

# SOUTHWEST REGION

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## SUMMARY AND TRENDS

The southwestern region has one major metal mine, a thermal coal mine and approximately 20 large industrial minerals and aggregate quarries that typically produce more than a quarter million tonnes per year. Most of the largest mines, including the region's metal and coal mines, take advantage of their proximity to tidewater or major rivers to transport their commodities to markets with attractive shipping costs. In addition to these major producers, there are a number of smaller industrial minerals operations and building/landscaping stone producers. Smaller aggregate operations in the region number in the hundreds.

The region's metal mine, **Myra Falls Operations**, produces zinc, copper, silver and gold. The nearby **Quinsam** coal mine is an underground thermal coal operation. Production is projected to be lower at both mines as compared to 2008 (Table 5.1).

For a number of industrial minerals producers and aggregate operations, demand was sharply lower in 2009. Aggregate producers report demand decreased by 25-45% (typically about 40%) and prices were down by 15-20% in early 2009 through mid-year. Trucking costs have also fallen in 2009. There were some signs of stabilization by the end of the year, and some producers had called back, or were planning to call back, some laid-off employees. Lower Mainland construction activity was expected to be light during the Winter Olympic period and producers were looking to Spring 2010 for improving sales.

Two significant projects entered the mine evaluation stage in 2009, **Raven Coal** and the **Texada South** proposed limestone quarry.

Exploration statistics for the southwest tend to be dominated by a few large projects in any year (Figures 5.1 to 5.5). The largest five projects (of the approximately 30 tracked) accounted for more than 80% of exploration spending in 2009. The largest project in the region this year was Raven coal, operated by the Comox Joint Venture, led by Compliance Energy Corporation. Other large projects were the Mineral Creek gold project, Pearson iron project, and a peripheral drill program at Myra Falls. Some of the smaller-scale but significant projects in the region this year were the Rogers Creek copper porphyry project, Ladner gold project, Bonanza-Sitka gold project and construction of an access road at Catface Copper.

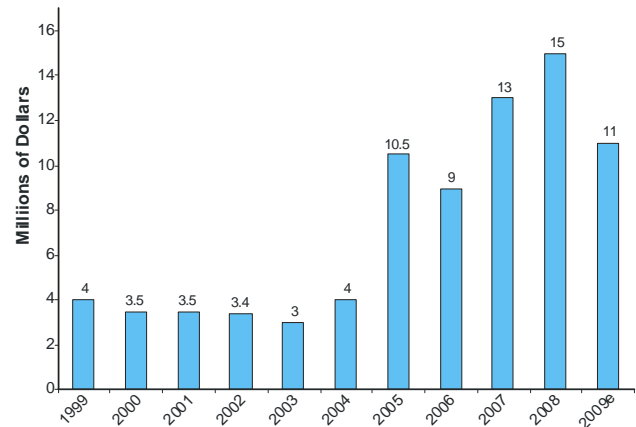


Figure 5.1. Exploration spending estimates 1999-2009. Spending in the southwest in 2009 exceeded early expectations.

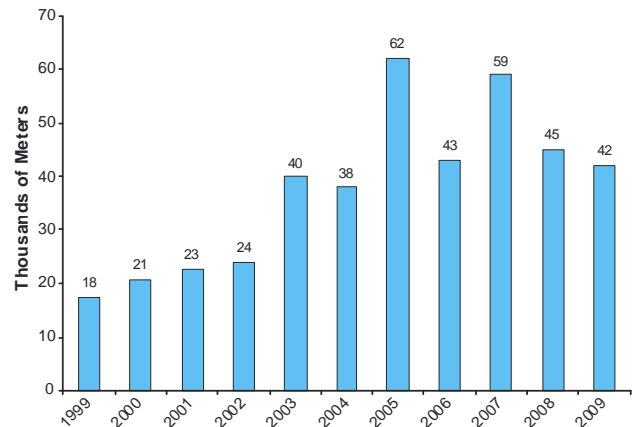


Figure 5.2. Exploration drilling in the southwestern region 1999-2009.

At approximately \$11 million, overall exploration spending in 2009 was 20-30% higher than anticipated early in the year (Figure 5.1). Less surprising, there was a notable shift toward gold exploration in addition to the large coal project that dominated the 2009 statistics (Figure 5.5, Table 5.2). Some proposed exploration programs were deferred, often due to the unattractiveness of raising funds in the depressed financial market that continued into 2009. Those unable or unwilling to mount drill campaigns have in some cases opted for less expensive prospecting, mapping and sampling projects. Unexpectedly, the proportion of exploration expenditures



**TABLE 5.1. MINE PRODUCTION AND RESERVES, SOUTHWEST REGION\*.**

Mine	Operator	Commodities	Mine Workforce	Forecast Production 2009	Production 2008	Reserves as of Dec 31, 2008
<b>METALS</b>						
<b>Myra Falls Operations</b>	NVI Mining Ltd (Breakwater Resources Ltd)	Zn-Cu-Au-Ag	217	31 500 t Zn 3 500 t Cu 441.7 kg Au 17 325 kg Ag  (metal in concentrate)	35 762 t Zn 5 024 t Cu 435.3 kg 20 566.5 kg  (metal in concentrate)	6 298 000 t 5.2% Zn 0.5% Pb 0.9% Cu 1.3 g/t Au 44 g/t Ag (proven and probable)
<b>COAL</b>						
<b>Quinsam</b>	Quinsam Coal Corp (Hillsborough Resources Ltd)	Thermal coal	130	390 000 t clean coal	431 500 t clean coal	22.073 Mt (proven and probable in situ reserves)
<b>INDUSTRIAL MINERALS</b>						
<b>Apple Bay (PEM 100)</b>	Electra Gold Ltd	Chalky geyserite	8	101 000 t	100 000 t	~5 million t
<b>Benson Lake</b>	Imasco Minerals Inc	White marble	4	26 000 t	38 400 t	100+ years
<b>Blubber Bay</b>	Ash Grove Cement Company	Limestone aggregate, dolomitic limestone	10-12	221 000 t (incl. 13 000 t dolomite)	610 000 t	100+ years
<b>Garibaldi Pumice</b>	Garibaldi Pumice Ltd	Pumice	4	20 000 m3	(bulk sample)	100+ years
<b>Gillies Bay</b>	Texada Quarrying Ltd (Lafarge North America Inc)	Limestone, aggregate	40	3.4 Mt	6.0 Mt	100+ years
<b>Monteith Bay</b>	Lehigh Northwest Cement Limited	Geyserite	Care and Maintenance 2008-2009			
<b>Mount Meager</b>	Great Pacific Pumice Ltd	Pumice	2	3000 m3	Care & maint.	100+ years
<b>Sumas Mountain</b>	Sumas Shale Ltd (Clayburn Industrial Group and cement manufacturer partners)	Shale and clay	10	285 000 t	510 000 t	~70 years
<b>Van Anda</b>	Imperial Limestone Company Ltd (JA Jack & Sons Inc)	Limestone	10	209 000 t	280 000 t	~50 years

\*Mine and industrial mineral production in the southwestern region, 2008-2009 exclusive of aggregate-only operations. See text for partial coverage of the aggregate industry.

## MINES AND QUARRIES

### METAL

NVI Mining Ltd, a subsidiary of Breakwater Resources Ltd, runs the **Myra Falls Operations** at Buttle Lake on Vancouver Island (Figure 5.6). It is a bimodal felsic or Kuroko-type volcanogenic massive sulphide deposit that produces zinc and copper with significant gold and silver contents. Zinc accounts for much of the revenue. A lead circuit also exists at the mill, but was not in regular operation in 2009. Concentrates are shipped from Breakwater's port facility near Campbell River (Figure 5.7).

The mine currently operates with just over 200 employees and early in the year was expected to process approximately 480 000 tonnes of ore in 2009. Mill throughput was somewhat lower than projected at the end of the third quarter. The 2009 production projection as of the end of the third quarter was for 31 500 t Zn, 3500 t Cu and 557 000 ounces (17 325 kg) Ag as metals in concentrate. In addition gold in concentrate was earlier projected at 14 200 ounces (441.7 kg).

As of December 31 2008, proven and probable reserves stood at:

6.298 Mt of 5.2% Zn, 0.5% Pb, 0.9% Cu, 44 g/t Ag, 1.3 g/t Au.

Measured and Indicated resources (including proven and probable reserves) were:

6.799 Mt of 6.9% Zn, 0.6% Pb, 1.2% Cu, 57 g/t Ag, 1.7 g/t Au.

An additional inferred resource was:

3.196 Mt of 8.2% Zn, 0.9% Pb, 1.1% Cu, 110 g/t Ag, 2.3% Au.

Late in 2008 and in early 2009, with zinc prices below the cost of production, the operation was in some jeopardy of closure along with numbers of other zinc mines worldwide. Discovery of the South Flank lens came at a crucial time, late in 2008 as plans were being made to temporarily suspend operations. Mining of that zone began in the first half of 2009. The roughly 200 000 t resource will provide a significant source of high grade mill feed into 2010. Zinc is found throughout, but the lens is vertically zoned, with higher copper values found toward the base and highest precious metal contents toward the top. It is located southeast of the H-W zone close to existing development, but on the opposite side of the Myra-Price fault, which crosses the trend of the H-W zone and was originally interpreted as having several hundred meters offset. The new zone is only slightly higher than H-W suggesting (if it is a continuation of the H-W) that offset on the fault is not as great as previously thought. An alternative interpretation

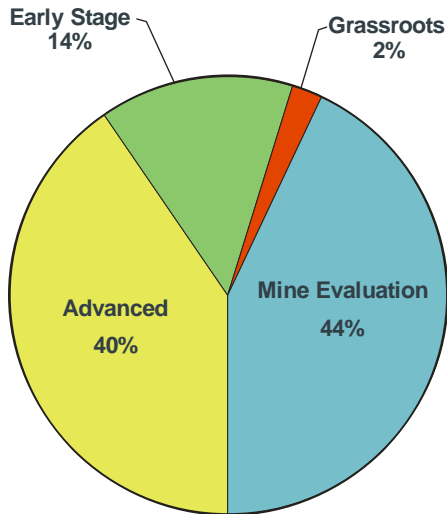


Figure 5.4. Southwestern region exploration spending in 2009 broken down by project exploration stage. Mine evaluation is notable this year, largely representing the Raven coal project. Spending on grassroots projects is similar to 2008.

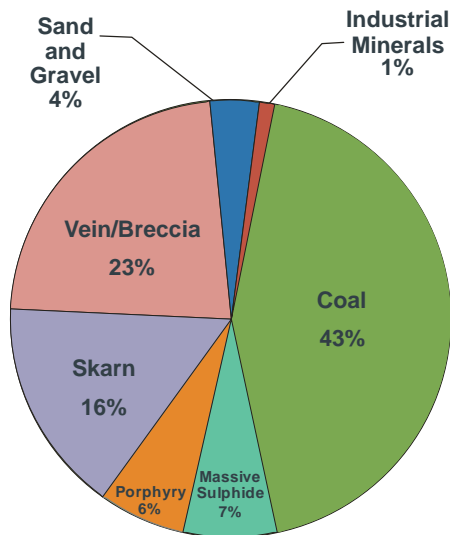


Figure 5.5. Southwestern region exploration spending in 2009 broken down by primary target type.

allocated to grassroots properties was similar to the previous year at about 2-3% (Figure 5.4). While there appeared to be more grass roots work reported in 2009, some basic mapping, sampling and prospecting occurred on and around relatively advanced properties. This type of work apparently continues to be effective (and cost effective) in the region: there were several prospecting discoveries reported in 2009. Some of these are expected to generate larger projects in 2010.



Figure 5.6. A truck in the underground maintenance area at Myra Falls.



Figure 5.7. A freighter at Campbell River, loading Myra Falls zinc and copper concentrates bound for Asia.

is that the new zone represents a previously unrecognized ore horizon.

There were clues pointing to the existence of this new zone as early as 2004, when a drillhole from the Price horizon designed to obtain a section to the H-W stopped in a fault containing ground sphalerite. Subsequent drilling from the H-W encountered pyrite stringers and sericite+silica alteration. A hole from the 20 level encountered mineralization.

Success in this near-field type of exploration has continued through 2009 (see exploration section below).

## COAL

**Quinsam** thermal coal mine, an underground retreat room and pillar mining operation, has in recent years produced roughly half a million tonnes of thermal coal per year from seams in the Upper Cretaceous Comox Formation (Figure 5.8). The mine is expected to produce 390 000 t of clean coal in 2009. The mine supplies Lower Mainland and US Pacific Northwest cement plants as well as the international thermal coal market through an off-take agreement with the Vitol Group. At the time of

writing, Hillsborough and Vitol Anker International B.V. had entered into an agreement providing for the acquisition of Hillsborough by Vitol. The Vitol Group is an international group of trading companies with a focus on energy. It entered the coal sector in 2006 and has since become a significant trader of thermal and anthracite coal.

Total proven and probable in-situ reserves at the Quinsam mine as of December 31 2008 were 22 073 000 t.

The focus of mining at Quinsam has shifted to the 5 South Phase I area and is expected to proceed with 5 South Phase II and 7 South. An application for 5 South Phase II has been submitted. A detailed mine plan has now been completed for 7 South and a Mine Permit application is in preparation at the time of writing. Re-commencement of mining in 4 South and the 242 block is being considered. Development at 1 Mains has been suspended due to low mining recoveries and washplant recoveries.

As mining progresses into the 7 South area, a higher sulphur coal will be mined (1.5-2% vs. 0.5% at present). Development work in 2009 also consists of plans for subaqueous disposal of potentially acid generating coarse coal rejects in the 2 North Pit Sump as well as the existing 3 South Pit disposal facility. There is a longer range plan for the creation of a subaqueous disposal facility at the 2 South Pit.

A 2009 estimate of Quinsam North resources identified 18.341 Mt measured, 5.456 Mt indicated and 1.498 Mt inferred resources of medium to high sulphur coal. The corporation is investigating the potential for blending this medium to higher sulphur coal with low sulphur coal from other mines.

## PLACER GOLD

There was a notable increase in placer activity in 2009. In 2009 there were 8 placer notices of work filed compared to 2 in the previous year. These notices were in the Leech River, Fraser River and Chemainus River areas. Other placer activity occurs in the region but much is below permitting thresholds and not tracked.

Gold was discovered on Leech River, southern Vancouver Island in 1864 and activity continues in the



Figure 5.8. The portals at Quinsam coal mine.

area to this day. This year there has been some renewed interest in placer gold on the Fraser River and its tributaries north of Hope. Hills Bar near Yale was the site of BC's first gold rush in 1858.

## **INDUSTRIAL MINERALS AND AGGREGATES**

### **Limestone**

Texada Quarrying Ltd, a subsidiary of Lafarge North America, operates BC's largest industrial minerals and aggregate operation near **Gillies Bay** on Texada Island. Approximately 80% of its product is limestone cement feed for Lower Mainland and US Pacific Northwest plants. The other 20% of its product is used as aggregate, including dikes cutting the limestone. The operation produces virtually no waste. As with most construction materials operations, production and shipments were down sharply in 2009, with approximately 3.4 Mt mined and shipped. At its peak, the operation produced roughly 7 Mt. The quarry's deep water loadout facility can accommodate Panamax freighters and the quarry is capable of serving western North America and Hawaii in addition to more local markets. Quinsam coal's international shipments are also loaded at this site.

**Blubber Bay Quarry**, a producer of limestone aggregate and dolomite is owned by Ashgrove Cement Company. At the end of the third quarter it had produced just over 207 000 t of limestone aggregate and expected to ship over 200 000 t in 2009. The quarry also produces dolomite, approximately 13 340 t in 2009. Dolomite is shipped to Ashgrove's Rivergate lime plant in Portland, Oregon.

Imperial Limestone Company Ltd operates another quarry on Texada Island, near **Van Anda** (Figure 5.9). The majority of its product goes into building materials, specifically glass and fillers in roofing and plastics as well as agricultural products. They expect to produce approximately 209 000 t in 2009. Parent company J.A. Jack & Sons Inc processes and distributes the product out of Seattle.

Imasco Mineral Inc continues to operate its **Benson Lake** white marble quarry on northern Vancouver Island. It produced approximately 26 000 t in 2009. The marble is barged to the Lower Mainland and sold as fine-ground bright white calcium carbonate filler and extender suitable for a number of industrial applications.

### **Clay, Silica and Alumina**

Sumas Shale Ltd is expected to produce approximately 285 000 t at **Sumas Mountain** in 2009. As in previous years, the large majority of the product (shale) goes to local cement plants as a source of alumina. A smaller amount of clay, approximately 3-4%, is used in the manufacture of bricks.



Figure 5.9. A drill rig at the Imperial Limestone quarry on Texada Island.

Se:math Industries is a re-launch of Sumas Clay Products, operator of the historic **Kilgard** brick plant and clay quarry. There was no 2009 production as they reduced inventory and began to focus on restoring the plant and building markets for specialty products including brick murals (Figure 5.10).

Electra Gold Ltd's **PEM 100** quarry near Apple Bay produces chalky geysersites, a silica-alumina cement feed product. The quarry is expected to produce 101 000 t in 2009. Electra has started crushing and screening its product on site. They have added Lafarge Canada as a customer and now ship to them as well as Ashgrove Cement in Washington. Electra currently trucks to a load out facility at Port Hardy, but is considering an alternative shipping route down the west coast of Vancouver Island.

The Lehigh Hanson Materials Ltd's **Monteith Bay** quarry, another silica producer, remained on care and maintenance in 2009.



Figure 5.10. Sumas Clay Industries is being re-launched as Se:math Clay industries with a focus on specialty and value-added brick products, including murals. From left to right are Ray Silver Sr., Brad Boyes and Ray Silver Jr.

## Cosmetic and Medical Clay

Coastal BC has resources of glacial clay typically found in glacial marine or lacustrine deposits along the coast. Clay has been mined periodically from sites near Bella Coola and in the Comox Valley. The largest supplier, Ironwood Clay Company, collects its material at De Cosmos Lagoon on Hunter Island. The quantities of raw material extracted are relatively small. The clays are processed and sold as value-added cosmetic and medical products. Precision Laboratories, Ironwood Clay Company and Glacial Marine Clay Inc are among those supplying products consisting of, or containing, glacial clays from coastal BC. Glacial Marine Clay Inc reports they have recently stopped producing clay in the Comox Valley, but are investigating a potential new source in cooperation with Pacific Iron Ore Corporation on southern Vancouver Island.

## Aggregate-Only Operations

The aggregate sector is an important part of BC's mining industry, particularly in the southwest, with its relatively high population and access to navigable rivers and tidewater which allow economical shipping. The Ministry of Energy, Mines and Petroleum Resources and Natural Resources Canada estimated BC's 2008 annual production at 47 Mt. The large majority of this production and consumption occurs in the southwestern region.

All of the aggregate producers surveyed reported significantly lower sales in 2009. Several noted steadier demand in the last few months of the year. Several of those interviewed expect the first month of 2010 to remain slow, with strengthening markets in the spring.

The two highest-volume aggregate producers in southwestern BC are Lafarge North America and Lehigh Hanson Materials Ltd, both large international construction materials companies. The number three producer in the Lower Mainland is a local company, Mainland Sand and Gravel Ltd. Smaller sand and gravel producers number in the hundreds and activity is not tracked for the purposes of this report. There are more than 800 sand and gravel permits designated as "active" in the southwest, although most are only intermittent producers.

The largest sand and gravel operation in BC is the

**Sechelt Mine** of Lehigh Hanson Materials Ltd (Construction Aggregates Ltd). In recent peak years production has been in the region of 5 Mt/y. In 2009 production and sales are forecast at 2.9 Mt. Approximately 75% has gone to Lower Mainland, Vancouver and Victoria, 22% to California and 3% to the local market. The main uses have been construction materials, road bases, sub-bases and blended products. The operation has a deep water loadout facility capable of accommodating Panamax freighters. A number of projects went ahead at the mine in 2009, including replacement of a stone scrubber, rock dewatering screen, a 6.5 cubic yard excavator and a 6.0 cubic yard loader. Approximately 5 ha of disturbed land was reclaimed in 2009.

Lehigh operates a number of other quarries in the region. Among the larger ones are the **Steelhead-Shxwhá:y** sand and gravel operation near Chilliwack and the **Gilley's** quarry on the Pit River, a producer of crushed quartz diorite. These each produce several hundred thousand tonnes per year.

Lafarge also operates a number of aggregate quarries in the southwestern region. The three largest are the operation at **Gillies Bay** (see above), which produces aggregate in addition to cement feed, the sand and gravel operation at **Earl Creek** near Egmont and the crushed rock producer **Pitt River Quarry**. Earl Creek is expected to produce 970 000 t in 2009, a 26% decrease from 2008 volumes. The quarry is expected to be the major aggregate supplier for the Port Mann Bridge upgrade, having secured a contract with Peter Kiewit Sons Inc, one of the joint venture partners contracted to design and build the project. Earl Creek's product is shipped by barge.

Volume at the other large Lafarge operation, Pitt River Quarries is expected to be approximately 930 000 t in 2009. This is a reduction of 28% from 2008. There were signs of improvement in the latter part of the year, as demand was supported by the completion of the Pitt River Bridge and asphalt aggregate sales. Approximately 60% of the product was shipped by barge in 2009, up from approximately 50% most years.

Mainland Sand and Gravel Ltd's **Cox Station** quarry has produced as much as 2.5 Mt of crushed aggregate in recent years. About 94% of the product is shipped by barge, 5% by truck and 1% by rail (Figure 5.11). Most of



Figure 5.11. Loading a barge at Mainland Sand and Gravel's Cox Station quarry.

the product is consumed in the Lower Mainland. Cox Station is the largest operation of Mainland Sand and Gravel. Unlike the region's two large international construction materials companies, Mainland is not vertically-integrated; the focus is on aggregate production and Cox Station is its biggest operation. Production and shipments are expected to be roughly 1.5 Mt in 2009. Mainland operates another smaller crushed aggregate quarry on Sumas Mountain and markets much of the sand dredged by Fraser River Pile and Dredge Ltd. Dredged material is a significant source of clean sand particularly suitable for fill, including construction pre-loading.

Polaris Minerals Corporation experienced a 40% reduction in demand for **Orca** quarry's products in the first nine months of 2009, roughly in line with the other southwestern BC producers surveyed. The operation's primary market remains California, but Orca continues to serve the BC Lower Mainland and Hawaii. Polaris had not published a current 2009 production estimate at the time of writing, but if the fourth quarter production is similar to the third, a figure of 1.2 to 1.3 Mt is likely. Positive news from Polaris was the company's progress toward establishing two new receiving terminals, one in Long Beach California and the other in San Diego. These will allow Polaris to enter the Los Angeles and San Diego markets. It currently ships to San Francisco Bay.

The **Pipeline Road** operations of Allard Contractors Ltd, Jack Cewe Ltd and Lafarge may exceed a million tonnes in 2009 combined. Product is trucked from these sites. Another large quarry operated by Jack Cewe on Jervis Inlet will probably exceed 500 000 t. The Jervis Inlet operation produces both natural sand and gravel and a crushed rock product. Material is barged to the Lower Mainland market.

Fraser Valley Aggregates Ltd is another of the major sand and gravel producers active in the Fraser Valley. Their **Bradner Road** operations were expected to produce roughly 500 000 t in 2009. Their Sylvester Road operation produced roughly 200 000 t.

## Pumice

Pumice is mined at two quarries in the **Mount Meager** area, by Great Pacific Pumice Inc and at another nearby location by Garibaldi Pumice Ltd (Figure 5.12). Production by Great Pacific resumed this year under new ownership with an output of approximately 3000 m<sup>3</sup>. Garibaldi Pumice acquired their mining lease and quarry permit in 2009. They produced approximately 20 000 m<sup>3</sup> and washed approximately 12 500 m<sup>3</sup> of its product. Both operations supplied mainly light weight aggregate in 2009, although Mount Meager pumice has a number of other potential uses such as lightweight concrete products, fillers, filter mediums, polishing compounds, pozzolans and cosmetic applications. Both producers foresee entering some of these markets in addition to light weight aggregates. When sold as aggregate in the Lower



Figure 5.12. Garibaldi Pumice Inc's quarry near Mount Meager.

Mainland, transportation represents nearly two-thirds of the cost of the product.

## Building and Landscaping Stone

Matrix Marble and Stone continues to quarry and fabricate marble products on Vancouver Island. They produced 120 t from their quarry near Tahsis and 70 t from a quarry near Jordan River. Products include slabs cut to size and other custom work. In addition to imported stone, they supply local marble in three colours: Black Carmanah, Tlupana Blue and Island White.

The historic quarry on **Haddington Island** produced approximately 1700 t of dimension stone in 2009, equivalent to the previous year (Figure 5.13). In addition, 5000 t of waste rock at the quarry was employed as rip rap for construction of a jetty at Port McNeill. The Provincial Parliament buildings are perhaps the best known use of this strong, durable andesite. More recently it was incorporated in the Air India memorial in Stanley Park.



Figure 5.13. Haddington Island Quarry – photo courtesy of Haddington Island Stoneworks Ltd.



Hardy Island Granite Quarries Ltd operates another historic quarry on **Hardy Island** in Jervis Inlet, originally active in the early part of the 20<sup>th</sup> century. It re-opened in 1999. In 2009 it is expected to produce approximately 4000 t of granodiorite dimension stone.

K2 Stone Quarries Inc mines meta-mudstone or meta-siltstone with slaty partings from the **K2 Quarry** in the Leech River Formation near Port Renfrew. K2 has increased sales in 2009 and a significant expansion of the existing quarry is underway. In 2009 they hauled approximately 14 000 t and produced approximately 2000 t of finished product. The company has added new distributors in Canada and has entered the US market, exporting as far as Los Angeles and Virginia. K2's success was recognized at the 2009 BC Export Awards with the "New Exporter" award, given for most notable success entering an export market. Their aggressive movement into the new market was in part driven by concerns that sales would fall in 2009 in response to market conditions.

Van Isle Slate Ltd is a smaller quarry located near Port Renfrew which has also seen improved sales in 2009. Van Isle Slate's fourth year was its best so far. They produce hand split landscaping stone, flagstone, slabs, steps and facing stone mainly for the local market, with some shipments to the Lower Mainland, Alberta and Washington. Their new tumbled stone products are selling well. Total 2009 production is expected to be between 500 and 700 t. There are several other small scale producers in the area.

Stone is quarried in the Sea-to-Sky corridor, mainly for landscaping purposes. Quaternary volcanic columns and slabs have been of most interest in recent years. There are intermittent granite quarries as well. The largest landscaping stone producer is Huckleberry Stone Supply, operator of the **Spumoni** quarry as well as smaller operations.

## **MINE DEVELOPMENT AND MINE EVALUATION PROJECTS**

One southwestern project entered the environmental assessment process in 2009, the **Raven** coal project located approximately 20 km south of Courtenay. The operator, Comox Joint Venture, consists of majority partner Compliance Energy Corporation, Itochu Corporation and LG International Corp. They have received an order under section 10 of the Environmental Assessment Act to proceed with an assessment.

Concurrent with infill drilling to upgrade resources were initiation of environmental baseline monitoring and initiation of a full feasibility study. The feasibility study will consider several options for transporting coal from the site to local port facilities. Coal may be trucked to facilities in Campbell River (Middlepoint), Nanaimo

(Duke Point) or Port Alberni. The latter port can accommodate Cape size freighters which could transport over 80 000 t. There is also a potential rail option to Port Alberni, which would require upgrading of the rail line and the port's handling facilities.

A 2007 preliminary economic assessment contemplated an operation producing 823 000 clean tonnes per year of high volatile hard coking coal. Thermal coal production was considered as an alternative. The thermal coal option would have better coal processing plant recovery but is projected to be less profitable. Should the mine develop as a metallurgical coal producer, some thermal coal may also be sold.

Lehigh Hanson Materials Ltd submitted an application to quarry limestone at its **Texada South** property. The proposed quarry is designed with an annual production of 240 000 t. It is intended to allow Lehigh to maintain a presence in the limestone aggregate market alongside Texada Island neighbours Lafarge and Ashgrove. Unlike the Texada Quarrying (Lafarge) operation, production of cement feed stock is not planned. Lehigh's Richmond cement plant is supplied by Texada Quarrying Ltd. The Texada South product would be shipped by barge from an adjacent loadout facility to target markets in Vancouver, Vancouver Island and possibly the US Pacific Northwest. In part, the quarry would replace production from the recently-closed Producer's Pit near Victoria. As designed, the operation would employ 8-10 people and have a 100 year life.

Three other southwestern mine development projects, **Sechelt Carbonate**, **Cogburn Magnesium** and **Hillsbar Aggregate** are on the Environmental Assessment Office's current projects list. Lehigh Hanson's current exploration program at Hillsbar is unrelated to the earlier project which entered the EA pre-application process.

Polaris Minerals Corporation was issued an EA certificate for the proposed **Eagle Rock Quarry** on Alberni Inlet in 2003. This is a proposed crushed aggregate producer which would utilize bulk freighters to supply the west coast of North America. Polaris has placed development of the quarry on hold as it focuses on its producing **Orca** quarry. A feasibility study begun in 2003 is also on hold. The environmental assessment certificate is valid until 2013.

An industrial minerals operation below the Environmental Assessment threshold, Garibaldi Pumice Ltd, obtained a mining lease in 2009, as well as a quarry permit for its operation near **Mt. Meager**. Mining and development continued in 2009.

## EXPLORATION HIGHLIGHTS

### COPPER PORPHYRY

#### Northern Vancouver Island

No field work was reported at **Hushamu** and **Northwest Expo** this year, however results of a Fall-Winter 2008 program were announced in February. Most of the 2008 work occurred on the NW Expo, extending known mineralization to the north and west. Highlights of drilling were reported as follows:

- 238m @ 0.61 g/t Au, 0.08% Cu, 0.010% Mo and 0.26 g/t Re (EC08-254)
- 102m @ 0.12 g/t Au, 0.01% Cu, 0.020% Mo and 0.75 g/t Re (EC08-252)
- 124m @ 0.30 g/t Au, 0.05% Cu, 0.017% Mo and 0.36 g/t Re (EC08-252)
- 92m @ 0.22 g/t Au, 0.02% Cu, 0.030% Mo and 2.21 g/t Re (EC08-250)

Two holes drilled in the Hushamu deposit confirmed molybdenum (not included in the existing resource estimate) and identified significant rhenium values.

- 179.3m @ 0.47 g/t Au, 0.42% Cu, 0.011% Mo and 0.44 g/t Re (EC08-03)
- 164m @ 0.51 g/t Au, 0.30% Cu, 0.007% Mo and 0.42 g/t Re (EC08-08)

Western Copper Corporation optioned the property to IMA Exploration Inc, which subsequently merged with Kobex Resources Ltd and International Barytex Resources Ltd to form Kobex Minerals Inc. The new company has indicated an intention to proceed with the option and is undertaking a scoping study, described as an order of magnitude engineering study. Kobex's plans for Hushamu will be guided by its findings.

#### Central West Coast Vancouver Island

New work at **Catface** in 2009 consisted of access road construction. Selkirk Metals Corp published a new resource estimate and indicated an intention to proceed with a permitted drill program following the rehabilitation of road access. The existing resource is contained within the Cliff zone, one of three mineralized zones for which further testing is proposed.

Copper at the Cliff zone consists of both sulphide and oxide mineralogy. The August 2009 open pit resource estimate included sulphide and mixed ore types. Copper in oxides (>66% CuO/Cu) is thought not to be economically recoverable given the relatively low tonnages identified.

Ore Type	Indicated tonnes (000's)	Cu%	Inferred tonnes (000's)	Cu%
Sulphide	43 968	0.41	230 063	0.38
Mixed	12 895	0.38	32 386	0.40
Total	56 863	0.40	262 448	0.38

The estimate is based on historical drill results and an 8-hole 2008 drill program designed to test the historical results. To the extent of the 2008 program, results were consistent with historical values. In addition, the 2008 results included potentially significant silver values. The possibility of modest precious metal and molybdenum contributions to the resource exists, but historical data were insufficient to prepare those estimates.

The Technical Research Committee on Reclamation, a committee consisting of BC government, industry and academic representatives recognized Selkirk's Catface reclamation effort in 2008 with its annual award in 2009.

Selkirk shareholders approved a proposed merger with Imperial Metals Corporation in the fall of 2009.

#### Lillooet River

Wallbridge Mining Limited continued exploration work on its **Rogers Creek** property in 2009 with a large induced polarization (IP) survey, mapping, prospecting and rock sampling. Their involvement in the property began in 2007 following a discovery of potential porphyry style alteration and mineralization on a recent logging road (Figure 5.14). The evidence for a porphyry environment continued to grow with further work and Wallbridge carried out an initial 3-hole drill program in late 2009. The target is a large IP anomaly. Copper-gold-silver mineralization and alteration zones are consistent with a porphyry environment.

The company discovered an additional Cu-Mo showing on the southwestern part of its extensive property, in the Fire Mountain area approximately 18 km from the focus of current drilling.

### VOLCANOGENIC MASSIVE SULPHIDE

#### Central Vancouver Island

Exploration at Myra Falls in the latter part of 2008 and through 2009 was curtailed, however successful exploration work did occur close to existing mine infrastructure, in a peripheral drill program that occurred from existing platforms. Exploration of the Marshall zone, which will occur from a drift west of the 24 level, remains on hold.

**TABLE 5.2. SIGNIFICANT EXPLORATION PROJECTS SOUTHWEST REGION, 2009.**

Property	Operator	MINFILE (NTS ref.)	Commodity	Deposit Type	Work Program	Meters Drilled
<b>Bonanza-Sitka</b>	Solomon Resources Limited	092L 292	Au	veins	G; GC; GP; TR	n/a
<b>Brynnor</b>	Logan Resources Ltd	092F 001	Fe (magnetite)	Fe skarn	G; MG; DD (1 hole)	n/a
<b>Catface</b>	Imperial Metals Corporation	092F 120, 092F 231, 092F 251	Cu, Ag	porphyry Cu	A (approx 8 km)	n/a
<b>Hillsbar</b>	Lehigh Hanson Materials Ltd / Yale First Nation	(092H.053)	Aggregate	sedimentary	A; PD	1200
<b>Ladner</b>	Module Resources Incorporated	092HNW007, 092HNW003, 092HNW018	Au	veins	A; MS; DD	800
<b>Mineral Creek</b>	Bitterroot Resources Ltd / Mineral Creek Ventures Inc	092F 079, 092F 331	Au	veins	DD (68 holes); UG-BU	8642
<b>Myra Falls</b>	NVI Mining Ltd (Breakwater Resources Ltd)	092F 330	Zn, Cu, Pb, Au, Ag	VMS	DD	~10 000
<b>Pearson</b>	Pacific Iron Ore Corporation	092C 091, 092C 022	Fe (magnetite)	Fe skarn	DD; G; GP	8337
<b>Raven</b>	Comox Joint Venture (Compliance Energy Corporation, Itochu Corporation, LG International Corp)	092F 333	Coal	sedimentary	DD/PD (42 holes); PF; CQ; EN; FS	9899
<b>Rogers Creek</b>	Wallbridge Mining Company Limited	(092J.008, 092J.009)	Cu, Au, Ag, Mo	porphyry Cu	IP (41 km); G; GC; DD (3 holes)	2122

**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 if known); CD = condemnation drilling; CQ = coal quality testing; CT = carbonization test (coal); DD (Xm) = diamond drilling totalling X metres; EN = environmental baseline studies/monitoring, remediation work; FS = feasibility studies; G = geology, mapping etc.; GC = geochemical sampling (rock, soil, silt etc.); GD = geotech 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; R = reclamation; RC = reverse circulation drilling; TR = trenching; UG (Xm) = X metres of underground development; UG-BU = underground bulk sample; UT = UTEM; VLF; WT = washability test (coal)

The peripheral drill program in the latter part of 2009 had three targets west of the Battle lens: the West Gap, West Gopher down drop and a new zone, the RE-108 lens, which remains open to the west. The latter is defined to an extent that it is being developed and brought into the mine plan. The south Flank drill program continued in 2009, delineating the Main and East lenses. As noted above, the South Flank is in production.

**GOLD-SILVER VEINS**

**Central West Coast Vancouver Island**

Selkirk Metals Corp carried out a program of prospecting, mapping, contour soil and regional stream geochemical sampling on the **Fandora** gold property northeast of Tofino. Underground workings were located and inspected. The Fandora vein system is within a



Figure 5.14. Wallbridge Mining Inc Project Geologist Kay Hofmann by the discovery outcrop along a logging road at the Rogers Creek project.

steeply dipping shear hosted in Sicker Group andesites and basalts. There are two additional mineralized structures identified on the property, the Free Gold, and Gold Flake veins. All three are sub-parallel.

To the south, G4G Resources Ltd also carried out a small program on its **Kennedy River** area gold property.

### Port Alberni

Processing of the bulk sample and a significant drill program continued on the **Mineral Creek** property. A 5000 tonne bulk sample has been permitted and mining began in the Linda vein in late 2007. Bitterroot Resources Ltd and Mineral Creek Ventures Inc share the costs and proceeds of this portion of the program, however Bitterroot has now increased its ownership in the overall project to 100%.

Early in 2009 a new 10 tonne-per-day ball mill was installed underground and processing the bulk sample continues at a rate of approximately 3-5 tonnes per day (Figure 5.15). In August 2009, a dore bar weighing 30.9 troy ounces (24 oz Au, 5.7 oz Ag) was poured. A second containing 36 troy ounces Au and 8.3 troy ounces Ag was poured on November. A second gravity concentrating table was recently purchased to improve throughput.

Drilling at Mineral Creek in 2009 concentrated on close-spaced definition drilling of the Ember vein (Figure 5.16), now defined over a 150 m strike length and elevation range of 90 m. In the course of this work, another vein was discovered, the HW-1, the sixth gold-bearing vein known on the property. The 2009 diamond drill program consisted of 68 holes which demonstrated good continuity of veins. A goal of the current program is to facilitate a preliminary resource estimate. Both the Ember and the HW-1 remain open along strike and down dip. These veins and the Linda veins appear to represent a series of roughly east-west trending en-echelon veins located on the east side of the roughly north-south



Figure 5.15. The ball mill and gravity table used to process a bulk sample at the Mineral Creek project.



Figure 5.16. Visible gold in drill core from the Ember vein, Mineral Creek project.

Mineral Creek fault, a large but lower grade gold zone. Two more zones, the 900 and 1050, are located roughly 300 m and 1100 m west of the fault, respectively. No work was reported on the adjacent Big Southeaster property in 2009.

### Mount Washington

Clibetre Exploration Ltd extracted a 100 tonne bulk sample at their **Mount Washington** property. The sample is believed to contain high grade gold with high arsenic values. The company is seeking a custom miller to process the sample.

### Southern Vancouver Island

Mill Bay Ventures Inc undertook a geochemical sampling and prospecting program at its Valentine Mountain property in 2009. In addition there was a comprehensive data compilation and digitizing project. A drill program at the Log Dam zone had commenced at the

time of writing. Surface samples at the zone have returned up to 94.7 g/t Au over a 0.4 m quartz vein.

### Central Coast

Solomon Resources Limited conducted an 8 week program of mapping, rock and soil sampling, geophysics (VLF-EM) and re-testing of historical trenching on the **Bonanza-Sitka** property. A single quartz vein shear has been exposed over a strike length of 280 m. The mean width is 1.55 m and average grade 3.39 g/t Au. A focus of the 2009 work was to explore the extension of this structure for possible multiple vein systems as are known at the Nugget Queen past producer to the northwest. Bonanza-Sitka and Nugget Queen are hosted by the same sedimentary-volcanic pendant in the Coast Plutonic Complex.

### Alouette Lake

Chai Cha Na Mining Inc reported the discovery of a gold vein southeast of Alouette Lake on its new **Mission North** property approximately 5.5 km north-northeast of the **Oro**, a past producer active in the 1930's. Exploration occurred at and around the Oro in the 1980's and 90's, however the area of this new showing is not known to have been explored. The vein is exposed along a recent logging road. A highlight of initial sampling included 185 g/t over 0.33 m in the centre of the vein which is approximately 1.5 m wide, subvertical and consists mainly of quartz hosted by a diorite to granodiorite intrusive. Work in 2009 consisted of preliminary mapping and sampling. Additional high grade results were reported off strike of the discovery vein.

### Harrison Lake

Near Harrison, a developed gold prospect, the **Abo** has not seen new work since 2006. Copper Canyon Resources Ltd has applied for a permit to drill and seeks a partner to advance the property. There is a 2002 National Instrument 43-101 compliant indicated resource estimate of 1.845 million tonnes 2.79 g/t Au and a further 0.6 million tonnes grading 2.8 g/t Au in the inferred category.

### Hope-Coquihalla

Module Resources Incorporated, holder of an option on the **Ladner Gold** property near Hope, began its exploration program in 2009, with improvement of access and rehabilitation of underground workings, including re-opening of the 800 and 900 levels of the former Carolin Mine and re-timbering of the portal (Figure 5.17). The objective is an underground mapping and drilling project. They have also begun testing of the mine tailings in cooperation with DryVac Services Canada Ltd for possible gold recovery. A non-43-101 compliant estimate



Figure 5.17. The portal at the former Carolin Mine was re-timbered as part of the underground rehabilitation at the Ladner project. Photo courtesy Module Resources Incorporated.

by Athabaska Resources in 2000 identified a “diluted mineable reserve in all categories” of 597 000 t grading 1.74 g/t gold within the tailings. The Carolin Mine itself has a historic estimate (non 43-101 compliant) of 1.35 Mt grading 4.41 g/t Au. Underground exploration had not begun at time of writing.

Drilling began on surface at the McMaster zone with a five hole, 800 m program designed to confirm 1996 results and test for possible extensions. The McMaster zone is being investigated as a potential open pit resource. It has a historical (non 43-101 compliant) resource estimate of 186 000 t grading 1.88 g/t Au.

The Ladner Gold property occupies a significant portion of the Coquihalla gold belt. Within the property's boundaries are five past producing mines. Most historically exploited epigenetic, mesothermal gold mineralization occurs within a few hundred meters east of the Hozameen fault and the Coquihalla serpentine belt. The orebodies in the Carolin Mine are hosted by turbidites of the Jurassic Ladner Group, but subsequent exploration in the 1990's identified vein mineralization in Spider Peak volcanics west of the historic production area.

Late in 2009, Homegold Resources Ltd began a program at its **Silver Peak** property, the historic Eureka Victoria silver mine near Hope. At the time of writing, improvements to access were underway. A 900 t underground bulk sample is planned. A historic (non-43-101 compliant) resource estimate exists for the Eureka vein: 48 900 t at 449.15 g/t Ag.

## COAL

### Northern Vancouver Island

Electra Gold Ltd published a measured and indicated resource estimate of 4.823 Mt for the **Suquash** No. 2 bed in the Upper Cretaceous Suquash Formation (Nanaimo Group). The Suquash coal basin is a sub basin within the Georgia Basin. Sediments generally dip 5-10° to the northeast. The target of a 4-hole drill program in 2008, the resource would have to be mined as an underground operation. Waste rock might be blended with high alumina material from Electra's nearby **PEM 100** quarry to produce a cement feedstock. Further exploration is planned.

### Campbell River

As noted above, new work was largely focused on development at **Quinsam** coal in 2009. There was one drillhole at the 7 South area. There is exploration potential in the eastern part of Hillsborough Resources Ltd's property suggested by historical drill intercepts.

### Comox Valley

At the **Raven** coal project, operated by the Comox Joint Venture, the objective of a large drill program in 2009 was largely to upgrade the 59 Mt inferred resource to measured and indicated categories (Figure 5.18). This would allow the current feasibility study to be based on a larger resource than the 39 Mt (measured and indicated) estimated in 2007. Drill intersections released to date encountered coal in all but one hole with the large majority of Seam 1 intersections exceeding 1.5 m thickness. Two of five known seams in the Tsable River area have been identified as of economic importance: Seam 1 (the lowermost) and Seam 3. Results of coal quality analysis and washability testing are anticipated at the end of 2009. Environmental baseline studies are ongoing.

Coal seams in the Comox Basin are Cretaceous, occurring in the Nanaimo Group, Comox Formation. Dips of the seams range from 24° at the western margins of the basin to less than 10° in the eastern extent of the resource area. An underground operation is contemplated.

## TUNGSTEN SKARN

### Inside Coast

Dentonia Resources Ltd reported a 2009 tungsten discovery in the Knight Inlet area near Stafford Lake (Figure 5.19). Chip and panel samples returned promising results including a series of 25 panel samples averaging 1.59% W (equivalent to 2.01% WO<sub>3</sub>). The scheelite-



Figure 5.18. Driving in casing for a drill hole on the Raven coal project.



Figure 5.19. Jim Turner and Bob Culbert channel sampling the recent W-skarn discovery near Stafford Lake. This material returned up to 6.5% WO<sub>3</sub>. Photo courtesy of Dentonia Resources Ltd.

bearing skarn occurs in an area not known to have seen previous exploration and dominated by granodiorite and quartz diorite of the Coast Plutonic Complex. The discovery exposure occurs along a logging road. Dentonia has published a NI 43-101 report identifying the discovery as a property of merit, and is considering a program to follow-up, including airborne geophysics. A regional government airborne survey missed a portion of the property.

## IRON SKARNS

### Central West Coast Vancouver Island

In late 2008, Logan Resources Ltd carried out a 20 hole drill program on the **Brynnor**, a magnetite iron skarn located on the company's Redford property. Following this, they published an updated 2009 resource estimate (Table 5.3).

**TABLE 5.3. RESOURCE ESTIMATE FOR THE BRYNNOR IRON SKARN, 2009.**

Resource Category	Resource tonnes	Grade % iron	Iron Concentrate tonnes	Grade % Iron
Measured	7 610 000	39.20%	4 070 000	63.70%
Indicated	4 590 000	35.00%	2 200 000	63.70%
Measured plus Indicated	12 070 000	37.60%	6 270 000	63.70%
Inferred	12 680 000	39.50%	7 120 000	63.70%

Exploration in 2009 consisted of one additional drillhole, geology, and a ground magnetometer survey to better define the limits of the deposit. Processing of the data, including an inversion, was underway at the time of writing.

Noranda operated an open pit iron mine at the site from 1961-1968. At that time, ore was crushed, concentrated and shipped directly to Japan from a nearby dock facility in Toquart Inlet (Figure 5.20). The customer was a consortium of steel mills.

### Southern Vancouver Island

Pacific Iron Ore Corporation continued its large scale exploration program at the **Pearson** project in 2009, following a major program in 2008. Prior to the 2009 drill program, they published a NI 43-101 compliant resource estimate for the Bugaboo iron skarn deposit (Figure 5.21) based primarily on 2008 results. The inferred resource is 7.8 million tonnes grading 63% magnetite at a cutoff of 20% magnetite. Part of the 2009 drill program was designed to expand this resource.

The Pearson project is located on a large land package containing other prospects, some of which emerged from the previous year's geophysical survey.



Figure 5.20. Pilings at the former Brynnor Mine's outloading facility in Toquart Inlet. Magnetite iron ore was shipped to Japanese steel mills from this site in the 1960's.

Several of these were followed up in the 2009 program, which included geological mapping and ground-based geophysics as well as drilling. Among the targets followed up were another skarn and occurrences of mafic-ultramafic rocks (Figure 5.22) found within the West Coast Crystalline Complex, some of which yielded anomalous nickel, copper and platinum group element values in float and soil samples. There are also extensive deposits of glacial clay on the property.



Figure 5.21. White marble in contact with massive magnetite at Pacific Iron Ore Corporation's Pearson project.



Figure 5.22. In addition to the iron skarns, West Coast Crystalline Complex ultramafic rocks at the Pearson project are being evaluated for their nickel and platinum group element potential.

## **INDUSTRIAL MINERALS**

### **Northern Vancouver Island**

Electra Gold Ltd reported a program at **Harvey Cove** where the target is geysirite, clay deposits produced by intense advanced argillic alteration. Of particular interest are high alumina zones, which may contain material marketable to cement producers. The 2009 program consisted of mapping, soil sampling, re-evaluation of historical drill core and specifically following-up high alumina zones.

### **Southern Vancouver Island**

Pacific Iron Ore's Port Renfrew area property, currently the focus of a magnetite iron project, also hosts a large deposit of glacial clay. Pacific Iron Ore and Glacial Marine Clay Inc are investigating this as a source of material for cosmetic and medical applications. They have drilled a 600 m x 150 m area with positive results, not yet published.

### **Fraser Canyon**

Lehigh Hanson Materials Ltd, in partnership with the Yale First Nation, drilled a sand and gravel deposit at **Hillsbar**, near the town of Yale. Results were not available at the time of writing.

## **OUTLOOK FOR 2010**

Financing remains a challenge for most junior companies at the end of 2009 and as always, 2010 exploration plans will be subject to market conditions and changing priorities. A number of major projects appear positioned to move ahead in 2010.

Work by Kobex Minerals Inc at **Hushamu-NW Expo** will depend on the outcome of an internal engineering study.

Construction of access and receipt of a Mines Act permit for **Catface** in 2009 has set the stage for further exploration in 2010. A drill program is planned.

The first three drillholes at **Rogers Creek** encountered porphyry style mineralization, and late in the year Wallbridge Mining extended their land position considerably to include other Cascades porphyry targets.

Work is also expected to continue at Bitterroot's **Mineral Creek** gold project. Another of the region's

active gold projects, Module Resources Incorporated's **Ladner** project, is expected to proceed with an underground exploration program.

Further work is anticipated at Pacific Iron Ore Corporation's **Pearson** project and a larger ground based magnetometer survey is planned by Logan Resources at **Brynnor**.

The Comox Joint Venture will continue the **Raven Coal** feasibility and environmental studies into 2010.

At **Myra Falls**, development and production are expected to continue at recently-discovered South Flank and RE-108 lenses.

**Quinsam** coal is expected to progress into phase II at the 5 South area. The mine is expected to pass the production landmark of 10 Mt clean coal in 2010. The proposed takeover of Hillsborough Resources by Vitol appears to be proceeding.

Smaller projects with plans to proceed in 2010 are numerous. While categorized as "small" in 2009, larger projects may well evolve. A few of those brought to the authors attention are listed here.

On Northern Vancouver Island, Electra Gold Ltd expects to conduct further work at **Suquash** coal. West of Cowichan Lake, Nitinat Minerals Corporation plans a program at the **Jasper**, which has volcanogenic massive sulphide and porphyry targets and Mill Bay Ventures Inc expects to drill at **Valentine Mountain**. Dentonia Resources Ltd is in the process of raising funds to explore its recent tungsten discovery near **Knight Inlet**. Nomad Ventures Inc is permitted to drill the **Krof**, a volcanogenic massive sulphide target east of Harrison Lake. Also east of Harrison, International Millennium Mining Corp plans to drill the **Jason** property, a nickel-copper-platinum-palladium prospect. Chai-Cha-Na Mining Inc plans further exploration at the new **Mission North** gold prospect.

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