ERICKSON GOLD MINING CORP.

TECHNICAL DESCRIPTION OF AN ELECTROMAGNETIC (EM) RESISTIVITY SURVEY

WILDCAT AND OLD GO GRIDS
CASSIAR, B.C.

LIARD MINING DIVISION
NTS 104P/4
LATITUDE: 59°37'N LONGITUDE: 129°14'W

AUTHOR: Dennis V. Woods, Ph.D., P.Eng.

DATE OF WORK: July 1990
DATE OF REPORT: December 1990

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Consul

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INTRODUCTION:

During the period 8 to 9 July 1990 an EM resistivity survey was carried out in the vicinity of the Erickson gold mine near Cassiar, B.C. on approximately 18 kilometers of cut line on the Wildcat grid. Later in August, 1.5 km was surveyed on the Old Go grid and an additional 3 km was surveyed on roads to north and south of the Wildcat grid. The purpose of these surveys was to: 1) map certain geologic features such as the contact between volcanics and argillites, and cross-cutting fault and dyke structures, and 2) provide a comparison to the gradient array IP/resistivity surveys carried out over the Wildcat and Eastern Contact grids (Woods, 1990).

The results of the survey are presented in this report along with a technical description of the methodology, field procedures and data processing. The report also contains a brief discussion of the data in general terms. A complete and detailed interpretation of the results is not included in this report. Such discussion is better left to those who have a more in-depth understanding of the geology of the area.

METHODOLOGY:

The electromagnetic (EM) conductivity method was developed by Geonics Ltd. as a relatively simple procedure to obtain apparent resistivity values without employing traditional, ground contact, galvanic resistivity surveys. The method is based on electromagnetic induction of currents in the earth under the assumption of "low induction number": i.e. the scale of measurement (coil separation and depth of investigation) is much less than the "skin depth" of the EM field. The "skin depth" is the depth at which the amplitude of the electromagnetic field has attenuated to 1/e (36.8%) of its primary field strength. Skin depth is an inverse function of the conductivity of the earth and the frequency of the EM field.

If the frequency and coil separation of the EM system are appropriately chosen, the amplitude of the secondary response from the currents in the ground, normalized by the primary field amplitude, will be directly related to the average or apparent terrain conductivity in the vicinity of the instrument. (The secondary field under conditions of low induction number will lead the primary field by 90° and thus is referred to as the "quadrature response").

The transmitter and receiver coil dipoles can be aligned either horizontal or vertical coplanar. The vertical coplanar dipole (horizontal coplanar loops) has greater penetration depth and less response from surficial materials than the horizontal coplanar dipole (vertical coplanar loops). However, the vertical coplanar dipole is more susceptible to misalignment noise, and it is much easier to maintain the horizontal coplanar dipole configuration in rugged topography since both loops are simply aligned with the traverse line. A complete discussion of the EM conductivity method is given by McNeill (1980).

Most EM systems can be used for conductivity measurement, however Geonics Ltd. developed two instruments which are specifically designed for accurate, noise-free, measurement of the quadrature response at low induction number. The EM31 is a rigid-boom type of instrument in which the transmitter and receiver coils are housed at either end of a fiberglass tube (coil separation is 3.66 m). The transmit and receive electronics are contained in an instrument case in the middle of the tube. The instrument is calibrated to give direct readout of apparent conductivity.

The EM31 is carried by a single person using a shoulder strap with the tube pointing in the direction of traverse. The coil configuration is vertical coplanar dipole but misalignment and coil separation noise is not a problem since both coils are rigidly fixed. Depth of penetration is reported to be about 6 metres (McNeill, 1980). The instrument can be operated in the horizontal dipole mode by turning it on its side but this is a rather cumbersome procedure and requires a second operator.

The EM34-3 employs two separate loops for the transmitter and receiver and hence must be operated by two individuals. The instrument can be used in either the horizontal or vertical coplanar dipole modes at three different coil separations: 10 m, 20 m and 40 m. The larger the coil separation, the deeper the penetration: 7.5 m, 15 m and 30 m respectively in the horizontal dipole mode, and 15 m, 30 m and 60 m respectively in the vertical dipole mode.

Specific details of these instruments are found in the Instrument Specifications at the end of this report.

SURVEY PROCEDURES:

The surveys were carried out by a single operator using a Geonics EM31 "terrain conductivity meter". Two different modes of operation were used in the surveys depending on the type of positional control employed: on a survey grid, or along roads and trails marked on a topographic map.

For the more random surveys along roads and trails, apparent conductivities were read directly from the analogue meter on the instrument, converted to apparent resistivities and noted on the topographic map. Readings were thus taken every 25 m or so along the survey traverse, or wherever there was a known positional control point or a significant change in the values.

For the grid surveys, readings were stored automatically in a microprocessor recorder attached to the EM31 via an RS232 interface cable. The automatic reading was activated by simply pressing a button on the side of the EM31 while the operator walked along the grid line. The operator was not required to stop at the reading stations but could continue a slow, steady pace (without shaking the instrument excessively) while pressing the record button every 5 metres or so. The distance between readings was estimated by counting paces, with due allowance for terrain, and fixing to survey markers every 25 m. This procedure may produce minor positioning errors of up to 5 m, but the continuous recording results in very rapid survey rates in easily traversed terrain.

To obtain precise conductivity measurements, the EM31 must be compensated before the survey in a highly resistive area, otherwise negative conductivities will be recorded in areas of more resistive rock.

DATA PROCESSING:

The EM31 records apparent conductivity in units of mmho/m and the in-phase secondary response as ppt of the primary field. The in-phase measurement can be used to delineate highly conductive structures.

The survey data are stored as a single data file in the micro-processor recorder along with a header file which contains all information required to locate each reading of the survey: line designation, traverse heading, station interval, starting position, etc. These files are downloaded into a computer from the recorder using the RS232 interface.

The first step in the data processing procedure is to edit the data or header files to correct any manual entry errors during the initial setup of the survey and instrument. Also, any duplicate or repeat readings are deleted at this stage. Data dumping, editing and generation of preliminary profile plots were carried out using software provided by Geonics Ltd. Once the data and header files are corrected, the data are then assigned to their appropriate station location, reformatted to ASCII characters and written out as XYZ data files. Calculation of apparent resistivity (= 1000/conductivity) and additional reformatting in preparation for plotting with Geopak or Muir software packages were carried out using a specially written program.

DATA PRESENTATION:

The final, corrected versions of apparent conductivity and apparent resistivity over the Wildcat and Old Go grids are presented as combined line profile and colour contour maps in Figures 1a, 1b, 2a and 2b respectively. Apparent resistivity is included in the presentation to enable direct comparisons to the IP/resistivity data (Woods, 1990). The apparent resistivity values obtained from the random survey are posted on a location map shown in Figure 3.

All maps of the same parameter from the EM conductivity surveys on the Erickson properties have the same plotting convention. The line profile plotting scales are: apparent conductivity - 5 mmho/m per mm and apparent resistivity - 100 ohm-m per mm. The contour intervals and colours are also standardized for all surveys on the Erickson properties. Apparent conductivity: blue < 10 mmho/m, green = 10-40 mmho/m, yellow = 40-80 mmho/m, red = 80-180 mmho/m, and purple > 180 mmho/m. Apparent resistivity: blue < 150 ohm-m, green = 150-500 ohm-m, yellow = 500-1000 ohm-m, red = 1000-2500 ohm-m, and purple > 2500 ohm-m.

DISCUSSION:

The data plots shown in Figures 1a, 1b, 2a and 2b are directly interpretable in a qualitative manner. High apparent resistivities are due to resistive units at or very near surface. High apparent conductivities are also related to conductive structures or rock types near surface. EM resistivity is affected more from near-surface features and may, in some areas, be dominated by overburden conditions (e.g. south of the Wildcat grid).

There is general agreement between the IP/resistivity survey results and the EM resistivity data. The EM conductivities and resistivities appear to have less variation from one area to another due to the moderating effect of overburden, which, in extreme cases, can dominate the EM response. Thick overburden has less effect on the IP/resistivity survey.

CONCLUSION AND RECOMMENDATIONS:

The EM resistivity surveys were effective for the stated aims of mapping conductive and resistive structures in the Wildcat and Old Go grids. The data is comparable to the gradient array, galvanic resistivity data and can be successfully utilized to map conductive and resistive formations (e.g. the volcanic/argillite contact) in areas where overburden is less than 3 to 5 m thick. In areas of thicker overburden, the method will produced a muted response which is more difficult to definitively interpret.

EM resistivity surveys can be carried out at a fraction of the cost of IP/resistivity surveys. Only a single operator is required with an EM31 instrument and equipment costs are also much lower. An EM31 survey can be carried out at a rate equivalent to what a person can comfortably walk over a given terrain. In relatively open, flat ground with a well marked grid it is possible to survey 10 kilometers or more per day.

It is recommended that all of the established grids in the vicinity of the Erickson mine be surveyed with EM resistivity. In addition, random surveys should be carried out along roads and trails using topographic maps and air photos for positional control. The primary motivation for these recommended surveys is to help map the contact between argillites and volcanics, and also to explore for anomalous, linear, conductive or resistive structures which may be due to faults, dykes or vein systems. The recommended EM resistivity surveys will also help focus IP/resistivity surveys to the most interesting and prospective areas on the property.

Respectfully submitted,

Dennis V. Woods, Ph.D., P.Eng.

Consulting Geophysicist

REFERENCES:

McNeill, J.D.: Electromagnetic Terrain Conductivity Measurement at Low Induction Number, Tech. Note TN-6, Geonics Ltd., October, 1980.

Woods, D.V.: Technical Description of a Gradient Array Induced Polarization and Resistivity Survey, Eastern Contact and Wildcat Grids, Cassiar, B.C., for Erickson Gold Mining Corp., Woods Geophysical Consulting, December 1990.

STATEMENT OF QUALIFICATIONS:

NAME: WOODS, Dennis V.

PROFESSION: Geophysical Engineer

EDUCATION: B.Sc. Applied Geology,
Queen's University, 1973

M.Sc. Applied Geophysics,
Queen's University, 1975

Ph.D. Geophysics,
Australian National University, 1979

PROFESSIONAL ASSOCIATIONS: Registered Professional Engineer, #15745
Province of British Columbia

Active Member,
Society of Exploration Geophysicist
Canadian Society of Exploration Geophysicist
Australian Society of Exploration Geophysicist

EXPERIENCE:

1971-79
- Field geologist with St. Joe Mineral Corp. and Selco Mining Corp. (summers)
- Research graduate student and teaching assistant at Queen's University and the Australian National University

1979-86
- Assistant Professor of Applied Geophysics at Queen's University
- Geophysical consultant with Paterson Grant & Watson Ltd., M.P.H. Consulting Ltd., James Neilson & Assoc. Ltd., Foundex Geophysics
- Visiting research scientist at Chervon Geosciences Ltd., Geological Survey of Canada and the University of Washington

1986-89
- Project Geophysicist with Inverse Theory & Applications (ITA) Inc.
- Chief Geophysicist at White Geophysical Inc.
- Chief Geophysicist at Premier Geophysics Inc

1989-
- President of Woods Geophysical Consulting

COST BREAKDOWN:

The cost of this survey has been calculated by proportioning the total costs of all geophysical surveys on the Erickson properties during the 1990 summer field season.

Mobilization and Demobilization	$143.90
Equipment Rental	1,030.50
Personnel	601.95
Supervision and Management	604.55
Miscellaneous Expenses	18.03
Report Preparation	475.00

Total	$2,873.93
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GROUND CONDUCTIVITY METERS

ONE MAN

CONTINUOUS READING

EM31-D

The Geonics EM31 provides a measurement of terrain conductivity without ground electrodes or contact using a patented electromagnetic inductive technique.

This instrument is direct reading in millisiemens per meter and, over a uniform half space reads identically with conventional resistivity instruments with fixed array spacings. Using the inductive method, surveys are readily carried out in regions of high resistivity such as sand, gravel, permafrost and bedrock.

The effective depth of exploration is about six meters making it ideal for many geotechnical and ground water contaminant surveys. Other important advantages of the EM31 over conventional methods are the speed with which surveys can be conducted, the precision with which small changes in conductivity can be measured and the continuous readout while traversing the survey area. The new EM31-DL provides an analog output of both the quadrature-phase and inphase components which can be recorded continuously (on a digital or dual channel analog recorder). The inphase component is especially useful for detecting small, shallow ore bodies and, in waste site surveys buried metal drums.

Specifications

MEASURED QUANTITY	Apparent conductivity of the ground in mS/m
PRIMARY FIELD SOURCE	Self-contained dipole transmitter
SENSOR	Self-contained dipole receiver
INTERCOIL SPACING	3.66 meters
OPERATING FREQUENCY	9.8 kHz
POWER SUPPLY	8 disposable alkaline 'C' cells (approx. 20 hrs life continuous use)
CONDUCTIVITY RANGES	3, 10, 30, 100, 300, 1000 mS/m
MEASUREMENT PRECISION	±2% of full scale
MEASUREMENT ACCURACY	±5% at 20 mS/m
NOISE LEVEL	<0.1 mS/m
OPERATOR CONTROLS	● Mode Switch ● Conductivity Range Switch ● Phasing Potentiometer ● Coarse Inphase Compensation ● Fine Inphase Compensation.
DIMENSIONS	Boom : 4.0 meters extended, 1.4 meters stored Console : 24 x 20 x 18 cm Shipping Case : 145 x 38 x 23 cm
WEIGHT	Instrument Weight : 11 kg Shipping Weight : 26 kg

TWO MAN

VARIABLE DEPTH

EM34-3

Operating on the same principles as the EM31-DL, the EM34-3 is designed to achieve a substantially increased depth of exploration and more information about the vertical conductivity profile.

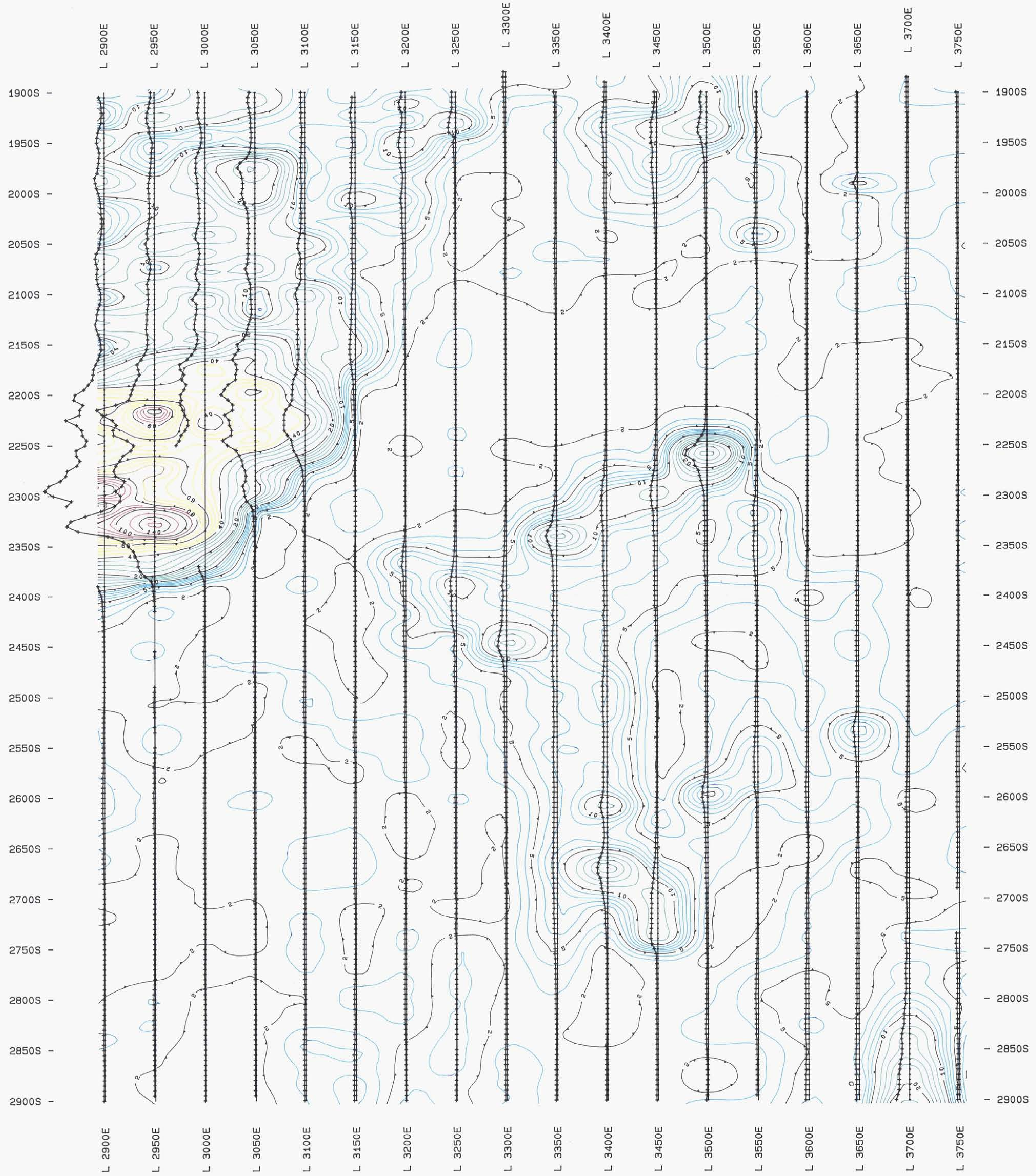
Simple operation, survey speed and straight forward data interpretation makes the EM34-3 a versatile and cost effective tool for the engineering geophysicist.

The underlying principle of operation of this patended non-contacting method of measuring terrain conductivity is that the depth of penetration is independent of terrain conductivity and is determined solely by the intercoil spacing and coil orientation. The EM34-3 can be used at three fixed spacings of 10, 20 or 40 meters and in the vertical coplanar (as shown) or horizontal coplanar modes, sensing to approx. 0.75 and 1.5 times the intercoil spacing respectively.

For surveys in regions of particularly high cultural and atmospheric noise the high powered EM34-3XL reduces the noise at the 40m spacing by a factor of 10 and by a factor of 4 at the 10m and 20m spacings.

Specifications

MEASURED QUANTITY	Apparent conductivity of the ground in mS/m
PRIMARY FIELD SOURCE	Self-contained dipole transmitter
SENSOR	Self-contained dipole receiver
REFERENCE CABLE	Lightweight, 2 wire shielded cable
INTERCOIL SPACING & OPERATING FREQUENCY	● 10 meters at 6.4 kHz ● 20 meters at 1.6 kHz ● 40 meters at 0.4 kHz
POWER SUPPLY	Transmitter : 8 disposable 'D' cells Receiver : 8 disposable 'C' cells
CONDUCTIVITY RANGES	3, 10, 30, 100, 300 mS/m
MEASUREMENT PRECISION	±2% of full scale deflection
MEASUREMENT ACCURACY	±5% at 20 mS/m
NOISE LEVEL	< 0.2 mS/m
DIMENSIONS	Receiver Console : 19.5 x 13.5 x 26cm Transmitter Console : 15 x 8 x 26cm Coils : 63cm diameter
WEIGHTS	Receiver Console : 3.1 kg Receiver Coil : 5.6 kg Transmitter Console : 3.0 kg Transmitter Coil : 8.8 kg Shipping Weight : 43 kg



GEOLOGICAL BRANCH
ASSESSMENT REPORT

21,548

Part 2 of 3

PROFILE SCALE: 5 mmho/m per mm
BASE LEVEL: 0 mmho/m

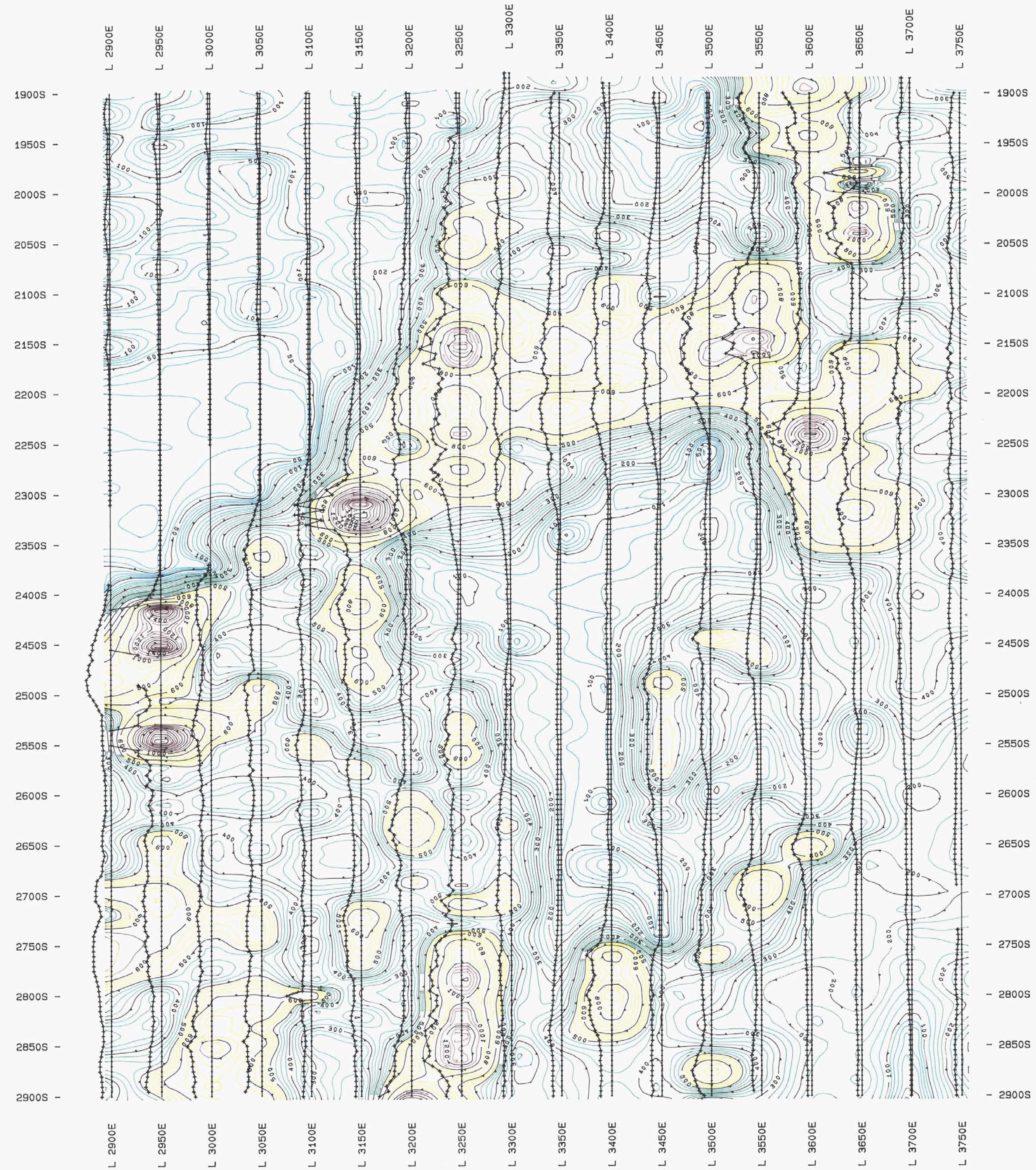
ERICKSON GOLD MINING CORP.

WILDCAT GRID
EM-31 RESISTIVITY SURVEY
APPARENT CONDUCTIVITY
Scale 1: 2500.0

0 50 100 150 200 250 M

Date: Dec 1990 | Survey: July 1990 | Figure: 1a

WOODS GEOPHYSICAL CONSULTING



GEOLOGICAL BRANCH
ASSESSMENT REPORT

21,548

Part 2 of 3

PROFILE SCALE: 100 ohm-m per mm
BASE LEVEL: 0 ohm-m

ERICKSON GOLD MINING CORP.

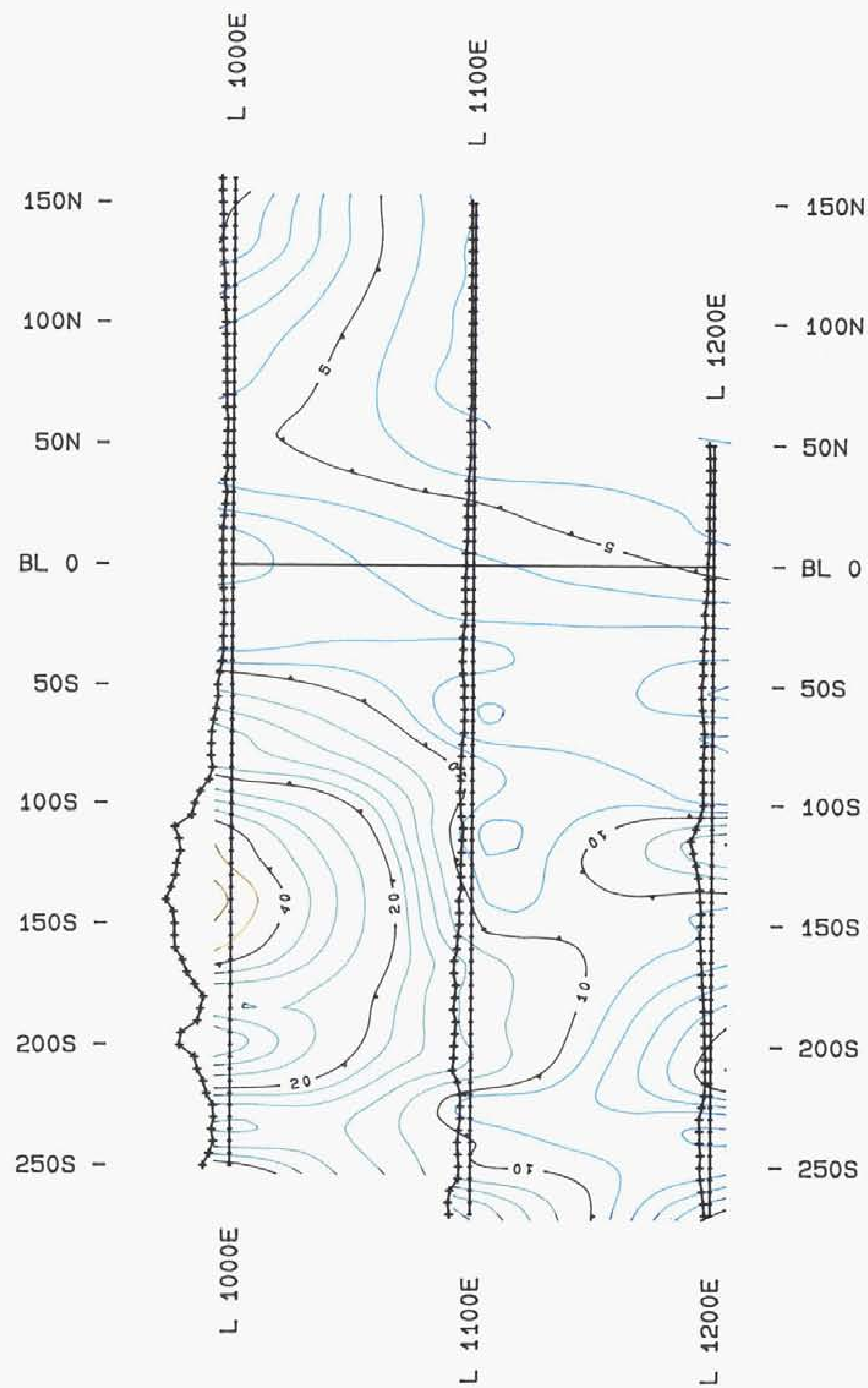
WILDCAT GRID
EM-31 RESISTIVITY SURVEY
APPARENT RESISTIVITY

Scale 1: 2500.0

0 50 100 150 200 250 M

Date: Dec 1990	Survey: July 1990	Figure: 1b

WOODS GEOPHYSICAL CONSULTING



PROFILE SCALE: 5 mmho/m per mm
BASE LEVEL: 0 mmho/m

ERICKSON GOLD MINING CORP.

OLD GO GRID
EM-31 RESISTIVITY SURVEY
APPARENT CONDUCTIVITY
Scale 1: 2500.0

0 50 100 150 200 250 M

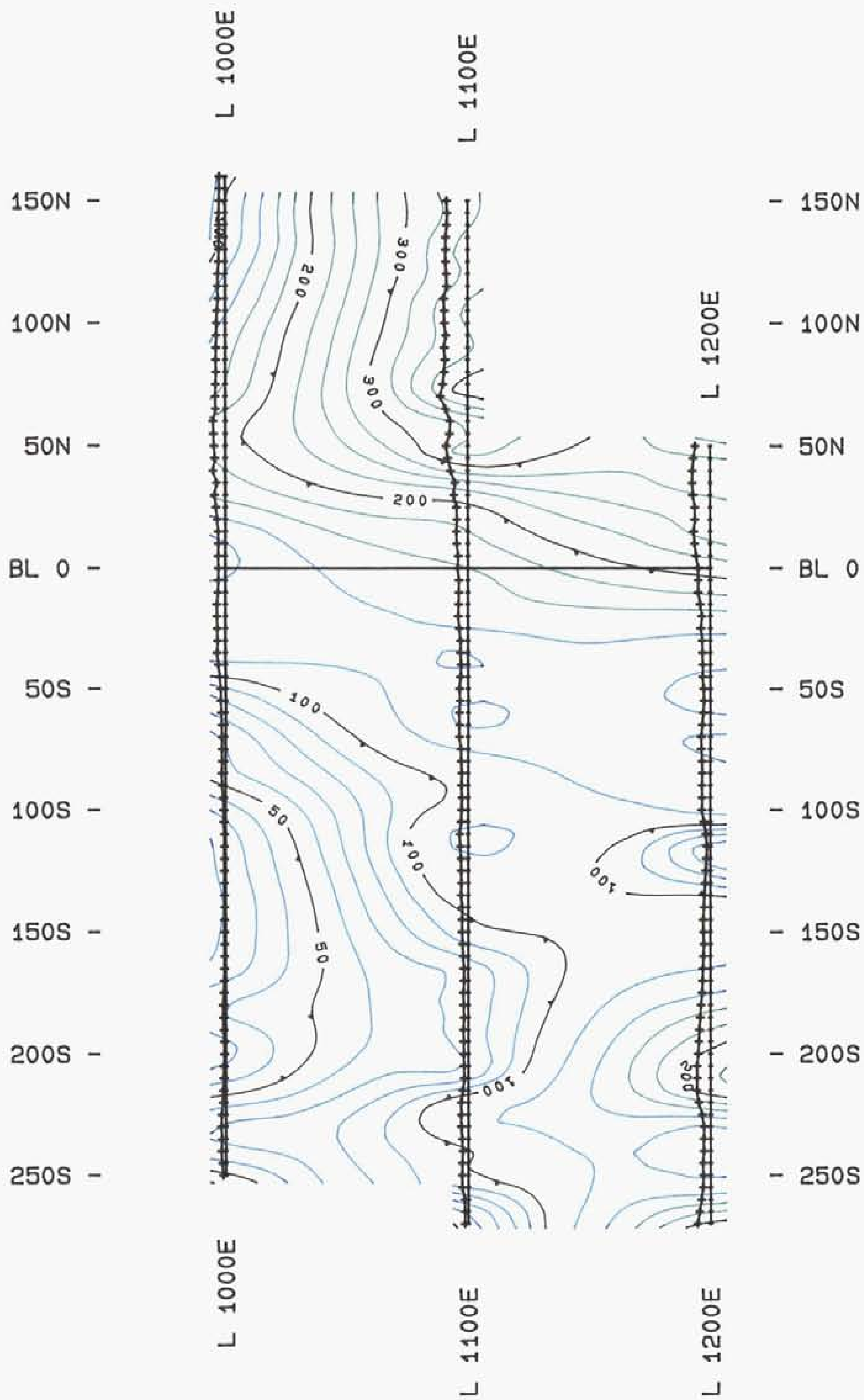
Date: Dec 1990	Survey: July 1990	Figure: 2a

WOODS GEOPHYSICAL CONSULTING

GEOLOGICAL BRANCH
ASSESSMENT REPORT

21,548

Part 2 of 3



PROFILE SCALE: 100 ohm-m per mm
BASE LEVEL: 0 ohm-m

ERICKSON GOLD MINING CORP.

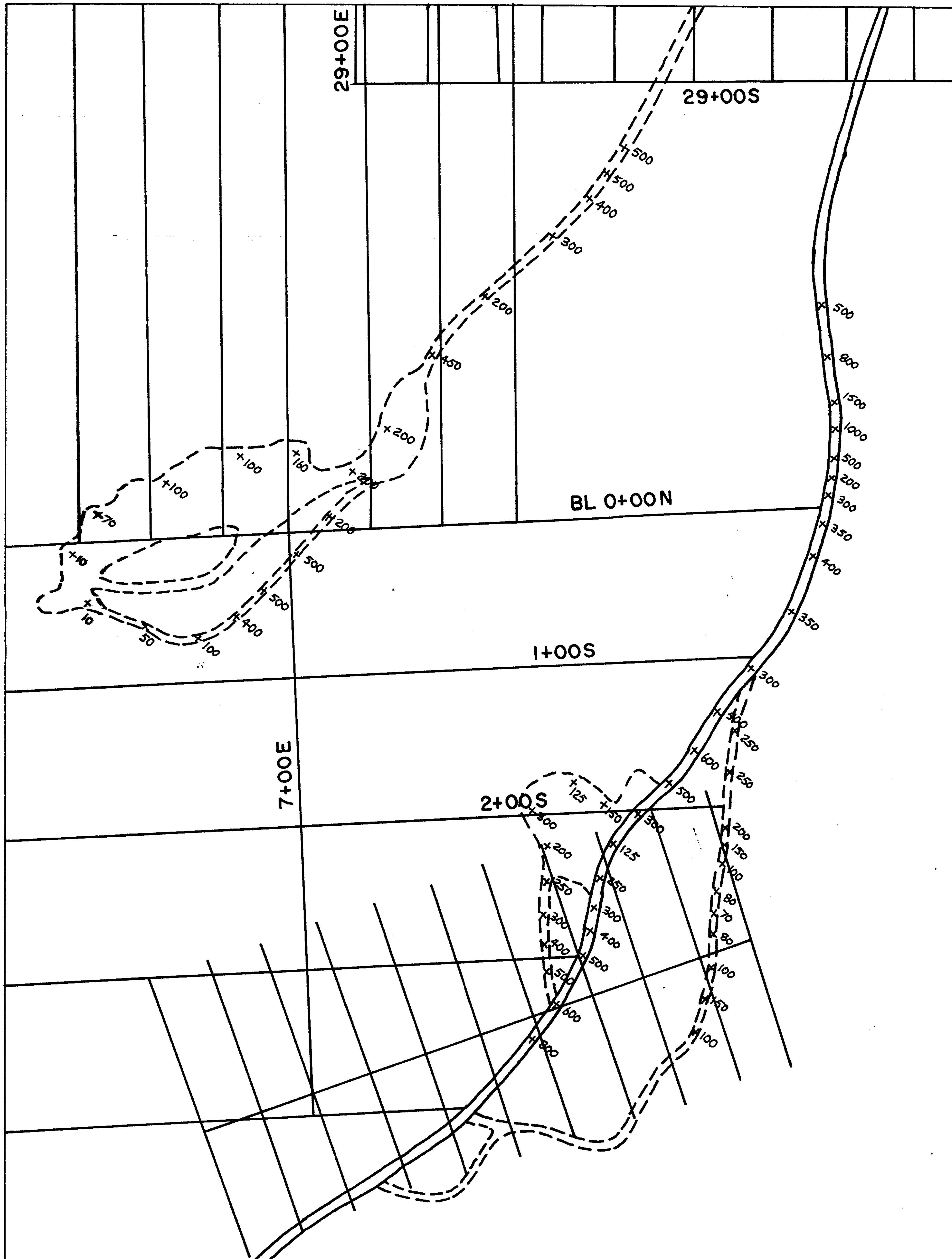
OLD GO GRID
EM-31 RESISTIVITY SURVEY
APPARENT RESISTIVITY

Scale 1: 2500.0

0 50 100 150 200 250 M

Date: Dec 1990	Survey: July 1990	Figure: 2b

WOODS GEOPHYSICAL CONSULTING



GEOLOGICAL BRANCH ASSESSMENT REPORT

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Part 2 of 3

ERICKSON GOLD MINING CORP.

WILDCAT SOUTH

EM-31 RESISTIVITY SURVEY

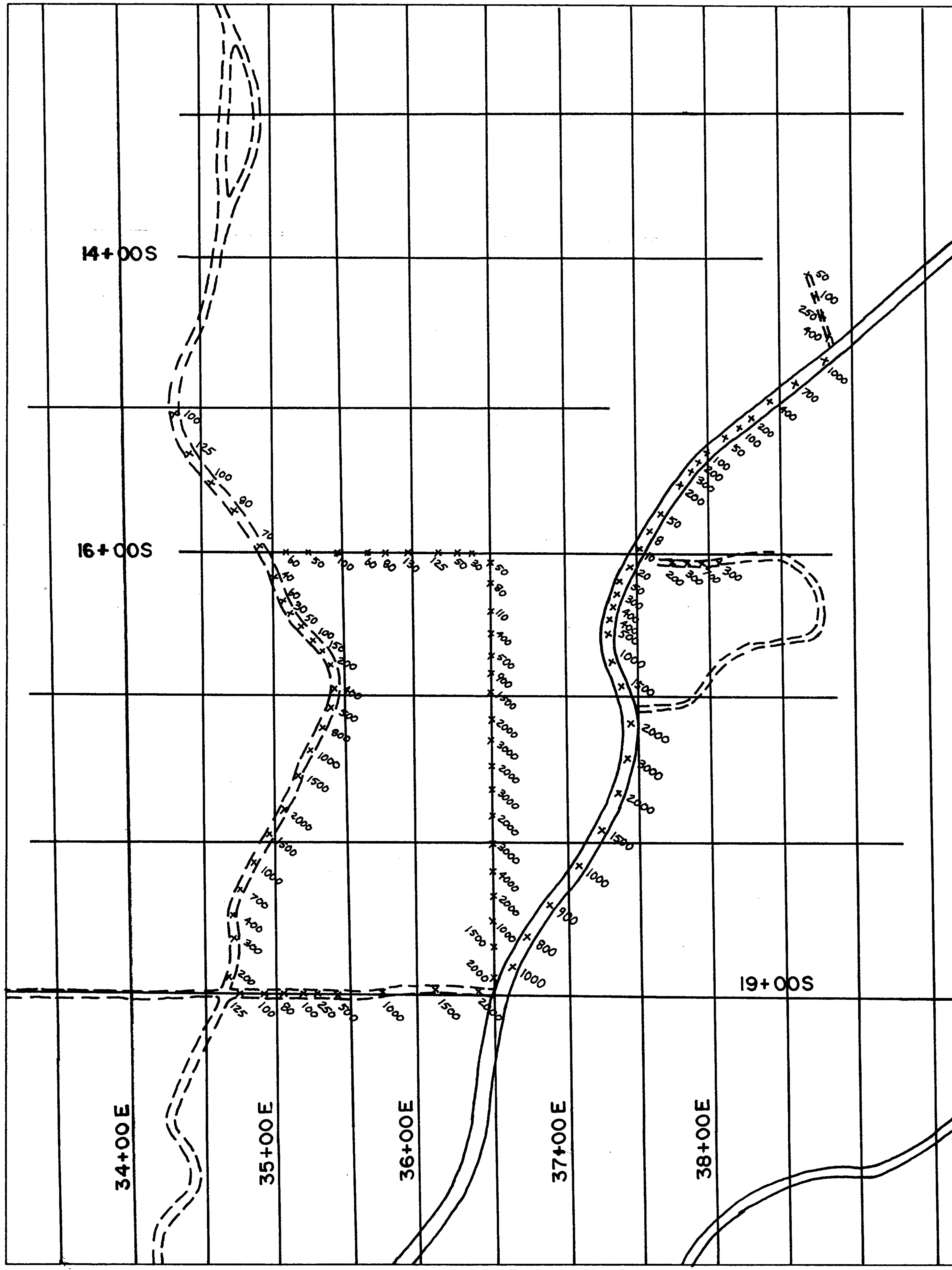
APPARENT RESISTIVITY

Scale 1: 2500.0

0 50 100 150 200 250 M

Date: Dec 1990	Survey: Aug 1990	Figure: 3a

WOODS GEOPHYSICAL CONSULTING



GEOLOGICAL BRANCH
ASSESSMENT REPORT

21,548

Part 2 of 3

ERICKSON GOLD MINING CORP.

WILDCAT NORTH
EM-31 RESISTIVITY SURVEY
APPARENT RESISTIVITY

Scale 1: 2500.0

0 50 100 150 200 250 M

Date: Dec 1990	Survey: Aug 1990	Figure: 3b

WOODS GEOPHYSICAL CONSULTING