THE OFFICIAL PUBLICATION OF THE SASKATCHEWAN MINING ASSOCIATION

ORE

POTASH:
Tonnes of Interest

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FALL/WINTER 2012

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Sherritt Coal Boundary Dam Mine, page 27

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COVER PHOTO
Corn is a major crop fertilized by potash. The three husks shown on the cover represent the three major international mining companies – BHP Billiton, Rio Tinto and Vale – who have recently moved here and are looking to add potash to their portfolio (p. 9). As discussed in this issue of ORE, many companies see the commodity as a solid investment with a lot of potential for the future.

CONTENTS

MINING: GREAT FOR SASKATCHEWAN BUSINESSES!

A MESSAGE FROM SMA EXECUTIVE DIRECTOR – PAM SCHWANN

Have you ever wondered why Saskatchewan has the world's largest potash and uranium deposits, and not Manitoba? Are you curious why the largest mining companies in the world are attracted to Saskatchewan or what is driving the multi-billion dollar investments of existing producers? In order to understand the game, you have to know the playbook and who the players are. We have introduced some new features to ORE that we think will do just that.

Each issue of ORE will give you the big picture of a specific mineral commodity while our new "Ore Deposits" feature takes you further into the game, describing how that mineral deposit formed. We are very pleased to be collaborating with the Saskatchewan Geological Survey, Ministry of the Economy, to bring you this new feature. Potash is the first commodity featured.

We are also pleased to have the Mining Industry Human Resources Council (MiHR) contribute their national insights, flavoured with Saskatchewan information, on Education and Workforce issues that are so critical to the success of the mining industry.

Additional articles in this edition of ORE include a salute to Saskatchewan's first "million ounce primary gold producer", Claude Resources; a description of the innovative native prairie reclamation work that Sherritt Coal is undertaking at their Poplar River Mine; an insiders view on the unique safety considerations involved in carrying out winter exploration programs; how technology and innovation continue to improve productivity at mines, and if you are a fan of "Hell's Kitchen", our Tagging Along feature gives you an idea of a day in the life of Sous Chef Jeremy Laliberte at Cameco's fly-in Rabbit Lake Mine.

The talents of artist, entrepreneur, pilot, and jet boat operator, Mr. Garry Thompson, are displayed for your enjoyment through our eARTh feature, and Beyond the Bio article features Mr. Vincent Martin, President and CEO of AREVA Resources Canada Inc.

With the addition of our new features, we hope you find this edition of ORE even more informative than previous editions!

A MESSAGE FROM SMA PRESIDENT – DAVID NEUBURGER

The past years have been exciting times for Saskatchewan. Economic growth in our province has often topped the nation. After decades watching our people leave for better opportunities elsewhere, we've finally seen our population grow. With this growth we are seeing the face of Saskatchewan change as we welcome many new immigrants into the province and see greater inclusion of our First Nations people in the workforce.

So what has brought on these recent years of growth? We are certainly fortunate to enjoy a great endowment of natural resources – oil and gas, great land for farming, and of course tremendous mineral reserves. Our mineral reserves in particular are diverse – gold, coal, and world class reserves of potash and uranium.

But it's not enough to have this rich endowment. There also needs to be demand. Over recent years the world certainly wants what we are fortunate enough to have. As economies like China and India have led global growth they have a great need for fuel, energy, metals and fertilizers.

While resources and demand are two key ingredients to growth, there's still one more thing required. The business climate and policy environment can either lead to investment or chase companies away. A supportive approach from government, fair royalties and taxation, a level playing field for different companies, predictable environmental approval process timelines, good infrastructure and a productive workforce are all factors companies consider when choosing to invest.

The convergence of great resources, solid demand, and a positive business climate are leading to some of the world's biggest mining companies exploring and planning to develop new projects in Saskatchewan.

At the same time, our existing producers are expanding operations and starting new projects. Growth plans will always heat up and cool down as world demand trends change but by maintaining positive conditions, we can expect to attract more than our share of new investments over the long-term.

In doing so, we will continue to create jobs and supply opportunities for this province.

Mining … great for Saskatchewan … Canada … and the world!

POTASH

Provided by Sask Geological Survey, Ministry of the Economy

What is potash?

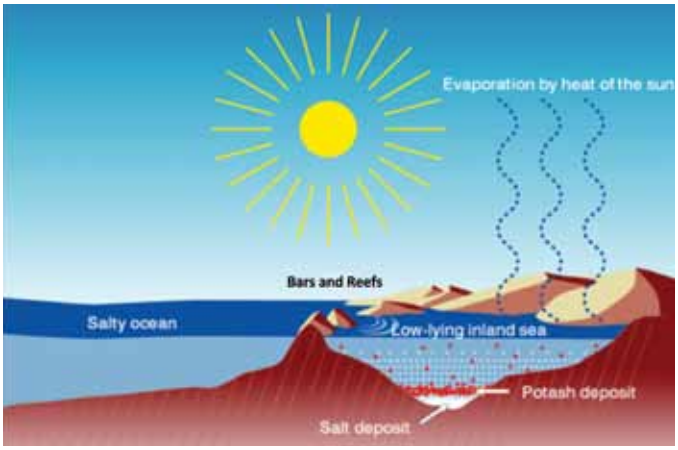
Saskatchewan potash ore consists of a mixture of halite (sodium chloride, NaCl, which table salt is composed of), sylvite (potassium chloride, KCl), and carnallite (potassium and magnesium chlorides, $KMgCl_3.6H_2O$) plus minor quantities of anhydrite, quartz, dolomite, clay minerals, and red-coloured iron oxides. Sylvite is the principal ore mineral.

What is potash used for?

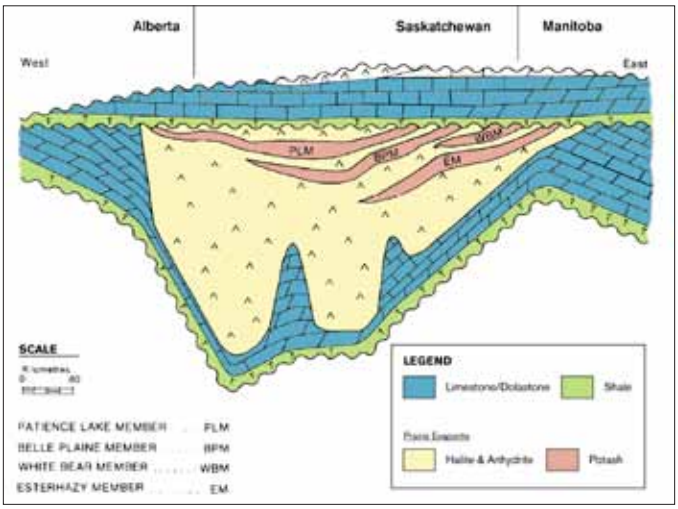
Potassium from potash is used mostly in fertilizers but small amounts are used in the manufacture of water treatment products, soaps, glass, pharmaceuticals, de-icing agents, and for other chemical and industrial purposes.

How did potash deposits form?

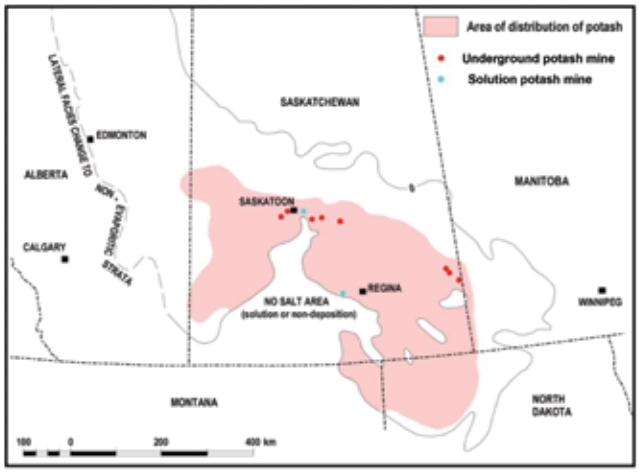
About 390 million years ago, during the Middle Devonian age, southern Saskatchewan was located south of the equator and most of it was covered by a shallow warm inland sea that stretched from the Northwest Territories to southern Manitoba, and into northern Montana and North Dakota. The flow of ocean water became restricted by a barrier reef complex which extended from the northeastern corner of British Columbia into the Northwest Territories, and this restriction, combined with a hot, arid climate, caused evaporation of the sea water resulting in precipitation of anhydrite and halite. Eventually, as evaporation and halite precipitation continued, sea water became enriched in potassium, and potassium salts (sylvite and carnallite) were precipitated. Periodic influxes of fresh seawater and continued evaporation resulted in cyclic precipitation of these evaporite minerals. It is in the upper 60 m of this thick sequence of evaporites known as the "Prairie Evaporite" that four potash-rich intervals were deposited. Through time, these deposits were buried by many more layers of rock that the top of the Prairie Evaporite is now buried beneath our feet at depths ranging from about 400 m near Prince Albert to 2740 m near Estevan.



(from PotashCorp)



(from Potash in Saskatchewan by Fuzesy, 1982)



(from Potash in Saskatchewan by Fuzesy, 1982)

How much potash is there in Saskatchewan?

Saskatchewan has about 46% of global potash reserves and typically supplies almost 30% of the world's potash. It is estimated that, at the current rate of production, Saskatchewan potash deposits are extensive enough to supply world demand for several hundred years. The thickness of potash ore is highly variable in each of the four potash-rich intervals, Esterhazy, White Bear, Belle Plaine, and Patience Lake; which are named for the areas in which they were first mined, except for White Bear which has not yet been mined. These intervals are commonly 6 to 15 m thick; maximum thickness (31 m) is found in the Patience Lake interval west of Saskatoon. ■

DIGGING DEEPER

Maps of potash members

Saskatchewan Geological Survey's Open File reports 2009 – 24 to 29:
http://bit.ly/UjpyCy

Saskatchewan potash facts:

http://bit.ly/R08MKa

Mineral deposit model: Potash

http://bit.ly/QmOSJw

Potash report (Fuzesy, 1982)

http://bit.ly/QmOV8f

Presentation on potash:

http://bit.ly/VcZtY8

MEET NEW

YOUR NEIGHBOURS

Three of the world's largest mining companies – BHP Billiton, Rio Tinto and Vale – see Saskatchewan's potash as key to their global portfolio in the coming decades.

Although the current spot price of potash may influence the timing of board decisions, it's the key fundamentals for potash that will create new mines in Saskatchewan.

Potash is vital for growing crops and helping those crops retain water. The world's population is increasing, but the amount of land available for food production is not. Efficient water use is becoming increasingly critical. Emerging economies, especially in China and India, are creating demand not only for more food, but also for better quality food with more protein – specifically, more meat, which requires even more crop production. Inevitably, the world will need more potash. As fortune would have it, Saskatchewan has the largest and best deposits, accounting for roughly 40 per cent of the world's known reserves.

Saskatchewan is also a good place to do business, with excellent standards of mining governance and top-class geological science. "Saskatchewan has a highly skilled workforce, great infrastructure like transportation, gas and power, as well as a stable political environment and predictable environmental process," notes Matthew Wood, project manager for Vale's Kronau Project 30 km southeast of Regina. Even though the company has changed the project's timelines and slowed the development process, "Vale remains committed to the Kronau Project. We are here to stay and be a part of the Saskatchewan community." That commitment could

A potash core from drilling

Copyright © Vale, Photo credit: Chris Hartle

Jansen shaft

Source: BHP Billiton

result in some 2000 people being employed during development of the solution mine, with 300 full-time positions needed to operate it.

Projects involving that many people and billions of dollars of investment are massive in the Saskatchewan context, but might not seem so daunting if you're on the outside looking in – especially if your vantage point is a boardroom in London or Sydney. Rio Tinto, for example, employs 77,000 people in more than 40 countries; its annual sales in 2011 were more than $56 billion. It's known for diamonds and iron ore; their most recent corporate profile doesn't even mention potash. Even so, in the mining business – regardless of size – the name of the game is new resources, new markets.

In that respect, potash is a mineral resource whose "time has come" when you look at emerging countries such as China, India and Brazil. Tim Cutt, president of Diamonds and Specialty Products at BHP Billiton Canada Inc., sees potash as part of the hierarchy of needs in a country's development, where you start with the need for infrastructure – requiring steel for construction and copper for electricity – but eventually you get to the creation of an emerging middle class that wants more and better food, which points to potash. "From a corporate perspective, when you think of rounding out our portfolio to meet all the needs in that cycle, potash was the one piece BHP Billiton still needed," says Cutt.

In fact, potash is targeted to be one of top five contributors among the nine commodities in BHP Billiton's portfolio, with the company's Jansen Project 140 km east of Saskatoon leading the way. It's an

ambition that very few companies in the world could pursue, says Cutt. "At BHP Billiton, we have a balanced portfolio around the world, and a balance sheet to support this scale of investment."

He says they are unconcerned about current market conditions. "We know supply and demand are more-or-less in balance in the short term, with brownfield expansions coming on stream, but we look with a long term view. It will take us ten years before we even reach our eight million tonne per year capacity, and we see sufficient demand by then to absorb that new supply." Considering BHP Billiton's holdings throughout the province – they now have exploration rights to about 14,500 square kilometres – Cutt calls it, "A 100-year strategy, not something that is developed overnight."

The Jansen Project's eventual capacity of 8 million tonnes – about triple the size of the average conventional Saskatchewan potash mine – is one of the keys to economic feasibility, despite those who question the wisdom of new mine development. "We know it is very difficult to be profitable with a new mine that produces only 2 million tonnes per year. That is why we are going to a much larger economy of scale."

He points again to the fundamentals. "Even when the current announced brownfield expansions are complete, the demand for potash will continue to grow at about three to four per cent a year. When you fast forward to 2020 and beyond, we don't believe the current mines can keep up with demand, says Cutt. "We want to be the company that comes in low on the cost curve, with large and efficient mines. Jansen will be the most technically advanced mine in the world, and will certainly be the largest."

Cutt is also quick to counter those who question BHP Billiton's long-term commitment to Saskatchewan. "Actions speak louder than words," says Cutt, citing the fact that BHP Billiton is accelerating its spend to roughly $2 million per day at Jansen, where work continues on the largest shafts with the largest lifting capacity in the world, along with a 2500-person camp. "By the end of this year, we will have the first 500 beds ready, with the standards that resemble a five-star hotel more than a camp. The first of our two 45 metre headframes we're currently building will be visible from a distance by October."

They have already built a freeze plant that could handle 25 NHL hockey rinks simultaneously. Right now, 400 people are on-site: 200 doing the subsurface work, and another 200 on the overall site preparation. Cutt emphasizes their demand for personnel will continue to grow. Already in their head office in Saskatoon, they are full to capacity on

K+S: Targeting 2015

Saskatchewan's first greenfield potash mine in more than 40 years will begin production in late 2015, according to Christine Stass, the company's communications specialist in the province. The Legacy Project, located near Bethune in southern Saskatchewan, will have an initial output of 2.86 million tonnes – and is expected to be in production for more than 50 years. The first 100 employees have now been hired; a total of 300 highly-skilled full-time positions will be required once the mine is fully operational.

"This mine is a high priority for K+S globally" says Stass, noting that it will "significantly boost" the German-based company's international competitiveness. She also pointed out that, "There is potential for expansion up to 4 million tonnes, but that would require additional project expenditure." Current project spend is approved for $3.25 billion.

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Opening a New Chapter in Potash

Latest progress at the Jansen Project

We are excited about new developments at the Jansen Potash Project. The Saskatchewan skyline is changing with the current construction of headframes at the mine site, and the Herrenknecht shaft sinking machines are being assembled in preparation to complete the excavation of the shafts. An average of 3m per day of drilling will take the shafts to their eventual depth of about 1km under the surface.

We look forward to sharing updates from the Jansen Project as it progresses. As we continue to develop and build the Jansen mine, we will strive to protect the environment, provide uncompromising safety for our employees and contractors, and support the local communities we now call home.

www.bhpbilliton.com

On the Horizon

There's no question that "Saskatchewan" is a familiar name in the boardrooms of the world's three largest mining companies.

Jansen shaft

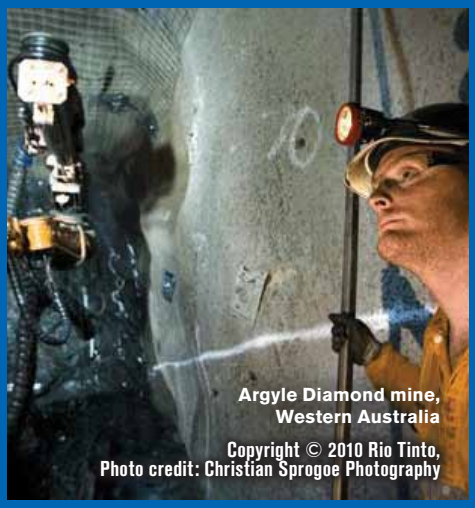
Source: BHP Billiton

BHP Billiton

Head Office: Australia

Size: 100,000 employees and contractors working in more than 100 locations worldwide.

Corporate Description: "We are among the world's top producers of major commodities."



Argyle Diamond mine, Western Australia

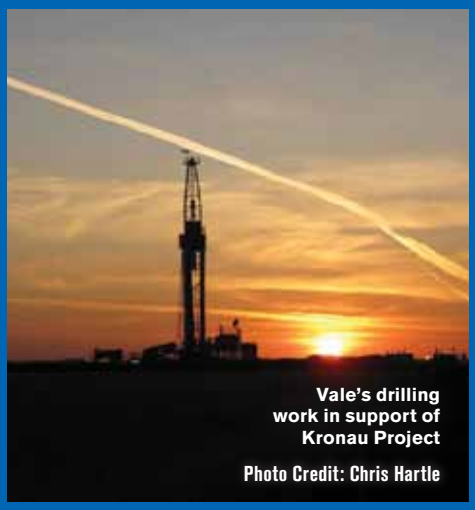
Copyright © 2010 Rio Tinto, Photo credit: Christian Sprogoe Photography

Rio Tinto

Head Office: UK

Size: 77,000 people in more than 40 countries.

Corporate Description: "A world leader in finding, mining and processing the Earth's mineral resources."



Vale's drilling work in support of Kronau Project

Photo Credit: Chris Hartle

Vale

Head Office: Brazil

Size: 110,000 people in more than 38 countries.

Corporate Description: "The second largest metals and mining company and one of the largest publicly traded companies in the world."

Note: Correct pronunciation of "Vale" rhymes with "ballet".

ORE Samples

Brownfield and Greenfield

In mining terms, "brownfield" refers to a place of existing operations. Thus, all of the expansions being undertaken by Saskatchewan's current producers (see p.16) are "brownfield developments". "Greenfield" refers to new developments including BHP Billiton, K + S, Rio Tinto and Vale projects.

all four floors, and will be taking additional space at a new office building at the River Centre.

Finding the people to fill the positions has been "a pleasant surprise." Cutt has found that when they show contractors and potential employees what BHP Billiton is doing, the confidence in the company is there, and so is the desire to be part of it. As with all companies, though, he admits that finding the skilled tradespeople for the next phase could be more challenging, due in large part to competition from the Alberta oilsands.

To have confidence in the world's largest mining companies, you have to look beyond today's headlines. To the BHPs, Rio Tintos and Vales of the world, "the long-term" means decades from now. To a province that is much more used to the fluctuations and fortunes of a seasonal agricultural economy, seeing that bigger picture – and getting comfortable with it – will also take time. ■

HERE TODAY. HERE TOMORROW.

PotashCorp, Mosaic and Agrium are seasoned veterans in the potash sector.

It's an impressive yet telling metaphor. On a peaceful prairie night, you might look out into the darkness and conclude, "There's not much going on out there." Yet, a kilometre beneath the surface, you would find hundreds of workers and machines working away in more than 800 km of tunnels, driving our economy and helping to feed the world.

Some forty years after the development of our last potash mine, the time has come for the next great phase in Saskatchewan's potash history. Leading the way are those who know potash mining the best in this province: PotashCorp, Mosaic and Agrium. Their brownfield expansions will increase total output in some mines by as much as 50 per cent, and continue to secure Saskatchewan's place among the leaders in the world potash market.

"Potash mining is not for the faint of heart, explains Tom Diment, vice-president of Potash and Phosphate Operations at Agrium. "What a lot people don't understand is that potash mining is not easy. Over the years, we've acquired a lot of learning, much of it through hard knocks."

Decisions of this magnitude are not made lightly, or quickly. The parent company, Agrium, has grown its business primarily through acquisition. In contrast, the Vanscoy expansion is the single largest project ever undertaken by Agrium anywhere in the world. The project is coming along well. "There are always lots of issues with a project of this size," says Diment, "but nothing has sidetracked our target date of the second quarter of 2014." The genesis of the project goes back to early discussions in 2008. In 2010 and 2011, they proceeded with intensive engineering work to present the business case to Agrium's board. Approval to proceed came in December 2011.

Mosaic's plans are also "on-plan" according to Peter Jackson, VP Operations, Potash, The Mosaic Company. The expansion at Belle Plaine was approved in 2008 and is expected to be completed by year-end. The first year will see an additional 100,000 tonnes of production, increasing to 600,000 additional tonnes capacity by 2016. Jackson describes it as "the greening of Mosaic in Saskatchewan".

At PotashCorp, "We are executing what is probably the largest capital expansion program in this province's history," explains Michael Hogan, senior vice-president. "We are approximately 80 per cent of the way through our $8.2 billion investment to expand our potash capability in Saskatchewan and New Brunswick, with $6 billion of that being spent in this province." PotashCorp's total production capacity is currently 11.8 million tonnes; after the expansions are completed and PotashCorp

"WE ARE APPROXIMATELY 80 PER CENT OF THE WAY THROUGH OUR $8.2 BILLION INVESTMENT TO EXPAND OUR POTASH CAPABILITY IN SASKATCHEWAN AND NEW BRUNSWICK, WITH $6 BILLION OF THAT BEING SPENT IN THIS PROVINCE."

MICHAEL HOGAN
SENIOR VICE-PRESIDENT, POTASHCORP

has ramped up its operations, they will be in a position to produce up to 17.1 million tonnes at their mines in the two provinces. As Hogan emphasizes, "When we make decisions about our operating strategy or our investment decisions, it is with a long-term view." He points out that mine developments are, "incredibly complex projects" and that, "We are happy to be closer to the end than the beginning of these projects. We believe most of the pressure on new projects starting today will be on the long side of the timeline and high side of the budget."

COMPANY	Expansion Capital Costs (announced)	Expansion (MMT KCl)	Estimated Completed Construction Period *
Agrium	$1.5 B	1.0	2014
Mosaic	$6.4 B	5.0	2015 - 2020
PotashCorp	$5.94 B	7.71	2007 - 2014
TOTAL	$13.84 B	13.71	

* Multiple projects with multiple construction periods

The expansions by the existing companies, along with interest from new players (see p. 9), "could lead to a very competitive marketplace" in Peter Jackson's view. However, he also voices a confidence shared by Saskatchewan's established producers. "At Mosaic, we know what our margins are. Mosaic will do fine." He points out that Mosaic will be "the first out of the blocks" with its expansion completions, and indeed, "Two of our mines are already there."

As Jackson says, the biggest winner in a highly competitive market will be Saskatchewan, especially Saskatchewan workers. At Agrium, for example, there are now 1000 people onsite for construction, with that number expected to swell to some 2000 workers by next summer.

Even with completion more than a year away, Agrium has already acquired most of the 650 workers needed to run the finished operation. Hiring well in advance is practiced by all the producers, simply because you can't acquire the right people with the right skills overnight. That's especially true in the new environment of expansion. "Assimilation used to be fairly easy," says Mosaic's Peter Jackson. "As a new person came on there would be several skilled, experienced workers to mentor them. That's not the

ORE Samples

Saskatchewan's Current Producers

1. PotashCorp

"The world's largest fertilizer producer by capacity."

2. Mosaic

"The world's largest supplier of phosphate and potash."

3. Agrium

"The only publicly traded company that is integrated from mining the raw materials for fertilizer production through to selling to growers."

case when one-third to one-half of your future employees will be new." Safety is a priority, punctuated by the reality that fewer and fewer of the prospects have any experience around heavy equipment to begin with. As Jackson says, "Nintendo doesn't prepare you for a dryer circuit."

Using Agrium's projections, an estimated 20 to 30 per cent of the skilled labour will come from western Canada, with 70 to 80 per cent from further afield. In the long term, what that means is that a child entering Grade One in Saskatchewan this year has a very good chance of an excellent job in mining waiting for them when they finish university or college in 15 to 20 years. The long-term projections also point to a solid business model for businesses and entrepreneurs who want to service the potash industry. Given the size of commitments, this is not a "here today, gone tomorrow" scenario.

As for the market demand, Jackson says that Mosaic, "welcomes competition." Even in difficult crop years, globally, potash demand will be there, as a way to increase production on marginal lands. The emphasis of governments to improve agricultural methods will lead to more advanced methods of fertilization, such as blending granular potash with phosphate and nitrogen. The biggest and most lucrative future customers will no doubt come from offshore, where Agrium, Mosaic and PotashCorp jointly market their products through Canpotex. In a mature market such as the USA, it is price alone that is the competitive factor and existing producers separately market their products. "In that market, we're like Coke and Pepsi," says Jackson.

Regardless of the scenario that will emerge, it's clear that Saskatchewan's experienced producers have done their homework and have complete confidence in their decisions. As they have proven through decades of operating, there's often a lot more to them than meets the eye. ■

Solution mining

Solution mining is the process of mining underground water-soluble minerals by dissolving the minerals with water or a solution under-saturated in potassium. The solution carrying the dissolved minerals is then extracted from the ground and the minerals are recovered from it.

The process starts by drilling a large borehole down over 1000 m to the layer of minerals in which the potash is found, creating a well. Hot water is then pumped down the borehole where it dissolves the minerals, eventually forming an underground cavern. Then a second borehole is drilled, into the underground cavern and the solution carrying the dissolved potash minerals is pumped up this well to surface for processing. Solution mining is used when the potash layer occurs at depths generally greater than 1000 m. Mosaic's Belle Plaine mine and K + S's Legacy mine are examples of solution mines.

Conventional underground mining

Conventional underground mining involves sinking vertical mine shafts down below the horizon to be mined. The shafts have large-scale elevators that transport workers between surface and underground, and transport ore to surface. Workers use machines called borers to develop underground passages and mine the ore. Ore removed by the borers is transported from the mining face to the skips in the production shaft by a conveyor belt system and hauled to surface for processing. Conventional underground mining is used when the potash layer is at depths of less than 1000 m. Most of the existing potash mines in Saskatchewan, and BHP's proposed Jansen Lake mine, are conventional mines.

Water sampling at McClean lake, Photo Credit: AREVA

WINTER EXPLORATION – MORE DEGREES OF SAFETY

Safety is the priority for all aspects of mining and exploration. Winter in Saskatchewan has its own unique safety challenges. To find out more, ORE interviewed Dale Huffman, vice-president of safety, health, environment and quality at AREVA Resources Canada, and chair of the SMA's exploration safety sub-committee.

ORE: When is the winter exploration season?

Huffman: Typically, winter exploration is scheduled to start in early January and run to the end of March, depending on the conditions.

ORE: If it's just three months, the obvious question is why do you explore during this period at all?

Huffman: Winter is a very good time, especially in the north, where most of the year you typically have to deal with a lot of water, thick bush and marsh areas – not to mention insects. Being able to travel along ice makes it much easier to move people and equipment around, rather than relying on helicopters which are much more expensive. It's also easier on the environment; there's much less rutting, for example.

ORE: How do you make sure the ice is safe?

Huffman: Ice conditions are monitored to reduce the risk of people or heavy equipment falling through. Extra precautions are taken when working on ice. For example, some personnel are required to wear a flotation suit. A large vehicle driven onto a small body of water can actually create wave action underneath the ice and cause break-up, so you have to be careful. Ice conditions can vary greatly. Dark ice is best, because it means it is less porous. If needed, we drill holes into the ice and then pump water onto the surface – much like flooding a rink – to create a thicker ice surface.

ORE: When people think of "winter", they would think that cold is the main safety concern.

Huffman: Cold is just one factor. Darkness, because of the short days, is another. In winter, too, thin sticks when frozen become spears. The biggest safety factor, though, is human error. You can get tired easily, which can cause errors in judgement. Safety records also show that a higher number of accidents occur either at the beginning of a person's work rotation, or near the end, when they're more likely to be thinking of getting back home. We also know that individuals who are attracted to doing exploration in remote areas can be more predisposed to taking risks, so we always have to stress caution in the field. In our world, snowmobiles are not meant for fun and excitement; they're meant for serious work.

ORE: So how do you prepare employees?

Huffman: Everybody undergoes training and orientation before they go out. Increasingly, companies are providing outdoor survival skills training, which includes spending a night in the bush using the skills you've been taught. As well, there is increased use of personal GPS units with a button you can push in order for you to be located.

ORE: What's your most important safety advice for personnel who get in trouble in the bush?

Huffman: First, you need to plan before you go and make sure your team knows where you are going and when you are expected to return. If you get into trouble, stay calm, stay put and stay warm. Panicking just uses up valuable energy.

ORE: So do all companies follow the same safety procedures?

Huffman: Safety is one area where we don't have competitive secrets. The SMA's exploration safety subcommittee was set up in order for all our members in mining and exploration, regardless of size, to share their knowledge and experience. That can be especially valuable for smaller companies who don't have the same resources as a company like AREVA or Cameco. In our industry, we want everyone to be as safe as they can be, always. ■

CLAUDE'S MILLION "RAISES THE GOLDEN BAR"

A $1.4 million gold souvenir! Former CEO Bill MacNeill (left) and Neil McMillan, current president and CEO, display the bar containing the one millionth ounce.

At today's soaring market prices, pouring one million ounces of gold is reason enough to celebrate. But that's only part of the story. On August 8 at its Seabee mine north of La Ronge, Claude Resources also became the first primary gold producer in Saskatchewan's history to reach that milestone. Speaking at the celebration, SMA executive director Pam Schwann said, "Seabee has literally raised the golden bar. Now that we have a million ounce gold producer in the province, other companies from outside the province who might have been shy about investing here will be taking note."

"This millionth ounce represents not only the past and current success of mining companies like Claude Resources operating in our province, but also the bright future that lies ahead for them," says Tim McMillan, Saskatchewan's Minister Responsible for Energy and Resources. "Our government is working to help ensure this future becomes a reality, for the benefit of Saskatchewan's economy and for the communities dependent upon its continued growth."

The mine – named after the type of float plane used in the discovery of the deposit in 1947 – is a testament to vision and determination. Neil McMillan, president and CEO of Claude Resources, points out that the mine is one of only three in the world that has survived the past twenty years producing at under 100,000 ounces per year. "The challenges faced at Seabee were as tough as any you would find anywhere in the world," notes Neil McMillan. In December of 1991, when Claude began production, the gold price was just $360 an ounce. (Twenty years later, in June of this year, the price hit $1600.)

There never would have been a mine, let alone a millionth ounce pour, without the involvement of founder and former CEO

Bill MacNeill and his now-retired vice-president of mining operations, Ray Gagnon. "A lot of people are part of our success story," says Neil McMillan, "but these two in particular deserve special credit. McMillan cites Gagnon as being "legendary in the underground gold mining business in Canada." MacNeill, who retired in 2005, is credited with running the company "during the tough times." Introducing him at the celebration, Neil McMillan said, "He refused to be bowed by the pressures. He put his head down, put his shareholders first, and went ahead and put the project into production."

As for MacNeill, he says he prefers to look ahead rather than dwell on the past. "The future bodes well for Claude Resources," he says. Of the world's 81 gold orebodies in production or development that host 1 million ounces of gold or more, Claude Resources owns three of them. Their Madsen Lake project in Ontario has an estimated two million ounces, followed by Amisk in northern Saskatchewan (1.6 million).

As for Seabee, "We have another 1.3 million ounces already identified in front of us," says Neil McMillan. With ramped-up production and investment in their operations, Neil McMillan confidently points out that, "Our next millionth ounce pour won't take us 20 years."■

RE-VEGETATING MINED NATIVE PRAIRIE AREAS

AS SUBMITTED BY
EMILY CLAUSON, ENVIRONMENTAL PLANNER, SHERRITT POPLAR RIVER MINE

Sherritt Coal's Poplar River Mine, located in southern Saskatchewan near the Town of Coronach, has been providing coal to SaskPower's Poplar River Power Generating Station, for over 30 years. More than 100 million tonnes of coal has been strip mined for power generation and over 8,800 acres of mined land have been reclaimed. Reclamation is the final stage in the mining process which returns the land back to its near original productive state.

During the process of coal mining, various land types including native prairie are being temporarily disturbed to recover the underlying coal. Since native prairie lands provide ecosystem diversity and habitats for many birds and animals, government regulations require that any disturbed native grasslands be re-established so that there is no net loss of native prairie lands.

MORE THAN 100 MILLION TONNES OF COAL HAS BEEN STRIP MINED FOR POWER GENERATION AND OVER 8,800 ACRES OF MINED LAND HAVE BEEN RECLAIMED.

Sherritt Coal has recently mined an area of approximately 80 acres of native prairie located adjacent to the Big Muddy Valley. The location and unique characteristics of this area led to a special reclamation plan that involved re-vegetating the area with strictly native grass species.

The Sherritt Coal Poplar River Mine has recently contoured mined land, replaced the native prairie topsoil and the re-vegetated the soil with an entirely native grass species seed mix.

Native Grass Species Growth on Coal Mined Lands taken in the summer of 2011

The first native seeds were planted in the area in June 2009 following consultation with native prairie experts from throughout the province about native plant species and proper seeding techniques. A disk drill was used to plant the seed mix which included western, northern and slender wheatgrass,

Native Grassland Mix

(Developed with the assistance of Sherritt, Grasslands National Park, Ducks Unlimited, the Native Plant Society of Saskatchewan, the Nature Conservancy of Canada and the Saskatchewan Ministry of Environment)

1. Green Needle Grass **(25%)** – Suited to the site and existed there prior to mining. Performs well on slopes of more than 5 per cent, especially east/west-facing slopes.

2. Needle and Thread Grass **(25%)** – Grows on the tops of hills and down hill slopes. Main grass species in the brown soil zone.

3. June Grass **(5%)** – Low-growing grass that works to hold the soil in place. It adds diversity to the seed mix.

4. Northern Wheatgrass **(15%)** – Important for soil protection, nutrient cycling and moisture retention. Its presence indicates a healthy native prairie stand.

5. Slender Wheatgrass **(5%)** – Short-living grass establishes rapidly. Added to the mix to boost production for the first couple of years.

6. Western Wheatgrass **(25%)** – Establishes easily and will spread quickly to cover an area.

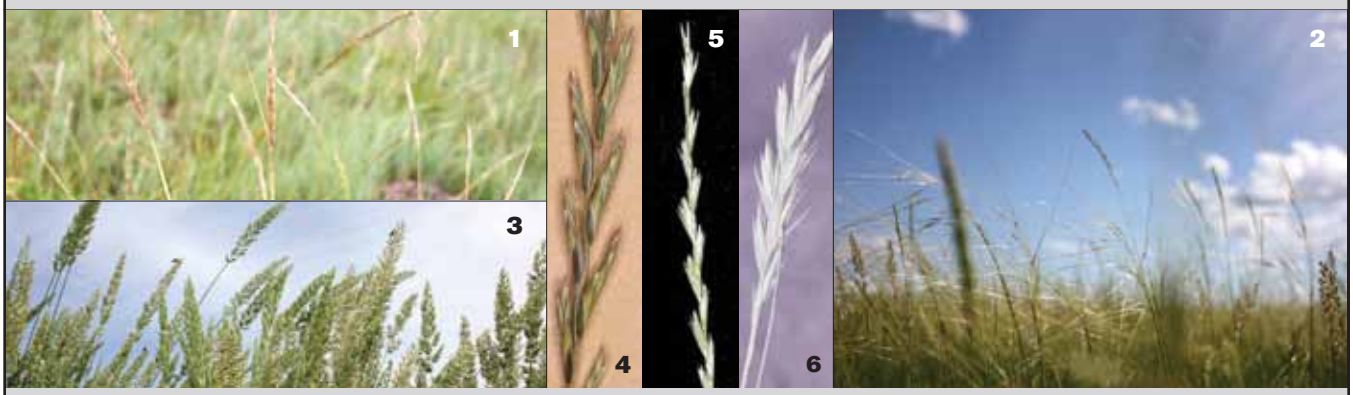


Photo credits: 1, 2, 3: Chet Neufeld, Executive Director, Native Plant Society of Saskatchewan; 4: Colin Stone, Alberta Agriculture; 5: Robert H. Mohlenbrock. USDA NRCS. 1992. Western wetland flora: Field office guide to plant species. West Region, Sacramento. Courtesy of USDA NRCS Wetland Science Institute; 6. Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA SCS. 1989. Midwest wetland flora: Field office illustrated guide to plant species. Midwest National Technical Center, Lincoln, NE.

2nd Year growth - This shows the native prairie establishment in July 2010

needle and thread grass, green needle grass and June grass. The area was lightly harrowed afterwards and left for Mother Nature to grow. The area received ample rain after being seeded that year and then received above average rainfall in the spring and early summer of 2010. The extra moisture aided tremendously in the establishment of the crop.

The native prairie stand has been monitored each year since the seeding. The information gained from this native prairie re-establishment project will help develop efficient and effective methods that can be used in revegetating future areas. Studies performed by a consultant showed that after the first year the 80 acres consisted of 21% native plants, 68% weeds and 11% bare ground. The study done after the second year reported 61% native plants, 24% weed cover and 15% bare ground.

The area is well on its way to becoming a successful native prairie field and a model for sustainable resource development in an ecologically sensitive area. ■

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Large Bucyrus-Erie drill being cleaned to be sold

Photos courtesy of Cold Jet

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- Pumps
- Filters & Screens
- Cranes
- Hoist Rooms
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- Chris Krasowski
General Manager, Medius Industrial

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HEAVY DUTY RESTORATION

MineStar Foreman, Dale Pederson monitoring mine equipment activity.

SEEING THE BIG PICTURE

GPS TECHNOLOGY FOR COAL MINING IS DRAMATICALLY CHANGING HOW SHERRITT COAL VIEWS – AND RUNS – ITS OPERATIONS.

Sherritt's coal-mining operations in Saskatchewan are not only massive; they are also complex. Boundary Dam and Bienfait mines cover approximately 100 square kilometers, utilize 6 draglines to remove the overburden to uncover coal in 4 active pits, 13 dozers, 15 haul trucks, 6 loaders, and employ over 300 workers that operate and maintain equipment for their 24 hour 365 day operation. Decisions need to be made continuously – decisions that affect productivity, efficiency and safety. But thanks to the first MineStar Fleet Commander system in the province, "It's so much easier to make good decisions faster," says Ashley Wallster, senior mine technologist for Sherritt Coal in Estevan.

Caterpillar describes its MineStar technology as, "a modern decision-support tool...allowing mines to understand, test and capture events in their mines in real time, as well as evaluate different planned operational scenarios." MineStar is essentially a monitoring and data storage system that feeds information back to Operations, Maintenance, Engineering, Human Resources or everyone that requires real time or historical information. Those out in the field – such as haul truck drivers – love the system; they view a screen somewhat like the GPS system in your car that shows them the haulage route and stores data which eliminates the need for the driver to record and provide a shift operating report. The system also monitors a wide range of functions in addition to location and production, such as engine health and performance, site hazards, training hours, fuelling assignments, shift change assignments and much more.

Sherritt introduced early GPS guidance systems on dozers in 2001, and has been expanding their use on a variety of different types of equipment throughout all nine of their mines in Western Canada over the years. Previously Caterpillar delivered their technology products in standalone systems but are presently working on integrating all of their systems together with full integration targeted for 2014. The production and health systems in place at Boundary/Bienfait are already proving their worth.

"We noticed a significant improvement in operating efficiencies on our hauling fleet in the first year with the MineStar production system," notes Wallster. "That's the largest improvement the mine has seen in the last 10 years." The increases in operating efficiencies are primarily related to reduction in queuing times and better overall loading and hauling information for the operators and all involved. The system optimizes when the trucks should arrive at a loading face and relays that information to the loading equipment to allow them to best utilize anytime that they may have between trucks. Another example of a gain in efficiency would be at the end of a shift. Drivers used to have to allow time to get to a central place for pick-up. Now, they operate until they are assigned to tie down at a predefined location spread out across the mine. This keeps the trucks productive until the very end of their shift, and keeps the trucks separated for the following shift to allow for a continuous flow of product.

Safety is another key benefit. Every truck on the site has a "mayday button" which instantly alerts dispatchers that the driver is in trouble and precisely where he is located. The MineStar system on our draglines has a machine awareness function that allows the dragline operator – who previously would only be able to see what is in front of them – to be alerted to the location of MineStar equipped machines anywhere around them. Wallster indicated that the newer coal haul trucks are equipped with a radar detection system that would detect an approaching vehicle or worker, and turn on a camera so the operator can view the situation in his cab. This tool will

help the mine maintain its enviable safety record – more than 8 years or 6 million person hours without a lost time injury.

The addition of a MineStar foreman and the MineStar system has allowed the pit foremen to concentrate on what's going on in the field rather than giving routine directions to workers. Previously the coal foreman would be trying to manage equipment and personnel spread out all over the site, making sure that they were providing coal to the proper locations at the proper rates. Now the MineStar foreman is able to see all of this from one central location. Working with the Pit foreman who knows what is going on in greater detail in the pits, they can easily assign things to where they need to go with a simple click of a button.

Kevin Fairburn, a mining specialist with Caterpillar dealer Kramer Ltd., says this enhanced capability can save a mine "hundreds of thousands of dollars." He cites the example of an operator who says his machine is "running hot." With the MineStar Health system, "You can diagnose the cause and sometimes even remedy the situation without ever having to send a technician out into the field." The dedicated real-time monitoring provides different warning severity levels which can reduce down times and avoid more expensive repairs.

When asked what is the biggest benefit of adding technology to the mining environment Wallster responded "It lets everyone know what's going on in real time, and the more accurately you know what's going on the better decisions you can make going forward which benefits the worker, the equipment and, in turn, the company".■

Historic Wings
DHC-2 Beaver CF-FHB (1948)
#1 Beaver Registered in Honour of Chief Designer F.H. Buller

eARTh

ART TAKES FLIGHT

Garry Thomson's paintings are as colourful as his personality, showing a spirit of adventure and a love of aviation.

Thompson is the owner of Osprey Wings Ltd., an air charter company located on the Churchill River system in the hamlet of Missinipe – with a satellite base in Points North Landing and a pick-up point in La Ronge. The company provides charter service to fishing lodges, private cabins, and for companies involved in mining exploration. Thompson also owns Pine Island Fishing Resort, located on Black Bear Lake.

"It's a five-star resort, no… maybe three-star fishing resort," he says, joking that the "distinction" doesn't really mean anything. "I just made it up."

Thompson is clearly an easy-going – albeit extremely busy – guy with a great sense of humour. He's humble about his exploits, which are numerous, and doesn't really get into his adventures. Nevertheless, he is quick to dispel some of the wilder rumours that have circulated about him – like a stunt he's alleged to have performed – flying an airplane under a bridge.

"It's a total lie," he says, adding he has no idea how the rumour started. "I've done a lot of stupid things, but never anything *that* stupid."

Thompson started flying in 1958 at the age of 17, and has lived and breathed airplanes ever since. He has close ties to the mining industry, and has worked with a number of major companies, often learning firsthand of exciting activities from his clients. That's his on-season.

With his summer adventures in mind, Thompson's off-season pursuits might come as a surprise to some.

Thompson is an accomplished artist, devoting two to three months every winter to his oil paintings. Primarily self-taught, he has been painting for over 20 years.

"Trial and error," he says, when asked how he learned to paint. "It's just something to do to relax... a hobby."

Thompson's paintings are inspired by his natural surroundings – with trees, water, wildlife, and of course, aircraft.

"I've done *Beavers, Norsemen, Otters*," he says. "I've always been interested in airplanes."

His current series, *Historic Wings*, showcases a variety of historic mining airplanes in different situations. His 2009 composition, entitled *DHC-2 Beaver CF-FHB*, depicts an important part of Canadian aviation and mining history.

The de Havilland #1 Beaver was designed and built in Canada in 1945 to fill the demands of bush operators. With all-metal construction, it offered excellent short take-off and landing capabilities while carrying heavy loads – a feature perfect for mining exploration. Since the aircraft is no longer in use today, Thompson had to research extensively, using old photographs to get the look and feel of the aircraft just right.

While he has never exhibited his paintings officially, Thompson does hang them up in his business. He doesn't sell them, but he has donated them to charity auctions.

"I had one piece sell at auction for $750, although my friend told me the frame was worth $749," he quips. "So I don't know what that means."

He also makes copies of them, and presents them as gifts to his clients.

"A lot of people give away hats and stuff – I thought I'd give these out," he says.

It's clear aviation and art are two of his biggest passions, but true to form, Thompson is quick to make a joke.

"Nope. I wouldn't say my passion is flying (or art). I would say my main passion is women," he says. "But I shouldn't say that because I'm married." ■

SASKATCHEWAN'S MINING INDUSTRY FOCUSES ON WORKFORCE DIVERSIFICATION TO ADDRESS THE LABOUR SHORTAGE

As submitted by Ryan Montpellier, Executive Director of MiHR

MiHR RHM | MINING INDUSTRY HUMAN RESOURCES COUNCIL

There is vast opportunity for growth in Saskatchewan's mining industry, but an aging workforce, a wave of retirements, and challenges in attracting and engaging key talent groups are threatening this potential. The Saskatchewan Mining Industry Hiring Requirements and Talent Availability Forecasts 2011 report, published in partnership between the Mining Industry Human Resources Council (MiHR) and the Saskatchewan Mining Association, states that even under a baseline scenario, the industry will need to hire over 15,000 workers by 2021.

To ensure that it is able to meet these future needs, Saskatchewan's mining industry will need to continue efforts to attract previously underrepresented groups into the workforce.

Increasing Aboriginal Inclusion

The Saskatchewan mining industry is a leading employer of First Nations and Métis people, representing 11.5

Mining Engineering Technology Program at SIAST

SIAST Kelsey Campus in Saskatoon offers a two-year diploma program in Mining Engineering technology. Graduates are prepared to work as technologists in mine operations both on the surface and underground.

The program includes training in:

- Surveying
- Drafting
- Computer Applications in Mining
- Mine Safety
- Basic Geology
- Mine Ventilation
- Ground Control
- Mine Hydrology and Environmental Concerns
- Ore Processing and Transportation
- Soil, Concrete and Shotcrete Testing
- Project Management
- Fluid Mechanics
- Basic Geophysics, Electricity and Instrumentation

Admission requirements include a Grade 12 diploma with an English Language requirement and a minimum of 60 per cent in Pre-Calculus 30. Physics 30 is recommended but not required. (Applicants without these requirements may be considered for special admission.)

SIAST offers many different learning methods to meet your needs. Some courses can be completed in the classroom, or through home study and online programs.

The course started in August 2012, and has been filled. However, SIAST is now providing information for the 2013 intake. For more information, visit http://gosiast.com or phone 1-866-goSIAST (1-866-467-4278).

per cent of the mining workforce in the province compared to 7 per cent of the Canadian mining workforce. The northern Saskatchewan mining industry is the leading industrial employer of Aboriginal people in Canada, comprising almost 50 per cent of site workforces. By attracting and retaining Aboriginal people to the industry, companies can benefit from a local, skilled and empowered workforce, and foster the economic development that results in healthy communities.

Saskatchewan's initiatives to attract and retain more First Nations and Métis people in the mining sector continues to form an important part of an industry-wide strategy to diversify the workforce and grow the talent pool to address the labour shortage. These efforts are even more critical going forward, given the demographics of the Saskatchewan population and the provincial mining industry's need for 15,000 new workers in the next ten years. Aboriginal youth are projected to make up 40 per cent of Saskatchewan's school-aged youth by 2020, with 100,000 Saskatchewan Aboriginal youth reaching working age by 2026. Aboriginal youth are also projected to make up 40 per cent of Saskatchewan's school-aged youth by 2020. While 19 per cent of Saskatchewan's "baby-boomer" workforce is forecast to retire by 2016, the median age of Saskatchewan's aboriginal population is 19 years younger than the median age of the non-aboriginal population.

MiHR produces resources to assist mining employers in attracting Aboriginal peoples to the workforce. Mining Essentials, a joint-venture between MiHR and the Assembly of First nations (AFN) is a pre-employment training program that teaches skills by combining industry examples, tools, documents and situations with traditional Aboriginal teaching methods and mediums including sharing circles and the involvement of Elders. ■

DIGGING DEEPER

www.aboriginalmining.ca

www.mihr.ca

www.saskmining.ca/news-article/Publications-Resources/PubRes/all/2/mi-hr-2008-and-2011-labour-market-reports.html

www.aboriginalhr.ca

www.indspire.ca

BEYOND THE BIO

VINCENT MARTIN, PRESIDENT & CEO, AREVA RESOURCES CANADA INC.

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

When Vincent Martin, his wife and two young boys arrived in Saskatoon in January 1994 from their home in southern France, it was close to midnight and -40°C. "We woke up the next morning, wondering how we could get from the hotel to a store to buy proper clothing," recalls Vincent. "We just weren't prepared!"

The weather might have been chilly, but the Martins quickly discovered a warm reception in the community, and at AREVA Resources Canada. Vincent appreciated the support he received in his new leadership position at AREVA, during an exciting and yet challenging time in the company's growth. As for their new home, the family found the city to be much "calmer with less pressure." Thinking that they would be here only a short time, they enrolled their two boys in the regular English-speaking school system to help them become bilingual. Little did they realize that almost 20 years later, they would still be here. The family now has dual citizenship and the boys, now attending university in Canada, consider English their first language. (On one trip to visit relatives in France several years ago, the boys even refused to speak French at one point – much to their grandparents' consternation!)

Martin believes anyone moving to a new country should try to embrace it and take advantage of what it has to offer. For him, that resulted in a love of nature, and in particular canoeing and kayaking. That led eventually to buying his ideal acreage home along the South Saskatchewan River.

The home, designed primarily by his wife, also demonstrates Martin's commitment to creating a greener world. Using a special concrete construction method, the home is solar-passive, uses geo-thermal heating, and the heating of the entire 3,000 square feet of living space consumes about as much as a car's block heater in winter. They also drive vehicles rated highly for energy-efficiency.

Born and educated as an engineer in France, Martin has travelled the world. He taught mining engineering for a year in Mali (Africa) – an experience which he says taught him more than he taught his students in many respects. He recalls times when they had to travel by car just to get drinking water, and when electricity, which relied on hydro, was available only half of the year.

His world view is consistent with AREVA's commitment to finding sustainable alternatives to carbon-based energies. "Nuclear energy is a vital component of meeting the world's growing demand for reliable electricity," he says. "But there doesn't need to be a competition among the green alternatives. Rather, they can all work together."

After a few challenging years for the nuclear industry worldwide, AREVA is ramping up again in Canada. Its McClean Lake Mill in northern Saskatchewan is undergoing a $150 million expansion so it can process the uranium ore from the Cigar Lake mine, expected to begin operation next year. AREVA also plans to hire some 100 new employees by the end of next year. "With this new growth will come new challenges, but these are the kind we welcome," says Martin. ■

TAGGING ALONG

JEREMY LALIBERTE, SOUS CHEF ATHABASCA CATERING

It's early morning at Rabbit Lake Mine and Sous Chef Jeremy Laliberte is already in the kitchen, planning the day's meals for the mine's hungry employees. The Cameco Corporation's mine employs 320 Cameco staff and a similar number of contract employees on a rotational schedule. It's up to the kitchen staff of 17 – employed by contract company, Athabasca Catering – to keep everyone well fed. It's a challenge Laliberte relishes.

"If you like cooking, it's a great thing to do," he says.

Athabasca Catering in a First Nations-owned mine site services company. Laliberte is one of 500 employees who provide catering, housekeeping, janitorial, and camp supply and management services to remote sites in Saskatchewan.

Laliberte's day starts at 6 a.m. and ends around 8 p.m. – with a short break from 1-2:30 p.m. As the Chef's right-hand man, he's responsible for prep work, kitchen management when required, and helping to plan the meals. Even though the basic menu is set by Athabasca's head office, the chefs have some freedom to rotate the dishes.

The Rabbit Lake kitchen staff also does their own ordering, so an important procedure is making sure the right ingredients are available at the right time.

"You have to really plan, because you can't run out to the store and pick something up," Laliberte says, noting food is delivered by truck twice a week from one of their supplier's warehouses.

Like other mine employees, Laliberte works a 7-day on, 7-day off schedule, flying home to Langham every other week. He says regular work schedules are unusual in the food industry – split shifts and irregular hours are the norm – so the security of mining hours was a major draw.

Still there are some downsides to being away from home.

"You're basically gone half the year," says Laliberte.

Laliberte's wife is a nurse and until recently, they were on the same rotation. Unfortunately, his promotion to Sous Chef changed his schedule, putting the couple on opposite shifts. The situation is tough, but Laliberte's hoping it's only temporary. He says his schedule would change again if he became a Chef.

Laliberte completed his education at SIAST in 2006, acquiring a Professional Cooking Certificate. He worked at an events centre and a private golf course before taking the job with Athabasca in 2007. He started as a Third Cook, before being promoted to Second Cook, and most recently to Sous Chef.

"I've kinda moved up the ranks," he says, noting he's spent much of his career at Rabbit Lake.

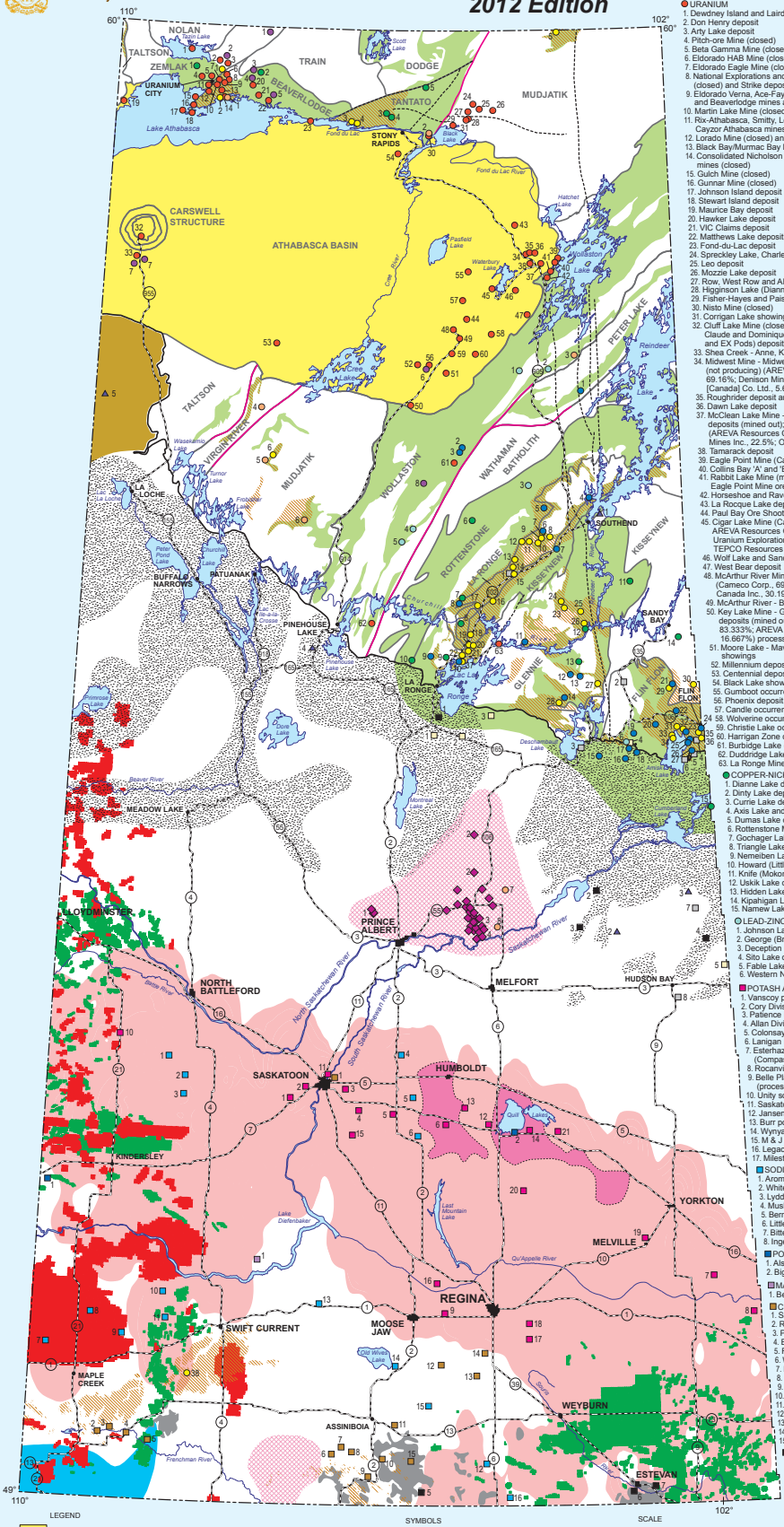
Not only that, but Laliberte has just completed his interprovincial Red Seal Journeyperson's designation. He's excited for the future, noting there are plenty of opportunities for advancement with Athabasca.

"Next step would be Chef," he says, adding that he would also like to own his own restaurant one day. ■

Saskatchewan Ministry of the Economy

MINERAL RESOURCE MAP OF SASKATCHEWAN

2012 Edition



KEY TO NUMBERED MINERAL DEPOSITS†

URANIUM
1. Dewdney Island and Laird Island deposits
2. Don Henry deposit
3. Arty Lake deposit
4. Pitch-ore Mine (closed)
5. Beta Gamma (closed)
6. Eldorado HAB Mine (closed) and Baska prospect
7. Eldorado Eagle Mine (closed) and ABC deposit
8. National Explorations and Eldorado Dubyna mines (closed) and Strike deposit
9. Eldorado Verna, Ace-Fay, Nesbitt Labine (Eagle-Ace) and Beaverlodge mines and Bolger Open Pit (closed)
10. Martin Lake Mine (closed)
11. Rix-Athabasca, Smitty, Leonard, Cinch Lake and Cayzor Athabasca mines (closed); St. Michael deposit
12. Lorado Mine (closed) and Uranium Ridge deposit
13. Black Bay/Murmac Bay Mine (closed)
14. Consolidated Nicholson Bay and Fish Hook Bay mines (closed)
15. Gulch Mine (closed)
16. Gunnar Mine (closed)
17. Johnson Island deposit
18. Stewart Island deposit
19. Maurice Bay deposit
20. Hawker Lake deposit
21. VIC Claims deposit
22. Matthews Lake deposit
23. Fond-du-Lac deposit
24. Spreckley Lake, Charlebois Lake and David deposits
25. Leo deposit
26. Mozzie Lake deposit
27. Row, West Row and ART deposits
28. Higginson Lake (Dianne) deposit
29. Fisher-Hayes and Paisley Lake deposits
30. Nisto Mine (closed)
31. Corrigan Lake showing
32. Cluff Lake Mine (closed) - D, Dominique-Peter, Claude and Dominique-Janine (North, EX OP, UG and EX Pods) deposits
33. Shea Creek - Anne, Kianna and Colette deposits
34. Midwest Mine - Midwest and Midwest A deposits (not producing) (AREVA Resources Canada Inc., 69.16%; Denison Mines Inc., 25.17%; OURD [Canada] Co. Ltd., 5.67%)
35. Roughrider deposit and J Zone
36. Dawn Lake deposit
37. McClean Lake Mine - JEB, Sue A, B, C and E deposits (mined out); McClean, Caribou, Sue D (AREVA Resources Canada Inc., 70%; Denison Mines Inc., 22.5%; OURD (Canada) Co. Ltd. 7.5%)
38. Tamarack deposit
39. Eagle Point Mine (Cameco Corp.)
40. Collins Bay 'A' and 'B' Zone deposits (mined out)
41. Rabbit Lake Mine (mined out); mill processing Eagle Point Mine ore
42. Horseshoe and Raven deposits
43. La Rocque Lake deposit
44. Paul Bay Ore Shoot
45. Cigar Lake Mine (Cameco Corp., 50.025%; AREVA Resources Canada Inc., 37.1%; Idemitsu Uranium Exploration Canada Ltd., 7.875%; TEPCO Resources Inc., 5%; start-up 2013?)
46. Wolf Lake and Sand Lake deposits
47. West Bear deposit
48. McArthur River Mine - McArthur River deposit (Cameco Corp., 69.805%; AREVA Resources Canada Inc., 30.195%)
49. McArthur River - BJ Zone deposit
50. Key Lake Mine - Gaertner and Deilmann deposits (mined out); mill (Cameco Corp., 83.333%; AREVA Resources Canada Inc., 16.667%) processing McArthur River Mine ore
51. Moore Lake - Maverick deposit; 525 and 527 showings
52. Millennium deposit
53. Centennial deposit
54. Black Lake showing
55. Gumboot occurrence
56. Phoenix deposit
57. Candle occurrence
58. Wolverine occurrence
59. Christie Lake occurrence
60. Harrigan Zone deposit
61. Burbidge Lake (BURR) deposit
62. Duddridge Lake (Thor) deposit
63. La Ronge Mine (closed)

COPPER-NICKEL AND COPPER-COBALT
1. Dianne Lake deposit
2. Dinty Lake deposit
3. Currie Lake deposit
4. Axis Lake and Rea Lake deposits
5. Dumas Lake deposit
6. Rottenstone Mine (closed)
7. Gochager Lake deposit
8. Triangle Lake deposit
9. Nemeiben Lake (Dunlop) deposit
10. Howard (Little Clam) Lake deposit
11. Knife (Mokoman) Lake deposit
12. Uskik Lake deposit
13. Hidden Lake deposit
14. Kipahigan Lake deposit
15. Namew Lake Mine (closed) (in Manitoba)

LEAD-ZINC
1. Johnson Lake (Marina) showing
2. George (Brakewell) Lake deposit
3. Deception Lake showing
4. Sito Lake deposits
5. Fable Lake showing
6. Western Nuclear Mine (closed)

POTASH AND SALT
1. Vanscoy potash mine (Agrium Inc.) and salt plant (NSC Minerals)
2. Cory Division potash mine (PotashCorp) (by-product CaCl, brine)
3. Patience Lake Division potash solution mine (PotashCorp)
4. Allan Division potash mine (PotashCorp)
5. Colonsay potash mine (The Mosaic Company)
6. Lanigan Division potash mine (PotashCorp)
7. Esterhazy K-1 and K-2 potash mines (The Mosaic Company) and salt plant (Compass Minerals)
8. Rocanville Division potash mine (PotashCorp) and salt plant (NSC Minerals)
9. Belle Plaine potash solution mine (The Mosaic Company) and fine salt plant (processes waste salt from potash mine) (Canadian Salt Co. Ltd.)
10. Unity solution salt mine and plant (Compass Minerals)
11. Saskatoon chloride-based chemical plant (ERCO Worldwide)
12. Jansen potash project
13. Burr potash project
14. Wynyard potash project
15. M & J potash project
16. Legacy potash project
17. Milestone potash project
18. Kronau potash project
19. Melville potash project
20. Muskowekwan potash project
21. Foam Lake project

SODIUM SULPHATE
1. Aroma Lake deposit
2. Whiteshore Lake (Palo) deposit
3. Lydden Lake deposit
4. Muskiki Lake deposit
5. Berry Lake deposit
6. Little Manitou Lake deposit
7. Bitter Lake deposit
8. Ingebrigt Lake plant (closed)
9. Vincent Lake deposit
10. Snakehole Lake plant (closed)
11. Verlo East deposit
12. Ceylon Lake (Salt Lake) deposit
13. Chaplin Lake plant (Sask. Minerals)
14. Frederick Lake (Bishopric) plant (closed)
15. Horseshoe (Shoe) Lake plant (closed)
16. Sybouts East (East Coteau Lake) plant (closed)

POTASSIUM SULPHATE
1. Alsask Lake plant (closed)
2. Big Quill Lake plant (Compass Minerals)

MAGNESIUM SULPHATE
1. Beechy plant (Touchwood Resources)

CLAY RESOURCES
1. Saskatoon clay quarry and plant (Cindercrete Products Ltd.)
2. Ravenscrag clay quarry (brick) (I-XL Industries Ltd.)
3. PR-1 and PR-3 clay deposits (stoneware)
4. Eastend clay deposit
5. Frenchman clay prospect
6. Wood Mountain - Fir Mountain kaolin prospect
7. Flintoft clay pit (refractory and ball clay) (closed)
8. Gollier Creek kaolin mine (closed)
9. Rockglen clay pit (brick clay)
10. St. Victor bentonite deposit (swelling bentonite)
11. Readlyn ball clay deposit and Willows clay pit (refractory and ball clay)
12. A.P. Green Claybank brick plant (closed)
13. Truax bentonite quarry (Canadian Clay Products Inc.)
14. Wilcox bentonite plant (Canadian Clay Products Inc.)
15. Willow Bunch clinker quarry (Colored Shale Products Inc.)

COAL AND PEAT
1. Lac La Ronge lignite (sub-bituminous) deposit
2. Carrot River Peat Moss Mine (Premier Tech Horticulture)
3. Carrot River peat moss plant (Premier Tech Horticulture)
4. Hudson Bay area coal deposits
5. Poplar River Coal Mine (Prairie Mines)
6. Boundary Dam (Shand, Costello, and Utility) Coal Mine (Prairie Mines)
7. Bienfait Coal Mine (Prairie Mines)

BUILDING MATERIALS
1. Neyrink Lake black and grey granite (diorite) building stone
2. Sahli green granite building stone
3. Deschambault marble (dolomite) quarry (Graham Construction)
4. Mystic Lake "Verde Antique" marble (veined amphibolite) building stone
5. McNally Lake buckskin marble (dolomite) building stone
6. Amisk Lake red marble (dolomite) building stone
7. Waskwei River cement rock deposit
8. Hudson Bay cement rock deposit

SILICA SAND
1. Bow River silica sand deposit
2. Nipekamew River silica sand deposit
3. Wapawekka Lake silica sand deposit
4. Hanson Lake silica sand quarry (Preferred Sands Unlimited)
5. Red Deer River silica sand quarry (Red Deer Silica Inc.)

GOLD
1. Neeley Lake deposit
2. Box mine (closed), Athona deposit and Frontier Adit showing
3. ELA deposit
4. Pine Channel showings
5. Nirdac Creek showing
6. Ithingo Lake deposit
7. Twin Zone and Wedge Lake deposits
8. Golden Heart deposit
9. EP Mine (Golden Band Resources Inc.) and Komis deposit
10. Corner Lake (Augustus) deposit and Oven Lake showing
11. Tower East and Memorial deposits
12. Niko deposit, Kaslo and Birch Crossing showings
13. Jojay deposit
14. Star Lake and Jolu mines (closed)
15. Jasper Mine (closed)
16. Greywacke deposit
17. Roy Lloyd Mine - Bingo deposit (Golden Band Resources Inc.)
18. North Lake deposit
19. Contact Lake Mine (closed)
20. Preview North and South, PAP A, B, C and SW deposits
21. Sulphide Lake deposits
22. Lynx Lake (GEM) deposit
23. Seabee Mine (Claude Resources Inc.)
24. Porky Lake and Pigeon Lake showings
25. Santoy 8 Mine (Claude Resources Inc.); ore milled at Seabee Mine
26. Georges Lake showings
27. Prongua Lake showings
28. Brownell Lake showings
29. Manson Bay (Schotts Lake) deposit
30. Eccles Lake (Dolly) deposit
31. Graham Mine (closed) and deposit
32. Robinson Creek deposit
33. Prince Albert (Monarch) Mine (closed)
34. Laurel Lake deposit
35. Newcor, Bootleg (Rio), and Henning-Maloney mines (closed)
36. Phantom Lake and McMillan mines
37. Anglo-Rouyn tailings
38. Simmie paleoplacer showing

COPPER-ZINC
1. Campbell River showings
2. Janice Lake showings
3. Jansem showings
4. Stackhouse Bay showing
5. Elephant Lake deposit
6. Discovery Lake deposits
7. Brabant Lake PEG/McKenzie deposit
8. Borys Lake deposit
9. Elizabeth Lake deposit
10. Anglo-Rouyn Mine (closed)
11. Pitching Lake deposit
12. SAD Zone (HBED Zone) deposit
13. Hook Lake (Gee Lake) deposit
14. Brownell Lake deposit
15. Bigstone Lake deposit
16. Miskat Lake deposit
17. McIlvenna Bay deposit
18. McDermott Lake (Balsam Zone) deposit
19. Ramsay (Quandt/Keputch) deposit
20. FON Zone deposit
21. Schotts Lake deposit
22. Otonadah Lake deposit
23. Black Prince showing
24. Flin Flon and Callinan mines (closed)
25. Birch Lake and Flexar mines (closed)
26. Konuto Lake Mine (closed)
27. Coronation Mine (closed)

IRON FORMATION
1. Fish Hook Bay showing
2. Triana deposit
3. Spence Lake showing
4. Nyberg Lake (VH) deposit
5. Ithingo Lake showing
6. Dot Lake showing
7. Kelsey Lake deposit
8. Choiceland deposit

RARE EARTH OCCURRENCES
1. Hoidas Lake - Nisikkatch Lake (+ uranium and thorium)
2. Bear Lake (+ uranium and thorium)
3. Alces Lake (+ uranium and thorium)
4. Oldman Lake
5. Archie Lake (+ thorium)
6. Maw REE Zone
7. Douglas River
8. Kulyk Lake (+ uranium and thorium)

KIMBERLITE OCCURRENCES
1. Sturgeon Lake
2. Candle Lake
3. Fort à la Corne kimberlite field
4. Star Kimberlite

MISCELLANEOUS OCCURRENCES
1. Deep Bay graphite deposit
2. Pasquia Hills oil shale deposit
3. Bainbridge nodular manganese deposit
4. Pinehouse limestone deposit
5. Axe Lake oil sands deposit

† Mine = Past, present, and test producing mines
Deposit = Deposits (calculated reserves - resources not 43-101 compliant in all cases) and developed prospects (drilling delineated mineralization)
Showing = Mineral occurrence with assays

This map is available from:
Saskatchewan Ministry of the Economy
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LEGEND
- Uranium potential
- Base metal potential
- Gold potential
- Diamond potential
- Major peat resource potential
- Carbon dioxide (CO_2) resource potential
- Oil pool
- Gas pool
- Oil sands potential
- Coal field
- Potash and salt resource area
- Carnallitic region (magnesium)

SYMBOLS
- Edge of Precambrian Shield
- Precambrian domain boundary and name
- Major bounding shear zone
- Major fault
- Road
- City
- Town

SCALE
25 0 25 50 75 Kilometres
25 0 25 50 Miles

SMA MEMBERSHIP

Agrium Partnership
AREVA Resources Canada Inc.
Associated Mining Construction
BHP Billiton
Boart Longyear
Cameco Corporation
Canadian Salt Co. Ltd. (The)
CanAlaska Uranium Ltd.
Claude Resources Inc.
Denison Mines Corp.
Fission Energy Corp.
Foran Mining Corporation
Forum Uranium Corp.
Golden Band Resources Inc.
Great Western Minerals Group Ltd.
Hathor Exploration Ltd.
HudBay Minerals
Hudson Bay Minerals & Smelting Co. Ltd.
JCU (Canada) Exploration Company Ltd.
JNR Resources Inc.
K+S Potash Canada GP
Kitsaki Procon Joint Venture
La Ronge Gold Corp.
The Mosaic Company
Mosaic Belle Plaine
Mosaic Colonsay
Mosaic Esterhazy
North Atlantic Potash Inc.
Pitchstone Exploration Ltd.
PotashCorp
PotashCorp Allan
PotashCorp Cory
PotashCorp Lanigan
PotashCorp Patience Lake
PotashCorp Rocanville
Purepoint Uranium Group Inc.
Red Rock Energy Inc.
Rio Tinto
Sherritt Coal
Shore Gold Inc.
Strongbow Exploration
Thyssen Mining Construction of Canada
Titan Uranium Inc.
UEX Corporation
Vale Potash Canada Limited
Wescan Goldfields Inc.
Westcore Energy
Western Potash Corp.

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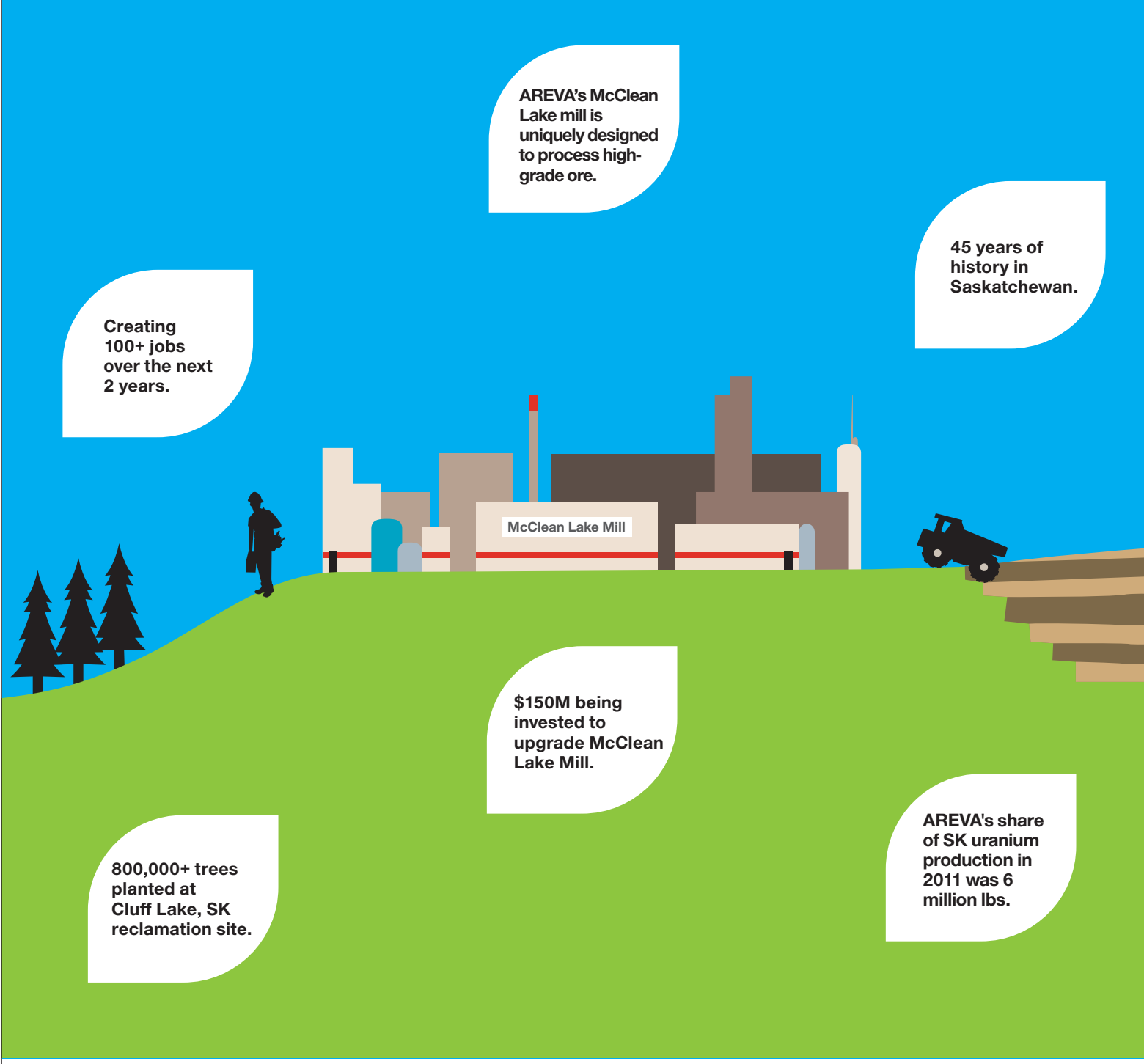

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