GEOPHYSICAL REPORT

ON

AIRBORNE MAGNETIC AND VLF-EM SURVEYS

OVER THE

ROLLS AND ROYCE CLAIMS

BJERKNESS CREEK, KASLO AREA

SLOCAN MINING DIVISION

BRITISH COLUMBIA

PROPERTY

: Northeast corner is 5 km S30°W
  of Kaslo, B.C.

: 49° 52' north latitude
  116° 57' west longitude

: N.T.S. 82P/15W

WRITTEN FOR

: HIGH RIDGE MINES
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DATED

: May 21, 1985
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Geotronics Surveys Ltd.
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In Back Pocket

Airborne Magnetic  & VLF-EM Survey  Results
Airborne magnetic and VLF-EM surveys were carried out over the Rolls and Royce claims owned by High Ridge Mines of Vancouver, B.C. during the latter part of December, 1984 and January, 1985. The claims are located on Bjerkness Creek, 5 km S30°W of the town of Kaslo. Access is best gained by helicopter. The terrain consists of steep and rugged 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 gold mineralization.

The Rolls and Royce claims occurs within the Kootenay Arc. It is underlain by sediments of the Milford and Slocan Groups as well as sediments, volcanics and their metamorphosed equivalents of the Kaslo Group. Porphyritic granite of the Nelson Batholith, as mapped by the G.S.C., occurs 1.5 km to the west of the property.

Silver, lead, zinc, cadmium and gold mineralization occurs eight to eleven km to the northwest and west of the property within the Slocan sediments adjacent to the Nelson Batholith. Also in the area, primarily to the north, occurs gold, silver, lead and zinc mineralization usually hosted by an andesite flow breccia of the Kaslo Group near its contact with the Slocan Group. Soil sampling in the area has revealed strong anomalies in gold within the Milford, Kaslo and Slocan Groups as well.

The airborne surveys were flown at about a 50-meter terrain clearance on contour 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

1. The magnetic survey indicates that most of the property is underlain by sediments as has been mapped by the G.S.C. It also indicates the northeast and northwest corners are underlain by Kaslo volcanics and that the Nelson Batholith may intrude into the western edge of the Royce claim. In addition there is a suggestion that on the eastern side of the property, Milford sediments overlying Kaslo volcanics are relatively thin.

2. The VLF-EM survey revealed four conductors, two of which are lineal shaped suggesting faults or shear zones to be the causative source. Any conductor or any part of a conductor could be reflecting mineralization.

3. 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 and native gold mineralization especially where the lineations cross.
RECOMMENDATIONS

The airborne geophysics has revealed target areas within the property such as the magnetic highs and the VLF-EM highs. It is recommended to check these out by prospecting, geological mapping and possibly soil geochemistry. Soil geochemistry lines could be run in the areas of interest, such as across the VLF-EM conductors. Ground VLF-EM and magnetic surveying may be quite useful as well in finding and delineating more accurately the target areas.

It is not expected, however, that all gold-sulphide mineralization in the area will be reflected by the airborne magnetic and VLF-EM surveys. It is simply a start as far as defining target areas, since the property is so large.

However, if one wants to cover the property effectively, the following program is recommended:

1. Take large soil samples every 50 m along contour lines preferably about 100 m apart in elevation. In the lab, the total sample should be pulverized, and not screened at all in order to preclude the screening out of coarser gold. The anomalous samples should then be followed up by sampling on a tight grid, say 15 to 20 m centers on a grid, say 200 m square.

2. At the same time, careful geological mapping and prospecting should be carried out preferably by a geologist and prospector familiar with gold mineralization. One large benefit of this will be a better interpretation of any geophysics that are carried out. Special attention should be paid to the VLF-EM conductors and magnetic highs.
3. The defined soil anomalies in gold should then be 'cat' trenched, if access and terrain permit.

4. Resistivity - IP mapping and/or MaxMin EM should then be considered in order to optimize drill targets.

5. Diamond drilling should then be carried out using a large diameter drill and a face discharge bit.
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 Rolls and Royce claims within the Kaslo area during the latter part of December, 1984 and January, 1985. The surveys were carried out by Lloyd Brewer, instrument operator and project manager, and John Kime, navigator, both of whom are of Columbia Airborne Geophysical Services (1984) Ltd. A total of 67.5 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 gold mineralization as is found in the Kaslo area. Magnetic surveys have especially been proven to be a good geological mapping tool. Also the VLF-EM has responded to some of the mineralization in the area.
PROPERTY AND OWNERSHIP

The property consists of two claims containing 33 units as shown on Map 2 and as described below:

<table>
<thead>
<tr>
<th>Claim Name</th>
<th>No. Units</th>
<th>Record No.</th>
<th>Expiry Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolls</td>
<td>15</td>
<td>4350</td>
<td>June 6, 1985</td>
</tr>
<tr>
<td>Royce</td>
<td>18</td>
<td>4351</td>
<td>June 6, 1985</td>
</tr>
</tbody>
</table>

The expiry dates shown does not take into account the surveys under discussion as being accepted for assessment credits.

The property is owned by High Ridge Mines of Vancouver, British Columbia.

LOCATION AND ACCESS

The northeastern corner of the property is found 5 km S30°W of the town of Kaslo, B.C. The property is located on Bjerkness Creek and on the southern and eastern slopes of True Blue Mountain.

The geographical coordinates for the center of the property are 49° 52' north latitude and 116° 57' west longitude.

The property is most easily accessed by helicopter since no roads occur on it. The closest roads are Highway #31, 1.8 km to the east of the Royce claim, a logging access road 1.8 km to the south of the Royce claim, and a logging access road 0.7 km to the northeast corner of the Rolls claim.
PHYSIOGRAPHY

The property is located within the Kokanee Range which is part of the Slocan Ranges. This mountain system lies on the eastern part of the Selkirk Mountains which is a physiographic division of the Columbia Mountains. The terrain is rugged with steep slopes throughout the whole property.

Elevations vary from 1,035 meters (3,400 feet) a.s.l. at the eastern side of the property on Bjerkness Creek, to 2,165 meters (7,100 feet) a.s.l. on True Blue Mountain located within the northwestern corner of the Rolls claim. This gives a relief of 1,130 meters (3,700 feet).

The main water source is the easterly-flowing Bjerkness Creek.

The forest cover is moderately dense and consists of hemlock, fir, cedar, spruce and tarmarack.

HISTORY OF PREVIOUS WORK

Exploration in the area probably dates back to the turn of the century. Prospecting has probably been done on the property and trenches, pits and adits may occur within the claim boundaries. However, since the claims have been staked no other work has been done.

GEOLOGY

The following is taken from Stewart's compilation of geological mapping done by government geologists, most notably Klepacki.
The High Ridge property occurs within the central section of the Kootenay Arc. The Arc is composed of a band of sedimentary, volcanic and metamorphic rocks that extend from northern Washington where they strike northeasterly, to north of Revelstoke where they strike northwesterly. The age of the rocks varies from Precambrian to Jurassic.

The oldest rocks in the area are those of the Lardeau Group which is Cambrian to Devonian or older in age. It occurs about 500 m east of the northeastern corner of the Royce claims and consists of mica schist and silicate marble.

The next oldest is the Milford Group which overlies the Lardeau Group and is separated from it by a northerly-trending fault. The Milford Group is Upper Mississippian to Pennsylvanian or Permian in age and consists of undifferentiated, fine-grained grey schist, grey phyllite, argillite, limestone and quartzite as well as some slate and chert. This group covers the eastern part of both claims.

The Kaslo Group is the next oldest and occurs on the western parts and northeast corners of both claims. It is of Mississippian(?) to Triassic(?) in age and consists of mafic volcanic breccia, andesite, basalt, chlorite schist, tuffaceous argillite, talc and serpentinite. Sills and small plugs of gabbro or diorite that probably are of this group occur throughout the older sediments.

The Slocan Group is the youngest and covers most of the property. It occurs within the central part of the Royce claim, along the western boundary of the Royce claim, and much of the western half of the Rolls claim. It is Upper Triassic in age. The rocks are undifferentiated slate, argillite, limestone, quartzite and tuffaceous sediments with some dolomite.
Occurring 1.5 km west of the property is the Nelson Batholith of Jurassic age. In this area it consists mainly of porphyritic granite. Intrusives related to the batholith may occur on the property as dykes, sills and plugs.

Through the eastern part of the property is a northerly and northwesterly-striking fault that is also a contact between the Milford and Slocan Groups. A similar-striking fault occurs on the western part of the property and is a contact between the Slocan and Kaslo Groups. Other contacts strike northerly and northwesterly through the two claims. Much folding, foliation and schistosity occur within the sedimentary rocks.

To date no mineralization is known to exist within the claims. However, eight to eleven km to the northwest and west along Keen Creek, nine deposits occur within the Slocan rocks next to the Nelson Batholith. Two of the better known ones are the Cork-Provence and the B.N.A., both described by Little.

On the Cork-Provence property, the underlying rocks are argillite, limestone and quartzite. These rocks are highly metamorphosed next to the batholith. The metallic minerals consist of sphalerite, galena, pyrite and some chalcopyrite in a gangue of siderite, calcite, quartz and fragments of wallrock. The property was mined at different intervals from 1900 to 1953 producing 169,433 reported tons of zinc, lead, silver, cadmium and gold ore.

The B.N.A. property is underlain by banded argillite and quartzite of the Slocan Group in a narrow belt flanked by porphyritic Nelson granite. The sedimentary rocks are metamorphosed and silicified. The mineralization consists of sphalerite and galena with some pyrite and native silver within a gangue cemented with calcite and a little quartz. 99 reported tons of silver, zinc,
lead and gold ore were mined at sporadic intervals from 1900 to 1952.

Much mineralization has been found in the area related to the Kaslo Group/Slocan Group contact, most notably on the Red Diamond property 12 km to the north. Usually the host rock is an andesite flow breccia with the mineralization being sulphides of iron, lead, zinc, copper and silver, with gold values. Also on the Red Diamond property, soil anomalies in gold and silver have been located within the Milford, Slocan and Kaslo Groups.

Goldsmith, et al, in their December 14th, 1983 report on the Red Diamond property, describes mineralization within the Milford Group as follows:

"Firstly, in the Milford Group at 2N 10E and 2S 12E, two types of mineralization are present. Rock sample 2+10N, 10E typifies the ridge area where conformable (sill-like) veins of dark brownish grey siderite-pyrite with quartz and calcite are found up to 0.25 meters wide. This sample contained 0.21% Pb, 0.57% Zn, and 110 ppb Au."

"At the knob outcrop area in the upper cirque basin near 2S 12E cherty and phyllitic sediments of the Milford Group are laced with weak to moderate stockwork-type of quartz and calcite with orange limonite in veins up to 4 cm wide. General trend of the zone which may exceed 10 m in width is N55°W 75°S. One to three percent pyrite with visible galena and sphalerite is common. Rock samples 2S, 11+25E contained 0.24% Zn, 360 ppm Pb and 65 ppb Au."
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 isomagnetic 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 transmitter used was the one located at Annapolis, Maryland, transmitting at 21.4 KHz.
The VLF (Very Low Frequency) method uses powerful radio transmitters 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 northeasterly to southeasterly strikes should respond to Annapolis transmissions.

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.

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 contour-line flown 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, such as within this survey.

The number of line km flown on the Rolls and Royce claims and surrounding area is 67.5.

The project supervisor, Mr. L. Brewer, has over 4 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 at a scale of 1:10,000 (1 cm = 100 m). The data were then contoured at a 25-gamma interval onto Map 3.

The VLF-EM anomalies were taken from the strip charts and plotted on the sheet with the magnetics. A distinction has been made on the map between weaker and stronger anomalies.
DISCUSSION OF RESULTS

a) Magnetics

The magnetic field over almost the entire property is very quiet which is very typical of sediments. The intensity is 300 to 450 gammas which can be considered as the magnetic background. The sediments, as mentioned above, are those of the Milford, Kaslo and Slocan Groups. It may also include meta-volcanics and non magnetic volcanics of the Kaslo Group.

The magnetic field, in a general sense, increases from the west to the east so that general northerly trends are evident in the property's magnetic field. These trends correlate quite closely with the trends of the faults and contacts between the various rock units. The background in the western part of the property is 300 to 375 gammas, whereas in the eastern part, it is 375 to 450 gammas. It is suspected the higher background within the eastern part of the property results from the Kaslo volcanics underlying a relatively thin layer of Milford sediments. The fact that the Kaslo Group underlies the Slocan Group is supported by the G.S.C. mapping in this area.

Thumb-print type magnetic highs as much as 150 gammas above the local background occur in the northeast corner of the Rolls claim, and within the northwest corner occurs a small magnetic high 250 gammas above local background. The causative source in both cases is undoubtedly Kaslo volcanics since the Kaslo Group has been mapped in each area.

A highly variable magnetic field occurs as an embayment within the southwestern corner of the Royce claim. This has been interpreted to reflect Nelson granites since the writer has noted a similar magnetic field in other nearby areas over this rock-type. The contact as suggested by the magnetics has been drawn...
Magnetic lows often occur along creek valleys, and/or areas of low topography. The reasons for this are as follows:

1. Valleys almost always contain deeper overburden which means the detecting element is further from the bedrock causing the magnetic field.

2. If the survey is flown across the valley or gully, then the detecting element is also further from the bedrock.

3. Gullies and valleys are often caused by faults or shear zones which are often reflected by magnetic lows.

b) VLF-EM

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.
The Rolls and Royce claims occur in extremely rough topography which adversely affects the VLF-EM results. The noise level is greatly increased which can thus obliterate signals from EM conductors such as geological structure and/or mineral zones. Therefore, the VLF-EM system may have responded to some of the known mineral zones but the signal may have been masked by the noise level.

However, four EM conductors have been mapped within the property boundaries which stand out above the noise level. These have been labelled by the lower case letters a to d, respectively.

Conductors a and b are longer, more lineal-shaped and thus are more indicative of geological structure. The strike for both conductors is northeasterly. Conductor a crosses the southeastern corner of the property and occurs entirely within the Milford sediments. Conductor b occurs within the Milford sediments southwesterly up to a fault. The dashed portion of conductor b indicates it may cross the fault.

Both conductors c and d are smaller anomalies, 200 and 500 m, respectively, occurring within the eastern part of the Rolls claim. Conductor c strikes northerly and appears to occur within Milford sediments though the magnetics suggest it may occur, close to the Kaslo volcanic contact. Conductor d strikes northwesterly and occurs within the Kaslo volcanics.

c) **Lineations**

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

1) Magnetic lows which are often caused by the magnetite within the rocks being altered by geological structure processes.
2) VLF-EM anomalies which more often than not are reflecting structure.

3) Topographic depressions such as creek valleys which are usually caused by structure.

Four lineations that are indicative of faults and contacts have been mapped across the property striking in different directions. Some or parts of the lineations correlate directly with lithologic contacts and faults as has been mapped by the G.S.C.

The lineations cross each other on the property in different 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.

[Signature]
David G. Mark,
Geophysicist

May 21, 1985
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Little, H.W., Nelson Map-Area, West Half, British Columbia (B2F W1/2), Mem. 308, GSC., 1960


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.

2. I have been practising my profession for the past 16 years and have been active in the mining industry for the past 19 years.

3. That I am an active member of the Society of Exploration Geophysicists and a member of the European Association for Exploration Geophysicists.

4. This report is compiled from data obtained from airborne magnetic and VLF-EM surveys carried out by Columbia Airborne Geophysical Services (1984) Ltd., under the supervision of L. Brewer during December, 1984 and January, 1985.

5. I have no direct or indirect interest in any of the properties mentioned within this report, nor in High Ridge Mines, nor do I expect to receive any as a result of writing this report.

May 21, 1985

David G. Mark
Geophysicist
AFFIDAVIT OF COSTS

I, Lloyd Brewer, president of Columbia Airborne Geophysical Services (1984) Ltd., certify that the airborne magnetic and VLF-EM surveys were flown in December of 1984, and that they were flown at a cost of $100/km, the total number of km being 67.5 to give a total cost of $6,750.00.

Lloyd Brewer

May 21, 1985