COMINCO LTD.

- GEOLOGICAL REPORT -
E & N LAND GRANT (SOUTH BLOCK)
1968
NTS: 92B & C


Cominco

C O M I N C O L T D.

EXPLORATION WESTERN DISTRICT

GEOLOGICAL REPORT
E & N LAND GRANT (SOUTH BLOCK)
1968
NTS: 92 B & C

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GGB:mk
April 11,1969
Vancouver, B.C.

C O M I N C O L T D.

EXPLORATION WESTERN DISTRICT

GEOLOGICAL REPORT
E & N LAND GRANT (SOUTH BLOCK)
1968
NTS: 92 B & C

SUMMARY AND CONCLUSIONS

Cominco entered into agreement with CPOG in 1965 to carry on exploration over the South Block of the E & N Land Grant on Vancouver Island. Since then, prospecting and reconnaissance work was carried out along the most attractive geological contacts and around known prospects. Detailed mapping and soil sampling was carried out over specific areas selected by the reconnaissance work.

The areas receiving attention in 1968 are as follows:-

A. Cowichan Lake North -(Allies Molybdenum)

Molybdenum showings are located within a pluton of Saanich intrusives at/near the contact with Sicker volcanics and sediments. A program of detailed and reconnaissance mapping and geochemical soil sampling was completed over selected areas.

The work indicates that the mineralization does not extend beyond the previously known limits.

B. Cowichan Lake South

Several copper showings are located within Karmutsen volcanics near the contact with overlying Sutton limestone. Saanich intrusives are present within the area. A program of reconnaissance and detailed geological mapping, soil sampling, and a limited magnetometer survey was carried out in the area.

No encouragement was received.

Since no targets remain to warrant further work at this time and no areas will be brought to lease, it is recommended that Cominco terminate the agreement with CPOG-Mitsubishi.

INTRODUCTION

A. General Statement

Cominco entered into agreement with Canadian Pacific Oil and Gas (CPOG) in March of 1965 and obtained the right to explore the South Block of the E & N Land Grant on Vancouver Island. In March of 1967, an amendment to the agreement gave Mitsubishi Metal Mining Co. Ltd. the right to participate.

B. Previous Exploration

Most of the South Block, in the four years, underwent prospecting, geological mapping, geochemical sampling, and geophysical work by Cominco. In the first year (1965), reconnaissance work was conducted on the Sicker shear zone and the northeastern portion of the block. The second year (1966), reconnaissance and detailed work was carried out on the Sicker shear zone, and reconnaissance work was carried out in the western and northwestern portion of the block. The third year (1967), work consisted of reconnaissance and detailed work on (1) the Sicker shear zone, (2) an area south of Cowichan Lake, (3) an area north of Cowichan Lake, and (4) an area in the extreme southern portion of the block.

Investigation by others of the area prior to Cominco's work, was mainly in and around certain prospects scattered throughout the block.

C. Location

The E & N Land Grant lies on the eastern half of Vancouver Island, extending from just north of Victoria at the south to just north of Campbell River at the north. The Land Grant is divided into three blocks--North, Central and South. The agreement covers only the South Block, that land lying south of latitude 49°00'N, and comprising an area of approximately 600,000 acres.

NTS: 92 B and C
Mining Division: Nanaimo and Victoria
Province: British Columbia.

The topography is varied in the South Block with low, rounded heavily treed hills in the south to steep, rugged, and forested mountains reaching 5000 feet in the north. Vegetation is intense over the greater portion of the block.

Access to the area is by a network of logging roads. In the more remote areas, it was necessary to use helicopters or gain access by foot.

EXPLORATION AND DEVELOPMENT

A. Cowichan Lake North - Allies Molybdenum

1. Geological Mapping

Reconnaissance and detailed mapping was carried out during the first part of August and the latter part of September. Primary objectives were to check mode of occurrence of mineralization and evidence of structural features with which mineralization might be related.

The reconnaissance mapping investigated the pluton to the southwest and to the north of Mount Buttle. Specific attention was paid to the Saanich-Sicker contact. See plate CPOG-68-1.

Detailed mapping was carried out over the Saanich-Sicker contact near the summit of Mount Buttle. A 2300-foot picketed base line was established at the center of the area. Chain and compass tie in to the base line provided mapping control. Samples were taken from selected zones to indicate the extent of mineralization. See plate CPOG-68-2.

2. Geochemical Work

In conjunction with the reconnaissance mapping, soil samples were taken along the drainage and analyzed for Cu and Mo. Samples were taken from both sides of the streams, two to four feet above creek bottom. It was considered that soil samples rather than silt samples would give more reliable information because of the high angle of slope and rapid runoff which would prevent silt accumulation in situ.

Some high Mo values (10 to 120 ppm) were obtained near the intrusive-volcanic contact. Mapping indicates these anomalous values to be related to quartz veins carrying sparse and erratic amounts of chalcopyrite and molybdenite. Generally, the soil sampling indicates a moderate-high background in metal values. See plate CPOG-68-1.

The soil samples were analyzed with Cominco's atomic absorption unit in Vancouver.

B. Cowichan Lake South

1. Geological Mapping

Reconnaissance and detailed mapping were carried out during August. The purpose was to follow up on widespread mineralization encountered in the latter stages of the 1967 program.

The reconnaissance mapping was carried out in a few scattered areas newly opened by logging operations during the past year. Additional mapping on a scale of 1" = $\frac{1}{4}$ mile was carried out on the Lens Mountain area. Control was gained by a logging company map and by aerial photographs. See plate CPOG-68-3.

A small grid, 1000 X 1500', was picketed at 100' intervals over the small skarn zone on the southeast slope of Lens Mountain and was mapped on a scale of 1" = 200 feet. See plate CPOG-68-4.

2. Geochemical Survey

Reconnaissance soil samples were taken along drainage systems in conjunction with the quarter mile mapping. A well developed B horizon is present in most of the area at a depth from 4 to 12 inches. The sampling indicates low metal content with a few anomalous readings to 150 ppm Cu present, which can all be related to known mineralization. See Plate CPOG-68-3.

Approximately 60 samples were taken on a 100 foot spacing to cover the small skarn and possible extensions. Again, the B horizon was sampled and all analyses were made by Cominco. See plate CPOG-68-4.

3. Geophysical Survey

A magnetic survey using a Sharpe MF-1 Fluxgate magnetometer was carried out on the grid over the skarn. Readings were taken every 100 feet along the picket lines.

Higher than normal readings are reflected by the limestone-volcanic contact, with the volcanics carrying appreciably more magnetite than the limestone. See plate CPOG-68-4.
Conclusion: Limited geological mapping, geochemistry, and geophysics conducted over the small skarn zone, indicated the zone to be limited to the area of discovery.

GEOLOGY

A. Regional

The area north of Cowichan Lake is underlain mainly by Permian and older volcanics and sediments of the Sicker group. The volcanics are primarily massive, but include amygdaloidals and flow breccias. The volcanics are overlain by thin bedded non-calcareous sediments and limestones.

The area south of Cowichan Lake is underlain by Triassic volcanics (Karmutsen) and limestone (Sutton), mainly, both of the Vancouver group.

These Sicker and Vancouver group rocks are deformed into northwesterly trending folds, many of which are overturned. A major N.W. fault trace lies in Cowichan Lake, with many minor faults also paralleling this northwesterly trend.

Granitic masses intrude both Sicker and Vancouver group rocks and range in composition from a quartz-diorite to granites. These intrusives are related to the Saanich granodiorite of Jurassic age.

Detrital Upper Cretaceous sediments of the Nanaimo group, unconformably overlie the older rocks, mainly on the east coast. They are moderately folded along westerly trending axes and are cut by steeply dipping, westerly to northwesterly trending faults.

A few gabbroic rocks intrude the aforementioned rocks near the east edge of Cowichan Lake. They are considered to be Tertiary, due to their similarity to the intrusives in the Sooke area.

B. Rock Types

1. Sicker Group

(a) Volcanics

These volcanics, considered as flows, are massive, light green to grey-green, and less commonly purplish on fresh surfaces. They weather dark grey-green, and rarely purplish or brown. Both aphanitic and porphyritic varieties are common. Small feldspar phenocrysts and hornblende are present in some porphyritic varieties. Chlorite, quartz, calcite, and epidote amygdules are common locally and are generally less than 5 mm in diameter and are present in both the aphanitic and porphyritic varieties.

(b) Breccias and Massive Sediments

Pyroclastic breccias and massive tuffaceous greywackes are present on the south and west slope of Mount Buttle. Both rock types are green or grey and are composed of crystal and rock fragments ranging from less than a millimeter to one foot across. Finer matrix material may or may not be present. Both coarse and fine fragments are mainly basaltic, fine grained clastics, and cherty sediments derived from the surrounding and underlying rocks.

(c) Thin Bedded Sediments - Non-Calcareous

On the east slope of Mount Buttle, cherty and feldspathic tuffs and fine grained tuffs are in contact with the intrusive.

The cherty tuffs are mainly cream colored to black or green on fresh surfaces. They become whiter on weathering and have a porcelaneous texture and break with a concoidal fracture. Chert and feldspar crystals vary widely in proportion, so that the rocks range from almost a pure chert to a feldspathic crystal tuff. Alternating bands, 1/4 to one inch wide, of two colors either grade into one another or are sharply defined.

The fine-grained tuffs are grey to black on fresh surfaces and whiter on the weathered surface. Individual beds range from 1/2 to four inches in thickness.

2. Vancouver Group

(a) Karmutsen-Franklin Creek Volcanics

These volcanics are flow rocks, dark green to black, fine-grained to aphanitic, characteristically weathering brown. Locally they are porphyritic with phenocrysts of feldspar and pyroxene.

Quartz, calcite, epidote, and chlorite amygdules are common with an average size of about 1/8 of an inch in diameter. The amygdules resist erosion and often stand up in relief on weathered surfaces.

Pillow structures are common in certain areas. The pillows are roughly ellipsoidal and range from about 10" to three feet in longest dimension. The pillows are usually finer grained than the amygdaloidal rocks. The presence of the pillows and the brown weathered surface, serve to distinguish these volcanics from the more massive Sicker volcanics.

(b) Sutton Limestone and Related Sediments

The Sutton limestone is a collective term to include all the intercalated limestones and sediments of the Upper Vancouver Group on South Vancouver Island.

The limestones are fine to medium grained, grey, grey-brown, or grey-blue and sometimes argillaceous. They are usually massive or vaguely banded, containing small irregular masses of chert, and are cut by veinlets of white calcite.

The sediments overlying the limestones are grey to green to brown argillaceous sediments which are again overlain by fine-grained volcanic breccia and pyroclastics.

The argillaceous and some limestone beds are usually prolific with several types of corals, bryozoans, gastropods, and benthonic fauna, by which Tozer (1967) has suggested the Sutton to be of the Upper Suessi zone, which is the uppermost of the Norian stage of the Upper Triassic. If this correlation is correct, the Sutton is not the equivalent of the Quatsino, but equivalent to the limestones of the Lower Bonanza of north Vancouver Island.

(c) Saanich Granodiorite

The intrusives encountered this past season range from quartz-diorite to granite with considerable assimilation apparent at contacts with the surrounding rocks. These intrusives have all been called Saanich and are probably of Upper Jurassic age.

At Allies Molybdenum, the granodiorite is medium grained, grey to dark grey on fresh surfaces, homogeneous and composed of quartz, feldspars, hornblende, biotite, and minor magnetite. Altered rocks are green-grey in color. The granodiorite grades into a granite and then to a border facies called "aplogranite", near the Sicker rocks. The aplogranites are white, medium grained, equigranular, and commonly rust stained siliceous rock with mafics less than 5%. Contacts between the granodiorite and aplogranites are gradational over only a few tens of feet. It is felt the aplogranite is genetically related to the granodiorite and forms a roof facies of the granodiorite.

The intrusives south of Cowichan Lake are similar to those at Allies Molybdenum, but the intrusives here show relatively fewer mafics and more feldspars. Felsitic dykes of probable Upper Jurassic age, form offshoots of the Robertson batholith to the east.

C. Metamorphism and/or Alteration

At Allies Molybdenum, alteration in volcanics has developed hornblende, epidote, and minor biotite. Alteration decreases away from the intrusive, with the most intense alteration occurring within 50 feet of the contact between the volcanics and the intrusive.

South of Cowichan Lake a skarn zone has been developed at the base of the limestone. Silicification and bleaching of volcanics was quite evident in and around the small mineralized shears.

D. Structure

1. Cowichan Lake North - Allies Molybdenum

The granodiorite is massive and displays no linear or planer structures. However, the intrusive body has probably been subjected to the faulting and deformation that affected the younger Nanaimo group.

Numerous sets of joints were recorded from a variety of locations within the intrusive. Two prominent sets of attitudes average N35°W and N45°E, with both sets dipping near vertical. No slickensides were noticed on any of the joints. The main drainage on the north slope of Mount Buttle has incised deep canyons, which based on air photo interpretation and ground work, have been mapped as faults. The intersection of these N.E. trending faults and the NW trending fault at the top of the mountain was considered as a possible ore controlling feature. However mapping and investigation did not support the hypothesis.

The quartz sulphide veins conform to the northwesterly jointing direction with most veins dipping steeply to the west.

2. Cowichan Lake South

The overall fabric of the area has a northwesterly trend with a moderate northeasterly dip. The volcanics, limestone and sediments are moderately folded and disturbed away from the intrusives; near intrusives they are highly disturbed.

In the Lens Mountain area, jointing has two preferred directions; an east-west strike with a near vertical dip and a northwesterly strike with a moderate southwest dip.

Air photo study revealed northwesterly trending linears, which ground checks indicate to be faults. Mineralization occurs in fractures in close proximity to these faults.

Felsitic dykes conform mainly to the northwesterly joint system.

E. Mineralization

1. Cowichan Lake North - Allies Molybdenum

Sulphides occur in a variety of places on the property in both the granodiorite and volcanics, but mainly in the granodiorite. Quartz-sulphide veins ranging from 1/4" to 4 feet in width, contain the main mineralization. Also, minor amounts of sulphides were observed as disseminations in the intrusive.

The main sulphides are pyrite, molybdenite, chalcopyrite, and minor pyrrhotite. Pyrite is several times more abundant than the other sulphides, with molybdenum forming as scattered rosettes and chalcopyrite as scattered flecks.

2. Cowichan Lake South

Sulphides occur mainly in two ways in the area:

(a) In Shears

Local sheared volcanics carry small high grade pods of chalcopyrite with pyrite and magnetite. Oxides as malachite and chalcocite were observed in some shears. Also, minor amounts of disseminated pyrrhotite and/or chalcopyrite were seen in other shears.

(b) Skarn

At one locality on the southeast slope of Lens Mountain, pyrite, chalcopyrite and magnetite were observed. Only minor amounts of sulphides occur and show no continuity.

RECOMMENDATIONS

It is recommended that Cominco terminate the agreement with CPOG-Mitsubishi. The overall agreement will terminate if Cominco does not lease ground during 1969.

ATTACHMENTS

(1) Location Map.
(2) Plates CPOG-68-1 to 4 inclusive.
(3) Expenditure Estimate.

REFERENCES

(1) B.C.D.M. Bull 37, J.T. Fyles.
(2) Cominco Reports 1965, 1966, 1967
(3) G.S.C. Mem. 96, C.H. Clapp.
(4) G.S.C. Mem. 156, E.T. Tozer

C O M I N C O L T D.

C.P.O.G. SOUTH EXPLORATION EXPENDITURES

MARCH 1 1968 TO FEBRUARY 28, 1969

AS PER E & N RAILWAY BELT CONCESSION AGREEMENT

DATED MARCH 1 1965, AS AMENDED

Geological work	$ 5,912.71
Geophysical work	241.84
Geochemical work	1,379.47
Transportation	1,146.35
Camp costs	847.01
Administrative services	952.74 ✓
	$ 10,480.12

R. Craig:jf
Montreal Office
March 25, 1969
Copies: Canadian Pacific Oil & Gas Ltd. (2)

James B. Jacka
ACCOUNTANT

C O M I N C O L T D.

C.P.O.G. SOUTH EXPLORATION EXPENDITURES

C.P.O.G. CURRENT PARTICIPATION LIABILITY

AS PER E & N RAILWAY BELT CONCESSION AGREEMENT

DATED MARCH 1, 1965, AS AMENDED

Cominco expenditures during initial permit year	$ 12,438.48
Cominco expenditures during second permit year	55,306.28
Cominco expenditures during third permit year	18,698.61
Cominco expenditures during fourth permit year	10,480.12
Total Cominco expenditures to February 28, 1969	$ 96,923.49

C.P.O.G's 45% portion of expenditures to February 28, 1969	$ 43,615.57
Less C.P.O.G. payments received	41,678.27
C.P.O.G. portion of expenditures payable	$ 1,937.30

R. Craig
Montreal Office
March 25, 1969
Copies: Canadian Pacific Oil & Gas Ltd. (2)

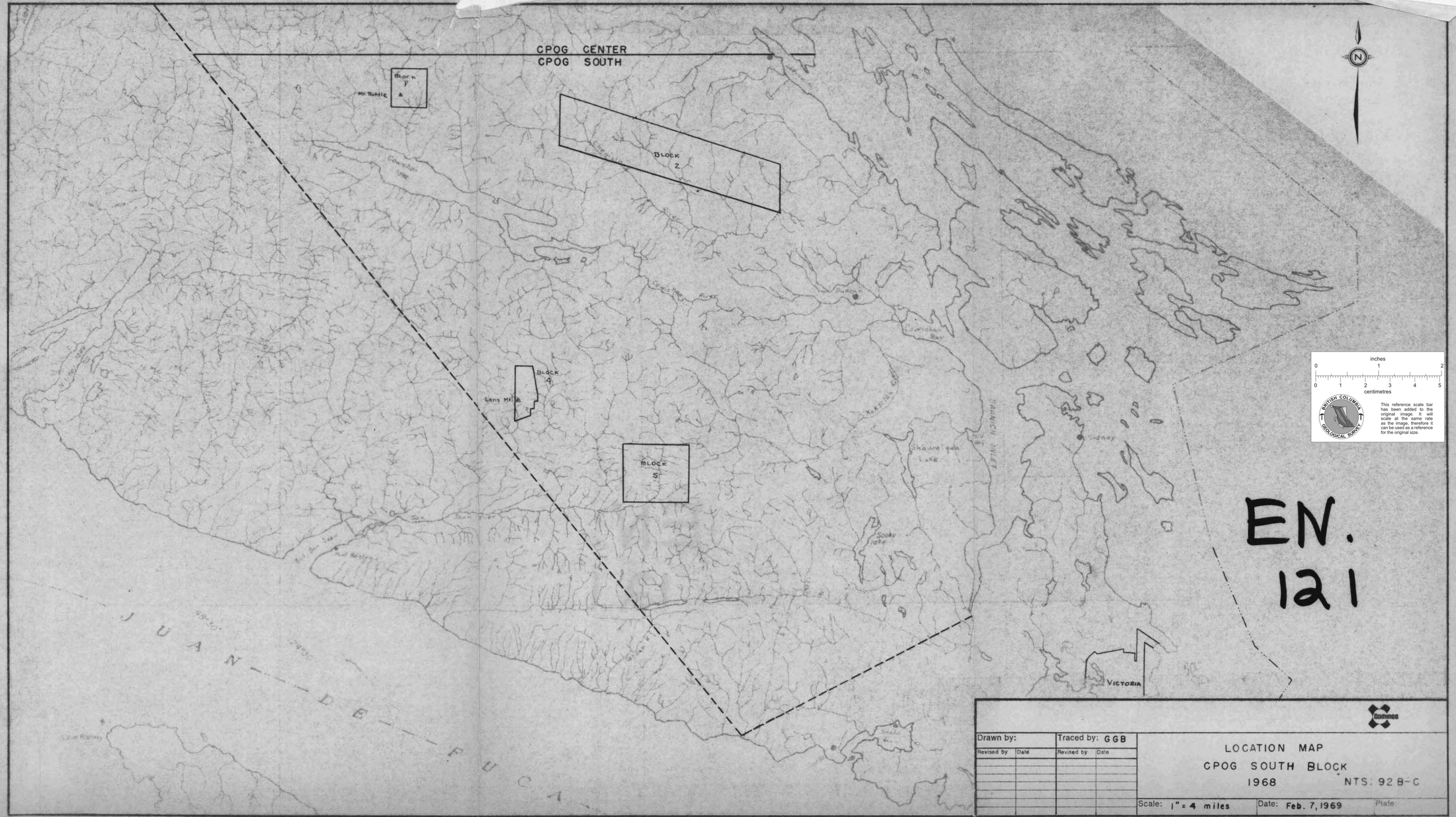
James D. Jicks
ACCOUNTANT

Report By G.G. Booth
G. G. Booth

Endorsed By J. Richardson.
J. Richardson

GGB:mk
April 11, 1969.
Enclosures
Distribution:

C.P.O.G.	2
Montreal	2
Western District	2
Field	1



EN. 121

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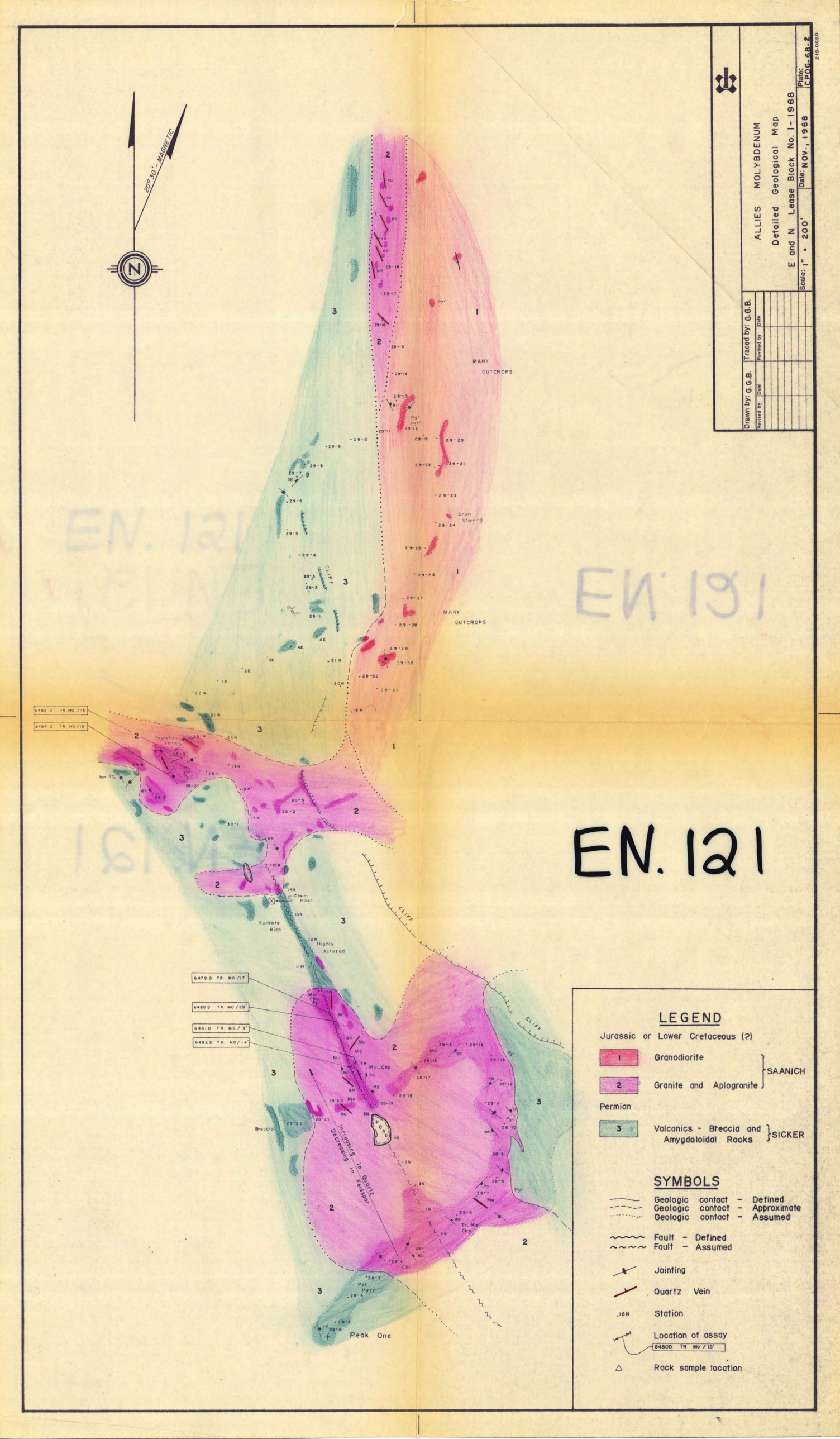
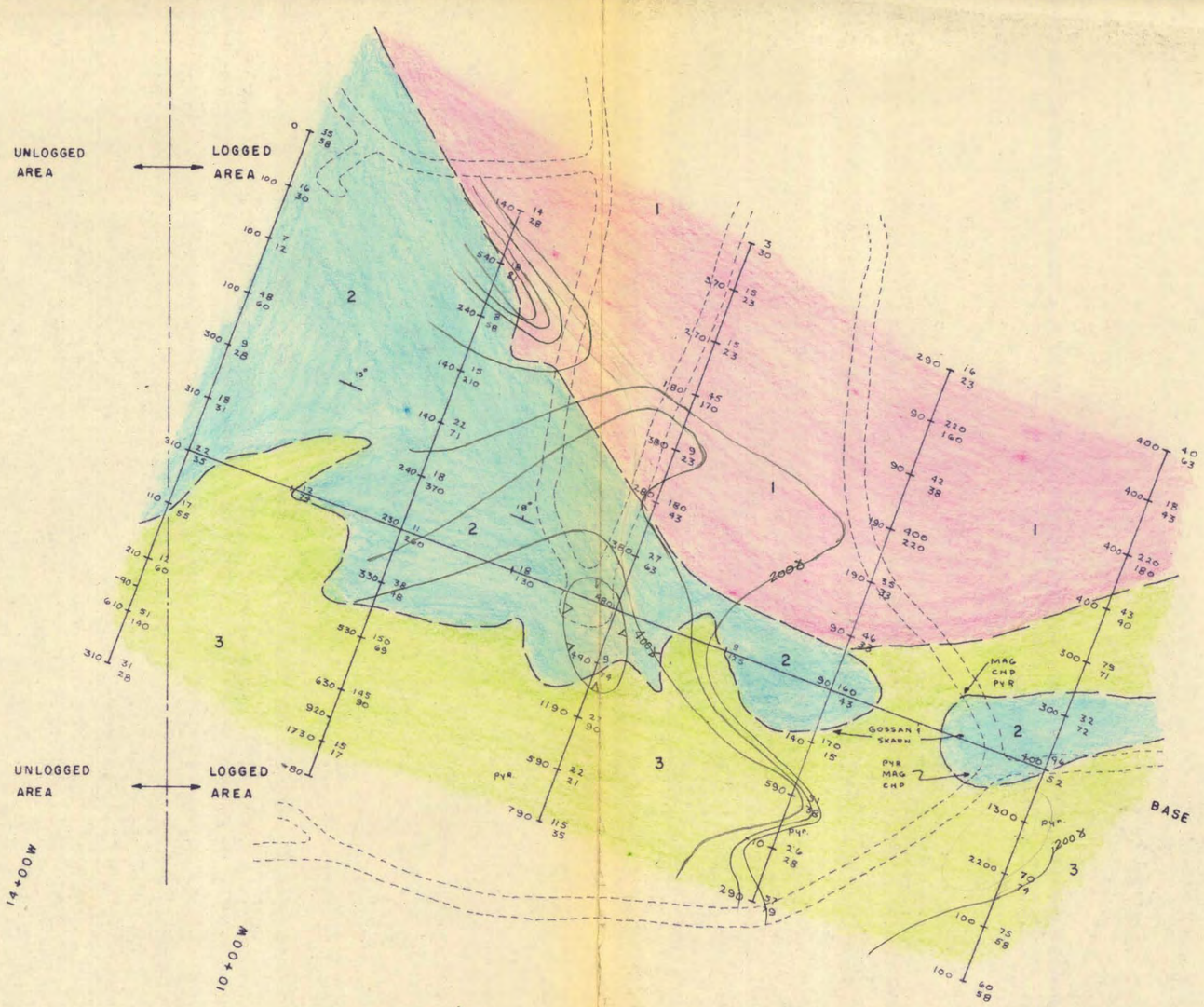
Revised by	Date	Revised by	Date

LOCATION MAP
CPOG SOUTH BLOCK
1968 NTS: 92 B-C

Scale: 1" = 4 miles | Date: Feb. 7, 1969 | Plate:


20°30'- MAGNETIC
N
ALLIES MOLYBDENUM
Detailed Geological Map
E and N Lease Block No. 1-1968
Scale: 1" = 200'
Date: NOV., 1968
Plate: CPDG-68-2
210-0680
Drawn by: G.G.B.
Traced by: G.G.B.
Revised by
Date
MANY OUTCROPS
Iron Staining
CLIFF
Claim Post
Epidote Rich
Highly Altered
Increasing in Quartz Decreasing in Feldspar
Breccia
Peak One
EN. 121
LEGEND
Jurassic or Lower Cretaceous (?)
1 Granodiorite
2 Granite and Aplogranite
SAANICH
Permian
3 Volcanics - Breccia and Amygdaloidal Rocks
SICKER
SYMBOLS
Geologic contact - Defined
Geologic contact - Approximate
Geologic contact - Assumed
Fault - Defined
Fault - Assumed
Jointing
Quartz Vein
.16N Station
Location of assay
6480D TR. Mo /15'
Rock sample location



Legend

JURASSIC OR LOWER CRETACEOUS

1 — Granodiorite - Saanich

TRIASSIC

2 — Limestone – Sutton

3 — Volcanics – Karmutsen

} VANCOUVER GROUP

Symbols

Geological Contact

Attitude of Bedding

Geophysical: 300 — 8 copper / 58 zinc

Geochemical: 100 — 20 copper / 100 zinc

Logging Road

inches
0 1 2
0 1 2 3 4 5
centimetres

BRITISH COLUMBIA GEOLOGICAL SURVEY

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

EN. 121

PROPERTY FILE

Cominco

Drawn by: G.G.B.		Traced by:	
Revised by	Date	Revised by	Date

LENS MOUNTAIN AREA
DETAILED WORK
Geological, Geophysical, Geochemical
Lease Block No. 4 — 1968

Scale: 1 INCH = 200 FEET | Date: JANUARY 20, 1969 | Plate: CP06-68-4

COMINCO 318-8648

EN. 131

124° 20' W

Lease Boundry

GREEN CREEK

JUMP CREEK

DELPHI LAKE

SKYLINE

SKYLINE 2

Approx. locations Feb/79

See Plate CPOG-68-2

Peak One

MT BUTTLE

Peak Two

Peak Three

MCKAY CREEK

124° 20' W

LEGEND

Jurassic or Lower Cretaceous (?)

1	Granodiorite	SAANICH
2	Granite and Aplogranite	SAANICH

Permian

3	Volcanics - Breccia and Amygdaloidal Rocks	SICKER
4	Sediments - Thin Bedded and Cherty Tuffs	SICKER

SYMBOLS

- Geological Contact
- Fault - Defined
- Fault - Assumed
- Attitude of Bedding
- Jointing
- Quartz Vein
- Adit
- Shaft
- Mineralization
- 7-20-1 Rock Sample
- Geochemical Soil Sample
- Lease Boundry
- Road
- Mountain Peak
- 0 / 120,10 Geochemical Results Cu,Mo (parts per million)

EN. 121

Reference: Bul. 37, B.C. Dept. Mines, J.T. Fyles

Commpa

Drawn by: G.G.B.		Traced by: G.G.B	
Revised by	Date	Revised by	Date

ALLIES MOLYBDENUM
Reconnaissance
Geological and Geochemical Map
E and N Lease Block No. 1 - 1968

Scale: 1" = 800' Date: October 28, 1968 Plate: CPOG-68-1

inches 0 1 2
centimetres 0 1 2 3 4 5

BRITISH COLUMBIA GEOLOGICAL SURVEY

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

Sample 6468 D
0.17 % Cu/5'

See Plate CPOG-68-4

FROST LAKE

LENS MTN.

FOSSILS

GATE

To Post Revenge

To Cowichan Lake

Legend

JURASSIC OR LOWER CRETACEOUS

1 — Granodiorite, Quartz Diorite, Diorite } SAANICH

TRIASSIC AND/OR YOUNGER

2 — Sutton Limestone

3 — Sediments of Sutton Limestone

4 — Karmutsen Volcanics – Andesite and Basalt Flows

} VANCOUVER GROUP

Symbols

- Geological Contact
- Fault – Defined
- Fault – Assumed
- Attitude of Bedding
- Shearing
- Geochemical Soil Sample (△ 74/50 Cu/Zn)
- x Sample Location
- o Mineralization
- Road
- Stream

inches
0 1 2
0 1 2 3 4 5
centimetres

BRITISH COLUMBIA GEOLOGICAL SURVEY

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

EN. 121

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Revised by	Date	Revised by	Date

LENS MOUNTAIN AREA

Geological And Geochemical Map

East and North Lease Block No. 4 – 1968.

Scale: 1 INCH = 1/4 MI. | Date: NOVEMBER, 1968 | Plate: CP06-68-3