McArthur River Operation

Northern Saskatchewan, Canada

National Instrument 43-101

Technical Report

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Units of measure and abbreviations

3D	three-dimensional
a	annum (year)
%	percent
°	degrees
°C	degrees Celsius
cm	centimetres
cfm	cubic feet per minute
d	day
eU_3O_8	equivalent uranium oxide
g	grams
g/cm^3	grams per cubic centimetre
hr	hours
ha	hectares (10,000 square metres)
hp	horsepower
IRR	internal rate of return
K	thousand
kg	kilograms
KLJV	Key Lake Joint Venture
km	kilometres
km/h	kilometres per hour
km^2	square kilometres
L	litres
lbs	pounds
M	million
Mt	million tonnes
m	metres
m^3	cubic metres
m^3/h	cubic metres per hour
m^3/s	cubic metres per second
masl	metres above sea level (elevation)
MRJV	McArthur River joint-venture
mm	millimetres
MPa	megapascal
Mt/a	million dry tonnes per year
MW	megawatts
N	newton
NI 43-101	National Instrument 43-101 – Standards of Disclosure for Mineral Projects
NPV	net present value
Pa	pascal (Newtons per square metre)
QP	Qualified Person for the purposes of NI 43-101
st	short tons
SX	solvent extraction
t	tonnes (metric)
t/h	tonnes per hour
t/d	tonnes per day
t/a	tonnes per year
U	uranium
% U	percent uranium (% U x 1.179 = % U_3O_8)
U_3O_8	uranium oxide (yellowcake)
% U_3O_8	percent uranium oxide (% U_3O_8 x 0.848 = % U)
$Cdn	Canadian dollars
$Cdn M	million Canadian dollars
$US	US dollars
$US M	million US dollars
$/t	Canadian dollars per tonne
$US/lb	US dollars per pound
$US/t	US dollars per tonne
>	greater than
<	less than

1 Summary

The McArthur River Operation is a material property for Cameco Corporation (Cameco) under Canadian securities laws. Production at the operation has been suspended for an indeterminate duration.

This technical report has been prepared for Cameco by, or under the supervision of, internal QPs in support of disclosure of new scientific and technical information relating to the McArthur River Operation, including Cameco's new mineral resource and mineral reserve estimates. This information is included in Cameco's annual management's discussion and analysis for the year ended December 31, 2018, Cameco's annual information form and 40-F for the year ended December 31, 2018, and Cameco's press release dated March 29, 2019.

All monetary references in this technical report are expressed in Canadian dollars, unless otherwise indicated.

1.1 Preamble

The McArthur River and the Key Lake Operations have been in care and maintenance since February 2018. In November 2017, Cameco and its joint venture partner Orano Canada Inc. (Orano) announced production from these operations would be temporarily suspended by the end of January 2018 for an expected duration of 10 months. In July 2018, the partners announced that the production suspension would continue for an indeterminate duration due to continued weakness in the uranium market.

The production suspension resulted in the permanent layoff of approximately 520 employees. A reduced workforce of approximately 175 Cameco employees remain employed at the operations to keep the facilities in a state of safe care and maintenance. All development and construction for new mining zones were halted. All underground definition drilling was halted.

As a result of the suspension, Cameco does not expect the operations to produce any uranium in 2019. Cameco does not plan to restart McArthur River and Key Lake until it can commit its tier-one pounds under long-term contracts that can provide an acceptable rate of return on these assets for its owners.

In November of 2012, Cameco prepared and filed a technical report for the McArthur River Operation based on scientific and technical information available at that time (2012 Technical Report). Since the 2012 Technical Report, there have been further advancements and changes in the McArthur River Operation.

This technical report is based on the scientific and technical information as of December 31, 2018. Key highlights include:

- Cameco has updated the mineral reserve and mineral resource estimates. Cameco's share of the mineral reserves increased from 250.7 million pounds U_3O_8 as of December 31, 2017 to 273.6 million pounds U_3O_8 as of December 31, 2018. The changes to the mineral reserve estimates are primarily due to the addition of 23.8 million pounds U_3O_8 of proven and probable reserves (Cameco's share) from Zone B following the incorporation of new drilling results.
- The McArthur River production schedule has been modified to incorporate the additional mineral reserves and to maintain a production rate of 18.0 million pounds U_3O_8 per year upon a production restart. Based on the current assumed production schedule, Cameco estimates that McArthur River will have a mine life of 23 years. See Section 16.6 for more details.
- Cameco's share of the total estimated life of mine capital costs for the McArthur River and Key Lake Operations is $658 million compared to $2.5 billion in the 2012 Technical Report. The reduction in capital expenditures is due to mine design optimization, completed capital spend between 2012 and 2018 and a reduced annual mining rate of 18 million pounds which reduces infrastructure requirements. See Sections 18, 21.1 and Table 21-1 for more details.
- Operating costs for the MRJV are estimated to average $14.97 per pound U_3O_8 over the mine life. This is a significant decrease from the estimate of $19.23 per pound U_3O_8 in the 2012 Technical Report. The

reduction in operating costs is indicative of the work to optimize the mine design and gain efficiencies in the mining and milling processes at an assumed annual production output level of 18 million pounds of U_3O_8. Blasthole stope mining has significantly improved McArthur River's overall operating costs by reducing underground development, concrete consumption, mineralized waste generation, and improving extraction cycle time. See Section 21.2 and Table 21-2 for more details.

- Cameco's share of cash operating and capital costs to maintain both operations during the production suspension shutdown is expected to range between $6 million and $7 million per month.

1.2 Introduction

Profile

McArthur River is an underground uranium mine located in northern Saskatchewan. It contains the world's largest known high-grade uranium deposit and has extracted approximately 327.5 million pounds U_3O_8 since the start of production in 1999. Cameco is the operator. McArthur River is owned by the MRJV. The MRJV partners are:

- Cameco (69.805%); and
- Orano (30.195%)

1.3 Location and site description

The McArthur River mine is a fully developed property located near Toby Lake in northern Saskatchewan, approximately 620 km north of Saskatoon. The McArthur River mine site is compact, occupying an area of approximately one km^2, not including the nearby airstrip and camp facilities.

The McArthur River mine site contains all the necessary services and facilities to operate a remote underground mine. Site facilities include a 1.6 km long gravel airstrip and air terminal, permanent camp, administration and maintenance buildings, warehouse, water containment ponds and treatment plant, freeze plant, concrete batch plant, one full service shaft and two ventilation shafts, site roads, powerhouse, electrical substations, ore slurry load out facility, freshwater pump house and miscellaneous infrastructure.

The means of access to the McArthur River property is by an all-weather road and by air. Supplies are transported to the site by truck year-round and can be shipped from anywhere in North America through the company transit warehouse in Saskatoon. An 80 km gravel road runs between the mine site and the Key Lake Operation. Calcined uranium ore concentrate is shipped from the Key Lake Operation by truck year-round to Saskatoon and elsewhere. An unpaved airstrip and terminal are located approximately one km east of the mine site within the surface lease, allowing flights to and from the McArthur River property.

The topography and the environment are typical of the taiga forested lands common to the Athabasca Basin area of northern Saskatchewan. The surface facilities are at an elevation of approximately 550 masl.

The McArthur River mine site receives its electrical power from the provincial grid via the I2P line. This line has sufficient capacity to meet the site's peak operating demand of 17.6 MW.

The site also has 18.7 MW of back-up generation capacity which is sufficient to maintain operations during power interruptions. In addition, the site has stand-alone back-up generation for the hoist (0.6 MW) and the camp (0.375 MW).

McArthur River has sufficient surface rights to meet all of its current mining operation needs. No tailings management facilities are required as McArthur River mineralization is sent to the Key Lake mill for processing.

1.4 Property tenure

The McArthur River mineral tenure consists of one mineral lease, totalling 1,380 ha (Mineral Lease or ML 5516), and 22 mineral claims (Mineral Claims), totalling 88,319 ha. ML 5516, which hosts the McArthur River deposit, sits on the northwestern edge of the Mineral Claims (Figure 4-2). The right to mine this uranium deposit was acquired by Cameco under this Mineral Lease. A small portion of the reported mineral reserves and resources crosses onto the adjacent Read Lake Claim (CBS 8927) which is owned by the Read Lake Joint Venture.

The Mineral Lease expires in March 2024 with a right to renew for successive 10 year terms absent a default by Cameco. Based on previous work submitted and approved by the Province of Saskatchewan, title to the Mineral Claims is secured until 2020 or later.

The surface facilities and mine shafts for the McArthur River Operation are located on lands owned by the Province of Saskatchewan. Cameco acquired the right to use and occupy the lands under a surface lease agreement with the Province. The most recent surface lease agreement was signed in November 2010 and has a term of 33 years. The McArthur River surface lease presently covers approximately 1,425 ha.

1.5 Geology and mineralization

The McArthur River uranium deposit is located approximately 40 km west of the eastern margin of the Athabasca Basin of northern Saskatchewan (Figure 7-1). Like other major uranium deposits of the basin, it is located at or near the unconformity contact separating late Paleoproterozoic sandstone of the basal portion of the Athabasca Group from Paleoproterozoic metasedimentary gneisses and migmatites of the Wollaston Group which are interfolded with Archean granitoid gneisses.

High-grade uranium mineralization has been delineated from surface drilling over a strike length of 2,700 metres, occurring at depths ranging between 500 to 640 metres below surface. Underground drilling programs have covered approximately 1,800 metres of this overall strike length.

Mineralized widths are variable along strike but the most consistent, high-grade mineralization occurs proximal to the main graphitic reverse fault by the upthrust basement rock. Less consistent and generally lower grade mineralization occurs downdip along this fault contact between basement rock and sandstone. The main part of the mineralization, generally at the upper part of the basement wedge, averages 12.7 metres in width and has a vertical extent ranging between 50 and 120 metres.

Nine mineralized areas at the McArthur River deposit have been well defined with underground drilling, namely Zones 1, 2, 3, 4, 4 South, Zone A, Zone B, McA North 1 and McA North 2.

Three other mineralized areas, known as McA North 3, McA North 4 and McA South 1, have not been well defined by surface or underground drilling.

The P2 reverse fault, also known as the P2 structure, is the most important mineralization control for the McArthur River deposit. Uranium occurs in both the Athabasca sandstone and the structurally overlying basement rock near the main zone of reverse faulting. Mineralization is generally within 15 metres of the unconformity contact with the exception of Zone 2. Less significant zones of mineralization may occur further from the unconformity, usually in the sandstone and are associated with subsidiary fracture/fault zones or along the margins of flat lying siltstone beds.

Zone 2 mineralization occurs deeper in the basement rocks in a unique area of the deposit. Here a footwall quartzite unit lies in close proximity to the main zone of reverse faulting. In this area of structural disruption, high-grade mineralization occurs not only in the hanging wall basement wedge but also in the basement below the P2 fault and above the footwall quartzite unit. The strike extent of this deeper basement mineralization is approximately 120 metres. The majority of this zone has now been mined out.

In general, the high-grade mineralization, characterized by massive uraninite, constitutes the earliest phase of mineralization in the deposit. Later stage, remobilized uraninite occurs as disseminations, veinlets, and fracture coatings within chlorite breccia zones and along the margins of silt beds in the Athabasca sandstone.

1.6 Exploration

Cameco, through one of its predecessor companies, the Saskatchewan Mining Development Corporation (SMDC), became operator of the McArthur River project in 1980. Surface exploration programs, ranging from small line cutting crews to large helicopter supported drilling and prospecting camps, were active from 1980 through to 1992.

In the summer of 1988, drilling was completed along the northern portion of an electromagnetic conductor. The last hole of the year, MAC-198, encountered an up thrusted basement/sandstone contact before intersecting a 10 metre thick zone of high-grade mineralization. Subsequent surface drilling programs in 1989, 1990, 1991, and 1992 delineated the mineralization over a strike length of 1,700 metres at depths ranging between 500 to 640 metres below surface.

In 1993, an underground exploration program, consisting of shaft sinking, lateral development, and diamond drilling was approved by government agencies. The shaft was completed in 1994. Approvals for mine construction and development were obtained in 1997. Construction and development of the McArthur River mine was completed on schedule and mining commenced in December 1999. Commercial production was achieved on November 1, 2000.

As at December 31, 2018, 189 surface drillholes totalling in excess of 116,000 metres, using a combination of conventional and directional diamond drilling have tested the P2 structure at intervals of 300 metres or less for a distance of 5.0 km northeast and 6.4 km southwest of the mine.

Since 1993, underground drillholes have delineated 1,800 metres of the strike length with hole spacing of 10x10 metres being targeted. Other underground diamond drillholes were drilled for geotechnical information, probe and grout covers, service and drain holes and freezeholes.

Underground exploration drilling and development continued in 2017 and then ceased by the end of the year following the temporary suspension of production activities.

1.7 Mineral resources and mineral reserves

The mineral resource and mineral reserve estimates are based on approximately 50 mineralized drillholes from surface, 1,125 mineralized drillholes and blastholes from underground, and 20 mineralized freezeholes.

A summary of the estimated mineral resources for the McArthur River deposit with an effective date of December 31, 2018 is shown in Table 1-1. Alain D. Renaud, P.Geo. of Cameco, is the QP within the meaning of NI 43-101 for the purpose of the mineral resource estimates.

Table 1-1: Summary of Mineral Resources – December 31, 2018

Category	Total tonnes (x 1,000)	Grade % U_3O_8	Total M lbs U_3O_8	Cameco's share M lbs U_3O_8
Measured	97.8	2.57	5.5	3.9
Indicated	35.1	2.86	2.2	1.6
Total Measured & Indicated	132.9	2.65	7.8	5.4
Inferred	80.5	2.25	4.0	2.8

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Reported mineral resources do not include amounts identified as mineral reserves. Totals may not add up due to rounding.

(2) Cameco's share of total mineral resources is 69.805% on the McArthur River property and 78.241% on the Read Lake property.

(3) The Read Lake portion of mineral resources on a 100% basis are 4,600 tonnes at a grade of 1.92% U_3O_8 for 0.19 million lbs U_3O_8 of measured + indicated and 700 tonnes at 1.86% U_3O_8 for 0.03 million lbs U_3O_8 of inferred.

(4) The mineralized domains have been interpreted from drillhole information on vertical and plan cross-sections or with 3D implicit modelling validated on plan views and in 3D.

(5) Mineral resources are estimated using a minimum mineralized thickness of 1.0 metre and at a minimum grade of 0.50% U_3O_8.

(6) Mineral resources have been estimated based on the use of longhole and raisebore underground mining methods.

(7) Inferred mineral resources are estimated on the basis of limited geological evidence and sampling, sufficient to imply, but not verify, geological and grade continuity. They have a lower level of confidence than that applied to an indicated mineral resource and cannot be directly converted to a mineral reserve.

(8) There are no known environmental, permitting, legal, title, taxation, socio-economic, political, marketing or other relevant factors that could materially affect the above estimate of mineral resources.

(9) Mineral resources do not currently have demonstrated economic viability.

A summary of the estimated mineral reserves for the McArthur River deposit with an effective date of December 31, 2018 is shown in Table 1-2. Linda Bray, P.Eng, Gregory M. Murdock, P.Eng, and Alain D. Renaud, P.Geo. of Cameco are the QPs within the meaning of NI 43-101 for the purpose of the mineral reserve estimates.

Table 1-2: Summary of Mineral Reserves – December 31, 2018

Reserve Category	Total tonnes (x 1,000)	Grade % U_3O_8	Total M lbs U_3O_8	Cameco's share M lbs U_3O_8
Proven	2,034.0	7.14	320.2	223.5
Probable	538.5	6.04	71.7	50.1
Total Reserves	2,572.5	6.91	391.9	273.6

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Totals may not add up due to rounding.

(2) Mineral reserves and are not adjusted for the estimated mill recovery of 99%.

(3) Cameco's share of total mineral reserves is 69.805% on the McArthur River property and 78.241% on the Read Lake property.

(4) The Read Lake portion of mineral reserves on a 100% basis are 10,800 tonnes at a grade of 1.47% U_3O_8 for 0.35 million lbs proven and probable reserves.

(5) Mineral reserves were estimated based on the use of the raisebore and blasthole stope mining methods and assume a 99.4% planned mine recovery and have allowance for expected waste (42% average) and backfill (6.8% average) dilution.

(6) Reserve estimates are based on an assumed annual packaged production of 18 million lbs U_3O_8.

(7) An average price of $44 (US) per pound of U_3O_8 was used to estimate the mineral reserves with an exchange rates of $1.00 (US) = $1.25 (Cdn).

(8) McArthur River mineral reserves have been estimated at a cut-off grade of 0.80% U_3O_8.

(9) Other than the factors described in Section 15.4, there are no other known mining, metallurgical, infrastructure, permitting or other relevant factors that could materially affect the above estimate of mineral reserves.

Changes to mineral reserves

Cameco has updated its mineral reserve estimates. Cameco's share of the mineral reserves increased from 250.7 million pounds U_3O_8 as of December 31, 2017 to 273.6 million pounds U_3O_8 as of December 31, 2018. The changes to the mineral reserve estimates are primarily due to the addition of 23.8 million pounds

U_3O_8 of proven and probable reserves (Cameco's share) from Zone B following the incorporation of new drilling results.

1.8 Mining

The McArthur River deposit presents unique challenges that are not typical of traditional hard or soft rock mines. These challenges are the result of mining in or near high pressure ground water in challenging ground conditions with significant radiation hazards due to the high-grade uranium ore. As such, mine designs and methods are selected on their ability to mitigate hydrological, radiological and geotechnical risks.

All the mineralized areas discovered to date at McArthur River are in or partially in water-bearing ground with pressures ranging from 680 to 850 psi. This high pressure water source is isolated from active development and production areas in order to reduce the inherent risk of an inflow. To date, McArthur River has relied on pressure grouting and ground freezing to successfully mitigate the risks of the high pressure ground water.

Ground Freezing: Ground freezing is used at McArthur River as a means to prevent or restrict high pressure ground water from entering the mine. Chilled brine is circulated through freezeholes to form an impermeable freeze barrier around the area being mined. This prevents water from entering the mine, and helps stabilize weak rock formations. Ground freezing reduces, but does not fully eliminate the risk of water inflows.

There are three approved mining methods at McArthur River: raisebore mining, blasthole stope mining and boxhole mining. However, only raisebore and blasthole stope mining remain in use.

Raisebore Mining: Raisebore mining has been in use since 1999. It is suitable for massive high-grade zones where there is access both above and below the ore zone. The raise opening created by mechanical cutting has proven to be very stable making this method favourable for mining the weaker rock mass areas of the deposit. In addition, holes can be drilled accurately over long distances when compared to traditional production drilling, eliminating the need for sublevel access. Waste and ore can be easily separated by bucket scanning.

Production raises are designed to overlap each other in order to maximize recovery of the high-grade ore at the expense of an average cement dilution of approximately 17%. Recoveries are typically 97.5% with a small amount of the ore lost in the cusps between the circular raises.

Raisebore mining is planned to continue to be one of the main extraction methods over the mine life, specifically for the creation of slots for blasthole stoping, for mining the Zone 4 clay area and for mining the more massive vertical ore areas of Zone B.

Blasthole Stoping: Testing of blasthole stoping began in 2011 and was approved by the Canadian Nuclear Safety Commission (CNSC) as an extraction method in November 2013. Since approval, the use of this method has expanded to the point where the majority of the ore is now extracted using this method.

Blasthole stoping is planned in areas where blastholes can be accurately drilled and small stable stopes excavated without jeopardizing the freeze wall integrity. Blasthole stope mining has shown an advantage over raisebore mining on overall extraction efficiency by reducing underground development, concrete consumption, mineralized waste generation, and improving extraction cycle time. Use of this method has significantly improved McArthur River's overall operating costs.

Boxhole Boring: After successful testing, boxhole boring was approved by the CNSC as an extraction method in July 2013. Originally, boxhole mining was planned for some of the more challenging upper mining areas, but following the success in development of Zone 2 - Panel 5, mine designs were revised and boxhole mining was replaced with more productive and cost effective methods. In 2015, the boxhole program was discontinued. No further use of this mining method is planned.

There are currently two active mine zones and one significantly advanced:

Zone 2: Zone 2 has been actively mined since production began in 1999. The ore zone was initially divided into three freeze panels and as the freeze wall was expanded, the inner connecting freeze walls were decommissioned in order to recover the inaccessible uranium around the active freeze pipes. Mining of Zone 2 is near completion with 4.8 million pounds of mineral reserves remaining secured behind freeze walls. The remaining reserves will be recovered with a combination of raisebore and blasthole stope mining.

Zone 4: Zone 4 has been actively mined since 2010. Similar to Zone 2, the zone was divided into four freeze panels and as the freeze wall was expanded, the inner connecting freeze walls were decommissioned. Zone 4 has 117.5 million pounds of mineral reserves secured behind freeze walls and it will be the main source of production when mine production restarts. Raisebore mining in combination with mass freezing will be utilized in the Zone 4 clay area while the remaining areas will be mined using blasthole stoping.

Zone 1: Zone 1 is the next planned area to be brought into production. Freezehole drilling was 90% complete and brine distribution construction was approximately 10% complete when work was suspended. Work remaining before production can begin includes completion of freezehole drilling, completion of the brine distribution, ground freezing, and drill and extraction chamber development. Once complete, an additional 46.6 million pounds of mineral reserves will be secured behind freeze walls. Blasthole stope mining is currently planned as the main extraction method.

McArthur River will continue to transition into new mine areas before the completion of Zone 4 mining as outlined in Section 16.7 in order to successfully meet the planned production in the life of mine schedule. To support these mining transitions, critical support infrastructure, such as freeze plant capacity and brine distribution, must also be expanded.

1.9 Processing

The McArthur River mine and ore processing facilities are licensed to produce up to 25 million pounds U_3O_8 annually. McArthur River produces two product streams, high-grade slurry and low-grade mineralization, which both report to the Key Lake mill to produce calcined uranium ore concentrate.

High-grade ore is slurried, ground, and thickened underground at McArthur River. The resulting slurry is pumped to surface and, after blending and further thickening, is transported to Key Lake in slurry trucks.

Low-grade mineralization is hoisted to surface and stored on the low-grade mineralization pads. This material is then hauled to the Key Lake low-grade mineralization blend pads.

McArthur River low-grade mineralization, including legacy low-grade mineralized waste stored at Key Lake, is slurried, ground and thickened at Key Lake and then blended with the McArthur River high-grade slurry to a nominal 5% U_3O_8 mill feed grade. All remaining uranium processing (leaching through to calcined uranium ore concentrate packaging) and tailings disposal also occur at Key Lake.

The Key Lake mill is owned by the KLJV and operated by Cameco. The KLJV partners are:

- Cameco (83.333%); and
- Orano (16.667%)

The KLJV has entered into a toll milling agreement with Orano for the processing of Orano's share of McArthur River mineral reserves at the Key Lake mill. See Section 19.2 for a discussion of this toll milling agreement. Cameco does not have a formal toll milling agreement for its share of mineral reserves.

The current production capacity of the Key Lake mill is sufficient to process McArthur River mineral reserves at a production rate of 18 million pounds U_3O_8 per year. The mill is licensed to produce up to 25 million pounds U_3O_8 per year.

1.10 Environmental assessment and licensing

The McArthur River Operation has regulatory obligations to both the federal and provincial governments. Being a nuclear facility, primary regulatory authority resides with the federal government and its agency, the CNSC. The main regulatory agencies that issue permits/approvals and inspect these operations are: the CNSC (federal), the Mine Safety Unit of Saskatchewan, Ministry of Labour Relations and Workplace Safety (provincial) and the Ministry of Environment (SMOE) (provincial). Other agencies that have an interest with respect to environmental monitoring programs and activities that may impact water ways are Environment and Climate Change Canada (ECCC) (federal) and the Department of Fisheries and Oceans Canada (federal).

There are three key permits that must be maintained to operate the mine. Cameco holds a “Uranium Mine Licence” from the CNSC, an “Approval to Operate Pollutant Control Facilities” from the SMOE and a “Water Rights Licence and Approval to Operate Works” from the Saskatchewan Watershed Authority. These permits are current. The CNSC operating licence was renewed for a 10 year term on November 1, 2013 and expires on October 31, 2023. The SMOE Approval to Operate Pollutant Control Facilities was renewed in 2017 and expires on June 30, 2023. The Saskatchewan Watershed Authority permit was obtained in 1993 and was last amended in November 2011. It is valid for an undefined term.

The Key Lake Operation is regulated in a similar manner as the McArthur River mine and as such has regulatory obligations to both the federal and provincial governments. There are two key permits that must be maintained to operate the Key Lake uranium mill. Cameco holds a “Uranium Operating Licence” from the CNSC and an “Approval to Operate Pollutant Control Facilities” from the SMOE. These permits are current. The SMOE Approval to Operate Pollutant Control Facilities was renewed in 2014 and expires on November 30, 2021. The CNSC operating licence was renewed for a ten year term in 2013 and expires on October 31, 2023.

Cameco initiated an environmental assessment (EA) in 2010 for the Key Lake mill to extend the operational life of the Key Lake mill and establish it as a regional mill, by increasing the tailings capacity and licensed annual production rate to 25 million pounds U_3O_8. The environmental impact statement (EIS) received federal and provincial approval in 2014. The CNSC licence condition handbook for Key Lake was amended in 2015 to authorize the increased production rate.

Following approval of the Key Lake Extension Project, in 2015 Cameco applied to increase the maximum annual production limit at the McArthur River mine to 25 million pounds U_3O_8. Later that year, this application received CNSC approval and Ministerial Approval from the province of Saskatchewan. The CNSC licence condition handbook for McArthur River authorizes the increased production rate.

1.11 Key Lake tailings management

There are two tailings management facilities at the Key Lake Operation:

- An above ground tailings management facility constructed in 1983, where tailings are stored within compacted till embankments. Cameco has not deposited tailings here since 1996, and is looking at several options for decommissioning this facility in the future.
- The Deilmann tailings management facility was commissioned in 1996 following completion of mining in the eastern portion of the Deilmann pit in 1995.

Beginning in July 2001, periodic sloughing of the pit walls in the western portion of the Deilmann tailings management facility was experienced. Cameco implemented a long-term stabilization plan and the final phase of this work is targeted for completion in 2019.

1.12 Care and maintenance

The McArthur River and Key Lake Operations have been in care and maintenance since February 2018. Cameco’s share of the cash operating and capital costs to maintain both operations during the suspension is expected to range between $6 million and $7 million per month.

1.13 Production restart plan

Due to the suspension of production for an indeterminate duration, no actual production start-up date is currently available. Year 1 of the production plan represents the first year of assumed production after restart is announced and could potentially occur any time after 2019.

The main steps in preparing the mine and mill for restart of production are:

- **Restart planning:** Detailed restart planning including identification of critical project and maintenance work required to be completed prior to restarting the operations.
- **Restart announcement:** Once conditions required to support restarting the McArthur River and Key Lake Operations have been met, an announcement will be made.
- **Critical project execution:** The current assumption is that all critical project work can be completed within a one year time frame.
- **Maintenance readiness checks:** As a significant number of the facilities will have been shut down for more than two years, equipment and facility readiness checks will be performed prior to restarting operations.
- **Recruitment:** Recruitment will begin once the restart decision has been made. Workers will be mobilized in stages (restart planning team, maintenance preparation team, and operational team).
- **Training:** It is currently assumed that a sufficient number of experienced workers can be recruited in order to minimize operational training requirements and timelines.

Once critical projects, maintenance readiness checks and sufficient recruitment and training have occurred, the mine and mill will restart operations. It is projected that this will take a minimum of 9 months. Initial mill feed for the Key Lake restart will come from the high-grade broken inventory (4.2 million pounds at a grade of 17% U_3O_8) stored underground at McArthur River.

1.14 Production plan

McArthur River currently has sufficient mineral reserves to permit mining for 23 years. Although McArthur River and Key Lake have licence permits for 25 million pounds U_3O_8 production per year, the production profile assumes the following:

- In the year of restart, 4 million pounds of packaged production; and
- For subsequent years, 18 million pounds of packaged production per year until year 21 with production ramping down in the last two years.

1.15 Economic analysis and costs

The economic analysis for the McArthur River Operation is based upon the current mine plan which considers mining and milling the reported mineral reserves. The analysis does not include any estimates involving the mining and milling of mineral resources.

Production from the McArthur River and the Key Lake Operation has been suspended for an indeterminate duration and no decision has been made to restart operations. However, to prepare the economic analysis, the following assumptions have been made:

- Work commences to restart operations at McArthur River and Key Lake on January 1, 2020
- Ramp-up of operations in 2020 with 4 million pounds packaged
- Annual production is 18 million pounds from 2021 to 2040
- Ramp-down of production in the final two years
- An average realized price of $56.39 (Cdn) per pound U_3O_8 over the period 2020 to 2042.

The foregoing dates are for assumption purposes only and do not reflect a decision to restart operations or a preferred timetable for a restart. No decision to restart has been made.

The analysis is from the point of view of Cameco, which owns 69.805% of the MRJV, and incorporates a projection of Cameco's sales revenue from its proportionate share of the related production, less its share of related operating and capital costs of the MRJV, as well as royalties and surcharges that will be payable on the sale of concentrates.

For the purpose of the economic analysis, the projected impact of income taxes has been excluded due to the nature of the required calculations. McArthur River operates as an unincorporated joint venture and is, therefore, not subject to direct income taxation at the joint venture level. It is not practical to allocate a resulting income tax cost to Cameco's portion of the McArthur River Operation, as Cameco's tax expense is a function of several variables, most of which are independent of its investment in McArthur River.

The economic analysis resulted in an estimated pre-tax NPV (at a discount rate of 8%) to Cameco for net cash flows from January 1, 2019 forward of $2.97 billion for its share of the current McArthur River mineral reserves. Using the total capital invested to December 31, 2018, along with the operating and capital estimates for the remainder of the mineral reserves, the pre-tax IRR has been estimated to be 11.6%. With no decision to restart the McArthur River mine and Key Lake mill being made, the NPV decreases as the indeterminate suspension is extended. The sensitivity to an extended suspension is summarized below in Table 1-3. The robust nature of the economics supports declaring mineral reserves notwithstanding the indeterminate duration of the production suspension.

Table 1-3: McArthur River Mine Net Present Value by Start-up Year

	Year of Restart Decision			
	2020	**2021**	**2025**	**2030**
NPV ($Cdn M)	$2,973	$2,761	$2,012	$1,211

Operating costs are estimated to be $14.97 per pound U_3O_8 over the life of the current mineral reserves. This is a decrease from the 2012 Technical Report, which showed estimated operating costs of $19.23 per pound U_3O_8. The reduction in operating costs is indicative of the work to optimize the mine design and gain efficiencies in the mining and milling processes at an assumed annual production level of 18 million pounds of U_3O_8. The operating cost projections are stated in 2018 constant dollars and assume the throughput described in Section 16.6.

The total remaining estimated life-of-mine capital cost for McArthur River mine and Key Lake mill is $941 million (Cameco share - $658 million), compared to $3.5 billion (Cameco share - $2.5 billion) shown in the 2012 Technical Report. The reduction in capital expenditures is due to mine design optimization, completed capital spend between 2012 and 2018 and a reduced annual mine rate to 18 million pounds which reduces infrastructure requirements.

1.16 Mining and milling risks

Production at McArthur River/Key Lake poses many challenges. These challenges include control of ground water, weak rock formations, radiation protection, water inflow, mine area transitioning, regulatory approvals, surface and underground fires and other mining related challenges. Operational experience gained since the start of production has resulted in a significant reduction in risk.

Specific mining and milling risks are described in more detail in Section 24.4.

1.17 Conclusions and recommendations

Conclusions

McArthur River is a mature operation that has extracted 327.5 million pounds of U_3O_8 since 1999. As of December 31, 2018, Cameco's share of the mineral reserves is estimated to be 274 million pounds U_3O_8, an increase of 9.1% since December 31, 2017. Cameco estimates that McArthur River will have a mine life of 23 years.

The McArthur River mine represents a significant economic source of feed material for the Key Lake mill and is forecast to produce a further 388 million packaged pounds U_3O_8. At the forecast average realized uranium price used in the economic analysis, Cameco estimates it will receive substantial positive net cash flows from its share of McArthur River production.

Operating costs for the MRJV are estimated to average $14.97 per pound U_3O_8 over the mine life. This is a significant decrease from the estimate of $19.23 per pound U_3O_8 in the 2012 Technical Report.

Cameco's share of the total estimated life of mine capital costs for the McArthur River and Key Lake Operations is $658 million compared to $2.5 billion in the 2012 Technical Report. Cameco's share of the cash operating and capital costs to maintain both operations during the production suspension is expected to range between $6 million and $7 million per month. Additional years of shutdown increases uncertainty for the timing of a successful restart of the operations and associated costs.

The economic analysis shows a NPV of $2.97 billion with an IRR of 11.6% in the scenario where restart occurs in 2020. If restart does not occur until 2030, the mining of the mineral reserves generates a NPV of $1.21 billion. The robust nature of the economics supports declaring mineral reserves notwithstanding the indeterminate duration of the production suspension. Future developments, such as a forecast shutdown extending beyond 10 years, could necessitate a reclassification of McArthur River mineral reserves. The McArthur River deposit is, in general, well delineated and shows limited mineral resource discovery potential within the immediate mine footprint. Given the size of the current proven and probable mineral reserve inventory and the anticipated future mining rate, exploration does not need to be accelerated.

Cameco's Key Lake mill has sufficient tailings capacity for all currently reported McArthur River mineral reserves and resources.

A significant risk to the McArthur River Operation is production interruption from water inflows. Cameco has demonstrated that the challenging conditions associated with mining the McArthur River mineral reserves can be managed. Operational experience gained since the start of commercial production has resulted in a significant reduction in risk.

Recommendations

Considering that McArthur River has extracted 327.5 million pounds since 1999, and the operations are suspended for an indeterminate duration, the report authors are only making the following recommendations:

Mine and Mill restart planning: Cameco's objective is that the McArthur River and Key Lake Operations are available to safely and reliably resume production. Well in advance of restart, it is recommended that detailed mine and mill restart planning and scheduling begin.

Metallurgical assumptions: It is recommended that a mineralogical and metallurgical analysis be completed on future mining areas to validate the forecast metallurgical and environmental performance assumptions.

Mineral reserves: The McArthur River Operation estimated mineral reserves have proven, thus far, to be slightly conservative with more pounds of U_3O_8 and tonnage extracted than predicted. Over the years, the mineral reserve model has been calibrated as required to better predict actual production results. Continued review of mineral resource models, applied mining recovery and dilution modifying factors and monitoring of production data against model expectations is recommended when mining resumes.

2 Introduction

2.1 Introduction and purpose

The McArthur River Operation is a material property for Cameco under Canadian securities laws.

This technical report has been prepared for Cameco by, or under the supervision of, internal qualified QPs in support of disclosure of new scientific and technical information relating to the McArthur River Operation. This information, including new mineral resource and mineral reserve estimates, is included in Cameco's annual management's discussion and analysis for year ended December 31, 2018, Cameco's annual information form and 40-F for the year ended December 31, 2018, and Cameco's press release dated March 29, 2019. This new information is the result of progress at McArthur River and changes since the 2012 Technical Report.

This report has an effective date of December 31, 2018 and has been prepared in accordance with NI 43-101 by the following individuals:

- Linda Bray, P.Eng., principal metallurgist, technical services, Cameco
- Gregory M. Murdock, P.Eng., general manager, Key Lake/McArthur River, Cameco, and
- Alain D. Renaud, P.Geo., lead geologist, technical services, Cameco

These individuals are the QPs responsible for the content of this report. All three QPs have visited the McArthur River and Key Lake sites.

Linda Bray is Cameco's principal metallurgist and has been practicing as a metallurgist/process engineer for over 20 years. Her relevant experience is in the areas of process plant operation and metallurgical support, production planning, metallurgical accounting and process plant design. Her last personal inspection of McArthur River and Key Lake Operations occurred from January 7-10, 2019.

Gregory M. Murdock is currently general manager of both Key Lake and McArthur River Operations. He has worked at the mine site from 2002 to 2013 and 2016 to present in various engineering, mine operations and management roles. Mr. Murdock is present at the sites generally four times a month for three to four consecutive days. Underground, surface and plant inspections and monitoring of project activities is part of his work routine when at the sites.

Alain D. Renaud has been involved with the McArthur River Operation since 2016 and has visited the site on several occasions. Mr. Renaud's last personal inspection of the McArthur River Operation occurred in November, 2017 and included a review of anticipated changes to year-end mineral reserves and resources, planned implementation of geological data quality assurance/quality control (QA/QC) improvements and the assessment of exploration drilling results. Mr. Renaud was involved with the 2018 McArthur River Zone B mineral resource update, being the primary contributor.

Report basis

This report has been prepared with available internal Cameco data and information, and data and information prepared for the MRJV and KLJV. The principal technical documents and files relating to the McArthur River and Key Lake Operations that were used in preparation of this report are listed in Section 27.

All monetary references in this report are expressed in Canadian dollars, unless otherwise indicated. Illustrations (Figures) in this report are from Cameco, and are dated December 31, 2018, unless otherwise specified.

Location references within this technical report use three different coordinate systems: latitudes/longitudes, Universal Transverse Mercator (UTM) and mine grid. The UTM coordinates are calculated using the World Geodetic System standard 84. The conversion from mine grid to UTM coordinates is provided below.

UTM Northing = (Mine Easting x -0.726562678) + (Mine Northing x 0.687100191) + 6401721.111
UTM Easting = (Mine Easting x 0.687100191) – (Mine Northing x -0.726562678) + 485669.566) x .999989
UTM Elevation = Mine Elevation – 1000 = masl

3 Reliance on other experts

The authors have relied, and believe they have a reasonable basis to rely, upon the following individuals who have contributed the environmental, legal and taxation information stated in this report, as noted below in Table 3-1.

Table 3-1: Reliance on Other Experts

Name	Title	Section Number (description)
Kevin Nagy, M.Sc.	Director, Compliance and Licensing, Cameco	1.10 (description of environmental assessment and licensing) 4.5 (description of known environmental liabilities) 4.6 (description of permitting) 20 (description of environmental studies, permitting and social or community impact), excluding Section 20.7
Larry Korchinski, LLB	Director Legal Services and General Counsel, Cameco	1.4 (description of Property tenure) 4.2 (description of Mineral tenure) 4.3 (description of Surface tenure) 6.1 (description of Ownership) 19.2 (description of Material contracts for property development)
Jill Johnson, MPAcc, CPA, CA	Director, Corporate Tax, Cameco	4.4 (description of Taxes and royalties) 22.5 (description of Taxes) 22.6 (description of Royalties)

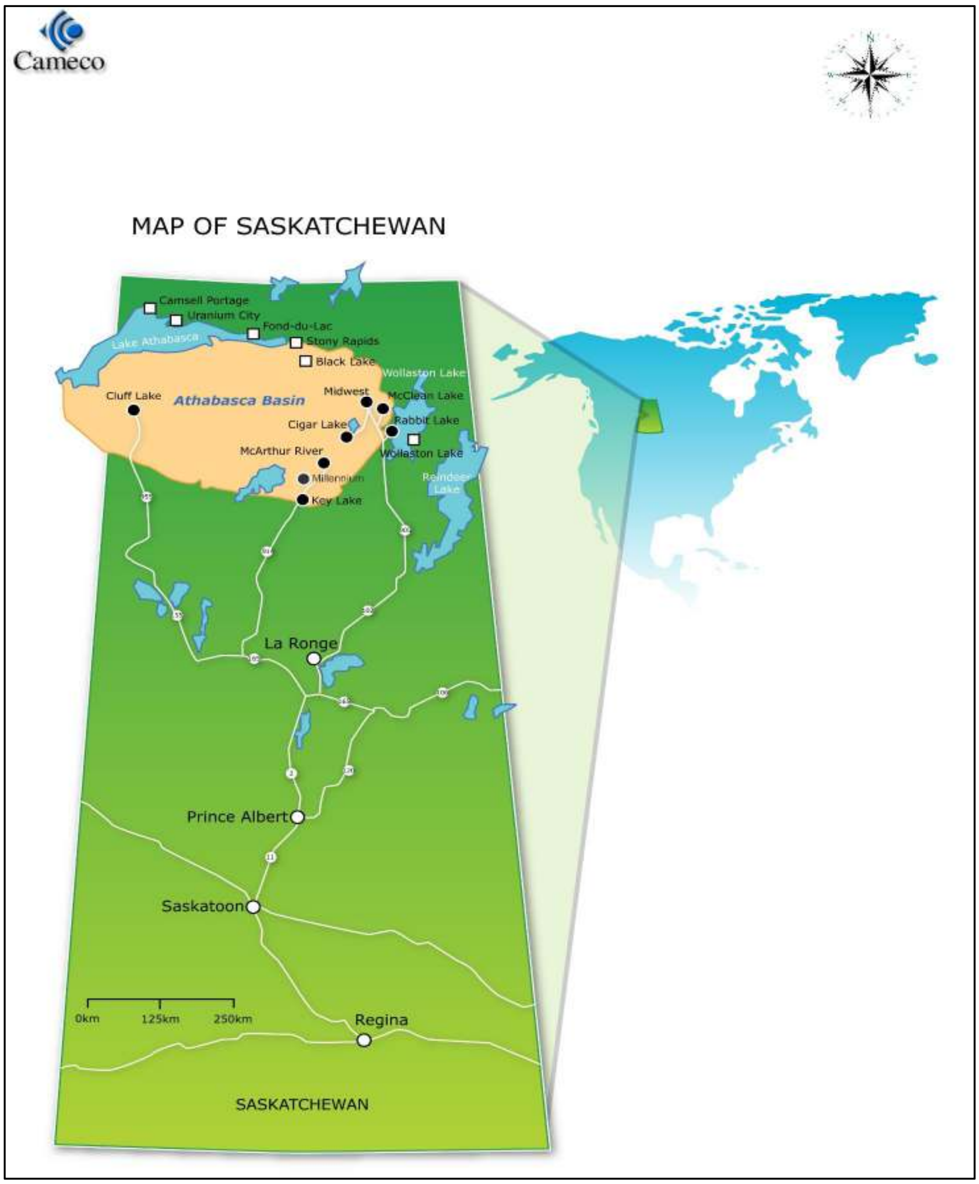
4 Property description and location

4.1 Location

The McArthur River mine is a fully developed property located in northern Saskatchewan, nearly 620 km north of Saskatoon, Canada, at approximate latitude 57º 46’ north and longitude 105º 03’ west, and about 40 km inside the eastern margin of the Athabasca Basin Region (see Figure 4-1). Toby Lake is a small lake close to the mine site. Read Lake and Yalowega Lake are nearby lakes.

The McArthur River mine site is 80 km northeast by road from the Key Lake Operation. The Cigar Lake mine is 46 km northeast from the McArthur River mine site. No direct roads connect McArthur River to the Cigar Lake mine.

Figure 4-1: McArthur River Operation Location



4.2 Mineral tenure

- one mineral lease: ML 5516
- 22 mineral claims: S 105653 to S 105673 inclusive, and CBS 8927
- total contiguous area: 89,699 hectares

ML 5516, which hosts the McArthur River deposit, sits on the northwestern edge of the Mineral Claims.

The right to mine the McArthur River deposit was acquired by Cameco under this Mineral Lease, as renewed, effective March 2014 from the Province of Saskatchewan. In August 2018, its status with the province was changed from a producing lease to a non-producing lease. Cameco holds this leasehold interest on behalf of the MRJV, in its capacity as operator of the McArthur River Operation. The MRJV partners are:

- Cameco (69.805%); and
- Orano (30.195%)

This Mineral Lease, which totals 1,380 ha, is granted by the Province of Saskatchewan under The Crown Minerals Act (Saskatchewan). Under The Mineral Tenure Registry Regulations, 2012 (Saskatchewan), issued under The Crown Minerals Act (Saskatchewan), the term of ML 5516 is for 10 years, with a right to renew for successive 10 year terms absent a default by Cameco. The Province of Saskatchewan may only terminate ML 5516 if Cameco breaches a provision of the lease or fails to satisfy any of its obligations under The Crown Minerals Act (Saskatchewan) or associated regulations, or in the event that any prescribed environmental concerns arise. The current mineral lease expires in March 2024.

The 22 Mineral Claims, which were granted by the Province of Saskatchewan to Cameco under The Crown Minerals Act (Saskatchewan), total 88,319 ha. These Mineral Claims grant Cameco the right to explore for minerals within them. Cameco holds title to the Mineral Claims (other than CBS 8927) on behalf of the MRJV, in its capacity as operator of the McArthur River Operation. A holder of a mineral claim in good standing has the right to convert a mineral claim into a mineral lease. Surface exploration work of a mineral claim requires additional government approval.

The 22 Mineral Claims and the Mineral Lease require annual exploration expenditures of $2,452,025. Based on previous work submitted and approved by the Province of Saskatchewan, title is secured until 2020 or later. Table 4-1 shows the status of ML 5516 and the Mineral Claims.

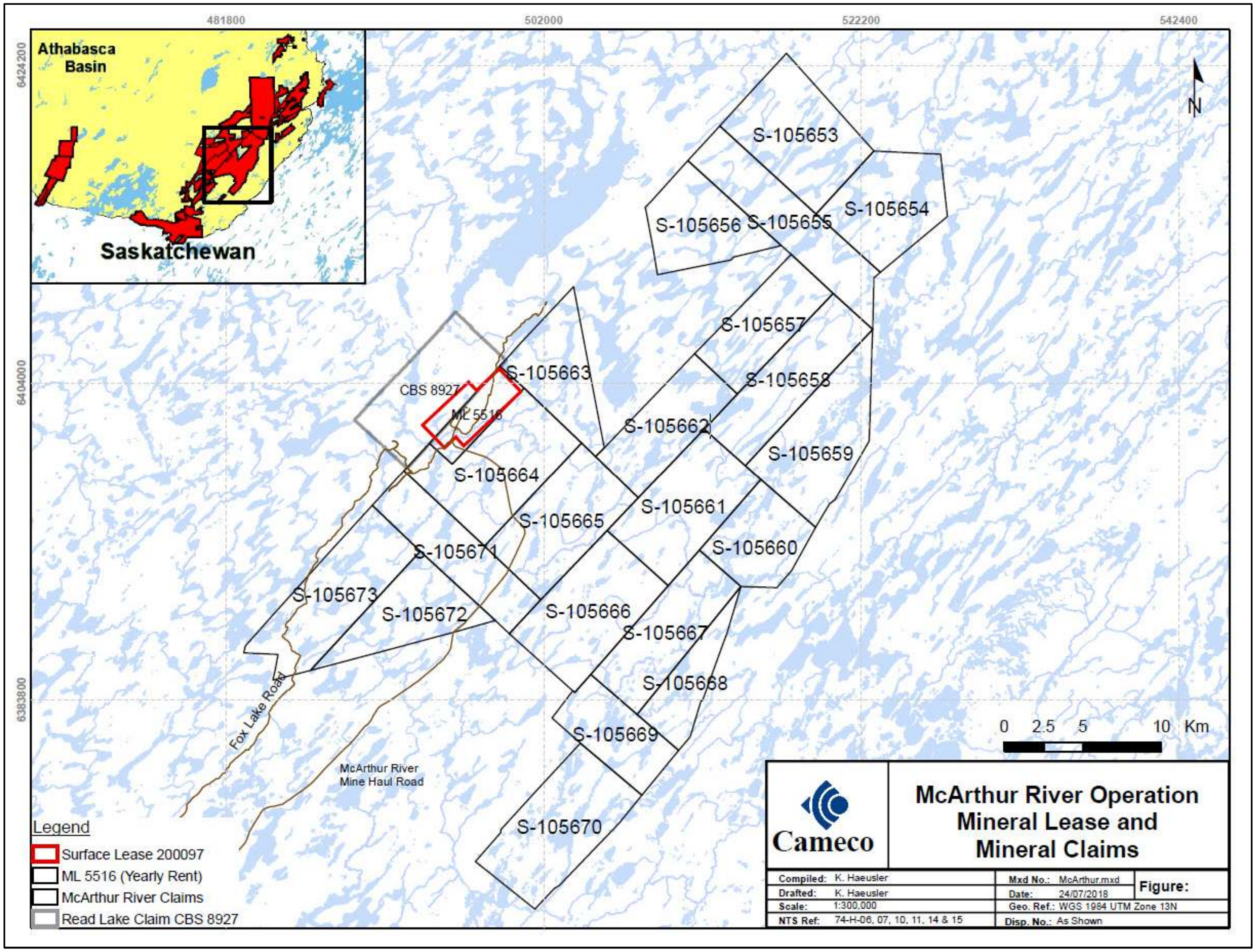
A portion of the reported mineral resources and reserves (described in Section 14 and Section 15) crosses onto the adjacent Read Lake Claim (CBS 8927) which is owned by the Read Lake Joint Venture at a slightly different ownership level (78.241% owned by Cameco and 21.759% owned by Orano). This mineral claim requires annual exploration expenditures of $122,025. Based on previous work submitted and approved by the Province of Saskatchewan, title is secured until 2040.

Figure 4-2 shows the McArthur River Mineral Lease and Mineral Claims, as well as CBS 8927, as currently registered with the Province of Saskatchewan.

Table 4-1: McArthur River Operation – Mineral Disposition Status

Disposition	Record Date (day/month/year)	Area (ha)	Annual Assessment	Next Payment Due (day/month/year)
ML 5516	08-Mar-84	1,380	$103,500	08-Mar-40
CBS 8927	01-Mar-78	4,881	$366,075	01-Mar-40
S 105653	08-Mar-77	4,880	$122,000	08-Mar-20
S 105654	08-Mar-77	4,076	$101,900	08-Mar-20
S 105655	08-Mar-77	4,380	$109,500	08-Mar-24
S 105656	08-Mar-77	3,434	$85,850	08-Mar-24
S 105657	08-Mar-77	3,290	$82,250	08-Mar-24
S 105658	08-Mar-77	4,060	$101,500	08-Mar-29
S 105659	08-Mar-77	4,752	$118,800	08-Mar-22
S 105660	08-Mar-77	2,945	$73,625	08-Mar-29
S 105661	08-Mar-77	4,505	$112,625	08-Mar-25
S 105662	08-Mar-77	3,470	$86,750	08-Mar-28
S 105663	08-Mar-77	3,248	$81,200	08-Mar-29
S 105664	08-Mar-77	5,055	$126,375	08-Mar-28
S 105665	08-Mar-77	4,519	$112,975	08-Mar-28
S 105666	08-Mar-77	4,930	$123,250	08-Mar-26
S 105667	08-Mar-77	3,926	$98,150	08-Mar-26
S 105668	08-Mar-77	2,075	$51,875	08-Mar-26
S 105669	08-Mar-77	2,838	$70,950	08-Mar-27
S 105670	08-Mar-77	5,207	$130,175	08-Mar-26
S 105671	08-Mar-77	3,586	$89,650	08-Mar-28
S 105672	08-Mar-77	3,390	$84,750	08-Mar-26
S 105673	08-Mar-77	4,872	$121,800	08-Mar-28
Total Claims (22)		**88,319**	**$2,452,025**	
Total Lease (1) and Claims (22)		**89,699**	**$2,555,525**	

Figure 4-2: Mineral Lease and Mineral Claims Map



4.3 Surface tenure

- Total surface lease area: 1,425 ha of Crown land
- Covers a portion of ML 5516

The surface facilities and mine shafts for the McArthur River Operation are located on lands owned by the Province of Saskatchewan. Cameco acquired the right to use and occupy the lands under a surface lease agreement with the Province of Saskatchewan. The most recent surface lease agreement was signed in November 2010 and has a term of 33 years.

The Province of Saskatchewan uses surface leases as a mechanism to achieve certain environmental protection and socio-economic objectives. As a result, the McArthur River surface lease contains certain obligations from the MRJV in that regard, including annual reporting regarding the status of the environment, land development, and progress on northern employment and business development. The McArthur River surface lease presently covers approximately 1,425 ha.

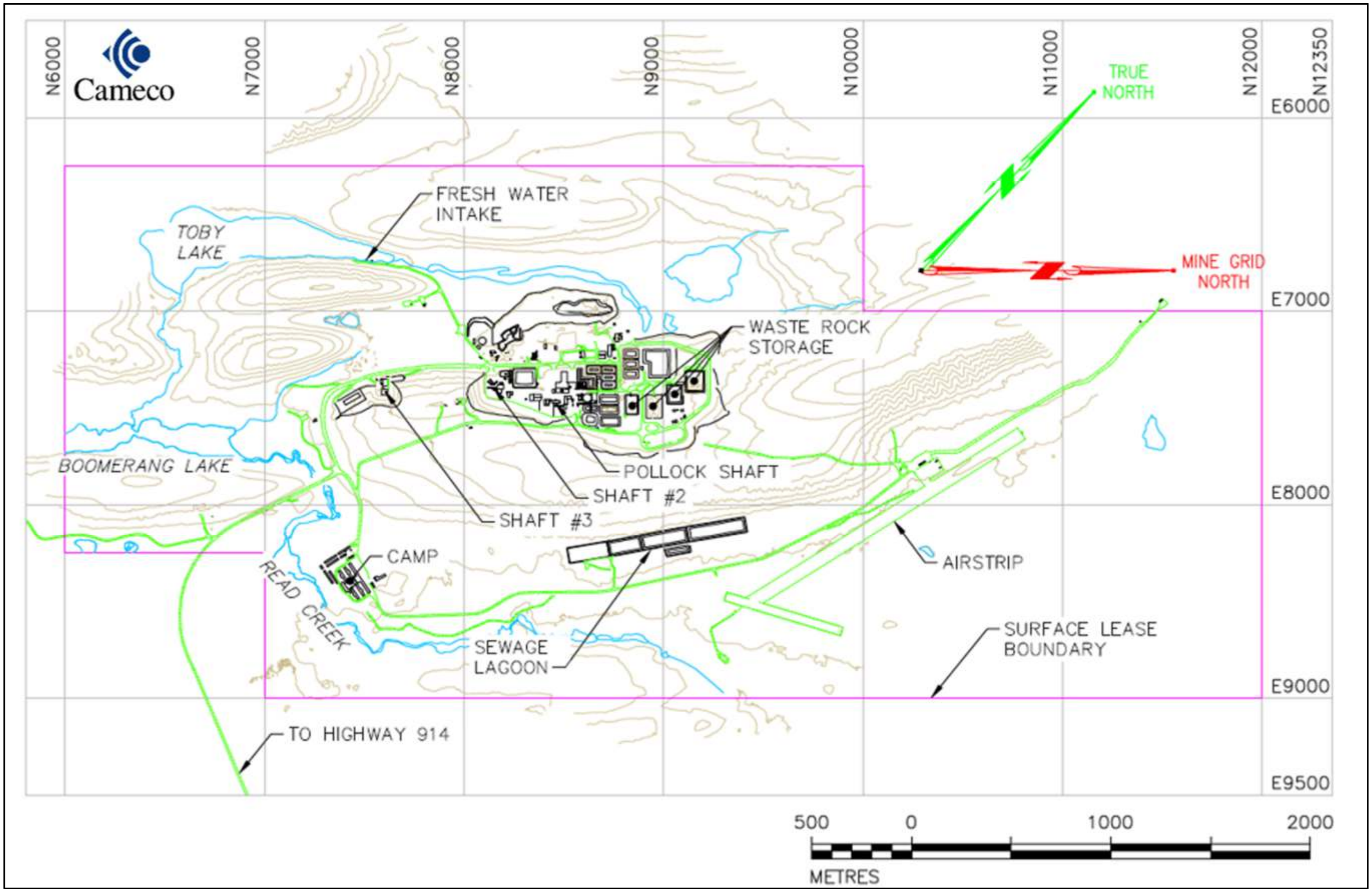
The McArthur River mine site is compact, occupying an area of approximately 1 km^2, not including the nearby airstrip and camp facilities.

Figure 4-3 shows the McArthur River general site arrangement with the outline of the surface lease.

In addition to the surface lease described above, there are four quarry leases pursuant to which Cameco, as operator of the MRJV, may use certain leased lands to carry out quarrying of sand, gravel, rock and clay, as applicable, in connection with its operations at McArthur River.

In 2018, the annual rent for the McArthur River surface lease and quarry leases was approximately $235,000 and $18,000 respectively, together with property taxes of approximately of $2.3 million in respect thereof.

Figure 4-3: Map of Mine Facilities and Surface Lease (Cameco, 2018)



4.4 Taxes and royalties

For a discussion of taxes and royalties, see Sections 22.5 and 22.6 respectively.

4.5 Known environmental liabilities

For a discussion of known environmental liabilities, see Section 20.6.

4.6 Permitting

For a discussion of permitting, see Sections 20.2.and 20.3.

5 Accessibility, climate, local resources, infrastructure and physiography

5.1 Access

The property is accessible by all-weather road and by air. Supplies are transported by truck and can be shipped from anywhere in North America through Cameco's transit warehouse in Saskatoon. Trucks travel north from Saskatoon, on a paved provincial road through Prince Albert and further north on gravel Provincial Road 914 to the Key Lake mill. An 80 km all-weather gravel road maintained by Cameco runs between the McArthur River Operation and the Key Lake Operation. This road is used to transport material from McArthur River to Key Lake for processing and to ship supplies to McArthur River. Although classified as a provincial road, public access to this road is controlled and restricted for security and safety reasons. Calcined uranium ore concentrate is shipped from the Key Lake Operation by truck year round to Saskatoon and elsewhere. Figure 5-1 shows the regional location of the McArthur River site and local roads.

An unpaved airstrip and terminal are located approximately one km east of the mine site within the surface lease, allowing flights to and from the McArthur River property.

5.2 Climate

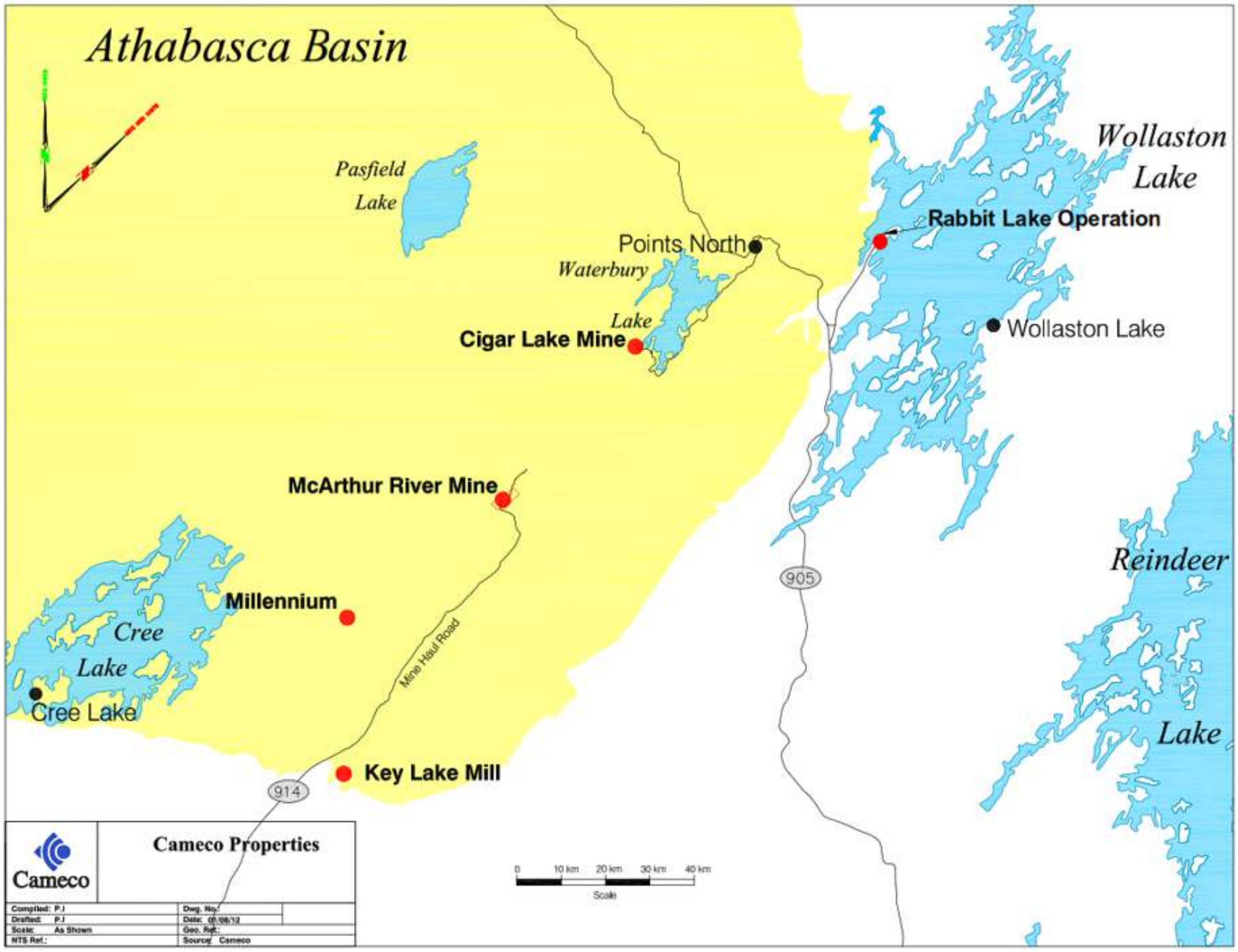
The climate is typical of the continental sub-arctic region of northern Saskatchewan. Summers are short and rather cool, even though daily temperatures can reach above 30°C on occasion. Mean daily maximum temperatures of the warmest months are around 20°C and only three months on average have mean daily temperature of 10°C or more. The winters are cold and dry with mean daily temperature for the coldest month below minus 20°C. Winter daily temperatures can reach below minus 40°C on occasion.

Freezing of surrounding lakes, in most years, begins in November and breakup occurs around the middle of May. The average frost-free period is approximately 90 days.

Average annual total precipitation for the region is approximately 480 mm, of which 67% falls as rain, more than half occurring from June to September. Snow may occur in all months but rarely falls in July and August. The prevailing annual wind direction is from the west with a mean speed of 12 km/h.

Site operations are carried out year round, despite cold winter conditions. The fresh air necessary to ventilate the underground working areas is heated during the winter months using propane-fired burners.

Figure 5-1: McArthur River Site – Regional Location and Roads



Notes:

(1) Green North arrow indicates true North.

(2) Red North arrow indicates mine grid North.

5.3 Physiography

The McArthur River Operation lies within the Athabasca Plain of the Boreal Shield Eco-Zone. The vegetation at the McArthur River property is typical of the taiga forested lands common to the Athabasca Basin area of northern Saskatchewan. The topography in the region is dominated by large scale drumlins, which locally can have a relief of 100 metres above the surrounding lakes. Overburden thickness over the deposit is approximately 10 metres. The terrain consists primarily of sandy rolling hills which are separated by a number of low-lying areas filled with lakes, creeks, and muskegs.

The dominant upland forest type is a semi-open jack pine forest with an understory of lichens and blueberries. The moist lowlands are predominated by open black spruce and tamarack stands with an understory of mosses and Labrador tea. Major forest fires have covered most of the McArthur River area over the last 30 years and have modified the local vegetation.

The mine site elevation is approximately 550 metres above sea level. The actual McArthur River is located approximately 20 km east of the mine site and flows between Baxter Lake and McNabb Lake.

5.4 Local resources

The closest inhabited community to the two operations by road is the village of Pinehouse, 240 km south of the Key Lake site by gravel Provincial Road 914. The McArthur River mine site is a further 80 km northeast from the Key Lake site.

Employees commute from a number of designated communities by air. Most company employees are on a week-in and week-off schedule. Contractor employees are generally on a longer work schedule. Personnel are recruited on a preferential basis from northern Saskatchewan.

The McArthur River site is linked by road and by air to the rest of the province of Saskatchewan, facilitating easy access to any population centre for purchasing of goods. Saskatoon is a major population centre some 620 km south of the McArthur River mine with highway, rail and air links to the rest of North America.

5.5 Mine and infrastructure

McArthur River is a developed property with sufficient surface rights to meet its planned mining operation needs. The McArthur River mine site contains all the necessary services and facilities to operate a remote underground mine, including camp accommodation, access to water, airport, site roads and other necessary buildings and infrastructure. The Key Lake site also contains all the necessary services and facilities to operate a remote mill.

For a detailed discussion, refer to Section 18.

6 History

6.1 Ownership

There have been numerous changes in ownership of participating interests in the joint venture that governs the McArthur River property, the most recent of which occurred in 2009. The current owners and their participating interests in the MRJV are as follows:

- Cameco (69.805%); and
- Orano (formerly AREVA Resources Canada Inc.) (30.195%)

The original joint venture was established in 1976 between Canadian Kelvin Resources Ltd. and Asamera Oil Corporation Ltd. (Asamera) to explore the Keefe Lake area. Asamera was the operator of the joint venture. In 1977, SMDC, one of Cameco’s predecessor companies, acquired a 50% interest in the joint venture.

Around 1979, the Keefe Lake Joint Venture proceeded to divide the Keefe Lake area into three separate project areas of Dawn Lake, McArthur River and Waterbury Lake (which includes a portion of the lands now known as Cigar Lake).

Effective January 1, 1980, a joint venture agreement was entered into to govern exploration of the McArthur River area and SMDC, holding a 50.75% participating interest in the joint venture at that time, was appointed the operator of the MRJV.

Between 1980 and 1988, SMDC was involved in a number of transactions of sales and purchases of participating interests in the MRJV.

In 1988, Eldorado Resources Limited merged with SMDC to form Cameco. In connection with the merger, SMDC assigned to Cameco its 43.991% participating interest in the MRJV and Cameco became the operator of the MRJV.

In 1992, Cameco acquired an additional 10.0% participating interest in the MRJV and in 1995, Cameco entered into two transactions with Uranerz Exploration and Mining Limited (Uranerz) that resulted in Cameco holding, in total, a 55.844% participating interest in the MRJV.

In 1998, Cameco bought all of the shares of Uranerz (and changed Uranerz’s name to UEM Inc. (UEM)), thereby increasing its direct and indirect participating interest in the MRJV to 83.766%.

In 1999, AREVA acquired one-half of the shares of UEM, thereby reducing Cameco’s direct and indirect participating interest in the MRJV to 69.805% and increasing AREVA’s direct and indirect participating interest in the MRJV to 30.195%.

In 2009, UEM distributed equally to its shareholders (Cameco and AREVA):

- its 27.922% interest in the MRJV, giving Cameco a 69.805% direct interest, and AREVA a 30.195% direct interest; and
- its 33.333% interest in the KLJV, giving Cameco an 83.333% direct interest, and AREVA a 16.667% direct interest

In February 2018, Orano announced its name change from AREVA Resources Canada Inc. to Orano Canada Inc.

6.2 Exploration and development history

General

Cameco, through one of its predecessor companies, SMDC, became operator of the McArthur River project in 1980. Surface exploration programs, ranging from small line cutting crews to large helicopter supported drilling and prospecting camps, were active from 1980 through to 1992.

The McArthur River deposit was discovered by surface drilling in 1988. Additional surface diamond drilling from 1988 to 1992 further delineated the mineralization. Mineralization occurs at depths of 500 to 640 metres and is hosted in both the Athabasca sandstones and the underlying Aphebian metasedimentary gneisses. A graphitic, southeast dipping reverse fault is the source of a coincident electromagnetic conductor. The deposit does not have the extensive clay alteration halo or the cobalt-nickel-arsenide mineral association common to many other Saskatchewan uranium deposits except in one isolated area above Zone 4 where mineralization is capped by a hematite clay alteration zone.

In 1993, an underground exploration program, consisting of shaft sinking, lateral development, and diamond drilling was approved by government agencies. The shaft was completed in 1994. Approvals for mine construction and development were obtained in 1997. Construction and development of the McArthur River mine was completed on schedule and mining commenced in December 1999. Commercial production was achieved on November 1, 2000.

The McArthur River deposit, originally called P2 North, is on the P2 grid situated on the north-western boundary of the property (see Figure 6-1). Some of the other significant, but sub-economic discoveries that are located on the property include the Harrigan Zone, the BJ Zone, and P2 Main. A brief history of exploration on the P2 grid is discussed below.

P2 grid exploration history

Routine prospecting in 1980 and 1981 discovered radioactive boulders about 10 km southwest of the McArthur River deposit. Although an on-property source for these boulders has never been proven, they did help to intensify exploration efforts in this portion of the property. Exploration on the P2 grid accelerated in 1984 following the detection of a basement conductor with reconnaissance geophysical surveying.

Definition of the entire P2 conductor was completed in 1986. The open ended conductor extended for 12 km on the property and became a high priority exploration target.

In 1985, drilling on the P2 conductor resulted in the discovery of the P2 Main sandstone hosted mineralization, associated with a major fault zone. Additional drilling to 1988 defined a 500 metres long, sub-economic zone of mineralization with the best intersection being 1.38% U_3O_8 over 7.3 m.

In the summer of 1988, drilling along the northeastern portion of the conductor encountered structural disruption and sandstone alteration in hole MAC-195. MAC-196 was collared about 100 metres away and intersected weak sandstone hosted mineralization, with characteristics similar to P2 Main. The next hole, 100 metres northeast, intersected a similar but wider zone of mineralization. The last hole of the year, MAC-198, encountered an upthrusted basement/sandstone contact before intersecting a 10 metre thick zone of high-grade mineralization. Subsequent surface drilling programs in 1989, 1990, 1991, and 1992 delineated the mineralization over a strike length of 1,700 metres at depths ranging between 500 and 640 metres.

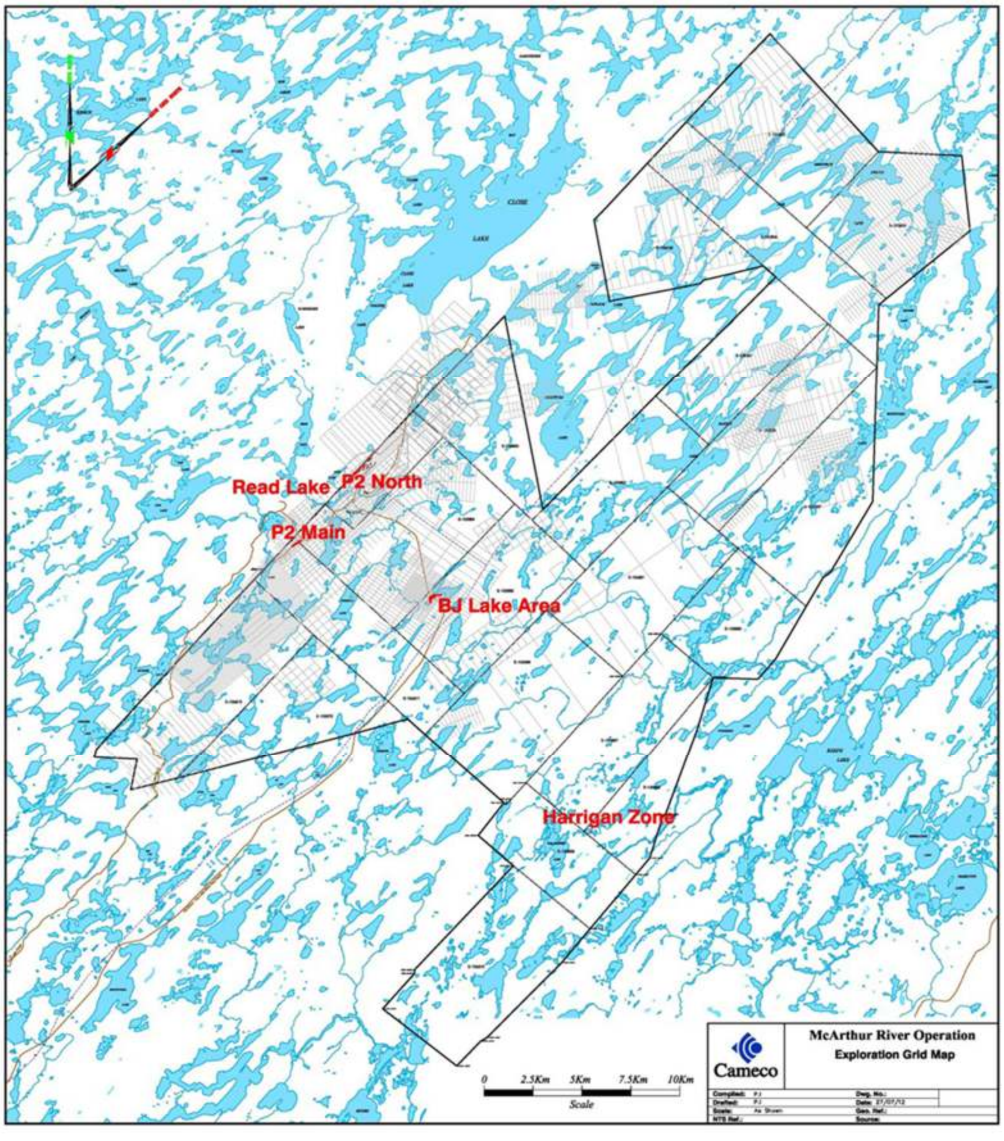
Since 1993, over 1,260 underground drillholes, totalling in excess of 115,000 metres, have provided detailed information for 1,800 metres of the strike length. Over 6,500 additional underground drillholes, totalling 356,000 metres, were drilled for geotechnical information; probe and grout covers; service and drain holes; production and freezeholes.

Nine mineralized areas at the McArthur River deposit have been well defined with underground drilling. The Zones are 1, 2, 3, 4, 4 South, A, B, McA North 1 and McA North 2.

Three other mineralized areas, known as McA North 3, McA North 4 and McA South 1, are poorly defined by surface drilling.

Diamond drilling to evaluate the P2 trend northeast of the McArthur River mine has been ongoing since 2004. Between 2007 and 2015, surface diamond drilling to evaluate the P2 trend both northeast and southwest of the McArthur River mine was significantly accelerated in order to assess the prolific P2 structure. As of December 31, 2018, 189 surface drillholes totalling in excess of 116,000 metres, comprising a combination of conventional and directional diamond drilling, have tested the P2 structure at intervals of 300 metres or less for a distance of 5.0 km northeast and 6.4 km southwest of the mine, respectively. Starting in 2016, exploration efforts shifted away from the P2 trend to the north part of the property.

Figure 6-1: Map of P2 Grid and Discoveries on the Mineral Lease and Mineral Claims



Notes:

(1) Green North arrow indicates true North.

(2) Red North arrow indicates mine grid North.

6.3 Historical mineral resource and mineral reserve estimates

There are no historical estimates within the meaning of NI 43-101 to report.

6.4 Historical production

Mine production began in the fourth quarter of 1999 (approximately 50,000 pounds U_3O_8 of production) and was ramped up over the next two years (see Table 6-1).

Key Lake mill production from McArthur River to February 2018 (when the production suspension commenced) is shown in the table below.

Table 6-1: McArthur River Historical Mine Production (100% Basis)

	Mine Production			Key Lake Packaged Production
Year	**Total tonnes (x 1,000)**	**Grade % U_3O_8**	**M lbs U_3O_8**	**M lbs U_3O_8**
1999	-	-	Approximately 50,000 lbs U_3O_8. Carried over to year 2000	-
2000	43.7	11.60	11.2	9.7
2001	48.0	16.23	17.2	17.3
2002	52.5	15.99	18.5	18.5
2003	45.4	15.21	15.2	15.2
2004	55.9	15.17	18.7	18.7
2005	60.4	13.90	18.5	18.7
2006	57.6	14.72	18.7	18.7
2007	59.6	14.24	18.7	18.7
2008	53.2	14.91	17.5	16.6
2009	65.2	12.89	18.5	19.1
2010	78.0	11.25	19.3	19.9
2011	80.2	11.17	19.7	20.0
2012	85.1	10.49	19.7	19.5
2013	104.1	8.83	20.3	20.1
2014	108.4	8.73	20.9	19.1
2015	86.6	10.33	19.7	19.1
2016	89.3	9.30	18.3	18.0
2017	91.4	8.15	16.4	16.1
2018	2.8	7.57	0.5	0.2
Total Prod (1)	**1,267.5**	**11.72%**	**327.5**	**323.2**

Note:

(1) Totals may not add up due to rounding.

7 Geological setting and mineralization

7.1 Regional geology

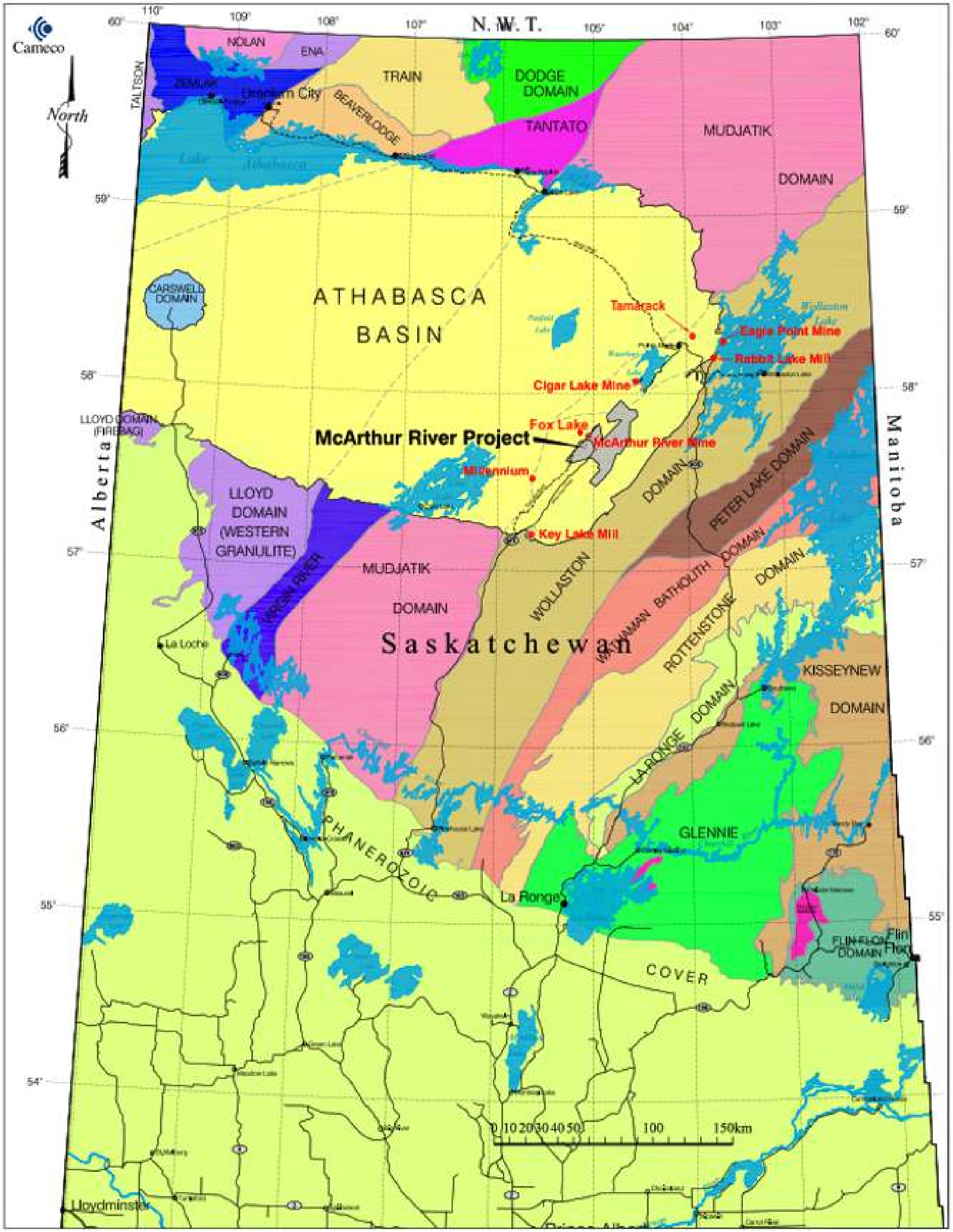
The McArthur River uranium deposit is located approximately 40 km west of the eastern margin of the Athabasca Basin of northern Saskatchewan. Like other major uranium deposits in this area of the basin, it is located at the unconformity contact separating late Paleoproterozoic to Mesoproterozoic sandstone of the Athabasca Group from middle Paleoproterozoic metasedimentary gneiss and plutonic rocks of the Wollaston Group.

The Athabasca Group appears largely undeformed with a maximum preserved thickness of about 1,500 metres within the eastern part of the Athabasca basin. The Manitou Falls (MF) formation sequence of sandstone is interpreted to have been deposited in an intra-continental sedimentary basin that was filled by fluviatile terrestrial quartz sandstone and conglomerate as units of the MF Formation.

During the Hudsonian orogeny (1800 – 1900 million years ago), the Wollaston Group underwent polyphase deformation and upper amphibolite facies metamorphism, with local green schist facies retrograde metamorphism.

The Hudsonian orogeny was followed by a long period of erosion and weathering along with the development of a paleoweathering profile that is preserved on, and beneath, the unconformity. Figure 7-1 below shows a regional geological map of Northern Saskatchewan.

Figure 7-1: Geological Map of Northern Saskatchewan



7.2 Local geology

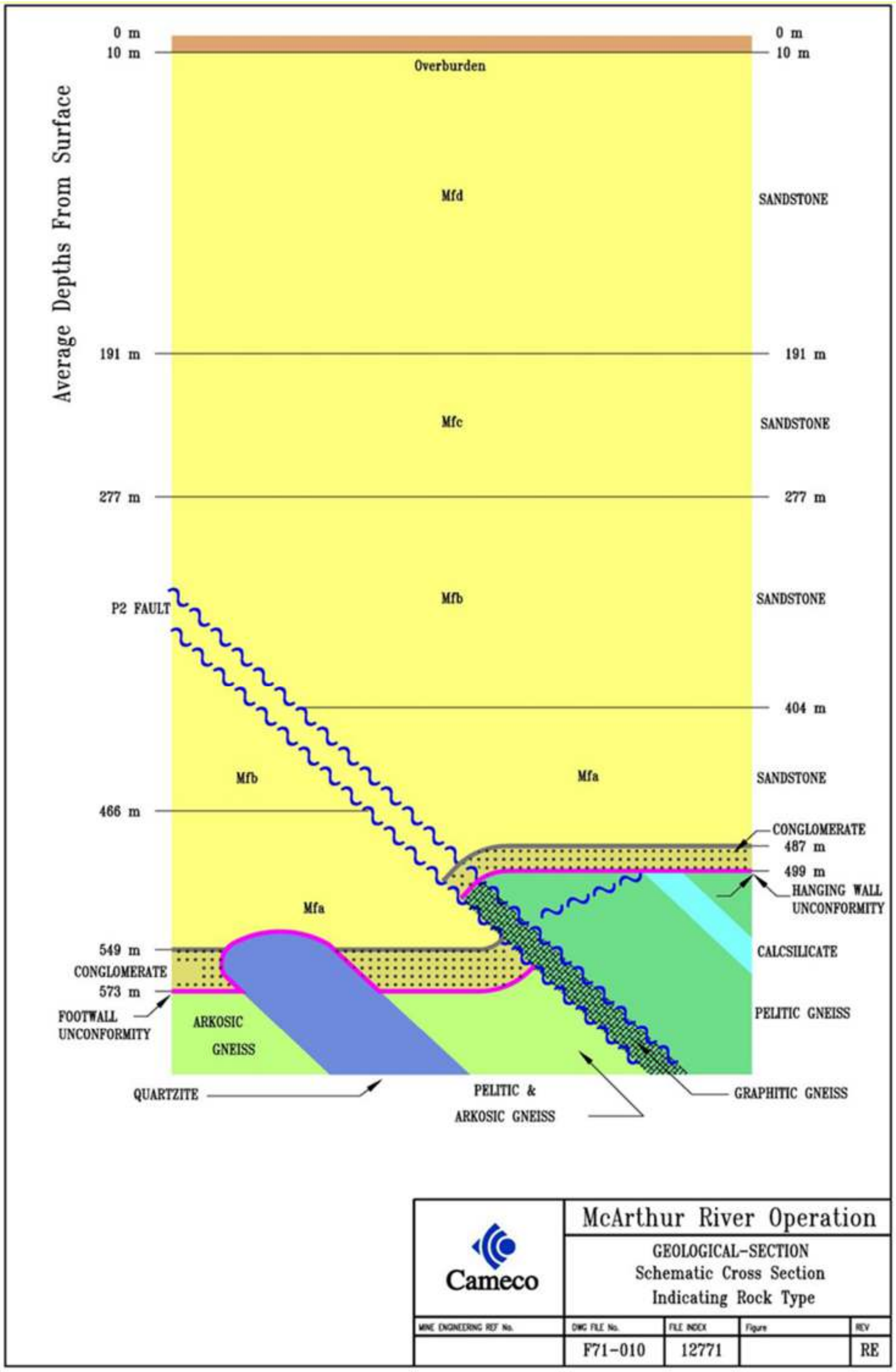
Two major lithostructural domains are present in the metamorphosed basement of the larger McArthur River property separated by the unconformity from the relatively unmetamorphosed overlying Athabasca sandstone.

These are as follows:

- Wollaston Domain: Covering the entire deposit area, composed mainly of metasedimentary gneiss overlying Archean granitoids, with an overall northeast-trending structural orientation.
- Mudjatik Domain: Mostly on the northern area with large Archean granitoid gneiss domes. In the deposit area, represented by sporadic small outliers of granitoid domes.

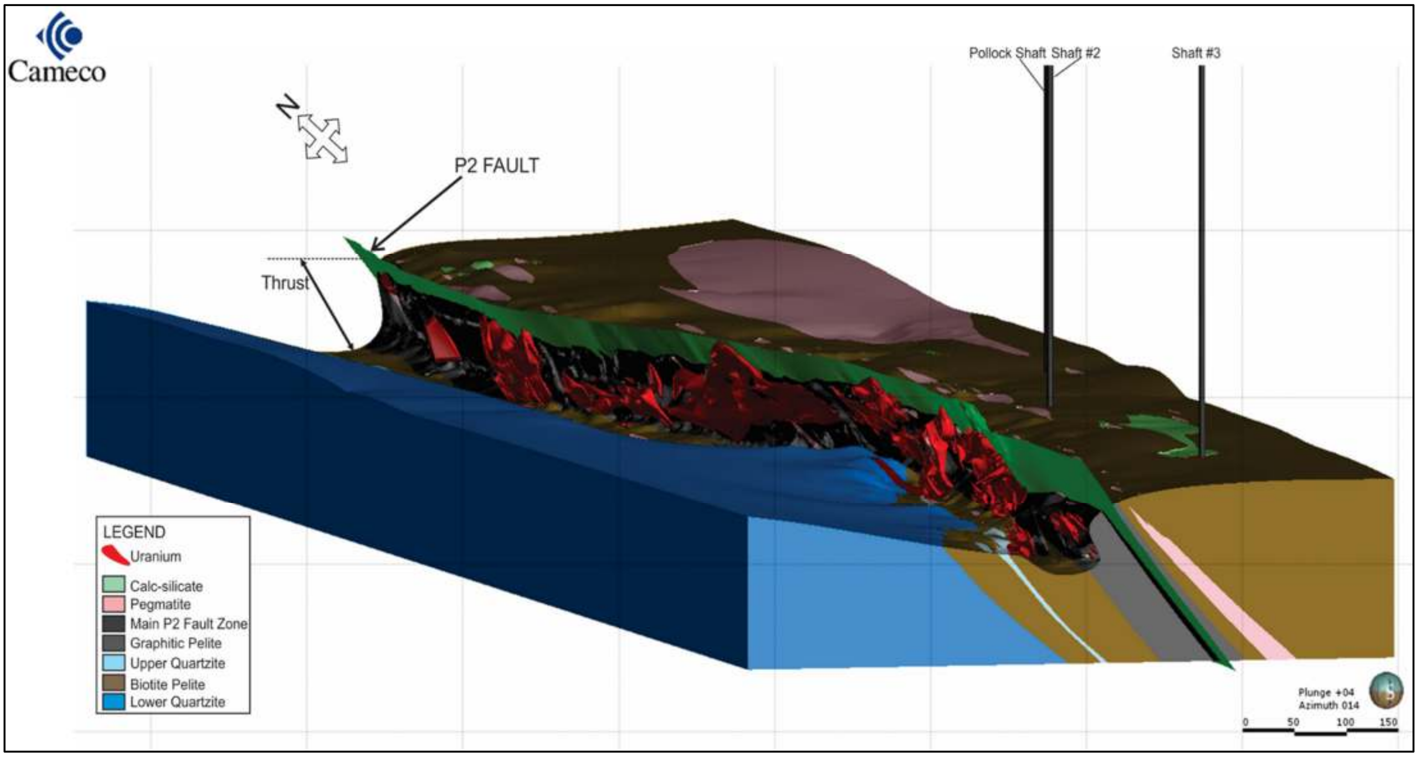
The unmetamorphosed sandstone belongs to the Athabasca Group, which in the McArthur River property is 480 to 560 metres thick, and made up of the MF Formation and represented by members MFd, MFc, MFb and MFa (Figure 7-2).

Figure 7-2: McArthur River Deposit – Schematic Cross-section Looking Northeast



Structurally the area is dominated by the graphitic P2 reverse fault which dips 40-65° to the southeast. In the McArthur River area, the fault has thrust a sequence of the Wollaston Domain metasedimentary rocks into the overlying Athabasca sandstone with vertical displacement along the reverse fault exceeding 80 metres at the northeast end of the deposit and decreasing to 60 metres at the southwest end (Figure 7-3).

Figure 7-3: Orthogonal View of the P2 Reverse Fault



Mineralization occurs at or near the sandstone/basement fault contact and is present in both the sandstone and basement lithologies on either side of the P2 fault as shown in Figure 7-4. Structural mapping along the P2 zone shows reactivation of the fault after the primary thrust and also existence of post mineralization faulting evident in the two commons sets of faults in the area that cross cut the main P2 fault with secondary mineralization. This is also supported by geochemical analysis of samples from uranium bearing rocks.

Two uranium-rich whole-rock samples were dated by the uranium-lead dating method and provided upper intercept discordia ages of 1348 ± 16 and 1521 ± 8 million years ago, the older being interpreted as the age of the primary uranium mineralization and the younger as the age of a remobilization event.

7.3 Property geology

The lithostructural setting of the McArthur River deposit consists of three principal geological units, namely the overlying Athabasca sandstone, the underlying metasedimentary gneisses of the Wollaston Domain, and the P2 fault zone.

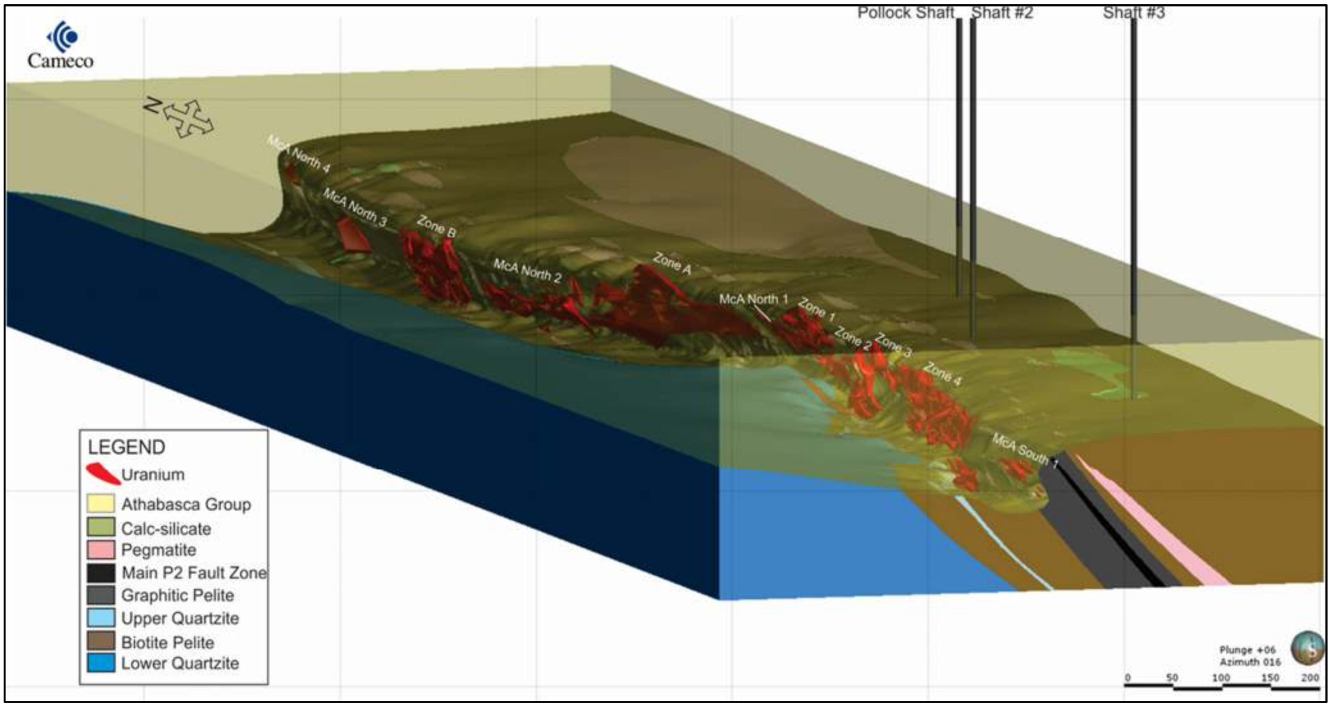
The Athabasca Group is represented by sandstones (with lesser conglomerates and siltstones) of the MFd, MFc, MFb and MFa subunits of the MF Formation. The preserved thickness of the MF Formation near the mine is 480 to 560 metres forming a major aquifer in the area despite the strong local silicification.

The Wollaston Domain stratigraphy in the property area has been locally divided into three blocks, based on their lithological and structural characteristics:

- A hangingwall block consisting of biotite and garnet gneiss, and calc-silicate.
- A middle block consisting of cordierite gneiss, graphitic cordierite gneiss, biotite gneiss, and arkose with the main graphitic fault zone situated within the upper 20 metre section.
- A quartzite block underlying the two upper units and consisting of massive to faintly laminated quartzite. This quartzite was more resistive to erosion than the gneissic units and as a result the quartzite exists at the unconformity as a paleotopographic ridge.

The northeast trending P2 reverse fault is the dominant structural feature of the McArthur River deposit (see Figure 7-3 and Figure 7-4). Reverse faulting occurs along several graphite-rich fault planes within the upper 20 metres of the Middle Block basement rocks. These faults run parallel to the basement foliation rarely exceeding one metre in width. Structural disruption is more severe in the overlying brittle and flat lying sandstone, evidenced by broad zones of fracturing, brecciation and strong alteration.

Figure 7-4: Orthogonal View of the McArthur River Deposit



Notes:

(1) Zone 4 includes Zone 4 South.

(2) Zones McA South 1, McA North 3 and McA North 4 are not reported as mineral resources.

(3) North arrow pointing to true North.

(4) As of December 31, 2018.

Two other sets of cross faults are present at McArthur River, these strike at 100-110° and at 160-170°, both steeply dipping and generally within 30° of vertical. Although displacement across these faults appears to be relatively minor, they are interpreted to have had a significant impact on the orebody, often truncating zones of high-grade mineralization and offsetting mineralization during reactivation phases. In the Zone 2 area, a significant vertical fault developed resulting in a zone of very weak ground consisting of sand, clay, and high pressure water along the eastern edge of the quartzite block.

Host rock alteration has played a critical role in the development of rock strength and geochemistry of the McArthur River deposit. Unlike other uranium deposits in the Athabasca basin, the McArthur River deposit is not surrounded by a huge alteration halo but is mainly locally developed along major faults associated with mineralization and brecciation zones along the P2 structure. Significant sandstone, clay and hematite alteration is encountered within the upper extensions of the P2 above Zone 2 and Zone 4; likely a result of increased fracture density resulting in higher permeability and poor ground conditions.

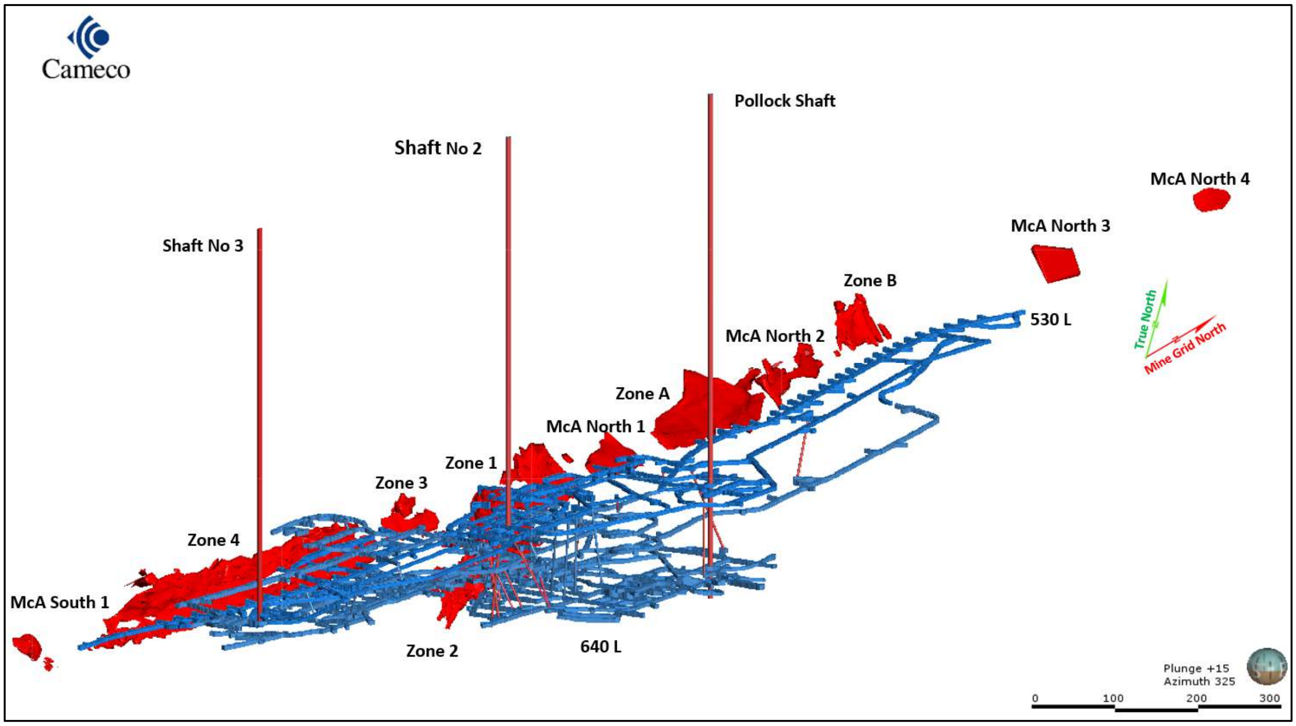
Outside the P2 zone, pervasive silicification is the dominant alteration process within the sandstone which hindered the development of extensive alteration halos. Graphite, chloritization, dravitization and clay alteration are the main alteration types observed within the basement hangingwall block.

7.4 Mineralization

Uranium mineralization has been delineated from surface drilling over a strike length of 2,700 metres and occurring at depths ranging between 500 metres to 640 metres below surface. Mineralized widths are variable along strike but the most consistent, high-grade mineralization occurs proximal to the main graphitic reverse fault by the upthrust basement block. Less consistent and generally lower grade mineralization occurs downdip along this fault contact between basement rock and sandstone. The main part of the mineralization, generally at the upper part of the basement wedge, averages 12.7 metres in width and has a vertical extent ranging between 50 metres and 120 metres.

The deposit consists of nine distinct mineralized areas and three under explored surface defined mineralized showings over a strike length of 2,700 metres, from 7225N to 9925N. The mineralized areas with reported mineral resources are named Zone 1, Zone 2, Zone 3, Zone 4, Zone 4 South, Zone A, Zone B, McA North 1 and McA North 2. The mineralized showings are designated as McA North 3, McA North 4 and McA South 1. Figure 7-5 shows the orthogonal view of the underground development and mineralized zones (Zones 4 and 4 South are combined).

Figure 7-5: Orthogonal View of Underground Development and Mineralized Zones Looking Northwest



Notes:

(1) Zone 4 includes Zone 4 South.

(2) Zones McA South 1, McA North 3 and McA North 4 are not reported as mineral resources.

(3) As of December 31, 2018.

Mineralization within the McArthur River deposit is primarily controlled by the P2 graphitic fault and occurs in two styles:

- high-grade mineralization at the unconformity near the P2 reverse fault and within both sandstone and basement rocks
- fracture controlled and vein like mineralization that occur in the sandstone away from the unconformity and within the basement quartzite

The high-grade mineralization along the unconformity constitutes the majority of the mineralization within the McArthur River deposit. Mineralization occurs across a zone of strongly altered basement rocks and sandstone across both the unconformity and the P2 structure. Mineralization is generally within 15 metres of the basement/sandstone contact with the exception of Zone 2. Less significant areas of mineralization occur further from the contact, usually in the sandstone associated with subsidiary fracture/fault zones or along the margins of flat lying siltstone beds. The majority of the mineralization occurs on the footwall side of the thrust except in one area where more mineralization is on the hangingwall side of the thrust.

Uranium oxide in the form of uraninite and pitchblende (+/- coffinite) occurs in both a sooty form and as botryoidal metallic masses. It occurs as disseminated grains in aggregates ranging in size from millimetres to decimetres, and as massive mineralized masses up to several metres thick. The mineralized rock is variably black, red and/or green in colour and varies in strength from clay to competent sandstone.

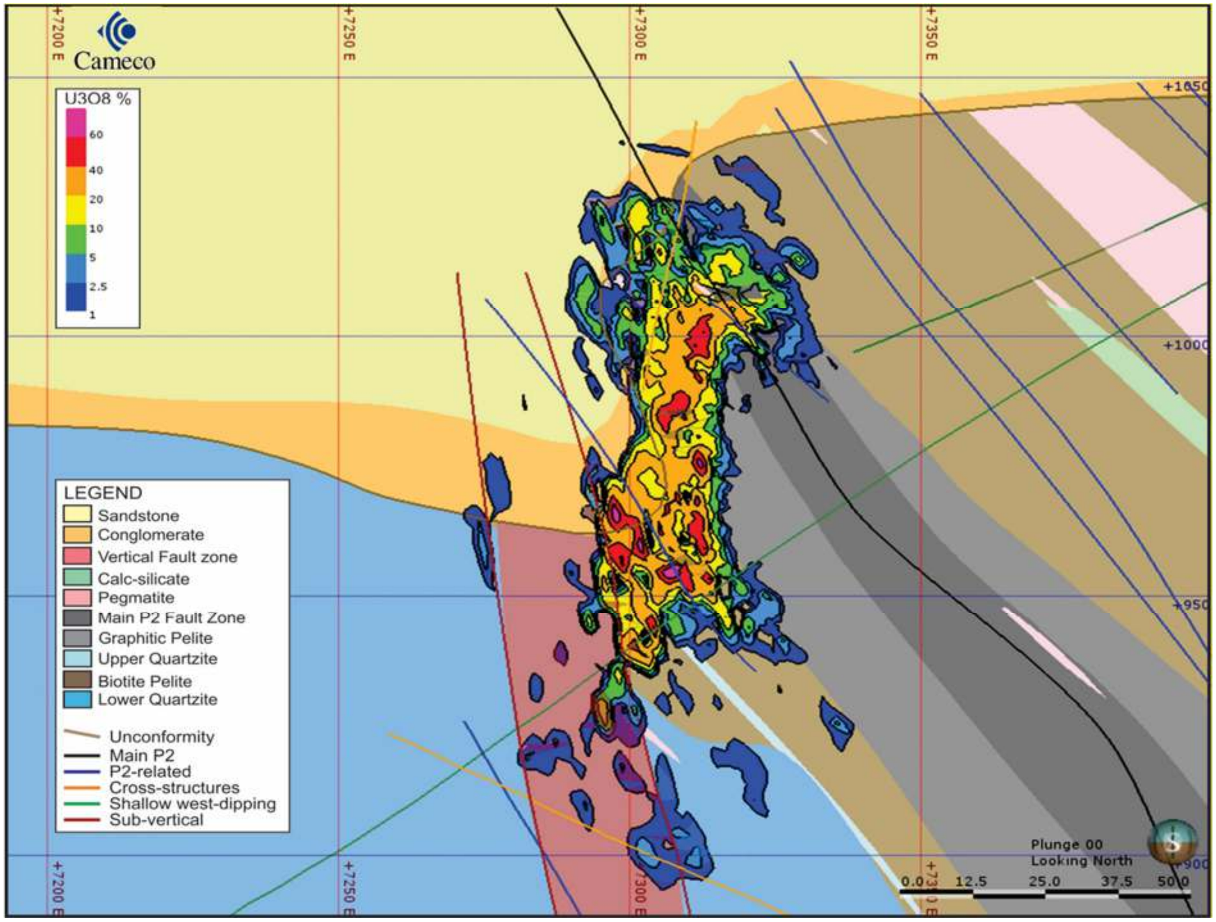
Geochemically, the deposit does not contain any significant quantities of the elements nickel, copper, cobalt, lead, zinc, molybdenum and arsenic that are present in other unconformity related Athabasca uranium deposits although locally elevated quantities of these elements have been observed in Zone B.

In general, the high-grade mineralization, characterized by botryoidal uraninite masses and subhedral uraninite aggregates, constitutes the earliest phase of mineralization in the deposit. Pyrite, chalcopyrite, and galena were also deposited during this initial mineralizing event. Later stage, remobilized uraninite occurs as disseminations, veinlets, and fracture coatings within chlorite breccia zones and along the margins of silt beds in the Athabasca sandstone and lower quartzite unit.

The deposit has been subjected to faulting subsequent to its formation, which has contributed to the formation of vein-type mineralization within the sandstone and the basement quartzite. These mineralized bodies form, volumetrically, a very small part of the total mineralized rock and are of no economic significance at this time. Pre- and post-mineralization faulting played major roles in creating preferential pathways for uranium-bearing fluids and, to some extent, in remobilizing uranium. The internal distribution of uranium within the unconformity mineralization has likely been largely controlled by geochemical processes along some structures. This is reflected in the continuity and homogeneity of the mineralization and its geometry.

Zone 2 mineralization occurs deeper in the basement rocks in a unique area of the deposit. Here, a footwall quartzite unit lies in close proximity to the main zone of reverse faulting. In this area of structural disruption, high-grade mineralization occurs not only in the hangingwall basement wedge but also overlies the footwall quartzite. The presence of this quartzite unit has resulted in a structurally disrupted zone that has affected a wide block of the footwall basement rocks. This 120 metre long segment of the basement rock hosts the Zone 2 mineralization. To the northeast and to the southwest, the quartzite unit trends away to the west and the tectonics of the reverse fault returns to a more planar nature. See Figure 7-6 for a representative geological section.

Figure 7-6: Typical Zone 2 Geological Section Looking Northeast (2018)



8 Deposit types

The McArthur River deposit is an unconformity-related uranium deposit. Deposits of this type are believed to have formed through an oxidation-reduction reaction at or near an unconformity where oxygenated fluids transporting uranium in a U^{6+} state interacted with reducing fluids and/or lithologies along fault zones resulting in precipitation of U^{4+} minerals. Within the McArthur River deposit, the unconformity surface is a contact between Athabasca Group sandstones and underlying metasedimentary rocks of Wollaston Domain (basement rocks). Graphitic faults such the P2 fault provided a conduit for interaction of oxygenated fluids from the sandstones with reducing fluids and/or lithologies in the basement.

This setting is analogous to the uranium deposits at Key Lake, McClean Lake, Midwest Lake, Collins Bay and Cigar Lake, which the McArthur deposit shares many similarities with, including general structural setting, mineralogy, geochemistry, host rock association and the age of the mineralization. The main difference between the McArthur River deposit and the other deposits is the absence of an extensive hydrothermal clay alteration zone in the sandstone above the extremely rich uranium mineralization and also its occurrence up dip along a reverse fault.

The McArthur River deposit is similar to the Cigar Lake deposit in that the sandstone that overlies the basement rock contains large volumes of water at significant pressure.

While the degree of alteration may vary, types of alteration found in these deposits are generally similar and include chloritization, hematization, kaolinization, dravitization, illitization, pyritization, desilicification and silicification.

Uranium occurs dominantly as pitchblende in semi-massive to massive pods, as fracture and breccia fillings, and as disseminations. Sulphides and arsenides are present in the mineralization at some deposits.

9 Exploration

ML 5516, which hosts the McArthur River deposit (also known as P2 North), sits on the northwestern edge of the Mineral Claims which comprise the McArthur River project.

Below is a brief description of all relevant exploration work, other than drilling, conducted by Cameco and its predecessor companies. This work was used to guide various drill programs in the area, leading to the McArthur River mineralization discoveries. See Section 10.1 for more details.

Asamera 1976 – 1979

In September 1976, the Keefe-Henday Joint Venture was formed between Canadian Kelvin Resources Ltd. and Asamera. This joint venture included all of what would later become the Dawn Lake, Waterbury Lake (portions of which are now known as Cigar Lake), and McArthur River projects. Asamera, as the operator, conducted various field investigations from 1976 to 1979, including airborne and ground geophysical surveys followed by lake sediment and water sampling programs.

SMDC/Cameco 1980 – Present

In January of 1980, SMDC took over as operator of the McArthur River project. During the years 1980 to 1992, SMDC (which merged with Eldorado Resources Limited to form Cameco in 1988) completed various airborne and ground geophysical programs, lake sediment and water sampling programs, boulder prospecting, and substantial diamond drilling.

Surface exploration resumed on the McArthur River project in 2000 after an eight year hiatus in drilling (see Table 9-1). In 2000 – 2001, historic geological and geophysical data was compiled and reassessed. Project-wide coverage by GEOTEM® airborne electromagnetic and magnetic survey and geochemical surveys over select portions of the project area were also undertaken during this period.

During 2002 – 2004, airborne (magnetic gradiometer) and ground (resistivity, gravity, time domain electromagnetic (TDEM) and audio magnetotelluric (AMT)) geophysical surveys supported the refined interpretation of the basement geology along the P2 trend. Drilling along the P2 trend northeast of the mine discovered Zone A in 2004 and Zone B in 2005 (see Section 10.1, 10.4).

In conjunction with the 2006 drill program, fixed loop time domain electromagnetic (FL TDEM) surveying was conducted along the southwestern portion of the P2 trend and a 3D borehole seismic survey was unsuccessfully attempted in the vicinity of Zone B.

Between 2007 and 2008, airborne geophysical surveys were completed and included property-wide gravity coverage, select triaxial magnetic gradiometer coverage and versatile time domain electromagnetic (VTEM™) surveys over the Harrigan area and northeastern portion of the P2. Ground definition fixed loop and stepwise moving loop time domain electromagnetic (SWML TDEM) surveys were also conducted over the northeastern portion of the P2 Trend prior to drill testing.

Ground geophysical surveys consisting of SWML TDEM and direct current (DC) resistivity were carried out in the Harrigan area in 2010 and 2011 respectively. A DC resistivity survey was also carried out along the P2 trend southwest of the mine in 2011 and a SWML TDEM survey was carried out on the P1 grid south of the mine in 2012 which helped prioritize drill targeting.

Airborne VTEM® and Z-Axis Tipper Electromagnetic system (ZTEM™) surveys over the northernmost portion of the project were followed with DC resistivity surveys and SWML TDEM surveys on the Carlson grid in 2016 and 2017.

Table 9-1: Summary of Surface Exploration at McArthur River 1980 – 2018

Year	Airborne Geophysics		Ground Geophysics		Other Exploration
	Type	Line (km)	Type	Length (km)	Type
1980-1992					Various airborne and ground geophysical programs, lake sediment and water sampling, boulder prospecting programs followed by 8 year hiatus.
2000					Compilation, historical drill core logging and sampling, soil gas survey
2001	GEOTEM®	1,533			Compilation, historical drill core logging and sampling, soil gas survey
2002			Gravity	19.3	Compilation, Historical drill core logging and sampling
			Pole-dipole resistivity	21.6	
			AMT	68 Stations	
2003	Triaxial Gradiometer	1,176	FL TDEM	37.4	SPOT5 Satellite Imagery
			Pole-pole resistivity	11.9	
2004			FL TDEM	137	
			In-loop electromagnetics (EM) soundings	23.1	
2006					Light Detection and Ranging surveying method (LIDAR) digital elevation model (DEM) survey
2007	Triaxial Gradiometer	4,457	FL TDEM	332.6	Compilation, historical drill core logging and sampling
	Gravity	3,736	In-loop EM soundings	3.45	
2008	VTEM™	1,261	SWML TDEM	115.0	

Year	Airborne Geophysics		Ground Geophysics		Other Exploration
	Type	Line (km)	Type	Length (km)	Type
2010			SWML TDEM	69.2	
2011			Pole-dipole Resistivity	45.0	
2012			SWML TDEM	39.0	
2014					2000 GEOTEM® and 2007 Bell Full Tensor Gradiometer (FTG) data reprocessed
2016	ZTEM™ VTEM™	1,064 995	DC resistivity	51.8	
2017			SWML TDEM DC resistivity	109.8 23.0	
2018			SWML TDEM	108.6	
Total		**14,222**		**1,148**	

10 Drilling

10.1 Surface drilling

In September 1976, the Keefe-Henday Joint Venture was formed between Canadian Kelvin Resources Ltd. and Asamera. The operator, Asamera, drilled 17 diamond drillholes during the 1978 and 1979 campaigns on what is now known as the McArthur River property.

Sub-economic uranium mineralization was discovered at the Volhoffer Lake, BJ, and P2 Main zones in the early- to mid-1980's. Exploration focused on surface drilling and later exploration led to the discovery of mineralization at P2 North (McArthur River deposit) in 1988. Surface definition drilling of the deposit took place between 1988 and 1992.

Surface exploration on the McArthur River project was halted in 1993 with the shift in focus to the development of the McArthur River mine. Refer to Section 6.2, for a discussion of exploration drilling that resulted in the discovery of the McArthur River deposit.

Surface drilling operations have been carried out by a variety of contractors since 2002. Between 2002 and 2004, diamond drilling was predominantly focused on the P2 trend both to the northeast and southwest of the mine. A total of approximately 7,400 metres in 14 holes were drilled in this three year period.

Positive drill results with grades ranging between 0.1% U_3O_8 / 1.0 m to 12.1% U_3O_8 / 30 m northeast of the Pollock Shaft, culminated in the definition of Zone A. In 2004, a 3D borehole seismic survey was conducted in the vicinity of Zone A.

In 2005, exploration activities continued to focus on the area northeast of the Pollock Shaft. Diamond drilling of five holes totalling approximately 3,310 metres continued on Zone A and on a second prospective area to the northeast in the vicinity of historic drillhole MAC-198 (4.7% U_3O_8 / 10 m). Two drillholes testing this northeastern area intersected high-grade mineralization with chemical grades of 35.9% U_3O_8 / 30.5 m and 6.25% U_3O_8 / 34.3 m. This zone of mineralization located 400 metres northeast of Zone A was referred to as Zone B.

In 2006, exploration focused on further defining Zone B and examining the P2 structure immediately northeast of this zone. Diamond drilling (10 holes / 5,361 m) extended Zone B marginally with MC-278 (7.7% U_3O_8 / 20.5 m) while the remaining holes only intersected low-grade mineralization.

Consecutive diamond drill programs in 2007 through 2008 focused on the systematic testing (200 metre spacing) of the P2 Trend northeast of Zone B. During this period, 30,319 metres were drilled with 55 drillholes using a combination of conventional and directional drilling methods.

Highlights of these programs include the discovery of the mineralized zone currently referred to as McA North 3, with a high intercept of 11.8% eU_3O_8 / 2.6 m. Weak mineralization up to 0.56% eU_3O_8 / 1.1 m was also encountered in systematic drilling along the northeastern extent of the P2 Trend.

With completion of these drill programs, a first pass evaluation of the P2 Trend was completed to 4.3 km north of the McArthur River deposit.

The 2009 exploration program remained focused along the P2 Trend. The program completed follow up work on targets to the northeast of McA North 3 with no significant upgrading of those showings and began systematic drill testing of the P2 Trend to the southwest of the McArthur River deposit. Diamond drilling consisted of 23 inclined drillholes and directional off-cuts for a total of 11,989 metres. Low-grade mineralization (0.61% U_3O_8 / 13.4 m) was encountered 600 metres southwest of the mine workings. Systematic 200 metre-spaced drill tests of the P2 structure were completed for 1.7 km southwest of the McArthur River deposit. Delineation drilling of Zone B with conventional and directional drillholes (13 holes – 6,355 m) was completed during Q4 2009.

Diamond drill programs between 2010 and 2012 continued the systematic drill testing of the P2 structure southwest of the McArthur River deposit. During this period, 38,972 metres were drilled with 59 drillholes using conventional and directional drilling methods. Drill coverage of the P2 structure at 200 metre step-outs was extended for 6.4 km southwest of the McArthur River deposit. Drill results from this period identified an anomalous uranium-in-sandstone halo coincident with the P2 Trend extending approximately 2 km southwest of the McArthur River deposit. Low-grade mineralization highlighted by 0.91% U_3O_8 / 22.8 m and 0.47% U_3O_8 / 18.1 m was sporadically intersected coincident with the P2 structure in this area.

Select targets within and proximal to the McArthur River deposit were also drill tested during these programs. While results improved the understanding of the structural architecture of the P2 Trend southwest of the McArthur River deposit, they failed to significantly upgrade this sub-economic deposit.

In 2013 the focus switched again to the P2 trend northeast of the mine. The program consisted of eight pilot drillholes and five offcuts for 8,672 metres. It focussed on the McA North 3 (formerly known as the B – C Gap) and McA North 4 (formerly the Zone C uranium showing) areas as well as select areas to the south of the mine (Cameco, 2015). Two diamond drillholes tested a structure hangingwall to the P2 as inferred from the EXTECH IV (2007) seismic data reports to the south and west of the mine. Drilling on the McA North 3 target area returned uranium mineralization associated with the P2 fault, highlighted by MC-410-01 on L29150E that returned 8.88% U_3O_8 / 9.3 m. Drilling in the McA North 4 area intersected P2-associated mineralization, but did not upgrade previous results in the area. The drill tests of the EXTECH IV (2007) seismic feature intersected only minor structural disruption in the lower sandstone.

The 2014 exploration program consisted of 13,956 metres of drilling carried out in 17 pilot holes and two offcuts that evaluated various targets along the P2 trend. Five holes were drilled to continue the evaluation of the McA North 3 area between sections L290+00E and L293+00E for a Zone 2 analogue, following up the results of 2013 drillhole MC-410-01. Drilling did not upgrade the historical intersections and cut off mineralization in all directions. The McA North 5 area between sections L299+00E and L305+00E was tested with seven holes between historic drillhole fences. Drill results do not indicate the presence of significant uranium mineralization in this area. Finally, seven holes that were drilled to test geophysical features, including the P2E conductor, east of the P2 fault did not return encouraging results.

In 2015 four holes, for a total of 3,153 metres, focused on testing the southwestern extension of the P2 structure and the P1 South trend in the southeastern part of the property without significant results.

From 2016 to 2018 exploration focussed on conductors in the far north portion of the property. Geophysical surveys in 2016 were followed by 16,154 metres of drilling in 27 holes.

Drillhole deviation surveys were completed using a Reflex EZ-SHOT™ instrument while core radioactivity was measured and recorded using an SRAT- SPP2 scintillometer.

All core was geologically logged and photographed.

All holes were radiometrically probed with a combination of Mount Sopris logging equipment which is calibrated at the beginning of each field season using reference pits containing known grades of uranium ore located at the Saskatchewan Research Council (SRC) Geoanalytical Laboratories facilities in Saskatoon.

The logging, downhole radiometric, and other ancillary data is catalogued and backed up on Cameco's network which is followed by sampling. Core is then temporarily stacked near the exploration core logging facility until it is moved to a permanent core storage facility. Core from P2 trend surface drilling is stored at Bermuda Lake and Serenity core storage facilities southwest of the McArthur River mine.

All drillhole locations are verified in the field by differential GPS or in the case of holes near the mine infrastructure by the mine site surveyors. A summary of surface drilling by year is shown in Table 10-1: indicates the location of the surface drilling in each area. The location of the surface drillholes in the southwest and northeast, respectively, is shown on Figure 10-2 and Figure 10-3.

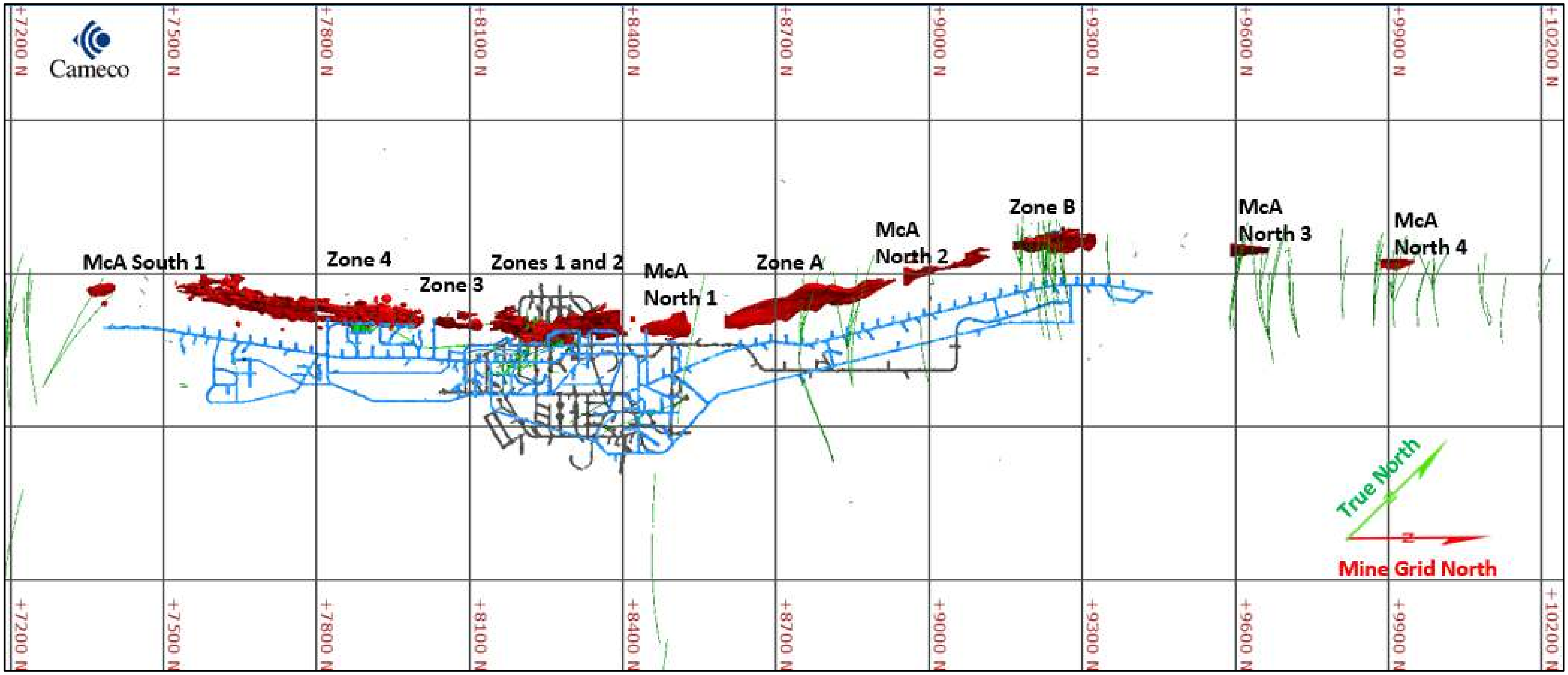
Surface holes are generally drilled on sections spaced at between 50 and 200 metres with 12 to 25 metres between holes on a section where necessary. Drilled depths average 670 metres. After a diamond drillhole is completed, a Van Ruth plug is set just below the unconformity to seal off basement-related fluids.

The cementing procedure depends on two factors: the presence of an additional unconformity surface and/or a fault zone. If there is another unconformity surface, the hole is cemented from the first Van Ruth plug, then another plug is set just below the second unconformity surface with cement being poured on top of the last plug. If there is an extensive fault zone (>10 metres) in the lower sandstone above an unconformity, cementing continues from the first plug. This is done until a Van Ruth plug is set above the structure and 50 metres of cement is poured above that plug. This cementing procedure has been incorporated as standard practice on the McArthur River project since 2004.

This procedure is followed for all mineralized holes as well as any holes nearby. A few holes are uncemented but they were not mineralized and located over 4 km from the current mine workings.

Supplemental to the above procedure, since 1996, 63 surface drillholes that were anticipated to come within 50 metres of projected future mine workings, have been fully cemented to surface.

Figure 10-1: Map of Surface Drilling (Green Trace Lines) by Mineralized Zones



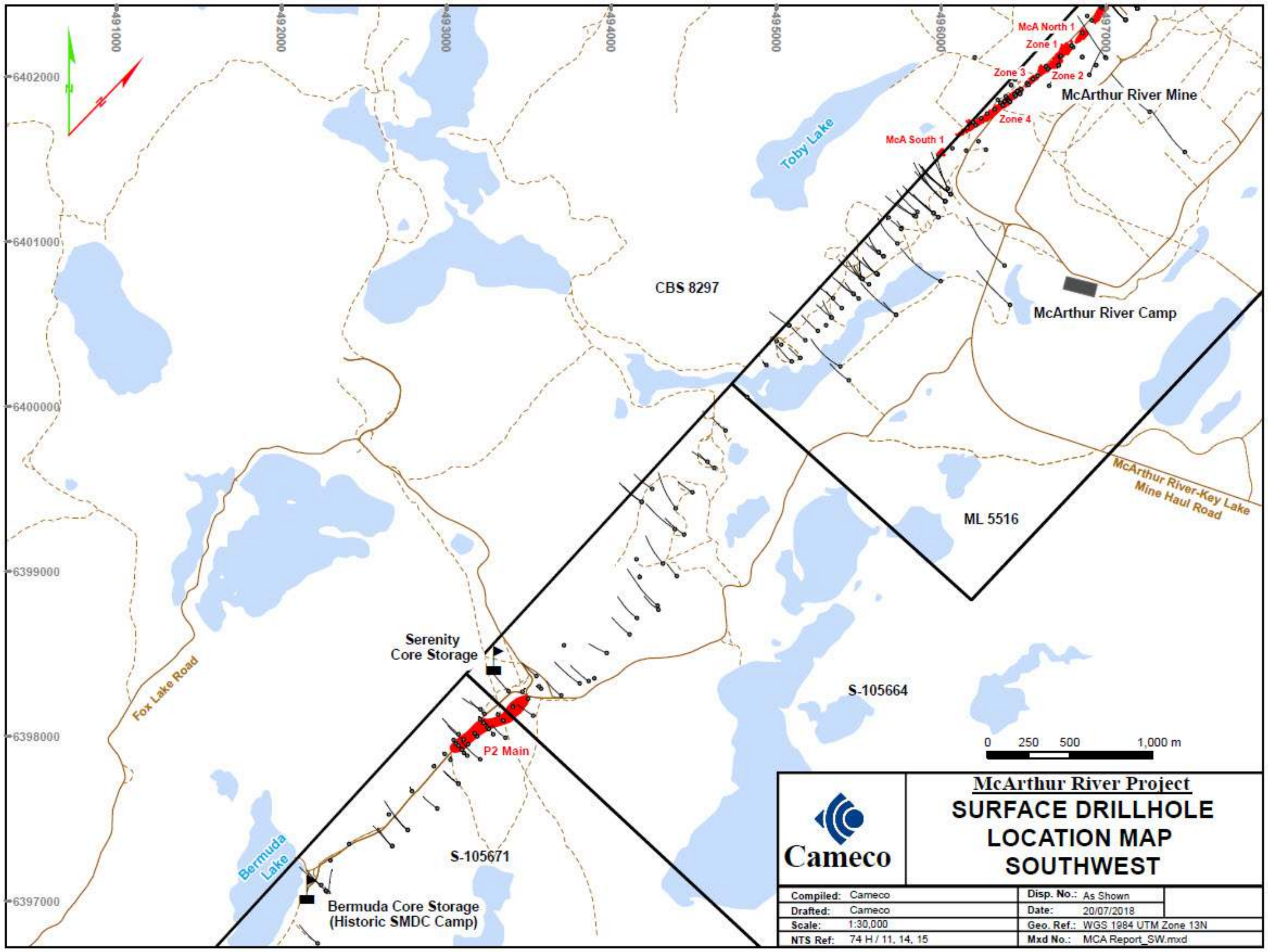
Notes:

(1) Zone 4 includes Zone 4 South.

(2) Zones McA South 1, McA North 3 and McA North 4 are not reported as mineral resources.

(3) As of December 31, 2018.

Figure 10-2: Surface Drill Collar Location Map – Southwest



Notes:

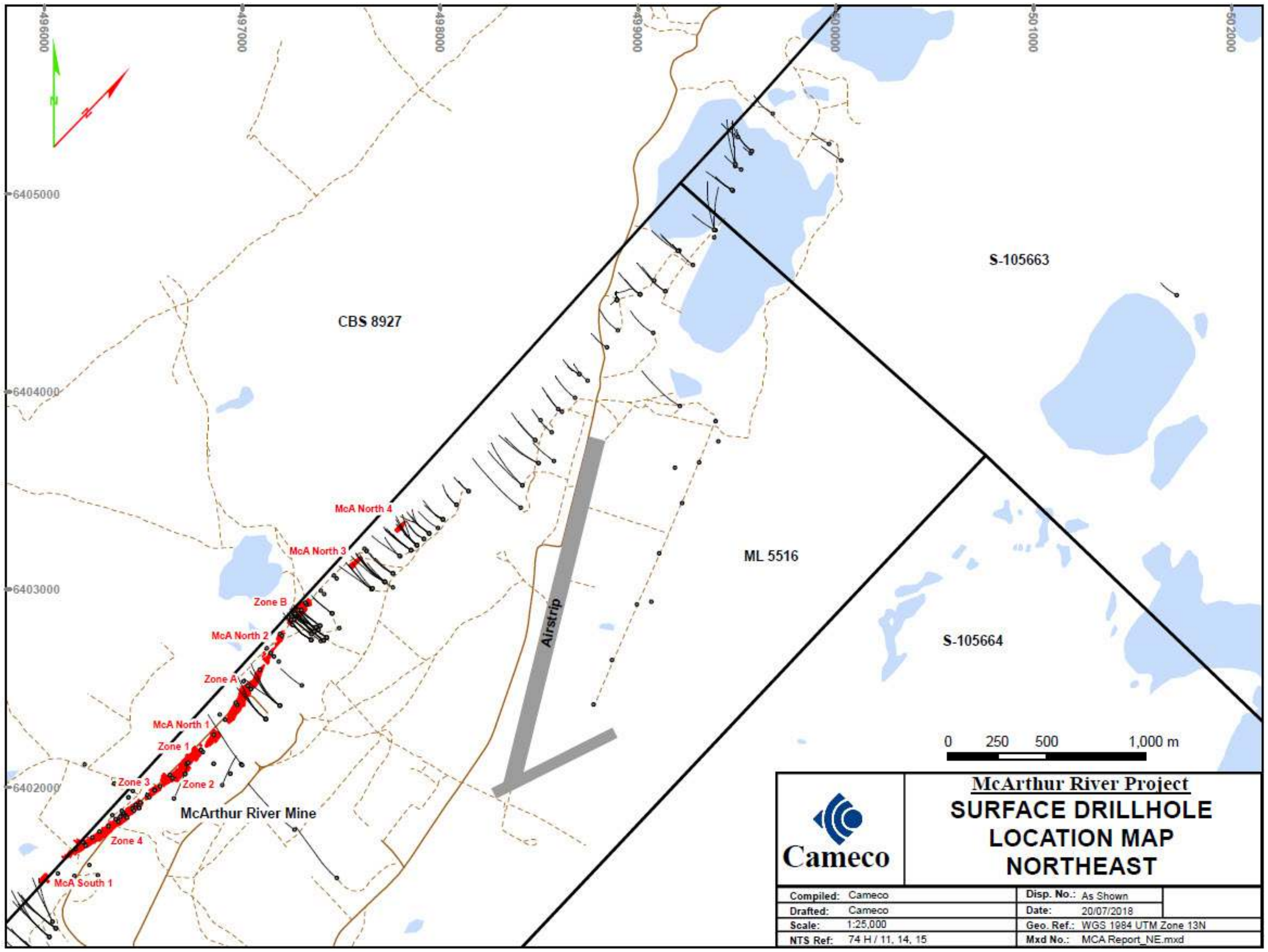
(1) Green North arrow indicates true North.

(2) Red North arrow indicates mine grid North.

(3) Zone 4 includes Zone 4 South.

(4) Zones McA South not reported as mineral resources.

Figure 10-3: Surface Drill Collar Location Map – Northeast



Notes:

(1) Green North arrow indicates true North.

(2) Red North arrow indicates mine grid North.

(3) Zone 4 includes Zone 4 South.

(4) Zones McA South 1, McA North 3 and McA North 4 are not reported as mineral resources.

Table 10-1: Summary of Surface Drilling by Year

Year	Company	Number of Holes	Metres Drilled
1978	Asamera	4	1,187
1979	Asamera	13	2,764
1980	SMDC	22	6,412
1981	SMDC	42	10,731
1982	SMDC	35	9,877
1983	SMDC	19	7,445
1984	SMDC	19	9,092
1985	SMDC	17	8,766
1986	SMDC	9	5,302
1987	SMDC	29	16,123
1988	SMDC	15	8,473
1989	Cameco	14	9,118
1990	Cameco	15	9,585
1991	Cameco	15	9,330
1992	Cameco	25	8,933
1996	Cameco	3	1,662
2002	Cameco	4	2,618
2003	Cameco	2	1,299
2004	Cameco	8	3,481
2005	Cameco	5	3,309
2006	Cameco	10	5,361
2007	Cameco	25	13,840
2008	Cameco	30	16,479
2009	Cameco	36	18,354
2010	Cameco	32	21,136
2011	Cameco	22	14,804
2012	Cameco	26	16,762
2013	Cameco	13	8,672
2014	Cameco	19	13,956
2015	Cameco	4	3,153
2016	Cameco	No drilling activities	N/A
2017	Cameco	10 holes	5,144
2018	Cameco	19 holes	11,010
Totals		**496**	**242,155**

10.2 Underground drilling

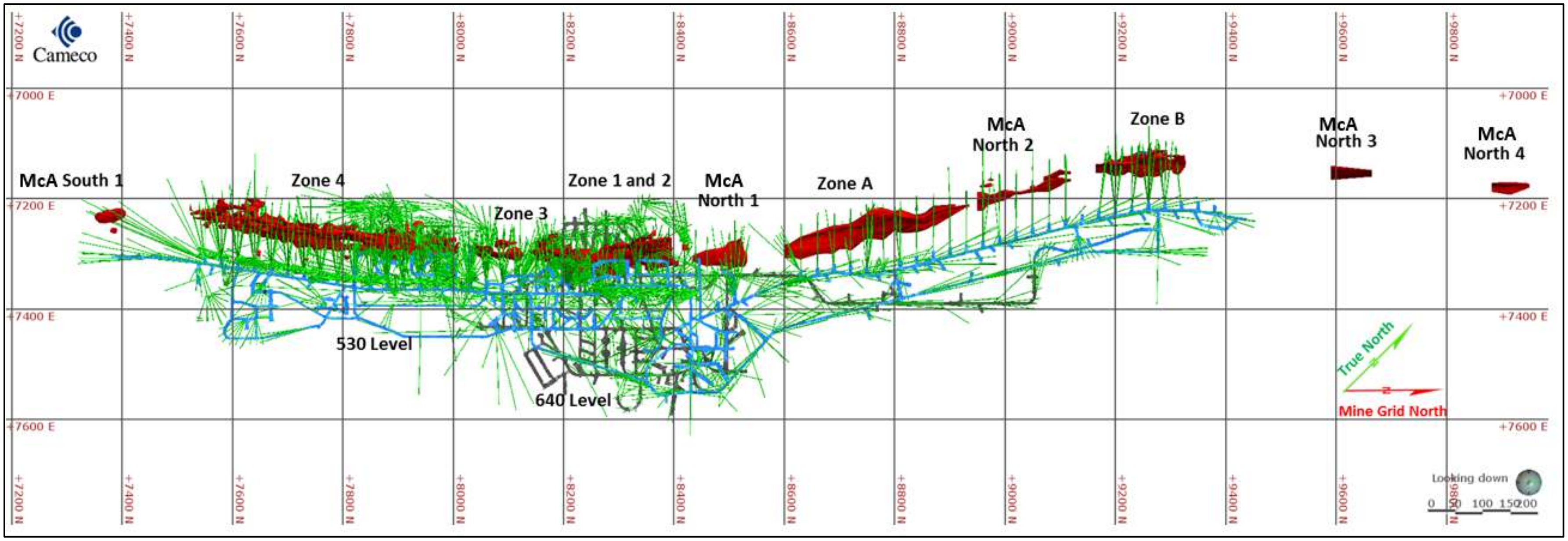
Underground core drilling began in 1994 and has been primarily for ore body delineation, rock mass characteristics, services installation, ground freezing and water flow determination (see Figure 10-4 and Figure 10-5). Early underground drilling encountered high water pressures combined with zones of sand and clay that made drilling challenging. This resulted in implementation of a collar security system to mitigate the risks. All holes drilled now use collar security. Freezehole diamond drilling was done until 2013 when all freeze drilling transitioned to percussion drilling. All freezeholes drilled in Zone 2 were radiometrically probed and used to delineate the Zone 2 orebody while in Zone 4 only a few freezeholes have been radiometrically probed.

Detailed delineation diamond drilling has been completed from underground drill bays over a strike length of 1,800 metres, between 7535N and 9335N. This area encompasses Zone 4 in the south to Zone B in the north. The majority of the delineation drilling has been accomplished from 30 metre spaced drill bays excavated on the northwestern side of the main drift on the 530 metre level. Each drill bay has a minimum of one fence of holes drilled directly west (on the mine grid), followed by fences that are angled to the north and south (on the mine grid), ultimately resulting in three,10 metre spaced sections at the expected mineralized area through the orebody from each drill bay. Each fence delineates the mineralization with hole angles ranging from +55° to -70°.

Each hole was gamma logged with a downhole radiometric probe. Radiometric probing was at 0.1 metre spacing in the radioactive zones and 0.5 metre in unmineralized zones. Deviation measurements were taken for each hole and collar locations were surveyed. Deviation survey tools used range from Sperry Sun in the early days, moving to Maxibor and most recently, to gyro tools. In a few instances, infill delineation drilling has been carried out from locations in the mine other than the 530 metre level drill bays including the 560 metre, 580 metre and the 640 metre levels.

In general, all zones with reported mineral resources or reserves have been drilled on 10 metre fences except Zone A and some areas of Zone B. Within the current Zone 2 and Zone 4 mining areas, further orebody delineation is done using production blastholes. These holes are drilled using percussion drills and are radiometrically probed. Following review, some of the holes were used to assist with wireframe generation in recent resource updates for Zone 4.

Figure 10-4: Map of Underground Exploration, Blasting and Probe Cover Drilling



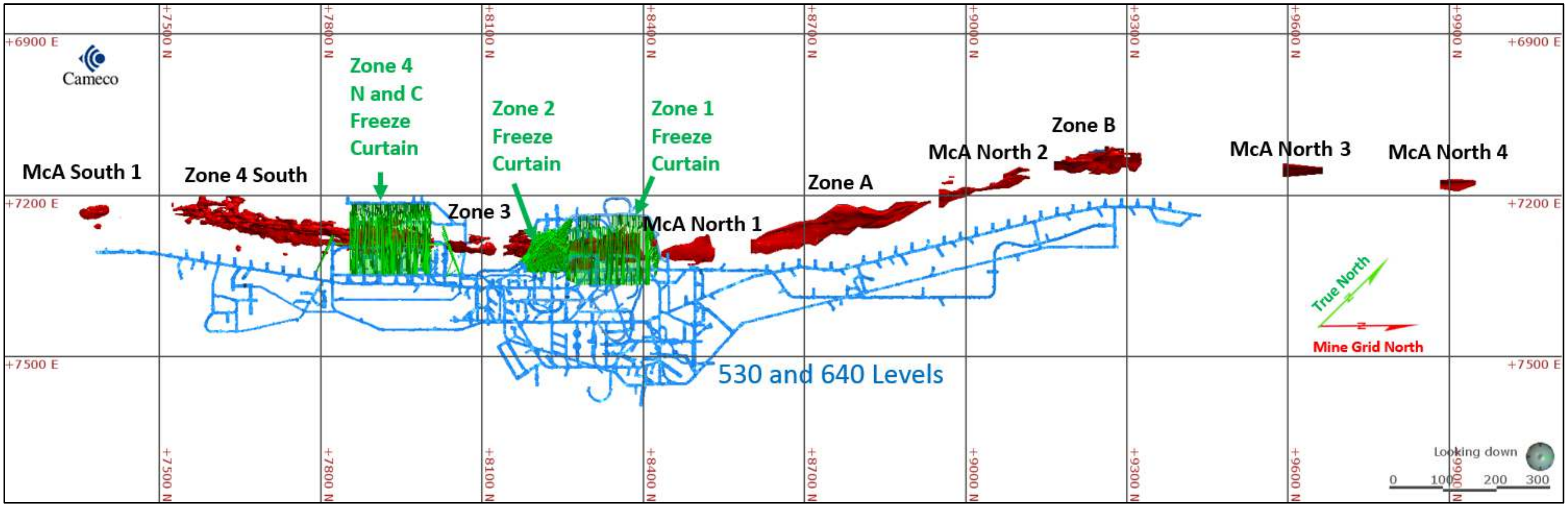
Notes:

(1) Zone 4 includes Zone 4 South.

(2) Zones McA South 1, McA North 3 and McA North 4 are not reported as mineral resources.

(3) As of December 31, 2018.

Figure 10-5: Map of Freeze Drilling and Freeze Curtains



Notes:

(1) Zone 4 includes Zone 4 South.

(2) Zones McA South 1, McA North 3 and McA North 4 are not reported as mineral resources.

(3) As of December 31, 2018.

10.3 Core handling and logging

The drill core is brought to surface and systematically logged, photographed, and racked outdoors. Drillhole core information is entered into a geological database directly from the logging computers. All required underground delineation and exploration core is kept in the outdoor core yard. All core boxes containing mineralized core greater than 500 counts per second (a measure of radioactivity) are marked with red paint to flag areas of mineralization. Labels are generated using a metal punch tape and stapled to each box for identification purposes. Information on the label includes the hole number, box number and the depth interval.

10.4 Factors that could materially affect the accuracy of the results

There are no known drilling, sampling or recovery factors that could materially affect the accuracy and reliability of results. Data quality concerns related to blasthole radiometric probing results are adequately mitigated and have a limited role in the mineral resource estimation process. For a further discussion of sampling and core recovery factors, see Section 11.

11 Sample preparation, analyses and security

11.1 Sample density and sampling methods

Surface holes were generally drilled on sections spaced between 50 and 200 metres with 12 to 25 metres between holes on a section when necessary. The surface drillhole spacing at McArthur River mine is illustrated on Figure 10-2 and Figure 10-3 in the previous section. Underground drilling is generally done from 30 metre spaced drill stations with three fans of holes from each station, targeting a 10 m by 10 m grid spacing in the plane of mineralization. The underground drillhole spacing is represented on Figure 10-4 and on Figure 10-5.

The orientation of mineralization is variable but, in general, vertical holes intersect mineralization at angles of 25 to 45 degrees, resulting in true widths being 40 to 70% of the intersected width. Angled holes usually intercept mineralization closer to perpendicular, giving intercepts closer to true width. Figure 11-1 illustrates the underground drillhole traces showing typical drillhole spacing, mineralization, and the P2 fault and host lithologies.

Surface

Any stratigraphy exhibiting noteworthy alteration, structures or radiometric anomalies is sampled. Specific basement sampling procedures are based on the length of the interval to be sampled and attempts are made to avoid having samples that cross lithological boundaries.

Underground

Core from underground drillholes is sampled to ascertain the U_3O_8 content beyond the probing limit of a hole or to provide correlation samples to compare against a probed interval. Occasionally there would be portions of the mineralized zone that were not probed, usually if the hole was dipping upwards and the probe could not be pushed far enough up the drill rods to reach the entire mineralized zone. In these circumstances, the core is sampled for uranium analyses with whole core samples taken starting 1.0 metre before the end of the probe data.

Since 2010, multi-element assaying of underground exploration drillholes was initiated with general guidelines of one to two drillholes from each 10 metre spaced drill section being selected and sampled for chemical analysis.

When sampling past the probe limit of a hole, the minimum sample interval used is 0.3 metre and the maximum interval is 1.0 metre.

To determine a chosen assay interval, the mineralization log and probed data intervals are used to differentiate between high-grade and low-grade intervals, which are sampled separately. The average sample interval is 0.5 metre but can range between 0.1 metre (to isolate massive pitchblende stringers) and 1.0 metre.

The typical sample collection process includes the following procedures:

- marking the sample intervals on the core boxes
- collection of the samples in plastic bags, taking the entire core
- documentation of the sample's interval location from the drillhole
- sample number and description of the sample, including radiometric values from a hand-held device
- recording of recovered core length
- bagging and sealing samples placing sample identification tags inside bags and marking sample numbers on the bags
- placement of sample bags in steel drums for shipping
- due to the radioactive nature of the samples, they are shipped to the SRC laboratory in Saskatoon under the Transportation of Dangerous Goods regulations
- laboratory results are received, validated and then added to the database

11.2 Core recovery

Core recovery through the McArthur River mineralized zones is generally excellent with local exceptions. When core recovery is below 75%, radiometrically derived eU_3O_8 values are used instead of chemical assays. These replacement values account for a very small portion of the overall sample database.

The QP for this section is satisfied that the 75% threshold for substitution of radiometrically derived eU_3O_8 values is reasonable.

11.3 Sample quality and representativeness

The quality and representativeness of the surface drillhole samples is adequate for resource estimation. This has been validated on numerous occasions by comparing underground drilling results in the vicinity of mineralized intervals drilled from surface.

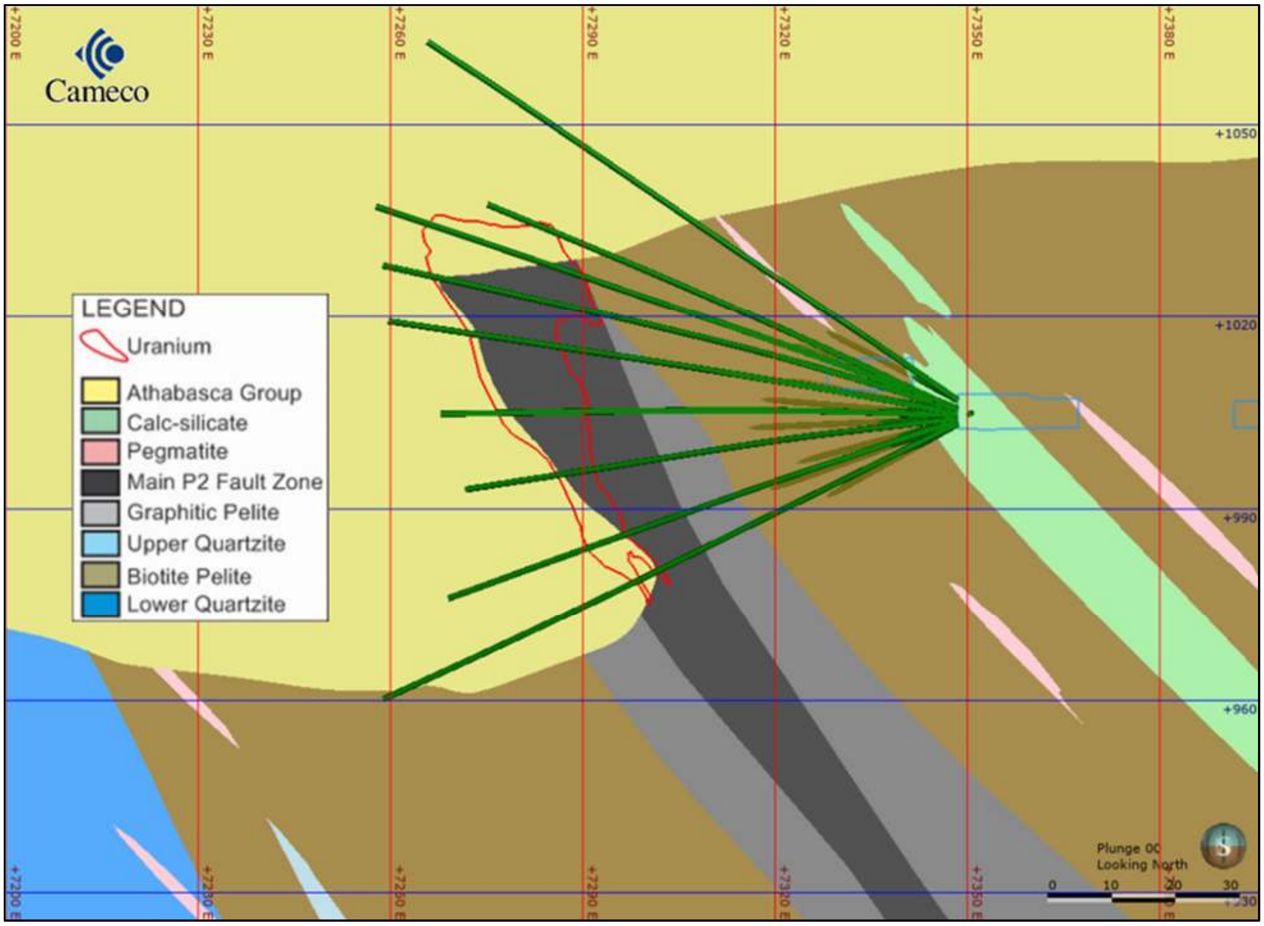
Uranium grade determinations in surface delineation drillholes is primarily based on chemical assays of drill core while underground drillholes are mostly based off of equivalent grade determinations determined from downhole radiometric probing. As noted in Section 11.1, more sampling of underground drillholes is done now than it was prior to 2010, and when assay data is available and core recovery is over 75%, assay data is used instead of the gamma probe value.

Eighty-nine percent of underground drillholes rely solely on equivalent grade determinations determined from downhole radiometric probing.

Whole core samples are collected for verification purposes or when radiometric probing cannot be performed to reduce the variability inherent in sampling and minimize human exposure to gamma radiation and radon gas. All core is photographed and core which is not sampled remains available for viewing at the site in a gated compound.

The QP for this section is satisfied that sample quality and representativeness is adequate for resource estimation and mine planning.

Figure 11-1: Typical Underground Drillhole Spacing – Section Looking Northeast



11.4 Sample preparation by Cameco employees

Beyond selecting, sampling, marking and bagging activities by Cameco employees, Cameco employees, officers, directors and associates are not, and have not, been involved with sample preparation.

11.5 Sample preparation

Sample preparation has been done at SRC, which is located in Saskatoon, Saskatchewan, and is independent of the MRJV partners. It involves jaw crushing to 60% passing 2 millimetres and splitting out a 100 to 200 gram sub-sample using a riffle splitter. The sub-sample is pulverized to 90% passing 106 microns using a puck and ring grinding mill. The sample is then transferred to a labelled plastic snap top vial.

11.6 Assaying

Sample analysis for drillholes used in resource and reserve estimates has been conducted by SRC. SRC is licensed by the CNSC for possession, transfer, import, export, use and storage of designated nuclear substances under CNSC Licence Number: 01784-1-09.3. As such, SRC is closely monitored and inspected by the CNSC for compliance. SRC is an accredited testing laboratory assessed by the Standards Council of Canada under the requirements of ISO/IEC 17025:2005 (CAN_P_4E), General Requirements for the Competence of Mineral Testing and Calibration Laboratories.

Assaying by SRC involved digesting an aliquot of pulp in a 100 millilitre volumetric flask in concentrated aqua regia mixture (nitric acid and hydrochloric acid in a molar ratio of 1:3) on a hot plate for approximately one hour. The lost volume is then made up using deionized water prior to analysis by inductively coupled plasma optical emission spectroscopy (ICP-OES). Instruments used in the analysis are calibrated using certified commercial solutions.

Chemical assay results were systematically checked against radiometric results to ensure their accuracy. Sample pulps and reject materials are retained and systematically catalogued. Discrepancies between chemical assay results and radiometric results are investigated and if required, check assays are performed.

11.7 Radiometric surveying

The majority of the grade data for the deposit have been calculated from the gamma probe results collected from inside the drill rods. These probes use a shielded detector that allows use of the probe in high-grade portions of the deposit as typical commercial probes will become saturated at substantially lower grades than those observed at McArthur River. Grade of the mineralization is directly correlated to the gamma values that were collected with the probe. Therefore, substantial quality controls for underground drillhole information focuses on ensuring quality probing results.

This is done by:

- using a software program to check for data errors such as overlapping intervals and out of range values
- entering surveyed drillhole collar coordinates and downhole deviations into the database and visually validating and comparing to the planned location of the holes
- checking the calibration of probes before using them and duplicating probe runs as required
- comparing downhole radiometric probing results with radioactivity measurements made on the core and drilling depth measurements
- validating uranium grades based on radiometric probing with sample assay results

Since 2000, the operation has regularly compared information collected from production activities, such as freezeholes, raisebore pilot holes, radiometric scanning of scoop tram buckets and mill feed sampling, to the drillhole data.

In 2014, a test program of the McArthur River radiometric probes was completed at Cigar Lake to demonstrate that consistent count rates were being obtained among probes. A total of eight surface freezeholes were probed multiple times with each probe to compare count rates. This test demonstrated that probes with the same equipment configurations and Geiger-Muller tubes produced very consistent count rates.

The reliability of the probe readings was confirmed in 2015 by comparison with the results of an independent non-Cameco test using a series of probes built by a different manufacturer. Additional testing was completed in 2016 and 2017 to ensure consistent count rate measurements between probes. Radiometric probe reliability is continually monitored, recorded and reviewed according to internal standards.

11.8 Density sampling

Historical density analysis (pre-1996) at McArthur River was performed using two methodologies:

- competent drill core sample dimensions were measured on site and had their weight measured using a kitchen scale to determine density
- competent drill core sample dimensions were measured on site and had their dry weight determined at the SRC laboratory to determine density

Modern density sampling and analysis has been conducted at SRC using a dry bulk method. For this method, samples are weighed dry, then coated with an impermeable layer of wax and re-weighed. Samples are then submersed in water and weighed. Weights are recorded into a database and rock densities are calculated for the samples.

Historical density estimates have been reviewed and only those demonstrating good correlation with modern data were used in further studies.

11.9 Quality assurance/quality control (QA/QC)

Exploration surface drilling

SRC performs analyses in batches of 40, including 37 samples provided by the client, two internal standard materials, and a pulp duplicate of one of Cameco’s samples.

For uranium assays SRC personnel, using the standards appropriate for each group, add Cameco standards to the sample groups. As well, for each assay group, an aliquot of Cameco’s blank material is also included in the sample batch.

Electronic copies of all geochemical data are reviewed upon receipt of the data. Quality control failures are immediately reported to the laboratory and to the project geologist for resolution. The accuracy and precision of the assay and geochemical control material are assessed periodically.

Underground drilling

QA/QC for underground drillhole information is focused on quality of probing results. This is ensured by Cameco employees checking the probes against a radiation source of known activity, by visually monitoring the radiometric measurements as they are read by the instrument going in and out of the hole, duplicating probe runs and assay verification.

Weekly tests are also carried out with each probe in two fixed radioactive sources. The results must fall within an accepted range for each probe in order for that probe to remain in service. Additional quality control is obtained through comparisons of the probing results with the core measurements and by visual inspection of the radiometric profile of each hole by experienced geologists at the mine site and in Cameco’s corporate office.

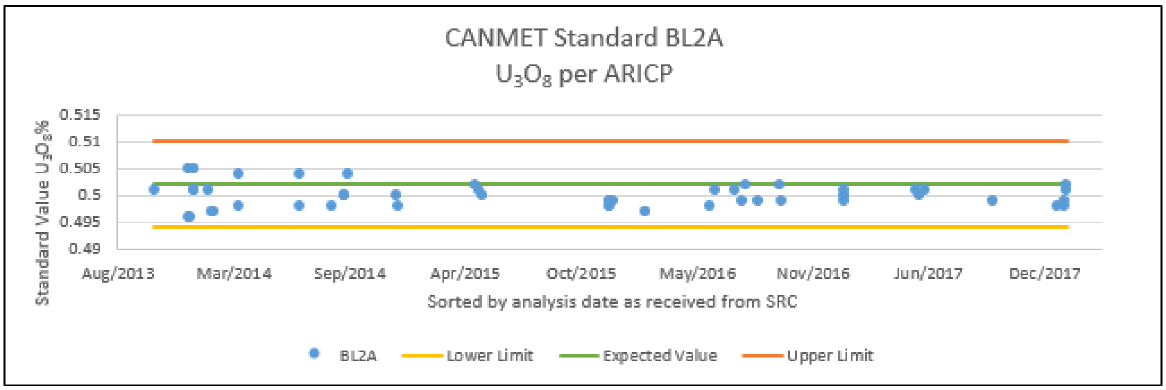
Quality control for more recent assaying at SRC includes the preparation and analysis of standards, duplicates and blanks. Prior to May 2017, standards used included only SRC internal standards BL-2a, BL-3, BL-4a and BL-5, all from Canada Centre for Mineral and Energy Technology (CANMET). In June 2017, the five standards developed at the SRC in 2013 from Cigar Lake ore (CL-1, CL-2, CL-3, CL-4 and CL-5) were introduced to provide more robust quality control and assurance due to the high-grade nature of the McArthur River deposit.

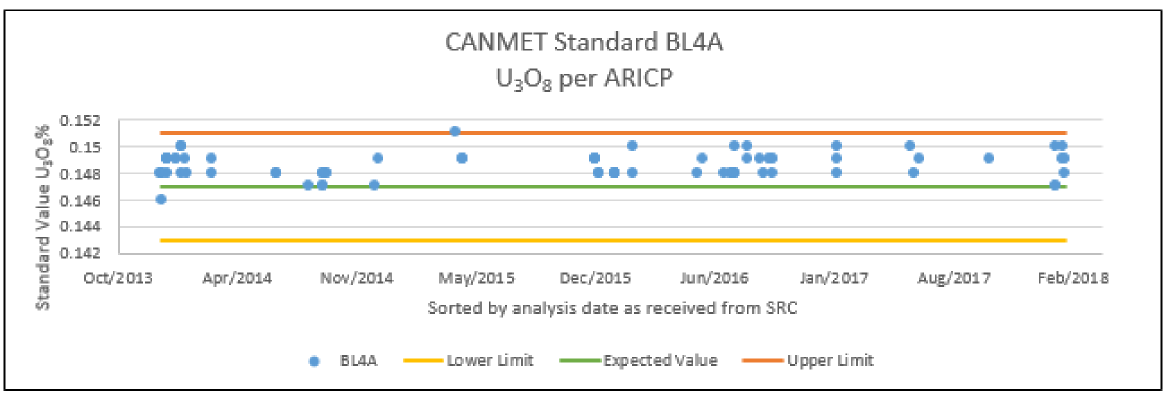
A standard is prepared and analyzed for each batch of samples, and one out of every 40 samples is analyzed in duplicate using an aqua regia digestion followed by ICP-OES. See Figure 11-2, Figure 11-3 and Figure 11-4 for results of standards and pulp duplicates since 2013. Except for one result on standard BL-4 in early 2015, all quality control results are within specified limits.

All assay data from the SRC is received electronically on a secure FTP server and automatically imported by the geological data management system.

Upon import, automatic QA/QC is run on the standards for select elements and reports are emailed to the database administrator and designated mine site personnel. Any results failing the automatic check are reviewed and resolved by the database administrator and site designate.

Figure 11-2: BL2A, BL4 and BL





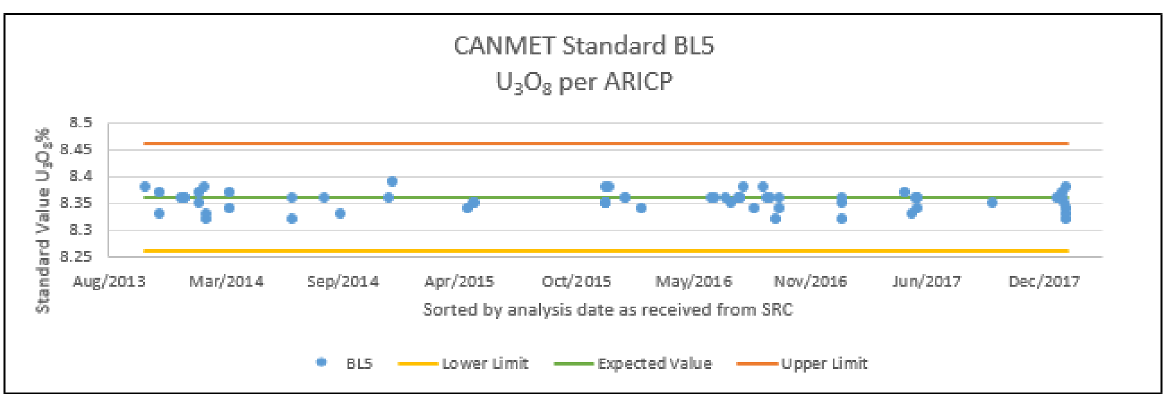
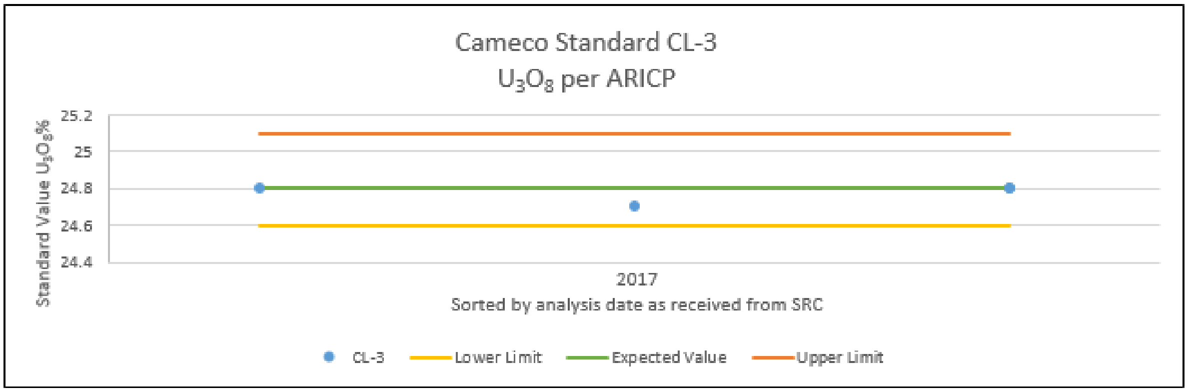
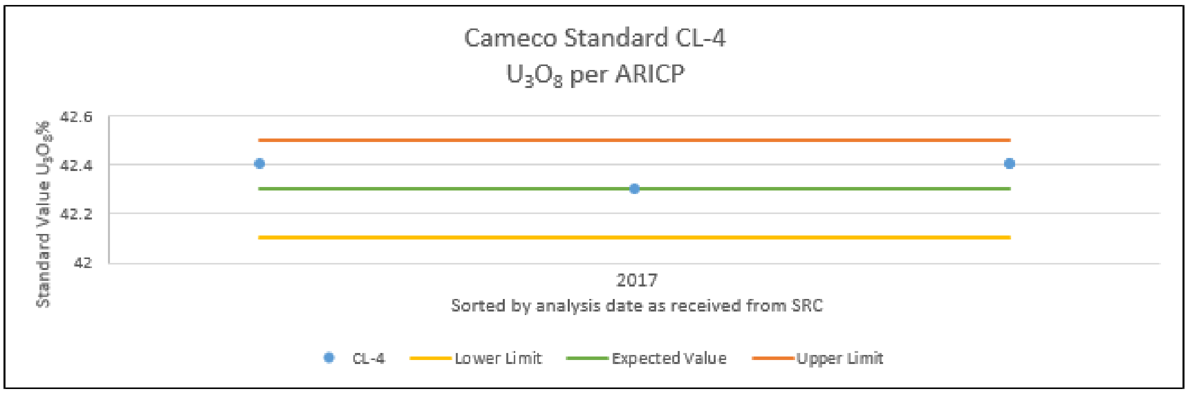


Figure 11-3: CL-3, CL-4 and CL-5 Standard





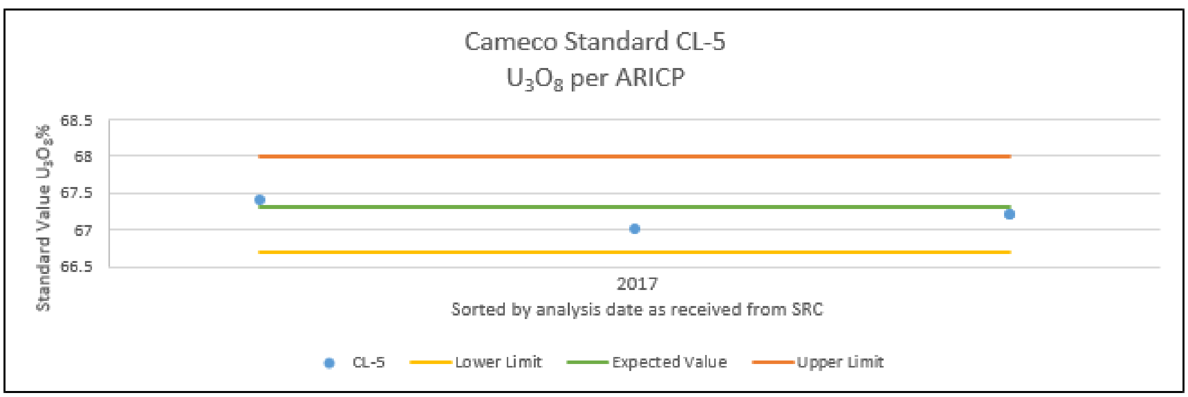
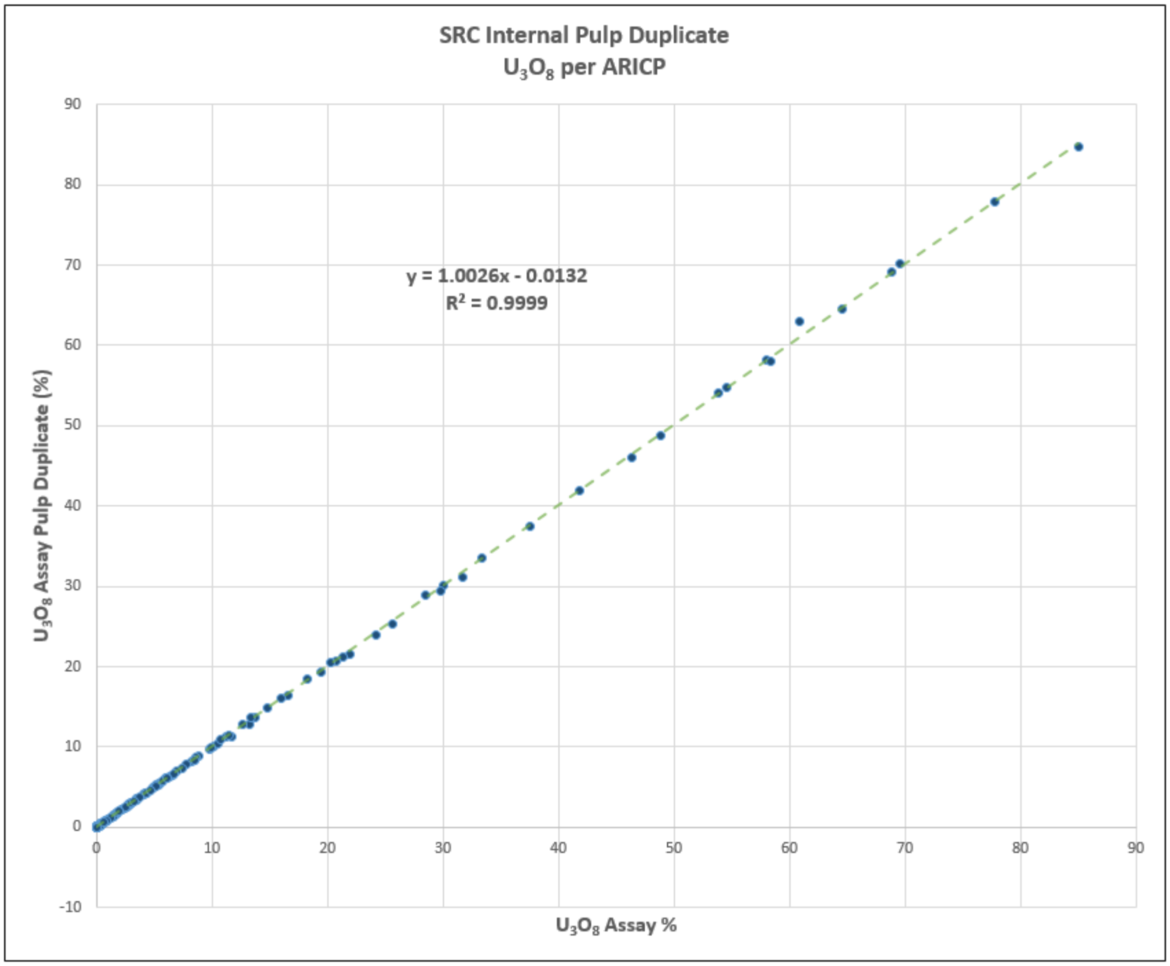


Figure 11-4: Pulp Duplicate AR-ICP Results



11.10 Adequacy of sample preparation, assaying, QA/QC and security

Current sampling protocols dictate that all samples are collected and prepared under the close supervision of a qualified geoscientist in a restricted core processing facility. The core samples are collected and transferred from the core boxes to high-strength plastic sample bags, then sealed. The sealed bags are then placed in steel drums and shipped with tamper-proof security seals under the Transport of Dangerous Goods Regulations through the Cameco warehouse facilities. Chain of custody documentation is present from inserting samples into steel drums to the final delivery of results by the SRC.

All samples collected are prepared and analysed under the close supervision of qualified personnel at SRC, which is a restricted access laboratory licensed by the CNSC.

The QP for this section is satisfied with all aspects of sample preparation and assaying. The sampling records are meticulously documented and samples were whole core assayed to reduce bias. The assaying was done to a high standard and the QA/QC procedures employed by the laboratories were adequate. Sample security is largely defined by regulation, and all samples have been stored and shipped in compliance with regulations. The QP responsible for this section believes that the sample security was and is maintained throughout the process. There has been no indication of significant inconsistencies in the data used for the latest update of the mineral reserve and resource estimates.

12 Data verification

The drillhole database, containing information from surface and underground drillholes used to produce the mineral resource and mineral reserve estimates over the years, has been verified on multiple occasions by site geologists, external consultants and other geologists within Cameco's technical services department. Many of the original signed assay certificates are available and have been reviewed by Cameco geologists.

In 2013, McArthur River implemented a centralized geological data management SQL server system to manage all drillhole and sample data. All core logging, sample collection, down-hole probing and sample dispatching activities are carried out and managed within this system. All assay and geochemical analytical results obtained from the external laboratory used for analysing samples are uploaded directly into the centralized database, thereby minimizing potential for manual data transfer errors.

Additional data verification procedures include the following:

- Surveyed drillhole collar coordinates and down-hole deviations were entered in the database and visually validated and compared to the planned hole locations
- Core logging information was visually validated on plan views and sections and verified against photographs of the core, or the core itself
- Using the Maptek Vulcan and Leapfrog software package, an additional validation query was developed that checks for data entry errors such as overlapping intervals and out of range values
- Down-hole radiometric probing results were compared with radioactivity measurements made on the core and drilling depth measurements
- eU_3O_8 grades based on radiometric probing were validated with sample assay results

A discussion of the quality assurance and quality control measures undertaken relating to assay and radiometric results is included in Section 11.

The QP for this section supervised mineral resources work involving two professional geoscientists who verified the data at the site and at Cameco's corporate office. He was involved in reviewing the assay and probing results, as well as the correlations between radioactivity and uranium grade, and between density and multiple elements. He attended internal peer reviews on the litho-structural data and interpretation, and was in regular communication with McArthur River's Chief Mine Geologist. In consideration of the above, the QP for this section is satisfied with the quality of the data and considers it valid for use in the estimation of the mineral resources and mineral reserves. Comparison of life-of-mine production with the reserve model supports this opinion.

13 Mineral processing and metallurgical testing

13.1 Overview

The McArthur River ore processing facilities were designed for the McArthur River orebody whilst the Key Lake mill facilities were adapted to the McArthur River orebody. Both facilities were commissioned for McArthur River ore in 2000 and the testwork programs to design and improve the facilities are described below including the assumptions used for current production planning.

13.2 Metallurgical testing for McArthur River ore processing facilities

The original flowsheet was largely based on the use of conventional mineral processing concepts and equipment. Where necessary, testwork was undertaken to prove design concepts or adapt conventional equipment for unique services. Simulated ore was utilised in much of the testwork because the off-site testing facilities were not licensed to receive radioactive materials. The major test programs undertaken included:

- Pipeline flow testing of simulated uranium ore slurries at SRC’s Saskatoon pump test facility to establish minimum flow velocities and maximum particle sizes.
- Operational testing on a full scale slurry container prototype at Key Lake including gravity unloading, time for contents to freeze while outside during cold weather and drop testing to evaluate the potential for leakage during a simulated road accident.
- Operational testing using simulated uranium ore slurries with prototype container loading and vacuum unloading platforms at the Saskatoon shops of Prairie Machine and the Northstar Business Center.
- Full scale testing of truck/trailer combinations to assess B-train handling and weight bearing characteristics related to ore slurry transportation in containers.
- Radiation scanning equipment testing on a full scale slurry container prototype at Key Lake. Although this testwork was successful, automated scanning equipment was not installed at Key Lake or McArthur River. Instead the use of closed circuit television cameras and manual scanning was implemented.
- Marconajet® testing on simulated crushed uranium ore at Pre-Con Limited’s (Pre-Con) Saskatoon shop to investigate the reclaiming of settled crushed ore from the bottom of storage tanks.
- MMD Sizer testing on simulated uranium ore at Pre-Con’s Saskatoon shop to investigate the use of low profile crushing equipment. This testwork was unsuccessful and an MMD Sizer was not included in the flowsheet.
- Testing of a water flush cone crusher at Pre-Con’s Saskatoon shop on simulated uranium ore to investigate the use of crushing equipment as part of the grinding circuit. Although this testwork was successful, a cone crusher has not been found to be necessary in the semi-autogenous grinding (SAG) circuit.
- Testing of a prototype transportable mining unit on simulated uranium ore at Pre-Con’s Saskatoon shop and later, underground at McArthur River to assess methods for recovering, screening, and pumping reamed ore. Although included in the original flowsheet, this equipment is no longer utilised at McArthur River. Instead reamed ore is hauled to the grinding circuit by underground load-haul-dump (LHD) vehicles.
- Testing at Key Lake of equipment to simultaneously measure slurry density and ore grade.
- Laboratory scale bond work index tests on representative ore samples for SAG mill sizing purposes.
- Laboratory scale settling and thickening tests on representative ore samples at the target grind for thickener sizing purposes.

Since commissioning, numerous changes have been made to the McArthur River ore processing and water treatment circuits to improve their operational reliability and efficiency. From a uranium recovery perspective, the most important was to change the grinding circuit classification system from screens to cyclones. This was completed in late 2009. Classification based on specific gravity and particle size instead of particle size alone resulted in preferential grinding of the denser uranium minerals versus the gangue, providing a measurable recovery increase in the Key Lake leach circuit. In addition, this change reduced particle segregation issues during ore slurry transport and storage, significantly reducing plugging and sanding out problems in pipelines and tankage at both McArthur River and Key Lake.

13.3 Metallurgical testing for Key Lake milling facilities

The original Key Lake milling facilities and related infrastructure have been in service since 1983. Prior to 2000, a program of bench scale testwork was completed at the Key Lake metallurgical laboratory. This testwork confirmed the suitability of the Key Lake mill circuit for processing McArthur River ore with some circuit modifications.

In late 2006, Cameco initiated a strategic plan to revitalize the Key Lake facilities in order to ensure that the mill would be able to continue to process McArthur River's mineral reserves. The revitalization testwork focused on the solvent extraction process and included pilot scale tests on pulsed columns for replacement of conventional mixer settlers as well as bench and pilot scale strong-acid stripping process tests. Neither of these flowsheet changes were adopted. Selected mixer settlers were instead modified to improve solution flows, phase disengagement and increase capacity and the strong-acid stripping process showed no benefit over ammonia stripping.

More recently, testing has shown that use of a silica coagulant was able to alleviate the issues caused by the cement dilution in the ore from McArthur River. This has eliminated the need to operate the gravity concentrator circuit as well as increased the solvent extraction circuit capacity.

13.4 Metallurgical assumptions

The key assumptions used in the production schedule are shown in Table 13-1 with the actuals achieved from 2012 to 2017 shown in Table 13-2.

Table 13-1: Key Assumptions

Inputs	Units	Maximum Annual Value
McArthur River Grinding Circuit Throughput	x 1,000 tonnes	65
Key Lake Mill Throughput	x 1,000 tonnes	188
Key Lake Mill Recovery	%	99
Key Lake Packaged Production	M lbs U_3O_8	18.4

Table 13-2: Key Annual Production Statistics 2012 – 2017

Year	McArthur River Grinding Circuit Throughput (x 1,000 tonnes)	McArthur River Grinding Circuit Utilization (%)	Key Lake Mill Throughput (x 1,000 tonnes)	Key Lake Mill Recovery (%)	Key Lake Packaged Production (M lbs U_3O_8)
2012	60	48	194	98.9	19.5
2013	60	48	184	99.3	20.1
2014	62	44	173	99.4	19.1
2015	57	46	166	99.4	19.1
2016	59	47	155	99.0	18.0
2017	54	50	143	99.1	16.1

Note:
(1) Grinding circuit utilizations do not include the annual production shutdowns.

Aside from the McArthur River grinding circuit throughput, the recovery and maximum capacities assumed for production scheduling purposes have been achieved previously. The low grinding circuit utilization indicates that there is sufficient available capacity to meet the increased annual throughput. However, these assumptions are only valid if the mineralogical and metallurgical properties of the ore do not change significantly. It is therefore recommended that a mineralogical and metallurgical analysis be completed on future mining areas to validate the forecast metallurgical and environmental performance assumptions.

14 Mineral resource estimates

The McArthur River deposit consists of nine mineralized zones with delineated mineral resources: Zones 1, 2, 3, 4, 4 South, A, B, McA North 1 and McA North 2.

The above and three under-explored mineralized showings, known as McA North 3, McA North 4 and McA South 1, as well as other mineralized occurrences have also been identified over a strike length of 2,700 metres.

An orthogonal view of these zones and three mineralized showings are shown in Figure 14-1.

14.1 Definitions

The McArthur River mineral resource estimates have been updated and reviewed by Cameco. Peer reviews have been conducted internally. No independent verification of the current mineral resource estimates has been performed.

The classification of mineral resources and their subcategories conform to the definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Council on May 10, 2014, which are incorporated by reference in NI 43-101. Cameco reports mineral resources and mineral reserves separately. The amount of reported mineral resources does not include those amounts identified as mineral reserves. Mineral resources, which are not mineral reserves, do not have demonstrated economic viability.

14.2 Key assumptions, parameters and methods

Reported mineral resources at McArthur has been divided into Zones 1, 2, 3, 4, 4 South, A, B, McA North 1 and McA North 2. These zones cover an approximate area between grid northing 7535N to grid northing 9325N. Recent underground drilling has extended known mineralization slightly into the adjoining Read Lake Property (see Figure 10-2). The mineral resource estimates are based on approximately 50 mineralized drillholes from surface, 1,125 mineralized drillholes and blastholes from underground, and 20 mineralized freezeholes.

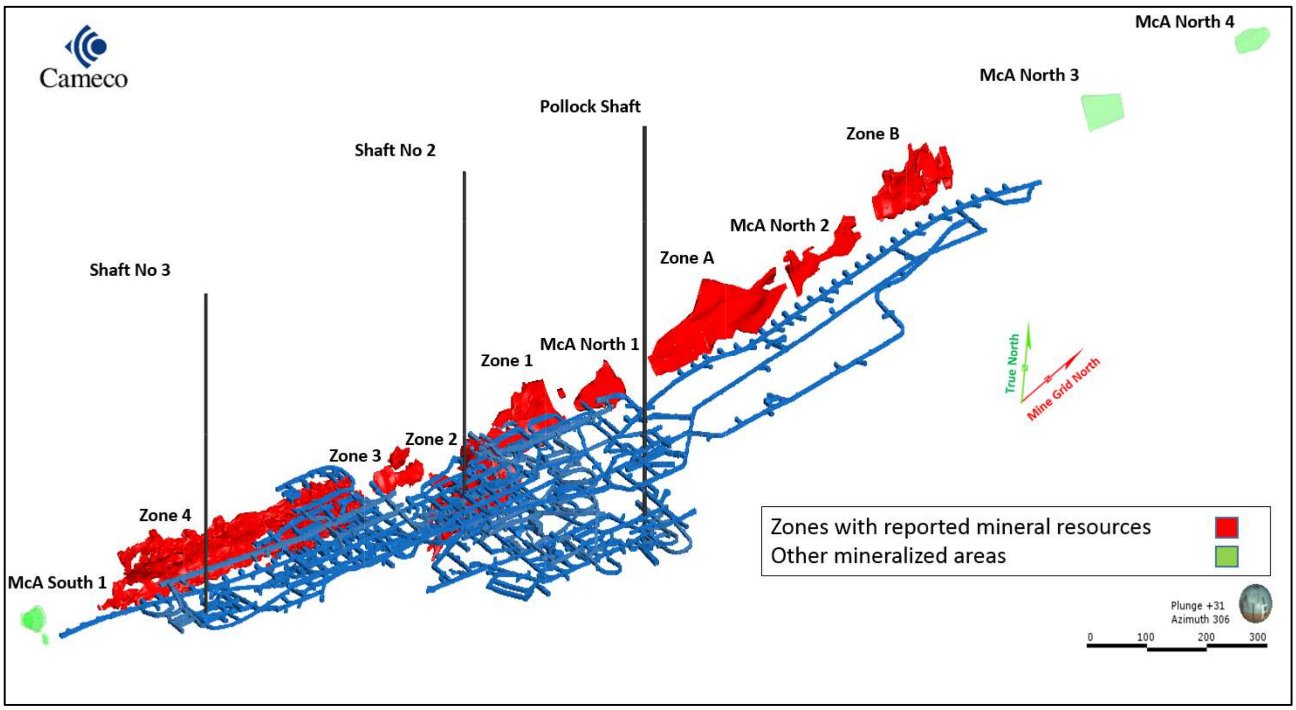
The key assumptions, parameters and methods used to estimate the mineral resources are:

- Mineral resources do not include allowances for dilution or mining recovery.
- Grades of U_3O_8 were obtained from chemical assaying of drill core or from equivalent % U_3O_8 grades obtained from radiometric probing results. In areas of poor core recovery (< 75%) or missing samples, the grade was determined from probing.
- A correlation between uranium only or uranium and clay content and density was applied where the density was not directly measured for each sample.
- The density of the samples varies widely, from about 1.56 grams per cubic centimetre to 8.24 grams per cubic centimetre, due to the intensity of the clay alteration and the variable presence of the high density mineral, pitchblende (+/- coffinite).
- Reasonable prospects for eventual economic extraction of the mineral resources is based on the long-term forecast uranium price, anticipated production costs and the tonnage and grade of the mineralized areas.
- The geological interpretation of the orebody was done on section and plan views, and in 3D derived from drillhole information using a minimum mineralized thickness of 1.0 metre and a minimum grade ranging between 0.40% and 0.50% U_3O_8.
- Mineral resources are reported at a cut-off grade of 0.50%.
- Extraction will be by underground mining methods.
- Mineral resources were estimated using a 3D block model. Ordinary kriging (OK) and inverse distance squared (ID2) were used to estimate the grade and density of the different areas.
- Maptek Vulcan and Seequent Leapfrog Geo mining software packages were used to generate mineral resource estimates.

14.3 Geological modelling

Using available surface and/or underground drilling, 3D models were created for Zones 1, 2, 3, 4 (includes 4 South), A, B, McA North 1 and McA North 2 using various versions of Seequent's Leapfrog Geo and/or Maptek Vulcan mining software. These models were created from the geological interpretation of mineralized domains using lithological, structural and uranium grade information. The primary mineralized domains have been interpreted on 2.5 to 25 metre spaced east-west orientated vertical cross-sections and validated on plan views and in 3D using a varying cut-off grade of 0.40% to 0.50% U_3O_8, depending on zone, to define the outer mineralized wireframe using a general mineralized minimum thickness of 1.0 metre. For certain zones, additional internal high-grade domains were explicitly or implicitly generated prior to estimation (see Figure 11-1). In the absence of a hard geological or structural boundary, mineralization was generally extended half way to the next un-mineralized drillhole or up to a maximum of 10 metre lateral distance.

Figure 14-1: Orthogonal View of Underground Development and Mineralized Zones (those with reported mineral resources in red)



Notes:

(1) Zone 4 includes Zone 4 South.

(2) As of December 31, 2018.

14.4 Compositing

Composites for McArthur River zones were generated for % U_3O_8, density (D), and density x % U_3O_8 (DG). Depending on the zone, composite lengths are either 0.5 or 1.0 metres which aligns with the majority of chemical assay interval lengths. Compositing was carried out for the variables using a length-weighted averaging method with each composite being assigned a rock code associated with its corresponding mineralized triangulation for later use in estimation. Partial composites less than half the chosen standard length along wireframe edges were combined with the preceding, full-length composite. High-grade capping of raw probe grades prior to compositing was reviewed and performed on a zone by zone basis if deemed necessary.

14.5 Block modelling

Depending on the zone, the mineral resource block models range between 1m x 5m x 1m and 5m x 5m x 5m parent block sizes with respective sub-blocking between 1m x 2.5m x 1m and 0.5m x 0.5m x 0.5m to accurately reflect the interpreted limits and volumes of the mineralization.

Drillhole spacing and selective mining unit considerations were also taken into account. The 3D mineralization wireframes were used to assign numeric code values to the block model and limit the composite influences to their respective domains.

Depending on the zone, each block's DG and D variable is estimated by OK or ID2 interpolation methods with the final grades % U_3O_8 being calculated (grade = DG/D) for subsequent mineral resource and reserve estimates work. In some cases, the grade variable (G) was also estimated independently for comparative purposes. Variographic analysis supporting of up to three variables, DG (density x grade), D (density) and, in some cases, U_3O_8 grade, were estimated using Sage 2001 or Maptek Vulcan software for each zone that utilized kriging interpolation. Zone-specific density regression curves have been developed from measured drill core density values and used to estimate the density for each sample when no measured values are available. Density values for all zones are singularly based off uranium concentrations with the exception of the Zone B density regression curve which also incorporates the impact of Al_2O_3 values related to clay alteration.

Mineral Resources for McA North 2 are based solely on the pre-1993 surface drilling and were estimated with the two-dimensional polygonal method on vertical sections at 50 metre or 100 metre spacing. McA North 2 has since undergone underground definition drilling and while a revised mineralized wireframe is available, the mineral resource has not yet been updated. Cameco currently reports 40,500 tonnes at a grade of 1.61% U_3O_8 for 1.4 million pounds of inferred mineral resources for this zone.

See Table 14-1 for a general summary of the estimation parameters by zone.

Table 14-1: General Summary of Estimation Methods and Primary Run Parameters for Major Lenses within Mining Zones

Methods and Parameters	Zone 1	Zone 2	Zone 3	Zone 4(1)	Zone A	Zone B	McA North 1	McA North 2
Estimation Method	OK	ID2	OK	OK/ID2	ID2	OK/ID2	ID2	2D Polygonal
Bearing (°)	349 to 7	5	7	5 to 7	345 to 360	355 to 360	360	N/A
Dip (°)	-45 to -63	-61	-45 to -85	0 to -70	-40 to -80	-50 to -70	-34 to -37	N/A
Plunge (°)	0	0	0	-20 to 12	0 to -38	0	0	N/A
Major Axis (°)	15	15	15	27 to 80	20 to 30	20 to 35	14 to 30	N/A
Semi-major axis (m)	15	15	15	9 to 27	10 to 15	20 to 35	8 to 30	N/A
Minor axis (m)	5	5	5	3 to 16	7.5 to 10	8 to 10	4 to 4.75	NA

Note:

(1) Zone 4 model estimation methods and parameters includes Zone 4 South.

14.6 Validation

Block models were validated as per Cameco standard procedures involving several methods, including but not limited to: visual review, statistical checks, spatial distribution plots, peer reviews and estimation via alternative methods. Further supporting the resource estimate parameters and methodologies is the fact that overall, based upon historical production, the mineral reserve estimates reconcile to 9% of uranium content.

14.7 Mineral resource classification

The criteria for the classification of the mineral resources are the levels of confidence on the geological interpretation and continuity of the uranium grade between sample locations, the estimation confidence and the drilling density. The criteria in general for each mineral resource confidence level are as follows:

Measured resources: Drillhole spacing approaches 10 m by 10 m in the plane of the mineralization and the level of confidence on the interpretation and the grade continuity is high.

Indicated mineral resources: Drillhole spacing approaches 30 m by 10 m and additional information may affect the interpretation and the assumed continuity of the grade.

Inferred mineral resources: Drillhole spacing is greater than 30 m by 10 m and the level of confidence on the interpretation and the continuity of the grade is low.

The McArthur River estimated mineral resources, with an effective date of December 31, 2018, are presented in Table 14-2. Alain D. Renaud, P.Geo., of Cameco, is the QP within the meaning of NI 43-101 for the purpose of the mineral resource estimates.

Table 14-2: Summary of Mineral Resources – December 31, 2018

Category	Total tonnes (x 1,000)	Grade % U_3O_8	Total M lbs U_3O_8	Cameco's share M lbs U_3O_8
Measured	97.8	2.57	5.5	3.9
Indicated	35.1	2.86	2.2	1.6
Total Measured & Indicated	132.9	2.65	7.8	5.4
Inferred	80.5	2.25	4.0	2.8

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Reported mineral resources do not include amounts identified as mineral reserves. Totals may not add up due to rounding.

(2) Cameco's share of total mineral resources is 69.805% on the McArthur River property and 78.241% on the Read Lake property.

(3) The Read Lake portion of mineral resources on a 100% basis are 4,600 tonnes at a grade of 1.92% U_3O_8 for 0.19 million lbs U_3O_8 of measured and indicated and 700 tonnes at 1.86% U_3O_8 for 0.03 million lbs U_3O_8 of inferred.

(4) The mineralized domains have been interpreted from drillhole information on vertical and plan cross-sections or with 3D implicit modelling validated on plan views and in 3D.

(5) Mineral resources are estimated using a minimum mineralized thickness of 1.0 metre and at a minimum grade of 0.50% U_3O_8.

(6) Mineral resources have been estimated based on the use of blasthole and raisebore underground mining methods.

(7) Inferred mineral resources are estimated on the basis of limited geological evidence and sampling, sufficient to imply but not verify geological grade and continuity. They have a lower level of confidence than that applied to an indicated mineral resource and cannot be directly converted to a mineral reserve.

(8) There are no known environmental, permitting, legal, title, taxation, socio-economic, political, marketing or other relevant factors that could materially affect the above estimate of mineral resources.

(9) Mineral resources do not currently have demonstrated economic viability.

A breakdown of the mineral resource estimates by zone as of December 31, 2018 is shown in Table 14-3.

Table 14-3: Mineral Resources by Zones – December 31, 2018

Resource Category	Zone	Total tonnes (x 1,000)	Grade % U_3O_8	Total M lbs U_3O_8	Cameco's share M lbs U_3O_8
Measured	1	3.6	1.63	0.1	0.1
	2	62.3	2.99	4.1	2.9
	4	1.0	3.34	0.1	0.1
	4 South	6.2	1.71	0.2	0.2
	B	4.7	3.36	0.3	0.2
	McA North 1	19.7	1.45	0.6	0.4
	TOTAL MEASURED	**97.8**	**2.57**	**5.5**	**3.9**
Indicated	1	1.4	2.54	0.1	0.1
	2	2.6	1.86	0.1	0.1
	4 South	4.0	1.92	0.2	0.1
	A	17.1	1.56	0.6	0.4
	B	4.2	1.98	0.2	0.1
	McA North 1	5.8	8.44	1.1	0.8
	TOTAL INDICATED	**35.1**	**2.86**	**2.2**	**1.6**
Total Measured & Indicated		**132.9**	**2.65**	**7.8**	**5.4**
Inferred	1	0.4	5.15	0.1	0.04
	2	21.6	1.24	0.6	0.4
	4	1.0	1.26	0.03	0.02
	4 South	1.3	2.07	0.05	0.04
	B	15.6	5.27	1.8	1.3
	McA North 2	40.5	1.61	1.4	1.0
	TOTAL INFERRED	**80.5**	**2.25**	**4.0**	**2.8**

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Reported mineral resources do not include amounts identified as mineral reserves. Totals may not add up due to rounding.

(2) Cameco's share of total mineral resources is 69.805% on the McArthur River property and 78.241% on the Read Lake property.

14.8 Factors that could materially affect the mineral resource estimate

The McArthur River drilling database is considered to be reliable. Any potential errors which may be present are not expected to cause any significant changes to the mineral resource models.

The QP responsible for the McArthur River mineral resource estimate is satisfied with the quality of data and considers the data valid for use in the estimation of mineral resources.

As is the case for most mining projects, the extent to which the estimate of mineral resources may be affected by environmental, permitting, legal, title, taxation, socio-economic, political, marketing or other relevant factors could vary from material gains to material losses. The McArthur River mineral resources are not significantly sensitive to variances in the uranium price. The QP responsible for the mineral resource estimate is not aware of any relevant factors that could materially affect the mineral resource estimate.

15 Mineral reserve estimates

15.1 Definitions

The McArthur River mineral reserve estimates have been updated and reviewed by Cameco. Internal peer reviews have been conducted. No independent verification of the current mineral reserve estimates was performed.

The mineral reserves include allowances for dilution and mining recovery. Stated mineral reserves are derived from estimated quantities of mineral resources profitably recoverable by established methods. Mineral reserves include material in place and stored on surface and underground. Only mineral resources under the measured and indicated categories which have demonstrated economic viability are included into the mineral reserves.

The classification of mineral reserves and the subcategories of each conform to the definitions adopted by the CIM Council on May 10, 2014, which are incorporated by reference in NI 43-101.

15.2 Key assumptions, parameters and methods

The McArthur River reported mineral reserves are limited to Zones 1, 2, 3, 4, 4 South, A and B. Mineral reserves are based upon estimated quantities of uranium recoverable by the raiseboring and blasthole stoping mining methods. The key assumptions, parameters and methods used to convert mineral resources into mineral reserves are:

- Mineral reserves have been estimated based on the use of the raiseboring and blasthole stope mining methods and assume a 99.4% planned mine recovery and have allowances for expected waste (42% average) and backfill (6.8% average) dilution.
- All planned mine areas are assumed to use freezewall protection.
- An average price of $44 (US) per pound of U_3O_8 was used to estimate the mineral reserves with an exchange rates of $1.00 (US) = $1.25 (Cdn).
- Reported mineral reserves are not adjusted for the estimated mill recovery of 99%.
- Mining rates assume annual packaged production of 18.0 million pounds U_3O_8.
- McArthur River mineral reserves have been estimated at a cut-off grade of 0.80% U_3O_8.
- All planned mine zones have been assessed to ensure sufficient recoverable pounds are present to pay for capital and fixed operating costs.
- Maptek Vulcan mining software was used to generate mineral reserve estimates.

The price assumption is based on an average of industry estimates of spot prices and the corresponding long-term prices and reflects Cameco's committed and uncommitted sales volumes.

Block models were validated using various estimation methods and parameters and from the reconciliation against mine production (see Table 15-1).

Table 15-1: Reconciliation of Production with Block Model (100% basis)

	Mine Production [1]			Block Model			Percent Difference Production vs Block Model		
Year	Total tonnes (x 1,000)	Grade % U_3O_8	M lbs U_3O_8	Total tonnes (x 1,000)	Grade % U_3O_8	M lbs U_3O_8	Tonnes	Grade	Lbs
2000	43.7	11.60	11.2	34.6	10.72	8.2	26%	8%	37%
2001	52.1	14.95	17.2	48.3	14.20	15.1	8%	5%	14%
2002	50.9	16.48	18.5	47.6	16.47	17.3	7%	0%	7%
2003	45.4	15.23	15.2	40.9	12.45	11.2	11%	22%	36%
2004	55.6	15.26	18.7	60.6	13.14	17.6	-8%	16%	6%
2005	59.2	14.17	18.5	62.8	12.75	17.7	-6%	11%	5%
2006	55.8	15.18	18.7	61.5	13.03	17.7	-9%	17%	6%
2007	58.7	14.46	18.7	67.2	12.07	17.9	-13%	20%	5%
2008	50.8	15.61	17.5	58.5	13.40	17.3	-13%	16%	1%
2009	63.8	13.17	18.5	61.2	12.22	16.5	4%	8%	12%
2010	74.7	11.72	19.3	63.3	14.67	20.5	18%	-20%	-6%
2011	78.3	11.43	19.7	83.8	9.54	17.6	-7%	20%	12%
2012	78.2	11.38	19.6	95.6	10.91	23.0	-18%	4%	-15%
2013	97.7	9.40	20.2	85.8	10.28	19.4	14%	-9%	4%
2014	83.0	11.37	20.8	66.6	11.92	17.5	25%	-5%	19%
2015	71.0	12.56	19.7	54.7	14.58	17.6	30%	-14%	12%
2016	74.2	11.16	18.3	65.7	10.76	15.6	13%	4%	17%
2017	73.1	10.20	16.8	66.3	9.57	14.0	10%	7%	20%
2018	2.8	7.55	0.5	1.7	9.02	0.3	65%	-16%	38%
Total Prod [2]	**1,169.0**	**12.71**	**327.6**	**1,126.7**	**12.15**	**301.8**	**4%**	**5%**	**9%**

Notes:

(1) Excludes development-based mineralized waste production.

(2) As of December 31, 2018.

(3) Totals may not add up due to rounding.

Since the start of mining, production tonnes are 4% higher, uranium grade higher by 5%, and pounds U_3O_8 higher by 9% than the model predictions. For the years prior to and including 2012 when raisebore mining was the major mining method, the reconciliation of mine production with the mineral reserve models was on average 6% greater than the estimated pounds U_3O_8, tonnage mined was lower by 2% and production grade was higher by 9%. Since 2013, the differences in tonnes and pounds U_3O_8 when compared with the models have respectively increased by 18% and 14% while the grade has been reduced by 3% as the blasthole stope mining has been used extensively.

The variance is primarily attributed to a combination of additional dilution material from the blasthole mining method and mining of mineralized material in Zones 2 and 4 not captured in the resource models. The Zone 2 production area model was updated in 2014 (Cameco, 2014d) while the Zone 4 model was last updated in 2016 (Cameco, 2017). Zone 2 is nearly mined out with 4.8 million pounds of proven and probable reserves remaining (excluding stockpiled material).

15.3 Mineral reserve classification

For mineral resources to be classified as mineral reserves, a viable and proved mining method and layout must be established with realistic allowances for recovery and dilution.

The mineral reserves classification follows the CIM definitions where economically mineable, measured and indicated resources can be converted to proven and probable reserves, but inferred resources cannot be reported as mineral reserves.

The McArthur River estimated mineral reserves, with an effective date of December 31, 2018, are presented in Table 15-2 and Table 15-3. Linda Bray, P.Eng., Gregory Murdock, P.Eng. and Alain D. Renaud, P.Geo., of Cameco are the QPs within the meaning of NI 43-101 for the purpose of the mineral reserve estimates.

Table 15-2: Summary of Mineral Reserves – December 31, 2018

Reserve Category	Total tonnes (x 1,000)	Grade % U_3O_8	Total M lbs U_3O_8	Cameco's share M lbs U_3O_8
Proven	2,034.0	7.14	320.2	223.5
Probable	538.5	6.04	71.7	50.1
Total Reserves	**2,572.5**	**6.91**	**391.9**	**273.6**

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Totals may not add up due to rounding.

(2) Mineral reserves and are not adjusted for the estimated metallurgical recovery of 99%.

(3) Cameco's share of total mineral reserves is 69.805% on the McArthur River property and 78.241% on the Read Lake property.

(4) The Read Lake portion of mineral reserves (100% basis) is 10,800 tonnes at a grade of 1.47% U_3O_8 for 0.35 million lbs proven and probable reserves.

(5) Mineral reserves have been estimated based on the use of the raiseboring and blasthole stope mining methods and assume a 99.4% planned mine recovery and have allowances for expected waste (42% average) and backfill (6.8% average) dilution.

(6) Mining rates assume annual packaged production of 18 million lbs U_3O_8.

(7) An average price of $44 (US) per pound of U_3O_8 was used to estimate the mineral reserves with an exchange rates of $1.00 (US) = $1.25 (Cdn).

(8) McArthur River mineral reserves have been estimated at a cut-off grade of 0.80% U_3O_8.

(9) Other than the factors described in Section 15.4 there are no other known mining, metallurgical, infrastructure, permitting or other relevant factors that could materially affect the above estimate of mineral reserves.

The current mine plan assumes extraction of all the reported mineral reserves. Reported mineral resources in the measured, indicated and inferred categories have not been included in the current mine plan. A breakdown of the mineral reserves estimates by zone, as of December 31, 2018, is shown in Table 15-3.

Table 15-3: Mineral Reserves by Zone – December 31, 2018

Reserve Category	Zone	Total tonnes (x 1,000)	Grade % U_3O_8	Total M lbs U_3O_8	Cameco's share M lbs U_3O_8
Proven	Stockpiles	439.6	0.58	5.6	3.9
	1	221.7	8.97	43.9	30.6
	2	54.9	3.96	4.8	3.3
	3	30.6	17.74	12.0	8.4
	4	385.7	13.81	117.5	82.0
	4 South	591.3	4.26	55.6	38.8
	B	310.1	11.83	80.9	56.5
	TOTAL PROVEN	**2,034.0**	**7.14**	**320.2**	**223.5**
Probable	1	23.4	5.40	2.8	1.9
	3	35.9	11.01	8.7	6.1
	4	5.3	0.57	0.1	0.1
	4 South	21.3	3.46	1.6	1.2
	A	403.6	5.2	46.3	32.3
	B	49.1	11.32	12.3	8.6
	TOTAL PROBABLE	**538.5**	**6.04**	**71.7**	**50.1**
Total Proven & Probable		**2,572.5**	**6.91**	**391.9**	**273.6**

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Totals may not add up due to rounding.

(2) Cameco's share of total mineral reserves is 69.805%.

15.4 Factors that could materially affect the mineral reserve estimate

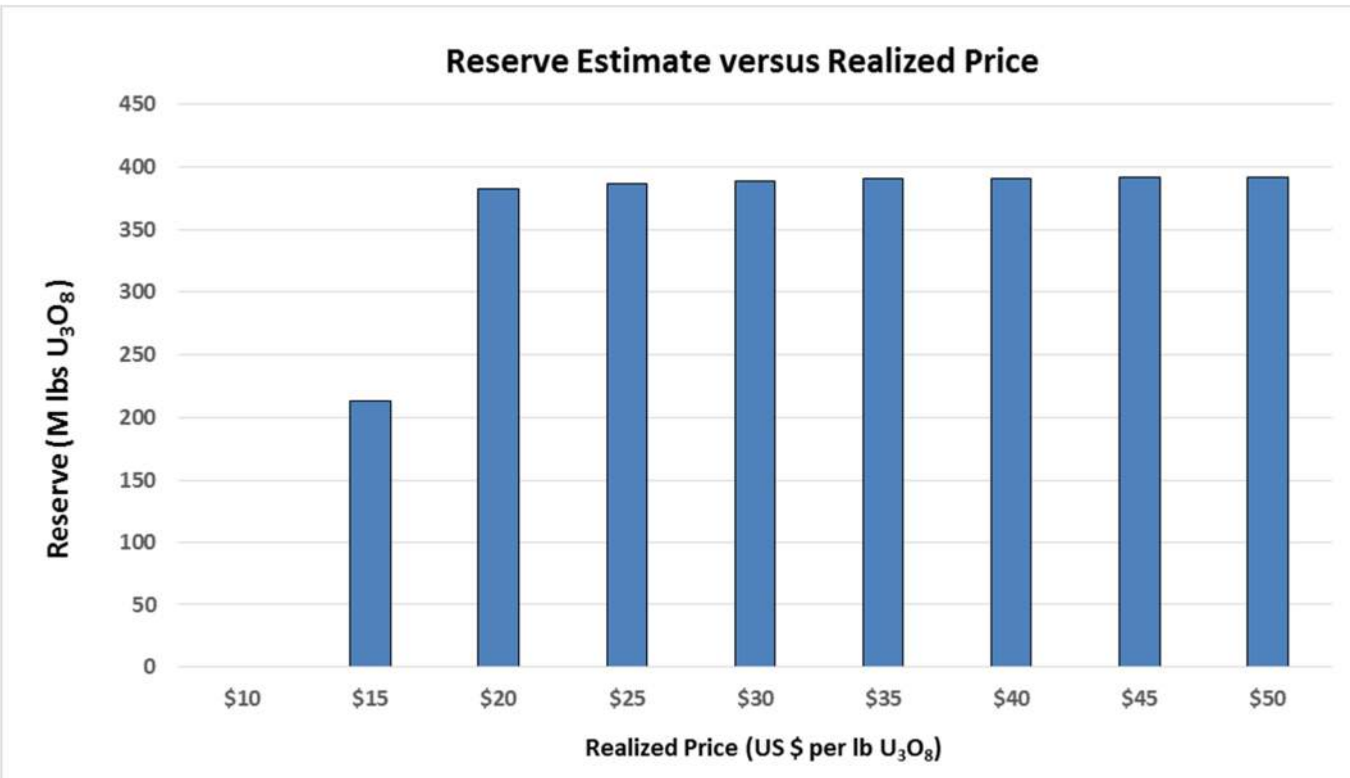
There are no relevant factors known to the authors of this section that could materially affect the mineral reserve estimate, except as follows:

Uranium market

Like other commodities, the uranium industry is cyclical. Historically there have been periods of low prices where new supply has not been incentivized and therefore supply begins to decrease. In addition, there have been periods of higher prices, which incentivize investment in higher-cost sources of production, eventually leading to an oversupplied market. Based on the long mine life of McArthur River, it is possible that the cyclical nature of the industry could impact Cameco's mining plans. In addition, timing of these cycles could have a material adverse impact on Cameco's future production decisions.

Under the assumptions discussed in Section 15.2, The McArthur River mineral reserves are not significantly sensitive to variances in the uranium price as long as an average uranium price above $20.00 (US) per pound is realized, as shown in Figure 15-1.

Figure 15-1: McArthur River Mineral Reserves Sensitivity to Realized Prices



Notes:

(1) Mine designs remained fixed over the assumed price ranges.

(2) Cut-off grades and royalties adjusted for the expected realized price.

(3) Reserves for the mine area are set to zero if insufficient pounds present to pay for capital and fixed costs.

(4) Time value of money is not considered for the analysis.

Water inflows

Water inflows pose a significant risk to the mine and have resulted in a production suspension in the past (refer to Section 24.4). Despite mitigation measures put in place by Cameco, there is no guarantee that mitigation measures will be 100% successful. The consequences of another water inflow at McArthur River would depend on its magnitude, location and timing, but could include a significant interruption or reduction in production, a material increase in costs or a loss of mineral reserves.

Geotechnical challenges

Challenging geotechnical conditions combined with additional ground stress induced by artificial ground freezing and proximal development have resulted in unplanned rehabilitation which has resulted in localized production interruptions. Rehabilitation induced production interruptions of a moderate nature are factored into the overall production plan, however, there is a risk that more extensive work or drift abandonment due to excessive deterioration could occur. This could potentially result in production deferral and potentially a partial loss of mineral reserves.

Raisebore drill chambers are planned to be developed through the Zone 4 clay zone using mass ground freezing. Although mass freezing has been previously used for production mining, this will be the first time that the site has used mass freezing specifically for mine development. The site believes the mine design and schedules are sufficiently conservative to address reasonably unforeseen conditions; however, there remains a risk that schedules cannot be executed on schedule, or that mine designs cannot be fully implemented. This could potentially result in production deferral and potentially a partial loss of mineral reserves.

16 Mining methods

This section describes the technical aspects of the underground mine, including hydrogeology, radiological and geological conditions and controls, mine development, ground freezing, mine equipment, mining methods and forecast production rates.

16.1 Mine conditions and controls

The McArthur River deposit presents unique challenges that are not typical of traditional hard or soft rock mines. These challenges are the result of mining in or near high pressure ground water in challenging ground conditions with significant radiation hazards due to the high-grade uranium mineralization.

Mining methods are selected on their ability to mitigate risks associated with high pressure water, radiation hazards and challenging ground conditions. Mine designs are coordinated through the site's mine engineering department. When required, third party technical experts are included in the design process. In general, designs are conservative in order to protect the high value deposit and to avoid a serious to catastrophic water inflow event.

All new development areas, new production areas and new mining methods undergo internal technical review and approval. These reviews are carried out to determine the level of risk associated with the planned work and if the controls identified are sufficient to mitigate that risk. In addition to the internal review and approval process, external CNSC regulatory review and acceptance is also required as per the site's Uranium Mine Facility Operating Licence.

Standard controls utilized at McArthur River for managing hydrological, radiological and geotechnical risks are described below.

Hydrological conditions and controls

All the mineralized areas discovered to date at McArthur River are in or partially in water-bearing ground with pressures ranging from 680 to 850 psi. Hydrological conditions can be divided into two regions:

Water-bearing: The water-bearing region consists of all the rock units above the unconformity contact (conglomerate and sandstone). Drawdown testing has demonstrated that the fracture patterns, along with water-bearing joints and bedding planes, are directly connected to the surface groundwater table. The sandstone and conglomerate itself, however, is not porous.

Water flow rates through the fractures and joints will vary, but typically the highest conductive pathways are associated with the P2 fault as the brittle, flat lying sandstone has been well fractured by the tectonic forces of the reverse fault.

Basement: The basement consists of all the rock units below the unconformity contact (biotite gneiss, cordierite gneiss, quartzite plus some minor units). The basement units are typically dry, but can contain open water pathways to the sandstone. These pathways typically consist of faults, fractures, joints and unsecured drillholes. The risk of intersecting water pathways increases with the proximity to the unconformity contact.

In order to reduce the inherent risk of an inflow, the high pressure water sources are isolated from active development and production areas. To date, McArthur River has relied on pressure grouting and ground freezing to successfully mitigate the risks of the high pressure groundwater.

Radiological conditions and controls

Gamma radiation, radon gas, radon progeny and long-lived radioactive dust (LLRD) hazards are all present at McArthur River. The degree of radiological risk and controls required is a function of location. The McArthur River deposit can be divided into three radiological regions:

Massive Mineralization: The massive mineralized region consists of known ore zones and areas of continuous mineralization. The ore regions are well identified ahead of development and typically consist of massive pitchblende and coffinite. Grades are typically greater than 10% U_3O_8 but can be greater than 80% U_3O_8 in localized areas.

Transition Mineralization: The transition areas consist of the ground that surrounds the orebody and typically contains low levels of mineralization due to small ore stringers that offshoot from the main orebody. Due to the random nature of these ore stringers, it is often difficult to model and identify. Transitions can be sharp when moving east-west (on the mine grid), but highly variable when moving sub vertically along the P2 fault trend.

Non Mineralized: The non-mineralized region consists of all the rock units located sufficient distance away from the orebodies where no mineralized stringers are present.

Gamma, radon, radon progeny and LLRD hazards are all present in the mineralized areas. Gamma and LLRD hazards are not present in the non-mineralized areas. Typically, water intersected in non-mineralized areas does not contain significant amounts of radon unless proximal to the mineralization.

Controls must be in place in order to ensure that the regulatory requirements are met. Typical controls used at McArthur River include avoiding development in high-grade mineralization whenever possible and practical, shielding of gamma sources, direct exhaust ventilation, point source ventilation capture of radon gas sources, remote technology whenever possible and practical, ground freezing and pressure grouting to prevent entry of radon bearing water.

Geotechnical conditions and controls

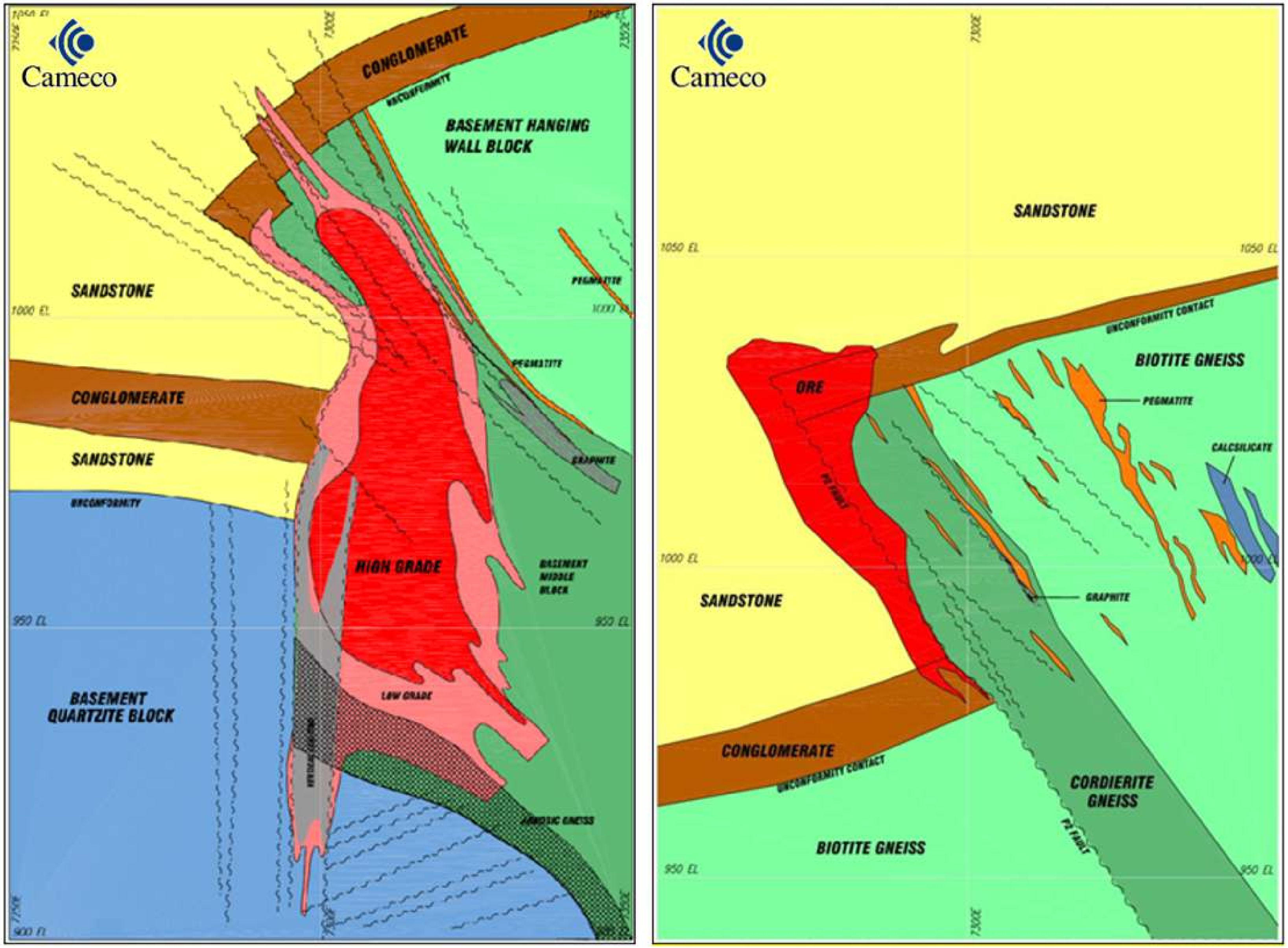
Ground conditions at McArthur River can be highly variable depending on location within the mine. Typically the rock mass is fair to excellent away from the P2 fault. Ground conditions near the P2 fault is typically poor to very poor due to alteration and fracturing (Table 16-1). Typical geological cross-sections are shown in Figure 16-1.

Stable openings must be maintained at McArthur River for both the safety of the underground workers and to prevent ground failures that may lead to an uncontrolled water inflow. Typical techniques employed at McArthur River include locating the openings in as stable ground as practical, limiting the size of the opening, excavation control such as perimeter control blasting or mechanical excavation, installation of ground support in a timely manner, conservative ground support design and tight filling of mined out areas.

Table 16-1: Rock Geotechnical Classification

Unit Name	Rock Quality	Compressive Strength (MPa)
Sandstone	good to excellent	50-230
Sandstone, altered	poor to extremely poor	<30
Ore zone	fair to extremely poor	highly variable
Cordierite Pyretic Gneiss (CPG)	good	40-130
Cordierite Pyretic Gneiss (CPG), altered	fair to poor	<40
Biotite Pyretic Gneiss (BPG)	good	40-120
Biotite Pyretic Gneiss (BPG), altered	fair to poor	<40
Graphite	very poor	<5
Pegmatite	good	80-130
Conglomerate	fair to good	30-180
Conglomerate, altered	fair to extremely poor	<30
Quartzite	good to excellent	50-280

Figure 16-1: Typical Geological Cross-Section of Zone 2 & Zone 4 (Looking Mine Grid North)



16.2 Mine development

Development at McArthur River is classified into three categories: low, medium, and high-risk development based on hydrological, geotechnical and radiological risks.

Low and medium risk development accounts for the majority of development while high risk development accounts for less than 5% of the overall mine development. High risk development is typically associated with development through the P2 fault or near the unconformity contact without freeze protection.

Probe and grout covers are maintained ahead of the development face to gather geological, geotechnical, hydrological and radiological information and to pressure grout off water-bearing structures. Formal probe and grout reviews are jointly carried out by the site's mine engineering and geology departments prior to advancing development.

Estimated required development by year following mine restart is shown in Figure 16-2. The development estimate includes all development required to mine the current mineral reserves, development required to access and drill known exploration targets, and development for underground support infrastructure.

Drift dimensions vary depending on the location and end use. Normal travel ways are excavated as a 5 m x 5 m drift with an arched back. Standard ground support consists of 2.4 m #7 rebar bolts on a 1.2 m x 1.2 m pattern and 6 gauge welded wire mesh screen. Worker entry under unsupported ground is not permitted.

Standard ground support is generally sufficient for all development classed as low risk. Ground support for medium and high-risk development plus intersections and large spans are assessed individually and the appropriate level of support installed.

Completed and planned development is maintained in three-dimensional mine design software, which is integrated with the geological model and drillhole database. Figure 16-3 shows the general locations of planned future development.

Figure 16-2: Annual Mine Development Summary

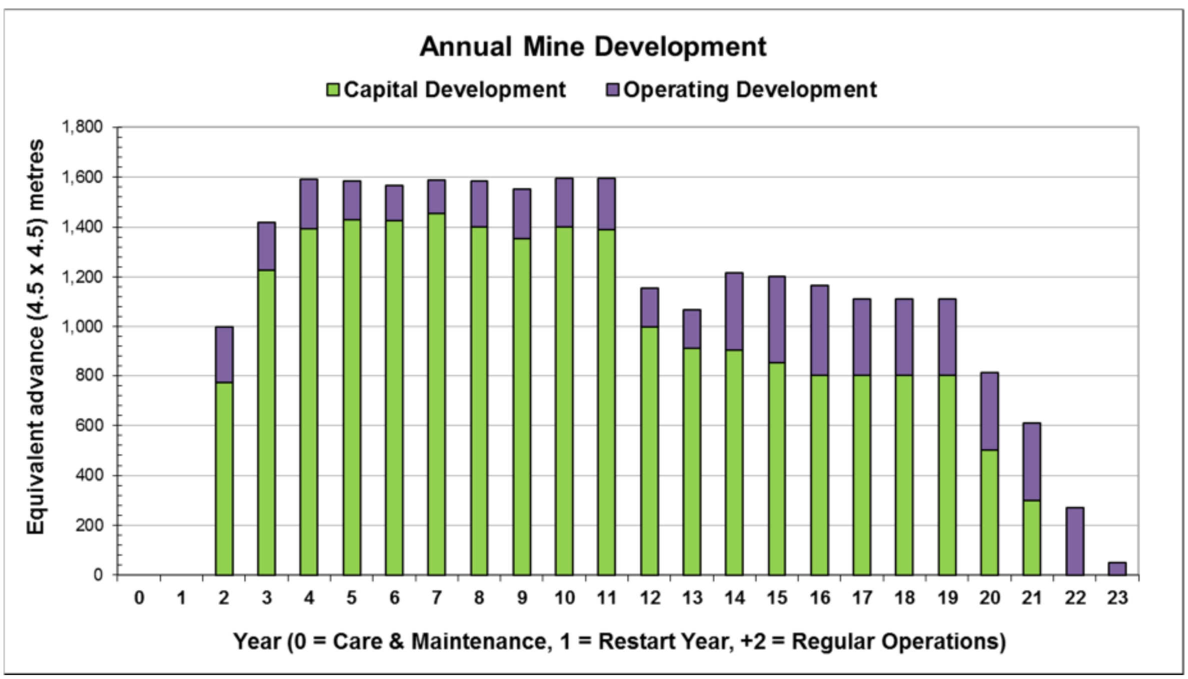
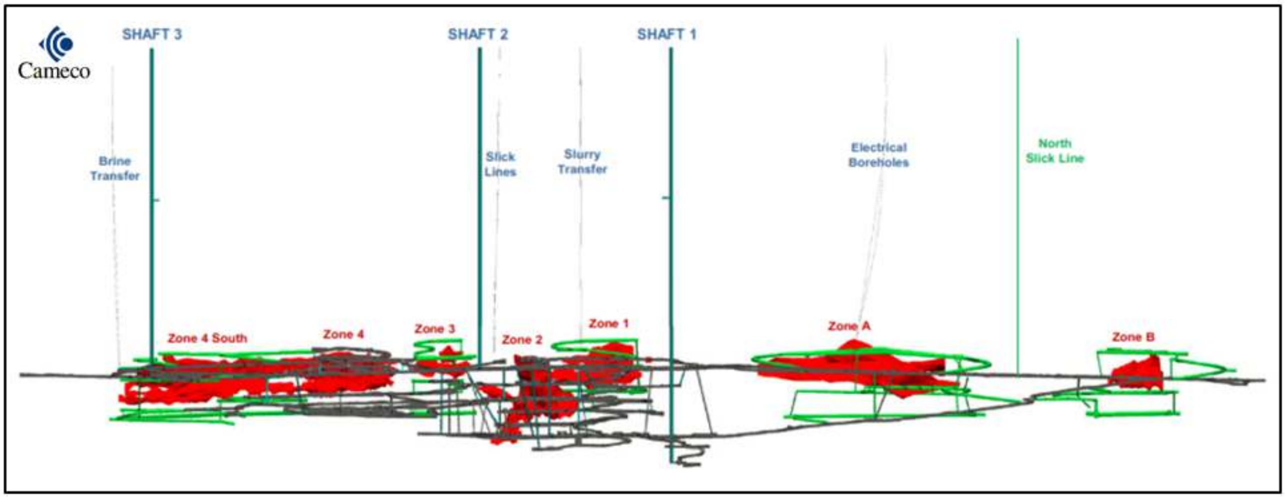


Figure 16-3: Future Mine Development



Notes:

(1) Only zones with mineral reserves shown.

(2) Future development shown in green.

(3) As of December 31, 2018.

16.3 Ground freezing

Ground freezing is used at McArthur River as a means to prevent or restrict high pressure ground water from entering the mine. To date, it has been used to isolate production zones, assist with isolating previous inflow areas and for development freeze coverage. Typical freeze barriers used to date at McArthur River consists of freeze walls, mass freezing, and freeze shields.

Freeze wall

A freeze wall (or shell) is a region of frozen ground that completely isolates a region of the underground workings or extraction areas from water-bearing ground. Ground within the freeze wall is distinguished by the lack of water re-charge once drained and by static water pressure significantly below the water-bearing ground outside the freeze wall. In order to achieve this, the freeze shell is made of interlocking freeze walls and is anchored into non water-bearing basement rock. Figure 16-5 shows a typical freeze wall schematic. For clarity, the end walls are not shown.

Freeze walls currently exist in the Zone 2 and Zone 4 areas. Freezehole drilling in Zone 1 is 90% complete. Freeze walls are planned for all the remaining undeveloped mine areas.

Mass freezing

Mass freezing is a method of bulk freezing the entire mining area, prior to the start of mining. Mass freezing is typically considered suitable for areas where the rock mass is exceptionally weak and at risk of uncontrolled cave-ins without strengthening by ground freezing. In order to successfully mass freeze an area, parallel freeze rings must be drilled close enough to allow the ground freezing to connect between rings. Mining extraction or development would take place between freeze rings.

Mass freezing was utilized as part of the boxhole test program and is intended to be utilized for mining the Zone 4 clay area. This is a localized massive clay area located over a 44 metre strike length in the upper centre of Zone 4.

Freeze shield

A freeze shield is a region of frozen ground that does not completely isolate a region from water-bearing ground. This type of freeze structure is typically used where simply impeding the flow of water through a water-bearing structure is sufficient.

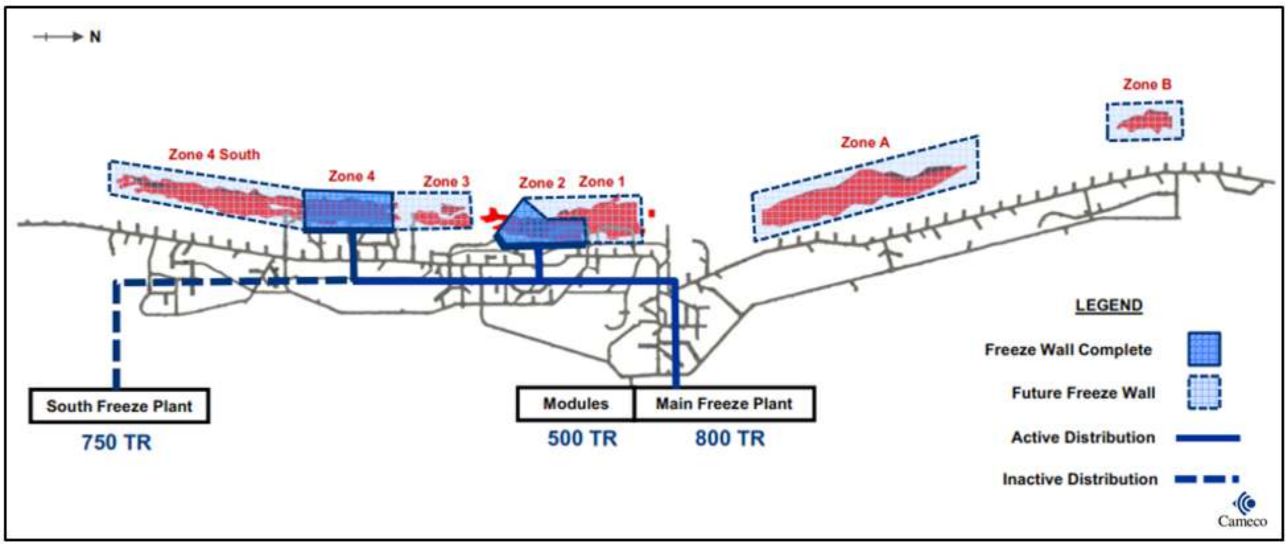
A freeze shield was used to successfully establish to the 530-7300E Zone 4 freeze drift where water conductive sub-faulting was known to pass closely to the planned excavation.

Future ground freezing

Ground freezing will remain the primary method for isolating the water-bearing ground from the production areas. All future mining areas will utilize freeze walls anchored into the basement rock similar to the current Zone 2 and Zone 4 mine areas. Figure 16-4 shows the areas which are either currently or planned in the future to use ground freezing.

It is currently assumed that the freeze walls remain in place for the life of the mine with only the inner connecting freeze walls being taken off-line. This assumption was made due to inflow risk and the cost to mitigate the risk associated of fully decommissioning a freeze wall.

Figure 16-4: 530m Level Plan View with Sketch of Current and Future Freeze Areas



Notes:

(1) North arrow indicates mine grid North.

(2) Only zones with mineral reserves shown.

(3) As of December 31, 2018.

16.4 Mining methods

At McArthur River, there are three approved mining methods: raisebore mining, blasthole stope mining, and boxhole mining, which have been used for mining approximately 327 million pounds U_3O_8 since production start-up in 1999. Of these, approximately 287 million pounds were produced with raisebore mining, 37 million pounds were mined with blasthole mining and remainder from mine development and boxhole mining.

Raisebore mining

Raisebore mining is suitable for massive high-grade zones where there is access both above and below the ore zone. The raise opening created by mechanical cutting has proven to be very stable making this method favourable for mining the weaker rock mass areas of the deposit. In addition, holes can be drilled accurately over long distances when compared to traditional production drilling, eliminating the need for sublevel access.

A raisebore chamber is typically developed in waste above the ore zone and an extraction chamber is typically developed in waste below the ore zone. A raisebore drill is set up in the raisebore chamber and a standpipe is installed. A pilot hole is then drilled to breakthrough into the lower extraction chamber. All cuttings from pilot drilling are contained and piped away to avoid radiation contamination of the work area.

Once breakthrough occurs, the reamer is installed and the face is “sumped in” (establish a flat face in the back perpendicular to the drill string). Reaming continues through waste and into the ore. Raisebore cuttings are mucked remotely as required. All cuttings from production raises are scanned for ore grade estimates and delivered to the appropriate dump locations.

Reaming stops at the upper ore contact below the raisebore chamber. The reamer is lowered to the brow of the open hole and final muck cleanup of the chamber is carried out. The reamer is then lowered to the sill and the backfill gantry is installed for head cover protection. The chamber and reamer are washed down and then the reamer and rods are removed. Once all the rods are out, the raisebore is moved to the next scheduled production raise.

Once the rods are removed, backfilling can begin. This is done in three stages (plug, second and final) using concrete as backfill material. The bottom of the raise is sealed with a backfill gantry and the initial plug pour is placed from the bottom of the raise using a portable concrete pump. After the first pour has set, the second pour is placed from the raisebore chamber through the pilot collar.

After the second pour is set, the plug is bolted for ground stability purposes. The final pour is then completed from the raisebore chamber through the pilot hole.

Production raises are designed to overlap each other in order to maximize recovery of the high-grade ore at the expense of an average cement dilution of approximately 17%. Recoveries are typically 97.5% with a small amount of the ore lost in the cusps between the circular raises.

Figure 16-5 shows a typical raisebore mine design in combination with a blasthole stope.

Cameco’s plan is to continue to use raisebore mining as one of the main extraction methods over the mine life, specifically for the creation of slots for blasthole stoping, for mining the Zone 4 clay area and for mining the more massive vertical ore areas of Zone B.

Blasthole stope mining

After successfully completing six test stopes in ore, blasthole stoping was approved by the CNSC as an extraction method in November 2013. Since approval, the use of this method has expanded to the point where the majority of the ore is now extracted using this method. Up to the end of 2017, 70 stopes have been successfully mined.

Blasthole stoping is planned in areas where blastholes can be accurately drilled and small stable stopes excavated without jeopardizing freeze wall integrity. Blasthole stope mining has shown an advantage over raisebore mining on overall extraction efficiency by reducing underground development, concrete consumption, mineralized waste generation, and improving extraction cycle time. Use of this method has significantly reduced McArthur River’s overall operating costs.

Drill access is developed in waste above the ore and undercut mucking access is developed in waste below the ore. A raisebore slot is excavated and drillholes placed around the slot. Drill standpipes are used to contain drill cuttings to avoid radiation contamination of the work area. The drillholes are then blasted into the slot, typically as several small blasts. Blasting takes place in the ore zone only to minimize dilution. A waste cap is left at the top of the stope.

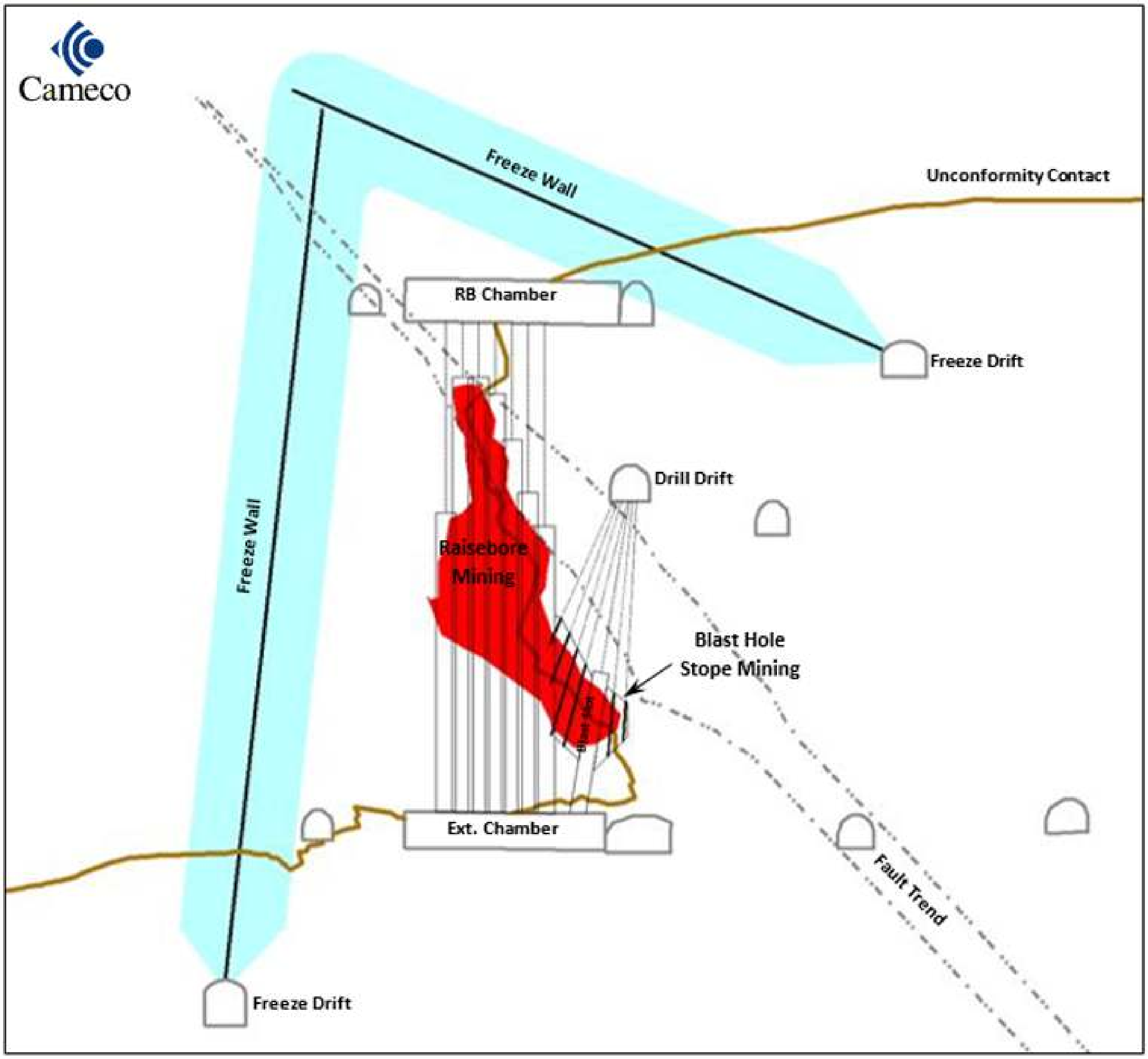
Blasted ore is remotely mucked from the raise draw point and scanned for ore grade estimates and delivered to the appropriate dump locations. Once blasting is complete, the stope is backfilled in the same manner as a production raisebore hole described above. Figure 16-5 shows a typical blasthole stope configuration.

Boxhole mining

After successfully completing six test raises, boxhole boring was approved by the CNSC as an extraction method in July 2013. A total of thirteen 1.5 metre and 2.1 metre diameter raises were completed and approximately 0.5 million pounds were extracted.

Originally, boxhole mining was planned for the some of the more challenging upper mining areas, but following the success in development of Zone 2 - Panel 5, mine designs were revised and boxhole mining was replaced with more productive and cost effective methods. In 2015, the boxhole program was discontinued. No further use of this mining method is planned.

Figure 16-5: Section Schematic looking North (Mine Grid) of Zone B showing Typical Freeze Wall and Ore Extraction Methods



16.5 Mining equipment

McArthur River currently owns all of its mine equipment with the exception of diamond drills and the low-grade mineralization trucking fleet which is contracted as required. Table 16-2 and Table 16-3 summarizes the main mobile equipment used on site.

Mine development utilizes standard development equipment consisting of 2-boom jumbos and mechanized scissor deck rock bolters. An AM75 roadheader is utilized when mechanical excavation is required. Blasted development rock is typically handled with 6-yard scoops. Wet shotcrete is batched on surface and mixed in cement mix trucks and then delivered to the underground using slicklines. The shotcrete is delivered to the active development face using transmixers and applied using mechanized shotcrete sprayers.

Freeze drilling is done with Cubex drills modified for the conditions encountered at McArthur River. The Cubex freeze drills can be used for either freeze or production drilling purposes.

For production raisebore mining and for the creation of slot raises for blasthole stope mining, McArthur River uses a fleet of 53R raisebore drills. These drills are set-up to ream up to a 3 metre diameter raise. Blasthole stope drilling is done with Cubex drills (either long hole or freeze drills). Ore is typically handled with 8-yard scoops.

For backfilling, concrete is batched on surface and mixed in cement trucks and then delivered to the underground using slicklines. For mass pouring of concrete, concrete is typically pumped using a fixed concrete pump from the slickline to the backfill area. Concrete for raisebore plugs or areas too far away to be pumped, is transported using transmixers and pumped locally using a portable concrete pump.

In addition to the main mining equipment, the site has other surface and underground support equipment such as scissor lifts, loaders, graders, haul trucks, fork lifts, water trucks, vacuum trucks and personnel carriers.

Table 16-2: McArthur River Main Underground Mobile Equipment

Main Underground Mobile Equipment	Number of Units
Scoops (8yd, 6yd and 4yd)	9
Mechanized Bolters	2
Two Boom Jumbo Drills	2
Cubex Long Hole Drills	2
Cubex Freeze Drills	4
Raisebore Drills	8
Transmixers	2
Shotcrete Sprayers	2
Concrete Pumps (portable and fixed)	5
AM75 Alpine Miner	1

Table 16-3: McArthur River Main Surface Mobile Equipment

Main Surface Mobile Equipment	Number of Units
Cement Trucks	4
Graders	2
Loaders	3
Dozers	2
Haul Trucks	2

16.6 Production plan

McArthur River currently has sufficient mineral reserves to permit mining for 23 years. Although McArthur River and Key Lake have licence permits for 25 million pounds U_3O_8 production per year, the production profile assumes the following:

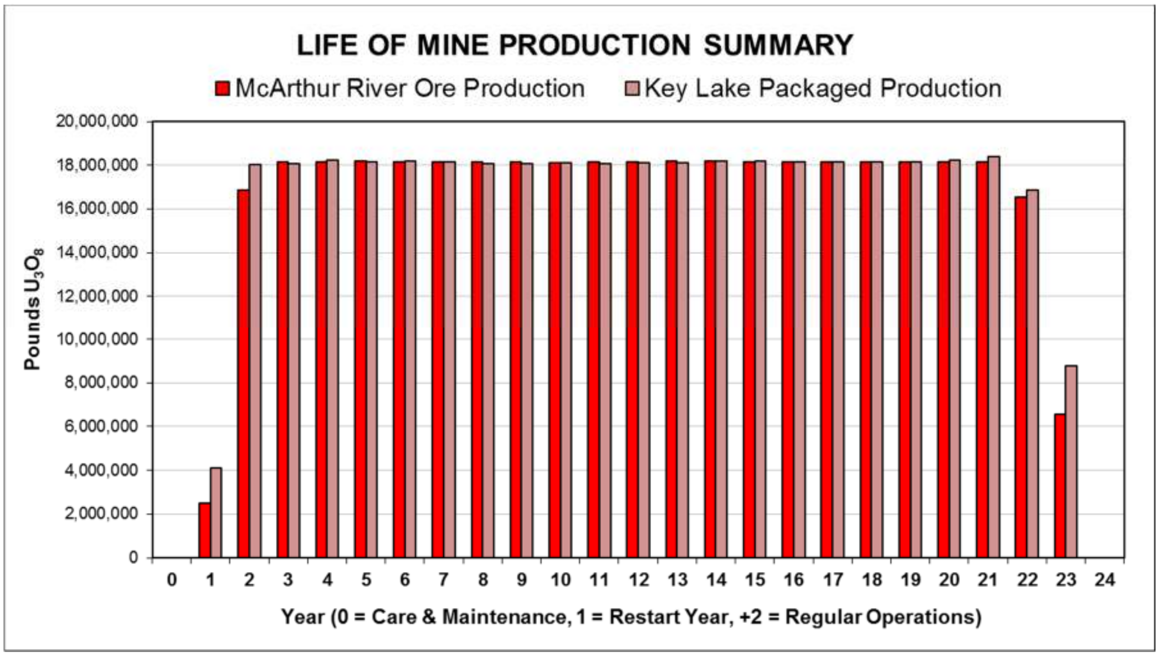
- In the year of restart, 4 million pounds of packaged production; and
- For subsequent years, 18 million pounds of packaged production per year until year 21 with production ramping down in the last two years.

The mine and mill forecast production rates for McArthur River and Key Lake Operations are shown in Figure 16-6,Table 16-4 and Table 16-5.

Mill production at Key Lake will closely follow mine production for the life of mine. Differences in a given production year between mine and mill production will occur due to the addition of mineralized material stockpiled at both McArthur River and Key Lake. Initial mill feed for the Key Lake restart will come from the high-grade broken inventory (4.2 million pounds at a grade of 17% U_3O_8) stored underground at McArthur River.

No production is currently planned in 2019. Due to the suspension of production for an indeterminate duration, no actual production start-up date is currently available. Year 1 represents the first year of assumed production after restart is announced and could potentially occur any time after 2019.

Figure 16-6: Annual Mine and Mill Production Schedule



Notes:

(1) High-grade broken inventory stored underground at McArthur River is 4.2 million lbs at a grade of 17% U_3O_8.

(2) Low-grade broken inventory stored on surface at McArthur River is 0.1 million lbs at a grade of 0.33% U_3O_8.

(3) Low-grade broken inventory stored on surface at Key Lake is 1.3 million lbs at a grade of 0.14% U_3O_8.

Table 16-4: McArthur River Mine Annual Production Forecast

	YEAR	1	2	3	4	5	6	7	8	9	10	11	12
Mined Ore	tonnes	12,000	79,000	72,000	60,000	69,000	72,000	74,000	99,000	110,000	113,000	120,000	123,000
	lbs U_3O_8 x 1M	2.5	16.8	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
	grade (% U_3O_8)	9.16%	9.69%	11.35%	13.64%	11.89%	11.44%	11.17%	8.26%	7.50%	7.25%	6.83%	6.70%

	YEAR	13	14	15	16	17	18	19	20	21	22	23	Total
Mined Ore	tonnes	122,000	115,000	120,000	110,000	103,000	103,000	103,000	103,000	103,000	96,000	53,000	**2,133,000**
	lbs U_3O_8 x 1M	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	16.5	6.6	**386.3**
	grade (% U_3O_8)	6.73%	7.17%	6.85%	7.44%	8.00%	8.00%	8.00%	8.00%	8.00%	7.76%	5.58%	**8.21%**

Notes:

(1) Mine production includes all unmined proven and probable ore reserves; broken ore inventory of 439,600 tonnes at a grade of 0.58% U_3O_8 not included.

(2) Mine production does not include expected mineralized development waste (459,000 tonnes at a grade of 0.12% U_3O_8).

Table 16-5: Key Lake Mill Annual Production Forecast

	YEAR	1	2	3	4	5	6	7	8	9	10	11	12
McArthur River	tonnes	27,000	110,000	90,000	96,000	89,000	104,000	91,000	120,000	134,000	135,000	128,000	131,000
	lbs U_3O_8 x 1M	4.0	18.0	18.1	18.2	18.1	18.2	18.2	18.1	18.1	18.1	18.1	18.1
	grade (% U_3O_8)	6.69%	7.42%	9.08%	8.61%	9.19%	7.93%	9.00%	6.81%	6.14%	6.09%	6.42%	6.28%
Blend	tonnes	7,000	55,000	62,000	58,000	63,000	49,000	61,000	64,000	50,000	50,000	57,000	54,000
	lbs U_3O_8 x 1M	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	grade (% U_3O_8)	0.66%	0.15%	0.15%	0.16%	0.15%	0.17%	0.15%	0.14%	0.15%	0.15%	0.14%	0.15%
Total Mill Feed	tonnes	35,000	165,000	152,000	154,000	153,000	153,000	152,000	184,000	184,000	185,000	185,000	184,000
	lbs U_3O_8 x 1M	4.1	18.2	18.3	18.4	18.4	18.4	18.3	18.3	18.3	18.3	18.3	18.3
	grade (% U_3O_8)	5.41%	5.00%	5.43%	5.44%	5.45%	5.45%	5.46%	4.50%	4.50%	4.49%	4.49%	4.50%
Packaged	lbs U_3O_8 x 1M	**4.1**	**18.0**	**18.1**	**18.2**	**18.1**	**18.2**	**18.2**	**18.1**	**18.1**	**18.1**	**18.1**	**18.1**

	YEAR	13	14	15	16	17	18	19	20	21	22	23	Total
McArthur River	tonnes	122,000	117,000	127,000	110,000	107,000	107,000	107,000	114,000	136,000	144,000	127,000	**2,572,000**
	lbs U_3O_8 x 1M	18.1	18.2	18.2	18.1	18.1	18.1	18.2	18.2	18.5	16.9	8.1	**391.9**
	grade (% U_3O_8)	6.74%	7.07%	6.51%	7.47%	7.70%	7.70%	7.71%	7.25%	6.16%	5.32%	2.88%	**6.91%**
Blend	tonnes	63,000	69,000	58,000	56,000	60,000	60,000	60,000	56,000	17,000	11,000	61,000	**1,200,000**
	lbs U_3O_8 x 1M	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.8	**4.8**
	grade (% U_3O_8)	0.15%	0.14%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%	0.36%	0.53%	0.59%	**0.18%**
Total Mill Feed	tonnes	184,000	186,000	185,000	167,000	166,000	166,000	167,000	170,000	153,000	155,000	188,000	**3,772,000**
	lbs U_3O_8 x 1M	18.3	18.4	18.4	18.3	18.3	18.3	18.3	18.4	18.6	17.0	8.9	**396.7**
	grade (% U_3O_8)	4.50%	4.49%	4.50%	4.99%	5.00%	5.00%	5.00%	4.92%	5.50%	5.00%	2.14%	**4.77%**
Packaged	lbs U_3O_8 x 1M	**18.1**	**18.2**	**18.2**	**18.2**	**18.1**	**18.2**	**18.2**	**18.2**	**18.4**	**16.9**	**8.8**	**392.7**

Notes:

(1) The mill plan assumes all McArthur River ore is processed at Key Lake. Numbers may not add due to rounding.

(2) McArthur River ore feed includes all current known mineral reserves (unmined plus current broken inventory).

(3) Blend material includes Key Lake low-grade mineralization remaining from the Deilmann and Gaertner pits, expected McArthur River mineralized development waste plus recycle product from Blind River and Port Hope facilities.

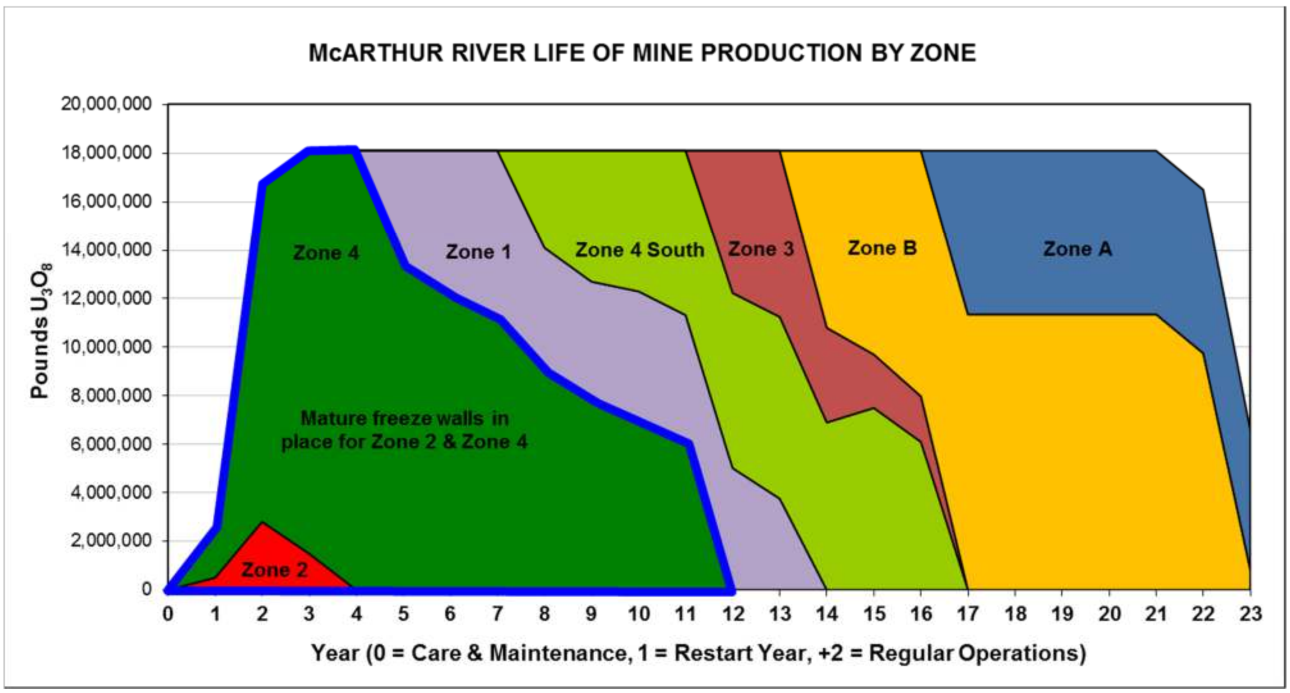
16.7 Transition into new mining zones

In order to successfully meet the planned production in the life of mine schedule, Cameco must continue to successfully transition into new mine areas. The main steps required to transition a mine area into production are the following:

- exploration infill drilling
- detailed mine design
- freeze drift development
- freeze drilling
- brine distribution construction and freezehole hook-up
- ground freezing
- drill and extraction chamber development

Figure 16-7 shows a summary of the life of mine production schedule by mine area. Each mine area identified by colour represents a freeze wall expansion that isolates a zone from the water-bearing sandstone in order to permit production mining to proceed. It typically takes five years or more to transition a mine area into production from the start of the freeze drift development stage. Mature freeze walls are currently in place for Zones 2 and 4.

Figure 16-7: Life of Mine Annual Production Schedule by Zone



Note:
(1) Blue outlined area represents zones currently secured behind freeze walls.

Below is a brief description of the status of the planned mining areas and extraction method:

Zone 2

Zone 2 has been actively mined since production began in 1999. The ore zone was initially divided into three freeze panels and as the freeze wall was expanded, the inner connecting freeze walls were decommissioned in order to recover the inaccessible uranium around the active freeze pipes. Mining of Zone 2 is near completion with 4.8 million pounds of mineral reserves remaining secured behind freeze walls. The remaining reserves will be recovered with a combination of raisebore and blasthole stope mining.

Zone 4

Zone 4 has been actively mined since 2010. Similar to Zone 2, the zone was divided into four freeze panels and as the freeze wall was expanded, the inner connecting freeze walls were decommissioned. Zone 4 has 117.5 million pounds of mineral reserves secured behind freeze walls and it will be the main source of production when mining restarts. Raisebore mining in combination with mass freezing will be utilized in the Zone 4 clay area while the remaining areas will be primarily mined using blasthole stope mining.

Zone 1

Zone 1 is the next planned area to be brought into production. Freezehole drilling was 90% complete and brine distribution construction was approximately 10% complete when work was suspended in 2018 as part of the production suspension. Work remaining before production can begin includes completion of freezehole drilling, completion of brine distribution, ground freezing, and drill and extraction chamber development. Once complete, an additional 46.6 million pounds of mineral reserves will be secured behind freeze walls. Blasthole stope mining is currently planned as the main extraction method.

Zone 4 South

Zone 4 South is an extension of Zone 4; however, average grades are approximately three times lower. Forty percent of the freeze drift development was completed when development was suspended due to the mine shutdown. Minor infill exploration drilling remains to be completed. Zone 4 South has a mineral reserve of 57.2 million pounds and is sequenced for mining after Zone 1. Blasthole stope mining is currently planned as the main extraction method.

Zone 3

Zone 3 has a mineral reserve of 20.7 million pounds and is sequenced for mining after Zone 4 South. Minor infill exploration drilling remains to be completed. Blasthole stope mining is currently planned as the main extraction method.

Zone B

Zone B has a mineral reserve of 93.1 million pounds and is sequenced for mining after Zone 3. Underground exploration access is complete and infill exploration drilling is near completion. The zone’s northern boundary is narrowing out but remains to be closed off. Zone B is planned to be extracted mainly using raisebore mining (85%), while drill and blast stope mining is planned for the fringe areas of the zone.

Zone A

Zone A has a mineral reserve of 46.3 million pounds and is sequenced for mining after Zone B. Underground exploration access for Zone A is complete. The zone has been drilled off on 30 metre ring spacing and a 10 metre hole spacing. Infill drilling to a 10m x 10m pattern remains. The Zone A is planned to be mined with blasthole stope mining.

17 Recovery methods

17.1 Overview

The McArthur River mine and ore processing facilities are licensed to produce up to 25 million pounds U_3O_8 annually and were designed for the McArthur River orebody. McArthur River produces two product streams, high-grade slurry and low-grade mineralization, which both report to the Key Lake mill to produce calcined uranium ore concentrate.

High-grade ore is slurried, ground, and thickened underground at McArthur River. The resulting slurry is pumped to surface and, after blending and further thickening, is transported to Key Lake in slurry trucks.

Low-grade mineralization is hoisted to surface and stored on the low-grade mineralization pads. This material is then hauled to the Key Lake low-grade mineralization blend pads.

Historically high-grade ore and low-grade mineralization was split at a grade of 2.0% U_3O_8. At production restart, regulatory approval has been granted to split at a grade of 3.0% U_3O_8.

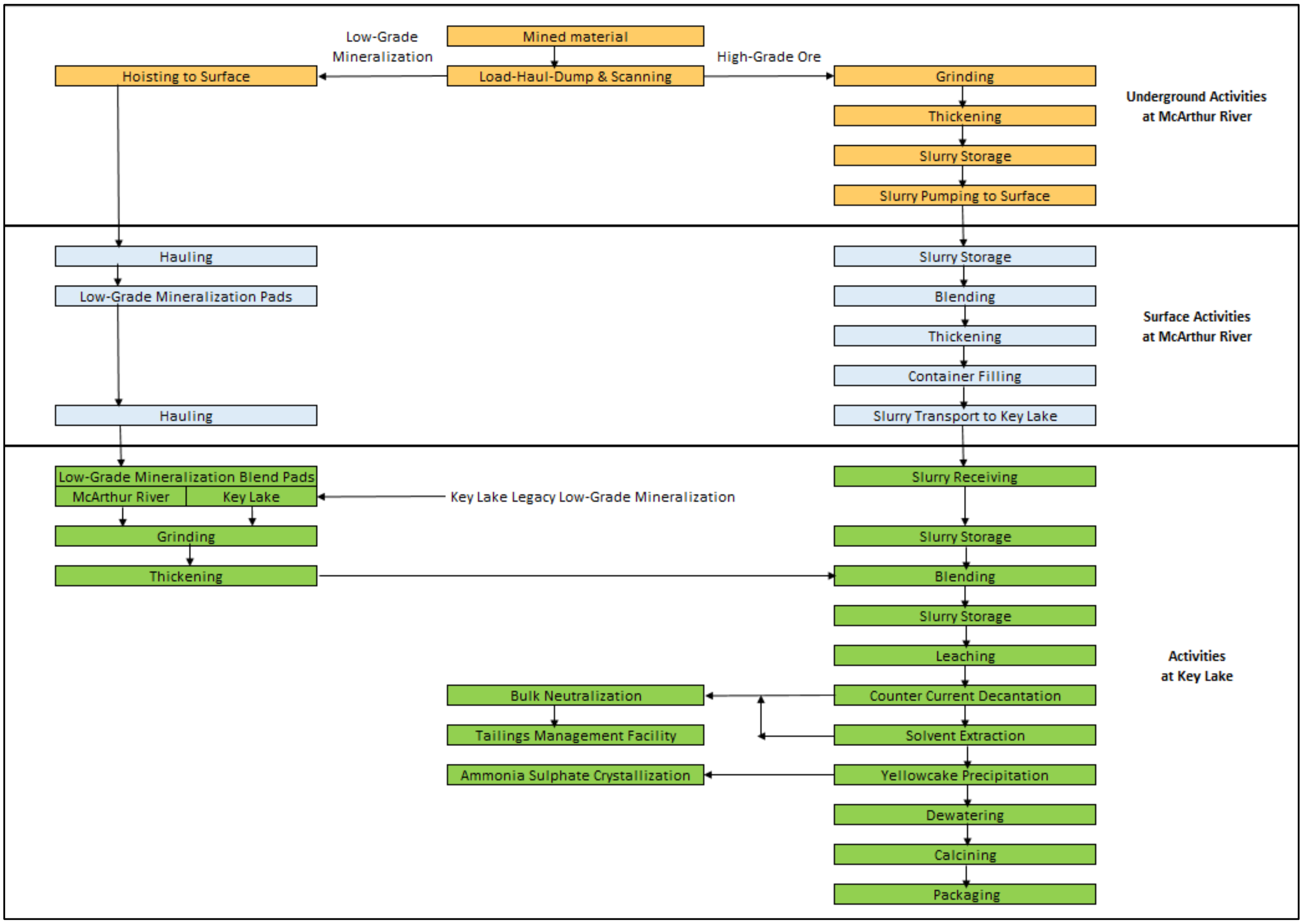
McArthur River low-grade mineralization, including legacy low-grade mineralized waste stored at Key Lake, is slurried, ground and thickened at Key Lake and then blended with the McArthur River high-grade slurry to a nominal 5% U_3O_8 mill feed grade. All remaining uranium processing (leaching through to calcined uranium ore concentrate packaging) and tailings disposal also occur at Key Lake.

Processing at Key Lake was initiated in 1983 on ore averaging 2.0% to 3.0% U_3O_8 mined initially from the Gaertner open pit and later from the adjacent Deilmann open pit. Mill tailings were initially disposed of in a purpose-built above ground tailing management facility. Following completion of mining in the eastern portion of the Deilmann pit in 1995, deposition of tailings in the Deilmann pit was commissioned in 1996. In 1999 the first high-grade McArthur River was delivered to Key Lake following construction of the ore slurry receiving plant and improvements to the calcining and ammonium sulphate plants.

Since 1999, a number of infrastructure upgrades have been completed to address capacity constraints and improve environmental performance at the Key Lake mill. These include upgrading of circuits, the replacement of the acid, steam and oxygen plants, replacing the main electrical substation and commissioning of the molybdenum and selenium removal circuits. The current production capacity is sufficient to process McArthur River mineral reserves at a production rate of 18 million pounds U_3O_8 per year. The Key Lake mill is licensed to produce up to 25 million pounds U_3O_8 per year.

A high level block flowsheet for the McArthur River ore is shown in Figure 17-1.

Figure 17-1: McArthur River Ore – Block Flowsheet



17.2 McArthur River handling and processing of mineralized material

Mined material is scanned and transported in load-haul-dump vehicles and depending on grade and production requirements fed directly to the underground grinding circuit, stockpiled underground in coarse ore storage or hoisted to surface.

Low-grade mineralization is transferred by load-haul-dump vehicles to a loading pocket at the base of Shaft 1. A rock breaker mounted over a storage bin is used to break the oversize material until it passes through the grizzly screen. The grizzly undersize is hoisted to surface and hauled to low-grade mineralization pads. This ore is then hauled to the Key Lake low-grade mineralization blend pads.

The high-grade ore is transferred by load-haul-dump vehicles to another grizzly covered hopper. A rock breaker mounted over the hopper is used to break the oversize material until it passes through the grizzly screen. Grizzly undersize material is then fed by belt conveyor to the semi-autogenous (SAG) mill.

The grinding circuit consists of a 4.6 metre long by 2.9 metre diameter SAG mill in closed circuit with hydrocyclones and a safety screen. The mill discharges through grates onto a blind trommel which removes tramp metal via a magnet. The trommel discharge is pumped to the hydrocyclones and the hydrocyclone underflow is returned to the SAG mill for further grinding.

Hydrocyclone overflow is pumped to the safety screen and the screen undersize is thickened in a 13 metre diameter thickener. The thickener underflow is pumped to and stored in the underground ore slurry storage tank before being pumped to surface. Safety screen oversize is returned to the SAG mill for further grinding while the thickener overflow is stored in a dam before being pumped to the surface ore loadout thickener.

Contaminated water from collection points throughout the mine as well as drill cuttings are pumped to two underground overflow-type surge tanks where the settled solids are intermittently re-slurried and transferred to the SAG mill by tank bottom-mounted solids recovery systems. The tank overflow is pumped to a second 13 metre diameter thickener for clarification and the thickener overflow is stored in a second dam before being pumped to surface for treatment. The thickener underflow is mixed with the ore slurry and pumped to surface.

The high-grade slurry, after pumping to surface, is stored in four air agitated pachuca storage tanks. Slurry discharged from the pachucas is blended to a maximum grade of 25% U_3O_8 in the ore mix tank. After excess water is removed from the blended ore slurry in the 15 metre diameter ore loadout thickener, the slurry is pumped into truck-mounted containers for shipment by road to Key Lake. Each truck train carries four 5 m^3 containers. Typically 12 to 20 truck loads are required daily to meet target production rates. The ore loadout thickener overflow is pumped to surface collection ponds prior to water treatment.

As much water as possible is re-used for mining and process activities. Excess water from both underground and surface is sent to surface collection ponds which act as surge capacity for the water treatment plant. The water treatment plant facilities include the primary/secondary water treatment plant and the contingency water treatment system. A total treatment capacity of up to 1,500 m^3/h is available, 750 m^3/h in the secondary treatment plant and 750 m^3/h in the contingency water system.

Primary water treatment features chemical treatment to control molybdenum, selenium, and arsenic while secondary water treatment includes chemical treatment to control uranium, radium and other metals. Flocculation and clarification are provided in a lamella thickener in primary water treatment and a conventional clarifier in secondary water treatment. Clarified water from the secondary thickener is polished in sand filters then the pH of the water is adjusted before reporting to the monitoring ponds. Precipitated solids from the water treatment process are dewatered in a filter press then transferred to the low-grade mineralization pads where they are mixed with low-grade mineralization and hauled to Key Lake.

Treated water is re-used where possible on surface and only excess water is released to the environment. The treated water is sampled and released to one of four monitoring ponds. If all federal and provincial regulations are met, the treated water is released to the environment. If not, the pond is recycled through the water treatment plant until the treated effluent becomes suitable for release.

The contingency water treatment system is designed to handle and treat inflow water that exceeds the treatment capacity of the secondary water treatment plant. It is a pond-based chemical precipitation contingency treatment system. This is a contingency system only and is tested on a yearly basis to ensure operational readiness.

17.3 Key Lake activities

High-grade ore slurry arriving at the Key Lake ore slurry receiving plant is unloaded from the truck mounted containers by a vacuum aspiration system and pumped to one of four large air agitated slurry storage pachucas.

McArthur River low-grade mineralization and legacy low-grade mineralized waste stored at Key Lake on the low-grade mineralization blend pads is delivered to the grinding circuit grizzly by loader. The grinding circuit consists of a SAG mill in open circuit with a sizing screen. The screen oversize reports to the ball mill in closed circuit with two sizing screens. The undersize from all three screens report to the neutral thickener. The neutral thickener overflow is combined with industrial water to be re-used throughout the circuit. As discussed in Section 13.3 the use of a silica coagulant has eliminated the need to operate the gravity concentrator circuit.

High-grade ore slurry is withdrawn from the ore storage pachucas and pumped to the blending tank where it is mixed with the neutral thickener underflow. The resulting slurry is pumped to one of three storage pachucas located in the leaching plant. Blending is necessary as the original Key Lake processing facilities were not designed from a radiation protection perspective to accommodate the high ore grades found at McArthur River. In addition to reducing the radiation exposure in the mill, the dilution of the high-grade ore serves two other purposes: recovery of uranium from the low-grade mineralized material; and final disposal of the low-grade mineralized waste.

The uranium is leached from the ore in the atmospheric leach pachuca and three continuous stirred tank reactors, while uranium-bearing solution is separated from waste solids in the counter current decantation (CCD) wash circuit. The high pressure autoclave secondary leaching circuit is on stand-by as the current ore is amenable to leaching at atmospheric pressure. Sulphuric acid, steam and oxygen are injected into the leach vessels to promote uranium extraction.

The CCD circuit consists of eight thickeners in series. The slurry flow is counter current to the wash water. The slurry moves from thickener one to thickener eight, while the wash water moves from thickener eight to one. The uranium-rich CCD overflow is pumped to the clarifier whilst the CCD underflow, with minimal residual uranium, is sent to the Deilmann tailings management facility.

In the solvent extraction plant, the clarified overflow pregnant solution is concentrated and purified by mixing with an organic solvent. The uranium transfers from the aqueous solution to the organic phase leaving behind most of the dissolved impurities. The organic solvent, loaded with uranium, is contacted with ammonium sulphate solution causing the uranium to transfer back to a highly concentrated aqueous phase known as loaded strip solution. A molybdenum removal circuit treats the loaded strip solution to remove molybdenum, an undesirable impurity in the final product.

Using ammonia, uranium is precipitated from the loaded strip solution in the precipitation tank as ammonium diuranate. The precipitate is dewatered in the yellowcake thickener followed by a centrifuge then calcined to U_3O_8 in a multi-hearth furnace. The final calcined uranium ore concentrate is packed in 200 litre drums for shipment to refineries around the world.

Excess ammonium sulphate is recovered from the yellowcake thickener overflow by evaporating the water and drying the resulting product, which is sold locally for use as a high purity fertilizer.

Contaminated water from the dewatering system associated with the depleted Gaertner and Deilmann open pits at Key Lake is treated in a reverse osmosis plant with the permeate used as industrial water.

Reject water from the reverse osmosis plant along with waste solvent extraction solution (raffinate) is sent to the bulk neutralization plant where the streams are neutralised with lime and other reagents are added to precipitate dissolved impurities. The resulting solids are combined with the CCD underflow and pumped to the Deilmann tailings management facility for final disposal. The treated water is sampled and released to one of four monitoring ponds. If all federal and provincial regulations are met, the treated water is released to the environment. If not, the pond is recycled through the bulk neutralization plant until the treated effluent becomes suitable for release.

The powerhouse/utilities/acid plant/oxygen plant complex provides acid, steam and oxygen for leaching and backup power as required.

Tailings management is discussed in more detail in Section 20.4.

18 Project infrastructure

At McArthur River, facilities and services for the mine site are well established. The site contains all the necessary services and facilities to operate a remote site and underground mine. The Key Lake site contains all the necessary services and facilities to operate a remote site and mill.

18.1 McArthur River surface infrastructure

The McArthur River mine site includes the following infrastructure:

- an airstrip and related facilities
- communication tower
- main camp and contractor trailers and recreation facilities
- sewage treatment lagoons
- potable water treatment plant
- landfill facility
- administration buildings
- water distribution systems including those for firefighting requirements
- water collection and treatment ponds
- waste water treatment facilities
- lined mineralized and waste storage pads
- shops and warehouses
- propane storage and distribution system
- concrete batch plant
- fuel storage
- freeze plants
- ore slurry load out facility
- core logging and storage facility
- electrical substations and distribution
- backup electrical generators

18.2 McArthur River shafts and service boreholes

The mine is accessed and serviced by three shafts and eight service boreholes from surface (see Figure 18-1).

Pollock Shaft (Shaft 1)

Shaft 1 is the main egress into the mine for both personnel and materials. It is a 680 metre deep, 5.5 metre diameter concrete lined shaft serviced by a single deck 28 person main cage, an auxiliary 6 person cage and an 8 ton skip. The shaft serves as a fresh air intake for the mine. Mine services feeding the underground through Shaft 1 consist of dewatering pipes, power cables, communication cables, brine lines, and a concrete slickline. The shaft connects to the 530, 640, 660 and 680 levels.

Shaft 2

Shaft 2 serves as the main ventilation exhaust for the mine. It is a 526 metre deep, 6.1 metre diameter concrete lined shaft. The shaft connects to the 530L only. All mine services and infrastructure inside the shaft (ladder escape way and abandoned slicklines) were removed in 2014 to improve the mine's ventilation flow.

Shaft 3

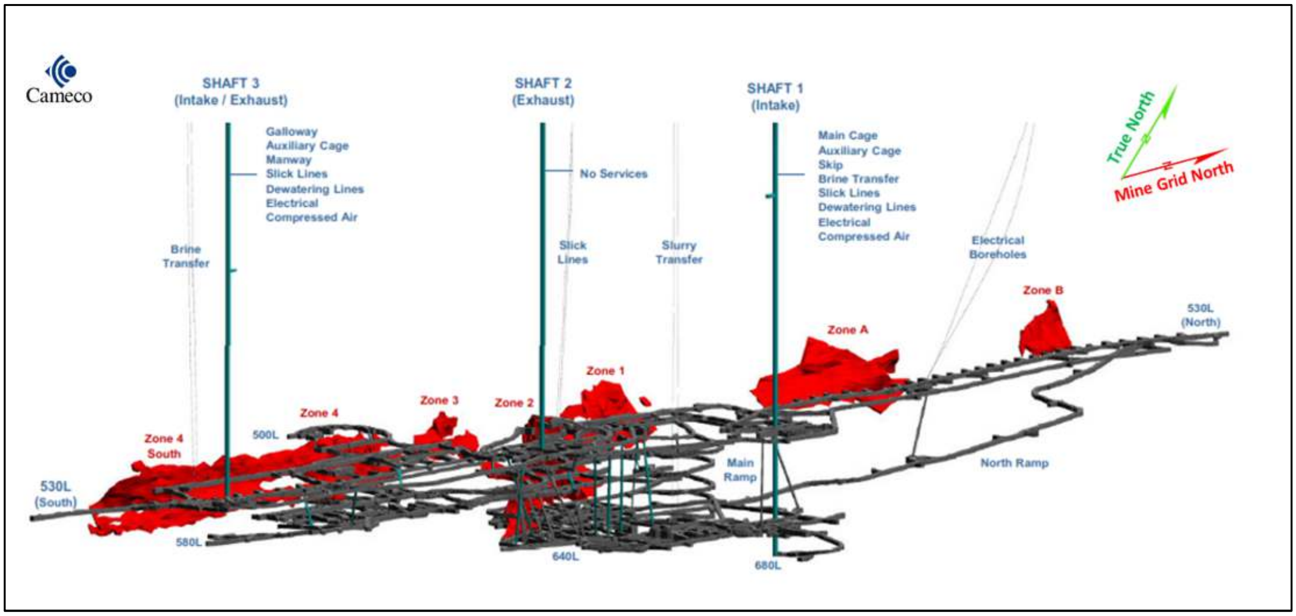
Shaft 3 is the emergency egress from the mine, with a conveyance and a ladder escape way. It is 530 metre deep and serves as both a fresh air intake and exhaust for the mine. It is a 6.0 metre diameter concrete lined shaft serviced by a six person auxiliary cage, a Galloway work platform and a material hoist. Mine services feeding the underground through Shaft 3 consist of the dewatering pipes, power cables, concrete slickline, and vent ducts.

Surface to Underground Boreholes

The underground mine is also serviced with the following boreholes:

- two high voltage electrical boreholes
- two high-grade slurry transfer boreholes
- two concrete transfer boreholes
- two brine transfer boreholes

Figure 18-1: Shaft & Mine Services from Surface (oblique view looking north-west)



Notes:

(1) Showing Zones with reported mineral reserves.

(2) As of December 31, 2018.

18.3 Underground mine infrastructure

The McArthur River mine has 12 levels which consist of two main levels (530 m level and 640 m level) and 10 sublevels. The main levels have full service cage access to Shaft 1 where personnel and materials can be moved into and out of the mine. The levels are connected by an internal ramp system which allows the mobile equipment to move throughout the mine. Figure 18-1 shows the general mine layout and current mineral reserve zones.

The underground infrastructure consists of all the necessary facilities to operate an underground mine which consists of the following infrastructure and facilities:

- refuge stations
- shops and workstations
- material storages
- ore and waste handling and storage systems

- underground communication systems
- compressed air distribution system
- heater exchangers and brine distribution systems
- mine water storage dams and distribution system
- water collection sumps and settling cones
- mine dewatering stations
- electrical substations and distribution
- auxiliary ventilation systems
- underground fuel bays
- underground explosives storage
- underground ore processing facility

18.4 Other site infrastructure

Mine Ventilation

The McArthur River mine is negatively ventilated by two 900 hp surface exhaust fans located at Shaft 2 and two 500 hp surface exhaust fans at Shaft 3. The current capacity of this system is approximately 519 m^3/s (1,100,000 cfm). When the mine is in production, normal operating demand is around 425 m^3/s (900,000 cfm).

Ventilation requirements for mining the currently reported mineral reserves at an 18 million pound annual rate indicates that the mine has sufficient ventilation capacity to meet the production plan over the life of the mine. Peak ventilation requirements are expected to be just over 1,000,000 cfm.

Underground ventilation distribution will be expanded as mine development advances and ventilation to mined out areas will be turned off when no longer required.

Electrical Supply and Distribution

The McArthur River mine site receives its electrical power from the provincial grid via the I2P line. This line has sufficient capacity to meet the site's peak operating demand of 17.6 MW. The site also has 18.7 MW of back-up generation capacity which is sufficient to maintain operations during power interruptions. In addition, the site has stand-alone back-up generation for the hoist (0.6 MW) and the camp (0.375 MW).

Between 2013 and 2017, the site's supply, substation capacity, main distribution and back generation capacity was expanded or upgraded. The McArthur River mine site currently has sufficient electrical capacity and infrastructure to meet its projected long-term requirements. Local underground power distribution will be expanded as required as development advances.

Freeze Plant & Brine Distribution System

The McArthur River mine site currently has a total of 2,050 tons of refrigerant (TR) capacity consisting of a 1,300TR plant at Shaft 1 and a 750TR plant at Shaft 3. Chilled calcium chloride brine can be circulated to the underground via Shaft 1 or Shaft 3 to the 530L. Heat exchangers on the 530 m level provide the interface between the primary/secondary and secondary/tertiary loops. From the heat exchangers, the brine is then distributed to the freeze areas on a low pressure circuit to the freezeholes.

Expansion of the original freeze plant from 800TR to 1,300TR was completed in 2014. Construction of the south freeze plant was completed in 2017. No additional freeze plants are planned for the remainder of the mine's life; however, expansion of the freeze plant capacity and distribution system will be required as the active freeze areas are expanded.

Surface Water Supply

Fresh water supply for potable water use is drawn from Toby Lake and is regulated through the Saskatchewan Watershed Authority. The water is pumped from the lake and stored in two tanks on a centrally located drumlin and gravity fed to the site's distribution system.

Shaft water is pumped to surface and stored in a tank for either industrial or firefighting requirements with Toby Lake water used as a backup if shaft water is not available.

These two water sources are sufficient to meet the current and future surface water requirements.

Underground Mine Water Supply

Shaft water (water leaking into the shafts from the sandstone formation) provides the underground operation with its water supply. No surface water is sent underground. The water is collected via shaft water rings in Shafts 1 and 3 and at the bottom of Shaft 2. The water is pumped or directed to the mine water distribution dam where it is pumped throughout the mine for various uses. This water supply is sufficient to meet current and future underground water supply needs.

Mine Dewatering

A mine water handling strategy has been developed that includes a minimum dewatering capacity standard, designed to handle normal background water combined with an estimated maximum sustained inflow. The predicted future water background levels and dewatering requirements are reviewed and updated annually.

McArthur River currently has a peak dewatering capacity of 1,885 m^3/hr. This dewatering capacity is expected to be sufficient to meet future operating and emergency dewatering requirements. Expansion of underground collection sumps and transfer dewatering lines will be required as new mining zones are developed to ensure local flooding does not occur.

Water Treatment

The water treatment plant is described in Section 17.2.

The current water treatment capacity of 1,500 m^3/hr is expected to be sufficient to meet future operation and contingency requirements.

Batch Plant & Concrete Distribution System

A surface batch plant is used to provide the underground with its concrete and shotcrete requirements as well as for surface construction projects. Concrete is used for backfill, tight filling of drifts, radiation shielding and for construction purposes. Shotcrete is used for both ground support and radiation shielding.

Expansion of the underground concrete distribution including a north slickline from surface to underground will be required as new mining zones are brought into production.

Site Accommodation

The permanent camp expansion from 221 to 473 rooms was completed in 2014. This camp expansion ensures that sufficient housing facilities are available for the permanent workforce, long term contractors, and short term contractors.

18.5 Key Lake infrastructure

The Key Lake operation is a milling facility that has been operating since 1983. Its infrastructure includes the mill, camp complexes, and airport terminal as well as tailings management facilities.

The milling facility and water treatment facilities are located in eight separate plants:

- ore slurry receiving plant
- grinding/blending plant
- reverse osmosis plant
- leaching/counter current decantation plant
- solvent extraction plant
- yellowcake precipitation/dewatering/calcining/packing/ammonium sulphate plant
- bulk neutralization/lime handling/tailings pumping
- powerhouse/utilities/acid plant/oxygen plant complex

19 Market studies and contracts

19.1 Markets

Overview

Nuclear plants around the world use uranium to generate electricity. The following is an overview of the uranium market.

Uranium demand

The demand for U_3O_8 is directly linked to the level of electricity generated by nuclear power plants.

Uranium supply

There are two sources of uranium supply: primary production is production from mines that are currently in commercial operation; and secondary supply includes other sources such as excess inventories, uranium made available from defence stockpiles and the decommissioning of nuclear weapons, re-enriched depleted uranium tails and uranium from enricher underfeeding, and used reactor fuel that has been reprocessed.

Mine production

While the uranium production industry is international in scope, there are only a small number of companies operating in relatively few countries. In 2018 world mine production was estimated at 135 million pounds U_3O_8:

- Over 75% of estimated world production was sourced from four countries: Kazakhstan (42%), Canada (13%), Australia (13%) and Namibia (8%).
- About 55% of estimated world production was attributable to four producers. Cameco accounted for approximately 9% (13 million pounds) of estimated world production.

Uranium markets

Uranium is not traded in meaningful quantities on a commodity exchange. Utilities buy the majority of their uranium products under long-term contracts with suppliers and meet the rest of their needs on the spot market.

Details on Cameco's customers and uranium supply commitments can be found in Cameco's most recent annual management's discussion & analysis for the year ended December 31, 2018.

Uranium spot and long-term prices

The industry average spot price (TradeTech and UxC) on December 31, 2018 was $27.75 (US) per pound of U_3O_8, up $4.00 (US) from the end of 2017.

The industry average long-term price (TradeTech and UxC) on December 31, 2018 was $32.00 (US) per pound of U_3O_8, up $1.00 (US) from the end of 2017.

19.2 Material contracts for property development

There are no contracts that are material to Cameco for the development and operation of McArthur River other than the collective agreement covering the unionized employees at McArthur River and Key Lake.

This section contains a description of this agreement, as well as descriptions of the toll-milling contract in place for McArthur River ore and Cameco's uranium sales contract portfolio.

Labour Relations

Cameco has unionized employees at its McArthur River mine and Key Lake mill. The collective agreement covering these unionized employees expired in December, 2017. There is a risk to the restart of operations after the production suspension if Cameco is unable to reach a collective agreement and there is a labour dispute.

Toll Milling Contract

The KLJV is operated by Cameco and is owned by Cameco (83.333%) and Orano (16.667%).

In June of 1999, the KLJV entered into a toll milling agreement with Orano for the processing of all of Orano's share of McArthur River ore at the Key Lake mill. The terms of the agreement (as amended in January 2001) include the following:

- Processing at cost plus a toll milling fee.
- The KLJV owners are responsible for decommissioning the Key Lake mill, including the costs of any tailing management associated with milling Orano's McArthur River ore.

With the UEM distribution described in Section 6.1, the toll milling agreement was amended as follows:

- The fees and expenses related to Orano's pro-rata share of ore produced just before the UEM distribution (16.234% – the first ore stream) have not changed. Orano is not responsible for any capital or decommissioning costs related to the first ore stream.
- The fees and expenses related to Orano's pro-rata share of ore produced as a result of the UEM distribution (an additional 13.961% – the second ore stream) have not changed. Orano's responsibility for capital and decommissioning costs related to the second ore stream are, however, as a KLJV owner under the original agreement.

The agreement was amended again in 2011 and now requires:

- Milling of the first ore stream at the Key Lake mill until May 31, 2028.
- Milling of the second ore stream at the Key Lake mill for the entire life of the McArthur River Operation.

Cameco's share of McArthur River ore is also milled at Key Lake, but Cameco does not have a formal toll milling agreement with the KLJV.

Uranium Sales Contracts Portfolio

Cameco has a long-term uranium sales contract portfolio where it commits to supply uranium to its customers. This uranium is projected to come from Cameco's mines, inventory, and from Cameco's spot and long term uranium purchase contracts. The commercial terms of these contracts are confidential.

Cameco targets a ratio of 40% fixed pricing and 60% market related pricing in its portfolio of uranium contracts, including mechanisms to protect Cameco when the market price is declining and to allow Cameco to benefit when market prices go up. Fixed price contracts are typically based on a term-price indicator at the time the contract is accepted and escalated over the term of the contract.

Market-related price contracts are different from fixed-priced contracts in that they may be based upon either the spot price or the long-term price, and that price is quoted at the time of delivery rather when the contract is accepted. These contracts sometimes provide for discounts, and often include floor prices and/or ceiling prices, which are usually escalated over the term of the contract, and reflect the market at the time the contract is accepted.

Uranium contract terms generally reflect market conditions when the contracts are negotiated. After a contract is accepted, deliveries under a long-term contract do not begin for several years. Cameco believes the terms of its long-term uranium sales contracts generally reflect industry norms.

19.3 Uranium price assumptions used for economic analysis

The uranium price projection used for the economic analysis is based upon an average of independent industry analyst forecasts of supply and demand fundamentals. To the extent the independent forecasts did not extend their projections to cover the entire expected mine life of McArthur River, the projections have been extrapolated forward to the end of the anticipated mine life.

The QPs for Sections 14, 15 and 22 have reviewed the studies and analyses underlying the uranium and supply demand forecasts used in this report, and confirm that the results of these studies and analyses support the assumptions used for the portions of the technical report such QPs are responsible for.

Cameco has historically sold U_3O_8 under long-term contracts with its customers at prices that reflect the market conditions at the time the contract is accepted. Cameco has committed some of its future production and purchased material to be delivered through its existing portfolio of long-term sales contracts. The remaining future production will be sold under yet-to-be-negotiated arrangements. For the purposes of the economic analysis, Cameco's portion of McArthur River production is assumed to be allocated into a mix of committed sales volumes and uncommitted sales volumes in the same proportion that Cameco expects to sell based on its current level of committed sales relative to its total sales targets.

Table 19-1 outlines the projected average realized prices, taking into account Cameco's current level of sales commitments and the independent spot price projections. The price projections are stated in constant 2018 dollars. The economic analysis assumes an average realized price of $56.39 (Cdn) per pound U_3O_8 over the period 2020 to 2042.

In preparing the cash flow analysis included in Section 22 of this report, the impact of Cameco's forward uranium sales strategy has been taken into account.

Table 19-1: Projected Average U_3O_8 Sales Prices

Price Assumptions	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
McArthur River Average Price $USD/lb	37	37	37	38	39	40	41	42	44	44	45	46
McArthur River Average Price $Cdn/lb	**47**	**46**	**46**	**48**	**49**	**50**	**52**	**53**	**54**	**55**	**56**	**57**
Exchange Rate	**1.28**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**

Price Assumptions	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**
McArthur River Average Price $USD/lb	48	48	49	50	50	50	50	50	50	50	50
McArthur River Average Price $Cdn/lb	**60**	**60**	**61**	**63**	**62**	**63**	**63**	**63**	**63**	**63**	**63**
Exchange Rate	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**

Notes:

(1) Cameco's sales volume targets assume no interruption in the company's supply from its production or third party sources.

(2) The projections are stated in constant 2018 dollars.

20 Environmental studies, permitting and social or community impact

20.1 Regulatory framework

The McArthur River and Key Lake Operations are both considered to be nuclear facilities and as such, primary regulatory authority resides with the federal government and its agency, the CNSC. The nuclear industry is a closely regulated industry whereby any significant change/modification to the facility or its operation requires prior regulatory approval. The level of assessment of each potential change or modification depends on the magnitude and complexity of the proposed change. Changes can require full environmental assessments prior to receiving regulatory approval.

Provincial regulatory authority is generally described in the surface lease agreement between the Province of Saskatchewan and each operation. In many cases, there is coordination amongst the federal and provincial regulatory agencies, but each agency retains responsibility for administering its own regulations, approvals, licences and permits where required. The main regulatory agencies that issue permits/approvals and inspect these operations are: the CNSC (federal), the Mine Safety Unit of Saskatchewan, Ministry of Labour Relations and Workplace Safety (provincial) and the SMOE (provincial). Other agencies that have an interest with respect to environmental monitoring programs and activities that may impact water ways are Environment and Climate Change Canada (federal) and the Department of Fisheries and Oceans Canada (federal). Environment and Climate Change Canada is specifically responsible for administering the federal Metal and Diamond Mining Effluent Regulations (MDMER) and approves environmental effects monitoring (EEM) programs required under MDMER.

20.2 Licences and permits

McArthur River operation

There are three key permits that are required to operate the mine. Cameco holds a “Uranium Mine Licence” from the CNSC, an “Approval to Operate Pollutant Control Facilities” from the SMOE and a “Water Rights Licence and Approval to Operate Work” from the Saskatchewan Watershed Authority. These permits are current. The CNSC licence was renewed for a ten year term in 2013 and expires on October 31, 2023. The SMOE Approval to Operate Pollutant Control Facilities was renewed in 2017 and expires on June 30, 2023. The Saskatchewan Watershed Authority permit was obtained in 1993 and was last amended in November 2011. It is valid for an undefined term.

Key Lake operation

The Key Lake Operation is regulated in a similar manner as the McArthur River Operation and as such has regulatory obligations to both the federal and provincial governments. There are two key permits that must be maintained to operate the Key Lake uranium mill. Cameco holds a “Uranium Mill Licence” from the CNSC and an “Approval to Operate Pollutant Control Facilities” from the SMOE. These permits are current. The CNSC operating licence was renewed for a ten year term in 2013 and expires on October 31, 2023. The SMOE Approval to Operate Pollutant Control Facilities was renewed in 2014 and expires on November 30, 2021.

20.3 Environmental assessment

The Key Lake and McArthur River Operations and all associated infrastructure have been the subject of several EAs and detailed environmental monitoring programs.

In regards to the Key Lake Operation, the EA process began in 1979, when the Key Lake Mining Corporation, a Cameco predecessor, filed an EIS with federal and provincial regulatory agencies. The EIS review was completed by the Key Lake Board of Inquiry in 1981.

In April 1991, the governments of Saskatchewan and Canada established a Joint Panel to assess the environmental and public concerns arising out of three non-Cameco related projects which had filed EISs, and two Cameco projects, McArthur River and Cigar Lake, which had filed preliminary project proposals.

In 1992, Cameco filed an EIS for the McArthur River Operation with the regulatory agencies to address proposed underground exploration activities. The Joint Panel reviewed the EIS and in 1993 recommended that the project be allowed to proceed subject to a series of conditions. All conditions were met and all underground exploration activities were completed.

In 1994, an EIS was filed for the Key Lake Operation that detailed a plan to create a new tailings storage facility in the existing Deilmann open pit using a sub-aqueous tailings deposition and storage program (Cameco 1994). Approval was obtained in 1995.

In 1995, Cameco submitted an EIS that covered the proposed mining activities at McArthur River and the proposed milling of all McArthur River ore at Key Lake. Federal and Provincial approval of the EIS was obtained 1997. Cameco requested and received approval to commence construction in 1997.

In 1999, the McArthur River Operation received both federal and provincial approvals to operate. Key Lake was also granted approval to receive and process McArthur River ore and waste rock.

In 2002, Cameco applied to increase the annual licensed production capacity at both the McArthur River mine and the Key Lake mill to 22 million pounds U_3O_8 per year compared to the then current annual licensed production capacity of 18.7 million pounds U_3O_8. This application received ministerial approval from the Province; however, a screening level EA was also required under the Canadian Environmental Assessment Act, with the CNSC as the responsible authority. The EA was delayed due to discussions with the CNSC regarding how to address local accumulation of molybdenum and trace amounts of selenium in the Key Lake mill downstream environment. The result was that the 22 million pounds U_3O_8 EA was suspended indefinitely. Cameco subsequently proposed modifications to the water treatment process at the Key Lake mill. The regulatory agencies accepted this proposal and the modified water treatment facility is currently in operation.

Following the successful implementation of the modified water treatment process at the Key Lake mill, in 2009 and subsequently in 2010, the CNSC amended the operating licence for first the Key Lake mill and then the McArthur River mine, to allow Cameco flexibility in annual licensed production. As a result, the Key Lake mill was able to produce up to 20.4 million pounds U_3O_8 per year while the McArthur River mine could produce up to 21 million pounds U_3O_8 per year, as long as, in each case, average annual production did not exceed 18.7 million pounds U_3O_8, and there was a shortfall of production based on previous years to recoup.

Concurrently with the improvements to the water treatment process at the Key Lake mill, Cameco initiated a separate EA in 2010 to extend the operational life of the Key Lake mill and establish it as a regional milling facility, by increasing the tailings capacity and licensed annual production rate to 25 million pounds U_3O_8. The EIS received federal and provincial approval in 2014. The CNSC licence condition handbook for Key Lake was amended in 2015 to authorize the increased production rate.

Following approval of the Key Lake Extension Project, in 2015 Cameco applied to increase the maximum annual production limit at the McArthur River mine to 25 million pounds U_3O_8. Later that year, this application received CNSC approval and Ministerial Approval from the province of Saskatchewan. The CNSC licence condition handbook for McArthur River was amended to authorize the increased production rate.

20.4 Environmental aspects

Tailings Management

There are two tailings management facilities at the Key Lake Operation:

- An above ground tailings management facility (AGTMF) constructed in 1983, where tailings are stored within compacted till embankments. Cameco has not deposited tailings here since 1996, and is looking at several options for decommissioning this facility in the future.
- The Deilmann tailings management facility (DTMF) was commissioned in 1996 following completion of mining in the eastern portion of the Deilmann pit in 1995.

The DTMF was initially operated in a subaerial tailings deposition mode. A sand envelop in the DTMF was designed to allow excess water to drain to a drainage blanket underlying the tailings at the bottom of the pit and then to dewatering pumps in a raise well connected by a drift to the drainage blanket. The DTMF was converted from subaerial tailings disposal system to a subaqueous tailings disposal system in 1998 following approval by the CNSC and SMOE, allowing the water level in the pit to rise above the tailings surface. The remaining Key Lake tailings were deposited subaqueously followed by the deposition of tailings from McArthur River ore in 2000 to present. Flooding of the pit was accomplished by reducing the pumping rate from peripheral dewatering wells that had been used to dewater the pit during mining and construction.

Beginning in July 2001, when rising water contacted the lowermost sections of the outwash sand in the Key Lake trough, periodic sloughing of the pit walls in the western portion of the DTMF was experienced. As a result of these events, Cameco undertook a number of actions to minimize potential damage from future events, including infrastructure relocation along vulnerable sections of the pit crest, installation of slope monitoring stations, and creation of a 30 metre wide “restricted” zone along the perimeter of the pit crest at the west end of the Deilmann TMF. Cameco also performed several studies to better understand the pitwall sloughing mechanism and initiated mitigation measures for prevention of sloughing.

Studies showed that stabilizing and reducing water levels in the pit enhances the stability of the pitwalls, which reduces the risk of pitwall sloughing. Cameco doubled its dewatering treatment capacity, allowing it to reduce the water level in the pit. Controlling the water level was an effective interim measure in managing further sloughing while work to cut back the slopes for long term stabilization was completed. In 2009, regulators approved Cameco’s plan for the long-term stabilization of the Deilmann TMF pitwalls. Cameco implemented the plan in phases based on DTMF water level and risk. Work was completed in 2013 on the west wall and 2016 on the south side. The final phase on the north east slope is targeted for completion in 2019.

In 2014, the CNSC approved an increase in Key Lake’s tailings capacity. Cameco now expects to have sufficient tailings capacity to mill all currently reported McArthur River mineral reserves and resources, with additional capacity to toll mill ore from other regional deposits.

Waste Rock management

At the McArthur River Operation, mineralized and waste rock are managed in contained facilities. Mined rock from underground activities is classified as clean waste, low-grade mineralization, or potentially acid generating waste, and transported on-site to its appropriate storage location. Low-grade mineralization is transferred to a lined storage pad where it is later placed in covered haul trucks for shipment to Key Lake. At the Key Lake Operation, the low-grade mineralization is placed on a lined pad where it is used for blending with the McArthur River high-grade slurry prior to processing in the mill.

At Key Lake, there are two stockpiles of mineralized waste rock generated from the historical mining activities of Key Lake: the Deilmann waste and the Gaertner waste stockpiles. Material generated from the mining of the Deilmann pit is called Deilmann waste and the material generated from the mining of the Gaertner pit is called Gaertner waste. Both stockpiles are stored on above ground lined pads. Deilmann and Gaertner wastes are also presently being used for blending with McArthur River ore. It is anticipated that all of the waste will be removed and consumed as blend material to manage the mill head grade before the Key Lake site is decommissioned in future.

Effluent treatment and discharge

Although there are some general temporary disturbances to wildlife, the primary influences on the environment from both the McArthur River and Key Lake Operations are associated with the releases of treated effluent generated from their operation. To a lesser extent, air emissions and airborne particulate material are also capable of potentially influencing the environment.

Treated effluent from the McArthur River Operation is discharged to the Read Creek watershed, via a constructed conveyance channel. Read Creek passes through Boomerang Lake, flowing eastward through Lucy and Unknown Lakes, before discharging into May Creek. May Creek continues flowing eastward through Little Yalowega Lake and then joins Yalowega Lake.

Treated effluent from the Key Lake Operation is discharged to Wolf Lake and flows through the David Creek system. The David Creek system from the effluent discharge location, in order, consists of: Wolf Lake, Fox Lake, Yak Creek, David Creek, Unknown Lake, Pyrite Creek and Delta Lake. Delta Lake discharges into the Wheeler River, which flows to Russell Lake. Treated effluent from the mine dewatering system is discharged into the McDonald Lake system at Horsefly Lake. Russell Lake receives flow from both the mine dewatering discharge and the ongoing mill effluent discharge.

The most recent environmental risk assessments submitted by Cameco for the McArthur River (2015) and Key Lake Operations (2013), have been accepted by the CNSC and indicate that the receiving environment downstream of both operations remains protected.

Environmental effects monitoring

Comprehensive environmental monitoring programs are in place at the McArthur River and Key Lake Operations to determine the full extent and nature of any environmental effects taking place within the sphere of influence of these facilities. The most significant component of this monitoring is the EEM program that Cameco performs and is required under its operating licences. The EEM includes the monitoring of water, fish health, benthic invertebrate monitoring, sediment, fish tissue, plants and animals. It is designed to incorporate the requirements of Environment and Climate Change Canada’s Metal and Diamond Mines Effluent Regulations, CNSC requirements and SMOE requirements. In general terms, the environmental monitoring programs continue to demonstrate that the environmental effects are generally in line with the predictions contained within the previously completed environmental assessments and that the receiving environment downstream of the McArthur River and Key Lake Operations remains protected.

20.5 Decommissioning and reclamation

As required by both federal and provincial legislation, Cameco maintains preliminary decommissioning plans (PDPs) and associated financial assurances for both the McArthur River and Key Lake Operations. The PDP describes, at a preliminary level, the methodologies that would be utilized to decommission and reclaim the operations based on the strategies described within approved environmental impact statements for the operations. The estimated cost of implementing the methodologies described within the PDP is provided within an associated document called the preliminary decommissioning cost estimates (PDCE). The cost estimate within the PDCE is the basis for the required financial assurance. Cameco provides the financial assurance in the form of irrevocable standby letters of credit with the SMOE as the beneficiary.

The PDP and PDCE documents are developed as per SMOE, CNSC, and CSA guide documents and are subject to review and comment from the CSNC and SMOE prior to their approval. The most recent PDPs and PDCEs for McArthur River and Key Lake were prepared by Cameco and submitted to the CNSC and SMOE in 2013 as part of the CNSC licence renewal process (Cameco, 2014a, Cameco, 2013a, Cameco, Cameco, 2014b, & Cameco, 2013b). These documents underwent extensive review and revision to capture any changes in decommissioning liabilities over the review period. Based on the total estimated decommissioning costs presented and approved in these PDCEs by both the CNSC and SMOE, financial assurances totalling $48.4 million and $218.3 million are currently in place for McArthur River and Key Lake, respectively. These financial assurances represent 100% of the total estimated costs and not Cameco's share of such costs.

The PDP and PDCE are required to be updated every 5 years; thus, these documents were updated and submitted to SMOE and the CNSC in 2018 and are currently under review. This systematic update and review of the documents is designed to capture all changes to known liabilities and improvements in decommissioning as the operations mature. As part of the current review process, Cameco now estimates the decommissioning cost of McArthur River and Key Lake to be $38 million (Cdn) and $222 million (Cdn), respectively. These represent 100% of the total estimated costs and not Cameco's share of such costs. These updated estimates are currently undergoing regulatory review.

20.6 Known environmental liabilities

The core generic estimates and assumptions made in the PDP and PDCE which are considered to have the greatest impact on the estimated cost to complete the decommissioning work are as follows:

- correct understanding of the geochemical and geotechnical properties of waste materials – these properties are used to provide long-term performance modelling estimates of the wastes, and are key to regulatory acceptance of detailed decommissioning plans
- quantity and degree of required isolation of waste rock piles from leaching by precipitation and groundwater transport
- quantity and degree of required isolation of tailings from leaching by precipitation and groundwater transport
- length and cost associated with any forecast pump and treat needed to generate acceptable contaminant flux rates from tailings and waste rock
- costs associated with managing the site throughout the active decommissioning period
- length and cost associated with required thaw and consolidation of tailings facilities
- negotiated contaminant loading and concentration limits, along with locations where these criteria apply
- cost of decommissioning of surface facilities
- magnitude of groundwater contamination generated underneath surface facilities during the operating phase that require remediation prior to site release
- ongoing licensing costs and along with post-release performance verification monitoring costs
- correct assumptions regarding the degree of environmental monitoring required during both the active decommissioning period as well as the post-decommissioning period monitoring conducted prior to acceptance of the site into the institutional control framework
- assumptions of application of discount rates and inflation within the PDCE

All known environmental liabilities associated with the McArthur River Operation are discussed within the current PDP (Cameco, 2013a), and are accounted for within the PDCE (Cameco, 2013b). The PDP and PDCE are developed to address known environmental liabilities of the facility at the time of preparation such that a reasonable estimated costs of decommissioning can be defined. This does not preclude formal regulatory processes which are followed prior to implementing actual decommissioning. Therefore it is possible that following such final approval processes, the liabilities understood in the PDP and PDCE may vary significantly from the final approved detailed decommissioning plan. This uncertainty is addressed through the conservatism built into the documents and the regulatory acceptance process. In general, the significant liabilities associated with the McArthur River Operation are accounted for in the PDP and PDCE are as follows:

- Underground facilities and surface shaft installation. The main long term liabilities are primarily from a safety perspective. These are addressed within the PDP by the capping of the shaft collars.
- Environmental liabilities associated with potential soil or groundwater contamination may exist beneath surface facilities (e.g. slurry loadout, water treatment infrastructure) or beneath the footprints of mineralized and waste rock piles. These potential liabilities are addressed within the PDP by excavation of any contaminated materials and backfill with clean waste rock.

All known environmental liabilities associated with the Key Lake Operation are discussed in the Key Lake Operation PDP (Cameco, 2014a) and the associated PDCE (Cameco, 2014b). In general, the significant liabilities associated with the Key Lake Operation and accounted for in the PDP and PDCE are as follows:

- Environmental liabilities associated with potential soil or groundwater contamination may exist beneath surface facilities (e.g. mill, water treatment infrastructure) or beneath the footprints of mineralized and waste rock piles. These potential liabilities are addressed within the PDP by excavation of any contaminated materials and backfill with clean waste rock.
- Above ground tailings management facility. The main long term environmental liability is from contaminant transport via groundwater from the facility, potentially impacting the downstream David Creek receiving environment. The PDP addresses this through allowing sufficient time for the tailings to thaw and consolidate with subsequent installation of an engineered cover to limit infiltration.
- Deilmann In-Pit Tailings Management Facility. The main long term environmental liability is from contaminant transport via groundwater from the facility, potentially impacting the downstream Outlet Creek receiving environment. The PDP addresses this with sub-aqueous sand cover of material within the DTMF, followed by long term (multi-year) post closure continued pump and treatment of groundwater in the area.
- Deilmann North Waste Rock Pile. The main environmental liability is potential groundwater contamination, and associated contaminant transport from this waste rock pile following cessation of the DTMF pump and treat period and allowance of groundwater levels to return to pre-mining levels. The PDP addresses this through installation of an engineered cover on this waste rock pile followed by a long-term period of collection and treatment of groundwater in the vicinity of this waste rock pile.

20.7 Social and community factors

Cameco is committed to building long-lasting and trusting relationships with the communities in which it operates. Cameco fulfils this commitment through a number of initiatives, including the implementation of collaboration agreements (CAs) with certain communities near its operations. These agreements are the foundation of Cameco’s corporate social responsibility strategy which aims to build relationships, strengthen partnerships and secure the support of the communities with whom Cameco works. The strategy is focused on workforce and business development, community engagement and investment, as well as environmental stewardship.

Engagement for the McArthur River Operation is targeted at northern Saskatchewan, namely, the northern village of Pinehouse and Kineepik Métis Local (Kineepik), English River First Nation (ERFN), the northern hamlet of Patuanak, and the Lac La Ronge Indian Band. These communities are the focus of public participation activities in relation to the operation.

In 2012, Cameco signed a CA with Pinehouse and Kineepik that reaffirms and formalizes its long-standing relationship with these communities. A CA was signed with ERFN at the end of 2013 and with the Lac La Ronge Indian Band in 2017. A participation agreement between Southend and Kinoosao First Nations, Thakotitan Economic Development Corporation and Cameco was signed in 2014. These agreements reflect the priorities within Cameco's corporate social responsibility strategy.

Cameco has also established a preferred northern contractor framework, which provides preference to majority-owned aboriginal businesses and helps establish long-term relationships between northern contractors and Cameco.

21 Capital and operating costs

Due to the suspension of production for an indeterminate duration, no production is currently planned from McArthur River and Key Lake.

21.1 Capital and other costs

Estimated capital and other costs to the MRJV include sustaining capital for both McArthur River and Key Lake Operations, as well as underground development at McArthur River to bring mineral reserves into production. The total estimated life of mine capital costs to the MRJV are $942 million. Cameco's share of the total estimated life of mine capital costs is $658 million.

For McArthur River, the largest component of capital costs is mine development work estimated to be $419.3 million. Other projects include installation of freezing and distribution systems, and upgrades to site electrical infrastructure.

For Key Lake, work to revitalize the mill to enhance its capability to produce over the long term is complete. Planned capital expenditures at the mill are to support the sustainment of operations, and there are no large capital investments anticipated at the planned 18 million pound production rate.

The estimated total capital costs to the MRJV for McArthur River and Key Lake, broken down by year, are shown in Table 21-1. Upon restart, it is estimated that capital expenditures of approximately $8 million at McArthur River and $30 million at Key Lake will be required to replace equipment and return processing circuits to their full production capabilities. Table 21-1 shows the restart capital required in the year of startup. The year in which these costs will be incurred is dependent on when conditions for a restart have been met and a decision to restart has been made. The capital projections are stated in constant 2018 dollars.

Table 21-1: McArthur River Capital Cost Forecast by Year

Capital Costs ($Cdn M)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**	**Year 12**
McArthur River Mine Development	$ -	$ 6.5	$ 26.5	$ 29.7	$ 30.7	$ 33.4	$ 30.1	$ 30.0	$ 30.3	$ 32.9	$ 31.3	$ 30.9	$ 16.4
McArthur River Mine Capital													
Freeze infrastructure	-	-	12.0	1.6	4.1	9.4	5.6	0.3	0.9	8.3	11.6	56.5	9.6
Water management	-	-	-	1.2	-	-	2.5	-	-	-	-	-	-
Ore handling & processing	-	-	0.1	0.5	0.3	1.0	-	0.5	-	0.5	-	0.5	-
Electrical infrastructure	-	-	3.9	1.9	0.5	0.5	0.9	0.9	0.9	1.3	0.4	-	-
Other mine capital	1.3	7.8	5.8	6.8	4.0	8.6	5.2	9.3	9.6	9.7	10.8	10.2	11.3
Total Mine Capital	1.3	7.8	21.8	12.0	8.8	19.4	14.2	11.0	11.4	19.7	22.7	67.1	20.9
Key Lake Mill Sustaining													
Mill Capital	4.1	30.3	2.4	3.4	1.7	8.6	8.5	3.7	3.5	8.0	5.8	8.5	8.0
Water Treatment & Tailings Management	-	-	1.9	0.5	3.2	-	-	5.0	5.0	0.5	2.8	-	0.5
Total Mill Capital	4.1	30.3	4.3	3.9	4.9	8.6	8.5	8.7	8.5	8.5	8.5	8.5	8.5
Total Capital Costs	**$ 5.3**	**$ 44.6**	**$ 52.6**	**$ 45.7**	**$ 44.5**	**$ 61.4**	**$ 52.7**	**$ 49.6**	**$ 50.2**	**$ 61.0**	**$ 62.5**	**$ 106.6**	**$ 45.8**

Capital Costs ($Cdn M)	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Total**
McArthur River Mine Development	$ 13.1	$ 12.3	$ 11.3	$ 10.9	$ 11.2	$ 11.1	$ 9.6	$ 6.2	$ 4.1	$ 0.5	$ -	$ 419.3
McArthur River Mine Capital												
Freeze infrastructure	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	-	-	-	122.7
Water management	1.8	1.8	-	-	-	-	-	-	-	-	-	7.3
Ore handling & processing	0.5	-	0.5	-	0.5	-	-	0.5	-	-	-	5.4
Electrical infrastructure	-	-	-	-	-	-	-	-	-	-	-	11.0
Other mine capital	23.2	10.7	10.2	10.7	10.6	11.5	8.6	5.6	3.1	1.5	-	196.1
Total Mine Capital	26.0	13.0	11.2	11.2	11.3	11.7	8.9	6.4	3.1	1.5	-	342.5
Key Lake Mill Sustaining												
Mill Capital	8.0	8.5	8.5	8.5	8.5	8.5	6.8	4.4	2.1	-	-	160.2
Water Treatment & Tailings Management	0.5	-	-	-	-	-	-	-	-	-	-	19.9
Total Mill Capital	8.5	8.5	8.5	8.5	8.5	8.5	6.8	4.4	2.1	-	-	180.1
Total Capital Costs	**$ 47.7**	**$ 33.9**	**$ 31.1**	**$ 30.7**	**$ 31.0**	**$ 31.4**	**$ 25.3**	**$ 17.0**	**$ 9.2**	**$ 2.0**	**$ -**	**$ 941.9**

Notes:

(1) Presented as total cost to the McArthur River Joint Venture.

(2) This cost profile assumes the McArthur River mine and Key Lake mill are both in a state of care and maintenance during Year 0 with a decision to restart in Year 1. No such decision has been made.

(3) Capital spending in Year 0 is representative of annual capital spending while the McArthur River mine and Key Lake mill are both in a state of care and maintenance.

(4) Mine development includes delineation drilling, mine development, probe and grout drilling, freeze drilling, and minor support infrastructure.

21.2 Operating cost estimates

Estimated operating expenditures to be incurred by the MRJV for the underground mining operations and for milling costs are presented in Table 21-2.

Operating costs at McArthur River consist of annual expenditures to mine the ore, to process the ore – including grinding, thickening, pumping to surface, further thickening and blending – and to transport the slurry to Key Lake.

Operating costs at Key Lake consist of annual expenditures to receive the slurry, to extract and precipitate the uranium into U_3O_8, and to dispose of tailings in the Deilmann TMF. Toll milling revenue has not been included as an offset to operating costs, as it is insignificant over the life of the mine.

Operating costs for the MRJV are estimated to average $14.97 per pound U_3O_8 over the mine life. This is a significant decrease from the estimate of $19.23 per pound U_3O_8 in the 2012 Technical Report. The reduction in operating costs is indicative of the work to optimize the mine design and gain efficiencies in the mining and milling processes at an assumed annual production level of 18 million pounds of U_3O_8. Blasthole stope mining has significantly reduced McArthur River's overall operating costs by reducing underground development, concrete consumption, mineralized waste generation, and improving extraction cycle time.

While the operations of McArthur River and Key Lake are in a full state of care and maintenance, annual costs are expected to total approximately $98 million (100% basis). During care and maintenance, the primary activities include water handling and treatment, environmental monitoring and reporting, and the maintenance of critical process circuits. There will be increased costs in the year the decision is made to restart operations. These costs include recruitment costs to achieve required operating staff levels, required equipment and process circuits repair costs, and mine workings and processing plants commissioning costs. The year in which these costs will be incurred is dependent on when conditions for restart have been met and a decision to restart has been made.

The operating projections are stated in constant 2018 dollars and assume the throughput outlined in the production schedule outlined in Section 16.

Table 21-2: McArthur River Operating Cost Forecast by Year

Operating Costs ($Cdn M)	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
McArthur River Mining													
Site Administration	$ 17.6	$ 37.4	$ 41.4	$ 41.1	$ 41.2	$ 40.9	$ 41.6	$ 41.9	$ 42.6	$ 42.3	$ 42.5	$ 42.1	$ 42.4
Mining Costs	20.6	50.6	66.4	65.1	65.1	64.6	66.3	69.8	74.9	75.1	76.0	76.7	78.0
Process	4.5	10.9	13.2	13.1	12.9	13.1	13.1	13.1	13.5	13.6	13.7	13.9	14.1
Corporate Overhead	2.3	5.8	8.2	7.9	7.9	8.2	8.0	8.2	8.6	8.9	9.2	10.3	8.5
Total Mining Costs	45.0	104.7	129.2	127.1	127.0	126.8	129.0	133.0	139.5	140.0	141.4	142.9	143.0
Key Lake Milling													
Administration	22.7	38.2	43.0	43.0	42.6	42.5	42.5	42.6	42.5	42.6	42.6	42.6	42.6
Milling Costs	26.2	47.9	66.9	66.6	66.2	66.1	65.9	65.9	65.9	65.9	66.3	65.9	66.0
Corporate Overhead	3.8	6.2	6.1	6.1	6.1	6.5	6.2	6.3	6.3	6.3	6.5	6.3	6.3
Total Milling Costs	52.7	92.3	116.0	115.7	115.0	115.2	114.7	114.7	114.8	114.8	115.4	114.8	114.9
Total Operating Costs	**$ 97.7**	**$ 197.0**	**$ 245.2**	**$ 242.9**	**$ 242.1**	**$ 242.0**	**$ 243.7**	**$ 247.7**	**$ 254.3**	**$ 254.8**	**$ 256.8**	**$ 257.7**	**$ 257.8**
Total Operating Cost per lb U3O8		**$ 49.32**	**$ 13.68**	**$ 13.51**	**$ 13.35**	**$ 13.42**	**$ 13.48**	**$ 13.71**	**$ 14.15**	**$ 14.17**	**$ 14.24**	**$ 14.33**	**$ 14.32**

Operating Costs ($Cdn M)	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Total
McArthur River Mining												
Site Administration	$ 43.2	$ 43.8	$ 43.9	$ 43.9	$ 44.0	$ 43.8	$ 44.1	$ 43.8	$ 43.5	$ 43.3	$ 43.2	$ 995.1
Mining Costs	80.0	83.9	84.1	83.8	83.1	80.8	80.4	76.7	74.2	73.4	65.8	1,715.4
Process	14.3	13.9	13.9	13.7	13.6	13.6	13.6	13.6	13.2	13.0	11.6	310.8
Corporate Overhead	8.5	8.3	8.2	8.2	8.2	8.1	7.9	7.3	6.8	6.7	6.3	186.3
Total Mining Costs	146.0	149.8	150.1	149.6	148.9	146.3	145.9	141.4	137.7	136.3	126.9	3,207.6
Key Lake Milling												
Administration	42.6	42.6	42.6	42.6	42.6	42.6	42.8	42.8	42.9	42.2	33.8	990.4
Milling Costs	66.0	66.0	66.3	65.9	65.9	65.7	65.5	65.6	64.8	60.8	47.1	1,501.5
Corporate Overhead	6.2	6.2	6.4	6.2	6.2	6.2	6.1	6.3	6.0	5.8	5.1	145.8
Total Milling Costs	114.8	114.9	115.4	114.8	114.8	114.6	114.5	114.7	113.6	108.7	86.1	2,637.7
Total Operating Costs	**$ 260.9**	**$ 264.6**	**$ 265.4**	**$ 264.4**	**$ 263.6**	**$ 260.9**	**$ 260.4**	**$ 256.1**	**$ 251.3**	**$ 245.0**	**$ 212.9**	**$ 5,845.3**
Total Operating Cost per lb U3O8	**$ 14.49**	**$ 14.63**	**$ 14.68**	**$ 14.64**	**$ 14.62**	**$ 14.45**	**$ 14.41**	**$ 14.14**	**$ 13.73**	**$ 14.61**	**$ 24.53**	**$ 14.97**

Notes:

(1) Presented as total cost to the McArthur River Joint Venture.

(2) This cost profile assumes the McArthur River mine and Key Lake mill are both in a state of care and maintenance during Year 0 with a decision to restart in Year 1. No such decision has been made.

(3) Operational spending in Year 0 is representative of annual operational spending while the McArthur River mine and Key Lake mill are both in a state of care and maintenance.

22 Economic analysis

22.1 Economic analysis

The following economic analysis, as shown in Table 22-1 for the McArthur River Operation, is based upon the current mine plan which considers mining and milling the current estimated mineral reserves. The analysis does not include any estimates involving the potential mining and milling of mineral resources. Expenditures required to bring any of the mineral resources into production have not been included. Mineral resources have not demonstrated economic viability and have not been included in the production plan.

Production from the McArthur River and Key Lake Operations has been suspended for an indeterminate duration and no decision has been made to restart operations. However, to prepare the economic analysis, the following assumptions have been made:

- Work commences to restart operations at McArthur River and Key Lake on January 1, 2020
- Ramp-up of operations in 2020 with 4 million pounds packaged
- Annual production is 18 million pounds from 2021 to 2040
- Ramp-down of production in the last 2 years of production
- An average realized price of $56.39 (Cdn) per pound U_3O_8 over the period 2020 to 2042.

The foregoing dates are for assumption purposes only and do not reflect a decision to restart operations or a preferred timetable for a restart. No decision to restart has been made.

The analysis is from the point of view of Cameco, which owns 69.805% of the MRJV, and incorporates a projection of Cameco's sales revenue from its proportionate share of the related production, less its share of related operating and capital costs of the MRJV, as well as royalties and surcharges that will be payable on the sale of uranium ore concentrates.

The economic analysis resulted in an estimated pre-tax NPV (at a discount rate of 8%) to Cameco for net cash flows from January 1, 2019 forward of $2.97 billion for its share of the current McArthur River mineral reserves. Using the total capital invested to December 31, 2018, along with the operating and capital estimates for the remainder of the mineral reserves, the pre-tax IRR has been estimated to be 11.6%. Table 22-2 presents an NPV sensitivity to various assumed restart dates.

Table 22-1: McArthur River Mine Economic Analysis – Cameco's Share

Economic Analysis ($Cdn M)	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Production volume (000's lbs U3O8)	-	2,788	12,508	12,550	12,653	12,591	12,621	12,611	12,550	12,556	12,587	12,553	12,569
Sales revenue	$ -	$ 131.7	$ 572.2	$ 577.5	$ 602.8	$ 618.7	$ 635.0	$ 651.6	$ 662.9	$ 683.3	$ 698.0	$ 709.1	$ 719.4
Operating costs	68.2	137.5	171.1	169.5	169.0	168.9	170.1	172.9	177.5	177.9	179.3	179.9	180.0
Capital costs	3.7	31.1	36.7	31.9	31.0	42.9	36.8	34.7	35.0	42.6	43.6	74.4	32.0
Basic royalty	-	5.6	24.3	24.5	25.6	26.3	27.0	27.7	28.2	29.0	29.7	30.1	30.6
Resource surcharge	-	3.9	17.2	17.3	18.1	18.6	19.0	19.5	19.9	20.5	20.9	21.3	21.6
Profit royalty	-	-	42.6	49.7	53.5	54.1	57.3	59.6	60.4	62.3	64.1	61.1	69.1
Net pre-tax cash flow	$ (71.9)	$ (46.5)	$ 280.2	$ 284.6	$ 305.5	$ 307.9	$ 324.8	$ 337.2	$ 341.8	$ 351.0	$ 360.4	$ 342.3	$ 386.2

Economic Analysis ($Cdn M)	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Total
Production volume (000's lbs U3O8)	12,567	12,630	12,618	12,602	12,591	12,603	12,611	12,649	12,779	11,705	6,060	272,553
Sales revenue	$ 748.7	$ 757.8	$ 772.9	$ 787.6	$ 780.6	$ 787.7	$ 794.5	$ 796.9	$ 805.1	$ 737.4	$ 381.8	$ 15,413.2
Operating costs	182.1	184.7	185.3	184.5	184.0	182.1	181.8	178.8	175.4	171.0	148.6	4,080.3
Capital costs	33.3	23.6	21.7	21.4	21.6	21.9	17.7	11.9	6.4	1.4	-	657.5
Basic royalty	31.8	32.2	32.8	33.5	33.2	33.5	33.8	33.9	34.2	31.3	16.2	655.1
Resource surcharge	22.5	22.7	23.2	23.6	23.4	23.6	23.8	23.9	24.2	22.1	11.5	462.4
Profit royalty	73.1	75.7	78.1	80.5	79.5	80.8	82.5	84.2	86.6	78.5	31.7	1,465.0
Net pre-tax cash flow	$ 405.9	$ 418.9	$ 431.7	$ 444.1	$ 438.9	$ 445.7	$ 454.9	$ 464.3	$ 478.2	$ 433.0	$ 173.8	$ 8,092.9

Pre-tax NPV (8%) to January 1, 2019	$ 2,973.3
Pre-tax IRR (%)	11.6%

Notes:

(1) For the purposes of the economic analysis, Year 0 is assumed to be 2019, and Year 1 is assumed to be 2020.

(2) Economic analysis assumes the McArthur River mine and Key Lake mill are both in a state of care and maintenance during 2019 with a restart occurring in 2020. No such restart decision has been made.

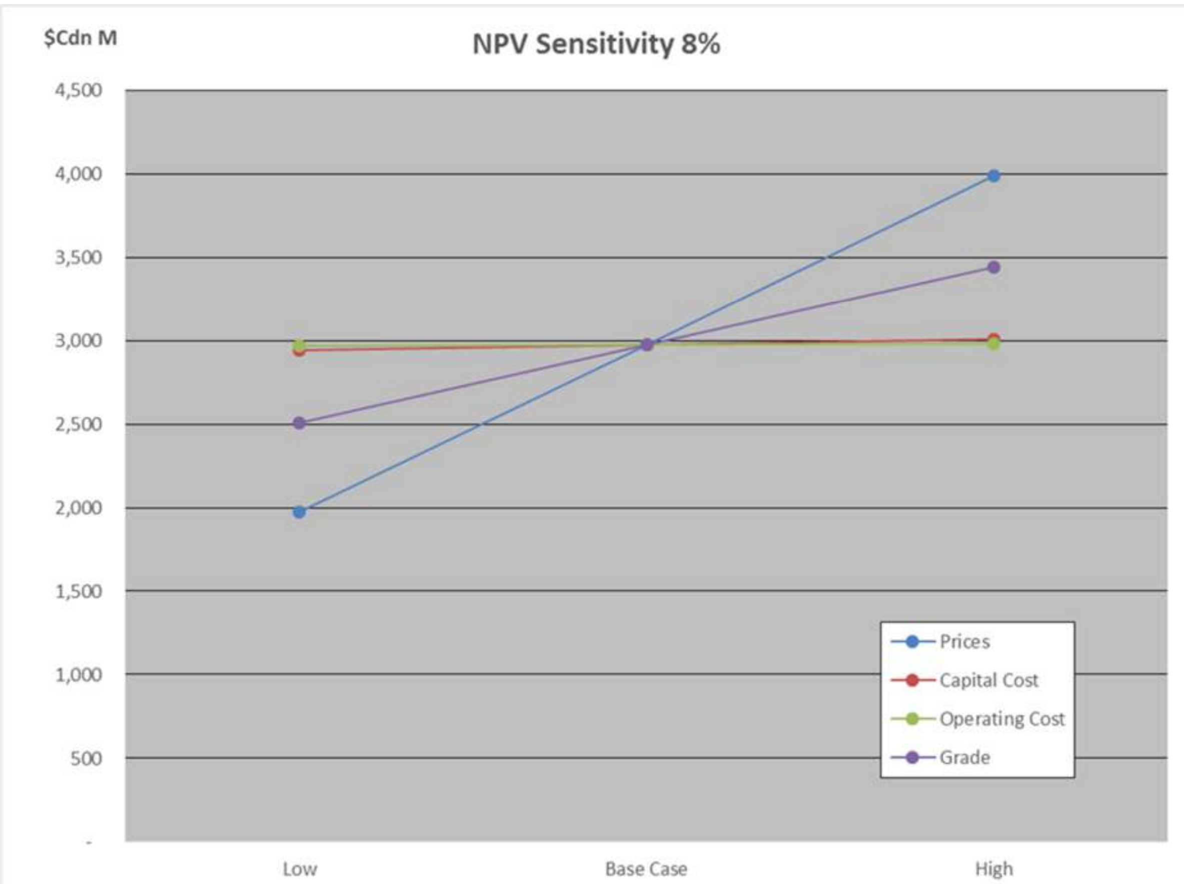
(3) Production volume does not include recycled product received from the Blind River Refinery and the Port Hope Conversion Facility.

(4) Operational and capital spending in Year 0 is representative of annual spending while the McArthur River mine and Key Lake mill are both in a state of care and maintenance.

22.2 Sensitivities

The graph in Figure 22-1 illustrates the operation's sensitivity to changes in uranium grade, capital cost, operating cost, and uranium prices (including the mitigating effects of Cameco's level of committed sales through its sales contract portfolio). The graph illustrates the variability around the base case pre-tax (see Section 22.5) net present value of $2.97 billion using the sensitivities of plus and minus 10% on all variables, except uranium price. For uranium price, the high and low cases represent a deviation of plus or minus $10 (US) per pound from the average spot price projections that were incorporated in the base case realized prices as shown in Table 19-1.

Figure 22-1: McArthur River Mine Economic Sensitivity Analysis



Note:

(1) The economic analysis assumes the McArthur River mine and Key Lake mill are both in a state of care and maintenance during 2019 with restart occurring in 2020. No such restart decision has been made.

The analysis shows relatively low sensitivity to changes in operating or capital cost projections. The relative sensitivity to changes in uranium price and ore grade realized is significantly higher due in part to the relatively high-grade nature of the deposit and the price estimates used.

The NPV from January 1, 2019 forward is also sensitive to the timing of restart. Table 22-2 summarizes the estimated NPV (8%) in the case that the McArthur River mine and Key Lake mill remain in a state of care and maintenance for an additional one, five, or ten years.

Table 22-2: McArthur River Mine Net Present Value by Start-up Year

	Year of Restart Decision			
	2020	2021	2025	2030
NPV ($Cdn M)	$2,973	$2,761	$2,012	$1,211

22.3 Payback

Payback for Cameco, including all actual costs, was achieved in 2010, on an undiscounted, pre-tax basis. After resumption of production, all care and maintenance and future capital expenditures are forecast to be covered by operating cash flow.

22.4 Mine life

Based upon its current mineral reserves, the remaining mine life of McArthur River is approximately 23 years.

22.5 Taxes

McArthur River operates as an unincorporated joint venture and is, therefore, not subject to direct income taxation at the joint venture level. Cameco, as the mine operator, operates the mine on behalf of the MRJV and distributes the resulting U_3O_8 production to the MRJV partners in proportion to their joint venture interests.

Cameco is subject to federal and provincial (Saskatchewan and Ontario) income tax in Canada. Royalties are fully deductible for income tax purposes.

For the purpose of the economic analysis, the projected impact of income taxes has been excluded due to the nature of the required calculations. Taxable income for Cameco is comprised of results from several discrete operations, which are combined to determine Cameco’s taxable income and its related tax liabilities. It is not practical to allocate a resulting income tax cost to Cameco’s portion of the McArthur River Operation, as Cameco’s tax expense is a function of several variables, most of which are independent of the investment in McArthur River.

22.6 Royalties

Cameco pays royalties on the sale of all uranium extracted at its mines in the province of Saskatchewan. Two types of royalties are paid:

- Basic royalty: this royalty is calculated as 5% of gross sales of uranium, less the Saskatchewan resource credit of 0.75%
- Profit royalty: a 10% royalty is charged on profit up to and including $23.29/kg U_3O_8 (2018 indexed value) and a 15% royalty is charged on profit in excess of $23.29/kg U_3O_8. Profit is determined as revenue less certain operating, exploration, reclamation and capital costs. Both exploration and capital costs are deductible at the discretion of the producer.

As a resource corporation in Saskatchewan, Cameco also pays a corporate resource surcharge of 3.0% of the value of resource sales.

23 Adjacent properties

Information on adjacent properties is not applicable to this technical report.

24 Other relevant data and information

24.1 Production suspension

In November 2017, Cameco and Orano announced production from the McArthur River and Key Lake Operations would be temporarily suspended by the end of January 2018 for an expected duration of 10 months. In July 2018, Cameco and Orano announced that the production suspension would continue for an indeterminate duration due to continued weakness in the uranium market. In addition to production, all development, construction and infill exploration activities for the new mining zones were also halted.

The production suspension resulted in the permanent layoff of approximately 520 employees from McArthur River and Key Lake. A reduced workforce of approximately 175 Cameco employees remain employed at the operations to keep the facilities in a state of safe care and maintenance.

As the result of the production suspension, Cameco does not expect the operations to produce any uranium in 2019.

24.2 Care and maintenance

The McArthur River and Key Lake Operations have been in care and maintenance since February 2018. Care and maintenance activities include mine dewatering, water treatment, freeze wall maintenance, and environmental monitoring. In addition, preservation maintenance and monitoring of the sites' critical facilities continues. Cameco's objective is that the McArthur River and Key Lake Operations are available to return to production in a timely manner once a decision is made to end the production suspension. Cameco's share of the cash operating and capital costs to maintain the operations during shutdown is expected to range between $6 million and $7 million per month.

24.3 Production restart

Due to the suspension of production for an indeterminate duration, no actual production start-up date is currently available. Year 1 of the production plan represents the first year of assumed production after restart is announced and could potentially occur any time after 2019.

The main steps in preparing the mine and mill for restart of production are:

- **Restart planning:** Detailed restart planning including identification of critical project and maintenance work required to be completed prior to restarting the operations.
- **Restart announcement:** Once conditions required to support restarting the McArthur River and Key Lake Operations have been met, an announcement will be made.
- **Critical project execution:** The current assumption is that all critical project work can be completed within a one year time frame.
- **Maintenance readiness checks:** As a significant number of the facilities will have been shut down for more than two years, equipment and facility readiness checks will be performed prior to restarting operations.
- **Recruitment:** Recruitment will begin once the restart decision has been made. Workers will be mobilized in stages (restart planning team, maintenance preparation team, and operational team).
- **Training:** It is currently assumed that a sufficient number of experienced workers can be recruited in order to minimize operational training requirements and timelines.

Once critical projects, maintenance readiness checks and sufficient recruitment and training have occurred, the mine and mill will restart operations. It is projected that this will take a minimum of 9 months. Initial mill feed for the Key Lake restart will come from the high-grade broken inventory (4.2 million pounds at a grade of 17% U_3O_8) stored underground at McArthur River.

24.4 Mining and milling risks

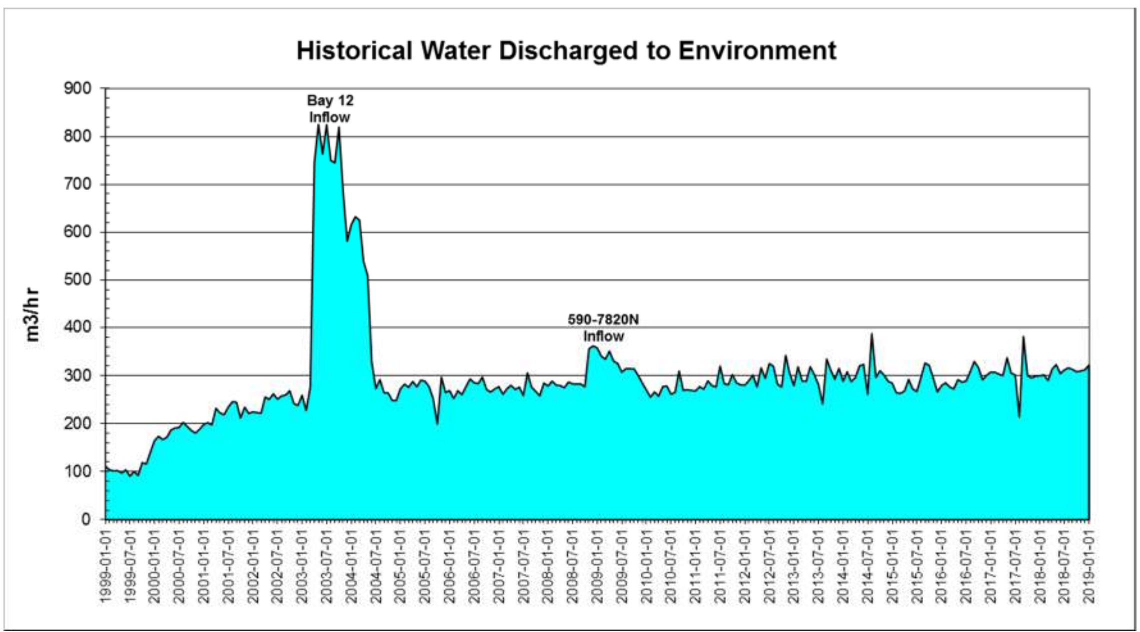
Production at McArthur River/Key Lake poses many challenges. These challenges include control of ground water, weak rock formations, radiation protection, water inflow, mine area transitioning, regulatory approvals, surface and underground fires and other mining related challenges. Operational experience gained since the start of production has resulted in a significant reduction in risk.

Water inflows

Water inflows pose a significant risk to the mine and have resulted in a production suspension in the past. There have been two notable water inflow incidents at the McArthur River mine (see Figure 24-1) and these two inflows have strongly influenced mine design, inflow risk mitigation and inflow preparedness:

- **Bay 12 Inflow:** Production was temporarily suspended on April 6, 2003, as increased water inflow due to a rock fall in a new development area (Bay 12 located just above the 530 metre level) began to flood the lower portions of the mine, including the underground grinding circuit area. Additional dewatering capacity was installed and the flooded areas were dewatered and repaired. Cameco resumed mining in July 2003 and sealed off the excess water inflow in July 2004.
- **590-7820N Inflow:** In November 2008, there was a small water inflow in the lower Zone 4 development area on the 590 metre level. It did not impact production, but did delay local development for approximately one year. In January 2010, the inflow was sealed off and local development was resumed.

Figure 24-1: Chart Showing Two Inflow Events against Historical Water Discharge



The consequences of another water inflow at McArthur River would depend on its magnitude, location and timing, but could include a significant interruption or reduction in production, a material increase in costs, or a loss of mineral reserves. Cameco takes the following steps to reduce the risk of water inflows, but there is no guarantee that these will be successful:

- Mine development: Cameco plans for its mine development to take place away from known groundwater sources whenever possible and practical. In addition, Cameco assesses all planned mine development for relative risk and applies extensive additional technical and operating controls for all higher risk development.

- Ground freezing: Before mining, Cameco drills freezeholes and freezes the ground to form an impermeable barrier around the area being mined. Ground freezing significantly reduces but does not fully eliminate the risk of water inflows.
- Pumping capacity and treatment limits: Cameco's standard for this mine is to secure pumping capacity of at least one and half times the estimated maximum sustained water inflow. Cameco reviews its dewatering system and requirements at least once a year and before beginning work on any new zone. Cameco believes it has sufficient pumping, water treatment and surface storage capacity to handle the estimated maximum sustained inflow.

Transition to new mine areas

In order to successfully achieve the planned production schedule after the restart of operations, Cameco must continue to successfully transition into new mining areas, which includes mine development and investment in critical support infrastructure.

Failure to successfully transition to a new mine area as scheduled could delay or reduce production, which could have a material and adverse effect on Cameco's earnings, cash flows and financial condition.

Mine and mill restart

The operational changes Cameco has made, including the suspension of production in 2018 for an indeterminate duration and the accompanying workforce reduction, carry with them the risks of a delay in restarting operations and subsequent production disruption.

Additional years of shutdown increases uncertainty for the timing of a successful restart of the operations and associated costs.

Labour relations

The collective agreement with the United Steelworkers local 8914 expired in December 2017 and the collective bargaining process has begun. This local represents unionized workers at McArthur River and Key Lake. There is a risk to the restart of operations after the production suspension if Cameco is unable to reach an agreement and there is a labour dispute.

24.5 Caution about forward-looking information

This technical report includes statements and information about expectations for the future that are not historical facts. When we discuss Cameco's strategy, plans and future financial and operating performance, or other things that have not yet taken place, we are making statements considered to be forward-looking information or forward-looking statements under Canadian and US securities laws. We refer to them in this technical report as forward-looking information.

Key things to understand about the forward-looking information in this technical report:

- It typically includes words and phrases about the future, such as believe, estimate, anticipate, expect, plan, intend, goal, target, forecast, project, scheduled, potential, strategy and proposed or variations (including negative variations) of such words and phrases or may be identified by statements to the effect that certain actions, events or results, may, could, should, would, will be or shall be taken, occur or be achieved.
- It is based on a number of material assumptions, including those we have listed below, which may prove to be incorrect.
- Actual results and events may be significantly different from what is currently expected, because of the risks associated with the project and Cameco's business. We list a number of these material risks below. We recommend you also review other parts of this document, including Section 24.4 which outlines a number of mining and milling risks, Cameco's annual information form for the year ended December 31, 2018 under the headings "Caution about forward-looking information" and "Risks that can

affect our business” and Cameco’s annual management’s discussion and analysis for the year ended December 31, 2018 under the headings “Caution about forward-looking information” and “Uranium Tier-one operations – McArthur River/Key Lake-Managing our risks”, which include a discussion of other material risks that could cause actual results to differ from current expectations.

Forward-looking information is designed to help the reader understand the current views of the QPs and management of Cameco. It may not be appropriate for other purposes. Cameco and the QPs will not necessarily update this forward-looking information unless required to by securities laws.

Examples of forward-looking information in this Technical Report

- Cameco’s plans and expectations for the McArthur River and Key Lake Operations, including the potential production restart any time after 2019;
- Estimates of capital, operating, sustaining, reclamation and closure costs, including decommissioning costs;
- Estimates of care and maintenance costs;
- Mineral resource and mineral reserve estimates;
- Forecasts relating to mining, development and other activities including but not limited to mine and mill production and mine life;
- Cameco’s expectation that all necessary regulatory permits and approvals will be obtained to meet its future annual production targets;
- Future royalty and tax payments and rates;
- Timing for completion of capital projects; and
- Results of the economic analysis, including NPV, IRR, cash flow forecasts and sensitivity analysis.

Material assumptions

- There is no material delay or disruption in Cameco’s plans as a result of ground movements, cave-ins, additional water inflows, natural phenomena (including inclement weather), surface and underground fires, delay in acquiring critical equipment, equipment failure, unanticipated consequences of cost reduction strategies, or other causes;
- There are no labour disputes or shortage;
- All necessary contractors, equipment, operating parts, supplies, regulatory permits and approvals are obtained when they are needed;
- Cameco’s mineral resource and mineral reserve estimates and the assumptions they are based on are reliable (see Sections 14.2 and 15.2, respectively);
- McArthur River development, mining and production plans succeed, including resumption of production after the end of the production suspension and transitioning to new mining areas;
- The Key Lake mill functions as planned and sufficient tailings capacity is available; and
- Cost estimates will be as expected, including care and maintenance and underlying assumptions associated with decommissioning costs.

Material risks

- An unexpected geological, hydrological, underground condition or an additional water inflow delays or disrupts production;
- Ground movements and cave-ins;
- The necessary regulatory permits or approvals cannot be obtained or maintained;
- Natural phenomena (including inclement weather), surface and underground fires, labour disputes, equipment failure, delay in obtaining the required contractors, equipment, operating parts and supplies, unanticipated consequences of cost reduction strategies or other reasons that cause a material delay or disruption in production;
- Mineral resource and mineral reserve estimates are not reliable;
- Cameco’s development, mining or production plans are delayed or do not succeed for any reason;
- Any difficulties in resuming McArthur River or Key Lake production after the end of the production suspension as a result of equipment failure on start-up or other reasons;
- Sufficient tailings facility capacity is not available; and
- Cameco’s expectations relating to cost estimates, including care and maintenance, prove to be inaccurate.

25 Interpretation and conclusions

McArthur River is a mature operation that has extracted 327.5 million pounds of U_3O_8 since its start of production in 1999. As of December 31, 2018, Cameco's share of the mineral reserves is estimated to be 274 million pounds U_3O_8, an increase of 9.1% since December 31, 2017, which is mainly due to the updated Zone B block model. The McArthur River production schedule has been modified to incorporate the additional mineral reserves. Cameco estimates that McArthur River will have a mine life of 23 years.

The McArthur River mine represents a significant economic source of feed material for the Key Lake mill and is forecast to produce a further 388 million packaged pounds U_3O_8 (100% basis). At the forecast average realized uranium price used in the economic analysis, Cameco estimates it will receive substantial positive net cash flows from its share of McArthur River production.

Operating costs for the MRJV are estimated to average $14.97 per pound U_3O_8 over the mine life. This is a significant decrease from the estimate of $19.23 per pound U_3O_8 in the 2012 Technical Report. The reduction in operating costs is indicative of the work to optimize the mine design and gain efficiencies in the mining and milling processes at an assumed annual production level of 18 million pounds of U_3O_8. Blasthole stope mining has significantly improved McArthur River's overall operating costs by reducing underground development, concrete consumption, mineralized waste generation, and improving extraction cycle time.

Cameco's share of the total estimated life of mine capital costs for the McArthur River and Key Lake Operations is $658 million compared to $2.5 billion in the 2012 Technical Report. The reduction in capital expenditures is due to mine design optimization, completed capital spend between 2012 and 2018 and a reduced annual production rate of 18 million pounds which reduces infrastructure requirements. Estimated capital and other costs to the MRJV include sustaining capital for both McArthur River and Key Lake Operations, as well as underground development at McArthur River to bring mineral reserves into production.

Cameco's share of the cash operating and capital costs to maintain both operations during the production suspension is expected to range between $6 million and $7 million per month. Additional years of shutdown increases uncertainty for the timing of a successful restart of the operations and associated costs.

An average uranium price of $44 (US) per pound U_3O_8 with a $1.00 (US) = $1.25 (Cdn) fixed exchange rate was used to estimate mineral reserves. Due to the high-grade nature of the McArthur River deposit, the McArthur River mineral reserves are robust and not significantly sensitive to variances in uranium price with annual production above 18 million pounds U_3O_8 and an average uranium price above $20.00 (US) per pound.

The economic analysis shows a NPV of $2.97 billion with an IRR of 11.6% in the scenario where restart occurs in 2020. If restart does not occur until 2030, the mining of the mineral reserves still generates a NPV of $1.21 billion. The robust nature of the economics supports declaring mineral reserves notwithstanding the indeterminate duration of the production suspension. Future developments, such as a forecast shutdown extending beyond 10 years, could necessitate a reclassification of McArthur River mineral reserves.

The McArthur River deposit is, in general, well delineated and shows limited mineral resource discovery potential within the immediate mine footprint. The northern extent of Zone B and target areas along the P2 trend, including McA South 1, McA North 3 and McA North 4, represent the primary remaining targets for mineral resource expansion and will need to be drilled in future years.

Given the size of the current proven and probable mineral reserve inventory and the anticipated future mining rate, exploration does not need to be accelerated.

The McArthur River Operation estimated mineral reserves have proven, thus far, to be slightly conservative with 4% more tonnage and 9% more pounds of U_3O_8 extracted than predicted. The mineral reserve models are updated as required to ensure model accuracy is maintained.

Cameco’s Key Lake mill has sufficient tailings capacity for all currently reported McArthur River mineral reserves and resources.

A significant risk to the McArthur River Operation is production interruption from water inflows. Cameco takes the following steps to reduce the risk of inflows:

Ground freezing: Before mining, Cameco drills freezeholes and freezes the ground to form an impermeable freeze barrier around the area being mined. Ground freezing reduces, but does not fully eliminate, the risk of water inflows.

Mine development: Cameco plans for mine development to take place away from known groundwater sources whenever possible. In addition, Cameco assesses all planned mine development for relative risk and applies additional technical and operating controls for all higher risk development.

Pumping capacity and treatment limits: Cameco’s standard is to secure pumping and treatment capacity of at least one and a half times the estimated maximum sustained inflow. Cameco believes it has sufficient pumping, water treatment and surface storage capacity to handle the estimated maximum sustained inflow. Cameco reviews its dewatering system and requirements at least once a year and before beginning work on any new zone.

Cameco has demonstrated that the challenging conditions associated with mining the McArthur River mineral reserves can be managed. Operational experience gained since the start of commercial production has resulted in a significant reduction in risk.

26 Recommendations

Considering that McArthur River and Key Lake has extracted 327.5 million pounds since 1999, and the operations are suspended for an indeterminate duration, the report authors are only making the following recommendations:

Mine and Mill restart planning

Cameco's objective is that the McArthur River and Key Lake Operations are available to safely and reliably resume production. Well in advance of restart, it is recommended that the following mine and mill restart planning activities be undertaken to identify:

- critical projects required to be completed prior to operational start-up
- critical maintenance work required to be completed prior to operational start-up
- restaffing and training requirements

This is necessary in order to be ready to restart in a timely manner once a decision is made to end the production suspension.

Metallurgical assumptions

It is recommended that a mineralogical and metallurgical analysis be completed on future mining areas to validate the forecast metallurgical and environmental performance assumptions.

Mineral reserves

Given the size of the current proven and probable mineral reserve inventory and the forecast rate of production when start-up of mining occurs, the authors of this technical report are of the opinion that exploration does not need to be accelerated. Additional delineation drilling is required for Zones A and B. When mining resumes, this drilling should be completed before transitioning to these new production areas.

The McArthur River Operation estimated mineral reserves have proven, thus far, to be slightly conservative with more pounds of U_3O_8 and tonnage extracted than predicted. Over the years, the mineral reserve model has been calibrated as required to better predict actual production results. Continued review of mineral resource models, applied mining recovery and dilution modifying factors and monitoring of production data against model expectations is recommended when mining resumes.

27 References

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28 Date and signature page

This technical report titled “McArthur River Operation, Northern Saskatchewan, Canada”, dated March 29, 2019, with an effective date of December 31, 2018, has been prepared by, or under the supervision of, the undersigned qualified persons within the meaning of NI 43-101.

Signed,

“Signed and sealed” March 29, 2019
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