CANADA

DEPARTMENT OF MINES

AND

TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

PAPER 44-21

HEMATITE DEPOSITS,

HINCKS TOWNSHIP, GATINEAU COUNTY,

QUEBEC

By

T. L. Tanton

OTTAWA

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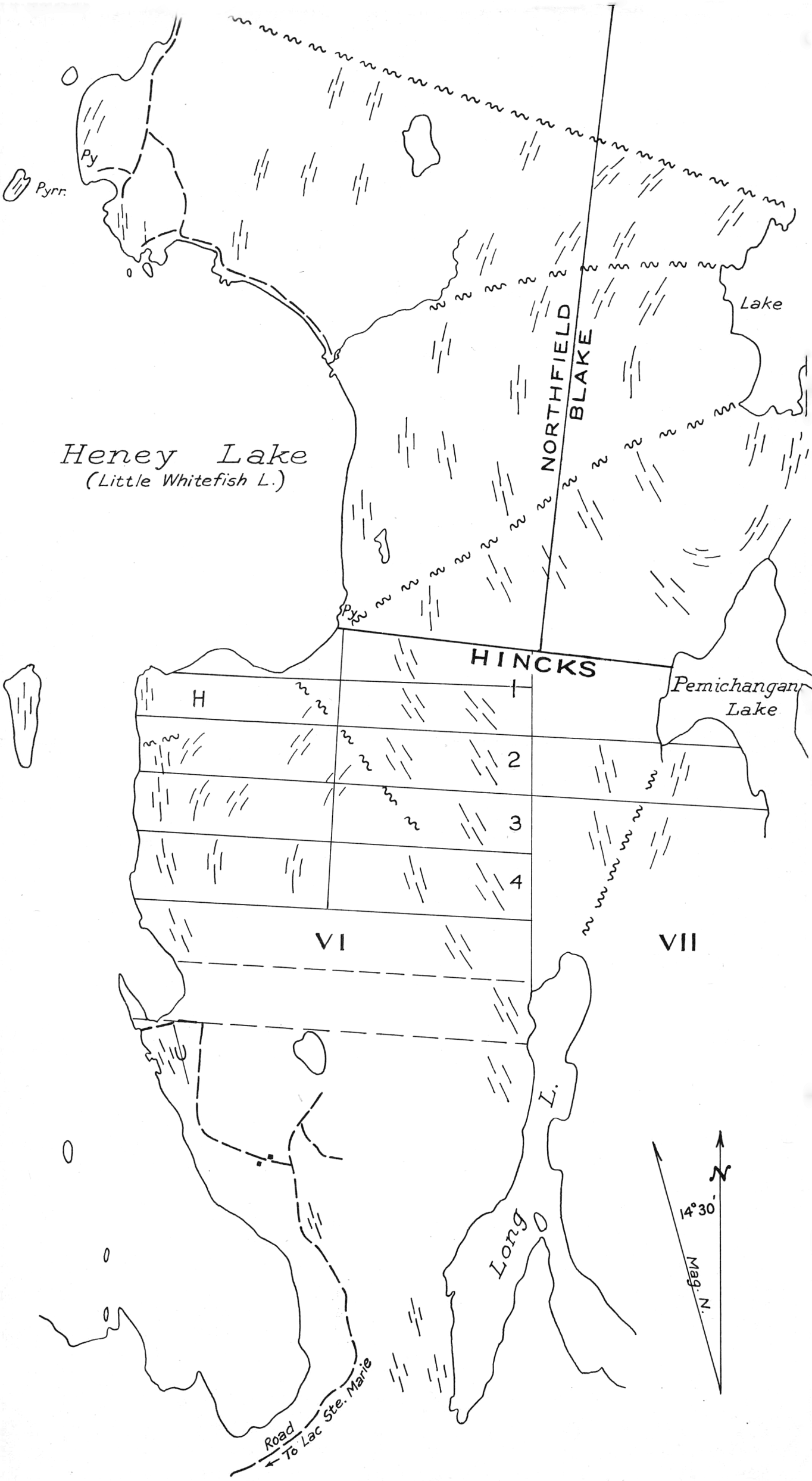


Figure 1: Sketch Map of parts of HINCKS, NORTHFIELD and BLAKE TOWNSHIPS, GATINEAU COUNTY, QUEBEC

Traced from R. C. A. F. Air Photographs, with Land Subdivisions in Range 6, Hincks Township, including The Wallingford-Gauthier Property, compiled from Plan C 453 / 1942 Service des Mines, Quebec.

1000' 0 1000' 2000' 3000' 4000' 5000'

Scale in feet

Trend lines taken from photographs; at some places known, and elsewhere inferred, to correspond to the strike of foliation in the gneisses .....

Lineaments, taken from air photographs, inferred trace of structural breaks .....

Glacial striae .....

Mineral occurrences:
- *Hematite* ..... H
- *Pyrite* ..... Py
- *Pyrrhotite* ..... Pyrr

Hematite Deposit, Hincks Township, Gatineau County, Quebec

INTRODUCTION

On November 4 and 5, 1943, the writer, under the guidance of Mr. George O. Wallingford, examined a deposit of hematite on lots 1 to 4, rge. VI, Hincks tp., on the east side of Heney or Little Whitefish Lake, Quebec. The locality is accessible from Kazabazua station on the Canadian Pacific Railway by a road leading 8 miles easterly to the village of Lake St. Mary, thence by a road 7 miles northeasterly to its terminus at a wharf on the Lemay farm, and thence by boat 1¾ miles north to lot 1, rge. VI, Hincks tp. (See Figure 1).

HISTORY

In 1890, after the area had been lumbered over, a forest fire swept through it, and at that time it is reported that Mr. Blanchette, a local resident, observed dark brown boulders on the hillside on lot 1, rge. VI, Hincks tp. In 1917 these boulders were brought to the attention of Mr. Louis Gauthier, who was then living in that vicinity. In 1940, Mr. Gauthier showed specimens taken from these boulders to Mr. George O. Wallingford of Timmins, Ontario, who identified them as limonite and brown hematite. He interested Mr. John Knox of Timmins in the occurrence, and the latter, under an agreement with Messrs. Wallingford and Gauthier, took up ten mining claims in 1941 and had an examination made by Mr. Wm. Murdoch of Timmins.

Mr. Murdoch reported that the hematite as then observed was in detached boulders. Mr. Wallingford examined the locality late in 1941 and concluded that the float ore was sufficiently extensive to warrant prospecting. In the spring of 1942, the title to the ten claims having been transferred to Messrs. Wallingford and Gauthier, the latter, under Mr. Wallingford's instructions, put in trenches, aggregating about 350 feet in length, exposing hematite in place within the area where abundant float had been found.

In July 1942 the original ten claims were divided, and four, i.e., lots 1, N. and S. halves, and lots 2 and 3, on range VI, were taken by Geo. O. Wallingford and Louis Gauthier (these embrace all of the hematite deposit so far as now known) and the other six were taken by Louis Gauthier and associates (See Figure 1).

GENERAL CHARACTER OF THE COUNTRY

Little Whitefish Lake is a beautiful expanse of clear, blue water, 6 miles long and about 1 mile wide, with bays and islands. At places, rocky cliffs and steep slopes rise as much as 400 feet from the lake, and between the hills there are drift-covered lowlands, margined, adjacent to the lake, by sandy beaches. The lake drains south to

Gatineau River, about 4 miles distant.

In the vicinity of the hematite deposit there are rocky ridges trending north and south that attain a height of about 300 feet above Little Whitefish Lake. Between two ridges and lying on the east side of the one adjacent to the lake shore there is a drift-covered, steep slope that rises to the southeast from the south side of the bay that is crossed by the north boundary of Hincks township. It is on this soil-covered, forested slope that hematite boulders were first observed, and on which the deposit in place has been revealed.

GENERAL GEOLOGY

The area is underlain by consolidated rocks of Archaean age. For purposes of general mapping and description, two composite groups, as shown on Geological Survey map No. 122, by R.W. Ells, are recognized. One, referred to as "crystalline limestone", consists of crystalline limestone with minor amounts of intimately intermixed gneisses and pegmatites; a second, mapped as "gneisses, etc.", consists of banded gneisses, ranging in composition from granitic to amphibolitic types, locally garnetiferous; pegmatitic intrusions; and minor amounts of crystalline limestone and other metamorphic rocks.

The area along the east side of Little Whitefish Lake, including the site of the hematite occurrences, is underlain by a north-south trending zone, about a mile wide, composed of a complex of rocks in which gneisses predominate. This zone is adjoined on both the east and west by areas in which crystalline limestone predominates.

The regional foliation, as observed in outcrops near the lake and elsewhere inferred from trend lines on vertical air photographs, strikes in a general northerly direction, with local curves and discontinuities. Lineaments, observed in the field and traceable for considerable distances on air photographs, at most places trend across the foliation and correspond in position to narrow zones in which discontinuities in foliation occur (See Figure 1).

In outcrops near the shore, within distances ranging between a few hundred feet and 1½ miles from the hematite occurrence, there are exposures up to a few yards wide and a hundred feet long of crystalline limestone, finely banded, folded and contorted; these masses are adjoined, and in some cases surrounded, by banded gneisses in which there appears to be a regional foliation striking north and south and dipping easterly at angles that vary from place to place between 20 and 80 degrees. Both the crystalline limestone and the gneisses are traversed by massive pegmatites in the form of lenses and dykes that at some places cut across the foliated structures and at other places are parallel to them.

Some of the common rocks in the complex contain local, small segregations of iron minerals; for example, the crystalline limestone on an island 1½ miles northerly from the hematite occurrences contains disseminated grains of pyrrhotite; and in the gneisses, exposed about ½ mile

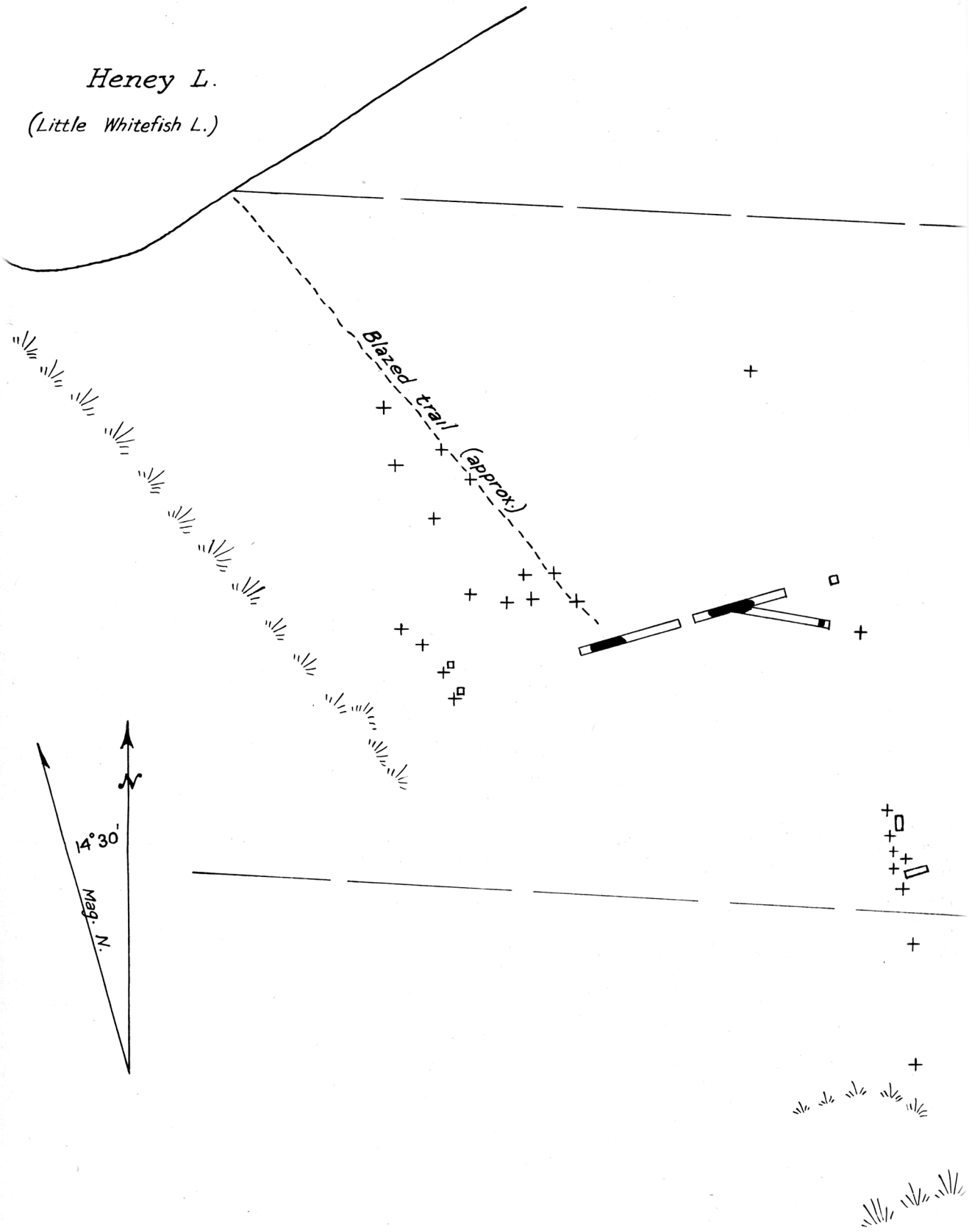


Figure 2: Sketch Map Showing Distribution of Brown Hematite on WALLINGFORD - GAUTHIER PROPERTY Lot 1, Range 6, Hincks Township, Gatineau County, Quebec

Exposed in trenches

Exposed in Float

Scale: 1 inch to 100 feet

100' 0 100'

northeasterly from the hematite occurrences, pyrite occurs in hornblende-rich segregations a few feet wide and several yards long.

The only exposure of rock observed that was iron-bearing, that was distinctively different from rocks commonly found in the complex of Archaean rocks of this region, and that appears to be related in lithological character to the hematite concentration, is in a trench about 200 feet south-southeast from the most easterly hematite exposure. The trench is 20 feet long in a direction north 68 degrees east, 5 feet wide, and in it rock is exposed to a depth of 4 feet. The rock, a foliated, kaolinized granite-gneiss, appears to be invaded by a medium- to coarse-grained, hydrothermally altered, massive pegmatite consisting of quartz, microcline, and kaolin; and this pale buff and white rock is traversed by two tabular bodies, each about 4 feet wide and from 1 to 4 feet apart, which converge toward the northwest and are composed of the altered pegmatite replaced in varying degrees with goethite. The quartz grains and the granular texture of the pegmatite are visible and apparently continuous across the sharply defined, though minutely irregular, contact between the white, kaolinized alteration product and the intimately associated, brown, iron-rich alteration product. The structure is complex. The western border of the iron-rich rock is apparently parallel to the foliation in the adjacent gneiss, which strikes north 18 degrees west and dips 25 degrees easterly; the northeasterly border of the iron-rich rock is apparently almost parallel with the foliated rock adjacent that strikes north 75 degrees west and dips 45 degrees northeasterly. The exposure is not sufficiently extensive to permit of an interpretation of the structure. The pegmatite may be accordant to a truncated pitching synclinal structure that may be inferred from foliation in the gneiss, or it may cut across this.

The consolidated rocks are overlain at the surface by an irregular mantle of till, and around the shores of the lake, in lowlands and terraces rising as much as 20 feet above lake-level, there are lacustrine deposits of sand and clay lying on the boulder clay and the bedrock.

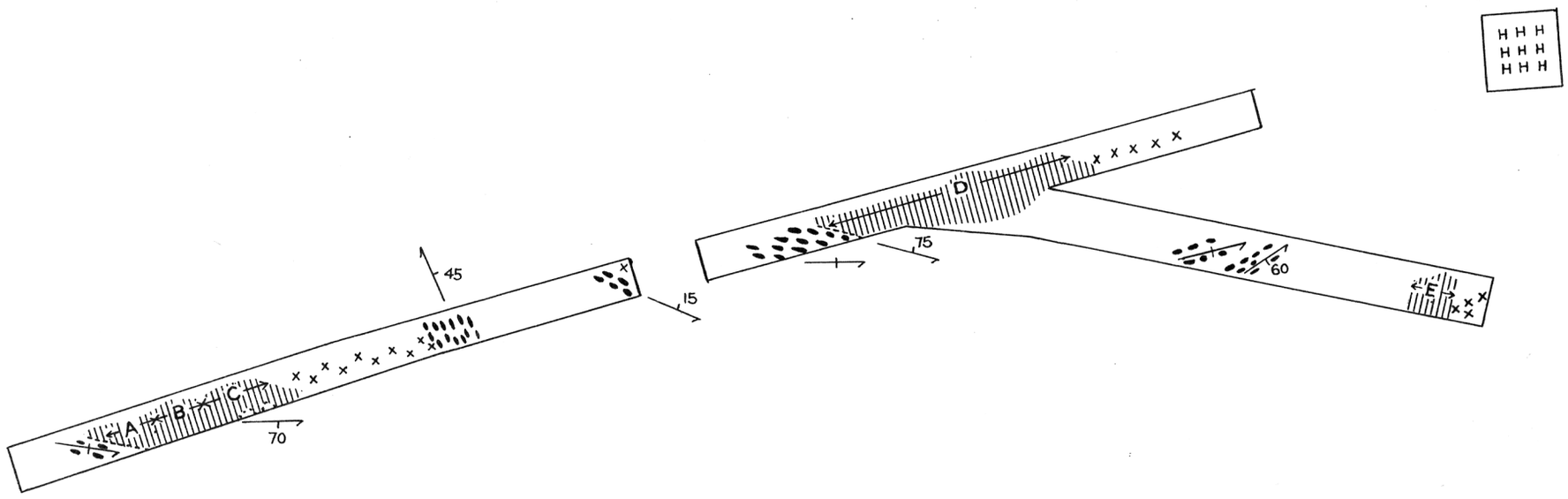
Glacial striae on the rocks record the advance of an ice-sheet from a direction north 15 degrees west.

HEMATITE

Information regarding the occurrence of hematite on lot 1, rge. VI, Hincks tp., was obtainable, originally, from float, or glacially transported boulders, naturally exposed on a surface of till; since 1941 pits and trenches have revealed deposits in place at the same locality.

Float

Boulders of hematite, brown and red, occur irregularly distributed over an area about 600 feet long northwest and southeast, by 300 feet wide, on a forested, drift-covered slope that rises inland southeast from a sand beach on Little Whitefish Lake, and between elevations of 30 feet and 150 feet above the lake (<u>See</u> Figure 2).



LEGEND

BROWN HEMATITE

Float, one or more boulders at each locality marked

Showings in slumped till, possibly in place

Reported occurrence in slumped pit, 14 ft. deep

Exposures in place

PEGMATITE

Replaced in part by brown hematite

PEGMATITE AND GNEISS

Kaolinized

Foliation inclined

A, B, C, D, E. Localities sampled for analyses

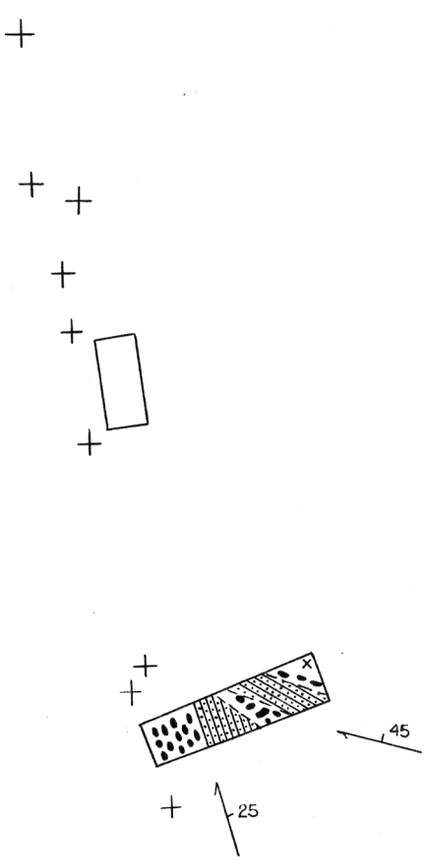


Figure 3: Geological Sketch Map of Surface Workings on WALLINGFORD-GAUTHIER PROPERTY Lot 1, Range 6, Hincks Township, Gatineau County, Quebec

Scale: 1 inch to 20 feet

20′ 0 20′ 40′

Geological Survey, 1944

The boulders, as observed, range from 6 inches to 4 feet in diameter and are subangular. They consist chiefly of hard, massive, brown hematite, with at most places a porous texture due to a system of tiny, vuggy cavities of irregular shape or a system of parallel concentric shrinkage fissures. Some of the boulders are of hard, massive, red hematite. Others show in varying amount one or more of the following minerals associated with the hematite: altered phlogopite, graphite, quartz, and kaolin.

None of the boulders shows a bedded structure; some, however, contain streaks and bands in which there are varying proportions of the mineral constituents or minor textural differences in the hematite. Some of the boulders resemble closely boulders of brown hematite found at Steeprock Lake, Ontario.

Hematite in Place

Hematite deposits, in place, have been revealed in trenches: one, 400 feet southeast of the sand beach where the north boundary of the south half of lot 1, rge. VI, Hincks tp., reaches the shore, is about 5 feet wide and 5 feet deep and extends east-northeasterly for 78 feet; a second trench, 8 feet beyond, continues with similar dimensions in the same direction for 70 feet; and a third, branching about midway from the second, extends east-southeasterly for 65 feet (See Figure 3).

Between 30 and 40 feet east of the east end of the second trench, there is a caved pit said to have been sunk 14 feet through boulder clay to bedrock. It is reported that a hematite deposit was exposed in the bottom of this pit. Blocks of the material, similar to the hematite float and to material exposed in place about 25 feet to the south, were observed on the dump.

In the western, first-mentioned trench, between 12 and 32 feet from its west end, a body of brown hematite, 20 feet long and 5 feet wide, has been exposed to a maximum depth of 5 feet. Adjacent to and under the hematite, about 12 feet from the west end of the trench, the country rock as exposed is fine-grained mica gneiss showing foliation curving within a few feet, and becoming steeper at depth; at a depth of 3 feet it strikes east and west and dips 60 degrees north. In the vicinity of the contact the mica gneiss is friable, and it gives place to a zone about 6 inches wide of buff-coloured paint rock. Adjacent to this, in a zone paralleling the foliation of the gneiss and kaolinized gneiss or paint rock, is an irregular zone with numerous minor projecting prominences, averaging 3 inches wide, of pale brown, dense rock, rich in iron oxide; this is adjoined by a zone, averaging 6 inches wide, of massive red hematite in which there are grains of quartz and mica clustered in small, irregular areas and possibly representing incompletely replaced inclusions of the country rock; the red hematite passes with an abrupt transition into the adjoining, massive, hard, dark brown goethite, or brown hematite, continuously exposed for 20 feet along the trench. Within the brown hematite there is no well defined structure; there are, however, at places grains of kaolin, scales of phlogopite, and, rarely, graphite and small vuggy cavities, each of these varying independently in their distribution, and at places traceable for at least a few inches in a linear structure. At places there are

well developed, widely spaced joints. The several minor structures in the rock vary from place to place in such a manner that no generalization that might be regarded as a clue to structure of the mass remote from its contact was made.

On the southern side of the trench, between 28 and 32 feet from its west end, a contact between the brown hematite and kaolinized gneiss is exposed. The foliation in the latter strikes east and west and dips 70 degrees toward the south; the hematite contact is irregular, with minor projections into the gneiss. The total width of the kaolinized gneiss exposed is only a few inches, and it is not known whether this is a narrow inclusion held within the hematite deposit or the wall of the deposit.

Representative samples were taken across the brown hematite body, by hammer and moil: A, for 6 feet; B, for 6 feet; and C, for 8 feet; measured along the trench. In these three adjacent sections minor differences in the colours of the hematite, the nature and distribution of the associated minerals, and the vuggy cavities were observed.

The trench continues for about 46 feet easterly from the hematite exposure. In the first 20 feet some slumped till made it difficult to determine whether the several showings of hematite are boulders or a continuation of the deposit in place. Between 20 and 26 feet there was an exposure of kaolinized granite-gneiss striking north-northwest and dipping 45 degrees toward the northeast. The trench floor toward the east was overspread with slumped till. At the east end of the trench there is kaolinized granite-gneiss cut by veins, or small, platy, replacement bodies, of goethite.

In the western part of the second trench there is kaolinized granite-gneiss striking east and west and dipping vertically. About 15 feet east of the west end of the trench a contact between the gneiss, which here contains narrow bands of crystalline limestone carrying graphite scales, and a mass of brown hematite is exposed striking east-southeast and dipping 75 degrees northeasterly. This mass of brown hematite, the largest revealed in this early exploration, is continuously exposed for a length, along the trench, of 30 feet, with a width of 7 feet and a depth of 7 feet.

The greater part of this mass consists of massive, hard, brown goethite. In it there are seams of red hematite, minor amounts of phlogopite or sericite, in disseminated flakes, and kaolin in vuggy cavities. At places there are nodular growths up to a few inches in diameter of dense, hard, crystalline goethite in a softer, mica-bearing phase of the rock.

A representative sample, D, was taken across the 30 feet exposed along the trench.

Slumped till obscured the bottom of the trench east of this occurrence. Projecting masses of hematite were observed, but it was not readily determinable whether they were in place or boulders of float ore, which are common in this vicinity.

At the eastern end of the third trench, which branches east-southeasterly from the second trench, there is a prominent exposure, about 5 feet in three dimensions, consisting chiefly of massive, dense, hard goethite. A representative sample, E, 5 feet wide, was taken across this deposit. Locally the rock is porous with numerous vuggy cavities, commonly 1/20 to ¼ inch in diameter; some contain kaolin, most are empty. A platy zone, about 4 inches wide, of massive, hard, red hematite was observed traversing the goethite.

The minor textural and mineralogical differences in the rock show at places a linear character, suggesting that the strike of the deposit is north-northeast. It is considered possible that the hematite reported in a 14-foot pit lying 30 feet north-northeast of this exposure is in a continuation of this deposit.

In the third trench the hematite bodies from which samples D and E were taken are about 45 feet apart, the intervening ground being for the most part drift-covered. Midway, however, in the trench, there are small exposures of kaolinized granite-gneiss, showing curving foliation and striking east-northeast and dipping steeply toward the south.

Mineral Composition

Mineralogical examination was made by E. Poitevin, of the Mineralogical Section of the Geological Survey, of a specimen of material such as makes up a considerable part of the brown hematite deposit. He reports that it consists mainly of an isomorphous intergrowth of limonite and goethite carrying some altered phlogopite mica and a little graphite. An analysis by R.J.C. Fabry of the Geological Survey, on what appears to be pure iron ore gave: Fe_2O_3, 83.66 per cent and H_2O, 11.86 per cent, for a total of 95.52 per cent. The difference, 4.48 per cent, consists mainly of mica flakes and a little graphite.

Red hematite, possibly turgite, and crystalline brown goethite occur in relatively small amounts, associated with the goethite-limonite intergrowths.

No pyrite nor other sulphide mineral was observed in or adjacent to the hematite deposits.

Analyses

Chemical analyses of the samples A, B, C, D, and E, above referred to, were made by J.A. Fournier, Bureau of Mines, Ottawa, with the following results:

P.M. Lab No. 6829 — Analyses and L.O.I. (on dry basis)

Lab No.	Sample
9393	A
9394	" B
9395	" C
9396	" D
9397	" E

		9393	9394	9395	9396	9397
	Fe_2O_3	80.67	68.53	72.62	77.64	78.29
	SiO_2	5.16	13.31	9.82	6.92	4.27
	Al_2O_3	0.69	2.00	0.64	0.63	2.46
	S	None detected	None detected	None detected	None detected	None detected
	P_2O_5	0.62	0.57	0.46	0.64	0.75
	MnO_2	2.83	2.77	2.34	1.47	1.47
	CaO	0.15	0.15	0.21	0.19	0.19
At 100° C.	H_2O	1.06	1.24	1.42	1.01	0.97
Above 100° C.	Loss on ignition	10.23	10.23	9.09	10.42	10.52

Origin

The hematite deposits meet the country rock in the manner characteristic of replacement deposits; at places beyond the main concentrations the hematite has permeated and partly replaced country rock that retains its original internal structure, and within and around the margins of the concentrations of hematite there are relics of inclusions of country rock partly replaced. In the greater part of the deposits the replacement appears to have been so nearly complete that there is no trace of host rock structures or textures and only minor amounts of minerals, such as mica and kaolin, that are common in the altered host rock.

The hematite deposit consists chiefly of goethite with which there is intimately associated limonite and red hematite. These ferric oxide minerals with different degrees of hydration are believed to have been deposited

at different temperatures, other factors being equal. Limonite is regarded as a mineral usually deposited at low temperatures, goethite at higher temperatures, and hematite from yet hotter solutions. Here, as at Steeprock Lake, where a similar association is encountered, it is inferred that the mineralizing solutions were hydrothermal. Variations in the temperature of such solutions, as recorded by the minerals at any given point in the deposit, are explainable as due to differences in distance that, with the passing of time, the upsurging solutions migrated through the overlying host rock from their advancing igneous source, and to differences associated with the waning of igneous activity. The vuggy cavities in the hard hematite are attributed to vapours, principally steam, from the mineralizing solutions, trapped in hematite as it was deposited. Alternative theories, such as have been advanced for the origin of brown hematite deposits, by the oxidizing and leaching action of meteoric waters, as at Helen mine and Steeprock Lake, are not satisfactory in the case of the deposits in Hincks township because of the intimacy of association at the surface, and the same depth below the surface, of the brown and red hematites, and the lack of any trace of associated deposits that could have been altered by surface waters to hematite.

The absence of deposits of iron sulphides and carbonates in the vicinity of the hematite deposits and the lack of any indication that the hematite has been derived locally from any pre-existing iron deposit lead to the conclusion that it is a primary deposit.

The hematite deposit in Hincks township is interpreted as a primary, hydrothermal replacement deposit.

Age

The hematite deposit is the youngest consolidated rock in the complex in which it occurs. All the rocks of the complex are regarded as Precambrian, and as in this region no satisfactory basis has yet been found for subdividing the Archaean and Proterozoic groups, it is customary to assign them to the Archaean.

The hematite deposit is intimately associated in place with, and is commonly bordered by, a kaolin deposit or kaolin-bearing paint rock. This is regarded by the writer (in harmony with the conclusions reached by H. Rosler, as described in "Mineral Deposits", by W. Lindgren) as a pneumatolitic or hydrothermal alteration product. Both the hematite and kaolin deposits can be observed to be represented in localized channels within a pegmatite intrusion. It is considered probable that these associated rocks are genetically related and that they were emplaced during the same geological period.

ECONOMIC POSSIBILITIES

The brown hematite deposit, as revealed in preliminary exploration trenches, has the grade of a commercially valuable iron ore. It is high in iron, low in silica, manganiferous, and free from sulphur. The phosphorus content, though somewhat

higher than desirable, is lower than in the Wabana ores used in the blast furnaces at Sydney, Nova Scotia. The ore material has a desirable structure, being, for the most part, hard and porous.

The quality of the float ore that occurs over a more extensive area than the exposures is apparently of similar grade to the material found in place. The float ore that lies to the north of the exposures was undoubtedly derived from deposits that were exposed to glacial erosion and that have not as yet been found in place.

In three trenches with a total length of about 210 feet, sunk through drift, there are three occurrences in which the potential ore "in sight" is estimated to be somewhat more than 200 tons. One may reasonably infer, from the deep-seated origin of the deposit, that it extends to considerable depth, possibly measurable in hundreds of feet, along the principal conduits traversed by the iron-depositing solutions. The distribution of the float ore, as now known over an area of 300 feet by 600 feet indicates that the deposits may be of considerable extent; and, as it is apparent that transportation of the boulders was by an ice-sheet advancing from a north-northwesterly direction, those boulders of float ore found in an area 250 feet by 200 feet lying to the north and west of the exposures were derived from a deposit or deposits that have not been revealed in place.

The writer interprets the scanty data available on the structure of the deposits as indicating that they occur as a group of tabular bodies traversing a complex of intricately folded, foliated, metamorphic rocks and pegmatitic intrusions.

It is possible that a tonnage of ore sufficiently large to warrant commercial development may occur in the area as yet unexplored, in the vicinity of the known deposits.

The nearest railway shipping point is Kazabazua station on the Canadian Pacific Railway, which is about 8 miles southwesterly from the deposit. Freight rates from that point, quoted in April, 1944, applicable to large shipments of iron ore, are: to Montreal, $1.70; to Three Rivers, $2.00; and to Sault Ste. Marie, Ontario, $3.30 per gross ton.

RECOMMENDATION

The hematite occurrence in Hincks township warrants further exploration in that immediate vicinity in the hope of revealing a commercially valuable deposit of iron ore.

Geophysical tests, designed to show the electrical conductivity of the rocks, would be likely to give information of value for determining the distribution underground of the hematite concentrations. There are no known magnetic rocks in or adjacent to the deposits and, consequently, a magnetometer survey would not be recommended.

The areas adjacent to the hematite exposures, and those indicated by a geophysical survey as having similar relatively high conductivities, could be explored by drilling.