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AYLWIN CREEK CLAIMS
Slocan District, B.C.

GEOLOGY, GEOCHEMISTRY and DRILLING
1980

by D. C. Durgin December 1980

iii. six claims, covering 60 units, staked by Riocanex in June 1979, and

iv. two claims, of a total 28 units, staked for the joint venture in May 1980, in the name of Riocanex.

Details of the claims are given in Appendix I.

Several crown grants and small claims held by other parties exist within the claim block. These were not being worked in 1980. A larger block protruding into the joint venture's holdings and adjoining the optioned reverted crown grants is held by Andaurex Resources Ltd.

2.3 HISTORY

The oldest claims at Aylwin Creek, the Willa, Rustler and Rockland crown grants, were staked in 1893 and surveyed in 1898. Prospectors were attracted by rusty cliffs, minor showings of malachite, and by "... an old log jam, the rotten wood of which had precipitated small nodules and sheets of metallic copper, also forming oxides and carbonates". (B.C. Minister of Mines Annual Report 1904, p. 174). First mention of the property is in the B.C. Minister of Mines Report of 1893 (p. 106) which briefly mentions, "One discovery, near Eighty (Eight) Mile Creek, yielded from one assay $249 and from another $400 gold per ton". By 1898 three tunnels had been driven into the mineralized zone - Willa # 1 - 80 metres, Willa #2 - 10 metres, and Rockland - 70 metres, (Dwg. G-8921) and 331 tons of copper-gold ore were shipped that year (B.C. Minister of Mines Report 1898). The grade of the ore is not mentioned.

In 1901, the property was examined by Benjamin Hodge of Granby Consolidated Mining Company. Sampling, largely from the Willa tunnel, gave modest gold and rather high copper values due probably to malachite and chrysocolla on the adit walls. The prospect was turned down due to remoteness and low grades.

The 1904 B.C. Minister of Mines Annual Report (p. 173) described the Willa showing as " a mineralized zone about 60 ft. wide carrying copper sulphides with gold values. Across the creek the mineralized zone appears in a bluff and is apparently of considerably greater width than the tunnel has yet proved. The zone was reported to run about 1% copper and $6 in gold." (@$20/oz.) The large, low-grade potential was recognized early.

Another brief report by E. E. Campbell of Granby Consolidated, dated 23 October, 1912, described eight samples from the Willa tunnel, which averaged 0.4% Cu, 0.15 oz/ton Ag, 0.6 oz/t Au. Again the property was rejected due to grade being too low for the metal prices and technology of the time. In 1932 access to the showings was improved by a small cat road and bridge, and the Rockland tunnel portal was retimbered. No significant exploration has been reported for this period. The property was decribed very briefly by C. E. Cairnes in 1932, noting "... appreciable values in gold, principally associated with the chalcopyrite." (Cairnes 1932, p. 116).

In 1955, the Rockland Claims group was examined by Egil Lorntzsen who maintained a financial interest in the property for a time. Judging from his report (Lorntzsen, 1955), work at this time was limited to minor surface sampling near the Willa tunnels, opening

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of the Rockland tunnel and the chip sampling near the face of the Rockland tunnel. His underground sampling averaged 0.54% Cu, and traces of gold over 116 ft. The copper values are probably high due to an abundance of secondary copper minerals.

The three crown grants, Willa, Rustler and Rockland were leased by Mr. D. H. Hawkins and reported on by Mr. J. A. Millican in 1964. His report was largely a brief review of the literature, recommending road rehabilitation and limited diamond drilling. The lease and additional claims were optioned to Northlode Exploration Limited who in turn granted an option to Cominco (McIntyre, 1967). This was the first significant exploration of the property since the turn of the century. Cominco conducted superficial bulldozer trenching late in 1964 but failed to reach bed-rock. In 1965 they carried out a programme of reconnaissance geological mapping (map missing) and put down four Ax diamond drill holes, C-1 through C-4, (Table I) for a total of 973 feet (297 metres) (See Dwg. G-8921). Holes C-1 and C-2 were designed to test the Willa zone where fracturing and malachite staining were most intense. C-3 was lost, and C-4 did not reach the intrusive-volcanic contact, for which it was aimed. Drill data is displayed in Table I (from Armstrong 1965), and plotted on the 1:500 scale plan map and appropriate sections.

Cominco's report leads to the following conclusions regarding the mineralization:

i. pyrite, pyrrhotite and chalcopyrite occur as streaks and veinlets in fractured volcanics;

ii. gold is associated with pyrite,

TABLE I

DRILL HOLE DATA - COMINCO, 1965

Hole	Location	Bearing°	Dip°	Length Ft.	Overburden Ft.	Objective
C-1	150 ft. South of Rockland on tributary of Aylwin Creek	140°	-30°	370	15	to test shear zone.
C-2	126 ft.North of Willa adit	135°	-40°	255	5	to test shear zone 600ft from hole C-1.
C-3	50 ft.North of Willa adit	0°	-40°	46	46	Did not reach bed-rock. Casing broke.
C-4	Same as C-3	0°	-45°	302	46	to test the area northwest of main shear zone.

AX core was used in all 4 holes.

Intersections

Hole	From ft.	To ft.	Length ft.	Au oz/t	Cu %
C-1	265	272	7	-	0.1
C-2	36	76	40	0.02	0.4
	230	245	15	tr	0.1
C-4	225	240	15	0.03	0.4

This data has been converted to metric units on the plans and sections accompanying this report.

iii. intensity of mineralization is correlated with intensity of fracturing, particularly around the Willa adit,

iv. the term breccia appears for the first time in drill logs.

v. minor molybdenite is mentioned.

The work by Cominco found copper-gold grades to be less than those suggested by old reports and found little mineralization in the southwestern portion of the Willa Fracture Zone (C-1). The option was dropped and the property reverted to Hawkins.

In April of 1967, J. F. McIntyre, P. Eng., examined the property for the then recently incorporated Rockland Mining Company Ltd. He concluded (McIntyre, 1967) that:

i. Hole C-1 was too far from known mineralization and missed the zone exposed in the Rockland adit.

ii. Holes C-3 and C-4 were logged as in deep overburden, but may have been in highly fractured, mineralized volcanics, but no core was recovered.

iii. Overall core recovery was poor and no sludge samples were recovered, thus reported grades are unreliable.

iv. The Willa and Rockland mineralized zones remained essentially untested.

He recommended 2000 feet of underground drilling, 4000 feet of surface drilling, bulldozer trenching, and surface prospecting.

Field work for the summer of 1967 included additional trenching and claim staking, prospecting, and a reconnaissance geochemical survey which was carried out by Amax Exploration Inc. under the supervision of D. Mustard (Mustard, 1967). Results indicated anomalous readings in copper and molybdenum. The geochemical survey pointed out "... a consistent background level in molybdenum regardless of rock type, while different background levels in copper are indicated for the volcanic and granitic rocks", (McIntyre, 1968). This suggests that copper and molybdenum mineralization were separate events. Several new molybdenum showings were noted. McIntyre's 1968 report includes Cominco's geological map and Amax's geochemical map. He recommends mapping, soil geochemistry, trenching, adit rehabilitation, 3000 feet of underground diamond drilling and 10,000 feet of surface percussion drilling.

Allen Geological Engineering Ltd. was asked to carry out a geochemical survey in the fall of 1968. Soil samples were collected at 100 feet intervals on lines 300 feet apart over an area of about one square mile centered on the Willa-Rockland showings. They were analyzed only qualitatively for copper, but indicated several anomalous areas related to the known showings, and to "quartz eye porphyry", (Allen, 1969). Some surface chip sampling was carried out as well along the north bank of Aylwin Creek near Willa #1 tunnel. The chip samples averaged 0.38 oz/t Ag, 0.017 oz/t Au, 0.28% Cu over 120 feet (36.6m) (Allen, 1969).

The consulting firm, Bacon & Crowhurst Ltd., was retained in 1969 to examine the property and to supervise a diamond drilling programme. This consisted of limited mapping and surface chip sampling, and drilling of five BX diamond drill holes (DH-1 to DH-5) totalling 2180 feet (667 metres). The programme was designed to test the downdip extension of the surface exposures of the Willa-Rockland zone at 200 foot intervals along strike. The holes are shown on the drill plan (Dwg. G-8921) and on the appropriate sections. Detailed drill logs are not available. Results are as follows, (Phendler, 1970a):

All holes intersected the trace of the Willa Zone and two encountered good mineralization over significant widths. A chip sample across the zone on the north side of Aylwin Creek by Phendler gave 0.37% Cu and 0.17 oz/t (5.8 g/t) Au over 100 feet (30m).

In a brief report dated August 1969, J. F. McIntyre interpreted the initial drilling data to suggest the presence of a large body of mineralization suitable for open pit mining or possibly for underground caving methods in high-grade zones.

Physical work carried out in 1970 was limited to prospecting, minor rehabilitation of the Rockland, Willa #1, and Little Daisy adits for sampling, and drilling access, and 1500 feet of trenching near the Rockland adit. Soil samples collected by Allen Engineering in 1968 were re-run quantitatively for copper and molybdenum. Phendler collected additional samples to extend coverage in anomalous areas. Geochemical maps (Phendler, 1970a) show several discrete copper anomalies which are related to known showings and to "quartz eye porphyry." Molybdenum anomalies are centered on the Little Daisy adit area and

TABLE II

DRILL HOLE DATA - ROCKLAND MINING, 1969

Hole	Location	Length Ft.	Width Ft.	Au oz/t	Cu %
DH-1	under principal showing	335	190	0.05	0.32
DH-2	130ft. Northeast of DH-1	386	105	0.06	0.42
DH-3	220ft. Southwest of DH-1	550	30	0.01	0.10
			5	0.01	0.25
			5	0.01	0.14
DH-4	400ft. Southwest of DH-1	500	23	0.02	0.06
			10	0.02	0.08
			15	0.02	0.05
DH-5	360ft. Northeast of DH-1	417	2	0.05	0.20
			5	tr	0.04

All holes inclined at 45° to the southeast.

Core recovery averaged 93%.

This data has been converted to metric units on the plans and sections accompanying this report.

on the Rockland tunnel, both underlain largely by "quartz eye porphyry".

Phendler also chip sampled the Willa #1 adit at 10 foot intervals. The main adit assayed 0.035 oz/t Au and 0.33% Cu over 100 feet (30 metres) (Dwg. G-8921). Chip samples in the Little Daisy adit were uniformly very low in copper, gold and molybdenum. Chip sampling of the 52 feet (15.9 metres) back from the face of the Rockland tunnel gave 0.18% Cu, trace Au, 0.014% MoS_2.

The property was examined by Riocanex late in 1970. Recommendations were "...that the results of the Rockland drilling be followed carefully but insufficient mineralization appears present to justify optioning the property at this time". (Hewton, 1970).

Late in 1970 Western Mining Company became a joint venture partner and helped to finance further drilling. In December underground diamond drilling was begun from the Little Daisy and Rockland tunnels to explore for molybdenum mineralization, under the supervision of R.W. Phendler. A total of 1309m were drilled. Results are summarized in Table III; (Murton, 1971).

No further work was carried out following the discouraging results from this near-surface molybdenum exploration, nor was the copper-gold target pursued further. The crown granted claims of the Rockland Mining Company subsequently reverted to the crown and the staked ground lapsed.

No core from any of these earlier drilling programmes is now available.

TABLE III

DRILL HOLE DATA - ROCKLAND, 1970

Hole	Bearing o	Dip o	Length ft.	Recovery %
Drilled from Little Daisy tunnel:				
Puma				
40-2	130	0	237	85
40-3	160	0	134	44
40-1	99	-3	503	78
40-2	130	-3	794	+83
40-3	160	-30	629	81
Drilled from Rockland tunnel:				
40-5	189	0	814	+68
40-6	145	-2	593	+85
40-7	310	0	590	96

INTERSECTIONS

Hole	From ft.	To ft.	Length ft.	Cu %	Mo %
40-2	670	674	4	0.19	tr
40-5	50	60	10	0.11	0.003
	150	160	10	0.14	0.01
	250	300	50	0.185	0.002
	700	740	40	0.132	0.005
40-6	270	280	10	0.102	0.004
	400	420	20	0.03	0.015
	450	460	10	0.032	0.017

This data has been converted to metric units on the plans and sections accompanying this report.

Between January 3, 1975 and May 18, 1979, Mr. Peter Leontowicz of Hills, B.C. acquired the nine reverted crown-granted claims and staked four additional two-post claims. As part of a regional molybdenum reconnaissance programme funded by Riocanex, J.R. Woodcock became interested in the Aylwin Creek area. After visiting the property, he recommended that Riocanex acquire the ground and do surface mapping and geochemistry. An option agreement was negotiated with Mr. Leontowicz and his partner, Mr. William C. Wingert, and plans were made to stake adjoining ground. The terms of an agreement were finalized and a letter of intent signed June 28, 1979.

J.R. Woodcock Consultants Ltd., subsequent to the staking, carried out a programme of rock-chip geochemistry and reconnaissance geological mapping at a scale of approximately 1:6,000. The geological interpretation was based largely on examination of hand specimens collected at sites of rock chip samples, some of which were studied in thin section.

This sampling developed a target on Aylwin Creek, centered near the old workings. Very well-defined, it has superimposed copper, molybdenum, fluorine, and tungsten anomalies over a complex series of porphyry intrusions which Woodcock called the South Stock. The target also displays abundant pyrite and a manganese low. Collectively these were interpreted as reflecting a buried molybdenum-porphyry system.

Riocanex personnel visited the property, noting alteration and molybdenite showings. The writer noted the possible presence of intrusive breccia. Deep diamond drilling, geological mapping, and additional lithogeochemical sampling were recommended for 1980.

3. PROGRAMME IN 1980

3.1 GENERAL

Prompted by Woodcock's work and recommendations, Riocanex in late 1979 was prepared to proceed with work on the geochemically anomalous zone on the optioned claims on Aylwin Creek.

asl. was defined as the 10,000m N and 10,000m E point of the coordinate system.

Holes 80-1 and 80-2 were surveyed immediately on completion by Sperry Sun Ltd., using gyroscopic instruments Other holes were surveyed for dip only by acid bottle test.

The services of J.R. Woodcock Consultants were retained for short periods throughout the work in 1980.

The major aspects and results of the geological mapping geochemical sampling and drilling etc. are discussed in greater detail in subsequent sections of this report.

4. REGIONAL GEOLOGY

The Aylwin Creek property lies in the southern part of the Selkirk Mountain, a region of numerous batholithic and stock-like intrusions, including the Nelson Batholith (G.S.C. OF481; Little, 1960). This area covers a lobe of a regional negative gravity anomaly that occurs over much of the southeastern B.C. (Woodcock, 1980).

Strata of the area may be divided into three major north to north northeasterly-trending sequences. The central one, comprising predominantly Mesozoic rocks, includes strata ascribed to the Slocan, Kaslo and Rossland groups of sedimentary and volcanic rocks and occurs generally to the north and south of the Nelson Batholith and as inliers within it. The Kaslo Group forms the eastern part and consists mainly of metamorphosed volcanic rocks. Slocan Group rocks, occurring mainly in the Slocan Syncline north of the batholith, are mainly sedimentary and include argillites, phyllites quartzite and some limestone and conglomerates and andesitic formations.

South of the Nelson Batholith, the main sequence of the central belt is made up of the rocks of the Rossland Group, a suite of volcanic and minor sedimentary rocks. All the Kaslo, Slocan and Rossland Group rocks are Triassic to Lower Jurassic in age.

To the west, mainly in the mountainous terrain west of Slocan Lake, published maps show metamorphosed Precambrian rocks which include metasediments of the Horsethief Group. These metasediments are exposed on the east side of the lake as a narrow strip, separated from the Mesozoic strata by a persistent crush zone. The Aylwin Creek property lies 2km to the east of this fault, within the Nelson Batholith.

Metamorphic strata, including the Lardeau and Milford Groups, of the eastern sequences form the large Kootenay Arc. The Slocan area lies towards the focus of this arc and is dominated by the Nelson Batholith of mid-to-late Jurassic age.

Several inliers shown (Little, op. cit) as occupied by Slocan, Kaslo or Rossland Group rocks occur within the Nelson Batholith. The Aylwin Creek property covers one of these inliers near the northern edge of the batholith. This inlier is shown by Little (op. cit) as occupied by Slocan Group, intruded by small bodies of Nelson Plutonic Rocks. Work in 1980 shows that the intrusions, at least for the most part, are pre-Nelson and are cut by it, while the stratified rocks are mostly volcanic and hence most probably of the Rossland Group.

Details of the geology of the property are set out in the following section that is based on the work in 1980.

5. PROPERTY GEOLOGY

5.1 GENERAL

Geological mapping of the Aylwin Creek property was carried out during and subsequent to the first phase of drilling. The area covered was approximately 12km^2. At that time the prime objective of the mapping was to obtain an understanding of the nature and relationship of the various rocks noted earlier, with lesser interest in the details of the metavolcanic rocks at surface as the target sought was at depth. Detailed notes were made, however, and a specimen collected at each geochemical sample site, allowing variation within the metavolcanics to be determined if needed, but contacts were not usually traced out. No thin section work was done at that time. The results of the geological mapping are shown on Dwg. G-8922.

The mapping was carried out on 1:5000 scale topographic maps with 20 metre contours prepared by McElhanney Surveying and Engineers Ltd. from aerial photography. An orthophoto map was also made, but was unavailable until mapping was nearly complete. Surface geology shown at 1:500 (Dwg. G-8921) was taken largely from the 1:5000 scale map with minor additional field work.

The following description of the rocks, structure etc., is based on the above mapping and the general conclusions from drilling as they pertain to the overall geology and especially that at surface on the property. Details of the geological aspects as they relate to the targets drilled and mineralization intersected are given under descriptions of the targets in Section 7 of this report.

5.2 ROCK UNITS

5.2.1 Metavolcanics (unit 1)

The metavolcanics are generally andesitic to locally basaltic in composition, altered to tremolite-actinolite and biotite. According to Woodcock (1980) "These secondary minerals comprise 50% to 75% of the rock and the biotite portion constitutes 20% to 35% of the minerals". The rock is less altered locally. Largely pyroclastic in origin, the rocks range from coarse breccias with fragments to 25cm to tuffs and volcanic siltstones. Published mapping (Little, 1960) shows these as Slocan Group, Upper Triassic to Lower Jurassic in age. However, from Little's description and recent field observations, the writer feels that the rocks may more closely resemble the Kaslo group, stratigraphically immediately below the Slocan group and occurring predominantly to the east of the batholith. The presence, however, within these volcanic rocks of augite porphyry suggests according to Wheeler (pers. comm.) that the sequence is most likely to be part of the Rossland group, of lower Jurassic age.

Within the Aylwin Creek inlier, volcanic breccias greatly predominate, making up perhaps 70% of the unit. The best exposures of coarse breccias are at the top of a talus slope immediately north of the outlet of Aylwin Lake. From this point a broad band of coarse pyroclastic rocks trends northeasterly to beyond the LH mine, a gold prospect. The breccias are generally composed of angular andesite fragments loosely to tightly packed in an ashy matrix. The breccia is generally monolithic and fragments lack conspicuous alteration rims.

Tuffaceous intervals are common within the metavolcanics and are generally andesitic in composition, though more silicic varities have been noted toward the west end of the ridge between Little Daisy and Congo Creeks. The tuffaceous rocks are generally thin-bedded, with grading locally well developed. Facing directions are inconsistent and data are insufficient to make any general statements. Thin-bedded siltstones, green to grey or pink in color have been observed in drill core and in outcrop 400m east of the Highland Light prospect near the head of Beaverton Creek.

A third member in the metavolcanics is augite porphyry. This consists of about 20% augite phenocrysts averaging 4mm, generally altered to tremolite-actinolite, in a fine-to-medium-grained dark matrix composed of biotite, fine-grained augite and feldspar. The augite porphyry is distributed in large irregular bodies, presumed to be intrusive in nature. Breccias and tuffaceous rocks with augite porphyry fragments were observed however, in drill core, implying that it might occur, at least partly, as thick elongate flows in the volcanic sequence.

Other varieties of volcanic rocks, such as biotite schists, minor rhyolite, and a few andesite dykes, have been observed but these are generally included in the mapping though not in the core, as undifferentiated metavolcanics or metasediments.

5.2.2 White Feldspar Porphyry (unit 2)

The only direct evidence of age relationships of this white feldspar porphyry with earlier porphyries is a chilled contact against the feldspar porphyry (unit 3) in drillhole 80-2. The similarity in alteration and mineralization is such that they both however, appear to have been intruded at about the same time in the mineralization sequence. There appear to be at least two phases of white feldspar porphyry best exposed at surface, but often obscured by alteration.

One phase of the porphyry is distinguished by the presence of about 20% squarish plagioclase to 3mm long in a very finely granular to aphanitic matrix. Mafic minerals and quartz phenocrysts are generally lacking in hand specimens. The rock is generally highly altered, pyritic and white in color, particularly on the south-facing slope of Little Daisy Creek. Contact metamorphism and silicification related to the Nelson Batholith, combined with alteration and a decrease in grain size make the unit very difficult to reoognize near the head of Little Daisy Creek.

Immediately south of Congo Creek, the white feldspar porphyry has abundant fine grained hornblende in the matrix, giving a grey color. The rock is quite fresh. This phase is found in a limited area and could, if warranted, be mapped separately.

5.2.3 Feldspar Porphyry (unit 3)

Feldspar porphyry was defined only in drill core and after surface mapping. It may thus be present on surface but has gone unrecognized.

Typically, the feldspar porphyry is composed of 25% lath-like slightly rounded plagioclase phenocrysts with a seriate porphyritic texture. Where fresh, it contains a few percent hornblende and, locally, biotite. Quartz phenocrysts are extremely rare. The matrix is fine-grained to aphanitic. The seriate texture, distribution in drill core and general appearance suggest an affiliation with quartz latite porphyry (unit 4), but a lack of quartz-MoS_2 veining strongly implies a younger, i.e., a post-molybdenum mineralization age. In float, accessory molybdenite was noted in this rock, outcrops are infrequent. Further work may distinguish this as a distinct and separate unit.

5.2.4 Quartz Latite Porphyry (unit 4)

There are several textural varieties of quartz latite porphyry all probably intruded within a very short time-span. The various phases were not distinguished in surface mapping, rather all similar porphyries with conspicuous quartz phenocrysts were included in this unit 4 or unit 4a, which appears to be the earliest phase. With careful mapping and petrographic work several phases might be mapped.

In hand specimen, quartz latite porphyry often appears to be a leucocratic, medium grained, phaneritic rock with a few large quartz phenocrysts. Actually, it is a porphyry with abundant phenocrysts and a seriate textured matrix. Feldspar phenocrysts are almost entirely plagioclase from 1mm to 3mm, making up as much as 50% of the rock. A few percent hornblende or biotite phenocrysts are generally present. The diagnostic feature of this unit, conspicuous rounded quartz phenocrysts up to 8mm, are always present but seldom make up more than a few percent of the rock. Woodcock's petrography (1980) indicates abundant K-spar in the matrix.

Woodcock (op. cit) described a finer-grained contact phase in which textures are obscured by deuteric and hydrothermal alteration. This phase appears erratically distributed and to bear at least some relationship to contacts, but will require further work to be separated properly.

Deep in drillhole 80-1 a quartz-bearing porphyry was orginally defined as "early porphyry (unit 4a)". Similar rocks were subsequently intersected in other holes. The name has been retained on maps and sections, though it is a phase of quartz latite porphyry. The rock is generally more biotitic than is usual, in other phases it is sometimes weakly banded, and occasionally has irregular contacts. The seriate texture and presence of quartz phenocrysts are distinctive. This "early porphyry" was so designated as, initially, it was thought to be more altered than other intrusives. In hole 80-1 (517.7-567.3m) the porphyry is cut by a stockwork of quartz and weak molybdenite mineralization (Dwg. D-8914).

Alaskite (unit 4b) is shown only on the 1:5000 scale geologic map (Dwg. G-8972). It is included with the quartz latite porphyry as it appears only slightly younger and related to the same intrusion-mineralization event. It is a fine- to coarse-grained white phaneritic rock composed of potassium feldspar, quartz, and plagioclase. Mafic minerals are lacking. Texturally it varies from aplitic to medium grained equigranular with irregular pegmatitic patches. In core, narrow dykes often have pegmatitic margins.

5.2.5 Hornblende Feldspar Porphyry (unit 5)

The youngest of the porphyries, this unit has been seen in contact only with white feldspar porphyry and metavolcanics. It is more mafic and essentially unaltered.

The rock contains up to 60% phenocrysts and in many hand specimens appears to be a dark grey, medium grained, phaneritic rock. Close field observation and Woodcock's (op. cit) petrography indicate that it is a dacite porphyry with 20% fresh hornblende, 30% plagioclase, and 10 percent K-feldspar phenocrysts. The aphanitic matrix is largely quartz and potassium feldspar.

Hornblende phenocrysts are sometimes aligned near contacts. The rock is unaltered and lacks veining. By contact metasomatism it may have been the source of the hornblende, both in small veinlets and in the matrix of adjacent white feldspar porphyry.

5.2.6 Heterogeneous Breccia (unit 6)

Extending approximately 350m southward from the Willa tunnels is a roughly oval body as yet not well delineated of heterogeneous intrusive breccia.

Its intrusive nature became apparent only after extensive observation in drill core, though it was suggested in surface observations.

The breccia consists of subangular to well-rounded rock fragments generally five to twenty centimetres in diameter in a matrix of smaller fragments and rock flour. Intrusive breccia textures are best preserved at 40m in drillhole 80-2. Larger blocks up to five metres across have been observed in outcrop and others up to several tens of metres across have been inferred from drill core. Fragments of all lithologies, noted on the property, except hornblende feldspar porphyry and Nelson quartz monzonite, have been observed. Many fragments of early porphyry, (4a), with quartz-molybdenite veinlets, have been noted in the breccia. A most convincing indication of the intrusive nature of the breccia is that, in the drill core, the breccia-wall rock contact is not sharp. Often, as the wall rock is approached, the proportion of fragments, of that specific wall-rock, in the breccia increases rapidly to 100%, matrix decreases to zero and the rock becomes essentially only fractured wall rock.

Rock fragments, particularly metavolcanics, commonly have bleached and silicified rims. The matrix and many fragments have been subjected to silicification and strong propylitic alteration giving the entire rock a distinctive pale epidote-like green color. Hardness and color alone may often be used to distinguish this rock type where fragments are not conspicuous.

The bulk of the breccia fits the above description well and was probably emplaced as one event. Occasional exceptions are noted in drill core. Near the collars of drillhole 80-4 and drillhole 80-5, the green alteration and silicification are absent and the matrix has abundant dark biotite. A few other short intercepts of somewhat abnormal breccia were noted. The possibility of there being more than one phase of breccia should be kept in mind during future work.

5.2.7 Nelson Quartz Monzonite (unit 7)

The Nelson batholith is the youngest major rock unit exposed in the Aylwin Creek area. It has not been observed in direct contact with heterogeneous breccia, but related aplite and pegmatite dykes have been noted cutting breccia in several drill holes. Vein sets seen to cut intrusive breccia are not present in Nelson quartz monzonite.

In the vicinity of Aylwin Creek, the quartz monzonite is grey, medium-grained and phaneritic with minerals generally 1mm to 4mm across. It is generally porphyritic with up to 5% irregularly distributed euhedral K-spar phenocrysts to 3cm. Plagioclase forms approximately 40% of the rock with some crystals slightly larger than the ground mass. Quartz (20%), K-spar (25%), and hornblende and/or biotite (15%) make up the remainder. Mafic-rich weakly foliated zones have been observed near the contact with metavolcanics.

Associated with and slightly later than the quartz monzonite is a series of aplite and pegmatite dykes (unit 7a). Volumetrically insignificant but abundant, they have been observed cutting nearly all earlier rock types in drill core.

5.2.8 Lamprophyre (unit 8)

As the latest of all rocks seen, lamprophyre dykes are noted cross-cutting all other rocks, but are only infrequently exposed on surface. Where exposed, the dykes are less than 1m thick and are curved or sinuous rather than planar. The unit includes several varieties of dark, fine-grained, mafic dykes with abundant biotite and odd textures. Some may be basaltic in composition rather than true lamprophyres.

5.3 STRUCTURE

At Aylwin Creek the large inlier or deep roof pendant is known to be engulfed by or surrounded on all but the northwest side, where outcrop is absent, by the Nelson quartz monzonite. This inlier is approximately 3.3km long and 1.6km wide with a lobe extending about 1.5km to the northeast beyond the LH Mine. It is separated by a narrow band of the Nelson quartz monzonite from a second inlier of smaller dimension to the southwest. This has not been mapped in the present work. Rocks of the inlier are exposed over a vertical interval of approximately 1300 metres on surface, or 1700 metres including drill intercepts. (Dwg. D-8907). Drillhole 80-2 entered the Nelson quartz monzonite at an elevation of 650m, and bottomed in it. However, drillhole 80-1 passed through approximately 45 metres of Nelson rocks and then into breccia about the same elevation, bottoming in this breccia at 460m elevation. It remains uncertain whether drillhole 80-2 entered the main body of the batholith or a large steeply dipping dyke. On surface, contacts are near vertical and locally digitated, as at the outlet of Aylwin Lake and near the Victor prospect. The writer contends that the inlier continues much deeper than it is presently tested.

Insufficient data was collected to determine the stratigraphic order and structure of the metavolcanic rocks. Graded bedding is locally well developed in tuffaceous intervals, but there are too few exposures with such detail. In general the volcanic rocks are steeply dipping and only gently folded, with no development of cleavage. Metamorphism is low-grade, and schistosity is developed only locally in more tuffaceous rocks.

The inlier is cut by the several varieties of feldspar porphyry described above and divided here for convenience into northern and southern complexes. The northern complex, between Little Daisy and Congo creeks, consists of two northwest-trending, steeply-dipping broad bands of white feldspar porphyry, (unit 2), with a later, similarly oriented body of hornblende feldspar porphyry (unit 5), separating them. Where exposed, contacts are near vertical. Woodcock (1980) discussed the possibility that the white feldspar porphyry was a sill-like body. Near its northwest end, the body is nearly parallel to bedding in nearby metasediments. It is however discordant to the bedding toward the southwest end and is therefore not a sill or an acidic interval within the metavolcanic sequence.

The southern intrusive complex is more thoroughly studied and considered more important economically at the present stage of exploration. Several arcuate bodies of quartz latite porphyry (unit 4) seemingly form a subcircular ring, 1km to 1,5km in diameter, centered near the Rockland and Willa tunnels. Other more linear trending and dyke-like bodies may be seen as roughly radial to this centre or the ring-dyke. The west part of the ring is poorly defined due to sparse outcrops and it appears to be cut by the Nelson Batholith. Contacts of the porphyry, are nearly vertical where exposed. The radial and concentric pattern implies radial and concentric fracturing due probably to the forcefull emplacement of a stock, which is postulated to be a probable source of the sought molybdenite mineralization.

Within the southern complex, feldspar porphyry and white feldspar porphyry are known only from drill intercepts. Their known distribution is thus over an area only about 200m across. They occur in and adjacent to the heterogeneous breccia and deep in drillhole 80-1. This close spatial association suggests a genetic relationship to the breccia. The feldspar porphyry contains a few short intervals of monolithic breccia with intense silicification and secondary biotite. This is distinctly older than the main breccia event.

The breccia body is offset from the centre of the southern complex by about 150 metres. It is roughly oval and its eastern contact appears nearly vertical where is crosses Aylwin Creek. Results in drillhole C-4, angled to the north near the north margin, suggests a steep north or northwesterly dip to the breccia. Breccia/wallrock contacts in drillhole 8-4 and drillhole 80-2 suggest a gentle northerly or even easterly dip, while the presence of breccia deep in drillhole 80-1 implies that the pipe plunges to the northwest.

These somewhat conflicting interpretations, and the presence of several very large blocks in the breccia, indicate that the present erosion level is possibly at the upper, highly ramified portion of a breccia pipe, and that the several branches have different attitudes. The overall plunge would however, appear to be steeply to the north-northwest.

Copper-gold-silver mineralization trends north-south within the zone of breccia and is apparently controlled by fracturing. The orientation of these fractures remains uncertain at this point, but most of the fractures appear to be steeply dipping.

A strong post-mineral fracture zone, referred to by previous workers as the Willa Shear Zone, is exposed by road construction along Wild Creek and near the Willa tunnels. Drilling in the 1960's indicated a nearly vertical dip and a strike of approximately N40°E to this zone. The zone is a few tens of metres wide but there is no evidence of significant movement along it.

Another fracture zone, perhaps a branch of the Willa zone, is exposed near the face of the Rockland tunnel. It trends N60°E, dipping 65° to 70° northwest, and is approximately 20m wide. Displacement along this fracture zone appears to be negligible.

5.4 AGE RELATIONSHIPS

The volcanic rocks, as suggested earlier in this report, are ascribed to the Rossland (or Kaslo) Group. The structure within these layered rocks is not known, nor is their stratigraphic order or attitude. They are the oldest rocks seen on the property.

Though early work suggested the relative ages of the porphyries, units 2, 3 and 4, as in that order of decreasing age, as implied in legends on maps etc. with this report, subsequent work has indicated the following sequence of emplacement.

youngest	(unit 8)	Lamprophyre
	(unit 7)	Nelson quartz monzonite
	(unit 6)	Heterogeneous breccia
	(unit 5)	Hornblende feldspar porphyry
	(unit 2)	White feldspar porphyry
	(unit 3)	Feldspar porphyry
oldest	(unit 4)	Quartz latite porphyry

Relative ages of units 2 and 3 are somewhat equivocal in that direct evidence was seen only once, in drill core in drillhole 80-2, and unit 3 is not seen at surface.

There is some evidence of minor post-breccia intrusion of porphyries resembling the quartz latite or the white feldspar porphyry.

All evidence implies that the mineralization, in both the silver-gold-copper zone and in the molybdenum-bearing stockwork and elsewhere is pre-Nelson in age. The relative ages of the two types of mineralization remain unclear. Some evidence indicates that the silver-gold-copper mineralization is younger than most of the molybdenite.

5.4.1 Age Dating

Five samples, of core and from outcrop, were sent to the Department of Geological Sciences, U.B.C. for age-dating by Dr. R. L. Armstrong.

The samples and dates determined are as follows: Locations are with respect to drillhole 80-1 at 10,000m E, 10,000m N.

Sample 1. Hornblende feldspar porphyry
Outcrop at 10,600m N and 10,240m E
K-Ar on hornblende separate - 148 ± 5 my.

Sample 2. Quartz latite porphyry
Outcrop at 10,200m N and 10,170m E
K-Ar on hornblende - 157 ± 5 my.

Sample 3. Nelson quartz monzonite
Drillhole 80-2 at 657m
K-Ar on biotite separate - 158 ± 5 my
K-Ar on hornblende separate - 181 ± 6 my
Rb-Sr on biotite separate - 148 ± 3 my.

Sample 4. Altered metavolcanic with quartz MoS_2 stockwork
Drillhole 80-1 at 372m
K-Ar on sericite separate - 57 ± 2 my.

Sample 5. Alaskite
Outcrop at 9,660m N and 9,690m E
Rb-Sr on whole rock - 149 ± 6 my.

The samples cluster about 153my, the generally accepted age of the Nelson Batholith, suggesting a resetting of ages by this intrusion. The 181my age of sample 3 is unexplained. The date of 57my, on sericite apparently related to the molybdenite mineralization, is enigmatic, though R. L. Armstrong (pers. comm.) has noted a similar age from a small stock near the head of the Nemo Creek, a few kilometres to the west of Slocan Lake, opposite Aylwin Creek.

5.5 ALTERATION & MINERALIZATION

In later segments of this report, alteration and mineralization are discussed in detail as they relate specifically to the molybdenum target and to the copper-gold-silver target in the southern intrusive complex. They are treated more generally here as observed at surface.

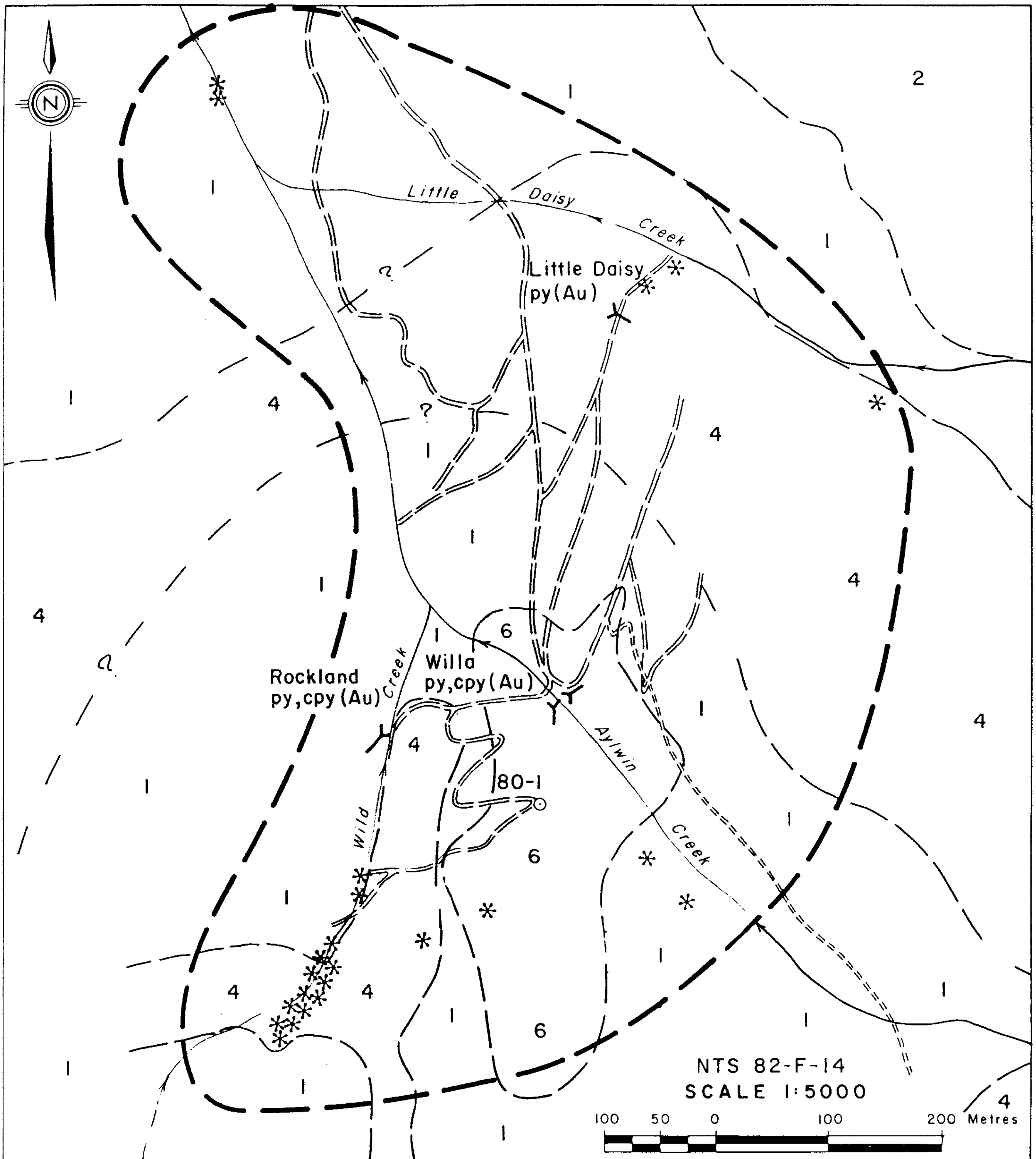
In the northern intrusive complex the hornblende feldspar porphyry is essentially unaltered though it contains a few glassy quartz veins near its margin. The adjacent white feldspar porphyry is cut by similar but more abundant quartz veinlets. Rock specimens are geochemically anomalous in molybdenum, but no molybdenite has been seen. The white feldspar porphyry is silicified and disseminated hornblende is developed in the matrix. A few hornblende veinlets are also present.

At the north end of the main ridge between Little Daisy and Congo creeks, tuffaceous metasediments have been altered to a biotite hornfels with abundant pyrite and pyrrhotite disseminated and in fractures. A conspicuous limonitic color anomaly has developed and is visible from the highway to the west. On the south-facing slope of Little Daisy Creek the white feldspar porphyry is generally pyritic and bleached. According to Woodcock (1980) much of the alteration here is replacement of plagioclase by microcline with some sericitization. Tremolite-actinolite pseudomorphs of mafic minerals are noted locally. Much of the bleaching at surface may be supergene argillic alteration, due to the weathering of pyrite.

The southern intrusive complex appears to be the main centre of alteration and mineralization, with two exploration targets. These represent two events, separate in time, but coincident in space; i. molybdenum-bearing alteration and mineralization event affecting a vast volume of rock including the entire intrusive complex; ii. copper-gold-silver mineralization which is relatively limited in terms of volume of rock affected as it is largely restricted to the breccia pipe.

i. The molybdenum mineralization is developed in a stockwork of glassy quartz-MoS_2 veinlets with silicification and sericitization along the margins. Alteration and mineralization are most intense where the stockwork is most strongly developed. The stockwork is best developed in quartz latite porphyry. Woodcock's finer grained contact phase of the porphyry shows intense sericitization of plagioclase and locally pervasive silicification. Occasionally only the rounded quartz eyes remain recognisable. Mafic minerals have been eliminated.

Some indications of mineralized quartz stockwork have been observed in drilling in a zone with an area of about 300 x 200 metres, and noted on surface in some outcrops scattered over an area of 800 metres across (Fig. 3). Pyrite is widely distributed and appears over-lapping and peripheral



LEGEND

6	Heterogeneous Breccia
4	Quartz Latite Porphyry
1	Metavolcanics
*	MoS_2 Occurrence
	Limit of MoS_2

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MoS_2 OCCURRENCES

DATE	DRAWN BY	
APR. 81	DCD/dag	FIGURE 3

to the molybdenum mineralization. The pattern of alteration and mineralization associated with radial and concentric dykes fits the general model for porphyry-molybdenum deposits.

ii. The copper-gold-silver mineralization is developed largely in the breccia pipe. The breccia and the wallrocks for a limited area around it are variably silicified and propylitically altered, particularly in the matrix. A later fracture set carries the mineralization which replaces fragments, matrix and earlier sulphides. Alteration associated with this phase is largely chlorite-epidote-actinolite, but, locally, coarse brown biotite is developed with the better mineralization. Pyrite and pyrrhotite accompany this mineralization. Pyrite occurs as fine disseminations and in hairline veinlets, in all pre-Nelson rocks within the general limits of the southern ring-like complex of quartz latite porphyry.

A hornfels is varyingly developed adjacent to the Nelson quartz monzonite and has been noted to extend as much as 400m from its contact.

6. GEOCHEMISTRY

6.1 SURFACE GEOCHEMISTRY

6.1.1 Sampling

Concurrently with the geological mapping, a programme of rock-chip geochemistry was carried out over nearly all of the area underlain by the inlier of volcanic rocks and adjacent portions of the Nelson batholith. Samples were not collected on a grid system, but a sample interval of approximately 100 metres was maintained wherever accessibility and outcrop distribution permitted. At each site several chips were collected, avoiding obvious mineralization, totalling approximately 1 to 1.5kg per sample. A rock specimen was also collected from each site. The sampling was planned to fill-in and expand the initial sampling carried out by Woodcock in 1979. The total data is approximately 600 samples. All of the 1980 samples (372), and most from 1979, were analyzed for Cu, Mo, F, Mn, Sn and W and reported in parts per million. Results of this work are plotted on Dwgs. GC-8923-8928.

6.1.2 Results

Study of the patterns of metal distribution yields the following general preliminary conclusions. More study needs to be done.

Copper distribution is in part controlled by rock type, in that the volcanics tend to have an erratical background, perhaps 30 to 40 ppm, which is higher than that of the Nelson quartz monzonite, with only

5 to 10 ppm. Values greater than 100 ppm are considered anomalous. The main Aylwin Creek anomaly, ie. that investigated, is the one with values greater than 200 ppm and these are concentrated in or near the breccia pipe and the associated copper-gold-silver mineralization.

Areas with anomalous molybdenum are very sharply defined. Regardless of rock type, background values are 2 ppm or less and a value greater than 12 ppm is considered very anomalous. Again, most of the higher values are in the main Aylwin Creek area.

The distribution of fluorine is erratic. Though background values appear variable, a threshold is defined at about 800 ppm, independant of rock-type. Highly anomalous fluorine values are found only in the main Aylwin Creek area, though there are several other weak anomalies.

Tungsten has a background of about 2 ppm, with anomalous areas well defined. Manganese shows negative anomalies, distinctly related to alteration. A large area of anomalously low manganese coincides with the southern part of the main Aylwin Creek area.

No pattern is indicated by tin. Most values are 1 to 2 ppm with a few scattered high ones.

6.1.3 Discussion

Rockchip sampling has defined several anomalous areas.

i. In an area of sparse outcrop, along Aylwin Creek about 700 metres downstream from the bridge, is a new-found anomalous area. Sampling is sparse, but the area contains significant values in copper, molybdenum and manganese. Priority is rather low, but it deserves some follow-up.

ii. Along Little Daisy Creek and west across Aylwin Creek is a narrow band of anomalous values in copper and a roughly coincident band of values in fluorine. The central part has anomalous molybdenum. This would appear structurally controlled and/or related to the northern part of the quartz porphyry ring-dyke.

iii. The main Aylwin Creek anomaly remains very attractive. Additional sampling has changed its shape in detail from that depicted by Woodcock, but the molybdenum, copper, tungsten, fluorine and manganese anomalies remain remarkably coincident. The distribution of the highest copper values possibly reflects the main copper-gold-silver zone and deposition in NE-SW structures. Most of these higher values are also within the breccia pipe. However, the broad anomaly with values greater than 100 ppm may not be entirely attributable to the copper-gold-silver mineralizing event and might in fact reflect the mineralization in a porphyry molybdenum system. The molybdenum anomaly remains little changed, with the higher values centered perhaps 150 metres southwest of drillhole 80-1. Better values are restricted to the quartz latite porphyry. It is important to note that the breccia pipe is recognized as being later than the molybdenite mineralization and it is seen to disrupt the geochemical expression of molybdenum.

Fluorine distribution is remarkably coincident in detail with that of copper, rather than with molybdenum, in forming southeast and south lobes along Aylwin and Wild Creeks. In drill core, fluorite is noted in late chlorite-amphiblole-pyrite veinlets cutting breccia and related in age to copper mineralization. The fluorine surface expression may thus not be related to early molybdenum mineralization.

The tungsten anomaly seems largely independent of the breccia body, forming a west-facing semi-circle with a non-anomalous center. Its distribution is closely related to that of molybdenum.

The manganese low, sharply defined, is offset to the south perhaps 300 metres from the center of the molybdenum anomaly. Its distribution appears independent of rock type.

The full rock geochemical pattern is disrupted by the lack of outcrop to the north and west of the Rockland tunnel. Further field work could possibly find additional outcrops.

The main Aylwin anomaly continues to merit additional attention in 1981, largely in the form of drilling.

6.2 DRILL HOLE GEOCHEMISTRY

6.2.1 Sampling

Drill core of all the drilling of 1981 was sampled with the specific aim of using results as a guide to locating any molybdenum deposit or system based on the model of haloes etc. established at other deposits.

From drillhole 80-1,a 2m section was split and sampled in each 10m. This interval was reduced to 2m in each 8m in 80-2 and subsequent holes. All samples were analyzed for Cu, F, Mo and W. Some of the initial analyses for Cu and Mo were done in the Riocanex laboratory but subsequently all were done by Chemex Labs Ltd. Two hundred and ninety three samples were collected and analyzed in this work.

Analytical results are given in the logs of each drillhole and presented on drillhole sections (Dwg. D-8914-8918 and 8920).

6.2.2 Results

Detailed study of the results remains to be done, and no statistical work to determine correlations among elements or with rock-type has been attempted. They are planned. Some general associations and trends are apparent despite their possibly being obscured by the post-molybdenite intrusion of the heterogeneous breccia and the Nelson quartz monzonite. Based principally on results in 80-1 and 80-2 the following observations are made.

Molybdenum exhibits a strong spatial relationship to the early porphyry (4a), while its distribution within the breccia is erratic as it occurs only in individual rock fragments scattered through the breccia. The Nelson quartz monzonite is nowhere anomalous for molybdenite due to its post-mineral age. Overall, molybdenum values are higher in 80-1 than in 80-2. There is no obvious increase in molybdenum with depth.

Tungsten remains enigmatic in its distribution in that samples with higher values show only weak correlation with results for molybdenum. A positive correlation of tungsten with intervals of breccia and with higher copper values is more readily apparent. The breccia in drillhole 80-1 is, however, less anomalous, suggesting either that the relationship of tungsten to breccia is merely spatial or that there may be more than one generation of breccia.

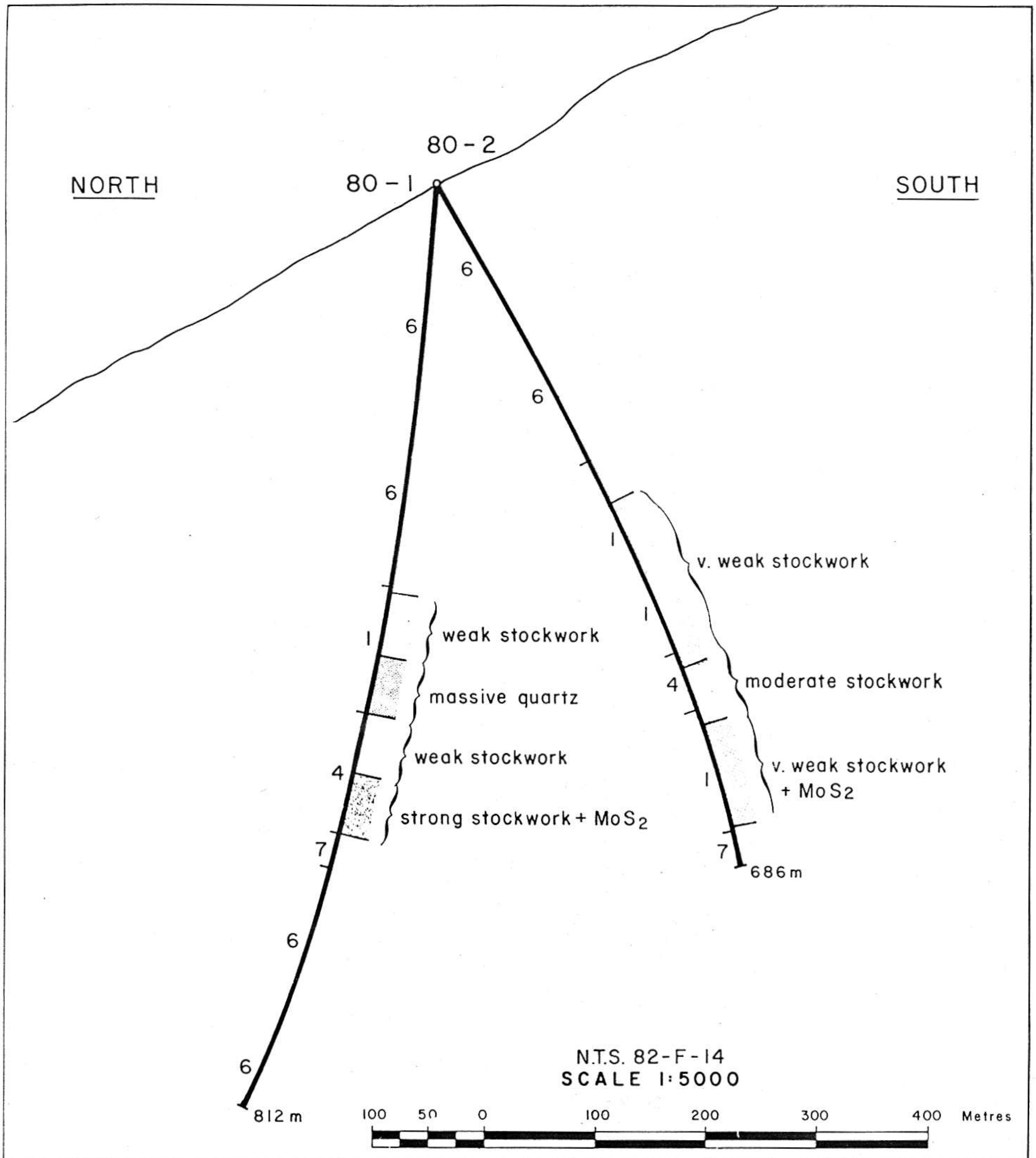
A strong correlation of better copper values with breccia is clear except with the intersections of copper-poor breccia deep in drillhole 80-1. In 80-2 the copper content is higher in all rock types but decreases downwards with sharp breaks at 270 and 570m. Nelson quartz monzonite carries very little copper.

Data for fluorine is vaguely contradictory. In drillhole 80-1 there is no clear correlation between fluorine and the higher molybdenum content. Samples with a high fluorine content generally bear high copper, though the reverse does not always apply. Sections with breccia generally tend to have a higher fluorine content.

In drillhole 80-1 the fluorine/molybdenum correlation is good though there is some evidence for correlation of fluorine with increased copper in intervals of metavolcanic rock, but not in this case in breccia. Overall the fluorine content is higher in 80-2 than in 80-1. It seems possible that there was more than one fluorine-mineralizing event.

6.2.3 Discussion

Despite the above general observations no pattern of distribution serving the aim of forecasting the direction to a prime target has been devised. Further study must incorporate results of all subsequent holes that were not studied in 1980 due to late arrival of results. Clearly emphasis will have to be put on correlation with rock-type and possibly on distinction of patterns associated with the copper-gold-silver and the molybdenum mineralization.



LEGEND

7	Nelson Quartz Monzonite
6	Heterogeneous Breccia
4	Quartz Latite Porphyry
1	Metavolcanics

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RIOCANEX-BP AYLWIN CREEK JOINT VENTURE

N-S Section 10,000 E

Through 80-1 and 80-2

DATE	DRAWN BY	DWG.
APR. 81	DCD/dag	FIGURE 4