



REPORT
AIRBORNE
ELECTROMAGNETIC AND MAGNETOMETER SURVEY

ON BEHALF OF
INTERNATIONAL MINE SERVICES LIMITED

FOR
PRADO EXPLORATIONS LTD.

IN THE
MARSH LAKE AREA, YUKON TERRITORY

Approved by **J. W. TINDALE, B.Sc.**
MARCH 1968
INTERNATIONAL MINE SERVICES LIMITED
TORONTO, ONTARIO

GEOLOGICAL SURVEY.
[Signature]
APR 3 1968
Resident Geologist
Whitehorse, Y. T.

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SUMMARY:

A helicopter-borne electromagnetic survey was conducted on behalf of International Mine Services Limited, in an area between 20 and 40 miles to the southeast of Whitehorse and situated northeast of Marsh Lake along the Alaska Highway. The area is underlain by volcanic rocks of uncertain age and by lower Mesozoic sediments. It was the purpose of the combined electromagnetic and magnetic survey to prospect for deposits of base metals.

Magnetic anomalies found during the survey indicate structural conditions which are quite different from the simplified geological map available for the area. A number of prominent magnetic anomalies strike either on an angle of 45° or under an angle of 90° to the presumed trend. A number of fault zones are indicated by the magnetic data. These fault zones might be of considerable interest for prospecting. Electrical anomalies were found in a fairly wide trend extending from Caribou Lake to the northwest. Where these anomalies were investigated on the ground, they were found to be caused by a wide zone of moderate electrical conductivity. Some graphite was found in this area and it was quite

likely that a graphitic zone is the cause of the anomaly. However, the graphite might occur in association with base metal mineralization and it is recommended to locate the remainder of the electrical anomalies on the ground and to conduct detailed geological investigations in order to determine their nature.

INTRODUCTION:

A combined electromagnetic and magnetometer survey was conducted by helicopter on an area of 120 square miles northeast of Marsh Lake in the Whitehorse area of the Yukon Territory.

The survey was conducted on behalf of International Mine Services Limited, of Toronto. The area was selected because of the similarity in the geology between the area of this survey and the location of several ore-bodies in the Whitehorse area.

LOCATION, ACCESS & PROPERTY:

The surveyed ground lies between 20 and 40 miles to the southeast of the town of Whitehorse in the Yukon Territory. The Alaska Highway cuts through the area, and, in fact, this highway has been used as a

base line for the survey operation. The availability of an all-weather road is an asset for further prospecting and would be a considerable asset should prospecting be successful. Whitehorse is connected by railroad with the Pacific Ocean and in spite of its northern location is well located as far as transportation of heavy goods is concerned.'

GENERAL GEOLOGY:

The geology of the Whitehorse area is reported on Map No. 1093A, Geology, Whitehorse, Yukon Territory, published by the Geological Survey of Canada. The area to the northeast of Marsh Lake which was covered by this survey, is underlain by volcanic rocks of uncertain age. These rocks are in part metamorphosed. They are followed by Jurassic rocks consisting of greywacke, arkose, argillites and related rocks. To the northeast, the Jurassic clastic rocks are underlain by similar Triassic rocks which do, however, include a certain amount of volcanic flows. According to Map 1093A, the Jurassic rocks appear to be intruded by granites in the particular area of this survey, while in general, granites intrude freely anyone of the Mesozoic rocks as well as the volcanics. A considerable part of the area

?

is covered by alluvial deposits which often mask contact zones. However, the general trend in the mapped area appears to be northwest-southeast, roughly parallel to the Alaska Highway.

One location of copper mineralization is shown within the surveyed area. Geological information can be gained also from Maps 1315G and 1340G of the Aeromagnetic Series of the Geological Survey of Canada.

INSTRUMENTATION AND PROCEDURES:

The survey was conducted with a helicopter-borne electromagnetic instrument developed by Sander Geophysics Limited. The instrument is described on a data sheet included with this report. The survey structure is suspended 65 feet below a helicopter and the helicopter is flown at an elevation that the survey structure is only a few feet from the top of the trees. This will mean, in general, a height of 120 feet from the ground. However, the country described by this report is very rugged and even a helicopter cannot follow the contours entirely. This is particularly true when flying sharply cut-in valleys or flying down a steep hill. On the present survey, the height of the instrumentation above the ground is estimated to have varied between 50 feet and 200 feet above the ground.

As often in mountainous terrain, the thickness of overburden varies considerably. The depth at which conducting zones can be detected by EM instruments depends very much on the size of the conducting body. A large conductor can be detected at a much greater depth than a small one. There is little doubt that in areas of deep overburden, the EM survey might have missed conducting zones, especially small ones. Depth of overburden is very hard to judge by inspection of the topography because of irregularities of the bedrock topography under the overburden which might create shallow locations within an area of deep overburden.

Line spacing during the survey was 1/8 of a mile. Control for the survey was unique. A major portion of the flight lines were flown perpendicular to the Alaska Highway which runs practically due Northeast ^W in the survey area. This prominent marker formed the western boundary of the survey area. The highway was chained and flagged at 1/8 mile intervals and a vehicle with a large helium filled red balloon was stationed at the flagged point to gain an accurate ^{the} ty point for each line. When the helicopter passed over the balloon the truck moved up the road to the next line. In addition

to this, the operator in the helicopter carried a photo mozaic of the area flown and traced the lines and noted anomalous readings as the lines were flown.

This method proved to be extremely accurate as borne out later by ground checks of anomalous readings.

RESULTS AND RECOMMENDATIONS:

The results of the survey are shown on two sheets indicating electromagnetic anomalies, six map sheets indicating variations of the magnetic field and one map giving the results of a ground electromagnetic survey conducted in order to check the most prominent ones of the airborne electromagnetic anomalies. The discussion of the results will deal with the magnetic survey first, because of the close relation between the geology of the area and the magnetic results. Electromagnetic results will be discussed in detail in the second portion of this section.

MAGNETOMETER SURVEY: MAP NO. 1:

The map sheets of the magnetometer survey are numbered from the northwest to the southeast. Map No. 1 covers the area of the M'Clintock River. A fairly

strong magnetic anomaly follows the M'Clintock River and appears to strike in the north-south direction, the same as the river. On the geological map, this area is shown to be covered by glacial deposits. However, the general strike within the volcanic series on either side of the river appears to be under a right angle to the river and to the magnetic anomalies. The direction of the magnetic anomalies comes somewhat as a surprise.

One electromagnetic anomaly is shown in the extreme north end of the map. The anomaly is adjacent to the river and lies probably in an area of very deep cover of overburden. It is recommended to check this anomaly on the ground.

MAP NO. 2:

Map No. 2 shows almost no magnetic variations. This map covers a broad valley which is largely covered by overburden, however, from the geological maps, it appears that most of the area is underlain either by andesites or by lower Jurassic sediments of the Laberge Group. A number of electrical anomalies are found on this map sheet. The anomalies appear to be located close to the contact zone between the volcanics and the Jurassic sediments.

MAP NO. 3:

A fairly prominent north-south trend is indicated on Map No. 3. The possibility of a fault or break in the north-east direction from the northern part of Caribou Lake is also indicated. This structure is suggested by the change in the magnetic trend in the northern portion of the map and also by the end of a fairly prominent trend of electrical anomalies lying to the southwest of Caribou Lake.

The north-south trend of the magnetic anomaly is fairly puzzling, as it does not conform with the general strike within either the volcanic series or the sediments. It might be worthwhile to determine the cause of this magnetic anomaly. The south of the map indicates the beginning of an extensive magnetic anomaly which, again, is not very well reflected in the geological map. It might be noticed that most of the areas which show strong magnetic relief are covered by glacial overburden, indicating the results of differential erosion.

MAP NO. 4:

A magnetic high extends from the west corner of the map to the centre where it disappears abruptly along a north-easterly trending line. This line appears

to represent a break which can be followed to the southwest on to Map No. 5. Referring to the G.S.C. map of the area, it should be noted that the magnetic anomaly is not conforming to stratigraphical changes. This might be either due to lack of detail in the geological map or to mineralogical changes which cut across stratigraphical boundaries. It is not uncommon that in the vicinity of intrusives, the iron content within the sediments appears as magnetite in certain zones and in non-magnetic form in others, depending on the proximity of the intrusives.

MAP NO. 5:

Map No. 5 shows an extensive magnetic trend following the Trans Canada Highway and the general strike of the volcanic formation in this area. However, to the south where there is considerably less magnetic variation, three magnetic highs are indicated to strike in the northeast direction, perpendicular to the general strike. The magnetic anomalies are very suggestive of dykes intruded in fault zones. The most prominent one lies in an area of extensive overburden and lines up with the south end of Marsh Lake. This trend seems to indicate a major structural break.

where the well is most!

MAP NO. 6:

Map No. 6 shows only very minor magnetic

variations. The major portion of this map is covered by a low trend.

SKETCH:

A small sketch is supplied with this report, indicating the location of major anomalies and major fault zones suggested by the aeromagnetic data. Some of these breaks are suggested by the topography. It is recommended to investigate these breaks and the magnetic anomalies. Structural conditions indicated by the fault zones should be important for the prospecting programme.

ELECTROMAGNETIC RESULTS:

The results of the electromagnetic survey are shown on two maps, designated as Central Sheet and Northwest sheet. No EM anomalies were found in the remainder of the area. On the EM maps, both the in-phase and out-of-phase response is indicated with each anomaly. The anomalies are fairly weak with the exception of a few anomalies which reach an in-phase response of approximately 100 PPM.

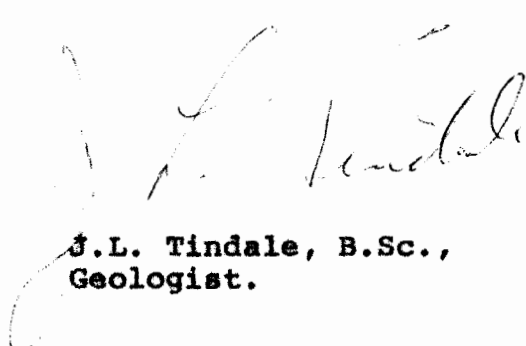
One trend is shown to the southwest of Caribou Lake. These anomalies were investigated on the ground shortly after the airborne geophysical survey was

conducted. The results of the ground work confirm the aerial electromagnetic anomaly. Anomalies on the ground are found to be not very strong, however, of considerable width. Some graphite was found in the vicinity of the anomalies and it appears to be quite likely that these anomalies are due to a graphitic zone. It is recommended to conduct a geological survey and to do some prospecting in the vicinity of this anomaly in order to determine its nature. A combination of sulphides and graphite might be the cause of the anomaly. A number of electrical anomalies which are not as distinct as the ones found south of Caribou Lake, but which appear to be somewhat of a similar nature were found on the northwest sheet. It is recommended to investigate these trends with ground geophysical work and if they are confirmed, to try to determine the cause of these anomalies by detail prospecting and geological surveying. It should be pointed out that some of the anomalies on the northwest sheet are of a very marginal nature. These anomalies are shown with a question mark.

It appears that the electrical anomalies form a trend parallel to the strike of the volcanics and sediments. They follow a general topographical low and extend over a considerable distance. They seem to

be associated with a horizon within the volcanic strata,
or possibly the contact zone between the volcanic strata
and the sediments.

March 11, 1968



J.L. Tindale, B.Sc.,
Geologist.

APPENDIX 'A'

The airborne electromagnetic and magnetometer survey is submitted for assessment on the following 153 claims. These claims are named and numbered as follows: -

OAK	1-120 incl.	12711 - 12830
PINE	26-27	20269 & 20292
	32-33	20271 & 20294
	38-39	20273 & 20296
	43-44	18889 & 20274
	47-48	18891 & 20276
	51-52	18893 & 20278
	55-56	18895 & 20280
	59-60	20214 & 18896
	64-65	20216 & 18898
	68-69	20217 & 20218
	73	20219
	80-81	18905 - 18906
	83-84	20378 & 20397
	86-87	20380 - 20381
	89-90	20133 - 20134
	92-93	20135 - 20136
	108-109	21006 - 21007

APPENDIX 'B'

Personnel of International Mine Services Ltd. and Sander Geophysics Ltd., directly associated with the survey, and expenses applicable to the assessment are as follows:

International Mine Services Ltd.:

(1601, 8 King Street East, Toronto 1, Ontario)

J.L. Tindale,	Geologist (July 1-10/67 & March 8-11/68)	\$	500.00
M.D. Kierans,	Geologist June 15 - July 15/67		500.00
E. Seagraves,	Draftsman, March 5-8/68		100.00
K. Morris,	Typist, March 5-7/68		100.00

Sander Geophysics Ltd.:

(1305 Richmond Road, Ottawa 14, Ontario)

<u>June 15 - July 15/67: -</u>			
George Sander,	Geophysicist		
Tibur Devenyi,	Electronic Engineer		
Ray Garbutt,	Geophysical Operator		
David Owen,	Geologist		
<u>August 10 - August 30/67: -</u>			
Connie Johnson,	Drafting		
Sally Brown,	Drafting		22,000.00
			<hr/>
			<u>\$23,000.00</u>



TECHNICAL DATA: EM AND MAGNETOMETER INSTRUMENT

Weight of towed structure:	80 lbs.
Weight of instrumentation and recording unit carried in the helicopter:	30 lbs.
A.P.N.1 Radio Altimeter:	30 lbs.
35 mm. Camera:	<u>10 lbs.</u>
	Total 150 lbs.

EM INSTRUMENT

Frequency:	1052 cycles per second
Coil separation:	23 ft.
Coils:	Vertical and co-axial
Measured unit:	Parts per million of the primary field, in-phase and out-of-phase component.

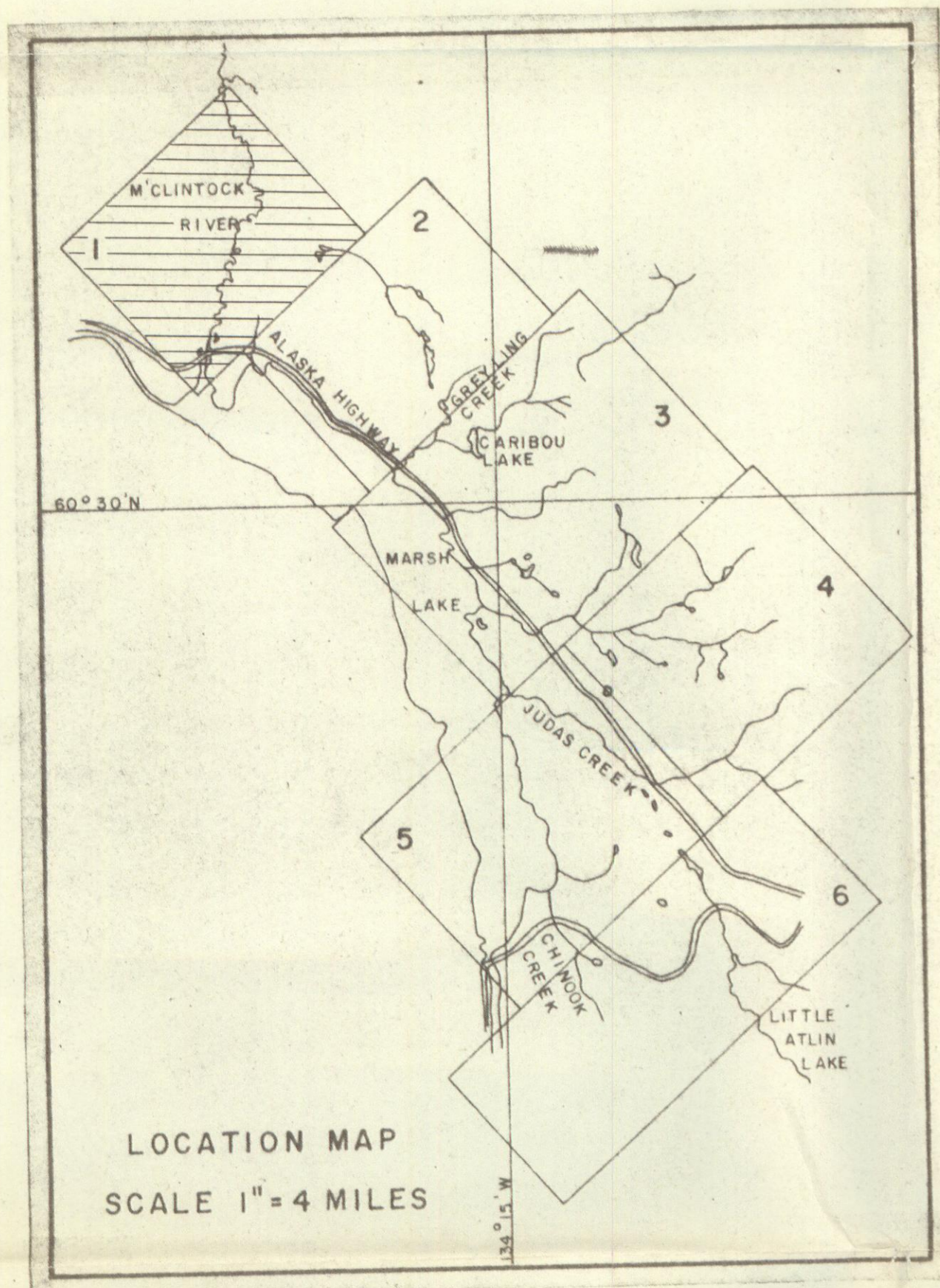
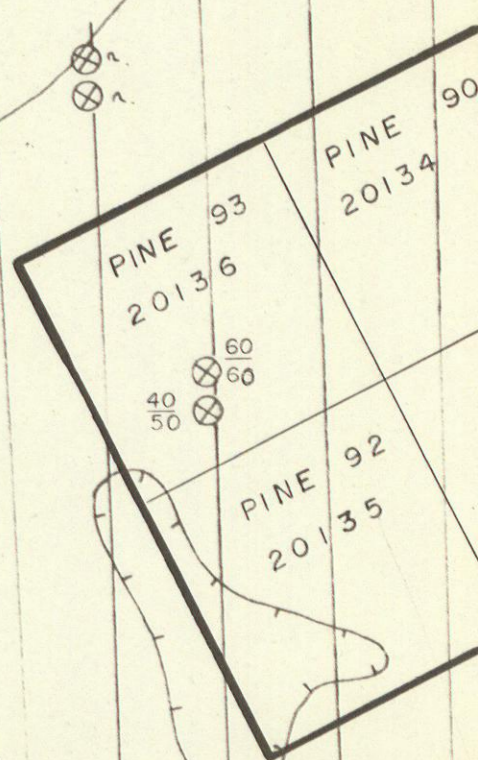
MAGNETOMETER

Type:	Nuclear Precession Magnetometer
Measuring interval:	1 second
Resolution:	±5 gammas
Stability:	Better than 1 gamma +40°C to -40°C.

RECORDER: 6 Trace Galvanometer Type.

Designation of traces:

1. EM in-phase
2. EM out-of-phase
3. Magnetometer 0-100 gammas
4. Magnetometer 100-1000 gammas
5. Magnetometer 1000-10,000 gammas
6. Radio Altimeter and fiducial marks.

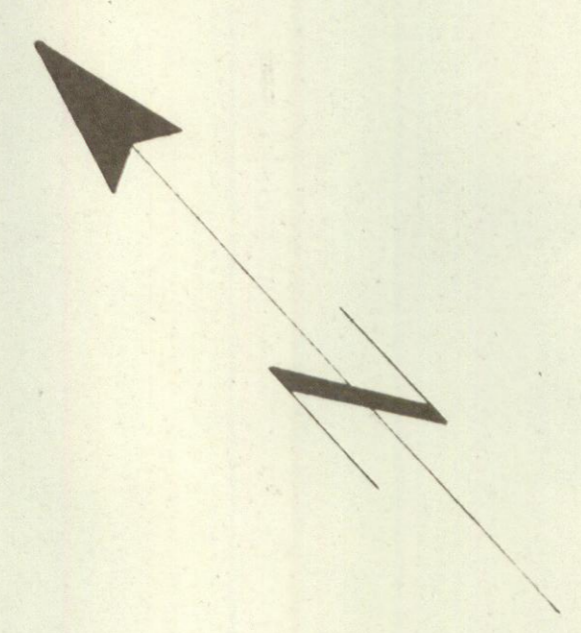


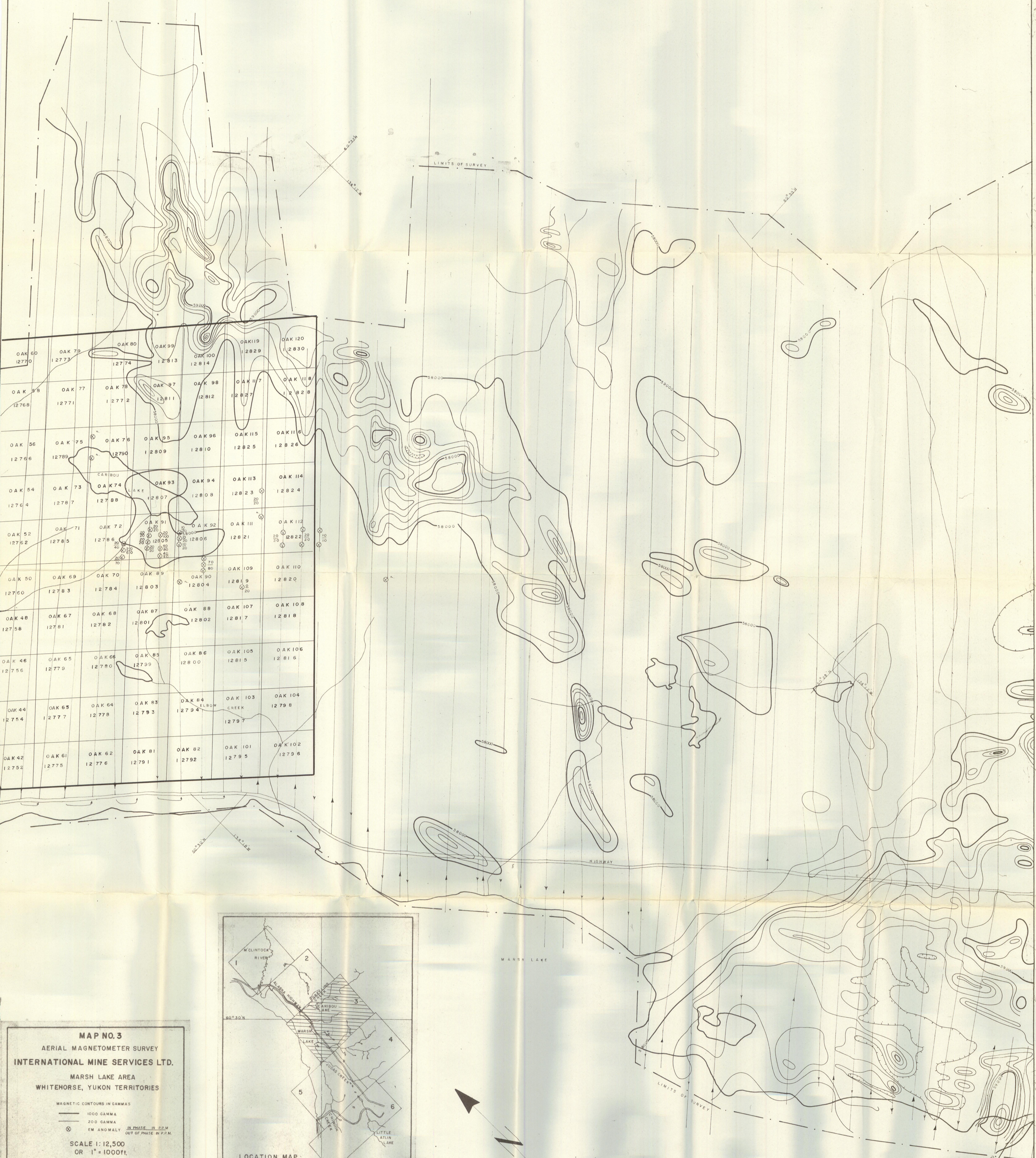
MAP NO. 1
AERIAL MAGNETOMETER SURVEY
INTERNATIONAL MINE SERVICES LTD.
 MARSH LAKE AREA
 WHITEHORSE, YUKON TERRITORIES

MAGNETIC CONTOURS IN GAMMAS
 ——— 1000 GAMMA
 ——— 200 GAMMA
 ⊗ EM ANOMALY IN-PHASE IN P.P.M.
 ○ EM ANOMALY OUT OF PHASE IN P.P.M.

SCALE 1: 12,500
 OR 1" = 1000ft.

OCT. 1967 SANDER GEOPHYSICS LTD.
 OTTAWA, ONTARIO.



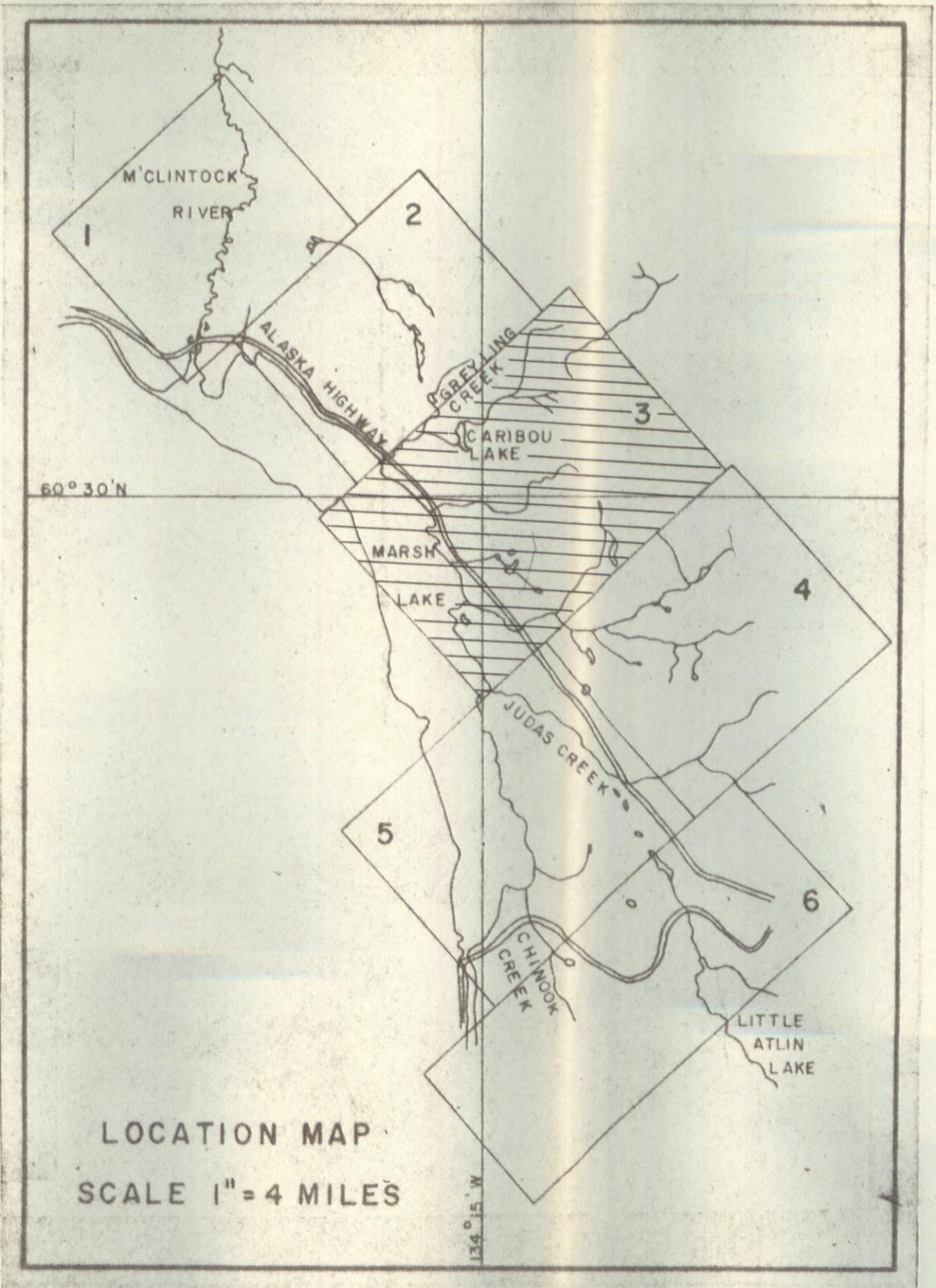


MAP NO. 3
 AERIAL MAGNETOMETER SURVEY
INTERNATIONAL MINE SERVICES LTD.
 MARSH LAKE AREA
 WHITEHORSE, YUKON TERRITORIES

MAGNETIC CONTOURS IN GAMMAS
 ——— 1000 GAMMA
 ——— 200 GAMMA
 ⊗ IN PHASE IN P.P.M.
 ⊙ OUT OF PHASE IN P.P.M.

SCALE 1:12,500
 OR 1" = 1000ft.

OCT. 1967 SANDER GEOPHYSICS LTD.
 OTTAWA, ONTARIO.

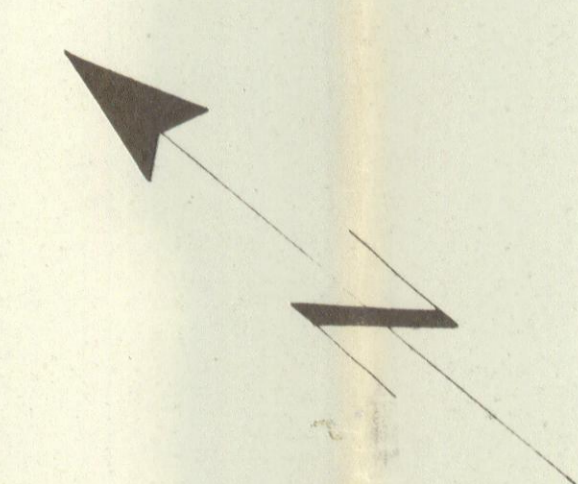
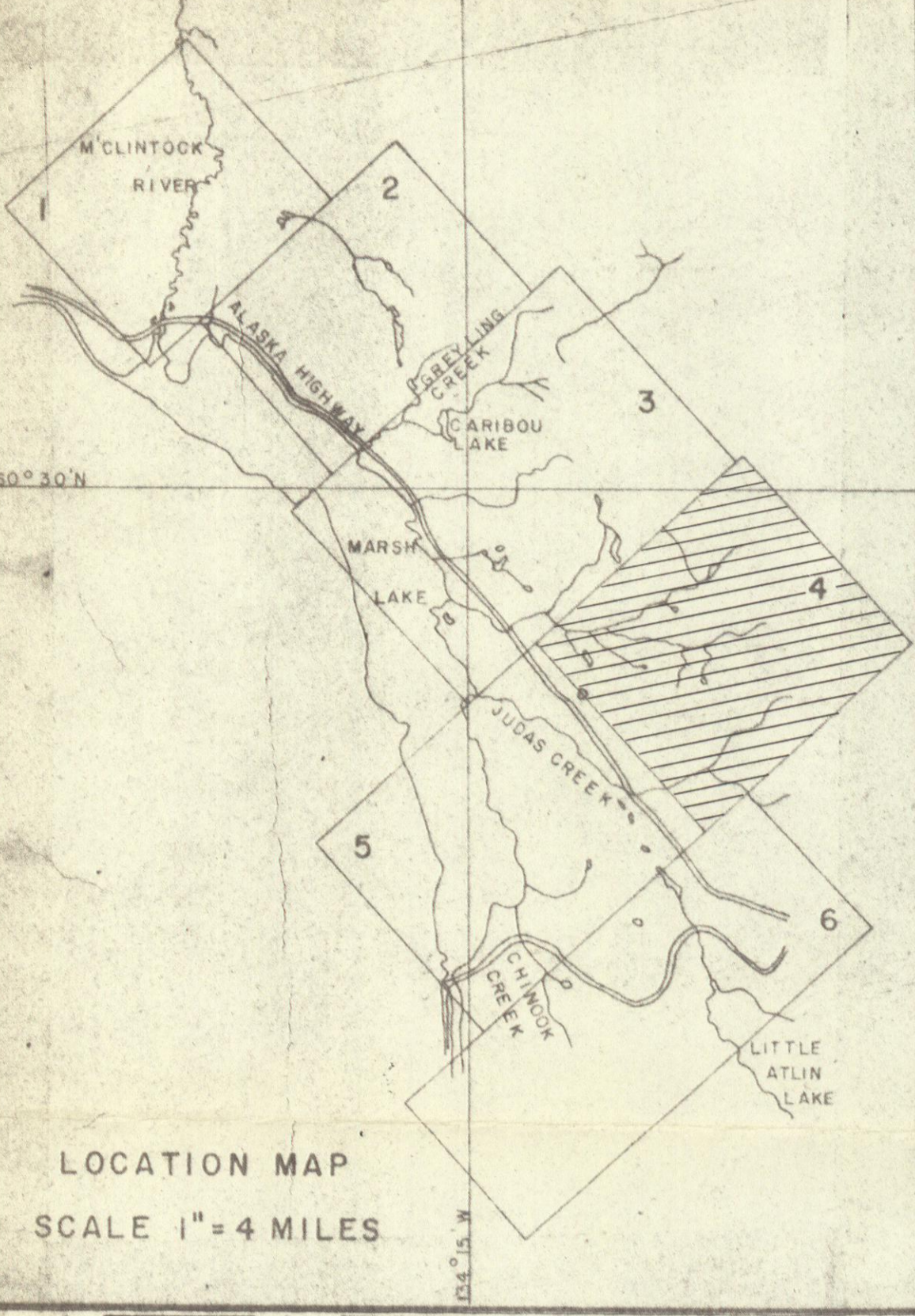


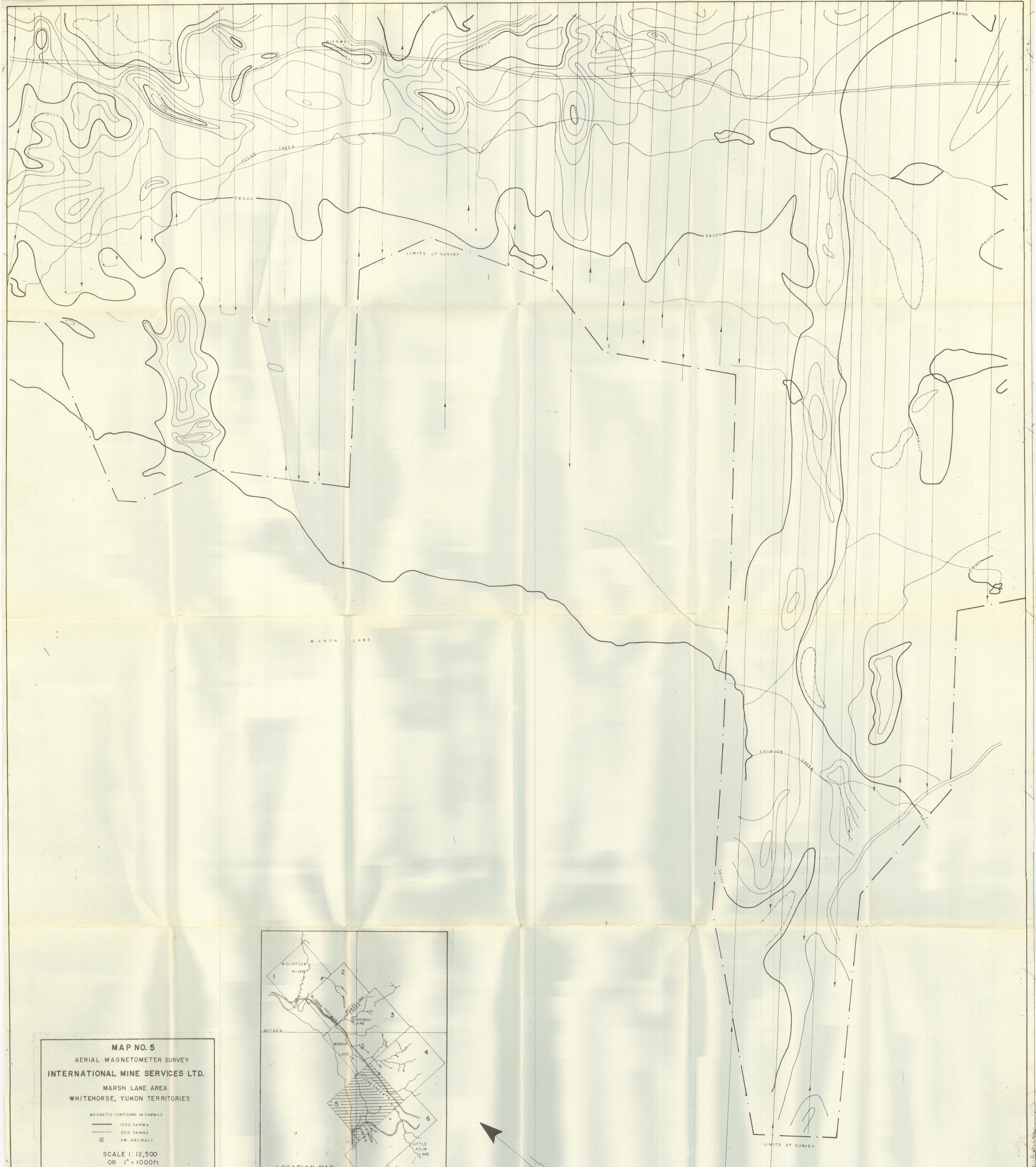
MAP NO. 4
 AERIAL MAGNETOMETER SURVEY
INTERNATIONAL MINE SERVICES LTD.
 MARSH LAKE AREA
 WHITEHORSE, YUKON TERRITORIES

MAGNETIC CONTOURS IN GAMMAS
 ——— 1000 GAMMA
 ——— 200 GAMMA
 ⊗ EM ANOMALY

SCALE 1" = 12,500
 OR 1" = 1000ft.

OCT. 1967 SANDER GEOPHYSICS LTD.
 OTTAWA, ONTARIO.



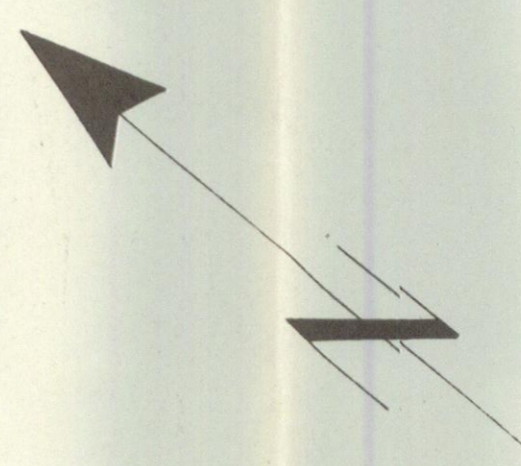
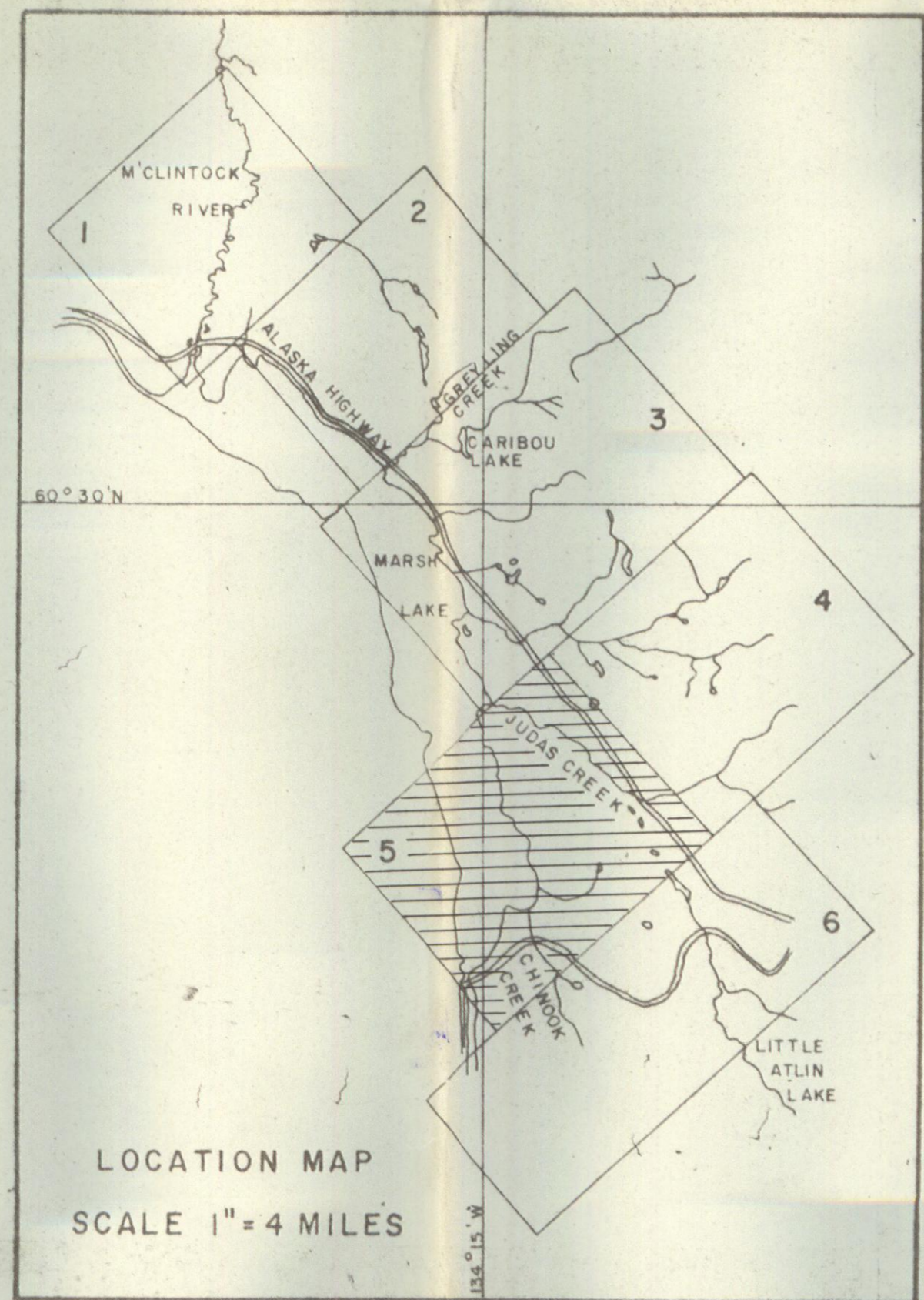


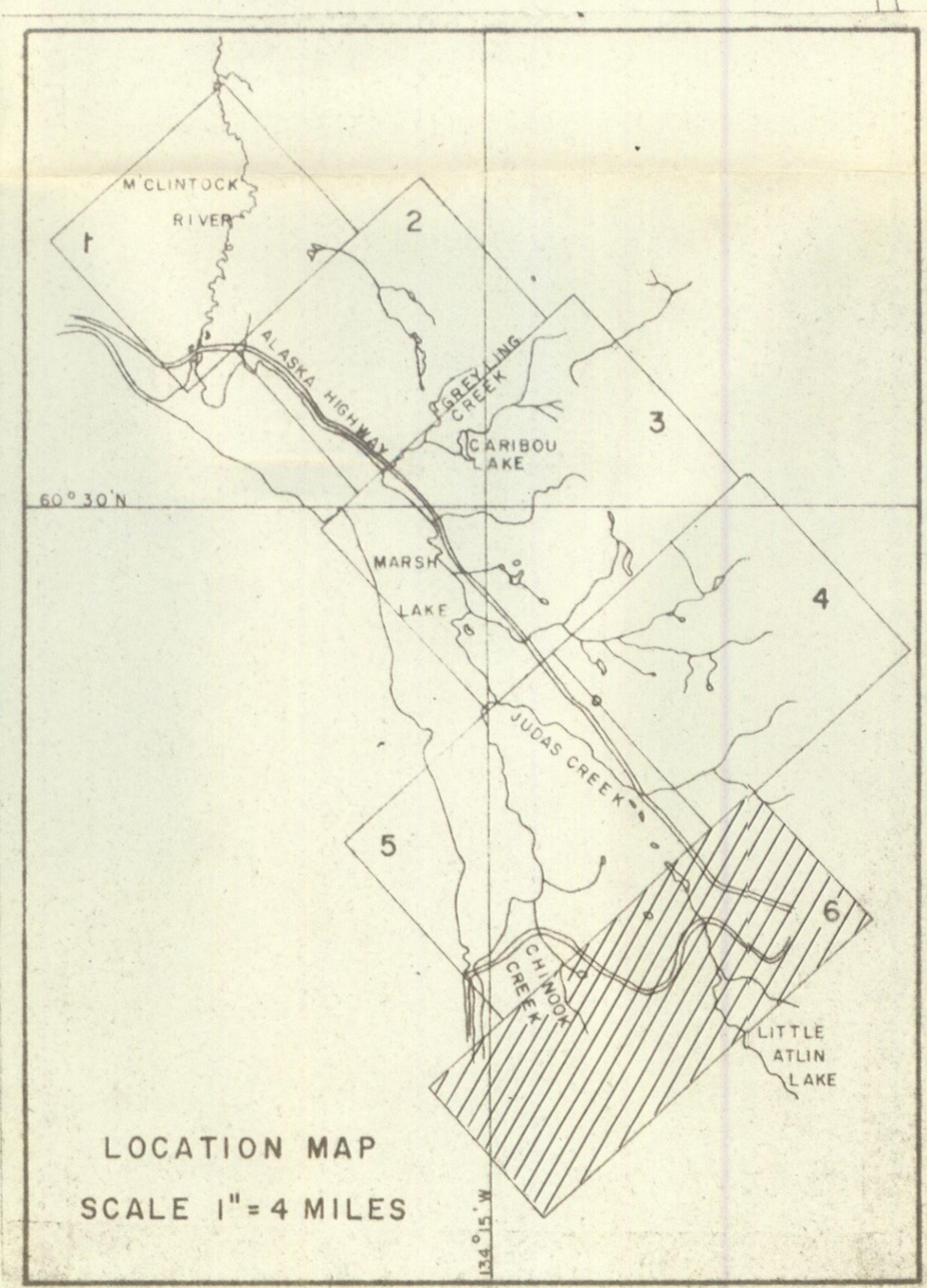
MAP NO. 5
 AERIAL MAGNETOMETER SURVEY
INTERNATIONAL MINE SERVICES LTD.
 MARSH LAKE AREA
 WHITEHORSE, YUKON TERRITORIES

MAGNETIC CONTOURS IN GAMMAS
 ——— 1000 GAMMA
 - - - 200 GAMMA
 ⊗ EM ANOMALY

SCALE 1" = 12,500
 OR 1" = 1000ft.

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 OTTAWA, ONTARIO.





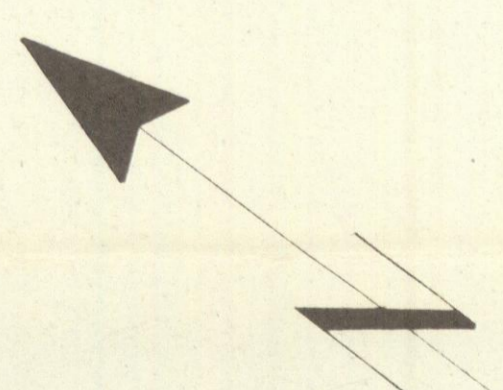
MAP NO. 6
 AERIAL MAGNETOMETER SURVEY
INTERNATIONAL MINE SERVICES LTD.
 MARSH LAKE AREA
 WHITEHORSE, YUKON TERRITORIES

MAGNETIC CONTOURS IN GAMMAS

	1000 GAMMA
	200 GAMMA
	EM. ANOMALY

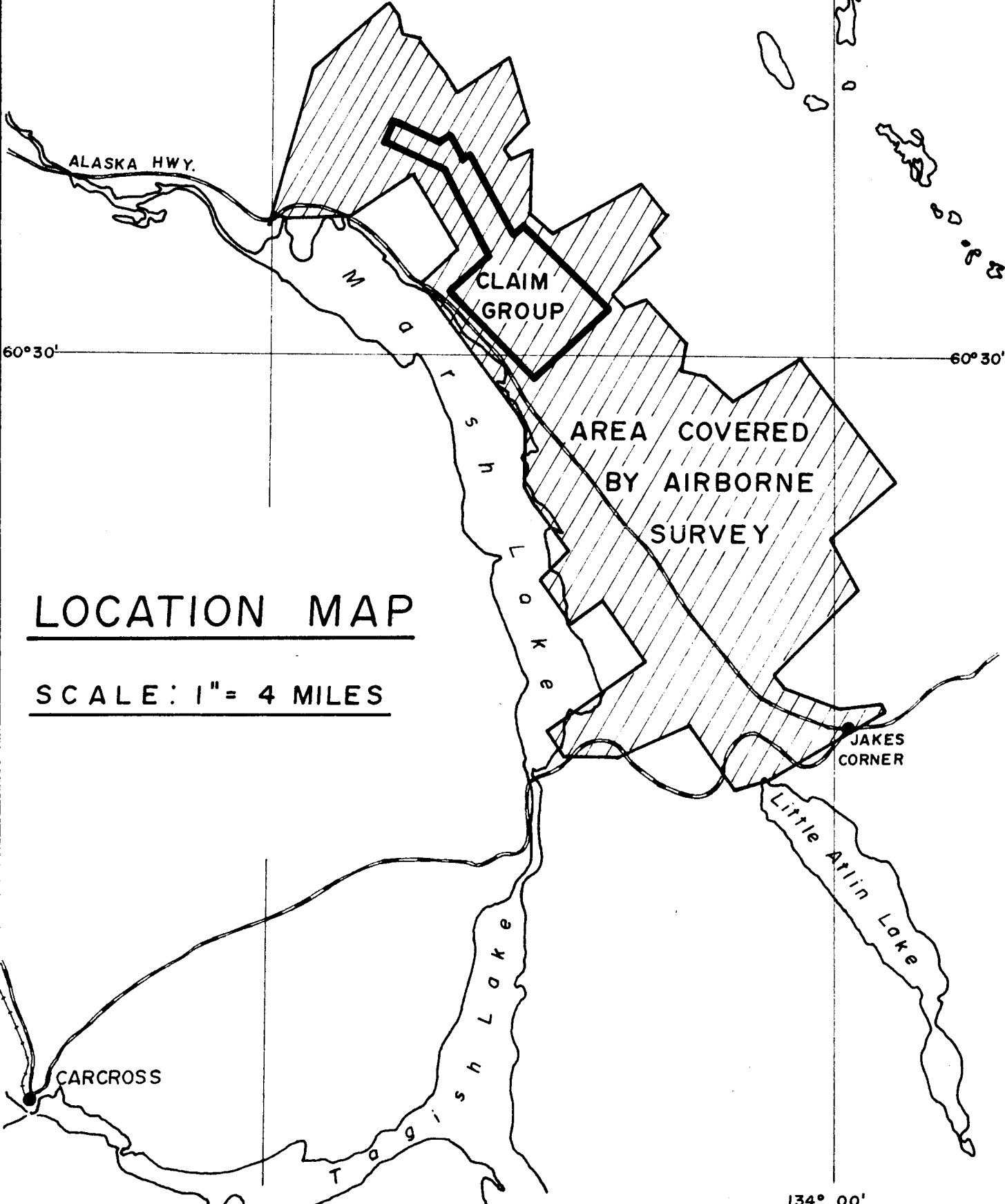
SCALE 1: 12,500
 OR 1" = 1000ft.

OCT. 1967 SANDER GEOPHYSICS LTD.
OTTAWA, ONTARIO.



134° 30'

134° 00'



ALASKA HWY.

CLAIM GROUP

AREA COVERED BY AIRBORNE SURVEY

LOCATION MAP

SCALE: 1" = 4 MILES

CARCROSS

JAKES CORNER

Fish Lake

Little Atlin Lake

T

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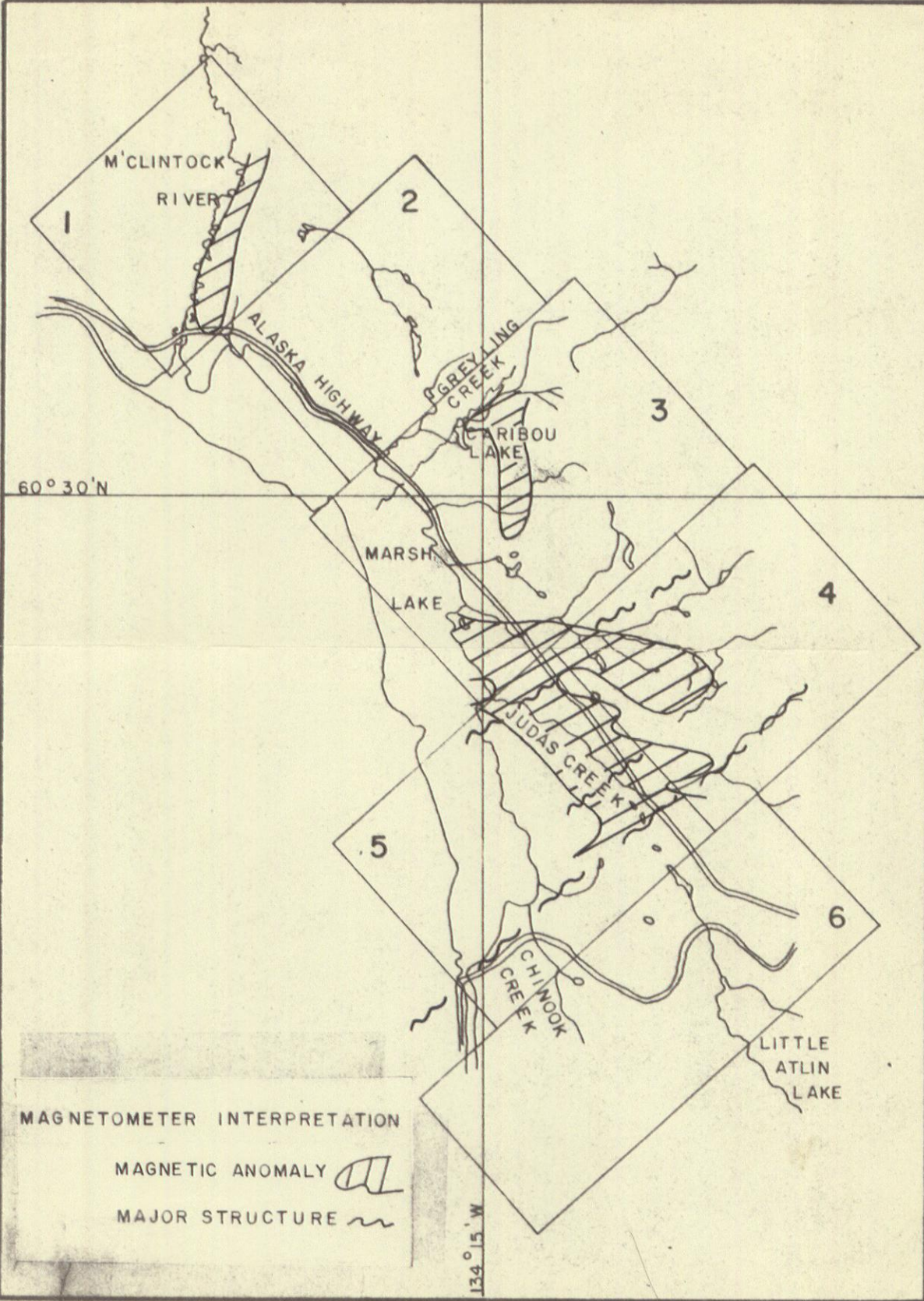
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134° 00'



M'CLINTOCK
RIVER

2

ALASKA HIGHWAY

GREYLING
CREEK

3

CARIBOU
LAKE

60° 30' N

MARSH
LAKE

4

JUDAS CREEK


5


6

CHINOEK
CREEK

LITTLE
ATLIN
LAKE

MAGNETOMETER INTERPRETATION

MAGNETIC ANOMALY 

MAJOR STRUCTURE 

134° 15' W