



## SOUTHWEST BRITISH COLUMBIA

### SOUTHERN VANCOUVER ISLAND

By G.E.P. Eastwood

#### INTRODUCTION

In 1975 responsibility for Vancouver Island was shared with K. E. Northcote. In general Northcote took the northern part and the writer the southern, but the exigencies of scheduling made it impossible to keep to this arrangement entirely. The writer was assigned to supervise grantees under the *Prospectors Assistance Act* who indicated they would be working on the south part of the Island. Five prospectors were visited in the field. Investigation of iron and iron-copper deposits on and near Renfrew Creek was continued, and reconnaissance mapping of Carnation Creek basin was concluded. One group of new showings was examined and surveyed, and two other new showings were examined. Two creeks were briefly examined for placer potential at the request of the Mineral Titles Division. Areas and properties reported on are arranged in NTS order.

#### RENFREW CREEK – HARRIS CREEK AREA (92C/9)

Further information on the general geology of this area has come from several sources: field trips with W. S. Read and prospector M. Dickens, discussion with Dickens, and rock samples loaned by Read. Mr. Read conducted reconnaissance soil sampling along the logging roads in 1974, under a *Prospectors Assistance Act* grant. Rock samples were also collected at all sample points where there was outcrop. Under a further grant in 1975 he did detailed follow-up sampling on a low ridge west of Harris Creek.

The two bands of limestone noted previously (Geological Fieldwork, 1974) are now known to extend southeast down the west slope of Hemmingsen Creek, and the more northerly band to extend down to the junction with the west fork. Bedding observed on the south slope of the west fork dips gently south into the hillside. Buff-coloured bluffs farther west on the slope suggest a granitic intrusion transecting this band. A northeast-striking fault with possible left-hand displacement is inferred to underlie the pass north of Renfrew Creek.

The ridge between Hemmingsen and Harris Creeks splits toward its south end. A patch of limestone lies on the nose of the low east branch, surrounded on three sides by intrusive breccia. East of the limestone there are few diorite intrusions and the rock is virtually massive andesite. Northward this andesite is in contact with virtually massive diorite. The

copper geochemical results showed a marked increase across the transition from diorite to andesite, but failed to indicate mineralization. Minor pyrite occurs in seams and as disseminations in the andesite.

#### **REAKO EXPLORATIONS LTD. (92C/9W)**

One week was spent in Vancouver logging core and gathering data relating to the property, and three weeks were spent on the property, surveying part of No. 8 zone (North Pit zone) and examining new showings.

Some of the individual magnetite occurrences in No. 8 zone are on a low ridge between the main logging road and Renfrew Creek. This ridge has been logged, and the slash was burned in 1975. Observations after the fire disclosed a jumble of small and large angular float and rounded boulders. Blocks of limestone, andesite, intrusive breccia, and magnetite are juxtaposed. Two large exposures of diorite and intrusive breccia may be projections of bedrock, but most of the ridge appears to have been transported by some form of mass movement. A glacial end moraine cannot be ruled out, but a large concavity in the hillside to the northeast is suggestive of a landslide. Recognition of the transported nature of the magnetite blocks results in a relatively minor reduction of indicated ore reserves, and on the other hand suggests that the source should be sought in the concave hillside. Of additional interest was the discovery of pyrite and bornite disseminated in one of the limestone blocks.

The new showings are on both slopes of the ridge rising west-southwest from the pass north of Renfrew Creek, and are within the northerly band of limestone. One significant and two minor magnetite showings were seen on the Renfrew Creek slope, and two significant showings were seen on the Hemmingsen Creek slope. Several smaller showings are also reported to occur on the Hemmingsen slope. The principal showing on the Renfrew slope is a body of almost pure magnetite emplaced directly in the limestone. Neither skarn nor sulphides were seen. The magnetite is exposed over an area of about 8 by 15 metres, but high positive and negative magnetic anomalies over adjacent overburden indicate that it may be more extensive.

One of the showings on the north slope is exposed intermittently for some 75 metres along a small creek. The width appears to range from 3 to 15 metres. The walls are mostly limestone, skarn is minor, and the magnetite is mostly massive. The other main showing is a long wedge of magnetite-bearing skarn between two creek gullies. The upper part has an estimated width of 45 metres, and the wedge was reported to have a slope length of 120 metres. The magnetite forms pockets and narrow bands in garnetite, and the overall grade probably does not exceed 30 per cent iron. The creek canyon on the west appears to mark the contact between the skarn and the presumed granitic intrusion. The east contact of the skarn is covered.

## **SOMBRIO RIVER (92C/9W)**

At the request of the Mineral Titles Division the writer accompanied the Claims Inspector on an examination of the Sombrio River drainage area. Information was needed as to whether this area warranted designation as a placer area under the *Placer Mining Act*. The placer potential was found to be modest, and the volume estimates published in the 1929 and 1930 Minister of Mines Annual Reports were not confirmed.

In the first place, the general overburden is not alluvial but rather unsorted material of probable glacial origin. There has therefore been little or no concentration of heavy minerals, and the gold content could be expected to be extremely low.

Secondly, the stream gradient is generally steep, and bedrock has been stripped bare along sections of the river and its two main tributaries. The bedrock consists of slaty beds of the Leech River Formation, striking west-northwest and dipping north at about 60 degrees. It may in places have formed natural riffles, although no instance of this was seen. A small amount of heavy minerals may have collected in fracture crevices, but the total amount of gold that could be expected on the stripped sections is very small.

The main placer potential is in the river delta and in channel bars along the river and its principal tributaries. The delta was not examined, but estimates can be made from the topographic map. A width of 300 metres at the beach, as previously reported, is not unrealistic. The contour spacing would suggest that the apex is 600 to 750 metres horizontally back from the shore. The reported thicknesses of 100 and 300 feet (30 and 90 metres) appear unrealistic; 15 metres would appear to be the maximum thickness possible.

Two channel bars were found, immediately below the main road, on the river and its main east tributary. Additional bars could be expected above the main road; the upper limit on the river would appear to be close to the 800-foot (240-metre) contour, above which the channel becomes a steep canyon. The bars observed are 25 and 37 metres long, 6 and 8 metres wide, and generally less than 120 centimetres thick. Boulders are few, and the gravel should not be difficult to handle.

## **CARNATION CREEK (92C/14E, 15W)**

An additional four days mapping was done in the Carnation Creek watershed, (*see Geological Fieldwork, 1974*). Most of the mapping was done along newly constructed logging roads in the lower part of the basin and is sufficient to elicit some patterns, which are illustrated on Figure 8.

The predominant rock in the basin is medium to dark grey and generally porphyritic with a dense groundmass. Locally it is bleached and resembles porphyry dykes. A few narrow

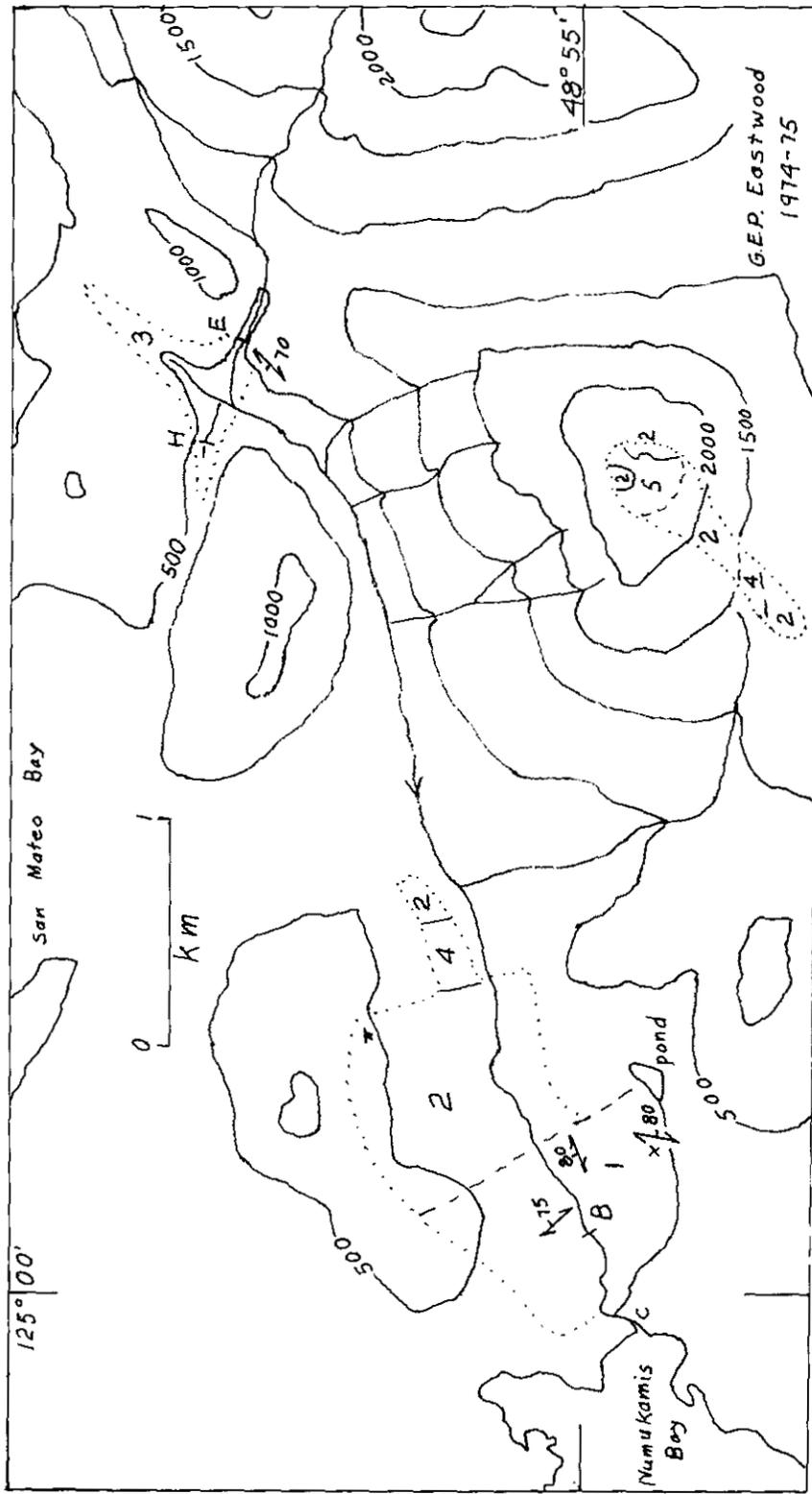


Figure 8. Reconnaissance geology, Carnation Creek Basin.

## LEGEND

1	BONANZA FORMATION, WESTERN AREA
2	BONANZA FORMATION, CENTRAL AREA
3	BONANZA FORMATION, EASTERN AREA
4	DIORITE, MAFIC QUARTZ DIORITE
5	QUARTZ DIORITE
B, E, H	FLOW-MEASURING WEIRS
C	STUDY CAMP
X	SAMPLE SITE
$\pi$	PYRITE OCCURRENCE
	LOCALLY PREVAILING ATTITUDE OF SHEAR ZONES
	MAPPED AREAS

sections of a purple rock were found south of the creek in both the western and central areas; two are clearly lapilli tuff. In thin section the purple colour is seen to be caused by grains and dust of hematite. Another lapilli tuff was found near the north limit of mapping in the central area; it consists of dark lapilli in a greenish grey matrix. Amygdules are common in the western area north of the creek, but scarce elsewhere.

For the predominant type of rock that is neither lapilli-bearing nor amygdaloidal there is scant indication in outcrop or hand specimen as to whether it is lava or tuff. Two thin section specimens were taken from the western area south of the creek. One specimen was tentatively identified in the field as intrusive, but in thin section the grain size is seen to grade down to dust, with no interlocking of grains. The rock is probably an unsorted crystal tuff. The other specimen was taken, along with a sample for silicate analysis, from the site marked 'X' on Figure 8. In thin section it is evidently a bedded crystal tuff, with the grain size again ranging down to dust, but with an alternation of coarser and finer beds. These beds are bent around large plagioclase crystals, which vary from euhedral to rounded to broken. The composition of the large crystals appears to vary somewhat, from about  $An_8$  to  $An_{12}$ , although the individual crystals are unzoned. It seems likely that much of the apparently porphyritic rock is in fact crystal tuff. This would support correlation with the Bonanza Formation.

The following analysis was obtained on the bedded tuff:

	<i>Per Cent</i>		<i>Per Cent</i>
SiO <sub>2</sub> .....	71.0	TiO <sub>2</sub> .....	0.27
Al <sub>2</sub> O <sub>3</sub> .....	14.6	MnO .....	0.06
Fe <sub>2</sub> O <sub>3</sub> .....	2.54	P <sub>2</sub> O <sub>5</sub> .....	<0.18
MgO .....	0.20	SO <sub>3</sub> .....	<0.2
CaO .....	0.94	CO <sub>2</sub> .....	0.05
Na <sub>2</sub> O .....	4.3	H <sub>2</sub> O .....	0.57
K <sub>2</sub> O .....	3.7		

When taken, the sample appeared to be typical of the predominant porphyritic rock, showing an almost black groundmass, and was selected because it appeared particularly fresh and clean. It is possible that it is more silicic and potassic than the average.

Three areas have been indicated, on the bases of structure, alteration, and mineralization. The western area is replete with shear and gouge zones. Taken together, they strike randomly, although prevailing directions are apparent in any one outcrop. They range in width from a few centimetres to a metre or so, and are spaced at intervals of a few metres to about 100 metres. Alteration and mineralization are common, enough to suggest that the area should be more thoroughly prospected. The principal alteration minerals are epidote and chlorite, and on a microscopic scale sericite and carbonate. Hematite and serpentine occur sporadically along slips. Quartz is common as seams and veinlets. Pyrite is common, both in joints and as disseminations. Pyrrhotite is disseminated with pyrite in

a very siliceous-looking rock near the north limit of mapping. Sporadic chalcocopyrite was found in joints, in quartz veinlets, in amygdules, and as disseminations.

The central area is more coherent structurally, shows only minor epidote alteration, and generally does not contain introduced quartz or sulphides. The few shear zones are widely spaced. Quartz veins were found only on the southwest ridge of Mount Blenheim, and pyrite only at the indicated site north of Carnation Creek.

The eastern area is marked by increased shearing, by very common epidote alteration and injection, and by considerable injection of quartz and carbonate. Some slips are hematitic. Sulphides were not found.

The volcanic rocks have been intruded by three small stocks and several granitic dykes. The stocks have been only partly outlined, and their full extent is not known. The stock north of the creek is medium to coarse grained, and medium grey in colour due to the presence of considerable dark minerals. In thin section it is identified as quartz diorite. The stock on the southwest slope of Mount Blenheim is coarse grained and dark grey to black, and appears to grade from mafic quartz diorite to diorite or gabbro. The stock which forms the summit of Mount Blenheim (unit 5) is a typical quartz diorite, consisting of a framework of coarse yellowish grey (5Y 8/1) plagioclase and interstitial quartz and mafic minerals. All three stocks contain considerable magnetite; the thin section from north of the creek is estimated to contain 8 per cent combined magnetite and ilmenite. Granitic dykes intrude the volcanic rocks in all three areas, and range in width from 3 to 10 metres. The two that were examined in thin section were identified as rhyolite porphyry and rhyodacite granophyre porphyry. A few narrow aplite dykes cut the stock on the summit of Mount Blenheim.

In addition to the shear and gouge zones, the rocks are cut by gougy slips, tight slips, and joints, all with a considerable variety of attitudes and with a great range in density. The result in the road cuts is a range from large stable blocks to fine rubble with a tendency to run. The volcanic rock in the western area has developed the most fine rubble, but a small amount has also developed in broken parts of the three stocks.

At least three faults or shear zones of larger magnitude are inferred in the basin of Carnation Creek.

- (1) In the central area west of the pyrite occurrence, striking northwest through the sharp bend in the 500-foot (150-metre) contour.
- (2) Along the deeply incised lower course of the creek flowing off the west slope of Mount Blenheim.
- (3) In the eastern area along the northeast tributary and along the course of Carnation Creek below the junction.

Some increase in the debris contributed to Carnation Creek can be anticipated from the fault and gouge zones and the fine rubble upon removal of the timber. This increase will depend greatly on the degree of disturbance of the ground surface and the consequent exposure of the soil and broken rock to stream and slope erosion.

#### **HORNET (92C/16E)**

This claim was located in 1975 by Vincent Allan to cover a newly discovered copper-bearing quartz vein on Ashburnham Creek, south of Cowichan Lake. The vein occurs at a fall in the creek about 300 metres upstream from the Honeymoon Bay water supply dam. The host rock is a grey volcanic rock of the Bonanza Formation containing common apple-green flakes and sporadic structures suggestive of volcanic fragments. It is criss-crossed by shear zones at every attitude and has evidently been crushed on a major scale. Many quartz veins have been injected, generally into the shear zones, but only one was found to contain sulphides. This vein strikes 085 degrees and dips 60 degrees south. It pinches just west of the creek, but in the east wall it widens from 10 centimetres at water level to 35 centimetres from 3 to 6 metres above. It consists of quartz, calcite, serpentine, and rock fragments, with chalcopyrite disseminated in the quartz for 4 to 10 centimetres along both walls of the vein.

From 150 to 210 metres above the fall, the creek crosses a band of mixed limestone, argillite, and calcareous argillite. It is not clear whether this is a lens within the Bonanza pyroclastic rocks or an upfolded equivalent of the Sutton limestone.

#### **LUCKY STRIKE (92C/16W)**

Ten Lucky Strike claims were located in 1974 by G. W. Horsman and partners over the west ridge and south slope of Mount Vernon to cover extensive pyrite mineralization. The rock under the west ridge is mainly white to light grey but is locally darker and appears to be an altered volcanic rock. In thin section it is seen to consist of plagioclase phenocrysts, in various stages of alteration to sericite and tremolite, set in a fine-grained felted matrix of tremolite, clinozoisite, and unaltered feldspar. Pyrite is disseminated through the rock as clots and discrete grains, generally superimposed on the other minerals. Sporadic grains of chalcopyrite accompany the pyrite in some exposures. A small body of magnetite-bearing skarn was partly exposed in the ditch of a logging road at 710 metres elevation on the south slope of the west ridge. In places chalcopyrite accompanies the magnetite. Specimens taken by the partners from farther east on this slope appear phaneritic, though altered and heavily pyritized.

The porphyritic rock probably is part of the Bonanza Formation, and the phaneritic rock may represent an intrusive phase. The alteration and especially the extensive pyritization are suggestive of a Bonanza volcanic centre, with copper mineralization possible somewhere in or adjacent to the centre.

## A CLAIMS (92F/2W)

Several new showings were examined in the company of the owner, Lawrence Vezina, and were subsequently tied in to logging roads shown on aerial photographs. It is now known that the saddle in which the showings occur is between the heads of two tributaries of Cous Creek, about 1 kilometre southeast of the head of Fosseli Creek. The saddle was incorrectly identified in *Geological Fieldwork, 1974*.

A narrow band of Quatsino limestone strikes northwest under the saddle, between Karmutsen lavas on the northeast and Bonanza volcanic rocks on the southwest. In a few places Parson Bay sedimentary rocks are exposed between the Quatsino and Bonanza. The limestone pinches out to the southeast and widens on the north-facing slope. The south showing of the 1974 report now appears to be in Karmutsen lava adjacent to the limestone contact. Further stripping and blasting at this site had exposed a modest amount of additional copper mineralization. The rusty patches noted in the lava in 1974 had been blasted into and found to result mainly from weathering of ankerite; chalcopyrite appeared to be negligible.

Mr. Vezina prospected the west flank and south nose of the low ridge east of the saddle with a magnetometer and by conventional means. He found seven new showings, and had opened them up to varying degrees by rock trenching and pitting. The most northerly is a body of almost massive magnetite mid-way along the ridge flank. It contains bands and pockets of pyrrhotite with some chalcopyrite. The trench measured 3 by 5 metres, and the limits of the magnetite had not been exposed. Farther south, two pyrrhotite occurrences had been exposed, but showed only minor copper stain.

The fourth new showing is on the southeast angle of the ridge nose. A trench about 4 metres long had exposed a body of massive sulphide apparently striking southeast and dipping 43 degrees southwest. A 15-centimetre hangingwall band of massive pyrrhotite with minor chalcopyrite is underlain by at least 45 centimetres of nearly massive chalcopyrite. The hangingwall limit of the body is the local bedrock surface, and the footwall was not reached. The body has been broken and offset on small faults, and tracing of extensions would require closely spaced pits and/or drill holes.

The fifth and sixth new showings are close to the more southerly tributary of Cous Creek. One consists of pyrite and minor chalcopyrite disseminated in Karmutsen volcanic breccia, the other of pyrrhotite and less chalcopyrite and bornite blebs in a relatively coarse-grained and light-coloured rock. The seventh new showing, farther to the southeast, and three reported mineral occurrences north of the saddle were not seen by the writer.

**CUP (92F/7E)**

This claim was located to cover chalcopyrite mineralization found in 1975 by H. J., A. O., and D. Rodstrom while prospecting under a *Prospectors Assistance Act* grant. The showings are southwest of Parksville, at elevations of 900 to 1 000 metres on the crest and west slope of the north ridge of the hill between the heads of French and Lockwood Creeks. The host rock is a hornblende diorite which extends an unknown distance to the west, north, and east. A siliceous volcanic rock is exposed on the hill summit and part of the west slope. The contact is not exposed, but the disposition of outcrops on the west slope suggests that it may be steep.

*The diorite is characterized by abundant prismatic hornblende and in part by xenoliths. The grain size ranges from fine to coarse; in some places the change is gradational, in others the fine-grained phase with its characteristic network of hornblende needles forms cognate xenoliths in a medium-grained or coarse-grained phase. Other xenoliths are clearly of volcanic origin. A few small bodies consist almost entirely of dark minerals: they are clearly not segregations *in situ* but may be xenoliths derived from the breakup of marginal segregations. In a few places the diorite texture is disordered.*

The diorite is mineralized with chalcopyrite and locally pyrite and pyrrhotite. Most commonly the chalcopyrite forms discrete blebs or clots ranging from pin-head to walnut size. For the most part the blebs show no structural control, but in a few places they line up to suggest deposition along an old, healed fracture. Part of the fine-grained phase of the diorite contains finely disseminated chalcopyrite which is invisible to the unaided eye. The xenoliths are almost totally barren. The chalcopyrite is sparse overall and is irregularly distributed. One block of rock of 30-litre size may contain a dozen or more blebs and adjacent blocks of similar size may show none at all. The overall mineralization dies away down the west slope of the ridge.

The common xenoliths on the ridge would suggest a position close to the roof of the intrusion, and the chalcopyrite would appear to have been introduced into this roof zone at a relatively early stage. It is probable that the best mineralization was concentrated higher in the roof zone and has since been eroded away.