```
GEOPHYSICAL REPORT
ON THE
DAIOFF CLAIM GROUP
HARRISON LAKE AREA, B.C.
Lat. \(49^{\circ} 30^{\prime}\) Long \(121^{\circ} 40^{\circ}\)
by
IRA S. ROTE (Geologist) endorsed by
E.R. GAYFER, B.SC.. P. Eng.
June 25, 1975
for
```


## GIANT EXPLORATIONS LIMITED (N.P.L.) <br> and

```
MASCOT COPPER MINES LIMITED (N.P.L.) Suite 900 - 837 W. Hastings St. Vancouver 1, B.C.
```


INTRODUCTION ..... 1
LOCATION AND ACCESS ..... 2
GENERAL GEOLOGY ..... 3
AREA -6 GEOLOGY ..... 3-4
SURVEY GRID ..... 4
ELECTROMAGNETIC SURVEY ..... 5
PRINCIPLE OF OPERATION - RONKA-16 ..... 5-6
SPECIFICATIONS - RONKA-16 ..... 6-7
CONCLUSIONS AND RECOMMENDATIONS ..... 7-8
PERSONNEL AND EXPENDITURES ..... 9-10
FIRST DERIVATIVE METHOD ..... Appendix I

## With Text:

Map Number:
$/$ Index Map
2 Location Map

$$
6-s-01
$$

$$
2 \text { Location Map }
$$

$$
6-s-02
$$

## In Pocket:

Grid Area No. 6

$$
\begin{aligned}
& 3 \text { Detail Grid } \\
& 5 \text { Topo, Geology \& Claims } \\
& 6 \text { Em Profiles } \\
& 7 \text { Em Anomalies } \\
& 8 \text { IU }
\end{aligned}
$$

$$
6-s-03
$$

$$
-04
$$



## INIRODUCTION

Giant Explorations Limited (N.P.L.) and Mascot Copper Mines Limited (N.P.L.) are carrying out mineral exploration in a area centered on Old Settler Mountain northwest of Hope, B.C.

The property consists of 346 claims; bounded on the west by Harrison Lake, on the south by Bear Creek, and to the north by Cogburn Creek. The Fraser river lies 6 miles east.

Exploration work during the years 1970 - 1973
disclosed a number of zones on the property which deserved more detailed exploration. One such zone, termed Area -6, was examined utilising grid lines for control.

In the interval 1970-1971, geologic and topographic maps were prepared for Area -6 , and magnetic and geochemical surveys were undertaken. In 1971, a modest drilling
program, employing an x-ray machine, was initiated to test outcroppings of mineralized pyroxenite. The latter work encountered low-grade nickel-copper mineralization in a zone which has not yet been fully delineated.

During the 1975 season, additional lines were cut on the Area -6 grid over the most favorable ground, and an electromagnetic survey was carried out during the period June 9th to June 13th, 1975.

PROPERTY - LOCATION \& ACCESS (MAPS 6-S - $1 \& 2$ )
The claims on which the survey was performed are located near the junction of Daioff and Talc creeks, approximately 6 miles south-southeast from the logging community of Bear Creek.

A logging road originating near the Bear Creek camp parallels Talc Creek up to the junction with Daioff Creek; however, the road is not being currently used and a considerable portion has sloughed into Talc Creek.

In order to carry out the 1975 geophysical work, it was necessary to bring in a crew and camp equipment by helicopter. The claims on which the electromagnetic survey took place are:

| Claim | Record No. | Anniversary Date |
| :---: | :---: | :---: |
| Ni 256 | 22023 | July 25 |
| Ni 258 | 22025 | July 25 |
| Ni 263 (FR) | 27174. | October 21 |
| Ni 717 (FR) | 27176 | October 21 |



## GENERAL GEOLOGY

The Talc Creek - Daioff Creek junction is an area in which strong faulting has occurred such that rather diverse rock types have been placed in close proximity. A body of biotite quartz-diorite occurs immediately to the northeast of the junction, an altered basic intrusive is situated a short distance southwest, and a mineralised, altered, pyroxenite underlies Area -6, which is less than a claim-length to the southeast.

AREA -6 GEOLOGY (MAP $6-S-04$ )
Area -6 straddles the nose of a spur which runs west from Old Settler Mountain. The north side and nose of this ridge is underlain by a uralitized pyroxenite in fault contact with metasediments to the east. Peridotite occurs on the southern flank of the ridge.

The northern part of Area -6 is transected by northwest and northeast trending joint and fault systems with attendant uralitic alteration. There is a good correlation between the extent of uralitic alteration in the pyroxenite, and the abundance of sulfides, consisting mainly of pyrite and pyrrhotite, accompanied by minor amounts of chalcopyrite. The peridotite in Area -6 contains small blebs and seams of magnetite; however, the rock contains few, if any, visible sulfides.

Diamond drilling has demonstrated the presence of disseminated sulfides and altered pyroxenite at depth; nevertheless, no massive sulfides have been encountered, nor have the boundaries of the favorable zone been delineated.

SURVEY GRID (2.8 line miles, Map 6-S-03)
Two new base lines, $A$ and $B$, were established in the northeastern part of Area 6 as shown in color on Drawing No. 6-S-03, with east-west cross lines at $\pm 50^{\prime}$ intervals in the northern part, and $\pm 100$ intervals in the southern part. Use was made of existing lines from the old 1971 geologic grid (400' spacing) whenever possible, and its numbering system, in large part, retained.

The grid has a five digit number to designate each station. The first digit represents the area number; the next two, the line number; and the last two, its distance from the original base line. For example, 6-23-27 defines a station in Area 6 on cross line 23 and situated 2700 feet west of the original base line. Due to steep cliffs occurring at the nose of the spur, a number of the 1971 cross lines were not straight and new cross lines with numbering inconsistent with the old were put in to cover open ground (e.g.. line 56).

ELECTROMAGNETIC SURVEY (4 line miles, Map 6-S-03)
The Ronka EM-16 electromagnetic instrument
was used for this survey. The station utilized was NPG Seattle, transmitting on 18.6 kilocycles, 250 kw , and bearing approximately $190^{\circ}$ (true). Readings (in Phase and Quadrature) were taken every $25^{\prime}$ on the cross lines. A base station was read in the morning and late afternoon to check the instrument.'s performance.

The instrument was orientated facing approximately east along the cross lines ( $100^{\circ}$ true) and a record was kept of topography and the drainage features encountered. The electromagnetic survey aggregated 4 line miles.

## PRINCIPLE OF OPERATION - RONKA-16

The VLF-radio stations operating for communications with submarines have a vertical antenna. The antenna current is thus vertical, creating a concentric horizontal magnetic field around them. When these magnetic fields meet conductive bodies in the ground, there will be secondary fields radiated from
these bodies. This equipment measures the vertical components of these secondary fields.

The EMl6 is simply a sensitive receiver covering the frequency band of the new VLF-transmitting stations, with means of measuring the vertical field component.

The receiver has two inputs with two receiving coils built into the instrument. One coil has a normally vertical axis and the other a horizontal axis.

The signal from one of the coils (vertical axis) is first minimized by tilting the coil. The tilt-angle is calibrated in percentages. The remaining signal in this coil is finally balanced out by a measured percentage of a signal from the other coil, after being shifted by $90^{\circ}$. The axis of this coil is at right angles to the axis of the first coil and is kept normally parallel to the primary field.

If the signals from the secondary field are small compared to the primary horizontal field, the mechanical tiltangle is an accurate measure of the vertical real-component, and the compensation $\pi / 2$-signal from the horizontal coil is measure of the quadrature vertical signal.

## SPECIFICATIONS - RONKA-16

Primary Field:

Frequency Range:

Horizontal from any selected VLF transmitting station.

Approximately 15-25 kc.

| Station Selection: | By plug-in units. Two stations selected by a switch on front panel. |
| :---: | :---: |
| Measured Field: | Vertical field in-phase and quadrature components. |
| Accuracy of Readings: | $\pm 1 \%$ resolution |
| Range of Measurements: | $\begin{aligned} & \text { In-Phase } \pm 150 \% \text { or } \pm 90 \% \text {, } \\ & \text { quadrature } \pm 40 \% \end{aligned}$ |
| Output Readout: | Null-detection by an earphone, real and quadrature components from mechanical dials. |
| Batteries: | 6, size AA penlight cells. Life about 200 hours. |
| Size: | $16 \times 5.5 \times 3.5$ in. ( $42 \times 14 \times 12 \mathrm{~cm}$ ) |
| Weight: | $2.4 \mathrm{lbs}.(1.1 \mathrm{~kg})$ |

## CONCLUSIONS AND RECOMMENDATIONS

No marked crossovers are visible on the plotted profiles (see Maps 6-S-05 and 6-S-06) and the variations in tilt angle can generally be attributed to topographic features such as an abrupt change of slope, or the presence of a surface or subsurface water course. However, in the northwestern part of the surveyed area, where it is underlain by sediments, some correlation between tilt angle and sulphide mineralization was noted in the field.

In order to obtain a better appreciation of this correlation, first derivative profiles were plotted for lines 6-22 to 6-22 3/4 and the effects of topography thus
minimized. Few of the calculated rates of change of tilt were found to exceed $0.20 \%$ per foot - the maximum rate of change of tilt which might be caused by a change in the slope of the ground surface - nevertheless a definite, although weak, relationship between tilt angle and the observed sulphide mineralization was confirmed.

The profiles have been plotted as if viewed from the north and high positive values of the first derivative indicate anomalous conditions. Three north striking zones, marked A, B, and C on Maps 6-S-05 and 6-S-07 show higher than average conductivity and there is some evidence to suggest that these zones coalesce to one body centered on line 6-22 $3 / 8$. The strike of the zones is more or less parallel to the schistosity of the sediments and also the the pyroxenite intrusive contact a short distance to the west.

It is recommended that diamond drilling be undertaken to test these conductive zones in order to determine whether the higher than average conductivity is caused by sulphide mineralization in the sediments themselves or by nickel-copper mineralization in the underlying intrusive near its contact with the sedimentary capping.

## PERSONNEL

From June 9 to June 13, 1975 work on the
Daioff Creek Area -6 grid was carried out under the supervision of the author. The personnel were as follows:

Ira S. Rote \#205-1717 Comox St., Vancouver, B. C. Don McCool 250 East l5th St., North Vancouver, B. C. Karl R. McLean 102 Centre St., Woodstock, N. B.

EXPENDITURES
Expenditures in connection with the work done on the Daioff Group are as follows:

COST STATEMENT RE
EXPLORATION WORK AT
THE DAIOFF GROUP

CREW



EQUIPMENT RENTALS
Ronka-16 E.M. Instrument \$ 100.00

VEHICLE RENTAL
Chev 3/4 ton truck with canopy

| 5 days @ \$22/day | $\$ 110.00$ |  |
| :--- | :--- | :--- |
| Operation | $\$ 10.00$ | $\$ 120.00$ |

## HELICOPTER CHARGES

2 trips to move men and equipment to and from Daioff Creek

CAMP SUPPLIES AND FOOD FOR 3 men
5 days @ $\$ 35 /$ day
$\$ 185.00$

## ENGINEERING SUPPLIES

Chain, axe, report printing, etc.
$\$ \quad 75.00$

TOTAL EXPENDITURES
$\$ 1851.17$


## CERTIFICATE

I, Ira S. Rote of the City of Vancouver in the Province of British Columbia hereby certify:

1. That I am engaged in work as a Geologist and reside at \#205 1717 Comox Street, Vancouver 5, British Columbia.
2. That I am a graduate of the University of Guelph with an Honours Bachelor of Science degree.
3. That I have done two years work towards an M.Sc. in Geology at the University of British Columbia.
4. That I have practiced as an exploration Geologist for six years.
5. That I have personally done work on the claims mentioned in this report.
6. That I am presently employed by Giant Mascot Mines Limited.

DATED this twenty-fifth day of June, 1975.


Ira S. Rote Geologist

## APPENDIX I <br> First Derıvatıve Method



FIGURE 3. Producing First Derivative Profiles from Tilt Angle Profiles

## 5. The First Derivative Mcolhod of Reducing Topographical Effects

The rate of change (or first derivative, or slope) of the tilt angle profile is often more diagnostic than the simple "crossover" type of interpretation since it more cleariy outlines zones of high conductivity and without much interference from the topography. This is due to the fact the first derivative (or rate of change) of the tift angle due to a mincralized zone is generally larger than the maximum 0.1 degree per loot due to topographical champes.
The first derivative profile is conatructed by subtracting the titt anglo values of adjacent stations, dividing by the distanco between these two ntathons, and assigning the rosultins "slope" or "first derivative" to tho mid point. This in mustrated in tikuro 8. Note that this profile is photted for an operatur fachar right $(\rightarrow)$, henco an increnso in till anglo in oncountered iornt. In Tabla $\operatorname{sic}(\mathrm{c})$ not afl tilt amide valuen aro linted sinco the profite is anamaed "wymmetrical". An exampiod dotermimation of the tirat dorivative between mathons 1 and $2:$

The genoral features to bo expected ovor a conductivity high is showit in figure 8(b): a nokative "low" tlanked by small positivo values. Note that the low can bo extrabolated to about -0.80 derroo per foot, which would be correct if the titt anclo protile had beon drawn as a smooth curvo. It is normal field practice to simply join the field points; if a smooth curvo were attempted one mifht tend to bias the results.

The width of the first derivativo profile at the zero degrees per foot line gives a rough indication of depth to the conducting zone.
If the first derivative is obtained over a whole map area it can be contoured and a first derivative contour map obtained. Such a map would bo much easier to interpret than a tilt angle contour map.

The effects due to topography should be small and their pattern should be easy to separate from.that pattern due to a conductivity high. The scale used to plot the first derivative should not be larger than 1 inch $=0.20$ dez:ee per foot or random fluctuations and topographical changes will be exagserated.
Figure 9 illustrates a tairly typical result, for a survey line run in southern B.C. The operator was facing to the right ( $\rightarrow$ ) so the tilt angle should increase first in crossing a conductor, and a first derivative low (negative) would denote a conductor, One noticeable first derivative low occurs between 14 and 15 stations. This anomaly bears a very close similarity to the idealized case presented in figure 8. The first derivative goes most nositive just to each side ot the main negative value. The actual location of the base line depends upon the topographical effect slope change which appears to be about - 0.02 to -0.04 degree/foot between stations 16 and 19, and about zero betore the negative peak. The "crossover" is clear on the tilt angle protite as well, but is fairly small. The atverage background (on figure 9) would be drawn as shown. For the region betweon stations 1 and 9 an averako background would bo hard to esti-

One must bo sure to assign negative values for negative slopes ( $\backslash$ ) and positive first derivative values to positive slopes (/) of the tilt anglo profile. This can be a real problem if tho general background due to topography shifts from + to - tilt angles or vice versu.
 (manz onivarive

FIGURE 9. Survey Lino from Southern B.C. Station, Spacing 25 iect


FIGURE 10. Survey Linc Results for a Western Conadian Property
mate; however, the first derivative profile suggests at least two, more conductive, regions. Again the low negative is flanked by positive values, with the large positive value (between stations 6 and 7) being probably due to the superimposition of the positive values on each side of the negative peaks, as well as.possible dip of the conducting zone. The most negative first derivative appears to be related to a (disseminated) sulfide-bearing dike.

The last example, shown in ligure 10, is of the type that anyoue would be quite happy to discover! The change in the tilt angle is very large, approximately $47^{\circ}$ (from - $8^{\circ}$ to $-55^{\circ}$ ) with a large negative first derivative (about -0.74). The survey was made with the operator facing to the right so one would expect a conductivity high to be detected by encountering an increase in tilt angle first (e.g. A) and a large negative first derivative. in this case, the tilt angle does not cross the zero tilt angle axis at all so no "truc crossover" exists: however, according to the approach presented in this paper we ean consider the normal "crossover" to be displaced by toposraphical effects. The estimated average tilt background is shown on figure 9 ( 0000 ). This backgrount would tend to drop more negatlve between statlons 0 to +4 sinco the toporraphient slope is large (over 45\% rade) in that repion. Ono thus esthiates the "crossover" position on average tilt angle background to oceur near station 1. This is nlso near the maximum negativo first derivat'vo.

One tmportane point should be mado hore. The distances between the station positlons of the least negative peak $\Lambda$ and that of the best nerative It (a datane of approximately 100 to 150 feet) sugkeste mineralization extends
at least to this depth. The width of the first derivative at the zero axis, gives about the same depth estimate. (Both estimates must be considered as only very approximate guides to depth of mineralization; however, in this case, drilling has shown the mineralization extends at least 100 feet so the estimates seem reasonable.)
100 feet would seem to be close to the maximum limit of practical penetration of the EM-16 under normal conditions, and one should probably view with some doubt any peak spacing (e.s. the distance between $A$ and B) greater thin this. The very high frequencies of these units will Hmit the useful depth penctration to this value, or less, unless the soil and rock is very dry. If the maximum neak values ( $A$ and $B$ ) are much greater than 100 feet apart the EM-16 results enter a very ambigious region as several other explanations become probable. One possible cause of "crossover" profiles with largo penk spreads is the change in rock types ot differing conductivity, marticularly when passing on to a flat tabular rock untt, then oft again (for example seo bosschart, 1968). Another nossible cause could be chamges in bedrock topography, not necessarily reflected

In the surface toparraphy.
As a result of this dephth penetration the ntation mpacian mhould be leas than 100 foet or many narrow, near sur. face thomalies can be over looked. Spaclugs of 25 or 50 feet seem most sutablo depending upen the nature of the work.

Once thls anomaly had been found. a bulldozer was Immedtately brounhe In and a vein was discovered. This vein is approximately 5 feet wide and contains massive lead and zine mineralization with high stiver values. The vein was under about 10 feet of overburden. Subserpent urlling has outlined at least 10,000 tons of ore at 20 oz. of silver per ton.

Contour maps (not shown) have been drawn for portions of the property. The tilt angle contour map is very difficult to interpret since it has many "high" zones which are caused by topography alone. The first derivative contour map. on the other hand. nicely outlines a number of "high conductivity" zones with very little apparent interference from the topography.

One should always bear in mind that in looking for smaller level anomalles, one looks for changes in the first derivative which are greater than about the maximum 0.1 degree per foot than can be due to topographical effects.

In closing, I would like to acknowledge with thanks, the permission of J. A. Willcox, M. W. Hall, J. W. Coldham and W. T. Campbell to use their data in three of the examples.

## References

1. Bosschart, R. A., 1968. EM Prospecting: Selection and Adaption of Methods. Mining in Canada Dec., 196 s .
2. Crone Geopliysics Lid., literature, 979 Lakeshore Road E. Port Credit, Ontario.
3. Eve A. S., and Keys D. A.. 1956, Applisd Gcophysics in the Scarch for Mtineralk. Cambridge Press.
4. Geonics I.te. titerature, 2 Thorneliffe Park Drive, Toronto 17, Ontario.
5. 1 loiland, C. A., 19.40, Gcophysical Expleration. (Reprintest, 196s, Hafner Publivicers).
6. Pbysies Department Student Experiments B.C. Institute of Technalogy, 3700 Wilhngdon Avenue, Burnaby. B.C.






