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GEOPHYSICAL REPORT

ON

AIRBORNE MAGNETIC AND VLF-EM SURVEYS

OVER THE

TROUT AND TROUT 2 CLAIMS

POPLAR CREEK AREA

OMINECA MINING DIVISION

BRITISH COLUMBIA

PROPERTY

- : Northwest corner 37.7 km S7°E of Houston, B.C. on south side of Poplar Creek
- : 54° 126° SW
- : N.T.S. 93L/2E

WRITTEN FOR

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DATED

: June 4, 19834



GEOTRONICS SURVEYS LTD. Engineering & Mining Geophysicists

VANCOUVER, CANADA

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LIST OF ILLUSTRATIONS

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Property Location Map 1:10,000,000

Sheet 1

Claim Map

1:50,000

Sheet 2

In Back Pocket

Airborne Magnetic 1:10,000

Sheet 3

& VLF-EM Survey

Results

SUMMARY

Airborne magnetic and VLF-EM surveys were carried out over the Poplar Creek property owned by Geotech Resources Inc. of Vancouver, B.C. during the month of May, 1984. The claims are located 38 km south of Houston on the south side of Poplar Creek. Access is easily gained by a two-wheel drive vehicle over logging roads from Houston. The terrain consists of mainly gentle to moderate slopes forested with moderately dense coniferous trees. The purpose of the surveys was to aid in the mapping of geology as well as to locate probable areas for exploration of silver-copper as well as possibly gold mineralization.

Outcrops have shown the property to be underlain by Eocene and Oligocene(?) Buck Creek volcanics as well as the older Eocene Goosly Lake volcanics. There also occurs cappings of Upper Tertiary Poplar Butte volcanics. Most of the property is drift covered, however, and therefore other rock units could easily occur.

The Equity Silver property occurs nearby and contains silver-copper mineralization within an intermediate rhyolitic pyroclastic unit of the Hazelton Group rocks. The Trout and Trout 2 claims were staked on an anomalous silver-copper values within rock outcrops.

The airborne surveys were flown at about a 50-meter terrain clearance on straight lines with a separation averaging about 200 meters. The instruments used were a Sabre Electronics proton precession magnetometer and a Sabre Electronics VLF-EM receiver. The magnetic data were picked from the strip charts and hand contoured. The contours were drawn on a survey plan on which the VLF-EM anomalies were plotted as well.

CONCLUSIONS

The magnetic survey has shown most, and probably all, of the Trout and Trout 2 claims to be underlain by volcanics. Mapped on the property are Goosly Lake volcanics and Buck Creek volcanics, but the magnetic survey does not distinguish between them. What it does say is that the volcanics within these two groups are probably intermediate in composition.

Four small cappings of Upper Tertiary Poplar Butte volcanics have been mapped by the magnetics throughout the property.

The VLF-EM survey has revealed several anomalies on the property some of which may be caused by terrain. There are no anomalies that particularly stand out.

Both the VLF-EM and magnetic surveys revealed lineations within the survey area that are likely caused by fault, shear and/or contact zones. These can be important indicators of sulphide mineralization especially where the lineations cross. The main trend of the lineations is northwesterly.

RECOMMENDATIONS

The recommendations contained in Bullis' engineering report should be continued with. The airborne magnetic and VLF-EM surveys have not shown any particular areas to concentrate on nor any change in direction in Bullis' recommendations.

The writer would like to stress, however, that geological mapping of the claims is guite important. This will enhance the interpretation of the airborne surveys as well as that of any future geophysical or geochemical surveys carried out.

GEOPHYSICAL REPORT

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INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data and the interpretation of low-level airborne magnetic and VLF-EM surveys carried out over the Trout and Trout 2 claims within the Parrott Lakes area during May of 1984. The surveys were carried out by Lloyd Brewer, instrument operator and project manager, and Dean Bowra, navigator, both of whom are of Columbia Airborne Geophysical Services Ltd. A total of 71.85 line km of airborne surveys were done over the property and surrounding area.

The object of the two surveys was to aid in the geological mapping of lithology and structure for the purpose of exploration of the type of silver-copper mineralization as is found within the Equity Silver deposit. Magnetic surveys have especially been proven to be a good geological mapping tool.

PROPERTY AND OWNERSHIP

The property consists of two contiguous claims totalling 40 units staked within the Omineca Mining Division as shown on Sheet 2 and as described below:

Claim Name	# Units	Record #	Expiry Date
		5223 OL.	
Trout	20	_ 5523'	June 16, 1984
Trout 2	20	5524 O.	June 16, 1984

The expiry date shown does not take into account the surveys under discussion as being accepted for assessment credits. It is believed 2 years have been or will be applied which will extend the expiry date to 1986.

The two claims are owned by Geotech Resources Inc. of Vancouver, British Columbia.

LOCATION AND ACCESS

The northwest corner of the property is found 37.7 km S7°E of the Town of Houston, B.C., and on the south side of Poplar Creek on Tekaiziyis Ridge.

The geographical coordinates are 54°05'N latitude and 126°30'W longitude.

Access is easily gained by a series of logging roads running southerly from Houston through which Highway 16 passes. The road runs along the Morice River, then Owen Creek, then Owen Lake and then along the Nadina River to Francois Lake. It is along the Nadina River that a turn-off runs northerly up towards the property.

PHYSIOGRAPHY

The property is found on the western side of the physiographic unit known as the Nechako Plateau, which is the northern part of the Interior Plateau System. The Nechako Plateau is an area of low relief with great expanses of flat or gently rolling country. The plateau surface lies between 9,000 and 1,500 meters elevations.

The plateau was occupied by ice, which, in moving across it, marked the surface with thousands of grooves and drumlin-like ridges which are parallel to the ice flow. Numerous depressions left on the plateau surface after the ice retreat are now occupied by myriads of lakes. Glacial drift is widespread and a high percentage of bedrock is obscured.

Elevations vary from 975 meters a.s.l. on the northwestern corner of the property to 1,190 meters a.s.l. on the western side of the Trout Claim and within the center of the Trout 2 Claim.

The main water sources would be the two small lakes occurring within the Trout and Trout 2 Claims, respectively, as well as Poplar Creek.

The area is moderately forested with fir, spruce and poplar with the underbrush usually being light. Some areas are covered by grassland. Also swamp-type vegetation occurs around the lakes and creeks.

HISTORY OF PREVIOUS WORK

Since the claims have been staked, some rock sampling and soil sampling have been done, the results of which are quoted in Bullis' engineering report.

GEOLOGY

The following is quoted from Bullis' June, 1983 report on the Trout and Trout 2 claims.

A. REGIONAL

"The region is underlain by an assemblage of (mainly) volcanic rocks that vary from flows and pyroclastic material to tuff and ash deposits. The composition of the volcanic rocks also varies from rhyolite to andesite and the age of the assemblage begins with a basement complex of the Hazelton Group, of Middle Jurrassis age, up to, and including the Endako Group of Miocene age.

"A few small intrusive bodies of monzonite-gabbro and granite are present in the region but not a major constituent of the surface exposures as mapped by the various workers in the field.

"The early Hazelton formation is exposed in 'windows' produced by recent erosion. The cover rocks, which vary in age from Cretaceous to Eocene, are rhyolite, dacitic and andesitic breccia, flows, tuff and ash deposits; they are relatively undeformed and fresh looking rocks that display well developed flow banding.

"The youngest rocks are the Endako Group of Miocene age and they form the flat tops of steep walled buttes which are the remnants of a much more widespread plateau that has been removed by local uplift and subsequent erosion.

B. LOCAL

"The rocks exposed on the Trout and Trout 2 claim blocks are mainly volcanic extrusive rocks which vary in composition from rhyolitic breccias and pyroclastic material to andesitic flows

and breccias. Sedimentary deposits, such as conglomerates and tuffs, were not observed on the property.

"Flow structure was observed in the andesitic rocks and prominent joining, striking north-west and dipping steeply east, was also noted. The flow structures strike east-west and dip to the north at dips of 30 to 40 degrees.

"Much of the rhyolite has been affected by some form of rock alteration; limonite, carbonates and a green mineral was noted. (The green material could be chlorite, or possibly olivine).

"The limonite appears to be a product of pyrite oxidation because much of the limonite fills cubic casts.

"The alteration is much less intense in the andesitic volcanic rocks although chlorite was observed.

"Some fine-grained jasperoid silicification is present in the rhyolite breccias.

"Andesite flows located on the western portion of the property exhibits feldspar "lathes" and small quartz "eyes" and some fresh pyrite cubes were observed.

"The age of the rocks underlying the property was not apparent from the limited field observations available but they could be part of the Hazelton group, of Mezozoic age, or else they may be part of the Tip Top Hill group of Cretaceous age.

"The only intrusives noted on the property are andesitic dykes which strike north-west and dip steeply. The dykes appear to be large, i.e. over thirty feet in width and they contain chlorite and/or olivine.

(C) EQUITY SILVER PROPERTY

"The deposits are located in Hazelton Group rocks that vary in composition from a lower conglomerate unit, through an intermediate pyroclastic unit to an upper (mainly) sedimentary unit.

"The deposits are flanked by a westerly quartz monzonite intrusive and an easterly gabbro-monzonite stock. Very spare copper-molybdenum mineralization is developed in the quartz-monzonite while the gabbro-monzonite is barren.

"Silver-copper mineralization occurs in the intermediate rhyolitic pyroclastic unit. The ore zone resembles a slab that increases in volume with depth. Well-mineralized rock contains pyrite, chalcopyrite, some pyrrhotite with minor tetrahedrite, sphalerite and other sulfo-salts. The rock alteration is pyrite-sericite with ankerite (carbonate), gypsum, tourmaline and some flourite."

INSTRUMENTATION AND THEORY

a) Magnetic Survey

The magnetic data are detected using a nuclear free precession proton magnetometer, manufactured by Sabre Electronic Instruments Ltd. of Burnaby, B.C. The magnetometer measures the total count of the earth's magnetic field intensity with a sensitivity of one gamma. The data are recorded on magnetic tape and 12 cm analog strip chart.

The magnetic patterns obtained from a regional airborne survey are directly related to the distribution of magnetite in the survey area. However, the geology cannot be deduced from iso-

magnetic maps by simply assuming that all magnetic highs are underlain by gabbro or ultramafic rocks, and that all magnetic lows are caused by limestone or chert. The problem with such a simplistic approach is that magnetite is not uniformly distributed in any type of rock. Other problems arise from the fact that most geologic terrains have rocks of high susceptibility superimposed on less 'magnetic' rocks, and vice versa. Cultural features such as powerlines, pipelines and railways also complicate matters. So many variables can be involved that it may be impossible to make a strictly accurate analysis of the geology of an area from magnetic data alone. It is preferable to use other information such as geological, photogeological and electromagnetic in combination with magnetic data to obtain a more accurate geological analysis.

b) VLF-EM Survey

A two-frequency omni-directional receiver unit, manufactured by Sabre Electronic Instruments Ltd., of Burnaby, B.C., was used for the VLF-EM survey. The transmitters used are NLK Arlington (Seattle), Washington, operating on 24.8 KHz, and Annapolis, Maryland, transmitting at 21.4 KHz. These signals are used due to their ideal orientation with respect to northwest and eastwest geological structures, and their good signal strengths. The measurement taken during the survey is the variation in the horizontal component of the signal strength.

The VLF (Very Low Frequency) method uses powerful radio transmitteres set up in various parts of the world for military communications. These powerful transmitters can induce electric currents in conductive bodies thousands of kilometers away from the radio source. The induced currents set up secondary magnetic fields which can be detected at surface through deviations in

the normal VLF field. The VLF method is inexpensive and can be a useful initial tool for mapping structure and prospecting. Successful use of the VLF requires that the strike of the conductor be in the direction of the transmitting station so that the lines of magnetic field from the transmitter cut the conductor. Thus, conductors with northeast to southeast strikes will respond to Annapolis transmissions, while conductors striking south to east will respond to Seattle transmissions. Conductors striking east to southeast may respond to both stations, giving coincident field strength peaks.

The theory of VLF-EM interpretation is quite simple. Conductors are located at field strength maxima. In the Houston area, one may assume that a Seattle field strength peak represents a conductor with a generally southeast trend, and an Annapolis peak will be a conductor with an east-west trend. This, of course, only applies to conductors with clearly linear trends and cannot be assumed for single line anomalies.

It is impossible to determine the quality of conductors with any reliability, using field strength data alone. The question of linearity is in doubt if the conductor does not appear to cross the adjacent flight lines. The relatively high frequency results in a multitude of anomalies from unwanted sources such as swamps, creeks and cultural debris. However, the same characteristic also results in the detection of poor conductors such as faults, shear zones, and rock contacts, making the VLF-EM a powerful mapping tool.

The interpretive technique requires information from magnetic surveys, air photo analyses, and ground traverses to aid in discrimination between important and unwanted anomalies. Even armed with this information the interpreter can easily be misled.

SURVEY PROCEDURE

A two-meter bird was fitted with a magnetometer coil and two omni-directional EM receivers and towed beneath the helicopter on a 10-meter cable. The terrain clearance for the bird was 50 m.

The surveys were straight-line flown in a northeast-southwest direction at an average line spacing of 200 m. Navigation was visual, using 1:50,000 scale maps blown up to 1:10,000.

The aircraft used to conduct this survey was a Bell Jet Ranger helicopter. Airspeed was a constant 60 KPH so that creek valleys and canyons were penetrated thoroughly. The slow airspeed provided safety, detailed coverage of boxed-in areas, and consistency of data retrieval, which is critical in rugged terrain.

The number of line km flown as shown on Sheet 3 is 71.85.

The project supervisor, Lloyd Brewer, has over 2 years of experience in conducting aerial magnetic and electromagnetic surveys from rotary-wing aircraft, under all types of terrain conditions.

DATA REDUCTION AND COMPILATION

The observant magnetic total field was recorded on analogue strip charts. These were played-back together with audio recordings containing fiducial markers, and the fiducial markers were transferred to the strip charts. The fiducial markers were identified with topographic features along the flight lines.

The magnetic data were taken from the strip charts and plotted on Sheet 3 at a scale of 1:10,000 (1 cm = 100 m). The data were then contoured at a 100-gamma interval.

The VLF-EM anomalies were taken from the strip charts and plotted on the sheet with the magnetics. For each anomaly, a heavy line along the flight line was drawn showing its half-width. An 'S' or an 'A' designated the anomaly as being from the Seattle transmitter or the Annapolis transmitter.

A question mark on the anomaly indicates that it could be caused by terrain or other noise. The survey area was somewhat hilly causing numerous VLF-EM anomalous responses most of which was easily sorted out as being caused by terrain. However, some were difficult to sort out and they were therefore plotted with a question mark.

Strong anomalies were plotted with exclamation marks, and anomalies without any marks indicate average responses. Other symbols are explained on the sheets.

DISCUSSION OF RESULTS

The magnetic field over the Geotech property is somewhat noisy but of relatively low amplitude. Other than two prominent highs, the field over most of the property varies from 900 to 1,400 gammas.

The two most prominent magnetic features are two magnetic highs occurring within the center and on the western side of the property. These, as well as other highs of smaller amplitude (say, all highs above 1,500 gammas) undoubtedly reflect cappings of Upper Tertiary Poplar Butte volcanics, which in this area is

comprised of olivine basalt. The magnetic field, however, indicates the cappings are smaller in area than as shown on Tippers G.S.C. geology map of the area.

Much of the rest of the survey area has a magnetic field that is low in amplitude but moderately noisy. Part of this magnetic field (northern part of Trout Claim) is underlain by Goosly Lake volcanics and another part (southeastern corner of Trout 2 claim) is underlain by Buck Creek volcanics. It is therefore likely the area with this type of magnetic field is underlain by these two rock groups. However, the magnetics does not seem to distinguish between them. Furthermore, considering the low amplitude of the magnetic field, it seems likely the rock-type is intermediate in composition, say, trachytes and possible dacites.

The northeastern part of the survey area is slightly higher in amplitude than the rest of the survey area, by about 100 gammas. This no doubt represents a different rock-type, probably a volcanic, though what type of volcanic, is difficult to say.

The major cause of VLF-EM anomalies, as a rule, are geologic structure such as fault, shear and breccia zones. It is therefore logical to interpret VLF-EM anomalies to likely be caused by these structural zones. Of course, sulphides may also be a causative source. But in the writer's experience, when VLF-EM anomalies correlate with sulphide mineralization, the anomalies are usually reflecting the structure associated with the mineralization rather than the mineralization itself.

There is some variation in intensity from one VLF-EM anomaly to the next. This is not only due to the conductivity of a causative source, but also the direction it strikes relative to the direction to the transmitter. In other words, those conductors lying close to the same direction as the direction to the transmitter can be picked up easier than those that are lying at a greater angle. Depending upon its conductivity, a conductor may not be picked up at all if it is at too great an angle.

A number of VLF-EM anomalies have been mapped throughout the Trout claims. Some are moderately strong and these therefore could be related to sulphide mineralization.

Most of the anomalies appear to be related to ridgetops and hilltops. This indicates the causative source is terrain. However, the lower slopes probably have more overburden which may be conductive and which therefore may mask bedrock conductors (geological structure, mineralization). On the other hand, the hilltops may be covered by overburden and therefore the EM would respond more to bedrock conductors which would result in more anomalies.

Lineal trends considered to be indicative of geological structure have been drawn on Sheet 3 taking into account:

- a) Magnetic lows which are often caused by the magnetite within the rocks being altered by geological structure processes.
- b) VLF-EM anomalies which more often than not are reflecting structure.
- c) Topographic depressions such as creek valleys which are usually caused by structure.

Several lineations that are indicative of faults have been mapped across the property striking mainly in northeasterly directions. The lineations cross each other on the property in dif-

ferent areas. Structure is often important for the emplacement of mineralizing fluids especially where lineations intersect. Thus these areas may have greater exploration interest.

Respectfully submitted, GEOTRONICS SURVEYS LTD.

David G. Mark, Geophysicist

June 4, 1984

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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 located at #403-750 West Pender Street, Vancouver, British Columbia.

I further certify:

- 1. That 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 16 years and have been active in the mining industry for the past 19 years.
- That I am an active member of the Society of Exploration Geophysicists and a member of the European Association for Exploration Geophysicists.
- This report is compiled from data obtained from airborne magnetic and VLF-EM surveys carried out over the Trout and Trout 2 claims by Columbia Airborne Geophysical Services Ltd., under the supervision of Lloyd Brewer during May of 1984.
- I have no direct or indirect interest in any of the properties mentioned within this report, nor in Geotech Resources Inc., nor do I expect to receive any interest as a result of writing this report.

David G. Mark Geophysicist

June 4, 1984

AFFIDAVIT OF COSTS

I, Eugene A. Dodd, president of Columbia Airborne Geophysical Services Ltd., certify that the airborne magnetic and VLF-EM surveys were flown in May of 1984, and that they were flown at a cost of \$100/km, the total number of km being 71.85, to give a total cost of \$7,185.00.

Eugene A. Dodd

June 4, 1984



