63.2797

QUESTOR SURVEYS LIMITED

AIRBORNE ELECTROMAGNETIC SURVEY REPORT

AREA 1969-44

TIMMINS AREA

ONTARIO

PREPARED FOR

HOLLINGER MINES LIMITED

APRIL 1970

CONTENTS

INTRODUCTION

This report contains our interpretation of the results of an airborne electromagnetic and magnetic survey flown in the Timmins Area of Ontario on February 21st to March 28th, 1970. A brief description of the equipment and the survey procedure are also included, together with some recommendations for ground follow-up.

The survey totalled 2312 line miles and was performed by Questor Surveys Limited. The survey aircraft was a Super Canso CF JMS and the operating base was Timmins, Ontario.

SURVEY AREA

The areas for which assessment credit is applied for outline ~~is~~ are shown on a 1:250,000 map at the end of this report. This is a part of the National Topographic Series sheet number 42A.

A line spacing of 1/8 mile was used.

EQUIPMENT

The aircraft was equipped with the Mark V INPUT airborne E.M. system and an AM-101 Precession magnetometer. An APN-1 radio altimeter was used for vertical control. The outputs of these instuments, together with fiducial timing marks were recorded by means of a galvanometer type recorder using light sensitive paper. A 35mm continuous strip camera was used to record the actual flight path.

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.

MAP COMPILATION

The base maps are uncontrolled mosaics constructed from 1" = 1/4 mile Ontario Department of Lands & Forests photographs. These mosaics were reproduced at a scale of 1" = 1/4 mile 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.

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 direction of flight. Their locations are plotted with reference to the fiducial numbers on the visicorder record. A sample record is included at the end of this report identifying the method used to correct for the position of the E.M. "bird" and identifies the parameters recorded on each channel.

Each symbol shows the number of channels on which the anomaly was recorded, and a surrounding circle indicates that a coincident magnetic anomaly has been observed. The value of the magnetic anomaly in gammas is shown as a number beside the anomaly letter. If a magnetic anomaly is recorded within 1000 feet on either side of a conductor, its location and value are also shown as illustrated in the legend.

Occasionally a question mark may be shown alongside the anomaly symbol. This may occur when the response is very weak and there is some doubt as to whether or not it is caused by turbulence or compensation noise caused by large changes in the position of the "bird" relative to the aircraft.

All the anomaly locations, magnetic correlations, and the amplitudes of channel number 4 are listed on the data sheets accompanying the final maps.

RESULTS

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 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.

In the Canadian Shield, the most common bedrock conductors are graphites and formational sulphides. These quite commonly occur in long trends having multiple conducting zones with or without magnetic correlation depending upon the presence or absence of magnetite or pyrrhotite. The possibility of a commercial sulphide body occuring within one of these zones cannot be ruled out, but it is extremely difficult to recommend any particular location unless some change in anomaly character or structure can be recognized.

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

The notes in the following sections are intended to give as much information as possible about the origin of the anomalies using the combined information from all the data available. They may be used to select priority targets, but the final assessment must be based on ground results.

INTERPRETATION AND RECOMMENDATIONS

A brief discussion follows on the majority of the conductors in the areas. They are not listed in any priority with regard to ground investigation. Interference from the radar transmitter has affected the results in blocks E and G and conductors could possibly exist in this area which were not picked up.

Weak anomalies may be significant because of the amount of overburden which is known to exist in the Timmins area.

WEST SHEET 1969-44A

1. Intercepts 21A and 23D are both well defined, good conductivity responses indicating a good conductor of short strike length. Ground work is recommended on this conductor and the weaker conductor directly to the north.

2. Ground work is recommended on this conductor comprised of well defined, good conductivity anomalies. Sulphides at depth could possibly be the cause.

3. Intercept 20A is a weak but definate, good conductivity bedrock response on the flank of a 130 gamma magnetic high. Ground work is recommended.

4. A graphitic or formational sulphide zone is the probable cause of the long conductor. Possibly a portion of the zone could be investigated near intercept 10B which is a good conductivity response.

5. Ground work should be done on this conductor. Intercept 10C is similar to that which could result from massive sulphides.

6. Good conductivity is exhibited by the anomalies of these two conductors. Ground work is recommended.

7,8,9,10. A ground electromagnetic survey should be done to resolve the various conductors in this area and to further evaluate these zones. Moderate conductivity is exhibited by most of the responses in this area.

EAST SHEET

11. These two anomalies are weak responses which may be caused from a bedrock source. A reconnaisance ground electromagnetic survey is recommended in an effort to detect the conductors.

12. These broad low conductivity anomalies are typical of conductive overburden. No ground work is recommended.

13. Similar recommendations are given to this zone as those of zone 11.

14 & 15. Both of these conductors appear to be bedrock effects.

16. This short bedrock conductor flanking a longer conductor exhibits moderate conductivity. Ground work is suggested.

17. This long conductor is associated with high magnetics which indicate a gabbro intrusive. Ground work is suggested on a portion of this zone, preferably around intercept 69A which is a strong, good conductivity anomaly.

18. The anomalies of this zone are strong, good conductivity intercepts coincident with the peak of a high magnetic feature which may reflect the gabbro in the area. Ground work is recommended.

19. The conductivity and strength varies along this long conductive zone which may be caused by graphite. Ground work is suggested to cover intercepts 69B and 70C which are both well defined good conductivity responses.

20. This conductor is similar to zone 19 and should be given the same considerations as zone 19. Ground work is suggested on intercepts 69C and 70B.

21. This zone appears to be on strike with zone 20 and it probably has the same cause. The anomalies are weak but definate bedrock responses which exhibit good conductivity. Ground work is recommended.

22. Poor to moderate conductivity is exhibited by the anomalies in this zone. Ground work is recommended, but on a low priority rating.

23. The strike of this zone is confirmed by the government aeromagnetic map. The anomalies are not well defined and indicate moderate conductivity. A low priority rating is given to this bedrock conductor.

24. This weak bedrock conductor could possibly be caused by sulphides at depth. A reconnaisance electromagnetic survey is recommended.

25. This is a superficial effect so no recommendations are given.

26. These weak responses could indicate a bedrock conductor at depth.

27. A low priority rating is given to these anomalies in the area. The conductors are marginal bedrock responses.

28. A high priority is given to this conductor. The anomalies are not strong but good conductivity is exhibited by the intercepts. There is magnetic correlation with two of the intercepts.

29,30,31. These three conductors are composed of weak responses but the conductivity indicates that the source of the conductors is in bedrock. Ground work is suggested on all three zones.

32,33,34. A portion of each of these zones should be investigated with ground geophysical techniques. The anomalies are not strong but the conductivity suggests sulphides and/or graphite at depth. On zone 32 intercepts 73A and 74A should be checked, on zone 33 intercepts 84B and 85B need attention while in zone 34 intercepts 80B, 81D, 82B and 83B should be investigated.

35,36,37. These short weak conductors are marginal bedrock responses. A low priority is given with regard to ground investigation.

38. The direct magnetic correlation with the weak but moderate conductivity conductor suggests the presence of pyrrhotite. Ground work is recommended.

39. A low priority is given to this weak, fair conductivity conductor.

86. Intercept 104A exhibits good conductivity while the other two anomalies in the zone are poor conductivity responses. Ground work is suggested to cover the centre of this zone.

87. Good conductivity is characteristic of the anomalies in this trend which may continue on the the north. Ground work is suggested.

88. Ground work is recommended to cover this good conductor.

89. This zone and the anomalies immediately surrounding are poor conductivity responses and are given a low priority rating.

90 & 91 Both of these zones are composed of poor conductivity anomalies and therefore no recommendations are given.

<u>1969-44D</u>

1. The three intercepts 1A, 2A, 3A are all similar and they appear to be surface effects. They have a rapid decay and are of no interest.

2. These five intercepts are channel 3, 4 and 5 anomalies and all comprise one conductor. They have fair to good conductivity and are fairly strong. This appears to be a bedrock conductor.

3. This is the edge of conductive overburden and ground work is not recommended.

4. These broad, poor conductivity anomalies are coincident with the creek bottom.

5. These anomalies are broad, and similar to those of zone 4. No ground work is recommended.

6. Fair to poor conductivity is shown by the four intercepts in this zone and appear to be a marginal bedrock conductor. A low priority is given this conductor.

7. This conductor consists of poor conductivity anomalies which could possibly be attributed to conductive overburden. No interest should be given to this conductor.

8. Intercept 18D is a moderate conductivity anomaly and is differenct from the other intercepts along this trend. Ground work is recommended to cover intercept 18D.

9. This intermittent conductor trend exhibits varying degrees of conductivity. Graphite is the obvious cause of the conductor, however, sulphides cannot be entirely eliminated.

10. The anomaly intercepts of this folded conductive horizon are strong and exhibit fair to good conductivity. The conductor is considered to be a bedrock conductor consisting of graphite or sulphides or a combination of the two. Investigation of a portion of this conductor is recommended.

11. This long conductor consists of strong, good conductivity anomalies. Graphite is the probable cause.

12. This intermittent conductor trend consists of weak, poor conductivity anomalies which may be attributable to conductive overburden. No ground work is recommended on these anomalies.

13. This long folded conductive horizon is composed of intercepts of varying conductivity. This is a definate bedrock conductor.with a probable graphite source. Ground work is, however, warranted on portions of this trend.

14 & 15 These two parallel conductors are similar in appearance and they both probably have the same cause. Ground work is recommended to cover the north end of conductor 14 (intercepts 34A, 35C, 37A). The anomalies at this end are strong, good conductivity anomalies.

The remainder of the anomalies in the south are in the vicinity of a built up area. A visual examination is recommended on these anomalies to see if they are caused by cultural features.

1969-44G

1 & 2 These anomalies are assumed to be caused by overburden effects and as a result no recommendations are given.

3. This is a low priority ground target. The anomalies are poor conductivity responses.

4. This is an overburden effect.

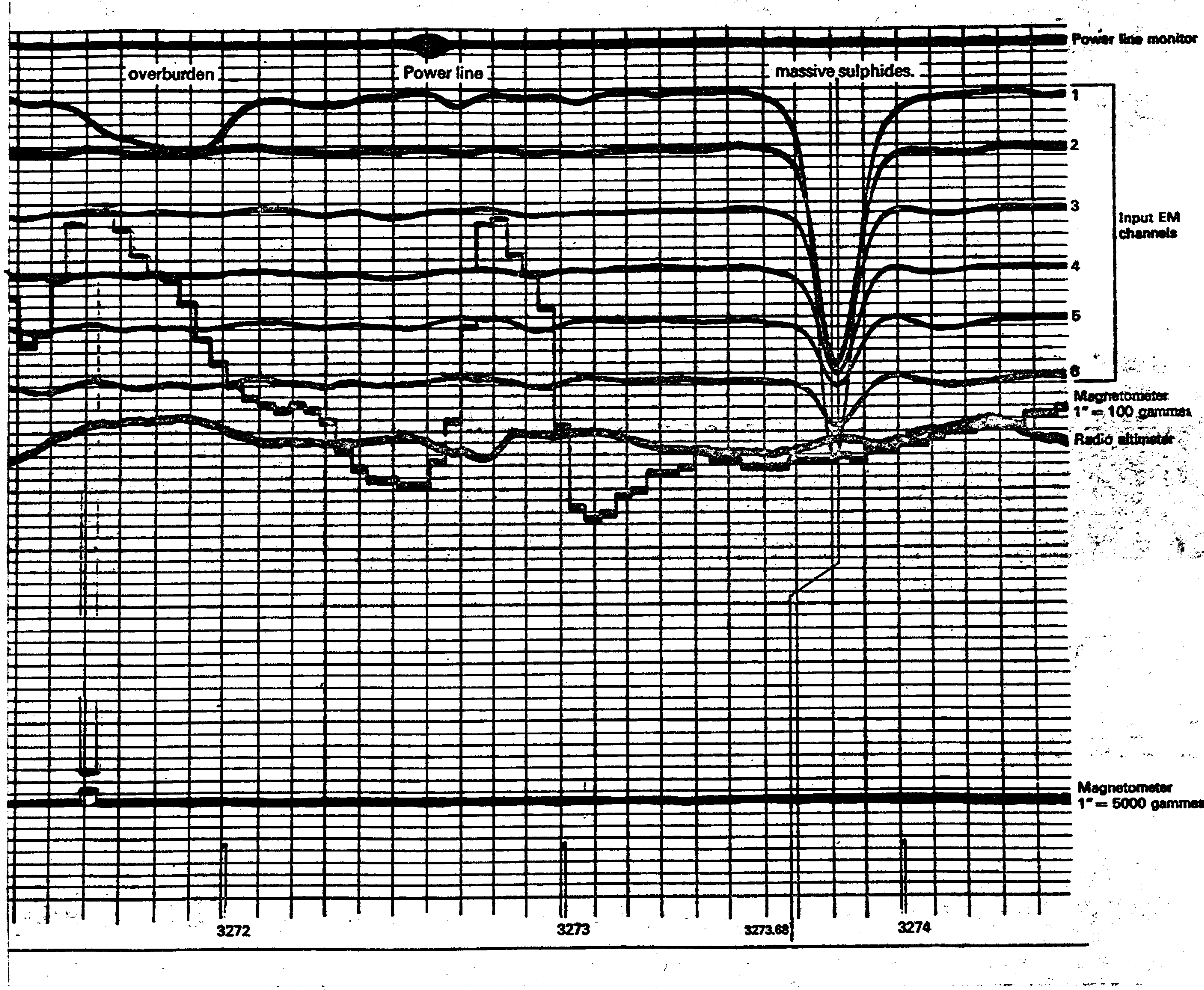
5. This weak response could possibly be due to bedrock source. A reconnaisance survey is recommended.

D. Watson

D. Watson

REGISTERED PROFESSIONAL ENGINEER
P. G. LAZENBY
PROVINCE OF ONTARIO

P. G. Lazenby



overburden
Power line
massive sulphides.
Power line monitor
1
2
3
4
5
6
Input EM channels
Magnetometer 1" = 100 gammas
Radio altimeter
Magnetometer 1" = 5000 gammas.
3272
3273
3273.68
3274

Questor Surveys Limited

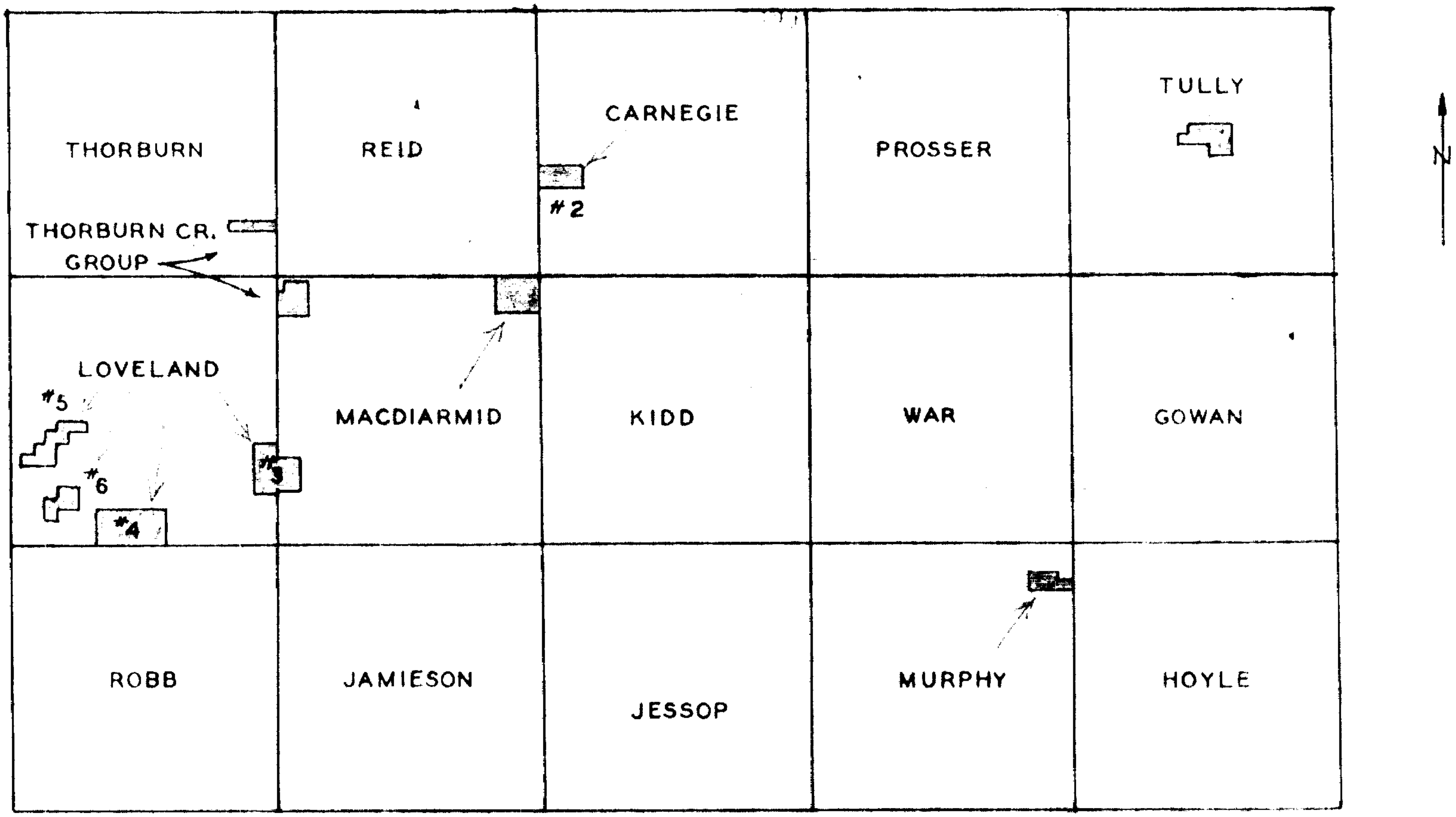
Area Timmins Area
File No. 1969-44A
Page No. 4

	Anomaly Number		Fiducial	Number of Channels	Channel 4 Amplitude	Direct Magnetic Correlation	Flanking Magnetic Peak		Remarks
							Location	Value	
	42	A	033.16	3			033.30	100γ	
	43								
✓	44	A	893.26	3		—			
		B	898.06	3		—			
✓	45	A	659.43	3		—			
✓	46	A	603.30	4	.10	—			
✓	47	A	711.94	5	.06	—			
✓	48	A	951.04	5	.12	—			
✓	49	A	084.15	4	.05	—			Not plotted Same as 50A
	50	A	785.98	4	.06				Mag U/S. Same as 49A
	51	A	679.78	4	.08	—			
	52								
	53	A	711.18	4	.05		711.30	100γ	Shoulder Mag
	54	A	593.70	4	.10	—			
		B	598.40	4	.06	—			
	55								
	56	A	957.62	4	.02				Mag U/S
		B	960.98	3					Mag U/S
	57	A	980.23	3			980.10	150γ	
		B	59	3			980.75	90γ	
		C	86	3			980.75	90γ	
		D	981.77	4	.05	100γ			
	58	A	804.68	2		110γ			8 sub fids
		B	805.89	3			806.00	150γ	
		C	806.20	3			806.00	150γ	
	59	A	687.71	5	.12		687.85	100γ	Shoulder Mag
		B	688.03	4	.05	—			

Questor Surveys Limited

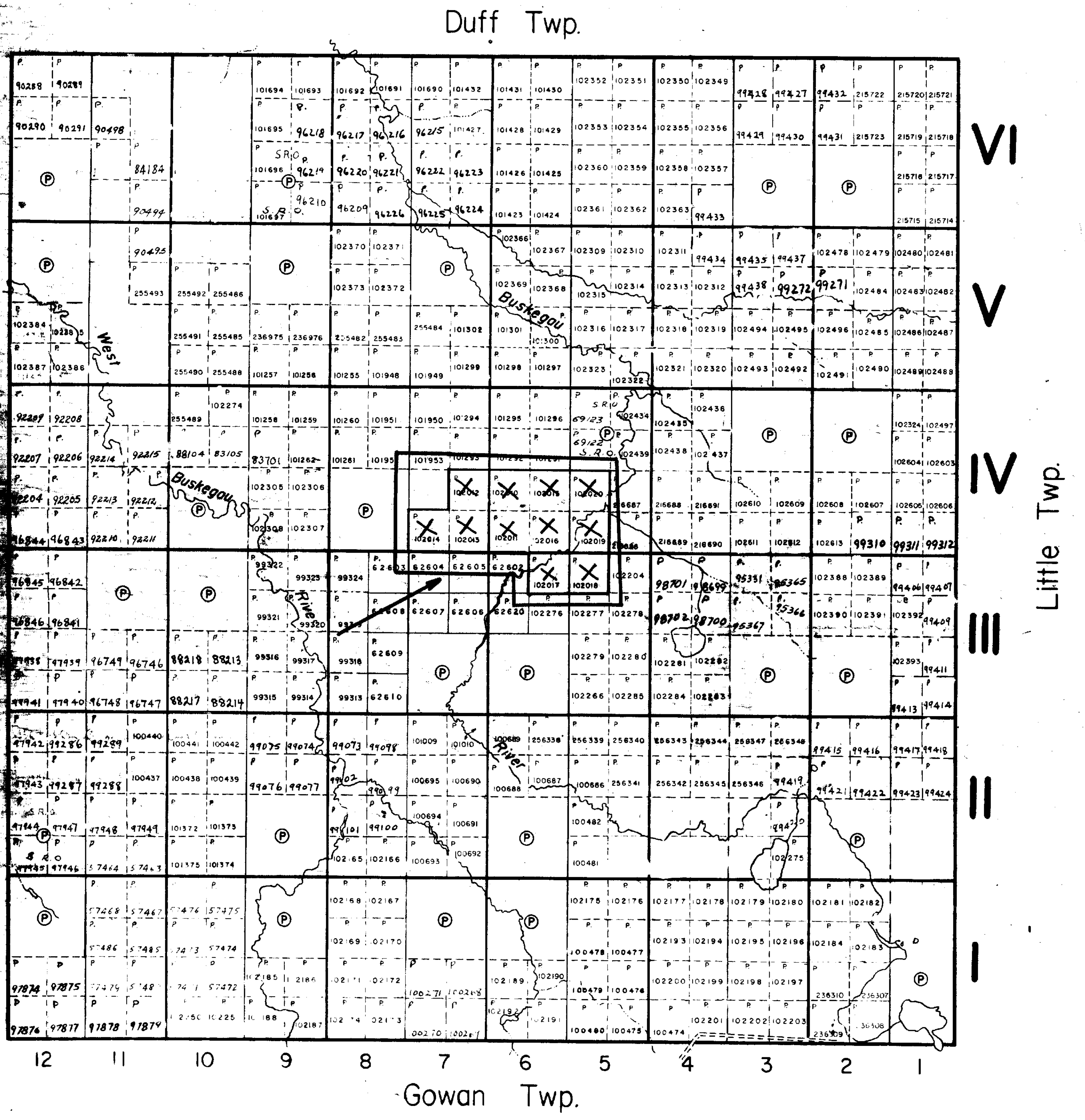
Area: Timmins Area
File No.: 1969-44A
Page No.: 5

Anomaly Number	Fiducial	Number of Channels	Channel 4 Amplitude	Direct Magnetic Correlation	Flanking Magnetic Peak		Remarks
					Location	Value	
60 A	568.32	4	.08	–			
B	575.57	5	.14		575.70	500γ	Shoulder Mag
C	87	5	.06		575.70	500γ	Shoulder Mag
61 A	863.10	4	.15	2000γ			
B	.32	4	.12	–			
C	.58	4	.10	–			
62 A	843.60	5	.30	–			
B	844.12	4	.10	–			
C	.43	4	.15	2300γ			
63 A	265.33	4	.05	–			
B	271.79	3			271.85	50γ	
C	272.17	5	.10	–			
D	.45	3		–			
E	.68	4	.10		272.75	2500γ	
64 A	445.10	4	.10		444.95	110γ	Shoulder Mag
B	447.30	6	.25		447.35	2500γ	
C	.67	5	.15	–			
D	.88	5	.15	–			
E	454.28	6	.13	40γ			
F	62	4	.05	–			
G	93	4	.05	–			
H	455.26	5	.10		455.15	20γ	S.M.
J	47	3	.02		455.60	80γ	
K	456.12	5	.10		456.30	50γ	
65 A	148.41	5	.10	–			
B	150.27	6	.25	2500γ			
C	.69	6	.10	–			
D	.91	6	.12	–			
√ E	157.32	6	.20	50γ			
F	93	4	.05		158.10	15γ	
G	158.27	5	.10		158.10	15γ	
H	159.18	4	.05		159.35	70γ	
√ 66 A	465.43	4	.08		465.30	15γ	
B	470.32	4	.10	–			
C	471.60	5	.10	–			
D	.80	5	.10	–			
E	472.22	6	.20	2640γ			



Plan showing claim groups
on which Airborne Geophysics is being filed
<u>For Assessment Credit</u>

Townships of Carnegie, Loveland, MacDiarmid,
<u>Murphy and Thorburn</u>
Porcupine Mining Division
Scale - 1" = 4 miles



THE TOWNSHIP "Claim Map"
TULLY

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.
ROADS	
IMPROVED ROADS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	
TRAIL	

NOTES

400' Surface Rights Reservation around all Lakes and Rivers.

DATE OF ISSUE
JUN 15 1970
ONTARIO DEPT. OF MINES

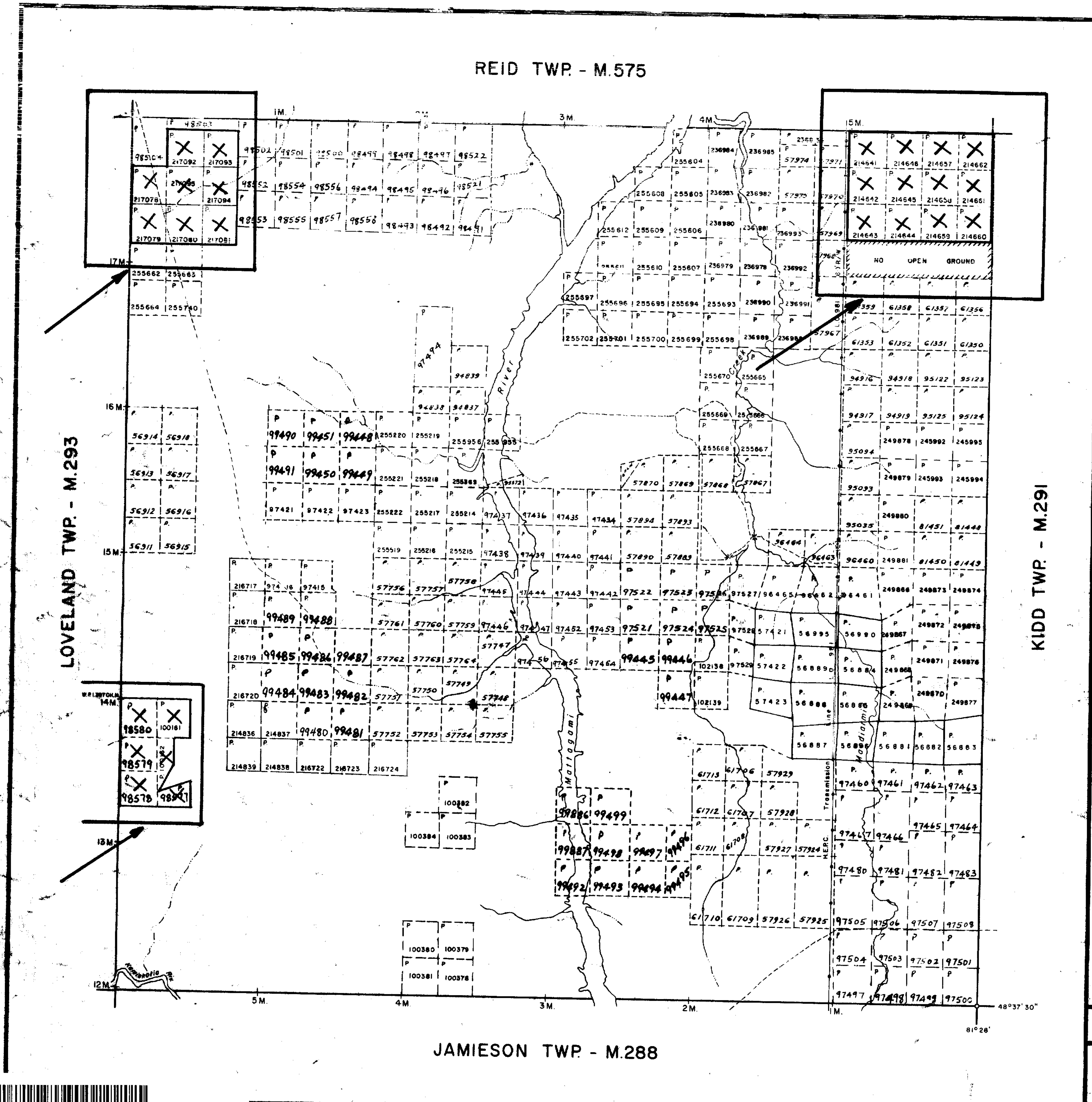
200

PLAN NO. – M.607

DEPARTMENT OF MINES
—ONTARIO—

42A14SE8552 63.2797 LOVELAND

200



THE TOWNSHIP OF

"Claim Map"

MACDIARMID

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.

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

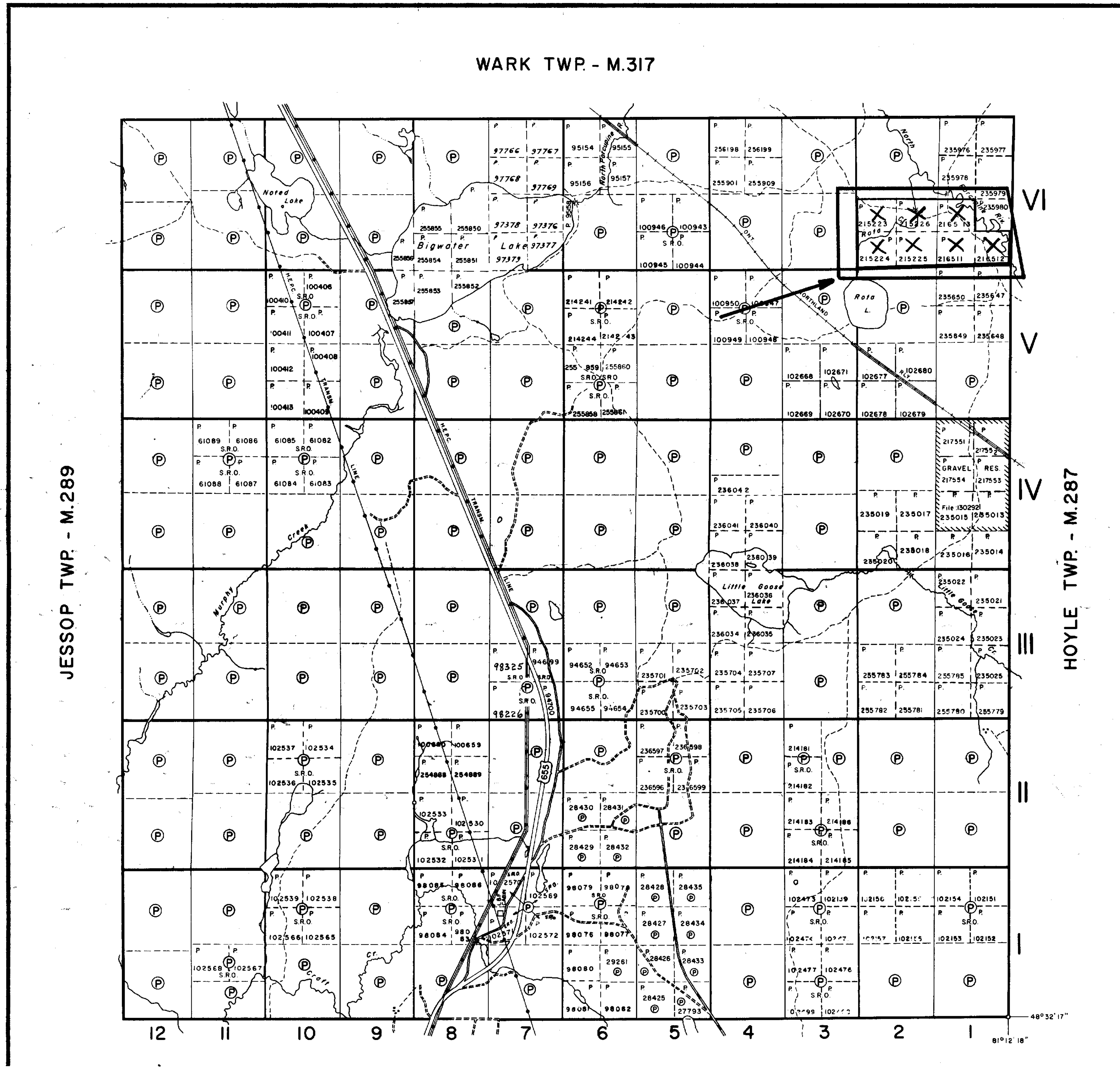
DATE OF ISSUE
JUN 15 1970
ONTARIO DEPT. OF MINES

PLAN NO. M.294

DEPARTMENT OF MINES
— ONTARIO —

42A14SE8552 63.2797 LOVELAND

210



THE TOWNSHIP OF

"Claim Map"

MURPHY

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.

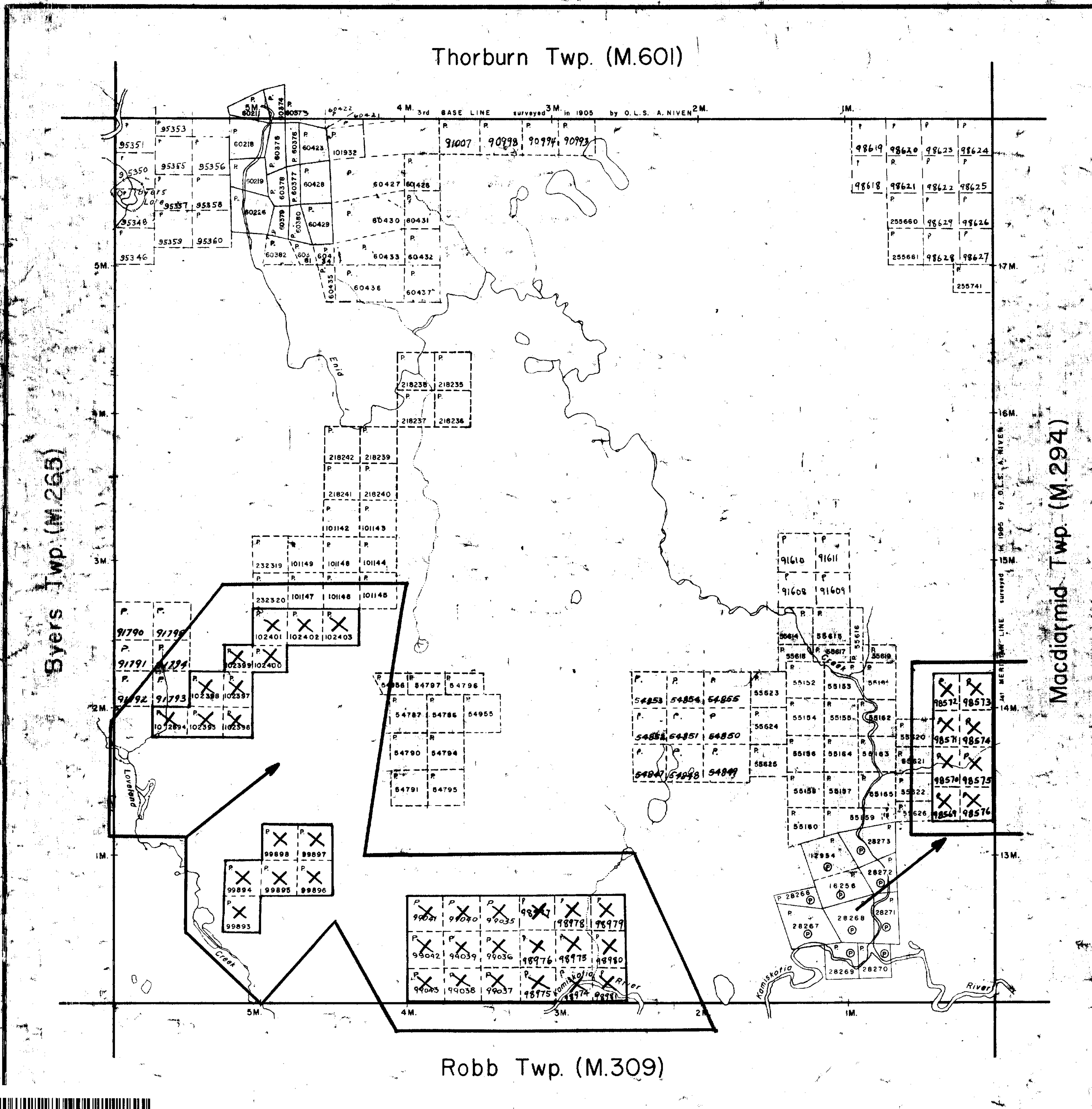
PLAN NO. M.303

DEPARTMENT OF MINES

— ONTARIO —

42A14SE8552 63.2797 LOVELAND

220



THE TOWNSHIP OF

"Claim Map"

LOVELAND

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	
KINGS HIGHWAYS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	
MINES	
CANCELLED	C.

NOTES

400' Surface Rights Reservation around all lakes and rivers.

DATE OF ISSUE
JUN 15 1970
ONTARIO DEPT. OF MINES

PLAN NO. M-293

DEPARTMENT OF MINES
— ONTARIO —

42A14SE8552 63.2797 LOVELAND

230

"Claim Map"

THORBURN

PORCUPINE MINING DIVISION

DISTRICT OF COCHRANE

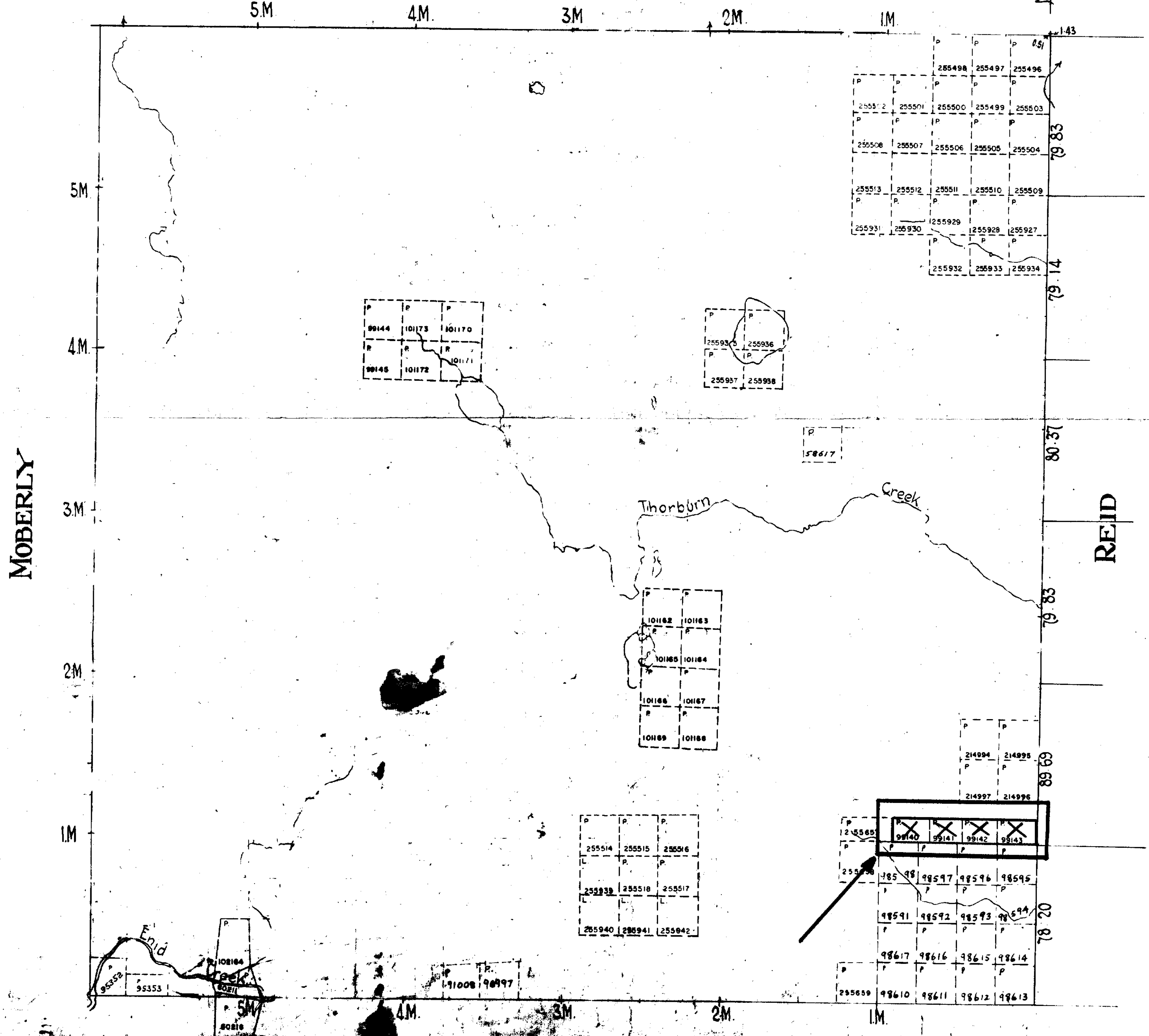
Scale - 40 Chains = 1 Inch

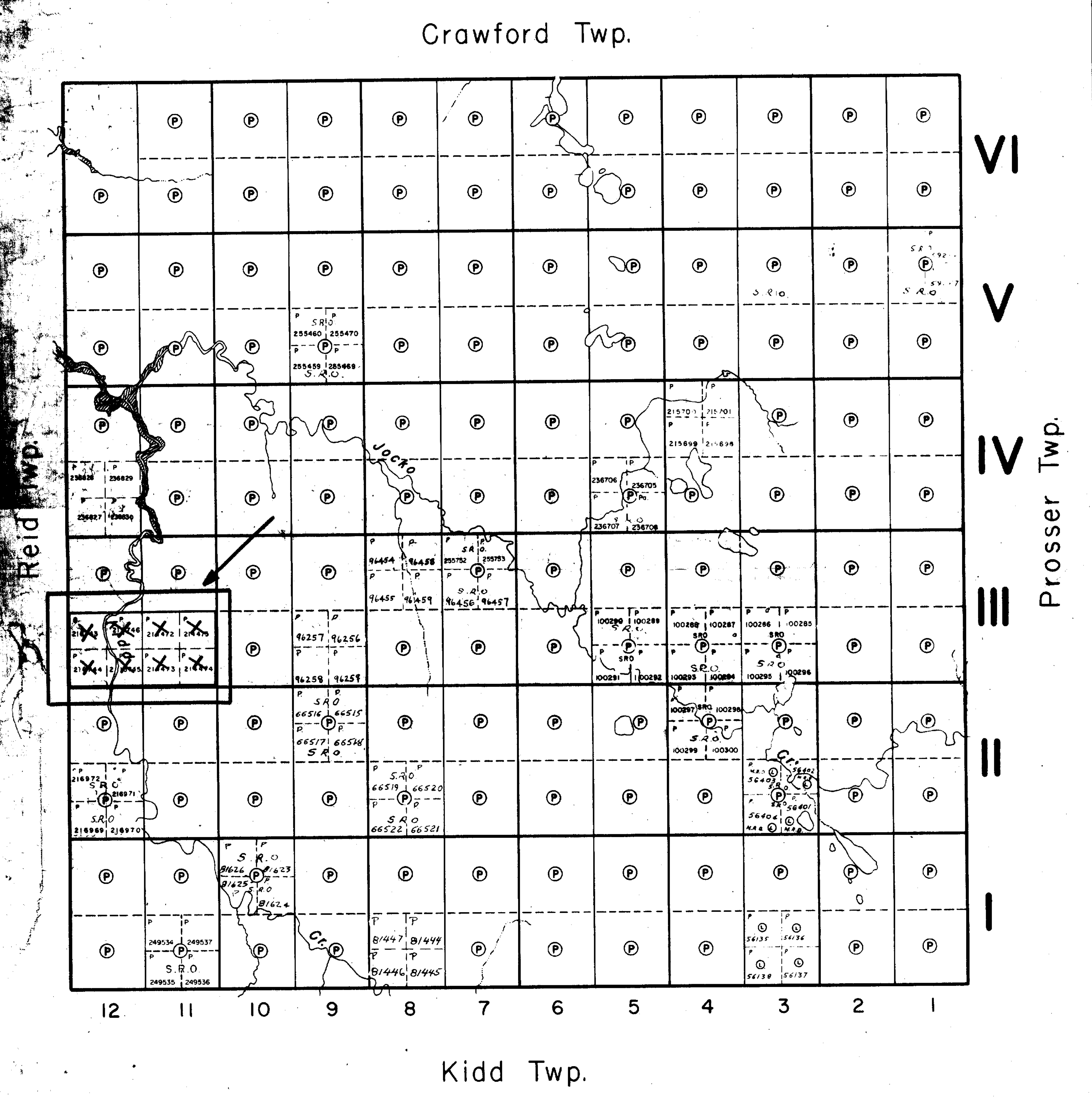
DATE OF ISSUE
JUN 15 1970
ONTARIO DEPT. OF MINES

NOTE

400' Surface Rights Reservation around all Lakes and Rivers.

GEARY





"THE TOWNSHIP
"Claim Map"
CARNEGIE
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.
ROADS	
IMPROVED ROADS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	

NOTES

L.O. 1344 shown thus

400' Surface rights reservation around all lakes and rivers

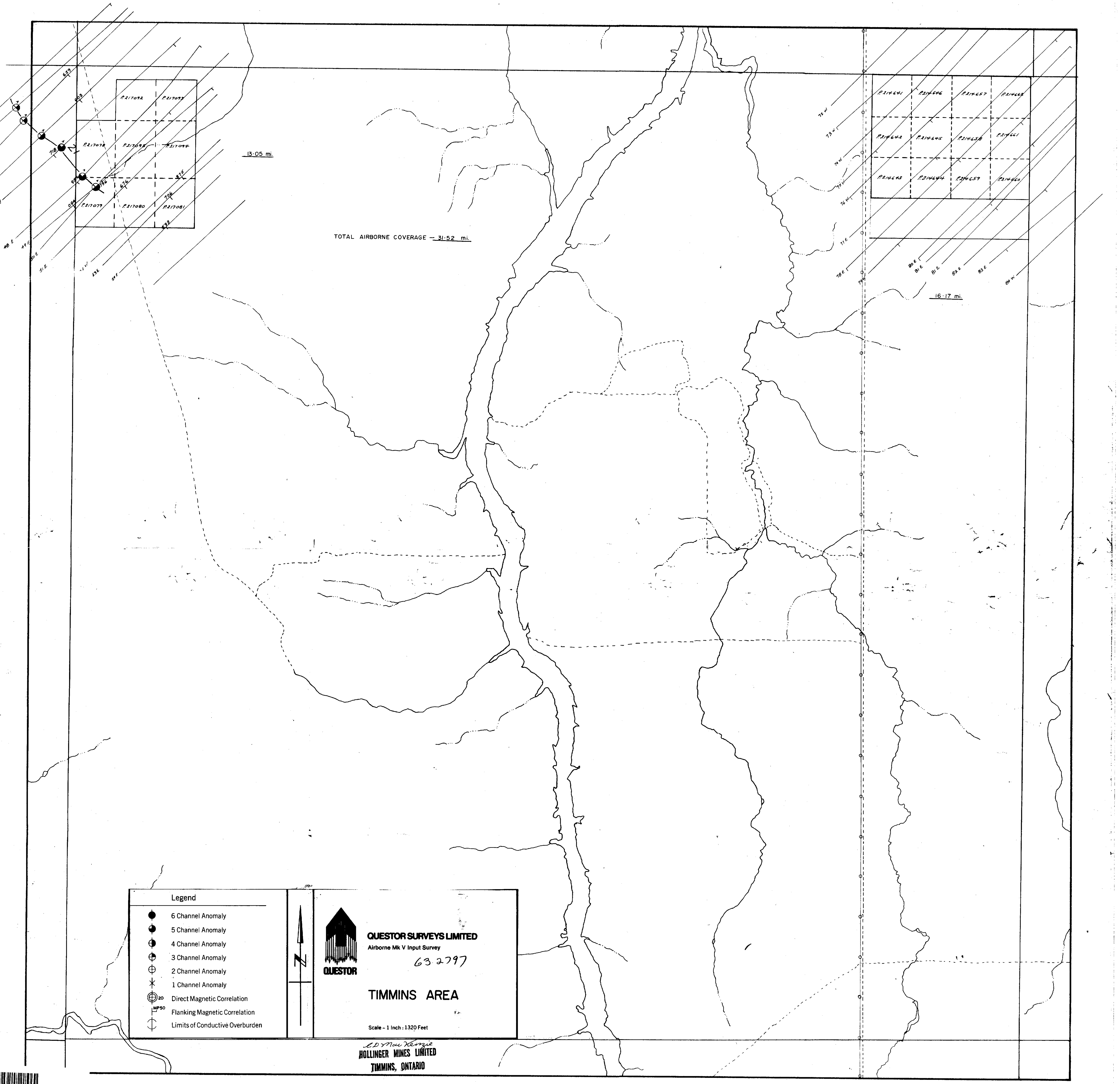
DATE OF ISSUE
JUN 15 1970
ONTARIO DEPT. OF MINES

PLAN NO. — M-441

DEPARTMENT OF MINES
—ONTARIO—

42A14SE8552 63.2797 LOVELAND

250

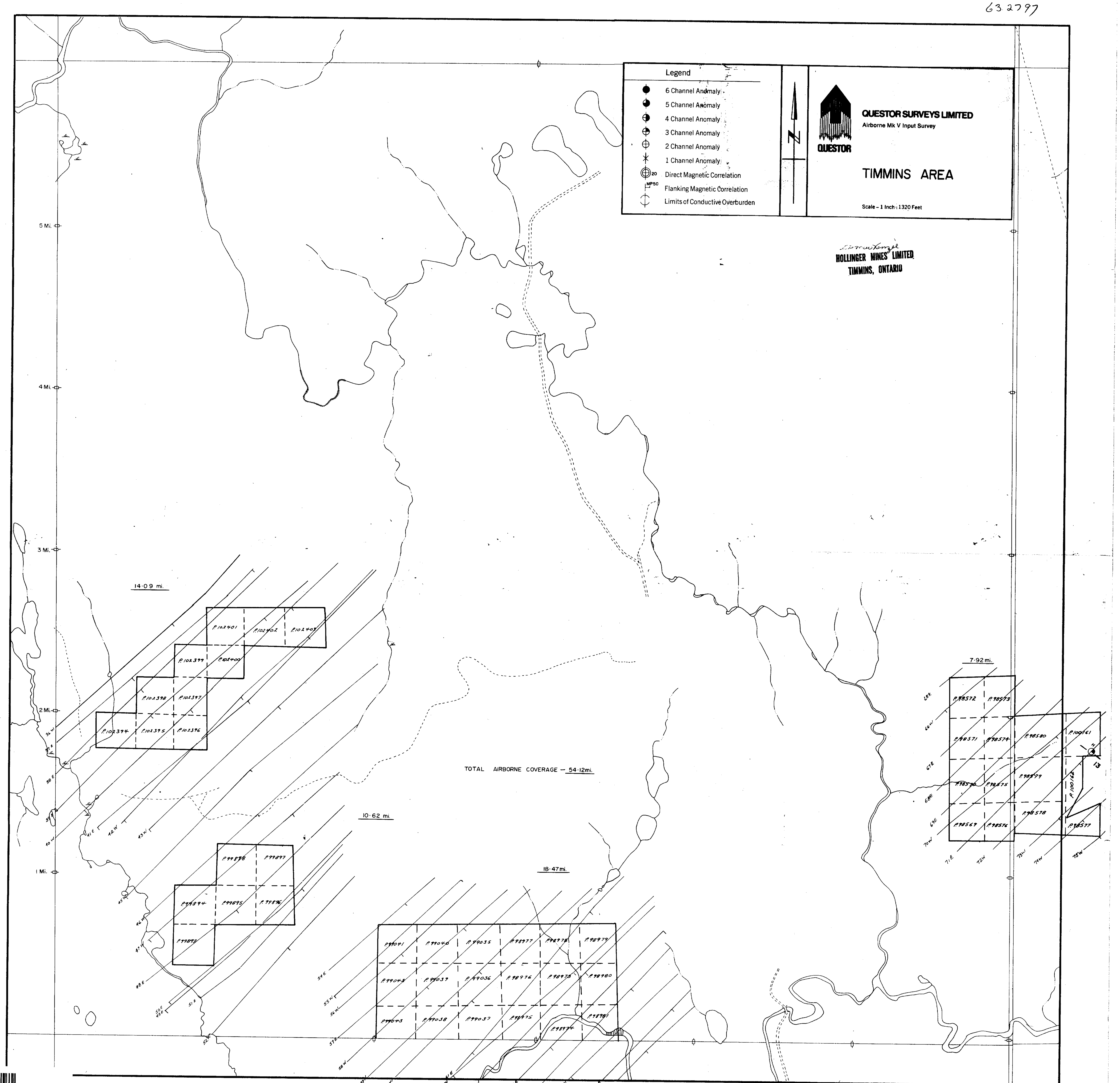


42A14SE8552 63.2797 LOVELAND

260

MACDIARMID 44 A

63.2797



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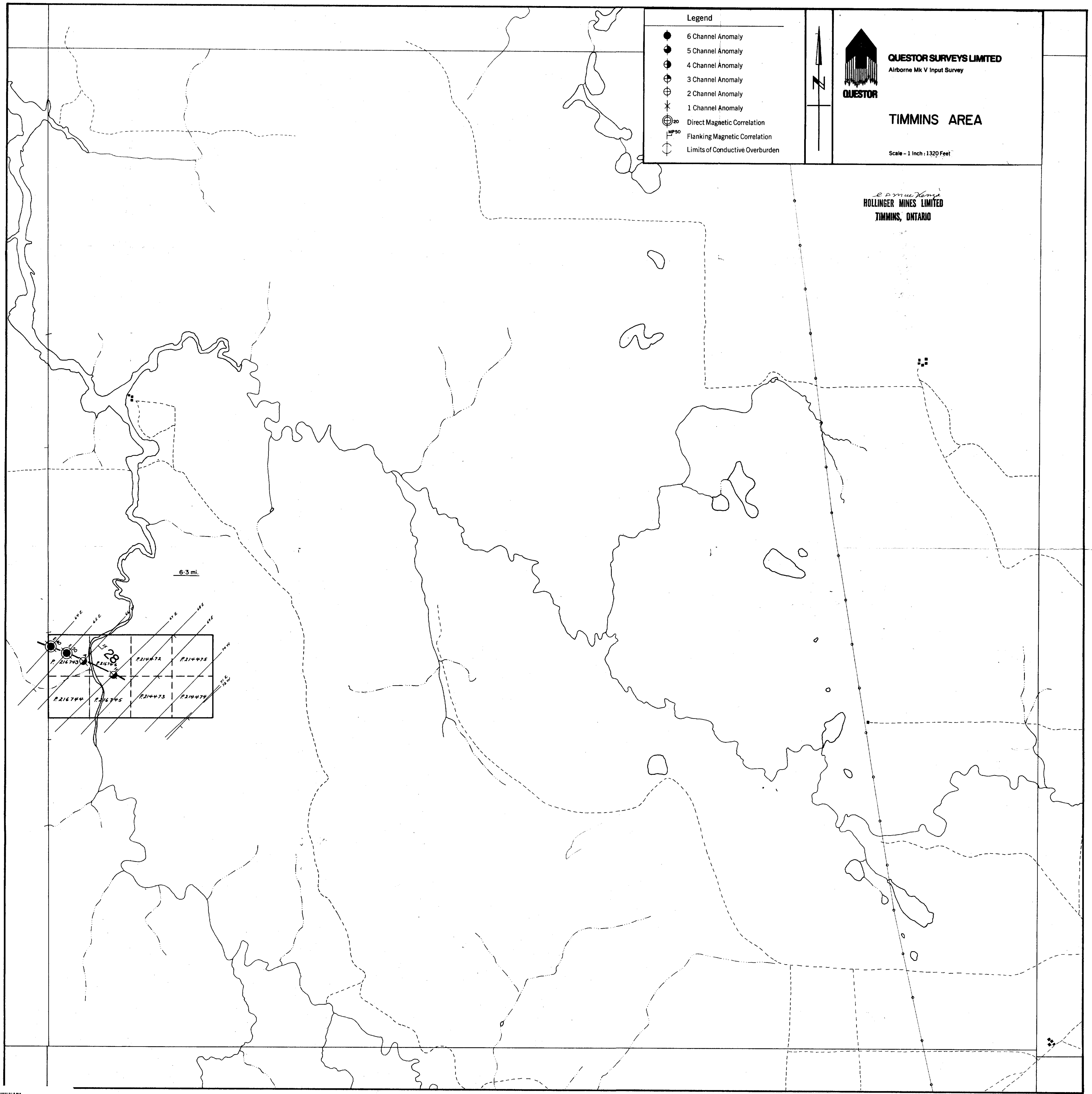
LOVELAND 44 A

63.2797



42A14SE8552 63.2797 LOVELAND

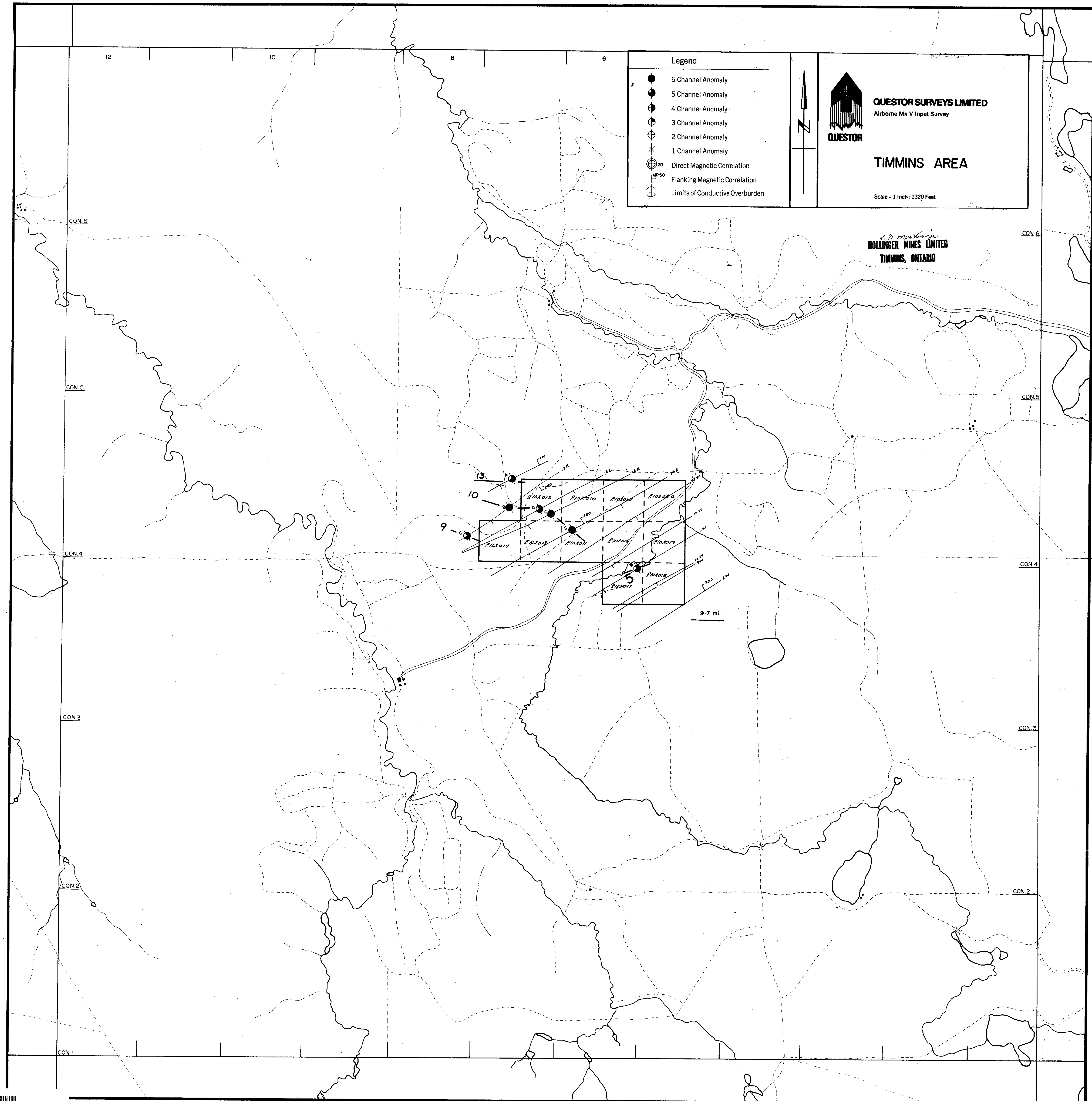
280

CARNEGIE

63.2797

44 A

63.2797



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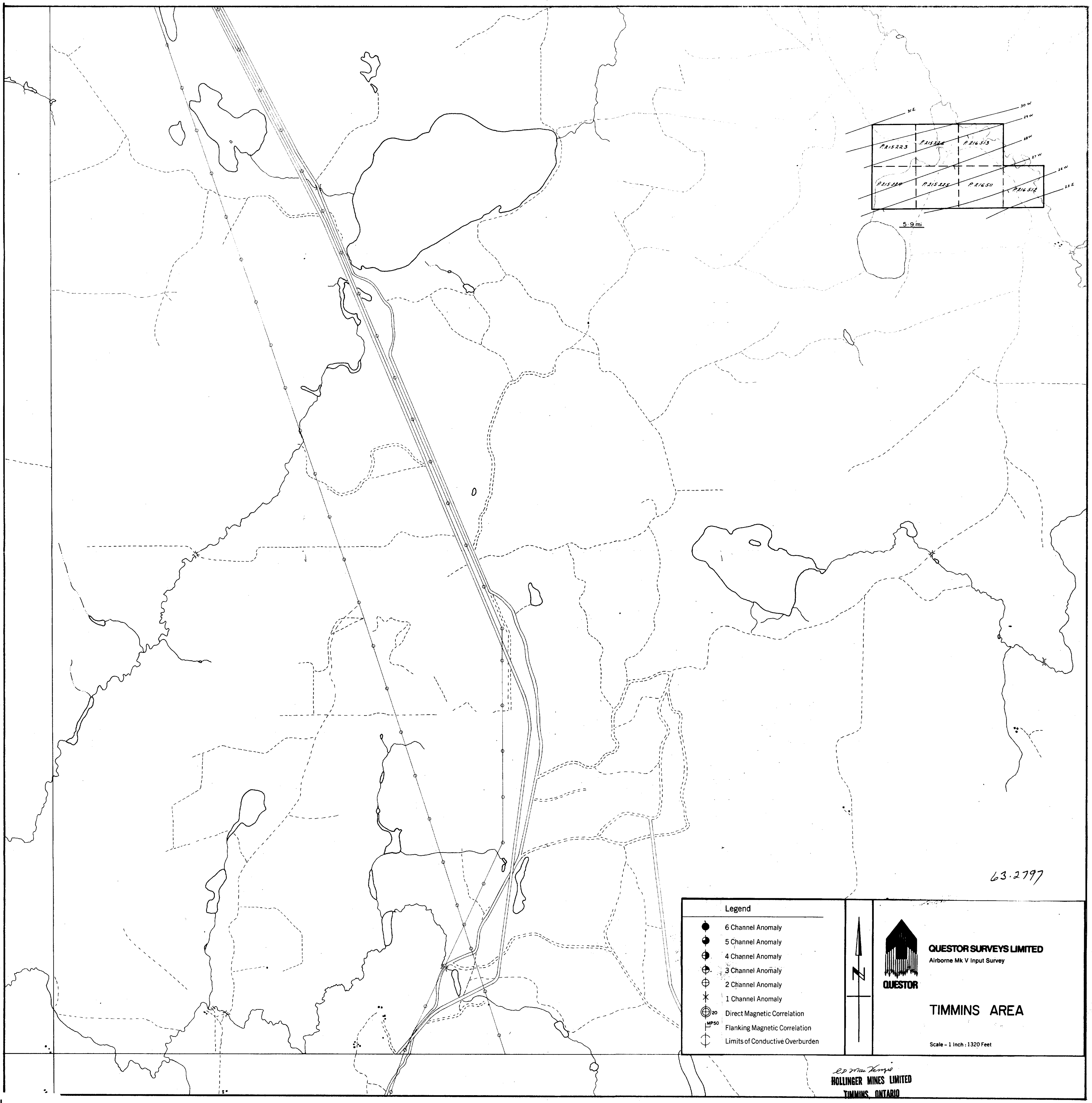
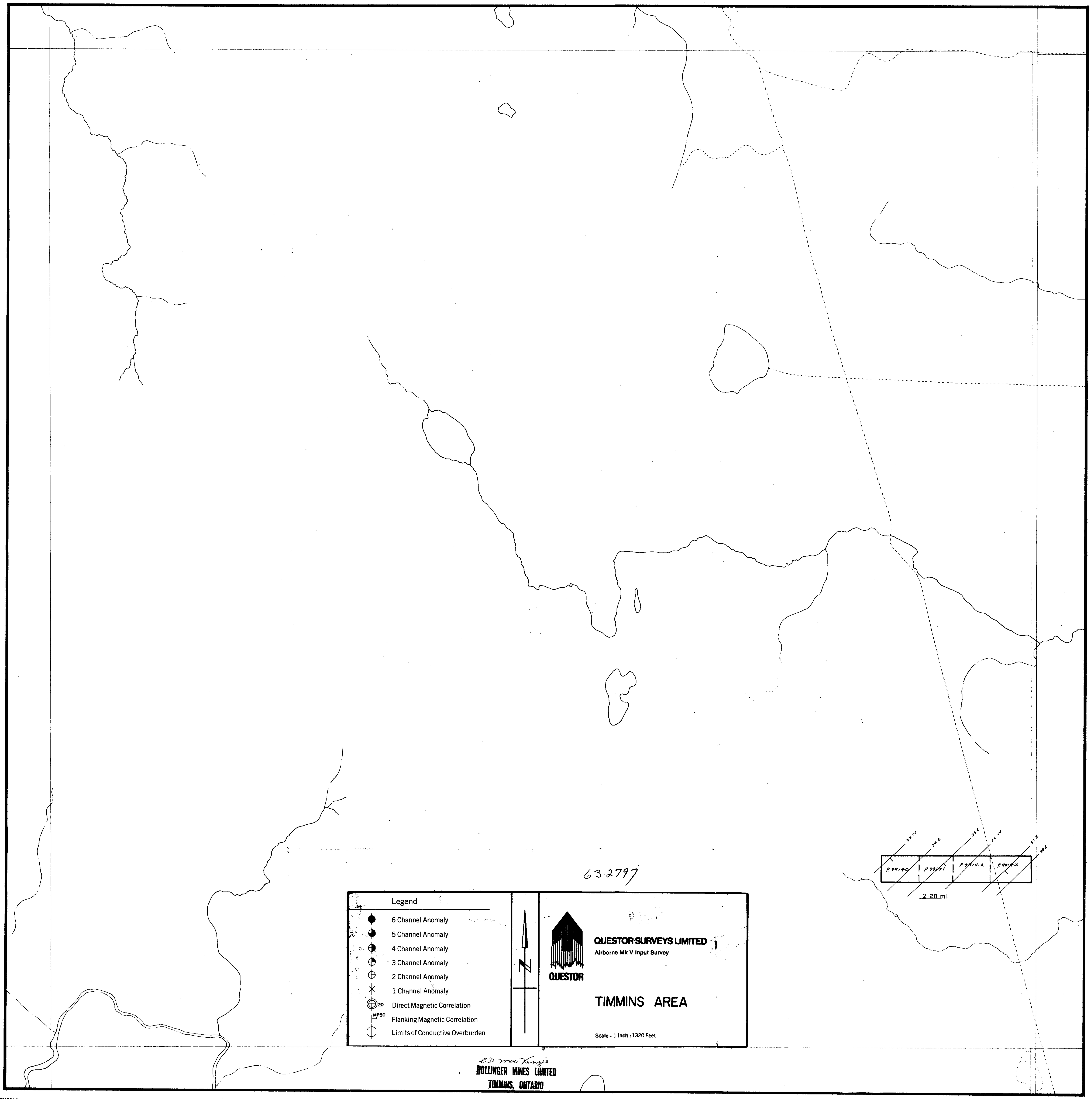
TULLY 44 D



42A14SE8552 63.2797 LOVELAND

300

MURPHY 44 C



42A14SE8552 63.2797 LOVELAND

310

THORBURN

44 A