REPORT ON A SEMI-AIRBORNE ELECTROMAGNETIC SURVEY REID, MACDIARMID AND THORBURN TOWNSHIPS, ONTARIO ON BEHALF OF MATTAGAMI LAKE MINES LIMITED

by

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SUMMARY

The Turair electromagnetic survey results in the location of six (sub-divided) conducting systems varying in length from 1500 ft. to 6000 ft. Response amplitudes were of a rather low order of magnitude. This is generally less than 0.5% amplitude ratio and 0.5° phase difference, however, calculated conductivity-width products were often high enough to be compatible with the presence of massive sulphide horizons (or other highly conducting zones such as graphite, shears, etc.). Several intersections displayed either coincident or flanking magnetics.

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INTRODUCTION

During the period of June 12th to 20th, inclusive, and July ~~17~~27th to ~~19~~29th, inclusive, 1971, a semi-airborne (Turair) survey was performed by Seigel Associates Limited on behalf of Mattagami Lake Mines Limited, in the western parts of the Reid and MacDiarmid townships and the eastern part of the Thorburn township, Porcupine Mining Division, Ontario.

The survey was under the direction Mr. Roger Peart, M.Sc., and Mr. Geoffrey Campbell, M.Sc., respectively, with the overall supervision of Mr. Jan Klein, M.Sc., P.Eng.

The survey area comprises two separate blocs, approximately 18 and 25 miles, respectively, north-northwest of Timmins, west of the Mattagami River (see figure 1 and Plate 4). The area is accessible in the winter by snow vehicles and in the summer (to a certain extent) along some the the trails which run through the survey area. The nearest all weather road extents to within six and twelve miles, respectively, of the centre of the areas. This road leads to Kam-Kotia Mine. The base of operations was centred in Timmins.

The airborne survey included Turair electromagnetic and magnetic measurements. Geophysical equipment used for these measurements was, respectively a Scintrex TAR-1 system, measuring the amplitude (%)

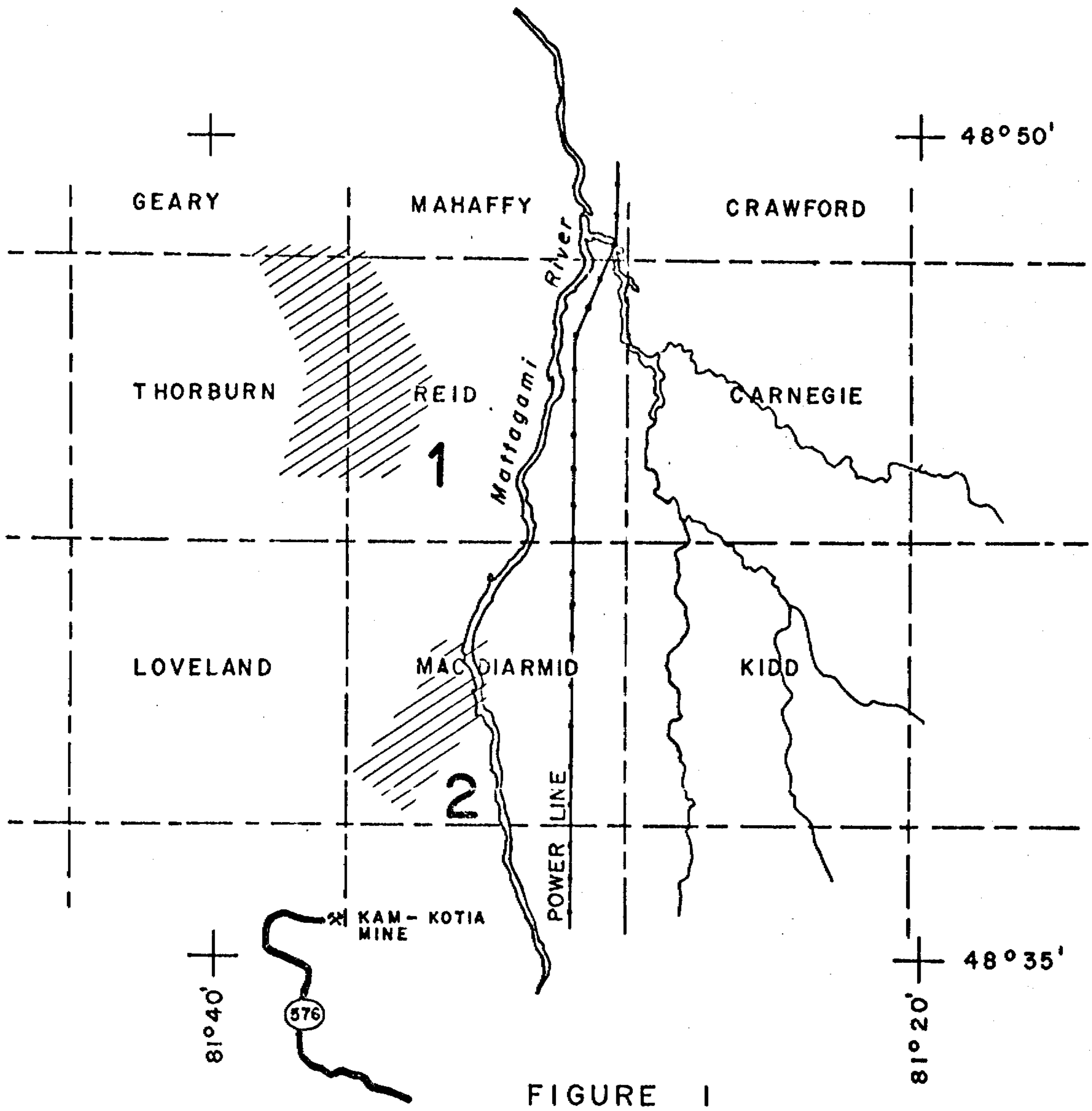

FIGURE I

LOCATION MAP

MATTAGAMI LAKE MINES LTD.

TIMMINS AREA, NORTHERN ONTARIO

AIRBORNE GEOPHYSICAL SURVEY

SCALE : 1":250,000

71-9325

and phase (o) of a stationary 400 cps electromagnetic field, and a Scintrex MAP-2 nuclear resonance, total intensity magnetometer, with a basic sensitivity of ± 1 gamma. Additional equipment included a 16 mm Vinten positioning camera, an intervalometer, a Bonzer radio altimeter, a Moseley 7100B dual trace recorder (Turair data) and a Moseley 680 single channel (magnetometer tape). This equipment was installed in a Bell 206A Jet Ranger.

Appendix C attached gives full technical details of the airborne geophysical equipment and ancillary equipment employed on this survey as well as the treatment of data resulting from the survey. The survey lines were flown at a nominal 660 ft. separation, in-flight navigation and flight path recovery being based on lay-down mosaics having a scale of 1" = 1320 ft.

Flight lines were oriented northeast-southwest which was the direction chosen by Mattagami Lake Mines Limited.

The survey was flown at an average airspeed of 70 mph and with a mean (helicopter) altitude of 250 ft.; the Turair electromagnetic sensor system was towed approximately 100 ft. below, and the magnetometer sensor 50 ft. below the helicopter.

Coverage of the irregular shaped blocs was achieved by laying a transmitter loop around each. The lines in the southern bloc (#2) are marked A33-A45 and those in the northern bloc (#1) are labelled 1-30. Two tie lines were flown over bloc #1 as well.

The survey aimed at locating potential sulphide mineralization which has been noted in the general Timmins area and therefore, the interpretation was based on trying to find subsurface conducting systems in the area. This would provide a view to locating massive sulphide deposits (beneath up to 200 feet of appreciable conducting clays) showing in-part highly conducting properties. The simultaneous magnetometer survey was used primarily to obtain (where applicable) correlation of magnetic activity with the conducting systems.

GEOLOGY

The geology of the Timmins area is extensively described in the publications and maps from the Geological Survey of Canada and the Ontario Department of Mines, as well as publications in different mining journals. Most of these publications deal with different mines and ore deposits.

Lately the Ontario Department of Mines is issuing compilation sheets of the geophysical data available in its files. Earlier this year two maps became available covering the ground vertical component magnetics and ground electromagnetics of MacDiarmid township (P683 and P685, on a scale of 1'' = $\frac{1}{4}$ mile).

On behalf of the ODM several E-phase, radiophase, magnetic and gamma ray spectrometric profiles were flown over a bloc of six townships including MacDiarmid (preliminary maps P688 and P689).

The airborne magnetic results, as flown by Dominion Gulf Company of Toronto and published by the GSC, are shown on maps 299G and 300G.

An interesting publication entitled ''Distribution and Characteristics of the Sulphide Ores in the Timmins Area'', by D.R Pyke and R.S. Middleton (CIMM Bulletin, June 1971, p.55-66) describes by different sulphide deposits as well as their geological settings.

PRESENTATION OF RESULTS

The Turair electromagnetic data is presented in analogue form, together with altimeter and fiducial recordings, on a dual trace Moseley 7100B recorder chart, the latter having a speed of 6" per minute. The magnetometer data (together with fiducials) are presented on a separate single channel Moseley 680 Recorder, this having a speed of 4" per minute.

The original geophysical traces are on the following scales:

Moseley 7100B Recorder

Channel 1	Fiducial Recordings	1 fiducial /second
Channel 2 (red pen)	Turair electromagnetometer Amplitude ratio	1" = 1%
Channel 3 (green pen)	Turair electromagnetometer Phase difference	1" = 0.5°
Channel 4 (side pen)	Altimeter recording	digital

Moseley 680 Recorder

Channel 1 (side pen)	Fiducial recordings	1 fiducial /second
Channel 2	Magnetometer	1" = 200 gammas (automatic steps of 1000 gammas)

The electromagnetic results of the geophysical survey, are presented, together with the magnetic contours on Plate 4, on a scale of 1" = 1320 ft.

The peak location of the conductor is shown on the plan by a circle in the appropriate location. In the case of broad conductors or closely spaced multiple conducting zones there may be more than one peak in which event all major peaks are shown. Conductor intersections have been graded in electrical categories 1, 2 and 3, based on the conductivity x width (which is to the contrary of Appendix C, page 7). The respective peak circles are shaded to reflect this categorization. Category 1 is fully shaded with category 2 half-shaded and category 3 unshaded. Category 1 has the highest conductivity x width values.

Only those conductors with amplitude ratios of 0.2% and higher have the calculated σt value marked in the right hand, top corner of the intersection.

Due to the preponderance of low amplitude, anomalies depth and σt calculations, when made, were subject to greater than normal errors, because of this, depth estimates have been categorized with an "X" in the lower left hand of the intersection when the conductor axis was $\gg$ 200 ft. (S = surface conductor, O = conductor within the overburden).

Where conductor indications were encountered on adjacent lines, these were tentatively linked together as one conducting system or zone, and suitably numbered.

Magnetic correlation if any is indicated for each conductor intersection by means of double circle. The magnetometer results are shown in Plate 4M (being an overlay of Plate 4) with a contour interval of 25 gammas.

DISCUSSION OF RESULTS

Magnetics

Grid # 1 - The magnetic contour plan reveals a very contorted pattern in the northern part of the bloc. This contorted bloc measures 2.5 miles in a north-south direction and $1\frac{1}{4}$ miles in an east-west direction. It is possibly open to the northwest. It is surrounded by regular but strong gradients.

The maximum relief of this area is 5600 gammas and it is very likely that an irregular shaped ultrabasic plug is the source of this magnetic expression. Folding and/or faulting are present. The depth, to the top of certain parts of this structure, is likely less than 200 ft.

To the south of this contorted pattern there is a somewhat more regular north-northwest trending pattern visible. Maximum relief is 600 gammas. The strongest parts possibly reflect diabase dykes. The lowest part likely reflects a more acidic mass. Some interpreted faults have been indicated.

Bloc #2 - The magnetic relief of this bloc is up to 300 gammas and the pattern suggests again a north-northwest trend for most of the area. The magnetic sources are likely much deeper than those in bloc #1.

One strong magnetic feature with a relief up to 3000 gammas occurs directly southwest of the centre of the bloc. It is open to the west and 3000 ft. wide. The steepness of the gradients suggests a source close to the surface ($\approx$200 ft.) D_2. This feature is possible surrounded by faults.

Electromagnetics

In general, the interpretation of airborne electromagnetic data is based upon 1) the amplitudes of the measured components (the field strength ratio and phase difference); 2) the calculated conductivity-thickness value; 3) depth to the conductor axis; 4) strike length (the average strike length of sulphide ore bodies in the Canadian Shield is 1000 ft.); 5) magnetic correlation; 6) relative width.

Most of the above values can be measured directly from the geophysical charts and the conductivity-thickness can be easily calculated employing simple phasor diagrams (see Appendix C). In the case of complex or partially resolved curves (of which we see many examples in the present survey) we are faced with a more complexed problem. In this case conductivity-thickness cannot be easily calculated.

It is well known that highly concentrated, massive sulphide bodies normally show high conductivity-width products and most of the copper-zinc ore bodies in the Canadian Shield contain a certain amount of pyrrhotite, therefore, they show a magnetic expression as well.

In the present survey area most of the bedrock is covered by up to 200 ft. of overburden, therefore, strong emphasis in the evaluation should be placed on the correlation with the magnetic contour plan.

The Turair electromagnetic survey results in the location of six (sub-divided) conducting systems varying in length from 1500 ft. to 6000 ft. Response amplitudes were of a rather low order of magnitude. This is generally less than 0.5% amplitude ratio and 0.5° phase difference, however, calculated conductivity-width products were often high enough to be compatible with the presence of massive sulphide horizons (or other highly conducting zones such as graphite, shears, etc.). Several intersections displayed either coincident or flanking magnetics.

<u>Bloc #1</u>

The amplitudes of ratio and phase were low throughout this bloc, which often results in an over estimation of the σt values

Intersections $7B_1$ and 9B of zone R_1 are the most interesting. Zone R_1 and R_2 occur along magnetic trends within the ultrabasic plug.

Zones S and T are likely reflecting overburden conduction and only single line anomalies 2A and 3A are of interest.

Bloc #2

Zone G reflects, up to a 1300 ft. wide, zone of multiple banded conductors. Depth estimates are unreliable due to the complexity of the distortions. It is, however, possible that intersections $A34A_2$ and A35A reflect basement conductors. The σt values in the northern part are higher (100 mhos) than in the southern part.

Zone H (short, narrow) is of interest due to its proximity to a small plug type magnetic high.

Zone J likely reflects overburden conductors.

Some of the single line indications might be deep, however, due to the weakness of responses these estimates are not too reliable.

CONCLUSIONS AND RECOMMENDATIONS

The magnetic pattern shown over the two blocs covered by the present survey is typical for an area underlain by Precambrian metavolcanics and sediments. The background relief in both blocs is between 300 and 400 gammas. However, in both grids locally a very strong relief (up to 5600 gammas) likely respresents ultrabasic plugs

The Turair electromagnetic results revealed in general weak responses of varying σt values. The following zones and intersections are of primary interest for further investigation.

Bloc #1 Sections $7B_1$ and 9B (and to a lesser degree 2A and 3A).

Bloc #2 Sections $A34A_2$ and A35A and zone G and zone H.

The ground investigation should consist of Turam electromagnetic and magnetic measurements on small grids, prior to diamond drilling.

Respectfully submitted,

Jan Klein

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Geophysicist.

APPENDIX C

SURVEY EQUIPMENT AND PROCEDURES

TURAIR

Semi-Airborne Electromagnetic System-Scintrex TAR-1

In the application of electromagnetic prospecting methods, it has long been recognized that, other things being equal, much greater exploration depths can be attained with systems employing a fixed source than with systems where both source and receiver are moved in unison. For example, a large conducting body which would already be undetectable at a depth of 60 m by any surface moving source (horizontal loop) system, could be detectable by a fixed-source method to a depth of as much as 200 m.

Most present-day airborne electromagnetic systems are of the moving source type, and although such systems have tangible advantages over the ground versions, it appears difficult to increase their useful penetration substantially beyond their present range. Under very favourable conditions the better moving source AEM systems may reach exploration depths of as much as 100 m or in exceptional cases 125 m below the ground surface. This is sufficient for many search problems but in some areas the geologic and topographic conditions necessitate a much deeper penetration to conduct meaningful mineral surveys.

The foregoing considerations have led to the development of the Turair method for the purpose of deep electromagnetic exploration. The system, which can be described as a fixed source, semi-airborne, gradient measuring device, employs a large transmitting loop on the ground as a primary source. The horizontal gradients of amplitude and phase of the vertical or horizontal magnetic field are measured from the air, along traverse lines across the source and perpendicular to the regional geological strike.

The Turair method, because of its semi-airborne character, is particularly suitable for the detailed, deep investigation of structures having geologically favourable characteristics, or a magnetic expression suggesting favourable geology. Because of its potential depth of exploration, it can be successfully employed in areas of deep sedimentary cover, deep weathering, or tall tree cover (tropical area), or in areas where shallower exploration has been established the presence of ore deposits and a deeper search is desired. It is, because of its fixed source configuration, less affected by near-surface conduction and can be applied with a very low exciting frequency (e.g. 200 Hz or less). Finally, as a helicopter-borne system it can operate in mountainous topography. Terrain clearance has far less effect on the exploration depth of the Turair system than it has in moving source methods and it can penetrate deep talus cover and valley fillings.

Economic ore deposits may have strike lengths less than 200 m. If we want to search for such targets, particularly at greater depths, line spacing should not be much greater and for the average survey line spacing of 200 m (or one-eighth mile) should be considered optimum. In fact, larger line spacings do not represent significant savings, because of the reduction of measurable profile from one loop layout. The largest primary loop that can efficiently be laid out (by helicopter) is 3 x 5 km. Under average conditions some 400-500 line km of profile at 200 m intervals can be surveyed from this source, the total operation covering approximately one day's field work.

EQUIPMENT

The Scintrex Turair is a fixed source, semi-airborne electromagnetic system designed for helicopter operation.

The system embodies a fixed transmitter on the ground and a receiver carried in the helicopter. The size of the transmitting loop is guided by geological conditions and the character of the survey. A typical loop size would be e.g. a square, 3 miles on each side--other shapes and sized can be used. The loop can be laid out from a truck or by helicopter. For airborne placement a special dispensing device is used which can feed out continuously, several miles of wire. The present system utilizes a 400 Hz primary field, excited by means of a 15 kW motor driven generator which supplies a current of 4-10 amperes into the transmitting loop. The system can operate at any other desired frequency depending on the geological conditions in the survey area.

The receiver system comprises 2 horizontal coplanar or 2 vertical coaxial air-cored coils, rigidly mounted

4.5 m apart in a "bird". This bird is towed approximately 30 m below the helicopter by means of a cable which also carries the electrical signals from the bird. The horizontal coplanar coil system is the one preferably used. In areas where conducting overburden, etc. might tilt the primary electromagnetic field from a mainly vertical to a more horizontally directed one, the vertical to a more horizontally directed one, the vertical coaxial coil system may have to be used. The present Turair receiving system is designed to detect signals stronger than 1 V in the coils (phase lock principle). The system has a noise level of less than 3 V. In this way, from a 3 Km x 3 Km loop, energized by 4 amperes, an area of about 55 square Km can be covered in a region underlain by e.g. 100 m or more of overburden or deep weathering of moderate conductivity.

The quantities measured with this dual coil (gradient) measuring electromagnetic system include the ratio of the field strength and the phase differences of the alternating magnetic field at the two coils. The changes in amplitude ratio and phase difference are expressed in percent and degrees respectively. The sensitivities of the system are 0.1 percent and 0.1 degrees respectively.

Both parameters are recorded in analogue form on a dual channel recorder. Digital output can be employed as well. The recorder scale sensitivities can be set to meet all kinds of survey conditions. (e.g. Deep-seated targets give generally lower responses than near surface ones. Therefore, in geological conditions where 100 m or more of sediments are present, higher scale sensitivities are utilized than in areas where strong responses are expected.)

Flying towards or away from the loop the strength of the field detected at the coils changes gradually but considerably. For this reason, a switch connected to the signal detector amplifier is manually activated to keep the amplified output of the preamplifiers within the signal strength limitations necessary for the equipment operation. These switching markers are shown on the recorder charts as short duration "spikes" with appropriate notation and are easy to interpret as such.

At one or more points during each flight, the scale sensitivities and zero levels are checked by means of calibration and zeroing signals respectively. The reference or zero level for each Turair electromagnetic trace is an arbitrary one, and is obtained empirically from the regional level of each section of a trace between the switching markers. These levels may drift slowly during a flight because of temperature changes. The drifts are very gradual and are readily distinguishable from local changes due to conductors of a geologic origin.

Since the gradients of the signals recorded close (i.e. within about 175 m) to the loop sides are too strong, it is not possible to distinguish field changes due to conductors of geologic origin lying in these "blind zone" regions. From a statistical point of view the chances of missing a significant conductor in these "blind zone" regions are very small, since these regions constitute only about 8% of the area surveyed from each loop.

The amplitude ratio and phase difference are recorded in such a way that flying "towards" the loop using the horizontal coplanar coil system, a normal anomaly shows a positive sign (i.e. upward deflection) for the former and a negative sign (i.e. downward deflection) for the latter parameter. While flying "away" from a loop these signs are reversed. Reversed anomalies can also be the result of particular geometric situation, e.g. when the source is located on the hanging wall side of a flatly dipping conductor (Bosschart, 1964, p.22 and figure 9). Man-made disturbances including power lines, pipe lines, metal fences, railways, etc. may cause spurious anomalies. The former are recognizable as such when they appear as cyclic noise of irregular shape and phase relationship. Non-energized, grounded power lines (e.g. 3 phase systems) sometimes give rise to anomalies that are more difficult to identify. Such indications as well as those from pipe lines and metal fences, etc. are however, of short duration and can be distinguished from most geologic sources except for very narrow, near-surface conductors. In some instances, ground investigation may be necessary in order to resolve the ambiguity of possible sources. Although the airborne geophysical crew attempts to note visible man-made conductors of the above type, the ground moves so rapidly at the low flight elevation employed that 100% recognition of such sources cannot always be expected from the air.

The normal terrain clearance of the bird is 30-60 m depending on the surface topography, tree cover, etc. with the helicopter 30 m above. The established useful depth of detection of the system for moderate-to-large conducting bodies, i.e. 300 m or more in plan length, is at least 175 m sub-bird under conditions of low extraneous geologic noise, i.e. where the general level of conductivity of the overburden and rock types of the area is low. The useful depth of detection of the system is therefore, at least 125-150 m beneath the ground surface under these conditions.

PRESENTATION OF RESULTS

The electromagnetic records are interpreted to determine the presence of conducting bodies and to obtain some information relating to their character. The intervalometer time marks are synchronized with the positioning camera film strip and thereby permit the relating of the conductors with appropriate ground locations. The terrain clearance is obtained from the altimeter data, presented in the form of sidepen markers whose separation is nearly proportional to the helicopter terrain clearance.

A plan is prepared, either using a subdued photomosaic ("greyflex") or an overlay from a mosaic or topographic plan as base. The flight path of each survey line is obtained by means of "tie points", which are features on the mosaic or topographic plan, identified on the positioning camera film. The flight path is interpolated between these tie points.

INTERPRETATION

Where field distortion occurs the curves indicate the location and the depth of the main current flow. The "current axis" is well defined when the current is concentrated, for instance, in thin, steeply dipping conductors. In wide, banded conductors, or in horizontal conductors such as overburden, the current is usually more dispersed and the anomalies yield less positive information.

(a) Peak Location

The peak location of the amplitude ratio (using the horizontal coplanar coil system or the cross-over in case the vertical coaxial coil system is used) is shown on the plan by a circle in the appropriate location. In the case of broad conductors or closely spaced multiple conductor zones there may be more than one peak, in which event all major peaks are shown. A conductor which is likely man-made is indicated by an X rather than by a circle.

As a rule the current axis is located right below the maximum field strength ratio deflection or the maximum phase anomaly, for the horizontal coplanar receiving coil system (Vertical Field). For the vertical coaxial coil system (Horizontal Field), the current axis is located right below the inflection point of the anomaly. Its depth under the traverse is indicated by the shape of the anomaly.

(b) Depth and Conductor Width

The "half width", i.e. the distance between the points of half the maximum response amplitude is for simple line current sources, using the horizontal coplanar coils, approximately equal to the depth of the source under the detector. In case the vertical coaxial system is used the peak to peak separation is for tabular bodies equal to 1.15 times the depth of the source under the detector. Flat-lying conductors (e.g. overburden) characteristically give rise to very large half widths, combined with rather irregular curve shapes. Here the half width may reflect the conductor width rather than the depth and the latter can usually not be determined. In cases where the conductivity zone is interpreted to have appreciable width, the separation between the edges is indicated on the plan by an open bar symbol along the flight line. Well defined peaks within this zone should be marked, and if possible interpreted as individual anomalies. The subsurface depth of the current axis (subtract detector altitude) is marked on the lower left of the peak location circle.

(c) Conductor Grading

Field strength ratio and phase difference anomaly amplitudes are dependent on the overall geometry as well as on target size and σt value. Their primary significance is in the degree of certainty they lend to detectability and quantitative interpretation. For the purpose of amplitude grading three categories are used: Category 1, fully shaded; Category 2, half shaded; and Category 3, unshaded.

(d) Conductivity-Thickness Factor

The field strength ratios and phase differences provide a measure of the conductivity of the conducting bodies, i.e. good conductors are characterized by field strength distortion combined with relatively little phase shifting, whereas poor conductors affect the phase rather than the strength of the resultant field.

For an accurate grading the conductivity-thickness factor (σt value) of individual conductors can be derived from the calculated in-phase and out-of-phase components, taking into consideration the exciting frequency and the strike length of conductor, by means of the diagram described below. The σt value is then marked on the upper-right side of the peak location circle.

Large, highly conducting bodies such as massive sulphides or graphite and seawater, etc., generally have high σt values. Moderate conductors will have σt values between 10 and 100 mhos. Poorly conducting bodies (e.g. most overburden and some sulphide and graphitic zones) will have σt values of less than 10 mhos. In areas where there is a clear differentiation in conductivity between the targets of potential economic interest and other possible conductors, the σt values may form the main basis for discrimination. When the conductivity ranges of economic and non-economic overlap, the σt value cannot, of course, be rigidly relied upon.

Diagram for the Evaluation of Conductivity-Thickness (σt) Factors

This diagram has been prepared from data obtained in model studies (R. A. Bosschart: "Analytical Interpretation of Fixed Source Electromagnetic Prospecting Data.") and is valid for Tabular steeply dipping 'Thin' Conductors.

To obtain the conductivity-thickness factor for a conductor system the amplitude-ratio and phase difference are plotted on abscissa and ordinate respectively and a line is drawn through the resultant point and the origin. Where this line intersects the curve corresponding to the interpreted strike length of the anomaly system one interpolates between the values of conductivity-thickness, in mhos, shown on the upper bounding curve.

Example:	Amplitude Ratio	0.7%
	Phase difference	0.2°
	Interpreted strike length of system	1000 metres
	Conductivity-thickness value (σt)	120 mhos

(e) Current Pattern

To obtain the projection of the current pattern, the anomalies are connected between lines, using depth σt values and other characteristics of the curves as criteria. The strike of the formation, if known, is also taken into consideration.

(f) Magnetic Correlation

Where magnetic data are available, preferably from a coincident magnetometer recording, any correlating magnetic expression is noted for the pertinent conductor peak. A conductor peak with direct magnetic correlation is indicated by a double concentric circle.

Location of a conductor on the flank of a magnetic anomaly is indicated by means of one half of a concentric circle on the side of the magnetic high.

The significance of direct or flank correlation depends on the search problem. In the former case the magnetic and conductive properties may be coincident or belong to two narrow adjoining zones. In the latter case the conductor may be located at the contact of a wider magnetic formation. In case of direct coincidence, the magnetic value is marked on the lower right side of the peak location circle.

REDUCTION OF DATA

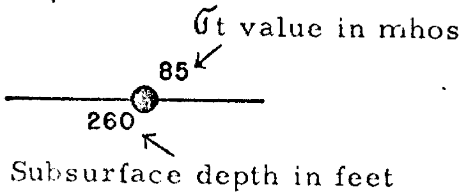
Upon completion of a flight, the film is developed and the actual path of the aircraft is plotted on a base map. This is accomplished by comparing film points with the base map planimetry. For any given point, the appropriate fiducial number is placed on the base map (or photo laydown). The actual flight path is produced by joining the fiducual points.

Where field results are desired, anomalies are chosen and are assigned appropriate fiducial numbers. The anomalies are then transferred to their correct position on the base map.

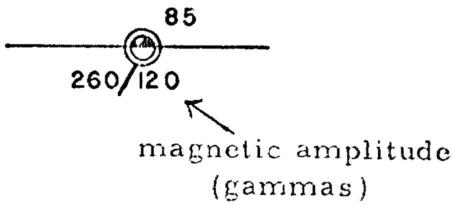
Flight lines and fiducial numbers are finally presented on a greyflex which is made using the photo mosaic as a base.

In the case of EM results the anomalies are plotted on the greyflex as boxes with symbols representing anomaly grade of amplitude (as noted on the legend accompanying each map). Anomaly "systems" are then outlined at which stage a geophysical interpretation can be made.

* (Bosschart, 1964, p. 22 and figure 9) Analytical Interpretation of Fixed Source Electromagnetic Prospecting Data.



Category one, no magnetic correlation



Category two, magnetic correlation

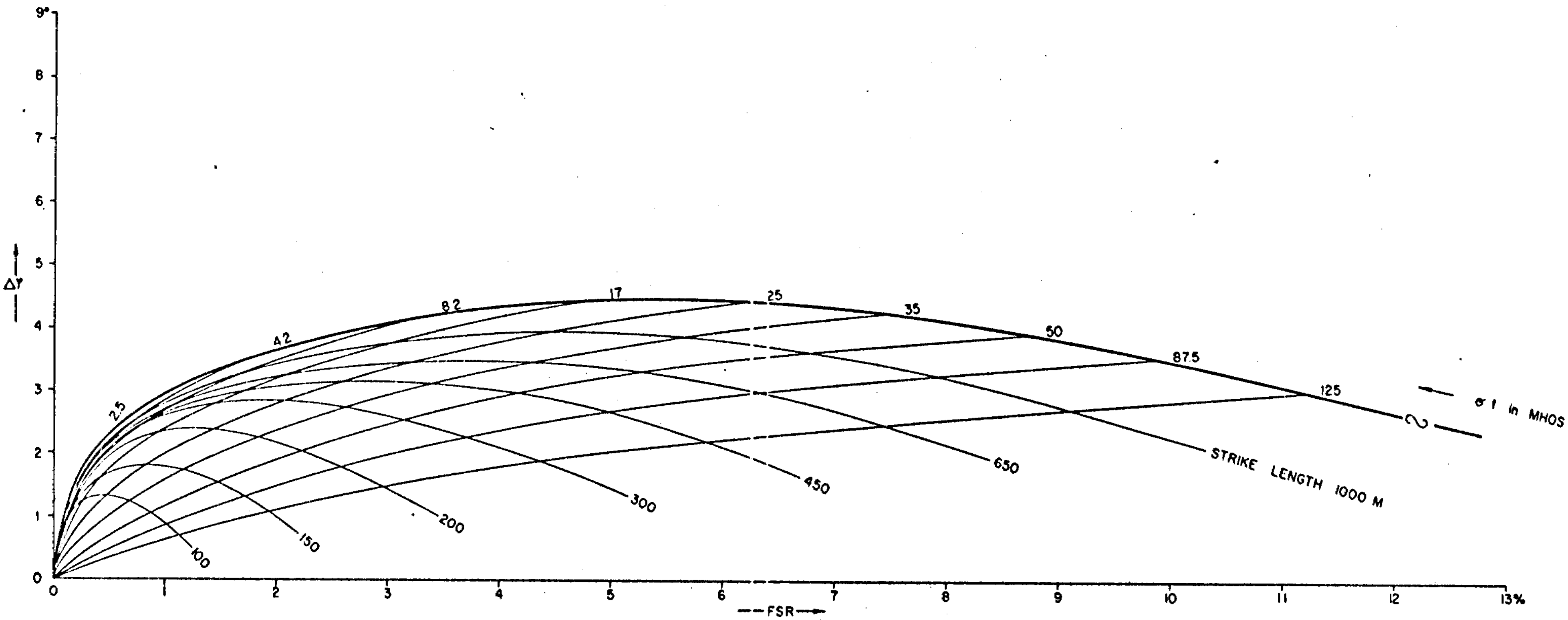
Category three, no magnetic correlation, anomaly too weak or insufficiently defined for quantitative determinations.

Wide conductive zone, banded (three marked)

Category three, reversed current flow, magnetic correlation

Probably man-made conductor.

EXAMPLES OF CONDUCTOR CODING



TURAIR
400 CPS
RESPONSE / SIZE DIAGRAM
TABULAR "THIN" CONDUCTOR

MAP-2 Proton-Precession Magnetometer

The MAP-2 is a lightweight, one gamma airborne proton-precession magnetometer with a range of 20,000 to 100,000 gammas and an automatic five digit visual display. This new instrument has several significant advantages over other instruments of this type besides its compact size and light weight.

One of its most interesting features is that, unlike other airborne magnetometers which have to be switched manually from one narrow (usually 4000-6000 gammas) range to another, the MAP-2 tracks automatically over its full 80,000 gamma range.

This advantage is particularly significant in surveys flown at low terrain clearances in areas of high magnetic relief, conditions which are common in mineral prospecting.

The instrument is of compact modular design ($\frac{1}{2}$ standard rack size) and has both digital and analogue outputs. The analogue outputs are either 100 or 1000 gammas full scale, with automatic stepping. During each step, an indication of the new stepping level is recorded, providing a permanent reference identifying each step.

The measuring sequence can either be sequentially triggered internally through its own programmer or initiated by a suitable command pulse.

In addition while on internal triggering the instrument provides an external output command pulse enabling other instrumentation to be synchronized with the magnetometer.

The MAP-2 has an unusually wide temperature range, +50°C to -30°C, to permit operation in conditions varying from tropical to arctic without any loss of accuracy.

Specifications:

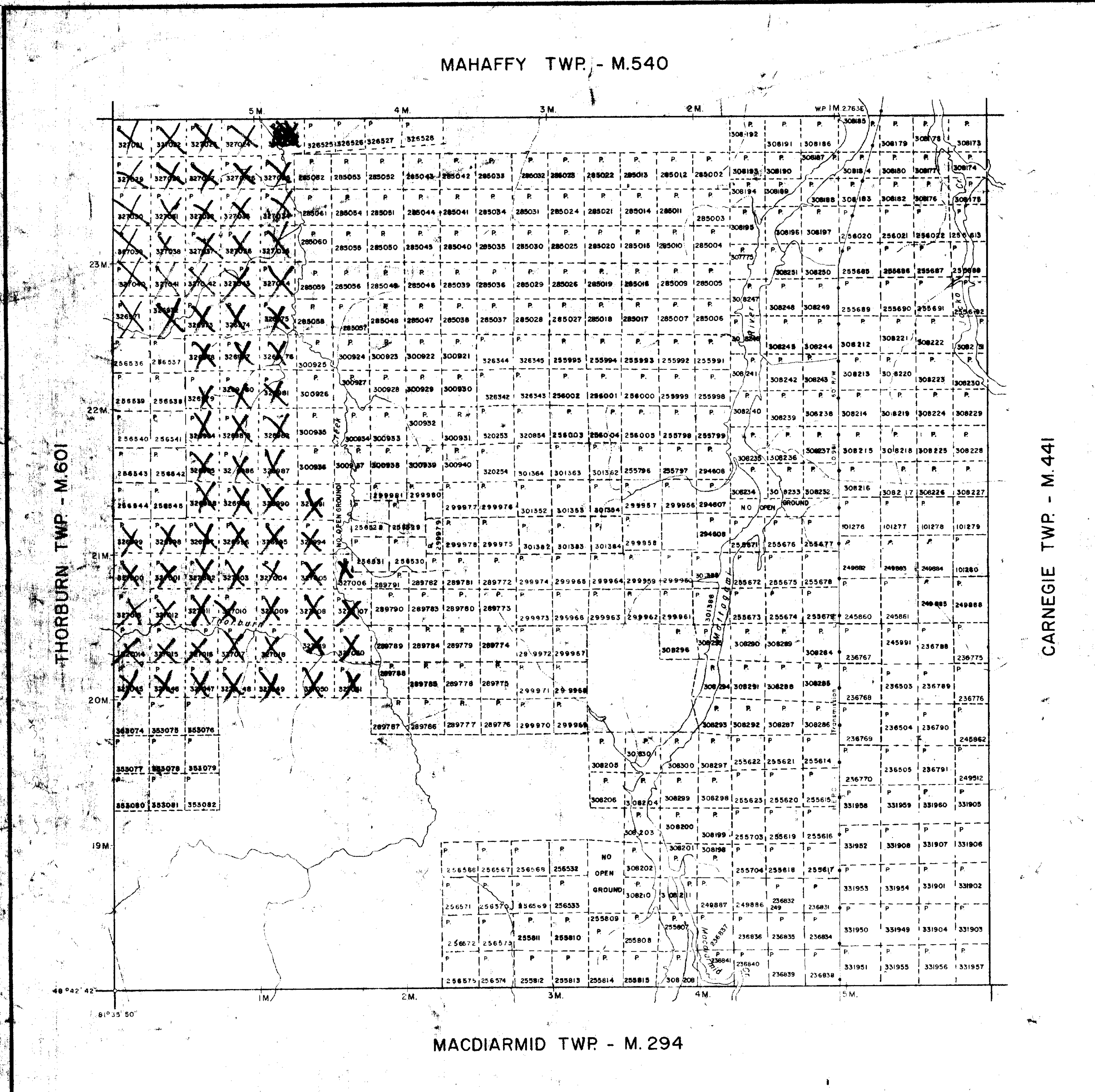
Range:	20 - 100,000 gammas (world-wide) continuous range (automatic tracking).
Sensitivity:	± 1 gamma (fully automatic)
Accuracy:	± 1 gamma
Sampling Rate:	Automatic standard 1 second, with provision for external triggering from other equipment with minimum 1 second intervals.

Readout-Visual:	Digital Display by 5 incandescent, 7 bar display lights.
Digital Data Output:	BDC 1-2-4-8 DTL, TTL Compatible
Analog Data Output:	5 V full scale for 1000 gammas, 100 gammas, 1 gamma resolution
External Trigger:	Requirement: +4V to 0 transition (as slave)
Trigger Output:	+4V to 0 transition at start of cycle (as master)
Power Requirements:	24-30V DC, 3.2A max.
Temperature Range:	-30 to +50 degrees C

Dimensions and Weights:

Console:
$8\frac{1}{2}$'' x $5\frac{1}{4}$'' x 13'' (half rack)
$21\frac{1}{2}$ cm x $13\frac{1}{2}$ cm x 33 cm
12 lbs. (5.4 kg)

Tow Bird:
7'' x 23'' (18 cm x 58 cm)
20 lbs. (9 kg)



THE TOWNSHIP OF

REID

DISTRICT OF COCHRANE

PORCUPINE MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

LEGEND

PATENTED LAND	Ⓟ
CROWN LAND SALE	C.S.
LEASES	Ⓛ
LOCATED LAND	Loc.
LICENSE OF OCCUPATION	L.O.
MINING RIGHTS ONLY	M.R.O.
SURFACE RIGHTS ONLY	S.R.O.
ROADS	
IMPROVED ROADS	
KING'S HIGHWAYS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	
MINES	
CANCELLED	C

NOTES

400' surface rights reservation around all lakes and rivers.

Subdivision of this twp. into lots and concessions annulled Aug. 19, 1953.

Flooding rights to areas along Mattagami River reserved to H.E.P.C. - L.O. 7085

DATE OF ISSUE
AUG 21 1972
ONT. DEPT. OF MINES AND NORTHERN AFFAIRS

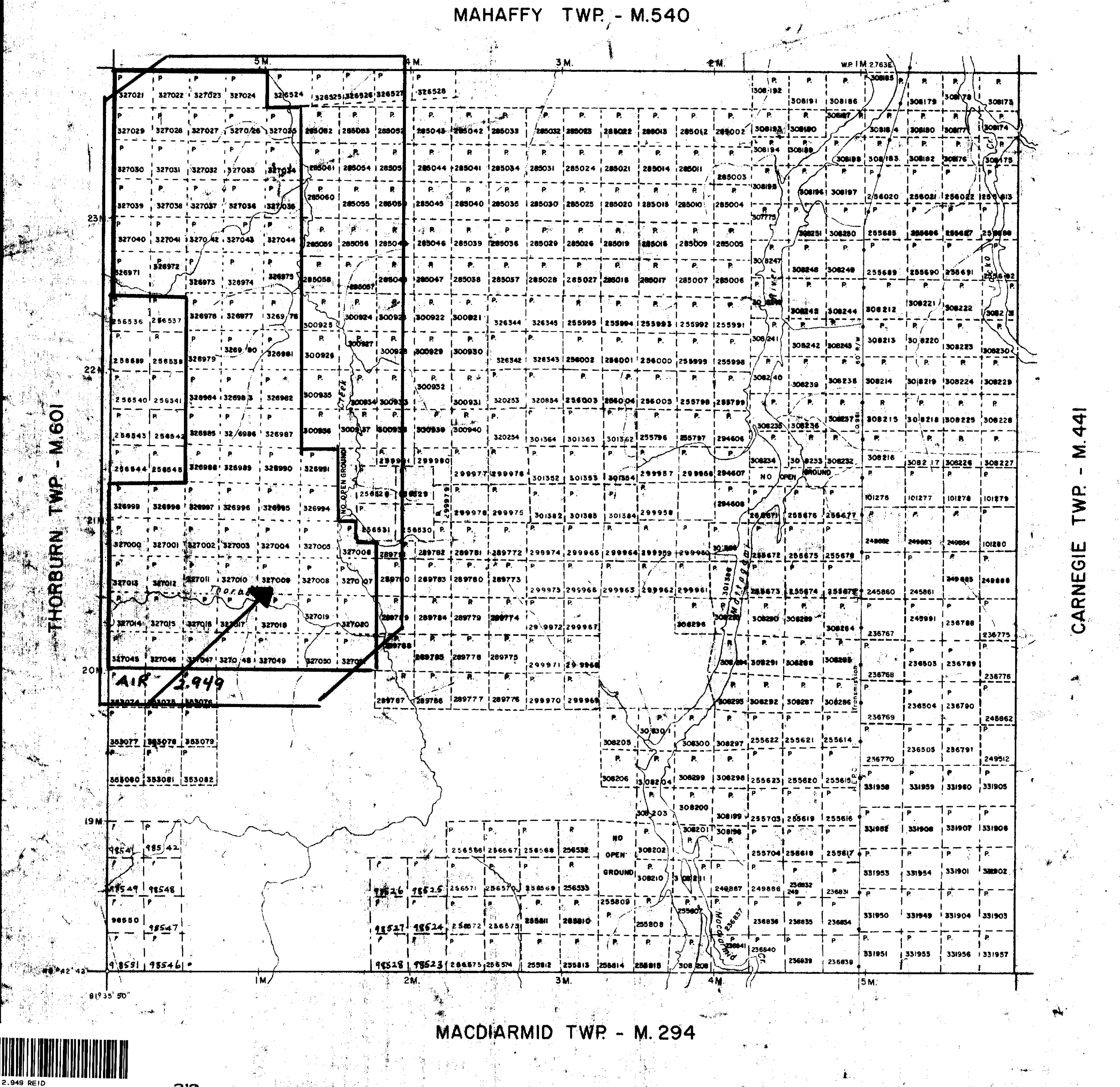
PLAN NO. M.575

ONTARIO
DEPARTMENT OF MINES AND NORTHERN AFFAIRS

42A13SE0084 2.949 REID

200

M.575
REID TWP.
M.575



THE TOWNSHIP
OF

REID

DISTRICT OF
COCHRANE

PORCUPINE
MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

LEGEND

PATENTED LAND	Ⓟ
CROWN LAND SALE	C.S.
LEASES	Ⓛ
LOCATED LAND	Loc.
LICENSE OF OCCUPATION	L.O.
MINING RIGHTS ONLY	M.R.O.
SURFACE RIGHTS ONLY	S.R.O.
ROADS	
IMPROVED ROADS	
KING'S HIGHWAYS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	
MINES	
CANCELLED	C.

NOTES

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Airborne
2.949

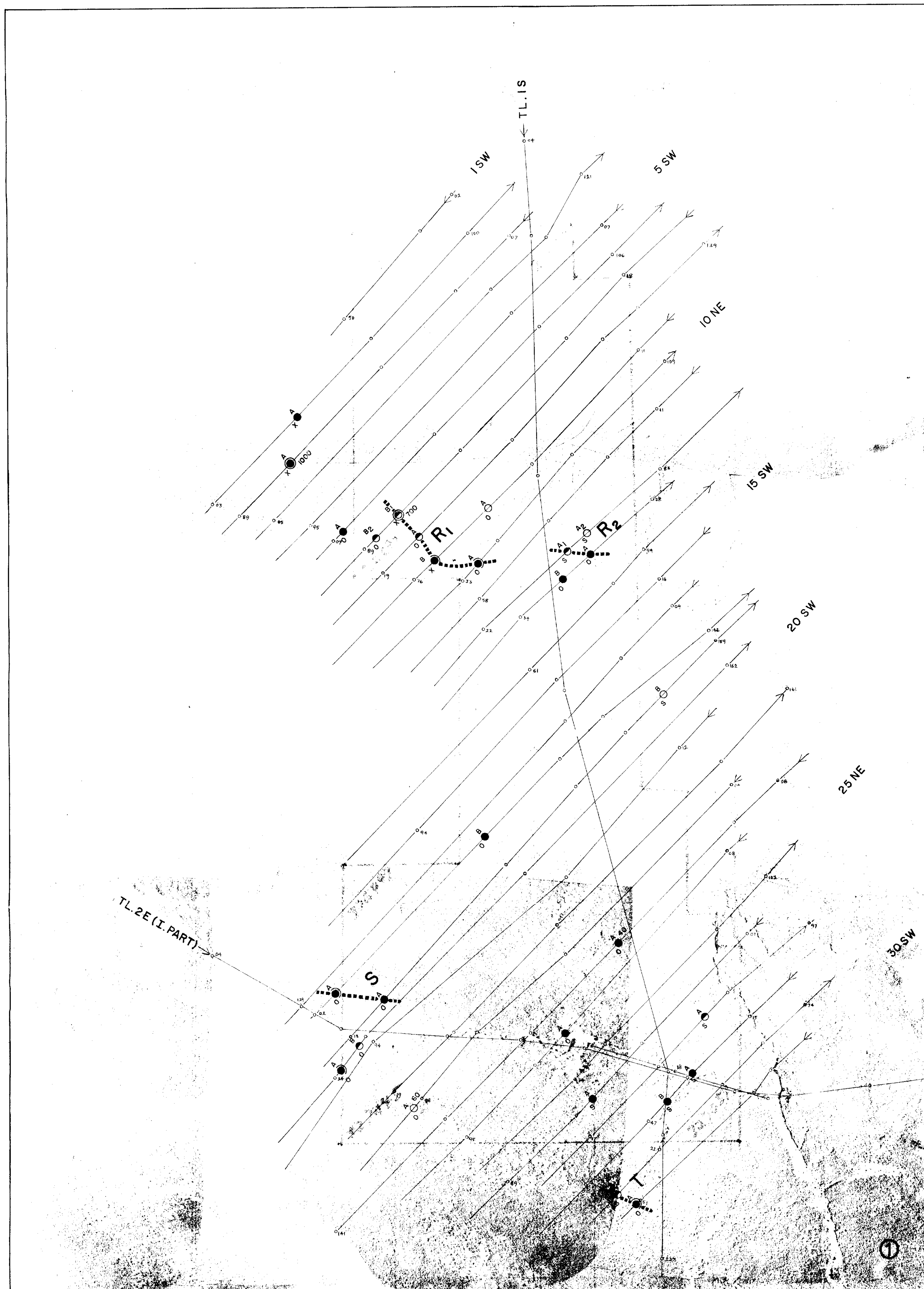
DATE OF ISSUE
JUL 2 1972
ONT. DEPT. OF MINES AND NORTHERN AFFAIRS

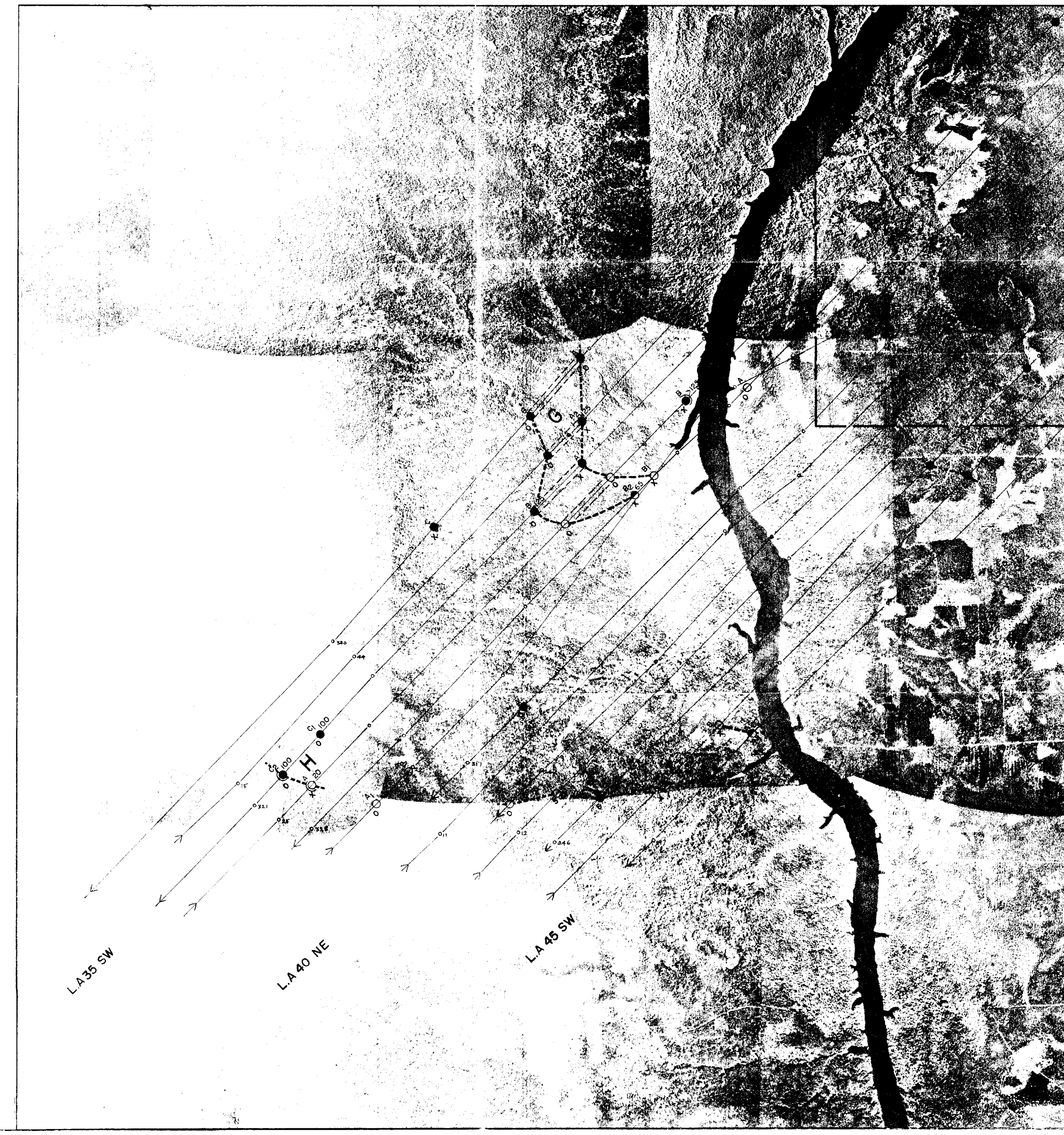
PLAN NO. M.575

ONTARIO
DEPARTMENT OF MINES
AND NORTHERN AFFAIRS

42A13SE0084 2.949 REID

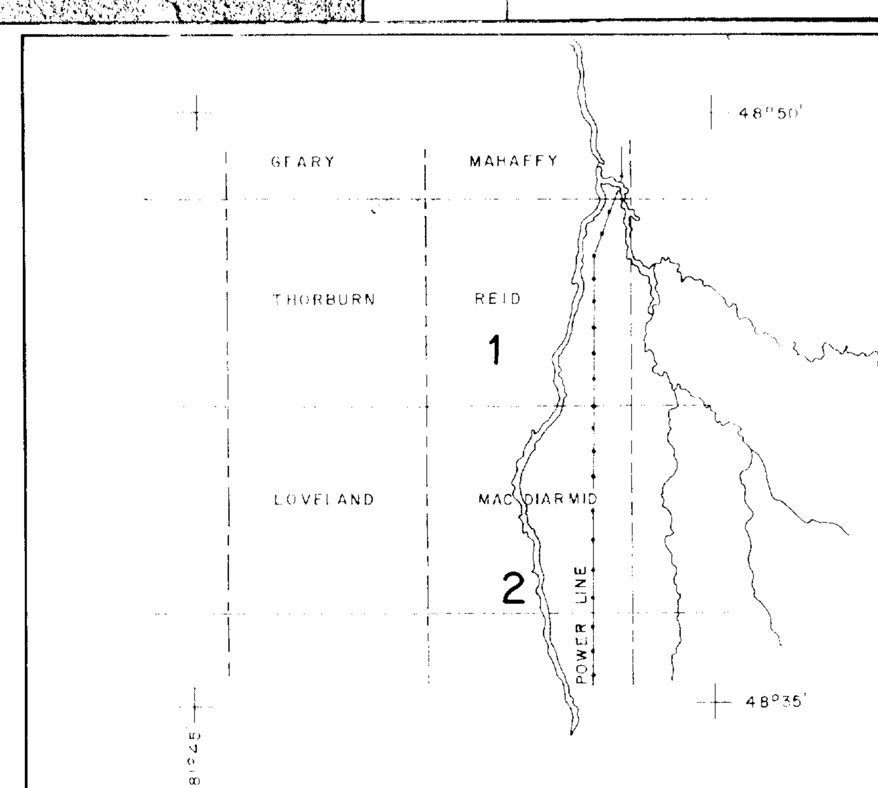
210





LEGEND

Symbol	Meaning
34W	FLIGHT LINE NUMBER DIRECTION AND NUMBERED CONTROL POINT
●	1st CATEGORY ANOMALY
◓	2nd CATEGORY ANOMALY
○	3rd CATEGORY ANOMALY
65 x 500	TURAIR ANOMALY WITH MAGNETIC CORRELATION: 65 CONDUCTIVITY THICKNESS (IN MHOS) x INTERP. DEPTH IN FEET 500 MAGNETIC CORRELATION AMPLITUDE IN GAMMAS
[ ]	REVERSE ANOMALY
⊗	MAN MADE CONDUCTOR
(○	CONDUCTOR ON FLANK OF MAGNETIC HIGH
- - - - -	CONDUCTOR AXIS



LOCATION MAP

PLATE 4

MATTAGAMI LAKE MINES LTD.

TIMMINS AREA, NORTHERN ONTARIO

AIRBORNE GEOPHYSICAL SURVEY

SCALE : 1" = 1320'

SURVEY BY SEIGEL ASSOCIATES LIMITED

FLOWN AND COMPILED JUNE - JULY 1971

FLIGHT ALTITUDE ≃ 250'

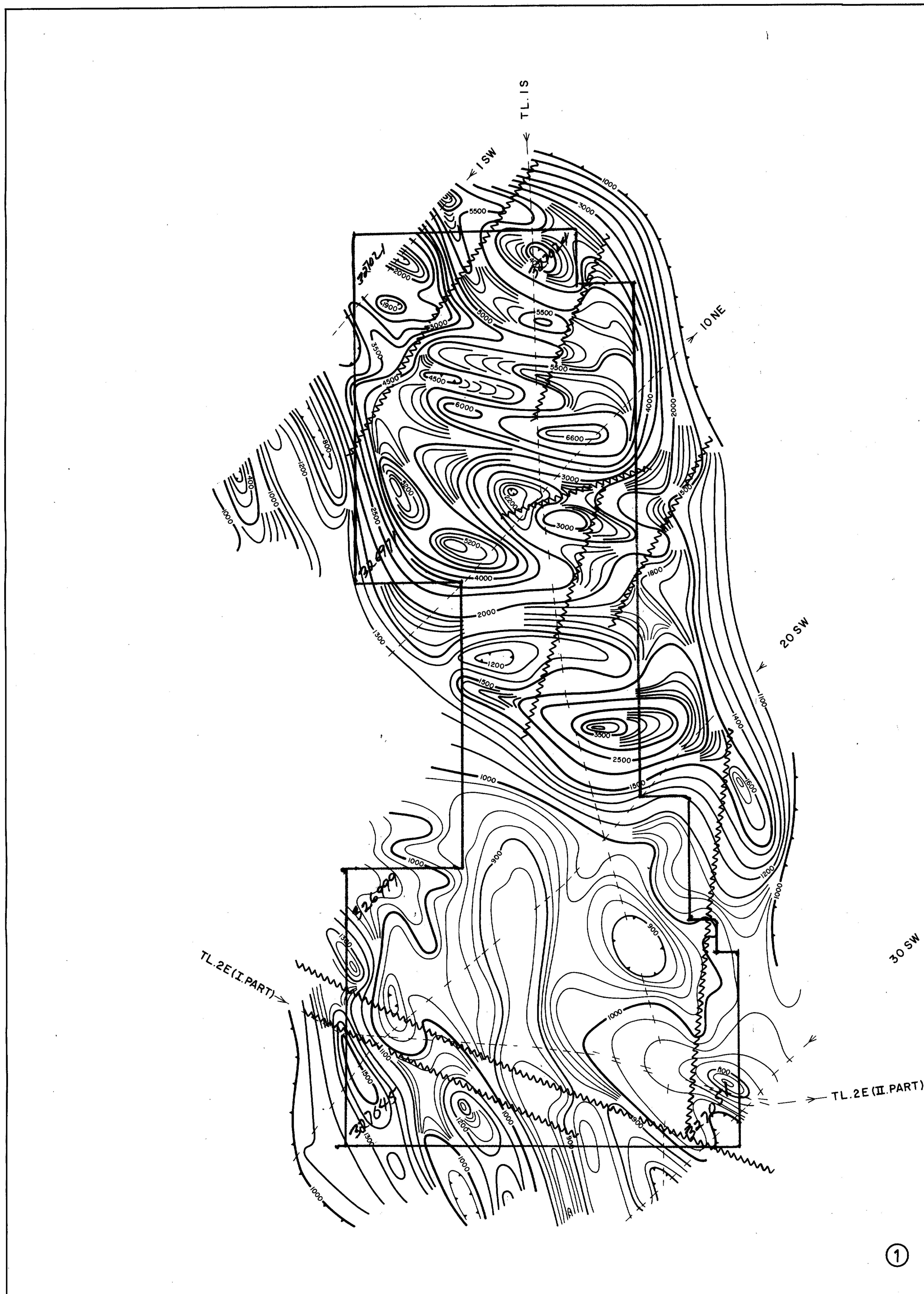
FLIGHT LINE SPACING ≃ $\frac{1}{8}$ MILE

42 A 12, 13

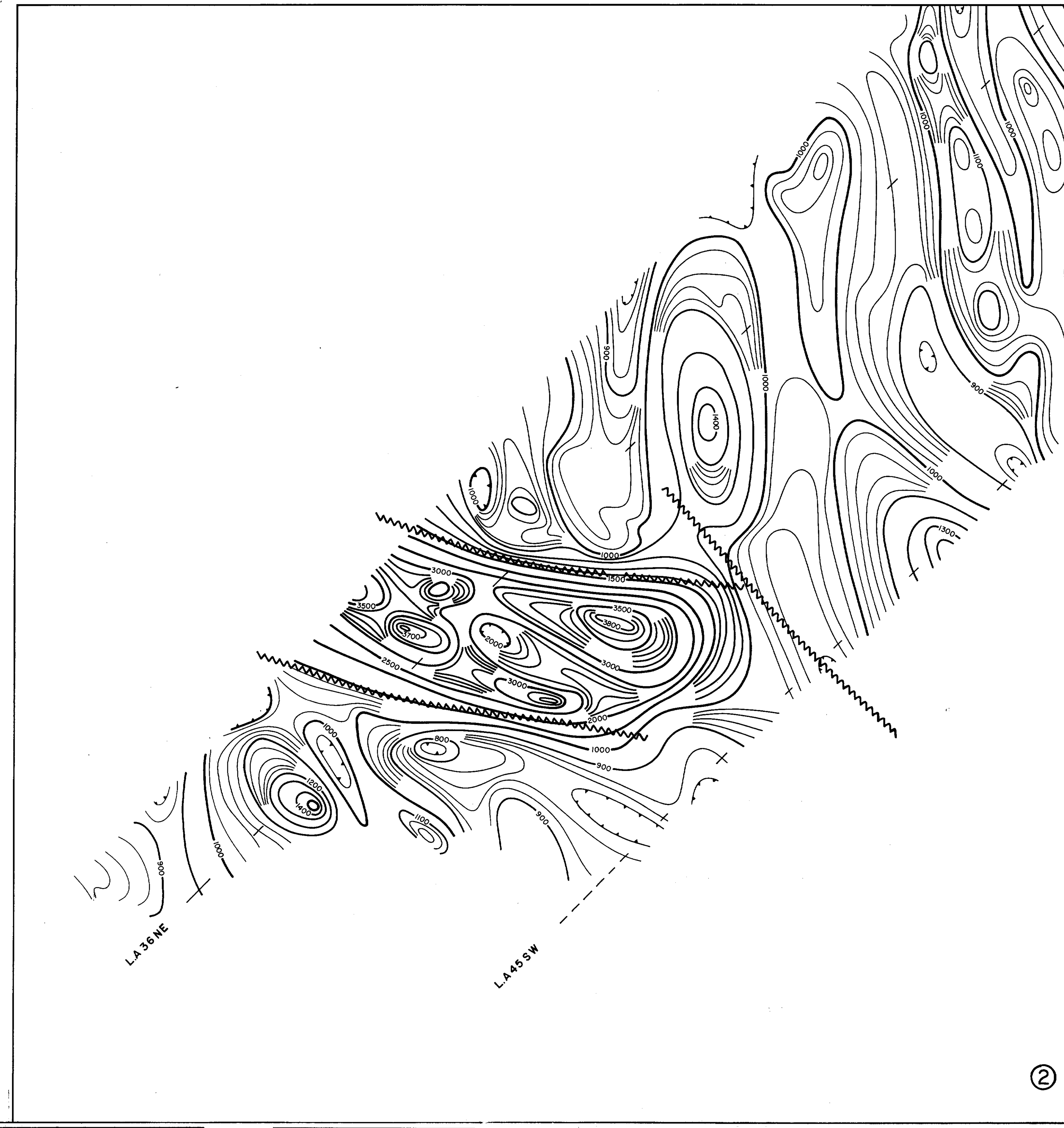
220

71-9325-04

2.949



①



②

MAGNETOMETER CONTOUR PLAN

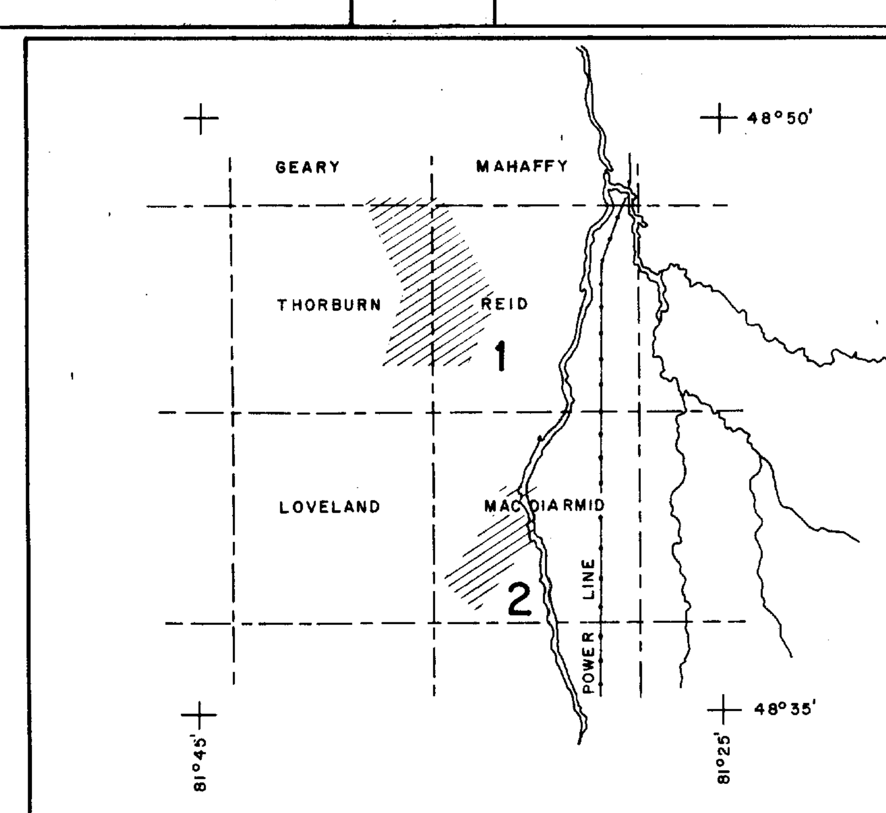
LEGEND:

- 34W — FLIGHT LINE NUMBER, DIRECTION AND NUMBERED CONTROL POINT.
- 500 GAMMA ISOMAGNETIC CONTOUR INTERVAL.
- 100 GAMMA ISOMAGNETIC CONTOUR INTERVAL.
- 20 GAMMA ISOMAGNETIC CONTOUR INTERVAL.
- MAGNETIC LOW.
- BASE VALUE 59,000 GAMMAS
- POSTULATED FAULTS

SCALE

1000 FEET 0 1000 2000 3000 4000 5000 FEET

1320 Feet to 1 Inch



LOCATION MAP

SCALE 1":250,000

PLATE 4M

MATTAGAMI LAKE MINES LTD.

TIMMINS AREA, NORTHERN ONTARIO

AIRBORNE GEOPHYSICAL SURVEY

SCALE : 1" ≃ 1320'

SURVEY BY SEIGEL ASSOCIATES LIMITED

FLOWN AND COMPILED JUNE – JULY 1971

FLIGHT ALTITUDE ≃ 250'

FLIGHT LINE SPACING ≃ 1/8 MILE

71-9325-04M