

**ORE**

# EXPLORATION:

## Going All In



**FLEX TIME**

**STRETCHING FOR SAFETY AT  
THE ALLAN POTASH MINE**

**RETURN TO NATURE**

**THE GREENING OF KEY  
LAKE'S WASTE ROCK**



**FALL / WINTER 2014**

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**RUNNING FOR SUCCESS**

**POTASHCORP'S JOCHEN TILK  
HAS A PASSION FOR RUNNING**



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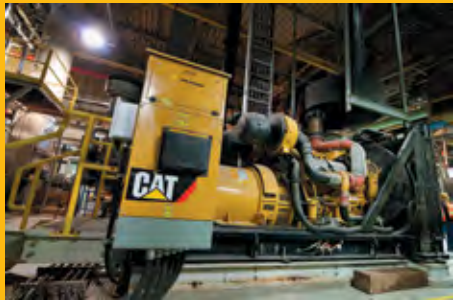


Camp at North Arrow Minerals' Pikoo diamond property in northern Saskatchewan.

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**COVER PHOTO**  
Mining and exploration companies working in Saskatchewan are taking risks to discover the resources of the future. When exploration is successful, the rewards can be significant – for the companies, but also for the province's economy and employment. This issue of ORE explores the companies now engaged in searching for mineral resources and the challenges they face.

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## A MESSAGE FROM SMA EXECUTIVE DIRECTOR – PAM SCHWANN EXPLORATION – THE QUEST TO DISCOVER

Mineral exploration is a game of hide and seek, with science tools like geophysics and geochemistry helping uncover the layers that hide the deposit. The high stakes world of mineral exploration, the important role exploration plays as the research and development phase of the mining cycle and the state of exploration in Saskatchewan and Canada are laid out in our two feature stories in this edition of ORE. The success of a mineral

(greenfield) targeting world-class deposits. Although he was speaking about space exploration, he could well have been referring to mineral exploration when American astronomer Seth Shostak, expressed “exploration occasionally rewards those who accept its risks, usually with new resources.” Rewards of a successful diamond exploration program are beautifully crafted and showcased in eARTH; while the Ore Deposit Model series describes the formation of these gemstones.

earth, technology plays an important role in other aspects of the mining business – including the use of drones for efficiently laying out mine plans, to the adoption of technology as a business strategy for Athabasca Basin Security’s work at minesites. ORE’s Tagging Along segment spotlights a geological engineer and describes how technology is embedded into his daily work routine.

Exploring is about asking why and searching for the answer. When a company explored why they were having certain injuries reported and what could be done to prevent these injuries, they discovered a very innovative and successful solution, as described in the Flex Time article. Exploration has also been called the engine of innovation – the Environment article Return to Nature describes the search to find the best way



to mimic Mother Nature’s vegetation regeneration in a sand-dominated environment of northern Saskatchewan. The economic commentary explores some of the issues with the state of rail transportation today and identifies solutions that would assist all shippers.

Finally, our Beyond the Bio feature keeps pace with Jochen Tilk, PotashCorp’s new president and CEO, as he settles into his new home in Saskatoon.

We hope you enjoy exploring this 8th edition of ORE with us.

“exploration occasionally rewards those who accept its risks, usually with new resources.”

exploration program is typically the result of coincident factors; an understanding of the geological framework of an area; an ore deposit model that fits the geological framework, favourable commodity prices, infrastructure access, security of mineral tenure and successful financing.

While advances in technology have facilitated finding mineral deposits at greater depths in the

The mineral exploration game is filled with optimistic players – they have to be, as the discovery of a mineral deposit and bringing it into successful production is against the odds. Reviews of exploration projects have found that the proportion of exploration targets that end up as profitable mines is very low; ranging from 1 in 24 for targets in existing, prolific mining areas (brownfield) and ranging from 1 in 1,000 (0.01%) to 1 in 3,333 (0.03%) for new exploration targets



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# DIAMONDS

## WHERE DO DIAMONDS COME FROM AND HOW CAN WE FIND THEM?

Provided by Sask. Geological  
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### How do Diamonds form?

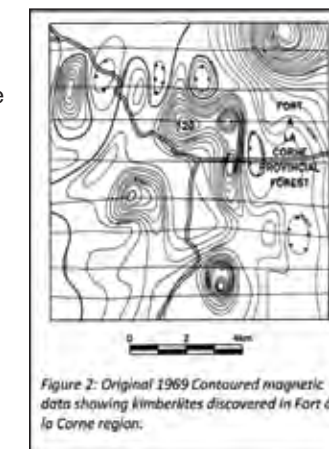
Diamonds are crystals of carbon that form within the earth's upper mantle (>150 km depth) under extreme temperature and pressure conditions in an area known as the diamond stability zone. These types of conditions do not exist on the surface of the earth where carbon more commonly crystallizes as graphite. The diamonds are brought up to surface by kimberlite magma which is generated down at the base of thick Archean (> 2.5 billion years old) continental crust, and rises up through the lithosphere along fractures and planes of weakness resulting in an explosive volcanic eruption. When the dust settles and the magma cools, these kimberlites are typically left with a carrot-shaped pipe

that includes an upper crater, a diatreme and root zone (Figure 1). In Canada, the upper crater zone, which is a mixture of kimberlite and country rock fragments, is frequently eroded away or removed by glaciers. The advancing glaciers scrape the top off of the kimberlite pipe spreading diamonds, and other more plentiful minerals indicative of kimberlites (such as pyrope garnets, chrome diopside, chromite and picroilmenite), across the surface. Explorers commonly analyze samples of glacial till for these indicator minerals, which can help determine if a kimberlite is nearby. Airborne geophysical surveys are also useful in finding kimberlites, which typically have contrasting physical properties (particularly magnetism and density) to the rocks they intrude.

### Diamonds in Saskatchewan

Diamonds were rumored to be found in Saskatchewan as far back as the 1950's, but it wasn't until 1988 when the first diamond-bearing kimberlites were found. Geologists from Uranerz Exploration and Mining Ltd. studied aeromagnetic maps, produced by the Geological Survey of Canada in the 1960s, and found large circular anomalies in the Fort à la Corne Provincial Forest

(Figure 2). These anomalies turned out to be a cluster of over 70 kimberlite pipes which ascended through the Archean Sask Craton



and compose one of the largest kimberlite fields in the world. The Fort à la Corne (FaC) cluster erupted

about 100 million years ago when Saskatchewan was covered with a shallow sea and was buried by layers of sandstone and shale before any erosion could occur (Figure 3). As a result, these unique kimberlites have huge volumes of crater zone materials with much smaller magmatic root zones.

Many other parts of Saskatchewan are underlain by similar Archean rocks and are prospective for diamond exploration. A recent discovery of root-zone diamond bearing kimberlite north of Deschambault Lake has reignited grass-roots exploration interests with over one million hectares of land being staked shortly after the diamond discovery was announced.

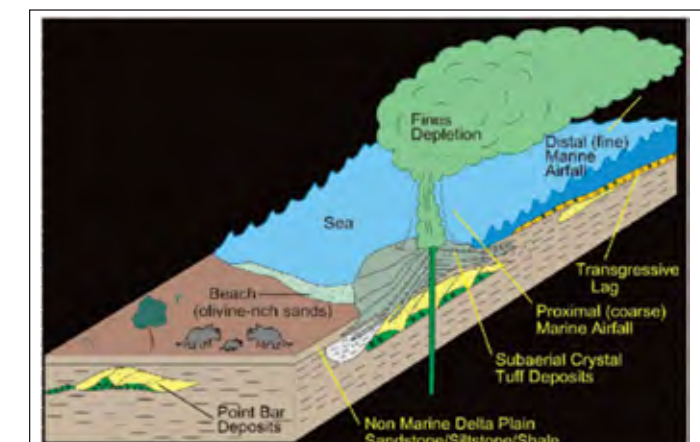
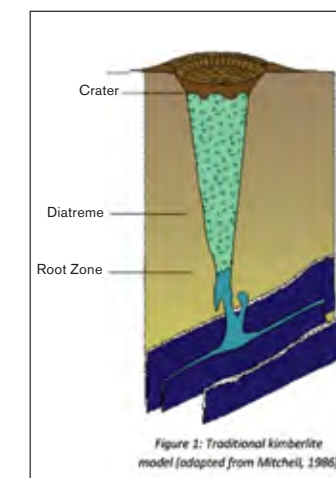


Figure 3: Example of the Fort à la Corne kimberlite depositional environment based on Leckie et al., 1997.





A geologist examines the till overlying North Arrow Minerals' Pikoo diamond property in northern Saskatchewan.

# EXPLORATION: *Going All In*

## COMPANIES FIND STRONG MINERALIZATION IN NORTHERN SASKATCHEWAN'S HARD ROCK

Hostile weather, daunting overburdens of rock and till, a constant search for financing and endless government paperwork: why would anyone want to face the challenges of hard rock exploration?

Perhaps the results speak for themselves. In the Athabasca Basin of Saskatchewan, mining companies continue to find spectacular deposits

of high-grade uranium. In the central-northeast region, diamonds glint amid the ore extracted from kimberlite pipes.

It is hard, slow going, but the prospecting gene tucked into the DNA of geologists will not be denied. They live for the good news – and in Saskatchewan, when it's good, it is really good.

Fission Uranium Corp. (TSXV: FCU) is generating both interest in and financing for its 100 percent-owned Patterson South property, on the southwestern edge of the basin. In late September, the company announced it had successfully raised \$14.4 million in flow-through shares for its exploration program.

*continued on p8*





Fission Uranium continues its exploration program from its camp at the Patterson South property.

highest grade deposits the Athabasca Basin, with a total resource of just over 70 million pounds, said Hochstein. However, while Gryphon's grades are lower, it will likely be easier to mine.

"With Gryphon, it's a different type of ore body. It's in the basement rock, not at the unconformity," the geological layer between the top sediments and the underlying basement rock. "Phoenix is more similar to McArthur River or Cigar Lake. You're looking at similar issues in terms of freezing and other issues to deal with.

"Gryphon, although it may not have the grades of Phoenix, it's certainly very exciting because it's in the basement which would enable us potentially to bring it into production sooner."

Fission's deposit is at the top of basement rock, with mineralization beginning at 50 metres, said McElroy. The trend is 2.24 kilometres, with about 1.2 kilometres of continuous high-grade mineralization.

"If you look at the basin as a whole, the edges host the shallowest deposits. We are near the edge of the basin – actually just outside. Our mineralization is at the top of the basement, at the top of bedrock. That's why we see mineralization at 50 metres depth. It's as close to the surface as you can get.

"The keys are that it's large, the grade has been spectacular, and how shallow it is. There hasn't been anything like this found for 40 years. We made this discovery in an

area where nobody had even been looking."

Global mining giant Rio Tinto is continuing its evaluation of the Roughrider property in northern Saskatchewan, acquired from Hathor Exploration. Still at an early stage, Roughrider will have to go before an internal investment committee before funds and approval can be obtained to move to the pre-feasibility stage, said Jay Fredericks, director of external relations.

Following its three-rig summer program, the company is assessing the merits of an underground exploration program where it would sink a shaft and develop one or more drifts parallel to the ore body and drill at close range, to get a better picture of the nature of the deposit

and the hydro-geologic conditions, said Fredericks.

"It is very tough at the moment," he added. "Internal competition for funds within Rio Tinto is intense for projects like an advanced exploration project at Roughrider."

In addition, the uranium market is not very strong at the moment, he said. However, Fredericks remains optimistic.

"When you're looking at developing a uranium project or any mineral deposit you can't look at what the markets are right at the moment," said Fredericks. "You have to look at forecasts of where markets will be a number of years down the road. Rio Tinto still sees a positive long-term outlook



Rio Tinto's Roughrider Project core camp from the air



The use of swamp mats at Rio Tinto's Roughrider Project for trail access across bogs reduces environmental impacts of trail development



An aerial view of the terrain near Deschambault Lake. Pikoo project, North Arrow Minerals

There are several reasons for the interest, among them that Fission's winter drill program showed  $U_3O_8$  (triuranium octoxide) grades ranging from under two percent to 38.5 percent. Multiple drill holes with wide intervals have demonstrated grades in the 15 to 27 percent range.

"Everything went well with the financing," said Ross McElroy, president, COO and chief geologist. McElroy was featured in ORE's Beyond the Bio feature in the spring/summer 2014 edition.

"The deal is now closed and we have additional money

in the bank for next year's exploration. The current plan is that the \$15 million will take us through the winter program and the summer one as well. We may decide to be more aggressive."

Fission recently completed its summer program and has announced results on 54 of the holes.

"We've hit 100 percent (mineralization) on those holes this summer. Overall, from discovery in November 2012 until now, a total of 222 holes have been drilled into the main mineralized trend, with a total of 216 hitting mineralization, for a success ratio of 97 percent."

At Denison Mines Corp. (TSX:DML), exploration continues at its Wheeler River property, where the Phoenix deposit and Gryphon zone are showing strong results.

"We are fully funded for our 2015 exploration," said president and CEO Ron Hochstein. "The money's in the tin, and now it's just a matter of evaluating our 2014-15 activity."

Denison has a 60 percent interest in the Wheeler River Joint Venture, comprised of 11,720 hectares in northern Saskatchewan. Cameco Corp. and JCU (Canada) Exploration Company Ltd. are the other partners, with 30

and 10 percent respectively.

The company's summer drill program highlight at Gryphon was hole WR-569A, which intersected a wide zone of alteration and mineralization with several high grade intervals, including 9.41 percent  $eU_3O_8$  (a gamma radiation measurement) over 3.7 metres and 5.27 percent  $eU_3O_8$  over 5.9 metres.

Exploration at the Phoenix deposit is much further along. "The discovery hole was in 2008 and we've been drilling it quite extensively since that time," said Hochstein.

The average grade at Phoenix is 18.5 percent, one of the



A helicopter flies into North Arrow Minerals' camp at the Pikoo property.

SHORE GOLD

*Shore Gold Inc. (TSX:SGF), the Saskatoon-based diamond exploration company, has proposed drilling 10 new holes into its Orion South kimberlite property in east-central Saskatchewan at a cost of approximately \$6 million.*

*The company hopes to raise the funds via flow-through shares in the near future, said George Read, the company's senior vice-president of exploration and development.*

*The new drilling is important to the company's future plans. Read said evaluation drilling and bulk sampling of the Orion South kimberlite were halted by the global financial crisis. Therefore, work on the Orion South*

*property has been limited, whereas Shore's Star kimberlite has produced a sample of about 15,000 carats of diamonds. Further drilling would also allow the company to include 12 previously-drilled holes in its model.*

*Because Orion South has significantly less overburden, it would be more economic in the early days of mining because high-grade kimberlite could be reached sooner, said Read.*

*"We elected to mine Star first because it was so well understood and all the evaluation was complete, which*

*was not true for Orion South, the evaluation of which had been curtailed by the world financial crisis," he said.*

*"The exercise of the drill program is to change that, so we upgrade the resource at Orion South with the aim of potentially mining there first. That could have a very positive effect on the economic model. It would cost significantly less because (it has) 30 metres less overburden. It would also generate cash flow sooner than Star."*

*The Star and Orion South projects at Fort a la Corne in east-central Saskatchewan hold*

*estimated reserves of 34.4 million carats valued at \$242 US per carat. The Star and Orion South kimberlites have been estimated to include inferred resources containing 15.7 million carats.*

*Shore has also recently filed its final Revised Environmental Impact Statement for the project to the Saskatchewan Ministry of Environment and the Canadian Environmental Assessment Agency.*

for uranium in the future. Saskatchewan is very much a place you want to be if you are in the uranium market."

While uranium deposits have been proven economic and mined in Saskatchewan for decades, diamonds are a new and, for many, thrilling prospective resource.

B.C.-based North Arrow Minerals (TSXV:NAR) has fairly recently joined the hunt for the gemstones. It has found a diamond-bearing kimberlite in east-central Saskatchewan, 140 km east of La Ronge and near Deschambault Lake.

Stornoway Diamond Corp., which owns 20 percent of the venture, began exploration on the property by collecting surface samples and determining that they contained indicator minerals. These minerals have a unique chemistry,

because they originate in a high pressure, but relatively low temperature environment in the upper mantle of the earth, and are strongly indicative of diamonds.

North Arrow president and CEO Ken Armstrong said his company then earned its interest in the venture by drilling in summer, 2013. North Arrow drilled five holes in the North Pikoo and South Pikoo properties, and hit kimberlite – the rock known to often contain diamonds – in nine of 10 holes.

"In exploration you don't always hit things on the first shot, so it's really quite exceptional," said Armstrong. "The main discovery is what we call the PK150, at the cutoff point of the South Pikoo indicator train. We tested it with three holes and hit kimberlite in all of them. From our drilling we determined the body

to be approximately 10 to 15 metres wide and at least 75 metres long."

Diamond analysis proved that the sample contained 745 diamonds, 23 of them greater than .85 millimetres in size – which is widely regarded as the cut-off point for commercial diamond size.

It was the number of diamonds larger than .85 (mm) that was very encouraging and compares very well to other diamond finds in Canada and is what has given us the encouragement to carry on.

"We followed up last year's discovery by collecting 441 till samples in June focused on areas that had shown encouraging initial sampling results, but lacked much infill sampling. We have about half of those results back," said Armstrong. "We like what we see so far, but because

we don't have all the results we've decided to hold off on our originally planned fall drill program. Instead, we will do some more sampling to better define some new target areas and then drill the best targets next winter.

"In our view it's the proper way to evaluate this discovery. It remains a very difficult market for companies to raise money to do exploration, so we need to be careful with that money and we need to evaluate things properly. With North Arrow...we are well-financed and have been well-financed, but have set ourselves up to make sure we are evaluating our projects in a smart way and be as efficient with our money as possible."





# FINDING THE FUNDS

## SASKATCHEWAN EXPLORATION FAIRLY STRONG DESPITE SOFT MARKETS

In what is widely known as a tough market for exploration companies, the search for Saskatchewan resources has continued at a healthy pace in 2013 and 2014.

"For 2014, the best estimate we have is that there will be about \$235 million spent on exploration in Saskatchewan," said Gary Delaney, chief geologist, Saskatchewan Geological Survey, Ministry of the Economy. "That's very comparable to actual expenditures of \$236 million last year in 2013." (See Figure 1).

Most of those expenditures in both years were for uranium and potash projects, although there is also renewed interest in diamonds with North Arrow Minerals' discovery of

diamond-bearing kimberlites last year, said Delaney.

Fission Uranium's Patterson Lake South discovery on the southwest side of the Athabasca Basin has generated a lot of market interest, because of its apparent size and high

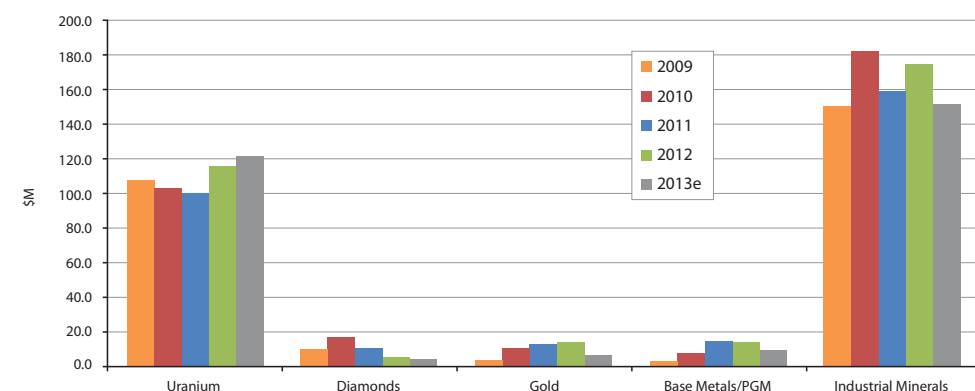
uranium grade. Exploration also continues at Denison Mines and partners' Wheeler River project.

"Where there have been successes, junior companies with nearby properties seem to be able to access money and put it into the ground,"

said Delaney. "There are a number of other juniors that are very challenged to raise any capital right now."

It's not because their projects aren't of high quality, he noted, but because they aren't positioned near new discoveries.

Figure 1 Mineral exploration expenditures in Saskatchewan



"I think we have good potential for new discoveries, not only as we've demonstrated with diamonds and uranium, but discoveries of base metals and even gold as well," added Delaney.

While the global exploration picture is fairly dim, today's environment in this province is significantly better than it was 10 to 15 years ago.

"The last really ugly times we had here when it comes to exploration was back in the period up to 2003. We typically only saw \$10, \$20, \$30 million a year for a long period there," said Delaney.

"In the period 2003 to 2014, we've seen almost \$3 billion spent on exploration in Saskatchewan," he said. "About \$1.35 billion of that was for uranium."

The all-time peak for exploration spending was about \$474 million in 2008, just before the global financial crisis. Clearly, spending has fallen off since then, but remains in the \$200 to \$300 million range annually, said Delaney.

There has been a marginal improvement in financing for Canadian companies of late, said Rod Thomas, president of the Prospectors and Developers Association of Canada (PDAC).

"In terms of financings, particularly for small companies, the word I would use is brutal. It's very difficult for small companies to raise money," said Thomas.

"Obviously their share prices are very low. In order to get funds they have to put out more shares, so you have dilution and shareholders don't like dilution. If they can't raise money they can't do anything, so it's a catch-22 situation."

Last year was a difficult one for mineral exploration financing, both in Canada

Figure 2 Australian, Canadian and Global Exploration Budgets (total amounts)

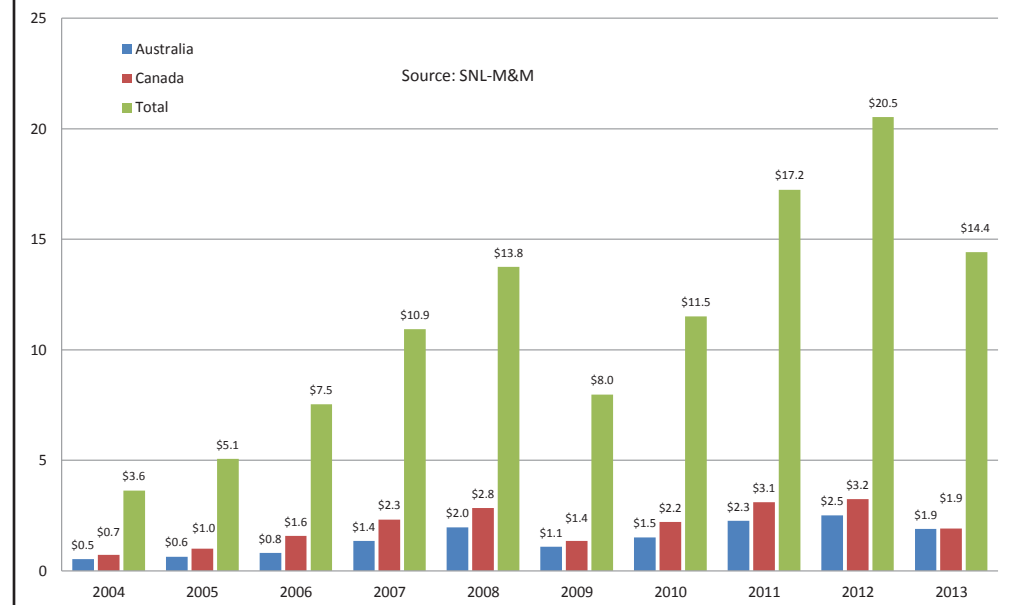
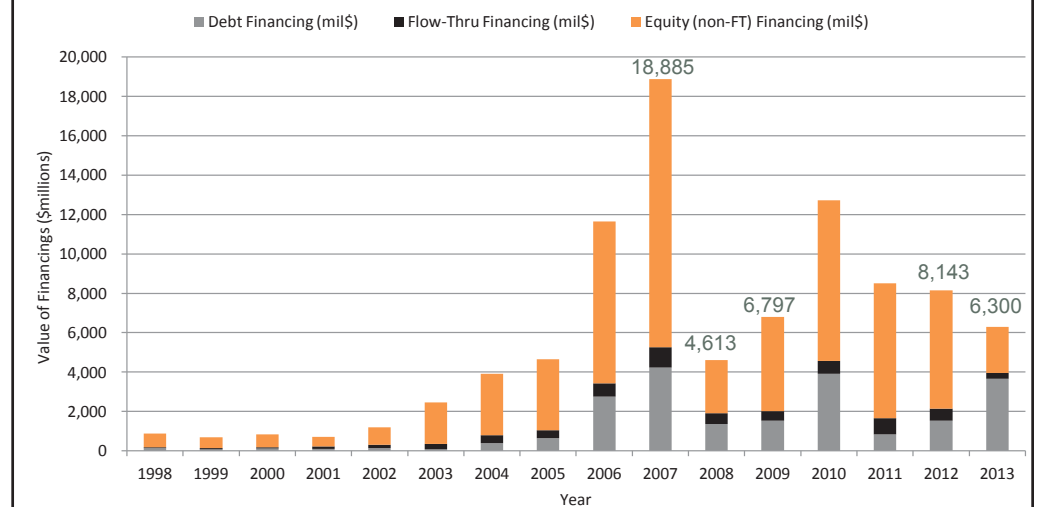


Figure 3 Value of Junior Company Financings Exploration Stage Companies Proposed/Arranged (\$millions)



and globally. Budgets fell 30 percent on a global basis. (See Figure 2). PDAC research showed that financing raised on the TSX Venture Exchange was for small amounts: over 50 percent raised \$500,000 or less, compared to 13 percent in 2010. Of those, 12 percent were for \$100,000 or less, as compared to only 0.5 percent in 2010.

Total cash generated from junior financing activities in Canada fell by 34

percent in 2013, after a 52 percent drop in 2012, according to PwC. Almost 60 percent of Canadian-listed juniors had working capital balances under \$200,000 as of May 6, 2014 (Kaiser Research Online, 2014). (See Figure 3).

Exploration companies face other challenges as well, added Thomas.

"These days in particular, there's a lot of money that's required just to maintain

the listing. The regulatory burden is much higher than it was 10 or 20 years ago. The number is in the order of \$200,000 a year just to keep your company listed on the stock exchange."

However, said Thomas, it will get better, even if a turn-around is not imminent.

"The mines are mining every day and depleting their reserves and those reserves need to be



replaced. At some point the cycle turns and prices go up and interest in junior exploration changes."

On the positive side, metals prices have not fallen as far as some predicted. While they have come off their highs, nickel, zinc, copper and lead prices are either reasonable or fairly high.

"The big issue for us as an industry is the gold price," said Thomas. "Probably four out of five junior companies are looking for gold. The gold commodity has a very high correlation between our industry, the activity in our industry, and the gold price. The gold price has fallen somewhat and is predicted to fall further. That's not good."

The global economic picture is mixed, said Thomas. China's economy is slowing down with no government intentions of trying to inflate the economy, and Europe is still battling deflation.

"The only bright light, really, in terms of the world financial scene is the U.S. The U.S. economy seems to be gaining traction. We are right next door, and what happens in the U.S., we get tugged along whether we like it or not.

"The world is getting richer day by day. The middle class is growing. Medium-term, all those economies are going to be consuming more metals than they are today.

"I'm optimistic. It will turn around. I'm convinced about that. But we may bounce along the bottom for a couple more years."

"Growth, potential and opportunity – that characterizes our mineral sector now," said Delaney. "It's a rough time, but a lot of us have been through this before."

Scott McHardy, vice-president of exploration at Cameco Corp. and chair of the Saskatchewan Mining Association's exploration section, said access to land in Saskatchewan is another advantage compared to other jurisdictions.

"We're a few steps ahead of other areas. We have a strong presence with the Saskatchewan Geological Survey, that actively promotes the province and archives the knowledge that's created, and then uses it to promote exploration in the province."

Saskatchewan also fares better than many other jurisdictions due to its multiple commodities, said McHardy. Potash and uranium account for the highest exploration expenditures, but diamonds, gold, base metals and industrial minerals also contribute to the relatively healthy \$230 million in exploration expenditures.

"You might have some commodity prices down, but you hope it will be rebalanced with some of the others. A lot of what drives the exploration investment is the optimism, the view of the future.

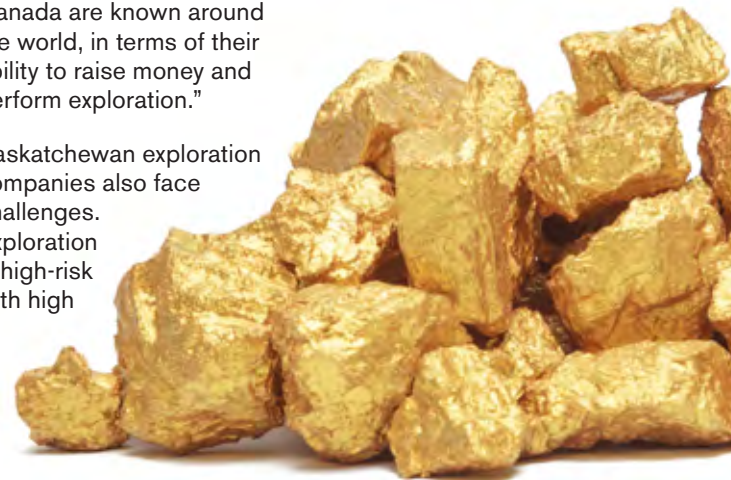
"The fact that we can maintain a relatively high exploration investment is a statement that reflects the view of optimism in Saskatchewan's future.

"The junior explorers of Canada are known around the world, in terms of their ability to raise money and perform exploration."

Saskatchewan exploration companies also face challenges. Exploration is high-risk with high

reward and not every project will be successful, said McHardy.

"Investing in new technologies, new geophysical techniques, lower detection limits in geochemical analyses and investing in drilling will result in creating new knowledge. Often it is the second or third generation of exploration on a property that can yield successful results or a new discovery."




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# RETURN TO NATURE

## KEY LAKE WASTE ROCK PILES GROWING GREEN

At the Key Lake mine site in northern Saskatchewan, there are three massive piles of barren brown waste rock that are waiting to be reclaimed.

Cameco Corp. is determined to turn them green.

Mining of the Gaertner and Deilmann ore bodies at the site began in the early 1980s by one of Cameco's predecessor companies, Key Lake Mining Corporation. Waste rock consisting of sandy overburden, sandstone and basement rock was stockpiled near the open pits. Key Lake was mined out by 1997, but even before then, Cameco began putting significant effort into figuring out how to return the waste

rock piles to the landscape. Today, they are close.

"We've been conducting vegetation trials and reclamation test work at Key Lake for the better part of 30 years now," said Dana Fenske, senior geological environmental engineer for Cameco.

"In this last stretch, we've built some momentum. We're pushing to get more of our sites actually reclaimed instead of continuing test work. There has been a push in the last five to eight years to get something done on these waste rock piles and get them reclaimed."

Cameco is focusing its research on the Deilmann North pile, which will be the first of the three – the others

are Deilmann South and Gaertner – to be reclaimed and revegetated, said Fenske.

It has been a challenge. Key Lake, which now mills uranium from the

**"A lot of the earlier work was predicated on the idea of re-establishing the native vegetation."**

McArthur River mine, is located in the sandy and rocky Athabasca basin.

"A lot of the earlier work was predicated on the idea of re-establishing the native vegetation," said Pat Landine, chief geoenvironmental engineer. "The area was

covered by jack pine forest, so there was a lot of effort put into re-establishing that jack pine forest. I think it was a mistake to try and plant a jack pine forest directly into bare sand."

What the Cameco team has learned is that jack pine requires a community of other vegetation native to the area. Therefore, jack pine cannot flourish without the ground cover vegetation, such as mosses, said Fenske.

### Native species planted at Key Lake

- Haircap Moss (*Polytrichum* sp.)
- Jack Pine (*Pinus banksiana*)
- Bearberry (*Arctostaphylos* sp.)
- Blueberry (*Vaccinium* sp.)
- Birch (*Betula* sp.)
- Willow (*Salix* sp.)
- Alder (*Alnus* sp.)
- Aspen (*Populus* sp.)

"What we're finding in a lot of the waste rock piles is the mosses get things stabilized, preventing wind and water erosion," he said.

"In the Athabasca basin, all we have is sand and sandstone, which turns into sand when it's exposed to the environment.

"If the sand is not stabilized, it blows around and makes it very difficult for the vegetation to grow."

Success has come through experimentation. The environmental engineers established 10 by 10 metre plots with eight different amendments to the substrate, such as manure, mulch or lake bottom sediment. Each type of plot was repeated in triplicate for a total of 24 plots.

Within those plots, they included several types of vegetation to see how each species responded to each amendment.

Then, they decided to add a few plots "where we did the 'everything' approach," said Landine.

"Lo and behold, those are the best plots, overall," said Fenske.

"In hindsight, that stands to reason. There's bound to be some synergistic effects to having all those things together at once."

Landine said they plan to flatten the slopes of the piles, establish a drainage system, compact the waste rock surface and then place the till on top.

"Long before we were ever at the site, the forest was growing there, on this sand. We know the natural processes will eventually get you there," said Fenske. "We're just figuring out how to get that process moving a little more quickly."

Landine and Fenske's revegetation work won them a 2010 Cameco Environmental Leadership Award in the ideas category, shared with Key Lake environmental co-ordinator Rob Van Stone. The awards recognized employees that demonstrated Cameco's commitment to environmental leadership. The three authors presented a comprehensive power point presentation to describe their efforts in revegetating the Key Lake site to the point that it would, once again,

look like native forest and not a tree plantation.

Very soon, they will see that work begin to come to fruition. After monitoring the scientific plots for four years, the data collected will be used over the next several months to design a reclamation program for Deilmann North. Next year, they will start to move dirt, reshape the piles and start the reclamation process.

"Maybe in three to five years, a person will fly over this and say, this pile that used to be brown is green," said Landine.

"Ideally, in 10 to 15 years from now, you wouldn't know it was a waste rock pile," added Fenske. "That's the intention here."





# RAIL TRANSPORTATION CROSSROADS – MORE TRANSPARENCY; MORE CAPACITY

## FEDS CAN'T PLAY FAVOURITES WITH RAIL RULES

Brendan Marshall | Director, Economic Affairs, Mining Association of Canada

This spring, the federal government instituted mandatory grain-shipping quotas for railways in an attempt to remedy delays in agriculture shipments from this past winter. But similar rail service issues have also plagued other industries, like mining. This interventionist and sector-specific approach to addressing Canada's rail transportation challenges runs counter to the government's trade and economic development priorities, and won't address the problems. Reliable and effective rail service is no less essential for mining and other products than it is for the movement of grain. Transportation policy, informed by railway data, should reflect this.

A particularly harsh winter, causing trains to travel more slowly with fewer cars in tow, converged with a bumper crop to create a significant grain backlog on the prairies. The government's response was to mandate grain sector specific volume commitments for Canada's Class I railways.

First, through an Order in Council, and then through Bill C-30 Fair Rail for Grain Farmers, the federal government enacted requirements for Canada's Class I railways – CN and CP – to carry no less than one million tonnes of grain each week combined. Failing that, they would be subject to monetary penalties. The current order in council keeps the one

million tonne minimum until Aug. 3, 2014, after which a new minimum level could be instituted. Bill C-30 sunsets in August 2016, meaning these exclusive volume commitments would be in force for at least the next two years.

The government acted under the auspices that it needed to protect Canada's trade reputation as a world-class grain supplier, when in reality the provisions enacted may dampen our reputation for the rest of the economy. These measures are likely to exacerbate existing rail capacity constraints to the detriment of other shipping sectors, including mining. Railways have a limited number of cars,

crew and equipment at their disposal to service all sectors. Requiring minimum volume commitments for grain effectively allocates rail capacity to the grain sector at the expense of all other shipping sectors.

The Canadian mining industry is the largest customer group of Canada's railways, consistently accounting for over half of the total rail freight revenue generated in Canada, and nearly half of total volume carried by Canadian railways annually. As such, miners are greatly invested in government measures that impact rail service.

Though the issues surrounding agriculture

shipments this winter were severe, the problems are systemic in nature, widespread throughout the shipper community, and longstanding. Poor rail service creates unpredictable operating environments, prevents companies from expanding their market share internationally, and creates a perception of company unreliability in their relations with customers. Rail service caused a range of challenges for miners through the winter, resulting in some instances in the downscaling of production at operations. It is a perennial issue across the network and needs to be addressed as such.

Railways are "supply-chain enablers" and do not produce the goods for export that allow trade to grow, our economy to expand, and employment to increase. In this light, the railways are a significant and essential domestic component of "market access" for

all of Canada's exports, as well as its domestic deliveries. By favoring one shipping sector over others, the government may unintentionally affect others adversely. Without a healthy and reliable railway network for all shipping sectors, Canada's reputation and success as a trading nation are seriously hampered.

In order to address rail service issues holistically, it is essential to properly identify the nature and extent of the problem. If sector and company-specific data were available to the government and shippers, they would be able to more easily determine the cause of service disruptions. Various performance measures could provide evidence of capacity displacement from one shipper to another or, conversely, prove that railways are acting responsibly. Moreover, transparency will likely lead to less of an adversarial

relationship between railways and shippers, as both parties, being aware of the strength of each other's position, will be motivated to negotiate to avoid a legal proceeding and arrive at mutually beneficial results.

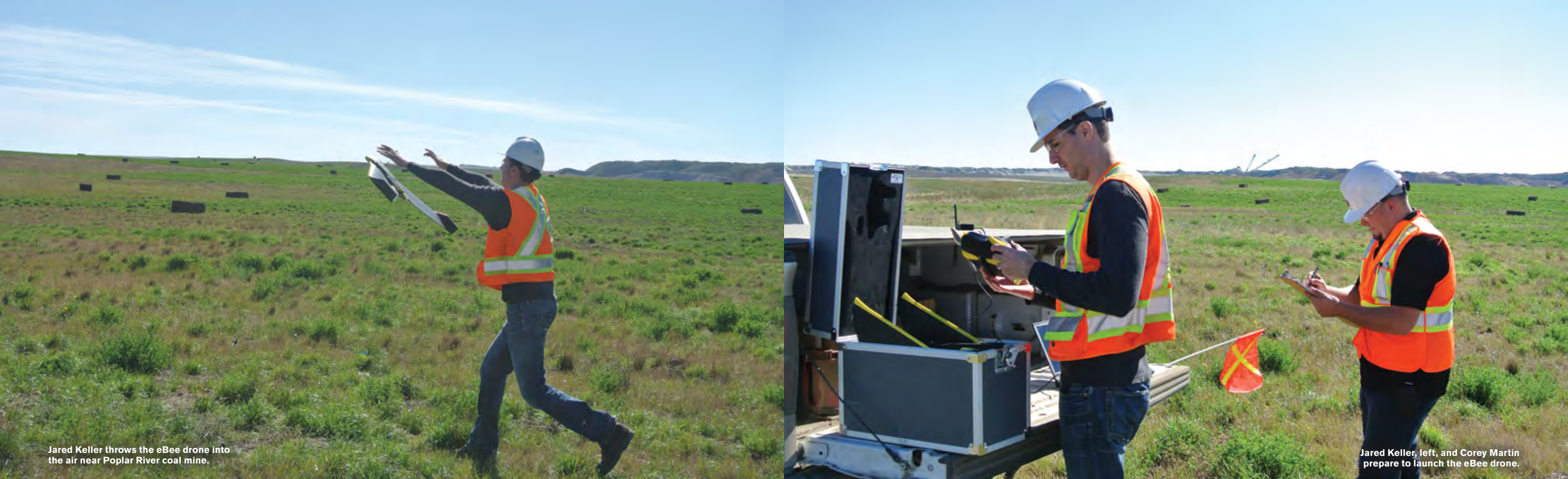
While appearing before the House of Commons Agriculture and Agri-Foods Committee on Bill C-30, MAC advocated for policies informed by accurate data, recommending the government enact a railway requirement to provide both regular monthly public rail performance data on a sector basis, and confidential company-specific performance data upon request.

As the government begins the 2015 Statutory Review of the Canada Transportation Act, it would be wise to ensure those conducting the review have the information required to make informed public policy

decisions. Data transparency would permit the government a clearer understanding of how the logistics supply chain is performing, where challenges exist, and what policies are needed to properly address them to the benefit of shippers and the Canadian economy as a whole.







Jared Keller throws the eBee drone into the air near Poplar River coal mine.

Jared Keller, left, and Corey Martin prepare to launch the eBee drone.

# EYE IN THE SKY

## DRONE TECHNOLOGY AND 3-D MODELLING IMPROVE ACCURACY IN MINE PLANNING

Westmoreland Coal Co. has a new eye in the sky, keeping watch on its mining operations at Poplar River in southern Saskatchewan.

In June, the company literally threw a camera-equipped drone named eBee into the air for the first time. EBee returned with a plethora of photographs, which, after being run through Autocad software, gave Westmoreland a three-dimensional view of its property.

EBee is now an integral part of the team.

"In the past we used aerial photographs taken from planes," said Corey Martin, junior mine engineer-in-training at Poplar River.

"The issue with that is they are quite costly and can only be done once a year, usually in September.

"In the strip mining industry we go through a lot of changes within a year .... Just having another tool to use, we can get more recent photographs from the air on work we have done recently."

The most important benefit to the drone, said Martin, is achieving a 3-D model of the ground.

"That is something that, in some cases is impossible due to accessibility. In the past the only way to model the ground is to actually physically survey it. We would have our surveyor walk the area with a GPS device.

"This way we can throw a drone up in the air – literally just throw it – and it will provide survey points every five centimeters. We bring that into our computers and have a full model of the ground we can work with."

Once the model is complete, Westmoreland can determine pit widths and forecast with greater certainty how much dirt will have to be moved to mine certain areas.

Made by senseFly, a Swiss company owned by Parrot, the drone weighs 0.7 kilograms (1.5 lbs.) and has a wingspan of 96 centimetres (38 inches). It operates on an 11 volt battery, which gives it 50 minutes of flying time and the ability to cover 10 square kilometres in a

single flight. The technology allows for a "throwing into the sky" launch, not entirely unlike a paper airplane.

"You literally draw a box over Google maps and it will fly that area to get all its photos," said Martin.

The operator – either Martin or engineering manager Jared Keller – uses a laptop which is in constant communication with the drone, including providing instructions to land. Once, said Martin, hawks in the area were taking interest in the drone, so he landed it right away to avoid hurting the birds.

EBee is not inexpensive, coming in at about \$40,000, but Martin says it has already saved the company money.

"Our stockpile is due for a good survey, so we are going to use it for that. It's a six-hour job for a surveyor to walk the stockpile. With a drone, we can do it in 20 minutes."

"While planning for a dragline, if you don't have good raw data, there are a lot of assumptions that have to be made which can lead to unsuitable plans. One wrong assumption can cost hundreds of thousands of dollars. One accurate project can pay for the drone itself," said Martin.

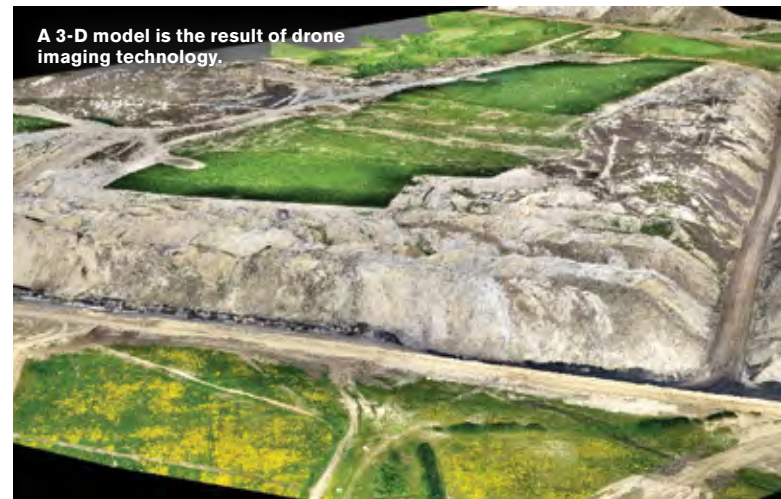
It also saves time. "Our stockpile is due for a good survey, so we are going to use it for that. It's a six-hour job for a surveyor to walk the

stockpile. With a drone, we can do it in 20 minutes," said Martin. "We get 20 times the accuracy as well."

Westmoreland is also using the drone technology to assist with reclamation, said Martin. The company is required to reclaim a certain number of hectares per year under government regulations.

"A dragline, when it digs, creates piles," explained Martin. "After, we flatten the piles with dozers and we have

A 3-D model is the result of drone imaging technology.



to get it below a maximum grade to meet the regulations of the province. We flew the area to make sure every point of that hill was within the regulations of the province."

Around Poplar River near the Coronach SaskPower plant, the new technology has been particularly useful because of the topography, which is quite hilly. However, it is proving itself at all Canadian Westmoreland mines: two in Saskatchewan and four in Alberta. Five are

mine-mouth operations and one is exporting.

Thus far, the drone has handled windy conditions with no problem. Since it has only been in use since early summer, Martin is waiting to see how it handles winter.

"We're pretty interested to see how it handles the cold."





**eARTh**  
SETTING STONES

## Saskatoon goldsmith first to set Sask. diamond

When Ken Paulson is bent over his workbench in downtown Saskatoon crafting a setting for a diamond ring, the “art” of his creation isn’t top of mind.

"There's a lot of technical stuff that goes into it, making it strong and wearable and still making it beautiful. Every component of the ring has to work together to show off the main event. Usually that's a gem stone," said

Paulson, owner of K.M.  
Paulson Goldsmith Ltd.

"Without the technical stuff, the art doesn't get done."

In 2007, Shore Gold Inc. contacted Paulson to set the first Saskatchewan mined diamond ever to be mounted into a piece of jewellery. Shore Gold showed him 40 stones of various sizes and colours, but one stood out. The 1.02Ct. VVS2-G stone

was brilliantly cut at Rio Tinto  
Diamonds in Australia.

"It was the nicest stone from a colour and clarity standpoint and it was perfectly cut," said Paulson.

The diamond, set into an elaborate antique mount made of platinum, was featured at Shore Gold's annual general meeting. Despite several inquiries from prospective buyers, the

diamond ring was not for sale because it was used for demonstration purposes, and not licensed for sale. Paulson is eager for Saskatchewan mined diamonds to come onto the market.

"I'm hoping to be the first in line when that diamond is available. That would be the ultimate. It would be the culmination of my career, especially if it was also cut in Saskatchewan."

Each piece of fine jewellery manufactured by Paulson and his two employees is unique. He refuses to duplicate any of their work, choosing instead to collaborate with a customer to design a one-of-a-kind piece of jewellery.

"It always starts with the drawing," said Paulson, gesturing toward a cabinet filled with sketch pads dating back to 1986.

Once Paulson and his customer are satisfied with the sketch, he makes a wax model of the piece. The model is cast using the 'lost wax' method, yielding a one-of-a-kind piece. When working with platinum, he often uses more traditional construction methods. Either way, the work has just begun.

"This is my favourite part. I take this rough rugged thing and make it into something shiny," he said with a wide grin.

About 80 per cent of Paulson's work is designing and manufacturing rings. His goal is to make each one a work of art.

## The four C's

**Diamonds are judged by four criteria, referred to as the four C's: carat, clarity, colour and cut.**

**Carat refers to the weight of a diamond. Each carat is 100 points, and equivalent to 0.2 grams.**

**Clarity** indicates the presence, or lack of presence, of inclusions, external marks or blemishes. Most diamonds have

tiny flaws or inclusions created during the stone's formation over millions or billions of years. The best grade is flawless, or FL, followed by internally flawless (IF), VVS1 (very very slight inclusions, hard to see under magnification); VS, or very slight; SI, slight; and I, for obviously included.

Colour, in the case of white diamonds, is signified by letters of the

alphabet. The letter D is given to the finest, most colourless diamonds; the letter Z signifies the least desirable colour.

Cut may be the most important criterion. A beautifully-cut diamond will demonstrate brilliance and life, as the facets flash light throughout the stone. Styles range from the classic round brilliant cut to a variety of fancy cuts.

“My stuff tends to be looked at very closely by the person wearing it. Where the art comes in is making it noticeable from a distance. You want to design it so it draws in the person across the table so they want to see it.”

Photos of Paulson's works of art can be seen on his website, [www.kmpltd.ca](http://www.kmpltd.ca).



**Saskatoon goldsmith Ken Paulson was the first to set a Saskatchewan-mined diamond into a ring (Shown above)**



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# TOMORROW'S MINERS SHINE AT COMPETITION



## NATIONAL MINING COMPETITION SIMULATES REAL-WORD MULTI-DISCIPLINARY APPROACH

With the success the National Mining Competition (NMC) is enjoying after just three years, they may have to change the first word in the title to "international."

In its first year, the case study competition organized by University of Saskatchewan students was truly national. In its second year, it attracted a team from the United States.

This year, two teams from the United Kingdom's Camborne School of Mines are attending, along with at least one American team and possibly one from India. Through the case study competition, teams demonstrate their critical thinking skills, knowledge of key technical concepts and strategic decision

making that are required by the global mining industry.

Last year's competition was won by Michigan Tech's team of Cora Hemmila, Matt Schuman, Matt Younger and Matt Schwalen. The school will field a team again this year.

Mark Nielsen, VP of corporate relations for the NMC, attributes the event's success to two things.

"The student organizers of the competition bring a lot of commitment and energy to organizing it. And, the competition is so inclusive, it is of big benefit to all students around the world."

The competition is a multi-disciplinary challenge, comprising all aspects

of the mining industry from the technical to the financial and business aspects. New this year is a crisis communications element, supported by the Saskatchewan Mining Association. Students prepare case studies involving all these elements, and present them to a panel of judges selected from the mining community.

"The other competitions are mining-specific," noted Nielsen. "There are not a whole lot that include commerce, engineering and geology."

Grant Isaac, Cameco senior vice-president and CFO, contributed his time as a judge last year. He regards the NMC as good experience for students.

"The National Mining Competition provides an excellent opportunity for university students interested in a career in the mining industry to broaden their knowledge in a business-focused competition," said Isaac. "By working in teams with fellow students studying engineering, finance, marketing and project management, participants gain insights into what it would actually be like to work in the mining industry."

PotashCorp is the NMC's title sponsor, and most of the mining companies operating in Saskatchewan, including Cameco, also support the event. It runs Oct. 30 to Nov. 2 ending in a gala, sponsored by K+S Potash Canada.

NMC was developed to "help students further their mining knowledge, refine their career goals, build professional networks, and develop the mining industry of tomorrow," says the organization.

NMC is just one of several educational events and programs supported by Saskatchewan mining companies and the Saskatchewan Mining Association (SMA).

Among them is the SMA's Digging Deeper Challenge, which asks students in Grades 4, 7, and 9 through 12 to participate in mining-related projects that are associated with the school curricula. The students can win cash prizes and have their projects posted online.

Minerals and Products, or MAP, is a one-day exhibition held for the first time last May at SIAST's Kelsey Campus gym. Geared for Grade 7 students, the exhibition covers exploration, mining, processing, products, sustainability and safety in a series of pavilions. Last year's inaugural MAP event generated reviews from attendees ranging from Awesome! (87.5 percent) for its level of interest to Wow! (81 percent) for learning experience.

Last year, over 300 Grade 7 students attended. Teachers gave the event rave reviews.

"I'm not sure that there is anything that could be done differently to significantly improve the learning experience," said one teacher. "Activities were all age/grade/level appropriate, and all of my students were engaged."

Both Digging Deeper and MAP for 2014-2015 are in the planning stages, and are expected to restart this fall.

For more information contact Kate at [education@saskmining.ca](mailto:education@saskmining.ca).



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## BEYOND THE BIO

JOCHEN TILK  
PRESIDENT AND CEO  
POTASHCORP

In each edition of ORE, we go beyond the official bios to give our readers insight into the leaders of Saskatchewan's mineral mining and exploration companies. This edition features Jochen Tilk, the new president and CEO of PotashCorp, one of the province's largest companies and the world's largest fertilizer producer.

In just three months of living in Saskatoon, Jochen Tilk had already covered 800 kilometres of city road and river trail.

After mining and family, running is Tilk's passion in life. He regards the pounding of pavement and dirt as not just physically, but mentally healthy.

"I usually run 80 to 100 kilometres a week, but I'm not here all the time; I do a fair amount of travelling," said Tilk. "At a minimum, I run 50 km a week (in Saskatoon). I think I would have run 800 kilometres."

He often runs along the Meewasin Valley Trail, which lines Saskatoon's riverbanks, and has also

participated in several local races including the River Run and Saskatoon marathon.

"It's great exposure to the community," said Tilk. Yet he usually runs alone.

"Some people are into team sports; some people are into social activities where they can meet peers. Running allows me to be physically

active, and it allows me to be silent. It's being physically active while you enjoy quiet time."

Because he so often works into the evening, Tilk's partner Denise has given him a headlight for night



running. He enjoys it, because it provides safety and vision in the dark.

"The only thing is, when someone is coming (toward you), it does look like a train is coming," he said with a laugh.

Tilk became PotashCorp's president and CEO on July 1, taking over from Bill Doyle. Tilk has spent 30 years in the mining industry, most recently as president and CEO of Inmet Mining Corp., a Canadian metals company known for its copper properties. He holds a Master's degree in engineering from the University of Aachen in Germany, his home country.

Coming to potash mining from copper, Tilk says there are both overlaps and differences. The overlap comes in relevant experience; the differences allow him to take a fresh look at the business. Tilk says he is constantly asking questions of his management team.

"Some of the (questions) are (intended) to become familiar with the business, and

some are to understand why certain things are a certain way. At some point in time you either feel comfortable with that....and other times you start pushing that.

"I think there is always an opportunity to bring in some outside thinking, and refresh the traditional way of doing things. The only way you get that is by reaching out and testing the boundaries."

In his career, Tilk has lived in many locations, ranging from remote areas to big cities. "I've had the privilege to live in a lot of beautiful places and they are all very different. I have lived in a lot of remote places.... I lived in Northern Michigan for a while on the famous UP – Upper Peninsula – which still qualifies for the most remote place on Earth.

"If you ever fly from Sioux Ste. Marie to Marquette (Michigan) and you look down, you will see nothing but water and trees. It's beautiful."

In Canada, he has lived in Northern Ontario and then Toronto, when he joined the corporate office at Inmet. He describes moving to Saskatoon as "a very easy move. It's certainly a beautiful place."

Tilk and his partner have purchased a home, but for now have taken residence in an apartment near the bustling district of Broadway. Near the trails he likes to run, it's an excellent location, since it is also close to the soon-to-be renovated home.

Tilk says he has felt "warmly welcomed" to Saskatoon. "We've been blessed and gratified by the openness."

He is also proud of the company's strong public presence in the city. "I was taken aback -- in a good way -- by how present we are."



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The pace and variety of Olson's work life takes boredom – that career engagement killer – entirely out of the equation.

With responsibilities for the Mosaic mines at Esterhazy, Colonsay and Belle Plaine in Saskatchewan, and Carlsbad, New Mexico, "I have a wide-ranging portfolio," said Olson. "It's never boring. There is always something happening.

"We've centralized the mine engineering function, the geological and geotechnical services functions. We have a land and minerals portfolio. We have applied process technology, essentially the R&D group for the processing side.

"We also have automation projects, and that's really trying to get mining equipment underground to run autonomously."

Olson oversees all of those functions. I am very fortunate to have an exceptional team to work with.

"My job is really about the responsible extraction of the resource," said Olson. On top of engineering, there are also responsibilities to the government, the environment, and communities. Safety is a big part of that, directing all activity from laying out the mine to its operation.

"Mines last a long time. We have to do it right."

A week of his life might look something like this.

Monday: Olson will often drive to Regina or to Belle Plaine from his home base in Saskatoon, to engage in budget, operations, or planning meetings. Sometimes, this means meeting with government officials on mining regulations.

Tuesday and Wednesday: He could be on the road

from Regina to Esterhazy, to discuss mine projects. "We have a new mine coming up at K3, near Esterhazy," said Olson. "People in my group are involved in that. We are assisting in shaft design, we're laying out the mine plans, equipment selection, we're continuing to do some more exploration, looking at the seismic surveys...those are all things my group does."

Thursday: Olson is often driving to Colonsay, where he may head underground. "I'm not underground as much as I'd like to be. When I go on site, I try to go underground, talk to the engineers and managers and see what the issues are. If you have a geology or ground control issue, we go down to check it out and see how we can handle it."

Friday: If all goes smoothly during the rest of the week, Olson returns to Saskatoon to catch up on paperwork, phone calls and emails. He also travels to Carlsbad four to five times a year.

Although Olson originally considered a career in oil and gas, he is glad he took the path to potash mining. He started at Esterhazy after graduating from the University of Manitoba with his geological engineering degree, and spent 13 years there, moving up from job to job. He was promoted and moved to Colonsay, where he served as mine manager for seven years. He then left the company in 2006 to do consulting work, and returned to Mosaic in October, 2011.

He offers some career advice to the new generation of mine engineers, based on his own experience.

"Take every job you can get," he said. "Take every opportunity. Don't shy away from it; do it for the experience, and get it under your belt. Even if it's not the path you envisioned, try it anyway."

# TAGGING ALONG

TOM OLSON  
DIRECTOR,  
TECHNICAL SERVICES  
FOR THE POTASH  
BUSINESS UNIT  
MOSAIC CO.

For Tom Olson, there is no such thing as a regular day on the job. The geological engineer, with responsibilities for four Mosaic Co. potash mines, is as likely to be found on the road as underground, or even, occasionally, in an office.

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## Course welcomes 1,000th grad

The SMA's Introductory Industrial Supervisor course has reached a millennial milestone in just four years.

In September, the course marked its 1,000th graduate during a program offering in Esterhazy. The SMA Safety Committee, under the leadership of then Chair Anita Kjersem, partnered with Don Beahm, owner of D.B. Safety Solutions, in developing the three-day mining-specific course.

The goal was to provide participants with skills to make them effective industrial supervisors in a safe and productive

working environment.

The course "gives the view from 30,000 feet, touching on all aspects of mine safety leadership, regulatory requirements and all responsibilities," Beahm has said.

Beahm sees inspirational leadership as the most important element of a safety program. Safety must be embedded into a company's culture to be successful.

The course outline can be found at [www.saskmining.ca](http://www.saskmining.ca)



some maintenance guys underground who take part in their own little corner."

It has paid off. Before the stretching program began, Poole would see many injuries due to strained muscles – as often as monthly.

"The success I like is we're seeing the benefits. We haven't seen a muscle strain in the maintenance group. That's pretty amazing. Not that we haven't had cut

fingers or pinched fingers or twisted ankles. But in terms of lifting up something heavy and hearing "oh my back" – you just don't see that anymore; nothing that's escalated into modified work or time off.

"It's a pretty good batting average. It's something we're proud of.

"It's a fact of life for a lot of people. They do it and they are seeing the benefits of it."

## FLEX TIME

### POTASHCORP ALLAN MINE WORKERS STRETCH TO STAY INJURY FREE

If football players can take ballet for agility – and not feel too silly – miners can take a few minutes each morning to do a little yoga.

Perhaps it's not exactly yoga, but the principle is the same. Stretching out arms, legs, shoulders and backs, and adding a few squats for core strength, has become a ritual at PotashCorp's Allan mine.

"It kind of, maybe, looks similar (to balletic football players)," said safety manager Doug Poole, musing on the mental image.

The stretching program began in 2006, and has picked up steam in the years following. Approximately 150 Allan mine workers now participate, on the surface and underground.

"What's driven the program, prior to that, was just ongoing

musculoskeletal type injuries – muscle strains, sore backs, sore arms, sore shoulders," said Poole. "Sometimes they would just be a first aid, sometimes they would turn into a recordable injury.

"The mill maintenance superintendent at the time (John Catton), he came to me and asked if our nurse, Helen Volk at the time (now retired), could provide them with more information on warming up in the morning. He was at his wit's end.

"It's industry, it's miners, it's maintenance guys. It just wasn't the culture to warm up in the morning. From a safety perspective we always promoted it. But it takes some strong leadership in the field to say, you know what boys? You're doing it."

That was what the recently-retired Catton provided.

"When he said we're going to fix this, people took him seriously," said Poole.

Catton's plan, with the help of the occupational health and safety nurse, was to get an approved series of stretches and warm-up exercises for first thing in the morning. The second challenge was finding the space.

"The first thing we needed to do was decide on an area big enough to accommodate these guys," said Poole. "So, we used the maintenance shop floor and declared it a personal protective equipment free zone. We just wanted it to be, this is your space to stretch... this is your job for the next 15 minutes."

The workers tucked in among the tool boxes and the nurse led them through the series of exercises. Not everyone was interested, but "there

### What's in a number?

All mine and mill sites in Saskatchewan must report injury statistics on a monthly basis to the Mine Safety Unit, OHS Division, Ministry of Labour Relations and Workplace Safety. The classification of an injury reflects the severity of an incident. The severity rating increases from First Aid to Medical Incident to Modified Work Injury through to Lost Time Injury. Definitions for these rating definitions can be found at [www.saskmining.ca](http://www.saskmining.ca)

was a fair bit of buy-in right from the get-go," said Poole. "A lot of our guys aren't shy and they don't mind being the centre of attention."

It began with the maintenance department, and then the nearby warehouse workers started to join in. Little pockets of mill operators began to gather in the control room lunch room.

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# ATHABASCA BASIN SECURITY GROWS ACROSS THE WEST

## TECHNOLOGY ENHANCES SECURITY



Seated, left to right: Claire Venne, Corinne Greeyes, Eric Tang  
Standing, left to right: Kendra Vedress, Sascha Sasbrink-Harkema, Ron Hyggen, Ron Hyggen Sr.

It all began with four employees opening and closing the security gates at AREVA Resources' McClean Lake mine in northern Saskatchewan.

Today, armed with the latest technology, Athabasca Basin Security (ABS) has a presence with nearly every mining company in Saskatchewan, and is now the province's largest industrial security company.

"We're up to 154 employees and continue to grow," said

CEO Ron Hyggen, noting the company had 56 staff when he started four years ago.

The doors opened in 2002, as the first company formed by Athabasca Basin Development (ABD). It, in turn, was founded by seven northern communities which realized that employment for their people was their highest priority. Today, ABD operates 12 companies serving the mining and oil and gas sectors, and is in the top 100 Saskatchewan businesses, according to Sask. Business magazine.

ABS, located on the English River First Nation urban reserve south of Saskatoon, has been adding mining clients regularly ever since the beginning. Cameco Corp. hired ABS to provide security at the Cigar Lake and Rabbit Lake mines. Mosaic Co. was the next client to sign on, for its mine at Esterhazy. "When we started there, it was pretty much a field, with access from every direction," said Hyggen. ABS provided five days a week of security service during daytime hours. "That grew into the 30 staff we have out there now."

In the north, 90 percent of ABS employees are aboriginal, whereas in the southern part of the province, the contingent is about 60 percent. Hyggen says he tries to reflect the population in various parts of the province.

"It should be representative," he said. "That's not just guards, but throughout the organization."

The staff uses a global access control system

integrating surveillance and access monitoring. "It's a lot more technology-driven than it used to be. It's matured a lot; now we also have paramedics. They run 24 hours a day."

The access control system is crucial in an emergency. When employees gather at muster sites, the system is a simple and accurate way to determine who is on and off site. It also assists in dealing with intruders, whether human or animal. While ABS is not the police, "we have to remove people from sites and sometimes, they don't want to go," said Hyggen.

"Everything at site is driven by safety. All of our trucks are GPS equipped, and each driver has his or her individual (identifying) fob."

Since all staff must drive, they are trained, closely monitored and that information is shared with clients. The company has had no lost time incidents in over 370 days.

"...founded by seven northern communities which realized that employment for their people was their highest priority."

ABS also offers CPR, hearing and lung testing, detector dogs trained to find illegal substances, and on-site security orientations.

Adoption of technology and a solid business plan,

Hyggen's first project when he joined the company, have allowed ABS to continue its growth, including in Alberta.

ABS now has an office in Fort McMurray, serving companies such as Japan

Canada Oil Sands Ltd. and Atco Electric. Back in Saskatchewan, ABS also landed the contract for BHP Billiton's Jansen mine near Humboldt, including the Atco Discovery Lodge – a camp that will be home to 2,600 men.

Jansen, said Hyggen, is a challenge for ABS due to its size. ABS has hired 31 people to serve at the site.

Most recently, ABS has also taken the security contract at Patience Lake, a PotashCorp mine just east of Saskatoon, and Hyggen has his sights set on new opportunities in B.C.

While technology has taken ABS into the modern security era, Hyggen says the growth enjoyed by the company – which this year will "add a zero" to its revenues – is largely due to the ABS team.

Employee retention rate is excellent, higher than anywhere else in the industry, said Hyggen. Pensions paid for by the company, benefits and service recognition all come into employee retention.

"We're successful because we keep people," said Hyggen.

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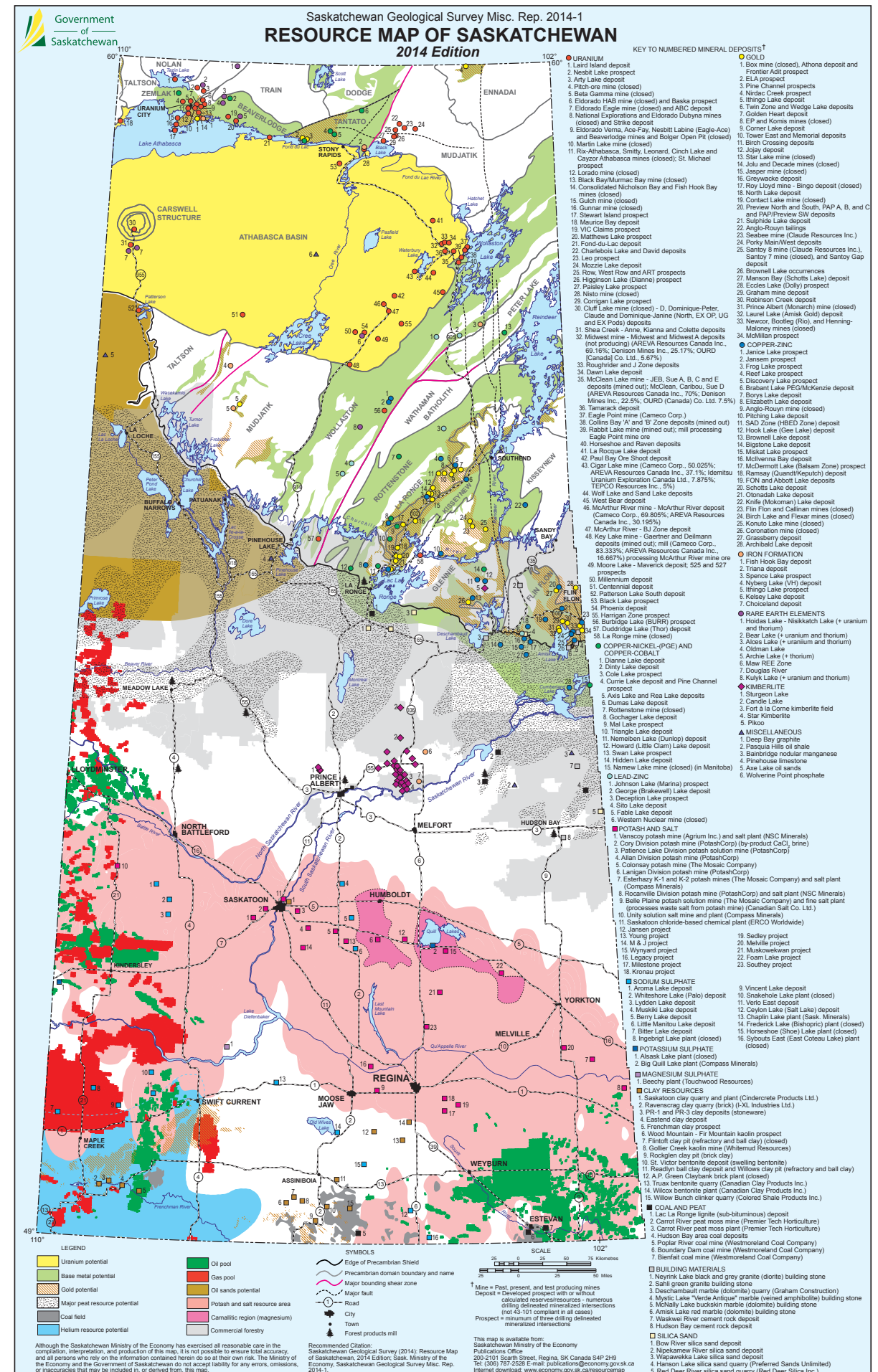
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Exploration activity in Canada  
<http://www.nrcan.gc.ca/mining-materials/publications/15605>

Geological Atlas  
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## GLOSSARY:

**Debt Financing:** Companies raise money for working capital or capital expenditures by selling bonds, bills, or notes to individual and/or institutional investors. In return for lending the money, the individuals or institutions become creditors.

**Equity Financing:** Companies raise capital through issuing shares of stock in a public offering.

**Flow-Through Share Financing:** Flow-through shares are common shares issued only in Canada by oil and gas or mineral exploration companies. They allow the shareholder to claim federal and sometimes provincial, tax deductions or credits. They must be newly-issued, and often come at a higher price than a common share due to the tax benefit.

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