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EXPLORATION AND MINING IN BRITISH COLUMBIA 2012



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Regional Geologist Summaries
EXPLORATION AND MINING
in British Columbia 2012

EXPLORATION AND MINING IN THE SOUTH-WEST COAST REGIONS, BRITISH COLUMBIA

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5.1 SUMMARY AND TRENDS

This report covers the provincial government's Coast Area natural resource sector, comprising the South Coast and West Coast regions including Haida Gwaii. The area has one major metal mine, Myra Falls, and one coal mine, Quinsam, in operation for 46 years and 26 years respectively. Both have active exploration programs as they had in 2011. There are also numerous industrial minerals and aggregates operations in the region serving local and international markets.

Overall there were fewer major exploration projects in 2012, but while many junior companies deferred exploration plans in 2012, total exploration expenditures in the South-West Coast Regions were very similar to last year at approximately \$17 million (Figure 5.1). Exploration drilling is recorded at just over 30 000 m (Figure 5.2). Based on voluntary reporting in the Regional Geologist's informal survey, at least \$6.5 million of the exploration spending total was attributable to environmental studies and monitoring on projects that were at or near production decisions and making application for necessary permits and environmental certification. Larger exploration projects at or around the major mines also continued (Figure 5.4). Coal dominated exploration expenditures, along with large projects at Myra falls Operations and in the Island Copper district (Figure 5.5).

While venture capital funded projects have felt the effects of market conditions, changes to the Mineral Tenure Act Regulations in 2012 designed to encourage assessment work and reporting are likely having the desired effect in encouraging preliminary and small scale exploration programs.

Bear markets notwithstanding there were some major advances in 2012:

- NorthIsle Copper and Gold Inc explored the Island Copper properties and produced a new resource estimate for the Hushamu deposit;
- On-lease exploration continued at Myra Falls;
- Hillsborough Resources Ltd developed Quinsam 7 South and explored at its Quinsam East property;
- Regional and McMaster Zone exploration continued at the New Carolin Gold Corp's Ladner Gold Project. The project also moved

ahead in terms of metallurgy, updated resource estimates and proposed re-processing of tailings;

- Compliance Energy Corporation's Raven Underground Coal Project received its terms of reference for environmental assessment;
- Nearly all major mines and quarries continued producing at or near recent levels.

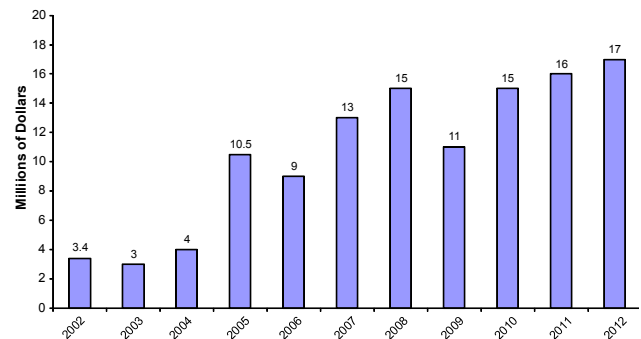


Figure 5.1. Exploration spending estimates for the South-West Coast Regions 2002-2012. The addition of Haida Gwaii to the region in 2010 had negligible impact on the statistics.

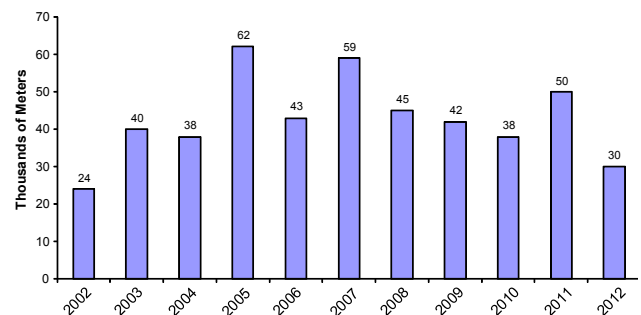


Figure 5.2. Exploration drilling in the South-West Coast Regions 2002-2012.

5.2 MINES

The location of operating mines and selected exploration projects are shown in Figure 5.3. Mine production and reserves statistics are given in Table 5.1.

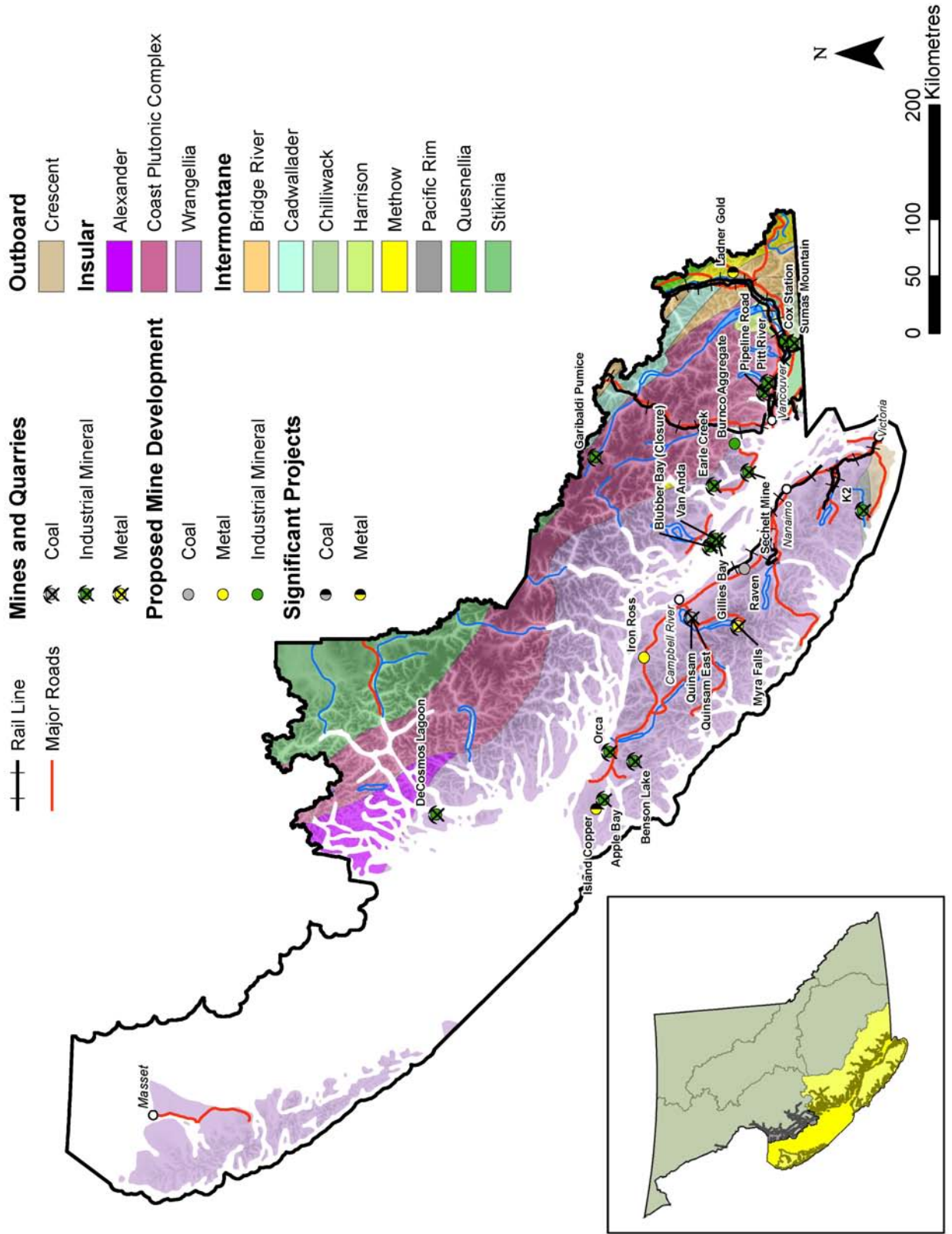


Figure 5.3. Operating mines and selected major exploration projects in the South-West Coast Regions, 2012.

TABLE 5.1. RESERVES, FORECAST MINE PRODUCTION, SOUTH-WEST COAST REGIONS, 2012

Mine	Operator	Commodities	Mine Workforce	Forecast Production 2012	Production 2011	Reserves as of Dec 31, 2011
Metals						
Myra Falls Operations	NVI Mining Ltd (Nyrstar N.V.)	Zn-Cu-Pb-Au-Ag	282 +contractors	Approximately 0.5 Mt mill throughput head grades: 7.26% Zn, 0.55% Pb, 1.03% Cu, 1.29 g/t Au, 48.49 g/t Ag	494 kt ore milled 36 000 t Zn 4 200 t Cu 800 t Pb 385.7 kg Au 17 853 kg Ag (metal in concentrate)	6.25 Mt 4.75% Zn 0.46% Pb 0.87% Cu 1.35 g/t Au 43.87 g/t Ag (proven+probable)
Coal						
Quinsam	Quinsam Coal Corp (Hillsborough Resources Ltd.)	Thermal coal	approx 140	365 000 t clean coal	480 000 t clean coal	N/A (Developing 5, 10, 15 year plans)
Industrial Minerals						
Apple Bay (PEM 100)	Electra Gold Ltd.	Chalky geyserite	8	Approx 50 000 t	49 248 t	~5 million t
Benson Lake	Imasco Minerals Inc.	White marble	4	36 300 t	26 000 t	100+ year
Blubber Bay	Ash Grove Cement Company	Limestone aggregate, dolomitic limestone	Care and Maintenance 2011-2012			100+ year
Garibaldi Pumice	Garibaldi Pumice Ltd.	Pumice	4	21 500 m3	5 200 t	100+ year
Gillies Bay	Texada Quarrying Ltd. (Lafarge North America Inc)	Limestone, aggregate	70	4.2 Mt	3.3 Mt	100+ year
K2	K2 Stone Quarries Inc	Building Stone	4	16 000 - 18 000 t	16 000 t	N/A
Monteith Bay	Lehigh Hanson Inc.	Geyselite	Care and Maintenance 2008-2012			
Mount Meager	Great Pacific Pumice Ltd	Pumice		No 2012 production	500 t	100+ years
Sumas Mountain	Sumas Shale Ltd (Clayburn Industrial Group and cement manufacturer partners)	Sandstone and shale	10	~ 400 000 t	381 000 t	~70 years
Van Anda	Imperial Limestone Company Ltd (JA Jack & Sons Inc.)	Limestone	9	~ 250 000 t	227 000 t	50+ years

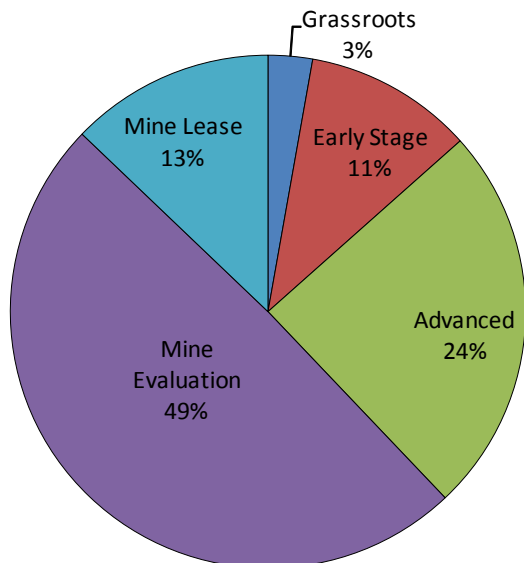


Figure 5.4. South-West Coast Regions exploration spending by exploration stage, 2012.

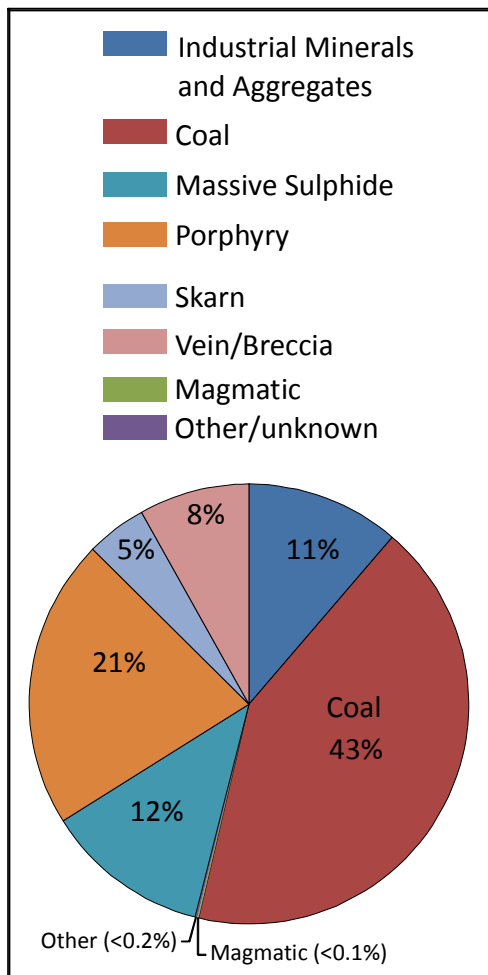


Figure 5.5. South-West Coast Regions exploration spending by primary target type.

5.2.1 Metals

The South-West Coast Regions' one major metal mine, **Myra Falls Operations** (MINFILE 092F 071-73, 330), located in Strathcona-Westmin Class B Provincial Park, continued to perform in line with its recent history and according to new owner Nyrstar NV's expectations. In the first three quarters of 2012 the operation milled 389 000 t at an average head grade of 7.26% Zn, 0.55% Pb, 1.03% Cu, 1.29 g/t Au, 48.49 g/t Ag. The mine is on track for approximately half a million tonnes throughput, similar to recent years. It employs 282.

Also consistent with the operation's recent history, there was approximately 20 000 m of underground drilling, mainly directed at finding extensions to ore bodies, or new lenses. An exploration track drift reached the Marshall zone in 2011. Drilling continued into 2012 until ground conditions in the drift temporarily interfered with exploration plans. However exploration drifts and drilling continues on other targets such as Ridge West and the Price mine. On-lease exploration at the mine is typically one of the largest exploration projects in the South-West Coast Regions. There are plans to step up the exploration program even further in the coming year in an effort to build reserves for a long term mine plan. Starting with a small open pit at the Lynx deposit in 1966, the operation has a history of success in replacing reserves. Limited tailings storage capacity is more likely to ultimately limit mine life than exhaustion of reserves.

As reported in this publication and elsewhere last year, Myra Falls has been the site of successful proof of concept testing of a new geophysical exploration technique. Muon geotomography uses sensors placed underground and cosmic rays to produce a three dimensional image of the earth's density distribution at up to one kilometer depth. Based on the research of UBC physicist Douglas Bryman, the concept is somewhat similar to medical or industrial applications of computed tomography, but it uses a naturally-occurring muon flux. It has been successful at Myra Falls in identifying massive sulphide bodies, which differ significantly in density from their host rock. Currently the technique is suitable for underground mine-site exploration, as it requires passageways capable of accommodating large sensors. Advanced Applied Physics Solutions Inc. is commercializing the technique.

The deposits are hosted in the Middle Paleozoic Sicker Group volcanics, an oceanic arc assemblage forming the basement of Vancouver Island. Devonian Myra Formation rocks host the mineralization at Myra Falls, which is in the Buttle Lake uplift, where Sicker Group basement is exposed along a northwest trending antiform roughly in the centre of Vancouver Island. Ore bodies are found in two horizons in the Myra Formation. The Myra Falls camp is generally considered a Kuroko-type or bimodal felsic type VMS environment.

5.2.2 Coal

Nearer the top of Vancouver Island stratigraphy, the **Quinsam Thermal Coal Mine** (MINFILE 092F 319) near Campbell River has been in operation since 1986 and is currently the only active coal mine in the South-West Coast Regions. It is the only underground coal mine in the province, though others are proposed, including the Raven underground metallurgical coal project near Comox. Vancouver Island has a history of underground coal mining dating back to 1849, and in terms of remaining resources it has the potential to continue many more years (Figure 5.6).

The Quinsam mine has focused on two coal seams of the Upper Comox Formation, Part of the Upper Cretaceous Nanaimo Group, producing approximately half a million tonnes per year. They anticipate somewhat less, approximately 365 000 t of clean coal in 2012. The mine supplies local cement plants and increasingly the Pacific thermal coal market since Hillsborough Resources Ltd. became part of the Vitol Group, an international energy trader.

In early 2012, Quinsam obtained a permit and began developing 7 South, a new area approximately 3.5 km by road from the previous mine site. Some production now comes from the new area (Figure 5.7). There are additional resources in the adjacent Quinsam North area reported under previous management, which could extend mine life many more years at the current rate. Hillsborough is now a private company and does not publish annual estimates of reserves and resources.

The company has been testing and researching underground waste and tailings disposal for several years. It is now permitted to dispose of coarse waste underground. In 2012 the mine disposed 120 000t of potentially acid generating coarse coal rejects in flooded workings.

In one of the significant exploration projects on Vancouver Island, there was exploration drilling at Quinsam East in 2012, approximately 8 km from the current mine site. Coal was intersected in the current drill program as it was in a 2010 phase of drilling and in the area historically. Results of the recent program are not published (Figure 5.8)

5.2.4 Industrial Minerals

Large quarries on the coast are well placed to serve Lower Mainland, Vancouver Island and US Pacific Northwest markets by barge. Those with access to freighter loadout facilities can also supply Pacific international markets. Most of the companies mentioned in this section maintain websites with product specifications to which the reader is referred for more information.



Figure 5.6. The concrete headframe of the Morden Mine, built in 1913. Though it was not a particularly successful operation (it closed in bankruptcy in 1921), it stands as a reminder of a previous era of coal mining on Vancouver Island which began in 1849. Vancouver Island's coal resources are far from exhausted. The Morden Mine itself may have as much as 7 million tonnes resources (but is located in a park in a rural/residential setting).



Figure 5.7. Site preparation of the 7 South area at Quinsam. A coal seam is exposed in the centre of the frame.

The largest limestone quarry on the coast is **Texada Quarrying** operation near Gillies Bay (MINFILE 092F 395). Texada Quarrying Ltd is a subsidiary of Lafarge North America. Most of its projected 4.2 million tonnes in 2012 goes to local cement plants. The quarry also produces aggregate, mainly from dykes, which would otherwise go to waste. On the site is also a white carbonate quarry, one of only a few sources on the coast. Texada Quarrying is in planning stages of an on-lease exploration program, likely commencing early in the New Year. (Figure 5.9, 5.10)

The Imperial Limestone Co. Ltd. quarry near **Van Anda** (MINFILE 092F 394) on Texada Island will produce approximately 250 000 t in 2012. The product is barged to parent company J.A. Jack & Sons Inc. in Seattle where it is processed and distributed for a wide variety of potential end uses. Currently much of the product is used in glass making and roofing manufacture. The white products have applications as fillers and extenders. Agriculture is also a major use of limestone with applications including soil sweeteners, animal feed additive, acid neutralization and environmental remediation. There has been quarrying at the Imperial site since the 1930's. Current owners have operated it



Figure 5.8. Rig preparing for drill move at Quinsam East.

since the early 1950's. They anticipate reserves will last in excess of a further 50 years (Figure 5.11).

Ashgrove Cement Company's **Blubber Bay** limestone quarry (MINFILE 092F 479) on Texada Island is on care and maintenance, but may resume for individual contracts. Its products are limestone and dolomite.

On Northern Vancouver Island, Electra Gold Ltd. continued to mine chalky geyserite at the **PEM 100** or **Apple Bay Quarry** (MINFILE 092L 150) in 2012. Production is similar to the past few years at roughly 50 000 tonnes. Since 2003 the product has gone mainly to Ash Grove Cement Company in Seattle for use as alumina silica source in cement manufacture.

Also on Northern Vancouver Island, Imasco Minerals Inc. increased sales of its **Benson Lake** (MINFILE 092L 295) white carbonate. Quarry production is expected to be approximately 36 300 t, representing an increase over last year. The product has a high dry brightness (95) and is used mainly as a white CaCO_3 filler and extender, available in a number of size gradations from Imasco's Surrey location. The carbonate is barged to Surrey from Port Alice.

The **Sumas Shale** quarry on Sumas Mountain (MINFILE 092GSE024, 092GSE004) is owned by Clayburn Industrial Group Ltd, operated by contractor Fraser Pacific Enterprises Inc and delivers its sandstone

and shale product to cement plants in Richmond and Seattle through a joint venture with Lafarge North America (Sumas Shale Ltd). The quarry is on track to produce approximately 400 000 t in 2012. Since Clayburn's brick and refractory products plant closed in Abbotsford, fireclay is no longer produced separately.

The Ironwood Clay Company Ltd. reports sales up 100% this year. Its increasing exports to Korea and China together with British and American sales made it a winner in the 2012 BC Export Awards in the Consumer Products category and earned it about \$10 million in sales. Their products are based on glacial marine clay mined on the Central Coast. Recent production has been from **DeCosmos Lagoon** (MINFILE 092M 019) south of Bella Bella. That site will be reclaimed and Ironwood will move production to Hvidsten Point. Ironwood's manufacturing facilities are in Richmond.

Others supply the growing cosmetic clay market at smaller scales from locations on the Central Coast and Vancouver Island. Generally, no Mines Act permits are required where material is collected by hand and typically these small quantities are not reported.

Materials marketed as cosmetic clays are generally mixtures. Cosmetic clays are said to have cleansing properties, exfoliating the skin, absorbing oils and adsorbing other contaminants. Clays from some deposits elsewhere in the world have antibacterial properties which make them suitable for medical applications.

In the Mount Meager area, Garibaldi Pumice Ltd produced 21 500 cubic meters of mainly coarse pumice at its **Garibaldi Pumice** quarry (MINFILE 092JW 039). The majority of pumice is used as lightweight fill, but it also used in lightweight concrete, landscaping and horticulture (including green roofing). Pumice may have additional applications including fillers, grinding compounds, cosmetics.

Garibaldi reported a program of exploration test pits which extended the deposit in measured and indicated categories by 8.2 million m^3 (coarse pumice) over a 2.35 km^2 area. There is an additional inferred 6.8 million m^3 , plus additional finer material. These findings support the visitor's visual impressions of a large potential pumice resource in the general Mount Meager-Plinth Peak area.

Neighbouring Great Pacific Pumice Inc (MINFILE 092JW 040) did not produce at their **Mount Meager** quarry but utilized existing stockpiles in 2012.

K2 Stone is a vertically integrated natural stone product supplier with quarries on Vancouver Island, near Port Renfrew (**K2**, MINFILE 092C 159) as well as Montana. K2 quarries, processes and distributes their products. Their Ocean Pearl colour comes from the Port Renfrew quarry which is expected to produce 16-18,000 t in 2012, similar to the past two years.

There are smaller producers of slate also quarrying slates of the Leech River Complex. **Van Isle Slate**



Figure 5.9. A view of Texada Quarrying's mine near Gillies Bay.



Figure 5.10. Texada Quarrying's ship loading facility.



Figure 5.11. A barge is loaded at Imperial Limestone's quarry near Van Anda.

(MINFILE 092C 154) is another such producer which has started from a very small operation over the past few years offering a line of hand cut products.

Matrix marble and Stone continues to quarry marble on Vancouver Island and fabricate a line of products including countertops, sinks, tiles and building products. They quarry their Carmanah Black near Port Renfrew (**Gordon River** MINFILE 092C 086) and Tlupana Blue Grey and Vancouver Island White near **Hisnit Inlet** (MINFILE 092E 020).

Landscaping stone is quarried in the Sea-to-Sky Corridor. The largest operator is Northwest Landscape and Stone Supply, with its **Spumoni Quarry** (MINFILE 092GNW100) and other sites, some of which are to be upgraded to full mining leases.

Haddington Island (MINFILE 092L 146) and **Hardy Island** (MINFILE 092F 425) are two small but regular producers of dimension stone on the coast. The Haddington Island product is a durable, resistant Miocene volcanic rock (70.5% silica) with a dry crushing strength of 18 428 psi, valued for its ability to sustain carving and hold edges. Hardy Island produces a uniform grey Coast Plutonic Complex granodiorite used mainly for residential and commercial construction. The Haddington Island and Hardy Island products are available through Adera Natural Stone Ltd and Bedrock Granite Sales, respectively, along with other local products.

Alpine Natural Stone Ltd also quarries stone in the Squamish-Whistler corridor at several locations. Elsewhere, several small quarrying operations proceed with bulk samples. Up to 10 000 t may be extracted without upgrading tenures to leases, allowing test marketing and small scale production.

Construction aggregates account for a large proportion of the mining business on the coast. The area hosts some of the largest aggregate pits and quarries in Canada. The availability of water transportation is a factor in the million tonne per year and larger operations, making shipment of this low unit value commodity more efficient than by overland means. The large majority of production is for local use, but aggregate continues to be exported to markets in California and Hawaii where local supply cannot meet demand.

The construction materials industry's two largest participants on the coast are also two of the world's largest: Lafarge North America and Lehigh Hanson. Number three is a local company, Mainland Sand and Gravel Ltd. followed by a number of smaller companies and individual operations. The aggregates industry is a major contributor to the provincial economy and perhaps overlooked as such. It is also necessary for residential, commercial and infrastructure construction and maintenance. According to BC Energy, Mines and Natural Gas and Natural Resources Canada, over 40 million tonnes were produced in 2011, with an estimated value of nearly \$350 million. The majority of this production and use occurs on the coast, with some

exports, generally from three of the largest mines. There are hundreds of producing pits and quarries in the region. Only a few of the largest are profiled here.

One of the largest aggregate-only mines on the coast is the **Sechelt Mine**, operated by Lehigh Hanson. The company no longer makes production figures public, but volumes have been in the 3-5 million tonne range in recent years. A ship loading facility capable of accommodating Panamax class freighters handles most shipments.

Lafarge North America's **Earle Creek** (MINFILE 092GNW102) operation will produce 1.35 million tonnes in 2012 and employs 30. Product is shipped by barge. **Pitt River Quarries** (MINFILE 092GSE007) will produce 1.45 million tonnes and employs 45. Product moves by truck and by barge.

Other large Lafarge aggregate operations in 2012 include:

Central Aggregates (Bradner Road Abbotsford) 850 000 t, 25 employees

Ward Road (Sumas Mountain), 850 000 t, 25 employees

Coquitlam (Pipeline Road) 400 000 t, 20 employees

Also on Pipeline Road are large operations by Jack Cewe Ltd and Allard Contractors Ltd. Together they produce in excess of one million tonnes per year.

For the nine months ended September 30 Polaris Minerals Corporation produced and sold over 1.5 million tonnes at its **Orca Quarry** (MINFILE 092L 220) near Port McNeill. The quarry is on track to produce and sell approximately 2 million tonnes in 2012.

Mainland Sand and Gravels Ltd's largest operation is the **Cox Station Quarry**, located on the north side of Sumas Mountain and another of the area's largest operations. The product is a crushed quartz diorite. Over 90% of the product goes to the Lower Mainland market via barge on the Fraser River. The quarry also has two CN Rail spur lines which allow shipment by rail. In recent years, production has been in excess of 2 million tonnes per year.

5.3.1 Mine Development

There are no major new mining projects in the South-West Coast Regions in development. However, as described above, the development of 7 South at Quinsam should see the operation continue at approximately the same rate for a period of several years, after which adjacent resources may be developed. Nyrstar undertook considerable underground development at Myra Falls, most of which is initially used for exploration drilling and subsequently will serve production if successful.

New aggregate quarries are developed and expansions occur regularly. Only the largest, such as

described below, are generally recorded in this publication.

5.3.2 Mine Evaluation

There are two major South-West Coast Region mining projects in the pre-application phase of Environmental Assessment, a proposed coal mine and a large aggregate operation. In addition a small magnetite mine is proposed on Vancouver Island.

The **Raven Underground Coal Project** (MINFILE 092F 333) is a proposed mine south of Comox on Vancouver Island. As projected in the feasibility study the main product is to be a semi soft coking coal with a thermal by product. Forecast production is approximately 830 000 t clean coal per year over 16 years. Compliance Energy Corporation, the majority partner in the Comox Joint Venture is focused on getting the project beyond pre-application and into Environmental Assessment and the majority of 2012 pre-development work on the Raven is directed toward that objective with environmental studies and public consultation. Work also continued on the project's feasibility study. The project received its terms of reference (Application Information Requirements for the EAO and Environmental Impact Statement Guidelines for the CEAA) in June 2012, which allow it to assemble and submit its applications for environmental certification. (Figure 5.12)

The **BURNCO Aggregate Project** in the McNab Creek Valley is also in the pre-application stage of environmental assessment with both the provincial and federal agencies. That proposed mine would ramp up to a 1 million tonne-per-year operation, initially barging product to BURNCO's ready-mix concrete plants in South Burnaby and Port Kells.

Work on the project in 2012 consisted largely of environmental monitoring and modelling. A smaller component of this year's efforts consisted of project design and engineering.

Near Sayward, Canadian Nexus Ventures Ltd. and Canadian Dehua International Mines Group Inc. are planning to re-open a small magnetite operation which last produced continuously in the 1960's and briefly in 2005, when a 4800 tonne bulk sample was used for X-ray shielding concrete. The **Iron Ross** project includes a cluster of magnetite skarn deposits (MINFILE 092K 043). The proponents have made application for a 70 000 tonne-per year operation. The mine plan describes basic quarrying, crushing, magnetic separation and trucking to Kelsey Bay (Figure 5.13).

Iron Ross deposits occur along a contact between Upper Triassic Karmutzen Formation basalts and overlying Quatsino Formation limestone. They are among numerous iron skarns on the coast hosted by Vancouver Group volcanics and carbonates.



Figure 5.12. Past producing Tsable River Coal mine in the foreground. In the upper right of the frame is the site of the Raven project.



Figure 5.13. Old quarry site with massive magnetite at the Iron Ross project near Sayward. A new 70 000 tonne per year operation is proposed.

Work continues toward obtaining the necessary authorities to start an aggregate operation that would utilize waste dumps from another skarn deposit, the former **Tasu** mine (MINFILE 103C 003) on Moresby island (Figure 5.14). Coastal Construction Aggregates Ltd. plans to ship by barge from the Tasu Aggregate Quarry to markets on the coast. Product should be suitable for applications such as railway ballast, marine fill, armour and rip-rap and may find use in various port expansion projects. The original Tasu iron mine operated between 1967 and 1983, producing tens of millions of tonnes of largely limestone, marble, basalt and diorite waste rock in addition to more than 23 million tonnes of ore. Waste from past-producing iron skarns has served as aggregate before, with examples on Texada Island and the Brynnoir mine near Ucluelet (MINFILE 092F 001).



Figure 5.14. View from the top of the waste pile at the former Tasu mine. Coastal Construction Aggregates proposes to utilize waste rock as aggregate.



Figure 5.15. Before and after repair shots of the core storage and logging area at the Abo gold project. Vandalism and theft are intractable problems at accessible locations. This core was apparently dumped to gain access to the rebar used in the racks.

5.4 EXPLORATION PROJECTS

Significant exploration projects are summarized in Table 5.2.

5.4.1 Coal Projects

The largest coal projects were the proposed Raven Underground Coal mine and exploration at Quinsam East, as discussed above.

5.4.2 Precious Metals

On the west central coast of Vancouver Island, Gonzaga Resources Ltd. continued a geochemical survey at its **Kennedy River** gold project in 2012 (MINFILE 092F 032, 392, 448). Initial results extend a geochemical gold target (G-1) to the west and they identify a separate area of elevated gold-in-soil results to the south-west.

Near Port Alberni the **Mineral Creek** project (MINFILE 092F 079, 331) changed hands in 2012 and now belongs to a private company, Lu'an Canada Capital and Energy Investment. The new owner has filed a Notice of Work and in 2012 completed a small soil geochemical survey to find surface expression of a high grade vein drill target.

St Elias Mines carried out a small project at its **Knight Inlet** property (MINFILE 092K 158, 161). Mineralization identified in the late 1980 and 1990's includes high sulphidation epithermal Au-Ag and Porphyry Cu-Mo occurrences.

Geochemical work is recorded for assessment on the **Ashlu** property (MINFILE 092GNW045,47,55,62) of Ashlu Mines Inc., a private company, which has assembled a land position around the former Ashlu Mine (MINFILE 092GNW013). Results of this year's work are not yet public. A rock, soil and silt sampling program has been ongoing for 3-4 years, successfully re-locating showings around the former mine. The Ashlu Mine is a past producer which exploited a narrow gold quartz vein (<1m to 4.6 m) over a strike length of 90m and 85 m down dip. In 1981 reserves were just under 90 000t of 8.57 g/t Au and 12.31 g/t Ag. The property is largely underlain by the Jurassic Cloudburst pluton, with a pendant of Gambier Group rocks in the southwestern portion of the property.

The **Abo**, or **Harrison Lake Gold** project (MINFILE 092HSW092) is located roughly 5 km northeast of the village of Harrison Hotsprings. The property was recently optioned by Sierra Madre Developments Inc doing business as Bear Mountain Gold Ltd. They have repaired the core logging/storage facility, rehabilitated the Jenner portal and conducted orientation soil geochemistry surveys (Figure 5.15 (above)). There is a five-year permit in place that allows for drilling.

In the deposit area Brokenback Hill Fm sediments and volcanic rocks are intruded by quartz diorite stocks. One of these, the Jenner stock, gives a sericite K-Ar age of Oligocene to early Miocene, reported in the BC Geological Survey's Geological Fieldwork 1984. Mineralization in the Jenner stock is characterized as disseminated pyrrhotite, minor pyrite, chalcopyrite and traces of molybdenite. The current exploration is based on an intrusion-hosted gold model (Fort Knox type Au).

Gold occurrences related to Tertiary quartz diorite or diorite stocks are also known to the southeast (**Blue Chip**, MINFILE 092HSW017) and northwest (**Doctor's Point**, MINFILE 092HNW071 probably **Providence**, MINFILE 092HNW030 and the **Fire Mountain** cluster of occurrences) close to the Harrison Fault. There was also a small program of geology and geochemistry at Doctors Point.

Near the north end of Harrison Lake, Electra Gold Ltd. optioned the **Golden Ridge** project, formerly the Quet or Hotspring Claims (MINFILE 092GNE027, 033, 038). Check assays on historical drill core were consistent with 1990 and 1997 results. Still at an early stage of exploration, the target is a near-surface low grade gold deposit. The company has submitted a Notice of Work and engaged archaeological consultants.

One of the more active properties in the area in 2012 was New Carolin Gold Corp's **Ladner Gold Project** (MINFILE 092HNW007, 008, 018 and others) east of Hope, which made several steps forward in 2012, including a new resource estimate, metallurgical work and continuing regional exploration and drilling at the McMaster Zone (Table 5.2).

One aspect of the project is an investigation of the economics of re-processing Carolin Mine tailings. A March 2012 preliminary economic assessment showed high price sensitivity with positive project economics above \$600/oz gold. At \$1100/oz gold the project was estimated to have NPV of \$8 million at a 5% discount rate (Figure 5.16)

Average recovery in the 1982-1984 Carolin Mine period of production was slightly better than 50%. At a cutoff grade of 1.0 g/t, the indicated resource is approximately 23,700 oz (Table 5.3). There is a further inferred resource (5000 oz) and a portion of the tailings (approximately 40%) which remain untested and not included in the estimate. New Carolin and Shoreline Resource Management Group have announced a Letter of Intent concerning the establishment of a modular plant at the site. Under the terms of the LOI, Shoreline would develop and build its own plant for 65% of proceeds.

To the south, the multi-year underground bulk sampling program continued at the **Silver Peak** high grade silver vein project, which includes the historic Eureka-Victoria silver mine (MINFILE 092HSW011). Ore is described as consisting mostly of a silver-rich tetrahedrite or friebertite in siderite. Homegold Resources Ltd is the operator.

TABLE 5.2. SIGNIFICANT EXPLORATION PROJECTS SOUTH-WEST COAST REGIONS, 2012

Property	Operator	MINFILE (NTS ref.)	Commodity	Deposit Type	Work Program	Meters Drilled
Iron Ross	Canadian Nexus Ventures Ltd/Canadian Dehua International Mines Group Inc	092K 043	Magnetite, Fe	Skarn	EN, FS	n/a
Island Copper	Northisle Copper and Gold Inc.	092L 173, 177 200, 240, 273	Cu, Mo, Au, Re	Porphyry Cu-Mo-Au	DD (18 holes); IP (70 km); G	5438.7
Ladner Gold	New Carolin Gold Corp	092HWN007, 003, 018	Au	Veins	DD (15 holes); MS; GC; AB (434 line km); PF	1620
McNab Valley	BURNCO Rock Products Ltd	(092G.053)	Aggregate	Sand and Gravel	EN; FS	n/a
Myra Falls	NVI Mining Ltd (Nyrstar Mining N.V.)	092F 071,072,073, 330	Zn, Cu, Pb, Au, Ag	VMS	DD; UG: GP (muon geotomography)	20 000
Quinsam East	Hillsborough Resources Ltd	092F 319	Coal (thermal)	Sedimentary	DD; PD (15 holes)	1969.5
Raven	Comox Joint Venture (Compliance Energy Corporation, Itochu Corporation, LG International Corp)	092F 333	Coal (met +/- thermal)	Sedimentary	EN; FS	n/a



Figure 5.16. The Carolin Mine tailings pond. New Carolin Gold Corp proposes to re-process the tailings. The Carolin mine achieved only about 50% recovery. New metallurgical tests suggest much better recovery is possible.

TABLE 5.3. LADNER GOLD PROJECT RESOURCE ESTIMATION

	Cut off	Indicated (tonnes)	Inferred (tonnes)	Grade (g/t)	Gold (grams)
Tailings	1.00	445 378		1.83	815 000
	1.00		93 304	1.85	172 600
McMaster Zone	2.00		548 000	2.24	1 225 000
	0.50		3 575 000	0.69	2 474 000
Carolin Mine	2.00		2 588 736	3.34	8 649 000
	0.50		12 352 124	1.53	18 886 000

5.4.3 Base Metals and Polymetallic

One of the largest projects on the coast in 2012 was the **Island Copper** project of Northisle Copper and Gold Inc (Table 5.2). The company has a large land package on northern Vancouver Island with several porphyry and epithermal style occurrences along a prospective belt that hosted the past-producing Island Copper Mine. Between 1971 and 1994, that deposit produced 345 million tonnes with average head grades of 0.41% Cu,, 0.017% Mo, 0.19 g/t Au.

The most advanced target at present is the **Hushamu** deposit (MINFILE 092L 240), the subject of 2012 drilling and a new resource estimate:

	Mt	Cu (%)	Au (g/t)	Mo (%)	Re (ppm)
Indicated:	304	0.21	0.29	0.010	0.55
Inferred:	205.6	0.18	0.26	0.008	0.38

This resource is now comparable in size to the neighbouring Island Copper past producer (MINFILE 092F 138), however with lower copper grades and higher gold. There is an untested IP anomaly to the northwest and the deposit remains open in the southeast. Northisle has begun preliminary engineering studies and expects to proceed with a preliminary economic assessment. A Notice of Work is in process for additional drilling. (Figure 5.17)

New Rhenium-Osmium molybdenite ages suggest the Hushamu mineralization is slightly older than that of Island Copper, and the geology and mineralogy and paragenesis as interpreted so far show the deposit is not directly comparable to Island Copper. Both deposits are however broadly similar in that they are related to Middle Jurassic Island Plutonic Suite intrusions of approximately the same age in Jurassic Bonanza Group rocks and they occur in a prospective belt north of the Holberg Fault.

This deposit shares some of the advantages of its Island Copper Mine predecessor in its proximity to tidewater, infrastructure and skilled labour. There are however potential disadvantages in an accessible location with overlapping interests and uses, as is a common theme in South-West Coast Regions projects.

Northwest of Gold River, Red Hut Metals Inc. filed a prospectus and technical report in 2012 based on a 2011 reconnaissance program including an airborne survey late in the year on their **Conuma** Property. The ground based program consisted of reconnaissance mapping, prospecting and rock and soil geochemistry.

Northeast of Gold River, another new property with a reconnaissance program in 2011 and 2012 is the **TIB**, recently optioned by Universal Ventures Inc. As is often the case in the densely forested region, new logging roads have revealed mineralization in an area of otherwise poor exposure. Following the discovery was a 585 line km airborne survey in 2011 and further prospecting, mapping, rock geochemistry and a 20-km closely-spaced 3D IP survey in 2012. Exploration is in a very early stage, but styles of mineralization so far include possible replacement and vein high grade copper-gold (for example 2.7% Cu over 3.5 m including 0.5 m >10 g/t Au) and stockwork showings spread over several hundred square meters. Drilling and trenching are proposed. The showings occur in Karmutsen volcanics, near an intrusive stock. Intrusives in the area are mapped as Jurassic Island Plutonic Suite. Previous operators believed known occurrences in the area (MINFILE 092E 050, 092F 401) were porphyry-related. (Figure 5.18)

World Organics Inc is re-negotiating an option agreement with Nahminto Resources Ltd regarding the **Macktush** property (MINFILE No 092F 012, 168, 221, 360). Results of 2010-2011 soil surveys, mapping, prospecting and rock sampling were published in 2012 and there was a remote sensing program on the property in early 2012. Drilling is proposed. The area of the **ReX** showing in the approximate centre of the property



Figure 5.17. Drilling in a snowstorm at the Island Copper Project (photo by J. Halle).

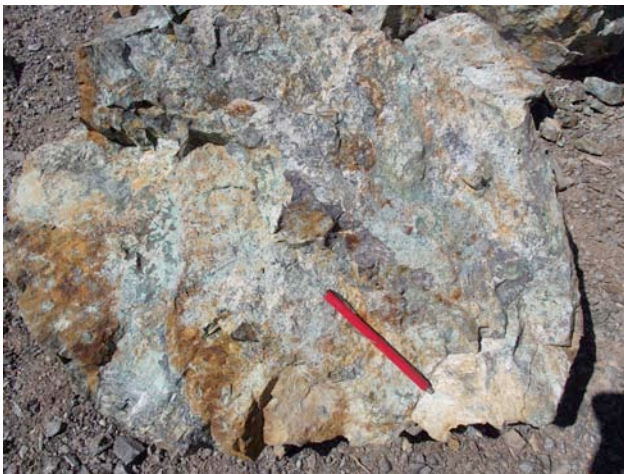


Figure 5.18. High grade copper-gold mineralization was discovered in a road cut on the TIB property north east of Gold River, prompting a grass roots exploration program in 2011-2012. (photo by J. Turner).

represents a porphyry Cu-Mo target, as yet untested by drilling (Figure 5.19).

To the south of Macktush is the **Nahmint** property (MINFILE 092F 140, 157, 092C 007 and others) where Snowfield Development Corp flew a 953 line km airborne magnetic and radiometric survey early in the year following a preliminary survey in 2011. In addition to hosting several skarn occurrences, Nahmint is also a porphyry target.

Golden Peak Minerals Inc filed technical reports on its **Columbia Shear** property (MINFILE 092F 282, 311, 339, 461) with results of 2011 and minor 2012 work, including a 261 line km airborne (VTEM and Magnetometer) survey. Of 10 reported showings on the property, half are described as volcanogenic, occurring in Sicker Group rocks. The company is seeking a TSX Venture Exchange listing.

To the south, and also with several VMS targets, Nitinat Minerals Corporation filed results of a small 2011 trenching and drilling program for assessment on its **Jasper** Property (MINFILE No 092C 080, 081, 088). Results are not public at the time of writing.

The **Okeover** or **OK** property (MINFILE No 092K 008, 057, 155, 092F 302) is owned 40% by Eastfield Resources Ltd, 60% by Prophecy Coal Corp. Work in 2012 consisted of additional soil geochemistry and rock sampling. The last drill program was in 2007. Since then, soil surveys, IP and ground-based magnetic surveys have identified new drill targets on this Cu-Mo porphyry prospect. An Inferred resource in the northern part of the property (North Lake Zone) remains open. Further drilling is permitted.

Near Pemberton, Clear Mountain Resources Corp. reported and followed up a 2011 airborne and mapping effort with additional mapping at the **Owl Creek** property (MINFILE 092JSE004,6,7,14). Skarn and disseminated Cu-Mo mineralization are known in the area and on the property. The primary target of the current program is porphyry Cu-Mo mineralization.

East of Harrison Lake, optionees of the **Cogburn** (MINFILE 092HNE307, 092HSW081, 092HNW041) and **Lekcin** (MINFILE 092HSW, 082, 143, 168) projects carried out small scale geochemical reconnaissance work in advance of planned and permitted drill projects based on targets generated in 2011. British Columbia's only nickel mine, the **Giant Mascot**, or **Pacific Nickel** Mine (MINFILE 092HSW 004,093, 125) operated in the area between 1958 and 1974, exploiting a number of pipe-like ore bodies. In total more than 4.3 million tonnes of ore were mined yielding 26.6 million kilograms of nickel, 13.2 million kilograms of copper and cobalt, silver and gold by-products. Owner Barrick Gold Corporation has no mineral exploration plans in the area, but proposes a ski resort at the former mine property.

Southeast of Hope, private company Savoy Ventures Inc flew an airborne survey over the **Big Range** property (MINFILE 092HSW145). The Hozameen Fault runs through the property and a felsic stock with arsenic, molybdenum and copper mineralization in quartz veins is known on the property.



Figure 5.19. Gossanous exposures in road cuts, copper-molybdenum showings, soil geochemistry and geophysics have lead to proposed drilling of a porphyry target at the Rex zone on the Macktush property.

5.4.3 Other Industrial Metals

The largest Iron Skarn project this year was the Iron Ross proposed mine, discussed above. Other large, advanced magnetite exploration projects were not active in 2012. The **Cogburn Magnesium** project was not active in the field, however the land package was assembled and the property optioned to a private company in 2011.

There was a small magnetometer survey at the past-producing **Argonaut** iron mine (MINFILE 092F 075). Results are not yet public. Similarly, results of a 7-hole drill program by private company Western Gateway Minerals Inc. at nearby **Bacon Lake** (MINFILE 092F 256), another iron skarn, are also not yet public, though operators indicate that both programs warrant follow-up.

In the same area, the **Camp Lake** magnetite project (MINFILE 092F 571) was not active in the field, however Compliance Energy Corporation reported results from the previous year's drilling and geochemical surveys. Highlights included a near-surface 8.9 m intercept of 58.36% magnetic iron, and an 8.4 m intercept of 41.35% magnetic iron. The property remains in the early stages of exploration.

5.4.4 Industrial Minerals

As described elsewhere in this report there has been exploration or other pre-development work at Lafarge's Texada quarry, the Garibaldi Pumice Quarry, Tasu Aggregate Quarry, and BURSCO Aggregate Project.

There were other, smaller projects as well. In one on Northern Vancouver Island, White Rose Holdings Ltd Conducted exploration work at the **Leo D'Or** marble quarry (MINFILE 092L 339), including a small 3 hole drill program and some re-habilitation of the quarry site. There was some production in 1993, and efforts to put the quarry back into production continue. As with decorative stone and many industrial minerals generally, the producer must evaluate not only the deposit but the market for their specific products. In the same area, Graymont Western Canada Inc had a small geochemical and geophysical program at Nimpkish Limestone (MINFILE 092L 349).

5.4.5 Public Geoscience

In a project funded by Geoscience BC and the Island Coastal Economic Trust, there was a large airborne magnetometer survey over part of Northern Vancouver Island, extending nearly to Port McNeill in the east and Zeballos in the west. In addition, there is a stream sediment sampling and re-analysis program covering the airborne survey area plus additional territory. Results are to be released in early 2013. This project complements

recent mapping by Graham Nixon and others of the BC Geological Survey.

Also in the South-West Coast Regions, as part of Natural Resources Canada's Targeted Geoscience Initiative 4, the Geological Survey of Canada, BC Geological Survey and UBC are collaborating on a study of the Giant Mascot Ni-Cu deposit, the origin and setting of which remain controversial.

5.5 OUTLOOK

A sluggish venture capital market stalled some interesting early stage projects in 2012, particularly those for which exploration drilling was to be the next phase. Should the market recover soon and convincingly, several of these are positioned to move ahead.

Larger, more advanced projects forged ahead, as was the case around the province. It is generally the case that projects heading toward feasibility studies, permitting and environmental certification become more expensive to operate than earlier stage exploration. There is an incentive to move ahead while economic information and data gathered to satisfy regulatory authorities remains valid. Proponents of the largest projects have stated their plans to proceed in 2013. NorthIsle Copper Gold expects to proceed with an economic assessment on Hushamu, exploration spending at Myra Falls is scheduled to increase, and Compliance Energy is due to submit its applications for environmental assessment. On the Mainland, New Carolin Gold is working toward a small operation to re-process tailings, which should eventually provide working capital to advance its exploration. Other promising projects will likely depend heavily on the availability of venture capital going forward.

At the very earliest stages of exploration, new regulations provide an incentive to conduct reconnaissance work as opposed to paying cash in lieu to maintain mineral properties. The end result should be additional grass roots discoveries and targets for more advanced exploration.

ACKNOWLEDGMENTS

Thanks to everyone who generously provided information and access to their properties. It is their participation that makes these publications possible and allows the authors to provide investors, branches of government, industry and the public with a basic summary of exploration and mining activity and trends in the province. Thanks also to my former supervisor Denis Collins with the Ministry of Forests Lands and Natural Resource Operations. Regional Geologists spent most of 2012 with that ministry, and several site visits were joint efforts with Denis. Garry Payie and George Owsiacki are thanked for the desktop publishing.

