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BRALORNE RESOURCES LIMITED

1975 GEOLOGICAL AND GEOCHEMICAL EXPLORATION ON THE PJ GROUP GATAGA RIVER, NORTHEASTERN BRITISH COLUMBIA

Liard Mining Division

Geographic Coordinates
58°8'N
125°15'W

NTS Sheet 94 K/3E & W

CLAIM: PJ, SYBIL, ANDREW

by

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SECTION 1.0 INTRODUCTION

During the late 1960's and early 1970's the mountainous area around the PJ Group was one of the more actively explored areas of British Columbia. Since then interest in the area has declined and the PJ Claims are one of the few groups still being maintained. The only producer within the area, Churchill Copper Corporation Ltd., lies 40 kilometres to the north. It has recently ceased production and sold its concentrator. The purpose of the 1975 exploration of the PJ Group was to prepare a more detailed geological map of the property and to assess the part below the treeline, largely covered by overburden. It was authorized by Mr. N.C. Croome of Bralorne Resources Limited.

During the period between July 22 and September 5, 1975 a two-man crew consisting of a geologist and an assistant, employed by Halferdahl & Associates Ltd. of Edmonton, worked on the PJ Group. This crew was assisted for the first week by Mr. T.R. Gallant, a geologist with Bralorne Resources Limited. Short supervisory trips were made to the property by Messrs. Croome, Halferdahl, and Lipsett.

Work on the property consisted of geological mapping at a scale of 1:5,000, a geochemical survey, and locating claim posts. Detailed mapping and sampling of the showings had been previously done and were not part of the assignment. A 1:5,000 topographic map, prepared from aerial photographs, was used as a base map. Access and service flights were provided by Okanagan Helicopters of Fort Nelson, British Columbia. Of two camps, the first, above treeline, was used for $5\frac{1}{2}$ weeks and the second, on the Gataga River, for the last $1\frac{1}{2}$ weeks. Metric units are generally used throughout this report. It is based on information gathered in the field and on published and unpublished reports.

SECTION 2.0 SUMMARY AND RECOMMENDATIONS

2.1 Summary

The PJ Group, in the Liard mining district, consists of a block of 74 mineral claims approximately 170 kilometres (106 miles) west southwest of Fort Nelson, British Columbia. Access to the property is by helicopter from Fort Nelson or from a small dirt airstrip 3 kilometres east of the property. The property is rugged with elevations ranging from 1100 to 2440 metres (3600 to 8000 feet). Previous work on the claims consists of hand trenching, mapping, and limited geophysics and geochemistry.

The Aida and Gataga Formations are the only bedrock exposed on the property. Units 1 through 3 have been assigned to the Aida Formation whereas Unit 4 has been designated as Gataga Formation. Unit 1 consists of buff to light-grey-brown-weathering dolomites, dolomitic siltstones, limestones, and mudstones. Unit 2 weathers medium brown and consists of well cleaved mudstones and siltstones with minor dolomite and sandstone. Unit 3 is a buff-weathering unit of dolomite, dolomitic siltstone, and limestone. Unit 4, the Gataga Formation, consists of dark-weathering, well cleaved mudstones and siltstones. Unit 5 consists of steeply dipping diabase dykes varying in thickness from 3 to 60 metres.

Typically beds strike northwestward and dip moderately to the southwest but widespread, small scale isoclinal folding cause significant variation in bedding attitudes and apparent stratigraphic thickness. One major fault crosses the property from southwest to northeast and forms a locus for much of the copper mineralization. A penetrative slaty cleavage is present in most mudstones and siltstones with an associated micro-fracture cleavage in many of the more arenaceous members.

Mineralization on the PJ Group consists of chalcopyrite as disseminations,

stringers and massive pods in quartz-carbonate veins. The Pelletier Zone is a series of discontinuous veins in a zone 30 to 60 metres wide and exposed for a strike length of approximately 300 metres. The Number 2 and Northeast Zones are less extensive.

In a geochemical soil survey over much of the wooded southern part of the property, 113 soil samples and 17 stream sediment samples were collected. Results of the stream silt survey were not very successful because rapid mechanical erosion severely restricts the amount of silts available for sampling. Results of the soil survey are not encouraging.

The recent closing of the Churchill Copper Corporation's Magnum mine and the selling of its concentrator illustrates the extreme problems facing a vein-type deposit in this area. A much larger type of deposit is needed for profitable mining.

2.2 Recommendations

Two options are presented concerning the PJ Group. Each has its own merits and which option should be taken will depend on Bralorne's long range plans and commitments.

1. Due to the economics of vein-type copper mineralization in the area the claims should be dropped. The work performed this season should be submitted for assessment purposes so that the payment previously made in lieu can be recovered, but the claims should be allowed to lapse at the new expiry date.
2. If keeping claims is part of Bralorne's plans, the total number of claims should be reduced. Only those claims should be kept which sufficiently cover the Pelletier and Northeast Zones and their possible extensions. The Northeast Zone can be adequately covered by PJ Claims 105 and 107. The Pelletier Zone and its immediate extensions are covered by PJ Claims 16, 18, 20, 49, and 51. Geological control below the treeline is poor and because of the arcuate nature of the fault related to the mineralization, further extensions cannot be reliably located. With the assumption of a simple strike extension towards Gataga River, additional claims to consider keeping are PJ 7 - 13. It is recommended that the Number 2 Zone not be retained. However if it is

kept an additional claim must be staked to adequately cover it. PJ Claims 85 - 88 should possibly be kept because of the anomalous lead values in the soil survey. If they are kept it may be advantageous to keep two to four additional claims between these and the Pelletier Zone so that they can be grouped together.

SECTION 3.0 PROPERTY

The PJ Group, in the Liard mining district, consists of 74 mineral claims and fractions:

Mineral Claim	Record Number
Sybil 1 - 6	42163-42168
Andrew 17 - 20	42221-42224
PJ 5 -20, 37 - 52,	42047-42062, 42079-42094
54, 56, 58, 60	42096, 42098, 42100, 42102
83 - 110	42125-42152

The expiry date for these claims was March 5, 1975. At that time payment in lieu of work required was made under Section 51 of the British Columbia Mineral Act. This consisted of a rental fee of 20 dollars per claim ($1480) and two hundred dollars per claim in lieu of work required ($14,800). Provisions are made under Section 55 of the Mineral Act to obtain a refund of cash paid in lieu if the work performed in the next year is not less than double the amount required to keep the claims in good standing for that year.

The eastern extremities of the Number 2 Zone are not completely covered by PJ Claims as located by the 1975 exploration. However, as all adjoining claims including the Book claims on the northwest side of the property had been abandoned when claims records were checked in August 1975, although not recommended, the staking of adjoining ground is feasible.

SECTION 4.0 GEOGRAPHIC SETTING

The PJ Group is located approximately 170 kilometres (106 miles) west southwest of Fort Nelson. Its southeast corner lies at approximately 58°8'N, 125°15'W on NTS sheet 94 K/3. Access to the property is by helicopter from Fort Nelson. A 600-metre (2000 foot) dirt airstrip 3 kilometres east of the property on the Gataga River floodplain appears serviceable for Otter or other small aircraft. Because the strip lies on the south side of the river a helicopter still is necessary for access between the strip and the property.

The nearest road is at the confluence of Delano and Churchill Creeks approximately 40 kilometres (25 miles) by air to the north northeast at the Churchill Copper Corporation Ltd. mill. The mill has been sold recently and with the closing of the mill the condition of the road is uncertain.

The claim group lies in rugged terrain almost entirely on the north bank of the Gataga River. Elevations on the property range from 1100 metres at the river to 2440 metres in the northeastern part of the property (3600 to 8000 feet). Treeline lies at approximately 1400 metres (4600 feet). Extensive areas are obscured by a cover of talus and glacial debris, and permanent ice and snow are found on the north-facing slopes of the northeastern part of the property. Three major creeks drain the property to the south into the Gataga River.

Much of the property is generally free of snow only from late June to late August but the south-facing lower parts may be snow-free by late May. Snow can and does fall throughout the summer. Daytime temperatures during July and August of this year averaged 8 to 10° C and rain was frequent.

SECTION 5.0 PREVIOUS WORK

To date work on the PJ Group includes blasting, hand trenching, and sampling of the copper-bearing veins; mapping of the property at a scale of 1 inch to 500 feet by R.K. Germundson in 1970; a V.L.F.-E.M. and I.P.

geophysical survey over part of the property in 1971; a stream sediment survey; and a limited soil geochemical survey over parts of the geophysical grid in 1971. The mapping done by Germundson made no attempt to sub-divide the Proterozoic sediments. Geochemical samples were analyzed only for copper.

Regional work in the area containing the PJ Group includes a Ph.D. thesis by Bell (1966), a Geological Survey of Canada Paper by Bell (1968), and a Memoir by Taylor and Stott (1973). Preto (1971) of the British Columbia Department of Mines and Petroleum Resources summarized the available data on the copper prospects in the area.

SECTION 6.0 GEOLOGIC SETTING

The Proterozoic Aida and Gataga Formations (see Table of Formations) are the only bedrock exposed on the PJ Group. Both formations consist of a monotonous sequence of well cleaved mudstones and siltstones with associated dolomites and limestones in the Aida Formation. The only recognizable marker horizon in these formations is a 55-metre thick unit of green chamositic mudstone in the lower Aida Formation. This, however, does not outcrop on the property.

The chamositic member and scattered float from the carbonaceous member were observed in two locations on the 428 Group immediately north of the PJ Group. After completion of the field work, examination of a geological map of the Andrew Group which adjoined the PJ Group on the east shows a band of green siltstone (Storey and Stokes, 1970). It is indicated as outcropping along the easternmost major, south-flowing stream. It trends easterly across the face of the mountain and swings northward towards the chamosite noted by Bell at the base of his measured section (Bell, 1966) and thence towards the area of outcrop seen on the 428 Group. The chamositic member is generally very distinct when viewed from the air. Although this area was flown over several times, once specifically looking for the chamositic member, it was not seen. This in addition to its

TABLE OF FORMATIONS

		Approximate Thickness (metres)
Undivided	Mesozoic and Paleozoic rocks	not estimated
	ANGULAR UNCONFORMITY	
Ordovician		
	Kechika Group: limestone, graptolitic shale, turbidites	600-1800
	ANGULAR UNCONFORMITY	
Cambrian		
	Atan Group: limestone, dolomite, shale, sandstone, conglomerate	600-1800
	DISCONFORMITY	
Hadrynian		
	Unnamed succession: quartz-chlorite phyllite, meta-sandstone	1200+
	ANGULAR UNCONFORMITY	
Helikian		
	Gabbroic dykes	8-80
	Gataga Formation: mudstone, siltstone, minor sandstone	1350
	Aida Formation: mudstone, siltstone, dolomite, limestone, chamositic and carbonaceous mudstone	1060-2160
	Tuchodi Formation: quartzite, dolomite, siltstone	1500+
	Henry Creek Formation: calcareous siltstone, mudstone, sandstone	210-450
	George Formation: limestone, dolomite	360-530
	Tetsa Fromation: dark grey mudstone, sandstone	300
	DISCONFORMITY	
	Chischa Formation: dolomite, quartzite	950+

structural trend immediately adjacent to the PJ Claims cast some doubt that this is the chamositic member. A very fine grained green siltstone was also reported exposed in a trench on the P Group 5 kilometres southeast of the property (Storey, Stokes, and Kirwan, 1970).

6.1 Stratigraphy of the Property

6.1.1 Unit 1: Middle Aida Formation

The upper part of Unit 1 consists of light grey-brown to buff-weathering dolomites with some interbedded dolomitic siltstones. The fresh surface of the rocks is medium grey. The rocks are poorly cleaved to uncleaved, finely laminated and massively bedded. Bedding ranges from 5 cm to 1 m. Sparse nodules of pyrite up to 2 cm in diameter are present in the dolomite. Farther down section limestones and limy mudstones and siltstones become predominant over the dolomites. The weathered color becomes more grey-brown and the rocks are poorly to moderately cleaved. Bedding ranges from 1 to 30 cm. Locally some beds contain up to 1 per cent fine-grained disseminated pyrite. Still lower in the section the rocks consist of limestones and limy sediments thinly interbedded with black, non-graphitic, non-calcareous mudstones. Fresh surfaces are generally dark grey to black with weathered surfaces light grey-brown. These rocks are generally moderately to well cleaved.

6.1.2 Unit 2: Middle to Upper Aida Formation

Unit 2 consists of a monotonous sequence of well cleaved mudstones and siltstones with minor dolomites and sandy horizons. Some of the slates are dolomitic. On a fresh surface the slates vary from light grey to black. The weathered color varies significantly with the orientation of the weathered surface with respect to the cleavage. On a gross scale where the cleavage dips into a rock face the weathered color is a medium grey-brown. On surfaces where the cleavage plane is parallel to the weathered surface the overall color is grey. On the outcrop scale weathered surfaces across the cleavage are greyish but have a

reddish tinge. Those surfaces parallel cleavage planes exhibit alternating olive greens, greys, and light browns in response to variations in lithology. Some of the blacker slates weather rusty due to the presence of minor fine-grained pyrite. Locally crossbedding, graded bedding and ripple marks can be observed in the more arenaceous members.

6.1.3 Unit 3: Upper Aida Formation (Fig. 5)

Unit 3 consists of a sequence of dolomites and dolomitic siltstones with minor limestones and limy sediments. The rocks are light to medium grey on fresh surfaces and weather light buff. Bedding ranges in thickness from 1 cm to 1 m and averages approximately 15 cm. The rocks are generally uncleaved to poorly cleaved with the dolomitic and limy siltstones moderately cleaved. Locally some beds contain knots of pyrite up to 1.5 cm in diameter.

6.1.4 Unit 4: Gataga Formation (Fig. 5)

Unit 4 has been tentatively assigned to the Gataga Formation. The unit is conformable and gradational with the underlying Unit 3 but the distinct change in weathering characteristics, primarily color, makes separation of the units possible. This unit is similar to Unit 2 in many respects. Lithologies, fresh and weathered colors and the development of slaty cleavage within the unit are all similar. The major difference, and even this is subtle, lies in the amount of carbonate material present. Although the lower portion of Unit 4 contains minor amounts of dolomite and dolomitic siltstones farther up section the slates are less dolomitic than much of Unit 2.

6.1.5 Unit 5: Intrusive Rocks

Diabase dykes of Proterozoic age cut both the Gataga and Aida Formations on the PJ Claims. They vary in thickness from 3 to 60 metres and extend up to a kilometre or so in length. Their general trend is north northeast

and north northwest with dips subvertical to steeply westward. Typically the dykes consist of augite and labradoritic plagioclase with minor quartz and magnetite. Traces of pyrrhotite, pyrite, and chalcopyrite were also seen. In a few places on asbestiform mineral, probably actinolite, fills fractures in the dykes. Other fracture fillings consisted of one or more of epidote, calcite, and quartz.

6.2 Structure

At first glance the structural geology in the vicinity of the PJ Group appears relatively simple with a regional strike to the northwest and relatively uniform dips to the southwest. Upon closer examination widespread isoclinal folding can be found. The folds plunge shallowly to the northwest and the axial planes are inclined approximately parallel to the regional dip. This in conjunction with the tightness of the folding makes the folding difficult to observe. This style of folding adds significantly to apparent stratigraphic thicknesses.

One major fault is present on the property and much of the mineralization is related to it. It follows a sinuous path northeasterly through the Pelletier, Book, and Northeast zones and through the mineralized zone of the now abandoned 428 Group immediately north of the PJ Claims. It dips steeply to the west. Movement on the fault is reverse in sense. Vertical displacement may be in the order of 300 metres (?) but horizontal displacement was not determined. Movement along an arcuate fault surface will cause dilation in some areas whereas other areas along the same surface will remain tight. This is a possible explanation for the distribution of vein material along the fault zone.

A smaller subsidiary fault to this major fault was also defined (Fig. 3 and 4). The vertical displacement is 20 metres, also in a reverse sense. Several other small faults are indicated on the geology map (Fig. 3 and 4).

Most of the rocks on the Gataga and Aida Formations are cleaved to varying degrees: mudstones are generally very well cleaved while the sandstones and carbonates are poorly cleaved or uncleaved. Cleavage refraction between competent and incompetent horizons is prevalent. Cleavage in the mudstone horizons is a penetrative slaty cleavage whereas a micro-fracture cleavage tends to be developed in the coarser grained units.

Bell's (1966) measured section of the Aida Formation across the north end of the property does not apparently take into account the widespread isoclinal folding nor the presence of at least one major and several minor faults. Thus some doubt can be placed on his estimate of 6606 feet for the Aida section on or near the property.

SECTION 7.0 MINERALIZATION

All of the known base metal showings in Precambrian and lower Cambrian rocks in the Gataga River area are structurally controlled: veins, shear zones, or breccia zones. Many are associated with diabase dykes but this relationship appears structural rather than genetic. Most of these showings are low tonnage and low grade. The Magnum deposit, owned by Churchill Copper Corporation Ltd., has been in unprofitable production twice since 1970 and has recently ceased production altogether with the concentrator being sold. Initial reserves were 1.1 million tons averaging approximately 4 per cent copper. Sulfide minerals which are found in the area consist of chalcopyrite, bornite, chalcocite, pyrite, galena, and sphalerite with chalcopyrite being by far the most abundant.

Mineralization on the PJ Group consists of a number of quartz-carbonate veins in which the carbonate is primarily ankeritic. Chalcopyrite is the major sulfide mineral. Minor secondary malachite, azurite, and limonitic gossans are found at the surface exposures of the veins.

7.1 Pelletier Zone

The Pelletier Zone consists of a series of cross-cutting quartz-carbonate veins in a zone 30 to 60 metres (100 to 200 feet) wide. The exposed strike length at the showing is approximately 300 metres. Two veins outcrop along the eastern and western flanks of the zone. These veins range in thickness from 1 to 1.5 metres (3 to 5 feet) and dip nearly vertical to steeply westward. The eastern vein trends 010° and the western vein 350°. A series of discontinuous veins are present within the centre of the zone. They range in thickness from ribbon-like veining, approximately 1 cm in width, in the black slates, to as much as 1.5 metres thick. Locally small veins cut the country rock adjacent to the zone. The rocks in the hanging wall are predominantly slightly dolomitic siltstones while those within the zone and in the footwall are predominantly black slates. The mineralized zones apparently lie within a major fault zone.

Chalcopyrite is the only major sulfide mineral. Disseminated chalcopyrite is present throughout much of the vein material. Rich pockets of stringer and massive chalcopyrite are present but many are lensoid and discontinuous. The lenses are generally found in the centre of the veins and are often less than 10 m long and 50 cm thick. Several other small showings exposed in test pits southwest of the main Pelletier Zone appear narrow and low grade. They are believed to be related to the same fault system as the Pelletier Zone.

7.2 Number 2 Zone

The Number 2 Zone consists of mineralized quartz-carbonate veins

exposed along both flanks of a diabase dyke. The strike length exposed at the showing is approximately 50 to 60 metres (150 to 200 feet). Mineralization is also exposed in a test pit above the main showing at the intersection of the dyke with a smaller subsidiary dyke. Minor mineralization was seen along the northwest edge of the dyke approximately 300 metres southwest of the main showing. The vein, and the structurally associated dyke, cut across dolomites and dolomitic siltstones.

The vein on the southeast flank of the dyke ranges in thickness from 0.3 to 0.6 metres (12 to 24 inches); the northwestern vein ranges from 0.3 to 0.9 metres. The veins contain rich pockets of massive chalcopyrite up to 10 metres long but as in the Pelletier Zone these are discontinuous. Mineralization is generally found in the form of stringers. The major sulfide mineral is chalcopyrite with minor pyrite and chalcocite. Whether this fine-grained chalcocite is primary or secondary is uncertain. Open-space crystal growth of the vein material occurred on the margins of the dyke before the deposition of the sulfides.

7.3 Northeast Zone

The Northeast Zone consists of a copper-bearing quartz-carbonate vein exposed in a series of 8 to 10 test pits. The vein ranges in thickness from 0.6 to 1.8 metres (2 to 6 feet) and averages 1.25 metres. It trends 028° and can be traced for a strike length of approximately 80 metres (260 feet). To the southwest it disappears under a small glacier. Farther extension to the northeast was not found. The vein cuts across buff-colored dolomites and siltstones.

Chalcopyrite, the only major sulfide, is present as disseminations, stringers, and massive pods. The pods, as at the other showings are concentrated in the centre of the vein and are discontinuous. It is likely that the Northeast Zone is related to the same fault system as the Pelletier and Book Zones.

7.4 Book Zone

Although the Book Zone is not within the PJ Group it is adjacent to it and was examined briefly. The north Book Zone, at the head of camp valley, consists of a quartz-carbonate vein 0.6 to 1.5 metres (2 to 5 feet) thick which trends 355° and dips steeply to the southwest. The exposed strike length is approximately 365 metres (1200 feet) with an additional 80 metres (260 feet) exposed along a conjugate vein trending 345°. The vein cuts across the adjacent buff-colored dolomites and dolomitic siltstones.

Chalcopyrite is the dominant sulfide. It is present as disseminations, stringers, and discontinuous massive pods. Associated with the chalcopyrite are minor fine-grained disseminated pyrite and galena. Fine- to medium-grained sphalerite was seen in diamond drill core from the Book veins and medium- to coarse-grained sphalerite was seen in float near the vein.

It appears the Book veins are related to the same fault system as the Pelletier Zone. Several smaller and less continuous mineralized veins are also present along the same fault system. These are shown in Fig. 3 and 4 but are not described herein.

SECTION 8.0 GEOCHEMICAL SURVEY

A geochemical soil survey was carried out over much of the wooded southern part of the property. A grid running approximately parallel to the topography was laid out with a compass and topofil, a mechanical device which measures distance by paying out and measuring a lightweight thread. Sample stations were marked and labelled with orange flagging. The sample interval used was 150 metres except over possible extensions of the Pelletier Zone where the spacing was reduced to 75 metres. In addition to the samples from this grid system one line of samples was taken on Bralorne's 1971 grid in order to see if the

results of the previous survey could be duplicated. Stream silt samples if available were taken at the intersection of streams and the grid lines. In all, 113 soil samples and 17 stream sediments were collected.

Analytical work was performed by Loring Laboratories Ltd. of Calgary. Each sample was dried overnight at 105° C, disaggregated with a porcelain mortar and pestle, and the seived -80 mesh fraction analyzed. Cu, Pb, and Zn were determined on one solution prepared by adding 1 ml distilled water, 1 ml conc. HNO_3 and 3 ml conc. HCl to $\frac{1}{2}$ g of sample and digested on a hot water bath at 100° C for 3 hours with periodic shaking. For analysis the digested sample was diluted to 10 ml with distilled water and determinations made by conventional atomic absorption methods with appropriate standards, using an air-acetylene flame.

Analytical results and sample descriptions are given in Appendices 11.1 and 11.2 (Fig. 6 and 8). Statistical information for the determination of background and threshold for Pb and Zn was obtained from cumulative frequency plots (Fig. 7). The cumulative frequency plot for Cu was used to determine the background (median), but not the threshold. Because of the extreme skewness of the distribution a statistical determination of median plus two standard deviations appears to provide a more valid threshold. As only 17 samples of stream silts were obtained cumulative frequency plots were not drawn. Instead background and threshold values were taken as sample mean and sample mean plus two standard deviations. Although this may not be strictly valid because of the small number of samples it does provide guidelines for assessing individual analytical results.

Soil Samples	Background (ppm)	Threshold (ppm)
Cu	13	226
Pb	17	28
Zn	70	115

Stream Sediments	Background (ppm)	Threshold (ppm)
Cu	34	83
Pb	21	33
Zn	84	148

Only four of the 113 soil samples showed anomalous copper values and these four were on the line previously run by Bralorne in 1971 and checked in this survey. Although the numerical values for the analyses on the Bralorne line are not the same, a similar pattern of high and low values is present (Fig. 9). There is an apparent lateral shift of 50 feet throughout the profile. The most plausible explanation is a discrepancy in sample number locations in one of the surveys.

Of the 113 soil samples ten show anomalous zinc values. These samples are widely spaced and have no obvious pattern. Ten samples showed anomalous lead values with seven on Line 0 east. However all of these seven are only just over the threshold value. They may be related to galena-bearing veins which have been noted in this stratigraphic part of the Aida Formation in other parts of the area or to traces of galena associated with quartz veins on the PJ Group.

The results of the soils survey are not encouraging and do not themselves justify additional work. As stream silts are poorly developed because of rapid mechanical erosion in the area, only 17 silt samples were collected, an insufficient number for statistical evaluation. The majority of soil samples were taken from the B horizon, but till was encountered at several of the sample sites. If this till is widespread and is present below the sampled B horizon it may be an explanation for the poor geochemical response in the lower parts of the valley.

SECTION 9.0 CONCLUSIONS

The recent closing of the Churchill Copper Corporation's Magnum mine and the selling of its concentrator illustrates the extreme problems facing a

deposit of moderate grade and low tonnage in a country of rugged terrain and extreme climatic conditions. Observations made on the PJ property, examination of diamond drill core from the Bronson Group and assessment reports on nearby properties all indicate that the mineralized veins on the PJ Group are less continuous and mineable quantities lower in grade than those at Churchill and Davis-Keays. Reserves in the veins on the PJ Group are most unlikely to surpass the reserves at Churchill's Magnum mine. Further exploration in the area appears warranted only if it can be expected to find much larger types of deposits than the known veins.

Respectfully submitted,

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L.B. Halferdahl, Ph.D., P. Eng.

Edmonton, Alberta
November 24, 1975

Expiry Date: August 5, 1976

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SECTION 11.0 APPENDICES

11.1 GEOCHEMICAL SAMPLE DESCRIPTIONS

Sample Location *	Sample Number	Soil Horizon	Sample Depth (cm)	Remarks
LINE 0				
9 + 50 E	011	B	15 - 20	red-brown; quite sandy
9 + 00 E	010	B	15 - 20	red-brown
7 + 50 E	009	B	15 - 20	red-brown
6 + 00 E	008	B	15 - 20	red-brown
4 + 50 E	007	B	15 - 20	red-brown
3 + 00 E	006	B	15 - 20	brown
1 + 50 E	005	B	20	red-brown
0 + 60 E	004	stream sample	-	very little silt fraction
B/L	002	A_0	10 - 15	
B/L	003	till	25	light grey-brown clay
1 + 11 W	044	stream sample	-	
1 + 50 W	045	till	20	light grey-brown clay
3 + 00 W	046	till	15	upper root-aerated layer of till
4 + 50 W	047	A_1	30	black muck just above till
6 + 00 W	048	B	25	light red-brown
6 + 82 W	049	stream sample	-	
7 + 50 W	050	B	30	dark brown
9 + 00 W	051	B	25	light red-brown
10 + 50 W	052	A_1	30	black organic-till interface
10 + 80 W	053	stream sample	-	sparse silt
12 + 00 W	054	B	20	red-brown
13 + 50 W	055	B	25	light brown
15 + 00 W	056	B	15 - 20	red-brown
15 + 75 W	057	B	20 - 25	light brown

* Departures east and west of the baseline are given in hundreds of metres.

Sample Location*	Sample Number	Soil Horizon	Sample Depth (cm	Remarks
LINE 0				
16 + 50 W	058	B	20	red-brown
16 + 93 W	059	stream sample	-	
17 + 25 W	060	till	25	light grey-brown clay
18 + 00 W	061	B	20	light red-brown
19 + 50 W	062	B	20	red-brown
LINE 1N				
12 + 00 E	012	B	20	light red-brown
10 + 50 E	013	B	15 - 20	light red-brown; sandy
9 + 00 E	014	B	15 - 20	red-brown
7 + 50 E	015	B	15 - 20	light red-brown
6 + 00 E	016	B	15 - 20	light brown
80 m N of				
5 + 70 E	017	stream sample	-	very little silt
4 + 50 E	018	B	15	reddish B above till
3 + 00 E	019	B	15 - 20	light brown
1 + 50 E	020	B	15 - 20	medium brown; abundant pebbles
B/L	021	B	15 - 20	light red-brown
1 + 50 W	022	A_1	25	black muck
3 + 00 W	023	B	15 - 20	light brown
4 + 50 W	024	B	15 - 20	light red-brown
6 + 00 W	025	B	15 - 20	red-brown
12 + 00 W	066	B	25	red-brown
13 + 30 W	065	stream sample	-	
13 + 50 W	064	B	15 - 20	light red-brown
14 + 25 W	063	B	15 - 20	red-brown
15 + 00 W	067	B	20 - 25	red-brown

Sample Location*	Sample Number	Soil Horizon	Sample Depth (cm)	Remarks
LINE 1N				
15 + 75 W	068	A_1	25	black muck
16 + 50 W	069	B	30	light brown
75 m N of				
16 + 50 W	043	B	25	dark brown
18 + 00 W	070	B	30	light brown
LINE 2N				
12 + 00 E	088	B	20	red-brown
10 + 50 E	087	B	30	light red-brown
9 + 00 E	086	B	15	red-brown
7 + 50 E	085	B	15 - 20	light brown
6 + 40 E	084	stream sample	-	sparse silt
6 + 00 E	083	B	15 - 20	medium brown
4 + 50 E	082	B	15 - 20	light red-brown
3 + 00 E	081	A_1	25	black muck
1 + 50 E	080	B	25	red-brown; abundant rock
0 + 90 E	079	stream sample	-	
B/L	026	B	15 - 20	light red-brown
1 + 50 W	027	B	15 - 20	light red-brown
3 + 00 W	028	B	25	red-brown
4 + 50 W	029	B	15 - 20	light red-brown
30 m N of				
6 + 00 W	030	B	25	red-brown
60 m N of				
7 + 50 W	031	A_1	30	black muck
80 m N of				
9 + 00 W	032	A_1	30	black muck

Sample Location*	Sample Number	Soil Horizon	Sample Depth (cm)	Remarks
LINE 2N				
10 + 50 W	074	B	25	light red-brown
12 + 00 W	073	B	25	light red-brown
12 + 75 W	072	B	15 - 20	light red-brown
13 + 50 W	071	B	15 - 20	red-brown
14 + 25 W	075	A_1	25	black muck
15 + 00 W	076	B	15 - 20	light red-brown
16 + 50 W	077	B	25	red-brown
75 m N of				
16 + 50 W	042	B	25	light red-brown
18 + 00 W	078	B	30	light red-brown
LINE 3N				
12 + 00 E	089	B	15	light red-brown
10 + 50 E	090	B	15 - 20	light brown
9 + 00E	091	B	25	red-brown
20 m N of				
7 + 65 E	092	stream sample	-	
7 + 50 E	093	B	15 - 20	brown; quite rocky
30 m N of				
7 + 20 E	094	stream sample	-	sparse silt
6 + 00 E	095	B	15 - 20	red-brown
4 + 50 E	096	B	15 - 20	red-brown
3 + 00 E	097	B	15 - 30	red-brown
3 + 00 E	098	stream sample	-	
15 m N of				
1 + 75 E	099	stream sample	-	
1 + 50 E	100	B	15 - 20	light red-brown

Sample Location*	Sample Number	Soil Horizon	Sample Depth (cm)	Remarks
LINE 3N				
B/L	101	B	15	red-brown
1 + 50 W	102	B	25	light red-brown; rocky
1 + 80 W	103	stream sample	-	
3 + 00 W	104	B	20	red-brown
4 + 50 W	105	B	20	red-brown
6 + 00 W	106	B	25	light red-brown
7 + 50 W	107	B	20	red-brown
30 m S of 10 + 50 W	033	B	20 - 25	red-brown
10 m S of 12 + 00 W	034	B	20 - 25	red-brown
10 m N of 12 + 75 W	035	B	25	light red-brown
10 m N of 13 + 50 W	036	stream sample	-	
10 m N of 13 + 50 W	037	B	25	red-brown
20 m N of 14 + 25 W	038	B	20	light red-brown
30 m N of 15 + 00 W	039	B	30	light brown
40 m N of 15 + 20 W	040	stream sample	-	
50 m N of 16 + 50 W	041	B	25	light red-brown
LINE 4N				
B/L	118	B	15	red-brown
1 + 50 W	119	B	30	red-brown; rocky

Sample Location*	Sample Number	Soil Horizon	Sample Depth (cm)	Remarks
LINE 4N				
3 + 00 W	120	B	30	light red-brown; rocky
4 + 50 W	121	B	20	light red-brown
6 + 00 W	122	B	15	light red-brown; rocky
7 + 50 W	123	B	20	light red-brown
9 + 00 W	124	B	20	red-brown
10 + 50 W	125	B	20	red-brown
11 + 25 W	126	B	25	light red-brown
12 + 00 W	127	B	15	light red-brown
12 + 75 W	128	B	25	red-brown
13 + 05 W	129	stream sample	-	
13 + 50 W	130	B	25	light red-brown
15 + 00 W	131	A_1	25	black muck
Bralorne 1971 Grid				
LINE 10 S				
0 + 50 E	108	A_1	25	dark brown; organic
1 + 00 E	109	B	20	dark brown; rocky
1 + 50 E	110	B	20	red-brown
2 + 00 E	111	A_1	20	dark brown; organic
2 + 50 E	112	B	15	red-brown
3 + 00 E	113	B	20	red-brown
3 + 50 E	114	A_1	20	black organic
4 + 00 E	115	A_1	20	black organic
4 + 50 E	116	B	20	red-brown
5 + 00 E	117	B	15	red-brown

11.2 ANALYTICAL REPORTS FOR GEOCHEMICAL SAMPLES

To: HALFERDAHL & ASSOCIATES LTD.,
18, 10509-81st. Ave.,
Edmonton, Alta.

ATTN: Dr. L.B. Halferdahl

File No. 10413
Date September 9, 1975
Samples Soil Geochems & Stream

Certificate of ASSAY

LORING LABORATORIES LTD.

PAGE # 1

SAMPLE No.	PPM Cu	PPM Pb	PPM Zn
002	13	31	100
003	21	31	103
004	34	21	75
005	31	25	160
006	26	23	108
007	13	29	93
008	109	29	140
009	36	23	111
010	9	33	81
011	4	21	84
012	11	13	165
013	4	14	84
014	5	15	93
015	4	10	57
016	7	15	55
017	28	25	69
018	5	15	67
019	4	14	69
020	31	21	60
021	5	21	88
022	117	17	54
023	15	20	62
024	9	17	55
025	13	26	93
026	5	14	55
027	200	25	67
028	3	12	57
029	9	14	55
030	9	17	103
031	69	17	47
032	104	12	42

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

J. Loring Laboratories

Licensed Assayer of British Columbia

To: HALFERDAHL & ASSOCIATES LTD.,
18, 10509-81st. Ave.,
Edmonton, Alta.

ATTN: Dr. LB. Halferdahl

File No. 10413
Date September 9, 1975
Samples Soil & Stream Geochems

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	PPM Cu	PPM Pb	PPM Zn
033	4	18	79
034	11	21	62
035	5	15	69
036	31	29	150
037	5	21	62
038	20	17	57
039	34	20	86
040	4	14	52
041	4	12	59
042	4	10	67
043	12	10	180
044	27	12	86
045	20	17	88
046	13	20	93
047	22	7	140
048	10	15	71
049	34	17	75
050	39	14	60
051	5	7	69
052	20	17	81
053	25	28	111
054	4	20	66
055	10	17	98
056	4	14	43
057	4	14	49
058	4	17	81
059	9	15	77
060	10	21	81
061	8	18	64
062	5	17	33
063	7	44	100

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made in advance.

A. J. McLeod

Licensed Assayer of British Columbia

To: HALFERDAHL & ASSOCIATES LTD.,
18, 10509-81st. Ave.,
Edmonton, Alta.

ATTN: Dr. L.B. Halferdahl

File No. 10413
Date September 9, 1975
Samples Soil & Stream Sediments

Certificate of ASSAY

LORING LABORATORIES LTD.

PAGE # 3

SAMPLE No.	PPM Cu	PPM Pb	PPM Zn
064	5	20	86
065	29	31	130
066	11	23	98
067	15	72	456
068	34	12	49
069	8	15	67
070	15	17	81
071	4	10	36
072	5	12	66
073	5	17	60
074	7	14	90
075	17	12	10
076	4	12	33
077	5	17	98
078	9	17	98
079	23	15	52
080	25	21	79
081	49	15	79
082	18	21	60
083	23	18	64
084	27	18	60
085	5	15	49
086	5	14	60
087	11	18	100
088	9	15	52
089	8	12	47
090	7	10	67
091	4	14	71
092	18	17	86
093	16	17	75
094	28	12	66

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

J. Lineaar

Licensed Assayer of British Columbia

To: HALFERDAHL & ASSOCIATES LTD.,
18, 10509-81st. Ave.,
EDMONTON, Alta.

ATTN: Dr. L.B. Halferdahl

File No. 10413
Date September 9, 1975
Samples Soil & Stream Sediments

Certificate of ASSAY

LORING LABORATORIES LTD.

PAGE # 4

SAMPLE No.	PPM Cu	PPM Pb	PPM Zn
095	8	12	66
096	13	23	90
097	72	23	165
098	43	21	98
099	77	21	69
100	22	25	57
101	5	17	33
102	13	18	64
103	109	25	39
104	8	17	49
105	4	12	54
106	37	17	81
107	13	18	58
108	285	25	69
109	500	51	84
110	42	21	135
111	68	17	180
112	46	20	93
113	49	25	90
114	305	17	28
115	930	14	46
116	12	18	73
117	21	25	54
118	10	10	29
119	8	17	130
120	29	23	62
121	8	14	52
122	25	28	79
123	7	14	34
124	8	10	34
125	10	17	75

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made in advance.

A. Leslie Isaac

Licensed Assayer of British Columbia

To: HALFERDAHL & ASSOCIATES LTD.,
18, 10509-81st. Ave.,
EDMONTON, Alta.

ATTN: Dr. L.B. Halferdahl

File No. 10413
Date September 9, 1975
Samples Soil & Stream Sediments

Certificate of ASSAY

LORING LABORATORIES LTD.

PAGE # 5

SAMPLE No.	PPM Cu	PPM Pb	PPM Zn
126	5	10	59
127	8	12	43
128	100	20	106
129	29	29	140
130	4	14	46
131	61	15	103

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia

11.3 FIELD CREW AND FIELD TIME

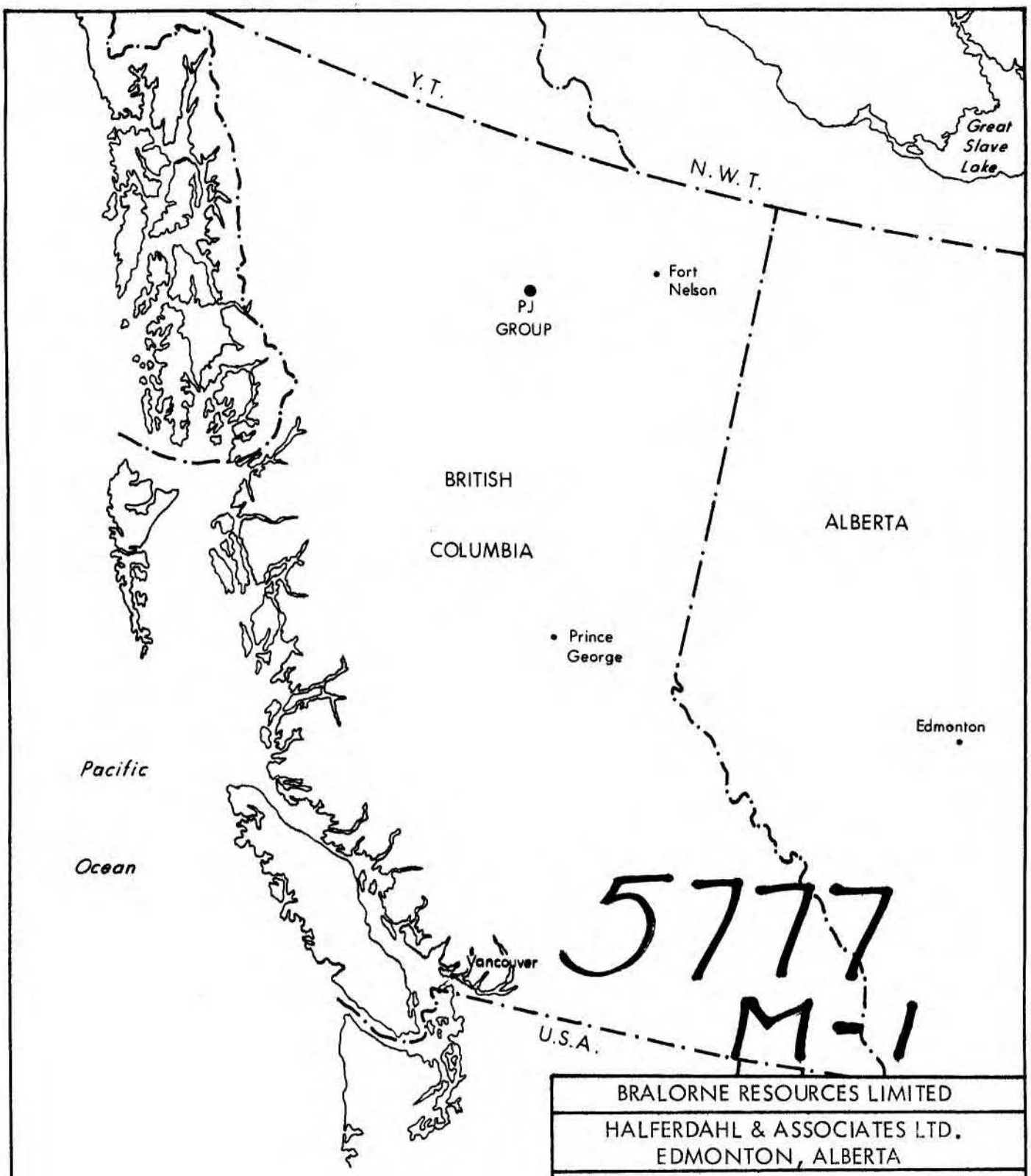
Name	Position	Time in Field 1975
N.C. Croome	Vice President Bralorne Resources Limited	August 27
T.R. Gallant	Geologist Bralorne Resources Limited	July 23 - July 30
L.B. Halferdahl	Geologist	August 6 - August 9 August 25 - August 27
E. Lipsett	Geochemist	August 6 - August 9
D. McKenzie	Assistant	July 22 - September 5
W.G. Powell	Geologist	July 22 - September 5

	Geological Work		Camp Work Travelling		Time Off		Total	
	Days	%	Days	%	Days	%	Days	%
July 22 - 31	12	43	10	36	6	21	28	100
August 1 - 31	50½	72	9½	13	11	15	71	100
September 1 - 5	5½	55	4	40	½	5	10	100
Total	68	62	23½	22	17½	16	109	100

Total days 46

Days rain and/or snow 24

Percentage of days rain 52%



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M-1

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Fig. 1 Location Map

PJ GROUP, GATAGA RIVER

KILOMETRES 100 0 100 200 300 KILOMETRES

WGP November 1975

Drawing No. PJ-75-1

L.B. Halferdahl

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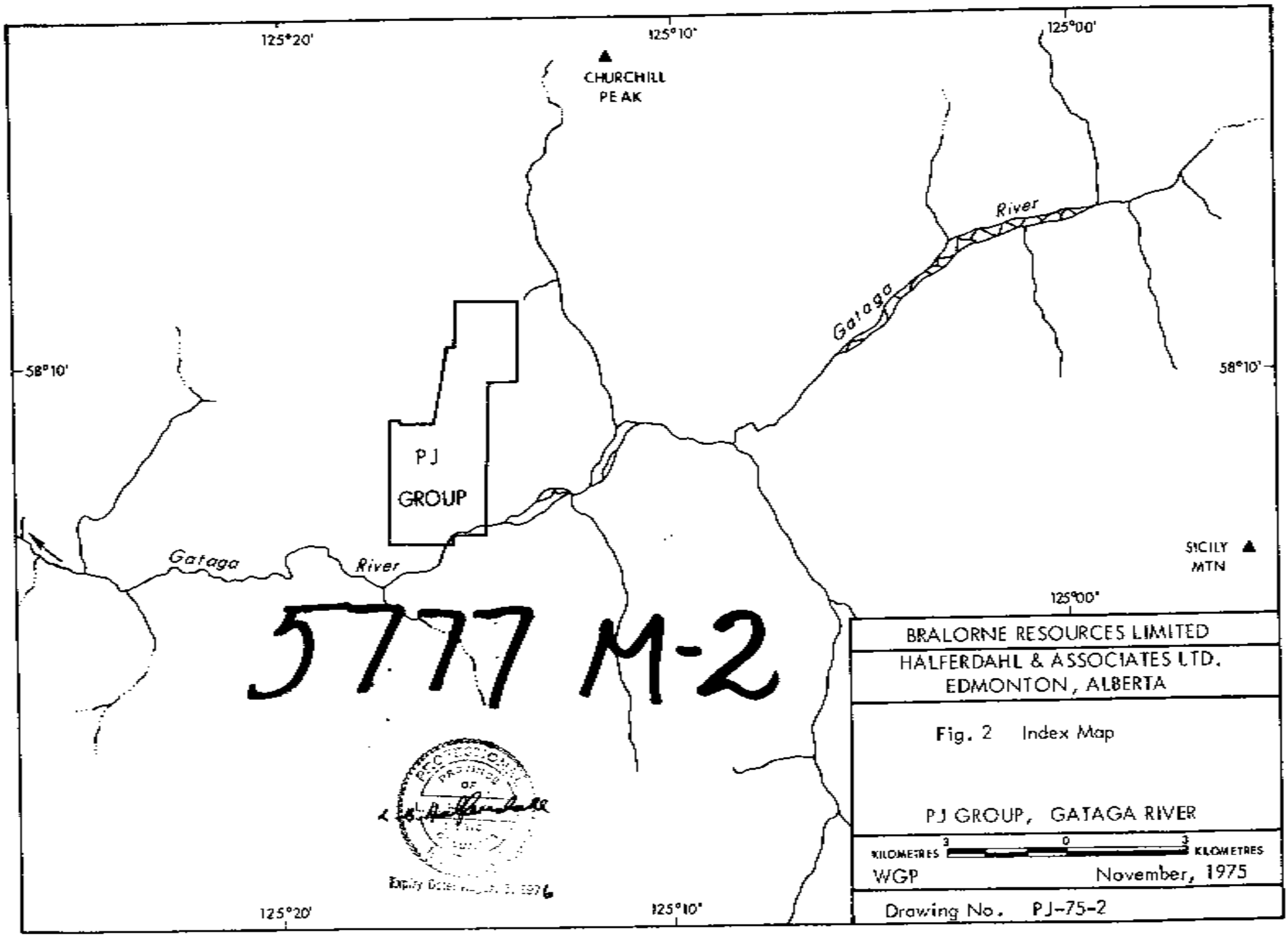
L. B. HALFERDAHL

Expiry Date: August 5, 1976


125°20'
125°10'
125°00'
CHURCHILL PEAK
Gataga River
58°10'
PJ GROUP
Gataga River
SICILY MTN
125°00'
125°20'
125°10'
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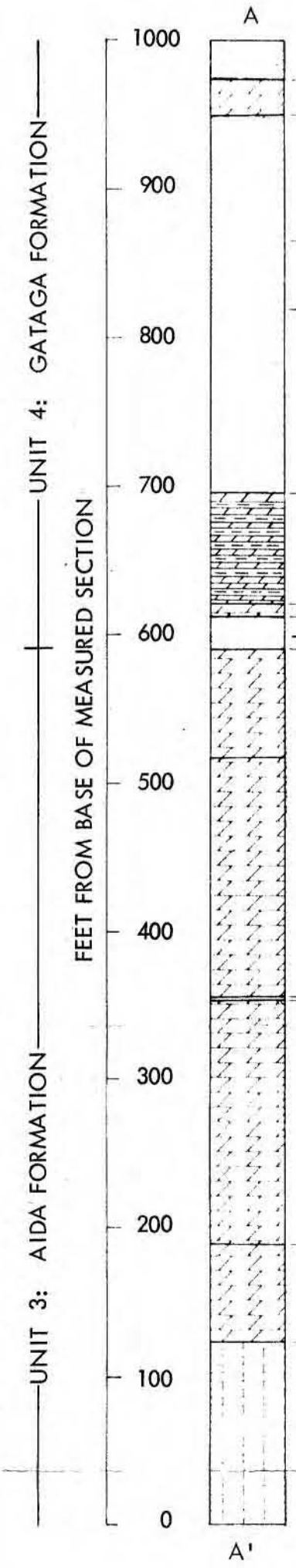
HALFERDAHL & ASSOCIATES LTD.
EDMONTON, ALBERTA
Fig. 2 Index Map
PJ GROUP, GATAGA RIVER
KILOMETRES 3 0 3 KILOMETRES
WGP November, 1975
Drawing No. PJ-75-2

5777 M-2



Siltstones - very slightly dolomitic; medium- to dark-grey; weathers medium grey-brown; very well cleaved.

Dolomite - interbedded with minor more silty beds; beds 2 to 12 inches; medium- to dark-grey; weathers light chocolate brown; poorly cleaved.

Siltstones - locally dolomitic; medium- to dark-grey; overall weathered color medium brown; across cleavage weathers with a reddish tinge; along cleavage weathers light and dark greys; very well cleaved.

- 865 ft. more dolomitic.

- 820 - 823 ft. slates weather rusty orange.

Dolomites plus interbedded siltstones - beds generally 2 to 12 inches; dolomites more predominant towards base of unit; medium- to dark-grey; weathers light brown; dolomites poorly to moderately cleaved; siltstone more cleaved.

Dolomite - beds 2 to 18 inches; medium grey; weathers whitish because of distinctive lichen which covers it; uncleaved.

Siltstones - dolomitic; medium-grey; weathers light grey-brown; moderately to well cleaved.

Dolomite - massively bedded; beds 3 to 36 inches; medium grey; weathers buff; uncleaved to poorly cleaved.

Dolomite - less massive; beds ½ to 4 inches; light- to medium-grey; weathers light buff, slightly less orange than above; poorly to moderately cleaved; contains minor knots of pyrite to 2 cm.

Quartz-carbonate vein - mineralized with chalcopyrite.

Dolomite - finely bedded; medium-grey; weathers light buff, poorly to moderately cleaved.

Dolomite - bedding 2 to 8 inches; light- to medium-grey; weathers light buff; poorly cleaved.

Limestone - locally dolomitic; light- to medium-grey; weathers light grey but slightly buff in lower 20 to 30 feet; poorly to moderately cleaved.

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Fig. 5 Measured Section A-A' PJ GROUP, GATAGA RIVER
WGP November, 1975
Drawing No. PJ-75-5

COST STATEMENT

a)	N.C. Croome	2 days	August 26 - 27, 1975	
	T.R. Gallant	8 days	July 23 - 30, 1975	
	L.B. Halferdahl	16 days	July 17 - 18, 1975 August 5 - 9, 1975 August 24 - 27, 1975 November 17 - 21, 1975	
	E. Lipsett	4 days	August 6 - 9, 1975	
	D. McKenzie	46 days	July 22 - September 5, 1975	
	W.G. Powell	109 days	July 14 - September 5, 1975 October 1 - November 24, 1975	
b)	N.C. Croome	$250/day	$500.00	
	T.R. Gallant	115/day	920.00	
	L.B. Halferdahl	250/day	4,000.00	
	E. Lipsett	250/day	1,000.00	
	D. McKenzie	1019.90/month	1,555.93	
	W.G. Powell	2488.61/month	8,779.34	
			$16,755.27	
c)	Total cost of food and accommodations		2,168.43	
d)	Total cost of transportation		1,105.91	
e)	Helicopter support		8,325.23	
f)	Nil			
g)	Analyses of geochemical samples (130 samples)		273.19	
h)	Cost of report preparation: typing, drafting, reproduction		1,627.76	
i)	Telephone		55.04	
	Miscellaneous		186.41	
	Total		$30,497.24	

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EDMONTON, ALBERTA

Fig. 7 Cumulative Frequency Plot for Geochemical Survey

PJ GROUP, GATAGA RIVER

WGP November, 1975

Drawing No. PJ-75-7

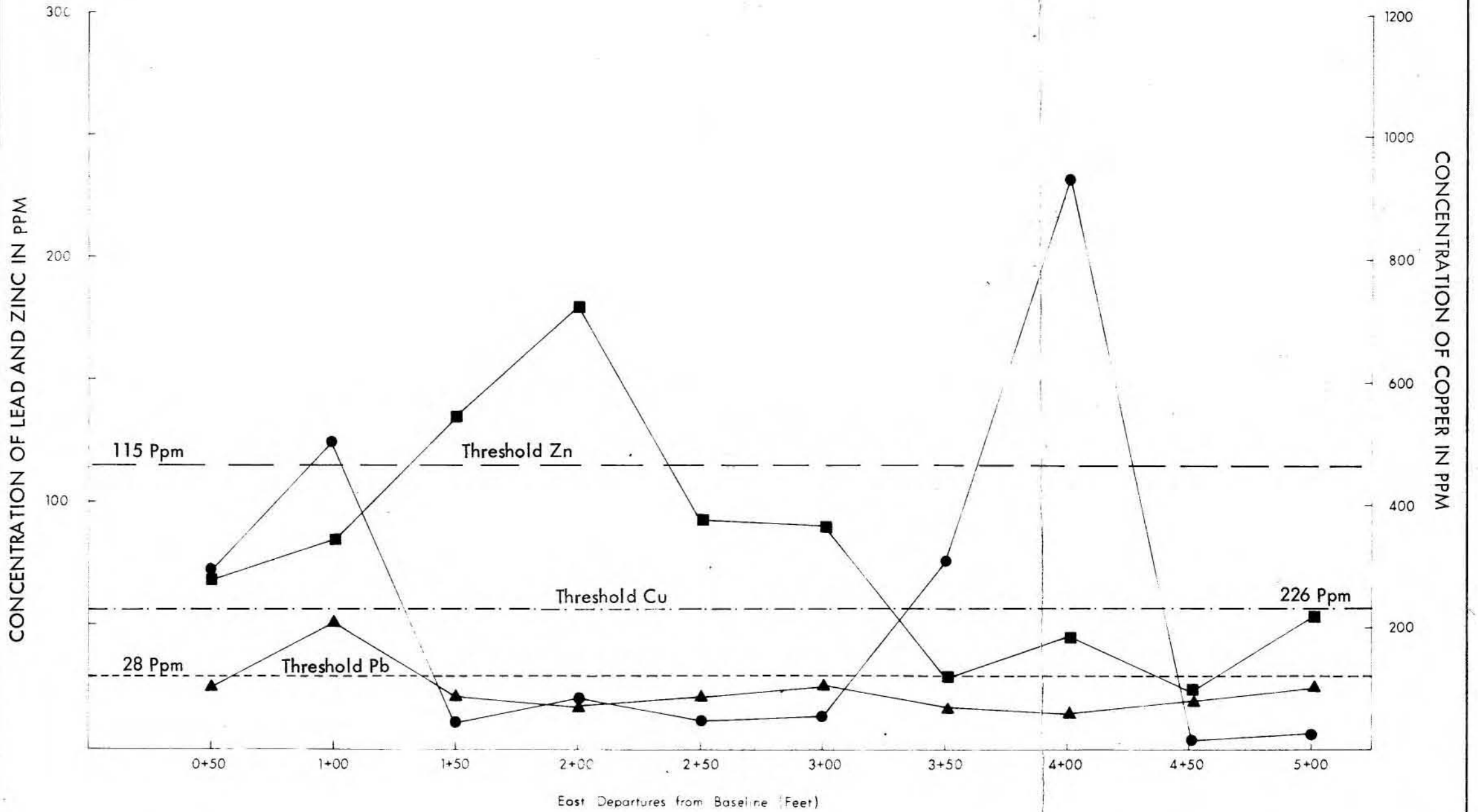

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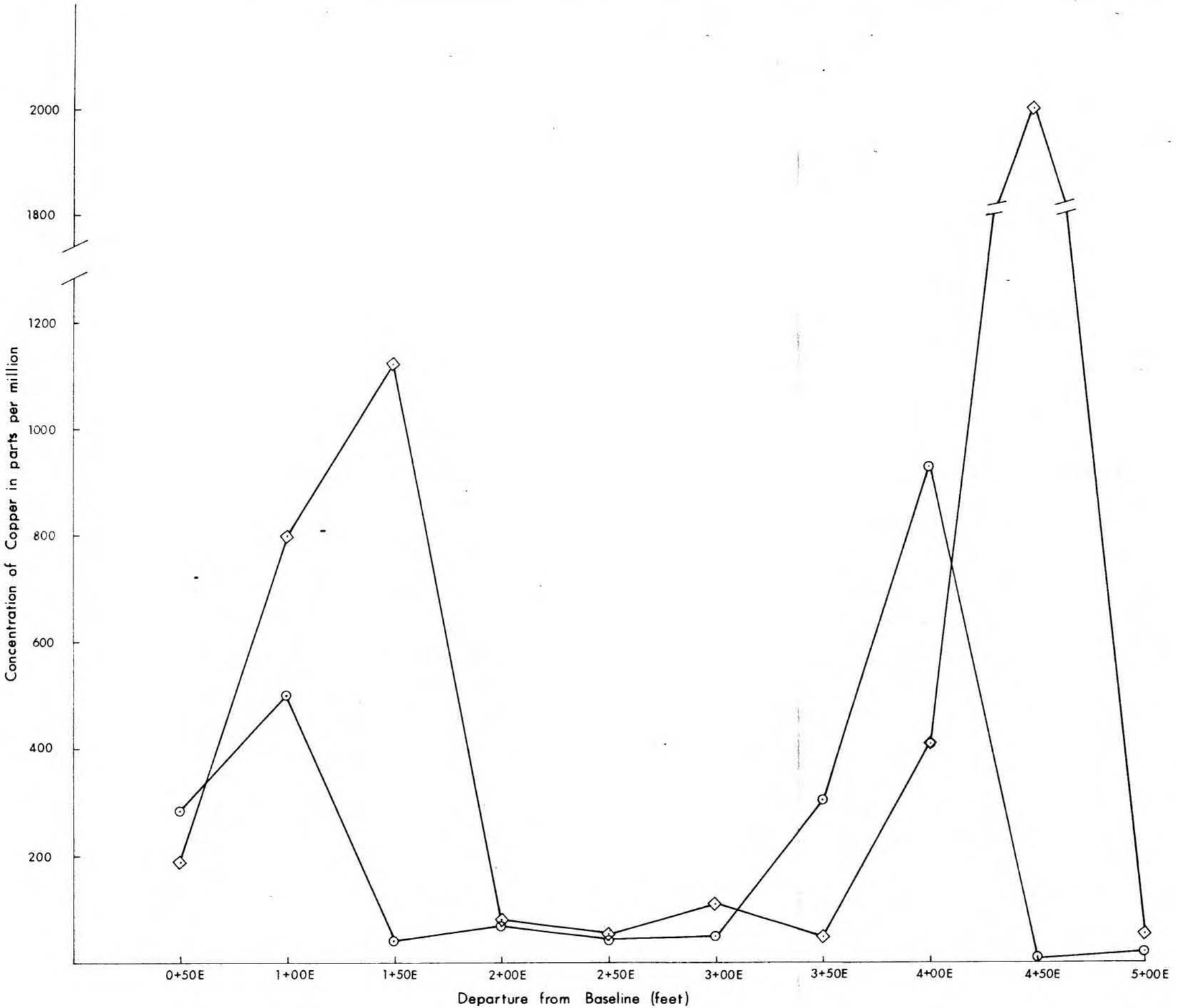
Fig. 8 Geochemical Profile for Line 10S of 1971 Grid PJ GROUP, GATAGA RIVER
WGP November, 1975
Drawing No. PJ-75-8



L. B. HALFERDAHL
PROFESSIONAL ENGINEER
BRITISH COLUMBIA

Expiry Date: August 5, 1976

BRALORNE RESOURCES LIMITED
HALFERDAHL & ASSOCIATES LTD. EDMONTON, ALBERTA
Fig. 9 Geochemical Profile for Line 10S 1971 and 1975 Results PJ GROUP, GATAGA RIVER
WGP November, 1975
Drawing No. PJ-75-9

Plate 1

Plate 2

PJ 109 | PJ 110 | SYBIL 5 | SYBIL 6

PJ 107 | PJ 108 | SYBIL 3 | SYBIL 4

PJ 105 | PJ 106 | SYBIL 1 | SYBIL 2

PJ 60 | PJ 103 | PJ 104 | ANDREW 19 | ANDREW 20

PJ 58 | PJ 101 | PJ 102 | ANDREW 17 | ANDREW 18

PJ 56 | PJ 99 | PJ 100

PJ 54 | PJ 97 | PJ 98

Northeast Zone

Snow and Talus

Snowfield

Talus

Glacial Debris

Talus and Rubble

Snow

Book Zone

1850 1700 1550 2000 2150 2300 2450

Note: See Plate 2 for Legend.

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EDMONTON, ALBERTA

REVISIONS	
INITIALS	DATE

Fig 3 Geology - Plate 1

PJ GROUP, GATAGA RIVER

SCALE: 1:5,000

W.G.P. NOVEMBER 1975

Drawing No. PJ-75-3

Expiry Date: August 5, 1976

5777 M-3

Plate 1

Plate 2

Intrusive Rocks

5 Diabase dykes.

Gataga Formation

4 Well cleaved dark mudstones and siltstones.

Aida Formation

3 Massive to thinly bedded dolomites and dolomitic siltstones; minor limestone.

2 Well cleaved dolomitic and non-dolomitic mudstones and siltstones; minor dolomite and sandy horizons.

1 Dolomite, dolomitic and limy siltstone and limestone; minor non-calcareous mudstones and siltstones.

Geological contact
Strike and dip of bedding: inclined, vertical
Strike and dip of cleavage: inclined, vertical
Strike and dip of joint: inclined
Small scale fold axis
Fault: defined, approximate
Mineralized vein
Measured section
Limit of outcrop
Limit of snowfield
Contour line (interval 37.5 metres) 1250
Boundary of property
Claim post: observed, reported present, witnessed
Claim number PJ 20

L. A. Halferdahl
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

Expiry Date: August 5, 1976

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Fig. 4 Geology - Plate 2

PJ GROUP, GATAGA RIVER

WGP NOVEMBER 1975

Drawing No. PJ-75-4

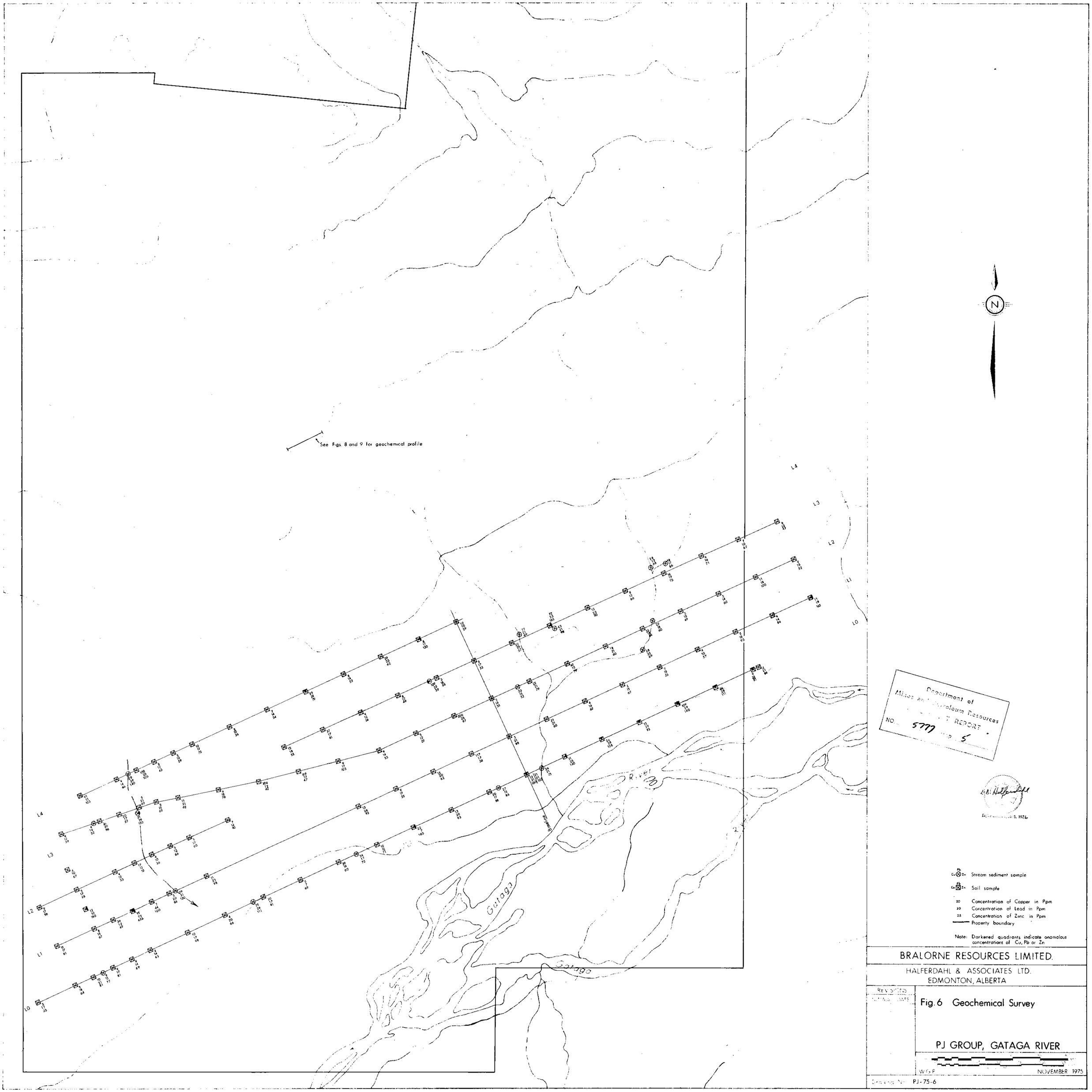

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Fig. 6 Geochemical Survey

PJ GROUP, GATAGA RIVER

W.G.P. NOVEMBER 1975

Drawing No. PJ-75-6