87-394-15942

REPORT ON
COMBINED HELICOPTER BORNE
MAGNETIC, ELECTROMAGNETIC AND VLF
SURVEY
BARKERVILLE PROPERTY, VAN WINKLE CREEK AREA
CARIBOO MINING DIVISION, BRITISH COLUMBIA

NTS ~~93G/1W, 1E~~ 93H 4E

LAT. 53°03'; LONG. 121°58'

5/93

for
MARK MANAGEMENT LIMITED
by
AERODAT LIMITED

July 4, 1987

CLAIMS SURVEYED

CLAIM NAME	RECORD NUMBERS	UNITS	RECORDING DATE
GRUB 1-4	8393, 8392, 8391, 8390	16	1 May
HORN 7	8123	20	1 May
ONSUN 2-5	5025, 5026, 5027, 5024	19	8 August
ONSUN 6	6226	16	19 June
ONSUN 7-8	6602-6603	27	26 October
MAY 1	4849	20	27 May

OWNER: J.A. BILLWILLER
OPERATOR: MARK MANAGEMENT LTD.

G. Podolsky, P. Eng.

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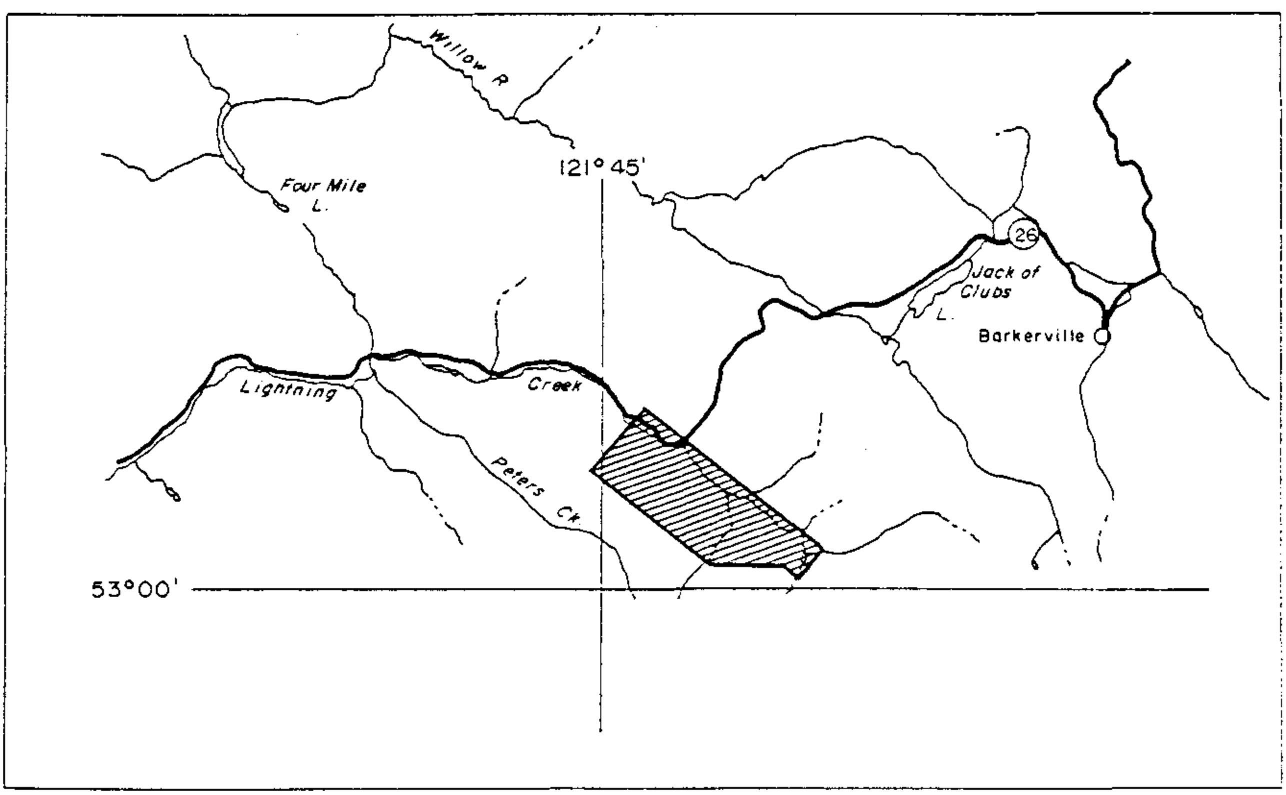
2: SURVEY AREA LOCATION

The survey area is depicted on the index map shown below. It is centred at Latitude 53 degrees 1.5 minutes north, Longitude 121 degrees 42 minutes west, approximately 14 kilometres west southwest of Barkerville and 53 kilometres almost due east of Quesnel in the Quesnel Highland area of northern British Columbia (NTS Reference Map No. 93 H/4). The area is accessed from the Quesnel-Wells Highway (# 26) that cuts the northern corner of the area or by helicopter out of Quesnel.



LIST of MAPS

(Scale 1:10,000)

MAPS: (As listed under Appendix "B" I. of the Agreement)

I PHOTOMOSAIC BASE MAP; prepared from an uncontrolled photo laydown, showing registration crosses corresponding to NTS co-ordinates on survey maps.

II FLIGHT LINE MAP; showing all flight lines and fiducials.

III AIRBORNE ELECTROMAGNETIC SURVEY INTERPRETATION MAP; showing flight lines, fiducials conductor axes and anomaly peaks along with inphase amplitudes and conductivity thickness ranges for the 4600 Hz coaxial coil system.

IV TOTAL FIELD MAGNETIC CONTOURS; showing magnetic values contoured at 2 nanoTesla intervals, flight lines, fiducials and anomaly peaks.

V VERTICAL MAGNETIC GRADIENT CONTOURS; showing magnetic gradient values contoured at intervals of 0.2 nanoTeslas per metre.

VI APPARENT RESISTIVITY CONTOURS; showing contoured resistivity values, flight lines, fiducials and anomaly peaks.

VII VLF-EM TOTAL FIELD CONTOURS; showing relative contours of the VLF Total Field response, flight lines, fiducials and anomaly peaks.

Note: 'Colour Products' listed under "B" II. are not discussed in this report.

1: INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of Mark Management Ltd. by Aerodat Limited. Equipment operated included a four frequency electromagnetic system, a high sensitivity cesium vapour magnetometer, a two frequency VLF-EM system, a video tracking camera, an altimeter and an electronic positioning system. Electromagnetic, magnetic and altimeter data were recorded both in digital and analog form. Positioning data were stored in digital form and recorded on tape as well as being marked on the flight path mosaic by the operator while in flight.

The survey area, comprising a block of ground in the Quesnel Mining District of northern British Columbia and situated about 14 kilometres west southwest of Barkerville, was flown on February 22, 1987. Two flights were required to complete the survey with flight lines oriented at Azimuths of 059-239 degrees and flown at a nominal spacing of 100 metres. Coverage and data quality were considered to be well within the specifications described in the contract.

The purpose of the survey was to record airborne geophysical data over and around ground that is of interest to Mark Management Ltd.

A total of 170 kilometres of the recorded data were compiled in map form and are presented as part of this report according to specifications outlined by Mark Management Ltd.

3: AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350D helicopter, (C-GNSM), owned and operated by Lakeland Helicopters Limited, was used for the survey. Installation of the geophysical and ancillary equipment was carried out by Aerodat. The survey aircraft was flown at a mean terrain clearance of 75 metres.

3.2 Equipment

3.2.1 Electromagnetic System

The electromagnetic system was an Aerodat four frequency system. Two vertical coaxial coil pairs were operated at 955 Hz and 4536 Hz and two horizontal coplanar coil pairs at 4268 Hz and 33.9 kHz. The transmitter-receiver separation was 7 metres. Inphase and quadrature signals were measured simultaneously for the four frequencies with a time constant of 0.1 seconds. The electromagnetic bird was towed 30 metres below the transmitter.

3.2.2 VLF-EM System

The VLF-EM System was a Herz Totem 2A. This instrument measures the total field and quadrature components of two selected transmitters, preferably oriented at right angles to one another. The sensor was towed in a bird 27 metres below the helicopter. The transmitting stations monitored were NLK, Jim Creek, Washington for the "Ortho" station and NAA, Cutler, Maine for the "Line" station broadcasting at 24.8 and 24.0 kHz respectively.

3.2.3 Magnetometer

The magnetometer employed a Scintrex Model VIW - 2321 H8 cesium, optically pumped magnetometer sensor. The sensitivity of this instrument was 0.1 nanoTeslas at a

H8 cesium, optically pumped magnetometer sensor. The sensitivity of this instrument was 0.1 nanoTeslas at a 0.2 second sampling rate. The sensor was towed in a bird 27 metres below the helicopter.

3.2.4 Magnetic Base Station

A Geometrics G803 proton precession magnetometer was operated at the base of operations to record diurnal variations of the earth's magnetic field. The clock of the base station was synchronized with that of the airborne system to facilitate later correlation.

3.2.5 Radar Altimeter

A King KRA-10 radar altimeter was used to record terrain clearance. The output from the instrument is a linear function of altitude for maximum accuracy.

3.2.6 Tracking Camera

A Panasonic video tracking camera was used to record flight path on standard VHS video tape. The camera was operated in continuous mode. Fiducial numbers and time reference marks, for cross-reference to the analog and digital data, were encoded on the tape.

3.2.7 Analog Recorder

An RMS dot-matrix recorder was used to display the data during the survey. In addition to manual and time fiducials, the following data were recorded:

Channel	Input	Scale
ALT	Altimeter (150 m at top of chart)	3 m/mm
CXI1	Low Frequency Inphase	2.5 ppm/mm
CXQ1	Low Frequency Quadrature	2.5 ppm/mm
CXI2	High Frequency Inphase	2.5 ppm/mm

CXQ2	High Frequency Quadrature	2.5 ppm/mm
CPI1	Mid Frequency Inphase	10 ppm/mm
CPQ1	Mid Frequency Quadrature	10 ppm/mm
CPI2	33 kiloHerz Inphase	20 ppm/mm
CPQ2	33 kiloHerz Quadrature	20 ppm/mm
VLT	VLF-EM Total Field, Line	2.5 %/mm
VLQ	VLF-EM Quadrature, Line	2.5 %/mm
VOT	VLF-EM Total Field, Ortho	2.5 %/mm
VOQ	VLF-EM Quadrature, Ortho	2.5 %/mm
MAGF	Magnetometer, fine	1.0 nT/mm
MAGC	Magnetometer, coarse	10 nT/mm
PWRL	Power Line Indicator	

3.2.8 Digital Recorder

A DGR33 data system recorded the survey on magnetic tape. Information recorded was as follows:

Equipment	Recording Interval
EM system	0.1 seconds
VLF-EM	0.5 seconds
Magnetometer	0.25 seconds
Altimeter	0.5 seconds
Power Line Monitor	0.5 seconds

4: DATA PRESENTATION

4.1 Base Map

A photomosaic base at a scale of 1:10,000 was prepared by enlargement of aerial photographs of the survey area.

4.2 Flight Path Map

The flight path was derived from the from an examination of the video tape from the flight path tracking camera system. Points along the flight path that could be identified on the video presentation, were marked on the photomosaic with reference to time. These points were then digitized to produce the 'picked' flight path. It is estimated that positioning is generally accurate to about 30 metres with respect to the topographic detail of the base map. The flight path is drawn with reference fiducials, time marks and navigator's manual fiducials for cross reference to both the analog and digital data and is presented on a Cronaflex overlay of the base map.

4.3 Airborne Electromagnetic Survey Interpretation Map

An interpretation map was prepared showing flight lines, fiducials, peak locations of anomalies and conductivity thickness range along with the Inphase amplitudes. These values were computed from the 4600 Hz coaxial response. Individual conductors, conductive zones and conductive areas have been delineated and numbered on the Interpretation Map. The data are presented on a Cronaflex overlay of the base map.

4.4 Total Field Magnetic Contours

The aeromagnetic data were corrected for diurnal variations by adjustment with the digitally recorded base station magnetic values. No correction for regional variation was applied. The corrected profile data were interpolated onto a regular grid at a 25 metre true scale interval using a cubic spline technique. The grid provided the basis for threading the presented contours at a 2 nanoTesla interval.

The aeromagnetic data have been presented with flight path and electromagnetic anomaly information on a Cronaflex overlay of the base map.

4.5 Vertical Magnetic Gradient Contours

The vertical magnetic gradient was calculated from the gridded total field magnetic data. Contoured at a 0.2 nT/m interval, the gradient data were presented on a Cronaflex overlay of the base map.

4.6 Apparent Resistivity Contours

The electromagnetic information was processed to yield a map of the apparent resistivity of the ground.

The approach taken in computing apparent resistivity was to assume a model of a 200 metre thick conductive layer (i.e., effectively a half space) over a resistive bedrock. The computer then generated, from nomograms for this model, the resistivity that would be consistent with the bird elevation and recorded amplitude for the coaxial frequency pair. The apparent resistivity profile data were interpolated onto a regular grid at a 25 metres true scale interval using a cubic spline technique.

The contoured apparent resistivity data were presented on a Cronaflex overlay of the base map with the flight path and electromagnetic anomaly information.

4.7 VLF - EM Total Field Contours

The VLF-EM signals from NAA, Cutler, Maine and NLK, Jim Creek, Washington, broadcasting at 24.0 kHz and 24.8 kHz respectively, were compiled in contour map form and presented on a Cronaflex overlay of the base map.

5: INTERPRETATION

5.1 GEOLOGY

No geologic data were supplied to Aerodat by Mark Management Ltd. and no other published data were available to the writer. Also, types of targets sought have not been discussed or identified by Mark Management Ltd. although it is generally assumed that the primary interest is in gold mineralization. Barkerville, a historic gold mining camp, lies approximately 14 kilometres east southeast of the survey.

5.2 MAGNETICS

The magnetic data from the high sensitivity cesium magnetometer provided virtually a continuous magnetic reading when recording at two-tenth second intervals. The system is also noise free for all practical purposes.

The sensitivity of 0.1 nT allows for the mapping of very small inflections in the magnetic field, resulting in a contour map that is comparable in quality to ground data. Both the fine and coarse magnetic traces were recorded on the magnetic charts.

A number of weak magnetic anomalies in the south eastern half of the survey fall along east-west to north east trends or very close to the flight line direction. This makes identification and delineation of magnetic trends rather difficult. Faults, represented by magnetic lows, appear to coincide with the various north northeasterly creeks or stream cuts such as the Winkle Creek - Perkins Gulch and the Milk Ranch Pass Creek - Houseman Creek systems. Over the north westerly part of the area, where the magnetic relief is even lower, structure is less obvious.

5.3 VERTICAL GRADIENT MAGNETICS

The relatively low levels of magnetic relief and the mountainous terrain are not conducive to good quality Vertical Magnetic Gradient data. Certainly, no lithologic or structural interpretation can be produced from these results and additional processing of the data is not warranted.

5.4 ELECTROMAGNETICS

The electromagnetic data was first checked by a line-by-line examination of the analog records. Record quality was very good to excellent with only minor noise levels on the high frequency coaxial trace. This was readily removed by an appropriate smoothing filter. Sferic noise was essentially absent. Geologic noise, in the form of surficial conductors, is present on the higher frequency responses but does not seem to be a significant problem in the identification of bedrock conductors.

Anomalies were picked off the analog traces of the low and high frequency coaxial responses and then validated on the coplanar profile data. These selections were then checked with a proprietary computerized selection program which can be adjusted for ambient and instrumental noise. The data were then edited and re-plotted on a copy of the of the profile map. This procedure ensured that every anomalous response spotted on the analog data was plotted on the final map and allowed for the rejection - or inclusion if warranted - of obvious surficial conductors. The 33 kHz data was not used in the selection of bedrock conductors but was relied upon for the identification of surficial zones.

Each conductor or group of conductors was evaluated on the bases of magnetic (and lithologic, where applicable) correlations apparent on the analog data and man made or surficial features not obvious on the analog charts.

RESULTS: Six bedrock conductors, conductive zones or conductive areas have been identified within the area of this survey. In addition, a number of possible bedrock responses have been indicated as anomalous responses on the Interpretation map. One power line, more or less along Highway # 26 into Stanley, was identified in the northern corner. With the exception of Conductor II, most of the zones show a discernible low frequency Inphase response. The anomalies on Lines 530 and 540, approximately in the centre, have been classed as possible bedrock anomalies since the low frequency response is regarded as questionable to weak.

CONDUCTIVE ZONE I - (Lines 10 to 70):
Conductive Zone I occurs in the extreme northern corner of the area along an approximate north-south conductive trend. There is no correlation evident with any magnetic trends. The conductor appears to be due to a relatively flat dipping (ie., into the mountain) high conductance sheet to the north of Lightning Creek.

CONDUCTOR II - (Lines 10 to 120):
This weak, narrow, low conductance, north-south trending band occurs to the south of Lightning Creek. Response is largely Quadrature and the conductor may be due to culture as it extends away from the power line along the

CONDUCTIVE ZONE III - (Lines 50 to 220):
This conductive zone extends north northwesterly along the north east facing slope of the Lightning Creek valley. The swing to the west at the south end may actually be an extension of Conductive Area IV. Conductance tends to be fairly high,

that is, the low frequency Inphase response is generally than the Quadrature response. (The Apparent Resistivity map gives the best representation of relative conductances.) The zone shows a shallow west dip - into Mount Anderson - although dip estimates are usually open to question in mountainous terrain. Several thin conductors may be involved. This gives the impression of substantial width.

CONDUCTIVE AREA IV - (Lines 150 TO 230?):
This fairly broad, high conductance area occurs to the south west of the village of Stanley, up Last Chance Creek that runs down the side of Grub Mountain. This appear to be a continuation of Zone III only a wider portion of the sheet has been exposed by erosion along the stream cut.

CONDUCTIVE AREAS V & VI - (Lines 470 to 610):
These two areas of moderate (to low) conductance appear to be smaller versions of Area IV. Although Area V shows a rough spatial correlation with a 50 nT (approximately) magnetic peak, the writer believes this to be entirely fortuitous.

5.5 APPARENT RESISTIVITY

The Apparent Resistivity map gives what the writer considers to be the best depiction of the distribution of conductive zones throughout the survey area, certainly better than the profile maps and far superior to the VLF map. Conductive Zone I appears to be an isolated low - i.e., isolated by the sharp valley - whereas Zone II and Area IV, along with a narrow, north easterly low up Chisholm Creek and continuing off the east end of Area IV, describe a continuous, semi-circular low. The only other resistivities below values of 100 ohm-metres occur over Conductive Areas V and VI along Lightning Creek and a third, possible zone along Winkle Creek.

5.6 VLF - EM TOTAL FIELD

All VLF response appears to be related to topography. In this respect, the Lightning Creek valley shows up as a broad VLF low. The tributary streams such as Winkle Creek are not as prominent since flight direction tended to parallel these drainage patterns.

There is a faint correlation of VLF "highs" with Resistivity lows, particularly over zones III and IV. This may arguably be topographic effect on the VLF, but in any event, the data are not convincing enough for one to regard VLF as an interpretive tool to apply in this survey.

5.7 CONCLUSIONS

The Apparent Resistivity map, when considered together with the topographic map, leads the writer to conclude that the conductive zones and areas in the northern portion of the survey represent a conductive stratum (or strata) at roughly the 4400 to 4600 foot level. Erosion has exposed these beds around the mountain sides and along the base of Lightning Creek. There is no correlation evident between the magnetic and electrical data.

5.8 RECOMMENDATIONS

On the bases of the results of this airborne survey, no further geophysical work can be recommended over the area. The resistivity data, together with any available geology, should be compiled on a topographic map of the area.

Without some knowledge of the client's mineralization criteria or exploration objectives in this area, recommendations on exploration targets or priorities cannot be made.

George Podolsky
for
AERODAT LIMITED
July 4, 1987

J8665.WC

REGISTERED PROFESSIONAL ENGINEER
G. PODOLSKY
PROVINCE OF ONTARIO

APPENDIX I

GENERAL INTERPRETIVE CONSIDERATIONS

Electromagnetic

The Aerodat three frequency system utilizes two different transmitter-receiver coil geometries. The traditional coaxial coil configuration is operated at two widely separated frequencies and the horizontal coplanar coil pair is operated at a frequency approximately aligned with one of the coaxial frequencies.

The electromagnetic response measured by the helicopter system is a function of the "electrical" and "geometrical" properties of the conductor. The "electrical" property of a conductor is determined largely by its electrical conductivity, magnetic susceptibility and its size and shape; the "geometrical" property of the response is largely a function of the conductor's shape and orientation with respect to the measuring transmitter and receiver.

Electrical Considerations

For a given conductive body the measure of its conductivity or conductance is closely related to the measured phase shift between the received and transmitted electromagnetic field. A small phase shift indicates a relatively high conductance, a large phase shift lower conductance. A small phase shift results in a large inphase to quadrature ratio and a large phase shift a low ratio. This relationship is shown quantitatively for a non-magnetic vertical half-plane model on the accompanying phasor diagram. Other physical models will show the same trend but different quantitative relationships.

The phasor diagram for the vertical half-plane model, as presented, is for the coaxial coil configuration with the amplitudes in parts per million (ppm) of the primary field as measured at the response peak over the conductor. To assist the interpretation of the survey results the computer is used to identify the apparent conductance and depth at selected anomalies. The results of this calculation are presented in table form in Appendix II and the conductance and inphase amplitude are presented in symbolized form on the map presentation.

The conductance and depth values as presented are correct only as far as the model approximates the real geological situation. The actual geological source may be of limited length, have significant dip, may be strongly magnetic, its conductivity and thickness may vary with depth and/or strike and adjacent bodies and overburden may have modified the response. In general the conductance estimate is less affected by these limitations than is the depth estimate, but both should be considered as relative rather than absolute guides to the anomaly's properties.

Conductance in mhos is the reciprocal of resistance in ohms and in the case of narrow slab-like bodies is the product of electrical conductivity and thickness.

Most overburden will have an indicated conductance of less than 2 mhos; however, more conductive clays may have an apparent conductance of say 2 to 4 mhos. Also in the low conductance range will be electrolytic conductors in faults and shears.

The higher ranges of conductance, greater than 4 mhos, indicate that a significant fraction of the electrical conduction is electronic rather than electrolytic in nature. Materials that conduct electronically are limited to certain metallic sulphides and to graphite. High conductance anomalies, roughly 10 mhos or greater, are generally limited to sulphide or graphite bearing rocks.

Sulphide minerals, with the exception of such ore minerals as sphalerite, cinnabar and stibnite, are good conductors; sulphides may occur in a disseminated manner that inhibits electrical conduction through the rock mass. In this case the apparent conductance can seriously underrate the quality of the conductor in geological terms. In a similar sense the relatively non-conducting sulphide minerals noted above may be present in significant consideration in association with minor conductive sulphides, and the electromagnetic response only relate to the minor associated mineralization. Indicated conductance is also of little direct significance for the identification of gold mineralization. Although gold is highly conductive, it would not be expected to exist in sufficient quantity to create a recognizable anomaly, but minor accessory sulphide mineralization could provide a useful indirect indication.

In summary, the estimated conductance of a conductor can provide a relatively positive identification of significant sulphide or graphite mineralization; however, a moderate to low conductance value does not rule out the possibility of significant economic mineralization.

Geometrical Considerations

Geometrical information about the geologic conductor can often be interpreted from the profile shape of the anomaly. The change in shape is primarily related to the change in inductive coupling among the transmitter, the target, and the receiver.

In the case of a thin, steeply dipping, sheet-like conductor, the coaxial coil pair will yield a near symmetric peak over the conductor. On the other hand, the coplanar coil pair will pass through a null couple relationship and yield a minimum over the conductor, flanked by positive side lobes. As the dip of the conductor decreased from vertical, the coaxial anomaly shape changes only slightly, but in the case of the coplanar coil pair the side lobe on the down dip side strengthens relative to that on the up dip side.

As the thickness of the conductor increases, induced current flow across the thickness of the conductor becomes relatively significant and complete null coupling with the coplanar coils is no longer possible. As a result, the apparent minimum of the coplanar response over the conductor diminishes with increasing thickness, and in the limiting case of a fully 3 dimensional body or a horizontal layer or half-space, the minimum disappears completely.

A horizontal conducting layer such as overburden will produce a response in the coaxial and coplanar coils that is a function of altitude (and conductivity if not uniform). The profile shape will be similar in both coil configurations with an amplitude ratio (coplanar:coaxial) of about 4:1*.

In the case of a spherical conductor, the induced currents are confined to the volume of the sphere, but not relatively restricted to any arbitrary plane as in the case of a sheet-like form. The response of the coplanar coil pair directly over the sphere may be up to 8* times greater than that of the coaxial pair.

In summary, a steeply dipping, sheet-like conductor will display a decrease in the coplanar response coincident with the peak of the coaxial response. The relative strength of this coplanar null is related inversely to the thickness of the conductor; a pronounced null indicates a relatively thin conductor. The dip of such a conductor can be inferred from the relative amplitudes of the side-lobes.

Massive conductors that could be approximated by a conducting sphere will display a simple single peak profile form on both coaxial and coplanar coils, with a ratio between the coplanar to coaxial response amplitudes as high as 8*.

Overburden anomalies often produce broad poorly defined anomaly profiles. In most cases, the response of the coplanar coils closely follows that of the coaxial coils with a relative amplitude ratio of 4*.

Occasionally, if the edge of an overburden zone is sharply defined with some significant depth extent, an edge effect will occur in the coaxial coils. In the case of a horizontal conductive ring or ribbon, the coaxial response will consist of two peaks, one over each edge; whereas the coplanar coil will yield a single peak.

* It should be noted at this point that Aerodat's definition of the measured ppm unit is related to the primary field sensed in the receiving coil without normalization to the maximum coupled (coaxial configuration). If such normalization were applied to the Aerodat units, the amplitude of the coplanar coil pair would be halved.

Magnetics

The Total Field Magnetic Map shows contours of the total magnetic field, uncorrected for regional variation. Whether an EM anomaly with a magnetic correlation is more likely to be caused by a sulphide deposit than one without depends on the type of mineralization. An apparent coincidence between an EM and a magnetic anomaly may be caused by a conductor which is also magnetic, or by a conductor which lies in close proximity to a magnetic body. The majority of conductors which are also magnetic are sulphides containing pyrrhotite and/or magnetite. Conductive and magnetic bodies in close association can be, and often are, graphite and magnetite. It is often very difficult to distinguish between these cases. If the conductor is also magnetic, it will usually produce an EM anomaly whose general pattern resembles that of the magnetics. Depending on the magnetic permeability of the conducting body, the amplitude of the inphase EM anomaly will be weakened, and if the conductivity is also weak, the inphase EM anomaly may even be reversed in sign.

VLF Electromagnetics

The VLF-EM method employs the radiation from powerful military radio transmitters as the primary signals. The magnetic field associated with the primary field is elliptically polarized in the vicinity of electrical conductors. The Herz Totem uses three coils in the X, Y, Z configuration to measure the total field and vertical quadrature component of the polarization ellipse.

The relatively high frequency of VLF (15-25) kHz provides high response factors for bodies of low conductance. Relatively "disconnected" sulphide ores have been found to produce measureable VLF signals. For the same reason, poor conductors such as sheared contacts, breccia zones, narrow faults, alteration zones and porous flow tops normally produce VLF anomalies. The method can therefore be used effectively for geological mapping. The only relative disadvantage of the method lies in its sensitivity to conductive overburden. In conductive ground the depth of exploration is severely limited.

The effect of strike direction is important in the sense of the relation of the conductor axis relative to the energizing electromagnetic field. A conductor aligned along a radius drawn from a transmitting station will be in a maximum coupled orientation and thereby produce a stronger response than a similar conductor at a different strike angle. Theoretically, it would be possible for a conductor, oriented tangentially to the transmitter to produce no signal. The most obvious effect of the strike angle consideration is that conductors favourably oriented with respect to the transmitter location and also near perpendicular to the flight direction are most clearly rendered and usually dominate the map presentation.

The total field response is an indicator of the existence and position of a conductivity anomaly. The response will be a maximum over the conductor, without any special filtering, and strongly favour the upper edge of the conductor even in the case of a relatively shallow dip.

The vertical quadrature component over steeply dipping sheet-like conductor will be a cross-over type response with the cross-over closely associated with the upper edge of the conductor.

The response is a cross-over type due to the fact that it is the vertical rather than total field quadrature component that is measured. The response shape is due largely to geometrical rather than conductivity considerations and the distance between the maximum and minimum on either side of the cross-over is related to target depth. For a given target geometry, the larger this distance the greater the depth.

The amplitude of the quadrature response, as opposed to shape is function of target conductance and depth as well as the conductivity of the overburden and host rock. As the primary field travels down to the conductor through conductive material it is both attenuated and phase shifted in a negative sense. The secondary field produced by this altered field at the target also has an associated phase shift. This phase shift is positive and is larger for relatively poor conductors. This secondary field is attenuated and phase shifted in a negative sense during return travel to the surface. The net effect of these 3 phase shifts determine the phase of the secondary field sensed at the receiver.

A relatively poor conductor in resistive ground will yield a net positive phase shift. A relatively good conductor in more conductive ground will yield a net negative phase shift. A combination is possible whereby the net phase shift is zero and the response is purely in-phase with no quadrature component.

A net positive phase shift combined with the geometrical cross-over shape will lead to a positive quadrature response on the side of approach and a negative on the side of departure. A net negative phase shift would produce the reverse. A further sign reversal occurs with a 180 degree change in instrument orientation as occurs on reciprocal line headings. During digital processing of the quadrature data for map presentation this is corrected for by normalizing the sign to one of the flight line headings.

APPENDIX II

ANOMALY LIST

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
5	10	A	4	26.5	6.8	8.7	14	36
5	10	B	4	23.1	5.1	10.3	1	52
5	20	A	3	19.0	5.3	7.1	20	35
5	20	B	5	13.8	1.8	18.0	24	41
5	30	A	5	24.8	3.7	17.8	20	33
5	30	B	4	28.9	5.4	13.7	16	33
5	30	C-CULT	0	7.2	6.7	0.9	9	52
5	40	A-CULT	1	11.2	8.1	1.6	17	40
5	40	B	5	13.5	1.8	17.4	28	37
5	50	A	6	28.8	2.4	40.8	16	35
5	50	B	5	28.4	3.4	24.9	12	39
5	50	C	3	19.9	6.1	6.3	11	44
5	50	D-CULT	1	9.8	7.8	1.3	15	43
5	50	E	4	16.5	4.0	8.2	20	39
5	60	A	4	19.2	3.5	12.6	19	38
5	60	B	4	19.4	3.7	11.9	16	41
5	60	C-CULT	1	9.2	8.2	1.1	13	43
5	60	D	2	13.2	6.0	3.2	23	37
5	60	E	4	17.2	3.8	9.4	19	39
5	70	A	3	15.4	4.6	6.0	17	43
5	70	B	2	14.7	7.7	2.8	15	41
5	70	C-CULT	0	6.9	6.3	0.9	12	50
5	70	D	3	12.2	3.8	5.3	24	40
5	80	A	4	15.2	3.3	9.3	23	38
5	80	B	3	16.3	4.3	7.3	18	41
5	80	C	0	5.9	10.4	0.3	12	35
5	80	D-CULT	0	6.9	7.5	0.7	13	44
5	90	A-CULT	0	3.9	4.8	0.5	9	57
5	90	B	0	3.9	8.2	0.2	15	33
5	90	C	1	5.7	3.0	1.9	31	47
5	100	A	3	11.6	3.2	6.1	19	47
5	100	B	0	5.2	10.9	0.2	17	26
5	100	C-CULT	1	7.2	6.3	1.0	15	47
5	100	D	0	6.0	6.6	0.7	30	30
5	110	A-CULT	0	3.5	4.6	0.4	15	52

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

J8665 BARKERVILLE PROJECT

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
5	110	B	0	1.2	4.6	0.0	0	54
5	110	C	2	9.2	4.1	2.9	29	39
5	120	A	2	6.3	2.7	2.7	24	54
5	120	B	0	2.4	6.3	0.1	7	43
5	120	C-CULT	0	6.2	6.9	0.7	17	42
5	130	A	0	7.4	7.7	0.8	20	37
5	130	B-CULT	0	2.7	5.7	0.1	9	46
5	130	C-CULT	0	2.7	5.7	0.1	9	46
5	130	D	2	10.1	4.8	2.8	26	39
5	140	A	2	7.5	3.4	2.7	19	54
5	150	A	0	4.5	7.8	0.3	15	37
5	150	B	1	5.0	2.6	1.9	35	47
5	150	C	2	7.0	2.8	3.1	24	52
5	160	A	3	9.5	3.3	4.2	20	49
5	160	B	3	14.7	4.9	5.1	29	30
5	160	C	3	12.0	3.6	5.5	16	49
5	160	D	0	4.9	7.5	0.4	23	31
5	170	A	1	7.4	5.5	1.3	19	46
5	170	B	2	9.3	5.2	2.1	30	35
5	170	C	2	8.9	4.4	2.5	27	41
5	170	D	3	10.1	2.9	5.6	23	46
5	180	A	3	21.0	8.8	4.2	18	33
5	180	B	2	23.7	11.5	3.6	19	29
5	180	C	2	17.6	7.7	3.7	1	54
5	180	D	1	8.2	5.5	1.6	28	37
5	190	A	1	5.7	4.4	1.1	35	35
5	190	B	2	20.9	9.4	3.8	2	49
5	190	C	3	31.6	11.8	5.6	20	25
5	190	D	4	27.2	7.3	8.3	13	36
5	190	E	2	9.3	5.3	2.1	31	34
5	200	A	1	8.5	5.2	1.8	25	41
5	200	B	3	16.3	4.7	6.4	20	39
5	200	C	3	14.0	5.5	4.0	14	45
5	200	D	2	11.5	7.0	2.0	15	44
5	200	E	1	9.6	8.8	1.1	21	34
5	200	F	0	8.2	9.1	0.8	10	43

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

J8665 BARKERVILLE PROJECT

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
5	210	A	2	7.3	3.3	2.6	30	44
5	220	A	3	11.1	3.4	5.2	22	45
5	290	A	0	2.8	7.2	0.1	13	35
5	300	A	0	4.3	8.9	0.2	8	39
5	300	B	0	3.6	5.7	0.3	33	26
5	320	A	0	3.8	7.6	0.2	20	31
6	360	A	0	3.5	7.6	0.2	8	41
6	370	A	0	6.5	8.0	0.6	12	43
6	380	A	0	10.8	19.3	0.4	7	30
6	380	B	0	4.6	10.7	0.2	17	26
6	390	A	0	7.8	12.6	0.4	11	33
6	470	A	1	11.5	9.8	1.3	23	31
6	470	B	1	11.5	10.2	1.2	22	30
6	480	A	0	6.6	6.6	0.8	16	44
6	480	B	1	12.9	12.0	1.2	22	28
6	490	A	0	8.2	11.6	0.5	3	44
6	490	B	0	7.5	10.5	0.5	12	36
6	500	A	0	5.9	7.2	0.6	19	39
6	500	B	0	8.5	10.3	0.7	10	40
6	520	A	0	6.9	9.0	0.6	10	42
6	520	B	0	12.1	13.9	0.9	17	29
6	530	A	0	7.8	8.1	0.8	6	50
6	530	B	0	6.9	10.4	0.4	13	36
6	530	C	1	10.5	9.9	1.1	14	38
6	530	D	0	6.1	7.0	0.6	21	37
6	540	A	1	13.3	13.5	1.1	14	33
6	540	B	1	13.8	14.4	1.0	16	30
6	540	C	0	4.9	8.0	0.3	9	43
6	570	A	1	10.2	9.1	1.1	7	47

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

J8665 BARKERVILLE PROJECT

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
6	570	B	0	9.4	12.3	0.6	15	31
6	580	A	2	21.7	12.0	2.9	4	45
6	580	B	1	18.2	13.0	1.9	3	45
6	590	A	1	14.6	10.1	1.9	22	31
6	590	B	2	20.3	11.0	2.9	17	32
6	600	A	0	8.7	13.0	0.5	15	30
6	600	B	0	7.2	12.2	0.4	15	30
6	600	C	1	12.0	8.2	1.8	26	31
6	610	A	1	13.9	12.6	1.3	22	26
6	630	A	0	4.6	8.6	0.2	18	31
6	630	B	0	6.1	10.5	0.3	16	31
6	640	A	0	6.4	11.8	0.3	17	27
6	650	A	0	10.3	12.7	0.7	14	33
6	670	A	0	7.8	10.5	0.6	11	38

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

APPENDIX III

CERTIFICATE OF QUALIFICATIONS

I, GEORGE PODOLSKY, certify that: -

1. I am registered as a Professional Engineer in the Province of Ontario and work as a Professional Geophysicist.

2. I reside at 172 Dunwoody Drive in the town of Oakville, Ontario.

3. I hold a B. Sc. in Engineering Physics from Queen's University, having graduated in 1954.

4. I have been continuously engaged in both professional and managerial roles in the minerals industry in Canada and abroad for the past thirty two years.

5. I have been an active member of the Society of Exploration Geophysicists since 1960 and hold memberships on other professional societies involved in the minerals extraction and exploration industry.

6. The accompanying report was prepared from information published by government agencies, materials supplied by Mark Management Ltd., and from a review of proprietary geophysical data compiled by Aerodat Ltd. in the course of producing this airborne survey. I have not visited the property.

7. I have no interest, direct or indirect, in the property described nor do I hold securities in Mark Management Ltd.

8. I hereby consent to the use of this report in a Statement of Material Facts of the Company and for the preparation of a prospectus for submission to the British Columbia Securities Commission and/or other regulatory authorities.

Signed,

George Podolsky, P. Eng.

GEOPOD ASSOCIATES INC.

Oakville, Ontario

July 4, 1987

REGISTERED PROFESSIONAL ENGINEER
G. PODOLSKY
PROVINCE OF ONTARIO

APPENDIX IV

COST STATEMENT

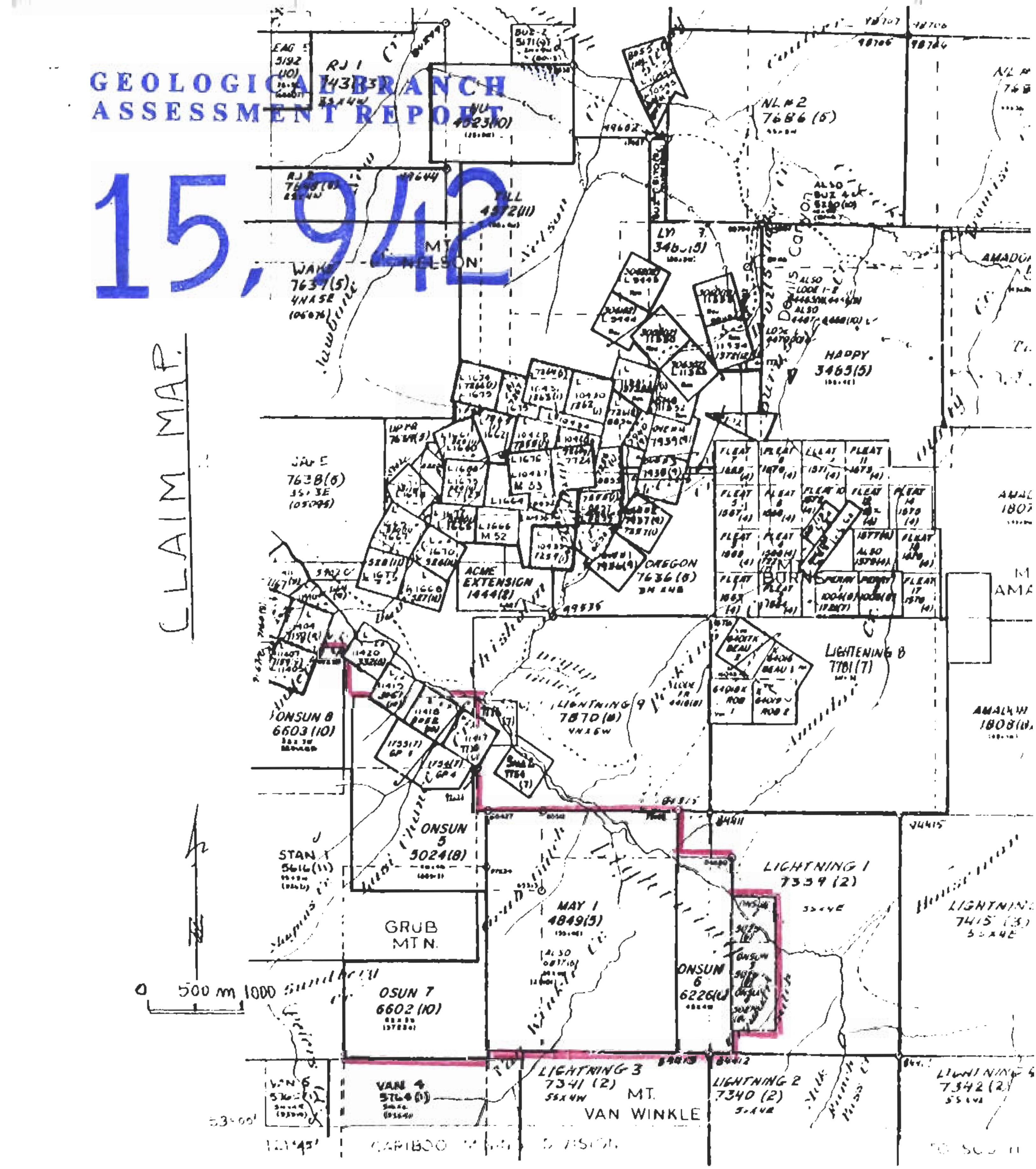
VAN WINKLE CREEK AREA CLAIMS
22 February 1987

AIRBORNE GEOPHYSICAL SURVEY

Aerodat Limited - 170 Line Km @ $75.00	$12,750.00
Mark Management - Planning, Supervision	1,912.50
TOTAL COST	$14,662.50

GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,942

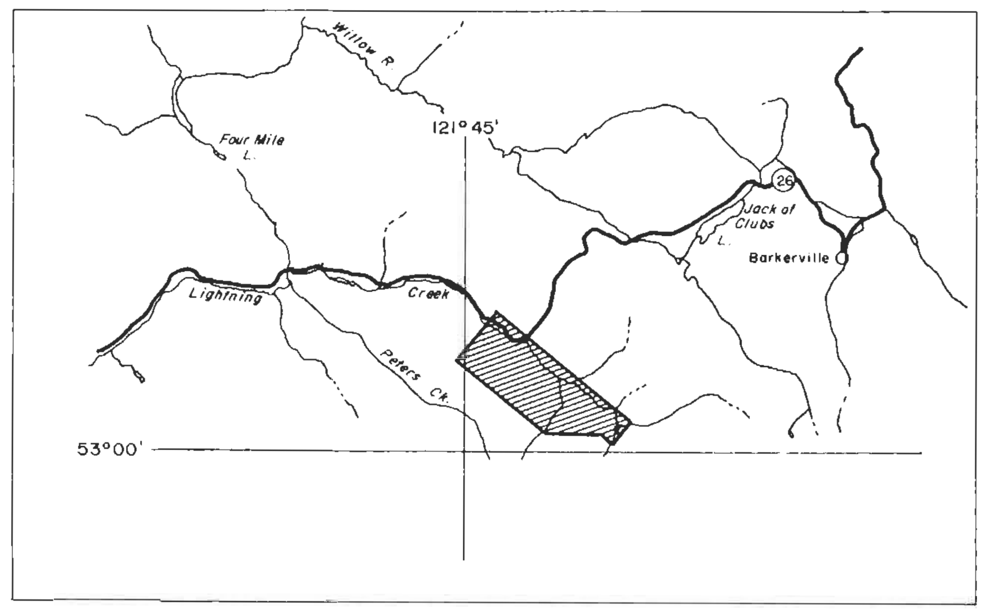


For up-to-date information on claims in any area you should apply to the Mining Recorder for the Mining Division concerned

DEPARTMENT OF MINES A
VICTO

MINERAL CLA

SCALE 1:2



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BASE MAP

BARKERVILLE AREA

BRITISH COLUMBIA

SCALE 1/10,000

0 330 660 1320 1/2 mile

0 100 200 500 1 Kilometre

AERODAT LIMITED

DATE:	February 1987
N.T.S. No:	93 H
MAP No:	1

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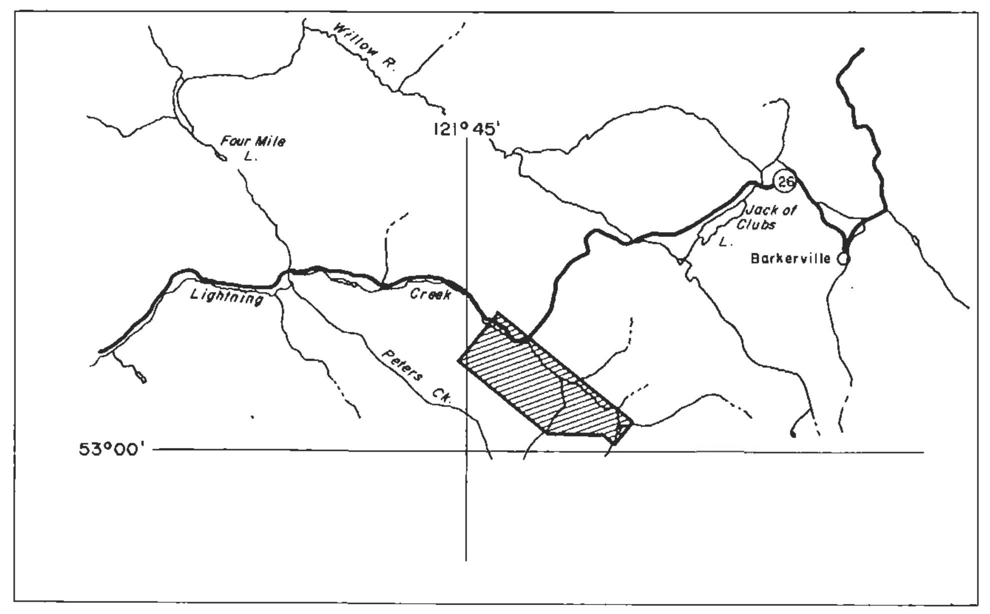
GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,942



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FLIGHT LINES

BARKERVILLE AREA

BRITISH COLUMBIA

SCALE 1/10,000

0 330 660 1320 1/2 mile

0 100 200 500 1 Kilometre

AERODAT LIMITED

DATE:	February 1987
N.T.S. No:	93 H
MAP No:	2

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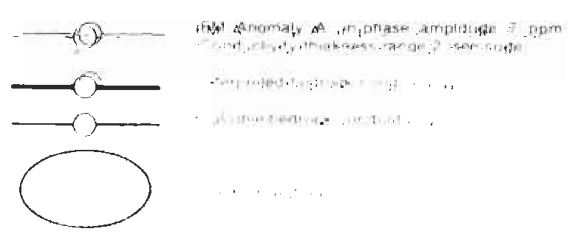
INTERPRETATION LEGEND

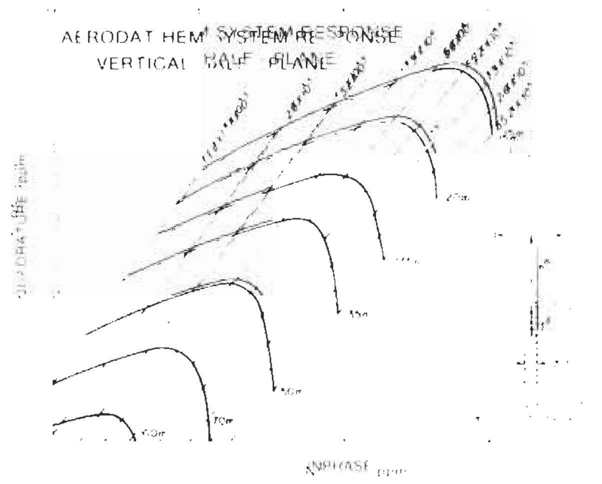


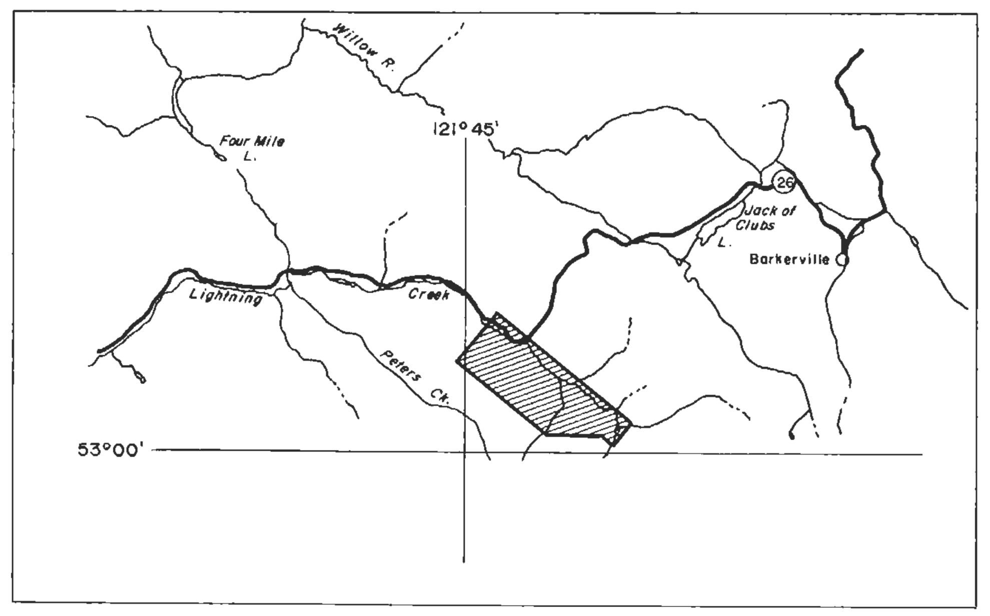
EM Anomalies

Conductivity Thickness (mhos)

◌	0 - 1
○	1 - 2
⊖	2 - 4
◕	4 - 8
◒	8 - 15
◔	15 - 30
●	> 30

Positioning	35 mm TRACKING FILM
Mean EM sensor elevation	30 metres
Mean flight line spacing	100 metres





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ELECTROMAGNETIC SURVEY INTERPRETATION

BARKERVILLE AREA

BRITISH COLUMBIA

SCALE 1/10,000

0 330 660 1320 1/2 mile

0 100 200 500 1 Kilometre

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DATE:	February 1987
N.T.S. No:	93 H
MAP No:	3

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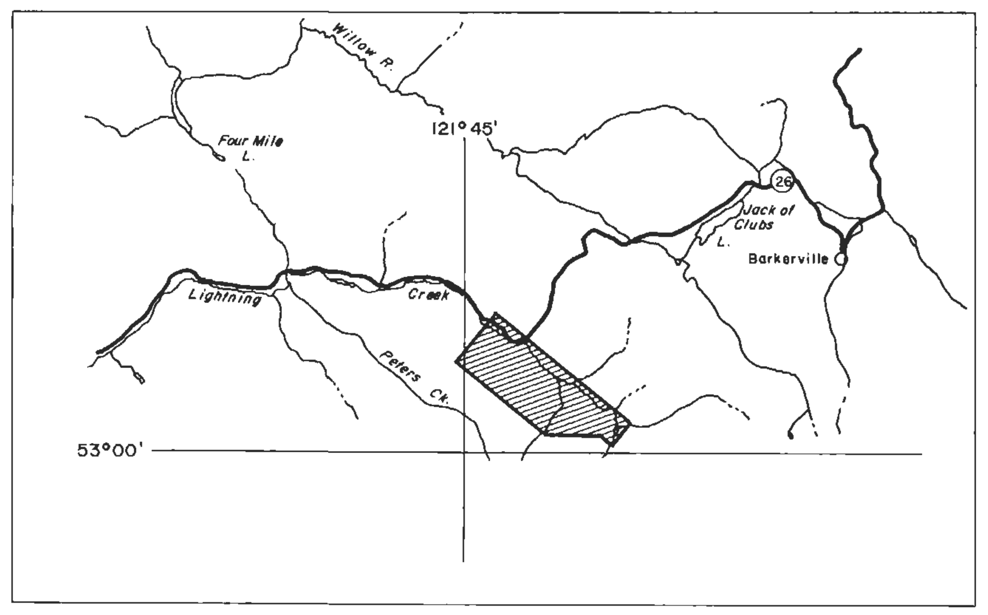
TOTAL FIELD MAGNETIC CONTOURS

MEAN MAGNETOMETER
SENSOR ELEVATION: 48 metres

CONTOUR INTERVAL 2 gammas

50 gammas ....
10 gammas. ....
2 gammas. ....



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TOTAL FIELD MAGNETIC CONTOURS

BARKERVILLE AREA

BRITISH COLUMBIA

SCALE 1/10,000

0 330 660 1320 1/2 mile

0 100 200 500 1 Kilometre

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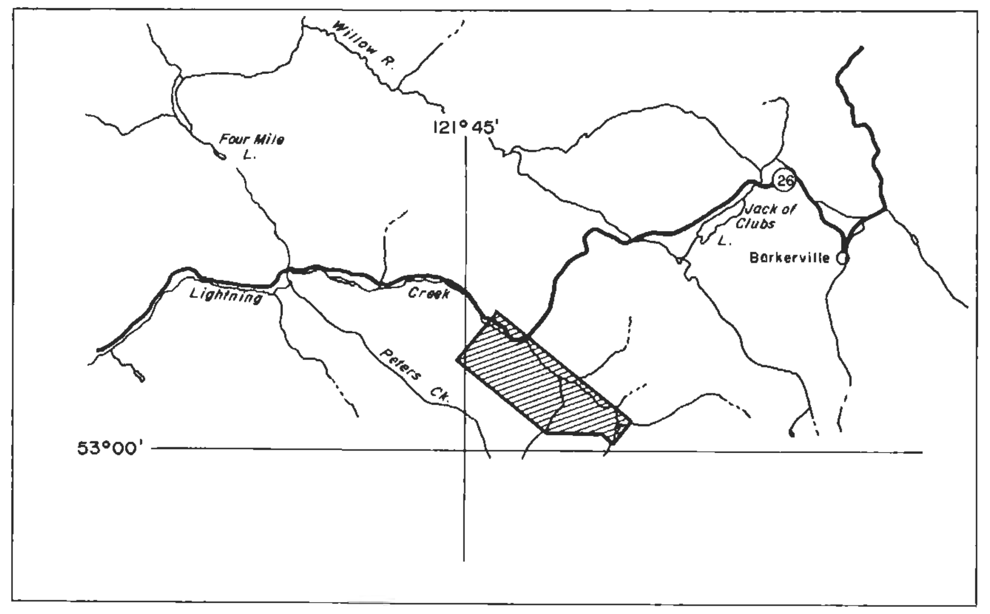
DATE:	February 1987
N.T.S. No:	93 H
MAP No:	4

J8665



VERTICAL MAGNETIC GRADIENT

(CALCULATED FROM TOTAL MAGNETIC FIELD)
CONTOUR INTERVAL

5 gammas / metre
1 gammas / metre
.2 gammas / metre

MARK MANAGEMENT LTD.

COMPUTED VERTICAL MAGNETIC GRADIENT CONTOURS

BARKERVILLE AREA

BRITISH COLUMBIA

SCALE 1/10,000

0 330 660 1320 1/2 mile

0 100 200 500 1 Kilometre

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DATE:	February 1987
N.T.S. No:	93 H
MAP No.	5

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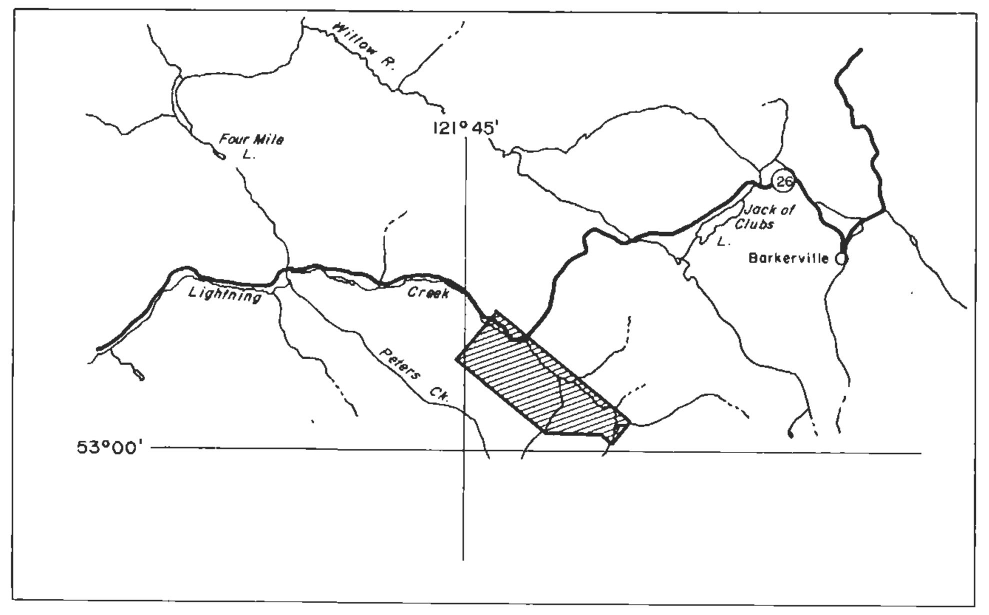
APPARENT RESISTIVITY CONTOURS

Calculated assuming 200 m conductive layer
(using 4600 Hz coaxial data)

$10^{N.0}$ OHM-M   N 1 2 3 ... 9
$10^{N.M}$ OHM-M   M 1 2 3 ... 9



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APPARENT RESISTIVITY CONTOURS

BARKERVILLE AREA
BRITISH COLUMBIA

SCALE 1/10,000
0 330 660 1320 1/2 mile
0 100 200 500 1 Kilometre

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N.T.S. No:	93 H
MAP No:	6

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GEOLOGICAL BRANCH
ASSESSMENT REPORT

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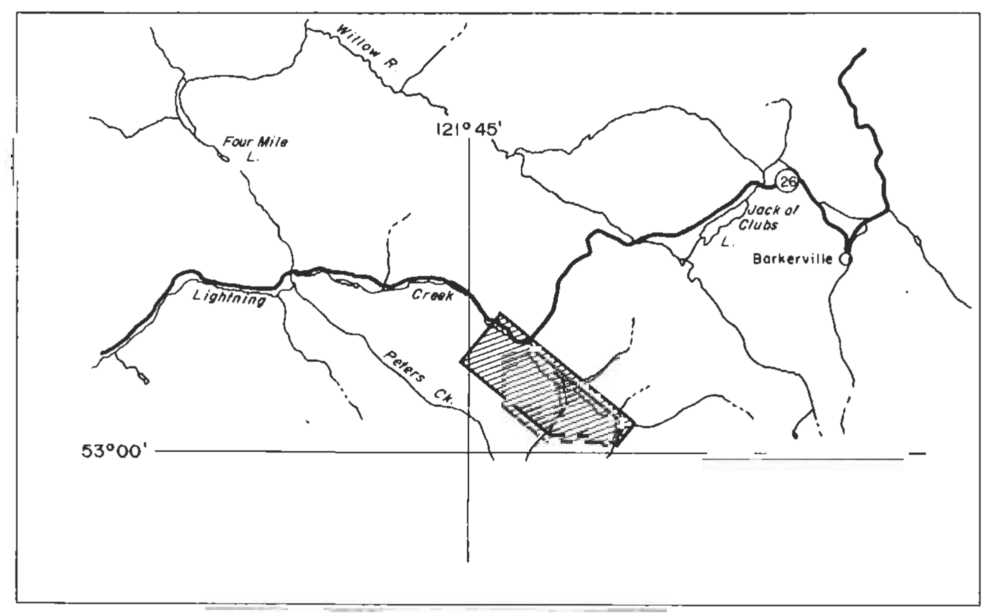
VLF-EM TOTAL FIELD CONTOURS

VLF STATION NAA (Cutler, Maine) 24.0 kHz
MEAN VLF-EM
SENSOR ELEVATION 48 metres

CONTOUR INTERVAL
50%
10%
2%



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VLF-EM TOTAL FIELD CONTOURS

BARKERVILLE AREA
BRITISH COLUMBIA

SCALE 1/10,000
0 330 660 1320 1/2 mile
0 100 200 500 1 Kilometre

AERODAT LIMITED

DATE: February 1987
N.T.S. No: 93 H
MAP No: 7

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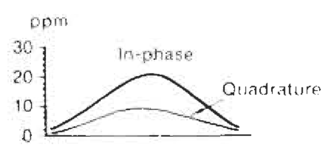
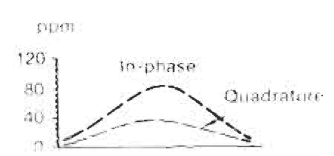
ELECTROMAGNETIC PROFILES-COAXIAL

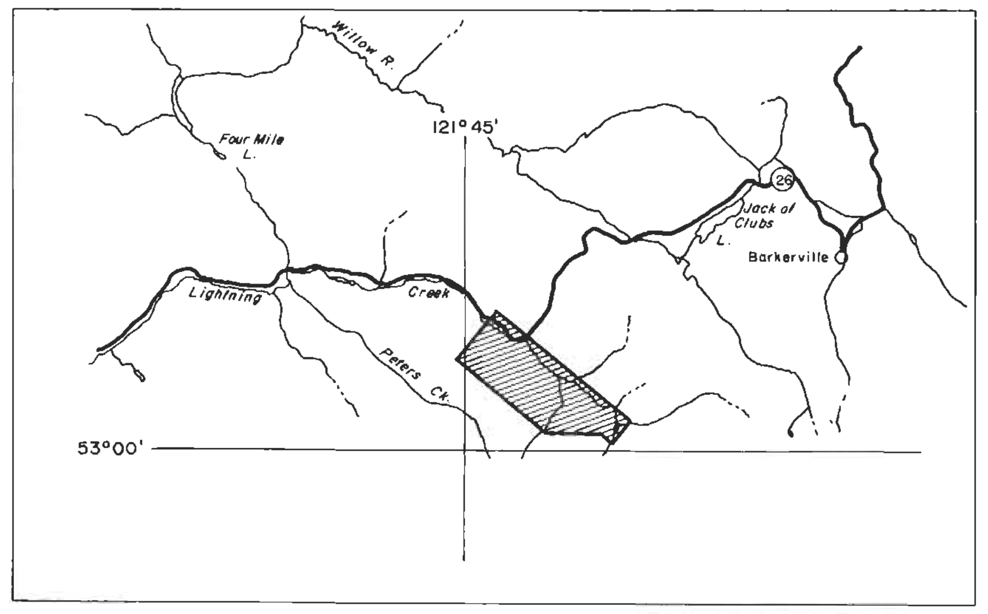
Coil Separation	7 metres
Frequency	4600 Hz
Sensor Elevation	30 metres
Vertical Scale	2 ppm/mm



ELECTROMAGNETIC PROFILES-COPLANAR

Coil Separation	7 metres
Frequency	4175 Hz
Sensor Elevation	30 metres
Vertical Scale	8 ppm/mm





MARK MANAGEMENT LTD.

ELECTROMAGNETIC SURVEY PROFILES

BARKERVILLE AREA

BRITISH COLUMBIA

SCALE 1/10,000

0 330 660 1320 1/2 mile

0 100 200 500 1 Kilometre

AERODAT LIMITED

DATE:	February 1987
N.T.S. No:	93 H
MAP No:	8a

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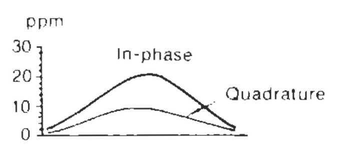
GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,942

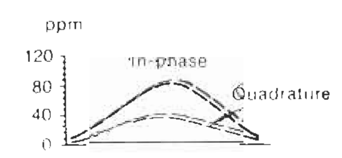
ELECTROMAGNETIC PROFILES-COAXIAL

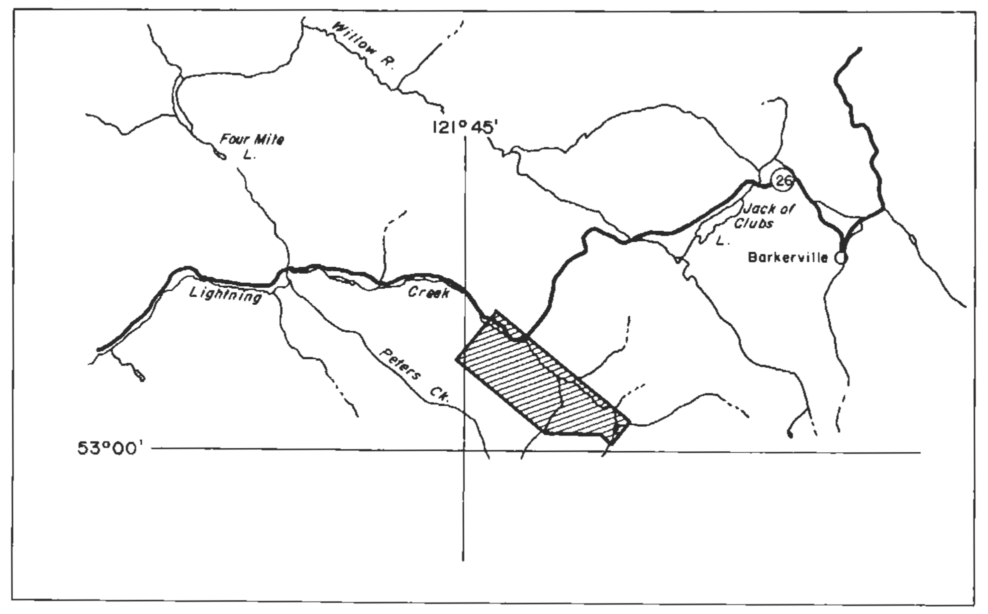
Coil Separation	7 metres
Frequency	935 Hz
Sensor Elevation	30 metres
Vertical Scale	2 ppm mm



ELECTROMAGNETIC PROFILES-COPLANAR

Coil Separation	7 metres
Frequency	34K Hz
Sensor Elevation	30 metres
Vertical Scale	8 ppm mm





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ELECTROMAGNETIC SURVEY PROFILES

BARKERVILLE AREA
BRITISH COLUMBIA

SCALE 1/10,000
0 330 660 1320 1/2 mile
0 100 200 500 1 Kilometre

AERODAT LIMITED

DATE:	February 1987
N.T.S. No:	93 H
MAP No:	8 b

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