# Exploration and mining in the Northwest Region, British Columbia

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## 1. Introduction

The Northwest Region includes about 263,000 km<sup>2</sup> of British Columbia, approximately 25% of the province (Fig. 1). The region has three operating mines and five proposed mine projects. More than 60 exploration projects were active in 2018, predominantly focussed on precious metal and porphyry style copper-gold mineralization.

In 2018, exploration expenditures, drilling estimates and other metrics for British Columbia were captured in the British Columbia Mineral and Coal Exploration Survey. The survey is a joint initiative between the Province of British Columbia Ministry of Energy, Mines and Petroleum Resources, the Association for Mineral Exploration, and Ernst & Young LLP. For the Northwest Region, exploration expenditures were estimated at \$164.0 million and exploration drilling was estimated at approximately 293,500 m (Clarke et al., this volume; Ernst & Young LLP (EY), 2019, in press).

The Northwest Region saw several significant events in 2018. Coeur Mining Inc. declared commercial production in September for the **Silvertip** mine they had acquired in October of 2017. In December, Pretium Resources Inc., received approval from the British Columbia Ministry of Energy, Mines and Petroleum Resources and Ministry of Environment and Climate Change Strategy to increase production from 2700 tpd to 3800 tpd.

IDM Mining Ltd. announced an updated mineral resource estimate of 2.77 Mt of 7.91 g/t Au and 22.75 g/t Ag, Measured plus Indicated, for their **Red Mountain** project. The project is a proposed high-grade underground gold mine. As well, they were granted their provincial environmental assessment certificate. A federal certificate is anticipated in early 2019.

Seabridge Gold Inc. extended the high-grade core of the Iron Cap deposit at their **KSM** project. Results included 548 m of 0.63 g/t Au and 0.44% Cu.

The first drill hole of 2018 at the North Boundary zone (NBZ), part of Aben Resources Ltd.'s **Forest Kerr** project, intersected multiple high-grade zones including 38.7 g/t Au over 10.0 m. Subsequent holes also returned high-grade gold assays.

Several companies reported new porphyry discoveries in 2018. GT Gold Corp. reported results for their **Tatogga** projects'

Saddle North target, approximately 1.5 km east-northeast of last year's Saddle South gold discovery, including 363 m of 1.02 g/t Au, 0.51% Cu and 1.72 g/t Ag within 904 m of 0.51 g/t Au, 0.30% Cu and 0.93 g/t Ag. Golden Ridge Resources Ltd. announced discovering a new copper-gold porphyry at their Hank project's Williams zone. Their first hole intersected 327 m grading 0.31% Cu, 0.35 g/t Au and 1.94 g/t Ag. Surge Copper Corp. (formerly Gold Reach Resources Ltd.) discovered a new copper zone 500 m northeast of the East Seel deposit at their Ootsa project. The discovery hole intersected 202 m of continuous mineralization and assayed 0.26% Cu, 0.31 g/t Au and 1.32 g/t Ag. ML Gold Corp. reported that drilling at two new targets on their Stars project intersected mineralized porphyry. In February, they announced 204 m assayed 0.45% Cu, 0.045 g/t Au, 1.64 g/t Ag, 0.0048% Mo. In August, they announced 405 m assayed 0.20% Cu, 0.0082% Mo, 0.754 g/t Ag and 24 ppb Au.

## 2. Geological overview

Metallogeny in British Columbia is intimately linked to the tectonic evolution of the Canadian Cordillera, first as an accretionary orogen consisting of allochthonous terranes that were welded to, and deformed with, the western margin of ancestral North America primarily during the Jurassic and then as the site of post-accretionary tectonism and magmatism (e.g., Nelson et al., 2013). The region includes all of the physiographic belts of the Canadian Cordillera (Fig. 1), and transects the Cordilleran orogen (Fig. 1). From east to west it is underlain by: 1) autochthonous and parautochthonous carbonate and siliciclastic strata deposited on the flank of Ancestral North America (Laurentia); 2) the Intermontane terranes, including the Slide Mountain terrane (back-arc basin); the Yukon-Tanana terrane (a rifted Devonian pericratonic arc); the Quesnel and Stikine volcanic arc terranes (formed outboard of Ancestral North America starting in the Late Paleozoic and accreted in the Middle Jurassic); and the Cache Creek oceanic terrane, which intervenes between Quesnellia and Stikinia; 3) the Alexander terrane; 4) post-accretionary rocks; and 5) younger cover rocks (Fig. 1).

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Fig. 1. Mines, proposed mines and selected exploration projects, Northwest Region, 2018. Terranes after Nelson et al. (2013).

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All of the allochthonous terranes initially accreted to each other and to western North America in the Jurassic. Since then, the mosaic has been intruded by post accretion plutonic suites and covered, in part, by Jurassic and younger syn- and post-accretionary siliciclastic deposits. For details about the geology, metallogeny, and tectonics of the Northwest Region see Nelson et al. (2013).

#### 3. Mines and quarries

During 2018, three significant metal mines operated in the region (**Red Chris, Brucejack and Silvertip**; Fig. 1; Table 1). Ten industrial mineral mines were tracked, including eight jade operations (Fig. 1; Table 2). Placer mining has been active in the Northwest Region for well over a century. Operations are mainly in the Atlin area and, to a lesser extent, in the Cassiar area. Numerous small aggregate operations supply mainly local needs throughout the region and are not discussed in this report.

#### 3.1. Metal mines

The **Brucejack** and **Red Chris** mines operated throughout the year and the **Silvertip** mine declared commercial production in September.

#### 3.1.1. Brucejack (Pretium Resources Inc.)

The **Brucejack** underground gold-silver mine is about 65 km north-northwest of Stewart. Road access is via combined all-weather dirt road and glacier road. An all-season airstrip is on the road access, approximately 20 km southeast of the mine site. Pretium completed a feasibility study in 2014 and started construction in September 2015. In July 2107, commercial production was announced. For the first three quarters ended September 30<sup>th</sup>, production totalled 279,670 oz Au and 308,676 oz Ag from 738,555 t of ore grading 12.0 g/t Au. Gold recoveries averaged 97.4%. Free gold and electrum is recovered to produce gold-silver doré, which is flown off site from their airstrip. In December 2018, Pretium received approval from the British Columbia Ministry of Energy, Mines and Petroleum Resources and Ministry of Environment and Climate Change Strategy to increase production from 2700 tpd to 3800 tpd.

Total mineral reserves and resources for the mine are based on the Valley of the Kings (VOK) and West zones. In December 2016, Pretium reported Proven plus Probable reserves for the VOK as 15.6 Mt grading 16.1 g/t Au and 11.7 g/t Ag. Proven plus Probable reserves for the West zone was reported as 2.9 Mt grading 6.9 g/t Au and 279 g/t Ag. Combined reserves are reported as 18.5 Mt grading 14.6 g/t Au and 53.5 g/t Ag. Reported Measured plus Indicated resources for the VOK zone are 16.4 Mt grading 17.2 g/t Au and 15.0 g/t Ag. Additional Inferred resources total 4.6 Mt grading 21.0 g/t Au and 26.9 g/t Ag. For the West zone, Measured plus Indicated were reported at 4.9 Mt grading 5.85 g/t Au and 267 g/t Ag. Additional Inferred resources total 4.0 Mt grading 6.44 g/t Au and 82 g/t Ag. Mineral resources are inclusive of reserves. Regional exploration efforts continue to follow up new targets outside of the mining lease in their surrounding 1200 km<sup>2</sup> of mineral claims (see section 6.3.1.).

## 3.1.2. Red Chris (Red Chris Development Company Ltd.)

The **Red Chris** copper-gold mine is accessed by a controlled mine road from highway 37. The project is owned by Red Chris Development Company Ltd., a subsidiary of Imperial Metals Corporation. Production to the end of the 3<sup>rd</sup> quarter of 2018 totalled 44.78 Mlbs Cu and 29,569 oz Au from 7.93 Mt of ore grading 0.34% Cu and 0.25 g/t Au. Metal recoveries averaged 75.39% for Cu and 45.82% for Au.

The Red Chris copper-gold deposit is hosted in a 204 Ma diorite-monzonite that intrudes Upper Triassic rocks of the Stuhini Group. The 6.5 x 1.5 km porphyry consists of four main intrusive phases. The second phase (P2) contains most of the copper and gold, and measures greater than 2 km x 650 m in plan and extends to a depth of more than 1.5 km. The syn-mineral P2 intrusive phase is high-potassic, calcalkalic in composition and contains abundant 'A' type quartz-chalcopyrite-magnetite+/-bornite veins (Rees et al., 2015).

Measured plus Indicated resources total 1.035 Bt with an average grade of 0.35% Cu, 0.35 g/t Au and 1.14 g/t Ag. Additional Inferred resources total 787.1 Mt grading 0.29% Cu, 0.32 g/t Au and 1.04 g/t Ag. Resource figures are for combined open-pit and planned underground operations and do not take into account any mining since start-up.

## 3.1.3. Silvertip (Coeur Mining Inc.)

Coeur purchased the **Silvertip** silver-zinc-lead mine in October of 2017 for about \$250 million. Coeur proceeded to upgrade facilities and restart mining. In September 2018, commercial production was declared. Coeur Mining Inc. also carried out a 57,660 m of exploration drilling at the mine site. Designed as infill drilling, the program also discovered new zones. Surface drilling at the Discovery zone intersected new mineralization including 11.4 m of 193.3 g/t Ag, 18.3% Zn and 3.2% Pb, and 6 m of 925.7 g/t Ag, 16.0% Zn and 15.2% Pb. The Discovery zone remains open to the north, south, and east, and at depth. New multiple stacked manto horizons and vertical feeders were intersected at the Silver Creek zone. Results included 3.8 m of 905.5 g/t Ag, 29.2% Zn and 16.5% Pb.

The Silvertip deposit is in the Cassiar terrane. The ore body consists of five zones: the Silver Creek, the 28, the 65, the Discovery and the Discovery North. The zones consist of massive sulphide bodies in limestones of the McDame Group and are unconformably overlain by Devonian-Mississippian rift-related, siliciclastic rocks of the Earn Group. Current Indicated resource estimates are 2.59 Mt at 10.26 oz/ton Ag, 6.74% Pb and 9.41% Zn.

## 3.2. Industrial mineral mines and quarries

Ten industrial mineral mines were tracked, including eight jade producers and two industrial rock quarries (Table 2).

Mine	<b>Operator</b> (partner)	Commodity; deposit type; MINFILE	Forecast 2018 Production (based on Q1- Q3)	Reserves	Resource	Comments
Brucejack	Pretium Resources Inc.	Au, Ag; Au-quartz veins, quartz stockwork breccia, epithermal; 104B 193	372,900 oz Au, 411,600 oz Ag	P+Pr: combined, VOK zone and West zone 18.5 Mt at 14.6 g/t Au, 53.5 g/t Ag	M+I: VOK zone 16.4 Mt at 17.2 g/t Au and 15.0 g/t Ag M+I: West zone 4.9 Mt at 5.85 g/t Au and 267 g/t Ag. Resources are inclusive of Reserves	Announced steady production in 2 <sup>nd</sup> quarter. Received government approval to increase production rate to 3800 tpd from 2700 tpd.
Huckleberry	Huckleberry Mines Ltd.	Cu, Au, Ag, Mo; porphyry Cu-Mo-Au; 093E 037	na	P+Pr: approx., 34.96 Mt at 0.32% Cu, 0.01% Mo	M+I: 180.7 Mt at 0.32% Cu., 0.01% Mo	Placed on care and maintenance in 2016.
Red Chris	Red Chris Development Company Ltd.	Cu, Au, Ag; porphyry Cu-Au; 104H 005	59.71 Mlbs Cu, 39,425 oz Au and 102,733 oz Ag	P+Pr: 301.5 Mt at 0.36% Cu, 0.27 g/t Au	M+I: 1.035 Bt at 0.35% Cu, 0.35 g/t Au and 1.14 g/t Ag	First year of full production in 2016. Reserve and Resource figures are for combined open- pit and planned underground operations and do not take into account mining since start-up.
Silvertip	Coeur Mining Inc.	Ag, Pb, Zn, Au; polymetallic manto; 104O 038	na	na	I: 2.59 Mtons at 10.26 oz/ton Ag, 6.74% Zn, 9.41% Pb	Commercial production declared in September. Mine site drilling returned results including 11.4 m of 193.3 g/t Ag, 18.3% Zn and 3.2% Pb and located new mineralization.

Table 1. Metal mines, Northwest Region.

P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

#### **3.2.1.** Nephrite Jade

Jade is the commercial term for jadeite and nephrite. In British Columbia, jade occurs as nephrite. Nephrite is composed of interlocking fibrous amphibole minerals derived from an ultramafic protolith that has undergone dynamothermal metamorphism and metasomatism. The two significant areas of nephrite jade extraction in the Northwest Region are east of Dease Lake in the Turnagain River area, and north of Dease Lake in the Cassiar area. Production varies between operations and ranges from 200 to 2000 t per year.

#### **3.2.2. Industrial rock quarries**

The Burning Daylight basalt stone quarry is owned by

Stone Ridge Quarries Limited. Access to the project is via a forest service road. Stone Ridge mines basalt for landscape and building stone markets.

The **Kalum** quarry is 3 km west of Terrace at the confluence of the Kitsumkalum and Skeena Rivers on the traditional territory of the Kitsumkalum First Nation. The quarry is owned and operated by the Kalum Quarry Ltd. Partnership, a subsidiary of the Kitsumkalum First Nation. The quarry has road access and a 3 km rail line connecting it to the CN mainline. Rock is drilled, blasted, and crushed on site to meet specific contact requirements. Various aggregate size products are produced for industrial and residential purposes. Typical products include large diameter rip-rap, railway ballast, asphalt crush, and finer

Mine	<b>Operator</b> (partner)	Commodity; deposit type; MINFILE	Forecast 2018 Production (based on Q1-Q3)	Reserves	Resource	Comments
Burning Daylight	Stone Ridge Quarries Ltd.	Columnar basalt; dimension stone	unknown	na	na	Basalt quarrying.
Cassiar Jade	Dynasty Jade Ltd.	Nephrite jade; gems and semi- precious stones; 104P 005	unknown	na	na	Trenching, quarrying, placer production.
Dean Kutcho	Cassiar Jade Contracting Inc.	Nephrite jade; gems and semi- precious stones; 104I 078	unknown	na	na	Mining.
Jade Valley	United Oriental Mining Ltd.	Nephrite jade; gems and semi- precious stones; 104I 048	unknown	na	na	Trenching, quarrying, placer production.
Kalum	Kalum Quarry Ltd. Partnership	Industrial rock; crushed rock	unknown	na	na	Drilling, blasting, crushing, production for CN railway bed.
Kutcho Creek Jade	Continental Jade Ltd.	Nephrite jade; gems and semi- precious stones; 104I 078	unknown	na	na	Mining, trenching.
Letain	Cassiar Jade Contracting Inc.	Nephrite jade; gems and semi- precious stones; 104I 079	unknown	na	na	Mining, trenching.
Polar Jade	Glenpark Enterprises Ltd.	Nephrite jade; gems and semi- precious stones; 104I 092	unknown	na	na	Mining.
Provencher	Glenpark Enterprises Ltd.	Nephrite jade; gems and semi- precious stones; 104I 092	unknown	na	na	Mining, trenching.
Wolverine	Cassiar Jade Contracting Inc.	Nephrite jade; gems and semi- precious stones	unknown	na	na	Mining, trenching.

Table 2. Selected industrial mineral mines and quarries, Northwest Region.

materials for concrete. An estimated 22 million cubic metres of material remains available for development. Basalt and andesite of the Hazelton Group are quarried.

## **3.2.3.** Placer operations

Placer mining operations have been active in the Northwest Region for well over a century. Because of the large number of mines and difficulty in obtaining information, these operations are not tracked.

## 4. Mine development

The mine development stage is achieved when a project acquires the required permits and has started mine construction. Essential permits include a Mines Act permit from the Ministry of Energy, Mines and Petroleum Resources, and an Environmental Management Act permit from the Ministry of Environment. Provincial and federal environmental assessment certificates may also be required. There were no mine development projects in the region in 2018.

#### 5. Proposed mines or quarries

Proposed mines are feasibility-stage projects for which proponents have begun or completed the environmental certification process (generally for large projects), or have submitted or received approvals for Mines Act permits (for projects below British Columbia Environmental Assessment Act thresholds).

## 5.1. Selected proposed metal mines

The Northwest Region has several proposed metal mines, five of which have been active within the past three years and/ or hold permits to allow construction if financing becomes available (Fig. 1; Table 3).

#### 5.1.1. Dome Mountain (Gavin Mines Inc.)

The **Dome Mountain** past-producing gold mine is accessed by forest service roads from highway 16. Gavin Mines Inc., a subsidiary of Metal Mountain Resources Inc. owns 54%, Grace Mining Inc. owns 30%, Dome Mountain Resources of Canada Inc. owns 14%, and two private shareholders own 2%. The project has Mines Act and Environmental Management Act permits in good standing and is allowed to extract up to 75,000 tpy. In early 2013, the project submitted applications to amend their existing Mines Act and Environmental Management Act permits to allow onsite milling and tailings storage. Due to delays, including regulatory changes due to the 2014 Mount Polley tailings breach, the permit amendments remain outstanding. Since 2016, stockpiled ore has intermittently been processed at Nicola Mining Inc.'s custom mill near Merritt.

## 5.1.2. Galore Creek (Galore Creek Mining Corporation)

The **Galore Creek** gold-copper project is operated by the Galore Creek Mining Corporation (GCMC). Ownership of GCMC is equally split between Teck Resources Limited and Newmont Mining Corporation. Newmont purchased their 50% interest from Novagold Resources Inc. in July. Newmont and Teck announced that they will complete prefeasibility studies over three to four years with an annual budget of \$10 to \$15 million (50 percent basis). The project consists of thirteen known zones of gold-copper mineralization with Proven plus Probable reserves reported as 528 Mt at 0.59% Cu, 0.32 g/t Au and 6.02 g/t Ag.

## 5.1.3. KSM (Seabridge Gold Inc.)

Owned by Seabridge Gold Inc., the **KSM** project occupies the adjoining mineral claims west of the Brucejack mine. Access to KSM is via helicopter. The project consists of four porphyry Cu-Au deposits: Kerr, Sulphurets, Mitchell, and Iron Cap. In 2018, Seabridge continued to drill the Iron Cap deposit. Results extended its high-grade core down plunge and will be used to produce an upgraded resource estimate. Highlight results included 548 m of 0.63 g/t Au and 0.44% Cu. KSM economics might be improved if the Iron Cap deposit is mined before the Kerr deposit.

The deposits represent what may be the largest undeveloped

copper-gold camp in the world (by reserves). Proven plus Probable reserves are reported as 2.198 Bt grading 0.55 g/t Au, 0.21% Cu, 2.6 g/t Ag and 42.6 g/t Mo. Measured plus Indicted resource estimate totals 2.924 Bt grading 0.52 g/t Au, 0.21% Cu, 2.7 g/t Ag and 55 ppm Mo. Seabridge received federal and provincial approval of the project environmental assessment in 2014 and is actively seeking partnership to advance into construction.

The KSM deposits are related to the Mitchell intrusions of the Texas Creek plutonic suite (Early Jurassic; ~194 Ma). Diorite, monzonite and quartz-syenite stocks and dikes intrude along the Sulphurets fault (pre-Early Jurassic) into surrounding sedimentary and volcanic rocks of the Stuhini and Hazelton groups. Mineralization is disseminated and in stockwork veins, and consists of fine-grained chalcopyrite, bornite, molybdenite, and pyrite.

## 5.1.4. Morrison (Pacific Booker Minerals Inc.)

Access to the **Morrison** Cu-Au-Mo-Ag project is by road and barge. Proven plus Probable reserves are reported as 224.25 Mt at 0.33% Cu, 0.163 g/t Au and 0.004% Mo. Proposed is an open-pit operation with a 30,000 tpd mill, equating to a 21-year mine life.

Pacific Booker submitted an EA application in 2010, which was denied in 2012. In late 2013, a Supreme Court ruled procedural fairness was not adhered to in the 2012 rejection and required the EAO to accept a remitted application for reconsideration. After the Mount Polly tailings breach, the review was suspended, but then resumed in June 2015. In July 2015, a letter from the British Columbia Minister of Environment and Minister of Energy and Mines stated that concerns still remained regarding the project design and that further information was required. In 2018, Pacific Booker continued to lobby for the project.

#### 5.1.5. Red Mountain (IDM Mining Ltd.)

The **Red Mountain** project is a proposed high-grade underground gold mine 18 km east-northeast of Stewart. In 2018, IDM Mining Ltd., carried out a 40 hole, 10,000 m diamond drilling program and announced an updated mineral resource estimate of 2.77 Mt of 7.91 g/t Au and 22.75 g/t Ag, Measured plus Indicated. As well, they were granted their provincial environmental assessment certificate. A federal certificate is anticipated in early 2019.

The project contains five known underground gold zones; Marc, AV, JW, 141 and 132.

Mineralized zones consist of crudely tabular, northwesterly trending and moderately to steeply southwesterly dipping gold and silver-bearing iron sulphide stockworks. Mineralized widths vary from less than 2 m to 40 m and average 16 m. The stockwork zones consist of pyrite microveins, coarse-grained pyrite veins, irregular coarse-grained pyrite masses and breccia matrix pyrite hosted predominately in a pale, strongly sericite-altered porphyry. Vein widths vary from 0.1 to 80 cm but widths of 1 to 3 cm are most common. The veins are very commonly

Project	<b>Operator</b> (partner)	Commodity; deposit type; MINFILE	Reserves	Resource	Comments
Dome Mountain	Dome Mountain Resources of Canada Inc.	Au, Ag; vein breccia and stockwork; 093L 022	na	na	Permit amendments outstanding. Stockpiled ore intermittently processed at Nicola Mining Inc. mill near Merritt.
Galore Creek	Galore Creek Mining Corp. (50% Teck Resources Limited, 50% Newmont Mining Corporation)	Au, Cu; alkalic porphyry; 104G 090	P+Pr: 528 Mt at 0.59% Cu, 0.32 g/t Au, 6.02 g/t Ag	M+I: 286.7 Mt at 0.33% Cu, 0.27 g/t Au, 3.64 g/t Ag. Resources exclusive of Reserves	Baseline monitoring. Newmont purchased 50% interest from Novagold Resources Inc. in July. Multi-year prefeasibility study announced, with an annual budget of \$10 to \$15 million (50% basis).
KSM	Seabridge Gold Inc.	Au, Cu, Ag, Mo; calc-alkalic porphyry; 104B 191	P+Pr: 2.198 Bt at 0.55 g/t Au, 0.21% Cu, 2.6 g/t Ag, 0.00426% Mo	M+I: 2.925 Bt at 0.52 g/t Au, 0.21% Cu, 2.7 g/t Ag, 0.0055% Mo. Resources include mineral Reserves	Results from 2018 drilling at the Iron Cap deposit extended its high-grade core down plunge and will be used for an upgraded resource estimate. Highlight results included 548 m of 0.63 g/t Au and 0.44% Cu.
Morrison	Pacific Booker Minerals Inc.	Cu, Mo; calc-alkalic porphyry; 093M 007	P+Pr: 224.25 Mt at 0.33% Cu, 0.163 g/t Au, 0.004% Mo	na	Baseline monitoring, EA ongoing. Resource information from company website.
Red Mountain	IDM Mining Ltd.	Au, Ag; porphyry related gold; 103P 086	na	M+I: 2.771 Mt at 7.91 g/t Au, 22.75 g/t Ag	Diamond drilling (40 hole, 10,000 m). Announced an updated M+I resource estimate. Granted a provincial environmental assessment certificate; federal certificate anticipated in early 2019.

Table 3. Selected proposed mines, Northwest Region.

P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

heavily fractured or brecciated with infillings of fibrous quartz and calcite. The pyrite veins typically carry gold grades ranging from  $\sim$ 3 g/t to greater than 100 g/t. Gold occurs as grains of native gold, electrum, petzite, and a variety of Au tellurides and sulphosalts. Pyrite is the predominant sulphide, although pyrrhotite is locally important. The stockwork zones also occur to a lesser extent in rafts of sedimentary and volcaniclastic rocks.

#### 6. Selected exploration activities and highlights

Exploration-stage projects are defined as the initial stages of evaluation for economic minerals. This includes grassroots activities such as prospecting, rock and soil sampling, regional mapping and airborne geophysical surveys. Early-stage activities include more focussed sample grids, geophysical surveys, prospect-scale geological mapping, drill target generation, and testing that set the stage for future mine evaluation. Collecting baseline environmental data is also common at this stage.

Table 4.	Selected	exploration	projects.	Northwest F	Region.
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Project	<b>Operator</b> (partner)	Commodity; deposit type; MINFILE	Resource (NI 43-101 compliant unless indicated otherwise)	Comments
Atlin Gold Project	Brixton Metals Corporation	Au; precious metal veins	na	Geological mapping, rock and chip sampling, biogeochemical studies, and 2500 soil samples. Several gold-in-soil anomalies.
Berg	Centerra Gold Inc.	Cu, Mo, Ag; porphyry; 093E 046	M+I: 557 Mt at 0.3% Cu, 0.037% Mo, 3.12 g/t Ag	Mapping and sampling in the Berbette and A12 target areas. Soil sampling t on the A12 target.
Boomerang	Hawkeye Gold and Diamonds Inc.	Cu, Au; porphyry	na	Soil and rock sampling. Rock samples returned Cu grades ranging from 0.10% to 1.80%.
Brucejack Regional	Pretium Resources Inc.	Au, Ag; epithermal vein	na	Evaluation of 1250 km <sup>2</sup> of mineral claims surrounding the mine area. Diamond drilling (8000 m), mapping and prospecting. At the American Creek zone, drilling highlight results included 1.5 m grading 10.15 g/t Au and 25.5 m grading 41.54 g/t Ag, 2.12% Zn and 0.56% Pb. Prospecting sample results located the new Upper Kirkham zone. Samples assayed as high as 3.55 g/t Au, greater than 10,000 g/t Ag, 4.7% Cu, greater than 20% Pb and 3.8% Zn.
Clone	Sunvest Minerals Corp.	Au, Ag, Cu, Co; Au; precious metal veins; 103P 251	na	Geochemical rock, silt and soil sampling, detailed geological mapping and packsack drilling. A number of samples returned anomalous Cu, Ag and Au assays. A newly discovered mineralized vein returned a 1 m chip sample result of 4.11% Cu, 160g/t Ag, 0.52g/t Au.
Dolly Varden	Dolly Varden Silver Corporation	Ag, Zn; Noranda/ Kuroko massive sulphide; 103P 188	I: 3.073 Mt at 321.6 g/t Ag Inf: 898,500 t at 373.3 g/t Ag	Drilling, 29,108 m in 84 holes. A new zone, (Bonus) discovered. Results included 15.50 m grading 161.4 g/t Ag, 0.25% Pb and 0.20% Zn. Drilling on known zones included 24.00 m grading 287.5 g/t Ag, 0.29% Pb, and 0.11% Zn at Torbrit East and 29.15 m grading 226.0 g/t Ag, 0.09% Pb, and 0.13% Zn at the Moose-Lamb zone.
Duke	Amarc Resources Ltd.	Cu, Mo, Au; porphyry Cu-Au; 093M 009, 121, 163	Historic non NI 43-101 compliant I: 41 Mt at 0.25% Cu, 0.01% Mo	Property straddles the Northwest and North Central regions. Six diamond drill holes totalling 3600 m completed. Highlight results included 348 m grading 0.23% Cu, 0.013% Mo, 1.1 g/t Ag, 0.05 g/t Au.
Dunwell	American Creek Resources Ltd.	Au, Ag, Pb, Zn; polymetallic veins; 103P 052	na	30 rock samples from both surface and historic underground workings. Reported results included high-grade Au (up to 61.2 g/t) and Ag (up to 1186 g/t) along with base metals.
Engineer	Engineer Gold Mines Ltd.	Au, Ag; epithermal veins; 104M 014	Inf: 41,000 t at 19.0 g/t Au	MMI soil sampling. Heavy equipment, fuel and diamond drill equipment barged to mine site in preparation for 2019 work.

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# Table 4. Continued.

Eskay Creek	Skeena Resources Limited	Au, Ag, Zn, Cu, Pb; VMS; 104B 008	I: 1.08 Mt at 4.9 g/t Au, 72 g/t Ag (pit constrained) Inf: 4.26 Mt at 3.3 g/t Au, 72 g/t Ag (pit constrained) I: 2.51 Mt at 7.2 g/t Au, 215 g/t Ag (underground) Inf: 0.81 Mt at 7.2 g/t Au, 214 g/t Ag (underground)	Diamond drilling, compiled and reviewed 20 years of exploration and production information and completed a geologic model and resource estimate. Drilling highlights include 14.55 m grading 7.36 g/t Au, 1189 g/t Ag and 31.50 m grading 10.16 g/t Au, 331 g/t Ag and 42.65 m grading 9.49 g/t Au, 111 g/t Ag.
Forest Kerr	Aben Resources Ltd.	Au, Ag, Cu; precious metal veins	na	Diamond drilling, 36 holes totalling 9900 m. Drilling intersected multiple high- grade zones including 38.7 g/t Au over 10.0 m.
Golddigger	Goliath Resources Limited	Au, Ag, Pb, Cu; polymetallic veins	na	A 0.55 m channel sample graded 29.70 g/t Au and 14.30 g/t Ag, a 0.50 m chip sample graded 47.50 g/t Au and 272.00 g/t Ag and grab samples graded up to 113.50 g/t Au and 249.00 g/t Ag.
Hank	Golden Ridge Resources Ltd.	Au, Cu; calc-alkalic porphyry	na	Drilling discovered new porphyry Cu-Au at the Williams zone. Discovery hole returned 327 m grading 0.31% Cu, 0.35 g/t Au and 1.94 g/t Ag.
Hat	Doubleview Capital Corp.	Au, Cu; calc-alkalic porphyry; 104J 015	na	Project optioned to Hudbay Minerals Inc. Hudbay by Doubleview Capital Corp. In the summer, a 40 line-km, deep-penetrating induced polarization survey was carried out to delineate drilling targets.
Iskut	Seabridge Gold Inc.	Au, Ag, Cu; intrusion related, calc-alkalic porphyry; 104B 107	na	Diamond drilling (2700 m) to test for high-grade epithermal precious metal mineralization, but encountered mineralization typical of a large porphyry Cu-Au system.
Keaper	Casa Minerals Inc.	Ag, Cu, Pb, Zn; polymetallic veins	na	Rock and soil sampling. Highlight rock sample results included 1512 g/t Ag with 0.88% Cu, 1.19% Pb, 13.9% Zn and >100 g/t Ag with 0.33% Cu.
Kinaskan-Castle	Colorado Resources Ltd.	Cu, Mo, Au; porphyry Cu- Au	na	IP surveying produced chargeability anomalies coincident with large gold and copper soil geochemical anomalies extending east-west for more than 2000 m. The anomalies are interpreted to be in the same stratigraphic unit that hosts the Saddle North and Saddle South discoveries on GT Gold's Tatogga property. Permits to allow drilling received in October.
Kinskuch (Hecla)	Hecla Quebec Inc.	Ag, Cu, Pb, Zn; polymetallic veins	na	Diamond drilling defined silver-enriched base metal mineralization over a strike length of 4.8 km.

# Table 4. Continued.

Kirkham	Metallis Resources Inc.	Au, Cu; calc-alkalic porphyry and Au, Ag, intrusion related; 104B 079	na	Although a porphyry Cu-Au target, drilling at Cole intersected an intrusion-related massive sulphide pyrite-pyrrhotite vein that assayed 11.18 g/t Au over 7.7 m.
Kirkham (Thunder North)	Metallis Resources Inc.	Ni, Cu; tholeiitic intrusion- hosted Ni-Cu	na	The project is approximately 2 km southeast of Garibaldi Resource's Nickel Mountain project. Diamond drilling to test airborne electromagnetic and magnetic targets underway in the fall.
KSP	Colorado Resources Ltd.	Au, Cu; calc-alkalic porphyry and Au, Ag, intrusion related; 104B 111, 13	na	Diamond drilling, 7847 m in 35 holes. Results included 32 m grading 0.32 g/t Au and 1.64% Zn and 50 m grading 2.28 g/t Au, including 6 m grading 7.36 g/t Au.
Kutcho	Kutcho Copper Corp.	Cu, Pb, Zn, Au, Ag; VMS; 104I 060	M+I: 16.853 Mt of 1.89% Cu, 2.87% Zn, 0.36 g/t Au and 32.8 g/t Ag (at a 1.0% Cu cut- off)	Results from 2018 drilling included 28 m of 2.09% Cu, 6.1% Zn, 65.8 g/t Ag, 0.82 g/t Au and 5.4 m of 2.48% Cu, 1.0% Zn, 114.0 g/t Ag, 0.24 g/t Au. A bench scale metallurgical study is underway and a feasibility study is scheduled for 2019.
Maroon	Gitennes Exploration Inc.	Au, Pb, Zn; pollymetallic veins; 103I 029	na	Reconnaissance prospecting found several polymetallic quartz-sulphide veins. Sampling focused on historical workings and returned results up to 50 g/t Au, 11.5% Zn and 13.9% Pb.
Nickel Mountain	Garibaldi Resources Corp.	Ni, Cu, Co, Pt, Pd, Au, Ag; tholeiitic intrusion; 104B 006	na	Diamond drilling (32 holes, 11,573 m). Highlight results for 10 holes include 30.5 m of 3.10% Ni, 1.86% Cu, 0.081% Co, 0.863 g/t Pt, 1.776 g/t Pd, 0.739 g/t Au, 7.3 g/t Ag and 5.6 m of 7.60% Ni, 3.36% Cu, 0.198% Co, 0.668 g/t Pt, 0.814 g/t Pd, 0.466 g/t Au, 9.0 g/t Ag.
Ootsa	Surge Copper Corp.	Cu, Au, Ag, Mo; porphyry; 093E 105	I: 67.76 Mt 0.21% Cu, 0.17 g/t Au, 0.015% Mo, 2.01 g/t Ag Inf: 410.88 Mt 0.16% Cu, 0.11 g/t Au, 0.018% Mo, 1.95 g/t Ag	A new copper zone discovered 500 m northeast of the East Seel deposit. Continuous mineralization (202 m) assayed 0.26% Cu, 0.31 g/t Au and 1.32 g/t Ag. A later hole intersected 22 m of 0.5% Cu, 0.10 g/t Au, 17.6 g/t Ag, 0.65% Zn and 0.14% Pb. Drilling between the East Seel and Damascus deposits intersected a new gold zone returning 2 m grading 9.4 g/t Au.
Pearson	Teuton Resources Corp.	Cu, Ag, Au; polymetallic veins	na	A grab sample from a 70 cm wide mineralized quartz vein returned 54.5 g/t Au, 87.8 g/t Ag and 7.54% Pb.

Table 4. Continued.				
Pitman	Casa Minerals Inc.	Au, Ag, Cu, Pb, Zn; polymetallic veins	na	New showings, Golden Dragon and Dragon Tale, discovered in 2018. Rock chip sampling at Golden Dragon returned 0.6 m assaying 574.42 g/t Au, 109 g/t Ag, 0.1% Cu, 1.56% Pb, 0.23% Zn and 0.9 m assaying 268.86 g/t Au, 127 g/t Ag, 0.2% Cu, 2.95% Pb, 0.04% Zn. The Dragon Tale showing returned rock sample assays as high as 231 g/t Ag and 6.15% Zn.
Porter	StrikePoint Gold Inc.	Ag, Au, Cu, Zn; polymetallic veins	na	StrikePoint Gold acquired the property from Skeena Resources Limited in July and carried out diamond drilling (4800 m), prospecting, and sampling. Thirty-two rock samples returned assays ranging from trace to 43.6 oz/t Ag, trace to 0.54 oz/t Au and trace Zn to 28.8%. A new mineralized vein was discovered with a 205 m strike length and widths of up to 2 m. Samples graded up to 876 g/t Ag and 10.8 g/t Au.
Premier East	Decade Resources Ltd.	Au, Ag, Cu; polymetallic veins	na	Rock sampling returned anomalous values for precious and base metals including one sample that graded 5.72 g/t Au, 716 g/t Ag and 11.60% Cu.
Premier/Dilworth	Ascot Resources Ltd.	Au, Ag; Au in quartz veins; 104B 044	I: 2.78 Mt grading 7.46 g/t Au and 26.2 g/t Ag (Premier/ Northern Lights, Big Missouri, Silver Coin and Martha Ellen deposits) Inf: 6.03 Mt grading 7.18 g/t Au and 24.0 g/t Ag (Premier/ Northern Lights, Big Missouri, Silver Coin, Martha Ellen and Dilworth deposits)	Diamond drilling 45,800 m. Results included 20.0 m of 8.04 g/t Au and 21.4 g/t Ag at the western extension of Premier, 7.2 m of 20.67 g/t Au and 24.92 g/t Ag at the Big Missouri zone, and 12.38 m of 8.91g/t Au and 22.9 g/t Ag at the North Star prospect. In December, an updated resource estimate was released.
RD	Primary Energy Metals Inc.	Au, Co, Cu; VMS	na	Detailed mapping and sampling. A total of 85 rock samples and 287 soil samples were collected. Highlight rock sample results included a 0.25 m chip sample returning 20 g/t Au, 0.194% Co and a grab sample returning 18.7 g/t Au, 0.653% Co, 0.969% Cu.
Red Cliff	Decade Resources Ltd. (65%), (Mountain Boy Minerals Ltd. (35%))	Cu, Au, Ag, Zn; polymetallic veins; 104A 037	na	A 53 hole, 11,000 m diamond drilling program carried out. Drilling results for the Waterpump zone included 4.54 m of 12.11 g/t Au and 7.26 m of 10.6 g/t Au.
Schaft Creek	Teck Resources Limited (75%), (Copper Fox Metals Inc. (25%))	Cu, Au; calc-alkalic porphyry; 104G 015	1.229 Bt at 0.26% Cu, 0.017% Mo, 0.19g/t Au, 1.69 g/t Ag	Collection of environmental base line data, ongoing First Nations consultation.

# Table 4. Continued.

Silver Coin	Ascot Resources Ltd.	Ag, Zn, Pb, Cu; intrusion- related Au pyrrhotite veins, subaqueous hot spring Ag, Au, polymetallic veins; 104B 095	na	Purchased by Ascot in October from Jayden Resources Inc. (80%) and Mountain Boy Minerals Ltd. (20%). The project is 800 m from Ascot's Big Missouri deposit and 5 km from the historic Premier mine mill, also owned by Ascot.
Silver Hope	Finlay Minerals Ltd.	Cu, Au, Ag; porphyry, subvolcanic Cu-Ag-Au; 093L 001, 373, 374, 256	na	Deep-penetrating induced polarization and magnetotelluric geophysical surveys to define new drill targets.
Silver Queen	New Nadina Explorations Ltd.	Ag, Cu, Au, Zn, Pb; polymetallic veins; 093L 002	na	Three diamond drill holes totalling 3053 m to test an induced polarization conductivity anomaly. Results did not explain the anomaly.
Silver Vista	Glacier Lake Resources Inc.	Au, Cu, Zn; polymetallic veins	na	Seven diamond drill holes (1273 m). Silver- copper mineralization in all holes, including 153.4 m grading 16.1 g/t Ag, 0.05% Cu and 0.10% Zn.
Snip	Skeena Resources Limited	Au, Ag; mineralized quartz veins; 104B 250	na	Underground and surface drilling (46 holes, 7732 m). Results included 13.8 g/t Au over 18.00 m. In October, Skeena granted Hochschild Mining Holdings Limited an option to acquire 60% of the project.
Stars	ML Gold Corp.	Cu, Au, Ag, Mo; porphyry	na	Reported that drilling at two new targets intersected mineralized porphyry. In February, they announced 204 m assayed 0.45% Cu, 0.045 g/t Au, 1.64 g/t Ag, 0.0048% Mo. In August, they announced 405 m assayed 0.20% Cu, 0.0082% Mo, 0.754 g/t Ag and 24 ppb Au.
Surprise Creek	Mountain Boy Minerals Ltd.	Barite, Zn, Pb, Ag; VMS	na	2017 drilling results reported in 2018. Drilling intersected a barite cap. Results included 15 m of 66.8% and 26 m of 41% $BaS0_4$ including 4.5 m grading 3.27% Zn, 0.71% Pb and 22 g/t Ag.
Tatogga (Saddle North)	GT Gold Corp.	Au, Ag, Cu; porphyry; 104G 432	na	New porphyry Cu-Au-Ag discovery. Initial drilling highlights included 430 m of 0.67 g/t Au, 0.41% Cu and 0.89 g/t Ag. A later hole, approximately 200 m to the northwest, returned 363 m of 1.02 g/t Au, 0.51% Cu and 1.72 g/t Ag in 904 m of 0.51 g/t Au, 0.30% Cu and 0.93 g/t Ag.
<b>Tatogga</b> (Saddle South)	GT Gold Corp.	Au, Ag, Cu; epithermal Au-Ag, low sulphidation; 104G 433	na	Gold-silver mineralized zones were extended along strike. Additional high- grade Au mineralization at depth. Drilling highlights included 40.89 m of 9.55 g/t Au.

Tenas	Allegiance Coal Limited (80%) (Itochu (20%))	Bituminous coal; 093L 156	M: 89.113 Mt I: 42.037 Mt Inf: 33.412 Mt	Drilling program for geotechnical information, installing water monitoring wells and collecting samples for geochemical and coal testing studies. 1400 kg of coal sent for sizing, washability, and comprehensive coal quality analyses and to generate samples for coke oven tests. In November, it was announced that Itochu Corporation of Japan (Itochu) was investing in the project. A definitive feasibility study was expected in early 2019.
Thorn	Brixton Metals Corporation	Ag, Au, Cu, Pb, Zn; subvolcanic; 104K 031	Inf: 7.4 Mt at 35.54 g/t Ag, 0.51 g/t Au, 0.13% Cu, 0.32% Pb, 0.59% Zn	Core re-logging, geological mapping, and sampling for whole rock lithogeochemical analysis. Short-wave infrared spectroscopy carried out.
Todd Creek	Sojourn Exploration Inc.	Cu, Au, Ag, Pb, Zn; polymetallic veins	na	Samples from the Yellow Bow zone averaged 0.68% Cu, including 10 samples with over 1% Cu. Samples from the Fall Creek zone returned up to 37.7 g/t Au and 5.3% Cu. Eight samples from the VMS zone averaged 0.213 g/t Au, 30.1 g/t Ag, 0.53% Pb, 2.54% Zn including individual assays up to 1.98% Cu, 9.15% Zn, 0.392 g/t Au and 112 g/t Ag.
Treaty Creek	Tudor Gold Corp. (60%), (Teuton Resources Corp. (20%), American Creek Resources Ltd. (20%))	Au, Ag; epithermal high sulphidation; 104B 078	na	Diamond drilling (nine holes, 7200 m) targeting the Copper Belle zone. Highlight results included 121.8 m of 1.04 g/t Au with a high-grade interval of 26.6 g/t Au over 1.5 m.
Turnagain	Giga Metals Corp.	Ni, Co; Alaskan-type; 104I 014	M+I: 865 Mt at 0.21% Ni, 0.013% Co Inf: 976 Mt at 0.2% Ni, 0.013% Co	Diamond drilling (40 holes, 10,835 m) to test new targets, infill, collect metallurgical samples and geotechnical information for pre-feasibility study.

 Table 4. Continued.

M = Measured; I = Indicated; Inf = Inferred

Advanced-stage activities concentrate on the delineation of a mineral resource. The mine evaluation stage concentrates on the environmental, social, engineering and financial evaluation of a proposed mine. Selected exploration projects active during 2018 are summarized in Table 4 and shown on Figure 1.

#### 6.1. Selected precious metal projects

Precious metal projects in the Northwest Region were generally concentrated in the Stewart area and in the Lower Iskut River area. Multiple drilling programs continued to test new targets and extend known mineralization.

## 6.1.1. Atlin Gold Project (Brixton Metals Corporation)

Since 2016, Brixton has staked claims and completed transactions to secure approximately 1000 km<sup>2</sup> of mineral rights for the **Atlin Gold** project. The project area is east of

the town of Atlin and is road accessible. In 2018, Brixton conducted geological mapping, rock and chip sampling, and biogeochemical studies, and collected 2500 soil samples over selected areas. Several gold-in-soil anomalies were defined.

#### 6.1.2. Engineer (Engineer Gold Mines Ltd.)

The **Engineer** project includes the historic Engineer gold mine on Tagish Lake, 32 km southwest of Atlin. The project has a Mines Act permit authorizing exploration, underground mining and on-site milling activities. In the fall, Engineer Gold Mines completed a MMI soil sampling survey over the core patented crown grants and the immediate mine area. Results were expected in early 2019. In preparation for a 2019 work program, the company barged loads of heavy equipment, fuel and diamond drill equipment to the mine site.

## 6.1.3. Forest Kerr (Aben Resources Ltd.)

The first drill hole of 2018 at the North Boundary zone (NBZ), part of Aben Resources Ltd.'s **Forest Kerr** project, intersected multiple high-grade zones including 38.7 g/t Au over 10.0 m (Fig. 2). Subsequent holes also returned high-grade gold assays. Mineralization at the NBZ is structurally controlled and hosted in a package of volcanic and volcaniclastic rocks of the Hazelton Group. The company also discovered a new mineralized zone (South Boundary zone), about 1.5 km south of the NBZ. Drilling intersected quartz veins with abundant pyrite and chalcopyrite and returned Au assays ranging from trace amounts to greater than 5 g/t in the 1 or 2 m sample intervals (Ag values ranged from trace to 8.7 g/t and Cu values range from trace to 9500 ppm).



Fig. 2. Visible gold in drill core from Aben Resources Ltd.'s Forest Kerr project. Photo courtesy of Aben Resources Ltd.

#### 6.1.4 Kirkham (Metallis Resources Inc.)

In 2018, Metallis carried out the first ever drill programs at the Cole and Nina targets of the **Kirkham** project. Although these are porphyry Cu-Au targets, drilling at Cole intersected an intrusion-related massive sulphide pyrite-pyrrhotite vein that assayed 11.18 g/t Au over 7.7 m.

#### 6.1.5. Premier/Dilworth (Ascot Resources Ltd.)

At their **Premier/Dilworth** project, Ascot Resources Ltd. drilled an additional 45,800 m in 2018, following up on 140,000 m of drilling in 2017. Results reported included 20.0 m of 8.04 g/t Au and 21.4 g/t Ag at the western extension of Premier, 7.2 m of 20.67 g/t Au and 24.92 g/t Ag at the Big Missouri zone, and 12.38 m of 8.91g/t Au and 22.9 g/t Ag at the North Star prospect. In December, the company released an updated resources estimate. For the Premier/Northern Lights, Big Missouri, Silver Coin and Martha Ellen deposits, total Indicated resources are 2.78 Mt grading 7.46 g/t Au and 26.2 g/t Ag. For the Premier/Northern Lights, Big Missouri, Silver Coin, Martha Ellen and Dilworth deposits, Inferred resources are 6.03 Mt grading 7.18 g/t Au and 24.0 g/t Ag.

# 6.1.6. Red Cliff (Decade Resources Ltd. 65%, Mountain Boy Minerals Ltd. 35%)

In 2018, a 53 hole 11,000 m diamond drilling program was carried out on the **Red Cliff** project. Drilling results for the Waterpump zone included 4.54 m of 12.11 g/t Au and 7.26 m of 10.6 g/t Au.

## 6.1.7. Silver Coin (Ascot Resources Ltd.)

The **Silver Coin** project was purchased by Ascot in October from Jayden Resources Inc. (80%) and Mountain Boy Minerals Ltd. (20%). The project is 25 km north of Stewart, 800 m from Ascot's Big Missouri deposit and 5 km from the historic Premier mine mill, also owned by Ascot. It is an advanced stage epithermal gold-silver project with a historical mineral resource estimate for the high-grade core of the orebody of 702,000 t grading 4.46 g/t Au in the Indicated category and 967,000 t grading 4.39 g/t Au in the Inferred category. Ascot considers there is potential for expansion of the mineralized zones and potential for discovering additional zones.

#### 6.1.8. Snip (Skeena Resources Limited)

Skeena Resources Ltd. continued with underground and surface drilling at their past-producing **Snip** gold mine project, completing 7732 m in 46 holes. Results included 13.8 g/t Au along 18.0 m. In October it was announced that Skeena granted Hochschild Mining Holdings Limited (a wholly owned subsidiary of Hochschild Mining plc) an option to acquire 60% of the project. Hochschild has three years to provide notice that they will exercise the option. After notification they have three years to meet expenditure commitments.

## 6.1.9. Tatogga (Saddle South) (GT Gold Corp.)

The **Tatogga** project is approximately 14 km west of the Red Chris copper-gold mine, less than 1 km west of Iskut, and close to a paved road (Highway 37). In 2018, GT Gold Corp. extended Saddle South gold-silver mineralized zones along strike and identified additional high-grade gold mineralization at depth. Drilling highlights included 40.89 m of 9.55 g/t Au. Saddle South, discovered in 2017, is the project's first high-grade epithermal vein occurrence. In 2018, GT Gold made a large porphyry Cu-Au-Ag discovery on the adjacent Saddle North target (see section 6.2.11.).

## 6.1.10. Treaty Creek (Tudor Gold Corp. 60%, Teuton Resources Corp. 20%, American Creek Resources Ltd. 20%)

The **Treaty Creek** project is adjacent to Seabridge's KSM project and Pretium's Brucejack mine. In 2018, Tudor drilled 7200 m in nine holes. The target was the Copper Belle zone and highlight results included 121.8 m of 1.04 g/t Au with a high-grade interval of 26.6 g/t Au over 1.5 m.

#### **6.2.** Selected porphyry projects

The Northwest Region is highly prospective for porphyry deposits related to island arc assemblages accreted to North America and to post-accretionary intrusive suites.

#### 6.2.1. Berg (Centerra Gold Inc.)

The **Berg** project is approximately 20 km northwest of the Huckleberry mine and contains the Berg porphyry Cu-Mo-Ag deposit. In 2018, Centerra carried out mapping and sampling

in the Berbette and A12 target areas. Soil sampling was carried out at A12.

#### 6.2.2. Boomerang (Hawkeye Gold and Diamonds Inc.)

Soil sampling at the **Boomerang** project in 2018, coupled with historical soil surveys, outlined an approximately 500 m by 1500 m anomaly, with most values ranging between 100 and 1225 ppm Cu.

#### 6.2.3. Duke (Amarc Resources Ltd.)

The **Duke** property straddles the Northwest and North Central regions. The property includes a porphyry Cu +/-Mo deposit that was the subject of an historic (NI 43-101 non-compliant) inferred resource estimated at 40.8 million tons at 0.25% Cu and 0.01% Mo. Amarc drilled six holes, totalling 3060 m to follow up on 2017 results. Seven of the eight holes drilled in 2017 and 2018 intersected porphyry Cu-Mo-Ag mineralization. Highlight results from 2018 included 348 m grading 0.23% Cu, 0.013% Mo, 1.1 g/t Ag, 0.05 g/t Au.

The property was explored intermittently between 1965 and 2010 by IP and magnetic surveys, and by shallow drilling, and was acquired by Amarc in 2016. Results to date suggest currently defined mineralization is open in all directions.

## 6.2.4. Hank (Golden Ridge Resources Ltd.)

Golden Ridge Resources Ltd. announced discovering a new porphyry Cu-Au at the Williams zone of their **Hank** project. Their first drill hole intersected 327 m grading 0.31% Cu, 0.35 g/t Au and 1.94 g/t Ag. Additional drilling returned similar grades, and the company expanded induced polarization survey coverage.

## 6.2.5. Hat (Doubleview Capital Corp.)

The **Hat** project contains the Lisle Au-Cu alkali porphyry zone. In 2018, Doubleview Capital Corp. optioned the project to Hudbay Minerals Inc. Hudbay will be the operator and has the right to earn up to 65% interest by fulfilling the terms of a three-stage agreement that includes expenditures of \$40 million and costs for a feasibility study. In the summer, a 40 line-km, deep-penetrating induced polarization survey was carried out to target the depth, shape, structure, and dimensions of goldcopper mineralization and to delineate drilling targets.

#### 6.2.6. Iskut (Seabridge Gold Inc.)

In 2018, Seabridge carried out 2700 m of diamond drilling on the Quartz Rise target at the **Iskut** project. The program was designed to test for high-grade epithermal precious metal mineralization but encountered mineralization typical of a large porphyry Cu-Au system. Drilling intersected a hydrothermal breccia containing abundant clasts of chalcopyrite, pyrite, and magnetite in veined intrusive rocks and stockworks positioned over a large IP chargeability anomaly interpreted as representing a sulphide-rich porphyry intrusion.

## 6.2.7. Kinaskan-Castle (Colorado Resources Ltd.)

Colorado Resource's **Kinaskan-Castle** project is 25 km west of the Red Chris mine and 1 km west of GT Gold Corp.'s Tatogga project. In 2018, Colorado extended induced polarization survey coverage on the property that produced chargeability anomalies coincident with large gold and copper soil geochemical anomalies, which extend along an east-west trend for more than 2000 m. The anomalies are interpreted to be in the same rock units that host the Saddle North and Saddle South discoveries on the Tatogga property. In October, Colorado received permits to allow drilling and a program is planned for 2019.

## 6.2.8. Ootsa (Surge Copper Corp.)

Surge Copper Corp.'s (formerly Gold Reach Resources Ltd.) **Ootsa** project is adjacent to the past-producing Huckleberry mine and mill complex. In 2018, Surge Copper discovered a new copper zone (Fig. 3) 500 m northeast of their East Seel deposit. The discovery hole intersected 202 m of continuous mineralization and assayed 0.26% Cu, 0.31 g/t Au and 1.32 g/t Ag. A later hole intersected 22 m of 0.5% Cu, 0.10 g/t Au, 17.6 g/t Ag, 0.65% Zn and 0.14% Pb. Drilling an uplifted fault block between the East Seel and Damascus deposits intersected a new gold zone returning a 2 m intersection grading 9.4 g/t Au.



**Fig. 3.** Chalcopyrite and pyrite mineralization, hole S18-214, Surge Copper Corp.'s Ootsa project. Photo courtesy of Surge Copper Corp.

# 6.2.9. Schaft Creek (Teck Resources Limited 75% and Copper Fox Metals Inc. 25%)

The **Schaft Creek** porphyry Cu-Au-Mo is an advanced-stage project. In 2018, the companies continued environmental base line studies and First Nations consultations. The project consists of three deposits: the Main (Liard) zone, The Paramount zone and the West Breccia zone. A 2013 feasibility study defined a Proven and Probable reserve of 940.8 Mt grading 0.27% Cu, 0.19 g/t Au, 0.018% Mo and 1.72 g/t Ag. Measured and Indicated resources were listed as 1,228.6 Mt grading 0.26% Cu, 0.017% Mo, 0.19 g/t Au and 1.69 g/t Ag and a 597.2 Mt

Inferred resource grading 0.22% Cu, 0.016% Mo, 0.17 g/t Au and 1.65 g/t Ag. Proven and Probable reserves are included within the stated Measured and Indicated resources.

## 6.2.10. Silver Hope (Finlay Minerals Ltd.)

In 2018, Finlay carried out deep-penetrating induced polarization and magnetotelluric geophysical surveys at the **Silver Hope** property to define new drill targets.

## 6.2.11. Stars (ML Gold Corp.)

ML Gold Corp. reported that drilling at two new targets on their **Stars** project intersected mineralized porphyry. In February, they announced 204 m assayed 0.45% Cu, 0.045 g/t Au, 1.64 g/t Ag, 0.0048% Mo. In August, they announced 405 m assayed 0.20% Cu, 0.0082% Mo, 0.754 g/t Ag and 24 ppb Au.

## 6.2.12. Tatogga (Saddle North) (GT Gold Corp.)

GT Gold Corp.'s **Tatogga** project is approximately 14 km west of the Red Chris copper-gold mine, close to a paved road (Highway 37). The project has two target areas, Saddle South and Saddle North. Saddle South is a high-grade gold discovery made in 2017 (in section 6.1.9.). In 2018, GT Gold reported discovering a new Cu-Au-Ag porphyry at the Saddle North target, approximately 1.5 kilometres east-northeast of the Saddle South gold discovery. Initial drilling highlights included 430 m of 0.67 g/t Au, 0.41% Cu and 0.89 g/t Ag. A later hole, approximately 200 m to the northwest, returned 363 m of 1.02 g/t Au, 0.51% Cu and 1.72 g/t Ag in 904 m of 0.51 g/t Au, 0.30% Cu and 0.93 g/t Ag.

## 6.2.13. Thorn (Brixton Metals Corporation)

The Chivas zone porphyry Cu-Au-Mo target is part of Brixton Metals' **Thorn** project. In 2018, Brixton completed a program of core re-logging, geological mapping and sample collecting for whole rock lithogeochemical analysis combined with short-wave infrared spectroscopy.

## 6.3. Selected polymetallic base and precious metal projects

The Northwest Region hosts many significant base and precious metal deposits, a number of which were explored in 2018.

## 6.3.1. Brucejack Regional (Pretium Resources Inc.)

Beyond the Brucejack mine area, Pretium continued to evaluate their surrounding 1250 km<sup>2</sup> of mineral claims. The **Brucejack Regional** project includes the American Creek, Bluffy, and Koopa zones, along with the newly discovered Upper Kirkham zone. The company carried an 8000 m drilling program along with mapping and prospecting. At the American Creek zone, drilling highlight results included 1.5 m grading 10.15 g/t Au and 25.5 m grading 41.54 g/t Ag, 2.12% Zn and 0.56% Pb. Prospecting sample results located the new Upper Kirkham zone. Samples returned assays as high as 3.55 g/t Au,

greater than 10,000 g/t Ag, 4.71% Cu, greater than 20% Pb and 3.81% Zn.

## 6.3.2. Clone Gold (Sunvest Minerals Corp.)

At the **Clone Gold** project Sunvest carried out geochemical rock, silt, and soil sampling, and packsack drilling in 2018. Recent ice retreat has resulted in new bedrock exposure and the company also carried out detailed geological mapping. Sampling at the Port 19 showing returned Cu values of 0.52%, 0.99%, 1.02% and 1.64% and a Ag assay of 220 g/t. Sampling at the Outbound showing returned multiple rock samples returning in excess of 0.10% Cu and a peak value of 0.56% Cu and up to 132 g/t Ag, and gold values in soil samples up to 1.04 g/t Au.

At the Clone prospect, sampling returned values including 10.9 g/t Au, and 0.64% Cu in rock samples, and peak values of 1.26 g/t Au and 1.66 g/t Au from soil samples. A new mineralized vein (Southern Glory prospect) was also announced. A quartz vein, up to 1.25 m wide, was mapped along a strike length of about 70 m. Results included a 1 m chip sample returning 4.11% Cu, 160 g/t Ag, 0.52g/t Au.

## 6.3.3. Dolly Varden (Dolly Varden Silver Corporation)

Dolly Varden Silver's **Dolly Varden** project consists of the Torbrit, Dolly Varden, Wolf, and North Star deposits and a number of mineralized zones. In 2018, Dolly Varden drilled 29,108 m in 84 holes and discovered a new zone (Bonus zone). Drilling results included 15.50 m grading 161.4 g/t Ag, 0.25% Pb and 0.20% Zn. Drilling on known zones included 24.00 m grading 287.5 g/t Ag, 0.29% Pb, and 0.11% Zn at Torbrit East and 29.15 m grading 226.0 g/t Ag, 0.09% Pb, and 0.13% Zn at the Moose-Lamb zone.

## 6.3.4. Dunwell (American Creek Resources Ltd.)

American Creek's **Dunwell** project contains the historic Dunwell gold-silver-lead-zinc mine. American Creek believes potential exists to develop more reserves along strike and below the original workings. In 2018, American Creek collected 30 rock samples from various locations, both at surface and underground. Reported results included high-grade Au (up to 61.2 g/t) and Ag (up to 1186 g/t) along with base metals.

## 6.3.5. Eskay Creek (Skeena Resources Limited)

The **Eskay Creek** project was acquired in late 2017 by Skeena Resources from Barrick Gold Inc. and includes the former producing Eskay Creek mine. In 2018, Skeena carried out diamond drilling, compiled and reviewed 20 years of exploration and production information, and completed a geologic model and resource estimate. The pit-constrained Indicated resource estimate is 1.08 Mt at 4.9 g/t Au, 72 g/t Ag, and the Inferred resource is 4.26 Mt at 3.3 g/t Au, 72 g/t Ag. The underground Indicated resource is 2.51 Mt at 7.2 g/t Au, 215 g/t Ag, and the underground Inferred resource is 0.81 Mt at 7.2 g/t Au, 214 g/t Ag. Lead, copper, zinc and antimony are

potential by-products worth incorporating into future mineral resource estimates.

Drilling highlights from 2018 include 14.55 m grading 7.36 g/t Au, 1,189 g/t Ag and 31.50 m grading 10.16 g/t Au, 331 g/t Ag and 42.65 m grading 9.49 g/t Au, 111 g/t Ag.

## 6.3.6. Golddigger (Goliath Resources Limited)

Goliath reported discovering multiple breccias, stockworks, and veins containing high-grade gold and polymetallic mineralization at the **Golddigger** project. A 0.55 m channel sample graded 29.70 g/t Au and 14.30 g/t Ag, a 0.50 m chip sample graded 47.50 g/t Au and 272.00 g/t Ag and grab samples graded up to 113.50 g/t Au and 249.00 g/t Ag. This new gold-enriched polymetallic discovery is in an extensive area where glacier retreat and snow pack loss has increased bedrock exposure.

## 6.3.7. Keaper (Casa Minerals Inc.)

At the **Keaper** project, Casa collected 85 rock samples and 580 soil samples in 2018. Highlight rock sample results include 1512 g/t Ag with 0.88% Cu, 1.19% Pb, 13.9% Zn and >100 g/t Ag with 0.33% Cu.

#### 6.3.8. Kinskuch (Hecla Mining Company)

Hecla reports that 2018 drilling at the **Kinskuch** project defined silver-enriched base metal mineralization along a strike length of 4.8 km and that high-grade zones appear to have continuity. These zones may represent two parallel structures or the limbs of a folded body. Although assay results were not mentioned, Hecla reported that they plan to produce a preliminary resource model.

#### 6.3.9. Kutcho (Kutcho Copper Corp.)

Kutcho Copper Corp.'s **Kutcho** project is at an advanced stage. A preliminary feasibility study from 2017 reports a Probable reserve of 10.4 Mt at 2.01% Cu, 3.19% Zn, 34.61 g/t Ag, and 0.37 g/t Au. At a 1.0% copper cut off, combined Measured and Indicated resources are estimated at 16.853 Mt of 1.89% Cu, 2.87% Zn, 0.36 g/t Au and 32.8 g/t Ag. In 2018, Kutcho carried out a comprehensive review of historic data to identify targets for drilling. Results of this drilling included 28 m of 2.09% Cu, 6.1% Zn, 65.8 g/t Ag, 0.82 g/t Au and 5.4 m of 2.48% Cu, 1.0% Zn, 114.0 g/t Ag, 0.24 g/t Au. A bench-scale metallurgical study is underway and a feasibility study is scheduled for 2019.

## 6.3.10. KSP (Colorado Resources Ltd.)

In 2018, Colorado diamond drilled 7847 m in 35 holes at the **KSP** property. Drilling tested step out targets near the historic Inel basin area, including the Big Rock Deformation zone (BRDZ) to the east, and the Inel zone to the north. Results included 32 m grading 0.32 g/t Au and 1.64% Zn and 50 m grading 2.28 g/t Au, including 6 m grading 7.36 g/t Au.

### 6.3.11. Maroon (Gitennes Exploration Inc.)

In 2018, Gitennes carried out reconnaissance prospecting and sampling at the **Maroon** project, and found several polymetallic quartz-sulphide veins. Sampling focussed on historical workings and returned results up to 50 g/t Au, 11.5% Zn and 13.9% Pb.

## 6.3.12. Pearson (Teuton Resources Corp.)

Teuton's **Pearson** project is approximately 20 km south southwest of Seabridge's KSM property. In 2018, diamond drilling of three holes (512 m) failed to reach intended target depths, but a grab sample from a 70 cm wide mineralized quartz vein returned 54.5 g/t Au, 87.8 g/t Ag and 7.54% Pb.

#### 6.3.13. Pitman (Casa Minerals Inc.)

The **Pitman** project includes previously known target areas including Gold Dome and Pitman, and 2018 discoveries, Golden Dragon, Dragon Tale. Rock chip sampling at Golden Dragon returned 0.6 m assaying 574.42 g/t Au, 109 g/t Ag, 0.1% Cu, 1.56% Pb, 0.23% Zn and 0.9 m assaying 268.86 g/t Au, 127 g/t Ag, 0.2% Cu, 2.95% Pb, 0.04% Zn. The Dragon Tale showing is about 1 km from Golden Dragon and rock sampling returned assays as high as 231 g/t Ag and 6.15% Zn.

#### 6.3.14. Porter (StrikePoint Gold Inc.)

The **Porter** project is within 4 km of Stewart and contains the historic Silverado mine, the historic Handsome Jack workings, the Porter historic resource area, the Big Nunatak showing and the Glacier Creek property. Having acquired the property from Skeena Resources Limited in July, StrikePoint Gold Inc. carried out diamond drilling (4800 m), prospecting, and sampling. Glacier retreat has exposed a new mineralized vein along a 275 m strike length near the historic Porter resource. Thirty two samples were collected, with assays ranging from trace to 43.6 oz/t Ag, trace to 0.54 oz/t Au and trace Zn to 28.8%. Sampling at Big Nunatak returned up to 427 g/t Ag and 0.78% Cu. At the glacier Creek property, 5.5 km northeast of the Porter mine site, a new mineralized vein was discovered with a 205 m strike length and widths of up to 2 m. Samples graded up to 876 g/t Ag and 10.8 g/t Au.

#### 6.3.15. Premier East (Decade Resources Ltd.)

Decade Resources carried out rock sampling on its **Premier East** project, adjacent to the historic Premier gold-silver mine. Results returned anomalous values for precious and base metals, including one sample that graded 5.72 g/t Au, 716 g/t Ag and 11.60% Cu.

#### 6.3.16. Silver Queen (New Nadina Explorations Ltd.)

At the **Silver Queen** project, New Nadina drilled three holes totalling 3053 m to test an induced polarization conductivity anomaly. Results did not explain the anomaly, but additional drilling is planned for 2019.

## 6.3.17. Silver Vista (Glacier Lake Resources Inc.)

Glacier Lake completed seven diamond drill holes totalling 1273 m at the **Silver Vista** project. Silver-copper mineralization was encountered in all holes, including 153.4 m grading 16.1 g/t Ag, 0.05% Cu and 0.10% Zn.

## 6.3.18. Surprise Creek (Mountain Boy Minerals Ltd.)

In January 2018, Mountain Boy reported results for drilling carried out in 2017 at the **Surprise Creek** project. Drilling intersected a barite cap, which is common in Kuroko-style VMS deposits. Results included 15 m of 66.8% and 26 m of 41% BaS0<sub>4</sub> including 4.5 m grading 3.27% Zn, 0.71% Pb and 22 g/t Ag.

#### 6.3.19. Todd Creek (Sojourn Exploration Inc.)

In 2018, Sojourn carried out rock and chip sampling at the **Todd Creek** project. Samples from the Yellow Bow zone averaged 0.68% Cu, including 10 samples with more than 1% Cu. Samples from the Fall Creek zone returned up to 37.7 g/t Au and 5.3% Cu. Eight samples from the VMS zone averaged 0.213 g/t Au, 30.1 g/t Ag, 0.53% Pb, 2.54% Zn including individual assays up to 1.98% Cu, 9.15% Zn, 0.392 g/t Au and 112 g/t Ag.

#### 6.4. Selected cobalt projects

An increase in the price for cobalt resulted in a number of cobalt specific-projects being undertaken in the province, including the RD project in the Northwest Region.

#### 6.4.1. RD (Primary Energy Metals Inc.)

The **RD** project is about 1 km south of Hazelton. Primary Energy carried detailed mapping and sampling of the Golden Wonder showing. A total of 85 rock samples and 287 soil samples were collected. Highlight rock sample results included a 0.25 m chip sample returning 20 g/t Au, 0.194% Co and a grab sample returning 18.7 g/t Au, 0.653% Co, 0.969% Cu.

## 6.5. Selected mafic and ultramafic hosted projects

The Northwest Region has several ultramafic-hosted metallic prospects, including intrusion-hosted and serpentinite-hosted nickel occurrences.

## 6.5.1. Nickel Mountain (Garibaldi Resources Corp.)

Garibaldi Resources Corp.s' **Nickel Mountain** project is located approximately 90 km northwest of Stewart. In 2018, Garibaldi carried out a 32 hole 11,573 m diamond drilling program. Highlight results for 10 holes include 30.5 m of 3.10% Ni, 1.86% Cu, 0.081% Co, 0.863 g/t Pt, 1.776 g/t Pd, 0.739 g/t Au, 7.3 g/t Ag and 5.6 m of 7.60% Ni, 3.36% Cu, 0.198% Co, 0.668 g/t Pt, 0.814 g/t Pd, 0.466 g/t Au, 9.0 g/t Ag. Results for the remaining 22 holes are pending. Additional drilling in 2019 is planned.

#### 6.5.2. Turnagain (Giga Metals Corp.)

Giga Metals Corp. carried out a 40-hole 10,835 m diamond

drill program at their **Turnagain** project. The program was designed to test new targets, provide infill, collect samples for metallurgical testing, and yield geotechnical information to support pre-feasibility studies. The project has Measured and Indicated resources of 865 Mt at 0.21% Ni, 0.013% Co, and an additional Inferred resource of 976 Mt at 0.2% Ni, 0.013% Co.

## 6.5.3. Kirkham (Thunder North) (Metallis Resources Inc.)

The Thunder North target of Metallis's **Kirkham** project is approximately 2 km southeast from Garibaldi Resource's Nickel Mountain project. In the fall, Metallis announced that diamond drilling to test airborne electromagnetic and magnetic targets was underway.

#### 6.6. Selected coal projects

The Northwest Region contains the Tuya, and Telkwa coalfields and part of the Groundhog-Klappan coalfield, which are prospective for anthracite coal deposits.

#### 6.6.1. Tenas (Allegiance Coal Limited 80%, Itochu 20%)

In 2018, Allegiance Coal Limited continued to move the **Tenas** project forward through their wholly owned subsidiary Telkwa Coal Limited. Eight PQ diameter holes were drilled, three for the installation of water monitoring wells and five to collect rock samples for geochemical studies and coal testing. Twelve sonic holes were drilled for geotechnical information. Fourteen large diameter (150 mm) holes were drilled, recovering 1400 kg of coal. The coal was sent for sizing, washability, and comprehensive coal quality analyses and to generate samples for coke oven tests. In November it was announced that Itochu Corporation of Japan (Itochu) was investing in the project. A definitive feasibility study was expected in early 2019.

#### 7. Geological research

van Straaten and Wearmouth (2019) reported on the third and final field season of a mapping project in the Dease Lake area that examined Upper Triassic to Middle Jurassic arcrelated volcanic and sedimentary rocks and allied intrusive rocks to better understand the tectonic and metallogenic history of northern Stikinia and bounding terranes. Working with archived samples, Mihalynuk et al. (2019) reported U-Pb zircon ages from the Granduc and Rock and Roll volcanic massive sulphide deposits that are consistent with previous work indicating that mineralization took place in the Late Triassic. Lett (2018) released the results from a previously unpublished moss mat-sediment geochemical survey from the Porcher Island, Grenville Channel, and Dundas Island area, central British Columbia coast. The MDO office co-ordinated the production of a brochure intended for a popular audience and devoted to the Golden Triangle of the Northwest Region (British Columbia Geological Survey, 2018).

## 8. Summary

The Northwest Region is highly prospective for discovering mineral deposits. The region has a number of advanced and proposed mine projects. The region also has numerous active exploration projects, primarily for precious and base metals. In 2018, exploration activity increased for the second year in a row. Exciting new results were announced for established projects and a number of new discoveries were made.

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