REPORT ON
COMBINED HELICOPTER-BORNE
MAGNETIC AND VLF SURVEY
CHUCHI LAKE/GERMANSEN LAKE
BRITISH COLUMBIA

JEAN PROPERTY
Omineca M.D.
NTS 93N/2W

FOR
IMPERIAL METALS CORPORATION
BY
AERODAT
AUGUST 30, 1990

Adriana Carbone
Geologist
Aerodat Ltd.

Sandra Takata
Project Supervisor/Geophysicist
Aerodat Ltd.

Dennis Gorc
Geologist
Imperial Metals Corporation

TABLE OF CONTENTS

LIST OF FIGURES

List of Maps
(Scale 1:10,000)

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

√1. **PHOTOMOSAIC BASE MAP;**
Prepared from available air photos and photographically enlarged to 1:10,000 scale.

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

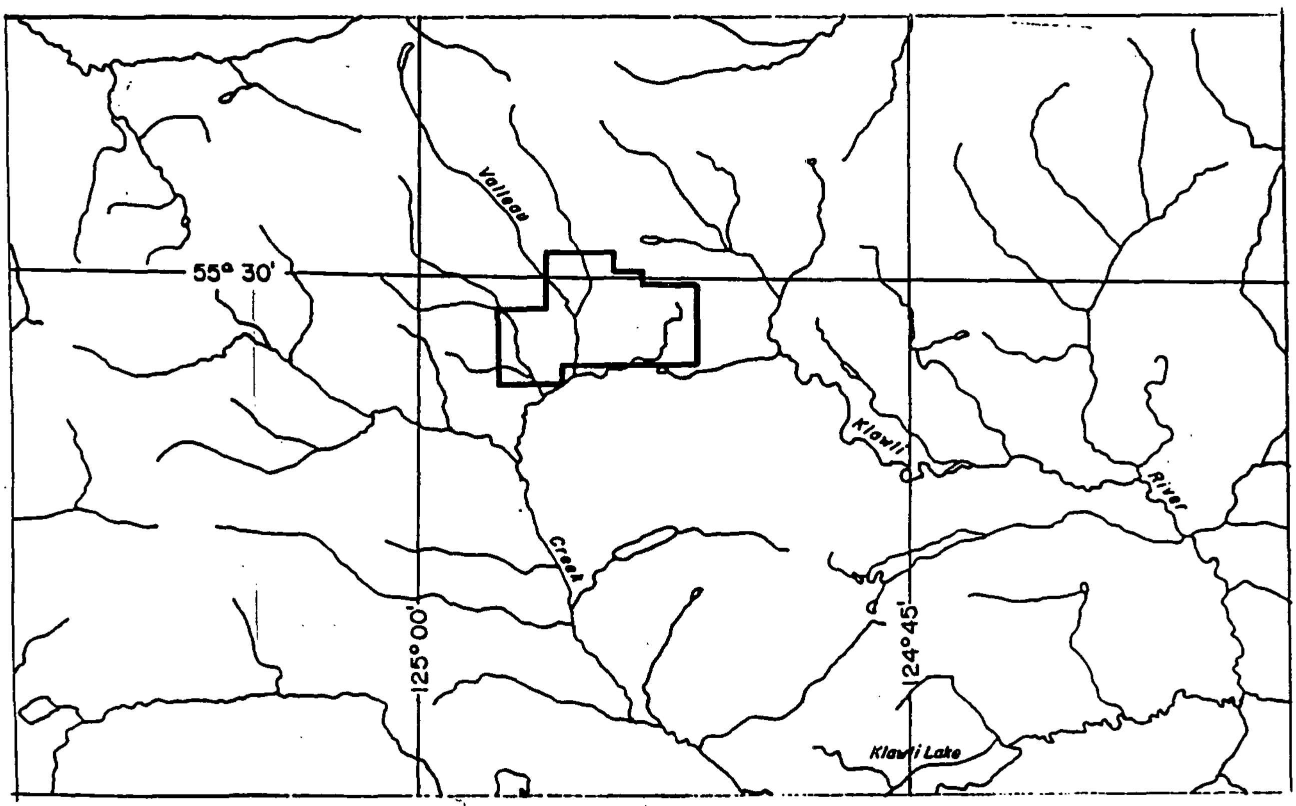
1. INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of Imperial Metals Corporation by Aerodat Limited. 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.

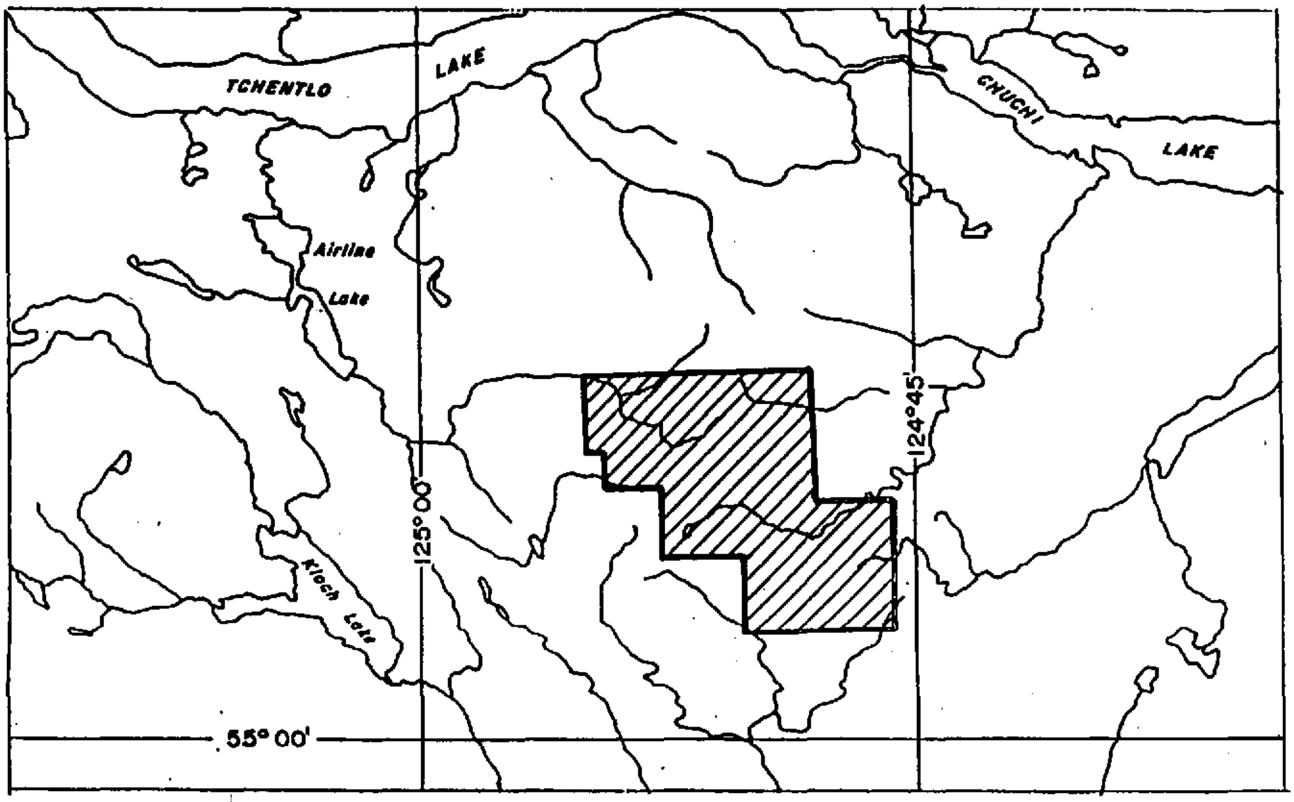
The survey is located in the Chuchi Lake/Germansen Lake, Prince George and Quesnal areas, British Columbia. The survey area consists of two claims, the Valley Girl claim and the Jean claim. The Valley Girl claim was flown from June 12 - June 13, 1990. The Jean claim was flown from July 1 - July 4, 1990. Data from ten flights were used to compile the survey results. The flight lines were oriented at an angle of 90 degrees with a nominal line spacing of 100 metres (according to Appendix "A" of the contract). Geophysical information is provided in the form of maps at 1:10,000. 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 Imperial Metals Corporation.

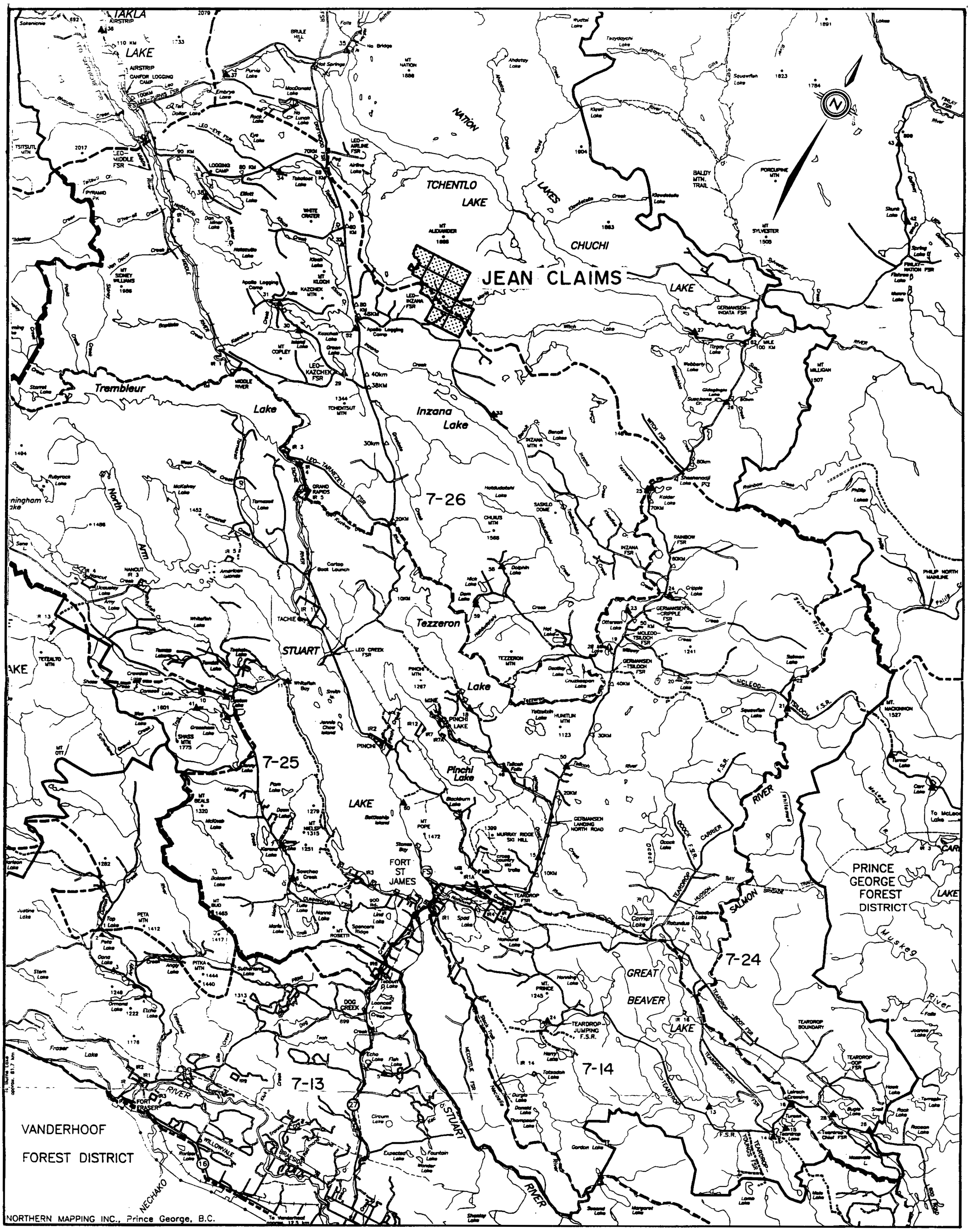
The Valley Girl claim consisted of 205 line kilometres, the Jean claim consisted of 545 line kilometres of the recorded data that were compiled in a map form at a scale of 1:10,000. The maps are presented as part of this report according to specifications laid out by Imperial Metals Corporation.

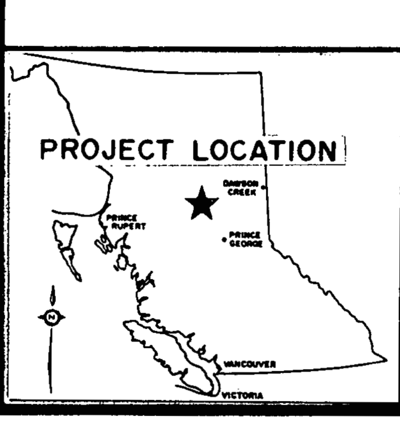


VALLEY GIRL CLAIM


TCHENTLO
LAKE
CHUCHI
LAKE
Airline
Lake
Kloch Lake
125°00'
124°45'
55°00'

JEAN CLAIM





IMPERIAL METALS CORPORATION

JEAN

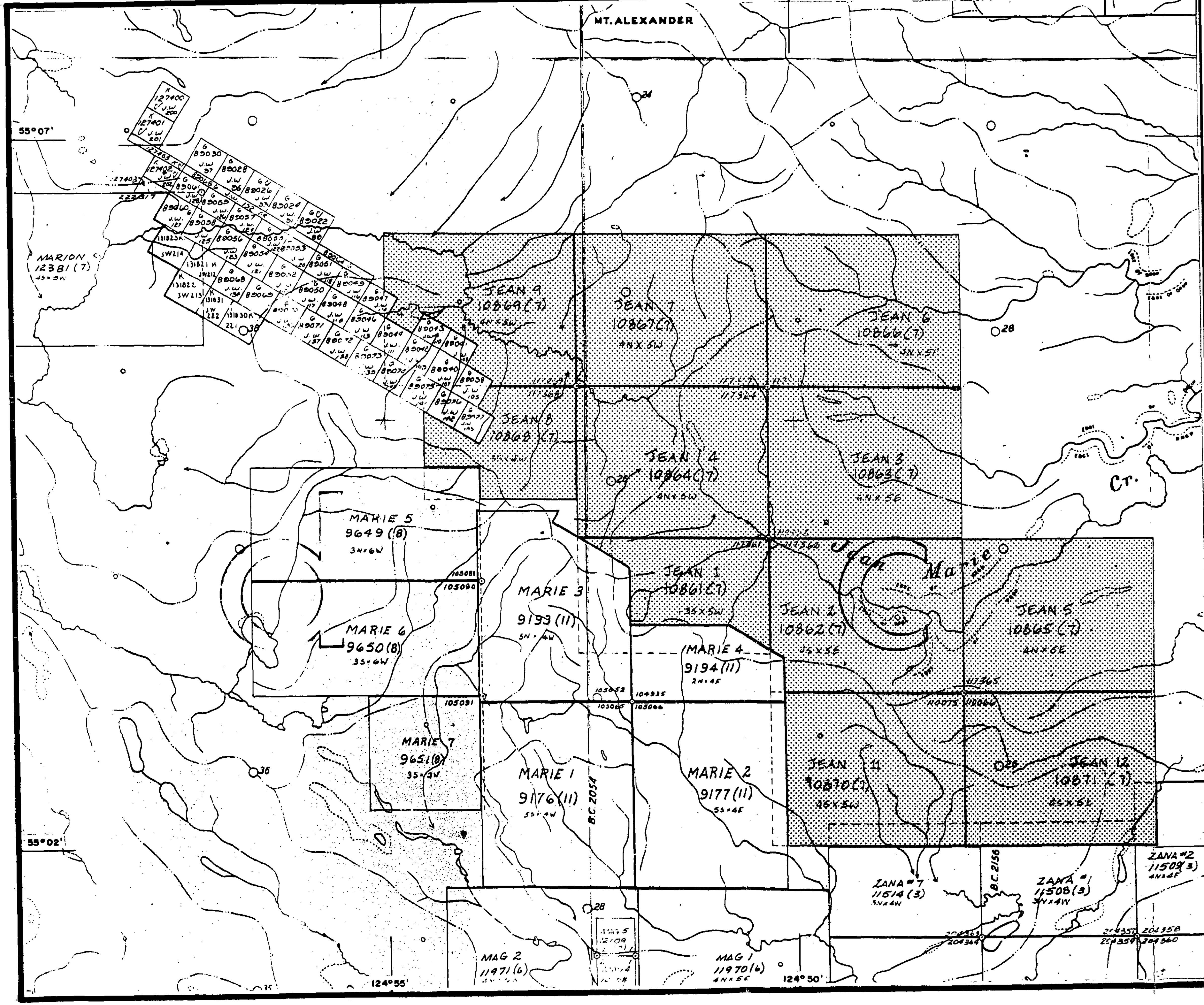
FIGURE I

N.T.S. 93N

LOCATION MAP

Km 10 0 10 20 Km

SCALE: 1: 500 000
GEOLOGIST: D. GORC
DATE: JANUARY 1991
DRAWN BY: S. HAWORTH



IMPERIAL METALS CORPORATION

JEAN

FIGURE 2

N.T.S. 93N/2W

CLAIM MAP

Km 1 0 1 2 Km

SCALE: 1:50 000

GEOLOGIST: D. GORC

DATE: JANUARY 1991

DRAWN BY: S. HAWORTH

2. SURVEY AREA LOCATIONS, ACCESS, TOPOGRAPHY

The survey area is depicted on the index map shown below. The Valley Girl claim is located at approximate geographic latitude 55 degrees 29 minutes North, longitude 125 degrees 53 minutes West. The Jean claim is located at appropriate latitude 55 degrees 08 minutes North, longitude 125 degrees 00 minutes west.

The Jean Property is located on NTS map sheet 93N/2W approximately 75 km NNE of Fort St. James, B.C. near the headwaters of Jean Marie Creek.

The southern portion is accessible by road from Fort St. James via the Leo Creek and Leo-Inzana logging roads. Both roads are major logging roads and are well maintained. Heading north from Fort St. James along the Leo Creek Road the Jean Property is located approximately 10 km east of the Leo Creek Road along the Leo-Inzana Road. The turnoff to the Leo-Inzana Road is at kilometre 48 of the Leo Creek Road. A cat trail was driven to the property in the early 1970s west from Chuchi Lake but is likely overgrown and impassable.

Elevations range from 1,000m to 1,597m. Most the property is characterized by low-lying coniferous forest with minor relief. However the central-west portion of the property abounds against a prominent NW-SE trending ridge of moderate relief.

2.1 Claim Information

The Jean Property consists of 12 mineral claims located on NTS map sheet 93N/2W in the Omineca M.D., B.C. The property totals 207 units and is held 100% by Imperial Metals Corporation.

Claim Name	Record Number	# of Units	Record Date
Jean 1	10861	15	July 6, 1989
Jean 2	10862	20	July 7, 1989
Jean 3	10863	20	July 10, 1989
Jean 4	10864	20	July 11, 1989
Jean 5	10865	20	July 10, 1989
Jean 6	10866	20	July 9, 1989
Jean 7	10867	20	July 10, 1989
Jean 8	10868	12	July 11, 1989
Jean 9	10869	20	July 10, 1989
Jean 11	10870	20	July 8, 1989
Jean 12	10871	20	July 9, 1989
		207	

2.2 Exploration History

The headwaters of Jean Marie Creek were first recognized as a porphyry copper-molybdenum target in 1969 by the N.B.C. Syndicate. The N.B.C. Syndicate consisted of Cominco Ltd., Conwest Exploration Co. Ltd., Duval Corporation Ltd. and Bacon and Crowhurst Ltd. The claims staked were called the Jean claims and covered much of what is the present Jean Property.

As work on the property progressed a new target developed to the west of the original claims. This new area was staked and was referred to as the JW or Jean West claims. The present Jean Property covers only a small portion of the JW Property.

From 1969 to 1971 Bacon and Crowhurst on behalf of the syndicate completed extensive geological mapping, soil sampling grids, some induced polarization surveys and 12 diamond drill holes.

In 1973 Cominco completed induced polarization surveys and geological mapping concentrating on the new JW target area. Results from 1973 were sufficient to prompt Cominco to construct a 32 km road from Chuchi Lake to the JW target area and complete a 40 hole (3,200m) percussion drill program on the JW Property.

During 1975, 1977 and 1978 Cominco Ltd. completed induced polarization and magnetometer surveys on portions of both the Jean and JW claims. In 1979 and 1983 they completed soil geochemical surveys on portions of the Jean Property.

In 1981 Noranda completed a regional airborne magnetometer-VLF electromagnetic survey in the area. The survey area included the Jean and JW target areas.

The above work outlined a Middle Jurassic intrusive complex within Takla Group volcanic rocks. The intrusive complex included monzonite, granodiorite, quart monzonite, quartz diorite and diorite. The southern contact of the intrusive with

Takla Group volcanic rocks was interpreted as being a fault contact although this is not certain due to the relative scarcity of outcrop.

Chalcopyrite-molybdenite mineralization was discovered on both the JW and Jean claims. This mineralization was primarily along fractures within intrusives along the southern contact of the complex. Pyritization and garnet-epidote skarns were noted in the nearby Takla Group volcanic rocks. Assay results from the drilling was not submitted in available assessment reports, however soil sampling and induced polarization surveys outlined widespread anomalies in the area. The anomalies include Cu-Mo soil anomalies 3,500 ft (1,066m) x 600 ft (183m) on the Jean Property and 6,000 ft (1,828m) x 1,200 ft (365m) on the JW Property.

In 1989 the Jean 1-9, 11, 12 mineral claims were staked by Imperial Metals Corporation.

3. AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350 B helicopter, (C-GYHT), piloted by R. Mitchinson owned and operated by Peace Helicopters Limited, was used for the survey. Mark Pelletier 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 Magnetometer System

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	Recording Interval
VLF-EM	0.20 seconds
Magnetometer	0.20 seconds
Altimeter	0.20 seconds
Nav System	0.20 seconds

3.2.8 Radar Positioning System

A Mini-Ranger MRS-III radar navigation system was used for both navigation and flight path recovery. Transponders sited at fixed locations 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.

4. DATA PRESENTATION

4.1 Base Map

A photomosaic base at a scale of 1:10,000 was prepared from available air photos and enlarged to the required scale.

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 navigator's manual fiducials for cross reference to both analog and digital data.

4.3 Magnetics

4.3.1 Total Field Magnetic Contour 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 <u>Vertical Gradient Contour Map</u>

The vertical magnetic gradient was calculated from the total field 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 VLF-EM Total Field Contours

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 1% interval.

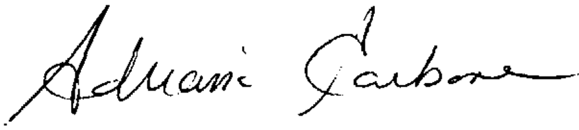
The VLF-EM signal from the line transmitting station was compiled as contours in map form on cronaflex copies of the base map with flight lines.

The transmitting station used for the Valley Girl claims was NLK, Seattle Washington, broadcasting at 24.8 kHz. The orthogonal VLF station used was NSS Annapolis, Maryland, broadcasting at 21.4 kHz.

The transmitting stations used for the Jean claim were NAA, Cutler Maine, broadcasting at 24.0 kHz, and NSS, Annapolis, MD, broadcasting at 21.4 kHz NAA was used for flights 1-3 and NSS was used for flights 4-7.

The orthogonal ULF station used was NLK, Seattle Washington, USA, broadcasting at 24.8 kHz.

Respectfully submitted,



August 30, 1990

Adriana Carbone
Geologist

Sandra Takata
Project Supervisor/Geophysicist

5.0 CONCLUSIONS

With the discovery of the Mt. Milligan Cu-Au deposit in central British Columbia the Quesnellia terrane has become the focus of extensive exploration for copper-gold porphyry deposits. Past and current exploration have very limited rock exposures and thick glacial cover making mineral exploration more difficult. Since most intrusives associated with this type of mineralization are magnetic, airborne magnetometer surveys are currently being completed over large portions of the Quesnellia terrane as a means of locating these intrusives as well as other geological features. It is for these reasons that this survey was commissioned. It was also hoped that the VLF electromagnetic survey would locate major fault structures.

The main magnetic feature are a linear series of magnetic highs trending SE-NW near the southern contact between the Middle Jurassic intrusive complex. These magnetic highs appear to follow the projection of this contact as it swing easterly in the eastern portion of the property. Similar magnetic highs appear on the northern contact of the intrusive complex.

Sharp N-S and NE-SE lineaments are apparent in the magnetic data suggesting possible fault structures. One such magnetic lineament along Jean Marie Creek is associated with a VLF electromagnetic anomaly.

Two main VLF electromagnetic anomalies are apparent both along Jean Marie Creek, one trending ENE and the other WNW. It is uncertain whether these anomalies are reflective of fault structures or conductive overburden.

Although it will have to be confirmed by field mapping the airborne survey appears to outline the outer edge of the intrusive complex and other geological features. This will be of assistance in planning future exploration.

APPENDIX I

PERSONNEL

FIELD

Flown	May - June, 1990
Pilot	R. Mitchinson
Operator	Mark Pelletier

OFFICE

Processing	A. Carbone S. Takata G. McDonald
Report	A. Carbone S. Takata

APPENDIX II

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.

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.

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 III

CERTIFICATE OF QUALIFICATIONS

I, Adriana Carbone, certify that:

1. I hold a B.Sc., in Geological Sciences from the University of Windsor, Ontario.
2. I reside at 2041 Banbury Crescent, in the Town of Oakville, Ontario.
3. I have been engaged in a professional role in the minerals industry in Canada for the past three years. I have been employed by Aerodat Limited since May 1990, and I currently hold a position as a Geologist.
4. I have been a member of the Prospectors' and Developers' Association since 1987.
5. The accompanying report was prepared from a review of the proprietary airborne geophysical survey flown by Aerodat Limited for Cathedral Gold Corporation. I have not personally visited the property.
6. I have no interest, direct or indirect, in the property described nor do I hold securities in Cathedral Gold Corporation.

Signed,

Adriana Carbone

Adriana Carbone
Geologist

Mississauga, Ontario
October, 1990

APPENDIX III

CERTIFICATE OF QUALIFICATIONS

I, Sandra A. Takata, certify that:

1. I hold an Honours B.Sc., Applied Earth Sciences, Geophysics from the University of Waterloo. I graduated in 1985.

2. I reside at 499 Prince Edward Drive in Etobicoke, Ontario.

3. I have been engaged in the minerals industry since 1982. Currently I hold the position of Project Supervisor/Geophysicist at Aerodat Limited. I have been employed by Aerodat Limited since May 1985.

4. I hold memberships in the Canadian Exploration Geophysical Society and Prospectors' and Developers' Association.

5. The accompanying report was prepared from a review of the proprietary airborne geophysical survey flown by Aerodat Limited for Cathedral Gold Corporation. I have not personally visited the property.

6. I have no interest, direct or indirect, in the property described, nor do I hold securities in Cathedral Gold Corporation.

Signed,

Sandra A. Takata
Project Supervisor/Geophysicist

Mississauga, Ontario
January, 1991

APPENDIX III

STATEMENT OF QUALIFICATIONS

I, **DENNIS M. GORC**, residing at 103, 2083 Coquitlam Avenue in Port Coquitlam, British Columbia, V3B 1J4, state that;

1. I graduated from Queen's University, Ontario with a B.Sc. (Eng.) degree in mineral exploration in May 1976;

2. Since 1976, I have supervised mineral exploration programs in British Columbia, Northwest Territories, Manitoba and Ontario;

3. I am presently employed as a geologist with Imperial Metals Corporation, Suite 800, 601 West Hastings Street, Vancouver, British Columbia.

4. I supervised the work on the Jean Property.

DATED THIS 21 DAY OF January, ~~1990~~. 1991

Dennis M. Gorc
IMPERIAL METALS CORPORATION
Vancouver, British Columbia