

Exploration and mining in the Thompson-Okanagan-Cariboo Region, British Columbia



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1. Introduction

Thompson-Okanagan-Cariboo is an administrative region in south-central BC, established after the province reorganized its natural resource agencies in 2010. Mining predates Confederation and today the region is home to five of BC's largest metal mines, several industrial mineral mines, and many small placer operations, gravel pits, and rock quarries. Mineral products include: copper; molybdenum; gold; silver; limestone; bentonite; zeolite; diatomaceous earth; high-alumina shale; precious opal; dimension stone; and aggregate. The region's diverse geology, natural endowment, infrastructure (road, rail, power), and skilled workers sustain the search for new deposits.

In 2015, major mines focused on their tailings storage facilities in the aftermath of the breach at Mount Polley mine in August 2014. Most small mines remained on care and maintenance. Some projects in the pre-application stage of environmental review made progress while others were suspended pending better economic conditions.

Exploration focused on defining or expanding porphyry and porphyry-related deposits (copper-gold; copper-molybdenum), gold deposits of various types, and stratiform base-metal deposits. The pace of exploration slowed in 2015, continuing a decline that started in late 2011. Many projects were inactive because operators were unable to raise venture capital or unwilling to spend it in the region. Exploration expenditures for the region were included in the provincial total (Clarke, this volume) but for confidentiality reasons, specific expenditures are not presented herein. The geological overview section was written by Paul Schiarizza, British Columbia Geological Survey, and is republished from last year (Britton, 2015).

2. Geological overview by Paul Schiarizza, BCGS

The tectonic and metallogenic evolution of the Canadian Cordillera are intimately linked (Fig. 1, e.g., Nelson et al., 2013). The Thompson-Okanagan-Cariboo Region straddles three of British Columbia's five morphogeological belts (from east to west: Omineca; Intermontane; Coast). The mid-Mesozoic and older geological framework is represented by cratonic and pericratonic rocks in the east, and a series of Late Paleozoic through mid-Mesozoic arc and oceanic terranes to the west (Fig. 1). Younger rocks, not shown on Figure 1,

include Jura-Cretaceous siliciclastic and local volcanic rocks, Eocene volcanic rocks, Neogene and Quaternary basalt, and Middle Jurassic to Eocene granitic intrusions.

2.1. Cratonic and pericratonic terranes

The Monashee complex, partly represented by a narrow belt along the eastern edge of the region, comprises Paleoproterozoic orthogneiss, interpreted as part of the North American craton, overlain by a Neoproterozoic to Paleozoic cover sequence that includes quartzite, pelitic schist, calc-silicate schist and marble (Armstrong et al., 1991). Basement gneisses, including the Malton gneiss, are also exposed to the north, near Blue River, where they are associated with Neoproterozoic sedimentary sequences (Windermere Supergroup) that were deposited following initial rifting that formed the western margin of ancestral North America (McDonough and Parrish, 1991; Murphy et al., 1991). Extending northwestward from there, Cariboo terrane comprises Neoproterozoic to mid-Paleozoic siliciclastic and carbonate rocks, represented by the Kaza, Cariboo and Black Stuart groups, which are interpreted as distal facies of the North American platform (Struik, 1988a).

Kootenay terrane comprises Neoproterozoic to mid-Paleozoic rocks that are interpreted as deep-water basin facies equivalents deposited west of the North American platform. Lower Cambrian and older rocks are similar to North American strata to the east, but the overlying lower Paleozoic succession is characterized by units of coarse siliciclastic and mafic volcanic rocks that may reflect intermittent extensional deformation (Colpron and Price, 1995). This belt also includes Devonian-Mississippian calc-alkaline to alkaline volcanic rocks and associated granitoid intrusions, found mainly in the Eagle Bay assemblage east and southeast of Clearwater (Schiarizza and Preto, 1987), which reflect the initiation of east-dipping subduction beneath the North American plate margin. These rocks host polymetallic volcanogenic massive sulphide occurrences, as well as the Harper Creek bulk tonnage copper deposit.

2.2. Arc and oceanic terranes

Slide Mountain terrane comprises the most inboard tract of oceanic rocks in the Canadian Cordillera. It includes the

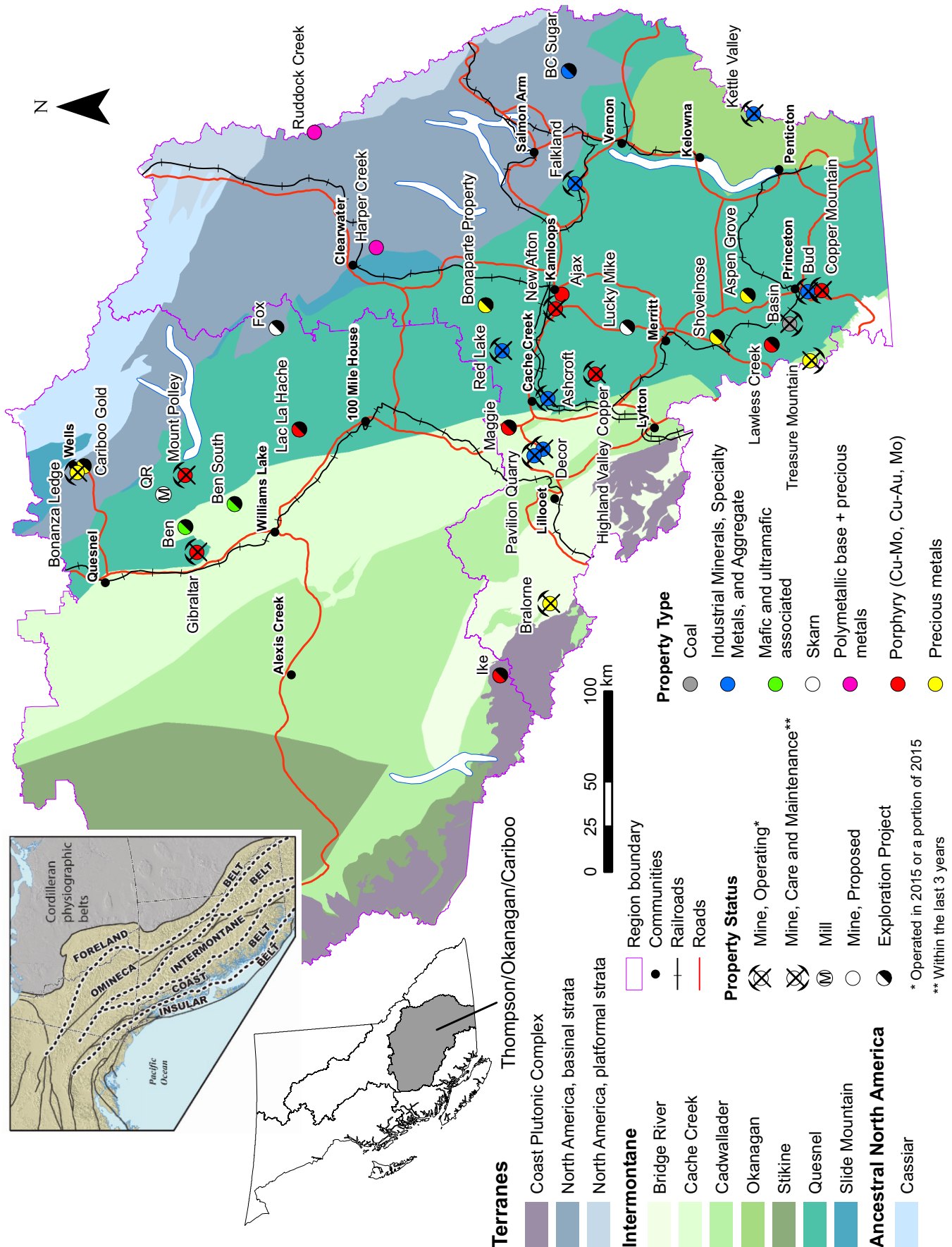


Fig. 1. Mines and selected mineral projects in the Thompson-Okanagan-Cariboo Region, 2015. Terranes modified after Colpron and Nelson (2011).

Fennell Formation, near Clearwater; the Antler Formation, near Wells; and, in the intervening area, a narrow, discontinuous belt of rocks referred to as the Crooked amphibolite. The Fennell and Antler formations comprise thrust-imbricated sequences of mainly basalt, chert, diabase, and gabbro, ranging from early Mississippian to mid-Permian (Schiarrizza and Preto, 1987; Struik and Orchard, 1985). These rocks may be the remnant of a Late Paleozoic marginal basin that formed behind a westward-retreating volcanic arc in Quesnel terrane. The Fennell Formation hosts Cu-Mo massive sulphide mineralization at the Chu Chua occurrence.

Quesnel terrane is a Late Triassic to Early Jurassic magmatic arc complex that formed along or near the western North American continental margin (Mortimer, 1987; Struik, 1988a, b; Unterschütz et al., 2002). It also includes a Late Paleozoic arc sequence, represented by the Harper Ranch Group (Beatty et al., 2006) and, in the south, assemblages of oceanic rocks that include the Old Tom, Independence, and Shoemaker formations (Tempelman-Kluit, 1989). The Mesozoic rocks are represented mainly by Middle to Upper Triassic volcanic and sedimentary rocks of the Nicola Group, together with abundant Late Triassic to Early Jurassic calc-alkaline to alkaline intrusions (Preto, 1977, 1979; Mortimer, 1987; Panteleyev et al., 1996; Schiarizza et al., 2013). The Nicola Group consists mainly of volcanic and volcanic-derived sedimentary rocks, but also includes an eastern sedimentary facies of dark grey siltstone and slate intercalated with quartzite and limestone (Bloodgood, 1990; Schiarizza et al., 2013; Mihalynuk et al., 2015). The volcanic rocks are mainly augite-phyric shoshonitic basalts, but the western part of the group locally includes a belt of calc-alkaline volcanic rocks with substantial amounts of rhyolite and dacite (Mortimer, 1987; Preto, 1977, 1979). A younger stratigraphic component of Quesnel terrane comprises Lower to Middle Jurassic sedimentary rocks (Ashcroft formation, Windy Mountain succession, Dragon Mountain succession) that overlie western parts of the Nicola Group unconformably or disconformably (Travers, 1978; Logan and Moynihan, 2009; Schiarizza et al., 2013).

Quesnel terrane is an important metallogenic province, particularly for porphyry deposits containing Cu, Au, and Mo (e.g., Logan, 2013; Logan and Mihalynuk, 2014). The plutons that host these deposits conform, in part, to a pattern defined by parallel belts of calc-alkaline or alkaline plutons that become progressively younger from west to east (Schiarrizza, 2014). The western (Late Triassic) calc-alkaline belt includes the Guichon Creek batholith, host to the Highland Valley Cu-Mo mines, and the Granite Mountain batholith, host to the Gibraltar Cu-Mo mine. A well-defined belt farther east comprises younger, latest Triassic alkaline plutons, which host alkalic porphyry Cu-Au deposits, including producing mines at Copper Mountain, Afton and Mount Polley. A third belt, younger and farther to the east, is defined by several large, Early Jurassic calc-alkaline plutons, including the Bromley, Pennask, Wild Horse, Thuya and Takomkane batholiths (Fig. 2).

Cache Creek terrane, comprising Carboniferous to Early

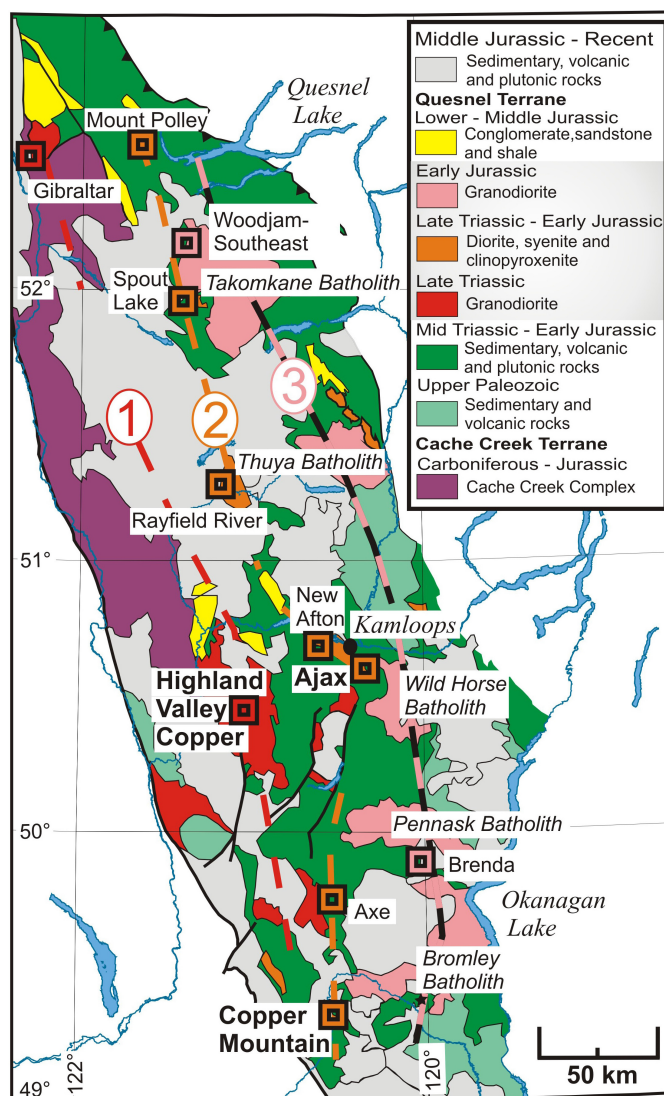


Fig. 2. Generalized geology of southern Quesnellia and Cu±Mo±Au deposits. Mesozoic arc plutons align along the length of southern Quesnellia to define three, north-trending, temporally distinct belts that get younger to the east: 1) Late Triassic; 2) Late Triassic-Early Jurassic; and 3) Early Jurassic. Discrete porphyry copper mineralizing events are directly linked to each of these magmatic episodes. From Logan (2013).

Jurassic chert, argillite, basalt, limestone, sandstone, gabbro and serpentinized ultramafic rocks of the Cache Creek complex, forms a belt to the west of Quesnel terrane in the central and northern parts of the region. It includes Late Triassic blueschists farther north (Ghent et al., 1996), and is interpreted, at least in part, as an accretion-subduction complex that was responsible for generating the Quesnel magmatic arc (Travers, 1978; Struik et al., 2001).

Cadwallader terrane, as interpreted by Schiarizza (2013), underlies parts of the Intermontane and eastern Coast belts, west of Cache Creek and Quesnel terranes. It includes a Late Permian-Early Triassic primitive oceanic arc complex, and an overlying Late Triassic-Middle Jurassic arc complex and associated siliciclastic apron. The older arc system includes

bimodal volcanic rocks and associated intrusions of the Wineglass assemblage, southwest of Williams Lake, and Late Permian intrusive rocks within the Mount Lytton complex (Friedman and van der Heyden, 1992; Schiarizza, 2013). The younger arc system includes Upper Triassic volcanic and sedimentary rocks of the Cadwallader Group and Tyaughton Formation, Late Triassic intrusions in the western part of the terrane and in the Mount Lytton complex, and Lower to Middle Jurassic siliciclastic and local volcanic rocks of the Ladner Group (Schiarizza, 2013, and references therein).

Bridge River terrane occurs in the eastern Coast belt, west of Lytton and Lillooet, where it is partially enveloped by Cadwallader terrane. It is represented mainly by the Bridge River complex, comprising structurally interleaved slivers of chert, argillite, basalt, blueschist, gabbro, serpentinite, limestone, and sandstone (Schiarizza et al., 1997). Dated cherts and limestones range from Mississippian to late Middle Jurassic, and blueschist-facies metamorphic rocks yielded Middle to Late Triassic Ar-Ar ages (Cordey and Schiarizza, 1993; Schiarizza et al., 1997). The Bridge River complex is thought to be the product of accretion and subduction processes, possibly related to Mesozoic arc volcanics of the adjacent Cadwallader terrane. Chert-bearing sequences are locally overlain by siliciclastic rocks of the Cayoosh assemblage (Jurassic-Cretaceous; Journeay and Mahoney, 1994), which forms the youngest component of the terrane.

Stikine terrane is a mid-Paleozoic to Middle Jurassic arc terrane that is markedly similar to Quesnel terrane, and forms a predominant component of the Cordillera in central and northern British Columbia. It is represented in the northwestern part of the Thompson-Okanagan-Cariboo Region by a few scattered exposures of volcanic and sedimentary rocks correlated with the Hazelton Group (Lower to Middle Jurassic; Tipper, 1959, 1969). Upper Triassic volcanic and sedimentary rocks assigned to the Mount Moore and Mosely formations, in the eastern Coast belt west of Chilko Lake, are also considered part of the Stikine terrane (Rusmore and Woodsworth, 1991).

2.3. Late Jurassic and younger rocks

Younger stratigraphic units overlap older terranes and cover large parts of the region. Although not shown in Figure 1, these units include: Upper Jurassic to Upper Cretaceous siliciclastic rocks of the Tyaughton-Methow basin, which overlap Cadwallader and Bridge River terranes in the eastern Coast belt (Schiarizza et al., 1997); and mid-Cretaceous arc volcanic rocks of the Spences Bridge Group which form a northwest-trending belt that overlaps Quesnel and Cache Creek terranes in the Merritt-Lillooet area (Monger and McMillan, 1989), and continues westward across the Fraser River where it overlaps Cadwallader and possibly Stikine terranes (Mahoney et al., 2013). Eocene volcanic rocks are predominant in some locations, and Neogene basalt of the Chilcotin Group overlaps Quesnel, Cache Creek, Cadwallader and Stikine terranes throughout much of the central part of the region (Dohaney et al., 2010). Granitic plutons, ranging in age from late Middle

Jurassic to Eocene, occur throughout the region, but are shown only in the southwest, where they form part of the Coast Plutonic complex (Fig. 1).

3. Mines and quarries

3.1. Metal mines

The Thompson-Okanagan-Cariboo Region hosts roughly half of the province's metal mines (Fig. 1, Table 1). Major mines include Gibraltar, Mount Polley, New Afton, Highland Valley, and Copper Mountain. Smaller mines include Bonanza Ledge, QR, Bralorne, and Treasure Mountain.

2015 began and ended with a focus on tailings. Following the breach of a tailings dam at Mount Polley in August 2014, government convened a committee of experts to provide an independent review of the disaster. In January 2015, the experts released their report and recommendations (Independent Expert Engineering Investigation and Review Panel, 2015). In December 2015, the Chief Inspector of Mines published his official investigation into the Mount Polley incident (Chief Inspector of Mines, 2015). Apart from formal investigations, government ordered all mines to evaluate their tailings storage facilities.

The **Gibraltar** copper-molybdenum mine (Fig. 2) operated by Taseko Mines Limited and Cariboo Copper Corp, began production in 1972 and completed its first full year of operation after modernization in 2013. The mine has generally met guidance of 85,000 t/d from combined mills, but in 2015 closed its molybdenum circuit and laid off staff to reduce operating costs. The deposit occurs in the Granite Mountain batholith (Late Triassic; see van Straaten et al., 2013 for detailed mine geology) within a fault bounded section of Nicola Group sedimentary and volcanic rocks (Quesnel terrane; Schiarizza 2014; 2015).

Mining at the **Mount Polley** copper-gold-silver mine (Fig. 2) of Imperial Metals Corporation resumed in August 2015, a full year after its tailings dam breached. Before restarting, the company spent more than \$65 million assessing the cause of the failure and repairing the damage it caused. Before shutdown, the mill had begun processing the first ore extracted from underground workings at the Boundary zone. The alkaline intrusive complex at Mount Polley has at least 8 discrete zones with a total resource inventory of ~411 million tonnes at 0.48% Cu equivalent (Measured and Indicated; as of 1 January 2013). Rees (2013) provides a comprehensive review of the Mount Polley deposit.

The **New Afton** gold-copper mine (Fig. 2) is a block cave operation owned by New Gold Inc. that opened in mid 2012 (Hall and May, 2013). Following tests of higher mining and milling rates in 2013, the company installed a new mill to increase capacity from a design rate of 11,000 t/d to 14,000 t/d. The new mill was commissioned in the second quarter of 2015, ahead of schedule. The deposit forms a high-grade keel beneath the past-producing Afton open pit mine, an alkaline porphyry in the Iron Mask batholith (Triassic). Exploration continued expand resources in the C zone, a down-plunge extension of

Table 1. Metal mines, Thompson-Okanagan-Cariboo Region, 2015.

Mine	Operator	Commodity; deposit type; MINFILE	Forecast 2015 Production (based on Q1-Q3)	Reserves (Proven + Probable)	Resource (Measured and Indicated)	Comments
Bonanza Ledge (on care and maintenance as of June 2015)	Barkerville Gold Mines Ltd.	gold; pyrite replacement; 093H 140	11,162 oz Au	Nil	Resource (as of 2015-03-31; cut-off 1.7 g/t Au): Measured: 170,000 t grading 8.74 g/t Au (containing 48,000 oz Au); Indicated: 240,000 t grading 6.86 g/t Au (containing 54,000 oz Au); M+I: 420,000 t grading 7.63 g/t Au (containing 102,000 oz Au)	Previously reported reserves have been reclassified as resources because profitable mining has not been demonstrated since test mining began in 2014.
Bralorne (on care and maintenance)	Avino Silver and Gold Mines Ltd.	gold; vein; 093JNE 001	Not available	Reserve data not available.	Measured and indicated resources (as of 2012-08-31; cut-off not stated): 154,750 t grading 9.11 g/t Au	2015 work improved tailings storage facilities and mine infrastructure.
Copper Mountain	Copper Mountain / Mitsubishi Materials	copper, gold, silver; alkalic porphyry; 092HSE 001	77.6 Mlb Cu; 29,200 oz Au; 288,400 oz Ag	Proven and probable reserves as of 2014-12-31; 0.18% Cu cut- off): 146 Mt grading 0.35% Cu, 1.47 g/t Ag, 0.12 g/t Au (containing 1.1 Blb of Cu; 6.9 Moz Ag; 560,000oz Au)	Measured and indicated resources (as of 2014-12-31; 0.18% Cu cut-off): 265 Mt grading 0.33% Cu, 1.33 g/t Ag, 0.40 g/t Au (containing 1.9 Blb Cu; 11.35 Moz Ag; 930,000 oz Au)	-
Gibraltar	Taseko Mines Ltd.	copper, molybdenum; calc-alkalic porphyry; 093B 012	144 Mlb Cu; 1.3 Mlb Mo.	Proven and Probable reserves (as of 2014-12-31; cut-off not stated): 749 Mt grading 0.256% Cu and 0.008% Mo. (Recoverable metal: 3.3 Blb Cu)	Measured and Indicated resources (as of 2014-12-31; cut-off grade not stated): 1,092 Mt grading 0.254% Cu and 0.008% Mo	-

Table 1. Continued.

Highland Valley Copper	Teck Highland Valley Copper Partnership	copper, molybdenum; calc-alkalic porphyry; 092ISW 012	146,900 t Cu; 3.3 Mlb Mo	Proven and probable reserves (as of 2014-12-31; cut-off not stated): 608 Mt grading 0.30% Cu; 0.008% Mo. (Recoverable metal: 1,570,000 t Cu; 30,000 t Mo.)	Resources (as of 2014-12-31; cut-off not stated): Measured: 395 Mt grading 0.32% Cu; 0.009% Mo; Indicated: 913 Mt grading 0.22% Cu; 0.011% Mo	-
Mount Polley (operations resumed August 2015)	Imperial Metals Corporation	copper; gold; silver; alkalic porphyry; 093A 008	5.8 Mlb Cu; 11,000 oz Au; 30,000 oz Ag	Probable reserves (as of 2014-01-01; 0.15% Cu cut-off): 86 Mt grading 0.295% Cu, 0.30 g/t Au, 0.62 g/t Ag	Measured and Indicated resources (as of 2014-01-01; 0.15% Cu cut-off): 411 Mt grading 0.28% Cu, 0.29 g/t Au, 0.81 g/t Ag	Company did not upgrade reserve and resource information for 2014.
New Afton	New Gold Inc.	copper, gold; alkalic porphyry; 092INE 023	405,000 oz Au; 1.8 Moz Ag; 95 Mlb Cu.	Proven and probable reserves (as of 2014-12-31; cut-off not stated): 42 Mt grading 0.56 g/t Au, 2.3 g/t Ag, 0.84% Cu; (containing 760,000 oz Au, 3.1 Moz Ag, 781 Mlb Cu)	Measured and Indicated resources (as of 2014-01-01; cut-off not stated): 73 Mt grading 0.75 g/t Au, 2.2 g/t Ag, 0.87% Cu; (containing 1.75 Moz Au, 5.2 Moz Ag, 1.4 Blb Cu)	-
QR (mine on care and maintenance; mill operates)	Barkerville Gold Mines Ltd.	gold; skarn; 093A 121	Not available	Not available	Not available	QR deposit depleted. Mill processes ore from Bonanza Ledge mine near Wells. -
Treasure Mountain (on care and maintenance)	Nicola Mining Inc.	silver, lead, zinc; vein; 092HSW 016	Not available	Not available	Not available	-

the area now being mined (Fig. 3; Rennie et al., 2015).

The **Highland Valley Copper** copper-molybdenum mine (Fig. 2), operated by Teck Highland Valley Copper Partnership (97.5% Teck and 2.5% Highmont Mining Company Ltd.), is the largest base metal mine in Canada. Mine production focused on the Valley pit as pre-stripping continued for the Lornex pit extension. In 2014 the company commissioned a new mill, a \$475 million investment to help extend mine life to 2026. The company has achieved throughputs of 139,000 tonnes per day, exceeding its rated capacity of 130,000 tonnes per day. Following ground geophysical survey and drilling programs

that started in 2012, Teck Highland Valley Copper Partnership continued to explore targets near the past-producing **Bethlehem** mine and their **Valley** pit. One hundred million tonnes of ore have been delineated at Bethlehem Phase 1. Engineering and feasibility studies are underway. A detailed description of deposits in the Highland Valley camp may be found in Byrne et al. (2013).

The **Copper Mountain** copper-gold mine, near Princeton (Fig. 2) has been producing since August 2011 (see Holbek and Joyes, 2013). It is operated by a partnership of Copper Mountain Mining Corporation (75%) and Mitsubishi Materials

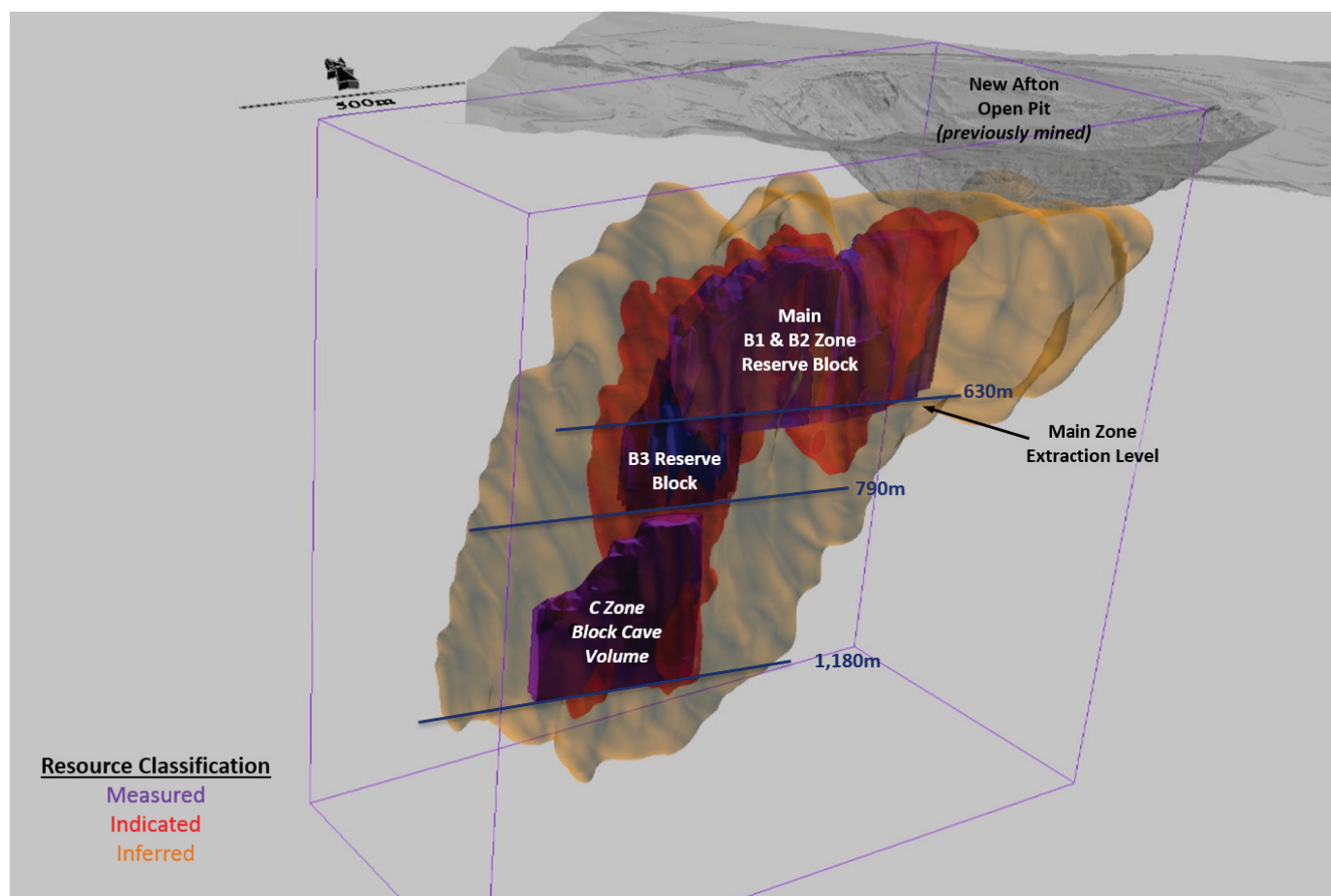


Fig. 3. New Afton's ore body forms a narrow keel under the former open pit mine. The C zone represents potential for future block-cave mining below current workings. (Image courtesy of New Gold Inc.).

Corporation (25%). The rate of mining has met or exceeded guidance figures, but until a new secondary crusher was installed in mid-2014, milling operations struggled to achieve the targeted 35,000 t/d. Quarterly mine production in 2015 has consistently exceeded targets. Copper Mountain received permits to mine the Virginia and Oriole deposits, respectively northeast and southeast of the main pit. Stripping at the Virginia pit commenced in 2015. Oriole will be mined once Virginia is depleted. A multi-year exploration program seeks to upgrade resources, test ore depths and find mineralization outside the current mine plan. In 2015, the company drilled (4 holes; 1,500 metres) the southern edge of the Virginia deposit looking for extensions.

The **Bonanza Ledge** mine, near Wells, is owned and operated by Barkerville Gold Mines Ltd. It is an open pit, truck and shovel operation with a mine life of four years. Test mining took place between March 2014 and June 2015 when it was halted due to problems with grade control and the costs of trucking ore to the company's mill at QR mine 110 km away. Previously published reserves (as of August 2009, proven: 130,724 tonnes grading 10.227 g/t Au; probable: 166,808 tonnes grading 8.114 g/t Au) were reclassified as resources because test mining had been unprofitable (Snowden, 2015). Bonanza Ledge is a

pyrite replacement deposit consisting of native gold in quartz veins within pyrite-bearing, carbonaceous and chloritic phyllite of the Snowshoe Group (Proterozoic-Paleozoic).

The **QR** mine of Barkerville Gold Mines Ltd has operated sporadically in recent years due to depleting ore and is now essentially closed. The mill at QR processes ore trucked in from Bonanza Ledge mine 110 km away.

The **Treasure Mountain** mine, 40 kilometres west of Princeton, was on care and maintenance in 2015. By December its owner, Huldra Silver Inc., completed restructuring under the Companies' Creditors Arrangement Act, changed its name to Nicola Mining Inc., and consolidated shares (five old for one new). The Treasure Mountain deposit is a stacked series of high-grade silver-lead-zinc veins in Cretaceous sedimentary rocks of the Pasayten Group in the Methow terrane (Fig. 1). A resource estimate (indicated, non-NI 43-101 compliant) prepared in 2009 was 33,000 tonnes grading 828 g/t Ag, 4.16% Pb, and 3.8% Zn, at a 311 g/t Ag cut-off. Other targets near the mine have not been drilled but have returned high-grade grab samples. Nicola Mining's mill is at the former Craigmont tailings facility, near Merritt.

Avino Silver & Gold Mines Ltd. acquired the **Bralorne** gold mine, near Gold Bridge, in 2014 and suspended mining shortly

thereafter. Work in 2015 included raising the tailings dam, mill improvements, underground development, and exploration (discussed below). Ore comes from gold-bearing mesothermal quartz veins between three former mines (Bralorne, King and Pioneer).

3.2. Coal

The **Basin** mine, operated by Coalmont Energy Corporation, continued on care and maintenance in 2015, pending restructuring under the Companies' Creditors Arrangement Act. The mine produced thermal coal between June and October 2013 at an initial rate of 250,000 tonnes per year of thermal coal (Table 2). Production halted due to a spill of mine water and has not restarted because of poor coal prices. Basin mine is 18 kilometres west of Princeton uses a 250 tonne per hour Parnaby wash plant, which eliminates the need for a tailings pond. Cleaned coal moves by truck and barge to Texada Island for shipment to local and overseas markets. Production comes from Eocene rocks in a half graben; the Main seam is about 32 metres thick and has four coal units separated by thin layers of siltstone, tuff or ironstone. Twenty-seven metres below the Main seam is the Lower seam (7 metres thick), which remains an exploration target.

3.3. Industrial minerals

Over ten industrial mineral quarries and processing plants operate in the region (Fig. 1; Table 3). These operations employ more than 250 people.

The **Kamloops** cement plant and **Harper Ranch** limestone quarry of Lafarge Canada Inc. continue to supply cement to meet demand in western Canada. Apart from limestone, the cement plant uses gypsum and anhydrite mined at the **Falkland** quarry and alumina-silica silt obtained from a loess deposit on site.

The **Decor** pit of Pacific Bentonite Ltd., 20 kilometres west of Cache Creek, supplies alumina-rich burnt shale to the Lafarge cement plant in Kamloops. The property also hosts a large bentonite deposit, which is being investigated for municipal engineering and tile manufacturing applications.

A few kilometres west of Decor, Graymont Western Canada Inc. operates the **Pavilion** limestone quarry and lime plant. The operation produces quicklime, high-calcium limestone fines, screened high-calcium stone products, lime kiln dust and rip rap. Graymont has a forty-year lease with the Ts'kw'aylaxw First Nation to mine on their reserve, and most of the operation's employees are Ts'kw'aylaxw.

Five kilometres east of Ashcroft, IG Machine and Fiber Ltd, a subsidiary of IKO Industries Ltd, operates the **Ashcroft** basalt quarry and roofing granule plant.

In January 2014, Craigmont Industries Ltd. started producing magnetite from their new recovery plant at **Mount Polley** mine. Operations stopped in August 2014, due to the tailings dam breach, but are expected to resume early in 2016. The plant captures magnetite from the mine's tailings stream and produces a dense media used for coal washing operations.

At their plant in Kamloops, Absorbent Products Ltd. manufactures cat litter, barn deodorizer, industrial absorbents, and carriers for agricultural products prepared from diatomaceous earth from the **Red Lake** quarry, 45 kilometres northwest of Kamloops, and bentonite from the **Bud** quarry 7 kilometres south of Princeton.

In 2014, Canadian Mining Company Inc. concluded its option agreement with Heemskirk Canada Ltd and regained control of the **Zeotech/Bromley Creek** zeolite quarry, 6 kilometres east of Princeton. Zeolite from the quarry has agricultural and absorbent applications.

Opal Resources Canada Inc. produces gem quality fire opal from the **Klinker** property, 25 kilometres northwest of Vernon. Opal forms fracture and vesicle-fillings in andesitic to basaltic lahars and breccias in the Kamloops Group (Eocene).

Decorative rock and dimension stone are produced at small quarries throughout the region. Kelowna Sand and Gravel mines gneiss, dacite ash, and basalt at the **Nipple Mountain, Kettle Valley, Canyon** and **Gemini** quarries and has been issued permits to explore other sites. Kettle Valley Stone Company of Kelowna processes this material to produce flagstone, ashlar, facing stone, and landscape rock. In 2010, Spectral Gold Corp. began developing the **Lady King Basalt** deposit, near Vernon, selling basalt columns as landscape rock.

Table 2. Coal mine, Thompson-Okanagan-Cariboo Region, 2015.

Mine	Operator	Commodity; deposit type; MINFILE	Forecast 2015 Production (based on Q1- Q3)	Reserves (Proven and Probable)	Resource (Measured and Indicated)	Comments
Basin	Coalmont Energy Corp.	TC; 092HSE 157	On care and maintenance in 2015	Not available	Not available	-

HCC = hard coking coal; PCI = pulverized coal injection; TC = thermal coal; ULV = ultra low volatile

Table 3. Industrial mineral mines, Thompson-Okanagan-Cariboo Region, 2015 (listed alphabetically).

Mine	Operator	Commodity; deposit type; MINFILE	Forecast 2015 Production (based on Q1-Q3)	Reserves (Proven + Probable)	Resource (Measured and Indicated)	Comments
Ashcroft	IG Machine and Fibers Ltd. (IKO Industries Ltd.)	Basalt (roofing granules); 092INW104	350,000 tons	Not available	Not available	-
Bromley Creek (Zeotech)	Canadian Mining Company Inc.	Zeolite; 092HSE243	On care and maintenance in 2015	Not available	M+I as of 2013-06-30): 550,000 t	-
Bud	Absorbent Products Ltd.	Bentonite; 092HSE162	Not available	Not available	Not available	-
Decor	Pacific Bentonite Ltd.	Alumina, landscape rock; 092INW084	100,000 tons	Not available	Not available	-
Falkland	Lafarge Canada Inc.	Gypsum; 082LNW001	6,000 tons	Not available	Not available	-
Harper Ranch	Lafarge Canada Inc.	Limestone; 092INE001	220,000 tons	Not available	Not available	-
Kettle Valley quarries	Kelowna Sand and Gravel Ltd./Kettle Valley Stone Ltd.	Ashlar, flagstone, thin veneer; 082ENW109, 111, 112	Not available	Not available	Not available	-
Klinker	Opal Resources Canada Inc.	Opal; 082LSW125	Intermittent operation	Not available	Not available	-
Lady King Basalt	Spectral Gold Corp.	Basalt columns; N/A	Intermittent operation	Not available	Not available	-
Mount Polley Magnetite	Craigmont Industries Ltd.	Magnetite (recovered from tailings); 093A 008	Not available. Plant will resume operating January 2016	Not available	Not available	-
Pavilion	Graymont Western Canada Inc.	Limestone; 092INW081	190,000 tons	Not available	Not available	-
Red Lake	Absorbent Products Ltd.	Diatomaceous earth; 092INE081	Not available	Not available	Not available	-

3.4. Placer, aggregate, and rock

A recent tally of ‘active’ placers, pits and quarries that have valid Mines Act permits, shows there are 419 placer surface mines; 1 placer underground mine (Wingdam); 298 sand and gravel pits; and 46 quarries in the region (A. Hart, pers. comm., January 2016). ‘Active’ is an administrative classification and includes mines undergoing reclamation and closure. Most of these operations are small, intermittent or seasonal, and lack production data.

4. Proposed mines

Five projects are in this category: **Ajax**, **Harper Creek**, **New Prosperity**, **Ruddock Creek**, and **Spanish Mountain** (Fig. 1, Table 4).

KGHM Ajax Mining Inc. continued engineering and baseline studies to advance their **Ajax** porphyry copper-gold project, on the outskirts of Kamloops. In September 2015, the company submitted their application to the Environmental Assessment Office and Canadian Environmental Assessment Agency.

Although the application was accepted by reviewing agencies, the company announced it would suspend the process to allow First Nation partners more time to study the 18,000 page submission. Ajax is a proposed 60,000 tonne-per-day open pit operation with a projected 20 year life. The company is a joint venture between KGHM Polska Miedź S.A. (KGHM SA) and Abacus Mining and Exploration Corporation. Exploration continued at nearby deposits such as DM-Audra and Rainbow. All mineralization occurs in the Iron Mask Batholith, a Triassic, multi-phase, alkaline intrusive complex (Fig. 2).

The **Harper Creek** copper-gold-silver project, 90 km north of Kamloops, is described as a stratiform, disseminated volcanogenic deposit in metamorphosed volcanic and sedimentary rocks of the Eagle Bay Formation (Devono-Mississippian). Yellowhead Mining Inc.’s application for an environmental assessment certificate to provincial and federal authorities was accepted in January 2015. In June, the company requested an extension to incorporate recommendations of the expert panel on tailings facilities. In October, the company

Table 4. Proposed mines, Thompson-Okanagan-Cariboo Region, 2015.

Project	Operator	Commodity; deposit type; MINFILE	Reserves (Proven + Probable)	Resource (Measured and Indicated)	Work Program	Comments
Ajax	KGHM Ajax Mining Inc.	Cu, Au; Alkalic porphyry 092INE012, 13	Reserves (P+P; NSR cut-off US\$7.10/t): 426 Mt grading 0.29% Cu; 0.19 g/t Au; 0.39 g/t Ag (containing 2.7 Bt Cu; 2.6 Moz Au; 5.3 Moz Ag)	Resources (M+I ; NSR cut-off US\$7.10/t): 568 Mt grading 0.26% Cu; 0.18 g/t Au; 0.35 g/t Ag	Environmental and engineering studies; exploration and condemnation drilling; feasibility study	Project application accepted for review in November 2015. Review temporarily suspended by applicant to allow further study by First Nations
Harper Creek	Yellowhead Mining Inc.	Cu, Au, Ag; Stratiform, volcanic- hosted 082M 008, 9	Reserves (P+P; cut-off 0.14% Cu): 716 Mt grading 0.26% Cu; 0.029 g/t Au; 1.18 g/t Ag	n/a	Environmental and engineering studies	Project application accepted for review in December 2014. Review suspended in October 2015 by company for economic reasons
New Prosperity	Taseko Mines Ltd.	Cu, Au; Calc-alkalic porphyry; 092O 041	Reserves (P+P; cut-off not stated): 831 Mt grading 0.23% Cu and 0.41 g/t Au; containing (recoverable) 3.6 Blb Cu; 7.7 Moz Au	n/a	Company seeks a judicial review of Federal EA decision. Results pending	Project at post- decision stage
Ruddock Creek	Ruddock Creek Mining Corporation	Pb, Zn, Ag; Monashee- type sediment- hosted massive sulphide; 082M 082	n/a	Resources (M+I; cut-off 4.0% Pb+Zn): 6.2 Mt grading 6.50% Zn, 1.33% Pb	Environmental and permitting work	Project at pre- application stage
Spanish Mountain	Spanish Mountain Gold Ltd.	Au, Ag; Sediment- hosted gold; 093A 043	n/a	Resources (M+I; cut-off 0.20 g/t Au): 237.8 Mt grading 0.46 g/t Au; 0.69 g/t Ag; containing 3.5 Moz Au; 5.28 Moz Ag	Environmental and permitting work	Project at pre- application stage

suspended further work on the project (including baseline environmental studies) due to a lack of funds. At year's end the company announced that it was seeking financing to complete the environmental review. Proven and Probable mineral reserves now stand at 716 million tonnes grading 0.26% Cu; 0.029 g/t Au and 1.2 g/t Ag. The study proposes a 70,000 tonne per day operation with a mine life of 28 years. Initial capital costs would exceed \$1 billion.

At the **Ruddock Creek** massive sulphide prospect, 75 kilometres northeast of Clearwater (Fig. 1), Imperial Metals Corporation collected environmental baseline data in preparation for future permitting requirements. The project is owned by Imperial Metals Corporation (50%) and joint venture partners Mitsui Mining and Smelting Co Ltd. (30%) and Itochu Corporation (20%). The operator and manager of the joint venture is the Ruddock Creek Mining Corporation. The deposit

is described as sedimentary exhalative, Monashee or Broken Hill-type, in marble, gneiss and calc-silicate rocks. A mineral resource estimate, released in March 2012, reported 4.65 million tonnes grading 6.77% Zn and 1.38% Pb (Indicated) and 5.38 million tonnes grading 6.69% Zn and 1.31% Pb (Inferred), using a 4.0% combined Pb+Zn cut-off.

The **New Prosperity** project of Taseko Mines Limited, 125 km southwest of Williams Lake, is described as a gold-copper porphyry with Proven and Probable reserves of 830 million tonnes grading 0.42 g/t Au and 0.23% Cu. Taseko continues to seek a judicial review of the February 2014 Federal decision not to authorize the project. BC granted Taseko a project certificate in November 2013 and has extended its expiry date by five years.

Spanish Mountain Gold Ltd. suspended exploratory work on its **Spanish Mountain** sediment-hosted gold deposit, 70 kilometres northeast of Williams Lake until economic conditions improve. Baseline environmental studies continue as the company prepares for formal environmental review. For the previous three years, the company has used reverse circulation drilling to gain more accurate sampling of friable mineralized layers. As of April 2014, Measured and Indicated resources (using a cut-off grade of 0.2 g/t Au) are 237.8 million tonnes grading 0.46 g/t Au and 0.69 g/t Ag.

5. Exploration activities and highlights

Exploration in 2015 focused on defining or expanding porphyry and porphyry-related deposits (copper-gold; copper-molybdenum; copper-tungsten), skarn deposits (tungsten), gold deposits of various types, stratiform base-metal deposits, and magmatic deposits (nickel). Industrial minerals (graphite; gypsum; jade) were also sought. Herein, projects are grouped by deposit type and location (Fig.1; Table 5).

5.1. Porphyry and porphyry-related deposits

Over the past few years, the southern end of the Quesnel terrane, between Aspen Grove and Princeton, has seen renewed exploration interest (see also Mihalynuk et al., 2013a, b, 2014, 2015 for results of recent British Columbia Geological Survey mapping, and Logan and Mihalynuk 2014 for a review of Cordilleran porphyry deposits). From north to south, some of the larger properties (and their operators or owners) include: **Big Kidd** (Julian Resources Inc.); **Aspen Grove** (60% Kaizen Discovery Inc./40% Itochu Corp.); **Man-Prime** (Sunrise Resources Ltd.); **Dillard** (Fjordland Exploration Inc./Sumac Mines Ltd.); Allison Lake; **Hit/Aspen Grove South** (Colorado Resources Ltd.); **Axe** (Copper Mountain Mining Corp./Weststar Resources Corp.); **Castle** (Blue River Resources Ltd.); **Miner Mountain** (Sego Resources Inc.); **Copper Mountain** mine (Copper Mountain Mining Corp.); and **Princeton** (Anglo Canadian Mining Corp.). A poor economy has idled most of these projects.

Kaizen Discovery Inc. acquired the **Aspen Grove** copper-gold project in 2013 and commenced drilling in 2014. Claims at Aspen Grove include a number of known mineral

occurrences (Zig, Par, Ketchan Lake, Coke; Fig. 4). Drilling in 2014 focused on the Par prospect. In 2015, drilling mostly targeted the Ketchan Lake stock. All 13 holes encountered potassic and/or calc-potassic alteration; 12 holes intersected Cu-Au mineralization with grades up to 0.5% Cu and 0.15 g/t Au over tens of metres. Some holes had positive results from surface. Drilling at Ketchan Lake confirmed the size of the porphyry intrusive and the continuity of mineralization along 1,800 metres of strike length. Drilling at the Par prospect also intersected mineralization. The Aspen Grove project is owned 60% by Kaizen and 40% by Itochu Corporation of Japan.

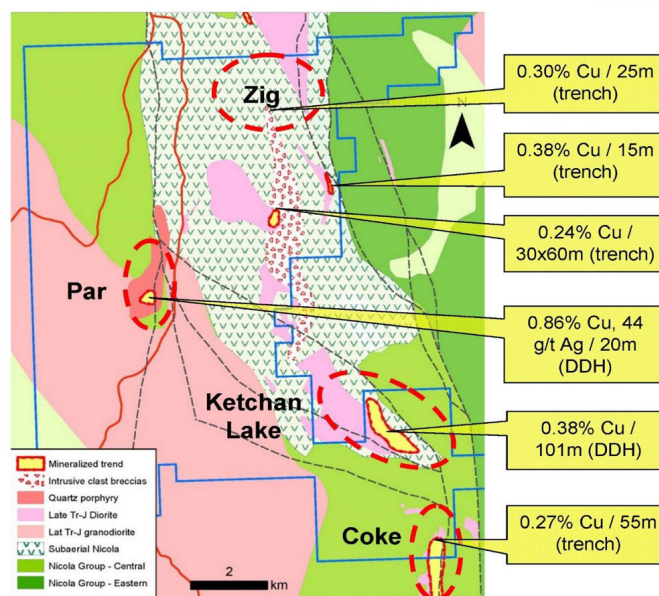


Fig. 4. Drilling at the Par and Ketchan Lake zones was the focus of exploration for Kaizen Discovery Inc. at its Aspen Grove project, between Merritt and Princeton (Image courtesy of Kaizen Discovery Inc.).

5.1.1. Copper-tungsten

Plate Resources Inc. has an option agreement with Nexgeo Inc. and Korea Resources Corporation to advance the **Lucky Mike** project at Swakum Mountain, 25 kilometres north of Merritt. The Swakum Mountain area has a variety of deposit types, including veins, skarns, and porphyries. Phase 1 drilling, completed late in 2014, focused on the Lucky Mike tungsten-copper(-silver) skarn but also discovered molybdenum mineralization over tens of metres of core. In 2015, Phase 2 drilling (17 holes; ~4,800 metres) further explored both the skarn and the molybdenum targets. The molybdenum target is a 25 hectare area with high magnetic and high chargeability values. Molybdenum mineralization occurs in small veins and fracture fillings over tens of metres of core (Fig. 5). The company's current geological model is a broad porphyry Mo(-Cu) porphyry with subordinate Cu-W skarn zones in altered calcareous horizons on the flanks.

Table 5. Selected exploration projects, Thompson-Okanagan-Cariboo Region, 2015 (listed alphabetically).

Project	Operator	MINFILE	Commodity; Deposit type	Resource (NI 43-101 compliant unless indicated otherwise)	Work Program	Comments
Aspen Grove (Ketchan)	Kaizen Discovery Inc.	092HNE 115	Cu, Au; Porphyry	n/a	Drilling	Improved geological model
BC Sugar	Lithium Corporation	n/a	Graphite; Disseminated/Vein	n/a	Geophysics; mapping; sampling; trenching	Analytical results pending
Ben	Westhaven Ventures Inc.	n/a	Ni; Magmatic(?)	n/a	Metallurgy; geophysics; drilling	Improved geological model
Bethlehem	Teck Highland Valley Copper Partnership	092ISE001	Cu, Mo; Porphyry	n/a	Engineering and feasibility studies; permitting	-
Bonaparte	WestKam Gold Corp.	092P 050	Au; Cu; Vein; porphyry	n/a	Drilling outside of Discovery zone area	Analytical results pending
Bralorne	Avino Silver & Gold Mines Ltd.	092JNE001	Au; Vein	n/a	Drilling (Alhambra, 52 and 77 veins)	Improved geological model
Cariboo Gold	Barkerville Gold Mines Ltd.	093H 019	Au; Vein; replacement	Cow Mountain block (as of 2015-03-31; cut off 0.5 g/t Au): Indicated: 35.8 Mt grading 2.4 g/t Au (containing 2.8 Moz Au); Inferred: 27.5 Mt grading 2.3 g/t Au (containing 2.0 Moz Au)	Drilling to define resources at BC vein and explore new targets	Improved resource definition; discovery of AG horizons
Fox / Ridley Creek	Happy Creek Minerals Ltd.	093A 259	W, Mo, Ag; Skarn	n/a	Drilling, rock and soil sampling	Improved geological model for Creek zone
Ike	Amarc Resources Ltd.	092O 025	Cu, Mo, Ag; Porphyry	n/a	Drilling	Mineralized zone extended
Lac la Hache	GWR Resources Inc.	092P 002	Cu, Au, Ag	n/a	Drilling; prospecting	Discovery of Berkey zone (copper porphyry)
Lucky Mike	Plate Resources Inc.	092ISE027	W, Cu, Mo; Skarn; porphyry	n/a	Drilling	Mineralized zone extended; improved geological model
Maggie	Constantia Resources Ltd.	092INW015	Cu, Mo, Ag; Porphyry	n/a	Drilling; community engagement	Analytical results pending; Web site: www.constantiaresources.com
Shovelnose	Westhaven Ventures Inc.	092HNE308, 309	Au; Vein; breccia	n/a	Drilling	Mineralized zone extended; Web site: www.westhavenventures



Fig. 5. A deep zone of molybdenum mineralization was discovered this year at the Lucky Mike project, near Merritt (Image courtesy of Plate Resources Inc.).

5.1.2. Copper-molybdenum

Late in 2015, Constantia Resources Ltd commenced a second phase of drilling at the **Maggie** project, a porphyry copper-molybdenum prospect north of Cache Creek. The first phase of drilling, completed in early 2014, confirmed historic grade and continuity of mineralization. The second phase will test possible extensions. Maggie is described as a typical, calc-alkaline porphyry deposit in which copper and molybdenum occur in stockwork veins and as disseminations. The intrusive is a multi-phase, quartz monzonite porphyry with a radiometric (U-Pb zircon) age of ~66 Ma (J. Lang, pers. comm., October 2015). Host rocks are part of the Carboniferous to Permian Cache Creek assemblage, consisting of deformed sedimentary and volcanic sequences of low metamorphic grade that are intruded by pyroxenite dikes and sills.

As part of its ongoing community engagement, Constantia maintains a community office in Cache Creek and has sponsored scholarships for students to become drill core technicians, held a job fair, and reached cooperation and benefits agreements with local First Nations.

Amarc Resources Ltd. continued drilling the **Ike** property in the South Chilcotin Mountains, 110 kilometres northwest of Lillooet, with financial assistance from Thompson Creek Metals Company Inc. The target is copper-molybdenum-silver porphyry mineralization in an extensive alteration zone in the Coast Plutonic complex. The project includes the Tasco (or Chilcotin Belle) mineral occurrence. The 9-hole, 5,400 metre drill program in 2015 encountered mineralization in all holes. The mineralized zone currently covers an area of 1200 x 1000 metres and extends to depths of 500 metres. It remains open in all directions. Drill intersections range up to almost 600 metres grading ~0.3% Cu, ~0.03% Mo and ~2 g/t Ag. Mineralization occurs as replacements and veins in granitic rocks that show evidence of repeated pulses of magmatism.

Work on the Ike project has revived interest in nearby

properties such as the **Mike** (Bridge River; Griswold; Russnor) owned by Cresval Capital Corporation, and the **Lorn** operated by Jet Gold Corporation.

Teck Resources Limited continued to explore targets near its **Highland Valley** copper-molybdenum mine hosted by the Guichon Creek batholith (Fig. 2) with a focus on the Valley and Bethlehem pits. To date drilling has confirmed 100 million tonnes of new ore at Bethlehem. Engineering and feasibility studies are underway.

In one of the few generative or grassroots exploration efforts in the region, private company Tech-X Resources Inc. followed up alteration mapping, completed in 2014, with induced polarization surveys at **Lawless Creek**, Nicola Lake, and southeast of Prince George. The Lawless Creek area, 50 kilometres south of Merritt, has not seen exploration since the early 1980s.

5.2. Skarn

Happy Creek Minerals Ltd continued to explore its **Fox** tungsten skarn property, 115 kilometres east of Williams Lake. Best intercepts from a limited drill program (8 holes; 1500 metres) at the Creek target within the Nightcrawler zone returned up to 1% WO₃ over 5 metres. Soil sampling on the South Grid has generated new targets that the company plans to pursue next year. Skarn mineralization is in flat-lying, Neoproterozoic to Lower Paleozoic Snowshoe Group sedimentary rocks that have been intruded by the Deception stock, a mid-Cretaceous (106 Ma) pluton that ranges in composition from quartz monzonite to muscovite-biotite granite.

GWR Resources Inc. drilled the Aurizon-South breccia zone (Fig. 6) on its **Lac La Hache** project with closely-spaced holes. The purpose was to test continuity of copper-gold-silver mineralization and assess potential for underground mining. The company announced discovering the new, **Berkey** zone which has chalcopyrite disseminated in a porphyritic syenite dike. Berkey was found in a recently logged but unexplored



Fig. 6. Breccia textures and copper mineralization at the Aurizon South prospect (Image courtesy of GWR Resources Inc.).

part of the 400 km² project area. The Berkey zone adds to the inventory of deposit types and exploration targets, ranging from high-grade, massive to semi-massive, skarns, veins, replacements and breccias to lower grade porphyries and disseminations, for which the Lac La Hache project is known.

5.3. Gold deposits (including vein, breccia, disseminated, sediment-hosted)

Refinancing and restructuring in 2013-2014 brought new management and technical staff to Barkerville Gold Mines Ltd. and revived its **Cariboo Gold** project (Stokes, 2015). The project lies 85 kilometres east of Quesnel and covers more than 117,000 hectares of claims, including three historic groups of Crown grants (Cariboo Group, Island Mountain Group, and Mosquito Creek Group).

During 2015, the company released a technical report with updated resource estimates (Snowden, 2015), made a new, blind discovery (“AG horizons”), and started a 55,000 metre drill program. Drilling had three goals: to define resources in the BC vein; to explore mineralized zones in the BC vein’s hangingwall and footwall; and to test soil geochemical anomalies.

The current resource estimate for the Cow Mountain portion of Cariboo Gold project, centred on the BC vein, has 2.8 million ounces of gold (Indicated) and 2 million ounces of gold (Inferred) at grades of 2.4 g/t and 2.3 g/t, respectively (Snowden, 2015).

The AG horizons discovery is in an area with no outcrop and no previous drilling about 550 metres east of the Bonanza Ledge open pit. A coincident gold and silver soil anomaly provided the target for drilling. Mineralization grading from 2 to 11 g/t Au were reported in two, separate (upper and lower) AG horizons. The discovery occurs in the hangingwall of the BC vein and establishes an untested structural / stratigraphic interval as a new exploration target. Metamorphosed siliciclastic sedimentary and subordinate volcanic rocks of the Snowshoe Group (Neoproterozoic-Lower Paleozoic) host BC vein and wall rocks (Fig. 7).

WestKam Gold Corp. has explored its **Bonaparte** project, 50 kilometres northwest of Kamloops, since acquiring the property in 2013. Historically, high-grade near-surface gold veins in quartz diorite have been the focus of exploration at Bonaparte. WestKam has two targets: shear-hosted, high-grade gold in quartz veins (Discovery zone); and bulk-tonnage, porphyry copper-gold located southwest of the Discovery zone. Following geophysical and geochemical surveys in 2013-2014, drilling in 2015 (7 holes; ~600 metres) evaluated high-grade gold intercepts within the Discovery zone and completed the first holes ever drilled outside the Discovery zone. One of the step-out holes found a new vein that returned ~8 g/t Au, 38 g/t Ag, 29 g/t Te and 0.33% Cu over 1 metre (drilled width).

In April 2015, Gold Mountain Mining Corporation released results from open-pit bulk sampling at the **Elk** project in 2014. The ~6,600 tonne sample averaged 16.7 g/t Au and showed that previous resource estimates were low: more gold was recovered

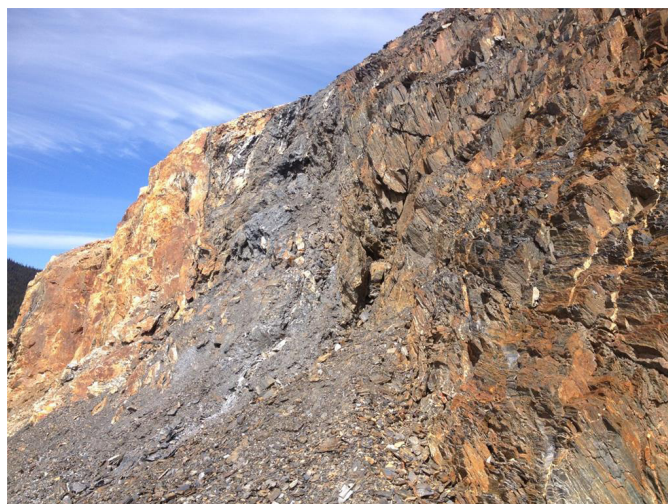


Fig 7. Metamorphosed siliciclastic rocks of the Snowshoe Group host disseminated and vein-controlled gold mineralization at Barkerville Gold Mines Ltd.’s Cariboo Gold Project (Image courtesy of Lesley Stokes, The Northern Miner).

from the bulk sample than expected. Work on this project stalled in 2015 but may resume in the future. Gold mineralization at Elk occurs in pyritic quartz veins in a Mesozoic granite that may be a phase of the Osprey Lake batholith (Jurassic).

Westhaven Ventures Inc. enlarged its stake in the Spences Bridge gold belt, 30 kilometres south of Merritt. It has acquired 100% of the **Shovelnose** gold property and 70% of the **Prospect Valley** gold property (from Strongbow Exploration Inc. and Berkwood Resources Ltd., respectively).

Work on Shovelnose included a LIDAR survey and ground based IP, magnetometer and VLF-EM surveys followed by 1,400 metres of drilling. The goal of the drill program is to expand or outline an epithermal gold zone that was recognized in 2014. Gold-silver mineralization occurs in quartz stockworks and silicified zones that appear to form a sub-horizontal, silicified, near-surface cap within felsic volcanic rocks of the Spences Bridge Group (Cretaceous). Previous assays of core returned ~0.5 g/t Au and ~5 g/t Ag over 50 metres.

Previous work by Berkwood Resources Ltd. at the **Prospect Valley** property, 30 km west of Merritt, has identified the North and South Discovery zones as well as a prospective trend (the QCA zone) with quartz-chalcedony veins and silicified rocks extending some 1200 metres south from the South Discovery zone. Mineralization discovered to date is described as a low-grade, epithermal gold system with potential for higher grade zones. Drilling has outlined an NI 43-101 compliant mineral resource. Taken together, the North and South Discovery zones have approximately 10 million tonnes grading 0.5 g/t Au (Inferred; using 0.3 g/t Au cut off). A number of geophysical and geochemical targets remain to be tested. In 2015, Berkwood carried out a program of prospecting, sampling, mapping, and geophysical surveys.

Avino Silver & Gold Mines Ltd. carried out surface drilling on its **Bralorne** property near Gold Bridge. Almost 6,600 metres

(in 22 holes) explored the Alhambra, 52 and 77 veins. Many gold-bearing intercepts were reported, some with mineable widths (at least 1.2 metres). Follow-up drilling is planned.

5.4. Stratiform base metal deposits

In the Mabel Lake area, 60 kilometres northeast of Vernon, prospectors Robert Thompson, Renee Hetherington, and Colin Dunn used biogeochemical and geophysical methods to find new showings of Monashee-type massive sulphide mineralization in dense forests on the **TL** and **CD** properties. Grab samples returned up to 19% zinc. The trio have plans to drill untested, strong geophysical anomalies in 2016.

5.5. Nickel

In May 2015, Westhaven Ventures Inc. reported results from preliminary metallurgical tests on drill core from the **Ben** and **Ben South** projects, 50 kilometres north of Williams Lake. Ninety per cent of the nickel occurs as sulphide minerals (heazlewoodite; pentlandite); 10% is in serpentine. Flotation methods produced a concentrate containing 12% nickel. Nickel sulphide mineralization occurs as disseminations in serpentinized ultramafic rocks of the Cache Creek group (Carboniferous-Permian). Geophysical methods have been useful in tracking favourable rock units. So far, large amounts of low grade material (~0.2% Ni) have been found. One goal of future exploration is to find higher-grade zones.

5.6. Graphite

Lithium Corporation followed up ground penetrating radar and a GEM-2 EM survey with trenching at the **BC Sugar** graphite project. The current focus of interest is the Weather Station zone but the property comprises a large block of claims between Mabel Lake and Sugar Lake, east of Vernon. Targets are exploitable concentrations of flake graphite. Crystalline graphite occurs in gneiss and marble of the Shuswap metamorphic complex (Neoproterozoic).

6. Outlook for 2016

Foreseeable economic conditions seem to offer few incentives for exploration. Financing grassroots or early stage projects continues to be challenging. Producing mines will continue to reduce operating costs, and may reduce production or employees, or go on care and maintenance as a result of weak commodity prices.

Ajax will be the only project to continue its formal environmental review, unless Harper Creek secures alternative financing. Most of the exploration projects active in 2015 that generated positive results are likely to continue. If economic conditions improve, grassroots exploration should pick up in the Gold bridge area (near the Ike project), Eagle Bay assemblage near Barriere, and the Quesnel terrane, in particular between Merritt and Princeton and between 100 Mile House and Quesnel.

Acknowledgment

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