REPORT ON AN

AIRBORNE MAGNETIC - ELECTROMAGNETIC SURVEY

IN BEATTY TOWNSHIP, ONTARIO

AMAX POTASH LIMITED
7 King Street East,
Toronto, Ontario.
M5C 1A2

April 1979

A. Watts

I. INTRODUCTION

During the period between November 21 and December 8, 1978, Questor Surveys Limited carried out an airborne Input electromagnetic survey over four claims in Beatty township for Amax Potash Limited.

The objective of the survey was to evaluate the claims for the presence of economic concentrations of conductive metallic minerals known to exist in the area, with a view to following up on the ground responses which lent sufficient encouragement.

II. PERSONNEL

Amax was represented by A. Watts, a staff geophysicist from Amax's Toronto office. S. Kilty was the Questor party manager, Clermont Ferrand the chief survey pilot. D. Watson of Questor paid a supervisory visit during the course of the survey.

III. SURVEY EQUIPMENT AND COVERAGE

The airborne survey was carried out utilizing the Mark VI Input electromagnetic system and a Geometrics G-803 proton precession magnetometer. A radar altimeter was used for vertical control. The outputs of these instruments together with fiducial timing marks are recorded by means of a galvonometer type recorder (Honeywell Visicorder) using light sensitive paper. A thirty-five millimeter continuous strip camera provided the required photographic record for adequate flight-path recovery. For a detailed description of the survey equipment see Appendix B.

Entire survey coverage totalled 1743 line miles at both 1/8 and ¼ mile line spacings. Coverage of the four claims in question totals approximately 1.5 miles. Assessment credit of 40 days for the airborne electromagnetic and magnetics is requested in conformity with the Ontario Mining Act.

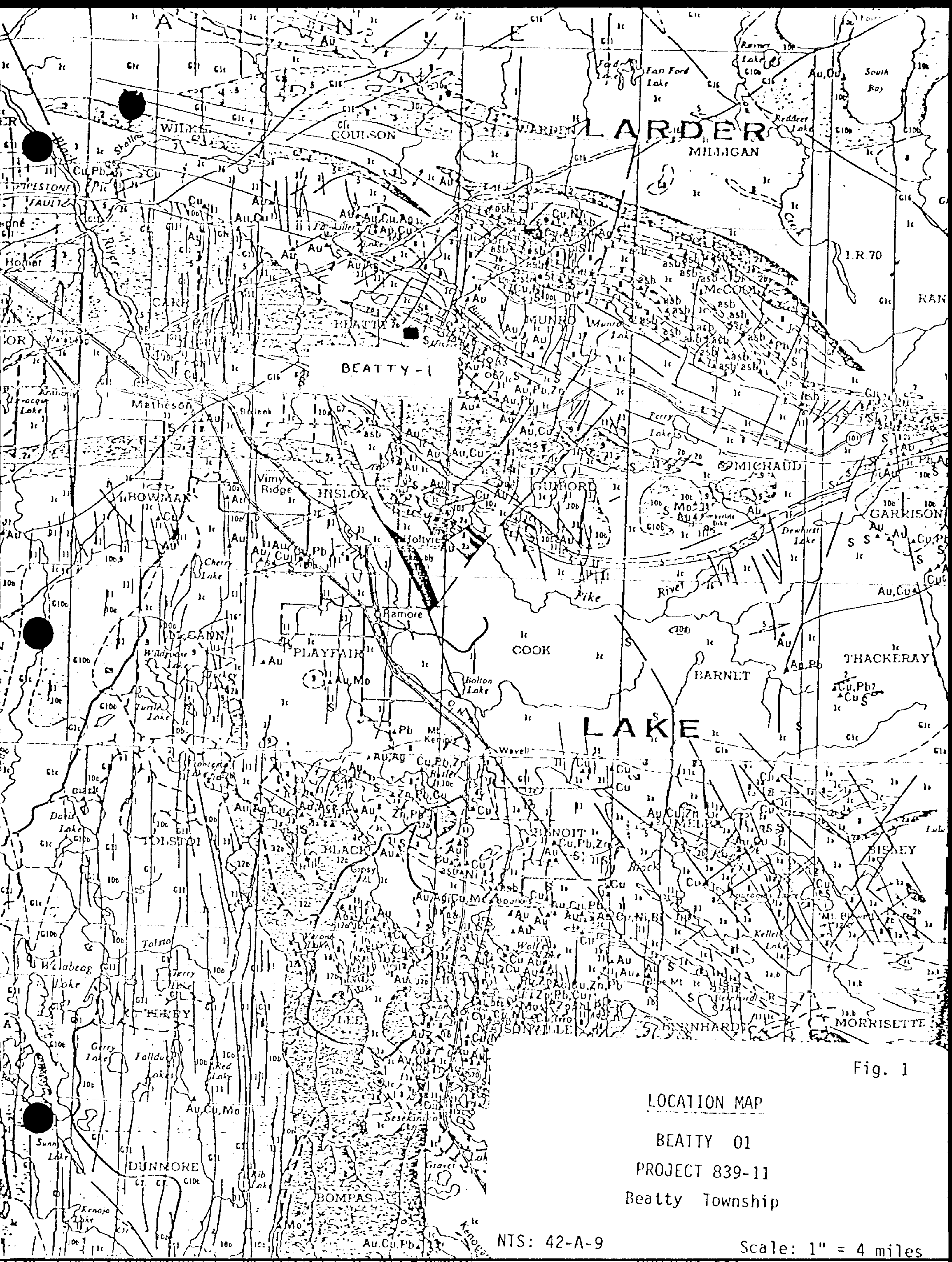


Fig. 1

LOCATION MAP

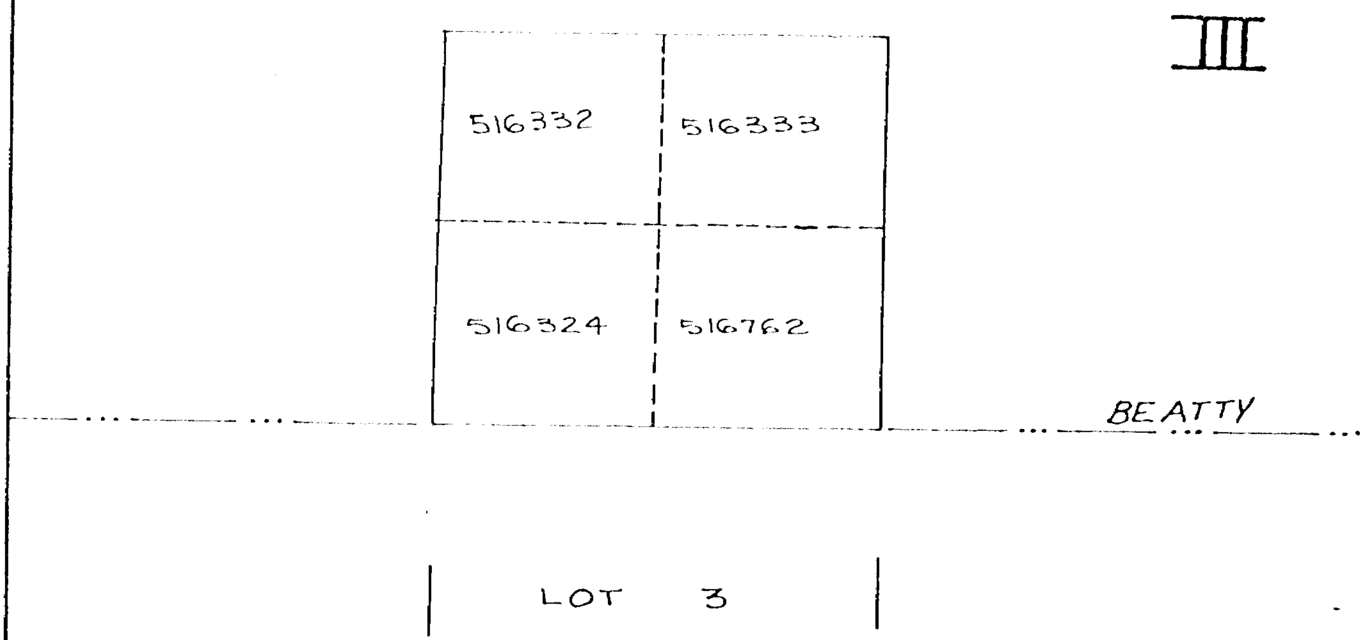
BEATTY 01

PROJECT 839-11

Beatty Township

NTS: 42-A-9

Scale: 1" = 4 miles



CLAIM MAP

PROJECT 839-11

BEATTY - 1

Beatty Township

1" = ¼ mile

NTS: 42-A-9

Fig. 2

IV. GEOLOGY

Most of the outcropping consists of mafic volcanic rocks. There are a few narrow bands of felsic to intermediate volcanic rocks cutting roughly east-west across the northern tip of one of the large mafic outcrops in the northern part of the claim group. In addition, there are two small Matachewan diabase dykes cutting the mafic volcanics.

The mafic volcanics consist of andesite as massive to pillowed flows. The andesite weathers a buff colour and is a mottled light to dark green on fresh surfaces. The andesite is a fine grained equigranular rock and has been chloritized and carbonatized. In addition to good pillowing in places, the andesite also exhibits flow top breccia and some breccia units.

The felsic to intermediate volcanic rock weathers white but is a greenish-grey colour on fresh surfaces. This rock is prophyritic with 1-2% glassy quartz phenocrysts on .5 to 1 mm diameter in a fine grained matrix. The rock has been slightly sericitized and apparently heavily chloritized.

There are a few relatively thin barren quartz veins cutting through the mafic volcanics which are composed of coarse white quartz.

The diabase dykes are very thin, up to 3/4 foot thick, and relatively fine grained.

V. PREVIOUS WORK

The only evidence of previous work is the occasional small pit on barren quartz veining in the mafic volcanic outcropping. Some trenching was also carried out in the past to expose the thin intermediate to felsic bands in the northern part of the claim group.

No drill setups or old grids were located, so it is likely that previous work was limited to surface prospecting.

The claim group consists of a recently lapsed patented group of four claims.

VI. PRESENTATION OF AEM AND MAGNETICS

The symbols used to designate the electromagnetic anomalies are shown in the legend on the electromagnetic and magnetics plan map provided. The anomalies on each line are lettered in alphabetical order in the direction of flight. Their locations are plotted with reference to the fiducial numbers on the analog record.

All the anomaly locations, magnetic correlations, conductivity thickness values and amplitudes of channel number 2 are clearly depicted for each individual anomaly on the plan map itself.

The magnetics has been computer contoured at a contour interval of 20 gammas and is superimposed on the Input results.

VII. DISCUSSION OF AEM AND MAGNETIC RESULTS

No conductors were discerned by the present Input survey over this claim group. A highly magnetic feature to the north-east of the claim group is the only geophysical feature in the immediate vicinity which provokes any interest at all. This feature is probably caused by one of the many ultramafic intrusives known to exist in the area.

VIII. SUMMARY AND CONCLUSIONS

The Input survey did not detect any conductors on this claim group, and as a result, no further work is recommended.

April 1979
Timmins, Ontario

A. Watts

A. H. Watts
Geophysicist

APPENDIX A

SCHEDULE OF CLAIMS

PROJECT 839-11

Claim No.	Township	Range	Lot	Acres	Staking Date
516332	Beatty	III	3	40	June 1, 1978
516333	Beatty	III	3	40	June 1, 1978
516324	Beatty	III	3	40	June 1, 1978
516762	Beatty	III	3	40	June 1, 1978

EQUIPMENT

The aircraft are equipped with Mark VI INPUT (R) airborne E.M. systems and Geometrics G-803 proton precession magnetometers. Radar altimeters are used for vertical control. The outputs of these instruments together with fiducial timing marks are recorded by means of galvanometer type recorders using light sensitive paper. Thirty-five millimeter continuous strip cameras are used to record the actual flight path.

(I) BARRINGER/QUESTOR MARK VI INPUT (R) SYSTEM

The Induced Pulse Transient (INPUT) system is particularly well suited to the problems of overburden penetration. Currents are induced into the ground by means of a pulsed primary electromagnetic field which is generated in a transmitting loop around the aircraft. By using half sine wave current pulses and a loop of large turns-area, the high output power needed for deep penetration is achieved.

The induced current in a conductor produces a secondary electromagnetic field which is detected and measured after the termination of each primary pulse. Detection is accomplished by means of a receiving coil towed behind the aircraft on four hundred feet of cable, and the received signal is processed and recorded by equipment in the aircraft. Since the measurements are in the time domain rather than the frequency domain common to continuous wave systems, interference effects of the primary transmitted field are eliminated. The secondary field is in the form of a decaying voltage transient originating in time at the termination of the transmitted pulse. The amplitude of the transient is, of course, proportional to the amount of current induced into the conductor and, in turn, this current is proportional to the dimensions, the conductivity and the depth beneath the aircraft.

The rate of decay of the transient is inversely proportional to conductivity. By sampling the decay curve at six different time intervals, and recording the amplitude of each sample, an estimate of the relative conductivity can be obtained. By this means, it is possible to discriminate between the effects due to conductive near-surface materials such as swamps and lake bottom silts, and those due to genuine bedrock sources. The transients due to strong conductors such as sulphides exhibit long decay curves and are therefore commonly recorded on all six channels. Sheet-like surface materials, on the other hand, have short decay curves and will normally only show a response in the first two or three channels.

The samples, or gates, are positioned at 310, 490, 760, 1120, 1570 and 2110 micro-seconds after the cessation of the pulse. The widths of the gates are 180, 180, 360, 360, 540 and 540 micro-seconds respectively.

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 these points.

(II) GEOMETRICS G-803 PROTON PRECESSION MAGNETOMETER

The magnetometers which measure the total magnetic field have a sensitivity of 1 gamma and a range from 20,000 gammas to 100,000 gammas.

Because of the high intensity field produced by the INPUT transmitter, the magnetometer results are recorded on a time-sharing 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 head is energized for 1.15 seconds while the precession frequency is being recorded and converted to gammas. Thus a magnetic reading is taken every 1.3 seconds.

DATA PRESENTATION

The symbols used to designate the anomalies are shown in the legend on each map sheet, and the anomalies on each line are lettered in alphabetical order in the direction of flight. Their locations are plotted with reference to the fiducial numbers on the analog record.

A sample record is included to indicate the method used for correcting the position of the E.M. Bird and to identify the parameters that are recorded.

All the anomaly locations, magnetic correlations, conductivity-thickness values and the amplitudes of channel number 2 are listed on the data sheets accompanying the final maps.

GENERAL INTERPRETATION

The INPUT system will respond to conductive overburden and near-surface horizontal conducting layers in addition to bedrock conductors. Differentiation is based on the rate of transient decay, magnetic correlation and the anomaly shape together with the conductor pattern and topography.

Power lines sometimes produce spurious anomalies but these can be identified by reference to the monitor channel.

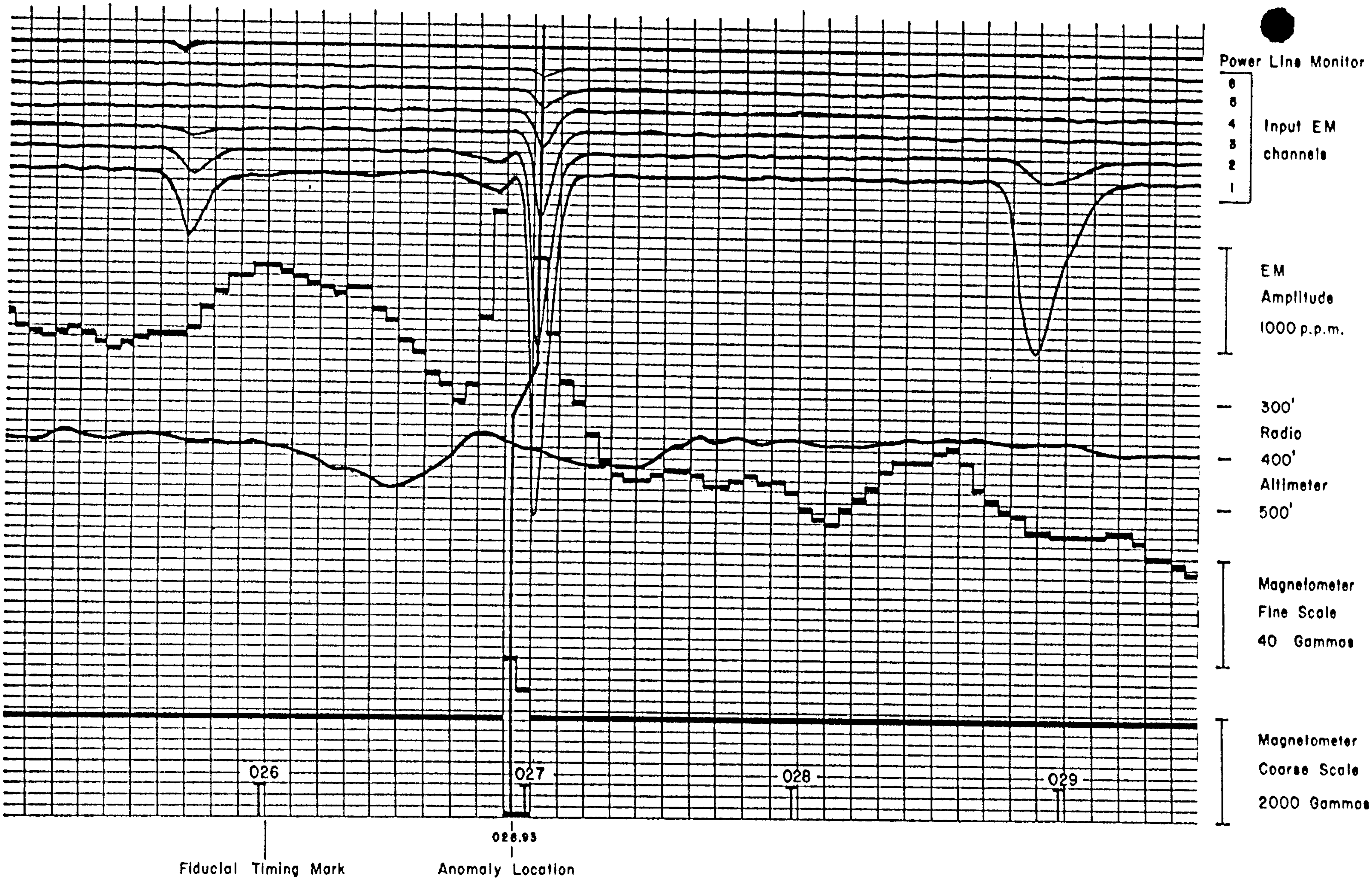
Railroad and pipeline responses are recognized by studying the film strips.

Graphite or carbonaceous material exhibits a wide range of conductivity. When long conductors without magnetic correlation are located on or parallel to known faults or photographic linears, graphite is most likely the cause.

Contact zones can often be predicted when anomaly trends coincide with the lines of maximum gradient along a flanking magnetic anomaly. It is unfortunate that graphite can also occur as relatively short conductors and produce attractive looking anomalies. With no other information than the airborne results, these must be examined on the ground.

Serpentinized peridotites often produce anomalies with a character that is fairly easy to recognize. The conductivity which is probably caused in part by magnetite, is fairly low so that the anomalies often have a fairly large response on channel #1; they decay rapidly, and they have strong magnetic correlation. INPUT E. M. anomalies over massive magnetites show a relationship to the total Fe content. Below 25 - 30%, very little or no response at all is obtained, but as the percentage increases the anomalies become quite strong with a characteristic rate of decay which is usually greater than that produced by massive sulphides.

Commercial sulphide ore bodies are rare, and those that respond to airborne survey methods usually have medium to high conductivity. Limited lateral dimensions are to be expected and many have magnetic correlation caused by magnetite or pyrrhotite. Provided that the ore bodies do not occur within formational conductive zones as mentioned above, the anomalies caused by them will usually be recognized on an E.M. map as priority targets.



Representative INPUT, Magnetometer and Altimeter Recording

I, Anthony H. Watts, residing at 24 Forest Manor Road, Willowdale, Province of Ontario, hereby certify that:

1) I am a graduate of Rhodes University, Grahamstown, South Africa, having received a B.Sc. in Geology and Chemistry in 1972.

2) I have been practising as a geophysicist since joining Geoterrex Limited, of 2060 Walkley Road, Ottawa, Ontario, in January, 1973.

3) I have been employed as a mineral exploration geophysicist by Amax Minerals Exploration since November, 1978.

4) I am an Associate Member of the Society of Exploration Geophysicists.

May 10, 1979
Date

Signed A. Watts
A. H. Watts, B.Sc.

Ontario

Ministry of Natural

GEOPHYSICAL – GEOLOGIC
TECHNICAL DATA

42A09SW0111 2.2951 BEATTY

900

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) Aeromagnetic - electromagnetic

Township or Area Beatty

Claim Holder(s) Amax Potash Limited

Survey Company Questor Surveys Limited

Author of Report A. Watts

Address of Author 1302, 7 King St. East, Toronto, Ontario

Covering Dates of Survey November 17 to December 8, 1978
(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 20 Electromagnetic 20 Radiometric
(enter days per claim)

DATE: May 10, 1979 SIGNATURE: A Watts
Author of Report or Agent

1.D.

Res. Geol. Qualifications

Previous Surveys

File No.	Type	Date	Claim Holder

OFFICE USE ONLY

MINING CLAIMS TRAVERSED
List numerically

(prefix)	(number)
L	516332
L	516333
L	516324
L	516762

1.5 miles x 40 ÷ 4 = 15 days

If space insufficient, attach list

TOTAL CLAIMS 4

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) Aeromagnetic - electromagnetic

Instrument(s) Input configuration Geometrics G-803 magnetometer
(specify for each type of survey)

Accuracy 1 gamma aeromag 1 ppm for AEM
(specify for each type of survey)

Aircraft used Trislander

Sensor altitude 150' AEM 400' AMAG

Navigation and flight path recovery method Visual - fiducial

Aircraft altitude 400' Line Spacing 1/8

Miles flown over total area 1800 Over claims only 1.5 miles

GEOCHEMICAL SURVEY – PROCEDURE RECORD

Numbers of claims from which samples taken ______________________

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Total Number of Samples ______________________

Type of Sample ______________________
(Nature of Material)

Average Sample Weight ______________________

Method of Collection ______________________

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Soil Horizon Sampled ______________________

Horizon Development ______________________

Sample Depth ______________________

Terrain ______________________

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Drainage Development ______________________

Estimated Range of Overburden Thickness ______________________

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SAMPLE PREPARATION
(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis ______________________

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General ______________________

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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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