

GEOPHYSICAL REPORT

On a Combined

MAGNETOMETER AND VLF-EM SURVEY

on the

ZEKE CLAIM GROUP

ANDRUS LAKE AREA. KAMLOOPS M.D., B.C.

January - February, 1973

ZEKE CLAIM GROUP:

19 miles NW of Kamloops

50° 120° NW

NTS - 92 I/15E

Report by:

David G. Mark Geophysicist

Geotronics Surveys Ltd. 514-602 W. Hastings Street Vancouver 2, B.C.

for:

T & C Management Ltd.

520-602 W. Hastings Street Vancouver 2, B.C.

May 8, 1973

Department of

Mines and Petroleum Resources

ASSESSMENT REPORT

Geotronics Surveys Ltd.

Vancouver, Canada

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#### SUMMARY

Magnetic and VLF-EM surveys were completed over a portion of the Zeke Claim group located on and to the immediate east of Andrus Lake approximately 19 miles NW of Kamloops, B.C.

Access to the property was by a series of 2-wheel drive roads to Pass Lake. Snow conditions necessitated the use of snowmobiles from Pass Lake to the property.

According to the G.S.C. geology map, the general area is underlain by rocks of the Kamloops group. There is, however, a window of Cache Creek rocks mapped in the immediate area.

There is known gold and copper mineralization in the old Allies group of claims to the immediate south of the Zeke Claim Group. No mineralization or structural features such as faults or shear zones are shown on the G.S.C. map. The government aeromagnetic map shows a lineation striking to the northwest through the claim group. This is interpretted to be a fault-contact.

The magnetic survey seems to reflect the Tertiary volcanics of the Kamloops group as well as possibly the Cache Creek group. It also seems to reflect the same fault-contact as the aeromagnetic survey does. The VLF-EM results were of low order and probably reflect shear or fracture zones and terrain variation. However, mineralization may be associated with the shear or fracture zones.

#### CONCLUSIONS AND RECOMMENDATIONS

It is felt that the magnetic and VLF-EM surveys were successful in their objectives of supplying information on the structural geology of the property and isolating areas which warrant additional work.

The ground magnetic work verified the existence on the property of a northwest-striking fault.

It is felt that in this area magnetic lows are probably representative of the Cache Creek group of rocks.

The Cache Creek rocks to the immediate south of the survey area are known to contain gold, silver, and sulphide

mineralization and there is a large copper deposit presently being developed to the south of this area by Afton Mines Ltd.

From the above it is felt that additional work on the property should be carried out in the following manner:

- 1) It is important that the property be thoroughly geologically mapped. This could be assisted by continuing the magnetometer and VLF-EM surveys over the remainder of the property. Special attention should be given to the areas showing magnetic values below 4,500 gammas.
- 2) The property should be soil sampled and tested for copper and possibly lead and gold. Special emphasis should be placed on the regions showing magnetic lows (less than 4,500 gammas).
- 3) Based on the results from the above an induced polarization survey should then be carried out over anomalous zones.
- 4) A seismic refraction survey carried out over specific areas of interest would be valuable aid in the interpretation of both geochemical and induced polarization results. It could also assist in the determination of

optimum survey parameters for the induced polarization survey and in the selection of the best locations for possible trenches or drill holes.

Respectfully submitted, GEOTRONICS SURVEYS LTD.

David G. Mark

Geophysicist

May 8, 1973

#### GEOPHYSICAL REPORT

on

MAGNETOMETER AND VLF-EM SURVEYS

ZEKE CLAIM GROUP

ANDRUS LAKE AREA, KAMLOOPS M.D., B.C.

#### INTRODUCTION AND GENERAL REMARKS

This report discusses the procedure, compilation and interpretation of a combined fluxgate magnetometer and very low frequency electromagnetic (VLF-EM) survey carried out on the Zeke Claim group near Andrus Lake during January and February, 1973.

The field work was carried out under the direct supervision of Howard A. Larson, geophysicist. The number of line miles completed was 10 and the area covered by the survey is as shown on Figure 2.

The object of these surveys was to outline structure, such as faults and shear zones, and geologic contacts.

Particularly, it was hoped to determine the possible existence of any mineralized intrusives similar to those known to exist immediately south of the property. It

is the writer's experience that the above geophysical methods have been successful in reflecting such zones of mineralization in this area.

In addition, a secondary object of the magnetometer survey was to verify the location of a magnetic low shown on the government aeromagnetic map.

# PROPERTY AND OWNERSHIP

The property is comprised of 37 contiguous mineral claims called the Zeke group and are held by location. They are as follows and as shown on Figure 2:

Record Number	Expiry Date
112272-112287	April 24, 1973
112288	April 24, 1973
112311	April 24, 1973
112318-112319	April 24, 1973
112320-112329	April 24, 1973
Tag Number	
376162M	
376164M-376166M	
376168M	
	112272-112287 112288 112311 112318-112319 112320-112329 Tag Number 376162M 376164M-376166M

The Rat claims were recently staked and therefore the record numbers are not available.

All claims are wholly owned by T & C Management Ltd. of Vancouver, B.C.

#### LOCATION AND ACCESS

The Zeke group is located to the east of Andrus Lake, 19 miles N4OW of Kamloops in a straight line.

The geographical coordinates are 50° 54° N latitude and 120° 36° W longitude.

Access to the claims is by the Pass Lake dirt road to Pass Lake. This road starts approximately 1 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 7 miles northwesterly to the property.

McQueen Lake is accessible by a 2-wheel drive vehicle all year around, the road being kept open in winter. A 4-wheel drive vehicle is recommended from Pass Lake to the property during summer months, and a snowmobile during winter months.

#### PHYSIOGRAPHY

The property is found on the Tranquille Plateau which forms part of the physiographic unit known as the Thompson Plateau. The terrain over most of the property is gentle except on the southeastern end where it becomes fairly steep. The elevation range is about 900 feet varying between 4300 feet and 5200 feet.

The main water source of the immediate area is Cannell Creek, Sydney Lake, Andrus Lake, Salstrum Lake, and Strachan Lake, which are to the south and east of the claim group. 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 in the general area 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 10°F and that in winter 20°F to 40°F.

#### HISTORY OF PREVIOUS WORK

No work has previously been done on the Zeke group of claims. However, several trenches and adits have been dug on the old Allies workings since the 1920's. This area sits to the immediate south of the Zeke group.

#### GEOLOGY

According to the GSC map of the area, the geology of which is done by W.E. Cockfield, the claims group is primarily underlain by Tertiary volcanics of the Kamloops Group. This consists of rhyolite, andesite and basalt with associated tuffs, breccias, and agglomerates.

A window of Cache Creek rocks of Carboniferous age is shown to exist in the vicinity of the claim group and may underlie the southeastern portion of the claims. The Cache Creek rocks consist of argillite, quartzite, hornstone, limestone, sheared conglomerate, breccia, greenstone and serpentine.

Cutting the Cache Creek rocks at the southern end of the window are dykes of light grey and dark grey porphyry. The dark grey porphyry is a dense rock with phenocrysts of hornblende and feldspar.

It is within the dark grey porphyry dykes that the sulphide mineralization of the old Allies prospect occurs. The sulphides are galena, pyrite, and chalcopyrite occurring within quartz veins within the dykes. Up to 1.42 oz/ton of gold is reported.

South of Kamloops are many copper occurrences 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 in the country rock with the principle copper minerals being chalcopyrite, bornite, and native copper as well as some chalcocite, cuprite, azurite, and malachite. The main developer of the area is Afton Mines Ltd. which has so far blocked out over 40 million tons of 0.65% copper as of June, 1972.

# INSTRUMENTATION AND THEORY

# 1) Magnetometer

The magnetic survey was carried out using a portable vertical component, Model G→110 fluxgate magnetometer manufactured by Geotronics Instruments 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.

#### 2) 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 electromagnetic 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.

# SURVEY PROCEDURE

As shown on Sheets 1 and 2, a base line was cut towards the northeast and southwest from the initial claim post of

Zeke 5 and Zeke 6. A spot fifty feet southwest of this post was taken to be base line station 0 + 00 and grid co-ordinates are relative to this point. Perpendicular cross lines were chained and compassed in at 400-foot intervals along this base line. Readings with both the magnetometer and the VLF-EM were taken at 100-foot intervals along these lines. Reading stations were flagged with orange flagging bearing the appropriate co-ordinates.

Corrections were made for magnetic diurnal variations by closing loops on base stations established at 400 foot intervals along the base line. All loops were closed within 2 hours.

#### COMPILATION OF DATA

# A) Magnetic

The magnetic data were corrected for diurnal drift and a cumulative frequency curve, Figure 3, was plotted. For ease of drafting, 50,000 gammas was subtracted from all values and the data was then plotted on Sheet 1, at a scale of 1" = 400 feet, and contoured at 500-gamma intervals.

The cumulative frequency curve shows that the mean background level (50%) for the survey area is just under 56,000 gammas.

This background contour is usually not drawn in, since it often detracts from the interpretability of the map. However, from the writer's previous experience on other surveys in the same area, and from the appearance of the contours on sheet 1, the mean background value seems closer to the 55,500 contour. Therefore, it is this contour that is not drawn in.

#### B) VLF-EM

Sheet 2 shows the VLF-EM results after they have been reduced by applying the Fraser filter. Filtered data is plotted between actual reading stations. The positive dip angle readings were contoured at intervals of 5°.

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 cross over on the unfiltered data quite often will show up on the filtered data.

#### INTERPRETATION

A) Government Aeromagnetic Survey

The government aeromagnetic survey was flown on eastwest flight lines approximately ½ mile apart. Terrain
clearance was about 1,000 feet. The reference sheet
for the Zeke claim group is Tranquille River (see
Selected Bibliography). A copy of this map around the
Zeke claims is given as figure 4 at the end of the report.

The magnetic contours on and around the claims are typical of Tertiary volcanics, that is, the data is high frequency. There is a northwest trending lineation apparent in the magnetic data that strikes along Cannel Creek, through the property, and through Strachan Lake. This would be caused by a rock contact and/or a fault. The Allies Group prospect south of the Zeke group is on this lineation. To the south-west of the lineation, the magnetic contours are in the 3000 - gamma range and the magnetic gradient is high. Whereas, to the northeast of the lineation, the contours are in the low 2000 - gamma range and the gradient is lower.

#### B) Ground Magnetic Survey

The magnetic values over the survey area range from a low of 53,000 gammas to a high of64,710 gammas to give a range of 11,710 gammas. This is fairly high and much of this range can be accounted for by isolated high values. This is represented on the cumulative frequency graph by the upper  $3\frac{1}{2}\%$  of the values, that is, those values that are 57,000 gammas and higher.

The graph shows the mean background level for the survey area, which is at the 50% level, to be just under 56,000 gammas. However, from the writer's previous experience on adjacent properties, and from examination of the data and contours on sheet 1, it appears that 55,500 gammas is a more correct value. For this reason the 55,000 - gamma contour was left out.

The magnetic data in general seems to show that much of the property is underlain by Tertiary volcanics of the Kamloops group. This is expecially shown by the isolated magnetic highs and adjacent lows which are probably a result of the dipole effect of isolated concentrations of magnetite within the volcanics. Some of the anomalous low zones may be reflecting rocks of the locally-favourable Cache Creek group. It is difficult to say which zones are likely reflecting Cache Creek rocks and which ones aren't. However, those anomalous lows which are of lower intensity and larger in size are the more probable ones.

The comments made in the above 2 paragraphs are in agreement with the G.S.C. geology map for the area. It shows the Zeke group to be underlain by the Kamloops volcanics and to be located to the immediate north of a window of the Cache Creek rocks (as mentioned under Geology).

There is a definite lineation of magnetic lows shown on sheet 1 to be A-A. This lineation is very likely reflecting the fault (fault-contact?) shown by the aeromagnetic contours (fig. 4) as interpreted by the writer.

Two other lineations of magnetic lows that could well be reflecting fault or shear zones are those labelled B-B' and C-C'.

#### C) VLF-EM

The VLF-EM Fraser filtered results are shown on Sheet 2 with the filtered data plotted between reading stations.

It can readily be seen that most of the anomalies strike in a northeasterly direction. Part of this is due to the fact that VLF-EM results will detect conductors which are approximately on strike with the transmitter station most easily. Also the grid parameters tend to bias the results in this direction.

Therefore, the existence of conductors striking in a north-west direction should not be ruled out. For example, this is likely the reason why the VLF-EM data does not seem to reflect the major northwest-striking fault that the magnetic data seem to reflect. There are, however, small VLF-EM anomalies along magnetic lineation A-A' that could be caused by this fault.

The VLF-EM anomaly marked D on sheet 2 is X-shaped and therefore could well be reflecting 2 cross-striking fault, shear, or

fracture zones. It is especially interesting since it is in an area of magnetic highs and lows and since it is to the immediate east of magnetic lineation A-A'.

The other VLF-EM anomalies are of relatively low magnitude (except E) and hence probably reflect fault or shear zones as well as terrain variations. In addition, the possibility that sulphide mineralization may be associated with these zones should not be ruled out, but should be considered in the light of any subsequent information obtained.

Respectfully submitted, GEOTRONICS SURVEYS LTD.

David G. Mark

Geophysicist

May 8, 1973

#### SELECTED BIBLIOGRAPHY

- Aeromagnetic Map, Tranquille River, British Columbia, Geol. Surv. of Can., Map 5220G, Sheet 921/15.
- Carr, J.M., Deposits Associated with the Eastern Part of the Iron Mask Batholith near Kamloops, Annual Report of the Minister of Mines of British Columbia, pp. 47-69, 1956.
- Cockfield, W.E. Geology and Mineral Deposits of the Nicola Map-Area, British Columbia, Geol. Surv. of Canada, Mem. 249, 1948.
- Mathews, W.H. Geology of the Iron Mask Batholith; unpublished thesis for the degree of Master of Science, University of British Columbia. about 1942.
- Preto, V.A.G. Geology of the Eastern Part of the Iron

  Mask Batholith, Report of the Minister of Mines and
  Petroleum Resources, 1967.

# 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 practising in my profession for the past five years and have been active in the mining industry for the past eight 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 a combined magnetic and VLF-EM survey supervised and carried out by H.A. Larson, geophysicist during February, 1973 on the Zeke Claim Group, and from pertinent data, published maps and reports as listed under Selected Bibliography.
- J have no direct or indirect interest in the properties or securities of T & C Management Ltd., Vancouver, B.C. nor do I expect to receive any interest therein.

David G. Mark Geophysicist

May 8, 1973

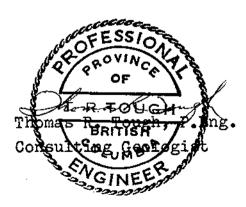
# ENGINEER'S CERTIFICATE

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

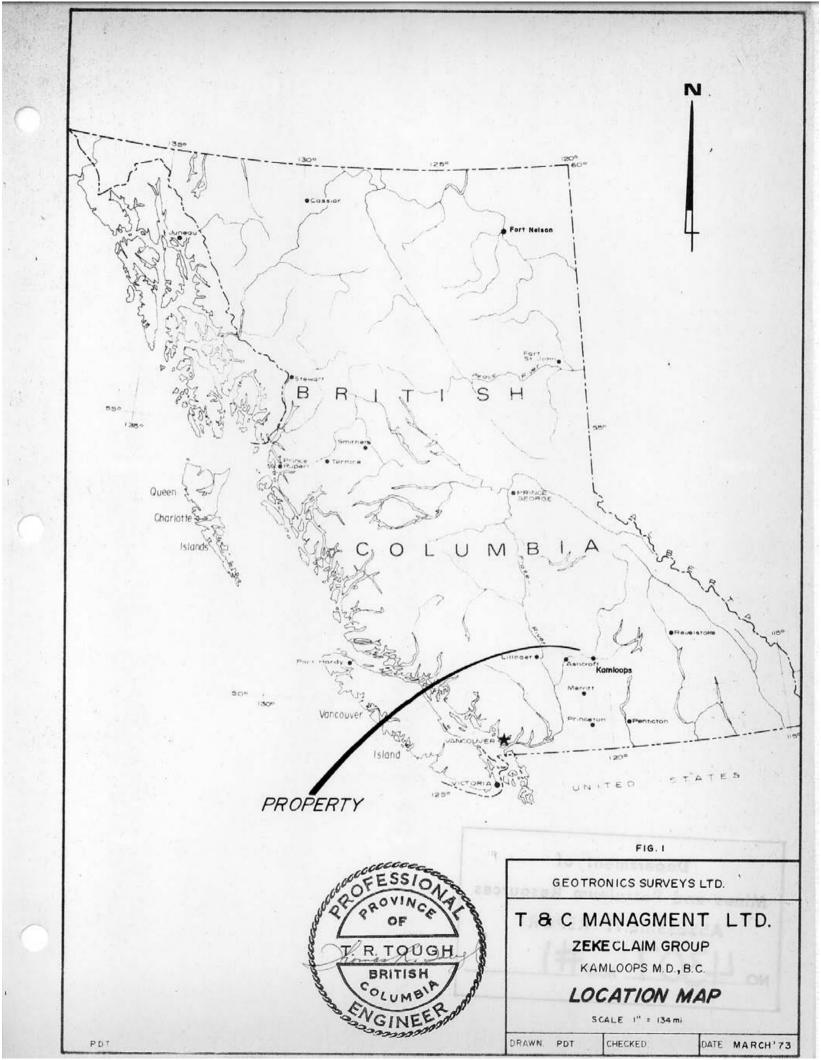
That I am a Consulting Geologist and an associate with T.R. Tough & Associates Ltd., with offices at 519 - 602 W. Hastings Street, Vancouver, B.C.

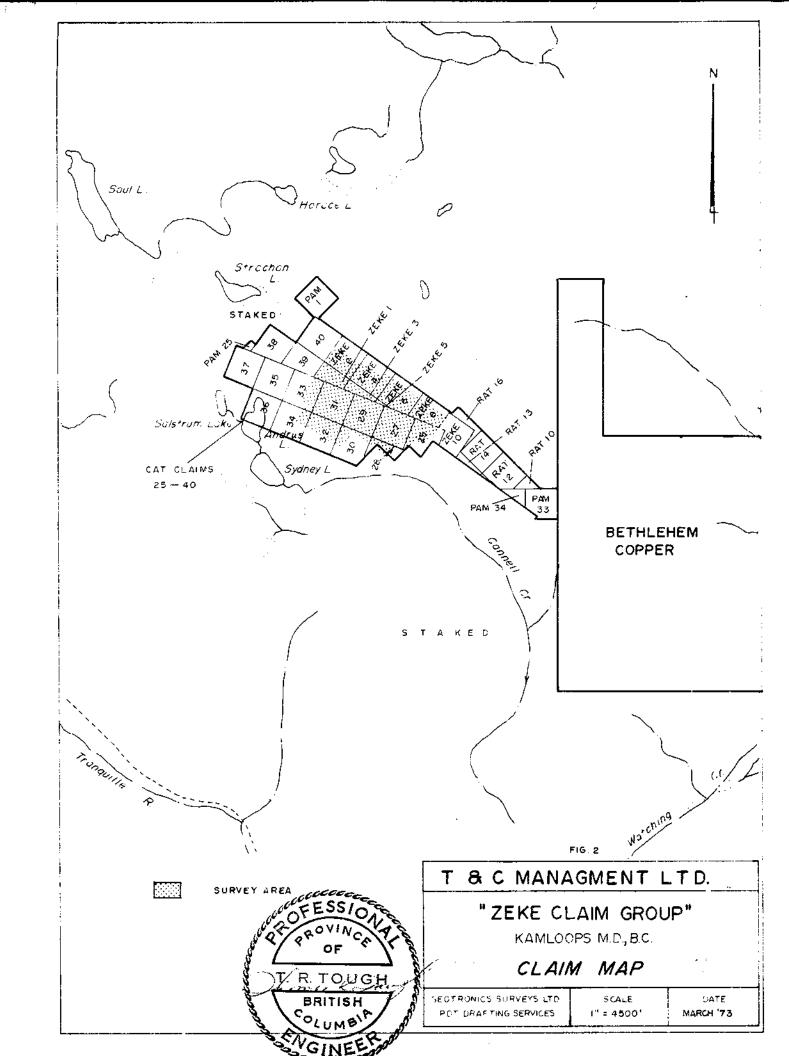
#### I further certify that:

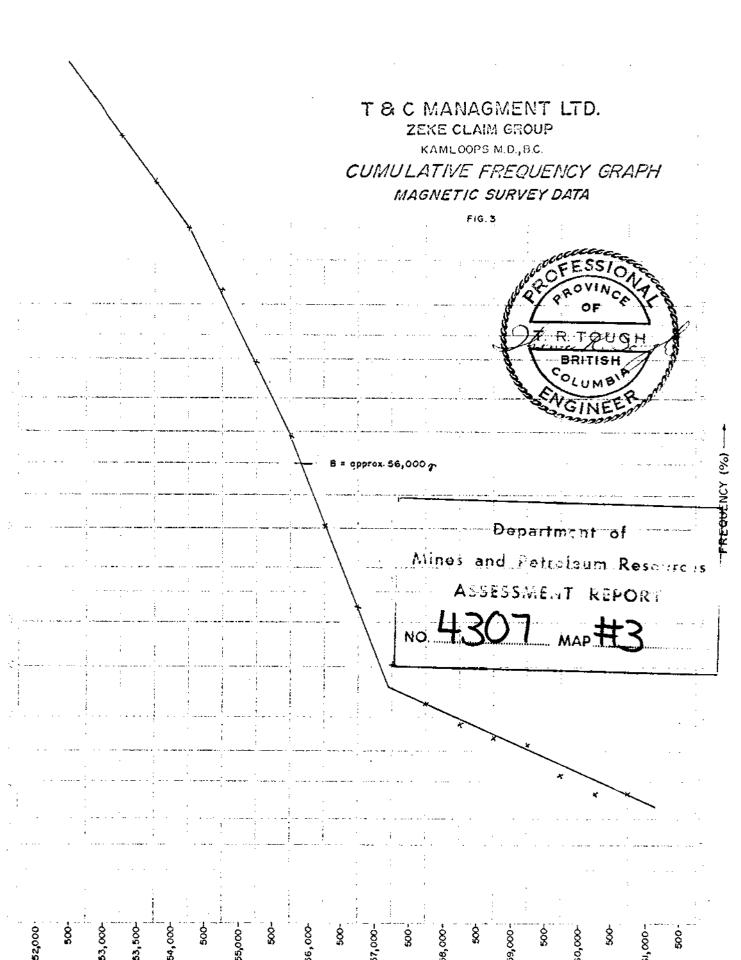
- 1. I am a graduate of the University of British Columbia (1965) and hold a B.Sc. degree in Geology.
- 2. I have been practising in my profession for the past seven years and have been active in the mining industry for the past fourteen years.
- 3. I am registered with the Association of Professional Engineers of British Columbia.
- I have studied the accompanying report dated May, 1973, on a magnetometer and VLF-EM survey submitted 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, nor the securities of T & C Management Ltd. and do not expect to receive any interest therein.



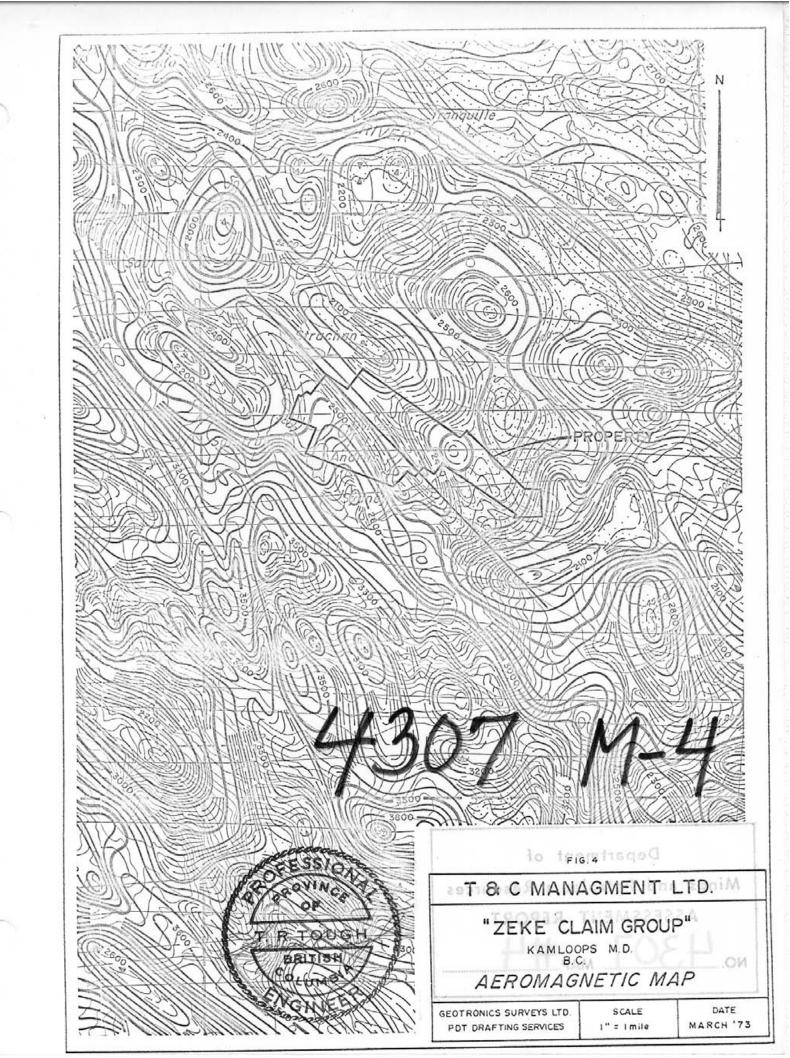
May, 1973







MAGNETIC VALUES (gammas)



# COST BREAKDOWN MAGNETOMETER AND VLF-EM SURVEY ON THE ZEKE CLAIM GROUP ANDRUS LAKE AREA, KAMLOOPS M.D., B.C.

# Wages

H. Larson, geophysicist, 14 days @ \$125/day	1750.00
B. Moraal, crew chief & instrument operator, 14 days @ \$75/day	1050.00
P. Jones, geophysical assistant, 14 days @ \$60/day	840.00
O. McLeod, geophysical assistant, 14 days @ \$60/day	840.00
	\$4480.00
2 G-110 magnetometers @ \$20/day	560.00
2 G-28 VLF-EM units @ \$20/day	560.00
2 skidoo snow mobiles @ \$20/day	560.00
1 4-wheel drive rental @ \$20/day	280.00
Mapping and geophysical report	500.00
Engineering fees	300.00
TOTAL	\$7240.00

