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CONSULTING GEOLOGICAL ENGINEERS

BENTALL CENTRE, VANCOUVER, B.C. 688-2568

POST OFFICE BOX 1708
WHITEHORSE, Y.T.

REPORT ON MAPPING AND SAMPLING

BELL CLAIMS, MCNEIL RIVER AREA, YUKON

CLAIM SHEET 105-G-5

FOR

CALTOR SYNDICATE

A. C. Ogilvy, P.
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September 1, 1970

Field work done
July 30 - August 18, 1970

Table of Contents

Illustrations

INTRODUCTION

Geological mapping, prospecting, soil sampling on a 400 foot grid, rock trenching and sampling were carried out on the Bell claims between July 30 and August 18. In addition, most of the existing claim posts were located and tagged, and four new claims were staked over an unprotected showing. This report describes the results of these activities.

LOCATION AND ACCESS

The Bell claim group is situated in the St. Cyr Range, Yukon, at 61°28'N and 131°46'W, within NTS claim sheet 105-G-5. The claims lie on a ridge ten miles north of McNeil Lake, and two miles north and west of McNeil River. Ross River, the nearest settlement, is 45 air miles to the northwest. McNeil Lake is suitable for landing float equipped aircraft, and a small airstrip is located on the Ross River - Watson Lake road near Mink Creek, 24 air miles northeast of the property. Helicopters are the only practical means of access. All showings are within easy walking distance of landing sites on the ridge.

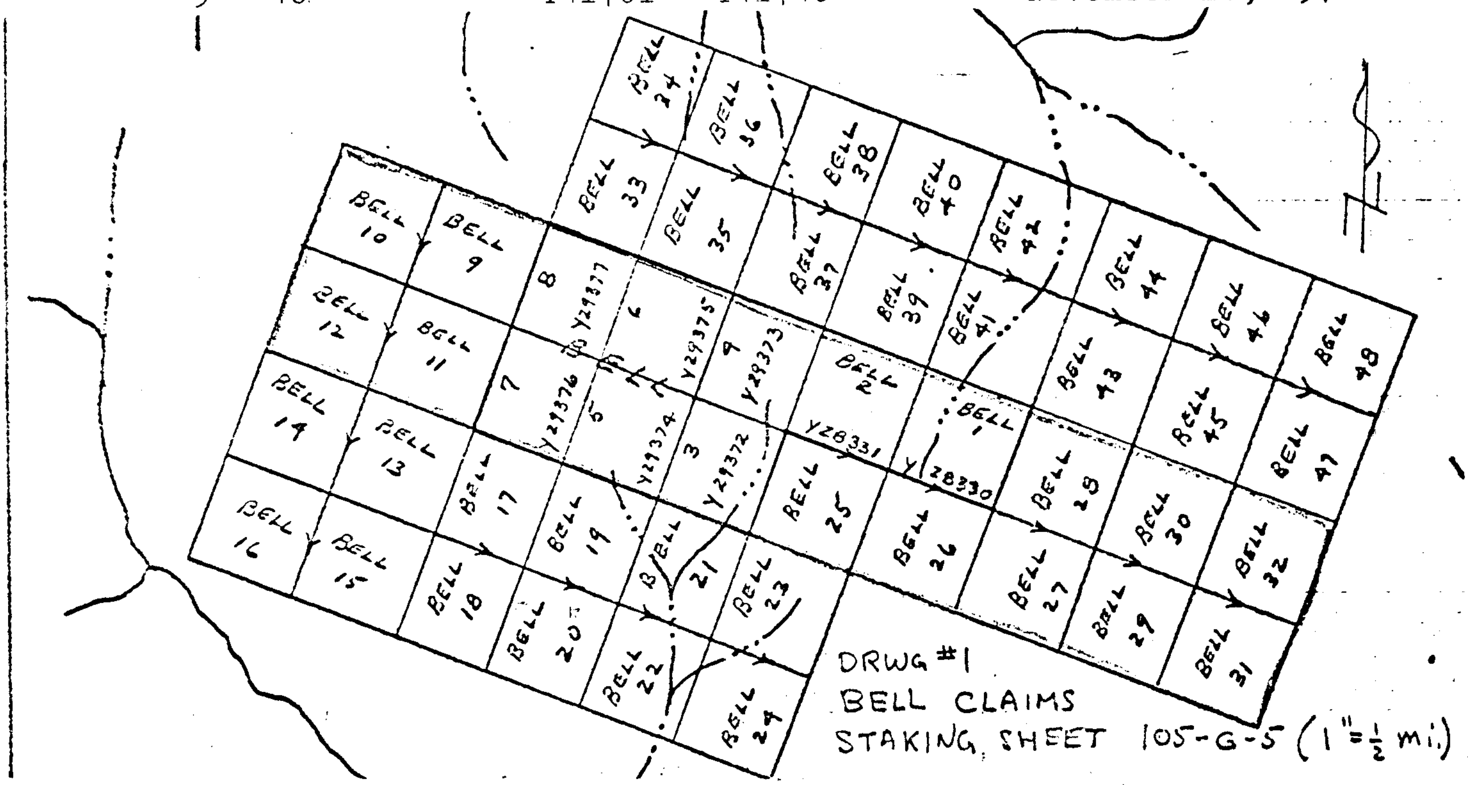
HISTORY

Nothing is known of the early history of these showings. Claim posts dating back to 1956 were found, and old hand trenches which probably are of the same age.

PROPERTY

The Bell group consists of 48 unpatented claims, which are registered at Watson Lake as follows:

Name	Grant No's	Expiry
Bell 1 - 2	Y28330 - Y28331	~~April 10~~ Nov 4, 1970
3 - 8	Y29372 - Y29377	November, 4, 1970
9 - 48	Y41701 - Y41740	November 18, 1970



DRWG #1
BELL CLAIMS
STAKING SHEET 105-G-5 (1" = ½ mi.)

ROCK EXPOSURE AND TOPOGRAPHY

Outcrop above treeline (4500 ft elevation) averages approximately 20 per cent. Including talus and scree, rock exposure above this elevation is about 50 per cent. Much of the outcrop on the northern flank of the ridge is inaccessible because of very steep cirque walls and cliffs. Best exposure is on side ridges leading to the northern part of the main ridge. On the main ridge, topography is subdued, with steep but rolling hills covered by scree and alpine vegetation. Below treeline, outcrop is confined to creek beds and total rock exposure is below 10 per cent. Much of this rock has been transported southerly from the cliffs by glacial action. Snow cover at higher elevations is scant by late July. Frequent snowstorms and gale force winds were encountered in August.

REGIONAL GEOLOGY

(Reference: GSC Preliminary Mapsheet 105-G - Finlayson Lake)

The property lies 20 miles southwest of the Tintina Fault, which separates folded and faulted Paleozoic strata to the southwest from granitic and metamorphic rocks to the northeast. The Bell claims are underlain by a Mississippian(?) or earlier, highly faulted, tightly folded, and sheared sequence of volcanic and sedimentary rocks. It has been mapped by the GSC as unit 6a, but more detailed mapping by the writer suggests that the rocks belong to GSC units 6a, 6b, 6c and possibly 5. No intrusive rocks were found, although minor quartz, calcite, and barite veining is present.

ROCK TYPES

(Refer to the accompanying geology map)

A brief description of rocks encountered on the property, in order of decreasing age, follows. Volcanic rocks are subdivided into three units (1, 6 and 7) generally on the basis of subtle differences in color over a large area rather than on genetic features, as the units, mainly aphanitic to fine-grained tuffs and flows, cannot be separated physically or chemically.

Unit 1 - Light to dark green tuffs and flows, usually aphanitic to very fine-grained. Phenocrysts, amygdules, and large tuffaceous fragments are not common, but when present they are commonly aligned. Beds are thick. Most rocks are more or less altered to greenstone. Lapilli tuffs, having rounded hornblende fragments 1 cm in diameter in a greenstone matrix, occur widely. Volcanic breccia and agglomerate, with light green fragments in a dark green to dark grey matrix are minor members of this unit. Maroon and grey volcanics are scarce.

Unit 2 - Dark green laminated to thin-bedded fine greywacke. Members vary in color from black to green, and occasionally brown. Sedimentary structures such as graded bedding and load casts are common.

Unit 3 - Yellow weathering chert and cherty shale. Beds are from 3 to 6 inches thick and commonly have thin black shaly partings. Fresh color ranges from light brown, green and grey to black. Pure chert is overlain by a thicker cherty shale member, which grades into unit 4. Pyrite and limonite are common.

Unit 4 - Black, thin-bedded, fissile shale and minor limy shale. The limy member appears to overly the other.

Unit 5 - Grey phyllite and phyllitic shale, often interlayered with recrystallized calcite. This unit is probably a sheared equivalent of unit 4.

Unit 6 - Maroon to dark grey volcanic rocks. Aphanitic to fine-grained tuffs and flows predominate. These rocks are rarely porphyritic or amygdaloidal, and are thick bedded. Greenstone and lapilli tuffs are minor members of this unit. Volcanic breccia and agglomerate are more common than in unit 1 but less common than in unit 7. Fragments of these members may be maroon or light to dark green, but the matrix is invariably maroon to dark grey. Black and maroon feldspar porphyries are rare but distinctive members of unit 6. Southeast of Wombat Creek unit 6 contains rounded inclusions of pink feldspar porphyry.

Unit 7 - Pillow lava, agglomerate, volcanic breccia. Pillows are maroon and fragments may be maroon or green in a dark grey to maroon and rarely green matrix. Pillows average one foot in diameter, while fragments in the breccia and agglomerate are variable in size and are usually aligned. Maroon and dark grey tuffs and flows are a major constituent of unit 7.

Unit 8 - Interbedded greywacke, shale, limestone, chert and sandstone. Thin beds of green greywacke, brown chert and sandstone underly a thicker sequence of thin-bedded shale and limestone which weathers differentially. Yellow-brown shale bands are more resistant than grey limestone.

Units 1 through 7 can all be correlated with GSC units 6a and 6b. Unit 8 may be equivalent to GSC unit 6c. Units 3, 4 and 5, particularly where they outcrop on the ridge top south of Wombat Creek may be GSC unit 5 which has been thrusted over the younger volcanic units.

Miscellaneous rock types not placed in units include veins, mylonite and fault breccias. Three types of veins are found - calcite, quartz, and barite (in decreasing order of abundance). Sedimentary units are generally free of veins whereas volcanic units, particularly near the ridge top, are highly veined. Small veins less than 1 inch thick occur as fracture healings while larger veins, up to 2 feet thick, have forcibly invaded and brecciated country rock. Relative ages of veins are calcite before quartz before barite. All large veins are medium to coarse-grained, grading to fine-grained near vein margins. Small veins are fine-grained. Yellow weathering medium to coarsely crystalline calcite has healed fault zones, particularly major northwest trending faults. Fine siliceous breccias and mylonites, well cemented by quartz or calcite, are abundant in fault zones. These rocks are generally well foliated and dark in color.

ALTERATION

Volcanic rocks are probably all partly altered, but owing to their very fine grain size, alteration products are unknown.

Chlorite rich greenstones, originally mafic phenocrysts and tuffaceous fragments altered to chlorite, epidote, calcite and quartz, and hematite along fractures and in zones (oxidized flow tops?) are common features of unit 1. Units 6 and 7 are more weakly altered. Feldspar phenocrysts are fresh and mafic phenocrysts have only incipient chlorite alteration. Amygdaloidal members of all three units frequently contain epidote, quartz and calcite. Shear zones cutting each unit are invariably highly altered, resulting in soft, green, well foliated chlorite-calcite rocks. Similarly, sedimentary rocks appear only weakly altered. Shale near shear zones has been altered to foliated and crenulated phyllitic rocks rich in calcite.

STRUCTURE

Predominant trends are northwest to west-northwest, parallel and subparallel to the Tintina Fault. Beds are right side up, strike fairly uniformly at 110° to 125°, and dip 50 to 60° south-southwesterly. Exceptions to this uniformity of bedding occur only in the folded sediments on the ridge top (i.e. the chert south of Wombat Creek and shale and limestone west of Drillnot Creek). More massive and thick-bedded volcanic units are more competent than the sediments, and as a result are generally highly sheared and fractured while sediments are tightly folded.

Rock units 1 to 8 form a conformable sequence which has been highly complicated by faulting subparallel and perpendicular to bedding. The only near complete section is up the west fork of Cobra Creek continuing up the side ridge east of showing 1. Faults in the bedding plane have produced much thinning of units. The large body of chert south of Wombat Creek is lithologically similar to the smaller chert outcrops north of the ridge. This unit has been repeated (along with others) on top of the ridge by a large northwest striking fault. Folding has increased its apparent thickness. Another possibility, however, is that this large chert body is GSC unit 5 which has been thrust over the younger volcanics.

Major, easily recognizable faults and shear zones are generally steeply dipping and strike roughly parallel to bedding. Shearing in volcanic rocks, most of which has been in the bedding plane, is recognized by areas of strong foliation and alteration. Northwest striking faults have been offset by less prominent north to northeast striking faults. The side ridge west of Wombat Creek below showing 3 is the most intensely sheared region on the property. At least three major shear zones cut this ridge.

Folding in volcanic units is restricted to small crenulations in areas of heavy shearing which have shallow plunges (less than 10°) towards the northwest (300-320°). Tight, similar folds in sediments (notably the large chert body) have been produced by flexural slip (relative movement between beds, giving rise to observed shaly partings) and plunge less than 10° towards the south-southwest (200-220°), perpendicular to the trend of folds in volcanics.

Two major and consistent joint planes cut sediments and volcanics. Average attitudes of these are 020/80°E and 120/80°S, corresponding to axial plan cleavage in sediments and volcanics respectively. The many other joint planes, in volcanics particularly, are more random.

GEOCHEMISTRY

Soil samples were taken at 400 foot intervals over most of the ridge. Steep north-facing cliffs and talus slopes prevented complete coverage. Soil conditions on the ridge and below the talus were generally good. Several silt samples were taken. Results are plotted on an accompanying map.

Geochemical soil background for silver in all units is less than 0.5 ppm. Copper background in the volcanic units is between 50 and 70 ppm. Sedimentary units have a lower background of 25 to 35 ppm copper. Silt background for the ridge is around 50 ppm copper and 1 ppm silver.

Anomalous soil values have an erratic distribution and indicate that the only copper and silver present is in the form of small localized bodies. No major and continuous copper zone is present. Strongly anomalous copper and silver values (greater than 200 and 1.5 to 2 ppm respectively) in general occur in pairs although there are exceptions.

The most consistently anomalous area lies below showing 3, to both the east and west, in talus and scree. Copper and silver in these areas is probably derived from showing 3. A silt sample taken above Lost Lagoon ran 700 ppm copper and 2 ppm silver. Source of this anomalous value is again showing 3.

ECONOMIC GEOLOGY

In addition to the four known copper showings on the northern side of the ridge (showings 1 to 4), five more minor showings (5 to 9) were found. All showings are small in size, lie close to major shears, and are associated with calcite veining. Bornite, chalcocite, covellite and chalcopyrite are the main copper sulphides; others may be present in small quantities. Malachite is invariably present on weathered surfaces. Showings 1, 3 and 4 are the largest, and were trenched. It was found that small, light drills performed badly in soft, wet ground at elevations greater than 5000 ft. Trench samples, of randomly chipped bedrock, each weighed roughly 10 pounds.

Dimensions of the five trenches dug are as follows:

Trench	Showing	Length (ft)	Width (ft)	Depth (ft)	Volume (cu/yds)
A	1	15	4	10	22.2
B	3	23	4	6	20.4
C	3	10	3	3	3.3
D	4	20	2	2	3.0
E	4	13	4	4	13.0

Showing 1

Showing 1 is located on a steep talus and scree slope roughly 300 ft east of a major fault. Sparsely scattered malachite stained and copper sulphide bearing float forms two zones on the slope (see Drawing 2). In the float, copper (bornite, covellite and chalcocite) exists in three ways: as fine disseminations in maroon and dark grey volcanic rocks; as thin (1/16-1/8") discontinuous veins and lenses; and as replacements of amygdules and tuff fragments. Some specimens contain roughly 30% copper, however, the average sulphide bearing rock would grade around 2%. Outcrop above the talus is dark grey to maroon andesite that contains traces of fine disseminated chalcocite, overlain by barren volcanics and sediments. Outcrops of various volcanic rocks at each side of thetalus are barren of sulphides. Trench A, dug above the upper mineralized talus zone (see Drawing 3), exposes some sulphides in bedrock. Rock float up to two feet above bedrock was stained by malachite yet barren of sulphides. Bedrock itself is barren except for a small irregular lens of fine disseminated chalcocite, bornite and covellite that would assay around 10% copper. Host rock is maroon andesite which has been coarsely brecciated by calcite. Dimensions of the lens are 1 foot by 4 inches by 4 inches. It follows a northwest striking shear zone (which defines its southern boundary) then veers to the north parallel to a prominent joint which is commonly calcite healed. A sample taken across the lens and roughly one foot on each side of it assayed 0.33% Cu and trace silver. Two samples taken along the length of the trench on opposite sides assayed trace silver and 0.04 and 0.18% Cu over lengths of 10 and 14 feet respectively.

Judging from the type and amount of copper bearing talus downslope, more lenses of the sort described as well as small veins and amygdules containing copper must exist in bedrock beneath the talus.

Showing 2

Showing 2 consists of trace amounts of chalcopyrite and pyrite in green altered tuffs and breccias which are cut by numerous calcite and quartz veins as well as one barite vein (see Drawing 2). Small veins (less than 2" wide) strike north and northwesterly, have steep dips, and tend to heal fractures whereas larger northwesterly striking and steeply dipping veins brecciate wall rocks and have more irregular boundaries. Chalcopyrite is in small blebs in the volcanics at the margin of a large northwesterly striking calcite vein. Pyrite in medium sized cubes occurs in a similar calcite vein nearby. Showing 1 lines up with the large northwesterly striking calcite, quartz and barite veins of showing 2. Although the type of calcite veining at showing 1 is similar to that at showing 2, it is unlikely that calcite (or copper) extend between the two showings, as no trace of calcite or copper was found in the talus between the showings.

Showing 3

Several small west and northwest striking bornite, covellite and chalcocite veins in addition to small amounts of chalcopyrite in maroon volcanics brecciated by calcite exist over a length of several hundred feet (see Drawing 4). A steep cliff marks the western boundary of the showing. Heavy malachite staining is present on west and northwest striking, steeply dipping fractures over a small area on the cliff and lower down near an old cairn in dark grey volcanics. Traces of chalcocite and bornite can be seen on these fracture planes. A sample taken across the stained cliff over a length of 15 feet assayed .02 ounces per ton silver and 0.18% copper. A northwest trending zone of intense calcite veining over a width of five feet and depth of three feet contains chalcopyrite in small blebs in the maroon volcanics and in calcite. This rock would assay less than 1% copper. Overlying the calcite in dark grey volcanics is an extremely irregular, generally northwest trending bornite-chalcocite zone which varies from 1/4 to less than 1/32 of an inch thick. This zone occurs in shears and fractures over a length of about 10 feet. Trench C exposes part of this zone and part of the brecciated rock. A sample through 8 feet of barren volcanics and 2 feet of breccia cuts the sulphide zone where it is about 1/16 of an inch thick. It assays trace silver and 0.08% copper. Trench B, a deeper extension of an old shallow trench, was dug to bedrock in order to determine the continuity of mineralization found to the east. No breccia, sulphides, or even malachite was found. A sample from this trench assayed trace silver and 0.05% copper. An old shallow trench some 50 feet long is located about 100 feet northeast of trench B and exposes dark grey volcanic float containing traces of chalcocite and covellite and some malachite. A trench blasted from a hillside outcrop another 100 feet northeast exposes several small bornite-chalcocite-covellite veins. The veins strike northwest to west, have steep dips, and occupy weak shears and fractures. The largest is 1/4 inch wide. Samples from this trench over a 12 foot width are reported to assay 0.76% Cu with selected grab samples up to 10 per cent copper (T. Antoniuk, personal communication). These samples were likely taken from the vein, as a visual estimation of grade for the whole outcrop is less than 1% copper.

Showing 4

Showing 4 is located 800 feet north of the major fault that places unit 6 in contact with unit 3 south of Wombat Creek. It consists of a single 25 foot long northwest striking zone of chalcocite, bornite, and covellite (Drawing 5). This zone runs parallel to numerous fractures and shears in the small outcrop of dark grey to maroon volcanics. Near the center of the outcrop the zone is vein shaped, dipping 50° southwest. Maximum thickness on the surface is 1/4 inch of massive sulphides and several inches of sparsely disseminated sulphides (in amygdules). The zone pinches out to the northwest so that at the end of outcrop only isolated patches of malachite exist. To the southeast, the vein pinches then bulges to a thickness of 1/4 inch. Trench E exposes a zone of coarse calcite which has brecciated the volcanics. The breccia is largely barren of sulphides and underlies the sulphide body in the trench which is lens shaped. It has a maximum cross-section of 8 by 6 inches and pinches out rapidly in all directions. Specimens from the lens contain about 15% bornite, 10% chalcocite, 25% covellite, and 50% dark grey volcanic rock. A sample taken across the lens where it is 2 inches wide assays 1.45% copper and 0.16 ounces per ton silver over 8 inches. A sample from the footwall runs 0.06% copper and trace silver over 6 feet. The hanging wall assays 0.03% copper and trace silver over 6 feet. Outcrop 30 feet northwest of Trench E across the sulphide zone assay 0.10% copper and trace silver over 20 feet. Trench D exposes barren volcanic rock and shows that the sulphide zone pinches out completely 30 feet southeast of Trench E. A sample from Trench D over 20 feet runs 0.03% copper and trace silver.

Showing 5

Irregular pods of borniteand covellite, less than 1 inch in any dimension, occur in a 1 inch thick, vertical, northerly striking vein of calcite and quartz which has been forcibly injected into the surrounding limy sediments (unit 8). Sulphides are concentrated over a length of 20 feet. Total length of vein that is exposed is over 100 feet. The whole vein would grade less than 1% copper, and the sulphide bearing 20 feet runs around 2% copper.

Showing 6

This is the only showing in unit 1. A small, inaccessible patch of malachite is located on a steep west-facing cliff. Host rocks are light green, altered lapilli tuffs. No sulphides were found in float beneath the cliff. Maroon, silicified, vesicular andesite that outcrops 100 feet north of the malachite patch contains about 1/2% chalcopyrite in tiny specks, adjacent to small calcite lenses in two zones 1 to 2 inches thick that run parallel to bedding.

Showing 7

Traces of chalcopyrite occur along with epidote, calcite and quartz in amygdules of dark grey andesite over a small area.

Showing 8

Minor amounts of fine chalcopyrite and pyrite occur in a two foot wide calcite vein which strikes northwest and dips 70° southwest. It has brecciated the maroon andesites and volcanic breccias at the margins of the vein.

Showing 9

Trace amounts of chalcopyrite occur in calcite and barite veins which cut the volcanic breccia just north of the major fault on the ridge.

SUMMARY

Showings are small and isolated, and are not restricted to definite rock types. Rather, they occur close to major shear zones at random, adjacent to or in calcite veins. Source of copper may have been the volcanics themselves - remobilized, segregated and concentrated by veining which followed major faulting and folding.

Sulphide associations are chalcocite-bornite-covellite (also possibly other fine copper rich sulphides and native copper) and chalcopyrite-pyrite. The former occurs in veins and small lenses whereas the latter is disseminated. No silver bearing minerals were observed.

CONCLUSIONS AND RECOMMENDATIONS

The Bell showings are quite typical of copper occurrences in basic volcanics throughout the Cordillera and are very similar to those which occur in Triassic volcanics in the Kluane district. Copper and silver are too low grade, too erratic and too small in tonnage to justify further work.

Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES LTD.

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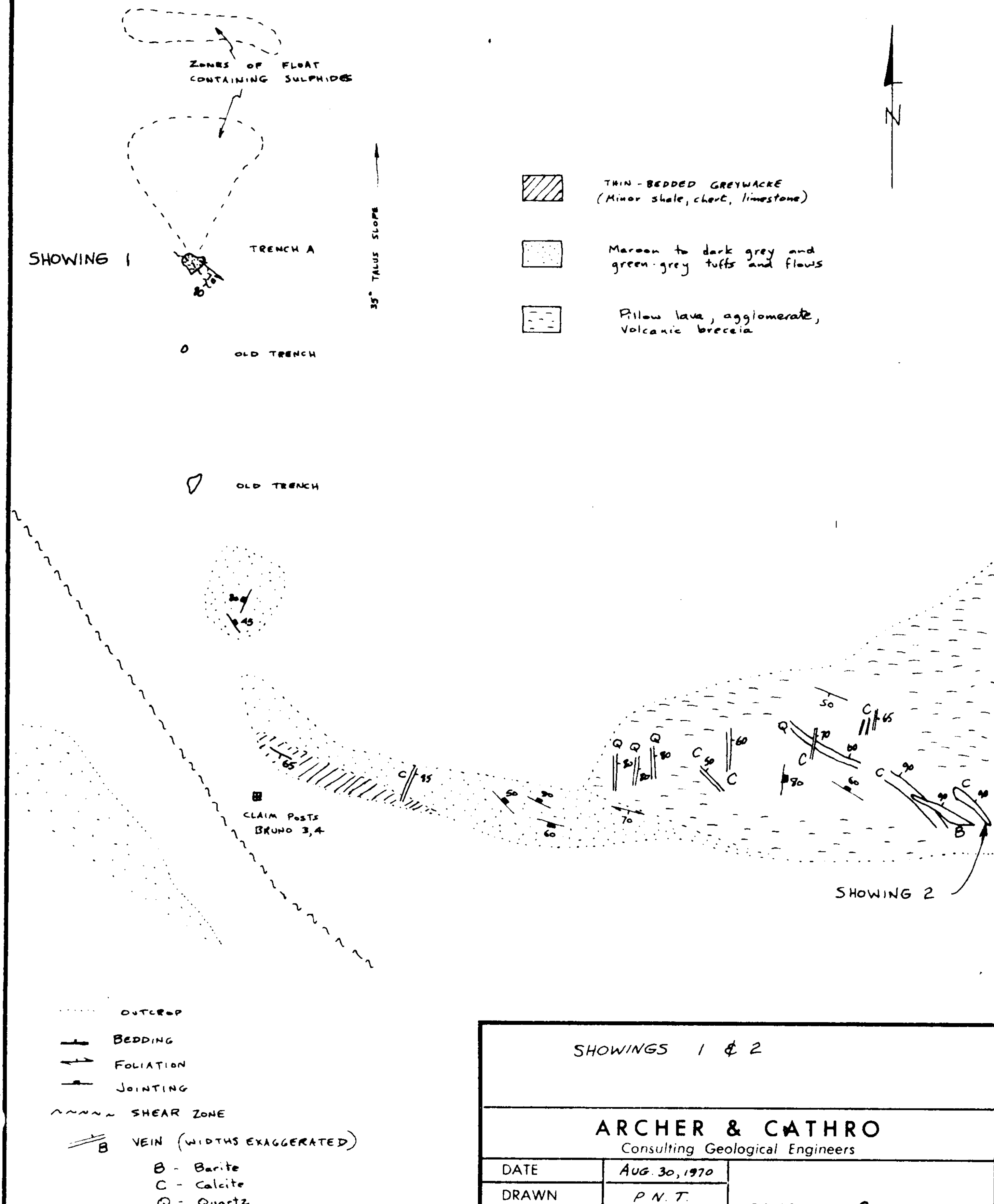
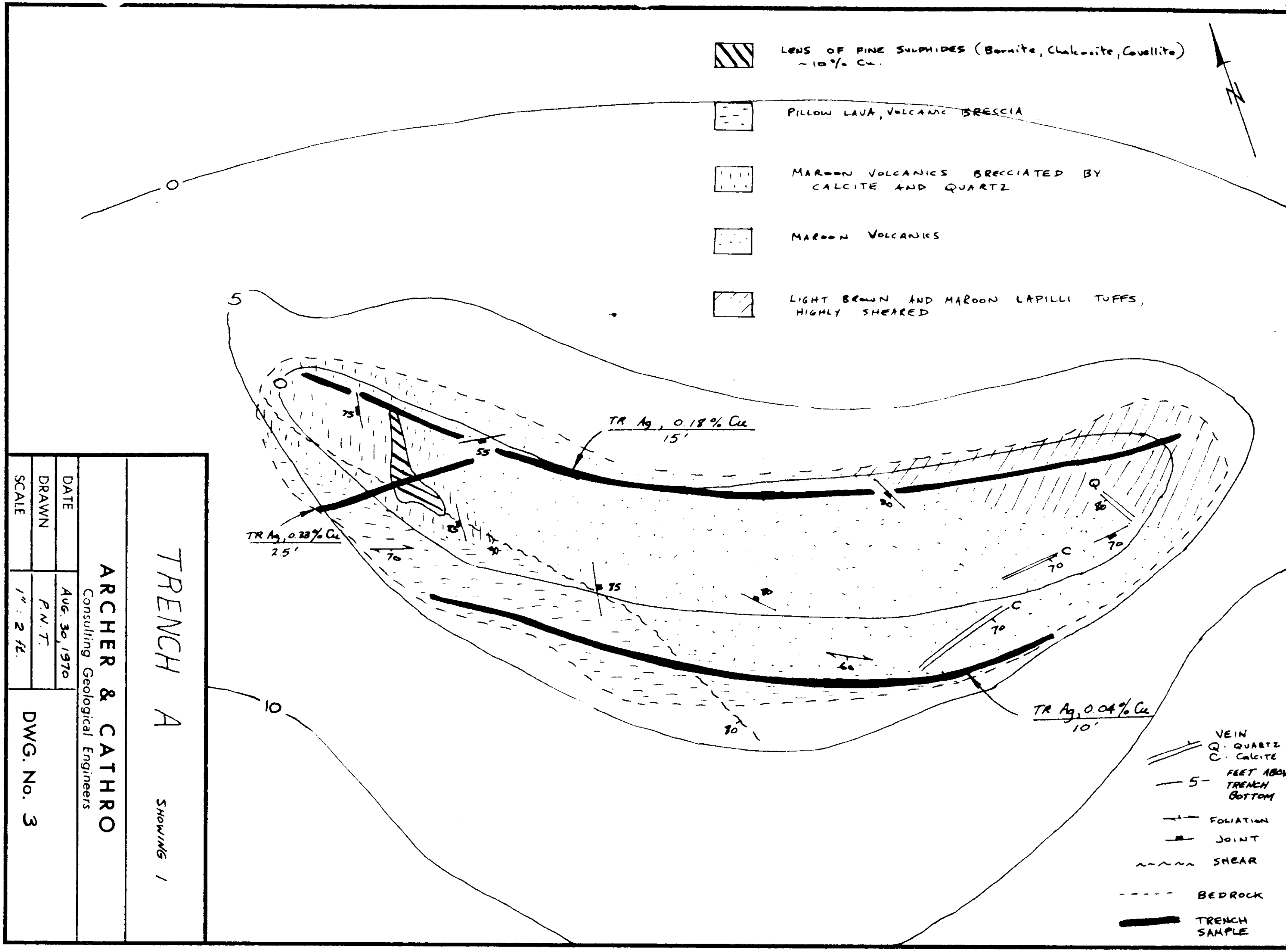


SHOWINGS 1 & 2

ARCHER & CATHRO
Consulting Geological Engineers

DATE	AUG. 30, 1970	
DRAWN	P. N. T.	
SCALE	1" . 100'	DWG. No. 2

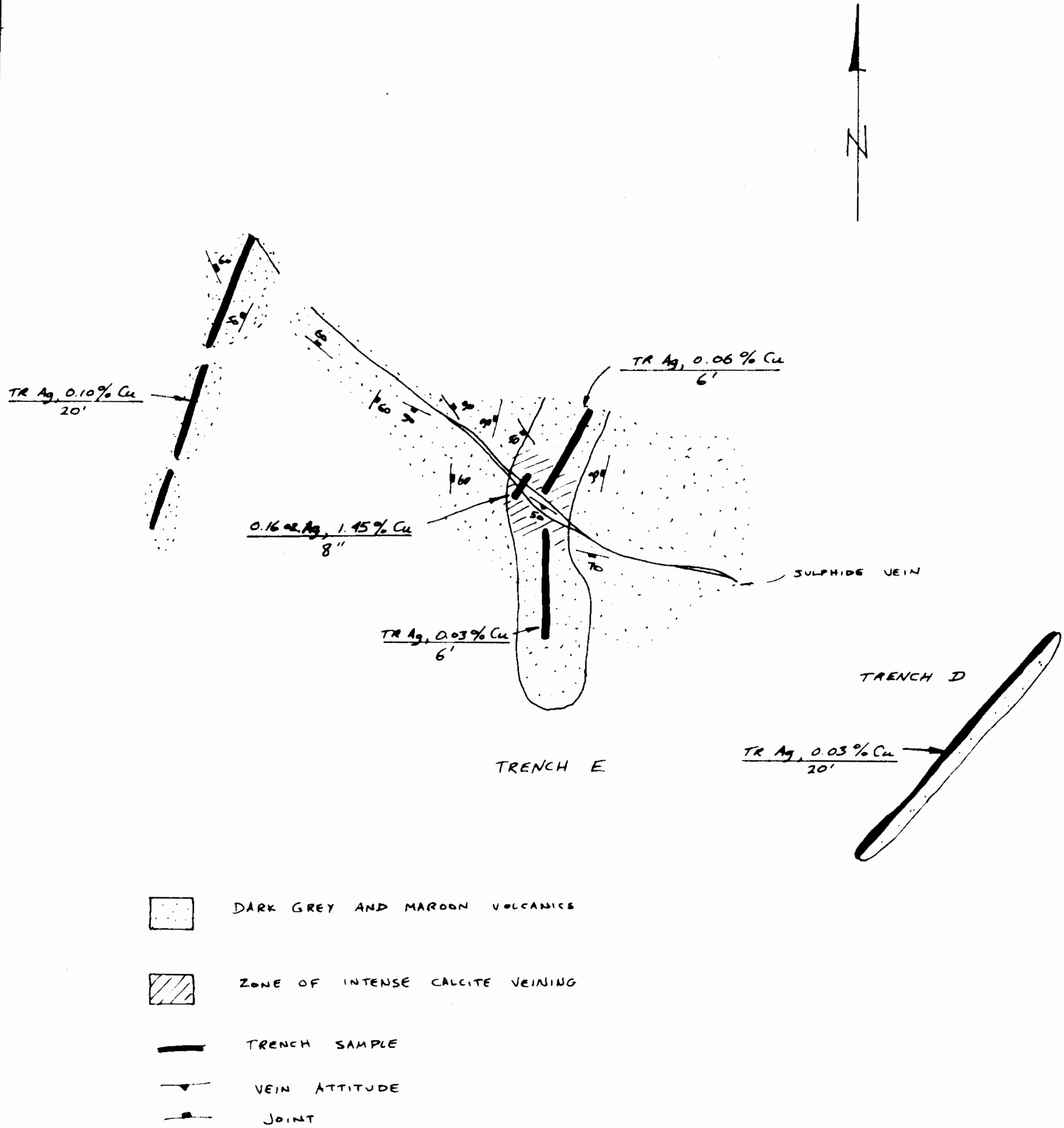


LENS OF FINE SULPHIDES (Bornite, Chalcocite, Covellite) ~10% Cu.
PILLOW LAVA, VOLCANIC BRECCIA
MAROON VOLCANICS BRECCIATED BY CALCITE AND QUARTZ
MAROON VOLCANICS
LIGHT BROWN AND MAROON LAPILLI TUFFS, HIGHLY SHEARED
N
0
5
10
TR Ag, 0.18% Cu
15'
TR Ag, 0.33% Cu
2.5'
TR Ag, 0.04% Cu
10'
Q
C
VEIN
Q. QUARTZ
C. Calcite
FEET ABOVE TRENCH BOTTOM
FOLIATION
JOINT
SHEAR
BEDROCK
TRENCH SAMPLE
TRENCH A
SHOWING 1
ARCHER & CATHRO
Consulting Geological Engineers
DATE
AUG. 30, 1970
DRAWN
P.N.T.
SCALE
1" : 2 ft.
DWG. No. 3

SHOWING 3

ARCHER & CATHRO
Consulting Geological Engineers

DATE	AUG. 30, 1970	DWG. No. 4
DRAWN	P. N. T.	
SCALE	1" : 50'	



SHOWING 4

ARCHER & CATHRO
Consulting Geological Engineers

DATE	AUG. 30, 1970	
DRAWN	P. N. T.	
SCALE	1" : 10'	DWG. No. 5


N
5000
4500
1
2
3
4
5
6
7
8
9
LEGEND
8 Thin-bedded brown-grey weathering greywacke, limestone and shale with minor sandstone and chert.
7 Pillow lava, volcanic breccia, agglomrate. Minor maroon and green tuffs and flows.
6 Maroon to dark grey flows and tuffs. Minor greenstone, feldspar porphyry, flow breccia and agglomerate.
5 Grey strongly foliated and crenulated phyllite shale.
4 Thin - bedded shale, limy shale.
3 Yellow weathering thin-bedded chert and cherty shale commonlly with shaly partings.
2 Dark green thin-bedded greywacke.
1 Dark to light green partly altered audesitic volcanic rocks, mainly greenstone and lapilli tuffs with minor agglomerate and flow breccia.
Bedding.
Bedding, tops known.
Trend and plunge of minor fold.
Foliation.
Fault.
Inferred fault.
Copper showing.
ARCHER, CATHRO & ASSOCS. LTD.
GEOLOGY
BELL CLAIMS
McNEIL RIVER, Claim Sheet 105G5
CALTOR SYNDICATE
400 0 400 800
August 24/70.
SCALE IN FEET
G.D.L.

DRILLNOT CREEK
COBRA CREEK
WOMBAT CREEK
5000
4500
N
JEFF LAKE
LOST LAGOON
BRUNO
END
LEGEND
P.P.M. – COPPER, SILVER
CLAIM POST
COPPER SHOWING
ARCHER, CATHRO & ASSOCS. LTD.
SOIL GEOCHEMICAL SURVEY
BELL CLAIMS
McNEIL RIVER, Claim Sheet 105G5
CALTOR SYNDICATE
400 0 400 800
SCALE IN FEET
August 24/70.
G.D.L.