



MINISTRY OF ENERGY AND MINES

[www.em.gov.bc.ca/geology](http://www.em.gov.bc.ca/geology)

# Regional Geologist Summaries

## EXPLORATION AND MINING IN BRITISH COLUMBIA 2013



6 Year  
Index Included





Ministry of  
Energy and Mines

Regional Geologist Summaries  
**EXPLORATION AND MINING**  
in British Columbia 2013

# EXPLORATION AND MINING IN THE THOMPSON-OKANAGAN-CARIBOO REGION, BRITISH COLUMBIA

Regional Office, Kamloops

---

## SUMMARY

The region saw two mines open (Basin; Treasure Mountain), major developments at two others (Highland Valley; Gibraltar), and steady progress on projects under environmental review.

The pace of exploration in 2013 was slower than in 2012. Many projects were inactive because operators were unable to raise venture capital or unwilling to spend it in the face of economic uncertainty.

Most 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.

Note: Information in this chapter has been compiled from published materials (e.g., company web sites; news releases; reports submitted to regulatory authorities), supplemented by telephone or email inquiries and a few field visits.

## MINES

Table 1 lists operating coal, industrial mineral and metal mines in the region. Figure 1 shows their locations.

## COAL

In June 2013, Coalmont Energy Corporation commenced production at their **Basin** mine near Princeton. The mine's initial production rate is 250 000 tonnes per year of thermal coal but the company has permits to increase production to 350 000 tonnes per year, which they plan to do in 2014. Pre-stripping and development of the existing 1 km long open pit commenced in February 2013. About 1.8 million cubic metres of waste rock, soil and overburden were removed to waste dumps. The coal trench was extended to 1500 metres along the Main seam (Figure 2). Coal production continued until temporary shut-down in October 2013. The company reports that just over 100 000 tonnes of clean coal was produced between June and October. Mining is expected to restart early in 2014.

Construction of a new, 250 tonne per hour Parnaby wash plant began in October 2012. The plant was commissioned in June 2013 (Figure 3). The wash plant uses a filter-press method to separate coal from waste. This method is new to Canada but is well established in

other countries. Its advantage is that it eliminates the need for a tailings pond. Process water is recycled and reject material (filter cake) is placed in designated waste dumps.

Cleaned coal is moved by truck and barge to Texada Island for shipment to local and overseas markets. Initial power plant combustion tests in Japan were well received.

The Basin deposit occurs in an Eocene half graben. The Main seam totals ~ 32 metres in thickness, and comprises four coal units separated by thin layers of siltstone, tuff or ironstone. A Lower seam, some 27 metres below the Main seam, is 7 metres thick and was the focus of a test bulk sample. Step-out drilling tested continuity and quality of the Main seam.

## INDUSTRIAL MINERALS

There are over fifteen industrial mineral quarries and processing plants in the region. These operations employ more than 250 people, most of whom live in nearby communities. There are opportunities for growth in this sector due to the region's diverse geology, good roads and power lines, and proximity to markets. Permits for industrial mineral operations are usually easier to obtain than they are for metal mines.

The **Kamloops** cement plant and **Harper Ranch** limestone quarry of Lafarge Canada Inc. continue to supply cement to meet demand in western Canada. Lafarge also draws materials from the **Falkland** and **Buse Lake** quarries, which provide gypsum and alumina-silica rock respectively.

The **Decor** pit of Pacific Bentonite Ltd. supplies alumina-rich burnt shale to the Lafarge cement plant in Kamloops. The shale beds occur directly above the Hat Creek coal deposit, located west of Cache Creek. Although most of the material is sold to Lafarge, other uses exist such as the crushed red gravel used on baseball diamonds. The property is also known to host a large bentonite deposit which is being investigated for municipal engineering and tile manufacturing applications. The company has patented a product ("Fibre-clay" panels) which combines pulp fibre and clay. The product is nearly impermeable and is suitable for liners and covers for mining and municipal water.

Also west of Cache Creek, Graymont Western Canada Inc. operates the **Pavilion** limestone quarry and lime plant on Indian reserves. The operation produces quicklime, high calcium limestone fines, screened high





**Figure 2.** Coal mining resumed at the Basin deposit in June 2013. View along 1.5 km working face, footwall to left. (Jim Britton photo)



**Figure 3.** New Parnaby wash plant, Basin coal mine. (Jim Britton photo)

calcium stone products, lime kiln dust and rip rap. Graymont has a forty-year lease with the Ts'kw'aylaxw First Nation, and most of the operation's employees are Ts'kw'aylaxw.

East of Ashcroft, IG Machine and Fiber Ltd, a subsidiary of IKO Industries Ltd, operates the **Ashcroft** basalt quarry and roofing granule plant. The granules are sized and coated with one of several distinct colours on site, and then shipped by rail and truck to IKO asphalt shingle plants in Calgary, Alberta; Sumas, Washington; Chicago, Illinois and to other plants in North America.

Imperial Metals Corporation has installed a recovery plant at its **Mount Polley** concentrator to capture magnetite from its tailings stream. The operation is intended to provide dense media for coal washing operations.

In 2012, Craigmont Mines Joint Venture ceased operations at the **Craigmont** magnetite operation located near Merritt due to depletion of economic

reserves. Since 1991 the mine produced 1 167 000 dry tonnes of magnetite. Mining equipment is now being sold and the site reclaimed.

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

Heemskirk Canada Ltd continues to market agricultural and absorbent products mined from their **Zeotech/Bromley Creek** zeolite quarry near Princeton. The material is transported to their plant in Lethbridge. The company also owns another deposit near Cache Creek, which is not currently in production, but contains an estimated 890 000 tonnes of zeolite (in situ, measured and indicated mineral resource)

Opal Resources Canada Inc produces attractive fire opal gemstones and jewelry from the **Klinker** property, located west of Vernon. Opal occurs as fracture and vesicle-fillings in andesitic to basaltic laharic breccia of lower members of Eocene Kamloops Group. Gemstone jewelry is sold to visitors and tourists from a retail store in Vernon. The company hopes to develop other North American markets.

Decorative rock and dimension stone are produced at numerous small quarries throughout the region. In 2012, Kettle Valley Stone Company of Kelowna sold its quarries to Kelowna Sand and Gravel Ltd in order to focus on processing and marketing. Kelowna Sand and Gravel continues to mine 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's processing facility produces flagstone, ashlar, facing stone and landscape rock. Markets include residential and commercial building projects in western USA and Canada.

In 2010, Spectral Gold Corp began developing the **Lady King Basalt** deposit, located near Vernon, selling slender basalt columns as landscape rock suitable for a variety of decorative and functional uses such as garden features, fountains, walls and stairs.

In 2013, Lithium Corporation of Nevada began prospecting for graphite on their **BC Sugar** property, a large block of claims the company staked between Mabel and Sugar lakes, 35 kilometres northeast of Lumby. Graphite occurs as disseminations and lenses in both calc-silicate and quartzofeldspathic gneisses of the Shuswap Metamorphic Complex.

## **ROCK QUARRIES, AGGREGATE PITS AND PLACER MINES**

Ministry of Energy and Mines' tracking system reports that there are 56 quarries, 480 sand and gravel pits and 704 placer mines (701 surface operations and 3 underground) classified as "active". The "active"



classification refers to the status of the permit and therefore includes mines that are exhausted and undergoing reclamation and closure. It also includes many operations that are small, seasonal or intermittent, and which supply products on an as-needed basis.

Statistical information (e.g., production; reserves; employment) on these operations has not been obtained. Nevertheless the number of operations reflects the magnitude of often-overlooked types of mining. The number also indicates the diversity of opportunities for mineral resource development that exist in the region. One can infer that these types of mines make an important contribution to the region's economy.

### **METAL MINES (INCLUDING NEAR-MINE EXPLORATION)**

With five major operating mines the Thompson-Okanagan-Cariboo region hosts roughly half of the province's metal mines.

New Gold Inc reported a very successful first full year of operation at their **New Afton** gold-copper mine, a block cave operation that opened in mid 2012. Production increased, reserves improved and head grades rose. By fall the company had achieved a targeted and sustainable increase in throughput to 12 000 t/d (surpassing its 11 000 t/d guidance) and had experimented with rates between 14 000 and 15 500 t/d. At present all ore comes from the B-zone. Exploration (mainly underground drilling) focused on two areas: the East Cave Extension and the C-zone. The East Cave Extension lies between the B-zone and the previously mined Afton open pit, whereas the C-zone is a down-plunge extension of the B-zone. The company reports positive results for both exploration targets. Increases in resource estimates for the East Cave Extension Zone will be published early in 2014; resources for the C-zone increased by an impressive 300%. C zone resources (measured and indicated) now stand at approximately 12.5 million tonnes grading 0.77 g/t Au, 1.50 g/t Ag and 0.77 % Cu.

The **Copper Mountain** copper-gold mine near Princeton has been in production since August 2011 and is operated by a partnership of Copper Mountain Mining Corporation (75%) and Mitsubishi Materials Corporation (25%). The rate of mining has met or exceeded guidance figures, but milling operations have struggled to achieve their target of 35 000 t/d. Rock hardness is one factor that has been cited for the lower throughput. Financing has been secured for a new secondary crusher that should be in operation by late 2014. A multi-year exploration program seeks to upgrade resources, test ore depths and find mineralization outside the current mine plan.

North of Williams Lake, the **Gibraltar** copper-molybdenum mine, operated by Taseko Mines Limited and Cariboo Copper Corp, celebrated a major milestone in September with the completion of the third phase of the Gibraltar Development Plan to modernize the mine. A

community event attended by more than 600 local residents, company officials and dignitaries was held on September 19 (Figure 4). By the end of the development plan, the company will have invested ~ \$700 million. The most recent phase included a new 30 000 t/d mill, a standalone facility that enhances operating flexibility and reliability, and additions to the mining fleet. Mine life has been extended to 2039.

The **Highland Valley Copper** copper-molybdenum mine near Logan Lake, 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. Construction is nearing completion on a \$475 million mill modernization project that will help extend mine life to 2026 (Figure 5). The project includes new flotation and pebble crushing capacity near existing circuits. The new mill will improve plant availability and increase copper recovery by 2%, molybdenum recovery by 3%, and annual mill throughput by 10%. The facility is expected to be commissioned early in 2014. Mine production focused on the Valley pit as pre-stripping continued for the Lornex pit extension.



**Figure 4.** Celebrating a bright, new future for the Gibraltar mine, 19 September 2013. (Image courtesy of Taseko Mines Ltd)



**Figure 5.** New mill under construction at Highland Valley Copper mine. (Image courtesy of Teck Highland Valley Copper Partnership)

Following successful ground geophysical survey and drilling programs in 2012, Teck Highland Valley Copper Partnership aggressively explored targets near the past producing **Bethlehem** mine and their **Valley** pit. The company announced plans for 90 000 metres of diamond drilling in 2013 and later reported that up to nine drill rigs were active. 100 million tonnes of ore have been delineated at Bethlehem Phase 1. Engineering studies are underway.

Located northwest of Williams Lake, the **Mount Polley** copper-gold-silver mine of Imperial Metals Corporation continues to delineate resources outside the main producing Springer pit. Exploratory drilling at the Springer pit increased reserves, enabling further expansion of the pit, and extension of mine life by two years (to 2025). Drilling also found ore-grade mineralization extending hundreds of metres below the current pit shell. Wall pushback continued at the Caribou pit for most of the year allowing the pit to contribute ore to the mill in the third quarter. Over 500 metres of ramps, cross-cuts, and raises were constructed in the Boundary zone to allow for underground drilling and to prepare for test mining. The nearby Zuke zone was also explored by underground drilling. This recently discovered zone is modeled as a pair of steeply-dipping, mineralized breccia lenses, approximately 8 metres wide, 30 metres high and 75 metres long, are separated by a 5 metre thick, unmineralized core and cut by a post-mineral dike. The alkalic intrusive complex at Mount Polley has at least 8 discrete zones with a total resource inventory of ~ 411 million tonnes at 0.48% copper equivalent (measured and indicated; as of 1 January 2013). The discovery potential within this complex remains good.

The **QR** mine of Barkerville Gold Mines Ltd has operated sporadically in recent years due to depletion of sustaining quantities of ore. In December 2012, approximately 6000 tonnes of surface ore were extracted from the West zone and milled. Dore gold bars were poured in late January 2013. Underground mining resumed in January. By October, 15 000 tonnes of ore were produced for processing. The QR mill awaits shipments of new ore from the Bonanza Ledge mine, near Wells, which is under development.

In March 2013, Huldra Silver Inc achieved commercial production at their **Treasure Mountain** mine located west of Princeton, in upper Tulameen River. Unfortunately, in June the mine and mill were placed on care and maintenance due to market factors and the company subsequently sought protection under the *Companies' Creditors Protection Act*. The Treasure Mountain deposit is described as a stacked series of high grade silver-lead-zinc veins in Cretaceous sedimentary rocks of the Pasayten Group. Vein material was mined from a small open pit and four underground drifts. A resource estimate (indicated, but not compliant with NI 43-101 standards) 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. Exploration potential on the property remains

excellent. The veins are open to the east and to depth. Other targets on the claims have not been drilled but have returned high grade grab samples. The epithermal nature of the mineralizing system is evidenced by a spectacular hydrothermal breccia on Level 4 (Figure 6). Huldra's mill is located at the former Craigmont tailings facility, near Merritt, where a magnetite recovery plant operated until November 2012.

Bralorne Gold Mines Ltd has been milling approximately 80 t/d from stockpiled and underground resources at its **Bralorne** gold mine. The company is mining gold-bearing mesothermal quartz veins in relatively undeveloped areas between three former mines: Bralorne, King and Pioneer. The company is currently evaluating its existing resources to identify targets for future development and advance an objective of expanding the operation to more than 200 t/d. The company has been actively developing the BK-3 zone through drifting and underground drilling. The high-grade M vein, discovered by surface drilling in 2011, continues to be a focus of underground exploration using inclines, drifts and raises from BK-3. The M vein grades almost 140 g/t Au (uncut) over an average width of 0.3 metre (Tables 1, 2).

## MINE DEVELOPMENT AND EVALUATION PROJECTS

### MINE DEVELOPMENT

In December 2011, the **Bonanza Ledge** project of Barkerville Gold Mines Ltd received approval under the *Mines Act* to develop an open pit gold mine near Wells. The open pit site has been logged and grubbed in preparation for mining and an agreement has been reached with forestry operators to utilize the 500 Forest Service Road to truck the ore 100 km to the company's QR mine where it will be milled. The QR mine permit has been amended to accommodate the ore and the mill has been made ready. In 2009, the company had proposed mining approximately 73 000 tonnes per year of gold ore



**Figure 6.** Hydrothermal breccia at Treasure Mountain mine. (Bruce Northcote photo)

**TABLE 1. THOMPSON-OKANAGAN-CARIBOO REGION MINE PRODUCTION, 2013**

<b>Mine</b>	<b>Operator</b>	<b>Deposit Type / Commodity</b>	<b>Production</b> <small>(tonnes or kilograms; estimated by government for 2013)</small>	<b>Number of Employees</b> <small>(date)</small>	<b>Proven and Probable Reserves</b> <small>(tonnes; date published)</small>
<b>Metals</b>					
Bralorne	Bralorne Gold Mines Ltd	Vein Au	106 kg Au	55 (March 2013)	Not available
Copper Mountain	Copper Mountain / Mitsubishi Materials	Alkalic porphyry Cu, Au, Ag	28 800 t Cu; 710 kg Au, 8895 kg Ag	~400 (Dec 2013)	211 000 000 t at 0.36% Cu, 0.1 g/t Au and 1.38 g/t Ag (28 July 2009)
Gibraltar	Taseko Mines Limited / Cariboo Copper Corp	Calc-alkalic porphyry Cu, Mo	53 300 t Cu, 585 t Mo	~ 700 (Sept 2013)	790 000 000 t at 0.30% Cu and 0.008% Mo  (31 Dec 2012)
Highland Valley Copper	Teck Highland Valley Copper Partnership	Calc-alkalic porphyry Cu, Mo	106 000 t Cu; 2660 t Mo	1267 (Nov 2011)	697 400 000 t at 0.29% Cu and 0.008% Mo (31 Dec 2012)
Mount Polley	Imperial Metals Corporation	Alkalic porphyry, Skarn Cu, Au, Ag	17 695 t Cu, 1470 kg Au, 2955 kg Ag	370 (Nov 2011)	93 078 000 t at 0.297% Cu, 0.299 g/t Au and 0.62 g/t Ag (1 Jan 2013)
New Afton	New Gold Inc	Alkalic porphyry Au, Cu	31 085 t Cu, 2570 kg Au	444 (Dec 2013)	52 500 000 t at 0.65 g/t Au, 2.3 g/t Ag and 0.93% Cu (31 Dec 2012)
QR (Intermittent)	Barkerville Gold Mines Ltd	Skarn Au	Not available <small>(~15 000 tonnes of ore stockpiled by Oct 2013)</small>	12 (mine); 6 (mill) (Oct 2013)	Not available
Treasure Mountain <small>(April 2013 start up. July 2013 shut down / care and maintenance.)</small>	Huldra Silver Inc	Vein Ag, Pb, Zn	Not available	~5 (Oct 2013)	Not available
<b>Coal</b>					
Basin <small>(June 2013 start up. Oct 2013 shut down / care and maintenance.)</small>	Coalmont Energy Corp	Thermal coal	>100 000 t <small>(June to October)</small>	102 (at shutdown)	Not available



## Industrial Minerals

Ashcroft	IG Machine and Fiber Ltd (IKO Industries Ltd)	Basalt (roofing granules)	350 000 t	~55 (plant & quarry)	
Bud	Absorbent Products Ltd	Bentonite		see Red Lake	
Buse Lake	Lafarge Canada Inc	Volcanic ash (alumina-silica)		see Harper Ranch	
Craigmont (Mining ceased in 2012. Reclamation underway.)	Craigmont Mines Joint Venture	Magnetite tailings	0 t	Not available	
Decor	Pacific Bentonite Ltd	Alumina, landscape rock	100 000 t	~10 (including trucking)	
Falkland	Lafarge Canada Inc	Gypsum	6000 t	see Harper Ranch	
Harper Ranch	Lafarge Canada Inc	Limestone	220 000 t	34 plus 10 contractors (plant & 3 quarries)	
Kettle Valley quarries	Kelowna Sand and Gravel Ltd/ Kettle Valley Stone Ltd	Ashlar, flagstone, thin veneer		~ 40 (quarries & plant)	
Klinker	Okanagan Opal	Opal			
Lady King Basalt	Spectral Gold Corp	Basalt columns			
Pavilion	Graymont Western Canada Inc	Limestone	190 000 t	~ 34 (plant & quarry)	
Red Lake	Absorbent Products Ltd	Diatomaceous earth		~ 40 (plant & 3 quarries)	
Zeotech / Bromley (Princeton Zeolite Deposit)	Heemskirk Canada Ltd	Zeolite			550 000 t; (M+I resource estimate; 30 June 2013)

(grading 9.05 g/t Au) over a period of four years. Engineering consultants (retained by the company to address BC Securities Commission concerns) reviewed this plan and made slight revisions to the design of the starter pit that will supply the first year of mill feed. They also recommended completion of a new pre-feasibility study since the economic parameters of the 2009 one were out of date. The new study is expected to be completed early in 2014. Ore consists of native gold in quartz veins within carbonaceous and chloritic phyllite. Stated reserves (as of August 2009) include 130 724 tonnes grading 10.227 g/t Au in the proven category and 166 808 tonnes grading 8.114 g/t Au in the probable category.

## MINE EVALUATION

In July a revised plan for the **New Prosperity** gold-copper mine of Taseko Mines Limited was reviewed by a Federal panel in accordance with the *Canadian*

*Environmental Assessment Act, 2012*. The plan proposed relocating a tailings storage facility (TSF) to an area 2.5 km upstream of Fish Lake and introduced a lake recirculation water management scheme. The proposed mitigations would cost about \$300 million. In October the review panel concluded that the revised plan would still result in a significant adverse impact to fish, fish habitat and water quality. The company challenged the panel's conclusion and it was discovered that the wrong TSF design was used by Natural Resources Canada in reaching their conclusions about adverse impacts. The issue remains outstanding. The Federal Cabinet is expected to make a final decision sometime in 2014.

The New Prosperity deposit is located 125 km southwest of Williams Lake. It 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.

Yellowhead Mining Inc continued to advance their **Harper Creek** copper-gold-silver deposit near

**TABLE 2. SELECTED EXPLORATION PROJECTS, THOMPSON-OKANAGAN-CARIBOO REGION, 2013**

<b>Property</b>	<b>Operator</b>	<b>MINFILE</b>	<b>Commodity</b>	<b>Deposit Type</b>	<b>Work Program</b>
Ajax	KGHM International Ltd	092INE 012, 013, 028, 030	Cu, Au, Ag, Pd	Porphyry	FS, ES, CD, GD
Baez	Tower Resources Ltd	092C 015	Au, Ag	Vein / Breccia	IP
Ben	Westhaven Ventures Inc	n/a	Au	Vein / Breccia	DD
Bethlehem / Highland Valley Mine (Exploration)	Teck Highland Valley Copper Partnership	092ISE 001	Cu, Mo	Porphyry	DD; IP
Bonanza Ledge (Barkerville Mountain)	Barkerville Gold Mines Ltd	093H 019	Au	Vein / Breccia	PFS; Preparations for mining
Bonaparte	WestKam Gold Corp	092P 050	Au	Vein / Breccia	3D-IP, MG
Bralorne Camp	Bralorne Gold Mines Ltd	092JNE 164, 001	Au, Ag	Vein / Breccia	DD
Cariboo Gold (Cow Mountain)	Barkerville Gold Mines Ltd	093H 019	Au	Vein / Breccia	Resource evaluation; TR
Dillard	Fjordland Exploration Inc / Sumac Mines Ltd	092HNE 042	Cu	Porphyry	GP, DD
Elk (Siwash North)	Gold Mountain Mining Corporation	092HNE 096	Au, Ag	Vein / Breccia	IP, DD, CD, BU
Fox / Ridley Creek	Happy Creek Minerals Ltd	093A 259	W, Mo, Ag	Skarn	DD, TR
Frank Creek	Barker Minerals Ltd	093A 152	Zn, Pb, Ag	Massive sulphide	DD, TR
Harper Creek	Yellowhead Mining Inc	082M 008, 009	Cu, Ag, Au, Zn, Mo	Stratiform Sulphide	PFS, EN, DD
Kamloops Gold Copper	First Americas Gold Corporation	092P 140	Cu, Zn, Pb, Ag	Massive sulphide	MS



Maggie	Constantia Resources Ltd	092INW 015	Cu, Mo, Ag	Porphyry	DD
Man-Prime	Sunrise Resources Ltd	092HNE 243	Cu, Au	Porphyry	DD
Miner Mountain	Sego Resources Inc	092HSE 078, 203	Cu, Au, Ag	Porphyry	PD
October Dome	Bearing Resources Inc	n/a	Cu, Au	Porphyry / Skarn	DD
Rabbit North	Tower Resources Ltd	n/a	Cu, Au	Porphyry	MG, IP, P
Ruddock Creek	Imperial Metals Corporation	082M 082	Zn, Pb, Ag	Massive sulphide	MS; PEA, EN
Shovelnose	Westhaven Ventures Inc / Strongbow Exploration Inc	092HNE 309	Au	Vein / Breccia	DD
Woodjam	Gold Fields Horsefly Exploration Corporation	093A 019	Cu; Au	Porphyry	DD

**Work Program Abbreviations:**

A = access; trail, road construction on claims; AB-EM = airborne electromagnetics; AB-MG = airborne magnetics; AB-RD = airborne radiometrics; BU (X tonnes) = bulk sample (weight in tonnes); CD = condemnation drilling; CQ = coal quality testing; CT = carbonization test (coal); DD (X m) = X metres of diamond drilling; EN = environmental baseline studies/monitoring, remediation work; FS = feasibility studies; G = geology, mapping, etc; GC = geochemical sampling (rock, soil, silt, etc); GD = geotechnical drilling; GP = geophysics (general); IP = Induced Polarization; 3D-IP; MG = magnetics; MK = marketing (primarily for industrial mineral products); MS = metallurgical studies; OB = overburden drilling; OP-BU = open-pit bulk sample; P = prospecting; PD = percussion drilling; PF = pre-feasibility studies; PP = pilot plant; R = reclamation; RC = reverse circulation drilling; TR = trenching, UG (X m) = X metres of underground development; UG-BU = underground bulk sample; UT = UTEM; VLF; WT = washability test (coal)

Vavenby, about 90 km north of Kamloops. The deposit is described as stratiform, disseminated and volcanogenic, within metamorphosed volcano-sedimentary rocks of the Eagle Bay Formation. In January 2013, the company released an amended feasibility study (NI 43-101 compliant; first released in March 2012). The study proposes a 70 000 t/d mine to exploit reserves of 704.4 million tonnes grading 0.26% Cu, 0.029 g/t Au and 1.14 g/t Ag (proven and probable; using a 0.14% Cu cut-off). In April, the company submitted an application for an Environmental Assessment Certificate and is now addressing government's comments. Late in 2012, the company commenced a 35 hole, 11 969 metre drill program. Results from this program, released early in 2013, confirm deposit continuity and grade. Public engagement included progress on memoranda of understanding with local First Nations with respect to their involvement in the environmental assessment process and future negotiations on benefit agreements.

The **Ruddock Creek** zinc-lead deposit is in the pre-application stage of the BC Environmental Assessment process. 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, within 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. Work conducted during 2013 included: site infrastructure studies; metallurgical testing; acid-base accounting; setting up humidity cells; collection of baseline environmental and geotechnical information; detailed geological and structural mapping; collection of samples

for radiometric age determination; construction of a higher capacity water control structure for the underground discharge; and consultation with First Nations.

KGHM Ajax Mining Inc continued work on their **Ajax** copper-gold porphyry deposit which lies on the southern outskirts of Kamloops within the Iron Mask Batholith, a multi-phase, alkaline intrusive complex. The proposal would see a 60 000 t/d open pit mine based on reserves of 503 million tonnes grading 0.27% Cu and 0.17 g/t Au. The site is a former open pit operation which was part of the Afton mine that closed in the mid-1990s. Work in 2013 included: geotechnical and condemnation drilling; various baseline and engineering studies (e.g., environmental; air and water quality; dust, noise and vibration; traffic and socioeconomic effects). Formal entry to the environmental review process is anticipated in 2014. Public engagement continues to be a high priority for the company. Arguments for and against the project regularly appear as editorials and letters in the local press.

Following the December 2012 release of a positive Preliminary Economic Assessment for the **Spanish Mountain** gold-silver project, Spanish Mountain Gold Ltd continued to advance resource definition and prepare for environmental review. In August, the company began a planned 10 000 metre reverse circulation drilling program within the “test block” area of their Main Zone (Figure 7). The purpose was to ascertain the potential for grade improvement and to address previously observed differences in assay results in samples obtained by reverse circulation drilling and diamond drilling, respectively. The drilling program at Spanish Mountain has been supervised by an independent consulting company. Preliminary results are encouraging. Final results will be released in 2014.

Located a few kilometres east of Likely, and 65 kilometres northeast of Williams Lake, Spanish



**Figure 7.** Preparing to collect samples from reverse circulation drilling at Spanish Mountain gold-silver project. (Jim Britton photo)

Mountain represents a relatively new class of deposits known provincially as shale-hosted vein deposits – although the gold is largely disseminated in the host rocks surrounding the veins. It is a low-grade, large tonnage gold and silver deposit within fine grained metasedimentary rocks. The company has utilized a resource of 216.2 million tonnes grading 0.46 g/t Au and 0.68 g/t Ag (measured and indicated) and 316.7 million tonnes grading 0.36 g/t Au and 0.65 g/t Ag (inferred) in its assessment. This supports a 40 000 t/d operation for up to 15 years at a capital cost of \$755.9 million. The operation would produce 2.8 million ounces of gold and 1 million ounces of silver over the life of mine at a cash cost of \$774/oz.

## EXPLORATION PROJECTS

Projects are arranged by deposit type and geography. Table 2 lists selected exploration projects. Figure 1 shows their locations.

### PORPHYRY PROJECTS

#### Thompson River - Shuswap Lake

Tower Resources Ltd acquired the **Rabbit North** project mid-year and completed a series of ground and airborne geophysical surveys as a first phase of exploration. The Rabbit North project is an alkalic porphyry copper-gold target located 15 km west of the New Afton mine. Mineralization is hosted in a zoned Triassic intrusion (Durand stock) and volcanic rocks of the Nicola Group.

The Guichon batholith saw relatively little activity apart from exploration at **Bethlehem** and **Valley** pits (see notes above).

Early in 2013, Happy Creek Minerals Ltd released encouraging results from a diamond drilling program they carried out late in 2012 at their **Rateria** property, a porphyry copper-molybdenum target located 12 km southeast of Highland Valley Copper mine. One hole drilled in Zone 2 returned 152.5 m with 0.35% copper and 0.57 g/t rhenium (including 32.5 m of 0.91% Cu, 0.010% Mo, 0.11 g/t Au and 1.83 g/t Re). Although unable to mount an exploration program this year, the company remains optimistic about the area. They increased their tenure holdings through staking and the Tyner Lake Option Agreement. The company now holds 100% interest in a contiguous property of over 200 square kilometres, linking Rateria with their **West Valley** project, four kilometres to the west.

At the southern end of the Guichon batholith, the past producing Craigmont mine and mineral tenure have been acquired (100%) by Huldra Properties Inc and renamed the **Thule** Copper-Iron Property. Huldra Properties is jointly owned by Huldra Silver Inc (50.1%) and Craigmont Mines Ltd (49.9%). A technical



report commissioned in 2013 recommended a \$2.3 million exploration program including data compilation, geophysics, rehabilitation and sampling of underground workings, and drilling. Execution of this program awaits improved corporate finances.

### Cariboo

Bearing Resources Ltd returned to their **October Dome** project located 6 km west of Likely. Initial drilling in 2012 had tested a 4000 metre by 400 metre area with elevated gold and copper in soils, and a coincident IP chargeability anomaly. The 2013 program focused on the northern end of this trend, in an area with high gold and arsenic in soil. It included 1086 metres of drilling in 6 holes. Drilling encountered propylitically altered monzonite and diorite intrusive rocks with minor hornfelsed sedimentary rocks and dikes. One hole intersected 15 metres of massive magnetite with semi-massive pyrite layers accompanied by chalcopryrite, epidote and garnet at a sediment/basalt contact. The property is extensively covered by glacial overburden but shows affinities with an alkalic porphyry system as well as skarn. Bearing's claims adjoin the Mount Polley mine property to the south, and the QR mine property to the northwest.

In the Takomkane batholith, the **Woodjam North** and **Woodjam South** properties located 50 km north-east of Williams Lake continued to be explored by Gold Fields Horsefly Exploration Corp. In May the company released updated resource estimates for the Southeast zone (within the Woodjam South property) as well as the Deerhorn and Takom zones (within the Woodjam North property). All resource estimates comply with NI 43-101 standards and are in the inferred category. The **Southeast** zone has 227.5 million tonnes grading 0.31% Cu (up from 146 million tonnes in 2012). The **Deerhorn** zone has 32.8 million tonnes grading 0.22% Cu and 0.49 g/t Au. The **Takom** zone has 8.3 million tonnes grading 0.22% Cu and 0.26 g/t Au. Gold Fields also conducted reconnaissance drilling on widespread targets on Woodjam South claims, as well as taking an option on the **Megaton** property which lies immediately to the east of the Southeast zone.

At the **Timothy** property east of Lac la Hache, Sunrise Resources Ltd drilled two diamond-drill holes totaling 648 m on Titan IP anomalies. Both holes encountered sporadic chalcopryrite mineralization in Nicola volcanic and metasedimentary rocks adjacent to syenite - monzonite intrusives. Analytical results are pending. The company also plans an IP survey at their **Diplo** project east of 70 Mile House.

In the fall, Constantia Resources Ltd commenced Phase 1 drilling at the **Maggie** prospect, located 15 km north of Cache Creek. The company plans a multi-phase exploration program to verify historical drilling results and to evaluate opportunities for deposit expansion. Subsequent phases depend on results and finances.

Maggie is described as a typical, calc-alkaline porphyry deposit. Copper and molybdenum mineralization occur as stockwork veins and disseminations (Figure 8). The intrusive is a multi-phase, quartz monzonite porphyry of probable late Cretaceous age. Host rocks are Carboniferous to Permian Cache Creek assemblage, comprising deformed sedimentary and volcanic sequences of low metamorphic rank, intruded by pyroxenite dikes and sills.

Almost two years before drilling commenced, the company undertook a lengthy period of engagement with local First Nations and the communities of Ashcroft, Cache Creek, and Clinton. Exploration practices were changed to address concerns raised by First Nations and community members. Of particular interest is the use of water recycling and zero-discharge drilling techniques. Return water and rock flour (drill cuttings) are contained in custom-built settling tanks at each of the drill rigs in use. The rock flour is removed from the tanks daily and taken to an approved disposal site (Figure 9). Prior to drilling, detailed archeological surveys were conducted. To mitigate impacts, some drill sites were relocated to avoid artifacts (e.g., flint chips). Contracting, hiring and training policies ensure that local communities benefit



**Figure 8.** Quartz monzonite porphyry cutting Cache Creek Group, Maggie copper-molybdenum project. (Jim Britton photo)



**Figure 9.** Removing rock cuttings from a rotary drill at the Maggie project where zero-discharge drilling mitigates exploration impacts. (Constantia Resources photo)

from exploration spending. Approximately 50% of the local site team is comprised of First Nations members. Newsletters and a web site provide regular updates about the project.

### Chilcotin

In December, Amarc Resources Ltd optioned the **Chilcotin Belle** (formerly **Tasco**) property from Oxford Resources Inc (formerly Highpointe Exploration Inc). This encouraging development may herald a revival of interest in the Taseko Lakes-Chilcotin Ranges area, 150 km southwest of Williams Lake. In 2011, Highpointe had reported positive results from reconnaissance drilling at **Tasco**. Two holes were drilled, totaling 683 metres. Hole 1 intercepted 216 metres grading 0.29% Cu, 0.02% Mo and 1.9 g/t Ag.

Two other properties in the Chilcotin Ranges may see exploration in 2014: the **Ridgestake** claims staked by American Copper Corporation in 2013 are located just north of Chilcotin Belle; and options may be taken on the nearby **Chita** copper-molybdenum project.

### Similkameen River

Over the past few years, the southern end of the Quesnel terrane, between Aspen Grove and Princeton, has seen renewed exploration interest. From north to south, some of the larger properties (and their operators or owners) include: **Big Kidd** (Jiulian Resources Inc); **Par/Aspen Grove** (West Cirque Resources Ltd); **Man-Prime** (Sunrise Resources Ltd); **Dillard** (Fjordland Exploration Inc/Sumac Mines Ltd); **Allison Lake**; **Hit/Aspen Grove South** (Colorado Resources Ltd); **Axe** (70% Weststar Resources Corp / 30% Bearclaw Capital Corp); **Castle** (Blue River Resources Ltd); **Miner Mountain** (Sego Resources Inc); **Copper Mountain** mine (Copper Mountain Mining Corp); and **Princeton** (Anglo Canadian Mining Corp).

Fjordland Exploration Inc and Sumac Mines Ltd commenced a phased program on the **Dillard** porphyry copper-gold project, including mapping, geophysics and drilling. Sumac has an option to earn a 51% interest by spending \$3.5 million over 3 years. The property had not seen exploration for almost 20 years. Preliminary results from 2013 have been encouraging. Two target areas have been identified: Dillard East and Dillard West. A diamond drilling program completed 6 holes (2600 metres) on coincident geophysical (IP) and geochemical anomalies. One intersection at Dillard West returned 158.5 metres with 0.20% Cu and 0.01 g/t Au. Mineralization occurs as disseminations in Nicola Group volcanic rocks intruded by coeval diorite (Figure 10).

Sunrise Resources Ltd completed a small drilling program at the **Man-Prime** property, located west of Dillard. The company drilled 2 diamond-drill holes totaling 1289 m in an area of strong IP responses. The company reports that both holes were strongly



**Figure 10.** Disseminated chalcopyrite in Nicola Group, Dillard West zone. (Fjordland Exploration photo)

mineralized with disseminated and stringer pyrite throughout their entire lengths including extensive intervals containing chalcopyrite and bornite mineralization. The bottom intervals of both holes returned some of the better grades encountered in the drilling program. Hole PR13-01 assayed 24.6 m of 0.385% Cu equivalent within a broader interval of 123.6 m assaying 0.304 Cu equivalent. Hole PR 13-02 returned 12 m of 0.374 Cu equivalent within a broader interval of 153.0 m assaying 0.234 Cu equivalent.

In 2012, Xstrata Copper Canada optioned both the **Big Kidd** and **Axe** properties, but in 2013 returned them to their owners, respectively Jiulian Resources Inc and Weststar Resources Corp. In August 2013, Weststar signed a letter of intent to option the **Axe** property to Copper Mountain Mining Corp.

In May, Seago Resources Inc flew an airborne geophysical (magnetic and radiometric) survey over their **Miner Mountain** copper-gold porphyry project, located a few kilometres north of Princeton. Subsequently they combined their new data with Titan 24 data obtained in 2009. Eight separate target zones were identified for follow-up drilling or geophysical surveys. In July percussion drilling commenced on coincident magnetic, chargeability and soil geochemical anomalies at the Upper Regal, Cuba, Quintana zones as well as a possible new zone northwest of the Cuba zone. Approximately 1784 metres were drilled in 34 short holes using a self-propelled, track-mounted rig (Figure 11). Preliminary results have been positive, including up to 30 metres of 0.31% Cu and 0.15 g/t Au from a hole at the Upper Regal zone.

Anglo Canadian Mining Corp resumed diamond drilling on the Combination Zone of its **Princeton Copper-Gold** project adjacent to the Copper Mountain Mine. Four short holes (~ 675 m) were drilled in a limited area but they confirmed grade and continuity within the zone and extended it by 75 metres. Drill intersections of up to 0.5% Cu and 4.0 g/t Ag were reported over narrow





**Figure 11.** Percussion drill at Sego Resources Inc's Miner Mountain project. (Jim Britton photo)

widths (4-6 m). The company has permits for a further 10 000 metres of drilling. Future plans are to test three other targets derived from a 3D-IP/magnetics survey, completed in 2011. One of these targets (called the "Haul Road" target) is a high chargeability anomaly more than 900 metres long and 500 metres deep.

## SKARN PROJECTS

### Cariboo

At the **Fox tungsten-molybdenum**, property, 75 km northeast of 100 Mile House, Happy Creek Minerals Ltd reported completion of 1300 m of drilling in 18 holes on their RC (Ridley Creek) prospect. Three other mineralized zones (the 708, BN and BK) crop out over a distance of 3 km and may have a lateral extent of more than 1 km. The company also reported preliminary metallurgical tests on material collected in 2012 from trenches. Once zinc minerals were removed by flotation, gravitational separation yielded a 70% WO<sub>3</sub> product. Tests using other beneficiation methods are underway.

Skarn mineralization occurs in flat lying, Upper Proterozoic 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 to aplite.

GWR Resources Inc was unable to mount an exploration program this year at their **Lac La Hache** Project. The project embraces a large area (400 sq km) with multiple deposit types and exploration targets, ranging from high grade, massive to semi-massive, skarns, veins, replacements and breccias to lower grade porphyries and disseminations.

## VEIN AND BRECCIA PROJECTS

### Thompson River - Shuswap Lake

Late in the year, WestKam Gold Corp commenced exploration on their **Bonaparte** property located 50 km north of Kamloops. Two targets have been identified. The first is the Discovery zone, which consists of shear-hosted gold-chalcopyrite quartz vein networks. The goal is to test for extensions of mineralization. The second lies in the Cooler Creek area, east of the Discovery zone, and consists of a 2 km long anomalous geochemical trend with quartz vein float that assayed up to 74 g/t Au. The 2013 program consists of 3D-IP and ground magnetometer surveys, along with prospecting and sampling. Drilling is planned for 2014. The geological setting of the Bonaparte property is a series of en echelon quartz veins within the Thuya batholith.

### Cariboo

Barkerville Gold Mines Ltd reported significant progress on their **Cariboo Gold Project** located about 85 km east of Quesnel and centred on the village of Wells. The project includes a block of claims covering more than 117 000 hectares, and includes three historic groups of Crown-grants named, respectively, the Cariboo Group, Island Mountain Group, and Mosquito Creek Group. In August 2012, the BC Securities Commission (BCSC) had issued a cease trade order citing concerns about technical disclosure of a resource estimate for the **Cow Mountain** portion of the Cariboo Group. Since that time the company has been working to address BCSC's concerns. The company retained Snowden Mining Industry Consultants Inc and APEX Geoscience Ltd as independent consultants to assist in preparing an updated technical report, in collaboration with Geoex Ltd who had done the earlier resource estimate.

In June 2013, the company released a new resource estimate for Cow Mountain in the area immediately surrounding the underground workings at the Cariboo Gold Quartz Mine. The Cow Mountain resource now stands at 17.7 million tonnes grading 2.00 g/t Au (indicated) and 49.2 million tonnes grading 2.74 g/t Au (inferred), using a cut-off grade of 0.012 oz/t (*sic*).

In mid July, the BCSC revoked their cease trade order. Since then the company has continued with data audit, review and verification. By October the company had collected ~ 7500 infill drill core samples from 155 previously drilled holes. Results will be released in the coming months. Consultants are also creating a

comprehensive digital database of all available historic and current information, and also collecting both channel samples (over 1000 samples from 48 trenches) and soil samples. Sampling is intended to corroborate previous work. The company remains optimistic about the Cariboo Gold Project and released separate, conceptual resource estimates for potential exploration targets at the Island Mountain and Barkerville Mountain areas.

Westhaven Ventures Inc commenced their inaugural drilling program at the **Ben** gold property, located 50 km north of Williams Lake, between Mount Polley and Gibraltar mines. Three holes, totalling 424 metres, were completed. Targets included: (1) a quartz-carbonate-mariposite-bearing structural corridor (listwanite) anomalous in Au, As, Sb and Hg; and (2) a high chargeability IP anomaly associated with a north-east trending structure. The company reports that the Ben property shows evidence of deep-seated faults associated with epithermal mineralization (and, potentially, mesothermal or shear-hosted gold mineralization).

### Chilcotin

In February, Sona Resources Corp. announced discussions with China Machinery Engineering Corporation of Beijing toward completing an engineering, procurement and construction (“EPC”) contract for the development of Sona’s **Blackdome-Elizabeth** Project. The project includes the **Elizabeth** mesothermal gold-vein deposit (developed prospect) and **Blackdome** epithermal gold-vein deposit (past producer).

Tower Resources Ltd reports that their **Baez** property, located 125 km west of Quesnel, represents a shallow, gold-silver bearing epithermal target hosted in poorly exposed, banded and brecciated felsic volcanic rocks of the Eocene Ootsa Lake Group. Based on regional geophysics, the company interprets these rocks as part of a much larger, collapsed rhyolite dome. A reconnaissance IP survey (22 line km; 8 lines; covering a 25 square kilometre area) was completed in order to define the size and scale of the mineralized targets which include the Camp, Clusko, and newly identified Boulder Ridge South.

Amarc Resources Ltd reports that their **Newton** and **Galileo** properties have been placed on care and maintenance while the company seeks joint venture partners. The Newton gold discovery is located 40 kilometres north of the Taseko’s New Prosperity copper-gold project. The Galileo claim package lies 16 kilometres west of New Gold’s Blackwater gold deposit and comprises 1100 square kilometres in four, non-contiguous claim blocks (Galileo; Hubble; Darwin; Franklin).

At **Newton**, gold mineralization is similar in age and geological characteristics to mineralization at the Blackwater deposit. The company released an initial mineral resource estimate in mid June 2012, confirming that Newton is an important bulk tonnage gold discovery that remains open to further expansion. Using a 0.25 g/t

gold cut-off, inferred mineral resources comprise 111.5 million tonnes grading 0.44 g/t gold and 2.1 g/t silver, and would contain 1.6 million ounces of gold and 7.7 million ounces of silver (Amarc news release dated 26 September 2012). The company reports that this epithermal system formed contemporaneously with felsic volcanic and intrusive rocks that were emplaced into a structurally-active graben environment, approximately 72 million years ago. Mineralization accompanies extensive zones of strong quartz-sericite alteration.

At **Galileo**, extensive airborne and ground-based IP surveys have identified four high-quality, overburden-covered anomalies that potentially represent important sulphide systems. These targets are ready for drill testing.

### Fraser River

Berkwood Resources Ltd was unable to explore their **Prospect Valley** property, located 30 km west of Merritt, but hope to resume work in 2014. 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 Discovery North and Discovery South 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.

### Similkameen

Westhaven Ventures Inc is working to acquire a 70% interest in the **Shovelnose** property under an option agreement with Strongbow Exploration Inc. In 2013, Westhaven explored the Tower Creek zone, a newly recognized epithermal gold system. Au-Ag mineralization occurs in quartz stockworks and silicified zones within felsic tuffs. Mineralization extends over an area at least 2 km east-west and 100 metres north-south, and remains open in all directions. The company completed a 6 hole, 1043 metre diamond drilling program. Their best drill intersection was 50 metres grading 0.24 g/t Au and 2.32 g/t Ag. Host rocks are felsic volcanics of the Cretaceous Spences Bridge Group.

### Okanagan

Gold Mountain Mining Corporation continued exploration at their **Elk** project, located 45 km east of Merritt and 2 km south of the Okanagan Connector (Highway 97C). Exploratory diamond drilling tested deep IP targets. Condemnation drilling evaluated an area proposed for waste rock storage located west of the existing pit. Reconnaissance work (mapping; soil sampling; prospecting) took place on the southern claims where a new mineralized zone, with high grade grab samples, was discovered in 2012. The company also reported successful processing of the initial 500 tonnes of their 10 000 tonne bulk sample. Gold recovery was 98%. Gold grade and tonnage from the sample matched within



5% of both mine site and drillhole estimates, boosting confidence in their mine model.

## STRATIFORM SULPHIDE PROJECTS

### Thompson River - Shuswap Lake

The Adams Plateau area, east of Barriere, has begun to see renewed interest after several quiet years. Exploration is anchored by continued work on Yellowhead Mining Inc's **Harper Creek** project, near Vavenby, which is now entering formal environmental review (see notes above).

In 2012, Astral Mining Corporation optioned the **Barrier Ridge** and **Honeymoon** projects but ownership of these projects appears to have passed to Orex Minerals Inc who acquired Astral in February 2013. Prospective lithologies include Eagle Bay Assemblage and contacts with the Cretaceous Baldy batholith.

In July, Victory Ventures Inc optioned the **Fortuna** claims located 12 km east of Louis Creek. Preliminary field work began in October with prospecting and sampling. The property is underlain by Devonian to Mississippian Eagle Bay assemblage comprising metamorphosed volcanic and sedimentary rocks. Some lead and zinc ore was shipped in the early 1900s but the property has not seen modern exploration.

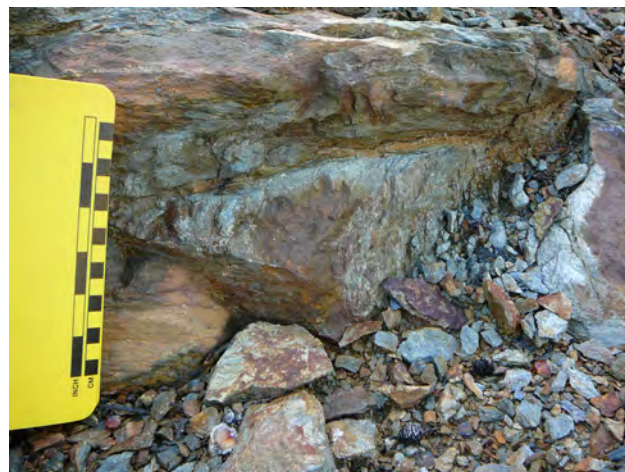
Also in July, First Americas Gold Corporation concluded an option agreement for the **Kamloops Gold-Copper** property, a large (~ 11 500 ha) block of claims that surround the past producing Chu Chua mine. In September, the company reported positive results from rock and soil geochemistry sampling, as well as a very-low frequency (VLF) electromagnetic survey. Rock sampling defined a gold-rich zone, extending 6 km long and up to 1 km wide south of Chu Chua mine, in a quartz-pyrite-sericite-altered rhyolite porphyry. Reconnaissance soil sampling of the organic (Ah) layer, along with novel inversion techniques applied to the VLF data, produced overlapping anomalies on strike with the Chu Chua deposit, but 600 metres and 1000 metres south of it. The company hopes to test these anomalies by drilling in 2014.

In October, Newport Exploration Ltd acquired the **Chu Chua** massive sulphide deposit from Reva Resources Corp. The focus of work is to confirm historic resource estimates and evaluate metallurgical characteristics. Initial work has been awarded to APEX Geoscience Ltd of Edmonton who will start metallurgical testing on drill core and other stored materials. Exploration for extensions of the deposit may begin in 2014. Chu Chua was discovered in 1978 and mined in the 1980s. When it closed in the early 1990s, there was a commonly quoted "open pit reserve" of approximately 1 million tonnes grading 3% Cu, 10 g/t Ag, 0.5 g/t Au and 0.3% Zn. (NB: These figures are historical and do not meet NI 43-101 standards for reporting.) The Chu Chua deposit comprises two sub-vertical lenses of massive

pyrite, chalcopyrite and magnetite up to 40 metres thick with a strike length of 400 metres and depth of 250 metres.

### Cariboo

Barker Minerals Ltd focused on their **Frank Creek** lead-zinc project, a volcanogenic massive sulphide target east of Likely and 77 km north-east of Williams Lake. Targets included an area of near-surface gold discovered in 2011 and precious-metal-rich VMS targets identified in past programs. Work included trenching and drilling short holes on Titan Trend "C" and Trend "A" conductors. Results are still being reviewed. Preliminary indications are that precious metal values are below expectations. However, the drilling has helped support an interesting geological model that the company has been developing for the property. The host rocks are a sequence of Cambrian(?) age volcanic and sedimentary rocks that have been regionally folded and are structurally overturned. Copper, zinc and lead sulphide minerals occur as massive and semi-massive lenses (Figure 12) and as stringers or stockworks. The latter are interpreted to be feeders to the former, but are situated higher in the local stratigraphy due to overturning.



**Figure 12.** Barker Minerals Ltd is exploring for stacked volcanogenic massive sulphide lenses at Frank Creek. (Jim Britton photo)

## MAGMATIC PROJECTS

### Thompson River - Shuswap Lake

Commerce Resources Corp. was unable to mount further exploration at its **Blue River** project, a tantalum and niobium bearing carbonatite, located 30 km north of Blue River. Resource updates expected in 2013 have been deferred while the company focused on a rare earth property in Quebec.

### Similkameen River

Near Tulameen, private company Magnetite Ridge Metals and Minerals Ltd of Kamloops, continued to investigate a large magnetite deposit located at their

**Magnetite Ridge** project within the Tulameen Ultramafic Complex. Metallurgical studies have been conducted by UBC / BC Mining Research on a large composite sample that graded 30% magnetite. These studies indicate that this material could be used for steel smelter feed or coal cleaning heavy medium. The company has applied for a mining lease covering 1.5 sq km.

## **OUTLOOK FOR 2014**

Mining operations should commence at the Bonanza Ledge project.

The Federal cabinet is expected to reach a decision on the New Prosperity project.

As mine evaluation projects submit required baseline studies, environmental review processes will continue, but no project is expected to complete formal review.

Most of the exploration projects that were active in 2013 have generated positive results and thus remain on track for advancement, barring further downturns in metal markets. If economic conditions improve, grassroots exploration should pick up in the Eagle Bay Assemblage near Barriere, the Quesnel terrane (in particular between Merritt and Princeton and between 100 Mile House and Quesnel), and the Chilcotin Ranges near Taseko Lake (e.g., **Chilcotin Belle (Tasco); Ridgestake; Chita**).