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92I/15E

GEOPHYSICAL REPORT

on a

GROUND MAGNETIC AND VLF-EM SURVEY

and the

GOVERNMENT AEROMAGNETIC SURVEY

DOG CLAIM GROUP

CANNELL CREEK, KAMLOOPS M.D.

BRITISH COLUMBIA

January-February, 1973

Dog Claim Group: 17.5 miles N35W of Kamloops
: 50° 120° NW

N.T.S. - 92 I/15E

Report by: David G. Mark
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March 13, 1973

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SUMMARY

The 30 claim Dog group is located on Cannell Creek about 17.5 miles N35W of the City of Kamloops. Access is by the Pass Lake dirt road and thence along the Cannell Creek road. The terrain varies from relatively flat to rock bluffs and tree cover consists of conifers.

The Dog claims are a restaking of the old Allies showings which were previously explored for gold. The mineralization consists of pyrite, chalcopyrite, bornite, and galena within quartz veins. These veins are within dark grey porphyry dykes cutting serpentine of the Cache Creek group. Overlying the Cache Creek rocks around the Dog claims are Tertiary volcanics of the Kamloops Group.

Residual downward continuation and second vertical derivative maps were derived from the government aeromagnetic map for the Dog group area. Two faults, approximately orthogonal, and the type of rock underlying the Tertiary volcanics were interpreted from these maps.

A combined magnetic and VLF-EM survey was carried out over most of the Dog claims during January and February, 1973. The VLF-EM data was Frazer-filtered. The contour interval and mean background level of the magnetic data were chosen from a cumulative frequency graph of the data. The magnetic data appears to have reflected the Kamloops volcanics and Cache Creek rocks as well as the zones of mineralization. The conductive zones outlined by the VLF-EM may be shear or fracture zones as well as magnetite-mineralized rocks.

CONCLUSIONS

1. The aeromagnetic maps show two lineations. One strikes northwest and is interpreted to be a fault-contact. The rocks underneath the Tertiary volcanic capping are felt to be Cache Creek sediments to the northeast of the fault contact and possibly Iron Mask intrusive to the southwest. The other lineation strikes northeast and is felt to be a fault. The two faults cross in the area of the old Allies workings within the Dog group.

2. Magnetic highs appear to be reflecting remnants of Tertiary volcanics overlying Cache Creek rocks.

3. Broad magnetic lows such as the southwestern grid area appear to be reflecting Cache Creek rocks.

4. Smaller magnetic lows, but not isolated lows of high intensity, correlate with zones of mineralization.

5. There is generally good correlation between the residual downward continued aeromagnetic map and the ground magnetic map if the aeromagnetic features are shifted northeasterly. The displacement of these features are probably caused by a combination of three errors which are mentioned in the text of the report.

6. The conductive zones as outlined by the VLF-EM survey would well be due to shear or fracture zones that mainly parallel the major northeast-trending fault.

7. Conductive zones A to D all have at least partial correlation with magnetic lows. This correlation increases the probability of sulphide mineralization.

8. The mineralized float of the BT shaft may have moved southwards 200 to 300 feet from an area defined by a magnetic low. Alternatively, it may have moved northwards 200 to 300 feet from an area defined by a VLF-EM high which correlates with two magnetic lows. The southward direction is favoured since this is the direction of the slope.

9. Many of the above points are inconclusive because of the lack of knowledge of the geology of the property.

RECOMMENDATIONS

1. It is strongly recommended to map the geology of the property quite thoroughly. This is important for a better interpretation of the results discussed in this report as well as any other surveys that may be carried out and for optimum spotting of drill holes.

2. The VLF-EM and magnetic survey should be completed over the remainder of the property when the property is devoid of snow cover.

3. A soil sample survey of the property would be extremely useful. Its results coupled with the magnetic, VLF-EM, and geology surveys should give good targets for diamond or percussion drilling.

4. The property should be diamond drilled, but much more preferably after the above recommendations have taken place. If the above recommendations are not carried out and it is decided to proceed with drilling, then it is recommended to first drill the magnetic low to the immediate north of the BT shaft. The results of this hole would determine where additional drilling should take place, such as other magnetic lows or VLF-EM conductive zones.

   The first hole should be drilled at a -45° angle to the east from 100 feet west of station (L-0,11NE). This location depends on favourable topography.

Respectfully submitted,
GEOTRONICS SURVEYS LTD.,

David G. Mark, Geophysicist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. R. TOUGH

March 15, 1973

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DOG CLAIM GROUP

CANNELL CREEK, KAMLOOPS M.D. B.C.

INTRODUCTION AND GENERAL REMARKS

This report discusses the procedure, compilation and interpretation of a combined fluxgate magnetometer and a very low frequency electromagnetic (VLF-EM) survey carried out on the Dog Claim Group during January and February of 1973. The report also discusses the digitizing, two methods of filtering,and interpretation of the resulting filtered maps of the government aeromagnetic survey over and around the Dog claims.

The work on the ground survey was supervised in the field by Howard A. Larson, geophysicist. The number of line miles completed was 20.4 and the area covered by the survey is as shown in Figure 3.

The purpose of the field survey and of filtering the government aeromagnetic map was to try to obtain information on the structure and lithology of the area. It was hoped also that the VLF-EM data would reflect directly any sulphides that may occur in the area.

PROPERTY AND OWNERSHIP

The Dog claim group consists of 30 contiguous claims which are as follows and as shown on Figure 3.

Name	Record No.	Expiry Date
Dog 103-112	81006-15	June 9, 1973
Dog 113-132	10738-402	May 16, 1973

All the claims are wholly owned by Bon-Val Mines Ltd (NPL) of Vancouver, British Columbia.

LOCATION AND ACCESS

The Dog claims are located on Cannell Creek, 17.5 miles N35W of Kamloops in a straight line.

The geographical coordinates are 50° 53' N latitude and 120° 34' W longitude.

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LOCATION AND ACCESS

The Dog claims are located on Cannell Creek, 17.5 miles N35W of Kamloops in a straight line.

The geographical coordinates are 50° 53' N latitude and 120° 34' W longitude.

Access to the claims is by the Pass Lake dirt road to Pass Lake. This road starts approximately one mile north of the city centre of North Kamloops along the west side of the North Thompson River. From the agricultural research station at Pass Lake, one travels northwesterly for 0.6 of a mile where one turns west and travels a further 5.2 miles N.W. to the Dog claims over a logging road.

Pass Lake is accessible by a two-wheel drive vehicle all year around, the road being kept open in the winter. A four-wheel drive vehicle is recommended from Pass Lake to the property during summer months and a skidoo during winter months.

PHYSIOGRAPHY

The property is found at the southern end of the Tranquille Plateau which forms part of the physiographic unit known as the Thompson Plateau. The terrain varies from gentle on the northeastern and southwestern parts of the property to steep on the sides of gullies. The elevation varies from 3800 feet along the southern portion of Cannell Creek to 4700 feet along the western, eastern, and northern perimeters of the property, which gives a relief of 900 feet.

Cannell Creek is the main water drainage of the area and flows southeasterly approximately through the center of the claims. Sydney Lake, about 1700 feet long, is found a few thousand feet to the northwest of the claims.

The property lies within the Tranquille forest with the major vegetation consisting of pines, spruce and other conifers.

Pleistocene ice occupied the Thompson Plateau and thus much of the claims area is probably covered by glacial drift which could become quite deep over the flatter areas.

The climate is semi-arid with annual precipitation varying from 11 to 12 inches. Temperatures vary from the high extreme in summer of around 100°F to the low extreme in winter of around -30°F, though the usual temperature during the summer days would be 60°F to 80°F and that in winter 20°F to 40°F.

HISTORY OF PREVIOUS WORK

This property was previously known as the Allies Group upon which work was done in exploration for gold during the 1920's and 1930's. At this time several trenches, shafts and adits were dug out.

Since the Dog claims were staked, a few 'cat' trenches were put in, the government aeromagnetics over the claim group was interpreted, and a preliminary examination and report was carried out by L. W. Saleken.

GEOLOGY

The geological description of the property is taken from Cockfield and Saleken. (see Selected Bibliography).

Much of the general area is underlain by Tertiary volcanics of the Kamloops Group. These consist of rhyolites, andesites and basalts with associated tuffs, breccias, and agglomerates.

Forming a window in the Tertiary volcanics and underlying much of the Dog claims are rocks of the Carboniferous Cache Creek group. This group in this area consists of argillite,

quartzite, hornstone, limestone, sheared conglomerate, breccia, greenstone, and serpentine. The units have a northwest trend with varied dips.

Cutting the Cache Creek rocks but not the Kamloops volcanics are light grey and dark grey porphyry dykes. The dark grey porphyry is a dense rock with phenocrysts of hornblende and feldspar.

The mineralization of the Allies prospect occurs as pyrite, chalcopyrite, bornite and galena within quartz veins which occur within the dark grey porphyry dykes. Up to 1.42 oz/ton of gold has been assayed with the sulphides.

Many of the claims in the area were staked during the "Afton rush." The property of Afton Mines Ltd is located south of Kamloops Lake. The main copper mineral is native copper and the tonnage so far blocked out is 40 million of 0.65% copper. This as well as other copper occurrences in the area occur within both the Iron Mask batholith and the older intruded Nicola rocks close to the batholith. Generally, they are veins, impregnations, stockworks, and mineralized shear zones within the country rock with the principle copper minerals being chalcopyrite, bornite, and

native copper, as well as some chalcocite, cuprite, azurite and malachite.

A. GOVERNMENT AEROMAGNETIC SURVEY

1. Survey Procedure:

The government aeromagnetic survey was flown by Lockwood Survey Corporation Ltd from November, 1966 to May, 1967. The terrain clearance was attempted to be kept at 1000 feet. Flight lines were flown in an east-west direction with the spacing averaging 1/2 mile. The data is contoured at a 10 gamma interval on a map of scale 1" = 1 mile.

2. Method of Digitizing:

The digitizing and filtering was supervised and/or carried out by Charles A. Ager, geophysicist.

The Dog claims are located within the Tranquille River aeromagnetic sheet, the N.T.S. of which is 92 I/15. An area on and around the Dog claims was blown up to a scale of 1" = 1000 feet. This map was digitized on a square grid with the grid interval being 500 feet. Linear interpolation was applied between contours. The digitized map was edited for error using a special edit program. In addition, visual editing was applied to correct subtle errors.

3. Description of Filtering:

a) Downward Continuation

The total intensity map was downward continued to 500 feet below mean flight path. This was done in order to obtain a better differentiation of anomalous zones. The operator used was a 4-point operator with a length of 7 designed to be a close approximation to the ideal case at low and medium frequencies, and also designed to attenuate the high frequencies (i.e., those in the order of the frequencies caused by rounding off values).

In addition, the regional gradient was removed to eliminate distortion.

The results were then computer-contoured and subsequently traced on sheet 2. This sheet then theoretically represents the residual field at approximately 500 feet above the ground surface. It essentially enhances the anomalies caused by near-surface material over those caused by basement sources at thousands of feet depth.

b) Second Vertical Derivative

The second vertical derivative enhances subtle anomalies caused by near-surface materials and suppresses those caused by more deeply buried regional features. The resulting map is quite similar to that of the residual downward continued map. However, considering the second vertical derivative

gives a different presentation which may make it easier to spot local anomalies and detect lineation, it was felt to be worth the small extra cost, and therefore was carried out.

Two disadvantages of the second vertical derivative map is that it contains more anomalies than the total field one does, and it is more sensitive to high frequency such as that caused by roundoff errors. For this reason the second vertical derivative map is used only as a guide in helping to interpret the total intensity map.

The total intensity data was treated by the second vertical derivative filter using a modified Rosenbach operator. The resulting data was computer contoured and then traced onto Sheet No. 3.

4. Discussion of Results:

The discussion of the results will largely be based on Sheet No. 2 which is the residual downward continued map. The total intensity map is good for interpreting larger, more regional features. The residual downward continued map is good for interpreting more localized features which are of greater exploratory interest in this case.

The second vertical derivative map is useful largely to corroborate the interpretation of the residual downward continued one.

Of primary interest are two lineations apparent on Sheet No. 2. The first one strikes northwest-southeast along Cannell Creek through the Dog Claim group, and through Strachan Lake. From the magnetic contours, the exact location is difficult to ascertain and therefore the topography (Cannell Creek and Strachan Lake) was used in addition to the magnetic data for interpretation. This lineation is also apparent on the total intensity and second vertical derivative maps.

The lineation is probably caused by a fault contact. The steep sided valley through which Cannell Creek flows suggests a fault. The writer feels it is also a contact on account of the difference in magnetic character on each side of the lineation. As can be seen on the total intensity map, the magnetic field is in the 3000-gamma range to the southwest of the lineation and in the low 2000-gamma range to the northeast. Also, all three maps show the magnetic field to have a high gradient to the southwest and a lower gradient to the northeast.

The G.S.C. map shows most of the area on both sides of the lineation to be Tertiary volcanics. It is therefore possible that the lower gradient and lower values to the northeast of the lineation is caused by a thinner capping of Tertiary volcanics than to the southwest. However, the lower values are largely on the Tranquille Plateau at an elevation of around 5000 feet whereas the higher values are on the southwest slope of the same plateau. Thus the topography and magnetic contour correlation do not suggest the change in the magnetic field to be caused solely by the thickness of the Tertiary volcanics.

As a result, the writer feels, as stated in a preceding paragraph, that the different character of the magnetic field on either side of the lineation is caused by two different rock types underlying the Tertiary volcanics. The northeastern portion is likely underlain by the low magnetic sedimentary rocks of the Cache Creek group. This is supported by the occurrence of the window of Cache Creek group and of the large mass of the Cache Creek group to the east. The southwestern portion may be underlain by an intrusive that, because of the strong magnetic field, is likely an extension of the Iron Mask batholith. The occurrence of the porphyry dykes within the Allies showing suggests the showing lies close to an intrusive. These dykes, however, appear to have a low magnetic material content (as opposed to a high amount

of magnetic material within the Iron Mask batholith as found from the ground magnetic survey discussed later. Nevertheless, the Iron Mask batholith is associated with two post-Iron Mask intrusive rocks called the Sugarloaf intrusive and the Cherry Creek intrusive. The dykes thus could well be related to one of these two intrusives.

The writer's conclusion is therefore that the lineation is a fault-contact between Cache Creek rocks to the northeast and an extension of the Iron Mask batholith to the southwest. The porphyry dykes within the Allies showing are possibly related to either the Sugarloaf intrusive or the Cherry Creek intrusive. It should be pointed out that this conclusion is only a theory that is based on all the evidence available to date. It will probably be proven or disproven only after thorough geological mapping and/or diamond drilling.

The second lineation is easily seen only on the residual downward continued map and on the second vertical derivative map. It strikes in a northeast-southwest direction and through the Dog claim group. This lineation appears to be a fault. When carrying out the ground survey, Mr. Larson noted a deep gully on the Dog claims in the area of the supposed fault, and striking in the same direction as the fault. To the southwest of the Dog group are two magnetic lows and two magnetic highs. These show a displacement of about 1500 feet of the southeast side of

the fault in a northeast direction relative to the northwest side.

The fault-contact and fault mentioned above are approximately orthoganol to each other and cross in the very close vicinity of the Allies group showings. The writer feels it necessary to point out that these two lineations were drawn on sheet 2 without reference to these showings.

The cause of the magnetic lows shown on the residual downward continued map could well be Cache Creek rocks, especially around the Dog claims. Other possibilities are that the cause is shear and fracture zones associated with the two faults, or the dipole effect which is a common explanation for lows situated adjacent to highs.

Many of the magnetic highs are likely caused by magnetite-bearing volcanics of the Kamloops group. Southwest of the Dog claims the magnetic field produced by the volcanics (if the volcanics in this area have a strong magnetic field) would be in addition to that produced by the underlying Iron Mask intrusive (if it exists).

B. GROUND MAGNETIC AND VLF-EM SURVEY

1. Instrumentation and Theory

a) Magnetometer

The magnetic survey was carried out using a portable vertical component, Model G-110 fluxgate magnetometer manufactured by Geotronics Surveys Ltd of Vancouver, B.C. This is a visual-null type instrument using digital dial readout with a range of 100,000 gammas and a reading accuracy of 10 gammas. The G-110 has a temperature coefficient of 2 gammas per degree centigrade.

Only two commonly occurring minerals are strongly magnetic; magnetite and pyrrhotite. Hence, magnetic surveys are used to detect the presence of these minerals in varying concentrations. Magnetic data are also useful as a reconnaissance tool for mapping geologic lithology and structure since different rock types have different background amounts of magnetite and/or pyrrhotite.

b) VLF-EM

A VLF-EM receiver, Model G-28, manufactured by Geotronics Surveys Ltd of Vancouver, B.C. was used for the VLF-EM survey. This instrument is designed to measure the electro-

magnetic component of the very low frequency field (VLF) transmitted at 18.6 KHz, from Seattle, Washington.

In all electromagnetic prospecting, a transmitter produces an alternating magnetic field (primary) by a strong alternating current usually through a coil of wire. If a conductive mass such as a sulphide body is within this magnetic field, a secondary alternating current is induced within it which in turn induces a secondary magnetic field that distorts the primary magnetic field..

It is this distortion that the EM receiver measures. the VLF-EM uses a frequency range from 16 to 24 KHZ, whereas most EM instruments use frequencies ranging from a few hundred to a few thousand Hz. Because of its relatively high frequency, the VLF-EM can pick up bodies of a much lower conductivity and therefore is more susceptible to clay beds, electrolyte-filling fault or shear zones and porous horizons, graphite, carbonaceous sediments, lithological contacts as well as sulphide bodies of too low a conductivity for other EM methods to pick up. Consequently the VLF-EM has additional uses in mapping structure and in picking up sulphide bodies of too low a

conductivity for conventional EM methods and too small for induced polarization (in places it can be used instead of IP). However, its susceptibility to lower conductive bodies results in a number of anomalies, many of them difficult to explain and, thus, VLF-EM preferably should not be interpreted without a good geological knowledge of the property and/or other geophysical and geochemical surveys.

2. Survey Procedure

The survey grid was established as shown on sheets 4 and 5. The baselines were run in a northeast-southwest direction and the survey lines in a northwest-southeast direction. These directions were chosen for the following two reasons:

i) The combination of rough terrain and snow would have made it much too difficult to run the survey along northeast-southwest lines,

ii) The northwest-southeast direction of the survey lines was much better suited for VLF-EM Readings using the Seattle transmitter.

Baseline station 0+00 was located at a point where a bridge crosses Cannell Creek. A second baseline was put in striking towards the southwest from (L-12SW, 20NW). Both baselines were blazed and flagged.

As the survey was being carried out, the survey lines were chained and compassed in perpendicular to the baselines at 400-foot intervals. At 100-foot intervals survey stations were marked with orange flagging tape bearing the grid co-ordinates. Detail lines were run at 200-foot intervals in areas of trenches and adits.

Readings were taken by both the magnetometer and the VLF-EM instrument at the 100-foot stations. The magnetic diurnal change was monitored by closing loops approximately every two hours.

Detail lines a-a', b-b', and c-c' shown on sheet 4 were run to check anomalies that followed the survey lines. The anomalous low at (L-0, 11NW) was rechecked.

3. Compilation of Data

a) Magnetic

A cumulative frequency graph was drawn up of all the magnetic values after they were diurnally corrected. From the 50% level, a mean background value was taken to be about 55,600 gammas. The data was then plotted on sheet 4 at a scale of 1" = 400 feet, with 50,000 gammas being subtracted from each value for ease of plotting. The data was then contoured at a 1000-gamma interval. The contours 6000 gammas and above were drawn in solid and those 5000 gammas and lower were drawn in dashed.

b) VLF-EM

Sheet 5 shows the VLF-EM results after they have been reduced applying the Fraser Filter. Filtered data is plotted between actual reading stations. The positive dip-angle readings have been contoured at an interval of 5^{o}.

The Fraser Filter is essentially a 4-point difference operator, which transforms zero crossings into peaks, and a low pass smoothing operator which reduces the inherent high frequency noise in the data. Therefore, the noisy, non-contourable data are transformed into less noisy, contourable data.

Another advantage of this filter is that a conductor that does not show up as a crossover on the unfiltered data quite often will show up on the filtered data.

4. Discussion of Results

a) Magnetic Survey

The magnetic survey data, as can be seen on Figure 4, and Sheet 4, extends from a minimum of 52,000 gammas to a maximum of 60,280 gammas to give a range of approximately 8300 gammas. This large spread is due mainly to isolated anomalous highs and adjacent anomalous lows which is typical of magnetite bearing rocks, such as the Tertiary volcanics. However, most of the survey area has values that spread from about 54,500 gammas to about 56,500 gammas for a range of 2000 gammas. This is more typical of the Cache Creek rocks.

The anomalous zones generally appear to strike to the northwest along Cannell Creek in the northeastern portion of the survey grid. However, in the northwestern portion of the grid, the anomalies are oriented more towards the northeast. These anomalies therefore parallel the two faults interpreted from the government aeromagnetic survey.

The magnetic lows of moderate amplitude (that is, as opposed to those lows that are isolated, of high amplitude, and usually adjacent to high amplitude anomalous highs) appear to reflect areas where mineralization occurs. This observation is not entirely conclusive. However, the first cut, where a fair amount of pyrite occurs, but little of ether sulphides, is located within a broad magnetic low. The southwest workings mentioned by Cockfield (p. 75) and containing low grade mineralization, also appear to be located within a broad magnetic low. They are found about 1500 feet southwest of the B.T. (or No. 1) shaft but were not located by the field crews due to snow cover.

The B.T. shaft was blasted through a large piece of float which is the best mineralized rock on the property to date. Cockfield reports the quartz veins within the float to carry up to 1.42 oz/ton of gold and recent assaying has found it to contain up to 0.68% copper.

The source of this float so far has not been located, although it is generally felt the float has not moved more than a few hundred feet. If the conclusion mentioned in the preceding paragraph is correct, then it is quite probable that the float has moved 200 to 300 feet south from an area of anomalous low magnetic readings. This area is 800 by 150 feet and strikes in a north-south direction.

The old workings around (L-6 SW, 13NW) were reported to have encountered porphyry dykes within serpentine, with little mineralization. The magnetic readings here are close to background.

The magnetic high centered at (L-4 SW, 18NW) is in all likelihood caused by basalt capping. Mr. Larson broke off a sample from a basalt outcrop at the same location and later verified it to be moderately magnetic. Profile a-a' (Figure 5), which was run across this anomaly, shows the magnetic field to correlate very closely to the topography. This is typical in any area where the underlying bedrock is magnetic in nature.

There seems to be good correlation between the ground magnetic survey and the residual downward continued aeromagnetic map. The aeromagnetic anomalies, however, appear to be shifted, relative to the ground survey, by approximately 2000 feet to the southwest. This shift is probably caused by a combination of the aeromagnetic data not being reduced to the pole, aeromagnetic plotting error, and differences in location of total field anomalies and vertical field anomalies.

If these displacements are allowed for, general extensions of the ground magnetic data can be extracted from the residual downward continued aeromagnetic data. For example, Dog claims 109 and 111 appear to be underlain by an aeromagnetic low, the northeast edge of which is surveyed by the ground magnetometer. Adjacent to this low to the southwest is an aeromagnetic high. The position of these anomalies has been somewhat verified by a ground magnetic survey carried out on adjacent property to the south of the Dog claims.

b) VLF-EM Survey

The conductive zones (or anomalies) generally appear to strike in a northeast-southwest direction. The fact that there are no conductive zones shown to be striking northwest-southeast is a result of the southwesterly direction to the transmitter. Therefore, conductive zones striking in other station directions cannot be precluded.

These conductive zones show good crossline continuity and are cutting across major topographic features. Though the transmitter station direction is largely responsible for this, it does show that the anomalies are not a result of slope changes.

Without a better geological knowledge of the property, it is difficult to conclusively say what the causes of the conductive zones are. A good possibility, however, is that they are shear or fracture zones that parallel the northeast-southwest striking fault.

The VLF-EM conductive zone labelled A on Sheet 5 sits to the immediate southeast of the BT shaft and a magnetic anomalous low. This zone is about 1200 feet long by 200 feet wide, strikes northeast-southwest and has a 500-foot arm on it that strikes north-south. It also correlates with a zone of magnetic lows.

The BT mineralized float could quite possibly have moved northwards from a source causing this combined magnetic low - VLF-EM anomaly rather than southwards from the magnetic low as mentioned previously. However, the writer favours the southward direction since the terrain slopes in this direction.

VLF-EM conductive zone B has dimensions of 5200 feet by 200 feet and is open on the southwestern end. This conductive zone cuts across a magnetic high which has previously been interpretted to be caused by basalt capping and joins two areas of magnetic lows. The one low is seen on lines 12 and 16 NE and the other on lines 6SW to 24SW. This

conductive zone could therefore be reflecting a shear zone and/or porphyry dyke, that is possibly mineralized, within Cache Creek rocks. The dipole-type magnetic high-low anomaly on lines 28 and 32 SW that is coincident with the VLF-EM conductive zone B could be caused either by a basalt capping or magnetite mineralization within the possible shear zone.

Conductive zones C and D also show relatively high intensities and correlations with regions of magnetic lows.

There are also some conductive zones that correlate with magnetic highs. It has been the writer's experience in interpretting other VLF-EM survey results, that there is a higher number of VLF-EM anomalies within magnetite-bearing volcanic rocks. The VLF-EM anomalies are therefore, probably caused by the magnetite.

In the southwestern portion of the property, there is a lower number of VLF-EM anomalies. However, the magnetic data indicates that the geological strike is along the survey lines. Therefore, the lower number can be explained by the terrain effects, the orientation relative to the transmitter station, and the effect of the Fraser filter operator.

From the results of this magnetic-VLF-EM survey and from the results of an adjacent survey, the southwestern portion of the survey area is very likely underlain by Cache Creek rocks. As is expected for Cache Creek rocks, the VLF-EM anomalies in this area are of lower intensity.

Respectfully submitted,
GEOTRONICS SURVEYS LTD.,

David G. Mark, Geophysicist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. R. TOUGH

March 13, 1973

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Resume of

Professional and Technical Experience

of

Howard Larson, Geophysicist

Education

1971 Graduate of the University of British Columbia with a Bachelor's degree in Science (B.Sc.) in geophysics.

Experience

August 1971 to Present	Geotronics Surveys Ltd geophysicist in both mining and engineering geophysics.
May 1970 to September 1970	Tri-Con Exploration Surveys Ltd. Field Supervisor in geophysics.
May 1969 to September 1969	Atlas Explorations Ltd. geochemical analyst and geophysical operator.
May 1968 to September 1968	Coast Eldridge Engineers and Chemists. Chemist's assistant on geochemical rock assays and soil samples.

Location of experience is British Columbia, Yukon and the Northwest Territories.

Types of geophysical surveys experienced are single and multi-channel seismic, induced polarization, resistivity, self-potential, magnetometer (air and ground), various types of electromagnetic, radiometric and soil sampling.

GEOPHYSICIST'S CERTIFICATE

I, DAVID G. MARK, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geophysicist of GEOTRONICS SURVEYS LTD, with offices at 514-602 West Hastings Street, Vancouver 2, B.C.

I further certify that:

1. I am a graduate of the University of British Columbia (1968) and hold a B.Sc. degree in Geophysics.

2. I have been practicing in my profession for the past four years and have been active in the mining industry for the past seven years.

3. I am an associate member of the Society of Exploration Geophysicists and a member of the European Association of Exploration Geophysicists.

4. This report is compiled from data obtained from:
   i) the government aeromagnetic survey data in the area of the Dog claims.
   ii) the residual downward continued filtering and the second vertical derivative filtering of i) carried out by Charles A. Ager, M.Sc., geophysicist of 815-B Cambie Road, Richmond, B.C.
   iii) a combined magnetic and VLF-electromagnetic survey carried out by Geotronics Surveys Ltd. under the field supervision of Howard A. Larson, geophysicist.
   iv) published maps and reports as listed under Selected Bibliography.

5. I have no direct or indirect interest in the properties or securities of Bon-Val Mines Ltd (NPL) Vancouver, B.C. nor do I expect to receive any interest therein.

David G. Mark
Geophysicist

March 15, 1973

ENGINEER'S CERTIFICATE

I, THOMAS R. TOUGH, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geologist and an associate with T.R. Tough & Associates Ltd., with offices at 518-602 West Hastings Street, Vancouver 2, B.C.

I further certify that:

1. I am a graduate of the University of British Columbia (1965) and hold a B.Sc. degree in Geology.

2. I have been practising in my profession for the past seven years and have been active in the mining industry for the past fourteen years.

3. I am registered with the Association of Professional Engineers of British Columbia.

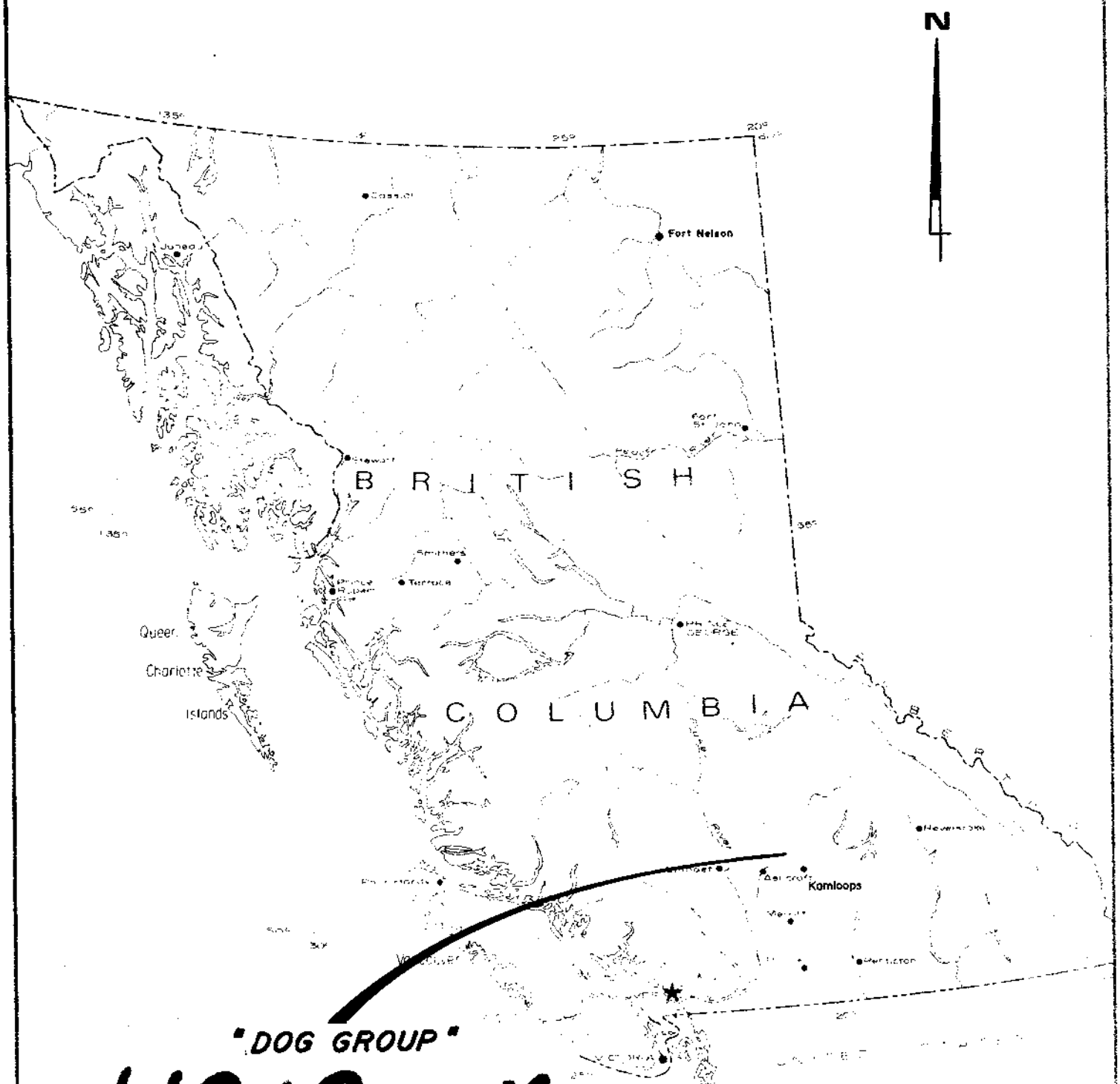
4. I have studied the accompanying report dated March 15, 1973 on the government aeromagnetic survey results in the area of the Dog claims and on the combined magnetic and VLF-EM survey carried out by Geotronics Surveys Ltd., written by David G. Mark, geophysicist, and concur with findings therein.

5. I have no direct or indirect interest whatsoever in the property described herein or in the securities of Bon-Val Mines Ltd. (N.P.L.) and do not expect to receive any interest therein.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. R. TOUGH

Thomas R. Tough, P.Eng.,
Consulting Geologist

March 15, 1973



4212 M-1

FIG. 1

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

GEOTRONICS SURVEYS LTD.

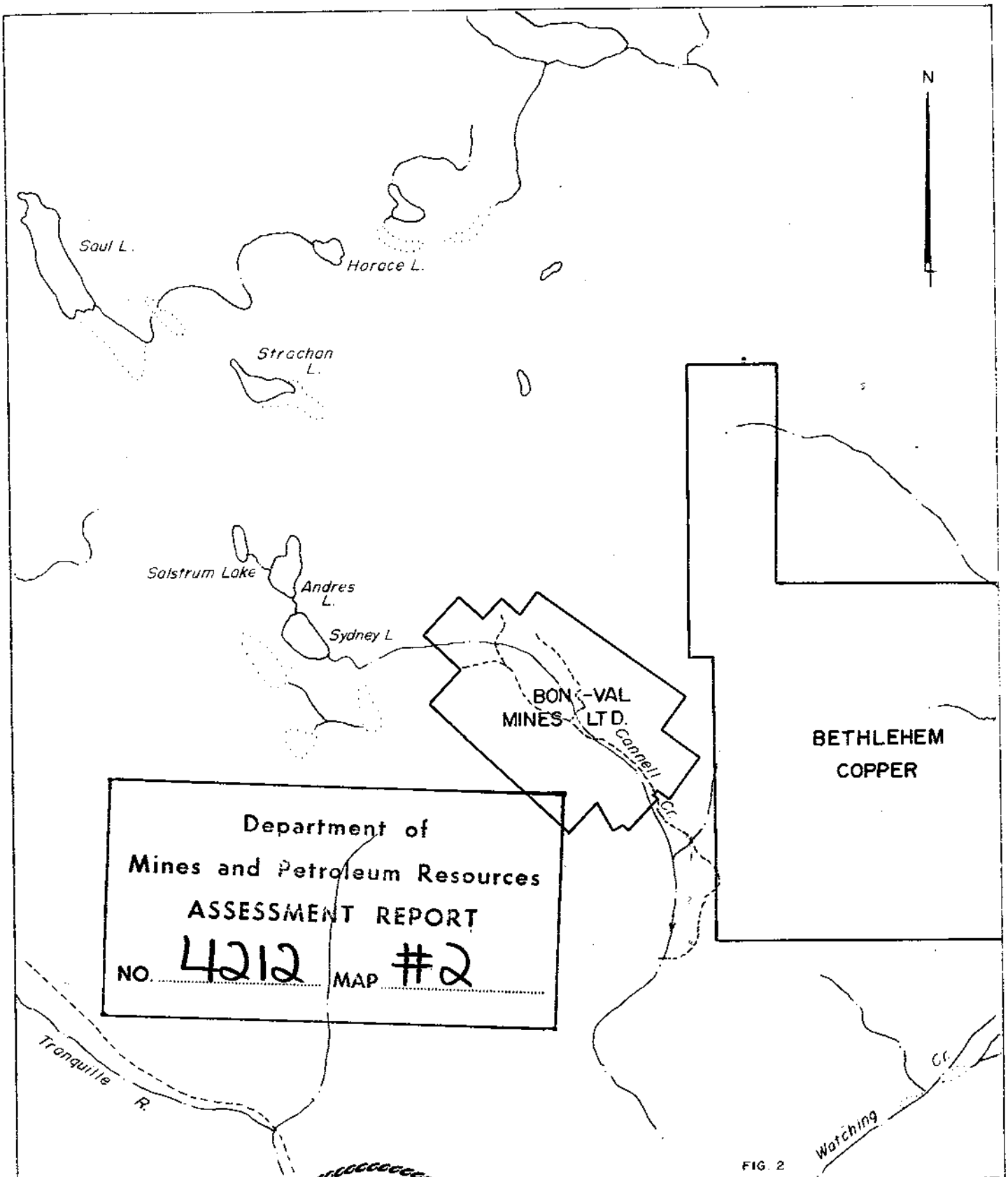
BON — VAL MINES LTD. (N.P.L.)
"DOG GROUP"
KAMLOOPS M.D., B.C.

LOCATION MAP

SCALE 1" = 134 mi

DRAWN. PDT	CHECKED.	DATE FEB '73

PDT



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4212 MAP #2

FIG. 2

PROFESSIONAL ENGINEER
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T. R. TOUGH

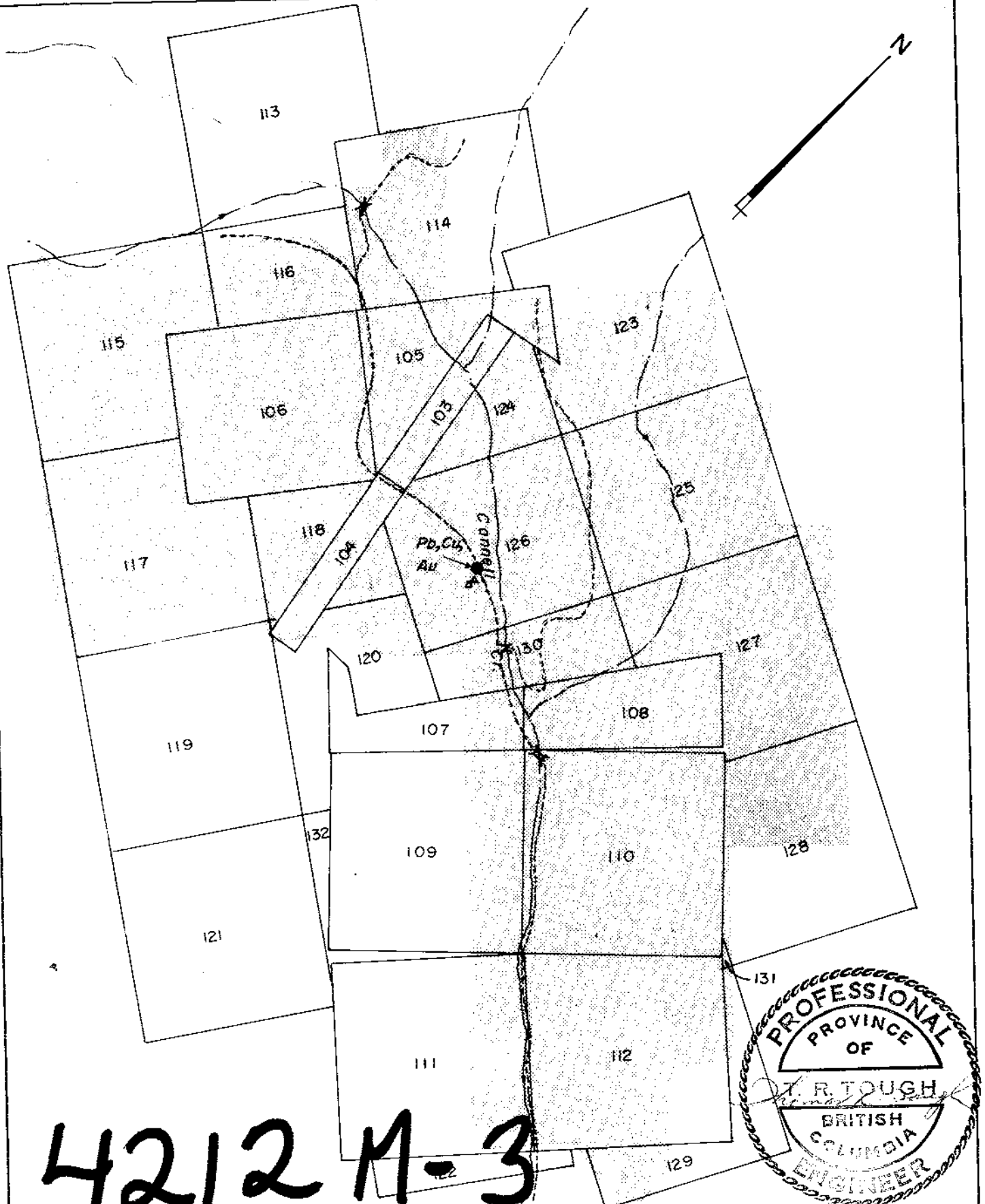
BON-VAL MINES LTD. (N.P.L.)

"DOG GROUP"

KAMLOOPS M.D., B.C.

PROPERTY LOCATION

GEOTRONICS SURVEYS LTD PDT DRAFTING SERVICES	SCALE 1" = 4500'	DATE MARCH '73



4212 M-3

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
O. R. TOUGH

SURVEY AREA

GEOTRONICS SURVEYS LTD.

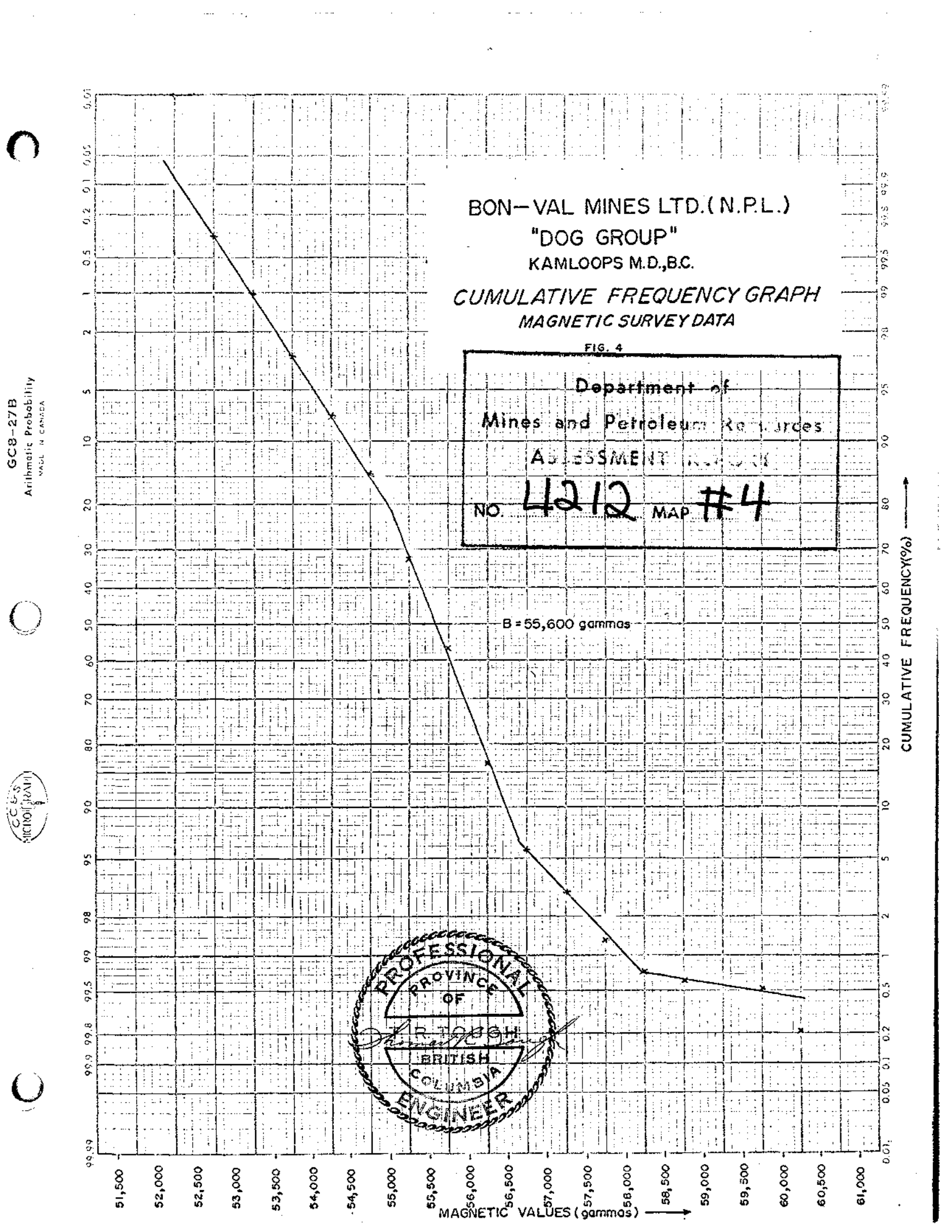
BON-VAL MINES LTD. (N.P.L.)

"DOG GROUP"

KAMLOOPS M.D., B.C.

CLAIM MAP

SCALE 1" = 1000' FEB. 1973 FIG. 3


BON–VAL MINES LTD.(N.P.L.)
"DOG GROUP"
KAMLOOPS M.D.,B.C.
CUMULATIVE FREQUENCY GRAPH
MAGNETIC SURVEY DATA
FIG. 4
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4212 MAP #4
B = 55,600 gammas
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
R. TOUGH
MAGNETIC VALUES (gammas)
CUMULATIVE FREQUENCY(%)
51,500
52,000
52,500
53,000
53,500
54,000
54,500
55,000
55,500
56,000
56,500
57,000
57,500
58,000
58,500
59,000
59,500
60,000
60,500
61,000

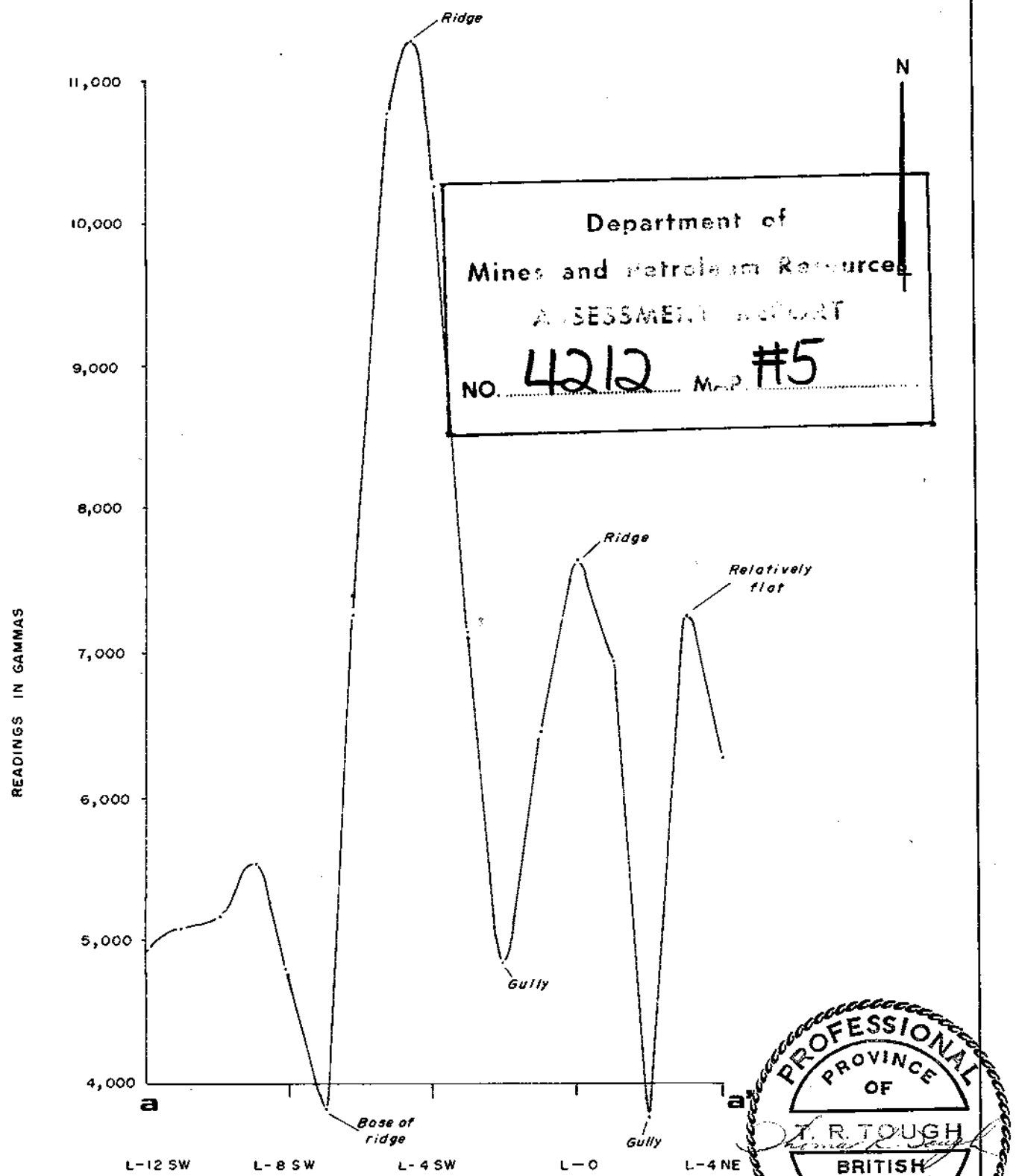


FIG. 5

NOTE: LINES TAKEN TO BE AT PERFECT 400' SEPARATIONS BECAUSE ACCURATE CHAINAGES COULD NOT BE MADE UP CLIFFS.

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"DOG GROUP"

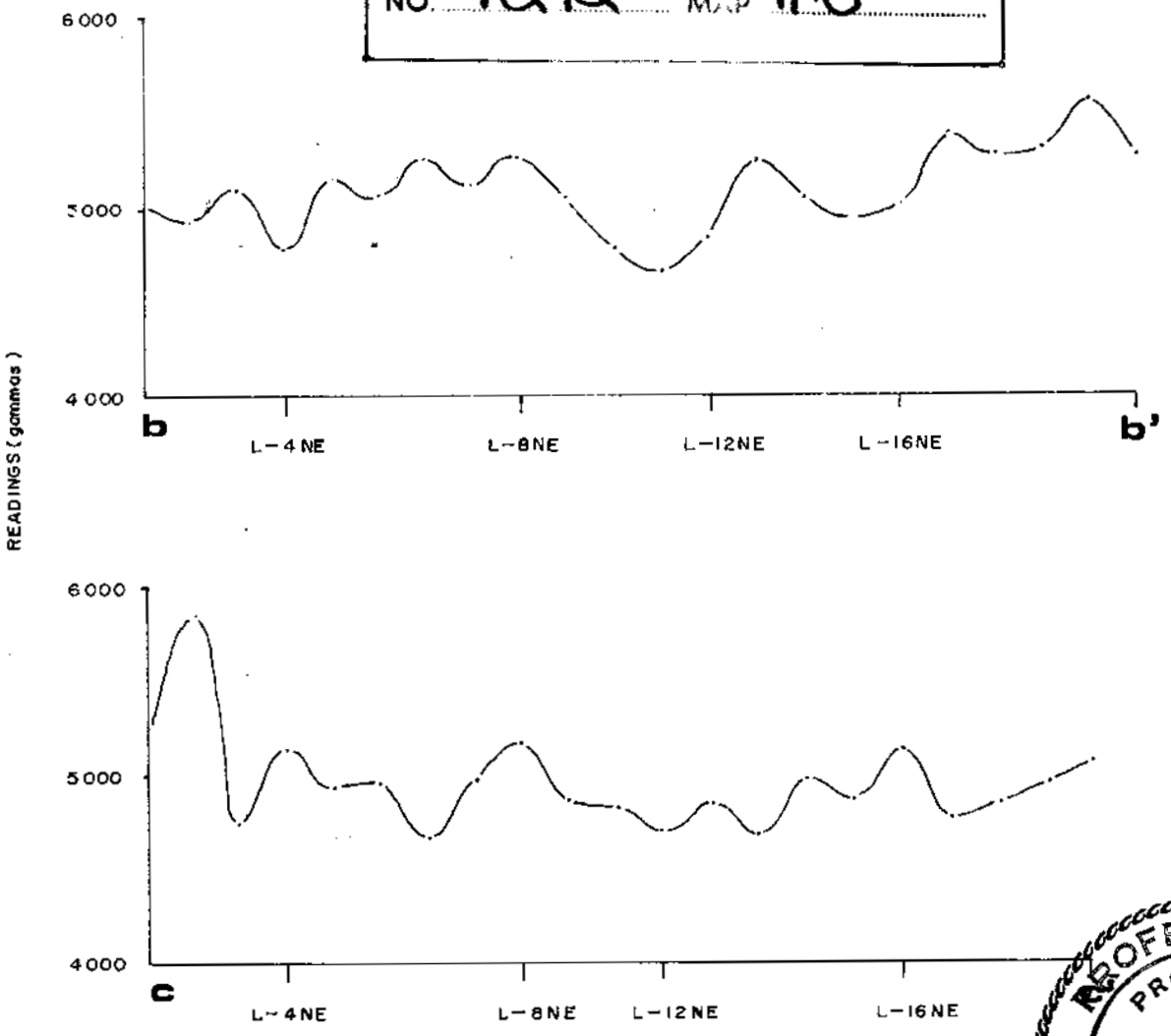
KAMLOOPS M.D., B. C.

MAGNETOMETER PROFILE
a — a'

GEOTRONICS SURVEYS LTD. PDT DRAFTING SERVICES	SCALE Horiz. 1" = 400' Vert. 1" = 1000γ	DATE MARCH '73.

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4212 MAP #6

N



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PROVINCE OF BRITISH COLUMBIA
T. R. TOUGH

NOTE: NO CORRECTIONS MADE FOR SLOPE & HEAVY BRUSH WHICH CAN CAUSE CHAINAGE ERRORS.
SLIGHT DEVIATIONS BETWEEN TIES WITH LINES CAUSED BY INABILITY TO LOCATE EXACT LOCATION OF ORIGINAL READING.

FIG. 6

BON-VAL MINES LTD.(N.P.L.)

"DOG GROUP"
KAMLOOPS M.D., B.C.
MAGNETOMETER PROFILES
b — b', c — c'

GEOTRONICS SURVEYS LTD. PDT DRAFTING SERVICES	SCALE Horiz. 1" = 400' Vert. 1" = 1000γ	DATE MARCH '73

COST BREAKDOWN

CONTRACT NO. 72-128

GROUND MAGNETIC AND VLF-EM SURVEY
and the
GOVERNMENT AEROMAGNETIC SURVEY

DOG CLAIM GROUP

CANNELL CREEK, KAMLOOPS M.D.

BRITISH COLUMBIA

Wages	
H. Larson, Geophysicist - 15 days @ $125/day	$ 1,875.00
L. Moraal, Crew chief & Instrument operator - 15 days @ $75/day	1,125.00
P. Jones, Geophysical assistant - 15 days @ $60/day	900.00
O. McLeod, geophysical assistant - 15 days @ $60/day	900.00
	4,800.00
Instrument and equipment rental @ $140/day	2,100.00
Mapping and geophysical report	1,000.00
Airmag. computer filtering & interpretation	2,000.00
Engineering fees	300.00
TOTAL	$ 10,200.00

N

Mag. decl. 23°E

44 NW — 40 NW — 36 NW — 32 NW — 28 NW — 24 NW — BASE LINE 20+00 NW — 16 NW — 12 NW — 8 NW — 4 NW — BL 0

L 36 SW — L 32 SW — L 28 SW — L 24 SW — L 20 SW — L 16 SW — L 12 SW — L 8 SW — L 4 SW — L 0

L 4 NE — L 8 NE — L 12 NE — L 16 NE — L 20 NE — L 24 NE

BASE LINE 0+00

BL 0 — 4 SE — 8 SE — 12 SE — 16 SE — 20 SE — 24 SE — 28 SE — 32 SE — 36 SE — 40 SE — 44 SE

A — B — C — D

Pb, Cu, Au showing

Approx. area of Southwest workings.

FIRST CUT

Seattle transmitter 18.6 KHz
S 15° W

LEGEND

- Survey line
- Claim line
- Claim post (assumed, located)
- Road
- Creek
- Adit
- Trench
- Shaft

NOTE: READINGS ARE IN DEGREES.
CONTOUR INTERVAL IS 5°

TO ACCOMPANY GEOPHYSICAL REPORT BY D.G.MARK

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. R. TOUGH

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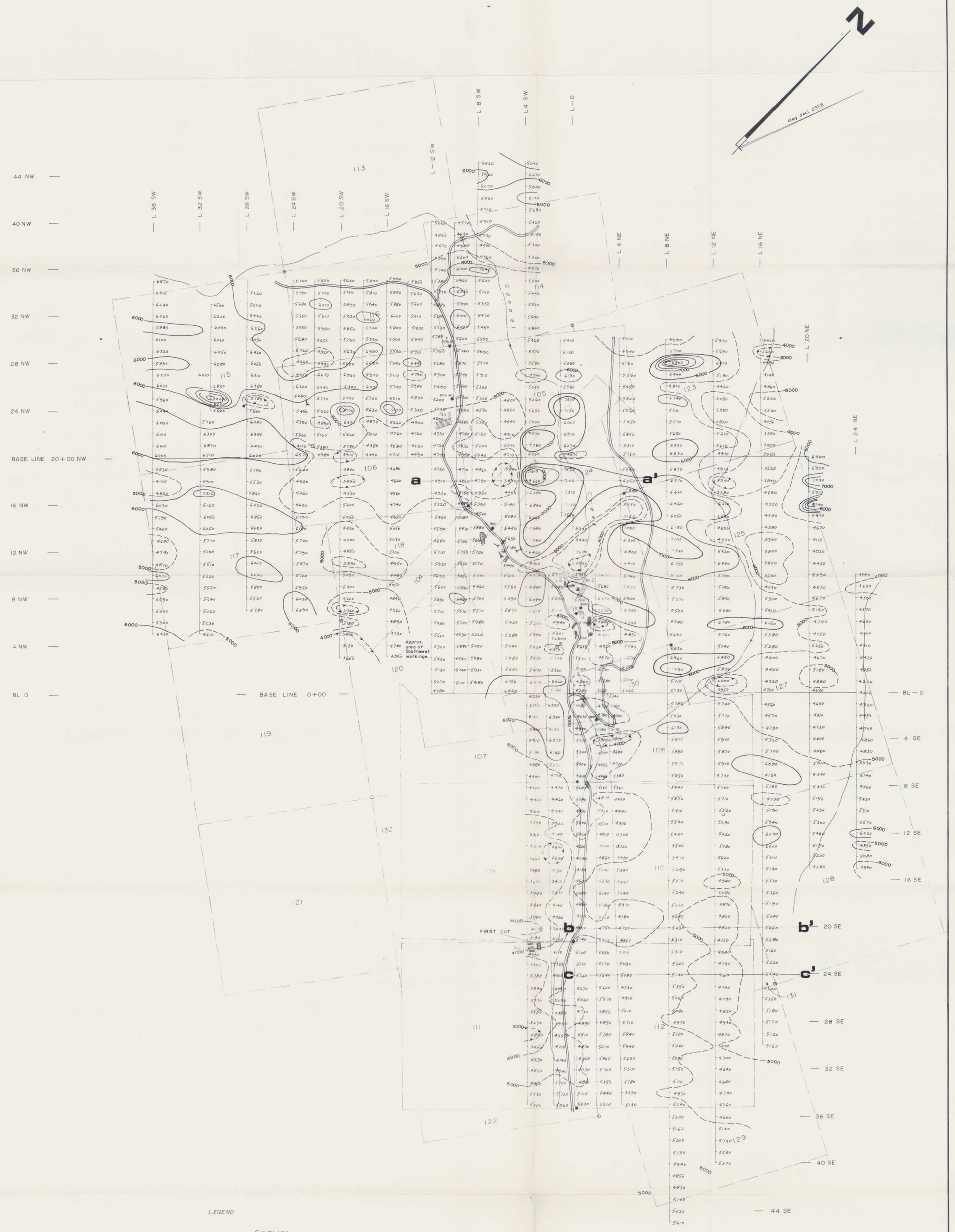
"DOG GROUP"
KAMLOOPS M.D., B.C.

VLF-EM SURVEY, FRASER FILTER
DATA & CONTOURS

PDT DRAFTING SERVICES	SCALE	DATE	JOB No	SHEET
	1" = 400'	FEB. 1973	72-128	5



LEGEND

- Survey line
- Claim line
- Claim post (assumed, located)
- Road
- Creek
- Adit
- Trench
- Shaft

CONTOURS : CONTOUR INTERVAL IS 1000 gammas

- CONTOUR 5000 OR LESS
- CONTOUR 6000 OR MORE

NOTE : READINGS ARE IN gammas.
50,000 gammas HAS BEEN SUBTRACTED FROM ALL READINGS.

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — T. R. TOUGH

TO ACCOMPANY GEOPHYSICAL REPORT BY D.G.MARK

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"DOG GROUP"
KAMLOOPS M.D., B.C.
MAGNETOMETER SURVEY
DATA & CONTOURS

PDT DRAFTING SERVICES	SCALE	DATE	JOB. No.	SHEET
	1" = 400'	FEB. 1973	72-128	4

NOTE: UNITS ARE IN gammas / ft²

CONTOUR INTERVAL IS 20 gammas/ft²

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T. R. TOUGH

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"DOG GROUP"

KAMLOOPS M.D., B.C.

AEROMAGNETIC MAP

SECOND VERTICAL DERIVATIVE

PDT DRAFTING SERVICES	SCALE 1" = 1000'	DATE FEB. 1973	JOB No. 72 – 128	SHEET 3

N

HORACE L

STRACHAN LAKE

SYNES L

ANDRUS LAKE

SYDNEY LAKE

FAULT

FAULT — CONTACT

CREEK

NOTE: TOTAL INTENSITY MAP HAS BEEN DOWNWARD CONTINUED FROM 1000' TO 500' TERRAIN CLEARANCE

CONTOUR INTERVAL IS 10 gammas

LINEATION INTERPRETED FROM AEROMAGNETIC MAPS ———— — — ———— — — ————

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"DOG GROUP"
KAMLOOPS M.D., B.C.

AEROMAGNETIC MAP

RESIDUAL DOWNWARD CONTINUED TOTAL INTENSITY

PDT DRAFTING SERVICES	SCALE 1" = 1000'	DATE FEB. 1973	JOB No. 72-128	SHEET 2

N

HORACE L.

STRACHAN LAKE

DYNES L.

ANDRUS LAKE

SIDNEY LAKE

Camp

CREEK

NOTE: MEAN TERRAIN CLEARANCE 1000 ft
FLIGHT LINE SPACING approx. 1/2 mile
FLIGHT LINE DIRECTION EAST—WEST

CONTOURS: ——— 100 gammas INTERVAL
——— 20 " "
- - - - - - - - 10 " "

4212M-7

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. R. TOUGH

TO ACCOMPANY GEOPHYSICAL REPORT BY D.G. MARK

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"DOG GROUP"
KAMLOOPS M.D., B.C.
AEROMAGNETIC MAP
TOTAL FIELD INTENSITY

POT DRAFTING SERVICES	SCALE 1" = 1000'	DATE FEB. 1973	JOB No 72—128	SHEET 1