faulting architecture of a mining property, for instance. Effigis steers its customers in the right direction – saving them valuable time and money. We have worked in Peru, Burkina Faso and Brazil recently, performing data modeling over mining concessions that enabled the tar-

geting of areas located within less than 15% of the concession coverage that showed the best exploration potential.

Effigis' work helps mining clients not only at the exploration phase, but also during operations, when accurate mapping of topography can result in a better management of resources extraction and environmental impact assessment. The same goes for the reclamation process; having an accurate mapping of past and current land or water conditions is key for sustainable mining.

What role does innovation play in Effigis' corporate philosophy?

The way we interact with technology in business is markedly different to the way it was 20 years ago when CEOs were far more conservative. The new generation of the workforce has made using technology very natural. At Effigis, we give our professionals the time to be creative to better support this new generation, and this is the foundation of our success. Effigis spends a significant amount of time and money on R&D every year to improve all aspects of its business. In terms of exploration, we are really improving data modeling for each data set we obtain to get the up-to-date information for targeting on the ground. Artificial intelligence (AI) and machine learning are currently key areas of focus for Effigis, and this will continue in 2019.

What are Effigis' main objectives for the next 12 months?

We want to strengthen the markets we are addressing, and mining is a key vertical in this respect. Effigis has had great success internationally, and we intend to continue showcasing our capabilities on an international stage. Innovation in the form of new methods of data modeling, advanced AI and machine learning will play a key role in Effigis' development.

Over 600 new EO satellites are planned for the next decade, grouped into specific constellations thus increasing the periodic views of a single area. Effigis will pursue the design of innovative ways to extract land information from such big data warehouses to better support real-time information delivery. An AI approach is currently being designed with this in mind, in particular for artisanal mining monitoring, based on Effigis' involvement on a national mapping project in Burkina Faso. We see huge mining potential in West Africa, and Effigis intends to play a major part in this in the next 10 years. ■

Alain Carrier, Carl Pelletier & Denis Gourde

AC: Co-Founder

CP: Co-Founder

DG: VP

INNOVEXPLO

AC



CP



DG

InnovExplo is an independent consulting firm in geology, mining engineering and sustainable development

Can you provide a brief background of InnovExplo and elaborate on some recent milestones of the company?

InnovExplo was established in 2003 with the original services being exploration and resource estimation. The company has experienced significant growth over the years, and our team has expanded from only two people to now having approximately 25 people. We have also added mining engineering services to our portfolio, as well as environmental and sustainable development expertise. The types of project we are involved in have also changed over time. We started with small projects for junior exploration companies, but as we grew, we gained access to bigger projects with major mining companies. For the larger projects, we assist clients with pre-feasibility and feasibility studies. We are able to offer a full solution to our clients.

InnovExplo's team has great competencies in the engineering and geology spaces. The company also has a sustainable mining certification that allows us to offer coaching and consulting services to mining operations in the region. In addition, we audit the sustainability strategies of companies. Our environmental sustainability services relate to health and safety advice, environmental permitting, drill site inspection and rehabilitation, independent environmental audit, operations manual writing, procedures manual writing and social acceptability.

In the current market, junior mining companies have found it difficult to attract funding. Is this reflected in InnovExplo's client base?

The difficulties that junior companies are currently experiencing are definitely reflected in our clients. Today, established producers such as IAMGold, Goldcorp and Glencore make up one third of our client base. The junior companies that we currently serve are companies that are already in advanced exploration or pre-feasibility stages, and they still have some financing. We used to have a good amount of junior exploration companies in our portfolio, but the number of these clients has been declining since 2013 as this segment continuously struggles to attract investment.

What are some of the benefits of turning to mining contractors, such as InnovExplo, for external expertise?

Outsourcing to mining contractors is beneficial for mining companies as the contractors already have the workforce and expertise. Mining companies can use contractors to avoid the pains of building their own internal teams. It is also required from producers to have an independent report, and this is where a contractor can play a significant role. When outsourcing to contractors and consultants, mining companies are also investing in the different types of expertise that the contractor can offer.

What are some discernable trends in demand for your services?

InnovExplo has seen a significant decrease in the demand for fieldwork since 2013. Our services are currently in greater demand at advanced projects where senior expertise is required. In terms of technological advances in the mining industry, InnovExplo needs to understand what innovations are available on the market. We need to include automation or innovation impacts in our reports and thus need to be up to date with developments within the industry. Developments in innovation are occurring extremely fast within the mining industry, and our clients expect us to be aware of all relevant technologies when we are conducting studies and completing reports on their projects.

Where does InnovExplo see the most opportunity for expansion?

In Canada, the regions of Québec, BC and Ontario are very promising. We are also looking at opportunities to further expand our footprint into the South American market. West Africa does hold a significant amount of opportunity, but the security challenges in some of those countries are concerning. Nonetheless, West Africa is a good place to expand into because we are familiar with the regulatory framework and the region is also French speaking.

In terms of commodities, initially InnovExplo had a focus on precious metals and base metals, but now we try to have mandates in all types of mining commodities. We want to expand into different types of minerals in order to have a good commodity balance for when prices fluctuate. As a service company, we have the ability to diversify our commodity focus quite easily. ■

Rob Hardman & Rodrigo Villarreal

RH: General Manager North America

RV: Business Development Manager

MAPTEK



RH



RV

Maptek is a leading provider of innovative software, hardware and services for the mining industry

What prompted Maptek to open offices in Montreal and Vancouver in 2017?

RH: We have always known that we needed a local presence [in Canada] to better understand our clients' needs and objectives, and our recent successes have paved the way to make it happen. The mines and projects in Canada have a very positive effect on the national economy and local communities, but also the decisions taken daily in headquarters across the country have a significant impact in the global mining industry. As a global company, Maptek is committed to remaining close to our customers and to continue bringing value through our technology.

RV: Since the very early days of almost 40 years of experience, Maptek has discovered that proximity to clients is key, and we have now 14 offices in nine countries. In addition to world-class solutions in terms of functionality, we also bring to the table excellent and convenient customer support. Having a regional presence helps to solve issues such as language barriers and understanding the nuances of operating in different cultures.

Which products have been driving growth for Maptek in the past 12 months?

RH: The BlastLogic product is an all-in-one solution that adds significant value to both the blasting process and the data management space. This cloud-based solution enables operations to make blast implementation decisions with regard to mine plans, geology and geo-technical data, with instant access to data. The flexible drill and blast system is designed to work in the most demanding environments and the solution can be scaled to suit the clients' specific operation.

RV: A second solution that has been a great success in the recent months are our Laser Scanners. It has multiple applications across the mining cycle in areas like surveying, geology, engineering and others. Maptek has been designing and manufacturing scanners for 20 years, and with the combination of I-Site Studio software (now PointStudio), we provide a unique solution in the market. Not only do we have the ability to capture a point cloud and an image in one simple process, but also we have one of the most powerful cloud processing softwares. Increased efficiency, multiple team collaboration, data accuracy and consistency are some of the main benefits that our customers are gaining with the new R3 Series Laser Scanners.

How does Maptek's Evolution 5.1 software assist during the mine scheduling process?

RH: Scheduling in the mining industry has become more centralized to help mines operate more efficiently and thus reduce costs. Evolution is a unique, agile and dynamic solution for targeting complex, real world challenges. It is able to optimize the tactical part of scheduling, and it optimizes net present value using grade cut-off techniques, a proven method for maximizing project value. Evolution also optimises the haulage fleet to deliver cost savings early in the schedule. Further savings can be achieved with waste dump optimization. The benefits include deferred capital expenditure, minimised clearance costs and improved waste planning.

Can you elaborate on Maptek's recently updated PointStudio 8 and the product's capabilities?

RH: PointStudio 8 is now able to perform fragmentation analysis reporting, which has become a very important function for many clients. In addition, the software also has an underground reporting model, which is especially important to the Canadian and eastern Canadian markets. There are a significant number of laser scanners on the market that can deliver the point cloud data, but what differentiates Maptek's PointStudio product is that the software makes data visualization, manipulation and modeling more user friendly.

What are Maptek's main objectives for 2019?

RV: The mining industry is moving from "good enough" solutions towards "best in class" solutions. Maptek is experiencing this trend within the Canadian mining industry and the timing of establishing a local presence in Canada was well aligned with this trend. Through a combination of software, hardware, mining expertise and the understanding of business objectives, we would like to continue delivering solutions that will bring value to the data of our customers.

RH: One of Maptek's goals is the convergence of our strategic roadmap with the roadmaps of our clients. The aim is to be in sync with the mining industry at multiple levels, as many companies are looking to change the way they operate. ■

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Security: The evolving threats that must be addressed

As software continues to evolve and operations become increasingly reliant on technology, the issue of cybersecurity has become more vital, particularly for heavy industries that have high-risk data that affect global markets and thousands of people. However, the mining industry is still far behind when it comes to cybersecurity, according to Claude Sarrazin, president and CEO of SIRCO, the Montréal-based private investigation firm offering undercover services, computer forensics and cybersecurity. In a staggering 96% of cases, SIRCO is able to break into its clients' systems when performing penetration testing, which illustrates the pertinent need to tighten security.

Patrick Vena, damage insurance broker and VP at BFL Canada weighs in on the issue: "The use of technology has progressively increased across all stages of mining operations, which has presented the sector with a wide range of new exposures." Vena identifies the following primary concerns: loss of

data or loss of access to data (financial, mining rights, etc.); disruption to supply chain; loss of communications; and loss of access to control systems and critical monitoring systems.

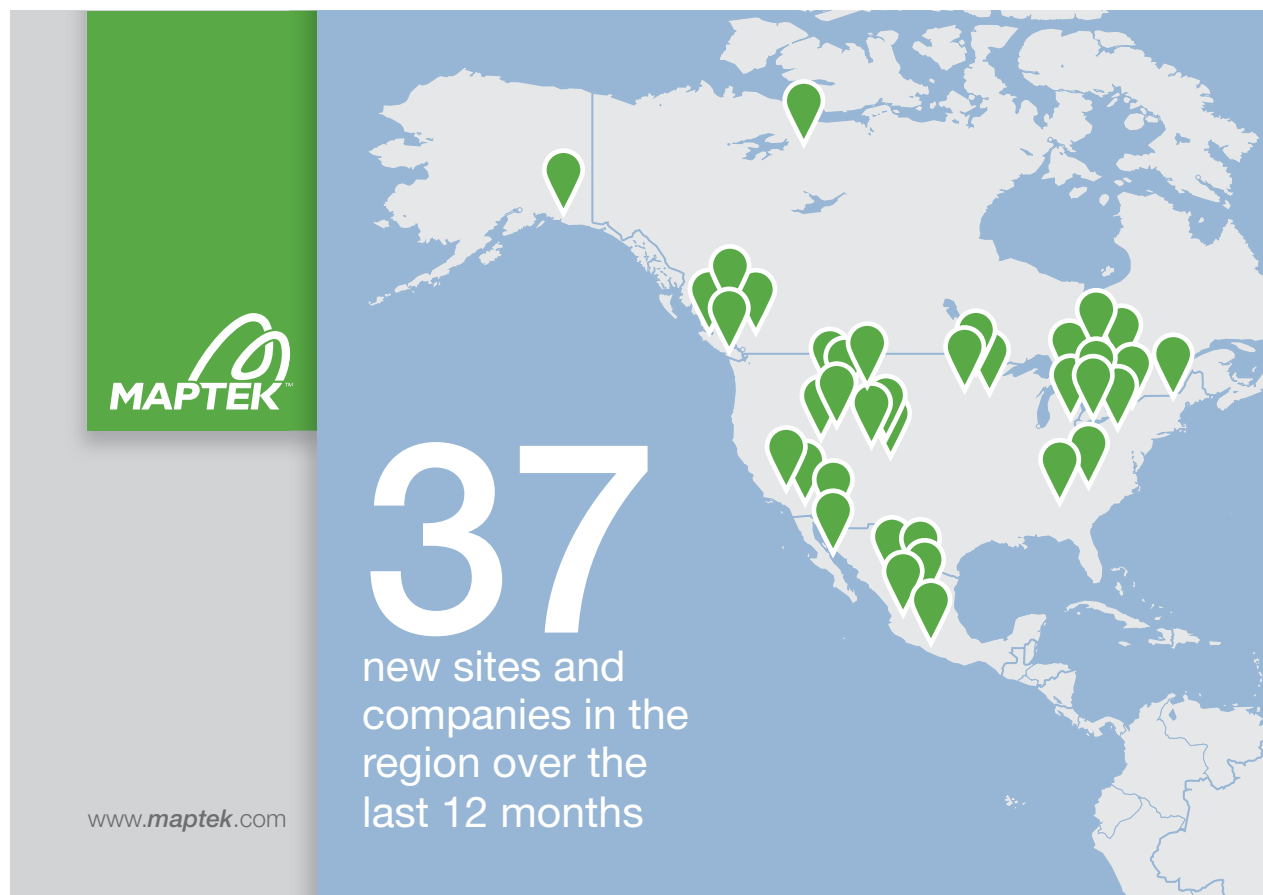
Security threats have been present long before the digital era, and SIRCO has conducted 21 training sessions related to narcotics over the last three months for companies in the mining sector alone, as more frequent testing for cannabis has seen positive results for other drugs such as methamphetamine and cocaine. In SIRCO's 27 years of experience, it has identified that around 10% of employees are problematic – deliberately breaking or vandalizing equipment, stealing company resources or benefitting from corruption. "This 10% represents most of a company's legal fees and insurance costs and can have a huge effect on profit margin and even the culture within an organization," said Sarrazin. "Security issues, whether internal or external, do not go away. You need to address them, and although they are not always high on the list of companies' priorities, it is vital that you stay on top of these risks before they turn into major issues," he concluded.

Environmental regulations drive growth for green technologies

The global drive away from higher carbon fossil fuels towards green-energy solutions transcends industries, and in a mining context has seen companies increasingly concerned about the environmental and economic costs of diesel fuel use, especially with government-imposed carbon-reduction legislation on the horizon.

Distributed Gas Solutions Canada (DGSC) is hoping to change this, and offers turn-key liquefied natural gas (LNG) and compressed natural gas (CNG) supply solutions for industrial and transportation end-users in Canada who are not served by pipeline infrastructure. DGSC was established in 2017 in a partnership created by three company partners: Hydromega Services, the Montréal-based renewable energy power producer; Galileo Advanced Solutions, the U.S.-based commodity supply chain arm of manufacturer Galileo Technologies; and Québec City-based Groupe Desgagnés, a marine transportation service company.

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Martin Laporte

CEO
DRONE VOLT CANADA

Drone Volt is focused on designing and manufacturing innovative commercial service UAVs

Can you give a brief overview of Drone Volt and the company's presence in the Québec mining industry?

Drone Volt was established in 2011 and the company has been working on finding drone solutions which will benefit various industries. We have exceptional technical expertise and experience and we are focused on designing and manufacturing innovative commercial service drones which can offer solutions to all industries, including the mining and construction industry. From image capturing to analysis, Drone Volt's services is the most comprehensive solution in the civil UAV market.

What is the case for drone usage in the mining space?

The advantage of operating drones for mining operations is that most of the operations will be conducted outside of a controlled airspace. With a basic pilot's license and a drone which is licensed through the Transport Canada website with a serial number related to the pilot, you will be allowed to operate the drone on the mining site.

Can you elaborate on the demands and requirements of the mining industry with regards to using drone technologies?

We have realized that the drone industry can offer more to the mining industry than what we are offering now. Expertise and technologies within the two industries can be merged to develop systems that can provide optimized results in specific applications. Over the last few years, Drone Volt

has been developing solutions like Thederd drone vertical take-off and landing drone call (VTOL) and autonomous charging systems for induction charging. The idea is that the drone can land on a docking station and charge itself without any human involvement. This innovation can be beneficial where surveying must be done on a very large area.

Is there a substantial demand for geophysical drone surveying from the mining industry?

There is demand, but cost is still an issue. The industries need to play open cards with each other and aim to understand what is possible from each's side. To make a project feasible, we need to be able to offer the right services at the right price.

Can you elaborate on the training services Drone Volt offers?

Drone Volt Academy is training Drone Pilots in 13 countries, we are also the official partner of the Québec National aviation school (CQFA). Drone Volt opened the first training facility for professional drone pilots in North America in 2012, in collaboration with the Québec Flying School. We have gone through a process with Transport Canada, and soon we will not only be flight instructors, but also flight reviewers for the future young pilots within the country. We will provide specific training with specific drone systems as our aim is not to train generic pilots, but rather train operators to get results on their specific missions. ■

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In November 2018 diesel fuel rack pricing was approximately C\$21.50/GJ in Montréal, whereas natural gas was approximately C\$5.50/GJ. In addition to the considerable cost benefits, Andrew Wilkins, DGSC's VP of business development, expanded on the environmental benefits that LNG offers: "CO₂ reductions of up to 25%-35% and nitrous oxides (NO_x) reductions of over 70% can be achieved. There is a virtual elimination of particulate matter PM and sulfur oxides SO_x, which are air pollutants that cause smog and human health problems."

More specific for the mining sector, the use of cyanide is increasingly being banned in progressive mining jurisdictions, and companies consequently face challenges in obtaining permits. Dundee Sustainable Technologies (DST) has developed two green processes for the treatment of materials in the mining industry: a cyanide-free gold extraction process and arsenic stabilization through a vitrification process. The company has already field tested the technology with the delivery of an arsenic plant to a customer operating in Africa, as well as the finalization of a second demonstration campaign on its gold extraction technology using chlorine. DST processed approximately 40 tons of high-value concentrate from Chile where 97% of the gold was recovered, 98% of the copper, as well as controlling 99% of the mercury and leaving barren tailings. President and CEO Brian Howlett commented that DST had experienced a recent upswing in demand from tier-one producers, not only as a prospective solution for the future, but actual implementation. "DST is currently working on numerous quality projects that aim at implementing our process on a commercial basis," he continued. "Our market is projects that are in advanced resource development and pre-feasibility stages where the clients are ready for metallurgical test work. We have worked with some major cobalt players, including eCobalt Solutions and Fortune Minerals, which are looking to establish a plant within the next 12 to 18 months."

As green goes, satellite-mapping company Japost adds a layer to the concept with its multispectral geobotany (GEOBS) technologies that trace geochemical changes in the vegetation in order to propose exploration targets. "The technology aims to detect and map changes and geochemical anomalies of vegetation and soil as well as litho-structural

elements," explained founder Bronislaw Popiela.

Another company promoting environmentally responsible practices is Avjet, which offers biodegradable lubricants, mostly used in a mining context as hydraulic oil/fluid and drilling oil/fluid as well as rod grease and anti-seize. André Martineau, from Avjet's lubricants division, believes every mine could and should use biodegradable lubricants because mineral-based lubricants can contaminate soil and cause long-term environmental damage if they are not decontaminated. "Biodegradable lubricants turn into carbon dioxide and water within 15 to 30 days with the help of microorganisms in the soil along with air and water and are not harmful to the environment at all," affirmed Martineau.

Water management has become paramount in the global mining industry, as companies look to protect the environment from degradation while at the same time reducing fresh-water costs. H2Flow acts as an integrator and represents 50 companies, providing water-treatment solutions that comply with

the new Metal and Diamond Mining Effluent Regulations (MDMER) that came into effect in June 2018. Eric Lannegrace, H2Flow's mining market manager, went into further detail about the updated MDMER: "The amendments establish more stringent limits for existing metal mines on arsenic, cyanide and lead, and also add new limits for unionized ammonia."

David Oliphant, VP business development of heavy industry for global water discharge giant Veolia Water Technologies weighed in on the topic: The big issue in Canada is not that there is not enough water, but rather too much water. Canadian mining companies are dealing with issues such as toxicity to aquatic life, but they need to get water off site, which is the issue in Canada." While 60% of Veolia's Canada projects are focused on gold mining, it is also focused on other metals such as nickel and lithium as well as rare earths. "The evaporation and crystallization technologies are a big part of our developments and we are currently looking at rare earth applications for these developments." ■

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Claude Sarrazin

President & CEO
SIRCO

SIRCO provides security services to address both internal and external risks that threaten the mining industry

SIRCO is a private investigations firm that has operated for 27 years. Can you provide an overview of the company's reach and the services it offers?

SIRCO is based in Montreal, has 125 employees, and serves clients in Québec, Ontario, Europe and South and Central America. We specialize in traditional investigations and offer undercover services, computer forensics and cybersecurity. The mining industry relies on us to provide undercover agents to make sure that no illegal substances are used or transported within their operations, and we are also involved in detecting employee fraud activity. Mining currently represents around 30% of SIRCO's business and is a key vertical for us.

What impact has the legalization of cannabis had on SIRCO's mining industry clients?

The legalization of cannabis has had a significant effect in many industries, and across the value chain in the mining sector. The mining industry deals with heavy machinery and operates in a context of potential high-risk, so automatically the responsibilities of the employer and employee are elevated.

SIRCO has conducted 21 training sessions related to narcotics over the last three months for companies in the mining sector alone. These sessions focus on training supervisors, junior managers and HR staff on how to detect narcotic use amongst employees. We have hired a specialist to consult companies on how to handle situations where employee tests return positive as this could lead to litigation and affect business productivity. Now that companies are testing for cannabis, we are also seeing positive results for other drugs like methamphetamine and cocaine, which is a growing cause for concern.

The deployment of undercover investigators (UCs) is a big part of SIRCO's business. Can you elaborate on the benefits of this strategy?

This is one of the most effective ways to detect wrongdoing and gather information inside organizations. It allows us to detect drug use, as well as theft, sabotage and falsification of time sheets. This may not seem impactful on a case-to-case basis, but globally it can have a huge impact on business productivity. SIRCO sends in an undercover agent, posing as a newly hired employee,

to be part of the team. The undercover agent will then try to attain as much information as possible to resolve the case. All of our employees have a BSP license and act with the highest standards of professionalism and confidentiality.

Has the demand for SIRCO's cyber security services increased as mines are shifting to a more digital strategy?

Demand in this area of the business will continue to grow as the march towards the digital mine gathers pace. Computers are not the main business of mining companies – they were brought in as useful tools – but very few correctly manage the security aspects of this tool. SIRCO can shed light on these issues and protect data and systems. In 96% of cases, SIRCO is able to break into its clients' systems when performing penetration testing, which illustrates the need to tighten security. Hackers are usually working within a system six to 12 months prior to detection. People do not have the necessary expertise to complete an adequate incident response, and thus SIRCO's services and skill-set are required. Mining companies have high-risk data that can affect market trends and thousands of people, however the mining industry is still far behind regarding cyber security. Companies must be proactive in dealing with cyber threats.

How is SIRCO using innovation to solve the problems its clients are facing?

SIRCO is always seeking new solutions to problems, often in collaboration with international partners. We are currently developing site control tools with partners in Europe and the Middle East that will allow customers to control all objects on site remotely and cost-effectively. We are also developing advanced tools to detect and control drug use with an Australian partner, as well as improving cyber security by encrypting data and remote-control signals.

What advice would you give to the mining industry regarding security?

Security issues, whether internal or external, do not go away. You need to address them, and although they are not always high on the list of priorities, it is vital you stay on top of them before they turn into major issues. SIRCO provides its customers with answers to questions on numerous subjects, meaning their risk becomes our risk. ■



Andrew Wilkins

Vice President -
Business Development and Marketing
**DISTRIBUTED GAS
SOLUTIONS CANADA (DGSC)**

DGSC works with mining companies to provide customized supply solutions for distributed Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG) across Canada

Distributed Gas Solutions Canada (DGSC) was established in 2017. Can you introduce the company and explain the circumstances surrounding its creation?

DGSC is a partnership that was created by three company partners: Hydromega Services, a Montreal-based independent power producer experienced in the development of renewable energy projects since 1987; Galileo Advanced Solutions, the U.S. based commodity supply chain arm of manufacturer Galileo Technologies, which has been in the natural gas treatment, compression, and liquefaction business for 30 years; and QuébecCity-based Groupe Desgagnés, one of Canada's leading marine transportation service companies operating since the 19th century.

DGSC's business model leverages Galileo Technologies' proven compression and liquefaction technology. We offer turnkey liquefied natural gas (LNG) and compressed natural gas (CNG) supply solutions for industrial and transportation end-users in Canada that are not served by the pipeline infrastructure. Galileo Technologies developed a unique modular and scalable micro-liquefaction technology in 2014 and currently has 30 units in commercial operation globally.

Why should mining companies consider a transition to natural gas as their energy source?

Mining companies are increasingly concerned about the environmental and economic costs of diesel fuel use, especially with government-imposed carbon reduction legislation on the horizon. DGSC's modular, mobile and scalable compression and liquefaction technology can make LNG/CNG supply available to end users in remote areas of Québec and elsewhere in Canada. We produce LNG/CNG as close as possible to our clients' operations, which reduces risk, emissions and costs associated with the transportation of LNG/CNG to where it is needed. We are able to optimize the CAPEX and supply chain within our turnkey solutions to offer the most economically competitive LNG/CNG delivered directly to mining sites.

How can LNG help with energy storage for mining operations?

If you take 600 cubic m of natural gas from a pipeline and it is liquefied, the same energy is condensed into 1 cubic m. Thus, there is a benefit of liquefying natural gas for storage

and transportation purposes. At the client site, the LNG is stored then vaporized back into a gaseous state to power Gensets, trucks and other industrial equipment. For mining trucks there are LNG conversion kits available that allow for LNG storage on the truck itself, and the gas is vaporized to fuel the engine. Currently, there are less than half a dozen LNG production facilities in Canada, which is clearly insufficient. DGSC's micro-liquefaction technology allows for distributed LNG production in many locations across Canada.

What are the environmental and cost advantages of natural gas compared to traditional fossil fuels?

CO2 reductions of up to 25-35% and Nitrous Oxides (NOX) reductions of over 70% can be achieved, depending on which fuel is being displaced. There is a virtual elimination of Particulate Matter (PM) and Sulfur Oxides (SOX), which are air pollutants that cause smog and human health problems. North American natural gas reserves are vast, and the price is relatively low and less volatile than crude oil-based fuels. Diesel fuel rack pricing was approximately C\$21.50/gigajoule (GJ), whereas natural gas was approximately C\$5.50/GJ in Montreal in November. At the moment, there is some general lack of awareness of the benefits of natural gas and available "Off Pipeline" solutions. Industry associations and the private sector have some work to do to ensure end users have accurate information when selecting fossil fuel energy for their operations.

How significant are the initial CAPEX costs of installing LNG technology on a mine site?

If it is an existing mine in operation, there are costs associated with equipment retrofits. However, mines in development should carefully evaluate the LNG option, even those that are pipeline connected to fuel trucks. There is a mine that will be online next year in northern Canada that has purchased dual fuel engines that can run on diesel or natural gas. The delta cost between a multi-fuel and a straight diesel fuel engine was less than 2%. We are currently in discussions with a number of mines to ensure they are aware that DGSC can supply them with LNG by truck, by ship and eventually by rail, no matter where their operations are in Canada. ■





Services

“Creating new concepts and techniques within the mining industry can change the playing field and pave the road for more and better discoveries to be made.”

- Michel Champagne,
President & CEO,
Sidex

Services

Engineering and consulting

While the innovations dragging the mining industry into the twenty-first century come from companies of all sizes, the movers and shakers in the engineering and consulting space in Québec have a decidedly international footprint.

As service companies in the mining industry go, few have a global reach that compares with SGS, with 14,000 of its 95,000 employees dedicated to the minerals sector, 2,400 offices and laboratories around the world and operations in 14 locations across Canada. SGS' newest sample preparation facility opened in Val-d'Or in July 2018 and is being used as a base for its geological consulting services, an area that SGS intends to expand in 2019, according

to Daniel Leroux, global business manager from SGS' Blainville office in Québec.

SGS plans to launch a new service within its geochem business line by March 2019, which will include on-site quick-testing capabilities, providing rapid information feedback to geologists so that they can make quicker decisions. Lawrence Ng, SGS' VP of minerals, highlighted the mini flotation pilot plant capabilities that SGS is adding to its existing pilot plant-testing expertise: "Mini flotation pilot plants deliver the same quality of engineering data as a large-scale pilot plant but only require a fraction of the sample volume typically required, saving substantial program costs," he stated. This service will be completed at any of SGS' metallurgical facilities in Canada, or at its client's projects across North America. A theme of consolidation became apparent in the engineering, procurement and construction management (EPCM) space during the downturn, as companies looked to expand their service offerings through M&A activity. One such case was DRA Global's acquisition of Montréal-based engineering firm MetChem in 2016, boosting DRA's lithium and graphite capabilities and adding a mineral resource and geology group to its portfolio. Daniel Gagnon, senior VP of mining, geology and Met-Chem operations at DRA Global, had been with Met-Chem for 19 years before the acquisition. He commented of the efficiency of the transition, due in part to a shared, hands-on philosophy and focus on innovation.

DRA Met-Chem is working with Nouveau Monde Graphite on its Saint-Michel-des-Saints project – the first-ever, all-electric, open-pit mine. Gagnon recounted Met-Chem's early-stage involvement as part of Nouveau Monde's task force committee: "We discovered that all the required technology and machinery existed and had been utilized in various other projects, but had not yet been brought together for one operation." The Saint-Michel-des-Saints graphite project, an important milestone for the global mining industry, is due to enter into production in 2021.

Stantec, the Canadian engineering and environmental services company with 22,000 employees globally, has grown its Québec operations through two acquisitions in recent years, the first being the acquisition of Dessau's engineering assets in 2014, followed by Saguenay-based Cegertec in 2018. Kirk Morrison, Stantec's executive VP, touched on the benefits of having expertise and experience in a wide range of sectors: "Stantec is well placed to take advantage of the cross-pollination that is starting to happen between the power and mining industries," he stated.



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LN: Vice President Minerals Canada

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LN



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SGS is a leading inspection, verification, testing and certification company

Can you provide an overview of the range of service SGS offers the mining industry?

DL: SGS offers an extensive range of services that cover exploration, plant design and engineering, production, industrial applications, decommissioning and closure. As a strategic industry partner, we can provide testing services, technology, trade services and consulting to help mining companies optimize their operations. At the exploration stage, SGS can assist with exploration planning, geochemical testing, NI 43-101/JORC compliant mineral resource estimations for various commodities, geometallurgy, scoping studies, mine audits and machine learning services.

Which of SGS's services has been the most popular in the Canadian mining industry, and how has the demand evolved in recent years?

DL: In Québec, SGS Geological Services (formerly known as SGS Geostat and globally recognized for its expertise in 3D geological modeling and resource evaluation) have been in very high demand. This service brings the disciplines of geology, geostatistics and mining engineering together to provide customers with accurate and timely mineral project evaluation solutions. We service customers across the board such as government institutions, companies coming into construction such as Nemaska Lithium, gold-focused juniors such as Eastmain Resources and others.

LN: Pilot plants and test work capabilities such as mineralogy and metallurgy required to extract lithium have been in high demand. Since the exploration market is also regaining strength, there is an increased need for quicker turnaround times. SGS has mobile sample preparation units, which allows us to assist clients on-site, resulting in the client having better control over the work flow, quicker turnaround times and significant cost savings.

How does SGS use innovations such as AI and machine learning to assist in exploration?

DL: In 2016, SGS Geostat won the Integra Gold Rush Challenge, based on its work applying machine learning and AI to the big data that Integra Gold provided to all the contestants. Since then, machine learning and AI have become a new business line for SGS, and we have been doing a significant

amount of work with regard to exploration prospectivity targeting. Many clients are looking to find new resources using machine learning, which allows them to justify the expenditure for drilling.

SGS' machine learning technologies are focussed on finding new ore bodies, evaluating risk and determining potential for mineral resource expansion rather than just optimizing operations. As new precious and base metal deposit discoveries become less frequent, mining companies must become more efficient with their exploration spending.

How does SGS deal with the challenge of attracting and retaining talent in Canada?

LN: SGS has a talent assessment program to establish the type of training we must provide to different employees. Through training, our aim is to retain employees and help them to create a career path within the company by creating an engaging environment. Attracting talent from outside the organization is always a challenge, and SGS has a talent acquisition team both locally and globally with an extensive network. Innovation also has a part to play – the automation of repetitive tasks allows our employees to focus on value added services.

What are SGS' vision and key objectives for the next 12 to 18 months?

DL: Since the sample preparation facility opened in Val-d'Or in July 2018, we have been using it as a base for SGS' geological consulting services, and we hope to expand this soon. SGS also aims to establish its Geological Services representation in Vancouver in 2019, as we believe that this could be a significant driver of growth. We have a proprietary licence for MMI™ (mobile metal ion) soil geochemistry, and we aim to expand our services in this field as well.

LN: SGS has developed a long-term business plan for 2020 that include optimizing services, gaining more market share and growing the business. We also aim to expand our service portfolio. We will be launching a new service within our geochem business line by March 2019, which will include on-site quick testing capabilities, providing rapid information feedback to the geologist so that they can make quicker decisions. We have also added mini flotation pilot plant capabilities to our existing pilot plant testing expertise. ■



Michael Gignac

VP, Controller

G MINING SERVICES

G Mining Services is a specialized mining consultancy firm that offers services to both underground and open pit mining projects from greenfield to operating mines

Can you highlight any milestone in the company's history since the founding in 2016?

We have grown from three staffers in 2006, to 70 employees and 150 expats on site in 2019. Our first mandate was from Orezone Gold Corporation to update the feasibility study for their Essakane project in Burkina Faso. We worked with Orezone during the construction phase and completed the project with IAMGOLD after they took over the project. We were able to deliver the project on time and on budget in 2010 for US\$447 million even though there was a change of ownership during construction. Essakane is still the largest gold mine in the country. Later, Newmont Mining contracted us to build a mine in Suriname, in which the Surinamese government invested 25% in the mine. The project cost US\$738 million, which was delivered US\$178 million under budget and a month ahead of schedule with all parties benefiting, including local citizens.

Can you provide an overview of your work at Fruta del Norte?

Currently, our biggest project is Lundin Gold's Fruta del Norte located in Ecuador, with a capital expenditure cost of US\$684 million. We began working on the project in late 2015 with Lundin Gold and have assisted them in reaching many project development milestones since. The project is going well, and first gold is expected to be poured in Q4 of 2019. Operating in Ecuador is exciting because it is a newly opened mining district and is attracting a lot of capital investment interest from mining companies. Since mining is a relatively new industry in Ecuador, we are helping to educate employees, contractors and various stakeholders on the intricacies of the mining industry.

You have chosen to move away from a EPCM contract model. Can you elaborate on G Mining Services' operational approach?

We operate on a self-perform approach. When we start construction, we create synergy between ourselves and our clients to ensure all information is shared and that resources are used efficiently. G Mining provides resources to cover certain aspects of a project, and the client provides various complimentary resources to reach mutually beneficial objectives. Our approach re-

places the common EPCM contract, which is a complicated legal agreement between project owner and contractors involving higher costs, duplication of resources in various departments and additional contracts.

With your global footprint, what proportion of the company's projects is located in Canada?

Canadian-based projects form 25% of our business with most of our services performed for projects abroad in Burkina Faso, Ecuador, the United States and Suriname. We are a net exporter of Québec mining knowledge to other regions and believe that Québec has a lot to offer to the global mining industry.

Where does G Mining see opportunities for growth?

Due to our experience working in Ecuador, we believe we can do well in other parts of Latin America. The region has not previously been significant for us, but we have been seeing more interest in our services from companies with projects in Latin America. So far, we have not put much emphasis on marketing and believe the mining industry could benefit from getting to know us better. With our latest experiences and contribution to an important project in Ecuador, we are hoping to see additional growth accordingly. The current increase in commodity prices is attracting more capital to the mining industry, which means more work for engineering and construction companies.

What differentiates G Mining from its competitors?

We are a Québec-based business with a focus on client satisfaction and long-term relationships. We boast strong leadership with extensive experience in mining companies. We believe our strength lies in the fact that we are focused purely on the mining industry where we have a strong experience and expertise. Safety is an integral part of our culture, and we apply the most stringent Canadian safety standards as well as ensure proper training of our staff – both on and off site. Our team also possesses the capability to adapt to different clients, commodities, mandates, climates, environments, cultures and unexpected conditions. ■

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The Montréal arm of Australian multinational EPCM company Ausenco is moving to a new office in 2019 to accommodate growth in the region. Ausenco's project delivery team in Montréal provides conceptual studies for clients such as Atlantic Gold at its Moose River Consolidated Gold project, an open-pit gold mine located 110 km northeast of Halifax, Nova Scotia. Marie-Andrée Morin, VP minerals and metals at Ausenco Canada, detailed the scope of the EPC contract that included the delivery of a 2-million tons per year carbon-in-leach gold-processing plant and associated infrastructure: "Working under a very tight schedule, we delivered the first gold pour, on schedule, in October 2017, 16 months after mobilization," she said.

Another engineering firm with Australian roots is Primero, which opened its North American headquarters in Montréal in 2017. Having developed a strong relationship with Galaxy Resources by working on its Mt Cattlin lithium mine in Western Australia, Primero was invited to work on Galaxy's James Bay project in northern Québec and decided it was an opportune moment to establish a North American base. Jacques Parent, general manager of Primero Americas, has witnessed the company grow from two employees to 22 in little over a year and hopes to triple those figures by the end of 2019. When asked to define Primero's business model, Parent responded: "We work from the standpoint of a partnership and prefer a client and engineer-constructor relationship, rather than a purely financial contracting endeavor."

Mining and engineering group Cementation, which also has a presence in Australia as well as the Americas and Africa, has worked with players like Falconbridge, Xstrata and Glencore and puts emphasis on the need for engineering to be more integrated into construction. "Getting involved in pre-feasibility, feasibility and peer review of the owner's plans is important to get an unbiased view of the budgets and schedule and a review by an experienced, reputable company," said Roy Slack, director at Cementation Americas. In 2018, after having worked on the project for 20 years through different designs, Cementation America was awarded the design and construction of the new internal underground shaft for the Onaping Depth Project at Craig Mine, which is part of Glencore's Sudbury Integrated Nickel Operations.

Commenting on the importance of a synergic relationship between company and client, Michael Gignac, VP at Montréal-based consultancy firm G Mining Services, points to the importance of ensuring all information is shared and that resources are used efficiently at an early stage of the project. "G Mining provides resources to cover certain aspects of a project, and the client provides various

complementary resources to reach mutually beneficial objectives," Gignac said. "Our approach replaces the common EPCM contract, which is a complicated legal agreement between project owner and contractors involving higher costs, duplication of resources in various departments and additional contracts."

Montréal-based Norda Stelo is a global company but prides itself on being "made in Québec," with 500 of the company's 700 employees based in the region. The company has grown through specializing in integrated projects and offers support to its client from planning to operations, with a special focus on brownfield projects. Adapting to 4.0. needs, VP Sophie Boisvert said that, "Automation and digitization is also becoming more relevant in the mining space

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Michel Robert

Marketing Director
MANULIFT

Manulift is the leading Canadian supplier of telehandlers and manlifts

Can you give a brief overview of Manulift and the evolution of the company?

Manulift was founded in 1976 and is a family business. Over the past five years we have doubled the business both in revenue and size. We are now approximately 250 employees based in four locations, Montreal, Québec, Toronto and Calgary. We also have approximately 26 sub-dealers to as to be able to extend our presence across country. We offer three equipment brands to the market, Merlo, Skytrak and Snorkel. Manulift is the largest independent distributor of Merlo equipment worldwide.

Can you elaborate on Manulift's business model?

Manulift is 100% telescopic and are specialized in what we do. We have many opportunities to distribute other type of products as we have a well established network in Canada, but we decided to stick to what we know, and we are the best in the market in terms of telehandlers. By focusing on only one type of equipment, we can offer the best brands to our clients and are able to provide specialized services. Currently we have 70% of the Québec market.

Can you give insight into Manulift's involvement within the mining industry?

When providing equipment to the mining industry, we have to adapt the equipment as to comply to their rules, regulations and demands. We have an engineering team and all adaptations and tailor made features are done in-house. We pride ourselves in the fact that our equipment is reliable, the machine is more compact, they can operate at a faster pace, the operator has better visibility and thus there is better safety and security, which is important in the mining industry.

Where does Manulift see more opportunity within the mining industry?

Over the last six months we have sold many units to the mining industry, which is significant. We believe that the mining industry is starting to see the advantage of using our equipment which opens opportunity for Manulift to further penetrate this market. ■

Louis Valade & Geneviève Rouleau

LV: President
GR: Communication Coordinator
MEGLAB



LV

Meglab designs, manufactures, and installs electronic and electrical equipment, as well as instruments and control systems, for the mining industry

Can you give a brief overview of Meglab and highlight some recent milestones?

Meglab was founded as an electronic shop in 1994. I joined the company, then consisting of six employees, in 2005, and brought the knowledge of the mining sector to the group. The company has seen significant growth and today we count 275 employees. Meglab has shops in five cities or towns in Québec and Ontario with approximately 20 engineers on our team. The company has a presence in twelve countries worldwide, including the United States, Mexico, Peru, Argentina and Morocco and Burkina Faso in Africa. Meglab is a one-stop shop, and we provide the entire package to our customers. We can design and install a complete communication system for a project and supply the electrical power while providing a support team to train and suggest opportunities to save costs.

Can you explain Meglab's partnership with Hytera and where you are headed with in the LTE space?

Hytera is known worldwide for their communication and surface installations. Due to their bandwidth capacity, we are able to share more data with the surface operations. Mines are evolving and they need more data to know what is happening underground immediately and continuously. Data can be accessed directly and remotely from anywhere. It is the first step towards the 5G.

What are Meglab's plans for the future?

Meglab is working on developing new products for the LTE implementation, as RF (radio frequency) cables, with UHF (ultra-high frequency) and VHF (very high frequency) signals need to be modified for LTE implementation. We have to develop new products that are LTE ready so we can safely and quickly send data from underground equipment and people to the surface. ■



Raymond Simoneau

VP and Co Founder
SENECA

Founded in 1997, Seneca is a Montreal-based industrial project and process engineering company

Can you give us a brief overview of Seneca and its role in the mining industry?

Seneca is a private engineering and consulting firm operating since 1997. We offer end-to-end services for developing industrial projects in Québec and internationally, and have a footprint in 15 countries. We're currently collaborating on a number of exciting projects in the extractive metallurgy and high-purification segments of the mining industry. These mostly first-generation projects are crucial for bringing value and for deploying mining operations. About 80% of our projects involve innovation, which can be a challenge to finance due to the risk perception. That being said, we are proud of our long and successful track record in risk management. We mitigate risk mainly by ensuring that we understand each project's technical fundamentals and applying our extensive expertise in industrial processing.

Is there a clear trend in the demand for Seneca's services and which technologies are being integrated into existing processes?

We are focused on becoming a market leader, but we still need to increase awareness of our brand and exciting solutions to further boost our reputation. We certainly have a talented and experienced team, but we first need to market ourselves and build trust within the industry.

Seneca excels at developing new process applications and implementing new technology in existing processes. For example, to reduce OPEX we may offer to develop sulfuric acid re-concentration loops, recover and recycle argon from plasma torches, process ammonium nitrate explosives or even build a specific molten salt electrolysis cell, to name a few. Our experienced team can develop and optimize industrial processes, conduct pre-project studies; build plants, and modify industrial installations already in operation. We have also added extractive metallurgy capabilities to our portfolio.

Mining companies are increasingly outsourcing their technical and engineering functions, and Seneca is primed to assist. We have found that companies are not really comfortable developing projects and prefer to outsource the engineering aspects to a specialized firm. This gives Seneca access to a lot more market opportunities because we offer the services that will help our clients reach their goals. In fact, Seneca is a project-centred firm and our clients can remain focused on production and

project deployment strategies.

What are some of Seneca's offerings to the mining industry?

Within the engineering and consulting space, Seneca offers a range of solutions, such as maintaining control of a project, and the financial consulting and planning aspects; defining what is needed to get the project to production; and operating the facilities. We excel in the front-end loading stages of complex projects. From the FEL study and support to financing, Seneca will then offer EPCM or even, in certain projects, EPC services. And then, this is where it gets exciting, we manage the process start-up and ramp-up to ensure a successful operation.

Our services aim to reduce client costs, either the OPEX or CAPEX, control risk and facilitate the process for obtaining funding and permits. The funding process is more difficult for junior companies than for mid-tier companies or major players in the market. From a technical standpoint, we help our clients, especially first-generation companies, navigate the funding process.

Sustainability has become integral to the mining industry. Can you elaborate on Seneca's work in this area?

Sustainability is central to Seneca's business and a huge driver for our products and services. We are in the process of deploying (financing is completed) the first automotive lithium-battery recycling hydropower pilot plant. Currently, 90% of our projects are driven by the sustainability factor, by either recycling or by improving yields. The entire Québec region is focused on sustainability, and the province's low-cost renewable hydro-energy resources offer great opportunities. We are always looking at how we can also integrate electricity, with good examples being the next magnesium smelter, and the upcoming natural graphite thermal purification demonstration and commercial plants.

What is Seneca's strategy and objectives going forward?

We believe our company's future is extremely bright and there is no limit to the market share we can capture. Engineering services are easily exported around the world. One of our company's key objectives is to continue building a reputable brand that clearly positions us as a market leader. We will also continue to focus on building first-generation, high-tech plants to support the mining industry. ■



Marie-Andrée Morin

Vice President Minerals & Metals
AUSENCO

Ausenco provides consulting, engineering, management and optimization solutions to the minerals & metals, oil & gas and industrial sectors

What is the significance of Ausenco's Canadian footprint in relation to its global presence?

Our Canadian footprint allows us to provide services to the Canadian minerals & metals, oil & gas and industrial sectors. However, we not only execute locally, but globally. Our teams collaborate with offices around the world, providing the right experts with the right experience and knowledge for the project at hand. We are currently working for a large number of Canadian based companies on study and execution projects located throughout the Americas, Africa and Europe. Some of our most significant headline projects globally over the last couple of years have either been located, or owned by companies based, in Canada.

Has Ausenco noticed increased optimism in the mining industry over the past 12 months?

Minerals and metals remains one of Ausenco's greatest strengths and a core business focus area, especially in Québec. We have remained focused and dedicated to the sector, in particular during the lean years, and have certainly seen an increase in optimism in the industry over the last 12-18 months, particularly in eastern Canada. Even though commodity price volatility has continued and the public equity market has been challenging as a result, companies appear to have recognized the benefit of de-risking their projects and we have seen a significant increase in study work year-over-year.

Construction decisions still depend heavily on the equity market and its contribution to overall financing plans, which has been impacted by the lack of appetite for significant new equity financings. The continued presence of "alternative" sources of financing such as private equity, streaming and royalty companies, coupled with a number of project finance focused institutions re-entering the market, appears to have fueled optimism. Challenges remain, and the scars of the previous cycles still loom, impacting the availability and cost of debt once the risk of cost overruns, schedule delays and underperforming process plants have been taken into account.

Can you describe Ausenco's involvement in the Moose River project in Nova Scotia?

Ausenco's latest success in Canada is Atlantic Gold's Moose River Consolidated gold project, an open-pit gold mine located 110 km northeast of Halifax, Nova Scotia. This is an exciting example of how we delivered a low cost plant under a fixed price EPC contract. Our involvement in the project began in 2007 with the completion of several studies. It was our value-driven approach and commitment to optimizing plant design and layout, demonstrated during the update of the feasibility study, that secured our work for the execution phase. The scope of the EPC contract included the delivery of a 2 mtpa Carbon-In-Leach gold processing plant and associated site infrastructure. Working under a very tight schedule, we delivered the first gold pour on schedule in October 2017, 16 months after mobilization. The plant was designed to produce approximately 90,000 oz of gold per annum, and in Q3 2018 continued to operate at 6,300 mt per day, in excess of design throughput.

How does Ausenco work to reduce costs for its clients?

We put a lot of effort into the optimizing of plants. We aim to reduce a plant's footprint as much as possible – the smaller the footprint, the less work goes into excavation and bulk quantities, which drives the cost down. We also aim to select a process customized for the specific needs of our clients' mine or "fit for purpose" for the orebody, which means applying the latest in innovation and paying attention to the maintainability and operability of the plant to drive optimized shareholder value.

Ausenco was named Canada's safest employer in 2018. What is the approach that contributed to this success?

We are incredibly proud of the award we won in the Mining and Natural Resources category at this year's Canada's Safest Employers awards. The award recognizes companies with outstanding accomplishments in promoting the health and safety of their workers. At Ausenco, we have six core values, one of which is "Safety in all we do." We have a very strong culture of advocating safety and have excellent health and safety tools and training. We are committed to Zero Harm, and our employees are dedicated to safety at work and at home. ■



Cheyne Poirier

Part-Owner and President
HYDROTECH MINING

HydroTech Mining specializes in the sale, design and production of pumping and dewatering systems for the mining industry

Can you give a brief overview of HydroTech Mining and the company's services?

The company was established in Val d'Or in 2016, and we have seen significant growth since then. We started with four employees and have grown to now be a team of 15. We are specialized in one field, mine dewatering, and we partner with other companies, such as water treatment companies, in order to complete our service offering. We offer dewatering services to all projects such as underground, open-pit and tailings ponds.

The company started by producing and selling our own brand of dewatering pumps, but increasingly we noticed that our clients demanded turnkey systems. We thus started to include custom design pumping systems according to the specific needs of our clients. We will go on-site as to see the operation, after which we will give the client a recommendation. We design, build and commission systems, and we also offer aftersales services to our clients. Today, custom design systems contribute approximate 50% to our business.

Can you elaborate on HydroTech Mining's customer base?

HydroTech Mining mostly provides services and systems to mid-tier and major companies within the mining industry. With regards to junior companies, we will do exchange programs where the client has one pump in operation, and we keep one in backup for them that can be exchanged if need be. We also support junior companies with consignment, and we will help these companies attain access to required equipment.

The company believes in service, and we thus have an inventory of approximately US\$2 million pumps in stock. We offer a 24/7 service and will deliver equipment to a client at any required time. Junior companies tend to live on the edge, keeping only the minimum that they need, and we will offer clients a quick response and turnaround on required equipment.

What are the maintenance requirements for HydroTech Mining's equipment?

Maintenance is very dependent on the client as well as the system. Some operations are harder on the equipment than others, but often we will see the maintenance is human induced, which means that mining conditions are rough and therefore our equipment has to be miner proof. We aim to make our equipment as robust as possible, using heavy-duty materials. Our aim is to minimize maintenance requirements on our equipment as much as possible.

What are some of the main challenges for HydroTech Mining in terms of operating in Canada?

Canada has very cold conditions, and there is always the possibility that the water will freeze. Underground temperatures are regulated, but the difficult applications are with open pits. We have to take this possibility into account not only on the pump, but also on the pumping line, which has to be adapted for very cold conditions. We also have to make sure that we are always able to move the water through the lines as stagnant water within the lines can significantly damage the system. We have to take into consideration that if a pump shuts down, there is a way to drain the lines, and thus pipe layout is very important.

Are battery driven pumps an innovation that will come to the mining industry in Canada soon?

In the cold conditions, battery power is only half and is thus not a great investment in the Canadian mining industry. Battery driven pumps will work more sufficiently in areas with higher temperatures.

Within the pumping industry, I believe that we will see a significant amount of innovation and advancement in terms of automation. Data gathering will be the next big step, and mining companies will be able to monitor and control their pumping systems remotely from an app.

What is the HydroTech Mining's vision moving forward?

HydroTech Mining has our own brand of submersible pumps, which means that we do not really have market limitations with regards to where we can sell our equipment. Our objective is to expand by developing a global distributor network across countries such as Canada, Mexico, Peru, Morocco and the United States. We also aim to continue developing our pumping lines so that we have more innovative products to offer. ■



Amélie St-Onge

General Manager
MICROMINE CANADA

Micromine is a leading provider of innovative software solutions that span the breadth of the mining cycle

Can you provide a brief background on the company and its role in the mining industry?

We were founded by a geologist with the primary goal to provide tools developed by geologists, for geologists. Over the course of our 33 years of experience, we further developed two other lines of products that support exploration geologists as well as mining engineers. Today, this means that we now offer three different software solutions: Geobank, Micromine and Pitram, which together cover the full spectrum of the mining lifecycle from exploration to exploitation.

Can you elaborate on the company's geographic presence?

We are headquartered in Perth, Australia with international offices around the world. Our Canadian head office is in Vancouver, and we are in the process of opening offices in eastern Canada, probably in Québec, in the upcoming six months. In addition, there is a U.S. head office in Denver; three other satellite offices in the states as well as some resellers in South America; and we are in the process of opening an office in Mexico.

Can you elaborate on the advantages of your local vendorship business model?

This has always been our model; every office works closely with HQ, but each location is independent in terms of national registration and workforce. It has always been very important for Micromine to have fully operational, international entities. The reason behind this is simply that the reality of our countries of focus are quite different – mining exploration in eastern Canada is significantly different from, for example, operating in Russia. If there is any problem, we want to be able to speak with the clients in person or over the phone while being in the same time zone. We have found that this approach is very valuable to our clients.

How many of your solutions are tailored for the specific needs of individual mines?

We have three different software solutions. The first one is Geobank, and to put it simply, it resembles an Excel or Access spreadsheet but on steroids. It is a vast database that can maintain an inventory of all the core samples and can be used by the exploration geologist or the labs. The software is user friendly, but we still make tweaks to adapt to clients' needs. We have a pretty big in-house team of Geobank support staff who can then build the necessary algorithm to make the software easier to use. Micromine is an extremely powerful and comprehensive tool, but it is also known for being intuitive and very easy to use. It has been integrated into the curriculum of several universities, and Micromine can be customized if needed, but most clients use the standard format. Pitram is our third software and is a fleet management solution for both underground and open-pit mines. As a fleet management solution, it is by default highly customized to our clients' needs. All three software solutions are continuously updated and further developed so that we can continue to provide tools that exceed our clients' expectations.

How do you attract the right kind of talent, in terms of AI and advanced IT solutions?

We collaborate with numerous Australian, Russian and Indonesian universities, and we are currently in the process of establishing the same type of relations in Canada. In Australia and Russia, we have not faced much challenge attracting the right talent – especially on the AI side of things.

Can you define what a typical client would be?

It depends on the product. Some junior mining exploration companies use Geobank and Micromine, as well as big project generators, active mines and consulting firms. Our client base is quite large and very diverse. For Pitram, our clients are all people who are actively mining and these are normally much bigger operations.

Where in Canada do you see the most opportunity?

By opening offices in the east, we hope to provide many more services to our clients based there. I spent a lot of time in Québec last year researching the market and found that there is a massive market gap that we have the right tools to fill. Conclusively, we see tremendous opportunities, and we are very excited to see what the future will bring in the east. ■



Daniel Gagnon

Senior Vice President Mining & Geology
DRA AMERICAS

Met-Chem is a wholly owned subsidiary of the DRA Group that provides engineering services to the mining industry

What were the circumstances that led to the DRA Global acquisition of Met-Chem in 2016?

Met-Chem was originally owned by US Steel, who started Met-Chem in the 1960s, with the purpose of providing engineering and construction services to the Mount Wright iron ore mine and its facilities. US Steel put Met-Chem up for sale in 2015, and there was interest from numerous parties. DRA subsequently acquired Met-Chem from US Steel as part of DRA's global diversification strategy. Met-Chem added a new and enhanced Mining and Geology division to the overall DRA service offering. Met-Chem also expanded DRA's footprint in the Canada with an office in Montreal. Additionally Met-Chem brought expertise in commodities especially Lithium to the DRA business in Canada.

How has the DRA acquisition affected business for Met-Chem?

Since the acquisition Met-Chem has seen an increase in demand for its services. We were considered too small to take on major projects however since the takeover this is no longer the case. There are 50 people in the Montreal office and additionally we are able to source external resources from Toronto, the USA, Australia and South Africa as required on various projects. This allows DRA to service customers all over the world on large-scale projects. The DRA name and reputation has enabled Met-Chem to attract customers that want to develop long term relationships, especially those who are looking for experienced companies in EPCM and operations management. Since July this year we have also rebranded to be known as DRA Met-Chem, which again strengthened our position being recognized as part of the global DRA business.

DRA Met-Chem is working with Nouveau Monde Graphite on the first ever all-electric open-pit mine. What has DRA Met-Chem's contribution been to the project?

We conducted the feasibility study for Nouveau Monde Graphite and have been in close collaboration with them from the very early stages. An all-electric, open pit mine operation, like this, has never been attempted before. From inception and throughout the process to date a large variety of organizations have been consulted on how to construct and operate a mine as unique as this.

DRA Met-Chem was invited to be part of Nouveau Monde's task-force committee for the project. Our task force operated "without boundaries" and discussed what would be required for this venture to be successful in relation to equipment and technology in an open pit environment. During our investigations we discovered that all the required technology and machinery already existed and had been utilized independently on various other projects. However, never before has these all been combined into one operation. The entire taskforce knew the project was possible, and we were all very excited to be involved in this important milestone for the global mining industry. The Saint-Michel-des-Saints graphite deposit should enter into production in 2021.

In 2017 DRA Met-Chem was awarded the pre-feasibility study for SRG Graphite's Lola project in Guinea. Do you expect to see more work from Francophone Africa in the future?

DRA Met-Chem is the go-to company in the graphite sector, and as native French speakers we have increased DRA's global capabilities and access to Francophone Africa. DRA has been very successful across the African continent and the increased presence in Francophone Africa is part of the natural growth and evolution of DRA. As for the Lola project; DRA Met-Chem were approached in 2017 to work on their PEA and mineral resource estimate and subsequently are currently performing a feasibility study on the project. DRA Met-Chem has also provided SRG with the maiden mineral resource estimate for its Gogota Nickel-Cobalt-Scandium project also in Guinea. Being the largest service provider of professional services to the mining industry on the African continent added certainty to SRG's projects. Our office in Montreal interacted extensively with our office in Johannesburg providing invaluable information to the delivery of the studies.

What does DRA Met-Chem hope to achieve in the next two years?

DRA Met-Chem is always looking to contribute successfully in increasing the return on shareholder value as part of DRA Global. Increasing our service offering and further diversification within the Canadian market is part of that strategy. ■



Dino Lombardi

VP
G4 DRILLING CANADA

G4 Drilling Canada is a drilling company providing surface and underground diamond drilling services

Can you give a brief company history of G4 Drilling and its strategy since expanding its offer to include surface diamond drilling services?

G4 Drilling was established in 2006, mainly operating in Mexico with an office in Hermosillo, Sonora. In 2009, we expanded into the Canadian market as well with our head office now being in Val d'or. At first, the company's main focus was supplying surface diamond drilling services to mining and exploration companies, after which we added underground diamond drilling services as well as RC drilling services to our portfolio. Our RC drilling services are mostly focused in Mexico, as there is not a great demand for that type of drilling in Canada.

Through the years, G4 Drilling has expanded significantly. We have added a R&D division that enables us to do most of the development on our diamond drill rigs in-house. We have also expanded into drill and blasting services for open-pit mines with the purchase of a company called CCL Drill and Blast. Through CCL we offer services in blast pattern design, the actual drilling of the holes, loading and detonation of the blast holes.

Could you elaborate on your different divisions?

G4 holding has 4 divisions: G4 Diamond Drilling, CCL Drill and Blast, G4 Energy and G4 R&D.

G4 Energy was a company that we developed when junior Québec-based companies were looking at hydrocarbons back in 2014. It was this division that did the drill holes on the Anticosti Island.

G4 Drilling puts significant emphasis on innovation. How do modernized rigs affect mine safety?

In order to make the rigs safer, one of the main aims is to keep people's hands out of danger. In the past, people were physically handling the diamond drill rods, but with innovation and automation, G4 Drilling has now incorporated mechanized robotic arms to handle the rods. Modernization has also allowed operators to be always isolated from any piece of equipment that is in rotation. On the environmental side, we are looking at systems to recycle the water required for drilling operations as well as separating drill cuttings from the water.

You offer drilling services across the mining board. Would you elaborate on the type of services you offer to each segment?

G4 Drilling's clients are both from the junior sector and major sector. We assist junior companies in exploring properties where no mines exist, and we also offer services to producing clients, which often is a combination of surface and underground drilling. In 2010, approximately 90% of our market was from the junior sector, but this has significantly changed over the years and today our market is 80% major miners and 20% junior exploration companies.

There has also been a geographical shift, and in previous years our rigs were split at 40% in Canada and 60% in Mexico, whereas today the split is 85% in Canada and 15% in Mexico.

Can you give our readers insight into G4 Drilling's manufacturing capabilities?

Our in-house development shop modifies G4 Drilling's rigs. The major rig components are bought on the market, mostly from Marcotte, but the rigs themselves are assembled in-house, and we also heavily modify some of the parts, specific to projects and requirements.

Where does G4 Drilling see the most opportunity for expansion, and how are these regions identified?

G4 Drilling will follow the mining sector. Over the last two years, it seems as if a significant amount of focus has been on countries that are safe mining jurisdictions. We have brought a significant amount of equipment from Mexico to feed the ever-growing mining industry in Canada, but we will not have a problem moving the equipment back to Mexico if the need arises. The company does see future opportunity in South America, and we will investigate expansion opportunities moving forward. We try to identify places where the demand outweighs the offer in terms of drilling services. We are not tied to one specific commodity as the same type of drilling applies to most commodities. G4 is a very lean management company, which gives us a competitive edge in the market. We pride ourselves on offering the best client services possible. For us, our people are our strength. ■

Image courtesy of Nolinor Aviation

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and Norda Stelo has a robotics division to service client's needs."

Equipment providers

As investors become increasingly surgical with their placements and technological innovation has transformed into an integral part of the sector, pressure on mining companies is steadily rising – and thereby companies along the value chain. Cost efficiency and productivity are decisive success factors, and service providers are expected to provide increasingly tailored solutions. Upon its founding in 2016, HydroTech Mining, which specializes in the sale, design and production of pumping and dewatering systems, started by selling their own brand of dewatering pumps but soon noticed that clients wanted turnkey solutions. "We will go on-site as to see the operation, after which we will give the client a recommendation," said part-owner and president Cheyne Poirier. "We design, build and commission systems, and we also offer after sales services to our clients. Today, custom design systems contribute approximately 50% to our business."



Similarly, Major Drilling – one of the world's largest drilling services companies primarily serving the mining industry – shifted its focus around the year 2000 from geographical expansion to specialized drilling. "Looking at our customer base,

we realized that numerous of our projects consisted of difficult drilling activities," said president and CEO Denis Larocque. "We saw that there was a niche market for specialized drilling services and then shifted our focus to this niche. We focused the

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Guy Tremblay

CEO
CMAC -
THYSSEN MINING GROUP

CMAC-Thyssen is a mining contractor and equipment manufacturer that offers a wide range of fully integrated services

Can you give a brief overview of CMAC and the company's operations?

CMAC is a mining contractor with special focus on underground turnkey services. The company has the expertise, equipment and workforce to provide services to all types of mining development and operations. With a team of almost 800 employees, we have the capabilities to manufacture and install underground infrastructure and we also offer industrial construction services, such as perimeter drilling, pre-splitting, blasting and vibration control, in addition to making underground subway tunnels and excavating hydroelectric stations. The solutions that we offer are tailored to each client's need and requirements.

CMAC will sometimes engage in partnerships as to add service capabilities to our portfolio. We have recently added two new products to our portfolio which is our Shaft Jumbo, and our Drilling Handling System (DHS), the latter is in partnership with RNP. We have already sold 70 DHS products and we are struggling to stay in front of the demand.

Currently, junior mining companies are struggling to attract investment and to find funding. Is this reflected in CMAC's client base?

CMAC has experienced that our services are not as much in demand from junior companies as they are from mid-tier companies in the industry. We do have junior companies in our client base, but there are very few. We believe that if it was easier for juniors to attract investment and find financing, we would have a significantly higher number of juniors as part of our client base. We believe that the market will recover and that it will again get easier for the junior companies to operate.

Is there a current trend with regards to the services that CMAC provides to the industry?

CMAC's services include blasting and drilling; underground infrastructure installations; excavation; Shaft sinking; and underground construction. We also manufacture three types of drills and have five different models. We started as a long-hole company, but over the last year, we have seen an increased demand for lateral development, and this is where most of our current revenues are coming from.

Can you elaborate on the training programs CMAC provides to the industry?

Training has been a big part of CMAC's success story. The company has invested significantly in developing a training program which teaches all the basics to be as proficient as possible underground. Within the training program we make sure that people follow their interests to achieve their goals. Our aim is to educate and train the workforce in order to respond to our clients' need and also to export the Québec expertise to other countries. We also heavily invest in our employee training as CMAC is committed to offering optimal services by focusing on quality and constantly striving to improve our methods and procedures. By training our manpower, we work on creating a workforce which in turn will benefit our operations and result in increased revenue.

Where do you see the most opportunity for CMAC in the coming years?

Geographically, I believe that the most opportunity for CMAC lies within Morocco and Québec. We are currently servicing major projects within these regions, but there is still opportunities in these regions that we would want to add to our portfolio. We believe that our services in the Northern part of Québec will expand significantly in the years to come, and our aim is to include all first nations in our training program in order to make them a crucial element in the mining industry. This will benefit the development of the industry in their territories, as well as create a bigger mining workforce.

Do you have a final message for our international readership?

CMAC has a high-performance management system which has been developed and implemented over the years. The system is based on four elements: workplace health and safety, work quality, equipment and productivity. Our workforce makes us proud every day by surpassing expectations and we believe our customers will be satisfied with the work we do with them and for them. We aim to provide the best possible services to our clients and we cannot wait to add more clients to our portfolio in the years to come. ■

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company on higher end services that were difficult, deep and remote, which requires significant expertise.”

Advancements in the service space is also an important factor in risk reduction. As pointed out by Dino Lombardi, VP at Val d’Or-based G4 Drilling Canada, the push for innovation and modernization is often towards safety and environment. “In the past, people were physically handling the diamond drill rods, but with innovation and automation, G4 Drilling has now incorporated mechanized robotic arms to handle the rods,” Lombardi said. G4 Drilling recently added a R&D division which enables the company to do most of the development on our diamond drill rigs in-house. G4 has also expanded into drill and blasting services for open-pit mines with the purchase of a company called CCL Drill and Blast.

Continuing the theme of specialization, Québec-focused Manulift has singled in on the telehandler market and doubled its business both in revenue and size over the last five years. The company now has approximately 250 employees based in four locations; Montréal, Québec, Toronto and Calgary. “When providing equipment to the mining industry, we have to adapt the equipment as to comply to their rules, regulations and demands,” said marketing and communications director Michel Robert. “We have an engineering team and all adaptations and tailor-made features are done in-house.”

Due to the need for increasingly specialized services, coupled with the overall volatility of the sector, outsourcing has also risen steadily over the last decades. Making use of external expertise means more flexibility for mining companies that have to adapt to seasonality and fluctuating commodity prices. Mining contractor and equipment manufacturer CMAC-Thyssen Mining Group has grown to 800 employees and offers turnkey solutions. CMAC’s services in-

clude blasting and drilling, underground infrastructure installations, excavation, shaft sinking and underground construction. “We also manufacture three types of drills and have five different models,” added human resources director Guy Tremblay. “We started as a long-hole company, but over the last year, we have seen an increased demand for lateral development, and this is where most of our current revenues are coming from.”

Another company strategy to separate from competition is to keep a large equipment fleet to lower client capex expenditure. Bird Construction is the contractor with

the largest fleet in eastern Canada, counting upward of 250 pieces of mining equipment. “Historically, a lot of our work was done for the iron ore mines in Labrador and Northern Québec,” said VP Anoop Singh. “We have nearly a 50-year history of working with the mines in that region. We have recently diversified to work on a lithium project in the James Bay region of Québec and for gold mines in the Abitibi region.”

Similarly, Montréal-based Entreprises Larry keeps a large rental fleet to lower costs for its client. Established in 1963, the com-

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CMAC •

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Steve Nevins

President

LOCATION MSN- VAL D'OR
(MEMBER OF LOU-TEC GROUP)

Part of the Lou-Tec group,
Location MSN is a equipment
rental and sales company
based in Val d'Or

■

Can you provide some company background?

Founded in 1979, Lou-Tec is the largest rental company for heavy machinery, equipment and tools in the construction, renovation and maintenance sectors for the commercial, industrial, institutional and residential sectors in Québec. Location MSN was established in June 2005 following a \$CA500.000 investment, by M. Steve Nevins. Today, we have some \$CA6 millions worth of inventory and have grown from three to 21 employees.

The mining industry constitutes a substantial part of your business. How much is geared towards your rentals?

The mining sector constitutes some 80% of our business. We rent machines but we also sell spare part and equipment. At present, 80% of our revenue comes from the rental part of the business. In addition to our Canada market we also have customers in the United States. We are able to sell and rent any quantities of machinery and equipment requested by our clients and this has put us in a very competitive market position. As mentioned, we have the advantage of a large machine and equipment portfolio, but we perceive service as the most important aspect of what we do.

As mining operations become more sophisticated, companies require increasingly tailored solutions. What are some recent trends in demand from the mining sector?

We have always offered big machinery but as of late the demand for heavy machines such as mobile elevated work platforms has really picked up. We also see a discernible trend in clients requesting very specific machinery that may be hard to acquire from one single renter.

That's what makes us different, we can count on our group of more than 80 branches. This allow us easily respond to more specific requests from our customers. Our model is to always accept the request and do our outmost to ensure the customer get the full range of equipment needed. We achieve this by having a large supplier network.

What does your client base look like at the moment?

Our clientele is very diversified, namely the mining, industrial and construction sectors. Our clients are very pro-active knowing precisely what they want, and they look for reliability and especially service. We operate across the board but currently small companies are opening up more opportunities for us. The market has of course been in a downturn the past few years but we have managed to remain profitable by adaptation both in regards to the companies we work with but also in the service we provide.

Where do you see most opportunity for Location MSN to grow right now?

We need to increase awareness of our model. Most people know that we do rental service but not necessarily also sell machines and equipment. We also have a special approach in that we never turn down clients even if we have to go to lengths to satisfy their needs. We see every client relation as a partnership rather than a one-off. In addition, we also do repairs and if our clients need training to operate the equipment we will help them with referrals to companies that offer the right type of training.

What are some of the key features of Location MSN that has allowed you to excel?

In this location we have three mechanics and one electro-mechanic and a \$CA6-million inventory. That is twice the amount of mechanics in comparison to our competition. This is how we provide a quality product and fast as well as efficient service. Our clients can testify to that the model works. During a period of reorganization, we rejected some projects as we knew that we would not be able to give the best possible service. High-quality service is what we do. ■

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pany focused on maintenance and repair services for the industrial sector in Québec. Today the company employs more than 100 people across our three divisions, which consists of air compressors and systems, compressed natural gas and natural gas heating and plumbing.

Logistics:

All-season access to remote locations

Projects that mine commodities are first and foremost infrastructure projects, and in extreme climates, the logistical components of a mining operation are of fundamental importance. A lack of all-season road access has been a significant barrier to the development of multi-billion dollar deposits, such as the Ring of Fire in Ontario. In Qué-

bec and the surrounding provinces, specialized air and sea travel services have become a vital part of the value chain.

Montréal-based global shipping company Fednav celebrates its 75th anniversary in 2019 and operates a fleet of between 100 and 115 ships. Tom Paterson, Fednav's senior VP for ship owning, arctic and projects, outlined that any mining project that requires shipping needs in-depth planning from an early stage: "New ports close to the mine sites must be designed in harmony with the mining companies' needs, in order to ensure maximum output and cost efficiency," he explained. Fednav ships approximately 2 million tons of base metal concentrates annually from various mines in remote locations across Canada and Alaska, such as Teck's Red Dog, Vale's Voisey's Bay, Glencore's Raglan and Ca-

nadian Royalties' Nunavik Nickel mine. Fednav also supplies these mines with all of their consumable materials, including fuel.

It is hard to compete with the growth rate of Axxess International; since it was acquired by Richard Gervais in 2005, the company has grown from two to 150 employees. The Montréal-based international freight forwarder and custom broker does brokerage in Canada and the United States as well as international freight. Due to the volatility of the freight sector, the company has adopted a model of 50-50 split between freight and custom brokerage. Gervais explained that the company got involved with the mining sector nine years ago through existing customers and see a lot of opportunity for growth as commodity prices start to rebound. "We started to develop relationships

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LOCATION MSN
LOU-TEC INDUSTRIEL

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LOCATION MSN specializes in the rental of tools and equipment. For several years we have significantly increased sales of parts, tools and equipment of all kinds. We also offer repair service in workshops and on construction sites. So we are a leader in our field. With all these services, we continue in the coming years, that our customers receive the same excellent service. Our priority is to bring constant improvement to the services offered.

Contact: Steve Nevins, President / Erik Frenette, General Manager / locationmsn@elb.sympatico.ca / location3m.com



Tom Paterson

■ Senior VP Ship Owning,
Arctic and Projects
FEDNAV LIMITED

Fednav is Canada's largest ocean-going dry-bulk shipowning and chartering group

■ Can you outline the role that shipping services play in the mining industry, and specifically the activity Fednav has in the region?

Mining and shipping projects are tied closely together, and any mining operation that will require shipping services needs in-depth planning from an early stage. For the shipping company, it is important to have adequate facilities to dock their ships, and therefore new ports close to the mine sites must be designed in harmony with the mining companies' needs in order to ensure maximum output and cost efficiency. It is vital that new docks are designed to take into account adequate water depths and are aligned with the prevailing wind conditions to minimize delays.

How does Fednav work in collaboration with companies during the early stages of a project?

When a discovery is made, the prospectors and developers usually contact an engineering firm to determine the feasibility of shipping from a specific location. Once a location is determined, the engineering firm contracts to survey the dock area and determines how to get the product there. We hope that the engineering firm consults Fednav on whether we would be able to ship from the location, how often, and if there are any downsides to the location. Northern Québec, for instance, is a very challenging place to ship product year round, as the formation of ice from December to June reaches about 1.7 m in thickness with shear zones reaching depths of up to 14 m.

What is Fednav doing to reduce its environmental impact, taking the IMO 2020 regulations into consideration?

Fednav has a zero tolerance policy towards ocean pollution. Today's biggest issue is the pending implementation of the use of low sulphur fuel in the world fleet. We made the decision not to fit open-loop scrubbers on our vessels, which transfer sulphur from the air into the water. Instead, we are going to be burning low sulphur diesel to power our vessels. We have worked hard at reducing the fuel consumption of our vessels over the last 20 years or so, with a real reduction of about 35% to 40%. Some of our modern 34,500 deadweight tonnage (dwt) ships built in 2017/2018 consume as low as 15 mt of fuel per day travelling at 12 knots, making our fleet very competitive. Heavy fuel will be a fuel of the past, and today's generation quite rightly expects us to do better and use renewable sources to reduce our impact on the environment. The electric, LNG or hydrogen-fueled autonomous ships of the future will happen; there is no doubt about this.

In 2018 Fednav was recognized as one of Montreal's best employers for the 8th consecutive year. What are the reasons that contributed to this achievement?

One of the main reasons for our success is that we have a young, dynamic team with a lot of experience based in Montreal, an area not well known for shipping. We employ well-educated university graduates and train them from a young age on how to excel in the industry. Fednav has a retention rate of about 97% as a result of trust and respect of the Fednav Owning family, robust internal policies that have been implemented over the years and the many opportunities we provide. Age is not a barrier to promotion. We encourage further education and pay for these further studies for the staff. In my opinion, one of the main contributors to the success at Fednav is the fact that our staff is given the best tools to work with, resulting in high quality work. This includes a well-maintained, young fleet of ships.

Do you have a final message for our readership?

Fednav has worked on every major mining project that has been developed in the north of Canada, and we can provide cost effective, tailor made solutions. Our track record speaks for itself – we have been operating in the Arctic for over 50 years and we have had zero pollution incidents. Fednav gives its customers the guarantee of getting their products to market as quickly as possible in pristine condition. We provide peace of mind to our customers, do not cut corners and have a strong management team that takes ownership and accountability seriously. ■



Image courtesy of Fednav Limited

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in the mining space and eventually decided to integrate it into our business,” Gervais said. “Today, Axxess works with both companies building mines as well as with suppliers, and we also assist in custom clearance.”

For many communities and mining operations in northern Québec, air travel is the only means of transportation due to a lack of infrastructure and extreme weather conditions that can reach -55 degrees Celsius. One of the airlines providing vital air services to remote communities is Air Inuit, collectively owned by the Inuit of Nunavik through the Makivik Corporation, which has been in operation for 40 years. Air Inuit services an area the size of France, working with mining clients that include Glencore, Canadian Royalties, Tata Steel and the Canadian government. Considering the extremity of the environment Air Inuit operates in, safety is paramount and has become the bedrock of the company. Pita Aatami, Air Inuit’s president and CEO, assured that his airline consistently looks to improve safety, and its record speaks for itself: “In 40 years of service at Air Inuit, we are proud to have never suffered any major accidents,” he stated.

Another airline with a specific focus on the mining industry is Nolinor Aviation, which offers services that include passenger transportation, cargo, hazardous materials, petroleum products and freight. Nolinor supports a diverse portfolio of mining clients of all sizes and covers all stages of the mining cycle, from exploration and production to mine closure. Nolinor is BARS (Basic Aviation Risk Standard) gold-certified and one of the only companies to offer real-time tracking of its aircrafts. Underlining its commitment to the mining industry, Marco Prud’Homme, Nolinor’s VP, mentioned some of the airline’s key clients: “Nolinor has worked for just about every mining project in the Yellowknife region, with one of our biggest projects being the Agnico Eagle mine and Baffinland Iron mine.”

Chrono Aviation began operations six years ago, and has worked with clients such as Nemaska Lithium, Osisko Mining, Stornoway Diamonds, Goldcorp and Rio Tinto. In 2019 it plans to add two more aircraft to a fleet that includes seven Pilatus PC-12s, two Beechwood 1900Ds, one Super King air 350 exec, one Dash 8, one Falcon 50 EX and two 737-200s. Vincent Gagnon, president of

Chrono Aviation, believes the airline competition in Québec is positive: “Our philosophy is that competition is healthy and it means that customers will get the best deals.”

Air Creebec and Propair are two Québec-focused airlines that have partnered in order to widen range of fleet, service offering and flexibility. “We have planes specifically dedicated to mining industry

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Pita Aatami

President & CEO
AIR INUIT

Air Inuit is collectively owned by the Inuit of Nunavik through the Makivik Corporation and has been in operation for 40 years

Can you provide an introduction to Air Inuit and outline how it works with mining clients?

Air Inuit is collectively owned by the Inuit of Nunavik, through the Makivik Corporation, and has been in operation for 40 years. We provide services to Northern Québec, where traveling by air is the only option because the area is isolated and there are no roads. The area that we service is the size of France, which is approximately 500,000 square kilometers.

For many years the Air Inuit has been working with clients from the mining industry. Some of our biggest clients include Glencore, Canadian Royalties, Tata Steel and the Canadian Government. We signed an impact benefit agreement in 1994 with Glencore where we are given priority for all types of contracts, and this has been very beneficial to the business. We have a fleet that includes combi and cargo aircrafts and we have been particularly helpful to companies doing exploration who sometimes need to land on water for their projects.

What sets Air Inuit apart from other aviation companies that serve the mining industry?

We pride ourselves on our high safety record. We take active steps in order to maintain and ensure safety for our customers as we meet every two weeks to discuss, assess and make improvements. We also meet with people on the ground and take suggestions as to how to better the Air Inuit experience. We invest much time and money into implementing these suggestions and improvements. In 40 years of service at Air Inuit we are proud to have never suffered any major accidents.

How have Air Inuit's services developed over the years, and are you looking to expand operations into new geographies?

We are now looking to fly to Nunavut, which is the newest territory in Canada – created in 1999. There is a mine on Baffin Island, generating activity, and we have been asked to do an RMF proposal to provide air services there. We also provide medical evacuation services, as well as bringing food, among other things, to the area. This is because almost nothing is produced in north due to the extreme conditions, reaching temperatures of -55 de-

grees Celsius; everything is imported from the south. The only exports from the north are the minerals.

What are some of the challenges facing airlines in Canada today?

Conserving the environment is a matter that is very important to us. The problem is that because of the presence of gravel airstrips, we still need to use older planes that may not be the most environmentally friendly, in comparison to modern aircraft used for standard passenger planes in normal climates. We have applied to the government to get newer planes and for the gravel airstrips to be tarred, so that we may use them and reduce our carbon footprint. Air Inuit's offices are all "green" buildings and we have been proactive to support the environment whenever and wherever possible. It is just a bit more difficult in some areas, as it requires a complete overhaul of technology and the improvement of infrastructure, which requires time as well as money.

Additionally, there is a shortage of pilots in Canada. The industry is always on the lookout for new pilots who can be trained and work for years to come. Air Inuit employs quality, experienced pilots, who are used to flying in extreme weather conditions.

Do you have a final message for the readers of *Engineering & Mining Journal* and *Global Business Reports*?

At Air Inuit, our main objective is safety. It is our promise to the customer and our reputation speaks for itself, as we have not had an accident in 40 years. Along with this, we ensure that our employees have a high level of job satisfaction, which is illustrated by the length of time our workforce stays with us – Air Inuit has a pilot who has been an employee for 33 years, with 15,000 hours of flying experience. Air Inuit stands out because of its expertise, deep knowledge of the region we operate in, and we have good relationships with the people in the region, providing fundamental help to the local community for decades and employing many Inuit people. All of these factors together have contributed to the great success Air Inuit has enjoyed over all of these years, and we intend to continue on this trajectory into the future. ■

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and frequently engage in partnership with mining companies in order to be of the best assistance with medical aid, transport or cargo,” said Propair’s president Étienne Lambert.

Matthew Happyjack, president and CEO of Air Creebec, continued, “Approximately 30% of Air Creebec’s clients are in the mining industry. We are mostly involved during the construction and production phases as we can transport employees and contractors to the mining sites. As mining sites are often times located in very remote areas, there is a significant amount of opportunity for us to offer our services to them.” The two companies emphasized the importance of having pilots who are used to flying in the sometimes extreme conditions of Québec. “Many of our pilots have over 20 years’ experience flying to the same destinations, which contributes to the safety aspect,” Happyjack said.

Air travel is, of course, not limited to planes, especially for mining companies looking to reach deposits located in rough terrain far away from a landing strip. Québec City-based Gohelico is home to the biggest helicopter hanger in North America and has a fleet of 12 helicopters. Yves Côté, sales director, provided an overview of Gohelico’s services for mining clients: “Gohelico services junior exploration companies, mid-tier producers and major mining companies, mostly transporting employees and environmental surveyors to and from sites.” As the need for remote service providers increase, Sirius Wilderness Medicine has developed an expertise in medical services in hard-to-reach areas. Founded as a wilderness first-aid educational company in 1990, Sirius has expanded its model to include medical support services, training and consulting for companies in developing emergency response plans, health and safety programs, as well as health promotion programs. “Sirius provides extra paramedic

training to enable our responders to implement a different kind of care to what they are used to in an urban setting,” said project director Yannick Sislá. “When they are at remote sites, they are typically regarded as the main medical resources and support.”

As new mining regions are opening up in remote areas with sparse infrastructure, companies are increasingly in need of logistical solutions with short turnaround time and flexibility. Sprung Structures has designed and patented a fabric membrane technology that delivers rapid construction capabilities, total design flexibility, exceptional durability and longevity and lower

overall project costs. “Large mine sites that we work with, such as Rio Tinto, value the product because they can install them in remote areas and never have to worry about them again, whereas conventional structures require routine maintenance,” said Tom Lloyd, regional business development manager. Sprung Structures operates in 120 countries with its Canada offices located in Toronto and Calgary. The structures are suited for Canadian climates as the product is insulated as part of the manufacturing process. “The standard sprung will operate, from energy efficiency standpoint, at 50% of the cost of standard conventional.” ■

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Marco Prud'Homme

Vice President
NOLINOR AVIATION

Nolinor Aviation is a charter airline based in Montréal that operates passenger charter and cargo services

Can you provide an introduction to Nolinor Aviation, and outline the services it offers the mining industry?

Nolinor is based in Mirabel, near Montréal, and has been in business for over 25 years. We offer customized air transport solutions, with a specific focus on the mining industry, which accounts for 90% of Nolinor's business. We offer services that include passenger transportation, cargo and a combination of both, as well as hazardous materials, petroleum products and freight.

We operate two types of aircraft: Convair 580; Boeing 737-200 and 737-300. We also have other divisions: Vinci Aviation, which does corporate jet charters with leer jets; and Corpo Aviation, which does runway flights with small Pilatus PC-12 aircrafts. Other customers include the Montréal Alouettes and Toronto Argonauts football teams, coast guards, correctional services and the United Nations. However, Nolinor is the only carrier in Canada that prioritizes mining clients to such an extent.

Does Nolinor work exclusively with major mining companies?

Nolinor supports a diverse portfolio of clients of all sizes in the mining industry, covering the full range of stages throughout the mining cycle, from exploration to production to mine closure. We cover the first flight with equipment, and then once the project is in the drilling phase, Nolinor provides the fuel. Following this, we cover things to do with lodging, food and the employees themselves. Over the life of the project, we bring the cargo and fly those working in and out. At the end of the life of mine, we take everything back. Nolinor has worked for just about every mining project in the Yellowknife region, with one of our biggest projects being the Agnico Eagle mine and Baffinland iron mine.

What advantages does Nolinor provide that make it stand out from other carriers?

We offer a service that is on time, and we have a remarkable safety record. We can do both passengers and cargo, and different variations of this. Nolinor also offers a niche service in that we transport bulk fuel. We are integrated with our customers and actively ensure that they have the best possible experience. Every year, Nolinor improves its safety, and we are BARS (Basic Aviation Risk Standard) gold certified. We embrace technology in any way that we can. For example, Nolinor is one of the only companies to offer real-time tracking of its aircrafts. We invest a lot of money into the maintenance of our aircrafts and the training of our pilots.

There is a worldwide shortage of pilots and a high rate of employment in Québec. How does Nolinor deal with the recruitment challenge?

At Nolinor we have introduced the Devenir Pilote program, which offers training and funding to aspiring pilots. We received twenty applications and currently have two people training with us, on the way to becoming fully licensed pilots. We believe the program will generate one to two new pilots every year, which is fantastic. However, we find that the industry is stagnant when it comes to new, more environmentally friendly aircrafts. We are always closely monitoring the situation and would be happy to be part of a new design that reduces omissions.

Looking ahead, what is Nolinor's strategy for growth in the mining industry?

Happily, business has been steady over the years and we know that new projects take time and that having patience in waiting for them is key. We are doing more R&D and will continue to innovate where we can.

Do you have a final message for our readership?

Many people believe that a successful airline is just about having the right type of aircrafts and keeping a tight schedule. These components are crucial, but there is so much more to it. At Nolinor, we also prioritize new ideas and systems that make working with customers more efficient. We recognize that liquidity is important, and we remain passionate in all circumstances. That has been the key to Nolinor's success, and our commitment to the mining sector will ensure we continue to serve the sector to the highest standards for years to come. ■



Yannick Sisla

Director of Projects

SIRIUS WILDERNESS MEDICINE

Sirius specializes in medical support personnel, telemedicine, medical direction and supervision, and consulting for companies in developing risk management plans, emergency response plans and health and safety programs

What are the challenges faced by medical personnel operating in remote areas?

When paramedics work in urban areas, they work within a specific scope of practice and are used to transporting a patient within 10 to 15 minutes. In a wilderness or remote setting, paramedics will have to care for patients over a longer period as many of the sites are only accessible by helicopter or plane, which may take 6 to 10 hours. The main difference is thus long-term versus short-term patient care. Sirius provides extra paramedic training to enable our responders to implement a different kind of care to what they are used to in an urban setting. While they are

at remote sites, they are typically regarded as the main medical resources and support.

Can you elaborate on Sirius' telemedicine services?

Telemedicine is a technological tool that allows remote health services to be provided to workers working in isolated areas and in absence of on-site medical support personnel by providing access to a medical practitioner. Information is provided through the electronic platform for a healthcare practitioner to evaluate a condition, make a diagnosis, propose treatment and suggest follow-up or a specific intervention. The means of communicating information in telemedicine may vary according to the quality and availability of the modes of communication, but include telephone calls, e-mail consultations and photos or videos. An app is also available to provide users access to digital medical tools such as bluetooth stethoscopes. These medical devices are plugged into a computer system and a remote medical assessment of the patient can be done to better provide advice, prescriptions or treatment. ■



Tom Lloyd

Regional Business Development Manager

SPRUNG STRUCTURES

Sprung fabric buildings adapt from prefab temporary modular buildings to permanent portable building structures

What is a key advantage Sprung Structures offers over its competition in structures?

The main difference between us and our competitors is that we are an alternative building solution and our entire sub structure is made from aluminum which is used for many reasons. Aluminum is light weight, has an extended life-span, no welding is required, it strengthens over time and it is flexible in high winds and heavy snow loads.

Who are your key clients in the mining space?

We work with everyone but tend to avoid junior companies. They tend to explore sites and sell out before development, so longer-term investment in quality structures isn't a priority. We supply products that are intended to last upwards of 50 years and can be relocated or deconstructed

and sold. We deal with major gold mining companies including Goldcorp, Rio Tinto, Barrick and Québec Iron Ore.

Please elaborate on the insulation properties of your products?

The aluminum subframe goes up first, and we build a channel for our membrane inside the aluminum beams. Most competitors wrap the membrane on the outside of their beams, but we insert the membrane into our beam from one to the next. The exterior membrane is then constructed, insulation inserted and the interior membrane, if required. The insulation fits between membrane and the beams, firmly fastened in place. It is best to avoid compressing insulation; when compressed, it loses its insulation capabilities. By keeping the original shape and not compressing, you get the best energy value out of it and that's what we do.

We vertically and horizontally tension our membranes, which means no maintenance. Our products are insulated as part of the manufacturing process, so insulation is guaranteed. We also have an air tight seal as part of our patent system, so the true energy value is very high. ■





Concluding Thoughts

“The mining sector plays a neuralgic role in Québec’s economy and in the dynamism of our regions. Our government relies on the significant contribution of this sector in a more sustainable economy, especially with regard to the challenges of energy transition.”

- Jonatan Julien,
Minister of Energy and Natural Resources

Concluding Thoughts

■ With gold constituting the bedrock of Québec's mineral wealth, the region is set to benefit greatly from rising gold prices in the coming decade. Yet, with cannabis and cryptocurrency diluting the investor wellspring, junior exploration companies struggle to attract the funds needed to generate new, large-scale discoveries. While key gold mining areas such as the Cadillac Break and the Abitibi Greenstone Belt are far from being depleted, and companies such as Osisko and Eldorado Gold bring new mines into production, Québec's mining sector has understood it needs to look beyond reliance on traditional gold mining to remain competitive. The government has already demonstrated its support of the mining industry, most notably with the economic development strategy, Plan du Nord, but also financial initiatives such as the 30% to 40% tax credit available for exploration activities. Québec also has the cheapest electricity in North America which is a

substantial benefit as mines move towards diesel independence. In an industry previously known for its conservatism, electrification, automation and digitalization are increasingly being embraced and contribute to higher efficiency as well as mine safety. Maybe most important for Québec, the industry 4.0 revolution could potentially solve the region's labor shortage while also shortening Québec's lengthy permitting processes by bettering predictive capabilities. However, this shift is still in a nascent stage and miners struggle to meaningfully connect digitalization to the unique circumstances and challenges of the industry. As new technology and software companies enter the market, there is — in the words of Drone Volt's CEO Martin Laporte — a need for companies to “play with open cards so we can understand their requirements and build the right tools to offer the best solutions for their operations.” The metals that underpin emerging tech-

nologies are also garnering the most investor attention and Québec is in a good position to ride the wave of future metals. The demand for electric vehicles is anticipated to exceed that of gas-powered cars already by 2030, and so far, China has been the quickest in securing a place on the future metals podium, controlling nearly half of global lithium production and 60% of electric battery production. China is also the primary global consumer of lithium. Eager





Image courtesy of Stornoway Diamonds

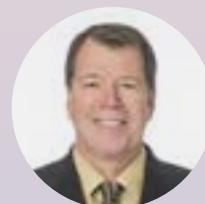
to reduce oil imports and counter the country's chronic air pollution, China represents nearly 40% of passenger EVs sold in the last decade. But Québécois firms are side-stepping Chinese autocracy to build their own future metals market, with Nemaska and North American Lithium leading the way. This opens the door for downstream processing possibilities and, as mentioned by Sayona Mining's general manager Jonathan Gagné, a group of lithium companies

is already detailing the plans to build a battery plant in Québec. Such initiatives would greatly benefit a region where electricity is cheap and lithium is drawn from hard rock which has strategic market advantages over lithium brine deposits. However, new market entries coupled with the race for supplies also entail risks. While the drastic uptake in production has been driven by skyrocketing lithium prices, an oversupply could just as easily entail a price plummet if companies

and governments make faulty prediction for future supply and demand. Lastly, Québec-based mining companies are bound to profit from the opening up of Canada's northernmost regions. Fueled by the construction and operation of new mines, economic growth in Nunavut is forecasted to grow with an average of 4.6% in the upcoming five years and Yukon's economy will also experience a boom, with two new mines set to open within the next five years. ■

“The days when a prospector made a discovery and went to a junior mining company that could move it up the ladder appear to be fading. These days, the bigger players acquire deposits or resources that have been de-risked by the smaller juniors, and go into development – they are not involved with the greenfield level and hence, don’t provide funding support at that level.”

**- John Langton, Associate and Senior Geologist
MRB & Associates**



“The exploration sector is a difficult industry by definition due to its business model. Exploration companies raise money and try to strike gold so to speak, however mining exploration is and will always be considered a risky investment. Although there has been some optimism surrounding the sector of late, the industry has had to compete with other high risk investments, notably cannabis and cryptocurrencies. These markets have attracted much of the investment we were hoping would return to the mining market.”

**- Patrick Vena, Damage Insurance Broker, VP
BFL Canada**



“Many senior employees will soon retire and, currently, there is inadequate experienced, competent personnel to take over these roles. This will result in increased interest in automation as less people will be required on the ground operating equipment. But the demand for experienced personnel will not disappear. The technology that allows one single operator to run numerous machines and equipment simultaneously already exists, but these machines still need to be serviced and maintained. Rather, a more accurate description of the phenomenon is a shift in qualification requirement – operators will become more maintenance oriented and less focused on operations.”

**- Dany Gaudreault, Business Development Director,
Mining and Indigenous
EBC Mines**





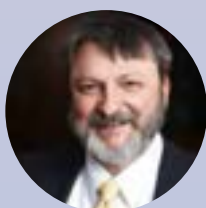
“Infrastructure in the mining industry is built in such a way that exploration must come first. There is no point in developing infrastructure around an area you are not sure will develop into a mine. Thus, exploration and the cost of exploration needs to be reduced and big deposits need to be discovered to develop surrounding infrastructure.”

- Dany Pelletier, VP - Capital Structure, Energy, Environment and Mine Fonds de Solidarité, FTQ



“The mining industry needs to be more visible in the media. I believe if the sector is more transparent, the public will have a better image of the industry, which would reflect positively on the industry’s attractiveness for investment. The mining industry has gone through significant positive changes in terms of environmental and taxation regulations and policies. Thus, creating awareness and a public image might make investors more confident about the industry.”

- Alain Bessette, Partner KPMG



“I personally think that the mining industry should be more aggressive about communicating to society the benefits of the industry to the market and to society. Educating the society about mining is one way to attract funding opportunities. The benefits that the industry offers need to be promoted and marketed to create awareness and interest within the investor community.”

- Eric Owens, President Granada Gold Mine



“The lack of adequate talent is the primary issue when implementing digital solutions in the mining sector. It is difficult both to acquire the talent and retain the talent. People will often be skeptical to the entry of new technology and often fail to see the potential of 4.0 solutions. It is important to understand that for Industry 4.0. to be beneficial, broad-ranging implications that touch on every aspect of an operation are often necessary.”

- Luc Poirier, Development Manager, Major Industrial Accounts Lumen



COMPANY/ INSTITUTION

WEBSITE

Association

Mining Association of Canada (MAC)	www.mining.ca/
Québec Mineral Exploration Association (QMEA)	www.aemq.org
Québec Mining Association (QMA)	www.amq-inc.com

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