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CANADA MINING

PROJECTS IN **PROGRESS**

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A REVIEW OF THE

CANADA MINING SECTOR

The material contained in this report was compiled by Sheila Barradas and the Research Unit of Creamer Media (Pty) Ltd, based in Johannesburg.

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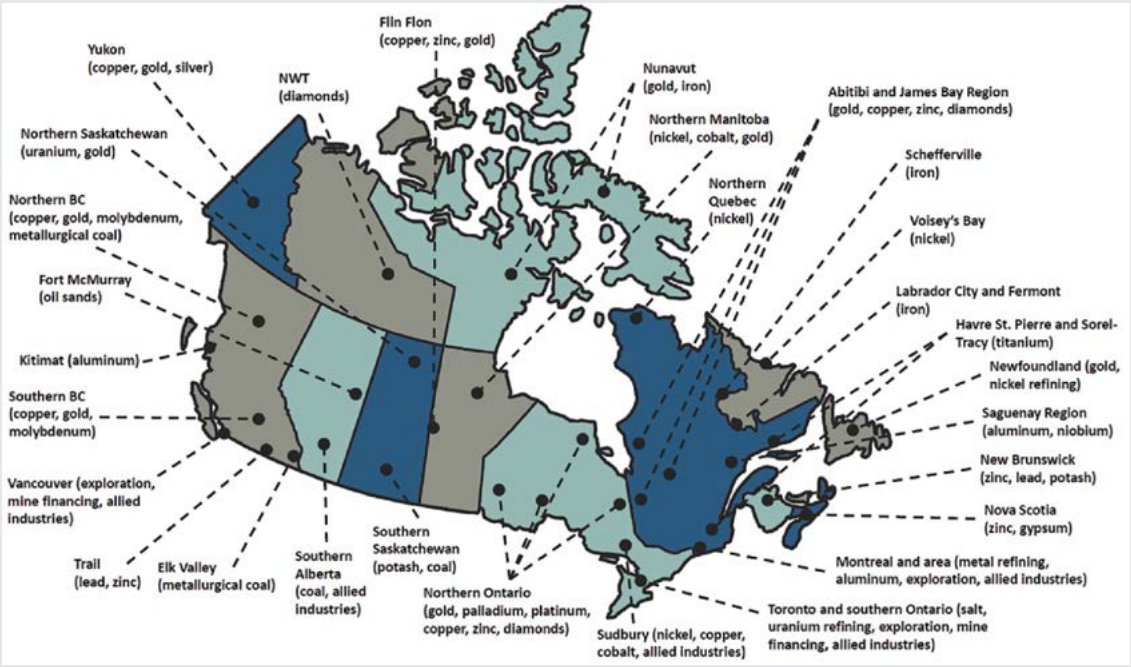

Canada is the global leader in production of potash and ranks among the top five global producers for cobalt, diamonds, gemstones, gold, graphite, indium, nickel, niobium, platinum-group metals, salt, titanium concentrate and uranium.

Canada's rich mineral endowment has led to the development of major mining regions such as the Labrador Trough on the Quebec-Newfoundland and Labrador border for iron-ore; the Abitibi goldbelt (Quebec and Ontario); the nickel/copper/platinum group elements mines of the Sudbury region (Ontario); the potash and uranium mines of Saskatchewan; the metallurgical coal, copper/gold and molybdenum mines of British Columbia; and the diamond mines of the Northwest Territories.

Mineral exploration also includes emerging commodities – such as rare-earth elements, graphite and lithium – used in highly valued applications in the clean technology and information technology sectors.

Source: The Mining Association of Canada: Facts & Figures 2018

COAL

GORDON CREEK COAL PROJECT

Name of the Project
Gordon Creek coal project.

Location
About 27 km south-south-east of Tumbler Ridge in north-east British Columbia, Canada.

Project Owner/s
Colonial Coal.

Project Description
The results of a preliminary economic assessment (PEA) have shown Gordon Creek to have positive economics worthy of further exploration and development.

The PEA is based on a conceptual underground mine plan that targets 111.60-million run-of-mine tonnes of resource, with a yield of 51% producing 57.40-million tonnes of clean coal over a mine life of 30 years.

Coal will be mined from seams B to G, and premium pulverised coal injection coal from seams J and K that will be mined last. Seams J and K are the two deepest seams and represent about 28.60% of the reported resources and about 31.50% of the reported saleable tonnes.

In full mine operation, projected clean coal production ranges from 1.60-million tonnes a year to 2.60-million tonnes a year averaging about 1.90-million tonnes a year.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has an indicative after-tax (and royalty) net present value, at a 7.50% discount rate, of $690.50-million and an internal rate of return of 24.40%, based on a weighted average coking coal price of $164.80/t and a premium pulverised coal injection, or PCI, coal price of $140.50/t.

The project's proposed payback of initial capital is estimated to be within three years from the start of coal production.

Capital Expenditure
The project will cost about $300-million to implement.

Planned Start/End Date
Not stated.

Latest Developments
None stated.

Key Contracts and Suppliers
Stantec Consulting Service (PEA).

On Budget and on Time?
Not stated.

Contact Details for Project Information
Colonial Coal, tel +1 604 568 4962.

HUGUENOT COAL PROJECT

Name of the Project
Huguenot coal project.

Location
The property is located in north-east British Columbia, in Canada.

Project Owner/s
Colonial Coal.

Project Description
The updated preliminary economic assessment (PEA) on the project supports a high level of confidence in the project's potential to become a standalone operation.

The project is based on conceptual openpit and underground mine plans targeting 122.30-million run-of-mine (RoM) tonnes of resource, with a yield of 73%, producing 89.30-million tonnes of clean coal over a mine life of 31 years.

The conceptual mine plan targets 56-million RoM tonnes of resource at an average stripping ratio of 8.6:1, while the conceptual underground mine plan targets an additional 66-million RoM tonnes of resource.

The openpit is projected to operate during years 1 to 14 while the underground mine will operate during years 3 to 31, with both mines operating simultaneously during years 3 to 14.

In full mine operation, projected clean coal production from combined surface and underground mining operations ranges from 1.40-million tonnes a year to 5.90-million tonnes a year, and averages about three-million tonnes a year.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has an after-tax net present value, at a 7.50% discount rate, of $1.17-billion and an internal rate of return of 33%, with a payback of five years from the start of operations.

Capital Expenditure
Preproduction costs are estimated at $661-million.

Planned Start/End Date
Not stated.

Latest Developments
None stated.

Key Contracts and Suppliers
Stantec Consulting Services (PEA).

On Budget and on Time?
Not stated.

Contact Details for Project Information
Colonial Coal, tel +1 604 568 4962.

Picture by Colonial Coal

DIAMONDS

STAR-ORION SOUTH DIAMOND PROJECT

Name of the Project
Star-Orion South diamond project.

Location
The project is situated in the Fort à la Corne diamond district of central Saskatchewan, Canada.

Project Owner/s
Star Diamond Corp.

Project Description
A preliminary economic assessment (PEA) has determined that an estimated 66-million carats of diamonds could be recovered from a surface mine over a 34-year life-of-mine.

Picture by Star Diamond Corp

Star-Orion South diamond project

The PEA envisages the development of two openpits, initially Orion South, followed by Star, using conventional openpit mining methods.

Conventional hydraulic excavators and haul trucks create a starting "key" for three bucket wheel excavators (BWEs) to remove the sand and clay overburden from the kimberlite. Conveyor belts will transfer the sand and clay from the BWEs to the nearby overburden waste area. The exposed kimberlite will be lightly blasted and conventional hydraulic shovels will load the rock into trucks. These trucks will transfer the rock to an in-pit feeder and the kimberlite delivered to the processing plant using a conveyor belt.

The processing facility will have the capacity to process 45 000 t/d of kimberlite using autogenous milling, followed by screening, X-ray transmission diamond recovery and dense-media separation of heavy mineral concentrate.

The recovery section will use X-ray technology, with grease as the scavenging technology to recover the low-luminescence diamonds. The diamonds will be sorted into parcels in the on-site sorting facility.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has an after-tax net present value, at a 7%

discount rate, of $2-billion and an internal rate of return of 19%, with a payback of 3.4 years after the start of construction.

Capital Expenditure
Preproduction capital expenditure is estimated at $1.41-billion.

Planned Start /End Date
Not stated.

Latest Developments
Star Diamond Corp recently announced that Rio Tinto Exploration Canada (RTEC) had completed the drilling of ten bulk sample holes (trenches) to conclude their programme on the Star-Orion South project.

It is Star Diamond's view that RTEC is one of the few companies in the world with the resources and expertise to progress with a project of this magnitude.

Key Contracts and Suppliers
SGS Canada; DRA Americas and ENGCOMP Engineering and Computing Professionals (PEA).

Picture by Star Diamond Corp

Kimberlite bulk sample bags

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Star Diamond Corp, tel +1 306 664 2202 or email stardiamondcorp@stardiamondcorp.com.

Picture by Star Diamond Corp

Aerial view of the Star diamond project

Picture by Bloomberg

GOLD

BLACKWATER GOLD/SILVER PROJECT

Name of the Project
Blackwater gold/silver project.

Location
The project is located in British Columbia, Canada.

Project Owner/s
New Gold.

Project Description
New Gold aims to build and operate an openpit gold and silver mine, which will produce 60 000 t/d of gold and silver ore with net production of 22-million tonnes a year over a mine life of about 17 years.

Potential Job Creation
The project could create up to 1 500 jobs during construction and 495 during operations over the life of the project.

Net Present Value/Internal Rate of Return
Not stated.

Capital Expenditure
C$1.80-billion.

Planned Start/End Date
The project is expected to take two years to complete.

Latest Developments
The project was issued with an environmental certificate by the provincial government in June 2019.

Picture by New Gold

Blackwater gold/silver project

New Gold will be bound by 43 conditions that form part of the Blackwater environmental assessment certificate, as well as design requirements that are specified in the certified project description.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Not stated.

Contact Details for Project Information
New Gold, tel +1 416 324 6000 or email info@newgold.com.

BRUCEJACK GOLD MINE EXPANSION

Name of the Project
Brucejack gold mine expansion.

Location
The project is located in north-western British Columbia, Canada.

Project Owner/s
Pretivm Resources.

Project Description
The project aims to increase the Brucejack mine's production from 2 700 t/d to 3 800 t/d of gold, which will result in an average production rate of 1.39-million tonnes a year, up from 990 000 t/y.

The project has a mine life of 14 years.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
Not stated.

Capital Expenditure
Based on preliminary engineering, the capital cost to increase the mill capacity is estimated to be less than $25-million, which is expected to be incurred in 2019.

Planned Start/End Date
Steady-state production is scheduled for 2020.

Latest Developments
In October 2019, Pretivm Resources reported that it expected to be able to feed the mill with 3 800 t/d on a consistent basis by the end of 2019, with steady-state production slated for 2020.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Not stated.

Contact Details for Project Information
Pretivm Resources, tel +1 604 558 1784 or email invest@pretivm.com.

Picture by Pretivm Resources

Brucejack gold mine

CARIBOO GOLD PROJECT

Name of the Project
Cariboo gold project.

Location
The project is located in the historic Wells-Barkerville mining camp, in the District of Wells, British Columbia, Canada.

Project Owner/s
In September 2019, Osisko Gold Royalties announced that it had entered into a definitive agreement with Barkerville Gold Mines, pursuant to which Osisko agreed to acquire all the issued and outstanding common shares of Barkerville that it did not own.

The transaction was concluded in November 2019.

Project Description
A preliminary economic assessment (PEA) has outlined a solid base case for significant and profitable gold production at the Cariboo project, with low capital costs in an extensive brownfield district and superb production expansion potential.

The project will comprise the extraction of the Cow, Valley, Shaft and Mosquito deposits, which together have indicated mineral resources of 12.53-million tonnes grading 5.60 g/t gold and inferred resources of 11.85-million tonnes grading 5 g/t gold.

The PEA envisions mining of up to 4 000 t/d using a longhole mining approach.

The mineralised material will be crushed underground, transported to surface by a vertical conveyor and stored in a silo at the surface concentrator.

The first concentration step will be completed using mineral sorters. Mineral sorter product (sulphide and gold bearing material) will be further crushed using a secondary cone crusher, for which the secondary crusher product will feed either the milling and flotation circuit for further concentration or the final mineralised material silo for transport to Quesnel River mill. Mineral sorter waste will be sent to a waste silo for placement in the waste rock storage facilities. A proportion (limited by the Wells mill design throughput) of the mineral sorter concentrate, as well as particles finer than 12 mm passing through the screens, will feed the flotation concentration circuit.

Potential Job Creation
The project is expected to contribute about 320 permanent jobs during the production phase and an additional 120 during the construction phase.

Net Present Value/Internal Rate of Return
The project has an estimated pretax net present value, at a 5% discount rate, of C$632.70-million and an internal rate of return of 34.90%, with a payback after the start of operations of 2.9 years.

Capital Expenditure
Preproduction capital expenditure is estimated at C$305.50-million.

Planned Start/End Date
Mine construction is expected to start mid-2021.

Latest Developments
None stated.

Key Contracts and Suppliers
Allnorth Consultants, BBA, InnovExplo, Golder Associates, Mining Plus Canada Consulting, SRK Consulting and WSP Canada (PEA).

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Barkerville Gold Mines, email info@BarkervilleGold.com.

ESKAY CREEK GOLD/SILVER PROJECT

Name of the Project
Eskay Creek gold/silver project.

Location
The project is located in the Golden Triangle of British Columbia, Canada.

Project Owner/s
Skeena Resources.

Project Description
A preliminary economic assessment (PEA) has clearly demonstrated that Eskay Creek has the potential to become an economically viable project.

The PEA envisages an openpit mine, with on-site treatment of the mined material by conventional milling and flotation to recover a gold/silver concentrate for provision to third-party smelters.

The mine will be an owner-operated, standard truck-and-shovel openpit, with a leased mining fleet. No contributions from previously reported underground resources are incorporated into this study.

The processing capacity of 6 850 t/d will result in a production life span of 8.6 years. An additional 1.5 years of prestripping, stockpiling and mine access development is planned before the processing facility becomes fully operational in Year 1.

Life-of-mine average production is estimated at 236 000 oz/y of gold and 5.81-million ounces of silver, or 306 000 oz/y gold equivalent.

The PEA leverages Eskay Creek's extensive existing infrastructure, including all-weather access roads, previously permitted tailing storage facilities and proximity to the recently commissioned 195 MW hydroelectric facilities and linked power grid.

Pit-constrained indicated mineral resources at a 0.70 g/t gold equivalent cutoff are estimated at 12.65-million tonnes grading 5.80 g/t gold equivalent, 4.30 g/t gold and 110 g/t silver. Inferred mineral resources are estimated at 14.42-million tonnes grading 2.90 g/t gold equivalent, 2.30 g/t gold and 47 g/t silver.

Underground indicated mineral resources at a 5 g/t gold equivalent cutoff are estimated at 819 000 t grading 8.20 g/t gold equivalent, 6.40 g/t gold and 139 g/t silver. Inferred mineral resources are estimated at 295 000 t grading 8.20 g/t gold equivalent, 7.10 g/t gold and 82 g/t silver.

Currently, no contributions from previously reported underground resources are incorporated into this study.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has an after-tax net present value, at a 5% discount rate, of $491-million and an internal rate of return of 51%, with a payback of 1.2 years.

Capital Expenditure
Preproduction capital expenditure is estimated at $233-million.

Planned Start/End Date
Not stated.

Latest Developments
None stated.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Skeena Resources, tel +1 604 684 8725 or email info@skeenaresources.com.

GOLDBORO GOLD PROJECT

Name of the Project
Goldboro gold project.

Location
Nova Scotia, Canada.

Project Owner/s
Anaconda Mining.

Project Description
Goldboro is an advanced exploration and development project.

A preliminary economic assessment completed on the project in January 2018 envisages an openpit and underground mining operation, on-site concentration through gravity and flotation circuits and leaching of the concentrate and gold recovery at Anaconda's Pine Cove mill, in Newfoundland.

The operation is expected to have an 8.8-year mine life, with 2.40-million tonnes of potential mill feed at an average grade of 5.13 g/t gold and a recovery rate of 93.60%, resulting in gold production of 375 900 oz.

Mining is expected to be conducted at 600 t/d of mineralised material at an average openpit grade of 2.99 g/t and an underground grade of 6.83 g/t.

Processing will be conducted at 600 t/d to 800 t/d of run-of-mine high-grade material and rehandle of 200 t/d of stockpiled openpit lower-grade material.

Average gold production is estimated at 41 770 oz/y.

Potential Job Creation
There is potential for up to 200 jobs to be created at the peak of production.

Net Present Value/Internal Rate of Return
The project has a pretax net present value, at a 7% discount rate, of $120-million and an internal rate of return of 38%, with a payback of 2.9 years.

Capital Expenditure
Preproduction capital is estimated at $47-million.

Planned Start/End Date
Not stated.

Latest Developments
In October 2019, Anaconda announced an update to the mineral resource estimate for the 100%-owned Goldboro gold project.

The project has measured and indicated resources of 4.10-million tonnes grading 5.30 g/t gold and inferred resources of 3.01-million tonnes grading 7.09 g/t gold.

The current upgraded and expanded measured and indicated portion of the mineral resource was expected to form the basis of the mine plan to be outlined in the Goldboro feasibility study expected in the fourth quarter of 2019.

Key Contracts and Suppliers
WSP Canada (mineral resource).

On Budget and on Time?
Not stated.

Contact Details for Project Information
Anaconda Mining, tel +1 416 304 6622, fax +416 363 4567 or email info@anacondamining.com.

HARDROCK GOLD PROJECT

Name of the Project
Hardrock gold project.

Location
Geraldton, Ontario, Canada.

Project Owner/s
Greenstone Gold Mines (GGM), a 50:50 joint venture between Centerra Gold and Premier Gold Mines.

Project Description
The project proposes conventional openpit mining techniques with 10 m benches using hydraulic shovels. The openpit operation is planned to be owner-operated, with certain support activities outsourced.

Production drilling will be done using blast-hole drill rigs with rotary and down-the-hole drilling capability.

Most of the loading in the pit will be undertaken by three hydraulic face shovels (two of them 26 m^3 and one 19 m^3) and two 21 m^3 front-end wheel loaders. The shovels and loaders will be matched with a fleet of 181 t payload mine trucks. As the openpit is recovering resources from previously producing underground mines, the presence of mined-out stopes was considered when designing the pits. Most of the underground openings are backfilled with sand fill or rock fill. Mining of the Hardrock main pit will take place in four phases, with the smaller satellite pit to the east mined in a single phase. Waste rock will be disposed of in four distinct waste dumps, with three located around the pit and one further to the south. The openpit will generate 548.90-million tonnes of overburden and waste rock.

Gold recovery will comprise a crushing circuit (gyratory and cone), a grinding circuit (a high-pressure grinding roll, or HPGR, and a ball mill), preleach thickening, a leach and carbon-in-pulp circuit, cyanide destruction and tailings disposal, carbon elution and electrowinning, carbon regeneration and a gold refinery. The HPGR is expected to assist in reducing GGM's operating costs and providing consistent predictable mill tonnage throughput.

The processing plant is designed to operate at a throughput of 27 000 t/d and the mill operation schedule will be 24/7, 365 days a year, with an overall availability of 92%.

Potential Job Creation
The planned peak total operating workforce will comprise 544 employees.

Net Present Value/Internal Rate of Return
The project has an after-tax net present value, at a 5% discount rate, of $709-million and an internal rate of return of 14.40%.

Capital Expenditure
Initial capital expenditure is estimated at $1.25-billion.

Planned Start/End Date
Construction is expected to take 23 months and the total preproduction period is estimated at 42 months, which includes detailed engineering, procurement, construction and commissioning activities up to commercial production being declared.

Latest Developments
GGM has been granted environmental approval from the federal government, marking a significant milestone for the proposed 288 000 oz/y gold project.

The environmental approval by Minister of Environment and Climate Change Catherine McKenna follows an environmental assessment conducted by the Canadian Environmental Assessment Agency with the participation of indigenous groups, the public, and federal departments including Fisheries and Oceans Canada, Environment and Climate Change Canada, Health Canada, and Natural Resources Canada. Participating provincial Ministries included the

Ministry of the Environment, Conservation and Parks, the Ministry of Natural Resources and Forestry, and the Ministry of Energy, Northern Development and Mines.

The provincial Ministry environmental approval review report was issued for public comment on October 22, and approval is expected in the first quarter of 2020.

Premier has reported that work on construction permit applications is well advanced and will be submitted for review once the federal environmental assessment and provincial environmental assessments are approved.

A definitive agreement with Long Lake #58 First Nation was signed in 2018 and GGM is negotiating agreements with the other local Indigenous communities.

GGM has engaged financial advisers to begin the process of identifying the various financing options that may be available for the Hardrock project.
Meanwhile, GGM has signed a long-term relationship agreement with the First Nations, with respect to the development and operation of the Hardrock project.

The signing of this agreement represents another important milestone as the partnership continues to advance the project to an ultimate production decision.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Too early to state.

Contact Details for Project Information
GGM, tel +1 905 829 3134 or fax +1 905 829 7880.
Premier Gold Mines manager of corporate development and investor relations Matthew Gollat, tel +1 807 346 1390, fax +1 888 346 1390 or email mgollat@premiergoldmines.com.
Centerra Gold VP of investor relations John Pearson, tel +1 416 204 1953 or email john.pearson@centerragold.com.

KNIGHT GOLD PROJECT

Name of the Project
Knight gold project.

Location
The project is located in the Shining Tree district, in Ontario, Canada, within the prolific gold-producing Abitibi greenstone belt.

Project Owner/s
Orefinders Resources.

Project Description
The project is a consolidation of six adjacent, high-potential properties with similar geology, along with significant drilling, exploration and development:

- Tyranite is a past producer with significant infrastructure in place and a historical resource of 472 000 t at 6.90 g/t gold, and 40 holes (8 762 m) drilled between 2009 and 2011.
- Minto is a very high-grade breccia pipe with a historical resource of 225 000 t at 6.20 g/t gold, and 16 holes (7 815 m) drilled from 2009 to 2012.
- Porphyry Lake is a mineralised porphyry system with elevated gold values. This property hosts high-grade breccia pipe similar to that of Minto, with five holes (853 m) drilled from 2011 to 2017.
- Duggan has a similar high-grade geological setting and mineralisation as those of Tyranite, with openpit potential, and 20 holes (7 680 m) drilled between 2007 and 2013.

Further, the Knight project abuts the Pan American Silver-owned multimillion-ounce Juby gold project to the south.

Orefinders considers the Knight gold project on par with Iamgold's Cote Lake project, which would require further consolidation with Juby to create a significant district-scale multimillion-ounce asset in the heart of Ontario that can easily be accessed by road.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
Not stated.

Capital Expenditure
Not stated.

Planned Start/End Date
Not stated.

Latest Developments
Orefinders Resources announced in November 2019 that it had completed its exploration programme on the Knight project and all analytical results had been received from the laboratory.

The data has confirmed the presence of gold and arsenic in bedrock anomalies coincident with Minto-type magnetic features, and ten new targets have been outlined between the Minto breccia and the western shore of Porphyry Lake over a strike length of about 2.30 km.

Follow-up exploration on the Minto-type anomalies will comprise additional prospecting on the ten targets, as well as line cutting and induced polarisation geophysical surveying over the best targets represented by the combined magnetic and geochemical responses. Any anomalous induced polarisation response on any of these anomalies will be considered a high-quality drill target.

Orefinders also started its core resampling programme at Knight in September 2019, which will validate 31 900 m of drill core at its Tyranite, Duggan and Minto properties. The intent of the resampling programme is to compile the Knight project's diamond drilling, which had been completed prior to Orefinders consolidating this land package. Resampling the core is another step towards a National Instrument 43-101 resource estimate at Knight.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Not stated.

Contact Details for Project Information
Orefinders, tel +416 644 1567 or email info@orefinders.ca.

MADSEN-RED LAKE GOLD PROJECT

Name of the Project
Madsen Red Lake mine.

Location
The project is located in the Red Lake mining district of Ontario, Canada. It is 9 km by highway south of the town of Red Lake.

Picture by Pure Gold Mining

Project Owner/s
Pure Gold Mining.

Project Description
A high-grade underground mining operation, with designed stopes containing one-million ounces of probable mineral reserves at 9 g/t gold is under construction.

Envisaged is a 12-year mine life with peak production of about 125 000 oz of gold, with average gold production in years 3 to 7 of 100 0000 oz. Total gold production is estimated at 970 000 oz.

Mining will be conducted from new ramp development using a combination of cut-and-fill and longhole mining methods. A new hoist house and double drum production hoist will use the existing shaft infrastructure to hoist ore and waste from the mine in Year 4 of operations.

The existing mill and tailings management facility will be upgraded to achieve mill production of 800 t/d. Upgrades include modernisation of controls and instrumentation, installation of new pumps, two new batch gravity concentrators, as well as expansion of the grinding circuit through replacement of the existing ball mill to achieve forecast productivity.

An active exploration programme is ongoing with the goal of increasing the resource base to allow for an expansion of the Madsen Red Lake production profile.

Potential Job Creation
During production, the feasibility study has projected that the Madsen Red Lake mine will employ an average of 340 workers over its 12-year mine life, with a projected $467-million in salaries, as well as a direct capital investment of $327-million over the life of the mine and the economic benefits of the new mine will have a regional impact that extends far beyond the borders of the town of Red Lake. Pure Gold has recently signed a project agreement with Wabauskang First Nation and the Lac Seul First Nation establishing a long-term, mutually-beneficial partnership.

Net Present Value/Internal Rate of Return
The feasibility study has used a base case gold price of $1 275/oz. The project has an after-tax net present value (NPV), at a 5% discount rate, of C$247-million and an internal rate of return (IRR) of 36%. At a $1 500/oz gold price the after-tax NPV, at a 5% discount rate, increases to C$390-million and the IRR to 51%.

Capital Expenditure
The project requires initial capital of C$95-million, including

Picture by Pure Gold Mining

contingency, to support the construction of an underground mine and associated infrastructure, including the expansion of existing milling capacity to 800 t/d. Pure Gold secured access to about $167.50-million in funding to advance Madsen, including a $65-million project finance facility, of which $10-million has been received to date, a $25-million gold metal stream with Sprott Resource Lending ("Sprott") and a $47.50-million equity raise. Upon satisfactory receipt of permits and other customary conditions, Pure Gold believes it has sufficient funds available to fund construction and development of the project to commercial operation. The financing also offers the flexibility to continue exploration and advance new discoveries forward.

Planned Start/End Date
The project has a 13-month preproduction period and is scheduled for its first gold pour in late 2020.

Latest Developments
Detailed design work on surface infrastructure and underground electrical distribution, mine ventilation, mine service design and stope optimisation has started. Equipment sourcing, including the purchase of mining equipment and the procurement of long-lead time items, is also under way.

Pure Gold is finalising the project execution schedule, including detailed engineering, procurement and cost estimation.

Key Contracts and Suppliers
JDS Energy and Mining, including contributions from Knight Piésold, Nordmin Engineering, MineFill Services Inc, Integrated Sustainability, Lorax Environmental Services, Ginto Consulting, and Equity Exploration Consultants (feasibility study); JDS Energy and Mining, Hatch and Knight Piésold (surface engineering and procurement contract); Dumas Mine Contracting (underground mine engineering).

On Budget and on Time?
Not stated.

Contact Details for Project Information
Pure Gold Mining VP of operations Ken Donner,
tel +1 604 646 8000 or email info@puregoldmining.ca.

MAGINO GOLD PROJECT

Name of the Project
Magino gold project.

Location
The project is located 40 km north-east of Wawa, Ontario, Canada.

Project Owner/s
Argonaut Gold.

Project Description
The project has total proven and probable reserves of 59-million ounces grading 1.13 g/t gold. A feasibility study on the project has determined that the Magino project is a strategic, long-life asset.

Envisaged is a 115 700 oz/y gold operation with a 17-year mine life.

Openpit mining operations will use a fleet comprising 16 m^3 front shovels, a 13 m^3 front-end loader and 140 t haul trucks.

This fleet will be supplemented by drills, graders, and track and rubber-tire dozers.

A 10 000 t/d processing facility has been selected for the feasibility study, compared with the 30 000 t/d plant presented in the January 2016 prefeasibility study.

The adopted flowsheet includes primary crushing, single-stage semiautogenous grinding and a gravity recovery circuit, as well as a cyanide leach and carbon-in-pulp gold adsorption circuit with cyanide recovery and detoxification, as well as thickening, before tailings are discharged to a tailings facility.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has a pretax net present value, at a 5% discount rate, of $408-million and an internal rate of return of 22.60%, with a payback of 3.8 years.

Capital Expenditure
Initial capital costs have been estimated at $321-million.

Planned Start/End Date
The project is expected to be completed over 24 months.

Latest Developments
In the third quarter ended September 30, 2019, Argonaut reported that a 6 000 m drill programme had started.

This was subsequently expanded to 20 000 m based on the early success of identifying high-grade structures beneath and to the east of the planned pit and to the west of the adjacent Island gold mine.

In December 2019, Argonaut announced that it had completed 16 diamond drill holes and about 12 200 m of the 20 000 m programme.

The results of the 2019 exploration programme suggested the continuity of high-grade structure below the planned open pit; at least two high-grade structures hosting multiple veins that remain open at depth and to the west; and several newly identified additional geological targets.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Not stated.

Contact Details for Project Information
Argonaut Gold, tel +1 775 284 4422, fax +1 775 284 4426 or email info@argonautgold.com.

VALENTINE LAKE GOLD CAMP PROJECT

Name of the Project
Valentine Lake Gold Camp project.

Location
New Foundland, Canada.

Project Owner/s
Marathon Gold.

Project Description
Valentine Lake comprises the Marathon, Leprechaun, Victory and Sprite deposits totalling measured and indicated resources of 44.34-million tonnes grading 1.79 g/t gold and inferred resources of 24.43-million tonnes grading 1.57 g/t gold.

An updated independent preliminary economic assessment (PEA) has optimised the development of the Valentine Lake Gold Camp mineral resource by employing openpit mining and will encompass two gold recovery operations – a milling/flotation/carbon-in-leach (CIL) plant and a heap-leach plant.

The mill will process three-million tonnes a year of high-grade mineralised material. The plant will consist of crushing, milling, gravity recovery, flotation of gravity tails, flotation concentrate regrind, cyanidation leaching of flotation concentrate and flotation tailings through a CIL circuit, carbon elution and gold recovery circuit. CIL tails will be treated for cyanide destruction and disposed of as tails in the tailings storage facility.

The heap-leach pad will process three-million tonnes a year of low-grade mineralised material from openpit operations and will consist of crushing, heap leaching and carbon-in-column gold adsorption. The loaded carbon from the heap-leach facility will be sent to the mill facility for gold recovery. The project is expected to produce 2.72-million ounces of gold over the life of the project, or an average of 225 100 oz/y over a 12-year mine life.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has an estimated net present value, at a 5% discount rate, of $493-million and an internal rate of return of 30%, with a capital payback of 2.5 years.

Capital Expenditure
Preproduction capital is estimated at $355-million.

Planned Start/End Date
Initial production is expected in 2022.

Latest Developments
Marathon Gold has appointed Ausenco Engineering Canada as the lead consultant for the prefeasibility study (PFS) at the Valentine gold project.

The results of the PFS are expected early in the second quarter of 2020.

Key Contracts and Suppliers
Lycopodium Minerals Canada, John T Boyd Company, Apex Geoscience and Stantec Consulting (PEA); Ausenco Engineering Canada (lead consultant – PFS); Moose Mountain Technical Services (mineral reserve estimation and mine design); Terrane Geoscience (geotechnical drilling and pit slope design); Gemtec (hydrogeology); Stantec (environmental assessment) and John T. Boyd Company (updated mineral resource estimate).

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Marathon Gold investor relations manager Christopher Haldane, tel +1 416 987 0714 or email chaldane@marathon-gold.com.

WASAMAC GOLD PROJECT

Name of the Project
Wasamac gold project.

Location
The project is located 15 km west of Rouyn-Noranda, in Abitibi, Quebec, Canada.

Client
Monarch Gold Corporation.

Project Description
Monarch has reported positive feasibility results, which show that the Wasamac project is an economically viable and low-cost producing mine. The project has total proven and probable reserves of 21.46-million tonnes grading 2.56 g/t.

The feasibility study provides a base case assessment for developing the Wasamac deposit as an underground mine, with a plant throughput of 6 000 t/d. The project will integrate Rail-Veyor technologies and a paste backfill system with a top-down mining approach, feeding a process plant located about 2 km from the mine site with a neutral dry-stacked tailings disposal facility about 5 km away to minimise the project footprint locally. The carbon-in-pulp process plant is designed to have a capacity of 6 900 t/d.

Production of 1.56-million ounces of gold is estimated over the 11-year life-of-mine (LoM) from proven and probable reserves of 21.46-million tonnes grading 2.56 g/t gold.

Potential Job Creation
Wasamac is expected to create more than 400 jobs during the construction stage and about 300 jobs once the mine goes into production.

Net Present Value/Internal Rate of Return
The project has a pretax net present value, at a 5% discount rate, of $522-million and an internal rate of return of 23.60%, with a payback of 3.6 years.

Value
Initial capital expenditure is estimated at $464-million, including about $230-million for the mill and tailings facility.

Duration
The process plant construction is scheduled to begin in the fourth quarter of 2020, with full capacity production expected by the fourth quarter of 2022.

Latest Developments
In November 2019, Monarch announced that it had filed a project notice with Quebec's Ministry of the Environment and the Fight Against Climate Change for its Wasamac gold project.

The project notice is the first step in the mining permit application process, which generally takes 18 to 24 months.

The company has also acquired a mining property west of the Wasamac property, from Gwen Resources, comprising 24 claims covering about 5 km^2. The purpose of the transaction was to secure the location of Wasamac's future mining infrastructure.

Key Contracts and Suppliers
BBA (feasibility study).

On Budget and on Time?
The project is on track, however, Monarch still needs to finalise the financing package to advance according to the company's schedule. This will be done through a combination of debt and equity or through a partnership with a Tier 1 producer.

Contact Details for Project Information
Monarch Gold senior geologist – communications specialist Elisabeth Tremblay, email e.tremblay@monarquesgold.com.

IRON-ORE

BLOOM LAKE PHASE II

Name of the Project
Bloom Lake Phase II.

Location
The project is located near the town of Fermont, in north-east Quebec, Canada.

Project Owner/s
Champion Iron.

Project Description
The project has total measured and indicated reserves of 895-million grading 29.30% iron. The reserves are estimated to be sufficient to support operations for more than 20 years.

A feasibility study has evaluated the combined Phase I and II mining plan, current concentrator plant at Phase I and completion of the Phase II concentrator plant.

Results of the study recommend an expansion of Bloom Lake, resulting in a life-of-mine (LoM) production averaging 15-million tonnes a year of high-grade 66.20% iron-ore concentrate.

Based on the new optimised mine plan, the mining rate will also be increased to accelerate the supply of ore to the expanded facilities while maintaining a LoM of 20 years. In addition to reserves at the Bloom Lake mine, Champion Iron also controls more than five-billion tonnes of resources south of current operations.

The Phase II mine plan continues with a conventional surface mining method using an owner mining approach. Electric hydraulic shovels will be complemented with front-end loaders to allow for a flexible mine plan. Additional drilling and hauling capacity will be added as mine tonnages increase, expected to begin in early 2021.

The processing plant for the Phase II concentrator is based on the design of the currently operating Phase I, with minor changes to further improve performance. The recovery circuit is similar to the Phase I concentrator, with the addition of a stage of scavenger up-current classifier to increase recovery and improve response to feed variations.

Potential Job Creation
In addition to the current workforce of about 500 employees, the Phase II project is estimated to employ another 500 employees during the build period and 375 permanent positions once in production.

Net Present Value/Internal Rate of Return
Under the base case assumption of an average life-of-mine P65 price of $83.90/t, the project has a pretax net present value, at an 8% discount rate, of $C1.53-billion and an internal rate of return of 42.40%, with a payback of 2.4 years. Under this base case assumption, the combined value of Phase I and II has a pretax net present value of $C3.76-billion or about C$8.60/share.

Capital Expenditure
Champion Iron benefits from $1.20-billion already spent on the Phase II project by its predecessor.

The completion of the project is estimated to require additional capital expenditure estimated at C$589.80-million, which includes a 15% contingency.

Planned Start/End Date
The project is expected to take 21 months to complete.

Latest Developments
The project is about 75% complete.

Champion reported in November 2019 that the previously approved $68-million work programme on Phase II to secure the timetable detailed by the feasibility study was progressing on schedule and on budget.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Champion Iron, tel +1514316 4858 or email info@championironmines.com.

Picture by Champion Iron

Picture by

OTHER MINING PROJECTS

AUTHIER LITHIUM PROJECT

Name of the Project
Authier lithium project.

Location
Quebec, Canada.

Project Owner/s
Sayona Mining.

Project Description
A revised definitive feasibility study (DFS) has shown the project's potential to become a sustainable and profitable new lithium mine, with higher returns than previously estimated.

The study is based on proven and probable reserves of 12.10-million tonnes at 1% lithium oxide at a 0.55% cutoff grade.

The project has a life-of-mine of 13.8 years, based on a higher daily production rate of 2 600 t, compared with the previous DFS that envisioned a lower daily rate of 1 850 t.

Mining will be undertaken using drill-and-blast, and conventional bulk mining methods using hydraulic excavators and dump trucks to deliver ore to the primary jaw crusher or to the run-of-mine stockpile.

The concentrator will process about 883 000 t/y of ore using conventional flotation technology suitable for a pegmatite orebody that will be located near the openpit.

Average spodumene production is estimated at 114 116 t/y in the revised DFS, compared with 87 400 t/y in the previous DFS.

Potential Job Creation
The project has the potential to create up to 176 new jobs.

Net Present Value/Internal Rate of Return
The revised DFS shows an improved net present value, at an 8% discount rate of C$216-million, compared with C$184.80-million in the previous study. The revised DFS estimates a pretax internal rate of return of 33.90% and apayback of 2.7 years.

Capital Expenditure
Initial capital costs are estimated at C$120-million.

Planned Start/End Date
Pending the necessary stakeholder support and government approval, construction could start as early as 2021, with the start of mining operations a year later.

Latest Developments
None stated.

Key Contracts and Suppliers
Sayona Quebec and BBA (revised DFS).

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Sayona Mining, tel +61 7 3369 7058 or email sayonamining.com.au.

LAC GUÉRET GRAPHITE PROJECT

Name of the Project
Lac Guéret graphite project.

Location
North-eastern Quebec, Canada.

Project Owner/s
Mason Graphite.

Project Description
Lac Guéret is one of the highest-grade graphite deposits in the world, and has proven and probable reserves of 4.74-million tonnes grading 27.80% total graphitic carbon (TGC).

An updated feasibility study has confirmed the project's robust economics.

The study envisages an openpit mining operation using a 100% owner-operated fleet, which has been selected to deliver an average of 190 000 t/y of mill feed that will be crushed on site and then transported on an existing road to Baie-Comeau for processing. The concentrator will produce an average of 51 900 t/y graphite concentrate over a 25-year mine life.

The ore mined is projected to yield an average grade of 27.80-% TGC. The concentrator has been designed for the standard purity of 96% TGC for the coarse products and will be capable of reaching purities of up to 97.50% TGC for the same sizes.

The Lac Guéret project will contribute about 10% of global production.

Potential Job Creation
The project will create about 100 jobs.

Picture by Mason Graphite

Graphite mineralisation seen outcropping on surface at Lac Guéret

Net Present Value/Internal Rate of Return
The project has a pretax net present value, at an 8% discount rate, of C$484-million and an internal rate of return of 27.70%, with a payback of 3.7 years.

Capital Expenditure
Initial capex has increased from C$200-million in the 2015 feasibility study to C$258.20-million.

Planned Start/End Date
The project is expected to take 13 to 16 months to complete.

Latest Developments
Early construction work is under way.

Key Contracts and Suppliers
GoldMinds Geoservices (technical and financial data); Met-Chem Canada Inc (mining and mineral reserve estimate); Soutex (process development) and Gesmine Inc (economics section, based on engineering work by Hatch).

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Mason Graphite, tel +1 647 801 7273 or email info@masongraphite.com.

DUMONT NICKEL/COBALT PROJECT

Name of the Project
Dumont nickel/cobalt project.

Location
Dumont is located in the western portion of the Abitibi region, in Quebec, Canada.

Project Owner/s
Dumont Joint Venture, which comprises RNC Minerals and Arpent, a subsidiary of Waterton Precious Metals Fund II Cayman, and Waterton Mining Parallel Fund Offshore Master.

Project Description
Once in production, Dumont will be one of the largest base metal mines in Canada, one of the top five sulphide nickel producers globally, and one of the only large-scale fully permitted nickel/cobalt projects that can begin to satisfy the significant growth in nickel and cobalt demand driven by the electric vehicle sector, according to RNC.

According to the updated feasibility, Dumont will be an openpit mine/mill operation using conventional drilling and blasting, with loading by a combination of hydraulic excavators and electric rope shovels into trucks ranging in capacity from 45 t to 290 t.

The process plant will be built in two phases.

Phase I will have an initial average throughput of 52 500 t/d using a seminautogenous grinding mill and two ball mills for grinding, cyclones for desliming, conventional flotation and magnetic separation to produce a nickel concentrate also containing cobalt and platinum-group elements.

Phase II throughput will be doubled to 105 000 t/d in Year 7 by mirroring the first line.

Initial nickel production in concentrate is estimated at 33 000 t/y, ramping up to 50 000 t/y in the Phase II expansion.

Over the project's 30-year mine life, it is expected to produce about 1.20-million tonnes of nickel in concentrate.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has an estimated pretax net present value, at an 8% discount rate, of $1.71-billion and an internal rate of return of 19.90%

Capital Expenditure
Initial capital expenditure is estimated at $1.02-billion.
Expansion capital is estimated at $610-million.

Planned Start/End Date
Not stated.

Latest Developments
None stated.

Key Contracts and Suppliers
Ausenco (feasibility study).

On Budget and on Time?
Not stated.

Contact Details for Project Information
RNC Minerals, Rob Buchanan, tel +1 416 363 0649 or email rbuchanan@rncminerals.com.

ELYSIS RESEARCH AND DEVELOPMENT CENTRE

Name of the Project
Elysis Research and Development Centre.

Location
The centre will be located at Rio Tinto's Complexe Jonquière, the site of the Arvida smelter, Vaudreuil refinery and Arvida Research and Development Centre, in the Saguenay–Lac-Saint-Jean region in Québec, Canada.

Project Owner/s
Elysis, a joint venture (JV) between Rio Tinto and Alcoa. The provincial government of Quebec will have a 3.50% equity stake in the JV with the remaining ownership split evenly between Alcoa and Rio Tinto.

Project Description
The Elysis process has the potential to reduce the environmental footprint of the aluminium industry on a global scale. The project entails the construction of a new research and development facility to commercialise breakthrough technology that eliminates all direct greenhouse gases (GHG) from the traditional aluminium smelting process, instead producing pure oxygen.

The new process will reduce operating costs of aluminium smelters while increasing production capacity. It could be used in new and existing aluminium smelters.

Potential Job Creation
The facility will directly employ more than 25 experts when it is fully operational.

Net Present Value/Internal Rate of Return
Not stated.

Capital Expenditure
C$188-million. Canada and Quebec are each investing C$60-million in the project. Apple is providing an investment of C$13-million.

The company helped to facilitate the collaboration between Alcoa and Rio Tinto on the carbon-free smelting process, and Apple has agreed to provide technical support for the JV partners.

Rio Tinto and Alcoa will invest C$55-million in cash over the next three years and contribute specific intellectual property and patents.

Planned Start/End Date
The project is expected to be fully operational in the second half of 2020.

Latest Developments
Construction officially started in August 2019.

Key Contracts and Suppliers
None stated.

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Elysis, tel +1 514 848 8398.

FIRST COBALT REFINERY RECOMMISSIONING PROJECT

Name of the Project
First Cobalt refinery – recommissioning and expansion project.

Location
Ontario, Canada.

Project Owner/s
First Cobalt Corp. First Cobalt and Glencore signed a memorandum of understanding on May 21, 2019, outlining the terms of a potential partnership to produce refined cobalt for the North American market.

Project Description
The First Cobalt refinery is the only permitted primary cobalt refinery in North America.

The project entails the recommissioning of the refinery at 12 t/d in late 2020 and then completing a 55 t/d expansion by the fourth quarter of 2021. At the expanded throughput, the parties expect that the refinery could produce an estimated 25 000 t/y of battery cobalt sulphate for the North American market.

Picture by First Cobalt

First Cobalt refinery

First Cobalt is also considering a dry stack tailings management facility as an alternative to tailing impoundments for the 55 t/d operating scenario.

Dry stacking or filtered tailings have a number of benefits, including a smaller environmental footprint and lower water-treatment requirements.

Potential Job Creation
The project will create direct full-time employment for up to 30 people.

Net Present Value/Internal Rate of Return
Not stated.

Capital Expenditure
Total capital investment under the three phases is estimated at $45-million.

On August 26, 2019, Glencore extended a $5-million loan to complete advanced engineering, metallurgical testing, fieldwork and permitting associated with the project, which will culminate in a definitive feasibility study for a 55 t/d refinery expansion.

Subject to certain conditions, Glencore is prepared to advance an additional $40-million to complete this project.

Planned Start/End Date
The feasibility study is scheduled for completion in the first quarter of 2020. The refinery is expected to be recommissioned by the fourth quarter of 2020.

Latest Developments
The prefeasibility study for a 12 t/d restart and a second definitive feasibility study (DFS) for a 55 t/d expansion scenario is on schedule for completion in the first quarter of 2020.

First Cobalt has said that given the fieldwork completed to date, the confidence level in the 12 t/d scenario could potentially reach the DFS level.

The field programme to assess the condition of equipment and systems currently installed in the refinery has been completed by Ausenco Engineering Canada. The six-week programme was concluded in four weeks largely owing to the overall good condition of the equipment that was tested

Knight Piésold has completed geotechnical drilling on a potential new tailings area in First Cobalt's 80 acre clay field to the north of the refinery complex to support feasibility-level design work.

Story Environmental is engaging with regulatory authorities to ensure that the 12 t/d restart scenario complies with existing permits. New baseline studies are in progress in anticipation of amending the existing permits for an expansion. A final decision to put the refinery back into production is contingent on the outcome of the feasibility study and the completion of a long-term feed supply agreement with Glencore.

Key Contracts and Suppliers
Ausenco Engineering Canada (equipment inspection); Knight Piésold (geotechnical drilling); and Story Environmental (baseline studies, permit compliance).

On Budget and on Time?
As of November 30, 2019, the feasibility study was on budget and on time.

Contact Details for Project Information
First Cobalt Corp, tel +1 416 900 3891 or
email info@firstcobalt.com

JANSEN POTASH PROJECT

Name of the Project
Jansen potash project.

Location
The project is located about 140 km east of Saskatoon, Saskatchewan, Canada.

Project Owner/s
BHP Billiton.

Project Description
The Jansen potash project has an estimated measured resource of 5.17-billion tonnes and an inferred resource of 1.27-billion, both grading at 25.70% potassium oxide, 7.10% insolubles and 0.07% magnesium oxide. The project is being designed to produce about eight-million tonnes a year of agricultural-grade potash in three separate phases. The project has an estimated 70-year life-of-mine.

The current scope of work involves the completion of the excavation and lining of the production and service shafts, and to continue the installation of essential surface infrastructure and utilities.

Capital Expenditure
Completing excavation, lining the production and service shafts, as well as installing essential surface infrastructure and utilities, are estimated at $2.70-billion.

Planned Start/End Date
Not stated.

Latest Developments
Preparation work for the final shaft lining is continuing.

Key Contracts and Suppliers
DMC Mining Services (development of two new mine shafts) and SNC-Lavalin (feasibility study for Jansen Phase 1, as well as engineering, procurement and construction management services for Phase 1).

On Budget and on Time?
The project is within budget.

Contact Details for Project Information
BHP Billiton tel +61 3 9609 3333.

SUPERIOR LAKE ZINC PROJECT

Name of the Project
Superior Lake zinc project.

Location
The project is located in Ontario, Canada.

Project Owner/s
Superior Lake Resources.

Project Description
A bankable feasibility study (BFS) has demonstrated Superior Lake as a highly economic project.

The project has probable reserves of 1.96-million tonnes grading 13.90% zinc, 0.60% copper, 0.20 g/t gold and 26.20 g/t silver.

The BFS is broadly based on the results of the restart study completed in October 2018.

The BFS proposes a plant throughput of 325 000 t/m, with a total life-of-mine of nine years and a total throughput of 2.20-million tonnes a month of ore at a grade of 13.70% zinc.

The production rate equates to about 73 000 t/y zinc concentrate and 5 200 t/y copper concentrate.

The project will produce about 38 000 t/y of contained zinc and 1 400 t/y of contained copper. The processing plant has been designed to allow for a doubling of throughput by duplicating the main equipment, which can be relatively easily undertaken.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has a net present value, at an 8% discount rate, of $158-million and an internal rate of return of 31%.

Capital Expenditure
Capital expenditure is estimated at $87-million.

Planned Start/End Date
Subject to successful completion of certain key activities, production is expected to start in 2021.

Latest Developments
Superior Lake continues to make significant progress with an optimisation study on its namesake project, on the back of the successful BFS released during the third quarter of 2019.

The main purpose of the optimisation study is to increase the project's debt carrying capacity, while improving the already robust financial returns.

The optimisation is focusing on two key areas, namely examining the potential to mine higher-grade ore earlier in the schedule to enable an increase in margins in the first two years of production; and optimising project cashflow through staging and deferring nonessential capital costs.

The optimisation study is expected to be completed during the first quarter of 2020.

Key Contracts and Suppliers
Primero (plant design, and operating cost and capital expenditure estimation), incorporating technical aspects from: Massa Geoservices (mineral resource estimate); Orelogy Consulting (mine planning and ore reserves); Mine Design Engineering (underground geotechnical); Nordmin Engineering (mine and general site infrastructure); SGS Canada (metallurgical testwork); Wood Canada (tailings and water studies) and Environmental Applications Group (environmental and permitting).

On Budget and on Time?
Too early to state.

Contact Details for Project Information
Superior Lake Resources, tel +61 8 6117 0479 or email info@superiorlake.com.au.

URANIUM

PATTERSON LAKE SOUTH URANIUM PROJECT.

Name of the Project
Patterson Lake South uranium project.

Location
Saskatchewan, Canada.

Project Owner/s
Fission Uranium.

Project Description
The project has total indicated resources of 2.22-million tonnes grading 2.10% uranium and 0.61 g/t gold. Inferred resources are estimated at 1.22-million tonnes grading 1.22% uranium and 0.50 g/t gold.

A prefeasibility study (PFS) has proposed the development of the Patterson Lake South project using only underground mining methods. This follows the results of an earlier PFS report outlining a hybrid mine approach using openpit and underground techniques.

With the underground PFS, access to the deposit is envisaged through a decline from land. The underground PFS proposes accessing the deposit using a decline developed from a position west of the deposits. The area of the decline will be temporarily dewatered while the development progresses through the overburden. The excavation method is known as the New Austrian Tunnelling Method (NATM), with other localised ground support planned. NATM is a common development method for soft ground.

Picture by Fission Uranium

Patterson Lake South uranium project winter drilling

In addition to the decline, two vertical shafts will be excavated sequentially to provide a dedicated ventilation system for the mine, comprising a fresh air intake shaft and an exhaust air shaft. After the decline extends through the overburden and transition bedrock zone, more typical hard-rock development can start. Longhole stoping will be used in transverse and longitudinal orientation, and isolated pockets of cut-and-fill development.

Partial recovery of the mineralised material approaching the contact between the overburden and bedrock will be achieved using artificial ground freezing. The ground is frozen by drilling holes into the overburden and shallow bedrock using horizontal directional drilling collared from an area on the shore of Patterson Lake.

Upon completion of the ground freezing holes, a refrigeration plant will pump a brine solution through the holes to create a frozen cap, with increased ground stability and reduced groundwater inflow.

Even with this system in place, some mineral resources approaching the overburden contact will be sterilised. This sterilised material could be further evaluated for eventual extraction in future studies.

The process plant design is based on conventional processing technology, including several ancillary facilities, as well as an on-site acid generating facility. Process recovery is estimated at 96.80%, based on detailed metallurgical testing.

About 2.30-million tonnes of material is expected to be processed over the seven year life-of-mine, grading 1.61% uranium containing 81.40-million pounds of uranium.

Production of 78.70-million pounds of uranium is envisaged, averaging 13.10-million pounds a year for the first five years.

Potential Job Creation
Not stated.

Net Present Value/Internal Rate of Return
The project has a pretax net present value, at an 8% discount rate, of C$1.33-billion and an internal rate of return of 34%, with a payback of 2.2 years.

Capital Expenditure
The project has a total capital cost of C$1.46-billion.

Planned Start/End Date
The project has an estimated three-year construction period, comprising a boxcut and portal, a decline, ventilation shafts, underground capital development, and plant and infrastructure construction.

Latest Developments
None stated.

Key Contracts and Suppliers
Roscoe Postle Associates (underground PFS); BGC Engineering (geotechnical aspects); Newmans Geotechnique (artificial ground freezing); Wood Canada (process and infrastructure); Melis Engineering (metallurgical testing); Clifton Associates (environment and tailings), Artisan Consulting Services (directional drilling assistance); and Thyssen Mining Construction of Canada (mine design, scheduling, and cost estimation support).

On Budget and on Time?
The project is currently in track

Contact Details for Project Information
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Fission Uranium president and COO Ross McElroy,
email ross@fissionuranium.com.

Picture by Fission Uranium

Patterson Lake South uranium project winter drilling

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CANADA MINING 2019

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