84-#752 — 12779

REPORT OF WORK 6/85

GEOPHYSICAL SURVEYS

ON THE

MABEL LAKE PROPERTY

N.T.S. 82L/10

LAT. 50°38' LONG. 118°35'

Sherpa (1,2,100,200,300)
Rebar (1,3,4,200,300,400,500,600,1100)
Rebar (2,100,700,800)

VERNON MINING DIVISION

Submitted by: L. Bradish
Division Geophysicist
Vancouver, B.C.
September 10, 1984

Noranda Exploration Company Limited

CONTENTS

APPENDICES

MAPS AND FIGURES

1.0 INTRODUCTION

During 1983 - 1984 several geophysical surveys were carried out on the "Mabel Lake" property located approximately 115 kilometers due east of Kamloops, B.C. The target was the source of highly mineralized boulders (stratiform sulphides Sp, Po, Py) found near the base of the hillside on which the claims lie. Geophysical surveys carried out on this property included Horizontal Loop E.M., Magnetometer, a limited amount of Induced Polarization and an airborne INPUT EM and Magnetic survey by Questor Surveys Ltd. Additional work completed during the same period included geological examinations, soil geochemistry, trenching and drilling.

2.0 LOCATION, ACCESS AND GRIDS

The property is located 115 kilometers due east of Kamloops, B.C. Specifically the claims are located on the east shore of Mabel Lake and north of Tsuius Creek (82L/10). Access to the claims is via Lumby and the Mabel Lake access logging road, approximately 50 km by road.

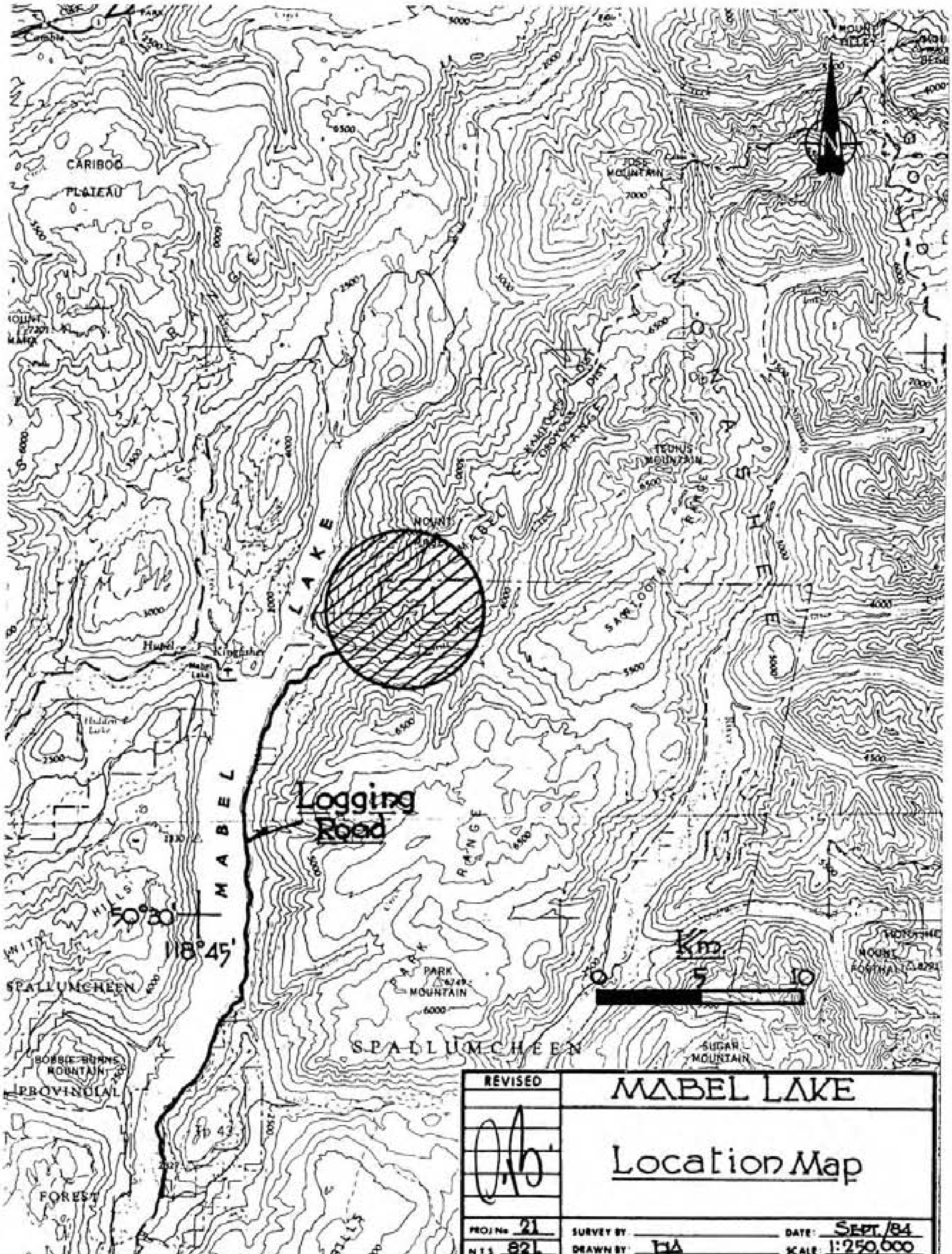
The first grid established on the property was quite extensive consisting of **56** winglines totalling **57.900** line kilometers. These survey lines are controlled by two north-south baselines and one east-west base line (13.800 km). A second detail grid was also established on the northwest portion of the property overlying the original north-west grid and consists of 20 lines controlled by a 1.900 km baseline for a total of 35.350 line km.

Reconnaissance lines totalling 0.825 km were also established to give a grand total of **107.775** line km of grid. Baselines and the detail grid were cut and blazed where as the wing lines on the large grid were flagged and chained.

3.0 CLAIMS

The property consists of several claims which have been grouped as follows:

	CLAIM	NO.of UNITS	MONTH OF RECORD
Mabel Lake-Alpha:	Sherpa 1	20	11
	Sherpa 2	20	11
	Sherpa 100	18	04
	Sherpa 200	18	04
	Sherpa 300	18	04


CARIBOO
PLATEAU
JOSS MOUNTAIN
TEMUS MOUNTAIN
MABEL LAKE
Logging Road
50°30'
118°45'
Km.
0 5 10
PARK MOUNTAIN
SPALLUMCHEEN
SUGAR MOUNTAIN
BOBBIE BURNS MOUNTAIN
PROVINCIAL
FOREST
Mabel
Kingfisher
REVISED
MABEL LAKE
Location Map
PROJ No. 21
NTS 82L
DWG. No.
SURVEY BY:
DATE: SEPT./84
DRAWN BY:
SCALE: 1:250,000
NORANDA EXPLORATION
OFFICE: Vancouver

Mabel Lake-Beta:	Rebar 1	20	06
	Rebar 3	12	08
	Rebar 4	4	11
	Rebar 200	1	12
	Rebar 300	1	12
	Rebar 400	1	12
	Rebar 500	1	12
	Rebar 600	1	12
	Rebar 1100	20	05
Mabel Lake-Charlie:	Rebar 2	20	06
	Rebar 100	20	11
	Rebar 700	15	01
	Rebar 800	8	01

4.0 PERSONNEL

The geophysical surveys were carried out under the supervision of the author. The HLEM and magnetometer surveys completed during the fall and winter of 1983 were performed by a crew on contract from Peter E. Walcott and Assoc. of Coquitlam, B.C.

The 1984 surveys (HLEM, mag and I.P.) were performed by employees of Noranda Exploration Company, Limited and were under the daily supervision of K. Lillie, Geophysical Supervisor.

Crew accommodation for the most part was located in a field camp at Tsuius Creek. For a brief period the crew was located at commercial lodgings in Lumby, B.C.

5.0 INSTRUMENTATION

5.1 INPUT EM AND MAGNETOMETER SURVEYS

"The Induced Pulse Transient (INPUT) method is a system whereby measurements are made, in the time domain, of a secondary electromagnetic field while the primary field is between pulses. Currents are induced into the ground by means of a pulsed primary electromagnetic field which is generated from a transmitting loop around the helicopter. By using half-sine wave current pulses and a transmitter loop of large turns-area, a high signal-to-noise ration and the high output power needed for deep penetration, are achieved.

Induced current in a conductor produces a secondary electromagnetic field which is detected and measured after the termination of each primary pulse. Detection of the secondary field is accomplished by means of a receiving coil, wound on an air core form, mounted in a PCV plastic shell called a "bird" and towed behind and below the helicopter on 76 meters (250 feet) of coaxial cable. The received signal is processed and recorded by equipment within the helicopter.

The axis of the receiving coil may be vertical or horizontal relative to the flight direction. In rolling or hilly terrain the standard or horizontal coil axis is preferred, although in steep terrain, the vertical axis coil optimizes coupling with horizontal or dipping stratigraphy. The secondary field is in the form of a decaying voltage transient, measured in time, at the termination of the primary transmitted pulse. The amplitude of the transient is proportional to the amount of current induced into the conductor, the conductor dimensions, conductivity and the depth beneath the helicopter.

The rate of decay of the transient is inversely proportional to conductance. By sampling the decay curve at six different time intervals and recording the amplitude of each sample, an estimate of the relative conductance can be obtained. Transients due to strong conductors such as sulphides and graphite, usually exhibit long decay curves and are therefore commonly recorded on all six channels. Sheet-like surface conductive materials, on the other hand, have short decay curves and will normally only show a response in the first two or three channels.

For homogeneous conditions, the transient decay will be exponential and the time constant of decay is equal to the time difference at two successive sampling points divided by the log ratio of the amplitudes at this point.

SONOTEK P.M.H. 5010 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 1 gamma and an operating range of 20,000 gammas to 100,000 gammas. 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 nose boom supporting the INPUT transmitter cable loop. A 3-term comensating coil and perma-alloy 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 a measurement is only 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 seconds when no current pulses are induced into the transmitter coil".[1]

[1] Konings, M., 1983, Helicopter Electromagnetic survey, Noranda Exploration Company, Limited, Mount Mabel Area British Columbia: Questor Surveys Limited, page A-1 - A-2, A-6.

5.2 HORIZONTAL LOOP EM SURVEY

The SE-88 unit differs from the normal HLEM systems such as the MaxMin 11 above in that it measures without regard to phase, the ratio of signal amplitude between two frequencies which are transmitted and received simultaneously. A low frequency of 112 Hz is used as a reference frequency. The signal difference is integrated or averaged over a period of time in order to improve the signal to noise ratio thus giving a sensitivity that rivals the normal HLEM methods.

The survey parameters employed on the follow-up programme are as follows:

Coil separation	: 100 meters
Frequencies	: 3037, 1012, 337 Hz
Reference frequency	: 112 Hz.
Integration period	: 16 or 8 seconds
Reading interval	: 25 meters
Measurement	: ratio of amplitude between reference and signal frequencies (%).

5.3 MAGNETOMETER SURVEY

The magnetometer survey completed on the main grids (by Peter E. Walcott and Associates) employed a GEM field and base station magnetometer system with a usable reading accuracy of $\pm$ 0.1 gamma. All applicable corrections to the field data were carried out.

"UNIMAG" G.836 Proton Precession magnetometers manufactured by Exploranium Geometrics of Ontario were utilized on the detail grid. The total field measurement is read with a resolution of 10 gammas and all values recorded on the grid were corrected for diurnal and day to day variations. Correction values were determined from an EDA PPM 500 recording base station. The magnetic datum was set at 57,000 gammas for the main grid and at 58,000 gammas for the small detail grid.

6.0 DISCUSSION OF RESULTS

The INPUT EM and magnetometer surveys (Maps 1 & 2) were flown by Questor Surveys Ltd. of Toronto, Ontario. The following discussion is an excerpt from their report to Noranda Exploration Company, Limited.

BLOCK "A"

"There is a direct relationship between the regional geology and the INPUT conductors. The geometry of the conductors is locally complex, with many apparent isolated conductors in the southern half of the survey area. A number of discontinuities may be attributed to high altitude segments of the profiles, and an attempt has been made to correlate conductor axes along strike. Although the regional magnetic fabric has a sympathetic alignment with the conductor axis directions, direct magnetic coincident anomalies related to conductance and amplitude are sadly lacking. Minor magnetic peaks in the 10 nT range are more likely the effect of geological and terrain variations than the hoped for pyrrhotite. Nevertheless, almost all of the conductors of the survey area have attributes of high apparent conductances and high amplitudes. In general, follow-up is recommended for every conductive horizon, as the prioritization criterion are similar for most conductors.

The interpreted conductor dips, although consistently north, appear to be substantially steeper than geological indications, especially in areas of multiple conductors. The superposition of responses will cause a change in the amplitude ratios on which the dip determinations are based. The apparent conductances of many responses are exceptional, that is, greater than 75S. Some of these values may vary for updip and downdip responses, dependent on the exact location of the picked anomaly peak. Apparent conductances will increase in a downdip direction from the projection of the conductor axis.

<u>Conductor 104F</u>	Priority 2
Conductance	34S
Dip	N
Magnetic Correlation	---
Related Responses	10010B

A similar response to the prime response exists off line 10050S, but may be seen at fiducial 37.8 on the profile records. The axis location is approximate on account of the absence of additional responses, both along strike and as the "main" response peak. No responses are evident on lines 10030 and 10020 due to a high local traverse altitude. At line 10060S, the zone has been interpreted to pass to the south of the flight lines, although there is no direct evidence to substantiate this. The anomaly is located within a magnetic low.

<u>Conductor 106D</u>	Priority 1
Conductance	25S
Dip	30-50 N
Magnetic Correlation	20 nT
Related Responses	10040CD, 10060C, 10071A, 10080EF

The 106D conductor has a substantial strike length coupled with structural complexities and a probable magnetic correlation. The magnetic patterns and the magnetic profile sharpen for both the 106D and 109A Zones, are remarkably similar and are highly suggestive of fault displacement of stratigraphy. The eastern end of the conductor is particularly flat dipping, as there is no sign of the "main" peak response.

Conductors 107BC	Priority 2
Conductance	19-108S
Dip	N
Magnetic Correlation	10 nT
Related Responses	10080D

A pair of weaker conductive responses across the northeastern end of 106D, appear as weaker conductors with possible weak magnetic correlations. They are strike terminated to the east by the proposed fault, and have little metal potential due to either short strike length of discontinuous mineralization. Follow-up of this zone could be adequately performed by extending several grid lines from the 106D conductor.

Conductor 108C	Priority 3
Conductance	6S
Dip	Flat
Magnetic Correlation	15 nT
Related Responses	---

The sharp and narrow form of the prime response is not characteristic of a vertical conductor but rather a very flat dip source. The lack of a peak shift and nearly summetrical shape is evidence of this. The zone has not lateral extent in any direction and may be considered isolated. Minor magnetic variations have an unknown relation to the conductive target. The low conductance would normally be associated with structural or graphitic conductors.

Conductor 109A	Priority 1
Conductance	20-25S
Dip	S ?
Magnetic Correlation	15 nT
Related Responses	10091B, 10100C

The location of the 109A conductive horizon closely matches the location of the 106D zone, relative to a local magnetic peak. There are however, several distinct differences in the profiles not apparent on adjacent lines. The 10091A intercept appears to have a southward peak shift, common to south dipping conductors. The amplitude of 10091B is significantly higher than "A". in spite of a greater amplitude. This combination is not the result of a simple geometry, and an additional conductor axis is a distinct possibility. The 10100C response is a typical updip response although it exhibits a substantially reduced conductance and very flat southward dip.

Conductor 112C	Priority 2
Conductance	23-63S
Dip	30N
Magnetic Correlation	15 nT
Related Responses	10090C & D, 10110C, 10131C, 10140C, 10150D, 10151A, 10160A.

The 112C zone also has similarities related to its location on the shoulder of a broad magnetic feature previously mentioned in the 106D and 109A zones. The 112C anomaly has a long strike length which has poorly defined strike extension to the 10170A intercept. Many of the responses along the trend have exceptional conductances coupled with amplitudes expected from nearly flat lying conductors. A magnetic coincidence is evident on lines 10140S and 10120C, but not on adjacent lines.

Conductor 114B	Priority 1
Conductance	20-40S
Dip	45N
Magnetic Correlation	---
Related Responses	10132A & B, 10140A & B.

The 114B conductor is indicative of a sharp strike departure to the northeast. The conductor is open in strike to the northeast; however, neither the magnetics nor electromagnetic responses show any clear pattern in the direction of the 109A zone. The 10120B intercept is the closest parallel response to the west. The prime response and its updip accessory have long decay transients which, by themselves are sufficient to warrant a ground evaluation.

Conductor 115B	Priority 1
Conductance	15S
Dip	50N
Magnetic Correlation	---
Related Responses	10131A, 19030G & H, 10150A & B

The 115B conductor, similar to other conductors in the southern half of the block is located on an apparent magnetic contact. Although somewhat higher in altitude on flight line 10140, there are no clear cut response peaks to correlate with the 10131A and 10150A & B responses. Both responses have moderate but consistent apparent conductances, after a characteristic of graphitic conductance.

Conductor 119A	Priority 1
Conductance	45S
Dip	45N
Magnetic Correlation	15 nT
Related Responses	10171A, 10180C, 10191A, 10200B & C, 10210B & C

Flat northward dips of 45 and less were interpreted for every flight line intercept. The zone differs from most of the longer conductors by its variable conductance which decreases significantly eastward. The 19030C and D responses are likely to be a strike continuation of the zone. At 10200B and C, a magnetic correlation occurs; however, a low feature may be traced along strike with other responses.

Conductor 120A	Priority 2
Conductance	57S
Dip	N
Magnetic Correlation	---
Related Responses	10180A & B, 10191B, 19030A & B.

For unknown reasons, the 120A conductor has greatly attenuated amplitudes, although the apparent conductances are high. The latter effect may result in part from the superposition of later time channel dip effects from 119A zone responses.

BLOCK "B"

The "A" and "B" survey blocks have an approximate common overlap in the area of intercepts 20090B and 20100A. The interpreted axis is undoubtedly duplicated for responses 10020A and 10032B. The northwest dip of the conductor is consistent with the northward dip of the "A" Block , but contrasts to the east and southeast dips of Block "B". The resultant synform is consistent with geological mapping, although the apparent conductor dips are significantly steeper than indicated by G.S.E. mapping (Map 1059A).

All of the conductor axes are recommended for ground evaluations, as enhanced sections of conductivity are present on every horizon. In spite of a strong magnetic gradient, many local magnetic anomalies correlate with the conductor axes. Magnetite variations are the most logical explanations, mainly because of the absence of a direct and consistent conductance correlation.

Conductors 202E, 206B	Priority 1
Conductance	10, 50S
Dip	60E
Magnetic Correlation	---
Related Responses	20010A & B, 20030A, 20031A, 20070B

Similarities in both the 202E and 206B conductors are indicative of a potentially similar origin. The 206B intercept is by far the most attractive response of the project, on account of the long decay transient, sharp profile appearance and short strike length. Ground follow-up should have little difficulty delineating this zone with standard follow-up procedures.

Conductor 204A	Priority 1
Conductance	32S
Dip	60E
Magnetic Correlation	---
Related Responses	20011A & B, 20020A, B & C 20032A, 20040B, 19010B.

The subdued amplitudes of the 20040A & B intercepts are probably caused by the high altitude of the flight line over the conductor (> 160 m). Nevertheless, significant conductances were obtained which have no apparent continuation in strike southward. The conductor is open to the north; however, this should not be interpreted as a negative criterion. The axis location is approximate, as several responses were not well defined. The control line intercept is consistent with the map axis interpretaton and dip.

Conductor 207D	Priority 1
Conductance	20S
Dip	75E
Magnetic Correlation	10 nT
Related Responses	20052G

The 207D zone is located directly adjacent to a more consistent conductor located immediately west. No obvious strike extension, although several possibilities exist. The 204A zone could be a strike extention to the 20052G response. The 20060A intercept is strong, and apparently overwrites the response obtained from the zone between the obvious anomalies. Southward from 20081, it is not clear which conductor continues; the 207D zone or its adjacent "formational" counterpart. Ground geophysics should detail both conductors because of their proximity to each other.

Conductor 206C	Priority 2
Conductance	12S
Dip	90
Magnetic Correlation	---
Related Responses	20060D, 20070A

The 20060C & D response pair is interpreted as a typical response for a near vertical plate conductor. Although the response originates from a higher than normal altitude, the low amplitudes may be the result of a very short strike length. Response dept is not likely to be great as the profile form is relatively sharp.

CONCLUSIONS AND RECOMMENDATIONS

The INPUT results of the Mount Mabel area closely substantiate known geological bedding strike directions and structures. The conductors intercepted demonstrate a substantial variation in geometrical and conductivity parameters as interpreted by the INPUT results. Although priorities favour the better conductors with short strike lengths, all conductors should eventually be explained. Magnetic anomalies are not a significant factor in the survey results, although regional susceptibility contrasts and interpreted contacts agree with conductive strike trends.

The follow-up selections presented in this report are recommended on the basis of the author's and Questor's experience and normally represent the best chances in massive sulphide exploration. Naturally, additional information gained by ground exploration may cause actual priorities to be altered.

All of the conductors are interpreted to subcrop close to the ground surface, and should be detectable by frequency domain electromagnetic equipment for 4-6 channel responses." [1]

[1] Konings, M., 1983, Helicopter Electromagnetic Survey, Noranda Exploration Company, Limited, Mount Mabel Area, British Columbia: Questor Surveys Limited, page 11-21.

5.2 HORIZONTAL LOOP E.M. AND MAGNETOMETER GROUND SURVEYS

MAIN GRID (MAPS 3, 4, 5, 7, 8 & 9

A vast multitude of conductor axes were detected by the HLEM survey particularly on Sheet 1 (Map 3). These axes combine to form a series of long sinuous conductors reflecting sources that are of shallow dip, near surface and generally of moderate to high conductivity. The sinuous nature of the zones are due to the shallow dip and topography. With few exceptions most of the conductors exhibit "good" characteristics. When coupled with the magnetic data some discrimination can be made to define zones that would rate a priority (conductivity and susceptibility).

Specifically, that combination can be shown to include zones "A" through "E" on Sheet 1 and "F" and "G" on Sheet 2. (Zones on Sheet 3 are poorly defined due to the grid parameters and will be dealt with under the Detail Grid Section.)

Anomaly "A": (L.16200E/9525N) this zone extends to lines 16400E and 16000E however, the magnetic anomaly (523 nT peak to peak dipole) is restricted to L.16200E. The conductivity is estimated to be 10 Siemens or less.

Anomaly "B": (L.16200E/9385N) This target lies approximately 225 meters grid south of "A" above. The magnetic signature is not as attractive as "A" due to its suppressed amplitude and shape.

Anomaly "C": (L15400E/9390N, L.15200E/9325N, L.15000E/9350N). This target extends further to the east however, the realized magnetic activity is restricted to the intercepts on Lines 15400E and 15000E. The conductivity varies between 5 Siemens to 20 Siemens.

Anomaly "D": (L.15600E/9825N, L.15400E/9825N). A wide anomaly of high conductivity (21-40 Siemens) with an appreciable susceptibility was defined on these two lines. This zone is particularly interesting in that the magnetic response is recorded along the full length of this high conductivity zone. A width of 25 meters is inferred from the HLEM data adds to its interest.

<u>Anomaly "E":</u> (L.15200E/9600N, L.15000E/9550N). This zone has an interpreted width of 100 meters over a strike length of 400 + meters. The conductivity of this anomaly is calculated to be 40 Siemens. The source does not appear to be a thin horizontal sheet but rather it seems that there is some depth extent. The magnetic response over the zone is subdued but there is no question that this zone is an attractive geophysical anomaly.

<u>Anomaly "F":</u> (L.13000E/9750N, L.13400E/9775N). This HLEM anomaly extends from L.3000E to L.13600E yielding an expected strike length of 800 meters. This high conductivity zone (> 40 Siemens) has good magnetic signatures on Lines 13000E and 13400E. A satelite zone is inferred to be located north of the baseline on L.12800E and appears to have some magnetic response.

<u>Anomaly "G":</u> (L.11800E/9955N, L.11600E/10000N ?). The location and dimensions of this source are unknown as it is located at the corner of the grid. There is an interesting high amplitude, narrow magnetic response associated with the zone.

5.3 HORIZONTAL LOOP E.M., I.P. AND MAGNETOMETER GROUND SURVEYS

DETAIL GRID (MAPS 6, 10, 11, 12, 13, 14, 15)

This grid was established after a drill hole (DDH Rebar No.5) had intersected mineralization. This hole was based on the original HLEM/mag surveys (Maps 5,9). The detail grid was surveyed with HLEM (SE-88), magnetics and five lines of Induced Polarization.

Two conductors were identified as seen on Map 6. The long zone south of the baseline has no magnetic response and has been determined to be sourced by a graphitic "sheet". The short conductor located north of the Baseline on Lines 4900N through L. 5500N has a direct magnetic response. The magnetic interpretation based on the data from Line 5200E with a depth of 8 meters and a dip of 70 degrees grid south. This agrees well with the HLEM interpretation for L.5200N as illustrated on the geocompilation diagram on the following page. Drilling has confirmed this interpretation to be within experimental error.

Five lines of I.P. were completed on portions of Lines 5000N to 5400N. The data has shown several interesting features:

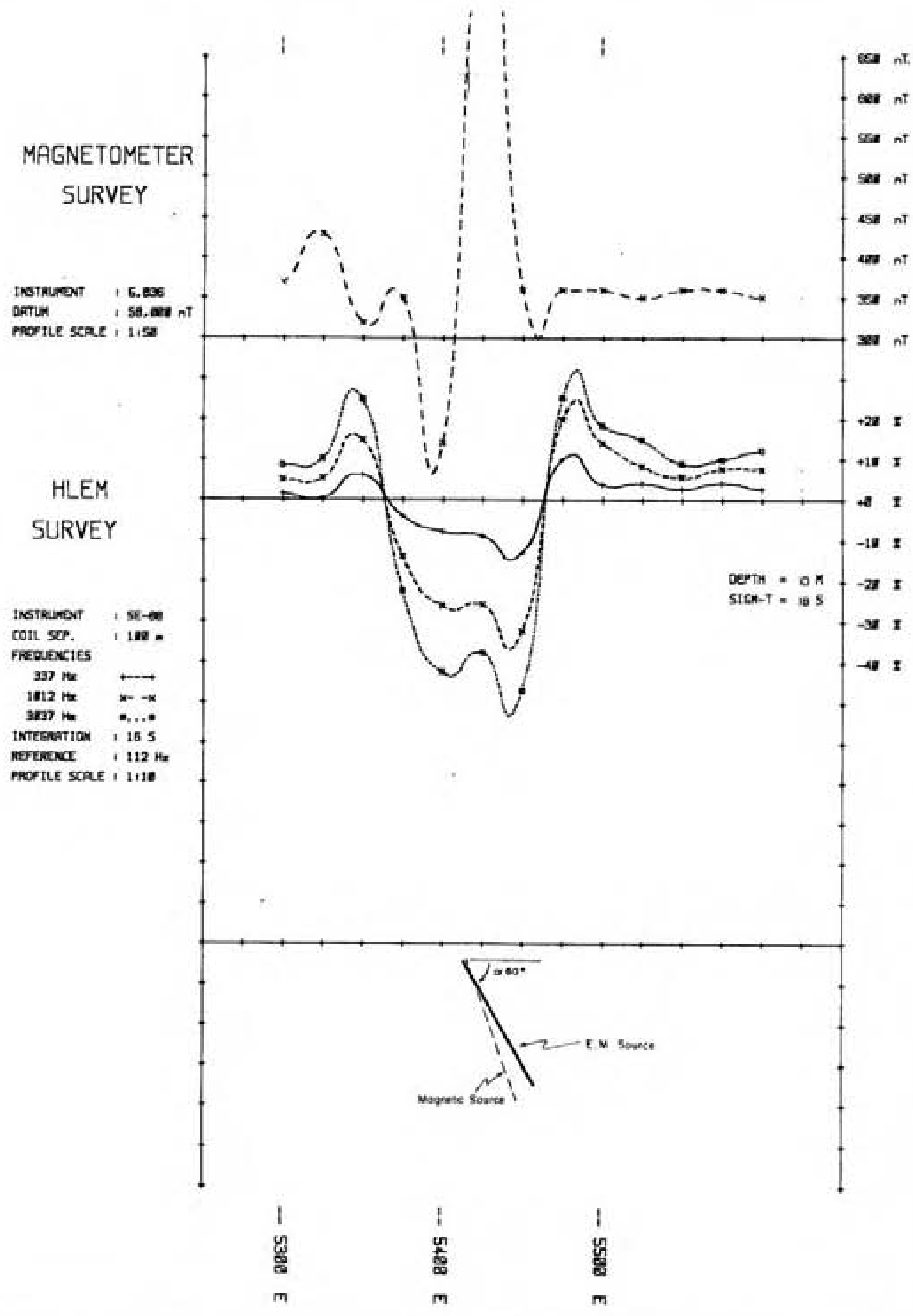
1) P.F.E. and Resistivity patterns are very consistent from Line to Line.

2) The HLEM source is expressed as a readily identifiable low-resistivity anomaly ($<$ 100 ohm-meter) coupled with a less distinct but definite P.F.E. response.

3) Grid east of the conductor a high P.F.E/low moderate resistivity package is evident and also expresses a higher magnetic background.

4) Grid west of the conductor there is a low P.F.E./high resistivity package.

The I.P. survey has demonstrated that the conductor of interest lies at (or near) the contact between two rock types.



PROJECT : 21
N.T.S. : 82
SCALE : 1:2500
DRAWN BY : Compupro
SURVEY BY : VK & AL
DATE : 4/84
DATA FILE : 21-5200N.DAT

REVISED	MABEL LAKE
	GEOCOMPILATION
	LINE 5200N
Fig. 2	NORANDA EXPLORATION OFFICE: Vancouver

7.0 RECOMMENDATIONS

The geophysical surveys have identified a vast number of conductive sources. Of the ground geophysical anomalies there are 7 targets ("A"...."G") that are considered priority 1 targets. The target on the Detail Grid has been sufficiently explained (by DDH) to warrant no further work at this stage.

The airborne survey has detected several targets that were not covered by the grid geophysics. Specifically anomalies 109A, 114B, 107B,C, and 108C (decreasing priority) warrant further investigation.

APPENDIX 1

STATEMENT OF COSTS

NORANDA EXPLORATION COMPANY, LIMITED

STATEMENT OF COST

PROJECT: Mabel Lake

TYPE OF REPORT: Geophysical Surveys

a)	Wages:		
	No. of Days	141	
	Rate per Day	$135.09517	
	Total Wages	141 x $135.09517	$19,048.42
b)	Food and Accommodation:		
	No. of days	141	
	Rate per day	$46.25695	
	Total Cost	141 x $46.25695	$ 6,522.23
c)	Transportation:		
	No. of days	141	
	Rate per day	$26.61865	
	Total Cost	141 x $26.61865	$ 3,753.23
d)	Instrument Rental and Repair		$ 1,433.98
f)	Analysis		N/C
g)	Cost of preparation of Report		
	Questor Surveys	$25,250.00	
	Peter Walcott & Assoc.	$27,922.59	
	Leo Loranger	$10,002.84	
	Larry Lebeboff	$ 2,940.36	$66,115.79
			$96,873.65

PROJECT: Mabel Lake

STATEMENT OF COST

e)	Unit costs for:	EM	
	No of units	63.9 Km	
	Unit costs	$488.7845	$31,233.33
	Total Cost	63.9 x $488.7845	
	Unit Cost For:	Mag	
	No. of units	73.3 Km	
	Unit Cost	$140.2401/Km	
	Cost	73.3 x $140.2401	10,279.60
	Unit Cost For:	AEM	
	No. of units	101 Km.	
	Unit costs	$264.9936 / km	
	Cost	101 x $264.99366	26,764.36
	Unit Cost For:	Line Preparation	
	No. of units	107.775 Km.	
	Unit Costs	$204.01076	
	Cost:	107.775 x $204.01076	21,987.26
	Unit Cost For:	IP	
	No. of Units:	1.1 Km	
	Unit Cost	$6,008.2727	
	Cost:	1.1 x $6,008.2727	6,609.10
			$96,873.65

APPENDIX II

STATEMENT OF QUALIFICATIONS

STATEMENT OF QUALIFICATIONS

I, Lyndon C. Bradish of the City of Vancouver, Province of British Columbia, do certify that:

1. I have been an employee of Noranda Exploration Company, Limited since May 1973.

2. I am a graduate of the University of British Columbia with a Bachelor of Science Degree in Geophysics.

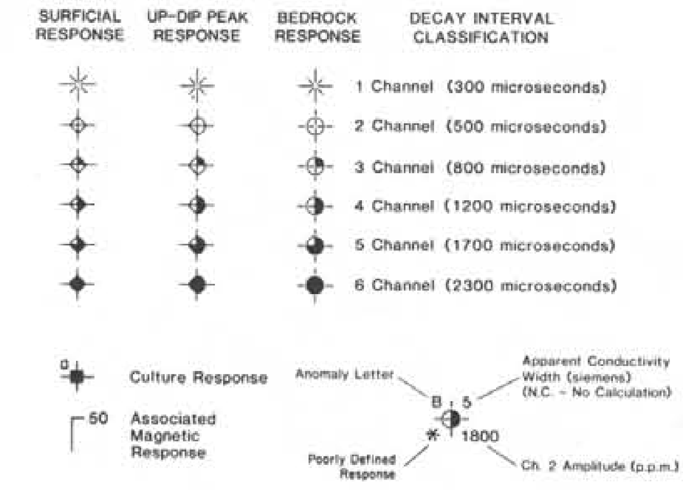
3. I am a member of the Canadian Institute of Mining and Metallurgy.

4. I am a member of the Society of Exploration Geophysicists.

5. I have held the position of Geophysicist for Noranda Exploration Company, Limited since May 1973.

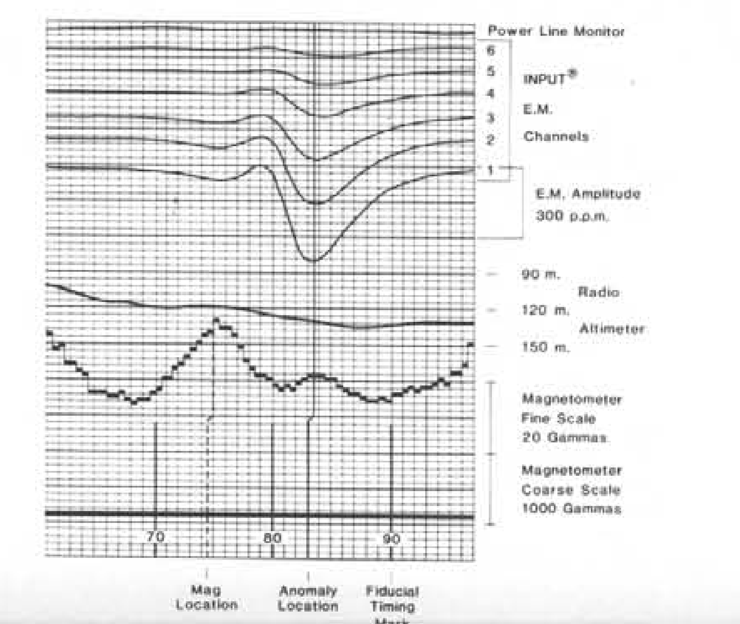
L.C. Bradish
Division Geophysicist
Noranda Exploration Company, Limited
(No Personal Liability)

INPUT® — Helicopter Vertical Axis Coil



INTERPRETATION

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 Sonotek PMH 5010 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

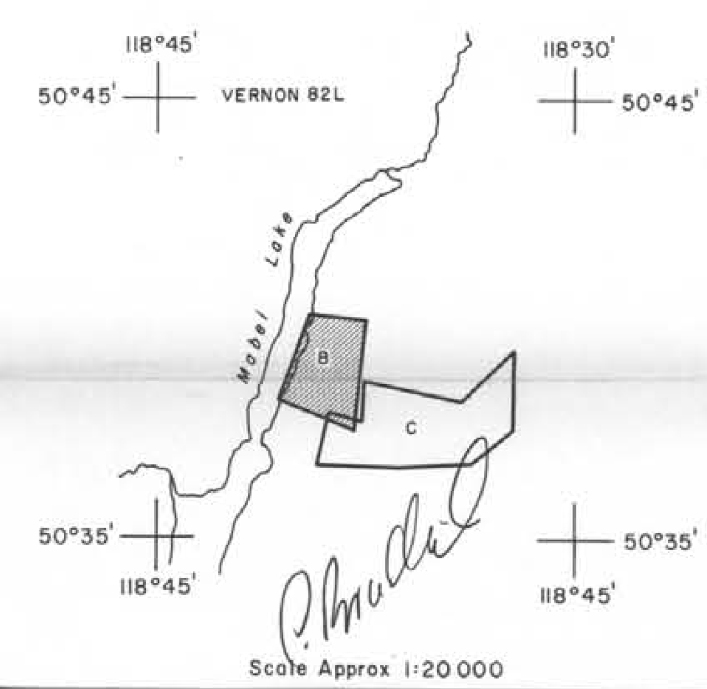
INTERPRETATION REFERENCES

Becker, A., Gauvreau, C., and Collett, L.S.
1972: Scale Model Study of Time Domain Electromagnetic Response of Tabular Conductors; Canadian Mining and Metallurgical Bulletin, Volume 65, No. 725, p. 90-96.

Dyck, A.V., Becker, A., and Collett, L.S.
1974: Surficial Conductivity Mapping with the Airborne INPUT* System; Canadian Mining and Metallurgical Bulletin, Volume 67, No. 744, p. 104-109.

Lazenby, P.G.
1973: New Developments in the INPUT* Airborne E.M. System; Canadian Mining and Metallurgical Bulletin, Volume 66, No. 732, p. 96-104.

Nelson, Philip, H.
1973: Model Results and Field Checks for a Time-Domain Airborne E.M. System; Geophysics, Volume 38, No. 5, p. 845-853.



HELICOPTER MK VI INPUT® SURVEY (Vertical Coil)

NORANDA EXPLORATION COMPANY LIMITED (no personal liability)

MOUNT MABEL AREA

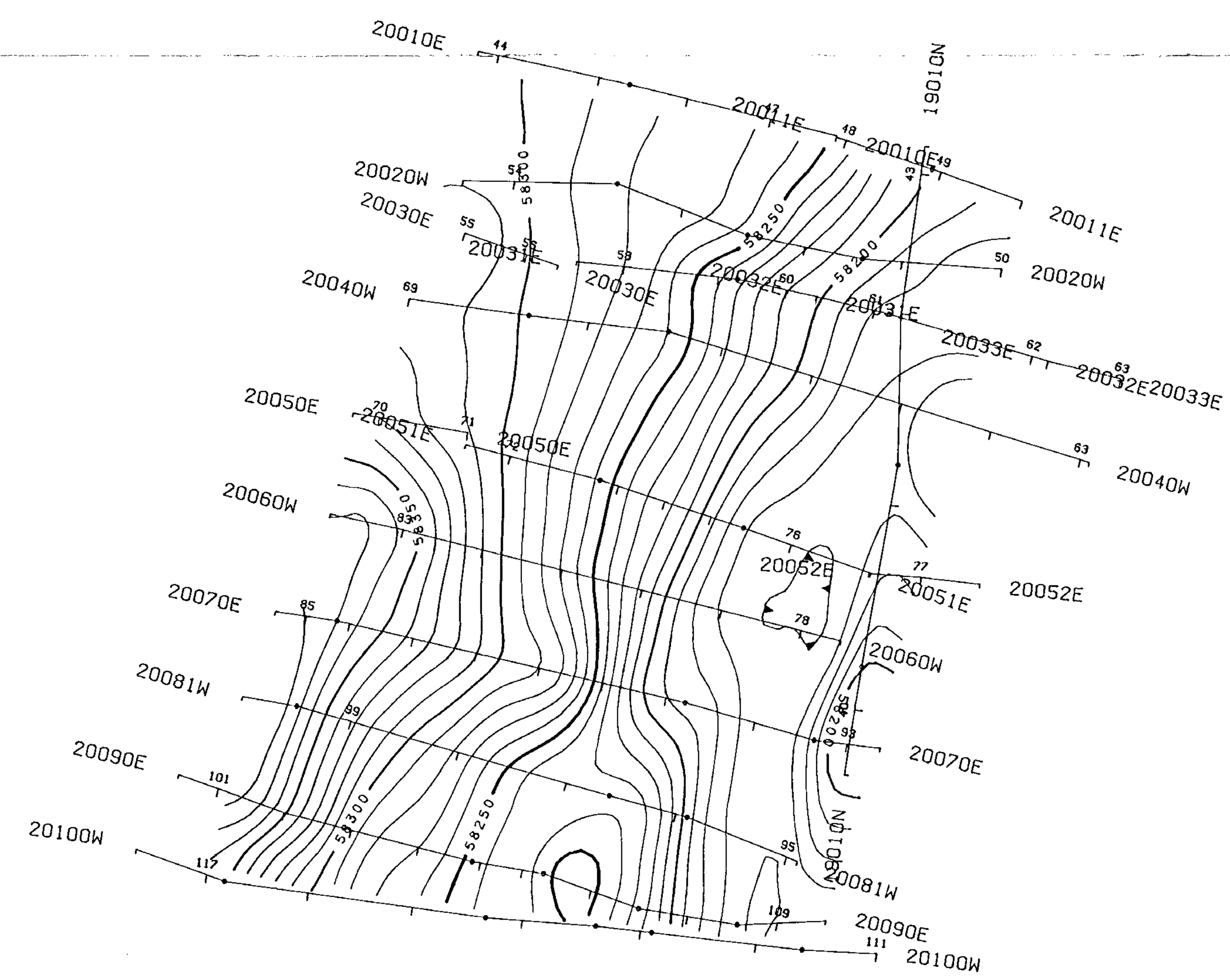
Province of BRITISH COLUMBIA

FILE NO.	SHEET NO.	DATE	COMPILED BY
25H54B	1 of 1	Oct., 1983	Questor Surveys Ltd.

Questor Surveys Limited
Mississauga, Ontario Canada

GEOLOGICAL BRANCH ASSESSMENT REPORT

12,779



MAGNETIC CONTOURS

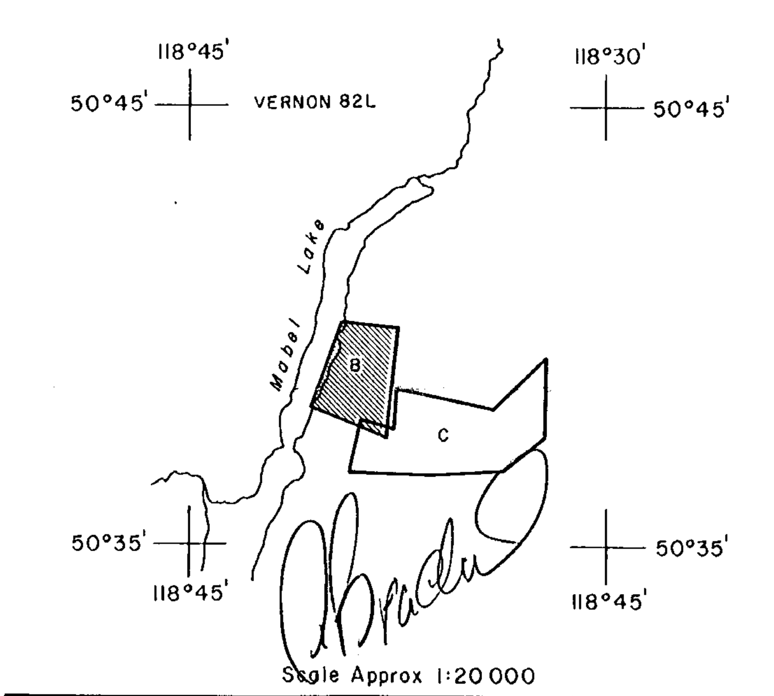
10 Gamma Contour Line

50 Gamma Contour Line

250 Gamma Contour Line

Magnetic Depression

1 Gamma = 1 Nanotesla in SI Units



Scale Approx 1:20 000

GEOLOGICAL BRANCH
ASSESSMENT REPORT

12,779

TOTAL MAGNETIC INTENSITY SURVEY

NORANDA EXPLORATION COMPANY LIMITED
(no personal liability)

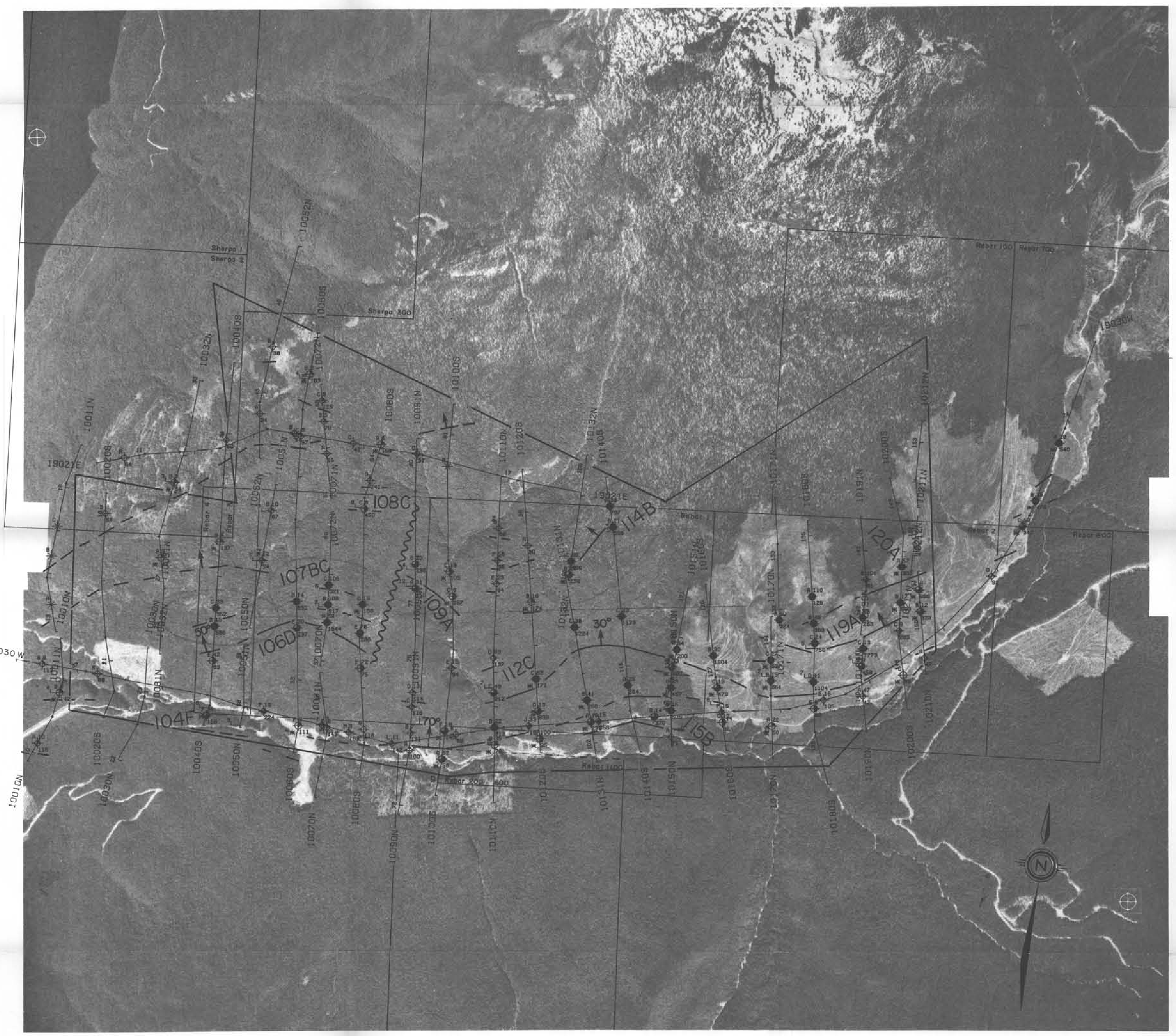
MOUNT MABEL AREA

Province of BRITISH COLUMBIA

FILE NO.	SHEET NO.	DATE	COMPILED BY
25H54B	1 of 1	Oct,1983	Questor Surveys Ltd.

Questor Surveys Limited
Mississauga, Ontario Canada

Map 1



INPUT* — Helicopter Vertical Axis Coil

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

Apparent Conductivity Width (siemens) (N.C. - No Calculation) — 5

Poorly Defined Response — *

Ch. 2 Amplitude (p.p.m.) — 1800

INTERPRETATION

20 Conductor Axis, with reference number (good definition)

20 Conductor Axis, with reference number (poor definition)

Vertical Conductor

60° Conductor Dip (magnitude and direction known)

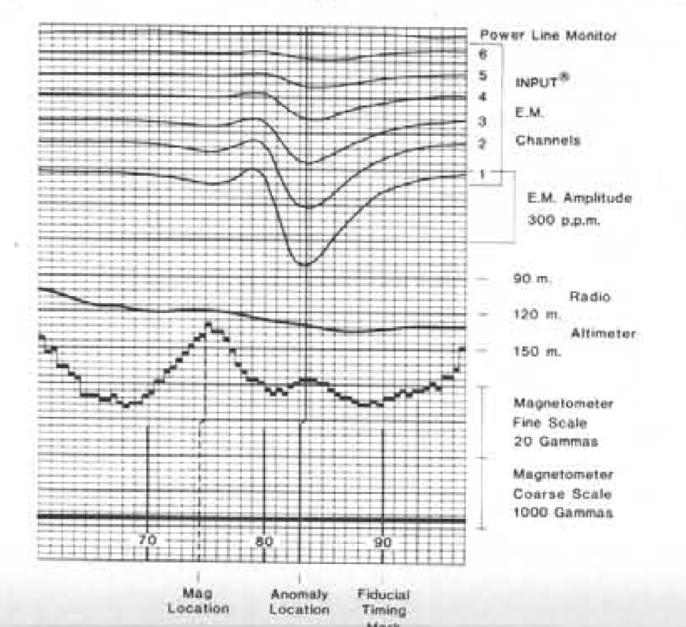
Conductor Dip (direction known)

20 Selected Zone, with reference number

Conductive Zone

Fault Zone

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 Sonotek PMH 5010 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

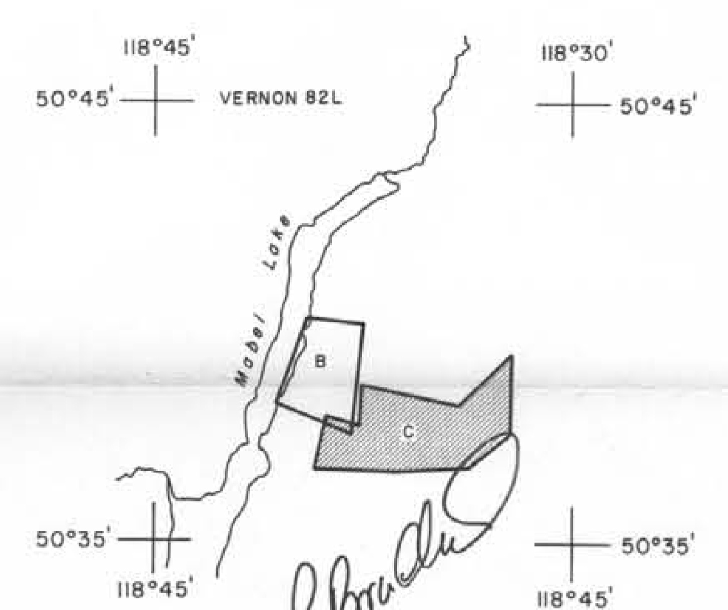
INTERPRETATION REFERENCES

Becker, A., Gauvreau, C., and Collett, L.S.
1972: Scale Model Study of Time Domain Electromagnetic Response of Tabular Conductors; Canadian Mining and Metallurgical Bulletin, Volume 65, No. 725, p. 90-96.

Dyck, A.V., Becker, A., and Collett, L.S.
1974: Surficial Conductivity Mapping with the Airborne INPUT* System; Canadian Mining and Metallurgical Bulletin, Volume 67, No. 744, p. 104-109.

Lazenby, P.G.
1973: New Developments in the INPUT* Airborne E.M. System; Canadian Mining and Metallurgical Bulletin, Volume 66, No. 732, p. 96-104.

Nelson, Philip, H.
1973: Model Results and Field Checks for a Time-Domain Airborne E.M. System; Geophysics, Volume 38, No. 5, p. 845-853.



Scale Approx 1:20 000

HELICOPTER MK VI INPUT® SURVEY
(Vertical Coil)

NORANDA EXPLORATION COMPANY LIMITED
(no personal liability)

MOUNT MABEL AREA

Province of BRITISH COLUMBIA

FILE NO.	SHEET NO.	DATE	COMPILED BY
25H54C	1 of 1	Oct.,1983	Questor Surveys Ltd.

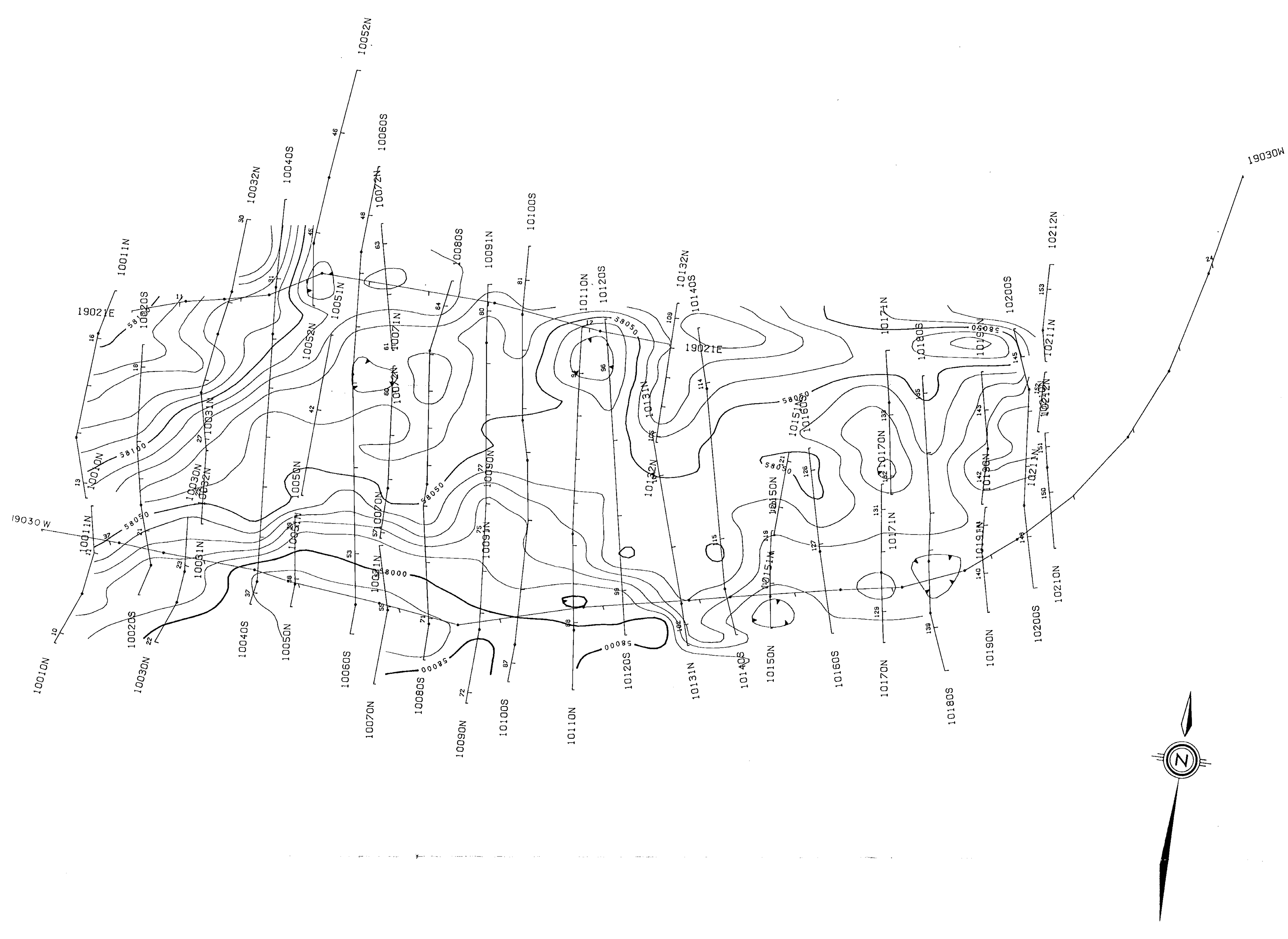
Questor Surveys Limited
Mississauga, Ontario Canada

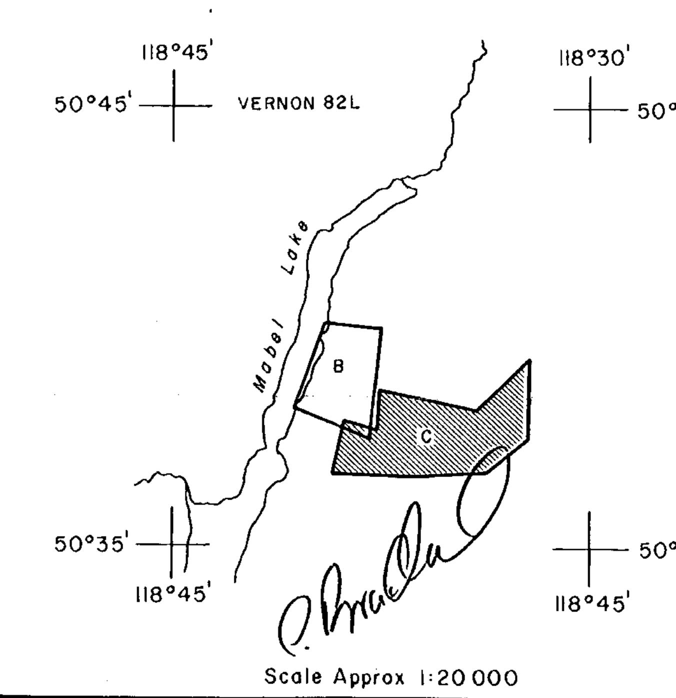
MAGNETIC CONTOURS

————	10	Gamma Contour Line
————	50	Gamma Contour Line
————	250	Gamma Contour Line

Magnetic Depression

1 Gamma = 1 Nanotesla in SI Units





Scale Approx 1:20 000

GEOLOGICAL BRANCH
ASSESSMENT REPORT

12,779

TOTAL MAGNETIC INTENSITY SURVEY

NORANDA EXPLORATION COMPANY LIMITED
(no personal liability)

MOUNT MABEL AREA

Province of BRITISH COLUMBIA

FILE NO.	SHEET NO.	DATE	COMPILED BY
25H54C	1 of 1	Oct,1983	Questor Surveys Ltd.

Questor Surveys Limited
Mississauga, Ontario Canada

Map 2

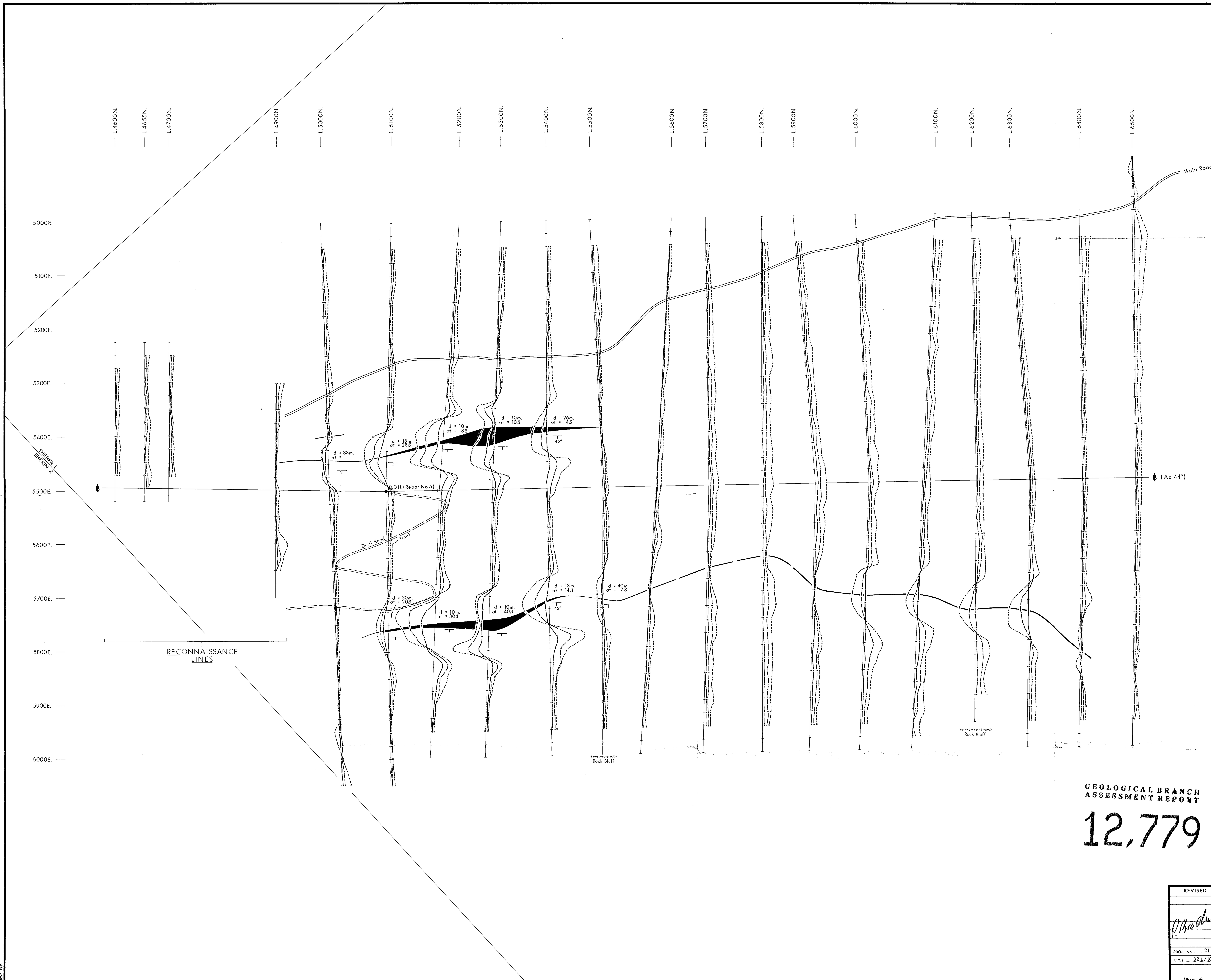
GEOLOGICAL BRANCH
ASSESSMENT REPORT
12,779
LOCATION MAP
1: 250,000
MABEL LAKE PROPERTY
Rebar 1
Rebar 2
Rebar 100
Rebar 800
Rebar 1100
Rebar 200-600
BL 10000 N
9800 N
9600 N
9400 N
9200 N
9000 N
8800 N
8600 N
Match Line — Sheets 1 & 2
L. 14000 E
L. 14200 E
L. 14400 E
L. 14800 E
L. 14600 E
L. 15000 E
L. 15200 E
L. 15400 E
L. 15600 E
L. 15800 E
L. 16050 E
L. 16200 E
L. 16400 E
L. 16600 E
L. 16800 E
L. 17000 E
L. 17200 E
L. 17400 E
L. 17600 E
L. 17800 E
L. 18000 E
L. 18200 E
L. 18400 E
L. 18600 E
L. 18800 E
LEGEND
INSTRUMENT : SE-88
COIL SPACING : 100 m.
FREQUENCY : Low 337 Hz
Med. 1012 Hz
High 3037 Hz
INTEGRATION TIME : 16 sec.
REF. FREQ. : 112 Hz
PROFILE SCALE : 1 cm. = 20 %
AREAS OF CONDUCTIVITY : High
Sheet 3
Sheet 2
Sheet 1
SURVEY DATE : Nov./83
Scale
Metres
REVISED
MABEL LAKE
H.L.E.M. SURVEY
PROJ. No. 1070
N.T.S. 82L/10
SURVEY BY: P.W. & Associates
DATE: Nov./83
DRAWN BY: W.M.R.
SCALE: 1: 5000
Map 3
NORANDA EXPLORATION
OFFICE: Vancouver

Match Line — Sheets 2 & 3
L. 11000 N
L. 10500 N
BL 10000 N
9800 N
9600 N
9400 N
9200 N
Sherpa 2
Rebar 4
Rebar 3
Rebar 1
Rebar 1100
Sheet 3
Sheet 2
Sheet 1
Match Line — Sheets 1 & 2
(% Primary Field)
10000 E
11000 E
L. 11600 E
L. 11800 E
L. 12000 E
L. 12200 E
L. 12400 E
L. 12600 E
L. 12800 E
L. 13000 E
L. 13200 E
L. 13400 E
L. 13600 E
L. 13800 E
LEGEND
INSTRUMENT : SE-88
COIL SPACING : 100 m.
FREQUENCY : Low 337 Hz
Med. 1012 Hz
High 3037 Hz
INTEGRATION TIME : 16 sec.
REF. FREQ. : 112 Hz
PROFILE SCALE : 20 %
AREAS OF CONDUCTIVITY: High
SURVEY DATE : Nov/83
NOTE : See Sheet 1 for Location Map
Scale
0 50 100 200 300 400 500 Metres
GEOLOGICAL BRANCH
ASSESSMENT REPORT
12,779
REVISED
MABEL LAKE
H.L.E.M. SURVEY
PROJ. No. 1070
N.T.S. 82 L-10
Map 4
SURVEY BY: P.W. & Associates
DATE: Dec./83
DRAWN BY: W.M.R.
SCALE: 1:5000
NORANDA EXPLORATION
OFFICE: Vancouver

GEOLOGICAL BRANCH
ASSESSMENT REPORT

12,779

REVISED	MABEL LAKE
Jan. /84 - Mini grid added	H.L.E.M. SURVEY
PROJ. No. 1070	SURVEY BY: P.W. & Associates DATE: Dec. /83
N.T.S. 82 L/10	DRAWN BY: W.M.R. SCALE: 1 : 5000
Map 5	NORANDA EXPLORATION OFFICE: Vancouver



GEOLOGICAL BRANCH
ASSESSMENT REPORT

12,779

REVISED	MABEL LAKE — LEASK OPTION — H.L.E.M. SURVEY
PROJ. No. 21	SURVEY BY: B.K. & T.L. — DATE: April/84
N.T.S. 82 L/10	DRAWN BY: [illegible] — SCALE: V-1cm = 20% H-1:2500
Map 6	NORANDA EXPLORATION — OFFICE: Vancouver


GEOLOGICAL BRANCH
ASSESSMENT REPORT
12,779
LOCATION MAP
1: 250,000
N
Rebar 1
Rebar 2
Rebar 100
Rebar 800
Rebar 1100
Rebar 200-600
BL 10000 N
10000 N
9800 N
9600 N
9400 N
9200 N
9000 N
8800 N
8600 N
Match Line — Sheets 1 & 2
L. 14000 E
L. 14200 E
L. 14400 E
L. 14800 E
L. 14600 E
L. 15000 E
L. 15200 E
L. 15400 E
L. 15600 E
L. 15800 E
L. 16050 E
L. 16200 E
L. 16400 E
L. 16600 E
L. 16800 E
L. 17000 E
L. 17200 E
L. 17400 E
L. 17600 E
L. 17800 E
L. 18000 E
L. 18200 E
L. 18400 E
L. 18600 E
L. 18800 E
LEGEND
INSTRUMENT :
FIELD MEASUREMENT : Total
DATUM : 57,000γ
CONTOURS : 100γ Intervals from 400 - 1000γ, then 1200, 1300, 1400, 1600, 1800γ
AREAS OF CONDUCTIVITY : High E.M.
SURVEY DATE : Dec. /83
Sheet 3
Sheet 2
Sheet 1
Scale
0 50 100 200 300 400 500 Metres
REVISED
MABEL LAKE
MAGNETOMETER SURVEY
PROJ. No. 1070
N.T.S. 82L/10
SURVEY BY: P.W. & Associates
DATE: Dec. /83
DRAWN BY: W.M.R.
SCALE: 1: 5000
Map 7
NORANDA EXPLORATION
OFFICE: Vancouver

LEGEND

INSTRUMENT :
FIELD MEASUREMENT : Total
DATUM : 57,000γ
CONTOURS : 100γ Intervals 400-1000γ, then 1200, 1300, 1400, 1600, 1800γ
AREA OF CONDUCTIVITY : High E.M.
SURVEY DATE : Dec./83

NOTE : See Sheet 1 for Location Map

Scale
0 50 100 200 300 400 500 Metres

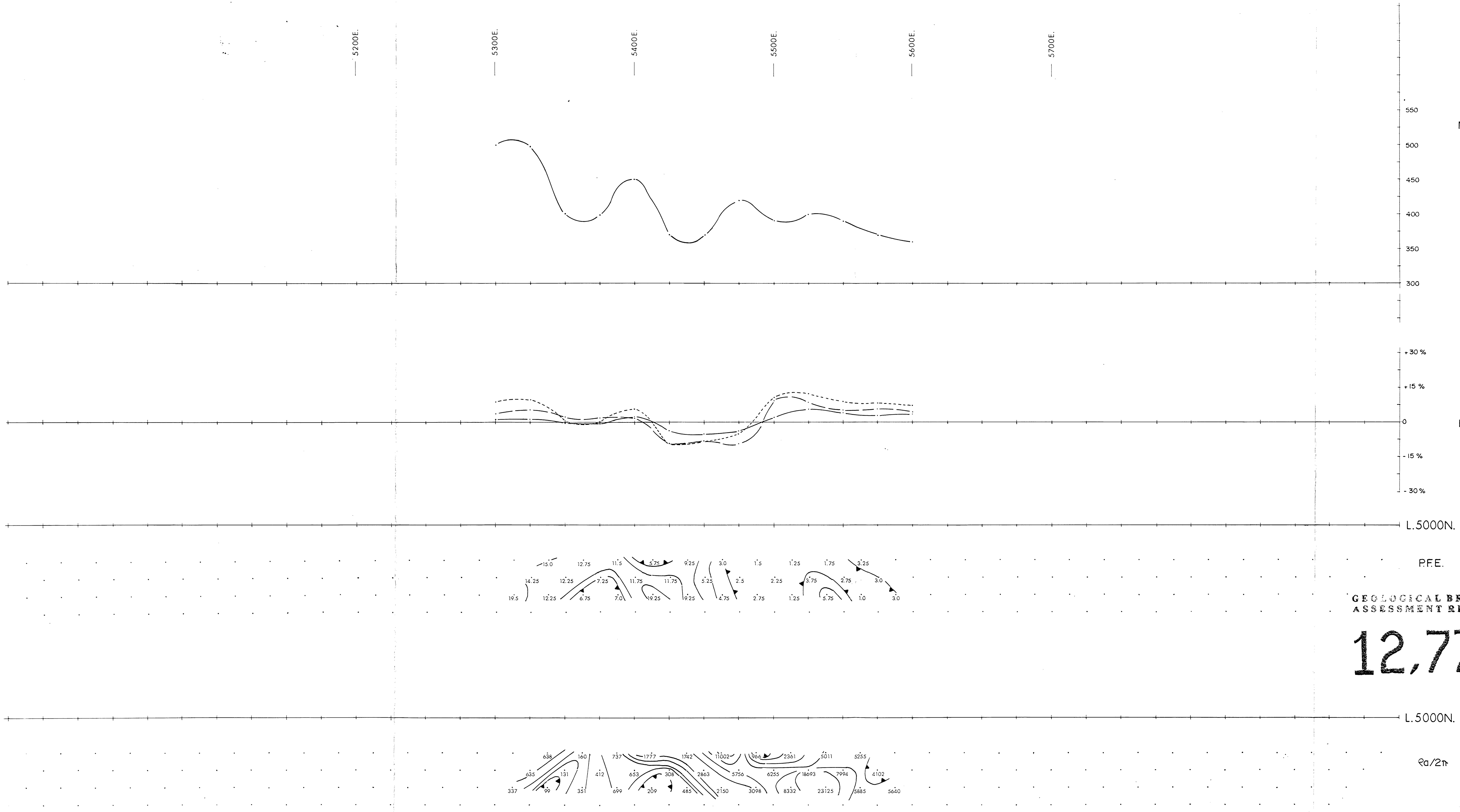
GEOLOGICAL BRANCH ASSESSMENT REPORT

12,779

REVISED	MABEL LAKE
	MAGNETOMETER SURVEY
PROJ. No. 1070	SURVEY BY: P.W. & Associates DATE: Dec./83
N.T.S. 82 L-10	DRAWN BY: W.M.R. SCALE: 1:5000
Map 8	NORANDA EXPLORATION
	OFFICE: Vancouver


9500 E
10000 E
10500 E
10700 E
11000 E
11500 E
12000 E
L. 15000 N
L. 14800 N
L. 14600 N
L. 14500 N
L. 14400 N
L. 14200 N
L. 14000 N
L. 13800 N
L. 13600 N
L. 13400 N
L. 13200 N
L. 13000 N
L. 12800 N
L. 12600 N
L. 12450 N
L. 12000 N
L. 11500 N
Sherpa 100
Sherpa 200
Sherpa 1
Sherpa 300
Sherpa 2
L. MG 13100 N
L. MG 13200 N
LEGEND
INSTRUMENT
FIELD MEASUREMENT : Total
DATUM : 57,000γ
CONTOURS : 100γ intervals 400 - 1000γ, then 1200, 1300, 1400, 1500, 1600, 1800γ
SURVEY DATE : Dec. /83
H.L.E.M. CONDUCTOR
Sheet 3
Sheet 2
Sheet 1
12,779
NOTE : See Sheet 1 for Location Map
Scale
0 50 100 200 300 400 500
Metres
REVISED
MABEL LAKE
MAGNETOMETER SURVEY
PROJ. No. 1070
N.T.S. 82 L/10
SURVEY BY: P.W.B. Associates
DATE: Dec./83
DRAWN BY: W.M.R.
SCALE: 1:5000
Map 9
NORANDA EXPLORATION
OFFICE: Vancouver
Match Line Sheets - 2 & 3


L.4600N.
L.4655N.
L.4700N.
L.4900N.
L.5000N.
L.5100N.
L.5200N.
L.5300N.
L.5400N.
L.5500N.
L.5600N.
L.5700N.
L.5800N.
L.5900N.
L.6000N.
L.6100N.
L.6200N.
L.6300N.
L.6400N.
L.6500N.
N
Main Road
5000E.
5100E.
5200E.
5300E.
5400E.
5500E.
5600E.
5700E.
5800E.
5900E.
6000E.
SHERPA 1
SHERPA 2
D.D.H. (Rebar No.5)
Drill Road
(Cat Trail)
(Az. 44°)
RECONNAISSANCE
LINES
Rock Bluff
Rock Bluff
GEOLOGICAL BRANCH
ASSESSMENT REPORT
12,779
LEGEND
INSTRUMENT — Unimag
DATUM — 58,000γ
CONTOUR INTERVAL — 100γ
OPERATOR — W.K.
SURVEY DATE — April/84
REVISED
MABEL LAKE
LEASK OPTION
MAGNETOMETER
SURVEY
PROJ. No. 21
N.T.S. 82 L/10
SURVEY BY: W.K.
DATE: April/84
SCALE: 1:2500
Map 10
NORANDA EXPLORATION
OFFICE: Vancouver



MAG. LEGEND

INSTRUMENT : Unimag
FIELD MEASUREMENT : Total
DATUM : 58,000 nt
PROFILE SCALE : 1 cm. = 25 nt

SURVEY DATE : Apr. /84
OPERATOR : K.L.

H.L.E.M. LEGEND

INSTRUMENT : SE-88
COIL SPACING : 100 m.
FREQUENCY : Low ·——· 337 Hz
Med. ·—–—· 1012 Hz
High ·----· 3037 Hz
INTEGRATION TIME : 16 sec.
REF FREQUENCY : 112 Hz
PROFILE SCALE : 1 cm. =75 %

SURVEY DATE : Apr. /84
OPERATOR : K.L.

I.P. LEGEND

ARRAY : Dipole - Dipole
FREQUENCY : 5.0 Hz & 0.3 Hz
a :
CONTOUR MULTIPLES : 1.0, 1.5, 3.0, 5.0, 7.5, 9.0
ρa/2π : In units of Ωm.

SURVEY DATE : April/84
OPERATOR : K. Lillie

REVISED	MABEL LAKE
	LINE 5000N.
	GEOCOMPILATION
PROJ. No. 21	SURVEY BY: K.L. DATE: April/84
N.T.S. 82 L/10	DRAWN BY: P.J.A. & W.R. SCALE: 1:2500
Map 11	NORANDA EXPLORATION OFFICE Vancouver

MAG. LEGEND

INSTRUMENT	:	Unimag
FIELD MEASUREMENT	:	Total
DATUM	:	58,000 nt
PROFILE SCALE	:	1 cm. = 25 nt
SURVEY DATE	:	Apr. /84
OPERATOR	:	K.L.

H.L.E.M. LEGEND

INSTRUMENT	:	SE-88
COIL SPACING	:	100 m.
FREQUENCY	:	Low ·—— · 337 Hz Med. ·——· 1012 Hz High ----· 3037 Hz
INTEGRATION TIME	:	16 sec.
REF FREQUENCY	:	112 Hz
PROFILE SCALE	:	1 cm. = 7.5%
SURVEY DATE	:	Apr. /84
OPERATOR	:	K.L.

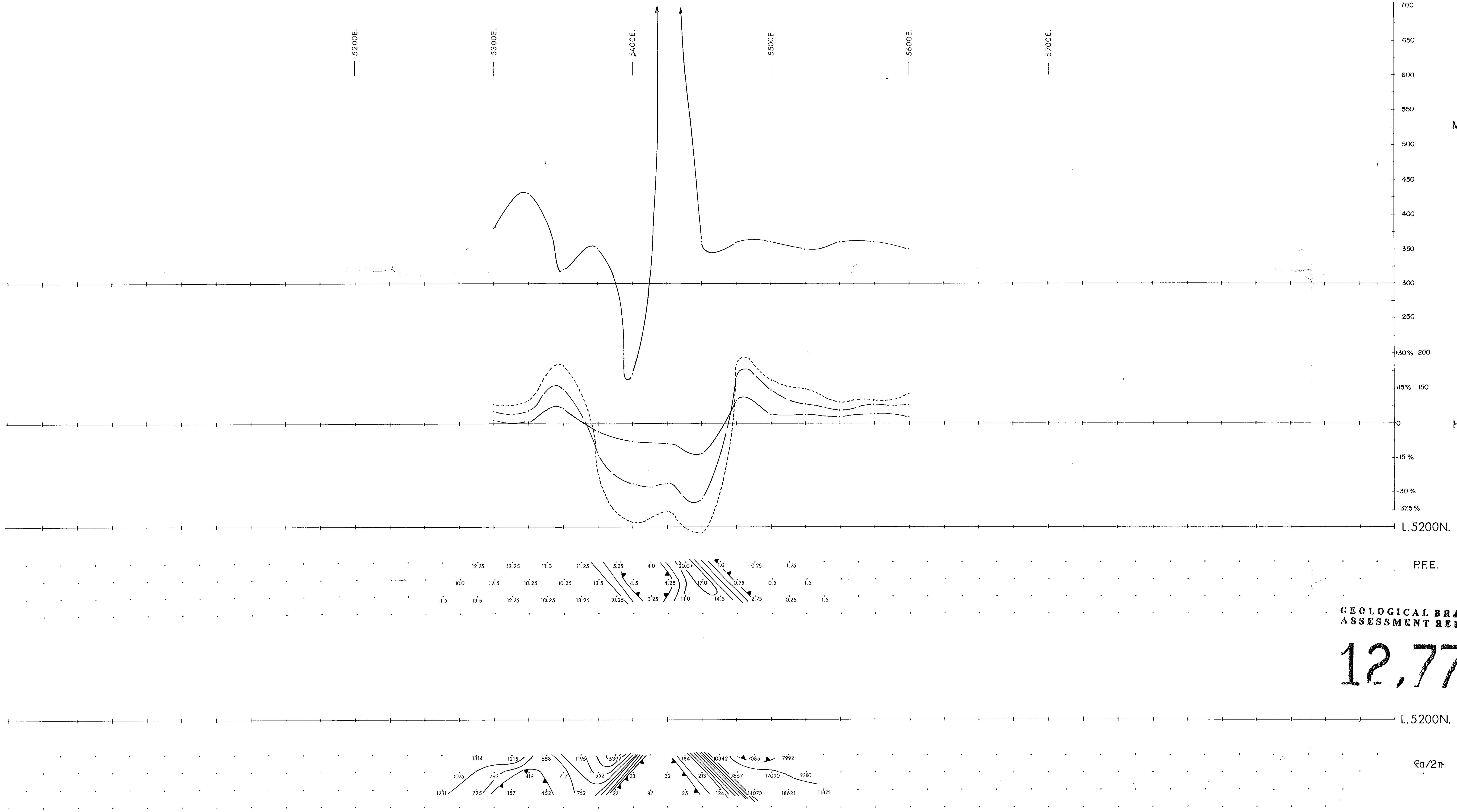
I.P. LEGEND

ARRAY	:	Dipole - Dipole
FREQUENCY	:	5.0 Hz & 0.3 Hz
a	:	
CONTOUR MULTIPLES	:	1.0, 1.5, 3.0, 5.0, 7.5, 9.0
ρa/2π	:	In units of Ωm.
SURVEY DATE	:	April/84
OPERATOR	:	K. Lillie

GEOLOGICAL BRANCH ASSESSMENT REPORT

12,779

REVISED	MABEL LAKE
	LINE 5100N.
	GEOCOMPILATION
PROJ. No 21	SURVEY BY: K.L. — DATE: April/84
N.T.S. 82 L/10	DRAWN BY: P.J.A. & W.R. — SCALE: 1:2500
Map 12	**NORANDA EXPLORATION** OFFICE: Vancouver



MAG. LEGEND

INSTRUMENT	:	Unimag
FIELD MEASUREMENT	:	Total
DATUM	:	58,000 nt
PROFILE SCALE	:	1 cm. = 25 nt
SURVEY DATE	:	Apr. /84
OPERATOR	:	K.L.

H.L.E.M. LEGEND

INSTRUMENT	:	SE-88
COIL SPACING	:	100 m.
FREQUENCY	:	Low 337 Hz Med. 1012 Hz High 3037 Hz
INTEGRATION TIME	:	16 sec.
REF FREQUENCY	:	112 Hz
PROFILE SCALE	:	1 cm. = 7.5 %
SURVEY DATE	:	Apr. /84
OPERATOR	:	K.L.

I.P. LEGEND

ARRAY	:	Dipole - Dipole
FREQUENCY	:	5.0 Hz & 0.3 Hz
a	:	
CONTOUR MULTIPLES	:	1.0, 1.5, 3.0, 5.0, 7.5, 9.0
ρa/2π	:	In units of Ωm.
SURVEY DATE	:	April/84
OPERATOR	:	K.Lillie

REVISED

MABEL LAKE

LINE 5200N.

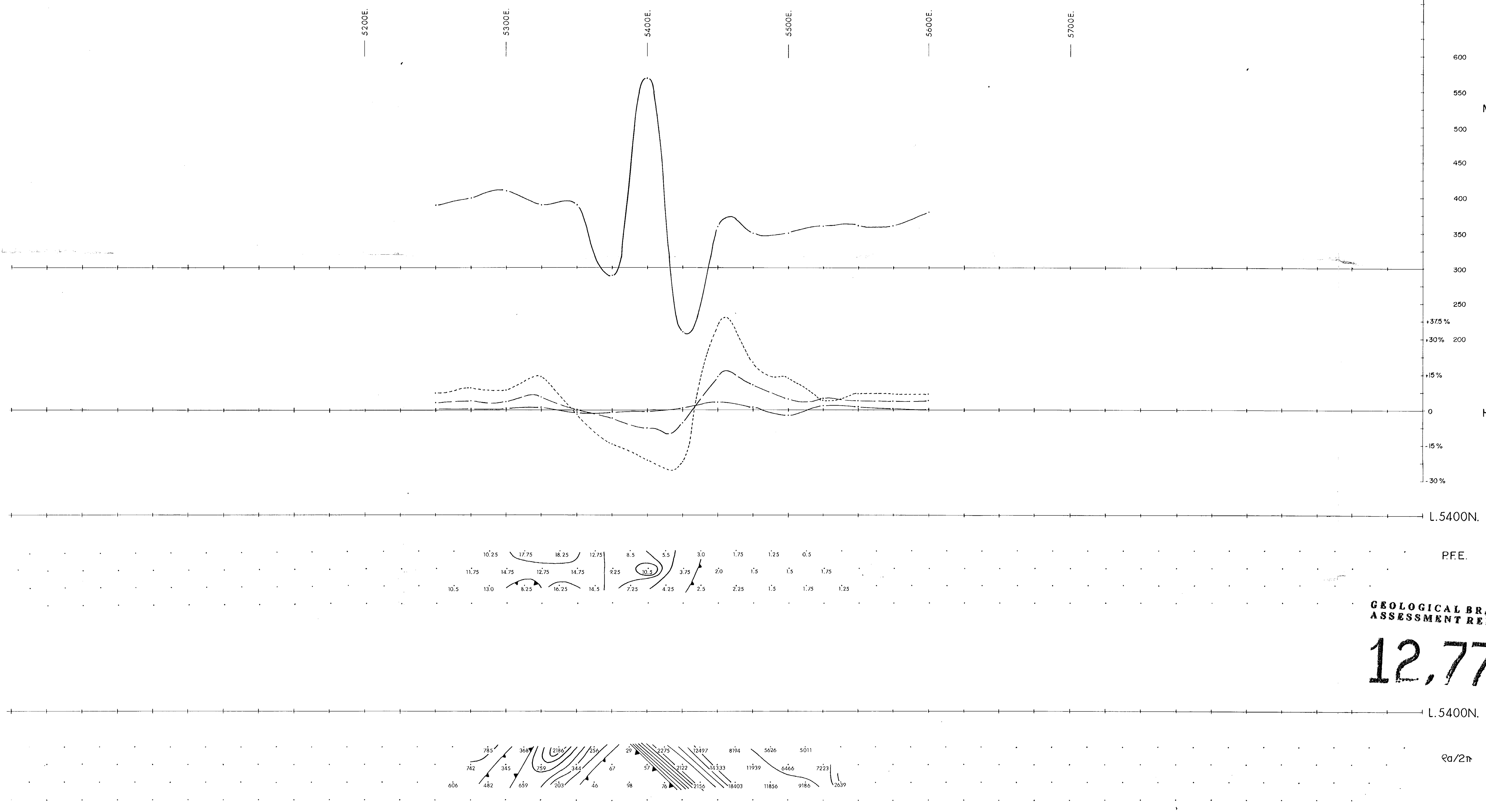
GEOCOMPILATION

PROJ. No. 21
N.T.S. 82 L/10
SURVEY BY: K.L.
DATE: April/84
DRAWN BY: P.J.A. & W.R.
SCALE: 1:2500

Map 13

NORANDA EXPLORATION
OFFICE: Vancouver

5200E.
5300E.
5400E.
5500E.
5600E.
5700E.
650
600
550
500
450
400
350
300
MAG.
MAG. LEGEND
INSTRUMENT : Unimag
FIELD MEASUREMENT : Total
DATUM : 58,000 nt
PROFILE SCALE : 1 cm. = 25 nt
SURVEY DATE : Apr./84
OPERATOR : K.L.
+30%
+15%
0
-15%
-30%
-37.5%
H.L.E.M.
H.L.E.M. LEGEND
INSTRUMENT : SE-88
COIL SPACING : 100 m.
FREQUENCY : Low 337 Hz
Med. 1012 Hz
High 3037 Hz
INTEGRATION TIME : 16 sec.
REF FREQUENCY : 112 Hz
PROFILE SCALE : 1 cm. =7.5%
SURVEY DATE : Apr./84
OPERATOR : K.L.
L.5300N.
P.F.E.
GEOLOGICAL BRANCH
ASSESSMENT REPORT
12,779
I.P. LEGEND
ARRAY : Dipole - Dipole
FREQUENCY : 5.0 Hz &0.3 Hz
a :
CONTOUR MULTIPLES : 1.0, 1.5, 3.0, 5.0, 7.5, 9.0
ρa/2π : In units of Ωm.
SURVEY DATE : April/84
OPERATOR : K.Lillie
L.5300N.
ρa/2π
REVISED
MABEL LAKE
LINE 5300N.
GEOCOMPILATION
PROJ. No. 21
N.T.S. 82 L/10
Map 14
SURVEY BY: K.L.
DATE: April/84
DRAWN BY: P.J.A. & W.R.
SCALE: 1:2500
NORANDA EXPLORATION
OFFICE Vancouver



MAG. LEGEND

INSTRUMENT : Unimag
FIELD MEASUREMENT : Total
DATUM : 58,000 nt
PROFILE SCALE : 1 cm. = 25 nt

SURVEY DATE : Apr./84
OPERATOR : K.L.

H.L.E.M. LEGEND

INSTRUMENT : SE-88
COIL SPACING : 100 m.
FREQUENCY : Low 337 Hz
Med. 1012 Hz
High 3037 Hz
INTEGRATION TIME : 16 sec.
REF FREQUENCY : 112 Hz
PROFILE SCALE : 1 cm. = 7.5 %

SURVEY DATE : Apr. /84
OPERATOR : K.L.

I.P. LEGEND

ARRAY : Dipole - Dipole
FREQUENCY : 5.0 Hz & 0.3 Hz
a :
CONTOUR MULTIPLES : 1.0, 1.5, 3.0, 5.0, 7.5, 9.0
ρa/2π : In units of Ωm.

SURVEY DATE : April/84
OPERATOR : K. Lillie

REVISED	MABEL LAKE
	LINE 5400N.
	GEOCOMPILATION
PROJ. No. 21	SURVEY BY: K.L. DATE: April/84
N.T.S. 82 L/10	DRAWN BY: P.J.A. & W.R. SCALE: 1:2500
Map 15	**NORANDA EXPLORATION** OFFICE: Vancouver