32E05NE9309 2.9776 BRADETTE

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INTERPRETATION REPORT

INPUT MK VI ELECTROMAGNETIC/MAGNETIC SURVEY

GOLDROCK RESOURCES INC.

BRADETTE/ST. LAURENT AREA

PROJECT NO. 28037 DECEMBER, 1986

RECEIVED

FEB 1 ? 1987

MINING LANDS SECTION

QUESTOR SURVEYS LIMITED, 6380 VISCOUNT ROAD, MISSISSAUGA, ONTARIO

TABLE OF CONTENTS

32E05NE9309 2.9776 BRADETTE

010C

PAGE

SUMMARY AND RECOMMENDATIONS i

INTRODUCTION 1

PROJECT LOCATION 2

PROPERTY 2

SURVEY OPERATIONS
- Survey Personnel 3
- Instruments 4
- Production 5
- Products 5
- Survey Procedure 6
- Magnetic Diurnal 7

DATA COMPILATION
- Data Recovery 8
- Computer Processing 10

INPUT DATA PRESENTATION 10

INTERPRETATION - GENERAL
- Geological Perspective 12
- Conductivity Analysis 12

INPUT INTERPRETATION 15

APPENDICES

APPENDIX A Barringer/Questor Mark VI INPUT (R) System
APPENDIX B The Survey Aircraft
APPENDIX C INPUT System Characteristics
APPENDIX D INPUT Processing
APPENDIX E INPUT Interpretation Procedures
APPENDIX F INPUT Response Models
APPENDIX G Quantitative Interpretation
APPENDIX H Bibliography

LIST OF FIGURES

Figure 1	Property Location Map	1:250,000
Figure 2	Claim Map	1"=1/2 mile
Figure 3	Airborne Input EM and Total Magnetic Intensity (Sheet 1)	1:20,000
Figure 4	Airborne Input EM (Sheet 1)	1:20,000
Figure 5	Total Magnetic Intensity (Sheet 1)	1:20,000
Figure 6	Calculated Vertical Magnetic Derivative (Sheet 1)	1:20,000

INTRODUCTION

This report details the operation and interpretation of a fixed-wing airborne INPUT electromagnetic and magnetic survey flown for Goldrock Resources Inc. The system used was the Questor/Barringer MK VI, 2 ms, INPUT system. The standard specifications for the INPUT transmitter and receiver are outlined in Appendix A.

The survey was commissioned by Mr. R.S. Middleton of Goldrock Resources Inc. on October 10, 1986. Marcel H. Konings, P.Eng., Geophysicist for Questor, supervised the data compilation and interpretation through to the completion of the project in November, 1986.

The survey objective is the detection and location of base metal sulphide conductors as well as any structures and conductivity patterns which could have a positive influence on gold and base metal exploration.

The primary survey area consists of 270 kilometres of traverse and control lines. These were flown in November, 1986 using LaSarre, Quebec as the survey operations base.

PROJECT LOCATION

The property is located in Bradette and St. Laurent Townships, Ontario. Bradette and St. Laurent Townships are some 90 kilometres north and west of the town of La Sarre, in the Municipalite De Baie James, Quebec and may be reached via the Selbaie road turning off onto the Camp Dieppe road. Numerous logging roads approach the property and further access may be gained via the Turgeon River as well as by helicopter from La Sarre or Cochrane, Ontario some 100 kilometress southwest of the property.

PROPERTY

The property consists of 60 claims in Bradette and 71 claims in St. Laurent Townships, Ontario for a total of 131 claims, (Figures 2 and 3).

Bradette Township

Claim Number	No.	Expiry Date
864709-864713	5	January 23, 1989
864714-864721	8	December 31, 1988
864722-864723	2	January 23, 1989
864724-864728	5	December 31, 1988
864738-864747	10	December 31, 1988
876951-876958	8	December 18, 1988
876959-876962	4	December 27, 1988
876968-876970	3	December 27, 1988
876971-876976	6	December 18, 1988
879754-879762	9	January 23, 1989
	60	

St. Laurent Township

Claim Numbers	No.	Expiry Date
864748-864749	2	January 10, 1989
876963-876965	3	December 27, 1988
876966-876967	2	February 7, 1989
876977-876983	7	February 7, 1989
877001-877004	4	January 23, 1989
877005	1	January 10, 1989
877006-877012	7	January 23, 1989
877016-877030	15	February 25, 1989
877276-877283	8	January 10, 1989
877288-877290	3	January 30, 1989
877295-877297	3	January 30, 1989
877702-877704	3	January 30, 1989
877709-877719	11	January 30, 1989
880473-880474	2	February 11, 1989
	71	

The claims have been transferred into Glen Auden Resources Limited's name and are being held in trust for Goldrock Resources Inc.

The relationship of this property to recent discoveries and other current exploration projects in the area having potential for finding economic deposits of precious and base metals is shown on the Casa Berardi Gold Area Property Location Map, Figure 1.

3c. Production

The flight line spacing over the block was 125 metres. Table 1 summarizes the kilometres flown during the survey operation.

Table 1

Traverse Lines........................253km.

Control Lines......................... 17 km.

Total Lines...........................270km.

The survey was completed in three production flights. No days were lost during the survey.

Table 2 summarizes the production during the survey operations:

Table 2

FLT. NO.	PRODUCTION BLOCK	NON PRODUCTION WX	EQPT	SFERICS	MAG	COMMENTS
149	X					
150	X	X				
151	X					

WX -bad weather

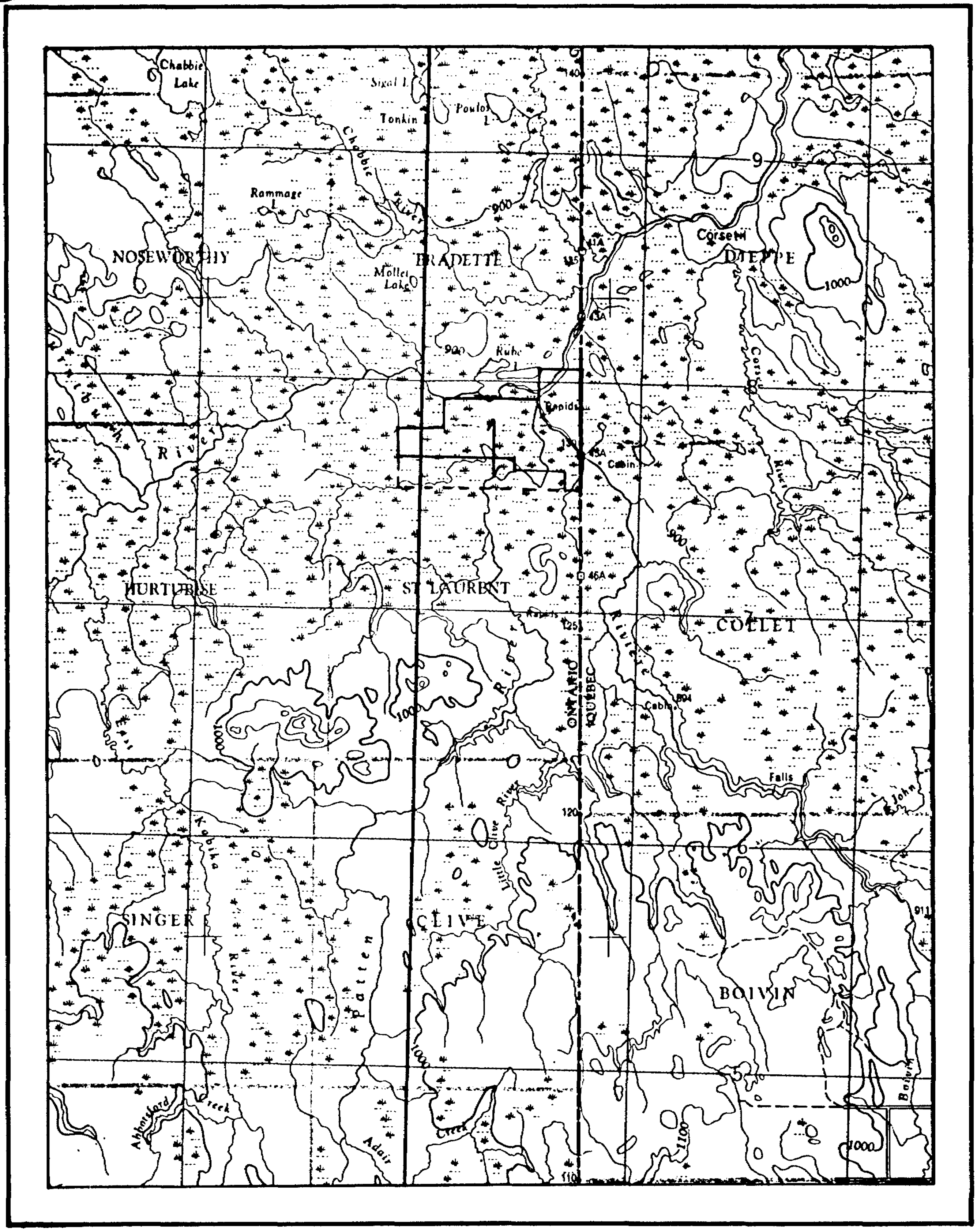
EQPT -survey equipment unserviceable

SFERICS -atmospheric noise (tweaks)

MAG -magnetic storm

3d. Products

The products delivered by Questor to Goldrock Resources Inc., together with four copies of this report:



SURVEY LOCATION MAP

Scale 1: 250000

5 0 10 Kilometres

Figure

3. SURVEY OPERATIONS

3a. Survey Personnel

The survey crew was made up of experienced Questor employees:

Crew Manager/Data Technician	- Ken Sherk
Pilot/Captain of Aircraft	- Wayne Swantek
Co-pilot/Navigator	- Terry McConnell
Equipment Technician	- Ron Kasper
Aircraft Engineer	- Pat Melen

The flight path recovery was completed at the survey base, while the final data compilation and drafting was carried out by Questor at its Mississauga, Ontario office. The magnetic and electromagnetic processing was carried out using Questor software and computer drafted. The INPUT interpretation and report was completed by Marcel H. Konings, P.Eng.

3b. Instruments

A, Short Skyvan, C-GDRG, equipped with the following instruments was used for the survey:

1. Mark VI INPUT Electromagnetic System;
2. Geometrics G-813 Proton Magnetometer (1 gamma sensitivity);
3. Sonotek SDS 1200 Data Acquisition System;
4. RMS GR33 Analogue Recorder;
5. 35mm Camera, Intervalometer and Fiducial System;
6. Sperry Radar Altimeter.

A Geometrics G-816 Base Magnetometer was used to monitor the diurnal magnetic changes.

The equipment, such as the INPUT system, magnetometer and radar altimeter were regularly calibrated at the beginning and end of each survey flight as well as in mid-flight, whenever necessary. Details of the calibration procedures are given in Appendix C.

The continuous chart speed of the RMS recorder was set at 15 cm./minute.

3c. Production

The flight line spacing over the block was 125 metres. Table 1 summarizes the kilometres flown during the survey operation.

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149	x						
150	x		x				
151	x						

WX - bad weather
EQPT - survey equipment unserviceable
SFERICS - atmospheric noise (tweaks)
MAG - magnetic storm

3d. Products

The products delivered by Questor to Glen Auden Resources Ltd., together with four copies of the report:

1. one unscreened master photo mosaic, scale 1:20,000;
2. one master photo mosaic with electromagnetic and magnetometer information and interpretation shown thereon, scale 1:20,000;
3. one magnetic overlay, scale 1:20,000;
4. one magnetic first derivative overlay, scale 1:20,000
5. four white prints of (2);
6. one computer plot of the electromagnetic and magnetometer flight analogues, scale 1:20,000;
7. one copy of colour contoured magnetics , scale 1:20,000;
8. one copy of colour contoured magnetic first derivative, scale 1:20,000;
9. the negative of the flight path film;
10. anomaly data sheets;
11. the flight logs.

3e. Survey Procedure

During the survey, the aircraft maintained a terrain clearance as close to 122 metres as possible, with the receiver coil (bird) at approximately 55 metres above the ground surface. In areas of substantial topographic relief and large population, the aircraft height may exceed 122 metres for safety reasons. The height of the bird above the ground is also influenced by the aircraft's air speed (see figure C1 in Appendix C), which was maintained at 110 to 120 knots, while on survey.

Whenever possible, the traverse lines were flown in alternate flight directions (e.g., north then south) to facilitate the interpretation of dipping conductors. When the traverse line spacing exceeded twice the normal spacing interval over a 2.2 kilometre distance, the gap is normally filled with an appropriately spaced fill-in line at a later date.

The details of each production flight are documented on the flight logs by the equipment technician. The logs include the survey times, line numbers and fiducial intervals, as well as a record of equipment irregularities and atmospheric conditions. One may refer to these logs in order to relate the flight path film to the geophysical data.

During the course of the survey the following data were recorded:

1. INPUT Electromagnetic results represented by six channels of successively increasing time delays after cessation of the exciting pulse (Appendix A);
2. a record of the terrain clearance as provided by radar altimeter;
3. a photographic record of the terrain passing below the aircraft as obtained from a 35 mm. camera;
4. time markers impressed synchronously on the photographic and geophysical records to facilitate accurate positioning on photomosaics;
5. airborne magnetometer data;
6. ground base station magnetometer data.

3f. Magnetic Diurnal

Diurnal variations in the earth's magnetic field had been recorded to an accuracy of ± 1 nT using a base station equipped with a Geometrics G-816 Proton Precession Magnetometer. It was monitored periodically during the day for severe diurnal changes (magnetic storms). A variation of 20 nT over a 5 minute time period was considered to be a magnetic storm. During such an event, the survey would normally have been discontinued or postponed and the survey data would have been scrubbed.

The base station magnetometer was set up at LaSarre, Quebec.

4. DATA COMPILATION

4a. Data Recovery

The flight path of the aircraft is recorded by a strip camera on black and white, 125ASA, 35mm. film which is exposed continuously during flight at a rate of 5 mm/sec. The apperture setting on the camera can be manually adjusted by the operator during flight, assuring the proper exposure of the film. The camera is fitted with a wide angle 18 mm. lens. Fiducial numbers are imprinted on the film, marked onto the analogue records and recorded digitally at the same instant.

The flight line headings are opposite on adjacent lines, which are normally flown sequentially in an "S" pattern. The navigation references are flight strips at a scale of 1:20,000 which are made from the base maps. The equipment operator enters the flight details information into the digital data system which are recorded and verified (read-after-write). The information includes line number, time, fiducial range and other pertinent flight information. This information is compared to the film, analogue records and the magnetic base station recording at the completion of the survey flight.

The film and all records are developed, edited and checked at the completion of each flight. Recovery of the flight track is carried out by comparing the negative of the 35mm. film to the topographic features of the base map. Coincident features are average interval of 1 kilometre. This corresponds to one whole fiducial unit or 20 seconds. The picked points will not necessarily fall on whole fiducial numbers, but on the final presentation, only the first and last whole fiducial numbers on a line are marked on each flight line. By interpolation, the whole numbers are marked as ticks along the flight path.

These procedures are performed on the survey site daily by the data technician so that the data quality and progress may be measured objectively. Reflights for covering navigational gaps and other deficiencies are usually flown on the following day.

The analogue records are inspected for coherence with specifications, and anomalies are selected for classification and plotting. Selected anomalous conductors are positioned by plotting their fiducial positions, less the lag factor (Appendix C). These resultant positions are located by interpolating between fiducial points established by the flight path recovery process.

The survey results are presented as an INPUT anomaly map with interpretation and a magnetic contour overlay. The following chapters describe the interpretation of INPUT results and present recommendations for ground follow-up surveys. A colour presentation of the magnetic contours was included.

4b. Computer Processing

The completed flight path is accurately digitized on a flat-bed digitizer at Questor using the picked point co-ordinates. The recovery is then routinely verified by a computer programme 'speed check', which flags any abnormalities in the distance per fiducial unit between picked points on a traverse line. As a final check, the rough magnetic contour maps are examined for contour irregularities that could be attributed to recovery errors.

5. INPUT DATA PRESENTATION

The base maps for the survey area are photomosaics constructed from 1:50,000 air photographs supplied by Ontario Ministry of National Resources and taken in 1978. The photomosaic was used to construct the navigation flight strips and also the base onto which the flight path was recovered. The mosaics are uncontrolled at a scale of 1:20,000.

The INPUT anomaly map presents the information extracted from the analogue records. This consists chiefly of the peak anomaly positions and response characteristics, surficial responses, up-dip responses, and magnetic anomaly locations. In effect, these represent the primary data analysis. The symbols are explained in the map legend, but the following observations are presented:

- position of peak anomaly;
- conductance or conductivity-thickness;
- amplitude of channel 2 response;
- position and peak amplitude of associated magnetic anomalies;
- where present, surficial, up-dip and poorly defined responses have been identified with a unique symbol.

The interpretation maps outline the geophysical-geological interpretation of the INPUT electromagnetic, magnetic, geological and physiographic data. Bedrock conductors have axis locations and dip directions, when they are interpretable. The anomalous zones which are recommended for follow-up have a reference label assigned, to which additional comments and recommendations are directed in the Interpretation Section of this report. Surficial response sources are mapped out by boundaries showing their interpreted lateral extent. The following list summarizes the interpretation presentation:

- bedrock conductor axis, probable and possible;
- conductor dip;
- surficial conductor outlines;
- anomalous conductors selected for ground evaluation with reference number.

6. INTERPRETATION - GENERAL

6a. Geological Perspective

The survey area is located in the western end of a major volcanic belt extending westward from Quebec. This part of the Abitibi belt contains mostly felsic to intermediate metavolcanics metamorphosed to greenschist and amphibolite facies. The area has been mapped by G.W. Johns in 1982 and documented in OGS Report 199. He suggests that the survey block is located within a volcanic pile which forms a domed feature. Although local folds have been suggested cutting across the felsics, this sequence appears to form a normal north facing pile with mafic volcanics to the south and metasediments dominating the lithology north of Bradette Township.

Drilling and outcrop mapping have established that volcanic sediments (tuffs and lapilli tuffs) dominate the lithology with flows being a very minor component. South of Rube Lake, very little mineralization has been established by previous drilling, while the northern part of the unit has been extensively explored and drilled.

6b. Conductivity Analysis

The conductivity-thickness products of planar horizontal, and thin steeply dipping conductors are proportional to the time constant of the secondary field electromagnetic transient decay. This transient may be closely approximated by an exponential function for which the conductivity-thickness product (TCP) is inversely proportional to the log of the difference of two channel amplitudes at their respective sample times.

These response functions are presented in the form of graphs in which the amplitudes of the 6 channels of INPUT response are plotted on a logarithmic scale against conductivity. The relative amplitudes of the secondary response, at any given conductivity, may be accurately related to the depth of a conductor below the surface. These are typically referred to as Palacky nomograms. These are available for a number of conductor geometries. It has been found that the shape of the decay transient and its amplitude is usually unique to a particular geometry. Therefore, if the origin of a conductive response is in question, a good "fit" of the peak response amplitude to one nomogram will define its origin.

The 90° nomogram was utilized exclusively to determine the apparent conductances of the responses obtained from the survey. This procedure is valid for near vertical conductors, within a dip range of $45\text{-}135^{\circ}$, relative to the aircraft flight direction.

Although the conductor depth can be interpreted from nomograms, the short strike lengths and the variability of conductor geometry may result in the over-estimation of depths. The INPUT system depth capability is well characterized for a vertical, 200 metres and 600 by 300 metres strike and depth extent target. The effective penetration depth increases for a dipping target and decreases for a smaller size conductor.

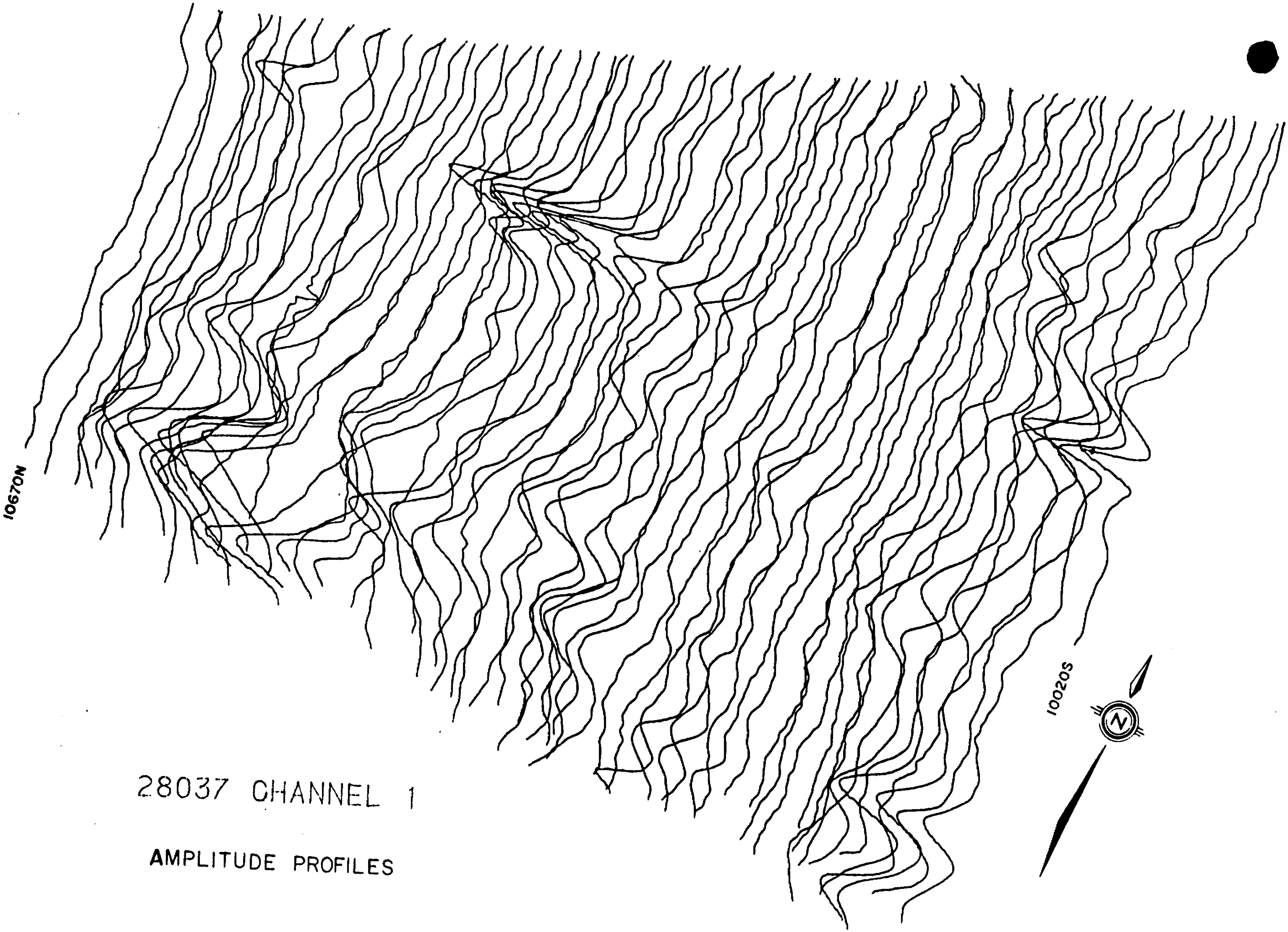
Depths were only determined for responses which appear to fit the interpretation model - a thin near vertical plate with a strike length of greater than 500 metres. Qualifications for these determinations are summarized in the interpretation section.

The depths for 5 and 6 channel anomalies were corrected for the interpreted conductor strike intersection relative to the line direction and the effects of aircraft altitude deviations from a flight altitude of 120 metres.

An anomaly listing at the back of this report summarizes each anomalous response in a numerical sequence. In addition to the standard anomaly parameters, an "anomaly type" classification has been added. The letters correlate with the plotted symbols according to the following table.

ANOMALY TYPE	RESPONSE SOURCE	SYMBOL
BLANK	bedrock conductors	circular
S	surficial (overburden or lakebottom) conductivity	diamond
U	up-dip accessory peak to main response	half circular, half diamond, symbolically "pointing" in dip direction
P	poorly defined response	asterisk "*" in lower left quadrant
C	cultural source	square

The "P" poorly defined response may not yield signatures diagnostic of a discrete bedrock anomaly to standard electromagnetic prospecting equipment. Interpreted axis locations may be approximate for these intercepts.



28037 CHANNEL 1

AMPLITUDE PROFILES

7. INPUT INTERPRETATION

The E.M./magnetic survey covered a segment of the Burntbush greenstone belt which has not received extensive previous evaluations. In addition to the strong conductors on which past exploration had focussed, many weak (previously undetected) conductors were interpreted. Only one conductor has been explored by drilling. The 38B Conductor was drilled "down-dip" into tuff-argillite rocks with minor disseminated pyrite.

The southern part of the survey area is covered by a weak but persistent overburden which trends parallel or subparallel to the magnetically inferred bedrock lithology. Although bedrock conductors have been interpreted for some of the narrower responses, these could have origins as bedrock troughs filled with a thin conductive layer.

The bedrock conductors with "base metal" characteristics within the claim block have already been explored. However, there are several conductors outside of the survey area which may have been overlooked during previous exploration efforts. These are summarized on the following pages. The reference number is a combination of both the line number and the sequential peak response letter which identifies the anomaly on the analogue records.

Weak bedrock conductors (one or two channels) cannot be quantitatively interpreted. Where they are continuous and parallel to the regional lithology, these are delineated by a dotted axis. These horizons are referenced by letters and are summarized below.

A - on strike with 58B
  - coincident with 5nT magnetic peak axis

B - south of 42D
  - inconsistent low amplitude magnetic coincidence peaks
  - 10420E and 10411D are definite bedrock responses

C - north of "A", along felsic-mafic contact
  - systematic amplitude variation with flight line direction infers bedrock origin

D - between A and C horizons, along north claim boundary
  - minor magnetic coincidence
  - best responses are 10360B, 10320B, 10330F

E - generally broad responses, possibly a bedrock trough
  - 10nT magnetic coincidence

F - a pair of responses with a direct magnetic coincidence

G - south of the northeast claim corner
  - extends into Quebec
  - best response is 10030F

CONDUCTOR 3D Priority 3

Line	10030N
Terrain Clearance	105 m.
Dip	N85°
Strike Intersection	90°
Strike Length	1000 m.
Conductance	4-5S
Depth	0-10 m.
Magnetic Correlation	5nT
Related Responses	10010B, 10040C, 10050D, 10060B, 10070E, 10081B, 10090C, 10100C, 10111B, 10120D
Geology	felsic tuff and pyroclastic breccia

This zone is an eastward strike extension of ZONE 38B. The responses are consistently uniform in decay rate (conductance) and it dips steeply northward. Although this is a departure from regional structure, it matches the geological interpretation of a synform axis passing south of Rube Lake. This conductor extends into Quebec, but has not been included in compilations on sheets 32E6-401 or 32E6-301.

Graphite, with minor sulphides, is the probable explanation for the conductive responses. The depths may have been underestimated due to the effects of current gathering. The wide profile shapes substantiate this conclusion.

CONDUCTOR 4E — Priority 2

Line	10040S
Terrain Clearance	109 m.
Dip	90^{o}
Strike Intersection	90^{o}
Strike Length	700 m.
Conductance	25S
Depth	-
Magnetic Correlation	-
Related Responses	10030B, 10040E, 10050B, 10060E, 10070B, 10081D, 10090A
Geology	mafic flows and breccias

The location of this conductor is immediately south of the Glen Auden claim boundary, but it has sufficient qualities to warrant property acquisition. Although located within mafic volcanics, it is very close to a contact with felsic volcanics. A small outcrop of felsic intrusive has been mapped a short distance to the south. The conductor extends westward to an interpreted magnetic break and eastward into Quebec. It has not been recognized in public compilations.

The responses are broad and fast decaying. Current gathering from overlying surficial sediments in electrical contact may have artificially amplified the results.

CONDUCTOR 23A		Priority 1
Line	10230A	
Terrain Clearance	111 m.	
Dip	90°?	
Strike Intersection	90°	
Strike Length	200 m.	
Conductance	11S	
Depth	0 m.	
Magnetic Correlation	25nT	
Related Responses	-	
Geology	mafic flows	

Similar to Conductor 4E, ZONE 23A is located off the survey area, but represents an opportunity as it may not have been previously detected. A local magnetic anomaly strikes to the northeast but may be unrelated to the conductivity. The conductor may extend to line 10220S but not to 10240S. A northward dip would increase the depth to approximately 15 m.

A local massive sulphide target is the conductor explanation. Graphitic sediments are seldom so strike limited that a small lens of massive sulphide is a probable source.

CONDUCTOR 42D | Priority 2

Line	10420S
Terrain Clearance	130 m.
Dip	90°
Strike Intersection	90°
Strike Length	600 m.
Conductance	9S
Depth	0 m.
Magnetic Correlation	-
Related Responses	10380C, 10400B, 10411E, 10430F, 10440E, 10450D, 10461B
Geology	felsic to intermediate tuff

ZONE 42D is part of a claim block previously evaluated by Rio Algom, but may not have been previously drill tested. In amplitude and conductance, responses are weaker, but share the line-to-line consistency of 38B. The lower conductance can be correlated with thinner and less massive graphite content.

CONDUCTOR 58B Priority 2

Line	10580S
Terrain Clearance	125 m.
Dip	85^{O}S
Strike Intersection	90^{O}
Strike Length	250 m.
Conductance	11S
Depth	15-35 m.
Magnetic Correlation	-
Related Responses	10570D, 10580CB, 10590CD, 10600B
Geology	felsic volcanic tuffs

Two conductive horizons form this zone, a "main horizon" and an accessory, 100 metres to the south. The conductor is isolated from formational conductors, and lies just outside of the claim boundaries. The strike of this zone is oblique to magnetic and geological trends. No previous work has been documented.

8. CONCLUSIONS AND RECOMMENDATIONS

The INPUT survey located a number of targets which may not have seen extensive exploration efforts in the past. Although a number of these are outside of the claim boundaries, they are in attractive geological environments.

At least seven very weak conductors may have a bedrock source. They appear to be on unique lithological horizons and some appear to have weak but direct magnetic coincidences.

Conductive surficial overburden is a problem only along the southern boundary. Weak conductors may be present under these units and these axes are marked.

Ground follow-up should utilize methods capable of clearly identifying weak bedrock troughs with conductive infilling (horizontal strip conductors) from weak, near vertical bedrock conductors.

Respectfully submitted,

QUESTOR SURVEYS LIMITED,

Marcel H. Konings, P.Eng.,
Chief Geophysicist

APPENDIX A

BARRINGER/QUESTOR MARK VI INPUT(R) AIRBORNE ELECTROMAGNETIC SYSTEM

INPUT (INduced PUlse Transient) is a time domain airborne electromagnetic survey system which has been used for over two million kilometres of survey, accounting for over 70 percent of all airborne electromagnetic (A.E.M.) flown world-wide.

The INPUT apparatus consists of a vertical axis transmitting loop surrounding the aircraft, a towed 'bird' containing a horizontal axis receiving coil oriented parallel with the direction of flight, and inboard electronics which control the system timing as well as performing the required signal processing and recording. Electric current pulses are applied to the transmitter coil in alternating polarity directions (Figure A2). The resultant electromagnetic field induces eddy currents in conductive terrestrial materials which in turn generate secondary, time varying, magnetic fields which induce electrical currents in the receiver coil. The decaying secondary magnetic field is repeatedly detected and measured by the receiver coil during the intervals when no current is circulating through the transmitting loop, ie: in the absence of the primary electromagnetic field. This measurement technique achieves a high signal-to-noise ratio.

The time-amplitude relationship of the transient secondary field is controlled by the conductor dimensions, conductivity, orientation, and position, or distance relative to the INPUT system. Terrestrial materials which have a higher conductivity-thickness demonstrate a longer secondary field decay persistence. This physical quality is often associated with massive sulphides as well as with graphite. In comparison, horizontally layered surficial conductive materials usually exhibit a more rapid secondary field decay. A quantitative evaluation of the conductance of an INPUT anomaly can therefore be made by a comparison of the associated secondary field decay with an empirically-derived standard. For purposes of decay-time analysis and conductance evaluation, the secondary field is sampled over six consecutive and discrete time intervals (Figure A3). The average value of the secondary field during each of these intervals is averaged over a number of measurement cycles, and the resultant running-average value for each time-channel is systematically recorded in analogue and digital formats.

INPUT System Characteristics

The INPUT receiver sensor is towed approximately 93 metres behind and 68 metres below the aircraft at a survey airspeed of 110 knots. The actual position of the bird is dependent on the airspeed of the survey aircraft, as can be seen in Figure A1. For the Trislander, Skyvan and DC-3 aircrafts, airspeeds average 110 knots.

EFFECT OF AIR SPEED ON BIRD POSITION

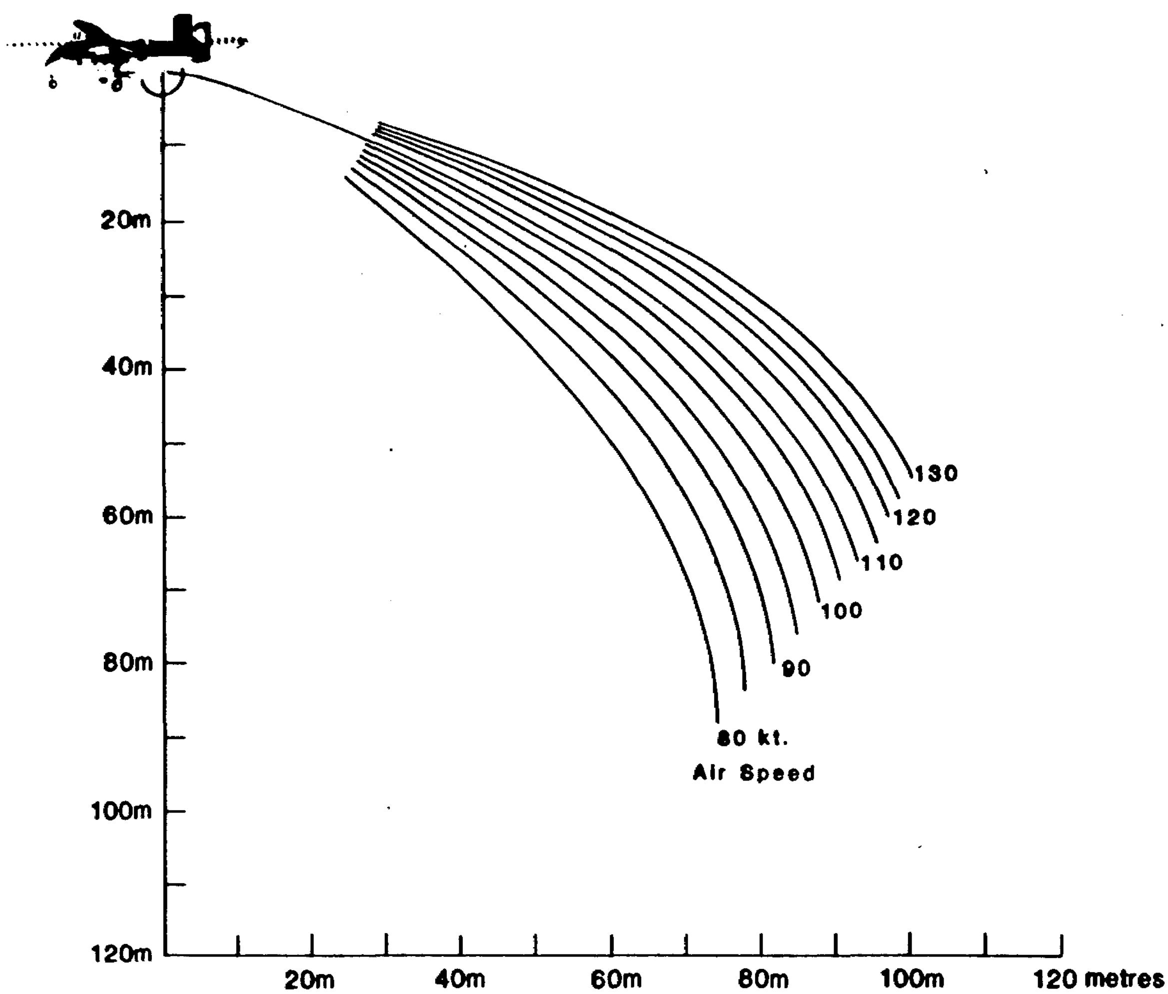


Figure A1

INPUT TRANSMITTER SPECIFICATIONS

Pulse Repetition Rate	180 pps.
Pulse Shape	half-sine
Pulse Width	2.0 ms.
Off Time	3.56 ms.
Output Voltage	75 V.
Output Current	240 A.
Output Current Average	54 A.
Coil Area	186 $m.^2$
Coil Turns	6
Electromagnetic Field Strength (peak)	267,840 amp-turn-$meter^2$

INPUT SIGNAL

TRANSMITTED PRIMARY FIELD

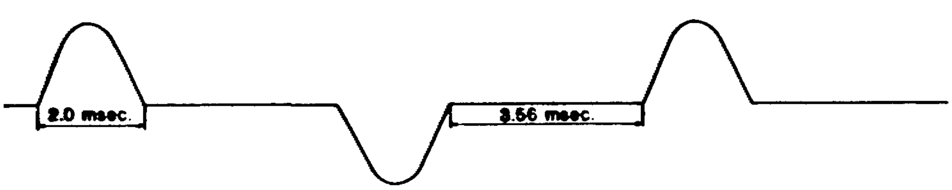


Figure A2

INPUT RECEIVER SPECIFICATIONS

Sample Gate	Windows (centre positions)	Widths
CH 1	300 µsec.	200 µsec.
CH 2	500	200
CH 3	800	400
CH 4	1200	400
CH 5	1700	600
CH 6	2300	600

Integration Time Constant 1.2 sec.

Receiver Features: Power Monitor 50 or 60 Hz

50 or 60 Hz (and harmonic) Filter

VLF Rejection Filter

Spheric Rejection (tweak) Filter

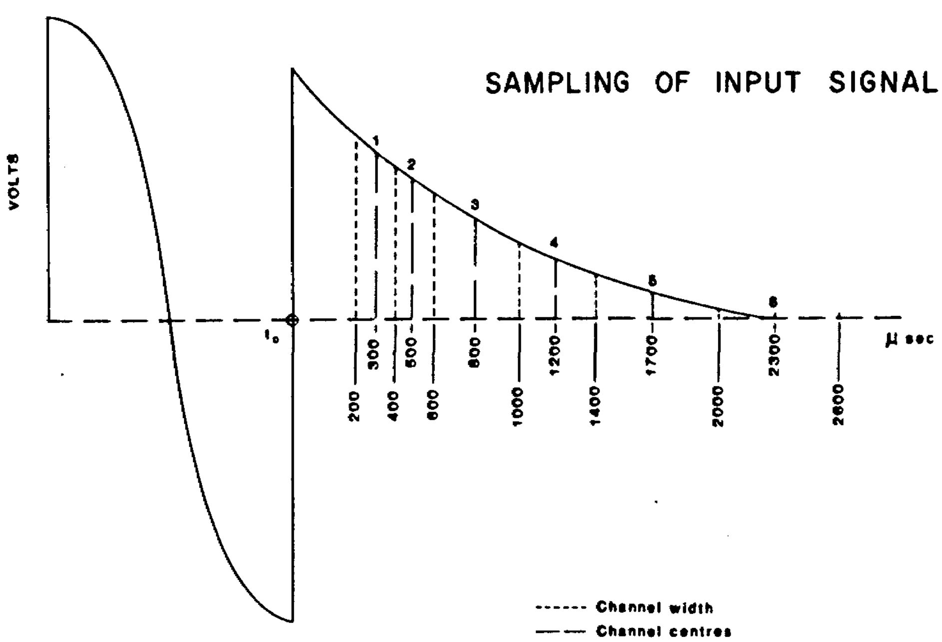


Figure A3

DATA ACQUISITION SYSTEM

Sonotek SDS 1200

Includes time base Intervalometer, Fiducial System

CAMERA

Geocam 75 SF

35 mm continuous strip or frame

TAPE DRIVE

DIGIDATA MODEL 1139

9 TRACK 800 BBI ASCII

OSCILLOSCOPE

Tektronix Model 305

ANALOGUE RECORDER

RMS GR-33

Heat Sensitive Paper (33cm)

Recording 10 Channels: 50-60 Hz Monitor, 6 INPUT Channels, fine and coarse Magnetics and Altimeter. Also, time, fiducial numbers, latitude and longitude (optional), timing lines, centimetre spaced vertical scale marks and line numbers are imprinted on the paper.

ALTIMETER

Sperry Radar Altimeter

GEOMETRICS MODEL G-813 PROTON MAGNETOMETER

The airborne magnetometer is a proton free precession sensor which operates on the principle of nuclear magnetic resonance to produce a measurement of the total magnetic intensity. It has a sensitivity of 0.1 gamma and an operating range of 17,000 gammas to 95,000 gammas. The G-813 incorporates fully automatic tuning over its entire range with manual selection of the ambient field starting point for quick startup. The instrument can accurately track field changes exceeding 5,000 nT and for this survey has an absolute accuracy of 0.5 nT at a 1 second sample rate. The sensor is a solenoid type, oriented to optimize results in a low ambient magnetic field. The sensor housing is mounted on the tip of the tail boom supporting the INPUT transmitter cable loop. A 3 term compensating coil and perma-allow strips are adjusted to counteract the effects of permanent and induced magnetic fields in the aircraft.

Because of the high intensity electromagnetic field produced by the INPUT transmitter, the magnetometer and INPUT results are sampled on a time share basis. The magnetometer head is energized while the transmitter is on, but the read-out is obtained during a short period when the transmitter is off. Using this technique the sensor head is energized for 0.80 seconds and subsequently the precession frequency is recorded and converted to gammas during the following 0.20 second when no current pulses are induced into the transmitter coil.

APPENDIX B

THE SURVEY AIRCRAFT

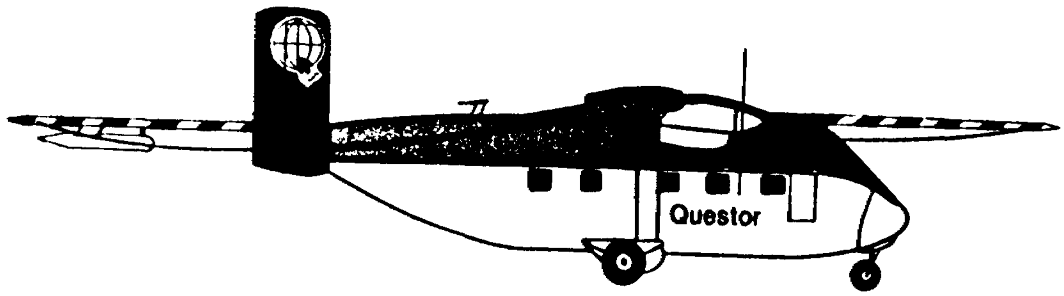


Figure B1

Manufacturer	Short Brothers Ltd.,
Type	SHORT SKYVAN
Model	SH-7 Series 3
Canadian Registration	C-GDRG
Dat of INPUT Installation	October 1981

Modifications:

1) Nose, tail and wing booms for coil mounting;
2) Long range cabin fuel tank: 8 hours of air time;
3) Winch, camera and altimeter ports;
4) Sperry C-12 navigational system;
5) Doppler navigationsal system (optional);
6) Capable of spectrometry;
7) Modified hydraulic driven generator system.

The SKYVAN is a short take-off and landing aircraft. It is powered by two low maintenance turbine engines. The configuration of the aircraft provides for easy installation of equipment and extra fuel capability. These factors have made the SKYVAN a reliable and efficient geophysical survey aircraft.

APPENDIX C

CALIBRATION OF THE SURVEY EQUIPMENT

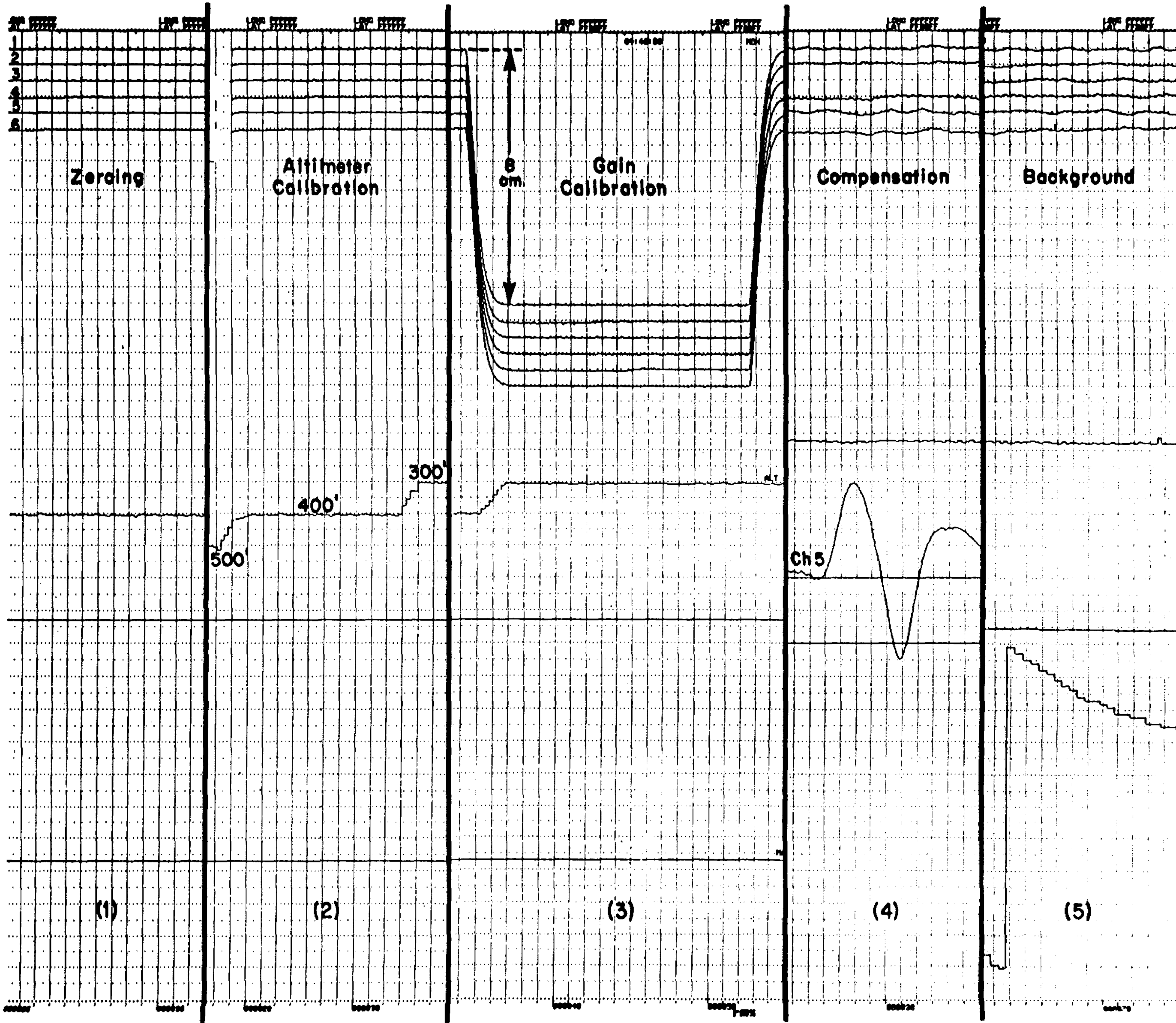
The major advance made during the transition from the INPUT MK V to the MK VI Model has been the ability to calibrate the equipment accurately and consistently.

At the beginning of each survey flight, the calibration of the survey equipment is performed by the following tests:

1) zero the 6 channel levels;
2) altimeter calibration;
3) calibration of INPUT receiver gain;
4) aircraft compensation;
5) record background E.M. levels at 600m;

This sequence of tests are recorded on the analogue records and may be repeated in midflight given that the duration of the flight is sufficiently long (Figure C1). At the termination of every flight, the calibration of the equipment is checked and recorded for any drift that may have occurred during the flight.

Channels 1 to 6 are zeroed on the analogue record by first placing the INPUT receiver into calibration mode, which isolates the receiver from any bird signal. Then, the channels are adjusted so that they are evenly spaced 5mm. apart with channel 6 positioned on the first half cm. line at the top of the record.


1
2
3
4
5
6
Zeroing
Altimeter Calibration
8 cm.
Gain Calibration
Compensation
Background
300'
400'
500'
Ch5
(1)
(2)
(3)
(4)
(5)

(Figure C1)

The magnetic data is recorded on two scales, a fine and a coarse scale. The two scales are permanently set so that a full scale deflection of 100 nanoTeslas is equivalent to 10 cm. on the fine scale and a shift of 2 cm. indicates a 1000 nanoTesla change on the coarse scale.

The aircraft altimeter is calibrated so that an altitude of 122 m. is positioned at the centre of the analogue records, on the 15 cm. line. This is the nominal flying height of INPUT surveys, wherever relief and aircraft performance are not limiting factors. A cm. above the 122 m. level corresponds to an altitude of 153 m. and a cm. below correlates with 91 m. in altitude.

The INPUT receiver gain is expressed in parts per million of the primary field amplitude at the receiver coil. At the 'bird', the primary field strength is maintained at 1.05 volts peak. The gain of the receiver is calibrated by introducing a calibration signal at the input stage of 4.0 mV. This signal should cause an 8 cm. deflection on all 6 traces, which translates to a sensitivity of:

$$((4 \times 10^{-3} \text{ volts}/1.05 \text{ volts})/8 \text{ cm}) \times 10^{6} \text{ ppm} = 475 \text{ ppm/cm}$$

In most towed-receiver airborne E.M. systems, variations in the position of the receiving coil 'bird' in relation to the aircraft generates a source of noise and needs to be taken account of before every survey flight is initiated.

The noise is the result of spurious eddy currents in the frame of the aircraft, which have been induced by the primary electromagnetic field of the INPUT system.

Compensation is the technique by which the effects of the noise are minimized. A reference signal obtained from the primary field at the receiver coil is utilized to compensate each channel of the receiver for coupling differences caused by bird motion relative to the aircraft. This signal is proportional to the inverse cube of the distance between the bird and aircraft.

Compensation procedures are carried out at an altitude of 600 metres in order to eliminate the influence of external geological and cultural noise. Coupling changes are induced by pitching the aircraft up and down to promote bird motion. The gain of channel 5 is increased to dramatize the effect of the bird swing. The compensation circuitry is then appropriately tuned to minimize the effect of bird motion on the remaining channels. Phase considerations of channel 5 relative to the other channels dictates whether sufficient compensation has been applied. If the channels are in-phase with channel 5 during this procedure, an over-compensated situation is indicated, whereas, out-of-phase would be indicative of an under-compensation case.

The background levels of the E.M. channels are recorded at the 600 metre altitude. They are used to determine the drift that may occur in the E.M. channels during the progression of a survey flight. If drift has occurred, the E.M. channels are brought back to a levelled position by use of the linear interpolation technique during the data processing.

TIME CONSTANT OF THE INPUT SYSTEM

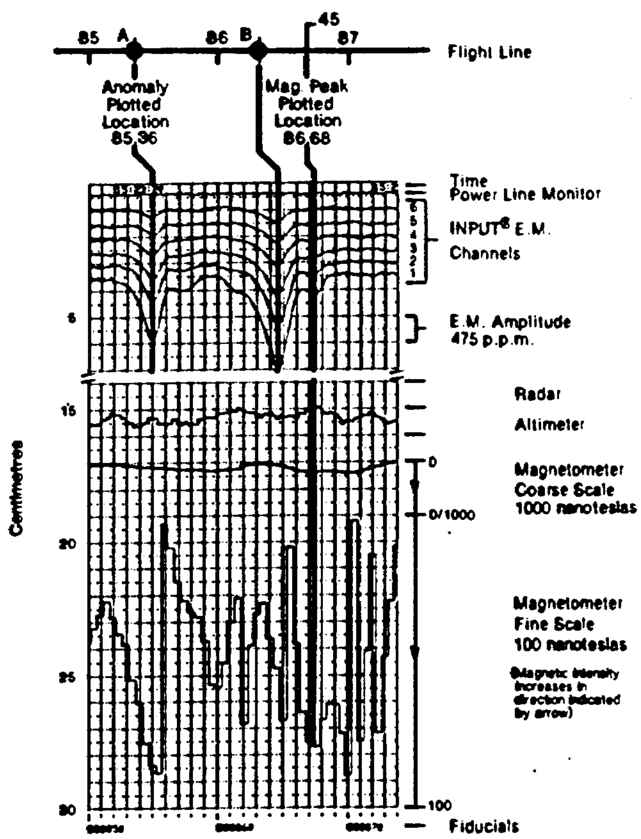
The time constant, is defined as the time for a receiver signal (voltage) to build up or decay to 63.2% of its final or initial value. A longer time constant reduces background noise but also has the effect of reducing the amplitude of a signal as well as the resolution of the system. A time constant of 1.1 sec. has been found to be the optimum value.

The time constant is periodically verified for continuity. It can be measured from the exponential rise or decay of the calibration signal, recorded during the calibration of the receiver gain (figure C1,(3)).

THE LAG FACTOR

The bird's spatial position, along with the time constant of the system, introduces a lag factor (Figure C2) or shift of the response past the actual conductor axis in the direction of the flight line. This is due to fiducial markers being generated and imprinted on the film in real time and then merged with E.M. data which has been delayed due to the two aforementioned parameters. This lag factor necessitates that the receiver response be normalized back to the aircraft's position for the map compilation process. The lag factor can be calculated by considering it in terms of time, plus the elapsed distance of the proposed shift and is given by:

$$\text{Lag (seconds)} = \text{time constant} + \frac{\text{bird lag (metres)}}{\text{ground speed (metres/sec)}}$$



The time constant of the system introduces a 1.1 second lag while, at an aircraft velocity of 110 knots, the 'bird' lag is 1.7 seconds. The total lag factor which is to be applied to the INPUT E.M. data at 110 knots is 2.8 seconds (1.4 fiducials). It must be noted that these two parameters vary within a small range dependent on the aircraft velocity, though they are applied as constants for consistency. As such, the removal of this lag factor will not necessarily position the anomaly peaks directly over the real conductor axis. The offset of a conductor response peak is a function of the system and conductor geometry as well as conductivity.

The magnetic data has a 1.0 second lag factor introduced relative to the real time fiducial positions. This factor is software controlled with the magnetic value recorded relative to the leading edge (left end) of each step 'bar', for both the fine and coarse scales. For example, a magnetic value positioned at fiducial 10.00 on the records would be shifted to fiducial 9.95 along the flight path.

A lag factor of 2 seconds (1.0 fiducial) is introduced to correct 50-60 Hz monitor for the effects of bird position and signal processing. In cases where a 50-60 Hz signal is induced in a long formational conductor, a 50-60 Hz secondary electromagnetic transient may be detected as much as 5 km. from the direct source over the conductive horizon.

The altimeter data has no lag introduced as it is recorded in real time relative to the fiducial markings.

APPENDIX D

INPUT DATA PROCESSING

The QUESTOR designed and implemented computer software for automatic interactive compilation and presentation, may be applied to all QUESTOR INPUT Systems. Although many of the routines are standard data manipulations such as error detection, editing and levelling, several innovative routines are also optionally available for the reduction of INPUT data. The flow chart on the following page (Figure D1) illustrates some of the possibilities. Software and procedures are constantly under review to take advantage of new developments and to solve interpretational problems.

a) INPUT Data Entry and Verification

During the data entry stage, the digital data range is compared to the analogue records and film. The raw data may be viewed on a high-resolution video graphics screen at any desirable scale. This technique is especially helpful in the identification of background level drift and instrument problems.

b) Levelling Electromagnetic Data

Instrument drift, recognized by viewing compressed data from several hours of survey flying, is corrected by an interactive levelling program. Although only two or three calibration sequences are normally recorded, levelling can be

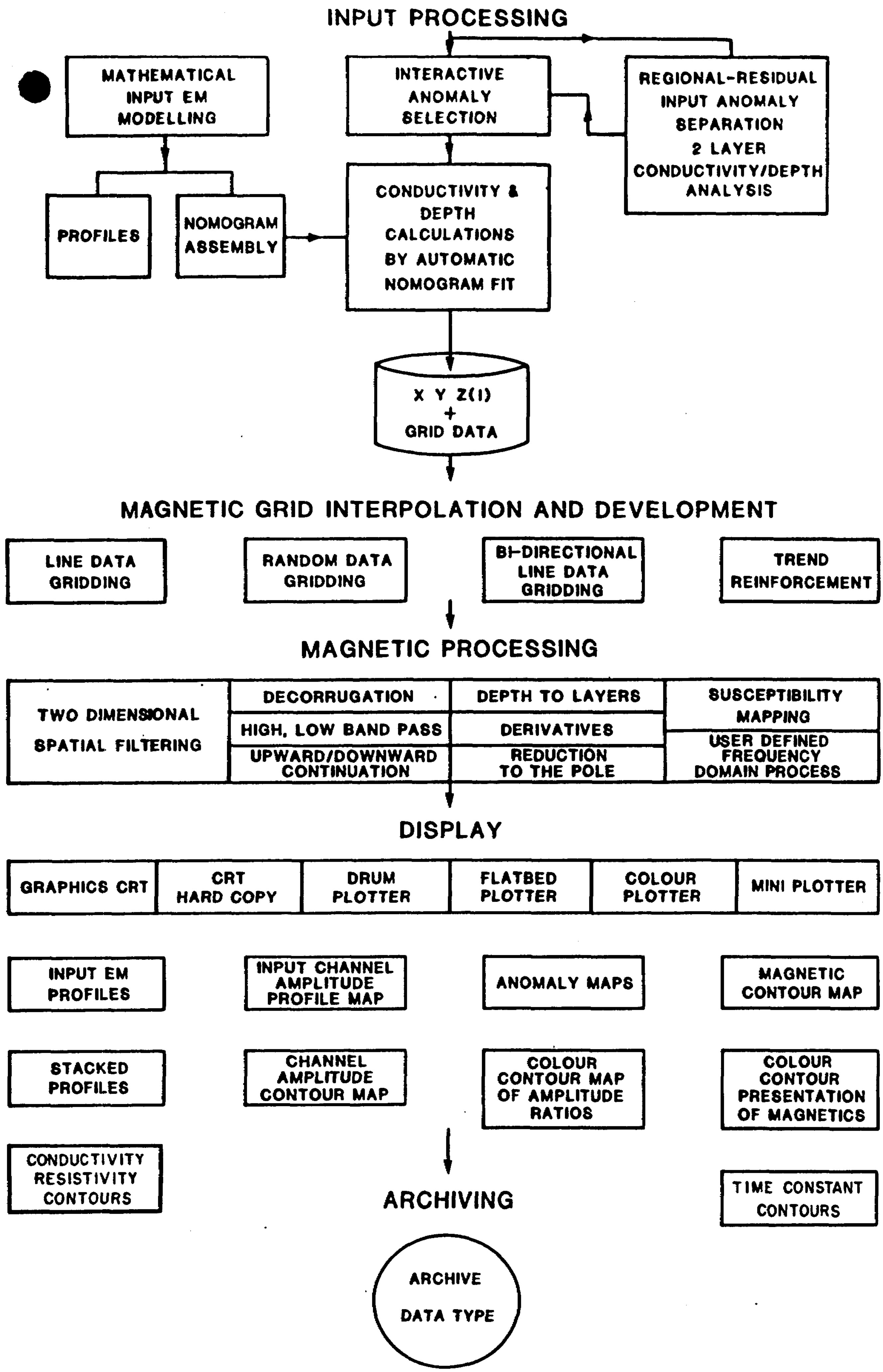

INPUT PROCESSING
MATHEMATICAL INPUT EM MODELLING
INTERACTIVE ANOMALY SELECTION
REGIONAL-RESIDUAL INPUT ANOMALY SEPARATION 2 LAYER CONDUCTIVITY/DEPTH ANALYSIS
PROFILES
NOMOGRAM ASSEMBLY
CONDUCTIVITY & DEPTH CALCULATIONS BY AUTOMATIC NOMOGRAM FIT
X Y Z(I) + GRID DATA
MAGNETIC GRID INTERPOLATION AND DEVELOPMENT
LINE DATA GRIDDING
RANDOM DATA GRIDDING
BI-DIRECTIONAL LINE DATA GRIDDING
TREND REINFORCEMENT
MAGNETIC PROCESSING
TWO DIMENSIONAL SPATIAL FILTERING
DECORRUGATION
HIGH, LOW BAND PASS
UPWARD/DOWNWARD CONTINUATION
DEPTH TO LAYERS
DERIVATIVES
REDUCTION TO THE POLE
SUSCEPTIBILITY MAPPING
USER DEFINED FREQUENCY DOMAIN PROCESS
DISPLAY
GRAPHICS CRT
CRT HARD COPY
DRUM PLOTTER
FLATBED PLOTTER
COLOUR PLOTTER
MINI PLOTTER
INPUT EM PROFILES
INPUT CHANNEL AMPLITUDE PROFILE MAP
ANOMALY MAPS
MAGNETIC CONTOUR MAP
STACKED PROFILES
CHANNEL AMPLITUDE CONTOUR MAP
COLOUR CONTOUR MAP OF AMPLITUDE RATIOS
COLOUR CONTOUR PRESENTATION OF MAGNETICS
CONDUCTIVITY RESISTIVITY CONTOURS
ARCHIVING
TIME CONSTANT CONTOURS
ARCHIVE DATA TYPE

Figure D1

performed with any multiple non-anomalous background recordings to divide a possible problematic situation into segments. Each of the 6 INPUT channels are levelled independently. The sensitivity of the levelling process is normally better than 15 ppm on data with a peak-to-peak noise level of 30 ppm.

c) Data Enhancement

Normal INPUT processing does not include the filtering of electromagnetic data. The residual high frequency variations often apparent on analogue INPUT data, are due almost entirely to atmospheric static discharge "spherics". In conductive environments, spherics are apparently grounded and effectively filtered. In resistive environments, frequency spectrum analysis and subsequent FFT (Fast Fourier Transform) filters may be applied to data to reduce the noise envelope.

d) Selection of EM Anomalies

E.M. anomalies are normally picked by an automatic anomaly peak selection program, which also determines the number of channels for the anomaly. In certain circumstances, particularly when conductive overburden responses are concerned, it may be preferable that the anomalies be manually selected. The E.M. data can be viewed sequentially on a graphic screen terminal for manual anomaly picking. An anomaly 'type' classification is ascribed during the manual selection or entered after the cross-correlation procedure, in the case of the automatic selection.

APPENDIX E

INPUT INTERPRETATION PROCEDURES

In the analysis of INPUT responses, the following parameters are considered:

a) Anomaly Characteristics

- amplitude, number of channels, decay rate, symmetry;
- half width and the overall relationships to adjacent and along strike responses, plus the ground-to-aircraft distance.

b) Geological Relationships

- known geological strike and dip patterns;
- host rock, overburden and saprolite conductivity.

c) Cultural Relationships

- as directed by the power line monitor;
- correlation with known features such as buried pipelines, fence lines, farm and industrial buildings, etc.

For each anomaly selected the following are documented:

- line number and anomaly letter;
- fiducial location on line;
- interpreted source type of the anomaly - bedrock, surficial, cultural;
- number of channels of response;
- amplitudes in parts-per-million of channels 1 through 6;
- apparent conductance in siemens based on the appropriate source model;

- corresponding magnetic association in nanoTeslas with fiducial location;
- altitude (ground-to-aircraft) in metres.

From the anomaly characteristics, interpretative aspects such as up-dip responses, dip direction and altitude are made. Anomalies are then grouped into linear trends for bedrock conductors, and zones for horizontal conductivity contrasts, by correlation with adjacent on-strike responses.

Also, the interpreted source of the INPUT response is categorized as bedrock, surficial, accessory (up-dip) or cultural.

Bedrock conductors are caused by massive sulphides, graphite bearing formations, serpentinized peridotites and in some instances by faults or shear zones. Magnetite concentrations may also, in some circumstances, yield anomalous INPUT responses. INPUT responses have been well documented by Macnae (1979), and Palacky and Sena (1979).

MASSIVE SULPHIDE DEPOSITS

The conductivity characteristic of massive sulphides is due to intergranular connections forming elongated sheet-like masses which permit the induction of eddy currents. These produce a secondary electromagnetic field which can be detected and quantitatively measured.

In most sulphide bodies the conductivity is caused by pyrrhotite and chalcopyrite. Pyrite, which often forms the greater quantity of sulphides present, usually occurs as isolated, albeit closely spaced grains or crystals, and therefore, only produces moderate or weak responses. Sphalerite does not provide anomalous responses and can even insulate the better sulphide conductivity portion of a deposit. The resultant overall conductivity response from a massive sulphide deposit is in the range of 5 to 30 Siemens/metre, although individual lenses or mineral aggregates may have much higher conductivities.

Massive sulphide deposits occur as injections, veins and stratiform bodies of variable size, geometry and conductivity. Given these variables, there are no universal rules for all sulphide deposits; however, there are some general observations regarding the INPUT responses. These are:

- Amplitudes primarily increase in response to conductor strike and depth extent up to an "infinite" size of some 600 metres by 300 metres. Thereafter, source conductor width contributes to amplitudes, that is, amplitude is dependant on sulphide mass.
- Conductance varies independantly with the overall integrated mineralogy and form of the sulphide components.

INPUT is often utilized in the search for volcanogenic copper-zinc sulphide deposits. These deposits are usually associated with felsic volcanic sequences, often at the interface of felsic-mafic rocks or with intercalated tuffs and/or sedimentary rocks. Many of these deposits have stringer sulphide zones in the footwall rocks related to feeder vent alteration systems and these can also contribute to the INPUT response. Laterally, the main sulphide deposits can lens out quickly or continue as minor bands, lenses or disseminated sulphides within more regionally extensive coeval tuffs or sediments and also provide INPUT responses along a considerable strike extent. All these variables must be considered in the explorationist's depositional model and in the analysis and interpretation of the geophysical responses. A careful analysis of the conductances, apparent widths (half peak width) and magnetic responses will often reveal the geometry-source aspects of the deposit. Stratiform base metal sulphides of up to 2,000 metres strike extent are known, although most sizeable deposits have strike lengths between 500 and 1,000 metres.

The magnetic response of a sulphide deposit is the most deceiving information available to the explorationist. Although many large economic deposits have a strong direct magnetic association, some of the largest base metal deposits have no magnetic association. Others have flanking magnetic anomalies caused by pyrrhotite/magnetite deposits in volcanic vent systems flanking the main sulphide body. Essentially non- homogeneous conductivities and magnetic responses may be favourable parameters.

GRAPHITIC SEDIMENTARY CONDUCTORS

Graphitic sediments are usually found within the sedimentary facies of greenstone belts. These represent a low energy, subaqueous sedimentary environment. Graphites are often located in basins of the subaqueous environment, producing the same geometrical shape as sulphide concentrations. Most often however, they form long, homogeneous planar sequences. These may have thicknesses from a metre to hundreds of metres. The recognition of graphite in this setting is often straightforward because conductivities and apparent widths may be very consistent along strike. Strike lengths of tens of kilometres are common for individual horizons.

The conductivity of a graphite formation is a function of two variables:

a) the quality and quantity of the graphite, and

b) the presence of pyrrhotite as an accessory conductive mineral

Pyrite is the most common sulphide mineral occuring within graphitic sequences. It does not contribute significantly to the overall conductivity as it will normally be found as disseminated crystals. Amphibolite facies metamorphism will often be sufficient to convert carbonaceous sediments to graphitic beds. Likewise, pyrite will often be transformed to pyrrhotite.

Without pyrrhotite, most graphitic conductors have less than 10 S conductivity-thickness value as detected by the INPUT system or 1 to 10 S/m conductivity from ground geophysical measurements. With pyrrhotite content, there may be little difference from other sulphide conductors.

It is not unusual to find local concentrations of sulphides within graphitic sediments. These may be recognized by local increases in apparent width, conductivity or as a conductor offset from the main linear trends.

Graphite has also been noted in fault and shear zones which may cross geological formations at oblique angles.

SERPENTINIZED PERIDOTITES

Serpentinized peridotites are very distinguishable from other anomalies. Their conductivity is low and is caused partially by serpentine. They have a fast decay rates, large amplitudes and strong magnetic correlation. Large profile widths with a shape similarity to surficial conductors are a common charactreristic.

MAGNETITE

INPUT anomalies over massive magnetites correlate to the total Fe content. Below 25-30% Fe, little or no response is obtained. However, as the Fe percentage increases, strong anomalies may result with a rate of decay that usually is more pronounced than those for massive sulphides.

Negative INPUT responses may occur in a resistive but very magnetic iron formation, the result of a very high permiability, however, these are extremely rare.

SURFICIAL CONDUCTORS

Surficial conductors are characterized by fast decay rates and usually have a conductivity-thickness of 1-5 siemens. This value is much higher in saline conditions. Overburden responses are broad, more so than bedrock conductors. Anomalies due to surficial conductivity are dependent on flight direction. This causes a staggering effect from line-to-line as the INPUT response is much stronger for the leading edge of the flat lying surface materials than for the trailing edge. When the surficial response has the form of a thin horizontal ribbon, anomalies may be very difficult to distinguish from weak bedrock conductors. A unique identification for all geometries of horizontal ribbon, sheet and layer conductivity contrasts is best accomplished by matching of transient decay amplitudes to the appropriate response nomogram.

CULTURAL CONDUCTORS

Cultural conductors are identifiable by examining the power line monitor and the film to locate railway tracks, power lines, buidings, fences or pipe lines. Power lines produce INPUT anomalies of high conductivity that are similar to bedrock responses. The strength of cultural anomalies is dependent on the grounding of the source. INPUT anomalies usually lag the power line monitor by 1 second, which should be consistent from line-to-line. If this distance between the INPUT response and the power line monitor differs between lines, then there is the possibility of an additional conductor present. The amplitude and conductivity-thickness of anomalies should be consistent from line-to-line.

APPENDIX F

INPUT RESPONSE MODELS

To the interpreter, one of the main advantages of the INPUT system geometry is the variation of the secondary response with conductor shape, size, depth and conductivity (Palacky 1976, 1977).

When we discuss the recognition parameters, one of the variables which is often omitted, is the plotting position of the main peaks in opposite flight directions on adjacent lines. In many cases, the responses may appear similar, but the plotting positions will show significant differences. These situations will be illustrated in the following section.

A third conductor identification factor is the INPUT decay transient for the main response peak. The decays may be used to identify the type of source, independent of the geometrical response which is dependent on the mutual coupling.

MODEL AND PHYSICAL CONDUCTORS

Economic conductive mineral deposits have no unique feature which would make their identification a straightforward process. Most ore bodies do have conductivity contrasts and at least one dimension which is significantly small. A conductivity contrast is necessary to overcome the "skin depth" attenuation effects of conductive overburden or lateritic soils on the primary electromagnetic field (West and Macnae 1982). The recognition of dipping conductors is possible, mainly due to the double peaks encountered in an updip flight direction (Figure F4). A horizontal mineral deposit is potentially the most difficult to select because the horizontal sheet model also applies to conductive overburden and lateritic soils. The theoretical shapes may be matched to physical-geological situations as has been done in the following summary:

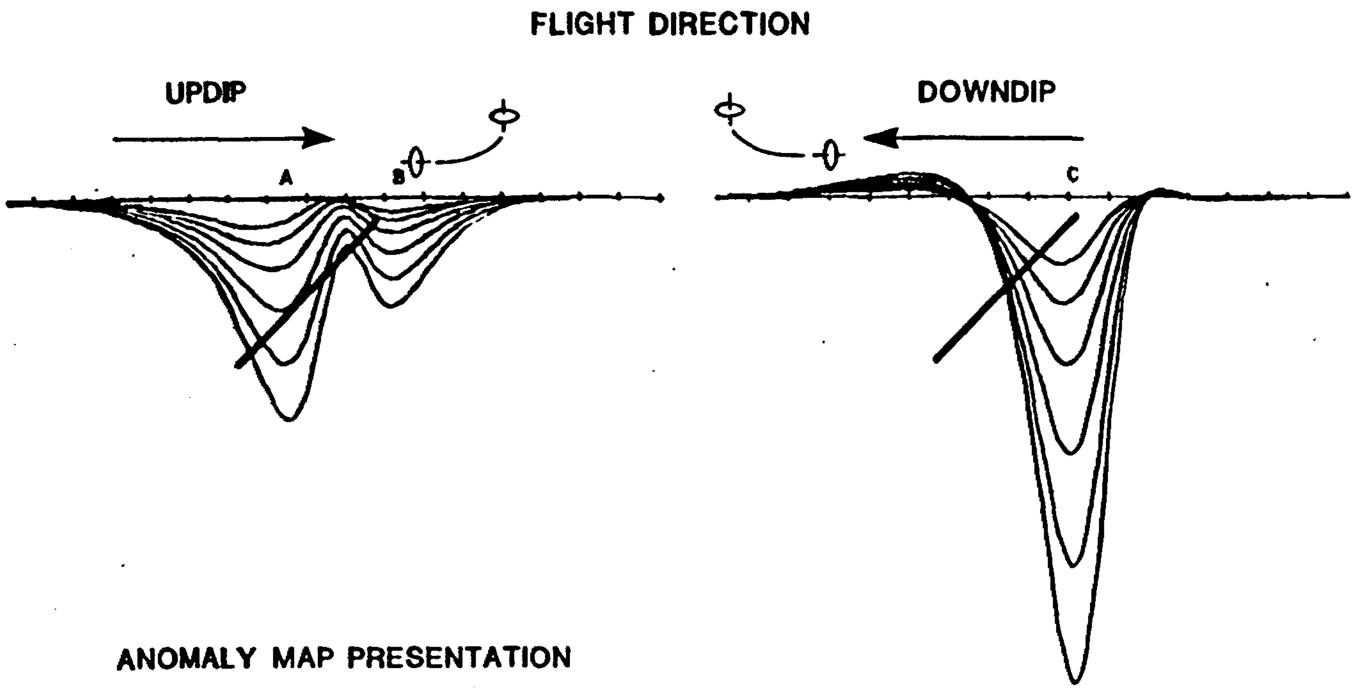
a) THE THIN DIPPING PLATE RESPONSE

economic - stratibound tabular ore body, dyke, vein, fault, fracture mineralization;

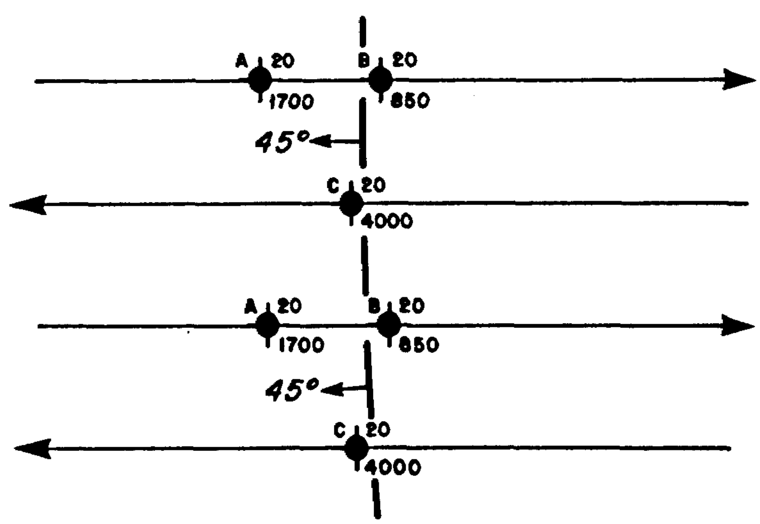
non economic - graphitic-carbonaceous shales, barren sulphides;

cultural - some grounded power lines, fences.

THE THIN DIPPING PLATE RESPONSE



ANOMALY MAP PRESENTATION



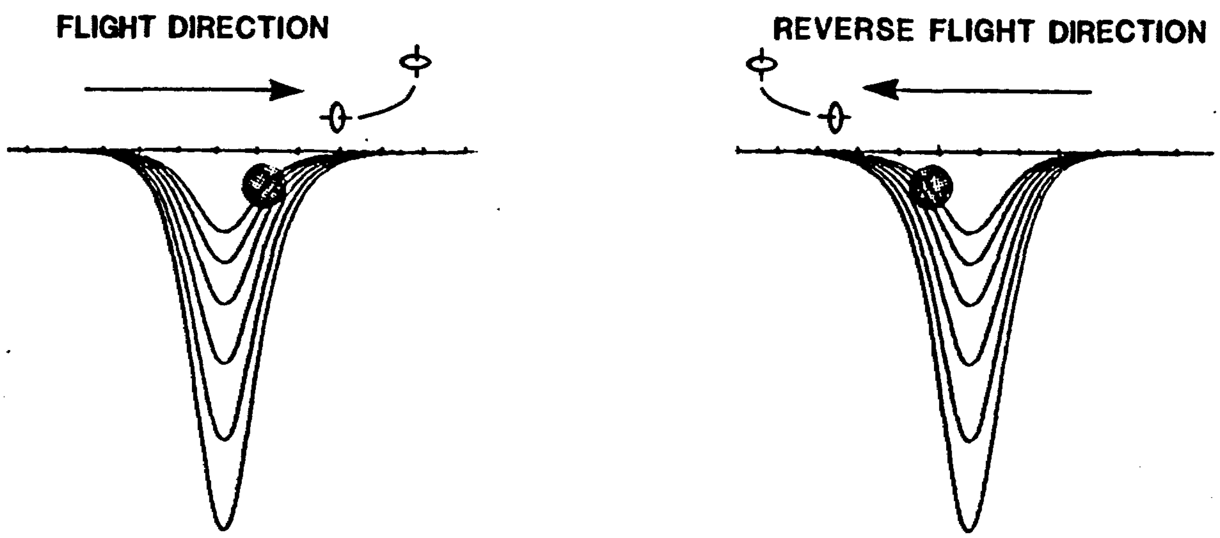
The interpreted conductor axis location varies with the source dip, conductivity, depth, thickness, depth extent and angle of intersection of the flight line to the conductor (strike direction).

b) THE SPHERE OR CYLINDER RESPONSE

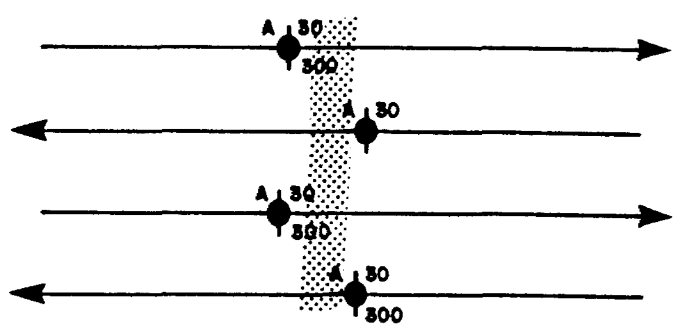
economic - compact massive orebody; horizontal pipe-shaped conductor;

cultural - some pipelines

THE SPHERE OR CYLINDER RESPONSE



ANOMALY MAP PRESENTATION



The response of a cylinder may be quite difficult to recognize from a thin strip. A cylinder or spherical model does not show a pronounced negative or upward peak following the main response. Due to the effect of the time constant of the INPUT receiver, the negative peaks which follow the theoretical response do not appear on the INPUT records (Mallick 1972, Morrison et al 1969). As the illustrations show, the sphere-cylinder response is perfectly symmetrical, but not centered over the body. The plotting position of the main peak leads the actual axis location because the most favourable mutual coupling occurs just before the transmitter coil passes the conductive body. The amplitude of the responses will be similar in both flight directions for a perfect cylinder.

c) THE HORIZONTAL SHEET

economic - some stratabound massive sulphides;

- regolith conductivity alteration haloes over some uranium deposits;

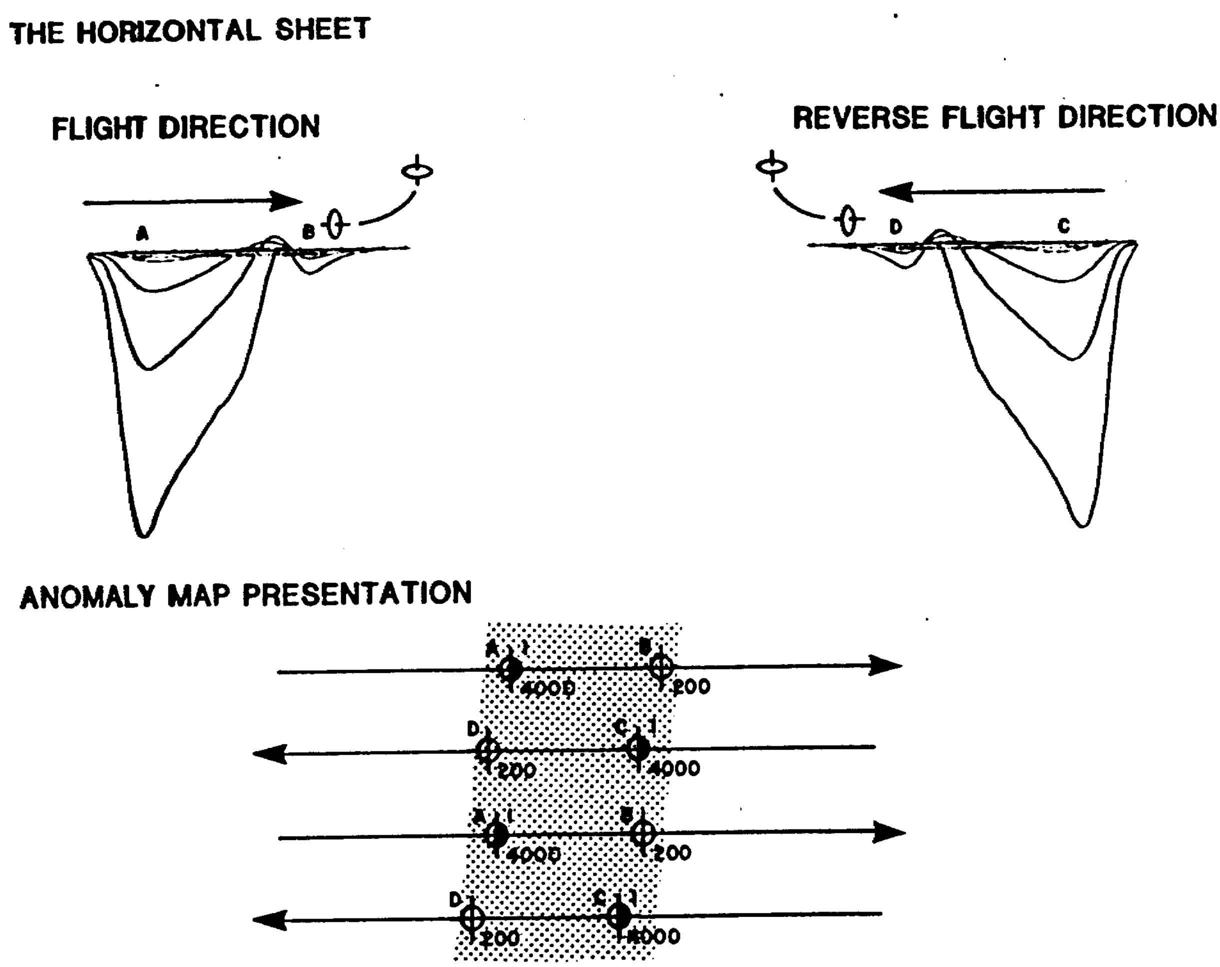
non

economic - overburden, lateritic soils;

- weathered rock;

- sea water or saline formations;

- graphitic metasediments.



The horizontal conducting sheet has many variations but it is essentially simple to recognize. The amplitudes of the earlier channels may reach 30,000 ppm where saline solutions are present, however, horizontal sheet responses of channels 4, 5 and 6 attenuate, more rapidly than for a vertical or steeply dipping plate.

The edge effect is a common interpretational problem where a conductive layer is encountered. A secondary peak may occur as the receiver coil crosses the trailing edge of the layer. These responses are always very sharp and often have very high apparent conductivities.

The edges of the sheet are positioned approximately at the half-peak width positions which are usually the inflection points of the profile.

The variations in plotting positions observed for dipping sheets are not as evident for the plate.

It is not unusual to see a shift in the peaks, with the latter channels migrating towards a section of improved conductance and/or increasing thickness. Another characteristic of poorly conducting sheets which respond only on channels 1 through 4 is the inversion of responses on channels 5 and 6. This is a reaction of the compensation circuits to changes in the primary field in the presence of a strong conductor and it serves no practical end except as a recognition aid.

The horizontal sheet model also applies to residual soils or laterite as well as conducting rock units. As the thin overburden situation changes to a thick overburden or two layer case and finally to a half space or a uniformly conductive earth, the responses also vary. The latter cases will have progressively broader responses which would seldom be mistaken for true discrete conductive zones.

When flight lines in opposite directions cross a conductive sheet, an asymmetric mirror image response occurs when the sheet is uniform. If there are variations in the geometry or conductance across the sheet, it may be necessary to compare responses with a shallow dipping sheet conductor to determine the effects, which would not be similar when compared with adjacent lines.

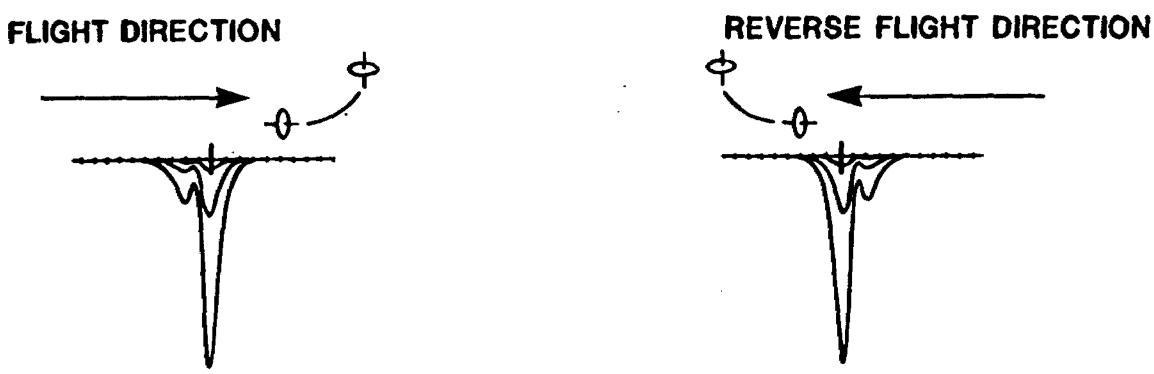
d) THE VERTICAL STRIP (RIBBON) RESPONSE

non

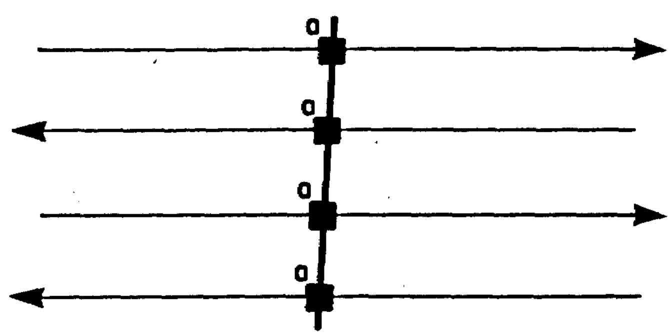
economic - rarely encountered in nature;

cultural - grounded hydro lines, lightning arrestor lines, fences.

THE VERTICAL STRIP (RIBBON) RESPONSE



ANOMALY MAP PRESENTATION



Due to the fact that this type of response is most commonly caused by fences, lightning protection lines and grounded power lines, the customary cultural presentation is a square symbol. This cultural response symbol may or may not have a power monitor (50-60 cycle) response but these will normally follow pipelines, fences, power lines, roads, railroads and other man made structures. The amplitude and apparent conductivity of such responses varies with the ground conductivity. In residual soils or conductive overburden, it is often possible to see a positive (up-dip type) peak followed by a small negative immediately before the main conductive response. The presence and amplitudes of such responses is normally very consistent. The cause of such responses is interpreted to be current gathering within the surficial sediments (West and Macnae 1982).

e) THE HORIZONTAL STRIP (RIBBON) RESPONSE

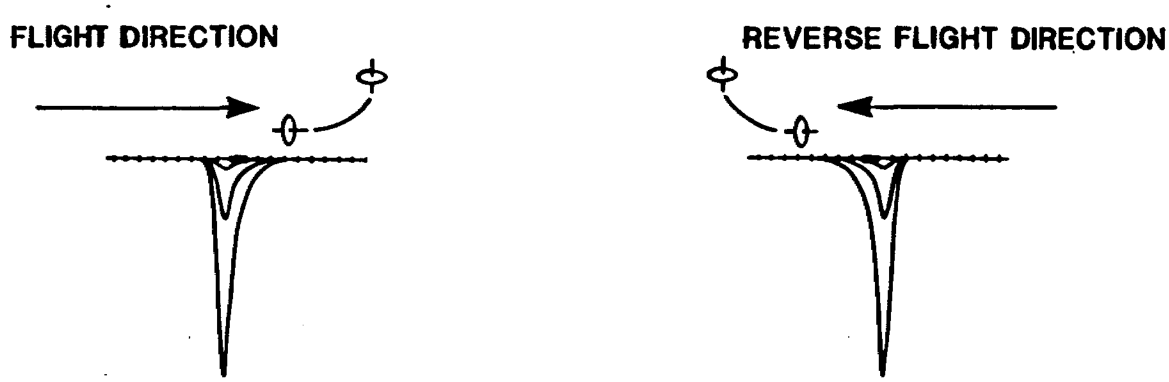
economic - some stratabound massive sulphides;

non economic - some stratabound mineral deposits;

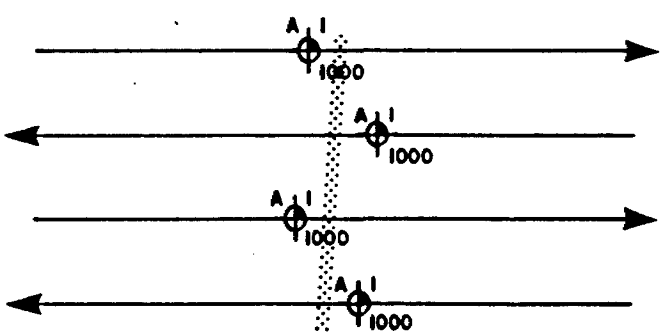
geological- weathering of narrow basic rock units with a high amphibolite content;

cultural - grounded and interconnected fences, pipes.

THE HORIZONTAL STRIP (RIBBON) RESPONSE



ANOMALY MAP PRESENTATION



The plotting positions of the responses could easily be mistaken for a vertical plate conductor, however, careful consideration must be given to the flight direction. The horizontal ribbon is a degeneration of the horizontal conducting sheet. It can be easily distinguished from a sphere or cylindrical body by its peak asymmetry, whereas the sphere model has a single symmetric main response.

APPENDIX G

QUANTITATIVE INTERPRETATION

The quantitative interpretation of the INPUT data is normally accomplished by comparing the resultant responses with type curves obtained from theoretical calculations, scale model studies and actual field measurements. A variety of results are available in literature for different conductor geometries and system configurations (see Ghosh 1971, Palacky 1974, Becker et al., 1972, Lodha 1977, Ramani 1980). They have also examined the effects of varying such parameters as conductance, conductor depth, dip and depth extent. Their approach has been successfully applied in interpretation of past field surveys.

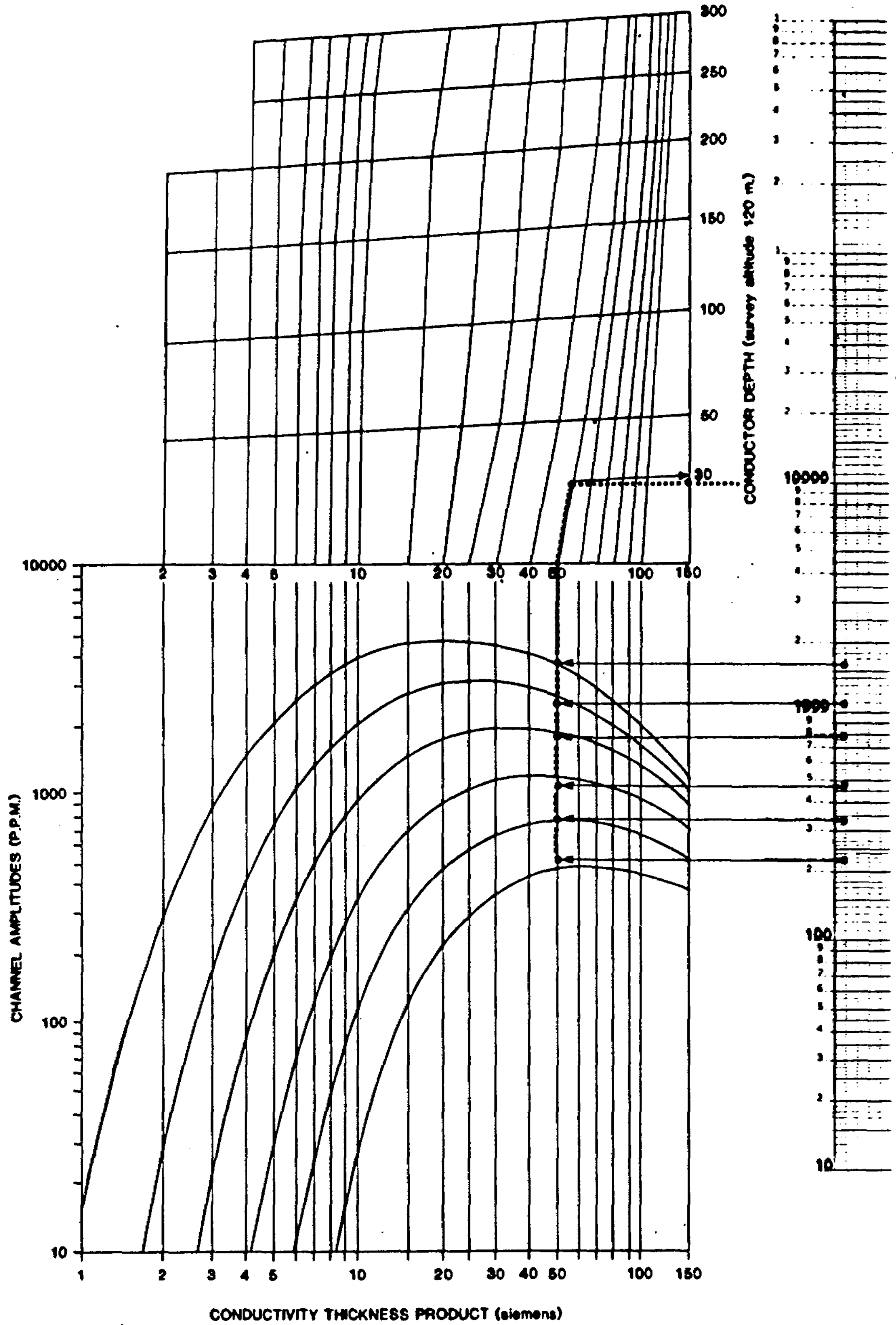
The nomograms which are currently available for the INPUT system are the Vertical Half-Plane, Homogeneous Half-Space, Thin Overburden and 135^{o} Dipping Half-Plane nomograms. The first is particularly useful for the interpretation of vertical dyke-like conductors frequently found in the Precambrian Shield type environments. In the case of a thick, homogeneous, flat-lying (less than 30 dip) source, the Homogeneous Half-Space nomogram should be applied. While in a thin overburden or tropically weathered rock environment, the Thin Overburden nomogram may be referenced to determine the depth and conductance of the overburden (Palacky and Kadekaru, 1979).

As an example, INPUT anomalies due to vertical dyke-like conductors, are asymmetric and independent of the flight direction.

Their shape is characterized by a minor first peak and a major second peak and their channel amplitudes are a function of the conductivity-thickness product and depth of the source. Anomaly B in Figure G1 illustrates one of these responses.

The channel amplitudes of anomaly A can be used in quantitative interpretation in the following way. Their values are plotted for each of the six channels on logarithmic (5 cycles K+E 46 6213) tracing paper in a straight line using the vertical logarithmic scale in parts per million as given on the right side of Figure G2. The six channel amplitudes for anomaly A, in ppm, are 1657, 1108, 821, 500, 356, 237, respectively. The amplitudes are measured in ppm (1cm = 475 ppm) from the flight records with reference to the normal background levels on respective channels. Those responses which do not provide at least three channels of deflection, or whose first channel amplitude is less than 50 ppm over the normal background, should not be subjected to this analysis. The six points on the semi-logarithmic paper are then fitted to the curves of the vertical half-plane nomogram (Figure G2) without any rotation. Having accomplished this, the lateral placement of the plot indicates the apparent conductivity-thickness value, in siemens, and the position of the 10,000 ppm line on the logarithmic paper indicates the conductor depth, in metres. In the example shown (Figure G2), the apparent conductivity-thickness value is 50 siemens and the depth is 30 metres.

FIXED WING 2ms PULSE
VERTICAL 600m x 300m PLATE
CONDUCTANCE / DEPTH NOMOGRAM



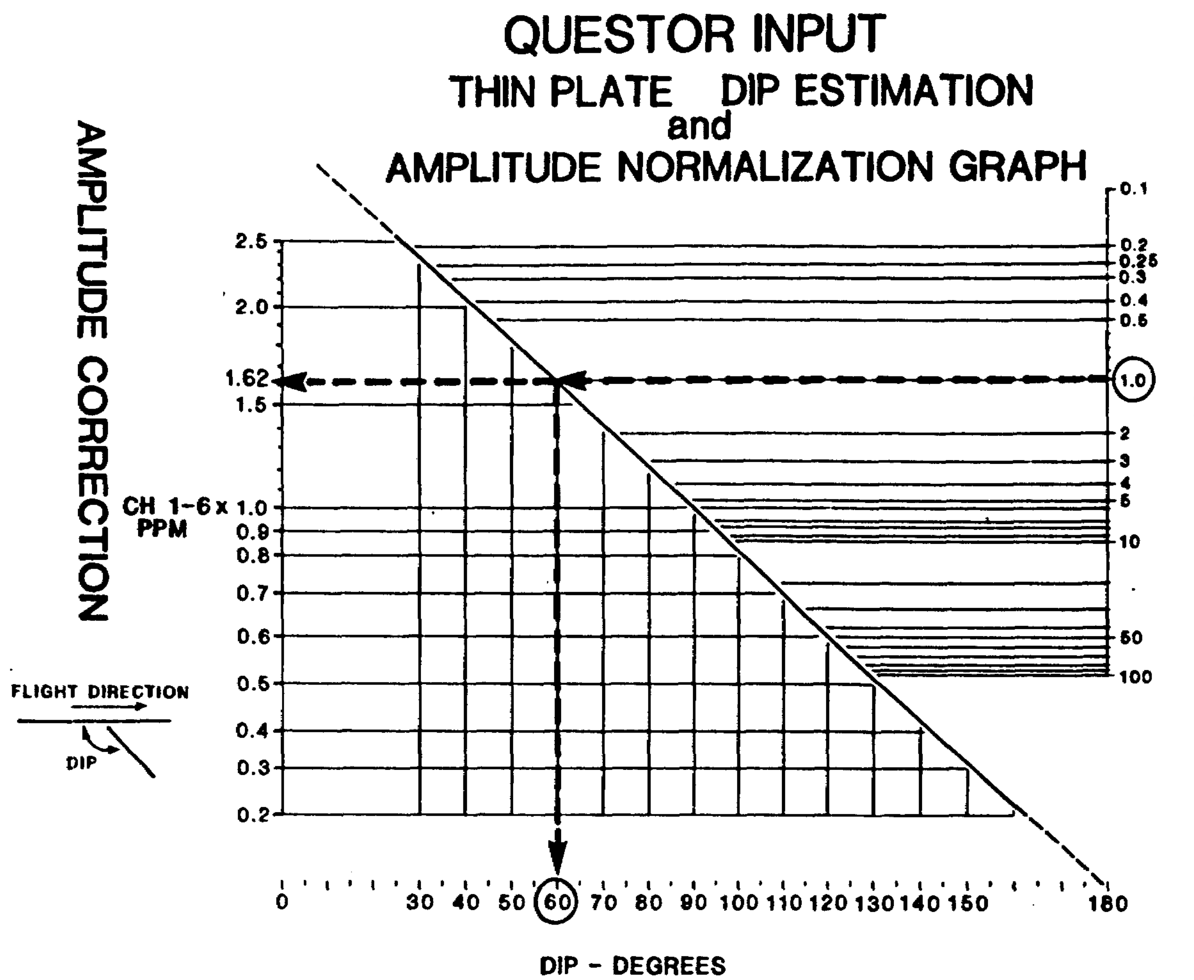

QUESTOR INPUT
THIN PLATE DIP ESTIMATION
and
AMPLITUDE NORMALIZATION GRAPH
AMPLITUDE CORRECTION
RATIO SECOND/FIRST PEAKS
CH 1-6 x PPM
FLIGHT DIRECTION
DIP
DIP - DEGREES
2.5
2.0
1.62
1.5
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.2
0.25
0.3
0.4
0.5
1.0
2
3
4
5
10
50
100
0
30
40
50
60
70
80
90
100
110
120
130
140
150
180

Figure I3

The asymmetric Tx-Rx configuration is very sensitive to changes of dip, particularly in the case of conductors dipping against the flight direction. In this circumstance, there is a change in the magnitude of the second/first peak ratio for all channels. The ratio of the amplitudes of the two peaks is a function of dip. The dip should be the first parameter determined in the quantitative interpretation of a dipping conductor. Before the amplitude is further used for an estimate of conductivity-thickness and depth, it must be normalized to a dip of 90^{o}. This correction is performed by means of the Thin Plate Dip Estimation and Amplitude Normalization Graph, Figure G3.

From the graph, it can be seen that a vertical dyke conductor should have a second/first peak ratio of approximately 6, i.e., that the first peak will have 16% of the amplitude of the second peak. In the case of anomaly A, this condition is true. Conversely, should the dyke dip at 60^{o}, the ratio will decrease to 1.0. Thus, the dip of a conductor can be estimated from the peak ratios of channel two by using the graph in Figure G3.

An example of amplitude correction determination is shown in Figure G3. A dipping conductor has an up-dip second-first peak ratio of 1.0 i.e., that the channel amplitudes of the minor first peak and major second peak of channel two are equal. Taking this ratio of 1.0 and applying the graph, a dip of 60^{o} is obtained for the conductor showing an amplitude correction of approximately 1.62. Consequently, the correction factor is applied to the six channel amplitudes of the associative down-dip response.

This response is then fitted to the vertical half-plane nomogram for the determination of its apparent conductivity-thickness value and depth. It should be mentioned that without the dip correction, the depth would be overestimated.

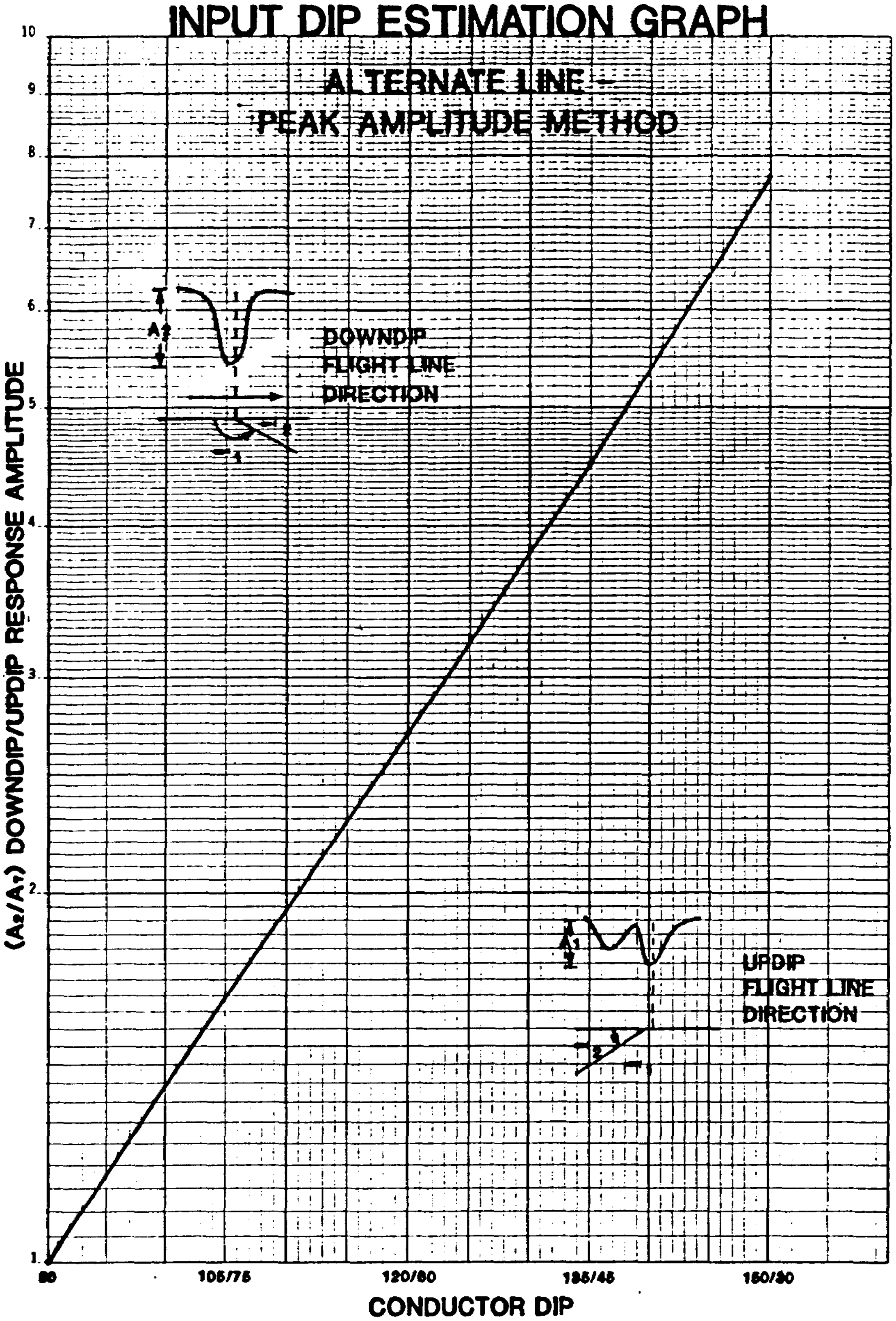
An alternate method for estimating the dips of longer, tabular conductors, utilizes the peak amplitudes on adjacent lines, see Figure G4. It is especially useful in multiple conductive zones where the up-dip responses may be obscured or yield false values due to the superposition of other nearby anomalies.

Note that the depth determination is made with the assumption that the aircraft is at 120 metres above the ground surface at the time of measurement. If the aircraft is above or below the altitude of 120 metres, the depth determination can be corrected by respectively, subtracting or adding the difference in altitude, within limits. In the case of Anomaly B, Figure G1, the anomaly was intercepted at an aircraft altitude of 131 metres. Therefore, a correction factor of 9 metres must be subtracted from the depth of the conductor, placing it at 21 metres below the ground surface.

The homogeneous half-space, thin overburden and the dipping half-plane 135° nomograms are used in the same fashion as that described above for the vertical half-plane.

To estimate the apparent strike length of a conductor, the ends of the conductive trend must be determined. Modelling has shown that the conductor ends are delineated by INPUT responses having channel amplitudes not less than 40% of those typical for the conductor. Responses with less than that of 40% are attributive to lateral coupling effects and are not considered as intercepts of the conductor. This is especially true for conductors of higher conductivity. Subsequently, the strike length of a conductor is equal to the distance between those responses representing the ends of the conductor.

INPUT DIP ESTIMATION GRAPH



APPENDIX H

MAGNETOMETER: COMPENSATION, SURVEY AND PROCESSING

Aircraft Magnetic Compensation

In order for a high sensitivity magnetometer system to function without interference from the aircraft, it must be magnetically compensated. The sources of magnetic interference, produced by the aircraft are: a) eddy currents; b) aircraft electrical system; c) induced magnetism; and d) permanent magnetism. These sources of magnetic noise have distinguishable characteristics on the analogue records and a ground and airborne test will indicate the capabilities of the magnetometer installation. By following established procedures most of the noise sources are eliminated.

a) Eddy currents are caused by movements of the larger conducting surfaces of the aircraft in the earth's magnetic field, whereby electric currents are generated, causing magnetic fields. By placing the sensor at the greatest practical distance from these surfaces and by not flying in turbulent wind conditions, eddy current noise can be minimized.

b) Aircraft electrical systems with varying loads can lead to serious noise problems if consistent operations procedures and circuit layout are not properly designed. The switching of the aircraft's 28 volt DC to almost any component during survey will create a variation in the static field existing under normal operating conditions. The three component compensator in the aircraft will see electrical system noise as DC level shifts from a heading invariant datum.

c) Induced magnetic fields are produced by ferromagnetic parts (mainly engines) in the earth's magnetic field. For a major change in magnetic latitude, it is necessary to check for variation of the aircraft's induced magnetic field. This is also dependant on the aircraft's heading and altitude. Compensation is accomplished by critical positioning of permalloy strips near the sensor. These produce fields opposite to the induced magnetic field of the aircraft, effectively cancelling it.

d) Permanent magnetism is produced by ferromagnetic parts within the aircraft. Compensation is accomplished with three orthogonal coils, through each of which an electrical current is passed, to create a resultant stable field opposite in polarity to the permanent field.

The compensation process has as its main objective the reduction of heading errors. These may be checked by flying the aircraft at survey altitude over a well defined non-anomalous landmark in the four cardinal headings. In addition, the effects of aircraft flight characteristics on the magnetometer installation are simulated by performing roll, pitch and yaw manouvers.

The aircraft has been originally compensated in Toronto, Ontario, where the induced field has been cancelled. In the survey area, a check is made to ensure that the permanent field does not induce heading dependant, magnetic field errors.

MAGNETOMETER SURVEY AND DATA ACQUISITION

The magnetometer survey is an integral part of INPUT operations, with no special procedures being required; with the exception of a ground magnetic recording station to monitor daily diurnal variations. The diurnal survey specifications relate to the control line spacing to minimize the possibilities of erroneous contours in area of low magnetic gradient.

The maximum diurnal gradient permitted is 20 gammas change within 5 minutes. The maximum control line spacing allowed is 8 kilometres. Where possible, control lines are routed through areas of low magnetic gradient over easily identified topographic points. As the time for the survey aircraft to span two control lines is approximately 2 minutes, a maximum diurnal anomaly of 4 nT (nanoTeslas) may exist after the data has been levelled.

The daily variation of the earth's magnetic field is monitored and recorded with a Geometrics G-826 Base Station Magnetometer and a GULTON or Hewlett Packard Strip Chart Recorder. The recorder has a 10 cm. chart width with a 100 nT full scale deflection, providing scaling of 1 nT/MM. An event marker provides time reference marks every minute. The chart speed is set to 20 cm/hour, with magnetometer readings taken every 4 or 10 seconds.

These readings may be digitally recorded using a portable data acquisition system synchronized with the aircraft data system, if required.

The magnetometer readings in the aircraft are recorded every second onto industry standard, 9-track tapes using the IBM NRZI Format.

APPENDIX I

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[illegible]

INPUT [illegible]	EM FIDUCIAL	ANOMALY TYPE	CHS	PEAK CH1	RESPONSE CH2	CH3	AMPLITUDES CH4	CH5	(PPM) CH6	TCF (S)	ALT (M)	MAGNETIC FIDUCIAL	VALUE
19030 A	39[illegible].250	S	2	587	102	-	-	-	-	3.24	123	-	
19030 B	395.275	P	2	677	129	-	-	-	-	8.35	116	-	
19030 C	39[illegible].150	P	2	1431	250	-	-	-	-	5.00	120	-	
19030 D	396.800	P	2	1266	237	-	-	-	-	5.55	111	396.85	10
19030 E	397.325	S	2	1494	230	-	-	-	-	4.16	122	-	
19020 A	385.000		2	415	88	-	-	-	-	6.44	120	-	
19020 B	386.300	P	2	186	82	-	-	-	-	4.92	135	-	
19020 C	386.725		2	278	118	-	-	-	-	9.60	132	-	
19020 D	389.925		2	633	106	-	-	-	-	3.78	122	-	
10010 A	14.900	S	2	457	41	-	-	-	-	3.23	121	14.80	16
10010 B	15.275		4	1277	352	112	41	-	-	5.52	114	-	
10010 C	15.650	S	3	899	113	57	-	-	-	9.10	116	-	
10010 D	16.520	S	2	306	15	-	-	-	-	2.03	119	-	
10020 A	26.400	S	2	789	139	-	-	-	-	2.71	109	-	
10020 B	29.175	S	2	767	102	-	-	-	-	3.23	128	-	
10020 C	29.500	S	2	857	116	-	-	-	-	3.08	110	-	
10030 A	30.600	P	2	386	81	-	-	-	-	2.77	106	-	
10030 B	31.200		2	615	110	-	-	-	-	2.87	124	-	
10030 C	32.220	P	2	421	49	-	-	-	-	2.22	123	-	
10030 D	33.825		3	1737	499	116	-	-	-	4.17	105	-	
10030 E	34.250	S	2	1014	114	-	-	-	-	3.12	107	-	
10030 F	35.350	P	2	239	44	-	-	-	-	1.78	119	35.53	26
10040 A	47.900	P	2	636	120	-	-	-	-	2.81	113	-	
10040 B	48.210	S	2	540	89	-	-	-	-	2.62	118	-	
10040 C	49.550		3	794	245	64	-	-	-	4.21	128	-	
10040 D	51.250	P	2	445	107	-	-	-	-	2.45	129	-	
10040 E	52.475		3	780	142	29	-	-	-	2.51	109	-	
10050 A	53.950	P	2	763	102	-	-	-	-	2.63	109	-	
10050 B	54.700		2	869	132	-	-	-	-	2.83	110	-	
10050 C	55.350	S	2	557	56	-	-	-	-	2.74	111	-	
10050 D	57.300		3	795	262	91	-	-	-	3.14	120	-	
10050 E	57.900	S	2	1004	120	-	-	-	-	3.73	118	-	
10050 F	58.720	S	2	361	44	-	-	-	-	2.14	105	-	
10060 A	72.600	S	2	705	121	-	-	-	-	2.88	121	-	
10060 B	73.925		2	711	205	-	-	-	-	2.67	119	-	

JOB NO:28037

INPUT EM No.	FIDUCIAL	ANOMALY TYPE	CHS	PEAK CH1	RESPONSE CH2	CH3	AMPLITUDES CH4	CH5	(PPM) CH6	TCP (S)	ALT (M)	MAGNETIC FIDUCIAL	VALUE
10060 C	75.225	S	2	776	107	-	-	-	-	2.92	118	75.13	11
10060 D	75.900	S	2	338	54	-	-	-	-	1.79	121	-	
10060 E	76.775		2	509	110	-	-	-	-	2.72	121	-	
10060 F	77.400	S	2	960	102	-	-	-	-	3.31	113	-	
10070 A	78.550		4	602	112	24	16	-	-	2.60	115	-	
10070 B	79.225	P	2	845	106	-	-	-	-	3.17	113	-	
10070 C	79.925	S	2	601	104	-	-	-	-	2.48	117	79.82	12
10070 D	81.250	S	2	255	55	-	-	-	-	1.64	123	81.20	13
10070 E	81.725		3	487	153	24	-	-	-	2.30	118	-	
10070 F	82.425	S	2	859	121	-	-	-	-	2.94	122	-	
10081 A	102.200	S	2	721	98	-	-	-	-	2.68	129	-	
10081 B	103.500		2	400	99	-	-	-	-	2.82	133	-	
10081 C	104.675	S	2	853	140	-	-	-	-	2.99	118	104.53	18
10081 D	106.250	P	2	469	83	-	-	-	-	2.46	124	-	
10090 A	108.550	P	2	367	90	-	-	-	-	2.33	128	-	
10090 B	109.350	S	2	663	83	-	-	-	-	3.44	121	-	
10090 C	111.050		2	364	115	-	-	-	-	2.03	134	-	
10090 D	111.650		2	718	100	-	-	-	-	3.06	128	-	
10090 E	112.150	P	2	884	109	-	-	-	-	3.09	117	-	
10100 A	126.125	P	2	810	113	-	-	-	-	3.00	120	-	
10100 B	126.700	S	2	339	45	-	-	-	-	2.45	117	-	
10100 C	127.480	P	2	433	71	-	-	-	-	2.56	133	-	
10100 D	128.950	S	2	717	92	-	-	-	-	3.79	124	-	
10100 E	130.925	S	2	511	108	-	-	-	-	2.74	106	-	
10111 A	138.320	S	2	742	79	-	-	-	-	2.81	120	-	
10111 B	139.900	P	2	329	95	-	-	-	-	1.94	129	-	
10111 C	140.500	S	2	740	96	-	-	-	-	2.77	122	-	
10120 A	153.700	P	2	494	78	-	-	-	-	2.52	120	-	
10120 B	154.800	P	2	611	61	-	-	-	-	3.26	120	-	
10120 C	155.250	S	1	309	-	-	-	-	-	2.45	119	-	
10120 D	156.150	P	2	426	65	-	-	-	-	2.11	123	-	
10120 E	157.325	S	2	716	102	-	-	-	-	2.88	118	157.13	14
10130 A	161.350	S	2	569	107	-	-	-	-	2.51	125	-	
10130 B	163.700	S	2	630	78	-	-	-	-	2.52	129	-	
10140 A	178.200	S	2	284	39	-	-	-	-	1.95	112	-	

JOB NO:28037

INPUT	EM	ANOMALY		PEAK	RESPONSE		AMPLITUDES		(PPM)	TCP	ALT	MAGNETIC	
[illegible]E	FIDUCIAL	TYPE	CHS	CH1	CH2	CH3	CH4	CH5	CH6	(S)	(M)	FIDUCIAL	VALUE
10140 B	179.375		2	661	95	-	-	-	-	3.39	117	179.15	1[illegible]
10140 C	179.750		2	436	102	-	-	-	-	2.04	116	-	
10150 A	183.850	P	2	440	82	-	-	-	-	2.20	123	-	
10150 B	184.250	S	2	382	74	-	-	-	-	2.62	126	-	
10150 C	185.800	P	2	234	37	-	-	-	-	1.82	120	185.57	14
10150 D	187.150	P	2	415	73	-	-	-	-	2.23	124	-	
10160 A	200.550	P	2	381	84	-	-	-	-	2.35	128	200.73	242
10160 B	204.000	S	2	502	108	-	-	-	-	2.93	125	-	
10170 A	208.070	S	2	397	71	-	-	-	-	2.27	135	-	
10170 B	211.250	S	2	303	46	-	-	-	-	2.23	132	-	
10170 C	211.900	P	2	476	101	-	-	-	-	2.32	128	211.70	231
10180 A	223.650	S	2	273	54	-	-	-	-	2.90	125	223.65	235
10180 B	225.850	S	1	254	-	-	-	-	-	3.08	124	-	
10180 C	226.975	S	2	547	113	-	-	-	-	3.15	134	226.77	1[illegible]
10180 D	227.600	S	2	351	85	-	-	-	-	2.41	117	-	
10190 A	231.575	S	2	518	107	-	-	-	-	3.13	129	-	
10190 B	233.250	S	2	168	44	-	-	-	-	1.52	117	-	
10190 C	234.675	P	2	404	86	-	-	-	-	2.73	114	-	
10200 A	248.350	S	1	268	-	-	-	-	-	4.26	125	-	
10200 B	251.000	S	2	811	161	-	-	-	-	2.96	124	-	
10200 C	253.150	P	2	541	121	-	-	-	-	2.57	124	253.05	27
10210 A	255.050	P	2	445	90	-	-	-	-	3.48	131	254.90	26
10210 B	256.600	S	2	506	70	-	-	-	-	2.93	126	-	
10210 C	259.120	P	2	347	67	-	-	-	-	1.96	125	-	
10220 A	273.600	P	3	323	85	46	-	-	-	3.35	129	-	
10220 B	274.600	S	2	544	125	-	-	-	-	3.48	120	-	
10220 C	276.700	P	2	612	152	-	-	-	-	3.41	122	276.80	24
10230 A	277.500		6	807	402	239	109	54	17	11.2	111	277.58	22
10230 B	277.900	P	2	457	66	-	-	-	-	2.04	123	-	
10230 C	279.125	S	2	381	86	-	-	-	-	1.2	119	-	
10230 D	280.650	P	2	193	49	-	-	-	-	1.25	121	-	
10230 E	281.050	P	2	205	73	-	-	-	-	1.68	117	-	
10230 F	282.000	P	2	293	78	-	-	-	-	2.94	120	-	

JOB NO:28027

LINE	INPUT EM FIDUCIAL	ANOMALY TYPE	ANOMALY CHS	PEAK RESPONSE AMPLITUDES (PPM) CH1	CH2	CH3	CH4	CH5	CH6	TCP (S)	ALT (M)	MAGNETIC FIDUCIAL	MAGNETIC VALUE
10240 A	294.070	S	2	233	54	-	-	-	-	1.65	149	-	
10240 B	294.950	P	2	160	39	-	-	-	-	1.56	117	-	
10240 C	295.625		2	329	103	-	-	-	-	3.93	127	-	
10240 D	296.450	S	1	562	-	-	-	-	-	1.5	132	296.42	10
10240 E	298.550	S	2	438	102	-	-	-	-	2.96	140	-	
10240 F	298.750		1	351	-	-	-	-	-	2.91	144	298.70	23
10250 A	300.475	S	2	460	98	-	-	-	-	2.34	125	-	
10250 B	301.050	S	2	399	92	-	-	-	-	4.71	119	-	
10250 C	302.050	P	1	261	-	-	-	-	-	4.69	117	301.92	10
10250 D	302.850	P	2	234	84	-	-	-	-	5.22	110	-	
10250 E	304.150	P	2	325	78	-	-	-	-	1.97	121	-	
10260 A	316.250	P	2	236	51	-	-	-	-	1.6	149	-	
10260 B	317.850	S	2	372	109	-	-	-	-	1.2	131	317.88	12
10260 C	318.475	P	3	461	122	49	-	-	-	3.50	121	318.52	10
10260 D	319.550	S	2	454	92	-	-	-	-	1.39	124	-	
10260 E	320.225		2	892	127	-	-	-	-	1.15	116	-	
10270 A	322.550		2	598	90	-	-	-	-	1.85	122	-	
10270 B	323.050	P	2	703	139	-	-	-	-	1.7	125	-	
10270 C	323.775	S	2	474	97	-	-	-	-	1.6	133	-	
10270 D	324.620	S	2	257	42	-	-	-	-	1.84	134	324.48	10
10270 E	325.400	P	2	251	77	-	-	-	-	4.44	133	-	
10270 F	326.720	P	2	248	62	-	-	-	-	2.05	142	-	
10280 A	339.000	P	2	268	52	-	-	-	-	1.55	122	-	
10280 B	340.500	P	3	524	159	56	-	-	-	4.14	127	-	
10280 C	341.275		2	387	101	-	-	-	-	3.6	135	341.30	10
10280 D	341.425		2	420	103	-	-	-	-	2.50	138	-	
10280 E	342.300	S	2	469	100	-	-	-	-	2.21	138	-	
10280 F	343.025	P	2	977	168	-	-	-	-	1.60	115	343.15	18
10280 G	343.575	P	2	409	100	-	-	-	-	2.89	116	-	
10290 A	358.200	P	2	665	161	-	-	-	-	3.04	125	-	
10290 B	358.750	P	2	585	56	-	-	-	-	3.18	125	-	
10290 C	359.580	S	2	413	65	-	-	-	-	2.25	121	-	
10290 D	360.400	P	2	280	108	-	-	-	-	1.88	134	-	
10290 E	361.700	P	2	83	39	-	-	-	-	1.27	138	-	
10300 A	373.950	S	1	124	-	-	-	-	-	1.41	142	-	
10300 B	375.600	P	2	590	138	-	-	-	-	3.16	122	-	
10300 C	376.325	S	2	673	123	-	-	-	-	2.83	120	-	

JOB NO:20027

INPUT [illegible]E	EM FIDUCIAL	ANOMALY TYPE	CHS	PEAK CH1	RESPONSE CH2	CH3	AMPLITUDES CH4	CH5	(PPM) CH6	TCP (S)	ALT (M)	MAGNETIC FIDUCIAL	VALUE
10300 D	377.475	P	2	679	141	-	-	-	-	2.92	127	-	
10300 E	378.025	S	2	918	110	-	-	-	-	2.98	119	-	
10300 F	379.600	S	2	358	56	-	-	-	-	2.34	113	-	
10310 A	380.000	P	2	430	48	-	-	-	-	2.21	127	-	
10310 B	380.500	P	2	577	134	-	-	-	-	2.66	128	-	
10310 C	381.050	P	2	872	105	-	-	-	-	2.91	122	-	
10310 D	382.000	P	1	445	-	-	-	-	-	2.18	124	-	
10310 E	382.675	P	2	348	126	-	-	-	-	2.16	120	-	
10320 A	396.150		1	202	-	-	-	-	-	1.39	126	-	
10320 B	396.650	P	2	134	47	-	-	-	-	1.24	121	-	
10320 C	397.700	P	3	519	102	42	-	-	-	3.88	121	-	
10320 D	398.350	P	2	723	130	-	-	-	-	3.17	117	-	
10320 E	399.450		2	815	159	-	-	-	-	3.41	119	-	
10320 F	400.250		2	576	108	-	-	-	-	3.04	133	-	
10320 G	400.700	P	2	210	46	-	-	-	-	1.73	135	-	
10330 A	402.050	P	2	371	62	-	-	-	-	2.32	128	-	
10330 B	402.550	P	2	552	96	-	-	-	-	2.38	130	-	
10330 C	403.000		2	986	87	-	-	-	-	3.15	121	-	
10330 D	404.050		1	356	-	-	-	-	-	1.88	112	404.00	12
10330 E	404.750	S	2	499	190	-	-	-	-	4.28	125	-	
10330 F	405.600	P	2	199	25	-	-	-	-	1.33	118	-	
10330 G	406.100		1	132	-	-	-	-	-	1.27	116	-	
10340 A	418.580	P	1	184	-	-	-	-	-	1.35	136	-	
10340 B	420.025		3	1017	338	107	-	-	-	5.43	124	-	
10340 C	420.625	P	2	379	89	-	-	-	-	3.95	120	-	
10340 D	421.825	S	2	827	157	-	-	-	-	3.37	119	-	
10340 E	422.420	P	2	590	62	-	-	-	-	2.82	124	-	
10340 F	423.000		1	174	-	-	-	-	-	1.67	118	-	
10350 A	425.075	P	2	494	85	-	-	-	-	2.48	128	-	
10350 B	425.525		2	793	139	-	-	-	-	2.95	127	-	
10350 C	426.850		1	187	-	-	-	-	-	1.67	127	-	
10350 D	427.350	U	3	172	71	31	-	-	-	2.50	128	-	
10350 E	427.650		5	747	352	156	58	36	-	8.51	134	-	
10350 F	428.400		1	190	-	-	-	-	-	1.59	132	-	
10350 G	428.950		1	78	-	-	-	-	-	0.99	121	-	
10360 A	442.300		1	122	-	-	-	-	-	1.07	148	-	
10360 B	442.850	P	2	164	61	-	-	-	-	1.54	135	-	
10360 C	443.750		5	1893	801	347	131	31	-	8.58	131	-	
10360 D	445.725	S	2	1050	172	-	-	-	-	4.00	118	-	

JOB NO:28037

INPUT EM		ANOMALY		PEAK	RESPONSE		AMPLITUDES		(PPM)	TCP	ALT	MAGNETIC	
[illegible]	FIDUCIAL	TYPE	CHS	CH1	CH2	CH3	CH4	CH5	CH6	(S)	(M)	FIDUCIAL	VALUE
10360 E	446.225	P	2	788	112	-	-	-	-	2.97	124	-	
10360 F	446.850		1	262	-	-	-	-	-	1.62	128	-	
10370 A	448.200	P	3	453	75	22	-	-	-	2.55	126	-	
10370 B	448.550	S	2	1261	184	-	-	-	-	4.19	121	-	
10370 C	449.000	S	2	777	90	-	-	-	-	3.45	121	-	
10370 D	450.700	U	3	500	211	99	-	-	-	5.43	125	-	
10370 E	450.925		6	1251	571	281	129	50	29	9.51	122	-	
10370 F	451.680		1	230	-	-	-	-	-	1.68	141	-	
10370 G	452.200		1	55	-	-	-	-	-	0.87	176	-	
10380 A	464.220		1	191	-	-	-	-	-	1.09	144	-	
10380 B	465.150		6	1898	846	407	165	78	32	10.1	129	-	
10380 C	465.480	P	3	287	101	28	-	-	-	5.76	125	-	
10380 D	466.525	S	2	1118	173	-	-	-	-	4.81	131	-	
10380 E	467.525	P	2	986	116	-	-	-	-	3.47	137	-	
10380 F	468.220		1	246	-	-	-	-	-	1.89	145	-	
10390 A	469.325		2	726	129	-	-	-	-	3.22	129	-	
10390 B	469.750		3	1364	239	57	-	-	-	5.00	135	-	
10390 C	471.650	U	3	563	158	73	-	-	-	8.49	129	-	
10390 D	471.875		6	1083	483	270	124	53	28	15.2	121	-	
10390 E	472.650		1	132	-	-	-	-	-	1.41	132	-	
10400 A	485.625		6	1628	620	288	117	64	19	9.68	131	-	
10400 B	485.850	P	3	449	161	79	-	-	-	7.44	132	-	
10400 C	487.525	S	2	990	173	-	-	-	-	3.66	126	-	
10400 D	488.100	P	2	932	115	-	-	-	-	3.78	132	-	
10400 E	488.450		1	336	-	-	-	-	-	2.35	130	-	
10411 A	37.625	P	2	569	113	-	-	-	-	3.37	136	37.50	538
10411 B	37.950	P	2	637	172	-	-	-	-	4.76	128	-	
10411 C	38.300		2	1578	287	-	-	-	-	4.80	130	-	
10411 D	39.500	P	2	232	44	-	-	-	-	2.32	128	-	
10411 E	40.000		2	883	228	-	-	-	-	3.91	123	-	
10411 F	40.180		1	539	-	-	-	-	-	8.25	125	-	
10411 G	40.225		3	660	277	103	-	-	-	8.45	126	-	
10411 H	40.900		1	77	-	-	-	-	-	1.16	130	-	
10420 A	52.380		1	141	-	-	-	-	-	1.41	134	-	
10420 B	52.770		1	157	-	-	-	-	-	1.37	130	-	
10420 C	53.625		3	1225	326	97	-	-	-	5.66	130	-	
10420 D	53.900		3	776	251	107	-	-	-	8.85	130	-	
10420 E	54.550	P	2	437	73	-	-	-	-	2.17	130	-	
10420 F	55.350	S	2	854	154	-	-	-	-	3.03	122	-	

JOB NO:28037

INPUT EM		ANOMALY		PEAK	RESPONSE	AMPLITUDES			(PPM)	TCP	ALT	MAGNETIC	
[illegible]E	FIDUCIAL	TYPE	CHS	CH1	CH2	CH3	CH4	CH5	CH6	(S)	(M)	FIDUCIAL	VALUE
10420 G	55.725	S	2	1470	203	-	-	-	-	3.77	[illegible]	-	
10420 H	56.050		2	1009	163	-	-	-	-	4.30	128	-	
10420 J	56.400	P	2	440	45	-	-	-	-	2.38	[illegible]	[illegible]	[illegible]
10420 K	56.850	S	2	519	62	-	-	-	-	2.47	124	-	
10430 A	57.350	S	3	1483	315	77	-	-	-	4.55	123	-	
10430 B	57.550	S	2	612	153	-	-	-	-	3.25	124	57.50	27
10430 C	57.925	P	2	1282	176	-	-	-	-	3.20	127	-	
10430 D	58.650	S	2	236	34	-	-	-	-	2.96	123	-	
10430 E	59.060	P	2	190	45	-	-	-	-	1.45	122	-	
10430 F	59.500		2	852	155	-	-	-	-	2.95	124	-	
10430 G	59.750		3	552	221	89	-	-	-	7.13	120	-	
10440 A	71.750	P	2	124	38	-	-	-	-	NC	134	71.72	107
10440 B	72.020		1	117	-	-	-	-	-	0.65	131	-	
10440 C	72.780	P	2	253	55	-	-	-	-	2.57	123	-	
10440 D	73.000		5	1509	585	231	96	26	-	7.41	123	-	
10440 E	73.300	P	2	248	67	-	-	-	-	5.49	122	-	
10440 F	74.000	P	2	339	55	-	-	-	-	2.92	121	-	
10440 G	75.200	S	2	1470	241	-	-	-	-	4.52	121	75.32	10
10440 H	75.450	P	2	1135	239	-	-	-	-	5.13	120	-	
10450 A	76.950	S	2	1832	338	-	-	-	-	4.79	120	-	
10450 B	77.850	S	2	817	106	-	-	-	-	3.20	128	-	
10450 C	78.750	P	2	169	39	-	-	-	-	1.60	129	-	
10450 D	79.230	P	3	264	83	21	-	-	-	2.51	126	-	
10450 E	79.475		3	556	232	95	-	-	-	4.78	128	-	
10450 F	79.850		1	142	-	-	-	-	-	1.63	126	-	
10461 A	95.375		3	554	184	45	-	-	-	4.35	122	-	
10461 B	95.780	P	2	230	53	-	-	-	-	2.29	122	-	
10461 C	96.950	P	2	723	149	-	-	-	-	3.23	126	-	
10461 D	97.750	S	2	652	179	-	-	-	-	3.23	127	-	
10461 E	98.750	S	2	538	102	-	-	-	-	2.78	131	-	
10470 A	99.350	S	2	1870	348	-	-	-	-	4.17	124	-	
10470 B	100.230	S	2	720	48	-	-	-	-	3.05	129	-	
10470 C	101.900	P	2	207	51	-	-	-	-	1.98	124	-	
10470 D	102.250		1	100	-	-	-	-	-	1.30	127	-	
10470 E	102.750		1	95	-	-	-	-	-	1.11	129	-	
10480 A	116.500	P	2	258	42	-	-	-	-	1.75	125	-	
10480 B	117.025		2	283	88	-	-	-	-	2.30	117	-	
10480 C	118.000		2	445	99	-	-	-	-	2.63	120	-	
10480 D	118.275		2	565	119	-	-	-	-	2.89	121	-	

JOB NO:28037

INPUT EM		ANOMALY		PEAK	RESPONSE		AMPLITUDES		(PPM)	TOC	ALT	MAGNETIC
[illegible]NE	FIDUCIAL	TYPE	CHS	CH1	CH2	CH3	CH4	CH5	CH6	(M)	(M)	FIDUCIAL VALUE
10480 E	118.850	S	2	939	165	-	-	-	-	3.38	[illegible]	-
10480 F	119.500	S	2	1246	210	-	-	-	-	3.74	126	-
10490 A	120.550	S	3	1681	342	86	-	-	-	4.98	[illegible]	-
10490 B	120.750	S	2	1806	335	-	-	-	-	5.02	120	-
10490 C	121.000	S	2	1549	206	-	-	-	-	4.50	118	-
10490 D	121.600	S	2	687	104	-	-	-	-	3.39	127	-
10490 E	122.250		1	172	-	-	-	-	-	1.76	119	-
10490 F	123.020	P	2	156	37	-	-	-	-	1.89	123	-
10490 G	123.250	P	2	78	15	-	-	-	-	1.56	129	-
10490 H	123.800		1	80	-	-	-	-	-	1.01	124	-
10500 A	136.090	P	2	193	45	-	-	-	-	2.35	[illegible]	-
10500 B	137.080	S	2	364	86	-	-	-	-	2.66	121	-
10500 C	137.950		1	427	-	-	-	-	-	3.87	121	-
10500 D	138.275		2	695	141	-	-	-	-	2.91	119	-
10500 E	138.750		2	949	143	-	-	-	-	5.46	123	-
10500 F	139.575		2	1916	352	-	-	-	-	3.81	128	-
10510 A	154.525		2	2002	383	-	-	-	-	4.37	129	-
10510 B	154.775		2	1440	216	-	-	-	-	4.71	120	-
10510 C	155.350		2	1176	141	-	-	-	-	4.48	117	-
10510 D	156.500		1	305	-	-	-	-	-	2.08	122	-
10510 E	157.400		1	43	-	-	-	-	-	1.70	127	-
10520 A	169.560	P	2	160	46	-	-	-	-	1.78	122	-
10520 B	170.450	S	2	628	105	-	-	-	-	3.65	116	-
10520 C	171.200	P	2	350	97	-	-	-	-	3.41	123	-
10520 D	171.640	P	2	836	141	-	-	-	-	5.06	128	-
10520 E	172.275		3	710	178	75	-	-	-	6.10	120	-
10520 F	172.825	S	2	1608	206	-	-	-	-	3.59	127	-
10520 G	172.950	S	2	1848	291	-	-	-	-	4.12	128	-
10530 A	174.225	S	2	401	120	-	-	-	-	3.59	134	-
10530 B	174.700	S	2	1323	240	-	-	-	-	5.35	126	-
10530 C	174.975		2	356	129	-	-	-	-	6.14	127	-
10530 D	175.420	S	2	839	82	-	-	-	-	3.64	120	-
10530 E	176.550	P	2	348	28	-	-	-	-	1.94	117	-
10530 F	177.400		1	75	-	-	-	-	-	1.05	130	-
10540 A	189.650	P	1	231	-	-	-	-	-	2.17	138	-
10540 B	190.650	S	2	431	72	-	-	-	-	3.93	122	-
10540 C	192.250	S	2	510	134	-	-	-	-	5.89	131	-
10540 D	193.125	S	2	1253	123	-	-	-	-	3.15	134	-
10540 E	193.400	S	2	834	123	-	-	-	-	3.68	141	-

JOB NO:28037

INPUT	EM	ANOMALY		PEAK	RESPONSE	AMPLITUDES		(PPM)		COND	ALT	MAGNETIC	
LINE	FIDUCIAL	TYPE	CHS	CH1	CH2	CH3	CH4	CH5	CH6	(S)	(M)	FIDUCIAL	VALUE
10550 A	195.300	S	2	433	176	-	-	-	-	[illegible]	[illegible]	-	
10550 B	195.725	S	2	858	104	-	-	-	-	3.28	120	-	
10550 C	196.550	S	2	257	28	-	-	-	-	1.95	122	196.38	73
10550 D	197.500	P	2	137	28	-	-	-	-	0.29	135	197.55	67
10561 A	213.780	P	2	496	56	-	-	-	-	5.99	124	213.63	88
10561 B	216.225	P	3	500	157	56	-	-	-	3.72	122	-	
10561 C	217.350	S	2	582	93	-	-	-	-	3.34	132	-	
10570 A	218.075	S	2	909	138	-	-	-	-	3.30	139	-	
10570 B	218.325	S	2	412	134	-	-	-	-	3.67	134	-	
10570 C	218.900	P	2	821	50	-	-	-	-	2.38	127	218.70	54
10570 D	220.300		1	239	-	-	-	-	-	2.42	124	-	
10570 E	220.720		1	112	-	-	-	-	-	1.64	128	220.77	92
10580 A	233.800	P	2	336	76	-	-	-	-	2.11	124	233.65	117
10580 B	234.200		5	611	208	100	63	20	-	11.2	125	-	
10580 C	234.300		2	549	144	-	-	-	-	10.2	125	-	
10580 D	236.175		2	555	157	-	-	-	-	3.42	121	236.32	57
10580 E	237.075		2	1059	111	-	-	-	-	3.11	129	-	
10590 A	238.350		2	312	109	-	-	-	-	11.7	127	-	
10590 B	238.920	P	2	565	38	-	-	-	-	2.24	121	238.73	45
10590 C	240.180	U	3	397	77	49	-	-	-	5.90	125	-	
10590 D	240.375		4	720	192	86	43	-	-	10.5	124	-	
10600 A	254.250	P	2	340	55	-	-	-	-	2.23	127	254.15	238
10600 B	254.625		3	1003	304	103	-	-	-	5.64	118	-	
10600 C	256.650	P	2	353	85	-	-	-	-	2.69	120	256.83	42
10600 D	257.475	S	2	616	83	-	-	-	-	3.84	126	-	
10610 A	258.750	S	2	411	96	-	-	-	-	5.54	137	-	
10610 B	259.250	P	2	543	38	-	-	-	-	1.91	123	259.10	40
10610 C	260.950	P	2	351	59	-	-	-	-	2.22	127	-	
10620 A	273.420	P	2	193	17	-	-	-	-	1.09	120	-	
10620 B	274.800		1	169	-	-	-	-	-	1.45	121	-	
10620 C	275.640		1	347	-	-	-	-	-	2.18	128	-	
10620 D	276.350	S	1	396	-	-	-	-	-	2.24	127	-	
10630 A	277.600	S	2	720	90	-	-	-	-	2.92	124	-	

JOB NO:28037

INPUT EM		ANOMALY		PEAK	RESPONSE		AMPLITUDES		(PPM)	[illegible]	ALT	MAGNETIC	
[illegible]	FIDUCIAL	TYPE	CHS	CH1	CH2	CH3	CH4	CH5	CH6	[illegible]	(M)	FIDUCIAL	VALUE
10630 B	278.200	S	1	295	-	-	-	-	-	1.64	118	278.08	29
10630 C	279.050	S	2	53	15	-	-	-	-	0.67	127	-	
10640 A	293.850	P	2	209	47	-	-	-	-	[illegible]	[illegible]	-	
10640 B	295.950	P	2	307	47	-	-	-	-	2.07	125	-	
10650 A	300.200		1	425	-	-	-	-	-	2.06	129	300.33	172
10660 A	312.900		1	56	-	-	-	-	-	0.79	122	-	
10660 B	315.000	P	2	263	38	-	-	-	-	1.80	129	-	
10670 A	319.300	P	2	405	23	-	-	-	-	2.09	126	319.40	175

32E05NE9309 2.9776 BRADETTE

900

Dear Mr. Barr

Re: Report of Work 542
Mining Claims L864709 et al

Enclosed please find two copies of the "Airborne Input EM and Magnetic Survey" in Bradette - St. Laurent Townships for our 131 claims in the name of Glen Auden Resources Limited.

Sincerely
Madra Carr

RECEIVED
FEB 12 1987
MINING LANDS SECTION

Ontario Ministry of Northern Development and Mines

(Geophysical, Geological, Geochemical and Expenditures) 542/86

Mining Act 2.9776

Note: – If number of mining claims traversed exceeds space on this form, attach a list. Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns. Do not use shaded areas below.

Type of Survey(s)	Township or Area
AIRBORNE INPUT EM AND MAGNETIC	BRADETTE – ST LAURENT

Claim Holder(s)	Prospector's Licence No.
GLEN AUDEN RESOURCES LIMITED	T-1915

Address: BOX 1637 TIMMINS ONTARIO

Survey Company	Date of Survey (from & to)	Total Miles of line Cut
QUESTOR SURVEYS LIMITED	26 11 86 (Day Mo. Yr.) – 13 12 86 (Day Mo. Yr.)	

Name and Address of Author (of Geo-Technical report): MARCEL KONNING 6380 VISCOUNT RD, MISSISSAUGA, ONTARIO L4V1H3

Credits Requested per Each Claim in Columns at right

Special Provisions	Geophysical	Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Man Days	Geophysical	Days per Claim
Complete reverse side and enter total(s) here	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	30
	Magnetometer	30
125m spacing	Radiometric	

DEC 16 1986

Mining Claims Traversed (List in numerical sequence)

Prefix	Number	Expend. Days Cr.	Prefix	Number	Expend. Days Cr.
See attached claim list					

RECEIVED
JAN 7 1987
MINING LANDS SECTION

Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

Instructions: Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

Total number of mining claims covered by this report of work: 131

Date	Recorded Holder or Agent (Signature)
Dec 3/86	Nadia Caina

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
7860	DEC 16 1986	M. G. Wenner
	Date Approved as Recorded	Branch Director
	6 May/87	[signature]

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying: NADIA CAINA, BOX 1637 TIMMINS ONTARIO P4N 7W6

Date Certified	Certified by (Signature)
Dec 3/86	Nadia Caina

1362 (85/12)

STURGEON STAKING SYNDICATE
BRADETTE TOWNSHIP - 60 CLAIMS Transferred to Glen Auden

CLAIM NUMBER	RECORDED HOLDER	RECORDING DATE	TOTAL DAYS FILED	EXPIRY DATE
864709	E. Passi	January 23/86	0	January 23/87
864710	E. Passi	January 23/86	0	January 23/87
864711	E. Passi	January 23/86	0	January 23/87
864712	E. Passi	January 23/86	0	January 23/87
864713	E. Passi	January 23/86	0	January 23/87
864714	E. Passi	December 31/85	0	December 31/86
864715	E. Passi	December 31/85	0	December 31/86
864716	E. Passi	December 31/85	0	December 31/86
864717	E. Passi	December 31/85	0	December 31/86
864718	E. Passi	December 31/85	0	December 31/86
864719	E. Passi	December 31/85	0	December 31/86
864720	E. Passi	December 31/85	0	December 31/86
864721	E. Passi	December 31/85	0	December 31/86
864722	E. Passi	January 23/86	0	January 23/87
864723	E. Passi	January 23/86	0	January 23/87
864724	E. Passi	December 31/85	0	December 31/86
864725	E. Passi	December 31/85	0	December 31/86
863726	E. Passi	December 31/85	0	December 31/86
864727	E. Passi	December 31/85	0	December 31/86
864728	E. Passi	December 31/85	0	December 31/86
864738	E. Passi	December 31/85	0	December 31/86
864739	E. Passi	December 31/85	0	December 31/86
864740	E. Passi	December 31/85	0	December 31/86
864741	E. Passi	December 31/85	0	December 31/86
864742	E. Passi	December 31/85	0	December 31/86
864743	E. Passi	January 23/86	0	January 23/87
864744	E. Passi	January 23/86	0	January 23/87
864745	E. Passi	January 23/86	0	January 23/87
864746	E. Passi	January 23/86	0	January 23/87
864747	E. Passi	January 23/86	0	January 23/87
876951	David Jones	December 18/85	0	December 18/86
876952	David Jones	December 18/85	0	December 18/86
876953	David Jones	December 18/85	0	December 18/86
876954	David Jones	December 18/85	0	December 18/86
876955	David Jones	December 18/85	0	December 18/86
876956	David Jones	December 18/85	0	December 18/86
876957	David Jones	December 18/85	0	December 18/86
876958	David Jones	December 18/85	0	December 18/86

CLAIM NUMBER	RECORDED HOLDER	RECORDING DATE	TOTAL DAYS FILED	EXPIRY DATE
876959	David Jones	December 27/85	0	December 27/86
876960	David Jones	December 27/85	0	December 27/86
876961	David Jones	December 27/85	0	December 27/86
876962	David Jones	December 27/85	0	December 27/86
876968	David Jones	December 27/85	0	December 27/86
876969	David Jones	December 27/85	0	December 27/86
876970	David Jones	December 27/85	0	December 27/86
876971	David Jones	December 18/85	0	December 18/86
876972	David Jones	December 18/85	0	December 18/86
876973	David Jones	December 18/85	0	December 18/86
876974	David Jones	December 18/85	0	December 18/86
876975	David Jones	December 18/85	0	December 18/86
876976	David Jones	December 18/85	0	December 18/86
879754	P. Matthews	January 23/86	0	January 23/87
879755	P. Matthews	January 23/86	0	January 23/87
879756	P. Matthews	January 23/86	0	January 23/87
879757	P. Matthews	January 23/86	0	January 23/87
879758	P. Matthews	January 23/86	0	January 23/87
879759	P. Matthews	January 23/86	0	January 23/87
879760	P. Matthews	January 23/86	0	January 23/87
879761	P. Matthews	January 23/86	0	January 23/87
879762	P. Matthews	January 23/86	0	January 23/87

~~Transfer will be forwarded as soon as possible~~

Claims are already in Glen Anders name

60 claims

Claim Number	Recorded Holder	Recording Date	Total days	Expiry Date
877016 87701 877018 877019 877020 877021 877022 877023 877024 877025 877026 877027 877028 877029 877030	David Jones	February 25, 1986	0	February 25, 198
876963 876964 876965	David Jones	December 27, 1985	0	December 27, 19
876966— 876967 876977 876978 876979 876980 876981 876982 876983		February 7, 1986	0	February 7, 198
877276 877277 877278 877279 877280 877281 877282 877283	Ed Passi	January 10, 1986	0	January 10, 198
877288 877289 877290 877295. 877296		January 30, 1986	0	January 30, 198

40

877297	Ed Passi	January 30, 1986	0	January 30, 1
87[illegible]301	David Jones	January 10, 1986	0	January 10, 19
877002 877003 877004 877005 877006	↓	↓		↓
877007 877008 877009 877010 877011 877012	↓	January 23, 1986 ↓	0 ↓	January 23, 19 ↓
877702 877703 877704	Ed Passi ↓	January 30, 1986 ↓	0 ↓	January 30, 19 ↓
877709 877710 877711 877712 877713 877714 877715 877716 877717 877718 877719	Ed. Passi ↓	January 30, 1986 ↓	0 ↓	January 30,
880473 880474	Ed. Passi ↓	February 11, 1986 ↓	0 ↓	February 11, 198 ↓
864748	↓	January 10, 1986	↓	January 10, 19
864749	↓	January 10, 1986	↓	January 10, 19
29				

M-179

Ministry of Northern Development and Mines

Ontario

Geophysical-Geological-Geochemical Technical Data Statement

File ______

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s) AIRBORNE INPUT EM AND MAGNETIC SURVEY

Township or Area BRADETTE (ST. LAURENT

Claim Holder(s) GLEN AUDEN RESOURCES LIMITED

Survey Company QUESTOR SURVEYS LIMITED

Author of Report MARCEL KONNINGS

Address of Author 6380 VISCOUNT RD. MISSISSAUGA

Covering Dates of Survey NOV 26 - DEC 15/86 (linecutting to office)

Total Miles of Line Cut ______

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

	DAYS per claim
Geophysical	
--Electromagnetic	
--Magnetometer	
--Radiometric	
--Other	
Geological	
Geochemical	

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer 40 Electromagnetic 40 Radiometric ______ (enter days per claim)

DATE: FEB 11/87 SIGNATURE: [signature] Author of Report or Agent

Res. Geol. ______ Qualifications 2.1666.

Previous Surveys

File No.	Type	Date	Claim Holder

OFFICE USE ONLY

MINING CLAIMS TRAVERSED
List numerically

(prefix)	(number)

If space insufficient, attach list

TOTAL CLAIMS 137

837 (85/12)

GEOPHYSICAL TECHNICAL DATA

GROUND SURVEYS -- If more than one survey, specify data for each type of survey

Number of Stations ____________ Number of Readings ____________

Station interval ____________ Line spacing ____________

Profile scale ____________

Contour interval ____________

MAGNETIC

Instrument ____________

Accuracy – Scale constant ____________

Diurnal correction method ____________

Base Station check-in interval (hours) ____________

Base Station location and value ____________

____

ELECTROMAGNETIC

Instrument ____________

Coil configuration ____________

Coil separation ____________

Accuracy ____________

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency ____________
(specify V.L.F. station)

Parameters measured ____________

GRAVITY

Instrument ____________

Scale constant ____________

Corrections made ____________

____

Base station value and location ____________

____

Elevation accuracy ____________

INDUCED POLARIZATION RESISTIVITY

Instrument ____________

Method ☐ Time Domain ☐ Frequency Domain

Parameters – On time ____________ Frequency ____________

– Off time ____________ Range ____________

– Delay time ____________

– Integration time ____________

Power ____________

Electrode array ____________

Electrode spacing ____________

Type of electrode ____________

SELF POTENTIAL

Instrument ________ Range ________

Survey Method ________

Corrections made ________

RADIOMETRIC

Instrument ________

Values measured ________

Energy windows (levels) ________

Height of instrument ________ Background Count ________

Size of detector ________

Overburden ________
(type, depth – include outcrop map)

OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)

Type of survey ________

Instrument ________

Accuracy ________

Parameters measured ________

Additional information (for understanding results) ________

AIRBORNE SURVEYS

Type of survey(s) QUESTOR AIRBORNE INPUT EM AND MAGNETIC SURVEY

Instrument(s) QUESTOR/BARRINGER MK VI, 2MS, INPUT SYSTEM, GEOMETRICS G-813 Proton Mag
(specify for each type of survey)

Accuracy ±1 nT, sixteenths
(specify for each type of survey)

Aircraft used Short Skyvan C-GDRG

Sensor altitude 55 metres

Navigation and flight path recovery method ________

Aircraft altitude 122 metres Line Spacing 100 m

Miles flown over total area 270 kilometres Over claims only ALL

GEOCHEMICAL SURVEY – PROCEDURE RECORD

Numbers of claims from which samples taken ____________________

____

____

Total Number of Samples ____________________

Type of Sample ____________________
(Nature of Material)

Average Sample Weight ____________________

Method of Collection ____________________

____

Soil Horizon Sampled ____________________

Horizon Development ____________________

Sample Depth ____________________

Terrain ____________________

____

Drainage Development ____________________

Estimated Range of Overburden Thickness ____________________

____

____

SAMPLE PREPARATION

(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis ____________________

____

____

____

General ____________________

____

____

____

____

____

____

____

____

____

ANALYTICAL METHODS

Values expressed in: per cent ☐ p. p. m. ☐ p. p. b. ☐

Cu, Pb, Zn, Ni, Co, Ag, Mo, As,-(circle)

Others ____________________

Field Analysis (____________________ tests)

Extraction Method ____________________

Analytical Method ____________________

Reagents Used ____________________

Field Laboratory Analysis

No. (____________________ tests)

Extraction Method ____________________

Analytical Method ____________________

Reagents Used ____________________

Commercial Laboratory (____________________ tests)

Name of Laboratory ____________________

Extraction Method ____________________

Analytical Method ____________________

Reagents Used ____________________

General ____________________

____

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____

TURGEON STAKING SYNDICATE
BRADETTE TOWNSHIP - 60 CLAIMS Transferred to Glen Auden

CLAIM NUMBER	RECORDED HOLDER	RECORDING DATE	TOTAL DAYS FILED	EXPIRY DATE
864709	E. Passi	January 23/86	0	January 23/87
864710	E. Passi	January 23/86	0	January 23/87
864711	E. Passi	January 23/86	0	January 23/87
864712	E. Passi	January 23/86	0	January 23/87
864713	E. Passi	January 23/86	0	January 23/87
864714	E. Passi	December 31/85	0	December 31/86
864715	E. Passi	December 31/85	0	December 31/86
864716	E. Passi	December 31/85	0	December 31/86
864717	E. Passi	December 31/85	0	December 31/86
864718	E. Passi	December 31/85	0	December 31/86
864719	E. Passi	December 31/85	0	December 31/86
864720	E. Passi	December 31/85	0	December 31/86
864721	E. Passi	December 31/85	0	December 31/86
864722	E. Passi	January 23/86	0	January 23/87
864723	E. Passi	January 23/86	0	January 23/87
864724	E. Passi	December 31/85	0	December 31/86
864725	E. Passi	December 31/85	0	December 31/86
863726	E. Passi	December 31/85	0	December 31/86
864727	E. Passi	December 31/85	0	December 31/86
864728	E. Passi	December 31/85	0	December 31/86
864738	E. Passi	December 31/85	0	December 31/86
864739	E. Passi	December 31/85	0	December 31/86
864740	E. Passi	December 31/85	0	December 31/86
864741	E. Passi	December 31/85	0	December 31/86
864742	E. Passi	December 31/85	0	December 31/86
864743	E. Passi	January 23/86	0	January 23/87
864744	E. Passi	January 23/86	0	January 23/87
864745	E. Passi	January 23/86	0	January 23/87
864746	E. Passi	January 23/86	0	January 23/87
864747	E. Passi	January 23/86	0	January 23/87
876951	David Jones	December 18/85	0	December 18/86
876952	David Jones	December 18/85	0	December 18/86
876953	David Jones	December 18/85	0	December 18/86
876954	David Jones	December 18/85	0	December 18/86
876955	David Jones	December 18/85	0	December 18/86
876956	David Jones	December 18/85	0	December 18/86
876957	David Jones	December 18/85	0	December 18/86
876958	David Jones	December 18/85	0	December 18/86

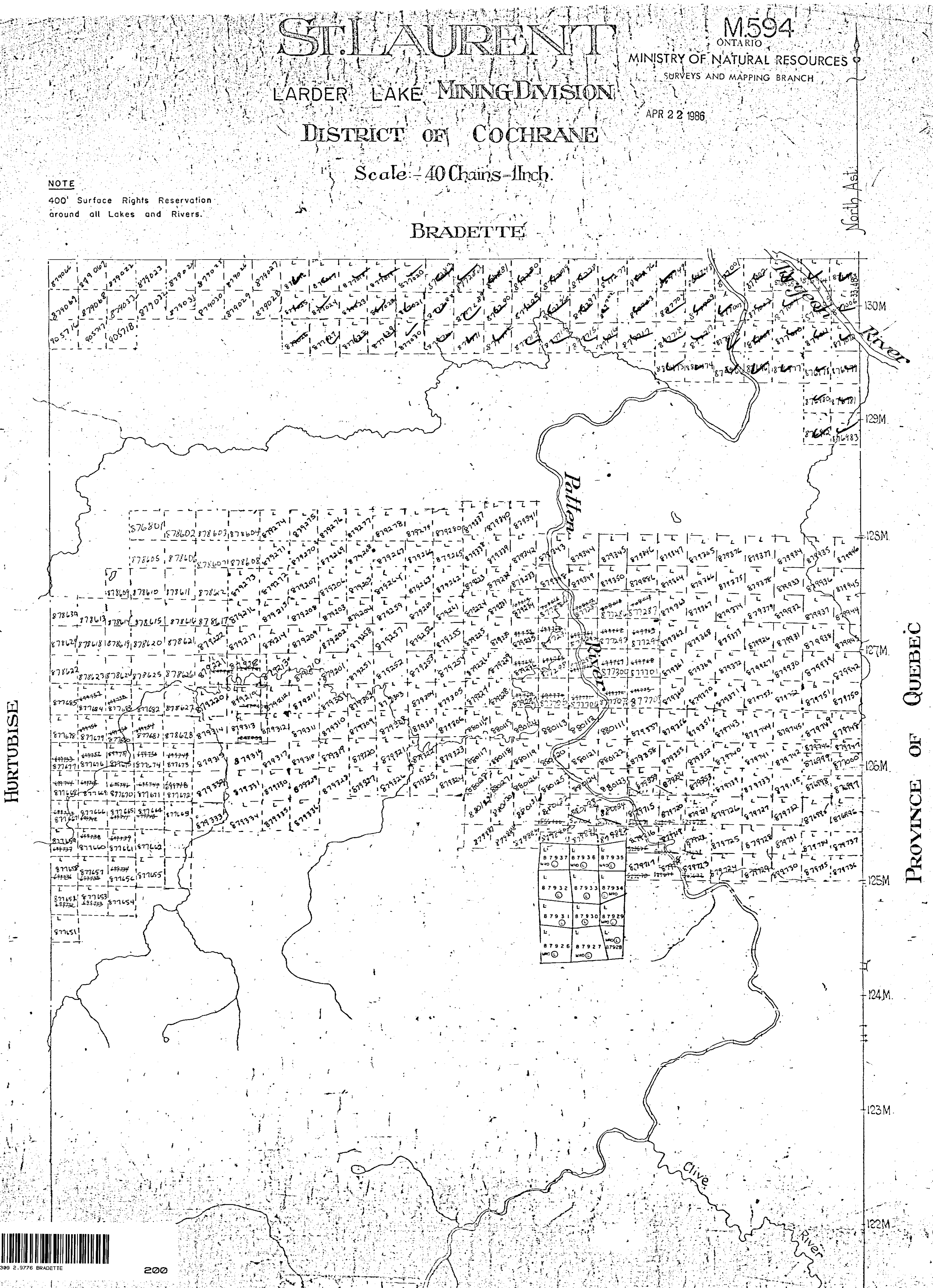
CLAIM NUMBER	RECORDED HOLDER	RECORDING DATE	TOTAL DAYS FILED	EXPIRY DATE
876959	David Jones	December 27/85	0	December 27/86
876960	David Jones	December 27/85	0	December 27/86
876961	David Jones	December 27/85	0	December 27/86
876962	David Jones	December 27/85	0	December 27/86
876968	David Jones	December 27/85	0	December 27/86
876969	David Jones	December 27/85	0	December 27/86
876970	David Jones	December 27/85	0	December 27/86
876971	David Jones	December 18/85	0	December 18/86
876972	David Jones	December 18/85	0	December 18/86
876973	David Jones	December 18/85	0	December 18/86
876974	David Jones	December 18/85	0	December 18/86
876975	David Jones	December 18/85	0	December 18/86
876976	David Jones	December 18/85	0	December 18/86
879754	P. Matthews	January 23/86	0	January 23/87
879755	P. Matthews	January 23/86	0	January 23/87
879756	P. Matthews	January 23/86	0	January 23/87
879757	P. Matthews	January 23/86	0	January 23/87
879758	P. Matthews	January 23/86	0	January 23/87
879759	P. Matthews	January 23/86	0	January 23/87
879760	P. Matthews	January 23/86	0	January 23/87
879761	P. Matthews	January 23/86	0	January 23/87
879762	P. Matthews	January 23/86	0	January 23/87

60 claims

ST. LAURENT - 71

Claim Numbers

L864748	L877016	L877288
L864749	L877017	L877289
L876963	L877018	L877290
L876964	L877019	L877295
L876965	L877020	L877296
L876966	L877021	L877297
L876967	L877022	L877702
L876977	L877023	L877703
L876978	L877024	L877704
L876979	L877025	L877709
L876980	L877026	L877710
L876981	L877027	L877711
L876982	L877028	L877712
L876983	L877029	L877713
L877001	L877030	L877714
L877002	L877276	L877715
L877003	L877277	L877716
L877004	L877278	L877717
L877005	L877279	L877718
L877006	L877280	L877719
L877007	L877281	
L877008	L877282	L880473
L877009	L877283	L880474
L877010		
L877011		
L877012		



32E05NE9309 2.9776 BRADETTE

200

BRADETTE

M.425

LARDER LAKE MINING DIVISION

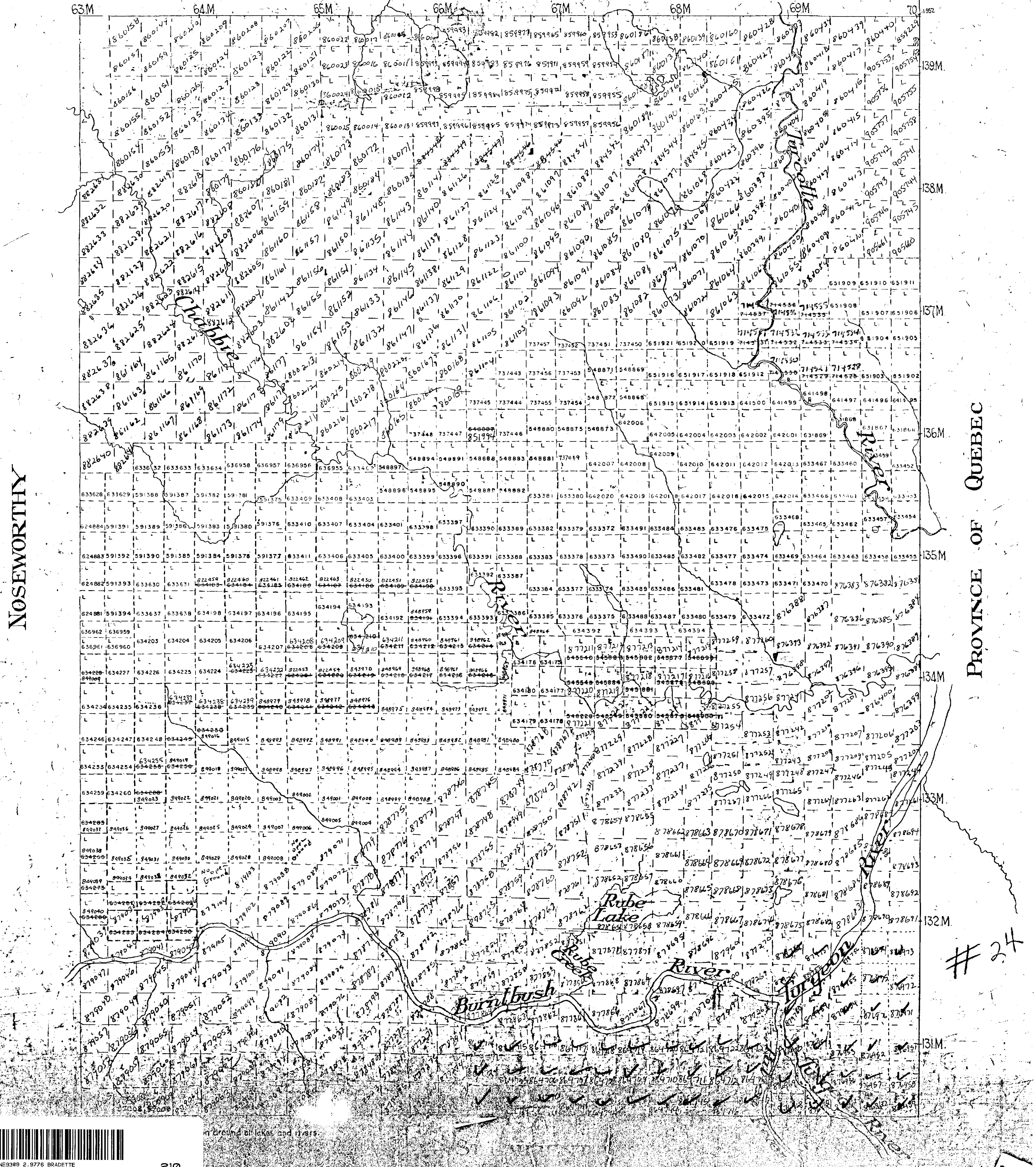
DISTRICT OF COCHRANE

Scale: - 40 Chains = 1 Inch.

OCT - 6 1986

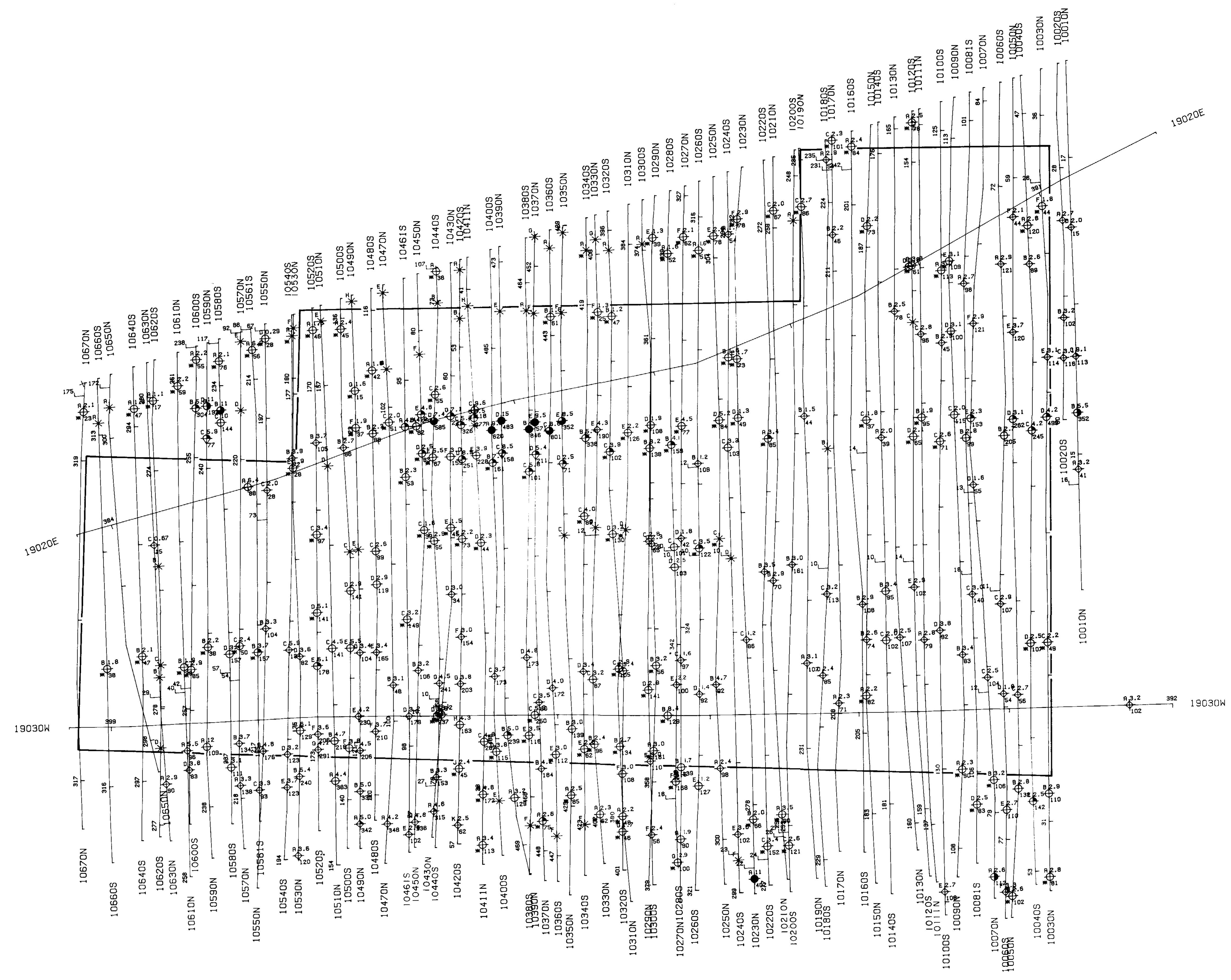
LEGEND

Cancelled	C
Patented Land	(P)
Crown Land Sale	C.S.
Leases	(L)
Located Land	Loc.
License of Occupation	L.O.
Mining Rights Only	M.R.O.
Surface Rights Only	S.R.O.

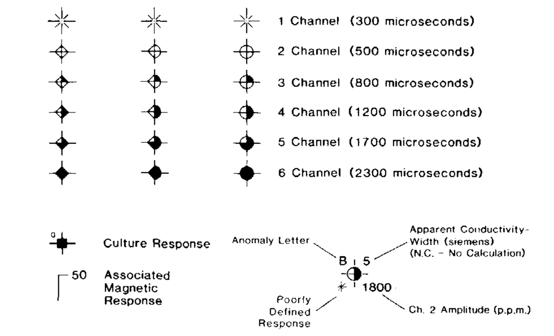


32E05NE9309 2.9776 BRADETTE

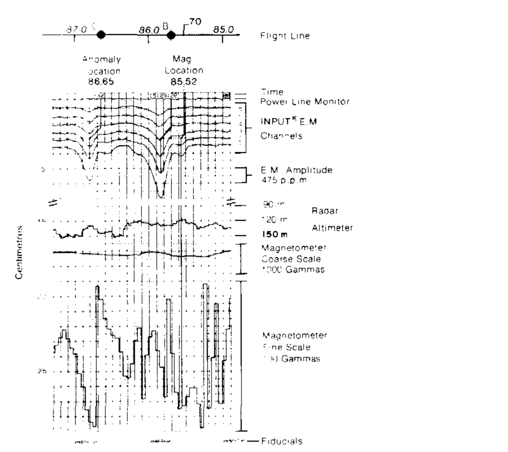
210



INPUT® PEAK RESPONSE SYMBOLS 2ms PULSE



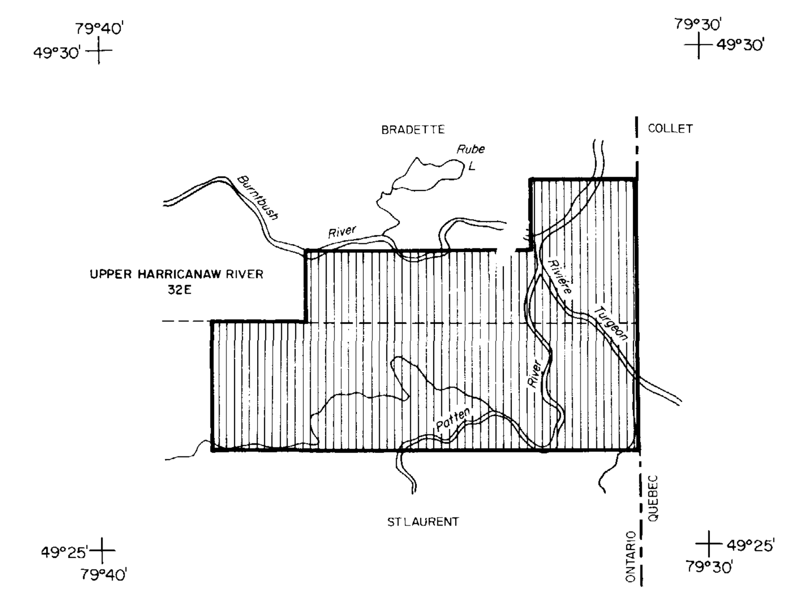
Representative INPUT® Magnetometer and Altimeter Recording



DESCRIPTIVE NOTES

The aircraft is equipped with the Barringer/Questor Mark VI INPUT® airborne E.M. System and the Geometrics G-803 Proton Precession Magnetometer and Sonotek SDS-1200 Series Data Acquisition System. The INPUT® system will respond to conductive overburden and near-surface horizontal conducting layers in addition to bedrock conductors. Discrimination of conductors is based on the rate of transient decay, magnetic correlation and the anomaly shape, together with the conductor pattern and topography.

® Registered Trade Mark of Barringer Research Limited



AIRBORNE MK VI INPUT SURVEY

GLEN AUDEN RESOURCES LTD.

BRADETTE - ST LAURENT TWPS

PROVINCE OF ONTARIO

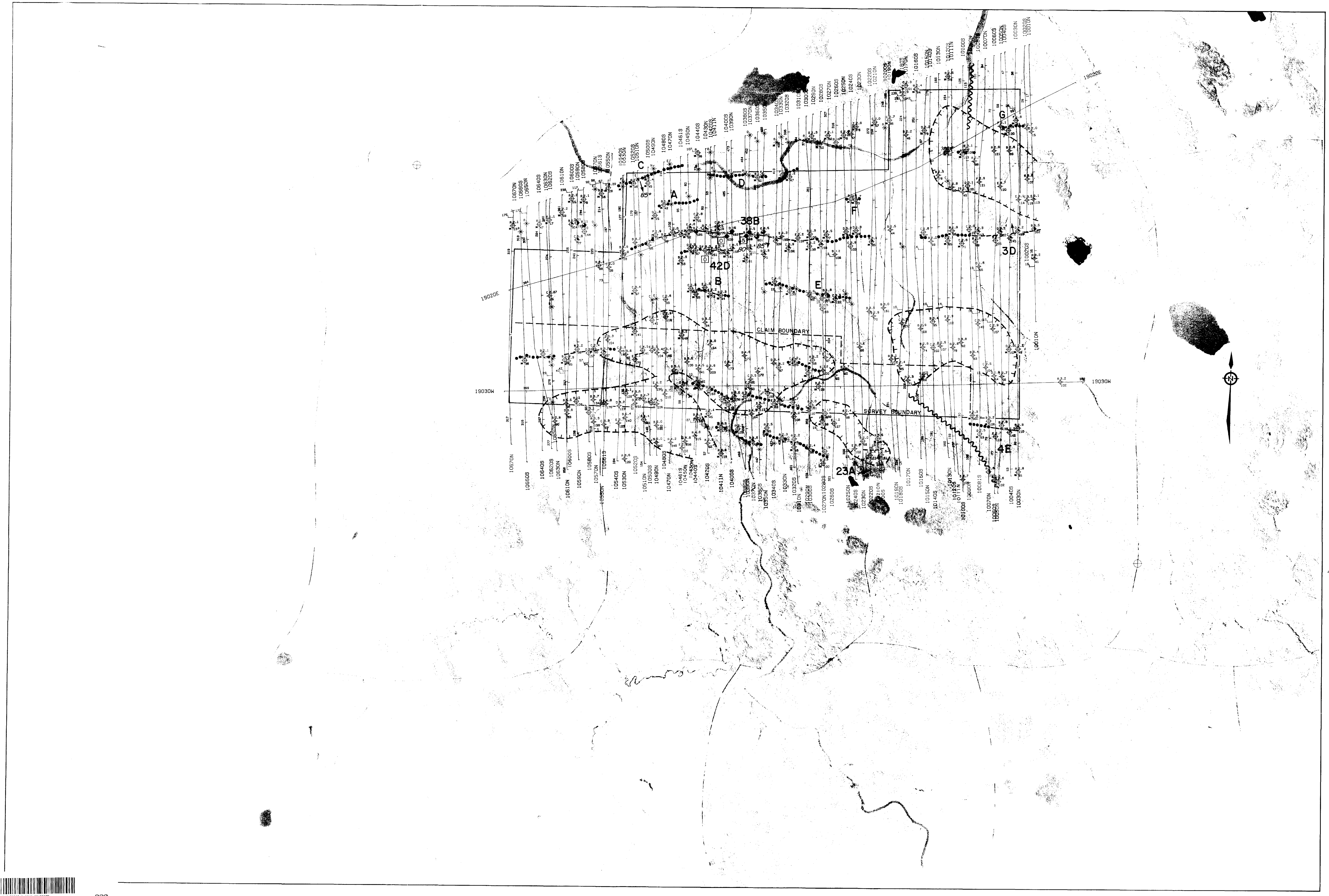
2.9776

SCALE 1:20000

FILE NO.	SHEET NO.	DATE
28037	1 OF 1	NOVEMBER 1986

QUESTOR SURVEYS LIMITED
MISSISSAUGA ONTARIO CANADA

220



INPUT® PEAK RESPONSE SYMBOLS 2ms PULSE

SURFICIAL RESPONSE	UP-DIP PEAK RESPONSE	BEDROCK RESPONSE	DECAY INTERVAL CLASSIFICATION
			1 Channel (300 microseconds)
			2 Channel (500 microseconds)
			3 Channel (800 microseconds)
			4 Channel (1200 microseconds)
			5 Channel (1700 microseconds)
			6 Channel (2300 microseconds)

Culture Response

50 Associated Magnetic Response

Anomaly Letter — B 5 — Apparent Conductivity-Width (siemens) (N.C. – No Calculation)

Poorly Defined Response — 1800 — Ch. 2 Amplitude (p.p.m.)

INTERPRETATION

20 Conductor Axis, with reference number (good definition)

20 Conductor Axis, with reference number (poor definition)

Vertical Conductor

80° Conductor Dip (magnitude and direction known)

Conductor Dip (direction known)

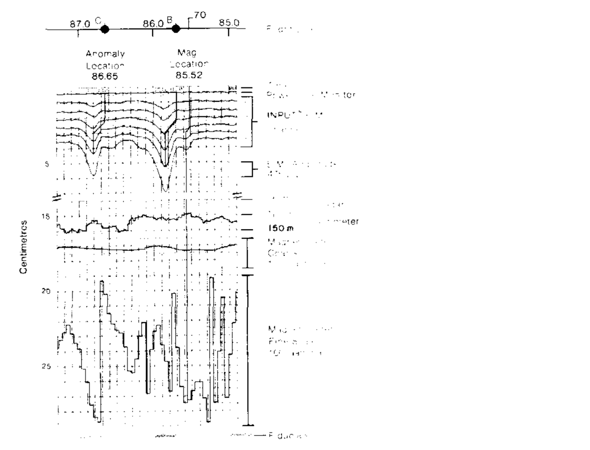
20 Selected Zone, with reference number

Conductive Zone

Fault Zone

5 Depth to top of conductor in metres

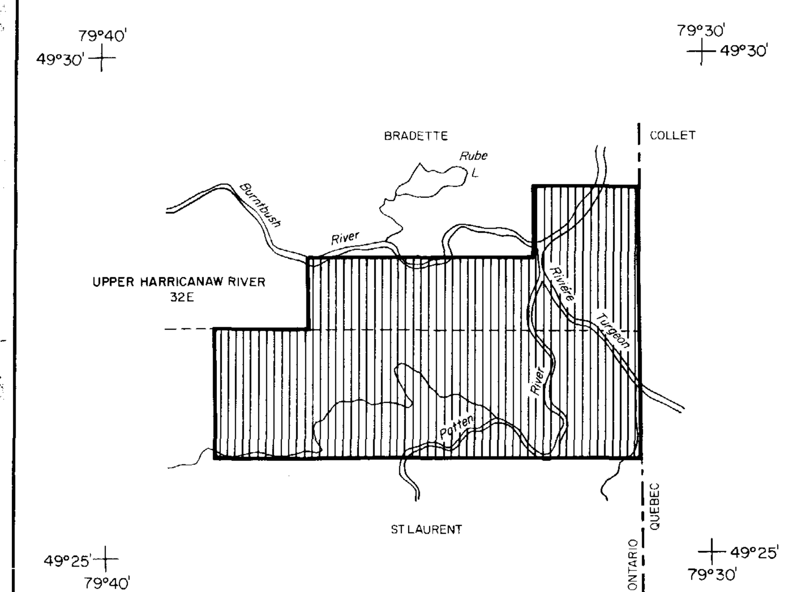
Representative INPUT® Magnetometer and Altimeter Recording



DESCRIPTIVE NOTES

The aircraft is equipped with the Barringer/Questor Mark VI INPUT® airborne E.M. System and the Geometrics G-803 Proton Precession Magnetometer and Sonotek SDS-1200 Series Data Acquisition System. The INPUT® system will respond to conductive overburden and near-surface horizontal conducting layers in addition to bedrock conductors. Discrimination of conductors is based on the rate of transient decay, magnetic correlation and the anomaly shape, together with the conductor pattern and topography.

® Registered Trade Mark of Barringer Research Limited



AIRBORNE MK VI INPUT® SURVEY

GLEN AUDEN RESOURCES

BRADETTE - ST LAURENT TWPS

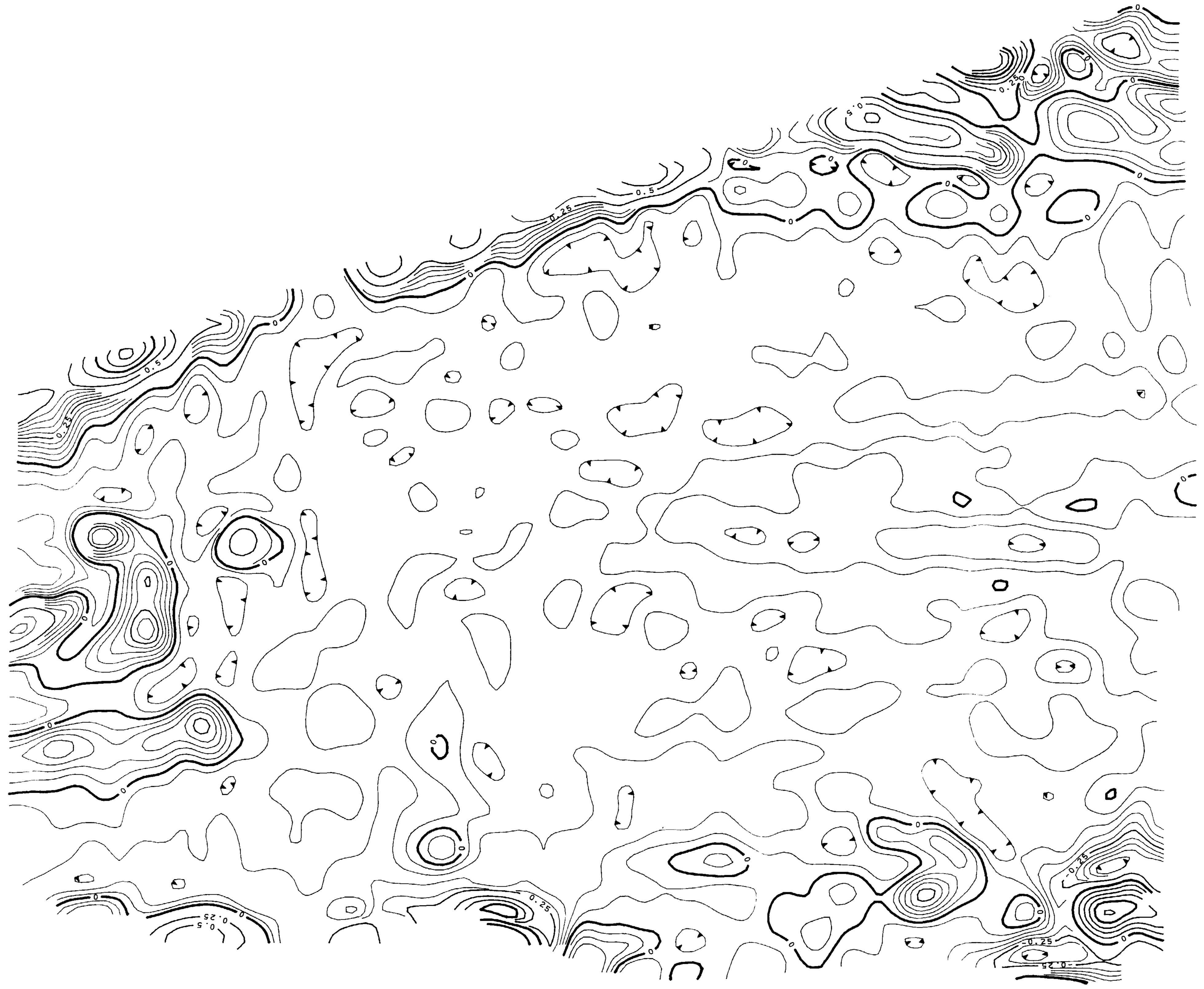
Provinces of ONTARIO 29776

1:20000

FILE NO	SHEET NO	DATE
28037	1 of 1	Nov 1986

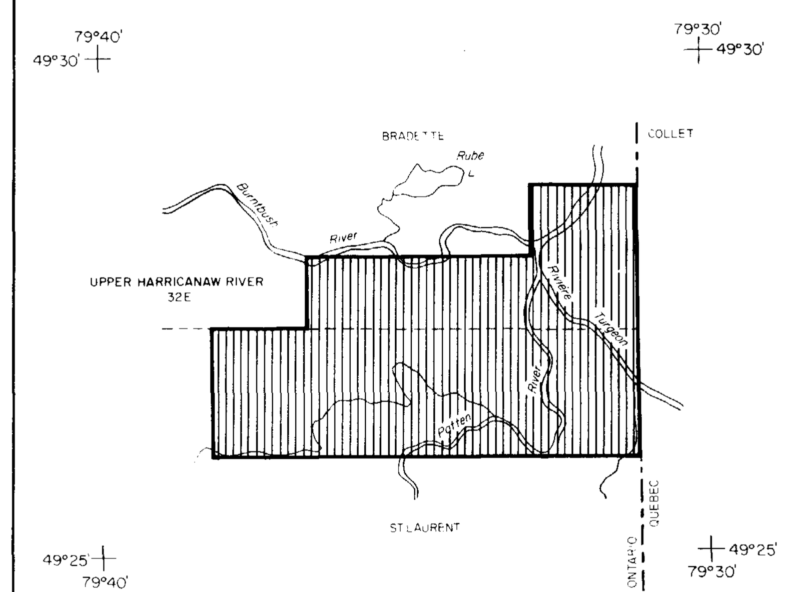
Questor Surveys Limited
Mississauga Ontario Canada

230



CONTOUR LEGEND

- 0.05 GAMMAS/METER
- 0.25 GAMMAS/METER
- 1.00 GAMMAS/METER
- 5.00 GAMMAS/METER



CALCULATED VERTICAL MAGNETIC DERIVATIVE

GLEN AUDEN RESOURCES

BRADETTE-ST LAURENT TWPS

Provinces of ONTARIO 2.9776

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28037	1 of 1	Nov 1986

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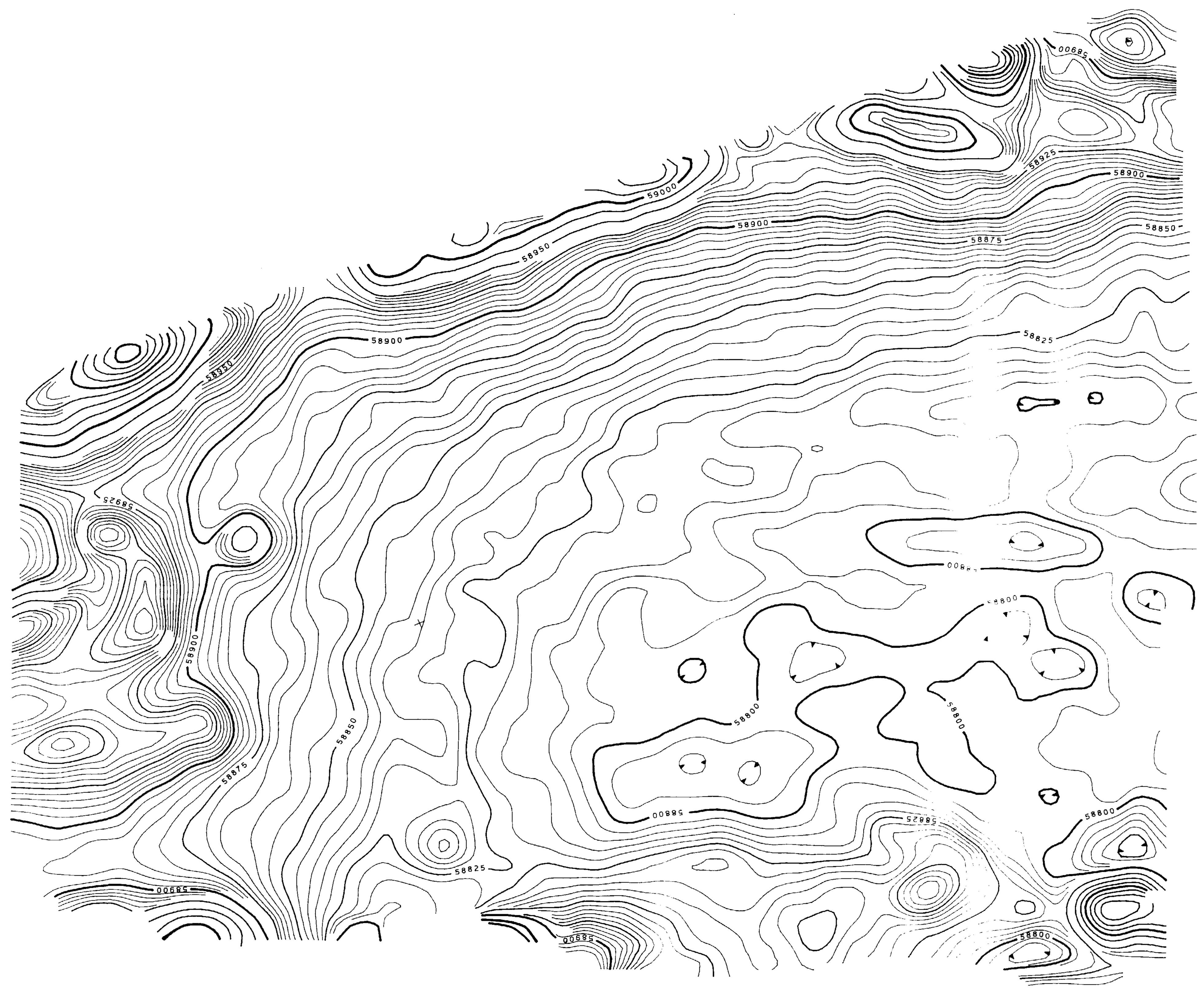
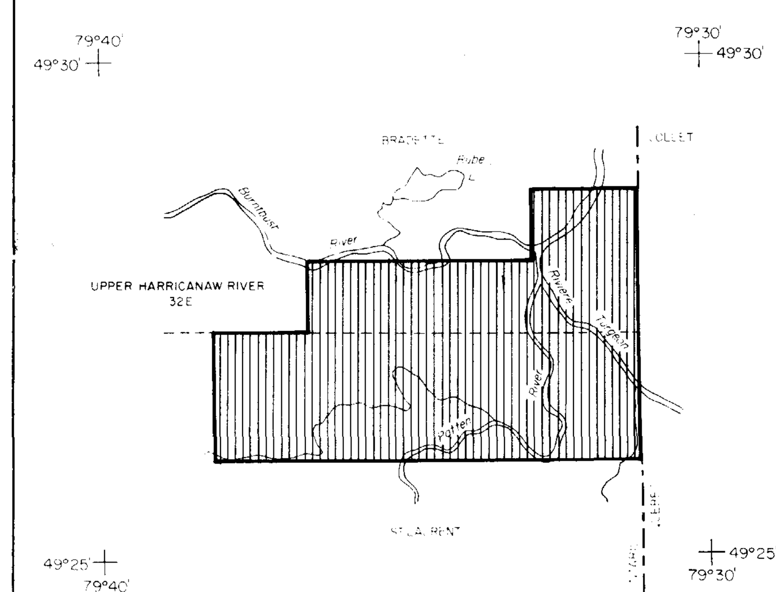


MAGNETIC CONTOURS

—	5 GAMMA CONTOUR LINE
—	25 GAMMA CONTOUR LINE
—	100 GAMMA CONTOUR LINE
—	500 GAMMA CONTOUR LINE



TOTAL MAGNETIC INTENSITY SURVEY

GLEN AUDEN RESOURCES

BRADETTE - ST LAURENT TWPS

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