GEOPHYSICAL REPORT

on

AIRBORNE MAGNETIC, VLF-EM AND RADIOMETRIC SURVEYS

over the

COPPER AND GOLD MINERAL CLAIMS FLORES ISLAND, ALBERNI M.D., B. C.

: 49° 126° SE Property

: N.T.S. 92E/8E

20 km NW of Tofino, B.C.

Clear Mines Ltd. Written for West Pender Street,

Vancouver, B.C.

David G. Mark, Geophysicist Ву

GEOTRONICS SURVEYS LTD. 420-890 W Pender Street,

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Columbia Geophysical Servi Surveys by

7050 Halligan Street,

Burnaby, B.C.

February 18th, 1980 Dated



GEOTRONICS SURVEYS LTD. Engineering & Mining Geophysicists

VANCOUVER, CANADA

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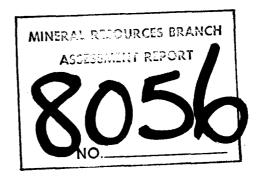


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SUMMARY

Airborne magnetometer, VLF-EM and radiometric surveys were carried out over the Copper and Gold mineral claims owned by Clear Mines Ltd. of Vancouver, B.C. during July, 1979.

The claims are located on Flores Island on the west coast of Vancouver Island in terrain varying from moderate to steep and precipitous, with vegetation being coniferous type of trees. Access is either by boat or float plane. The purpose of the surveys was to aid in the mapping of geology as well as locate probable areas for the exploration of copper, gold, silver and molybdenum mineralization.

The general area is underlain by a fairly complex bedrock sequence of Siker Group volcanics and sediments, greywacke units, Westcoast crystalline complex gneiss and acidic intrusives. The mineralization on the property is found within two different prospects and consists of chalcopyrite, magnetite, pyrite, pyrrhotite, bornite, native copper and minor molybdenite occurring within an altered monzonite.

The airborne surveys were flown at about a 100-meter terrain clearance on east-west lines with a separation of about 200 meters. The instruments used were a Sabre Electronics proton precession magnetometer, a Sabre Electronics VLF-EM receiver, and a Precision Instruments scintillometer with a 2-inch sodium iodide crystal. The magnetic and radiometric data were picked from the strip charts, plotted on a survey plan, and contoured.

CONCLUSIONS

- The magnetic and radiometric surveys quite effectively mapped the basic rock types of the Westcoast Complex and the silicic rocks of the Sooke Intrusions.
- Several magnetic lineations, likely a reflection of geological structure, were mapped striking mainly in a northwesterly and northeasterly direction.
- 3. The cliff zone has a magnetically flat expression. The creek zone occurs on the western end of a west-trending magnetic low indicating possible extension to the east.
- 4. A radiometric high occurs nearby the cliff and creek zones indicating a zone of potassium feldspar associated with the mineral zones. As a result, a second radiometric high could be an indication of sulphides occurring nearby.

RECOMMENDATIONS

1. The writer feels Cochrane's recommendations should be continued, especially the ground magnetic survey. The airborne magnetic survey results were quite flat, especially over the cliff zone, probably a result of the 100 meter terrain clearance. However, it is quite likely that a ground magnetic survey will reflect the mineralized zones.

The general area of the two radiometric highs mentioned in the body of the report should be prospected for economic sulphide mineralization.

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INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data and the interpretation of airborne magnetic, VLF-EM and radiometric surveys carried out over the Copper and Gold mineral claims during the middle of July, 1979. The surveys were carried out by T. W. Rolston, instrument operator and project manager, and N. Newsom, navigator, who both are of Columbia Geophysical Services Ltd. The survey data were brought to the writer, already compiled and contoured, for interpretation.

The two claims were staked for copper, gold, silver and moly-bdenum. Two mineral occurrences are located within the claim group.

The object of all three surveys was to aid in the geological mapping of lithology and structure for the purposes of

exploration for a large, low-grade sulphide deposit. An additional object of the magnetic survey was to directly locate probable areas of copper mineralization since it occurs with magnetite. That of the VLF-EM survey, besides the mapping of structure, was to locate conductive zones of sulphide hopefully containing economic mineralization.

PROPERTY AND OWNERSHIP

The property is comprised of two contiguous claims comprised of 20 units a piece to give a total number of units of 40. The claims are shown on Figure 2 and are described below as follows:

Name	No.Units	Record No.	Tag No.	Expiry Date
Gold	20 (4 x 5)	430	49341	April 3, 1980
Copper	20 (4 x 5)	428	49345	April 3, 1980

The claims are wholly owned by Clear Mines Ltd. of Vancouver, British Columbia.

LOCATION AND ACCESS

The property is located on the eastern half of Flores Island and on the eastern flanks of Mount Flores. It is 20 km northwest of Tofino and 6 km northwest of the Indian village of Marktosis which is on the southeast corner of Flores Island.

Access is best gained by travelling 120 km by road from Port Alberni to Tofino. From Tofino one can travel by either boat, helicopter or float plane to Flores Island, a distance of about 20 air km.

PHYSIOGRAPHY

The property is located in the physiographic unit known as the Vancouver Island Mountains near its western border with the Estevan Coastal Plain. Both units are part of the Insular Mountain physiographic division. The topography of the property is quite typical of the general area with a terrain varying from moderate to steep as well as precipitous in areas. Mount Flores lies just off the southwest part of the property reaching an elevation of 850 m a.s.l., the highest point on the island. The elevation on the property ranges from 180 m on the northeast boundary to 790 m on the west center boundary to give a range of 610 m.

The main trend of the topography is mainly east-west. The northern, central and southern parts of the property are comprised of east-striking ridges or a series of hills that are separated by east-striking valleys.

Several creeks flow through the property. A number of small lakes occur to the north of and west of the property boundary.

HISTORY OF PREVIOUS WORK

Falconbridge Nickel Mines Ltd held the ground until January 1979. In the late 60's and early 70's, they carried out exploration including geochemical and geological surveys.

The property was restaked in the spring of 1979 and subsequently sold to Clear Mines. The writer is unaware of any other work being carried out.

GEOLOGY

The following is quoted from the engineering report on the property by D. R. Cochrane:

"Fairly recent geological mapping by Muller (G.S.C. Paper 68-50) shows the general area to be underlain by a fairly complex bedrock sequence ranging in age from Permian and older (Siker Group volcanics and sediments); to Jurassic-Cretaceous greywacke units; Westcoast Crystalline Complex gneiss; to Tertiary acidic intrusives. The later type is sometimes host to porphyry-type copper (with minor Mo and Au) occurrences such as Catface, the Big I, Corrigan Creek and Mount Washington.

"The author inspected two mineral occurrences within the claims area and these are herein designated the cliff zone and creek zone.

(a) CLIFF ZONE

"The cliff zone lies on the northerly side of a 2000 foot prominence close to the common boundary between the Gold and Copper claims. Metallic mineralization consists of chalcopyrite, magnetite, pyrite, pyrrhotite, bornite, native copper and minor molybdenite. The host rock is altered multiphased hornblende-biotite monzonite. (field name only). The rock varies in texture from very fine grained (often slightly more acidic) to a coarse grained equigranular pinkish grey intrusive. The intrusive is brecciated and quite obviously stained. Secondary minerals include limonite, jarosite, malachite and moly ochre. The presently exposed portion of the cliff zone is well over 100 feet wide and the only easily accessible part of the zone is along the base of a shear cliff which rises to over 100 feet in height. Northerly from the base of the cliff the ground is covered with scree and overburden such that the extent of the mineralization along the cliff zone is unknown.

(b) CREEK ZONE

"The creek zone is located about one mile (1.6 km) due south of the cliff zone at an elevation about 1200 feet (366m) above sea level and on the east side of a small creek to the south of the present camp site. Mineralized float was found in the creek bed and follow-up led to the location of a sheared zone parallel to the course of the creek. The host rock is an altered intrusive containing chalcopyrite, pyrite, magnetite and traces of molybdenite. There are a few outcrops in the area however some of the "float" is well mineralized."

INSTRUMENTATION AND THEORY

1) Magnetic Survey:

The magnetic data was detected using a nuclear free precession magnetometer, made by Sabre Electronics of Burnaby, B.C. This measures the absolute value of the earth's magnetic field intensity in three ranges which are 1,000, 2,500 and 5,000 gammas respectively. The sensitivity is 1 gamma and the absolute calibration is governed by a crystal-controlled oscillator so that it cannot drift.

The magnetic data as well as the VLF-EM data were recorded on an MFE model M-22 CAHA dual channel strip chart recorder. There are four chart speeds which are 1, 5, 25, and 50 mm/sec respectively.

Only two commonly occurring minerals are strongly magnetic; magnetite and pyrrhotite. Hence, magnetic surveys, both ground and airborne, 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 the structure since different rock types have different background amounts of magnetite and/or pyrrhotite.

2) VLF-EM

A VLF-EM receiver manufactured by Sabre Electronics of Burnaby, B.C. was used for the VLF-EM survey. This instrument is designed to measure the current induced, in a vertical coil, by the primary and secondary fields of the very low frequency electromagnetic field (VLF-EM) transmitted at 18.6KHz 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 structures and in picking up sulphide bodies of too low conductivity for conventional EM methods and too small for induced polarization (in places it can be used instead of IP). However, its subsceptibility 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.

3) RADIOMETRIC SURVEY

The instrument used to carry out this survey was a Model 118 Royal Scintillator manufactured by Precision Radiation Instruments Ltd. The detecting element used with this scintillator is a 2-inch sodium iodide crystal. The data was recorded on a Bausch & Lomb 6-inch strip chart recorder. The complete airborne system was installed as close as possible to the rear of the aircraft to ensure against radiation from the plane's navigational equipment.

All radiometric surveys, ground or airborne, work on the principle of gamma-ray emission from radioactive sources. The most common sources incurred in geophysical prospecting are radioactive isotopes of uranium (\mathbf{U}^{238}), thorium (\mathbf{Th}^{232}) and potassium (\mathbf{K}^{40}). These isotopes disintegrate spontaneously into daughter elements emitting alpha and beta particles, and gamma rays. The alpha and beta particles travel no more than 1 to 2 feet through air and thus are little use for geophysical detection. On the other hand, the gamma ray travels hundreds of feet through air and thus is of prime importance. These gamma rays, in a radioactive survey, are generally detected by thalium-activated sodium iodide crystals.

The gamma ray can be shielded by two feet of water or rock and thus over large lakes there is a minimum signal. Thus, also radiometric surveying is essentially surveying for outcrop expression of rocks containing radioactive minerals. However, around uranium showings, if the rock and overburden is porous and fractured enough (and not water-soaked), the uranium can be detected at greater depths because of the uranium daughter product, radon gas, seeping upwards.

The main source of error are topographic noise and cosmic noise.

Topographic noise is in the form of anomalous highs or lows and is produced by the terrain clearance becoming correspondingly lesser or greater. A related type of noise is a variable amount of snow cover wherein a few feet of snow would completely eliminate gamma rays from the ground.

Cosmic noise is only exhibited by anomalous highs and is caused by bursts of cosmic showers, which are radioactive particles from outer space. However, a constant low background of cosmic noise continually exists.

SURVEY PROCEDURE

A Bell 206B Jet Ranger helicopter beloning to Highland Helicopters flown at a speed of about 120 kph, was used to fly the survey. The magnetometer head and the VLF-EM receiving antenna were towed in a bird at the end of a 20-meter cable. The scintillometer detector crystal was placed in the floor of the helicopter. The flight lines were flown in an eastwest direction with a separation of about 200 meters. The bird was flown at a terrain clearance of about 100 meters. Tie points were made over prominent topographic features. They were numbered, recorded, and plotted on the flight-line and data sheets. There were considerable topographic features to serve as visual tie points so that the flight lines can be considered to be plotted fairly accurately.

The magnetic readings were taken with the magnetometer set on a 1.2 second recycling period which corresponds to readings taken at intervals of about 40 meters.

The magnetic diurnal change was not monitored but the survey was done in short enough time so that any possible error would be minimal. As for magnetic storms, which are frequent at this time, there were none on the day of the survey. This was checked with the monitoring station at Victoria.

All radiometric readings were taken with the scintillometer set on a 5-second response time whereby the meter would respond to the average count of gamma particles received over a 5-second interval of time. Therefore, the sample length averaged about 160 meters.

COMPILATION OF DATA

The magnetic and radiometric data were picked off the strip charts at equal intervals of length of 100 meters. In some instances, variations were made in this sampling interval to more accurately define isolated areas of change.

The magnetic data were then plotted on Sheet 1 at a scale of 1:10,000 (1 cm = 100m) and contoured at a 100-gamma interval on Sheet No. 2. The mean background value appears to be about 2,400 gammas which is approximately equivalent to 57,000 gammas total field.

The VLF-EM data on the strip chart was examined for anomalies but was found to be very flat. Therefore, no VLF-EM results are plotted. The lack of results is undoubtedly due to the unfavourable station direction relative to the flight line direction.

The radiometric data was visually scanned to determine the background. It was then contoured on the basis of being two or three times background. The contours were placed on Sheets 1 and 2.

DISCUSSION OF RESULTS

(a) Magnetic

The magnetic survey results can be divided into two areas on the basis of magnetic intensity:- 1) the southern half of the survey area with a relatively low intensity, and 2) the northern half of the survey area with a relatively high intensity. These two areas are quite sharply divided by a lineation that trends northwest and west.

The southern half varies in magnetic intensity from 1700 gammas to 2400 gammas giving a range of 700 gammas. The background level appears to be about 2000 gammas. Not only is this area relatively low in magnetic intensity, but it is also fairly quiet. That is, there isn't a high frequency variation from lows to highs. The contouring is much less intense. This indicates a relatively even distribution in the background amount of magnetite.

Correlating this area with the geological mapping done by Muller, the magnetic results are shown to reflect the silicic Sooke intrusions. This group is composed of the rock-types quartz diorite, trondhjemite, agmatite, and porphyry.

The northern area has a magnetic range of 2200 gammas taken from the results varying from 1800 to 4200 gammas. The background level is about 2400 gammas. The northern area is much noisier containing many thumprint-size magnetic highs and lows. This is commonly a reflection of young basalts.

According to Muller, this area is underlain by basic rocks of the Westcoast Complex. The rock types are hornblende plagioclase gneiss, quartz diorite, agmatite and amphibolite.

In the northeast corner of the survey area on the eastern shore of Flores Island, is a relatively quiet, low-intensity

area that could quite possibly be underlain by silicic intrusions (or sediments?).

The southern edge of the survey area, according to Muller, is underlain by the same basic rocks as in the northern half. However, the magnetics indicate only silicic rocks as occur in the south center of the survey area. Quite possibly the contact as mapped by Muller should be further south. The geological map is quite small-scaled.

Many of the magnetic highs and lows in the northern area follow the flight line direction. This is caused by the rough terrain combined with the high magnetic intensity. It is very difficult for the helicopter to keep a constant terrain clearance. This effect is hardly noticeable in the southern area where the magnetic intensity is lower, even though the terrain is similar.

On Sheet 2 the writer has drawn in several magnetic lineations. These are most often reflective of structure such as faults, contacts, and shear zones.

The most prominent lineation, as mentioned above, is the one that divides the northern area from the southern area. This lineation reflects the contact between the silicic Sooke Intrusions and the basic Westcoast Complex.

The other lineations strike northeasterly and northwesterly. The two faults mapped by Muller within the survey area have a northwest strike.

The cliff zone occurs on a topographic high that is caused by a young intrusive plug within the area mapped as Sooke Intrusions. The crystals are fine to medium grained and the potassium feldspar content is quite high. Though the zone of mineralization contains magnetite, the airborne magnetic expression is quite flat. The magnetite content is, therefore, too low to affect an airborne survey with a terrain clearance of 100 m.

The creek zone is also found within the Sooke Intrusions. It occurs at the western end of a magnetic low that follows a flight line. The magnetic low may be due to terrain but it could also easily be related to the mineralization.

Magnetic highs within the Sooke intrusions could be due to magnetite associated with zones of sulphide mineralization. All of them correlate, however, with topographic highs. This is not to say it precludes the possibility of sulphides occurring with the magnetite.

b) Radiometric Survey:

The radiometric survey results are much smoother than those of the magnetic survey results. Most of the area is background in gamma radiation with large areas being two times background and three small areas being three times background. The radiometrics within this survey area are undoubtedly simply a mapping of the potassium feldspar content of the bedrock.

Almost all of the two times background areas occur within the low magnetic intensity southern area, which is, as mentioned above, a mapping of the silicic intrusions. This is not surprising since silicic rock is generally higher in potassium feldspar. Conversely, the northern area is almost devoid of any radiometric expression at all.

The two times background areas also occur at higher elevations, a probable result of light overburden cover. The valleys between the topographic highs have no radiometric expression.

The magnetically low zone in the northeast corner of the survey area is also two times background in gamma radiation. This indicates much more strongly that the area is underlain by the more silicic Sooke Intrusions.

The one three times background radiation anomaly occurs fairly close to the cliff zone as well as the creek zone. This indicates a zone of potassium feldspar that is probably related to the two zones of mineralization.

The second anomaly of three times background occurs within a magnetic low within the more magnetically intense northern half, and therefore, within the basic rocks of the Westcoast Complex. However, considering the magnetic low and the radiation high (large area of two times background) this area is probably an embayment of silicic Sooke Intrusions into the basic Westcoast Complex. Nevertheless, the three times background anomaly provides an area of interest for the possible occurrence of sulphide mineralization.

The third anomaly of three times background occurs on the eastern shore and is of low interest because of its thumb-print size.

Respectfully submitted, GEOTRONICS SURVEYS LTD.,

David G. Mark Geophysicist

February 18, 1980

SELECTED BIBLIOGRAPHY

Cochrane, D.R. Report on the Copper and Gold Mineral Claims situated on Flores Island, for Clear Mines Ltd. Cochrane Consultants Ltd., April, 1979.

Muller, J.E. <u>Geology of Vancouver Island</u>, Geol. Surv. of Can. O.F. 463, 1977.

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 420-890 West Pender Street, Vancouver,
British Columbia.

I further certify:

- 1. I am a graduate of the University of British Columbia, (1968) and hold a B.Sc., degree in Geophysics.
- I have been practising my profession for the past twelve years and have been active in the mining industry for the past fifteen years.
- 3. I am an active 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 airborne magnetic and radiometric survey carried out by Columbia Geophysical Services Ltd., under the supervision of T. W. Rolston, during the middle part of July, 1979.
- 5. I have no direct or indirect interest in Clear Mines Ltd., Vancouver, B.C. nor in any of its properties, nor do I expect to receive any interest therein as a result of writing this report.

David G. Mark

February 18, 1980

COST BREAKDOWN

Geophysical Technician and navigator

This is to certify that the airborne magnetic, VLF-EM, and radiometric surveys were carried out to the value of the following:

FIELD

30 hours @ \$50/hour	\$	1,500.00
Helicopter time, 20 hours @ \$400/hour		8,000.00
Room and board		400.00
Truck rental		250.00
Instrument rental		1,000.00
	\$	11,150.00
OFFICE		
Geophysicist, 20 hours @ \$35/hour		700.00
Geophysical Technician, 100 hours @ \$25/hour		2,500.00
Drafting and printing (including blow ups)		1,400.00
Report typing and compilation		250.00
	\$	4,850.00
TOTAL	<u>\$</u>	16,000.00

The work was carried out in the middle of July, 1979. The work was divided according to survey area flown amongst the different claims as follows:

Copper and Gold claims	\$ 4,000.00
Lead claims	2,000.00
Moly, Rhenium, and Silver claims	10,000.00
	\$ 16,000.00

Respectfully submitted, COLUMBIA GEOPHYSICAL SERVICES LTD.

T.W. Rolston Manager

