LOGISTICS REPORT ON COMBINED HELICOPTER-BORNE MAGNETIC AND VLF-EM SURVEY KUKAGAMI PROPERTY, ONTARIO

for

DERRY, MICHENER, BOOTH, & WAHL

by

AERODAT LIMITED

June, 1987

TABLE OF CONTENTS

<u>LIST OF MAPS</u>

(Scale 1:10,000)

<u>Maps</u>

0. Photomosaic base.

1. Total Field Magnetic Contours

2. VLF-EM Total Field Contours.

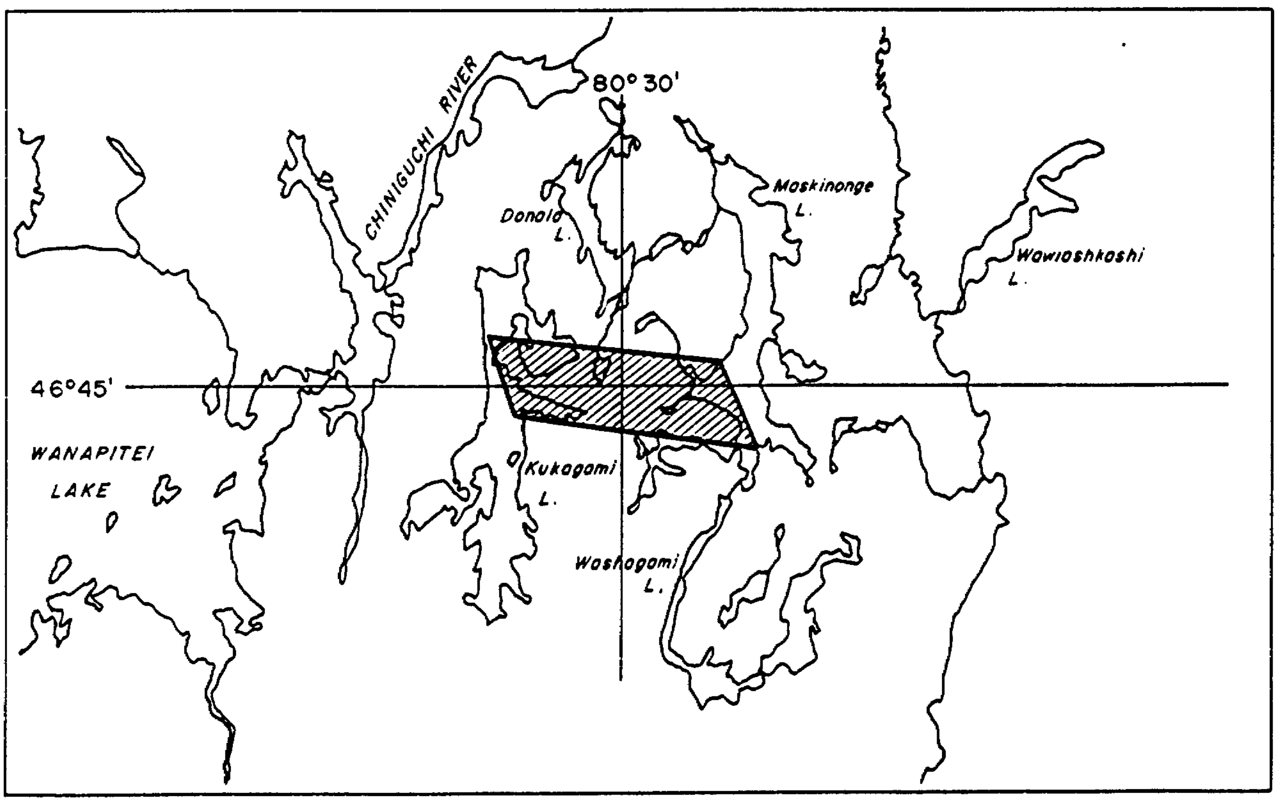
1. INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of Derry, Michener, Booth, & Wahl by Aerodat Limited. Equipment operated included a high-sense Cesium magnetometer, a VLF-EM system, a tracking camera, and a radar altimeter.

The survey area, identified as the Kukagami Property, was located about 40 kilometres northeast of Sudbury, in Kelly Township, Ontario. The survey was flown in three flights on May 7, 1987. At a nominal line spacing of 100 metres, 66 transverse lines of 2.4 to 3.0 kilometres length totalling 178 line kilometres were flown to provide thorough coverage of survey block. The quality of the recorded geophysical data was considered to be well within the specifications described in the contract.

2. SURVEY AREA LOCATION

The survey area is depicted on the index map shown below. The flight line direction was 25 degrees west of north. The area is accessible by float plane to Kukagami Lake on the west or Maskinonge on the east; and by dirt road to within 6 kilometres south of the area.



3. AIRCRAFT AND EQUIPMENT

3.1 Aircraft

The helicopter used for the survey was an Aerospatiale A-Star 350B operated by Questral Helicopters Limited, with registration JIX. Installation of the geophysical and ancillary equipment was carried out by Aerodat. The survey aircraft was flown at a mean terrain clearance of 75 metres.

3.2 Equipment

3.2.1 VLF-EM System

The VLF-EM system was a Herz Totem 2A. This instrument measured the total field and quadrature components from two transmitting stations, providing two channels of both line and orthogonal information.

The sensor was towed in a bird 10 metres below the helicopter, 65 metres above the terrain. The transmitting station used for the line channels was NAA (Cutler, Maine, 24.0 kHz). For the orthogonal direction, station NSS (Annapolis, Maryland, 21.4 kHz) was received.

3.2.2 Magnetometer

The magnetometer was a Scintrex Cesium optically pumped high sensitivity type. The sensitivity of the instrument was 0.2 gammas at a 0.2 second sampling rate. The sensor was towed in a bird 12 metres below the helicopter.

3.2.3 Magnetic Base Station

A Geometrics 803 proton precession magnetometer was operated at the base of operations to record diurnal variations of the earth's magnetic field.
The clock of the base station was synchronized with that of the airborne system to facilitate later correlation.

3.2.4 Radar Altimeter

A King Air radar altimeter was used to record terrain clearance. The output from the instrument is a linear function of altitude for maximum accuracy.

3.2.5 Tracking Camera

A Geocam tracking camera was used to record flight path on 35mm film. The camera was operated in strip mode and the fiducial numbers for cross-reference to the analog and digital data were imprinted on the margin of the film.

3.2.6 Analog Recorder

An RMS dot-matrix recorder was used to display the data during the survey. In addition to manual and time fiducials, the following data was recorded:

Channel	Input	Scale
MAGF	Magnetometer Sensor-Fine	2.5 nT/mm
ALT	Radar Altimeter	10 ft./mm
MAGN	Magnetometer Sensor-Noise	.025 nT/mm
VOQ	VLF-EM Quadrature - Ortho	2.5%/mm
VOT	VLF-EM Total Field - Ortho	2.5%/mm
VLQ	VLF-EM Quadrature - Line	2.5%/mm
VLT	VLF-EM Total Field - Line	2.5%/mm
MAGC	Magnetometer Sensor-Coarse	25.0 nT/mm

3.2.7 Digital Recorder

An RMS DGR 33 digital acquisition system recorded the survey on magnetic tape. Information recorded was as follows:

Equipment	Interval
VLF-EM	0.2 seconds
Magnetometer	0.2 seconds
Altimeter	0.2 seconds

Positional information was also recorded at 0.2 second intervals on a DAC/NAV I.

3.2.8 Radar Positioning System

A Motorola Mini-Ranger (MRS III) radar navigation system was used for both navigation and flight path recovery. Transponders sited at fixed locations were interrogated several times per second and the ranges from these points to the helicopter measured to a high degree of accuracy. A navigational computer triangulates the position of the helicopter and provides the pilot with navigation information. The range/range data was recorded on magnetic tape for subsequent flight path determination.

4. DATA PRESENTATION

4.1 Base Map and Flight Path

A photomosaic base at a scale of 1:10,000 was prepared by enlargement of aerial photographs of the survey area. This base was used for both the navigation and flight path recovery in conjunction with the 35 mm tracking film.

4.2 Total Field Magnetic Contours

The aeromagnetic data was corrected for diurnal variations by subtraction of the digitally recorded base station magnetic profile. No correction for regional variation was applied.

The corrected profile data were interpolated onto a regular grid at a 20m true scale interval using a cubic spline technique. The grid provided the basis for threading the presented contours at a 2 gamma interval.

The aeromagnetic data have been presented with flight path on a greyflex copy of the photo base map.

4.3 VLF-EM Total Field Contours

The line VLF-EM total field signals from Naa (Cutler, Maine) were also gridded at a 20 metre interval and and presented on a greyflex copy of the photo base map along with the flight lines.

5. GENERAL INTERPRETIVE CONSIDERATIONS

Total Field Magnetics

The total field magnetic map shows contours of the total field using a high sensitivity magnetometer, at a fine contour interval of five gammas.

The magnetic map is characterized by numerous magnetic features and should be carefully correlated with existing geologic maps of the area. Such correlations should prove extremely useful for updating the known geology of the area.

VLF Electromagnetics

The VLF-EM method employs the radiation from powerful military radio transmitters as the primary signals. The magnetic field associated with the primary field is elliptically polarized in the vicinity of electrical conductors. The Herz Totem uses three coils in the X, Y, Z configuration to measure the total field and vertical quadrature component of the polarization ellipse.

The relatively high frequency of VLF (15-25 kHz) provides high response factors for bodies of low conductance. Relatively "disconnected" sulphide ores have been found to produce measureable VLF signals. For the same reason, poor conductors such as sheared contacts, breccia zones, narrow faults, alteration zones and porous flow tops normally produce VLF anomalies. The method can therefore be used effectively for geological mapping. The only relative disadvantage of the method lies in its sensitivity to conductive overburden. In conductive ground the depth of exploration is severely limited.

The effect of strike direction is important in the sense of the relation of the conductor axis relative to the energizing electromagnetic field. A conductor aligned along a radius drawn from a transmitting station will be in a maximum coupled orientation and thereby produce a stronger response than a similar conductor at a different strike angle. Theoretically, it would be possible for a conductor, oriented tangentially to the transmitter to produce no signal. The most obvious effect of the strike angle consideration is that conductors favourably oriented with respect to the transmitter location and also near perpendicular to the flight direction are most clearly rendered and usually dominate the map presentation.

The total field response is an indicator of the existence and position of a conductivity anomaly. The response will be a maximum over the conductor, without any special filtering, and strongly favour the upper edge of the conductor even in the case of a relatively shallow dip.

The vertical quadrature component over steeply dipping sheet-like conductors will be a cross-over type response with the cross-over closely associated with the upper edge of the conductor.

The response is a cross-over type due to the fact that it is the vertical rather than total field quadrature component that is measured. The response shape is due largely to geometrical rather than conductivity considerations and the distance between the maximum and minimum on either side of the cross-over is related to target depth. For a given target geometry, the larger this distance the greater the depth.

The amplitude of the quadrature response, as opposed to shape is function of target conductance and depth as well as the conductivity of the overburden and host rock. As the primary field travels down to the conductor through conductive material it is both attenuated and phase shifted in a negative sense. The secondary field produced by this altered field at the target also has an associated phase shift. This phase shift is positive and is larger for relatively poor conductors. This secondary field is attenuated and phase shifted in a negative sense during return travel to the surface. The net effect of these 3 phase shifts determine the phase of the secondary field sensed at the receiver.

A relatively poor conductor in resistive ground will yield a net positive phase shift. A relatively good conductor in more conductive ground will yield a net negative phase shift. A combination is possible whereby the net phase shift is zero and the response is purely in-phase with no quadrature component.

A net positive phase shift combined with the geometrical cross-over shape will lead to a positive quadrature response on the side of approach and a negative on the side of departure. A net negative phase shift would produce the reverse. A further sign reversal occurs with a 180 degree change in instrument orientation as occurs on reciprocal line headings. During digital processing of the quadrature data for map presentation this is corrected for by normalizing the sign to one of the flight line headings.

Respectfully submitted,

AERODAT LIMITED

June, 1987

Richard D.C. Yee

P.Eng., Geophysicist

#87-38 KELLY

Ministry of Natural Resources
Ontario

Report of Work
(Geophysical, Geological, Geochemical and Expenditures)

LG.

41I15SE0039 2.10192 KELLY

900

Type of Survey(s)	Township or Area
Airborne Helicopter Magnetic and Electromagnetic	KELLY

Claim Holder(s)	Prospector's Licence No.
Nickeldale Resources Inc.	T4724

Address: Suite 500, 67 Richmond St. W. TORONTO M5H 1Z5

Survey Company	Date of Survey (from & to)	Total Miles of line Cut
Derry Michener Booth and Wahl (Aerodat)	04 05 87 (Day Mo. Yr.) – 07 05 87 (Day Mo. Yr.)	NA

Name and Address of Author (of Geo-Technical report): R.W. Woolham, Suite 410, 20 Richmond St E. TORONTO M5C 2R9

Credits Requested per Each Claim in Columns at right

Special Provisions		Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	Geophysical	
	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Man Days		Days per Claim
Complete reverse side and enter total(s) here	Geophysical	
	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	40
	Magnetometer	40
	Radiometric	

Mining Claims Traversed (List in numerical sequence)

Prefix	Number	Expend. Days Cr.	Prefix	Number	Expend. Days Cr.
S	See attached List		S		

RECEIVED
MAY 19 1987
MINING LANDS SECTION

Total number of mining claims covered by this report of work: 79

Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

Instructions
Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

Date	Recorded Holder or Agent (Signature)
May 12/87	R W Woolham

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
5,060	1987 05 13	[signature]
	Date Approved as Recorded: 1987.08.28	Branch Director: [signature]

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying: R.W. WOOLHAM, Suite 410, 20 Richmond St. E. TORONTO ONT. M5C 2R9

Date Certified	Certified by (Signature)
May 12/87	R W Woolham

KELLY TOWNSHIP CLAIMS

39

S 8[illegible] 800		
S 872901	S 872929	S872957
902	930	958 *
903	931	959
904	932	960
905	933	961
906	934	962
907	935	963
908	936	964
909	937	965
910	938	966
911	939	967
912	940	968
913	941	969
914	942	970
915	943	971
916	944	972
917	945	973
918	946	974
919	947	975
920	S 872 948	976
921		977
922	S 872 950	978
923	951	S 872 979
924	952 *	TOTAL = 23
925	953 *	
926	954 *	
927	955	
S 872 928	S872956	
TOTAL = 29	TOTAL = 27	TOTALS = 79

File ____________

Ministry of Natural Resources

Ontario

GEOPHYSICAL – GEOLOGICAL – GEOCHEMICAL 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(s) Airborne Helicopter Electromagnetic and Magnetic

Township or Area Kelly

Claim Holder(s) Nickeldale Resources Inc.

Survey Company Aerodat Ltd. / Derry Michener Booth Wahl

Author of Report R.D.C. Yee P.Eng.

Address of Author TORONTO

Covering Dates of Survey May 7/87 (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: July 3/87 SIGNATURE: R H Wolk
Author of Report or Agent

* See Mining Recorders allocations attached.

Res. Geol. ____________ Qualifications ____________

Previous Surveys

File No.	Type	Date	Claim Holder

OFFICE USE ONLY

MINING CLAIMS TRAVERSED
List numerically

See attached list
(prefix) (number)

If space insufficient, attach list

TOTAL CLAIMS ____________

837 (5/79)

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

SEE SPECIFICATIONS IN REPORT.

Type of survey(s) ____

Instrument(s) ____

(specify for each type of survey)

Accuracy ____

(specify for each type of survey)

Aircraft used ____

Sensor altitude ____

Navigation and flight path recovery method ____

____

Aircraft altitude ____ Line Spacing ____

Miles flown over total area ____ Over claims only ____

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 ______________________

KELLY TOWNSHIP CLAIMS

S 839 800		
S 872 901	S 872929	S872957
902	930	958
903	931	959
904	932	960
905	933	961
906	934	962
907	935	963
908	936	964
909	937	965
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911	939	967
912	940	968
913	941	969
914	942	970
915	943	971
916	944	972
917	945	973
918	946	974
919	947	975
920	S 872 948	976
921		977
922	S 872 950	978
923	951	S 872 979
924	952	TOTAL = 23
925	953	
926	954	
927	955	
S 872 928	S 872956	
TOTAL = 29	TOTAL = 27	TOTALS = 79

MAP SYMBOLOGY

Aerial Cableway, Boundary, Bridge, Building, Chimney, Cliff, Pit, Pile, Contours, Control Points, Culvert, Falls, Fence, Hedge, Wall, Feature Outline, Flooded Land, Lock, Marsh or Swamp, Mast, Mine Head Frame, Outcrop, Pipeline, Railroad, Road, Rapids, Reservoir, River, Stream, Canal, Rock, Shoal, Spot Elevation, Tower, Transmission Line, Tunnel, Utility Poles, Wharf, Dock, Pier, Wooded Area

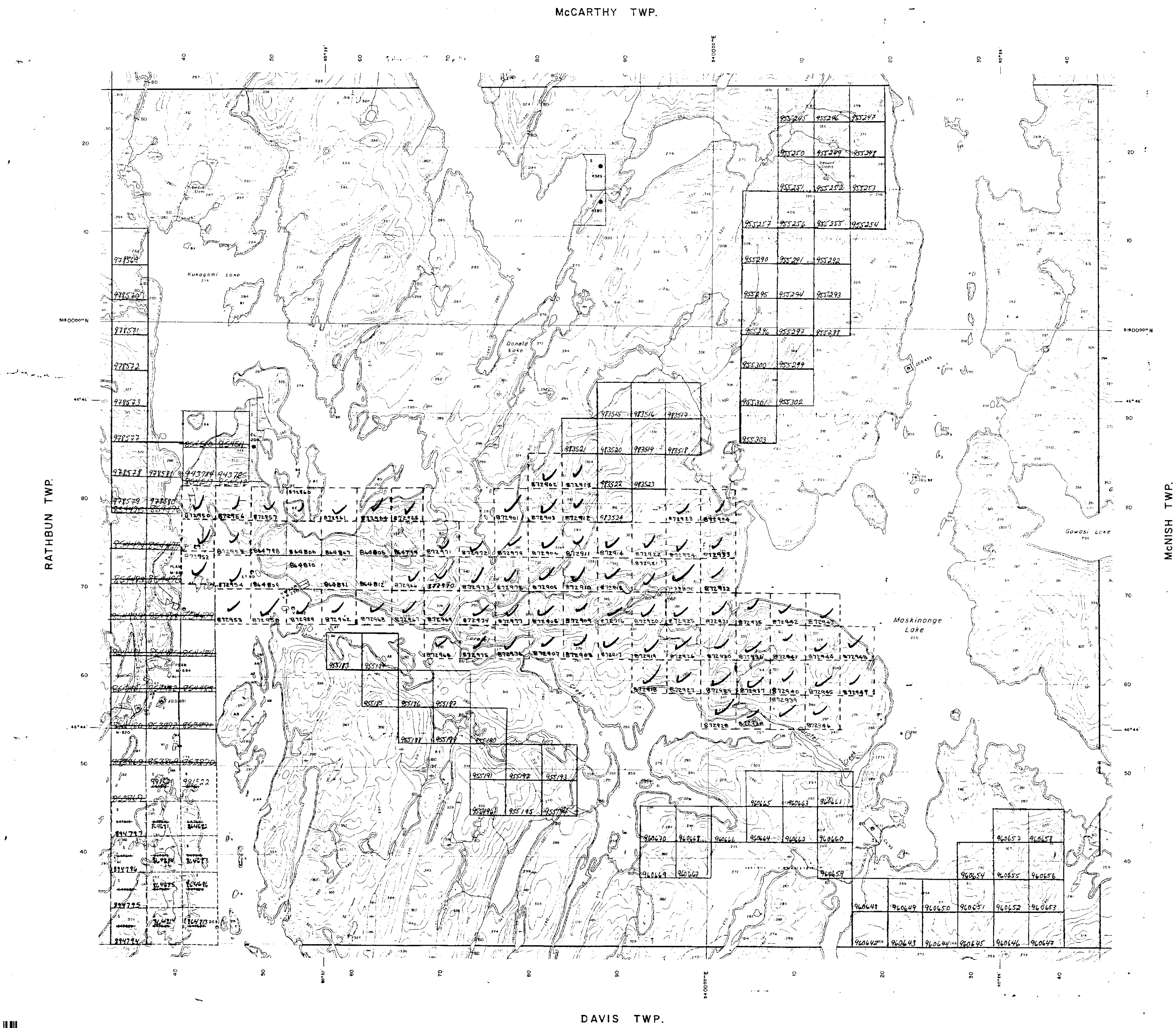
AREAS WITHDRAWN FROM DISPOSITION

M.R.O. – MINING RIGHTS ONLY
S.R.O. – SURFACE RIGHTS ONLY
M.+S. – MINING AND SURFACE RIGHTS

Description	Order No.	Date	Disposition	File

NOTES

SUBDIVISION OF KELLY TWP. INTO LOTS AND CONCESSIONS WAS ANNULLED 18 SEPT., 1953.



LEGEND

HIGHWAY AND ROUTE No.
OTHER ROADS
TRAILS
SURVEYED LINES:
TOWNSHIPS, BASE LINES, ETC.
LOTS, MINING CLAIMS, PARCELS, ETC.
UNSURVEYED LINES:
LOT LINES
PARCEL BOUNDARY
MINING CLAIMS ETC.
RAILWAY AND RIGHT OF WAY
UTILITY LINES
NON-PERENNIAL STREAM
FLOODING OR FLOODING RIGHTS
SUBDIVISION OR COMPOSITE PLAN
RESERVATIONS
ORIGINAL SHORELINE
MARSH OR MUSKEG
MINES
TRAVERSE MONUMENT

DISPOSITION OF CROWN LAND

TYPE OF DOCUMENT — SYM

PATENT, SURFACE & MINING RIGHTS
" , SURFACE RIGHTS ONLY
" , MINING RIGHTS ONLY
LEASE, SURFACE & MINING RIGHTS
" , SURFACE RIGHTS ONLY
" , MINING RIGHTS ONLY
LICENCE OF OCCUPATION
ORDER-IN-COUNCIL
RESERVATION
CANCELLED
SAND & GRAVEL

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO M 1913, VESTED IN ORIGINAL PATENTEE BY THE PU LANDS ACT, R.S.O. 1970, CHAP. 380, SEC. 63, SUBS

SCALE 1:20 000

GRID ZONE 17

TOWNSHIP

KELLY

M.N.R. ADMINISTRATIVE DISTRICT

SUDBURY

MINING DIVISION

SUDBURY

LAND TITLES / REGISTRY DIVISION

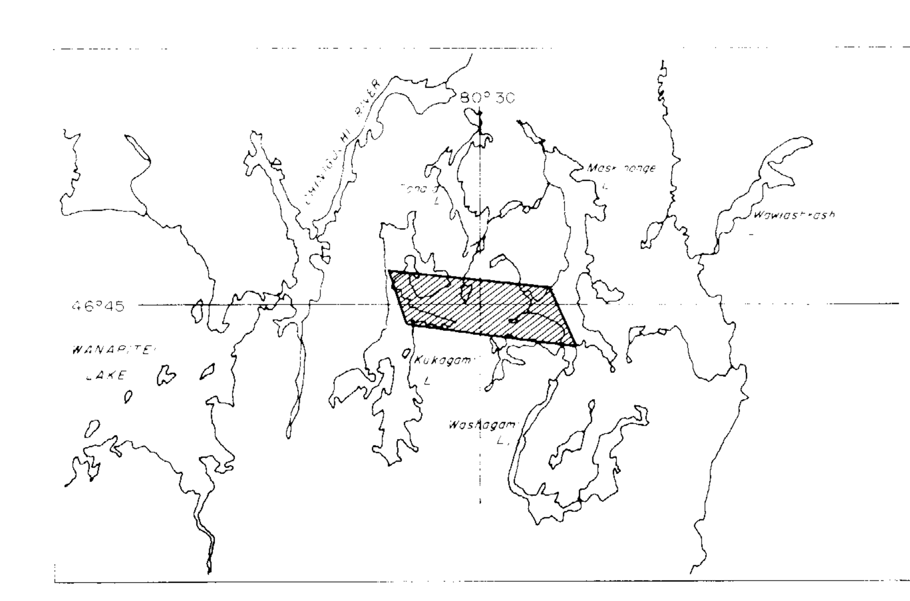
SUDBURY

Ministry of Natural Resources — Land Management Branch
Ontario

Date NOVEMBER, 1984 — Number G-303

41I15SE0039 2.10192 KELLY

200



NICKELDALE RESOURCES INC.

DERRY, MICHENER, BOOTH and WAHL

BASE MAP

2/10/92

KUKAGAMI PROPERTY

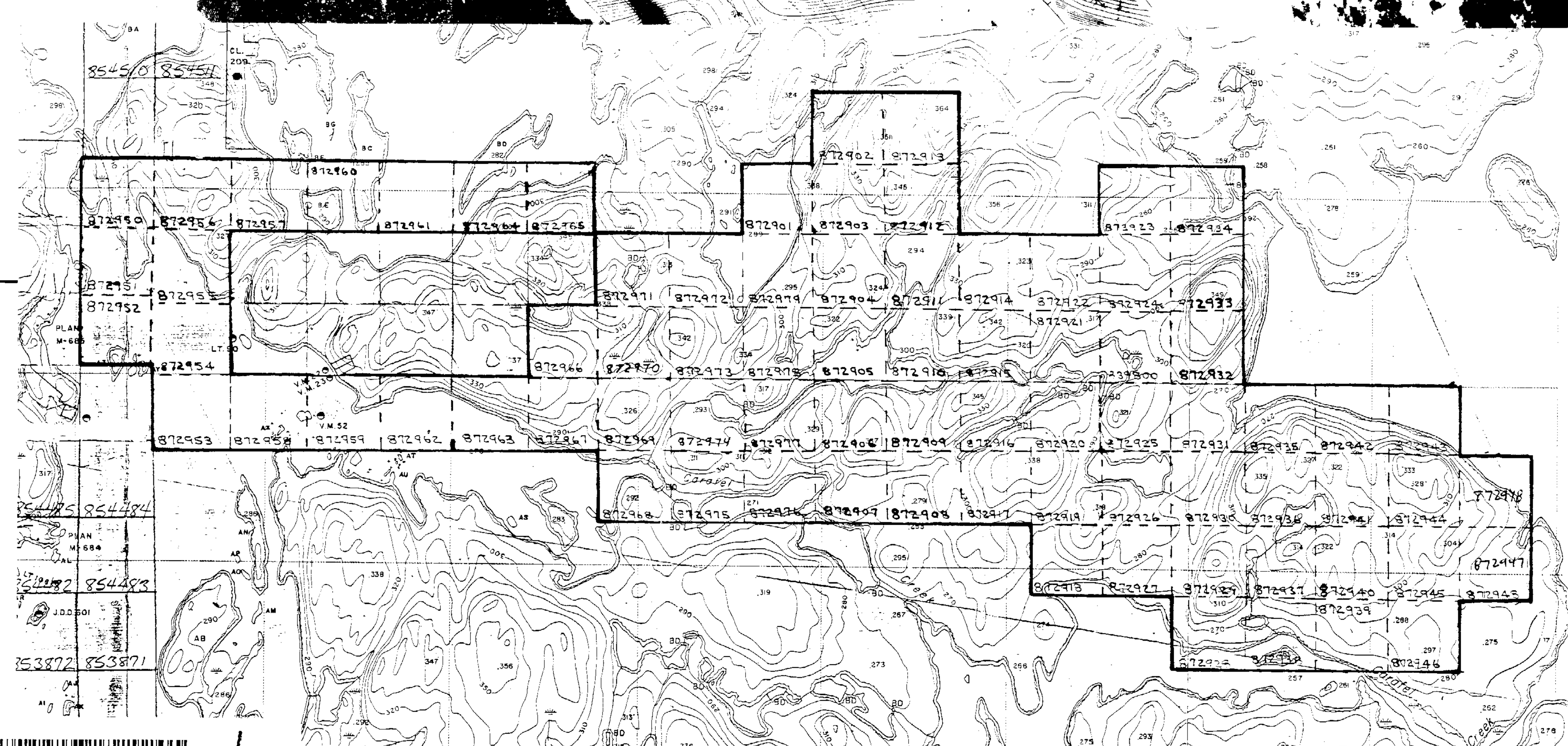
ONTARIO

DATE	May 1987
N.T.S. No.	41-I
MAP No.	

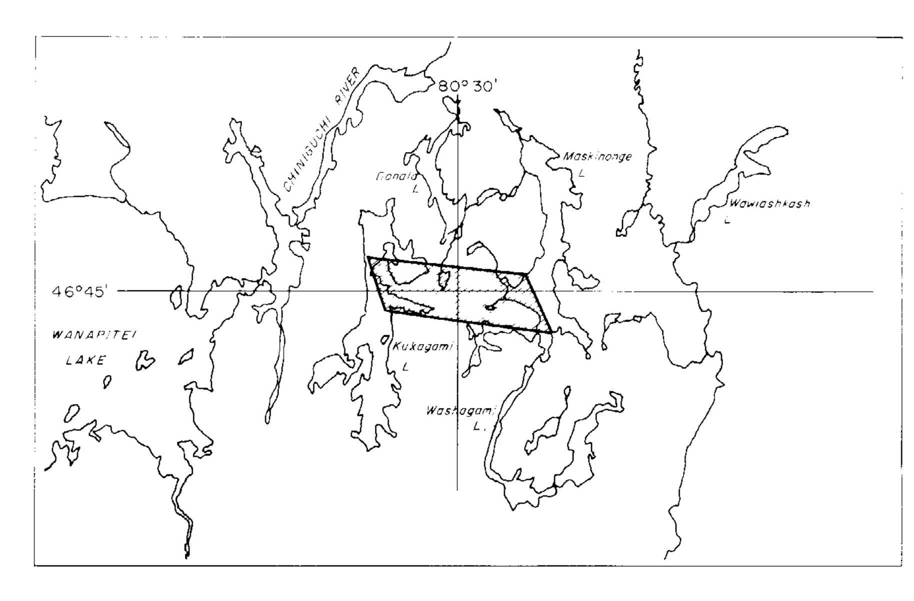
▼ AERODAT LIMITED

J8726

210



TOTAL FIELD MAGNETIC CONTOURS



NICKELDALE RESOURCES INC.

DERRY, MICHENER, BOOTH and WAHL

TOTAL FIELD MAGNETIC CONTOURS
SHOWING CLAIMS

2/8/92

KUKAGAMI PROPERTY
ONTARIO

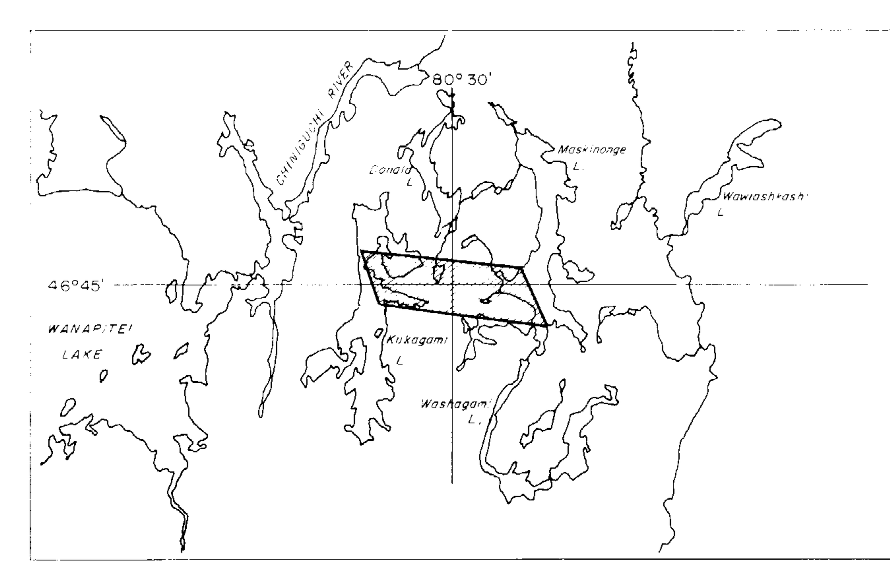
SCALE 1/10,000

DATE:	May 1987
N.T.S. No:	41-I
MAP No:	1

AERODAT LIMITED

J8726

220



NICKELDALE RESOURCES INC.

DERRY, MICHENER, BOOTH and WAHL

VLF-EM TOTAL FIELD CONTOURS

2.15192

KUKAGAMI PROPERTY

ONTARIO

SCALE 1/10,000

DATE:	May 1987
N.T.S. No:	41-I
MAP No:	2

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230