

~~Geological~~
Geological, Geochemical and Geophysical
Report

680298
B2M

on the

Hydro Jain group.

Kamloops Mining Division

British Columbia

for
Barrier Reef Resources Ltd (NPL)
904-675 West Hastings St.
Vancouver, B.C. V6B 1W2

Covering: Hydro #1 (4 units) Hydro #2 (12 units)
Hydro #3 (8 units), Hydro #4 (4 units) Hydro #5 (8 units)

Work Performed: Sept 1, 1978 - Feb , 1979

Location: (1) 51°52' N, 119°20' W
(2) NTS MAP B2M/14W
(3) 8 kilometers north of Avola, B.C.

prepared by

Kerr, Dawson and Associates Ltd.
1-219 Victoria St.
Kamloops, B.C.

J. Dawson, G. Long
Feb , 1979.

Table of Contents

Page.

Introduction

Summary and Conclusions

Property

Location and Access

Physiography and Vegetation

History

Geology

~~Water~~ Mineralization

Geochemistry

Magnetic survey

Appendix A: Personnel

Appendix B: Programme Costs

Appendix C: References

Appendix D: Writers Certificate

~~Appendix E:~~

Maps

Figure 176-1 Location Map

176-2	Index Map
176-3	Geology Map
176-4	Copper in Soils
176-5	Molybdenum in Soils
176-6	Tungsten in Soils
176-7	Magnetometer Survey.

Introduction

This report describes the results of a detailed exploration programme carried out on the Hydro property during September 1978.

Field work consisted of grid layout, geological mapping, geochemical soil sampling and a magnetic survey.

The field data ~~was~~ ^{was} interpreted by the writer and results are shown on a series of maps accompanying this report.

Summary and Conclusions

- ① The Hydro property consists of 5 contiguous metric claims totalling 36 units located in moderate terrain about 140 km. north-northeast of Kamboja B.C. and is road accessible.
- ② This property has been known and prospected for many years, however, the only ~~not~~ ^{recorded} work is a limited programme of induced ~~polarization~~ ^{polarization} and drilling carried out by Granite Mountain Mine Ltd in 1970.
- ③ The property is underlain by mixed sequences of high grade metamorphic rocks intruded by two separate plutonic bodies.
- ④ Copper and molybdenum mineralization is found within a centrally located band of skarn, hornfels

153
amphibolite and lesser schist and gneisses. Copper seems to be intimately related to skarn occurrence while molybdenum ~~is always~~ although often occurring in skarn is always closely associated with quartz veins.

- ⑤ Most showings are low grade and spotty, however, a linear, northwest-trending zone about 125 meters wide and perhaps 500 meters long contains most molybdenite showings, some of the highest copper, molybdenum and tungsten soil geochemical values and some of the ~~the~~ greatest magnetic relief on the grid. This area could contain larger, more persistent and better mineralized skarn zones.

Property

The property consists of 5 ~~contiguous~~ contiguous metes claims as follows:

<u>Claim Name</u>	<u>Record No</u>	<u>Tag No</u>	<u>Expiring Date</u>
Hydro #1	1255	43700	June 27/79
Hydro #2	1329	43786	Aug 3/79
Hydro #3	1330	43787	"
Hydro #4	1331	43788	"
Hydro #5	1332	43789	"

Disposition these claims is shown on figure 176-2 in this report.

Location and Access

The property is located in south-central British Columbia approximately 140 km north-northeast of Kamloops and about 8 km north of the village of Avola. Approximate geographic center of the claims is at $51^{\circ}52'$ north latitude and $119^{\circ}20'$ west longitude.

Access from Kamloops is gained via about 160 km. north on Route No. 5 to Avola and thence via about 9 km on the Avola Mountain road to the center of the claims. Some logging roads ~~and~~ and a B.C. Hydro line right-of-way provide further access to parts of the property but ~~most~~ of access to ~~the~~ the property. ~~The property is reached only by~~

Physiography and Vegetation

The subject property lies at the north end of a north-northeasterly trending ridge which parallels and lies immediately west of the North Thompson River. Topography is moderate except in the northeast and northwest corners where slopes steepen in the valleys of North Thompson River and Dennis Creek respectively. Elevations vary from about 5200 feet a.s.l. (1580 meters) in the ~~southeast~~^{southwest} corner of the claim block down to less than 2600 feet a.s.l. (790 meters) at the northeast corner.

The property is covered by a mature stand of cedar, balsam and fir except for a few logged areas and the power line right-of-way. Underbrush is not heavy but locally consists

7

of dense clumps of ~~the~~ devil's club.

History

Numerous old claim posts ~~attest~~ indicate considerable prospecting over the years however the first recorded work was performed in 1970.

In that year Granite Mountain Mine Ltd carried ~~out~~ out limited stream sediment sampling, 1 1/2 miles of induced polarization survey and the drilling of two diamond drill holes totalling 231 feet.

In 1975 limited prospecting and blasting of trace was done on two showings.

The property was staked by Mr. Harold Rothack in June 1970 and later optioned to Barrier Reef Resource Ltd (N.P.C.)

Geology

The property is underlain by a mixed sequence of high grade metamorphic rocks intruded by two granitic stocks. The main orientation of foliation and schistosity is north-northwest with moderate to steep dip east and west. Combined effects of regional metamorphism of at least amphibolite grade and thermal alteration from the intrusions make for rapid change in rock type over short distances. ~~Of these~~ Small bodies of quartzofeldspathic pegmatite are locally abundant and cut all rock types except the fresh, coarse quartz monzonite. The youngest rock type is ^{fine grained,} ~~the~~ greenish-grey, andesite dikes which were noted in about 20 places ^{and cut all other rock types.} ~~at this property.~~

On the basis of gross lithology the metamorphic rocks have been subdivided into 3 main units: Unit 5-

2

quartz-feldspar-biotite gneiss, Unit 4 - primarily mostly weathered quartz-sericite schist and minor amphibolite and Unit 3 - a mixed sequence of ~~quartzite~~ quartzofeldspathic schists and gneisses, striped hornfels and skarn and lesser amphibolite

Unit 5 is a distinctive, ^{coarse,} grey-white, massive quartz-feldspar-biotite gneiss which ~~is~~ does not vary much in composition over its outcrop area. It occurs in the west central and northern parts of the grid area ~~and is~~ adjacent to and partly surrounded by rocks of Unit 3.

Unit 4 is found almost exclusively in the west central part of the property. It is characterized by ~~the~~ ^{the} mostly weathering character of the prevalent quartz-sericite schists. Some of these ~~schists~~ schists are very soft and flaky

~~where~~ there are more massive with lenses and knots of ~~mass~~ material with a higher quartzo-feldspathic content. Thin layers and lenses of amphibolite are common in this unit. They are usually more massive, dark brown to black and limonitic with streaks of pure biotite and hornblende.

Unit 3 is a mixed assemblage occupying the central part of the grid and the claim block. It is a northwesterly-trending ~~block~~ band from 300 to ~~2~~?900 meters wide, truncated by intrusive rocks to the southeast and open but narrowing to the northwest.

Within this unit are rocks somewhat akin to those of units 4 and 5 in that they are dominantly micaceous or quartzo-feldspathic. These rocks constitute about 30% of Unit 3 and are

11
/

randomly dispersed as ~~light~~ bands between the more distinctive, darker hornfels, skarn and amphibolite. Amphibolite makes up about 20% of the volume of unit 3.

By far the most interesting rocks of unit 3 are the mixed hornfels and skarn layers which make up about 50% of the ^{volume of this unit.} ~~total of unit 3.~~ The hornfels is usually a dense, dark gray to black fine grained rock frequently displaying relict bedding. Skarn is more variable and may be dark brown ^{to rusty brown} or pale greenish to dark greenish black depending upon the relative amounts of ~~garnet~~, ^{diopside} ~~diopside~~ or epidote, the three main constituents. It may be fine grained or coarser with patches of euhedral crystals. Relict laminations or bedding are usually evident. As stated above such

layers of scharn and hornfels are usually interlayered with mica schist or quartz-feldspathic ~~gneiss~~ ^{gneiss} so that individual layers are rarely more than 5-8 meters thick. Additionally such bands are ~~commonly~~ ^{sometimes} ~~cut~~ ^{crosscut by} or lie adjacent to irregular bodies of pegmatite or ~~apophyses~~ ^{apophyses} of fine grained granitic ~~rock~~ ^{material} related to unit 2.

Unit 2 consists primarily of fine to medium grained leucocratic granite to quartz monzonite. Phases of this intrusive rock locally may contain abundant ferromagnesian minerals so as to resemble a granodiorite or quartz diorite, however it contains abundant xenoliths of all type of metamorphic rocks and the dark minerals may simply be remobilized from some of these "stopped" blocks. Intrusive rocks

Unit 2 vary widely in texture with frequent local areas of pegmatite or aplite so that it sometimes resembles a schomphic granite.

Unit 2 is widely ^{digitated} along the east and south sides of the property and ^{extends} much further south towards Avola.

Unit 1 is a distinctive fresh, medium to coarse grained pinkish quartz monzonite. It seems to be (?) younger than Unit 2 although it may be a ^{much cleaner} ~~phase of~~ phase of that intrusive. Unit 1 is only exposed ~~westward~~ ^{within} and adjacent to the southwest corner of the claims. Its total extent is unknown.

Mineralization

Pyrite can usually be found as minor accessory

grains in all rock ^{types} units except unit 1. Local areas of limonite staining in units 2, 3 and 4 usually indicate its presence. Locally pyrite may ~~constitute~~ ^{constitute} as much as 10% in some areas of skarn and/or amphibolite.

Chalcopyrite accompanied by pyrite and sometimes pyrrhotite was noted in at least 10 outcrops of skarn ~~at~~ widely separated localities in unit 3 (see figure 176-3). Chalcopyrite is usually fine grained and sporadically ~~at~~ distributed so that rarely is any 2-3 meter width estimated to run more than 0.3% Cu. Selected specimens may run as high as several percent copper.

Molybdenite was found at ~~7~~ ⁷ localities in unit 3 all but one of which are confined to a narrow

northwest-trending band near the south end of the outcrop area of unit 3. This zone is, ^{roughly} 100 to 150 meters wide and about 400 meters long and corresponds with some of the areas of greatest magnetic relief as well as some of the highest molybdenum, copper and tungsten values in soils.

Molybdenum is ~~always~~ ^{almost} always associated with quartz veining. ~~In~~ ^{In} several instances it occurs in the same outcrop ~~with~~ ^{with} chalcopyrite in skarn, however, the two minerals are believed to have a different provenance. The chalcopyrite ~~was probably~~ ^{was probably} related to the basic tuff and calcareous sediments from which the amphibole and skarn were derived while molybdenite was introduced ~~in~~ ^{with} late stage silica vein fillings.

Molybdenite is usually found as clusters of coarse rather in quartz veins though locally it may occur as fine grained flakes disseminated in hornfels and skarn. Minor ferromolybdate coatings were seen at two outcrops. Minor amounts of pyrrhotite ~~was~~ ^{are} ~~found~~ found surrounding some clusters of molybdenite flakes.

Trace amounts of tungsten presumably as scheelite usually occur ~~also~~ with molybdenum.

At 2+30 meters south 0+10 meters west ^{on the grid} a band of mixed skarn, hornfels and amphibolite containing copper and molybdenum mineralization ^{is exposed in a road cut.} This zone is as much as 12 meters wide and can be traced intermittently for about 30 meters on strike. Disseminated chalcocite and disseminated to semimassive pyrrhotite occur

11

sporadically in some of the skarn lenses. Coarse rosettes of molybdenite occur in quartz veins cutting these rocks or in the host rocks adjacent to ~~the~~ quartz ^{veins}. A sample across 7 meters of this zone assayed 0.34% Cu, 0.094% Mo, 0.01% WO_3 and 0.06% Ag. A selected piece of semimassive pyrochlore with disseminated chalcopyrite assayed 0.86% Cu, 0.012% Mo, 0.01% WO_3 and 0.01% Zn. A selected piece of mostly hornfels with coarse rosettes of molybdenite in quartz veins assayed 0.06% Cu, 1.85% Mo and 0.06% WO_3 .

A more impressive showing of molybdenite is located at 5+50 S, 0+50 W. Here a poorly exposed outcrop of mixed, banded skarn and hornfels is cut by narrow quartz stringers all of which contain coarse flakes of molybdenite. However,

more significantly ~~coarsely~~^{finer} grained molybdenite is found disseminated through some ~~stone~~, remote from any quartz veins. This outcrop lies within the zone mentioned on page 15 where a number of molybdenite showings coincide with high Mo, Cu and W values in soils and with some strong magnetic anomalies.

Geochemistry

Soil samples were collected at 100 meter intervals on lines spaced 100 meters apart (see figures 176-4, ~~176-5~~ 176-5 and 176-6).

Samples were collected from the "B" horizon where possible (approximately 15 to 45 cm deep). Sample stations were marked with flagging and the appropriate grid co-ordinates. After collection

samples were stored and shipped in waterproof kraft envelopes

A total of 354 soil samples were collected and analysed for copper, molybdenum and tungsten. Analysis was performed by Bondar-Clegg and Company Ltd at their Vancouver laboratories. Samples were dried and sieved and an aliquot of the -80 mesh fraction obtained. For copper and molybdenum, extraction was attained using hot aqua regia with analysis by atomic absorption spectrophotometry. For tungsten extraction was accomplished by basic fusion with analysis by colorimetry.

The mean and standard deviation for ^{all three} ~~both~~ metals was computed and the data were classified into the following categories:

Negative	0	-	Mean
Possibly Anomalous	Mean	-	(Mean + 1 Std. Dev.)
Probably Anomalous	(Mean + 1 Std. Dev.)	-	(Mean + 2 Std. Dev.)
Definitely Anomalous		>	(Mean + 2 Std. Dev.)

The values were plotted on 1:5000 scale base maps of the property and definitely anomalous, probably anomalous and possibly anomalous areas were outlined (see figures 176-4, 176-5, 176-6).

Most definitely anomalous and probably anomalous ~~Copper~~ values correlate well with known ~~and projected~~ ^{or projected} areas of skarn with chalcopyrite. The area underlain by units 2 and 5 ^{for the most part} has a rather uniformly low background (10-15 ppm). The highest copper value (520 ppm) coincides with the highest tungsten values and the highest positive magnetometer reading.

Higher molybdenum values in soils show some ~~coincidence~~ ^{coincidence} with ^{higher} copper values. They occur primarily within

21
the area underlain by unit 3, however values higher than 5 ppm are concentrated in the south central part of the grid (see figure 176-5). ~~There~~ There is no correlation of higher molybdenum values with higher copper values around the mineralized stream occurrences near the northwest corner of the grid.

Anomalous
~~High~~ tungsten values show more of a scatter and there are fewer of them in the probably anomalous and definitely anomalous categories. Still, the majority of these higher values lie within the area underlain by unit 3. Several of the highest values correlate with the previously mentioned zone of molybdenite occurrences. ~~High copper values are also present in this area.~~

Magnetic Survey
~~Exploration of the area~~

A magnetic survey was carried out over the

entire grid area utilizing a McPhar model M-700 fluxgate magnetometer. This instrument measures the vertical component of the earth's magnetic field. Readings were taken at 25 meter intervals along cross lines and loop corrections made after each traverse. Individual loop traverses were corrected against a base station traverse made along the base line. The corrected readings were plotted on a 1:5000 scale base map and contoured at 100 gamma intervals (see figure 176-7).

On the whole, magnetic relief correlates well with geology. Areas underlain by intrusions show very little variation. The portion of the grid underlain by units 3 and 4 show many scattered and discontinuous high and lows. This is consistent

21

with the lenticular and discontinuous nature of observed bands of amphibolite and skarn. Some of the greatest magnetic relief occurs near the south central part of the grid where the bulk of molybdenite occurrences are found and coincident high copper and tungsten geochemical values occur.

Exploration Potential

Most of the copper and molybdenum occurrences exposed on the Hydro property are relatively low grade, narrow and appear to have little continuity along strike. Copper and molybdenum minerals though found in close proximity in several instances, appear to have different origins.

The main area of interest (roughly described by grid co-ordinates 0S, 2E; 7+50S, 1E; 3+50S, 2W; 4+50S, 3+50W) encloses most of the molybdenite occurrences, many of the higher geochemical values for Mo, Cu and W and some of the highest recorded magnetic relief. This area could contain larger or more continuous and better mineralized skarn lenses and/or better molybdenum values at depth. It is possible that this general area could be the locus of a blind, molybdenum-bearing porphyry stock.

respectfully submitted.

Per, Dawson and Assoc. Ltd.

James H. Dawson, P. Eng.

Appendix A
Personnel

Personnel.

J. M. Dawson, P. Eng

Geologist

Sept 2,
Sept 26, 27, 28, 29
1977
Jan 29, 30, 31, 1977
Feb 1, 2 1977
11 days

W. Greenwall

Geologist

Jan 26, 29, 30
Feb 1, 2 1977
5 days.

M. Dawson

Fieldman

Sept 2 - 27 in
26 days.

S. Williams

Fieldman.

Sept 2 - 27 in
26 days.

Appendix B
Statement of Expenditure.

Statement of Expenditures.

① Labour:

J. M. Dawson, P. Eng.
10 days @ \$175/day \$ 1750.00

W. Yunnold, B.Sc.
~~10~~ 5 days @ \$110.00/day 550.00

M. Dawson
26 days @ \$40/day 1040.00

S. Williams
26 days @ \$40/day 1040.00

\$ 4380.00

② Expenses and Disbursements

(a) Assays and Geochemical analyses \$ 2039.40

(b) Air Photos and base map preparation 115.75

(c) magnetometer rental 300.00

(d) room and board.
~~30 man~~ 57 man days @ \$30/man/day 1710.00

(e) Truck Rental 855.40

(f) Field supplies and maps. 157.65
~~157.65~~

(g) Xerox, blueprints, telephone, freight,
secretariat, and etc. 248.60

\$ 5426.00

Total Cost of Programme

\$ 9806.00

Appendix C
References.

References.

Campbell, R. B. (1966): Adams Lake Map Area; CSC ~~Map~~
Map 5-1966

Annual Report of B.C. Minister of Mines 1966.

Personal Communication:

Mr. A. F. Reeve
Vancouver, B.C.

Mr. H. Rottacker
Clearwater, B.C.

Mr. E. Grosshander
Vancouver, B.C.

Appendix D
Writer's Certificate

CERTIFICATE

I James M. Dawson of Kamloops, British Columbia, Hereby Certify That:

- (1) I am a geologist employed by Ken, Dawson and Associates Ltd. of Suite #4, 219 Victoria Street Kamloops, B.C.
- (2) I am a graduate of the Memorial University of Newfoundland — B.Sc. (1960), M.Sc. (1963), a fellow of the Geological Association of Canada and a Member of the Association of Professional Engineers of British Columbia. I have practised my profession for 15 years.
- (3) I am the author of this report which is based on an exploration programme carried out on the subject property under my supervision.

Ken, Dawson & Associates Ltd.

James M. Dawson, M.Sc., P. Eng.
Geologist

February 2, 1979
Kamloops, B.C.