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GEOPHYSICAL AND GEOCHEMICAL REPORT

on a

SELF-POTENTIAL, VLF-EM & SOIL GEOCHEMISTRY SURVEYS

KR & K CLAIMS

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

AUGUST, 1973

KR & K Claims : 25 miles N 10 E of Merritt, B.C.

: 50° 120° SW

NTS : 92I/7E

Report by: David G. Mark
Geophysicist
GEOTRONICS SURVEYS LTD.
514-602 West Hastings Street
Vancouver 2, B.C.

for: NICOLA COPPER MINES LTD. (NPL)
9897 - 138A Street
Surrey, B.C.

September 26, 1973

TABLE OF CONTENTS

SUMMARY

Self-potential and VLF-EM field strength measurements were taken across VLF-EM Fraser-filter anomalies in August, 1973 on the Greenstone Creek property of Nicola Copper Mines. Also a soil geochemistry survey was carried out and the samples tested for copper.

The purpose of the SP work was to determine whether any of the VLF-EM anomalies were caused by massive sulphides. That of the VLF-EM field strength was to find out whether or not VLF-EM anomalies A and B were caused by one source. That of the soil sampling was to locate probable areas of copper sulphides and to find out if any of these areas correlated with the VLF-EM anomalies.

A Sabre model G-18A was used for the SP measurements and the resulting data was profiled. A Sabre model 27 VLF-EM receiver was used for the field strength measurements and the resulting data diurnally corrected and also profiled.

The soils were tested for copper by the hot acid extraction and atomic absorption method. The resulting data was statistically analyzed for the background and anomalous threshold parameters and then plotted and contoured.

Except for one possible exception, the SP measurements produced no anomalies. The VLF-EM field strength highs correlated almost exactly with the VLF-EM Fraser-filter highs. The soil geochemistry survey produced a number of isolated anomalies and 1 very large anomaly.

CONCLUSIONS

1) The VLF-EM anomalies are not caused by massive sulphides.

2) The VLF-EM anomalies A and B reflect 2 different sources, respectively. It is therefore very likely these 2 anomalies are caused by a series of faults (or shear zones).

3) Except for 2 possible exceptions, copper mineralization does not seem to be related to the VLF-EM anomalies. This does not preclude the possible existence of other mineralization.

4) The large copper soil geochemistry anomaly located on the eastern part of the survey area could be caused by either copper mineralization or a differing rock-type containing a higher background amount of copper.

RECOMMENDATIONS

It is recommended to shift the emphasis of exploration on this property from the VLF-EM anomalies to the large soil geochemistry anomaly. This anomaly should be explored in the following manner:

1) The area should be thoroughly prospected and the geology mapped in order to determine whether a copper mineralization or a different rock-type is the causitive source.

2) If no outcrops can be located, then trenching, shallow percussion drilling and/or shallow diamond drilling should be considered in order to carry out the objective mentioned in 1).

3) Dependent on the above results, the soil geochemistry survey should be expanded to the north, south and east.

4) Also dependent on the above results, 3 lines of induced polarization survey should be carried out across the anomaly.

Respectfully submitted

GEOTRONICS SURVEYS LTD.

David G. Mark
Geophysicist

September 26, 1973

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. R. TOUGH

GEOPHYSICAL AND GEOCHEMICAL REPORT
on a
SELF-POTENTIAL, VLF-EM AND SOIL GEOCHEMISTRY SURVEYS
KR & K CLAIMS
GREENSTONE CREEK, KAMLOOPS M.D., B.C.

INTRODUCTION AND GENERAL REMARKS

This report discusses the results of a self-potential (SP) and very low frequency electromagnetic work (VLF-EM) field strength measurements carried out by the writer on the Greenstone Creek property of Nicola Copper Mines Ltd. during August 7 and 8, 1973. Also discussed are the copper-tested results of soil samples picked up by employees of Nicola Copper during the middle of August.

The above-mentioned work was carried out as recommended in a report by the writer on a VLF-EM survey over the property. The report revealed several anomalies, a few of which were fairly strong.

The purpose of the SP work was to find out the probability of any of the VLF-EM anomalies being caused by massive sulphides. Copper mineralization occurs in massive form in the area and SP is a good exploration tool for shallow deposits of this type.

The purpose of the VLF-EM field strength measurements was to find out if the 2 largest VLF-EM anomalies, A and B, were caused by one large source, or 2 separate sources. If the causitive source is one, then dip-angle measurements will be anomalous on its edges (such as anomalies A & B) and field strength measurements will be anomalous over the

complete source. Conversely, if A and B are reflecting 2 sources respectively, then the field strength measurements will be anomalous only where A and B are, that is, where there is a conductor. Since it was no extra trouble to measure the field strength where the SP was being carried out, the other VLF-EM anomalies were measured also.

The soil geochemistry was carried out to determine how probable any of the VLF-EM anomalies are caused by copper sulphides.

The descriptions of location, access, physiography, history of previous work and geology were given in the writer's previous report and therefore are not repeated here.

PROPERTY AND OWNERSHIP

The property is composed of 12 contiguous mineral claims as shown on figure 2 and as described below:

Claim Name	Record Number	Expiry Date
KR & K 200-211	97255-97266	June 2, 1974

All claims are wholly owned by Nicola Copper Mines Ltd. of Surrey, B.C.

GEOPHYSICS

A. INSTRUMENTATION & THEORY

1) Self-Potential

The SP instrument used was a model G-18-A manufactured by Sabre Electronic Instruments Ltd. of Burnaby, B.C. It

is a transistorized millivoltmeter with a high input impedance and has a sensitivity of 2mv./meter division on the 100 mv. scale. Unglazed, porous porcelain pots were used for the electrodes and a copper sulphate solution was used for the electrolyte.

Self potentials are produced in the crust of the earth from a variety of processes that are chemical, physical and electromagnetic inductive. Sulphide bodies produce a potential from chemical processes that range in magnitude from a few tens of millivolts to several hundred millivolts and, in rare cases, above 1,000 millivolts. The causes of sulphide self potentials is not fully understood or agreed upon by geophysicists. However, the more accepted theory is that this 'battery action' is caused by a difference in pH in the upper ground water electrolytes (more acidic) and the lower ground water electrolytes (less acidic) and is abetted by the oxidation of sulphides near the surface forming acids that, therefore, increase the contrast. The current caused by the potential flows from the apex of the sulphide body to some point at depth (terminus of deposit or point of minimum acidity), into the wall rock, back to the surface and back into the sulphide apex. A negative pole is thus created at ground surface and, therefore, except for a few rare cases, sulphide bodies are reflected by negative anomalies.

Two field methods are in common practice. One measures the potential itself and is carried out by keeping one electrode fixed and moving the other at equal intervals.

The other measures the potential gradient and is carried out by moving both electrodes, with a fixed interval, usually 100 feet. The data from one method can be calculated from the data from the other method.

2) VLF-EM

The VLF-EM field strength measurements were carried out by VLF-EM receiver Sabre model 27 manufactured by Sabre Electronic Instruments Ltd. of Burnaby, B.C. This instrument is designed to measure the dip angle and field strength of a very low frequency electromagnetic field. VLF-EM theory was discussed in the writer's previous report.

B. SURVEY PROCEDURE

1) Self-Potential

The self-potential readings were taken on the existing grid only across the VLF-EM anomalies with a magnitude greater than 10^{o}. They were taken by keeping one electrode fixed and moving the other at 50-foot intervals.

2) VLF-EM Field Strength

Field strength measurements were taken on 2 lines across VLF-EM anomalies A and B as well as across the VLF-EM anomalies SP measurements were being taken. All readings were taken at 50-foot intervals. The procedure used was to hold the instrument in a horizontal position and then rotate it in a horizontal plane until the field strength meter showed a minimum. This minimum constituted the field strength reading. The minimum was adjusted to read 50 emu's (electromagnetic units) off of each VLF-EM anomaly.

The field strength diurnal change was monitored by checking back to the first station read on each line.

C. COMPILATION OF DATA

1) Self-Potential

Profiles of the SP measurements were drawn and then visually adjusted so that the average value was approximately zero millivolts (i.e. so that the positive parts of the profile approximately equalled the negative parts). The profiles were then traced onto sheet 3. (sheets 1 and 2 are found in the writer's previous report).

2) VLF-EM Field Strength

The field strength measurements were first corrected for diurnal change. Profiles were then drawn and visually adjusted so that the background value was approximately 50 emu's. These were then traced onto sheet 3.

The VLF-EM Fraser-filter profiles were also traced onto sheet 3.

D. DISCUSSION OF RESULTS

The self-potential profiles do not show any significant anomalies over the VLF-EM anomalies. There is some correlation between small negative SP measurements and VLF-EM highs but these are considered by the writer to be too small to obtain any meaningful interpretation. It can be concluded, however, that the causitive sources of the VLF-EM anomalies are not massive sulphides.

On the eastern end of L -4 S, the SP profile reaches a high of 31 mvs. This is becoming significant and could possibly be the western edge of an SP anomaly. It is interesting to note that a few hundred feet further east is a large copper soil geochemistry anomaly (as will be discussed below).

The VLF-EM field strength readings across anomalies A and B shows anomalous in the same locations but not in between. Therefore anomalies A and B are reflecting 2 separate conductors.

The other Fraser-filter anomalies are verified quite well by the field strength readings. Therefore, none of these either are reflecting the edge of a larger conductor.

SOIL GEOCHEMISTRY

A. Survey Procedure

The samples were picked up on the existing grid at 100-foot centers and 50-foot centers where there were VLF-EM anomalies. The colour of the soil samples was apparently reddish-brown and therefore was probably B layer. Samples were dug with a mattock, usually to a 6- to 8- inch depth, and placed in brown, wet-strength paper bags.

B. Testing Procedure

All samples were tested by Bondar-Clegg & Co. Ltd. of North Vancouver, B.C. The sample is first thoroughly dried and then sifted through a -80 mesh screen. A measured amount of the sifted material is then put into a test tube

with subsequent measured additions of agua regia. This mixture is next heated for a certain length of time. The parts per million (ppm) copper is then measured by atomic absorption.

C. Treatment of Data

The values in ppm copper were first grouped into a logarithmic interval of 0.075. The cumulative frequency for each interval was then calculated and then plotted against the correlating interval to obtain the logarithmic cumulative frequency graph as shown in figure 3.

The coefficient of deviation, indicative of the range or sperad of values was calculated to be 0.14 a relatively low value.

The graph shows the mean background value to be about 50 ppm taken at the 50% level. The sub-anomalous threshold value (a term used by the writer to denote the minimum value that is not considered anomalous but still important as an indicator of mineralization) is taken at one standard deviation from the mean background value which is at the 16% level and is in this case about 70 ppm. The anomalous threshold value is two standard deviations away at the 2½% level and is on this property 94 ppm.

The graph shows a break at the 1.3% level which therefore indicates that there is a small increase of copper values above 100 ppm on the KR & K Claim Group.

The results on Sheet 4 were contoured at approximately an interval equal to one standard deviation. This gave a sub-anomalous contour of 70 ppm (which was dashed in) and anomalous contours of 95, 130, 180 and 240 ppm (which were drawn in solid).

D. Discussion of Results

As mentioned above, the mean background value is 50 ppm. This is a relatively high value for Nicola volcanics, which in the writer's experience commonly varies between 5 and 25 ppm.

The results mapped on Sheet 4 show 12 small, isolated anomalies and one very large anomaly. The isolated anomalies are of little further interest. One correlates poorly with VLF-EM anomaly C which therefore could well be coincidental. Two other copper highs are found between VLF-EM anomalies A and B. Larry Sookochoff, geological engineer, and the writer noted minor chalcopyrite when examining the outcrops in this area (August 7, 1973).

The large anomaly, which is found on the eastern part of the survey area, is characterized by the following:

i) The strike appears to be north-south

ii) It measures 900 by 2200 feet and is open on the north, south, and east ends.

iii) It is composed almost entirely of sub-anomalous values with a few isolated anomalous values.

iv) One isolated anomalous value correlates with VLF-EM anomaly E.

v) The whole anomaly is found on gentle terrain.

This large anomaly is reflecting either copper sulphides or a different rock-type with a higher background amount of copper. The different rock-type (if this is the cause) is explained by the largeness of the anomaly and it containing almost only sub-anomalous values.

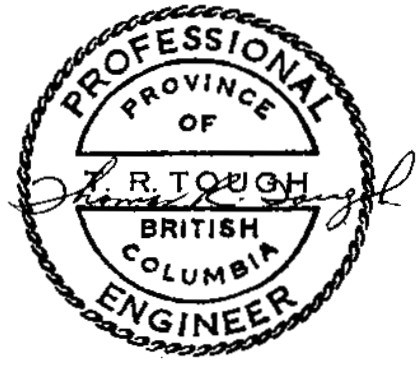
The anomalous values at the south end near the lake are likely a result of swamp-type copper ion accumulation.

Respectfully submitted,

GEOTRONICS SURVEYS LTD.

David G. Mark
Geophysicist

September 26, 1973



REFERENCE

MARK, David G. Geophysical Report on a VLF-EM Survey, KR & K Claims, Greenstone Creek, Kamloops M.D., B.C., July 31, 1973.

This report contains a Selected Bibliography.

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 VLF-EM field strength and self-potential measurements and a soil geochemistry survey carried out by Richard Conte under the supervision of myself, during August 1973 on the KR & K claims.

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

David G. Mark
Geophysicist

September 26, 1973

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4793 MAP #3

FIG. 3

NICOLA COPPER MINES LTD.(N.P.L.)

GREENSTONE CR. PROPERTY

KAMLOOPS M.D., B.C.

CUMULATIVE FREQUENCY GRAPH
SOIL GEOCHEMISTRY

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 West 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 eight years and have been active in the mining industry for the past fifteen years.

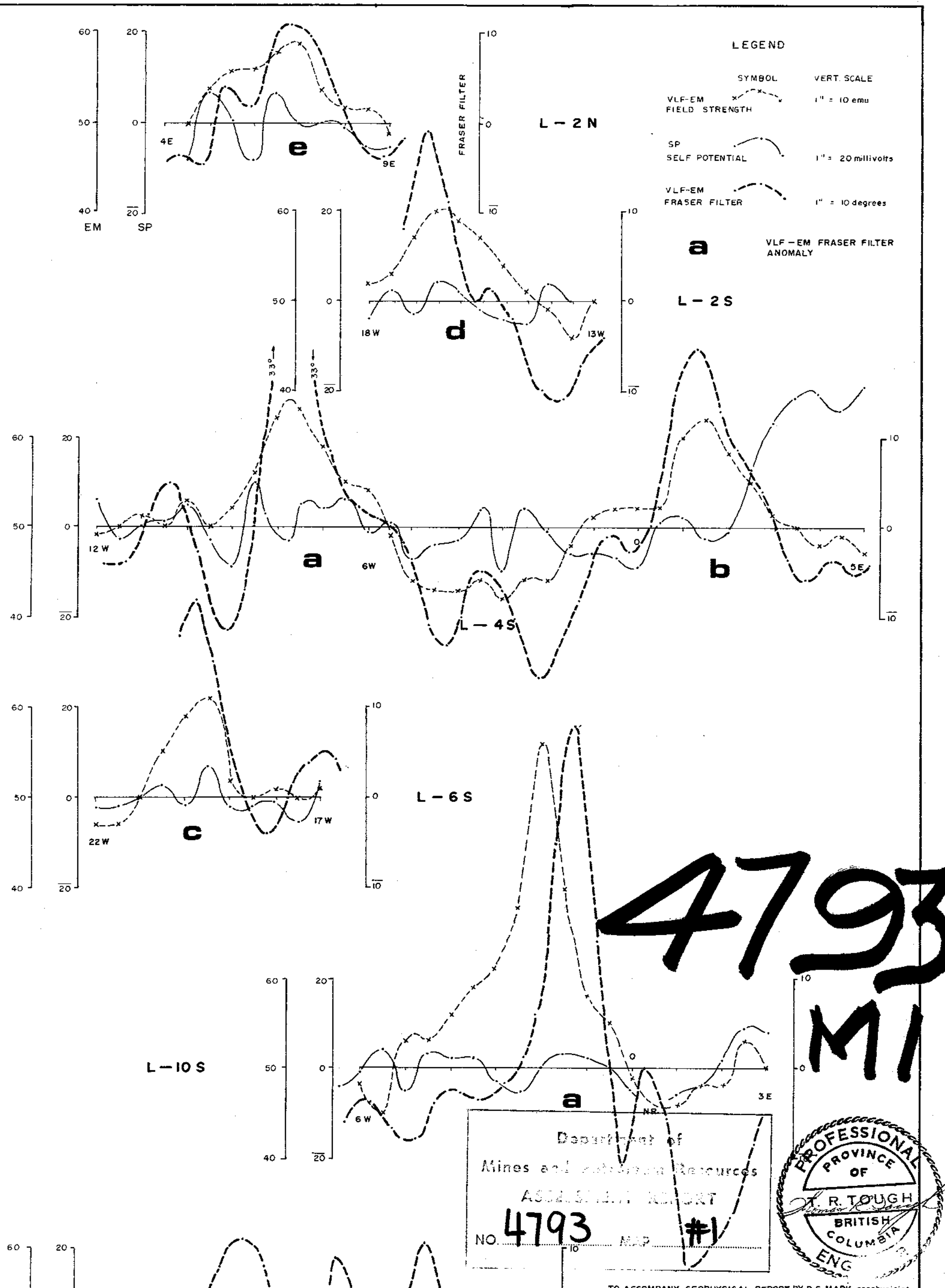
3. I am registered with the Association of Professional Engineers of British Columbia.

4. I have studied the accompanying report dated September 26, 1973, on a Self-Potential, VLF-EM and Soil Geochemistry 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 in the securities of Nicola Copper Mines Ltd. (NPL) and do not expect to receive any interest therein.

Thomas R. Tough, P.Eng.
Consulting Geologist

December 31, 1973



4793

M1

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4793 MAP #1

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. R. TOUGH

TO ACCOMPANY GEOPHYSICAL REPORT BY D.G.MARK, geophysicist

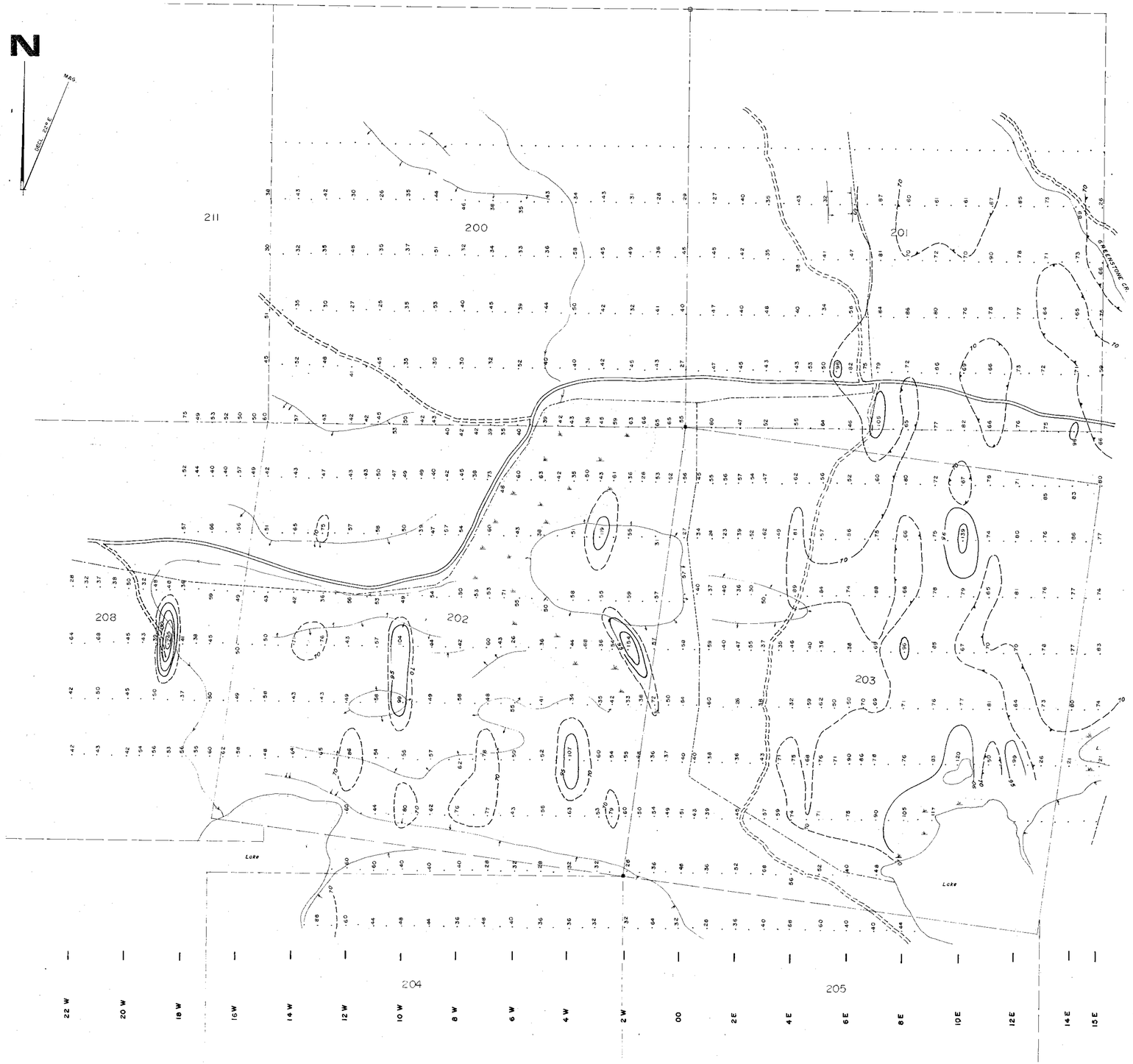
GEOTRONICS SURVEYS LTD.

NICOLA COPPER MINES LTD. (N.P.L.)
GREENSTONE CR. PROPERTY
KAMLOOPS M.D., B.C.

VLF – EM & SP PROFILES

DRAWN :	SCALE :	DATE :	SHEET
PPECEK	1"=200' HORIZ VERT. AS SHOWN	SEPT.1973	3

73–78



L-10N
L-8N
L-6N
L-4N
L-2N
L-0
L-2S
L-4S
L-6S
L-8S
L-10S
L-12S
L-14S
L-16S
L-18S

LEGEND

- SURVEY LINE
- CLAIM LINE
- ■ O CLAIM POST (LOCATED, ASSUMED)
- ROAD
- FENCE
- SWAMP
- CREEK
- SLOPE (medium, steep)

NOTE: READINGS ARE IN ppm (Cu)

CONTOURS

- 70 ppm (SUB—ANOMALOUS)
- 95, 130, 180, 240 ppm (ANOMALOUS)

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. R. TOUGH

TO ACCOMPANY GEOCHEMICAL REPORT BY D. S. MARK, GEOPHYSICIST

4793 M2

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4793 MAP #2

GEOTRONICS SURVEYS LTD.

NICOLA COPPER MINES LTD. (N.P.L.)
GREENSTONE CR. PROPERTY
KAMLOOPS M.D., B.C.

GEOCHEMISTRY SOIL SAMPLING—Copper
DATA & CONTOURS

POT DRAFTING SERVICES	SCALE 1" = 200'	JOB No. 73—78	DATE JULY 1973	SHEET No. 4