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FUTURE PROSPECTS

Grade 7 students in Saskatoon learn about mine rescue at the Mining 4 Society event.

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COVER PHOTO
Young people are involved in mining at all levels, from exploration to production and reclamation, and are as crucial to the future of mining in Saskatchewan as our plentiful metal and mineral resources.
Photo courtesy of the Saskatchewan Geological Survey.

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Saskatchewan has long been known as a world-leading producer of potash and uranium, but once you scratch the surface, you see there is much more potential.

A MESSAGE FROM SMA PRESIDENT, PAM SCHWANN

FUTURE PROSPECTS

Recognized by the Fraser Institute as the No. 1 jurisdiction in the world for investment attraction potential, and more recently by the Mining Journal's World Risk Report as the top ranked jurisdiction in the world to invest resources capital, Saskatchewan's future for mineral development is highly prospective. Certainly SSR Mining's recent announcement that they will be investing $90 million in the next seven years underscores the potential for future gold prospects at the Seabee Mine camp, which has already been operating for over 25 years.

Future prospects isn't just about mineral potential though – it speaks to the mining sector across a number of fronts, and some of these are explored in this edition of ORE.

In innovation, future prospects revolve around increasing productivity while making continuous improvements to safety; on the regulatory front, legalization of marijuana raises a number of important workplace safety considerations for employers and employees that need to be addressed in a short timeframe; while the prospect of "green" electrification of the transportation system may lead to renewed momentum for our uranium mining industry.

In terms of workforce, the Tagging Along feature relates the benefits of a diversified skillset and working within multidisciplinary teams. I can attest that the future workforce of Saskatchewan's mining industry is strong, as dozens of students from the University of Saskatchewan's Department of Engineering and Saskatchewan Polytechnic Mine Engineering Technology program volunteered their expertise at the SMA-hosted, Mining 4 Society event that is described in this edition of ORE.

While ORE isn't going to the birds, the article on the Saskatchewan Bird Atlas will raise awareness of this important initiative while underscoring the importance of science-informed decisions in future resource development and how exploration and mining companies can help fill data gaps.

Mineral prospects may ultimately result in a mine development (although fewer than one in 10,000 mineral showings do), solidifying employment and business opportunities for Saskatchewan residents. The article on northern business development illustrates the economic and community development importance of mining in northern Saskatchewan. Particularly compelling is the success of indigenous-owned businesses in northern Saskatchewan and how they have evolved and grown their expertise over the past 30 plus years to become movers and shakers beyond Saskatchewan's borders and the mining sector.

At the end of the day, future mineral prospects are explored for and developed because people throughout the world need the products made from minerals. As the public often doesn't make the connection between what is mined with its end use, we want to tell this story better, so read on to learn more about Saskatchewan's Future Prospects.

FUTURE PROSPECTS

Saskatchewan's rich geological resources spur exploration and attract investment

Saskatchewan is known for its vast potash and uranium resources. Indeed, the province's geological formations contain 45 per cent of the world's potash reserves and the highest-grade uranium deposits thus far found on Earth.

While these two commodities are the backbone of the mined resource economy, Saskatchewan hosts many other metals and minerals crucial to the future of the province. Base metals such as copper and zinc are poised for a resurgence. Cobalt and nickel are important to a clean energy future, as components in car batteries and high-tech equipment.

The most beautiful metals and minerals are also found in this province. Gold is extracted from the Seabee mining operation in northeastern Saskatchewan; and diamonds glitter in the kimberlite at Shore Gold's Fort à la Corne property, not far from Prince Albert.

Lately, all of these commodities have seen an increase in exploration interest, but also investment interest.

Shore Gold, for example, has attracted a new partner — the giant global mining firm Rio Tinto, through its arm Rio Tinto Exploration Canada Ltd. Rio can earn a 60 per cent stake in the diamond property over the next seven and a half years through investments of $70.5 million (M).

"We are extremely pleased to partner with Rio Tinto to further develop the potential of the project," Shore Gold president and CEO Ken MacNeill said in a statement. "Rio Tinto is one of the few companies in the world with the resources and expertise to move forward with a project of the magnitude of the Star-Orion South Diamond Project."

Saskatchewan has also recently seen a massive investment in a greenfield potash mine by the German company K+S Group. The company's Bethune mine in southwestern Saskatchewan went into production this year.

Sam Farris, Vice-President and General Manager of Operations for K+S Potash Canada, noted that Bethune is the first greenfield mine in 40 years, creating hundreds of jobs and representing an enormous investment of $4.6 billion (B).

"For Saskatchewan in terms of the economic landscape, we're a direct employer of well over 300 people at K+S," he said. "You have to invest every year whether it's expanding infrastructure for your mine or maintenance – millions of dollars every year. There's an ongoing economic impact every year."

It was not only the deposit that drew K+S to Saskatchewan. Ulrich Lamp, CEO of K+S Potash Canada, said the company also chose to build here because of the legal and democratic system.

Farris said the stability of the long-term potash market was a big factor in deciding to commission the mine.

"The growth is there. I always compare it to the stock market or investing. You don't build a potash mine without a long-term outlook. Long term, there's a pretty stable year-over-year growth. That's the growth you have to target and not get caught up in when things go crazy like in 2008."

Another plus for K+S was the access to markets such as China, Brazil and the U.S. from the Saskatchewan location, he added.

"It's really significant in terms of the K+S landscape. It gives us access to markets and ore we've never had. We're a big part of the overall growth plan of potash."

While prices for potash have been a bit low lately, Saskatchewan producers have been shipping record volumes to their customers.

"The industry is well positioned and potash isn't going away," said Gary Delaney, Chief Geologist, Saskatchewan Ministry of the Economy. "It's important in many countries to grow the food you need to keep your population fed, and for that you need fertilizer. Long term, the outlook for the industry looks good. All the existing operations have done significant expansions over the last few years and now we have the new K+S potash mine going."

In addition, there are a number of other potash projects at various stages of exploration and evaluation, including the BHP Billiton Jansen project near Humboldt.

"There's a whole number of projects out there from BHP to some of the smaller ones. That falls out of the potash rush that started about 10 years ago," he said.

Uranium prices are also down, mainly due to oversupply and decrease in demand in part due to the impact of the Fukushima nuclear reactor incident in Japan after the devastating tsunami several years ago.

"Before that they had about 50 reactors online and only five have come back into service. They're going through a deliberate safety evaluation process before they bring more back into service, as well as looking at their future energy mix," said Delaney.

"But we're seeing a number of new reactor builds particularly in China. It's part of their strategy going forward which includes a mix of renewables and nuclear with less reliance on coal. Some other jurisdictions are looking at nuclear as well; certainly India has a need for nuclear power. And we have the world's two largest-producing uranium mines at McArthur River and Cigar Lake in the Athabasca Basin of Northern Saskatchewan."

> "The growth is there. I always compare it to the stock market or investing. You don't build a potash mine without a long-term outlook."
>
> **SAM FARRIS, VP AND GENERAL MANAGER, K+S POTASH CANADA**

There's been a number of new exploration successes in Athabasca Basin including both in the eastern part of the basin, where much of the historic production has come from, and more recently in the southwest where several new discoveries have been made including those of NexGen Energy Ltd and Fission Uranium Corp. The Fission project has attracted a 20 per cent investment from China General Nuclear Power (CGN), one of the two operators of nuclear reactors in China.

"Looking into the future, we believe China, with over 50 reactors operating or in construction, and many more planned, could be an important market for Saskatche-wan," said Delaney. "We're currently the second largest primary uranium producer after Kazakhstan, so I think it's fair to say we will be significant in that game going forward."

Garrett Ainsworth, Vice-President Exploration and Development for Vancouver-based NexGen, said the company's Arrow deposit has also attracted an investment of $110 M in convertible debt and shares from CEF Holdings Limited.

"They fully get the characteristics of the Arrow deposit. It's actually a deposit that will go into production."

NexGen has put out two resource estimates, one in 2016 and a revised one in March, 2017. In July, 2017, they provided the maiden preliminary economic assessment outlining the financial highlights and proposed mining methods, along with other details of the mining.

"The results that came back from that study put Arrow in a class of its own," said Ainsworth.

The indicated mineral resource at Arrow of 179.5 M lbs U3O8 from 1.18 M tonnes (t) of ore at 6.88% U3O8 includes a high-grade domain of 165 million pounds U3O8 from ore grading 18.9 % U3O8; but it's the remarkable aspects to the deposit — its location and formation — that also make it unique.

"Any step we can take that makes it a greener mine, we will do."

GARRETT AINSWORTH,
VICE-PRESIDENT EXPLORATION AND DEVELOPMENT,
NEXGEN ENERGY LTD

The ore zones are hosted in competent basement rock which can be efficiently and safely mined by long-hole stoping.

NexGen has a goal of commencing productions in 2023, and is planning a pre-feasibility study in mid-2018.

"We have very good metallurgy. The recoveries are 96 per cent. Because we're dealing with such a small volume of rock, because it's so high grade, instead of putting it into a tailings pond we're going to be putting it back into the mine as paste fill. There's no tailings pond at surface.

"Any step we can take that makes it a greener mine, we will do."

THE FUTURE OF PRECIOUS AND BASE METALS

The future of mining is shining for base and precious metals, as well as diamonds, and exploration continues in all of these areas to varying degrees, said Delaney.

"We have had a history of producing base metals in the past, particularly in the Creighton-Flin Flon area," said Delaney.

"We see significant potential for more base metal discoveries and potential production. There are a couple of advanced projects. In particular, if you look at the base metals, there's an area near the east central border of the province known as the Flin Flon greenstone belt, a Precambrian volcanic belt. The Flin Flon mine was historically a large base metal producer and much of that was in Saskatchewan. Some of the geoscience work we're working on going forward will be to profile the Province's base metal potential.

"We do also have Rare Earth resources, and most of them are north of Lake Athabasca. In the past, we've done some substantial research on that. People are continuing to look at those."

Lithium, graphite, cobalt and other smaller deposits are also seeing some interest and early exploration.

Delaney also sees gold exploration starting to ramp up. At the SSR Mining's Seabee operation, which has produced over 1.3 M ounces (oz) of gold, production has risen incrementally over the past few years. The Seabee operation, which includes the Santoy and Seabee mines, produced a record 77,640 ounces of gold in 2016, and the company expects production of 75,000 to 85,000 ounces in 2017.

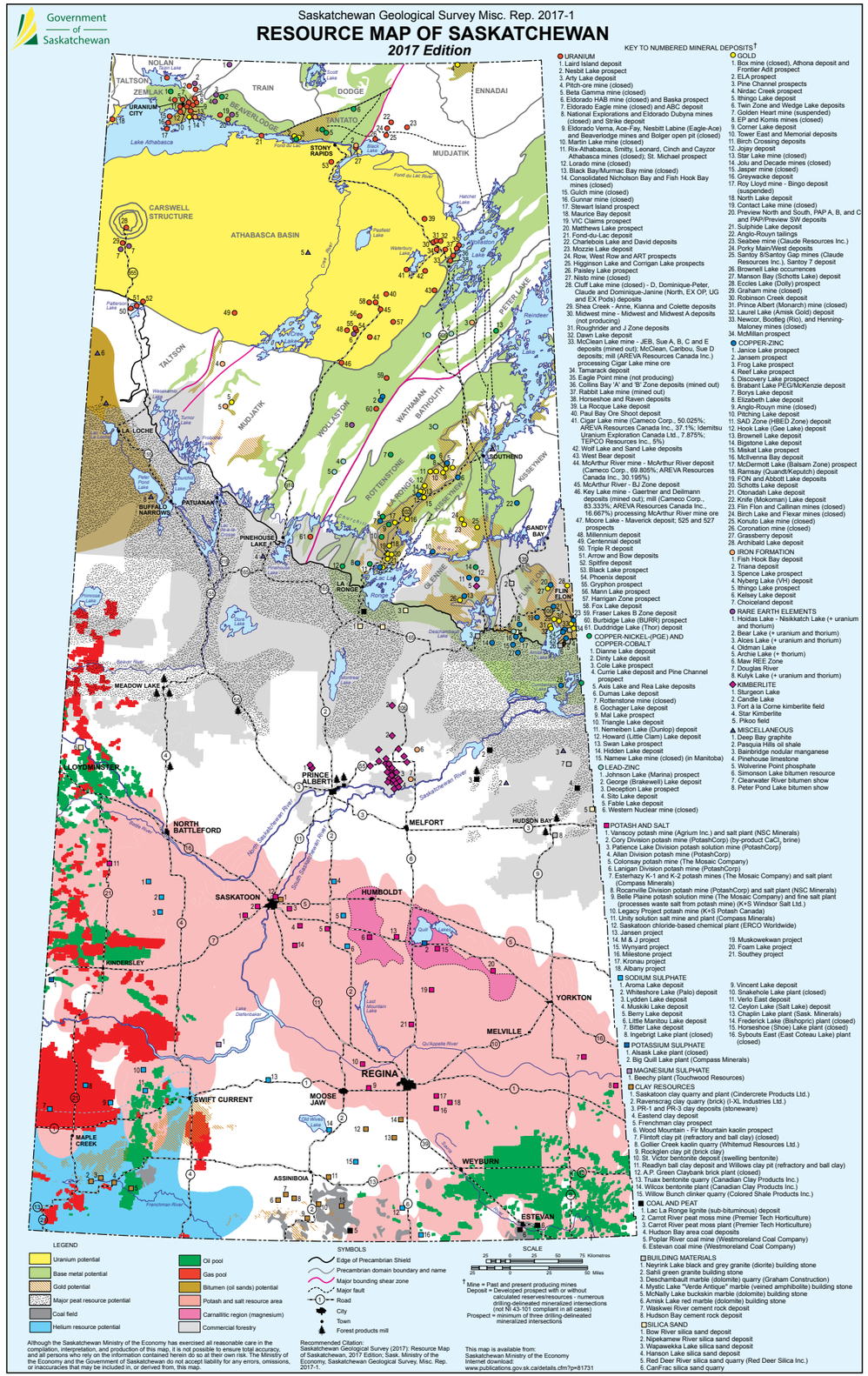
With proven and probable reserves of 360,000 ounces, SSR Mining is investing $90 million over the next seven years in production and exploration activity in the region.

"We have other companies like Eagle Plains Resources Ltd. and its subsidiary Teralogic Exploration Services looking at gold potential in the Seabee area," said Delaney. "There's quite a number of historical gold occurrences there. I wouldn't be surprised to see more gold coming out of that area."

Delaney believes Saskatchewan has a future in diamonds, as well.

"We do have a significant area of diamond potential literally stretching from Fort a la Corne into the Precambrian Shield where North Arrow Minerals have identified ten kimberlite bodies at the company's Pikoo project.

"We also feel there is significant other potential along that whole trend. I wouldn't be surprised if in the future it will attract more interest from more industry players."



INNOVATION PATHWAYS

New equipment and products take safety, environmental protection and cost reduction to the next level

DynaIndustrial's DynaBolter

Innovation is a very big word. It's usually understood as a massive change, a great discovery or a completely new product.

Sometimes, it is one of those three things. Consider the Goldcorp Inc. Borden mine near Chapleau, Ontario: a year ago, Goldcorp announced that Borden would become the company's first all-electric mine.

Its entire underground fleet of vehicles will run on electricity and battery power, eliminating emissions from the movement of ore and waste rock. Goldcorp will also use battery-operated drilling and blasting equipment, among other greenhouse gas-friendly equipment.

Without the incremental innovation that has occurred in electric vehicles and equipment improvements, however, this colossal project would not be possible.

Constant innovation is taking place in mining, and that includes Saskatchewan's industry. Innovations created by supply companies in consultation with mining companies are constantly improving costs, safety, procedures and the environment.

It's a perpetual part of the supplier-miner relationship, says Eric Anderson, Executive Director of the Saskatchewan Industrial and Mining Supply Association (SIMSA).

"If you look at anything SIMSA does, it always involves bringing our members face to face with the mining sector and their procurement people. That's so they can find out what these people need, so they can fill their requirements directly or know what needs to be made, what needs to be made better.

"Rather than shooting arrows in the dark, you talk to them, find out what they need, and bring back the solution. SIMSA is trying to facilitate that through our events with the mining sector."

Areas often addressed are innovations in safety, innovations in costs, innovations in environmental concerns and mining operations whether in the mill, underground processing or even maintenance, said Anderson.

"Anything the mining sector touches, our organization members try to make it faster, safer and more efficient. And through that, create more value."

One example of this kind of innovation is the DynaBolter, designed, engineered and manufactured by DynaIndustrial. It's a global company with 40 years of experience, and a location in Saskatoon.

The DynaBolter is a semi-automated, low profile, single-operator roof bolter that improves safety, increases efficiency and provides optimal versatility, said Victoria Rhodes, Director of Sales for DynaIndustrial.

"In the fall of 2009, we received a call from a local soft rock mine manager," said Rhodes. "He was looking for a roof bolter that was more compact, safer, and faster than what was currently being offered in the market."

The bolter is used to stabilize mine roofs, and the DynaBolter allows the human operator to do the entire operation from the safety of a vehicle.

"By exemplifying the best of design thinking, collaborating with the client and real-world testing at the mine site, the DynaBolter was created," said Rhodes.

DynaIndustrial is a fully integrated engineering, machining and fabrication company, specializing in large custom design/build projects, industrial equipment repair and medium volume production runs.

Park Derochie, meanwhile, has been seeking solutions for Saskatchewan potash and uranium mining companies in the area of coatings. In potash mines, for example, everything made of metal must be coated.

"From a coating perspective, the potash mine is very corrosive," explained Doug Barker, President of Park Derochie Saskatchewan and Vice-President of Park Derochie Canada. "Everything is rusting all the time. Based on our knowledge and our relationships with all the coatings manufacturers, we're seeing people reaching out to us."

The coatings based on former specifications aren't made any more, he said. Park Derochie brings in new products from all over the world and matches the coatings to the specific mine's requirements.

"There's also the coating selection," Barker added. "If you're putting a cheap coating on a tank liner with an abrasive mixture of slurry, you're going to have a train wreck. It's not like painting a wall in your house. There's a lot of moving parts, whether there's oil or water or slurry going through the line."

The company has seen growth every year from 2010 to 2017, with 23 per cent growth last year.

"For us it's been part of our growth, transparency and trust," said Barker. "We deliver a lot of products, systems and new technology. "

At Prairie Machine and Parts in Saskatoon, a hazard was eliminated when the company designed a safety device for potash boring machines. The machines create a cusp, or a V, of ore between the two circles cut by the rotors. A shaft in the gearbox drives a chain to trim the material; but often, the chain would get stuck. The safety pin would shear off and the machine would stop.

PMP developed a system eliminating the shear pin, whereby the machine operator is able to reset the device from his seat — avoiding all the dangers that go along with being at the mining face, like falling cusps. The device can be reset in just five minutes. It's not only safer, but a major time-saver.

AGI-Envirotank of Biggar, Sask., is innovating new designs of time-tested mining infrastructure. The company makes some of the largest tanks on the market, and creates them out of a huge plant that spirals out cylinders measuring up to 183 inches in diameter.

Its manufacturing specialty landed AGI-Envirotank a massive contract to create and install a potash mineshaft lining, similar to the original Blairmore ring that held back the shifting, wet underground in the early days of potash mining.

It was a three-year job to install 800 feet of a 20-foot diameter tank, and it was the first modern version of the ring since 1964.

Innovation, to solve problems and advance processes, improve safety and reduce costs, is alive and well in Saskatchewan's mining sector.

> "Anything the mining sector touches, (we) try to make it faster, safer and more efficient. And through that, create more value."
>
> **ERIC ANDERSON, EXECUTIVE DIRECTOR, SASKATCHEWAN INDUSTRIAL AND MINING SUPPLY ASSOCIATION (SIMSA)**

PLATINUM GROUP ELEMENTS AND COBALT

ORE DEPOSITS

Provided by Saskatchewan Geological Survey, Ministry of the Economy

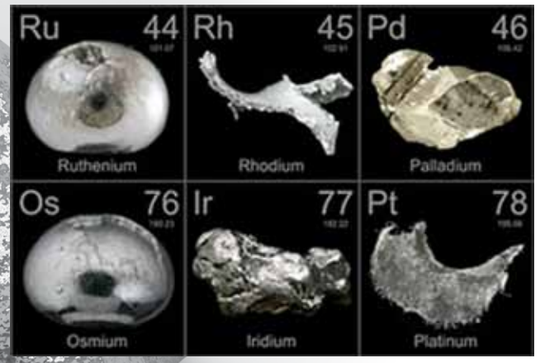


FIGURE 1: PGEs figure courtesy of *specialtymetals.com*

FIGURE 2: Centennial Wind Power Facility near Swift Current, SK. *Photo courtesy of SaskPower.*

The platinum group elements (PGEs) are six silver-white, noble, precious metallic elements (platinum (Pt), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), and osmium (Os); **FIGURE 1**) that tend to be found together in the same mineral deposits. These elements have important physical and chemical properties affording them high corrosion resistance, excellent high-temperature characteristics, and stable electrical properties.

Due to their excellent catalytic properties, the automobile industry has been the dominant consumer of PGEs since the late 1970s, using them primarily as oxidation catalysts in catalytic converters to treat automobile exhaust emissions (USGS, 2017a). PGEs are the most active and stable catalysts used in nearly all thermal and electrocatalytic processes, and platinum in particular is a critical component in most types of hydrogen fuel cells, which some view as the future of the auto industry (Kaufman, 2014). In addition to the auto industry, PGEs are used in jewelry, smart phones, aircraft turbines, medical implants, forensic equipment, chemical production, and much more. In fact, the International Platinum Group Metals Association estimates that one in four goods manufactured today either contains, or was manufactured with, PGEs. PGEs are most often produced as co-products from copper (Cu) and nickel (Ni) mines, with more than 80% of the 2016 global primary production (208,000 kg) coming from South Africa and Russia. The scarcity and resilience of PGEs means the industry relies heavily on secondary production, with increasing recycling rates and recovery efficiencies of up to 95% (IAP, 2017). In 2016, about 125,000 kg of platinum, palladium and rhodium were recovered globally from recycling (USGS, 2017a).

Historically prized for its distinctive deep blue colour, cobalt (Co) is a high-strength, magnetic, metallic mineral with a wide range of uses from rechargeable batteries, magnets, electric motors, generators and transformers to super alloys. The mineral's high temperature resistance, hardness and durability have made cobalt integral to the renewable energy sector, contributing to wind turbines (Figure 2), solar power panels, geothermal power plants, hybrid vehicles and gas/coal-to-liquid technologies (Cobalt Institute, 2017). Like PGEs, cobalt is primarily recovered as a by-product of nickel and copper mining. In 2016 over half of the world's cobalt production came from the Kinshasa region of the Democratic Republic of the Congo (54%), with lesser production from China (6.3%), Canada (5.9%), Russia (5.0%), Australia (4.2%) and other countries (24.6%). China is currently the world's largest consumer of cobalt, nearly 80% of which is used in the rechargeable battery industry (USGS, 2017b).

CO-PGE IN SASKATCHEWAN

In northern Saskatchewan cobalt and PGEs occur in Ni-Cu deposits in Precambrian mafic and ultramafic rocks such as gabbro. There are two general associations: 1) Ni-Cu mineralization with co-product PGEs occurring in concentrated sulphide deposits; and 2) PGE mineralization associated with minor disseminated sulphides (Rogers, 2014). The only historical production in the province was from the Rottenstone mine, a small but very high-grade Ni-Cu-PGE deposit that operated in the mid 1960s. The mine produced 40,000 tons of ore, averaging 3.28% Ni, 1.83% Cu and 9.63 g/t Pt-Pd-Au (gold), which occurred as semi-massive sulphides hosted in an ultramafic sill (Saskatchewan Energy and Mines, 1991). There are several other deposits of this type with historical resources located in a number of geological domains in northern Saskatchewan. Examples of these include: Nemeiben Lake (Ni, Cu); Gochager (Ni, Cu); Axis Lake (Ni, Cu, Co, Au, Ag (silver)); and Dinty Lake (Ni). The Peter Lake Domain, a large igneous province near Reindeer Lake, contains several occurrences of both Ni-Cu ± PGE-Co and PGE-dominant associations. Cobalt, which occurs as arsenide minerals, is also commonly associated with the uranium deposits in the eastern Athabasca Basin in northern Saskatchewan.

BUILDING A WORKFORCE FOR A GREENFIELD MINE

K+S "starts from scratch" to create 325-person team

Six years ago, the site of the K+S Potash Canada mine in southwestern Saskatchewan was literally a farmer's field.

Today, 325 people are employed at the Bethune mine, which opened officially in May after one of the largest construction projects in the history of the province. When the Saskatoon head office group is included, K+S now employs about 460 people in the province.

As the first greenfield potash mine built in Saskatchewan in over 40 years, K+S put forward a massive recruitment and hiring effort to find the right people for the many onsite jobs, from construction through to operations. They were building a workforce from scratch.

"The majority of the people were hired well in advance, and were engaged with all the commissioning work," explained Maryann Deutscher, Senior Manager, Human Resources for K+S.

"We did bring a few people over from Germany, about 20 subject matter experts, but most were pulled from the local market, either Saskatchewan people or Alberta people coming home."

Most of the workforce at Bethune live nearby — about 60 per cent in Regina, 35 per cent from Moose Jaw and five per cent from nearby communities like Bethune, Last Mountain Lake and Regina Beach.

By far the largest hiring push came in 2016, particularly in the first two quarters, with employment increasing by 100 as the company prepared for actual operations.

The variety of occupations is extensive, said Deutscher. The maintenance area employs a variety of journeyman tradespeople including welders, mechanics, instrumentation people and electricians.

Production requires mill operators who typically come from previous manufacturing heavy industrial settings, most with a minimum of three to five years of experience.

Also on the production side are employees running the railcar system, doing warehouse inventory, and providing functions that support operations including HR, procurement and logistics.

The lab is populated by science grads performing quality assurance, while engineers from many disciplines such as mechanical, electrical and civil are also on site, along with power engineers.

"Very important are our health and safety people," said Deutscher. "They typically come from an operations area but have taken significant training in safety."

Shifts at Bethune are comprised of four day weeks, ten hours a day, with the production staff working rotating 12-hour shifts, she said.

"The majority of the employees come in by shuttle bus from Regina and Moose Jaw. We have different shuttles for different shifts, and there are those who choose to drive."

Looking back at the hiring process, Deutscher said it was a huge undertaking.

"From our perspective, it was a significant amount of people to bring in and hire. They all have to be trained," she said.

"A large number of people went to Germany. Sometimes you have to go somewhere for training, but it's not too often you get to go to Germany.

"It was mostly to understand the mill operations. Our plant wasn't operating yet; in 2015 we were still in the build stage. We had an extensive training program, but nothing replaces hands-on experience which is what they got at the German plants."

German-owned K+S is an international mining operation, with 14,000 employees world-wide and more than 76 sites. Bethune is the company's first solution mine.

Instead of using boring machines to extract the ore, Bethune uses hot water to dissolve the potash into a brine. It is pumped to the surface, where it is dried and prepared for export.

Constructing the mine and mill was a colossal achievement, said Deutscher.

"Investment in Bethune is the single largest investment by a German company in Canada in many years. The enormity of the project is incredible," she said.

"The Titanic took 24,000 tons of steel; we have 35,000 tons of steel. We have six well pads," from which the drilling originates. "Each has 18 wells and nine caverns, the equivalent of 108 CFL football fields underground."

The employees have taken great pride in being part of something unique, massive and new, she added. It took a lot of time and effort to develop the right teams under the right supervision, but it's all going very well.

"The people who came on to work at a greenfield mine wanted to create something new that the province hasn't seen in 40 years," she said. "It has really been a case of everybody coming together and bringing their expertise.

"A lot of our recruitment relied on people saying it's a great place to come and work. We've been a 'best place to work' for four years, a MediaCorp top employer, which is incredible for a startup."

And it has also been positive for the surrounding communities. Employees are encouraged to do volunteer work, and K+S provides time off for those endeavours.

"There's a huge impact from K+S that wouldn't be there otherwise," said Deutscher. "That makes the people who work for us really proud."

K+S workers in the control room at the Bethune mine

eARTh

Wildlife artist brings natural beauty to McClean Lake camp

Gary Dennis Natomagan walked the trapline with his father when he was growing up in Pinehouse, Saskatchewan. Even as a child, there was an artistic spark in his mind. From the beginning, the natural surroundings and abundant wildlife of his boyhood and youth were etched in his imagination.

He combined his artistic talent with those wildlife images, and today Natomagan is an accomplished artist in many media: glasswork, carpentry, painting, carving, even burning images onto wooden paddles. His work is detailed, descriptive, and often haunting: imagine an elk bellowing in the dusk, or a loon on a quiet evening on the lake.

Recently, AREVA Resources Canada and its camp at McClean Lake were the beneficiaries of his talent. The pool room, a gathering spot for the staff, now features a 12 by 30 foot work painted in four days by Natomagan.

"I was working for Pinehouse Business North, a growing company here in Pinehouse," said Natomagan, who is also a commercial carpenter and painter. "They sent me to McClean Lake to do some renovations to their laboratory there.

"At the main camp, I saw this little poster there, that they needed an artist to paint little artworks on the windows; one of them had been done. I decided to do one of them. When I finished that one, I wanted to do another one. And another one."

He ultimately did them all. The first one was a deer; then he added other wildlife images, including an eagle, a moose, a loon and an elk. While working on the windows, he noticed a wall in need of some renovation, and perhaps decoration.

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"I asked them if they wanted a wall painted in the pool room. There was a lot of drywall patching on the wall, and they said sure, that would be nice."

He started by creating a water feature in the form of rapids, then added trees into the landscape. As he went along, he added hidden images of animals, tucking 20 images into the design including a horse, a mouse, a moose, an eagle, a buffalo, an elk, a bear and a polar bear.

He used regular house paint to create the mural. "I like working with that. It's easy to mix," he said.

There was no sketch, no grid, no detailed plan. Natomagan simply carried the design for the mural in his mind, and expressed it on the wall — in four days.

It's not his first or only large-scale venture. The town hall in Pinehouse has been enhanced with scenery and a Metis flag; the casino in Prince Albert has a mural featuring the northern lights, to reflect the casino's name.

In the past, Natomagan lived in Saskatoon for nine years where he milled glass and turned it into works of art; and he has travelled abroad promoting his artwork.

He is presently carving large animal statues. One is six feet tall, depicting an eagle and a fish; another features a bear. And, he's creating two paddles, burning them in with images of a bear and a wolf, to help raise funds for medical expenses for a little boy.

Natomagan accepts commissions, and people are welcome to call him at (306) 930-3344.

"I enjoyed it," he said of painting the mural. "If other mines would like similar work done, that would be cool."

In each edition of ORE, we go beyond the official bios to give our readers insight into the leaders of Saskatchewan's mining and exploration companies.

Beyond the Bio

BRIAN REILLY

SENIOR VICE-PRESIDENT AND CHIEF OPERATING OFFICER
CAMECO CORPORATION

The Reilly family can't help singing a Prairie tune these days.

It's very appropriate, since Brian Reilly, new Chief Operating Officer (COO) at Cameco Corporation, has taken a position in Saskatchewan for the third time in his career. And the tune is?

"It's The Guess Who song, Running Back to Saskatoon," he explains in an interview. "That has become a theme song."

The Nova Scotia native, with a master's degree in geology, first worked in Saskatoon with AREVA Resources, ultimately spending 11 years with the France-based company. His first job was "a beauty," as a district geologist in the Northwest Territories.

"Nunavut wasn't even formed yet. I was in Baker Lake working with the Inuit. That was a cool job."

He then spent a couple of years in the Paris office and frequently travelled back and forth to Kazakhstan.

"It was really interesting because we were developing the projects in Kazakhstan, and then the Kiggavik project in Nunavut came back on stream, so I was based in Paris and following projects in Kazakhstan and Nunavut. I would wake up some mornings, and I didn't know where the heck I was."

In 2007, Reilly left AREVA to become president and CEO of the junior company, Titan Uranium, "and in a bull market, it's the best job in the world."

But the bull market did not last, and he saw in an advertisement one day that Cameco was looking for a managing director in Perth, Australia. "That was 2011. I went to Perth."

In Australia, he took over Cameco's Kintyre project, acquired from Rio Tinto and the flagship for Cameco in that part of the world. In 2012, Cameco also acquired the Yeelirrie project from BHP Billiton. The two properties were, however, placed into care and maintenance until the market rebounds.

"The mandate was to get a couple of projects ready for production. When the market went soft, it was time for me to come back to Saskatoon."

That softness has remained since uranium prices took a sharp tumble after the tsunami that devastated Japan, and its nuclear reactors.

"These are challenging markets, and that's perhaps an understatement," said Reilly. "Our focus in this market is to extract as much value as possible from our existing assets. We're focused on increasing productivity, reducing costs and making our operations more efficient and more profitable while maintaining a strong safety culture.

"Having said that, we think the long-term fundamentals remain very strong and we're watching demand increase in China, India and other parts of the world. But in the short to mid-term, these are tough markets."

When Reilly returned in March, he restarted his Saskatoon career in the role of vice-president, mining, technology and projects.

"Then our good friend Bob Steane announced his retirement after 34 years with the company, and I was asked to take on the chief operating officer role July 1. That's pretty fresh," said Reilly, who also holds an MBA.

"The honeymoon is still on; that probably ends next week, looking at my calendar," he added, with a laugh. "As my predecessor said, the COO doesn't operate anything. I see the role more as a mentor and a coach. Since I've started, I've had the opportunity to visit all of the operations. We have some skilled and committed individuals in the business, and my role is to provide support.

"Cameco is a great company and it starts at the top with the leadership team. We have some of the best assets in the business, and in spite of the challenging markets of the day, we have a bright future. That's what gets us out of bed in the morning."

When not at work, Reilly recharges his batteries through sports and outdoor activities, like hunting and fishing. His passions have changed somewhat over the years, though, by necessity.

"I arrived in Perth in 2011 a hockey player and a skier. I looked around and said, uh oh. What's next? So I bought a surfboard and was just getting the hang of it when there were a number of shark attacks at the local beaches, and I sold my surf board.

"Shark attacks was going too far. It took the edge off.

"Australia has a strong cycling culture, so I bought a road bike. That is my new passion. Over the past few years I've been involved with a number of cycling events and charity rides. We raise funds for local charities. And we do long distances; the last one we did was 300 kilometres over three days."

The bike, he says, is "a Ferrari. It has a very aggressive geometry. You have to be really fit to ride it. I'm not quite there yet."

It's stored in his "bachelor pad" right now, next to his bed. Reilly's family has not yet relocated from Australia, and he temporarily settled into a small apartment as he awaited the return of his wife, Cheryl, and two children, Moira and James.

"Our kids were raised on the Prairies," and born in Saskatchewan, he noted. "My wife and I are from the East Coast. But this is home for them.

"I don't think there's another international move in our future. Our kids lived on three continents in their teenage years. That may sound pretty romantic, but it's tough.

"We will make Saskatoon home again, and we're pretty excited about that."

Brian Reilly, centre, got on his bike to ride for a cure with teammates in the Australian Ride to Conquer Cancer.

Saskatchewan uranium an important part of future electrification

Here are three recent headlines to get the attention of owners of gasoline-powered cars: *Electric Cars Reach a Tipping Point, Electric Cars Will Be Cheaper than Conventional Vehicles by 2022* and *GM Plans 20 All-Electric Models by 2023*.

Another example of "fake news?"

Definitely not.

These were all headlines on stories and columns produced in September and October of this year by Bloomberg, the influential producer of business and economic news. The articles argue that 2017 may go down as the year when the electric car gathers a momentum all its own.

If so, Saskatchewan's uranium mining industry may find renewed momentum as the need to charge millions of electric cars without adding to the planet's carbon footprint means utilities will need to have clean, guaranteed, baseload power available 24 hours a day.

A path to what the future might look like can be found in Port Hope, Ontario where Harriet (Hattie) Barnes has car use patterns unlike other recently retired Baby Boomers. The former resident of Toronto and her partner Diane moved to Port Hope several years ago to downsize and become mortgage free in retirement. They also made a major move into the transportation future when they bought an early model Tesla Model S, a vehicle that Barnes describes as "driving a computer with wheels."

Barnes says this SUV-sized Tesla, with its range of 300 kilometres, is her vehicle of choice for weekly appointments at the Women's College Hospital near Queen's Park, more than 100 kilometres down congested Highway 401 from picturesque Port Hope. The hospital even has eight charging stations that provide some extra assurance for the return trip to Port Hope.

Ontario driver Hattie Barnes (right) and her partner, Diane, enjoy driving the electric Tesla.

"I can get there and back with one charge, but I have not had to," Barnes said. "Everyone is very interested in what a Tesla can do. I am more than willing to talk about it.

"There is no down side in having an electrical car. It's a vehicle with instant acceleration and gets you out of any situation."

While the Tesla car revolution is the brainchild of Elon Musk who has close relatives in Regina, and briefly lived in Herbert, SK. as a young boy, the clean air connection to Saskatchewan goes far beyond family ties. On any given day, more than 60% of the electrons flowing on Ontario's grid have their source in Saskatchewan's Far North.

Paul Hebert, the director of communications for the Canadian Nuclear Association, says it is becoming widely accepted that electrification of transportation will be one way to mitigate climate change.

"An electrical vehicle is only as good as the source of its electricity that is emissions free," he said. "It is technology like nuclear that really multiplies the impact of electric cars."

Besides recent retirees from Toronto, Port Hope is also home to Cameco Fuel Manufacturing, the processing and manufacturing arm of Saskatoon-based uranium giant Cameco Corporation. At one of its two main facilities in Port Hope, natural uranium from Saskatchewan is purified and the powder then sent down the street to a second plant where it is formed and sintered at high temperature into fuel pellets and then placed into fuel bundles assembled within a highly robotic manufacturing process.

Among the biggest customers for this Saskatchewan-sourced uranium is Bruce Power on the shores of Lake Huron where eight separate nuclear reactors comprise cumulatively the largest nuclear power facility in the world.

Ottawa-based energy consultant Stephen Alpin agrees the electric car could be a game changer that will accelerate the need to shift big energy demand activities such as recharging cars to off peak hours.

"The electric car will revolutionize electrical power distribution and generation," he said.

In Port Hope, Barnes already takes advantage of Ontario's time-of-day discount after midnight and pays only 6.5 cents a kilowatt hour to charge her Tesla on a supercharger in her garage.

Alpin is a severe critic of the way Ontario government policy has encouraged high cost renewable power installations of wind or solar that have pushed daytime electricity prices in Ontario cities to as high as 23 cents per kWh.

He says critics who think nuclear power in Ontario can be displaced cheaply are wrong on a number of counts. Alpin says the investment in large scale battery storage to back up wind or solar power will be enormous. He also says Quebec Hydro, touted by many as an alternative to rebuilding nuclear plants, is not a real option as Quebec government policy is directing almost all of its electricity exports to the United States where it sees the greatest return for its massive dam building projects.

Besides the possible addition of thousands of households to the electric car revolution, Alpin notes that government policy is moving towards electrification of mass transit including Ottawa's light rail network and the extensive Go Train system that runs through Toronto from Burlington and Kitchener to the west and as far as Oshawa to the east.

Hebert says organizations such as the Canadian Nuclear Association support use of renewable green energy sources such as wind power and solar but point out there has to be the right mix to assure people have reliable and affordable electric power.

"(Nuclear) needs to be part of the energy mix," Hebert said. "We need to be enablers of wind and solar."

TAGGING ALONG

JODI DERKACH
SENIOR GEOLOGIST
POTASHCORP

Jodi Derkach once thought she might like to be a dietician, but a class in geology changed her mind. It was the first step in the process to becoming a geologist for one of Saskatchewan's top mining companies, PotashCorp. We asked Jodi about her career, why she loves it, and how she balances work and life.

Q: Why did you decide to become a geologist?

A: Before I started university, I thought I might like to pursue a career in the health sciences, but I took a geology class as a science elective and decided that geoscience was the career path that I would like to follow.

I have family who work in the oil and gas industry, and an uncle who is a geologist, so the geoscience professions have been known to me since I was very young. My grandfather also had an influence on me; as I was growing up, he taught me about maps, mountains, and waterways and gave me an appreciation of earth processes. And I get my love of the natural world from my dad.

Q: What is your educational background and where did you study?

A: I completed a geology degree from the University of Saskatchewan. I then worked a few years in the diamond exploration industry after university. I went back to school and completed a certificate in Geographic Information Science for Resource Management through SIAST (now Sask. Polytechnic).

Q: What is exciting, fun or challenging about your job?

A: Many of the projects that I work on require a multidisciplinary approach – they involve people from different backgrounds like geophysics and a variety of engineering disciplines and even legal and accounting. This gives me a challenging opportunity to learn about things outside of my own specialization.

Since map-making and geospatial analysis are also part of my skill set, many times I am presenting information or scenarios to management. This allows me to interact with decision-makers, which is a wonderful career development opportunity. From this, I see how my work fits into the company's core values and strategic priorities.

By far, the most exciting part of my job, though, is the exploration work that I get to participate in. This includes surface drilling and 3D seismic.

Q: What does an average day in your work life look like?

A: As a part of the Technical Services team at PotashCorp, I don't typically do routine work. Most of my workload is project-based and support-based and it is forever changing. One day I am working with a geophysicist and the site engineering department planning a seismic acquisition program, and the next I am working with my colleague to sort out mineral rights matters. Changing tasks and priorities keeps me on my toes and my job interesting.

Right now, I am working collaboratively to develop two different guidance documents; one for surface drilling and one for mine planning. These documents will be accepted as a standard by PCS Potash, so the team must ensure that all stakeholders have been properly consulted, and that resulting best practices are put in place. This has been both challenging and interesting.

Q: What's great about working in Saskatchewan?

A: The best thing is being close to my family. Though I love to travel and explore faraway places, when it comes to settling in somewhere I'm a homebody, and Saskatchewan is home. I really enjoy living in the province where I was born and raised.

I think your work is more meaningful if you can feel a connection with your community. The company that I work for contributes to the province's economy in a big way and is very community-oriented from an investment and volunteerism perspective. Through my organization, I have been part of an industry team of consultants for the Province of Saskatchewan as they develop and update regulations. This all makes me feel connected to the province that I live in.

Q: How do you balance work and family life?

A: My husband, two-year-old daughter, and my three pets keep me grounded and really give me a reason to work hard to achieve a healthy work/life balance. PotashCorp helps to support this through some flexibility in work hours. The company is also unique in that most of the potash mine sites are less than a day's commute from Saskatoon where I live and work. The close proximity to home also allows for more face-to-face meetings with my colleagues at the sites.

FUN & GAMES

Word Jumble

Unscramble the names of these rocks and minerals to unearth the hidden phrase.

EHYATTSM ___ ___ ___ ___ ___ ___ ___ ___

___ ___ ___ ___ ___ ___ ___ ___ TIMETHAE

___ ___ ___ ___ ___ ___ ___ ___ SLMNETIOE

___ ___ ___ ___ ___ ___ ___ EIALHT

SGNISE ___ ___ ___ ___ ___ ___

RATEING ___ ___ ___ ___ ___ ___ ___

HLTYORIE ___ ___ ___ ___ ___ ___ ___ ___

___ ___ ___ ___ ___ ___ ___ LITORUFE

___ ___ ___ ___ ___ ___ ___ CCLIATE

LEBKIMIETR ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

STHCIS ___ ___ ___ ___ ___ ___

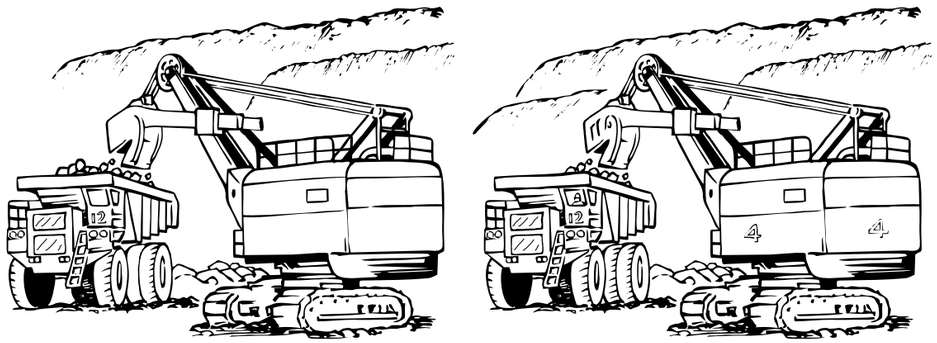
___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ !!

WORD BANK

AMETHYST
CALCITE
FLUORITE
GNEISS
GRANITE
HALITE
HEMATITE
KIMBERLITE
LIMESTONE
RHYOLITE
SCHIST

Spot the Differences

Can you find eight differences between these two pictures?



Patty the Prospector

Learn about Patty's job as a prospector by filling in the blanks with the correct words from the word bank.

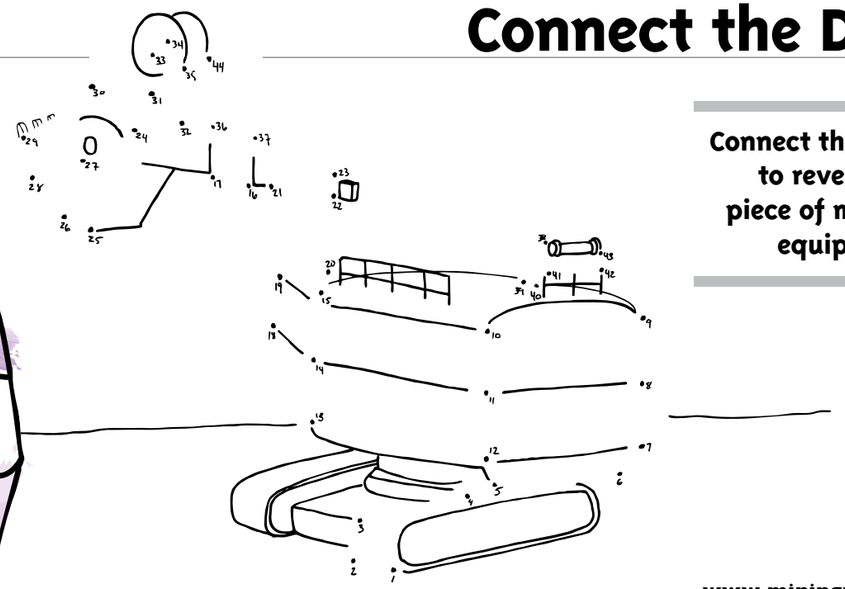
WORD BANK

ADVENTURE
DETECTIVE
EARTH
GOLD
GPS
ROCK HAMMER
SAFETY GLOVES
WOODS

As a prospector, Patty explores different regions of the _____, acting as a _____, trying to discover valuable mineral deposits such as copper, _____, or even diamonds. She uses her _____ to help find her way through the _____. She uses her _____ to break rock to collect samples. Patty always wears her safety boots, safety glasses and _____ to protect her from nature's elements. A day in the life of Patty the Prospector is always an _____!

Connect the Dots

Connect the dots to reveal this piece of mining equipment.



Mining 4 Society event a big hit with Saskatoon and area students

Learning about mining can be a lot of fun, as 650 Grade 7 students from Saskatoon Public Schools, Greater Saskatoon Catholic Schools, Prairie Spirit School Division and Saskatoon Tribal Council learned in late September.

Students were able to experience hands-on activities and interactive demonstrations of each step of the mining cycle from exploration and production, to processing, sustainability, safety and products. They "flew" helicopter geophysical surveys as they prospected for mineral deposits — mini geological formations made of playdough; they dug for diamonds, and simulated solution mining of potash in another playdough model — who knew there were so many uses for playdough in science? They blew bubbles to separate ore minerals from waste; they designed mine reclamation plans and then constructed them; they matched up minerals with the products they were used in, and they learned about radiation and ran safety relays.

The two day event, Mining 4 Society (M4S), was held in conjunction with CIM MEMO 2017 Conference. The educational and interactive event also showcased the diversity of careers in the mining sector. The event was hosted by the Saskatchewan Mining Association in partnership with the Saskatoon Industry Education Council, and by SMA members including AREVA Resources, Cameco Corporation, Mosaic Co., NexGen Energy Ltd., PotashCorp, Purepoint Uranium and Westmoreland Coal Co. Funding was provided by the SMA, the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) and the CIM Foundation.

SMA members understand the importance of attracting bright young people to mining, to ensure Saskatchewan's industry is well-positioned for the future. And what better way than to demonstrate the many careers available in mining to the students of today?

M4S was also intended to increase the students' knowledge of the mining cycle. It showed the grade 7 students how minerals are used in their day to day lives and activities: metals and minerals extracted through mining are used in many every-day products, such as toothpaste, computers and bicycles, and in other industries such as farming.

M4S was also supported by many enthusiastic engineering students from the University of Saskatchewan and Saskatchewan Polytechnic, as well as the Saskatchewan Geological Survey-Government of Saskatchewan, the Canadian Nuclear Safety Commission, Pearson Exploration Ltd., Saskatchewan Research Council, and the Women in Mining and Women in Nuclear (WIM/WiN) Saskatchewan.

NORTHERN SASKATCHEWAN REAPS LONG-TERM BENEFITS FROM MINING

Saskatchewan's northern half is home to approximately 40,000 people, many of them from Cree, Dené and Métis nations.

It's also home to some of the province's richest mineral resources, dominantly uranium but also gold and diamonds.

Over the last 30 years, northern mine operations have worked hard to ensure the province's first peoples benefit from the exploration for and extraction of those resources.

The 2016 Summary of Benefits from Northern Mining prepared by the provincial government shows that mining is the major private industry in the north, employing over 2,800 people. In 2016, six mines and mills operated in the region, including uranium operations McArthur River mine/Key Lake mill, Cigar Lake mine/McClean Lake mill and the Rabbit Lake mine and mill. The Seabee operation mined and milled gold.

"After 30 years, the outcome is an increase in local skilled workers; competitive local suppliers; and better-informed communities," concluded the government in its report.

Among the big success stories emerging from the North, and supported by the mining industry, is Athabasca Basin Development (ABDLP). One of the company's initial contracts was with McClean Lake for a security contract with about 20 employees. The contract evolved and grew to become

> "Their level of dedication to reinvesting earnings is remarkable, and we would not be where we are today without it."
>
> **GEOFF GAY, CEO, ATHABASCA BASIN DEVELOPMENT (ABDLP).**

Athabasca Basin Security (ABS), a company with operations in Alberta, northern and southern Saskatchewan and Manitoba and over 300 employees.

Today, ABDLP is an investment company reaching beyond Saskatchewan and outside the resource industry. For example, it has invested in Winnipeg-based Arctic Beverages, which distributes both beverages and food into northern Manitoba and Saskatchewan, northwest Ontario and Nunvaut. Another investment has come to Tru-North RV, Auto and Marine in Prince Albert.

"Our company was formed to build wealth and help make an impact on the people in the Athabasca region," said CEO Geoff Gay. "We started from humble beginnings and a few contracts in the north — contracts that were instrumental in getting us started and remain vital to us today.

"These contracts were so important because they gave us the expertise to work in a highly regulated industry, which helped us build capacity to work in many industries outside the north. We have grown these initial contracts into ownership in twelve separate companies employing around a thousand people with operations that have ranged in locations across Canada."

The key to the company's growth has been reinvestment, he added.

"The unity of our board and our seven shareholder communities in northern Saskatchewan's Athabasca region was instrumental in making this happen. For seven remote communities whose members experience significant economic and social challenges, their level of dedication to reinvesting earnings is remarkable, and we would not be where we are today without it."

Companies like Athabasca Basin have also contributed to growing the northern workforce. According to the recent government report, the northern workforce has grown in both numbers and abilities over the years.

As of Dec. 31, 2016, the mining industry:

- Employed 2,866 people at northern mine sites, including employees and contractors
- Maintained a high northern participation rate of 48 per cent: Companies employed 923 northerners and long-term contractors employed 441, or 1,364 northern people.
- Was one of the largest employers of Indigenous peoples in Canada, with 41 per cent of the workforce on site. Sixty-seven per cent of northern workers continue to reside in the region.

Positions held by northerners are 28 per cent of the total management/supervisory jobs; 13 per cent professional; 33 per cent technical; 66 per cent of the administration support jobs; 30 per cent trades; 72 per cent operations; and 78 per cent support services. These workers were paid $102 million in wages last year.

BY THE #S
MINING'S CONTRIBUTION TO THE NORTH IN 2016

- **$ Employed 2,866 people at northern mine sites**
- **$ Paid $102 million in wages**
- **$ Purchased $316.3 million in goods and services from northern suppliers**
- **$ Paid $7.1 billion to northern employees and suppliers since 1991**

But the support to the north does not stop with employment. Mining operators also purchased $316.3 million in goods and services from northern suppliers in 2016, 43 per cent of their total buy; and since 1991, have paid $7.1 billion to northern employees and goods and services suppliers.

Saskatchewan's mining companies make a great effort to maintain preferred supplier programs to maximize procurement from northern suppliers. Over the last 20 years, the number of northern suppliers has grown significantly, and many main supply businesses are owned by Indigenous people or communities.

While 14.7 per cent of the total goods were supplied by northerners, 57 per cent of all services were purchased in the north, including catering, janitorial and disposals; contractors and consultants; environmental services; exploration, drilling and explosive services; flights, charters and travel; freighting and expediting; and industrial and maintenance contracting.

Mining companies also are committed to supporting education in the north, providing $135,000 in school awards and scholarships while also supporting educational events and institutions.

The benefits from mining in the north contribute to every part of life, from work and education to community support. The mining industry is committed to maintaining these supports during their operations. The community and business capacity developed during this period will be a legacy that lasts beyond the mine life.

BURNING QUESTIONS

In 2018, marijuana use will become legal. But what does that mean for employers, employees and ensuring safe workplaces?

The Federal Liberal government has stated that consuming cannabis will become legal in Canada in mid-2018, and it's fair to say that everyone in the policy, legal, law enforcement and industry communities are working hard to understand the implications.

While the issues are complex, there are fundamentally two aspects to legalized marijuana that are important for mining employers and employees to understand.

One, just because it's legal to smoke a joint or eat a home-made, pot-laced brownie, does not mean it's legal to be "under the influence" or impaired on the job; and two, determining if someone is under the influence has its own set of challenges.

The legalities around consumption and impairment will be very similar to those governing alcohol, explains Meghan McCreary, partner with law firm MLT Aikins LLP in Regina, a specialist in drug testing.

"Employers are still absolutely entitled to insist on employees being fit for work. The fact of marijuana becoming legal doesn't change that," said McCreary.

Furthermore, "the same rules with respect to drug and alcohol testing will still apply. In Canada, in safety-sensitive environments, there is a model that allows for testing in safety-sensitive positions. It allows for pre-employment testing, reasonable cause testing, post-incident/accident testing and return-to-work testing after a violation."

Safety-sensitive employers do include mines, she added. "There is an acceptance in case law that miners are safety sensitive. At one time you had to prove an industry was safety sensitive."

The trickier part will be determining when someone is high. One of the issues is establishing a per se limit for impairment, said McCreary, in the same way alcohol impairment is measured at .08 (80 milligrams of alcohol in 100 millilitres of blood). Proposed levels for marijuana are between two and five nanograms per millilitre of blood, determined by a saliva test.

> "Employers are still absolutely entitled to insist on employees being fit for work. The fact of marijuana becoming legal doesn't change that."
>
> **MEGHAN MCCREARY, MLT AIKINS LLP**

"Employers are never going to be permitted to use blood samples, because it's too intrusive," she said. "Police will have the right to collect a blood sample, but they're now trying to get the saliva roadside test up and running.

"With respect to employers, there is usually a urine test to detect the presence of marijuana, followed by a saliva test if it is positive."

Complicating matters is the fact that THC is metabolized in fat, as opposed to alcohol which is metabolized in water, said McCreary. Therefore, THC remains in the body for far longer.

"Society has agreed on the impairment level for alcohol, so they are looking for the same agreement with marijuana. But there is controversy about that, because some scientists say someone may not be impaired at five nanograms if marijuana was used, for example, three days ago.

"It's hard to prove current impairment. The police have drug recognition experts (DREs) who have tests they have developed to see if someone is impaired from drugs; but the testing is extensive, takes an hour and a half, and requires a trained DRE to do it."

McCreary has not seen employers using DREs as yet, but she said it would give good evidence of impairment. "However, they'd have to be on site, because the test would have to be done immediately following an incident. You can't allow the person to continue working. The timing is really important."

For employees using medical marijuana, the rules around impairment will not be different.

"Our view is that it's business as usual for safety-sensitive employers in terms of their authority for fitness to work. They don't allow alcohol on site and won't allow marijuana, unless it can be shown on medical evidence that medical marijuana use does not impair fitness for work."

Many employers are now training supervisors on how to detect signs of impairment, and equally important will be evaluating policies and educating employees, said McCreary.

"One thing that needs to happen is that employer policies regarding fitness to work need to be updated. Now they all say marijuana is an illegal drug, and it won't be an illegal drug. They have to put marijuana in the same category as alcohol. They should be reviewing those policies about fitness to work and drug and alcohol testing."

Safety is paramount at minesites, and employers have a duty to ensure that the health and safety of every person at work is protected.

"There is a lot of work to do within a relatively short time-frame," says Pam Schwann, President of the SMA. In addition to revising policies related to prohibited substances such as marijuana, safety supervisors need to have additional training to recognize when someone is unfit for duty as a result of marijuana use. Companies will also need to develop education to employees about the effects of marijuana in their system in terms of cognitive impacts, and consequences of not being "fit for duty" at work. Schwann says, "We are asking the federal government to delay implementation of The Cannabis Act to allow time for a safe, effective and responsible framework for cannabis regulation to be in place prior to the legalization date. In our opinion, anything less is reckless and does not support efforts to provide safe workplaces."

In his submission to the House of Commons Standing Committee on Health, Mr. Norm Keith, a partner in the law firm Fasken Martineau and leading legal expert on the issue of alcohol and drugs in the workplace, identified a number of recommendations for a legislative framework for marijuana to support the employers' legal mandate to provide a safe workplace for all workers. Along with legislated cut-off limits for cannabis, the mining sector would support these recommendations which include:

- a shared responsibility between employers and employees that would require a prohibition of workers from entering a workplace under the influence of cannabis or other drugs, without prior medical authorization and employer approval;
- a legal definition of "safety sensitive position" in the workplace;
- a positive duty on workers to disclose to their employer if they have a prescription for cannabis or other drugs when they hold a "safety-sensitive position";
- permitting employers to conduct random testing of workers for cannabis and other drugs in "safety sensitive positions."

"The end goal for all parties is to ensure that everyone goes home safely at the end of the shift – we just need time to make sure that, with respect to legalization of cannabis, that all the pieces are in place to support safe workplaces," said Schwann.

"The American Automobile Association has indicated that fatal motor vehicle accident crashes have more than doubled in American States that have legalized recreational cannabis use, including Colorado."

"The Canadian Medical Association has stated that the developing brain of young Canadians from the ages of 18 to 25, are adversely affected and may be seriously impaired in development by the use of cannabis. This age group represents a particularly vulnerable group of young workers who are at higher risk of accidents and fatalities."

"Research by the World Health Organization has demonstrated cognitive impairment from marijuana last more than 24 hours and up to 20 days for chronic marijuana use."

MINING COMPANIES GO THE EXTRA MILE TO PROTECT MIGRATORY BIRDS

As V-shaped formations of Canada Geese honk by overhead each evening during the fall months in Saskatchewan, it may be easy to assume that migratory bird life in this province is plentiful.

But much isn't known about bird habitats in the province and how they are affected by both natural factors and human disturbances, says Kiel Drake, the Saskatchewan program manager for Bird Studies Canada.

The non-government organization started a five-year field study in the summer of 2017 to create the Saskatchewan Breeding Bird Atlas. Drake says this work will replicate bird atlases produced for such provinces as B.C. and Manitoba and will provide an invaluable tool for wildlife conservation, education, and research in the province. Birds are good indicators of environmental health because they are conspicuous, they occur in all ecoregions and habitats, and they respond quickly to environmental stressors and habitat change.

To manage the data collection, the Bird Atlas design subdivides Saskatchewan into 6,900 10 km by 10 km squares. Then a subset of between 1,300 and 1,500 atlas squares that provide representation of the province's geography and birdlife will be identified, with the aim of getting 20 hours of "general atlassing" in for each square.

With help from individual mining companies and other industry players as well as government biologists, Drake says Bird Studies Canada hope the work can apply more precision to where exactly the many bird species to be found in Saskatchewan pair up and reproduce.

As Drake explained to the SMA Environment Committee and Exploration members earlier this year, identifying the presence of bird species can be done using bioacoustics. Autonomous recording devices are placed in the field as a means to detect rare or elusive species, or to get better representation of entire avian communities. While some recorders are limited to recording sounds within a 200-metre distance, others can be recorded at 1 km distances. The timeframe of June 7 – July 7 is the optimal listening period for bird calls, and the recorders only need to stay in a location for one week to capture sufficient data to be used in the Bird Atlas.

While southern Saskatchewan's distinction of having the highest proportion of roads per capita will help in accessing the areas covered by the representative southern atlas squares, the challenge of "general atlassing" and gathering bioacoustics data is greater in the northern half of the province where road access is extremely limited.

Pam Schwann, President of the Saskatchewan Mining Association, says this is where exploration and mining companies can assist in gathering data for northern atlas squares.

"Many of our member companies have exploration programs and existing mining operations in the Precambrian Shield area and are ideally situated to fill in some of the data gaps that currently exist. By partnering with Bird Studies Canada, we can help keep the program's logistical costs down while providing access to remote locations.

"For instance, autonomous recorders can be set up during winter exploration programs when access to areas is best, and then be activated in the summer during the peak listening period to capture the bird calls."

Dale Huffman, the vice president, health, safety, environment and regulatory affairs for AREVA Resources Canada, says the issue of surveying bird populations in the nearby boreal forest was raised by the Saskatchewan Environment Society (SES) during recent discussions related to AREVA's McClean Lake and Midwest operations.

"The SES made the suggestion that AREVA could contribute the data collected as part of their environmental protection program to support the Bird Atlas development. We have seen this as a good suggestion, which we will act upon," Huffman said.

Huffman said data from AREVA's updated environmental assessments for the sites will be shared with those assembling the bird atlas. In 2018, AREVA plans to work with Bird Studies Canada to support atlas surveys at the McClean Lake Operation, and other areas in northern Saskatchewan.

The mining industry's involvement isn't just limited to the northern atlas squares. K+S Potash Canada is also participating in the Bird Atlas Project as a Silver Sponsor and the company will be providing any useable data collected from day-to-day activities to the Bird Atlas database.

For members of the public interested in the Saskatchewan Bird Atlas project, more information can be found at *sk.birdatlas.ca*

SMA MEMBERSHIP

Abasca Resources Inc.
Agrium Inc.
ALX Uranium Corporation
AREVA Resources Canada Inc.
AREVA Resources Canada Inc. – McClean Lake Operation
BHP Billiton
Boart Longyear
Cameco Corporation
Cameco Corporation – Cigar Lake Operation
Cameco Corporation – Key Lake Operation
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