AIRBORNE ELECTROMAGNETIC SURVEY

COPPER-LODE MINES LTD

BELANGER TWP. AREA, ONTARIO

FILE NO: 14023

Questor Surveys Limited, 20 Canso Rd., Rexdale, Ontario, Canada.

INTRODUCTION

This report contains our interpretation of the results of an airborne electromagnetic survey flown in the Belanger Twp. Area, Ontario on August 10 and 11, 1972. A brief description of the survey procedure together with recommendations for ground follow-up is included.

The survey totalled 450 line miles and within the claim blocks, the line mileage has been calculated to be 90 miles. The survey was performed by Questor Surveys Limited and the survey aircraft was a Skyvan CF-QSL. The operating base was Red Lake, Ontario.

The area outline is shown on a map at the end of this report.

MAP COMPILATION

The base maps are uncontrolled mosaics constructed from Ontario Department of Lands and Forests 1" = 1/4 mile photographs. The mosaics were reproduced at a scale of 1" = 1320 feet on stable transparent film from which white prints can be made.

Flight path recovery was accomplished by comparison of the prints of the 35mm film with the mosaic in order to locate the fiducial points. These points are approximately one mile apart.

SURVEY PROCEDURE

Terrain clearance was maintained as close to 400 feet as possible, with the E. M. Bird at approximately 150 feet above the ground. A normal S-pattern flight path using approximately one mile turns was used. The equipment operator logged the flight details and monitored the instruments.

A line spacing 1000 feet was used.

INTERPRETATION AND RECOMMENDATIONS

Two conductors were intercepted as a result of the INPUT survey. One anomaly, located in the north-west corner of the claim block, displays a good E. M. response and its apparent conductivity-width has been estimated to be 15 mhos. There is also good direct magnetic correlation, in the order of 720 gammas. The geology has been indicated to be amphibolite biotite gneiss.

The second conductor, which is located in the southern part of Fredart Lake, displays a very poor E.M. response. The anomalies also correlate with a magnetic low. The probable cause of the conductor is lake bottom sediments.

The magnetic highs correlate with gabbroic intrusions and basic volcanics while the magnetic lows correlate with granite and meta-sediments.

Ground follow-up is suggested on the anomaly that is located in the north-west corner of the claim block to determine the cause of the conductor.

QUESTOR SURVEYS LIMITED

R. de Carle

R. de Carle
Geophysicist.

APPENDIX

EQUIPMENT

The aircraft are equipped with Mark VI INPUT (R) airborne E.M. systems and Barringer AM-104 or AM-101A 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 260, 480, 755, 1100, 1575 and 2100 micro-seconds after the cessation of the pulse. The widths of the gates are 225, 225, 320, 410, 500, 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) BARRINGER AM-104 OR AM-101A PROTON PRECESSION MAGNETOMETER

The magnetometers which measure the total magnetic field have a sensitivity of 5 gammas 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 and then the transmitter is switched off for 0.15 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, 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.

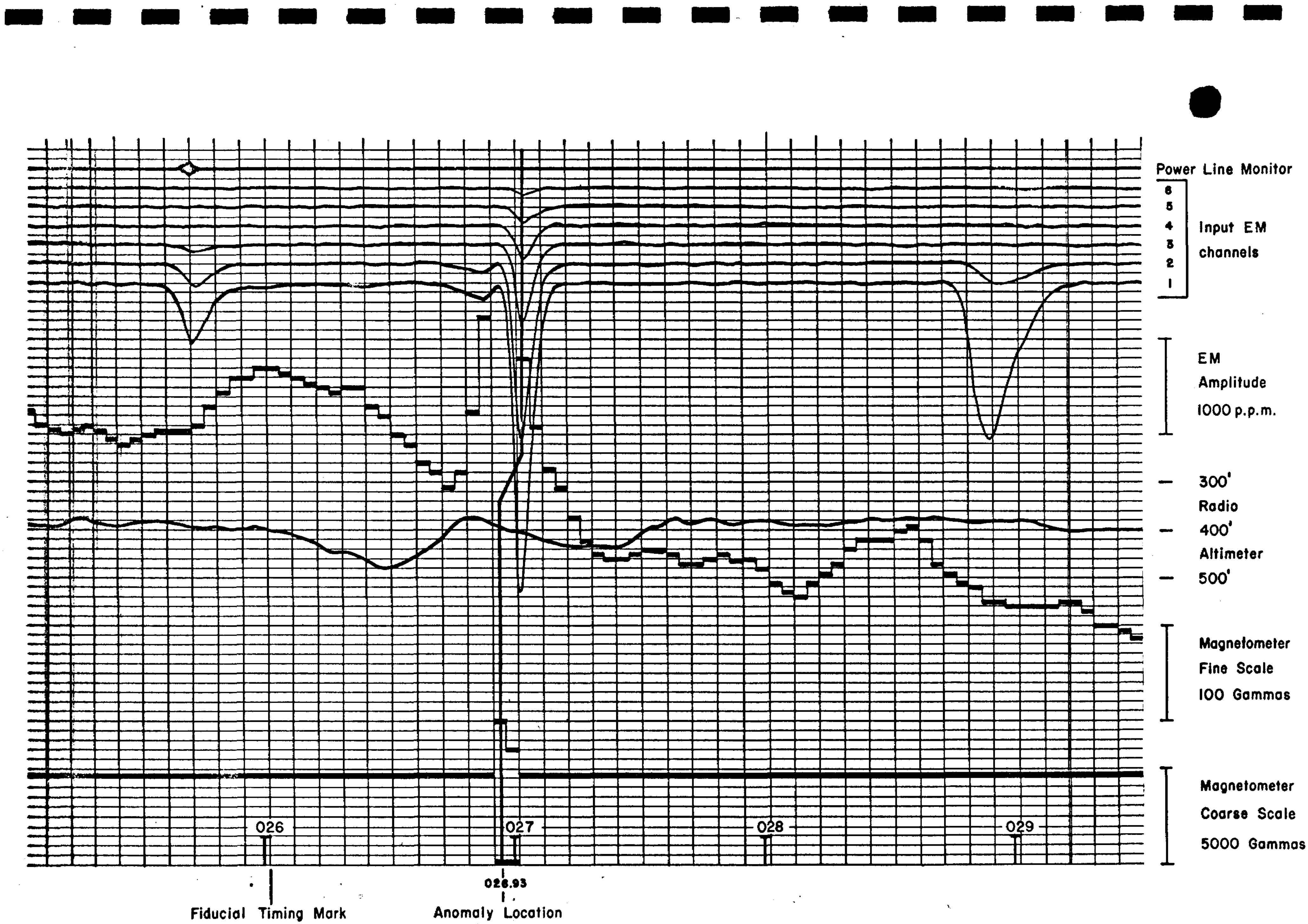
Railroad and pipeline responses are recognized by studying the film strips.

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

Questor Surveys Limited

Area BELANGER TWP.
File No. 14023
Page No. 1

Anomaly Number	Fiducial	Number of Channels	Channel 4 Amplitude	Direct Magnetic Correlation	Flanking Magnetic Peak		Remarks
					Location	Value	
36 A	298.00	3	–	600 γ			
37 A	212.74	6	.40	720 γ			
38 A	278.71	4	.10		278.65	500 γ	
39 A	194.75	3	–	860 γ			
40 A	260.36	5	.20	1425 γ			
41 A	177.01	5	.20	–			
41 B	177.12	6	.70	2280 γ			
42 A	242.34	6	.30	–			
42 B	242.40	6	.40	–			
47 D	124.02	1	–	–			
48 A	187.01	1	–	–			
49 B	106.00	1	–	–			
50 A	168.85	2	–	–			
51 B	087.70	2	–	–			

52K15NW0006 2.1179 BELANGER

900

MAR 23 1973

PROJECTS SECTION

GEOPHYSICAL – GEOLOG TECHNICAL DATA STATEMENT

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: Electromagnetic & Magnetic

Township or Area: Belanger Township

Claim holder(s): Copper Lode Mines Ltd.
3rd Floor - 55 Yonge St., Toronto

Author of Report: Robert de Carle

Address: 20 Canso Rd., Rexdale, Ont.

Covering Dates of Survey: August 10th & 11th, 1972
(linecutting to office)

Total Miles of Line cut:

SPECIAL PROVISIONS CREDITS REQUESTED

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

ENTER 20 days for each additional survey using same grid.

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

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

Magnetometer 40 Electromagnetic 40 Radiometric
(enter days per claim)

DATE: Mar. 21/73 SIGNATURE: Robert de Carle
Author of Report

MINING CLAIMS TRAVERSED
List numerically

(prefix) (number)

SEE ~~ATTACHED~~ LIST

If space insufficient, attach list

TOTAL CLAIMS 99 claims

OFFICE USE ONLY

PROJECTS SECTION

Res. Geol. Qualifications 2.467

Previous Surveys 2.753, 63.2428 Geophysicals (Ground and Air) 1968 different instruments
2.1160 Air (mag & EM) diff instruments L. D.

Checked by \ flown in 1967 date

GEOLOGICAL BRANCH

Approved by date

GEOLOGICAL BRANCH

Approved by date

GEOPHYSICAL TECHNICAL DATA

GROUND SURVEYS

Number of Stations ______________________ Number of Readings ______________

Station interval ______________________

Line spacing ______________________

Profile scale or Contour intervals ______________________
(specify for each type of survey)

MAGNETIC

Instrument ______________________

Accuracy - Scale constant ______________________

Diurnal correction method ______________________

Base station location ______________________

____

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 ______________________

Time domain ______________________ Frequency domain ______________

Frequency ______________________ Range ______________

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) Electromagnetic Magnetic

Instrument(s) Barringer / Questor Mk VI INPUT® E.M., Barringer AM-104 Mag.
(specify for each type of survey)

Accuracy INPUT® E.M. 100 ppm. Magnetometer 5 gammas
(specify for each type of survey)

Aircraft used Short Skyvan CF-QSL

Sensor altitude 150 feet

Navigation and flight path recovery method Flight mosaics and the use of 35 mm film

Aircraft altitude 400 feet Line Spacing 1000 feet 660'?

Miles flown over total area 450 miles Over claims only 90 miles

GEOCHEMICAL SURVEY – PROCEDURE RECORD

Numbers of claims from which samples taken ______________________________

Total Number of Samples ______________________

Type of Sample ______________________
(Nature of Material)

Average Sample Weight ______________________

Method of Collection ______________________

Soil Horizon Sampled ______________________

Horizon Development ______________________

Sample Depth ______________________

Terrain ______________________

Drainage Development ______________________

Estimated Range of Overburden Thickness ______________________

SAMPLE PREPARATION

(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis ______________________

General ______________________

ANALYTICAL METHODS

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

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

Others ______________________

Field Analysis (______________ tests)

Extraction Method ______________________

Analytical Method ______________________

Reagents Used ______________________

Field Laboratory Analysis

No. (______________ tests)

Extraction Method ______________________

Analytical Method ______________________

Reagents Used ______________________

Commercial Laboratory (______________ tests)

Name of Laboratory ______________________

Extraction Method ______________________

Analytical Method ______________________

Reagents Used ______________________

General ______________________

	Claim No.	Days
KRL	67456	80
	67457	80
	67458	80
	67459	80
	67460	80
	67461	80
	67462	80
	67463	80
	67464	80
	67465	80
	67466	80
	67467	80
	67468	80
	67469	80
	67470	80
	67471	80
	67472	80
	67473	80
	67474	80
	67475	80
	67476	80
	67477	80
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	67500	80
	67501	80
	67502	80
	67503	80
	67504	80
	67505	80
	67506	80
	67507	80
	67508	80
	67509	80
	67510	80

	Claim No.	Days
KRL	67511	80
	67512	80
	67513	80
	67514	80
	67515	80
	67516	80
	67517	80
	67518	80
	67519	80
	67520	80
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	67529	80
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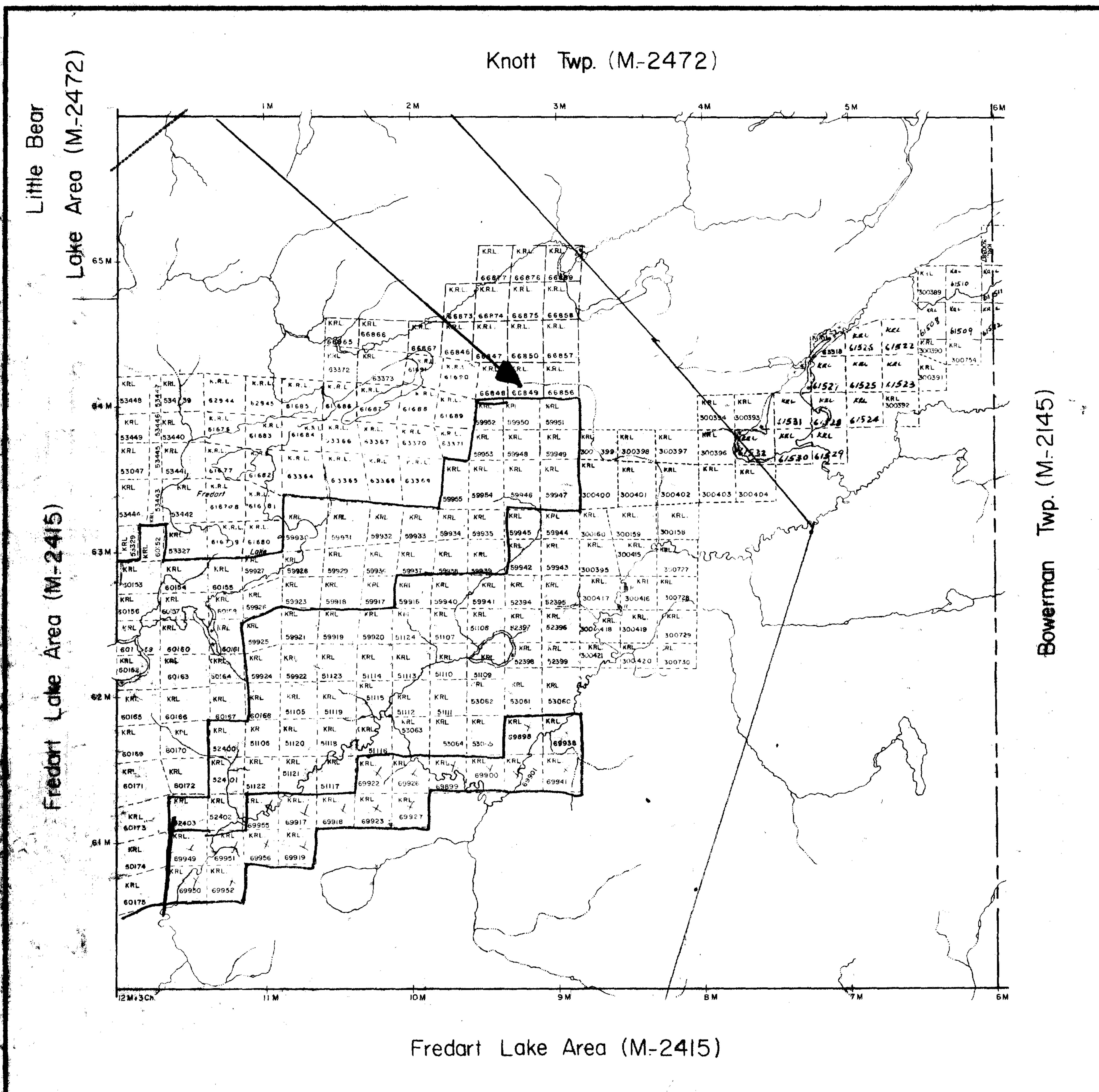
	67534	80
	67535	80
	69898	80
	69899	80
	69900	80
	69901	80
	69917	80
	69918	80
	69919	80
	69922	80
	69923	80
	69926	80
	69927	80
	69938	80
	69941	80
	69949	80
	69950	80
	69951	80
	69952	80
	69955	80
	69956	80

= 99 claims

TRIM LINE



THE TOWNSHIP
OF

BELANGER

DISTRICT OF
KENORA
(PATRICIA PORTION)

RED LAKE
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

100' R/W to Dept. of Highways & H.E.P.C. trans. line - Files: 119040 & 102046 shown thus:

400' Surface Rights Reservation around all Lakes and Rivers.

- MINING LANDS -
DATE OF ISSUE
MAR 27 1973
MINISTRY
OF NATURAL RESOURCES

PLAN NO.- M-1868

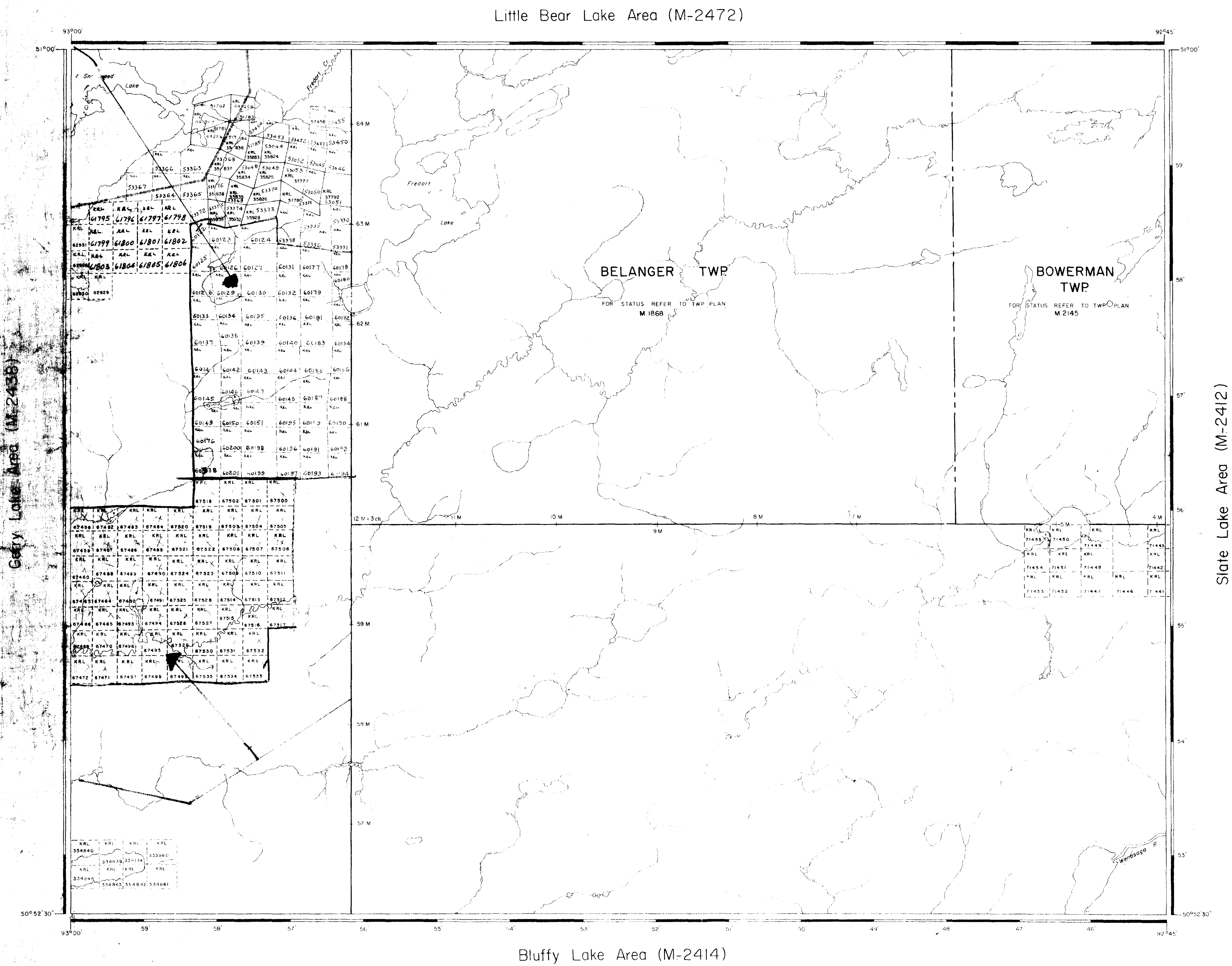
ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH

2.1179

52K15NW0006 2.1179 BELANGER

TRIM LINE

200



AREA OF

FREDART LAKE

DISTRICT OF KENORA (PATRICIA PORTION)

RED LAKE 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	

NOTES

100' R/W to Dept. of Highways & H.E.P.C. trans. line - File: 119040 shown thus:

400' Surface Rights Reservation around all Lakes and Rivers.

2.1179

NATIONAL TOPOGRAPHIC SERIES 52 K

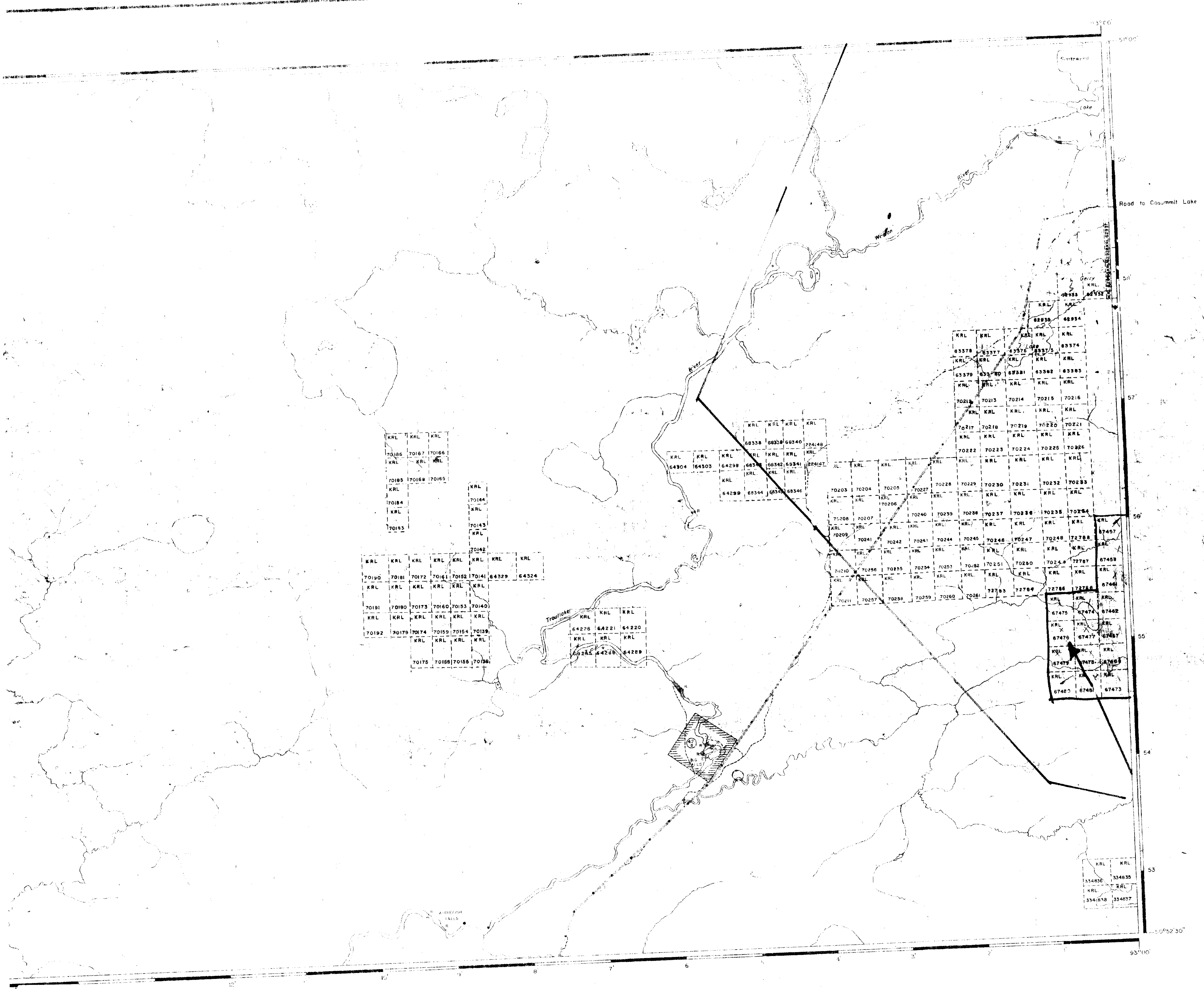
PLAN NO. M-2415

ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH

508924

TRIM LINE

210



AREA OF

GERRY LAKE

DISTRICT OF
KENORA
(PATRICIA PORTION)

RED LAKE
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	

NOTES

100' R/W to Dept. of Highways & H.E.P.C. trans. line - Files: 119040 & 102046 shown thus:

400' Reserve around all lakes & rivers to Dept. of Lands & Forests.

Areas withdrawn from staking under Section 42 of The Mining Act.

File	Date	Disposition
ⓐ 163474	25/8/70	S.R.O.

MINING LANDS
DATE OF ISSUE
APR 5 1973
MINISTRY OF NATURAL RESOURCES

NATIONAL TOPOGRAPHIC SERIES 52 K

PLAN NO. M-2438

ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH

508931

52K15NW0006 2.1179 BELANGER

220

2.1179

Legend

- 6 Channel Anomaly
- 5 Channel Anomaly
- 4 Channel Anomaly
- 3 Channel Anomaly
- 2 Channel Anomaly
- 1 Channel Anomaly
- 20 Direct Magnetic Correlation
- MP50 Flanking Magnetic Correlation
- Limits of Conductive Overburden

QUESTOR SURVEYS LIMITED

Airborne Mk V Input Survey

BELANGER TWP. AREA

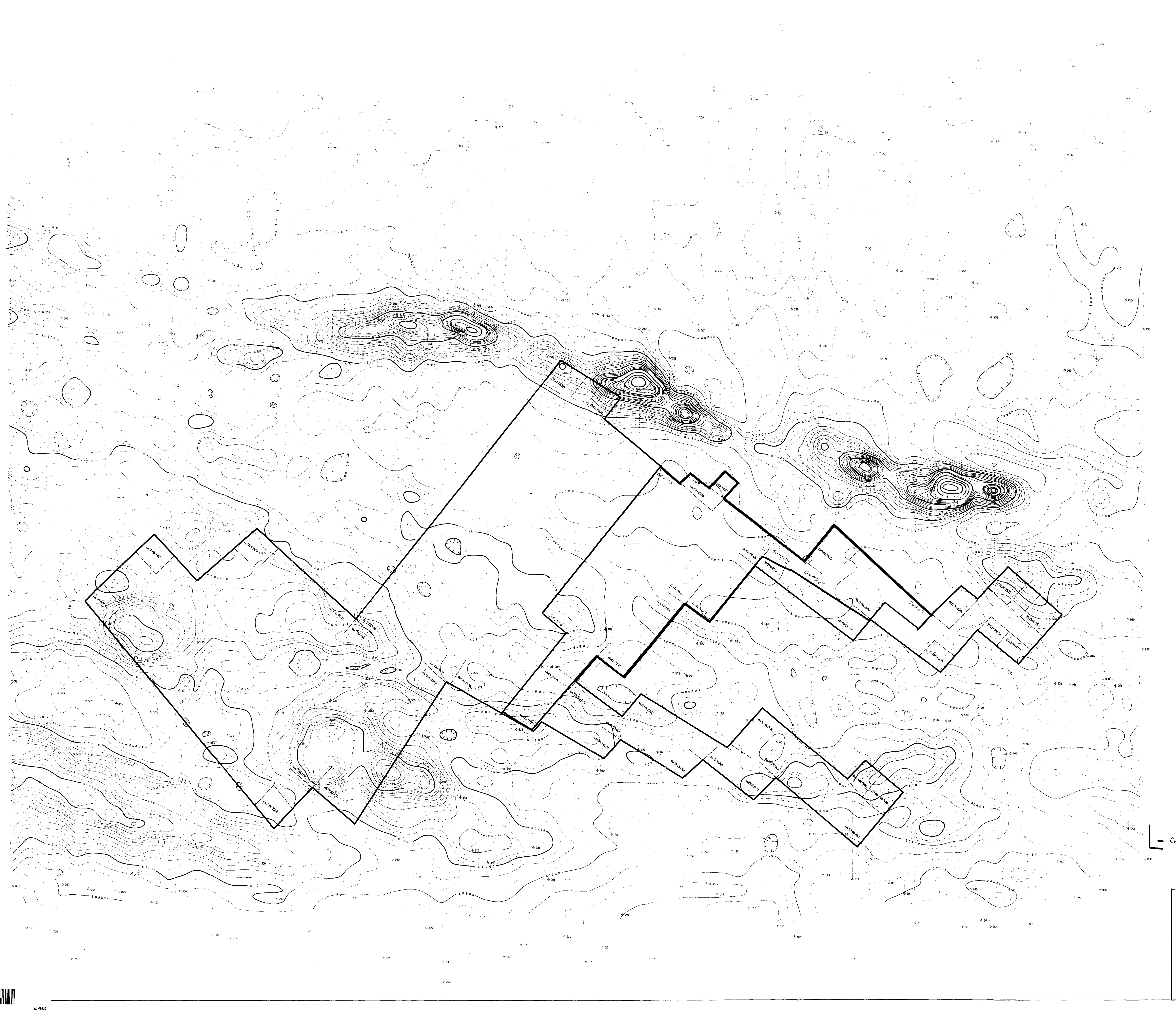
COPPER LODE MINES PROPERTY

Scale—1": 1320 feet

Drawn By	J.D.D.
Dates Flown	AUG. 10-11th '72
Flight Path Recovery	R.K.
Data Reduction	R.K.
Completed	SEPT. '72
Checked	M.S.
File No.	

52K15NW0006 2.1179 BELANGER

230



Claims covered by this submission

ISOMAGNETIC INTERVAL

(TOTAL FIELD)

25 GAMMA CONTOUR LINE
50 GAMMA CONTOUR LINE
100 GAMMA CONTOUR LINE
MAGNETIC DEPRESSION
FLIGHT ALTITUDE 400' ABOVE TERRAIN

QUESTOR SURVEYS LIMITED

Airborne Magnetometer Survey

R. de Carle

BELANGER TWP. AREA

COPPER LODE MINES PROPERTY

1320 feet

Dataplotting

August 10, 11, 1972

R.K.

Dataplotting

Contoured

Dataplotting

240