Aeromagnetic Survey in the Nova [illegible]

I. INTRODUCTION

An airborne magnetic survey was conducted for Amax Exploration, Inc., by Geoterrex Limited of Ottawa, Ontario in March, 1971. The major part of the survey covered the western half of Nova Township; small segments in Belford, Oates and Oswald Townships were also included (See Figure 1). The purpose of the aeromagnetic survey was to map the distribution of magnetic minerals in various bedrock units in support of geologic mapping activities and analysis of electromagnetic conductors.

A total of 463.1 line miles were flown in the Nova Area covering approximately 58 square miles. Lines were flown approximately north 50° west with a spacing of 1/8th mile at a mean altitude of 175 feet. The claims covered in the course of the survey, for which assessment credit is requested, are listed in Appendix A. Coverage over these claims was 53.5 line miles.

II. PERSONNEL

The following personnel were involved in this survey:

A. Field Operation:

Pilot	Mr. J. Whiteduck, Maniwacki, Ontario
Navigator	Mr. R. Bolivar, Ottawa, Ontario
Operators	Mr. R. Stone, Ottawa, Ontario Mr. R. Youngberg, Ottawa, Ontario
Data Compilers	Mr. G. McKnight, Ottawa, Ontario Mr. W. Couwenberghs, Ottawa, Ontario Mr. P. Stone, Ottawa, Ontario.
Geophysicist	Mr. B. Anderson, Ottawa, Ontario
Aircraft Engineer	Mr. W. McFadden, New Brunswick

B. Office Compilation:

Data	Mr. D. Sarazin, Ottawa, Ontario
Drafting	Mr. M. Dostaler, Ottawa, Ontario
Geophysics	Mrs. R. Dowse, Ottawa, Ontario Mr. D. M. Wagg, Manotick, Ontario

C. Field Supervision:

Geophysicist	Mr. J. Roth, Amax Exploration, Inc., 7 King Street East, Toronto, Ontario.

III. EQUIPMENT

The survey was conducted with an Otter Aircraft CF-AYR, owned and operated by Geoterrex and equipped with a Geometrics G-803 high performance proton resonance magnetometer, as well as an in-phase out-of-phase electromagnetic system operation at 320 Hz, and other auxiliary survey equipment. A detailed description of this system and the procedures employed is included in Appendix B to this report.

IV. DATA PRESENTATION

The value of the total intensity of the earth's magnetic field was recorded at 1 second intervals at a mean terrain clearance of 175 feet. The aeromagnetic values are presented in plan form at a scale of 1" = 1320', on a photomosaic base (Figures 2 and 3). Contour intervals are 20 gammas except in areas of steep gradients where only 100 gamma divisions are shown. The values shown are relative to a nominal regional value of 60,000 gammas. The boundaries and numbers of the claims for which assessment credit is requested are also shown in Figures 2 and 3.

V. GEOLOGY

The most recent geological work in this area is contained in the Geologic Report No. 78 of the Ontario Dept. of Mines by G. Bennett, 1969.

It will be noted that within the area covered by the survey there are relatively few outcrops. In the central portion the outcrops are largely felsic volcanics, rather highly metamorphosed. This unit is bordered on the west by granitoid rocks of very high metamorphic level (Kapuskasing High structure), with extensive faulting indicated between these two units. To the east more intermediate to mafic volcanics occur with several granitic intrusive domes outlined.

VI. DISCUSSION OF AEROMAGNETIC RESULTS

The aeromagnetic results presented in Figures 2 and 3 reflect an extremely complex geologic history of the area. At the very northern boundary the highly magnetic unit with susceptibility in excess of 10,000 cgs X 10^{-6} is undoubtedly a serpentinized ultramafic. The major faults that divide the Kapuskasing high-level metamorphic rocks to the west from the belt of the metavolcanics are clearly seen trending approximately NNE along the eastern boundary. East of these faults two magnetic units, one in the north and one in the south stand out as particularly distant. Both are characterized by a number of narrow magnetic highs faulted and folded in an extremely complex manner. In fact, two periods of deformation are suggested here, the latest probably associated with the Kapuskasing High structure.

Portions of some of these magnetic features are known to contain essentially barren massive sulphides, predominately pyrrhotite. Consequently, it is suggested that these two areas are comprised of felsic to intermediate volcanics with iron formation grading from sulphide to oxide facies. A number of local faults of small displacement, subsidiary to the main NNE fault direction, are readily interpreted. Magnetic highs sympathetic to this trend may well represent diabase dikes emplaced at the time of major faulting.

VII. CONCLUSIONS

In general, the aeromagnetic data support the interpreted geology of the ODM. However, considerably greater complexity is indicated by the aeromagnetics than could be inferred from the relatively few outcrops observable. The presence of known massive sulphides, albeit relatively barren, in a felsic volcanic environment suggests that the area may have some economic potential.

Respectfully submitted,

Jeremy Roth

Jeremy Roth

4) Office Reduction:

On completion of the survey, base maps are drawn using the photo laydown as a base. Flight lines and fiducial numbers are shown on this base map.

In the case of EM or radiometric results the anomalies are then plotted on the base map as boxes with symbols representing anomaly grade or amplitude (as noted on the legend accompanying each map). Anomaly "systems" are then outlined as conductive zones at which stage geological comparison and interpretation may be made.

In the case of magnetic results, the values noted on the Moseley chart are transcribed to a work sheet (overlay of the base map) after levelling or correcting for heading error, diurnal, etc. The values are then contoured on the work sheet and then drafted on a copy of the base map.

Since base maps use the photo laydown as a base, all geophysical results portrayed may be compared as overlays, and all features of interest may be identified on the appropriate photo for subsequent ground location.

Following is a description of equipment and procedures used during this airborne geophysical survey.

A. EQUIPMENT

1) Aircraft:

The aircraft is a deHavilland Otter DHC-3 with Canadian registration CF-AYR. This aircraft is a single engine, slow speed, high performance type with a gross weight of 8,000 lbs. The aircraft may be equipped with wheels, skis, or floats, as required. Normal survey speed is 100 miles per hour.

2) Electromagnetometer:

The electromagnetic unit is a Rio Tinto type, measuring In-Phase and Out-of-Phase components of the secondary field at a frequency of 320 cycles per second. The unit was designed and built by Geoterrex, and carries Serial #1.

A transmitter generates a closely controlled sine wave of 320 cps which is amplified and fed to a transmitting coil mounted on the starboard wing-tip. This coil is iron cored and has vertical windings, with coil axis in the direction of flight. The circulating coil power is some 5000 volt amperes.

A receiving coil is mounted on the port wing, co-planar with, and 62 feet from, the transmitting coil. The voltage developed in the receiver coil due to the transmitted field is some 300 millivolts. In the absence of external conductors, this voltage is cancelled by a reference voltage derived directly from the transmitter voltage.

When the aircraft comes within range of a conductor, the normal (or primary) field is changed by a secondary field and the resultant voltage at the receiver coil is amplified and passed on to the EM receiver in the aircraft. This signal is filtered and split into one component in-phase and one component out-of-phase with reference to the transmitter voltage. The signals are then passed through phase-sensitive detectors where their amplitudes may be read on meters, or recorded on a chart. A system of calibration is included so that amplitude of responses (anomalies) may be determined in "parts per million" of the primary receiver coil voltage prior to cancellation. Noise level of the system due to movement of the metal aircraft within the EM field is normally 50 parts per million or less. Significant conductors depending on distance and size, will produce anomalies of more than 50 parts per million.

The system is also equipped with a receiver noise channel operation at a frequency of 268 cps. This channel is not susceptible to the electromagnetic response, and is affected only by radiated noise such as power and telephone lines, and atmospheric discharges. It is frequently useful in determining the validity of electromagnetic anomalies.

An accelerometer is also installed and the output recorded on the 8-channel recorder. This indicates flexure on the aircraft and enables discarding of false anomalies which could result from the aircraft motion.

Calibration marks are displayed on the eight-channel chart, and are approximately 15 millimeters for 200 parts per million.

Any anomalies noted are listed in Appendix A of this report, indicating position, (fiducial number on the path recovery camera), amplitudes, aircraft altitude, magnetic relationship if any, relative anomaly rating, and comments which may be of significance.

The anomalies are then plotted on the base map in coded form, according to the legend accompanying this Appendix. Anomaly groups which reflect probable ground conductors are circled and numbered. These are described and discussed in the report in the context of geophysical and where possible, geological significance.

3) Magnetometer:

The magnetometer used is a Geometrics Model G-803 Proton Resonance type incorporating a High Performance option. Recording times are variable, from three times per second to once per 2 seconds, with respective sensitivities of 2 gammas to 0.5 gamma. In normal use readings are obtained once per second with a sensitivity of 1 gamma.

The sensing head is a torvidal coil immersed in a special hydrocarbon fluid and mounted beneath the port wing.

The magnetometer is a digital readout unit and output is used to drive a paper recorder (Hewlett Packard Model 5050-B). In addition analogue outputs are fed to the 8-channel recorder for direct comparison with the electro-magnetic results, and to a Hewlett-Packard Model 680 - six inch rectalinear strip recorder.

Full scale deflection usually used in mineral surveys is 1000 gammas although other sensitivities are available. Automatic stepping of the full scale analogue deflection is incorporated. Recordings made on the paper tape are the values of the total field intensity.

Contouring of results is accomplished as desired.

4) Spectrometer:

An Exploranium DGRS-1000 spectrometer is normally carried on the Otter, along with a sensing head containing three 6" x 4" Sodium Iodide crystals.

This is a four channel differential gamma-ray unit measuring energy levels of potassium 40, bismuth 214 thallium 208 plus total count.

Time constants and full scale ranges are variable and are selected to suit the conditions and background of the survey area.

Depending on requirements of the survey, one or more channels may be recorded on the eight channel recorder.

Data presentation, if required, is usually in the form of plotted anomalies showing channel intensities and aircraft altitude. Contour maps of one or more channels may be produced in special circumstances.

5) Altimeter:

The altimeter is a GAR Model 10 wide band radar type.

One unit is carried on each wing. The output from the altimeter recorded on the eight channel recorder. The recording is linear and normally covers from 50 feet to 300 feet, or 25 feet per major division.

6) Camera:

The camera used for path recovery is a Hulcher continuous strip 35 millimeter type. It can accommodate 400 ft. lengths of film, good for some 250 line miles of survey. It is fitted with a special wide angle lens for low level work.

Fiducial numbers and markers are impressed on the film and controlled by the intervalometer.

7) Intervalometer:

This is a Geoterrex Model X-1 solid state unit which derives triggering from the magnetometer. Basic fiducial pulses are provided once for each two magnetometer readings, so that in usual operation one fiducial is recorded every two seconds. A long pulse is produced once for every ten normal fiducials.

These fiducial marks are impressed on the path recovery film, the eight channel recorder, the Hewlett Packard Model 680 recorder and the digital printer in order to identify and locate geophysical records with ground positions.

8) Eight Channel Recorder:

This recorder is a Gulton Industries Model TR-888. Records are made on heat sensitive paper of 16 inch width. Each channel has a width of 1.6 inches. Individual signal processors are included for each channel, selected according to requirements for each channel to be recorded.

Normal chart speed is 5.0 inches per minute giving a horizontal scale of approximately 1000 feet per inch.

A typical chart record is included with this appendix.

B. PROCEDURES

1) Photo Laydowns:

Prior to undertaking of the survey, air photos of the area are obtained from which a photo laydown is produced, to an appropriate scale, usually 1" = 1320 feet. Proposed lines are drawn on the laydown, in the appropriate direction and line spacing. These "flight-strips" are then used by the air crew for navigating the airplane visually along the proposed lines. This photo laydown is also used to produce the subsequent base maps.

2) Aircraft Operation:

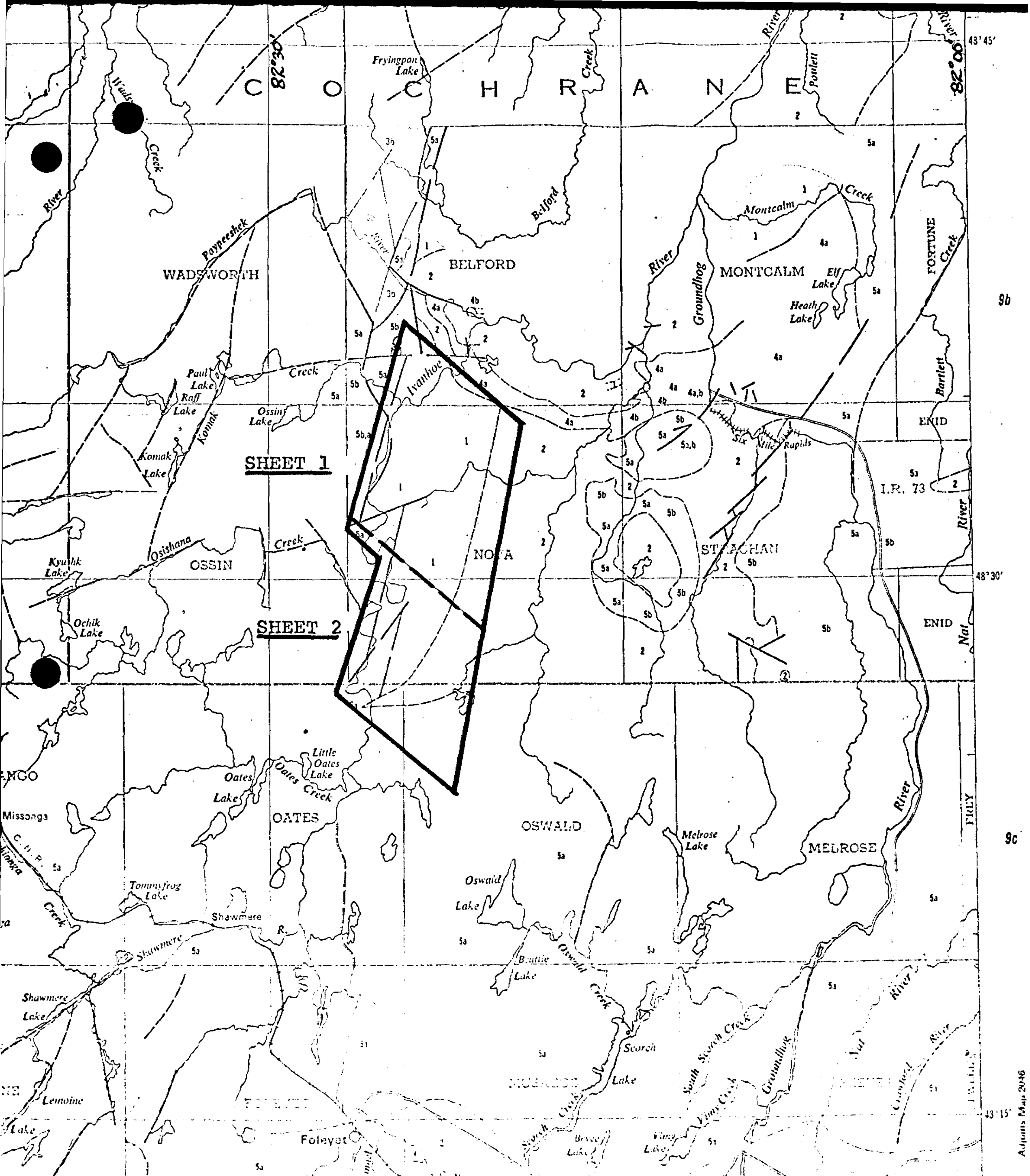
The air crew consists of pilot, co-pilot (or navigator) and equipment operator. The aircraft is flown along the proposed lines at an altitude of some 200 feet, using the flight strips for navigation. Altitudes in excess of 300 feet are generally considered too high for effective penetration.

The operator records lines, direction of flight and starting and finishing fiducial numbers on a flight log. Equipment is normally left on during the whole of the survey flight, while the intervalometer is turned on only for the actual survey line. Thus, the appearance of fiducial marks on the charts indicates the extent of the survey line.

3) Field Reduction:

Upon completion of the flight, the film is developed and the actual path of the aircraft is plotted on the photo laydown. This is accomplished by comparing film points with the photo. For any given point, the appropriate fiducial number is placed on the photo laydown and the points joined to produce the actual flight path.

When field results are desired, anomalies are chosen and assigned appropriate fiducial numbers. The anomalies are then transferred to their correct position on the photo laydown.



AEROMAGNETIC SURVEY

NOVA TWP AREA

1" = 4 mi

Figure 1

PERFORMAN

ASSESSMENT WORK DETAILS

42B09SW0023 2.528 NOVA

900 ID

Township or Area Nova - Oates Township

Type of Survey Airborne Magnetometer
A separate form is required for each type of survey

Chief Line Cutter or Contractor Geoterrex Ltd.
Name
1320 Bank St., Ottawa, Ontario
Address

Party Chief R. Bolivar
Name
1320 Bank St., Ottawa, Ontario
Address

Consultant D. M. Wagg
Name
1320 Bank St., Ottawa, Ontario
Address
J. Roth, 7 King St. E., Toronto, Ontario

List numerically

Listed on attached
Schedule A
(102 claims)

If space insufficient, attach list

COVERING DATES

Line Cutting

Field March 3 - March 6, 1971
Instrument work, geological mapping, sampling etc.

Office March 13 - June 19, 1971

INSTRUMENT DATA

Make, Model and Type Geometrics Model-G-803 Proton Resonance Magnetometer

Scale Constant or Sensitivity 1 gamma

Or provide copy of instrument data from Manufacturer's brochure.

Radiometric Background Count

Number of Stations Within Claim Group

Number of Readings Within Claim Group

Number of Miles of Line ~~cut~~ flown Within Claim Group 53½ miles

Number of Samples Collected Within Claim Group

RECEIVED
JUL 29 1971
PROJECTS SECTION

TOTAL

CREDITS REQUESTED	20 DAYS per claim	40 DAYS per claim	Includes (Line cutting)
Geological Survey	☐	☐	
Geophysical Survey	☑	☐	Show Check ✓
Geochemical Survey	☐	☐	

DATE June 23, 1971

SIGNED B. MacDonald

Send in duplicate to:
FRED W. MATTHEWS
SUPERVISOR-PROJECTS SECTION
DEPARTMENT OF MINES & NORTHERN AFFAIRS
WHITNEY BLOCK
QUEEN'S PARK
TORONTO, ONTARIO

Performance and coverage credits do not apply to airborne surveys

SUBMISSION OF GEOLOGICAL, GEOPHYSICAL AND GEOCHEMICAL SURVEYS

AS ASSESSMENT WORK

In order to simplify the filing of geological, geochemical and ground geophysical surveys for assessment work, the Minister has approved the following procedure under Section 84 (8a) of the Ontario Mining Act. This special provision does not apply to airborne geophysical surveys.

If, in the opinion of the Minister, a ground geophysical survey meets the requirements prescribed for such a survey, including:

(a) substantial and systematic coverage of each claim
(b) line spacing not exceeding 400 foot intervals
(c) stations not exceeding 100 foot intervals or
(d) the average number of readings per claim not less than 40 readings

it will qualify for a credit of 40 assessment work days for each claim so covered. It will not be necessary for the applicant to furnish any data or breakdown concerning the persons employed in the survey except for the names and addresses of those in charge of the various phases (linecutting contractor, etc.). It will be assumed that the required number of man days were spent in producing the survey to qualify for the specified credit.

Each additional ground geophysical survey using the same grid system and otherwise meeting these requirements will qualify for an assessment work credit of 20 days.

A geological survey using the same grid system, and meeting the requirements for submission of geological surveys for maximum credits will qualify for an assessment work credit of 20 days. If line cutting has not previously been reported with any other survey and is reported in conjunction with the geological survey a credit of 40 days per claim will be allowed for the survey.

Similarly, a geochemical survey using the same grid system with the average number of collected samples per claim being not less than 40 samples, and meeting the requirements for the submission of geochemical surveys for maximum credits, will qualify for an assessment work credit of 20 days. If line cutting has not previously been reported with any other survey and is reported in conjunction with the geochemical survey a credit of 40 days per claim will be allowed for the survey.

Credits for partial coverage or for surveys not meeting requirements for full credit will be granted on a pro-rata basis.

If the credits are reduced for any reason, a fifteen day Notice of Intent will be issued. During this period, the applicant may apply to the Mining Commissioner for relief if his claims are jeopardized for lack of work or, if he wishes, may file with the Department, normal assessment work breakdowns listing the names of the employees and the dates of work. The survey would then be re-assessed to determine if higher credits may be allowed under the provisions of subsections 8 and 9 of section 84 of the Mining Act.

If new breakdowns are not submitted, the Performance and Coverage credits are confirmed to the Mining Recorder at the end of the fifteen days.

APPENDIX A

Nova Township

Group 1:

Claim Number	DAYS ASSESSMENT REQUESTED
P264178	20
P264179	20
P264180	20
P264181	20
P264182	20
P264294	20
P264295	20
P264296	20
P264297	20
P264298	20
P264446	20
P264447	20
P264535	20
P264536	20
P264537	20
P264538	20
P264539	20
P264540	20
P264541	20
P264542	20
P264543	20
P264544	20
P264545	20
P264546	20
P264547	20
P264548	20
P264549	20
P264550	20
P264551	20
P264552	20
P264553	20
P264554	20
P264555	20
P264556	20
P264557	20
P264558	20

	Claim Number	Days
	P264559	20
	P264560	20
	P264561	20
	P264562	20
	P264563	20
	P264564	20
	P264565	20
	P264566	20
	P264567	20
	P264568	20
	P267229	20
	P267230	20
ova-Oates Gr.2	P267231	20
	P307244	20
	P307245	20
	P307246	20
	P307247	20
	P307248	20
	P307249	20
	P307250	20
	P307251	20
	P307252	20
	P307253	20
	P307260	20
	P307261	20
	P307262	20
	P307263	20
	P307264	20
	P307265	20
	P307266	20
	P307267	20
	P307268	20
	P307269	20

Nova Township

Group 2:

Claim Number	Days
P264450	20
P264451	20
P264452	20
P264453	20
P264454	20
P264455	20
P264456	20
P264457	20
P264458	20
P264459	20
P264460	20
P264461	20

Oates Township

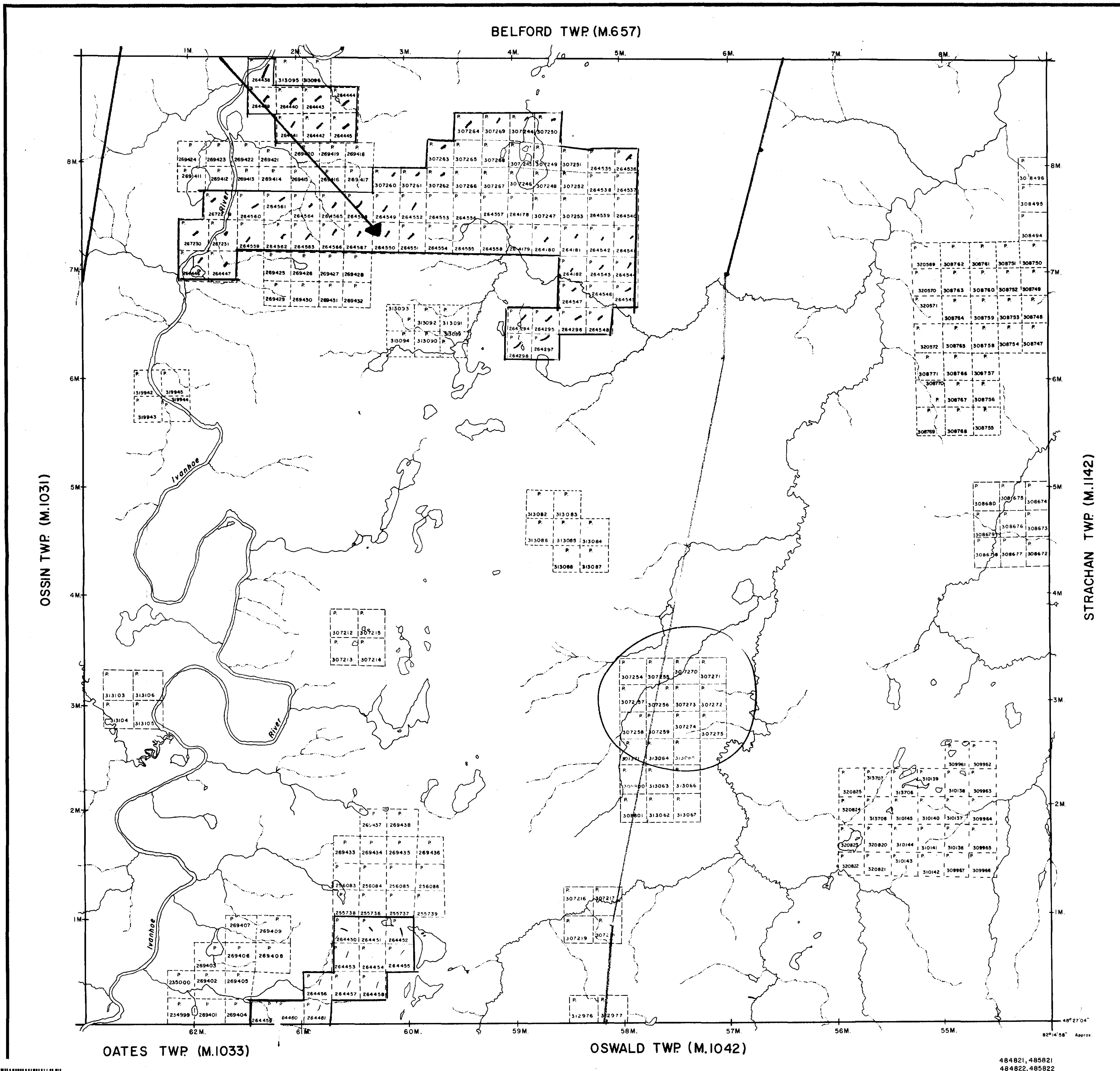
P256475	20
P256476	20
P256477	20
P256478	20
P256479	20
P256480	20
P256481	20
P256482	20
P256483	20
P256484	20
P256485	20
P256486	20

Oswald Township

P264462	20

Nova Township

Group 3:	Days
P264438	20
P264439	20
P264440	20
P264441	20
P264442	20
P264443	20
P264444	20
P264445	20



THE TOWNSHIP OF

Claim Map

NOVA

DISTRICT OF COCHRANE

PORCUPINE MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

LEGEND

PATENTED LAND	P
CROWN LAND SALE	C.S.
LEASES	L
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 along the shores of all lakes and rivers.

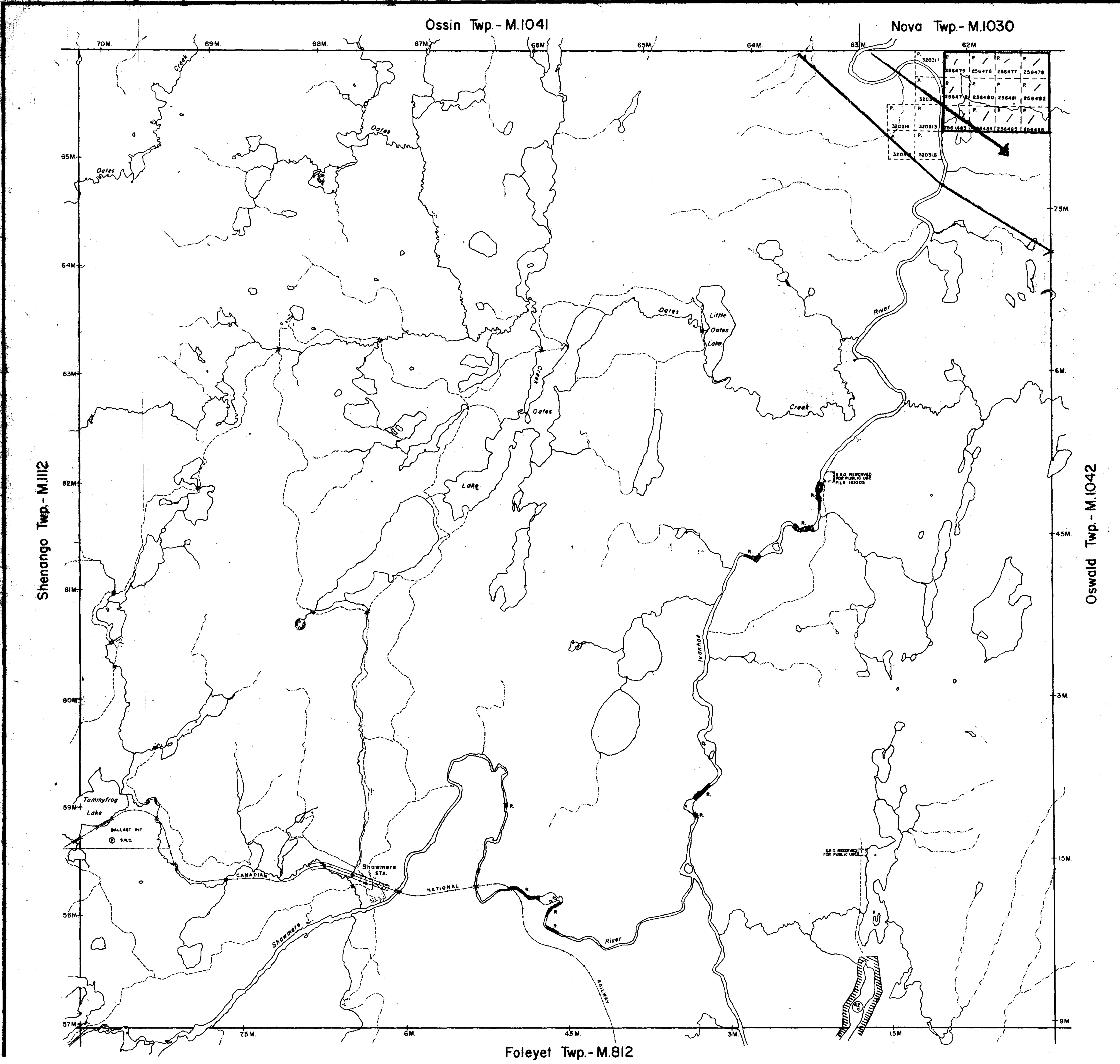
DATE OF ISSUE
AUG - 1 1971
ONT. DEPT. OF MINES AND NORTHERN AFFAIRS

PLAN NO.- M.1030

ONTARIO
DEPARTMENT OF MINES AND NORTHERN AFFAIRS

42B09SW0023 2.528 NOVA

200



THE TOWNSHIP OF

OATES

DISTRICT OF SUDBURY

PORCUPINE MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

LEGEND

PATENTED LAND	P
CROWN LAND SALE	C.S.
LEASES	L
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.

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

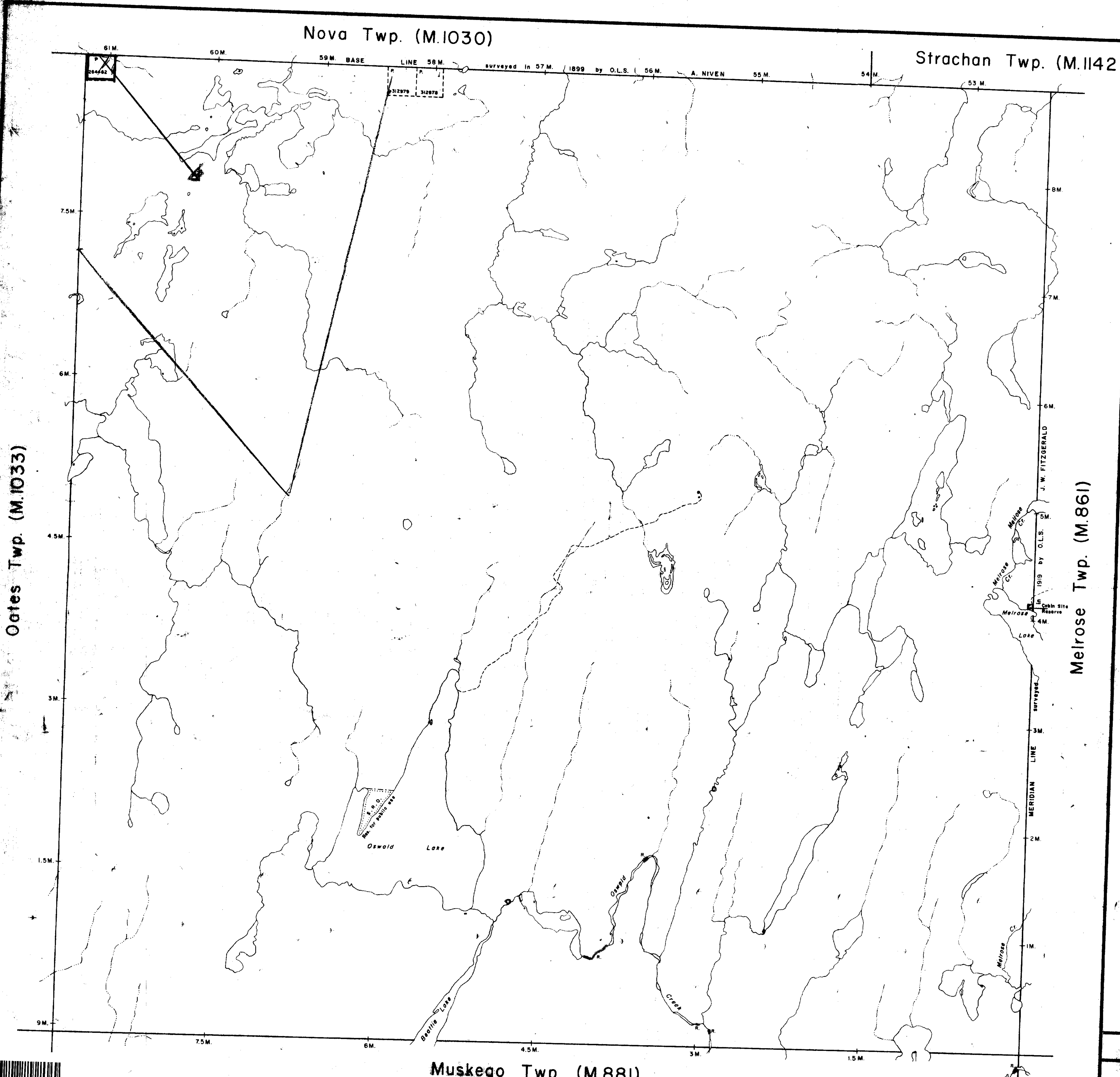
File	Date	Disposition
163002	25/8/70	S.R.O.

DATE OF ISSUE
AUG - 4 1971
ONT. DEPT. OF MINES AND NORTHERN AFFAIRS

PLAN NO.- M.1033

ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS

210



THE TOWNSHIP OF

OSWALD

DISTRICT OF SUDBURY

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.

DATE OF ISSUE
AUG - - 1971
ONT. DEPT. OF MINES AND NORTHERN AFFAIRS

PLAN NO. M-1042

ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS

220

2. 528

AIRBORNE GEOPHYSICAL SURVEY

MAGNETOMETER

FOR

AMAX EXPLORATION INC.

NOVA TOWNSHIP
ONTARIO

SHEET I

SCALE : 1" = 1,320'

geoterrex limited

FLOWN IN MARCH 1971

GEOTERREX PROJECT No. 84-77

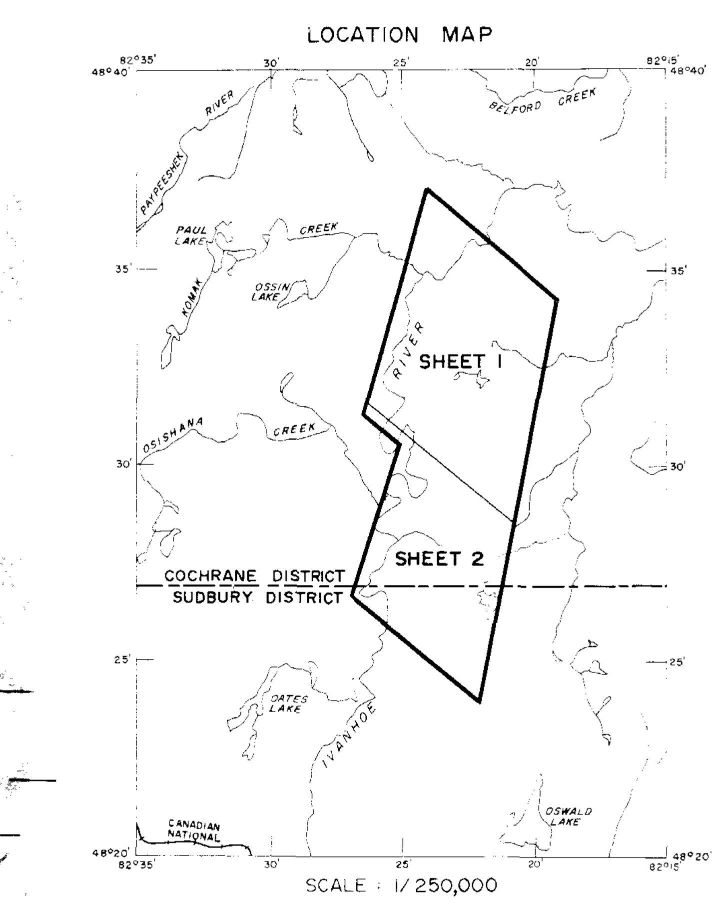


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Figure 2

AIRBORNE GEOPHYSICAL SURVEY

MAGNETOMETER

FOR

AMAX EXPLORATION INC.

NOVA TOWNSHIP

ONTARIO

SHEET 2

SCALE : 1" = 1,320'

240

SURVEYED, COMPILED & INTERPRETED BY geoterrex limited OTTAWA HOUSTON

FLOWN IN MARCH 1971

GEOTERREX PROJECT No. 84-77

LEGEND

500 GAMMAS

100 GAMMAS

20 GAMMAS

MAGNETIC LOW

CONTOUR INTERVAL 20 GAMMAS