LOG NO: march	14/91	RD.
ACTION:		

ASSESSMENT REPORT

FILE NO:

OCTOBER 1990 AIRBORNE GEOPHYSICAL SURVEY

GOLD CREEK PROPERTY

FORT STEELE MINING DIVISION

BRITISH COLUMBIA

NTS 82 G/3W

LATITUDE 49° 06'N LONGITUDE 115° 18'W

OWNER AND OPERATOR:	N C H O R T	
SOUTH KOOTENAY GOLDFIELDS IN 305 - 675 W. HASTINGS ST. VANCOUVER, B.C. V6B 1N2	R H	
BY PETER KLEWCHUK, GEOLOGIST 246 MOYIE ST. KIMBERLEY, B.C.	GICAL SMENT	
MARCH 8, 1991	GEOLO	

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APPENDIX 1 Report on Combined Helicopter-Borne Magnetic and VLF Survey - Cranbrook, British Columbia, by Aerodat Limited, October 17, 1990.

1.00 INTRODUCTION

1.10 Location and Access

The Gold Creek property is located immediately west of the Rocky Mountain Trench, 45 kilometers SE of Cranbrook, B.C. It covers approximately 24,000 hectares of land within the lower drainage of Gold Creek, a south-flowing tributary of the Kootenay River (Fig.1).

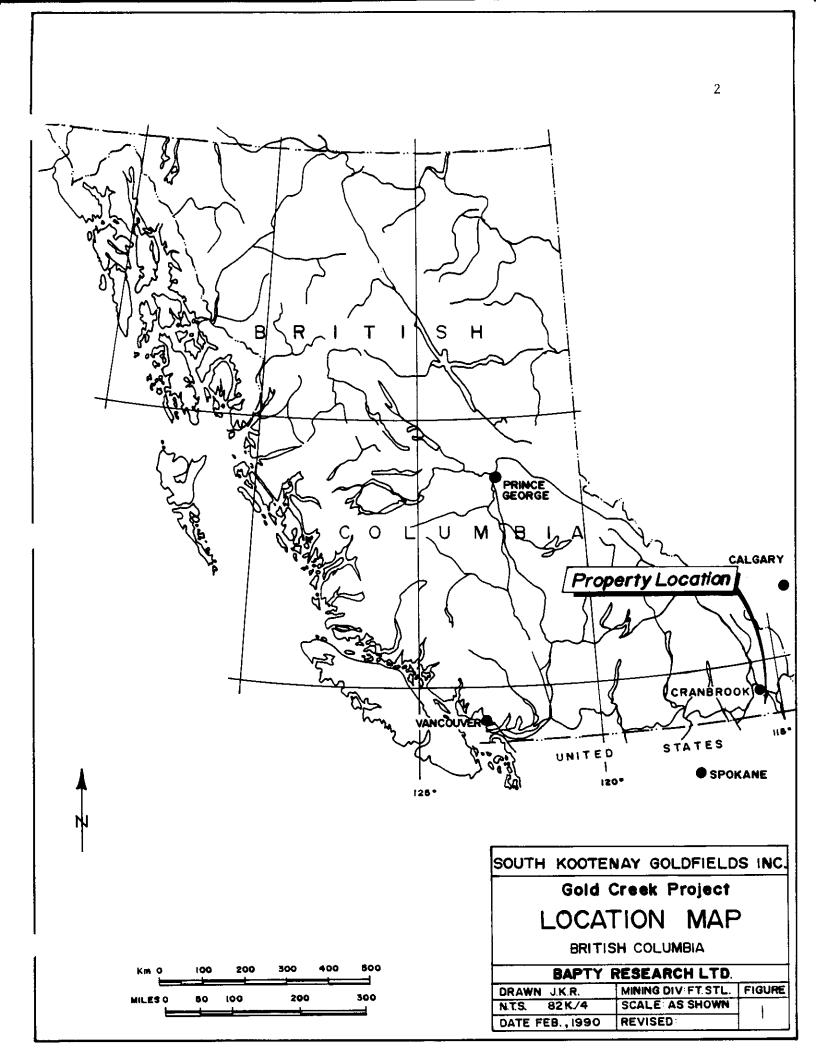
The property is readily accessible by road from Highway 3/39 at Jaffray or the Ranger Station west of Elko. Good logging roads cross much of the property.

1.20 Physiography

The property lies immediately west of the Rocky Mountain Trench in the southern Purcell Mountains. Topography is moderate to steep, ranging in elevation from 800 to 1700 meters. Mountain slopes and stream valleys are forested with Douglas Fir, Lodgepole and Yellow Pine and Western Larch.

Gold Creek flows southeasterly with tributaries Teepee and Caven Creeks flowing in from the west. Steep slopes on the west bank of Gold Creek are essentially unlogged while more gentle slopes to the east have been extensively logged in places.

Glacial drift is widespread. Bedrock exposures are limited and are found along ridges, stream gulleys and road-cuts.



1.30 History

Fine placer gold in Gold Creek has attracted small placer operations since about 1864 when placer gold was first discovered in the Cranbrook area. In 1988, South Kootenay Goldfields Inc. commenced an exploration program for lode gold sources in the Gold Creek area, based on known surface alteration zones, anomalous mercury in bedrock, and the known placer gold. Exploration activity since then has included prospecting, geologic mapping, soil and rock geochemistry, geophysics and diamond drilling.

1.40 Property

The Gold Creek property consists of 969 units in 56 mineral claims. This report concerns the following claims:

Claim	Name	Record Number	Number of Units	Date of Record	Expiry Date
Link	2	3899	12	1989/12/12	91
Link	3	3904	20	1989/12/15	91
Link	5	3906	20	1989/12/20	91
Link	6	3907	20	1989/12/21	91
Twin	10	3283	<u>16</u>	1989/01/09	93
			88 unit	S	

1.50 Objective of Survey

The airborne Magnetic and VLF-EM survey flown in August, 1990, over part of the Gold Creek claim block was done to help identify structure and magnetic parameters which might be related to gold mineralization.

2.00 GEOLOGY

2.10 Regional Geology

The Gold Creek property is located on the eastern flank of the Purcell Anticlinorium, a geologic sub-province which lies between the Rocky Mountain Thrust and Fold Belt to the east and the Kootenay Arc to the west.

The core of the anticlinorium contains a thick sequence of fine-grained clastic rocks of the Aldridge, Creston and Kitchener Formations. These range in depositional regime from basinal turbidites to tidal flat or flood plain deposits. The Gold Creek area tends to be of the latter with lowermost siltstones and very fine sands gradational to dolomites, quartzites and limestones higher in the section.

The Kitchener Formation is the oldest unit exposed and is successively overlain by the Van Creek, Nicol Creek, Gateway, Phillips and Roosville Formations (Table 1).

Siltstone, shale and locally developed carbonates of the Van Creek Formation were deposited on extensive tidal flats or flood plains. Nicol Creek basaltic flows, volcaniclastics and tuffaceous rocks form an extensive sheet centered in the Cranbrook area, and extend north and south, within the Rocky Mountain Trench area. Overlying carbonates and siltstones of the Gateway, Phillips and Roosville Formations are evidently tidal flat or flood plain deposits.

TABLE 1

Age, Name	Description
MESOZOIC Late Cretaceous or Tertiary	
Syenite	Grey-green, porphyritic.
PALEOZOIC Upper Devonian	
Fairholme Group	Limestone, dolomite, platey and argillaceous; siltstone, orthoquartzite and laminated limestone; buff grey limestone and minor siltstone with possible stromatoporoids.
PROTEROZOIC Helikian, Purcell Supergroup	
Roosville Formation	Green siltstone and argillite; stromatolitic dolomite and dark brown oolitic dolomite, quartz arenite toward the top.
Phillips Formation	Maroon micaceous siltstone, quartz wacke and argillite.
Gateway Formation	Dolomite, lamellar and stromatolitic, well developed quartz wacke, green siltstone, argillite.
Nicol Creek Formation	Massive to amygdaloidal basalti to andesitic lava flows, volcanic and feldspathic sandstone, siltite.
Van Creek Formation	Green, mauve laminated siltston and quartz wacke, minor tuffaceous siltstone at top.
Kitchener Formation	Grey, black dolomite, limestone green argillite, dolomitic siltstone.

Table 1. Lithologic descriptions of map units in the lower Gold Creek area (from Hoy and Carter, 1988). The volcanic rocks of the Nicol Creek Formation are variably magnetic and account for the prominent magnetic anomalies on regional aeromagnetic maps.

Mapping by Leech (1960) and Hoy and Carter (1988) shows a series of NNW trending, west-dripping normal faults cutting the Kitchener to Gateway stratigraphy in the lower Gold Creek area. The Gold Creek Fault is the most prominent of these, extending at least 100 kilometres from northwest of Cranbrook, southward into northern Montana.

The Gold Creek Fault closely parallels the trend of the Rocky Mountain Trench and may be considered a Laramide structure, but this northwest trend is also sub-parallel to structural breaks further west which host Precambrian base metal vein sulfides (eg. the St. Eugene and Vine veins). A strip of Devonian Fairholme Group is shown by Leech to occur along the west side of the Gold Creek Fault, north of Plumbob Creek. This fault contact represents considerable structural displacement and indicates a possible graben feature. These faults are seen as potential fluid channelways for hydrothermal solutions, which may have precipitated gold mineralization.

East-west cross-faults might also provide channelways for fluids and areas of intersection with the northwest structures may be favoured sites for mineral deposition. Although Hoy and Carter do not show any cross-faults in the lower Gold Creek area, both Schofield (1915) and Leech (1960) allude to the possibility of cross-faults in the Tepee - Plumbob creek area.

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2.20 Property Geology

The Gold Creek area is underlain by Proterozoic and Paleozoic sedimentary and volcanic rocks (Figure 3). Basaltic flows and volcaniclastics of the Nicol Creek Formation occur in scattered outcroppings while siltstones, dolomites and dolomitic quartzites of the Gateway Formation are widespread. Quartzites of the overlying Phillips Formation and fossiliferous limestones of the Upper Devonian Fairholme Group outcrop in the northeast.

Bedding generally strikes north-northwest with a 30 to 40 degree dip to the northeast.

The claim area is transected by a series of NNW-trending normal faults and associated splay faults. The most prominent is the Gold Creek Fault. This is an extensive structural break and may be a controlling feature for deposition of hydrothermal mineralization.

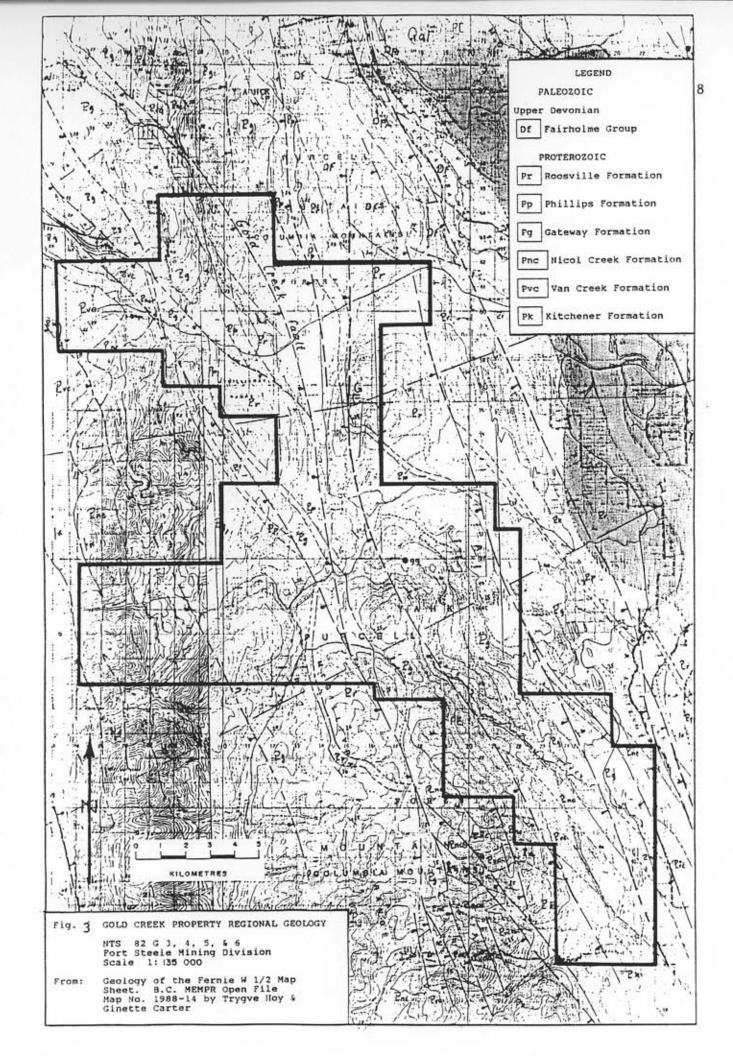
3.00 AIRBORNE SURVEY

During August 26 and 27, 1990, Aerodat Limited flew a combined Helicopter-borne Magnetic and VLF-EM Survey over four blocks of the Gold Creek Property south of Cranbrook, B.C.

The Aerodat report is appended to this report. Area 4 of the survey covers part of the claim block dealt with in this report.

The VLF-EM data (Map No. 2) appears strongly affected by topography, with the most prominent linear trend parallel to Gold Creek. Other anomalous responses occur coincidentally with

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smaller topographic features like the ridges and gulleys on the northeast slope of Gold Mountain. Northeast of Gold Creek in the area of relatively flat topography, there are no distinctive linears which might reflect buried structures.

The Total Field Magnetic data (Map No. 4) shows two prominent mag high areas separated by a linear NW-oriented mag low. A linear E-W oriented mag low separates the two mag highs from the southern half of the survey area. These linears may reflect buried structures. The southern half of the survey area contains a more complex network of magnetic responses. Nicol Creek volcanics are known to underly part of this area and the pattern of anomalies reflects, at least in part, the patchy magnetic character of these volcanic rocks.

4.00 CONCLUSIONS

The Aerodat Limited airborne geophysical survey has provided useful regional coverage of parts of the Gold Creek claim block. The magnetic data suggests the existence of previously unknown structural breaks and thus has indicated areas for more detailed exploration.

5.00 RECOMMENDATIONS

The results of the Aerodat Limited airborne geophysical survey should be combined with known geological and geochemical information on the property to establish target areas for more detailed exploration.

6.00 STATEMENT OF EXPENDITURES

Airborne Geophysical Survey	\$ 9,150.00
Survey preparation and report writing 2 days @ \$400/day	600.00
Drafting, typing, copying	250.00
	\$10,000.00

7.00 REFERENCES

Hoy, Trygve, and Carter, Ginette, 1988. B.C. MEMPR Open File Map No. 1988-14, Geology of the Fernie W1/2 Map Sheet (and part of Nelson E1/2).

Leech, G.B. 1960. GSC Map 11-1960, Geology, Fernie (West Half).

Schofield, S.J., 1915, Geology of the Cranbrook Map-Area, British Columbia, GSC Memoir 76.

8.00 AUTHOR'S QUALIFICATIONS

As author of this report, I, Peter Klewchuk, certify that:

- 1. I am an independent consulting geologist with offices at 246 Moyie Street, Kimberley, British Columbia.
- 2. I am a graduate geologist with a BSc degree (1969) from the University of British Columbia and an MSc degree (1972) from the University of Calgary.
- 3. I am a Fellow in good standing of the Geological Association of Canada.
- 4. I have been actively involved in mining and exploration geology, primarily in the province of British Columbia, for the past 17 years.
- 5. I have been employed by major mining companies and provincial government geological departments.

Dated at Kimberley, British Columbia, this 5th day of March, 1991.

M

Peter Klewchuk Geologist

APPENDIX

REPORT ON COMBINED HELICOPTER-BORNE MAGNETIC AND VLF SURVEY - CRANBROOK B.C. BY AERODAT LIMITED

REPORT ON COMBINED HELICOPTER-BORNE MAGNETIC AND VLF SURVEY CRANBROOK BRITISH COLUMBIA

FOR BAPTY RESEARCH LTD. BY AERODAT LIMITED October 17, 1990

> Adriana Carbone Geologist

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APPENDIX I - Personnel APPENDIX II - General Interpretive Considerations

List of Maps

(Scale 1:10,000)

Basic Maps: (As described under Appendix B of the Contract)

1. TOPOGRAPHIC BASE MAP;

A topographic base map at a scale of 1:20,000, was prepared from 1:50,000 Government NTS maps.

2. FLIGHT LINE MAP; Showing all flight lines and fiducials with the base map.

3. TOTAL FIELD MAGNETIC CONTOURS; Showing magnetic values corrected of all diurnal variation with flight lines, fiducials, and base map.

4. VERTICAL MAGNETIC GRADIENT CONTOURS; Showing magnetic gradient values calculated from the total field magnetics with flight lines, fiducials and base map.

5. VLF-EM TOTAL FIELD CONTOURS;

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Showing VLF total field response from the line transmitter with flight lines, fiducials, and base map.

1.INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of Bapty Research Ltd. Equipment operated during the survey included a high sensitivity cesium vapour magnetometer, a two frequency VLF-EM system, a video tracking camera, radar altimeter, and an electronic positioning system. Magnetic and altimeter data were recorded both in digital and analog forms. Positioning data was stored in digital form, encoded on VHS format video tape and recorded at regular intervals in local UTM coordinates, as well as being marked on the flight path mosaic by the operator while in flight.

The survey areas are located southeast of Cranbrook, British Columbia and are referred to as Area 1 - Area 4 inclusive and the fifth area is known as the Jake Area. Area 1 was flown on August 26, 1990, Area 2 was flown on August 27, 1990, Area 3 and Area 4 were flown on August 26, 1990 and the Jake Area was flown on August 27, 1990. Data from five flights were used to compile the survey results. The flight lines were oriented at an angle of 0 degrees, with a nominal line spacing of 200 metres (according to Appendix "A" of the contract) for Area 1 - Area 4 inclusive. The flight lines for the Jake area were oriented at an angle of 0 degrees with a nominal line spacing of 300 metres (according to Appendix "A" of the contract). Geophysical information is provided in the form of maps at 1:20,000. Coverage and data quality were considered to be well within the specifications described in the service contract.

The purpose of the survey was to record airborne geophysical data over ground that is of interest to Bapty Research Ltd.

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The survey encompasses approximately 614 line kilometres of the recorded data that were compiled in a map form at a scale of 1:20,000. The maps are presented as part of this report according to specifications laid out by Bapty Research Ltd.

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2.SURVEY AREA LOCATION

The survey areas are depicted on the following index maps.

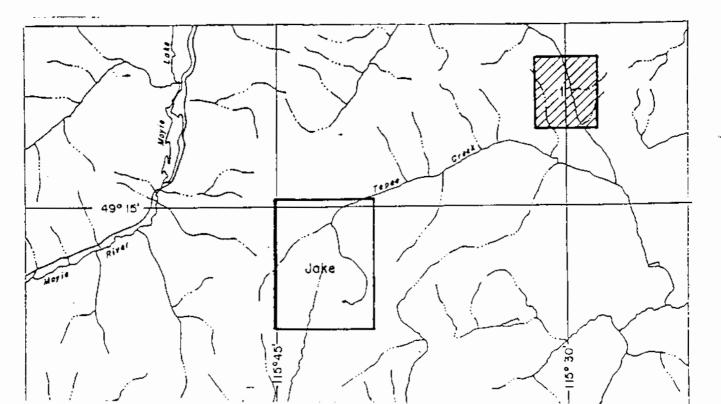
Area 1 is centred at approximate geographic latitude 49 degrees 18 minutes North, longitude 115 degrees 30 minutes West.

Area 2 is centred at approximate geographic latitude 49 degrees 10 minutes North, longitude 115 degrees 27 minutes West.

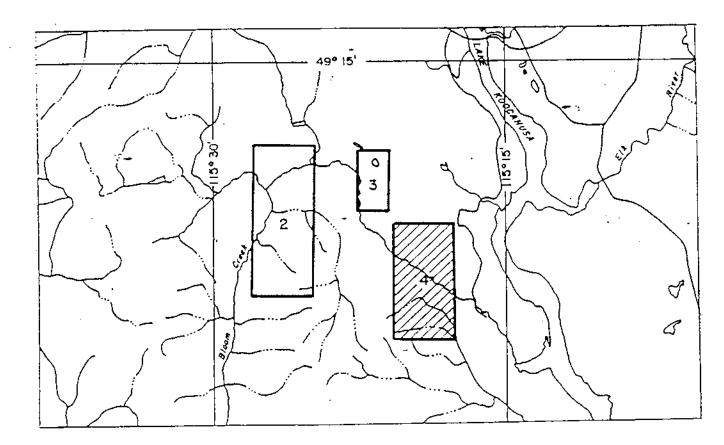
Area 3 is centred at approximate geographic latitude 49 degrees 11 minutes North, longitude 115 degrees 23 minutes West.

Area 4 is centred at approximate geographic latitude 49 degrees 08 minutes North, longitude 115 degrees 19 minutes West.

Jake is centred at approximate geographic latitude 49 degrees 12 minutes North, longitude 115 degrees 43 minutes West.



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3.AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350 B helicopter, (CG-UPH), piloted by Roger Morrow, owned and operated by Peace Helicopters Limited, was used for the survey. Pierre Moisan of Aerodat acted as navigator and equipment operator. Installation of the geophysical and ancillary equipment was carried out by Aerodat. The survey equipment was flown at a mean terrain clearance of 60 metres.

3.2 Equipment

3.2.1 VLF-EM System

The VLF-EM System was a Herz Totem 2 A. This instrument measures the total field and quadrature component of the selected frequency. The sensor was towed in a bird 30 metres below the helicopter.

3.2.2 <u>Magnetometer System</u>

The magnetometer employed a Scintrex Model VIW 2321 H8 cesium, optically pumped magnetometer sensor. The sensitivity of this instrument was 0.1 nanoTeslas. The sensor was towed in a bird 30 metres below the helicopter.

3.2.3 Magnetic Base Station

An IFG 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.

3.2.4 Altimeter System

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.

3.2.5 Tracking Camera

A Panasonic video flight path recording system was used to record the flight path on standard VHS format video tapes. The system was operated in continuous mode and the flight number, real time and manual fiducials were registered on the picture frame for cross-reference to the analog and digital data.

3.2.6 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 was recorded:

Channel	Input	Scale
VLT	VLF-EM Total Field, Line	25 %/cm
VLQ	VLF-EM Quadrature, Line	25 %/cm
VOT	VLF-EM Total Field, Ortho	25 %/cm

VOQ	VLF-EM Quadrature, Ortho	25 %/cm
RALT	Radar Altimeter	100 ft./cm
MAGF	Magnetometer, fine	25 nT/cm
MAGC	Magnetometer, coarse	250 nT/cm

3.2.7 Digital Recorder

A DGR 33:16 data system recorded the survey on magnetic tape. Information recorded was as follows:

Equipment	<u>Recording Interval</u>
VLF-EM	0.20 seconds
Magnetometer	0.20 seconds
Altimeter	0.20 seconds
Nav System	0.20 seconds

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3.2.8 Radar Positioning System

A Mini-Ranger MRS-III radar navigation system was used both for . navigation and flight path recovery. Transponders sited at fixed positions were interrogated several times per second and the ranges from these points to the helicopter were measured to a high degree of accuracy. A navigational computer triangulated the position of the helicopter and provided the pilot with navigation information. The range/range data was recorded on magnetic tape for subsequent flight path determination.

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4.DATA PRESENTATION

4.1 <u>Base Map</u>

A topographic base map at a scale of 1:20,000 was prepared from a 1:50,000 Government NTS map.

4.2 Flight Path Map

The flight path was derived from the Mini-Ranger radar positioning system. The distance from the helicopter to two established reference locations was measured several times per second and the position of the helicopter was calculated by triangulation. It is estimated that the flight path is generally accurate to about 10 metres with respect to the topographic detail on the base map.

The flight lines have the time and the navigators manual fiducials for cross reference to both analog and digital data.

4.3 <u>Magnetics</u>

4.3.1 Total Field Magnetic Contours Map

The magnetic data from the high sensitivity cesium magnetometer provided virtually a continuous magnetic reading when recording at 0.2 second intervals. The system is also noise free for all practical purposes. A sensitivity of 0.1 nanoTesla (nT) allows for the mapping of very small inflections in the magnetic field, resulting in a contour map that is equal to or exceeds ground data in quality and accuracy.

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

The contoured aeromagnetic data has been presented on a Cronaflex copy of the base map with flight lines.

4.3.2 Vertical Gradient Contour Map

The vertical magnetic gradient was calculated from the total magnetic data. Contoured at a 0.2 Nt/m interval the data was presented on a cronaflex copy of the base map with flight lines.

4.4 <u>VLF-EM Total Field Contours</u>

The VLF data was interpolated onto a regular grid at a 25 metre true scale interval using an Akima spline technique. This grid provided the basis for threading the contours at a 2% interval.

The VLF-EM signal from the line transmitting station was compiled as contours in map form on cronaflex copies of the base map with flight lines.

The VLF stations used for Blocks 1, 2, 3 and 4 were NAA, Cutler, Maine, broadcasting at 24.0 kHz, and NSS, Annapolis, Md., broadcasting at 21.4 kHz. NAA was used as the line transmitting station for Blocks 1, 2, 3 and 4. NSS was used as the orthogonal station for Blocks 1, 2, 3 and 4.

The VLF stations used for the Jake area were NPM, Lualualei, Hawaii, broadcasting at 23.4 kHz, and NSS, Annapolis, Md., broadcasting at 21.4 kHz.

NPM was used as the line transmitting station, and NSS was used as the orthogonal station.

Respectfully submitted,

Aduana Carbone

Adriana Carbone Geologist

October 17, 1990

APPENDIX I

PERSONNEL

FIELD

Flown	August, 1990
Pilot	Bruce Macdonald

Operator Joe Mercier

OFFICE

Processing	A. Carbone
-	G. McDonald

A. Carbone

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Report

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<u>APPENDIX II</u>

GENERAL INTERPRETIVE CONSIDERATIONS

Magnetics

A digital base station magnetometer was used to detect fluctuations in the magnetic field during flight times. The airborne magnetic data was levelled by removing these diurnal changes. The Total Field Magnetic map shows the levelled magnetic contours, uncorrected for regional variation.

The Calculated Vertical Gradient map shows contours of the magnetic gradient as calculated from the total field magnetic data. The zero contour shows changes in the magnetic lithologies and will coincide closely with geologic contacts assuming a steeply dipping interface. Thus this data may be used as a pseudo-geologic map.

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

measurable 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 to 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.

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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 thisaltered 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

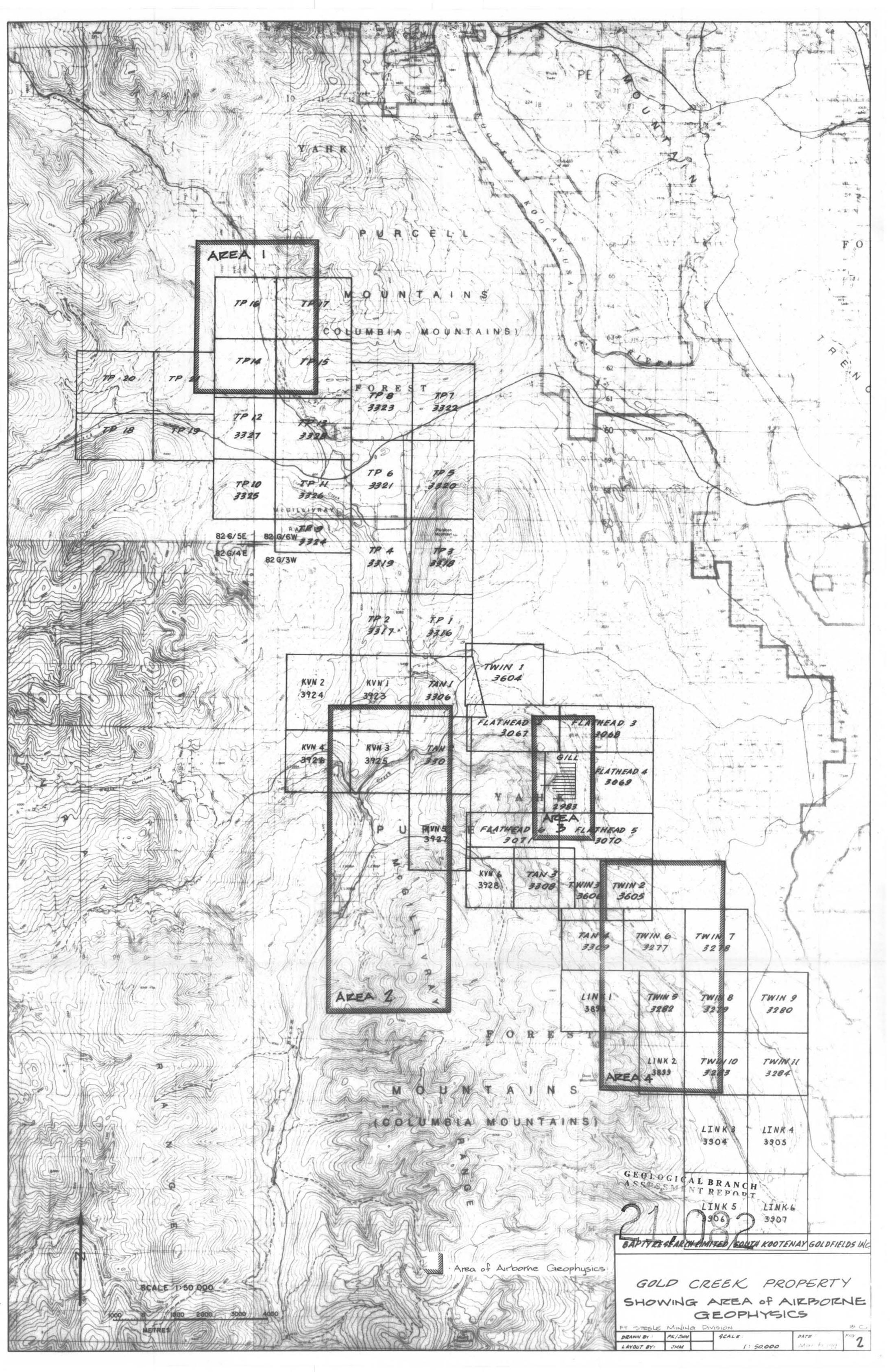
shifted in a negative sense during return travel to the surface. The net effect of these 3 phase shifts determine the phase of the secondary field sensed at the receiver.

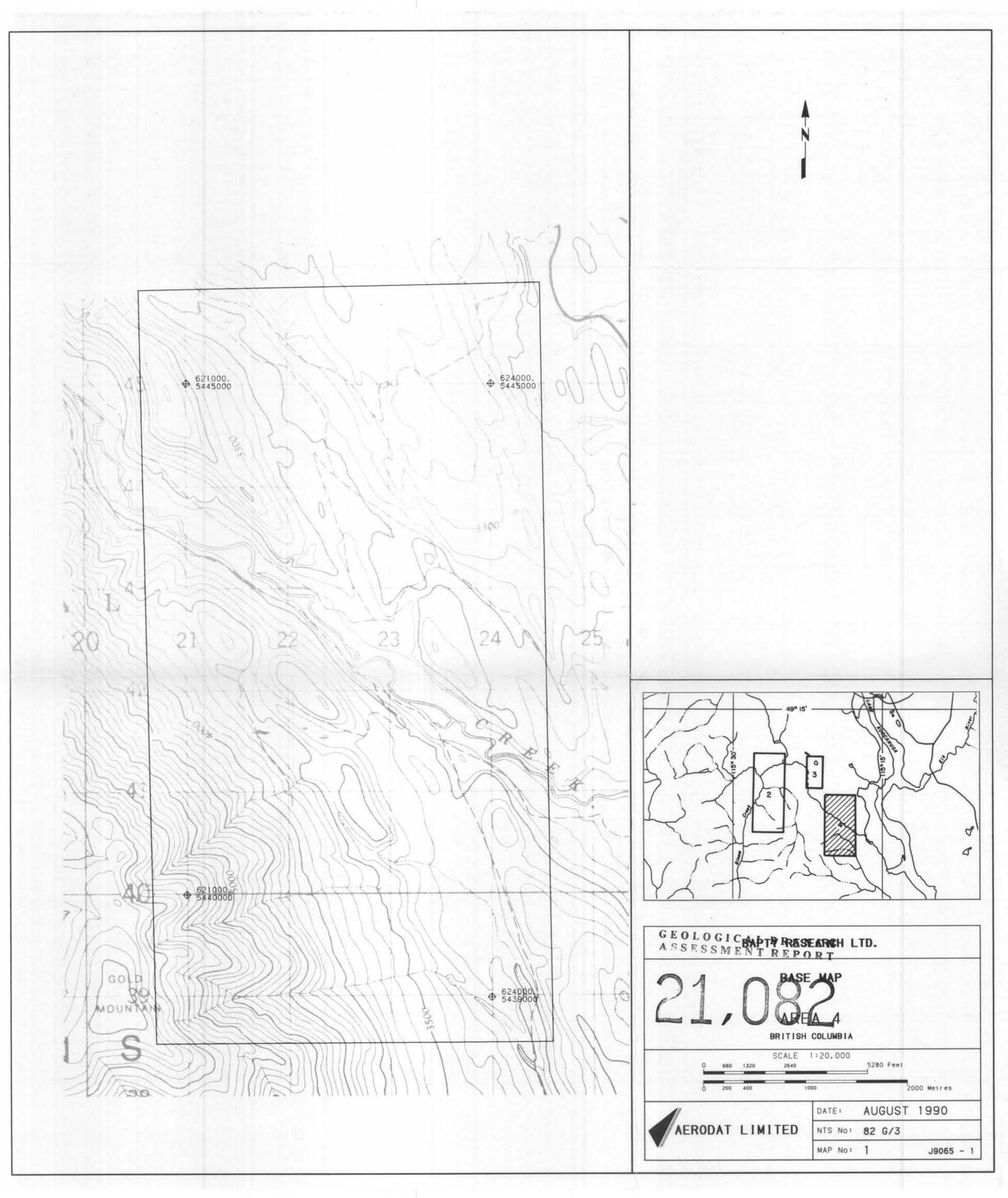
A relatively poor conductor in resistive ground will yield a net positive phase shift. A relatively good conductor in more conductive ground will yield a net negative phase shift. A combination is possible whereby the net phase shift is zero and the response is purely in-phase with no quadrature component.

- 3 -

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.

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AERODAT LIMITED DATE: AUGUST 1990 NTS NO: 82 G/3 MAP NO: 2 J9065 - 1
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