2701

GEOPHYSICAL REPORT

on an

AIRBORNE MAGNETOMETER SURVEY

of an

Area Approximately 6 miles by 7 miles long

Situated

East of the Brenda Mines Site

Okanagan Area

Province of British Columbia

and centered at

Latitude 49° 55'N Longitude 119° 55'W

N. T. S. 82E

on behalf of

ARROW INTER-AMERICA CORPORATION

by

Geo-X Surveys Ltd.
Vancouver, B.C.

April 27, 1970

Report by:

G. E. White, B.Sc.,
Geophysicist

D. R. Cochrane,
P. Eng.

604-685-0312
TELEX 04-50404

GEO-X SURVEYS LTD. 627 HORNBY STREET, VANCOUVER I, B.C.

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PREFACE

Since ferromagnetic susceptibility and natural rock magnetism change measurably from one rock type to another, accurate detailed mapping of the geomagnetic field often provides valuable information about the subsurface geology (even in heavily drift covered areas). Aeromagnetic surveys provide new knowledge of the type, general attitude, configuration and complexity of the geosuperstructure and often identifies local elements which sometimes indicate ore. Aeromagnetic prospecting can be applied to the delineation of buried contacts and disruptions or the location of areas of possible plutonic differentiation and its varied products. Considerable speed and accuracy is inherent in this survey method. When it comes to interpretation, however, there are two factors which can exert considerable influence. The first is geologic control, which reduces the number of variables that the interpreter must consider. The second is data analysis, which is essentially the use of filtering techneques. Filtering can remove noise, regional variation, and the effects of various physical phenomena (such as the effect of topography, or changing depth of burial). In addition, interpretation techniques (explaining the data) must be flexible enough to be revised in the light of new geological, geochemical or geophysical information. The following report describes the data mainly in a general or regional sense. A more quantative approach can be employed with additional data processing and with the aid of field geological descriptions of some of the magnetic features herein described.

SUMMARY

Late in January, 1970 to early February, 1970 Geo-X Surveys Ltd. completed 470 line miles of total field aeromagnetic surveying on an area situated near Peachland, B.C. and on behalf of Arrow Inter-America Corporation.

The survey was completed in an Excalibur 800 fixed wing aircraft with a Varian V4937A proton precession magnetometer (±1 gamma); SDV 4991 digital recorder and analogue chart recorders. Flight line positioning was facilitated by 35mm strip photography matched to mosaics prepared from Government airphotos. Terrain clearance was recorded in analogue mode by a radar-type pulse altimeter.

Data processing was conducted by Geo-X Surveys Ltd. personnel using IBM equipment in Vancouver.

The total field isomagnetic plan (Figure 2, 1":1000') was plotted by a computer-plotter unit at a contour interval of 25 gammas.

The survey located several large magnetic low trends which correlated with strong NE-SW and NW-SE photo linears.

An area designated Magnetic Terrain IV located in the northeast section of the surveyed area shows a high incidence of magnetic and photo linears and a moderate increase in magnetic intensity. This area in particular has been recommended for further investigation by normal ground mining exploration techniques.

Respectfully submitted,

Glen E. White,
Geophysicist

Read and Checked by: D. R. Cochrane,
P. Eng.

INTRODUCTION

During the period January 29 to February 3, 1970 Geo-X Surveys Ltd. of Vancouver, British Columbia, on behalf of Arrow Inter-America Corporation, conducted an airborne magnetometer survey over an area encompassing some 42 square miles located in the Okanagan Area of the Province of British Columbia.

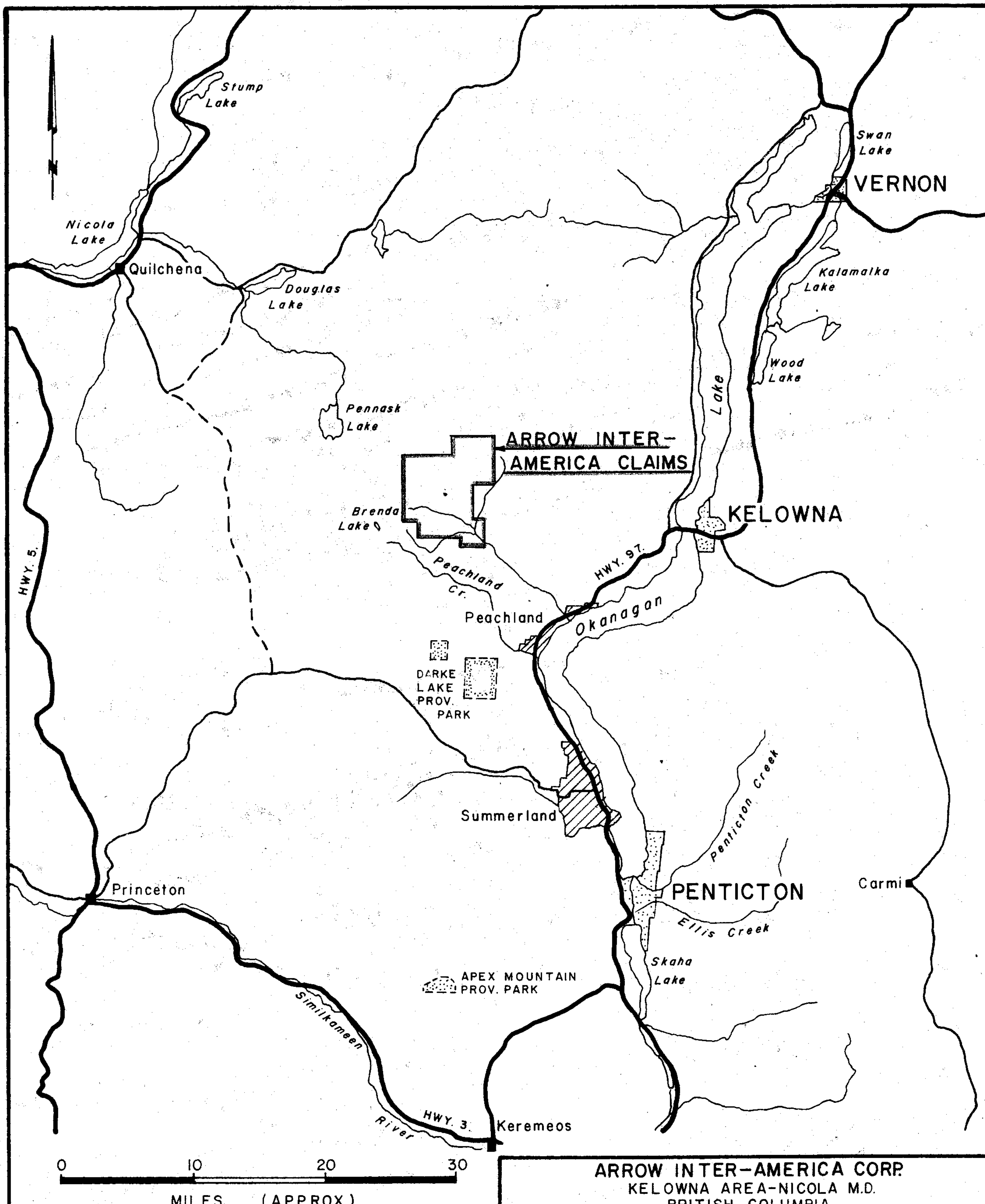
A total of 470 line miles of total intensity airborne magnetometer surveying was conducted. This report describes the instrumentation, field procedure and data processing, and discusses the results obtained.

LOCATION AND ACCESS

The 6 mile X 7 mile area covered by this report is centered at latitude 49° 55'N and longitude 119° 55'W immediately east of the Brenda Mine Site some 16 miles northwest of Peachland, B.C. Access to the property is by all weather roads from Peachland and Summerland, B.C.

GENERAL SETTING

The area covered by this survey is situated in the Thompson Plateau subdivision of the Interior Plateau Physiographic division of British Columbia. It is, in general, a gently rolling upland of relatively low to moderate relief.



ARROW INTER-AMERICA CORP.
KELOWNA AREA-NICOLA M.D.
BRITISH COLUMBIA

LOCATION MAP

GEO - X SURVEYS LTD.	Drawn A.N.S.	Dated Apr. 27,1970	Fig. No.
	Checked [signature]	Job No. 1137	1

The survey area is located at an average elevation of some 5000 feet above M. S. L. The highest point being Mt. Gottfriedsen with a zenith of 6224 feet, A. S. L. Geologically the area is underlain primarily by the Nelson Plutonic rocks which vary in composition from acid to basic granites. The Valhalla plutonic rocks consisting of granite and granodiorite underlay the eastern side of the survey area. Both rock units are believed to be Cretaceous in age. The northeast corner of the survey area is underlain by the Chapperon group of chlorite schist and quartzite of Precambrian age.

S. S. Holland Landforms of British Columbia A Physiographic Outline, British Columbia Department of Mines and Petroleum Resources Bulletin No. 48, 1964.

G. S. C. Geology Map 15 - 1961 (Revision of Map 538A) Kettle River (west half)

AIRBORNE FIELD PROCEDURE

The total intensity of the geomagnetic field was measured and recorded along 97 flight lines, flown in an east-west direction at an average terrain clearance of 500 feet and an average line spacing of 500 feet.

The survey was flown in a fixed wing aircraft, towing an airfoil sensor. A proton magnetometer, digital and chart recorders, camera and altimeter were mounted in the aircraft. The magnetometer and chart recorder continuously measured and recorded the magnetic field intensity. At one second intervals, the field amplitude and fiducial number were recorded on punch tape by the digital recording system. At thirty second intervals, the time and line number were punched on the tape. At two second intervals, a split image camera simultaneously photographed (1) the terrain, and (2) the clock and fiducial display panel. Thus each terrain photograph is bordered by a photograph of the clock and fiducial number.

The terrain clearance was measured with a Bonzar pulse type radar altimeter and recorded by a G-2000 chart recorder.

Solar flare warning and predictions, issued daily at the Space Disturbance Forecast Center in Boulder, Colorado, were used to schedule the flight during a magnetically quiet period.

The punch tape, chart and strip photograph processing is described in the following section. Instrument specifications are in Appendix IV.

DATA PROCESSING

The data processing consisted of 4 steps discussed under the following headings:

(1) Flight line positioning

(2) Paper tape editing and magnetic tape generation

(3) Variable selection and grid interpolation

(4) Mathematical analysis, computation, contouring

1. FLIGHT LINE POSITIONING

(a) Photographic Location Data

Terrain photographs taken in flight are bordered by an image of the clock-fiducial display. On each line certain prominent topographical features are recognized by comparing the terrain photograph with an air-photograph mosaic. The fiducial numbers associated with these features are marked on the line and data points are then evenly distributed along the line between these known positions.

(b) X-Y Location

An arbitrary rectangular coordinate system was superimposed on the flight line data observed by (a) above, with +Y north and +X east. The position of each data point is uniquely described by X (distance east of origin) and Y (distance north of origin).

From the strip photos Geo-X personnel plotted the flight lines on a mosaic prepared from the government photos. An X-Y coordinate system was also superimposed on the flight lines on a mosaic prepared from the government photos. An X-Y coordinate system was also superimposed on the flight line mosaic with +Y north and +X east. Thus, every position along a flight line is defined in terms of X (number of feet east of the origin) and Y (number of feet north of the origin).

2. Editing of the Paper Tape

A listing of the contents of the paper tape was made by IBM of Vancouver. The listing was examined and compared with the analogue record as a guard against possible machine or operator error. The magnetic readings for areas of flight line intersection were compared as a check on the time variations of the geomagnetic field.

3. Tabulation of Critical Fiducial Numbers

The first and last fiducial number on each line were tabulated along with their X-Y coordinates. In addition, points where the flight line changed direction were tabulated along with the appropriate fiducial number.

The tabulated information was keypunched onto computer cards, and sent with the punch tape to IBM.

4. Contour plotting

IBM fed the punch tape to a computer, along with the X-Y coordinates of the start, end and any changes of direction that may have occurred in the flight line. The data sampling interval along the flight lines was roughly 165 feet. The magnetometer readings were evenly spaced along the line segments and contoured by a computer-plotter unit at a contour interval of 25 gammas.

DISCUSSION OF RESULTS

The aeromagnetic data is presented as follows:

(i) Figure 2 consists of a Black line mosaic on which the isomagnetic contour plan has been superimposed. The mosaic is planimetrically semi-controlled and is at an approximate scale of 1":1000'.

(ii) Figure 3 presents the flight line track and general interpretation map which are at the same X-Y (lateral) scale as Figure 2. The general interpretation map illustrates the primary features to be discussed and has been contoured to highlight various magnetic patterns.

The total field isomagnetic contour data varied from a minimum of some 57,300 gammas to a maximum of some 58,300 gammas. In general, the magnetic intensity varied moderately around a background value of some 57,800 gammas. The magnetic intensity data would appear to be divisable into four magnetic terrains described as follows: (see figure 3)

I. Magnetic division I occurs in the south eastern corner of the survey area. It is a large NW trending magnetic high with two peak response areas just over 58,300 gammas in amplitude.

II. Magnetic division II is situated in the southwestern section of the surveyed area and is characterized by only slight magnetic relief.

III. Magnetic division III is a central magnetic plateau of fairly gentle relief and pronounced curvilinear isomagnetic patterns arrayed around a small magnetic low designated IIIA.

IV. Magnetic division IV is situated in the northeastern corner of the survey area. It is a zone of complex magnetic high amplitudes which reflect the curvilinear isomagnetic patterns of III.

Magnetic terrain I is a large magnetic high with steep magnetic gradients and may possibly be due to a large remnant of Nicola volcanic rocks.

Magnetic terrain II is of relatively uniform magnetic intensity possibly indicating homogeneous acidic intrusives. Magnetic anomaly IIA may also be due to a small remnant of Nicola volcanics.

Magnetic terrain III is of slightly higher magnetic intensity than magnetic terrain II and may therefore suggest a slightly different intrusive phase, more complex and basic. Magnetic low IIIA is of interest in that it is the intersection point of several photo linears as well as the axis for the curvilinear isomagnetic contour patterns. Magnetic highs IIIB and IIIC are located on the western edge of magnetic terrain III and may be due to a remnant of Nicola volcanics (Nicola rocks have been mapped slightly to the west). However, magnetic high IIIB is a well defined "thumb print" type of anomaly which should be further investigated. The small magnetic highs designated I, II and III may not be valid in that they are interpolated from between line gradients.

Magnetic terrain IV is located in the northeastern section of the surveyed area. It is an area of complex magnetic patterns, which in general, rise some 300 gammas above the general background of 57,800 gammas. It is flanked to the northeast by a large magnetic low. Six magnetic highs were located within terrain IV and have been designated numbers IV A to F inclusive. The magnetic patterns in this area also reflect the isomagnetic curvilinear patterns of magnetic terrain III. In this area, magnetic terrain IV, the Nelson plutonics may be in contact with the younger Valhalla granites to the east and with the Chapperton group to the northeast. The area between magnetic highs IVB-E is highly dissected with magnetic and photo linears. Thus the moderate increase in magnetic intensity for magnetic terrain IV could possibly be due to a more basic granitic phase of the Nelson pluton or an Xenolith from the Chapperton metasediments.

Magnetic terrains I, II and III are separated by strong NE-SW and NW-SE linear magnetic lows which coincide with areas of structural deformation as shown by the photo linears A-A', B-B' and C-C'

Linear A-A' is a strong NE-SW directed photo linear. Starting in the northeast corner it passes through the intersecting magnetic low, passes through the small magnetic low IIIA, intersects the photo and magnetic linear B-B' and passes just to the north of the Brenda Mines site. Linear B-B' is the strongest magnetic feature and photo linear within the survey area. It is directed WNW-SSE. An examination of the flight lines in this area validates the data. It is possible that this feature may have been caused by mechanical deformation and subsequent chemical weathering. Linear C-C' is NE-SW directed almost parallel to A-A' and is also a combined magnetic-photo linear. It intersects linear B-B' in the southeastern corner of the survey area and appears to cause a NE-SW offset in B-B'. The economic sulphide mineralization in the Brenda deposit reportedly occurs in NE-SW fractures. An induced polarization survey of the Brenda deposit, described by D. Fountain* indicates that the I. P. anomaly reflecting total sulphide mineralization trends principally in a NW-SE direction and weakly in a NNE-SSW direction.

It is interesting to note that magnetic terrains II and III appear as competent crustal blocks which may have undergone componental movement. Magnetic terrain II appears as an elipse with the long axis E-W. The Brenda deposit occurs within the elipse at its western end. Magnetic terrain III appears almost plug-like, reflected by the curvilinear isomagnetic contours, with its center near magnetic low IIIA. It may be possible that linears A-A', B-B' and C-C' are a result of late crustal tectonics and therefore may not have controlled deposition.

* D. K. Fountain. The use of Geophysics in Mineral Exploration in the Northwestern United States and Southern British Columbia. McPhar Geophysics.

CONCLUSIONS AND RECOMMENDATIONS

The area covered by this survey is relatively large, thus no small magnetic feature can be exhaustively discussed. Several magnetic features were located which require evaluation by normal ground mining exploration methods. These are as follows:

(i) The cause of magnetic terrain IV and the magnetic low to the northeast.

(ii) The cause of magnetic low IIIA.

(iii) The area between magnetic low IIIA and magnetic highs IVC-E.

(iv) The cause of magnetic terrain I and magnetic high IIIB

It is possible that ground follow-up may demand a complete interpretive revaluation of the magnetic data. It is also suggested that it may be advantageous to take the area around magnetic low IIIA and magnetic terrain IV, increase the present scale to 1":500' and computer plot and contour every data point. Fourier Residual-Trend surface analysis programs are also available should they be desired.

Respectfully submitted,

Glen E. White,
Geophysicist

Read and checked by: D. R. Cochrane,
P. Eng.

PROFESSIONAL PROVINCE OF D. R. COCHRANE BRITISH COLUMBIA ENGINEER

APPENDIX I

PERSONNEL

Name:	COCHRANE, Donald Robert
Education:	B.Sc. - University of Toronto M.Sc. (Eng.) - Queen's University
Professional Associations:	Professional Engineer of British Columbia, Ontario and Saskatchewan. Jr. member of C.I.M.M., member of G.A.C., M.A.C. Geological Engineer.
Experience:	Engaged in the profession since 1962 while employed with Noranda Exploration Co. Ltd., Quebec Cartier Mines Ltd., Meridian Exploration Syndicate. Presently employed as Engineer with Geo-X Surveys Ltd. Experience in West Indies, Latin America, South America, United States and Canada.

APPENDIX I

PERSONNEL

Name:	WHITE, Glen E.
Education:	B. Sc. Geophysics - Geology University of British Columbia.
Professional Associations:	Assoicate member of Society of Exploration Geophysicists.
Experience:	Pre-Graduate experience in Geology-Geochemistry-Geophysics with Anaconda American Brass. Since Graduation in 1966 in Geophysics - Geology, has obtained experience in Mining Geophysics with Sulmac Explorations Ltd. Airborne Geophysics with Spartan Air Services consulting on second derivative. Micro-Gravity project with Velocity Surveys Ltd. Recently acted as mining Geophysicist and technical Sales Manager in the Pacific north-west for W. P. McGill and Associates Presently employed as Airborne and Mining Geophysicist with Geo-X Surveys Ltd. Active experience in all Geologic provinces of Canada has been obtained.

APPENDIX II

PERSONNEL AND DATES WORKED

The following Geo-X Surveys Ltd. personnel were employed on the Arrow Inter-America Corporation airborne magnetometer survey project.

A. FIELD WORK

H. Clark	Pilot	Jan. 29-30 , Feb. 3
N. Wilson	Flight Operator	Feb. 3
D. Clegg	Flight Operator	Jan. 29-30
R. Schultze	Navigator	Jan. 29 , Feb. 3

B. DATA PROCESSING AND REPORT PREPARATION

G. E. White	Geophysicist	Apr. 15, 21-24
D. R. Cochrane	P. Eng.	Apr. 23,24
J. Cerne	Geophysicist	Mar. 27,30,31
N. Dowds	Geophysicist	Mar. 27,30,31
C. Waters	Data Processor	Apr. 1-4
A. Mlcuch	Data Processor	Feb. 16-20, 23,24, Mar.2,3, 4,9
J. Carvajal	Data Processor	Feb. 9,10

C. DRAFTING AND REPRODUCTION

R. Key	Draftsman	Jan. 12-14, Feb. 2,3,4,12,13, 16,27, Mar. 2-4,9,11,13,17,19, 20,24
T. Malesku	Draftsman	Feb. 17, Mar. 18-20,23
B. Roddy	Photo Coordinator	Jan. 6,7, Feb. 2-6,12,16,20, 23-25, Mar. 4-6,9
L. Dobson	Photo Coordinator	Jan. 14,29,30, Mar. 5,6,9,13,23
A. Schampier	Draftsman	Feb. 9,11,18,19,20,26, Mar. 11, 12,13, Apr. 23,24,28
N. W. Bellamy		Apr. 24-28

APPENDIX III

COST BREAKDOWN

The following is a cost breakdown for an Airborne Magnetometer Survey conducted over an area of approximately 42 square miles by Geo-X Surveys Ltd. through an Agreement with Arrow Inter-America Corporation, dated December 31, 1969.

Geo-X Surveys provided the following for an all inclusive price.

(a) Air Photo Mosaic
(b) Aeromagnetic Survey Coverage
(c) Base Map Preparation
(d) Preliminary Data Preparation
(e) Computer Data Processing
(f) Report Preparation

470 line miles at $20.38 per line mile

ALL INCLUSIVE TOTAL PRICE $9,580.00

P. F. Mould, Controller

Declared before me at the City of Vancouver, in the Province of British Columbia, this 16th day of November, 1970, A.D.

Sub-mining Recorder
A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.

APPENDIX IV

INSTRUMENT SPECIFICATIONS

Aircraft

Type and Model:	Excalibur 800 (Beechcraft Twin Bonanza modified by Swearingen Aircraft, San Antonio, Texas)
Power:	Two 400 H.P. Lycoming 10-720-AIA engines.
Gross Weight:	7900 pounds
Empty Weight:	5300 pounds
Useful Load:	2600 pounds
Fuel Capacity:	230 gallons (U.S.)
Performance at 7900 lbs. Gross:	Climb - 1535 feet per minute (at sea level) Cruise - 230 miles per hour. Range - 1200 miles.

APPENDIX IV

SPECIFICATIONS OF THE V-4937A MAGNETOMETER SYSTEM

Performance

Range:	20,000 to 100,000 gamma (worldwide)
Sensitivity:	± 1/2 and ± 1 gamma in any field.
Sampling Rate:	manual and "clock" operation permits any timing sequence.

Power Requirements

22-30 V, 6 amps for magnetometer, 60 watts for analog recorder and 100 watt maximum for digital recorder.

Physical Specifications

Console:	size - 19 x 17 x 24 inches; Weight 68 lbs.
Analog Recorder:	dual channel - 15 x 10 x 10 inches, 30 lbs.
Scanner-coupler:	fucical counter, ident. control, 24 hr. clock, 40 lbs.
Recorder:	size - 14 x 11 x 28 inches; Weight 41 lbs.

Data Output

Digital Recording:	BCD 1-2-4-8 (four line output) "O" state - 18 to -30v through 100K ohms 1 state -1 to +3v through 100k ohms
Print Command:	Positive going 12 to 25v pulse; 15M second.
Auxiliary Channels:	A & B for radio altimeter and navigation equipment.
Analog Recording:	Galvanometric -1 mA full scale into 1500 ohms Potentiometric: 100mV full scale. Minimum load resistance 20K Full scale resolution of the least most significant digits of the total geomagnetic field 0-99, 0-999 at 1 gamma sensitivity; 0-49, 0-499 at 1/2 gamma sensitivity.

APPENDIX IV

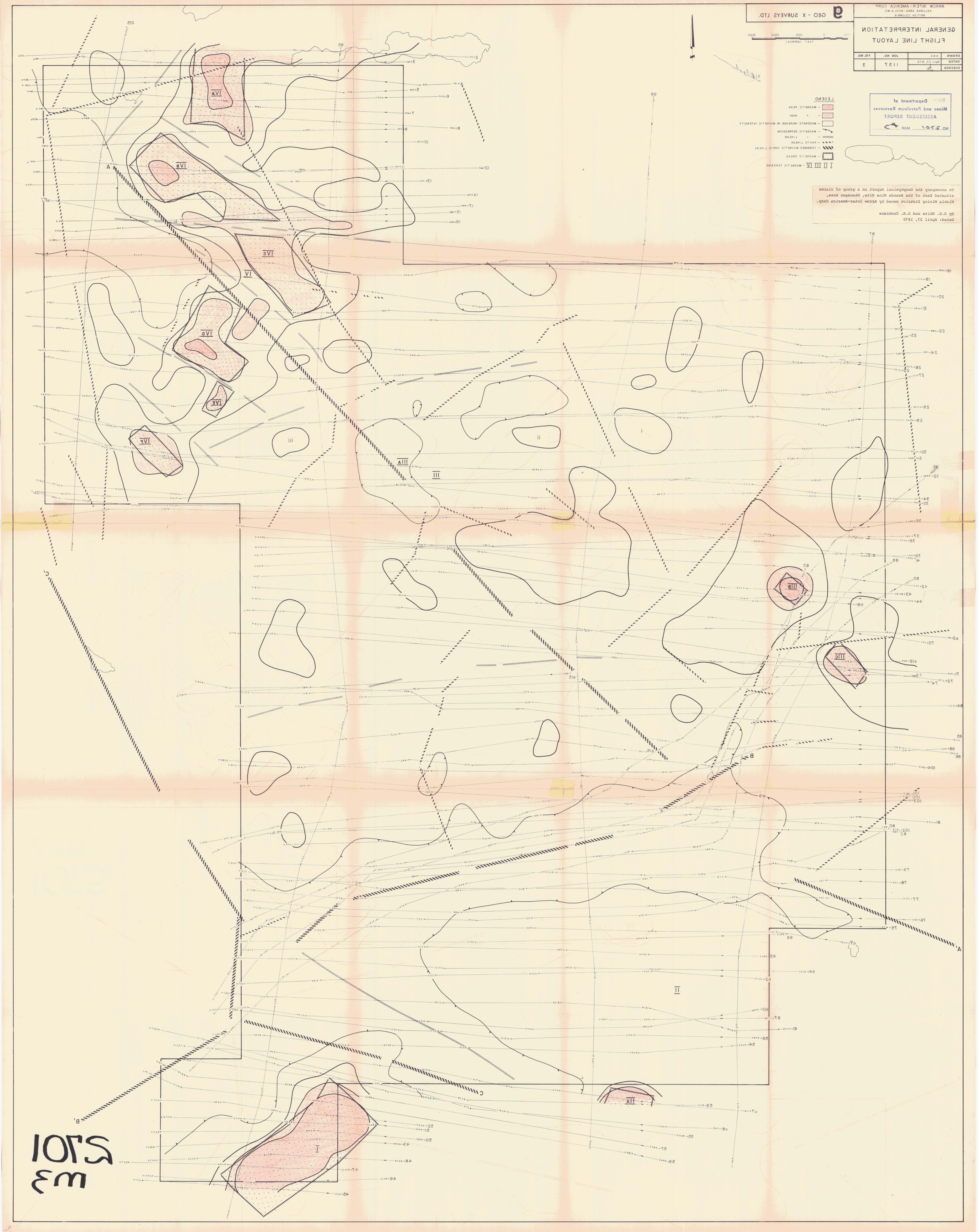
Instrument Specifications

Camera

Type:	Neyhard Automax 35 m.m. pulse camera
Model:	G-2 with auxiliary data box
Pulse Rate:	Up to 10 frames per second
Film Format:	0.738" x 0.738" square picture with 0.200" x 0.738" data area.
Magazine:	Mitchell 400 foot 35 m.m.
Lenses:	(a) 17 m.m. F/14 Super-Takumar Fish-eye (b) 35 m.m. F/2.0 Super Takumar
Data Box:	(a) 24 hour Accutron Clock (b) Frame counter (c) Available for optional feature

Dimensions (less magazine): 8 3/8" high, 4 1/2" deep, 6 1/4" wide.

Weight (less lens and magazine): 12 lbs.


ARROW INTER-AMERICA CORP.
KELOWNA AREA - NICOLA M.D.
BRITISH COLUMBIA
GENERAL INTERPRETATION
FLIGHT LINE LAYOUT
GEO - X SURVEYS LTD.
LEGEND
MAGNETIC PEAK
HIGH
MODERATE INCREASE IN MAGNETIC INTENSITY
MAGNETIC DEPRESSION
LINEAR
PHOTO LINEAR
COMBINED MAGNETIC PHOTO LINEAR
MAGNETIC AREAS
I II III IV VI - MAGNETIC TERRAINS
To accompany the Geophysical Report on a group of claims situated East of the Brenda Mine Site, Okanagan Area, Nicola Mining District owned by Arrow Inter-America Corp.
By G.E. White and D.R. Cochrane
Dated: April 27, 1970
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO 2701 MAP 3
2701
M3


ARROW INTER-AMERICA CORP.
KELOWNA AREA-NICOLA M.D.
BRITISH COLUMBIA
AIRBORNE
ISOMAGNETIC PLAN
CONTOUR INTERVAL : 25 GAMMAS
DRAWN CROSS CAN. COMP.
DATED April 27, 1970
CHECKED
JOB NO. 1137
FIG. NO. 2
GEO - X SURVEYS LTD.
1000 0 1000 2000 3000
FEET (APPROX.)
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2701 MAP #2
To accompany the Geophysical Report on a group of claims
situated East of the Brenda Mine Site, Okanagan Area,
Nicola Mining District owned by Arrow Inter-America Corp.
By G.E. White and D.R. Cochrane
Dated: April 27, 1970
OUTLINE OF AREA
REQUESTED TO BE SURVEYED
2701
m2