[redacted]RT on a MAGNETOMETER SURVEY o[redacted] GREEN LAKE ZONE OF IRON CITY MINES LTD. in PARKMAN Tp., NIPISSING co., Northeastern Ontario by

ALBERT HOPKINS, B.A.Sc., etc., Consulting Mining Engineer & Geologist

Introduction

An aeromagnetic survey map published by the Geological Survey of Canada ("G.S.C.") in 1965 (Ottertail Creek sheet No.1480G) showed a pair of strong magnetic peaks, hitherto unknown, near Green lake in Parkman tp., as part of the overall magnetic anomaly now held by Iron City Mines Ltd.

On seeing this new map, prospector Arnold Hardie, who already hald adjacent mining claims covering known Iron Formation ("I.F."), also staked this Green lake aerial anomaly. He optioned his whole iron prospect to Cessland Corp. of Toronto, which formed Iron City Mines Ltd. on approximately 200 contiguous mining claims to cover the known I.F. and the overburdened magnetic anomalies.

The present magnetometer ("mag.") survey was performed in two parts, (a) by Mr. R.S. Gray of Asarco Exploration Co. of Toronto in 1965 and (b) later extended by the writer, Albert Hopkins in 1965 and 1966.

Property

Although Iron City Mines Ltd. holds approximately 200 contiguous mining claims in Parkman & adjoining townships, the present "mag." survey covered only part or all of the following 19 contiguous mining claims in Parkman tp.:-

T.56531	T.56624	T.57272	T.60419, now L.104522
56532	56625	57274	60420, now 104521
		57276	60421, now 104523
		57277	60422, now 104524
		57278	60423, now open
		57279	60425, now 104525
		57280	60426, now 104526
		57281	

Property Ownership

The property is held beneficially (if not directly) by Iron City Mines Ltd. (Miner's License No.A.38419), 555 Burnhamthorpe Road, Etobicoke, Ont. President is Michael Murray.

Location

The mag. surveyed area lies in the south-central section of Parkman tp., 2½ miles due south of McLaren's Bay, Lake Timiskaming, Nipissing county, NE. Ontario. This is at 46°50'N. lat. & 79°17'W. long., or in National Topographic Series rectangle No. 31.L.14.(SE.¼), about 40 airmiles NE. of North Bay, Ontario.

Access

The surveyed area may be reached by car from North Bay, by driving about 35 miles NE. along paved highway No. 63 to a point two miles short of the hamlet of Eldee. At this point one drives N. by an Ontario. Dept. of Lands & Forests ("L.& F.") "Clarkson tp." acc

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access gravel road 25 miles, via McConnell lake, to the survey Base Line ("B.L.") which crosses the road about 2 miles short of McLaren's Bay. The wurveyed area is also traversed by a drillers' tractor road.

Topography, Timber, & Facilities

Apart from two outcrops near D.D.H.#7, the entire surveyed area is covered by Pleistocene glacial sand and gravel of considerable thickness, including moraines, kames, drumlins, and kettle holes. Thus the relief is sometimes over 200 feet, and the sand-gravel thickness from zero to perhaps 300 feet.

The surveyed area contains part of Green lake and its outlet, Green creek. Much of the rainfall and ground water percolates eastward through the sand and gravel to lake Timiskaming.

The area is well wooded with maple, jackpine, birch, poplar, spruce and balsam, with some oak, ash, cedar, and white pine.

The C.P.R. branch line to Angliers passes 4 miles E. of Green lake, in Quebec province. The O.N.R. main line passes through Diver station, 14 miles W. of Green lake. A high-tension electric power line, Ont. highway No. 11, and the trans-Canada natural gas pipeline, all pass about 26 miles W. of Green lake.

General Geology

Apart from the recent preliminary geological whiteprint "Tomiko Sheet" No.P.394 by the Ont. Dept. of Mines ("O.D.M.") late in 1967, this immediate area has never been mapped by federal or provincial geological surveys. Moreover, the area is mainly drift-covered, as mentioned above, and therefore very little is known of the bedrock surface. However, from the few rock outcrops plus the few successful diamond drill holes bored, the geology seems to be typical Grenville metamorphosed igneous and sedimentary rocks. Here we are about 15 miles SE. of the Grenville Front geo-thrust fault.

The rocks include, besides the Iron Formation, carbonate metasediments (mainly marble); Migmatitic and non-migmatitic quartzo-felspathic metasediments and orthoquartzite with intercalated layers of amphibolite and calc-silicate rocks; Biotite-quartz-plagioclase metasediments locally with intercalated layers of quartzo-felspathic metasediments and amphibolite; Massive and gneissic amphibolites of unknown origin (could include both ortho- and para-amphibolites), in places iron-rich and magnetic; and Migmatitic granitic rocks and granitic gneisses containing lens-like bodies and layers of massive granite.

Economic Geology

Known economic minerals of the area include gold, cobalt, copper, iron, kyanite, nickel, lead, sulphides of iron, talc, and vermiculite. Uranium has been discovered across lake Timiskaming at Hunter's Point, lake Kipawa, Quebec.

On the Iron City Mines Ltd. property, iron occurs mainly as an oxide (soluble magnetic iron) in highly metamorphosed Grenville metasediments, interbedded with ortho- and para-gneisses, in a large fold, several miles in length.

The Green lake section appears to represent a steep synclinal basin, pitching northward and outcropping under the sand oberburden at Green creek. The grades and widths found to date are on the low side for present-day iron ore requirements.

However, very few drill holes were successful in even reaching the bedrock, and more drillingis warranted. The excellent location of this iron property as regards its proximity to markets, suggests its possible importance for the future.

Magnetometer Instruments Used

(a) Mr. R.S. Gray used a Sharpe A-2 vertical force magnetometer, made by Sharpe Instruments Ltd. of 79 Martin Ross Av., Downsview, Ont. It is a Schmidt-type vertical intensity magnetometer designed for one-man operation, with a permanently-mounted compass. It is used to measure the variation in the vertical component of the magnetic field.

The instrument consists of a magnetic needle system precisely balanced on fused quartz knife-edges and bearings. The needle system is contained in an aluminium housing which supports the compass, the optical system, and two accurate level bubbles. A large knurled drum at the side of the the housing raises the needle system from the bearings and locks automatically. In its locked position the needle system is held against the blade springs, and during the reading the needle is quickly damped electro-magnetically.

A uniquely-designed lifter arrangement eliminates the danger of damaging the knife-edge as this allows the needle to come down rapidly within a fraction of an inch, and then lowers it very gently onto the quartz bearings. A safety catch prevents any accidental lowering of the needle.

Readings are taken by observing on the scale of the telescope system the image of one of the three standard indes lines (3 illuminated lines, 30 divisions apart), which are reflected by a mirror carried on the needle system as the illumination moves across the scale with the needle.

The difference between observations made at various stations is a measure of the difference in vertical magnetic intesities in these places. The scale is provided with 60 divisions, a deflection of one division having a value usually of 20 gammas, although the sensitivity of the instrument is adjustable from 10 gammas upwards.

The separation of the index lines is made equal to 30 scale divisions, and their purpose is to extend the range of observation when the main or centre index line has been deflected offscale. In this way, the total range of the scale is extended from -30 to plus 90, that is, 120 divisions.

The needle system is provided with adjustments for temperature and latitude. The instrument is compensated for temperature changes down to 0.2 gammas per degree centigrade, so that the effect of temperature variation is negligible.

The standard sensitivity of the instrument is 20 gammas. Its measurable intensity range is 13,000 gammas. There are also small, medium, and large auxiliary magnets used with this instrument.

(b) The writer, Albert Hopkins, used a Sharpe PMF-1 fluxgate magnetometer, also made by Sharpe Instruments Ltd. of Downsview, Ont. This is also a vertical component One-man magnetometer with transistorized circuitry and temperature compensation. It gives direct readings in gamma values and accurate zero setting at

base stations, and is especially useful for iron formation surveys.

It has a maximum sensitivity of 20 gammas (per scale division) on 1000 gamma range. It readability is to 5 gammas ($\frac{1}{4}$ scale division on 1000 gamma range), and its maximum range is plus or minum 100,000 gammas.

Extent of the Mag. Survey

A B.L. 11,500' long was cut at an azimuth of 145°. Normal to it, and varying in length, 140 Picket Lines ("P.L.'s") were cut and chained, usually at 200' intervals . The total line length was 82,800 feet or 14.75 miles. Magnetometer readings were taken at each 100' pocket, and in between where warranted. The total number of reading stations was 1030. As stated above, the survey covered parts or all of the 19 contiguous mining claims mentioned on page 1.

Aeromagnetic Survey

This was flown in 1959 and 1960 by the Geophysics Division of the G.S.C., Dept. of Mines & Technical Surveys, Ottawa, Canada, compiled by Aero Photos. Inc., and published in 1965 as the "Otter-tail Creek" sheet, map No. 1480G. The flight altitude was 1000' above the ground level.

The magnetic data on the aeromap were compiled from information recorded along the flight lines shown. The anomalies expressed by the magnetic contours are dependent on the variable magnetic intensities of the underlying rocks, and may be due to conditions near, or at unknown depths below the surface. High magnetic anomalies normally indicate the presence of basic rocks, such as diabase, gabbro, or serpentinite, which have a relatively high iron content; but in special instances may be due, or partly due, to concentrations of magnetic minerals, such as magnetite or pyrrhotite. By means of the magnetic anomalies, various rock bodies or structural features, such as faults or folds, may be traced into, or across, areas of few or no outcrops. In many instances, however, no interpretation of particular anomalies may be possible without further geological information.

The north Green lake air anomaly is circular, with a maximum intensity of over 6000 gammas. The subsequent ground mag. survey showed a SE-striking mag. zone, apparently dipping steeply to the vert.or NE., over 15000 long.

The south Green lake air anomaly is also circular, with a maximum intensity over 5500 gammas. The subsequent ground mag. survey whowed a somewhat elliptical magnetic anomaly about 2500' long NW-SE by 1250' NE-SW, with an apparent steep dip to the NE.

Purpose of the Ground Survey

This was to outline the I.F. and to guide the diamond drilling, in order to evaluate the economic possibilities, as outcrops are very scarce.

Geophysical Intrepretation

From the shape of the ground mag. anomalies and their profiles and intensities, and from subsequent diamond drilling, an asymmetrical synclinal basin is envisaged at Green lake. This would measure some 2500 feet long, with the two flanks outcropping under the sand overburden about 2500 feet apart. The synclinal

sin outcrops under the sand just NE. of Green creek, and pitches in a NW. direction. The I.F. is interbedded and infolded with Grenville para- and ortho-gneisses. The individual I.F. bands vary from 1 up to 50 feet in width. However the overall I.F. widths, including barren bands of gangue, waste, and inclusions, range from 100' to 550'. The trough bottom is probably some 2000' below surface.

Work Done to Date on the Survey Area (see attached maps)

Besides the present picket line grid and ground mag. survey, the only exploration work performed was a series of 10 attempted or completed diamond drill holes (mostly performed after this mag. survey) as follows:- Note:- "ob." means overburden. "oc." means outcrop.

Hole No.	Slope Length	Collar Co-ords. N. or S.	E. or W.	Dip	Strike	Claim No. T	Remarks
1	102'	6230'S	980'W	-45°S	202°	56532	S. flank. Abandoned in ob.
2	962'	6400'S	2105'W	45°N	55°	57276 & 56532	Ditto. Undercut IF.
3	103'	7120'S	1775'W	45°N	22°	57277	do. Abandoned in ob.
3A	862'	7075'S	1710'W	58°N	22°	57277 & 56625	do. Undercut the IF.
4	102'	6550'S	1025'W	80°S	195°	56625	do. Abandoned in ob.
4A	108'	6560'S	1025'W	75°S	195°	56625	do. Abandoned in ob.
V-1	996'	6800'S	1300'W	90°	-	56625	First "winner" in I.F.
V-2	1051'	6705'S	1080'W	90°	-	56625	Second "winner" in I.F.
V-3	786'	6400'S	950'W	90°	-	56532	Rods broke, temp'ly abndned
7	836'	4575'S	90'E	45°	205°	56531	N. flank, drilled from oc.
10	5908'	Totals					

Results of the Diamond Drilling

This diamond drilling showed substantial tonnages of magnetic I.F. averaging about 20% soluble Fe plus up to 3% Mn.

The North Green lake magnetic peak or flank anomaly was cut by only one D.D.H., #7, which intersected 149' of magnetic I.F. of which 100' averaged 20.8% soluble iron plus 3% to 4% manganese. The magnetic survey indicates that this north flank has a length of 1500', which would make about 19,500 tons per vertical foot. Therefore down to 200' open pit depth there should be about 4,000,000 tons of I.F., about 2/3 of which would average about 20% Fe plus 3% Mn.

The South Green lake magnetic peak or flank anomaly was successfully cut by only 2 D.D.H.'s, Nos. V-1 and V-2. Hole V-3 is believed to have been almost to the Hanging Wall of the Banded I.F. ("B.I.F.") when the bit stuck in the hole, and it and 300' of rods were lost in the hole. This hole should be wedged, the rods bypassed and the hole deepened, or a parallel new hole drilled nearby.

Hole V-1 intersected 290' of I.F. out of 615', or an average of 47.2% I.F. (52.8% waste or gangue). This is 1 part of I.F. to 1.12 parts of waste, most of which could in a production operation be separated from the I.F. (the coarse or wide bands in the open pit, the balance in the magnetic separator). The I.F. averaged 26.8% soluble Fe.

Hole V-2 intersected 167' of I.F. out of 674.5', or an average of 26% I.F. and 74% waste. This is 1 part of I.F. to 2.85

orts of waste. The I.F. assayed 21.4% combined soluble Fe & Mn. No average grade or tonnage estimate can yet be made for this South flank zone, but it should be much greater than the North zone.

A 300-lb. composite sample of all the Green lake I.F. drill core samples was sent to the Mines Branch laboratory of the federal Dept. of Mines & Technical Surveys, Ottawa for investigation. It reported that the sample assayed 31.9% total iron and 23.5% soluble (magnetic) iron.

It is obvious that insufficient drilling has been done on these Green lake zones to properly evaluate the widths, tonnages, and grade of the B.I.F. The reasons for the drilling being so costly and being temporarily suspended are:-

(a) The drilling was done under exceptionally hard winter conditions, with poor access from the highway due to deep snow and no side roads at that time.
(b) The deep sand overburden caused our early angle holes to fail. Even the vertical holes are difficult and costly.
(c) The company became short of funds.

Summary & Conclusions

1. The Green lake aerial magnetic anomalies are intense and overburdened.

2. Ground geophysics indicates a large synclinal basin with a peripheral Iron Formation of possible economic importance as iron ore. The ground survey is incomplete, from Green lake westward and northward through claims Nos. T.57272, T.57269, and L.104521, to Webb lake.

3. Glacial oberburden is widespread, and is composed mainly of sand and gravel esker, kame, and moraine material. It varies from 0 to 300 feet in depth. Surface water percolates through the sand, and emerges as springs feeding into Green lake and Green creek. These never completely freeze over in winter. The deep overburden makes angle drill holes difficult, if not impossible.

4. Diamond drilling to date totalled 5908 feet in 10 holes, of which only 3 holes were successful (Nos. V-1 and V-2), or partially successful (No.7).

5. The Mines Branch of Ottawa reports 31.9% total iron or 23.5% soluble (magnetic) iron, with no deleterious constituents, from a composite sample of all Green lake I.F. diamond drill intersections. The difference between the total and soluble iron is made up of iron silicates such as hornblende, biotite, etc. This latter iron is, of course, not recoverable.

6. The deep sand and gravel overburden, percolating ground water, relatively low iron content, and in places narrow widths are all unfavourable factors for a large-tonnage, open-pit iron ore mining operation. However, against these may be weighed the following favourable factors:- excellent location as to markets, close railway transportation, electric power, natural gas pipeline, labour, and the other Iron City iron deposits nearby.

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- Further work in the form of drilling is warranted, to determine the approximate average recoverable iron content, mining widths, and open pit tonnages available.

Recommendations

It is recommended by the writer that:-

1. The picket line grid and magnetometer survey be extended from Green lake to Webb lake, NW. through claims Nos. T.57272, T.57269, L.104521. This would entail about 10 line-miles, and would cost about $1000.

2. In future in this deep oberburden, only vertical drill holes be attempted. Hole V-3 should be wedged, bypassed and deepened, or duplicated, proposed 2300' hole No. V-4 be drilled, and at least one more vertical hole, call it V-5, be drilled. This should be 1000' deep at 500'W., 4400'S. Total cost probably about $25,000.

3. Extensive concentration, recovery, and feasibility tests be done on bulk samples by a steel company, Lakefield Research Ltd., or a university specializing in such things, e.g. University of Minnesota. Cost would be up to $10,00000

GEOLOGICAL ASSOCIATION OF CANADA
Albert Hopkins
FELLOW

All of which is respectfully submitted,

Albert Hopkins

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Consulting Mining Engineer & Geologist.

Toronto, Canada.
9 December 1968

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PMF-3

PROSPECTORS FLUXGATE MAGNETOMETER

This field magnetometer is designed to fill the needs of the prospector and geologist in a lightweight, low cost instrument. Accuracy and speed, the prime requirements of ground surveys, are easily achieved and unmatched by any other instruments of comparable cost.

The fully transistorized, solid state circuitry and the absence of mechanical moving parts, means trouble-free operation regardless of climatic conditions.

The first-in-line relationship with the famed MF-1 Fluxgate Magnetometer is obvious — taking the operating procedure as one example:

There is only one switch which in sequence checks the battery voltage and allows a selection of gamma ranges — one control permitting the proper latitude setting required at the start of the survey — and finally the meter indicating instantaneous direct gamma values.

S P E C I F I C A T I O N S

MAXIMUM SENSITIVITY: 100 gammas (per scale division) on 3000 gamma range

READABILITY: 50 gammas (½ scale division) on 3000 gamma range

RANGES: (ZERO CENTRE) ± 3,000 gammas, ± 10,000 gammas, ± 30,000 gammas, ± 100,000 gammas,

MAXIMUM RANGE: ± 300,000 gammas

LATITUDE ADJUSTMENT RANGES: 15,000 to 75,000 gammas Northern hemisphere convertible to 15,000 to 75,000 gammas Southern hemisphere

DIMENSIONS: 5" x 4" x 9"

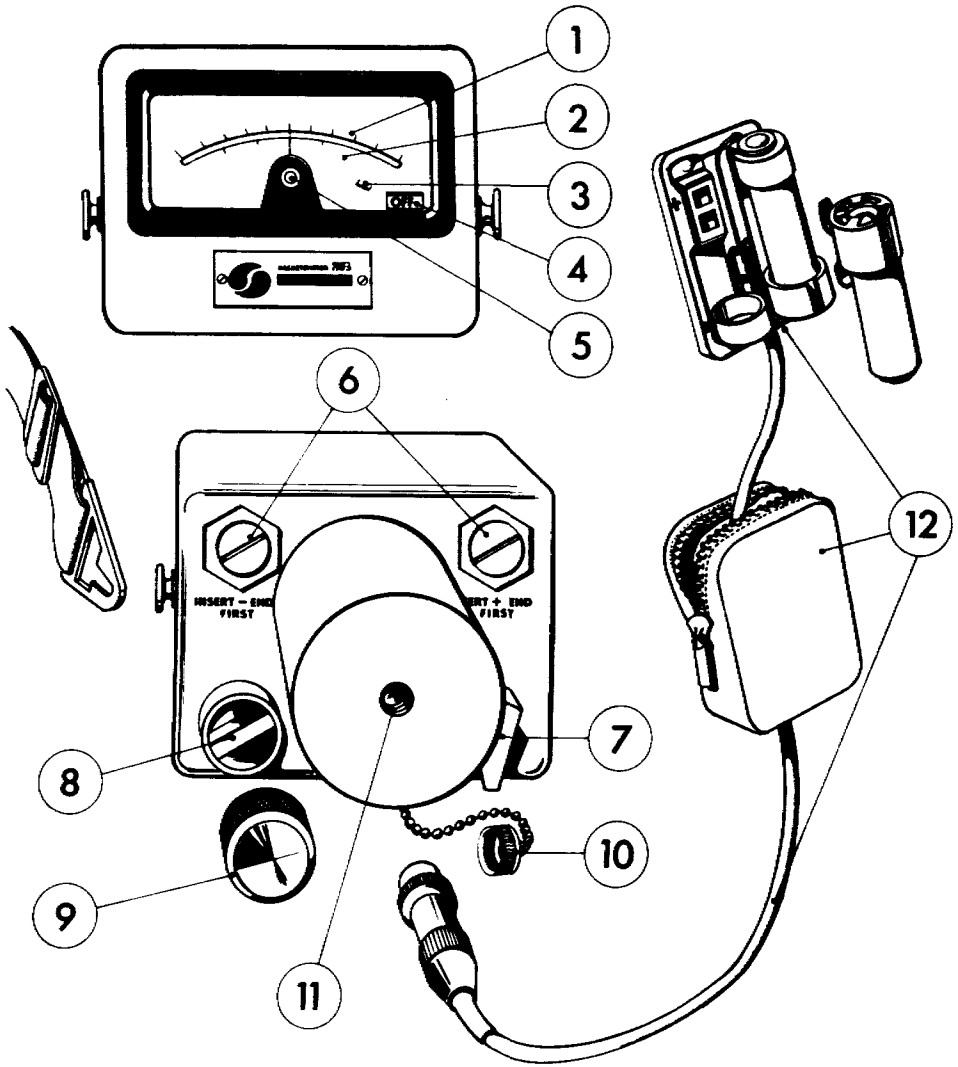
WEIGHT: [illegible] lbs.

BATTERIES: [illegible] Mercury Cell Batteries, Eveready #E12N 1.35V

METER: [illegible] band suspension, zero centre scale

ACCESSORIES: [illegible] battery case for winter use, Unipod for easier levelling of instrument, [illegible] shipping container, sturdy aluminum construction with molded foam inserts.

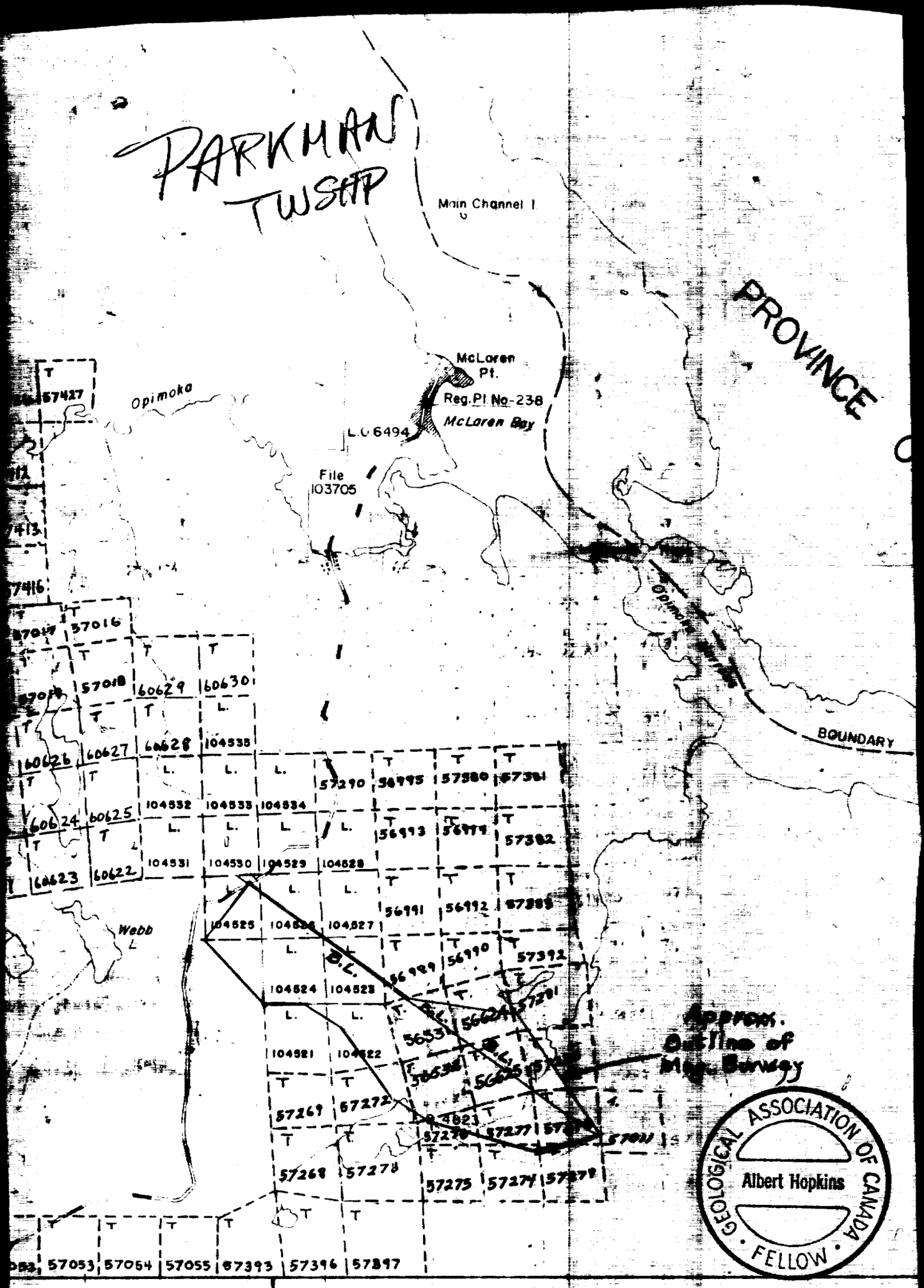
DESCRIPTION OF SHARPE MODEL PM[illegible]-3 FLUXGATE MAGNETOMET[illegible]



1. UPPER SCALE
2. LOWER SCALE
3. RED ARC for battery check
4. WINDOW
5. LEVEL
6. BATTERY RECEPTACLE
7. SWITCH
8. LATITUDE CONTROL
9. PROTECTION CAP
10. CONNECTOR COVER for external battery pack
11. SOCKET for unipod
12. EXTERNAL BATTERY PACK

[illegible] INSTRUMENTS OF CANA[illegible]ITED
[illegible] MELVIN ROSS AVE., P.O. BOX [illegible]
DOWNSVIEW [illegible] ONTARIO

PRINTED IN CANADA


PARKMAN TWSHP
Main Channel
PROVINCE
McLaren Pt.
Reg. Pl No-238
McLaren Bay
L.O. 6494
File 103705
Opimoka
BOUNDARY
Webb L.
Approx. Outline of Mag. Survey
GEOLOGICAL ASSOCIATION OF CANADA
Albert Hopkins
FELLOW
5 M
6 M
1 M
2 M
Wyse Twp
2D10407

31·L·14

A. Hopkins

Sept. '68

Magnetic Survey and Drilling

GREEN LAKE IRON ZONES

IRON CITY MINES LTD.

Parkman Tp., Timiskaming Mg. Div.
Ontario

Readings by R.S. Gray & A. Hopkins

Scale: 1" = 200'

Readings in 1,000 Gamma Units

15th Nov. 1965 725 Readings A. Hopkins
revised May 1966,
1. Nov. '67

DRAWING No. 65-10

63·2400

Legend

- 5,000 to 10,000 gammas
- 10,000 to 20,000 gammas
- 20,000 to 40,000 gammas
- over 40,000 gammas
- Pond
- Claim Corner
- Stream
- Negative Mag. depression
- Diamond Drill Hole
- Diorite in Core
- Iron Ore in Core
- Drill Hole Casing

T. 60420

T. 60421

T. 60419

T. 57272

T. 56531

T. 56532

T. 56625

T. 57276

T. 57277

T. 57278

T. 57279

T. 57280

T. 57281

T. 56624

T. 56625

Proposed D.D.H. No 7 - Str. 205°, dip 45° length 840 Collar 4475'S., 90'E.

Outcrop: Barren Granite Gneiss

D.D.H. No 1 abandoned Str. 20° dip 45° length 102' (Gravel) Collar 6230'S. 980'W.

D.D.H. No 2 Str. 55° dip 45° length 962' Collar 64S. 21W. Co-ords approx. same as Green Lake

D.D.H. No 3 & HOLE 3A Dip 86° @ 58° Azim 22° Dip 45° 1775'S. from island abandoned

Tractor Road to Main Road 1 mile

Green Lake

Pump House

ROAD

TRACTOR ROAD

Pond

Pond

ISLAND

Green Creek

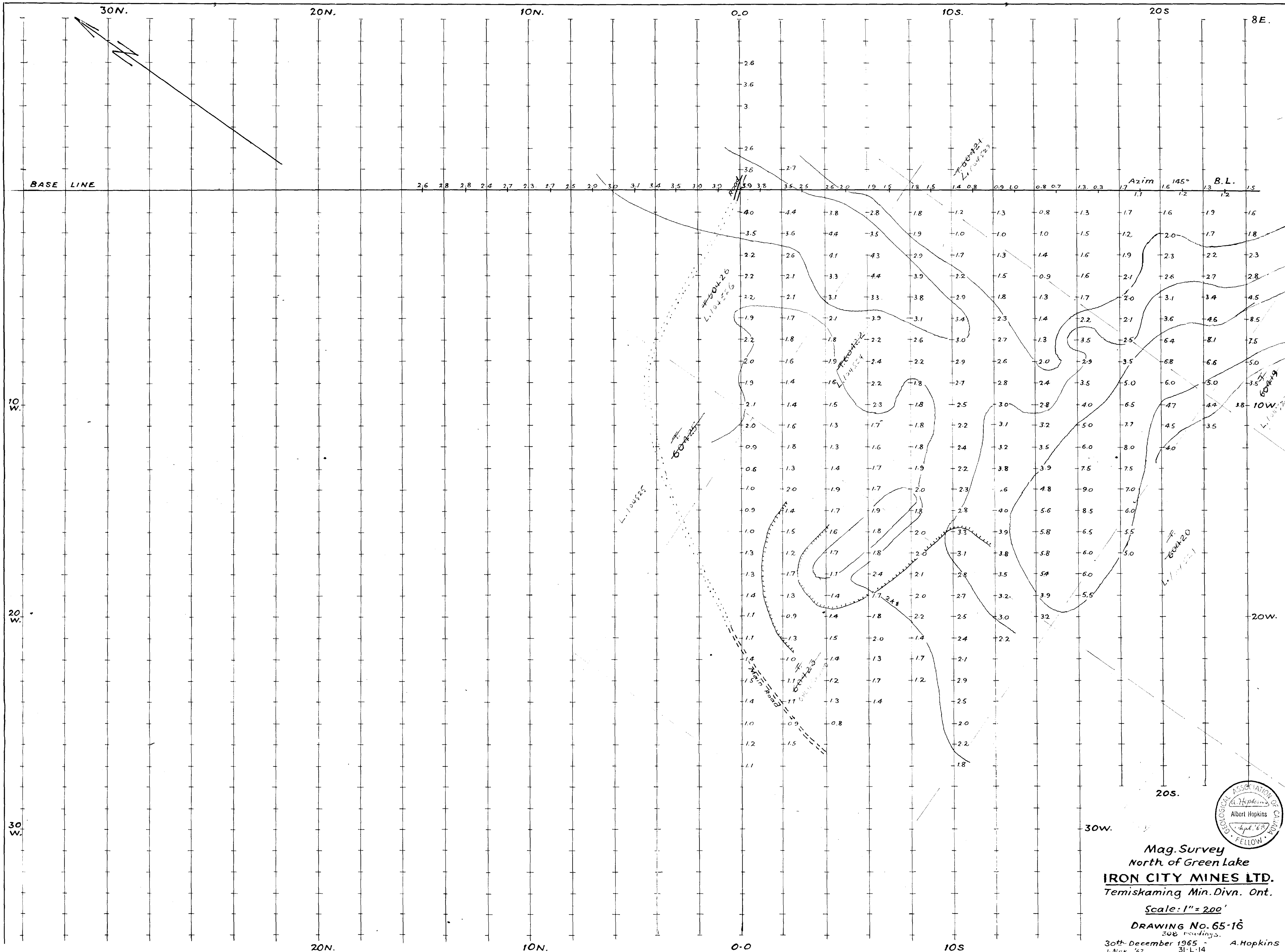
Moose pasture

thin dangerous ice

Baseline 145°

22.00S. 24+00S. 28+00S. 32+00S. 36+00S. 38+00S. 40+00S. 44+00S. 48+00S. 52+00S. 56+00S. 60+00S. 64S. 68S. 72S. 76S. 80S. 84S. 86S. 88S. 90S. 92S. 94S. 96S. 98S. 100S.

10W. 5W. 5E. 10E. 15E. 20W. 24W. 15W.



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